KiwiRail

Digital Engineering Information Standard

Part 2: Information Production

Version 2

Document Control

Version History

Version Number	Version Date	Summary of Changes	Author
1.0	20/08/2021	Initial publish for project use	G Evans & S Zoie
1.1	22/11/2021	Colour Scheme (3.1.4, Appendix 4) Inclusion, Utilities (3.1.10) Update	G Evans
1.2	13/05/2022	Included reference to new Digital Design Management Guidance Note	N Wagner
2.0	18/03/2024	Updates to align with KiwiRail's DE requirements, Tucana references added	J Cronje & M Mills

Reviewers' Name

Reviewer Name	Date	Signature	Position
T Bray	22/03/2023		Digital Engineering Programme Manager

Signed off by Approvers

Approver Name	Date	Signature	Position
D Jannings	22/03/2024		Programme Director – Digital Engineering

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1 Introduction

1.1 PURPOSE

The Digital Engineering Information Standard (DEIS) outlines the information requirements across KiwiRail's capital projects. The DEIS is an appendix to the overarching DE framework and is split into two discrete parts; so that the documents remain concise and specific to the target audience:

- Part 1: Information Management Methods and Procedures
- Part 2: Information Production Methods and Procedures

Part 1 is focussed on the information management function across the KiwiRail project portfolio, including reference to the enabling technologies such as the Common Data Environment (CDE) and Collaboration Platform (Revizto).

Part 2 then covers the technicalities of producing valuable information to KiwiRail within the context of the project, including the standardisation of how information is produced and transmitted, covering; geometric information (e.g. 2D drawings, 3D models and point cloud information) and non-geometric information (e.g. asset information and documentation).

1.2 AUDIENCE

The language and terminology used within the DEIS is more suited towards project delivery professionals, with Part 2 being developed with the intention of being primarily consumed by those involved in projects as information authors or creators, such as:

- Designers & Modellers
- Technical Engineers
- Information Managers

DEIS: Part 2 requires a sound fundamental understanding of the importance of well-structured information, and how this information can be produced and transmitted within the tools and technologies used as an author or creator.

1.3 SCOPE

The DEIS is to be adopted by all task and delivery teams when managing information within a digital enabled project.

1.4 TERMINOLOGY

This section articulates the 'language' of compliance. The following terms have defined meanings.

- must – describes a legal requirement
- shall – describes mandatory requirements of the standard
- should – describes non-mandatory, best practice recommendations
- may – describes possible options that are neither mandatory nor best practice.

1.5 TERMS AND DEFINITIONS

For terms and definitions outlined in this document refer to Appendix 1: .

1.6 KIWIRAIL REFERENCES

Part 2 of the DEIS relies upon the information contained within the following:

- Services & Utility Identification and Modelling Guidance Note
- Spatial Capture Framework

In addition to these, it should be recognised that the DEIS: Part 2 forms part of a larger document suite, and may draw reference to other relevant standards, requirements, specifications, or guidelines included in Table 1.

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.

