Why wouldn?t you get everybody out?

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There are numerous means of evacuating buildings in the event of fire - and some alternatives. James Lane examines the options

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There has been a great deal of criticism of the fire safety measures in UK residential tower blocks lately, in particular the provisions for fire detection and alarm.

Public perception, however, may not always be in line with what is required by the Building Regulations, or what the fire engineering profession considers best practice. Eyewitness accounts from various fire incidents often say that the fire alarm system did not work, without appreciating that purpose-built residential blocks will usually employ a 'stay put' policy and only the alarm in a flat that is on fire will be activated.

But we must also consider that people do not always react in their own best interest on hearing an alarm or, in some cases, even when they confront a fire.

Fire alarms

Fire alarms in the workplace should be a regular event. The system should be tested weekly. However, as real fire events are relatively infrequent, when the alarm does go off people do not react quickly, if at all, and assume it is either another drill or possibly a false alarm.

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Delaying our reaction to an alarm could put us at risk should there actually be a fire in the building. There is even a video case study, well known in the fire engineering profession, of a fire in an off-licence where a display stand is clearly alight. As the fire grows, the CCTV footage shows a mother usher her children into the shop doorway to look at the blaze. One man is also seen entering the shop and then leaving quickly; he was later found by police to have two bottles of stolen spirits in his pockets.

To deal with the wide range of human behaviour - and to protect us, our property and contents from criminal activity that uses the fire as a diversion - various means of emergency evacuation are available, each with different supporting measures.

Evacuation options

Simultaneous evacuation

The simplest and most common method of evacuating a building is to set off an immediate alarm throughout the premises. Whether there is an automatic system - triggered by smoke or heat detectors, for example - or simply manual call points, the alarm is raised when a fire is discovered and everybody leaves.

As this is the method favoured in office buildings, it is the one with which we are most familiar; it is based on simple cause and effect and therefore appears the most logical. If there is a fire, why wouldn't you get everybody out? There are now calls from the public for this to be the default for all tower blocks.

Security considerations include protection from entry where different tenants occupy parts of the same building, meaning that someone from a company in an office on one floor should not be able to enter the space occupied by another. If the building is empty because the alarm has gone off, you could be relying on CCTV for detection rather than prevention, unless there are door security and coded entry systems to restrict access.

The benefit of simultaneous evacuation, however, is its simplicity: it means a less sophisticated alarm and detection system can be used, and that a smaller burden is placed on management for coordinating the evacuation. Save for a fire warden sweep of the floor, there might be little else required.

Phased evacuation

In buildings using simultaneous evacuation, the fire precautions will require that sufficient capacity is provided for all the occupants to make their way out of the building together within a reasonable time. This is notionally set at 2 minutes 30 seconds, for reasons that we need not cover here.

Although this is fine for smaller and lower-rise buildings, the width of escape routes in taller buildings, in particular the stairs, can make simultaneous evacuation of all occupants impractical.

With phased evacuation, the building population is broken down into smaller portions, usually by floor level. In this way fewer people will be using the escape routes at any one time and the width requirement for the stairs is reduced.

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Although flexible, the process is typically that occupants on the floor of fire origin - where it is first detected - are evacuated as the first phase, along with more vulnerable occupants such as people using wheelchairs or who have a sight impairment, and any basement floors. Evacuation of the remainder of the building will then be by phases of 2 floors at a time going up and subsequently 2 floors at a time going down until the entire building is vacated.

Other than the reduction in stair width, advantages include greater business continuity for occupants in the later phases of evacuation. It is possible that if a fire is quickly brought

under control or there are false alarms then full evacuation of the building will be unnecessary.

The downside is that a greater level of management control will be required, as will more sophisticated detection and alarm systems that can warn of fire as well as signal evacuation, more staff training, and a higher degree of fire separation between floors.

Zone evacuation

Sometimes also known as staged evacuation, this is similar in concept to phased evacuation but, rather than being used in taller buildings, this suits those:

- with larger footprints;
- that are more complex; or
- where there might be a higher occupation density, such as shopping malls and transport hubs.

In these circumstances the building is divided into zones, which could coincide with smoke control, fire suppression, alarm zones or other divisions. Activation of the fire alarm in a given zone will prompt its evacuation, with occupants leaving the building or possibly moving into an adjacent zone.

As there is likely to be a line of sight between the fire zone and zones that are not being evacuated, this method requires greater management control of crowd issues, and potentially complex alarm and directional signals to provide the correct information and encourage the appropriate response from occupants.

