

Fire detection and fire alarm systems for buildings —

Part 9: Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems

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Committees responsible for this British Standard

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- British Cables Association
- British Fire Consortium
- British Fire Protection Systems Association
- British Nuclear Fuels plc
- BT plc
- Chartered Institution of Building Services Engineers
- Consumer Policy Committee BSI
- Department of Health NHS Estates
- Electrical Contractors Association
- Energy Industries Council
- Engineering Industries Association
- Health and Safety Executive
- Her Majesty's Fire Service Inspectorate
- Institute of Fire Prevention Officers
- Institution of Fire Safety
- Institute of Petroleum
- Institution of Electrical Engineers
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- London Fire and Emergency Planning Authority
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- MOD — UK Defence Standardization
- National Association of Fire Officers
- National Caravan Council Limited
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Foreword

This part of BS 5839 has been prepared by Technical Committee FSH/12/1. No existing standard is superseded.

Emergency voice communication systems allow firefighters and others to communicate with one another during emergency situations in and around buildings and at sports and similar venues, such as entertainment centres. They also allow communication with disabled persons. Although such emergency communication systems have been in common use for many years, they have not been directly covered by any British Standard or code of practice. In recent years, this absence of standardization has given rise to an anomaly, since fire detection and alarm systems and voice alarm systems, in the same buildings as emergency voice communications systems, are normally covered respectively by BS 5839-1 and BS 5839-8. Emergency voice communication systems, as later defined in this code of practice, are used in connection with life safety and should therefore be subject to high standards of design, manufacture, installation and servicing, similar to those covering fire detection and alarm systems and voice alarm systems.

There is very restricted reference to fire telephone systems (a form of emergency voice communication systems), or similar emergency communication systems, in other standards or codes of practice. This code of practice has, therefore, been prepared to:

- a) give guidance to those who specify, design, manufacture, install, commission, service and use such emergency voice communication systems;
- b) 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.

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.

Normative clauses are arranged into two parts, namely, commentary and recommendations. It is envisaged that, when emergency voice communication systems are audited (e.g. by enforcing authorities, third party certification bodies, or representatives of the purchaser or user), only the recommendations will form the basis for the audit. The commentary is intended to provide an explanatory background to the recommendations, especially where the recommendations might otherwise appear arbitrary.

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 does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 36, an inside back cover and a back cover.

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Section 1. General

1 Scope

This code of practice provides recommendations for the planning, design, installation, commissioning and maintenance of emergency voice communication systems in and around buildings and at sports, entertainment and similar venues. It does not recommend whether or not an emergency voice communication system should be installed in a given premises.

Henceforward in this code of practice, emergency voice communication systems are usually referred to as EVC systems and the term EVC is used to mean emergency voice communication.

This code of practice primarily relates to the use of EVC in assisting both firefighters and those responsible for evacuating buildings or sports stadia in fire emergency situations, including evacuation of disabled persons. Use, other than in fire emergency situations, by disabled persons and others, although not precluded, is not addressed in detail.

Other than in exceptional circumstances, EVC systems are not intended as the means of raising a fire alarm, in lieu of manual call points. Reference should be made to BS 5839-1 for guidance on fire detection and alarm systems.

In the context of this code of practice, an EVC system contains no portable parts. Mobile telephones and two-way radio sets are therefore not within its scope.

An EVC system should be:

- 1) restricted to a building, building complex or sports or similar venue;
- 2) continuously monitored for faults;
- 3) for use as described in this part of BS 5839.

The term emergency voice communication systems is therefore not intended to cover general-purpose intercom systems, lift intercom systems, local (internal) telephone systems for general use, or any external communication systems, such as the public switched telephone network.

Voice alarm systems are primarily intended for the automatic broadcasting of evacuation messages; they are covered by BS 5839-8 and are therefore excluded from this code of practice.

This part of BS 5839 does not cover systems combining electrically the functions of EVC systems with functions of other fire-related or non-fire-related systems. That is, for example, an EVC master station may mechanically share part of its enclosure with the control and indicating equipment of a fire alarm system, but recommendations for sharing a single mains-derived extra low voltage power supply are not within the scope of this standard. Recommendations for integrated systems are given in BS 7807.

