

BS 7827:2011



BSI Standards Publication

Code of practice for designing, specifying, maintaining and operating emergency sound systems at sports venues

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 62, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 September 2011. It was prepared by Technical Committee EPL/100, *Audio, video and multimedia systems and equipment*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 7827:1996, which is withdrawn.

Relationship with other publications

This British Standard has been drafted to complement and avoid conflict with other standards with similar scope, but not specifically for sports venues, notably:

- BS 5839 (part 8 in particular);
- BS EN 54 (all parts); and
- ISO 7240 (parts 16 and 19 in particular).

See the introduction for further information.

Information about this document

This is a full revision of the standard, and introduces the following principal changes.

- Cross references to other standards have been updated. These are mostly in relation to voice alarm systems used in conjunction with fire detection and alarm systems.
- References to speech intelligibility have been updated to reflect advances in technology and practical experience.
- More guidance has been given on design criteria.
- Information has been provided to help the purchaser understand the need to allow sufficient funding to enable a properly functioning system to be engineered.
- Environmental issues have been taken into account.

Use of this document

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 compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Section 1: General

0 Introduction

This standard specifically applies to sports venues. Sports venues include a variety of building types and typically consist of enclosed, covered and open spaces all within the same venue. Design standards apply to all sports venue buildings as they do to any other public facility. More specifically, fire standards such as BS 5839 (and Part 8 on voice alarm systems in particular) as well as BS EN 54 and ISO 7240-19 on sound systems for emergency purposes apply in the normal way.

Contained within many, but not all, sports venues are buildings and spaces that warrant special attention with regard to the most effective way to inform and manage spectators and other members of the public through the safe and clear use of the emergency sound system. Important factors and characteristics include the following.

- Sports venues often contain spaces designed to hold members of the public who do not know any pre-planned evacuation procedures.
- Sports venues often contain spaces designed to hold spectators in high numbers and densities, which introduces the requirement for effective general crowd control as well as during dangerous situations, such as bomb threat, civil commotion and fire.
- Sports venues often contain large open-air areas, such as the pitch of a cricket ground or the track-side of a racetrack. The fact that these spaces do not pose a risk in terms of fire, does not preclude them from crowd-related risks such as that of people returning to a building which is in an evacuation status; a reliable and effective means to communicate with occupants is still paramount for such areas.
- Effective and intelligible emergency sound systems can be used, not only to provide clear and useful commentary to spectators, but also to provide entertainment quality music, audio for video replay, advertising, etc. It is these non-emergency enhancements which can be usefully integrated with the emergency requirements and thus give added value to the system.
- Sports venues may be put to a range of uses beyond the primary use, in some cases outnumbering the occasions of primary usage in the annual event schedule; the emergency sound system may therefore have multiple modes of operation, including that of a voice alarm.

It is therefore important that this standard not only interfaces with other standards in a non-conflicting manner, but also introduces parameters and requirements which are not usually found in built spaces for which the generic standards (e.g. BS 5839-8:2008) are intended. An example of the latter would be that in large venues, the sound pressure level needed to produce intelligible communication at the listener can probably only be achieved using products not designed for the usual voice alarm market and therefore not type approved. The risk assessment process can therefore be used to demonstrate that the proposed solution achieves the same level of integrity specifically in situ as well as achieving the required performance.

Useful guidance can also be found in *The Guide to Safety at Sports Grounds* published by The Football Licensing Authority on behalf of the Department for Culture, Media and Sport (commonly referred to as the "Green Guide" [1]), and, for pop concerts, *The Event Safety Guide* [2].

1 Scope

This British Standard gives recommendations and guidance for the design, specification, 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 venue to which the public have access, no matter what type of event is taking place, as well as those areas outside the sports venue that the system is intended to serve.

This standard applies irrespective of whether or not a special sound system is installed for an event.

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.