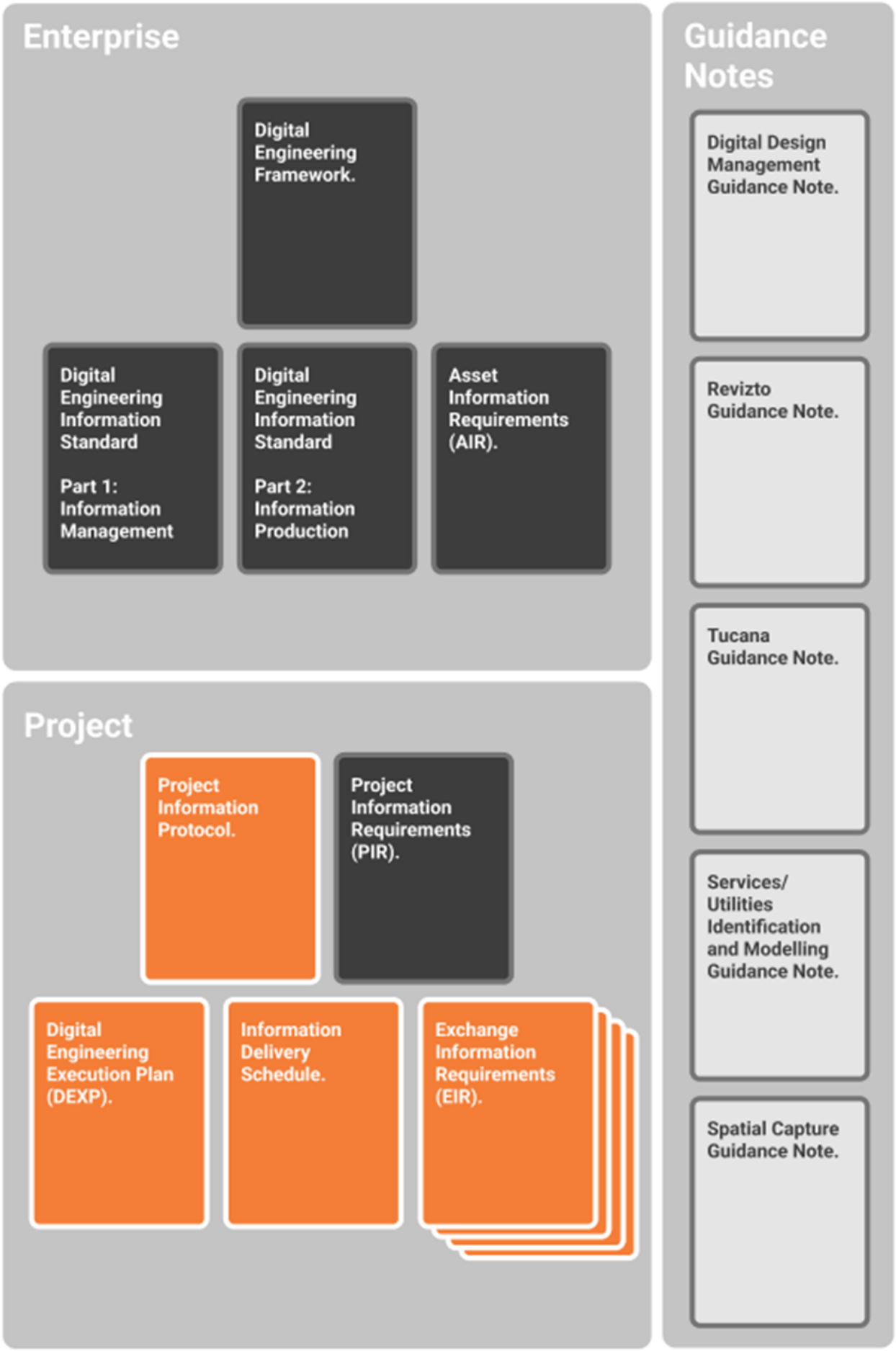


Figure 1: Digital Engineering Document Structure

2 General

This section articulates general requirements that are required for any form of information deliverable submitted to KiwiRail.

2.1 UNITS OF MEASURE

All delivered information shall adopt the use of the International System of Units (SI, Système international), for all projects. Units of measure shall be limited to:

- SI base units.
- SI derived units.
- Non-SI units referenced within SI.
- Rail industry specific units.

Units shall be consistent with the respective industry best practices and common terminology. In any instance of ambiguity, please contact the KiwiRail DE team.

2.2 KIWIRAIL'S NAMING CONVENTION

All information submissions shall follow the project specific naming convention. KiwiRail have adopted the use of the file naming convention presented in Table 2.

Table 2: Typical Naming Convention

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Project Number	Originator	Discipline	MA Code (KiwiRail)	Document Type	Document Number
6 numeric	3 alphanumeric	2 alphabetical	4 alphanumeric	2 alphanumeric	4 numeric

An example of a file name could be: **811300-KR-RS-MA70-M3-0001**

Refer to the Exchange Information Requirements document (EIR) for the project's specific file naming convention. It is understood that suppliers may need to adhere to their internal naming conventions to align with their Common Data Environment (CDE) requirements. In such cases, the naming convention will be adjusted and mutually agreed upon within the post-contract DEXP by all involved parties.

3 Geometric Information

3.1 3D MODELS

The creation and submission of 3D model information within the scope of a DE enabled project shall align with the requirements articulated in this section. The 3D Asset model definition is described below.

3.1.1 3D Asset Model

3D asset models are pivotal deliverables in KiwiRail projects, serving beyond mere visualization. They encompass 3D data and attributes that not only refine the physical object's definition but also explain its purpose in relation to other assets. Please note section 3.1.1 does not refer to GIS deliverables.

Unlike conventional 3D models, our model authoring systems are tailored to correspond to real-world assets. For instance, a Steel Column, visually represented as a vertical cylinder with accurate dimensions, is classified as a ‘Column’ in the authoring software. Its asset type is automatically attributed with material specifics, thickness, and a weight factor.

Typically, 3D asset models incorporate parametric behaviours. For example, when a window is placed on a Wall's face, the model automatically creates a penetration cut in its solid representation, updating its size, weight, and material quantity to suit the removed material.

Throughout the construction project lifecycle, 3D asset models offer additional benefits. They enable the extraction of rich information from classified asset properties, unlocking capabilities such as cost analysis, quantity take-offs, construction simulation/staging, and numerous other advantages.

In the example below, we observe a selected Vertical Column Asset in the authoring software. The physical representation is reflected, and examining its asset metadata reveals valuable information about the asset. This asset information may vary between authoring packages and depends on the project's asset information requirements.