This part of BS 5839 applies only to emergency voice communication systems for use in a temperate climate such as that of the United Kingdom.

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 5499-1, *Graphical symbols and signs — Safety signs, including fire safety signs — Part 1: Specification for geometric shapes, colours and layout.*

BS 5588-5, *Fire precautions in the design, construction and use of buildings — Part 5: Code of practice for firefighting stairs and lifts.*

BS 5588-8, *Fire precautions in the design, construction and use of buildings — Part 8: Code of practice for means of escape for disabled people.*

BS 5588-10, *Fire precautions in the design, construction and use of buildings — Part 10: Code of practice for shopping complexes.*

BS 5588-11, *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 alarm systems for buildings — Part 1: Code of practice for system design, installation, commissioning and maintenance.*

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

BS EN 54-2:1998, *Fire detection and fire alarm systems — Part 2: Control and indicating equipment*.

BS EN 54-4:1998, *Fire detection and fire alarm systems — Part 4: Power supply equipment*.

BS EN 60529, *Specification for degrees of protection provided by enclosures (IP code)*.

BS EN 60651, *Specification for sound level meters*.

[IEC 60651]

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

[IEC 60702-1]

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

[IEC 60702-2]

Guide to Safety at Sports Grounds. The Scottish Office, 1997.

Fire Safety Guide No. 3, Phased Evacuation from Office Buildings. London District Surveyors Association.

3 Terms and definitions

For the purposes of this part of BS 5839, the following terms and definitions apply.

3.1

competent person

person with the necessary training and experience, and with access to the requisite tools, equipment and information, and capable of carrying out a defined task

3.2

duplex operation

operation of transmitting and receiving apparatus at one location in conjunction with associated transmitting and receiving equipment at another location, the processes of transmission and reception being concurrent

3.3

emergency voice communication system

EVC system

system that allows voice communication in either direction between a central control point and a number of other points throughout a building or building complex, particularly in a fire emergency situation

3.4

evacuation lift

lift that may be used for the evacuation of disabled people in a fire under the direction of management or firefighters

3.5

firefighting lobby

protected lobby providing access from a firefighting stair to the accommodation area, and to any associated firefighting lift

3.6

firefighting stair

protected stairway communicating with the accommodation area only through a firefighting lobby

3.7

fire telephone system

commonly-used form of emergency voice communication system that includes telephone handsets at outstations and usually also at master stations

3.8**group call**

call made from a master station to more than one outstation simultaneously

3.9**handset**

part of a telephone, combining receiver and transmitter, one at each end of the handle

3.10**hook-switch**

switch operated automatically by removal of a handset from, or replacement of a handset in, its rest position

3.11**intelligibility**

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

3.12**master station**

control unit located at a central control point which controls the EVC system

NOTE In large buildings or building complexes, there may be several master stations communicating with each other.

3.13**off-hook**

the status of a handset when removed from its normal rest position to initiate an outgoing call or receive an incoming call.

3.14**on-hook**

the status of a handset when in its normal rest position, terminating a call or permitting notification of an incoming call

3.15**outstation**

unit, located at a strategic point in a building or building complex, that allows two-way voice conversation with a master station

3.16**phased evacuation**

system of evacuation in which different parts of the premises are evacuated in a controlled sequence of phases, those parts of the premises expected to be at greatest risk being evacuated first

3.17**protected lobby/corridor**

circulation area consisting of a lobby or corridor enclosed with fire-resisting construction (other than any part that is an external wall of a building)

3.18**protected stairway**

stair discharging through a final exit to a place of safety (including any exit passageway between the foot of the stair and the final exit) that is enclosed with fire resisting construction

3.19**refuge**

area that is enclosed with fire-resisting construction (other than any part that is an external wall of a building) and served directly by a safe route to a storey exit, evacuation lift or final exit, thus constituting a temporarily safe space for disabled people to await assistance for their evacuation

4 Need for an emergency voice communication system

4.1 Commentary

The need for EVC in any specific building or complex will normally be determined by the authority responsible for enforcing fire safety legislation in that building and/or by a fire risk assessment carried out by the owner, landlord, occupier(s), employer(s) or other responsible person, as appropriate.

