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<tr>
<td>1</td>
<td>Hazardous Vehicular Areas</td>
<td>The placement of Detectable Warnings (DW) is required for &quot;Hazardous Vehicular Areas&quot; but application varies widely due to differing interpretations.</td>
<td>CBC Section 11B-247.1.2.5 &quot;Hazardous vehicular areas. If a walk crosses or adjoins a vehicular way, and the walking surfaces are not separated by curbs, railings or other elements between the pedestrian areas and vehicular areas, the boundary between the areas shall be defined by a continuous detectable warning complying with Sections 11B-705.1.1 and 11B-705.1.2.5.&quot;</td>
<td>None</td>
<td>Sutter Preference: The project team should meet with the building officials and the Sutter PAC team to define the 'Hazardous Vehicular rea' on a project-by-project basis.</td>
<td>See Detail Page 5.1</td>
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<td>2</td>
<td>Curb Ramps</td>
<td>The exact placement of Detectable Warnings at curb ramps is specified in the CBC.</td>
<td>CBC Section 11B-705.1.2.2 Curb ramps. Detectable warnings at curb ramps shall extend 36 inches in the direction of travel. Detectable warnings shall extend the full width of the ramp run excluding any flared sides. Detectable warnings shall be located so the edge nearest the curb is 6 inches minimum and 8 inches maximum from the line at the face of the curb marking the transition between the curb and the gutter, street or highway. Exception: On parallel curb ramps, detectable warnings shall be placed on the turning space at the flush transition between the street and the sidewalk.</td>
<td>None</td>
<td>Detectable Warnings must be placed: 36&quot; in the direction of travel, and must be placed at the landing of the curb ramp.</td>
<td>See Detail Page 5.2</td>
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<td>3</td>
<td>Contrast</td>
<td>Visual Contrast is specified in the 2013 CBC, however, recently approved amendments to the building code will allow the use of yellow detectable warnings to be accepted as automatic compliance with the contrast requirements.</td>
<td>IMPORTANT NOTE: The California Building Standards Commission has approved amendments to the 2013 CBC which will simplify compliance, DW must either be yellow, or comply with contrast requirements. (Sutter will choose ‘yellow’). CBC Section 11B-705.1.1.3: &quot;Contrast. Detectable warning surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light. The material used to provide contrast shall be an integral part of the surface. Contrast to be determined by: Contrast = ((B1-B2)/B1) x 100 percent where B1 = light reflectance value (LRV) of the lighter area and B2 = light reflectance value (LRV) of the darker area. Exception: Where the detectable warning surface does not adequately contrast with adjacent surfaces, a 1 inch wide black strip shall separate yellow detectable warning from adjacent surfaces. &quot;</td>
<td>None</td>
<td>Sutter will comply with the contrast requirements thru the use of ‘yellow’ detectable warnings for projects under the 2013 CBC. Sutter will also request acceptance of ‘yellow’ as the method for compliance with projects under previous codes.</td>
<td>See Detail Page 5.3</td>
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<td>4</td>
<td>Color</td>
<td>The color of Detectable Warnings is specified in the 2013 CBC to be Yellow, with color exceptions allowed for Curb Ramps.</td>
<td>CBC Section 11B-705.1.1.5 Color. Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595C. Exception: Detectable warning surfaces at curb ramps, islands or cut-through medians shall not be required to comply with Section 11B-705.1.&quot;</td>
<td>None</td>
<td>Sutter Preference: Detectable Warnings shall be Yellow as a Sutter standard practice.</td>
<td>See Detail Page 5.4</td>
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<td>5</td>
<td>Resiliency</td>
<td>DW are required to provide a difference in sound when a cane-user taps the DW as opposed to tapping the surrounding paving.</td>
<td><strong>CBC Section 11B-705.1.1.4</strong> &quot;Resiliency. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. <strong>Exception:</strong> Detectable warning surfaces at curb ramps, islands or cut-through medians shall not be required to comply with section 11B-705.1.1.5&quot;</td>
<td>None.</td>
<td>Sutter preference is to specify rubber or similar resilient materials for detectable warnings.</td>
<td>See Detail Page 5.5</td>
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<td>6</td>
<td>Installation Method</td>
<td>Glue-down and/or surface-mounting installations have raised concerns about trip-hazards due to excessive height and lack of durability.</td>
<td><strong>CBC Section 11B-303.2 Vertical.</strong> Changes in level between 1/4” high maximum shall be permitted to be vertical and without edge treatment.</td>
<td>None.</td>
<td>Sutter Preference: DW shall be recessed at all locations where the substrate is not an existing surface which is to remain.</td>
<td>See Detail Page 5.6</td>
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<td>7</td>
<td>Curved Installation</td>
<td>Curved installations have raised concerns about compliance with the dome spacing requirements and possible trip hazards due to field cut DW mats.</td>
<td><strong>CBC 11B-705.1.1.2 Dome spacing.</strong> Truncated domes in a detectable warning surface shall have a center-to-center spacing of 2.3 inches minimum and 2.4 inches maximum, and a base-to-base spacing of .65 inch minimum, measured between the most adjacent domes on a square grid. <strong>Exception:</strong> Where installed in a radial pattern, truncated domes shall have a center-to-center spacing of 1.6 inches minimum to 2.4 inches maximum.</td>
<td>None.</td>
<td>1. Sutter preference is to avoid curved installations when possible. 2. Sutter discourages cutting the DW mats in a way that presents partially cut domes at the leading edge of the DW mat. 3. Curved installations must meet the dome spacing requirements of 1.6” minimum and 2.4” maximum center-to-center spacing. For installations with an inside radius less than 100’ Sutter discourages a curved application.</td>
<td>See Detail Page 5.7</td>
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A. It is understood that a parking lot, including individual parking stalls, and driveways are frequently considered to be ‘hazardous vehicular areas’. This is based on two factors:
   1) The building code definition of a ‘vehicular way’ is:
      “A route provided for vehicular traffic, such as in a street, driveway, or parking facility.
   2) Precedent. A significant number of building officials in California have interpreted parking lots, parking stalls, and their associated driveways as ‘hazardous vehicular ways’ and subject to the requirements for detectable warnings.