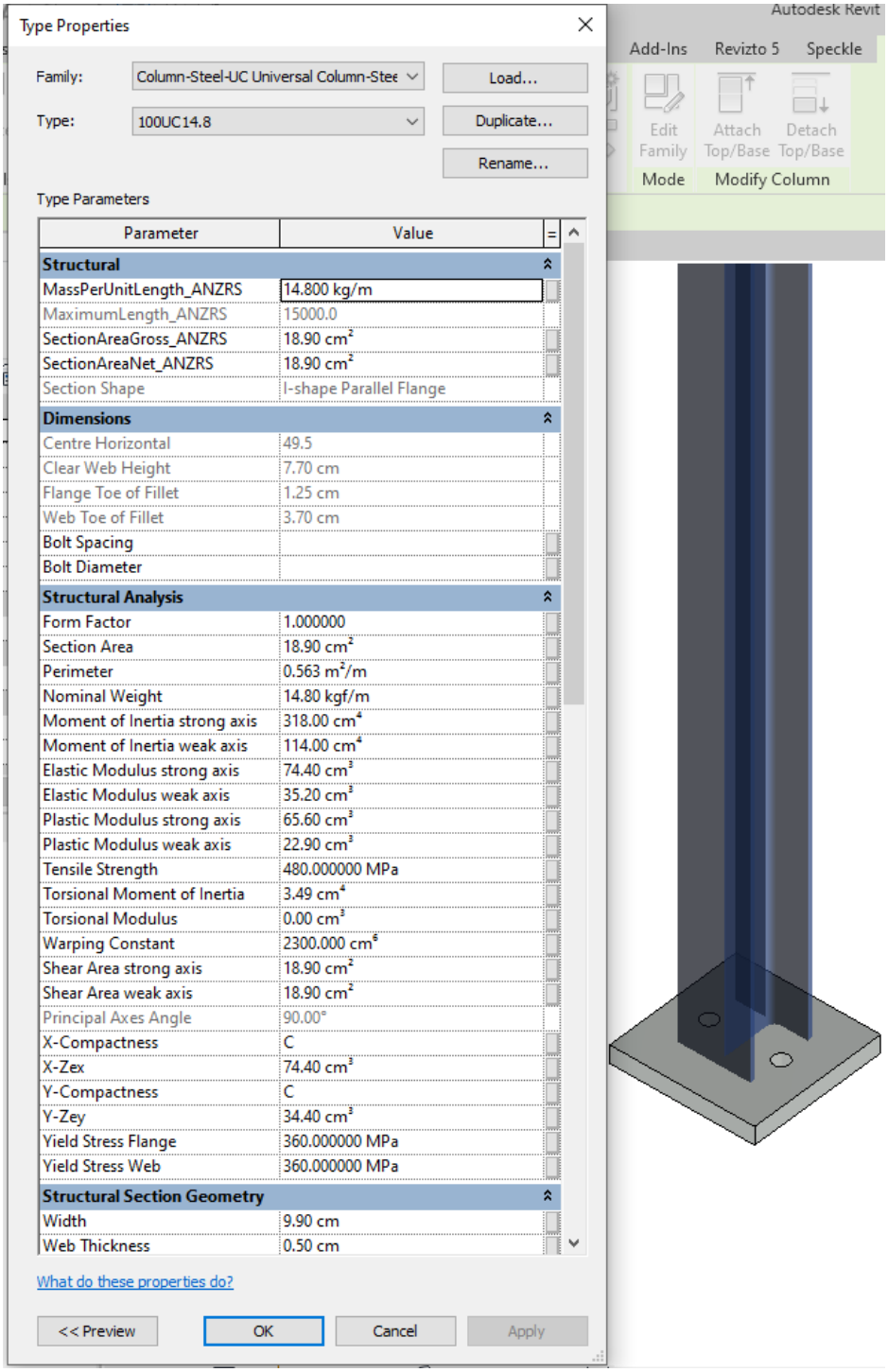


Figure 2 Type properties

A 3D Asset model accurately represents a physical asset in 3 dimensions. It can be a single or multi solid asset.

It shall:

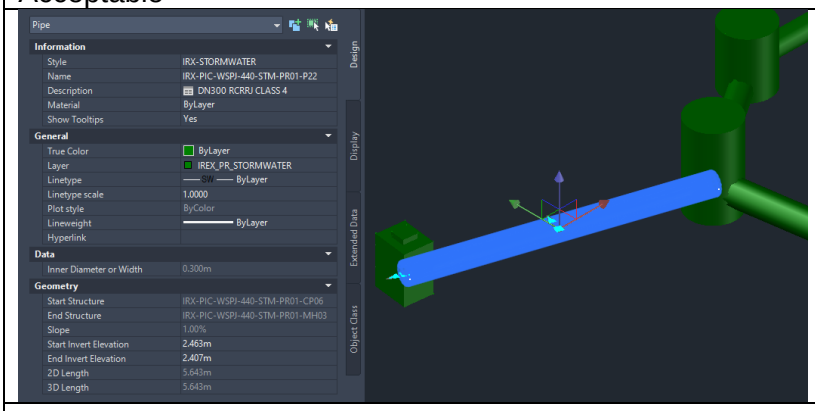
- Be a 3D solid that represents the shape, size, and spatial characteristics of the physical asset
- Include sufficient geometry to create a realistic visual representation in alignment with the LoIN
- Have textures and materials assigned
- Be at 1:1 scale
- In the correct units in accordance with the DEXP
- Be in the correct project datum in accordance with the DEXP
- Model elements should have the correct classification applied according to the EIR and AIR
- Have the correct colour scheme applied, refer to appendices 1 in the Services & Utilities Identification and Modelling Guidance Note document.
- In a format ingestible by the principal and its suppliers
- Able to be spatially coordinated and suitable for clash detection with other 3D assets
- Contain metadata or attributes associated with the asset. This metadata shall align with the KiwiRail minimum data requirements in the project EIR and AIR

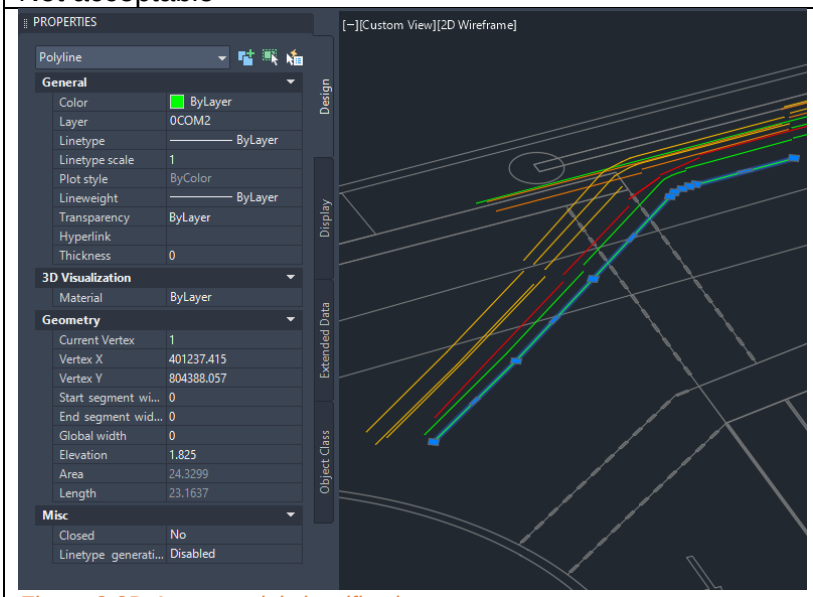
What is not considered a 3D model?

