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Fire detection and alarm systems —

Part 19: Design, installation, commissioning and service of sound systems for emergency purposes

Systèmes de détection et d'alarme d'incendie —

Partie 19: Conception, installation, prise en charge et entretien des systèmes sonores pour les besoins de secours

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7240-19 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This first edition of ISO 7240-19 together with ISO 7240-16 cancels and replaces IEC 60849:1998, which has been technically revised.

ISO 7240 consists of the following parts, under the general title *Fire detection and alarm systems*:

— *Part 1: General and definitions*

— *Part 2: Control and indicating equipment*

— *Part 4: Power supply equipment*

— *Part 5: Point-type heat detectors*

— *Part 6: Carbon monoxide fire detectors using electro-chemical cells*

— *Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization*

— *Part 8: Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*

— *Part 9: Test fires for fire detectors* (Technical Specification)

— *Part 10: Point-type flame detectors*

— *Part 11: Manual call points*

— *Part 12: Line type smoke detectors using a transmitted optical beam*

— *Part 13: Compatibility assessment of system components*

— *Part 14: Guidelines for drafting codes of practice for design, installation and use of fire detection and fire alarm systems in and around buildings* (Technical Report)

— *Part 15: Point type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor*

— *Part 16: Sound system control and indicating equipment*

— *Part 19: Design, installation, commissioning and service of sound systems for emergency purposes*

— *Part 21: Routing equipment*

— *Part 22: Smoke-detection equipment for ducts*

— *Part 27: Point-type fire detectors using a scattered-light, transmitted-light or ionization smoke sensor, an electrochemical-cell carbon-monoxide sensor and a heat sensor*

— *Part 28: Fire protection control equipment*

A part 26 dealing with oil mist detectors is under development.

Introduction

A sound system for emergency purposes (s.s.e.p.) alerts occupants to a hazard that can require their safe and orderly evacuation from the building. It operates automatically or manually. Equipment to alert building occupants is, therefore, required to function after the hazard has been detected. Fire in a building is a common hazard that is often detected by an automatic fire detection and alarm system. A s.s.e.p. can operate as part of a fire detection and alarm system or can function in conjunction with other emergency detection systems.

When used for emergency purposes, it is recommended that the s.s.e.p. form part of a complete facility (equipment, operating procedures and training programmes) for the control of emergencies.

The s.s.e.p. can be the subject of approval by relevant authorities.

This part of ISO 7240 has been prepared by ISO/TC 21/SC 3 and is based on IEC 60849:1998, *Sound systems for emergency purposes* prepared by the International Electrotechnical Commission IEC/TC 100 *Audio, video and multimedia systems and equipment*.

This part of ISO 7240 contains specific requirements for the design, installation, commissioning and service of sound systems for emergency purposes and follows the general format specified in ISO/TR 7240-14.

Fire detection and alarm systems —

Part 19: Design, installation, commissioning and service of sound systems for emergency purposes

1 Scope

This part of ISO 7240 specifies the design, installation, commissioning and service requirements for a sound system for emergency purposes (s.s.e.p.; see ISO 7240-1:2005, Figure 1, item C), which is primarily intended to broadcast information for the protection of lives within one or more specified indoor or outdoor areas during an emergency. The s.s.e.p. is intended to initiate a rapid and orderly mobilization of occupants in an emergency by including systems using loudspeakers to broadcast voice announcements for emergency purposes, alert signals complying with ISO 7731 (where applicable) and evacuation signals complying with ISO 8201. In some cases, sound systems are used in preference to sounders or bells in order to broadcast a range of coded warnings that is difficult to communicate with sounders or bells.

The use of the s.s.e.p. for normal sound reinforcement and distribution systems purposes under non-hazardous circumstances is not excluded. When used for non-emergency purposes, the zoning of the loudspeakers can differ from the zones used for emergency purposes.

This part of ISO 7240 does not apply to sound systems that use bells or sounders.

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.

ISO 7240-1:2005, *Fire detection and alarm systems — Part 1: General and definitions*

ISO 7240-2, *Fire detection and alarm systems — Part 2: Control and indicating equipment*

ISO 7240-4, *Fire detection and alarm systems — Part 4: Power supply equipment*

ISO 7240-13, *Fire detection and alarm systems — Part 13: Compatibility assessment of system components*

ISO 7240-16:—, *Fire detection and alarm systems — Part 16: Sound system control and indicating equipment*

ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals*

ISO 8201, *Acoustics — Audible emergency evacuation signal*

IEC 60331-23, *Tests for electric cables under fire conditions — Circuit integrity — Part 23: Procedures and requirements — Electric data cables*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

EN 54-24, *Fire detection and fire alarm systems — Part 24: Components of voice alarm systems — Loudspeakers*

3 Terms, abbreviated terms and definitions

3.1 Definitions

For the purpose of this document, the terms and definitions, together with Figure 2, given in ISO 7240-1:2005 and the following apply.

3.1.1
acoustically distinguishable area
a.d.a.
subdivision of an emergency loudspeaker zone, that may be an enclosed or otherwise physically defined space, characterized by an individual reverberation time and an ambient noise level

3.1.2
area of coverage
area, inside and/or outside a building or structure, where the s.s.e.p. meets the requirements of this part of ISO 7240

NOTE Certain parts of an area can be excluded, see 5.4.4.

3.1.3
automatic mode
mode of operation of a s.s.e.p. that is linked to a fire-detection system or other means of triggering the sound system to broadcast emergency messages without human intervention, in a manner that is pre-set according to an agreed evacuation policy

3.1.4
cabinet
housing that affords a degree of protection and robustness to its constituent parts and subassemblies

3.1.5
competent person
person who, in relation to the work undertaken, has the necessary knowledge, skill and experience to complete the work satisfactorily and without danger or injury to any person

3.1.6
control point
location from where the evacuation is controlled

NOTE The control should be undertaken by competent persons.

3.1.7
emergency microphone
microphone dedicated for use by competent personnel during the voice alarm condition

3.1.8
emergency loudspeaker zone
subdivision of the premises composed of one or more acoustically distinguishable areas, such that the occurrence of an emergency within it is indicated separately from any other subdivision

NOTE When used for non-emergency purposes, the zoning of the loudspeakers may differ from the zones used for emergency purposes.

3.1.9
listener
person of normal hearing and who is able to understand the language used

3.1.10
manual mode
mode of operation where an operator is directly in control of the broadcast of live or pre-recorded sounds, especially those of an emergency nature

3.1.11
quiescent condition
functional condition characterized by the absence of the voice alarm, fault warning, disabled and test conditions

3.1.12
reference ambient noise level
sound pressure level spectrum with a reference to 20 µPa, together with the A-weighted sound pressure level, expressed in dBA per octave band, from 125 Hz to 8 kHz (centre frequencies) of the ambient noise level that is unlikely to be exceeded for more than 10 % of the time in emergency mode

NOTE 1 The reference ambient noise level is expressed in decibels.

NOTE 2 The reference ambient noise level is used in the assessment of speech intelligibility.

NOTE 3 Where the reference ambient noise level exceeds 90 dBA, satisfactory speech intelligibility becomes increasingly difficult to achieve.