B. The application of this code requirement has been handled in a variety of ways by architects, building officials, and access specialists. Due to the wide range of possible applications, the specific locations of detectable warnings must be worked out on a case-by-case basis by the project team.

   Specifically, the Sutter project team should meet with the building officials having jurisdiction, and develop an agreement that defines the ‘Hazardous Vehicular Area’ (HVA) on a project-specific basis. Once the HVA is defined, then the DW must be placed at any flush junction between the HVA and a pedestrian way.

   Sutter project teams that wish to deviate from a literal code interpretation must secure the confirmation from the ‘Authority Having Jurisdiction’ (AHJ) that the proposed location of DW is an acceptable interpretation of the code requirements of 11B-247.1.2.5.

C. Detectable Warnings shall not be installed at ambulance entry points (as long as there are separate public entries that are well defined)
D. Detectable Warnings – Continuous Runs

The application of this code requirement in literal terms is a common approach, and is not subject to criticism for non-compliance. Simply-put, this approach is to install DW for the full length of any and all junctures where the pedestrian way meets the vehicular way. Sutter would like to discourage long runs of DW where possible, by breaking them up with planters etc. where possible.
E. Detectable Warnings – Ambulance Entry

Detectable Warnings are not to be installed at ambulance entry points (as long as there are separate public entries that are well defined)
A. Detectable Warnings must be 36” long in the direction of travel
B. Detectable Warnings must be placed at the bottom landing of curb ramps.
C. The Detectable Warnings are required to be less than 2% slope at parallel curb ramps only.
A. **Code History:** Because determining the 'Light Reflectance Value' of concrete, asphalt and other paving materials is both imprecise and technically challenging, the contrast requirement has been revised in a recently approved amendment to the California Building Code. The original 2013 CBC code text of 11B-705.1.1.3 carried forward the 2010 CBC text, except inadvertently left out the '70%' requirement. Thus it provided a formula to determine the contrast ratio between two surfaces, but did not specify what constitutes a compliant ratio (which is stated as 70% in the 2010 CBC).

