



BSI Standards Publication

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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Foreword

Publishing information

This part of [BS 5839](#) is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 August 2021. It was prepared by Subcommittee FSH/12/5, *Alarm devices, voice alarm evacuation sub-systems and emergency voice communications*, under the authority of Technical Committee FSH/12, *Fire detection and alarm systems*. A list of organizations represented on these committees can be obtained on request to the committee [BS 2646-5:1993](#) manager.

Supersession

This part of [BS 5839](#) supersedes [BS 5839-9:2011](#), which is withdrawn.

Relationship with other publications

[BS 5839](#) is published in the following parts:

- Part 1: *Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises*;
- Part 3: *Specification for automatic release mechanisms for certain fire protection equipment*;
- Part 6: *Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises*;
- Part 8: *Code of practice for the design, installation, commissioning and maintenance of voice alarm systems*; and
- Part 9: *Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems*.

Information about this document

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

- clarification of the three primary applications for emergency voice communication (EVC) systems, namely, fire telephone, refuge intercom and stewards' telephones at sports grounds;
- several changes to definitions;
- introduction of a Type C outstation;
- clarification of recommendations regarding visual indicators on stewards' telephones;
- clarification of recommendations for locations of stewards' telephones;
- inclusion of recommendations when more than one master station is provided;
- changes in recommendations regarding background noise;
- inclusion of recommendations regarding EVC systems installed on campuses where transmission paths might not meet the recommendations of this standard;
- mains isolation recommendations brought into line with [BS 5839-1](#);
- inclusion of recommendations regarding testing of non-EVC mode devices that might be provided; and
- inclusion of new normative annex regarding calculating standby battery capacity.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at bsigroup.com/standards, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Use of this document

As a code of practice, this British Standard takes the form of recommendations and guidance. It is not to be quoted as if it were a specification. Users are expected to ensure that claims of compliance are not misleading.

Users may substitute any of the recommendations in this British Standard with practices of equivalent or better outcome. 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 of 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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

The word “should” is used to express recommendations of this standard. The word “may” is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word “can” is used to express possibility, e.g. a consequence of an action or an event.

Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

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Introduction

Emergency voice communication (EVC) can be used for different applications, such as communicating with people in refuges, communicating with fire wardens, fire marshals and firefighters in firefighting lobbies and communicating with stewards at sporting events.

Emergency voice communication systems, as later defined in this part of [BS 5839](#), are used in connection with life safety and need, therefore, to be subject to high standards of design, manufacture, installation, commissioning and maintenance, similar to those covering fire detection and fire alarm systems and voice alarm systems.

This part of [BS 5839](#) has been prepared to:

- a) give guidance to those who specify, design, manufacture, install, commission, maintain and use such emergency voice communication systems; and
- b) ensure that high standards of reliability, safety and security are achieved, together with acceptable standards of performance.

Section 1: General

1 Scope

This part of [BS 5839](#) provides recommendations for the planning, design, installation, commissioning and maintenance of emergency voice communication (EVC) systems in and around buildings and at sports, entertainment and similar venues. It does not recommend whether or not an emergency voice communication system is installed in a given premises.

This part of [BS 5839](#) relates to the use of EVC in communicating with people in refuges, fire wardens, fire marshals and firefighters in firefighting lobbies and communicating with stewards at sporting events. 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, instead of manual call points. Refer to [BS 5839-1](#) for guidance on fire detection and alarm systems.

This part of [BS 5839](#) covers systems with components linked by wires, wirelessly, or a combination of both.

This part of [BS 5839](#) covers EVC systems and 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 and cellular telephone networks.

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 part of [BS 5839](#).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 476 (all parts), *Fire tests on building materials and structures*

[BS 4678-4](#), *Cable trunking – Part 4: Specification for cable trunking made of insulating material*²⁾

[BS 5266-1](#), *Emergency lighting – Code of practice for the emergency lighting of premises*

[BS 5839-1:2017](#), *Fire detection and alarm systems for buildings – Part 1: Code of practice for system design, installation, commissioning and maintenance of systems in non-domestic premises*³⁾

[BS 7629-1](#), *Electric cables – Specification for 300/500 V fire resistant, screened, fixed installation cables having low emission of smoke and corrosive gases when affected by fire – Part 1: Multicore cables*

[BS 7671](#), *Requirements for Electrical Installations – IET Wiring Regulations*

[BS 9999](#), *Fire safety in the design, management and use of buildings – Code of practice*⁴⁾

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

²⁾ Withdrawn in 2019.

