LOIN SPECIFICATION

VERSION: 1.1 (Final)

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Amendment History

Change Number	Revision Description	Pages Affected on Respective Version	Revision / Version Number	Date	Approval Reference
1	1st Draft	All	0.1	23.11.2021	
2	2nd Draft – Circulation to BSWG	All	0.2	30.11.2021	
3	3rd Draft – Updated according to Feedback from BSWG	All	0.3	24.12.2021	
4	1st Final – Circulation to BSSG	-	1.0	14.1.2022	
5	Updated according to new DEVB TC(W) requirements	All	1.1	xx.07.2023	

LIST OF ABBREVIATION

Abbreviation	Full Expression
2D	Two Dimensional
3D	Three Dimensional
4D	Four Dimensional (i.e. Three Dimensional with Time)
5D	Five Dimensional (i.e. Three Dimensional with Time and Cost)
AM	Asset Management
AIR	Asset Information Requirements
AIM	Asset Information Model
BEP	BIM Project Execution Plan
BIM	Building Information Modelling / Building Information Model
BIM Manager	BIM Manager (and his team) appointed in the works
CAD	Computer Aid Design
CAT	Category Code for BIM matrix model elements
CDE	Common Data Environment
BIM CDCP	Common Data Collaboration Platform for BIM
CEDD	Civil Engineering and Development Department, HKSAR Government
CIC	Construction Industry Council, Hong Kong
CMMS	Computerized Maintenance Management System
COBie	Construction Operation Building Information Exchange
CSDI	Common Spatial Data Infrastructure
CSWP	CAD Standard for Works Projects
DEVB	Development Bureau, HKSAR Government
EIR	Exchange Information Requirements
GIS	Geographic Information System
IFC	Industry Foundation Classes
LandsD	Lands Department, HKSAR Government
LOD	Level of Development
LOD-G	Level of Graphics
LOD-I	Level of Information
LOIN	Level of Information Need
Project manager	Agency on behalf of the Employer
PIM	Project Information Model (Project BIM Model)
PIR	Project Information Requirements
Service Manager	Agency on behalf of the Employer
QA	Quality Assurance
QC	Quality Control
TC(W)	Technical Circular (Works)
WIP	Work In Progress
VR	Virtual Reality

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Purpose

1.1.1. LOIN is introduced in ISO19650 to communicate the amount of information needed to support the decision-making process of the appointing party. The generic definition of LOD-G and LOD-I may not accurately specify the requirement of each 3D Object elements and introduce miscommunication.

1.1.2. CEDD has identified the common object libraries required in the modelling manual. This Specification further communicate the detail geometrical and informational requirement of each object libraries to support the BIM implementation. The BIM Manager shall propose additional objects and their LOIN according to the particular specification of the works if necessary.

1.1.3. This document should be always read with the BIM Modelling Manual, the particular specifications / design brief, BEP, and the asset information requirements of the maintenance parties. This LOIN definition will not override the specific requirements in the works.

1.1.4. The BIM Manager shall refer to the deliverables and minimum requirement of LOIN in the particular specification of the works to propose the exact LOIN of each objects / additional objects in the BIM Project Execution Plan (BEP) for the approval of the Employer's Agent / *Project Manager*. The BIM Manager shall refer to the BEP template of CEDD for further details.

1.1.5. This Specification layout the requirements of the Project Information Model (PIM) in CEDD. The BIM Manager shall review the requirement from maintenance parties in preparation of Asset Information Model (AIM), which may require specific attribute fields or different definition of object unity.

1.2. Structure

1.2.1. Section 2 recaps the LOIN definition used in CEDD.

1.2.2. Section 3 -5 specified the LOIN of common 3D Object elements used in CEDD according to CEDD's matter federation grouping.

2. LOIN DEFINITION

2.1. General

2.1.1. LOIN defines the information required to support each decision-making point throughout the works. LOIN includes geometrical (LOD-G), informational (LOD-I), documentations (DOC), which should be specified in the particular specification of the works and agreed in the BEP.

2.1.2. This generic definition of LOD-G and LOD-I applies to the new 3D Object elements that are not covered in this LOIN specification during the communication of requirement.

2.2. LOD-G / LOD-Graphics

2.2.1. LOD-G refers to the graphical representation which deals with geometric representation, symbology, and visualisation.

2.2.2. LOD-G 250 is introduced in CEDD for the purpose of modelling existing 3D Object elements. Some parts of a 3D Object element may not be accurately modelled in 3-Dimensions due to its as-built situation (such as underground portion of a structure). LOD-G is 250 is used when the overall size and physical properties of the entire 3D Object element is unable to be captured with the onsite surveying methodologies. The definition of LOD-G is listed below:

LOD-G	Description
100	The model element is graphically represented within the model by a 2D symbol or generic representation or rough 3D shape. It may be a 2D graphical symbol, centre lines, 3D polygons, or simple cuboid to indicate the overall size and approximated location of an object.
200	The model element is graphically represented within the model as a generic system, object or assembly with approximate quantities, assumed size, shape, location, and orientation. The assumed spaces required for access and maintenance shall be indicated. It is a generic/typical 3D object with most salient geometry being model to indicate the overall size, typical components and approximated location of an object.
250	The model element is graphically represented within the model as a generic system, object, or assembly. It is modelled with location and orientation derived from site survey information with approximate geometry detail (type, size, shape and dimensions).
300	The model element is graphically represented within the model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation. The model shall include details of the spaces required for handling installation, operation and maintenance, and the interface details for checking and coordinating with other models / objects. It is a specific 3D object with most salient geometry being model to indicate the overall size of all visible components and exact location of the object.
400	The model element is graphically represented within the model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation with detailing for fabrication, assembly, and installation. It is a specific 3D object with most salient geometry and connection details being model to support the construction and fabrication need of all visible components and exact location of the object.
500	Not used.

LOD-G	Description
	Section 2.6.7 and 2.6.8 of CIC BIM Standards - General: Ver. 2.1, 2021 Edition for details.

2.3. LOD-I / LOD-Information

2.3.1. LOD-I refers to the attribute information required to facilitate the modelling, production, analysis, sharing and collaboration of BIM models and deliverables.

2.3.2. In addition to the attribute required to generate deliverables for the works, the BIM Manager shall refer to the below table from the BIM Harmonisation Guidelines as the generic reference to create the attributes of different LOD-I.

No.	Type	Attribute Name	Description	LOD-Information					Input Format
				100	200	300	400	500	
1	Project Information	Organisation Name	Client name (per agreement/ contract)	M	M	M	M	M	Alphanumeric
		Project Issue Date	Project Commencement date	M	M	M	M	M	MMM YYYY (eg. Nov 2014)
		Project Issue Date	The street address of the project	M	M	M	M	M	Alphanumeric
		Project Name	The project name as shown on the drawing sheet's title block	M	M	M	M	M	Alphanumeric
		Project Number	he project number as shown on the drawing sheet's title block	M	M	M	M	M	Alphanumeric
2	General Properties	CAT Code	Departmental category	R	R	R	R	R	Alphanumeric
		SUBCAT CODE	Sub CAT Code	R	R	R	R	R	Alphanumeric
		Locations	Location (e.g. district code for outdoor object)		R	R	R	R	Alphanumeric
		Departmental Unique ID (e.g. PWD Code in Port and Marine Services)	The unique ID for departmental information management		R	R	R	R	Alphanumeric
		LOD-G	Definition value	R	R	R	R	R	Alphanumeric
		LOD-I	Definition value	R	R	R	R	R	Alphanumeric
3	Design Properties	Material	Singular material or all materials pertaining to the assembly		R	R	R	R	Alphanumeric
		Material Grade	Material grade (e.g. concrete grade, steel grade)		R	R	R	R	Alphanumeric
		Design Capacity	Design capacity		R	R	R	R	Alphanumeric
		Number	Room Number				R	R	Alphanumeric

No.	Type	Attribute Name	Description	LOD-Information					Input Format
				100	200	300	400	500	
		Name	Room Name				R	R	Alphanumeric
4	Classification Properties	OmniClassCode	OmniClass code			R	R	R	Alphanumeric
		OmniClassTitle	OmniClass title			R	R	R	Alphanumeric
		OmniClassVersion	OmniClass version			R	R	R	Alphanumeric
5	Manufacturer's Equipment Properties	Brand Name	Brand name				R	R	Alphanumeric
		Manufacturer Name	Manufacturer name				R	R	Alphanumeric
		Model Number of element / equipment	Model number				R	R	Alphanumeric
		Equipment Capacity	Equipment capacity				R	R	Alphanumeric
		Asset ID	Asset ID				R	R	Alphanumeric
		Contract Number of the Equipment	The equipment's contract number				R	R	Alphanumeric
6	Condition Properties	Certified Completion Date	Certified completion date				R	R	MMM YYYY (eg. Nov 2014)
		Handover Date	Handover date				R	R	MMM YYYY (eg. Nov 2014)
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)

R: Required

2.3.3. The general properties and classification properties are mandatory attributes for all PIM and AIM submitted to CEDD. Yet, some attributes may not be available in a particular object by nature. The BIM Manager shall propose and agree the content and format of the attributes of each disciplinary model in the BEP and agree with the Employer's Agent / *Project Manager*.

2.3.4. For all Asset Information Model submitted to Port and Marine Services, the BIM Manager shall refer to the Asset Information Requirement, Modelling Guideline and Standards of PWD (AIR of the PWD) to include the additional attributes required for the PWD's asset. The disciplinary models of the Ports and Marine Services are listed in the section 3.1 of the BIM Modelling Manual of CEDD.

2.3.5. For all PIM and as-built model submitted to Geotechnical Engineering Services, the BIM Manager shall refer to the BIM project execution plan template of GEO (BEP of GEO) to include the additional attributes required for the GEO's assets. The disciplinary models of the Geotechnical and Engineering Services are listed in the section 3.1 of the BIM Modelling Manual of CEDD.

2.3.6. The BIM Manager shall refer to the AIR or asset template from the maintenance departments to create the Asset Information Model / As-built Model submission. If an asset template is not available from the maintenance departments, the BIM Manager shall refer to LOD-I 400 to propose the asset template in the BEP.

2.3.7. All attribute fields should be filled in English Language, unless specified by CEDD

2.3.8. The BIM Manager shall refer to the Annex A of the BIM Modelling of CEDD for the technical requirement in the creation of attributes.

2.3.9. LOD-Doc / LOD-Document

2.3.9.1. LOD-Document refers to the manuals, specification, technical documents, test reports, drawings, etc required to develop a specific deliverable in the works to support decision making. A typical example of LOD-DOC includes the requirement maintenance manual in the as-built/asset information model to support asset maintenance purpose.

2.3.9.2. The BIM Manager shall refer to the particular specification, BEP and asset information requirement of the project office and maintenance parties in preparing the documents required in the PIM, As-built BIM model and AIM.

2.3.9.3. For all PIM and as-built model submitted to Geotechnical Engineering Services, the BIM Manager shall refer to the BIM project execution plan template of GEO (BEP of GEO) to include the documents required for the GEO's assets. The disciplinary models of the Geotechnical and Engineering Services are listed in the section 3.1 of the BIM Modelling Manual of CEDD.

3. BUILDING WORKS MODEL

3.1. Disciplinary Models

3.1.1. List of disciplinary models

3.1.1.1. Building Works Model include the 4 disciplinary models:

PROJECT MODEL	1ST LEVEL FEDERATION	2ND LEVEL FEDERATION (DISCIPLINARY MODELS)	DESCRIPTION
PROJECT INFORMATION MODEL	**Proposed Building Model(s)**	**Architectural Model**	Architectural elements of each building / plant room /etc in the service
		Structural Model	Structure elements of each building / plant room /etc in the service
		Building Services Model	MEP elements of each building / plant room /etc in the service

3.2. Architectural Model

3.2.1. List of Common Objects Elements

3.2.1.1. The following object elements are classified under the Architectural Model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Access Ladders and Catwalks	ALA	CAT	23-17 23 15 13	Vertical Ladders
2	Architectural Wall	TWL	Multiple*	23-15 13 19	Wall Panels
3	Blue Colour Paint	MAO[1]	ABP	23-15 21 11 13	Textured Paints
4	Ceiling	CEL	___	23-15 13 21	Ceiling Panels
5	Curtain wall/ glass wall	CTP	Multiple*	23-13 33 19 11	Cladding and Curtainwall Panels
6	Door/Entrance	ADO	Multiple*	23-13 33 21	Entrances
7	Elevator / Lift Shaft space	MCO	SHF	23-19 29 11 11 11	Lift Shaft Components
8	Finishes	DTL	FNH	23-13 00 00[2]	Structural and Exterior Enclosure Products
9	Floor, Slab	TLA	Multiple*	23-15 17 13	Floor covering strips, Tiles, Blocks and slabs
10	Furniture	FUR	Multiple*	23-21 00 00	Furnishing, Fixture and Equipment Products

[1] [Note: To facilitate the review purpose, the codes not available in the BIM harmonisation guideline are highlighted in Yellow]
[2] The BIM Manager should further detail the Omniclass classification to Level 3 according to the actual type of finishes used on site

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
11	Gate	AGT	Multiple*	23-21 35 21	Security and Vault Equipment and Furnishings
12	Louvers	WDW	LVR	23-17 21 11 15	Exterior Louvers and Grilles
13	Mass concrete fill	SFD	OTR	23-13 15 11	Concretes
14	Non-Slip Yellow Nosing	MAO	AYN	23-15 17 11 15 15	Slip Resistant floor Treatment
15	Precast Facade	TWL	TFC	23-13 33 19	Precast Concrete Façade
16	Railing, handrail	FRA	Multiple*	23-17 25 11	Guardrails
17	Ramp	TPD	ROS	23-17 23 11	Ramps
18	Roof / Architectural Roof	Multiple*	ROO	23-13 39 11	Exterior Roof Panels
19	Roof Gutter		AGT	23-13 41 33	Roof Gutters
20	Skylight	WDW	SKY	23-17 17 00	Skylights
21	Stairs	TTE	___	23-17 23 17	Stairs
22	Tactile Warning strip	FWS	Multiple*	23-11 21 13 15	Detectable Warning Surface for Roadways
23	Window	WDW	Multiple*	23-17 13 00	Windows

3.2.2. Access Ladders and Catwalks

3.2.2.1. Cat ladder is often used to describe a ladder that is used for working on a sloping roof with a hook at one end and load spreading pads. These kinds of ladder are most commonly designed for use as access steps for maintenance to the roof of a building.

3.2.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Steps railings, posts, supports, post, sign plate, foundation, cat ladder, chord and bracing.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	Object height must be limited by designed max height
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.2.3. Architectural/Non-structural Wall

3.2.3.1. An architectural wall is 3D Object element used to divide or enclose the building to form the periphery of a room or a building. An architectural wall does not support floor or roof load.

3.2.3.2. The finish should be separated from the wall 3D Object elements at LOD-G 400.

3.2.3.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness (including the finish)	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information, including wall finish detail including tiling, stone, cladding and screed. Openings modelled according to the requirements of the building services builders	Modelled from Joint to Join from floor slab to soffit of beam or slab above	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Schedules to be dynamically updated from the size of the Openings

3.2.4. Blue Colour Paint

3.2.4.1. Blue Colour paint is the special painted finish used in ports and marine facilities for identification and navigation.

3.2.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Object with approximated shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located at typical depth of system	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact shape	Exact nominal dimension and approximate thickness	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	3D Object elements are modelled to support offsite fabrication and installation

3.2.4.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.5. Ceiling

3.2.5.1. A Ceiling is the overhead surface or surfaces covering a room, and the underside of a floor or a roof. Ceilings are often used to hide floor and roof construction.

3.2.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with typical depth of suspended ceiling system	Assumed / Typical size of component (s)	Object insertion point(s) approximately located at typical depth of system	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Ceiling thickness, framing and major openings	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Construction details objects in additional to 300 components, such as Framing, tees, hangers, support structures, ceiling tiles, openings and penetrations	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	3D Object elements are modelled to support offsite fabrication and installation

3.2.6. Curtain Wall/Glass wall

3.2.6.1. A curtain wall is defined as thin, usually aluminium-framed wall, containing in-fills of glass, metal panels, or thin stone. The framing is attached to the building structure and does not carry the floor or roof loads of the building.

3.2.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with typical thickness as a single assembly	Assumed / Typical size of component	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Mullions, transoms, insulations, air space, interior/exterior skins, shading devices, windows, louvers, doors and major openings on the curtain wall	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Construction details objects in additional to 300 components, such as Façade brackets, embeds, fixings, cast-ins, secondary sub-frames	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	3D Object elements are modelled to support offsite fabrication and installation

3.2.7. Door/Entrance

3.2.7.1. A door is a movable barrier secured in an opening, known as the doorway, through a building wall or partition for the purpose of providing access to the inside of a building or rooms of a building. A door is held in position by doorframes, the members of which are located at the sides and top of the opening or doorway.

3.2.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with size and width	Assumed / Typical size, dimension in terms of location, count and type	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with all components, including Door and Ironmongery (handles, locks, hinges, etc)	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information,	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.8. Elevator/Lift Shaft Space

3.2.8.1. Lift shaft refers to the enclosed space, reinforced by concrete, to support the movement of lifts/elevators.

3.2.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D boundary/region with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape	N/A
300	3D Object element with exact spacing	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	Overall size and shape of each component	N/A
400	3D Object element with specific requirement from the AIR of the maintenance parties	Same as 300	Same as 300	N/A	N/A

3.2.9. Finishes

3.2.9.1. Finishes is used in the final part of the construction or manufacturing process, forming the final surface of an element. They can protect the element from impact, water, frost, corrosion, abrasion, and so on, and/or they can be decorative.

3.2.9.2. The finish should be separated from the parent 3D Object elements at LOD-G 300 or above.

3.2.9.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	N/A	N/A	N/A	N/A	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact shape	Exact nominal dimension of each component	Object insertion point(s) located and aligned exactly as parent 3D Object elements	3D solids blocks rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	Patterns and layouts to be updated with the manufacturer's information

3.2.9.4. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.10. Floor, Slab

3.2.10.1. Floor slab refers to a floor that has been formed using concrete and may form part of the structure of a building.

3.2.10.2. The finish should be separated from the floor/slab at LOD-G 300 or above.

3.2.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.11. Furniture

3.2.11.1. Furniture refers to moveable objects that are used to support human activities in the built environment. It is more widely refer to fitted objects and equipment.

3.2.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with all components and parts according to manufacturer's information	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.12. Gate

3.2.12.1. Gate refers to a hinged barrier that can be used to secure an opening in a wall, fence and hedge.

3.2.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with all components, including Door and Ironmongery (handles, locks, hinges, etc)	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information to support fabrication	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.13. Louvers

3.2.13.1. Louver refers to narrow, sloping slats held in a frame and typically used to cover a vertical opening. They provide screening and can also prevent access, shade from the sun and provide protection against wind and rain.

3.2.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with all components and parts according to manufacturer's information	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.14. Mass concrete fill

3.2.14.1. Mass concrete fill refers to any volume of concrete with dimensions large enough to required that measures be taken to cope with the generation of heat from hydration of cement and attendant volume change to minimize cracking.

3.2.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D polylines	N/A
200	Generic Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.15. Non-slip Yellow Nosing

3.2.15.1. Non-slip yellow nosing is the anti-slip finish applied in the staircase and decking slab of Marine and port facilities.

3.2.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with approximated shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located at typical depth of system	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object with all components and parts	Exact nominal dimension and thickness of all components	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with all components and parts according to manufacturer's information	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.15.3. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.16. Precast Facade

3.2.16.1. Precast façade refers to façade that is prepared, cast and cured off-site. It is usually created in a controlled factory environment, using reusable moulds.

3.2.16.2. The finish should be separated from the parent facade elements at LOD-G 400 or above.

3.2.16.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts with all components, including nominal penetrations and Ironmongery (handles, locks, hinges, etc)	Exact nominal dimension and size of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with all components and parts [including penetrations for major openings, brackets, embeds sub-frame Ironmongery (handles, locks, hinges, etc)] according to manufacturer's information	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.17. Railing, handrail

3.2.17.1. Railing, handrail or guardrails refers to a fence or barrier made of rails to prevent people from falling off.

3.2.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts with all components, including railings, posts and support	Exact nominal dimension, size, length, height, and alignment of each component	Object insertion point(s) located and orientated exactly as nominal alignment and levels.	3D solid block of each component	N/A
400	3D Object element with all components and parts with all components, including railings, posts and support according to the details of the manufacturer's information for fabrication	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.18. Ramp

3.2.18.1. Ramp refers to sloped pathways used inside and outside buildings to provide access between vertical levels.

3.2.18.2. The finish should be separated from the parent ramp 3D Object elements at LOD-G 300 or above.

3.2.18.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.19. Roof / Architectural Roof

3.2.19.1. Roof refers to structure forming the upper covering of a building or other shelter.

3.2.19.2. The finish should be separated from the parent roof 3D Object elements at LOD-G 300 or above.

3.2.19.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with all components and parts, including the reinforcement components	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.19.4. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.20. Roof Gutter

3.2.20.1. A gutter is a pipe or trough along the edge of a roof that carries rainwater away from a building. The purpose of the gutters on a roof is to prevent water damage to a structure or flooding around its foundation. A gutter directs the flow of rainwater away from the house, often into a drain or rain barrel.

