Using Human and Technological Resources to Manage People Movement

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The key purpose of any detection system is to detect deteriorating conditions sufficiently early so that an emergency response can commence in a timely manner. In reality, the detection system may be formed from a technological component (e.g., automated systems) and a human component (e.g., staff noting fire cues directly or through monitoring CCTV, etc.). The emergency response can be improved in two ways. Firstly, the available safe egress time can be increased; e.g., through actively addressing the incident with a suppression system, reducing the time of detection, etc. Secondly, the time required to reach safety can be reduced; e.g., through initiating and managing the response of the evacuating population. It is important to note that there are human and technological elements in both approaches. This paper looks at integrating the human and technological solutions available to manage the response of a population and improve the use of the information provided by the detection process. This approach should be especially valuable where the population is transient, where the potential scenarios are numerous, where security is an issue, and where possible false alarms would lead to expensive and disruptive responses.

Information rather than fear

A critical element of the evacuation process is the time for a population to respond to information. In contrast to much of the thinking of the 20th century, it is now accepted that a key procedural problem is getting people to respond in a timely manner according to the procedure in place. This has replaced the idea that we should be worried about frightening people into an irrational response by informing them of the incident at all. In many situations, the time to respond to an incident (e.g., to commence egress movement, see Figure 1) may be a significant part of the overall time to reach safety.

Figure 1: RSET components.

This situation can be improved through the coordinated use of notification systems and of active staff.

To detect and serve

It is critical that incidents are detected in order for them to be assessed and then for an appropriate response to be implemented. Automatic detection systems are required for this detection to take place. These systems are supported by staff activities. In some situations, staff may note a developing incident prior to the automatic system being activated; e.g., where the detection system is located some height above a developing incident, or where detection coverage is incomplete, etc. In addition, detection systems are not perfect and require confirmation; i.e., false positives are possible. This is critical as the value of these systems relies in the credibility of their messages. Therefore, a combined human and technological response is required both for the detection and confirmation of an incident.

Tools of the trade

Notification systems can help alert the population to the existence of an incident once it has been detected. However, in addition to alerting the population of an incident, it is also important to provide information on the response needed. This will help encourage the population to respond and then act in accordance with the procedure in place. The notification and response process has four key components: the emergency message is received; the message is recognized as indicating a real fire; the message provides guidance on the response required; the individual is able to perform the response required of them. Notification technology can help address the first three components; however, for all three of these components to be addressed, the technology would need to alert and inform the population; e.g., through the presence of voice notification systems, screens, etc. Suitably trained, assertive and informed staff may help address all four of the components.

The notification process becomes all the more important where the population is unfamiliar with the structure or the procedure in place (see Figure 2). In many instances (e.g., shopping malls, airport terminals, hotels, etc.), the population will be unable to take part in regular training or emergency exercises. Where this pre-incident preparation is not possible, the information provided by staff and the notification system forms the general population's understanding of the incident and of the response needed. In many occupancies code does not require that guidance is provided; e.g., the use of voice notification is not compulsory. However, this does not mean that the provision of (for example) voice notification in such cases would not be of enormous benefit to the emergency response.

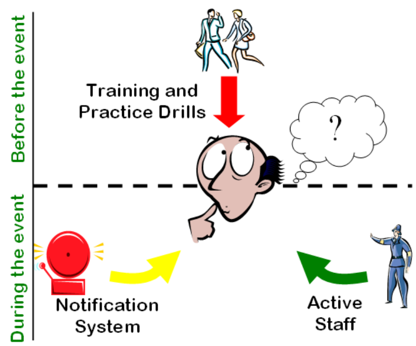

Figure 2: Opportunities to inform the population of the necessary response.

The relationship of the population with the building therefore has a direct impact on the tools available to address an incident. In some instances, the population can be primed for the required response; in others, the onus falls on the technological and human resources employed to manage the response.

The building as a people movement system

A building is effectively a people movement system that can operate in a number of phases: people can enter a building; people can use the building; people can leave a building (see Figure 3).

