

Fire detection and fire alarm systems for buildings —

Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems

ICS 13.220.20; 13.320

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee FSH/12, Fire detection and alarm systems, upon which the following bodies were represented:

AEA Technology
 British Cable Makers Confederation
 British Fire Protection Systems Association Ltd.
 British Fire Services' Association
 British Telecommunications plc
 Chartered Institution of Building Services Engineers
 Chief and Assistant Chief Fire Officers' Association
 Consumer Policy Committee of BSI
 Department of Health (NHS Estates)
 Department of the Environment (Building Research Establishment)
 Department of the Environment, Transport and the Regions
 Department of the Environment (Property and Buildings Directorate)
 Electrical Contractors' Association
 Health and Safety Executive
 Home Office
 Institute of Fire Safety
 Institute of Petroleum
 Institution of Electrical Engineers
 Institution of Fire Engineers
 London Fire and Civil Defence Authority
 Loss Prevention Council
 Ministry of Defence
 National Association of Fire Officers
 National Caravan Council Limited
 National Inspection Council for Electrical Installation Contracting
 Professional Lighting and Sound Association
 Trades Union Congress

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The following body was also represented in the drafting of the standard through subcommittees and panels:

Engineering Industries Association

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Amendments issued since publication

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16066	23 December 2005	References and terms updated. Clarification provided in light of recent practice.
16219 Corrigendum No. 1	25 January 2006	Correction to 19.3 . Minor corrections to 18.1 and Clause 23 .

The following BSI references relate to the work on this standard:
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Foreword

This Part of BS 5839 has been prepared by Technical Committee FSH/12. No existing standard is superseded but this Part of BS 5839 expands the recommendations given in BS 5839-1. It should be read in conjunction with BS 5839-1, BS 6259 and BS 60849.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to text carry the number of the amendment. For example, text altered by Amendment No. 1 is indicated by **A1** **A1**.

Conventional alarm sounders, such as bells or electronic sounders, are not always sufficiently informative to ensure a rapid and safe evacuation of buildings in the event of a fire. In many buildings there is a need to broadcast clear emergency voice messages, particularly where phased evacuation procedures are used, or for other emergencies. This has led to the increasing use of sound distribution systems in lieu of conventional alarm sounders. These systems are generally known as “voice alarm” systems and are normally used in conjunction with manually operated or automatic fire detection and fire alarm systems.

Other standards relating to fire detection and fire alarm systems refer only briefly to public address as a means of giving alarms. Conversely, standards relating to sound systems do not always give specific information about fire alarm applications. This code of practice for voice alarm systems has, therefore, been prepared to:

- a) give guidance to those who specify, design, install, commission, maintain and use voice alarm systems;
- b) help clarify interpretation of other sound and fire alarm system standards in respect of voice alarm systems;
- c) ensure that high standards of reliability, safety and security are achieved, together with acceptable standards of performance.

It has been assumed in the drafting of this standard that the execution of its provisions will be entrusted to appropriately qualified and experienced persons.

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 iii, a blank page, pages 1 to 49 and a back cover.

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Section 1. General

1 Scope

A1 This code of practice provides recommendations for the planning, design, installation, commissioning and maintenance of voice alarm systems associated with fire detection and fire alarm systems in and around buildings. It does not cover the fire detection and fire alarm systems themselves, which are covered by BS 5839-1.

This code of practice also covers systems that include a manual facility for transmission of live voice messages as well as automatically generated messages. Systems that necessitate only manual intervention are outside the scope of this code of practice.

This code of practice applies to extensions and alterations to existing systems, at least in respect of the design, installation, commissioning, maintenance, and the certification of the new work, albeit that the extended or altered system might not, overall, comply with the recommendations of this standard. **A1**

Voice alarm systems covered by this code of practice are those which automatically transmit messages in response to signals from their associated fire detection and **A1** fire **A1** alarm systems. Systems that necessitate manual intervention are outside the scope of this code of practice, although voice alarm systems normally include a facility for transmission of live voice messages as well as automatically generated messages.