3.1.13
sound system control and indicating equipment
s.s.c.i.e
equipment complying with ISO 7240-16 that is used to

a) receive alarm signals from an emergency detection system(s),

b) receive audio messages from emergency microphones,

c) determine signal priority and routing,

d) cause audible warning signals to be broadcast to emergency loudspeaker zones,

e) automatically supervise the correct functioning of the system and give audible and visible warning of specified faults,

f) provide manual controls and visual status indicators

3.1.14
transmission path
physical connection between sound system components (external to the cabinet of the component) used for the transmission of information, including audio and/or power

3.1.15
voice alarm condition
alert signal, evacuate signal, recorded or live emergency signal broadcast in at least one emergency loudspeaker zone

3.2 Abbreviated terms

— a.d.a. acoustically distinguishable area

— s.s.c.i.e. sound system control and indicating equipment

— s.s.e.p. sound system for emergency purposes

4 Design requirements

A s.s.e.p. shall be designed, installed, commissioned and serviced in accordance with requirements of this part of ISO 7240. The design shall also consider any national regulations that place other limitations on the design, such as

a) the maximum size of emergency loudspeaker zones,

b) interface requirements to an emergency detection system,

c) installations in explosive atmospheres.

5 Planning

5.1 Responsibilities

Planning of the s.s.e.p., including components and usage requirements, shall be undertaken in a systematic process in accordance with a quality system, such as ISO 9001.

5.2 Qualifications

The planning of the s.s.e.p. shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular design requirements.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognized competency framework.

5.3 Documentation

5.3.1 Emergency management plan

A documented emergency management plan for the building or structure shall be prepared. The emergency management plan shall consider the following:

a) occupancy use of the building or structure;

b) number of people likely to occupy the building or structure and changes in occupancy levels;

c) time required to evacuate the building or structure;

d) need for people to control the evacuation of emergency loudspeaker zones;

e) need for the use of an alert signal in conjunction with the evacuate signal;

f) use of phased evacuation (For buildings and structures over 25 m effective height, the alert signal duration and any automatic sequencing of the warning signal should consider horizontal and vertical exiting, occupant characteristics, the building design approach, affected compartments and adjacent compartments as a sequence and management in use principles.);

g) need for and specification of speech messages (The need and specification should consider agreed scripts and voice characteristics, such as language, dialect and gender, of persons trained in the proper use of microphones, for making the pre-recorded messages.);

h) s.s.c.i.e. category (see 5.5);

i) location of equipment, such as emergency microphones, main and remote equipment;

j) evacuation zone information (When used for non-emergency purposes, the zoning of the loudspeakers may differ from the zones used for emergency purposes. The planning documentation should specify any zoning differences to assist in the system design.);

k) the physical limits of each emergency loudspeaker zone;

l) access to the s.s.e.p. (The party requesting the s.s.e.p. should provide an emergency management plan as part of the initial specification. Where the emergency management plan is not available, the designer should develop the emergency management plan in consultation and agreement with the owner and the relevant authorities. The emergency management plan may need to be approved by the relevant authority.).

5.3.2 Documentation necessary to prepare design

5.3.2.1 The designer shall have access to documentation necessary to design the s.s.e.p. in accordance with the requirements of this part of ISO 7240. Documentation shall include the following:

— plans of the building;

— acoustic report, including

  — a schedule of the a.d.a.(s) for each emergency loudspeaker zone (The total area of the a.d.a.(s) within each emergency loudspeaker zone should be equal to the total area of the emergency loudspeaker zone.),

  — predicted or measured reverberation time of each a.d.a. in at least the 500 Hz, 1 000 Hz and 2 000 Hz octave bands,

  — reference ambient noise level in each a.d.a.;

— description of the hazard;

— description of the environmental conditions such as

  — temperature,

  — humidity,

  — corrosive atmosphere,

  — electromagnetic influences (e.g. areas subject to severe thunderstorms);

— description of the environment where the equipment is installed (e.g. occupancy of the building, hazardous locations);

— emergency management plan.

5.3.2.2 The designer shall state any assumptions made and provide justifications for solutions selected.

5.4 System design

5.4.1 The s.s.e.p. shall permit the broadcasting of intelligible information on measures to be taken for the protection of lives within one or more emergency loudspeaker zones. The audible warning signals shall be distributed throughout the appropriate emergency loudspeaker zones by a system of loudspeakers.

Consideration should be given to the need for the distribution of warning signals for the hearing-impaired via means other than loudspeakers, such as

a) visual warning devices, such as strobes and high-intensity LEDs;

b) induction-loop systems, where they augment a sound re-enforcement system;

c) other sensory systems.

The designer should consider the features of different s.s.c.i.e. categories (see 5.5) and ensure that an appropriate category is selected for the application.

5.4.2 The s.s.e.p. shall be operated in accordance with an emergency management plan, including the live broadcasting of messages.

5.4.3 The following criteria shall be fulfilled.

a) When any alarm occurs, the s.s.e.p. shall immediately disable or override any functions not connected with alarm condition (such as paging, music or general pre-recorded announcements being broadcast to the loudspeaker zones requiring emergency broadcasts).

   Where a phased evacuation is implemented, non-emergency broadcasts may continue to emergency loudspeaker zones within the building not currently affected by the emergency. This may be used to promote the orderly evacuation of building occupants and should be considered as part of the overall emergency management plan.

b) Unless damaged as a result of the emergency, or repair or service, the s.s.e.p. shall be available for operation at all times. In the event of unavailability due to service, suitable provisions shall be made for alternative methods of communication under all prevailing circumstances until the s.s.e.p. is restored to full functionality.

c) The s.s.e.p. shall be able to broadcast warning signals and speech messages to one or more areas simultaneously. There shall be at least one warning signal alternating with one or more speech messages for this purpose.

d) All messages shall be clear, short, unambiguous and, as far as practicable, pre-planned.

e) The content of all messages and the language(s) used shall be specified and/or approved by the purchaser and relevant authorities.

5.4.4 The design may exclude from the area of coverage defined areas rarely or never occupied by people.

5.5 Category of s.s.c.i.e.

5.5.1 Each s.s.c.i.e. shall be categorized based on the inclusion of additional functions (see ISO 7240-16:—, Annex A) specified in Table 1.

The categories are based on evacuation strategy, risk and level of staff competency. The categories reflect the degree of manual control required and should be appropriate to the risk and to the availability of trained personnel to operate the s.s.e.p. A category 4 system is not necessarily more effective than a category 1 system and can be less effective for building occupants if manual controls are used inappropriately.

5.5.2 Additional optional functions permitted in ISO 7240-16 (e.g. alert signals complying with ISO 7731) may be included with each category.

NOTE The addition of optional functions provides design flexibility so that the appropriate solutions can be specified for particular applications.

Table 1 — Category of s.s.c.i.e.

Category				Optional Functions
1 [a]	2 [b]	3 [c]	4 [d]	
—	✓	✓	✓	Emergency microphone
—	—	✓	✓	Emergency loudspeaker zone group microphone control
—	—	—	✓	Manual mode control

[a] No optional functions are required for an s.s.c.i.e. to be categorized as category 1. Category 1 offers automatic operation of the s.s.e.p. in accordance with a preprogrammed set of evacuation rules. The category 1 s.s.e.p. is under the sole control of the emergency detection system.

[b] In addition to the automatic functions provided by category 1, a category 2 s.s.e.p. provides functions to broadcast live messages by means of at least one all-call microphone located at a control point.

[c] In addition to the functions of category 2, a category 3 s.s.e.p. provides functions to broadcast live messages to preselected emergency loudspeaker zones or groups of zones. Category 3 allows for evacuation control where an automatic evacuation plan might not be appropriate in all circumstances.

