MMRCL EIR

(Exchange Information Requirements)

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References			
No	Title	Version	Date
1	MMRCL EIR Standards, Methods and Procedures	V1.1	01-Jan-2024
2	**ISO 19650-1:2018** Information management using building information modelling – Concepts and principles.		2018/2019

3	**ISO 19650-2:2018** Delivery phase of the assets		2018/2019
4	MMRCL CAD Standard	V1.1	01-Jan-2024
5	PMRCL - Engineering Assurance File Naming Convention	V04.5	01-Jan-2024
6	MMRCL Master Information Delivery Plan Template (MIDPT)	V01.1	
7	MMRCL Master Delivery List	V01.1	
8	MMRCL Master Production Delivery Table	V01.1	

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1. PURPOSE

The "Employer's Information Requirements" (EIR) document is a key component in the context of Building Information Modelling (BIM) and construction projects. It is a document that outlines the employer's specific information and project requirements for a construction project utilizing BIM. The EIR serves as a foundation for collaboration and communication between MMRCL (Maha Metro Rail Corporation Ltd) or its agent and the project team (Detailed Design Consultant / Contractor/Proof Consultant/Sub-contractor) ensuring that everyone involved has a clear understanding of what information needs to be produced, in what format, and at what stage of the project.

The key purposes of the Employer's Information Requirements (EIR) document include:

1. Defining Information Needs: The EIR outlines the specific information that the employer requires throughout the various stages of the project. This includes not only the final deliverables but also the level of detail, format, and any specific standards that should be adhered to.

2. Setting BIM Standards: The document helps in establishing the BIM standards and protocols to be followed during the project. This can include defining the level of detail (LOD) for different elements, specifying data formats, and ensuring consistency in data exchange.

3. Aligning Expectations: By clearly articulating the employer's expectations, the EIR helps align the expectations of all parties involved in the project. This minimizes misunderstandings and ensures that the project team delivers information that is in line with the employer's needs.

4. Facilitating Collaboration: The EIR promotes collaboration by providing a shared understanding of the project requirements. It acts as a reference point for all stakeholders, fostering a collaborative environment where everyone is working towards common goals.

5. Managing Information Exchange: It helps in managing the flow of information throughout the project lifecycle. This includes not only what information is required but also when it is required, facilitating a smoother information exchange process.

6. Enhancing Project Efficiency: By clearly defining requirements and standards, the EIR contributes to the overall efficiency of the project. It helps in reducing rework, improving coordination, and ensuring that the project team delivers the expected outcomes.

In summary, the MMRCL's Information Requirements (EIR) document is a crucial tool in BIM-enabled construction projects, playing a pivotal role in specifying what information is needed, how it should be provided, and when it should be delivered to meet the employer's objectives.

The EIR sets out MMRCLs EIR standards, methods and procedures to be used for producing and managing Information Artefacts during each project phase, to make sure that the developed engineering solution meets project objectives and desired outcomes and benefits.

As such, it is incumbent on the Supplier to explain:

Pre-contract (if applicable):

As part of the Supplier tender submission and scope of services, and specifically within the pre-contract BEP (BIM Execution Plan):

- how the Supplier intends complying with the MMRCL Design, Review and Acceptance procedure
- how the Supplier intends complying with MMRCL EIR SMP (Standards, Methods and Procedures)
- how the Supplier will help MMRCL achieve its BIM objectives in a manner which helps eliminate risk from the project and which promotes collaboration, innovation and right first time design
- how the Supplier intends producing and delivering Information Artefacts in compliance with MMRCL standards

Post Contract:

As part of the Supplier post-contract BEP (BIM Execution Plan) and in addition to the precontract points listed above:

- how the Supplier intends developing the scope and delivery schedule for the MIDP (Master Information Delivery Plan) for agreement with MMRCL
- how the supplier intends to make sure that Information Artefacts are submitted in accordance with the MIDP, to the required schedule, LOD and quality
- how the Supplier intends publishing Drawing information to support Design Reviews, costing or any other identified purpose
- how the Supplier intends sharing and publishing Modelling information for Coordination and Collaboration purposes
- how the Supplier intends working collaboratively with interfacing disciplines and contracts in order to eliminate coordination issues, design clashes and constructability issues
- how the Supplier intends satisfying the Level of Definition (LOD) requirements

The EIR sets out Level of Definition requirements. Level of Information Need(LOIN) is concepts in Building Information Modeling (BIM) that help define the extent and accuracy of information associated with different components of a building or infrastructure project. These concepts ensure consistency and clarity in communication among project stakeholders regarding the level of development and information associated with various elements within the model.

The level of information need is a broad concept which represents the framework for how the 'richness' of each information deliverable is going to be defined.

LOIN refers to the degree of completeness or refinement of a modeled object within a BIM. It defines how much graphical and non-graphical content is included in the representation of a building component.

The LOD principles and requirements are set out in sections 3.4 and 3.5 respectively.

Note that this EIR document has been produced in alignment with ISO 19650-1:2018(BS1192:2007) [Ref 2] and ISO 19650-2:2018(PAS 1192:2-2013) [Ref 3] and uses terminology consistent with this standard including:

- Task Team
- Master Information Delivery Plan (MIDP)
- Master Production Delivery Table (MPDT)
- BIM Execution Plan (BEP)

A glossary of key terms used in this EIR can be found in section 8 Definitions.

