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Rail Network Configuration Management

EGP-03-01

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ARTC Network Wide

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Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
2.0	18 Apr 19	Appendix 2	NAN example updated to include new mandatory stakeholder of Train Control Systems Manager
2.1	02 Sep 20		Included ability for Configuration Management to be managed via Ellipse.
2.2	17 Mar 22	2.6.3	Updated Physical Configuration Audit requirements
2.3	12 Apr 23	2.4.1, 2.4.2, 2.4.3, 2.4.5	Updated for new NAN system and process in SharePoint.

Table of Contents

1 Introduction

1.1 Purpose

The purpose of this procedure is to:

1. Define the rail network configuration change management process used in ARTC.
2. Provide an overview of the tools used in the implementation of configuration change management.
3. Explain the different requirements between simple and complex projects.

1.2 Scope

IN SCOPE

- This procedure covers all rail network items managed by ARTC and the documentation that describes these items. Rail network items include all assets, systems and related documentation/drawings and software required to operate and maintain the ARTC rail network.

OUT OF SCOPE

- This procedure does not cover the assessment of new rail network equipment and systems from a suitability perspective and type approval process. Refer to *EGP-21-01 New Equipment and System Approvals.*

1.3 Procedure Owner

The Configuration Manager is the Procedure Owner and is the initial point of contact for all queries relating to this procedure.

1.4 Responsibilities

See *Section 2.2.1 Configuration Management Plan* (CMP)

Successful implementation of CM begins with configuration planning and the creation of a Configuration Management Plan (CMP).

A CMP should address the roles and responsibilities, configuration change management procedures, activities, and oversight necessary for that particular project to cover the main components of configuration management:

Configuration Identification

- Configuration Change Management
- Configuration Status Accounting
- Configuration Verification

- Within the CMP, configuration planning defines how and where configuration management activities fit into the organisation and its processes. The content within the CMP is dependent upon the complexity and type of project being undertaken.
- The type of project, complex or simple, will determine whether a stand-alone CMP is required ,or the CM information may just be incorporated into the Project Management Plan (PMP).

A template CMP, EGN0301T-01 Configuration Management Plan, is available as a starting point for project managers to develop their CMP.

Roles and Responsibilities

1.5 Parent Procedure

- *EGN-03-01 Configuration Management Manual* - This is the parent manual and should be read in conjunction with this procedure.

- *AS/ NZ 10007- 2003 Guidelines for Configuration Management* – This is the Australian Standard which has been used to guide the development of ARTC's configuration management framework.

1.6 Reference Documents

The following documents are referred to in this procedure:

- AS ISO 10007 – 2003 Guidelines for Configuration Management
- EGN-03-01 Configuration Management Manual
- EGP-01-01 Engineering Document Control
- EGP-03-02 Equipment Register Updating and Maintenance
- EGP-04-01 Engineering Drawings and Documentation
- EGP-04-02 Drawing Management System [DMS]
- AMT-PR-10 Asset Management System
- EGP-20-01 Project Management
- EGP-21-01 New Equipment and System Approvals
- EGW-03-04 Configuration Change Boards
- EGN0301T-01 Configuration Management Plan
- EGP0301F-01 Network Alteration Notice (Template)
- OGP-30-01 Route Access Condition Notice
- OPE-PR-001 Preparation and Distribution of Operational Notices
- RSK-PR-001 Risk Management Procedure
- ARTC SMS Safety Audit
- ARTC SMS Manage Accreditation – Variation and Change
- PP-130 Control of Software Configuration for Signalling & Communications Systems
- PP-151 Annual Work Program
- Network Information Books (NIBs)
- Route Access Standard (RAS)

1.7 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
Approved Alternative Item	An item that has been type approved in accordance with EGP-21-01 and that fulfils the function of the original item that it replaces.
Change Initiator	The person initiating the change. This may be, for example, the ARTC Project Manager, Major Works Alliance Partner, Area Manager, Project Delivery Manager, Corridor Manager, or Maintenance Alliance Partner.
Configuration	▪ The Functional and Physical characteristics of an existing or planned product, or a combination of products. ▪ One of a series of sequentially created variations of a product.

Configuration Audit	An audit of the functional and physical status of an item and the documents which fully describe it (specifications, design reports, drawings, test reports, commissioning reports, user manuals etc)
Configuration Baseline	Configuration of a product and the documents which fully describe it, formally established at a specific point in time, which serves as reference for further activities.
Configuration Change Board (CCB)	A group of individuals (often Subject Matter Experts) forming a committee that are responsible for assessing when and if any particular changes are to be made from the current configuration baseline in regard to rail network configuration and project scope, schedule and budget.
Configuration Item	A non-specific term used to denote any product, including systems, materials, parts, software, subassemblies, sets, accessories, etc.
Configuration Management (CM)	Technical and Organisational activities comprising of configuration identification, configuration control, configuration status accounting and configuration auditing and provides the necessary management controls that enable: ▪ The orderly establishment, recording, and maintenance of a product's performance, functional and physical characteristics. ▪ Orderly management and control of changes to the product's characteristics.
Configuration Management Plan (CMP)	A Configuration Management Plan describes how Configuration Management is accomplished and how consistency between the product's definition, its configuration, and the configuration management records is achieved and maintained throughout the applicable phases of the product's life. Guidance is provided in EGN-03-01 Configuration Management Manual
Equipment Register (Ellipse)	A register of all items of Network equipment and data within the Network. Refer EGP-03-02 Equipment Register Updating & Maintenance for more information.
General Managers Asset	General Manager Asset Management – Interstate Business Unit General Manager Asset Management – Hunter Valley Business Unit
Network Information Books (NIBs)	Network Information Books (NIBs) and associated line diagrams can be found on the ARTC website at https://www.artc.com.au/customers/operations/nib/
Network	Any defined infrastructure or operational system, on / off track maintenance / measuring equipment that is required for the purpose of creating or supporting ARTC deliverables.
Network Alteration Notice (NANs)	The form used to coordinate the notification and authorisation of a configuration change.
Product	Something that is used or produced to satisfy a need or is as a result of a process (e.g., documents, facilities, firmware, hardware, materials, processes, services, software, systems,).
Project Management Procedure	EGP-20-01 Project Management is the primary document for reference and further guidance is provided in the supporting work instructions and templates depending on whether a project is deemed to be simple or complex