BS 5839-8:2008, *Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems*

BS 7671, *Requirements for electrical installations – IEE Wiring Regulations*

BS EN 60268-16, *Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index* [BS 6840-16, IEC 60268-16]

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1 area of circulation

area where the public can move freely from one compartment to another, such as concourses, stairways and pathways

3.2 area of congregation

area of a venue which causes a restriction to the natural flow of people such as a turnstile, gate or, to a lesser extent, a merchandizing or catering booth within the confines of a compartment

3.3 area of coverage

area, inside and/or outside a building, adequately covered by the voice alarm system

3.4 area of dispersal

area outside the main structure of the venue which has a minimum of restrictions to the flow of people; such as car parks, grassed areas, roadways which are not public highways, etc.

3.5 audibility

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

3.6 automatic mode

mode of operation of a voice alarm system which does not require manual intervention

3.7 certificate holder

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

3.8 clarity

property of a sound which allows its information-bearing components to be distinguished by the listener, related to the freedom of the sound from distortion of all kinds

NOTE There are three kinds of distortion involved in the reduction of clarity of a speech signal in an electro acoustic system:

- a) *time domain distortion, due to reflection and reverberation in the acoustic domain;*
- b) *frequency distortion, due to non-uniform frequency response of transducers and selective absorption of high frequencies in acoustic transmission;*
- c) *amplitude distortion, due to non-linearity in electronic equipment and transducers.*

3.9 clipping

short term inability of an amplifier to provide the voltage required

3.10 compartment

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

3.11 control point

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

3.12 critical signal path

components and interconnections between every emergency microphone and the input terminals on, or within, each loudspeaker enclosure used for voice alarm

3.13 emergency loudspeaker zone

part of the area of coverage to which emergency information can be given separately

3.14 emergency microphone

microphone dedicated for use by the emergency services or other responsible persons as part of the sound system

3.15 emergency mode

status of a system whereby emergency messages (either live or pre-recorded) are broadcast; in manual mode, all emergency messages are preceded by a pre-announcement tone; in automatic mode, all messages have intervening tones between the messages

NOTE If the system is used for broadcasting sounds other than live messages, these sounds have to be disabled for some or all of the period of the state of emergency, in controlled zones or across the whole venue.

3.16 emergency sound system

sound system for all types of emergencies

3.17 equalization

process of adjusting the gain or attenuation of certain frequencies within a signal

3.18 equipment room

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

3.19 headroom

ratio (usually expressed in decibels) of the maximum signal amplitude that a device can accept or produce, without unacceptable non-linearity or damage, to a specified reference amplitude

3.20 intelligibility

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.

3.21 listener

person of normal hearing who is within the area of coverage and is able to understand the speech message broadcast

3.22 loudspeaker circuit

transmission path to an assembly of loudspeakers supplied from the same control equipment and protected against over-current by the same protective device(s) or current limitation arrangements

3.23 loudspeaker zone

part of the area of coverage to which information and/or music can be separately routed

NOTE A loudspeaker zone may be the same as an emergency loudspeaker zone, may be a sub-division of an emergency loudspeaker zones, or may be unrelated.

3.24 manual mode

mode of operation where an operator is directly in control of the broadcast of live or pre-recorded sounds

3.25 noise measurement

$L_{A10,t}$
noise level exceeded for 10% of the measurement period with "A" frequency weighting calculated by statistical analysis over a representative period, t

3.26 normal mode

status of a system whereby either music or other entertainment or operational messages (either live or pre-recorded) are broadcast without intervening tones or pre-announcement tones

NOTE Typical messages are for people management, such as warnings not to leave bags unattended, or to wear personal protective equipment while on site.

3.27 PAVA system

sound system, interfaced with the fire detection & alarm system, designed to be used for both PA (non emergency) as well as VA (emergency) purposes; this includes parts of the system which are dedicated for use as either PA or VA only, as well as parts of the system which are used for both PA and VA.