3.2.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	N/A	N/A	N/A	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact nominal dimension, alignment, longitudinal fall and invert levels of each section	Object insertion point(s) located and aligned exactly as nominal alignment and locations and invert levels	3D solid block of each component	N/A
400	3D Object element with all components and parts, separated according to the construction sequence	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.20.3. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.21. Skylight

3.2.21.1. Skylight refers to opening build into the roof of a building filled with glass.

3.2.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with all components and parts including frame elements and glazing, and Ironmongery according to the manufacturer's information	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.21.3. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.22. Stairs

3.2.22.1. Stairs refer to a set of steps leading from one floor of a building to another, typically inside the building.

3.2.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with threads, risers and landings	Approximate length, width, dimension and levels	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with threads, risers, and landings to accurately indicate stringers and nosing	Exact nominal length, width, dimension and levels	Object insertion point(s) located and aligned exactly as nominal	3D solid block of each component	N/A
400	3D Object element with threads, risers, and landings to accurately indicate stringers and nosing and support fabrication and installation	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.2.23. Tactile Warning Strip

3.2.23.1. “Tactile warning strip” means a standardized pattern applied to or built onto walking surfaces through the use of tactile hazard warning tiles / blocks to warn persons with visual impairment of certain construction features.

3.2.23.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D object as a single assemble	Assumed/ Approximate dimension	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D object block	Exact nominal length, width, dimension, levels and alignment	Object insertion point(s) located and aligned exactly as nominal	3D solid block of each component	N/A
400	Object block with details to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.2.23.3. For the PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.2.24. Window

3.2.24.1. Window refers to a vented barrier provided in a wall opening to admit light and air into the structure and to give outside view.

3.2.24.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Objects as a single assemble	Assumed / Typical size, dimension in terms of location, count and type	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with ironmongery	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with ironmongery, window frame elements, brackets, embeds, fixing, cast-in, modelled according to the details of the manufacturer's information,	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3. Structural Model

3.3.1. List of Common Objects Elements

3.3.1.1. The following object elements are classified under the Structural Model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Base Plates, Blots, clip angles, fixing etc.	SFM	BRA	23-13 35 19	Rafters, Beams, Joists
2	Beams	TBS	Multiple*	23-13 35 11 13 13	Beams
3	Columns	SCL	Multiple*	23-13 35 11 13 11	Columns
4	Foundation (Pile, pile cap, ground beams & Footings)	SFD	Multiple*	23-13 29 00	Foundations
5	Mass concrete fill	SFD	OTR	23-13 15 11	Concretes
6	Slabs	TLA	Multiple*	23-15 17 13 19	Precast tile and slab flooring
7	Ramp	TPD	ROS	23-17 23 11	Ramps
8	Stairs	TTE	___	23-17 23 17	Stairs
9	Structural Wall	TWL	Multiple*	23-13 35 21	Structural Walls
10	Tank structures	SFD	___	23-27 29 13	Tank Foundation

3.3.1.2. The structure elements of PIU/PWD and GEO are not included in this Model.

3.3.2. Base Plates, Bolts, clip angles, fixing etc.

3.3.2.1. Base plate refers to a plate attached to the bottom of the column, which rests on a foundation or other support. Bolt refers to parts to anchor plates to a foundation or other support. Clip angle refers to a short piece of angle iron for connecting structural parts at angles. Fixing refers to parts that will hold things together or to attach them to the surfaces such as walls, floors, or roof.

3.3.2.2. The base plates, bolts, clip angles, fixing should be separately modelled from the parent steel structural element at LOD-G 400.

3.3.2.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	N/A	N/A	N/A	N/A	N/A
250	N/A	N/A	N/A	N/A	N/A
300	N/A	N/A	N/A	N/A	N/A
400	3D Object elements including base plates, blots, clips, angles, welds, coping, washers and nuts modelled according to the details of the manufacturer's information,	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solids of each component rendered by Material texture according to the finish material	N/A

3.3.3. Beams

3.3.3.1. Beams refer to structural elements that resist loads applied laterally to their axis.

3.3.3.2. The finish should be modelled separately from the Beam 3D Object elements at LOD-G 400.

3.3.3.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element	Exact nominal size and dimension	Object insertion point(s) is located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.3.4. Columns

3.3.4.1. Column refers to vertical structure intended to transfer a compressive load.

3.3.4.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

3.3.4.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3.5. Foundation (Pile, pile cap, ground beams & Footings)

3.3.5.1. Pile foundation refers to a series of columns constructed or inserted into the ground to transmit loads to a lower level of subsoil. Ground beam refers to reinforce concrete beams for supporting walls and joists at or near ground level. Footing refers to foundation unit constructed in brick work, stone masonry or concrete under the base of a wall column for the purpose of distributing the load over a large area.

3.3.5.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

3.3.5.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension, and cut-off depth	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by material texture according to the finish material	N/A

3.3.6. Mass concrete fill

3.3.6.1. Mass concrete fill refers to any volume of concrete with dimensions large enough to required that measures be taken to cope with the generation of heat from hydration of cement and attendant volume change to minimize cracking.

3.3.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3.7. Slab

3.3.7.1. Slab refers concrete structural element. It is used to create flat horizontal surfaces such as floors, roof decks and ceilings.

3.3.7.2. The finish should be separated from the floor/slab at LOD-G 300 or above.

3.3.7.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3.8. Ramp

3.3.8.1. Ramp refers to sloped pathways used inside and outside buildings to provide access between vertical levels.

3.3.8.2. The finish should be separated from the parent ramp 3D Object elements at LOD-G 300 or above.

3.3.8.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3.9. Stairs

3.3.9.1. Stairs refer to a set of steps leading from one floor of a building to another, typically inside the building.

3.3.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	Symbols/2D lines	N/A
200	3D Object with threads, risers, and landings	Approximate length, width, dimension, and levels	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with threads, risers, and landings to accurately indicate stringers and nosing	Exact nominal length, width, dimension and levels	Object insertion point(s) located and aligned exactly as nominal	3D solid block of each component	N/A
400	3D Object element with threads, risers, and landings to accurately indicate stringers and nosing and support fabrication and installation	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.3.10. Structural Wall

3.3.10.1. Structure wall refers to a load bearing wall or a wall that carries load in addition to its own load.

3.3.10.2. The finish should be separated from the wall 3D Object elements at LOD-G 400.

3.3.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness (including the finish)	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including reinforcement, wall finish detail including tiling, stone, cladding and screed. Openings modelled according to the requirements of the building services builders	Modelled from Joint to Join from floor slab to soffit of beam or slab above	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Schedules to be dynamically updated from the size of the Openings

3.3.11. Tank structures

3.3.11.1. Tank structure refers to create a tank-link seal to protect walls against water penetration.

3.3.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and cut-off depth	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4. Building Services Model

3.4.1. List of Common Objects Elements

3.4.1.1. The following object elements are classified under the Building Services Model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	MVAC System				
1a	Exhaust (extract) air duct	BDU	___	23-33 49 13	Ventilation Ducts
1b	Fresh air duct	BDU	___	23-33 49 13	Ventilation Ducts
1c	Return air duct	BDU	___	23-33 49 13	Ventilation Ducts
1d	Supply air duct	BDU	___	23-33 49 13	Ventilation Ducts
1e	Access panel	AAP	___	23-33 49 15	Duct Access Panels
1f	Air handling unit	BAC	___	23-33 25 00	Air Handling Units
1g	Chillers	MCQ	CHR	23-33 21 13	Chillers
1h	Chilled water supply pipe	MCQ	CHL	23-33 00 00	HVAC Specific Products and Equipment
1i	Chilled water return pipe	MCQ	CHL	23-33 00 00	HVAC Specific Products and Equipment
1j	Condensate drainpipe	MPI	PVC	23-33 00 00	HVAC Specific Products and Equipment
1k	Damper	BDA	Multiple*	23-33 29 00	HVAC Dampers
1l	Diffuser, air-boot, air grill, air filter, register	BDI	EXH	23-33 49 11	Ventilation Diffusers
1m	Fan	BFA	Multiple*	23-33 31 19	Fans
1n	Fan Coil Unit	BFC	___	23-33 33 11	Fan Coil Unit
1o	Fire damper	BDA	FIR	23-33 29 23	Fire Dampers
1p	Insulation	PIS	NA	23-33 49 17	Duct Insulation
1q	Primary air unit	BAC	___	23-33 39 00	Air Conditioning Equipment
1r	Silencer	BSI	___	23-33 00 00	HVAC Specific Products and Equipment
1s	Smoke extraction system	MCQ	VCS	23-39 27 11	Firs Fighting Smoke Extractors
1t	Variable control damper	BDA	VOC	23-33 29 37	Volume Control Dampers
1u	Dynamic envelope in MVAC model	DNE	___	23-33 00 00	HVAC Specific Products and Equipment

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
2	Plumbing System				
2a	Flush water piping	PLM	DRN	23-31 35 00	Plumbing Tubing
2b	Fresh water piping (water supplies)	WSD	___	23-31 35 00	Plumbing Tubing
2c	Tap, faucet	PLM	TAP	23-31 11 00	Faucets
2d	Valve	MVA	Multiple*	23-31 00 00	Plumbing Specific Products and Equipment
2e	Dynamic envelope in plumbing & water supply model	DNE	___	23-31 00 00	Plumbing Specific Products and Equipment
3	Drainage and Sewerage				
3a	Floor drain	DTH	ODR	23-31 27 00	Floor Drains
3b	Gully, sealed trapped gully, clean outs and vent	GUL	Multiple*	23-31 27 15	Floor Drains cover
3c	Kitchen waste pipe work including floor drain, open trapped	MPA	Multiple*	23-31 35 00	Plumbing Tubing
3d	Rainwater, storm water pipe, storm drain, drainage downpipe	STP	___	23-13 41 39 19	Siphonic Roof Drains
3e	Rainwater outlet	SNF	___	23-13 41 39 11	Roof Downspouts
3f	Surface channel, slot channel, external drainage	SUP	DSC	23-13 41 39 17	Eavestroughs
3g	Sewerage pipe, foul sewer drains	FWD	CSU	23-27 39 00	Piping
3h	Vent pipe	MPI	PVC	23-27 39 00	Piping
3i	Dynamic envelope in drainage & sewage model	DNE	___	23-31 00 00	Plumbing Specific Products and Equipment
4	Fire Services System				
4a	Fire Alarm Control Panel	BFP	Multiple*	23-29 31 13	Fire Alarm Control Panel
4b	Fire Alarm Audio/ Visual	BFS	Multiple*	23-29 31 19	Combination Audible and Visible Fire Notification Devices
4c	Fire Alarm Devices	ALM	Multiple*	23-29 31 00	Fire Notification Appliances

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
4d	Break glass unit	BFB	___	23-29 29 11	Fire Alarm Pull stations
4e	Fire detection system, heat or smoke detectors	BFD	Multiple*	23-29 29 13	Fire Detectors
4f	Fire hydrant/hose reel system	BFH	___	23-29 25 00	Fire Fighting Equipment
4g	Sprinkler pipe work	SRK	___	23-29 33 00	Fire suppression System Components
4h	Sprinkler head	SRK	___	23-29 33 00	Fire suppression System Components
4i	Sprinkler valve & flow switch	SRK	___	23-29 33 00	Fire suppression System Components
4j	Dynamic envelope fire services model	DNE	___	23-29 33 00	Fire suppression System Components
5	Electrical System / MEP System for Marine and Ports				
5a	Cable Draw pit	ECD	Multiple*	23-17 11 27 23	Manhole Accesses
5b	CCTV Camera	BCA	Multiple*	23-29 11 11 13	Visual Light wavelength CCTV Camera
5c	Corrosion Monitoring Pit	CSE	Multiple*	23-17 11 27 23	Manhole Accesses
5d	Corrosion Monitoring Terminal Box	CSE	Multiple*	23-17 11 27 23	Manhole Accesses
5e	Directional Exit Sign	BFX	___	23-35 47 15	Exit Illuminated Signs
5f	Earthing and Lightning equipment	Multiple*	___	23-35 39 00	Electric Power protection Devices
5g	Electrical Cable tray, cable containment, power feed, cable ducting	CTF	Multiple*	23-35 33 19	Electrical Cable Trays
5h	Emergency lighting	BLF	___	23-35 47 13	Emergency Lighting
5i	Exit sign	BFX	___	23-35 47 15	Exit Illuminated Signs
5j	GovWifi equipment	CSE	Multiple*	23-37 13 17	Wide Area Network Devices
5k	ICCP Transformer Rectifier	ETR	Multiple*	23-80 50 00	Terminals for Power supply
5l	Inspection manhole	UMH	___	23-17 11 27 23	Manhole Accesses
5m	Light fitting/Lighting	BLF	Multiple*	23-34 47 11	Lighting Fixtures
5n	Panel board, motor control center	ECP	___	23-35 31 13	Distribution Panel Boards
5o	Pillar box (including	ETR	Multiple*	23-80 50 00	Terminals for Power supply

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
	ICCP AC power supply pillar box and electric pillar box)				
5p	Sensors	CSE	Multiple*	23-27 11 00[3]	General Instrument
5q	Solar Panel	CSE	SOP	23-75 10 27 17	Solar Collector Units
5r	Trucking, bus duct, busbar, busway	CTF	CHN	23-35 33 21	Electrical Bus ducts
5s	Dynamic envelope electrical model	DNE	___	23-35 47 00	Electrical Lighting

3.4.1.2. Mechanical Model includes all the 3D Object elements designed for special plants / facilities in proposed in the buildings/facilities. It is applicable to all Environmental and Sustainability services. The BIM Manager should propose the 3D Object elements in the BEP accordingly.

ITEM	3D OBJECT ELEMENT	CAT CODE	SUBCAT CODE*	OMNICLASS NO	OMNICLASS DESCRIPTION
1					

[3] The BIM Team should further detail the Omniclass classification to Level 3 according to the actual type of sensors installed on site

3.4.2. MVAC air ducts

3.4.2.1. MVAC Air duct includes all air ducts or pipes for conveying air.

3.4.2.2. This section describes the requirements for exhaust air duct, fresh air duct, return air duct and supply air duct under the Building Services Model.

3.4.2.3. Dynamic envelope should be always modelled to indicate required occupation/working space.

3.4.2.4. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The ductworks should be modelled as connect systems
400	3D Object element with components modelled, including ducts, insulations, flanges, hangers according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.3. MVAC Access panel

3.4.3.1. Access panel refers to an opening that can be easily removed to provide access to MVAC system.

3.4.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	3D Object element, including maintenance space envelop with exact size and dimension	Size and shape requirement according to support the fabrication requirement.	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A

3.4.4. MVAC Air handling unit

3.4.4.1. Air handling unit refers to encased assembly consist of a fan or fans and other necessary equipment.

3.4.4.2. The BIM shall refer to the AIR of the maintenance parties in developing the LOD-G 400 model.

3.4.4.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3DObject with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.5. MVAC Chillers

3.4.5.1. Chiller refers to machine that remove heat from a liquid coolant via vapour-compression, adsorption refrigeration or absorption refrigeration cycles.

3.4.5.2. The BIM shall refer to the AIR of the maintenance parties in developing the LOD-G 400 model.

3.4.5.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape, including water inlet/outlet, condense water inlet/outlet, anti-vibration footing, power provision, compressor, evaporator; and dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.6. MVAC Chilled water supply pipe

3.4.6.1. Chilled water supply pipe refers to pipes carry chilled water around a building.

3.4.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object elements with components modelled, including pipes and insulations according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.7. MVAC Chilled water return pipe

3.4.7.1. Chilled water return pipe refers to pipes carry water return to the chiller.

3.4.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Objects with components modelled, including pipes and insulations according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.8. MVAC Condensate drainpipe

3.4.8.1. Condensate drainpipes refer to pipes carrying moisture as to the exit through the evaporator coil.

3.4.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object element with components modelled, including pipes and insulations according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.9. MVAC Damper

3.4.9.1. A damper is a valve or plate that stop or regulates the flow of air inside the air handling unit.

3.4.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The damper should be connected with the parent systems
400	3D Object element with components modelled, including dampers, insulations and hangers according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.10. MVAC Diffuser, air-boot, air grill, air filter, register

3.4.10.1. Diffuser refers to air distribution outlet, usually located in the ceiling and consisting of deflecting vanes discharging supply air in various directions and planes and arranged to promote mixing of the air which is supplied to the room with the air already in the room.

3.4.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with size and dimension of each component	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The object should be modelled as connect systems
400	3D Object element with components modelled according to the details of the manufacturer's information to support fabrication and installation.	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.11. MVAC Fan

3.4.11.1. Fan refers to a mechanical device for moving air or other gases in a direction at an angle to the incoming fluid.

3.4.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape, housing, impellers, and casing. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.12. MVAC Fan Coil Unit

3.4.12.1. Fan Coil Unit refers to a device that uses a coil and a fan heat or cool a room without connectin to ductwork.

3.4.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape, water inlet/outlet, power provision, dip tray, connections for condensation drain. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.13. MVAC Fire Damper

3.4.13.1. Fire damper refers to device designed to impede the spread of fire through walls, floors and partitions.

3.4.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The damper should be connected with the parent systems
400	3D Object element with components modelled, including dampers, insulations and hangers according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.14. MVAC Insulation

3.4.14.1. Insulation refers to a thick layer of substance that keeps the temperature constant.

3.4.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned and updated with the parent pipes/ducts
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with overall size and dimension.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	Aligned and updated with the parent pipes/ducts
400	N/A	N/A	N/A	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.15. MVAC Primary air unit

3.4.15.1. Primary air unit refers to machine used to transfer and modify the air in a structure as part of HVAC system.

3.4.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct/pipe system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.16. MVAC Silencer

3.4.16.1. Mechanism capable of reducing the sound pressure level between its inlet and its outlet.

3.4.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct/pipe system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.17. MVAC Smoke extraction system

3.4.17.1. Smoke extraction system refers to exhaust ducts, which remove heat and smoke through grilles located on the ventilation ducts.

3.4.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including insulations with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The ductworks should be modelled as connect systems
400	3D Object element with components modelled, including ducts, insulations, flanges, hangers according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.18. MVAC Variable control damper

3.4.18.1. Variable control damper refers to system enable energy-efficient system distribution by optimising the amount and temperature of distributed air.

3.4.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the duct/pipe system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.19. Dynamic envelope in MVAC model

3.4.19.1. Dynamic envelope refers to an area near the MVAC model to prevent access.

3.4.19.2. The geometry of the envelope shall always align with the LOD-G requirement of the parent object.

3.4.19.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic layout	Assumed size	Symbol insertion point(s) approximately located	2D polygons	N/A
200	3D Object with approximate size/dimension aligned with the parent object	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned with the parent object
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact size/dimension aligned with the parent object	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block for each parent component	Aligned with the parent object
400	N/A	N/A	N/A	N/A	N/A

3.4.20. Plumbing Flush water piping

3.4.20.1. Plumbing flush water piping refers to pipe that carries flush water in a system.

3.4.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object element with components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.21. Plumbing Fresh water piping

3.4.21.1. Plumbing flush water piping refers to pipe that carries fresh water in a system.

3.4.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object element with components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	Rendered by Material texture according to the finish material	Same as 300

3.4.22. Plumbing Tab, faucet

3.4.22.1. A faucet is **a device for delivering water from a plumbing system**. It can consist of the following components: spout, handle(s), lift rod, cartridge, aerator, mixing chamber, and water inlets. When the handle is turned on, the valve opens and controls the water flow adjustment under any water or temperature condition.

3.4.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including spout, handle(s), lift rod, cartridge, aerator, mixing chamber, and water inlets with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the pipe system
400	3D object elements with components modelled to support the fabrication requirement.	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.23. Dynamic envelope in plumbing & water supply model

3.4.23.1. Dynamic envelope refers to an area near the plumbing and water supply model to prevent access.

3.4.23.2. The geometry of the envelope shall always align with the LOD-G requirement of the parent object.

3.4.23.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic layout	Assumed size	Symbol insertion point(s) approximately located	2D polygons	N/A
200	3D Object with approximate size/dimension aligned with the parent object	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned with the parent object
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact size/dimension aligned with the parent object	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block for each parent component	Aligned with the parent object
400	N/A	N/A	N/A	N/A	N/A

3.4.24. Floor drain

3.4.24.1. Floor drain refers to plumbing fixture that is installed in the floor of the structure, mainly designed to remove any standing water nearby.

3.4.24.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including grate, flashing, outlet and trap with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The floor drain should be connected with the parent waste water systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.25. Gully, sealed trapped gully, clean outs and vent

3.4.25.1. Gully refers to a drainage fitting which has an open top, a definite base, and an outlet to one or more side of the body of the gully.

3.4.25.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including grate, hopper, plot, water trap and outlet with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The object should be connected with the parent waste water systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.26. Kitchen waste pipe work including floor drain, open trapped

3.4.26.1. Kitchen waste pipe work refers to piping system connects pipes in kitchen to gully.

3.4.26.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including sink, fittings, trap and outlet with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The object should be connected with the parent wastewater systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.27. Rainwater, storm water pipe, storm drain

3.4.27.1. Rainwater pipe refers to pipes and drains that is used to direct rainwater away from a building.

3.4.27.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.28. Rainwater outlet

3.4.28.1. Rainwater outlets are designed to provide effective drainage of rainwater on flat roofs.

3.4.28.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including grate and downspouts with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the rainwater pipe system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.29. Surface channel, slot channel, external drainage

3.4.29.1. A rain gutter, eavestrough, eaves-shoot or surface water collection channel is a component of a water discharge system for a building.

3.4.29.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including trough, endcap, and downspout with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The object should be connected as a system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.30. Sewerage pipe, foul sewer drains

3.4.30.1. Sewage pipe and foul sewer drain refer pipes used to carry wastewater to a sewage works for treatment in a building/facility.

