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Function: Engineering
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Rail Network Configuration Management

EGP-03-01

Applicability

ARTC Network Wide

SMS

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2.1	02 Sep 20	Configuration Manager	Stakeholders	Manager Standards	General Manager Technical Standards 29/09/2020

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.

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]
- EGP-10-01 Asset Management System
- EGP-20-01 Project Management
- EGP-21-01 New Equipment and System Approvals
- 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-115 Asset Identification
- 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

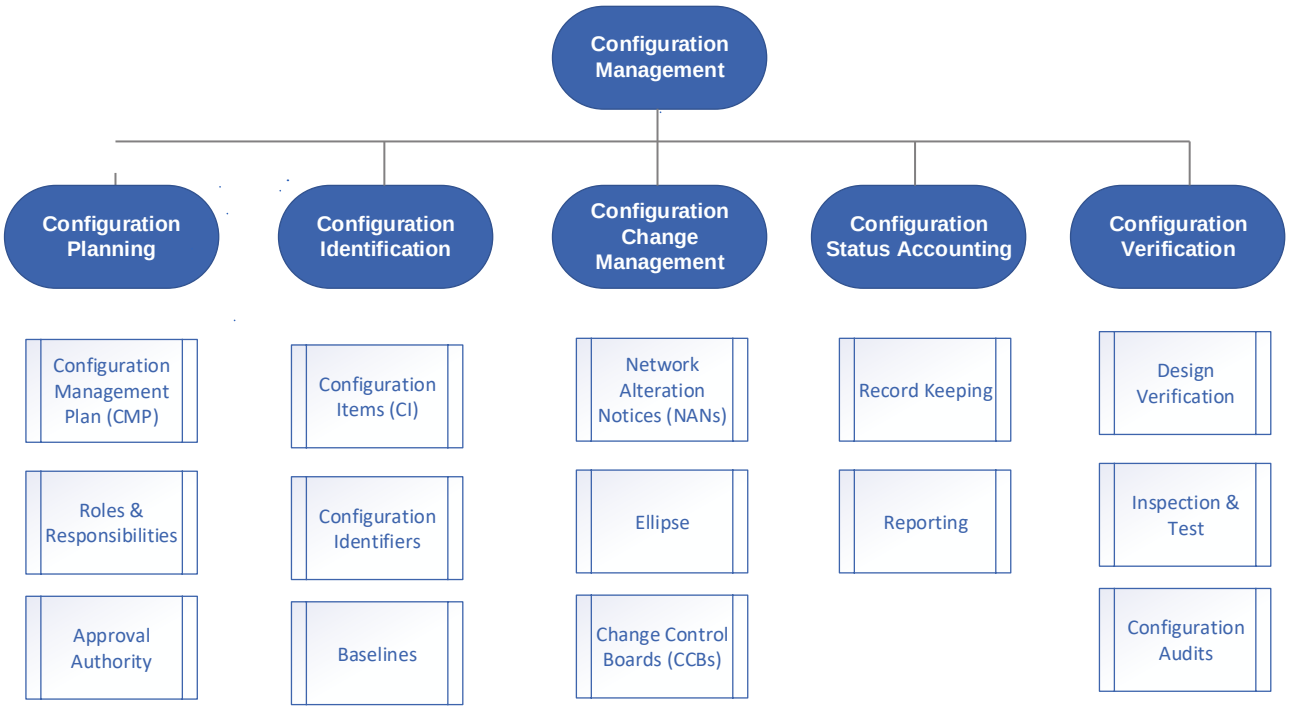
2 Overview

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 2.4.1 Is Approval for the Change Required ?*) a Network Alteration Notice (NAN) is required as per *Section 2.4.2 Network Alteration Notices (NANs) for Configuration Change Management*.

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 (eg ATMS - Advanced Train Management System), major projects (eg 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 2.4.2 Network Alteration Notices (NANs) for Configuration Change Management*.**

- 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 2.4.1 Is Approval for the Change Required ?*

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:

- *EGW10-01 Data Classification – Structures*
- *EGW10-02 Data Classification - Universal*
- *EGW10-03 Data Classification – Signal Systems*
- *EGW10-04 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 it's 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).

