
**Mechanical vibration — Measurement
of vibration generated internally in
railway tunnels by the passage of trains**

*Vibrations mécaniques — Mesurage des vibrations produites à
l'intérieur des tunnels ferroviaires par le passage des trains*



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is 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 10815:1996), of which it constitutes a minor revision with the following changes:

- normative references have been updated;
- subclause numbering has been updated;
- bibliography has been updated.

Introduction

Railway tunnels are regularly exposed to vibration originating from internal sources (trains and service carriages, maintenance work, etc.).

In this document, only vibration resulting from the passage of trains is considered.

Vibration is measured in tunnels for different purposes, which are summarized as follows.

When a tunnel is reported to be exposed to vibration which might cause concern regarding its integrity, suitable measurements (see [9.2](#)) should be taken to assess whether the levels are acceptable.

Measurements of vibration might be carried out in the following cases:

- when the maximum allowable vibration level has been established and a regular check is required (see [9.3](#));
- when the dynamic performance of a newly built tunnel has been predicted and performance has to be checked against design data (see [9.2](#));
- a special situation may arise when the tunnel has been exposed to abnormal external action (e.g. due to fires, earthquakes, blasting, pile drivers or demolition of nearby buildings) and the integrity of the structure has to be checked (see [9.2](#));
- when any modification to the track and/or internal vibration sources (e.g. load on vehicle axles) has been made.

Mechanical vibration — Measurement of vibration generated internally in railway tunnels by the passage of trains

1 Scope

This document establishes the basic principles for measuring, processing and evaluating vibration generated internally in railway tunnels by the passage of trains.

By establishing a standard procedure, comparative data may be obtained on response of the tunnel elements from time to time, provided that the excitation source is the same. Data obtained in different tunnels may also be compared.

The measurements considered in this document concern the response of the structure and secondary elements mounted in the tunnel. They do not concern the response of persons in the tunnel or in its vicinity, or of passengers on trains running through the tunnel.

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. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1683, *Acoustics — Preferred reference values for acoustical and vibratory levels*

ISO 5348, *Mechanical vibration and shock — Mechanical mounting of accelerometers*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

tunnel

underground structure in which passenger trains, freight trains or service trains travel

3.2

background noise

sum of all the signals except the one under investigation

4 Factors affecting vibration

4.1 Tunnel-related factors

4.1.1 General

The dynamic characteristics of a tunnel depend largely on its geometry, secondary elements, depth of the tunnel and soil properties.