Transport Asset Standards Authority

T MU AM 02001 ST

**Standard**

# Asset Information and Register Requirements

Version 4.0

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# Important message

This document is one of a set of standards developed solely and specifically for use on Transport Assets (as defined in the Asset Standards Authority Charter). It is not suitable for any other purpose.



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## Standard governance

**Owner:** Manager Asset Information, Asset Standards Authority

**Authoriser:** Director, Network and Asset Strategy, Asset Standards Authority

**Approver:** Executive Director, Asset Standards Authority on behalf of the ASA Configuration Control Board

## Document history

| Version | Summary of changes |
|---|---|
| 1.0 | First issue 30 October 2014. |
| 2.0 | Second issue 2 December 2014. Minor changes to correct wording, improve clarity and alignment with asset classification. |
| 3.0 | Third issue 28 April 2016. Minor changes to contents to align with the TfNSW EAM service delivery requirements and change of document title from *Asset Information Management* to *Asset Information and Register Requirements*. |
| 4.0 | Minor changes to include references to new standards in relation to asset information handover, asset register template, asset attributes and metadata requirements as well as the management of asset information in support of the data and information asset management policy. |

# Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the *ASA Charter*, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW's governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW's process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW's Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset's whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

## About this document

This standard provides information regarding the requirements for the asset register, associated asset data and documents for assets owned by TfNSW over the asset life cycle.

This document is part of an integrated set of asset management standards. Changes to this version include updates to the following:

- reference documents
- transport modes
- requirements for asset information handover
- asset register template
- asset attributes and metadata
- management of asset information in support of the *TfNSW Data and Information Asset Management Policy*.

This standard is the fourth issue.

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# 1. Introduction

The Asset Standards Authority (ASA) is committed to effective and efficient management of transport assets. The ASA is collaborating with other government and non-government organisations to continuously improve the capability, performance and condition of the assets over the full life cycle.

This standard defines the asset information and asset register requirements for Transport for NSW (TfNSW) owned assets over their life cycle or portion thereof.

Asset custodians and stewards are required to demonstrate that assets and related asset information is managed accurately and efficiently in accordance with the requirements of this standard throughout the asset life cycle.

# 2. Purpose

This document describes the requirements of the asset information system and asset register used in the creation and management of the asset information related to all assets owned by TfNSW and managed by and on behalf of TfNSW across the asset life cycle. It also defines ownership of the asset information system, data and documents and access requirements.

The requirements of this standard ensure consistency, accuracy and completeness of asset information. These requirements also support and enable the transition to digital engineering.

## 2.1. Scope

This standard establishes the requirements of the asset information system and asset register including all associated asset information. This standard defines an asset classification framework required to be used in the development and identification of assets in the asset register.

The document also specifies an asset classification system and associated technical object library, asset data dictionary and asset reference coding library to support a common structure, terminology and naming of the assets. This enables ease of identification, collaboration, collection, exchange, access and reporting of the assets and associated asset information.

This standard also defines the conditions for when assets should be created in the asset register and how they are classified, specified and located across the Transport Network.

Asset information requirements (AIRs) presented in this standard cover the whole-of-life management of assets required to support and substantiate decisions made over the life cycle including, but not limited to, the following:

- financial management requirements including asset capitalisation and whole-of-life costing
- asset information handover requirements including asset acceptance information

- asset configuration change requirements including asset type approvals or sub-component type approvals, new assets, configuration and operational changes including changes in asset strategy and concessions to standards

## 2.2. Application

This standard applies to the Transport cluster, Authorised Engineering Organisations (AEOs) and other service providers involved in the planning, delivery, operation, maintenance and disposal of assets owned by TfNSW across the transport portfolio. The requirements in this standard apply to all stages of the asset life cycle.

This document also applies to organisations, service providers or project deliverers that perform asset management related services for TfNSW, including AEOs, suppliers and other organisations who are involved in defining, designing, implementing, commissioning or integrating into the operating network any new or altered assets or systems owned by TfNSW. This standard also applies to the decommissioning, disposal and repurposing of assets.

This standard applies to the asset information system and asset register including all associated asset information used to manage assets owned by TfNSW and operated and maintained by TfNSW agencies and service providers as custodians and stewards of the asset.

Applicability of this standard is limited to TfNSW assets and does not apply to assets managed by RMS up to and including the merging of TfNSW and RMS. For road assets directly related and combined with rail operations (e.g. rail overbridges and underbridges), the asset information related to those assets will continue to be classified and managed according to this standard.

# 3. Reference documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

**International standards**

ISO 12006-2 Building construction – Organization of information about construction works - Part 2: Framework for classification

**Transport for NSW standards**

ST-207 Digital Engineering Standard Part 2 – Requirements (available from digital.engineering@transport.nsw.gov.au)

T MU AM 01003 ST Development of Technical Maintenance Plans

T MU AM 01006 ST Asset Location Classification

T MU AM 01007 TI Asset Reference Codes Register

T MU AM 01008 ST Technical Maintenance Plans and Coding System

T MU AM 01009 TI Technical Maintenance Coding Register

T MU AM 01012 ST Engineering Document Requirements

T MU AM 01014 ST Asset Information Handover Requirements

T MU AM 02002 TI Asset Classification System

T MU AM 02003 TI Register of Asset Information Systems and Repositories

T MU AM 02004 ST Management of Asset Information

T MU AM 02006 TI Asset Register and Data Dictionary

T MU AM 06009 ST Maintenance Concept Definition

T MU MD 00006 ST Engineering Drawings and CAD Requirements

**Other reference documents**

ASA Charter

TfNSW Data and Information Asset Management Policy

State Records Act 1998

*Additional documents that may assist in providing contextual information on asset information management not cited in the text are in Appendix A.*

# 4. Terms and definitions

The following terms and definitions apply in this document:

**AEO** Authorised Engineering Organisation

**AIDP** asset information delivery plan

**AIM** asset information model; data and information that relates to assets to a level required to support an organisation's asset management system

**AIR** asset information requirement; data and information requirements of the organisation in relation to the assets it is responsible for

**ASA** Asset Standards Authority

**asset** an item, thing or entity that has potential or actual value to an organisation. Physical assets usually refer to equipment, inventory and properties owned by the organisation. Physical assets are the opposite of intangible assets, which are non-physical assets such as leases, brands, digital assets, use rights, licences, intellectual property rights, reputation or agreements

**asset class** used to define and group assets having a similar nature in the operations of an entity and comprised of a number of related asset functions

**asset data custodian** a person accountable for managing the asset information on behalf of the data owner for the relevant life cycle stage and process within their scope

**asset data manager** a person responsible for managing the asset information repository and the processes related to the governance of the asset information in the repository on behalf of the data steward

**asset data steward** a person responsible for managing the asset information on behalf of the data custodian

**asset discipline** represents a top level grouping of related asset classes

**asset function** used to define and group assets having a similar function in the operations of an entity and comprised of a number of asset types that perform the same or similar function within an asset class

**asset information** the combined set of data (geometrical and non-geometrical) and documents (drawings, manuals, plans, certificates) required to support the management of assets over the life cycle

**asset information management** the discipline of managing the asset-related data and documents to a sufficient quality to support organisational objectives and outcomes

**asset information repository** a recognised physical or electronic location for the storage and management of asset information

**asset information system** a set of interrelated repositories of structured asset information and related processes required to manage the asset portfolio over the life cycle

**asset life** period from asset creation to asset end-of-life (AS/ISO 55000:2014)

**asset management system** management system for asset management whose function is to establish the asset management policy and asset management objectives.

> *Note: The asset management system is a subset of asset management. (AS ISO 55000)*

**asset portfolio** assets that are within the scope of the asset management system
(AS ISO 55000)

**asset register** record of asset inventory considered worthy of separate identification including associated historical, condition, construction, technical and financial information about each asset

**asset specification** used to define and group assets having common characteristics that distinguish them separately (different make and model or a different build) and associated with an asset type or function

**asset type** used to define and group assets that perform the same or similar asset function and which may serve the same purpose within an asset function. An asset type will have

characteristics that distinguish them separately from other asset types within an asset function (different technical specification or different construction). The difference in specification within an asset type including variations in make and model is identified by the asset specification also known as the technical maintenance code (TMC)

**ATP** automatic train protection

**attribute** piece of data forming a partial description of an object or entity

**availability** the measure of the percentage of time that an item or system is available to perform its designated function

**CCTV** closed circuit television

**component** parts of an asset (defined by its specification or build) having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality. Also identifies the defective part or part causing failure that requires repair or replacement

**conditional failure** a defect is a conditional failure when it has the potential to become a functional failure and occurs when the asset condition is outside a maintenance threshold but it is still able to perform its function and does not yet have operational consequences (may need to be monitored as part of condition assessment or repaired)

**configuration change** a functional or physical change to an asset

**corridor** a linear zonal area (within a boundary and defined by a start and end node) that contains heavy rail, metro rail, light rail, road or maritime infrastructure assets to support the operation of transport services

**document** any record of information and includes -

a) anything on which there is writing,

b) anything on which there are marks, figures symbols or perforations having a meaning for the person qualified to interpret them, or

c) anything from which sounds, images or writings can be reproduced with or without the aid of anything else, or

d) a map, plan, drawing or photograph

**dynamic data** data collected over time about how the asset is operating, performing, its condition, work done and measurements which change through its operation and maintenance

**facility** a zonal area (within a precinct boundary) that contains buildings, systems, plant and associated infrastructure assets to support the operation and maintenance of transport services

**functional failure** a defect is a functional failure when the equipment cannot fully perform its design function and causes immediate operational consequences such as train delays or loss of power (subject to the level of available redundancy)

**HV** high voltage

**HVAC** heating, ventilation and air conditioning

**information model** a data set comprising of documentation, geometrical (graphical - using shape and arrangement in space) and non-geometrical (non-graphical - using alphanumeric characters) data linked together using a common data structure (schemas) and classification system

**interchange** the area where customers access and egress transport services on the public transport network and may transfer between modes or services. Interchanges have the following attributes:

- includes transport infrastructure assets attributed to the main station, wharf or stop, and other transport modes
- can have multiple areas which may not be contiguous
- there are no interchanges within interchanges, although an interchange may contain stations, wharves, stops or sub-areas where specific customer transfers occur but the whole facility is regarded as one interchange

**life cycle** the scope of the system or product evolution beginning with the identification of a perceived customer need, addressing development, test, manufacturing, operation, support and training activities, continuing through various upgrades or evolutions, until the product and its related processes are disposed of

**level of development** collective term used for and including the level of detail (graphical or geometrical) and level of information (non-graphical or non-geometrical)

**LV** low voltage

**maintainability** characteristics of a design and installation that determines the probability that a failed or non-compliant piece of equipment, machine, or system can be restored to its normal operating state within a given timeframe using the prescribed practices and procedures. From a human factors perspective, this means maintenance tasks can be carried out safely, effectively and efficiently and are tolerant to human error

**maintenance** in the context of this document has two components:

- routine maintenance, also referred to as recurrent maintenance, is a collective of all preventive and repair activities excluding renewals. Includes visual inspections, preventive maintenance, corrective maintenance and breakdown maintenance
- renewals maintenance, also referred to as capital maintenance or major periodic maintenance, includes the cyclic renewal and upgrading of assets to avoid deterioration in their condition to ensure long term asset performance and financial sustainability

**MTBF** mean time between failures; the predicted elapsed time between inherent failures of a system during operation

**MTTR** mean time to repair; basic measure of the maintainability of repairable items

**network configuration** the configuration of transport assets viewed as an overall system that is for achieving the transport objectives of TfNSW and is composed of discrete configuration items identified at a level commonly identified by TfNSW

**PIM** project information model; set of structured and unstructured information containers relating to the delivery phase

*Note: refer to ISO 19650-1: 2018 for the definition of information containers*

**PIR** project information requirement; specification for what, when, how and for whom information is to be produced in relation to the delivery of an asset

**reliability** the ability of an item of equipment or a system to perform a required function under stated conditions for a stated period of time or at a given point in time (AS 4292.4)

**rotable** a component or inventory item which can be removed from a unit, repaired or improved, and returned to the unit repeatedly and economically

**static data** data about an asset that does not change after being recorded and which is usually related to its design and configuration

**structured data** information with a high degree of organisation, such that inclusion in a relational database is seamless and readily searchable by simple, straightforward search engine algorithms or other search operations

**TfNSW** Transport for NSW

**TMC** technical maintenance code; identifies the variation of unique technical specifications for an asset type. Assets are assigned a TMC to reflect their configuration based on the asset type and specification and to define the applicable technical maintenance plan (TMP)

**TMP** technical maintenance plan; defines the maintenance plan applicable for an asset (assets are associated with their required maintenance plan by the TMC). The TMP defines what maintenance tasks are to be performed (required tasks and associated maintenance actions - packaged as service schedules), when (frequency of servicing - time/condition/event), why (reference for traceability) and where the maintenance tasks are to be performed (make/model/type of equipment)

**transport assets** assets used for or in connection with or to facilitate the movement of persons and freight by road, rail, sea, air or other mode of transport, and includes transport infrastructure (Transport Administration Act 1988)

**transport form** type of vehicle or method used to facilitate the movement of people and freight. For example train, bus, ferry, light rail vehicle, car, motorbike, bicycle or walking

**transport infrastructure** infrastructure (including associated vehicles, vessels and rolling stock) used for or in connection with or to facilitate the movement of persons and freight by road, rail, sea, air or other mode of transport (including walking and cycling). It includes:

- railways and railway infrastructure
- roads and road infrastructure
- maritime infrastructure and ports
- transport safety infrastructure
- systems, works, structures, buildings, plant, machinery and equipment associated with or incidental to transport infrastructure

**transport mode** the means by which people and freight move from place to place. Falls into one of three basic types; land (road, rail, active), sea, and air

**Transport Network** the transport system (transport services and transport infrastructure) owned and operated by TfNSW, its operating agencies or private entities upon which TfNSW has power to exercise its functions as conferred by the Transport Administration Act or any other Act.

**transport services** includes railway services (including heavy rail, metro rail and light rail), bus services and ferry services

**transport system** means the transport services and transport infrastructure of NSW for all modes of transport

**yard** a linear zonal area (within a boundary and defined limits) that contains heavy rail, metro rail, light rail, road or maritime infrastructure assets and facilities to support the stabling, servicing and presentation of the transport fleet. This is an area that contains one or more rail sidings, roads or a ship yard identified for a business purpose

# 5. TfNSW asset portfolio

The TfNSW transport system is a complex multi-modal and multi-discipline portfolio of fixed infrastructure and mobile fleet assets, covering the following:

- fleet assets (buses, ferries, trains, light rail vehicles and mobile plant) including all contained onboard systems and products
- non-linear infrastructure assets (interchange and facility based - stations, stops, wharves, stabling facilities, depots and substations) including all contained systems and products
- linear infrastructure assets (corridor based roads, railway tracks, overhead traction, barriers, earthworks, tunnels and utilities) including all contained systems and products

The TfNSW asset portfolio includes the following high level asset groups:

- interchanges
    - stations, stops and wharves
- facilities
    - electrical facilities including substations, sectioning huts, distribution substations and external low voltage (LV) supply locations
    - rail signalling facilities including signal complexes and enclosures
    - road traffic facilities
    - telecommunications facilities including communications rooms and enclosures
    - technology facilities
    - maintenance facilities
    - logistics facilities
    - service facilities
    - operations facilities including drivers and training facilities
    - rest areas
- corridors
    - heavy rail, metro rail, light rail, road and waterway
- fleet (including onboard systems)
    - trains
    - light rail vehicles
    - ferries
    - buses
    - vessels
    - track vehicles and machines including recording vehicles
    - locomotives
    - wagons
    - rail cars and vans
    - road vehicles and trailers

- feeders
    - HV cable feeders, aerial line feeders and pole equipment
    - telecommunications backbone cables

The following assets are usually contained within one of the five high level asset groups (they are, interchanges, facilities, corridors, fleet, or feeders):

- plant including mobile plant, fixed plant and minor plant and equipment
- bridges including overbridges, underbridges, footbridges and subways
- drainage and culverts
- tunnels
- earthworks and geotechnical equipment
- buildings
- level crossings
- fencing and barriers
- car parking and taxi ranks
- station, stop and wharf structures including access ramps, stairs, concourses, platforms, canopies, shelters, plinths, jetties, moorings, piers and pontoons
- overhead and support structures including overhead traction supports, gantries and towers
- retaining structures including retaining walls, sea walls and basins
- miscellaneous structures including slipways, dry docks, inspection pits, airspace developments, walkways and cycleways
- track including mainline track, crossovers and sidings, turnouts, buffer stops, trackslabs, lubricators and insulated joints
- roads including access roads
- electrical substations including traction, non-traction substation and distribution equipment
- electrical LV distribution equipment
- overhead traction including overhead wiring and equipment
- rail signalling systems including trackside signalling equipment, level crossing protection, automatic train protection (ATP), interlockings, workstations, telemetry, power supplies and cables
- road traffic control systems
- rail control systems

- technology and telecommunications systems including road traffic information systems, audio-visual information systems, road traffic warning systems, security systems, ticketing systems and information technology systems
- technology and telecommunications equipment including the following:
    - audio-visual information equipment including indicators, clocks, audio and public address equipment
    - security help points and closed circuit television (CCTV) equipment
    - wireless network and terminal equipment
    - telecommunication licences
    - condition monitoring equipment
    - ticketing equipment
    - hardware
    - software applications and licences
- services including building management, vertical transport (lifts and escalators), fire management, , LV electrical installation and lighting, gas, air, fuel, hydraulic (water, sewer and drainage) and heating, ventilation and air conditioning (HVAC) systems
- furniture and fixtures including bike lockers, bike racks, seats, bins, boards, screens, light poles, totems and amenities
- service routes, underline crossings and pits
- wayfinding and facility signage
- guidance, delineation and corridor signage
- electrolysis and bonding equipment
- land
- landscaping including gardens, pavers and trees
- aids to navigation
- heritage items

# 6. Information models and requirements

Information models are a collection of geometric (including 2D drawings and building information modelling (BIM) models), non-geometric (non-graphical) data and any other information needed to deliver and manage an asset throughout its life cycle. The information requirements specified throughout the asset life cycle are determined by TfNSW business

objectives required to support life cycle decision making in the design and delivery of sustainable service outcomes. The relationship between the information requirements and models is shown in Figure 1 and is based on the information principles of PAS 1192-3 *Specification for information management for the operational phase of assets using building information modelling*. This has been adapted by TfNSW by renaming employer information requirements to project information requirements (PIRs).

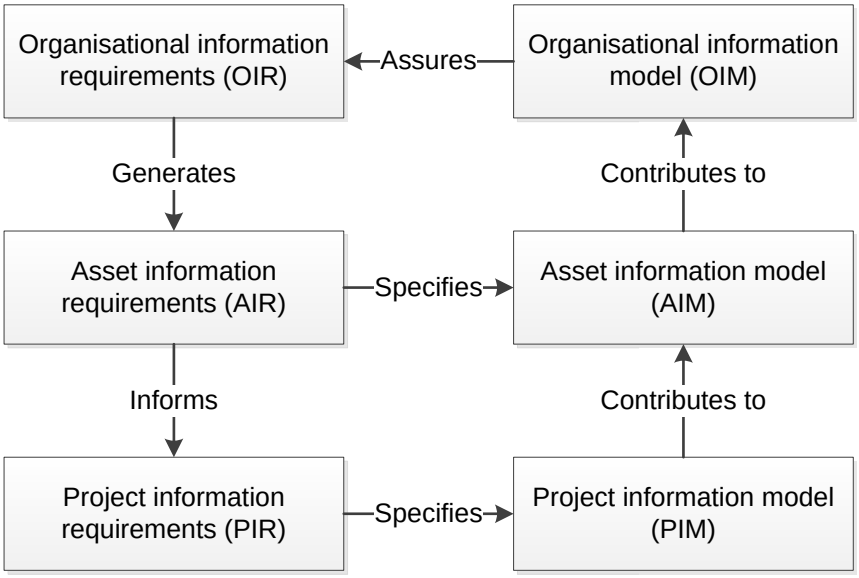



**Figure 1 - Information model and requirements**

PIRs focus on the delivery of the project and support the decisions required in the planning, design and construction or procurement of new or altered assets including estimating, scheduling and costing. The data and information created during the project phase is defined as project information and aligned with the project information model (PIM). Not all information generated as part of the design and construction or procurement of assets during a project is required for asset management.

PIRs include the following:

- requirements management
- design verification and validation
- construction verification and validation
- project estimation, schedule and cost
- project assurance

A subset of the PIRs is the asset information that is created during the planning and delivery of a project that is directly related to an asset or assets contained within a corridor, interchange, facility, feeder or fleet (train, light rail vehicle, ferry or bus). This asset information is built up progressively during the plan and acquire stages and submitted to TfNSW at defined delivery points throughout the project to support operational readiness, leading up to and post asset

handover for use in the operate and maintain stage by a Transport cluster agency or a contracted service provider.

Asset information associated with any altered or disposed assets also needs to be recorded and maintained. The remainder of the asset information is created and managed as a result of operation and maintenance activities including any configuration changes.

