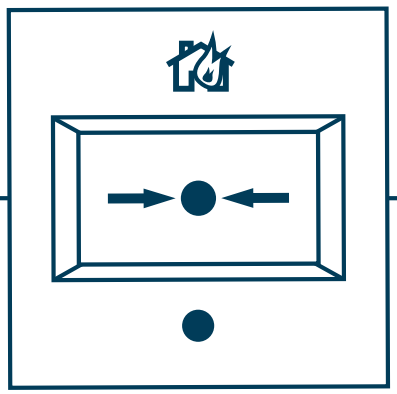
Fact File 75

Fire Industry Association



Published Document PD CEN/TS 54-32:2015
Fire detection and fire alarm systems

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INTRODUCTION

Published Document PD CEN/TS 54-32:2015. Fire detection and fire alarm systems. Planning, design, installation, commissioning, use and maintenance of voice alarm systems, was published in the UK on 31 July 2015.

This guidance document explains why this document was created, how it relates to BS 5839-8 and its relationship with other standards relating to voice alarm systems.

BACKGROUND

CEN/TS 54-32 was written to provide guidance on voice alarm installation, maintenance etc. that can be used across the whole of the EU. This is important because many countries do not have their own relevant standards. It was published as a Technical Specification rather than as a Standard because, if it had been published as a Standard, all EU countries would have to withdraw conflicting Standards within six months.

In the UK, this would have meant the withdrawal of BS 5839-8 and BS 7827. However, every effort was made to ensure that it does not conflict with UK and other national standards, and it provides up-to-date guidance that complements the existing standards, especially in the case of variations.

Its authors hope that it will be adopted across Europe and that existing national standards will be revised over time so that they will be fully aligned.

TYPES OF EMERGENCY SOUND SYSTEM

Voice alarm systems are public address systems that are used to alert people in the case of fire. They are 'secure' in that they are monitored for faults and have standby power supplies. They are normally connected to a fire detection system in place of sounders, although they may be manually controlled, such as during a football match.

However, emergency sound systems that are used for emergencies other than fire also exist. For example, a school that has a fire detection and alarm system with sounders, but also has a 'secure' public address system for use in case of an emergency such as a 'Columbine' type shooting incident.

USE OF VOICE ALARM SYSTEMS

Voice alarm systems are normally installed in places where significant numbers of untrained people might be at risk from a fire, or in places where people can be trained but there is a need to give clear directions.

This covers premises ranging from theatres and office buildings, through to airport terminals and industrial complexes. Many buildings also need public address or music facilities, and so it is common to use a voice alarm system for both rather than install two systems.

This leads to many voice alarm systems having additional demands put on them, such as the need for additional loudspeaker zones and for music inputs and non-emergency microphones.

THE DRAFTING OF PD CEN/TS 54-32

Work on PD CEN/TS 54-32:2015 was initially based on the draft of CEN/TS 54-14, Fire detection and fire alarm systems – Part 14: Guidelines for planning, design, installation, commissioning, use and maintenance.

However, as it developed, sections were introduced that are based on recommendations in BS 5839-8, such as model certificates, user responsibilities etc. This means that there is a high degree of correlation between the two standards.

Scope

The scopes of the two documents are effectively identical.

MAJOR TOPICS

Intelligibility

The primary purpose of a voice alarm system is to provide intelligible pre-recorded and/or live emergency messages. It is therefore essential that achieving this be considered from the beginning of the planning and design process.

PR CEN/TS 54-32 offers two design approaches to designing loudspeaker systems to achieve acceptable intelligibility; the prescriptive method and the detailed design method.

The prescriptive design method – this is effectively the same as in BS 5839-8

The prescriptive design method is suitable for simple Acoustically Different Areas (ADA), whereas the detailed design method may be used in any ADA.

In many buildings, such as offices, hotels etc., ADAs are acoustically simple and designers have always followed rules of thumb to design loudspeaker systems for them.

PR CEN/TS 54-32 formalises this approach and requires that the building designer should provide the expected reverberation time and ambient noise levels for each ADA. Of course, building designers are not used to providing this information and so it may not be available, in which case, a voice alarm system (VAS) designer can use the parameters as limits for their design.

For the prescriptive design method to be used in an ADA the following should be predicted or measured:

- *The average reverberation time is not greater than 1.3 seconds;*
- *the reference ambient noise level is less than 65 dBA;*
- *the sound pressure level of the alert tone(s) plus message(s) is greater than 75 dBA;*
- *the installation height of loudspeakers is no more than 5 metres above floor level;*
- *the distance between the centres of adjacent loudspeakers is not greater than 6 metres for uni-directional loudspeakers and 12 metres for bi-directional (corridor) loudspeakers;*
- *the unobstructed distance between a loudspeaker and any occupant of an ADA should not be greater than 4.5 metres for unidirectional loudspeakers and 6 metres for bidirectional loudspeakers.*

Detailed design method – this guidance complements that in BS 5839-8

It is essential to use a detailed design method in reverberant or noisy ADAs such as transport termini or stadiums.