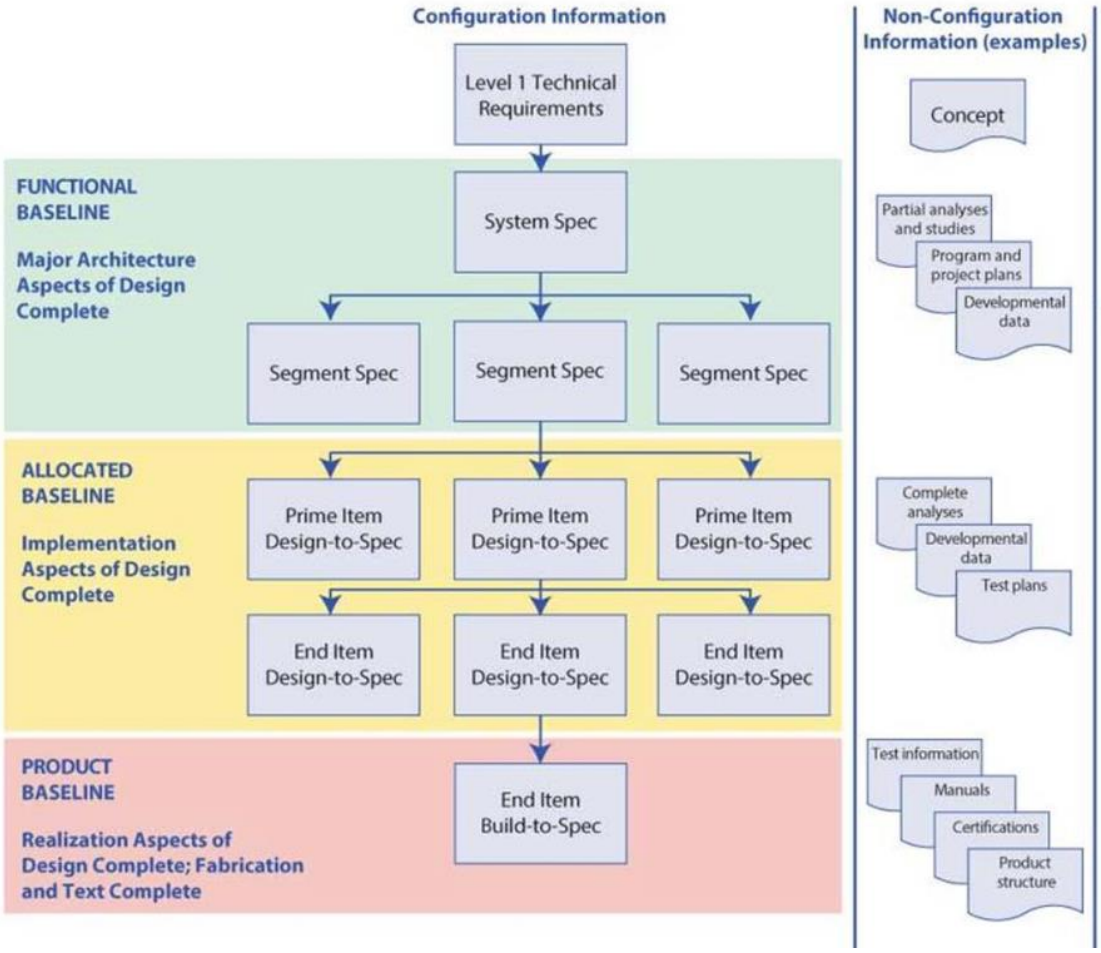
To put simply, it’s about knowing the current performance of the existing rail network for the boundary of the project being undertaken, and then identifying the required *future performance requirements* as a result of the project and changes proposed to be undertaken.

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 (eg 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.