[d] In addition to the functions of category 3, a category 4 s.s.e.p. provides functions to select and direct stored emergency messages to preselected emergency loudspeaker zones or groups of zones. Category 4 s.s.e.p. also includes functions to enable and disable broadcast messages and display their status. Category 4 allows competent staff to implement evacuation control with a higher degree of selectability than category 3.

5.6 Classification of priorities

5.6.1 In automatic mode only, the order of priority for the message distribution shall be based upon

a) any automatic programmed response,

b) the perceived risk to occupants, which may require manual alarm output control of the programmed response.

5.6.2 Events shall be prioritized according to their urgency.

The following primary levels are recommended but there can be advantages in adding further subgroups, depending on the operational strategies of the emergency management plan for the building or structure:

a) evacuate: potentially life-threatening situation needing immediate evacuation;

b) alert: dangerous situation nearby requiring warning of impending evacuation;

c) non-emergency: operational messages, e.g. s.s.e.p. tests, etc.

The use of these levels in descending order of priority ensures that appropriate alarm signals and messages are provided first to the emergency loudspeaker zones at immediate risk.

5.7 Speech intelligibility

5.7.1 General

Unless otherwise specified in mandatory national standards, the requirements of either 5.7.2 or 5.7.3 shall apply.

5.7.2 Measurement method

The speech intelligibility in 90 % of the a.d.a., and in any other areas exceeding 10 m^2 within the a.d.a., shall be measured in accordance with one of the methods described in Annex A and shall be not less than the values given in Table 2.

Table 2 — Required speech intelligibility values

Measurement method chosen	Required values	
	Mean intelligibility value measured across all applicable areas in the a.d.a. [a]	Minimum intelligibility value measured across all applicable areas in the a.d.a.
STI_r or STIPA	0,50	0,45
PB 256 words, %	94	91
PB 1000 words, %	77	68
MRT, %	94	90
SII	0,50	0,45

[a] Where Annex A requires only one measurement point (for an a.d.a. less than 25 m^2), a single measurement may be taken for both the mean and minimum intelligibility value.

The speech intelligibility requirements are considered to be a reasonable minimum, although in some very reverberant spaces and areas with very high ambient noise levels this can be impractical to achieve. In such cases, an acceptable level of intelligibility should be agreed by the relevant authorities and all other interested parties.

5.7.3 Prescriptive method

Within the a.d.a., the s.s.e.p. shall satisfy the following requirements.

a) The average reverberation time across 500 Hz, 1 kHz and 2 kHz octave bands is not greater than 1,3 s.

b) The reference ambient noise level is less than 65 dBA.

c) The sound pressure level of voice messages is greater than 75 dBA L_{eq}, measured over a period of not less than 10 s.

d) The distance between the centres of the loudspeakers is not greater than

   — 6 m for unidirectional loudspeakers,

   — 12 m for bidirectional loudspeakers.

e) The unobstructed distance between a loudspeaker and any listener is not greater than

   — 6 m for unidirectional loudspeakers,

   — 7,5 m for bidirectional loudspeakers.

   When calculating the distance to the loudspeaker, seated listeners shall be taken as being 1,2 m above the floor and standing listeners shall be taken as being 1,6 m above the floor.

5.8 Warning signals

5.8.1 Alert and evacuate signals

5.8.1.1 For buildings and structures where the emergency management plan requires the use of both the alert signal (e.g. where assisted or directed evacuation of occupants is required) and the evacuate signal, the alert signal shall precede the evacuate signal within the relevant emergency loudspeaker zone.

5.8.1.2 When the alert signal is used, it shall continue to operate until manual alarm output control of the s.s.e.p. is taken, or if not responded to in a prescribed time from initiation, it shall be automatically replaced by an evacuate signal. The prescribed time shall be in accordance with the emergency management plan and shall not exceed 10 min.

The primary use of the alert signal is to signal to competent evacuation staff that they should attend designated points to receive further instructions regarding the emergency or evacuation of the emergency loudspeaker zone. In other buildings and structures with occupants trained in the operation of the management plan, the alert signal may be used to signal to occupants to prepare for further instruction. The instruction may be the initiation of the evacuate signal to commence the evacuation.

5.8.2 Evacuate signal only

5.8.2.1 For buildings and structures where the emergency management plan requires the unassisted or immediate evacuation of occupants, the s.s.e.p. may be configured to immediately generate the evacuate signal, without the use of an alert signal.

Evacuation signals, other than the signal specified in ISO 8201, may be mandated by national requirements.

5.8.2.2 The evacuate signal shall include a verbal message stating “Emergency” and “Evacuate now”. These messages shall be inserted in the time period between the temporal pattern phases in accordance with ISO 8201.

ISO 8201 permits the insertion of longer additional voice messages between evacuate signal cycles. More detailed messages, giving specific instructions, should be included as part of the emergency-management plan.

5.9 Emergency loudspeaker zones

5.9.1 General

5.9.1.1 The s.s.e.p. shall be divided into emergency loudspeaker zones if required by the emergency management plan. It is not necessary that the emergency loudspeaker zones be the same as other zones, for example emergency detection zones or non-emergency loudspeaker zones.

5.9.1.2 In determining emergency loudspeaker zones, the following criteria shall apply.

a) The intelligibility of messages broadcast in one zone shall not be reduced below the requirement of 5.7 by the broadcasting of messages in other zones or from more than one source.

b) A single emergency detection zone shall not contain more than one emergency loudspeaker zone.

For non-emergency use, an emergency loudspeaker zone can be subdivided into smaller zones.

5.9.2 Loudspeakers

Unless otherwise specified in national regulations, loudspeakers shall comply with the requirements of EN 54-24.

5.9.3 Output of loudspeakers

5.9.3.1 At all places within the emergency loudspeaker zone where warning signals are conveyed to building occupants, the A-weighted sound pressure level during the “On” phases of the audible warning signals, measured with the time-weighting characteristic F (Fast) (see IEC 61672-1), shall exceed by a minimum of 10 dB the ambient sound pressure level averaged over a period of 60 s and shall not be less than 65 dBA nor more than 105 dBA at the listener position.

Measurement should be taken in the normal standing positions on the floor of coverage.

5.9.3.2 If the audible warning signals are intended to arouse sleeping occupants, the minimum A-weighted sound pressure level of the signal shall be 75 dBA at the bedhead, with all doors closed.

75 dBA might not be adequate to awaken all sleeping occupants and other tactile and visual signals can be required.

5.9.3.3 Loudspeakers installed within the vicinity of the s.s.c.i.e. shall not inhibit or adversely affect the operation of the s.s.c.i.e. In particular, care shall be taken that the proximity and power setting for any speakers near the s.s.c.i.e. do not cause acoustic feedback when the microphone is used.

Where it is important that occupants, such as patients in hospital wards, not be subject to the possible stress imposed by loud noises, the sound pressure level and content should be arranged to provide warning for the staff and minimize trauma.

5.9.4 Loudspeaker installation

5.9.4.1 Loudspeakers shall be permanently mounted.

5.9.4.2 Each incoming and outgoing conductor of the same potential shall be connected to a separate screw or clamping facility on a terminal block. Terminal blocks shall be securely fixed to the loudspeaker. Tools or special equipment shall be required to disconnect conductors from the terminal block.

NOTE Tools include screw drivers and special equipment includes ladders but not chairs.

5.9.4.3 Conductors shall be supported and connected so that there is no undue mechanical stress on the conductors or the terminations to which they are connected.

5.10 Visual warning devices and tactile warning devices

5.10.1 In areas having high ambient noise levels, the s.s.e.p. shall be reinforced by a system of visual warning devices or other devices to provide sensory stimulation adequate to the needs of the person at risk. The temporal pattern described in ISO 8201 shall be imposed on the visual and tactile evacuation signals.

