Metrolinx
Risk Assessment Report: Product Description

MX-SEA-PD-111

Revision 00

Date: April 2023

Risk Assessment Report: Product Description

MX-SEA-PD-111

Publication Date: April 2023

Amendment Record

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

Preface

This is the first edition of the Metrolinx Risk Assessment Report Product Description (MX-SEA-PD-111). 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 Risk Assessment Report which summarizes the risk assessment activities performed by the project proponents to demonstrate the identified risks have been controlled and the risk level have been reduced as low as reasonably practicable (ALARP). 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

Contents

Tables

Documents

Table 1 Supporting Documents

Document Number	Document Title	Relation
Railway Safety Management System Regulations, 2015 P.C. 2015-91 2015-02-05	Railway Safety Management System Regulations	Regulation
CSA R114-22	Canadian Method for Risk Evaluation and Assessment for Railway Systems	Parent Standard
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
TBD	Hazard Analysis Report	Related Standard
MX-SEA-STD-100	RAMS Process Standard	Related Standard
MX-SEA-STD-006	RAMS Risk Assessment Process	Related Standard
MX-SEA-GDC-111	Risk Assessment Report Guidance	Guidance
MX-SEA-TPL-111	Risk Assessment Report Template	Template
MXSD-SSA-L3-TK-0004	Hazard Management Toolkit	Related Toolkit
MXSD-SSA-LST-0002	Preliminary Hazard list	Related List
MXSD-SSA-L1-STD-0001	Railway Risk Assessment Standard	Supporting Standard
MX-SMS-G001	Metrolinx Safety Department Risk Assessment Guide	Related Guide
MX-SMS-W001	Operational Risk Assessment Worksheet	Related Worksheet
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**
ALARP	As Low As Reasonably Practicable
CMREA	Canadian Method for Risk Evaluation and Assessment for Railway Systems CSA R114-22
ERE	Explicit Risk Estimation
ISA	Independent Safety Assessor
RACI	Responsible, Accountable, Consulted and Informed
RAM	Reliability, Availability and Maintainability
RAMS	Reliability, Availability, Maintainability and Safety
RAP	Risk Acceptance Principle
SCC	Safety Certification Committee
SRAC	Safety-related Application Conditions
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
Risk Acceptance Principle	The rules used to determine whether or not the risk related to one or more hazards is acceptable	CSA R114-22
Risk Assessment	Overall process comprising a risk analysis and a risk evaluation.	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 Risk Assessment Report

1.1 Purpose

1.1.1 The purpose of a Risk Assessment Report is to document RAMS risk assessment activities that are not included in the Hazard Analysis Report. This can include risks that do not have safety implications or risks that require more detailed analysis than what is practical to include in the Hazard Record or Hazard Analysis Report.

1.1.2 Risk assessments can be used to consider both Safety and RAM elements of a system. When considering safety, the risk assessment shall focus on potential sources of harm to people, equipment or the environment. For RAM, performance related risks are considered; since RAM risks often also have Safety implications the project proponent must determine if a performance related risk is included in the Hazard Record.

1.1.3 Risk Assessment supports population of the Hazard Record. Risks may be escalated to Enterprise Risk Management by Metrolinx if necessary.

1.2 Applicability

1.2.1 This product is intended to support the RAMS Process Standard (MX-SEA-STD-100) which is required for projects that undertake a technical change to the railway. Under the Railway Safety Management System Regulations, 2015, it addresses scenarios 15(1)(c)(i) and 15(1)(c)(ii)that require initiation of a risk assessment.

"15 (1) A railway company must conduct a risk assessment in the following circumstances:

(c) when a proposed change to its railway operations, including a change set out below, may affect the safety of the public or personnel or the protection of property or the environment:

i. the introduction or elimination of a technology, or a change to a technology,

ii. the addition or elimination of a railway work, or a change to a railway work"

All other scenarios, which includes addressing identified safety concerns during operations, changes to staffing/personnel and the transportation of dangerous good, shall be addressed through the Operational Risk Assessment process, as per MX-SMS-G001 and MX-SMS-W001, instead of the RAMS process.

1.2.2 This product documents the RAMS risk assessment activities that are not included in the Hazard Analysis Report. For situations where risks are mitigated using Codes of Practice or Similar Reference Systems as the Risk Acceptance Principle (RAP) as per CMREA, the risk assessment can be recorded directly in the Hazard Record with the process documented in a Hazard Analysis Report. This product is to be produced to document risks assessment activities that either:

1.2.3 do not have safety implications (i.e., Limited to RAM or performance related risks that do not have safety implications and are not documented in the Hazard Analysis Report)

1.2.4 may have safety implications and require more analysis than what is practical to include in the Hazard Record or Hazard Analysis Report such as when the need to perform explicit risk estimation is identified

1.2.5 The Risk Assessment Report shall be referenced in the Hazard Record.

1.2.6 A project may produce multiple risk assessment reports to support the Hazard Record and Hazard Analysis report or to analyze RAM risks. The report provides a record of the analysis conducted and the options considered.

