**Chapter 18 Notification Appliances**

18.1\* Application

18.1.1

The requirements of this chapter shall apply where required by the authority having jurisdiction governing laws, codes, or standards; or other parts of this Code.

18.1.2

The requirements of this chapter shall address the reception of a notification signal and not the signal's information content.

18.1.3

The performance, location, and mounting of notification appliances used to initiate or direct evacuation or relocation of the occupants, or for providing information to occupants or staff, shall comply with this chapter.

18.1.4

The performance, location, and mounting of annunciators, displays, and printers used to display or record information for use by occupants, staff, responding emergency personnel, or supervising station personnel shall comply with this chapter.

18.1.5\*

The requirements of this chapter shall apply to the areas, spaces, or system functions where required by the authority having jurisdiction governing laws, codes, or standards; or other parts of this Code requiring compliance with this chapter.

18.1.6

Notification appliances shall be permitted to be used within buildings or outdoors and to target the general building, area, or space, or only specific parts of a building, area, or space designated in specific zones and sub-zones.

18.1.7

The requirements of Chapters 10, 14, 23, and 24 shall apply to the interconnection of notification appliances, the control configurations, the power supplies, and the use of the information provided by notification appliances.

18.2 Purpose

Notification appliances shall provide stimuli for initiating emergency action and provide information to users, emergency response personnel, and occupants.

18.3 General

18.3.1 Listing

All notification appliances installed in conformity with Chapter 18 shall be listed for the purpose for which they are used.

18.3.2 Nameplates

18.3.2.1

Notification appliances shall include on their nameplates reference to electrical requirements and rated audible or visual performance, or both, as defined by the listing authority.

18.3.2.2

Audible appliances shall include on their nameplates reference to their parameters or reference to installation documents (supplied with the appliance) that include the parameters in accordance with 18.4.4 or 18.4.5.

18.3.2.3

Visual notification appliances shall include on their nameplates reference to their parameters or reference to installation documents (supplied with the appliance) that include the parameters in accordance with 18.5.3.1 or Section 18.6.

18.3.3 Physical Construction

18.3.3.1

Appliances intended for use in special environments, such as outdoors versus indoors, high or low temperatures, high humidity, dusty conditions, and hazardous locations, or where subject to tampering, shall be listed for the intended application.

18.3.3.2\*

Notification appliances used for signaling other than fire shall not have the word FIRE, or any fire symbol, in any form (i.e., stamped, imprinted, etc.) on the appliance visible to the public.

18.3.3.3

Notification appliances with multiple visible elements used for signaling other than fire shall be permitted to have fire markings only on those visible elements used for fire signaling.

18.3.4\* Mechanical Protection

18.3.4.1

Appliances subject to mechanical damage shall be suitably protected.

18.3.4.2

If guards, covers, or lenses are employed, they shall be listed for use with the appliance.

18.3.4.3

The effect of guards, covers, or lenses on the appliance's field performance shall be in accordance with the listing requirements.

18.3.5 Mounting

18.3.5.1

Appliances shall be supported independently of their attachments to the circuit conductors.

18.3.5.2

Appliances shall be mounted in accordance with the manufacturer's published instructions.

18.3.6\* Connections

Terminals, leads, or addressable communication, that provide for monitoring the integrity of the notification appliance connections shall be provided.

18.4 Audible Characteristics

18.4.1 General Requirements

18.4.1.1\*

An average ambient sound level greater than 105 dBA shall require the use of a visual notification appliance(s) in accordance with Section 18.5 where the application is public mode or Section 18.6 where the application is private mode.

18.4.1.2\*

The total sound pressure level produced by combining the ambient sound pressure level with all audible notification appliances operating shall not exceed 110 dBA at the minimum hearing distance.

18.4.1.3\*

Sound from normal or permanent sources, having a duration of at least 60 seconds, shall be included when measuring maximum ambient sound level.

18.4.1.4

Sound from temporary or abnormal sources lasting less than 60 seconds shall not be required to be included when measuring maximum ambient sound level.

18.4.1.5

Audible alert and evacuation signal tones, including those that precede or follow voice messages, shall meet the requirements of 18.4.4 (Public Mode Audible Requirements), 18.4.5 (Private Mode Audible Requirements), 18.4.6 (Sleeping Area Requirements), or 18.4.7 (Narrow Band Tone Signaling for Exceeding Masked Thresholds), as applicable.

18.4.1.5.1\*

The designer of the audible notification system shall identify the rooms and spaces that will have audible notification and those where audible notification will not be provided.

18.4.1.5.2\*

Unless otherwise required by other sections of this Code, the coverage area for audible occupant notification shall be as required by other governing laws, codes, or standards.