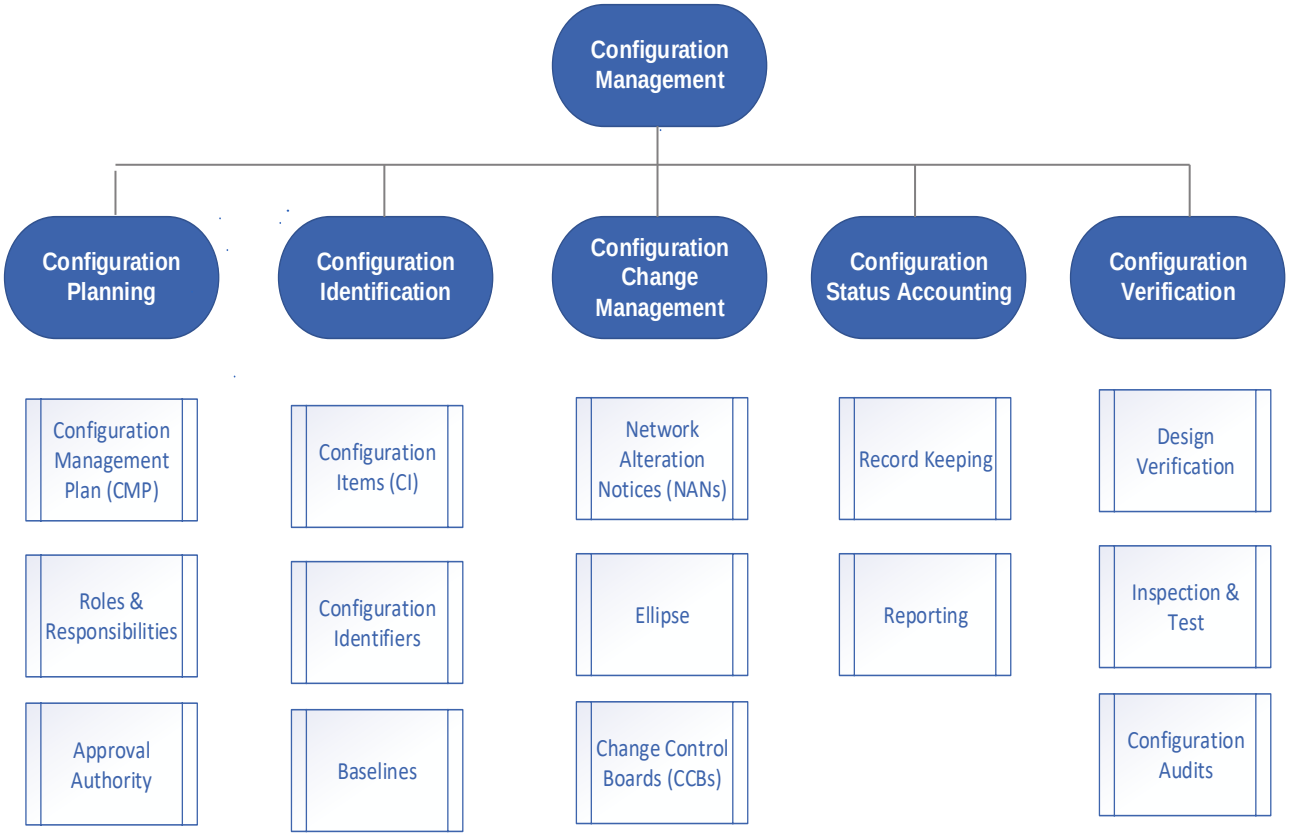
2 Overview

2.1 Introduction

Configuration Management (CM) in ARTC is a risk control and change management process that's applied over the life cycle of the network or a product to provide visibility and control of its functional and physical characteristics. This is usually due to maintenance or approved project activity.

This process comprises of five integrated elements:

1. Configuration Planning
2. Configuration Identification
3. Configuration Change Management
4. Configuration Status Accounting
5. Configuration Verification



2.2 Configuration Planning

2.2.1 Configuration Management Plan (CMP)

Successful implementation of CM begins with configuration planning and the creation of a Configuration Management Plan (CMP).

A CMP should address the roles and responsibilities, configuration change management procedures, activities, and oversight necessary for that particular project to cover the main components of configuration management:

- Configuration Identification
- Configuration Change Management
- Configuration Status Accounting
- Configuration Verification

Within the CMP, configuration planning defines how and where configuration management activities fit into the organisation and its processes. The content within the CMP is dependent upon the complexity and type of project being undertaken.

The type of project, complex or simple, will determine whether a stand-alone CMP is required ,or the CM information may just be incorporated into the Project Management Plan (PMP).

A template CMP, *EGN0301T-01 Configuration Management Plan*, is available as a starting point for project managers to develop their CMP.

2.2.2 Roles and Responsibilities

It's important that the Roles and Responsibilities for managing the rail network configuration change management process are clearly identified.

Role	*Responsibility*
General Manager Asset Management	1. For the implementation of configuration change management within their Business Unit area of responsibility in accordance with this procedure. 2. For ensuring that an appropriate level of risk assessment is performed for Major Projects, Major Periodic Maintenance, Capital Works, and Third-Party projects as per *RSK-PR-001 Risk Management.* 3. The Business Unit representative of the Approval Authority responsible for any changes within their area of responsibility that require approval prior to proceeding.
Corridor / Maintenance Manager	The Business Unit representative of the Approval Authority representing *Assets* for any changes that require approval prior to proceeding in their corridor.

Service Delivery Manager	The Business Unit representative of the Approval Authority representing *Operations* for any changes that require approval prior to proceeding which are within the authority of their Network Control Centre.
General Manager Technical Standards	Ensuring that an appropriate level of risk assessment is performed, as per *RSK-PR-001 Risk Management,* for new equipment and systems Type Approvals and their introduction into the ARTC Network as per *EGP-21-01 New Equipment and Systems Approvals.*
Configuration Manager	Responsible for the development of the Configuration Management system / process and the provision of training in configuration management.
Change Initiators	Responsible for adhering to the change management process outlined in this procedure by ensuring configurable items are identified, approvals granted, stakeholders notified, and systems / documents updated as a result of the change.
Stakeholders	Responsible for interpreting any change alteration notifications that they receive as a result of this procedure to ensure they're aware of any changes proposed or being undertaken and to take action if required.
System Owners	Once advised of a configuration change, the owners of the systems / documents that require updating are required to promptly perform the changes to their relevant systems / documents and provide written verification that the change has been implemented or is pending back to the Change Initiator.
ARTC Contractors	Responsible for working in accordance with this procedure and supplying documents / drawings/ software, etc. for updating ARTC systems / documents.
ARTC Alliance Partners	Responsible for working in accordance with this procedure and supplying documents / drawings/ software, etc. for updating ARTC systems / documents.

2.2.3 Approval Authority

For configuration changes that require Authority Approval, (refer to Section 1.1.1), a Network Alteration Notice (NAN) is required as per *Section 1.1.1.*

The Approval Authority for NANs is comprised of three members which represent their area of responsibility for where the change will occur on the ARTC network. All members must sign the NAN form for authority to be granted.

1. *General Manager Asset Management* – representing overall Business Unit.
2. *Corridor / Maintenance Manager* – representing Assets.
3. *Service Delivery Manager* – representing Operations.