The recently approved amendment to this code section corrects the error by clarifying that the contrast as determined by the formula must result in at least a 70% contrast. The amendment additionally provides two options for providing adequate contrast: 1. Provide a 70% contrast, or 2. specify yellow detectable warnings compliant with the Federal Specification “FS 33538” for ‘yellow’. It is Sutter policy to specify yellow detectable warnings at all locations where detectable warnings are required.

B. **Technically Challenging:** In practice, per the specified formula, yellow DW will provide approximately a 30% contrast with off-white concrete. This reality contributed to the recent code change. Many have overcome the contrast issue by specifying dark red or dark brown DW, which works well except that the code specifically requires yellow unless it is for curb-ramps, islands or cut-through medians.
### DETECTABLE WARNINGS

**SUTTER HEALTH - BARRIER INTERPRETATION NOTICE**

- **Author:** Bill Zellmer
- **ISSUE DATE:** November 7, 2014
- **REVISIONS:** N/A

### BIN 5

5.4 – Color

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#### A. Detectable Warnings shall be **yellow** as a Sutter preference and as required by the 2013 CBC.

**CBC Section 11B-705.1.1.5 “Color.”** Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595C. Exception: Detectable warning surfaces at curb ramps, islands or cut-through medians shall not be required to comply with Section 11B-705.1.

#### B. An exception to this code section allows non-yellow DW at **curb ramps, islands, and cut-through medians.**

#### C. It is Sutter preference to specify **YELLOW** at all locations where detectable warnings are required.
A. CBC Section 11B-705.1.1.4 “Resiliency. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Exception: Detectable warning surfaces at curb ramps, islands or cut-through medians shall not be required to comply with section 11B-705.1.1.5

B. This code section offers no methodology for measurement, requiring individual judgment-calls. It is particularly difficult to determine the variation of the sound-on cane contact between two surfaces that have not yet been installed. There is no corresponding requirement in the ADA Standards, therefore, final determination of compliance will be up to the building official.

C. Assuming that the surrounding surfaces are concrete, asphalt or similar paving; it is likely that a rubber or other similarly resilient detectable warning will comply with these requirements.

D. Sutter discourages specification of a non-resilient detectable warning material such as cast iron, as this may not satisfy the resiliency requirement. While curb ramps are exempt from this requirement, Sutter preference is to specify a resilient material for detectable warnings in all locations.
D. Sutter Policy – Recessed Installation:
   1. It is Sutter policy to require recessed installation methods for all new construction. This will limit Sutter exposure to trip-hazard liability and provide a more durable and better-looking installation.

   2. Sutter will allow surface-applied installations at retrofit projects only. When the under-laying paving is being replaced anyway (for correction of slope, or other issues) then Sutter will consider it to be ‘new construction’.

E. Trip-Hazard: The surface-applied installation presents a trip-hazard that is a significant issue for healthcare facilities. Even when the maximum .25” vertical height requirement is met, there is a compounding concern that a ¼” vertical edge at edge of the DW mat in combination with another .2” of the actual domes creates a .45” aggregate height change from the surrounding paving, and a significant trip hazard. The recessed installation avoids the trip-hazard and is an all-around better solution.
A. The two primary methods of installation are:
   1. Cast-in-place - Recessed
   2. Glue-down – Surface Applied (may also have mechanical fasteners)

B. Code Requirements: There are two essential code requirements that must be satisfied:
   1. The maximum allowed vertical change in height is ¼”
   2. The installation must be ‘maintained’ in working condition. Therefore, any glued-down installations must be ‘permanent’.

C. Sutter Preference – Glue-down:
   1. Sutter discourages glue-down installation.
   2. Project teams that choose to provide glue-down installation methods must be able to confirm a long-lasting, durable installation.
### SUTTER HEALTH - BARRIER INTERPRETATION NOTICE

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#### 5.6 – Installation Method

**D. Sutter Preference – Recessed Installation:**

1. It is Sutter preference to require recessed installation methods for all new construction. This will limit Sutter exposure to trip-hazard liability and provide a more durable and better-looking installation. The finished surface of the DW should be flush with surrounding paving, with only the domes rising above the flush surface.

2. Surface-applied installations at appropriate for **retrofit projects only**. When the under-laying paving is being replaced anyway (for correction of slope, or other issues) then Sutter will consider it to be ‘new construction’.

