

Evaluation and measurement for vibration in buildings —

Part 2: Guide to damage levels from groundborne vibration

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the General Mechanical Engineering Standards Policy Committee (GME/-) to Technical Committee GME/21, upon which the following bodies were represented:

- Electricity Association
- Federation of Civil Engineering Contractors
- Imperial College of Science and Technology
- Institute of Sound and Vibration Research
- Institution of Mechanical Engineers
- Lloyds Register of Shipping
- Ministry of Defence
- Open University
- Power Generation Contractors' Association (BEAMA Ltd.)
- Railway Industry Association of Great Britain
- Sira Test and Certification Ltd.
- Society of British Aerospace Companies Limited
- University of Manchester

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Association of Consulting Engineers
- British Coal Corporation
- British Railways Board
- British Society for Strain Measurements
- Department of the Environment (Building Research Establishment)
- Department of Trade and Industry (National Engineering Laboratory)
- Department of Transport (Transport Research Laboratory)
- Health and Safety Executive
- Heriot-Watt University
- Institute of Acoustics
- Institute of Explosives Engineers
- Institution of Environmental Health Officers
- University of Leeds

This British Standard, having been prepared under the direction of the General Mechanical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 November 1993

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Foreword

This Part of BS 7385 has been prepared under the direction of the General Mechanical Engineering Standards Policy Committee. It should be considered together with BS 7385-1:1990 *Guide for measurement of vibrations and evaluation of their effects on buildings*.

More detailed consideration of the methodology for measurement, data analysis, reporting and building classification is given in BS 7385-1, to which the reader is referred for further guidance beyond the basic principles given here.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

Groundborne vibration from sources such as blasting, piling, machinery or road/rail traffic can be a source of concern for occupants of buildings in the vicinity. This concern can lead to a need to assess the effect of the imposed vibration on the building structure to ascertain whether damage could occur. This Part of BS 7385 provides guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources.

There is a lack of reliable data on the threshold of vibration-induced damage in buildings both in countries where national standards already exist and in the UK. This Part of BS 7385 has been developed from an extensive review of UK data, relevant national and international documents and other published data. Although a large number of case histories was assembled in the UK database [1], very few cases of vibration-induced damage were found. It has been necessary therefore, to refer to the results of experimental investigations carried out in other countries into vibration-induced damage thresholds.

This Part of BS 7385 sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. It is intended to provide a standard procedure for measuring, recording and analysing building vibration together with an accurate record of any damage occurring.

1 Scope

This Part of BS 7385 gives guidance on the levels of vibration above which building structures could be damaged. It identifies the factors which influence the vibration response of buildings, and describes the basic procedure for carrying out measurements. Vibrations of both transient and continuous character are considered. A method of assessment which takes into account the characteristics of the vibration, the building and the measured data is given. It is appropriate for the types of investigation given in BS 7385-1, but for detailed engineering analysis, criteria other than the vibration levels may need to be considered.

Only the direct effect of vibration on buildings is considered. The indirect effects on the building structure due to ground movement, the movement of loose objects within buildings, the possibility of damage to sensitive equipment and the effect of vibration on people are outside the scope of this Part of BS 7385. There is a major difference between the sensitivity of people in feeling vibration and the onset of levels of vibration which damage the structure. Levels of vibration at which adverse comment from people is likely are below levels of vibration which damage buildings, except at lower frequencies. The evaluation of human exposure to vibration in buildings is covered in BS 6472.

This Part of BS 7385 does not consider the many other causes of cracking in buildings; cracking commonly occurs in buildings whether they are exposed to vibration or not (see annex A).

Damage due to earthquakes, air overpressure, wind or the sea are also outside the scope of this Part of BS 7385. It is applicable only to vibration transmitted through the ground and not to vibration set up by machinery within a building. Chimneys, bridges and underground structures such as chambers, tunnels and pipelines are not covered.

2 References

2.1 Normative references

This Part of BS 7385 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on page 10. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 7385 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 7385 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 10, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 7385, the following definitions apply.

3.1

peak particle velocity (p.p.v.)

the maximum instantaneous velocity of a particle at a point during a given time interval