The complete set of AIR forms the asset information model (AIM) as shown conceptually in Figure 2, Figure 3 and explained in detail in Appendix B. The asset data custodian will vary throughout the life cycle from project deliverer to owner to maintainer. TfNSW remains the owner of the asset information.

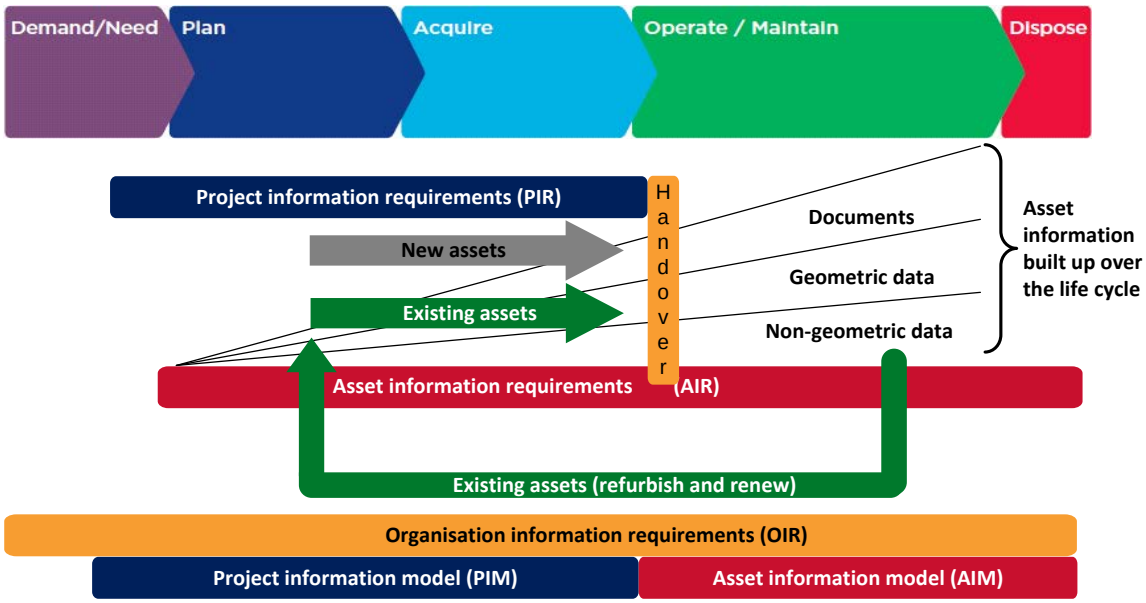



**Figure 2 - Information requirements and models across the asset life cycle**

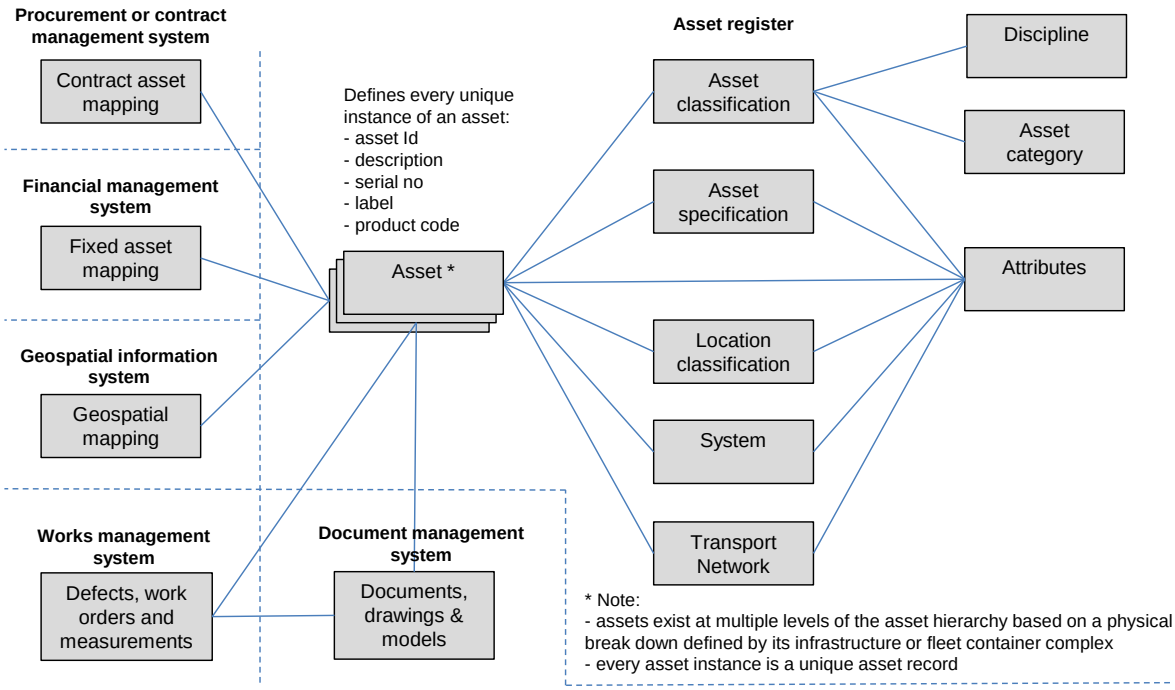



**Figure 3 - AIM details**

Existing network infrastructure information in the operate and maintain stage managed by the asset data custodian shall be made available and used as the baseline asset data set for current and future brownfield projects.

AIR covers the following:

- network configuration information
- asset configuration (including location, classification and specification), performance, condition and warranty information
- asset maintenance contract and interface agreement information
- maintenance requirements and work history information including defects
- operating requirements, capacity and usage information
- asset acquisition financial information and life cycle costing information

AIR focus on those technical aspects required to support the whole-of-life operation and maintenance of the asset. These requirements not only support the delivery of new as-built or altered assets, they also support decisions required in operations and maintenance including the following:

- asset refurbishment, renewal and replacement
- asset modification
- asset decommissioning and disposal

- asset transfer through change of contract or vesting (change of asset custodian)
- asset repurposing

# 7. Asset information model requirements

AIRs specify the data and information that together form the AIM shown in Figure 3. Further details on these requirements including coding conventions, reference data and metadata requirements are defined in this standard.

The AIM shall be comprised of the following:

- a structured asset register in accordance with defined schema and tagged with the required attributes and metadata in Section 9.15.1, including but not limited to the following:
    - asset identification (asset identifier, description, label, serial number, product code and batch number)
    - asset classification (technical object)
    - asset specification (manufacturers make, model and variant)
    - asset location (network complex, corridor, zone, position, room and coordinates)
    - asset attributes (configuration, condition, operation, organisation, maintenance, financial) including warranty and heritage considerations
- a structured file-based repository of the following:
    - drawings and engineering documents
    - approved for construction (AFC) and as-built models
- partner relationships for operations and maintenance contracts
- financial fixed asset relationships supporting asset capitalisation, revaluation and depreciation
- geometrical relationship linked to a geospatial information system containing georeferenced coordinates information defining asset location including point, linear and area shape features

The extent of the TfNSW asset portfolio is defined in Section 5. The three primary areas, key to establishing and defining assets in an asset register are as follows:

- define what the asset is (unique identification, asset classification and specification) - physical and functional requirements
- define the purpose of the asset (utilisation and capacity) - operational requirements
- define where the asset is (physical location and spatial coordinates)

Figure 4 shows a diagrammatic representation of the three key areas.

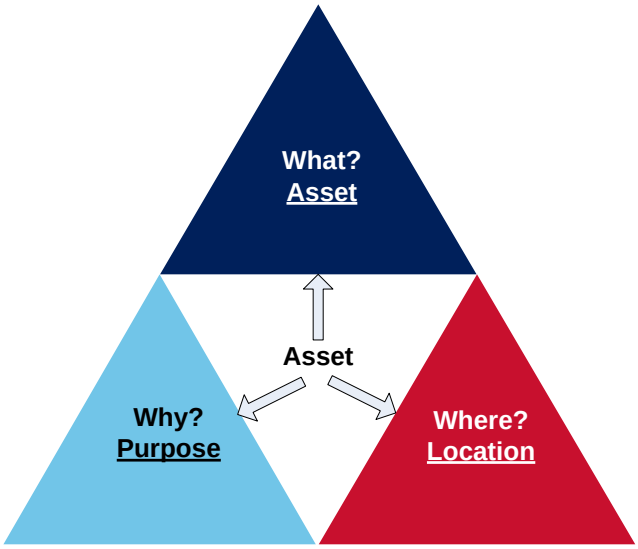



**Figure 4 - Asset core requirements**

The asset register is the focus and is the core element as it enables the following:

- searching, filtering and sorting information about assets including associated attributes and metadata
- linking assets with other unstructured records – drawings, documents and models
- linking assets with other structured records – defects, work orders, configuration change control and, service and measurements records

The focus of this standard is the asset register (data, structure, schema and coding) and the asset related information held in the associated systems (document, works management, geospatial, financial and procurement systems) shown in Figure 3 and is further defined in Section 9.

Figure 5 shows a subset of the AIM and the requirement to link unstructured documents including drawings with assets in the asset register and link structured attribute data with assets in the asset register based on defined TfNSW data standards and schema.

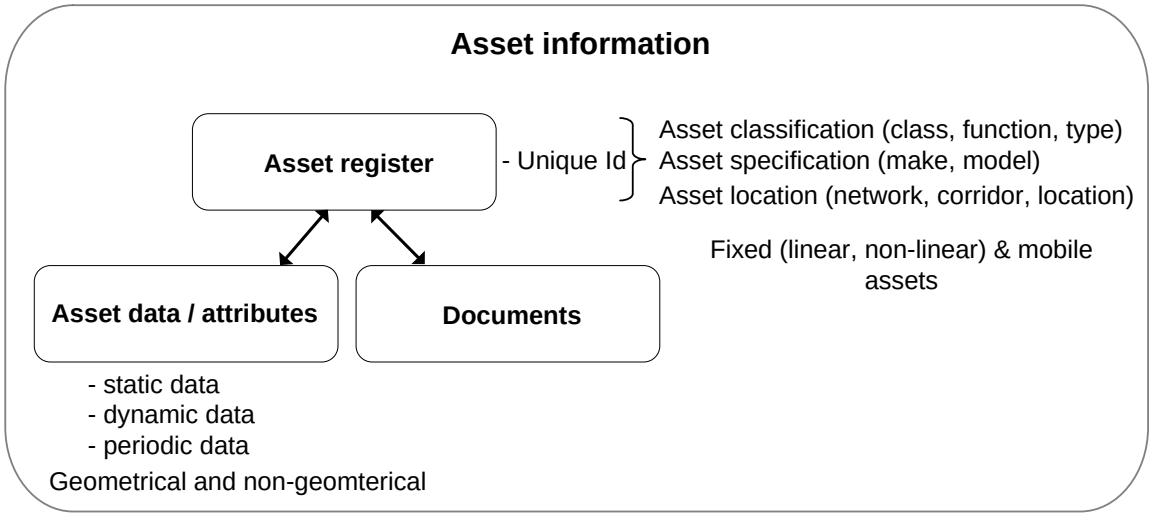



**Figure 5 - Asset register link to asset data and documents**

Accurate and complete asset information supports and substantiates key decisions made on the existing asset portfolio to ensure the following:

- maintaining the condition and long term value to ensure delivery of sustainable services by achieving the following:
    - improving effectiveness on investment decisions based on total life cycle costs and taking into consideration the enterprise risks in relation to safety, security and the environment
    - improving effectiveness of repair and replace decisions through greater knowledge of asset condition and utilisation
    - enhancing and extending the life of the assets through the optimisation of maintenance plans
- improving the efficiency and sustainability of services and operations by achieving the following:
    - reducing downtime by reducing mean time to repair (MTTR)
    - improving reliability by increasing mean time between failures (MTBF)
- analysing and addressing gaps between performance of the existing asset portfolio and the assets that are required to support current and future service needs, with the key questions to be analysed including the following:
    - asset dependability – can service delivery be made less asset dependent?
    - asset utilisation – are the assets fully utilised in the delivery of current and future services?
    - asset location – are the assets properly located to optimise service delivery and are they meeting the current and future business requirements?

- asset capacity – are the assets able to support a change in service demand?
- asset functionality – are the assets functionally suitable to support current and future service demands?

Decisions may be based on the asset location, asset condition including age and remaining life, failure probability and consequence, resource constraints, spares availability, regulatory compliance, business priorities and whole-of-life costs.

Asset information shall also support the following activities:

- plan (specify, procure), acquire (design, build, integrate, accept), maintain (service, repair, refurbish, renew, replace) and dispose of assets (decommission, repurpose)
- comply with relevant asset management standards and legislative requirements
- monitor asset performance, condition and reliability
- monitor contract performance
- manage whole-of-life asset and service risk
- maintenance assurance

## 7.1. Asset data

Asset data and attributes associated with assets contained in an asset register is categorised into the following data groups:

- configuration – includes physical and functional data related to identifying and providing static referencing of manufacturer details, asset construction, asset procurement, technical characteristics and physical relationship with other assets
- location – includes data related to physical and geospatial attributes; for example, information on environmental and spatial relationship with other assets
- condition – includes data related to past and current condition such as information on residual life
- operational – includes data related to usage, tonnage, restrictions and criticality
- maintenance – includes data related to the management and recording of maintenance activities
- organisational – includes data related to the identification of the owner, operator and maintainer
- financial – includes data related to costing from capital acquisition, operation, maintenance to disposal

Asset data and attributes can be of a geometrical or non-geometrical nature and classified as follows:

- static data – requires a one-off capture and validation, infrequent update required
- periodic data – requires a regular collection and updating regime, periodic update required
- dynamic data – requires continuous updating in real or near real time

Asset data and attribute requirements shall support linear, non-linear and mobile assets. See Section 9.15 for further detail on attributes, metadata and the asset data dictionary.

## 7.2. Asset documents

Asset documents associated with assets contained in an asset register includes manuals, plans, photos, drawings, models, certificates, licences, reports, procedures and diagrams.

All CAD drawings and models shall be defined and submitted to TfNSW or agreed asset data custodian in accordance with the requirements of T MU MD 00006 ST *Engineering Drawings and CAD Requirements* including required metadata.

All engineering documents (excluding drawings and models) shall be defined and submitted to TfNSW or agreed asset data custodian in accordance with the requirements of T MU AM 01012 ST *Engineering Document Requirements* including required metadata.

## 7.3. AIM assurance and governance

The AIM shall be continually assessed to ensure the quality of data is maintained by the asset data custodian (for example, maintenance service provider) to ensure compliance with the requirements in Section 11 of this document and in conjunction with the requirements of T MU AM 02004 ST *Management of Asset Information* together with targeted surveillance audits. Data quality is determined by the following factors:

- completeness – data shall be complete
- correctness – data shall be accurate and up to date
- consistency – data shall be defined including business rules and format
- clarity – data shall be clear and unambiguous
- integrity – data shall be structured and relationships maintained with other data repositories
- uniqueness – no duplication of the data shall exist

A formal approach to the governance of the asset information is required to ensure the information is current, accurate, accessible and complete to support and substantiate asset decisions to meet TfNSW objectives in accordance with the *TfNSW Data and Information Asset Management Policy* and T MU AM 02004 ST.

## 7.4. AIM ownership and data access

The asset register and associated asset information including data and documents are owned by TfNSW. The ASA represents TfNSW in this capacity in accordance with the *ASA Charter*.

A range of asset information is in existence and is continually developed by TfNSW and parties working directly or indirectly with TfNSW. The ASA is the delegated owner of the asset register and associated asset information. Asset information is generally restricted to that in Section 8 and is necessary for the effective management and sustainability of the assets that form the TfNSW asset portfolio as specified in Section 5.

Transport cluster agencies and service providers (asset custodians) shall provide access to any new or existing asset information system and transparency to the asset register used to manage TfNSW owned assets as requested and at no cost to TfNSW. This includes any new asset information system delivered as part of a project.

# 8. Asset information requirements

Asset information shall be derived throughout the asset life cycle. Figure 2 illustrates the asset life cycle stages.

AIRs identify the following:

- what asset information (data and documents) including the asset register shall be required over the asset life cycle – Section 8.1, Section 8.3 and Section 8.4
- when the asset information (data and documents) shall be submitted and exchanged - Section 8.2, Section 8.5 and T MU AM 01014 ST *Asset Information Handover Requirements*
- what events and activities shall trigger a change and update to the asset information – Section 8.7
- what assets shall be created and managed in an asset register - Section 9.4
- how the assets shall be classified in an asset register and its specification – Section 9.7 and Section 9.8
- how the assets shall be located across the network in an asset register – Section 9.9
- how the assets shall be structured in an asset register including the asset hierarchy – Section 9.10 and Section 9.11
- how rotable assets shall be tracked and managed – Section 9.13
- how the assets shall be capitalised (individually or rolled up) based on the assets created and managed in an asset register - Section 9.14
- how the asset register data shall be collected and captured – Section 9.15

- what asset attributes shall be required (general and asset class specific requirements) and associated metadata – Section 9.15
- how the asset information system shall be designed and configured – Section 10
- the role and responsibilities of service providers (asset custodian) – Section 11, T MU AM 02004 ST and the *TfNSW Data and Information Asset Management Policy*

## 8.1. Demand/need, plan and acquire stage asset information

The AIRs shall include asset specific information where applicable and relevant for each asset captured and managed during the demand/need, plan and acquire stages.

As part of the asset handover, the AIRs including the asset register shall be provided and updated within the asset information system. This is required for both new assets (investment) and the renewal or refurbishment (sustainability) of existing assets as shown in Figure 2 which may be delivered in conjunction with the requirements of ST-207 *Digital Engineering Standard Part 2 - Requirements*.

The detailed scope and timing of these handover requirements is in Section 8.2.

By the end of the acquire stage the asset register shall contain the following detail (see Section 9 for further details):

- asset identification (description, label, serial number, product code and batch number)
- asset classification (technical object - based on the asset class, function and type) - see Section 9.7 for further details
- asset specification (manufacturers make, model and variant - for both constructed or procured assets) - see Section 9.8 for further details
- asset location (including physical geographical and geospatial referencing data for fixed infrastructure assets, or home depot location for mobile fleet and plant assets) - see Section 9.9 for further details
- asset status and asset status date
- date manufactured, date purchased, date installed and date commissioned
- asset attributes and metadata in accordance with T MU AM 02006 TI *Asset Register and Data Dictionary* and supporting reference data including (see Section 9.15 and 9.16 for further details): –
    - name plate details including configuration attributes for both linear and non-linear assets
    - design data, for example, ratings, loadings, areas and lengths
    - design life

- survey data
- heritage data
- supplier or vendor data
- warranty data
- design/calibration settings
- asset condition of new or altered asset
- asset owner
- asset maintainer and service contract identifier
- asset operator
- asset criticality
- operational settings, for example, circuit breaker trip setting
- hazards, for example, confined space and restrictions
- capital acquisition cost (provides link to financial fixed asset register for depreciation and revaluation purposes)

Additional asset information deliverables required in this stage include the following:

- spares register
- defect register - residual defects and risks remaining at handover shall be transferred to the operator and maintainer and managed within the asset information system

Refer to T MU AM 01014 ST for all project delivery asset document deliverables covering registers, plans, manuals, certificates, procedures, reports, drawings and models

## 8.2. Exchange of asset information at project handover

The exchange of validated and assured data and documents shall be electronic and implemented through an agreed exchange process determined by TfNSW in collaboration with the project deliverer and maintenance service provider (asset custodian).

The frequency and scope of each information exchange shall be managed between the project deliverer and the asset custodian in accordance with T MU AM 01014 ST. The agreed scope shall be defined as part of the asset handover plan and associated asset information delivery plan (AIDP).

The data (structured and unstructured) shall be provided and validated in accordance with any existing data collection templates where applicable. The information provider or project deliverer shall ensure that the data quality is in accordance with the requirements in Section 7.3.

The content of the asset register as part of the information exchange shall be sufficient to meet the requirements of this standard.

The asset custodian shall process or upload the data and documents provided at handover in accordance with the requirements in Section 11. The asset custodian shall advise TfNSW of the asset information system repositories used to capture and manage the asset data and documents during the contracted period. The list of asset information system repositories shall be published in T MU AM 02003 TI *Register of Asset Information Systems and Repositories*.

## 8.3. Operate and maintain stage asset information

The AIRs shall include asset specific information where applicable and relevant for each asset captured and managed during the operate and maintain stage as well as updated information initially provided from the acquire stage at handover.

Asset information shall be continually collected across the whole asset life cycle including operation, maintenance and disposal as indicated in Figure 6.

