
**Acoustics — Impulse sound propagation
for environmental noise assessment**

*Acoustique — Propagation des sons impulsionnels et évaluation du
bruit environnemental*



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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 13474 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

Introduction

The aim of this Technical Specification is to specify engineering methods to calculate sound levels from impulse sound sources at distant locations. Its specific purpose is environmental noise assessment, and not assessment of damage risk to buildings, or injury risk to animals or people.

This procedure includes the use of both measured and calculated quantities, and offers empirical relationships and analytical methods for use when measurements are unavailable or impractical. In each case where alternative methods are given, they are presented in decreasing order of preference and accuracy.

Measured immission levels only pertain to prevailing meteorological and ground surface conditions during the measurements. Such sound levels can vary significantly as conditions change, and therefore, obtaining an accurate *averaged* level demands the averaging of measured data for different conditions.

The working method is comparable to that of ISO 9613-2. In the working method of ISO 9613-2, the immission level is calculated for a so-called *down-wind* condition and the long-term average level is estimated using a correction factor, C_{met} . For impulse sound events, however, higher pressure levels and lower frequencies are involved. Lower frequency sounds are generally less attenuated over a given distance in the atmosphere than higher frequencies. Provided that the background sound is unchanged, it follows that impulse sounds can be heard over greater distances and will be more affected by weather and other environmental influences.

In this method the long-term averaged immission level is calculated as a weighted average for a number of weather conditions. The weighting factors are given by the probability of occurrence of each weather condition during the relevant time period for the location of interest. To conduct calculations using the procedure, it is necessary to have a database of sound transfer functions and the statistical distribution parameters pertaining to the relevant meteorological and ground surface conditions.

Acoustics — Impulse sound propagation for environmental noise assessment

1 Scope

This Technical Specification specifies engineering methods to calculate the average sound immission for a distribution of impulse sound events for the purposes of environmental noise assessment. It is applicable to impulse sounds propagating long distances (e.g. 0,5 km to 30 km) from sources such as mining blasting, artillery firing and bomb explosions using conventional explosives of moderate size (e.g. 0,05 kg to 1 000 kg of TNT equivalent mass). Prevailing meteorological conditions and terrain are considered wherever possible.

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 9613-1, *Acoustics — Attenuation of sound during propagation outdoors — Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 9613-2, *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*

ISO 10843, *Acoustics — Methods for the description and physical measurement of single impulses or series of impulses*

3 Terms and definitions

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

3.1

instantaneous sound pressure

total instantaneous pressure at a location in the presence of a sound wave minus the static pressure at that location

NOTE 1 It is expressed in pascals.

NOTE 2 Adapted from ISO 10843.

3.2

impulse sound

single short burst or series of short bursts of sound pressure

NOTE 1 The pressure-time history of a single burst includes a rise to peak sound pressure, followed by a decay of the pressure envelope.

NOTE 2 Adapted from ISO 10843.