
**Acoustics — Assessment of noise
annoyance by means of social and
socio-acoustic surveys**

*Acoustique — Évaluation de la gêne causée par le bruit au moyen
d'enquêtes sociales et d'enquêtes socio-acoustiques*

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Published in Switzerland

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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:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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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order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn.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again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.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 15666 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

Introduction

This Technical Specification is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

Many countries have already developed regulations concerning the acceptability of environmental noise exposure, while others are likely to do so in the future. Such regulations often take into account relationships between noise exposure and noise-induced annoyance.

Measurement of environmental noise has been standardized. For example, ISO 1996 contains detailed specifications about basic quantities and procedures, about acquisition of (noise) data, and about the application of these data to set noise limits. ISO 3891 specifies measurements of aircraft noise heard on the ground. No International Standard yet recommends practices for measuring the prevalence of noise-induced annoyance, however.

The intent of this Technical Specification is to provide specifications for the assessment of noise annoyance by social and socio-acoustic surveys. When these specifications are met, the statistically relevant possibilities of comparing and pooling survey results will be increased, thus offering more and better quality information for use by environmental policy makers.

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Acoustics — Assessment of noise annoyance by means of social and socio-acoustic surveys

1 Scope

This Technical Specification provides specifications for socio-acoustic surveys and social surveys which include questions on noise effects (briefly referred to hereafter as “social surveys”). Its scope includes questions to be asked, response scales, key aspects of conducting the survey, and reporting the results. This Technical Specification does not prescribe methods for the analysis of data obtained from these questions.

It is recognized that specific requirements and protocols of some social and socio-acoustic studies may not permit the use of some or all of the present specifications. This Technical Specification in no way lessens the merit, value or validity of such research studies.

The scope of this Technical Specification is restricted to surveys conducted to obtain information about noise annoyance “at home”. Surveys conducted to obtain information about noise annoyance in other situations, such as recreational areas, work environments and inside vehicles, are not included.

This Technical Specification concerns only the questions on noise annoyance used in a social survey and the most important additional specifications needed to accomplish a high level of comparability with other studies. Other elements which are required to provide high-quality social surveys, but which are not specific for social surveys on noise (such as sampling methods), can be found in textbooks (e.g. see references [1] and [2]).

Compliance with the recommendations of this Technical Specification does not guarantee the collection of accurate, precise or reliable information about the prevalence of noise-induced annoyance and its relationship to noise exposure. Other aspects of study design, as well as uncertainties of estimation and measurement of noise exposure, can influence the interpretability of survey findings to a great extent.

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

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

ISO 1996-3, *Acoustics — Description and measurement of environmental noise — Part 3: Application to noise limits*

ISO 3891, *Acoustics — Procedure for describing aircraft noise heard on the ground*

3 Terms and definitions

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

3.1

noise-induced annoyance

one person's individual adverse reaction to noise

NOTE 1 The reaction may be referred to in various ways including, for example, dissatisfaction, bother, annoyance and disturbance due to noise (see reference [3]).

NOTE 2 Community noise annoyance is the prevalence rate of this individual reaction in a community, as measured by the responses to questions specified in Clause 5, and expressed in appropriate statistical terms.

3.2

socio-acoustic survey

social survey in which noise-induced annoyance is assessed and values of measured or calculated noise metrics are attributed to the subjects' residential environment

NOTE Many general social surveys of environmental factors including noise are not considered to be "socio-acoustic" surveys because they do not have associated noise data.

4 Specifications for wording and scaling of questions on annoyance

Two questions have been formulated: one question with a verbal rating scale; one with a numerical rating scale.

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a) Question with verbal rating scale

Thinking about the last (12 months or so), when you are here at home, how much does noise from (noise source) bother, disturb or annoy you?

- Not at all?
- Slightly?
- Moderately?
- Very?
- Extremely?

b) Question with numerical rating scale, with introduction

Introduction:

This uses a 0-to-10 opinion scale for how much (source) noise bothers, disturbs or annoys you when you are here at home. If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Question:

Thinking about the last (12 months or so), what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by (source) noise?

The rationale for the specification and wording is presented in Annex A. The most accurate translations into several other languages are presented in Annex B.

5 Additional specifications for conducting social and socio-acoustic surveys when asking about noise annoyance

General specifications for conducting social surveys of any kind are found in numerous articles, papers and textbooks (e.g references [1] and [2]). This clause does not give a comprehensive overview of these general specifications. The focus in this clause is on additional specifications with respect to the design of the questionnaire when asking about noise annoyance. More information is given in Annex A.