3.28 pre-announcement tone

short tone or series of tones which is broadcast before each message when a state of emergency exists and the system is in manual and emergency modes

3.29 private areas with a view of the event

compartments to which the public have restricted access, such as executive suites or press viewing areas

NOTE The difference between these areas and public audience areas is that the view of the event is normally through windows.

- 3.30 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
- 3.31 public address system PA system**
sound system intended to distribute signals from one or more locations to a number of other locations through a multiplicity of loudspeakers
NOTE In these systems, also known as sound distribution systems, the microphones are not normally exposed to the sound produced by the loudspeakers.
- 3.32 public audience areas**
areas provided for the express purpose of accommodating members of the public being entertained within the venue
- 3.33 purchaser**
person or organization responsible for the purchase of a sound system or their appointed representative
NOTE Representatives can include members of the design team or a contractor.
- 3.34 QoS
Quality of Service**
ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow
- 3.35 responsible person**
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
- 3.36 signal delay**
electronic delay of the signal to a loudspeaker(s) placed at distant locations from a primary loudspeaker so as to be equal to the time sound takes to travel through the air from the primary loudspeaker to the distant loudspeaker
- 3.37 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
- 3.38 speech transmission index for public address
STIPA**
measure of potential speech intelligibility over a public address system using a condensed STIU measurement format
- 3.39 sports ground**
sports venue which is largely open space
- 3.40 system designer**
technically competent person who takes responsibility for the technical specification and adequacy of the design for the system
- 3.41 transmission path**
connection between sound system components (external to the cabinet of the component) used for the transmission of information, including audio, control, and/or power

3.42 user

person or organization responsible for the operation of a sound system or their appointed representative

3.43 voice alarm system**VA system**

sound distribution system that provides means for broadcasting speech messages and/or warning signals in the event of any emergency and which is interfaced to the fire detection and alarm system

4 Standards and guidance with performance requirements

COMMENTARY ON CLAUSE 4

Many standards concerning emergency evacuation, notably fire-related standards, are, of necessity, generic. While they might allow for categorization on grounds of size or complexity of building, they are nevertheless aimed for use in standard buildings types, such as offices, shopping centres, factories, schools, and the like.

For these, the type and period of use are often common, i.e. regular days of non-use each week, and use only during the day. Other characteristics, such as a fairly consistent background noise footprint, are likely. The standards recognize these characteristics and therefore enable product standards to require minimum performance in these cases.

Where avoidable disasters have taken place and a trend is noticed, the general public demand that measures are put in place to learn from the mistakes of the past and create minimum standards of performance. This standard is one of those. It also supports the Green Guide [1], which gives wider guidance on safety at sports grounds from planning through construction to operation. Within the latter there are specific requirements in relation to crowd control, staff and management, and communications between them.

Emergency sound systems at sports venues are covered by this document as a specific case because sports venues form a class of "building" which has certain parameters which define a particular need in terms of life safety.

These include, but are not restricted to:

- *a centralized or focussed performance or activity area;*
- *peripheral audience area(s) for the public;*
- *peripheral support areas for the public;*
- *"back of house" areas for operational and administrative purposes;*
- *areas of circulation;*
- *areas of collection and dispersal (e.g. car and coach parks, railway stations).*

Due to differences in emphasis, there might be conflict between the specific guidance of national fire and emergency standards, the Green Guide [1], and European fire standards.

Where one standard or guide is in conflict with another, or the performance requirement can be considered onerous or irrelevant for a particular venue, the designers, together with the purchaser, should agree an appropriate solution subject to the following.

- a) The solution and its rationale should be published and agreed with all relevant interested parties prior to commitment of a design.
- b) The efficacy of the solution should be reviewed on a regular basis by the operator and/or the purchaser and adjusted accordingly if possible. Any

change to any part of the building or to the planned use and procedures associated with the facility should also prompt a review.

