KiwiRail

Project Information Requirements (PIR)

Project Name

Version 1

Document Control

Version History

Version Number	Version Date	Summary of Changes	Author
1.0	XX/YY/ZZZZ	Initial publish for project use	

Reviewers' Name

Reviewer Name	Date	Signature	Position
	XX/YY/ZZZZ		

Signed off by Approvers

Approver Name	Date	Signature	Position
	XX/YY/ZZZZ		

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1 Introduction

To support the implementation of Digital Engineering within KiwiRail digital-enabled projects, KiwiRail have developed the following Project Information Requirements (PIR) which:

Outline the scope of the project, at high-level, including general project information and stakeholders, specific initiatives around the use of Digital Engineering within the project context, and the expected project milestones throughout both the design and construction processes.

Align with the ISO 19650 standard document suite – outlining the best practice of implementing Building Information Modelling (BIM) and Digital Engineering (DE).

1.1 PURPOSE

The purpose of the Project Information Requirements (PIR) is to outline the requirements for information across the full project lifecycle, including both design and construction phases, covering the production and delivery of both the Project Information Model (PIM), completed from the design phase and the Asset Information Model (AIM), delivered at the end of construction.

PIR are populated at the inception of the project, and therefore reflect the best-known information requirements, at the time of creation. Due to the difficulty of predicting the behaviour of the project from the inception, what is represented within the PIR can often be considered high-level. The PIR answers, at a high level, responses to each of the common questions on a project:

- What is the scope of the project?
- What are the expected project delivery milestones?
- What information needs to be produced?
- Who is the party that should be responsible for creating this information?

1.2 AUDIENCE

The Project Information Requirements (PIR) are targeted towards all stakeholders which may be involved in a project, such as:

- Asset owners, such as KiwiRail, or any parties working in conjunction with KiwiRail on a project.
- Design teams or consultancies who will be conceptually and detailing the design of the Project Information Model (PIM).
- Constructors or contractors, who will physically complete the work on site, leading to the creation of the Asset Information Model (AIM).

This document is most useful for those in managerial positions within a project, such as programme, project or design managers or directors.

1.3 CONTEXT

As previously noted, the Project Information Requirements (PIR) are a set of high-level requirements devised at the inception of the project and can be consumed by any stakeholder within the project. The PIR itself do not form contractual obligations for any suppliers (including both design consultants and constructors) for information delivery within the scope of the project.

The contractual information delivery requirements are included within the associated Exchange Information Requirements (EIR). The EIR can be considered a distillation of the PIR, written at the time of appointment for each supplier during the project. As the EIR can be written closer to the time of appointment with a greater understanding of both the project and the engagement, with the EIR being more detail oriented and articulate the Digital Engineering process within the engagement. Across a project there can exist several

different appointments and therefore EIR. Each EIR from all these appointments should form a single coherent and coordinated set of information requirements, sufficient to address all the PIR.

The PIR will be revised or amended throughout the lifecycle of the project, however, will see the majority of updates undertaken when transitioning between design and construction phases of the project.

The position of the PIR within the Digital Engineering document structure is illustrated in Figure 1: Digital Engineering Document Structure