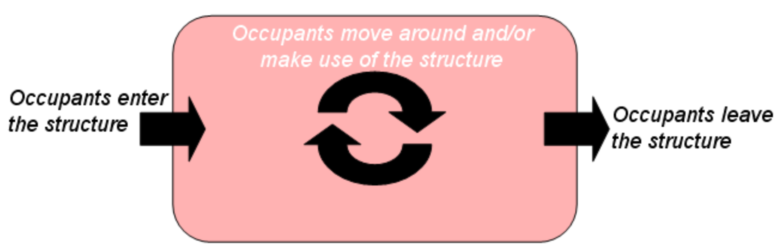

Figure 3: The building as a people movement system.

These phases can occur under emergency and non-emergency conditions. It is naïve to think that these phases do not influence each. In particular, they influence the effectiveness of the emergency and non-emergency procedures in place. Not only do procedures exist to manage these different phases of the building's use, but many procedures may co-exist within each of these phases. For instance security procedures will exist in conjunction with operational procedures during the routine running of the building. Procedures will also be in place to govern the emergency response to a range of different incidents, including a fire, a breach of security, etc. It is critical that these procedures are coordinated, and do not compromise on the effectiveness of other procedures. Therefore, we should be mindful of the way in which procedures interact. A case in point is the way in which security and fire procedures interact at airports. Does the enactment of the emergency response to a fire compromise security? Alternatively, do security measures compromise the routine operation of the building? The detection and notification system in place should therefore account for their impact on the building's use; the building's use should also be taken into account when implementing the detection and notification system in place.

Managing information and response

This paper outlines an approach to emergency procedures that is mindful of the impact that they have on security procedures, but also on the impact they have on the normal operation of the structure. It also acknowledges the impact that historical events can have on the effectiveness of a procedure – be it the routine use of the building, the occurrence of false alarms, the preparedness of the staff/general population, etc. It is therefore based on the assumption that you cannot simply insert technology into a building to solve the problem of emergency response. The approach is instead centered on accounting for the people movement system that is the building, through the use of the technology and human resources available: confirming detection; notifying the population; managing their response. The managed approach outlined is based on the use and availability of information to determine the veracity of an incident, identifying who needs to respond to the incident, and establishing what this response should be. This is highly dependent on the availability of accurate, comprehensive and current information (see Figure 4) – information that will also be enormously useful in the running of the building, in the prevention of incidents developing, and in the response selected.

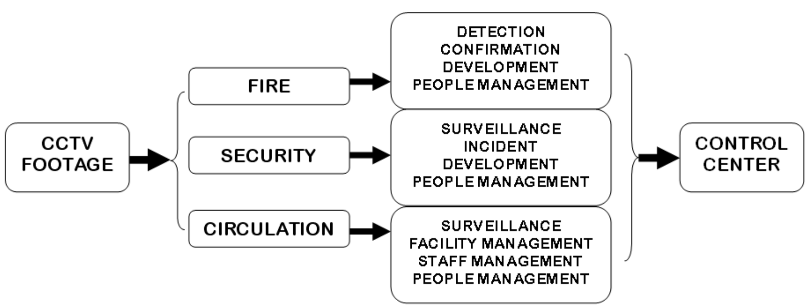

Figure 4: Information management.

The response is sensitive to the nature of the incident, without automatically assuming that a full evacuation is always required or even safe. Critically, this should minimize possible gaps in security, the number of false alarms (thereby increasing the perceived credibility of the notification system), the disruption to the normal operation of the building, and help improve safety.

Several examples will be presented to demonstrate the value of this approach and where it is appropriate to use it. It is also acknowledged that the confirmation process has the potential to insert delays into the RSET process; e.g., if there are delays in the staff response or in the detection process, then the enactment of the emergency procedure may be delayed. This needs to be acknowledged and factored into any procedural design; e.g., accounting for potential delays in the ASET/RSET calculation, defaulting to a general alarm should the staff response be too slow thereby limiting the extent of such a delay, etc.

In environments where people are unfamiliar with the procedures in place, the provision of information and guidance is critical. An information vacuum must be avoided. In providing this information, the human and technological resources available can be employed to ensure a safe response that is proportional to the incident: accurately assessing the incident and guiding occupants to an appropriate and managed response, with the minimum of disruption and the maximum of safety. This paper describes such an approach.