3.4.30.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including waste pipes, soil pipe, trap, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connected systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.31. Vent pipe

3.4.31.1. Vent pipe refers to pipes above a waste pipe or soil pipe that allows gas to escape from the system.

3.4.31.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connected systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.32. Dynamic envelope in drainage & sewage model

3.4.32.1. Dynamic envelope refers to an area near the drainage and sewage model to prevent access.

3.4.32.2. The geometry of the envelope shall always align with the LOD-G requirement of the parent object.

3.4.32.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic layout	Assumed size	Symbol insertion point(s) approximately located	2D polygons	N/A
200	3D Object with approximate size/dimension aligned with the parent object	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned with the parent object
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact size/dimension aligned with the parent object	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block for each parent component	Aligned with the parent object
400	N/A	N/A	N/A	N/A	N/A

3.4.33. Fire Alarm Control Panel

3.4.33.1. Fire alarm control panel refers to the device which all other devices of the fire alarm system is connected.

3.4.33.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.34. Fire Alarm Audio/Visual

3.4.34.1. Fire alarm audio/visual refers to sound or visual by the fire alarm device during an emergency.

3.4.34.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.35. Fire Alarm Devices

3.4.35.1. Fire alarm device refers to the device which will give a sound/visual warning.

3.4.35.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.36. Break glass unit

3.4.36.1. Break glass unit refers to device with a breakable glass to set off the fire alarm in an emergency.

3.4.36.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.37. Fire detection system, heat or smoke detectors

3.4.37.1. Fire detection system and detectors refers to device that will detect fire, heat or smoke.

3.4.37.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.38. Fire hydrant/hose reel system

3.4.38.1. Fire hydrant/hose reel system refers to a fitting in public place of the building with a nozzle by which a fire hose may be attached to a water main.

3.4.38.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including water inlet/outlet, wheel size, front/back panel, stop cock valve, fire hose and pipe with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected as connected system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.39. Sprinkler pipe work

3.4.39.1. A fire sprinkler system is an active fire protection method, consisting of a water supply system, providing adequate pressure and flowrate to a water distribution piping system, onto which fire sprinklers are connected.

3.4.39.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.40. Sprinkler head

3.4.40.1. A fire sprinkler or sprinkler head is the component of a fire sprinkler system that discharges water when the effects of a fire have been detected, such as when a predetermined temperature has been exceeded.

3.4.40.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including the thread, plug, frame, glass blub and detector with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.41. Sprinkler valve & flow switch

3.4.41.1. Control valves control the flow of water in an automatic fire sprinkler system.

3.4.41.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including the all gauges, water inlet/outlet, all flow switch/control, monitor valve, test drain, panel, retard chamber, alarm with outer form and shape. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The unit should be connected to the fire system
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

3.4.42. Dynamic envelope fire services model

3.4.42.1. Dynamic envelope refers to an area near the fire services model to prevent access.

3.4.42.2. The geometry of the envelope shall always align with the LOD-G requirement of the parent object.

3.4.42.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic layout	Assumed size	Symbol insertion point(s) approximately located	2D polygons	N/A
200	3D Object with approximate size/dimension aligned with the parent object	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned with the parent object
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact size/dimension aligned with the parent object	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block for each parent component	Aligned with the parent object
400	N/A	N/A	N/A	N/A	N/A

3.4.43. Cable Draw Pit

3.4.43.1. A Drawpit is the manhole of the ducting world. They are chambers situated along a line of underground ducting and facilitate access to the ducting to allow for initial installation, maintenance and monitoring.

3.4.43.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover, location of equipment, routing and size of cable trucking with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame and cover, location of equipment, containments, risers, switch board, routing and size of cable trucking.	Size and shape requirement according to the AIR of maintenance party.	Same as 300	Rendered by Material texture according to the finish material	N/A

3.4.43.3. For PWD projects, the attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.44. CCTV Camera

3.4.44.1. Closed-circuit television, also known as video surveillance, is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors.

3.4.44.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the housing and installation support of with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.44.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.45. Corrosion Monitoring pit

3.4.45.1. A Corrosion Monitoring pit is the manhole/chambers situated in marine facilitate access to allow for initial installation, maintenance and monitoring of corrosion monitoring equipment.

3.4.45.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover, location of equipment, with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.45.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.46. Directional Exit Sign

3.4.46.1. An exit sign is a pictogram or short text in a public facility (such as a building, aircraft, or boat) denoting the location of the closest emergency exit to be used in case of fire or other emergency that requires rapid evacuation.

3.4.46.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, supports, text and symbol with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.46.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.47. Electrical cable tray, cable containment, power feed, cable duct

3.4.47.1. Cable trays are mechanical support systems that provide a rigid structural system for electrical cables, raceways, and insulated conductors used for electric power distribution, control, signal instrumentation, and communication.

3.4.47.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including cable channel/tray/ladder, supports, fittings and connecters. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object elements with components modelled, including cable channel/tray/ladder, supports, fittings and connecters according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.48. Earthing and Lightning equipment

3.4.48.1. A system including the metal rod mounted on a structure and earthing system used to protect the structure from a lightning strike.

3.4.48.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including lightning rod, mounting base, cable strap, ground rod and earthing equipment with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.48.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.49. Emergency lighting

3.4.49.1. An emergency light is a battery-backed lighting device that switches on automatically when a building experiences a power outage.

3.4.49.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, supports, text and symbol with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.49.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.50. Exit Sign

3.4.50.1. An exit sign is a pictogram or short text in a public facility (such as a building, aircraft, or boat) denoting the location of the closest emergency exit to be used in case of fire or other emergency that requires rapid evacuation.

3.4.50.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, supports, text and symbol with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.50.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.51. GovWiFi equipment

3.4.51.1. The GovWifi equipment is commonly used for local area networking of devices and Internet access supplied by the HK Government, allowing nearby digital devices to exchange data by radio waves.

3.4.51.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including switches and power supplies with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.51.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.52. ICCP Transformer Rectifier

3.4.52.1. Cathodic protection transformer rectifier units (also known as TR or TRU) are used as power supply component of Impressed Current Cathodic Protection (ICCP) systems. This unit is purpose-built and generally featured remote control monitoring capabilities and current interrupters.

3.4.52.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including rectifier, test meter, electrolyte with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.52.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.53. Inspection Manhole

3.4.53.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

3.4.53.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.53.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.54. Lighting fitting/lighting

3.4.54.1. A light fixture, light fitting, or luminaire is an electrical device containing an electric lamp that provides illumination.

3.4.54.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, lights/lamp, cover with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.54.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.55. Panel board, motor control center

3.4.55.1. A panel board is a component of an electrical distribution system which divides an electrical power feed into branch circuits, while providing a protective circuit breaker or fuse for each circuit, in a common enclosure.

3.4.55.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the housing and switches with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.55.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.56. Pillar box

3.4.56.1. Cathodic protection transformer rectifier units (also known as TR or TRU) are used as power supply component of Impressed Current Cathodic Protection (ICCP) systems. This unit is purpose-built and generally featured remote control monitoring capabilities and current interrupters.

3.4.56.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the housing with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.56.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.57. Sensors

3.4.57.1. A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor.

3.4.57.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.57.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.58. Solar Panel

3.4.58.1. A solar cell panel, solar electric panel, photo-voltaic module or just solar panel is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity.

3.4.58.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.58.3. The attributes specified in the AIR of the PWD should be included as LOD-I 300, 400 & 500 requirement

3.4.59. Trucking, bus duct, busbar, busway

3.4.59.1. Compact power distribution systems that rely on copper or aluminium busbars to channel electricity, while being enclosed in an aluminium housing for protection.

3.4.59.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including bus duct, cable tray, riser, end cover, elbow, switch board, hanger and supports. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object elements with components modelled, including bus duct, cable tray, riser, end cover, elbow, switch board, hanger and supports according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

3.4.60. Dynamic envelope electrical model

3.4.60.1. Dynamic envelope refers to an area near the electrical model to prevent access.

3.4.60.2. The geometry of the envelope shall always align with the LOD-G requirement of the parent object.

3.4.60.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic layout	Assumed size	Symbol insertion point(s) approximately located	2D polygons	N/A
200	3D Object with approximate size/dimension aligned with the parent object	Assumed size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Aligned with the parent object
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact size/dimension aligned with the parent object	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block for each parent component	Aligned with the parent object
400	N/A	N/A	N/A	N/A	N/A

4. CIVIL INFRASTRUCTURE WORKS MODEL

4.1. Disciplinary Model

4.1.1. List of disciplinary models

4.1.1.1. Proposed Works Model include the 15 disciplinary models:

PROJECT MODEL	1ST LEVEL FEDERATION	2ND LEVEL FEDERATION (DISCIPLINARY MODELS)	DESCRIPTION
PROJECT INFORMATION MODEL	Proposed Works Model	**Fender System Model**	Fender systems and related object elements in port and marine facilities
		Geotechnical Model	Site boundary, Geological elements, Slope works and related stabilisation system
		Geotechnical Structure Model	Concrete structures, foundations and access elements in slope works
		Highway Structure Model	Underground structure for foundation supports
			Above ground structure of highways
			Other structure such as Tunnel linings, portals, etc
		Landscape Model	Outdoor landscape systems including planting, parks, recreation facilities, etc
		Marine Civil Model	Furnitures within marine facilities, including site boundary, proposed topologies and bathymetry
		Marine Structure Model	Structural elements in port and marine facilities
		Roadworks Model	Road works systems including roadworks and related dwarf wall, retaining structure, slope works and site boundary
		Sewerage Model	Proposed/Rediverted Sewerage network of the Service
		Specialised Systems Model	Tunnel Ventilation system
			Tunnel Fire Services System
			Traffic Control and Surveillance System
		Stormwater Model	Proposed/Rediverted Stormwater network of the Service
		Water Supplies Model	Proposed/Rediverted freshwater supplies network of the Service
		Gas Supply Model	Proposed/Rediverted Gas Supply system of the Services
		Electrical Power Supply Model	Proposed/Rediverted Power supply system of the Services
		Telecommunications Model	Proposed/Rediverted Telecommunication system of the Services

4.2. Fender System Model

4.2.1. Summary of elements

4.2.1.1. The Fender Model includes all the object elements in the fendering system proposed in the works for the Port and Marine services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Capping (Rubber or Timber)	FEN	FCA (PWD Code)	23-39 21 11 11 13	Boat Fenders
2	Chain for Fender System	FEN	FCH	23-39 21 11 11 13	Boat Fenders
3	Eye blot for Fender System	FEN	FEB	23-39 21 11 11 13	Boat Fenders
4	Frontal Pad	FEN	FFP	23-39 21 11 11 13	Boat Fenders
5	Horizontal Fender (plastic, timber, rubber)	FEN	FHF	23-39 21 11 11 13	Boat Fenders
6	Horizontal/Inclined fender wailing	FEN	FVF/FIW	23-39 21 11 11 13	Boat Fenders
7	Rubber Buffer	FEN	FRB	23-39 21 11 11 13	Boat Fenders
8	Step Block (Rubber or Timber)	FEN	FSB	23-39 21 11 11 13	Boat Fenders
9	Steel Bracket	FEN	FBK	23-39 21 11 11 13	Boat Fenders
10	Steel Plate for Wailing system	FEN	FSP	23-39 21 11 11 13	Boat Fenders
11	Vertical Fender (plastic, timber, rubber)	FEN	FVF	23-39 21 11 11 13	Boat Fenders

4.2.2. LOD-I Requirement for Fender Model

4.2.2.1. All the attributes specified in the AIR of the PWD should be included in the Fender Model for LOD-I 200, 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the AIR of PWD as far as practicable

4.2.3. Capping (Rubber or Timber)

4.2.3.1. The longitudinal piece of timber fitted over the heads of the frames or timbers of the port and marine facilities to form the top of the bulwark.

4.2.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object with components to be modelled according to AIR of the PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.4. Chain for Fender System

4.2.4.1. A chain to fasten the fenders and the rubber buffer

4.2.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and length	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal size and length	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object with components to be modelled according to AIR of the PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.5. Eye blot for Fender System

4.2.5.1. Eyebolts is some form of anchor bolt to enable fastening into fenders.

4.2.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with openings	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal dimension of openings	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object with components to be modelled according to AIR of the PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.6. Frontal Pad

4.2.6.1. Rubber protection elements at fender panels.

4.2.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object with components to be modelled according to AIR of the PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.7. Horizontal Fender (plastic, timber, rubber)

4.2.7.1. A fender is a bumper used to absorb the kinetic energy of a boat or vessel berthing against the port and marine facility.

4.2.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.8. Horizontal/Inclined fender wailing

4.2.8.1. A horizontal/inclined beam used to provide support to the side of the fender system.

4.2.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.9. Rubber Buffer

4.2.9.1. Rubber buffers are elastic buffers to limit the spring travel by moving masses to absorb the kinetic energy of objects as vibration dampers to achieve a damping effect and thus effectively protect objects from vibrations.

4.2.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.10. Step Block (Rubber or Timber)

4.2.10.1. ...

4.2.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with approximate size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.11. Steel Bracket

4.2.11.1. A steel bracket is a general-purpose connector where fender members cross each other at angles.

4.2.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with approximate location and typical size of the openings and screw	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal dimension of object and openings	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.12. Steel Plate for Wailing system

4.2.12.1. A steel plate attached to both sides at each joint of the fenders.

4.2.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with approximate location and typical size of the openings and screws	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal dimension of object and openings	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.2.13. Vertical Fender (plastic, timber, rubber)

4.2.13.1. A fender is a bumper used to absorb the kinetic energy of a boat or vessel berthing against the port and marine facility.

4.2.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with approximate size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3. Geotechnical Slope Model

4.3.1. Summary of elements

4.3.1.1. The Geological slope Model include the geological object elements proposed in the works for Geotechnical and Engineering services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Baffle	GSM	BAF	23-11 17 00	Retention Structures
2	Earthwork (cut/fill) (for slopeworks)	SUS	Multiple*	23-11 13 11 17	Soil Stabilization Fill
3	Flexible barrier net, shackle for net, round clip	GSM	FBR	23-11 19 00	Slide and Avalanche Protection
4	Flexible Barrier Post, Base plate, Footing, shackle on post, running wheel	GSM	FBR	23-11 19 00	Slide and Avalanche Protection
5	Flexible barrier cable rope, rope clip, braking element	GSM	FBR	23-11 19 00	Slide and Avalanche Protection
6	Man-made slope (Registered)	GSM	MMS	14-34 11 00	Slopped Topographical spaces
7	Natural slope	GSM	NSL	14-34 11 00	Slopped Topographical spaces
8	Raking Drains	GSM	RKD	23-11 13 11 23	Field Drainage Blocks
9	Rigid barrier	GSM	RBR	23-11 17 00	Retention Structures
10	Soil Nail	GSM	SON	23-11 11 13 11	Earth Reinforcement Soil nails
11	Site/Slope Boundary Polygon	LOT	SIT	14-37 11 14	Site
12	Terrain (Site formation)	DTM	TSF	14-37 11 14	Site
13	Geological model				
13a	Borehole	GEO	BOH	N/A	N/A
13b	Fill	GEO	FIL	N/A	N/A
13c	Compacted Fill	GEO	COF	N/A	N/A
13d	Design Groundwater profile	GEO	GRW	N/A	N/A

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
14	Ground anchors	GSM	GAR	23-11 11 11	Retaining Stabilizing Ground Anchors
15	Gabion for Rigid Barrier	GSM	GAB	23-11 17 15	Gabions
16	Cushioning Material for Rigid Barrier	GSM	CUM	23-11 00 00	Site Products
17	Steel Grating for Rigid Barrier	GSM	GRA	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers
18	Tree Ring	GSM	TRR	23-11 27 13	Planting Accessories
19	Erosion Control Mat	GSM	ECM	23-11 15 11 21	Sheeting Synthetic Erosion Controls
20	Wire Mesh	GSM	WRM	23-13 19 11 15	Mesh for General Use

4.3.2. LOD-I Requirement for Geotechnical Model

4.3.2.1. All the attributes specified in the LOD specification of GEO should be included in the Geotechnical Model for LOD-I 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the LOD specification of GEO as far as practicable.

4.3.3. LOD-Doc / LOD-Document for Geological model

4.3.3.1. The BIM Manager shall refer to the BEP of the GEO in preparing the LOD-DOC of the PIM and as-built information model.

4.3.4. Baffle

4.3.4.1. An element for natural terrain hazard mitigation measure constructed at the uphill of the proposed rigid/flexible barrier to serve as prescribed measures for enhancing robustness of the mitigation scheme.

4.3.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object including post, footings and foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object including post, footings and foundations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid of each component	N/A
400	3D Object including post, footings, foundations, steel base with stiffeners, bolts with washers and nuts, cement grout (if any)	Exact construction size of each component parts	Same as 300	3D solid of each component rendered by Material texture according to the finish material	N/A

4.3.5. Earthwork for slope works (Cut/Fill)

4.3.5.1. Earthwork consists of excavations (cuts) and embankments (fills) for slope formation. Earthwork includes all types of materials excavated and placed in embankment, including soil, granular material, rock, shale, and random material.

4.3.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Cut and fill area boundary	Assumed boundary	object insertion point(s) approximately located	2D hatches	N/A
200	Cut and fill area boundary, 2D Contour lines and spot levels	Approximate boundary	Spots and contour insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Digital terrain models of each calculated cut and fill surfaces	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Digital terrain models of each calculated rock and soil cut and fill solids	Exact calculated locations and volumes	Object insertion point(s) located and orientated exactly as calculated	3D solids of each component	N/A

4.3.6. Flexible barrier net, Base plate, shackle for net, round clip, Post, Footing, shackle on post, running wheel, cable rope, rope clip, braking element

4.3.6.1. A flexible barriers net is used to trap stream loads from a traversing a stream course.

4.3.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including post and barrier with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including standing post, foundation concrete pad, steel wire ropes, ground anchor	Exact nominal location, dimension, and orientation	Objects insertion point(s) located, orientated and aligned exactly as nominal locations, levels and alignment.	3D solid block of each component; barrier as a semi-transparent sheet	Steel post location and orientation updated with the alignment of the barrier
400	3D Object element including standing post, barrier, foundation concrete pad, steel wire ropes, ground anchor, breaking elements	Exact setting out location, dimension and orientation	Objects insertion point(s) located, orientated, and aligned exactly as setting out locations, levels and alignment; approximate location of breaking elements	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.7. Man-made slope (Registered Slope)

4.3.7.1. A slope formed by unnatural process and usually registered under a maintenance department.

4.3.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Slope boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including locations of exposed rock head, toe-line, soil nails, settlement markers	Exact Surveyed locations, extend and size	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models including locations of exposed rock head, toe-line, soil nails, settlement markers, berm in 3D polylines / symbols	Exact nominal locations, extend and size	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines (5m major, 1m minor), spot levels, 3D polylines and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Digital terrain models including soil/rock interfaces, benching and waterproofing layer, as well as locations of exposed rock head, toe-line, soil nails, settlement markers, berm in 3D polylines /symbols	Exact setting out locations, extend and size	Same as 300	Rendered by Material texture according to the finish material	N/A

4.3.8. Natural slope

4.3.8.1. A slope formed by natural process.

4.3.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Slope boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including locations of man-made features, large boulders, rock outcrop, tree locations	Exact Surveyed locations, extend and size	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

4.3.9. Raking Drains

4.3.9.1. Raking drains are used in lowering the groundwater level and relieving the groundwater pressure at depth or used as contingency measures to cater for uncertainties in the groundwater conditions and possible adverse effects of subsurface seepage (e.g. from leaking services) on slope stability.

4.3.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	3D Object element including the drill hole, and end cap	Exact nominal dimension of each component	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.10. Rigid barrier

4.3.10.1. Rigid debris-resisting barriers are a key example of risk mitigation measures, which catch landslide debris and prevent them from reaching populated or developed areas.

4.3.10.2. Information Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including barrier structure, slabs, wall, large openings, cushioning material, foundations	Exact nominal dimension and size	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	3D Object element including barrier structure, slabs, wall, large openings, cushioning material, foundations, movement joints, foundation piles and caps, steel furniture (e.g. trash grating)	Exact nominal dimension of each component	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.11. Soil Nail

4.3.11.1. Soil nailing is a remedial construction measure to treat unstable natural soil slopes or as a construction technique that allows the safe over-steepening of new or existing soil slopes.

4.3.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension/orientation	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including steel bars, soil nail head, tie beams, grillage beams, grout envelope	Exact nominal dimension and size	Object insertion point(s) located and orientated exactly as nominal locations and levels	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.12.

Site/Slope Boundary Polygon

4.3.12.1. Site boundary means the outermost perimeter of the slope.

4.3.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	2D polylines	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	N/A	N/A
250	3D polylines	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Closed polygons	N/A
300	3D polygons	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	Closed polygons	N/A
400	N/A	N/A	N/A	N/A	N/A

4.3.13. Terrain (Site formation)

4.3.13.1. Proposed topography is the mesh representation of entire finished site surfaces.

4.3.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including slope and platforms	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models, including slope, platforms and breaklines of proposed man-made features	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

4.3.14. Borehole

4.3.14.1. A borehole is a narrow shaft bored in the ground, either vertically or horizontally to support site investigation.

4.3.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including concrete chamber, covers, outer casing, inner casing	Exact nominal dimension and size	Object insertion point(s) located and orientated exactly as nominal locations and levels	3D solid block of each component	N/A
400	N/A	N/A	N/A	N/A	N/A

4.3.15. Geology – Fill / Compact fill / Design Ground water profile

4.3.15.1. Various layer of material that covers the earth's surface.

4.3.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Material's extend boundary, 2D Contour lines and spot levels	Approximate location	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
200	3D object including stratigraphy, with layers of fill, transported soils, location of the boreholes	Approximate location, depth and thickness	Object insertion point(s) approximately located	3D Boundary, Contour lines, spot levels and symbols	N/A
250	Same as 200	Same as 200	Object modelled according to the borehole logs results or AGS from ground investigation works	Same as 200	Same as 200
300	3D Digital terrain models, including inferred surfaces boundary of soils and rocks, location of boreholes, as well as ground water profile for design purpose	Exact inferred location, depth, and thickness of all components	3D surfaces modelled according to the borehole logs results or AGS from ground investigation works	3D Boundary, Contour lines, spot levels and 3D objects of surfaces	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

4.3.16. Ground anchors

4.3.16.1. .