**E. Trip-Hazard:** The surface-applied installation presents a trip-hazard that is a significant issue for healthcare facilities. Even when the maximum .25” vertical height requirement is met, there is a compounding concern that a ¼” vertical edge at edge of the DW mat in combination with another .2” of the actual domes creates a .45” aggregate height change from the surrounding paving, and a significant trip hazard. The recessed installation avoids the trip-hazard and is an all-around better solution.
A. **Code Citation:** CBC 11B-705.1.1.2 Dome spacing. Truncated domes in a detectable warning surface shall have a center-to-center spacing of 2.3 inches minimum and 2.4 inches maximum, and a base-to-base spacing of .65 inch minimum, measured between the most adjacent domes on a square grid. Exception: Where installed in a radial pattern, truncated domes shall have a center-to-center spacing of 1.6 inches minimum to 2.4 inches maximum.

B. The nature of curved installations requires choosing between options that each have significant down-sides. The three most common methods are discussed on the follows pages as:

1. Side-Miter
2. Strict-Grid
3. Manufactured Radial Pattern
### DETECTABLE WARNINGS

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**BIN 5**

#### 5.7 – Curved Installations

1. **Detectable Warning – Side-Miter**

   This is probably the most common installation method to date. Straight sections of detectable warnings are cut along the sides to create a slightly ‘pie-shaped’ trapezoid. The trapezoids are installed with the cut edges ‘mitered’ along the sides, which creates a shape that follows the curve of the particular installation.

   **Downside:** The dome spacing along the mitered edge will change from a larger spacing to a smaller spacing at the inside of the curve, and in most cases will actually result in spacing that drops below the minimum allowed spacing of 1.6 inches. Furthermore, in many installations the mitered edge will result in cutting through some of the domes. Sutter discourages installations of this type with an inside radius less than 100 feet, as it is likely that the dome spacing will be less than the 1.6” minimum allowed by code.

   **Up-side:** The miter-cut edge and any cuts through domes occur only at panel edges, and are easily avoided by wheelchair users who prefer to align their wheels in the valleys between rows of domes. As one crosses the detectable warnings, the direction of travel is perpendicular to the miter-joints and will rarely result in a wheelchair that encounters any of the miter joints.

   Furthermore, the leading edge of the detectable warnings are always full, un-cut domes, that are perpendicular to the path of travel,
1. Detectable Warning – Strict-Grid

In this methodology, the grid orientation is aligned with the preferred path-of-travel, and is strictly maintained in the same orientation throughout the installation. This method is especially common at street intersections where the orientation of dome grid helps the sight impaired (as well as wheelchair users) to align themselves in the direction of the cross-walk.

**Downside:** The curved shape inevitably requires cutting through domes at varied and unpredictable angles. Frequently, the cut domes are field-beveled to reduce the trip hazard of the abrupt cut dome edges. The cut domes are always along the leading edge of the detectable warnings and unavoidable by both wheelchair users and the sight-impaired.

Furthermore, technically, the field-cut and field beveled domes do not meet the size and height requirements of the CBC, and again, are an un-avoidable part of the path-of-travel.

**Up-side:** For applications at street crossings, the ‘Strict-Grid’ arrangement allows sight-impaired and wheelchair users to align themselves with the direction of the cross-walk.
1. Detectable Warning – Manufactured Radial Pattern

In efforts to resolve the curve problem, some manufacturers offer detectable warnings in pre-manufactured, radial patterns. The radius of the curve may be ‘stock’ or may be specified to suit the project.

**Downside:** Cost, availability and convenience are factors to consider. The use of pre-manufactured radial pattern detectable warnings requires a higher degree of project management as the curved sections are not interchangeable with straight sections. Curve radius must be specifically ordered to suit the project.

The code specifically limits the spacing of domes manufactured in a radial pattern, making tight curve installations non-compliant. 
**CBC 11B-705.1.1.2 Exception:** “Where installed in a radial pattern, truncated domes shall have a center-to-center spacing of 1.6 inches minimum to 2.4 inches maximum.”

**Up-side:** The pre-manufactured radial pattern resolves both the problems of miter-joint installations, and Strict-Grid installations. There are no field-cuts through domes, and the spacing of domes is compliant for larger radius installations.