

Code of practice for

Designing, specifying, maintaining and operating emergency sound systems at sports venues

Committees responsible for this British Standard

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- Association of British Theatre Technicians
- Audio Engineering Society
- British Broadcasting Corporation
- British Educational Suppliers' Association
- British Federation of Audio
- British Radio and Electronic Equipment Manufacturers' Association
- British Telecommunications plc
- Federation of the Electronics Industry
- Independent Television Association (ITVA)
- Institute of Sound and Communication Engineers
- Institution of Electrical Engineers
- International Association of Broadcasting Manufacturers
- Professional Lighting and Sound Association
- Royal National Institute for Deaf People
- Royal Institute of British Architects
- Society of Cable Television Engineers

The following bodies were also represented in the drafting of this standard in panel EPL/100/3/4:

- Association of Noise Consultants
- District Surveyors Association
- Health and Safety Executive

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Foreword

This British Standard has been prepared by Technical Committee EPL/100/3. This standard has been written as a code of practice at the express wish of industry and recommends good accepted practice for the accomplishment of the defined tasks and their sequence, as followed by competent practitioners. It supersedes information on this subject previously published by the *Sound and Communication Industries Federation*.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of conformity are not misleading.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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 to iv, pages 1 to 22, an inside back cover 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.

Section 1. General

1.1 Scope

This British Standard gives recommendations and guidance for the preparation of specifications, maintenance and operation of permanently installed sound systems used for emergency purposes at sports venues.

It aims to ensure that, in an emergency, voiced messages are intelligible in all parts of the sports ground and premises to which the public have access, no matter what type of event is taking place, and also those areas outside the sports ground or premises that the system is intended to serve.

This standard applies irrespective of whether a special sound system is installed for an event.

Reference should be made to BS 7443, *Sound systems for emergency purposes*. For pop concerts, reference should also be made to *Guide to Health, Safety and Welfare at Pop Concerts and Similar Events* [1].

1.2 References

1.2.1 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 updating or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

1.2.2 Informative references

This 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.

1.3 Definitions

For the purposes of this standard the following definitions apply.

1.3.1

areas of congregation

areas of a venue which cause a restriction to the natural flow of people. Such places are turnstiles, gates and, to a lesser extent, merchandising or catering booths within the confines of a compartment

1.3.2

areas of circulation

those areas where the public can move freely from one compartment to another, exemplified by concourses, stairways and pathways

1.3.3

areas of dispersal

those areas outside the main structure of the venue which have a minimum of restrictions to the flow of people; examples are car parks, grassed areas, roadways which are not public highways etc.

1.3.4

audibility

that property of a sound which allows it to be heard among other sounds

NOTE At present, for objective analysis, for example when using the STI equation (see BS 6840-16), the concept of audibility takes account of the relative loudness and frequency content of the sound in comparison with other sounds which are present at the same time.

1.3.5

certificate holder

that person or legal entity to whom a current safety certificate has been granted

1.3.6

clarity

the property of a sound which allows its information-bearing components to be distinguished by the listener

NOTE Clarity is related to the freedom of the sound from distortion of all kinds.

1.3.7

compartment

a part of a structure separated from all other parts of the same structure by walls, ceilings or floors

1.3.8

control area

an area which contains an announcement microphone (with or without a zone control panel) or an area which contains a control panel for any part of a sound system

1.3.9

emergency announcement control panel

the control panel given the highest access priority to the sound system and in an area accessible to the highest ranking police officer on duty during an event

1.3.10

equipment room

an area which contains equipment associated with the fundamental processes of a sound system

**1.3.11
idling noise**

the electrical noise generated within a sound system, which, in the absence of an input signal, is reproduced as audible noise through the loudspeakers

**1.3.12
intelligibility**

a measure of the proportion of the content of a speech message that can be correctly understood

NOTE Satisfactory intelligibility requires adequate audibility and adequate clarity.

**1.3.13
licensee**

that person or legal entity to whom a current licence has been granted

**1.3.14
certifying authority (licensing authority)**

a regulatory body which exercises its powers granted to it in the interest of public safety or public protection

**1.3.15
listener**

a person of normal hearing and who is able to understand the language broadcast

**1.3.16
microphone input equalization**

frequency response correction introduced (normally in a microphone channel or preamplifier) to compensate for uneven frequency response of the microphone and/or for the rise in low frequency output from the microphone which occurs when the user speaks very close to it

NOTE Some types of microphone do not exhibit this rise in low frequency output.