The following sections of this EIR document describe the Employers Objectives, the EIR Standards Methods and Protocols and Supplier obligations in more detail.

2. THE EMPLOYERS 5D BIM OBJECTIVES

It is MMRCL's objective to have a common strategy for the adoption of ~~5D~~ BIM. The strategy includes an approach to describing information requirements across all aspects of the asset lifecycle with the Information Requirements (EIR) for such, being described in this document.

2.1 The Employer's Objectives

1. Improved Collaboration and Communication:
   - Foster better communication and collaboration among project stakeholders, including architects, engineers, contractors, and facility managers.
   - Enhance coordination and reduce the likelihood of conflicts during the design and construction phases.

2. Efficient Project Delivery:
   - Accelerate project delivery by streamlining processes and improving efficiency in design, construction, and facility management.
   - Minimize delays and cost overruns through better project planning and management.

3. Cost Savings:
   - Realize cost savings through improved project visualization, clash detection, and risk analysis, enabling early identification and resolution of issues.
   - Enhance construction planning and reduce the likelihood of rework, minimizing overall project costs.

4. Quality and Accuracy:
   - Achieve higher quality construction outcomes through accurate and detailed project documentation.
   - Ensure that design intent is accurately translated into the construction process, leading to better-built facilities.

5. Asset Management and Operation:
   - Enhance the use of BIM for asset management by ensuring that relevant and accurate information is available for ongoing operations and maintenance.
   - Improve the life-cycle management of the facility, optimizing performance and minimizing operational costs.

6. Regulatory Compliance:
   - Ensure compliance with building codes and regulations by using BIM to track and manage regulatory requirements throughout the project life cycle.
   - Facilitate the documentation and reporting necessary for regulatory approvals.

7.Risk Management:
   - Mitigate project risks through the use of BIM for risk analysis, simulation, and visualization.
   - Improve decision-making by providing a better understanding of potential issues before they become critical.

8. Data Management and Standardization:
   - Establish clear data management protocols and standards to ensure consistency and interoperability across different project phases.
   - Facilitate the exchange of information among various stakeholders using standardized BIM formats.

9.Knowledge Transfer:
   - Capture and retain knowledge throughout the project life cycle, enabling better-informed decisions for future projects.

- Promote the transfer of lessons learned from one project to another, improving overall organizational efficiency.

2.2 Project Objectives

The Employer's 5D BIM objectives for the Pune Metro Project / Contracts are to:

- Attain the designated capital delivery cost
- Provide optimal value through innovative solutions
- Secure digital assurance and evidence by employing Information Artefacts to validate the integrity and comprehensiveness of the engineered solution's design at every Project/Contract stage
- Verify the constructability of the engineered solution by acquiring digital assurance and evidence using Information Artefacts
- Acquire digital assurance and evidence by utilizing Information Artefacts to validate the efficient constructability/installation of the asset(s) and simplify the methods involved
- Secure digital assurance and evidence by employing Information Artefacts to confirm the identification and fulfilment of health and safety as well as CDM (Construction (Design and Management) regulations) requirements
- Secure digital assurance and evidence, confirming the integrity and thoroughness of the Information Artefacts related to the handover process
- Acquire organized (Asset) data for populating Asset Management Information Systems

3. INFORMATION UTILISATION AND PLANNING

3.1 Primary Uses of Data and Information

The Employer's primary uses for the Information Artefacts, throughout the lifecycle of the asset(s), are as detailed in Table 3-1.

Table 3.1 – Primary Use

Reference	Description
PU01	**Assurance** To verify that MMRCL assurance requirements are satisfied and evidenced
PU02	**Project Coordination** To verify coordination and integration between disciplines and with adjacent works / contracts
PU03	**Business Case and Whole Life Cost** To validate the business case and whole life cost forecasts, making sure they are robust and outcomes and benefits can be / will be achieved.
PU04	**Cost** Facilitate the population of the cost and estimating systems
PU05	**Operations and Maintenance** To validate that the assets will meet the operational and maintenance requirements as set out in the (Asset sections of the) Model Production and Delivery Table (MPDT)
PU06	**Asset Registration** To facilitate the asset registration process and subsequently populate the Asset Management Information Systems
PU07	**Benefits Management** To help verify that the project outcomes and benefits have been achieved

3.2 Stage Gate Digital Assurance

All Information Artefacts, as explicitly defined in the MIDP, shall be submitted to MMRCL using the MMRCL Common Data Environment (CDE), in order to:

provide the requisite level of assurances in accordance with the Employers Requirements

- inform stage gate decisions, as defined below to enable Stage Gate sign-off:
  - **Stage 1: INITIATION**

    Have business outcomes and benefits (that the projects must deliver) been established?
  - **Stage 2: CONCEPT DESIGN**

    Are the business outcomes and benefits achievable?

    Is there an option that delivers optimum value?
  - **Stage 3: PRELIMINARY DESIGN**

    Have the design principles been defined?

    Can the scope of the project be frozen?
  - **Stage 4: DETAILED DESIGN**

    Will the designed solution deliver the required outcomes?

