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# Mass Notification 101

Specifying code-compliant emergency communications

by Ted Milburn

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**WHEN IT COMES TO SPECIFYING AN EFFECTIVE EMERGENCY COMMUNICATIONS SOLUTION,**

THERE ARE MYRIAD PRODUCTS, COUNTLESS VENDORS, AND INDUSTRY CODES TO DECIPHER. CONDUCTING AN ONLINE SEARCH FOR 'EMERGENCY COMMUNICATIONS SYSTEMS' PRODUCES FAR TOO MUCH INFORMATION FOR AN INUNDATED BUILDING DESIGNER TO REVIEW. FROM INDOOR VOICE EVACUATION SYSTEMS AND OUTDOOR HIGH-POWER SPEAKER ARRAYS TO AUTOMATED VOICE DIALING SYSTEMS AND SMS/TEXT MESSAGING, THE TECHNOLOGY IS SPREADING.

The key is not only specifying the right mix of emergency communications systems (ECS) to meet the needs of building owners and occupants, but also understanding and complying with codes, regulations, and requirements. This entails knowledge of the different technologies available, and how products can be integrated together and with other life-safety systems.

The 2010 edition of National Fire Protection Association (NFPA) 72, *National Fire Alarm and Signaling Code*, now applies to more than fires. It includes a new chapter on requirements for ECS, also known as mass notification systems (MNS). This article summarizes how the codes were developed, what specifiers need to know, building blocks to get there, and the future of MNS.

**What is mass notification?**

The role of mass notification—warning and alerting people—is not new. The legend surrounding Paul Revere's midnight ride is an example of using both



## Evolution of communications

In 1996, terrorists attacked a U.S. Air Force (USAF) housing complex, Khobar Towers (Dhahran, Saudi Arabia), killing 19 U.S. servicemen and wounding hundreds of others.

William Cohen, U.S. Secretary of Defense, issued a post-incident report, which concluded there was no effective notification system with which to warn personnel. The principal means for sounding an alarm at the housing complex consisted of having personnel go from door-to-door throughout an eight-story dormitory, alerting residents of the danger.

This primitive approach prompted the Air Force to develop the *Antiterrorism Force Protection Standards* in 1999. Three years later, DoD added to the standards by creating the Unified Facilities Criteria (UFC) 4-010-01, *Minimum Antiterrorism Standards for Buildings*—the first time mass notification was defined. In 2004, DoD published UFC 04-021-01, *Design*

For projects as diverse as sporting venues, military installations, and schools, mass notification systems (MNS) combine fire, security, and alerting processes to provide a complete integrated emergency communications solution.

Images courtesy Cooper Notification

audible and visual alerting methods—two NFPA requirements. In April 1775, the legendary story goes that Reverend hung two lanterns in the Boston bell tower, indicating from pre-planned signals the British troops would row by sea. He then alerted the countryside by riding and stopping at each house.

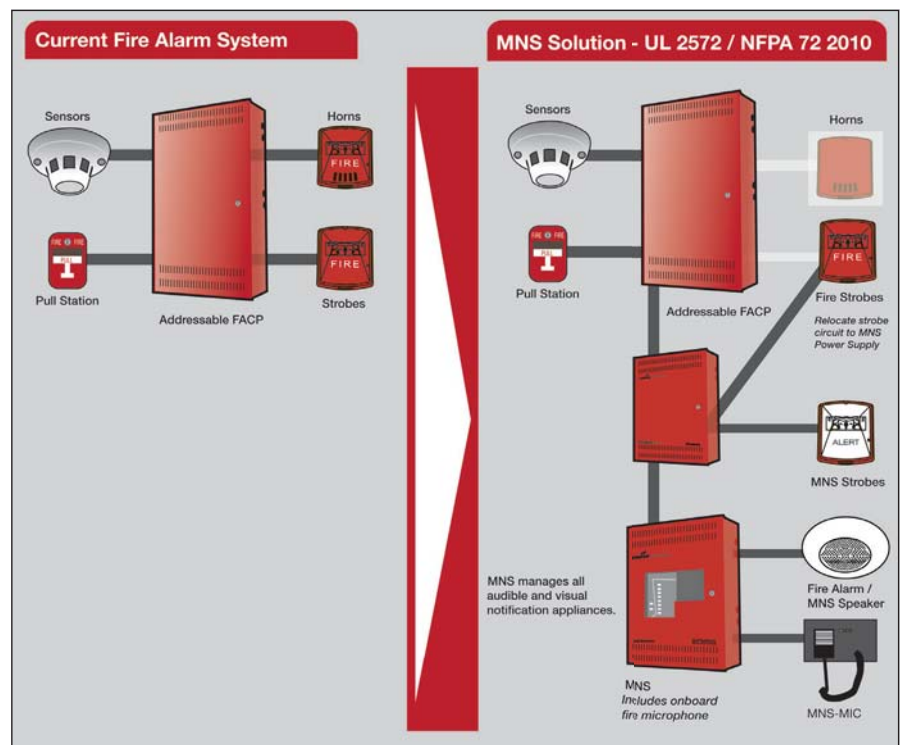
Alarm systems have certainly come a long way since the late 18<sup>th</sup> century. Today's sophisticated MNS combine fire, security, and alerting processes to provide a complete integrated emergency communications solution to handle threats. Although the role of MNS is not new, the term 'mass notification' was only introduced within the past decade. During this time, it has quickly transformed to a defined stage and is now regulated with codes and requirements.

