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# **Common Data Environment (CDE) Data Standard**

**JANUARY 2021**

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# Acknowledgements

This Standard was prepared by Housing and Development Board (HDB), JTC Corporation (JTC), Defence Science and Technology Agency (DSTA) and Building and Construction Authority (BCA) with inputs from the industry.

While every effort has been made to ensure the accuracy and quality of information contained in this publication, the Building and Construction Authority, its employees, agents and industry partners involved in this publication can take no responsibility for the subsequent use of this information, nor for any errors or omissions that it may contain.

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# 1 Introduction

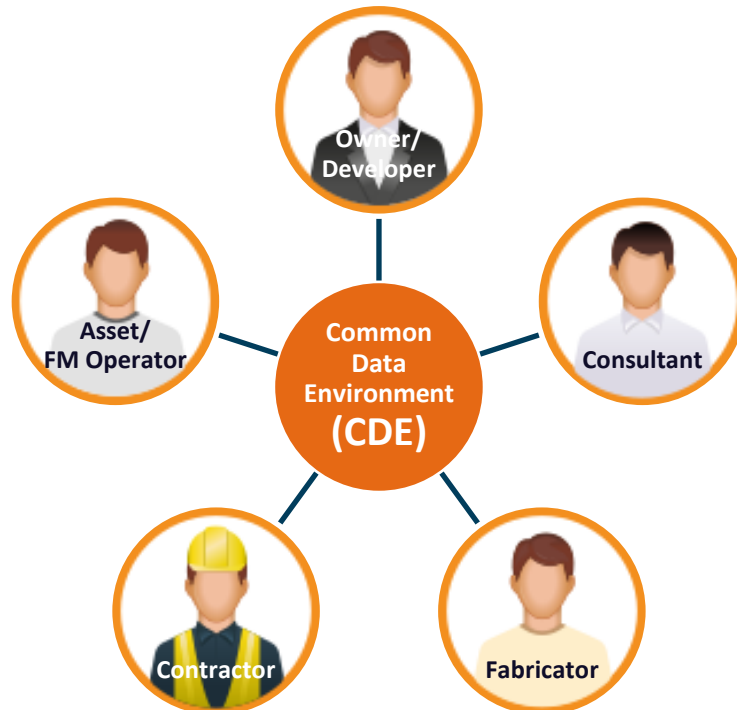
Building projects involve many parties from the developer to consultants to contractors, sub-contractors and to facility managers. It also involves communication of large amount of information along the value chain in the execution of the project. The timeliness, accuracy and completeness of information over the various stages of the value chain is key to successful completion of the project on time and within budget.

To better integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle, there is a strong need to put in place Common Data Environment (CDE) to enable a more structured manner to create, organise and communicate information for project collaboration and life-cycle management of delivered facilities.

Today, project teams often have to deal with different information requirements from different developers. This is not ideal as it would mean having to deal with different data sets and standards, making process changes within project and enterprise, and spending time understanding the information requirement specifications for each new project.

Hence, the various government agencies – Housing and Development Board (HDB), JTC Corporation (JTC), Defence Science and Technology Agency (DSTA) and Building and Construction Authority (BCA) had worked together with the industry to establish the information requirements in a common data environment for projects to ensure consistency in information requirements to support the project delivery and life-cycle management of assets.

## 2 Definition & Components of Common Data Environment (CDE)



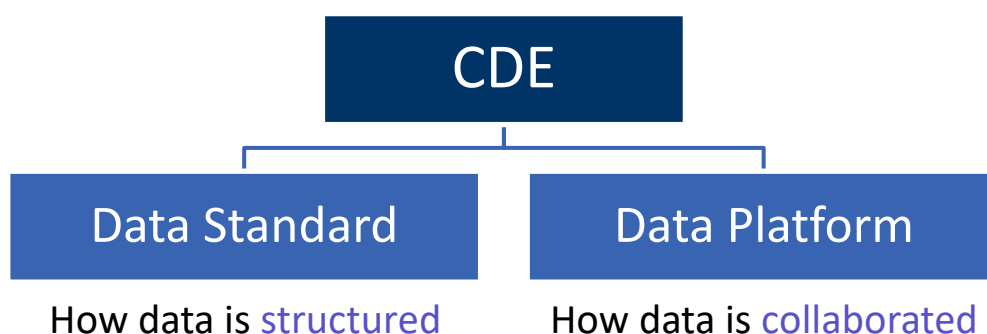
### Definition of Common Data Environment:

**Common digital space** that hosts the relevant information for collaboration, exchange and communication to deliver a project.

### Components:

CDE comprises two components – the Data Standard and the Data Platform.

- **Data Standard** defines *what* are the *information required* and *how* the information is *structured* for sharing and collaboration within a common data environment to deliver a project.
- **Data Platform** refers to the *computer system* or *technology platform* that the data and information is stored, shared and collaborated on in a CDE.



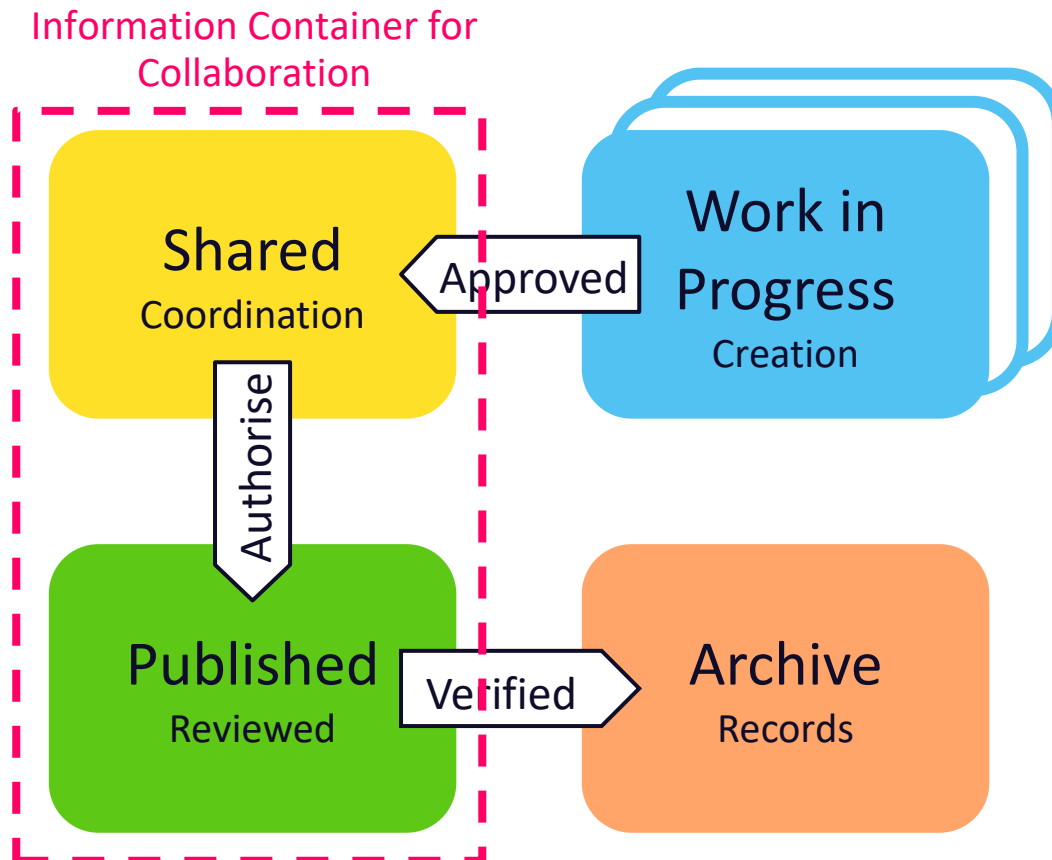
## 3 Objectives of CDE

The Common Data Environment (CDE) aims to:

- Ensure consistent and better managed project information and process for projects.
- Allow project team members timely access to up-to-date, relevant and reliable project information in a common and structured environment for the delivery of a project.
- Facilitate close collaboration among project team members through sharing, exchanging, communicating and managing the project information in a common space.
- Enable project teams to derive useful project performance insights for trending purpose.

## 4 CDE Framework

The CDE focuses on the coordination and review states of the data and information at the shared and published states to support collaboration, information exchange and management and the project delivery process.