It is appropriate to install EVC in many buildings where phased evacuation applies, to help appropriate persons in the building and, in particular, the fire service, to manage the evacuation of the building.

At sports venues and in similar complexes, EVC will assist stewards in controlling the evacuation of the area in an emergency. Stewards, firefighters and other emergency services will be able to communicate from strategic points throughout the site, with a central control area.

An EVC system will also assist the fire service in firefighting operations after evacuation of a building or other complex.

Installation of an EVC system may be appropriate for buildings without phased evacuation where the types, size and/or shape of the building necessitates communication between remote locations and a central control point, to facilitate evacuation or firefighting.

In any building or sports or similar venues where there are disabled people, the installation of an EVC system might be required to facilitate communication with people at refuges.

4.2 Recommendations

The following recommendations are applicable.

a) Where there is uncertainty regarding the need for an EVC system, reference should be made, by the potential purchaser or user, to one or more of the following:

- 1) BS 5588-5, -8, -10 and -11;
- 2) Guide to Safety at Sports Grounds. The Scottish Office, 1997;
- 3) Fire Safety Guide No 3, Phased Evacuation from Office Buildings. London District Surveyors Association;
- 4) Approved Document B, The Building Regulations 2000, DETR;
- 5) guidance documents that support fire safety legislation;
- 6) any authority responsible for enforcing fire safety legislation that applies to the premises.

5 Exchange of information and definition of responsibilities

5.1 Commentary

The main purpose of an EVC system is to support the fire safety strategy of the building or complex (see Clause 7). It is therefore important that system design suitably supports the required evacuation and firefighting procedures.

The system requirements, including those imposed by the evacuation procedures, the configuration of the building or complex, and the use to which the building is put, should be ascertained as accurately as possible by consultation between the user or purchaser and other interested parties, such as the enforcing authority.

A key performance requirement to be determined in relation to EVC systems is whether there is a need for calls to be made to, as well as from, outstations. Any proposal to make outstations more secure [see 11.5.2g)] should also be agreed with the interested parties.

There should also be relevant consultation between the user or purchaser and the system designer.

The design may be undertaken by the supplier, the installer, representatives of the user or purchaser, or by any combination of these parties.

5.2 Recommendations

The following recommendations are applicable:

a) The user or purchaser of the system should ensure that, to the extent appropriate, there is consultation at, or prior to, the system design stage with the authority enforcing legislation (e.g. the building control body, fire authority, local authority or Health and Safety Executive) and, where applicable, the police service.

NOTE 1 Where any variations from the recommendations of this part of BS 5839 are proposed, they should be agreed with the relevant interested parties.

b) The purchaser or user should ensure that the designer of an EVC system is adequately appraised of the objectives of the system and, in particular, whether there is a requirement for calls to be made to, as well as from, outstations.

c) The designer of the system should ensure that, to the extent appropriate, there is consultation at the design stage with all relevant interested parties within the following list:

- the user or purchaser;
- the supplier of the system;
- the installer of the system;
- consultants (including architects, mechanical and electrical consultants and fire safety engineering consultants).

NOTE 2 Some of the consultations may be undertaken by parties such as the designer or consultants, acting on behalf of the user or purchaser.

d) The installer of the system should ensure that, to the extent appropriate, there is consultation with all relevant interested parties within the following list:

- the designer;
- the supplier of the system;
- consultants (including architects, mechanical and electrical consultants and fire safety engineering consultants).

e) Before an order is placed for the system, the responsibility for each of the following stages should be clearly defined and documented:

- system design;
- installation;
- commissioning and certification.

6 Variations from the recommendations of this standard

6.1 Commentary

This part of BS 5839 is a code of practice and, as such, its contents take the form of recommendations, rather than requirements. The recommendations, which are based on recognized good practice in the design, installation and maintenance of EVC systems, should be suitable for the majority of normal applications.

There will, however, be applications in which the recommendations may be unsuitable and would lead to systems that would be unnecessarily expensive, incorporating measures that could not be regarded as cost-effective, or that could be difficult to install.

This does not, however, imply that the designer or installer should have freedom to ignore the recommendations of this standard under circumstances in which a user, purchaser or enforcing authority seeks compliance with it. Variations should always be the subject of specific agreement amongst all interested parties and should be clearly identified in all relevant system documentation.