The Department of Defense (DoD) defines mass notification as a means to:

provide real-time information and instructions to people in a building, area, site, or installation using intelligible voice communications along with visible signals, text, and graphics, and possibly including tactile or other communication methods.

The DoD further states these systems:

protect life by indicating the existence of an emergency situation and instructing people of the necessary and appropriate response and action.



With the emergence of new Underwriters Laboratories (UL) and National Fire Protection Association (NFPA) standards, fire alarm systems have evolved. There is ample room for retrofit opportunities.



It is not enough to simply have loudspeakers, ready to broadcast warnings—an integrated security and life safety system must be in place.

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and O&M: *Mass Notification Systems*, which required installation of intelligible voice notification systems in and around new “inhabited buildings.”

In creating the UFC, DoD discovered most fire alarm systems were unable to communicate with people in non-fire

emergencies such as severe weather. The Air Force petitioned NFPA to develop MNS requirements. As a result, Annex E (“Mass Notification Systems”) was added as recommended guidelines in the 2007 NFPA 72, *National Fire Alarm Code*. For the first time in the code’s history, a non-fire alarm system could take precedence over a fire alarm system.

In the new 2010 NFPA 72, *National Fire Alarm and Signaling Code*, Annex E has evolved to become Chapter 24 (“Emergency Communications Systems”)—the first mass notification code for the private sector.

Most recently, Underwriters Laboratories (UL) has also moved toward establishing a new standard for mass notification—UL 2572, *Control and Communication Units for Mass Notification Systems*, will measure how an MNS performs against the NFPA codes.

### New construction and retrofit projects

NFPA 72’s Chapter 24 comprises a complete set of requirements for installation

and performance of indoor and outdoor emergency communications systems. There are two classifications of systems: one-way and two-way.

- Examples of one-way systems include:
- in-building fire emergency voice/alarm communications systems;
  - in-building MNS;
  - wide-area MNS; and
  - distributed recipient MNS (e.g. text messages, voice calls, e-mails, pagers, and desktop notification).

