



# **Metrolinx Failure Reporting Analysis and Corrective Action System: Product Description**

MX-SEA-PD-126

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# Failure Reporting Analysis and Corrective Action System: Product Description

MX-SEA-PD-126

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## Amendment Record

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

# Preface

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This is the first edition of the Metrolinx Failure Reporting Analysis and Corrective Action System (FRACAS) Product Description (MX-SEA-PD-126). 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 process required to provide feedback to the Operations Safety Manager, Designer, Manufacturer, Operations Manager and Maintenance Manager regarding failures, defects and their causes found during operational service. 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](mailto: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-STD-001	FRACAS (Failure Reporting, Analysis, and Corrective Action System) Process, RAMS-1	Supporting Standard
MXSD-SSA-L1-STD-0001	Railway Risk Assessment Standard	Supporting Standard
ISO 9001:2015	Quality management systems – Requirements	Supporting Standard
TBD	Hazard Record Product Description	Related Product
MX-SEA-PD-142	Operations Procedure Product Description	Related Product
MX-SEA-PD-143	Maintenance Procedure Product Description	Related Product
MX-SEA-PD-144	Training Procedure Product Description	Related Product
MX-SEA-PD-145	Commissioning Procedure Product Description	Related Product
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

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Table 2 Acronyms and Abbreviations

Abbreviation	Full Name
CTO	Consent to Operate
CLOS	Customer Level of Service
FRACAS	Failure Reporting Analysis and Corrective Action System
ISA	Independent Safety Assessor
Mx	Metrolinx
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
Failure	Loss of ability to perform as required	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	<p>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.</p> <p>The special-purpose entity which has entered into a Project Agreement with the Contracting Authority.</p>	CKH-QMA-FRM-003
Project Management	<p>Appointed by Metrolinx as its representative and is responsible for the delivery of the Project within the prescribed Schedule and budget.</p> <p>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.</p> <p>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</p>	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
Utilization	The measure of the time, or other appropriate parameter such as cycles, ridership, miles, loads, trips, etc. that the asset is in active operation	MX-SEA-STD-001



# 1 Failure Reporting Analysis and Corrective Action System

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## 1.1 Purpose

- 1.1.1 The Failure Reporting Analysis and Corrective Action System (FRACAS) is a process required to provide feedback to the Operations Safety Manager, Designer, Manufacturer, Operations Manager and Maintenance Manager regarding failures, defects and their causes found during operational service. The process shall be clear and logical and ensure that there is a collective forum for all stakeholders to agree the sources of failure, investigation, and corrective actions.
- 1.1.2 The FRACAS process shall be implemented for all projects to manage failures during the implementation of the change. The process shall be continued for the life of the project; however, the responsibility for ongoing maintenance and review may be handed over from the project to the maintainer.
- 1.1.3 The FRACAS process implemented by the project shall follow the Metrolinx standard MX-SEA-STD-001 "FRACAS (Failure Reporting, Analysis, and Corrective Action System) Process" to ensure a consistent and compliant approach is implemented by all involved parties.

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

## 1.3 Supporting Material

- 1.3.1 Guidance on implementing the FRACAS including required contents and formatting of output reports is located in MX-SEA-STD-001.

## 1.4 Products

- 1.4.1 The FRACAS 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 FRACAS process implementation, as well as producing the FRACAS report at Phase 10 (Acceptance).

- 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 FRACAS. The System Review Panel ensures that the FRACAS 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 FRACAS are met and would not develop the FRACAS.
- 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 endorse the FRACAS whereas a contracted party responsible for RAM would develop the FRACAS 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 FRACAS is available in MX-SEA-STD-100.

## **1.6 Competence**

- 1.6.1 All personnel responsible for the delivery of the FRACAS shall possess the necessary competence to deliver the works. This shall include competency in RAM, data management and experience of failure management.

## **1.7 Structure**

- 1.7.1 The structure of the FRACAS Report is described in Metrolinx standard FRACAS Process (MX-SEA-STD-001).

## **1.8 Content**

- 1.8.1 The FRACAS data and report is described in Metrolinx standard FRACAS Process (MX-SEA-STD-001).
- 1.8.2 As a minimum, it shall contain the following information about failures and defects identified during operation and maintenance:
  - 1) Failure Data;
  - 2) Utilization Data;
  - 3) Maintenance Data;
  - 4) Corrective Action Data; and
  - 5) CLOS Targets, RAMS Targets, and Industry benchmarking Data.

- 1.8.3 The FRACAS reports shall be reviewed to determine whether any improvement is needed in the following:
- a) operation and maintenance procedures and manuals;
  - b) training and commissioning procedures;
  - c) hazard record;
  - d) system design; and
  - e) human factors aspects of operation and maintenance.
- 1.8.4 To ensure that priority issues are addressed, the failures and defects shall be categorized for both safety and reliability for varying levels of severity/criticality.

## 1.9 Quality Criteria

- 1.9.1 The FRACAS process is clear and logical and ensures that there is a collective forum for all stakeholders to agree the sources of failure, investigation, and corrective actions. It shall set a clear policy statement for all actors responsible for FRACAS activities.
- 1.9.2 The quality management system used shall conform to 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 FRACAS process is implemented at Phase 8 (Integration) and is related to the development of the RAM Validation Plan. The FRACAS implementation is updated through Phases 9 / 10 (System Validation / Acceptance) alongside the RAM Test Specification and RAM Validation Report.
- 1.10.2 The first FRACAS Report is produced at phase 10 (Acceptance) to demonstrate the system performance from validation testing, as a required submission for CTO gate.
- 1.10.3 Table 4 provides an overview of the FRACAS document phases.

Document	Phase
FRACAS (process implementation)	8 - Integration - 10 - Acceptance
FRACAS Report	10 - Acceptance

TABLE 4: DOCUMENT PHASES