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Metrolinx Reliability, Availability and Maintainability Plan: Product Description

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

Preface

This is the first edition of the Metrolinx Reliability, Availability and Maintainability (RAM) Plan Product Description (MX-SEA-PD-119). 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 Plan which details the activities, resources and events that satisfy the RAM requirements for a given project. Project proponents may need to generate a RAM Plan 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) (PHASE 1: Adoption of European Standard EN 50126-1:2017)	Parent Standard
MX-SEA-STD-100	RAMS Process Standard	Related Standard
MX-SEA-PD-117	Reliability, Availability and Maintainability Analysis Process Product Description	Product Description
MX-SEA-GDC-119	Reliability, Availability and Maintainability Plan Guidance	Guidance
MX-SEA-TPL-119	Reliability, Availability and Maintainability Plan 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

Abbreviation	Full Name
AIP	Approval In Principle
CMREA	Canadian Method for Risk Evaluation and Assessment for Railway Systems
ISA	Independent Safety Assessor
LRU	Line Replaceable Unit
PDD	Process Description Document
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 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

1 Reliability, Availability and Maintainability Plan

1.1 Purpose

1.1.1 The Reliability, Availability and Maintainability (RAM) Plan is a documented set of time scheduled activities, resources and events serving to implement the organizational structure, responsibilities, procedures, activities, capabilities and resources that together ensure that an item satisfies given RAM requirements relevant to a given project.

1.1.2 The RAM Plan describes the RAM activities that will be completed during a project and how they will be managed.

1.1.3 The objective of the RAM activities is to provide assurance that the relevant equipment meets the RAM requirements for the project.

1.1.4 The RAM plan identifies and documents the duration and resource requirements to complete RAM activities

1.2 Applicability

1.2.1 This product is mandatory for all projects that undertake 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 Plan template is located in MX-SEA-TPL-119.

1.3.2 Guidance on completing the RAM Plan is located in MX-SEA-GDC-119.

1.4 Products

1.4.1 The RAM Plan 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 Plan. Preparation of the RAM Plan 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 Plan. The System Review Panel ensures that the RAM Plan 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 the RAM Plan are met and would not develop the RAM Plan.

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 participate in endorsing the RAM Plan whereas a contracted party responsible for RAM would develop the RAM Plan 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 Plan is available in MX-SEA-STD-100.

1.6 Competence

1.6.1 All personnel responsible for the delivery of the RAM Plan shall possess the necessary competence to deliver the works. This shall include competency in RAM management, project management, and a technical understanding of the project.

1.7 Structure

1.7.1 The structure of the RAM Plan is described in the RAM Plan Guidance document located in MX-SEA-GDC-119.

1.7.2 The document requires the following section titles:

a) Introduction;

b) RAM Policy

c) System Boundary;

d) System Description;

e) RAM Organization;

f) RAM Management;

g) Reliability;

h) Availability;

i) Maintainability; and

j) Project RAM Delivery Program.

1.8 Contents

1.8.1 The contents of the RAM Plan is described in the RAM Plan Guidance document located in MX-SEA-GDC-119.

1.8.2 As a minimum, it shall contain the following:

a) a description of how the contracted project shall implement and manage RAM activities;

b) a policy for resolving conflicts between safety and other aspects like availability and reliability;

c) the maintenance and repair policy / policies;

d) the policy to be followed where the system does not satisfy the RAM requirements and targets;

e) the responsibilities of the main actors;

f) the scope and physical boundary of the contracted project;

g) any interfaces with third parties;

h) a summary of the system definition;

i) the system life cycle and RAM tasks and processes to be undertaken within each phase of the life cycle;

j) a list of RAM deliverables;

k) RAM acceptance tasks;

l) constraints and assumptions made in the RAM plan;

m) subcontractor management arrangements;

n) details of the RAM Analysis Process (refer to MX-SEA-PD-117); and

o) the project delivery planning for the project RAM activities.

1.9 Quality Criteria

1.9.1 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.

1.9.2 The RAM Plan sets out clear management to ensure that the RAM activities are effectively carried out as mandated by EN 50126 in co-operation with other project activities. It shall set a clear plan for all actors responsible for RAM activities.

1.10 Document Management

1.10.1 The first issue of the RAM Plan shall be prepared in the System Definition Phase (Phase 2) of the product lifecycle as defined in EN 50126.

1.10.2 The RAM Plan shall be implemented, reviewed, and maintained during the product lifecycle from the Risk Analysis Phase (Phase 3) to the Integration Phase (Phase 8), including;

a) As soon as a third party interface is added/modified, the RAM Plan shall be updated; and

p) While the system design is developed, the system requirements and description could be amended/improved. When this happens, the RAM Plan is reviewed, and where required the RAM Plan shall be amended/improved and re-issued.

1.10.3 Table 4 provides an overview of the RAM Plan document phases.

Document	Phase
RAM Plan	2 – System Definition
RAM Plan (Updated)	3 – Risk Analysis – 8 – Integration

TABLE 4: DOCUMENT PHASES