



## Technical Memorandum

**To:** FILE

**From:** SDOT ADA Committee

**Date:** April 2, 2020

**Re:** Detectable Warning Surfaces: Requirements and Design & Installation Considerations

---

### **Overview and Purpose**

A detectable warning surface (DWS) is required where curb ramps or other pedestrian facilities intersect the roadway at street crossings. These warning features provide critical information to pedestrians with visual impairment where they may be entering a potentially hazardous area. The intent of this Technical Memorandum is to summarize current federal, Washington State, and local requirements and to clarify installation expectations in the Seattle public right-of-way.

Refer to regulations, standards, and guidance at the end of this document for a full listing of requirements and supplemental technical information.

### **DWS Material Contrast and Color Requirements Summary**

Per the ADA Standards and federal guidelines, a detectable warning surface must contrast with adjacent walking surfaces (light-on-dark, or dark-on light). There are no specific federal requirements for coloration of the DWS.

The State of Washington (WSDOT) and the City of Seattle require visual contrast (light-on-dark, or dark-on-light). Both agencies also require detectable warning surfaces to be federal yellow in color. Exceptions to the color specified may be made by the engineer in both cases.

### **User Preference Considerations**

While federal guidelines do not specify or require the use of a specific color for DWS, the state and local standard is federal yellow. Pedestrians in the region and the State have learned to identify yellow as the color of these warning features. It is important to provide a treatment that is consistent and predictable for users.

In addition, SDOT has solicited feedback from the disability community, including pedestrians with low-vision and mobility instructors. These outreach efforts have determined that the preference is clearly for a yellow detectable warning surface. Pedestrians with low vision may rely on the yellow DWS as a visually detectable cue in helping to navigate the City's streets and sidewalks. It has also been noted by the disability community that the use of darker colors for detectable warning can be confusing and may appear to be an opening or a void in the sidewalk surface.

While exceptions or deviations may be made on a case-by-case basis, engineers should strive to meet our state and local color requirements for DWS. A DWS surface should be considered as a feature to assist

people using city sidewalks and street crossings that should be consistent in application. Function and usability should be primary objectives over aesthetic value.

### **SDOT DWS Installation Expectations and Considerations**

In addition to contrast and color considerations, DWS materials and installation methods should also be acknowledged by engineers. SDOT's Maintenance and Operations Division (MOD) is the ultimate asset owner when curb ramps and sidewalks are installed in the Seattle public right-of-way. It is important that installations are compatible with our maintenance capabilities and expectations.

The City of Seattle [Plans and Specifications for Road, Bridge, and Municipal Construction](#) list DWS products that are acceptable for installation.

The standard plans indicate that DWS should not be cut or altered unless necessary, and if so, must be performed according to manufacturer's directions. Features that are cut or altered and installed without adequate anchoring or adhesion can become a maintenance concern over time.

While surface-mounted DWS may be applied in certain circumstances, MOD generally prefers that cast-in-place products are used with an option for replaceability in the future. Some DWS products may be removed and replaced without disrupting an existing curb ramp significantly. This can allow broken or failing DWS surfaces to be replaced without entirely reconstructing a curb ramp.

### **Regulations, Standards, and Guidance**

#### **1) 2006 DOT ADA Standards for Transportation Facilities**

**406.8 Detectable Warnings.** A curb ramp shall have a detectable warning complying with 705. The detectable warning shall extend the full width of the curb ramp (exclusive of flared sides) and shall extend either the full depth of the curb ramp or 24 inches (610 mm) deep minimum measured from the back of the curb on the ramp surface.

**705.1 General.** Detectable warnings shall consist of a surface of truncated domes and shall comply with 705.

**705.1.1 Dome Size.** Truncated domes in a detectable warning surface shall have a base diameter of 0.9 inch (23 mm) minimum and 1.4 inches (36 mm) maximum, a top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and a height of 0.2 inch (5.1 mm).

**705.1.2 Dome Spacing.** Truncated domes in a detectable warning surface shall have a center-to-center spacing of 1.6 inches (41 mm) minimum and 2.4 inches (61 mm) maximum, and a base-to-base spacing of 0.65 inch (17 mm) minimum, measured between the most adjacent domes on a square grid.

**705.1.3 Contrast.** Detectable warning surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light.

**705.2 Platform Edges.** Detectable warning surfaces at platform boarding edges shall be 24 inches (610 mm) wide and shall extend the full length of the public use areas of the platform.

#### **2) Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (2011)**

##### **R208 Detectable Warning Surfaces**

**R208.1 Where Required.** Detectable warning surfaces complying with R305 shall be provided at the following locations on pedestrian access routes and at transit stops:

1. Curb ramps and blended transitions at pedestrian street crossings;
2. Pedestrian refuge islands;
3. Pedestrian at-grade rail crossings not located within a street or highway;
4. Boarding platforms at transit stops for buses and rail vehicles where the edges of the boarding platform are not protected by screens or guards; and
5. Boarding and alighting areas at sidewalk or street level transit stops for rail vehicles where the side of the boarding and alighting areas facing the rail vehicles is not protected by screens or guards.