- 2D objects, symbols and linework (including polylines)
- 3D Linework (including polylines)

Why are some 2D and 3D objects not considered 3D Asset models? They can be combinations of objects such as points, lines, faces, and symbols and can be ambiguously misunderstood because the objects cannot be geometrically represented as a real-world asset. Typically, they don't have parametric behaviours which lead to cumbersome and in-efficient re-modelling methods in the authoring tools when a design change occurs.

Below is an example of what is acceptable and not acceptable by KiwiRail. These examples are provided for context only. If the supplier is in doubt, they shall confirm with KiwiRail prior to submitting model information for acceptance .

Acceptable	Why
	• 3D solids represent the assets physical size, shape and characteristics • Metadata can be seen in the asset properties • Colour scheme is correct • Can be coordinated and clashed against other assets • Has enough detail to visually understand the context • Note this example is taken from a Civil3D model however the context applies to all authoring tools

Not acceptable	Why
 *Figure 3 3D Asset model classification*	• Does not represent the physical size, shape, or characteristics of the asset • No asset meta data has been applied • Not 3 Dimensional • Insufficient model geometry detail • Cannot be coordinated or used for clash detection because of the physical size and shape • Provided as polylines • In this case of an underground services model, the assets have not been split per service • Note this example is taken from a Civil3D model however the context applies to all authoring tools

3.1.2 Model Segregation

At a minimum 3D model information shall be segregated into one or more files to ensure that no model spans between multiple zones or areas, depending on the design phase of the project.

3.1.3 Coordination

All 3D models shall adopt the use of the project standard datum, in alignment with the geospatial requirements detailed in section 5.1 of the Spatial Capture Framework. A local datum may be used to accommodate known limitations within industry standard authoring software. In instances where a local datum is used, a projection must be made back to the standard datum.

Any information which cannot be consolidated into the project federated model without manual alignment shall not be acceptable for use within the project. It is the responsibility of the supplier to test the coordination prior to submission of any 3D model information.

3.2 MODEL COLOUR CODING

To support easier identification of different model types, KiwiRail has opted to align all Underground services colour coding with the AS 5488 standard; refer to Appendices1 in the Services & Utilities Identification and Modelling Guidance note.

3.2.1 Clash Avoidance and Detection

The purpose of this section is to outline the required clash avoidance & detection processes to be adopted and implemented throughout the project design and pre-construction stages.

KiwiRail requires a clash detection process to be implemented to support efficient coordination and reduce risks during construction.

The focus shall be on both hard and soft clashes (construction tolerances, engineering requirements and clearances, dynamic affects, and safe working / maintenance zones).

KiwiRail has chosen Revizto+ as its collaboration platform. It is preferred that suppliers conduct their automated clash detection within the Revizto+ platform. If a supplier chooses to use alternative automated clash detection methods, approval from the KiwiRail DE team is necessary.

The supplier shall document the processes on clash detection and the resolution of these clashes within the DEXP.

As a minimum the following clash rules should be checked against the project information model during the project. Further clash rules shall be developed in consultation with KiwiRail and shall be included in the DEXP.

Table 3: Minimum Clash Detection Rules – Horizontal Infrastructure

KiwiRail Clash Detection Rules: Horizontal Assets												
	Sleepers	Rail	Track Centreline	Formation	Platform	OLE	OLE Foundations	Signals	Utilities	Architecture	Bridges	Fence
Sleepers	X											
Rail	X	X										
Track Centreline	X	X	X									
Formation	X	X	X	X								
Platform	H	H	X	X	X							
OLE	X	H	S	X	X	X						
OLE Foundations	H/S	H	S	X	X	X	X					
Signals	H/S	H	S	X	X	H	H	X				
Utilities	H/S	H	X	X	X	X	H	H	X			
Architecture	H	H	X	X	X	H	H	H	H	X		
Bridges	H	H	X	X	X	H	H	H	H	X	X	
Fence	H	H	X	X	X	H	H	H	H	X	X	X
Legend:												
H = Hard Clash = Objects that are physically colliding with each other												
S = Soft Clash = Objects that require clearances/tolerances												
H/S = Both Hard and Soft Clashes to be checked												
X = Clash test not run												

Table 4: Minimum Clash Detection Rules – Vertical Assets

KiwiRail Clash Detection Rules: Vertical Assets												
	Façade	Structural	Sanitary Services	Mechanical Ducting	Mechanical Ducting	Water Services	Fire Protection	Electrical Containment	Specialty Services	Electrical Fixtures	Ceilings	Architecture
Façade	X											
Structural	1	2										
Sanitary Services	1	1	2									
Mechanical Ducting	1	1	1	2								
Mechanical Piping	1	1	1	1	2							
Water Services	1	1	1	1	1	2						

Fire Protection	1	1	1	1	1	1	2					
Electrical Containment	1	1	1	1	1	1	1	2				
Specialty Services	1	1	1	1	1	1	1	1	2			
Electrical Fixtures	1	1	1	1	1	1	1	1	1	X		
Ceilings	X	1	1	1	1	1	1	1	1	X	X	
Architecture	X	X	1	1	1	1	1	1	1	X	X	X
Legend:												
1 = 10mm Hard Clash - Conservative												
2 = 25mm Hard Clash - Conservative												
X = Clash test not run												

3.2.1.1 Coordination Issue Tracking

All design coordination and clash detection issues are to be tracked and managed through the project collaboration environment, Revizto. This may be achieved by federating within Revizto, while pushing clash report data directly from Navisworks. The proposed approach shall be outlined within the DEXP.

