PROAUDIUM

Voice Alarm Essentials

A guide for the non-audio specialist to the essentials of using public address systems for emergency evacuation, checked clause by clause against BS 5839-8:2023, BS EN 50849:2017, BS 6259:2015 and the product standards.

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Key standards referenced in this guide

- BS 5839-8:2023, Fire detection and fire alarm systems for buildings, Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems (fire voice alarm systems (VAS)). A code of practice: it recommends.
- BS EN 50849:2017, Sound systems for emergency purposes (non-fire emergency sound systems (ESS); supersedes BS EN 60849:1998). A requirements standard: it requires.
- BS 6259:2015, Code of practice for the design, planning, installation, testing and maintenance of sound systems.
- BS EN IEC 60268-16:2020, Objective rating of speech intelligibility by speech transmission index (the Speech Transmission Index (STI) and its public address variant, STIPA).
- BS EN 54-16:2008, Voice alarm control and indicating equipment (VACIE).
- BS EN 54-24:2008, Loudspeakers for voice alarm systems.
- BS EN 60118-4:2015, Induction-loop systems for hearing aid purposes: system performance requirements. Cited from the 2015 text; BSI's current edition is BS EN IEC 60118-4:2015+A1:2018, and the clauses cited here have not been re-read against the amendment.

Introduction

The following guide is written for the non-audio specialist who needs to understand the essentials and complications of using public address systems to evacuate a venue, rather than using bells, sirens, or sounders. These systems are commonly called voice alarm (VA), and once a public address system becomes a voice alarm system it is expected to meet a code of practice written for life safety, BS 5839-8:2023, which binds when a contract, a specification or a fire safety duty calls it up. The code itself says it takes the form of recommendations and guidance and is not to be quoted as if it were a specification (BS 5839-8:2023, Foreword, "Use of this document"). Therefore, labelling a sound system as voice alarm should be carefully considered.

Although this guide simplifies the voice alarm system, the subject is not for the inexperienced. It is complex, drawing on several British, European and international standards at once, and the code asks for responsibility for the design, installation, commissioning, acceptance and verification stages to be clearly defined and documented before an order is placed (Clause 5.5). The questions in this guide are the ones worth putting to whoever takes on each stage.

Two standards in particular, BS 6259:2015 (code of practice for the design, planning, installation, testing and maintenance of sound systems) and BS EN 50849:2017 (sound systems for emergency purposes, which supersedes BS EN 60849:1998), have well-founded principles that this guide reinforces. For fire-specific voice alarm systems, BS 5839-8:2023 is the primary code of practice, now in its latest edition. The convention of dealing first with inputs and moving through the signal chain is followed throughout.

Microphones

Signal-to-noise ratio

The term is not used here in the conventional sense. The input into any microphone is, however, made up of a desirable element (signal, voice) and an undesirable element (background noise, reverberation). For our purposes, we are interested in the rejection of spurious sound from the sides and rear. There are many types and varieties of microphones but very few are suitable for voice alarm applications. Many of the problems that arise are due to using unsuitable types.

Omni-directional microphones respond to acoustic vibrations equally from all directions. Cardioid microphones have a rejection of sound from the rear, whereas a super- or hyper-cardioid microphone has reduced sensitivity at the sides and gives greater overall rejection of non-frontal sounds. Unlike the other two, the omni-directional has no vents in the side. Careful choice of the correct microphone can help to maximise the desirable element of a signal and defeat the undesirable element.

Frequency response

BS 6259:2015 describes a Category S1 system (Clause 5.1.2) as one that aims mainly at the reproduction of speech with good intelligibility, rather than a high degree of naturalness. Where acoustic conditions are bad (for example, because noise levels are high or reverberation is excessive), such a system can be expected to provide the best results that can be achieved.

The two types of transducer in common voice alarm usage are the condenser and dynamic. They can both have significant roll-off of the lower frequencies and/or lift of the higher frequencies within the speech band. All exhibit the proximity effect whereby lower frequencies are intensified at close quarters, and all rely equally on good microphone techniques for optimum performance. A microphone may be chosen for voice alarm which is "bright" to the point of lifting the upper speech frequencies and severely rolling off the bass. A Speech Transmission Index measurement made with the test signal injected electrically after the microphone (BS EN IEC 60268-16:2020, Clause 8.4) does not see that response at all; only an acoustic input through the microphone itself includes it (Clause 8.2).