    Can the detailed design be used for contracting delivery of the works?
  - **Stage 5: CONSTRUCTION (INSTALLATION)**

    Have all (Production) Information Artefacts been provided and verified?
  - **Stage 6: HANDOVER**

    Have all (Handover) Information Artefacts been provided and verified?

    Have the assets been accepted by the end user?
  - **Stage 7: OPERATIONS**

Note: the table below provides a cross-reference between the generic project stages listed above and contract specific project stages

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
	INITIATION	CONCEPT DESIGN	PRELIMINARY DESIGN	DETAILED DESIGN	CONSTRUCTION (INSTALLATION)	HANDOVER	OPERATIONS
Viaduct	Initiation	Concept Design	Preliminary Design	Detailed Design	Construction	Commissioning & Handover	Operation & Maintenance
Station	Initiation	Concept Design	Preliminary Design	Detailed Design	Construction	Commissioning & Handover	Operation & Maintenance
Traction	Initiation		Preliminary	Detailing	Material/ Equipment Procurement	Commission	Operations & Maintenance
					Installation & Testing		
Electrical & Mechanical	Initiation		Preliminary	Detailed	Procurement (Manufacturing & Inspection)	Testing & Commissioning	Operations & Maintenance
					Supply	Integrated Testing	
					Installation	Handing Over	
Telecom	Initiation	Concept	Preliminary	Detailed	Delivery	Interface test & Configuration	Revenue Operations Date
					Installation Test Procedures		
					Own Commissioning & Configuration	ITC (Final Testing)	
					Partial Acceptance		
					System Configuration	Trail Runs	
					System Acceptance Test		
Rolling Stocks	Initiation	Preliminary	Pre-final	Detail	Mock	Integrated Testing & Commissioning	Operations
					Production		
					Testing & Commissioning	Trail Run	
Signalling	Initiation		Preliminary	Detail	FAT	Testing & Commissiong	Operations
					Delivery		
					Installation	As-Built	
Depot							
Track							

- facilitate the primary uses as set out in Table 3-1
- deliver the required types of documentation as part of the (Handover) Information Artefacts, as defined in the MIDP (Master Information Delivery Plan).

NOTE: The Supplier shall identify and capture within the MIDP, the Information Artefacts that will be delivered to support and inform the stage decisions and assurances, as set out within the ***MMRCL Design Review and Acceptance Procedure*** [Ref 6].

3.3 LOIN (Level of Information Need) - Principles and Requirements

3.3.1 Purpose and Scope

The purpose of this section is to define the LOIN principles and requirements for each of the primary systems and components within each Discipline for each project stage.

The Employer's LOIN requirements are specified in the Employer's MPDT (Model Production Delivery Table) – which is provided as a referenced document to this EIR document. The Employers MPDT declares:

- The list of systems for which models are required
- The project stage or stages (eg DETAILED DESIGN) at which models are to be developed by the Supplier

  NOTE: see section 3.5 Master Production and Delivery Table (MPDT): The Employers Requirement, for the stages at which models are to be developed by the Supplier.

- The required LOIN for each of the systems models
- The intended purpose of the models
- The native and deliverable formats in which the models are to be issued to the CDE

NOTE: The Supplier shall develop the MIDP and BEP to provide assurances and evidence as to how the points above will be addressed

3.3.2 LOIN Principles

The Level of Information Need is a collective term used to describe both the '**Level of Model Detail**' [LOD] and the '**Level of Information Detail**' [LOI] to be authored and issued to the Employer by the Supplier.

These principles are based on ISO 19650-2:2018 [Ref 3] as illustrated below:

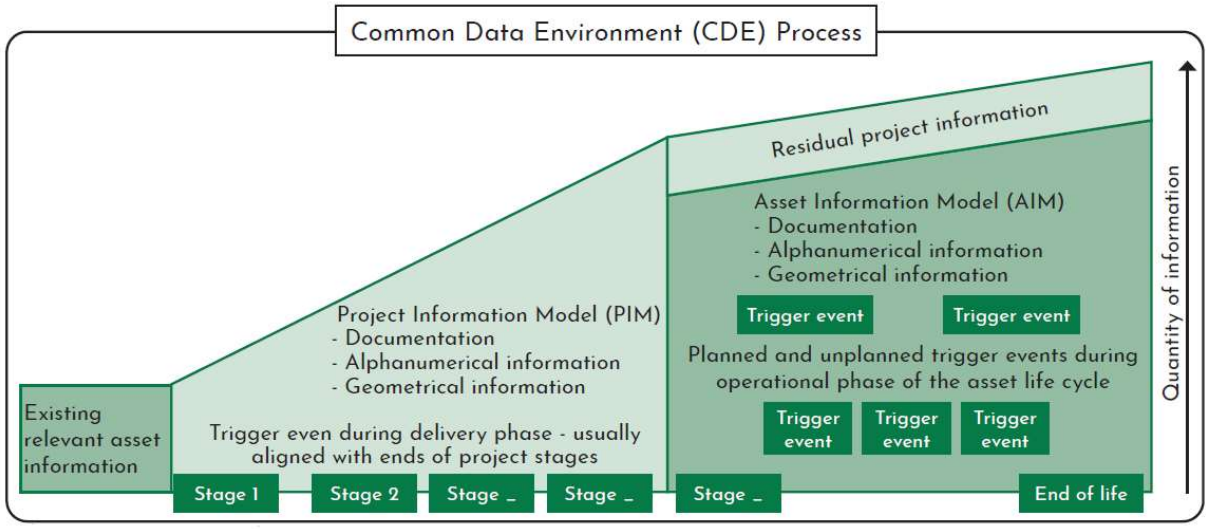
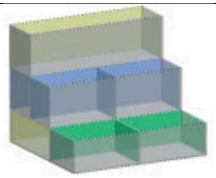
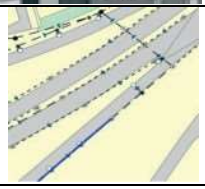
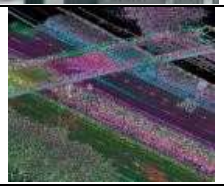


Figure 1. Plan of Work and the progressive Level of Definition.

