

Detectable Warnings: Synthesis of U.S. and International Practice

12 May 2000

Accessible Design for the Blind

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For more relevant information, please visit the Armor Tile website. This website is an excellent resource on ADA solutions, ADA regulations and requirements, truncated domes, detectable warning surface tiles and more.

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Definition & specification

Definition of detectable warnings

A detectable warning is:

A standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired people of hazards on a circulation path. ADAAG 3.5

Detectable warnings are unique and standardized features, intended to function much like a stop sign. They alert pedestrians who are visually impaired to the presence of hazards in the line of travel, indicating that they should stop and determine the nature of the hazard before proceeding further.

Specification for detectable warnings

ADAAG specifies:

Detectable warnings shall consist of raised truncated domes with a diameter of nominal 0.9 in (23 mm), a height of nominal 0.2 in (5 mm) and a center-to-center spacing of nominal 2.35 in (60 mm) and shall contrast visually with adjoining surfaces, either light-on-dark or dark-on-light.

The material used to provide contrast shall be an integral part of the walking surface. Detectable warnings used on interior surfaces shall differ from adjoining walking surfaces in resiliency or sound-on-cane contact. ADAAG 4.29.2

Visual contrast

The appendix to ADAAG recommends that detectable warnings contrast visually with adjoining surfaces.

The material used to provide contrast should contrast by at least 70%. Contrast in percent is determined by:

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

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. ADAAG A4.29

Geometry of detectable warnings

Dome alignment & pattern

The detectable warning surface consists of truncated domes on a square pattern which are typically arranged in either of two configurations:

- Diagonal alignment
- Parallel alignment

Figure 2-1 illustrates how both configurations can comply with the ADAAG specification for detectable warning.

Depending on which configuration is used, the rows of domes will be aligned with, or at a 45° angle to:

- the curb or platform edge
- the direction of travel

Pedestrians encountering either configuration will find the surface pattern equally detectable.

Another acceptable and plausible arrangement of truncated domes uses an equilateral triangular grid. Only one U.S. manufacturer has ever chosen to produce a detectable warning surface using this pattern.

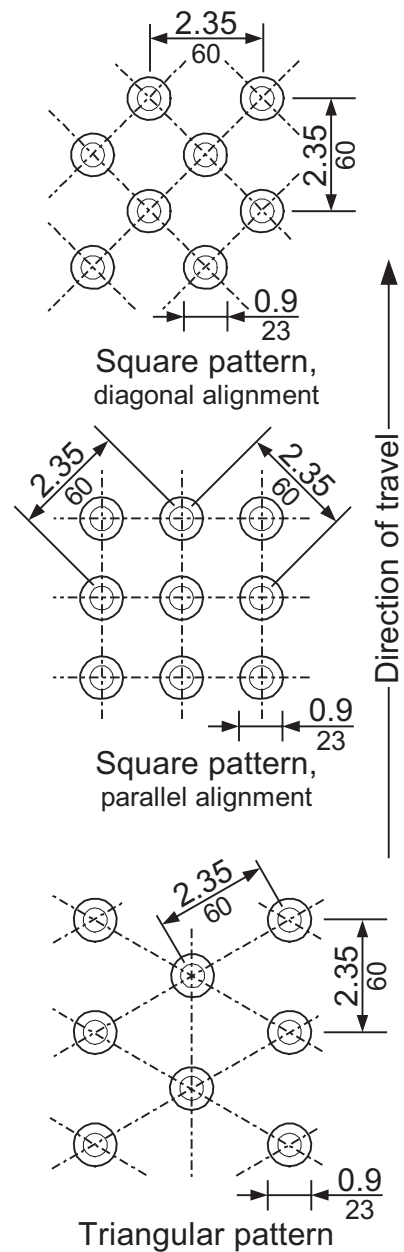
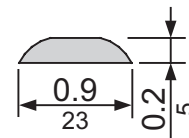


FIG. 2-1. PATTERNS AND ALIGNMENTS OF TRUNCATED DOMES COMPRISING THE ADAAG DETECTABLE WARNING.

Dome profile

FIG. 2-2. HEIGHT AND DIAMETER OF TRUNCATED DOMES USED IN ADAAG DETECTABLE WARNING.



Research on visual contrast

Contrast of detectable warnings

ADAAG 4.29.2 requires that detectable warnings contrast visually with adjoining surfaces, either dark on light, or light on dark. A 70% contrast in light reflectance between a detectable warning and an adjoining surface is recommended in the Appendix (A4.29.2).

Research shows value of safety yellow

Recent research indicates that the color safety yellow is so salient—even to persons having very low vision—that it is highly visible even when used in association with surfaces having light reflectance values differing by as little as 40% (new, gray-white concrete) (Bentzen, Nolin, and Easton, 1994a).

- A safety yellow detectable warning surface having a 40% reflectance difference from new concrete was subjectively judged more detectable than a darker warning surface which contrasted with new concrete by 86% (Bentzen et al., 1994a).
 - Hughes (1995) found that yellow or yellow-orange warning surfaces were preferred over black warning surfaces.
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Standards for safety yellow

Safety yellow is a color that is standardized for use as a warning in the pedestrian/highway environment.

- U.S. —ANSI Z535.1-1991, 6.3
 - Internationally—ISO 3864-1984(E)
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