Although this Part of BS 5839 does not cover the use of voice sounders in a fire detection and **A1** fire **A1** alarm system, recommendations for the use of these devices have been included in Annex E.

This standard applies only to voice alarm systems for use in a temperate climate such as that of the United Kingdom.

A1 Sports grounds are also covered by BS 7827. **A1**

2 Normative references

A1 The following referenced documents are indispensable for the application of this document. For dated references, only the reference cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 1635:1990, *Recommendations for graphic symbols and abbreviations for fire protection drawings*.

BS 5330:1976, *Method of test for estimating the risk of hearing handicap due to noise exposure*.

BS 5588-11:1997, *Fire precautions in the design, construction and use of buildings — Part 11: Code of practice for shops, offices, industrial, storage and other similar buildings*.

BS 5839-1:2002, *Fire detection and fire alarm systems for buildings — Part 1: Code of practice for system design, installation, commissioning and maintenance*.

BS 6259:1997, *Code of practice for the design, planning, installation, testing and maintenance of sound systems*.

BS 7629-1:1997, *Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire — Part 1: Multicore cables*.

BS 7629-2:1997, *Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire — Part 2: Multipair cables*.

BS 7671:2001, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition*.

BS 7807:1995, *Code of practice for design, installation and servicing of integrated systems incorporating fire detection and alarm systems and/or other security systems for buildings other than dwellings*.

BS EN 54-4, *Fire detection and fire alarm systems — Part 4: Power supply system*.

BS EN 60079-14, *Electrical apparatus for explosive gas atmospheres — Part 14: Electrical installations in hazardous areas (other than mines)*.

BS EN 60268-16, *Sound system equipment — Part 16: Objective rating of speech intelligibility by speech transmission index*.

BS EN 60529:1992, *Classification of degrees of protection provided by enclosures (IP code)*. **A1**

A1 BS EN 60702-1, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V — Part 1: Cables*.

BS EN 60702-2, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V — Part 2: Terminations*.

BS EN ISO 13943, *Fire safety — Vocabulary*. **A1**

A1 3 Terms and definitions

For the purposes of this Part of BS 5839, the terms and definitions given in BS EN ISO 13943 and BS 5839-1 apply, together with the following: **A1**

3.1

area of coverage

the area throughout which speech signals from the voice alarm system are sufficiently intelligible and warning signals from the system are sufficiently audible

3.2

audibility

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

NOTE Audibility depends upon the relative loudness and frequency content of the sound in comparison with other sounds which are present at the same time.

3.3

access level

the accessibility of controls and visibility of indications, subclassified as follows:

- a) access level 1: no restrictions;
- b) access level 2: restricted to persons authorized to operate voice alarm equipment;
- c) access level 3: restricted to persons authorized to re-configure site specific data or carry out servicing;
- d) access level 4: restricted to persons authorized by the manufacturer to carry out repair or make hardware and/or software changes to voice alarm equipment beyond that which is authorized at access level 3.

3.4

clarity

A1 the property of a sound which allows its information-bearing components to be distinguished by the listener. It is 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 electroacoustic system:

- a) amplitude distortion, due to non-linearity in electronic equipment and transducers;
- b) frequency distortion, due to non-uniform frequency response of transducers and selective absorption of high frequencies in acoustic transmission;
- c) time domain distortion, due to reflection and reverberation in the acoustic domain. **A1**

3.5

critical signal paths

all components and interconnections between every fire alarm broadcast initiation point and the input terminals on, or within, each loudspeaker enclosure

3.6

A1 emergency microphone

a microphone dedicated for use by the fire and rescue service or other responsible persons as part of a voice alarm system **A1**

3.7

fire risk

a combination of the probability of fire occurring and the magnitude of the consequences of fire

3.8**intelligibility**

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

NOTE Satisfactory intelligibility requires adequate audibility (see 3.2) and adequate clarity (see 3.4).

