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Metrolinx
Reliability, Availability and Maintainability Test Specification: Product Description

MX-SEA-PD-124

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Amendment Record

Revision	Date (DD/MM/YYYY)	Description of changes

Preface

This is the first edition of the Metrolinx Reliability, Availability and Maintainability (RAM) Test Specification Product Description (MX-SEA-PD-124). It forms part of a suite of guidance documents that describe the procedures to be followed to comply with Metrolinx's Reliability, Availability, Maintainability and Safety (RAMS) requirements.

The purpose of this document is to describe the document that defines the actions required to test the RAM requirements for the change to the railway system and details how the test actions shall be implemented. Project proponents may need to apply the process when they are undertaking a technical change to the railway system or modifying a maintenance regime or undertaking an operational change to the railway system.

Suggestions for revision or improvements can be sent to the Metrolinx Systems Engineering Assurance office at Engineering.Assurance@metrolinx.com. The Director of the Systems Engineering Assurance office authorizes the changes. Include a description of the proposed change, background of the application and any other useful rationale or justification. Be sure to include your name, company affiliation (if applicable), e-mail address, and phone number.

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Contents

Tables

Documents

Table 1 Supporting Documents

Document Number	Document Title	Relation
BS EN 50126-1:2017	Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) Part 1: Generic RAMS Process	Parent Standard
MX-SEA-STD-100	RAMS Process Standard	Related Standard
MX-SEA-GDC-124	Reliability, Availability and Maintainability Test Specification Guidance	Guidance
MX-SEA-TPL-124	Reliability, Availability and Maintainability Test Specification Template	Template
MX-SEA-PD-123	RAM Validation Plan Product Description	Related Product
ISO 9001:2015	Quality management systems — Requirements	Supporting Standard
MX-SEA-TOR-001	Metrolinx System Review Panel (SRP) Terms of Reference (ToR)	Review Panel ToR
April 5, 2023	Metrolinx Safety Certification Committee (SSC) Terms of Reference (ToR)	Certification Committee ToR

Acronyms and Abbreviations

Table 2 Acronyms and Abbreviations

Abbreviation	**Full Name**
CTO	Consent To Operate
ISA	Independent Safety Assessor
PFD	Process Flow Diagram
RACI	Responsible, Accountable, Consulted and Informed
RAM	Reliability, Availability and Maintainability
RAMS	Reliability Availability Maintainability and Safety
SCC	Safety Certification Committee
SRP	System Review Panel
ToR	Terms of Reference

Definitions

Table 3 Definitions

Term	Definition	Source
Asset Owner	Groups and individuals that are responsible for asset ownership, asset maintenance, inventory management, document control, asset handover and reliability engineering	MX-ALM-STD-001
Availability	Ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided.	BS EN 50126:2017
Maintainability	Ability to be retained in, or restored to, a state to perform as required, under given conditions of use and maintenance.	BS EN 50126:2017
Project Company	The private sector entity which enters into the Project Agreement with Infrastructure Ontario and Lands Corporation and Metrolinx to design, build and where applicable, finance, operate or maintain a Project. The special-purpose entity which has entered into a Project Agreement with the Contracting Authority.	CKH-QMA-FRM-003
Project Management	Appointed by Metrolinx as its representative and is responsible for the delivery of the Project within the prescribed Schedule and budget. Metrolinx employees fulfilling the role of the Project Manager may also be considered the Cost Centre Manager, if this person is also delegated signing authority in accordance with the Metrolinx Corporate Administrative Manual, Administrative Management, Approval Authorization Controls and Designations. It is noted that non-Metrolinx employees fulfilling the role of the Project Manager are not considered Cost Centre Managers. In such cases refer to approved Project Chart of Accounts for the Program for the designated Cost Centre Manager.	CKH-QMA-FRM-003

Reliability	Ability to perform as required, without failure, for a given time interval, under given conditions.	BS EN 50126:2017
Subsystem	Part of a system, which is itself a system	BS EN 50126:2017
System	Set of interrelated elements considered in a defined context as a whole and separated from their environment	BS EN 50126:2017

1 Reliability, Availability and Maintainability Test Specification

1.1 Purpose

1.1.1 The Reliability, Availability and Maintainability (RAM) Test Specification defines the actions required to test the RAM requirements for the change to the railway system and details how the test actions shall be implemented.