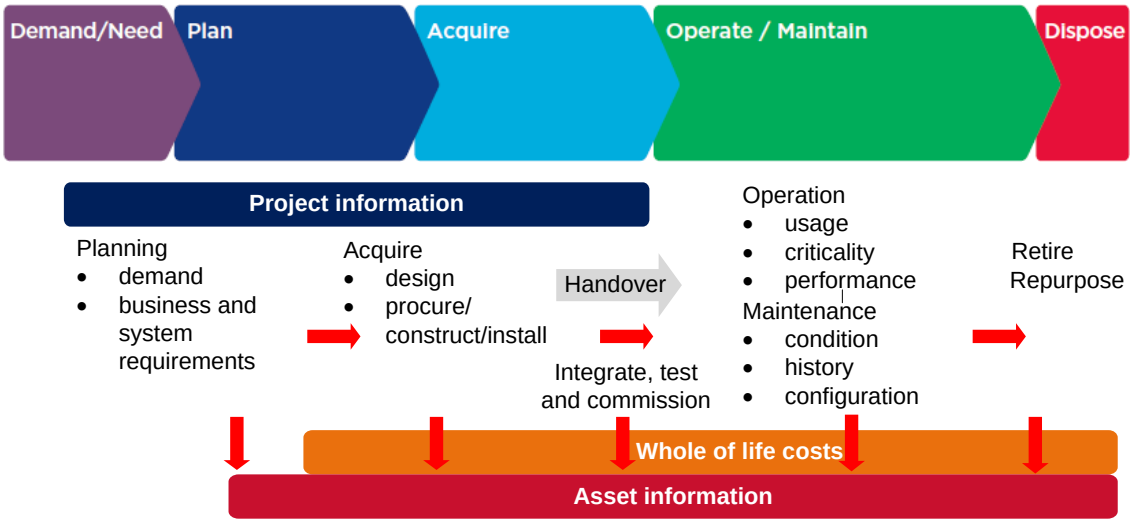



**Figure 6 - Asset data drops across the life cycle**

During the operate and maintain stage the asset register shall be updated to reflect changes over the operational service life and include the following detail (see Section 9 for further details):

- Asset identification (description and label) – updated as a result of relocation, relabelling or rotable fitment or defitment. A new serialised asset having the same or different specification shall be a different asset (new asset identifier with a new asset life) to the one it replaced. The replaced asset may then be sent for repair if it is a rotable or otherwise disposed.
- Asset status and asset status date.
- Date first in service.

- Asset attributes and metadata in accordance with T MU AM 02006 TI and supporting reference data including (see Section 9.15 and 9.16 for further details):
    - asset condition and date reassessed
    - remaining life (reassessed based on design life, condition and utilisation of the asset)
    - asset criticality
    - asset utilisation and capacity including performance requirements – tonnage or volume, time in service, hours operated, number of operations
- Additional asset information requirements in this stage include a defect register and work order register covering maintenance activities - preventive, corrective, breakdown and renewal including supporting activities, operational activities; for example switching and standby, and condition or event triggered activities; for example heat patrol and feeder trip covering:
    - preventive service schedules including method of scheduling (time/frequency, usage or condition), criticality and latitude defined as part of the technical maintenance plan (TMP) and generated as work orders
    - work orders created for every maintenance activity associated with the lowest asset in the hierarchy or rotable asset
    - defects (service requests or notifications) created for every conditional and functional failure associated with the lowest asset in the hierarchy or rotable asset - failure mode, operational consequence (including service delays), failure type both conditional and functional, defective part or part causing failure, root cause and action taken
    - unit rate estimates per activity type
    - duration per activity
    - materials used
    - measurements, adjustments and calibration records captured as a result of required maintenance activities
    - configuration change, rotable change and any modifications made as a result of required maintenance activities
- Failure or incident management data (to support MTBF and MTTR) including:
    - time failed, time attended, time rectified and time in service
    - link defect and asset with the associated failure or incident
- Maintenance costs – labour, material, plants and equipment and contract (by activity per asset captured on the work order). Capital improvement and upgrading costs to be updated in the financial fixed asset register.

- Work order type (recurrent or capital) – support changes to the financial fixed asset register in relation to capital improvements and upgrades – and to support revaluation.
- Spares usage and stock levels including location of critical spares.

Refer to T MU AM 01014 ST for all operations and maintenance asset document deliverables covering registers, plans, manuals, certificates, procedures, reports, drawings and models.

## 8.4. Dispose stage asset information

The AIRs shall include the following asset specific information where applicable and relevant for each asset captured and managed beyond the operate and maintain stage (decommissioning or repurposing).

Subject to end of operational service life, end of economic life or as a result of repurposing the asset register shall be updated to reflect changes and include the following detail (see Section 9 for further details):

- asset status and asset status date
- date disposed

Additional asset information requirements in this stage include a work order register covering the following:

- maintenance disposal or repurposing activities
- work orders for every maintenance activity
- disposal costs – including costs for labour, material, plant and equipment, and contract by activity per asset captured on the work order
- residual capital value of the asset to be written off in the financial fixed asset register

## 8.5. Exchange of asset information at maintenance handover

The exchange of validated and assured data and documents during the maintenance contract period and at the end of the contract period shall be electronic and implemented through an agreed exchange process determined by TfNSW in collaboration with the maintenance service provider (asset custodian).

The frequency and scope of each information exchange shall be managed between the asset custodian and TfNSW in accordance with T MU AM 01014 ST and contract conditions. The scope shall be defined as part of the asset handover plan and associated AIDP.

## 8.6. Supporting asset information

The asset information system shall contain the following to support the asset over the life cycle:

- training materials
- competency and certification of staff records
- accreditation records of operators and maintainers (including third parties)

Training systems (for example, simulators) shall be defined as assets and managed as part of an operations or training facility.

## 8.7. Events triggering changes to asset information

Across the asset life cycle various events can occur that trigger the requirement to update the relevant asset information. These events can result from changes in asset strategy, service strategy, new asset type, maintenance strategy including maintenance requirements and asset configuration. Figure 7 illustrates some events that trigger updates to asset information.


**Figure 7 - Events that trigger updates to the asset information across the life cycle**

Examples of events which occur over the life cycle that trigger the need for the asset information to be updated include the following:

- introduction of new assets, whether an existing asset type or new asset type, including asset trials
- asset relocation including rotable movement
- asset decommissioning and disposal
- minor maintenance – preventive, corrective, breakdown including inspection, testing and calibration including component change
- major maintenance – refurbishment (component change out), upgrade (new asset type) or replacement (existing like for like asset)
- asset revaluation
- change in assessed risk level
- change in asset ownership, asset operator or asset maintainer (demarcation of responsibility)
- concession to a standard

- change in operation (timetable and usage) and asset criticality
- change in regulations and standards
- asset repurposing

These events may require additional asset key configuration data to be added to the standard asset reference data library in accordance with the requirements stated in Section 9.16.

The financial fixed asset register may need to be updated to reflect the change in asset value.

# 9. Asset register requirements

The asset register integrates associated asset information and provides a current and historical record of both financial and non-financial information over each asset's life cycle.

The asset register shall be a defined and structured inventory of the assets owned by TfNSW and shall be used by the operator and maintainer (asset custodian) to determine and report on the following:

- the condition and integrity of the assets
- the configuration of the assets (including rotable fitment, modifications and change outs)
- the location of the assets
- the history of work performed and future planned, scheduled and forecasted work
- the age, expected life (design life) and remaining life of the assets
- when the assets are required to be repaired, refurbished, renewed, replaced or disposed
- maintenance compliance to specified maintenance requirements and TMPs
- maintenance effectiveness including work arising and repeat failures
- the asset maintenance plan (AMP) and associated delivery of the annual works plan (AWP) including backlog
- the operational consequence (delays) resulting from asset failures
- the reliability and performance of the assets
- the life cycle costs including initial asset capital cost, accumulated maintenance costs, depreciation and disposal costs
- the utilisation of the assets
- the capacity of the assets
- the operational criticality and risk

Figure 8 illustrates the integration of the asset register and the related asset information required to support and manage the asset management activities over all stages of the life cycle.


**Figure 8 - Integrated asset information framework model**

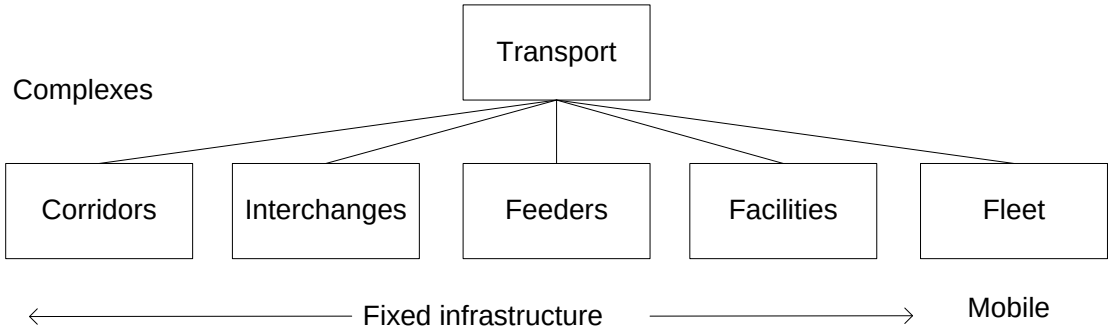
Assets owned by TfNSW are categorised by discipline and grouped into asset classes in Section 9.1. These asset classes are further subdivided by function and type in Section 9.7 to define an asset classification framework. The asset classification shall be applied to every asset within the asset register to enable consistent structuring, searching and reporting and shall be coded in accordance with T MU AM 02002 TI *Asset Classification System*.

## 9.1. Asset classes and containers

Asset classes exist for all fixed infrastructure, mobile fleet and their associated assets and asset systems, (fixed and onboard) both physical and non-physical (for example, software).

Asset classes are defined as part of the asset classification system detailed in Section 9.7 and shall be used as a primary means of grouping assets having a similar function and type.

Asset containers shall be used to create a functional asset hierarchy structure in the asset register for all transport assets across the TfNSW asset portfolio as shown in Figure 9 and further defined in Section 9.10. Asset containers, referred to as complexes in this document, are defined as complexes based on ISO 12006-2 *Building construction - Organization of information about construction works - Part 2: Framework for classification*.




**Complexes** are a container of assets categorised as entities, systems, products and elements. They may be linear and horizontal, for example, corridors and feeders, they may be discrete and vertical, for example, interchanges and facilities or they may be mobile, for example, fleet.

**Figure 9 - Primary asset containers (complexes) across the TfNSW asset portfolio**

These complexes allow the Transport Network to be defined and modelled consistently as shown conceptually in Figure 10. All assets along the corridor or feeder not associated with an interchange or facility shall be defined and contained within the corridor or feeder asset hierarchy structure respectively.

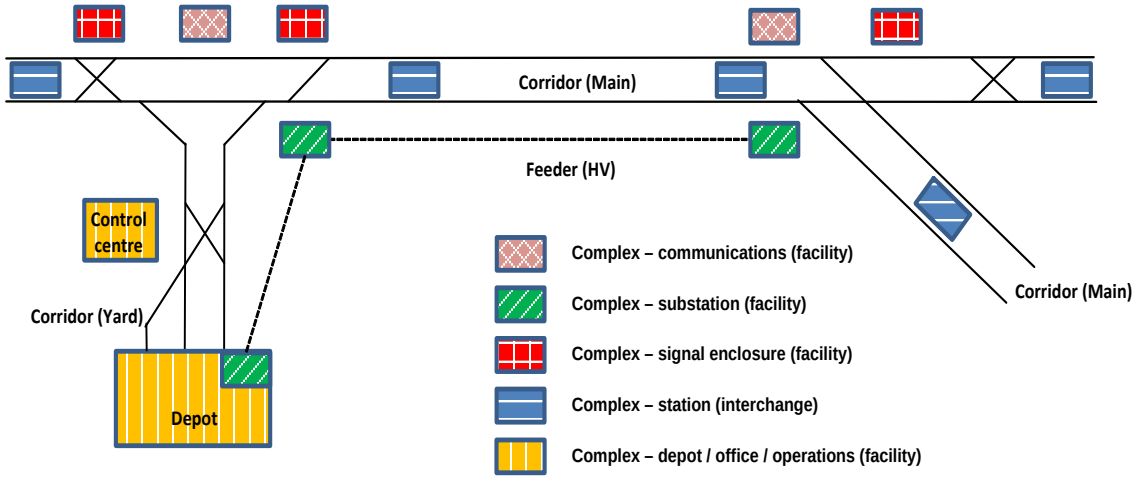



**Figure 10 - Geographical network architecture concept model - asset containers (complexes)**

These complexes provide the means to define all related assets as entities, systems, elements and products in a functional asset hierarchy structure that are physically and functionally contained within each complex as shown in Figure 11 and further defined in Section 9.10.

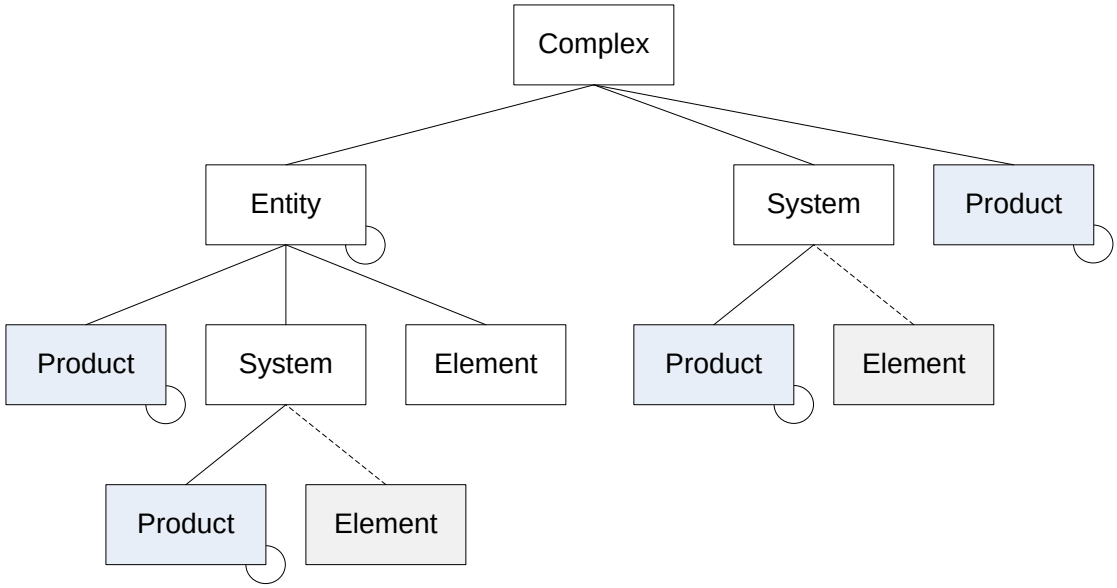



**Figure 11 - Asset hierarchy model**

The various elements in Figure 11 are as follows:

- Complexes are a container of assets. These contained assets are categorised as entities, systems, products and elements. They may be linear and horizontal, for example corridors and feeders, they may be discrete and vertical, for example, interchanges and facilities or they may be mobile, for example, fleet.
- Entities are discrete assets like buildings and bridges or linear assets like tracks, roads, tunnels, overhead wiring and fencing. They provide the areas where different activities occur. They are typically constructed and contain elements, systems and products. Entities may also contain other entities, for example, track will have turnouts that are part of the track but separately managed.
- Systems are the collection of products assembled together to perform a function within an entity or a complex, for example, drainage system, ventilation system, lift system, wayfinding and ticketing.
- Elements are the assets that comprise the physical structure of an entity that are managed separately due to the complex construction and maintenance requirements of the entity, for example, bridge (abutments, piers, spans). Elements can comprise part of a system but these are usually treated as components within the system and may not be managed as separate assets, for example, wiring and ducts.
- Products are assets used to construct a system, for example, pumps and fans or can be directly associated with a complex or entity, for example, crane, navigation aid or gate. Products may also contain other products (fixed or rotable). If serialised products are rotable (repairable asset that requires tracking) they need to be clearly identified as a rotable and located in a specified fitted position.

*Note:*

*Even though products are functionally part of a system and grouped together they may be physically distributed throughout the complex (for example, facility or interchange).*

*Spaces contain assets that perform a function that may not be part of a system. The space is not an asset but is used as a location reference to describe the position of an asset within a network and complex (see location classification - asset container, zone, position and room).*

Assets shall be created within the complex asset hierarchy in accordance with the criteria in Section 9.4 and shall be classified to determine what they are. All maintainable objects have a defined function in accordance with T MU AM 02002 TI.

Critical components that also meet the criteria in Section 9.4 shall be created as assets within the complex asset hierarchy down to the required level. Non-critical components in Section 9.8.1 as part of the asset specification are not given an asset classification as they are not uniquely managed as assets within the asset register. See Section 9.13 for details in regards to rotable assets. Asset classification defines the following:

- what each complex type is within the Transport Network
- what the entities, systems, products and elements are that exist within the Transport Network associated with each complex type

Assets at all levels of the asset hierarchy shall be classified to determine where they are in accordance with T MU AM 01006 ST *Asset Location Classification* and T MU AM 01007 TI *Asset Reference Codes Register*. Location classification defines the following:

- the extent of the Transport Network (including modal identifier - see Section 9.3)
- where each complex type is within the Transport Network
- where the entities, systems, products and elements are within the Transport Network associated with each complex type

Fixed infrastructure assets and associated fixed systems shall be defined within an asset hierarchy structure as part of one of the following infrastructure complexes down to the lowest maintainable item:

- corridors
- interchanges
- facilities
- feeders

Mobile fleet assets and their associated onboard systems shall be defined within an asset hierarchy structure as part of one of the following fleet complexes down to the lowest maintainable item:

- trains
- light rail vehicles
- ferries
- buses
- vessels
- road vehicles and trailers
- locomotives
- wagons
- track vehicles and machines
- rail cars and vans
- mobile plant

These complexes shown in Figure 12 enable a structured approach to navigation within an asset register hierarchy. See Section 9.10 for further details on asset structuring and Section 9.11 for examples of how these details are applied.

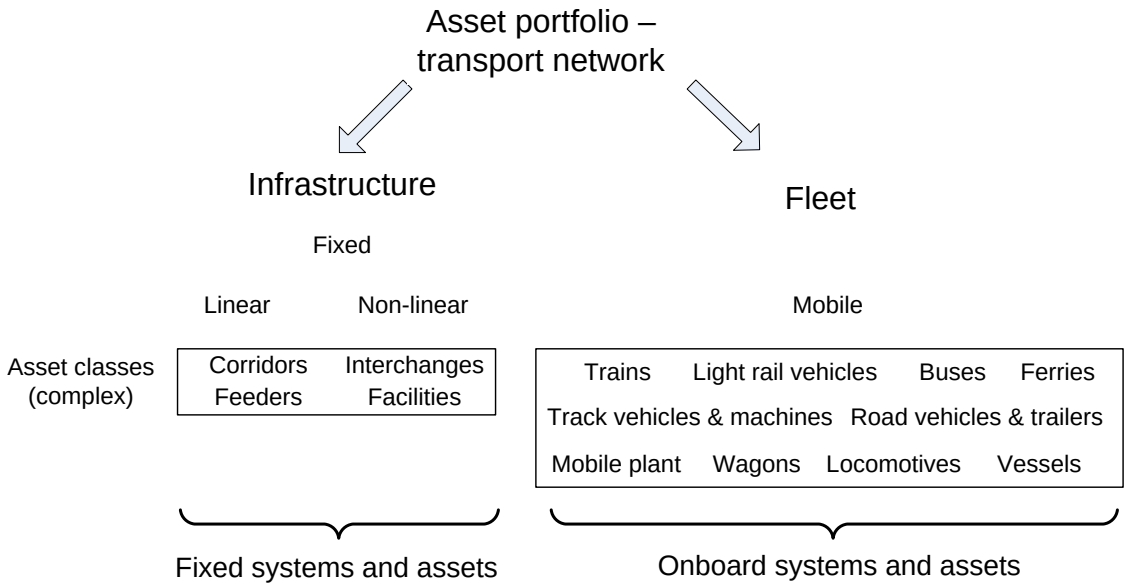



**Figure 12 - Infrastructure and fleet containers (complexes)**

The asset complex (based on the network infrastructure asset class and function or fleet asset class and function) shall be captured and managed as an attribute for each asset instance at all

levels within the complex in the asset register. See Section 9.15 for more details covering general and asset class specific attributes for linear, non-linear and mobile assets.

The assets within the complex may be further containerised into complex zones. See Section 9.9 for details on application of additional location references.

## 9.2. Asset category

All assets defined within an infrastructure of fleet complex asset hierarchy are categorised as linear, non-linear or mobile which is derived from its asset classification in Section 9.7.

Asset categories across the TfNSW asset portfolio are defined as follows:

- fixed (linear or non-linear) - for infrastructure assets and associated fixed systems contained within a corridor, interchange, feeder or facility
- mobile - for fleet assets and associated onboard systems (including plant and equipment)

Linear assets also require linear attributes to be captured and managed in Section 9.15.1.

## 9.3. Transport mode and transport form

Transport modes are the means by which people and freight move from place to place. They fall into three basic types; land (road, rail and active), sea or air.

In TfNSW the following seven transport modes apply:

- road
- rail
    - heavy rail
    - metro rail
    - light rail
- maritime
- air
- active

All fixed infrastructure assets shall be associated with one of the transport modes. The transport mode shall be identified as part of the network code attribute and defined by a four character code in accordance with T MU AM 01007 TI. The network code provides the high level location classification that shall be captured and managed as an attribute for each asset instance in the asset register. Further location classifications are in Section 9.9. The following are examples of network codes:

- HR-S (heavy rail – Sydney)
- HR-C (heavy rail – country)
- LR-N (light rail – Newcastle)
- LR-P (light rail – Parramatta)
- LR-S (light rail – Sydney)
- MR-S (metro rail – Sydney)

Fleet defines the type of vehicle used to facilitate the movement of people and freight which interact with the fixed network infrastructure to enable the provision of transport services. Fleet operating on the Transport Network including trains, light rail vehicles, ferries, buses, road vehicles and vessels shall also be associated with a network code (for example, trains operating on the heavy rail – Sydney network, trams operating on the light rail – Newcastle network).