Monitoring

Any microphone within the critical signal path should be monitored, including the wiring up to the microphone capsule, with a fault indicated at the control equipment within 100 s (BS 5839-8:2023, Clause 10.1.1 b)). Likewise, all links to the control equipment should be monitored, and the cables of the whole critical signal path should be capable of resisting the effects of fire (Clause 26.2). Any microphone not required for emergency purposes need not be monitored. However, failure of any such microphone or cabling should not be capable of affecting the safe working of the critical signal path.

Control systems

Matrices

The forerunner of the solid-state matrix was relay switching. Programmable processor-based matrices now tend to dominate and are normally placed in-line before the amplifiers. Small systems often combine inputs, pre-amplifiers, matrix, and power amplifiers within a single frame.

Essentially, a cross-point matrix will route an input to one or more outputs without any signal processing and with unity gain. A programmable matrix responds to an event (such as a changing contact from a fire alarm panel or a microphone paging button) by carrying out a pre-designated task list. This can include the transmission of information such as busy and confirm lamps, and a resolution of any conflicts with competing sources, prior to routing an audio signal to the designated outputs.

All microprocessor-based control equipment needs a means of checking that its software is still running. For voice alarm control and indicating equipment the product standard requires program monitoring, and a hardware watchdog is one accepted means (BS EN 54-16:2008, Clause 14.4, as its Annex C.2 explains). For non-fire emergency sound systems, BS EN 50849:2017 requires a monitoring circuit that, on a failure by a microprocessor to execute its software correctly, re-initialises the processor and attempts to restart the program within 10 s (Clause 5.4 c)). An emergency microphone with an all-call "press to talk" switch is part of Type V2, V3 and V4 voice alarm systems (BS 5839-8:2023, Clause 22.4.3); a Type V1 system has no emergency microphone (Clause 4).

Fire panels

Where a voice alarm system is to be used for fire, evacuate and alert messages are triggered in most circumstances by a fire panel. Occasionally, where a station is manned 24 hours a day, fire messages are triggered manually.

Fire panels collect information from a fire detection system and provide the necessary serial data or volt-free contacts to announce a voice alarm message as appropriate. This may be an evacuate message to areas immediately affected and alert messages elsewhere. Analogue addressable detector systems enable an element of interrogation ahead of the evacuation decision. Fire messages, once initiated, should be silenced and reset only via a unique instruction from the fire detection and fire alarm system's control and indicating equipment, and not simply by removal of the triggering signal (Clause 7.6).

Fault monitoring

BS 5839-8:2023 sets out recommendations for fault monitoring of fire voice alarm systems. It classifies voice alarm systems into types, V1 to V5, reflecting the degree of manual control required (Clause 4), and spells out the fault conditions on the critical signal path that should be indicated at the control equipment within 100 s (Clause 10.1.1). It also recommends a level of intelligibility. Where the objective method is used, the average STI of all measurement points in an acoustically distinguishable space should normally be 0.50 or greater, and at least 90 % of the measurement points should be at 0.45 or greater (Clause 20.3.2). The extent and method of assessment are agreed by the interested parties and stated in the system specification; in a simple acoustic space the assessment is usually subjective, with an objective test in the event of a dispute (Clause 20.2.1). What those figures mean in practice is set out in our intelligibility figures page (proaudium.com/knowledge-hub/voice-alarm-intelligibility-figures/).

For non-fire emergency sound systems, BS EN 50849:2017 requires a fault indication within 100 s (Clause 5.3) and lists 14 fault conditions, items a) to n), that must be indicated: among them short circuits and interruptions in the transmission paths to the loudspeakers, missing amplifiers and failure of a standby amplifier, failure of a processor to execute its software, and short circuit, disconnection or failure of the main and standby power sources and their battery chargers (Clause 5.3 a) to n)). Earth-fault monitoring of loudspeaker circuits is a BS 5839-8:2023 recommendation (Clause 10.1.1 a)), not an item in that list.

