
**Acoustics — Acoustic quality of open
office spaces**

Acoustique — Qualité acoustique des espaces de bureaux ouverts



This document is a preview generated by EKO



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
3.1 General terms	2
3.2 Terms related to the workspace layout	2
3.3 Terms related to acoustics	3
3.4 Acoustic descriptors and related terms	4
4 General approach	6
4.1 Introduction to the general approach	6
4.2 Methodology	6
5 Typology, acoustic challenges and requirements	7
5.1 General	7
5.2 Space type 1: activity not known yet – vacant floor plate	7
5.2.1 Description	7
5.2.2 Noise environment characterising this type of space	7
5.2.3 Acoustic challenges	7
5.3 Space type 2: activity mainly focusing on outside of the room communication (by telephone/audio/video)	8
5.3.1 Description of the activity	8
5.3.2 Noise environment characterising this type of space	8
5.3.3 Acoustic challenges	8
5.3.4 Acoustic indicators and values	8
5.4 Space type 3: activity mainly based on collaboration between people at nearest workstation	9
5.4.1 Description of activity	9
5.4.2 Noise environment characterising this type of space	9
5.4.3 Acoustic challenges	9
5.4.4 Acoustic indicators and values	10
5.5 Space type 4: activity based on a small amount of collaborative work	10
5.5.1 Description of activity	10
5.5.2 Noise environment characterising this type of space	10
5.5.3 Acoustic challenges	11
5.5.4 Acoustic indicators and values	11
5.6 Space type 5: activity that can involve receiving public	11
5.6.1 Description of activity	11
5.6.2 Noise environment characterising this type of space	12
5.6.3 Acoustic challenges	12
5.6.4 Acoustic indicators and values	12
5.7 Space type 6: combining activities within the same space	12
5.7.1 Description of activities	12
5.7.2 Source/receiver	13
5.7.3 Noise environment characterizing this type of space	13
5.7.4 Acoustic challenges	13
5.7.5 Acoustic indicators and values	13
6 Workspace layout and room acoustics	14
6.1 Dimensions and geometry of open-plan space	14
6.2 Position of support spaces with respect to open-plan space	15
6.3 Distance between workstations in open-plan spaces	15
6.4 Principles of room acoustic treatment	15
6.4.1 General	15

6.4.2	Ceiling treatment.....	16
6.4.3	Wall treatment.....	16
6.4.4	Floor treatment.....	16
6.5	Effect of type of furniture.....	16
6.5.1	Principle.....	16
6.5.2	Screen fixed to worktop (low divider), free-standing screens and suspended screens.....	17
6.6	Accessibility and special needs.....	18
Annex A (normative)	Detailed definition and measurement method of the $D_{A,S}$ parameter	19
Annex B (normative)	Flow chart summarising the approach	22
Annex C (informative)	Collective use of open-plan spaces: etiquette	26
Annex D (informative)	Example of a user survey on open-plan office acoustics	27
Annex E (informative)	Minimum requirements for measuring workstation noise level, $L_{Aeq,T}$ during an activity	35
Annex F (informative)	Sound masking systems	36
Annex G (informative)	Acoustic indicators and values when the activity isn't known yet	37
Bibliography	38

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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Open-plan offices are increasingly common. They can cause apprehension from users due to noise and the difficulty of performing two theoretically contradictory activities in terms of acoustics: oral communication and focused individual work. In this type of space, disturbance caused by speech can result in tension between people who want to concentrate and people who are required to talk to perform their activity.

This document is concerned with the acoustics of open-plan spaces and, more specifically, cognitive effects of noise, i.e. acoustic comfort and noise disturbance linked to the obligations of the activity.

It is intended for stakeholders working in the planning, design, construction or layout of open-plan offices. Its aim is to help them provide users with a good level of acoustic comfort. It is meant as a basis for discussion and dialogue between the stakeholders involved in creating office spaces. In particular, it is intended for project owners to fine-tune the drafting of the acoustic specifications and help project management companies decide upon their objectives and the resources linked to the architecture and layout of open-plan offices.

The aim of this document is to offer principles, descriptors and measurement methods to characterise acoustics, which are easy to use and correspond to the perception of the acoustical environment by the occupants of the spaces.

Studies^[3] to ^[5] have shown that noises that are uncontrollable, intelligible and with no link to the activity of an individual are the most disturbing and shall be minimised. They most often come from adjacent workstations, recreational areas, shared areas or neighbouring offices. For this reason, this document is focused on containing speech propagation.

The approach chosen for open-plan spaces is to limit disturbance between adjacent workstations but also to optimize comfort for short-distance conversations. The underlying idea is that a high level of intelligibility in the area of communication (near to the workstation) results in less disturbance at more distant workstations. This document addresses the issues of noise comfort, in particular via the concepts of "discretion" and "distraction reduction".

This document provides an opportunity to reflect further, by including an analysis of activities that involve more or less collaboration on the one hand, and by addressing everything that constitutes an open-plan space on the other, in particular in terms of surface treatments and additional office layout such as furniture, acoustic screens or low dividers, etc.

This document establishes a link between acoustic quality and the acoustic performance to be achieved in an open office. The principles and descriptors apply to usual situations in terms of acoustic disturbance, privacy and discretion. They also include the working practices inherent to these spaces and the expectations of the organisations that use them regarding productivity and the well-being of employees.

This document reflects the technological and economic context of office construction in relation to both operations in unfurnished offices and resulting layout practices. In addition, this document reflects the expectations of the end users, based on the experience from the members of the commission and publications available at the date the text was drafted.

Acoustics — Acoustic quality of open office spaces

1 Scope

This document provides technical guidance to achieve acoustic quality of open office spaces to support dialogue and formal commitment between the various stakeholders involved in the planning, design, construction or layout of open-plan workspaces: end customers, project owners, prescribers, consultants, etc.

It is applicable to all open-plan offices in which the following activities are performed:

- Space type 1: activity not known yet – vacant floor plate;
- Space type 2: activity mainly focusing on outside of the room communication (by telephone/audio/video);
- Space type 3: activity mainly based on collaboration between people at the nearest workstations;
- Space type 4: activity based on a small amount of collaborative work;
- Space type 5: activity that can involve receiving public;
- Space type 6: combining activities within the same space.

More specifically, this document applies to refitting projects of existing business sites (renovation and/or change or add activities) and layout projects for new spaces and spaces delivered unfurnished.

It covers both the activities and the operations of the following stakeholders:

- end customers: diagnosis, survey, expression of needs in keeping with their knowledge in the area of acoustics;
- project owners: drafting contract specifications;
- project management companies (architects, acousticians, ergonomists, economists and consulting engineers): indicating the performance of acoustic solutions and the layout principles used to achieve the result expressed in the specifications;
- building traders: reaching a clear and verifiable target with respect to the choices of materials and implementation;
- Building developer: promoting indoor environmental quality, including acoustic comfort, in estate operations in order to use it as a competitive element;
- specialists in occupational health, safety and quality;
- expert assessments and consultancy.

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 354, *Acoustics — Measurement of sound absorption in a reverberation room*

ISO 11654, *Acoustics — Sound absorbers for use in buildings — Rating of sound absorption*