18.4.1.5.3

Where other governing laws, codes, or standards require audible occupant notification for all or part of an area or space, coverage shall only be required in occupiable areas as defined in 3.3.187.

18.4.1.5.4

The sound pressure levels that must be produced by the audible appliances in the coverage areas to meet the requirements of this Code shall be documented by the system designer during the planning and design of the notification system.

18.4.1.5.5

The greater of the expected average ambient sound pressure level or expected maximum sound pressure level having a duration of at least 60 seconds shall be documented for the coverage area by the system designer to ensure compliance with 18.4.4, 18.4.5, 18.4.6, or 18.4.7.

18.4.1.5.6

The design sound pressure levels to be produced by the notification appliances for the various coverage areas shall be documented for use during acceptance testing of the system.

18.4.1.5.7

Where required by the authority having jurisdiction, documentation of the design sound pressure levels for the various coverage areas shall be submitted for review and approval.

18.4.1.6\*

Voice messages shall not be required to meet the audibility requirements of 18.4.4 (Public Mode Audible Requirements), 18.4.5 (Private Mode Audible Requirements), 18.4.6 (Sleeping Area Requirements), or 18.4.7 (Narrow Band Tone Signaling for Exceeding Masked Thresholds), but shall meet the intelligibility requirements of 18.4.11 where voice intelligibility is required.

18.4.1.7

Audible notification appliances used for exit marking shall not be required to meet the audibility requirements of 18.4.4 (Public Mode Audible Requirements), 18.4.5 (Private Mode Audible Requirements), 18.4.6 (Sleeping Area Requirements), or 18.4.7 (Narrow Band Tone Signaling for Exceeding Masked Thresholds), except as required by 18.4.8 (Exit Marking Audible Notification Appliance Requirements).

18.4.2 Distinctive Evacuation Signal

18.4.2.1\*

To meet the requirements of Section 10.10, the alarm audible signal pattern used to notify building occupants of the need to evacuate (leave the building) or relocate (from one area to another) shall be the standard alarm evacuation signal consisting of a three-pulse temporal pattern. The pattern shall be in accordance with Figure 18.4.2.1 and shall consist of the following in this order:

"On" phase lasting 0.5 second ±10 percent

"Off" phase lasting 0.5 second ±10 percent for three successive "on" periods

"Off phase lasting 1.5 seconds ±10 percent

Exception: Where approved by the authority having jurisdiction, continued use of the existing consistent evacuation signaling scheme shall be permitted.

Key:

Phase (a) signal is on for 0.5 sec ±10%

Phase (b) signal is off for 0.5 sec ±10%

Phase (c) signal is off for 1.5 sec ±10% [(c) = (a) + 2(b)]

Total cycle lasts for 4 sec ±10%

FIGURE 18.4.2.1 Temporal Pattern Parameters.

18.4.2.2

A single-stroke bell or chime sounded at "on" intervals lasting 1 second ±10 percent, with a 2-second ±10 percent "off" interval after each third "on" stroke, shall be permitted.

18.4.2.3

The signal shall be repeated for a period appropriate for the purposes of evacuation of the building, but for not less than 180 seconds.

18.4.2.3.1

The minimum repetition time shall be permitted to be manually interrupted.

18.4.2.3.2

The minimum repetition time shall be permitted to be automatically interrupted for the transmission of mass notification messages in accordance with Chapter 24.

18.4.2.4\*

The standard evacuation signal shall be synchronized within a notification zone.

18.4.3 Distinctive Carbon Monoxide Audible Alarm Signal

18.4.3.1

Where a carbon monoxide detector or alarm is required by other codes or standards or by the authority having jurisdiction and where an audible signal is required, a distinctive signal pattern shall be required that is different from a fire evacuation signal.

18.4.3.2

Where an audible signal is required, the carbon monoxide signal shall be a four-pulse temporal pattern and comply with the following:

Signals shall be a pattern consisting of four cycles of 100 milliseconds ± 10 percent "on" and 100 milliseconds ± 10 percent "off," followed by 5 seconds ±10 percent "off," as demonstrated in Figure 18.4.3.2.

After the initial 4 minutes of the carbon monoxide signal, the 5-second "off" time shall be permitted to be changed to 60 seconds ±10 percent.

The alarm signal shall be repeated in compliance with 18.4.3.2(1) and 18.4.3.2(2) until the alarm resets or the alarm signal is manually silenced.

Phase a: signal is on for 100 ms ± 10 ms.

Phase b: signal is off for 100 ms ± 10 ms.