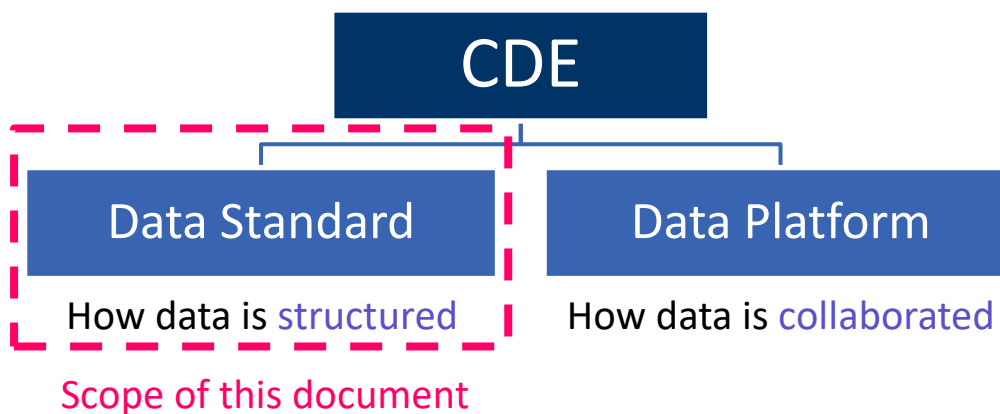
Based on the international standard *ISO 19650: Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling – Common Data Environment Workflow*

## 5 Purpose of CDE Data Standard

This document focuses only on the [Data Standard](#) of the CDE and sets out the information requirements for the various digital use cases in a common data environment for [projects](#). The data captured within the CDE can also be used to monitor the health of individual projects e.g. monitor delays and to benchmark the performance across different projects e.g. performance of contractors for different projects.

Organisations can select the relevant use cases and related data requirements from this Data Standard and add on agency-specific requirements according to specific project needs.

Private sector firms can also adopt the standard and manage their project information in a structured and collaborative environment.





# 6 Key Principle: Common vs Organisation-Specific Requirements

Organisations can select from the list of common Digital Use Cases as specified in the Data Standard based on their project needs and can add on to cater to specific project requirements.

## CDE Data Standard Scope

COMMON INFORMATION REQUIREMENTS (ORGANISATIONS CAN SELECT)

<p><b>1. Activities</b></p> <ul style="list-style-type: none"> <li>List of Digital Use Cases &amp; Definitions</li> <li>CDE Use Cases</li> <li>Deliverables for each Digital Use Case</li> </ul>	<p><b>2. Content: Model</b></p> <ul style="list-style-type: none"> <li>Common Elements</li> <li>Common Parameters, Data Type &amp; Units</li> </ul>	<p><b>3. Performance</b></p> <ul style="list-style-type: none"> <li>Benchmark Metrics</li> </ul>
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ORGANISATION-SPECIFIC INFORMATION REQUIREMENTS (ADD-ONS)						
ORG 1	ORG 2	ORG 3	ORG 4	ORG 5	Other organisations	
1a. Project Stages	1a. ....	1a. ....	1a. ....	1a. ....		
1b. Use Cases for each stage	1b. ....	1b. ....	1b. ....	1b. ....		
1c. Deliverables for each Use Case	1c. ....	1c. ....	1c. ....	1c. ....		
2. Elements and Attributes for each stage	2. ....	2. ....	2. ....	2. ....		
3. Benchmark Metrics	3. ....	3. ....	3. ....	3. ....		

## 7 Terms & Definitions

For the purpose of this document, the following terms and definitions apply:

### CDE Use Case

Implementation of a Digital Use Case in the context of information management in a common data environment.

### Deliverables

End product or results to be generated from the common data environment use cases.

### Digital Use Case

A project sub-task that can be digitised.

### Integrated Digital Delivery (IDD)

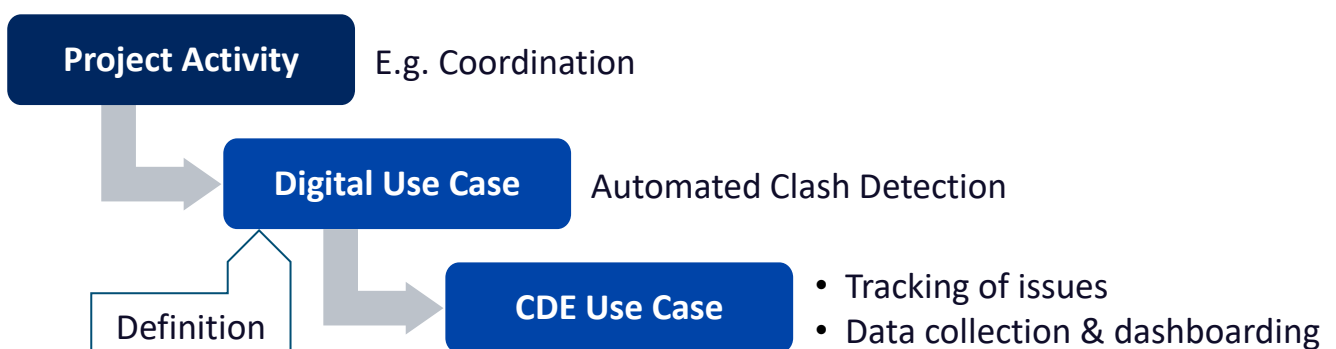
The use of digital technologies to integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle.

### Performance Metric

Quantifiable measure that gauges how well a specific action or activity performs.

### Project Activity

Typical tasks performed for a project.



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## 8 Project Activities, Digital and CDE Use Cases, Deliverables and Performance Metrics

This section outlines the Project Activities involved to deliver a typical building and construction project. With each activity, various Digital Use Cases have been identified and the corresponding Digital Deliverables and CDE Use Cases are also included.

Project Activities may be applied at specific Project Stage or across various Project Stages, depending on the project needs and as specified by the client. The list is not exhaustive and organisations may add on project-specific activities and use cases.

## 8.1 Definitions of Digital Use Cases and Requirements for the Deliverables and CDE Use Cases

The use of a digital platform as the Common Data Environment is recommended to maximise the benefits of the Digital Use Cases. The CDE Use Cases listed here are non-exhaustive and will depend on the functionalities of the digital platform.