Section 2: Planning and assessment

5 Procurement

COMMENTARY ON CLAUSE 5

The designer, installer or project engineer has to be a competent person. As an indication, in the UK, such a person might have corporate or full membership of one or more recognized and relevant institutions such as the Institute of Sound and Communications Engineers (ISCE), the Audio Engineering Society (AES), or the Institute of Acoustics (IOA), or be a Chartered Engineer.

Whilst the ability of a contractor to demonstrate previous successful installations conforming to the standard is desirable, this does not preclude others as long as the user or purchaser of the system is satisfied with their competence. Those responsible for design, installation, commissioning and maintenance should have been involved in at least one project where sound quality and speech intelligibility were critical requirements.

Adherence to a recognized quality standard is to be encouraged but this does not preclude installers as long as a client is satisfied with the installer's quality assurance methods.

5.1 Care should be taken in choosing a suitable supplier and installer for a compliant installation.

5.2 The person responsible for the design and its implementation should have relevant qualifications and experience.

5.3 The purchaser should ensure that the person responsible for the design is adequately appraised of the objectives of the system and any relevant requirements of enforcing authorities.

6 Need for emergency sound systems at sports venues

COMMENTARY ON CLAUSE 6

The need for an emergency sound system for a sports venue is determined by the local and/or sporting authorities in relation to the safety of the public at the venue and the subsequent issue of a safety certificate or licence.

Sports venues are not always large, semi-enclosed spaces like stadiums, but are often open spaces with a building for seating, refreshment and administration such as a cricket ground, racecourse or racetrack.

The recommendations for voice alarm in the context of fire detection and alarm only apply to the building and not to the open spaces. However such venues might also need to communicate with the audience in the open space in order to control the crowd, e.g. telling them not to enter the building because of an emergency, or not to go to a particular area because of a bomb threat. Equally the message might not be directed at the public, but the stewards. Where radio communication systems are not employed throughout, coded messages to the stewards are often used in order to initiate the investigation of a threat, or to position stewards prior to broadcasting an un-coded message to the public.

Even in large stadiums, the playing surface is a space which might not be at direct risk of fire, but might still need PA communications. For example, if the emergency planning strategy includes use of the pitch as a safe area to evacuate, the PA might be used to direct spectators on the pitch to a different place of safety and not into the area in an emergency condition.

Sports venues which include enclosed spaces are covered by emergency sound systems standards as well as this document, as well as open air spaces, are not covered by emergency sound systems standards but might require clear PA coverage in response to the specific emergency planning strategy. On this basis, open-air areas (not covered by explicit emergency sound systems requirements) might not have to have system integrity to emergency sound systems requirements (e.g. monitored loudspeaker circuits, fire and mechanically protected cabling, speech intelligibility requirements). However, compliance with emergency sound systems standards in these areas may be considered appropriate within the context of the specific emergency plan, as well as providing operational benefits to the user of the system and operator of the venue. For example, there is a benefit to the user that the whole system is monitored as this eases and speeds the proving of the system prior to the turnstiles opening, as well as prompting and quickening any maintenance and fault-finding. The manpower saved by this facility translates directly into cost and can offset the initial investment in monitoring.

Therefore the system designer needs to define which areas are public address and voice alarm (PAVA) and which are only public address (PA) in order to optimize the cost to the purchaser. Furthermore, the requirements of the system in PA only areas will need to be defined in the context of the emergency planning strategy.

The emergency sound systems usually also provides a means of entertainment, for commentary and/or music, and therefore there can be an operational economic benefit derived from a system used for both life safety and entertainment purposes. The reproduction of music needs some degree of improved system performance specification, such as bass response, fine equalization, evenness of coverage and system dynamics. The implications of these improvements might have little or no effect on the system cost in some cases, and in others might have a significant but justifiable impact. However, the further augmentation to provide a primary role during music concert performances would require a considerably improved specification level (such as extended level capability, extended low frequency capability) that is unlikely to be justifiable to build into a system used mostly for commentary, DJ music and audio for video.

