Government of South Australia
Department for Infrastructure and Transport

Inspection, Testing and Commissioning of Assets for Rail Projects Guideline

Rail Commissioner

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DOCUMENT AMENDMENT RECORD

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1	Initial Issue	19/11/12	
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1. Introduction

The Department for Infrastructure and Transport (The Department) manages and operates, the Adelaide Metropolitan Passenger Rail Network (AMPRN) under the Rail Accreditation assigned to The Rail Commissioner (RCom) by the Office of the National Rail Safety Regulator (ONRSR).

Rail Safety National Law (RSNL) (South Australia) Act 2012 requires RCom to have a structured and disciplined approach to management of the asset lifecycle.

2. Purpose

To ensure that new or modified assets can only be introduced to the AMPRN following a rigorous inspection, testing and commissioning process. The process requires that assets meet all functional and design requirements and are introduced safely and without any negative impact to the network or service delivery.

3. Scope

This document is applicable to all projects delivering new or modified assets to the AMPRN.

There are two levels of inspection, testing and commissioning applicable to the introduction of assets into operational service:

- Level 1 Individual asset or component testing which is applicable to individual assets or components
- Level 2 'Whole of System' integration testing which is applicable to multiple individual assets or components to the network

This document provides the guidelines to be applied by Project Manager engaged by the Rcom to ensure that:

- All inspection, testing and commissioning of individual assets or components are carried out to meet the functional, specification and design requirements,
- All inspection, testing and commissioning of interdependent multiple asset types introduced into service are carried out to meet the 'whole of system' functional, specification and design requirements,
- The inspection, testing and commissioning for the introduction of new or modified assets is comprehensive, documented, and without compromise to 'whole of system' safety or service delivery.

Signaling, communications and rollingstock projects often involve additional testing and commissioning requirements that will be defined within the contract specification.

4. Supporting Information

4.1. Acronyms

ACRONYM	EXPANDED ACRONYM
AMPRN	Adelaide Metropolitan Passenger Rail Network
CCTV/PI	Closed Circuit television/Public Information
DynIT	Dynamic Integration Test
EMS	Engineering Management System
FAT	Factory Acceptance Test
FSAT	Final System Acceptance Test
IOT	Installation and Operational Testing
IT&C	Inspection, testing and commissioning
EDMP	Engineering and Design Management Plan
PTF	Product Technical File
SAT	Site Acceptance Test
SIT	System Integration Test

4.2. Definitions

TERM	DEFINITION
The Department	The Department for Infrastructure and Transport
The Contractor	Main contractor and associated sub-contractor

4.3. Related documents

DOCUMENT NAME	DOCUMENT NUMBER
Systems Engineering Management Standard	AM4-DOC-001217
Development and Approval of Engineering Waivers	PR-AM-GE-807
Engineering Authorities AMPRN	GL-EM-GM-1626
Asset Management Technical Data Requirements for Projects	PTS-MS-05-AM-PRC-00000091
Testing and Commissioning of Signalling Systems	SG1-DOC-000452
Certificate of Signalling – Completion	QPF-401-8
Certificate of Train/Tram Running – Rail Infrastructure	FO-EM-NS-203
Certificate of Train/Tram Running – Overhead Wiring	FO-EM-EE-240
Punch List Management Procedure	PR-AM-GE-762
Type Approval for Railway Products on AMPRN	AM4-DOC-000466

4.4. Referenced documents

- Rail Safety National Law (South Australia) Act 2012

5. Stakeholder responsibilities

5.1. Project Manager

The Project Manager engaged by the Rcom is responsible for:

- Ensuring the Project Design Life Cycle Process is followed in accordance with the AM4-DOC-001217 Systems Engineering Standard.
- Ensuring The Contractor prepares, documents and implements all individual asset or component inspection, testing and commissioning in accordance with this document, the master specifications and the Engineering and Design Management Plan (EDPM), and
- Reviewing and assessing the suitability of the IT&C Plan for the achievement of the project requirements, handover and implementation into service.

5.2. The Contractor

The Contractor is responsible for preparing, documenting and implementing all individual asset and component inspection, testing and commissioning in accordance with this document, project requirements and the EDMP.

The inspection, testing and commissioning management plan must address “Whole of System” inspection, testing and commissioning requirements to ensure all of the interfaces have been managed to prevent any “Whole of System” failure. This is to ensure that track, signalling, communications, rolling stock, OHW and traction power systems function correctly together recognising any design decisions or deviations that may have occurred through the project life cycle phases.

5.3. Chief Commissioning Engineer

The Chief Commissioning Engineer appointed by the Contractor and responsible for ensuring that inspection, testing and commissioning activities comply with the project requirements and supported by a team of experienced commissioning engineers and technicians.