3.9**listener**

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

3.10**loudspeaker zone**

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

3.11**system monitoring**

the automatic checking of the voice alarm system for integrity throughout its audio and/or associated control-data paths

3.12**voice alarm system**

a sound distribution system that provides means for automatically broadcasting speech messages and warning signals

3.13**loudspeaker circuit**

a 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

NOTE An alarm zone *can* contain one loudspeaker circuit, or more than one loudspeaker circuit.

3.14**voice alarm control and indicating equipment****VACIE**

component or components of a voice alarm system through which other components may be supplied with power and which:

a) are used:

- 1) to receive signals from the Fire Detection and Alarm C.I.E.;
- 2) to receive audio messages from emergency microphones;
- 3) to determine processing priority and signal routing;
- 4) to transmit messages to loudspeaker circuits;

b) provide:

- 1) if required, manual controls for the selection of loudspeaker circuits;
- 2) if required, indicators for identifying which loudspeaker circuit is selected;
- 3) message generators and power amplifiers;

c) are used to monitor the correct functioning of the system and give audible and visible warning of any faults in the critical path of any part of the system intended to be used in an emergency **A1**

4 Exchange of information

4.1 General

The requirements for the voice alarm system, including those imposed by the configuration and usage of the premises, should be ascertained by consultation between the user of the system and all other interested parties. On the basis of these consultations, a system specification should be prepared showing the following:

- a) definition of the functional requirements;
- b) details of the installation proposed;
- c) accommodation required for the equipment;
- d) special provisions required for the equipment and its wiring;
- e) interconnections with the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system required to achieve the specified functions;
- f) interconnections with any other systems.

It is desirable that one organization should be given overall responsibility for the performance of the total system formed by the integration of the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system and the voice alarm system. The responsibilities of the main contractor and all sub-contractors should be clearly defined in all relevant documentation relating to the installation.

Prior to undertaking changes or extensions, consideration should be given to their effect on the performance of the existing system and agreement should be obtained from all interested parties.

4.2 Action in the event of an alarm of fire

The design of the voice alarm system and the way in which it interfaces with the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system will depend on the actions required after a fire has been detected. It is thus essential that these actions are established and agreed after discussions amongst all relevant parties.

If the preferred mode of evacuation of the building is such that different actions may be required in different areas of the building, then the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system and the voice alarm system should be so designed that the necessary commands, messages or signals can be distributed easily. The area in which the fire is first detected usually determines the initial distribution of alarm signals and messages. The relationship between the location of the fire and the distribution of warning signals and pre-recorded messages should be carefully defined and specified prior to the design of the system, since it may reflect strongly on the facilities required in the voice alarm system, the wiring arrangement and the nature of the interface between the voice alarm system and the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system. For example, a building using a phased evacuation scheme could require an evacuation message in some areas, while in other areas an alert message only would be broadcast initially. The exact content of the alert or evacuation messages may also vary with the area of the building where they are broadcast. In such cases, it is essential that the interfaces between the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system and the voice alarm system are capable of providing this differentiation. Care should be taken to ensure that messages are not misunderstood in any parts of the building where signals relating to more than one area may be audible, for example a stairwell or an atrium.

This code of practice is concerned with the design of the voice alarm system and its interface to the fire detection and $\boxed{A_1}$ fire $\langle A_1 \rangle$ alarm system; the requirement for the evacuation scheme should be determined in consultation with the relevant authorities (see also BS 5588-11).

If the voice alarm system is shared with alarm systems associated with hazards other than fire, then the various hazard alarms should be properly co-ordinated and distinct from each other. In these buildings the relative priorities should be carefully assessed and the voice alarm system designed so that a higher priority alarm cannot be prevented or obscured by a lower priority alarm. Although in general fire will have the highest priority, there are buildings in which other hazards have a higher priority. If the voice alarm system is also used to provide other audio services such as general paging and background music, the system should be designed so that those services cannot prevent or delay any fire alarms. If the voice alarm system is shared with another form of alarm system, reference should be made to BS 7807.