4.3.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including steel bar, wire rope, concrete pad, grout envelope	Exact nominal location, dimension, and orientation	Object insertion point(s) located and orientated exactly as nominal locations and levels	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.17. Gabion for Rigid Barrier

4.3.17.1. .

4.3.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal location, dimension, and orientation	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	Same as 300	Exact setting out location, dimension and orientation	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.18. Cushioning Material for Rigid Barrier

4.3.18.1. .

4.3.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal location, dimension, and orientation	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	Same as 300	Exact setting out location, dimension and orientation	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.19. Steel Grating for Rigid Barrier

4.3.19.1. .

4.3.19.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal location, dimension, and orientation	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	Same as 300	Exact setting out location, dimension and orientation	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.20. Tree Ring

4.3.20.1. .

4.3.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal dimension and size	Object insertion point(s) located and orientated exactly as nominal locations and levels	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.3.21. Erosion Control Mat

4.3.21.1. .

4.3.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 250	Exact nominal thickness of each layer	Object insertion point(s) located and orientated exactly as nominal locations and levels	Overall shape 3D solid block, rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	N/A

4.3.22. Wire Mesh

4.3.22.1. .

4.3.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with extend and thickness	Exact nominal thickness of each layer	Object insertion point(s) located and orientated exactly as nominal locations and levels	Overall shape 3D solid block, rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	N/A

4.4. Geotechnical Structure Model

4.4.1. Summary of elements

4.4.1.1. The Geotechnical Structure Model includes the structural object elements proposed in the works in Geotechnical and Engineering services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Foundation (pile)	SFD	FPL	23-13 29 11	Foundation piles
2	Foundation (pile cap)	SFD	FCA	23-13 29 11 11 21	Pile Caps
3	Foundation (ground beam)	SFD	FBM	23-13 29 15 13	Grade Beams (shallow foundations)
4	Footing	SFD	OTR	23-13 29 15 15	Strip Foundation Blocks (shallow foundations)
5	Mass Concrete Infill (including No-fines Concrete)	GSM	MAC	23-13 15 11	Concretes
6	Retaining Wall on Slope	SUS	RET	23-11 17 13	Retaining Walls
7	Structural concrete beam	GSM	BEM	23-13 35 11	Structural Frames
8	Structural concrete wall	GSM	SWL	23-13 31 11	Structural Concrete
9	Structural concrete column	GSM	SCL	23-13 35 11	Structural Frames
10	Structural concrete slab	GSM	SLA	23-13 31 11	Structural Concrete
11	Structural steel column, post	GSM	SCL	23-13 35 11	Structural Frames
12	Steel access ladder	GSM	SAL	23-17 23 15	Ladders
13	Temporary work, temporary structure, platform	GSM	TMW	23-23 25 00	Scaffolding
14	Steel Handrailing (to Maintenance Stairway on Slope)	GSM	SRL	23-17 25 13	Handrails
15	Steel Staircase	GSM	SST	23-17 23 17 11	Stair component products
16	Steel Gate	GSM	SGA	23-17 23 17 11 21	Stair Barrier Gates

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
17	Maintenance Access (incl. Concrete Stairway/Berm)	GSM	CMS	23-13 31 17	Concrete Formwork
18	Foundation (Other)	SFD	Multiple*	23-13 29 00	Chain Link Metal Fences
19	Chain Link Fence on Slope	GSM	CLF	23-11 25 19 19	Foundations
20	Skin Wall	GSM	SWL	23-13 00 00	Structural and Exterior Enclosure Products

4.4.2. LOD-I Requirement for Geotechnical Structure Model

4.4.2.1. All the attributes specified in the LOD specification of GEO should be included in the Geotechnical Structural Model for LOD-I 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the LOD specification of GEO as far as practicable.

4.4.3. LOD-Doc / LOD-Document for Geotechnical Structure model

4.4.3.1. The BIM Manager shall refer to the BEP of the GEO in preparing the LOD-DOC of the PIM and as-built information model.

4.4.4. Structural Foundation – Pile / Pile Cap / Foundation / Footings

4.4.4.1. Foundation refers to a series of columns constructed or inserted into the ground to transmit loads to a lower level of subsoil. Foundation/Ground beam refers to reinforce concrete beams for supporting walls and joists at or near ground level. Footing refers to foundation unit constructed in brick work, stone masonry or concrete under the base of a wall column for the purpose of distributing the load over a large area.

4.4.4.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

4.4.4.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and cut-off depth	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Move with structural grid and reference elevation plane
400	3D Object element modelled with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.5. Mass concrete fill

4.4.5.1. Mass concrete fill refers to any volume of concrete with dimensions large enough to required that measures be taken to cope with the generation of heat from hydration of cement and attendant volume change to minimize cracking.

4.4.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.6. Retaining Wall on Slope

4.4.6.1. Retaining walls are relatively rigid walls used for supporting soil laterally so that it can be retained at different levels on the two sides. Retaining walls are structures designed to restrain soil to a slope that it would not naturally keep to.

4.4.6.2. The finish / skin wall should be separated from the wall 3D Object elements at LOD-G 400.

4.4.6.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object, including footing with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including foundation and retaining wall elements.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid of each component	N/A
400	3D Object element including bearing depth, foundation, reinforcement, pile cut-off depths (if applicable) Openings modelled according to the requirements of the building services builders	Exact construction size of each component parts according to joints	Same as 300	3D solid of each component rendered by Material texture according to the finish material	N/A

4.4.7. Structural concrete beam

4.4.7.1. Beams refer to structural elements that resist loads applied laterally to their axis.

4.4.7.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

4.4.7.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.4.8. Structural concrete wall

4.4.8.1. Structure wall refers to a load bearing wall or a wall that carries load in addition to its own load.

4.4.8.2. The finish should be separated from the wall 3D Object elements at LOD-G 400.

4.4.8.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness (including the finish)	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information, including wall finish detail including tiling, stone, cladding and screed. Openings modelled according to the requirements of the building services builders	Modelled from Joint to Join from floor slab to soffit of beam or slab above	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Schedules to be dynamically updated from the size of the Openings

4.4.9. Structural concrete column

4.4.9.1. Column refers to vertical structure intended to transfer a compressive load.

4.4.9.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

4.4.9.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.10. Structural concrete slab

4.4.10.1. Slab refers concrete structural element used to create horizontal surfaces such as berms and decks.

4.4.10.2. The finish should be separated from the slab at LOD-G 300 or above.

4.4.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.11. Structural steel column, post

4.4.11.1. Steel column refers to vertical structure intended to transfer a compressive load.

4.4.11.2. The finish should be separated from the steel beam 3D Object elements at LOD-G 400.

4.4.11.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with base plates, blots, clips, angles, welds, coping, washers, and nuts modelled according to the details of the manufacturer's information,	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.12. Steel access ladder

4.4.12.1. Access ladder is often used to describe the maintenance access ladder on the slope.

4.4.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Steps railings, posts, supports, post, sign plate, foundation, ladder, chord and bracing.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.4.13. Temporary work, temporary structure, platform

4.4.13.1. Temporary structure used to support a work crew and materials to aid in the construction, maintenance and repair of the slope.

4.4.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object including post, platform, guard rail	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including post, platform, guard rail, base plates, bracings, toe board, access ladder	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.14. Steel Handrailing (to Maintenance Stairway on Slope)

4.4.14.1. Steel handrailing are railings designed to minimize fall risk at a work site where there is high fall risk.

4.4.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object including post, rail, vertical members	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including post, rail, vertical members, supports, baseplates and concrete footing	Exact nominal height, length, dimension of each component	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.15. Steel Staircase

4.4.15.1. Access ladder is often used to describe the maintenance access ladder on the slope.

4.4.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including Steps railings, posts, supports, post, sign plate, foundation, ladder, chord and bracing.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.16. Steel Gate

4.4.16.1. Steel Gate refers to a hinged barrier that can be used to secure an opening in a wall, fence and hedge.

4.4.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components, including post, foundation, and flats	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.17. Maintenance Access (including Concrete stairway / Berms)

4.4.17.1. Maintenance access include the concrete stairway and berms constructed to allow the inspection and maintenance of the man-made slope features.

4.4.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including stairway and berms with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including stairway and berms	Exact nominal dimension and thickness of each component; approximate size of steps	3D solid block of each component rendered by Material texture according to the finish material	N/A	N/A
400	Same as 300	Same as 300	Same as 300		

4.4.18. Foundation (Other)

4.4.18.1. .

4.4.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components, including post, foundation, and flats	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.4.19. Chain Link Fence on Slope

4.4.19.1. .

4.4.19.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components, including post, tube bracing, foundation, barbed wire, wire mesh and flats	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	N/A

4.4.20. Skin Wall

4.4.20.1. Skin wall is a type of wall treatment that can be a useful way of adding detail or changing the overall aesthetic of a retaining structure.

4.4.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	N/A	N/A	N/A	N/A	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact shape and thickness	Exact nominal dimension, thickness of each component	Object insertion point(s) located and aligned exactly as parent 3D Object elements	Rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	Patterns and layouts to be updated with the manufacturer's information

4.4.20.3. For the GEO projects, the attributes specified in the BEP of the GEO should be included as LOD-I 300, 400 & 500 requirement

4.5. Highways Structure Model

4.5.1. Summary of elements

4.5.1.1. Highways Structural Model includes all the structural object elements proposed in the works for road, tunnels, and highways construction. It is applicable to all services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Super structure model: Bridge				
1a	Abutment	TBR	AOR	23-13 31 11	Structural Concrete
1b	Bearings	TBR	BEA	23-39 13 13 19	Bridge Bearings
1c	Deck/Segment	TBR	DEC	23-39 13 13 23	Bridge Decking
1d	Girder/main beams/webs	TBR	GOM	23-39 13 13 13	Bridge beams
1e	Pier/Column/Soffit	TBR	COP/SOF	23-13 31 11	Structural Concrete
2	Noise Enclosure System				
2a	Noise Enclosure	TNE	Multiple*	23-39 11 11 13	Noise Barriers
2b	Noise Barrier	TNB	Multiple*	23-39 11 11 13	Noise Barriers
3	Super structure model: Footbridge				
3a	Abutment	TFB	AOR	23-13 31 11	Structural Concrete
3b	Bearings	TFB	BEA	23-39 13 13 19	Bridge Bearings
3c	Deck/Segment	TFB	DEC	23-39 13 13 23	Bridge Decking
3d	Girder/main beams/webs	TFB	GOM	23-39 13 13 13	Bridge beams
3e	Pier/Column/Soffit	TFB	COP	23-13 31 11	Structural Concrete
3f	Staircases (bridge)	TFB	ROS	23-17 23 17 11	Stair components products
3g	Roof and skylights (bridge)	TFB	ROO	23-13 39 11	Exterior Roof Panels
3h	Lift Tower (Bridge)	TLT	Multiple*	23-13 31 11	Structural Concrete
4	Sub- Structure Model				
4a	Pile	SFD	FPL	23-13 29 11	Foundation piles

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
4b	Pile Cap	SFD	PCA	23-13 29 11 11 21	Pile Caps
4c	Cable Trench	CTF	CHN	23-13 31 11	Structural Concrete
4d	Excavation and refill for sub-structure	EXL	BAF	23-11 13 11 17	Soil Stabilization Fill
4e	Foundation	Multiple*	Multiple*	23-13 29 00	Foundation
5	Other Structural elements				
5a	Diaphragm Wall	EXL	DIW	23-11 17 00	Retaining Structures
5b	Lining	UCL	Multiple*	23-39 13 11 15	Tunnel Lining
5c	Tunnel Structure Segments	TIS	Multiple*	23-39 13 11	Tunnels
5d	Panel Wall	UPL	PW_	23-13 35 21 19	Structural Panels
5e	Temp. Support Structure	EXL	Multiple*	23-11 11 00	Ground Anchorages

4.5.2. LOD-I Requirement for Highway Structure Model

4.5.2.1. All the attributes specified in the AIR of Highways Department should be included in the Highways Structural Model for LOD-I 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the AIR of Highways Department as far as practicable.

4.5.3. LOD-Doc / LOD-Document for Highway Structure model

4.5.3.1. The BIM Manager shall refer to the LOD specification/AIR of Highways Department in preparing the LOD-DOC of the PIM and as-built information model.

4.5.4. Bridge Abutment

4.5.4.1. A bridge abutment is a structure which connects the deck of a bridge to the ground, at the ends of a bridge span, helping support its weight both horizontally and vertically.

4.5.4.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.4.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object, including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat, foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat and plinth, foundations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat and plinth, foundations and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.5. Bridge Bearings

4.5.5.1. A bridge bearing is a component of a bridge which typically provides a resting surface between bridge piers and the bridge deck. The purpose of a bearing is to allow controlled movement and thereby reduce the stresses involved.

4.5.5.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.5.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with overall shape	Assumed / Typical size of object	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with major components	Exact nominal dimension	Object insertion point(s) located, levelled and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element including upper plate, top bearing plate, urethane disc, limiting ring and threaded shear pin	Exact nominal dimension and size of each component	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.6. Bridge Deck/Segment

4.5.6.1. A deck is the surface of a bridge. A structural element of its superstructure, it may be constructed of concrete or steel.

4.5.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and deck	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the parent alignment and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including top slab, bottom slab, parapet, profile barrier, boxing out	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent road/object	3D solid block of each component	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including top slab, bottom slab, parapet, profile barrier, boxing out, catchpits, gully, downpipes, blister for prestress tendon, openings, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.7. Bridge Girder/main beams/webs

4.5.7.1. A girder is a support beam used in construction used to build bridges. It is the main horizontal support of a structure which supports smaller beams. Girders often have an I-beam cross section composed of two load-bearing flanges separated by a stabilizing web, but may also have a box shape, Z shape, or other forms.

4.5.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including concrete beam, top and bottom flange, bar, interior, and exterior girder	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element including concrete beam, top and bottom flange, bar, interior and exterior girder, wedge, web, plate, bracket, reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.8. Bridge Pier/Column/Soffit

4.5.8.1. A pier short column used as a foundation member in construction. Also, a large column or wall type bridge support. A column is a Vertical structural member supporting a floor beam, girder, or other member, and supporting primarily vertical loads.

4.5.8.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.8.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including foundation, pier, pier head, portal	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element including foundation, pier, pier head, portal with reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.9. Noise Enclosure System / Noise Barrier

4.5.9.1. A noise enclosure system is an exterior structure designed to protect inhabitants of sensitive land use areas from noise pollution

4.5.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Lines and Symbols	N/A
200	3D Object with size and shape of the steel structure, foundation, panels	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including steel structure, barrier, foundation, panels	Exact nominal size and dimension	Located, orientated and sloped as nominal	Overall shape 3D solid block of each component	N/A
400	3D Object element including steel structure, barrier, foundation, panels, blots, nuts, angles, welds, coping, bases plates, bracing to support fabrication	Exact construction size and shape according to construction joints	Same as 300	Overall 3D shape solid block of each component rendered by Material texture according to the finish material	N/A

4.5.10. Footbridge Abutment

4.5.10.1. A footbridge abutment is a structure which connects the deck of a bridge to the ground, at the ends of a bridge span, helping support its weight both horizontally and vertically.

4.5.10.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object, including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat, foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat and plinth, foundations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element including wingwall, abutment wall, foundation, ballast wall, cantilever, bearing seat and plinth, foundations, and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.11. Footbridge Bearings

4.5.11.1. A bridge bearing is a component of a bridge which typically provides a resting surface between bridge piers and the bridge deck. The purpose of a bearing is to allow controlled movement and thereby reduce the stresses involved.

4.5.11.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.11.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with overall shape	Assumed / Typical size of object	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with major components	Exact nominal dimension	Object insertion point(s) located, levelled and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element including upper plate, top bearing plate, urethane disc, limiting ring and threaded shear pin	Exact nominal dimension and size of each component	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.12. Footbridge Deck/Segment

4.5.12.1. A deck is the surface of a bridge. A structural element of its superstructure, it may be constructed of concrete or steel.

4.5.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and deck	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the alignment and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including top slab, bottom slab, parapet, profile barrier, boxing out	Exact nominal dimension of each component	Object aligned and orientated exactly as designed 3D alignment and cross fall	3D solid block of each component	Dynamically updated according to the changes in the alignment, cross fall, and sections
400	3D Object element including top slab, bottom slab, parapet, profile barrier, boxing out, catchpits, gully, downpipes, blister for prestress tendon, openings, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.13. Footbridge Girder/main beams/webs

4.5.13.1. A girder is a support beam used in construction used to build bridges. It is the main horizontal support of a structure which supports smaller beams. Girders often have an I-beam cross section composed of two load-bearing flanges separated by a stabilizing web, but may also have a box shape, Z shape, or other forms.

4.5.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including concrete beam, top and bottom flange, bar, interior and exterior girder	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element including concrete beam, top and bottom flange, bar, interior and exterior girder, wedge, web, plate, bracket, reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.14. Footbridge Pier/Column/Soffit

4.5.14.1. A pier short column used as a foundation member in construction. Also, a large column or wall type bridge support. A column is a Vertical structural member supporting a floor beam, girder, or other member, and supporting primarily vertical loads.

4.5.14.2. The finish of the abutment should be modelled as separated object at LOD-G 400.

4.5.14.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including foundation, pier, pier head, portal	Exact nominal size and dimension	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element including foundation, pier, pier head, portal with reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.15. Footbridge Staircases (Bridge)

4.5.15.1. Staircases refer to a set of steps leading from one floor of a footbridge to another.

4.5.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with threads, risers, landings, and foundations	Approximate length, width, dimension, and levels	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with threads, risers, landings, and foundation to accurately indicate stringers and nosing	Exact nominal length, width, dimension, and levels	Object insertion point(s) located and aligned exactly as nominal	3D solid block of each component	N/A
400	3D Object element with threads, risers, landings and foundation to accurately indicate stringers and nosing with reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.16. Footbridge Roof and skylights (bridge)

4.5.16.1. Roof refers to structure forming the upper covering of a footbridge. Skylight refers to opening build into the roof of a footbridge filled with glass

4.5.16.2. The finish should be separated from the parent roof 3D Object elements at LOD-G 300 or above.

4.5.16.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with all components and parts, including the reinforcement components, frame elements and glazing, and Ironmongery according to the manufacturer's information	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.17. Footbridge Lift Tower (Bridge)

4.5.17.1. The structural element to provide the travel space of the escalator for footbridge.

4.5.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with columns, beams, curtain walls	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element Elements with columns, beams, curtain walls with reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.18. Sub-Structure/foundation Pile and Pile cap

4.5.18.1. Foundation (pile and pile cap) refers to a series of columns constructed or inserted into the ground to transmit loads to a lower level of subsoil.

4.5.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and cut-off depth	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.19. Sub-Structure Cable Trench

4.5.19.1. Cable trenching is a method of laying cables into the ground by digging trenches. The cables are submerged underground via the cable trench structure and are then covered by a layer of earth, bitumen or concrete.

4.5.19.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and depth	Located, orientated, and sloped as nominal alignments, offsets and levels	3D solid block of each component	N/A
400	3D Object element modelled with all foundation components, including reinforcements and chambers	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.20. Excavation and refill for sub-structure

4.5.20.1. Excavation and refill refer to the soil or rock removed / fill from/to a site to form/fill an open face, hole or cavity.

4.5.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with extend and depth	Assumed / approximate size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with extend and depth	Exact nominal location and elevation of each terrain mesh	Generated from 3D digital terrain meshes located and orientated exactly as nominal.	3D solid block of each soil/rock components	N/A
400	N/A	N/A	N/A	N/A	N/A

4.5.21. Diaphragm Wall

4.5.21.1. Diaphragm wall is a continuous wall constructed in ground in to facilitate certain construction activities, such as: As a retaining wall. As a cut-off provision to support deep excavation. As the final wall for basement or other underground structure (e.g. tunnel and shaft).

4.5.21.2. Geometrical Requirement\

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information, including reinforcement and wall finish detail Openings modelled according to the requirements of the building services builders	Modelled from Joint to Joint from slab to soffit of slab	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.22. Lining

4.5.22.1. Tunnel lining is used in both trenchless construction and rehabilitation to maintain the shape of the tunnel and to shield whatever might pass through it.

4.5.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including base slab, ventilation tunnel, lining with exact thickness	Exact nominal alignment and thickness	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent road/object.	3D solid block of each component	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including reinforcement. Openings modelled according to the requirements of the building services builders	Modelled from Joint to Joint	Object insertion point(s) located, and aligned exactly as nominal alignments, offsets and level at Joints	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.23. Tunnel Structure segments

4.5.23.1. Segmental concrete tunnel liners are prefabricated structural support pieces that are combined to form a complete tube along tunnel passageways. The segments are created in manufacturing plants for tunnel projects

4.5.23.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the alignment, cross fall, and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal alignment and thickness	Object insertion point(s) located, and aligned exactly as nominal alignments, offsets and cross-fall.	3D solid block of each component	Dynamically updated according to the changes in the alignment, cross fall, and sections
400	3D Object element, including reinforcement according to the manufacturer's information to support fabrication (if applicable)	Modelled from Segment to Segment	Object insertion point(s) located, and aligned exactly as nominal alignments, offsets and cross-fall/level at Joints	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.24. Panel Wall

4.5.24.1. Panel wall means a non-bearing wall in skeleton construction, built between columns or piers, and wholly supported at each story.