Phase c: signal is off for 5 sec ± 0.5 sec for initial 4 minutes.

After the initial 4 minutes Phase c: signal is permitted to be changed to 60 s ± 6 s off.

Although the diagram shows a square waveform, the wave can have other shapes that produce a similar effect.

FIGURE 18.4.3.2 Temporal Pattern Parameters — Carbon Monoxide Signal.

18.4.3.3

The signal shall be synchronized within a notification zone of a protected premises.

18.4.3.4

The audible signal of carbon monoxide alarms and systems installed to meet the requirements of Chapter 29 shall not be required to be synchronized.

18.4.4\* Public Mode Audible Requirements

18.4.4.1\*

To ensure that audible public mode signals are clearly heard, unless otherwise permitted by 18.4.4.2 through 18.4.4.5, they shall have a sound level at least 15 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA).

18.4.4.2

Where approved by the authority having jurisdiction or other governing codes or standards, the requirements for audible signaling shall be permitted to be reduced or eliminated when visual signaling is provided in accordance with Section 18.5.

18.4.4.3

Audible notification appliances installed in elevator cars shall be permitted to use the audibility criteria for private mode appliances detailed in 18.4.5.1.

18.4.4.4

If approved by the authority having jurisdiction, audible notification appliances installed in restrooms shall be permitted to use the audibility criteria for private mode appliances detailed in 18.4.5.1.

18.4.4.5

A signaling system arranged to stop or reduce ambient noise shall comply with 18.4.4.5.1 through 18.4.4.5.3.

18.4.4.5.1

A signaling system arranged to stop or reduce ambient noise shall produce a sound level at least 15 dB above the reduced average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds after reduction of the ambient noise level, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA).

18.4.4.5.2

Visual notification appliances shall be installed in the affected areas in accordance with Sections 18.5 or 18.6.

18.4.4.5.3

Relays, circuits, or interfaces necessary to stop or reduce ambient noise shall meet the requirements of Chapters 10, 12, 21, and 23.

18.4.5 Private Mode Audible Requirements

18.4.5.1\*

To ensure that audible private mode signals are clearly heard, they shall have a sound level at least 10 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA).

18.4.5.2\*

Where approved by the authority having jurisdiction or other governing codes or standards, the requirements for audible signaling shall be permitted to be reduced or eliminated when visual signaling is provided in accordance with Section 18.5.

18.4.5.3

A system arranged to stop or reduce ambient noise shall comply with 18.4.5.3.1 through 18.4.5.3.3.

18.4.5.3.1

A system arranged to stop or reduce ambient noise shall be permitted to produce a sound level at least 10 dB above the reduced average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds after reduction of the ambient noise level, whichever is greater, measured 5 ft (1.5 m) above the floor, using the A-weighted scale (dBA).

18.4.5.3.2

Visual notification appliances shall be installed in the affected areas in accordance with Sections 18.5 or 18.6.

18.4.5.3.3

Relays, circuits, or interfaces necessary to stop or reduce ambient noise shall meet the requirements of Chapters 10, 12, 21, and 23.

18.4.6 Sleeping Area Requirements

18.4.6.1\*

Where audible appliances are installed to provide signals for sleeping areas, they shall have a sound level of at least 15 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds or a sound level of at least 75 dBA, whichever is greater, measured at the pillow level in the area required to be served by the system using the A-weighted scale (dBA).

18.4.6.2

If any barrier, such as a door, curtain, or retractable partition, is located between the notification appliance and the pillow, the sound pressure level shall be measured with the barrier placed between the appliance and the pillow.

18.4.6.3\*

Audible appliances provided for the sleeping areas to awaken occupants shall produce a low frequency alarm signal that complies with the following:

The waveform shall have a fundamental frequency of 520 Hz ± 10 percent.

\* The notification equipment shall be listed for producing the low frequency waveform.

18.4.7\* Narrow Band Tone Signaling for Exceeding Masked Thresholds

18.4.7.1 Masked Threshold Allowance

Audible tone signaling shall be permitted to comply with the masked threshold requirements in this subsection in lieu of the A-weighted signaling requirements in 18.4.4 and 18.4.5.

18.4.7.2\* Calculation Method

The effective masked threshold shall be calculated in accordance with ISO 7731, Danger signals for public and work places — Auditory danger signals.

18.4.7.3 Noise Data

Noise data for calculating the effective masked threshold shall be the peak value of noise lasting 60 seconds or more for each octave or one-third octave band.

