KiwiRail

Digital Engineering Information Standard

Part 2: Information Production

Version 1

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

Reviewers' Name

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Signed off by Approvers

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Final Distribution

Name	Position
File	-

Contents

Tables

Figures

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: Terms and Definitions.

1.6 FUTURE UPDATES

KiwiRail recognise that there remains a workstream to revise the information contained within the DEIS. The current workstreams in development include:

1. Migration of horizontal and vertical asset schemas into a single unified schema, including a standardised asset information exchange template.
2. Standardisation of information container naming conventions for consistency between GeoDocs and authoring software.
3. Improved referencing between the DE document suite.
4. Updates to Data Security requirements.

1.7 REFERENCES

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

- DE Subsurface Utility Identification and Modelling Guidance Note
- DE 3D 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.
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.
Asset Data Dictionary	Outlines all the possible asset types, and their associated attribution requirements.
GeoDocs Guidance Note	Supplementary document which covers off the correct usage of the CDE, including details of the background processes for those wanting additional detail.
Revizto Guidance Note	How KiwiRail standardise the use of Revizto across the KiwiRail projects portfolio.
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.
Project	
Digital Engineering Execution Plan (DEXP)	Outlines how Digital Engineering will be completed throughout the scope of the engagement, responding to the requirements outlined in the EIR. Outlines the roles and responsibilities within the supplier's organisation and can be used as a form of assessment for the tender submission process. Pre-contract is to be prepared by the supplier, and the post-contract is collaboratively developed between KiwiRail, its partners and the supplier.
Project Information Protocol	Provides additional clauses which enable the scope of Digital Engineering to be amended to the contract.
Information Delivery Schedule	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.
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)