## 9.4. Creation of assets in the asset register

Assets owned by TfNSW shall be created in the asset register under any of the following conditions:

- to enable scheduling of work, capture of costs and maintenance to be recorded and analysed using work orders associated with an asset
- to distinguish between operational and non-operational assets and their maintenance requirements
- the asset has a defined maintenance plan
- the asset is operationally critical and to assess condition and performance over the service life
- the asset is of a major value and is also required for financial capitalisation and depreciation requirements (including property and licences)
- the asset is required for parent hierarchy grouping purposes
- the asset is rotable, individually serialised and for which service life installation and maintenance history is required
- the asset is required for safety or statutory purposes

- the asset is required for recording statistical and measurement details for operational or maintenance purposes
- the asset is required for configuration control purposes including the management of type approved assets and assets under trial
- the asset requires warranty details to be recorded and managed
- to identify total cost of ownership or life cycle costs of the asset
- the asset has heritage significance
- to support renewal or replacement strategies of complex assets where components have different useful lives and need to be managed separately; in these situations the components are created as sub-assets within the asset register hierarchy linked to the parent asset (see Section 9.8 in relation to componentisation)

If an asset does not satisfy any of these conditions, it does not require an entry in the asset register.

## 9.5. Unique identification of assets in the asset register

All assets (operational, non-operational and disposed assets) shall have a unique asset identifier within the asset register managed by the maintenance service provider as the responsible and contracted asset and data custodian. The unique asset identifier is created by the maintenance service provider on the acceptance of new assets handed over as part of asset acquisition (construction or procurement) of new assets in accordance with requirements in Section 9.4.

As the owner of the asset, TfNSW may define an additional unique asset identifier that is cluster wide. This will support asset register consolidation and to enable the transition of contracted assets from one maintenance service provider to another maintenance service provider without loss of historic information. The TfNSW asset identifier will not be the same as the service provider asset identifier; however, they shall be linked within the service provider's asset information system or enterprise asset management system.

The requirements for an asset identifier are to ensure the information system stores a unique identifier that serves as the primary key to link related asset data, attributes and documents against a particular discrete asset located at a geographical point in the system, against a linear asset, against a mobile asset or a rotable asset. This unique asset identifier also enables searching for and tracking of rotable assets.

The asset identifier in the maintenance service provider's asset information system is allocated to the acquired asset for the whole-of-life; however, this may be limited to just the length of the contracted maintenance period and hence the requirement for both a TfNSW asset identifier and linked service provider asset identifier.

The asset identifier in the maintenance service provider's asset information system provides the primary means to identify the asset uniquely in the operating environment and for maintenance purposes. See Section 9.10 in relation to asset identifiers, structuring and the asset hierarchy. As the asset information system used by each maintenance service provider can vary, the asset register identifiers shall contain either of the following as a minimum:

- List of assets with system generated asset identifiers that provide a parent – child asset hierarchy to be managed for fixed infrastructure, mobile fleet and rotable assets.
- List of assets with structured coding asset identifiers which may support a location based approach for defining fixed asset positions (infrastructure and fleet). The structured code assigned may contain references to its location, function, kilometrage or label (for example, vehicle or carriage number, door number, CCTV camera number) to ensure uniqueness.

If the structured code is an alias and not the primary key (for example, system generated number also exists) then this can be changed or updated over its life and is suitable for all assets. If the structured code is the primary key then, it is not suitable as an asset identifier of rotable assets as the location may change over its life.

## 9.6. Disposal of assets in the asset register

Disposed assets shall be retained in the asset register together with all its associated asset information and maintenance records in accordance with the *State Records Act 1998*.

Disposed assets shall indicate a date of disposal and have its status updated to 'disposed'. New assets that have replaced a disposed asset shall have a new asset identifier in Section 9.5 however, shall still refer to the same location, position and label details as applicable (for example, 501A points, signal 101, plat 3 speaker 2).

An existing asset may become disposed as a result of the following:

- like for like replacement (same make or model) or similar replacement (different make or model) with the new asset fulfilling the same business requirements
- upgraded replacement with the new asset fulfilling new or improved business requirements
- being uneconomical to repair
- being no longer required for operational service

A modified asset or refurbished asset may not result in the asset being disposed.

## 9.7. Asset classification system and technical object

The asset classification system establishes a consistent definition, structure and categorisation of assets across the asset portfolio for the following purposes:

- ensuring common terminology of assets and asset structuring within the asset register
- establishing a base for asset attribute and metadata standards
- supporting easy exchange or integration of asset information including asset registers, asset attributes and documentation
- establishing a base for structuring maintenance and renewal planning activities
- establishing a base for financial valuation and capitalisation activities
- supporting collaboration and building up of required asset information for asset handover and acceptance
- defining the level of asset information required to be captured and managed to support and substantiate decisions made over the asset life cycle
- supporting the development of a functional architecture model
- ensuring management of configuration change and risk
- enabling standardised and consolidated reporting
- enabling whole of portfolio investment planning and decision making

The asset classification system is comprised of the following four levels:

- level 1 - asset discipline
- level 2 - asset class
- level 3 - asset function
- level 4 - asset type, defines the level at which different types of equipment essentially provide the same function

The concatenation of levels 2, 3 and 4 (class, function, type) defines the technical object. All assets shall be classified by a technical object code as an attribute in the asset register in accordance with T MU AM 02002 TI. See Section 9.15 for details in relation to asset attributes.

The remaining levels 5 and 6 are not directly part of the asset classification system but are required to support maintenance functions and processes in Section 9.8.1. The content of these levels are not specified by TfNSW. These levels are as follows:

- level 5 - component, which is linked to the asset type (but derived from the asset specification – asset make and model or construction)
- level 6 - sub-component, which is linked to the component

Figure 13 illustrates the asset classification system levels.

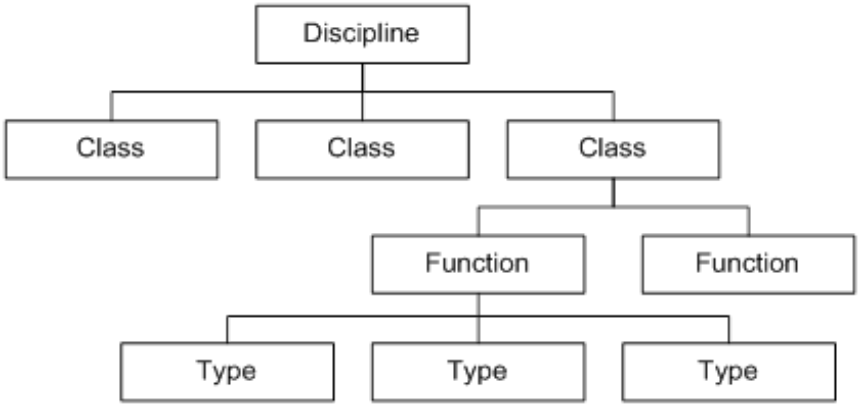



**Figure 13 - Asset classification system levels**

## 9.7.1. Asset discipline

The asset discipline represents a grouping of related asset classes, for example, civil and structures, electrical, signalling and fleet. The asset discipline is linked with one or more asset classes.

Refer to T MU AM 02002 TI for a list of asset disciplines.

## 9.7.2. Asset class

The asset class represents a high level grouping of similar assets, for example, bridges, overhead traction, signalling equipment and trains.

Refer to T MU AM 02002 TI for a list of asset classes.

## 9.7.3. Asset function

An asset function is associated with an asset class, for example, bridges asset class contains overbridges and footbridges as separate asset functions. An asset function can be associated with one or more asset class.

Refer to T MU AM 02002 TI for a list of asset functions by asset class.

The asset function is used to define the following:

- grouping of asset types (where applicable)
- non-geometric data attributes (physical and functional characteristics) required to be captured and managed, including asset nameplate details
- data standard for the associated data attributes and metadata, including the name, type, format, unit of measure and list of values where applicable

### 9.7.4. Asset type

Asset types have unique characteristics that distinguish them from other asset types that perform the same asset function. Asset types do not include differences in material construction or manufacturers make, model and variant detail (except for fleet where the fleet type is associated with the asset function). Not all asset functions have an asset type defined within the technical object.

Refer to T MU AM 02002 TI for a list of asset types associated with an asset function where applicable.

## 9.8. Asset specification

All assets shall contain a reference to an asset specification. Each asset in the asset register shall have an asset specification assigned in accordance with T MU AM 01008 ST *Technical Maintenance Plans and Coding System* and T MU AM 01009 TI *Technical Maintenance Coding Register*. See Section 9.7 for details on asset classification and coding requirements.

Figure 14 illustrates the information associated with the asset in the asset register in relation to its asset classification and asset specification. The asset shall inherit the properties associated to its asset classification (class, function, type) and asset specification.

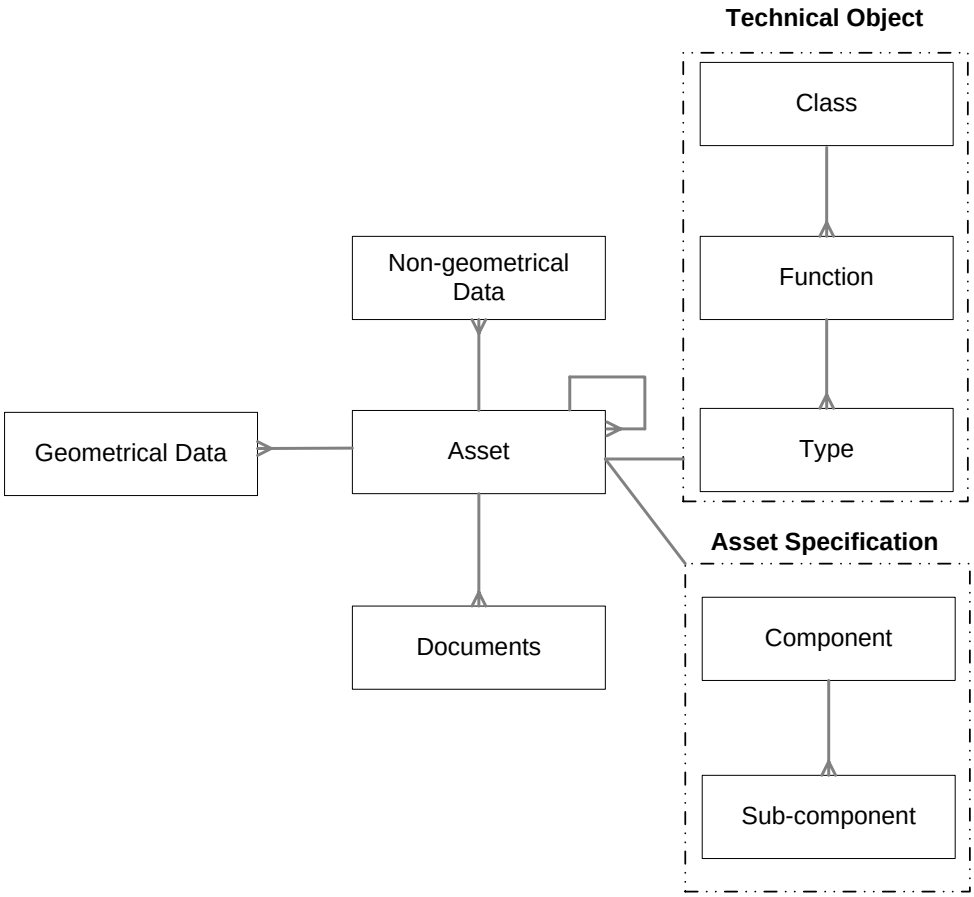



**Figure 14 - Asset linked to the asset classification and asset specification**

The asset specification is used to define the following:

- Maintenance strategy to be applied including the TMP (includes details of maintenance tasks, resources and competencies, tools and materials). Different asset specifications associated with the same asset function and type may have the same or a similar TMP based on the manufacturer's make or model requirements or approved service providers' maintenance requirements developed in accordance with T MU AM 01003 ST *Development of Technical Maintenance Plans.*
- Component parts required to support defect identification and management (component and sub-components are not directly associated to each asset function and type; they are linked via the asset specification that defines a common parts list for assets of that asset type) in Section 9.8.1.
- Manufacturer's warranty to be applied.
- Material part list (inventory) required for service, maintenance and repairs.
- Failure modes, causes, effects and criticality (based on the failure mode, effects, and criticality analysis (FMECA)) relative to the failure of components associated with the asset.

## 9.8.1. Components and sub-components

Component parts shall be related to an asset function or asset type, which defines the build of the asset. Sub-component parts are related to the component. Components and sub-components can vary across the different asset functions and types, for example, different signal asset types can have different component builds.

The asset breakdown structure shown in Figure 15, Figure 16 and Figure 17 are only indicative of the level of componentisation required to manage the asset and support life cycle maintenance requirements. Componentisation in complex assets may be required to support:

- renewal strategies for assets with different useful lives
- manage preventive and corrective maintenance including root cause of failures
- manage configuration changes over the asset lifecycle including modifications
- identify and track serialised components.

Critical components are managed as an asset when they meet the criteria in Section 9.4. The asset classification of an asset does not specify the component structure as the configuration of each asset having the same asset classification (technical object) may vary.

Figure 15 shows an example of an asset classification and asset specification applied for a track asset including componentisation. The technical object is 'Mainline Track'. Both the asset classification and asset specification shall be recorded against every instance of a track asset in the asset register.

The track itself is contained within the rail corridor asset register hierarchy in Section 9.1.

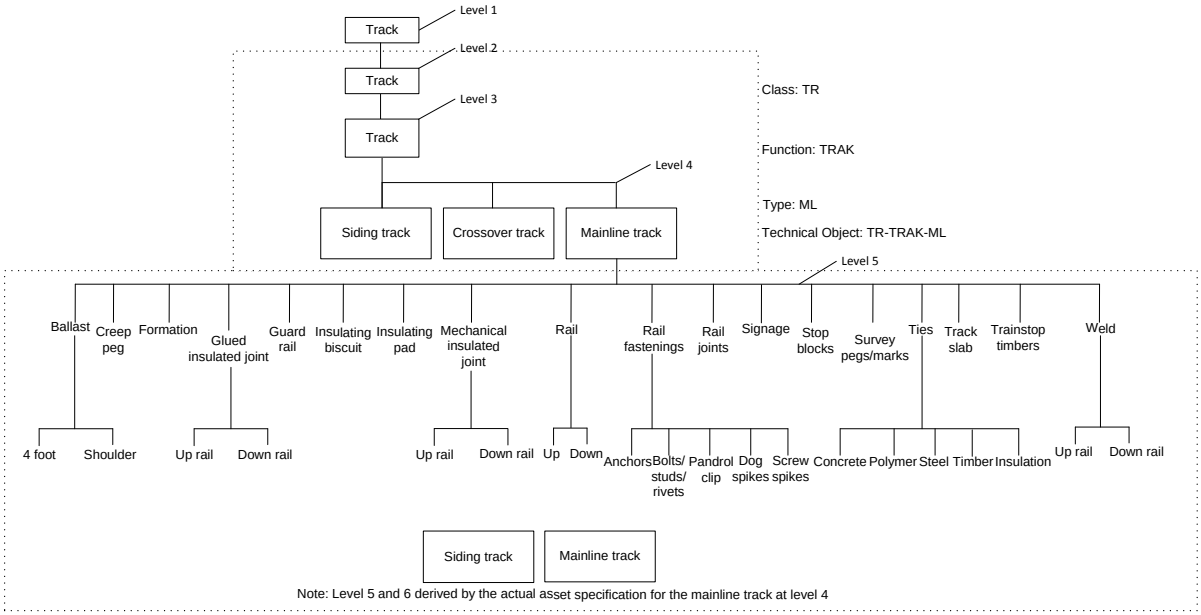



**Figure 15 - Example of asset classification, specification and componentisation for a main line track asset**

Figure 16 shows an example of an asset classification and asset specification applied for a signal asset including componentisation. The technical object is 'Running Signal'. Both the asset classification and asset specification shall be recorded against every instance of a signal asset in the asset register.

The trackside signal itself is contained within the rail corridor asset register hierarchy in Section 9.1.

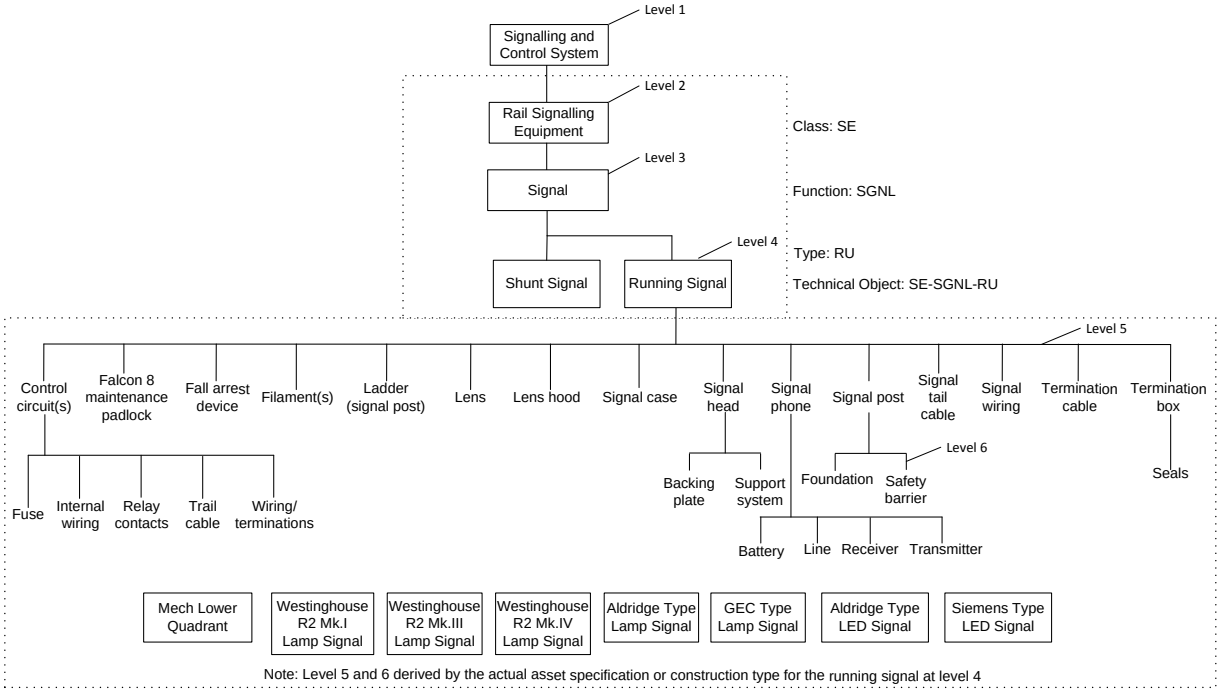



**Figure 16 - Example of asset classification, specification and componentisation for a trackside signal asset**

Figure 17 shows an example of an asset classification and asset specification applied for an electrical substation asset including componentisation. The technical object is a 'Direct Current Feeder Circuit Breaker'. Both the asset classification and asset specification shall be recorded against every instance of an electrical substation asset in the asset register.

The circuit breaker itself is contained within the substation facility asset register hierarchy in Section 9.1.

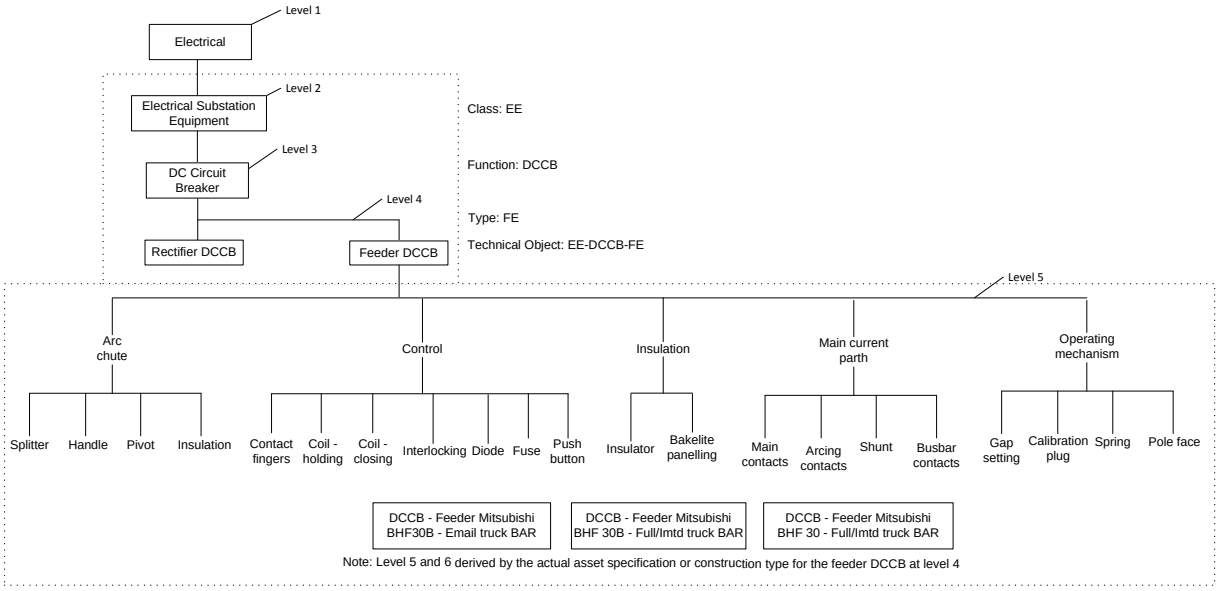



**Figure 17 - Example of asset classification, specification and componentisation for an electrical substation DC circuit breaker asset**

## 9.9. Asset location classification

Location classification is used to identify the general geographical and physical location of all transport assets across the Transport Network within the asset register and associated information repositories (for example, document management systems, operational and timetable systems and incident management systems).