³⁾ This document also includes informative reference to BS 5839-1:2002+A2:2008.

⁴⁾ This document also includes informative reference to [BS 9999:2017](#).

BS EN 54-2:1997+A1:2006, *Fire detection and fire alarm systems – Part 2: Control and indicating equipment*

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

BS EN 54-16:2008, *Fire detection and fire alarm systems – Part 16: Voice alarm control and indicating equipment*

BS EN 60529, *Degrees of protection provided by enclosures (IP Code)*

[BS EN 61386](#) (all parts), *Conduit systems for cable management*

BS EN 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

[BS EN IEC 60118-4](#), *Electroacoustics – Hearing aids – Part 4: Induction loop systems for hearing aid purposes – System performance requirements*

BS ISO 3864-4, *Graphical symbols – Safety colours and safety signs – Part 4: Colorimetric and photometric properties of safety sign material*

PD IEC TR 63079, *Code of practice for hearing-loop systems (HLS)*

Other publications

[N1] DEPARTMENT FOR CULTURE, MEDIA AND SPORT (DCMS). Guide to Safety at Sports Grounds. Sixth edition. The Stationery Office, 2018. ISBN: 978-1-9164583-0-7.

3 Terms and definitions

For the purposes of this part of [BS 5839](#), the following terms and definitions apply.

3.1 access level

one of several states of the EVC system in which selected:

- a) controls can be operated;
- b) manual operations can be carried out;
- c) indications are visible; and/or
- d) information can be obtained

NOTE Further information on access levels is given in [Annex A](#).

3.2 competent person

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

3.3 duplex

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

3.4 emergency voice communication system (EVC system)

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

3.5 evacuation lift

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

3.6 EVC mode

status of a system whereby communication is taking place between Type A, B or C outstations and a master station

NOTE If the system is used for purposes other than EVC, then their functions are to be overridden by the EVC functions.

3.7 firefighting lobby

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

3.8 firefighting stair

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

3.9 fire telephone system

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

3.10 group call

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

3.11 handset

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

3.12 hook-switch

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

3.13 intelligibility

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

3.14 master station

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

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

3.15 non-EVC mode

status of a system whereby communication is taking place between devices other than Type A, B or C outstations and the master station

NOTE Non-EVC functions typically include help points, lift intercoms and accessible toilet alarms.

3.16 off-hook

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

3.17 on-hook

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

3.18 on hold

condition when an off-hook outstation is no longer connected to speech and is receiving a confidence tone to reassure that the outstation is still operational, and the call is registered

3.19 outstation

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

NOTE Three types of outstation are described in [Clause 11](#): Type A, which incorporates a telephone style handset; Type B, which is hands-free with a fixed microphone and adjacent loudspeaker; and Type C, which is a combined Type A and Type B outstation.

3.20 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

3.21 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)

3.22 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

3.23 premises management

persons having day-to-day control of the premises, the EVC system(s) and implementation of the fire procedures

NOTE In large premises, a single person with specialist knowledge is often delegated the responsibility for the fire detection and fire alarm system and associated matters. In small premises, a person with specialist knowledge is unlikely to be present, but responsibility for the EVC system can still be delegated to a specific person.

3.24 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

NOTE 1 The term “disabled people” can also include any person who is unable to safely use an exit route, e.g. people with back or sports injuries, pregnant women and those who cannot walk unaided.

NOTE 2 Refuges are not areas where disabled people are to be left alone indefinitely until rescued by the fire and rescue service, or until the fire is extinguished. More information on refuges is given in [BS 9999](#).

