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

Part 1: Noise control strategies

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

Partie 1: Stratégie de réduction du bruit



Reference number
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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.

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.

International Standard ISO 11690-1 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*

Part 1 is the central document in the series. Parts 2 and 3 give additional technical and explanatory information. It is therefore recommended to start with part 1.

Annex A of this part of ISO 11690 is for information only.

Introduction

Most of the existing International Standards prepared in ISO/TC 43/SC 1 specify methods for measurement and/or evaluation of noise. The final objective of ISO 11690, however, is noise reduction.

A number of noise control measures are offered. However, in order to be effective, the most appropriate noise control measure(s) should be chosen for a given situation.

It is important when non-acoustic engineers are involved in noise control practice for these engineers to have a basic knowledge of noise emission and propagation characteristics and to understand the basic principles of noise control.

To assist in the development of noise control in the workplace, it is essential that the information contained in these recommended practices is disseminated through International Standards.

In order to reduce noise as a hazard in the workplace, individual countries have produced national legislation. Generally, such national legislation requires noise control measures to be carried out in order to achieve the lowest reasonable levels of noise emission, noise immission and noise exposure, taking into account:

- known available measures;
- the state of the art regarding technical progress;
- the treatment of noise at source;
- appropriate planning, procurement and installation of machines and equipment.

This part of ISO 11690, together with the two other parts in the series, outlines procedures to be considered when dealing with noise control at workplaces, within workrooms and in the open. These recommended practices give in relatively simple terms the basic information necessary for all parties involved in noise control in workplaces and in the design of low-noise workplaces to promote the understanding of the desired noise control requirements.

The purpose of the ISO 11690 series is to bridge the gap between existing literature on noise control and the practical implementation of noise control measures. In principle, the series applies to all workplaces and its main function is:

- to provide simple, brief information on some aspects of noise control in workplaces;
- to act as a guide to help in the understanding of requirements in standards, directives, text books, manuals, reports and other specialized technical documents;

- to provide assistance in decision making when assessing the various measures available.

The ISO 11690 series should be useful to persons such as plant personnel, health and safety officers, engineers, managers, staff in planning and purchasing departments, architects and suppliers of plants, machines and equipment. However, the above-mentioned parties should keep in mind that adherence to the recommendations of the ISO 11690 series is not all that is necessary to create a safe workplace.

The effects of noise on health, well-being and human activity are many. By giving guidelines for noise control strategies and measures, the ISO 11690 series aims at a reduction of the impact of noise on human beings at workplaces. Assessment of the impact of noise on human beings is dealt with in other documents.

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

Part 1: Noise control strategies

1 Scope

This part of ISO 11690 outlines strategies to be used in dealing with noise problems in existing and planned workplaces by describing basic concepts in noise control (noise reduction, noise emission, noise transmission and noise exposure). It is applicable to all types of workplaces and all types of sources of sound which are met in workplaces, including human activities.

It includes those important strategies to adopt when buying a new machine or equipment.

This part of ISO 11690 deals only with audible sound.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11690. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11690 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1996-1:1982, *Acoustics — Description and measurement of environmental noise — Part 1: Basic quantities and procedures.*

ISO 1996-2:1987, *Acoustics — Description and measurement of environmental noise — Part 2: Acquisition of data pertinent to land use.*

ISO 1999:1990, *Acoustics — Determination of occupational noise exposure and estimation of noise-induced hearing impairment.*

ISO 3740:1980, *Acoustics — Determination of sound power levels of noise sources — Guidelines for the use of basic standards and for the preparation of noise test codes.*

ISO 3741:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberation rooms.*

ISO 3742:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms.*

ISO 3743-1:1994, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for small, movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms.*

ISO 3743-2:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for small, movable sources in reverberant fields — Part 2: Methods for special reverberation test rooms.*

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane.*

ISO 3745:1977, *Acoustics — Determination of sound power levels of noise sources — Precision methods for anechoic and semi-anechoic rooms.*

ISO 3746:1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane.*

ISO 3747:1987, *Acoustics — Determination of sound power levels of noise sources — Survey method using a reference sound source.*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment.*

ISO 9614-1:1993, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points.*

ISO 9614-2:1996, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning.*

ISO 11200:1995, *Acoustics — Noise emitted by machinery and equipment — Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions.*

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field plane.*

ISO 11202:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ.*

ISO 11203:1995, *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level.*

ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections.*

ISO/TR 11688-1:1995, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning.*

ISO 11689:1996, *Acoustics — Procedure for the comparison of noise-emission data for machinery and equipment.*

ISO 11690-2:1996, *Acoustics — Recommended practice for the design of low-noise workplaces containing machinery — Part 2: Noise control measures.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

3 Definitions

For the purposes of this part of ISO 11690, the following definitions apply.

3.1 General noise descriptors

3.1.1 sound pressure level, L_p : Ten times the logarithm to the base 10 of the ratio of the mean-square sound pressure (p , in pascals) to the square of the reference sound pressure ($p_0 = 20 \mu\text{Pa}$).

$$L_p = 10 \lg \left(\frac{p^2}{p_0^2} \right) \text{ dB}$$

The sound pressure level is the main quantity to describe the noise at a given point. It is expressed in decibels and shall be measured with a standardized sound level meter (see IEC 651).

The frequency weighting (A or C) or the width of the frequency band and the time weighting (S, F, I or peak) used shall be indicated.

NOTES

1 For example, the C-weighted sound pressure level with time weighting peak is $L_{pC, \text{peak}}$.

2 The notation L_p is used whether the sound pressure level refers to emission (see 3.2), immission or exposure (see 3.3).

3.1.2 time-averaged sound pressure level, $L_{p\text{eq},T}$: Sound pressure level of a continuous steady sound that within a measurement time interval, T , has the same mean square sound pressure as a sound under consideration which varies with time; it is the level of the mean square sound pressure over a time interval. It is expressed in decibels.

$$L_{p\text{eq},T} = 10 \lg \left[\frac{1}{T} \int_0^T 10^{0,1 L_p(t)} dt \right] \text{ dB}$$