Metrolinx Integration Plan: Product Description

MX-SEA-PD-132

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Date: April 2023

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Amendment Record

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

Preface

This is the first edition of the Metrolinx Integration Plan Product Description (MX-SEA-PD-132). 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 Plan which defines the activities that shall be undertaken as part of system integration in order to demonstrate that the system as a whole is compliant with the defined requirements and ensures a smooth integration with existing systems as well as system components. 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.

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-GDC-132	Integration Plan Guidance	Guidance
MX-SEA-TPL-132	Integration Plan Template	Template
MX-SEA-PD-133	Integration Report Product Description	Related Standard
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**
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
Integration	process of assembling the elements of a system according to the architectural and design specification, and the testing of the integrated unit	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	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
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 Integration Plan

1.1 Purpose

1.1.1 The Integration Plan documents the activities and resources required to confirm functionality of the system and to demonstrate that the system meets the specified RAMS requirements.

1.1.2 The Integration Plan shall apply both to the integration of components and subsystems into the system, as well as to the integration of the system with other interfacing systems.

1.1.3 The system shall be tested and analysed in accordance with the Integration Plan. These tests and analyses shall show that all subsystems and components of the system interact correctly as specified to perform their intended function and do not perform unintended functions. The results of these integration activities are documented in the Integration Report [ref. MX-SEA-PD-133].

1.1.4 The Integration Plan describes the strategy and sequence that components and sub-systems will be tested and connected to interfacing systems, until the system is fully integrated.

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.

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

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

1.3 Supporting Material

1.3.1 The Integration Plan template is located in MX-SEA-TPL-132.

1.3.2 Guidance on completing the Integration Plan is located in MX-SEA-GDC-132.

1.4 Products

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

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

1.6 Competence

1.6.1 The Integration Plan shall be completed by personnel with knowledge of safety management systems and the technical, organizational and operational aspects of the project, with a clear understanding of project integration.

1.7 Structure

1.7.1 The structure of the Integration Plan is described in the Integration Plan Guidance document located in MX-SEA-GDC-132.

1.7.2 The document requires the following section titles:

a) Introduction;

b) System Description;

c) Integration Plan and Methodology;

d) Change Management;

e) Caveats, Assumptions, and Limitations;

f) Reporting.

1.8 Contents

1.8.1 The contents of the Integration Plan are described in the Integration Plan Guidance document located in MX-SEA-GDC-132.

1.8.2 As a minimum, it shall contain the following:

a) a description of the system including boundaries and interfaces;

b) a description of the activities to be undertaken as part of the integration of the overall project, including:

1) Description of each activity;

2) Rationale for each activity including:

i. The goal of the activity; and

ii. Any safety and RAM requirements being verified or validated during an integration activity is listed in the rationale to ensure traceability;

3) Pass/fail criteria;

4) System configuration during test, analysis and inspection activities, test conditions, type of test;

5) A reference to, or description of, any procedures and test specifications that will govern the activity;

6) Equipment, space/infrastructure, facilities or other external resources required;

7) Personnel including witnesses or other external resources; and

8) A complete, logic-tied schedule for all tasks;

c) Risks associated with any integration activities;

d) Health and Safety Requirements during integration activities;

e) Identification of any integration activities that confirm key safety functionalities and therefore must be prerequisites of other activities;

f) A problem resolution policy including required documentation, roles & responsibilities, troubleshooting protocols, and contingency plans for activities that have a high likelihood of occurrence or a severe consequence;

g) a process for modifying or changing the integrated system, to ensure:

1) an impact analysis of the system is completed and documented to ensure subsystems interact safely and the system still functions as intended

2) an evaluation of which activities (tests, analyses, reviews etc.) must be repeated as a result of the modification is completed and documented

3) rollback procedure and checklist is available when implementing the modification or change

h) all the caveats, assumptions, and limitations identified during the integration planning; and

i) the documentation to be produced as part of the planned integration activities.

1.9 Quality Criteria

1.9.1 The Integration Plan shall have sufficient detail to enable understanding of the integration that is needed due to the change, a clear plan for implementing the required integration for each stage, and detail of who is responsible for the actions. It shall set a clear plan for all actors responsible for integration.

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 integration Plan is produced in Phase 4 (System Requirements).

1.10.2 Table 4 provides an overview of the Integration Plan document phases.

Document	Phase
Integration Plan	4 - System Requirements

TABLE 4: DOCUMENT PHASES