
**Mechanical vibration and shock —
Vibration of fixed structures —
Guidelines for the measurement of
vibrations and evaluation of their effects
on structures**

*Vibrations et chocs mécaniques — Vibrations des structures fixes —
Lignes directrices pour le mesurage des vibrations et l'évaluation de
leurs effets sur les structures*



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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.

ISO 4866 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 2, *Measurement and evaluation of mechanical vibration and shock as applied to machines, vehicles and structures*.

This second edition cancels and replaces the first edition (ISO 4866:1990), of which it constitutes a technical revision. It also incorporates the Amendments ISO 4866:1990/Amd.1:1994 and ISO 4866:1990/Amd.2:1996.

Introduction

The necessity for structures to sustain vibration is increasingly recognized, and requires consideration both in the design for structural integrity, serviceability and environmental acceptability, and in the preservation of historic structures.

Measurement of vibration in a structure is carried out for a variety of purposes:

- a) *problem recognition*, where it is reported that a structure is vibrating at such a level as to cause concern to occupants and equipment, possibly making it necessary to establish whether the levels warrant concern for structural integrity;
- b) *control monitoring*, where maximum permitted vibration levels have been established by an agency and those vibrations have to be measured and reported;
- c) *documentation*, where dynamic loading has been recognized in design, and measurements are made to verify the predictions of response and provide new design parameters (These may use ambient or imposed loading. Strong motion seismographs, for example, may be installed to indicate whether the responses to earthquake warrant changes on operating procedure in a structure.);
- d) *diagnosis*, where it has been established that vibration levels require further investigation, measurements are made in order to provide information for mitigation procedures (another diagnostic procedure is to use structural response to ambient or imposed loading to establish structural condition, e.g. after a severe loading, such as an earthquake).

Such diverse purposes call for a variety of measuring systems, ranging from simple to sophisticated, deployed in different types of investigations.

Technical guidance is needed by many interested parties on the most appropriate ways of measuring, characterizing and evaluating those vibrations that affect structures. This applies to both existing structures, which may be subjected to different types of excitation, and new structures erected in an environment where sources of excitation may be significant.

The effects of vibration may also be determined analytically.

Although the material in this International Standard may be used to evaluate the relative severity of structural vibration, it is not to be regarded as suggesting acceptable or non-acceptable levels. Nor does it consider economic and social aspects, which are dealt with as appropriate by national regulatory bodies.

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Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures

1 Scope

This International Standard establishes principles for carrying out vibration measurement and processing data with regard to evaluating vibration effects on structures. It does not cover the source of excitation except when the source dictates dynamic range, frequency or other relevant parameters. The evaluation of the effects of structural vibration is primarily obtained from the response of the structure, using appropriate analytical methods by which the frequency, duration and amplitude can be defined. This International Standard only deals with the measurement of structural vibration and excludes the measurement of airborne sound pressure and other pressure fluctuations, although response to such excitations is taken into consideration.

This International Standard applies to all structures built above or below ground. Such structures are used or maintained and include buildings, structures of archaeological and historical value (cultural heritage), bridges and tunnels, gas and liquid installations including pipelines, earth structures (e.g. dykes and embankments), and fixed marine installations (e.g. quays and wharfs).

This International Standard does not apply to some special structures, including nuclear plants and dams.

The response of structures depends upon the excitation. This International Standard examines the methods of measurement as affected by the source of excitation, i.e. frequency, duration, and amplitude as induced by any source (e.g. earthquake, hurricane, explosion, wind loading, airborne noise, sonic boom, internal machinery, traffic, and construction activities).

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 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 2041 and the following apply.

3.1

vibration source

simple or multiple solid, liquid or gaseous body causing vibration in its environment

[ISO 14964:2000^[8], 3.10]

3.2

vibration event

modification of existing ambient vibrations due to single or multiple sources