Table 3.4.1 below declares MMRCL's overall vision and principles for modelling, LOIN across the project lifecycle.

Table 3.4.1 - Generic principles of Levels of Model definition for building and infrastructure projects							
Stage Number	1	2	3	4	5	6	7
Model Number	INITIATION	CONCEPT DESIGN	PRELIMINARY DESIGN	DETAIL DESIGN	CONSTRUCTION	HANDOVER	OPERATIONS
Systems to be covered	N/A	As per MPDT requirements	As per MPDT requirements	As per MPDT requirements	As per MPDT requirements	As per MPDT requirements	As per MPDT requirements
Graphical Illustration (Building Project)							
Graphical Illustration (Infrastructure Project)							

What the model can be relied upon for	Model information communicating the brief, performance requirements, performance benchmarks and site constraints	Models which communicate the initial response to the brief, aesthetic intent and outline performance requirements. The model can be used for early design development, analysis and co-ordination. Model content is not fixed and may be subject to further design development. The model can be used for co-ordination, sequencing and estimating purposes.	A dimensionally correct and coordinated model which communicates the response to the brief, aesthetic intent and some performance information that can be used for analysis, design development and early contractor engagement. The model can be used for co-ordination, sequencing and estimating purposes including the agreement of a first stage target price	A dimensionally correct and model that can be used to verify compliance with regulatory requirements. The model can be used as the start point for the incorporation of specialist contractor design models and can include information that can be used for fabrication, co-ordination, sequencing and estimating purposes, including the agreement of a target price/guaranteed maximum price.	An accurate model of the asset before and during construction incorporating coordinated specialist subcontract design models and associated model attributes. The model can be used for sequencing of installation and capture of as installed information	An accurate record of the asset as a constructed at handover, including all information required for operation and maintenance.	An updated record of the asset at a fixed point in time incorporating any major changes made since handover, including performance and condition data and all information required for operation and maintenance.
Output	Project brief and procurement strategy	Refined project brief and concept approval	Approval of coordinated developed design		Integrated production information. Complete fabrication and manufacturing details, system and element verification, operation and maintenance information Modify to represent as installed model with all associated references.	As constructed systems, operation and maintenance information. Agreed final account Building Log Book Information gathered as key elements are completed to feed installation information for the later packages.	Agreed final account. In use performance compared against Project Brief. Project process feedback: risk; procurement information management, soft landings

Stage Number	1	2	3	4	5	6	7

Model Number	INITIATION	CONCEPT DESIGN	PRELIMINARY DESIGN	DETAIL DESIGN	CONSTRUCTION	HANDOVER	OPERATIONS

Parametric Information	Project needs update: definition of function(s), operation, quality and time. Benchmarking updated: capital cost, maintenance cost, time, health & safety, risk procurement contract. Performance requirements: Priorities and aspirations for: function, mix of uses, scale, location, quality, performance in use, cost (CAPEX & OPEX), value, time, health & safety, embodied and in use carbon, energy and resources needs, standard designs. Site constraints: geo-spatial, available site information.	Sufficient date to estimate per square metre rates and other similar metrics. Wireframe for surfaces/solids. Concepts, site context placeholder/ volumes/ package volumes, system routings, site selection, datum points & levels. Integrated concept for the project setting scope, scale, form and primary design criteria: architectural form and spatial arrangements, services philosophy and special arrangements preliminary assessment of energy use and embodied/in-use carbon, incorporation of standard systems	Co-ordinated Developed Design for the project setting: generic systems, objects, or assemblies represented with, detailed form, function, cost, defining all components in terms of overall size, typical detail, performance and outline specification, primary geometry frozen, integration of standard designs and systems, builders work strategy for significant interfaces, energy use, embodied and in use carbon. Maintenance plan Detailed design and construction program.	Production information for the project: Specific systems, objects and assemblies accurate in terms of specification, size, form, function and location. Critical interfaces flagged Fixing Methodology Confirmed clash free detailed production program sequence. Updated: energy use and embodied and in use carbon, detailed design and construction program	Production record for the project: Specific systems, objects and assemblies accurate in terms of specification, size, form, function and location with detailing, fabrication, assembly, and installation information Detailed routing of system Fixings and interfaces details to be used. Updated: energy use and embodied and in use carbon, detailed design and construction program.	Updated: Geometry and installed product information, "as constructed" Accuracy/resolution of information. Commissioned performance for: OPEX, energy, and carbon Detailed maintenance methodology. Snagging action status.	Revisions for modifications to the facility during its life.