3.25 refuge communication system

form of emergency voice communication system that usually includes hands-free outstations at refuges

NOTE A refuge communication system is also known as a disabled refuge system (DRS).

3.26 stewards' telephone system

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

3.27 voltage standing wave ratio (VSWR)

measure of how efficiently radio-frequency power is transferred to an antenna system

3.28 wireless link budget

accounting of all the gains and losses through the transmitting medium to the receiver

NOTE It accounts for the attenuation of the transmitted signal due to propagation, as well as the antenna gains, feedlines and miscellaneous losses.

3.29 wireless repeater

device used to extend the coverage of a wireless-linked system

4 Need for an emergency voice communication system*COMMENTARY ON CLAUSE 4*

An EVC system enables communication between strategic points throughout the building or site and the central control point(s). An EVC system is generally needed in the following situations:

- a) in any building or sports or similar venues where there are disabled people or people who might have difficulty negotiating the evacuation route;*
- b) in buildings with phased evacuation and/or firefighting lifts where it facilitates secure communications for building managers, fire wardens, fire marshals and attending fire officers; and*

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

- c) at sports venues and in similar complexes, where it assists stewards in controlling the evacuation of the area in an emergency. The term steward is as defined in the Guide to Safety at Sports Grounds [N1].*

In some buildings it might be necessary to take into consideration that the EVC system will address multiple uses and the outstation design will reflect its intended use.

The need for EVC in any specific building or complex is normally determined by the appropriate regulation and/or a fire risk assessment carried out by the owner, landlord, occupier(s), or employer(s), as appropriate.

The following recommendations are applicable.

- a) Where there is uncertainty regarding the need for an EVC system, the developer, potential purchaser, or user should make reference to one or more of the following:
 - 1) [BS 9999](#);
 - 2) *Guide to Safety at Sports Grounds*, Sixth edition, 2018 [N1] or later;
 - 3) guidance documents that support fire safety legislation;
 - 4) any authority responsible for enforcing fire safety legislation that applies to the premises;
 - 5) any relevant fire risk assessment; and
 - 6) any other relevant legislation.
- b) The purchaser or user should ensure that the designer of an EVC system is adequately apprised of the objectives of the system.

5 Exchange of information and definition of responsibilities

COMMENTARY ON CLAUSE 5

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, need to 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 g](#)] needs to also be agreed with the interested parties.

The following recommendations are applicable.

- a) There should be relevant consultation between the user or purchaser and the system designer.

NOTE 1 The design may be undertaken by the supplier, the installer, representatives of the user or purchaser, or by any combination of these parties.

- b) 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 and rescue authority, local authority or Health and Safety Executive) and, where applicable, the police service.

NOTE 2 Where any variations from the recommendations of this part of [BS 5839](#) are proposed, they need to be agreed with the relevant interested parties.

- c) The user or purchaser should ensure that the designer of an EVC system is adequately apprised 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.
- d) 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:

- 1) the user or purchaser;
- 2) the supplier of the system;
- 3) the installer of the system; and
- 4) consultants (including architects, mechanical and electrical consultants, fire safety engineering consultants, access consultants, acoustic consultants and risk assessment consultants).

NOTE 3 Some of the consultations may be undertaken by parties such as the designer or consultants, acting on behalf of the user or purchaser.

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

- 1) the designer;
- 2) the supplier of the system; and
- 3) consultants (including architects, mechanical and electrical consultants, fire safety engineering consultants, access consultants, acoustic consultants and risk assessment consultants).

- f) Before an order is placed for the system, the responsibility for each of the following stages should be clearly defined and documented:
- 1) system design;
 - 2) installation; and
 - 3) commissioning and certification.
-

6 Variations from the recommendations of this British Standard

COMMENTARY ON CLAUSE 6

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, are suitable for the majority of normal applications. There will, however, be applications in which the recommendations might 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 has the freedom to ignore the recommendations of this British Standard under circumstances in which a user, purchaser or enforcing authority seeks compliance with it. Variations are always the subject of specific agreement amongst all interested parties and need to 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 conform exactly to this British Standard for reasons relating to the building's construction.