4.5.24.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element modelled according to the details of the manufacturer's information, including reinforcement and wall finish detail Openings modelled according to the requirements of the building services builders	Modelled from Joint to Joint from slab to soffit of slab	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.5.25. Temp. Support Structure / ELS

4.5.25.1. Excavation and lateral support works (ELS works) is normally called for in the construction of pile caps, basement, underground drainage and tunnel works.

4.5.25.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and shape of the supports	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with size and shape of the supports and foundation elements	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	N/A	N/A	N/A	N/A	N/A

4.6. Landscape Model

4.6.1. Summary of elements

4.6.1.1. Landscape Model includes all the object elements for the landscaping works proposed in the works. It is applicable to all services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Barrier	FBF	Multiple*	23-39 11 11 15	Traffic Barrier
2	Bollard	FBL	Multiple*	23-39 11 19	Bollards
3	Hard Surface Cover (e.g. shotcrete)	GSM	HSC	23-11 13 11	Soil stabilization products
4	Lighting	LSL	Multiple*	23-35 47 11 21 23	Street and Roadway Lighting Fixture
5	Planter (including planter for slope)	LTW	SHS	22-11 27 13	Planting Accessories
6	Railing / Handrail	FRA	Multiple*	23-17 25 11	Guardrails
7	Recreation area/facilities	LOT	REA	23-11 31 00	Athletic and Recreational Surfaces
8	Retaining Wall Finishes	DTL	FIN	23-13 00 00[4]	Structural and Exterior Enclosure Products
9	Signage / Traffic Sign	FTW	Multiple*	23-39 11 13	Roadway signage
10	Sign Gantry	VRS	___	23-39 11 13	Roadway signage
11	Tree (New plant)	LTP	Multiple*	23-11 27 19 13	Trees
12	Vegetation Surface Cover	GSM	VSC	23-11 13 11	Soil stabilization products

[4] The BIM Team should further detail the Omniclass classification to Level 3 according to the actual type of finishes used on site

4.6.2. Barrier

4.6.2.1. Barrier refers to linear 3D Object elements installed in the works area to control road traffic to prevent automotive vehicles from colliding or crashing into pedestrians and structures.

4.6.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Lines and Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the post, barrier, footings, and foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent pavement/object	3D solid block of each component as a 3D continuous span	Barrier dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including the post, barrier, footings, and foundation	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.3. Bollards

4.6.3.1. Bollards refers to posts installed in the works area to control road traffic prevent automotive vehicles from colliding or crashing into pedestrians and structures.

4.6.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the post, barrier, footings and foundations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Specific components with details to be modelled according to AIR of the maintenance parties	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.4. Hard surface cover

4.6.4.1. Hand surface cover refers to material (e.g. shotcrete) applies to the slope surface to protect it from landslip.

4.6.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with extend and thickness	Exact nominal thickness of each layer	Object insertion point(s) located exactly as nominal locations and elevations	3D solid of each layer, rendered by Material texture according to the finish material	N/A
400	N/A	N/A	N/A	N/A	N/A

4.6.5. Lighting

4.6.5.1. Lighting refers to the light mounted on a pole and constituting one of a series spaced at intervals along a public street or highway.

4.6.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the lights, post, footings and foundations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Specific components with details to be modelled according to AIR of the maintenance parties	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.6. Planter (including planter for slope)

4.6.6.1. Planter refers to the concrete structure for the planting of vegetations.

4.6.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including footings	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid of each component	N/A
400	Specific components with details to be modelled according to AIR of the maintenance parties	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid of each component rendered by Material texture according to the finish material	N/A

4.6.7. Railing/Handrail

4.6.7.1. Railing, handrail, or guardrails refers to a fence or barrier made of rails to prevent people from falling off.

4.6.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts with all components, including railings, bracing, supports, posts and footing	Exact nominal dimension, size, length, height and alignment of each component	Object insertion point(s) located and aligned exactly as nominal alignment and levels.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.8. Recreation area/facilities

4.6.8.1. Recreation area refers to surface/area designated to the recreation area or facilities.

4.6.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with extend and thickness	Exact nominal thickness of each layer	Object insertion point(s) located exactly as nominal locations and elevations	3D solid of each component	N/A
400	N/A	N/A	N/A	N/A	N/A

4.6.9. Retaining Wall Finishes

4.6.9.1. Retaining Wall Finishes are used in the final part of the construction or manufacturing process, forming the final surface of the retaining wall. They can protect the retaining wall from impact, water, frost, corrosion, abrasion, and so on, and/or they can be decorative.

4.6.9.2. The finish should be separated from the parent 3D Object elements at LOD-G 300 or above.

4.6.9.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	N/A	N/A	N/A	N/A	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element with exact shape and thickness	Exact nominal dimension, thickness of each component	Object insertion point(s) located and aligned exactly as parent 3D Object elements	Rendered by Material texture according to the finish material	N/A
400	Same as 300	Same as 300	Same as 300	Same as 300	Patterns and layouts to be updated with the manufacturer's information

4.6.9.4. For the GEO projects, the attributes specified in the BEP of the GEO should be included as LOD-I 300, 400 & 500 requirement

4.6.10. Signage / Traffic Sign

4.6.10.1. Traffic signs or road signs are signs erected at the side of or above roads or highways to give instructions or provide information to road users.

4.6.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the post, sign plate, foundation, draw pit (if applicable)	Exact nominal dimension of each component according to the requirement of the Transport department	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 300	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.11. Sign Gantry

4.6.11.1. Traffic signs or road signs are signs erected at the side of or above roads or highways to give instructions or provide information to users.

4.6.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the post, sign plate, TCSS sign-plates, foundation, draw pit (if applicable), bracing, cat ladder	Exact nominal dimension of each component according to the requirement of the Transport department	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including the post, sign plate, foundation, draw pit (if applicable), bracing, cat ladder, TCSS accessories	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.6.12. Tree (New plant)

4.6.12.1. New plant tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves planted under the works' requirement.

4.6.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with diameter, height and spread	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Object with specified diameter, height and spread	Exact nominal diameter, height and spread	Object insertion point(s) located exactly as nominal location(s) and level(s).	3D solid of each component	N/A
400	Specific components with details to be modelled according to AIR of the maintenance parties	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	3D solid of each component	N/A

4.6.12.3. For the GEO projects, the attributes specified in the BEP of the GEO should be included as LOD-I 300, 400 & 500 requirement

4.6.13. Vegetation surface cover

4.6.13.1. Vegetation surface cover refers to vegetation material applies to the slope surface to protect it from landslip.

4.6.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element with extend and thickness	Exact nominal thickness of each layer	Object insertion point(s) located exactly as nominal locations and elevations	Overall shape 3D solid block of each layer, rendered by Material texture according to the finish material	N/A
400	N/A	N/A	N/A	N/A	N/A

4.7. Marine Civil Model

4.7.1. List of Common Objects Elements

4.7.1.1. The Civil Model mainly used in the Ports and marine services; the following object elements are classified under Civil Model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Access/Cat Ladder	ALA	CAL	23-17 23 15 11	Vertical Ladders
2	Terrain (Proposed Profile or Tunnel Seabed Levels)	DTM	BAP	14-34 17 24	Shoreline
3	Barrier Bollard	SIT	CBB	23-39 11 19	Bollards
4	Bench	SIT	CBN	23-11 29 13 11	Exterior Benches
5	Concrete Plinth	SFD	CCP	23-13 31 15	Precast Structural Concrete
6	Fence	SIT	CFC	23-11 25 19	Fences
7	Gate	SIT	CGT	23-11 25 11	Perimeter Entry Devices
8	Lifebuoy	SIT	CLB	23-29 00 00	Facility and Occupant Protection products
9	Marine Notice Board	SIT	CMN	23-19 11 17	Notice Board
10	Mooring eye	FEN	CME	23-39 21 11 11 11	Mooring Post
11	Mooring Bollard	FEN	CBO	23-39 21 11 11 11	Mooring Post
12	Navigation Light Post	SIT	CNL	23-39 21 17 13	Navigation Lights
13	Pier Notice board	SIT	CNB	23-19 11 17	Notice Board
14	Terrain (Site formation)	DTM	TSF	14-34 17 99	Other Land and Water Topographical Transitions
15	Railing/Handrail	FRA	Multiple*	23-17 25 11	Guardrails
16	Signage/information plate (include landing /structural no. plate, pier)	SIT	CSG	23-19 11 11	Information Signs
17	Step iron	FEN	CSI	23-39 21 11 11 11	Mooring Post
18	Site Boundary Polygon	LOT	SIT	14-37 11 14	Site
19	Tidal Gauge House	SIT	CGH	23-13 31 15	Precast Structural Concrete
20	Tidal Gauge Tubes	SIT	CTG	23-27 11 21 23	Level Sensors

4.7.2. LOD-I Requirement for Marine Civil Model

4.7.2.1. All the attributes specified in the AIR of the PWD should be included in the Marine Civil Model for LOD-I 200, 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the AIR of PWD as far as practicable

4.7.3. Access/Cat Ladder

4.7.3.1. Cat ladder is often used to describe a ladder that is used for working on a sloping roof with a hook at one end and load spreading pads. These kinds of ladder are most commonly designed for use as access steps for maintenance to the roof of a building.

4.7.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including steps railings, posts, supports, post, sign plate, foundation, cat ladder, chord and bracing.	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	Object height must be limited by designed max height
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.7.4. Terrain (Proposed Profile or Tunnel Seabed Levels)

4.7.4.1. Bathymetry is the underwater topography to show the proposed water profile.

4.7.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Boundary, 2D Contour lines and spot levels	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	2D lines and symbols	N/A
250	3D Digital terrain models	Exact Surveyed locations and depths	Object insertion point(s) is located at / derived from the onsite survey point(s)	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models	Exact nominal locations and depths	Object insertion point(s) located and orientated exactly as nominal	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Object rendered by Material texture according to the finish material	Same as 300

4.7.5. Barrier / Bollard

4.7.5.1. Bollards refers to posts and structure installed in the ports and marine facilities to control road traffic prevent automotive vehicles from colliding or crashing into pedestrians and structures.

4.7.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the post, bollard, and the footings	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.6. Bench

4.7.6.1. A long seat for several persons in marine facilities.

4.7.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.7. Concrete Plinth

4.7.7.1. A concrete plinth is a reinforced concrete beam that is constructed between the wall and its foundation.

4.7.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.8. Fence

4.7.8.1. A fence is a structure that encloses an area, typically outdoors, and is usually constructed from posts that are connected by boards, wire, rails, or netting. A fence differs from a wall in not having a solid foundation along its whole length.

4.7.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks;	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including post, strut, horizontal railing, steel tie, hoist, foundation, mesh and barbed wire	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component; barrier fence as a semi-transparent sheet	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.9. Gate

4.7.9.1. Gate refers to a hinged barrier that can be used to secure an opening in a wall, fence, and hedge.

4.7.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with all components, including post, foundation, and flats	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.10. Lifebuoy

4.7.10.1. A lifebuoy is a life-saving buoy designed to be thrown to a person in water, to provide buoyancy and prevent drowning.

4.7.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with hanger	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.11. Marine Notice Board

4.7.11.1. A display board in the Port and Marine facilities.

4.7.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with text and labels	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.12. Mooring eye

4.7.12.1. A forged or cast metal loop to which mooring ropes may be tied.

4.7.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with size and width	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.13. Mooring Bollard

4.7.13.1. A mooring bollard refers to a strong vertical post of timber or iron, fixed to the ground structure of ports and marine facilities, to which the ship's mooring lines etc are secured.

4.7.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with foundation	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.14. Navigation Light Post

4.7.14.1. A marine navigation light post is the concrete/steel structure for the navigation lights.

4.7.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with foundation	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.15. Pier Notice board

4.7.15.1. A bulletin board in the Port and Marine facilities for public.

4.7.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements with size and width	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.16. Terrain (Site formation)

4.7.16.1. Proposed topography is the mesh representation of entire finished site surfaces.

4.7.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including slope and platforms	Exact Surveyed locations and depths	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models, including layout and size of man-made features in 3D polylines / symbols	Exact nominal locations and depths	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, 3D polylines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Rendered by Material texture according to the finish material	Same as 300

4.7.17. Railing/Handrail

4.7.17.1. Railing, handrail or guardrails refers to a fence or barrier made of rails to prevent people from falling off from the Port and Marine facilities.

4.7.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components and parts with all components, including railings, bracing, supports, posts and footing	Exact nominal dimension, size, length, height and alignment of each component	Object insertion point(s) located and aligned exactly as nominal alignment and levels.	3D solid of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid of each component rendered by Material texture according to the finish material	N/A

4.7.18. Signage/information plate (including landing/structural no. plate, pier)

4.7.18.1. A bulletin board in the Port and Marine facilities to show the pier/structural number.

4.7.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object elements include the plate and the text	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.19. Step iron

4.7.19.1. A U-shaped heavy metal loop which is set into masonry work for ladders.

4.7.19.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object with size and width	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.20. Site Boundary Polygon

4.7.20.1. Site boundary means the outermost perimeter of the works/site.

4.7.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site extend boundary	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	2D polygon	N/A
250	Site extend boundary	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Closed polygon	N/A
300	Site extend boundary	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	Closed polygon	N/A
400	N/A	N/A	N/A	N/A	N/A

4.7.21. Tidal Gauge House

4.7.21.1. A tide gauges house is used to house the tidal gauge tube.

4.7.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame, and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.7.22. Tidal Gauge Tubes

4.7.22.1. Tide gauges tubes are used to measure tides.

4.7.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the stilling well, float wheel, and the measurement equipment	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8. Marine Structure Model

4.8.1. Summary of elements

4.8.1.1. The Marine Structure Model includes all the object elements in the structural elements in the Port and Marine services proposed in the works. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Terrain (Shoreline / Beach Finish Level)	DTM	BFL	12-34 17 24	Shoreline
2	Pile Cap	MSF	SPC	23-13 29 11 11 21	Pile Caps
3	Pile Foundation	MSF	SPI	23-13 29 11 11	Foundation Piles
4	Concrete Foundation for Beacon	MSF	SCF	23-13 29 15 15	Strip Foundation Blocks
5	Anchor Blot/Post	MSF	SAB	23-13 35 19	Rafters, Beams and Joists
6	Structural Beam (Concrete Beam, Steel Beam and Tie Beam)	MSF	SBM	23-13 35 11 13 13	Beams
7	Structural Column (Concrete Column, Steel Column and Post)	MSO	SCL	23-13 35 11 13 11	Column
8	Bracing (Horizontal/Vertical)	MSF	SBH /SBV	23-13 35 19	Rafters, Beams and Joists
9	Slab/Pier Deck	MSO	SLA	23-15 17 13 19	Precast Tile and Slab Flooring
10	Precast Beam Slab Panel	MSO	SPP	23-13 31 15	Precast Structural Concrete
11	Ramp	MSO	SRP	23-17 23 11	Ramps
12	Corbel/Concrete Bracket for Pier	MSO	SCO	23-13 29 00	Structural Foundation
13	Structural wall / retaining wall	MSO	SWL	23-13 35 21 11	Concrete structural wall
14	Concrete structure for Beacon, Dolphin, vertical seawall, and a solid pier	MSF	SCS	23-13 31 11	Structural Concrete
15	Steel structure for Beacon	MSO	SSS	23-39 21 11 11	Navigation components
16	Access Structure	MSO	SAC	23-13 35 23 11	Structural Concrete floor decks
17	Landing Platform	MSO	SLP	23-13 35 23 11	Structural Concrete floor decks

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
18	Landing Staircase Structure	MSO	SLS	23-13 31 11	Structural Concrete
19	Landing Step	MSO	SLT	23-13 31 11	Structural Concrete
20	Concrete Coping	MSF	SCC	23-13 31 11	Structural Concrete
21	Gabion Wall	MSO	SGW	23-11 17 15	Gabions
22	Wave Absorption Chamber	MSO	SWA	23-13 31 11	Structural Concrete
23	Precast Concrete Block (include seawall block, solid pier concrete block, wave wall/barrier)	MSO	SBK	23-13 31 15	Precast Structural Concrete
24	Rock Armour for seawall and breakwater	MSO	SRA	23-39 21 15 13	Seawalls
25	Rock Fill	MSO	SRF	23-13 11 13	Aggregates
26	Berm Stone	MSO	SBS	23-13 21 11	Concrete Masonry Units
27	Bagged Concrete	MSO	SBC	23-13 21 11	Concrete Masonry Units
28	Levelling Stone	MSO	SLV	23-13 11 13	Aggregates
29	Pell Mell Rubble	MSO	SPM	23-13 11 13	Aggregates

4.8.2. LOD-I Requirement for Marine Structure Model

4.8.2.1. All the attributes specified in the AIR of the PWD should be included in the Fender Model for LOD-I 200, 300, 400 and 500 requirements. During the preparation of the PIM, the LOD-I should align with the details in the AIR of PWD as far as practicable

4.8.3. Terrain (Shoreline / Beach Finish Level)

4.8.3.1. Beaches are dynamic environments which for the buffer between land and sea. The Beach finish level refers to the terrain surface from the foreshore (surf zone) to the backshore (usually above the high tide mark).

4.8.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Boundary, 2D Contour lines and spot levels	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	2D lines and symbols	N/A
250	3D Digital terrain models	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Object rendered by Material texture according to the finish material	Same as 300

4.8.4. Pile and Pile cap

4.8.4.1. Foundation (pile and pile cap) refers to a series of columns constructed or inserted into the seabed to transmit loads to a lower level of subsoil.

4.8.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and cut-off depth	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.5. Concrete Foundation for Beacon

4.8.5.1. Foundation refers to the concrete structures constructed or inserted into the seabed to transmit loads to a lower level of subsoil.

4.8.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all foundation components	Exact nominal size, dimension and cut-off depth	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with all foundation components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.6. Anchor Blot/Post

4.8.6.1. Anchor bolts are used to connect structural and non-structural elements to concrete.

4.8.6.2. The base plates, bolts, clip angles, fixing should be separately modelled from the parent element at LOD-G 400.

4.8.6.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	N/A	N/A	N/A	N/A	N/A
250	N/A	N/A	N/A	N/A	N/A
300	N/A	N/A	N/A	N/A	N/A
400	3D Object element, such as base plates, blots, clips, angles, welds, coping, washers and nuts modelled according to the details of the manufacturer's information,	Exact design dimension of each component	Object insertion point(s) located and orientated exactly as designed.	Overall shape, rendered by Material texture according to the finish material	N/A

4.8.7. Structural Beam (Concrete Beam, Steel Bean and Tie Beam)

4.8.7.1. Beams refer to structural elements that resist loads applied laterally to their axis of the port and marine facilities.

4.8.7.2. The finish should be modelled separately from the Beam 3D Object elements at LOD-G 400.

4.8.7.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.8.8. Structural Column (Concrete Column, Steel Column and Post)

4.8.8.1. Column refers to vertical structure intended to transfer a compressive load of the port and marine facilities.

4.8.8.2. The finish should be modelled separately from the Column 3D Object elements at LOD-G 400.

4.8.8.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.9. Bracing (Horizontal/Vertical)

4.8.9.1. A bracing system serves to stabilize the main girders during construction, to contribute to the distribution of load effects and to provide restraint to compression flanges or chords where they would otherwise be free to buckle laterally.

4.8.9.2. The finish should be modelled separately from the Beam 3D Object elements at LOD-G 400.

4.8.9.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.8.10. Slab/Pier Deck

4.8.10.1. Slab refers concrete structural element. It is used to create horizontal deck surfaces of the port and marine facility.

4.8.10.2. The finish, surfacing material and floor paving should be modelled separately from the slab/deck at LOD-G 300 or above.

4.8.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.11. Precast Beam Slab Panel

4.8.11.1. Precast Beams slab refer to precast structural elements that resist loads applied laterally to their axis of the port and marine facilities.

4.8.11.2. The finish should be modelled separately from the beam 3D Object elements at LOD-G 400.

4.8.11.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc to support prefabrication	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.8.12. Ramp

4.8.12.1. Ramp refers to sloped pathways used inside ports and marine facilities to provide access between vertical levels.

4.8.12.2. The finish, surfacing material and floor paving should be modelled separately from the parent Ramp object at LOD-G 300 or above.

4.8.12.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as designed.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.13. Corbel/Concrete Bracket for Pier

4.8.13.1. A corbel is a structural piece of stone, wood or metal jutting from a wall to carry a super incumbent weight, a type of bracket. A corbel is a solid piece of material in the wall, whereas a console is a piece applied to the structure.

4.8.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element Elements	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.8.14. Structural wall / retaining wall

4.8.14.1. Structure wall refers to a load bearing wall or a wall that carries load in addition to its own load.

4.8.14.2. The finish and surfacing material should be modelled separately from the wall at LOD-G 300 or above.

4.8.14.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness (including the finish)	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object including wall thickness of the major components and their finish	Modelled from floor slab to soffit of beam or slab above	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including reinforcement, wall finish detail including tiling, stone, cladding and screed. Openings modelled according to the requirements of the building services builders	Modelled from Joint to Join from floor slab to soffit of beam or slab above	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Schedules to be dynamically updated from the size of the Openings

4.8.15. Concrete structure for Beacon, Dolphin, vertical seawall, and a solid pier

4.8.15.1. Structural concrete elements/block(s) to support the port and marine facilities

4.8.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension of each block or component parts	Object insertion point(s) Located, levelled, and orientated and as nominal	3D solid block of each component	N/A
400	3D Object element modelled with reinforcements	Exact construction size of each block, component part according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.16. Steel structure for Beacon

4.8.16.1. Steel structure above the structural foundation in Beacon facilities

4.8.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and shape of the supports	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Object element including post, strut, bracing	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
400	3D Object element modelled with post, strut, bracing base plates, blots, clips, angles, welds, coping, washers, and nuts modelled according to the details of the manufacturer's information,	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.17. Access Structure

4.8.17.1. Structural concrete slabs or elements to allow the access of the port and marine facilities from the boarding boat.

