Accessible Design for the Blind

Tactile Walking Surface Indicators: What are they, and where should they be used?

Billie Louise (Beezy) Bentzen, Linda Myers, Jennifer Graham, & Alan Scott – Accessible Design for the Blind, LLC
www.accessforblind.org

Tactile walking surface indicators (TWSIs) is a generic term now used in the US for three types of walking surfaces that are used to aid wayfinding by pedestrians who are blind or who have low vision. All have been demonstrated by human factors research to be readily detectable under foot and by use of a long cane. They should all contrast light-on-dark or dark-on-light with the surrounding surface.

- **Detectable warning surface (DWS).** A surface standardized in the 2010 Americans with Disabilities Act Accessibility Guidelines (ADAAG), comprised of truncated domes built in or applied to walking surfaces or other elements to warn of hazards on a circulation path. DWS are required by the DOT ADA Standards (2006) at curb ramps and at the edges of transit boarding platforms (see Figure 1).

  When pedestrians who are blind or who have low vision encounter a DWS (truncated domes), they should stop, determine whether there is a street or platform edge in front of them, and prepare to cross or board. The DWS is not a reliable cue for alignment for street crossing.

- **Tactile direction indicator (TDI).** A surface comprised of raised, parallel, flat-topped, elongated bars that may be used in a few ways. TDIs may be used to indicate an unobstructed path of travel where there are no natural guidelines such as edges of sidewalks, walls or curbs, and where other directional cues such as traffic may be missing or ambiguous (see Figure 2). TDIs may be used to indicate locations of transit stops, locations where doors of transit vehicles will open, or hard-to-find street crossings (see Figures 3-4). They may also be used to provide a physical cue for establishing a heading to cross that is in line with the crosswalk direction (see Figures 3-5).

  When pedestrians who are blind or who have low vision encounter a strip of TDI (raised bars), they should understand that this is a surface they can follow to an intermediate or final destination. They can choose to cross it or to follow it on either side. The TDI does not imply that there is any danger. Small areas of TDI may indicate a transit stop, or where the transit door will open. When a two-foot by two-foot area is found near the end of a detectable warning farthest from the center of an intersection, it will give you an accurate cue for aligning for street crossing

- **Tactile warning delineator (TWD).** A raised linear surface that is trapezoidal in cross-section delineating the boundary between a sidewalk and a separated bicycle lane at sidewalk level or between a pedestrian access route and the shared zone in a shared street (see Figure 6).

  When pedestrians who are blind or who have low vision encounter a TWD (strip of trapezoidal delineator), and they are walking on a sidewalk, on the portion that is closer to a building line than to a vehicular way, they should understand that they should not cross this surface because there is danger of a crash with a bicycle or vehicle on the other side.

Technical specifications for truncated dome DWS are provided in 2010 ADAAG. The most comprehensive requirements for installation are in the Public Rights-of-Way Accessibility Guidelines (PROWAG, 2023). DWS should be used at the following locations.

- Curb ramps and blended transitions at street crossings
- Pedestrian refuge islands (excluding those less than six feet wide)
- Pedestrian at-grade rail crossings not located within a street or highway

- Boarding platforms at transit stops for buses and rail vehicles where the edges of the boarding platform are not protected by screens or guards
- Boarding and alighting areas of 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

DWS are now widely, but still not universally used on curb ramps, blended crossings, and transit platform edges in the US.

TDIs comprised of raised bars are increasingly being installed to provide a tactile guidance surface in open, paved areas where natural tactile guidelines are lacking, and in transit terminals to define routes to destinations such as faregates or bus bays. There are no US technical specifications for TDIs at this time. Existing products in the US do, however, conform to the international standard for a guidance pattern (ISO 23599:2019). TDIs may also be installed in the following ways.

