AUDIBLE AND VISIBLE ALARMS PRIMER

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Alarms are an important component of building evacuation systems. Depending upon occupancy, fire alarm notification components prescribed in Section 907 of the 2015 *International Building Code*® (IBC®) include visible and audible notification devices, smoke alarms and emergency voice/alarm communication systems. Audible alarms must be provided to serve all occupiable areas where a fire alarm system is required by the code. Visible alarms must be provided in areas where the ambient noise level is such that audible alarms may not be heard (Section 907.5.2.1.2).

The maximum sound pressure for audible alarm notifications is 110 dBA. This has been reduced from 120 dBA in the 2006 IBC. Many hearing aids have a safety feature causing them to shut off with a sound pressure of 120 dBA.

Visible alarms are required in all public-use and all common-use areas to alert people with hearing impairments (Section 907.5.2.3.1). Public-use areas are defined as "interior or exterior rooms or spaces that are made available to the general public" and common-use areas as "interior or exterior circulation paths, rooms, spaces or elements that are not for public use and are made available for the shared use of two or more people" (Chapter 2).

This means visible alarms must be provided in all occupied spaces where audible alarms are required, except mechanical rooms and private offices. Further, systems must be designed so that if an employee in a private office wants a visible alarm in his or her work space, the request can be accommodated with a minimum of disruption.

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The alarm system must be designed to accommodate possible expansion for employees – i.e. 20 percent of the capacity for circuits serving employee work areas (Section 907.5.2.3.1).

Exemptions

Due to concern that flashing lights may create a distraction or tripping hazard, visible alarms are not required in exits, including exit passageways and interior or exterior exit stairs or ramps (Section 907.5.2.3 Exception 2).

There are other situations in which the loud noise and flashing light typical of alarm notification devices may not be desirable. For example, alarms in operating areas and some patient areas of hospitals, such as intensive or critical care units, could be hazardous. The activation of the alarm could startle a doctor during a delicate operation or panic patients incapable of self-evacuation. While audible and visible alarms are technically required throughout, alternative means consistent with standard hospital practice, such as central notification points occupied by staff trained to assist with evacuation, are permitted where approved by the building official (Section 907.2.6 Exception 2, 907.5.2.1 Exception 1, 907.5.2.3, Exception 4).

In addition to visible and audible alarms, specific code provisions require a public address system be part of the alarm notification system in large assembly buildings, schools, special amusement buildings, high-rise buildings, underground buildings and covered mall buildings (Sections 907.2.1.1, 907.2.3, 907.2.12.3, 907.2.13, 907.2.19, 907.2.20, respectively). This would allow for the delivery of verbal instructions in the event of unsafe crowd responses or potential confusion regarding egress paths. Captioning of this communication is required in stadiums, arenas and grandstands (Section 907.2.1.2). This aids persons with hearing impairments and the general population that cannot hear the announcement due to distortion or noise levels.

In mercantile facilities, a voice announcement may be used to notify occupants (Section 907.2.7.1). Because the original alarm signal must be sent to a constantly attended location, this option is typically used only when the store is open for business, with the audible and visible alarm notification system used during non-business hours. Per the fire evacuation plan provisions given in Section 404 of the 2015 *International Fire Code®*, the staff of facilities that employ this option must be trained to search the store to make sure occupants are aware of the emergency and the need for evacuation.

Institutional and Residential Facilities

Institutional and residential facilities may require visible and audible alarms under the IBC (Sections 907.5.2.3.2 and 907.5.2.3.3). Smoke alarms also are required in Groups I-1 assisted living facilities and in Group R residential occupancies (Section 907.2.11). While audible alarms must be capable of being heard throughout the building, visible alarms are not typically required within individual patient rooms, guestrooms or apartments (i.e. sleeping units and dwelling units).

Visible alarms must be installed in a minimum number of units in Group I-1 assisted living facilities and in Group R-1 hotels (Section 907.5.2.3.2). The units may or may not be the Accessible units; the number of units in which visible alarms are required is about double the number of Accessible units required (Section 1107). Units with visible alarms should be available upon request for persons with hearing impairments.

Group R-2 residential buildings—such as apartments, dormitories and congregate residences—are another special consideration (Section 907.5.2.3.3). When a building is required to have a general evacuation alarm, public areas such as lobbies, hallways and community dining rooms are required to have visible and audible alarms. The general alarm notification must be audible within the residential units. Visible alarm notification appliances are not required within each unit, but visible notification can be easily made available when requested for persons with hearing impairments, via

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the smoke alarms within their units.

Single- or multiple-station smoke alarms are required within each sleeping room, immediately outside of all sleeping rooms, and on each floor level in a suite or dwelling unit (Section 907.2.11.2). When multiple smoke alarms are installed in a unit, they must be interconnected (Section 907.2.11.5). In Group R-2 facilities, when a building evacuation alarm system is installed, a wire from the general system must be provided to one of the smoke detectors in the unit (Section 907.5.2.3.3 and ICC/ANSI A117.1, *Standard on Accessible and Usable Buildings and Facilities*, Section 1006.4).

When a person with a hearing impairment wants visible notification in their apartment, it is easy to switch out the typical audible smoke detectors for smoke detectors that have visible and audible alarms (Note: Alarm devices must be listed for the purpose they are to serve). Through the existing wiring, the general building evacuation alarm will be connected to the smoke detectors. Note that while hearing-impaired residents will not know whether notification is due to a general alarm or an alarm within their units, they can at least be notified of a possible emergency situation. Also note it is neither intended nor desirable that smoke alarms within a unit set off the general building alarm evacuation system due to the possibility of frequent false alarms.

Conclusion

All persons and situations must be considered when specifying a fire alarm system. With few exceptions, audible alarms are required throughout a building, and visible notification is required in all public-use areas and all common-use areas. Private areas also must be designed to allow for the installation of visible alarms when a person with a hearing impairment requests that accommodation. In limited situations where alternative systems are permitted (e.g. hospitals), staff must be continually available to provide appropriate assistance. **bsj**