Automatic noise sensing

Wherever background noise is likely to fluctuate significantly, there is a case for automatic noise sensing (ANS). A noise sensing controller uses a sensor, usually a microphone, sited in the loudspeaker zone, and adjusts the broadcast level as the ambient noise changes; the code's design guidance is a broadcast level typically 10 dB above the ambient noise, measured over the second before the broadcast starts (BS 5839-8:2023, Clause 16 commentary and Clause 20.1.3). Attention-drawing signals are a separate matter: BS EN 50849:2017 requires the alarm signal, not the voice announcement, to sit between 6 dB and 20 dB above the A-weighted background noise (Annex C, C.2 c)).

Such systems continually sample noise levels and take a statistical average reading. Sudden sounds, such as the dropping of a crate on a railway platform, are ignored. Conventionally, dedicated microphones are positioned within roof and ceiling spaces with discreet cabling fed back to the noise sensing control unit that normally serves as an attenuator. The code asks for the controller's dynamic range, sensor sensitivity and response time to be adjustable and pre-set during commissioning (Clause 16 commentary). Noise sensing systems are part of the critical signal path and are monitored like the rest of it: failure of any part of an ANS controller, including its microphones and their cables, should be indicated within 100 s (Clause 10.1.1 e)). They should fail safe, so that emergency broadcasts revert to the commissioned maximum level (Clause 16.1), and their sensors should be labelled "VOICE ALARM" (Clause 16.3).

Digital voice announcers

Modern technology provides extensive options for the quality and quantity of digitally recorded announcements. Many systems use computer-based storage, touch-screens, and sophisticated programming for the compilation and event-driven release of messages. Coupled with routing matrices, such systems provide a wealth of programming and language options for a variety of venues, not least major transport termini.

However, how the messages are stored matters more than the interface. The product standard for voice alarm control and indicating equipment requires pre-recorded messages to be stored in non-volatile memory that retains them when all power is removed (BS EN 54-16:2008, Clause 13.13), and BS EN 50849:2017 requires a non-volatile solid-state store that is continuously monitored for availability (Clause 4.1 h)). A wide selection of message cycling, repeats, pauses, tones, and speech can be programmed in multiple simultaneous channels. Erasable programmable read-only memories (EPROMs), where used, are normally loaded at the factory using a script provided by the client. Regional accents and male or female voice can be specified. BS 5839-8:2023 asks for emergency messages that are clear and concise, delivered in a calm and authoritative manner (Clause 18.2), spoken slowly and clearly in plain language (Clause 18.5), and recorded by an experienced announcer in a controlled acoustic environment (Clause 18.7); it does not recommend one voice over another, though its commentary suggests a different voice, such as male instead of female, where two different messages might be heard at the same time (Clause 18 commentary). The speed of delivery should take account of the most reverberant part of the building (Clause 18.3), so difficult acoustic areas are best countered by means of slow, deliberate messages.

Signal processing

Compression

Amplitude compression is used throughout the sound industry including broadcasting and popular music. Music has a very wide dynamic range capable of causing damage to transducers, and amplitude compression is deployed to reduce the range between peaks and troughs. Amplitude compression is applied as a dynamic function over and above a prescribed threshold. By increasing the compression ratio, the rate of change of output level against input level is systematically reduced.

Speech is not evenly loud. The vowel sounds carry most of the energy, and the consonants, which carry most of the meaning, are far quieter, so it is the vowels that tend to mask weaker consonants and reduce intelligibility. A compressor reduces the level changes above its threshold by its ratio: at 4:1, a swing of 20 dB at the input becomes 5 dB at the output. That narrows the gap between the loudest and quietest sounds, which is the point, and it also changes the tonal balance of the speech.

Compression affects the measurement as well as the speech. Measured STI and STIPA values can be altered when compression is applied to the test signal; only minor changes in perceived intelligibility occur with a limited amount of compression, but compression schemes generally alter the perceived tonal balance of speech, which in turn can adversely affect intelligibility (BS EN IEC 60268-16:2020, Clause 7.10). Compressor/limiters have otherwise been deployed chiefly to compensate for poor microphone technique and to restrict dangerous amplitude swings.

Limiting

Limiters are used extensively in microphone circuits to maintain control over maximum sound levels and to protect loudspeaker systems from damage due to misuse or poor microphone technique. Limiters tend to provide an absolute maximum output level. Automatic gain control (AGC) circuits are often used to compensate for varying distance between the person speaking and the microphone. Microphones need to be carefully selected to avoid dramatic acoustic feedback, particularly with any AGC circuitry.