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 might 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 British 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 need to 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 [Clause 5](#)).
- d) All variations should be listed in the system certificate (see [Clause 24](#)).

Section 2: Design considerations

7 Purpose

COMMENTARY ON CLAUSE 7

EVC 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 and rescue service arrives, the EVC system may be used for communication between a person at a fire control centre and, 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 has been cleared of occupants.

b) Use by the fire and rescue service during an evacuation

After arrival in the building or at the venue, it might be necessary for the fire and rescue service to take over control of the evacuation. To facilitate this, there might be a need for an officer to be located at a master station, communicating with other officers via the EVC system.

c) Use by the fire and rescue service after evacuation

During a fire, the fire and rescue service would continue to use EVC after completion of evacuation, to support firefighting operations.

d) Use by disabled people

Particularly during a fire, but also in any other emergency situation, disabled persons in refuges (and anyone who is not able to use an exit route – see Note 1 to [3.23](#)) would be able to signal their presence and communicate with a person, e.g. a control room operator at a fire control centre, via appropriately situated outstations. Such communication arrangements would then conform to the recommendations of [BS 9999:2017](#), [45.8](#) on use of refuges, which states “there should be a system of two-way communication between those waiting in each refuge and the team who are organizing the evacuation of the building. These two-way communication systems should be such that they are readily operated by, and comprehensible to, all persons likely to need to use them.” See [BS 9999:2017](#), [4.7](#) on inclusive design; [BS 9999:2017](#), Clause [16](#) commentary, Clause [16](#) on horizontal escape; [BS 9999:2017](#), [17.8](#) on methods of vertical escape for disabled people and [BS 9999:2017](#), [40.9](#) on communications.

e) Other uses

NOTE The facilities referred to in e) as “Other uses” are not addressed within the scope of this British Standard.

- 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 local broadcast capability, allowing voice messages or signals arising from a master station to be heard in the vicinity 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 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 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) *Communication between outstations, which ought to be available only under the control of the master station.*
- 5) *Group calls between a master station and more than one outstation. This might result in a “conferencing” outcome, such that outstations are able to communicate with other outstations as well as with the master station.*
- 6) *Communication with Help Points.*
- 7) *Communication with lift intercoms, particularly in evacuation and firefighting lifts (see [BS 9999:2017](#), 45.9 on evacuation using lifts).*
- 8) *Signals from alarm systems in accessible WCs.*

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 wardens, fire marshals and control room operators) and members of the fire and rescue 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 [Clause 5](#)).
- d) Optional features such as the capability for “broadcast” and “listen” 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 “broadcast” capability of the EVC system as described in [Clause 7](#), Commentary e)2).
 - 2) Where an outstation has the “listen” capability described in [Clause 7](#), Commentary e)3), this should not interfere with the use of the EVC system for communications within the scope of this British Standard.

8 System circuitry and software

COMMENTARY ON CLAUSE 8

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. Wireless links, or any combination of wireless or wired links may also be used. Whichever arrangement is chosen, circuits need to be continuously monitored for faults and circuit design needs to be as resilient as possible to faults.

It is important that unauthorized persons are not able to operate the equipment and that unauthorized changes are not made to system configuration.

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 a\)3iv](#)].
- 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 or short circuit of the loop at any one point. Fault monitoring of the loop(s) should be in accordance with [10.2 a\)3iv](#)).
- c) A wireless-linked system may be used. In this case, if a link fails, an individual fault indication should be given at the master station, specifically related to the link affected [see [10.1 c](#)].
- d) Where program-controlled systems are used, changes to the programs should be possible only at access level 3 or 4.

NOTE Access levels are described in [Annex A](#).

- e) Master stations should be able to be operated only at access level 2.
- f) Outstations for public use, such as outstations in refuges, should be at access level 1 but outstations for restricted use, such as fire telephones, should be at access level 2.
- g) 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

COMMENTARY ON CLAUSE 9

In an emergency, delays in voice communication need to be minimized. Conversation in an emergency needs to involve no further actions by the outstation user other than initiation, and communication quality ought to be as for a normal telephone or hands-free telephone system.