3.2.1.2 Manual Check Process

Further to automated clash detection, manual coordination issue and clearance checks are to be performed within the collaboration environment and assigned to appropriate parties for resolution. Manual checks are necessary around design related coordination issues.

3.2.2 Level of Information Need

KiwiRail identify the Level of Information Need to consist of the definitions listed in Table 5.

Table 5: Level of Information Need

#	Term	Initialism	Scale	Description
1	Level of Detail	LoD	1-5	Level of Detail is the amount of geometrical (graphical) information contained in a 3D model.
2	Level of Information	LoI	1-6	Level of Information is the amount of non-geometrical (non-graphical) data embedded within an Information Model or 3D model.
3	Level of Development*	LOD	100-500	Level of Development refers to both the Level of Detail and Level of Information contained within a model element.

* Level of Development (LOD) is provided for reference only.

As part of the Project DEXP, the supplier should look at producing a LoIN matrix in relation to the assets being created and may contain fields such as:

- Discipline (e.g. Civil)
- Category (e.g. utilities, drainage, pavements)
- General Description of asset (e.g. pipes, manholes)
- Geometric banding relating to a visual diagram (e.g. Level 1 shows an extruded cylinder only, Level 4 could show a pipe that has wall thickness, flanges, and bends, next to an image of a 3D model that relates)
- What the detail can be relied upon (e.g. pits and pipe dimensions are accurate)
- Intended model use (e.g. Model may be used to support quantification, 3D coordination, Setout)
- What standard attributes are included (e.g. lengths, diameters, materials, volumes)

- What stages what information would be provided at

3.2.3 File Submission Formats

3.2.3.1 Native

KiwiRail require information to be submitted directly from the design authoring software from which 3D model information was produced. It is **preferable** to KiwiRail if:

- Design authoring software adopts the use of Autodesk AEC collection,
- Bentley OpenRail is used for the creation of rail alignment geometry and associated permanent way model elements,
- Autodesk Revit is used for creation of 3D model information (in situations where Revit is a recognised, discipline standard modelling package, e.g., structural, MEP).
- 12d software can be used however the supplier should consult with the KiwiRail DE team to understand the limitations in regard to population of asset information and exchange formats.

These authoring software provide additional benefits within the existing DE workflows, such as Revizto, and software available within KiwiRail.

3.2.3.2 Exchange Formats

In addition to the submission of the native file format from the authoring software, KiwiRail also require all models to be submitted in Industry Foundation Class (IFC) format. Files processed with the IFC protocol shall be uploaded using the latest version available within the authoring software, generally IFC4. **Responsibility of ensuring all the embedded information is carried through translation remains the responsibility of the supplier**.

KiwiRail can accept other file exchange formats, in the instance where suppliers do not use the native design authoring tools listed above in Section , Examples may include detailed parts and equipment models or specific formats needed to be consumed by visualisation tools. Formats may include .STEP, FBX, OBJ, .XML however in any case the supplier shall consult with KiwiRail DE team to agree the best approach.

3.2.3.3 Model Specification for Designers

KiwiRail has collaborated closely with its suppliers to develop a model specification. This specification serves as guidance regarding the information and outputs necessary for contractors to execute construction tasks effectively. Designers are expected to collaborate with KiwiRail's Digital Engineering team and the appointed contractor(s) to ensure that the design outputs align with the construction requirements of the contractor(s) Refer to Appendix 4.5

3.2.3.4 Federated Models

Where task teams are creating federated models with Revizto then these models shall be provided to KiwiRail in Navisworks (.nwd) format. Any federated model submissions shall satisfy the clash detection and validation processes outlined in Section 3.2.1 The number of federated models within a project shall be kept to a minimum and shall be agreed upon within the post-contract DEXP.

Federated models can be submitted in the CDE alongside the agreed file formats and deliverables in the IDP however the supplier still needs to provide the agreed native file formats and IFC files in accordance with the Project's DEXP and EIR.

3.2.4 File Size

While the KiwiRail CDE Tucana doesn't have a file size limit, suppliers should consider file sizes that are practical to work with in a collaborative project environment.

Where suppliers are submitting point cloud data these should be delivered as LAZ files not greater that 500MB per file.

For all other 3D model formats it is desirable that file sizes are not greater than 200MB.

Where model sizes are anticipated to exceed the above limits, these shall be agreed within the DEXP.

3.2.5 Naming Convention

3D models shall be submitted to the project CDE using the naming convention, as agreed upon by the project team and outlined in the EIR and post-contract DEXP.

3.2.6 Subsurface Utilities

The creation of any subsurface utility 3D models shall be undertaken following the practices outlined within the KiwiRail Subsurface Utility Identification and Modelling Guidance Note. Any created subsurface utility 3D models shall be consolidated with all other project information and included within any federated models. All supplied subsurface utility models shall conform with the model colour scheme included in Appendix 5 of the Services & Utility Identification and Modelling Guidance Note.

