

Method for

Rating industrial noise affecting mixed residential and industrial areas

ICS 17.140.20

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Committees responsible for this British Standard

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- Association of Consulting Engineers
- Association of Consulting Scientists
- Association of Metropolitan Authorities
- Association of Noise Consultants
- British Association for Shooting and Conservation
- British Cement Association
- British Coal Corporation
- British Occupational Hygiene Society
- British Scrap Federation
- Chartered Institute of Environmental Health
- Confederation of British Forgers
- Department of the Environment (Building Research Establishment)
- Electricity Association
- Institute of Acoustics
- Institute of Sound and Vibration Research
- Institution of Civil Engineers
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- London Transport
- Ministry of Defence
- National Physical Laboratory
- Open University
- Royal Automobile Club
- UK Steel Association
- University of Bradford
- University of Salford

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Foreword

This British Standard has been prepared by Subcommittee EH/1/3. It supersedes BS 4142 : 1990, which is withdrawn.

This British Standard describes a method of determining the level of a noise of an industrial nature, together with procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. The user is reminded that this standard is not based on substantive research but rather on accumulated experience. It has been prepared under the direction of the Health and Environment Sector Board. First published in 1967, BS 4142 was amended in 1975, 1980 and 1982. It was revised in 1990 to align it with ISO 1996: Parts 1 to 3, which are implemented as BS 7445 : Parts 1 to 3. This revision clarifies aspects of the standard in the light of comments from the users. In particular, the term 'residual noise level' has been introduced and the term 'steady noise' deleted, the section dealing with measurement of specific noise level has been clarified and requirements for verification and traceability of instrumentation have been aligned with BS 7445 (ISO 1996).

Response to noise is subjective and affected by many factors (acoustic and non-acoustic). In general, the likelihood of complaint in response to a noise depends on factors including the margin by which it exceeds the background noise level, its absolute level, time of day, change in the noise environment etc., as well as local attitudes to the premises and the nature of the neighbourhood. This standard is only concerned with the rating of a noise of an industrial nature, based on the margin by which it exceeds a background noise level with an appropriate allowance for the acoustic features present in the noise. As this margin increases, so does the likelihood of complaint.

The standard is intended to be used for assessing the measured or calculated noise levels from both existing premises and new or modified premises. The standard may be helpful in certain aspects of environmental planning and may be used in conjunction with recommendations on noise levels and methods of measurement published elsewhere.

The standard is necessarily general in character and may not cover all situations. The likelihood that an individual will complain depends on individual attitudes and perceptions in addition to the noise levels and acoustic features present. This standard makes no recommendations in respect of the extent to which individual attitudes and perceptions should be taken into account in any particular case.

Although, in general, there will be a relationship between the incidence of complaints and the level of general community annoyance, quantitative assessment of the latter is beyond the scope of this standard, as is the assessment of nuisance.

It should be noted that noise assessment is a skilled operation and should be undertaken only by persons who are competent in the procedures.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

1 Scope

This British Standard describes methods for determining, at the outside of a building:

- a) noise levels from factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises; and
- b) background noise level.

The standard also describes a method for assessing whether the noise referred to in (a) is likely to give rise to complaints from people residing in the building. The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.

NOTE. For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.

Examples of how to use the standard to obtain noise ratings and to assess the likelihood of complaints are given in annex A.

2 References

2.1 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions and symbols

For the purposes of this British Standard, the following definitions apply.

NOTE. The convention applied to this standard is that all measured or calculated numbers are rounded to the nearest whole number with 0.5 being rounded up.

3.1 equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T , has the same mean-squared sound pressure as a sound that varies with time. It is given by the following equation:

$$L_{Aeq,T} = 10 \lg_{10} \left\{ (1/T) \int_{t_1}^{t_2} (p_A^2(t) / p_0^2) dt \right\} \quad (1)$$

where:

$L_{Aeq,T}$ is the equivalent continuous A-weighted sound pressure level determined over a time interval $T = t_2 - t_1$;

p_0 is the reference sound pressure (20 μ Pa);

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa).

The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

3.2 specific noise source

The noise source under investigation for assessing the likelihood of complaints.

3.3 reference time interval, T_r

The specified interval over which an equivalent continuous A-weighted sound pressure level is determined.

3.4 specific noise level, L_{Aeq,T_r}

The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

3.5 measurement time interval, T_m

The total time over which measurements are taken.

