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5	8/9/2025	Final draft ready for QA and PC

Preface

This Standard was prepared by the Rolling Stock Interior Environment Development Group, overseen by the RISSB Rolling Stock Standing Committee.

Since the first publishing of this Standard, additional RISSB products have been developed and published that supersede the information in previous versions of the AS 7513 series.

The major changes in this edition are as follows:

(a) Combination of AS 7513.1, AS 7513.3 and AS 7513.4 into a single Standard;

(b) The requirements from earlier published versions of the AS 7513 series pertaining to comfort parameters and non-ionizing radiation can now be found in AS 7482, *Heating ventilation and air conditioning (HVAC)* and AS 7722, *EMC Management* respectively; and

(c) Previous versions of the AS 7513 series also sourced requirements from documents no longer current though still widely used in the industry, this information is preserved in the informative appendixes.

Objective

The objective of this Standard is to describe the requirements for the interior environmental specification and performance of rolling stock. The main purpose of the requirements is to provide a safe and comfortable environment on rolling stock for humans.

This RISSB Standard attempts to define good to best environmental practice from existing legislation and other sources to incorporate as mandatory and recommended requirements for Australian rail networks.

Compliance

There are four types of provisions contained within Australian Standards developed by RISSB:

(a) Requirements.

(b) Recommendations.

(c) Permissions.

(d) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred. Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied, or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

For compliance purposes, where a recommended control is not applied as written in the Standard it could be incumbent on the adopter of the Standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the Standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

RISSB Standards address known hazards within the railway industry. Hazards, and clauses within this Standard that address those hazards, are listed in Appendix A.

Appendices in RISSB Standards may be designated either “normative” or “informative”. A "normative" appendix is an integral part of a Standard and compliance with it is a requirement, whereas an "informative" appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

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Equations

Tables

Section 1 Scope and general

1.1 Scope

This document describes requirements for the interior environment specification and performance of locomotive, passenger rolling stock, crew cars and infrastructure maintenance rolling stock.

Within this document, where reference is made to passenger rolling stock, it is to be read that crew cars requirements are in line with passenger requirements.

This document applies to new and modified rolling stock.

Existing rolling stock could be assessed and modified to meet the requirements of this document where practical to do so.

The main purpose of the requirements is to provide a safe and comfortable environment on rolling stock for passengers and rail traffic crew.

This document defines good to best environmental practice from existing legislation and other sources to incorporate as mandatory and recommended requirements for Australian rail networks.

The document covers the design, construction and maintenance of rolling stock.

Operation of rolling stock regarding network safe working rules, procedures and route standards is not covered.

This document is not specifically intended to cover freight wagons, light rail, heritage rolling stock or cane railways, but items from this document could be applied to such systems as deemed appropriate by the relevant rail transport operator (RTO).

1.2 Normative references

The following documents are referred to in the text in such a way that *some* or all of their content constitutes requirements of this document:

- AS 1269, *Occupational Noise Management*
- AS 2670, *Evaluation of Human Exposure to Whole-body Vibration*
- AS 7509, *Dynamic Behaviour*
- AS 7482, *Railway Rolling Stock - Heating Ventilation and Air Conditioning (HVAC)*
- AS 7722, *EMC Management*
- AS/NZS 2399, *Acoustics – Specifications for personal sound exposure meters*
- ISO 3381:2021, *Railway Applications - Acoustics - Measurement of Noise Inside Railbound Vehicles*
- ISO 5349-1, *Mechanical Vibration - Measurement and Evaluation of Human Exposure to Hand-transmitted Vibration - Part 1: General Requirements*
- EN 14363, *Railway Applications - Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests*
- EN 12299, *Railway Applications - Ride Comfort for Passengers - Measurement and Evaluation*
- IEC 61672, *Electroacoustics - Sound level meters*
- *National Standard for Occupational Noise [NOHSC: 1007(2009)]*
- *National Code of Practice for Noise Management and Protection of Hearing at Work [NOHSC: 2009 (2009)]*

NOTE:

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

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

1.3.1
cab
driving cabs or any enclosed occupiable workspace

1.3.2
crew car
relay car
crew van
rail test car
hauled vehicle utilized for the transport of workers in freight train

1.3.3
exposure action value
level of hand arm vibration exposure that requires action to reduce risk when reached or exceeded

1.3.4
exposure limit value
maximum permissible level of hand arm vibration exposure

1.3.5
fast fourier transform (FFT)
efficient algorithm for calculating a fourier transform

1.3.6
hand arm vibration
mechanical vibration transmitted into the hands and arms

1.3.7
health guidance caution zone
whole-body vibration level where action is required to reduce risk if the lower limit is reached, and the upper limit cannot be exceeded

1.3.8
high horn
country warning device
audible warning device with a sound intensity level defined in AS 7532 that is intended for main line operation where a higher sound level is required

Note 1 to entry: The sound generating device can be pneumatic, electric or a combination.

Note 2 to entry: Country warning device, both in labelling and terminology, is still used by some RTOs; High horn is the RISSB standard term now being applied. The reason for using the term high horn instead of country horn is to remove the misconception that it was only operated in country areas.

1.3.9
low horn
town warning device
audible warning device with a sound intensity level defined in AS 7532 that is intended for use where a lower sound level is required when compared with the high horn.

Note 1 to entry: The sound generating device can be pneumatic, electric or a combination.

Note 2 to entry: Town warning device, both in labelling and terminology, is still used by some RTOs. Low horn is the RISSB standard term now being applied. The reason for using the term low horn instead of town horn is to remove the misconception that it was only operated in town areas.

1.3.10
HVAC
heating ventilation and air conditioning

1.3.11
LAeq
continuous A-weighted sound pressure level in dB(A) referenced to 20 micropascals

1.3.12
LAFmax
A-weighted maximum sound level measured with a fast time-constant

Note 1 to entry: Maximum is not to be considered peak.

1.3.13
modified rolling stock
rolling stock where a change has been implemented that affects its compliance with the requirements in this document

1.3.14
rail infrastructure manager (RIM)
As defined in Rail Safety National Law

1.3.15
rail stock operator (RSO)
As defined in Rail Safety National Law

1.3.16
rail traffic crew (RTC)
competent worker responsible for the operation of rail traffic

1.3.17
rail transport operator (RTO)
As defined in Rail Safety National Law

1.3.18
ride characteristics
dynamic qualities of a train's movement that affect the experience of passengers and the performance of the vehicle as it travels along the track

1.3.19
ride comfort
complex sensation, produced on the passenger by the vehicle body motions of the railway vehicle, transmitted to the whole body through the interfaces

1.3.20
ride index
parameter used to evaluate vehicle ride comfort

1.3.21
ride quality
overall assessment of how smoothly and comfortably rollingstock travels along the track, as experienced by passengers and measured by technical indices

1.3.22
whole body vibration
mechanical vibration transmitted into the body through a supporting surface when seated or standing

General rail industry terms and definitions are maintained in the RISSB Glossary. Refer to: https://www.rissb.com.au/glossary/

Section 2 Interior noise

2.1 General

For noise level requirements applicable to existing rolling stock, refer to limits in accordance with *NOHSC: 1007.*

2.2 Noise measurement

Unless specified in this document, noise measurements shall be undertaken in accordance with AS 1269.1:2005 and ISO 3381:2021.

Type 1 Sound Level Meters shall comply with the appropriate sections of IEC 61672:2013.

Unless specified in this document, time intervals shall be in accordance with those specified in ISO 3381:2021.

2.3 Multi-mode traction rolling stock

Where rail traffic is operating in a combination of two or more traction systems, the requirements shall pertain to the unit which is in the lead or powering position and which the RTC is operating from. This may include combinations of diesel and electric rollingstock, or future technologies such as battery or hydrogen powered units.

2.4 Non tonal requirements

Internal noise within rolling stock should be non-tonal such that the sound pressure level in each unweighted one-third octave band (L1/3oct, eq, T) shall not exceed the level of the adjacent bands on both sides as follows:

(a) by 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz;

(b) by 8 dB or more if this centre frequency is between 160 Hz ~ 400 Hz; and/or

(c) by 15 dB or more if this centre frequency is below 160 Hz.