18.4.7.4 Documentation

Analysis and design documentation shall be submitted to the authority having jurisdiction and shall contain the following information:

Frequency data for the ambient noise, including the date, time, and location where measurements were taken for existing environments, or projected data for environments not yet constructed

Frequency data of the audible notification appliance

Calculations of the effective masked threshold for each set of noise data

A statement of the sound pressure level that would be required by 18.4.4 or 18.4.5 if masked threshold signaling had not been done

18.4.7.5 Sound Pressure Level

For masked threshold signaling, the audible signal tone shall meet the requirements of either 18.4.7.5.1 or 18.4.7.5.2 but not for the reproduction of prerecorded, synthesized, or live messages.

18.4.7.5.1

The sound pressure level of the audible tone signal shall exceed the masked threshold in one or more octave bands by at least 10 dB in the octave band under consideration.

18.4.7.5.2

The sound pressure level of the audible tone signal shall exceed the masked threshold in one or more one-third octave bands by at least 13 dB in the one-third octave band under consideration.

18.4.8 Exit Marking Audible Notification Appliance Requirements

18.4.8.1\*

Exit marking audible notification appliances shall meet or exceed the frequency and sound level settings and guidelines specified in the manufacturer's documented instructions.

18.4.8.2\*

In addition to 18.4.8.1, as a minimum, to ensure that exit marking audible notification appliance signals are clearly heard and produce the desired directional effects for 50 ft (15.24 m) within an unobstructed egress path, they shall meet the audibility requirements of 18.4.7 in at least one one-third octave band or one octave band within the effective frequency ranges of the interaural time difference (ITD), interaural level or intensity difference (ILD or IID), and anatomical transfer function or head-related transfer function (ATF or HRTF) localization cues.

18.4.8.3

The exit marking audible notification appliance signal shall penetrate both the ambient noise and the fire alarm signal.

18.4.8.4

Where required by the authority having jurisdiction governing laws, codes, or standards; or other parts of this Code, exit marking audible notification appliances shall be installed in accordance with the manufacturer's published instructions.

18.4.8.5\*

Where required by the authority having jurisdiction governing laws, codes, or standards; or other parts of this Code, exit marking audible notification shall be located at the entrance to all building exits and areas of refuge as defined by the applicable building or fire code.

18.4.8.6

Where exit marking audible notification appliances are utilized to mark areas of refuge, they shall provide an audible signal distinct from that used for other exits that do not have areas of refuge.

18.4.9 Location of Audible Notification Appliances for Building or Structure

18.4.9.1

If ceiling heights allow, and unless otherwise permitted by 18.4.9.2 through 18.4.9.5, wall-mounted appliances shall have their tops above the finished floors at heights of not less than 90 in. (2.29 m) and below the finished ceilings at distances of not less than 6 in. (150 mm).

18.4.9.2

Ceiling-mounted or recessed appliances shall be permitted.

18.4.9.3

If combination audible/visual notification appliances are installed, the location of the installed appliance shall be determined by the requirements of 18.5.5.

18.4.9.4

Appliances that are an integral part of a smoke detector, carbon monoxide detector, smoke alarm, carbon monoxide alarm, or other initiating device shall be located in accordance with the requirements for that device.

18.4.9.5

Mounting heights other than required by 18.4.9.1 and 18.4.9.2 shall be permitted, provided that the sound pressure level requirements of 18.4.4 for public mode or 18.4.5 for private mode, or 18.4.6 for sleeping areas, based on the application, are met.

18.4.10 Location of Audible Notification Appliances for Wide-Area Signaling

Audible notification appliances for wide-area signaling shall be installed in accordance with the requirements of the authority having jurisdiction, approved design documents, and the manufacturer's installation instruction to achieve the required performance.

18.4.11\* Voice Intelligibility

Within the acoustically distinguishable spaces (ADS) where voice intelligibility is required, voice communications systems shall reproduce prerecorded, synthesized, or live (e.g., microphone, telephone handset, and radio) messages with voice intelligibility.

18.4.11.1\*

ADSs shall be determined by the system designer during the planning and design of all emergency communications systems.

18.4.11.2

Each ADS shall be identified as requiring or not requiring voice intelligibility.

18.4.11.3\*

Unless specifically required by other governing laws, codes, or standards, or by other parts of this Code, intelligibility shall not be required in all ADSs.

18.4.11.4\*

Where required by the authority having jurisdiction governing laws, codes, or standards; or other parts of this Code, ADS assignments shall be submitted for review and approval.

18.4.11.5

Quantitative measurements shall not be required.

18.4.11.6

Quantitative measurements shall be permitted. (See D.2.4.)

18.5\* Visual Characteristics — Public Mode

18.5.1\* Visual Signaling

18.5.1.1

Public mode visual signaling shall meet the requirements of Section 18.5 using visual notification appliances.