**R208.2 Where Not Required.** Detectable warning surfaces are not required at pedestrian refuge islands that are cut-through at street level and are less than 1.8 meters (6.0 ft) in length in the direction of pedestrian travel.

##### **R305 Detectable Warning Surfaces**

**R305.1 General.** Detectable warning surfaces shall consist of truncated domes aligned in a square or radial grid pattern and shall comply with R305.

**R305.1.1 Dome Size.** The truncated domes shall have a base diameter of 23 mm (0.9 in) minimum and 36 mm (1.4 in) maximum, a top diameter of 50 percent of the base diameter minimum and 65 percent of the base diameter maximum, and a height of 5 mm (0.2 in).

**R305.1.2 Dome Spacing.** The truncated domes shall have a center-to-center spacing of 41 mm (1.6 in) minimum and 61 mm (2.4 in) maximum, and a base-to-base spacing of 17 mm (0.65 in) minimum, measured between the most adjacent domes.

**R305.1.3 Contrast.** Detectable warning surfaces shall contrast visually with adjacent gutter, street or highway, or pedestrian access route surface, either light-on-dark or dark-on-light.

**R305.1.4 Size.** Detectable warning surfaces shall extend 610 mm (2.0 ft) minimum in the direction of pedestrian travel. At curb ramps and blended transitions, detectable warning surfaces shall extend the full width of the ramp run (excluding any flared sides), blended transition, or turning space. At pedestrian at-grade rail crossings not located within a street or highway, detectable warnings shall extend the full width of the crossing. At boarding platforms for buses and rail vehicles, detectable warning surfaces shall extend the full length of the public use areas of the platform. At boarding and alighting areas at sidewalk or street level transit stops for rail vehicles, detectable warning surfaces shall extend the full length of the transit stop.

**R305.2 Placement.** The placement of detectable warning surfaces shall comply with R305.2.

### 3) **WSDOT Design Manual M 22-01.15 (July 2018)**

**1510.09(2)(g).** Detectable warning surfaces are required where curb ramps or landings connect to a roadway. (See the [Standard Plans](#) for placement details and other applications.) •

Detectable warning surfaces shall contrast visually (either light-on-dark or dark-on-light) with the adjacent walkway surface, gutter, street, or highway.

Note: Federal yellow is the color used to achieve visual contrast on WSDOT projects. Within cities, other contrasting colors may be used if requested by the city.

### 4) **City of Seattle Standard Plans and Specifications for Road, Bridge, and Municipal Construction (2020)**

#### **Standard Plan No 422k (General Notes #10-12).**

(10) Detectable warning must be provided at curb ramps and at locations where the sidewalk and roadway are flush. The detectable warning surface must have a truncated dome pattern as shown, with a minimum depth of 2'-0" and must be placed at the back of curb but no more than 8" from the face of curb for monolithic curbs or atypical curb widths. Detectable warning must match the width of the ramp or the opening where the sidewalk and roadway are flush. The truncated domes on the detectable warning should align with the curb ramp run or the direction of travel. Domes may be on a radial grid pattern where the detectable warning surface is placed at curb radii.

(11) Detectable warning color must be "federal safety yellow," unless otherwise directed by engineer.

(12) Detectable warning surfaces should generally not be cut or altered to fit unless there is no alternative available. If required, cut or alter the detectable warning per the manufacturer's directions. Detectable warning surfaces placed at curb radii must match the curb radii without gaps or inconsistencies in placement.

**Standard Specifications SECTION 9-36 DETECTABLE WARNING**

**9-36.1 GENERAL** The detectable warning plate (cast in place with curb ramp or surface) and the detectable warning plate retrofit (surface applied to existing curb ramp or surface) must comply with the requirements for tactile warning surfaces established by the ADA (Americans with Disability Act) Accessibility Guidelines (ADAAG). Detectable warnings must consist of a surface of truncated domes and must comply with the following:

1. Dome Size: Truncated domes in a detectable warning surface must have a base diameter of 0.9 inches (23 mm) minimum and 1.4 inches (36 mm) maximum, a top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and a height of 0.2 inches (5.1 mm).
2. Dome Spacing: Truncated domes in a detectable warning surface must have a center-to-center spacing of 1.6 inches (41 mm) minimum and 2.4 inches (61 mm) maximum, and a base-to-base spacing of 0.65 inches (17 mm) minimum, measured between the most adjacent domes on a square grid. See Standard Plan 422k for truncated domes detail.

Unless the Contract specifies otherwise, the detectable warning must extend the full width of the curb ramp (exclusive the flared sides) and must extend either the full depth of the curb ramp or 24 inches (610 mm) deep minimum measured from the back of the curb on the ramp surface. The truncated dome pattern must be perpendicular to the long axis of the ramp. The detectable warning plate must comply with the following:

- a. Federal Safety Yellow (Federal Standard 595 Color FS 33538) in color;
- b. ASTM Compressive strength of 10,000 psi unless otherwise approved;
- c. Slip resistance (coefficient of friction on top of domes and on field area,) wet and dry of 0.80 minimum (ASTM C 22 1028);
- d. Resistant to breakage, fading, permanent deformation, and loss due to abrasion;
- e. Durable, high impact resistant, and possess thermal and moisture stability; and,
- f. Approval by the Engineer.