3.2.7 As-Built Information

It is expected that the as-built model will comprise of the following:

- Surveyed spatial position aligned to the accuracy requirements of the KiwiRail Spatial Capture Framework
- As constructed metadata relating to the assets and model elements, either attributed within a model file or as standalone tabulated data as outlined in the minimum data requirements document.
- Along with the individual as built asset models , A federated model updated from the for-construction revision, to reflect the spatial position where it varies from the design is to be supplied.

3.2.8 Model Validation

Prior to submission of any 3D model information to the project CDE, the minimum validation checks shall be undertaken as outlined within each of the Sections contained within 3.1, alongside any project specific requirements as detailed within the post-contract DEXP. KiwiRail may at a review stage request 3D model verification or quality assurance evidence from the supplier. Model checks by KiwiRail may be undertaken at any stage, in line with the project EIR's acceptance criteria.

3.3 2D DRAWINGS

The creation and submission of any 2D drawings shall follow the requirements outlined within this section.

3.3.1 General

All 2D drawing information shall be produced and submitted on the following bases:

- 2D drawing geometry has been derived directly from the 3D model view, including General Arrangements (GA).
- Only one drawing sheet shall be contained within an individual CAD file with individual document number (no multiple tabs within the CAD file), unless agreed upon within the scope of a project.
- eTransmital of .dwg files that will include all xrefs as a zip file.
- Legacy drawings shall be transferred onto a project specific title block.
- All 2D drawing files are to be produced using KiwiRail's CAD template file, which shall be supplied by KiwiRail following commencement of the project.

The supplier shall be responsible for completion of all appropriate title block attributes, as required throughout the design and construction process. This attribution shall be completed natively within the authoring software without any modification to the title block.

3.3.2 File Submission Formats

KiwiRail require the supplier to submit each of the following file formats to form the delivery of 2D information within a project.

3.3.2.1 Native

KiwiRail require information to be submitted in the native file format, following one of the processes below:

- DWG or DGN file, with unbound reference sheets.
- Zipped DWG with reference files, all linked with relative paths.
- Alternative native file types shall be managed on a case-by-case basis.

In instances where drawing views have been created completely within Autodesk Revit, the supplier shall ensure that the submitted Revit model file (.rvt) contains all embedded sheet views, for integration with KiwiRail's adopted collaboration tool, Revizto.

3.3.2.2 Exchange

Drawing information shall also be exchanged using Portable Document Format (.pdf) on the following provisions:

- The exported or plotted PDF title block is text-searchable.
- Vector files rather than raster, that is, any layers contained within the PDF **shall not** be flattened.
- Drawings are plotted with correct plot styles applied.
- All drawings are plotted on A1 paper size, using Layout plot area.

3.3.3 As-builts

As-built drawing information shall be derived from the 3D model view, and therefore shall be subject to the requirements as outlined in Section 3.2.7.

3.3.4 Drawing Validation

Prior to submission of any 2D drawing information to the project CDE, the minimum validation checks shall be undertaken as outlined within each of the Sections contained within 3.3, alongside any project specific requirements as detailed within the post-contract DEXP.

3.4 GEOSPATIAL INFORMATION

For detail on the technical requirements of geospatial information delivery within DE projects. Refer to the KiwiRail Spatial Capture Framework.

3.5 NON-GEOMETRIC INFORMATION

Any non-geometric based information shall be produced and delivered in accordance with the following sections.

3.6 ASSET INFORMATION

Refer to the Asset Information Requirements document, for specific details retaining to KiwiRail's asset requirements.

3.6.1 Metadata Structure

All asset information submitted to KiwiRail shall be in accordance with Appendix 4: Asset Metadata Requirements.

3.6.1.1 Horizontal Asset Information

All information that relates to horizontal assets shall be provided to KiwiRail against the requirements of the Horizontal Data Dictionary. The format of horizontal asset information delivery is to be agreed upon between the supplier and KiwiRail.

3.6.1.2 Vertical Asset Information

All information that relates to vertical assets shall be provided to KiwiRail against the requirements of the Vertical Data Dictionary. It should be noted that in the current data dictionary state, some items may exist in both the horizontal and vertical data schemas. In such cases duplication is found, the horizontal data dictionary shall take precedence.

3.7 DOCUMENTED INFORMATION

Any information contained within a document, such as a report or spreadsheet, shall be delivered in the appropriate file format as stated in Table 6.

Table 6: Documented Information File Formats

Type	Authoring Software	File Format(s)
Documents	Microsoft Word	.docx
Spreadsheets & Registers	Microsoft Excel	.xlsx, .xlsm
Presentations	Microsoft PowerPoint	.pptx
Schedules	Microsoft Project	.mpp[1]
Photos & Images	N/A (location services shall be enabled)	.png, .jpg
Video	N/A	.mp4 (H.264)

Use of Portable Document Format (PDF, .pdf) has been specifically excluded from the list of file formats for documentation delivery. This is to ensure that the information included in the supplied documentation can be re-used within the context of the engagement without modification or translation issues.

Document authors should make use of the document protection tools within authoring software in instances where the information being shared must not be editable from a regulatory or legal perspective.

3.8 OTHER NON-GEOMETRIC INFORMATION

For any information that is produced within the scope of a DE enabled project, which has not been included in the sections covered above, shall be considered, and managed on a case-by-case basis between the KiwiRail DE team and the supplier. Any information not covered should be identified as early as possible within the project to avoid undue delays.

[1] It is recognized that the Microsoft Project (.mpp) file format is not an open file format. However, KiwiRail have adopted the software across the business and is therefore mandatory for delivery within Digital Engineering projects.

