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Engineering Procedure

EPD 0018

INTEGRATED SUPPORT REQUIREMENTS

Version 3.0

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Owner:	Manager, Engineering Standards and Configurations		
Approved by:	Jagath Peiris Manager Engineering Standards and Configurations	Authorised by:	Jim Modrouvanos General Manager Chief Engineers

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Document control

Version	Date	Summary of change
All	1.0	First issue
All	1.1	Section numbering updated, Reference corrections and Document Control Page added.
All	1.2	Replace reference from RIC to RailCorp
All	1.3	Standardising Format
2.0	May 2010	Application of new Engineering Procedure format as specified in TMA 400
3.0	September 2010	Responsibilities of the Integrated Services Unit updated. References to analysis tools updated.

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1 Introduction

Action to introduce new assets or to modify existing assets will, in many cases, lead to changes in the support requirements for the asset. These changes may take the form of revised requirements for maintenance, different spares support requirements, the need for additional training, and the need for changes to operating and maintenance manuals.

Failure to recognise and to update support requirements as an integral part of design or configuration change action has the potential to:

- introduce new and uncontrolled operating and personal hazards
- reduce asset integrity through the lack of proper maintenance or the use of inappropriate spares or maintenance and repair methods
- lead to inefficiencies in maintenance and support of assets.

As configuration changes impact design features such as safety, implementation and maintenance, the need to consider integrated support requirements associated with configuration changes is also necessary for compliance with the Rail Safety Act and the Occupational Health and Safety Act.

In this procedure, 'assets' refers to engineering assets such as rolling stock and infrastructure.

2 Scope

This procedure establishes integrated support requirements as part of configuration changes for RailCorp assets.

This procedure also provides information on various analysis techniques in conjunction with design action in support of configuration change.

Other specific requirements are included in individual procedures within the suite of Engineering Design Management Procedures.

3 Referenced documents

RailCorp AM 9995 PM Maintenance requirements analysis manual

ISO/IEC 26702 (IEEE Std 1220) Systems engineering – Application and management of the systems engineering process.

Background documents

AS/NZS 15288 Systems engineering

New South Wales Rail Safety Act

New South Wales Occupational Health and Safety Act

New South Wales Occupational Health and Safety Regulation

4 Definitions and terms

Terms used in this procedure are in accordance with the glossary included in *EPD 0001 Design management process*.

Additional term:

Integrated support is a complete process for identifying the support requirements for a new or existing rail system asset (from *ED-ISG-01 Overview process*)

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5 Requirements

5.1 Integrated support analysis—general requirements

The integrated support requirements for new or modified assets or when assets are removed from the RailCorp inventory shall be identified and documented.

Integrated support analysis can be initiated at any time during the life cycle of an asset. It is part of the design process, beginning with the concept stage and continuing through the detailed design, and takes into account life cycle safety risks, reliability and costs.

The main elements of integrated support activity are shown on the diagram in Figure 1. This simplified diagram does not show all relationships.

Analysis of integrated support requirements shall be carried out as a fundamental part of all RailCorp design projects. Integrated support requirements form part of the scope of the design verification (refer *EPD 0011 Design verification*), validation (refer *EPD 0012 Design validation*) and approval and acceptance (refer *EPD 0010 Design approval and acceptance*). Integrated support documentation and support provisions, e.g. spares, shall accurately reflect the approved configuration of assets.

Ensuring that appropriate changes have been made or initiated to integrated support requirements is an essential step in the design verification process and therefore a pre-requisite to design approval.