The standard gives two examples:

a) Calculations based on statistically predicted parameters

This refers to the speech transmission index (STI) and to EN 60268-16, sound system equipment, Part 16: Objective rating of speech intelligibility by speech transmission index.

b) Computer simulation model based on simulated impulse responses

This refers to the use of proprietary computer simulation software and requires data that describes the electro-acoustic parameters of proposed loudspeakers.

Annex C, measurement of speech intelligibility

This annex is based on the latest version of EN 60268-16 Sound system equipment, Part 16.

It specifies the use of either the STI (speech transmission index) or STIPA (speech transmission index – public address) methods of intelligibility measurement and says that other methods, such as RASTI or STITEL, are not suitable.

Auxiliary mains power supplies

An auxiliary mains power supply is defined in PD CEN/TS 54-32 as follows:

A locally provided mains power supply used to provide power to a VAS (voice alarm system) so that the quiescent condition can be maintained during a mains power supply failure without compromising the duration of operation of a VAS.

EN 54-1 requires that voice alarm systems have a mains power supply and a standby power supply and that these should comply with EN 54-4.

However, it is common to provide auxiliary mains power supplies such as UPS or generators, that do not comply with EN 54-4, to keep important electrical systems operational during a mains power supply failure.

Also, because of the high power requirements of large VAS such as those in stadiums, installers sometimes try to avoid using an EN 54 power supply at all and say that a UPS or generator is sufficient. However, even if this is acceptable to the building control authorities, this system is not under the control of the voice alarm installer or maintenance contractor, so the line of responsibility is unclear.

PD CEN/TS 54-32 makes it clear that if the VAS is connected to such a system, it does not remove the requirement to provide EN 54-4 standby power supply(s), although it may be acceptable to reduce the standby time.

Transmission paths and networking

Distributed VAS

It is very common for the VACIE of a VAS to be distributed around a building. This may be done to reduce losses in transmission paths to loudspeakers or to make a VAS more resilient, or simply because there is not enough space to install the equipment in one location.

In the past, distributed VACIE were analogue, with separate control and audio cables, whereas modern VAS use digital technology.

This has led to a desire to use structured cable Ethernet systems, which is acceptable in some European countries. However, it is not acceptable in the UK, where fire-resistant cable and compliance with BS 5839-1 is recommended.

Also, as with auxiliary mains power supplies, even in countries where the use of structured cabling is acceptable, the voice alarm installer and maintenance contractor are unlikely to have control of the infrastructure, which may also use network switches of unknown reliability and that have non-EN 54 power supplies.

PR CEN/TS 54-32 therefore makes the following recommendations, which are intended to be used in conjunction with local regulations:

A single short-circuit or interruption in any transmission path should not prevent the activation of a voice alarm output condition to more than one voice alarm zone for longer than 100 seconds following the occurrence of the fault.

Variations in the time taken to process emergency signals between VACIE should not adversely affect the intelligibility in any ADA.

Where Ethernet (or any other third-party physical layer) is used to connect a distributed VAS, the VAS designer should take responsibility for design and reliability including, but not limited to, transmission path protection, power supplies, checking that network routers and network switches have been tested and verified to operate correctly with the VACIE, and ensuring that transmission path latency will not adversely affect intelligibility in any ADA.

Hierarchical VAS

Hierarchical VAS are systems with more than one VACIE, in which one VACIE is designated as the main VACIE. They are typically used where a site is divided into subsidiary parts; for instance, in industrial sites, hospitals, campus sites and shopping centres.

In this case, compliance with installation standards is likely to be achieved within the separate buildings. However, the main VACIE will normally receive signals from and/or transmit signals to any subsidiary VACIE and also indicate the status of any subsidiary VACIE, which means that the integrity of the links between VACIE is critical.

It is also essential that the operation of automatic and manual emergency controls is prioritised.

In VAS where a control centre is fundamental to the evacuation strategy, failure of a single transmission path should not result in loss of indications from or control of a subsidiary VAS.

Where a control centre can broadcast or control emergency messages, it is essential that failure of a transmission path is indicated at the control centre and at the affected subsidiary VAS.