Location classification requirements are defined as a set of asset reference codes including, but not limited to, the following:

- network codes (in relation to the mode in Section 9.3)
- corridor codes (general)
- location codes (general)
- site codes (facility specific)
- base codes (track specific)

To define the location of assets within each infrastructure or fleet complex in Section 9.1, general geographical and physical location references have been defined and shall be used as the primary means of asset location referencing aside from geospatial referencing.

Assets shall have more than one asset reference allocated to assist in determining its location within the network and asset complex. Besides network, corridor, location, site and base code references, additional location attributes including kilometrage, complex zone, position, room and address shall be required to be captured and managed.

Asset reference codes shall be recorded in the asset register as an attribute and applied in accordance with T MU AM 01006 ST and T MU AM 01007 TI. See Section 9.15 for further details on asset attributes.

## 9.10. Asset register structuring

Asset register structuring provides the framework and a means to logically navigate within an asset register hierarchy and provides the logical representation of the asset relationship within the asset register. Detailed asset register hierarchy examples for each of the asset complex types are provided in Section 9.11. See Section 9.13 for rotable assets and tracking.

If the service provider is using structured coding asset identifiers within the asset register then, they shall be unique and provide intelligence in the coding between each level to define and identify asset at all levels within each complex as shown in Figure 18.

| | | |
|---|---|---|
| **Portfolio** | | **Infrastructure class** |
| TfNSW | **F** | Corridor |
| | **F** | Interchange |
| | **F** | Facility |
| | **F** | Feeder |
| | | **Fleet class** |
| | **M** | Train |
| | **M** | Light rail cehicle |
| | | |
| | **M** | Bus |
| | **M** | Ferry |

| Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|
| **Infrastructure type & No** | **Infrastructure asset/system & No** | **Infrastructure sub asset/system & No** | **Infrastructure asset & No** |
| Corridor type & Id | Corridor asset/system & Id | Corridor sub asset/system & Id | Corridor asset & Id |
| Interchange type & Id | Interchange asset/system & Id | Interchange sub asset/system & Id | Interchange asset & Id |
| Facility type & Id | Facility asset/system & Id | Facility sub asset/system & Id | Facility asset & Id |
| Feeder type & Id | Feeder asset/system & Id | Feeder sub asset/system & Id | Feeder asset & Id |
| **Fleet type & set No** | **Fleet sub-type & No** | **Fleet asset/system & No** | **Fleet sub asset/system & No** |
| Train set type & Id | Train car type & Id | Train asset/system & Id | Train sub asset/system & Id |
| LRV set type & Id | LRV car type & Id | LRV asset/system & Id | LRV sub asset/system & Id |
| **Fleet sub-type & No** | **Fleet asset/system & No** | **Fleet sub asset/system & No** | |
| Bus & Id | Bus asset/system & Id | Bus sub asset/system & Id | |
| Ferry & Id | Ferry asset/system & Id | Ferry sub asset/system & Id | |

Key: F - fixed infrastructure complex
M - mobile fleet complex

Trains and LRVs are configured and managed by set and car
Buses and ferries are managed individually
Rotable assets and assemblies are fitted at the appropriate level

**Figure 18 - Asset register structuring using within each complex**

The examples in Section 9.11 illustrate the level of structuring as shown in Figure 18 for the eight asset complex types and their assets contained within. These examples provide a guide to the identification, logical navigation and structured coding at the levels used to define and identify assets within the asset register hierarchy. The eight asset complex types and their assets contained within are as follows:

- corridor - rail corridor (right of way)
- interchange - train station
- facility – fleet maintenance depot
- facility - electrical traction substation
- feeder - electrical HV feeder
- fleet - train set and carriage
- fleet - bus
- fleet - ferry

## 9.11. Asset register hierarchy

Assets shall be defined at a number of different levels within the hierarchy and created in accordance with the criteria in Section 9.4. The asset hierarchy ensures the following:

- Assets can be viewed in a logical way in reference to how they physically and functionally relate with other assets (for example, physically within the complex or functionally by system within the complex). Physical reference attributes (for example, corridor, complex zone, position, room) and functional reference attributes (for example, system) exist to support both physical and functional asset hierarchies.
- Assets can be grouped in a way that they are managed and maintained (by system, for example, fire hydrant system, CCTV security system or by physical location, for example, platform 1/2, car park and office building 1st floor).
- Rotable assets can be added (fitted within the complex asset hierarchy for example, train bogie, substation DC circuit breaker, bus or ferry engine) and removed (moved to the complex spare or off-line or sent to workshop for repair or overhaul).
- Asset specific, system or parent or zonal maintenance activities can be managed (for example, complex examinations – corridor, interchange, facility, feeder, fleet; system examinations; entity or product specific examinations). Maintenance requirements may dictate the depth of the asset hierarchy and the level to which the type of maintenance is scheduled, planned and managed. Planned work (for example, preventive inspections or examinations, modifications and refurbishments) maybe conducted at a different level to unplanned corrective and breakdown activities. Maintenance may be conducted at a different level for infrastructure assets (for example, by system or product) compared to fleet assets (for example, by whole vehicle and system).
- Assets with different warranties and lives and can be managed.
- Assets with different serial numbers can be identified or tracked.
- Asset performance, financial and maintenance reporting can be managed at different levels.

Assets from one asset class may form part of a hierarchy with assets from another asset class.

### 9.11.1. Corridors

A corridor is a linear zonal area containing heavy rail, metro rail, light rail, road or maritime infrastructure assets to support the operation of fleet services. A rail corridor covers both the main line corridor and the rail stabling yards.

Figure 19 shows examples of corridors across various transport modes.











**Figure 19 - Examples of corridors and stabling yard across various transport modes**

Corridors contain fixed infrastructure assets and systems. The types of corridors include the following:

- rail (heavy rail, metro rail and light rail)
- road (major state, federal and regional roads)
- maritime waterways

The following infrastructure assets are generally included in the transport corridors and stabling yards:

- bridges including overbridges, underbridges, footbridges and subways
- drainage and culverts
- tunnels

- earthworks and geotechnology
- level crossings
- fencing and barriers
- overhead and support structures including overhead traction supports, gantries and towers
- retaining structures including retaining walls, sea walls and basins
- miscellaneous structures including slipways, dry docks, inspection pits, airspace developments, walkways and cycleways
- track including mainline track, crossovers and sidings, turnouts, buffer stops, trackslabs, lubricators and insulated joints
- roads including access roads
- overhead traction including overhead wiring and equipment
- rail signalling systems equipment including trackside signalling equipment, level crossing protection, ATP, interlockings, workstations, telemetry, power supply and cables
- road traffic control systems
- service routes, underline crossings and pits
- guidance, delineation and corridor signage
- electrolysis and bonding
- land
- landscaping including gardens, pavers and trees
- aids to navigation

Figure 20 and Figure 21 show examples of a heavy rail corridor asset hierarchy based on the corridor complex in Section 9.1. An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

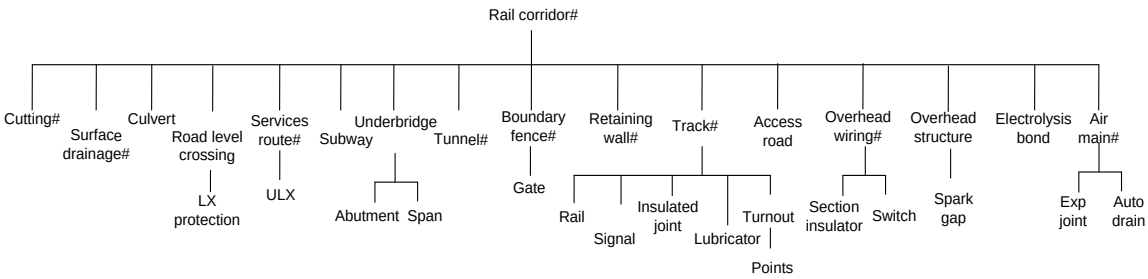



**Figure 20 - Example of a rail corridor asset hierarchy – concept model**

| | Asset | | | | Service Provider Asset ID | | | |
|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description |
| Corridor | Co | | | | RWAY-M00 | 10000000 | | Main Suburban-Central-Granville |
| | | En | | | RWAY-M00-FENC01 | 10000001 | 10000000 | Main Suburban-Bdry Fence-Up Side |
| | | | El | | RWAY-M00-FENC01-GATE01 | 10000002 | 10000001 | Main Suburban-Bdry Gate U15+162 |
| | | | El | | RWAY-M00-FENC01-GATE02 | 10000003 | 10000001 | Main Suburban-Bdry Gate U16+000 |
| | | | El | | RWAY-M00-FENC01-GATE03 | 10000004 | 10000001 | Main Suburban-Bdry Gate U17+923 |
| | | En | | | RWAY-M00-ROAD01 | 10000005 | 10000000 | Main Suburban-Access Rd 15.162Km |
| | | En | | | RWAY-M00-CUTT01 | 10000006 | 10000000 | Main Suburban-Cutting 15.987Km |
| | | En | | | RWAY-M00-RETW01 | 10000007 | 10000000 | Main Suburban-Retaining Wall 12.427Km |
| | | En | | | RWAY-M00-OHWG01 | 10000008 | 10000000 | Main Suburban-Up Main OHW |
| | | | Pr | | RWAY-M00-OHWG01-SWIT01 | 10000009 | 10000008 | Main Suburban-OHW Swit 631A&B 17.543Km |
| | | | Pr | | RWAY-M00-OHWG01-SINS01 | 10000010 | 10000008 | Main Suburban-OHW SI 17.543Km |
| | | | Pr | | RWAY-M00-OHWG01-TREG01 | 10000011 | 10000008 | Main Suburban-OHW T/Reg 16.786Km |
| | | En | | | RWAY-M00-OHWS01 | 10000012 | 10000000 | Main Suburban-OHW Mast SL16+786 |
| | | En | | | RWAY-M00-UBGE01 | 10000013 | 10000000 | Main Suburban-Ubge 5.162Km |
| | | | El | | RWAY-M00-UBGE01-UBSP01 | 10000014 | 10000013 | Main Suburban-Ubge 5.162Km Span No1 |
| | | | El | | RWAY-M00-UBGE01-UBSU01 | 10000015 | 10000013 | Main Suburban-Ubge 5.162Km Abut No1 |
| | | | El | | RWAY-M00-UBGE01-UBSU02 | 10000016 | 10000013 | Main Suburban-Ubge 5.162Km Abut No2 |
| | | En | | | RWAY-M00-CULV01 | 10000017 | 10000000 | Main Suburban-Culvert 13.762Km |
| | | En | | | RWAY-M00-RDXG01 | 10000018 | 10000000 | Main Suburban-R/Xing 19.201Km |
| | | | Sy | | RWAY-M00-RDXG01-RXNG01 | 10000019 | 10000018 | Main Suburban-R/Xing 19.201Km Prot Sys |
| | | | | Pr | RWAY-M00-RDXG01-RXNG01-LXBO1 | 10000020 | 10000019 | Main Suburban-R/Xing 19.201Km Up Boom |
| | | En | | | RWAY-M00-TRAK01 | 10000021 | 10000000 | Main Suburban-Up Main Track |
| | | | En | | RWAY-M00-TRAK01-RAIL01 | 10000022 | 10000021 | Main Suburban-Up Main Track-Up Rail |
| | | | En | | RWAY-M00-TRAK01-RAIL02 | 10000023 | 10000021 | Main Suburban-Up Main Track-Dn Rail |
| | | | En | | RWAY-M00-TRAK01-CPNT01 | 10000024 | 10000021 | Main Suburban-C/Point 725A 19.345Km |
| | | | En | | RWAY-M00-TRAK01-TOUT01 | 10000025 | 10000021 | Main Suburban-Turnout 729A 18.436Km |
| | | | | Pr | RWAY-M00-TRAK01-TOUT01-PTSM1 | 10000026 | 10000023 | Main Suburban-Points 729A 18.436Km |
| | | | Pr | | RWAY-M00-TRAK01-SGNL01 | 10000027 | 10000021 | Main Suburban-Signal SH12.8 |
| | | | Pr | | RWAY-M00-TRAK01-TSTP01 | 10000028 | 10000021 | Main Suburban-T/Stop SH12.8 |
| | | | Pr | | RWAY-M00-TRAK01-TCCT01 | 10000029 | 10000021 | Main Suburban-Trk Cct T12.8 |
| Key: | | | | Pr | RWAY-M00-TRAK01-TCCT01-TCRX1 | 10000030 | 10000027 | Main Suburban-Trk Cct T12.8 Rx |

| | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**M00 is an example of unique coding of the Main West Heavy Rail Corridor (defined as a Corridor Reference Code)**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Alias may also be used with assets having system generated numbering**

**Figure 21 - Example of a rail corridor asset hierarchy (not shown complete) – with asset identifiers and descriptions**

Figure 21 also shows an example of the use of structured asset identifiers and system generated asset identifiers as part of the rail corridor complex asset register breakdown. Typically only one asset identifier method is used unless an alias is required to assist in the identification of assets that have system generated asset identifiers.

The structured asset identifiers provide a parent-child structure in the coding at the different levels. The system generated asset identifiers provide a parent-child relationship at the different levels.

The rail corridor is shown broken down into a functional set of contained assets within and along the corridor (entities, systems, elements and products) including examples of detailed asset descriptions for every asset instance.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

## 9.11.2. Interchanges

An interchange is a zonal area containing stations, stops, wharves, taxi ranks and car, bus or cycle parking infrastructure assets to allow the customer to join or transfer between transport modes. An interchange shall include at least one of the following:

- train station
- light rail stop
- bus stop
- ferry wharf

An interchange may also contain a taxi rank and car, bus or cycle parking facilities.

Figure 22 shows examples of interchanges.


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**Figure 22 - Examples of various transport interchanges**

Interchanges contain fixed infrastructure assets and systems. The types of interchanges include the following:

- stations
- stops
- wharves

The following infrastructure assets and systems are generally included in transport interchanges:

- bridges including footbridges and subways
- buildings
- fencing and barriers
- car parking and taxi ranks
- station, stop and wharf structures including access ramps, stairs, concourses, platforms, canopies or shelters, plinths, jetties, moorings, piers and pontoons
- overhead and support structures including towers
- retaining structures including retaining walls
- miscellaneous structures including walkways
- technology and telecommunications systems including passenger information systems, passenger security systems and ticketing systems
- technology and telecommunications equipment including the following:
    - customer information indicators and clocks, audio and public address
    - security help points and CCTV
    - wireless, network and terminal equipment
    - telecommunication licences
    - condition monitoring equipment
    - ticketing equipment
    - hardware
    - software applications and licences
- services including building management, vertical transport (lifts and escalators), fire management, HVAC, LV electrical and lighting, gas, air, fuel and hydraulic (water, sewer and drainage) systems
- furniture and fixtures including bike lockers, bike racks, seats, bins, boards, screens, light poles, totems and amenities
- wayfinding and facility signage
- landscaping including gardens, pavers and trees
- heritage items

Figure 23 and Figure 24 show examples of a train station interchange asset hierarchy (grouped by functional system where applicable) based on the interchange complex described in Section 9.1. An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

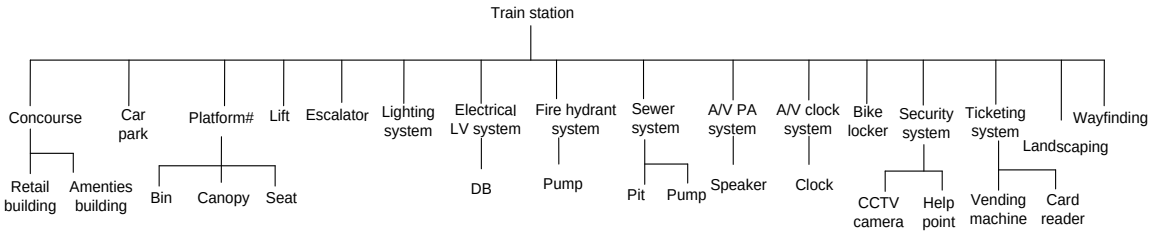


**Figure 23 - Example of a train station asset hierarchy – concept model**

| | Asset | | | | Service Provider Asset ID | | | |
|---|---|---|---|---|---|---|---|---|
| **Container** | Level 1 | Level 2 | Level 3 | Level 4 | **Structured Asset ID or Alias** | **System Generated Asset ID** | **System Generated Parent Asset ID** | **Asset Description** |
| Interchange | **Co** | | | | STAT-WMD01 | 20000000 | | Westmead Stn Interchange |
| | | **En** | | | STAT-WMD01-PLAT01 | 20000001 | 20000000 | Westmead Stn-Plat 1/2 |
| | | | **En** | | STAT-WMD01-PLAT01-CNPY01 | 20000002 | 20000001 | Westmead Stn-Plat 1/2 Cnpy |
| | | | **Pr** | | STAT-WMD01-PLAT01-SEAT01 | 20000003 | 20000001 | Westmead Stn-Plat 1/2 Seat A |
| | | | **Pr** | | STAT-WMD01-PLAT01-RBIN01 | 20000004 | 20000001 | Westmead Stn-Plat 1/2 Bin No1 |
| | | **En** | | | STAT-WMD01-CONC01 | 20000005 | 20000000 | Westmead Stn-Conc |
| | | | **En** | | STAT-WMD01-CONC01-BLDG01 | 20000006 | 20000005 | Westmead Stn-Conc Retail Bldg No1 |
| | | | **En** | | STAT-WMD01-CONC01-BLDG02 | 20000007 | 20000005 | Westmead Stn-Conc Amen Bldg |
| | | | | **Sy** | STAT-WMD01-CONC01-BLDG02-TOIL1 | 20000008 | 20000007 | Westmead Stn-Conc Amen Bldg Toilet Sys |
| | | **En** | | | STAT-WMD01-CRPA01 | 20000009 | 20000000 | Westmead Stn-Car Park (A)-Up Side |
| | | **En** | | | STAT-WMD01-CRPM02 | 20000010 | 20000000 | Westmead Stn-Car Park (M)-Dn Side |
| | | **En** | | | STAT-WMD01-FBGE01 | 20000011 | 20000000 | Westmead Stn-Fbge |
| | | | **El** | | STAT-WMD01-FBGE01-FBSP01 | 20000012 | 20000011 | Westmead Stn-Fbge Span No1 |
| | | | **El** | | STAT-WMD01-FBGE01-FBSU01 | 20000013 | 20000011 | Westmead Stn-Fbge Abut No1 |
| | | | **El** | | STAT-WMD01-FBGE01-FBSU02 | 20000014 | 20000011 | Westmead Stn-Fbge Abut No2 |
| | | | **En** | | STAT-WMD01-FBGE01-WALK01 | 20000015 | 20000011 | Westmead Stn-Fbge Walkway |
| | | **Pr** | | | STAT-WMD01-BKER01 | 20000016 | 20000000 | Westmead Stn-Bike Rack No1-Dn Side |
| | | **Sy** | | | STAT-WMD01-LIFT01 | 20000017 | 20000000 | Westmead Stn-Lift No1 Conc-Up Side |
| | | **Sy** | | | STAT-WMD01-LIFT02 | 20000018 | 20000000 | Westmead Stn-Lift No2 Conc-Plat 1/2 |
| | | **Sy** | | | STAT-WMD01-LGTF01 | 20000019 | 20000000 | Westmead Stn-LV Lighting Sys-Gen |
| | | **Sy** | | | STAT-WMD01-ELEC01 | 20000020 | 20000000 | Westmead Stn-LV Reticulation Sys |
| | | **Sy** | | | STAT-WMD01-PIDS01 | 20000021 | 20000000 | Westmead Stn-Disp Sys |
| | | | **Pr** | | STAT-WMD01-PIDS01-MONI01 | 20000022 | 20000021 | Westmead Stn-Plat 1/2 Indi No1 |
| | | **Sy** | | | STAT-WMD01-PICS01 | 20000023 | 20000000 | Westmead Stn-Clock Sys |
| | | | **Pr** | | STAT-WMD01-PICS01-CLCK01 | 20000024 | 20000023 | Westmead Stn-Conc Clock No1 |
| | | **Sy** | | | STAT-WMD01-PADS01 | 20000025 | 20000000 | Westmead Stn-PA Sys |
| | | | **Pr** | | STAT-WMD01-PADS01-SPKR01 | 20000026 | 20000025 | Westmead Stn-Plat 1/2 Speaker No1 |
| | | **Sy** | | | STAT-WMD01-SECS01 | 20000027 | 20000000 | Westmead Stn-CCTV Sys |
| | | | **Pr** | | STAT-WMD01-SECS01-CCTV01 | 20000028 | 20000027 | Westmead Stn-Plat 1/2 CCTV No1 |
| | | | **Pr** | | STAT-WMD01-SECS01-CCTV02 | 20000029 | 20000027 | Westmead Stn-Dn Side Entry CCTV No2 |
| | | | **Pr** | | STAT-WMD01-SECS01-CCTV03 | 20000030 | 20000027 | Westmead Stn-Bus Stand A CCTV No3 |
| | | | **Pr** | | STAT-WMD01-SECS01-HELP01 | 20000031 | 20000027 | Westmead Stn-Plat 1/2 Help Pt No1 |

| **Key:** | |
|---|---|
| **Co** | Complex |
| **En** | Entity |
| **Sy** | System |
| **Pr** | Product |
| **El** | Element |
| **R** | Product (rotable) |

**WMD is an example of unique coding of an Interchange or Facility located in Westmead (defined as a Location Reference Code)**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Alias may also be used with assets having system generated numbering**

**Figure 24 - Example of a train station asset hierarchy (not shown complete) – with asset identifiers and descriptions**

Figure 24 also shows an example of the use of structured asset identifiers and system generated asset identifiers as part of the train station interchange complex asset register breakdown. Typically only one asset identifier method is used unless an alias is required to assist in the identification of assets that have system generated asset identifiers.