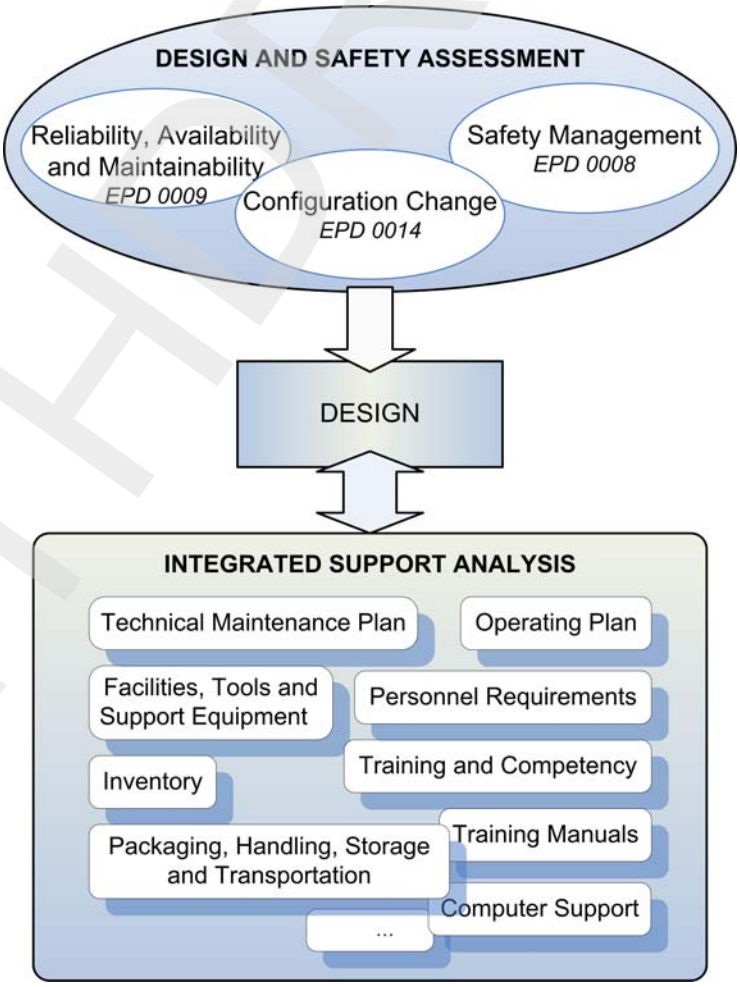

Figure 1 - Integrated support analysis as part of configuration change action (typical)

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5.1.1 Responsibility for integrated support analysis

Many of the inputs to the integrated support analysis process flow directly from design decisions.

Design engineers and managers have a primary responsibility to ensure that integrated support requirements are taken into account when developing new designs or introducing changes to existing assets. Satisfactory definition of revised support requirements is a condition of design approval in accordance with *EPD 0010*.

Development of integrated support provisions for new or altered designs shall be a joint process between the various RailCorp divisions responsible for engineering.

Application of the analysis processes and techniques is a specialised field of engineering. In some areas of integrated support, capability has been established within Integrated Support Unit (ISU) as a source of expertise for both the development and application of these techniques. ISU staff may be able to assist with the completion of detailed analyses and for providing design engineers with recommendations arising from the analysis. These may either impact on design decisions or be implemented following approval of the configuration change for construction.

5.1.2 Timing of support analyses

Integrated support analyses shall be completed in conjunction with the development of changes to the design.

Release of updated integrated support provisions shall be managed to ensure that the information is available at the time that new or modified asset is commissioned for use.

5.1.3 Approval of integrated support requirements

With few exceptions, detailed changes to integrated support requirements do not alter the approved configuration for RailCorp assets and changes do not require submission of a configuration change request (CCR). Exceptions include safety inspections that are a condition of the approved design and mandatory for continued assurance of asset integrity.

Notwithstanding, all changes to integrated support provisions for RailCorp assets shall be managed and approved under a rigorous process that is equivalent to the design approval and acceptance process established in *EPD 0010*. Key requirements are:

- All proposed changes shall be documented and registered.
- Detailed records shall be maintained covering the basis for all changes to integrated support requirements. These shall be treated in the same way as other design records, in accordance with *EPD 0014 Managing configuration change* and *EPD 0017 Design documentation and records*.
- New requirements or changes to existing requirements shall be approved in the same manner as a design as specified in *EPD 0010*.

5.2 Maintenance requirements

Maintenance requirements for any asset are defined within maintenance policies for the equipment which specify:

- what tasks are to be performed
- when they are to be carried out
- how (i.e. the method by which) they are to be completed, which includes safety procedures as well as tools and equipment required for completion

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- the organisation responsible for completion
- the necessary skills and accreditation to complete the task.

Determination of the task content and interval are the key decisions. These requirements provide the means of preserving the safety and integrity of all assets and provide the basis for determining other elements of the complete maintenance policy, as well as related support requirements.