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
Design Generation	Design authoring	Create BIM models and 2D drawings for design exploration, design iterations and communication and specific purposes as specified by the client	<ul style="list-style-type: none"> <li>• BIM models</li> <li>• Drawings</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of file versions and status</li> <li>• Tracking of changes made to files (e.g. person making the change, date and time of change etc.)</li> <li>• Collection of data for analysis (at project or organisational level)</li> <li>• Maintenance of relationships between model files</li> </ul>
	Design for Safety	Develop designs that integrate safety considerations and risk management and into the BIM models	<ul style="list-style-type: none"> <li>• BIM models</li> <li>• Drawings</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of file versions and status</li> <li>• Tracking of changes made to files (e.g. person making the change, date and time of change etc.)</li> <li>• Collection of data for analysis (at project or organisational level)</li> <li>• Maintenance of relationships between model files</li> </ul>
	Computational design	Develop algorithms to generate and manipulate 3D models and information for optimisation, automation and validation	<ul style="list-style-type: none"> <li>• Scripts and algorithms</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of file versions and status</li> <li>• Tracking of changes made to files (e.g. person making the change, date and time of change etc.)</li> <li>• Maintenance of relationships between model files</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
<b>Quality Assurance/ Quality Control</b>	Model quality assurance	Establish a set of quality metrics and use model checking tools to automate and perform quality checks of BIM models based on model content requirements for different stages of project (e.g. design, fabrication, construction and asset management etc.)	<ul style="list-style-type: none"> <li>• Verified models</li> <li>• Reports on compliance</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of versions</li> <li>• Tracking of changes to model quality from previous version</li> <li>• Tracking of approvals</li> <li>• Collection of data on model quality for analysis (at project or organisational level)</li> <li>• Maintenance of relationship between BIM models and compliance reports</li> </ul>
<b>Coordination</b>	3D visualisation	Utilise 3D models to communicate the visual, spatial or functional qualities through renderings, fly-throughs, scenography and holography	<ul style="list-style-type: none"> <li>• Digital 3D models (can be further processed according to project needs)</li> <li>• Rendered models</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of file versions</li> <li>• Tracking of changes made to files (e.g. person making the change, date and time of change etc.)</li> <li>• Maintenance of relationships between design and visualisation models</li> </ul>
	Automated clash detection	Automatically identify possible clashes/conflicts of building elements between the different disciplines using digital models and clash detection tools/platform prior to actual fabrication or construction	<ul style="list-style-type: none"> <li>• Clash detection reports</li> <li>• Digital notes of discussions</li> <li>• Coordinated BIM models</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of individual issue (e.g. person responsible to follow up, due date, status)</li> <li>• Collection of data for analysis (at project or organisational level)</li> <li>• Maintenance of relationships between files used</li> </ul>
	Digital Request for Information (RFI)	Raise, communicate and track issues through digital means to facilitate resolution	<ul style="list-style-type: none"> <li>• Issues and resolution dashboards</li> <li>• Digital notes of discussion</li> <li>• Updated BIM models</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of requests (e.g. person responsible to follow up, due date, status)</li> <li>• Collection of data for analysis (at project or organisational level)</li> </ul>
	Integrated Concurrent Engineering (ICE) meetings	Conduct meetings (technical, review, coordination etc.) with the relevant project team members in a collaborative way and enabled by digital technologies and BIM	<ul style="list-style-type: none"> <li>• Digital records of decision (e.g. federated models), actions to be taken and party responsible</li> </ul>	<ul style="list-style-type: none"> <li>• Central repository of information required for coordination and follow-ups</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
<b>Design Review</b>	Visualisation and design checks	Utilise BIM models or other digital 3D models or immersive technologies like Augmented Reality (AR) <sup>1</sup> / Virtual Reality (VR) <sup>2</sup> / Mixed Reality (MR) <sup>3</sup> to seek feedback and validate design aspects, space requirements and other settings such as buildability and constructability	<ul style="list-style-type: none"> <li>• BIM models or other digital 3D models (can be further processed according to project needs)</li> <li>• Rendered models</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of comments</li> <li>• Tracking of file versions and status</li> <li>• Maintenance of relationships between files used for reviews</li> </ul>
	Digital submission & approval	Submit deliverables required by various stakeholders for decision through digital means	<ul style="list-style-type: none"> <li>• Information required for tracking</li> <li>• Decision records</li> </ul>	<ul style="list-style-type: none"> <li>• Digital endorsement through electronic signatures, QR Codes and access IDs</li> <li>• Tracking of comments</li> <li>• Tracking of submission status</li> <li>• Collection of data on design issues for analysis (at project or organisational level)</li> </ul>
<b>Simulations and Analysis</b>	Structural analysis	Perform simulations and analysis using 3D models and analysis tools to optimise the design of the structural system for better buildability and constructability	<ul style="list-style-type: none"> <li>• Simulation models</li> <li>• Simulation and analysis reports</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of relationship between design and analysis models</li> </ul>
	Building performance and sustainability analysis	Perform simulations and analysis of building performance using 3D models and building performance simulation and analysis tools to optimise environmental sustainability (e.g.	<ul style="list-style-type: none"> <li>• Simulation models</li> <li>• Simulation and analysis reports</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of relationship between design and simulation models</li> <li>• Hosting of multiple files for environment simulations (3D GIS, etc.)</li> </ul>

<sup>1</sup> Augmented Reality (AR) – Technology that allows users to see and interact with the real world with the virtual objects being overlaid in a real-world environment.

<sup>2</sup> Virtual Reality (VR) – Technology that immerses users in a completely virtual environment that is generated by a computer.

<sup>3</sup> Mixed Reality (MR) – Technology that combines virtual environment with the real-world and allows users to interact with both the real world and the virtual environment.

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
		daylighting, computational fluid dynamics, simulations of energy consumption etc.) and user-centricity of system and building designs		
<b>Regulatory Compliance</b>	Regulatory compliance verification	Verify compliance with regulatory requirements automatically with BIM models	<ul style="list-style-type: none"> <li>• Verified BIM models</li> <li>• Compliance reports</li> </ul>	<ul style="list-style-type: none"> <li>• Collection of data on compliance with regulatory requirements for analysis (at project or organisational level)</li> <li>• Maintenance of relationship between BIM models and compliance report</li> </ul>
	Computation of metrics for regulatory compliance	Automatically compute metrics (e.g. buildability score) required to comply with regulatory compliance utilising data from BIM models and other sources	<ul style="list-style-type: none"> <li>• Metrics</li> </ul>	<ul style="list-style-type: none"> <li>• Collection of data on metrics for analysis (at project or organisational level)</li> </ul>
<b>Cost Estimation</b>	BIM-based cost estimation	Estimate costs at various project stages based on available information from BIM models	<ul style="list-style-type: none"> <li>• Costing models</li> <li>• Costing and quantity-take-off documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of relationship between design information and cost database</li> </ul>
<b>Tender</b>	BIM-based tender documentation	Prepare tender documents based on information primarily generated from BIM models	<ul style="list-style-type: none"> <li>• BIM models</li> <li>• Drawings</li> <li>• Tender specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Management of tender documents</li> <li>• Management of tenderers</li> <li>• Access control of tenderers to tender documents</li> <li>• Collection of data and dashboarding of tenderers' past performance</li> </ul>
<b>Fabrication</b>	Detailing for fabrication	Develop fabrication detailing and create shop drawings /shop models	<ul style="list-style-type: none"> <li>• Detail drawings generated from BIM models</li> <li>• Shop models for direct fabrication</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of versions</li> <li>• Tracking of changes made to files (e.g. person making the change, date and time of change etc.)</li> <li>• Tracking of approvals</li> <li>• Maintenance of relationship between BIM model and detail drawings</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
	Digital production	Utilise BIM and digital information to facilitate the production of precast components and prefab modules in a controlled environment	<ul style="list-style-type: none"> <li>• Fabrication models</li> <li>• BIM-based shop drawings/models</li> </ul>	<ul style="list-style-type: none"> <li>• Common reference for the latest revision of fabrication drawings/models</li> <li>• Digital reference between fabricated part and fabrication drawings</li> </ul>
<b>Logistics Planning and Management</b>	Digital logistics	Plan the prefabrication production schedule and track and monitor the production, delivery and installation of the prefab components digitally	<ul style="list-style-type: none"> <li>• Production schedule</li> <li>• Digital logistic delivery records</li> <li>• Simulations of logistic paths and conditions (optional)</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining relationship between environment model and construction model</li> <li>• Connectivity of production schedule to logistics management system</li> <li>• Extraction of contents for digital dashboarding of logistics progress</li> <li>• Digital dashboards/models of tracking and monitoring of production, delivery and installation</li> </ul>
<b>Site Preparation</b>	Digital setting out	Conduct site setting-out using BIM models and digital surveying solutions	<ul style="list-style-type: none"> <li>• Records of digital setting-out data and site photos</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of versions of digital survey files</li> <li>• Maintenance of relationship between digital survey files and design construction models</li> </ul>
<b>Construction Planning and Scheduling</b>	Digital construction scheduling and sequencing	Plan and monitor construction activities using digital construction scheduling, simulation and sequencing	<ul style="list-style-type: none"> <li>• 4D time-based construction schedules, simulations or sequencing models</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of versions</li> <li>• Tracking of changes made to schedule (e.g. person making the change, date and time of change etc.)</li> <li>• Tracking of approvals</li> <li>• Maintenance of relationship between BIM models and schedule</li> </ul>



PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
<b>Progress Monitoring</b>	Digital progress monitoring	Monitor site progress using digital solutions/scanning and update schedules and 3D models for progress reports and payments	<ul style="list-style-type: none"> <li>Records of site progress photos, updates to schedules and 3D models; or</li> <li>Progress reports (actual vs planned; current month vs previous month)</li> </ul>	<ul style="list-style-type: none"> <li>Tracking of progress (actual vs planned; current month vs previous month)</li> </ul>
<b>Contracts Management</b>	Digital procurement	Procure materials and services based on information primarily generated from BIM models and automate purchase orders	<ul style="list-style-type: none"> <li>Digital BQ</li> <li>Digital procurement orders</li> </ul>	<ul style="list-style-type: none"> <li>Tracking of statuses for orders and deliveries</li> </ul>
	Digital claims	Generate progress claims based on digital records of works completed	<ul style="list-style-type: none"> <li>Digital payment claims</li> <li>Digital records of completion (e.g. point cloud)</li> <li>Digital endorsement of completion</li> <li>Digital payment</li> </ul>	<ul style="list-style-type: none"> <li>Tracking of payment claims and statuses</li> <li>Tracking of approvals for claims</li> <li>Authentication of endorsement identity</li> </ul>
	Digital variations	Highlight changes from contractual provision and generate estimates of costs and time implications of changes for decisions	<ul style="list-style-type: none"> <li>List of variations with details on costs and time</li> </ul>	<ul style="list-style-type: none"> <li>Tracking of statuses</li> <li>Tracking of approvals</li> <li>Collection of data for analysis (at project or organisational levels)</li> </ul>

