

mandatory and advisory control mounting height provisions for typical equipment.

Electrical receptacles installed to serve individual appliances and not intended for regular or frequent use by building occupants are not required to be mounted within the specified reach ranges. Examples would be receptacles installed specifically for wall-mounted clocks, refrigerators, and microwave ovens.

## A4.28 Alarms.

**A4.28.2 Audible Alarms.** Audible emergency signals must have an intensity and frequency that can attract the attention of individuals who have partial hearing loss. People over 60 years of age generally have difficulty perceiving frequencies higher than 10,000 Hz. An alarm signal which has a periodic element to its signal, such as single stroke bells (clang-pause-clang-pause), hi-low (up-down-up-down) and fast whoop (on-off-on-off) are best. Avoid continuous or reverberating tones. Select a signal which has a sound characterized by three or four clear tones without a great deal of "noise" in between.

**A4.28.3 Visual Alarms.** The specifications in this section do not preclude the use of zoned or coded alarm systems.

**A4.28.4 Auxiliary Alarms.** Locating visual emergency alarms in rooms where persons who are deaf may work or reside alone can ensure that they will always be warned when an emergency alarm is activated. To be effective, such devices must be located and oriented so that they will spread signals and reflections throughout a space or raise the overall light level sharply. However, visual alarms alone are not necessarily the best means to alert sleepers. A study conducted by Underwriters Laboratory (UL) concluded that a flashing light more than seven times brighter was required (110 candela v. 15 candela, at the same distance) to awaken sleepers as was needed to alert awake subjects in a normal daytime illuminated room.

For hotel and other rooms where people are likely to be asleep, a signal-activated vibrator placed between mattress and box spring or under a pillow was found by UL to be much more effective in alerting sleepers. Many readily available devices are sound-activated so that they could respond to an alarm clock, clock

radio, wake-up telephone call or room smoke detector. Activation by a building alarm system can either be accomplished by a separate circuit activating an auditory alarm which would, in turn, trigger the vibrator or by a signal transmitted through the ordinary 110-volt outlet. Transmission of signals through the power line is relatively simple and is the basis of common, inexpensive remote light control systems sold in many department and electronic stores for home use. So-called "wireless" intercoms operate on the same principal.

## A4.29 Detectable Warnings.

**A4.29.2 Detectable Warnings on Walking Surfaces.** The material used to provide contrast should contrast by at least 70%. Contrast in percent is determined by:

$$\text{Contrast} = [(B_1 \cdot B_2) / B_2] \times 100$$

where  $B_1$  = light reflectance value (LRV) of the lighter area  
and  $B_2$  = light reflectance value (LRV) of the darker area.

Note that in any application both white and black are never absolute; thus,  $B_1$  never equals 100 and  $B_2$  is always greater than 0.

## A4.30 Signage.

**A4.30.1 General.** In building complexes where finding locations independently on a routine basis may be a necessity (for example, college campuses), tactile maps or prerecorded instructions can be very helpful to visually impaired people. Several maps and auditory instructions have been developed and tested for specific applications. The type of map or instructions used must be based on the information to be communicated, which depends highly on the type of buildings or users.

Landmarks that can easily be distinguished by visually impaired individuals are useful as orientation cues. Such cues include changes in illumination level, bright colors, unique patterns, wall murals, location of special equipment or other architectural features.

Many people with disabilities have limitations in movement of their heads and reduced peripheral vision. Thus, signage positioned