Australian Standard™

Evaluation of human exposure to whole-body vibration

Part 4: Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems

[ISO title: Mechanical vibration and shock—Evaluation of human exposure to whole-body vibration, Part 4: Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew combort in fixed-guideway transport systems]

Standards Australia

This Australian Standard was prepared by Committee AV-010, Mechanical Vibration and Shock Human Effects. It was approved on behalf of the Council of Standards Australia on 30 September 2001 and published on 6 November 2001.

The following interests are represented on Committee AV-010:

Association of Australian Acoustical Consultants

Australasian Railway Association

Australian chamber of Commerce and Industry

CSIRO—Division of Telecommunications and Industrial Physics

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PREFACE

This Standard was prepared by the Standards Australia Committee AV-010, Mechanical Vibration and Shock Human Effects.

The objective of the Standard is to provide designers, operators and relevant authorities with guidance on the evaluation of the effects of mechanical vibration on the comfort and passengers and crew in fixed-guideway transport systems.

This Standard is one of a series dealing with the evaluation of human exposure to whole-body vibration, the series being arranged as follows:

Part 1: General requirements

Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz)

Part 4: Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems

Fixed-guideway vehicles provide a predictable but complex multi-axis motion environment that is a function of the guideway, vehicle and seat or berth. Passengers evaluate ride comfort not only based on motion but also on their expectations with regard to the class of service that they have purchased. The duration of the trip has not been demonstrated to be a direct factor in predicting comfort (with the possible exception of kinetosis), but the anticipated duration of the trip is related to the types of activities passengers expect to accomplish while on board. Passengers on trips of more than a few minutes may expect to read, write, eat and drink; on trips of longer duration they will expect to sleep. To the extent that ride-induced vibration interferes with these activities, passengers may rate differently the comfort of vehicles with the same motion environment but different expected levels of service or different trip durations. Passengers are likely to judge comport based on the interaction of vibration with factors such as acoustic noise, temperature, humidity, air quality and seat design.

This Standard is identical with and has been reproduced from ISO 2631-4:2001, *Mechanical vibration and shock—Evaluation of human exposure to whole-body vibration,* Part 4: *Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems.*

The term 'normative' has been used in this Standard to define the application of the annex to which it applies. A 'normative' annex is an integral part of a Standard.

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number appears on the cover and title page while the International Standard number appears only on the cover.

(b) In the source text, 'this part of ISO 2631' should read 'this Australian Standard'.

(c) A full point substitutes for a comma when referring to decimal mark.

References to International Standards should be replaced by identical Australian Standards, as follows:

Reference to International Standard		Australian Standard	
ISO		AS	
2631	Mechanical vibration and shock—Evaluation of human exposure to whole-body vibration	2670	Evaluation of human exposure to whole-body vibration
2631-1	Part 1: General requirements	2670.1	Part 1: General requirements
IEC			
61260	Electroacoustics—Octave-based and fractional-octave-band filters	—	

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AUSTRALIAN STANDARD

Evaluation of human exposure to whole-body vibration

Part 4:
Guidelines for the evaluation of the effects of vibration and rotational motion on passenger and crew comfort in fixed-guideway transport systems

1 Scope

This part of ISO 2631 provides guidance on the application of ISO 2631-1 to the evaluation of the effects of mechanical vibration on the comfort of passengers and crew in fixed-guideway systems. It is intended to be used by organizations which purchase, specify or use fixed-guideway systems, to help them to understand the relationship between the design of the guideway as well as other features of the system and the comfort of passengers and crew. These guidelines establish methods for the evaluation of relative comfort between systems, as opposed to absolute levels of comfort.

This part of ISO 2631 is applicable to people in normal health exposed to rectilinear vibration along their x-, y- and z-axes, as well as rotational vibration about these (body-centred) axes. It is intended to provide guidance on the assessment of comfort as a function of motions along and about vehicle axes that produce the body motions. This part of ISO 2631 is not applicable to high-amplitude single transients which may cause trauma, such as those resulting from vehicle accidents or "run-ins" produced by "longitudinal slack action", nor is it applicable to high-amplitude vibration which may affect health.

For the purposes of this part of ISO 2631, fixed-guideway passenger systems include rail systems (heavy and light rail), magnetically levitated (MAGLEV) systems and rubber tyre metro-type systems, as well as any of the system types listed above that incorporate a tilt capability to compensate for lateral acceleration when traversing curves.

This part of ISO 2631 provides guidance on the effects of very low-frequency accelerations (0,1 Hz to 0,5 Hz) experienced as vertical forces that may cause kinetosis. These forces may be caused by combinations of curve transition, super-elevation and tilt-body technology. However, this part of ISO 2631 is not intended to give guidance on comfort implications of very low-frequency accelerations (below 0,5 Hz) experienced as lateral or longitudinal forces. Such accelerations can be generated by guideway geometry (horizontal alignment and cant).

This part of ISO 2631 gives guidance on the evaluation of ride comfort based on motion environment only.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 2631. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 2631 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2631-1:1997, *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements*.