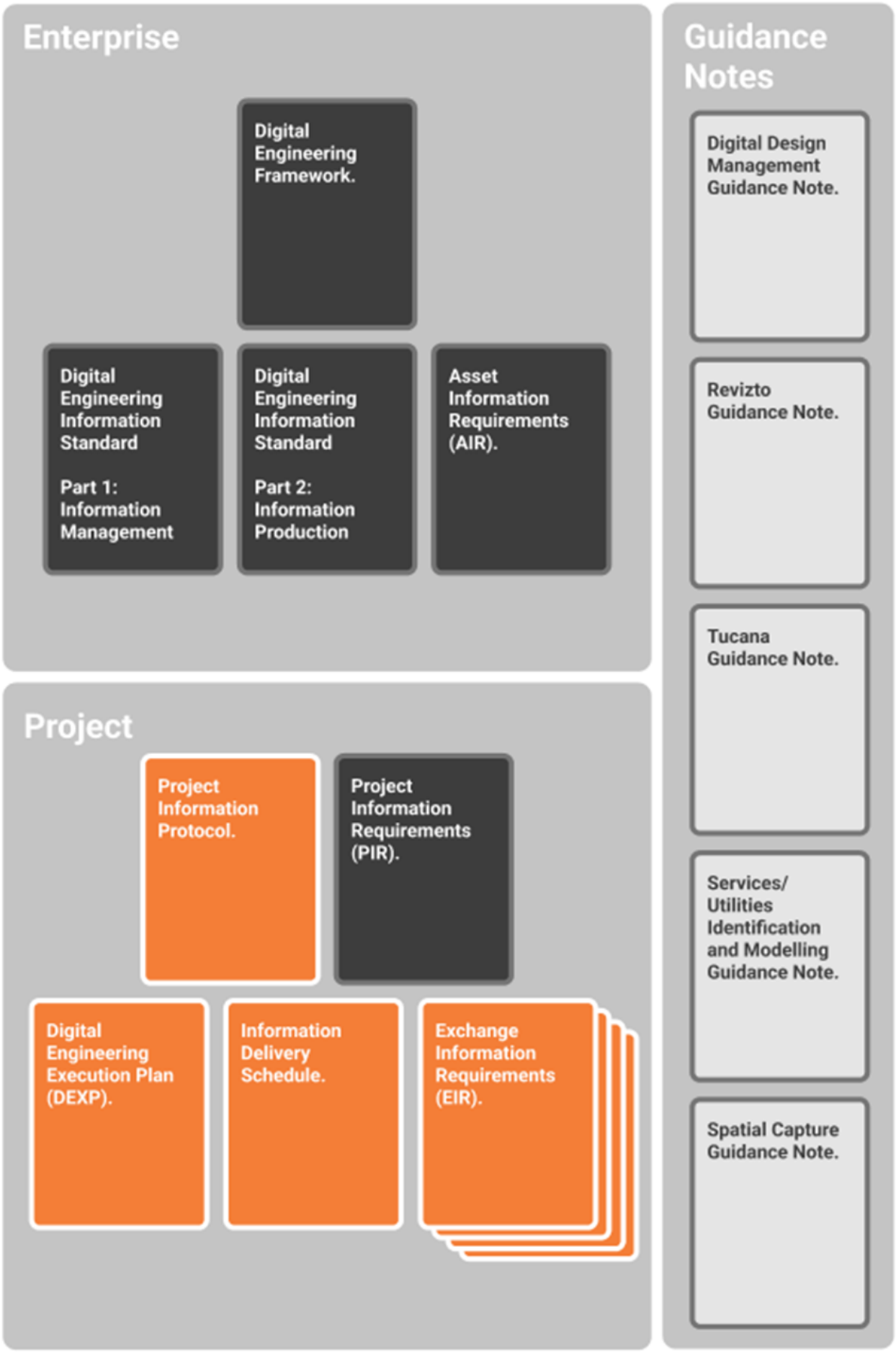

Figure 1: Digital Engineering Document Structure

1.4 INFORMATION MODELS

1.4.1 Project Information Model (PIM)

A project information model is a holistic model made of many information types that are produced during the delivery phases, including both design and construction, and is what ultimately contributes to, the Asset Information Model (AIM).

