

A Systems Based Approach to Carbon Monoxide Detection

Driven by a regulatory trend mandating carbon monoxide (CO) detection in university dormitories, protecting students, staff and visitors from CO poisoning is an emerging requirement for university officials responsible for life safety protection. Currently, Massachusetts, Maryland, Utah, Rhode Island, and Oregon require CO detection in dormitories and several more states will require CO detection for dormitories beginning in 2011. It should be noted that the International Code Council (ICC) membership will vote in May of this year on a proposal to require CO detection in Group-R occupancies for the 2012 edition of the International Building Code (IBC) and International Fire Code (IFC).

University officials may also see the need to provide CO detection in non-dormitory occupancies, such as education buildings, assembly occupancies and cafeterias, because it is very common to have fixed fuel-burning appliances or attached parking garages in these types of facilities.

A key decision for universities is whether to use a systems approach that utilizes a control unit with system-connected CO detectors instead of single- and multiple-station CO alarms, which are not designed or listed to be connected to a control unit. While there are many applications where single- and multiple-station CO alarms may meet code requirements, there are many applications where a systems-based approach may be more desirable. For example, the stakeholders may determine a systems approach is needed after conducting a risk analysis. Questions to ask when determining if a systems-based approach would be preferred might include:

- Is supervised annunciation at a constantly onsite attended location desirable?
- Would the application benefit from offsite monitoring by a supervising station?

If the answer to either of these questions is yes, then the application would likely require systems-based CO detection.

Once the decision has been made to use a systems approach, the next decision is whether to use a dedicated CO detection system or a combination system. Several sections of the current edition (2009) of NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment*, provide direction on the various types of CO detection systems, the occupant notification requirements and the secondary power supply requirements. It is HIGHLY recommended you get a copy of the 2009 edition of NFPA 720 before designing your CO detection system.

For non-dormitory occupancies and dormitories, NFPA 720 permits a CO detection system to operate as a single, stand-alone system or it can be combined with either a fire alarm system or a security system. Specifically, sections 5.5.2.1 and 5.5.4.1 permit CO detection systems to share components, equipment, circuitry and installation wiring with non-CO detection systems. However, there are several very important factors to keep in mind when using a combination system. If a CO detection system is combined with a fire alarm or security control unit:

- All component subsystems shall be capable of simultaneous, full-load operation without degradation of the required overall system performance (5.5.2.2)
- The non-CO detection system functions shall not interfere with the required operation of the CO detection system (5.5.4.2)
- CO alarm signals shall be distinctive, be clearly recognizable, and take priority over signals associated with property protection (5.5.4.6)

The priority requirements for fire alarm and mass notification systems, including combination fire alarm systems that incorporate CO detection, are established in NFPA 72, National Fire Alarm and Signaling Code. When a CO detection system is combined with either a fire alarm system and or an intrusion detection system section 4.4.3.1.2 permits the trouble signals from each sys-

tem shall be permitted to use a common audible signal.

NFPA 720 does not require system notification appliances, including visible notification appliances, to be installed throughout the building for occupant notification. Instead the standard intentionally gives latitude to authorities having jurisdiction (AHJs), system designers, building owners, or governing codes. Section 6.1.5 states the requirements of chapter 6, notification appliances for CO detection systems, shall apply to the areas, spaces, or system functions. An example may be an appliance that is specifically located to provide information or notification to a person at a specific desk within a larger room. Furthermore, where CO signals are transmitted to a constantly attended onsite location or off-premises location, section 5.5.6.2.2 permits selective public mode occupant notification to be limited to the notification zone encompassing the area where the CO signal originated. In this type of application, the integral sounder of a system-connected CO detector will be sufficient for notifying building occupants.

However, if CO notification appliances are required by the AHJ or other governing codes, the standard has specific requirements and does not preclude CO occupant notification from being in line with fire alarm zones in order to keep the system infrastructure simple and to avoid increasing costs:

- If notification appliances are used for CO signaling, they shall not have the “FIRE” marking, or any fire symbol in any form on the appliance visible to the public, and lights shall be clear, nominal white, or another color as required by the emergency plan or AHJ (6.3.3.2)
- Lights used for CO signaling shall be clear, nominal white, or another color as required by the emergency plan or AHJ (6.5.2.4)

The secondary power supply requirements of a CO detection system are considerably different than for fire alarm systems and at first glance may appear to be excessive. Section 4.4.1.5.2.3 of NFPA 720 requires the CO detection system to have sufficient secondary power to operate the system under quiescent load for 24 hours, and at the end of that period, be capable of operating all of the notification appliances for 12 hours if the system is not monitored by a supervising station. However, the exception to 4.4.1.5.2.3 permits the 12-hour alarm requirement to be reduced to 60 minutes if the CO detection

system is monitored by a supervising station. Also, if the system is being monitored by a supervising station, occupant notification is not required throughout the building because section 5.5.6.2.2 permits selective public mode occupant notification.

Finally, if the CO detection system is combined with a fire alarm system, section 4.4.1.5.2.1 requires the secondary power supply capacity requirements to comply with 4.4.1.5.2.3 and NFPA 72, National Fire Alarm Signaling Code.

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