Employer activities							

Stage Number	1	2	3	4	5	6	7
Model Number	INITIATION	CONCEPT DESIGN	PRELIMINARY DESIGN	DETAIL DESIGN	CONSTRUCTION	HANDOVER	OPERATIONS

Critical Interfaces and logic	N/A	Environmental control philosophy and special allocations for ventilation; Availability of the site and outline construction methodology assumptions; Services capacity for the site Permitted working hours on site	Assumed procurement package performance ad spatial boundaries; Other relationships between procurement packages; Assumed design codes regarding dimensional tolerances of related systems; Foundation tolerances for use of offsite modular system; Assessment of predicted movements (thermal, loading, creep, shrinkage etc.)	Allocated procurement package relationships, performance and special boundaries; Actual dimensional interface requirements; Records of any derogations approved; Actual on-site to offsite interface specifications.	Progressive capture of actual dimensional data for critical interface dimensions. Progressive capture of information for calculating material requirements for follow on packages. Capture of object status for progress reporting and collaborative planning.	As constructed 3D scan Element performance test results. System Commissioning status.	As modified survey data.
Construction requirements (Examples)	N/A	Crane use zones; Traffic diversions	Confirmed crane (or other lifting system) zones framework details. Traffic diversion details.	Actual crane (or other lifting system) zones and movement sequences. Construction methodology, sequence and movements, critical to how the production design is developed.	Status of construction requirements. Safety briefing information. Construction methodology, sequence and movements, critical to installation. Formwork details including install and removal sequence. Actual traffic diversion details.	Confirmed status that the construction aids have been removed.	Design of any construction requirements, eg: temporary safety supports or restraint supports or restraint systems if structural defects have been discovered.

Project Costs	Initial project budget. Order of cost estimate.	Feasibility cost plan. Feasibility life cost plan.	Commitment Cost Plan. Contractor's first stage bid submission. Detailed whole life cost plan.	Contract Sum/Target price/ Agreed Maximum Price. Pre-construction whole life cost plan	Contract Sum/ Target Price/ Agreed Maximum Price. Preconstruction whole life cost plan.	Final account.	Actual in-use costs. Asset replacement sinking fund.
Project Logistics and off site activities (examples)	Client requirements, eg to avoid impact on other operations.	Assumed access and egress points; Potential delivery and lay down zones.	A feasible logistics sequence for the construction sequence; Confirmed modular strategy (volumetric, panelised, hybrid or other)	Finalised logistics sequences. Details of actual off-site system to be used.	Object status progress recording to initiate demand pull signals for deliveries.	Remote monitoring systems status.	Remote monitoring systems status.
Stage Number	1	2	3	4	5	6	7
Model Number	INITIATION	CONCEPT DESIGN	PRELIMINARY DESIGN	DETAIL DESIGN	CONSTRUCTION	HANDOVER	OPERATIONS

Project facilities (Welfare, IT Infrastructure, security etc) onsite and offsite (examples)	Collaboration tools; Data standards	Assumed access and welfare zones; Design team collocation.	Confirmed access zones and design team collocation.	Finalized, costed plan, Critical lead times confirmed. Off-site manufacturing capacity reserved.	Recording status of security critical areas (EG unchecked, sweep in progress, screened and secured)	Security system operational, potentially using model information for lines of sight from cameras, PAVA zone controls, etc.	Security system operational. Facilities management systems running on model generated information Geometry for letting activities accessed from "as constructed" model

Notes and associated project documents, based on model information	Management systems for information and decision making Approval policies.	Technical strategy studies. Commissioning philosophy NRM1 capital cost plan NRM3 maintenance cost plan	Provides the basis for Integrated Production Information to be produced on a package basis with limited risk of changes to primary coordination Room Information sheets, Detailed construction methodology NRM2 and NRM3 cost plans Health and safety risk management Risk Management plan.	Updated: maintenance plan, risk management plan, detailed construction methodology, NRM2 procurement pricing schedule, NRM3 maintenance cost an, health and safety risk management plan, risk management plan.	Detailed construction methodology, Updated health and safety risk management plan NRM3 maintenance cost plan	Approximate final account Maintenance procurement pricing Remedial works, handover and maintenance program.	N/A (project closed)

3.4 Master Production and Delivery Table (MPDT): The Employers Requirement

The Employers MPDT Requirements define the minimum LOIN required for each System. These are explicitly defined in the Employers MPDT, which are referenced by to this EIR document.

NOTE: It is MMRCL's requirement that **model** Information Artefacts should be developed from the start of **DETAILED DESIGN** stage of the project. 2D drawings approved at the end of the preliminary stage should be used for developing the 3D Model which is only to be submitted for Review. On Final approval (Level A or Level B) of the 3D Model, 2D drawings are extracted and submitted for review with 3D drawings for Construction certification.

The Supplier shall develop the MIDP and BEP to provide assurances and evidence as to how the points below will be addressed:

- How models shall be developed to the required LOIN.
- How models (and 2D drawings) shall be developed and issued to the CDE in the identified native and deliverable formats
- How the Supplier intends working collaboratively with interfacing disciplines and contracts in order to eliminate coordination issues, interface and design clashes and constructability and construction sequencing issues
- How all information artefacts (both models and drawings) shall comply with the ***MMRCL - Engineering Assurance File Naming Convention*** [Ref 5]
- How all information artefacts (both models and drawings) shall comply with the ***MMRCL CAD Standard*** [Ref 4]

3.5 Value Engineering

NOTE: The Supplier shall provide details of how Information Artefacts will be used to show the effectiveness (and provide assurance and evidence) of value engineering.