6.1 Where there is uncertainty regarding the need for a sound system to meet the recommendations of this standard, reference should be made by the purchaser to one or more of the following:

- a) guidance documents pertaining to such venues such as the Green Guide [1];
- b) any authority responsible for issuing an operating certificate or licence (without which the venue cannot admit members of the public);
- c) any authority responsible for enforcing fire safety codes that apply to the premises.

6.2 The sound system designer should identify in the design scope which areas are considered appropriate for PA and which should comply with VA recommendations. Areas requiring VA messages but no PA messages or entertainment (e.g. plant rooms) should also be identified, and consideration given to whether a fire sounder/beacons in conjunction with staff training, are adequate. In general, in staff areas not requiring PA, sounders/beacons may adequately provide alert and evacuate notification, in conjunction with staff training. In many cases, the designer would indicate that the whole system is to be designed as combined PAVA in all areas covered. The details of scope decisions should be agreed with the relevant parties.

NOTE Relevant parties may include the purchaser, the user, the purchaser's professional design team, the local authority, the sport's licensing authority or any other relevant authority.

6.3 The sound system designer should use the guidance of this standard as well as BS 5839-8:2008 for areas designated to require voice alarm (VA and PAVA).

6.4 The sound system designer should identify which areas, if any, are considered appropriate for increased performance for music or speech reproduction, and agree this with the purchaser. The designer should also apprise the purchaser of the degree of the proposed increase of performance according to the application.

NOTE In general it is preferable to install one system that performs the task of both PA and VA.

6.5 The use of the emergency sound system for other purposes is not precluded but should not affect the emergency use.

NOTE Designing a system for entertainment purposes such as music can provide design and operational benefits. The zoning of loudspeakers for emergency purposes can differ from the zones used for non-emergency purposes. The system must be designed to accommodate both but without compromise to the clarity of the relevant user interfaces.

7 Exchange of information and responsibilities

In addition to following the recommendations of BS 5839-8:2008, Clause 6, consideration should also be given to operational requirements for the full range of public events likely to be held at the venue.

NOTE Public events might include other sports and non-sporting events such as conferences, music events and religious events.

8 Planning considerations

COMMENTARY ON CLAUSE 8

At the planning stage of any new sports venue or refurbishment project, and especially at the planning of any refit or upgrade of public safety and information systems, due consideration needs to be given to various factors critical to the achievement of a sound system for public safety and emergency use. The emergency management plan will provide guidance to the sound designer; factors such as the size and acoustic properties/conditions of spaces, and structural support (for e.g. loudspeakers) will be critical.

It is advisable to seek professional advice at the planning stage to assist the purchaser in satisfying the following recommendations.

It is advisable that the purchaser consults with the operator of the venue before progressing to the design phase.

Where the purchaser has been noted in the following subclauses as responsible for any particular action, they may delegate the task to an appropriate member of the design team, such as the system designer, architect, structural engineer, etc.

8.1 The purchaser should ensure that the acoustic properties of the various spaces are compatible or made to be compatible with achieving the speech intelligibility and sound quality recommendations in this document.

8.2 Roof-mounted loudspeakers likely to be required for large audience areas such as the bowl of a stadium can have weight loading implications on the structure that should be taken into account by the system designer, the design team and purchaser. In this case, consideration should be given to possible failure of the primary loudspeaker fixings and to the use of secondary safety fixings to secure the most massive components of the loudspeakers to the structure.

NOTE Bass loudspeakers can be particularly heavy.

8.3 The purchaser should define all safety management plans, including evacuation methodologies, the roles of officials and marshals and the provision or proposal of complimentary emergency and essential information systems, such as fixed and variable signage, in order that the sound system can be designed in accordance with these plans.

8.4 The purchaser should arrange for the scope of the project to be evaluated by a sound system designer to ensure compatibility with the recommendations of this standard.

NOTE A sound system planning report would typically contain such an evaluation and verify that all planning considerations have been made.

