



## **Fire Industry Association**

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### **FIA Information paper on the 2008 edition of BS5839-8 – Code of Practice for the design, installation, commissioning and maintenance of voice alarm systems**

#### **1. Scope**

This FIA Fact File provides essential information on BS5839-8, the Code of Practice for the design, installation, commissioning and servicing of voice alarm systems. In particular, it highlights the main differences between the 1998 and 2008 versions of the codes.

#### **2. Introduction**

A Voice Alarm (A) systems is the alarm output function of the Fire Detection and Fire Alarm (FD&FA) systems, and, as such, must achieve a high degree of availability and reliability in readiness for fire emergency events. It is important that this concept is embedded in any codes of practice used for planning, designing and installing such systems. In this respect, the 2008 version of BS 5839-8 reiterates and re-enforces the 1998 version.

The revision of BS5839-8 fulfilled three main requirements:

- To address a number of technical issues that had arisen when using the 1998 code;
- To update references to newly published European standards; and
- To update the format in line with BS5839-1:2002

This revision of the Code brings new thinking into the conception and implementation of Voice Alarm systems that affect Voice Alarm companies as well as Fire Detection and Alarm companies.

#### **3. New Document Structure**

BS5839-8 has been significantly rewritten. It has been given a new structure modelled on that used in the 2002 version of BS5839-1. For example, the running order of the various clauses is similar.

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Like BS5839-1:2002 and BS5839-6:2004, background commentaries have been separated from recommendations, which they now precede. This makes each recommendation as clear and succinct as possible.

Importantly, by removing nearly all cross-references to BS5839-1, the new BS5839-8, unlike the old version, will be a stand-alone document. It is no longer necessary for the reader to have both documents at hand when trying to understand all the compliance needs.

#### **4. Public Address Systems vs. Voice Alarm Systems**

Public Address (PA) systems do not have to meet any particular availability and reliability requirements. For example, the need that applies to VA systems for standby power and continued intelligibility of emergency messages under fault conditions are not found in PA systems.

In order to avoid duplication of loudspeakers and associated wiring, it is common to combine PA and VA systems into one system. In certain situations this can be seen as welcome as it may promote the use of VA systems where they might not have otherwise been considered.

BS5839-8 allows for this combination of functions, but clearly states that the VA function of PA systems should conform to the intelligibility, availability and reliability demanded in fire emergency situations.

#### **5. Types of systems**

The new Code introduces categorisation of VA systems in five different types. These types are based on the degree of operator control needed for effective implementation of the evacuation plan, rather than on the size of the systems or the number of evacuation zones.

Five types are described as follows:

- System Type V1 is purely automatic, responding only to alarm signals it receives from an FD&A system. Some non-emergency controls are however permitted.
- System Type V2 has an ALL-CALL microphone, zone microphone facility but no other emergency manual controls.
- System Type V3 has, in addition to ALL-CALL and zone microphones, capabilities to manually control recorded messages.
- System Type V5 is intended for applications requiring a site specific engineered approach.

The Code recommends that the Type of system selected is agreed by all interested parties and recorded in the contractual documents. The more manual control, the greater degree of operator training.

#### **6. Risk Assessment based on evacuation plan**

The new Code recommends that “an assessment of the risk rating” is made in order to determine the most appropriate evacuation plan for the building. It does not give prescriptive methods, recommending instead a pragmatic approach based on considering various aspects of the building.

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This would include for example:

- The need for manual intervention;
- The provision of continuing staff training;
- The regularity of evacuation drill;
- The layout and complexity of the building;
- The density of occupation;
- The type of occupants, be it members of staff, the public, disability, etc;
- The need for phased and/or partial evacuation;
- The likelihood of any hazards, such as fire, bomb, chemical spillage, civil commotion.

The Type of VA system best suited for a particular application should be determined from this risk-rated based evacuation plan.

## **7. System interfaces**

BS5839-8 recommends that monitoring of the interface between the FD&FA system and VA system is done at the FD&FA control equipment. The interface itself may be achieved by putting loop-driven input/output modules adjacent to the VA system control equipment.

At least one trigger signal is needed for each emergency loudspeaker zone. This may be a discrete signal or coded information on a data link. The use of data transmission, however, requires close co-operation between the FD&FA and VA companies (where they are different). Because of this, the discrete signalling method tends to be more flexible and often used.

In order to reset the VA system a silence signal needs to be received from the fire detection and fire alarm system control and indicating equipment.

A general fault condition must be signalled from the VA system to the FD&FA system.

## **8. System Components and Standards**

The product design recommendations which were in the 1998 version of the Code have been removed. These recommendations proved no longer necessary as European product standards have been redeveloped.

Consequently, the new Code is able to cross-refer to a number of applicable products standards in the EN 54 series, including:

- EN 4-2 FD&FA control and indicating equipment
- EN54-4 for power supplies
- EN54-16 for the VACIE
- EN54-24 for VA loudspeakers, and
- EN54-25 for radio linked equipment.

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One of the implications of the introduction of harmonised European product standards is the requirement to comply with the Construction Product Directive (CPD) and CE marked products following third party certification by a notification body such as BRE/LPCB. Although this will be voluntary on Part 16 and Part 24 from March 2008 when these standards were published, it will become mandatory in March 2011 and July 2011 respectively.