18.5.1.2\*

The coverage area for visual notification shall be as required by other governing laws, codes, or standards.

18.5.1.3

Where other governing laws, codes, or standards require visual notification for all or part of an area or space, coverage shall only be required in occupiable areas as defined in 3.3.187.

18.5.2 Area of Coverage

18.5.2.1

The designer of the visual notification system shall document the rooms and spaces that will have visual notification and those where visual notification will not be provided.

18.5.2.2\*

Unless otherwise specified or required by other sections of this Code, the required coverage area for visual notification shall be as required by other governing laws, codes, or standards.

18.5.2.3

Where required by the authority having jurisdiction, documentation of the effective intensity (cd) of the visual notification appliances for the area of coverage shall be submitted for review and approval.

18.5.3 Light, Color, and Pulse Characteristics

18.5.3.1

The flash rate shall not exceed two flashes per second (2 Hz) nor be less than one flash every second (1 Hz) throughout the listed voltage range of the appliance.

18.5.3.2

The maximum light pulse duration shall be 20 milliseconds, except as permitted in 18.5.3.3.

18.5.3.3\*

Light pulse durations greater than 20 milliseconds, but not greater than 100 milliseconds, shall be permitted where the alerting capability of the visual notification appliance is demonstrated to be equal to or greater than visual notification appliances with a 20-millisecond pulse duration.

18.5.3.4

The pulse duration shall be defined as the time interval between initial and final points of 10 percent of maximum signal.

18.5.3.5\*

Visual notification appliances used for fire alarm signaling only or to signal the intent for complete evacuation shall be clear or nominal white and shall not exceed 1000 cd (effective intensity).

18.5.3.6

Visual notification appliances used to signal occupants to seek information or instructions shall be clear, nominal white, or other color as required by the emergency plan and the authority having jurisdiction for the area or building.

18.5.3.7\*

The visual synchronization requirements of this chapter shall not apply where the visual notification appliances located inside the building are viewed from outside of the building.

18.5.3.8

Visual notification appliances used for carbon monoxide signaling shall be as required by the emergency plan and the authority having jurisdiction for the area or building and shall not exceed 1000 cd (effective intensity).

18.5.4\* Appliance Photometries

The light output shall comply with the polar dispersion requirements for public mode signaling as described in ANSI/UL 1971, Standard for Signaling Devices for the Hearing Impaired, ANSI/UL 1638, Standard for Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories, or equivalent.

18.5.5 Appliance Location

18.5.5.1\*

Wall-mounted appliances shall be mounted such that the entire lens is not less than 80 in. (2.03 m) and not greater than 96 in. (2.44 m) above the finished floor or at the mounting height specified using the performance-based alternative of 18.5.5.7.

18.5.5.2

Where low ceiling heights do not permit wall mounting at a minimum of 80 in. (2.03 m), wall mounted visual notification appliances shall be mounted within 6 in. (150 mm) of the ceiling.

18.5.5.3

Where low ceiling heights do not permit wall mounting at a minimum of 80 in. (2.03 m), the room size covered by a visual notification appliance of a given value shall be reduced by twice the difference between the minimum mounting height of 80 in. (2.03 m) and the actual lower mounting height.

18.5.5.4\*

Visual notification appliances listed for mounting parallel to the floor shall be permitted to be located on the ceiling or suspended below the ceiling.

18.5.5.5\* Spacing in Rooms

18.5.5.5.1\*

Spacing shall be in accordance with either Table 18.5.5.5.1(a) and Figure 18.5.5.5.1 or Table 18.5.5.5.1(b).

Table 18.5.5.5.1(a) Room Spacing for Wall-Mounted Visual Notification Appliances

Maximum Room Size Minimum Required Light Output [Effective Intensity (cd)]

ft m One Visual Notification Appliance per Room Four Visual Notification Appliances per Room (One per Wall)

20 × 20 6.10 × 6.10 15 NA

28 × 28 8.53 × 8.53 30 NA

30 × 30 9.14 × 9.14 34 NA

40 × 40 12.2 × 12.2 60 15

45 × 45 13.7 × 13.7 75 19

50 × 50 15.2 × 15.2 94 30

54 × 54 16.5 × 16.5 110 30

55 × 55 16.8 × 16.8 115 30

60 × 60 18.3 × 18.3 135 30

63 × 63 19.2 × 19.2 150 37

68 × 68 20.7 × 20.7 177 43

70 × 70 21.3 × 21.3 184 60

80 × 80 24.4 × 24.4 240 60

90 × 90 27.4 × 27.4 304 95

100 × 100 30.5 × 30.5 375 95

110 × 110 33.5 × 33.5 455 135

120 × 120 36.6 × 36.6 540 135

130 × 130 39.6 × 39.6 635 185

NA: Not allowable.