Conversation needs to be as continuous as possible. If, however, a technical requirement arises whereby the full duplex nature of a two-way conversation is not possible, then any manual speech direction steering requirement needs to be controlled by the master station operator, and not involve any action by the outstation user. Since it is possible that a handset could be accidentally left off-hook (or the door of its enclosure could be left open), particularly in an emergency, it is important that this does 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, it is important that this does 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 might 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. In the case of wireless-linked systems, it is important that the signal strength of each wireless link has sufficient wireless link budget to ensure that the link is reliable.

The system designers might wish to incorporate the EVC system into other systems such as building management systems, fire detection and fire alarm, voice alarm, telephone systems, intercoms, or

LAN-based systems. In such cases, the primary objective of the system is to ensure that it operates reliably and, in the manner, recommended by this British Standard.

The following recommendations are applicable.

- a) Type A outstations, which use a telephone-style handset, should employ full duplex speech communication. Type B outstations, which use an intercom-style fixed microphone and adjacent loudspeaker, may be full duplex. However, they may use automatic voice level speech direction steering techniques as employed in hands-free loud-speaking telephones or they may use manual steering from the master station.
- 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, the complete equipment set for an EVC system should be purchased from one supplier, which would then have responsibility for its overall performance.
- f) Interconnections should be in accordance with the recommendations of [Clause 14](#) and should be monitored for faults in accordance with [10.1 d\)](#).
- g) Where an EVC system is incorporated into another system, or where another system or systems are incorporated with an EVC system, the recommendations of this British Standard still apply. Any fault in the non-EVC system should not affect the operation of the EVC system.

NOTE Faults with non-EVC system components or transmission paths that are not reported can erode confidence in the correct operation of the EVC system.

10 Fault monitoring and indication

COMMENTARY ON CLAUSE 10

EVC needs to be a secure and reliable means of communication. Nevertheless, 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, a wireless repeater 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 can be called in to make any necessary repairs.

10.1 Fault conditions

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

- a) power supply fault indications as required by BS EN 54-4;
- b) rupture of any fuses or operation of automatic circuit breaker, isolator or protective devices that could prevent voice communication in an emergency;
- c) failure of any transmission path including any radio link or open-circuit or short-circuit fault up to the transducers in a handset;
- d) open-circuit and short-circuit faults on interconnecting cabling or failure of any transmission path linking any outstation to any master station including any cables between a handset and outstation enclosure;

- e) any earth fault on interconnecting cabling linking any outstation to any master station, where this fault would inhibit any mandatory function of the system;
- f) any failure of a wireless link from an outstation to a master station either direct or via a wireless repeater; and
- g) failure of any processor to correctly execute its software program, including cessation of any scanning or interrogating process, or detection of any error in memory checking procedures.

All of the above faults a) to g) should be monitored at all times, including when the system is in non-EVC mode.

10.2 Fault indications

The following recommendations are applicable.

- a) The following fault indications should be given at all master stations in the system within 100 s of the occurrence of a fault regardless of whether the EVC system is in EVC mode or non-EVC mode:
 - 1) an audible warning indication, preferably within each master station. The sound level should be not less than 50 dB(A) at 1 m from the master station, when measured with an instrument conforming to BS EN 61672-1, any group, either Class 1 or Class 2, with time weighting (slow);

NOTE 1 A master station ought to be located in an area with low background noise.

However, if the background noise exceeds 47 dB $L_{Aeq, 5 \text{ min}}$, the level of sound from the audible warning device should be at least 3 dB above that of the background noise. An (additional) external audible warning device might then be required.
 - 2) a visible indication by means of a separate light emitting indicator (the general fault indicator);
 - 3) separate light emitting indicators and/or a graphic or alphanumeric display, giving the following:
 - i) a visible indication, common to all power supplies, of the faults described in [10.1 a\)](#);
 - ii) a visible indication, common to all signal paths, of the rupture of any fuse or operation of protective device, as described in [10.1 b\)](#), if the fault is capable of adversely affecting emergency voice communication and is not otherwise indicated as a fault of a monitored function;
 - iii) an individual visible indication, for each outstation, of the faults described in [10.1 c\)](#), except in the event of a fault of the type described in [10.1 b\)](#), that would prevent transmission of the fault signal to the master station;
 - iv) in the case of radially wired systems, an individual visible indication, for each cable connecting an outstation to the master station, of the faults described in [10.1 d\)](#). In the case of a loop-wired system, assuming the loop to be closed as recommended in [Clause 8 b\)](#), an individual visible indication, for each such loop, of the faults described in [10.1 d\)](#);
 - v) a visible indication common to faults described in [10.1 d\)](#) and [10.1 e\)](#);