NOTE. This may consist of the sum of a number of non-contiguous, short term measurement time intervals.

3.6 rating level, L_{Ar,T_r}

The specific noise level plus any adjustment for the characteristic features of the noise.

3.7 ambient noise

Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

3.8 residual noise

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

3.9 residual noise level, $L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level of the residual noise.

3.10 background noise level, $L_{A90,T}$

The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, T , measured using time weighting, F , and quoted to the nearest whole number of decibels.

4 Measuring equipment

4.1 Equivalent continuous noise level

Equivalent continuous noise levels shall be measured in terms of $L_{Aeq,T}$ using an integrating-averaging sound level meter or equivalent system conforming to type 2 or better of BS EN 60804.

NOTE. If the noise is steady, an approximation to $L_{Aeq,T}$ can be obtained by visually averaging the indication of a sound level meter set to frequency weighting 'A' and the use of this method should be reported.

4.2 Background noise level

For measurement of background noise level, $L_{A90,T}$, the components of the measuring system shall conform to type 2 or better of BS EN 60651.

5 Measurement practice

5.1 Operational tests

Apply an acoustic calibrator or pistonphone conforming to BS 7189 to the microphone to check the sensitivity of the measuring equipment before and after measurements. Record the results of such tests.

5.2 Verification and traceability

In addition to the tests in 5.1, at certain time intervals, e.g. every two years, more extensive tests of the performance of the instrumentation may be prescribed by authorities responsible for the use of the results.

NOTE. In deciding on how comprehensive these tests should be, the level of accuracy involved in application of this standard in the particular case should be considered. For the highest level of verification, tests of the conformity of the calibrator or pistonphone to BS 7189 and verification of the complete measuring equipment to BS 7580 : Part 1 should be carried out either by a national metrology institute, or a competent calibration laboratory that can demonstrate that its measurements are traceable to national or international standards. In the UK, acoustical calibration laboratories are accredited by the United Kingdom Accreditation Service (UKAS); the relevant national metrology institute is the National Physical Laboratory. Where less comprehensive tests are prescribed these should also be reported under clause 10.

5.3 Measurement positions

Choose measurement positions that are outside buildings and that will give results that are representative of the specific noise level and background noise level at the buildings where people are likely to be affected.

To minimize the influence of reflections, make the measurements at least 3.5 m from any reflecting surface other than the ground.

NOTE 1. The preferred measurement height is 1.2 m to 1.5 m above the ground.

NOTE 2. Where it is necessary to make measurements above ground floor level, choose a position which is 1 m from the facade on the relevant floor of the building.

NOTE 3. Report the measurement position, height and the distance from any reflecting structure other than the ground.

5.4 Precautions against interference

Take precautions to minimize the influence on the readings from sources of interference such as the following (and from any other sources):

- wind, passing over the diaphragm of the microphone of a sound level meter which can generate noise interference;
- heavy rain, falling on the microphone windshield or nearby surfaces which can cause noise interference;
- electrical interference, which can be caused in the sound level meter by, for example, nearby power cables or radio transmitters.

Use an effective windshield to minimize turbulence at the microphone.

NOTE. For the purposes of this standard, windshields are generally effective up to windspeeds of 5 m/s.

Measured levels shall be considered valid only if they exceed readings on the measuring instrument owing to the above influences by at least 10 dB.

5.5 Weather conditions

Record the weather conditions prevailing during all measurements.

NOTE 1. Weather conditions can affect noise levels by influencing sound propagation or generating noise which can be pertinent to the assessment.

NOTE 2. More than one assessment may be appropriate.

6 Specific noise level

6.1 General

Determine the specific noise level at the assessment location(s) as a discrete entity, distinct and free of influence from other noises contributing to the ambient noise, following the appropriate procedures in 6.3. Report in detail the methods used.

Take care that all sample measurements are representative of the period of interest.

6.2 Reference time interval

Evaluate the specific noise, in all cases, over the appropriate reference time interval which is as follows:

- 1 h during the day;
- 5 min during the night.

NOTE. The shorter reference time interval at night means that short duration noises with an on time of less than 1 h lead to a greater specific noise level when determined over the reference time interval during the night rather than during the day. The choice of day and night periods will depend on normal local circumstances. It is intended that the night period should cover the times when the general adult population are preparing for sleep or are actually sleeping.

6.3 Determination of the specific noise level

6.3.1 Determine the specific noise level by applying the procedures in 6.3.2 to 6.3.14.