Delegation of Authority

Any of the Approval Authority members may delegate their authority if desired with the following provisos:

- *The delegation must be recorded in writing, be stored, and readily available to present in the event of an audit or investigation.*
- *The delegate should be a direct report of that member.*
- *The delegation should indicate the job role being delegated to rather than an individual name.*
- *The delegation must indicate the period of time the delegation is valid (e.g. forever in perpetuity, or for a financial year, etc)*

2.2.4 Change Control Boards (CCBs)

A *Change Control Board* (CCBs) is a group of individuals (often Subject Matter Experts) forming a committee that are responsible for assessing when and if any particular changes are to be made from the current configuration baseline in regard to rail network configuration, project scope, schedule, and budget.

A CCB is not mandatory and is at the discretion of the individual Business Unit.

It should be assessed at the configuration planning stage as to whether a CCB will be setup and utilised for the project and subsequently documented in the CMP.

A CCB may be setup individually for complex projects (e.g., ATMS - Advanced Train Management System), major projects (e.g., Port Botany Duplication), or perhaps as a jurisdiction based CCB (e.g. Corridor, State, etc) for reviewing changes proposed for that particular area.

The level of control applied is dependent upon the application area, complexity of the specific project, contract requirements, and the context and environment in which the project is performed.

The CCB determines when and if a series of changes should be made in the first instance, however **the FINAL approval for the change must be granted by the Approval Authority via a Network Alteration Notice (NAN*)* as per *Section 1.1.1.***

- The CCB reviews and studies the impact of the proposed changes on the configurable items in question, and then, after making that evaluation, the CCB can then either approve or reject the proposed changes. In some cases they may request more information or postpone the decision pending some other occurrences to take place that would factor into their ultimate decision.
- If the CCB approves the changes to proceed, then the rail network configuration changes *must* obtain final approval from the Approval Authority via a *Network Alteration Notice (NAN)* if it's deemed approval is require as per *Section 1.1.1.*

2.3 Configuration Identification

Configuration identification is the activity which determines, defines, and documents the functional and physical characteristics and requirements of the rail network or system, including interoperability and interface requirements. The configuration identification function includes:

- *Configurable Items* - The selection of the individual Configurable Items (CI) which constitutes the overall rail network.
- *Configuration Identifiers* - The numbering and other identifiers affixed to the CIs and to the technical documentation that defines the CI's configuration, including internal and external interfaces.
- *Baselines* - The establishment of various configuration baselines.

2.3.1 Configuration Items (CI)

Identify the CIs

One of the key tasks of configuration identification is to decide which parts of a network / product / system should be designated as a Configuration Item (CI) and managed as such.

CIs are simply the critical parts (e.g. product, materials, parts, software, documentation, subassemblies) of an end item (e.g. rail network, network control system, signalling system) that's required for the delivery of a service (e.g. freight train path from location A to location B).

A physical "asset" is something that has intrinsic value to an enterprise (e.g. rail, signals, turnouts) and is often a CI, but CIs are not necessarily physical "assets" (e.g. manuals, drawings, documents, software).

The change initiator is required to evaluate the scope and deliverables of the project and ensure that those items that will change (added, disposed, modified, updated) as a result of the project are identified as CIs. These will need to be managed by the Configuration Change Management process and the relevant systems / documents updated as per *Section 2.4 Configuration Change Management.*

Systems / Documents – A important part of identifying CIs is to also identify the systems and/or documents that either define the CI, or utilise this CIs configuration information. By altering the CI, the change initiator must also identify what impact it has on the remainder of the ARTC business systems and the different business units' functions.

Owners of Systems / Documents - The owners of these systems / documents must also be identified and communicated with to ensure they are updated during the different stages of the project lifecycle.

Stakeholders - There are many different business unit functions and roles within ARTC that may also need to be aware of this change in CI (e.g. maintenance, planning, performance, etc), even if they aren't the owners of the systems / documents. These other stakeholders are also required to be communicated with to ensure they're aware of the change and any implication it may have for their area of responsibility.

2.3.2 Configuration Identifiers

Configurable Items (CI) are generally identified by their properties. These properties may be common to all the CIs. Examples of common properties:

- Unique Identifier or Identification Code
- Name or Label (often, both long names and short names)
- Abbreviations or Acronyms
- Description
- Location (e.g. Basecode, Loop, Km, etc)

ARTC has defined product identifiers, naming conventions, and data structures for equipment used in the *Enterprise Asset Management System, Ellipse*, and may be found in the following Work Instructions:

- *AMT-WI-021* *Data Classification – Structures*
- *AMT-WI-020* *Data Classification - Universal*
- *AMT-WI-022* *Data Classification – Signal Systems*
- *AMT-WI-023* *Data Classification – Track & Civil*

In addition to the existing naming and identification conventions there may be more complex projects or new technologies / asset types that may require their own identification and versioning systems suited to that particular project (eg ATMS - Advanced Train Management System). An identification system may need to be created for that particular project and should be included in the Configuration Management Plan.

However, where possible, the standard ARTC identification system should be utilised.

2.3.3 Baselines

A baseline is the configuration of the ARTC rail network at a point in time in regard to its functional performance and physical attributes / configuration. Establishing a baseline creates a “snapshot” in time and serves as the basis for defining changes in the future. A change is any movement from this current baseline state to a future state.

The current existing “assets” in ARTC’s network and the functional performance they provide may be considered as the current *Product Baseline*.

In respect to ARTC, the “p*roduct*” being referred to may include the rail network and associated peripheral assets, network control systems, drawings, manuals, software, etc.

With the rail network being a linear asset, the term “*product*” may need to be defined based on the context of each individual project. The boundaries and hence “assets” for the context of the “product” may change based on the geographical boundaries of the project.

For example, different projects will span over different geographical boundaries:

- Train Path – e.g. Sydney to Melbourne
- Corridor – e.g. Taree to Acacia Ridge (TAR)
- Loop - e.g. Ararat
- Basecode – e.g. 50000 – Keswick to Wolsley
- Level Crossing

This is known as the ***Product Baseline*.**

The functional requirement for these “products” will also change depending on the context of the project (e.g. tonnage, axle load, line speed, transit time, safe-working, etc).