4.3 Consultation

The following parties should be involved in consultation where appropriate:

- a) the user or the user's representative;
- b) the designer of the voice alarm system;
- c) the designer of the fire detection and $\boxed{A_1}$ fire $\boxed{A_1}$ alarm system;
- d) the acoustics engineers or consultants;
- e) the installer(s);
- f) the local fire authority or other enforcing authorities;
- g) the fire insurer;
- h) the building contractors;
- i) the architects.

Any $\boxed{A_1}$ variations $\boxed{A_1}$ from the recommendations of this code of practice should be agreed by the interested parties.

4.4 Multi-occupancy buildings

If the building is under the control of more than one occupant, a fire in a part of the building under the control of one occupant may spread to, or otherwise affect, a part or parts under the control of others. It is, therefore, important that, where possible, all those who might be affected should be consulted prior to designing the voice alarm system, to ensure that emergency messages take into account the requirements of all the occupants of the building.

$\boxed{A_1}$ 4.5 Variations from the recommendations of this standard

The following recommendations are applicable.

- a) Any variations from the recommendations of this part of BS 5839 incorporated within a specification or design proposal should be clearly identified, so that they are obvious to any party from whom approval of the specification or design proposal may be sought, such as the user, purchaser, enforcing authority or insurer.
- b) Any variations from the recommendations of this part of BS 5839 identified or proposed during installation or commissioning, but not clearly identified in the documented design, should be documented (other than in the case of errors or "snags" for which rectification is proposed), for subsequent approval.

NOTE This recommendation is not intended to imply that it is the responsibility of the installer or commissioning engineer to verify or certify compliance of the system design with this standard. However, if variations are identified by an installer or commissioning engineer, particularly variations related to circumstances that might not have been known to the designer (e.g. structural features of the building that affect intelligibility), they should be documented for referral to the designer, user or purchaser for agreement or action.

- c) All variations, whether of the type described in a) or b), should be agreed amongst the interested parties (see 4.3).
- d) All variations should be listed in the relevant system certificate (see 28.6). $\boxed{A_1}$

5 Planning schedule

A typical list of events to be taken into consideration in preparing a planning schedule is as follows, but not necessarily in the order stated:

- a) survey of the site or detailed examination of site drawings, including acoustic assessment;
- b) assessment of the usage of the site including:
 - 1) periods of non-occupation;
 - 2) areas with high noise levels requiring special consideration;
 - 3) personnel, for example: hard of hearing, trained or untrained, non-English speaking;
 - 4) proposed actions and procedures to be taken in the event of a fire;
- c) liaison with all interested parties to ensure system compatibility, for example interface with fire detection and **A1** fire **A1** alarm system;
- d) system specification and requirements for design and estimating purposes;
- e) tendering and quotation;
- f) consideration of proposals, prices and delivery times;
- g) consideration of servicing requirements;
- h) agreement on the proposal and actions to be taken in the event of a fire, including signal and message details;
- i) agreement on the facilities to be provided at the control equipment, for example manual controls and indications, (see clause 17);
- j) detailed system design;
- k) ordering;
- l) agreement on final specification and any variations from the original specification **A1** such variations should be put in writing and included in the specification and copied into the maintenance manual **A1**;
- m) production, pre-delivery acceptance test and delivery of equipment;
- n) installation and testing of equipment and system, including audibility and intelligibility;
- o) commissioning and certification of system;
- p) system documentation and user training;
- q) acceptance by the client and other interested parties;
- r) handover of system;
- s) service agreement.

On large sites, all the above considerations should normally be included as stages of a critical path chart.

Consideration should be given to the siting and accommodation of equipment (see clause 25).