Some variations may arise from a fire risk assessment, or may be based upon the engineering judgement of a competent person. There might, for example, be situations where the number or siting of outstations would not comply exactly with this code of practice for reasons relating to the particular building construction.

6.2 Recommendations

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, or enforcing authority.
- 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 certificate compliance of the installation 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 outstation number or siting), 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 **5.2**).
- d) All variations should be listed in the system certificate (see **22.2**).

Section 2. Design considerations

7 Purpose

7.1 Commentary

Emergency voice communications systems, in the context of this part of BS 5839, are intended for specific types of communication. They are not, for example, designed for general use for non-emergency purposes, and the location and construction of EVC system component parts (see Clause 11 and Clause 12) tend to illustrate this.

Intended uses for EVC systems are as follows.

a) *Use by the management of the building or complex for its initial evacuation:*

In the first stages of evacuation, before the fire service arrives, the EVC system may be used for communication between a person at a fire control centre with, for example, fire wardens or fire marshals on various floors of the building or with stewards at a sports venue. Typically, in the case of a building, a call would be made from an outstation on a particular floor to advise the fire control centre that the floor in question had been cleared of occupants.

b) *Use by the fire service during an evacuation:*

After arrival in the building or at the venue, the fire service would normally take over control of evacuation, with an officer at the fire control centre communicating with other officers via the EVC system.

c) *Use by the fire service after evacuation:*

During the course of a fire, the fire service would continue to use EVC after completion of evacuation, to assist firefighting.

d) *Use by disabled people:*

Particularly during a fire, but also in any other emergency situation, disabled persons in refuges would be able to identify their presence and communicate with a person, e.g. a control room operator, at the fire control centre, via appropriately situated outstations. Such communication arrangements would then comply with the recommendations of BS 5588-8:1999, Clause 13, which states “...there has to be a system of two-way communication between those people who are temporarily waiting in each refuge and those members of the building management who are organizing the evacuation of the building. The two-way communication system needs to be readily operated by, and comprehensible to, disabled people.”

e) *Other uses:*

1) *An EVC system may be used by designated persons within a building for non-emergency purposes; for example, someone on a security patrol could use outstations to communicate that person’s location to the fire control centre (which would normally also be a security centre).*

2) *An outstation may have a “loud speak” capability, allowing voice messages or signals arising from a master station to be broadcast over a limited area in the region of the outstation. This facility might be used to allow the operator at the master station to continue to speak to someone in distress near the outstation.*

3) *Whether on- or off-hook, an outstation may also have a “listen” facility such that any sound in its immediate vicinity can be heard at the relevant master station(s). In addition to enabling the operator at the master station to listen generally for any sounds near outstations, this facility might be used to allow that operator to continue a conversation with someone in distress near an outstation.*

4) *Use for communication between outstations is not recommended by this code of practice.*

NOTE When a group call is made by a master station, there may be a “conferencing” outcome, such that outstations are able to communicate with other outstations as well as with the master station.

The facilities referred to in e) as “other uses” are not addressed within the scope of this standard.

7.2 Recommendations

The following recommendations are applicable.

- a) Other than in the case of EVC systems provided in refuges, users of an EVC system should generally be restricted to appropriate staff (e.g. stewards, fire marshals and control room operators) and members of the fire service.
- b) Communication should be between an outstation and a master station, not between an outstation and any other outstation, except where this is possible only because the relevant master station has performed a group call.
- c) Communication should normally be initiated from the outstation. However, the facility to call an outstation from the master station might be required in some applications. This should be determined by consultation with interested parties (see 5.2).
- d) Optional features such as the capability for “loudspeaking” and “listening” may also be provided subject to the following.
 - 1) Where a voice alarm is installed in the building or complex, care should be taken that voice alarm emergency broadcast is not affected adversely or overridden by use of the “loudspeaking” capability of the EVC system as described in 7.1e)2).
 - 2) Where an outstation has the “listening” capability described in 7.1e)3), this should not interfere with the use of the EVC system for communications within the scope of this code of practice.

