Metrolinx
Reliability, Availability and Maintainability Requirements Validation Report: Product Description

MX-SEA-PD-138

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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) Requirements Validation Report Product Description (MX-SEA-PD-138). 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 RAM Requirements Validation Report which summarizes the validation activities performed by the project proponents to assure the RAM requirements of the project identified from Phases 1 to 4 have been properly specified. Project proponents may need to generate this report 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.

April 2023

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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
BS EN 50126-2:2017	Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) – Part 2: Systems Approach to Safety	Parent Standard
MX-SEA-STD-100	RAMS Process Standard	Related Standard
MX-SEA-GDC-138	RAM Requirements Validation Report Guidance	Guidance
MX-SEA-TPL-138	RAM Requirements Validation Report Template	Template
MXSD-SSA-L1-STD-0001	Railway Risk Assessment Standard	Supporting Standard
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

Acronym	Full Name
ISA	Independent Safety Assessor
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

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 Manager	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
Validation	Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled	BS EN 50126:2017

1 Reliability, Availability and Maintainability Requirements Validation Report

1.1 Purpose

1.1.1 The purpose of the Reliability, Availability and Maintainability (RAM) Requirements Validation Report is to demonstrate that the RAM requirements identified in the early phases of the project (Phase 1 to 4) have been properly specified. It shall demonstrate that the process carried out by the project company has properly supported the identification of RAM requirements and the process that was undertaken by the validator to reach a conclusion of the validation activities. It shall include evidence, or links to evidence supporting the validation activities considered appropriate by the validator.

1.2 Applicability

1.2.1 The product is mandatory for any project that undertakes 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 as defined by the requirements of EN 50126.

1.2.2 This product is not applicable for established routine maintenance activities including like-for-like replacement for 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 Requirements Validation Report template is located in MX-SEA-TPL-138.

1.3.2 Guidance on completing the RAM Requirements Validation Report is located in MX-SEA-GDC-138.

1.4 Products

1.4.1 The RAM Requirements Validation Report 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 Requirement Validation Report. Preparation of the RAM Requirement Validation Report 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 design at the time of development.

1.5.3   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 Requirements Validation Report are met and would not develop the RAM Requirements Validation Report.

1.5.4   Some of the Asset Owner obligations and responsibilities may be transferred through contracting. The Metrolinx Asset Owner would participate in endorsing the RAM Requirements Validation Report whereas a contracted party would develop the RAM Requirements Validation Report as directed by the Project Management.

1.5.5   The System Review Panel (SRP) has delegated authority from the Safety Certification Committee (SCC) and is responsible for endorsing the RAM Requirement Validation Report. The System Review Panel ensures that the RAM Requirement Validation Report is compliant with the project requirements, applicable legislation, 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.

1.5.6   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 Requirement Validation Report is available in MX-SEA-STD-100.

1.6   Competence

1.6.1   All personnel identified within the RAM Requirements Validation Report shall possess the required competence in the Canadian Method for Risk Evaluation and Assessment for Railway Systems (CMREA) and RAM management principles, understanding of the project organization proposed lifecycle and domain knowledge of the project company.

1.7   Structure

1.7.1   The structure of the RAM Requirements Validation Report is described in the RAM Requirements Validation Report Guidance document located in MX-SEA-GDC-138.

1.7.2   The document requires the following section titles:

a)   Introduction;

b)   System Definition;

c)   Project RAM Organization;

d)   RAM Analyses and Requirements;

e)   Validation of RAM Requirements; and

f)   Discussion and Conclusion.

1.8   Contents

1.8.1   The contents of the RAM Requirements Validation Report are described in the RAM Requirements Validation Report Guidance document located in MX-SEA-GDC-138.

1.8.2   As a minimum, it shall contain the following:

    a)   Identification and name of:

        1)   the system under consideration;

        2)   the documents and other items used for the validation;

        3)   processes, technical support tools and equipment used if any;

        4)   the simulation models used if any;

    b)   confirmation that process and activities have been conducted to what has been described in the RAM plan. Deviations from the RAM plan shall be recoded and justified;

    c)   validation of the RAM system requirements against RAM targets and RAM policies of the railway duty holders;

    d)   confirmation that all system requirements (including RAMS, functional, and external legal requirements) are adequately analysed and specified in order to allow the system under consideration to serve the intended use.

1.9   Quality Criteria

1.9.1   The RAM Requirements Validation Report shall demonstrate that that the system under review / assessment has properly specified the RAM requirements as mandated by CMREA and EN 50126 through reporting of all the activities that have been undertaken as part of the risk assessment activities.

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 Requirements Validation Report is produced at Phase 4 (System Requirements).

1.10.2   The document provides an input for the RAM Validation Plan to be produced in Phase 4 and updated through Phase 9 (System Validation). The implementation of the RAM Validation Plan will provide the results to be documented in the RAM Validation Report in Phase 10 (Acceptance).

1.10.3   Table 4 provides an overview of the RAM Requirements Validation Report document phases.

Document	Phase
RAM Requirements Validation Report	4 – System Requirements

TABLE 4: DOCUMENT PHASES