9 When a system is PA but not PAVA

COMMENTARY ON CLAUSE 9

A sound system may contain parts which are PA only, VA only or PAVA. The classification depends upon whether that part of the system in question is to be used for life safety or not. The relationship is illustrated in Figure 1.

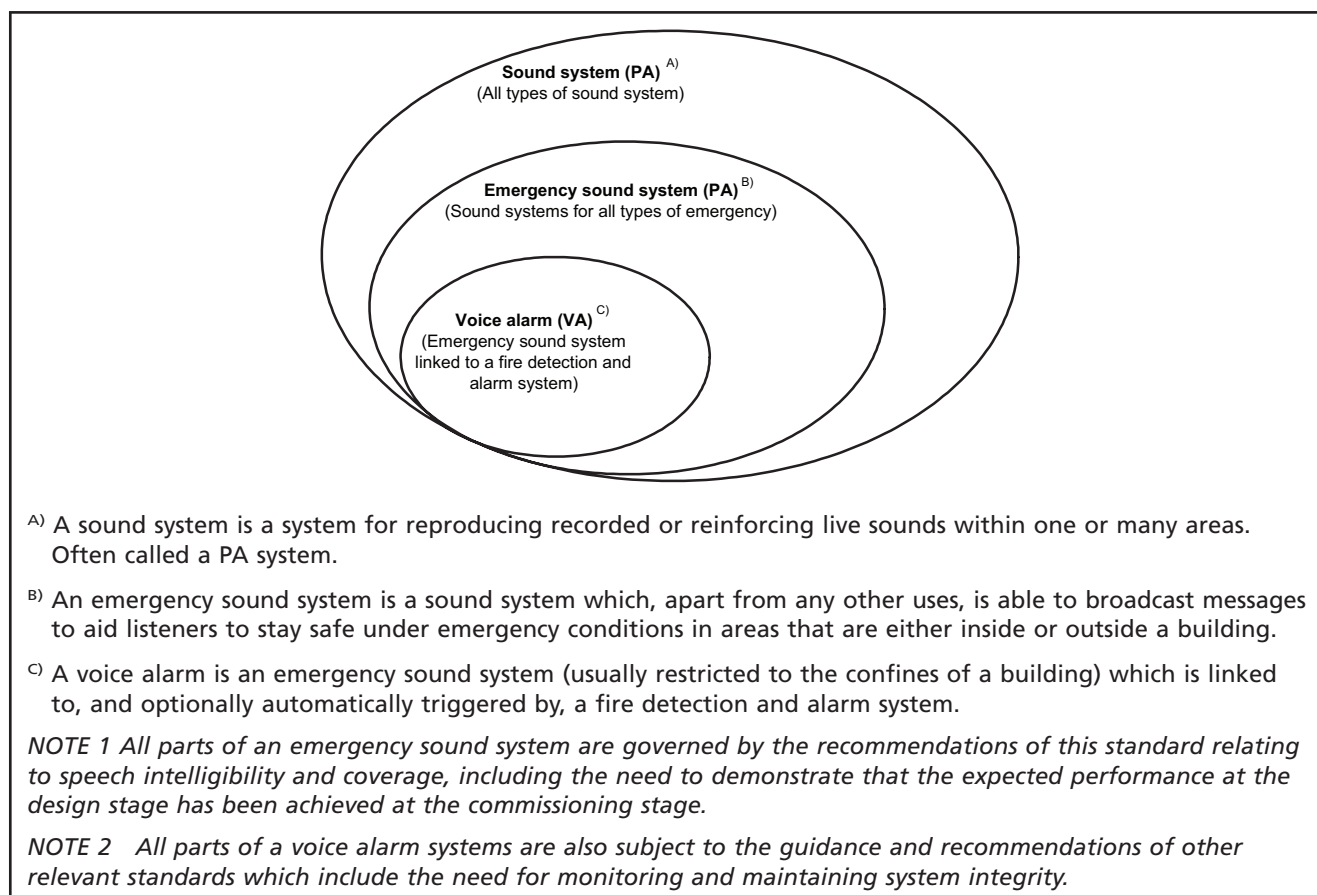
The system requirements, in particular those relating to the building evacuation procedures, have to be ascertained as accurately as possible by consultation between the user, purchaser and other interested parties, such as the enforcing authority and the emergency services (see BS 5839-8:2008).