5.10.2 Visual warning devices shall be installed in areas where the background A-weighted ambient noise level exceeds 95 dBA or where the wearing of hearing protection devices is required or where required by national requirements for hearing-impaired persons.

5.11 Delay to outputs

5.11.1 Where required by the emergency management plan, the s.s.e.p. shall introduce a delay before entering the voice alarm condition. In this case the following shall apply.

a) There shall be provision to switch on and switch off delays by means of a manual operation at access level 2; see Annex B.

b) There shall be provision to automatically switch on and/or switch off delays by means of a programmable timer, which shall be configurable at access level 3.

5.11.2 The delay may be introduced for the following events:

— before the alert signal (e.g. to allow a person to investigate an alarm);

— between the alert signal and the evacuate signal (e.g. to allow competent personnel to attain designated points to receive additional information);

— before the evacuate signal (e.g. to allow a person to investigate an alarm).

5.12 Initiation

The s.s.e.p. shall be initiated by either an emergency detection system, manual call point or at the s.s.c.i.e.

The use of a timer may delay the broadcast of the warning signal in accordance with an emergency management plan.

5.13 Manual alarm output

A manual alarm output control shall be installed for a category 4 s.s.c.i.e at a main control point and also at remote control points specified by any relevant authority to allow

a) switching on or off of selected loudspeaker zones,

b) selection of appropriate of pre-recorded messages,

c) starting or stopping of pre-recorded messages,

d) broadcasting of live messages (if any) via the microphone.

NOTE On large projects, there are often two distinct types of emergency microphone:

— full function – normally only one microphone located in a control room and used by competent staff;

— restricted function – several microphones in locked cabinets in public places (for example, in the main entrance and close to an emergency detection system display). These microphones are normally for use by emergency personnel who are unfamiliar with the building and are used as a “last resort”, for example upon the loss of the control room. If there is no control room, it can be appropriate to limit the functions made available, for instance, to “all call” announcements only.

The manual alarm output control may form part of a fire or other detection system.

5.14 Sound system control and indicating equipment

5.14.1 General

The s.s.c.i.e. shall comply with ISO 7240-16.

5.14.2 Location

5.14.2.1 Where manual operation of the s.s.e.p. is required, the s.s.c.i.e. shall be installed such that indications of the correct functioning, or otherwise, of required functions of the s.s.e.p. are available to the operator.

5.14.2.2 The indicator panels shall be installed in approved locations complying with the following requirements.

a) The area shall be secure from unauthorized access.

b) The ambient noise level at the microphone shall be not greater than 70 dBA.

NOTE This part of ISO 7240 assumes that the ambient noise level is assessed taking into consideration the unusual circumstances of an emergency. For example, during a fire, it is expected that a fire brigade booster pump can be operating outside the building, possibly increasing the noise level in the lobby area above 70 dBA. The lobby area, in this case, might not be suitable for the controls, unless provisions are made for its acoustic isolation.

c) Access to the controls and indicators shall not be obstructed.

d) Operation of the s.s.e.p. shall not obstruct the evacuation of the building.

e) Visible indications shall remain readily distinguishable under all ambient lighting conditions.

f) Required controls and indicators shall be not less than 750 mm and not more than 1 850 mm above floor level.

g) The s.s.c.i.e. shall be located in an area that presents a low risk of damage to the equipment and injury to personnel in an emergency.

h) Where manual operation of the s.s.e.p. is required, the workspace for operational personnel shall be arranged so as to minimize distraction by peripheral activities.

i) The area shall be free of ignition sources and stored combustible materials. Areas such as electrical switch rooms and store rooms are not acceptable locations.

j) Where the s.s.c.i.e. shares a common cabinet with control and indicating equipment complying with ISO 7240-2, controls shall be located such that they can be used by separate individuals, unless the controls are common to both equipment, as permitted by ISO 7240-16.

It is recommended that a telephone, with access to the public network, be provided in the vicinity of the controls.

5.14.3 Protection of distributed s.s.c.i.e.

Distributed s.s.c.i.e. serving other than the emergency loudspeaker zone in which it is installed, shall be installed in an area that is free from ignition sources and stored combustible materials.

5.15 Power supply

5.15.1 Power supply equipment

5.15.1.1 Power supply equipment for the s.s.c.i.e. shall comply with the requirements of ISO 7240-4.

5.15.1.2 The power supply equipment shall be capable of operating the s.s.e.p. in the voice alarm condition for a period of not less than twice the time required to evacuate the building or some other time determined by the appropriate authority.

5.15.2 Main power source

The power supply equipment shall be energized by a reliable source of supply and shall be connected in accordance with national electrical wiring requirements. The main power source shall be either

a) an a.c. supply from an electricity supply company, or

b) a source of quality and reliability equivalent to that in 5.15.2 a).

5.15.3 Standby power source

5.15.3.1 In the event of loss of the main power source, the standby-power-source standby time shall comply with requirements of local regulations. Where local regulations do not exist, the standby power source shall power the s.s.e.p. for 24 h in quiescent condition and 30 min in the voice alarm condition.

5.15.3.2 When tested after 24 h of quiescent operation and the period required to evacuate the premises, which shall in no case be less than 30 min, the performance of the s.s.e.p. under standby power source operation shall not cause

— the speech intelligibility to fall below the required values,

— the audible warning signal to fall by more than 6 dB sound pressure level (SPL) below the required sound level; see 5.9.3.

5.15.3.3 Annex C provides example calculations for battery capacity, charging current and power source. When calculating the capacity of the power supply, any ancillary loads powered by the power supply equipment shall be included.

5.15.3.4 Non-emergency functions within the s.s.e.p., such as background music, may be operated from the secondary power supply only if these functions do not reduce the quiescent condition and voice alarm condition to a level less than the minimum requirements.

5.15.4 Batteries

Batteries shall be located and installed in accordance with the manufacturer's recommendations. Batteries shall be provided with adequate ventilation and protected against corrosion and the dangers resulting from the gases emitted by the batteries.

5.15.5 Battery enclosures

5.15.5.1 The battery and enclosure shall be readily accessible for inspection.

5.15.5.2 Battery enclosures shall be accessible at access level 2.

5.15.5.3 For non-sealed batteries, the battery enclosure shall not be mounted above the s.s.e.p. enclosure.

5.15.5.4 The connecting leads to the battery shall be clearly labelled to reduce the possibility of reverse connections to the battery. The battery shall not be tapped for intermediate voltages and all connections shall be made using suitable connectors.

5.16 Supervision of transmission paths

5.16.1 Transmission paths from the emergency detection system

The transmission path between an emergency detection system and the s.s.e.p. shall be supervised for faults in accordance with ISO 7240-2.

5.16.2 Transmission paths within the s.s.e.p.

The transmission path between the s.s.c.i.e. and

— power supply equipment and

— speakers

shall be supervised for faults in the transmission paths.

5.17 Wiring

5.17.1 Separation from other systems

The wiring of the s.s.e.p. shall be separate and distinct from power and light circuits.

5.17.2 Wiring type

The wiring shall be dedicated to the s.s.e.p., except that the wiring may be shared with systems complying with other parts of the ISO 7240, provided that the wiring complies with the most onerous requirements of the relevant part of ISO 7240.