Progressive horizontal evacuation

Like zoned evacuation, this involves moving parts of the population sideways out of the risk area, except that here the zones are physically separated from one another by fire-resisting walls and floors. The concept is that by moving people into a neighbouring fire compartment they will be temporarily safe, while the facilities and personnel needed to make further evacuation to the street are arranged.

This method is used in many healthcare buildings where occupants are more dependent on assistance for evacuation, or might not be able to leave the building at all. By its nature, this method is used where buildings are naturally highly managed and control of evacuation closely controlled.

Because the occupants might be vulnerable people such as hospital patients or care home residents, they remain inside for as long as it is safe to do so, and are protected from:

- the weather;
- becoming disoriented and getting lost outside; and
- external personal attack.

Alternatives to evacuation

Staying put

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People neither expect nor want to be unnecessarily disturbed in their own home and might be asleep when a fire breaks out. Coupled with the likely absence of management assistance on site, it is the standard procedure for smoke or heat detectors to alert only those residents in the dwelling where the fire originates.

Neighbours in a block will not be made aware of the alarm automatically, and are expected to stay put. Although this may seem contrary to the philosophy we expect, it does make sense if we think about the number of times our smoke alarm goes off by accident, and this approach has proven perfectly adequate for the past 5 decades or so of high-rise living.

To make this system acceptable, residential towers benefit from a higher degree of fire compartmentation than other types of building. By separating the tower into a series of smaller fire-resisting boxes and providing smoke ventilation to the escape routes - which is not usually necessary otherwise - the level of protection is much greater, and prolonged occupation during a real fire incident is made possible. Compartmentation has recently been called into question, but if it is designed, constructed and maintained correctly we know it works.

So what are the benefits of a 'stay put' policy? If everybody is regularly made to leave a tower block and stand on the street when an alarm goes off but there is no fire then people will become complacent and reluctant to react when an actual fire has started, and might ignore an alarm.

This could be the case even when there is a fire in their own dwelling. Furthermore, because residents might take longer to react and evacuate a building it is possible, if not likely, that the routes used for access by the fire service will be congested.

If there is a fire, having all the residents of a tower block trying to use the stairs at the same time that the fire and rescue service are trying to ascend with equipment can seriously hamper early extinguishing of a blaze.

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Any decision to change the 'stay put' policy during a fire will be for the fire and rescue service to make if they believe there is a risk to people on the floor of origin or upper floors. Usually, that decision will be made quickly and communicated if a

fire is not under control.

From a security perspective, if somebody knew that by deliberately setting off the fire alarm there would be an empty and unguarded building full of everybody's belongings it could give them a criminal opportunity. If on the other hand all but one flat might still be occupied this would then be little different to normal.

Invacuation and lockdown

Not all emergencies are fires, so the appropriate response is not always to escape from the building.

If moving outside puts people at a greater risk then the appropriate action is likely to involve moving to a refuge space within the building, away from windows and external doors. This might be in response to extreme weather such as tornados, to a bomb threat in the local area, or to the release of noxious gases and fumes.

Lockdown, although similar, is subtly different. There has been greater press coverage lately of terror attacks involving individuals with knives and guns. Consequently, my daughters now practise lockdown at school as regularly as fire drills.

In this case, the procedure is to remain in place, secure doors and windows against entry and conceal occupants from view. If the room is not secure then moving to a secure space is necessary.

The simple way to differentiate between the two procedures is to think of invacuation as protection against indiscriminate events and lockdown as against a specific and targeted attack, although that target might be a location, building or institution rather than a specific person.

Safe and secure egress

Fire safety and the means of evacuation or otherwise are taken into account as part and parcel of the routine design process for a new build, extension, fit-out or refurbishment, whether standard guidance recommendations are followed or a fire engineering approach is taken. But at what stage is security considered? And has it been integrated with other design features and emergency procedures?

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> In February 2018, lone gunman Nikolas Cruz entered Stoneman Douglas High School in Florida, USA. The former pupil operated a fire call point and began shooting as people were evacuating the building. Reports suggest that the alarm caused confusion because there had been a fire drill earlier that day.

Cruz had been spotted just beforehand, and alert messages were sent. But despite the school operating lockdown procedures he managed to kill 17 people and injure 17 others. Had security been part of the integrated design and fire evacuation procedures, or if the building had been designed with a security strategy and the systems in place used to their full potential, then maybe the number of victims would have been fewer.

Security must be part of the initial design to be effective. Bolting on equipment at a later stage might not only be expensive, it might also be misguided and ineffective.

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Further information

- Related competencies include: Fire safety
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