NOTE 2 This indication may be the general fault indicator.
 - 4) all fault indications should conform to the design requirements of BS EN 54-16:2008, **13.7**;
 - 5) graphic and alphanumeric displays should conform to BS EN 54-16:2008, **13.8**, except that “the voice alarm condition” is replaced by “a call from an outstation”.

- b) The indication of faults that exist prior to emergency use of the system may be suppressed during emergency use, except the general fault indicator.
- c) If the indication of any fault condition is suppressed during emergency voice communication, the indication should be given in accordance with the recommendations of **10.2a)** within 100 s after cessation of that communication.

10.3 Audible fault warning

The audible fault warning recommended in **10.2 a)1)** should be different from the audible warning of an incoming call. This audible fault warning should sound for a minimum of 0.5 s every 5 s.

NOTE Provision may be made for manually silencing the audible fault warning, [see **12.2 j)**].

10.4 Resetting from the fault warning condition

Resetting from the fault warning condition should either be automatic when all faults are removed (non-latching fault warnings) or should be by a manual control (latching fault warnings). If the fault warning condition can be cancelled by resetting when the fault(s) still exists, then the fault warning condition should be restored within 100 s.

NOTE It is permissible for the fault warnings to latch for some types of fault and not for others.

10.5 Monitoring of software-controlled equipment

The correct operation of the system software by any processor should be monitored by internal self-checking procedures and by an appropriate monitoring circuit, e.g. a watch-dog circuit, in accordance with the following recommendations.

- a) The monitoring circuit and its associated indication and signalling circuits should not be prevented from determining and signalling a fault condition by the failure of any monitored processor or associated clock circuits.
- b) The monitoring circuit should monitor the operation of routines associated with the functions of the main program elements, i.e. it should not be solely associated with “waiting” or other “housekeeping” routines.
- c) In the event of failure by a microprocessor to execute its software correctly, the monitoring circuit should, in addition to initiating an audible and visual fault warning, perform as follows:
 - 1) re-initialize the processor and attempt to restart the program at a suitable point within 10 s of the occurrence of the failure. The re-initialization procedure should verify that the contents of the memory, both program and data, are not corrupted; and
 - 2) either:
 - i) record that a failure has occurred using a system capable of recording a minimum of 999 failures and resettable only by an operation restricted to authorized servicing personnel; or
 - ii) automatically reset the equipment and give both a visual and audible warning that an automatic reset has occurred.

10.6 Monitoring of memory contents

The contents of any memory files containing site-specific data should be automatically checked at intervals not exceeding 1 hour. The checking device should signal an appropriate fault if a corruption of the memory contents is detected.

10.7 System integrity

- 10.7.1** A fault in one circuit or wireless transmission path between an outstation and a master station, or between master stations, should not affect any other such circuit or path.

NOTE This means, for example, that where, in a wired system, a master station is radially connected to a number of outstations, an open or short circuit occurring on one radial circuit from one outstation will affect emergency voice communication to and from that outstation only.

- 10.7.2** In a wired system, where a master station is connected to a number of outstations via one ring (closed loop) circuit, in the event of a single open-circuit or short-circuit fault in that circuit, the appropriate fault indication should be given at the master station but emergency voice communication to and from the outstations on the circuit should be unaffected by a single fault.