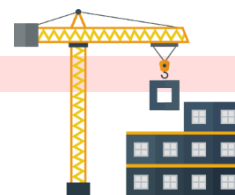
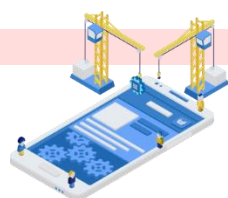
PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
<b>Site Installation/ Construction</b>	Digital-enabled assembly and installation	Deploy and operate construction equipment (e.g. cranes) with the help of digital technologies such as IoT, sensors, cameras for automatic or assisted installation of building components on-site	<ul style="list-style-type: none"> <li>• Construction schedules</li> <li>• Simulations of assembly &amp; installation sequence</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of relationship between construction schedule and construction equipment</li> </ul>
	Digital QA/QC inspections	Record observations and track follow-ups using digital solutions	<ul style="list-style-type: none"> <li>• Records of QA/QC site inspections conducted</li> <li>• Audit trails of resolution/approvals</li> </ul>	<ul style="list-style-type: none"> <li>• Enable lite BIM viewing for QA/QC reference</li> <li>• Version tracking of QA/QC report and inspection records</li> <li>• Tracking of resolution/approvals</li> </ul>
<b>Safety Management</b>	Digital safety planning, geofencing, surveillance and inspections	Track workers movement and ring-fence dangerous site spaces to manage safety practices compliances and non-compliances and safety incidents and observation reports digitally and via dashboards	<ul style="list-style-type: none"> <li>• BIM models with safety zones</li> <li>• Digital demarcation of dangerous zones</li> <li>• Digital forms for safety incidents and observation reports</li> <li>• Digital records of inspections</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining relationship between construction sequence model and safety zoning model</li> <li>• Tracking of version modification of safety zoning model</li> <li>• Tracking of changes between different safety dashboards</li> <li>• Digital dashboards/systems of safety practices compliances and non-compliances</li> </ul>
<b>Manpower Management</b>	Manpower management	Monitor and manage manpower utilisation, certifications and productivity metrics digitally	<ul style="list-style-type: none"> <li>• Digital records of manpower activities</li> <li>• Digital certifications and identity of workers</li> </ul>	<ul style="list-style-type: none"> <li>• Real-time tracking of manpower deployment</li> <li>• Automated alerts based on pre-determined parameters</li> <li>• Collection of data for analysis (at project or organisational levels)</li> </ul>
<b>Defects Management</b>	Digital defects management	Manage and track defects and rectification using digital checklists and dashboards	<ul style="list-style-type: none"> <li>• Master defects list</li> <li>• Digital defects location record</li> <li>• Defects rectification reports</li> </ul>	<ul style="list-style-type: none"> <li>• Tracking of rectification (e.g. party to follow up, due date, status)</li> <li>• Collection of data for analysis (at project or organisational levels)</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	DEFINITION	DIGITAL DELIVERABLES	CDE USE CASE
<b>As-Built Records</b>	As-Built documentation	Generate digital as-built information and verify against actual built progressively	<ul style="list-style-type: none"> <li>• BIM models</li> <li>• Drawings</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance of relationships between model files</li> </ul>
<b>Handover</b>	Digital handover	Generate digital asset information of the built physical assets and hand over as-built records, manufacturers' specifications and warranties and O&M manuals digitally	<ul style="list-style-type: none"> <li>• 3D asset models with assets information</li> <li>• As-built records</li> <li>• Manufacturers' specifications and warranties</li> <li>• O&amp;M manuals</li> </ul>	<ul style="list-style-type: none"> <li>• Connectivity between asset BIM models and organisational FM Systems</li> <li>• Compilation of all documentation for handover</li> </ul>
<b>Operations and Maintenance (where applicable)</b>	Real-time monitoring of assets performance	Track key operating parameters of assets such as utilisation, downtime, availability etc. real-time	<ul style="list-style-type: none"> <li>• Digital operating data</li> <li>• Object/system centric FM data collection</li> </ul>	<ul style="list-style-type: none"> <li>• Operating information link to Asset BIM</li> <li>• Digital dashboards/systems for real-time monitoring</li> </ul>
	Digital operations and maintenance	Perform operations and maintenance of assets and facilities using digital platforms integrated with technologies such as IoT, sensors, data analytics etc.	<ul style="list-style-type: none"> <li>• Digital maintenance records</li> <li>• Digital records of work orders</li> <li>• Audit trails of resolution/follow-ups</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining of relationship between monitoring data, work orders</li> <li>• Dashboarding of asset performances</li> <li>• Dashboarding of FMC performances</li> <li>• Work order status tracking</li> <li>• Management of work orders against maintenance records</li> </ul>

## 8.2 Example: Project Activities at IDD Stages and \*Organisation-Specific Project Stages

The Project Activities in this table are based on IDD Stages. The respective organisations will specify their Organisation-Specific Project Stages and determine the Digital Use Cases required for their projects accordingly.

DESIGN	FABRICATION	CONSTRUCTION	ASSET MANAGEMENT
*Concept/Preliminary/ Detailed/Tender	*Prefabrication/Production	*Construction	*As-Built
Design Generation			
Design for Safety			
Quality Assurance/Quality Control (QA/QC)			
Coordination			
Design Review			
Simulations & Analysis			
Regulatory Compliance			
Cost Estimation			
Building Tender			
Fabrication			
	Logistics Planning & Management		
		Site Preparation	
		Construction Planning & Scheduling	
		Progress Monitoring	
		Contracts Management	
		Site Installation/Construction	
		Safety Management	
		Manpower Management	
		Defects Management	
		As-Built Records (including As-Fabricated)	
		Handover	



\* Organisation-Specific Project Stages

## 8.3 Key Performance Metrics

### Definitions:

#### Objective

Activities or actions to achieve the outcome.