- Strips across sidewalks to indicate the location of hard-to-find crossings, such as at roundabouts, channelized turn lanes, and mid-block crossings, and to provide a cue for alignment.
- Strips across sidewalks to indicate the location of transit stops, especially when those stops are not at corners.
- In 2-foot by 2-foot squares at corner crossings where good cues for aligning to cross are absent, such as at apex curb ramps, where curb ramps do not slope in the direction of the associated crossing, at skewed crossings, or where traffic parallel to the crosswalk is absent or intermittent.
- In small areas at curbs or on transit platforms to indicate where transit vehicle doors will open.

Two-foot-wide strips of TDIs in which the raised bars are oriented perpendicular to the direction of travel on an associated crosswalk are now recommended for installation across sidewalks to indicate locations of non-corner crosswalks and to provide a good tactile alignment cue (Bentzen et al., 2017; Bentzen et al., 2022; see Figure 4). Similar strips of TDIs across a sidewalk are increasing in use to indicate the locations of transit stops.

Two-foot by two-foot squares of TDIs in which the raised bars are oriented perpendicular to the direction of travel on an associated crosswalk are now recommended for installation near the end of DWSs farthest from the center of an intersection as an alignment cue for crossings where other cues are missing or ambiguous (Bentzen et al., 2022; see Figure 5).

Crossing raised bar TDIs with bars parallel versus perpendicular to their direction of travel was compared for research participants having various mobility disabilities and using a variety of travel aids. Crossing TDIs with bars parallel to their direction of travel required less effort and caused less instability than crossing TDIs with bars perpendicular to their direction of travel, and the bars parallel to the direction of travel were preferred (Bentzen et al., 2020a). The parallel orientation with the direction of travel on the sidewalk that is best for people with mobility disabilities is perpendicular with the crossing direction. That is, the orientation that provides best alignment for pedestrians with vision disabilities.

Raised bar TDIs are not recommended for use as delineators between pedestrians and bicycles on separated bike lanes at sidewalk level because TDIs do not indicate any danger, TDIs can normally be crossed without risk, and TDIs can normally be followed along either side.

TWDs that are trapezoidal in cross section are recommended for use between pedestrians and bicycles where separated sidewalks are at sidewalk level (Bentzen et al., 2020b). They may also be used to delineate the boundary between pedestrian and shared use areas of shared streets.

Figure 1. A crosswalk with a cut-through island with truncated dome DWS on the curb ramps and the island. [Source: J.M. Barlow]