The Chief Commissioning Engineer is responsible for:

- Ensuring that all 'whole of system' user/functional requirements and specifications are established and documented as the basis for development of relevant inspection and testing for the 'whole of system' integration of assets,
- Establish, manage and co-ordinate the inspection, testing and commissioning principles, program, requirements and procedures
- Ensuring the EDMP contains all the necessary 'whole of system' Integration IT&C requirements for the project,
- Ensuring that all asset and system interdependencies and interfaces are identified, documented and managed through the IT&C process
- provide all necessary and appropriate assistance and co-operation to the project manager during all phases of the inspection, testing and commissioning process
- Preparing an IT&C Management Plan, and
- Ensuring that all 'whole of system' Integration IT&C is documented and carried out in accordance with this document and the EDMP.

5.4. Engineering Discipline Leads

The Engineering Discipline Leads or delegates are responsible for:

- Reviewing and endorsing functional requirements,
- Reviewing and endorsing the IT&C Management Plan, and
- Individual asset and component 'whole of system' IT&C Integration.

6. Levels of Inspection, Testing and Commissioning for Assets

Railway systems have many different asset types the approach to IC&T must be tailored to the type of asset, complexity, safety and risks associated to the change. Common asset types include, but are not limited to:

- Signaling
- Stations
- Electrical systems with varying voltages
- Overhead wiring (OHW) traction and power supply
- Track
- Civil structures
- Communications
- Train detection and control systems
- Rolling Stock
- Building services, equipment, plant and systems

The two levels of IC&T applicable to the introduction of assets into operational service are detailed below:

6.1. Individual Asset or Component Testing – Level 1

IT&C, where an individual asset or component is being introduced or modified, is to be carried out to verify the following:

- That the individual asset or component, when fully operational, will meet the agreed functional requirements and specifications,
- That the individual asset or component, when fully operational, complies with the agreed final design and
- That the individual asset or component performs as intended when introduced into operational service.

For individual assets or components, The Contractor is responsible for developing an IT&C Management Plan which must detail the IT&C methodology, technical processes, safety procedures, witness, and hold points.

The EDMP must contain all of the necessary individual asset and component IT&C requirements for the project including engineering acceptance authorities.

6.2. 'Whole of System' Integration Testing – Level 2

Railway projects rarely introduce a single individual asset or component into service – they usually involve the commissioning, often simultaneously, of multiple assets which are connected and interdependent. This requires an advanced level of integrated / interconnected 'whole of system' IT&C to ensure:

- That all individual asset and component IT&C meets the specific functional requirements, specifications and designs,
- That the integrated / interdependent multiple asset system when fully operational meets the agreed 'whole of system' functional requirements and specifications,
- That the integrated / interdependent multiple asset system when fully operational complies with the 'whole of system' final design and
- That the introduction to service of the new interconnected assets is seamless and does not compromise safety or service delivery

While this level of IT&C may be undertaken by The Contractor, it is the responsibility of the Chief Commissioning Engineer to ensure that the introduction of interdependent multiple asset types into service, having 'whole of system' impact, is carried out effectively and efficiently.

The EDMP must contain the entire 'whole of system' IT&C for the project including engineering acceptance authorities.

7. Inspection, Testing and Commissioning Requirements for Projects

Shown at Appendix 1 is the model that must be used in conjunction with the master specifications to identify and capture the requirements and IT&C deliverables for submission through the life cycle of the project.

8. Individual Asset or Component Inspection and Testing – Level 1

While the principles of inspection and testing are applicable to all projects the specific form of the IT&C Management Plan will vary with the type of individual asset or component being introduced to the system.

8.1. Product Approval

The approval for use of an individual asset or component of the system will be through the mechanism of a Product Technical File (PTF) that must be submitted for each item by The Contractor to the RCom's representative during the design process.

The Contractor must provide a comprehensive PTF for each asset or component that is to be used in the construction and operation of the System.

The PTF for each asset or component must have been submitted, reviewed and approved by the RCom representative prior to that equipment being installed.

Each PTF must follow a standard format that has been previously agreed with RCom.

The PTF must cover the design, manufacture, operation and maintenance of the asset or component to the extent necessary for the assessment to be made.

8.2. Type Approval

Type Approval (TA) is the process of certifying that a product proposed for use on the AMPRN meets its critical requirements for safe operations and maintenance.

The TA process adopted by the RCom for the introduction of new or modified safety critical rail products into the AMPRN.

There is no requirement to obtain TA for facilities, construction activities, structures or one-off designs.