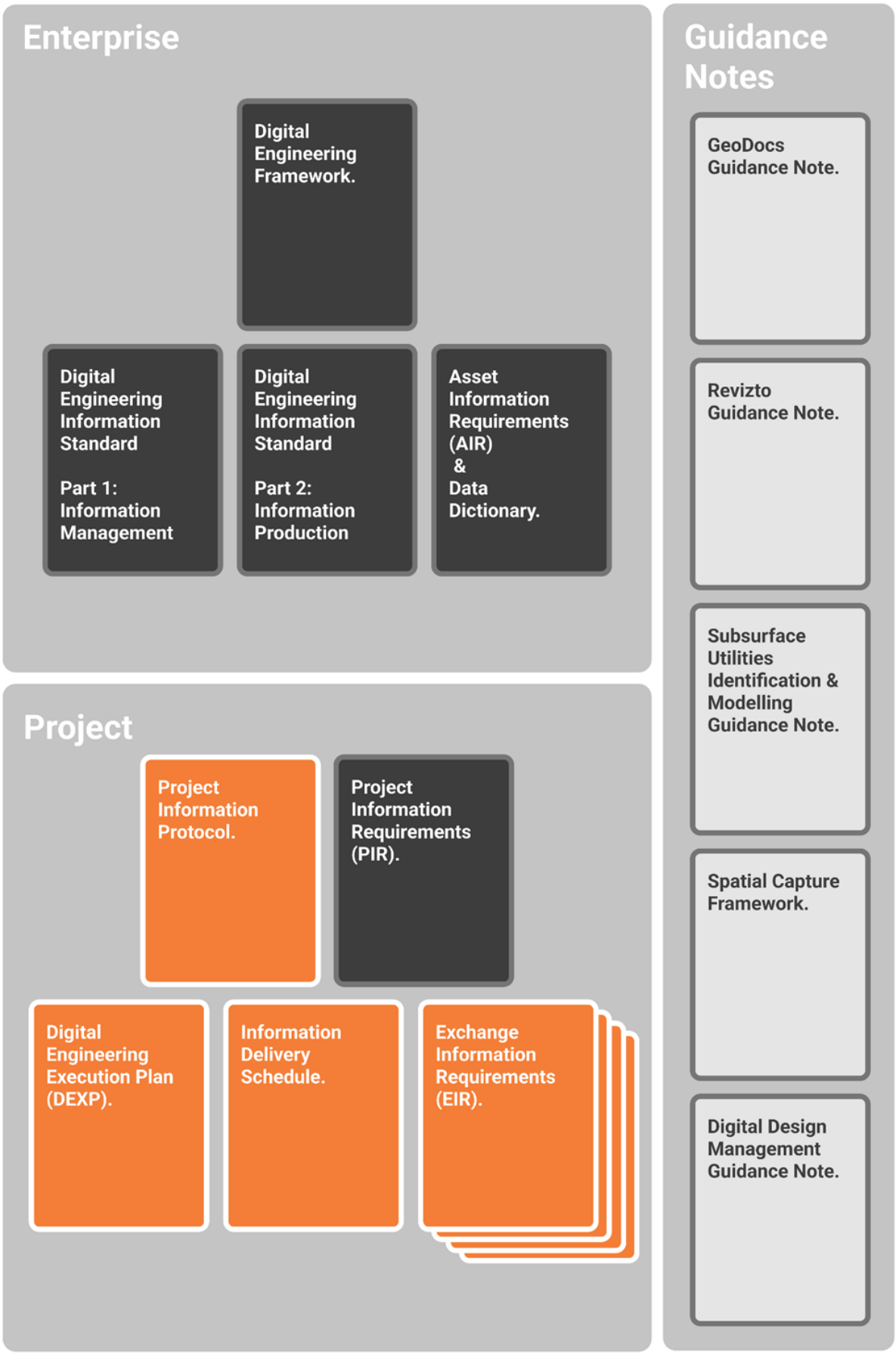

Figure 1: Digital Engineering Document Structure

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 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**

It is recognised that some fields within the typical naming convention may not be suitable for bespoke KiwiRail projects, and in such instances, the naming convention shall be adapted and agreed upon within the post-contract DEXP by all 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.

3.1.1 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.

Table 3: Model Segregation Requirements

Design Phase*	Zone	Area	Asset
Concept Design	Divided between zones	N/A	N/A
Preliminary Design	Divided between zones	N/A	N/A
Developed Design	Divided between zones; and	Divided between areas	N/A
Detailed Design	Divided between zones; and	Divided between areas; and	Divided by asset

* The project phases detailed outline the minimum requirements at the conclusion of the respective design phase.

3.1.2 Coordination

All 3D models shall adopt the use of the project standard datum, in alignment with the geospatial requirements detailed in Section 4.3 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.

3.1.3 Classification

KiwiRail have adopted the use of the Uniclass 2015 classification system, published by the National Building Specification (NBS). 3D model submissions within vertical assets shall comply with the requirements articulated within the engagement EIR, derived from the KiwiRail AIR.

The minimum requirements of asset classification throughout a given project are specified in Table 4.

Table 4: Minimum Asset Classification Requirements

Design Phase	Element / Function (EF)	Systems (Ss)	Products (Pr)
Concept Design	EF_xx	Ss_xx	Discretionary
Preliminary Design	EF_xx	Ss_xx	Discretionary
Developed Design	EF_xx_xx	Ss_xx_xx	Pr_xx
Detailed Design	EF_xx_xx_xx	Ss_xx_xx_xx	Pr_xx_xx
Construction	EF_xx_xx_xx	Ss_xx_xx_xx	Pr_xx_xx

Minimum requirements for Uniclass location classifications, including complexes (Co), entities (En), and spaces and locations (SL) should be specified by KiwiRail during the appointment process, where applicable.

3.1.4 Colour Scheme

To support easier identification of different model types, including both those above ground and below ground, all 3D models shall be submitted to KiwiRail with the colour scheme outlined in Appendix 4: Model Element Colour Scheme.

The basis for this scheme split by above and underground model types, where:

- Underground services alignment with industry best practice, as defined by AS 5488.
- Aboveground model elements are generally grouped by discipline and share a similar colour palette within the discipline (e.g. track elements comprise of various shades of yellow).

3.1.5 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 recognises current industry practice that utilises Navisworks for running clash detection rules. This process is supplemented on KiwiRail projects through the use of Revizto for assigning issues to disciplines for resolution so project members can work collaboratively and close out issues. It is KiwiRail's intention to democratise clash detection activities using the Revizto clash detection tools in early 2022.

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 5: 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 6: 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												

3.1.5.1 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 outline within the DEXP.

3.1.5.2 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.