Table 18.5.5.5.1(b) Room Spacing for Ceiling-Mounted Visual Notification Appliances.

Maximum Room Size Maximum Lens Height\* Minimum Required Light Output (Effective Intensity); One Visual Notification Appliance (cd)

ft m ft m

20 × 20 6.1 × 6.1 10 3.0 15

30 × 30 9.1 × 9.1 10 3.0 30

40 × 40 12.2 × 12.2 10 3.0 60

44 × 44 13.4 × 13.4 10 3.0 75

20 × 20 6.1 × 6.1 20 6.1 30

30 × 30 9.1 × 9.1 20 6.1 45

44 × 44 13.4 × 13.4 20 6.1 75

46 × 46 14.0 × 14.0 20 6.1 80

20 × 20 6.1 × 6.1 30 9.1 55

30 × 30 9.1 × 9.1 30 9.1 75

50 × 50 15.2 × 15.2 30 9.1 95

53 × 53 16.2 × 16.2 30 9.1 110

55 × 55 16.8 × 16.8 30 9.1 115

59 × 59 18.0 × 18.0 30 9.1 135

63 × 63 19.2 × 19.2 30 9.1 150

68 × 68 20.7 × 20.7 30 9.1 177

70 × 70 21.3 × 21.3 30 9.1 185

\*This does not preclude mounting lens at lower heights.

FIGURE 18.5.5.5.1 Room Spacing for Wall-Mounted Visual Notification Appliances.

18.5.5.5.2

Visual notification appliances shall be installed in accordance with Table 18.5.5.5.1(a) or Table 18.5.5.5.1(b) using one of the following:

A single visual notification appliance.

\*Two groups of visual notification appliances, where visual notification appliances of each group are synchronized, in the same room or adjacent space within the field of view. This shall include synchronization of visual appliances operated by separate systems.

More than two visual notification appliances or groups of synchronized appliances in the same room or adjacent space within the field of view that flash in synchronization.

18.5.5.5.3

Room spacing in accordance with Table 18.5.5.5.1(a) and Figure 18.5.5.5.1 for wall-mounted appliances shall be based on locating the visual notification appliance at the halfway distance of the wall.

18.5.5.5.4

In square rooms with appliances not centered or in nonsquare rooms, the effective intensity (cd) from one wall-mounted visual notification appliance shall be determined by maximum room size dimensions obtained either by measuring the distance to the farthest wall or by doubling the distance to the farthest adjacent wall, whichever is greater, as required by Table 18.5.5.5.1(a) and Figure 18.5.5.5.1.

18.5.5.5.5

If a room configuration is not square, the square room size that allows the entire room to be encompassed or allows the room to be subdivided into multiple squares shall be used.

18.5.5.5.6\*

If ceiling heights exceed 30 ft (9.1 m), ceiling-mounted visual notification appliances shall be suspended at or below 30 ft (9.1 m) or at the mounting height determined using the performance-based alternative of 18.5.5.7, or wall-mounted visual notification appliances shall be installed in accordance with Table 18.5.5.5.1(a).

18.5.5.5.7

Table 18.5.5.5.1(b) shall be used if the ceiling-mounted visual notification appliance is at the center of the room.

18.5.5.5.8

If the ceiling-mounted visual notification appliance is not located at the center of the room, the effective intensity (cd) shall be determined by doubling the distance from the appliance to the farthest wall to obtain the maximum room size.

18.5.5.6\* Spacing in Corridors

18.5.5.6.1

The installation of visual notification appliances in corridors 20 ft (6.1 m) or less in width shall be in accordance with the requirements of either 18.5.5.5 or 18.5.5.6.

18.5.5.6.2

Paragraph 18.5.5.6 shall apply to corridors not exceeding 20 ft (6.1 m) in width.

18.5.5.6.3

In a corridor application, visual notification appliances shall be rated not less than 15 cd.

18.5.5.6.4

Corridors greater than 20 ft (6.1 m) wide shall comply with the spacing requirements for rooms in accordance with 18.5.5.5.

18.5.5.6.5\*

Visual notification appliances shall be located not more than 15 ft (4.6.m) from the end of the corridor with a separation not greater than 100 ft (30.5 m) between appliances.

18.5.5.6.6

If there is an interruption of the concentrated viewing path, such as a fire door, an elevation change, or any other obstruction, the area shall be treated as a separate corridor.