Consideration should also be given to other work being done on the site so that the installation can be carried out at convenient times without conflicting with other contractors.

Temporary physical protection may be required on some system components to prevent deterioration arising from dust, damp or physical damage.

The final connection, switching on and commissioning of the voice alarm system should be carried out at times agreed between interested parties. There may, however, be an interim period of partial operation, either because of partial occupation of the building or to provide protection against risks during construction. Such operation is a matter of agreement between the interested parties.

Section 2. Design considerations

6 General

6.1 Purpose

A voice alarm system is primarily intended to be used in conjunction with a fire detection and A_1 fire A_1 alarm system to control the safe evacuation of building occupants by providing:

- a) clear, unambiguous spoken instructions for evacuation of the area of immediate risk;
- b) voice messages and signals which contribute to the management of an emergency.

Voice alarm systems linked to fire detection and A_1 fire A_1 alarm systems may be used to give warning of other incidents, for example bomb alert, chemical spillage and extinguishing agent discharge (see 4.2). The system may also be used for routine functions, such as broadcast of music, paging or general announcements providing that such facilities are always overridden in the event of an emergency (see clause 16).

6.2 Messages

Once a fire has been detected, it is essential that persons be evacuated from the areas of immediate danger as quickly as possible to minimize risk to life.

This may present few problems where occupants are familiar with the site and have been trained in the evacuation procedures. In public locations, few will be totally familiar with the site and therefore will require precise verbal information on the actions required of them. Reference should be made to clause 14 for recommended types of messages.

6.3 Circuit design

Compatibility of voice alarm system components is essential if the effectiveness and intelligibility of broadcast messages is to be achieved.

Compatibility should be ensured between the system components, for example microphones, amplifiers, loudspeakers and interconnecting cables, all of which can have a marked effect on system performance. All interconnecting cables should be in accordance with the recommendations of clause 19. Particular care should be taken to ensure compatibility with cable parameters, such as capacitance, and signal characteristics.

Interconnecting cables should be monitored as recommended in clause 7.

6.4 System interface

The link between the fire detection and A_1 fire A_1 alarm system and the voice alarm system is of vital importance to maintain the integrity of overall operation. It may be desirable on larger systems, where distributed control equipment is used, to provide a link at each control equipment location rather than to rely on a central location. Each link should be monitored as recommended in clause 7. The voice alarm system should be capable of continuing to broadcast alarm messages which have been initiated by the fire detection and A_1 fire A_1 alarm system even in the event of a subsequent fault in the interconnecting link between the two systems; i.e. the voice alarm system should “latch” on receipt of a signal from the fire detection and A_1 fire A_1 alarm system until de-latched by a separate command from the fire detection and alarm system. Interruption by higher priority broadcasts should still be possible.

In complex buildings where activation of the Evacuate or Alert signal can be manually initiated at remote voice alarm equipment, consideration should be given to the need for such actions to be indicated at any central fire detection and A_1 fire A_1 alarm control and indicating equipment.

The interlinking cable between the fire detection and alarm system and the voice alarm system should be protected against fire and mechanical damage (see 19.3) and should, where practicable, pass through areas of low fire risk.

A_1 The fire alarm interface wiring should be arranged such that a single fault on the wiring does not disable the interface between the fire detection and fire alarm system and the voice alarm system. This can be achieved as follows:

- a) with a single loop driven interface protected against short circuits directly connected to the voice alarm CIE; or
- b) by using two diversely routed cables connected in such a way that a fault on one does not cause an alarm signal to fail to be received. A_1

The interface between the fire detection and **A1** fire **A1** alarm system and the voice alarm system should be such that any delay in the automatic transmission of the relevant pre-recorded message (see clause 13) is minimized. **A1** Text deleted **A1**

A1 The cause and effect schedule is to be agreed with the enforcement authority, the fire engineering consultant (where appointed) and the system designer in relation to the delay (if any) between the initiation of a detector and/or manual call point and the activation of the pre-recorded message(s). Under normal circumstances, the delay should be adjusted in the fire detection and fire alarm system. Once the message initiation command is received by the VACIE the message should start broadcasting within one second. **A1**

The division of control exercised by the fire detection and **A1** fire **A1** alarm system and the voice alarm system should be such that automatic functions by one system do not prevent the correct functioning of the other system.