8.3. Factory Acceptance Testing

Individual assets or components that are manufactured or supplied must be thoroughly tested by The Contractor prior to dispatch to site for installation. Specific Factory Acceptance Testing (FAT) inspection and test plans must be developed by The Contractor and submitted to the RCom Project Manager for review and comment. In some cases, the FAT will require witnessing by the RCom Project Manager and/or other RCom representatives. The Contractor will be advised of this requirement at the review stage.

The FAT should provide:

- Independent proof of functionality (by conventional function testing or simulation), quality and integrity,
- Verification of availability and quality of all important documents, such as manuals, instructions, plans, drawings
- Verification of contract requirements and
- Assurance that the individual asset or component performs as expected under the testable range of foreseeable conditions, including misuse and error.
- Final Inspection records

8.4. Installation and Operational Testing

Installation and Operational Testing (IOT) must be carried out by The Contractor during and after the installation of individual assets or components. Such tests will be used to identify design and installation errors prior to the Site Acceptance Testing (SAT). The Contractor must supply documentation detailing the scope and results of the installation and operational tests.

IOT assures, through appropriate performance tests and related documentation and records, that the individual assets or components have been installed correctly and that all future operations will be reliable within prescribed or specified operating limits.

9. Whole of System Inspection, Testing and Commissioning – Level 2

Having undertaken a range of inspection and testing to ensure that the individual asset will work as intended it must then be tested for suitability for integration into the whole network. This introduces a set of complex interfaces that will require inspection, testing and commissioning to ensure that there will be no adverse impact on the integrity of the whole network when the asset ‘goes live’ e.g. if an individual signaling asset is being introduced to the network, then ‘whole of system’ testing is essential to ensure that it is not going to cause a failure of the whole signaling system.

All of the interfaces between the individual asset and the ‘whole of system’ must be identified and documented. A testing regime is to be developed that will validate that all of the interfaces have been managed to prevent any ‘whole of system’ failure.

The ‘whole of system’ inspection, testing and commissioning management plan/s will be developed by The Contractor and reviewed by the project manager, RCom and

maintainers and, may comprise System Integration Test (SIT), Dynamic Integration Test (DynIT)and a Final System Acceptance Test (FSAT) depending on the complexity of the project.

9.1. Static Test / Site Acceptance Test

The Contractor must undertake a SAT following the installation of an individual asset or component. The SAT must not commence until the FAT and IOT have been completed and approval is received from the RCom Project Manager to proceed to the SAT.

The SAT covers inspection, testing and validation of individual assets or components by The Contractor. Specific SAT plans must be developed by The Contractor and submitted to the RCom Project Manager for review and approval. In some cases, the SAT will require witnessing by the RCom Project Manager or other representatives of RCom. The Contractor will be advised of this requirement.

9.2. System Integration Test

A System Integration Test (SIT) must be undertaken prior to FSAT to:

- Ensure that the interfaces between individual assets and all the relevant AMPRN operational systems have been identified and documented,
- Ensure that all testing across the individual asset and 'whole of system' interfaces that can be carried out prior to 'go live' is undertaken to provide assurance that at handover they will operate effectively and safely without any adverse effect on any AMPRN operational systems, and
- That any issues arising from the testing are identified and remedial actions planned and implemented before the FSAT.

The SIT may use indirect methods such as simulation, test trains or track recording to test the quality of the interface management.

The Project Manager – IT&C must issue formal notification to the RCom Project Manager and the appropriate RCom representative/s before a SIT is to be conducted. Advice will be provided as to whether the RCom representatives intend to attend the SIT. If attendance is confirmed, then the SIT must not proceed unless the RCom representative is present.

9.3. Dynamic Integration Test

A DynIT may be required prior to the Final System Acceptance Test (FSAT) to:

- Ensure system integration with the AMPRN as well as external rail transport operator networks, utility services, third parties etc.
- Ensure that the design and installation of the plant and material, systems and the works comply with the applicable contract requirements and that all system interfaces are integrated so that the system operates properly and safely.

The following certificates are required before any test train or revenue train can operate on the AMPRN:

- Certificate of Signalling – Completion QPF-401-8
- Certificate of Train/Tram Running – Rail Infrastructure FO-EM-NS-203
- Certificate *of* Train/Tram Running – Overhead Wiring FO-EM-EE-240, if electrified network

Throughout DynITs, non-revenue passenger trains will be operated as the test train. The number of passes by the test train will be progressively increased throughout to the level required by the RCom for final acceptance.

9.4. Final System Acceptance Tests

An FSAT (also known as a Client Acceptance Test) must not be carried out until the SIT and DynIT have been completed and all issues arising from these tests have been closed out to the satisfaction of RCom.

FSATs must be carried out as a joint activity between the Project, RCom and maintainer/s.

9.5. Driver Training and Public Familiarisation

Assurance which demonstrates that the system is safe and fit for purpose must be provided before the commencement of driver training and public familiarization.