The low frequency component of any internal noise should be such that the total linear noise level is no greater than the total A-weighted noise level by more than 15 dB within the frequency range 10 Hz ~ 160 Hz.

2.5 Stationary noise

Operation of the horn for a 3 s duration should not increase the noise level when measured as LAeq over 3 s within the rolling stock cab:

(a) above 95 dB(A) for the high-level high horn; and

(b) above 85 dB(A) for the low-level low horn under any stationary operating condition.

2.6 Internal noise limits by rolling stock type

2.6.1 Locomotive and infrastructure maintenance rolling stock

The noise level within the rolling stock cab should not exceed an LAeq of 70 dB(A) with:

(a) the engine/s (where fitted) are at idle;

(b) all auxiliary equipment operating at maximum load; and

(c) at any throttle setting under self-load for infrastructure maintenance rolling stock.

The noise level within the rolling stock cab should not exceed an LAeq of 75 dB(A) with:

(d) the engine/s (where fitted) at maximum throttle setting under self-load; and

(e) auxiliary equipment all operating at maximum power.

2.6.2 Passenger rolling stock

The noise level within any area of the vehicle normally accessible to the crew and passengers, with the vehicle stationary and all auxiliary equipment operating at maximum load, should not exceed the following LAeq values:

(a) 65 dB(A) for electric multiple-unit trains;

(b) 65 dB(A) for light rail vehicles;

(c) 70 dB(A) for diesel multiple-unit trains; and

(d) 65 dB(A) for hauled passenger vehicles and crew cars.

Microphone positions shall be in accordance with ISO 3381:2021.

2.7 Running noise

2.7.1 General

For all running noise measurement testing, track conditions shall be in accordance with the requirements of ISO 3381:2021.

The internal noise level of rolling stock should not increase by more than 7 dB(A) when:

(a) traversing tunnels or bridges; and

(b) within 50 m of reflective surfaces such as cuttings or walls.

The noise level of an activated railway track signal (also known as a detonator) measured in LAFmax at the crew seated positions shall:

(c) be a minimum of 65 dB(A); and

(d) exceed the maximum running noise at full speed/power under any track condition by at least 15 dB(A).

2.7.2 Locomotive and infrastructure maintenance rolling stock

The requirements of this Clauses 2.7.2 exclude the inclusion of the noise from an activated railway track signal as specified in Clause 2.7.1 (c) and (d).

The noise level within the rolling stock cab should not exceed an LAeq value of 75 dB(A) when the:

(a) engine/s (where fitted) are at idle; and

(b) rolling stock is operating at 50 km/h or its maximum speed (whichever is the lesser).

The noise level within the rolling stock cab speed should not exceed an LAeq value of 80 dB(A) when:

(c) under all service conditions including braking and acceleration as per ISO 3381; and

(d) the rolling stock is operating at its maximum operating speed.

2.7.3 Passenger rolling stock

The noise level within any area of the vehicle normally accessible to the crew only should not exceed an LAeq value of 75 dB(A) when:

(a) measured according to the reference positions in ISO 3381; and

(b) the vehicle is operating at its maximum speed.

The noise level within any area of the vehicle normally accessible to passengers should not exceed the following LAeq values in Table 2-1 with:

(c) the vehicle operating at its maximum speed;

(d) the engine/s (where fitted) are under full power;

(e) air conditioning equipment is operating at full cooling capacity; and

(f) any auxiliary equipment is operating at full power.

Table 2-1 Passenger Rolling Stock Noise Levels by Area

Vehicle type	Passenger zone	LA eq over 5 s
EMU	saloon area	70 db(A)
EMU	vestibules	74 db(A)
DMU	saloon area	70 db(A)
DMU	vestibules	74 db(A)
Hauled passenger vehicles and crew cars	all	70 db (A)

2.8 Noise exposure

2.8.1 General

The equivalent noise exposure level LAeq in a vehicle over an 8 h period shall not exceed the noise exposure limits as defined by NOHSC:1007(2009).