#### Performance Metric

Quantifiable measure that gauges how well a specific activity or action performs

PROJECT ACTIVITY	DIGITAL USE CASE	OBJECTIVE	VISIBILITY TO ACHIEVE OBJECTIVE	PERFORMANCE METRICS
Design Review	Digital Submission	<ul style="list-style-type: none"> <li>Track project progress</li> <li>Enable faster, efficient and seamless submissions</li> </ul>	<ul style="list-style-type: none"> <li>Percentage completion of all project documents – linked to project progress</li> <li>Percentage completion of project activities for design stage</li> </ul>	<ul style="list-style-type: none"> <li>No. of submitted documents against target no. of total submissions per project</li> <li>No. of documents at each state e.g. submitted, under review, approved, rejected etc. – further drill down by discipline, organisation, user ID etc. as specified by the client</li> <li>Cumulative no. of submissions for each type of submission e.g. letters, SOI, RFAs, RFIs etc. over time</li> <li>No. of submissions for each project activity</li> <li>Time taken to complete each project activity</li> </ul> <p><i>Drill-down:</i></p> <ul style="list-style-type: none"> <li>No. of documents in each state by each discipline</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	OBJECTIVE	VISIBILITY TO ACHIEVE OBJECTIVE	PERFORMANCE METRICS
			<ul style="list-style-type: none"> <li>• Source/cause of delay in approvals e.g. frequent submissions, late reviewer, irregular submissions etc.</li> <li>• Overdues or upcoming deadlines for project activities</li> </ul>	<ul style="list-style-type: none"> <li>○ No. of documents in each state by each organization</li> <li>○ No. of documents in each state by each user ID</li> <li>○ No. of outstanding documents by discipline &amp; organization</li> <li>○ Time and quality of submissions</li> <li>• Reasons/categories for rejection or resubmission (e.g. bad quality, insufficient data, incorrect format, etc.)</li> <li>• Cumulative no. of outstanding/late review response per discipline/sub-discipline/organisation/reviewer over time</li> <li>• Cumulative no. of submissions made over time</li> <li>• No. of submissions due within the next x no. of days</li> <li>• No. of overdue submissions against the no. of days overdue</li> </ul>
<b>Contracts Management</b>	Digital claims	<ul style="list-style-type: none"> <li>• Monitor project budget</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor budget and spending</li> <li>• Progress claims</li> </ul>	<ul style="list-style-type: none"> <li>• Project budget and spending over time</li> <li>Actual claims vs projected claims</li> </ul>
	Digital variations		<ul style="list-style-type: none"> <li>• Project budget/spending's approval limits</li> <li>• Variations</li> </ul>	<ul style="list-style-type: none"> <li>• Budget approval gateways</li> <li>• No. of requests for variations</li> <li>• Value of each variation</li> <li>• Cumulative value of variations approved</li> </ul>
<b>Progress Monitoring</b>	Digital progress monitoring	<ul style="list-style-type: none"> <li>• Monitor site progress</li> </ul>	<ul style="list-style-type: none"> <li>• Actual vs planned schedule</li> <li>• Payments disbursement</li> </ul>	<ul style="list-style-type: none"> <li>• Actual on-site progress vs planned schedule</li> <li>• Percentage of works done by trades/activities</li> <li>• Amount disbursed and outstanding payments</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	OBJECTIVE	VISIBILITY TO ACHIEVE OBJECTIVE	PERFORMANCE METRICS
<b>Safety Management</b>	Digital safety planning, geofencing, surveillance and inspections	<ul style="list-style-type: none"> <li>Track and ensure timely closure of safety issues</li> <li>Identify and investigate reasons for safety issues</li> </ul>	<ul style="list-style-type: none"> <li>No. of safety occurrences, types and frequency</li> </ul>	<ul style="list-style-type: none"> <li>No. of occurrences of each type of safety issues by month</li> <li>Cumulative no. of safety observations and severity with time</li> </ul>
			<ul style="list-style-type: none"> <li>Monthly safety bonus and overall safety score</li> <li>No. of defects and criticality</li> </ul>	<ul style="list-style-type: none"> <li>Tabulation of safety observations and match scores to corresponding records, computation of monthly scoring</li> <li>Safety score by month and current average</li> </ul>
			<ul style="list-style-type: none"> <li>No. of recorded and outstanding safety issues</li> </ul>	<ul style="list-style-type: none"> <li>Cumulative no. of safety observations logged and cumulative no. of resolved logs over time</li> <li>Safety issues by disciplines/trades/organisation</li> </ul>
			<ul style="list-style-type: none"> <li>Location of safety issue occurrences/observations</li> </ul>	<ul style="list-style-type: none"> <li>No. of occurrences of each type of safety issues break down by project locations (or BIM spaces)</li> </ul>
<b>Defects Management</b>	Digital defects management	<ul style="list-style-type: none"> <li>Track and ensure timely closure of defects</li> <li>Identify and investigate reasons for defect occurrences</li> </ul>	<ul style="list-style-type: none"> <li>No. of defect occurrences and types</li> </ul>	<ul style="list-style-type: none"> <li>No. of defect occurrences and types</li> <li>Cumulative no. of defects identified by type and time</li> </ul>
			<ul style="list-style-type: none"> <li>Quality scoring and penalty</li> </ul>	<ul style="list-style-type: none"> <li>Cumulative quality score and penalty over time</li> </ul>
			<ul style="list-style-type: none"> <li>Master defects list of total defects items and their resolution status</li> </ul>	<ul style="list-style-type: none"> <li>List of defects items and resolution status</li> <li>Cumulative no. of defects vs cumulation no. of resolutions over time</li> <li>Type of defects by location, disciplines and organisation</li> </ul>

PROJECT ACTIVITY	DIGITAL USE CASE	OBJECTIVE	VISIBILITY TO ACHIEVE OBJECTIVE	PERFORMANCE METRICS
			<ul style="list-style-type: none"><li>• Type and location of defects observation</li></ul>	<ul style="list-style-type: none"><li>• Type of defects recorded sorted by location</li><li>• Type of defects recorded sorted by disciplines/organisation</li></ul>



## 9 Model Element Parameters, Data Type and Units

BIM Models are one of the key deliverables for the Digital Use Cases in the CDE. They contain the information required by the various stakeholders for sharing, collaboration and communication amongst the different project members to successfully deliver a project.

Hence, the standardisation of the model element names and specification of the element attributes or parameters will provide better consistency and clarity in the communication of the information required between the project members.

Note: Will align to *ISO 16739-1:2018 Industry Foundation Classes (IFC) for Data Sharing in Construction and Facility Management Industries – Part 1: Data schema*.

## 9.1 Requirements for Model Elements, Parameters, Data Type and Units

### NOTES:

1. 'Main Element' and 'Sub-Element' names and 'Parameters' are **generic terms commonly used**.
2. Parameters if indicated for 'Sub-Element', are add-ons to those shown for the 'Main Element' e.g. 'Ramp' has an additional parameter *Gradient* on top of the other parameters such as *Type, Description, Level/Storey* etc. under 'Main Element' - 'Floor'.
3. Vendors are to map the generic parameters to their respective software parameters and to add on any required parameters as new parameters if not already found in the software.
4. Software-specific element names are provided for ArchiCAD and Revit only for now.

### LEGEND:

**Blue Text**                      Derivable from geometry

**SUB-ELEMENT\***                Organisations can add on sub-elements depending on project needs

**\***                                      Specified in this Data Standard and required for regulatory submissions  
(Additional parameters required for regulatory submissions should be referred to the respective regulatory agency's requirements.)

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Ceiling		<ul style="list-style-type: none"> <li>• IfcCovering</li> <li>• Slab/Morph/Roof/Shell (A)</li> <li>• Ceiling (R)</li> </ul>	Architecture	Type	Text	N.A.
				Description	Text	N.A.
				Height (AFFL)	Number	mm
				Area	Number	m <sup>2</sup>
				Material ( <i>visible surface e.g. plasterboard</i> )	Text	N.A.
				Fire Rating	Number	hr
				R-Value	Number	m <sup>2</sup> /W
				Acoustic Rating ( <i>if applicable</i> )		
Door		<ul style="list-style-type: none"> <li>• IfcDoor &amp; IfcDoorPanelProperties</li> <li>• Door (A)</li> <li>• Door (R)</li> </ul>	Architecture	Type	Text	N.A.
				ID	Text	N.A.
				Description	Text	N.A.
				Material, Finish	Text	N.A.
				Frame Type, Material & Finish	Text	N.A.
				Level/Storey	Text	N.A.
				Overall Width	Number	mm
				Overall Height	Number	mm
				Overall Leaf Width	Number	mm
				Overall Leaf Height	Number	mm
				Leaf Count, Thickness	Number	mm
				Fire Rating*	Number	hr

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>IFC</li> <li>ARCHICAD (A)</li> <li>REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Floor		<ul style="list-style-type: none"> <li>IfcSlab</li> <li>Slab/Morph (A) <i>(Same slab can be used by Architectural and Structural discipline)</i></li> <li>Floor: Architectural/ Floor: Structural (R)</li> </ul>	Architecture, Structure	Type (e.g. Slab Edge, Slab, Strip Footing, Ramp, Screed etc.)	Text	N.A.
				Description	Text	N.A.
				Level/Storey	Text	N.A.
				Thickness	Number	mm
				Area	Number	m <sup>2</sup>
				Volume	Number	m <sup>3</sup>
				Material	Text	N.A.
				Rebar Ratio	Number	kg/m <sup>3</sup>
Floor	Ramp	<ul style="list-style-type: none"> <li>IfcRamp &amp; IfcRampFlight</li> <li>Slab/Morph (A)</li> <li>Ramp (R)</li> </ul>	Architecture, Structure	Concrete Grade* (where applicable)	Text	N.A.
				Gradient*	Number	N.A.

Plumbing Fixture		<ul style="list-style-type: none"> <li>IfcSanitaryTerminal/ IfcWasteTerminal</li> <li>Object (A)</li> <li>Plumbing Fixture (R)</li> </ul>	Architecture, MEP	Type Description Overall Dimensions System Material Manufacturer/Model	Text Text Number Text Text Text	N.A. N.A. mm N.A. N.A. N.A.
Plumbing Fixture	Basin Bath Shower Sink Urinal WC	As per Plumbing Fixture above for each Sub-Element				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: • IFC • ARCHICAD (A) • REVIT (R)	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
	Floor Waste/Tundish					
Plumbing Fixture	Downpipe & Sump	• IfcDistributionPort • Pipe (A) • Pipe (R)	Architecture, MEP	Length	Number	mm
				Cross-sectional Profile	Text	N.A.
Railings/ Balustrade		• IfcRailing • Railing (A) • Railing (R)	Architecture	Type	Text	N.A.
				Description ( <i>of Assembly/Pattern</i> )	Text	N.A.
				Length	Number	mm
				Height*	Number	mm
				Cross-sectional size of members	Text	mm x mm
				Material	Text	N.A.
Roof		• IfcRoof • Roof/Morph/Slab/Shell (A) • Roof (R)	Architecture, Structure	Type	Text	N.A.
				Description ( <i>material &amp; construction assembly</i> )	Text	N.A.
				Material	Text	N.A.
				Thickness	Number	mm
				Perimeter	Number	mm
				Area	Number	m <sup>2</sup>
				Volume	Number	m <sup>3</sup>
				U-Value	Number	W/m <sup>2</sup> K
				Concrete Grade ( <i>where applicable</i> )	Text	N.A.

