

Acoustics — Recommended practice for the design of low-noise workplaces containing machinery —

Part 3: Sound propagation and noise prediction in workrooms

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National foreword

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, page 2, the ISO/TR title page, pages ii to iv, pages 1 to 22 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.

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English version

Acoustics — Recommended practice for the design of
low-noise workplaces containing machinery —
Part 3: Sound propagation and noise prediction in
workrooms

(ISO/TR 11690-3:1997)

Acoustique — Pratique recommandée pour la
conception de locaux de travail à bruit réduit
contenant des machines —
Partie 3: Propagation du son et prévision du
bruit dans les locaux de travail
(ISO/TR 11690-3:1997)

Akustik — Richtlinien für die Gestaltung
lärmarmer maschinenbestückter
Arbeitsstätten — Teil 3: Schallausbreitung
und -vorausberechnung in Arbeitsräumen
(ISO/TR 11690-3:1997)

This European Standard was approved by CEN on 9 January 1998.

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Foreword

The text of the International Standard from Technical Committee ISO/TC 43 “Acoustics” of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 211 “Acoustics”, the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Warning

This document was published as a European Standard to provide a harmonized base for national standards.

It is a guidance document which means that it cannot be used for type-approval purposes.

The guidance contained in this standard is not intended to be exhaustive, but to highlight important aspects to which attention should be given.

Endorsement notice

The text of the International Standard ISO/TR 11690-3:1997 has been approved by CEN as a European Standard without any modification.

TECHNICAL REPORT

ISO/TR 11690-3

First edition
1997-02-15

Acoustics — Recommended practice for the design of low-noise workplaces containing machinery —

Part 3:

Sound propagation and noise prediction in workrooms

*Acoustique — Pratique recommandée pour la conception de locaux de
travail à bruit réduit contenant des machines —*

Partie 3: Propagation du son et prévision du bruit dans les locaux de travail



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Descriptors: Acoustics, machinery, noise (sound), engine noise, noise reduction, workplaces, workroom, design, sound transmission, rules of calculation.

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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard (“state of the art”, for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 11690-3, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

ISO 11690 consists of the following parts, under the general title *Acoustics — Recommended practice for the design of low-noise workplaces containing machinery*:

- *Part 1: Noise control strategies*;
- *Part 2: Noise control measures*;
- *Part 3: Sound propagation and noise prediction in workrooms*.

Introduction

This Technical Report is intended for use by all parties involved in noise reduction in workplaces and design of low-noise workplaces. The objective is:

- to make them aware of what is the current technical consensus regarding sound propagation and noise prediction in workrooms,
- to aid the interaction between them within a common technical framework,
- to promote the understanding of the desired noise control requirements.

This Technical Report provides the connection between the emission of sound sources e.g. machines and the sound pressure level at workstations caused by their operation in a workroom. Therefore, it allows an interchange of information between machine suppliers, who are responsible for noise emission values, and machine users, who require low noise immission values.

A further target is the assessment of the acoustical performance of a workroom.

These tasks are connected by the determination of the sound propagation descriptors of a workroom.

A methodology for noise prediction in workrooms is presented and a structure is given for the classification of prediction methods according to the level of detail of input parameters.

1 Scope

In this part of ISO 11690, sound propagation in a room is considered together with the prediction of sound pressure levels and of noise immission at the workplace.

Details of the description of the physical phenomena involved in a noise prediction scheme are strongly dependent on the situation being considered and the way this situation is modelled (input parameters, calculation techniques). This dependency is surveyed and the methodology for noise prediction is described. Recommendations are provided concerning the use of noise prediction as an aid for noise control in workrooms. Examples of use of noise prediction methods are given in Annex A to Annex E.

2 References

References listed in ISO 11690-1 should also be consulted when using this Technical Report.

3 Definitions

Definitions given in ISO 11690-1 apply to this Technical Report.

4 Basic principles of sound propagation in rooms

4.1 Sound propagation descriptors

A basic element for noise prediction in workrooms is the prediction of the distribution of sound pressure levels caused by an omnidirectional point source. This distribution is influenced by:

- the shape and the volume of the room,
- the absorption of the surfaces,
- the fittings.

The resulting sound level distribution can be considered using a spatial sound distribution curve (see definition 3.4.11 of part 1 and Figure 1 and Figure 2 of this Technical Report). The information contained in this curve can be summarized, for a given distance range, by two quantities (see definitions 3.4.12 and 3.4.13 of part 1):

- the rate of spatial decay of sound pressure level per distance doubling (DL2),
- the excess of sound pressure level with respect to a free field (DLf).

The spatial sound distribution curve and these two quantities are used to describe the acoustical characteristics of a room. The sound pressure level caused by a given source is indeed smaller if DLf is low and DL2 is high (see 6.3 of part 2). Annex D shows how the acoustical characteristics of a room can be described from spatial sound distribution curves.

The spatial sound distribution curve is determined on a free path with no obstacle between the source and the receiver. For its measurement, see 8.4 of part 2.

NOTE 1 An International Standard specific to the measurement of spatial sound distribution curves in rooms is in preparation (ISO 14257 presently at the stage of draft).

NOTE 2 When sound sources (machines) with dimensions too large to be neglected are considered, the sound distribution curve may differ from that of a point source for distances less than the typical dimension of the machine.

4.2 Rooms with diffuse sound fields

If diffuse sound field conditions are met (see definitions 3.4.8 and 3.4.9 of part 1), at a certain distance from the source, sound pressure levels are nearly constant and independent of receiver position, as shown in Figure 1.