For any interior noise measurement, the peak noise level LCpeak shall not exceed the noise exposure limits as defined by NOHSC:1007(2009).

To record the employee noise exposure, a personal noise dose meter that is in accord with AS/NZS 2399 or an equivalent integrating sound level meter to IEC 61672 may be used.

2.8.2 Passenger rolling stock

The equivalent noise level LAeq over an 8 h period within any passenger area and crew working area of the vehicle with the vehicle at any operating condition shall not exceed the noise exposure limits as defined by NOHSC: 1007(2009).

For travel duration exceeding 8 hours the exposure level shall be normalized to an equivalent 8 h exposure as per AS1269.1:2005

2.8.3 Infrastructure maintenance rolling stock

For any noise measurement at a non-enclosed operating position on the vehicle, when in work mode, the peak noise level LCpeak should not exceed the noise exposure limits as defined by NOHSC: 1007.

Where the equivalent or peak noise exposure levels at an operating position on the vehicle exceed the limits defined by NOHSC: 1007, then suitable hearing protection will need to be worn.

Section 3 Vibration

3.1 General

For Infrastructure maintenance rollingstock this shall include work and travel modes.

For vibration requirements applicable to existing rolling stock, refer to limits in accordance with *NOHSC: 1007.*

3.2 Whole-body vibration

The following whole-body vibrations apply when standardized to an 8 h day and measured and evaluated by the health evaluation method of AS 2670.1:

(a) Persons on new rolling stock shall not be subject to whole-body vibrations which exceed the lower limit of the health guidance caution zone of 0.5 m/s^2.

(b) If modified rolling stock develops vibration levels such that persons can be subjected to vibrations which exceed upper limit of 1.0m/s2, action shall be taken to reduce vibrations to below 1.0m/s2. It is ideally reduced to below 0.5m/s2 SFAIRP.

3.3 Hand-arm vibration

Persons on rolling stock shall not be subject to hand-arm vibrations which exceed a daily exposure limit value of 5 m/s^2 when standardized to an 8 h day and measured on each of the three orthogonal axes as identified in ISO 5349-1:2013.

Persons on rolling stock should not be subject to hand-arm vibrations which exceed a daily exposure action value of 2.5 m/s^2 when standardized to an 8 h day and measured on each of the three orthogonal axes as identified in ISO 5349-1:2013.

Section 4 Ride characteristics and comfort

4.1 General

This section recommends levels of ride quality to achieve a safe and comfortable environment and includes ride characteristics in so far as it pertains to the safety and comfort of passengers and RTC within rollingstock cab and crew areas.

The client or RSO should specify the comfort evaluation method required.

4.2 Ride characteristics

AS 7509 defines mandatory minimum levels of base ride performance.

EN 14363 details the minimum acceptable running characteristics in rollingstock. Unless otherwise specified by the asset owner or RSO, the maximum values for accelerations in the vehicle body shall not exceed the maximum values identified in EN 14363:2016.

Ride characteristics assessment for all rolling stock shall be conducted in accordance with EN 14363:2016.

Alternative methods of assessment as specified by the client or RSO may be acceptable for rolling stock operating on a gauge other than standard gauge as defined in EN 14363.

4.3 Ride quality and comfort assessment

4.3.1 Ride comfort

Unless otherwise specified by the asset owner or RSO, ride comfort of RTC, passengers and travelling crew in crew cars should be assessed in accordance with EN 12299.

EN 12299 describes a method for assessment of the degree of ride comfort achieved and permits higher levels of ride comfort to be specified, according to the requirements of the asset owner or RSO.

The testing methodologies outlined can be relevant to vehicles operating on networks with alternative track gauges such as narrow gauge, and associated threshold values and testing parameters can possibly differ.

Unless otherwise specified by the asset owner or RSO, the standard method for mean ride comfort shall be used.

The asset owner or RSO shall also specify the target value required using the scale for comfort index as per EN 12299:2024.

