

**Railway applications –
The specification and demonstration of
Reliability, Availability, Maintainability and Safety (RAMS)
Part 3: Guide to the application of EN 50126-1
for rolling stock RAMS**

*Applications ferroviaires –
Spécification et démonstration de la fiabilité,
de la disponibilité, de la maintenabilité
et de la sécurité (FDMS)
Partie 3: Guide pour l'application de l'EN 50126-1
à la fiabilité, la disponibilité, la maintenabilité
et la sécurité du matériel roulant*

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CENELEC

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Foreword

This Technical Report was prepared by Working Group B11 of SC 9XB, Electromechanical material on board of rolling stock, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as CLC/TR 50126-3 on 2004-08-28.

This Technical Report forms an informative part of EN 50126 and contains guidelines for the application of EN 50126-1 to Rolling Stock RAM.

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Introduction

EN 50126-1 is likely to enhance the general understanding of the issues involved in achieving RAMS characteristics within the railway field. It defines a comprehensive set of tasks for the different phases of a generic life cycle for a total rail system. Although some of the examples given in the annexes of EN 50126-1 are for rolling stock, the standard is essentially aimed as a top level railway system document.

RAMS characteristics for rolling stock (i.e. its long term operating behaviour performance), as for any other system, forms an important part of its overall performance characteristics. But the consideration of RAMS, in contractual terms, between a customer / operator and a Main Supplier for the procurement of rolling stock has been problematic. Also, in rolling stock contracts, there is now a greater emphasis on the impact on end customers of service failures and on the economic and risk considerations of RAMS (i.e. the business perspective).

Consequently, Life Cycle Cost is being used as a measure of satisfying customer needs and providing a wider perspective of RAM's importance in terms of the business economics.

Life Cycle Cost approach represents a holistic, total cost of ownership philosophy for addressing the economic considerations. The contribution of RAMS to the LCC of rolling stock could be used to allow the economic considerations to be addressed.

This application guide focuses mainly on the procurement issues, from the tender to the operation phase, and is intended to help in establishing a common approach for capturing the different, time dependant, performance requirements of rolling stock from an operator/business perspective.

EN 50126-1 is a standard, which treats the overall aspects of RAMS in Railway Applications. This guide deals with the application of RAM part of EN 50126-1 to rolling stock only, as stated in the Scope and clarifies areas where EN 50126-1 could be misinterpreted.

Entities Involved In the Life Cycle Phases of Rolling Stock:

Depending on the organisational and management structure of the railway system concerned, a number of entities, performing different functions, may be involved within the life cycle phases of rolling stock. For the purpose of guidance on contractual relations, the entities are divided into 2 main categories, i.e. customer and supplier.

It is therefore advisable, to identify all the entities that can be a part of this relationship and to examine how the responsibilities of dealing with these entities are shared between the customer and supplier relationship. Table 1 gives some typical examples only:

Table 1 – Possible sharing of responsibility

Entity	Supplier responsibility	Customer responsibility
Main supplier of the rolling stock	X	
Sub supplier of the rolling stock	X	
Operator of the rolling stock		X
Owner of the rolling stock		X
Maintainer of the rolling stock	X	X

1 Scope

This document provides guidance on applying the RAM requirements in EN 50126-1 to rolling stock and for dealing with RAM activities during the system life cycle phases from invitation to tender to demonstration in operation only. All references to EN 50126-1 concern the version of 1998.

The guide is aimed at the customers/operators and main suppliers of rolling stock. The main purpose of the guide is to:

- enable a customer/operator of rolling stock:
 - to specify the RAM requirements addressing the type of operation in terms of the end customer needs, considering service availability and economic considerations;
 - to evaluate different tenders, in terms of RAM requirements, on a common basis with the aid of specific RAM documents;
 - to gain assurance, during design/development phase, that the rolling stock being offered is likely to satisfy the RAM contractual requirements by examining step by step detailed and specific RAM documents as an output of the RAM activities performed during the development phase;
 - to validate that the rolling stock, as delivered, satisfies the specified RAM requirements
- to enable the main supplier of rolling stock
 - to understand the customers/operators RAM requirements
 - to provide substantive information/visibility in a tender to show that the product offered is likely to satisfy the RAM requirements by performing preliminary RAM analysis;
 - to provide substantive information during design/development phase to show that the product offered is likely to satisfy the RAM requirements by performing detailed RAM analysis;
 - to demonstrate that the product delivered satisfies the RAM requirements;

1.1 Limitation of scope

Regarding Safety, this application guide is restricted to providing, for reference purposes only, a list of the most common rolling stock Hazards associated with an operation.

Regarding LCC (Life Cycle Cost), this application guide is restricted to providing only the key RAM parameters necessary to be incorporated into an LCC Model.

This application guide excludes:

- RAM values connected to the different RAM requirements (however, it contains a simple guide line of actions for supporting the decision making process and choosing appropriate values, see 5.4)
- specific RAM documents to be produced and activities to be performed. However, it provides, only as an example, typical data and document templates for recording the output of a RAM analysis).

2 Definitions

For this guide, the in EN 50126-1 and the following apply:

2.1

Part Number

the alphanumeric code, generally assigned by the Main Supplier, to represent a family of items with the same characteristics of Form, Fit and Function.