18.5.5.6.7

In corridors where more than two visual notification appliances are in any field of view, they shall flash in synchronization.

18.5.5.6.8

Wall-mounted visual notification appliances in corridors shall be permitted to be mounted on either the end wall or the side wall of the corridor in accordance with spacing requirements of 18.5.5.6.5.

18.5.5.7\* Performance-Based Alternative

18.5.5.7.1

Any design that provides a minimum of 0.0375 lumens/ft2 (0.4036 lumens/m2) of illumination at any point within the covered area at all angles specified by the polar dispersion planes for wall- or ceiling-mounted public mode visual notification appliances in ANSI/UL 1971, Standard for Signaling Devices for the Hearing Impaired, ANSI/UL 1638, Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories, or equivalent, as calculated for the maximum distance from the nearest visual notification appliance, shall be permitted in lieu of the requirements of 18.5.5, excluding 18.5.5.8.

18.5.5.7.2

Documentation provided to the authority having jurisdiction shall include the following:

Inverse Square Law calculations using each of the vertical and horizontal polar distribution angles in ANSI/UL 1971, Standard for Signaling Devices for the Hearing Impaired, or equivalent.

The calculations shall account for the effects of polar distribution using one of the following:

The percentages from the applicable table(s) in ANSI/UL 1971, Standard for Signaling Devices for the Hearing Impaired, or equivalent.

The actual results of laboratory tests of the specific appliance to be used as recorded by the listing organization

18.5.5.8 Sleeping Areas

18.5.5.8.1

Combination smoke detectors and visual notification appliances or combination smoke alarms and visual notification appliances shall be installed in accordance with the applicable requirements of Chapters 17, 18, 23, and 29.

18.5.5.8.2

Combination carbon monoxide detectors or alarms with visual notification appliances shall be located in accordance with the applicable requirements for the visual notification appliance and the applicable requirements for the carbon monoxide detector or alarm of Chapters 17, 18, 23, and 29.

18.5.5.8.3\*

Table 18.5.5.8.3 shall apply to the minimum required intensity of visual notification appliances in sleeping areas after establishing the mounting height.

Table 18.5.5.8.3 Effective Intensity Requirements for Sleeping Area Visual Notification Appliances

Distance from Ceiling to Top of Lens Minimum Intensity

(cd)

in. mm

≥24 ≥610 110

<24 <610 177

18.5.5.8.4

For rooms with a linear dimension greater than 16 ft (4.9 m), the visual notification appliance shall be located within 16 ft (4.9 m) of the pillow.

18.5.6 Location of Visual Notification Appliances for Wide-Area Signaling

Visual notification appliances for wide-area signaling shall be installed in accordance with the requirements of the authority having jurisdiction, approved design documents, and the manufacturer's published instructions to achieve the required performance.

18.6\* Visual Characteristics — Private Mode

Visual notification appliances used in the private mode shall be of a sufficient quantity and intensity and located so as to meet the intent of the user and the authority having jurisdiction.

18.7 Supplementary Visual Signaling Method

A supplementary visual notification appliance shall be intended to augment an audible or visual signal.

18.7.1

A supplementary visual notification appliance shall comply with its marked rated performance.

18.7.2

Supplementary visual notification appliances shall be permitted to be located less than 80 in. (2.03 m) above the floor.

18.8 Textual Audible Appliances

18.8.1 Loudspeaker Appliances

18.8.1.1

Loudspeaker appliances shall comply with Section 18.4.

18.8.1.2\*

The sound pressure level, in dBA, of the tone produced by a signaling loudspeaker shall comply with all the requirements in 18.4.4 (public), 18.4.5 (private), or 18.4.6 (sleeping) for the intended mode or shall comply with the requirements of 18.4.7 (narrow band tone signaling).

18.8.2 Telephone Appliances

Telephone appliances shall be in accordance with Section 24.8.

18.9\* Textual and Graphical Visual Appliances

18.9.1 Application

18.9.1.1

Textual and graphical visual appliances shall be permitted to be used to signal information about fire or other emergency conditions or to direct intended responses to those conditions.

18.9.1.2

This section does not apply to means of egress signs, room identification signs, and other signage that could be required by other governing laws, codes, or standards.

18.9.1.3

Textual visual appliance messages shall be permitted to be static, flashing, or scrolling.

18.9.2 Location

18.9.2.1 Private Mode

Unless otherwise permitted or required by other governing laws, codes, or standards, or by other parts of this Code or by the authority having jurisdiction, all textual and graphical visual notification appliances in the private mode shall be located in rooms that are accessible only to those persons directly concerned with the implementation and direction of emergency response in the areas protected by the system.