6.5 Circuits containing fire detectors

If communication between the fire detection and **A1** fire **A1** alarm system and the voice alarm system is achieved via the fire detection circuit, then the removal of any detector(s) should not inhibit the operation of the voice alarm system.

A single fault on a fire detection circuit should not affect communication with the voice alarm system.

6.6 Loudspeaker circuits

6.6.1 General

The integrity of a voice alarm system should be at least equivalent to that recommended by BS 5839-1 for sounder circuits. That standard recommends that the wiring of sounder circuits should be so arranged that, in the event of a short-circuit developing in any part of the wiring during a fire, a minimum of one alarm sounder should continue to sound. Therefore, in the event of a single open-circuit or short-circuit fault on a loudspeaker circuit of a voice alarm system, the emergency broadcast should be intelligible at one point, at least, in the building, preferably at a supervised location, such as a reception area, security control room or main entrance foyer. This minimum provision would not ensure that the reduced emergency broadcast is audible and intelligible throughout the building. If it is considered that some audibility or intelligibility should be maintained over a greater area of the building, additional loudspeaker circuits should be provided (see 6.6.3).

6.6.2 Loudspeaker circuits failure

Failure of loudspeaker circuits can be caused by physical damage to cables, faults in equipment or damage to cables by fire. In the case of systems designed in accordance with this Part of BS 5839, loudspeaker circuits should be protected against accidental or fire damage (see 19.3). An open-circuit or short-circuit fault on one loudspeaker circuit should not affect the operation of any other circuit or loudspeaker zone. A short-circuit fault on a loudspeaker circuit should not cause damage to the associated amplifier. In addition, any failure of a loudspeaker circuit should result in a fault warning at the fire detection and alarm control and indicating equipment within 100 s of its occurrence.

6.6.3 Additional loudspeaker circuits

In buildings designed to accommodate the general public in large numbers, typically within a single space, the threat to life in the event of a fire may be such that the provision of additional loudspeaker circuit(s) within a loudspeaker zone is justified. Examples include:

- a) transport terminal concourses;
- b) mall areas of covered shopping complexes;
- c) public areas of:
 - 1) cinemas, theatres and other places of entertainment;
 - 2) large department stores;
 - 3) leisure centres.

Additional loudspeaker circuits should be provided in any uncompartmented public spaces of such buildings if the space is either:

- i) greater than 4 000 m² in area; or
- ii) designed to accommodate more than 500 members of the public.

Even if additional loudspeaker circuits are provided in large public spaces in order to satisfy the above recommendations, it is not generally necessary to provide them in small cellular spaces and non -public areas of such buildings.

In areas where additional loudspeaker circuits are installed, the intention in the event of failure of one circuit should be to maintain a level of audibility and intelligibility, albeit at a reduced level. In order to achieve this, the loudspeaker circuits should be evenly distributed and interleaved such that adjacent loudspeakers are on different circuits.

The additional loudspeaker circuits should not be enclosed in a common cable sheath. For example, two circuits should not be served by a common four core cable, as this would not adequately protect against loss of both circuits due to fire or mechanical damage.

6.7 Visual alarm signals

Where high background noise is present or where occupants are likely to be hard of hearing or wearing ear protection, the broadcast messages should be supplemented with visual alarm signals. Visual alarm signals should A1 text deleted A1 be used where background noise levels exceed 90 dBA.

The visual alarm devices should normally be as described in A1 17.2 of BS 5839-1:2002 A1. Other types of visual alarm devices may be used as appropriate to site conditions.