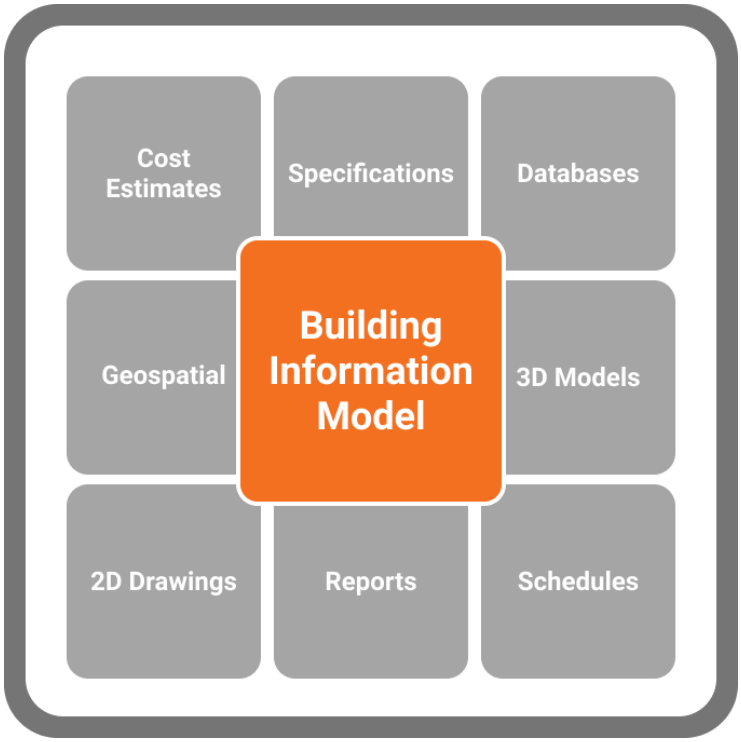

Figure 2: The Project Information Model (PIM)

1.4.2 Asset Information Model (AIM)

The Asset Information Model (AIM) is a holistic model made up of many information types and comprises of the completed Project Information Model (PIM), alongside other key operations and maintenance information, when all compiled within the KiwiRail asset management system.

Figure 3: The Asset Information Model (AIM)

1.5 REFERENCE INFORMATION

While the PIR should be consumable without requiring knowledge of the remaining Digital Engineering Framework, the documents outlined in Table 1: Digital Engineering Documentation

Document	Purpose
Enterprise	
Digital Engineering Framework	To outline KiwiRail's DE vision and overarching objectives. To provide guidance as to where specific detail can be found in other documentation.
Digital Engineering Information Standard – Part 1 (Management)	Outlines the process of how information is managed and consumed within the context of a project.
Digital Engineering Information Standard – Part 2 (Technical)	Outlines the details of how information should be produced by an author to meet KiwiRail's information requirements.
Asset Information Requirements	Outlines all the possible asset types, and their associated attribution requirements.
Project	
Project Information Protocol	Provides additional clauses which enable the scope of Digital Engineering to be amended to the contract.
Project Information Requirements (PIR)	Includes general project information, including scope, stakeholders, and high-level delivery milestones. Outline the overarching project specific digital initiatives for implementation on the project. PIR explain the information needed to answer or inform high-level strategic objectives within the appointing party in relation to a particular built asset project. PIR are identified from both the project management process and the asset management process. (extract from ISO)
Exchange Information Requirements (EIR)	Breaks down the overarching project objectives in the Project Information Requirements into the requirements of each engagement within a project at a detailed level. Details the expectations of information delivery against the project milestones. EIR set out managerial, commercial, and technical aspects of producing project information. The managerial and commercial aspects should include the information standard and the production methods and procedures to be implemented by the delivery team. (extract from ISO)
Information Delivery Plan (IDP)	Details the level of information need, required against asset data dictionary classifications, throughout the project lifecycle. Specifies the types of asset classifications expected throughout the scope of the project. Outlines an exhaustive list of digital artifacts required for project close out.
Guidance Notes	
Digital Design Management Guidance Note	Outlines how the DE tools & processes of KiwiRail's DE Framework can be embedded within the design phase of a capital project to support & enable design management fundamentals.
Revizto Guidance Note	How KiwiRail standardise the use of Revizto across the KiwiRail projects portfolio.
Tucana Guidance Note	Supplementary document which covers off the correct usage of the CDE, including details of the background processes for those wanting additional detail.
Subsurface Utilities Identification and Modelling Guidance Note	How to identify, model and transmit subsurface utility information to KiwiRail within a project.
Spatial Capture Framework	Outlines how spatial information is to be captured, created, referenced, and controlled.
Resources	
Construction Delivery Matrix (CDM)	Helps to facilitate a discussion between the designers and contractors around which piece of information can be used for pricing and construction setout.

Minimum Data Requirements	Helps to facilitate specifying the minimum asset data requirements for capture during the project's lifecycle, and who's responsibility it is to provide this information.
Asset Information Exchange Template	Helps to facilitate the Asset Information Exchange process between suppliers and DE team.
Scan Register	Scan register template to provide KiwiRail with details around the captured scan / survey data.

may be read in conjunction with the PIR to obtain a better understanding of some of the information alluded to within the PIR.