Policy and techniques to carry out a maintenance requirements analysis are contained in *AM 9995 PM*. Further descriptions and requirements are in *EPD 0019 Maintenance requirements analysis*.

Organisational responsibility for each task shall be determined through the level of repair analysis (LORA) process. This process is outlined in Section 5.2.1.

5.2.1 Level of repair analysis

Level of repair analysis (LORA) is a technique for reviewing and analysing the economic considerations of repair decisions and for determining whether items of a particular type should be recovered through maintenance or discarded. The end result of the LORA process is to determine whether failed or partially failed equipment is to be repaired or overhauled and, if so, at what facility.

For internal RailCorp reference, ISU has subject matter expertise on LORA.

5.3 Spares support requirements

Maintaining the safety, integrity and reliability of assets requires that replacement spares be of at least an equivalent standard to the items specified within the approved design. Achievement of required levels of asset availability requires, among other things, that a spare part of the correct standard is available when needed.

These aspects, in combination with the approved maintenance policy for individual items or parts of assets, jointly provide the basis for determining spares support requirements for assets. The process of determining requirements is constrained by available funding and other economic factors to arrive at recommended spares holdings for RailCorp assets.

Changes to asset configuration have clear potential to alter spares support requirements and it is essential that the impact on both the range and quantity of spare items be assessed as part of all configuration change action.

For new assets the process shall determine the new items to be added to the inventory. For changes to existing assets, the process shall determine the changes to the range and quantity of existing stockholdings and the need to remove superseded items from the inventory. In all cases, the spares assessment process shall document procurement standards for replacement spares that directly reflect the requirements of the approved design.

Spares assessments shall be reviewed for all configuration changes. Recommended changes to spares support strategies shall be included in the integrated support documentation for all relevant changes, i.e. those where the spares holding requirements have changed.

Reference should also be made to *EPD 0020 Inventory management*. For internal RailCorp reference, ISU has subject matter expertise on spares requirements analysis.

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5.4 Facilities and tools

Changes to requirements for facilities and tools shall be considered as part of the task analysis completed in accordance with Section 5.2 and the results incorporated in work management and process control plans.

5.5 Training

The introduction of new assets or changes to the design of existing assets may create the need to train operators and maintenance staff on the use and maintenance or repair of the equipment.

Initial consideration of training requirements should include the need for development of a formal training course and/or whether the need can be met by on-the-job training or instruction.

Assistance shall be sought from RailCorp Training and Development where the scope of the change is such that a detailed training needs analysis is necessary, or where extensive changes are needed to a training syllabus. Design engineers shall consider both the needs of existing field staff and the training of new employees in making this assessment, to ensure that training requirements are maintained in line with the approved asset configuration.

Requirements for training shall be included in the incorporation instructions for any approved configuration change or for projects introducing new equipment.

5.6 Documentation and manuals

Design engineers shall identify the need for updating of operating, maintenance and other manuals as part of the configuration change action.

Design engineers shall specify technical content for operation and maintenance of equipment, including limits and tolerances for tests, approved repair methods and limits.

Design engineers shall provide documentation on the technical requirements for packaging, handling, storage and transportation (PHS&T), ordering spares, and the like.

Specific controls for review and validation of manual content as well as controls for release of new manuals or revisions shall be in accordance with *TMA 400 Engineering publications manual*.

6 Responsibilities

6.1 Discipline heads

Discipline heads are responsible for:

- ensuring designs consider integrated support requirements.

6.2 Design engineers

Design engineers are responsible for:

- ensuring that integrated support requirements are considered as an integral part of all tasks that affect the approved configuration of RailCorp assets
- developing or updating manuals for operations, maintenance, testing, spares and the like, and documentation on the technical requirements for PHS&T.

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6.3 ISU Manager

The ISU Manager is responsible for:

- procedures for review and approval of
  - failure modes, effects and criticality analysis (FMECA) and reliability centred maintenance (RCM) methodologies
  - level of repair analysis (LORA) process
  - spares assessment methodology.
- updating of technical maintenance plans (TMPs) and service schedules.

6.4 ISU staff

ISU staff are responsible for:

- analysis of maintenance requirements, including preparation and issue of TMPs and service schedules for existing assets
- conducting level of repair analysis for existing assets where required
- assessment of spares requirements for existing assets where required.

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