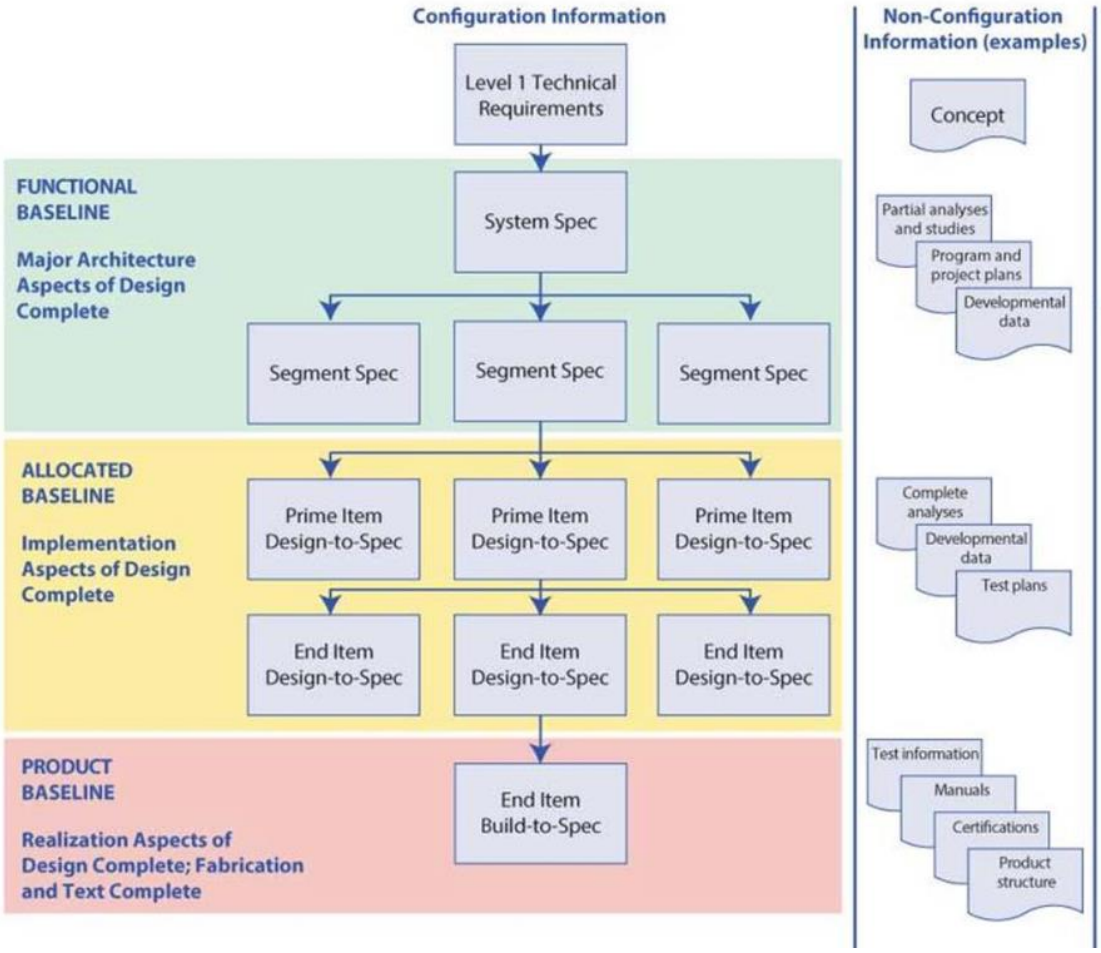
To put simply, it’s about knowing the current performance of the existing rail network for the boundary of the project being undertaken, and then identifying the required *future performance requirements* as a result of the project and changes proposed to be undertaken.

This is known as the ***Functional Baseline***.

For large complex programs / projects (e.g. Port Botany Duplication, Inland Rail) which may be staged over a long period of time, the implementation from design to through to final commissioning may be delivered in separate “projects” or “stages”. This may require separate interim network configurations in terms of both physical assets and performance. Multiple different baselines may be required over time addressing each different project stage.

These are known as ***Allocated Baselines***.

Configuration baselines should be established whenever it’s necessary to define a reference configuration during the life of the product, which serves as a starting point for further activities.



During Configuration Planning, it's important to determine which baselines may need to be established, when they need to be established, and how they will be defined. The project Configuration Management Plan (CMP) or Project Management Plan (PMP) should document which baselines are relevant for the project.

Simple projects may not require multiple baselines be established as the change in functional requirements and physical assets are easily identified from the "existing" Product Baseline to the new "as-built" Product Baseline.

Complex network changes, particularly where a project may be delivered in stages (eg Port Botany Duplication), or development projects (e.g. Advanced Train Management System – ATMS), there may be several configuration baselines between specification and final commissioning. These can include the Functional Baseline, Design Baseline, and Allocated Baseline.

For more detailed information on "How to Baseline" refer to *EGN-03-01 Configuration Management Manual*.

An Example: Configuration Baselining

Here's an example of configuration baselining.

Let's say ARTC requires a new loop for improving capacity of a rail Corridor. To achieve this capacity, ARTC may prepare a requirements document to communicate to the tendering contractors the capabilities the loop would require.

*These requirements would typically be documented in a "System Functional Specification" covering the loops requirements for axle load, length, speed, signalling, communications, etc. This would be considered the "**Functional Baseline**."*

Typically, the bidding contractors would respond with a loop design to meet ARTC's requirements. The proposed design would be documented by a series of specifications, drawings and plans. Each of which would describe critical parts or subsystems of the rail network.

*Upon a contract award to the winning bidder, these documents would be considered the "**Allocated Design Baseline**" of the loop. It should be possible to trace each functional requirement in ARTC's Functional Baseline document to one or more of the contractor's design documents. For example, signalling requirements could be traced to a signal design plan to verify the design will deliver the specified requirements, which would be a critical part of the loop.*

*The completed commissioned loop would be documented by a set of "as-built" engineering drawings and plans. These documents are sometimes referred to as a "Technical Data Package" (TDP). Besides drawings and plans, the finished loop could be documented by a series of product inspection and test procedures, manufacturing instruction documents, software source code, and proprietary source documents. Together, all these documents would comprise the new "**Product Baseline**" of the loop.*

These documents would be critical for the lifetime operation of the loop as over-time the components would wear and require maintenance, or perhaps the loop be upgraded or expanded again. The Product Baseline documents are critical in maintaining the loop and enhancing it with future modifications.

2.4 Configuration Change Management

Configuration Change Management is the actual process of control by which network changes are monitored and systematically implemented as part of the engineering / project management process.

The primary benefit of an effective change management procedure is that proposed changes are evaluated in terms of their impact on the entire network and system. Changes can be reviewed by a variety of stakeholders with different interests and areas of specialty / responsibility (e.g. operations, track & civil, signalling, Asset Management Systems, GIS, etc). This minimises impacts of changes on other components of the network and ensures that changes are properly implemented.

ARTC has many systems, databases, registers, drawings, documents, etc which may require updating as a result of a change to the ARTC Network. It's important this information remains current and accurate to ensure that ARTC continues to safely operate the network for it's customers, general public and employees.

It's important that all the information is updated to ensure the ARTC Network is able to be maintained, repaired, and upgraded with current and accurate information on the Network assets.

A *Network Alteration Notice (NAN)* is the method for implementing changes to ARTC systems and documentation as a result of a change to the ARTC Network which alters the operational capability, network / asset configuration, asset type, or operational systems.