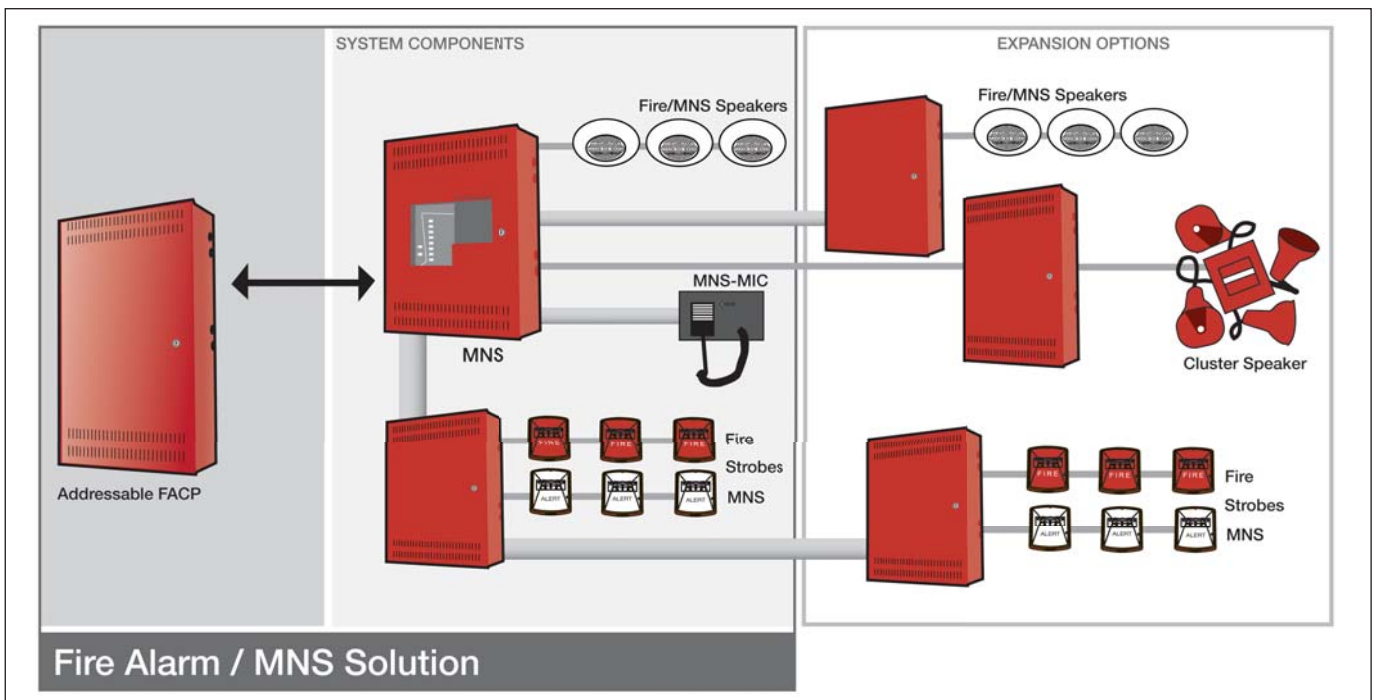
Two-way systems include:

- two-way telephones; and
- two-way in-building radio communications.

According to the current NFPA 72, an ECS is:

intended to communicate information about emergencies including, but not limited to, fire, human-caused events (accidental and intentional), other dangerous situations, accidents, and natural disasters.

To communicate information properly, an ECS must broadcast messages with



Components of a typical mass notification system, along with various expansion options.

Image courtesy Cooper Notification

specific, consistent, accurate, and intelligible information that the intended recipient will hear and understand. The system must be able to provide pre-recorded, synthesized, or live messages with voice intelligibility in accordance with NFPA 72 Chapter 18 (“Notification Appliances”).

An ECS must be installed in occupancies, where required by the Authority Having Jurisdiction (AHJ) or other applicable governing laws, codes, or standards. Regardless of whether an ECS is voluntary or demanded by the AHJ, installing a code-compliant system assures the building owner that the notification assembly has achieved a level of performance and has been tested to rigorous standards.

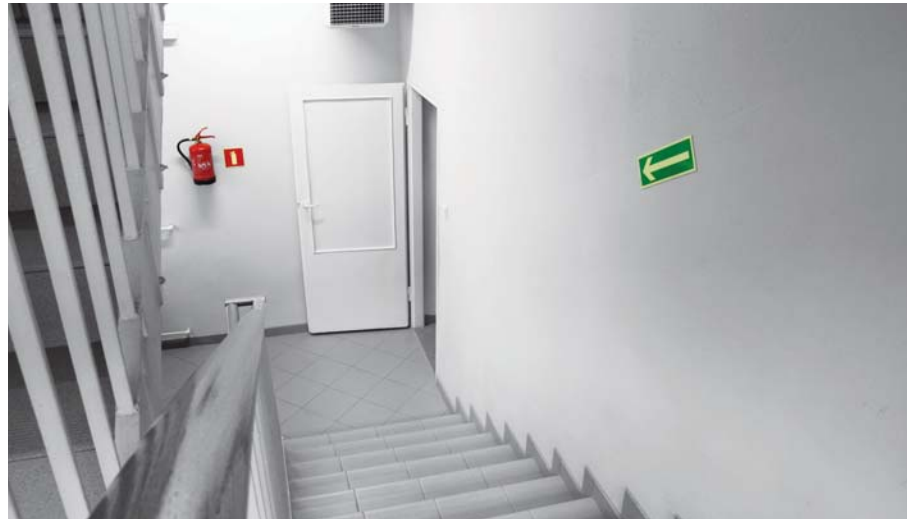
### In-building systems

As defined by NFPA, in-building mass notification systems are installed in buildings or structures for notifying and instructing occupants of an emergency. They provide information and instructions to people within a space using intelligible voice communications and visible signals, text, graphics, tactile, or other communication methods.

