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Railway applications — Vehicle reference masses

Applications ferroviaires — Masses de référence des véhicules

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Contents

Page

Foreword

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This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found atwww.iso.org/members.html.

Introduction

This document provides a set of vehicle reference masses and describes how each is derived. These reference masses can be used as a clear and unique specification of the load conditions of rail vehicles in relation to dimensioning, design, testing, acceptance, marking, delivery, operation, maintenance, etc. This document does not specify for which cases a defined reference mass is applied. The determination of how these reference masses are applied is governed by the corresponding application standards or specifications.

The reference masses are determined from the parameters described in the document (see 5.1), and their default values. If the default values are not applicable for certain vehicles, specific reference masses may, where justified, be chosen from a range of values given in brackets. The corresponding vehicle specification identifies where specific values are used instead of default values. In this sense, the reference masses, whether based on default values or on specific values, are consistent for all applications which use them.

This document does not supersede mass definitions in application standards. As such, application standards can provide their own mass definitions (special purpose masses). To align these mass definitions in application standards, such special purpose mass definitions should stay within the framework of the specifications described in this document.

Railway applications — Vehicle reference masses

1 Scope

This document provides reference masses for specifying the requirements for rail vehicles.

These reference masses are specified with respect to the whole vehicle, but they can also be applicable to a specific system or component.

This document does not supersede mass or payload conditions which are specified in application standards.

This document is applicable for all types of rail vehicles.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
mass increment
quantity added to or subtracted from the vehicle mass

EXAMPLE *Payload* (3.2), staff, consumables, *wear allowance* (3.10).

3.2
payload
mass increment (3.1) for the load carried by the vehicle (passengers, luggage or cargo)

Note 1 to entry: This is typically a load from which revenue is derived.

3.3
luggage compartment
closed area that is intended for the carriage of luggage and goods, and not for the transport of passengers

3.4
luggage area
low-level location or unit in a passenger saloon or vestibule provided to store luggage

Note 1 to entry: Overhead luggage racks are not regarded as luggage areas.

3.5
passenger area
dedicated area inside the vehicle for transporting passengers

Note 1 to entry: *Catering areas* (3.6) are not regarded as passenger areas.

3.6
catering area
area set aside for passengers for the purchase or consumption of catering services

EXAMPLE Buffet, bar, bistro.

3.7
standing area
unobstructed part of either a *passenger area* (3.5) or a *catering area* (3.6) which can be used by standing passengers

EXAMPLE Vestibules, aisles, stairways.

3.8
normal seat
permanent seat in a *passenger area* (3.5) or *catering area* (3.6)

3.9
tip-up seat
folding seat fixed to a wall or partition for temporary use

3.10
wear allowance
quantity of mass that is assumed to be lost in service due to abrasion and mechanical wear

Note 1 to entry: The main sources of wear to be accounted for are from wheels and brake friction materials.

3.11
dead mass
mass of the vehicle in the "as built" condition without consumables and without staff

Note 1 to entry: See 5.3 for further information.

3.12
working order
condition in which the vehicle is available for service, including staff and an amount of consumables, but without any *payload* (3.2)

Note 1 to entry: The amount of consumables depends on the vehicle condition [*design condition* (3.15) or *operational condition* (3.16)] as given in Table 4.

Note 2 to entry: This state is sometimes described as "unladen" or "tare". Nevertheless, the use of the expression "working order" is encouraged to harmonize wording.

3.13
normal payload
typical *payload* (3.2) seen on a regular basis

Note 1 to entry: The normal payload depends on the vehicle condition (design or operational condition) as given in Table 2.

Note 2 to entry: For freight vehicles, the payload is always taken as the maximum payload as specified in the loading table of the vehicle.

3.14
exceptional payload
maximum possible *payload* (3.2) that can be carried

Note 1 to entry: The exceptional payload represents the design limit for operation of the vehicle and is only defined for the design condition (see also Table 2).

3.15
design condition
theoretical state for analysis and calculation

3.16
operational condition
assumed average state when in service

3.17
application standard
standard which makes use of the provisions given in this document

3.18
special purpose mass
mass, specified in an *application standard* (3.17), which is based on the reference mass or *payload* (3.2) state definitions specified in this document

Note 1 to entry: In accordance with this definition, a reference mass or payload state as defined in this document, which is used without modification by an application standard, is not considered as a special purpose mass.

Note 2 to entry: See 5.6 for detailed information about the mass definitions in application standards.

3.19
default value
nominal parameter which is used as the basis for the determination of reference masses

Note 1 to entry: In Table A.1, Table A.2 and Table A.3, the default values are given without brackets.

3.20
particular value
alternative parameter within certain limitations which is used as the basis for the determination of reference masses

Note 1 to entry: In Table A.1, Table A.2 and Table A.3, the limitations for particular values are given within brackets.

3.21
vehicle specification
document stating technical vehicle requirements

Note 1 to entry: The vehicle specification typically forms part of the contractual relationship between the manufacturer and the operator.

4 Symbols

The symbols used throughout this document are derived as follows:

Symbol	Definition
m	total vehicle mass
$m_{D,N}$	design mass under normal payload
$m_{O,N}$	operational mass under normal payload
m_U	dead mass
$m_{D,V}$	design mass in working order
$m_{O,V}$	operational mass in working order
$m_{D,X}$	design mass under exceptional payload
Δm	mass increment (payload, consumables, staff, wear allowance)
Δm_{DC}	mass increment for the design consumables

Δm_{OC} mass increment for the operational consumables

Δm_{ND} mass increment for the normal design payload

Δm_{NO} mass increment for the normal operational payload

Δm_{XD} mass increment for the exceptional payload

Further provisions concerning symbols are given in Annex B. Historically used abbreviated terms are listed in Annex C.

5 Calculation of vehicle reference masses

5.1 General

This document specifies methods for calculating reference masses including default values and particular values for payloads.

To determine a reference mass, the following parameters are required:

— applicable vehicle category (see 5.2);

— applicable mean population mass level (see Annex A);

— applicable payload state (see 5.4); and

— condition required:

  — design condition; or

  — operational condition.

These parameters are specified in the relevant vehicle specification and application standard(s).

Tolerances to the reference masses can be given in application standards or in the vehicle specification.

NOTE Certain applications can require reference masses to be evaluated and then place tolerances on those individual values.

Within the framework of reference masses described in this document it is permissible to deviate from the default values and specify particular values within the ranges given in Annex A. If particular values are to be used, then they shall be provided in the vehicle specification.

In specifying particular values for determining reference masses, consideration should be given to:

— consistency between payload states. For example, if the mass per square metre is modified for an exceptional payload, the value to be used for normal payload can potentially also require modification;

— ensuring that any reference mass is applied consistently to applicable system components (for example vehicle body loads and bogie loads).

EXAMPLE A particular value for standing areas of 420 kg/m^2 at $\Delta m_{ND}(420)$ is inconsistent with a particular value for standing areas of 350 kg/m^2 at $\Delta m_{XD}(350)$.

In consideration of the climatic conditions and operating environment where the vehicle is intended to be used, it can be necessary to include additional loads (for example snow and ice build-up on running gear and underframes or rainwater absorbed by wooden freight wagon floors) with the reference masses. Any environmental loads to be considered shall form part of the vehicle specification.