4 Appendices

4.1 APPENDIX 1: TERMS AND DEFENITIONS

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.	

4.2 APPENDIX 2: DOCUMENT TYPE CODE LIST

Code	Document Type	Code	Document Type
AM	Agenda/Minutes	**MM**	Minutes of Meetings
AS	Assumption	**MN**	Manual
AU	Audit	**MO**	Memorandum
BQ	Bill of Quantities	**MP**	Management Plan
BR	Brief	**NC**	Notice to Contractor
CA	Calculations	**NE**	Notice to Engineer
CD	Credit Summary	**PC**	PCG Documents
CE	Certificates	**PE**	Permits
CH	Change Note/Request	**PF**	PERF
CN	Construction Notes	**PL**	Policy
CO	Consents	**PO**	Point Cloud
CR	Correspondence	**PP**	Pricing Package
CT	Contract	**PR**	Process or Procedure
DA	Design Advice	**PS**	Presentation
DB	Database	**QA**	Quality Assurance
DD	Design Departure Request	**RA**	Risk Assessment
DG	Drawing	**RF**	Reference
DR	Drawing Register	**RG**	Register
DRR	Document Review Record	**RI**	Request for Information
DV	Design Verification Record	**RP**	Report
ES	Estimate	**RQ**	Requirements
EV	Evidence	**RR**	Risk Register
FI	File Note	**SH**	Schedule (Programme)
FM	Form	**SK**	Sketch
FN	Financial	**SO**	Set Out
FR	Forecasts	**SP**	Specification
GL	Guideline	**ST**	Standard
GS	Geospatial	**SU**	Surveys
IM	Image/Photo/Video	**TE**	Tender Document
IN	Invoices	**TM**	Template
LE	Letters	**TN**	Technical Note
LI	List (General)	**TP**	Task Plan

MA	Media	**TR**	TOR
MD	Model	**TS**	Transmittal

4.3 APPENDIX 3: DISCPLINE CODE LIST

Code	Discipline	Code	Discipline
AC	Access Management	**MA**	Marine / Maritime Engineering
AR	Architectural	**ME**	Mechanical Engineering
AS	Asset Management	**MEP**	Mechanical, Electrical and Plumbing
BB	Bridges	**MP**	Master Planning
BC	Business Case	**OL**	Overhead Line Equipment / Traction
BE	Building Services Engineer	**OO**	Management
BM	Benefits Management	**PM**	Project Management/Controls
CC	Civil Engineering	**PR**	Procurement
CM	Commercial Management	**PS**	Project Management System
CN	Contractor Management	**QL**	Quality
CO	Cost Management	**QS**	Quantity Surveying
CP	Construction Planning	**RE**	Resource Management/Environmental Planning
CR	Consent/Regulatory	**RI**	Risk
CS	Communications Systems	**RM**	Rail Maintenance
CT	Construction	**RO**	Rail Operations
DE	Design	**RQ**	Requirements Management
DG	Digital Engineering	**RR**	Roads and Highways
DM	Design Management	**RS**	Rail Systems (general)
DR	Drainage	**SA**	Safety and Systems Assurance
EH	Electrical HV	**SC**	Scheduling and Time control
EL	Electrical LV	**SH**	Ships
FE	Fire Engineering	**SI**	Signaling
FI	Finance	**SM**	Stakeholder Management and Communications
GE	General Engineering	**ST**	Structural
GS	GIS	**SU**	Sustainability
GT	Geotechnical Engineering	**SV**	Survey and Mapping
GV	Governance	**SY**	Systems
HF	Human Factors	**TE**	Traffic Engineering
HR	Human Resources	**TK**	Track
HS	Health, Safety and Environment	**TR**	Transport, Planning, and Integration
IM	Integrated Management Systems	**TU**	Tunnels
INF	Information Management	**UT**	Utilities

LD	Landscaping	**VT**	Vertical Transport
LX	Level Crossings		

4.4 APPENDIX 4: ASSET METADATA REQUIREMENTS

The following fields shall be recorded against all asset elements, domains and values for specific asset classes are contained within the data dictionary.

	Attribute Field Name	Description	Responsible	Phase Required	Example
Data Provider Identification	DataProvider_Name	Name of the Data Provider	Supplier	ALL	Company Name
	DataProvider_AssetID	ID of the asset in the providers system	Supplier	ALL	STC_01
	DataProvider_AssetName	Human readable name of the asset in the providers system	Supplier	ALL	OLE STC Mast 01
	DataProvider_AssetType	Classification used by the data provider internally	Supplier	Optional	ole_stc_mast
	DataProvider_AssetParent	ID of the parent of this asset in the contractor's system	Supplier	Optional	PLATFORM_2
	DataProvider_AssetZone	Zone in the contractor's system	Supplier	Optional	Drury Central
	DataProvider_Project	Project the contactor is working on	KiwiRail	ALL	Drury Rail Stations
	DataProvider_Package	Delivery Package	Supplier	ALL	MWD01
	DataProvider_Status	Asset Status [DESIGN, ASBUILT]	Supplier	ALL	ASBUILT
	DataProvider_DataSource	File name of the native model where this asset can be found	Supplier	ALL	601601-OL-MD-0023-[P02].dwg
	DataProvider_Comments	Any other comments related to the Asset	Supplier	Optional	
KiwiRail Project Identification	Project_AssetGUID	Unique ID (to track assets on a project)	KiwiRail	ALL	4bb5b1d7-12cd-4b7d-934f
	Project_AssetName	Unique name for asset that is used by the project (Can be different from the name of the asset in Maximo or SAP)	KiwiRail	ALL	STC 01 - Mast 1X
	Project_AssetTypeName	Plain English name for the Asset Type used on the Project	KiwiRail	ALL	Traction Support Mast
	Project_AssetTypeID	Asset 'Class' or 'Type' as understood by KiwiRail	KiwiRail	ALL	H_Traction_Overhead SupportStructures_Mast
	Project_AssetTypeVersion	Version of the AssetTypeID used	KiwiRail	ALL	beta_0.9.7a