Simple Projects and **Complex Projects** will **all have to follow this change management process.**

2.4.1 Network Alteration Notice (NAN)

For detailed instruction on how to create a NAN, refer to Work Instruction *EGW-03-01 Using Network Alteration Notices (NAN) for Configuration Change Management.*

A NAN comprises two parts :

1. NAN (Network Alteration Notice) – The NAN outlines the project information, proposed change details, NAN status and approvals. It's stored in a *NAN Register* on SharePoint. It contains information such as :

- Project information
- Description of proposed change
- Location of proposed change
- Forecast timing of the proposed change
- Configuration Change List (CCL) (as an attachment)
- Approvals
- Person initiating the NAN

- Status of the NAN as it progresses (i.e. Awaiting Approval, Approved, Closed Out, etc)

2. **CCL (Configuration Change List)** – The CCL is created and attached to the NAN within the SharePoint *NAN Register* and provides a detailed listing of all the systems, documents, data, drawings, etc. that will be required to be updated as a result of the changes proposed in the NAN. It also provides an ability to use the CCL as a scheduling and tracking sheet for advising each of the system owners of the changes and the timeframe they're required to notify pre / post commissioning (i.e. T-Minus timing).

2.4.2 When is a NAN Required ?

A NAN (and associated CCL) is required as a result of a proposed change to the ARTC Network which alters the :

- *Network / Asset Configuration* –
  - New or disposed assets - e.g. sidings / loops / tracks, signals, turnouts / crossovers, level crossings, bridges, wayside devices, etc
  - Moved assets – i.e. change in km - e.g. signals, turnouts, level crossings, slewed track, etc
  - Upgraded assets - e.g. passive to active level crossing
- *Asset Type* – e.g. underbridge to culvert; timber to concrete turnout, etc
- *Operational Capability* – e.g. axle loads, speeds, speed board locations, interface agreements, route access, yard limits, etc
- *Operational Systems* – e.g. train control systems, safeworking systems, communications, network control boundaries

Note : This is not an exhaustive list, just examples of the types of changes that may require a NAN. There are many other Network changes that will require a NAN.

2.4.3 When is a NAN *not* Required ?

A NAN *is not required* when :

- **Exactly the same manufacturer and part number item** is replaced during maintenance or projects. Generally, this is an asset management change and it's the Asset Management Systems (e.g. Ellipse) that may be required to be updated. *This is not considered a configuration change and hence does not need to follow this NAN process.* Refer to procedures *EGP-10-01 Asset Management System* and *EGP-03-02 Equipment Register Updating and Maintenance* for updating the Asset Management System.
- **Type Approved Alternative items** used as replacements during maintenance or projects, as per *EGP-21-01 New Equipment and System Approvals*, do not need to follow this NAN process **PROVIDED** *they don't result in any change in asset type (e.g.*

underbridge to culvert; timber to concrete turnout, etc), network configuration, operational capability or operational systems of the ARTC Network.

- If there are no changes to asset type, network configuration, operational capability or operational systems, then these are considered asset management changes and it's the Asset Management System (e.g. Ellipse) that may be required to be updated. *This is not considered a configuration change and hence does not need to adhere to this NAN process.* Refer to *EGP-10-01 Asset Management System* and *EGP-03-02 Equipment Register Updating and Maintenance* for updating the Asset Management System.
- **If the Type Approved Alternative does change** asset type (e.g., underbridge to culvert; timber to concrete turnout, etc), network configuration, operational capability, or operational systems, **then the NAN process will be required to be followed as per this Work Instruction.**

2.4.4 Do Incidents Require a NAN ?

NAN's are only required for items that will incur a permanent change. For incidents, a NAN shall be retrospectively issued if permanent changes to the infrastructure results from any restoration works.

2.4.5 Change Control Boards (CCBs)

A Change Control Board (CCB) is not mandatory and is at the discretion of the individual Business Unit.

A CCB is a group of individuals (often Subject Matter Experts, SME) forming a committee that are responsible for assessing when and if any particular changes are to be made from the current configuration baseline in regard to rail network configuration and project scope, schedule and budget.

A CCB may be setup individually for complex projects (e.g., ATMS - Advanced Train Management System), major projects (e.g. Port Botany Duplication), or perhaps as a jurisdiction based CCB (e.g. Corridor, State, etc) for reviewing changes proposed for that area.

The level of control applied is dependent upon the application area, complexity of the specific project, contract requirements, and the context and environment in which the project is performed.

The CCB determines when and if a series of changes should be made in the first instance, however the final approval for the change must be granted by the Approval Authority (or delegate) for the project.

The configuration change management of any changes to the Network **must still be managed via a Network Alteration Notice (NAN*)*** as per *Section 1.1.1.*

The process:

- The CCB reviews and studies the impact of the proposed changes on the configurable items in question, and then, after making that evaluation, the CCB can then either approve or reject the proposed changes.

- In some cases they may:
    a. Request more information.
    b. Have further SMEs evaluate the proposal.
    c. Postpone the decision pending some other occurrences to take place that would factor into their ultimate decision.
- If the CCB endorses the changes to proceed, and the Approval Authority (or delegate) approves the change, then any rail network configuration changes *must* be managed via a *Network Alteration Notice (NAN)* as per *Section 1.1.1.*
- If the CCB rejects the proposal, then the changes do not proceed, or the proposal is amended further.

2.5 Configuration Status Accounting

Configuration status accounting is the recording and reporting of the “product” configuration information and the status of proposed, or in progress, changes to provide a traceable record of activities. It’s applied in conjunction with Configuration Identification and Configuration Change Management. Configuration status accounting includes the following tasks:

- Storage and control of product configuration information, including the receipt and issue of configuration documents (e.g., Drawing Management System transmittals)
- Maintaining records of configuration documents and identification codes (e.g., Ellipse)
- Maintaining records of the implementation status of proposed and approved configuration changes (e.g., Network Alteration Notice)

Configuration information sets associated with specific baselines will individually and collectively evolve during the product lifecycle. Configuration status accounting tracks the current status of a configuration baseline, providing traceability of configuration information attributes to their configuration items throughout their development and operation.

The configuration information throughout the lifecycle the project should be systematically recorded, updated, validated and disseminated to maintain the currency of the baseline.

A configuration status accounting system should be able to:

- Identify the current approved configuration, documentation, and identifier associated with changes.
- Record and report the status of proposed engineering changes from initiation to final approval.
- Record and report the results of configuration verifications and audits, including the status of identified discrepancies / defects.
- Record and report the status of deviations and waivers.

The systems / processes / methods to be used within the project for recording and reporting of configuration information should be described in the Configuration Management Plan or Project Management Plan.

