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## Evacuation Systems
## A lack of understanding

# A lack of understanding


***When a bell rings or an alarm sounds, what does it actually mean? Depending upon which site you are in, and how well you have been trained and drilled in emergency procedures, you might be able to differentiate one from another and understand its meaning. However, if you are not from that site, are a visitor or if the site caters for the public, it is unlikely that you will be able to separate a fire warning from a panic alarm or any other audible warning device.***

No matter what industry or commercial sector you work in, the reality is that your company will, somewhere and at some time, use an audible warning device. There are many different types, and even specific devices will differ greatly, and therein lies the problem. If a bell is ringing or a sounder howling, what does it actually mean? The warning it is giving is only of value if all that hear it understand it and know exactly how to react. Otherwise, it is simply a loud noise that adds to the overall confusion.

The use of audible signals to attract attention to events that require some form of action is firmly established. Attracting attention is one thing, but instigating an appropriate action is another entirely. It is also vital that people are able to act rapidly when an alarm event occurs. A ringing bell or howling siren can actually have a detrimental effect if people are site are debating its meaning or second-guessing what to do next. The overall level of



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confusion and panic can be increased rather than allowing a structured evacuation.

The growth of electronic safety and security systems has produced a confusing number of alarms that only the well informed can interpret, leaving those who might not be in the know somewhat bemused; this reduces their effectiveness as a method of transmitting essential information. In essence, if such a scenario occurs, the reason for having a warning system has been missed, and the system has failed!

## Raising understanding

The problem for many who are not *au fait* with a site's activities is that audible alarms are relatively ineffective in their role as warning devices. Analysis of fire events and observations from experiments over the last 30 years has revealed that less than 20 per cent of the general public will respond to a fire alarm signal. Indeed, even those who are trained to respond and would react diligently in their own place of work show a marked indifference to alarms when in less familiar surroundings.

For people to react to any warning signal they have to be confident that they understand its meaning. Uncertainty leads to hesitation and possibly a reticence to react until their decision can be ratified by some other additional information. In other words, when a fire alarm rings, people are likely to stand around and question whether or not it is a fire alarm – or whether there is a fire – until the time that someone in authority points out that they must leave because a fire alarm is ringing!

Considerable periods of time can be wasted during which smoke spread can render escape routes impassable and ultimately limit the chances for safe evacuation. The lack of clarity as to what a warning device's message actually means can put people in greater danger rather than allowing an area to be quickly cleared. If they are going to wait until a person in authority tells them what to do, the task would be simpler without a high level of background noise.

Of course, such a line of thinking brings us full circle! Sounders and sirens and bells were introduced because using human communication was too slow and unpredictable. However, the sounders and sirens and bells have now become confusing and difficult to understand, and as such are often as unsuitable as human intervention.

One of the problems is that the British Standards for fire detection and alarm systems do not make sufficient stipulations about the signals themselves. Alarm sounders for use on fire alarm systems are designed to comply with BS EN54-3: 2002(1). This standard only specifies the performance limits of the device and how it should be tested for compliance; it does not specify how the product is applied in any given circumstances. The BS EN54-3 Standard ensures that the sounders are manufactured to provide durability and set levels of performance. No parameters are defined for the tones produced; only their relative sound pressure levels under various operating conditions.

Of course, BS 5839-1 does offer guidance on sounder usage, but its recommendations only ensure that a fire alarm signal can be heard, not that it can be recognised.

People are far better at deciphering the temporal pattern of a signal rather than its frequency, an example being that people will recognise a musical extract regardless of what key it is played in. Recommended frequencies aid audibility and penetration through the structure of a building rather than aid identification.

Warning devices are required to have similar characteristics throughout a building so inhabitants can be educated to recognise the designated signal. However, outside of that environment there is no guarantee of commonality or even similarity.

## A verbal solution

The obvious answer, therefore, is the use of alarms providing voice messages, and there are a number of technologies currently

**Any delay in evacuations can have serious consequences for those in a site and the site owners and managers.**



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available. These are increasingly finding favour as they provide a message that is unambiguous and has been shown to be extremely effective in the management of people in emergency conditions.

A typical voice alarm system will comprise an interface to the alarm system, a number of pre-recorded messages, amplifiers and loudspeakers, monitored for faults throughout and with battery back-up to ensure continuity in the event of a mains failure. In larger sites, such systems will often also be integrated with a public address system.

As well as the fact that voice alarms make the public and those less familiar with a site take more notice, they are also an improvement on sounders for other reasons. A spoken message, even if pre-recorded, clearly identifies the nature of the problem and provides a clear instruction to all in the relevant area.

A voice alarm integrated with a PA system allows the operator to override the recorded messages and issue specific instructions to certain zones. In this way, people in one part of the building can be requested to leave through the west exits, while persons in another area can be directed towards exits in the east side of the building. The operator can ask people to stand away from windows if there is a bomb threat, or to stay where they are if staircases are congested - even once an evacuation has started.

For a voice alarm to be an improvement , the messages must be intelligible.A lot of that is down to loudspeakers and their positioning (although with live announcements, the person making the announcement has a big influence on this!). In the vast majority of projects with normal acoustics, loudspeaker placement can be quickly resolved using simple rules on separation distances for different sorts of speakers.

BS5839pt8 and EN60849 require that messages transmitted through a voice alarm system achieve a high degree of intelligibility. This is defined within BS5839 as meeting an STI measurement of 0.5 or greater. This measurement is quite prescriptive and requires the uses of quite expensive analysis equipment to provide a calibrated confirmation. EN60849 offers a range of measurement schemes applied across a common index, giving more choice as to the measurement technique to be applied and then giving minimum measurements that must be achieved for each to reach the equivalent of 0.5 STI.

There are some projects where acoustics will be an issue. If you are not certain that an area will achieve good intelligibility, make sure that your voice alarm supplier will assist to offer a compliant design.

With the increasing importance being placed on the enforcement of the Disabilities Discrimination Act, there is a growing need for visual beacons to supplement audible alarm devices.

Strobes allow a coloured light to flash during an alert message, which is replaced by a second coloured strobe (usually red) if an evacuation message is broadcast. During other messages, the strobes remain off and only the voice message is broadcast.

## In conclusion

The reason for fitting warning devices with fire or other life safety systems is a simple one; the goal is to ensure that people at site can be evacuated quickly and efficiently. Bells and sounders cannot always achieve this.Voice message sounders, however, can allow specific messages to be targeted at people in any given area, advising them of the site status and delivering accurate information that aids the evacuation process.