Value engineering must be integrated into the Design Review procedure. An MMRCL Operations Representative must have access to all relevant Information Artefacts and attend all value engineering reviews.

NOTE: The Supplier shall provide details of how Information Artefacts will be presented and approved during the review process.

3.6 Health and Safety and Construction Design Management (CDM)

NOTE: The Supplier shall provide details of how Information Artefacts will be utilised to support health and safety and CDM obligations; identifying, eliminating and reducing hazards and risks and providing better safety management.

Where the Supplier is contracted to carry out Detailed Design they shall provide details of process for integrating the construction plan with other components of the Production Information. Details shall include how safety measurements will be validated and how compliance with safety regulations will be checked.

3.7 Asset Information

Table 3-5 provides details of the Employer's corporate solutions for the management of Asset Information and the vehicle for delivery of the required information.

Table 3.5 – Asset Information		
Description		
System	Data / Information	Information Exchange Format
CDE	Documentation	Word/Excel/PDF
	Graphical Data	Refer to Table 6.2
	Non-Graphical Data	Excel

Note: Where the MMRCL MPDT Requirements extend to the CONSTRUCTION, HANDOVER or OPERATIONs phases, the Supplier shall develop and include a MPDT response within the Suppliers BEP providing assurances and evidence as to how the points below will be addressed:

- How Asset Information Artefacts shall be developed to the required LOIN for each of the listed systems and project stages
- How Asset Information Artefacts (and 2D drawings) shall be developed and issued to the CDE in the identified native and deliverable formats
- How Asset Information Artefacts shall comply with the ***MMRCL - Engineering Assurance File Naming Convention*** [Ref 5]
- How Asset Information Artefacts (drawings) shall comply with the ***MMRCL CAD Standard*** [Ref 4]

3.8 Training Arrangements

The Supplier is responsible for making sure that their staff (and that of their Sub-contractors of any tier) are adequately briefed and trained to undertake the Information Management and Information Modelling aspects of the project.

The Supplier shall provide details of how they will make sure (and manage and maintain) their staff (and that of their Sub-contractors) have the capability and competency to provide verified and coordinated Information Artefacts in accordance with these EIRs.

4. STANDARDS, METHODS AND PROCEDURES

4.1 Standards

All Information Artefacts, as specified in the MPDT and as defined and agreed in the MIDP, shall be produced, managed and submitted into the CDE in accordance with the standards and procedures listed below and in any case in compliance with the ***MMRCL EIR Standards, Methods and Procedure***s [Ref 1].

Table 4.1 – Industry Standards		
Standard Ref	Title	Revision
ISO 19650-1:2018	Information management using building information modelling – Concepts and principles.	N/A
ISO 19650-2:2018	Delivery phase of the assets	

Table 4.1 – Project Standards & Procedures		
Standard Ref	Title	Revision
MMRCL CAD Standard	MMRCL CAD Standard	V1.0

4.2 Security

NOTE: The Supplier shall provide details and assurances within the BEP of how the following potential security concerns will be addressed:

Note that the scope and context of these security concerns relates to the Suppliers production and management of Information Artefacts, in particular when working outside of the MMRCL CDE

- How the Supplier will comply with all relevant MMRCL security policies
- How the Supplier will protect MMRCL IP (Intellectual Property)

- How the Supplier will make sure that access to Information Artefacts will be restricted only to the relevant, authorised personnel
- How the Supplier will protect Information Artefacts against malicious attach

4.3 Roles and Responsibilities

The role of a Project Information Manager shall be appointed by the Supplier.

The responsibilities of the Project Information Manager include:

- Making sure that the BEP has been completed and agreed with the Employer and (where appropriate) briefed to Sub-contractors or suppliers of the Supplier and the relevant the Project / Task Team members
- Making sure that the BEP is updated as works progress, in compliance with project change control procedures
- Making sure that all Employer standards, methods and procedures are fully complied with
- Promoting collaborative behaviours
- Providing the focal point for all Information Artefact management issues on the project
- Making sure that all Information Artefacts are compliant with the requirements of the contract and all relevant Employer standards
- Making sure that all Information Artefacts are managed and submitted through the CDE and that all mandatory meta-data has been populated
- Making sure that the Supplier, Sub-contractors or suppliers of the Contractor / Consultant, and the relevant the Project / Task Team members (as applicable) have continued and appropriate access to the Project Data Environment
- Providing clear instructions, including on the following areas:
    - Which Information Artefacts are required, by whom and for what purpose;
    - Who will generate the Information Artefacts and maintain them;
    - How Information Artefacts will be sorted and distributed;
    - How frequently Information Artefacts will be shared (for example for interdisciplinary coordination purpose); and
    - What actions should be taken on receipt of Information Artefacts

The Roles and Responsibilities relating to the authoring, checking, sharing, publishing and management of the Information Artefacts can be found in the ***MMRCL EIR Standards, Methods and Procedures*** [Ref 1].