## **9. Types and protection of loudspeakers**

The recommendations in the new Code for the selection of the type of loudspeaker has been simplified and rationalised. The emphasis has been placed on the need to choose the type of loudspeakers after consideration of the acoustical properties of the space where they will be installed in order to achieve the desired intelligibility.

The Code does not recommend that loudspeakers should survive a fire. Indeed, it is recognised that in order to achieve intelligibility, it is not feasible to protect loudspeakers from the excessive heat of fires. For example, most loudspeakers utilise a paper cone and cannot be expected to survive.

If a fire breaks out in a particular room, the occupants will normally be aware of it and leave very quickly. However, it is critical that the integrity of the loudspeaker circuit is maintained so that other occupants in other areas of the building can also be alerted of the incident. To achieve this, it is important that the cables survive and therefore mechanical construction to protect cables and connectors is a serious issue. Fire Resistant cables should be used.

## **10. Emergency microphones**

Emergency microphones used to be called fireman's microphones in the old version of the Code but this implied that they can only be used by fire officers. In fact, emergency microphones are intended for use by trained staff prior to the arrival of the fire and rescue service. The new Code also allows for their use in other emergencies such as bomb warning announcements, so the name was changed.

In order to broadcast intelligible messages, training and instructions in the proper use of microphones is needed and the new Code includes a recommendation that a pictogram is mounted near the microphone location. Separate pictograms are illustrated for close talking and normal situations.

Emergency microphones are normally installed in the fire control room and at fire access points, normally next to fire alarm repeater panels. If there is no control room, they may be installed in a common area.

Microphones are included in the performance requirements and verification tests of EN54-16. For example, verification of the VACIE frequency response will include a manufacturer's specified microphones.

## **11. Voice-enhanced sounders**

The 1998 version of BS5839-8 warned about the limitations of voice sounders which, at the time, were a relatively new and unproven technology. The 2008 version recognises that voice-enhanced sounders are acceptable components in some VA applications.

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Voice-enhanced sounders do not normally incorporate facilities for broadcasting live emergency messages and, hence, are used in automatic Type V1 systems. Except for governmental or local guidance documents there is no restriction to the size of installations that can be achieved with voice sounders and such large applications now exist.

Voice sounders that use loudspeaker transducer technology are capable of providing performance in the more complex acoustic environments. However, the Code recognises that, due to size and cost constraints, many voice sounders use an audio sound transducer that has a more restricted frequency response than cone or horn loudspeakers. This type of voice sounders are suitable in quiet and non-reverberant spaces but not in the larger and noisier public spaces. It also recognises that it is not necessarily the case that voice sounders can be installed at the same spacing as alarm sounders, because this may be too far apart to meet intelligibility requirements. The Code takes these limitations into consideration and recommends that the quantity and location of voice sounders should be determined as recommended for loudspeaker. Also, the recommendations of the Code regarding intelligibility apply fully to VA systems using voice sounders.

## **12. Networked systems**

The new Code introduces recommendations for networked systems. The key recommendations include:

- The use of fire resistant cables in all paths critical to emergency broadcast;
- Monitoring network loops for continuity;
- The need to broadcast emergency messages within 1 second of the initiation triggers having been received at any sub-systems.

## **13. Radio-linked components**

The new Code also introduces recommendations for systems with radio-linked components. These include:

- 7 days standby + 30 minutes power supply autonomy for radio components;
- The need to monitor external cables to antennae;
- The need to use fire resistant cables for the connection to external antennae.

The new clause on radio-linked components also draws the attention and recommends the need for radio signal site survey.

## **14. Commissioning and maintenance**

The new Code does not make any major changes to the recommendations for intelligibility. The two main aspects remain the needs for a minimum speech signal to background noise ratio of at least 10dB. The recommendation that a minimum STI (Speech Intelligibility Index) of 0.5 is achieved also remains. The new Code however, accepts some relaxation to 0.45 STI in difficult acoustic space provided that this is agreed by all parties.

It is therefore important that this relationship is properly planned and tested, preferably by means of a factory acceptance test.

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## 15. Testing and adjusting loudspeaker circuits

The most common problem for fire alarm companies when commissioning is to understand how to test and adjust loudspeaker circuits. For these circuits, it is not possible to make meaningful measurements with a multi-meter. A 'megger' is even less useful. For loudspeaker circuits it is essential to use impedance or load meters to ensure that there are no faults and that the correct loudspeaker load is connected. The new Code gives advice about impedance measurements and adjusting loudspeaker power settings.

Another issue is that loudspeakers are usually delivered set at maximum power but are rarely used at maximum power. This must be altered at the installation stage or problems will ensue that are difficult to fix once access equipment has been removed.

The new Code gives advice about impedance measurements and adjusting loudspeaker power settings.

In many systems, the cause and effects relationship between alarm inputs and recorded message broadcast is critical to the implementation of the building evacuation plan. It is therefore important that this relationship is properly planned and tested, preferably by means of factory acceptance test. The new Code gives advice on planning and testing complex 'cause and effects' relationship.