4.8.17.2. The finish, surfacing material and floor paving should be modelled separately from the parent structure at LOD-G 300 or above.

4.8.17.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension of each block or component parts	Object insertion point(s) Located, levelled, and orientated and as nominal	3D solid block of each component	N/A
400	3D Object element modelled with reinforcements	Exact construction size of each block, component part according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.18. Landing Platform

4.8.18.1. A landing platform is a concrete platform sticking out into water, usually the sea, which people walk along or use when getting onto or off boats.

4.8.18.2. The finish, surfacing material and floor paving should be modelled separately from the slab at LOD-G 300 or above.

4.8.18.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension of each block or component parts	Object insertion point(s) Located, levelled, and orientated and as nominal	3D solid block of each component	N/A
400	3D Object element modelled with reinforcements	Exact construction size of each block, component part according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.19. Landing Staircase Structure

4.8.19.1. A landing is the area of a structural concrete floor slab near the top or bottom step of a stair.

4.8.19.2. The finish, surfacing material and floor paving should be modelled separately from the slab at LOD-G 300 or above.

4.8.19.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/2D lines	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact thickness	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with exact thickness and reinforcement	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.20. Landing Step

4.8.20.1. Landing steps are the concrete blocks between staircase landings

4.8.20.2. The finish, surfacing material and floor paving should be modelled separately from the slab at LOD-G 300 or above.

4.8.20.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	Symbols/2D lines	N/A
200	3D Object with threads, risers, and landings	Approximate length, width, dimension and levels	Object insertion point(s) approximately located	Overall shape of staircase	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of staircase	N/A
300	3D Object element with threads, risers, and the structural blocks	Exact nominal height, width and levels of each component	Object insertion point(s) located and aligned exactly as nominal	Overall shape of each step and structural blocks	N/A
400	3D Object element with threads, risers, structural blocks and reinforcement	Same as 300	Same as 300	Overall shape rendered by Material texture according to the finish material	N/A

4.8.21. Concrete Coping

4.8.21.1. Copings are used to cap the tops of masonry parapets and freestanding walls to prevent rainwater from penetrating into the construction below

4.8.21.2. The finish should be modelled separately from the concrete coping 3D Object elements at LOD-G 400.

4.8.21.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element	Exact nominal size and dimension	Located, orientated and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	Responsive with structural grid and reference elevation plane
400	3D Object element modelled with reinforcements, camber, chamfer, etc.	Same as 300	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.8.22. Gabion Wall

4.8.22.1. A gabion wall is a retaining wall made of stacked stone-filled gabions tied together with wire

4.8.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic Linear object with all foundation components	Assumed / Typical size of component (s)	Located, orientated and aligned as nominal alignment and level	Overall shape of a Linear object	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of a Linear object	N/A
300	3D Object element blocks with all foundation components	Exact nominal size, and dimension	Object insertion point(s) is located, aligned and levelled as nominal locations	Overall shape of a Linear object	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Object insertion point(s) is located, orientated and as nominal locations	Shape of each object block	N/A

4.8.23. Wave Absorption Chamber

4.8.23.1. Wave absorption chamber is a structure chamber constructed to reduce wave reflection

4.8.23.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame, and cover with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame, and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame, cover, and reinforcement to support prefabrication	Size and shape requirement according to the AIR of PWD	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.8.24. Precast Concrete Block (include seawall block, solid pier concrete block, wave wall/barrier)

4.8.24.1. Precast concrete solid blocks to support the port and marine structure.

4.8.24.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object	Assumed / Typical size of component (s)	Located, orientated and aligned as nominal alignment and level	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element blocks, settlement marker	Exact nominal size, and dimension of each block	Object insertion point(s) is located, aligned, and levelled as nominal locations	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Object insertion point(s) is located, orientated and as nominal locations	N/A	N/A

4.8.25. Rock Armour for seawall and breakwater

4.8.25.1. A human-placed rock or other material used to protect shoreline structures against water and wave.

4.8.25.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic extend of the object	Assumed / Typical extend and thickness	Located, orientated and aligned as nominal alignment and level	Overall shape of an aera coverage	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of an aera coverage	N/A
300	3D Object element	Exact nominal extend and thickness	Object insertion point(s) is located, orientated and levelled as nominal locations	Overall shape of a single solid block	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Same as 300	Same as 300

4.8.26. Rock Fill

4.8.26.1. Rock in armour layers and underlayers in rubble mound construction should normally be placed from the bottom to the top of a section, in such a manner and sequence that individual rock pieces interlock and do not segregate and the interstices are kept free of small rock fragments

4.8.26.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including slope and platforms	Exact Surveyed locations and depths	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models, including slope and platforms	Exact nominal locations and depths	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

4.8.27. Berm Stone

4.8.27.1. Berm stone are used protect the toe of the port and marine structure against scouring due to waves and currents

4.8.27.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic extend of the object	Assumed / Typical extend and thickness	Located, orientated and aligned as nominal alignment and level	Overall shape of an aera coverage	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of an aera coverage	N/A
300	3D Object element	Exact nominal extend and thickness	Object insertion point(s) is located, orientated and levelled as nominal locations	Overall shape of an single solid block	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Same as 300	Same as 300

4.8.28. Bagged Concrete

4.8.28.1. Bagged concrete is used to create seawall structure.

4.8.28.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic Linear object with all foundation components	Assumed / Typical size of component (s)	Located, orientated and aligned as nominal alignment and level	Overall shape of a Linear object	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of a Linear object	N/A
300	3D Object element blocks with all foundation components	Exact nominal size, and dimension	Object insertion point(s) is located, aligned and levelled as nominal locations	Overall shape of a Linear object	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Object insertion point(s) is located, orientated and as nominal locations	Shape of each object block	N/A

4.8.29. Levelling Stone

4.8.29.1. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic extend of the object	Assumed / Typical extend and thickness	Located, orientated and aligned as nominal alignment and level	Overall shape of a aera coverage	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of a aera coverage	N/A
300	3D Object element	Exact nominal extend and thickness	Object insertion point(s) is located, orientated and levelled as nominal locations	Overall shape of a single solid block	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Same as 300	Same as 300

4.8.30. Pell Mell Rubble

4.8.30.1. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	Generic extend of the object	Assumed / Typical extend and thickness	Located, orientated and aligned as nominal alignment and level	Overall shape of a aera coverage	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape of a aera coverage	N/A
300	3D Object element	Exact nominal extend and thickness	Object insertion point(s) is located, orientated and levelled as nominal locations	Overall shape of a single solid block	N/A
400	3D Object element with components to be modelled according to AIR of PWD	Size and shape requirement according to the AIR of PWD	Same as 300	Same as 300	Same as 300

4.9. Roadworks Model

4.9.1. Summary of elements

4.9.1.1. The Roadworks Model includes all object elements of the road works proposed in the works. It is applicable to all services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Earthwork (Cut/Fill)	SUS	Multiple*	23-11 13 11 17	Soil Stabilization Fill
2	Kerb	RKB	Multiple*	23-39 11 11 19	Roadway Curbs
3	Man-made slope (for road construction)	SRS/SUS	Multiple*	23-11 13 11 17	Soil Stabilization Fill
4	Pavement				
4a	Carriage way	RCW	Multiple*	23-11 21 13	Roadways
4b	Cycle Track	RCT	Multiple*	23-11 21 00	Pavements
4c	Foot path	RFW	Multiple*	23-11 21 00	Pavements
5	Retaining Structure	SFD	DWL	23-11 17 00	Retaining Structures
6	Road Marking	RMK	Multiple*	23-39 11 15 11	Roadway Surface Markings
7	Site Boundary Polygon	LOT	SIT	14-37 11 14	Site
8	Traffic Island- Other	RIO	Multiple*	23-39 11 11 19	Roadway Curbs
9	Traffic Island- Refuge Island	RIR	Multiple*	23-39 11 11 19	Roadway Curbs
10	Terrain (Roadworks)	DTM	SIT	14-37 11 14	Site

4.9.2. Earthwork associated with roadworks (Cut/Fill)

4.9.2.1. Earthwork consists of roadway excavations (cuts) and roadway embankments (fills) for highways and associated items of work. Earthwork includes all types of materials excavated and placed in embankment, including soil, granular material, rock, shale, and random material.

4.9.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Cut and fill area boundary	Assumed boundary	object insertion point(s) approximately located	2D hatches	N/A
200	Cut and fill area boundary, 2D Contour lines and spot levels	Approximate boundary	Spots and contour insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	N/A	N/A	N/A	N/A	N/A
300	3D Digital terrain models of each calculated cut and fill surfaces	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Digital terrain models of each calculated rock and soil cut and fill solids	Exact calculated locations and volumes	Object insertion point(s) located and orientated exactly as calculated	3D solids of each rock and soil region	N/A

4.9.3. Kerb

4.9.3.1. A kerb or curb is a vertical or sloping member provided along the edge of a pavement or shoulder to give strength and protect the edge of the pavement

4.9.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including the foundation and backing	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent pavement/object	3D solid each component as a 3D continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including kerb, foundation, backing, ramping, and blinding	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid of each segment, rendered by material texture according to the finish material	N/A

4.9.4. Man-made slope

4.9.4.1. A slope (associated with the roadworks) formed by unnatural process and usually registered under a maintenance department.

4.9.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Slope boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including locations of exposed rock head, toe-line, soil nails, settlement markers	Exact Surveyed locations, extend and size	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models including locations of exposed rock head and toe-line, settlement markers and berms in symbols / 3D polylines	Exact nominal locations, extend and size	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines (5m major, 1m minor), spot levels, symbols and 3D polylines	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	3D Digital terrain models including benching and waterproofing layer and locations of exposed rock head, toe-line, soil nails, settlement markers, berm, soil/rock interfaces in symbols / 3D polylines	Exact setting out locations, extend and size	Same as 300	3D terrain model rendered by Material texture according to the finish material	N/A

4.9.5. Pavement - Carriage way / Cycle Track / Footpath

4.9.5.1. A pavement is the durable surface material laid down on an area intended to sustain vehicular or foot traffic, such as a carriageway, cycle track or footpath.

4.9.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including friction course, wearing course, base-course, road-base, sub-base, concrete slab, paving block	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent pavement/object	3D solid of each component as a 3D continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element type including friction course, wearing course, base-course, road-base, sub-base, concrete slab, paving block, openings (boxing out, man-holes), and joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid of each segment, rendered by material texture according to the finish material	N/A

4.9.6. Retaining Structure (Roadside retaining structures)

4.9.6.1. Retaining structures (associated with the roadworks) are relatively rigid walls used for supporting soil laterally so that it can be retained at different levels on the two sides next to the pavement (Carriageway, foot walk, cycle track)

4.9.6.2. The finish / skin wall should be separated from the wall 3D Object elements at LOD-G 400.

4.9.6.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object, including footing with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including foundation and retaining wall elements.	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent pavement/object	3D Solid of each component as a 3D continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including bearing depth, foundation, reinforcement, pile cut-off depths (if applicable) Openings modelled according to the requirements of the building services builders	Exact construction size of each component parts according to joints	Same as 300	3D Solid of each component rendered by Material texture according to the finish material	N/A

4.9.7. Road Marking

4.9.7.1. Road marking is any kind of device or material that is used on a road surface in order to convey official information.

4.9.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape	N/A
300	3D Object element with size, pattern, and width; approximate thickness	Exact nominal dimension, size and pattern and approximate thickness of each mark / line according to the requirement of the Transport Department	Object insertion point(s) located, aligned, and orientated exactly as nominal parent alignments and road levels.	Overall size, shape and pattern of each mark / line as a 3D continuous span	N/A
400	Same as 300	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	Rendered by Material texture according to the finish material required by the Transport Department	N/A

4.9.8. Traffic Island - Other

4.9.8.1. A traffic island is a solid or painted object in a road that channels traffic.

4.9.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape	N/A
300	3D Object element with size, pattern and width; approximate thickness	Exact nominal dimension, size and pattern and approximate thickness of each mark / line according to the requirement of the Transport Department	Object insertion point(s) located, aligned, and orientated exactly as nominal parent alignments and road levels.	Overall size, shape and pattern of each mark / line as a 3D continuous span	N/A
400	Same as 300	Size and shape requirement according to the AIR of the maintenance parties	Same as 300	Rendered by Material texture according to the finish material required by the Transport Department	N/A

4.9.9. Traffic Island - Refuge Island

4.9.9.1. A refuge island, also known as a pedestrian refuge or pedestrian island, is a small section of pavement or sidewalk, completely surrounded by asphalt or other road materials, where pedestrians can stop before finishing crossing a road.

4.9.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including Pavement (friction course, wearing course, base-course, road-base, sub-base, concrete slab, paving block), Kerb (kerb, foundation and backing), and Signage (if applicable)	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent pavement / object	3D solid of each component as a 3D continuous span	N/A
400	3D Object element type including Pavement (friction course, wearing course, base-course, road-base, sub-base, concrete slab, paving block), Kerb (kerb, foundation and backing), and Signage (if applicable), openings (boxing out, man-holes), draw pits and joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid of each segment, rendered by material texture according to the finish material	N/A

4.9.10. Terrain (Roadworks)

4.9.10.1. Proposed topography is the mesh representation of entire finished road surfaces.

4.9.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including low points	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models, including low points	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

4.10. Sewerage Model

4.10.1. Summary of elements

4.10.1.1. The Sewerage Model include all the object elements of the Sewerage works proposed in to works. It is applicable to all services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Box Culvert (Sewerage)	FBP	___	23-11 21 21 11 13 15	Concrete Box Culverts
2	Chamber	FCH	___	23-39 29 11 15	Wastewater drainage pipes, couplings, collectors
3	Rising Main	FRM	___	23-39 29 11 15	Wastewater drainage pipes, couplings, collectors
4	Sewerage Manhole	FMH	Multiple*	23-39 29 11 13 11	Wastewater storm drain manhole
5	Sewerage Manhole Cover	FMC	Multiple*	23-39 29 11 13 13	Wastewater storm drain manhole cover
6	Sewerage Gravity Sewer	FWD	___	23-39 29 11 15	Wastewater drainage pipes, couplings, collectors
7	Special Manhole	FSH	Multiple*	23-39 29 11 13 11	Wastewater storm drain manhole
8	Terminal Manhole	FLH	Multiple*	23-39 29 11 13 11	Wastewater storm drain manhole
9	Tunnel (Sewerage)	FTP	___	23-11 21 21 11 13 15	Concrete Box Culverts

4.10.2. Box Culvert (Sewerage) / Tunnel (Sewerage)

4.10.2.1. A culvert is a structure that channels sewerage water past an obstacle or to channel a subterranean waterway. Typically embedded to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete, or other material

4.10.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent object	3D solid blocks of each component in a continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation, openings, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	Overall size and shape of each segment, rendered by material texture according to the finish material	N/A

4.10.3. Chamber

4.10.3.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.10.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element including wall, slab, frame and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame and cover and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.10.4. Rising Main

4.10.4.1. Rising Main means a sewer through which foul sewage and/or surface water is pumped.

4.10.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	Specific components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.10.5. Sewerage Gravity Sewer

4.10.5.1. A gravity sewer is a conduit utilizing the energy resulting from a difference in elevation to remove unwanted sewage.

4.10.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	Specific components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.10.6. Sewerage Manhole and cover / Special Manhole / Terminal Manhole

4.10.6.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.10.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame, and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame, cover, benching arm, step iron, stainless steel hook, chain, handrailing and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.11. Specialised Systems Model

4.11.1. Summary of elements

4.11.1.1. The Specialised Systems Model includes all the object elements of the electrical, mechanical and control system required in the roads, tunnels and highways proposed in to works. It is applicable to all services. The following object elements should be included:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	TCSS	SPQ	___	23-39 11 15 17	Traffic Signals
2	Tunnel Ventilation System	UFC	Multiple*	23-29 27 00	Fire Ventilation Equipment

4.11.2. TCSS

4.11.2.1. Traffic Control & Surveillance Systems (TCSS) are a monitoring and control system for tunnel and highway operations. It usually includes LED signs, CCTV, backbone networking, emergency telephone services, public address systems and trunked mobile radio.

4.11.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including LED signs, CCTV, networking facilities, emergency telephone booth, radio stations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including LED signs, CCTV, networking facilities, emergency telephone booth, radio stations	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 400	Size and shape requirement according to the AIR of maintenance party.	Same as 300	Rendered by Material texture according to the finish material	N/A

4.11.3. Tunnel Ventilation System

4.11.3.1. Tunnel ventilation is a system where exhaust fans are located at one end of the house and two large openings are installed at the opposite end.

4.11.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including exhaust fan and ventilation tunnel	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including exhaust fan, ventilation tunnel, major power supplies, status, and control panels	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	Same as 400	Size and shape requirement according to the AIR of maintenance party.	Same as 300	Rendered by Material texture according to the finish material	N/A

4.12. Stormwater Model

4.12.1. Summary of elements

4.12.1.1. The Stormwater Model includes all the object elements of storm water drains proposed in the works. It is applicable to all services. The following object elements should be included

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Box Culvert	SBP	___	23-11 21 21 11 13 15	Concrete Box Culverts
2	Catchpit	SCH	___	23-39 29 13 19 11	Surface Water Catch Basins, Grates and Frames
3	Chamber	SBH	Multiple*	23-39 29 13 19 17	Surface water retention chamber
4	Decked Nullah	SDP	___	23-11 21 21 15	Channels
5	Inlet	SIH	___	23-39 29 13 19 13	Combination storm drain and underdrain inlets
6	Nullah	SNP	___	23-11 21 21 15	Channels
7	Outlet	SNF	___	23-39 29 13	Waste water subdrainage
8	Gully	GUL	Multiple*	23-39 29 15	Waste water channels, gullies, gratings, covers
9	Gully Pipe	SWD	___	23-39 29 13 17	Subgrade drains
10	Sand Trap	SPH	___	23-39 29 11 17	Wastewater Pipework Access Fittings
11	Stepped Channel	SSP	Multiple*	23-11 21 21 15	Channels
12	Stormwater manhole cover	SMC	Multiple*	23-39 29 13 19 15	Storm drainage manholes, frames and covers
13	Stormwater manhole	SMH	Multiple*	23-39 29 13 19 15	Storm drainage manholes, frames and covers
14	Stormwater pipe	SWD	___	23-39 29 13 17	Subgrade drains
15	Terminal manhole	SLH	Multiple*	23-39 29 13 19 15	Storm drainage manholes, frames and covers
16	U-Channel / Covered U-Channel	SUP	___	23-11 21 21 15	Channels
17	Concrete Cover for Channels	SUP	SUC	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers
18	Cast Iron Grating for Channels	SUP	SUG	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers

4.12.2. Box Culvert

4.12.2.1. A culvert is a structure that channels stormwater past an obstacle or to channel a subterranean waterway. Typically embedded to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete, or other material

4.12.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent object	3D solid blocks of each component in a continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation, openings, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid blocks of each segment, rendered by material texture according to the finish material	N/A

4.12.3. Catchpit

4.12.3.1. Catchpits are usually constructed to receive stormwater from stream courses or from slopes.

4.12.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximated size of outline	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including slab, wall, pipe connector, cover and frame (if applicable), trap	Exact nominal dimension and size	Object insertion point(s) located and orientated exactly as nominal location, cover level and invert level.	3D solid blocks of each component	Depth of the catchpit controlled by parameters related to the cover level and/or the pipe invert(s), specified in the applicable standard drawings
400	3D Object element including slab, wall, pipe connector, cover and frame (if applicable), trap, reinforcement details, step iron, benching arm, stainless steel hook/chain, handrailing	Exact setting out location, dimension and orientation	Objects insertion point(s) located, orientated, and aligned exactly as setting out locations, cover levels and invert levels	3D solid blocks of each component rendered by material texture according to the finish material	N/A

4.12.4. Chamber

4.12.4.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.12.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element including wall, slab, frame and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame and cover and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.12.5. Decked Nullah / Nullah

4.12.5.1. Nullah refers to an open, usually concrete-lined channel designed to allow rapid drainage of storm precipitation or industrial wastewater from high ground, to prevent flooding of urbanised coastal areas.

4.12.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent object	3D solid blocks of each component in a continuous span	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
400	3D Object element including top slab, bottom slab, wall, wing wall of inlet and outlet, foundation, openings, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid blocks of each segment, rendered by material texture according to the finish material	N/A

4.12.6. Inlet

4.12.6.1. Inlet is an opening structure to allow incoming of stormwater to a stormwater system from a larger body of water.

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including headwall, slab, orifice plate, trash rack, safety grate and foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent object	3D solid blocks of each component	N/A
400	3D Object element including headwall, slab, orifice plate, trash rack, safety grate, foundation, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid blocks of each segment, rendered by material texture according to the finish material	N/A

4.12.7. Outlet

4.12.7.1. Outlet is an opening structure to allow outgoing of stormwater from a stormwater system to a larger body of water.