Where such systems are to be installed the designer should:

- *ensure mutual compatibility;*
- *define suitable working procedures (including procedures for resetting, silencing, isolation, etc.);*
- *define and specify the interfaces between the parts of the hierarchical network;*
- *define how message priorities will operate;*
- *define which controls have priority over other controls, at what times or under what circumstances;*
- *define which audio sources have priority over other audio sources, at what times or under what circumstances.*

The equipment used and the transmission path integrity should be such that at least the following indications are given at the control centre:

- *identify any subsidiary VAS that is in the voice alarm condition;*
- *identify any condition of a subsidiary VAS in which an emergency message could be prevented from being broadcast (such as fault or disabled conditions);*
- *identify any failure of a link to a subsidiary VAS that might prevent a voice alarm condition from being displayed at the control centre or at the affected subsidiary VAS;*
- *ensure that failure of any one VAS does not prevent the independent operation of any other VAS.*

Requirements for other control and indication facilities should be determined from the consultations referred to in Clause 5.4.

BS 5839-8 CLAUSE 5, TYPES OF SYSTEM

Some countries, such as Germany and the Netherlands, have established guidelines for voice alarm systems that differ from the UK. The guidance on types of system provided in BS 5839-8 could not, therefore be included into the main text of TC EN 54-32, but the UK guidance has been included in informative annex B2 of PR CEN/TS 54-32.

RELATED STANDARDS

BS 5839-8: 2013. Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems.

BS 5839-8 is used as guidance for most voice alarm systems in the UK.

BS 5839-8: 2013. Fire detection and fire alarm systems for buildings –

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

BS 5839-8 Scope

This standard gives recommendations for the design, installation, commissioning and maintenance of voice alarm systems which automatically broadcast speech or warning tones, in response to signals from their associated fire detection and fire alarm systems. It also covers systems that include a manual facility for the transmission of live voice messages as well as automatically generated messages for emergency purposes.

BS 7827: 2011. Code of practice for designing, specifying, maintaining and operating emergency sound systems at sports venues.

BS 7827 makes many references to BS 5839-8 and provides specific guidance for large sports venues where crowd control is important.

BS 7827: 2011. Code of practice for designing, specifying, maintaining and operating emergency sound systems at sports venues.

BS 7827 Scope

This British Standard gives recommendations and guidance for the design, specification, maintenance and operation of permanently installed sound systems used for emergency purposes at sports venues.

It aims to ensure that, in an emergency, voiced messages are intelligible in all parts of the sports venue to which the public have access, no matter what type of event is taking place, as well as those areas outside the sports venue that the system is intended to serve.

This standard applies irrespective of whether or not a special sound system is installed for an event.

BS EN 60849:1998. Sound systems for emergency purposes

BS EN 60849 is based on IEC 60849, which was withdrawn in 2007 and replaced by ISO 7240-19. It is similar to BS 5839-8 but with less specific recommendations.

It has two major problems:

- It does not require the use of EN 54 components, which are mandatory under the Construction Product Regulation for voice alarm systems. However, its scope does not exclude use in case of a fire emergency.
- Ideally, it should have been withdrawn at the same time as the IEC version, but several countries objected because it provided the only relevant guidance in most of Europe.

BS EN 60849 Scope

This International Standard applies to sound reinforcement and distribution systems to be used to effect a rapid and orderly mobilization of occupants in an indoor or outdoor area in an emergency situation.

This standard applies to systems using tone signals and to systems with voice announcements for emergency purposes.

EN 50849. Sound systems for emergency purposes which are not part of fire detection and alarm systems

EN 50849 is based on EN 60849, but has been updated to make it clear that such systems are not for use for evacuation in case of fire emergency, whether physically connected to a fire detection system or not. It also includes up-to-date recommendations on assessing intelligibility based on EN 60268-16.

EN 508449 Scope

This European Standard specifies the performance requirements for sound systems which are primarily intended to broadcast information for the protection of lives within one or more specified areas in an emergency. It also gives the characteristics and the methods of test necessary for the specification of the system.

This European Standard applies to sound reinforcement and distribution systems to be used to effect a rapid and orderly mobilization of occupants in an indoor or outdoor area in an emergency, including systems using loudspeakers to broadcast voice announcements for emergency purposes and attention-drawing or alarm tone signals.

This European Standard applies to emergency sound systems unless they are to be used for evacuation in case of fire emergency.

EN 50849 will be available from January 2017 and will be published in July 2017. It will replace EN 60849, which will be withdrawn on July 2019.

DISCLAIMER
The information set out in this document is believed to be correct in the light of information currently available but it is not guaranteed and neither the Fire Industry Association nor its officers can accept any responsibility in respect of the contents or any events arising from use of the information contained within this document.

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