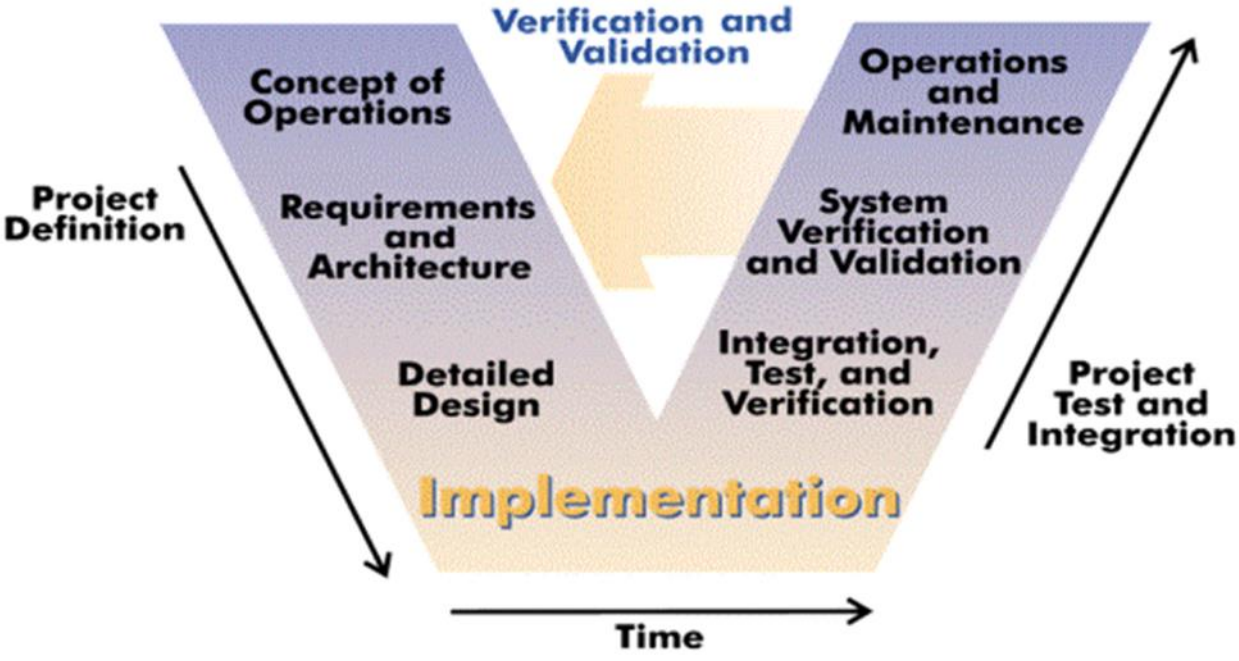
2.6 Configuration Verification

Configuration Verification is a *continuous activity* embedded within the development, testing, construction, commissioning, modification and maintenance processes.

Verification ensures that:

- The "*product*" *design* (e.g. rail network) complies with the required performance and functional capabilities as per the *specified requirements* of the project.
- There is consistency between the "*product*" and its *Configuration Information*.
- The successful completion of verification and audit activities results in *verified CIs* and *product configuration information* sets that may be confidently considered a *new Product Baseline.*

The concept follows the Systems Engineering "Flying-V" approach to specification and verification. This is where projects/products are specified in the early phases of a project in terms of Functional, Performance and User Requirements, etc. Then during the design/delivery phases of the project, verification steps are taken to ensure that the design and construction of the product being delivered complies with the specified requirements of the project.



The verification process:

- *Design Verification* – Ensures that the "product" design (e.g. rail network) will deliver the required performance and functional capabilities as specified for the project, and that it complies with relevant industry Standards and Safety requirements.

- *Inspection and Testing* – During construction of the physical "product", inspection and testing of components, assemblies, systems, etc. may be required to verify the individual

elements of the product are being delivered to specification. Once the entire physical product has been constructed, final commissioning testing of the entire system will be required prior to live use and handover to Operations and Maintenance to verify the entire system is performing as per the specified requirements.

- *Physical Configuration Audits* – These are explicit events that confirms the integrity of As-Built product and the ARTC configuration / information systems.

2.6.1 Design Verification

ARTC accepts changes to the design or configuration of the infrastructure on the basis that the changes conform to an approved design. The acceptance process must include the verification and validation of the design against the required performance and functional capabilities as specified for the project, and that it complies with relevant industry Standards and Safety requirements. ARTC utilises independent agents for the verification and validation of design integrity.

ARTC requires submission of design drawings for consideration prior to commencing construction or maintenance work. The design drawings shall be signed by the independent agent's designer, checker, independent reviewer / verifier and design approver and accepted by ARTC before construction commences.

Where the specialised nature of the design requires checking of portions by different individuals, then the contractor must allocate a checking representative that is responsible for the review of the overall design.

For further information refer to:

- *COR-GL-014* *Safety in Design*
- *ESI-05-14* *Signal Design and Maintenance Configuration Information*
- *SCP 06* *Signalling Documentation and Drawings*
- *EGP-04-01* *Engineering Drawings & Documentation*
- *PEO-PR-008* *Engineering, Design, and Project Management Identification of Competence*

2.6.2 Inspection and Test

Verification is achieved by test, inspection, and assessment against a checklist of items, which may be more extensive than that required for construction certification. For example, the verification activity will include inspection and assessment of the infrastructure against ARTC and Contractor/Alliance Partner documented monitoring and maintenance practices.

There are various types of inspection and testing activities that can be carried out for given condition parameters. Each inspection type has specific conditions it's aimed at detecting.

Visual and other inspection types are generally carried out for one of the following reasons:

- To detect unsafe conditions, which may be expected to occur in the infrastructure between other more detailed inspections.
- To detect unsafe conditions that may occur in the infrastructure due to accelerated deterioration.
- To detect faults that cannot be measured by any other means.

Verification methods by test or inspection must consider the following:

- Clear definition of the defect conditions that may be found from each inspection method.
- The ability of the inspection and test process to reliably detect the defect condition to an appropriate accuracy.
- Location, method, level of detail and frequency of inspection and testing.
- Control, calibration and maintenance of equipment used for inspection and testing.

Refer to:

- *EGP-20-02* *Inspection and Test Plans*
- *EGP2001T-10* *Infrastructure Certification and Handover Form*
- *EGP2001T-12* *Certificate of Practical Completion – ARTC Internal*
- *EGP2001T-13* *Certificate of Practical Completion – Contractor*
- *ESC-21-01* *Inspection and Testing of Signalling - Roles, Responsibilities & Authorities*
- *ESC-21-02* *Inspection and Testing of Signalling – Plans, Programs, Documentation and Packages*
- *ESC-21-03* *Inspection and Testing of Signalling – Inspection and Testing Principles*
- *ESC-21-04* *Inspection and Testing of Signalling – Standard Forms*
- *AS 7717* *Signal Testing and Commissioning*
- *AS 7716* *Signal Testing Process*

2.6.3 Physical Configuration Audits

Physical configuration audits (PCA) may be conducted at the discretion of the project Approval Authority for complex and simple projects. They are not required for work activity projects.

