
**Mechanical vibration and shock —
Evaluation of human exposure to whole-
body vibration —**

Part 2:

Vibration in buildings (1 Hz to 80 Hz)

iTeh STANDARD PREVIEW

*Vibrations et chocs mécaniques — Évaluation de l'exposition des
individus à des vibrations globales du corps —*

Partie 2: Vibrations dans les bâtiments (1 Hz à 80 Hz)

ISO 2631-2:2003

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 2631-2:2003

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	2
4 Measurement of building vibration	2
4.1 General	2
4.2 Direction of measurement.....	2
4.3 Location of measurement	2
4.4 Frequency weighting	2
4.5 Evaluation of vibration	3
4.6 Measuring instrumentation	3
5 Human responses to building vibration	3
Annex A (normative) Mathematical definition of the frequency weighting W_m.....	4
Annex B (informative) Guidelines for collecting data concerning human response to building vibration	7
Bibliography	10

[ISO 2631-2:2003](https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003)

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

This second edition cancels and replaces the first edition (ISO 2631-2:1989) which has been technically revised, as follows. The whole text was redrafted in order to harmonize it with ISO 2631-1:1997 and to take account of international practice. The frequency weighting defined in this part of ISO 2631 has not been changed compared to the first edition, except in the method of presentation and designation, i.e. W_m instead of $W.B.$ combined used in previous documents. This is the result of a questionnaire held in 1995. A further reason is the use of this frequency weighting in other fields of application, e.g. evaluation of ship vibration. Consequently an adjustment of the frequency weighting at the lower end has not been made.

Subclause 4.5 "Evaluation of vibration" defines categories of vibration in order to give guidance for the application of this part of ISO 2631. The content of Clause 5 "Human responses to building vibration" was restricted to the first paragraph of the former edition. The rest of the text was deleted because its content is now included in ISO 2631-1.

Guidance values above which adverse comments due to building vibration could occur are not included any more since their possible range is too widespread to be reproduced in an International Standard.

A normative Annex A has been added to define the frequency weighting W_m in a manner compatible with the mathematical definition of frequency weightings in ISO 2631-1.

An informative Annex B has also been added which gives guidelines to consider associated phenomena such as reradiated noise and visual effects. Finally, the Bibliography has been updated.

ISO 2631-2 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*, Subcommittee SC 4, *Human exposure to mechanical vibration and shock*.

ISO 2631 consists of the following parts, under the general title *Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration*:

- *Part 1: General requirements*
- *Part 2: Vibration in buildings (1 Hz 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*
- *Part 5: Method for evaluation of vibration containing multiple shocks*

Introduction

Structural vibration to which human beings are exposed in buildings can be detected by the occupants and can affect them in many ways. More particularly, their comfort and quality of life may be reduced.

For the evaluation of vibration in buildings with respect to comfort and annoyance, overall weighted values of the vibration are preferred. The value obtained with the appropriate frequency weighting characterizes the place or site within the building where people may be present, by giving an indication of the suitability of that place.

This part of ISO 2631 is also intended to encourage the uniform collection of data on human response to building vibration.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 2631-2:2003](https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003)

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 2631-2:2003

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>

Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration —

Part 2: Vibration in buildings (1 Hz to 80 Hz)

1 Scope

This part of ISO 2631 concerns human exposure to whole-body vibration and shock in buildings with respect to the comfort and annoyance of the occupants. It specifies a method for measurement and evaluation, comprising the determination of the measurement direction and measurement location. It defines the frequency weighting W_m which is applicable in the frequency range 1 Hz to 80 Hz where the posture of an occupant does not need to be defined.

NOTE 1 The frequency weightings given in ISO 2631-1 can be used if the posture of the occupant is defined.

Whilst it is often the case that a building will be available for experimental investigation, many of the concepts contained within this part of ISO 2631 would apply equally to a building in the design process or where it will not be possible to gain access to an existing building. In these cases, reliance will have to be placed on the prediction of the building response by some means.

This part of ISO 2631 does not provide guidance on the likelihood of structural damage, which is discussed in ISO 4866. Further, it is not applicable to the evaluation of effects on human health and safety.

Acceptable magnitudes of vibration are not stated in this part of ISO 2631.

NOTE 2 At present it is not possible to give guidance on acceptable magnitudes of vibration until more information has been collected in accordance with this part of ISO 2631.