Whichever ride comfort assessment method is chosen, the vehicle ride should meet the respective values under the following conditions:

(a) at all speeds up to the maximum operating speed for the rolling stock, inclusive of travel mode for infrastructure maintenance rolling stock;

(b) the rolling stock in normal operating condition (i.e. air springs inflated);

(c) in both empty and loaded conditions; and

(d) for wheel profiles as nominated by the RIM.

Simulation may be used to assess wheel profile at differing levels from new to fully worn condition.

For rolling stock equipped with air springs, the Client or RSO may nominate a ride comfort limit that applies for:

(e) the air springs inflated case, at one or more nominated travel speeds, and

(f) the air springs deflated case, at a nominated travel speed.

Commentary *C4.3.1*

Ride index methodology and values that have been sourced from historical documents could be used if agreed by the asset owner or RSO. Examples of these values can be found in Appendix B.

4.4 Testing requirements

Ride quality tests shall be conducted:

(a) for all new and modified passenger rolling stock up to the maximum operating speed for the rolling stock;

(b) for all new and modified passenger rolling stock with air springs inflated and air springs deflated ride quality tests shall be conducted up to the nominated speed, in accordance with Clause 4.2.1, for the rolling stock in each condition.

Ride quality tests should be conducted on the actual track on which it is intended to operate the rolling stock. If this is not available, a representative section of the quality of track on which it is intended to operate the rolling stock may be used.

Section 5 Comfort parameters

Heating, ventilation and air conditioning (HVAC) shall be in accordance with AS 7482:2022.

Commentary *C5*

Comfort parameters include:

- fresh air;
- air velocity;
- atmospheric contaminants;
- temperature; and
- humidity.

Emerging technologies such as hydrogen, ammonia or battery thermal runaway could have potential leakage risks. While these technologies are still in early development stages, consideration of the position of Fresh air intakes on rolling stock could help avoid ingesting flammable or toxic gases.

Section 6 Non-ionizing radiation

The limits of exposure for non-ionizing radiation shall be in accordance with AS 7722:2016.

Appendix A Hazard Register (Informative)

Hazard reference number	Hazard Description
5.3.1.3	Bodily impact
5.3.1.7	Persons being crushed
5.3.1.25	Poor ride quality causing nausea
5.3.1.38	Harmful exposure to vibration
5.3.1.39	Harmful exposure to noise
5.6.1.24	Background noise level in train being too high so that train crews are unable to hear the telecommunication system resulting in Train Control and train crews being unable to communicate
5.14.1.6	Alarms lacking visibility or audibility (Alerting system alarms not noticed)
5.20.1.7	Excessive noise or vibration
5.20.1.8	Excessive cab control equipment forces
5.46.1.2	Inadequate suspension (Excessive vertical acceleration)
5.46.1.5	Inadequate rolling stock structure stiffness (Excessive vertical acceleration)
5.46.1.6	Inadequate suspension (Excessive lateral acceleration)
5.46.1.9	Excessive dynamic longitudinal train forces (Excessive longitudinal acceleration)
5.53.1.6	Test conditions being inappropriate
5.53.1.7	Being unable to achieve desired test conditions
5.53.1.8	Design parameters not being correct (Design error)
5.53.1.9	Incorrect analysis methods (Design error)
5.53.1.10	Equipment not being suitable (Equipment error)
5.53.1.11	Equipment being faulty or out of tolerance (Equipment error)
7.2.1.14	Harsh work environments

Appendix B Ride Index Analysis Requirements (Informative)

B.1 General

The following is provided for information only and for those organizations that still use ride index analysis. The information is sourced from obsolete *Railways of Australia* (ROA) manuals.

Ride comfort assessment or all rolling stock is to be assessed using the ride index with the following criteria:

(a) The sampling rate should be 256 Hz.

(b) Peak vertical and lateral accelerations in the 0 Hz ~ 20 Hz band should not exceed 0.3 g.

B.2 Ride index infrastructure maintenance rolling stock

For ride comfort assessment in accordance with ride index, the vertical and lateral ride index values should not exceed the values shown in Appendix Table B-1.