PCAs provide the Approval Authority confidence that the physical “As-Built” product conforms to its “As-Designed” / “Issued-for-Construction” product configuration information. It ensures that the configuration information updated in the ARTC configuration / information systems for the configurable items accurately describes the As-Built product commissioned into service.

This audit should be conducted once all the ARTC configuration / information systems have been updated and the Network Alteration Notices (NAN) closed-off.

For significantly complex projects however, it may be divided into workable incremental packages and performed as individual components of the projects are commissioned and systems updated.

The objective is to:

- Provide assurance that the ARTC configuration / information systems (including drawings, design documentation, software, manuals, etc) accurately, clearly, and completely describe the configurable items.
- Resolve any discrepancies between the physical configurable item subject to audit and the associated ARTC configuration / information systems.
- Establish the new Product Baseline for the As-Built and commissioned product.

The PCA process is broken down into three activities:

1. *Audit Planning* – Planning establishes the schedule, agenda, facilities, rules for audit, and identifies the participants for the audit. It's the responsibility of the *Project Manager* (or delegate) to assemble the audit team. The audit team members should have some independence from the project team and not be involved in the day-to-day management of the project delivery. Audits may be conducted by the organisation responsible for the design / development, by ARTC, or by a third party designated by ARTC. The audit plan should include:
    - Audit identification (PCA)
    - Audit scope, schedule, and objective
    - Personnel and facilities required
    - Audit checklists and forms
    - Content and format of the audit report
    - Action item procedures and forms

    An example of controls that may be audited include, but not limited to :
    - Completion and close-out of the Network Alteration Notice (NAN)
    - Correct and timely updating of systems as identified in the Configuration Change List (CCL) in the NAN
    - Drawings being correctly checked, independently verified, and accepted as per *EGP-04-01 Engineering Drawings and Documentation*
    - Assessment of the As-Built product to ensure all configurable items have been identified
2. *Audit Execution* – Execution is the act of undertaking the audit activity. The audit team records discrepancies or anomalies and recommend courses of action. Audit minutes provide a record of audit findings, conclusions and recommendations / action items.

3. *Audit Evaluation* - Once an audit has been performed and follow-up actions have been agreed it's necessary for the audit team to compile an audit report. The audit report will be submitted to the Approval Authority for approval. The Project Manager (or delegate) is responsible ensuring all action items agreed in the audit report are subsequently followed-up and completed. Once all action items are completed, the Approval Authority may approve the close-off the audit report.

2.6.4 Process Audits

In addition to Configuration Audits, the relevant *General Manager Asset Management* is responsible for ensuring their Business Unit's adherence to this *EGP-03-01 Rail Network Configuration Management* procedure and for the process auditing of the implementation of configuration management. These audits may be conducted by either ARTC internal auditors, or external auditors at the discretion of the General Manager Asset Management as part of "business-as-usual" processes within ARTC.

3 Simple Projects

3.1 Configuration Planning

3.1.1 Configuration Management Plan

For Simple Projects or Work Activity Projects CMPs may be scalable such that the information in the CMP may just be incorporated as a section within in the *Project Management Plan (PMP)* itself rather than a separate plan.

If desired however, a separate CMP may be established using template *EGN0301T-01 Configuration Management Plan*.

The CMP / PMP should be developed by at least *Phase 3 Assessment* of the project ready for project approval.

Refer to:

- *EGW-20-02* *Managing Simple Projects (*Work Instruction)
- *EGW2002T-01* *Simple Project Management Plan (*PMP Template)
- *EGW2002T-03* *Work Activity Project Management Plan (*PMP Template)

3.1.2 Roles & Responsibilities

Refer to *Section 2.2.2 Roles and Responsibilities*

3.1.3 Approval Authority

Refer to *Section 2.2.3 Approval Authority*

3.1.4 Change Control Boards

Simple Projects or Work Activity Projects generally do not require a CCB.

3.2 Configuration Identification

3.2.1 Configuration Items

For Simple Projects or Work Activity Projects which are changing the existing ARTC network the selection of the CIs are those items that will be replaced / added / modified / updated as a result of the project.

These items generally should already be in the Enterprise Asset Management System equipment register, however new items may need to be added using the procedure *EGP-03-02 Equipment Register Updating and Maintenance.*

3.2.2 Configuration Identification

Simple Projects or Work Activity Projects will generally use ARTC's defined product identifiers, naming conventions, and data structures for equipment used in the Enterprise Asset Management System and may be found in the following Work Instructions:

- *AMT-WI-021 Data Classification – Structures*
- *AMT-WI-020 Data Classification - Universal*
- *AMT-WI-022 Data Classification – Signal Systems*
- *AMT-WI-023 Data Classification – Track & Civil*

3.2.3 Baselines

Simple Projects or Work Activity Projects will generally not require multiple baselines be established as the change in functional requirements and physical assets are easily identified from the "existing" Product Baseline to the new "as-built" Product Baseline.

The project Configuration Management Plan (CMP) or Project Management Plan (PMP) should document the relevant baselines for the project.

3.3 Configuration Change Management

Simple Projects or Work Activity Projects **must adhere** to Configuration Change Management as per *Section 2.4 Configuration Change Management*.

3.4 Configuration Status Accounting

The systems / processes / methods to be used in the project for recording and reporting of configuration information should be described in the Configuration Management Plan / Project Management Plan as per *Section 2.5 Configuration Status Accounting.*

3.5 Configuration Verification

Simple Projects and Work Activity Projects may only require a simplified and scaled-down verification process. The process to be undertaken should be documented in the Project Management Plan, or Configuration Management Plan.

All projects will differ, however an example may be:

- Have design drawings signed by the independent agent's designer, checker, independent reviewer / verifier and design approver and accepted by ARTC.
- Create an *Inspection and Test Plan* and/*or Commissioning Plan* and implement during and post-construction as required.
- Complete the *Infrastructure Certification and Handover.*
- Complete the *Certificate of Practical Completion.*

Independent Review of Configurable Items

It's recommended that an independent review be performed on the list of Configurable Items (CIs) identified for change to ensure completeness, accuracy, and ensure all items identified are correct without any omissions.

It's recommended that this review be conducted prior to seeking approval from the Approval Authority. The independent reviewer could be a relevant Subject Matter Expert, or perhaps a member of the Business Unit Assurance team.

4 Complex Projects

4.1 Configuration Planning

4.1.1 Configuration Management Plans

For complex projects a separate CMP should be created using template *EGN0301T-01 Configuration Management Plan.*

The CMP should be fully developed by at least *Phase 3 Assessment* of the project ready for project approval.