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including headwall, slab, orifice plate, trash rack, safety grate and foundation	Exact nominal dimension of each component	Object continuously aligned and orientated exactly as designed 3D alignment and cross fall of the parent object	3D solid blocks of each component	N/A
400	3D Object element including headwall, slab, orifice plate, trash rack, safety grate, foundation, construction joints and expansion joints	Exact construction size of each component parts according to joints	Object location and orientated exactly as designed setting out.	3D solid blocks of each segment, rendered by material texture according to the finish material	N/A

4.12.8. Gully

4.12.8.1. A gully is a fitting with a chamber which is designed to collect rainwater, wastewater, and groundwater, conveying it to an underground surface-water sewer.

4.12.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, grating, weir, gully former and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, grating, weir, gully former, cover and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.12.9. Gully Pipe

4.12.9.1. Drainage pipe that connects gully and stormwater manholes

4.12.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	Specific components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.12.10. Sand Trap

4.12.10.1. Sand trap is a structure that is constructed to exclude the quantity of sand that is carried by water flowing in the channels or tunnels for power generation or irrigation or some other purposes. Sand trap is provided in the form of chambers that depends upon the discharge that is to be carried by the channel or tunnel.

4.12.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame, cover, benching arm, step iron, stainless steel hook, chain, handrailing and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.12.11. Stepped Channel

4.12.11.1. Stepped surface channel used for draining rainwater away from driveways, patios and forecourt areas.

4.12.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with bottom slab, channel wall, steps	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	3D Object element with bottom slab, channel wall, steps, location of joints	Exact nominal dimension of each component	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.12.12. Stormwater Manhole and cover / Terminal Manhole Terminal manhole

4.12.12.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.12.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame, and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame, cover, benching arm, step iron, stainless steel hook, chain, handrailing and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.12.13. Stormwater pipe

4.12.13.1. Conduits used to carry off rainwater.

4.12.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and accessory with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems
400	Specific components modelled, including pipes, all fittings and accessory according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.12.14. U-Channel / Covered U-Channel

4.12.14.1. U-shape surface channel used for draining rainwater away from driveways, patios, and forecourt areas.

4.12.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with bottom slab, channel wall, steps	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each segment	N/A
400	3D Object element with bottom slab, channel wall, steps, location of joints	Exact nominal dimension of each component	Same as 300	3D solid block of each segment rendered by Material texture according to the finish material	N/A

4.12.15. Concrete Cover for Channels

4.12.15.1. .

4.12.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each component	N/A
400	Same as 300	Exact nominal dimension of each component	Same as 300	3D solid block of each segment rendered by Material texture according to the finish material	N/A

4.12.16. Cast Iron Grating for Channels

4.12.16.1. .

4.12.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with exact size/dimension	Exact nominal dimension	Object insertion point(s) located and orientated exactly as nominal locations, levels and alignment.	3D solid block of each-component	N/A
400	Same as 300	Exact nominal dimension of each component	Same as 300	3D solid block of each segment rendered by Material texture according to the finish material	N/A

4.13. Water Supplies Model

4.13.1. Summary of elements

4.13.1.1. The Water Supplies Model includes all the object elements of the water supplies network proposed in the works. It is applicable to all services. The following object elements should be included

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Fresh watermain	WSD	___	23-39 27 11	Water Utility pipeline equipment
2	Salt Watermain	SSD	___	23-39 27 11	Water Utility pipeline equipment
3	Chamber / Pump Pit	SBH	Multiple*	23-39 27 11	Water Utility pipeline equipment
4	Fittings	PPF	Multiple*	23-39 27 11	Water Utility pipeline equipment
5	Valve	PPA	VLV	23-27 31 00	Valves
6	Thrust Block	THB	___	23-39 27 11	Water Utility pipeline equipment
7	Fire Hydrant	FS_	SFH	23-29 25 13	Fire Hydrants

4.13.2. Fresh watermain / Salt water main

4.13.2.1. Pipe used to supply water services.

4.13.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and valve with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems as far as practicable
400	Specific components modelled, including pipes, all fittings, valve and concrete blocks according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.13.3. Chamber / Sump Pit

4.13.3.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.13.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	3D Object element including wall, slab, frame and cover	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element including wall, slab, frame and cover and reinforcement	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.13.4. Fittings

4.13.4.1. A fitting or adapter is used in pipe systems to connect straight sections of pipe or tube and adapt to different sizes or shapes. Fittings mainly include elbow, coupling, union, reducers, tee, cap, flange, flare, and plug

4.13.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems as far as practicable
400	Specific components modelled, including fasteners, clean-out, and gasket according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.13.5. Valve

4.13.5.1. Valves stop (or regulate) the flow of supply water

4.13.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	The object should be modelled as connect systems as far as practicable
400	Specific components modelled, including fasteners, clean-out, and gasket according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.13.6. Thrust Block

4.13.6.1. A thrust block can be defined as a structural member that is installed at the rear of the launching shaft for the purpose of transmitting the horizontal force transmitted from the pipe jacks to the surrounding soil.

4.13.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object	Assumed / Typical size of component (s)	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with all components	Exact nominal size, and dimension	Located, orientated, and sloped as nominal and/or structural grid and reference elevation plane	3D solid block of each component	N/A
400	3D Object element modelled with all components, including reinforcements, chamfer, etc.	Exact construction size of each component parts according to joints	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.13.7. Fire Hydrant

4.13.7.1. A fire hydrant is a connection point by which firefighters can tap into a water supply. It is a component of active fire protection

4.13.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location.	3D solid block of each component	The object should be modelled as connect systems as far as practicable
400	Specific components modelled, according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.14. Gas Supply Model

4.14.1. Summary of elements

4.14.1.1. The Gas Supply Model includes all the object elements of the gas supply utilities proposed in the works. It is applicable to all services. The following object elements should be included

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Gas Pipe	GAP	___	23-39 25 11	Gas Utility Pipeline Equipment
2	Gas Inspection pit	GIP	___	23-17 11 27 23	Man Hole Accesses
3	Gas Value	PPA	VLV	23-27 31 00	Valves

4.14.2. Gas pipe

4.14.2.1. Pipe used to supply gas.

4.14.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element, including pipes, all fittings and valve with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location and levels	3D solid block of each component	The pipes should be modelled as connect systems as far as practicable
400	Specific components modelled, including pipes, all fittings, valve and concrete blocks according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.14.3. Gas Inspection Pit

4.14.3.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.14.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.14.4. Gas Valve

4.14.4.1. Valves stop (or regulate) the flow of supply gas

4.14.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element with overall size and dimension. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal location, invert levels, and longitudinal fall.	3D solid block of each component	The pipes should be modelled as connect systems as far as practicable
400	Specific components modelled, including fasteners and gasket according to the details of the manufacturer's information to support fabrication and installation. Dynamic envelope to indicate the maintenance spaces if applicable	Size and shape requirement according to support the fabrication requirement.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	Same as 300

4.15. Electrical Power Supply Model

4.15.1. Summary of elements

4.15.1.1. The Electrical Power Supply Model includes all the object elements of the electrical power supply utilities proposed in the works. It is applicable to all services. The following object elements should be included

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Electric Box	ELQ	Multiple*	23-39 23 00	Electrical Utility Equipment
2	Electric Inspection pit	EIP	___	23-17 11 27 23	Man Hole Accesses
3	Electric Manholes	EMH	___	23-17 11 27 23	Man Hole Accesses
4	Power Cables / lines	EPD	___	23-35 33 25	Electrical Wireway
5	Transformers	ETR	___	23-39 23 11	Electrical Transmission Equipment

4.15.2. Electric Box

4.15.2.1. An electrical box is an enclosure housing electrical connection. It protects the electrical connections from the weather, as well as prevent people from accidental electric shocks

4.15.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline of the housing with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, control panel and footing with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.15.3. Electric Inspection pit / Electric Manhole

4.15.3.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.15.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.15.4. Power Cables / lines

4.15.4.1. Power distribution systems that rely on copper or aluminium busbars to channel electricity, while being enclosed in an housing for protection.

4.15.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of cable containment	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including cable duct, and concrete surroundings. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal depths and size of each cable containment	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.15.5. Transformers

4.15.5.1. A transformer is a passive component that transfers electrical energy from one electrical circuit to another circuit, or multiple circuits

4.15.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline of the housing and footings with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including housing, control panel and footing with outer size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.16. Telecommunication Model

4.16.1. Summary of elements

4.16.1.1. The Telecommunication Model includes all the object elements of the telecommunication utilities proposed in the works. It is applicable to all services. The following object elements should be included

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Telecommunication lines	TED	___	23-37 11 17 13	Telecommunication Wireways
2	Tel Inspection pit	TIP	___	23-17 11 27 23	Man Hole Accesses
3	Tel Manholes / Drawpits	TMN	___	23-17 11 27 23	Man Hole Accesses

4.16.2. Telecommunication lines

4.16.2.1. Telecommunication/networking systems that rely on copper or aluminium busbars to channel signals, while being enclosed in a housing for protection.

4.16.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of cable containment	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including cable duct, and concrete surroundings. Dynamic envelope to indicate approximated maintenance spaces if applicable	Exact nominal depths and size of each cable containment	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

4.16.3. Tel Inspection pit / Tel Manhole / Drawpits

4.16.3.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

4.16.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	3D Object element including wall, slab, frame and cover with exact size and dimension	Exact nominal dimension of each component	Object insertion point(s) located and orientated exactly as nominal.	3D solid block of each component	N/A
400	3D Object element with components to be modelled according to AIR of the maintenance party	Size and shape requirement according to the AIR of maintenance party.	Same as 300	3D solid block of each component rendered by Material texture according to the finish material	N/A

5. EXISTING CONDITION MODEL

5.1. Disciplinary Models

5.1.1. List of disciplinary models

5.1.1.1. Existing Condition Model include the 4 disciplinary models:

PROJECT MODEL	1ST LEVEL FEDERATION	2ND LEVEL FEDERATION (DISCIPLINARY MODELS)	DESCRIPTION
PROJECT INFORMATION MODEL	**Existing Condition Model**	Existing Structure	All existing above ground and underground structures of the Service area
		Existing Site Topography	Topology (Digital Terrain Model) of the site area, include GI data and bore hole data
		Existing Street Furniture	Relevant existing planters, traffic sign, road markings, railings, street lighting, barriers, kerbs etc
		Existing Underground Utilities	All existing underground utilities systems of the Service area

5.2. Existing Structure model

5.2.1. List of Common Objects Elements

5.2.1.1. The following object elements are classified under the Existing Structure model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Culverts	TCU	Multiple*	23-11 21 21 11 13	Concrete Culverts
2	Existing Building Structure Mass Model	MAS	MAS	23-19 29 00	Complete Buildings
3	Existing Bridge and Tunnel Structure Mass Model	MAS	MAS	23-39 13 00	Tunnels and Bridges
4	Existing Retaining Structure	SRW	___	23-11 17 00	Retention Structure
5	Foundation (pile)	SFD	FPL	23-13 29 11	Foundation piles
6	Foundation (pile cap)	SFD	FCA	23-13 29 11 11 21	Pile Caps
7	Foundation (ground beam)	SFD	FBM	23-13 29 15 13	Grade Beams (shallow foundations)
8	Foundation (Other)	SFD	Multiple*	23-13 29 00	Foundations
9	Footing	SFD	OTR	23-13 29 15 15	Strip Foundation Blocks (shallow foundations)
10	Mass Concrete Infill (including No-fines Concrete)	GSM	MAC	23-13 15 11	Concretes
11	Retaining Wall on Slope	SUS	RET	23-11 17 13	Retaining Walls
12	Concrete Beam,Steel Beam, Hanger	BEM	___	23-13 35 11	Structural Frames
13	Structural Wall	SWL	___	23-13 31 11	Structural Concrete
14	Structural Columns	SCL	Multiple*	23-13 35 11	Structural Frames
15	Floor, Slab	SLA	___	23-13 31 11	Structural Concrete
16	Steel access ladder	GSM	SAL	23-17 23 15	Ladders
17	Steel Handrailing (to Maintenance Stairway on Slope)	GSM	SRL	23-17 25 13	Handrails

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
18	Steel Staircase (Maintenance Stairway on Slope)	GSM	SST	23-17 23 17 11	Stair component products
19	Steel Gate	GSM	SGA	23-17 23 17 11 21	Stair Barrier Gates
20	Maintenance Access (incl. Concrete Stairway/Berm)	GSM	CMS	23-13 31 17	Concrete Formwork
21	Diaphragm Wall	EXL	DIW	23-11 17 00	Retention Structures
22	Lining	UCL	Multiple*	23-39 13 11 15	Tunnel Lining
23	Tunnel Structure Segments	TIS	Multiple*	23-39 13 11	Tunnels
24	Temp. Support Structure	EXL	Multiple*	23-11 11 00	Ground Anchorages
25	Chain Link Fence on Slope	GSM	CLF	23-11 25 19 19	Chain Link Metal Fences

5.2.2. Culverts

5.2.2.1. A culvert is a structure that channels stormwater past an obstacle or to channel a subterranean waterway. Typically embedded to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete, or other material

5.2.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.3. Existing Building Structure Mass Model

5.2.3.1. Exterior of the existing structure in 3-dimension solid blocks

5.2.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object, including outline mass with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Solid of each component rendered by Material texture	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.4. Existing Bridge and Tunnel Structure Mass Model

5.2.4.1. Exterior of the existing bridge and tunnel in 3-dimension solid blocks

5.2.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object, including outline mass with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Solid of each component rendered by Material texture	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.5. Existing Retaining Structure

5.2.5.1. Retaining structure are relatively rigid walls used for supporting soil laterally so that it can be retained at different levels on the two sides.

5.2.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object, including footing with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Solid of each component rendered by Material texture	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.6. Structural Foundation – Pile / Pile Cap / Foundation / Footings

5.2.6.1. Foundation refers to a series of columns constructed or inserted into the ground to transmit loads to a lower level of subsoil. Foundation/Ground beam refers to reinforce concrete beams for supporting walls and joists at or near ground level. Footing refers to foundation unit constructed in brick work, stone masonry or concrete under the base of a wall column for the purpose of distributing the load over a large area.

5.2.6.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

5.2.6.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with all foundation components	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.7. Foundation (Other)

5.2.7.1. Foundation (Other) is classified as other foundation which is not categorised as pile/pile cap/footings.

5.2.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.8. Mass concrete fill

5.2.8.1. Mass concrete fill refers to any volume of concrete with dimensions large enough to required that measures be taken to cope with the generation of heat from hydration of cement and attendant volume change to minimize cracking.

5.2.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.9. Retaining Wall on Slope

5.2.9.1. Retaining walls are relatively rigid walls used for supporting soil laterally so that it can be retained at different levels on the two sides. Retaining walls are structures designed to restrain soil to a slope that it would not naturally keep to.

5.2.9.2. The finish / skin wall should be separated from the wall 3D Object elements at LOD-G 400.

5.2.9.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object, including footing with size and shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.10. Concrete Beam,Steel Beam, Hanger

5.2.10.1. Beams refer to structural elements that resist loads applied laterally to their axis.

5.2.10.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

5.2.10.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.11. Structural Wall

5.2.11.1. Structure wall refers to a load bearing wall or a wall that carries load in addition to its own load.

5.2.11.2. The finish should be separated from the wall 3D Object elements at LOD-G 400.

5.2.11.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness (including the finish)	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.12. Structural Columns

5.2.12.1. Column refers to vertical structure intended to transfer a compressive load.

5.2.12.2. The finish should be separated from the Beam 3D Object elements at LOD-G 400.

5.2.12.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall shape	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.13. Floor, Slab

5.2.13.1. Slab refers concrete structural element used to create horizontal surfaces such as berms and decks.

5.2.13.2. The finish should be separated from the slab at LOD-G 300 or above.

5.2.13.3. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.14. Steel access ladder

5.2.14.1. Access ladder is often used to describe the maintenance access ladder on the slope.

5.2.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.15. Steel Handrailing (to Maintenance Stairway on Slope)

5.2.15.1. Steel handrailing are railings designed to minimize fall risk at a work site where there is high fall risk.

5.2.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object including post, rail, vertical members	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.16. Steel Staircase

5.2.16.1. Access ladder is often used to describe the maintenance access ladder on the slope.

5.2.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.17. Steel Gate

5.2.17.1. Steel Gate refers to a hinged barrier that can be used to secure an opening in a wall, fence and hedge.

5.2.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.18. Maintenance Access (including Concrete stairway / Berms)

5.2.18.1. Maintenance access include the concrete stairway and berms constructed to allow the inspection and maintenance of the man-made slope features.

5.2.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including stairway and berms with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.19. Diaphragm Wall

5.2.19.1. Diaphragm wall is a continuous wall constructed in ground in to facilitate certain construction activities, such as: As a retaining wall. As a cut-off provision to support deep excavation. As the final wall for basement or other underground structure (e.g. tunnel and shaft).

5.2.19.2. Geometrical Requirement\

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.20. Lining

5.2.20.1. Tunnel lining is used in both trenchless construction and rehabilitation to maintain the shape of the tunnel and to shield whatever might pass through it.

5.2.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the parent alignment, cross fall, and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.21. Tunnel Structure segments

5.2.21.1. Segmental concrete tunnel liners are prefabricated structural support pieces that are combined to form a complete tube along tunnel passageways. The segments are created in manufacturing plants for tunnel projects

5.2.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object with overall thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	Dynamically updated according to the changes in the alignment, cross fall, and sections
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.22. Temp. Support Structure / ELS

5.2.22.1. Excavation and lateral support works (ELS works) is normally called for in the construction of pile caps, basement, underground drainage and tunnel works.

5.2.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbol	N/A
200	3D Object with size and shape of the supports	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	N/A	N/A	N/A	N/A	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.2.23. Chain Link Fence on Slope

5.2.23.1 A Chain Link Fence On Slope is a structure that encloses a slope, and is usually constructed from posts that are connected by netting.

5.2.23.2 Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3. Existing Site Topography model

5.3.1. List of Common Objects Elements

5.3.1.1. The following object elements are classified under the Existing Site Topography model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Terrain (Bathymetry)	DTM	BAE	14-34 17 99	Other Land and Water Topographical Transitions
2	Land Lot Boundary	LOT	LAN	14-37 11 11	Parcel
3	Terrain (Rock head)	DTM	ROK	14-31 99 00	Other Space Designations to facilitate design and construction
4	Terrain (Shoreline / Beach Finish Level)	DTM	BFL	12-34 17 24	Shoreline
5	Terrain (Site Topology)	DTM	TOP	14-37 11 14	Site
6	Tree / Vegetation	LTP	Multiple*	23-11 27 19 13	Trees
7	Man-made slope (Registered)	GSM	MMS	14-34 11 00	Slopped Topographical spaces
8	Natural slope	GSM	NSL	14-34 11 00	Slopped Topographical spaces
9	Site/Slope Boundary Polygon	LOT	SIT	14-37 11 14	Site
10	Borehole	GEO	BOH	N/A	N/A
11	Fill	GEO	FIL	N/A	N/A
12	Marine deposits	GEO	MAD	N/A	N/A
13	Alluvium	GEO	ALL	N/A	N/A
14	Colluvium	GEO	COL	N/A	N/A
15	Residual Soil	GEO	RES	N/A	N/A
16	Completely decomposed rock	GEO	CDR	N/A	N/A
17	Highly decomposed rock	GEO	HDR	N/A	N/A
18	Bedrock	GEO	BED	N/A	N/A
19	Compacted Fill	GEO	COF	N/A	N/A

5.3.2. Terrain (Bathymetry)

5.3.2.1. Existing Bathymetry is the underwater topography to show the proposed water profile before the works.

5.3.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Boundary, 2D Contour lines and spot levels	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	2D lines and symbols	N/A
250	3D Digital terrain models	Exact Surveyed locations and depths	Object insertion point(s) is located at / derived from the onsite survey point(s)	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.3. Land Lot Boundary

5.3.3.1. Land lot boundary refers to the land lot ownership information created according to the record provided by the Lands Department.

5.3.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	2D polylines	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	N/A	N/A
250	3D polylines	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Closed polygons	N/A
300	3D polygons	Exact determinated locations and levels	Object insertion point(s) located and orientated exactly as determined by the surveyor	Closed polygons	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.4. Terrain (Rock head)

5.3.4.1. Rock head surface determined from the site investigation records

5.3.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Material's extend boundary, 2D Contour lines and spot levels	Approximate location	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
200	Object including stratigraphy with decomposed rock and bed rock, location of the boreholes	Approximate location, depth, and thickness	Object insertion point(s) approximately located	3D Boundary, Contour lines, spot levels and symbols	N/A
250	Same as 200	Same as 200	Object modelled according to the borehole logs results or AGS from ground investigation works	Same as 200	Same as 200
300	3D Digital terrain models, including inferred surfaces boundary of decomposed rocks and bed rock, location of boreholes, as well as ground water profile for design purpose	Exact inferred location, depth, and thickness of all components	3D surfaces modelled according to the borehole logs results or AGS from ground investigation works	3D Boundary, Contour lines, spot levels and 3D objects	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

5.3.5. Terrain (Shoreline / Beach Finish Level)

5.3.5.1. Beaches are dynamic environments which for the existing buffer between land and sea. The Beach finish level refers to the terrain surface from the foreshore (surf zone) to the backshore (usually above the high tide mark).

5.3.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Boundary, 2D Contour lines and spot levels	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	2D lines and symbols	N/A
250	3D Digital terrain models	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	Boundary, Contour lines and spot levels	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

5.3.6. Terrain (Site Topology)

5.3.6.1. Proposed topography is the mesh representation of entire existing site surfaces.

5.3.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Site boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including slope and platforms	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models, including slope, platforms and breaklines of man-made features	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines, spot levels, symbols and 3D breaklines	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

5.3.7. Tree / Vegetation

5.3.7.1. Plant tree is a perennial plant with an elongated stem, or trunk, supporting branches and leaves in the existing site area.