5.17.3 Wiring protection

The following wiring systems, including cables, joints, terminations and fixing mechanisms, shall be rated to withstand fire for 30 min in accordance with IEC 60331-23 or such higher rating as required by national requirements, and shall have a mechanical rating protection suitable for the hazard depending on where it is installed:

a) wiring systems that traverse any fire compartment to service another fire compartment;

b) wiring systems that traverse any emergency loudspeaker zone to service another emergency loudspeaker zone;

c) wiring systems between emergency detection systems and the s.s.e.p., except where the equipment is in the same room and not separated by more than 2 m;

d) wiring systems between distributed parts of s.s.c.i.e.;

e) wiring systems between s.s.c.i.e. and power supply equipment, except where the equipment is in the same room and not separated by more than 2 m.

5.17.4 Joints and terminations

5.17.4.1 Joints and terminations shall be made only in a suitably labelled enclosed terminal box employing fixed terminations and rated the same as the cable.

5.17.4.2 Joints and terminations associated with vertical riser cables shall be made within the associated fire isolated duct.

5.17.5 Effect of faults on emergency loudspeaker zones

The wiring shall be arranged such that a single short-circuit or open-circuit in a cable within an emergency loudspeaker zone shall not affect the normal operation of any other emergency loudspeaker zone.

5.18 Interconnection to a fire detection and alarm system

5.18.1 The s.s.e.p shall be interconnected with a fire detection and alarm system where provided.

5.18.2 Any fault condition on the s.s.e.p. shall be communicated to the fire detection and alarm system.

5.18.3 Any fire detection and alarm system connected to the s.s.e.p. shall have a disable facility to allow the fire detection and alarm system to be tested without initiating operation of the s.s.e.p.

5.19 Use for non-emergency purposes

The s.s.e.p. may be used for public address or background music under non-emergency conditions provided that

a) the s.s.c.i.e. is designed to override these functions as specified in ISO 7240-16,

b) the capacity of the power supply equipment provides sufficient current and meets any additional non-emergency load imposed,

c) the s.s.e.p. integrity is maintained,

d) specified continuous fault monitoring and indicating functions are maintained.

5.20 Documentation

5.20.1 The designer shall prepare the following documentation:

a) plans of the building that show the location of

- s.s.c.i.e.,
- power supply equipment,
- emergency detection systems connected to the s.s.e.p.,
- manual control points,
- s.s.e.p. cabling routes and termination points,
- loudspeakers,
- visual warning devices,
- tactile warning devices;

b) emergency management plan incorporating

- type of emergencies considered,
- an evacuation plan for the relevant types of emergency,
- contingencies to be taken in the event that it is necessary to change the plan,
- who has responsibility for access to the s.s.e.p., including who can
  - switch off parts of the s.s.e.p.,
  - undertake routine tests,
  - undertake service,
  - undertake changes to the s.s.e.p.;

c) any assumptions made and justifications for the design solution;

d) contingency measures to take in the event that an evacuation is required during system maintenance;

e) s.s.e.p. operating manuals, including equipment documentation, in accordance with ISO 7240-16;

f) list of components and subassemblies;

g) list of component compatibility;

h) list of service items;

i) service requirements;

j) operational instructions for the operation of the s.s.e.p., including actions to take in accordance with established and well rehearsed procedures.

Operational instructions shall be provided in the form best suited to the environment in which they are used. This may take the form of a bound document, or laminated cards, or both, or some other means.

In addition, contractual considerations may require the provision of manuals in a different form or of a different type.

As far as possible, graphic illustrations should be used. Where text is necessary, it should be clearly legible and in the preferred language(s).

The number of copies of the operational instructions required varies, but as a guide, there should be one copy for every control position, one copy for every equipment rack location, one copy for the purchaser's archive, one copy for the contractor's archive and one copy for the consulting engineer's archive.

5.20.2 A copy of the documentation shall be made available to the building owner or authority approving the design.

6 Equipment and material

6.1 Quality of components

Where available, components of the s.s.e.p. shall comply with relevant equipment standards. If International Standards do not exist, then the equipment shall comply with standards permitted by national requirements.

6.2 Standards

Components used as part of the s.s.e.p. shall be manufactured in accordance with a recognized quality system, such as ISO 9001.

6.3 Additional requirements

Each item of equipment shall be installed within an environment for which it has been certified.

6.4 Sound system control and indicating equipment optional functions

6.4.1 Where the design of the s.s.e.p. allows the use of additional equipment connected to the s.s.c.i.e. (e.g. remote control points or graphic displays), the equipment shall be assessed as compatible with the s.s.c.i.e. in accordance with ISO 7240-13.

6.4.2 The operation of the s.s.e.p. shall not be reliant on the additional equipment attached to the s.s.c.i.e.

6.4.3 Failure of any additional equipment attached to the s.s.c.i.e. shall not affect the correct operation of the s.s.e.p.

6.5 Installation materials

6.5.1 Connectors and distribution boxes shall be suitable for the size of cables used in the s.s.e.p.

6.5.2 Installation wiring shall be supported on cable trays or catenary cables, suitably fastened and insulated from the wiring of other systems.

7 Systems compatibility

7.1 Responsibility

7.1.1 The designer shall ensure that components used in the s.s.e.p. have been independently assessed as compatible with the s.s.c.i.e. in accordance with ISO 7240-13.

7.1.2 Where the requirements of ISO 7240-13 do not directly apply, then it may be used as a guide to prepare a suitable compatibility assessment procedure.

7.2 Documentation

The designer shall prepare a list of all components used in the s.s.e.p. and identify which components are compatible.

7.3 Certification

7.3.1 Equipment used in the s.s.e.p. shall be certified for compliance with the relevant part of ISO 7240 or other standards, as appropriate, by a testing laboratory that is accredited by a national body to assess equipment in accordance with the relevant standard.

7.3.2 Where assessment has not been made by an independent party, the designer shall identify the components and describe why assessment has not been undertaken.

Assessment of components such as s.s.c.i.e. and loudspeakers should be undertaken as part of assessment in accordance with ISO 7240-16. However, where the s.s.e.p. has to interface with a building-management system using voltage-free relay outputs, then self-assessment may be made by the designer and documented accordingly.

Where an interface to another system is by a high-level link (e.g. serial data communication), then the designer should prepare a suitable test plan to ensure reliable interfacing, including the testing of failure and fault modes. This may be done in conjunction with the equipment manufacturer.

8 Approvals

The s.s.e.p. shall be certified for compliance with this part of ISO 7240 and other standards as appropriate by an independent party.

9 Installation

9.1 Responsibility

9.1.1 Installation of the s.s.e.p. shall be undertaken by a suitable installer. The installation shall comply with the design plan and shall also include the following:

a) indication of other works that can also be occurring in the building;

b) resources available to the installer;

c) availability of equipment and materials.

9.1.2 Where the installer encounters problems with the design (e.g. due to changes in the building plan or a flaw with the design), the designer shall review the design and make any required changes. Any changes to the design or installation plan shall be approved by the owner and the relevant authority.

9.2 Qualifications

The installation of the s.s.e.p. shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular installation requirements.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognized competency framework.

9.3 Certification

Conformity of the installation to the design documentation shall be assessed and certified upon completion of the installation.

This certification should confirm the correct installation of the components of the s.s.e.p. in accordance with the design documentation.

The owner or the relevant authority may require assessment by an independent party.

10 Commissioning

10.1 Responsibility

Commissioning of the s.s.e.p. shall be undertaken by a suitable commissioner.

10.2 Qualifications

The commissioning of the s.s.e.p. shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular commissioning requirements.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognised competency framework.

