Metrolinx
Preliminary System Definition: Product Description

MX-SEA-PD-105

Revision 00

Date: April 2023

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MX-SEA-PD-105

Publication Date: April 2023

Amendment Record

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

Preface

This is the first edition of the Metrolinx Preliminary System Definition Product Description (MX-SEA-PD-105). 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 Preliminary System Definition documentation that project proponents may need to generate 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
CSA R114:22	Canadian method for risk evaluation and assessment for railway systems	Parent Standard
MX-SEA-STD-100	RAMS Process Standard	Process Flow Diagram
MX-SEA-GDC-105	Preliminary System Definition Guidance	Guidance
MX-SEA-TPL-105	Preliminary System Definition Template	Template
MXSD-SSA-L1-STD-0001	Railway Risk Assessment Standard	Supporting Standard
MX-SSA-002	Significance Tool: Guidance	Supporting Guidance
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
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 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	CKH-QMA-FRM-003

	approved Project Chart of Accounts for the Program for the designated Cost Centre Manager.	
Reliability	Ability to perform as required, without failure, for a given time interval, under given conditions.	BS EN 50126:2017
Safety	Freedom from unacceptable risk that related to human health or to the environment	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 Preliminary System Definition

1.1 Purpose

1.1.1 The Preliminary System Definition captures the high-level scope of the project and determines if the project is considered a significant change as per CSA EXP11:20. The significance decision and justification is documented as part of the Preliminary System Definition.

1.1.2 The Preliminary System Definition is produced at Phase 1 (Concept) and forms part of the bid submission, reviewed by the both the Metrolinx and the project Independent Safety Assessor (ISA).

1.1.3 As this document is produced at an early stage of the project it also records any uncertainties or assumptions and how they may impact on the project. This document outlines how the system is to be broken into subsystems and the method of determining the subsystem structure, where known.

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 For renewal of subsystems (like for like replacement), this product may be limited to asset information and configuration management. The document shall include sufficient detail of the renewal or replacement to assess if it is truly like-for-like, i.e., that any differences are insignificant with regards to risk and record the justification that the overall change is not significant according to the Canadian Method for Risk Evaluation and Assessment for Railway Systems (CMREA).

1.3 Supporting Material

1.3.1 The Preliminary System Definition template is located in MX-SEA-TPL-105.

1.3.2 Guidance on completing the Preliminary System Definition is located in MX-SEA-GDC-105.

1.4 Products

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

1.5.5 Some of the Asset Owner obligations and responsibilities may be transferred through contracting, whereby the contract contains Reliability, Availability, Maintainability and Safety (RAMS) and operating requirements. The Metrolinx Asset Owner would participate in endorsing the Preliminary System Definition whereas a contracted party responsible for RAMS would develop the Preliminary System Definition 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 Preliminary System Definition is available in MX-SEA-STD-100.

1.6 Competence

1.6.1 The Preliminary System Definition shall be drafted by a person with competence in safety management and shall include people with technical expertise of the proposed change to ensure that all relevant technical considerations and assumptions are included.

1.7 Structure

1.7.1 The structure of the Preliminary System Definition is described in the Preliminary System Definition Guidance document located in MX-SEA-GDC-105.

1.7.2 The document requires the following section titles:

a) Executive Summary

b) Scope of the Project

c) Additionality; Relevant Projects

d) Functions and Subsystem Allocation

e) System Boundaries and Interfaces

f) Operational and Maintenance Requirements

g) Operational Environment

h) Failure Consequence

i) Novelty and Complexity

j) Monitoring and Reversibility

k) Risks and Assumptions

l) Conclusion

1.8 Contents

1.8.1 The contents of the Preliminary System Definition are described in the guidance on completing the Preliminary System Definition located in MX-SEA-GDC-105.

1.8.2 As a minimum, it shall contain the following:

a) A comprehensive summary describing the project goals, the scope and functions of the system, the significance decision and justification and major risks and assumptions that need to be addressed in subsequent project phases;

b) details of the project including the project objectives and any other associated projects covered by the application, and (if applicable) reference to the program Railway level Systen Definition;

c) a description of any recent or planned safety related changes to the system that were not judged to be significant;

d) details of the system functions including allocation to subsystems;

e) a definition of the system boundaries and interfaces including project interfaces, the physical environment, other railway systems, and duty holders to determine if the change may affect the safety of other systems, or if a failure of an external system could lead to a safety risk;

f) all known system operational and maintenance requirements including different operating modes (e.g. normal, abnormal, emergency), new operator competencies, new maintenance tools, equipment, training and any significant changes to the maintenance schedule;

g) a description of the operational environment including weather conditions, mechanical/electrical environment (e.g. electromagnetic interference, vibrations etc), operational conditions/service patterns, behaviors of passengers/staff/public;

h) details of the credible worst-case scenario in the event of failure of the changes introduced to the system including consideration of existing safety barriers/controls outside of the system;

i) a description of any changes that would be considered novel and/or complex including consideration of innovative products or product applications, standard deviations, operating practices, technical and organization complexity that may affect the system safety profile;

j) consideration of the ability to monitor the safety performance of the system throughout its lifecycle and if it would be practical or possible to revert the system to a previous, safe, configuration; and

k) a conclusion summarizing the major risks, assumptions, and mitigations and a clear statement as to whether the change is significant or non-significant under CMREA with justification.

1.9 Quality Criteria

1.9.1 The Preliminary System Definition shall contain sufficient information about the proposed project to complete a significance decision and record the significance decision taken.

1.9.2 The quality management system used shall conform to EN ISO 9001 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 Preliminary System Definition shall feed into the Preliminary Railway System Definition which allows consideration of the impact of multiple projects.

1.10.2 The Preliminary System Definition shall be developed into the System Definition at Phase 2 (System Definition). This dependent document is a requirement for Approval In Principle (AIP) gate progression.

1.10.3 In addition, the Preliminary System Definition influences the initial drafts of the System Safety Plan and the RAM Plan, which are delivered in parallel at Phase 2 (System Definition).

1.10.4 The preliminary System Definition is delivered during Phase 1 (Concept Design). See MX-SEA-STD-100 Appendix A.1 for a full list of RAMS project tasks at each phase.

1.10.5 Table 4 provides an overview of the Preliminary System Definition document phases.

Document	Phase
Preliminary System Definition	1 – Concept Design

TABLE 4: DOCUMENT PHASES