**1.3.17
place of entertainment**

a place to which people resort for entertainment or recreation

**1.3.18
private areas with a view of the event**

compartments to which the public are allowed restricted access as an operational choice, exemplified by suites for which the public pay a premium to use (sometimes called executive suites or press viewing areas). The difference between these areas and public audience areas is that the view of the event is normally from behind glazed apertures

**1.3.19
the public**

people resorting to a place of entertainment and recreation, whether or not as members of a club and whether or not they pay a fee for attending events

**1.3.20
public audience areas**

those areas provided for the express purpose of accommodating members of the public being entertained within the venue

**1.3.21
responsible person**

the person, identified by name or job specification, who is responsible for ensuring that a sound system is properly maintained and repaired, so as to continue to operate as specified, and for ensuring that operators are adequately trained

**1.3.22
sound system**

all equipment and resources necessary to reinforce original sound or to reproduce recorded sound, in appropriate parts of a place of entertainment, with adequate intelligibility

**1.3.23
sports premises**

a sports venue which is not a sports ground or a sports stadium

NOTE An example of sports premises is a theatre when used for presenting boxing or snooker tournaments.

**1.3.24
sports ground**

a sports venue which is largely open space

**1.3.25
system designer**

a technically competent person who takes responsibility for the technical specification and adequacy of the design for the system

Section 2. Assessment and design

2.1 Intelligibility

2.1.1 General

Intelligibility has been defined in a number of different ways but in this context it means that speech messages are of sufficient *audibility* and *clarity* that they are capable of being understood by average *listeners*. The responsibility for ensuring that the messages are meaningful to the *listeners* lies with the operator of the system (see section 7).

2.1.2 Behavioural tests

It is not practicable to apply rigorous, truly behavioural intelligibility tests of the system performance in the context of an occupied *venue* nor is it possible to test the system under true emergency conditions. Moreover, such tests would be of limited value as design tools. However, general behavioural tests are important as a continuous evaluation of the effectiveness of the announcer, the correctness of the adjustment of the sound system controls and the continuing operational status of the equipment. It is envisaged that these tests might conveniently incorporate staff announcements.

2.1.3 Listening tests

A simple way of making a purely qualitative assessment of intelligibility is to use listening tests, in which speech is broadcast over the system and *listeners* are required to report what they have heard. The results are then compared against the list of broadcast messages to determine the number of items correctly heard (see annex A).

2.1.4 Objective criteria

It is necessary to specify objective measures of the system performance as design targets. Conformity with these targets will help to ensure that the system has adequate intelligibility under emergency conditions. In order to determine conformity it is necessary to carry out objective tests of the system at the commissioning stage and listening tests at regular intervals thereafter. If the results of the listening tests are unsatisfactory, objective tests should be carried out after any repairs or re-adjustments.

2.1.5 Objective measurement indices

There are three objective measurement indices of intelligibility in common use. Two are electroacoustical measurements; the speech transmission index (STI), or in its shortened form, the rapid speech transmission index (RASTI) (see note 1 and BS 6840-16:1989) and the percentage articulation loss of consonants (% AL_{cons}). The third method, phonetically balanced (PB) word-scores, uses listeners to report what they heard. None of these indices can be considered as being completely reliable for the present purpose but there are no other objective methods which give better results. It is unlikely that satisfactory performance will be achieved unless the following equivalent criteria are satisfied under high noise of crowd conditions.

Maximum % AL _{cons}	11 %
Minimum STI	0.5
Minimum PB word-score	percentage according to the test procedure used

The practical use of % AL_{cons} is not considered further in this standard.

NOTE 1 According to BS 6840-16, speech transmission index values are to be expressed as "STI" values, whether the full STI procedure or the RASTI procedure has been used. The procedure used should be noted separately, so that a value of 0.5 measured by the RASTI method is expressed as "STI = 0.5, measured by the RASTI method".

NOTE 2 The value of 0.5 STI is the equivalent of 11 % AL_{cons}. However, the accuracy of measured STI values is seldom better than ± 0.05 .

A number of instruments are available which are capable of measuring these indices (or close approximations to them), but such measurements are only really practicable when the ground is empty. In general, it is not possible to apply an objective test using these measurement indices under true emergency conditions or even under large crowd conditions. However, with expert assistance it is possible to convert data obtained under ground empty conditions to predict the performance that would be obtained under emergency conditions, but considerable experience is required to carry out the conversion process.