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Site (External Works)			Architecture, Structure, Civil	Type	Text	N.A.
				Description	Text	N.A.
				Nominal Dimensions	Number	mm
				Material	Text	N.A.
				Cross-sectional Profile (where applicable)	Text	N.A.
			RLs (where applicable)	Number (Platform level)	m	
Site (External Works)	Road/Driveway	<ul style="list-style-type: none"> <li>• IfcCivilElement</li> <li>• Mesh/Slab (A)</li> <li>• Toposurface (R)</li> </ul>		As per Site (External Works) above for each Sub-Element		
	Fence	<ul style="list-style-type: none"> <li>• IfcWall</li> <li>• Wall (A)</li> <li>• Wall: Architectural (R)</li> </ul>				
	Surface Drainage	<ul style="list-style-type: none"> <li>• IfcDistributionSystem</li> <li>• Object (A)</li> </ul>				
	Culvert	<ul style="list-style-type: none"> <li>• Object (A)</li> </ul>				
	Inspection Chamber (ICs)/Manhole	<ul style="list-style-type: none"> <li>• IfcDistributionChamberElement</li> <li>• Object (A)</li> </ul>				
	Linkway & Covered Area	<ul style="list-style-type: none"> <li>• IfcCivilElement</li> <li>• Mesh/Slab (A)</li> </ul>				
Site (External Works)	Topographic Surface	<ul style="list-style-type: none"> <li>• IfcSite</li> <li>• Object (A)</li> <li>• Toposurface (R)</li> </ul>	Architecture, Civil, Landscape	Area	Number	m <sup>2</sup>
				Cut/Fill Volume	Number	m <sup>3</sup>
Site (External Works)	Parking	<ul style="list-style-type: none"> <li>• IfcSpace</li> <li>• Object (A)</li> <li>• Parking Component (R)</li> </ul>	Architecture, Civil, Landscape	Count	Number	N.A.

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: • IFC • ARCHICAD (A) • REVIT (R)	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Specialty Equipment		<ul style="list-style-type: none"> <li>Object (A)</li> <li>Mechanical Equipment (R)</li> </ul>	Architecture	Type	Text	N.A.
				Description	Text	N.A.
				Overall Dimensions	Number	mm x mm
				Manufacturer/Model	Text	N.A.
Specialty Equipment	Medical Equipment	<ul style="list-style-type: none"> <li>Object (A)</li> <li>Mechanical Equipment (R)</li> </ul>	Architecture	As per Specialty Equipment above for each Sub-Element		
Stair		<ul style="list-style-type: none"> <li>IfcStair &amp; IfcStairFlight</li> <li>Stair (A)</li> <li>Stair (R)</li> </ul>	Architecture, Structure	Type	Text	N.A.
				Description	Text	N.A.
				Base Level	Number	mm
				Width	Number	mm
				No. of Risers	Number	N.A.
				Riser Height*	Number	mm
				Tread Length*	Number	mm
				Stair Height (top to bottom, vertical rise)	Number	mm
				Construction Method*	Text (Selection)	N.A.
Concrete Grade (where applicable)	Text	N.A.				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Wall		<ul style="list-style-type: none"> <li>• IfcWall &amp; IfcWallType</li> <li>• Wall (A) <i>(Same wall can be used for Architectural and Structural disciplines)</i></li> <li>• Wall: Architectural/Wall: Structural (R)</li> </ul>	Architecture, Structure	Type	Text	N.A.
				Description <i>(indicate material assembly including thickness per material)</i>	Text	N.A.
				Wall Type <i>(Structural/Non-Structural)</i>	Text	N.A.
				Material	Text	N.A.
				Bottom Elevation	Number	mm
				Top Elevation	Number	mm
				Thickness <i>(overall)</i>	Number	mm
				Length	Number	mm
				Height	Number	mm
				Area	Number	m <sup>2</sup>
Volume	Number	m <sup>3</sup>				
Fire Rating*	Number	hr				
Wall	Architectural Wall	<ul style="list-style-type: none"> <li>• IfcWall &amp; IfcWallType</li> <li>• Wall (A)</li> <li>• Wall: Architectural (R)</li> </ul>	Architecture	As per Wall above for each Sub-Element		
	Structural Wall	<ul style="list-style-type: none"> <li>• IfcWall &amp; IfcWallType</li> <li>• Wall (A)</li> <li>• Wall: Structural (R)</li> </ul>	Structure			
Wall	Curtain Wall	<ul style="list-style-type: none"> <li>• IfcCurtainWall</li> <li>• Curtain Wall (A)</li> <li>• Wall: Architectural Wall (R)</li> </ul>	Architecture	Panel Height	Number	mm
				Panel Width	Number	mm
				Panel Thickness	Number	mm
				Typical Mullion Profile Size	Text	mm x mm
				Glazing Acoustic Rating <i>(External)</i>	Text	N.A.



MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: • IFC • ARCHICAD (A) • REVIT (R)	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Window		<ul style="list-style-type: none"> <li>• IfcWindow, IfcWindowStyle, IfcWindowPanelProperties &amp; IfcWindowLiningProperties</li> <li>• Window (A)</li> <li>• Window (R)</li> </ul>	Architecture	Type	Text	N.A.
				Description	Text	N.A.
				Opening Action	Text	N.A.
				Glass Type	Text	N.A.
				Overall Width	Number	mm
				Overall Height	Number	mm
				Panel Thickness	Number	mm
				Area of Unit/Panel	Number	m <sup>2</sup>
				Frame Cross-sectional Size	Text	mm x mm
				Frame Material	Text	N.A.
Frame Finish	Text	N.A.				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Structural Foundation		<ul style="list-style-type: none"> <li>• IfcPile/IfcFooting</li> <li>• Object/Slab/Morph (A)</li> <li>• Structural Foundation: Isolated/Structural Foundation: Slab/Structural Foundation: Wall (R)</li> </ul>	Structure	Type	Text	N.A.
				Description	Text	N.A.
				Level/Storey	Text	N.A.
				Length (or Diameter)	Number	mm
				Width	Number	mm
				Height	Number	mm
				Cross-sectional Size/Profile	Text	mm x mm
				Volume	Number	m <sup>3</sup>
				Material	Text	N.A.
				Loading	Number	kg
Strength	Number	kN				
Reinforcement Type & Rate (weight/unit area or volume)	Number	kg/m <sup>2</sup> or kg/m <sup>3</sup>				
Concrete Grade* (where applicable)	Text	N.A.				
Structural Foundation	Pile Cap Pile	<ul style="list-style-type: none"> <li>• IfcPile</li> <li>• Object/Slab/Morph (A)</li> <li>• Structural Foundation: Isolated/Structural Foundation: Slab/Structural Foundation: Wall (R)</li> </ul>		As per Structural Foundation above for each Sub-Element		
Structural Foundation	Isolated Pad Footing	<ul style="list-style-type: none"> <li>• IfcFooting</li> <li>• Slab/Morph (A)</li> <li>• Structural Foundation: Isolated (R)</li> </ul>	Structure	Concrete Grade*	Text	N.A.
Structural Foundation	Strip Footing	<ul style="list-style-type: none"> <li>• IfcFooting</li> <li>• Slab/Morph (A)</li> <li>• Structural Foundation: Wall (R)</li> </ul>	Structure	Cross-sectional Size	Text	mm x mm
				Concrete Grade*	Text	N.A.