10.3 Procedure

10.3.1 A commissioning plan shall comply with the requirements in this part of ISO 7240 and any amendments incorporated as part of the design plan.

10.3.2 The commissioning plan shall be approved by the owner and the relevant authority.

NOTE Annex D provides an example of a commissioning plan that records the results of the commissioning tests.

10.4 Certification

Conformity of the installation to the design documentation shall be assessed and certified upon completion of the commissioning.

This certification should confirm the correct operation of the s.s.e.p. in accordance with the design objectives.

The owner or the relevant authority may require assessment by an independent party.

11 Normal use

11.1 Access to system

Access to the s.s.e.p. shall be in accordance with the emergency management plan.

11.2 Other responsibilities

Operation instructions shall be updated after additions to or modifications of the s.s.e.p., or on the basis of practical experience or revised procedures.

11.3 Routine tests and regular controls

11.3.1 Test the operation of the emergency management plan at intervals not exceeding 12 months.

This should include the evacuation of the building occupants using the s.s.e.p. and may be undertaken in conjunction with the relevant authorities.

11.3.2 The operation of the emergency management plan shall be performed by a competent person.

Staff training should take place at regular intervals and should include the use of all manual controls (where fitted).

11.4 Documentation

A log shall be maintained to record the operation of the s.s.e.p., any faults and routine tests.

The log may be part of the log maintained to record service events; see 12.3.

11.5 Operating instructions

Operating instructions shall be positioned adjacent to each control point.

12 Service

12.1 Responsibility

Service of the s.s.e.p. shall be undertaken by suitable service personnel. Service of the s.s.e.p. shall include routine inspections, tests and preventive maintenance to minimize the risk that the s.s.e.p. will not function as designed.

12.2 Qualifications

Service of the s.s.e.p. shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular service requirements.

National regulations may exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition may form part of a recognised competency framework.

12.3 Service plan

12.3.1 Precautions

Inspection, testing and preventive maintenance of the s.s.e.p. shall be carried out after notifying building occupants.

12.3.2 Inspection

12.3.2.1 Inspect the s.s.e.p. in accordance with Table 3 at intervals not exceeding 6 months.

Table 3 — Inspection schedule

Reference subclause	Action required
5.14.2.2 a)	Check that the area is secure from unauthorized access.
5.14.2.2 c)	Check that access to the s.s.c.i.e. is not obstructed.
5.14.2.2 d)	Check that operation of the s.s.c.i.e. does not obstruct the evacuation of the building.
5.14.2.2 e)	Check that the visible indications remain readily distinguishable in ambient light conditions.
5.14.2.2 g)	Check that the location of the s.s.c.i.e. presents a low risk to the equipment and personnel in an emergency.
5.14.2.2 i)	Check that the location of the s.s.c.i.e. is free from ignition sources and combustible materials.
11.5	Check that operating instructions are available.

12.3.2.2 Record the results of the inspection.

If the inspection determines that the item fails to comply with the requirements of this part of ISO 7240, the building owner should take action to remedy the non-compliance.

NOTE An example of a report record is included in Annex E.

12.3.3 Test

12.3.3.1 Test the s.s.e.p. in accordance with Table 4.

Table 4 — Test schedule

Reference subclause	Action required	Test interval period months
7240-16:—, 7.1.1	Measure the time required for the s.s.e.p. to be capable of broadcasting in the voice alarm condition by the operator, or automatically on receipt of a signal from a fire or other detection system.	6
5.4.3 a) 5.19	Test that all non-emergency functions are disabled during emergency operation.	6
5.4.3 c)	Test that the s.s.e.p. is able to broadcast warning and speech signals in one or more areas simultaneously.	6
5.7	Check that speech intelligibility requirements are satisfied.	12
5.14.2.2 b)	Measure and record the ambient noise level at the s.s.c.i.e. emergency microphone.	6
5.15.3	Test that the standby power source capacity is equal to or greater than the calculated requirements.	6
5.16.1	Test that the failure of the communication link between the emergency detection system and the s.s.e.p. is reported as a fault.	6

12.3.3.2 Record the results of the test.

If the inspection determines that the item fails to comply with the requirements of this part of ISO 7240, the building owner should take action to remedy the non-compliance.

NOTE An example of a report record is included in Annex F.

12.3.4 Preventive maintenance

Unless the power supply equipment batteries have been tested and found to have sufficient capacity to fulfil the requirements of this part of ISO 7240, replace the batteries after 2 years of use.

12.4 Documentation

12.4.1 Instructions

12.4.1.1 The information left at the building or structure upon completion of the installation shall be such that a reasonably competent person who has never seen the site before can investigate faults and instigate repairs without any undue delay.

12.4.1.2 Service manuals shall give details of all work required to service the installation, including

a) method of service,

b) any sequence related to service,

c) identification of parts requiring service, giving reference to the location of items on drawings, together with manufacturers' or suppliers' reference numbers,

d) at least one set of equipment and materials catalogues,

e) list and location of spare parts,

f) list and location of special tools,

g) any test certificates that can be required for examination by the relevant authority,

h) a set of "as installed" drawings.

12.4.1.3 Service manuals shall be provided in a form best suited to the environment in which they are used. They may take the form of bound documents or data files, or both, or some other means.

12.4.2 Records to be kept

12.4.2.1 Installation, log and service records shall be kept by the end user and/or service organization. These shall comprise the following:

a) installation:

   1) details of the locations of all items of equipment including "as installed" schematics showing the cable labelling of the interconnections, these having been certified as true, preferably by an independent reviewer;

   2) "as installed" performance measurements of the s.s.e.p. on a zone-by-zone and circuit-by-circuit basis, including

      — measured loudspeaker loading per circuit in the voice alarm condition,

      — settings of any adjustable items within the s.s.e.p., including equalization settings, relative level settings, signal delay settings, the output level of power amplifiers on a loudspeaker circuit-by-circuit basis,

      — sound pressure levels on a loudspeaker zone-by-zone basis at locations designated by the s.s.e.p. designer as being representative,

      — intelligibility measurements on a loudspeaker zone-by-zone basis at representative locations agreed with the s.s.e.p. purchaser;

b) log.

12.4.2.2 A means of recording and securely preserving the dates and times of routine and/or preventive maintenance and test activities, any remedial action taken, by whom and on whose authority, shall be provided in a format that is appropriate to the building, its s.s.e.p. installation and its operational use.

12.4.2.3 Where a category 2, 3, or 4 s.s.c.i.e. is used, the log shall include a record of the competent persons to operate the s.s.e.p.

NOTE The purpose of such a log is

— to allow investigation of an incident if it is suggested that the s.s.e.p. failed to broadcast in a particular area at the time of an incident;

— to allow service personnel to monitor the pattern of faults arising, so aiding the diagnosis of s.s.e.p. problems and the management of preventive maintenance.

As a guide, the log should include

— dates and times of usage of the s.s.e.p.;

— details of tests and routine checks carried out;

— time and date of each fault occurrence;

— details of the fault found and the circumstances of its identification (for example, during routine maintenance);

— action taken to rectify or remedy;

— date, time and name of person in charge of the s.s.e.p.;

— countersignature of the responsible person, if any faults have occurred or have been rectified.

13 Abnormal situations — System disconnection

Where the s.s.e.p. or part of the s.s.e.p. is not available for use in an emergency, the building occupier shall be advised.

The emergency management plan should detail steps to be taken in the event of failure of all or part of the s.s.e.p. These steps may include the deployment of temporary evacuation equipment, such as loudhailers, or the notification of building occupants that the s.s.e.p. is not available. Where the s.s.e.p. is planned to be made unavailable, building occupants should be notified before the s.s.e.p. is disabled.