Combining or integrating in-building fire emergency voice/alarm communications with other systems such as mass notification, public address, and paging is now allowed and encouraged by the code. Integrated systems are financially beneficial to the owner since they reduce design, installation, and ongoing lifecycle costs. Fire alarm or priority mass notification messages, as determined by a risk analysis, must take precedence over any other announcement, such as paging or public address.

In-building MNS components include:

- primary control unit for in-building MNS, which monitors and controls notification appliances;
- dedicated microphone for live emergency communication messages (distinguishable from a fire microphone);
- interface to fire alarm system; and



Mass notification comprise only part of a building's life safety strategies. Clearly marked—and visible in darkness or smoke—wayfinding signage is another aspect of a holistic solution, along with compartmentalization, material choices, and suppression systems.

Photo © Dreamstime/Ambrozinio

- audible and visual notification devices. (The latter two are connected via Notification Appliance Circuit [NAC].)

### Emergency response plans

Creating an Emergency Response Plan (ERP) requires a detailed risk analysis. When designing a mass notification system, one must consider the anticipated risks to each facility, probability and frequency of occurrence, and projected loss.

How the facility disseminates information and specific take-action instructions needed for different types of emergencies is an important element of risk mitigation. A facility's ERP should be developed based on the risk analysis and in accordance with NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs*, and NFPA 1620, *Recommended Practice for Pre-incident Planning*. The ERP should include the following emergency response elements:

- team structure;
- procedures for building system-, human-, terrorism-, and weather-related emergencies;
- equipment and operation;
- notification (e.g. message content and approval/initiation processes); and
- training and drills.

### System coverage

MNS provides live voice and pre-recorded localized messaging within a protected individual building, the surrounding areas, and other outdoor spaces that have been designated.

The notification zones are based on the risk analysis. Each separate building should be provided with a separate in-building MNS, which must be designed with intelligible voice in accordance with Chapter 18 in the 2010 edition of NFPA 72.

### Operation

An effective in-building MNS manages all audio and visual notification appliances and reports trouble and supervisory signals through the fire alarm system. Determined by the ERP, the control unit can override the fire alarms with live voice from an MNS microphone or manual activation of a high-priority message.

After the in-building MNS relinquishes control, the fire alarm system is automatically restored to normal operation (without an active fire alarm signal) or operates based on the Emergency Response Plan with an active fire alarm signal.



While the principles behind MNS may be consistent, different manufacturers offer proprietary products with specific features.

Photo courtesy Cooper Notification

#### *Voice message priority*

The priority level of recorded messages is determined by the ERP and based on an evaluation of occupancy impact on individual security, danger to life, community, and the nation. Only recorded messages determined by the ERP to be of higher priority than fire alarm activation are permitted to override the fire alarm notification and initiate the mass notification priority message. Activation of any other recorded message should not interfere with the operation of the fire alarm system. Signal priority is as follows:

- discharge (*i.e.* fire suppression);
- MNS;
- fire; and
- local microphone (higher priority than preprogrammed responses).

#### *Visible notification*

Where there is audible notification, the in-building MNS must also provide visible notification for the hearing-impaired and for high-noise areas. Visible notification is typically accomplished using clear strobes for fire alarms and amber ones for MNS. Textual, graphic, or video dis-

plays can be used in addition to the strobes. Transmission of visible notification and messages must be simultaneous to the audible ones.

#### **Wide-area MNS**

Wide-area mass notification systems cover large outdoor areas by broadcasting real-time intelligible voice messages, tones, and sirens. This type of MNS can be used for applications such as campus or facility ‘Giant Voice’ systems, public warning systems, and military base outdoor notification systems. System components include the central control station and the high-power speaker array (HPSA).

The wide-area MNS must be designed to ensure:

- each notification zone can be individually controlled by the central control station;
- intelligibility is in accordance with the code; and
- minimum mounting heights are based on the output of the speaker array to prevent hearing damage.

The HPSA must have the capability to

operate for a minimum of seven days in standby, followed by 60 minutes of operation at full load.

#### **Distributed recipient mass notification system**

Although distributed recipient mass notification systems (DRMNS) cannot be used in place of the required audible and visible alerting systems, they can be added and integrated with these systems whenever possible for a multi-tiered communications system.

The DRMNS needs to communicate to hundreds or thousands of individuals through multiple delivery methods, including:

- mass-dialing systems;
- e-mails;
- text messages;
- paging; and
- desktop pop-up notifications.