Some configuration changes will require formal approval from an Approval Authority prior to proceeding with the works as per *Section 2.4.1 Is Approval for the Change Required ?* Some changes will not require any formal Approval Authority at all*, however the change will still be required to follow the change management process.*

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

ARTC has two Configuration Change Management methods available for implementing change management for rail network changes. The selection of which depends on :

a. Whether the project requires formal approval from the Approval Authority, and

b. The method used for managing the project.

Where the change initiator has the option to use either of the Configuration Change Management methods, it's at their discretion which method they choose. The method they select should be recorded in the Configuration Management Plan or Project Management Plan. The table below shows when each different method may be used :

Configuration Change Management Method	Approval Authority Required ?	Method of Managing Project ?	Able to Use this Method ?
Network Alteration Notice (NAN)	**Yes**	Any method	**MUST USE THIS METHOD IF APPROVAL REQUIRED**
Network Alteration Notice (NAN)	No	Any method	Yes
Ellipse - Work Orders	No	Ellipse using Standard Job Estimate Templates	Yes

If using **Network Alteration Notices (NAN),** refer to *Section 2.4.2 Network Alteration Notices (NANs) for Configuration Change Management.*

If using **Ellipse**, refer to *Section 2.4.3 Ellipse for Configuration Change Management.*

The basic flow for both of the methods is similar :

- Identify the changes about to occur which require configuration change management.
- Determine if the change requires approval from the Approval Authority.
- Select the method of configuration change management to use– ie. NANs or Ellipse.
- Identify the Configurable Items involved in the change, and what change will be required (e.g. added / disposed / modified).
- Identify the systems / documents that will require updating as a result of the change.
- Identify the owners of the systems / documents that will be updated.
- Identify other stakeholders within ARTC that may require notification of the change.
- Obtain approval from the Approval Authority (if required).
- Communicate to stakeholders and system / document owners of the pending change.
- Implement the change.
- Manage any scope changes – e.g. further approvals, communication .
- Advise system / document owners of the completed change and for them to updated their systems / documents.
- Communicate to stakeholders the completed change.
- Receive advice from system / document owners that updates have been completed.
- Close-out the configuration change management method.

2.4.1 Is Approval for the Change Required ?

There are some circumstances where a configuration change may not require the full Approval Authority process to be conducted, however still require the configuration change management process be undertaken to ensure systems are updated and stakeholders informed.

Approval Authority <u>is not required</u> when :

- **Exactly the same manufacturer and part number item** is replaced during maintenance or projects. Generally, this is only an asset management change and it's the Enterprise Asset Management System, Ellipse, that may be required to be updated. *This is not considered a configuration change and hence does not need to adhere to this process.*
- **Type Approved alternative items** are used as a replacement during maintenance or projects **<u>PROVIDED</u> they don't result in any changes in asset type (e.g. underbridge to culvert; timber to concrete turnout, etc), or changes to the operational capability, network configuration, or safe-working** requirements of the ARTC

Network. *Whilst approval authority is not required, this is still considered to be a configuration change and is required to adhere to this procedure for communicating the change and updating the relevant systems.*

NOTE : If the Type Approved alternative does change the asset type, or affect operational capability, network configuration, or safe-working, ***then approval authority will be required*** **and the Network Alteration Notice process will be required** to be followed as per work instruction *EGW-03-01 Using Network Alteration Notices (NANs) for Configuration Management.*

2.4.2 Network Alteration Notices (NANs) for Configuration Change Management

For detailed information on how to use Network Alteration Notices (NANs) for configuration change management, refer to Work Instruction EGW-03-01 Using Network Alteration Notices (NANs) for Configuration Change Management.

The basic NAN concept is :