Annex A
(normative)

Measurement of speech intelligibility

A.1 Methods of measurement

The following methods of measuring speech intelligibility are considered in this part of ISO 7240.

A.1.1 Phonetically balanced word scores

The phonetically balanced (PB) word score method depends on the transmission of specially chosen words, selected from a known population, to a panel of listeners. General information is given in ISO/TR 4870. This method may be used with 256 words or 1 000 words.

For this type of subjective test involving room acoustics, the test words should be embedded in carrier phrases as this produces representative reflections and reverberation during the presentation of the test word.

A.1.2 Modified rhyme test

The modified rhyme test (MRT) method uses a panel of listeners. General information is given in ISO/TR 4870.

For this type of subjective test involving room acoustics, the test words should be embedded in carrier phrases as this produces representative reflections and reverberation during the presentation of the test word.

A.1.3 Speech transmission index — STI_r (male)

The speech transmission index STI_r (male) is derived by calculation from measurements of the modulation transfer function (MTF). A number of computer-based measuring systems offer this facility. The method is standardized in IEC 60268-16. Original STI, RASTI, STITEL and any other alternate version of STI, except STIPA, are excluded from this part of ISO 7240.

Where only female voices are used to broadcast emergency announcements, it may be agreed by the relevant authorities and all other interested parties that the female version of the revised STI is used instead of the male version. In this case, the required intelligibility values should be the same as those for the male version.

A.1.4 Speech transmission index for public address — STIPA

The STIPA is an index obtained by a condensed version of the STI method. The method is standardized in IEC 60268-16.

A.1.5 Speech intelligibility index — SII

The speech intelligibility index (SII) is determined from the equivalent speech and noise spectra levels, together with the equivalent hearing threshold level. The method is standardized in ANSI/ASA S3.5-1997.

A.2 Measurement procedure

A.2.1 Choice of method of measurement

Select one method of measuring speech intelligibility as described in this part of ISO 7240.

The method selected shall take into account the limitations given in the relevant Standards.

A.2.2 Measurement points

Measure the speech intelligibility within each a.d.a. at several measurement points chosen according to the following requirements.

a) The number of measurement points for each a.d.a. shall be equal to or greater than the number specified in Table A.1.

b) The distance between adjacent measurement points shall not exceed 12 m.

c) The measurement points shall be evenly distributed throughout the a.d.a.

d) No more than one third of the points shall be located on the axis of a loudspeaker.

e) Unless otherwise specified, the height of the measurement points shall be 1,2 m above finished floor for seated positions and 1,6 m above finished floor for standing positions.

Table A.1 — Minimum number of measurement points

Acoustically distinguishable area m^2	**Minimum number of measurement points**
Less than 25	1
25 to less than 100	3
100 to less than 500	6
500 to less than 1 500	10
1 500 to less than 2 500	15
Greater than 2 500	15 per 2 500 m^2

A.2.3 Ambient noise

Measure the ambient noise level within each a.d.a. at representative points across the a.d.a. over a duration sufficient to represent the ambient noise at the time of the speech intelligibility test.

Ambient noise is rarely constant. Typical usage ambient noise is the best measure and this should be measured as an $L_{(A)T}$ over a representative period of time.

A.2.4 s.s.e.p. conditioning

Place the s.s.e.p. into the alarm condition.

Ensure the whole s.s.e.p. remains operational throughout the test.

Where phased evacuation is used, the s.s.e.p. might not be configured to broadcast warning signals to all emergency loudspeaker zones simultaneously; however, for the purposes of measurement, the s.s.e.p. loading should be that which occurs in an emergency. This depends upon practical limitations. In an occupied building, where the operational functioning of the building can be compromised if the whole system broadcasts for any more than a short period, it can be more practical to use artificial loads in some emergency loudspeaker zones.

A.2.5 Test signal

Where an emergency microphone is used, acoustically apply the test signal to simulate a normal talker. In the other cases, electronically inject the signal at a suitable input of the s.s.e.p.

Where it is not practical to continuously apply an acoustic test signal to the emergency microphone, direct injection may be used, provided that the sound pressure level is equal to that of normal microphone announcement and that the microphone is subjectively checked for correct operation. It is also important to take into account the frequency response of the microphone and to equalize the test signal accordingly.

Adjust the test signal such that the A-weighted sound pressure level of the test signal is equal to the L_{Aeq}, measured for not less than 10 s when the s.s.e.p. is broadcasting speech (pre-recorded or, if applicable, live emergency message, whichever is the lowest).

Broadcast test signals to the configured emergency loudspeaker zone(s) and measure the speech intelligibility.

Where it is not possible or not practical to broadcast the test signal to all configured emergency loudspeaker zones, the actual status of the s.s.e.p. shall be recorded on the test report and justification provided to show that the partial broadcast does not affect the minimum requirements for all configured emergency loudspeaker zones.

A.2.6 Record

a) For ambient noise, record the following:

- locations of measurement points;
- ambient noise level, expressed in decibels, with reference to 20 µPa at each measurement point;
- duration of measurement period;
- time of measurement;
- any unusual circumstances that can affect the validity of the measurements.

b) For each the test signal, record the following:

- method of measurement;
- locations of measurement points;
- speech intelligibility at each measurement point;
- location of the lowest speech intelligibility value measured;
- arithmetic mean of all speech intelligibility results within the a.d.a.

If the ambient noise level is not equal to the reference ambient noise level, apply an appropriate correction to the raw data of the test results to obtain speech intelligibility values, taking into account the reference ambient noise within the a.d.a. Record the correction factor and the adjusted speech intelligibility result.

Annex B
(informative)

Explanation of access levels

B.1 General

This part of ISO 7240 defines access levels for the indications and controls relating to mandatory functions. In some cases, alternatives are offered (e.g. access level 1 or 2). This is because either may be appropriate in different operational circumstances. The purpose of the different access levels is not defined by this part of ISO 7240; however, in general they are expected to be used as follows.

— Access level 1:

  By members of the general public, or persons having a general responsibility for safety supervision, who might be expected to investigate and initially respond to an emergency alarm or a fault warning.

— Access level 2:

  By persons having a specific responsibility for safety, and who are competent and authorised to operate the s.s.c.i.e. in the

  — quiescent condition;

  — alarm condition;

  — fault warning condition;

  — disabled condition;

  — test condition.

— Access level 3:

  By persons who are competent and authorized to

  — reconfigure the site-specific data held within the s.s.c.i.e. or controlled by it (e.g. labelling, zoning, alarm organization, stored messages and tones);

  — maintain the s.s.c.i.e. in accordance with the manufacturer's published instructions and data.

— Access level 4:

  By persons who are competent and authorized by the manufacturer either to repair the s.s.c.i.e., or to alter its firmware, thereby changing its basic mode of operation.

B.2 Accessibility

ISO 7240-16:—, 14.6, defines the minimum requirements for accessibility. Only access levels 1 and 2 have a strict hierarchy. Examples of special procedures for entry to access level 2 and/or to access level 3 are the use of

— mechanical keys,

— a keyboard and codes,

— access cards.

Examples of special means for entry to access level 4 are the use of

a) mechanical keys,

b) tools,

c) an external programming device.