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1.6 TERMS AND DEFINITIONS

For any Digital Engineering Terms and Definitions, please refer to Appendix 1. Higher level concepts are outlined in the DE Framework.

2 Project Scope & Information

This section details the anticipated scope of the project, its stakeholders, the proposed procurement route, and the expected plan of work. This section also articulates the overarching Digital Engineering initiatives which KiwiRail are looking to implement within the project lifecycle.

Table 2: Project & Contact Details

Project Details		
Project Name	Project	
Project Location (latitude, longitude)	e.g. Project Site: 37.62808219071153, -116.8484666202478	
Project Identification Code(s)	XXXXXX	
KiwiRail Contact Details		
Digital Engineer	*<Name>*	*<Email>*
Programme Director	*<Name>*	*<Email>*
Project Manager	*<Name>*	*<Email>*
DE Programme Director	*<Name>*	*<Email>*
GIS Lead	*<Name>*	*<Email>*
Partner Contact Details		
<Role>	*<Name>*	*<Email>*
<Role>	*<Name>*	*<Email>*
Engineer to Contract Contact Details		
Engineer to Contract	*<Name>*	*<Email>*

2.1 SCOPE & SUMMARY

Insert a few paragraphs of text here which outline the scope of the project. Often this can be extracted from other generic project documentation (e.g. design reports, scopes of work, etc). Check with the project manager to see if there is something appropriate.

2.2 SPECIFIC PROJECT INITIATIVES

The underlying expectation from the use of DE on this project is to return the outcomes of:

- Improved quality of project design and delivery, driving efficiencies in design, construction, and future operations; and
- Reduced construction risk and cost driven through the creation of coordinated and verified design information.
- Innovation that is developed as part of the project that is applicable to be used is embedded back into the business leaving a legacy of change and more than just physical assets.
- Project information hand back, Project asset information (both data and artifacts) is to be handed back in a structured way in alignment with KiwiRail's asset information requirements.

To attain these outcomes, KiwiRail has established several mandatory project initiatives, detailed in Table 3 and Table 4**Error! Reference source not found.** below. Some of these initiatives may align with established best practices in the engineering industry. In the second section of the table, additional initiatives may be embraced by the project and its supply chain to extend beyond existing practices. It's

important to note that the list of initiatives is not exhaustive and reflects the current state within KiwiRail. These specific initiatives may undergo further refinement and development throughout the project lifecycle.

Table 3 Digital Engineering – Mandatory project Initiatives

#	DE Project Initiatives (Mandatory)	Description	D	C	O
1	Project Information within Tucana	All project information stored within Tucana throughout both design and construction phases.	✓	✓	
2	Design Collaboration within Revizto	Adoption and use of Revizto as a collaboration platform for the entire design and construction teams to drive design and construction efficiencies.	✓	✓	
3	Clash Detection & Mitigation	Use of industry standard tools to detect and avoid clashes during design to reduce construction risk.	✓		
4	Site Inspection & Photos	All site-based photos are to be captured with location services and GPS enabled to facilitate geospatial insights.		✓	✓
5	Model First Methodology	Undertake design on a philosophy of model-first. Model creation should precede the development of drawings, and any drawings must be derived from the model.	✓		
6	Model Driven Reviews	Models to be used as the basis of all design reviews, preceding information produced on drawings. This includes standard reviews alongside safety in design.	✓		
7	Digital Asset Creation	Model elements produced and attributed with KiwiRail asset data requirements for handover to operations. All documentation to be attributed against asset tags.	✓	✓	✓
8	Non graphical Asset information	Information generated as part of the project but unrelated to the 3D Model and its asset information. Examples can include specifications, owners manuals, calculations, maintenance schedules and contract documents	✓	✓	✓
Phases: D = Design, C = Construction, O = Operations					