3.1.6 Level of Information Need

KiwiRail identify the Level of Information Need to consist of the definitions listed in Table 7.

Table 7: 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.

Note that KiwiRail have elected to split the ISO 19650 term of Level of Information Need into its elementary components of Level of Detail and Level of Information, in alignment with ISO 19650 and the adoption of the Uniclass classification system. This is to allow flexibility in supporting circumstances where:

- 3D model geometry is highly refined and does not require the corresponding information; or
- Simple 3D geometry is required, however requires well defined information.

Exemplar Levels of Information Need can be found within the published Uniclass toolkit[1]. This reference information is primarily centred around vertical assets, however, should provide sufficient guidance for horizontal assets.

3.1.7 File Submission Formats

3.1.7.1 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).

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

3.1.7.2 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**.

3.1.7.3 Federated Models

Where task teams are creating federated models with Revizto then these models shall be provided to KiwiRail in Navisworks (.nwc) format. Any federated model submissions shall satisfy the clash detection and validation processes outlined in Section 3.1.5. The number of federated models within a project shall be kept to a minimum and shall be agreed upon within the post-contract DEXP.

[1] NBS Uniclass Toolkit Definitions: https://toolkit.thenbs.com/definitions

3.1.8 File Size

While the KiwiRail CDE can accept information containers up to 15GB files of this size are not generally 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.

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.

3.1.9 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 post-contract DEXP.

3.1.10 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 4: Model Element Colour Scheme.

3.1.11 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 3d Spatial Data Capture Framework
- As constructed metadata relating to the assets and model elements (either attributed within a model file or as standalone tables referenced with asset IDs and GUID codes from model elements.
- A federated model updated from the for-construction revision, to reflect the spatial position where it varies from the design.

3.1.12 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.

3.2 2D DRAWINGS

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

3.2.1 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 drawing number, unless agreed upon within the scope of a project.
- Drawing files shall be provided with any external references bound into the file.
- Legacy drawings shall be transferred onto a project specific title block.
- All 2D drawing files related to KiwiRail's linear assets are to be submitted on the KiwiRail Engineering Services title block format, 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.

3.2.2 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.

3.2.2.1 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.

3.2.2.2 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.

3.2.3 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 3.1.11.

3.2.4 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 3.2, alongside any project specific requirements as detailed within the post-contract DEXP.

3.3 GEOSPATIAL INFORMATION

The following section articulates the technical requirements of geospatial information delivery within DE projects. This section should be read in conjunction with the KiwiRail Spatial Capture Framework.

3.3.1 Point Cloud & LiDAR

3.3.1.1 Classification

Point cloud data sets should be delivered to against the Level of Classification as required by the project. The minimum required classifications against each of the pre-set Levels of Classification are detailed in Table 8. Classifications have been derived from the American Society for Photogrammetry and Remote Sensing (ASPRS) LAS Specification 1.4 – Revision 14.

Table 8: Point Cloud Data – Level of Classification (LoC)

LoC	Values[2]	Meaning	Notes
1	1	Unclassified	
2	2	Ground	
3	3	Low Vegetation	Should be consolidated to single ‘Vegetation’ class.
	4	Medium Vegetation	
	5	High Vegetation	
	6	Building	
	9	Water	
	10	Rail	
	11	Road Surface	
	17	Bridge Deck	
	64	Rail Platforms	

[2] American Society for Photogrammetry and Remote Sensing (ASPRS) Specification 1.4 – Revision 14: http://www.asprs.org/wp-content/uploads/2019/03/LAS_1_4_r14.pdf

4	13 14 16	Wire – Guard (Shield) Wire – Conductor (Phase) Wire-Structure Connector	Should be consolidated to single ‘Wire’ class.
	19 65	Overhead Structure Traction Poles & Gantries	

Any values not identified in Table 8 which exist within the ASPRS Specification may be ignored and remain as unclassified data.

Classification shall be undertaken using two methodologies:

- Automated software classification
- Manual inspection

The supplier shall undertake both classification methodologies to ensure that data has been appropriately classified as per Table 8. In cases where the classification meaning may be ambiguous, the supplier shall seek agreement on classification with the KiwiRail DE team.

3.3.1.2 File Format, Size & Tiling

Point cloud data shall be provided in LiDAR LAZ (compressed LAS) file format only and uploaded to the respective project CDE. Point clouds, in compressed LAZ format shall **not exceed 500MB** per file, so that the weight and scope of data within visualisation and modelling environments can be managed.

In instances where a single point cloud (in LAZ format) exceeds 500MB, the point cloud shall be split across multiple tiles. Tiles shall stitch together back to the project datum. When point clouds are split between multiple tiles, a tile map (i.e., aerial image with tile regions annotated) shall be produced.

There are two standard approaches for the creation of tiles, and shall vary based on the scope of the project:

- Grid-based tiles (based on coordinate grid systems)
- Track section-based tiles (based on track chainage)
- The preferred tiling methodology shall be outlined within the EIR.

3.3.1.3 Level of Resolution

The Level of Resolution (LoR) of point cloud data throughout DE enabled projects shall fall under the tiers outlined in Table 9. The requirements of point density vary on a per-project basis and shall be defined by the supplier based on the design intent and project requirements within the DEXP, throughout the project lifecycle.

Table 9: Level of Resolution (LoR) Tiers

Level of Resolution	Point Density (ppm^2)	Usage
1	0.5 – 1.0	Conceptual Digital Elevation Models (DEM)
2	1.0 – 2.0	Preliminary calculations & modelling
3	2.0 – 5.0	General capture for context & reference
4	5.0 – 10.0	Developed design modelling & visualisation
5	10.0+	Detailed design modelling & visualisation

With the submission of point cloud data, the supplier shall include evidence, in the form of summary report or calculation, that the supplied Level of Resolution has been satisfied.

3.3.1.4 Level of Accuracy

The Level of Accuracy (LoA) of geospatial data is defined within the KiwiRail 3d Spatial Data Capture Framework. Suppliers shall reference and state the anticipated Level(s) of Accuracy within the project DEXP based on the design intent and project requirements, throughout the project lifecycle.

3.3.1.5 Digital Elevation Model

Any Digital Elevation Models (DEM) shall be produced using survey information and submitted as a 3D model drawing (.dwg) file. The resolution or quality of the DEM shall be derived from the Level of Resolution and Level of Accuracy of the available data at the time of production, unless otherwise specified.

3.3.1.6 Information Format

Any other geospatial information which has not been prescribed a submission format shall be delivered as an ESRI file geodatabase. File database information shall be delivered with the minimum attribution requirements, specific to the asset type, and will be provided to the supplier post-contract.

For any asset classes which do not currently have outlined attribution requirements, the supplier shall speak to the KiwiRail DE team before the production of information to ensure the data is fit-for-purpose.

3.4 OTHER 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.

4 Non-Geometric Information

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

4.1 ASSET INFORMATION

4.1.1 Metadata Structure

All asset information submitted to KiwiRail shall be in accordance with Appendix 5: Asset Metadata Requirements.

4.1.1.1 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.

4.1.1.2 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.

4.2 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 10.

Table 10: 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[3]
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.

4.3 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.

[3] 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.

5 Appendices

5.1 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.	

Term(s)	Definitions	ISO 19650 term
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.	✔
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	✔
Metadata	Data that describes the information container stored in a common data environment (For example: project number, title, life cycle state, revision, etc.).	
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.	
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.	

Term(s)	Definitions	ISO 19650 term
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.	

5.2 APPENDIX 2: DOCUMENT TYPE CODE LIST

Code	Document Type	Code	Document Type
AM	Agenda/Minutes	**MN**	Manual
AS	Assumption	**MO**	Memorandum
AU	Audit	**MP**	Management Plan
BQ	Bill of Quantities	**NC**	Notice to Contractor
BR	Brief	**NE**	Notice to Engineer
CA	Calculations	**PC**	PCG Documents
CD	Credit Summary	**PF**	PERF
CE	Certificates	**PL**	Policy
CH	Change Note/Request	**PP**	Pricing Package
CN	Construction Notes	**PR**	Process or Procedure
CO	Consents	**PS**	Presentation
CR	Correspondence	**QA**	Quality Assurance
CT	Contract	**RF**	Reference
DA	Design Advice	**RG**	Register
DD	Design Departure Request	**RP**	Report
DG	Drawing	**RQ**	Requirements
DR	Document Review Record	**RR**	Risk Register
DR	Drawing Register	**SH**	Schedule (Programme)
DV	Design Verification Record	**SK**	Sketch
ES	Estimate	**SO**	Set Out
EV	Evidence	**SP**	Specification
FM	Form	**ST**	Standard
FN	Financial	**TE**	Tender Document
FR	Forecasts	**TM**	Template
GL	Guideline	**TN**	Technical Note
IM	Image/Photo/Video	**TP**	Task Plan
MA	Media	**TR**	TOR
MD	Model	**TS**	Transmittal

5.3 APPENDIX 3: DISCIPLINE CODE LIST

Code	Discipline	Code	Discipline
AC	Access Management	**IM**	Integrated Management Systems
AS	Asset Management	**LD**	Landscaping
BC	Business Case	**ME**	Mechanical Engineering
BM	Benefits Management	**MP**	Mechanical, Electrical and Plumbing
CC	Civil Engineering	**OL**	Overhead Line Equipment / Traction
CM	Commercial Management	**PM**	Project Management/Controls
CN	Contractor Management	**PR**	Procurement
CO	Cost Management	**PS**	Project Management System
CP	Construction Planning	**QS**	Quantity Surveying
CS	Communications Systems	**RE**	Resource Management/Environmental Planning
CS	Communications and Stakeholder	**RI**	Risk
CT	Construction	**RM**	Rail Maintenance
DM	Design Management	**RQ**	Requirements Management
DR	Drainage	**RO**	Rail Operations
EH	Electrical HV	**RS**	Rail Systems (general)
EL	Electrical LV	**SA**	Safety and Systems Assurance
FE	Fire Engineering	**SC**	Scheduling and Time control
FI	Finance	**SM**	Stakeholder Management
GE	General Engineering	**SI**	Signaling
GS	GIS	**ST**	Structural
GT	Geotechnical Engineering	**SV**	Survey and Mapping
GV	Governance	**SU**	Sustainability
HF	Human Factors	**TE**	Traffic Engineering
HR	Human Resources	**TR**	Transport, Planning, and Integration
HS	Health, Safety and Environment	**TU**	Tunnels
		UT	Utilities

5.4 APPENDIX 4: MODEL ELEMENT COLOUR SCHEME

Classification	Discipline	System	Colour	AutoCAD	R	G	B	Notes
Model Type	ALL	As-built		254	190	190	190	Used against all model types
Model Type	ALL	Demolished		12	189	0	0	Used against all model types
Model Type	ALL	Existing		251	80	80	80	Used against all model types
Model Type	ALL	Modified		162	0	46	189	Used against all model types
Model Type	ALL	Temporary		122	0	189	141	Used against all model types
Proposed	MP	Hot Water		20	255	63	0	
Proposed	EH	HV Electrical - Other		31	255	212	170	Example: Transformers
Proposed	EL	LV Electrical - Other		32	189	94	0	Example: Security systems
Proposed	RS	Track-Rails		40	255	191	0	
Proposed	RS	Track-Sleepers		42	189	141	0	
Proposed	RS	Track-Ballast		44	129	96	0	
Proposed	RS	Track-Formation		46	104	78	0	
Proposed	ST	Structural - Other		60	191	255	0	Example: Platform face
Proposed	MP	Mechanical - Other		80	63	255	0	
Proposed	MP	Steam		120	0	255	191	
Proposed	SI	Signal Foundation		130	0	255	255	
Proposed	SI	Signal Gantry		132	0	189	189	
Proposed	SI	Signal Masts		134	0	129	129	
Proposed	MP	Chilled Water		150	0	127	255	
Proposed	CC	Civil - Other		190	127	0	255	Example: Retaining walls
Proposed	MP	HVAC		200	191	0	255	
Proposed	OL	OLE Foundation		230	255	0	127	
Proposed	OL	OLE Structure/SPS/Wiring/Registration		232	189	0	94	
Proposed	AR	Architectural - Other		253	130	130	130	Examples: Platform shelters
Services	EL	Earthing/Earth Grid		34	129	64	0	
Services	FE	Fire Service		1	255	0	0	
Services	EH	Electricity		30	255	127	0	Best estimate of colour within AutoCAD
Services	MP	Air		92	0	189	0	
Services	ALL	Redundant Services		166	0	25	104	
Services	ALL	Other		249	79	53	59	
Services	MP	Petroleum (Flammable & Combustible)		36	104	52	0	Best estimate of colour within AutoCAD
Services	CC	Sewerage		41	255	234	170	Best estimate of colour within AutoCAD
Services	MP	Gas		50	255	255	0	
Services	CC	Drainage (Stormwater/Raw Water)		62	141	189	0	Best estimate of colour within AutoCAD
Services	CC	Potable Water		142	0	141	189	Best estimate of colour within AutoCAD
Services	CC	Recycled Water		192	94	0	189	Best estimate of colour within AutoCAD

Classification	Discipline	System	Colour	AutoCAD	R	G	B	Notes
Services	ALL	Unidentified Services		210	255	0	255	
Services	EL	Communications		255	255	255	255	

Notes:

1. Architectural models (such as a building façade) should be coloured in a realistic manner, however, should avoid overlap with the colour scheme.
2. KiwiRail prefers the assignment of model colours to occur within the native authored file, rather than within end products and viewers such as Revizto.
3. Colours have been assigned with Autodesk authoring packages in mind, however, have been provided with RGB values for cross-compatibility. Colour indexes from alternate software may be added to this scheme where appropriate.
4. In instances where the ‘other’ model type is frequently used (e.g. Civil – Other) throughout a project in different applications, the project team should consult the KiwiRail DE representative to determine whether additional schemes should be applied. Note that this will initially be provisioned on a ‘per-project’ basis and rationalised across the portfolio as and when required.

5.5 APPENDIX 5: 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 Name *Abbreviated*	Attribute Name *Full*	Data Type	Unit of Measure	Max Length	Comments	Contents	Example
Unique_ID	Unique Identifier	Alpha / Numeric		20 chars	No commas included	Unique ID of the model derived from source modelling software.	
Uniclass_ID	Uniclass classification number	Alpha / Numeric		n/a	No commas included	Uniclass classification code to allow model and document data to be classified together, refer to data dictionary for code assignment	EF_80_70 (Rail Tracks element)
Maximo_ID	Maximo Classification	Alpha / Numeric		20 chars	No commas included	Unique ID of the asset created by the asset model (Maximo).	
Owner	Owner	Alpha / Numeric		100 chars	No commas included	Name of the asset owner.	KiwiRail, GWRC
Line	Line location	Alpha / Numeric		10 chars	No commas included	What line is the asset located on	NIMT, WL, JVILLE, MEL
Chainage_from	Km location	Integer	km	n/a	3 decimal places	What is the start km [chainage can be derived by KiwiRail using its linear referencing workbench in FME]	29.400
Chainage_to	Km location	Integer	km	n/a	3 decimal places	What is the end km [chainage can be derived by KiwiRail using its linear referencing workbench in FME]	32.320
Status	Status	Alpha / Numeric		10 chars	No commas included	The current operational state of the asset.	New, Active, Redundant, Removed
Const_Date	Construction Date	Date	Time	n/a	dd/mm/yyyy	Date the asset was constructed/built/installed/relined/renewed	e.g. 15/06/2019
Source	Source	Alpha / Numeric		10 chars	No commas included	Data source or method that was used to collect the data and populate the attributes	Field
H_Prec	Horizontal Precision	Alpha / Numeric		10 chars	No commas included	Horizontal Precision to which the asset has been captured.	
V_Prec	Vertical Precision	Alpha / Numeric		10 chars	No commas included	Vertical Precision to which the asset has been captured.	
Des_Life	Design Life	Integer	Time	n/a	Whole number	Indicates the Manufactured Life / expected life on use. Design Life length in years	
Cost	Cost	Decimal	Currency	n/a	2 decimal places	Cost of the asset determined at time of construction in dollars	130.25
Comments	Comments	Alpha / Numeric		250 chars	No commas included	Any additional comments that relate to this asset	
HSE_SiD	Health & Safety or Safety in Design Issues	Alpha / Numeric		250 chars	No commas included	Health and safety Issues that need to be known	Specific instruction from Safety in Design register


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