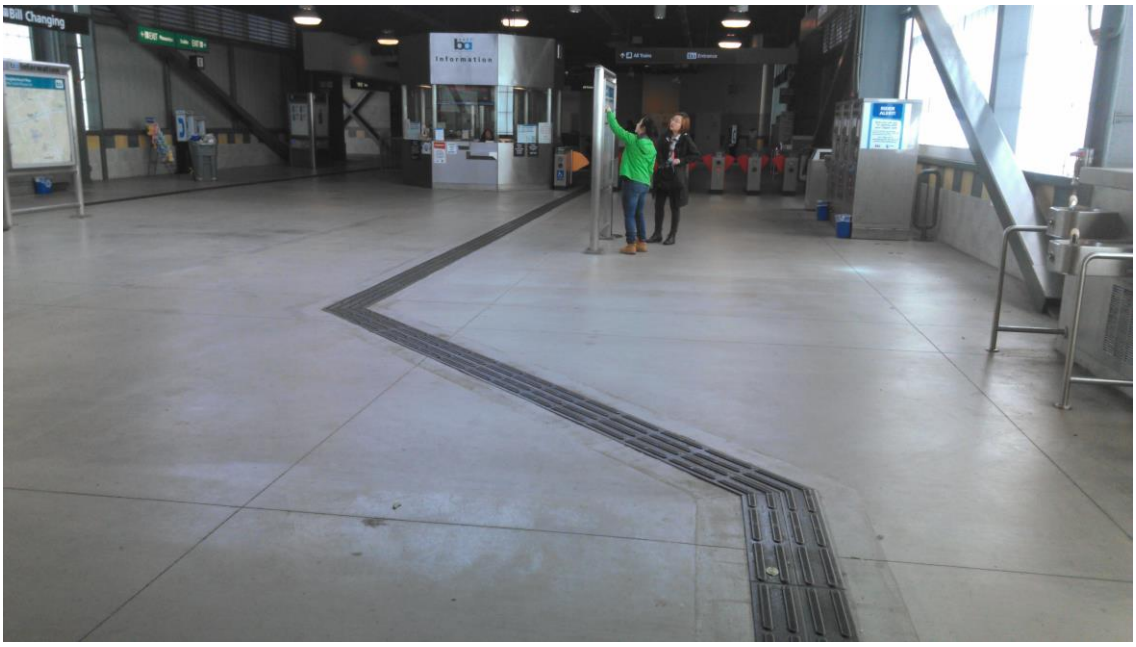

Figure 2. Tactile direction indicator (raised bars), 1 foot wide, providing guidance from a BART station entrance to the accessible fare gate. [Source: B. Bentzen]

Figure 3. Photo of TDI with raised bars perpendicular to the direction of travel across the crosswalk, installed beside the detectable warning, found to enable efficient location of hard-to-find crossings and to significantly improve alignment for crossing by research participants who had little or no vision (Bentzen et al., 2017). [Source: B. Bentzen]

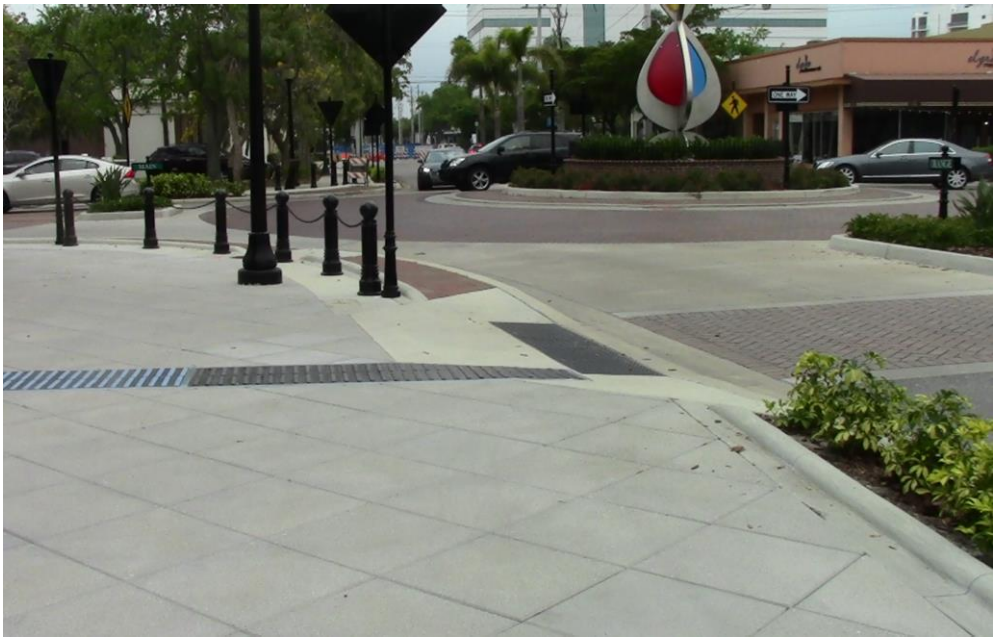

Figure 4. Roundabout crossing in Sarasota showing raised bar TDI, with bars oriented perpendicular to the crossing direction, extending across the sidewalk, ending beside the truncated dome DWS [n.b., Various colors of TDI bars are meaningless; they are simply what was available as prototype from the manufacturer.] (Bentzen et al., 2022). [Source: R.Wall Emerson]

Figure 5. Photo of a corner crossing in Seattle showing a 2 ft x 2 ft square of raised bar TDI on the side of the DWS farthest from the center of the intersection for an apex curb ramp. The bars are oriented perpendicular to the direction of travel across each crosswalk (Bentzen et al., 2022). [Source: R. Wall Emerson]