1.2.7 This product is not applicable for established routine maintenance activities or operations including like-for-like replacement of components. Safety concerns associated with established routine maintenance activities or operations shall be addressed through the Operational Risk Assessment process and other resource available through the Metrolinx Safety Management System.

1.3 Supporting Material

1.3.1 There are many stakeholders within Metrolinx that have developed tools and resources to support Risk Assessment activities. The supporting material should be reviewed and applied appropriately based on risk being assessed, the purpose of the assessment, and the project Safety and RAM Plans.

1.3.2 Engineering Assurance has produced a RAMS Risk Assessment Process (MX-SEA-STD-006).

1.3.3 System Safety Assurance has produced a Hazard Management Toolkit (MXSD-SSA-L3-TK-0004), Metrolinx Risk Assessment Standard (MXSD-SSA-L1-STD-0001) and a Hazard list (MXSD-SSA-LST-0002). The Metrolinx Risk Assessment Standard (MXSD-SSA-L1-STD-0001) applies to proponents making any change to a railway system that is technical, operational or organizational in nature.

1.3.4 Metrolinx Safety Department has produced an Operational Risk Assessment Worksheet (MX-SMS-W001) and Metrolinx Safety Department Risk Assessment Guide (MX-SMS-G001)

1.3.5 The Risk Assessment Report template is located in MX-SEA-TPL-111.

1.3.6 Guidance on completing the Risk Assessment Report is located in MX-SEA-GDC-111.

1.4 Products

1.4.1 The Risk Assessment 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 and update of the Risk Assessment Report. Preparation of the Risk Assessment Report may be delegated; however, the Project Company is responsible for its content and quality.

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

1.1.1 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 Risk Assessment Report are met and would not develop the Risk Assessment Report.

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

1.1.3 The System Review Panel (SRP) has delegated authority from the Safety Certification Committee (SCC) and is responsible for endorsing the Risk Assessment Report. The System Review Panel ensures that the Risk Assessment Report 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.

1.1.4 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 Risk Assessment Report is available in MX-SEA-STD-100.

1.6 Competence

1.6.1 All personnel identified within the Risk Assessment Report shall possess the required competence in the Canadian Method for Risk Evaluation and Assessment for Railway Systems (CMREA) and safety 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 Risk Assessment Report is described in the Risk Assessment Report Guidance document located in MX-SEA-GDC-111.

1.7.2 The document requires the following section titles:

a) Introduction;

b) Project Safety Organization;

c) Overview of Hazards (those to be assessed);

d) Methodology of Risk Assessment;

e) Risk Assessment Results;

f) Discussion and Conclusion; and

g) Supporting Evidence and Reference Documents

1.8 Contents

1.8.1 The contents of the Risk Assessment Report are described in the Risk Assessment Report Guidance document located in MX-SEA-GDC-111.

1.8.2 The Risk Assessment Report must:

a) Describe the purpose of the risk assessment including the circumstances that triggered the requirement to conduct the risk assessment;

b) Define the scope of the Risk assessment

c) Identify and describe the risks being assessed

d) Describe the methodology used for the risk assessment including the factors taken into account in the risk assessment, including the persons that may be affected and whether property or the environment is affected;

h) State who has been involved in making the risk assessment decisions and show that they are competent to do so.

e) Indicate, for each risk, the likelihood that the risk will occur and the severity of its consequences;

f) Identify the risks that require remedial action; and

i) Identify any methods considered for reducing risk.

j) Demonstrate that the selected risk reduction methods achieve RAM and Safety targets

k) Include any Risk Acceptance Principles (RAP) applied as per CMREA

l) Define any RAM and Safety requirements identified from the risk assessment process.

m) Summarize the results of risk assessment, including methods considered for reducing risk and supporting evidence for the risk assessment;

n) Include a conclusion as to whether the risks of the identified hazards have been reduced to ALARP.

1.9 Quality Criteria

1.9.1 The Risk Assessment Report shall demonstrate that the risks identified in the system under consideration have been properly controlled and the risk levels have been reduced as mandated by CMREA and EN 50126 through reporting of all the risk assessment activities that have been undertaken.

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 main risk assessment commences within Phase 3 (Risk Analysis) and continues iteratively through to Phase 5 (Apportionment) to define the system and subsystem requirements.

1.10.2 The Risk Assessment Reports are reviewed and updated throughout the project stages until the final versions of the Reports are produced at Phase 10 (Acceptance).

1.10.3 Whenever changes are introduced, the Risk Analysis Phase 3 of the lifecycle shall be reapplied including evaluation of the impact on subsequent lifecycle phases.

1.10.4 There may then be more detailed analyses produced in later Phases to assess issues which arise during the project (e.g., detailed design points or deviations from original requirements), which may require an additional report in Phase 10 to summarise the final risk assessment activities as an input to the System Safety Case.

1.10.5 Table 4 provides an overview of the Risk Assessment Report document phases.

Document	Phase
Risk Assessment Report(s)	3 - Risk Analysis – 5 - Apportionment
Risk Assessment Report(s) (when applicable)	6 - Design and Implementation – 10 - Acceptance

TABLE 4: DOCUMENT PHASES