1.2 Applicability

1.2.1 This product is mandatory for any project that undertakes a technical change to the railway system (i.e. introduction of a new subsystem, renewal of an existing subsystem, a modification to an existing subsystem, or introduction of a new or modified maintenance regime) or undertakes an operational change to the railway system.

1.2.2 This product is not applicable for established routine maintenance activities including like-for-like replacement of components.

1.2.3 This product is considered good practice when developing or modifying any complex system.

1.3 Supporting Material

1.3.1 The RAM Test Specification template is located in MX-SEA-TPL-124.

1.3.2 Guidance on completing the RAM Test Specification is located in MX-SEA-GDC-124.

1.4 Products

1.4.1 The RAM Test Specification is a product of the System Assurance process. Guidance on this process is available via MX-SEA-STD-100.

1.5 Key Responsibilities

1.5.1 The Project Company is responsible for the production of the ram test specification. Preparation of the RAM test specification may be delegated, however the Project Company is responsible for its content and quality.

1.5.2 The Project Company is the organization responsible for the contracted scope of work at the time of development.

1.5.3 The System Review Panel (SRP) has delegated authority from the Safety Certification Committee (SCC) and is responsible for endorsing the RAM Test Specification. The System Review Panel ensures that the RAM Test Specification is compliant with the project requirements, applicable legislation, and national, industry, and Metrolinx standards. The

SRP may also identify uncertainties, issues, and assumptions that may arise as the project progresses that should be addressed.

1.5.4 The Project Management may be performed by Metrolinx or may be contracted, for example in a Design/Build, whereby Metrolinx Project Management would ensure contract provisions for RAM Test Specification are met and would not develop the RAM Test Specification.

1.5.5 Some of the Asset Owner obligations and responsibilities may be transferred through contracting, whereby the contract contains RAM and operating requirements. The Metrolinx Asset Owner would endorse the RAM Test Specification whereas a contracted party responsible for RAM would develop the RAM Test Specification as directed by the Project Management.

1.5.6 The full Responsible, Accountable, Consulted, and Informed (RACI) information that sets out the interaction between all stakeholders involved in the production and endorsement of the RAM Test Specification is available in MX-SEA-STD-100.

1.6 Competence

1.6.1 The RAM Test Specification shall be completed by personnel with general knowledge of RAM management and detailed knowledge of the specific RAM requirements and activities of the project.

1.7 Structure

1.7.1 The structure of the RAM Test Specification is described in the RAM Test Specification Guidance document located in MX-SEA-GDC-124.

1.7.2 The document requires the following section titles:

a) Introduction;

b) RAM Test Specification; and

c) RAM Test Reporting.

1.8 Contents

1.8.1 The contents of the RAM Test Specification are described in the RAM Test Specification Guidance document located in MX-SEA-GDC-124.

1.8.2 As a minimum, it shall contain the following:

d) Summary background information about the context of the project including project interfaces and boundaries;

e) expansion on the activities in the RAM Validation Plan, adding specific detail to the RAM Validation activities which require testing to be carried out;

f) details of the RAM test activities to be carried out on the project, including the applicable RAM requirements, the system configuration, any test conditions or limitations, and the pass/fail criteria; and

g) a process for how any non-conformances identified during the test process will be escalated and managed.

1.8.3 Any update to the RAM Test Specification shall consider and capture those activities which are already completed, and hence define any remaining activities (including potentially repeating activities where required).

1.9 Quality Criteria

1.9.1 The RAM Test Specification shall have sufficient detail to completely define RAM test activities such that these activities are clearly and unambiguously defined, and adequately support the RAM Validation Plan. It shall set a clear plan for all actors responsible for RAM testing.

1.9.2 The quality management system used shall conform to ISO 9001:2015 rules or equivalent rules accepted by the Metrolinx Project Delivery Team and be appropriate for the system under consideration.

1.10 Document Management

1.10.1 The RAM Test Specification may be completed at any point from Phase 4 (System Requirements) onwards but shall be complete by Phase 7 (Manufacture). The RAM Test Specification is a requirement for the Consent to Test (CTT) Gate.

1.10.2 Table 4 provides an overview of the RAM Test Specification document phases.

Document	Phase
RAM Test Specification	7 – Manufacture

TABLE 4: DOCUMENT PHASES