Equalisation

Elementary two-band equalisation (treble and bass control) is often provided in mixer pre-amp modules. Equalisation is of particular interest on the output side of a matrix to compensate for large room acoustics in a particular zone of operation.

In voice alarm systems, the emphasis is on restricting unhelpful frequencies and lifting those particularly concerned with good intelligibility. Since the characteristics of loudspeakers also play a major part in the process, devices with widely differing characteristics (for example, horns and cone loudspeakers) should not be wired on the same circuit and should be equalised separately; the code asks for any loudspeaker that needs equalisation to meet the bandwidth required by BS EN 54-24 to be placed on its own dedicated circuit with that equalisation provided (BS 5839-8:2023, Clause 13.10). Filtering out the lower frequencies at the possible sacrifice of natural sound may significantly reduce the harmful effects of reverberation. As with compression, processing of this kind changes what a Speech Transmission Index measurement sees, so it should be settled before the system is measured.

Amplifiers

Power rating

In common with other devices in the signal chain, there are several creative ways of expressing amplifier power rating. By taking an optimistic view of the input signal, distortion, or load characteristics, power ratings can be claimed higher than those measured in accordance with the amplifier part of the sound system equipment series, IEC 60268-3. For voice alarm control and indicating equipment the output power is whatever the manufacturer declares (BS EN 54-16:2008, Clause 13.12.1). Since we are concerned with commonality of expression, power ratings should be stated strictly under rated conditions only.

It is important not to skimp on amplifier power, since a degree of optimism has probably been applied to the insertion losses created by multiple loudspeaker transformers, volt drops and reactive effects of long cable runs, and loudspeaker sensitivities. It always pays to have amplifier headroom, and the code asks for it: the amplifier's rated power output should be at least 20 % greater than the initial design for the loudspeaker load (BS 5839-8:2023, Clause 15.3).

Distortion

Total harmonic distortion of a voice alarm amplifier is specified more loosely than that of a pro-sound amplifier, which reflects the difference between performance sound and speech intelligibility. Distortion increases with amplifier load and, once into overload and signal clipping, climbs rapidly.

Monitoring

The safe working of amplifiers is a key factor for monitoring. A variety of methods are deployed including pulsed or continuous surveillance tones and verification of quiescent current taken from the power supply. Where a surveillance tone is injected at the front end of the system (such as the microphone preamplifier), the presence of the tone can be verified at both pre-amplifier and amplifier stage, and any faults indicated for the specific point in the critical signal path.

Substitution

In the past, amplifiers were regarded as a particularly weak link in the system chain. Many specifications still call for the manual or automatic substitution of amplifiers in case of failure, although standby amplification is not a general recommendation of BS 5839-8:2023: its commentary says amplifiers built to BS EN 54-16:2008 are not expected to fail, so provision for amplifier failure is in most cases unnecessary unless a risk assessment shows a need (Clause 15 commentary and Clause 15.1). Modern amplifier circuits such as metal-oxide-semiconductor field-effect transistors (MOSFETs) provide extremely reliable power amplifiers with a high degree of built-in protection against short and open circuit abuse. Where standby amplifiers are provided, including those intended for manual substitution, they should be kept powered up and continuously monitored (Clause 15.2); where the control equipment itself offers a spare amplifier, the product standard requires the failed amplifier to be replaced automatically within 10 s of the fault being detected (BS EN 54-16:2008, Clause 13.14.1 a)).

Loudspeakers

Frequency response

Several "imaginative" ways of expressing frequency response can be observed in sales literature. Expressions such as "effective frequency range" or "useful frequency range" may mean different things to different people and do not provide common ground. A Speech Transmission Index test measures the whole chain, loudspeaker included, and the control equipment's own frequency-response limits exclude the loudspeakers (BS EN 54-16:2008, Clause 13.12.3, Note 1), so the loudspeaker is where bandwidth is won or lost and its frequency response needs to be honestly expressed.

Acoustic modelling also dictates the need for reality. Often responses are shown for loudspeakers without their 100 V line transformers fitted, or ceiling loudspeakers without their metal fire domes. Customised loudspeakers with increased fire rating or ingress protection are not accompanied by a re-measure of the frequency response. In all situations, a full frequency curve should be made available.