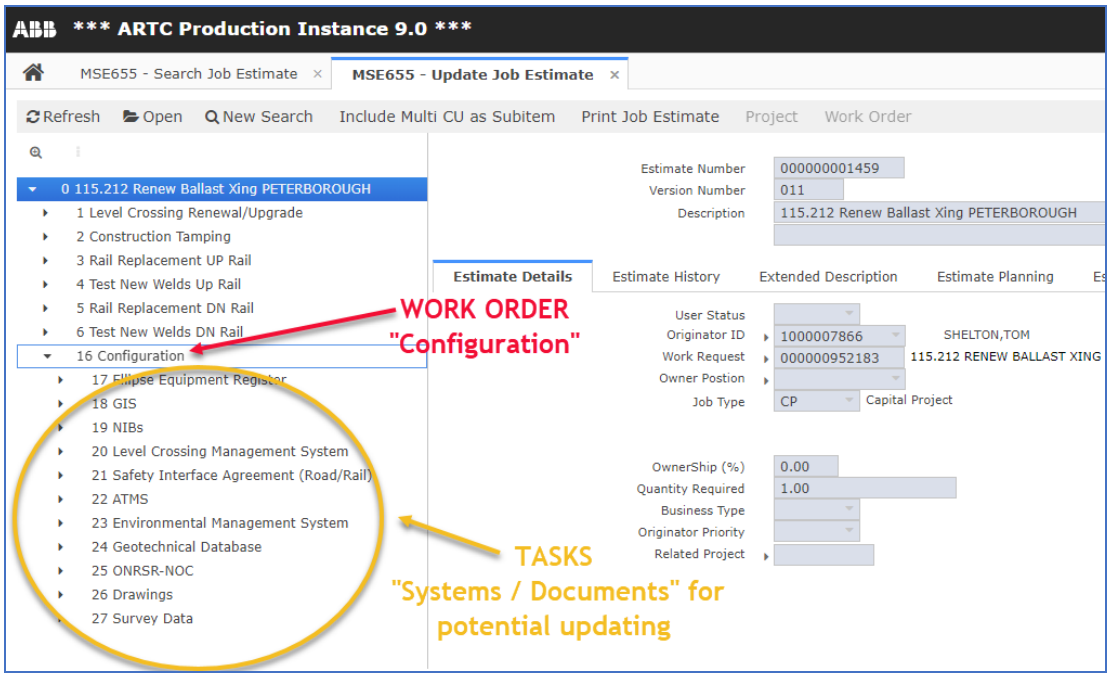
- The NAN is a word document (*EGP0301F-01 Network Alteration Notices - Template*) that's completed by the Change Initiator.
- There's an excel spreadsheet *NAN Register* to obtain the next unique identifying number for the NAN, and to maintain a record of the status of the NAN as it progresses through it's stages.
- There's a *NAN Directory* on the ARTC network S:\ drive to store the NANs and any associated documents / drawings and signed approvals.
- The NAN form is completed from the template with all the details of the project, a listing of all the configuration items that will change, the systems / documents that will require updating and their owners, and the stakeholders that will require notification.
- The NAN form is sent to the Approval Authority for approval (if required).
- Communicate to stakeholders and system / document owners of the pending change.
- Implement the change.
- Manage any scope changes – e.g. further approvals, communication.
- Advise system / document owners of the completed change and for them to update their systems / documents.
- Communicate to stakeholders the completed change.
- Receive written advice from system / document owners that updates have been completed.
- Close-out the configuration change management method.

2.4.3 Ellipse for Configuration Change Management

For detailed information on how to use Ellipse for configuration change management, refer to Work Instruction EGW-03-02 Using Ellipse for Configuration Change Management.

The basic concept of using Ellipse is :

- A work request is created in Ellipse using a pre-configured *Standard Job Estimate Template* which already has already been pre-configured with all the potential configuration management systems / documents that may require updating as a result of that specific type of work activity.
- *The* Standard Job Estimate Template will have an additional work order named "*Configuration*" which is added to the work request. This additional "*Configuration*" work order already contains tasks below it which are the actual "*systems / documents*" that may require updating as a result of the work.
- The work request starts with all the potential systems / documents that may require updating for that type of work, and as the change initiator further refines the scope of the job estimate, they may remove/delete the systems / documents tasks that aren't relevant to that job, or add more configuration tasks to it if they weren't in the original Standard Job Estimate Template.
- Once the job estimate (work plan) is approved it continues to follow the process for managing, assigning, packaging and executing Work Order / Requests to deliver the physical project / maintenance as per work instruction *EGW-10-06 Work Order Management*.
- Once the work is physically completed, they advise the system / document owners of the completed change and request they update their systems / documents.
- A written advice from system / document owners that updates have been completed is received and that task may be closed-out..
- Once all the configuration tasks are closed-out, the configuration work order may be closed-out.