The Supplier shall assure MMRCL that that responsibilities have been adequately allocated and that a contact list of those assigned to the project, including Curriculum Vitaes (CV) is maintained for assurance purposes.

4.4 Naming Conventions

The Supplier shall make sure that a single File Naming convention is used for all Information Artefacts and that File Names are unique across the Project.

The File Naming Convention is defined in ***MMRCL EIR Standards, Methods and Procedures*** document [Ref 1].

4.5 Classification

The Supplier shall structure all Information Artefacts; categorising the functional and physical characteristics of the assets such that they can be efficiently identified, grouped and utilised

5. INFORMATION MANAGEMENT

5.1 System Performance and Constraints

The Supplier shall provide details of any limitations / restrictions of all IT systems; this should as a minimum determine limitations on files size and any restrictions on the use of the MMRCL recommended software platforms.

The Supplier is responsible for procuring, testing and implementing any required IT infrastructure, hardware and software in advance of project mobilisation and on-boarding.

5.2 Planning and Work Segregation

Zoning and Volume Strategy

The Contractor / Consultant shall provide details of their massing strategy in accordance with Section 3.4 **LOIN (Level of Information Need) - Principles and Requirements** which shall define the extents of the proposed design, including:

- Shape
- General size
- Location
- Orientation

Modelling Strategy

The Supplier shall provide details of their modelling strategy, which must explicitly define how Information Artefacts will be developed to allow;

- Parallel working across discipline / Task Teams
- Coordination within (and across) interfacing disciplines / Task Teams and all adjacent works /contracts
- Efficient Information Artefact exchange through the CDE
- Delivery of graphical information in accordance with the ***MMRCL CAD Standard*** [Ref 4]

Volume Strategy

The Supplier shall provide details of their volume strategy, which must explicitly define how the extents of the massing strategy are sub-divided into spaces within which discipline / Task Teams can effectively coordinate their designs (i.e. rooms, horizontal and vertical circulation, structures, service routes).

The Supplier shall provide details of their processes for utilising the volume strategy to:

- Federate models
- Provide assurances and evidence of coordination between interfacing disciplines / Task Teams and all adjacent works / contracts
- Design within each volume
- Provide assurances and evidence of the coordination and integration between the volumes

Please refer to Section 3.4 **LOIN (Level of Information Need) - Principles and Requirements** for more details.

5.3 Common Data Environment (CDE)

All Information Artefacts shall be authored, checked, shared, published and managed through the CDE, in accordance with ***MMRCL EIR Standards, Methods and Procedures*** [Ref 1] – but see qualifying notes below with respect to authoring and checking.

The CDE comprises:

- **A Project Data Environment**

  MMRCL will provide a designated system accessible to all Task Teams and other relevant stakeholders (as authorised by MMRCL), which shall be used as a managed 'single source of truth' for all Information Artefacts **shared** for (non-contractual) coordination and collaboration purposes and for all Information Artefacts **published** for (contractual) MMRCL Design Review and Acceptance purposes

- **Task Team Data Environment(s)**

  MMRCL will provide each Task Team with a dedicated, secure working area (the Task Team Data Environment) where Information Artefacts shall be Shared and Published, in accordance with the Master Information Delivery Plan (MIDP).

  All Shared and Published Information Artefacts shall first be approved by the Task

Team Manager before issue to the relevant Shared or Published Area of the Project Data Environment

All Shared and Published Information Artefacts shall first be approved by the Task Team Manager before issue to the relevant Shared or Published Area of the Project Data Environment

MMRCL shall provide the Project Data Environment as described in ***MMRCL EIR Standards, Methods and Procedures*** [Ref 1]. All other details relating to the Collaboration Tools used to support the CDE are documented below.
The Employer Collaboration tool is declared in Table 6.1. Details of how the Supplier (and their Sub-contractors) shall access and interact with the system, including the security model, access rights and training and support to be provided is documented in the ***MMRCL EIR Standards, Methods and Procedures*** [Ref 1].

5.3.1 Task WIP (Work in Progress) Team Data Environment

Note that Suppliers may optionally choose to develop WIP Information Artefacts within the MMRCL Task Team Data Environment.

On request, MMRCL shall provide each Task Team with a secure WIP (Work in Progress) working area, where the Supplier can author and check Information Artefacts in advance of issuing to the relevant Shared or Published Area of the Project Data Environment should the Supplier choose to work this way – the Supplier shall notify and document this intent within the Suppliers BEP response

5.4 Collaboration Process

The Supplier shall make sure that all Information Artefacts are checked, approved and verified as Information Artefacts are issued to or are passed through the CDE.

The types of checks and approvals shall be determined by the purpose for which the Information Artefacts is being shared.

The Supplier shall provide the following details:

- Processes for checking, approving and verifying Information Artefacts within the CDE
- Triggers for sharing / exchanging Information Artefacts
- Purposes of sharing / exchanging Information Artefacts
- Assurances of compliance against the prescribed information exchange format
- Frequency and purpose of each design review / coordination workshop

5.5 Compliance Plan

The Supplier shall provide details and evidence of how Information Artefacts, delivered through the CDE, are:

- Verified against Project Requirements (including the EIR)
- Compliant with the standards set out in section 4.1
- Progressed to the agreed LOIN as set out in the MIDPs and BEP
- Spatially coordinated in relation to the assets physical space, operational space and maintenance space
- Useable by the software platforms identified in Table 6-1
- In the information exchange formats identified in Table 6-2; and
- Checked and approved for technical content, in accordance with the MMRCL Design, Review and Acceptance Procedure [Ref 6]

6. DIGITAL ENGINEERING

6.1 Software Platforms

6.1.1 Collaboration Platforms

The Employers Collaboration Platforms are listed in Table 6-1.