- a) Each respondent shall be asked both questions specified in Clause 4. Respondents shall not be eliminated on the basis of some previous question about whether they “hear” the noise, nor on the basis of length of residence. If it is necessary to determine whether some respondents do not hear the noise source, a question about the audibility of the noise may be asked separately later in the interview.
- b) Respondents shall not first be asked if they are annoyed or not and then, if they are annoyed, about their degree of annoyance.
- c) The questions shall be placed early in the questionnaire, unless this conflicts with other survey objectives, and before other, more detailed, questions about noise have been asked. If other questions on noise annoyance are more important for the survey’s purposes, the specified questions may be asked later.
- d) When asking a question about annoyance, do not imply that the noise should be present in the respondent’s situation at home. Ask, for instance, about “noise from aircraft” instead of “noise from the aircraft”.
- e) If pre-tests indicate that the questions are perceived as repetitious, include appropriate instructions. An example is presented in Annex A.
- f) If show cards are used, the answer categories of the five-point verbal scale shall be presented without numbers, as follows:

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CARD QV	<p>NOT AT ALL</p> <p>SLIGHTLY</p> <p>MODERATELY</p> <p>VERY</p> <p>EXTREMELY</p>
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The show card for the numerical scale shall be as follows:

CARD QN										
NOT AT ALL					EXTREMELY					
0	1	2	3	4	5	6	7	8	9	10

The chosen answer shall be marked clearly within one box.

- g) Prepare written instructions for interviewers. For telephone or personal interviews, the interviewers shall be provided with written instructions that
- instruct interviewers to ask questions exactly as written,
 - train interviewers to respond to “I don’t understand” with methods that do not require paraphrasing the question,
 - urge respondents to choose between the offered answers,
 - encourage all residents to answer these questions (new residents can be instructed to answer about only their recent period of residence), and
 - if repetition is expected to be a problem, provide interviewers with instructions for respondents who find the questions to be repetitious.

6 Specifications for assessing the degree of annoyance

Results of the questions shall be given as the frequency or cumulative distributions of the individual annoyance scores, if available for each category of noise exposure. Other (summarizing) statistics such as the mean or median annoyance score, or percentages of respondents who are annoyed to a certain degree, may be given.

No specification is given for defining the percentage of respondents who should be regarded to have at least a certain degree of annoyance, such as for example “highly” annoyed. This depends on the cut-off scores used in individual countries or preferred by individual researchers. On the basis of the specified frequency distributions, any cut-off score may be chosen.

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7 Specifications for reporting core information from social and socio-acoustic surveys

In Table 1, minimum specifications are presented for reporting core information from social and socio-acoustic surveys in scientific reports. This information is essential to judge whether comparisons with other surveys can be made. More detailed information can be found in reference [4].

Table 1 — Minimum specifications for reporting core information from social and socio-acoustical surveys in scientific reports

Topic area	Item	Topic	Required information
Overall design	1	Survey date	Year and months of social survey
	2	Site location	Country and city of study sites
	3	Site selection	Any important, unusual characteristic of the study period or sites Map or description of study site locations relative to the noise source
	4	Site size	Rationale for site selection Site selection and exclusion criteria
	5	Study purpose	Number of study sites Number of respondents by site State original study goals
Social survey sample	6	Sample selection	Respondent sample selection method (probability, judgmental, etc.) Respondent exclusion criteria (age, gender, length of residence, etc.)
	7	Sample size and quality	Response rate Reasons for non-response
Social survey data collection	8	Survey methods	Method (face-to-face, telephone, etc.)
	9	Questionnaire wording	Exact wording by primary questionnaire items (including answer alternatives)
	10	Precision of sample estimate	Number of responses for main analyses
Acoustical conditions	11	Noise source	Type of primary noise source (aircraft, road traffic, etc.) Types of noise source operations that are included or excluded Protocols to define the noise source (e.g. minimum level, operations, days of week)
	12	Noise metrics	Give the complete description of any noise metric reported, according to ISO 1996-1, ISO 1996-2, ISO 1996-3 or ISO 3891 (if applicable): — Provide $L_{Aeq,24h}$, L_{dn} and L_{den} (or L_{Aeq} by time-period) for all locations or — provide conversion rule(s) to estimate $L_{Aeq,24h}$, L_{dn} and L_{den} under the specific study conditions from the study's preferred metric — Discuss the adequacy of the conversion rule(s) — Provide impulse and/or tone corrections
	13	Time period	Hours of day represented by noise metric Period (months, years) represented by noise metric
	14	Estimation/measurement procedure	Estimation approach (modelling, measurement during sampled periods, etc.)
	15	Reference position	Nominal position relative to noise source and reflecting surfaces Present exposure (or give conversion rule) for noisiest façade, specifying whether reflections from the façade are taken into account or not
	16	Precision of noise estimate	Best information available on precision of noise exposure estimates
Basic dose/response analysis	17	Dose/response relationships	Tabulation of frequency of annoyance ratings for each category of noise exposure