

**TR 96:2021**  
(ICS 03.100.70)

**TECHNICAL REFERENCE**

# **Asset condition assessment approach in the Singapore railway industry – Permanent Way**

**TR 96:2021**  
(ICS 03.100.70)

---

TECHNICAL REFERENCE

**Asset condition assessment approach in the  
Singapore railway industry – Permanent Way**

---

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](mailto:standards@enterprisesg.gov.sg).

© Enterprise Singapore 2021

ISBN 978-981-5042-14-6

**Contents**

	<b>Page</b>
Foreword _____	4
0 Introduction _____	5
1 Scope _____	5
2 Normative references _____	5
3 Terms and definitions _____	6
4 Approach _____	7
5 Definition of asset hierarchy and assessment scope _____	9
6 Tagging of assets and configuration _____	12
7 Definition of assessment and scoring methodology _____	15
8 Conduct of the ACA inspection _____	19
9 Calculation of condition scores _____	21
10 Documentation and report _____	24

**Annexes**

A Assigning of configuration identification codes _____	26
B Parameters to assess for various components _____	30

**Tables**

1 Summary of asset condition assessment approach _____	8
2 Asset hierarchy for plain line _____	10
3 Asset hierarchy for turnout _____	11
4 Summary of how to define a monitoring zone _____	13
5 Example of monitoring zones ID _____	15
6 Various condition data inspection methods _____	16
7 Inspection methods for PWay sub-systems _____	17
8 Definition of condition score _____	17
9 Example of a condition score table _____	18
10 Methods of condition inspection _____	21
11 Illustration of how scores are rolled up from lower-level assets to higher level assets _____	22
12 Asset condition scores and asset planning decision _____	23
A.1 Possible track foundation configurations at a plain line sub-sector _____	27
A.2 Possible track foundation configurations at a turnout sub-sector _____	27
A.3 Possible third rail configurations at a plain line and turnout sub-sectors _____	28
A.4 Possible rail sub-system configuration at a plain line sub-sector _____	28
A.5 Possible track furniture configurations at plain line and turnout sub-sectors _____	28

	<b>Page</b>
A.6 Possible switch and crossing configuration at a turnout sub-sector _____	29
A.7 Resultant possible asset combination configurations at a plain line sub-sector _____	29
A.8 Resultant possible asset combination configurations at a turnout sub-sector _____	29

**Figures**

1 Asset condition assessment approach _____	8
2 Generic asset hierarchy of PWay system _____	10
3 Typical layout of a sector in the rail network _____	10
4 Example asset condition score of a sub-system or component presented in a rail network map _____	13
5 Typical asset management decisions arising from asset condition assessment _____	23

## Foreword

This Technical Reference (TR) was prepared by the Working Group on Asset Condition Assessment Approach in the Railway Industry – Permanent Way set up by the Technical Committee on Railway Systems under the purview of the Trade and Connectivity Standards Committee.

This TR is intended to describe a common approach towards condition assessment of Permanent Way assets of a mass rapid transit system. This will help different entities plan and conduct condition assessment in a consistent way so that the outputs from their assessments can be used to monitor and compare Permanent Way asset health, and support asset management analysis and decision-making.

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.

In preparing this TR, reference was made to PWay asset condition assessment reports by KPMG Services Pte Ltd.

Acknowledgement is made to The Local Government and Municipal Knowledge Base for the reproduction of materials from <http://www.lgam.info> into this standard.

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.*

# Asset condition assessment approach in the Singapore railway industry – Permanent Way

## 0 Introduction

Information on asset condition and degradation rate is crucial to formulate an effective and proactive asset management programme. The information can be used for long-term asset utilisation planning and timely prioritisation of budget for asset refurbishment or replacement to meet the desired asset management objectives.

Conducting periodic condition assessment on the asset of interest is one way to collect such information. For the information to be useful, the asset condition assessment (ACA) must need to be conducted in a systematic, objective and consistent manner to collect relevant data, not only across different assessors, across rail lines but also from one cycle of assessment to the next.

It is important to recognise that ACA does not replace routine maintenance inspections, defect rectification and asset preservation activities. It is conducted to collect data to support decision making for a long-term cost-effective and strategic approach to asset life cycle management.

The Permanent Way (PWay) in a rail network is a class of asset that will benefit from the concept of ACA as PWay assets are subjected to mechanical loads and wear by daily train operations, the condition of which deteriorate over time, and will need to undergo replacement periodically in the life cycle of the rail network.

While the concept and principles of ACA may be similar for different classes of rail assets (e.g., trains, buildings, signalling systems etc), the asset hierarchy structuring, asset identification code assignment, asset conditions to be assessed and scoring methodology are unique to the PWay asset class. Hence, this standard seeks to specify the process and methodology to be adopted for ACAs so that all ACAs for PWay assets can be conducted in a consistent and rigorous manner.

## 1 Scope

This Technical Reference (TR) applies to the condition assessment of PWay assets in the Singapore mass rapid transit (MRT) railway context. It describes the way in which the ACA is performed for PWay assets, covering the following systems: rail system, third rail system, turnout system, track furniture and track foundation (i.e., the ballast or slab track supporting the rail system).

The overhead catenary system is typically not classified as a PWay asset and is not included in the list of systems above.

## 2 Normative references

There are no normative references in this TR.