Sensitivity

The "umph" of a loudspeaker is often referred to in terms of watts. Loudspeaker sensitivity, which is a far more meaningful measure, establishes the sound pressure level from a loudspeaker at 1 W and 1 m distance at a prescribed frequency. Unfortunately, loudspeakers with high sensitivities, such as industrial horns, generally have poorer frequency responses.

Dispersion

Large room acoustics normally dictate the use of loudspeakers with highly controlled dispersion characteristics. The idea is to focus sound into listening areas and to minimise spillage elsewhere in order not to over-excite reverberation.

The mathematics involved in the prediction of intelligibility refers to Q, the directivity factor of the source. A loudspeaker which radiates sound equally in all directions would have a directivity factor Q of 1. The higher the value of Q, the more directional the loudspeaker. Dispersion characteristics are available from polar plots. Since loudspeaker directivity can have a fundamental effect on overall system intelligibility, it is an area not to be taken lightly. You can hear the effect for yourself: Hear the room (proaudium.com/tools/critical-distance/) plays the same announcement from loudspeakers of different directivity at different distances in the same room.

Fire protection

BS 5839-8:2023 recommends that loudspeaker circuits are monitored for open circuit, short circuit and earth faults (Clause 10.1.1 a)) and that the cables of the critical signal path resist the effects of fire (Clause 26.2). Loudspeakers themselves are not asked to survive a fire; the code asks that they do not comprise materials that could fail in the environment prevalent in their location, extreme heat included, or are treated to eliminate the risk (Clause 13.7).

The code goes further than anything before in spelling out the case for terminal blocks that do not short under fire: suitable design measures should be taken to minimise the likelihood of a short circuit occurring directly at a loudspeaker terminal block under fire conditions, and its note lists ceramic terminal blocks, blocks protected by thermal insulation, blocks designed so that melting does not cause a short circuit, and a thermal fuse that isolates the short circuit from the external loudspeaker

circuit (Clause 13.11 and its Note). The critical signal path is defined as running to the input terminals on, or within, each loudspeaker enclosure (Clause 3.10). This adds to the growing weight of opinion that loudspeaker cabling should be carried into and out of the loudspeaker itself rather than to a nearby junction box. Fire domes (rear covers) on flush-mounted ceiling loudspeakers are there to reduce damage from falling objects (Clause 13.8); the rear cover need not be completely sealed unless the ceiling forms part of a fire-resisting barrier (Clause 13.8, Note), and where loudspeakers breach a fire-resisting barrier this should not compromise its performance (Clause 13.9).

Line monitoring

Loudspeaker cabling should be carried into and out of the loudspeaker itself rather than to a nearby junction box, although, except for ceiling loudspeakers, most manufacturers still require a voice alarm junction box next to each loudspeaker.

Loudspeaker lines should be monitored for open circuit, short circuit and earth faults (Clause 10.1.1 a)). Whilst loudspeakers themselves do not require individual monitoring, a break at any point should be capable of indicating a fault. The removal of a single loudspeaker is harder to detect, and the code does not ask line monitoring to do it. What it does ask is that all loudspeaker circuit impedances are measured every year and compared with the previous year's measurements, ideally with the same calibrated test equipment, and that any deviation is investigated (Clause 40.2 i)), which is where a missing loudspeaker shows up.

Audio frequency induction loop systems (AFILS)

By turning a hearing aid to the "T" position, anyone with a hearing impairment is able to take advantage of an induction loop system. An electromagnetic field is created by means of a loop amplifier and coils of copper wire, which induce an audio signal into the hearing aid. Such systems are common in airports and public buildings and, in simplified form, at reception desks and service counters.

A body of opinion exists that such systems can form part of a voice evacuation system and should therefore be monitored as an element in the critical signal path. Methods exist of verifying the field strength of the induction loop and providing two loops on an A and B feed, similar to a loudspeaker installation. The performance requirements are set by BS EN 60118-4:2015: a reference magnetic field strength of 400 mA/m (0 dB), which is the maximum the loop is set up to produce with a sinusoidal test signal (Clause 3.1 and Clause 8.2.7), and a frequency response within ±3 dB, referred to the response at 1 kHz, from 100 Hz to 5 000 Hz (Clause 8.3.7).

Site works

Design

Involving an audio contractor at an early stage in a project reduces grief later. The code expects consultation at the design stage between the user or purchaser, the consultants (including architects, mechanical and electrical consultants, acoustic consultants and fire engineering consultants) and the designer (BS 5839-8:2023, Clause 5.3). There is an opportunity to set the right level of expectations and to address issues which otherwise remain beneath the surface. This is particularly true concerning intelligibility.