18.9.2.2 Public Mode

Textual and graphical visual notification appliances used in the public mode shall be located to ensure visibility to the occupants of the protected area or to the intended recipients.

18.9.2.3 Mounting

Desktop and surface-mounted textual and graphical visual notification appliances shall be permitted.

18.9.3 Performance

The information produced by textual and graphical visual appliances shall be clear and legible at the intended viewing distance.

18.9.4\* Character and Symbol Requirements and Viewing Distance

18.9.4.1

This section applies to visual characters and graphic elements and does not address raised characters or braille that could be required by other governing laws, codes, or standards.

18.9.4.2\*

Characters and symbols shall contrast with their background using either positive contrast (light on a dark background) or negative contrast (dark on a light background).

18.9.4.3

Characters and symbols and their background shall have a nonglare finish.

18.9.4.4\*

Characters shall be permitted to be uppercase or lowercase, or a combination of both.

18.9.4.5

Characters shall be conventional in form and not italic, oblique, script, highly decorative, or of other unusual form and shall use sans serif fonts.

18.9.4.6

Characters shall be selected from fonts where the width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I".

18.9.4.7\*

Character and symbol height for appliances other than desktop monitors or displays shall meet all of the following criteria:

Minimum character height shall comply with Table 18.9.4.7.

Viewing distance shall be measured as the horizontal distance between the character and an obstruction preventing further approach towards the appliance.

Character height shall be based on the uppercase letter "I".

Table 18.9.4.7 Visual Character and Graphic Symbol Height Based on Height and Distance

Horizontal Viewing Distance Minimum Character or Symbol Height for Installed Elevation

At 40 in. to 70 in. (1.0 m to 1.8 m) Above the Floor At Greater Than 70 in. to 120 in. (1.8 m to 3.1 m) Above the Floor At Greater Than 120 in. (3.0 m) Above the Floor

ft m in. mm in. mm in. mm

1 0.3 5/8 16 2 51 3 76

2 0.6 5/8 16 2 51 3 76

3 0.9 5/8 16 2 51 3 76

4 1.2 5/8 16 2 51 3 76

5 1.5 5/8 16 2 51 3 76

6 1.8 5/8 16 2 51 3 76

7 2.1 3/4 19 2 51 3 76

8 2.4 7/8 22 2 51 3 76

9 2.7 1 25 2 51 3 76

10 3 11/8 29 2 51 3 76

11 3.4 11/4 32 2 51 3 76

12 3.7 13/8 35 2 51 3 76

13 4 11/2 38 2 51 3 76

14 4.3 15/8 41 2 51 3 76

15 4.6 13/4 44 2 51 3 76

16 4.9 17/8 48 21/8 54 3 76

17 5.2 2 51 21/4 57 3 76

18 5.5 21/8 54 23/8 60 3 76

19 5.8 21/4 57 21/2 64 3 76

20 6.1 23/8 60 25/8 67 3 76

21 6.4 21/2 64 23/4 70 3 76

22 6.7 25/8 67 27/8 73 31/8 79

23 7 23/4 70 3 76 31/4 83

24 7.3 27/8 73 31/8 79 33/8 86

25 7.6 3 76 31/4 83 31/2 89

>25 >7.6 3 + h\* 76 + h\* 31/4 + h\* 83 + h\* 31/2 + h\* 89 + h\*

\*For each foot of horizontal viewing distance greater than 25 ft (7.6 m), add 1/8 in. (3 mm) to the character or symbol height.

18.9.4.8\*

All characters and symbols displayed by textual and graphical visual notification appliances shall be a minimum of 40 in. (1.02 m) above the ground or finished floor.

18.9.4.9

Stroke thickness of the uppercase letter "I" shall be minimum 10 percent and maximum 30 percent of the height of the character.

18.9.4.10

Character spacing shall be measured between the two closest points of adjacent characters, excluding word spaces. Spacing between individual characters shall be minimum 10 percent and maximum 35 percent of character height.

18.9.4.11

Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.

18.10 Tactile Appliances

Tactile appliances shall be permitted if used in addition to audible and/or visual notification appliances.

18.10.2\* Performance

Tactile appliances shall meet the performance requirements of ANSI/UL 1971, Standard for Signaling Devices for the Hearing Impaired, or equivalent

18.11\* Standard Emergency Service Interface

Where required by the enforcing authority; governing laws, codes, or standards; or other parts of this Code, annunciators, information display systems, and controls for portions of a system provided for use by emergency service personnel shall be designed, arranged, and located in accordance with the requirements of the organizations intended to use the equipment.