

# Establishing the Contractor-CDE

## Digital Engineering Framework

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## Contents

**Introduction**

**Overview**

**CDE principles**

**Consistent use of 'state'**

**Consistent use of 'suitability'**

**Consistent use of 'revision'**

**Applying the Project Data Building Blocks**

**Security**

**Onboarding staff**

**For information on DE Framework**

## Introduction

The purpose of a common data environment (CDE) is to achieve higher quality coordination at lower cost, by applying systematic collaboration and efficient management of information.

## Overview

A CDE usually takes the form of a connected network of software solutions governed by consistent principles and processes. The principles of a CDE enable efficiencies in collaboration and quality assurance to a degree not feasible with traditional methods.

The CDE principles apply consistently across all information on the project regardless of the system which holds it. However, TfNSW distinguishes between the data environment which belongs to each contractor (the Contractor-CDE) and the data environment which belongs to TfNSW (the TfNSW-CDE). Treating these as distinct parts provides more freedom to each contractor (or group of contractors working under one contract) to work efficiently according to their own systems and processes, so long as these comply with high level principles and requirements.

The Digital Engineering (DE) Framework focuses predominantly on the information provided to TfNSW, by defining requirements for the exchange of information. Relatively few requirements are applied to the configuration of contractor systems. The deliverables themselves must be submitted according to the requirements of the Digital Engineering (DE) Standard.

The DE Standard gives explanatory guidance on common data environment principles (refer to DMS-ST-202 – *DE Standard, Part 1: Concepts and Principles*, Section 8, and DMS-ST-207 – *DE Standard, Part 2: Requirements*, Section 3), part of which includes an Enterprise Content Management (ECM) schema for document management.

This quick reference guide provides additional guidance to contractors regarding the practical implementation of a Contractor-CDE in line with the principles of the TfNSW DE Framework.

## CDE principles

ISO 19650-1:2018 describes CDE principles as spanning the entire project, considering both the owner and contractor as a single ecosystem even if the two parties are using segregated IT systems. The TfNSW DE Framework uses the same principles but maintains a distinction between TfNSW’s environment (the TfNSW-CDE) and the contractor’s environment (the Contractor-CDE), with exchange protocols agreed between the two. Figure 1 illustrates a typical CDE set-up for TfNSW DE projects.

Regardless of how the CDE is practically applied, three fundamental principles are managed systematically across the Contractor-CDE and TfNSW-CDE for each deliverable. These are the file’s:

- state
- suitability (what ISO 19650-1:2018 defines as ‘status’)
- revision

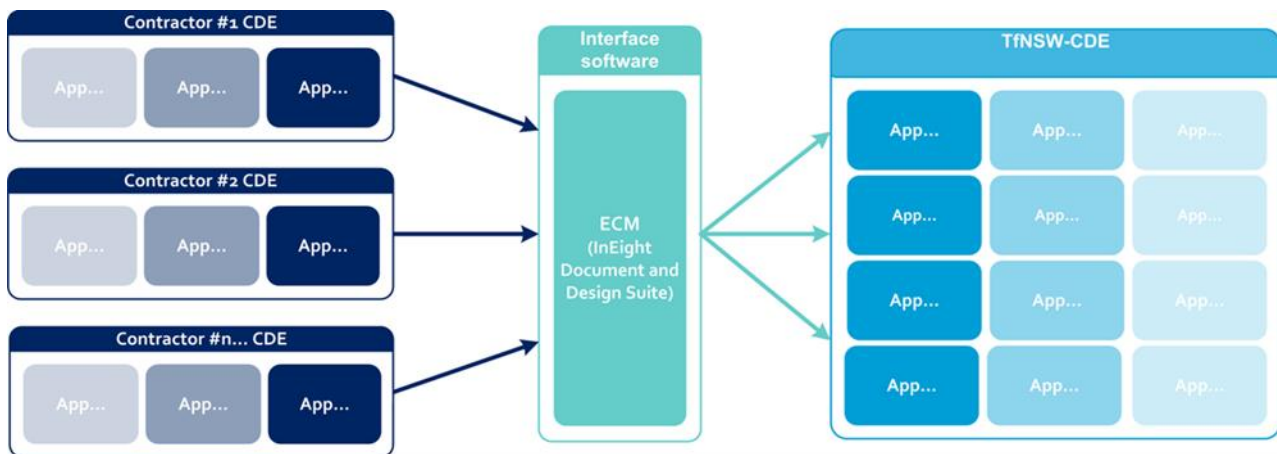


Figure 1 – Typical CDE set-up for TfNSW DE projects

## Consistent use of ‘state’

The current revision of each file within the CDE should be in one of several states, which are defined in Table 5 in DMS-ST-207 – *DE Standard, Part 2: Requirements*. Declaring the ‘state’ of each file in a consistent manner improves collaborative working and reduces mistakes in communication.