2.4.4 Change Control Boards (CCBs)

A *Change Control Board* (CCBs) 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 is not mandatory and is at the discretion of the individual Business Unit. A CCB may be setup individually for complex projects (eg ATMS - Advanced Train Management System), major projects (eg 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 via a Network Alteration Notice (NAN)** as per *Section 2.4.2 Network Alteration Notices (NANs) for Configuration Change Management.*

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 approves the changes to proceed, then any rail network configuration changes *must* obtain final approval from the Approval Authority via a *Network Alteration Notice (NAN)* as per *Section 2.4.2 Network Alteration Notices (NANs) for Configuration Change Management.*
- 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 (eg Drawing Management System transmittals)
- Maintaining records of configuration documents and identification codes (eg Ellipse)
- Maintaining records of the implementation status of proposed and approved configuration changes (eg 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.

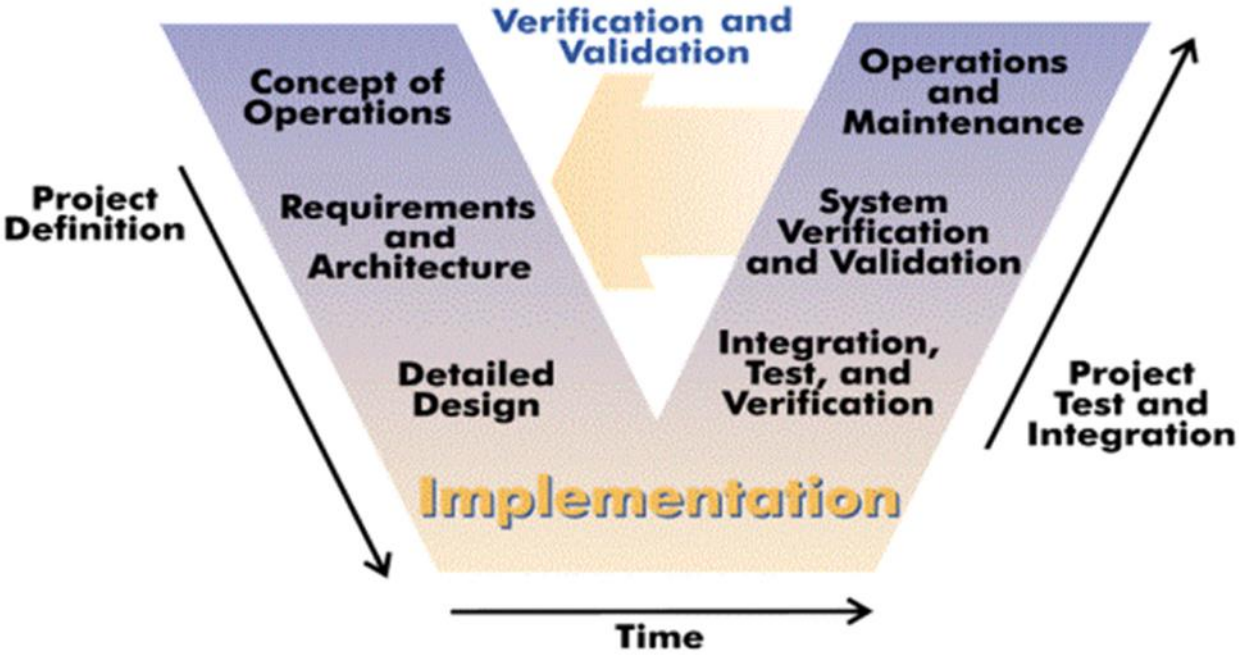
2.6 Configuration Verification

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.

- *Configuration Audits* – These are explicit events that confirms the integrity of a "product" prior to its operation. There are two types of configuration audits – *Functional Configuration Audits* and *Physical Configuration Audits.*

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 of integrated engineering and operating systems in terms of requirements, standards and designs, and validation against 'As-Built' documentation. 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 Configuration Audits

For more detailed information on the process of conducting Configuration Audits refer to *EGN-03-01 Configuration Management Manual*.