The structured asset identifiers provide a parent-child structure in the coding at the different levels. The system generated asset identifiers provide a parent-child relationship at the different levels.

The train station interchange is shown broken down into a functional set of contained assets within the interchange (entities, systems, elements and products) including examples of detailed asset descriptions for every asset instance.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

### 9.11.3. Facilities

A facility is a zonal area (within a precinct boundary) that contains buildings, systems, plant and associated infrastructure assets to support the operation and maintenance of transport services including the home depots of mobile fleet assets. The types of facilities include the following:

- rest area facilities
    - rest area locations
    - load checking area locations
- electrical facilities
    - substations (traction, non-traction and distribution)
    - sectioning huts
    - electrical backup supply locations
- signalling, control and traffic facilities
    - rail signal complexes and signal locations
    - rail control system locations
    - road traffic control locations
- telecommunications facilities
    - communications, passenger security and passenger information locations
    - road traffic information, warning, compliance and regulatory locations
    - condition monitoring locations
- service facilities
    - services control locations – buildings and tunnels
    - services plant locations - water and sewerage treatment plants
    - laboratories

- maintenance facilities
  - maintenance depots (fleet – train, light rail, bus and ferry) – servicing and presentation
  - maintenance depots (infrastructure)
  - workshops
- logistics facilities
  - warehouses
  - fabrication centres
  - quarries
- operations facilities
  - operations control centres
  - drivers and guards facilities
  - training centres
  - office complexes
  - shed complexes

Figure 25 shows examples of service facilities (electrical, signalling and communications), maintenance facilities and operations facilities.















**Figure 25 - Examples of facilities**

The following infrastructure assets and systems are generally included in transport facilities:

- plant including mobile plant, fixed plant and minor plant and equipment
- buildings
- fencing and barriers
- car parking and taxi ranks
- retaining structures including retaining walls, sea walls and basins
- miscellaneous structures including slipways, dry docks, inspection pits, walkways and cycleways
- roads including access roads
- electrical substations including traction, non-traction substation and distribution equipment
- electrical LV distribution
- rail signalling and control equipment including trackside signalling equipment, level crossing protection, ATP, interlockings, workstations, telemetry, power supply and cables
- road traffic control systems
- rail control systems
- technology and telecommunications systems including road traffic information systems, passenger information systems, road traffic warning systems, passenger security systems and ticketing systems
- technology and telecommunications equipment
    - customer information indicators and clocks, audio and public address
    - security help points and CCTV
    - wireless, network and terminal equipment
    - telecommunication licences
    - condition monitoring equipment
    - ticketing equipment
    - hardware
    - software applications and licences
- services including building management, vertical transport (lifts and escalators), fire management, HVAC, LV electrical and lighting, gas, air, fuel and hydraulic (water, sewer and drainage) systems

- furniture and fixtures including bike lockers, bike racks, seats, bins, boards, screens, light poles, totems and amenities
- landscaping including gardens, pavers and trees
- heritage items

Figure 26 and Figure 27 show examples of a fleet maintenance depot facility asset hierarchy (grouped by functional system where applicable) based on the facility complex described in Section 9.1. An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

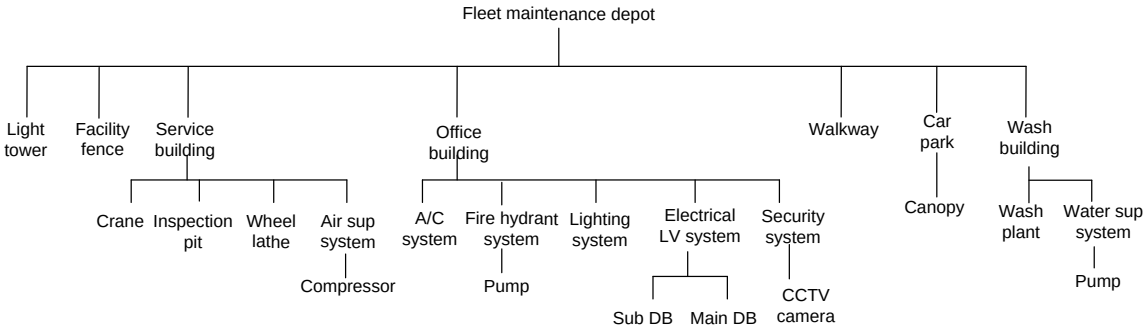


**Figure 26 - Example of a fleet maintenance depot facility asset hierarchy - concept model**

| | Asset | | | | Service Provider Asset ID | | | |
|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description |
| Facility | Co | | | | BDPT-KGE01 | 30000000 | | Kingsgrove Bus Dept |
| | | En | | | BDPT-KGE01-FENC01 | 30000001 | 30000000 | Kingsgrove Bus Dept-Secu Fence |
| | | En | | | BDPT-KGE01-BLDG01 | 30000002 | 30000000 | Kingsgrove Bus Dept-Off Bldg |
| | | | Sy | | BDPT-KGE01-BLDG01-FHYS01 | 30000003 | 30000002 | Kingsgrove Bus Dept-Off Bldg-Fire Hy Sys |
| | | | Sy | | BDPT-KGE01-BLDG01-ACON01 | 30000004 | 30000002 | Kingsgrove Bus Dept-Off Bldg-Air Con Sys |
| | | | Sy | | BDPT-KGE01-BLDG01-ELEC01 | 30000005 | 30000002 | Kingsgrove Bus Dept-Off Bldg-LV Elec Sys |
| | | | Sy | | BDPT-KGE01-BLDG01-SECS01 | 30000006 | 30000002 | Kingsgrove Bus Dept-Off Bldg-CCTV Sys |
| | | | | Pr | BDPT-KGE01-BLDG01-SECS01-CCTV1 | 30000007 | 30000006 | Kingsgrove Bus Dept-Off Bldg-CCTV No1 |
| | | | | Pr | BDPT-KGE01-BLDG01-SECS01-CCTV2 | 30000008 | 30000006 | Kingsgrove Bus Dept-Car Prk-CCTV No2 |
| | | En | | | BDPT-KGE01-BLDG02 | 30000009 | 30000000 | Kingsgrove Bus Dept-Serv Bldg |
| | | | Pr | | BDPT-KGE01-BLDG02-CRNE01 | 30000010 | 30000009 | Kingsgrove Bus Dept-Serv Bldg-Crane |
| | | | Pr | | BDPT-KGE01-BLDG02-LATH01 | 30000011 | 30000009 | Kingsgrove Bus Dept-Serv Bldg-Lathe |
| | | | En | | BDPT-KGE01-BLDG02-IPIT01 | 30000012 | 30000009 | Kingsgrove Bus Dept-Serv Bldg-Insp Pit |
| | | En | | | BDPT-KGE01-BLDG03 | 30000013 | 30000000 | Kingsgrove Bus Dept-Wash Bldg |
| | | | Sy | | BDPT-KGE01-BLDG03-WATR01 | 30000014 | 30000013 | Kingsgrove Bus Dept-Wash Bldg-Water Sys |
| | | | | Pr | BDPT-KGE01-BLDG03-WATR01-PUMP1 | 30000015 | 30000014 | Kingsgrove Bus Dept-Wash Bldg-Water Pump |
| | | | Pr | | BDPT-KGE01-BLDG03-WASH01 | 30000016 | 30000013 | Kingsgrove Bus Dept-Wash Bldg-Wash Plant |
| | | En | | | BDPT-KGE01-CRPS01 | 30000017 | 30000000 | Kingsgrove Bus Dept-Car Prk |
| | | | En | | BDPT-KGE01-CRPS01-CNPY01 | 30000018 | 30000017 | Kingsgrove Bus Dept-Car Prk Cnpy |
| | | En | | | BDPT-KGE01-WALK01 | 30000019 | 30000000 | Kingsgrove Bus Dept-Walkway |

| | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**KGE is an example of unique coding of an Interchange or Facility located in Kingsgrove (defined as a Location Reference Code)**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Alias may also be used with assets having system generated numbering**

**Figure 27 - Example of a fleet maintenance depot facility asset hierarchy (not shown complete) - with asset identifiers and descriptions**

Figure 27 also shows an example of the use of structured asset identifiers and system generated asset identifiers as part of the fleet maintenance depot facility complex asset register breakdown. Typically only one asset identifier method is used unless an alias is required to assist in the identification of assets that have system generated asset identifiers.

The structured asset identifiers provide a parent-child structure in the coding at different levels. The system generated asset identifiers provide a parent-child relationship at different levels.

The fleet maintenance depot facility is shown broken down into a functional set of contained assets within the facility (entities, systems, elements and products) including examples of detailed asset descriptions for every asset instance.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

Figure 28 and Figure 29 show examples of an electrical traction substation facility asset hierarchy (grouped by functional system where applicable) based on the facility complex described in Section 9.1 and shows the electrical traction substation complex made up of functional set of contained assets (entities, systems, elements and products). An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

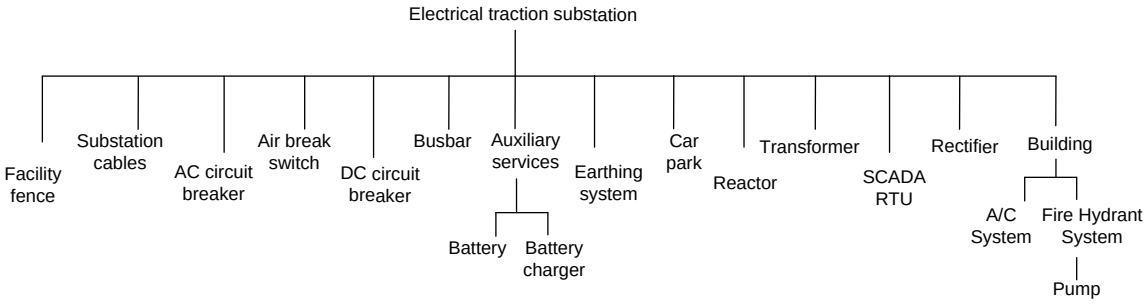


**Figure 28 - Example of an electrical traction substation facility asset hierarchy - concept model**

| | Asset | | | | Service Provider Asset ID | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description | Rotable | S/No. Fitted |
| Facility | Co | | | | TSUB-LMW01 | 40000000 | | Lewisham West SS | | |
| | | En | | | TSUB-LMW01-FENC01 | 40000001 | 40000000 | Lewisham West SS-Secu Fence | | |
| | | Sy | | | TSUB-LMW01-ERTH01 | 40000002 | 40000000 | Lewisham West SS-Earthing Sys | | |
| | | En | | | TSUB-LMW01-CRPS01 | 40000003 | 40000000 | Lewisham West SS-Staff Car Prk | | |
| | | En | | | TSUB-LMW01-BLDG01 | 40000004 | 40000000 | Lewisham West SS-Bldg | | |
| | | | Sy | | TSUB-LMW01-BLDG01-ACON01 | 40000005 | 40000004 | Lewisham West SS-Air Con Sys | | |
| | | | Sy | | TSUB-LMW01-BLDG01-FHYS01 | 40000006 | 40000004 | Lewisham West SS-Fire Hy Sys | | |
| | | Pr | | | TSUB-LMW01-FEXT01 | 40000007 | 40000000 | Lewisham West SS-Fire Ext A | | |
| | | Pr | | | TSUB-LMW01-FEXT02 | 40000008 | 40000000 | Lewisham West SS-Fire Ext B | | |
| | | Pr | | | TSUB-LMW01-AXPA01 | 40000009 | 40000000 | Lewisham West SS-AC Aux Panel | | |
| | | Pr | | | TSUB-LMW01-ACCB01 | 40000010 | 40000000 | Lewisham West SS-ACCB Rect Tran | | |
| | | R | | | TSUB-LMW01-DCCB01 | 40000011 | 40000000 | Lewisham West SS-DCCB Fdr D8-U8 | Y | DCCB1234 |
| | | R | | | TSUB-LMW01-DCCB02 | 40000012 | 40000000 | Lewisham West SS-DCCB Fdr D9-U9 | Y | DCCB1235 |
| | | Pr | | | TSUB-LMW01-SWIT01 | 40000013 | 40000000 | Lewisham West SS-DC Swit U8 | | |
| | | Pr | | | TSUB-LMW01-SWIT02 | 40000014 | 40000000 | Lewisham West SS-DC Swit U9 | | |
| | | Pr | | | TSUB-LMW01-BUSB01 | 40000015 | 40000000 | Lewisham West SS-DC Busb 750V | | |
| | | Pr | | | TSUB-LMW01-CABL01 | 40000016 | 40000000 | Lewisham West SS-AC Cabl 11KV Fdr | | |
| | | Pr | | | TSUB-LMW01-CABL02 | 40000017 | 40000000 | Lewisham West SS-DC Cabl Fdr U8 | | |
| | | Pr | | | TSUB-LMW01-CABL03 | 40000018 | 40000000 | Lewisham West SS-DC Cabl Fdr U9 | | |
| | | R | | | TSUB-LMW01-TRAN01 | 40000019 | 40000000 | Lewisham West SS-Rect Tran 11KV | Y | TRAN6789 |
| | | Pr | | | TSUB-LMW01-TRAN02 | 40000020 | 40000000 | Lewisham West SS-Aux Tran 600/415V | | |
| | | Pr | | | TSUB-LMW01-TRAN03 | 40000021 | 40000000 | Lewisham West SS-Isol Tran 415V | | |
| | | Sy | | | TSUB-LMW01-AUXS01 | 40000022 | 40000000 | Lewisham West SS-Aux Serv Sys | | |
| | | | Pr | | TSUB-LMW01-AUXS01-BATT01 | 40000023 | 40000022 | Lewisham West SS-Aux Serv-Batt | | |
| | | | Pr | | TSUB-LMW01-AUXS01-BCHG01 | 40000024 | 40000022 | Lewisham West SS-Aux Serv-Batt Chgr | | |
| | | Pr | | | TSUB-LMW01-RECT01 | 40000025 | 40000000 | Lewisham West SS-Rect | | |
| | | Pr | | | TSUB-LMW01-HFLT01 | 40000026 | 40000000 | Lewisham West SS-DC Harm Fltr | | |
| | | Pr | | | TSUB-LMW01-RECO01 | 40000027 | 40000000 | Lewisham West SS-REC | | |
| | | Pr | | | TSUB-LMW01-SCDE01 | 40000028 | 40000000 | Lewisham West SS-SCADA RTU | | |

| Key: | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**LMW is an example of unique coding of an Interchange or Facility located in Lewisham West (defined as a Location Reference Code)**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Serialised rotable does not have a structured asset identifier as it may move over its life (it may have an Alias)**
**Alias may also be used with assets having system generated numbering**

**Figure 29 - Example of an electrical traction substation facility asset hierarchy (not shown complete) - with asset identifiers and descriptions**

Figure 29 also shows an example of the use of structured asset identifiers and system generated asset identifiers as part of the electrical traction substation facility complex asset register breakdown. Typically only one asset identifier method is used unless an alias is required to assist in the identification of assets that have system generated asset identifiers.

The structured asset identifiers provide a parent-child structure in the coding at the different levels. The system generated asset identifiers provide a parent-child relationship at the different levels.

The electrical traction substation facility is shown broken down into a functional set of contained assets within the facility (entities, systems, elements and products) including examples of detailed asset descriptions for every asset instance.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

If the asset is a rotable it shall not have a structured asset identifier that is used to define its location or position as this may change over time.

## 9.11.4. Feeders

Feeders contain fixed infrastructure assets. The types of feeders include the following:

- HV feeders (heavy rail)
- communication feeders

Each feeder shall include the following infrastructure assets where applicable:

- cable feeders, aerial line feeders and pole equipment
- service routes, underline crossings and pits

Figure 30 and Figure 31 show examples of an electrical HV feeder asset hierarchy based on the feeder complex described in Section 9.1. An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

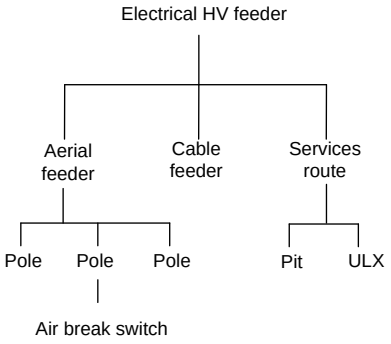


**Figure 30 - Example of an electrical HV feeder asset hierarchy - concept model**

| | Asset | | | | Service Provider Asset ID | | | |
|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description |
| Feeder | Co | | | | HFDR-721 | 50000000 | | 33KV Fdr 721 Granville-Blacktown |
| | | En | | | HFDR-721-CABL01 | 50000001 | 50000000 | 33KV Fdr 721 Cabl-Granville SS-Pole1 |
| | | En | | | HFDR-721-AERL01 | 50000002 | 50000000 | 33KV Fdr 721 Aerial-Pole1-15 |
| | | | Pr | | HFDR-721-AERL01-POLE01 | 50000003 | 50000002 | 33KV Fdr 721 Pole No1 |
| | | | Pr | | HFDR-721-AERL01-POLE02 | 50000004 | 50000002 | 33KV Fdr 721 Pole No2 |
| | | | Pr | | HFDR-721-AERL01-POLE03 | 50000005 | 50000002 | 33KV Fdr 721 Pole No3 |
| | | | Pr | | HFDR-721-AERL01-POLE04 | 50000006 | 50000002 | 33KV Fdr 721 Pole No4 |
| | | En | | | HFDR-721-CABL02 | 50000007 | 50000000 | 33KV Fdr 721 Cabl-Pole15-Blacktown SS |
| | | En | | | HFDR-721-CSRB01 | 50000008 | 50000000 | 33KV Fdr 721 Cabl Services Route |
| Key: | | | Pr | | HFDR-721-CSRB01-CPIT01 | 50000009 | 50000008 | 33KV Fdr 721 Cabl Services Route-Pit1 |

| | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**Feeder Number 721 is supplied by the Electrical Supply Authority**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Alias may also be used with assets having system generated numbering**

**Figure 31 - Example of an electrical HV feeder asset hierarchy (not shown complete) - with asset identifiers and descriptions**

Figure 31 also shows an example of the use of structured asset identifiers and system generated asset identifiers as part of the electrical HV feeder complex asset register breakdown. Typically only one asset identifier method is used unless an alias is required to assist in the identification of assets that have system generated asset identifiers.

The structured asset identifiers provide a parent-child structure in the coding at the different levels. The system generated asset identifiers provide a parent-child relationship at the different levels.

The electrical HV feeder is shown broken down into a functional set of contained assets within the feeder (entities, systems, elements and products) including examples of detailed asset descriptions for every asset instance.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

## 9.11.5. Fleet

Fleet assets includes passenger trains, light rail vehicles, ferries, vessels, buses, track vehicles and machines, locomotives, wagons, recording vehicles, mobile plant, road vehicles and trailers.

Each fleet asset contains onboard fleet systems. Figure 32 and Figure 33 shows examples of fleet types including mobile plant.

















**Figure 32 - Examples of passenger and freight fleet**









**Figure 33 - Examples of mobile plant**

Plant assets cover the following three classes:

- mobile plant
- fixed plant
- minor tools and equipment

Mobile plant is covered under fleet whereas fixed plant and minor tools and equipment are associated with assets contained within a facility as explained in Section 9.11.3.