The recommended method to represent the state of each file is as metadata to the file, rather than as a suffix to the file name or by using folders.

Transition between states must be subject to appropriate checking and approval measures.

Figure 2 shows an application of the generic CDE workflow spanning both the Contractor-CDE and TfNSW-CDE, highlighting appropriate check/review/approve hold-points at each state transition. For each applicable step in the diagram the contractor is encouraged to plan:

- Which system(s) manage(s) the information?
- What quality assurance processes are applied to the information?
- Which staff have authority to take action?
- How will the team know the process and who has authority?

Figure 2 is to be viewed in conjunction with Figure 4 in *DMS-ST-207 – DE Standard, Part 2: Requirements* which illustrates how information moves between the Contractor-CDE and the TfNSW-CDE.

Apart from information produced by TfNSW, Work in Progress (WIP) and Shared information is found only in the Contractor-CDE, while Client Shared and Published information is generally replicated across both environments.

ISO 19650-1:2018 states that information being developed by its originator or task team is not visible to or accessible by anyone else. Safeguarding WIP information helps prevent the proliferation of errors across the project by preventing the distribution of unchecked work.

## **Consistent use of ‘suitability’**

The term ‘suitability’ in the DE Standard is equivalent to ‘status’ in ISO 19650-1:2018 and is an attribute which defines the purpose or authorised use of a file, establishing the appropriate limits of its use beyond which liability falls on the user. Used in combination with a container’s ‘state’, the two attributes communicate how a file can be used.

Table 6 in *DMS-ST-207 – DE Standard, Part 2: Requirements* provides suitability codes which are defined terms for contractors using the DE Framework.

The recommended means to manage the suitability of each deliverable throughout its lifecycle is as metadata to the file, rather than only as a suffix to the file name. To achieve this the contractor must use a more comprehensive collaboration platform than a basic shared drive.

The suitability applied to a file when it is submitted in the TfNSW document management tool may drive the workflow that is applied to it. For example, a document submitted ‘for review and comment’ will automatically enter a review workflow.

## Consistent use of ‘revision’

DMS-ST-207 – DE Standard, Part 2: Requirements, Section 3.4.7 sets requirements for the revision number shown on documentation submitted by the contractor. The contractor is encouraged to work with this revision numbering schema (which increments each time the document is submitted to TfNSW), but to use an additional internal version numbering system for managing internal iterations. The DE title block (DMS-FT-549) includes a cell for the contractor’s internal version numbering.

The recommended means to manage the revision of each deliverable throughout its lifecycle is as metadata to the file, rather than only as a suffix to the file name