Wiring to visual alarm devices should satisfy the recommendations of A1 Clause 19 A1.

6.8 Program controlled systems

Where the configuration or any other function of the voice alarm system is determined by a device the operation of which is reliant on a stored A1 program(s) A1, the following provisions apply.

- a) Access to facilities provided for alteration should be restricted to access level 3 for site specific data and access level 4 for the program and all other data (see 17.3.3).
- b) Any function relying on a stored program should not use rotating disks or other media using moving parts or any other form of easily corruptible memory.
- c) The operation of processors should be continuously monitored (see 17.4).
- d) In the event of failure of any processor, provision should be made for a minimum level of fall-back operation appropriate to the application, at least allowing manual access to all loudspeaker zones using the A1 emergency A1 microphone.
- e) Following re-initialization, repair of any fault or restoration of any total power supply failure, the system should be capable, within 30 s, of giving a general Evacuate broadcast and, within a further 10 min, of attaining a normal operating condition.

6.9 Interfaces with other sound systems

If there are other independent systems on the site, for example a sound distribution system, audio-visual presentation or sound reinforcement system, switching outputs should normally be provided for automatically muting these systems.

A1 In circumstances where there is a public performance venue accommodating more than 300 people, the evacuation will be manual (as recommended by BS 5588-6) and the automatic message trigger should be disabled whilst the emergency control centre is manned. A1

Consideration is needed as to when the mute function should operate, i.e. on Alert or Evacuate status. Cancellation of the mute should be possible only at the control equipment of the fire detection and A1 fire A1 alarm system.

6.10 Combined use with fire alarm sounders

There may be circumstances in which both voice alarm loudspeakers and fire alarm sounders are used in the same building, such as:

- a) use of voice alarm in public areas of a large building complex with fire alarm sounders in, for example, plant areas to which the public has no access;
- b) use of fire alarm sounders as a primary means of warning with a voice alarm system to provide supplementary information.

In such cases, the following recommendations apply.

- 1) The operation of fire alarm sounders should not cause the intelligibility of the voice broadcast to be below the recommendations given in clause 15.
- 2) Attention-drawing signals used to introduce voice messages should be the same as those produced by the fire alarm sounders for a similar stage of alarm and should be in accordance with **16.2** of BS 5839-1:2002 **A1**.
- 3) The procedures for operating such systems should be such as to avoid confusion in an emergency.
- 4) If it is necessary to silence fire alarm sounders in order to broadcast the voice messages, re-starting of the fire alarm sounders should be automatic so that no period of silence exceeds 10 s.

A1 6.11 Systems in explosive gas or dust atmospheres

The following recommendations are applicable.

- a) Any system (or part of a system) protecting an area, or with cables passing through an area, in which there may be an explosive gas, vapour or mist atmosphere should comply with the requirements of BS EN 60079-14.
- b) Any system (or part of a system) protecting an area, or with cables passing through an area, in which there may be an explosive dust atmosphere should comply with the requirements of BS EN 50281-1-2. **A1**

7 Fault monitoring

7.1 Interface with the fire detection and **A1** fire **A1** alarm system

A short-circuit or disconnection of the communicating link between the fire detection and **A1** fire **A1** alarm system and the voice alarm system should be indicated at the fire detection and **A1** fire **A1** alarm system control and indicating equipment.

As a minimum, the voice alarm system should be capable of transmitting to the fire detection and **A1** fire **A1** alarm system one common "Voice alarm system fault" for any fault condition which may occur within the voice alarm system.

7.2 Monitoring of the voice alarm system

The voice alarm system control equipment should be capable of indicating any of the following conditions:

- a) short-circuit or disconnection of any normal power supply associated with the giving of any alarm of fire, or other total loss of power from such a normal power supply;
- b) short-circuit or disconnection of any standby power supply associated with the giving of an alarm of fire. Where the standby power supply comprises a number of batteries connected in parallel, the indication should be given in the event of disconnection of any one battery or short-circuit of a single cell within a battery;

NOTE 1 Unmonitored facilities may be provided for giving an audible and visible warning in the event of simultaneous failure or disconnection of both mains and standby power supplies.