The mathematical definition of the frequency weighting W_m is given in Annex A. Guidelines for collecting data concerning complaints about building vibration are given in Annex B.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 8041, *Human response to vibration — Measuring instrumentation*

IEC 61260:1995, *Electroacoustics — Octave-band and fractional-octave-band filters*

3 Terms and definitions

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

3.1 evaluation

range of activities which includes survey, measurement, processing, ordering, characterization, rating and presentation of relevant data

3.2 building

static construction used for habitation or allocated to any other human activity, including offices, factories, hospitals, schools, day-care centres

3.3 work time

period of activity, or working hours, of the vibration source defined by the daily start and finish times

3.4 exposure time

period during which exposure to the vibration occurs

4 Measurement of building vibration

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4.1 General

The general requirements for signal conditioning and the duration of measurement as specified in 5.4 and 5.5, respectively, of ISO 2631-1:1997 shall be followed.

[ISO 2631-2:2003](https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003)

4.2 Direction of measurement

<https://standards.iteh.ai/catalog/standards/sist/fde6cb11-8a4c-40df-96cf-04d5042613e0/iso-2631-2-2003>

The vibration shall be measured in all three orthogonal directions simultaneously. For this purpose, the directions of vibration are related to the structure rather than to the human body. The orientations of the structure-related x -, y - and z -axes shall be those for a standing person as given in ISO 2631-1.

4.3 Location of measurement

The evaluation with respect to human response shall be based solely on the expected occupation, the tasks performed by the occupants, and the expected freedom from disturbance. Each relevant place or room shall be assessed with respect to these criteria. The vibration shall be measured at that location in the room where the highest magnitude of the frequency-weighted vibration occurs, or as specifically directed, on a suitable surface of the building structure.

NOTE It may be necessary to take measurements at several locations in the building to determine the local variation of the vibration.

4.4 Frequency weighting

The vibration measured at the relevant location and in the three directions according to 4.2 and 4.3 shall be frequency weighted. This part of ISO 2631 (as well as ISO 2631-1) uses frequency-weighted acceleration to express the vibration magnitude.

It is recommended that the frequency weighting W_m according to Annex A be used irrespective of the measurement direction.

NOTE 1 The frequency weightings given in ISO 2631-1 can be used if the posture of the occupant is defined.

Annex A gives the exact definition of the frequency weighting W_m . The values given in Table A.1, applicable to vibration acceleration as the input quantity, are calculated using the true one-third-octave band mid-frequencies and include the band limitation between 1 Hz and 80 Hz. Figure A.1 shows the frequency weighting W_m in a schematic way.

NOTE 2 W_m was previously designated as W.B.combined.

4.5 Evaluation of vibration

4.5.1 Vibration measurement

Vibration values should be determined by application of the methods given in ISO 2631-1. The vibration axis with the highest frequency-weighted vibration magnitude should be identified, and values obtained in this direction used for the evaluation.

In order to allow different kinds of future evaluation, it is recommended, wherever practicable, to use a measurement technique which records vibration time histories unweighted at least within the frequency range 1 Hz to 80 Hz.

4.5.2 Categories of source

For an evaluation, it is useful to categorize the vibration according to the major types of source which have been found in practice to give rise to adverse comments. Different magnitudes of vibration may be acceptable for the different categories. To establish international consistency of approach, the following categories are defined:

- iTeh STANDARD PREVIEW
(standard.iTech.ai)
- a) continuous or semi-continuous processes, e.g. industry;
 - b) permanent intermittent activities, e.g. traffic;
 - c) limited duration (non-permanent) activities, e.g. construction.
- <https://standards.iTech.ai/catalog/standards/sist/6cb11-8a4c-40df-96cf-04d5042615c0/iso-2631-2-2003>

The categories have been selected to reflect the human perception of different vibration sources. They are not intended to be exclusive but to give guidance for the application of this part of ISO 2631.

4.6 Measuring instrumentation

The requirements for measuring instrumentation, including tolerances, as given in ISO 8041 shall be followed.

5 Human responses to building vibration

Experience in many countries has shown that adverse comments regarding building vibration in residential situations may arise from occupants of buildings when the vibration magnitudes are only slightly in excess of perception levels (see ISO 2631-1:1997, Annex C). In some cases complaints arise due to secondary effects associated with vibration, e.g. reradiated noise (see Annex B). In general, satisfactory magnitudes are likely to be related to general expectations and to economic, social and other environmental factors. They are not determined by factors such as short-term health hazards and working efficiency. Indeed, in practically all cases the magnitudes are such that fatigue directly induced by the motion is very unlikely.

Situations exist where significantly higher vibration magnitudes can be tolerated, particularly for temporary disturbances and transient events. Examples of this are construction projects. Any startle factor can be reduced by a proper programme of public relations which may include announcements such as warning signals and/or concerning regularity of occurrence. Only in extremely rare cases should it be necessary to consult the criterion "health" as given in ISO 2631-1. For situations in which vibration occurs over an extended period, long-term familiarization may give rise to a change in adverse comment thresholds.