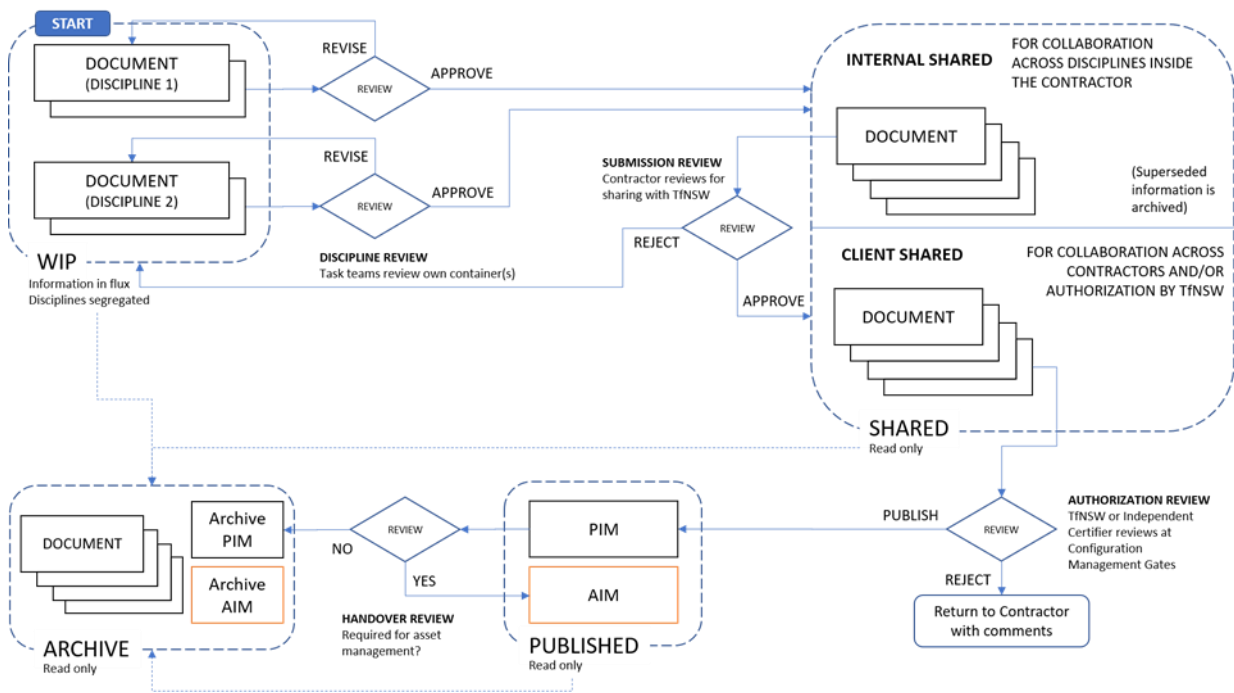


Figure 2 – A CDE workflow spanning both the Contractor-CDE and TfNSW-CDE

## Applying the Project Data Building Blocks

### Project Data Building Blocks

TfNSW uses common sets of data to manage its assets and projects in a consistent and computational manner. Datasets may be:

- governed at a high level and applicable to many TfNSW projects (for example Infrastructure NSW’s assurance gates, Asset Management Branch’s (AMB’s) corridor codes and TfNSW’s technical disciplines)
- specific to a project and set by the TfNSW project team (for example contract codes)
- influenced by contractors (for example design packages).

The TfNSW project team manages these common datasets, referred to collectively as the Project Data Building Blocks (PDBB). Many of the datasets are applied to multiple aspects of the project including document management, model properties, GIS fields and drawings. Since the contractor is obliged to submit documentation which makes use of the PDBB, it is highly recommended that the data is built into the Contractor-CDE from the start. In practice this generally involves making the right data available in drop-down lists where possible in each of the software platforms.

## Where to obtain the datasets

Datasets are usually provided by TfNSW to the contractor in task-specific Project Data Schemas (PDSs), as appendices to the DEXP template. These PDSs are likely to vary slightly from project to project, so contractors should take care to obtain the schemas which relate to the project rather than using templates only or schemas from other projects.

## Document management

The contractor is encouraged to use a collaboration platform which is able to apply custom metadata and build document numbers intelligently from the metadata.

The applicable Project Data Schema is the project's Enterprise Content Management (ECM) Schema and Specification (built from the template DMS-FT-533). This document lists the datasets set by TfNSW for document management and details how each field is applied.

## Models and drawings

The contractor is encouraged to plan modelling and drawing software as part of the Contractor-CDE. The tools should integrate with the collaboration platform and be capable of developing information according to the principles and requirements of DMS-ST-202 – *DE Standard, Part 1: Concepts and Principles* and DMS-ST-207 – *DE Standard, Part 2: Requirements*.

For setting up model properties and data, obtain the project's BIM Schema and Specification (built from the template DMS-FT-516), which details the standard model properties and the datasets to use.

For setting up for drawing production obtain the project's CAD Schema and Specification (built from the template DMS-FT-562), along with the title block template (DMS-FT-549).

## Other types of project information

The TfNSW project team may provide additional Project Data Schemas for other purposes. Regardless of whether additional schemas are provided, the contractor should plan to integrate the Project Data Building Blocks into all other types of digital information generated by the project, wherever the datasets apply. This includes but is not limited to:

- system engineering – refer to the Requirements Schema for DE projects (DMS-FT-563)
- survey – refer to the Survey Schema for DE projects (IP-0043-GD01)
- utility – refer to the Utility Schema for DE projects (DMS-FT-493)
- GIS – refer to the GIS Schema for DE projects (DMS-FT-580)

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- scheduling – refer to the Scheduling Schema for DE projects (DMS-FT-520)
- risks – for example plan to apply location codes where applicable
- others.

## Security

Security of the Contractor-CDE is critical. Before establishing the CDE the contractor must:

- understand all applicable information security legislation and requirements
- establish the sensitivity of the information which the CDE will hold
- make appropriate and skilled considerations with regard to risk and security
- plan the hardware, software and information use processes to meet all information security needs.

Contractor's CDE must comply to TfNSW security requirements. Further information on security guidance to contractors is in development.

## Onboarding staff

Good collaboration requires skill and knowledge. The contractor should plan to induct staff to the CDE to ensure the team understands the systems and processes. Since modern collaboration platforms commonly integrate numerous project processes (such as digital approvals for quality assurance), they can be complex tools.

Inductions should cover as a minimum:

- state, suitability and revision
- Project Data Building Blocks
- collaboration processes
- information security
- practical skills.

## For information on DE Framework

To find out more about the DE Framework, contact [Digital.Engineering@transport.nsw.gov.au](mailto:Digital.Engineering@transport.nsw.gov.au).