Table 4 Digital Engineering – Additional project Initiatives

#	DE Project Initiatives (May Be Adopted)	Description			
1	Model Based Quantity Take Off (QTO)	Undertake design with a model-first methodology, and attribution throughout the design process to allow smarter cost estimation through model-based QTO.	✓		
2	Virtual Reality (VR) Engagement	Creation and delivery of graphical information in formats to support visualisation for engagement through use of Virtual Reality (VR) tools and technology.	✓		
3	Site Based Augmented Reality (AR)	Use of geospatially coordinated site-based survey markers to facilitate augmented reality model engagement.	✓	✓	
4	Digital Consenting	Creation and development of information to support assignment of digital building consents, through use of tools such as Revizto.	✓		
5	4D Construction Sequencing	Use of 4D BIM to both accurately and pragmatically schedule the construction works to drive improved delivery from the subsequent construction delivery team.	✓		
6	5D Cost / Financial Forecasting	Use of 5D BIM to provide increased visibility and reliability of cost-based information for project and programme governance insights.	✓		
7	Clash Detection Democratisation	Adoption of Revizto clash detection technology allowing clash detection methodology to be accessed by the wider project team.	✓		

8	Machine Control	Uses digital information to guide and control machinery and equipment used in a construction environment.		✓	
9	Machine Avoidance	Uses digital information, technology, and sensors to detect and prevent potential clashes between construction machinery, equipment, workers, and others in the vicinity.		✓	
10	Gamification and Simulation	Adopts gaming design principals, motions and features based on the digital 3D model to the construction/built environment for stakeholder engagement, health, and safety initiatives and more.	✓	✓	✓
11	Sustainability	Uses the BIM model to track, analyse and report on sustainability initiatives such as carbon footprint calculations	✓		
12	GIS	GIS data includes information about the project's assets spatial data associated with the assets location, size, shape, and others viewable through a GIS portal or app. Types of objects include Points, Lines, Polygons, Topology, Annotations, and 3D objects.	✓	✓	✓
13	UAV technology	Use of UAV equipment, often equipped with sensors, cameras, and other technology for of surveying, progress monitoring and inspections to capture valuable data for design and construction purposes.	✓	✓	✓
Phases: D = Design, C = Construction, O = Operations					

2.3 PROFESSIONAL HEADS

KiwiRail have several engineering Professional Heads (PH), of whose duty it is to provide the final approval of any engineering design of rail network infrastructure before progressing to construction. Throughout the design process, it may be required that some design information will be subject to the approval of the relevant KiwiRail Professional Head.

If any approval is required for information produced as part of the design process, the respective terminal project manager will provide the information to contact the relevant Professional Head and design review process.

2.4 PROCUREMENT ROUTE

Outline of the procurement route planned for the project (e.g. design and build as a single contract, or design and construct as two separate contracts (i.e. one design, one construction). Include any interface with partners throughout the project (e.g. will KiwiRail be owning the contract, or could this be shared with the partners?)

2.5 PLAN OF WORK & PROGRAMME

Outline of the high-level design or construction phases in alignment with the project (and also ideally CIC).

As outlined in the overall project programme, the design phases should generally be broken down into the phases in Table 5.

Table 5: Design Phases

#	Design Phase	Basis of Design	Dates	Notes
1	Concept Confirmation	Basis of Design – 25%	01/01/2023	Confirmation of the current design basis
2	Preliminary Design	Basis of Design – 25% - 50%		
3	Developed Design	Basis of Design – 50% - 75%		
4	Detailed Design	Basis of Design – 75% - 100%		
5	Issued for Construction	Basis of Design – 101%		Also includes As built information hand back

Each of these phases will contain delivery milestones within each of the phases, which will be articulated within the respective Exchange Information Requirements (EIR).

The construction plan of work is anticipated to follow the phases outlined in **Error! Reference source not found.**. The table will be updated once information comes available.

3 Information Requirements

To facilitate the effective design and construction of the built asset(s), KiwiRail require at a high-level, the information presented in Table 6.

Table 6: Information Requirements with Project Phases

Project Phase	Information Requirement
Concept Confirmation	Assurance that the principles of the concept design philosophy are valid to progress the design further.
Preliminary Design	Representative Project Information Model or Design Intent Model which has amended major issues or mitigated major risks of the concept design. Should allow for some price and schedule certainty, and for the progression of any regulatory procedures, such as building or resource consents.
Developed Design	Federated and generally coordinated multi-disciplinary Project Information Model, which has identified and addressed the key design risks, including those raised in the regulatory process, and contains suitable information to allow for pricing and scheduling certainty.
Detailed Design	Fully federated and coordinated Project Information Model, at a state in which it can be issued for construction to a lead contractor. Should be relied upon with price and schedule certainty.
Construction	Monthly as-built information throughout the whole construction lifecycle. Amendment to the Project Information Model in accordance with the engagement requirements, leading to creation of an Asset Information Model which is no more than one month out of date. Further improved certainty of price and schedule.

While Table 6 provides guidance on the level of information needed within the project lifecycle, including both design and construction, the specifics of the detailed delivery to meet these criteria are presented in the appointment's Exchange Information Requirements.

4 Appendices

4.1 APPENDIX 1: TERMS AND DEFINITIONS

Term(s)	Definitions	ISO 19650 term
Appointed party	*Other consultants, sub-consultants to* the lead appointed party, who is the provider of information pertaining works, goods, *or services.*	✔
Appointing party	*End client, Asset owner or similar. Receiver of information from appointed party pertaining to works, goods or services.*	✔
Asset	*Item, thing, or entity that has potential or actual value to an organisation.*	✔
Asset information model (AIM)	An Asset Information Model (AIM) is a model that compiles the data and information necessary to support asset management, that is, it provides all the data and information related to, or required for the operation of an asset. – *Source NBS*	✔
Asset Life cycle	Life of the asset from the definition of its requirements to the termination of its use, covering its conception, development, operation, maintenance support and disposal.	✔
Author/Owner	The person responsible for the content in the information container.	
Building information modelling (BIM)	Use of a shared digital representation of a built asset to facilitate design, construction, and operation to form a reliable basis for decisions Note: BIM is a process for sharing structured information	✔
Classification	Information classifications allow information objects to be grouped for the purpose of common, agreed controls. Examples of controls may include object permissions, workflows, naming etc.	
Common data environment (CDE)	A system that manages the collaborative production, control and exchange of information based on a common standard and agreed access.	✔
Content engine	A content engine is a system designed to manage the production, control, and exchange of project information. Content engines are chosen based on the content they will manage	
Deliverable	Information container contractually agreed to be supplied to the client. The product of engineering and design efforts to be delivered to the client as digital files and / or printed.	
Delivery team	Lead appointed party and their appointed parties. Multi-organizational team working on a part of the project under a lead appointed party	✔
Design Intent Model	A stage of the project information model which demonstrates the early co-ordination of multidisciplinary design elements, including outline specifications and requirements.	✔
Digital Engineering Execution Plan (DEXP)	An agreed set of information to define the projects digital way of working during the delivery phase. The digital engineering execution plan may also be referred to as a BIM Execution Plan, Digital Work Plan, this may be dependent on industry or clients.	
Document	Information (meaningful data) and the medium on which it is contained. Container for persistent information that can be managed and interchanged as a unit. This can represent snap shots from the information model for a specific purpose. This is a synonym to information container	
Document code	A unique code attached to an information container for management purposes. The document code may also be referred to as the Information container code when applied to an information object.	
Information	For the purpose of this standard information is defined as geometric and non-geometric objects or set of objects that forms part of the project information model and ultimately the asset information model.	
Information breakdown structure	A means of grouping information objects by a common purpose. For example, by Work breakdown structure or plant area or facility.	
Information container	A named persistent set of information retrievable from within a file, system, or application storage hierarchy. An information container can refer to a specific information object or a set.	✔

Term(s)	Definitions	ISO 19650 term
Information life cycle	Information on a project goes through several stages starting with the requirements for information to the final archiving of the information after project closure.	
Information object	A specific information container such as a document, geometrical model or piece of data which is produced, received, or referenced during the delivery of the project. This is a synonym to information container	
Information set	A set of information objects grouped for the purpose of information control. This control may include reporting, quality assurance or workflow state change activities. Information sets will be typically applied to define groups of information objects delivered as part of the transmittal process. For example, an engineering work pack containing a number of information objects.	
Issued	An information object, or information package, that is distributed either internally or externally formally via a transmittal. The act of issuing may be carried out for many reasons and is defined by status coding. Typically, information is issued at defined workflow state changes such as Shared and Published.	
Lead appointed party	“Lead consultant”, EPC (Engineering, Procurement and Construction) or similar	✔
Master Information Delivery Plan (MIDP)	The MIDP (Master Integrated Deliverable Register) serves as a comprehensive record generated by the supplier It meticulously documents all anticipated deliverables encompassing the entire contract scope and designates responsibility for each. Additional details for each deliverable are also captured, encompassing its document number, design package, and the specified due date	✔
Metadata	Data that describes the information container stored in a common data environment (For example: project number, title, life cycle state, revision, etc.).	
Model deceleration form	A form that highlights key information stating the reason for the model issue, such as the suitability code and a short summery of the changes since the last revision	
Native	Term used for the information objects original file format created by the authoring application. E.g. docx, dwg, dgn, or rvt	
Phase	A point in time of an asset life cycle examples include opportunity, delivery and operational.	
Project	Unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost, and resources. For the purpose of this standard, a project is the full life cycle from initiation project hand back/closeout according to the KiwiRail CPAD Manual.	
Project Information Management	Project Information Management is the application of management techniques and computer software to collect project information, communicate it within and outside the organization, process it to enable managers to make quicker and better decisions and ultimate disposition through archiving or destruction.	
Project information model (PIM)	A Project Information Model (PIM) is a model that compiles the data and information necessary to support design and construction phase of an asset, that is, it provides all the data and information related to, or required for the build of an asset.	✔
Project team	Appointing party and all the delivery teams	✔
Published	An information container is identified as ready for use outside the delivery organization, its actual use is typically defined by status coding clearly defines its allowed use and may enable it to be used to support different life cycle phases. Typically, it will be formally issued to the employer or contractor at this life cycle phase and in a suitable format.	
Rendition	A non-editable version of a native information container, typically a PDF or 3D review format such as Autodesk’s Navisworks or Bentley’s iModel.	

Term(s)	Definitions	ISO 19650 term
Retention period	A time period applied to records to ensure retention of information to meet legal obligations and support business continuity. Retention periods are governed by the KiwiRail Information Management Policy, KRG-IS008-POL0.	
Revision	A formal label stored on an information container to formally identify it from previous copies of the information container. Typically, revisions are incremented to reflect changes in life cycle states. Revisions may be alpha or numeric characters or a combination of both. Note: Revision numbers within the KiwiRail CDE are alphanumerical (e.g. P01) and are automatically assigned based on review/approval workflows.	
Shared	Once development of a deliverable has reached a suitable point and has been suitably checked, reviewed, verified, and approved, it may be shared outside of the immediate task team. Typically, this is the point at which the design may be translated and made available for cross discipline coordination. The information container may also be issued for external quality assurance review and/or verification processes.	
State	A state represents the different areas of the Common data environment workflow through which information objects transition. The only defined states applied by this standard are Work in Progress, Shared, Published and Archived.	
Status code	A formal label stored on an information container to formally identify the allowed use of the information container in a specific state in the workflow. (This term is contained in ISO 19650 and is also known as a suitability code).	✔
Supplier	Supplier is used as an all-encompassing term for any party contracted to KiwiRail to undertake any form of work, which could include; design (by a design consultancy) or construction (undertaken by a contractor).	
Task Information Management	The management of information sets defined by individual activities or tasks. Each activity has a task information delivery plan (TIDP) which described its information container, format, schedule etc. Task information delivery plans are combined to form a master information delivery plan (MIDP).	
Task team	Individuals assembled to perform a specific task. One or more task teams are appointed by the delivery team. Small projects may define a single task team.	✔
Version	Versioning is a system-controlled copy of the information object to define an auditable history of change.	
Virtual Construction Model	The virtual construction model provides information describing the detailed design, and should be relied upon for construction sequencing, methodologies, and other construction planning, before commencing construction on site.	✔
Work breakdown structure (WBS)	A means of breaking up the delivery of a project scope into packages, typically defined by a hierarchical coding system. *"deliverable oriented hierarchical decomposition of the work to be executed by the project team." – PMBOK definition.*	
Work in progress (WIP)	The first state in a workflow at which effort is applied, ongoing development of a task or deliverable prior to review and approval for share outside the originating task team. Typically work in progress is the only state where an information container can be edited.	✔
Workflow	The automation of a business process, in whole or part, during which information or tasks are passed from one participant to another for action, according to a set of procedural rules, a series of states.	

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