Driver training and public familiarization must not commence until *the Asset Handover Certificate* has been accepted by RCom

9.6. Commissioning Handover

Commissioning handover takes place when the RCom has accepted that the “Systems Inspection, Testing and Commissioning” has been completed.

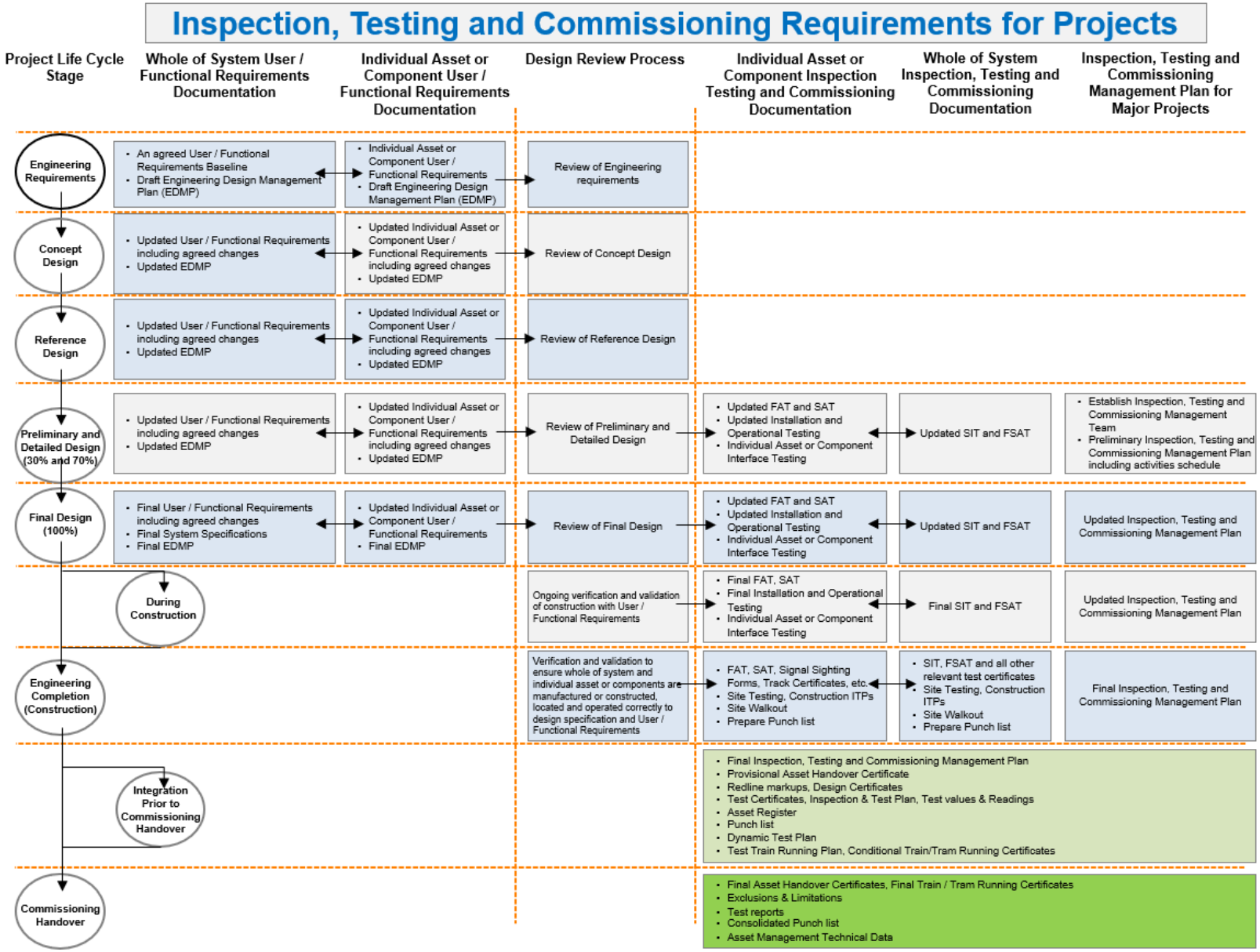
At the time of commissioning and handover, all documentation related to inspection, testing and commissioning must be provided to RCom.

10. Records

All documentation associated with all inspection, testing and commissioning must comply with PTS-MS-05-AM-PRC-00000091 Asset Management Technical Data for Projects.

The Contractor must maintain and supply all records necessary to provide evidence of compliance with the requirements in PC-RW60 “Asset Management Handover”.

As a completion requirement for the *Asset Handover Certificate*, all maintained assets must be registered in the relevant Asset Management System with all associated asset data aligned for operational readiness and use by the maintainer.



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