8 System circuitry and software

8.1 Commentary

The components of EVC systems may be interconnected in various ways. A radial wiring arrangement can be used. It might, however, be more economical for cable to use a loop configuration, or multiple loops. Whichever arrangement is chosen, circuits should be continuously monitored for faults and circuit design should be as resilient as possible to faults.

8.2 Recommendations

The following recommendations are applicable.

- a) A radial-wired system may be used. In this case, if a cable fault occurs, an individual fault indication should be given, specifically related to the radial link affected. [see 10.2.2a)3)iv].
- b) Alternatively, a single or multiple loop configuration may be used. In either case, for integrity in operation, each loop should be closed, such that emergency voice communication can continue to take place between any outstation and the master station, in the event of an open-circuit of the loop at any one point. Fault monitoring of the loop(s) should be as recommended in 10.2.2a)3)iv).
- c) Where program-controlled systems are used unauthorized changes to the programs need to be prevented.
- d) If a master station is supplied with power from power supply equipment contained in a separate enclosure, the connections between the equipment should be duplicated such that a single open or short-circuit in the connections does not completely remove power from that master station.

9 Audio and data signal paths

9.1 Commentary

In an emergency situation, no delays in voice communication should be introduced by the system. Conversation should be possible exactly as if no electronic communication system were involved.

Since it is quite possible that a handset could be accidentally left off-hook (or the door of its enclosure could be left open), particularly in an emergency, this should not jeopardize the correct operation of the remainder of the EVC system.

Similarly, it is possible for a “call” button to become jammed in the “call” position. Once again, this should not affect communication between other elements of the EVC system.

Compatibility of EVC system components, both within a master station or outstation, and particularly between master station and outstation, is necessary for effective communication.

A typical EVC system will be supplied as a complete set of equipment, without wiring. Outstations may be presumed to have been designed to be compatible with the master stations supplied. However, it is important to use the correct type of interconnecting cables and for the cable links to be reliable.

9.2 Recommendations

The following recommendations are applicable.

- a) To facilitate conversation in an emergency situation, duplex operation should be employed.
- b) When a call is initiated, either at an outstation or at a master station, the incoming call warning indication at the receiving end should operate within three seconds of the initiation.
- c) If any outstation handset is off-hook, this should not affect communication between any other outstation on the EVC system and the master station.
- d) Jamming of a “call” button or any other means of initiating a call should not affect communication between any other outstation on the EVC system and the master station.
- e) Compatibility should be ensured between system components. In particular, master stations and outstations should be compatible. Generally, therefore, it is recommended that the complete equipment set for an EVC system should be purchased from one supplier, which would then have responsibility for its overall performance, provided the wiring is acceptable.
- f) Wiring should be in accordance with the recommendations of Clause 14 and all interconnecting cables should be monitored for faults as recommended in 10.2.1f).

10 Fault monitoring and indication

10.1 Commentary

EVC needs to be a secure and reliable means of communication. However good its design and installation, there is still the possibility of an EVC system developing a fault. A fault could occur within a master station or an outstation, in a power supply, or anywhere in the system wiring. Such faults need to be detected and indicated without delay, so that a service engineer may be called in to effect any necessary repairs.

10.2 Recommendations

10.2.1 Fault conditions

The following recommendations are applicable.

The master station should be capable of monitoring any of the following conditions:

- a) short-circuit or disconnection of any normal power supply associated with the operation of EVC equipment, or other total loss of power from such a normal supply;
 - b) short-circuit or disconnection of any standby power supply associated with the operation of EVC equipment, including where the standby power supply comprises a number of batteries connected in parallel;
 - c) disconnection of any one battery or short-circuit of a single cell within a battery;
- NOTE Facilities may be provided for giving an audible and visible warning in the event of simultaneous failure or disconnection of both normal and standby power supplies.
- d) short-circuit or disconnection of any battery charging equipment associated with the operation of EVC equipment;
 - e) rupture of any fuses or operation of automatic circuit breaker, isolator or protective devices that could prevent voice communication in an emergency;
 - f) failure of an outstation, including any open- or short-circuit fault in the circuits up to the microphone capsule, loudspeaker or ear-piece, and any fault in an associated amplifier;
 - g) open-circuit, and short-circuit faults on interconnecting cabling linking any outstation to any master station;