Wherever possible, acoustic modelling should be deployed and, coupled with experience, used to substantiate a sound approach towards the desired result. Well-worked prediction modelling can form the basis of final commissioning, handover tests, and maintenance and upgrade programmes for years to come.

Cable

Line losses. Most manufacturers have basic rules of thumb for determining loudspeaker cable sizes, based on Ohm's law. Most methods take into account the distance of the nearest loudspeaker to the amplifier, the average loudspeaker distance, and the expected load. The code sets the floor and the ceiling: conductors should generally have a cross-sectional area of at least 1 mm² (Clause 26.5), and the maximum voltage drop in any loudspeaker circuit should not exceed 10 %, which its note equates to about 1 dB of sound pressure level (Clause 26.1 and its Note). It should be remembered that standard loudspeaker terminal blocks would not be suitable for the wiring in and out of the larger conductor sizes this can lead to.

Separation. The adverse effects of electromagnetic radiation are often most directly experienced with cable runs. Loudspeaker lines with surveillance pulses can give false readings when run in long lengths alongside fire alarm and building management system (BMS) cabling. Loudspeaker and mains cabling can interfere with low-signal cables such as microphones. The former is avoidable by separate containment systems and the latter by segregating microphone circuits from other services by at least 300 mm or by dedicated and compartmentalised trunking or conduit (BS 6259:2015, Annex D.3); microphone and other signal cables are Category 2 circuits under BS 7671 and are kept apart from the mains and other Category 1 circuits (BS 6259:2015, Clause 7.6.2).

Integrity. More problems arise through cable faults before or after handover than any other single system element. Added to this, cable runs are exposed to subsequent building works and are often not sufficiently documented or labelled. Loudspeaker cabling needs to be carefully arranged for continuity and integrity of monitoring.

Equipment considerations

Control equipment

Control equipment should be sited in areas of low fire hazard, so that it is unlikely to be involved in a fire before adequate warning has been broadcast (BS 5839-8:2023, Clause 22.1.1); and, as one of the two alternatives Clause 7.3 offers for the fire alarm interface, the fire alarm panel and the voice alarm control equipment are less than 10 m apart and in the same area of low fire risk (Clause 7.3 b)). All controls need to be tamper-proof or the racks located in locked rooms with limited access.

Some systems rely on natural ventilation; others deploy forced ventilation. Battery life depends on temperature, so it is important to ensure adequate air movement to maintain a sensible ambient temperature: the code asks for the ambient temperature in the vicinity of the batteries to be checked at each service against the control equipment manufacturer's recommendations (Clause 40.1 j)). BS EN 50849:2017 requires the charging system to compensate the charging current for changes in ambient temperature where that is necessary to achieve the specified battery life (Clause 5.6), and specifies an operating range of −5 °C to +40 °C for control and amplification equipment and their associated battery power supplies (Clause 5.7 a)).

Microphone placement

A vital issue is the careful placing of microphones. Too often, paging microphones are positioned in escalator wells at airports with the attendant rumble of the escalator motor. Careful microphone positioning and choice can also minimise the risk of acoustic feedback from adjacent loudspeakers.

Loudspeaker placement

More than any other item, loudspeakers are shaped by what the building wants to look like. The code settles the argument: loudspeakers should be chosen primarily for their ability to produce an intelligible result rather than for aesthetic considerations such as size or appearance (Clause 13.3), and their response should not be compromised by their immediate surroundings, such as rear enclosures of insufficient volume, grilles or decorative covers with insufficient acoustic transmission, or coves and dropped ceilings that stop them radiating directly into the listening space (Clause 13.4). Where a loudspeaker has to be hidden or disguised, that is the list to check it against.

Handover, training, and certification

The sound contractor should formally hand over and certify the system as complying with the agreed standards. BS 5839-8:2023 provides model certificates in Annex D for design, installation, commissioning, acceptance, verification, inspection and servicing, and modification (Annex D, Figures D.1 to D.7). Agreement should have already been reached concerning the methodology and any points of interpretation. This particularly applies to intelligibility: the extent and method of assessment should be agreed by the interested parties and stated in the system specification (Clause 20.2.1), and where the objective method is used the figures are those given under Fault monitoring above (Clause 20.3.2).