If, after consultation, it is agreed that there is no immediate risk to life in a defined area (for example, if the area has no immediate means of catching fire, is not used for large gatherings/muster points, or is unlikely to contain a hidden bomb such as the pitch of a cricket field or the track of a racecourse) then there is no need to comply with the guidance of standards such as BS 5839-8:2008 in terms of the type of cabling used or (at the discretion of the designer) the monitoring of the loudspeaker circuits. It is possible that by introducing this relaxation to the system design, some costs can be reduced. This would be classified as an "emergency sound system only" area.

If an area is not accessible to the public but is required in the specific emergency planning strategy to be served by a voice alarm, then clearly a VA system will be required in that area. However, consideration has to be given to whether a simple fire sounder circuit would be more appropriate. In general, in staff areas not requiring PA, sounders might adequately provide alert and evacuate notification, in conjunction with staff training.

Areas that require sound for entertainment as well as an emergency sound system are classified as PAVA. Performance specifications (such as frequency response) of the system may be extended in these areas so that the reproduction of music is of appropriate quality for the entertainment purposes intended. Indeed, in some venues, the PAVA system may well be used to augment pop concert systems in an effort to reduce the environmental noise impact. Such systems would include the use of bass, or even sub-bass, speakers. If this is the case, it is wise to band limit or mute the bass parts of the system when the mains fails and the system is running on secondary power, since the cost of maintaining the extra load can be quite considerable.

Figure 1 Hierarchy of sound systems



9.1 All parts of the system should be designed in accordance with relevant standards for life safety systems (including BS 5839-8:2008) unless, following a risk assessment, there are some parts where the potential threat to life is agreed as being negligible.

9.2 All parts of the system should be designed to meet agreed speech intelligibility targets (see Annex A).

10 Variations from the recommendations of this standard

COMMENTARY ON CLAUSE 10

The requirements of this standard are not designed to exclude or restrict new or innovative methods of producing a suitable sound system “fit for purpose”.

Where a method proposed deviates from the recommendations of this standard, any potential risks of adopting the approach should be shown to be acceptable and to achieve the intended outcomes of this standard. This should form part of the risk assessment for the project and should be agreed with the relevant parties.

11 The importance of a performance specification

COMMENTARY ON CLAUSE 11

The principal purpose of providing an effective emergency sound system at a modern sports venue is to allow clear speech communications to be delivered to the occupants.

The most critical application of this provision would be the delivery of instructions to evacuate the building in a timely manner, without unnecessary confusion or anxiety caused, in the event of an emergency. Such instructions would vary in complexity from an explicit evacuation to a detailed set of actions directed at the staff or specific portions of the crowd in response to an emerging situation.

The achievement of sufficient levels of speech intelligibility directly implies minimum requirements of signal levels, frequency or temporal distortion.

The system should be designed (planned and specified) and implemented (installed, commissioned, operated, demonstrated and maintained) to achieve the speech intelligibility requirements and all other performance requirements recommended in this document. Project specific requirements should be agreed by all interested parties as part of a defined and recorded emergency management plan. These may include, but not be limited to relaxation of intelligibility requirements for certain specific areas mitigated by alternative methods of achieving a safe environment.

Section 3: Engineering

12 Location and environment of emergency microphones

COMMENTARY ON CLAUSE 12

The environment of emergency microphones is important. It is important to ensure that messages broadcast from emergency microphones are of adequate intelligibility, and not unduly affected by interference from background noise, reverberation, feedback, etc.

The prime location for initiating emergency messages during an event would be the event control room. However when there is no event taking place and the event control room is unmanned, the next logical place would be at the site "security" post which is where the fire and rescue service would expect to find the fire detection and fire alarm system control panel intended for their use.