- 10.7.3** In a wired system, different circuits interconnecting master stations and outstations should not be contained within a common cable sheath and, where a master station is connected to a number of outstations via one ring (closed loop) circuit, “go” and “return” sections of that circuit should not be contained within a common cable sheath.

NOTE For example, if several circuits are served by a multicore cable this will not adequately protect against loss of some or all such circuits because of fire or mechanical damage.

- 10.7.4** If a master station is powered by 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 the master station. The duplicated cables should be separated by at least 300 mm where practicable. Where a power supply unit or a standby battery is housed in a separate enclosure from the master station, any cable between that enclosure and the master station should be suitably protected against overcurrent in accordance with [BS 7671](#).

NOTE Where the enclosure is located immediately adjacent to, and in contact with, the master station, such that cables run directly between the enclosure and the master station, the enclosure need not be regarded as separate from the master station; the recommendations of [10.7.4](#) do not then apply.

- 10.7.5** The number of loop-connected outstations that could fail in the presence of more than one fault should be taken into account in the integrity of the design of the system.

11 Outstations

11.1 General

COMMENTARY ON 11.1

An EVC system contains several outstations, located at strategic points throughout a building or complex. Intercoms for disabled people may be included as forms of outstations, but there will often be several outstations specifically located for use by persons such as firefighters, fire wardens or fire marshals, during evacuation of the building or during firefighting.

Three (physical) types of outstation are covered by this British Standard.

These are:

- a) Type A – an outstation using a telephone-style handset for voice communication, so that the user’s mouth and ear can be as close as possible to the microphone and ear-piece, respectively;*
- b) Type B – an outstation using an intercom-style fixed microphone and adjacent loudspeaker, normally mounted on a wall or other vertical surface; and*
- c) Type C – an outstation using an intercom-style fixed microphone and adjacent loudspeaker, with a telephone handset behind a cover, which overrides the intercom when taken off hook.*

During an evacuation or firefighting in a building or at a complex, there might be a high level of background noise. It is important that outstation design minimizes the effect of background noise upon voice communication.

An outstation needs to be of high integrity so that it can be used in an emergency with high confidence that it will operate correctly.

The following recommendations are applicable.

- a) An outstation intended for fire warden or fire marshal use in an evacuation or firefighting use should be Type A.
- b) An outstation intended for use by disabled people or other people who require assistance to evacuate at refuges should be Type B, except where the background noise is uncontrolled when Type A can be used.
- c) An outstation intended to be used where a refuge is located in a shared firefighting lobby should be Type C.

NOTE It is also acceptable to install separate Type A and Type B outstations.

- d) When an outgoing call has been initiated, a reassurance tone, i.e. a tone similar to the ringing tone in a normal telephone system, or a reassurance message should be heard by the caller at the outstation via either the handset ear-piece or the integral loudspeaker.

11.2 Controls

COMMENTARY ON 11.2

Controls at outstations are for use during emergencies. It is therefore essential that operation of an outstation be as simple as possible to avoid confusion. All controls need to be clearly labelled.

The following recommendations are applicable.

- a) For operation of Type A outstations, no controls should be necessary to make a call in EVC mode, i.e. lifting the handset to make a call should automatically operate the hook-switch or, alternatively, opening the door of the enclosure should initiate the call.
- b) Operation of Type B outstations should require only the use of a single call button to initiate a call. This control should be a momentary-action pushbutton switch so that there is no need for it to be mechanically reset after use.
- c) In the case of Type B outstations, consideration should be given to the inclusion of means to help locate the call button. For example, a raised bezel might be fitted around the pushbutton.
- d) Both Type A and Type B outstations should be labelled with simple instructions on how to initiate a call. Preference should be given to pictograms to describe the method of operation.
- e) Consideration should be given to the use of Braille at outstations for use by disabled people and members of the public. In order to aid understanding, Braille should be concise.

NOTE See the guidance on Braille available from www.iceb.org/ueb.html.

11.3 Indications

COMMENTARY ON 11.3

It is important for indications at an outstation to be kept to the minimum to avoid any confusion in an emergency.

For outstations intended to receive incoming calls, the incoming calls need to be indicated audibly and, where necessary, visually.