Fleet includes but is not limited to the following onboard systems, subsystems and assemblies:

- air conditioning system
- ballast system
- bilge system
- body and hull system
- bogie system
- braking system
- chassis system
- catering equipment system

- control and monitoring system
- communications system
- customer information system
- control and monitoring system
- door system
- engine and drive system
- electrical system
- lighting system
- main and auxiliary power system
- navigation system
- pneumatic system
- propulsion system
- steering system
- ticketing system
- traction system
- transmission system
- sanitary system

Figure 34 and Figure 35 show examples of a train and ferry asset hierarchy (containing a list of serialised assets some of which are rotable that exist physically and are grouped by functional system where applicable) based on the fleet complex in Section 9.1. An asset classification, asset specification and applicable asset references shall be applied at all levels and to all objects in the asset hierarchy.

| | Asset | | | | Service Provider Asset ID | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description | Rotable | S/No. Fitted |
| Train | Co | | | | TSET-T20 | 60000000 | | Tangara Set T20 | | |
| | | Co | | | TSET-T20-TCAR-6101 | 60000001 | 60000000 | Tangara Car 6101 | | |
| | | | R | | TSET-T20-TCAR-6101-BOGS-BOGI1 | 60000002 | 60000001 | Tangara Car 6101-Bogie No1 | Y | BOGI123 |
| | | | R | | TSET-T20-TCAR-6101-BOGS-BOGI2 | 60000003 | 60000001 | Tangara Car 6101-Bogie No2 | Y | BOGI124 |
| | | | Pr | | TSET-T20-TCAR-6101-INCS-CPLR1 | 60000004 | 60000001 | Tangara Car 6101-Auto Coupler | | |
| | | | Pr | | TSET-T20-TCAR-6101-INCS-CPLR2 | 60000005 | 60000001 | Tangara Car 6101-Semi Perm Coupler | | |
| | | | Pr | | TSET-T20-TCAR-6101-INCS-GWAY1 | 60000006 | 60000001 | Tangara Car 6101-Gangway | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOOR13 | 60000007 | 60000001 | Tangara Car 6101-Door 1/3 | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOOR24 | 60000008 | 60000001 | Tangara Car 6101-Door 2/4 | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOOR57 | 60000009 | 60000001 | Tangara Car 6101-Door 5/7 | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOOR68 | 60000010 | 60000001 | Tangara Car 6101-Door 6/8 | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOORD | 60000011 | 60000001 | Tangara Car 6101-Drivers Side Door | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOORG | 60000012 | 60000001 | Tangara Car 6101-Guards Side Door | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOORI | 60000013 | 60000001 | Tangara Car 6101-Intermediate End Door | | |
| | | | Pr | | TSET-T20-TCAR-6101-DOOS-DOORT | 60000014 | 60000001 | Tangara Car 6101-Transverse Door | | |
| | | | Pr | | TSET-T20-TCAR-6101-APSS-SINV1 | 60000015 | 60000001 | Tangara Car 6101-Static Inverter | | |
| | | | Pr | | TSET-T20-TCAR-6101-APSS-BCHG1 | 60000016 | 60000001 | Tangara Car 6101-Battery Charger | | |
| | | | R | | TSET-T20-TCAR-6101-CCOS-ACON1 | 60000017 | 60000001 | Tangara Car 6101-Air Cond Unit No1 | Y | ACU123 |
| | | | R | | TSET-T20-TCAR-6101-CCOS-ACON2 | 60000018 | 60000001 | Tangara Car 6101-Air Cond Unit No2 | Y | ACU124 |
| | | | Pr | | TSET-T20-TCAR-6101-MPSS-HSCB1 | 60000019 | 60000001 | Tangara Car 6101-High Speed Cct Breaker | | |
| | | | Pr | | TSET-T20-TCAR-6101-MPSS-PNTO1 | 60000020 | 60000001 | Tangara Car 6101-Pantograph | | |
| | | | Pr | | TSET-T20-TCAR-6101-BRKS-AXBR1 | 60000021 | 60000001 | Tangara Car 6101-Aux Brake Unit | | |
| | | | Pr | | TSET-T20-TCAR-6101-CMOS-DLGR1 | 60000022 | 60000001 | Tangara Car 6101-Data Logger | | |

Key:

| | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**Set T20 and Car Number 6101 are examples of unique coding for the Tangara Train Fleet**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Serialised rotable does not have a structured asset identifier as it may move over its life (it may have an Alias)**
**Alias may also be used with assets having system generated numbering**

**Figure 34 - Example of a train set and car asset hierarchy (not shown complete) - with asset identifiers and descriptions**

| | Asset | | | | Service Provider Asset ID | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Container | Level 1 | Level 2 | Level 3 | Level 4 | Structured Asset ID or Alias | System Generated Asset ID | System Generated Parent Asset ID | Asset Description | Rotable | S/No. Fitted |
| Ferry | Co | | | | FERY-FE05 | 80000000 | | Victor Chang Ferry | | |
| | | R | | | FERY-FE05-PRPS-ENGN1 | 80000001 | 80000000 | Victor Chang Ferry-Main Engine Stbd | Y | 6143 |
| | | R | | | FERY-FE05-PRPS-ENGN2 | 80000002 | 80000000 | Victor Chang Ferry-Main Engine Port | Y | 6144 |
| | | R | | | FERY-FE05-PRPS-GBOX1 | 80000003 | 80000000 | Victor Chang Ferry-Gearbox Stbd | Y | 9A3801 |
| | | R | | | FERY-FE05-PRPS-GBOX2 | 80000004 | 80000000 | Victor Chang Ferry-Gearbox Port | Y | 9A3800 |
| | | R | | | FERY-FE05-PRPS-MGEN1 | 80000005 | 80000000 | Victor Chang Ferry-Main Gen Stbd | Y | G160365 |
| | | R | | | FERY-FE05-PRPS-MGEN2 | 80000006 | 80000000 | Victor Chang Ferry-Main Gen Port | Y | G160366 |

| | |
|---|---|
| Co | Complex |
| En | Entity |
| Sy | System |
| Pr | Product |
| El | Element |
| R | Product (rotable) |

**FE is based on the Emerald Class Fleet type code**
**Parent - Child relationship inferred in structured coding or based on system generated numbering**
**Serialised rotable does not have a structured asset identifier as it may move over its life (it may have an Alias)**
**Alias may also be used with assets having system generated numbering**

**Figure 35 - Example of a ferry asset hierarchy (not shown complete) - with asset identifiers and descriptions**

Figure 34 and Figure 35 show examples of the use of structured asset identifiers as part of the fleet complex asset register breakdown. The complex is shown broken down into its physical set of contained assets (products) including asset descriptions.

To assist coding with the structured asset identifiers the applicable asset classification functions can be applied to all maintainable levels within the asset hierarchy in Section 9.7 and Section 9.10 and in accordance with the coding requirements in T MU AM 02002 TI. This may be the primary asset key or an alias.

If the asset is a rotable it shall not have a structured asset identifier as the primary key that is used to define its location or position as this may change over time.

As shown in Figure 29, Figure 34 and Figure 35 where there is a requirement to manage and track rotable assets, the asset register hierarchy shall be designed to accommodate rotable assets being fitted and removed to allow repair, replacement or refurbishment activities to be performed either with the rotable fitted in situ or at a repair facility. See Section 9.13 for further details.

## 9.12. Asset register descriptions

Asset descriptions in Figure 21, Figure 24, Figure 27, Figure 29, Figure 31, Figure 34 and Figure 35 shall be based on the complex and provide detailed information to uniquely describe the asset in regards to their complex type or name, asset function or type, location or position, or label.

All assets contained within the complex shall also make reference to the complex itself at all levels including the fitted rotable asset. The complex for a rotable asset may change over its life as it is removed, repaired, stored and fitted back into service. Where asset description character limits exist the asset function may be abbreviated to align with the function code as defined in the asset classification, for example, the code for footbridge is FBGE and the code for battery charger is BCHG.

The asset description for rotable assets shall also include details of the location or position or label it is fitted to: for example, No1 position, starboard engine, feeder A123. The serial number is an attribute that may also be included as part of the asset description if required.

## 9.13. Rotable assets and tracking

The maintenance concept definition (MCD) identifies and describes the strategies for acquiring and managing the appropriate levels of spare parts (including critical components) to support maintenance and maintenance support activities in accordance with T MU AM 06009 ST *Maintenance Concept Definition*.

The acquisition and management of spare parts includes the following:

- parts used to replace items that have failed in service, however, are not economical to repair and will be disposed of appropriately (may be serialised though not tracked)
- rotable parts which can be economically managed through a process where they are removed, repaired by an authorised repairer and returned to a working and serviceable condition to be stored for future use (serialised and tracked)

Rotable assets are serialised assets or assemblies that are fitted or removed from an asset and refitted to the same or other similar asset such as a train bogie, traction motor and HV withdrawable circuit breaker as shown in Figure 36. Rotable assets shall be managed to ensure minimum service downtime and shall be tracked by their serial number in the asset register when fitted or removed into a spare location or repair facility. Serialised rotable products or an assembly of products shall be fitted into defined positions where required. Assemblies may also be broken down into individual products if they are to be tracked and managed separately.

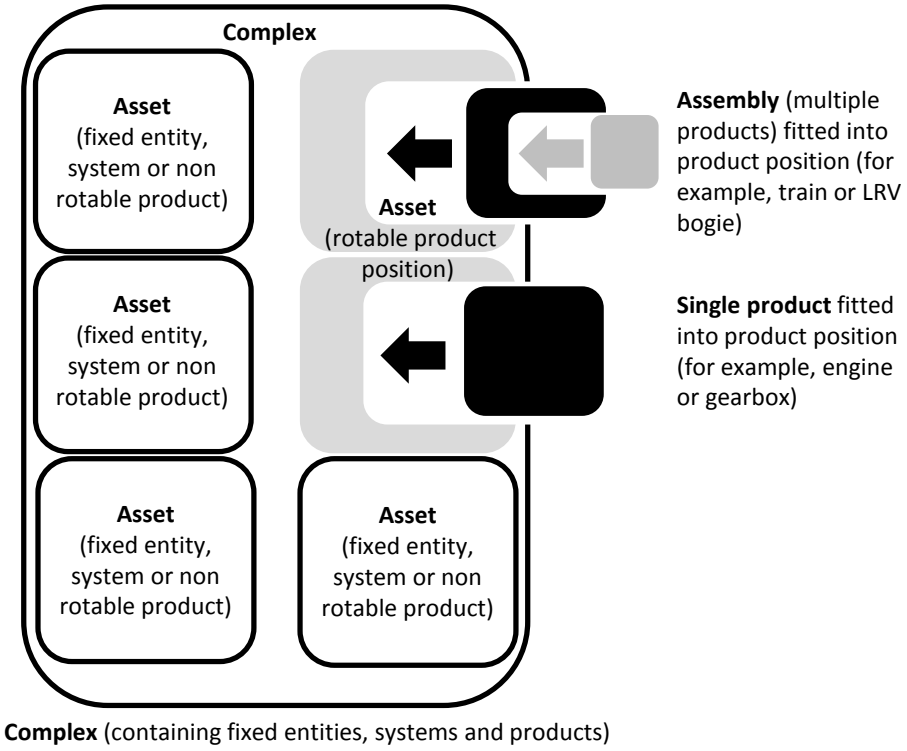


**Figure 36 - Rotable assets and assemblies within a complex**

Figure 37 shows some examples of a rotable asset and its tracking for an electrical HV circuit breaker and train bogie.

The HV circuit breaker shown in the 'Feeder B' position (S/No. DCCB1235) is moved to the spare position for maintenance, failure repair or for operational requirements. As a result the current spare circuit breaker (S/No. DCCB1238) is moved into the operational feeder B position.

The train carriage bogie shown fitted in the 'Bogie 1' position (S/No. BOGI4567) is removed as a result of failure and requires repair or refurbishment. As a result a different bogie is fitted back into the 'Bogie 1' position to restore the train to an operational state.

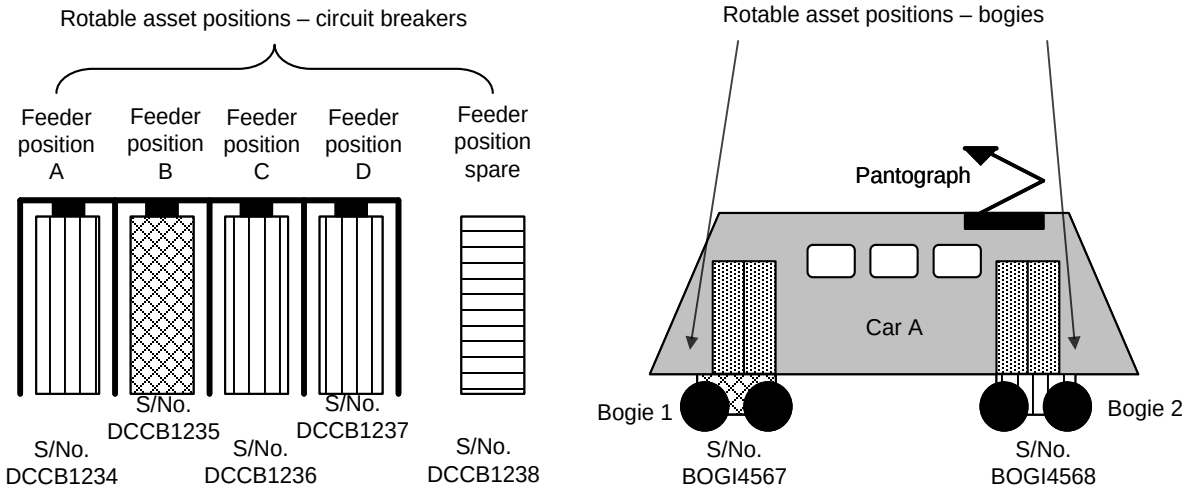


**Figure 37 - Example of rotable assets and tracking**

Assets or assemblies may be moved throughout their useful life due to the following reasons:

- maintenance examination – rotate interchangeable asset or assembly with a spare for temporary maintenance purposes and to keep system operational (maintained asset or assembly shall be moved back into operation while spare is placed back into the spare location)
- failure repair – rotate interchangeable failed asset or assembly with a spare to replace the failed item (failed asset or assembly shall be sent for repairs if it is a repairable item or disposed if it is not economically viable)
- refurbishment – rotate interchangeable degraded asset or assembly (based on condition or age) with a spare to replace the degraded item (degraded item shall then be sent for refurbishment if it has a remaining useful life or disposed if it is not economically viable)
- operational duty – rotate interchangeable asset or assembly with a spare to support operational requirements and to ensure even usage distribution

The asset register shall reflect the current configuration and status of all fitted assets and assemblies and the location and status of removed assets and assemblies.

Not all serialised assets are rotable. All rotable assets shall be identified as a rotable within the asset register by the rotable asset attribute.

## 9.14. Asset capitalisation and the fixed asset register

NSW Treasury requires TfNSW to value its assets at 'fair value'. In the context of this document 'fair value' for new assets is based on the cost of construction of the completed asset and will applies to any expense with a value greater than $5000 (excluding land and network assets which have no capitalisation threshold), with an economic benefit exceeding 12 months and when it is considered a fixed asset in accordance with accounting standards.

These assets shall be included in the TfNSW fixed asset register.

Assets in the fixed asset register shall be aligned with the TfNSW owned assets managed in the asset register by the asset custodian at the appropriate level in the hierarchy when capitalised as a direct acquisition cost or by the aggregation of costs of the children assets rolled up to a parent asset level (facility or system level, for example, signal locations where the internal infrastructure asset capital costs are rolled up to the parent facility and capitalised at this level).

Asset as defined in Section 9.1 shall be related to one fixed asset class. The fixed asset classes are as follows:

- land
- buildings (leased or owned)
- infrastructure

- plant and equipment (leased or owned)
- fleet (leased or owned)
- intangibles

The relationship between assets (technical objects) and their associated fixed asset class is in T MU AM 02002 TI. The asset classification system provides a mapping as to when capital costs are applied directly or when capital costs are to be rolled up from a child asset to a parent facility or system level. The capital acquisition cost shall be recorded in the asset register as an attribute.

The asset hierarchy shall support the rollup of asset capital acquisition and maintenance costs to a parent level to enable asset capitalisation and financial revaluation requirements when capital costs are incurred over the operate and maintain stage of the asset life cycle. The ongoing depreciation and residual value of the asset are to be managed in the fixed asset register.

## 9.15. Asset data capture and asset attributes

Asset register data capture shall be in accordance with the requirements of the template and data dictionary provided in T MU AM 02006 TI. Examples of completed asset registers using the template in T MU AM 02006 TI are shown provided in Appendix C.

This asset register template and data dictionary support the handover of asset data for new and altered assets procured or constructed during projects and captured during the design and acquire stages defining the following:

- general requirements and attributes for all asset classes
- asset class specific attributes

The data dictionary contains both a list of general attributes and asset class specific attributes together with metadata that is supported by a library of published reference data as shown in Section 9.16.

These data attributes cover all fixed network infrastructure (linear and non-linear) and mobile fleet assets. Additional requirements for linear attributes and features are in Section 9.15.1.

### 9.15.1. Linear attributes and features

Assets are categorised as being linear, non-linear or mobile in accordance with Section 9.2.

A linear asset is an asset with a defined start kilometrage and end kilometrage or distance reference. Linear assets include track, road pavement, tunnels, boundary fencing, retaining walls, cuttings, embankments and overhead wiring along the corridor and platforms at an interchange. Linear asset attributes and features, including physical and functional configuration characteristics and maintenance information, shall also be defined with a start and end

reference relative to the length of the linear asset and shall also have a date reference to provide a record of when past and current physical configuration changes or maintenance activities were completed over its length.

A linear asset may also have attributes along its length defined as a single point reference, for example, kilometrage of a rail weld, rail joint or sign.

Figure 38 provides an example of the linear data attributes for track.

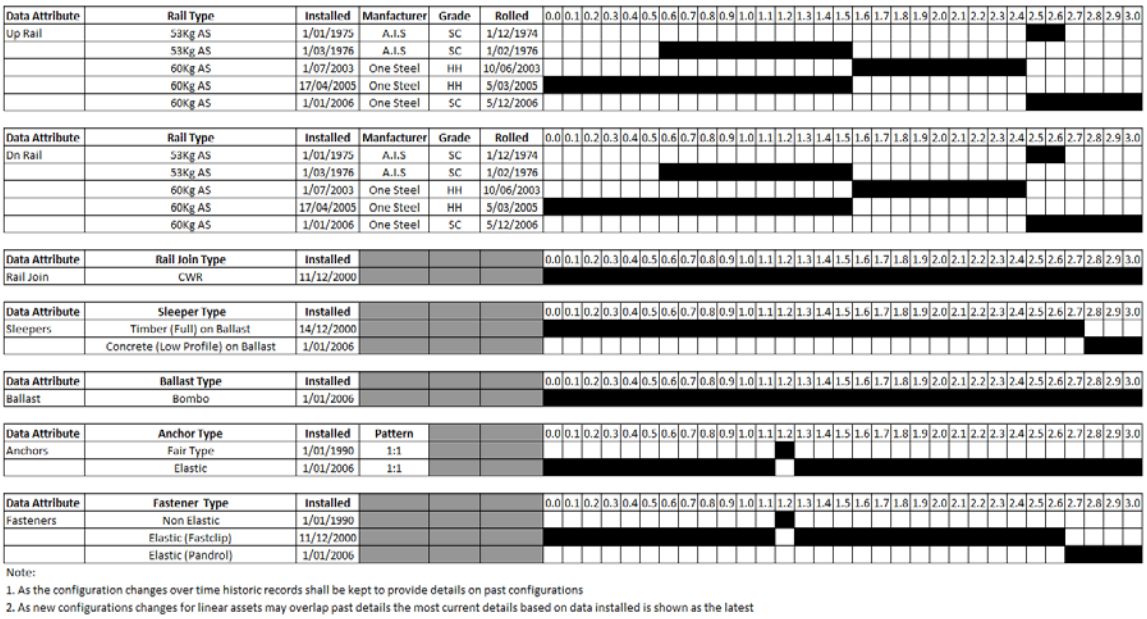


**Figure 38 - Example of linear configuration data attributes for track**

A linear asset may also describe any asset having the same start and end kilometrage or distance reference. These types of linear assets are located at discrete points along the corridor, for example, turnouts, bridges, level crossings, signals and trainstops.

## 9.16. Asset reference data library

The asset reference data library shall be used and consistently applied by all TfNSW cluster agencies and private operators and maintainers within their asset information systems and applied to all assets within the asset register as required by this standard.

The asset reference data libraries include the following:

- asset classifications (refer to T MU AM 02002 TI I)
- asset specifications (refer to T MU AM 01009 TI)

For all other key configuration asset data, the following attributes and metadata value lists shall be used and applied in accordance with T MU AM 02006 TI, T MU AM 01006 ST and T MU AM 01007 TI:

- Transport Network codes
- network corridors
- asset locations or sites
- asset base codes (track codes) and track names
- asset status (life cycle)
- asset condition index
- asset criticality index
- asset work order types and maintenance activity types
- asset work order priorities including maintenance service schedule classification
- asset owners, operators, maintainers (asset custodians and service providers)
- asset manufacturers

# 10. Asset information system requirements

The asset information system shall contain the following:

- a complete listing of the assets managed by the asset custodian on behalf of the asset owner in an asset register aligned with the asset classification system including all asset metadata and reference data
- all the asset information associated with the assets in the asset register as specified in this standard

Projects shall ensure that all key stakeholders (including TfNSW and the asset custodian) are involved collaboratively in the design and configuration of any new asset information system planned to be delivered.

Projects shall ensure that all key stakeholders (including TfNSW and the asset custodian) are involved collaboratively in transitioning the asset information (data and documents) to the new or existing asset information system managed by the asset custodian.