Table 6.1 – Employer Collaboration Platforms

Use	Platform	Version
CDE: Project Data Environment – Collaboration Tool	MMRCL CDE	
CDE: Project Data Environment – DMS (Document Management System)	MMRCL CDE	
Project Scheduling (EPPM)	Primavera/MSP	
Enterprise Reporting (ERP)	SAP	

6.1.2 Content Development and Analysis Platforms

The Employer shall not place any restrictions on the content development or analysis tools to be used by the Supplier.

However, in order to minimise compatibility and interoperability issues, the Employers mandates that any RVT format which is issued to the CDE is published using Revit 2021 or higher.

The Supplier shall document assurances to this affect through the BEP response.

6.2 Information Exchange Formats

The Supplier shall deliver Information Artefacts (issued through the CDE), in accordance with the MIDP and in the exchange formats declared in Table 6-2 and where appropriate in accordance with ***NRMCL CAD Standard*** [Ref 4].

Data/Information	Exchange Format
Documentation	PDF, DOC, XLXS
2D Drawings (Design & Construction)	DWG, PDF
2D Drawings (As Built & Operations & Maintenance)	DWG, PDF
Native 3D discipline based models (Graphical Data)	RVT
Deliverable 3D models (Graphical Data)	RVT, NWC,NWD,NWF
4D Simulation (Graphical Data and Non-Graphical Data)	NWC,NWF
Cost Data (Non-Graphical Data)	XLXS
Schedules/Programs	XER, PLF, MPP, PDF, XLS

If necessary, the Supplier shall provide details of how interoperability issues will be addressed to make sure that Information Artefacts are delivered in the formats prescribed above.

6.3 Coordinates

All geographical Information Artefacts shall be exchanged, through the CDE, in compliance with the MMRCL Project Grid:

- Survey information, including mapping
- All Information Artefacts which represent the fixed geographical location of an asset or assets.

7. COMMERCIAL REQUIREMENTS

The Supplier shall respond to this EIR in the form of a BIM Execution Plan (BEP); the template for which shall be provided by MMRCL.

8. DEFINITIONS

Table 8 – Definitions

Term	Definition
Asset Management Information System	Systems used to store and manage data about assets.
BEP (BIM Execution Plan)	A document within which the proposed approach, capability, capacity and competencies of the prospective or selected Contractor / Consultant sets out the response to the EIRs
CDE (Common Data Environment)	The agreed solution for the production, use and management of Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s), as set out in the SMP, BEP and MIDP(s)
Composite Model	Computer Aided Design (CAD)/ Building Information Model(BIM) file(s) displaying one or more Model Files (attached as references), for the purpose of performing coordination activities and / or compiling Document Definitions.
Data Authoring	Creation of Production Information and Handover Information
Data Capture	Collecting, from various sources, Graphical Data and NonGraphical Data relating to asset(s)
Data Coordination	Use of Graphical Data and Non-Graphical Data, about the asset(s), to virtually assure and evidence coordination across all task teams, existing infrastructure and adjacent works
Data Simulation	Use of Graphical Data and Non-Graphical Data to virtually test the design, construction, operation and maintenance of the asset(s)
Data Validation	Rule based tools used to validate and check all Production Information and Handover Information against the EIR and Standards
Data Visualisation	Visually representing Graphical Data and Non-Graphical Data to support decision making.
Document Definition	Data file produced, containing a view of the Non-Graphical Data and / or Model File(s) and / or Composite Model(s), to derive meaning for a specific purpose
Document Rendition	A data file in an immutable format, derived from a Document Definition
Handover Information	Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s) which have been agreed between the Parties to be produced, updated, maintained and delivered as set out in the Master Information Delivery Plan(s) in accordance with the Employers requirements

Information Artefacts	The collective term for Production Information, Handover Information and any other model or drawing deliverables identified within the MIDP and MPDT – all Information Artefacts shall be authored, shared, published and archived within the CDE
MIDP (Master Information Delivery Plan)	A forward looking schedule of the Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s) which are to be produced, maintained and delivered as Information Artefacts
Model File	Computer Aided Design (CAD) file(s)/ Building Information Model(s)(BIM) containing shape(s) with defined origin, orientation and dimensions, communicating the physical characteristic of the assets. A Model File may also include Non-Graphical Data, associate to the CAD file(s)/3D model(s) and / or shape(s), identifying the functional characteristics of the asset(s)
Non-Graphical Data	Data file containing alphanumeric characters, communicating the physical and functional characteristics of the asset(s)
Production Information	The Model File(s), Composite Model(s), Non-Graphical Data, Document Definition(s) and Document Rendition(s), including Engineering Information which have been agreed between the Parties to be produced, updated and maintained in order to provide the Works and be delivered during the design and construction stages of the Project, as set out in the MIDP(s). Referred to within **ISO 19650-2:2018** as the PIM (Project Information Model).