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Column		<ul style="list-style-type: none"> <li>• IfcColumn</li> <li>• Column (A) <i>(Same column can be used for Architectural and Structural disciplines)</i></li> <li>• Column: Architectural/Structural Column (R)</li> </ul>	Architecture, Structure	Description	Text	N.A.
				Level/Storey	Text	N.A.
				Perimeter	Number	mm
				Length (Height) & Cut Length	Number	mm
				Volume	Number	m <sup>3</sup>
				Cross-sectional Size or configuration	Text	mm x mm
				Material	Text	N.A.
				Mass/m or Mass/m <sup>3</sup>	Number	kg/m <sup>3</sup>
				Material Strength ( <i>Tensile/Compressive</i> )	Text	N.A.
				Nominal Reinforcement Rate	Number	kg/m <sup>3</sup>
Concrete Grade*	Text	N.A.				
Column	Architectural Column	<ul style="list-style-type: none"> <li>• IfcColumn</li> <li>• Column (A)</li> <li>• Column: Architectural Column (R)</li> </ul>	Architecture	As per Column above for each Sub-Element		
Column	Structural Column	<ul style="list-style-type: none"> <li>• IfcColumn</li> <li>• Column (A)</li> <li>• Column: Structural Column (R)</li> </ul>	Structure			

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Structural Framing		<ul style="list-style-type: none"> <li>• IfcBeam</li> <li>• Complex Profile Beam/Beam (A)</li> <li>• Beam (R)</li> </ul>	Structure	Beam Type ( <i>primary/secondary/tertiary/bracing/other</i> )	Text ( <i>Selection</i> )	N.A.
				Material	Text	N.A.
				Level/Storey	Text	N.A.
				Cut Length	Number	mm
				Length	Number	mm
				Cross-sectional Size/Profile	Text	mm x mm
				Volume	Number	m <sup>3</sup>
				Mass per unit length ( <i>for profiled steel</i> )	Number	kg/m
				Fire Protection/Treatment	Text	N.A.
Structural Framing	Beam	<ul style="list-style-type: none"> <li>• IfcBeam</li> <li>• Beam (A)</li> <li>• Beam (R)</li> </ul>	Structure	Reinforcement Type & Rate ( <i>weight/unit area or volume</i> )	Number	kg/m <sup>2</sup> or kg/m <sup>3</sup>
				Construction Method ( <i>Prestressed/Post-Tensioned</i> )	Text ( <i>Selection</i> )	N.A.
				Concrete Grade* ( <i>where applicable</i> )	Text	N.A.

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Services Routing		<ul style="list-style-type: none"> <li>• IfcDuctSegment/ IfcPipeSegment/ IfcCableCarrierSegment/ IfcCableSegment</li> <li>• Duct/Pipe/Cable Tray with Cover/Pipe /Cable Tray (A)</li> <li>• Duct/Pipe/Conduit/Cable Tray (R)</li> </ul>	MEP	Type	Text	N.A.
				Description ( <i>include insulation</i> )	Text	N.A.
				System	Text	N.A.
				Material	Text	N.A.
				Insulation Material, Thickness	Text	N.A.
				Length per run/per system	Number	mm
Exact intended Cross-sectional Size ( <i>Inside/Outside Dimensions</i> )	Text	mm x mm				
Services Routing	Ductwork  Pipework  Conduit  Cable Tray & Bus Bar	<ul style="list-style-type: none"> <li>• IfcDuctSegment</li> <li>• Duct (A)</li> <li>• Duct (R)</li> <li>• IfcPipeSegment</li> <li>• Pipe (A)</li> <li>• Pipe (R)</li> <li>• IfcCableCarrierSegment</li> <li>• Cable Tray with Cover/Pipe (A)</li> <li>• Conduit (R)</li> <li>• IfcCableSegment</li> <li>• Cable Tray (A)</li> <li>• Cable Tray (R)</li> </ul>		As per Services Routing above for each Sub-Element		

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Equipment (Primary)		<ul style="list-style-type: none"> <li>• Ifc - varies</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment/Electrical Equipment/Plumbing Fixture (R)</li> </ul>	Architecture, MEP	Type Description System <a href="#">Overall Height, Width, Length</a> Capacity <i>(for Chillers, Cooling Towers, AHUs, Pumps, FCUs, Heat Exchangers)</i> <a href="#">Location</a> Manufacturer Model Number Electrical Panel Name <i>(not applicable for plumbing fixtures)</i> Electrical Panel Circuit <i>(not applicable for plumbing fixtures)</i> Asset Code Barcode/QR Code Installation Date Warrantor Warranty Description Warranty Duration	Text Text Text Number Number Text Text Text Text Text Text Text Text Text Date Text Text Text Number	N.A. N.A. N.A. mm kW/kg/litres N.A. N.A. N.A. N.A. N.A. N.A. N.A. N.A. N.A. N.A. dd/mm/yyyy N.A. N.A. N.A. years
Equipment (Primary)	Boiler  Chiller  Cooling Tower	<ul style="list-style-type: none"> <li>• IfcBoiler</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> <li>• IfcChiller</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> <li>• IfcCoolingTower</li> </ul>		As per Equipment (Primary) above for each Sub-Element		

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
		<ul style="list-style-type: none"> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	Pump	<ul style="list-style-type: none"> <li>• IfcPump</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	AHU	<ul style="list-style-type: none"> <li>• IfcUnitaryEquipment</li> </ul>				
	Fan Coil Unit (FCU)	<ul style="list-style-type: none"> <li>• Equipment/Object (A)</li> </ul>				
	Package Air Conditioning	<ul style="list-style-type: none"> <li>• Mechanical Equipment (R)</li> </ul>				
	Heat Exchanger	<ul style="list-style-type: none"> <li>• IfcHeatExchanger</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	Distribution Board/Switchboard	<ul style="list-style-type: none"> <li>• IfcElectricDistributionBoard</li> <li>• Equipment/Object (A)</li> </ul>				
	Switchgear	<ul style="list-style-type: none"> <li>• Electrical Equipment (R)</li> </ul>				
	Transformer	<ul style="list-style-type: none"> <li>• IfcTransformer</li> <li>• Equipment/Object (A)</li> <li>• Electrical Equipment (R)</li> </ul>				
	Uninterruptible Power Supply (UPS)	<ul style="list-style-type: none"> <li>• IfcElectricFlowStorageDevice</li> <li>• Equipment/Object (A)</li> <li>• Electrical Equipment (R)</li> </ul>				
	Generator	<ul style="list-style-type: none"> <li>• IfcElectricGenerator</li> <li>• Equipment/Object (A)</li> <li>• Electrical Equipment (R)</li> </ul>				
	Water Treatment Assembly	<ul style="list-style-type: none"> <li>• IfcWasteTerminal</li> <li>• Equipment/Object (A)</li> <li>• Plumbing Fixture (R)</li> </ul>				
				As Equipment (Primary) above for each Sub-Element		

Equipment (Primary)	Elevator	<ul style="list-style-type: none"> <li>IfcTransportElement</li> <li>Object (A)</li> <li>Mechanical Equipment (R)</li> </ul>	Architecture, MEP	Overall Dimensions	Number	mm
				Minimum shaft width and depth	Number	mm
				Capacity (kg)	Number	kg
				Capacity (persons)	Number (Count)	N.A.
				Door Size (H x W)	Text	mm x mm
				Internal Car Size (H x W x D)	Text	mm x mm x mm
				Speed	Number	m/s
				Power System Description	Text	N.A.
				Current	Number	A
				Voltage	Number	V
				Frequency	Number	Hz
Equipment (Primary)	Escalator	<ul style="list-style-type: none"> <li>IfcTransportElement</li> <li>Object (A)</li> <li>Mechanical Equipment (R)</li> </ul>	Architecture, MEP	Overall Dimensions	Number	mm
				Minimum shaft width and depth	Number	mm
				Capacity (kg)	Number	kg
				Capacity (persons)	Number (Count)	N.A.
				Speed (m/s)	Number	m/s
				Power System Description	Text	N.A.
				Current	Number	A
				Voltage	Number	V
				Frequency	Number	Hz



MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Equipment (Secondary)		Varies	MEP	Type	Text	N.A.
				Description	Text	N.A.
				System	Text	N.A.
				Capacity <i>(for Compressors, Condensers, Waste Disposal Equipment)</i>	Number	kW/kg/litres
				Electrical Panel Name <i>(not applicable for plumbing fixtures, air terminals &amp; duct accessories)</i>	Text	N.A.
				Electrical Panel Circuit <i>(not applicable for plumbing fixtures, air terminals &amp; duct accessories)</i>	Text	N.A.
				Overall Height, Width, Length	Number	mm
				Manufacturer & Mode/Series	Text	N.A.
				Serial Number	Text	N.A.
Warranty Data	Text	N.A.				
Equipment (Secondary)	Fan	<ul style="list-style-type: none"> <li>• IfcFan</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>	MEP	As per Equipment (Secondary) above for each Sub-Element		
	Variable Air Volume (VAV)	<ul style="list-style-type: none"> <li>• IfcAirTerminalBox</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	Radiator	<ul style="list-style-type: none"> <li>• IfcSpaceHeater</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	Filter	<ul style="list-style-type: none"> <li>• IfcFilter</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
	<b>Motor</b>	<ul style="list-style-type: none"> <li>• IfcMotor</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>		As per Equipment (Secondary) above for each Sub-Element		
	<b>Compressor</b>	<ul style="list-style-type: none"> <li>• IfcCompressor</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	<b>Condenser</b>	<ul style="list-style-type: none"> <li>• IfcCondenser</li> <li>• Equipment/Object (A)</li> <li>• Mechanical Equipment (R)</li> </ul>				
	<b>Valve</b>	<ul style="list-style-type: none"> <li>• IfcValve</li> <li>• Inline Equipment (A)</li> <li>• Pipe Accessory (R)</li> </ul>				
	<b>Trap</b>	<ul style="list-style-type: none"> <li>• IfcWasteTerminal</li> <li>• Terminal (A)</li> <li>• Plumbing Fixture (R)</li> </ul>				
	<b>Strainer</b>	<ul style="list-style-type: none"> <li>• IfcWasteTerminal</li> <li>• Equipment/Object (A)</li> <li>• Plumbing Fixture (R)</li> </ul>				
	<b>Air Terminal</b>	<ul style="list-style-type: none"> <li>• IfcAirTerminal</li> <li>• Terminal (A)</li> <li>• Air Terminal (R)</li> </ul>				
	<b>Damper</b>	<ul style="list-style-type: none"> <li>• IfcDamper</li> <li>• Inline Equipment (A)</li> <li>• Duct Accessory (R)</li> </ul>				
	<b>Fire Indicator Panel</b>	<ul style="list-style-type: none"> <li>• IfcUnitaryControlElement</li> <li>• Object (A)</li> <li>• Electrical Equipment (R)</li> </ul>				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
	Waste Disposal Equipment	<ul style="list-style-type: none"> <li>• IfcWasteTerminal</li> <li>• Object (A)</li> <li>• Plumbing Fixture (R)</li> </ul>				
	Boiling Water Unit (BWU)/Hot Water Unit (HWU)	<ul style="list-style-type: none"> <li>• IfcBoiler</li> <li>• Equipment/Object (A)</li> <li>• Plumbing Fixture (R)</li> </ul>				
Equipment (Secondary)	Fire Extinguisher	Device: Fire Alarm	Architecture, MEP			
	Fire Hydrant	Plumbing Fixture				

Spatial Allocation		<ul style="list-style-type: none"> <li>• IfcSpace/IfcSoatialZone</li> <li>• Zone (A)</li> <li>• Space/Room/Zone (R)</li> </ul>	Architecture, MEP	Name	Text	N.A.
				Room Type/Classification	Text	N.A.
				Area Type/Classification	Text	N.A.
				Height	Number	m
				Area	Number	m <sup>2</sup>
Spatial Allocation	Space/Room	<ul style="list-style-type: none"> <li>• IfcSpace</li> <li>• Zone (A)</li> <li>• Space/Room (R)</li> </ul>		As per Spatial Allocations above for each Sub-Element		
	Access/Egress	<ul style="list-style-type: none"> <li>• IfcSpace</li> </ul>				
	Plenum	<ul style="list-style-type: none"> <li>• Zone (A)</li> <li>• Space (R)</li> </ul>				
	Zone	<ul style="list-style-type: none"> <li>• IfcSpatialZone</li> <li>• Zone (A)</li> <li>• Zone (R)</li> </ul>				

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>IFC</li> <li>ARCHICAD (A)</li> <li>REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Fixture/Device		Varies	MEP	Type	Text	N.A.
				Description (e.g. ceiling mounted recessed downlight)	Text	N.A.
				Location (Room/Space)	Text	N.A.
				System	Text	N.A.
				Nominal Size	Text	mm x mm
				Manufacturer & Model/Series	Text	N.A.
Fixture/Device	Street Lighting	<ul style="list-style-type: none"> <li>IfcLightingFixture</li> <li>Object (A)</li> <li>Lighting Fixture (R)</li> </ul>	MEP	As per Fixtures/Devices above for each Sub-Element		
	Lighting Switch	<ul style="list-style-type: none"> <li>IfcSwitchingDevice</li> <li>Object (A)</li> <li>Device: Lighting (R)</li> </ul>				
	Lightning Protection	<ul style="list-style-type: none"> <li>IfcProtectiveDevice</li> <li>Object (A)</li> <li>Device: Electrical Fixture (R)</li> </ul>				
	Wi-Fi Router/Repeater	<ul style="list-style-type: none"> <li>IfcCommunicationsAppliance</li> </ul>				
	Controller	<ul style="list-style-type: none"> <li>Object (A)</li> </ul>				
	Speaker	<ul style="list-style-type: none"> <li>Device: Communication (R)</li> </ul>				
	Intercom					
	Nurse Call Device	<ul style="list-style-type: none"> <li>IfcCommunicationsAppliance</li> <li>Object (A)</li> <li>Device: Nurse Call (R)</li> </ul>				
	Manual Call Point	<ul style="list-style-type: none"> <li>IfcAlarm</li> <li>Object (A)</li> <li>Device: Fire Alarm (R)</li> </ul>				
Security Card Reader	<ul style="list-style-type: none"> <li>Object (A)</li> </ul>					

MAIN ELEMENT	SUB-ELEMENT*	ELEMENT NAME: <ul style="list-style-type: none"> <li>• IFC</li> <li>• ARCHICAD (A)</li> <li>• REVIT (R)</li> </ul>	DISCIPLINE	PARAMETERS (GENERIC TERMS)	PARAMETER DATA TYPE	UNIT
Fixture/Device	Light Fixture	<ul style="list-style-type: none"> <li>• Device: Security (R)</li> <li>• IfcLightFixture</li> <li>• Lamp (A)</li> <li>• Lighting Fixture (R)</li> </ul>	MEP	Luminance*	Number	lumens
				Wattage	Number	watts
Fixture/Device	Power Outlet/Switch	<ul style="list-style-type: none"> <li>• IfcSwitchingDevice</li> <li>• Object (A)</li> <li>• Device: Electrical Fixture (R)</li> </ul>	MEP	Height above FFL	Number	mm
				Rated Amps	Number	A
				Amperage	Number	A
				Supply Type (ESS/NESS/UPS)	Text (Selection)	N.A.
				Power Type (Single/Three-phase)	Text (Selection)	N.A.
				Voltage	Number	V
Fixture/Device	Data Outlet	<ul style="list-style-type: none"> <li>• IfcCommunicationsAppliance</li> <li>• Object (A)</li> <li>• Device: Communication (R)</li> </ul>	MEP	Height above FFL	Number	mm
	Telephone Outlet					
	Fire Sprinkler					
Fixture/Device	Security Camera	<ul style="list-style-type: none"> <li>• Object (A)</li> <li>• Device: Security (R)</li> </ul>	MEP	Physical configuration (fixed/PTZ)	Text (Selection)	N.A.
				Housing (dome/anti-vandal/weatherproof)	Text (Selection)	N.A.
Fixture/Device	Sensor & Detector	<ul style="list-style-type: none"> <li>• IfcAlarm</li> <li>• Object (A)</li> <li>• Device: Fire Alarm (R)</li> </ul>	MEP	Detector Type	Text (Selection)	N.A.

## 9.2 Example: Common vs Organisation-Specific Model Elements and Parameters (JTC)

PROJECT STAGES# ELEMENT	INITIATION/ CONCEPT DESIGN#	PRELIMINARY DESIGN#	DETAILED DESIGN#	TENDER DOCUMENTATION#	CONSTRUCTION#	AS-BUILT#
Wall	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> </ul>	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> </ul>	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Wall Type</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> <li>• Fire Rating*</li> <li>• Type Number#</li> <li>• Keynote#</li> </ul>	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Wall Type</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> <li>• Fire Rating*</li> <li>• Type Number#</li> <li>• Keynote#</li> </ul>	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Wall Type</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> <li>• Fire Rating*</li> <li>• Type Number#</li> <li>• Keynote#</li> </ul>	<ul style="list-style-type: none"> <li>• Type (<i>key purpose</i>)</li> <li>• Description (<i>to describe the wall's including Thickness of each layer and Material</i>)</li> <li>• Wall Type</li> <li>• Bottom Elevation</li> <li>• Top Elevation</li> <li>• Thickness (<i>overall</i>)</li> <li>• Length</li> <li>• Height</li> <li>• Area</li> <li>• Volume</li> <li>• Fire Rating*</li> <li>• Type Number#</li> <li>• Keynote#</li> </ul>

# Organisation-Specific Project Stages and Parameters

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