Refer to:

- *EGW-20-01* *Managing Complex Projects* - Work Instruction
- *EGN0301T-01* *Configuration Management Plan.*

4.1.2 Roles & Responsibilities

Refer to *Section 2.2.2 Roles and Responsibilities*

4.1.3 Approval Authority

Refer to *Section 2.2.3 Approval Authority*

4.1.4 Change Control Boards

A CCB is not mandatory for Complex Projects and is at the discretion of the individual Business Unit. A CCB may be setup individually for complex projects (e.g., ATMS - Advanced Train Management System), major projects (e.g. Port Botany Duplication), or perhaps as a jurisdiction based CCB (e.g. Corridor, State, etc) for reviewing changes proposed for that particular area.

4.2 Configuration Identification

4.2.1 Configuration Items

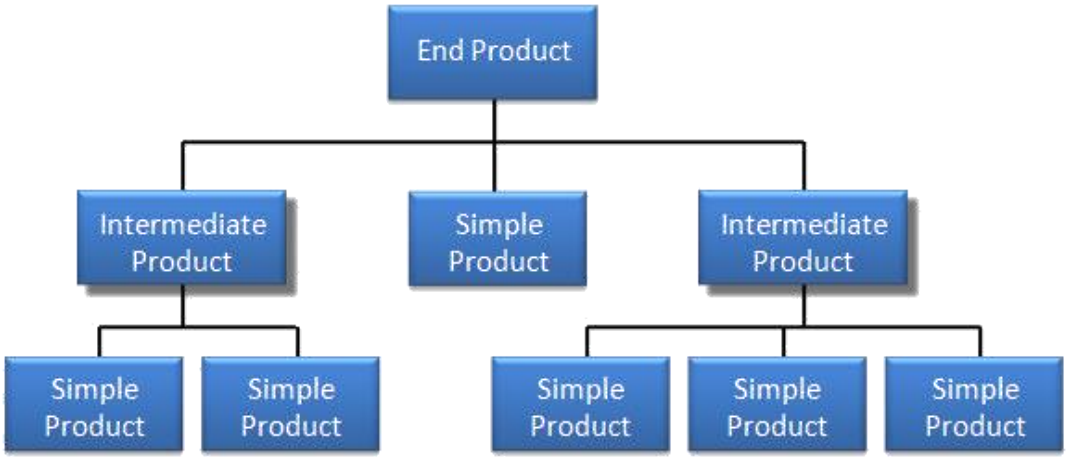
For Complex Projects, or new technologies (e.g., ATMS – Advanced Train Management System) where new technology and/or equipment is being developed or implemented, then the selection of CIs requires sound judgement based upon engineering requirements, experience and cost benefit.

One of the fundamental issues in CI selection is in determining the optimum number of CIs. Too many CIs and their management can impede development progress, whereas too few CIs may result in insufficient visibility and control of that same progress. The optimum number will depend on the complexity of the project and the product maturity.

One planning tool that may assist in determining new CIs is the *Product Breakdown Structure (PBS)*. The PBS ensures that all required products for a planned product are considered during

the planning process. In addition, the product breakdown structure is reviewed and revised multiple times by its creators to ensure that no component is forgotten.

The PBS comes in the form of a hierarchy, much like a Work Breakdown Structure used in Project Management. The hierarchy is composed of the products, sub-intermediate products, and final simple end-product. The term "product" in the case of PBS can also be used to refer to items required to manage the product and may include paper-based items as well (manuals, drawings. etc.)



CIs are selected by breaking down the system to a level of detail that is adequate by considering the following aspects:

- The maintenance activities to be performed.
- A configuration item's criticality.
- Interfaces to other elements.
- Procurement conditions.

4.2.2 Configuration Identification

Complex Projects will generally use ARTC's defined product identifiers, naming conventions, and data structures for equipment used in the Enterprise Asset Management System and may be found in the following Work Instructions:

- *AMT-WI-021* *Data Classification – Structures*
- *AMT-WI-020* *Data Classification - Universal*
- *AMT-WI-022* *Data Classification – Signal Systems*
- *AMT-WI-023* *Data Classification – Track & Civil*

Where possible the standard ARTC identification system should be used, however there may be Complex Projects within ARTC that may require their own identification and versioning systems suited to their particular project (e.g., ATMS - Advanced Train Management System).

Any new identification systems created for a project should be documented in the CMP.

4.2.3 Baselines

For complex network changes, particularly where a project may be delivered in stages (e.g., Port Botany Duplication), or technology development projects (e.g., ATMS - Advanced Train Management System), there may be several configuration baselines between functional specification and final commissioning.

These can include the Functional Baseline, Design Baseline, and Allocated Baseline as per *EGN-03-01 Configuration Management Manual*. During configuration planning, it's important to determine which baselines may need to be established, when they need to be established, and how they will be defined.

The project CMP should document which baselines are relevant for the project. The following are examples of baselines that may be considered:

Functional / System Baseline

The Functional Baseline consists of the functional configuration documentation, which describes the systems functional performance, interoperability, interface requirements, and the verifications required to demonstrate the achievement of those specified requirements. The proposed Functional Configuration Documentation (e.g., Customer Requirements or Design Brief) should be released prior to the Preliminary Design Review, for review and agreement at the Preliminary Design Review. The Functional Baseline is established following Functional Configuration Documentation approval and Preliminary Design Review close out.

Allocated / Design Baseline

The Design Baseline consists of the approved design configuration documentation, which is the combined performance and design documentation utilised for the construction. The proposed Design Configuration Documentation shall be released prior to the Design Review, for review and agreement at the Design Review. The Design Baseline is established following Design Review close out.

Commissioned Baseline

The Commissioned Baseline consists of the "marked up" approved design configuration documentation. This documentation is established after closing out of the Functional and Physical configuration audits and prior to the commencement of operation. The documentation shall be released prior to the Product Configuration "As Built" Baseline.

Product Baseline

The Product Baseline consists of the approved product configuration documentation, which is the "As Built" documentation. The Product Baseline is established after the commissioned baseline has been formally drafted and released.

This new baseline is typically, but not exclusively, described by specifications, design reports, drawings, user and maintenance manuals, spares lists, test reports, updates to related documents and systems (e.g. Ellipse), and commissioning reports.

It's a requirement that all technical documentation relevant to the as-built configuration, per the list above, be stored electronically in the applicable record management systems for ready future access e.g. Drawings, Plans and Engineering Reports in the Drawing Management System (DMS) as per *EGP-04-01 Engineering Drawings and Documentation*.

4.3 Configuration Change Management

Complex Projects **must adhere** to Configuration Change Management as per *Section 2.4 Configuration Change Management*.

4.4 Configuration Status Accounting

The systems / processes / methods to be used in the project for recording and reporting of configuration information should be described in the Configuration Management Plan as per *Section 2.5 Configuration Status Accounting.*

4.5 Configuration Verification

Complex Projects will require a detailed and thorough *Configuration Verification Plan* which should be documented in the Configuration Management Plan. Refer to *Section 2.6 Configuration Verification*