2.6.3.1 Functional Configuration Audits

Functional Configuration Audits are used to verify the consistency between the product and its product configuration information, and whether the product and CIs have achieved the performance and functional characteristics as per the specifications and design.

The objective is to:

- Review the verification results of the tests, analyses, inspections, demonstrations and simulations performed to validate specified performance requirements were achieved.
- Ensure problems, test failures or variances have been identified and addressed and any necessary regression testing conducted.
- Hazard log contents and their classification have been reviewed.

2.6.3.2 Physical Configuration Audits

Physical Configuration Audits determine whether the physical "As-Built" product conforms to its "As-Designed" / "Issued-for-Construction" product configuration information. Physical inspection, process control, or a combination of both achieves this.

The objective is to:

- Provide assurance that the configuration documentation (including drawings, design documentation, models, software, manuals, etc) accurately, clearly and completely describes the item subject to audit.
- Resolve any discrepancies between the physical item subject to audit and the associated configuration documentation.
- Establish the new Product Baseline.

2.6.3.3 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.

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:

- *EGW10-01 Data Classification – Structures*
- *EGW10-02 Data Classification - Universal*
- *EGW10-03 Data Classification – Signal Systems*
- *EGW10-04 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.
- Conduct a *Functional Configuration Audit* to ensure the accepted design will satisfy the specified requirements of the project.
- 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.*
- Conduct a *Physical Configuration Audit* to ensure the physical “As-Built” product conforms to its “As-Designed” / “Issued-for-Construction” product configuration information in terms of drawings, design documentation, models, software, manuals, etc.

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 (eg ATMS - Advanced Train Management System), major projects (eg 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

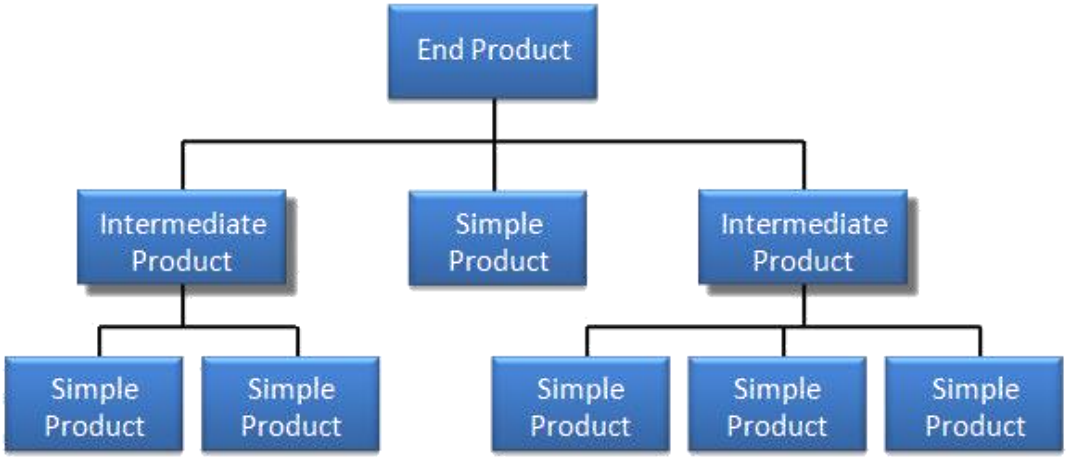
4.2.1 Configuration Items

For Complex Projects, or new technologies (eg 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:

- *EGW10-01 Data Classification – Structures*
- *EGW10-02 Data Classification - Universal*
- *EGW10-03 Data Classification – Signal Systems*
- *EGW10-04 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 (eg 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 (eg Port Botany Duplication), or technology development projects (eg 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 and Audit Plan* which should be documented in the Configuration Management Plan.

For more detailed information on configuration management verification and audit preparation, planning, and execution, refer to *EGN-03-01 Configuration Management Manual.*