12.1 The proposed location of emergency microphones should be assessed in order to optimize the intelligibility of the broadcast. This assessment should include:

- a) typical ambient noise (e.g. avoid a security hut near a busy road or an area close to noisy machinery);
- b) atypical ambient noise (e.g. a control room where during an emergency there is an increase in the ambient noise due to direct communication between other people or indirect communication such as the base station of a radio system);
- c) reverberance of the space.

NOTE The adverse effects of ambient noise and reverberation may be minimized by introducing acoustic absorption in the immediate environment of an emergency microphone by means of an acoustic hood, booth or similar device.

12.2 The acoustic conditions of the emergency microphone position should have, where practicable:

- a) reverberation time (average of 500 Hz, 1 kHz, 2 kHz octave bands) no greater than 0.7 s; and
- b) background noise conditions due to noise ingress, building services or equipment within the room no greater than NR35 for 30 s or more, and not greater than NR55 at any time from equipment likely to operate during an emergency microphone announcement (e.g. telephones, fire panel warnings).

12.3 There should always be more than one emergency microphone. They should always be in different parts of the building so that the secondary location can be used even if the primary location is compromised.

13 Electro-acoustic modelling

COMMENTARY ON CLAUSE 13

The ability to demonstrate that the proposed electro-acoustic system is likely to meet the performance requirements, not only for life safety applications but also entertainment, is desirable. The electro-acoustic design, preferably modelled in a proprietary computer software programme, is also a useful benchmark for any future verification process (See Clause 11).

There are computer programmes which allow the surfaces of a defined space to be modelled, attributed with absorption coefficients, and loudspeaker performance characteristics to be inserted such that the SPL and potential speech intelligibility can be predicted.

Such computer programmes generally employ a simplified geometry to represent the space. The result is that they are a fair approximation of the likely result which will be achieved if a particular electro-acoustic design were implemented. They provide the following benefits as part of the design process.

- *Different loudspeaker types, quantities, and locations can be tried.*
- *Different amounts and locations of acoustic absorption can be tried.*
- *Results can take the form of graphical representations which are easier to understand for a lay person.*

However, in order to obtain results which are anywhere near being a fair approximation of the likely outcome, the user needs to understand sound and system design. If a verification process is to be carried out (see Clause 34) caution is advisable in respect of the difference in data available at the time of the modelling and design versus the built environment.

13.1 The electro-acoustic design for major areas within a sports venue should be modelled, preferably with the aid of a proprietary computer software programme.

13.2 Care should be taken in the interpretation of predictions and the overall electro-acoustic design process should only be entrusted to a competent person.

14 Audio source priorities

COMMENTARY ON CLAUSE 14

Most sports venues have more than one use, resulting in different operational requirements on event and non-event days. Accordingly, routing and priority levels might need to be changed to accommodate different uses.

It is likely that on a non-event day a voice evacuation system in accordance with BS 5839-8:2008 would be suitable. During event days, when the event control room is manned, the level of priorities may be changed, and it is expected that any automatic evacuation broadcast will be disabled.

The evacuation plan may include a statement that during an alert message, commentary or background music is maintained in those areas which are not being addressed by the emergency announcement in order to obviate any confusion. It might be necessary to reduce the level of these signals in adjacent zones in order to preserve the intelligibility of the emergency announcement.

14.1 For venues with an enclosed capacity of less than 500, automatic evacuation broadcast capability may be appropriate. All other venues should have the automatic broadcast disabled while the event control room is manned for an event.

14.2 A clear schedule of priorities should be created for both event days and non-event days.

14.3 For event days the priority level in descending order should be:

- a) the emergency broadcast microphone(s);

NOTE It is likely that emergency broadcast microphones will have equal priority on a first-come-first-served basis.

- b) emergency evacuation messages;

- c) emergency alert messages, including coded staff messages;