	Project_AssetDescriminator	Field to discriminate between assets when required (in absence of detailed data)	Provider	ALL	“STC” for a 'Traction Support Structure' “SWALE” for a 'Surface Drain'
	Project_Action	Intended final action for this asset. [Existing/NotSure, Existing/Remove, Existing/Replaced, Existing/NoChange, Existing/UpdateInfomation, Existing/Modify, Existing/Move, New/NotSure, New/Install, New/Replaces]	Provider	ALL	New/Install Existing/Remove
	Project_Zone	Geographical or WBS (Aligns with Tucana)	Provider	ALL	South Junction
	Project Area	Geographical or WBS (Aligns with Tucana)	Provider	ALL	West Track
	Project_Line	Name of line associated with asset	KiwiRail	ALL	NIMT
	Project_Track	Name of tracks or crossover associated with asset (name used on design or colloqually on the project) Primary track (where two tracks are impacted) is listed first, followed by other tracks in a semi-colon separated list	KiwiRail	All	Up Main Up Main; Loop 1 Crossover 86
	Project_StartChainage	Start chainage in meters	Provider	All	45078 m
	Project_EndChainage	End chainage (always greater than start chainage) in meters	Provider	All	45078 m
	Project_ChainageRefPoint	Reference point that the chainage is generated from	Provider	All	42Km Peg
	Project_ChainageSource	Source for the chainage [Survey, Model, Handsketch]	Provider	All	Survey Model Hand sketch
	Project_ReasonForTracking	Reason	KiwiRail	All	Installation of new STC OLE structure Existing untracked asset Replacement of existing OLE 12345 with new TTC
	Project_ActionStatus	For internal tracking of asset change [Planned, Cancelled, Complete]	Provider	All	Planned
	Project_ActionPackage	Name of package of works or separable portion	KiwiRail	All	Package 3

4.5 APPENDIX 5: MODEL SPECIFICATION GUIDANCE FOR DESIGNERS

MODEL HANDOVER TYPE	DESCRIPTION	3D DATA TO BE SUPPLIED AS	FILE EXCHANGE FORMATS
Pre-Existing Ground Survey Models	The ground information is utilised for designing tie-ins, determining earthwork quantities, and fulfilling all other requirements prior to the IFC stage of works	Point Cloud,	Las, dem
		TIN Surface	.dwg, 12daz or .xml
Existing Utilities/Services Models	The services, including stormwater, potable water, sewer, and other utilities, are utilised for designing tie-ins, determining earthwork quantities, and fulfilling all other requirements prior to the IFC stage of works	3D Pipe Network (Civil3D) or Drainage Network (12d)	dwg or 12da and excel export xlsx or csv
Finished Level	The final design includes levels with surface and 3D strings/feature lines	TIN Surface	dwg or 12da and .xmls
Other Formation Levels or Sub Surface Level	The pavement layers or structural fill layers are represented using surface and strings/feature lines	TIN Surface	dwg or 12da and .xmls
Control Alignment and Other Reference Alignments	The main alignment, including horizontal and vertical geometry, along with any additional reference alignments, are integrated to form the design mode	3D Alignments	.dwg or 12da and .xmls
Kerbs or Platform Frontage	All road kerbs/platform beams are to be provided as solids, including all key 3D details	3D Solids and 3D String lines/ Feature lines	dwg or12da or .rvt
Lighting, Fencing, Bollards, Barriers, and Furniture (Shelters, Handrails, Seating etc)	All fencing, bollards, and barriers are to be provided as 3D solids, accompanied by 3D strings or points indicating start and end set-out information	3D Solids and 3D String lines/ Feature lines	dwg or12da or .rvt
Signal, Ducting and Overhead Traction	The signal ducting should be presented as both a 3D network and 3D solids	3D Solids and 3D String lines/ Feature lines	dwg or12da or .rvt or dgn
Design Services (SW, WW, PW, Swales and Longitudinal Drains etc)	All design services are to be presented as 3D networks, with pipes and structures clearly named and labelled. In the case of swales and surface drains being modelled, they should be provided as surfaces and 3D strings. Additionally, the designer should produce and supply 2D CAD drawings for both plan and long sections, with drainage network output provided in .xlsx format	3D Pipe Network (Civil3D) or Drainage Network (12d)	dwg or 12da and excel export xlsx or csv
Utilities (Power, Comms, gas etc)	All design utilities must be presented as 3D networks, clearly naming and labelling cables, ducts, structures, and utility trenches. Additionally, the designer is expected to create and supply 2D CAD drawings detailing trench specifications and the typical arrangement of services, including minimum cover and clearance from other service	3D Pipe Network (Civil3D) or Drainage Network (12d)	dwg or 12da and excel export xlsx or csv

Civil Structures, Foundations, Steel Structures. I.e., Bridges, Retaining Walls, Stations	All structural elements such as foundations and retaining walls, Structural steel components such as Columns to be provided as 3D solids	3D Solids and 3D String lines/ Feature lines	dwg or .rvt

KiwiRail