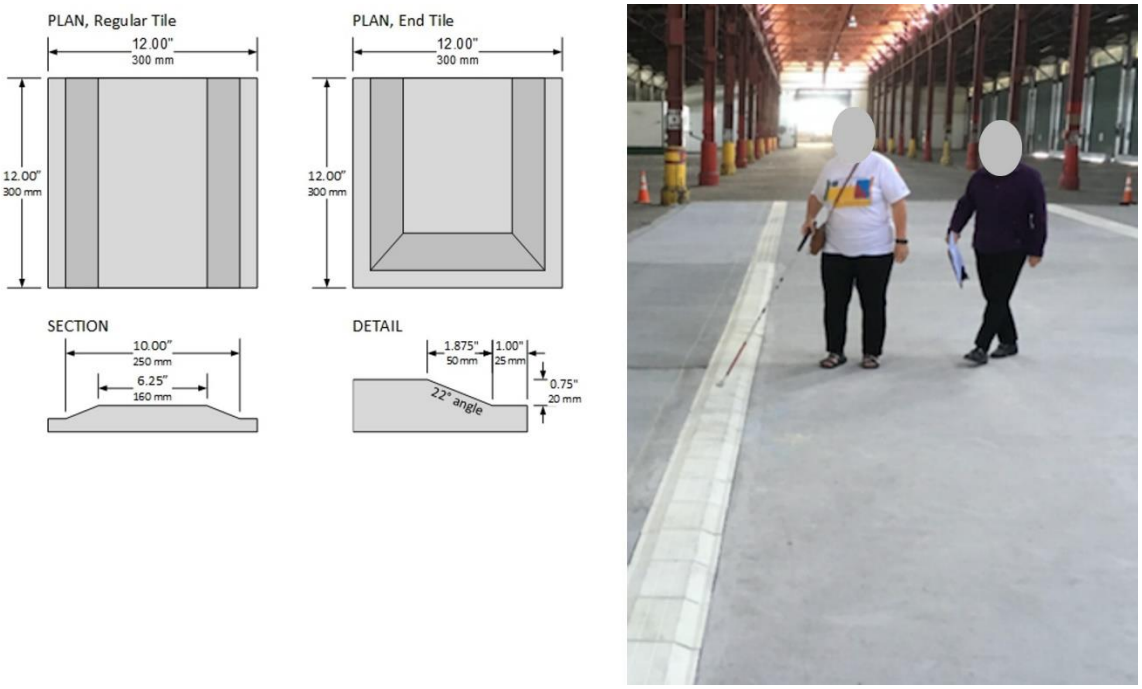

Figure 6. The left panel is drawings of the trapezoidal TWD in top view and cross section. The right panel is a photo of a research participant who was blind detecting the TWD with their long cane. An orientation and mobility specialist is nearby to ensure participant safety. [Sources: Drawing, L. Tabor; photo, B. Bentzen]

References

Bentzen, B.L., Barlow, J.M., Scott, A.C., Guth, D.A., Long, R. & Graham, J. (2017). Wayfinding problems for blind pedestrians at non-corner crosswalks: A novel solution. *Transportation Research Record: Journal of the Transportation Research Board, No. 2661,* 120-125 https://doi.org/10.3141/2661-14

Bentzen, B.L.; Scott, A.C.; Barlow, J.M., Emerson, R.W., & Graham, J. (2021). A Guidance Surface to Help Vision Disabled Pedestrians Locate Crosswalks and Align to Cross. *Transportation Research Record. National Academy of Sciences: Transportation Research Board.* https://doi.org/10.1177/03611981221090934

Bentzen, B.L.; Scott, A.C.; Emerson, R.W., & Barlow, J.M. (2020a). Effect of tactile walking surface indicators on travelers with mobility disabilities. *Transportation Research Record. National Academy of Sciences: Transportation Research Board* https://doi.org/10.1177/0361198120922995

Bentzen, B.L.; Scott, A.C., & Myers, L. (2020b). Delineator for separated bicycle lanes at sidewalk level. *Transportation Research Record. National Academy of Sciences: Transportation Research Board* https://doi.org/10.1177/0361198120922995