Responsibility does not end at handover. BS 5839-8:2023 asks for a single, named member of the premises management to be appointed to supervise all matters pertaining to the system, with duties that include regular training of the people who operate it, a check of the control equipment at least once every 24 h for faults, arrangements for testing and maintenance, and keeping the logbook up to date (Clause 42). BS EN 50849:2017 likewise requires the person or body having control of the premises to nominate a responsible person for maintenance and repair (Clause 4.2). The first line of training is at operator level, particularly in the use of microphones (Clause 42 a) 1)). Operating and maintenance manuals should provide a simple set of diagnostics and fault-finding down to module level.

Maintenance

A voice alarm system changes after handover, and the code's six-monthly visual inspection exists because of it: it asks whether structural or occupancy changes have affected the siting of loudspeakers, including new or relocated structures, changes of use that raise the ambient noise, and alterations or extensions that need additional loudspeakers (Clause 40.1 b)). Loudspeakers are knocked out of line, new cabling creates interference, building changes alter the acoustic environment, and batteries age faster in a warm equipment room.

Regular routine and preventative maintenance is built into both codes. BS EN 50849:2017 requires the complete system to be verified at least once a year by a competent person (Clause 7.3.1). BS 5839-8:2023 recommends a weekly test by the premises management, operating a manual call point and confirming the correct message in the correct zone (Clause 39.1 a)); servicing at intervals not

exceeding six months, covering the logbook, the visual inspection above, the emergency microphones, the fault indicators and the batteries, among other items (Clause 40.1); and annual items including operating every automatic initiation input, a visual check of every loudspeaker where practicable, measurement of every loudspeaker circuit impedance against the previous year, and a subjective intelligibility test in all loudspeaker zones (Clause 40.2). There is no quarterly maintenance visit in the code; its only three-monthly item is the premises' own weekly test run in normal working hours, at intervals of not more than three months, so that occupants hear the message (Clause 39.1 b)). An objective STI measurement is not part of its maintenance schedule; it belongs to commissioning and verification.

Maintenance is also where the records are built. The logbook (Clause 43), the inspection and servicing certificate (Clause 40.4) and the year-on-year impedance figures are what the next organisation to take on the system will read first, because the code asks it to commission a special inspection of the existing system, including the records, before planning its maintenance (Clause 41.1 a)).

ProAudium maintains, repairs and advises on Public Address Voice Alarm (PAVA), emergency sound, Emergency Voice Communication (EVC) and induction loop systems; it does not install them and does not maintain fire detection. For a question about your own system, write to contactus@proaudium.com or call 01273 034 630.

In short

- A public address system becomes a voice alarm when a fire panel can trigger it, and from then on BS 5839-8:2023 expects a fault anywhere on the path from that trigger to the loudspeaker terminals to show at the control equipment within 100 s (Clauses 3.10 and 10.1.1).
- The code recommends; it is not a specification. It binds when a contract, a specification or a fire safety duty calls it up, and the stages from design to verification, where applicable, are allocated before the order (Clause 5.5).
- Loudspeakers are chosen for an intelligible result, not for looks, and their directivity (Q) decides how much of the room they excite (Clauses 13.3 and 13.4).
- Where intelligibility is measured, the figures are an average STI of 0.50 or greater with at least 90 % of points at 0.45 or greater; whether it is measured at all is agreed in the specification (Clauses 20.2.1 and 20.3.2).
- Maintenance is weekly by the premises, six-monthly and annual by the maintainer, with every loudspeaker circuit impedance compared with last year's (Clauses 39.1, 40.1 and 40.2). There is no quarterly maintenance visit (the three-monthly item is the premises' own occupied-hours test, Clause 39.1 b)) and no STI test in the schedule.
- A named person in the premises management owns the system between visits (Clause 42).

Next step

Hear what loudspeaker directivity and distance do to the same announcement in the same room: Hear the room, proaudium.com/tools/critical-distance/. No email, no form.

Issued by ProAudium, November 2026. Checked against BS 5839-8:2023, BS EN 50849:2017, BS 6259:2015, BS EN IEC 60268-16:2020, BS EN 54-16:2008 and BS EN 60118-4:2015. A code of practice recommends; it binds when a contract,

a specification or a fire safety duty calls it up.