These Web-based communication systems must be installed behind appropriate Internet firewalls to protect the network and designed with a backup configuration to facilitate distribution of messages.

#### **A system of systems**

With various different MNS solutions available, one of the latest trends security professionals are recognizing is the need for a ‘system-of-systems’ approach to emergency communications.

There is no single technology that fits every situation. NFPA states reliance on just one technology to do the job in an emergency could result in a relatively large population not receiving the message. The overall solution is to utilize multiple communication systems that combine to produce a reliable and robust design, ensuring information successfully reaches the affected audience.

A system-of-systems approach to MNS includes:

- broadcasting alerts over indoor or outdoor mass notification systems;
- sending text messages and e-mails;
- distributing automated voice calls; and

- using display signs, desktop alerts, and social media.

However, building owners are realizing that launching alerts from multiple communication systems can greatly increase the time it takes to send and receive messages. With limited staff and multiple communication systems to operate, building owners need an integrated emergency notification system with a simplified, single interface to launch the different applications. This would allow facility managers and emergency response personnel to focus on the emergency at hand without being slowed down, trying to activate multiple systems.

### Implementing mass notification

As regulations and standards evolve, it is important for architects, engineers, and specifiers to keep up to ensure optimal performance and compliance of the systems installed. While this may sound overwhelming, it is crucial to choose a vendor that has a handle on codes and requirements. If it is a retrofit project, building owners and designers must understand how they can utilize solutions enabling them to leverage existing infrastructure, systems, and equipment with minimal upgrades and modifications.

For new construction, the range of state-of-the-art ECS technology ensures success does not have to be a difficult endeavor and can be accomplished by starting with the following steps:

1. Begin with a vulnerability and risk assessment.
  2. Develop a master plan that integrates:
    - protection systems;
    - mass notification systems; and
    - emergency action plans.
  3. Implement on a phased basis.
  4. Leverage existing systems and equipment.
- Completing a vulnerability and risk assessment provides building owners a scope of their current situation and allows them to develop a master plan to address the facility's needs. It is highly recommended these master plans inte-



Fire alarms have come a long way. Rather than standalone, they are now an integral component of audio-visual notification.

Photo © Dreamstime/Lisa F. Young

grate protection systems, the MNS, and emergency action plans.

To help building owners and managers meet the latest requirements and simplify their retrofit, some manufacturers have developed proprietary assemblies to integrate with a facility's addressable fire alarm system (FAS) for a complete in-building MNS that performs both emergency communications and fire alarm functions.

Compliant with UL 2572 and the 2010 NFPA 72 codes, such systems provide personnel and building occupants with intelligible live and pre-recorded voice messages that communicate what to do in response to an emergency. They can manage all audible and visual notification and feature a modular and flexible design to meet the functional requirements of ERPs as well as the complexities of the new codes.

### Future of MNS

In the near future, building designers and owners will see flexible MNS solutions that easily adapt to an organization's risk analysis and emergency response plans (as well as a heightened

convergence of the elements therein— interoperable protection, sensor, and alerting systems). By integrating these technologies, including fire protection, access control, accountability, video services, and mass notification, a facility greatly improves its situational awareness, system management, and emergency response time.

A hypothetical example of near-future integrated life-safety systems could be at a chemical facility. In this instance, an intrusion detection system triggered in the back of the property activates a camera to stream live video of the area and an MNS to send an alert to the security guard, stating there is an trespasser in the restricted access area and broadcasting a message to the detected area to deter the offender.

By viewing the video, the guard confirms the threat and with a couple of clicks, sends notification to security officers within the area to respond, alerts employees in the surrounding area, and locks all the building doors with the access control system. Responding to this situation takes place within minutes, saving lives and reducing chaos.

Fire codes apply to more than fire situations. They also cover today's sophisticated threats and emergencies. With

myriad mass notification technologies available and numerous vendors from which to choose, the key is finding a pro-

vider that can offer the right mix of systems that meet the latest codes and the needs of emergency response plans. **CS**

## ADDITIONAL INFORMATION

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### **Abstract**

As codes continue to change, it is important for building owners to keep up to ensure optimal performance and compliance. The article discusses the evolution of mass notification systems, outlining the new Underwriters Laboratories standards in the context of the *National Fire*

*Alarm and Signaling Code*. The article also explains the steps building owners, specifiers, and contractors can take to meet these new codes and standards.

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