

TR 95 : 2021
(ICS 03.100.70)

TECHNICAL REFERENCE

**Specification of key performance indicators for
asset management in the Singapore railway
industry**

TR 95 : 2021
(ICS 03.100.70)

TECHNICAL REFERENCE

**Specification of key performance indicators for
asset management in the Singapore railway
industry**

Published by Enterprise Singapore

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying and microfilming, without permission in writing from Enterprise Singapore. Request for permission can be sent to: standards@enterprisesg.gov.sg.

© Enterprise Singapore 2021

ISBN 978-981-5024-94-4

Contents

	Page
Foreword _____	3
1 Scope _____	4
2 Normative references _____	4
3 Terms and definitions _____	4
4 General _____	4
5 Reliability KPIs _____	6
6 Availability KPIs _____	9
7 Maintenance and maintainability KPIs _____	12
8 Safety KPIs _____	15
9 Sustainability KPIs _____	19

Annexes

A Examples of processes used to translate organisational objectives into asset management KPIs _____	23
B Examples of using asset management KPIs to guide decision-making _____	25

Tables

1 Input parameters for computation of train service mean kilometres before failure (MKBF) ____	8
2 Other examples of reliability KPIs _____	9
3 Input parameters for computation of train fleet availability _____	11
4 Other examples of availability KPIs _____	12
5 Input parameters for computation of maintenance completion rate _____	14
6 Other examples of maintenance and maintainability KPIs _____	15
7 Input parameters for computation of passenger injury rate while using escalators/lifts/travellers _____	18
8 Other examples of safety KPIs _____	18
9 Input parameters for computation of total maintenance costs incurred over total train-kilometres _____	21
10 Other examples of sustainability KPIs _____	21

Figures

A.1 Process of translating organisational objectives into asset management KPIs _____	23
A.2 Example of translating a railway organisation's strategic objectives into asset management KPIs _____	24
B.1 Process of using KPIs for decision-making _____	25
B.2 Example of using KPIs in the decision-making process for asset management planning ____	26
Bibliography _____	27

Foreword

This Technical Reference (TR) was prepared by the Working Group on Key Performance Indicators for Asset Management in Singapore Railway Industry set up by the Technical Committee on Railway Systems under the purview of the Trade and Connectivity Standards Committee.

This TR describes key performance indicators (KPIs) and the principles of using these KPIs for identified aspects of asset management of railway assets. This TR groups asset management KPIs into key focus areas commonly used in systems engineering and dependability management in the operations and maintenance (O and M) phase of the railway system, covering reliability, availability, maintenance and maintainability, safety and sustainability (RAMSS); provides guidance on their applicability during various phases of an asset's life cycle from the operator's business value perspective to encourage users to adopt a systems and life cycle approach towards asset performance monitoring and management; and performance monitoring of asset management activities.

The TR describes the specification of relevant KPIs through adoption of commonly used "SMART" principles to ensure the performance of asset management can be assessed consistently. It also provides general guidance on the translation of an organisation's business values to asset management KPIs and the use of KPIs for decision-making. Relevant examples of KPIs are provided for each RAMSS focus area to enhance understanding.

This TR is a provisional standard made available for application over a period of three years. The aim is to use the experience gained to update the TR so that it can be adopted as a Singapore Standard. Users of the TR are invited to provide feedback on its technical content, clarity and ease of use. Feedback can be submitted using the form provided in the TR. At the end of the three years, the TR will be reviewed, taking into account any feedback or other considerations, to further its development into a Singapore Standard if found suitable.

Attention is drawn to the possibility that some of the elements of this TR may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

- 1. Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "mature standards". Mature standards will not be subject to further review unless there are requests to review such standards.*
- 2. An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*
- 3. Compliance with a SS or TR does not exempt users from any legal obligations.*

Specification of key performance indicators for asset management in the Singapore railway industry

1 Scope

This Technical Reference (TR) describes the principles and methodologies of defining and measuring asset and asset management performance within the context of the Singapore railway industry.

This TR focuses on KPIs commonly used in systems engineering and dependability management in operations and maintenance life cycle phases of the railway system, namely reliability, availability, maintenance and maintainability, safety and sustainability. Resource and financial management aspects of asset management and related KPIs are not a focus of this TR and will not be covered in detail.

This TR is applicable only to physical assets.

2 Normative references

There are no normative references in this document.