- c) short-circuit or disconnection of any battery charging equipment associated with the giving of an alarm of fire;
- d) rupture of any fuses or operation of automatic circuit breaker, isolator or protective devices that may prevent an emergency broadcast;
- e) failure of **A1** an emergency **A1** microphone including the capsule voice coil, pre-amplifier and essential wiring to the rest of the equipment;

f) failure of critical signal paths;

NOTE 2 Switching devices, whether solid-state or electromechanical, in a critical signal path need not be tested or exercised automatically as part of the critical path monitoring. However, the signal path between these switching devices and other components in the critical signal path should be monitored up to the switching devices themselves. For example, if there is a relay in the critical signal path, failure of the connection to the relay contacts should result in a fault warning. It is accepted that mechanical failure of the relay, such that it would not operate on demand, will be identified only during the course of routine testing or servicing (see clause 32).

g) amplifiers and/or modules missing within a critical signal path;

h) failure of emergency message generators including all emergency pre-recorded message stores;

i) open-circuit, short-circuit or earth faults on any loudspeaker circuit, including any spur circuit;

j) failure of a processor to correctly execute its software program;

k) failure of any power amplifier, including any standby amplifier;

l) failure of the interconnecting data and/or voice communication links between components of a distributed system;

m) cessation of any scanning or interrogating process within the control equipment;

n) detection of any error in memory checking procedures recommended in 6.8;

o) failure of an ambient noise sensing and compensation controller (see clause 11).

The fault indication should be given within 100 s of the occurrence of the fault regardless of whether the voice alarm system is being used for a non-emergency purpose, such as transmission of background music.

The indication of faults that exist prior to initiation of an emergency broadcast may be suppressed during the emergency broadcast, except where these pre-existing faults might adversely affect any emergency broadcast.

Open-circuit or short-circuit faults on loudspeaker circuits that occur after initiation of an emergency broadcast should be indicated in accordance with the recommendations of 7.3 during the emergency broadcast, unless this is prevented by the broadcast of the emergency message in the same zone as the fault. Other faults that occur after initiation of the emergency broadcast may be suppressed during the emergency broadcast.

If the indication of any fault condition is suppressed during an emergency broadcast, the indication should be given in accordance with the recommendations of 7.3 within 100 s of the silencing of the emergency broadcast.

7.3 Fault warning

7.3.1 Fault warning responses

In the event of any of the fault conditions listed in 7.2 occurring, a fault warning should be given, at the control equipment, by at least the following:

a) an audible warning from a sounder, preferably within the control equipment. The sound level should not be less than 50 dBA at 1 m from the control equipment enclosure, when measured with an instrument conforming to BS EN 60651, type 2 with slow response;

NOTE BS 5839-1 recommends that the sound level produced by the sounder should be not less than the ambient sound level. A sound level of 50 dBA might not be adequate for control equipment installed in noisy environment; in such situations an (additional) external sounder might be required.

b) a visible indication by means of a separate light emitting indicator (the general fault indicator);

c) separate light emitting indicators and/or an alphanumeric display, giving at least the following:

1) a visible indication, common to all power supplies, of the faults described in 7.2a, 7.2b and 7.2c.

2) a visible indication, common to all signal paths, of the rupture of any fuse or operation of protective device, as described in 7.2d, which is capable of affecting a critical signal path and which is not otherwise indicated as a fault of a monitored function;

3) a visible indication, common to all $\overline{A_1}$ emergency $\overline{A_1}$ microphones, of the faults described in 7.2e;

4) a visible indication, common to all emergency message generators, of the faults described in 7.2h;

5) an individual visible indication, for each loudspeaker circuit, of the faults described in 7.2i;