It may be acceptable that the entry to access level 4 requires only a simple tool, such as a screwdriver, after access level 2 or 3 has been reached. For example, the manufacturer may declare in his documentation which parts of the s.s.c.i.e. are not user-serviceable, and the entry to access level 4 may then be controlled by management of the user. It is also considered acceptable to use external tools to carry out certain functions at access level 3, e.g. to program site-specific data.

It may be desirable in certain circumstances that the s.s.c.i.e. has additional access levels within access level 2 or access level 3 (e.g. 2A and 2B), which would permit different classes of authorized user to have access to a selected group of controls or functions. This is not forbidden by this part of ISO 7240. The exact configuration depends on the type of installation, the way the s.s.c.i.e. is used, and the complexity of the functions provided.

Annex C
(informative)

Power source calculations

C.1 Battery capacity

The battery capacity requirement should be determined as follows.

a) Determine the quiescent load current, I_Q. Where the load can vary, the worst-case average over any 24 h period shall be used.

b) Determine the full load current, I_A.

c) Determine the capacity derating factor, F_C, of the battery when discharged at the half-hour rate, taking into account the minimum operating voltage of the connected control and indicating equipment.

d) The 20 h discharge battery capacity, C_{20}, at 15 °C to 30 °C shall be determined as given by Equation (C.1):

$$C_{20} = 1{,}25\left[\left(I_Q \times T_Q\right) + F_C\left(I_A \times T_A\right)\right] \quad \text{(C.1)}$$

where

1,25 is a factor for expected battery deterioration;

I_Q is the total quiescent current;

T_Q is the quiescent standby power source time (nominally 24 h);

F_C is the battery re-rating factor at half-hour discharge rate;

I_A is the total current in alarm state;

T_A is the full load standby power source time (nominally 0,5 h).

Where the average battery temperature is outside 15 °C to 30 °C, the battery manufacturer's data shall be used to determine any further derating factor to be applied.

C.2 Charging current

The battery charging current should return a charge to a discharged battery, within 24 h, sufficient to maintain the s.s.e.p. for 5 h on normal quiescent load followed by 30 min on full load.

A discharged battery is one that has reached the minimum control and indicating equipment operating voltage when discharged at the nominal quiescent current.

The minimum charging current, I_C, is calculated as given by Equation (C.2):

$$I_C = \frac{1{,}25\left[\left(I_Q \times 5\right) + F_C\left(I_A \times 0{,}5\right)\right]}{24} \quad \text{(C.2)}$$

where

1,25 is the uplift factor to account for various losses during charging;

I_Q is the total quiescent current;

F_C is the battery re-rating factor at half-hour discharge rate;

I_A is the total current in alarm state.

C.3 Power source calculations

The main power source capacity is required to meet the requirements of this part of ISO 7240. A typical calculation for the total current, I_{PSE}, required to power the s.s.e.p. in its quiescent state and to charge the battery is given by Equation (C.3) and that for the total quiescent current, I_Q, is given by Equation (C.4):

$$I_{PSE} = I_Q + I_C \tag{C.3}$$

$$I_Q = I_{QWS} + I_{QANC} \tag{C.4}$$

where

I_C is the charging current;

I_Q is the total quiescent current;

I_{QWS} is the highest quiescent current of the s.s.e.p.;

I_{QANC} is any quiescent ancillary load connected.

Annex D
(informative)

Commissioning report

Table D.1 provides an example of a report used to record the results of the routine inspections and tests undertaken as described in 10.3.

Table D.1 — Commissioning report

Site name : _____

Site address : _____

: _____

Owner : _____

Date of commissioning tests : _____

Commissioning company : _____

Reference		
7240-16:— 7.1.1	The time required for the s.s.e.p. to be capable of broadcasting in the voice alarm condition by the operator, or automatically on receipt of a signal from a fire or other detection system.	___s
5.4.3 a) 5.19	All non-emergency functions are disabled during emergency operation in emergency loudspeaker zones being evacuated.	Y/N
5.4.3 c)	The s.s.e.p. is able to broadcast warning and speech signals in one or more areas simultaneously.	Y/N
5.7	Speech intelligibility requirements are satisfied.	Y/N
5.14.2.2 a)	The area is secure from unauthorized access.	Y/N
5.14.2.2 b)	The ambient noise level at the emergency microphone.	___dBA
5.14.2.2 c)	Access to the controls and indicators is not obstructed.	Y/N
5.14.2.2 g)	The location of the s.s.c.i.e. presents a low risk to the equipment and personnel in an emergency.	Y/N
5.14.2.2 i)	The location of the s.s.c.i.e. is free from ignition sources and combustible materials.	Y/N
5.14.2.2 d)	The operation of the control and indicating equipment does not obstruct the evacuation of the building.	Y/N
5.14.2.2 e)	Visible indications remain readily distinguishable in ambient light conditions.	Y/N
5.14.2.2 f)	Measure and record the mounting height of controls and indicators.	___mm
5.15.3	Standby power source capacity is equal to or greater than the calculated requirements.	Y/N
5.16.1	Failure of the communication link between the emergency detection system and the s.s.e.p. is reported as a fault.	Y/N
12.4	Information is available on site to enable the investigation of faults and initiation of repairs.	Y/N
11.5	Operating instructions are available on site.	Y/N

Name : _____ Signature : _____

Annex E
(informative)

Inspection report

Table E.1 provides an example of a report used to record the results of the routine inspections and tests undertaken as described in 12.3.2. The report example is designed to identify failures.

Table E.1 — Inspection report

Premises name:		Date of test:
Address:		Test period:
Routine inspections		
Reference	**Action required**	
5.14.2.2 c)	Access to the s.s.c.i.e. is not obstructed.	Y/N
5.14.2.2 d)	Operation of the s.s.c.i.e. does not obstruct the evacuation of the building.	Y/N
5.14.2.2 e)	The visible indications remain readily distinguishable in ambient light conditions.	Y/N
5.14.2.2 g)	The location of the s.s.c.i.e. presents a low risk to the equipment and personnel in an emergency.	Y/N
5.14.2.2 i)	The location of the s.s.c.i.e. is free from ignition sources and combustible materials.	Y/N
—	The s.s.e.p. passes all inspection requirements and does not require additional work.	Y/N
Comments:		
Owner/Agent:		Service person:
	(Print)	(Print)
Signature:		Signature:
Date:		

Annex F
(informative)

Test report

Table F.1 provides an example of a report used to record the results of the routine inspections and tests undertaken as described in 12.3.3. The report example is designed to identify failures.

Table F.1 — Test report

Premises name:		Date of test:
Address:		Test period:
Routine tests		
Reference	**Action required**	
7240-16:—8.1.1	The time required for the s.s.e.p. to be capable of broadcasting in the voice alarm condition by the operator, or automatically on receipt of a signal from a fire or other detection system.	___s
5.4.3 a) 5.19	All non-emergency functions are disabled during emergency operation.	Y/N
5.4.3 c)	The s.s.e.p. is able to broadcast warning and speech signals in one or more areas simultaneously.	Y/N
5.7	Speech intelligibility requirements are satisfied.	Y/N
5.14.2.2 a)	The area is secure from unauthorized access.	Y/N
5.14.2.2 b)	The ambient noise level at the s.s.c.i.e.	___dBA
5.15.3	The standby power source capacity is equal to or greater than the calculated requirements.	Y/N
5.16.1	The failure of the communication link between the emergency detection system and the s.s.e.p. is reported as a fault.	Y/N
—	The s.s.e.p. passes all inspection requirements and does not require additional work.	Y/N
Comments:		
Owner/Agent: _____ (Print)		Service person: _____ (Print)
Signature: _____		Signature: _____
Date:		

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