5.3.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with diameter, height and spread	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.8. Man-made slope (Registered Slope)

5.3.8.1. A slope formed by unnatural process and usually registered under a maintenance department.

5.3.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Slope boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including locations of exposed rock head, toe-line, soil nails, settlement markers	Exact Surveyed locations, extend and size	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	3D Digital terrain models including locations of exposed rock head, toe-line, soil nails, settlement markers, berm in 3D polylines / symbols	Exact nominal locations, extend and size	Object insertion point(s) located and orientated exactly as nominal	3D Boundary, Contour lines (5m major, 1m minor), spot levels, 3D polylines and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

5.3.9. Natural slope

5.3.9.1. A slope formed by natural process.

5.3.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	Slope boundary, 2D Contour lines and spot levels	Approximate dimension	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
250	3D Digital terrain models including locations of man-made features, large boulders, rock outcrop, tree locations	Exact Surveyed locations, extend and size	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D Boundary, Contour lines, spot levels and symbols	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.10. Site/Slope Boundary Polygon

5.3.10.1. Site boundary means the outermost perimeter of the slope.

5.3.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	2D polylines	Assumed / Typical size of component(s)	Object insertion point(s) approximately located	N/A	N/A
250	3D polylines	Exact Surveyed locations and levels	Object insertion point(s) is located at / derived from the onsite survey point(s)	Closed polygons	N/A
300	3D polygons	Exact nominal locations and levels	Object insertion point(s) located and orientated exactly as nominal	Closed polygons	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.11. Borehole

5.3.11.1. A borehole is a narrow shaft bored in the ground, either vertically or horizontally to support site investigation.

5.3.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size and location	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	Same as 200	Exact nominal size and location	Object insertion point(s) located and orientated exactly as nominal locations and levels	3D solid block of each component	N/A
400	N/A	N/A	N/A	N/A	N/A

5.3.12. Geology – Fill / Marine Deposit / Alluvium / Colluvium / Residual Soil / Completely decomposed rock / Highly decomposed rock / Bedrock / Compact fill

5.3.12.1. Various layer of material that covers the earth's surface.

5.3.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Material's extend boundary, 2D Contour lines and spot levels	Approximate location	Object insertion point(s) approximately located	2D polygons, contour lines and symbols	N/A
200	3D object including stratigraphy, with layers of fill, transported soils, decomposed rock and bed rock, location of the boreholes	Approximate location, depth and thickness	Object insertion point(s) approximately located	3D Boundary, Contour lines, spot levels and symbols	N/A
250	Same as 200	Same as 200	Object modelled according to the borehole logs results or AGS from ground investigation works	Same as 200	Same as 200
300	3D Digital terrain models, including inferred surfaces boundary of soils and rocks, location of boreholes, as well as ground water profile for design purpose	Exact inferred location, depth, and thickness of all components	3D surfaces modelled according to the borehole logs results or AGS from ground investigation works	3D Boundary, Contour lines, spot levels and 3D objects of surfaces	Support earthwork calculation. Allow users to switch object appearance dynamically by configuration
400	N/A	N/A	N/A	N/A	N/A

5.4. Existing Street Furniture model

5.4.1. List of Common Objects Elements

5.4.1.1. The following object elements are classified under the Existing Street Furniture model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Barrier	FBF	Multiple*	23-39 11 11 15	Traffic Barrier
2	Bollard at Road	FBL	Multiple*	23-39 11 19	Bollards
3	Catchpit	SCH	___	23-39 29 13 19 11	Surface Water Catch Basins, Grates and Frames
4	Pavement	RCT	PAV	23-11 21 17	Paving blocks
4a	Carriage way	RCW	Multiple*	23-11 21 13	Roadways
4b	Cycle Track	RCT	Multiple*	23-11 21 00	Pavements
4c	Foot path	RFW	Multiple*	23-11 21 00	Pavements
5	E&M Pit / Cable Draw Pit	ECD	___	23-17 11 27 23	Manhole Accesses
6	Bus Shelter / Terminus	FST	Multiple*	23-19 29 13	Covers and Shelters
7	Electric Pole	SIT	ETP	23-39 23 11 11	Electrical Utility Poles
8	Electric Transformer	ETR	Multiple*	23-35 13 11	Current Transformers
9	Exterior Benches / Seating	SIT	SIT	23-11 29 13	Exterior Seating
10	Fence	FBF	Multiple*	23-11 25 19	Fences
11	Fire Hydrant	FS_	SFH	23-29 25 13	Fire Hydrants
12	Fire Valve	PPA	VLV	23-29 25 13	Fire Hydrants
13	Gate	FEG	Multiple*	23-11 25 15	Perimeter Gates
14	Grating	GRA	Multiple*	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers
15	Guard Rails/ Railings	FRA	Multiple*	23-17 25 11	Guardrails
16	Gully	GUL	Multiple*	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers
17	Hoarding	EHO	Multiple*	23-11 25 13	Perimeter Walls
18	Inspection Chamber	ECD	___	23-17 11 27 23	Manhole Accesses
19	Lamp Post / Lighting column/ Lighting pole	LLP	Multiple*	23-35 47 11 21 23	Street and Roadway Lighting Fixture

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
20	Planter	LTW	SHS	23-11 27 13	Planting Accessories
21	Road Kerbs	RKB	Multiple*	23-39 11 11 19	Roadways Curbs
22	Road Marking	RMK	Multiple*	23-39 11 15 11	Roadway Surface Markings
23	Sign Pole / Traffic sign	FTS	Multiple*	23-39 11 13	Roadway Signage
24	Staircase	TTE	___	23-17 23 17 11	Stair Component Products
25	Street Name Plate	FNP	Multiple*	23-11 29 33	Exterior Directional Signs
26	Telephone Pole	SIT	TEP	23-37 11 17	Communication Wireways
27	Traffic Light	FTL	Multiple*	23-39 11 15 17	Traffic Signals
28	U-Channel/ Covered U-Channels	SUP	___	23-11 21 21 15	Channels
29	Sand Trap	SPH	___	23-39 29 11 17	Wastewater Pipework Access Fittings
30	Storm Water Manhole cover	SMC	Multiple*	23-39 29 13 19 15	Storm Drainage Manholes, Frames, and Covers
31	Baffle	GSM	BAF	23-11 17 00	Retention Structures
32	Raking Drains	GSM	RKD	23-11 13 11 23	Field Drainage Blocks
33	Soil Nail	GSM	SON	23-11 11 13 11	Earth Reinforcement Soil nails
34	Stepped Channel	SSP	Multiple*	23-11 21 21 15	Channels
35	Flexible Barrier	GSM	FBR	23-11 19 00	Slide and Avalanche Protection
36	Rigid barrier	GSM	RBR	23-11 17 00	Retention Structures
37	Hard Surface Cover (e.g. shotcrete)	GSM	HSC	23-11 13 11	Soil stabilization products
38	Recreation area/facilities	LOT	REA	23-11 31 00	Athletic and Recreational Surfaces
39	Vegetation Surface Cover	GSM	VSC	23-11 13 11	Soil stabilization products
40	Tree Ring	GSM	TRR	23-11 27 13	Planting Accessories
41	Erosion Control Mat	GSM	ECM	23-11 15 11 21	Sheeting Synthetic Erosion Controls
42	Wire Mesh	GSM	WRM	23-13 19 11 15	Mesh for General Use
43	Ground Anchors	GSM	GAR	23-11 11 11	Retaining Stabilizing Ground Anchors

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
44	Concrete Cover for Channels	SUP	SUC	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers
45	Cast Iron Grating for Channels	SUP	SUG	23-39 29 15	Waste Water Channels, Gullies, Gratings, Covers

5.4.2. Barrier

5.4.2.1. Barrier refers to linear object elements installed in the works area to control road traffic to prevent automotive vehicles from colliding or crashing into pedestrians and structures.

5.4.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Lines and Symbols	N/A
200	3D Object post including barrier, footings, and foundation	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.3. Bollard at Road

5.4.3.1. Bollards refers to posts installed in the works area to control road traffic prevent automotive vehicles from colliding or crashing into pedestrians and structures.

5.4.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.4. Catchpit

5.4.4.1. Catchpits are usually constructed to receive stormwater from stream courses or from slopes.

5.4.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including slab, wall, pipe connector, cover, and frame (if applicable),	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.5. Pavement - Carriage way / Cycle Track / Footpath

5.4.5.1. A pavement is the durable surface material laid down on an area intended to sustain vehicular or foot traffic, such as a carriageway, cycle track or footpath.

5.4.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object type	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	3D Object including road surfacing and openings	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.6. E&M Pit / Cable Draw Pit

5.4.6.1. A draw pit is the manhole of the ducting world. They are chambers situated along a line of underground ducting and facilitate access to the ducting to allow for initial installation, maintenance, and monitoring.

5.4.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.7. Bus Shelter / Terminus

5.4.7.1. A bus shelter is a roofed structure for people to wait under at a bus stop.

5.4.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Lines and Symbols	N/A
200	3D Object with size and shape of the steel structure/structure, foundation, panels	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.8. Electric Pole

5.4.8.1. Electric pole refer to one of a series of large, upright poles used to support electric cables.

5.4.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including post, footings, and foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.9. Electric Transformer

5.4.9.1. Transformer is a passive component that transfers electrical energy from one electrical circuit to another circuit, or multiple circuits

5.4.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object outline of the housing and footings with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.10. Exterior Benches / Seating

5.4.10.1. A long seat for several persons in public space.

5.4.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.11. Fence

5.4.11.1. A fence is a structure that encloses an area, typically outdoors, and is usually constructed from posts that are connected by boards, wire, rails or netting. A fence differs from a wall in not having a solid foundation along its whole length.

5.4.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including post, strut, horizontal railing	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D solid block of each component; barrier fence as a semi-transparent sheet	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.12. Fire Hydrant

5.4.12.1. A fire hydrant is a connection point by which firefighters can tap into a water supply. It is a component of active fire protection

5.4.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.13. Fire Valve

5.4.13.1. A fire valves stop (or regulate) the flow of supply water of fire hydrant

5.4.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.14. Gate

5.4.14.1. refers to a hinged barrier that can be used to secure an opening in a wall, fence and hedge.

5.4.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.15. Grating

5.4.15.1. A grating / manhole cover covering a drain (as illustrated) can be a collection of iron bars (the identical, elongated elements) held together (to ensure the bars are parallel and regularly spaced) by a lighter iron frame. Gratings over drains and air vents are used as filters, to block movement of large particles (such as leaves) and to allow movement of small particles (such as water or air).

5.4.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including all iron bars	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.16. Guard Rails/ Railings

5.4.16.1. Railing, handrail, or guardrails refers to a fence or barrier made of rails to prevent people from falling off.

5.4.16.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including railings, bracing, supports, posts and footing	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.17. Gully

5.4.17.1. A gully is a fitting with a chamber which is designed to collect rainwater, wastewater and groundwater, conveying it to an underground surface-water sewer.

5.4.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, and cover with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.18. Hoarding

5.4.18.1. A hoarding is defined as a barrier structure between a construction site and the public.

5.4.18.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including post, beams, bracing, enclosures, and footings	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	3D solid block of each component	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.19. Inspection Chamber

5.4.19.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel to support inspection works.

5.4.19.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, and cover	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.20. Lamp Post / Lighting column/ Lighting pole

5.4.20.1. A light fixture, light fitting, or luminaire is an electrical device containing an electric lamp that provides illumination.

5.4.20.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including lights/lamp, post, foundation	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.21. Planter

5.4.21.1. Planter refers to the concrete structure for the planting of vegetations.

5.4.21.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.22. Road Marking

5.4.22.1. Road marking is any kind of device or material that is used on a road surface in order to convey official information.

5.4.22.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.23. Road Kerb

5.4.23.1. Kerb or curb is a vertical or sloping member provided along the edge of a pavement or shoulder to give strength and protect the edge of the pavement

5.4.23.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object type	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.24. Sign Pole / Traffic sign

5.4.24.1. Traffic signs or road signs are signs erected at the side of or above roads or highways to give instructions or provide information to road users.

5.4.24.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.25. Staircase

5.4.25.1. Staircases refer to a set of steps leading from one level to another.

5.4.25.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including steps and landings	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.26. Street Name Plate

5.4.26.1. Traffic signs or road signs are signs erected at the side of or above roads to describe the road name.

5.4.26.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object with size and width, road name text	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.27. Telephone Pole

5.4.27.1. Telephone pole refer to one of a series of large, upright poles used to support telephone wires.

5.4.27.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including post, footings and foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.28. Traffic Light

5.4.28.1. Traffic lights, traffic signals, stoplights or robots are signalling devices positioned at road intersections, pedestrian crossings, and other locations to control flows of traffic.

5.4.28.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols	N/A
200	3D Object including traffic lights, housing, post, and footings	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.29. U-Channel/Covered U-Channels

5.4.29.1. U-shape surface channel used for draining rainwater away from driveways, patios and forecourt areas.

5.4.29.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with bottom slab, channel wall	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Surveyed size of component (s)	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.30. Sand Trap

5.4.30.1. Sand trap is a structure that is constructed to exclude the quantity of sand that is carried by water flowing in the channels or tunnels for power generation or irrigation or some other purposes. Sand trap is provided in the form of chambers that depends upon the discharge that is to be carried by the channel or tunnel.

5.4.30.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.31. Stormwater Manhole and cover / Terminal Manhole Terminal manhole

5.4.31.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.4.31.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.32. Baffle

5.4.32.1. An element for natural terrain hazard mitigation measure constructed at the uphill of the proposed rigid/flexible barrier to serve as prescribed measures for enhancing robustness of the mitigation scheme.

5.4.32.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	N/A	N/A	N/A	N/A	N/A
200	3D Object including post, footings and foundations	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.33. Raking Drains

5.4.33.1. Raking drains are used in lowering the groundwater level and relieving the groundwater pressure at depth or used as contingency measures to cater for uncertainties in the groundwater conditions and possible adverse effects of subsurface seepage (e.g. from leaking services) on slope stability.

5.4.33.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.34. Soil Nail

5.4.34.1. Soil nailing is a remedial construction measure to treat unstable natural soil slopes or as a construction technique that allows the safe over-steepening of new or existing soil slopes.

5.4.34.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension/orientation	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.35. Stepped Channel

5.4.35.1. Stepped surface channel used for draining rainwater away from driveways, patios and forecourt areas.

5.4.35.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with bottom slab, channel wall	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Surveyed size of component (s)	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.36. Flexible barrier net, Base plate, shackle for net, round clip, Post, Footing, shackle on post, running wheel, cable rope, rope clip, braking element

5.4.36.1. A flexible barriers net is used to trap stream loads from a traversing a stream course.

5.4.36.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including post and barrier with approximated size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.37. Rigid barrier

5.4.37.1. Rigid debris-resisting barriers are a key example of risk mitigation measures, which catch landslide debris and prevent them from reaching populated or developed areas.

5.4.37.2. Information Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.38. Hard surface cover

5.4.38.1. Hand surface cover refers to material (e.g. shotcrete) applies to the slope surface to protect it from landslip.

5.4.38.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.39. Recreation area/facilities

5.4.39.1. Recreation area refers to surface/area designated to the recreation area or facilities.

5.4.39.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D polylines	Exact Surveyed locations and levels	Object insertion point(s) approximately located	Closed polygons	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Closed polygons	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.40. Vegetation surface cover

5.4.40.1. Vegetation surface cover refers to vegetation material applies to the slope surface to protect it from landslip.

5.4.40.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D hatches	Assumed size	Symbol insertion point(s) approximately located	2D hatches	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.41. Tree Ring

5.4.41.1. Tree ring is an opening in a supporting toe slab to allow tree roots to extend into the ground.

5.4.41.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.42. Erosion Control Mat

5.4.42.1. Erosion control mat is a measure to apply directly on exposed soil surface to improve its resistance against soil erosion by slowing down the flow velocity, and by cushioning the impact of raindrops loosening the soil.

5.4.42.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.43. Wire Mesh

5.4.43.1. Wire mesh is a measure to help prevent or minimise shallow or washout type of slope failures.

5.4.43.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with extend and thickness	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.44. Ground anchors

5.4.44.1. .

5.4.44.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size	Assumed / Typical size of component (s)	Object insertion point(s) approximately located and orientated	Overall shape 3D solid blocks	N/A
250	Same as 200	Assumed size	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.45. Concrete Cover for Channels

5.4.45.1. Concrete cover for channels is a cover made by concrete to cover up the drainage channels.

5.4.45.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.4.46. Cast Iron Grating for Channels

5.4.46.1. Cast iron grating for channels is a cover made by cast iron grating to cover up the drainage channels.

5.4.46.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5. Existing Underground Utilities Models

5.5.1. Summary of Elements

5.5.1.1. The following object elements are classified under the Existing Underground Utilities model:

ITEM	OBJECT ELEMENT	CAT CODE	SUBCAT CODE	OMNICLASS NO	OMNICLASS DESCRIPTION
1	Manhole	UMH	___	23-17 11 27 23	Manhole Accesses
2	Manhole Foul Water / Sewer	FMH	Multiple*	23-39 29 11 13	Waste Water Storm Drain
3	Manhole Storm Water	SMH	Multiple*	23-39 29 13 19 15	Storm Drainage manholes, frames and covers
4	Manhole Telephone	MTL	___	23-17 11 27 23	Manhole Accesses
5	Valve Gas	PPA	VLV	23-39 25 11	Gas Utility Pipeline Equipment
6	Valve Waterworks	PPA	VLV	23-39 27 11	Water Utility Pipeline Equipment
7	Power cables / lines	EPD	___	23-35 33 25	Electrical Wireway
8	Gas pipe	GAP	___	23-39 25 11	Gas Utility Pipeline Equipment
9	Telecommunication lines	TED	___	23-37 11 17	Communication Wireways
10	Sewage Pipe	FWD	___	23-39 29 11 15	Waste Water Drainage pipe, couplings, Collectors
11	Storm Water pipe	SWD	___	23-39 29 13 19 11	Surface Water Catch Basins, Grates and Frames
12	Fresh Watermain	WSD	___	23-39 27 11	Water Utility Pipeline Equipment
13	Salt Watermain	SSD	___	23-39 27 11	Water Utility pipeline equipment
14	Box Culvert	SBP	___	23-11 21 21 11 13 15	Concrete Box Culverts
15	Chamber	SBH	Multiple*	23-39 29 13 19 17	Surface water retention chamber
16	Inlet	SIH	___	23-39 29 13 19 13	Combination storm drain and underdrain inlets
17	Nullah	SNP	___	23-11 21 21 15	Channels

5.5.2. Manhole

5.5.2.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.5.2.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.3. Manhole Foul Water/ Sewer

5.5.3.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.5.3.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.4. Manhole Storm Water

5.5.4.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.5.4.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.5. Manhole Telephone

5.5.5.1. A manhole is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.5.5.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.6. Valve Gas

5.5.6.1. Valves stop (or regulate) the flow of supply gas.

5.5.6.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.7. Valve Waterworks

5.5.7.1. Valves stop (or regulate) the flow of supply water.

5.5.7.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.8. Power cables / lines

5.5.8.1. Power distribution systems that rely on copper or aluminium busbars to channel electricity, while being enclosed in a housing for protection.

5.5.8.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension of cable duct, and concrete surroundings dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of cable containment	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.9. Gas pipe

5.5.9.1. Pipe used to supply gas.

5.5.9.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.10. Telecommunication lines

5.5.10.1. Telecommunication/networking systems that rely on copper or aluminium busbars to channel signals, while being enclosed in an housing for protection.

5.5.10.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of cable containment	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.11. Sewage Pipe

5.5.11.1. A sewage pipe is a conduit to remove unwanted sewage.

5.5.11.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.12. Storm Water Pipe

5.5.12.1. Conduits used to carry off rainwater.

5.5.12.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.13. Fresh watermain / Salt water main

5.5.13.1. Pipe used to supply water services.

5.5.13.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object with approximate size/dimension and dynamic envelope to indicate approximated spaces if applicable	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.14. Box Culvert (Sewerage) / Tunnel (Sewerage)

5.5.14.1. A culvert is a structure that channels sewerage water past an obstacle or to channel a subterranean waterway. Typically embedded to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete, or other material

5.5.14.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.15. Chamber

5.5.15.1. A manhole (alternatively person hole, utility hole, maintenance hole, or sewer hole) is an opening to a confined space such as a shaft, utility vault, or large vessel. Manholes are often used as an access point for an underground public utility, allowing inspection, maintenance, and system upgrades.

5.5.15.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including wall, slab, frame and cover with approximate size/dimension and dynamic envelope to indicate approximated spaces	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid block	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid block	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.16. Inlet

5.5.16.1. Inlet is an opening structure to allow incoming of stormwater to a stormwater system from a larger body of water.

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A

5.5.17. Decked Nullah / Nullah

5.5.17.1. Nullah refers to an open, usually concrete-lined channel designed to allow rapid drainage of storm precipitation or industrial wastewater from high ground, to prevent flooding of urbanised coastal areas.

5.5.17.2. Geometrical Requirement

LOD-G	Content	Size and Shape	Location & Orientation	Appearance	Behavior
100	Conceptual/Schematic 2D symbol	Assumed size	Symbol insertion point(s) approximately located	Symbols/lines	N/A
200	3D Object including the outline of slab and box	Assumed / Typical size of component (s)	Object insertion point(s) approximately located	Overall shape 3D solid blocks	N/A
250	Same as 200	Same as 200	Object insertion point(s) is located at / derived from the onsite survey point(s)	Overall shape 3D solid blocks	N/A
300	N/A	N/A	N/A	N/A	N/A
400	N/A	N/A	N/A	N/A	N/A