The asset information system shall be capable of the following:

- managing an asset register and all associated asset information, plans, manuals and activities into a consolidated system comprising one or more integrated repositories
- exporting data in commonly used industry standard formats

- providing integrated asset information within a reporting dashboard format to TfNSW and approved stakeholders
- planning, scheduling, prioritising and completing asset management activities
- storing the current and complete historical record of all asset information in a secured, controlled environment
- providing records in relation to inventory management, work order management, tracking of costs and asset warranty
- enabling the delivery of the following asset management functions:
    - plan and document management
    - work management, including capital work, recurrent maintenance work and costing
    - failure and defect management
    - asset condition management
    - configuration management
    - program and project management, including estimating
    - materials management
    - reporting
- integrating information with the following asset management related systems:
    - incident
    - financial
    - procurement
    - human resource and rostering
    - condition monitoring and supervisory control and data acquisition (SCADA)
    - operational systems, including control and timetables
    - business intelligence reporting and analysis
    - maintenance requirements analysis
    - engineering design
    - information modelling
    - mobile technology systems and devices, including supporting remote information access, review, capture and update
- producing reports on the configuration, condition, planned work, work history and performance of all assets including defect and failure, and incident analysis

- integrating data
- being sustainable, maintained fit for purpose and scalable

# 11. Asset data custodian requirements

The asset data custodian shall comply with the following requirements:

- manage and update the asset register and associated asset information on behalf of TfNSW
- ensure the asset register and associated asset information is updated in a timely manner for any new or altered assets including changes in Section 8.7
- ensure the asset register and associated asset information is a true and accurate representation of the asset condition and status of all assets throughout the contract period
- ensure all approved current TMPs and related service schedules are fully implemented relative to each asset within the asset register
- ensure all approved new or amended TMPs are fully implemented relative to each affected asset within the asset register within three months of being approved
- provide to TfNSW the asset register, associated asset information and reports held in the asset information system in an agreed format
- handover the asset register, associated asset information and reports to TfNSW at the end of contract in an agreed format
- accept new assets and update the asset register and associated asset information prior to operational readiness, including asset modifications and disposals
- provide direct access and training in the use of the asset information system to TfNSW nominated staff where required, including user and training materials in accordance with Section 7.4
- provide direct access and training in the use of the asset information system to third party maintainers where required
- ensure that all asset management activities are planned, scheduled, prioritised, controlled, recorded and monitored in the asset information system over the full life cycle of the asset, together with the planning and coordination of possessions and access to the asset

- ensure that all asset management activities are recorded in the asset information system within three business days of the activity taking place covering, but not limited to, the following:
    - spare parts and materials consumed on work orders including spares replenishment and the management of emergency (critical) spares
    - work order creation, management and cost collection for scheduled and unscheduled work, including work raised against the lowest asset in the asset register hierarchy where applicable
    - servicing records for measurements, condition assessment, photos, operating statistics, settings and adjustments to ensure asset remains within operating threshold or tolerance
    - defects or fault creation and management - part causing failure, size, criticality, status, root cause and corrective action for both functional and conditional failures (for both temporary and permanent repairs) including reference to the incident or event where applicable
    - incident management - capturing incident or event details including the impact on operations and delays
- record all asset information in the asset information system as a result of configuration change, including the following:
    - asset configuration changes or modifications including modifications to individual discrete asset and linear asset configuration changes over the length of the linear asset
    - installation and exchange of components including type approved products and products under trial
    - fitment and removal of rotable serialised assets including the location and status of the removed assets
    - changes to the TMP, including service schedules, frequency, tasks, latitude and criticality
    - changes as a result of failure and corrective action
    - changes as a result of a concession to a standard (the concession document shall also be linked to the asset in the document management system)
- generate reports to TfNSW as required from the asset information system on the following:
    - current performance of the asset
    - current condition of the asset

  - current asset duty and utilisation of the asset
  - annual works planning, delivery, production and backlog
  - maintenance compliance
  - asset register configuration and history
- allow TfNSW to audit the accuracy, validity and currency of the asset register and associated asset information as requested
- monitor and analyse the asset information to detect the need for maintenance, indicated by the following:
  - a fault or defect requiring immediate attention
  - a series of faults or defects comprising separate events that individually do not require action, however, which collectively have passed a specified threshold of acceptability
  - usage that indicates the need for preventative maintenance
  - condition, where a physical property of an asset has fallen outside of acceptable limits
  - performance, where a measured factor has fallen below a specified level or outside of an acceptable range
  - predicted failure or the predicted and unacceptable decline of an asset
- ensure that the asset information is managed and secured by the following:
  - provision of disaster recovery and suitable storage
  - allocation of roles and responsibilities for the creation, maintenance, access to and assurance of the data

# Appendix A Suggested reading

The following documents have not been directly referred to in this standard. However, these documents may assist in providing some contextual information on asset information management.

AS ISO 55001 - *Asset management – Management systems – Requirements*

AS ISO 55002:2014 - *Asset management – Management systems – Guidelines for the application of ISO 55001*

ISO 19650-1 - *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part1: Concepts and principles*

ISO 19650-2 - *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 2: Delivery phase of the assets*

PAS 1192-3 *Specification for information management for the operational phase of assets using building information modelling*

# Appendix B AIM

The centre of the AIM is the asset register that contains the details for every unique instance of an asset across the Transport Network managed by transport agencies and contracted service providers on behalf of TfNSW.

The asset register contains data in relation to its identification (including an asset id, description, serial no, label, product code).

The asset data set is extended to cover the following:

- Asset classification – a single code that associates and asset with an asset class, function and type – this is concatenated to define a technical object code. The asset discipline and the asset category (linear, non-linear or mobile) are linked with the technical object code.
- Asset specification – a single code that associates an asset with an asset specification. This defines; make or model attributes (physical or functional), components, failure modes, maintenance requirements and spares.
- Location classification – a set of codes that associates an asset with one or more physical and spatial location references. This defines; corridor, location or site, zone, position, room, kilometre reference, track base code, road or link and spatial coordinate references.
- System – a single code that associates an asset with a system (where relevant) to define a functional grouping of related assets and is based on its asset classification.
- Transport Network – a single code that associates an asset with one transport mode and network. This provides a modal view across the portfolio and includes; heavy rail (Sydney, country), light rail (Sydney, Newcastle, Parramatta), metro rail (Sydney), road, maritime, air and active.
- Attributes – a set of references associated with an asset defining a range of generic and specific attributes based on its asset classification and specification.

The assets in the asset register are integrated with records that support the life cycle management of assets owned by TfNSW. These records extend the asset information to cover the following:

- Works management - an asset is linked with defects and maintenance and servicing transactional records.
- Document management - an asset is linked with a range of technical engineering documents, drawings and models including those based on its specification covering; technical maintenance plans, operating and maintenance manuals, certificates, warranties, drawings and models, test and commissioning reports, design reports, condition reports and maintenance reports.

- Geospatial information - an asset is linked with spatial information (point, line, and polygon) to define shape and geospatial location.
- Financial management - an asset is linked to a fixed asset ID and capitalised based on its asset classification. This covers the initial cost of capital acquisition as well as costs incurred over the life-cycle used to improve and extend the asset life.
- Procurement and contract management - an asset is linked to a contract ID and service provider.

# Appendix C Asset register examples

Figure 39 to Figure 41 show indicative examples and display details of the requirement to capture asset register data to enable the handover of new and altered assets at the acquire stage or the handover of existing assets at the maintenance stage. Only general attributes are displayed.

**Example (Fleet)**
**Train Set and Carriage**

| | Example set of asset attributes | | | | | | | | | | | | | | | | | Rotable and non-rotable attributes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asset Description | Label | Asset Technical Object | Asset Sys | Transport Mode And Network | Asset Complex | Asset Complex Zone | Position (incl rotable) | Room | Corridor | Location | Start Km | End Km | Rotable (Y/N) | Asset Owner | Asset Operator | Asset Maint Prim | Asset Maint Prim Contract ID | Serial No | Manufacturer | Model | Variant | Asset Specification TMC |
| Tangara Set T20 | T20 | TN-TSET-T | | HR-S | TSET-T20 | | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | Goninan | Tangara | | RT00000000 |
| Tangara Car 6101 | 6101 | TN-TCAR-T2 | | HR-S | TCAR-6101 | | Car Position No1 | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | Goninan | Tangara | Control Trailer | RT15000000 |
| Tangara Car 6101-Bogie No1 | | FS-BOGI-TC | BOGS | HR-S | TCAR-6101 | Bogie | Bogie No1 | | | MCS01 | | | Y | TfNSW | SYDTR | SYDTR | | BOGI1234 | | TKA | | RT15020100 |
| Tangara Car 6101-Bogie No2 | | FS-BOGI-TC | BOGS | HR-S | TCAR-6101 | Bogie | Bogie No2 | | | MCS01 | | | Y | TfNSW | SYDTR | SYDTR | | BOGI1235 | | TKA | | RT15020100 |
| Tangara Car 6101-Gangway | | FS-GWAY | INCS | HR-S | TCAR-6101 | Gangway | No2 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15030400 |
| Tangara Car 6101-Coupler-Auto | | FS-CPLR-AU | INCS | HR-S | TCAR-6101 | Headstock | No1 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | ACPL1278 | | | | RT15030100 |
| Tangara Car 6101-Coupler-Semi Permnt | | FS-CPLR-SP | INCS | HR-S | TCAR-6101 | Headstock | No2 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | SCPL1234 | | | ` | RT15030200 |
| Tangara Car 6101-Door 1/3 | 1/3 | FS-DOOR-PA | DOOS | HR-S | TCAR-6101 | Body | 1/3 | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040400 |
| Tangara Car 6101-Door 2/4 | 2/4 | FS-DOOR-PA | DOOS | HR-S | TCAR-6101 | Body | 2/4 | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040400 |
| Tangara Car 6101-Door 5/7 | 5/7 | FS-DOOR-PA | DOOS | HR-S | TCAR-6101 | Body | 5/7 | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040400 |
| Tangara Car 6101-Door 6/8 | 6/8 | FS-DOOR-PA | DOOS | HR-S | TCAR-6101 | Body | 6/8 | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040400 |
| Tangara Car 6101-Drivers Side Door | | FS-DOOR-DR | DOOS | HR-S | TCAR-6101 | Drivers Cab | No2 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040200 |
| Tangara Car 6101-Guards Side Door | | FS-DOOR-GU | DOOS | HR-S | TCAR-6101 | Drivers Cab | No2 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040200 |
| Tangara Car 6101-Intermediate End Door | | FS-DOOR-IE | DOOS | HR-S | TCAR-6101 | Body | No1 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040500 |
| Tangara Car 6101-Transverse Door | | FS-DOOR-TD | DOOS | HR-S | TCAR-6101 | Drivers Cab | No2 End | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15040300 |
| Tangara Car 6101-Static Inverter | | FS-SINV | APSS | HR-S | TCAR-6101 | Roof | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15100100 |
| Tangara Car 6101-Battery Charger | | FS-BCHG | APSS | HR-S | TCAR-6101 | Roof | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15100300 |
| Tangara Car 6101-Air Con Unit No1 | | FS-ACON | CCOS | HR-S | TCAR-6101 | Roof | Air Con Unit No1 | | | MCS01 | | | Y | TfNSW | SYDTR | SYDTR | | ACU1117 | | | | RT15080100 |
| Tangara Car 6101-Air Con Unit No2 | | FS-ACON | CCOS | HR-S | TCAR-6101 | Roof | Air Con Unit No2 | | | MCS01 | | | Y | TfNSW | SYDTR | SYDTR | | ACU1118 | | | | RT15080100 |
| Tangara Car 6101-High Speed Cct Breaker | | FS-HSCB | MPSS | HR-S | TCAR-6101 | Roof | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15110400 |
| Tangara Car 6101-Pantograph | | FS-PNTO | MPSS | HR-S | TCAR-6101 | Roof | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15110100 |
| Tangara Car 6101-Aux Brake Unit | | FS-AXBR | BRKS | HR-S | TCAR-6101 | Underframe | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15050320 |
| Tangara Car 6101-Data Logger | | FS-DLGR | CMOS | HR-S | TCAR-6101 | Drivers Cab | | | | MCS01 | | | N | TfNSW | SYDTR | SYDTR | | | | | | RT15130800 |

**Figure 39 - Example of an asset register template for fleet – train (not shown complete)**

**Example (Fleet)**
**Ferry**

| | Example set of asset attributes | | | | | | | | | | | | | | | | | Rotable and non-rotable attributes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asset Description | Label | Asset Technical Object | Asset Sys | Transport Mode And Network | Asset Complex | Asset Complex Zone | Position (incl rotable) | Room | Corridor | Location | Start Km | End Km | Rotable (Y/N) | Asset Owner | Asset Operator | Asset Maint Prim | Asset Maint Prim Contract ID | Serial No | Manufacturer | Model | Variant | Asset Specification TMC |
| Victor Chang Ferry | | FE-FERY-FE | | FE-S | FERY-FE05 | | | | | BJM01 | | | N | TfNSW | TSYDF | TSYDF | | | Incat | 35m Catamaran | | |
| Victor Chang Ferry-Main Engine Stbd | | FS-ENGN | PRPS | FE-S | FERY-FE05 | Below Main Deck | Main Engine Stbd | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | 6143 | Yanmar | 6AYEM-GT | | |
| Victor Chang Ferry-Main Engine Port | | FS-ENGN | PRPS | FE-S | FERY-FE05 | Below Main Deck | Main Engine Port | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | 6144 | Yanmar | 6AYEM-GT | | |
| Victor Chang Ferry-Gearbox Stbd | | FS-GBOX | PRPS | FE-S | FERY-FE05 | Below Main Deck | Gearbox Stbd | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | 9A3801 | Twin Disc | Quickshift MGX6599SC | | |
| Victor Chang Ferry-Gearbox Port | | FS-GBOX | PRPS | FE-S | FERY-FE05 | Below Main Deck | Gearbox Port | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | 9A3800 | Twin Disc | Quickshift MGX6599SC | | |
| Victor Chang Ferry-Main Generator Stbd | | FS-MGEN | PRPS | FE-S | FERY-FE05 | Below Main Deck | Main Generator Stbd | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | G160365 | Mase | Mariner 3400T | | |
| Victor Chang Ferry-Main Generator Port | | FS-MGEN | PRPS | FE-S | FERY-FE05 | Below Main Deck | Main Generator Port | Engine Room | | BJM01 | | | Y | TfNSW | TSYDF | TSYDF | | G160366 | Mase | Mariner 3400T | | |

**Figure 40 - Example of an asset register template for fleet – ferry (not shown complete)**

**Example (Infrastructure)**
**Train Station**

| | Example set of attributes | | | | | | | | | | | | | | | | | Rotable and non-rotable attributes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asset Description | Label | Asset Technical Object | Asset Sys | Transport Mode And Network | Asset Complex | Asset Complex Zone | Position (incl rotable) | Room | Corridor | Location | Start Km | End Km | Rotable (Y/N) | Asset Owner | Asset Operator | Asset Maint Prim | Asset Maint Prim Contract ID | Serial No | Manufacturer | Model | Variant | Asset Specification TMC |
| Westmead Stn Interchange | | FA-STAT | | HR-S | STAT-WMD | | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | PP02100100 |
| Westmead Stn-Plat 1/2 | | BD-PLAT-TR | | HR-S | STAT-WMD | Platform 1/2 | | | W00 | WMD | 25.062 | 25.262 | N | TfNSW | SYDTR | SYDTR | | | | | | AR09130100 |
| Westmead Stn-Plat 1/2 Cnpy | | BD-CNPY-TR | | HR-S | STAT-WMD | Platform 1/2 | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR09140100 |
| Westmead Stn-Plat 1/2 Seat 1 | Seat 1 | FF-SEAT | | HR-S | STAT-WMD | Platform 1/2 | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Street Furniture Australia | Concourse | 4 Seater-Post | |
| Westmead Stn-Plat 1/2 Bin No1 | Bin 1 | FF-RBIN-SA | | HR-S | STAT-WMD | Platform 1/2 | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Hub Street Equipment | 20/20 Bin | Garbage Chute | |
| Westmead Stn-Conc | | BD-CONC | | HR-S | STAT-WMD | Concourse(Paid) | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR09150100 |
| Westmead Stn-Conc Retail Bldg No1 | | BD-BLDG-RE | | HR-S | STAT-WMD | Concourse(Paid) | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR09110100 |
| Westmead Stn-Conc Amen Bldg | | BD-BLDG-AM | | HR-S | STAT-WMD | Concourse(Paid) | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR09110100 |
| Westmead Stn-Conc Amen Bldg Toilet Sys | | FF-TOIL-PU | TOIL | HR-S | STAT-WMD | Concourse(Paid) | | Mens Toilet | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | |
| Westmead Stn-Car Park (A)-Up Side | | PK-CRPA | | HR-S | STAT-WMD | Car Park | Up Side-Railway Ave | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR10120100 |
| Westmead Stn-Car Park (M)-Dn Side | | PK-CRPM | | HR-S | STAT-WMD | Car Park | Down Side-Station St | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR10110100 |
| Westmead Stn-Fbge | | BR-FBGE-SS | | HR-S | STAT-WMD | Footbridge | | | W00 | WMD | 25.155 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | CV01310100 |
| Westmead Stn-Fbge Span No1 | | BR-FBSP | | HR-S | STAT-WMD | Footbridge | | | W00 | WMD | 25.155 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | CV01320100 |
| Westmead Stn-Fbge Abut No1 | | BR-FBSU | | HR-S | STAT-WMD | Footbridge | | | W00 | WMD | 25.155 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | CV01330100 |
| Westmead Stn-Fbge Abut No2 | | BR-FBSU | | HR-S | STAT-WMD | Footbridge | | | W00 | WMD | 25.155 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | CV01330100 |
| Westmead Stn-Fbge Walkway | | BR-WALK | | HR-S | STAT-WMD | Footbridge | | | W00 | WMD | 25.155 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | CV01700100 |
| Westmead Stn-Bike Rack No1-Dn Side | | FF-BKER | | HR-S | STAT-WMD | Bicycle Park | Down Side | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Street Furniture Australia | Semi Hoop | | |
| Westmead Stn-Lift No1 Conc-Up Side | Lift 1 | VT-LIFT | LIFT | HR-S | STAT-WMD | Concourse(Paid) | Up Side | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Schindler | 2400 | Mk II | AR01110100 |
| Westmead Stn-Lift No2 Conc-Plat 1/2 | Lift 2 | VT-LIFT | LIFT | HR-S | STAT-WMD | Concourse(Paid) | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Schindler | 2400 | Mk II | AR01110100 |
| Westmead Stn-LV Lighting Sys-Gen | | ES-LGTF-BD | LGTF | HR-S | STAT-WMD | Concourse(Paid) | South End | Power Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR07110100 |
| Westmead Stn-LV Reticulation Sys | | ES-ELEC-BD | ELEC | HR-S | STAT-WMD | Concourse(Paid) | South End | Power Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | AR07270100 |
| Westmead Stn-Disp Sys | | PI-PIDS | PIDS | HR-S | STAT-WMD | Concourse(Paid) | South End | Comms Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE09310100 |
| Westmead Stn-Plat 1/2 Indi No1 | Indi 1 | PI-MONI | PIDS | HR-S | STAT-WMD | Platform 1/2 | North End | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE093101-- |
| Westmead Stn-Clock Sys | | PI-PICS | PICS | HR-S | STAT-WMD | Concourse(Paid) | South End | Comms Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE09210100 |
| Westmead Stn-Conc Clock No1 | Clock 1 | PI-CLCK | PICS | HR-S | STAT-WMD | Concourse(Paid) | | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE092101-- |
| Westmead Stn-PA Sys | | PI-PADS | PADS | HR-S | STAT-WMD | Concourse(Paid) | South End | Comms Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE09110100 |
| Westmead Stn-Plat 1/2 Speaker No1 | Speaker 1 | PI-SPKR | PADS | HR-S | STAT-WMD | Platform 1/2 | North End | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | TOA | CS-154 | | TE091101-- |
| Westmead Stn-CCTV Sys | | PS-SECS | SECS | HR-S | STAT-WMD | Concourse(Paid) | South End | Comms Room | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE11100100 |
| Westmead Stn-Plat 1/2 CCTV No1 | CCTV 1 | PS-CCTV | SECS | HR-S | STAT-WMD | Platform 1/2 | North End | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Axis | P1435-LE | | TE111001-- |
| Westmead Stn-Dn Side Entry CCTV No2 | CCTV 2 | PS-CCTV | SECS | HR-S | STAT-WMD | Entry/Exit | Down Side | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Axis | P1435-LE | | TE111001-- |
| Westmead Stn-Bus Stand A CCTV No3 | CCTV 3 | PS-CCTV | SECS | HR-S | STAT-WMD | Bus Stand A | Up Side-Railway Ave | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | Axis | P1435-LE | | TE111001-- |
| Westmead Stn-Plat 1/2 Help Pt No1 | Help 1 | PS-HELP | SECS | HR-S | STAT-WMD | Platform 1/2 | North End | | W00 | WMD | 25.162 | 25.162 | N | TfNSW | SYDTR | SYDTR | | | | | | TE111001-- |

**Figure 41- Example of an asset register template for infrastructure – train station interchange (not shown complete)**