Appendix Table B-1 Ride Index Values – Infrastructure Maintenance Rolling Stock

Vertical Ride Index	3.5
Lateral Ride Index	3.5
Longitudinal Ride Index	3.5

B.3 Ride index locomotives

For ride comfort assessment to be in accordance with ride index:

(a) Ride index testing should be conducted with accelerometers mounted as close as possible to the bogie centre pivot on the locomotive floor.

(b) Vertical and lateral ride index values should not exceed the values shown in Appendix Table B-2.

Appendix Table B-2 Ride Index Values for Locomotives

Speed range (km/h)	0 ~ 115	116 ~ 130	131 ~ 160
Vertical Ride Index	2.5	2.8	3.2
Lateral Ride Index	2.5	2.8	3.0

B.4 Ride index value for passenger areas

For ride comfort assessment to be in accordance with the ride index:

(a) vertical, lateral (and where relevant) longitudinal accelerometers should be placed as near as practicable to the centreplate along the longitudinal centreline of the vehicle at floor level, or over an axle in the case of two-axle vehicles;

(b) tests should be performed for a minimum of four different periods for a minimum duration of five minutes each; and

(c) the ride index values should not exceed the values shown in Appendix Table B-3.

Appendix Table B-3 Ride Index Values for Passenger Areas

Transit duration	Short	Medium	Long
Example route type	Metro/suburban	Outer suburban/regional	Regional/intercity
Vertical Ride Index	2.8	2.75	2.5
Lateral Ride Index	2.8	2.75	2.5
Longitudinal Ride Index	2.8	2.75	2.5

Commentary *CB.4*

The longitudinal ride index values are intended for use for passengers facing laterally across the vehicle.

Table B-6 uses a mix of the above values to give an improved ride quality with increasing journey distance

B.5 Equations

For ride index, accelerations are weighted by the ride index function RIi as given in Appendix Equation B.5-A, where the i-th value refers to the peak amplitude of a frequency component derived from a fast fourier transform (FFT) analyzer.

Appendix Equation B.5-A Ride Index Function

$$RIi = 7.07(Vi)^{0.1}$$

Equations for Vi for the calculation of ride index are dependent on frequency and direction as given in Appendix Table B-4.

Appendix Table B-4 Values of Vi for Ride Index Valuation

Frequency	Vertical	Lateral
0 Hz ~ 6 Hz	0.325 FA^3	4.32 A^3
6 Hz ~ 20 Hz	400 A^3/F^3	650 A^3/F^3
20 Hz ~ 100 Hz	A^3/F	A^3/F

Where
F = frequency (Hz)
A = amplitude (g)

The total ride index (RItotal) is computed from the i-th value as given in Appendix Equation B.5-B.

Appendix Equation B.5-B Total Ride Index

$$RI_{total} = [\Sigma(RI_i)^{10}]^{0.1}$$
$$i=1 \quad i=n$$

Frequency analysis uses FFT analysis of sufficient resolution over a frequency band of 0 to 50 Hz inclusive, ignoring those values below 0.5 Hz by using a 4-pole 0.5 Hz ~ 50 Hz band-pass Butterworth filter, with the FFT analyzer set to read peak amplitude, not root-mean-square (rms).

Data is averaged over 32 samples.

The FFT analyzer is set to 50% overlap.

Weighting filters implementing the above weighting are acceptable, provided that:

(a) integration is performed over 10 - 15 second periods; and

(b) the integrated values are recorded over at least 3 km of track and reported as mean and variance.

To determine the ride index for a complete journey accelerometer data from all speeds encountered during testing including periods of acceleration and deceleration is required. Ride index values determined by analysis of data acquired only at constant speeds should be clearly identified as such.

Bibliography (Informative)

The following referenced documents are used by this Standard for information only:

- AS 7501, Railway rolling stock - Rolling stock standard certification
- UIC 513 Guidelines for evaluating passenger comfort in relation to vibration in railway vehicles.
- ISO 2631-1, Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration - Part 1: General requirements
- EN 13129-1, Railway applications. Air conditioning for main line rolling stock. Comfort parameters
- EN 50500, Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure