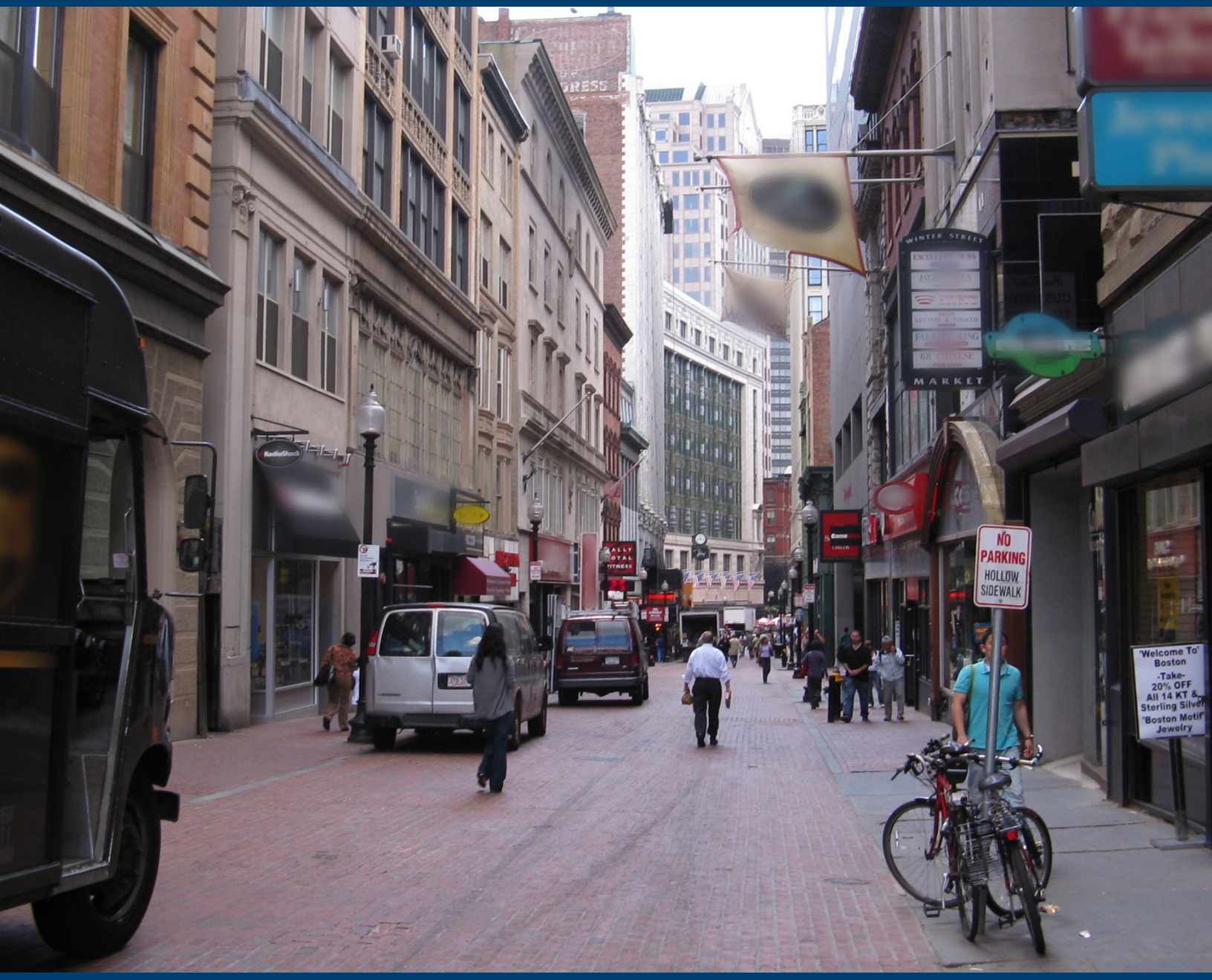
ACCESSIBLE SHARED STREETS

NOTABLE PRACTICES AND CONSIDERATIONS FOR ACCOMMODATING PEDESTRIANS WITH VISION DISABILITIES



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16. Abstract

This document reviews notable practices and considerations for accommodating pedestrians with vision disabilities on shared streets. It focuses on streets where pedestrians, bicyclists, and motor vehicles are intended to mix in the same space.

The guide includes a description of shared streets, an overview of vision disabilities and the strategies people with vision disabilities use to navigate in the public right-of-way. It discusses the specific challenges pedestrians with vision disabilities face when navigating shared streets. It provides an overview of relevant U.S. guidance, a toolbox of strategies for designing shared streets that improve accessibility for pedestrians with vision disabilities, and ideas on how accessibility for pedestrians with vision disabilities can be addressed in the planning and design process.

It provides information from case studies of completed shared streets in the United States that highlight accessibility features and lessons learned, as well as a bibliography that includes sources specifically referenced in the body of the guide and other sources that inspired the guide content and may be useful for shared street designers.

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1. INTRODUCTION

A shared street is a street that includes a shared zone where pedestrians, bicyclists, and motor vehicles mix in the same space.

Communities across the U.S. are implementing shared streets for a variety of reasons, including to foster economic development, improve safety, provide more flexible public space, and accommodate demand for more walking and bicycling opportunities. As the shared street concept gains momentum, there is a need to ensure that shared street designs meet the needs of all users.

This document addresses a specific type of shared street user–pedestrians with vision disabilities. It reviews notable practices and considerations for accommodating pedestrians with vision disabilities on shared streets. This document is not a comprehensive guide to shared street design and planning. For example, it does not discuss the history and theory of shared street design, drainage, parking, or other relevant issues except as they pertain to pedestrians with vision disabilities. Additional research is needed on these and other shared street design topics. This document focuses on accessibility, specifically on streets where pedestrians, bicyclists, and motor vehicles are intended to mix in the same space rather than streets that lack curbs but are not intended to encourage this mixing, such as curbless streets *(see 2.2 Shared Streets vs. Curbless Streets)*.

FHWA has engaged in topics relating to shared street planning and design and speed management for decades. The guide builds on this long history and is based on an extensive stakeholder engagement process that involved pedestrians with vision disabilities, including people who were both deaf and blind, orientation and mobility specialists, shared street designers, and Federal, State, and local government officials. The stakeholder engagement process included two multi-day workshops, two focus groups, a peer exchange involving shared street designers from across the country, and one-on-one interviews with stakeholders. It also included field visits to several shared streets in the United States to gain on-the-spot feedback and insight from pedestrians with vision disabilities, orientation and mobility specialists, local government officials and others. The guide includes:

- An overview of shared streets.
- An overview of existing legal requirements regarding accessibility.
- An introduction to vision disabilities and the strategies people with vision disabilities use to navigate in the public right-of-way.
- A description of the specific challenges pedestrians with vision disabilities face when navigating shared streets.
- An overview of research, specifications, and best practices for the use of tactile walking surface indicators and detectable edges.
- Ideas on how accessibility for pedestrians with vision disabilities can be addressed in the planning and design process.
- Lessons learned from shared streets implementation in the United States.
- A toolbox of strategies for designing shared streets that improve accessibility for pedestrians with vision disabilities (Figure 1).
- A bibliography that includes sources specifically referenced in the body of the guide and other sources that inspired the guide content and may be useful for shared street designers.

Figure 1: Example graphic from the Shared Streets Design Toolbox.

Note: Research is underway on signs and markings relating to shared streets. Signs that are compliant with the Manual on Uniform Traffic Control Devices (MUTCD) and other signs currently in use are shown in Figure 37 on Page 32. For more information, visit mutcd.fhwa.dot.gov

2. SHARED STREETS

2.1 Shared Streets

A shared street is a street that includes a shared zone where pedestrians, bicyclists, and motor vehicles mix in the same space (Figure 2). This is accomplished through a design that:

- **Encourages low motor vehicle speeds.** Low motor vehicle speeds increase pedestrian comfort and improve safety for all users by decreasing the likelihood and severity of crashes (Jurewicz, Sobhani, Woolley, Dutschke, & Corben 2016). Shared streets are generally designed to produce motor vehicle operating speeds between 5 and 15 mph.
- **Encourages low motor vehicle volumes.** Low motor vehicle volumes combine with low motor vehicle speeds to increase pedestrian comfort and reduce the potential for crashes. In commercial areas, the low speed environment on a shared street often results in lower volumes of motor vehicles, because drivers tend to avoid the street and take alternative routes unless their destination is located on the shared street.
- **Lacks design elements that suggest motor vehicle priority and segregate modes.** Such elements include vertical curbs, signs, many pavement markings, traffic controls and other conventional street elements. (Note that it is possible for a street to include some of these elements and still function like a shared street, e.g., a downtown commercial street with curbs and narrow sidewalks where pedestrian volumes are high and motor vehicle speeds and volumes are low.)
- **Includes design elements that suggest pedestrian priority and the function of the street as a place for social, economic, and cultural exchange.** Such elements include gathering areas, seating and site furnishings, lighting, art, and special plantings.

Shared street environments can be challenging for pedestrians with vision disabilities, because they often lack navigational cues such as curbs and defined crossings that pedestrians with vision disabilities typically use when navigating the street, and because the social exchange involved in negotiating the right-of-way often depends on the ability to see. However, potential benefits of shared streets include:

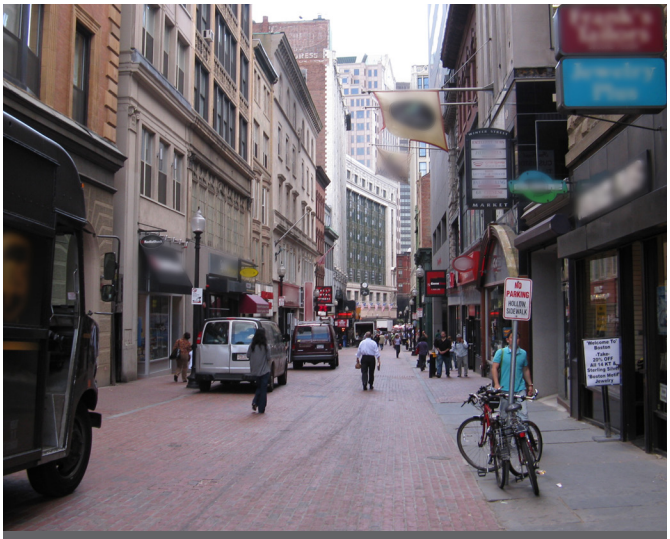


Figure 2: Winter Street, Boston, MA.

- **Additional space** that offers pedestrians freedom of movement.
- **An expanded accessible walking area** which can be useful in constrained conditions, such as when there is insufficient room for accessible sidewalks due to limited rights-of-way.
- **More space for amenities** such as tables, chairs, and benches, landscaping elements, bicycle parking, and art.
- **A flexible public space** that can support a variety of routine activities as well as parades, concerts, festivals, and other special events.
- **Improved physical access to the destinations along the shared street,** particularly for people with mobility disabilities or people using strollers or bicycles.
- **Improved safety** through reduced motor vehicle speeds.
- **Economic development,** because well-designed shared spaces tend to attract more people and, as a consequence, can play a role in boosting economic activity.

2.2 Shared Streets vs. Curbless Streets

Curbless streets (also known as flush streets or festival streets) are similar to shared streets in that they lack curbs. However, curbless streets are not intended to enable pedestrians to comfortably mix with moving vehicles in the same space. Instead, curbless streets are designed to provide flexible and accessible space for festivals, farmers markets, and other activities, during which time the street is closed to motor vehicles. At other times, pedestrians and vehicles are segregated as on a conventional street, with pedestrians occupying the sidewalk and motor vehicles occupying the vehicular travel lanes. (See Figure 3 and Figure 4)

This document is focused on the design of shared streets. Although some of the guidance provided in this document may be relevant for curbless streets, this document does not cover some key considerations related to curbless street, including how to prevent pedestrians with vision disabilities from inadvertently crossing into vehicular lanes at locations that are not designated crossings when the curbless street is operating as a conventional street.

FHWA maintains a table summarizing Pedestrian and Bicycle Funding Opportunities: U.S. Department of Transportation Transit, Highway, and Safety Funds. The table indicates potential eligibility for pedestrian and bicycle projects under U.S. Department of Transportation surface transportation funding programs. This table includes planning and design elements that can be incorporated into shared streets, for example curb cuts and ramps, bicycle parking, benches, lighting, signs, and safety enforcement.

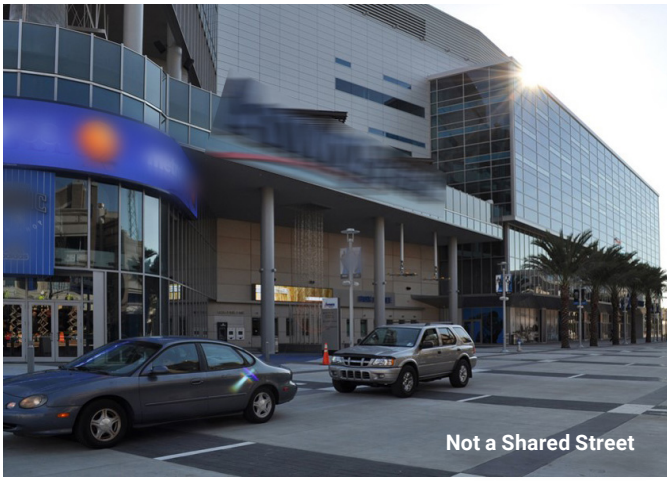


Figure 3 and Figure 4: W. Church Street in Orlando, FL is an example of a curbless street. For special events, a section of W. Church Street can be closed off to motor vehicles with retractable bollards. At other times this section operates as a conventional street.

3. LEGAL REQUIREMENTS REGARDING ACCESSIBILITY

Title II of the Americans with Disabilities Act of 1990 provides that no person with a disability shall, because a public entity's facilities are inaccessible or unusable, be excluded from participation in or denied the benefits of a public entity's programs, services, or activities—including pedestrian facilities in the public right-of-way. However, there is relatively little U.S. guidance on how to design shared streets that are accessible to people with vision disabilities. The NACTO *Urban Street Design Guide* addresses shared streets, but does not discuss accessibility for pedestrians with vision disabilities in detail. Two recently published guidebooks from FHWA, *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts* and *Small Town and Rural Multimodal Networks*, address shared conditions but include limited detail on accessible design of these spaces.

The best source for general guidance on creating accessible pedestrian spaces in the public right-of-way is the United States Access Board's 2011 *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (Proposed PROWAG)*. Because these proposed guidelines have not yet been finalized by the Access Board and adopted by the U.S. Department of Justice or the U.S. Department of Transportation, they are not enforceable standards. The draft guidelines may, however, provide a useful framework to help public entities meet their obligations to make their programs, services, and activities in the public right-of-way readily accessible to and usable by individuals with disabilities. For that reason, FHWA considers the *Proposed PROWAG* a best practice for the design and construction of sidewalks, pedestrian facilities, and other elements in the public rights-of-way. However, *Proposed PROWAG* has very little information specific to the shared street environment.

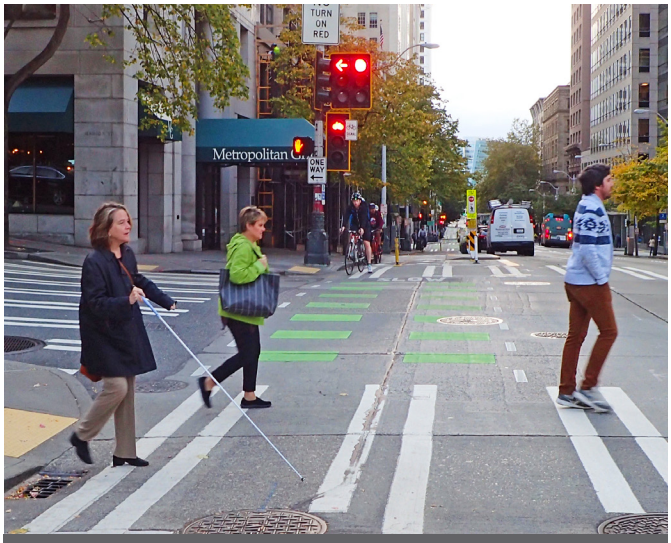


Figure 5: The Americans with Disabilities Act of 1990 requires public entities to ensure that their public rights-of-way are accessible to and useable by individuals with disabilities.

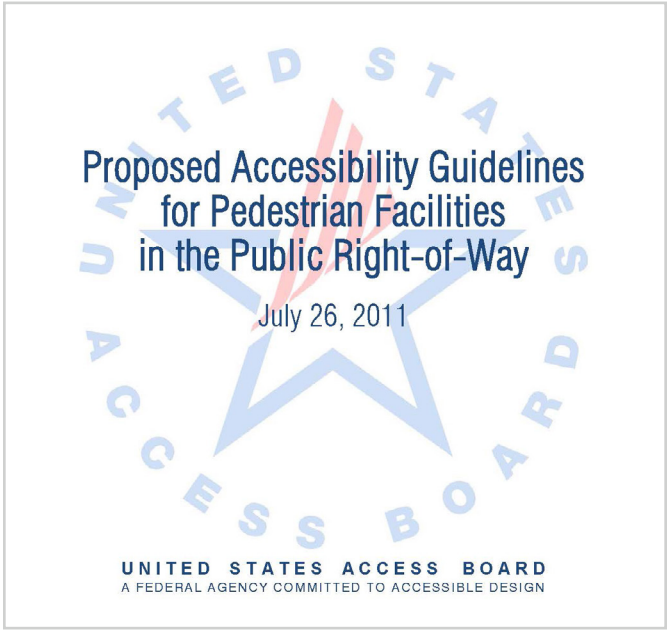


Figure 6: The best source for general guidance on creating accessible pedestrian spaces in the public right-of-way is the *Proposed PROWAG*.

4. SHARED STREETS AND PEOPLE WITH VISION DISABILITIES

4.1 Vision Disabilities

As of the 2010 Census, over 56 million (18 percent) Americans 15 years and older and 52 percent of Americans age 65 and over have some kind of disability. The curbless aspect of many shared streets enhances access for the roughly 31 million individuals 15 years and older who have a mobility disability (Brault 2010). However, curbless conditions can create challenges for people with vision disabilities, who in 2015 accounted for 9.4 percent of the adult population or 22.9 million people (CDC, 2015).

There are many forms of vision disability. Moderate to severe visual loss can include limited field of vision, peripheral loss, loss of central vision, night blindness, or overall acuity loss (blurriness). Legal blindness is defined as a visual acuity of 20/200 or less in the better eye with best correction or a visual field restricted to 20 degrees or less. Approximately 85 percent of those who are considered legally blind do possess some remaining vision. (See Figure 7)

The functional effects of reduced visual acuity include failure to see or identify objects especially relevant to pedestrian travel, such as traffic signals, crosswalks, curbs, vehicles and other pedestrians. Even a slight reduction in visual acuity can affect a pedestrian's ability to negotiate with drivers and bicyclists about when to cross the street, since such communications often involve eye contact, nods, hand gestures and other visual forms of communication.

The functional effects of reduced visual field include failure to see objects adjacent to the traveler, such as vehicles and pedestrians. Especially problematic are vehicles that may be turning across the pedestrian's path of travel, for example, vehicles turning right at the corner where the pedestrian is waiting to cross. Orientation and wayfinding are also affected by reduced fields of vision.

In addition to limitations in visual acuity and field of vision, pedestrians with low vision may have:

- Difficulty with depth perception, which affect the ability to judge the location of vehicles or obstacles in their path.
- Difficulty judging the approach speed of vehicles.
- Reduced sensitivity to visual contrast, which may make it difficult to distinguish elements like holes from shadows.
- Reduced ability to see different colors or color contrast accurately.
- Difficulty reading signs and signals.
- Reduced attentional field (functional visual field is less than clinically measured field).
- Age-related hearing loss.

4.2 How Pedestrians with Vision Disabilities Navigate

Streets are designed with a myriad of cues that indicate where to walk and where and when to cross. Elements like sidewalk edges, curb ramps, crosswalk markings, pedestrian signals, and the sight and sound of vehicle and pedestrian movement help define the walking environment. Often these are the same elements pedestrians with vision disabilities use for navigation, but they take on more importance as guidance markers.

Pedestrians with vision disabilities may also use a range of navigational aids to help them navigate streets, including:

- **Human guides,** which are used in specific situations by many people with vision disabilities but are not considered a primary navigational aid.
- **Long white canes,** which are used in an arc just wider than the width of the body as a probe to identify the

Figure 7: Types of Vision Loss

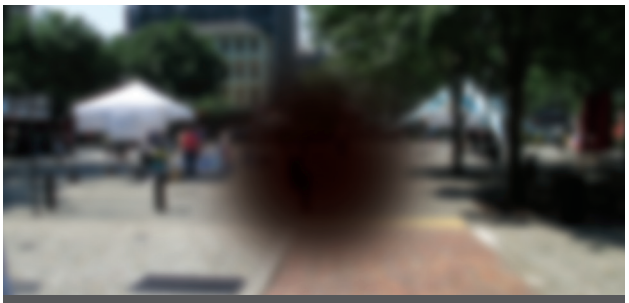
20/20 Vision

20/20 Vision

Legal Blindness

Reduced Visual Acuity

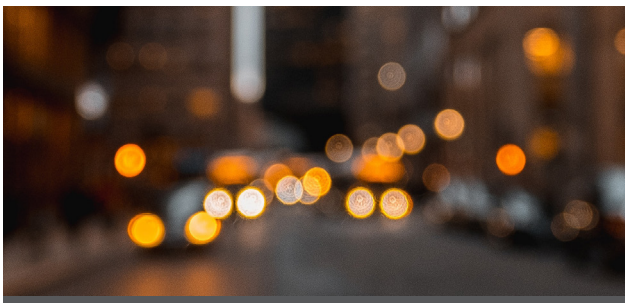
Peripheral Field Loss



Central Field Loss

Total Vision Loss

Other Vision Disabilities



Night Blindness

Color Blindness

walking surface and locate obstacles. There are different types of canes and different techniques with which they may be used. (See Figure 8)

- **Dog guides,** which can help pedestrians with vision disabilities avoid hazards by leading their handler around obstacles and by stopping at curbs, stairs and other level changes. Dog guides and handlers work as a team, with the handler giving commands and the dog guide responding to those commands. Dog guides are used by approximately 2-5 percent of people with vision disabilities.
- **Telescopes and other low vision aids,** which are used primarily for reading signs.
- **Emerging technologies,** such as digital navigation/ wayfinding applications and hand-held devices that use ultrasonic echo-location to help pedestrians with vision disabilities detect objects.

Individuals with vision disabilities also rely on a variety of non-visual cues to navigate streets and public spaces. These cues may include:

- **Audible information,** such as the sounds produced by traffic and other pedestrians, echolocation and accessible pedestrian signals.
- **Detectable edges,** such as curbs and building faces (although it is also important to understand that, to avoid obstacles and move more quickly, many people with vision disabilities do not follow along curbs or buildings edges as a primary technique).
- **Information received through touch,** such as sidewalk, ramp, or driveway slopes, or tactile walking surface indicators perceived underfoot or by use of the long cane *(See 5. Tactile Walking Surface Indicators and Detectable Edges)*.

Figure 8: Common Cane Techniques

Sweeping Technique

Using the sweeping (or constant-contact) technique, the forearm is held still and the wrist bends left and right, with the cane tip remaining in contact with the walking surface at all times. The arc is just slightly wider than shoulder width.

Touch Technique

The touch technique is just two touches, with the cane very slightly raised between them. The arc is just slightly wider than shoulder width.

- **Direction of the sun or wind, which sometimes aid in maintaining orientation.**
- **Movement of other roadway users.**
- **Visual contrast, via tone or color.**

Familiarity with the area, or knowledge about it, helps pedestrians with vision disabilities perceive, correctly interpret, and use available cues for wayfinding and hazard avoidance. However, people with vision disabilities do travel to new places and are not oriented in advance to every location where they may be walking.

4.3 Navigational Challenges on Shared Streets

Shared streets, which desegregate drivers and pedestrians to create a lively and flexible space, can result in an ambiguous, highly variable, and potentially difficult experience for pedestrians with vision disabilities. Potential navigational challenges include:

Safe space: Without the typical segregation of users, shared streets typically lack clearly delineated zones for pedestrians of all abilities to seek refuge out of the way of obstacles and potential conflicts with other users of the space, especially motorists and cyclists.

Rules of the road: Conventional streets are regulated by traffic control devices and established "rules of the road" that all users agree to follow. Shared streets depend on social interaction and negotiation established through visual awareness, and eye contact or hand signals—activities that put pedestrians with vision disabilities at a disadvantage.

Patterns of use: Shared streets accommodate different types of use, including people using the space as a corridor for movement or the delivery of goods and people using the area as open space for a range activities such as café seating, open air markets, movable seating, etc. These use patterns may confuse people who are not able to visually discern such activities and patterns.

Orientation and wayfinding cues: Shared streets typically lack design elements like curbs, curb ramps, detectable warning surfaces, and crosswalks that help pedestrians with vision disabilities orient themselves. In addition, street furnishings, pedestrian amenities, and vertical elements like trees, bollards, and signs may not be organized in an intuitive manner, and pedestrians with vision disabilities may have difficulty using audible cues for navigation due to low motor vehicle volumes.

Surfacing: Shared streets that use patterned paving for aesthetic effect can be confusing and disorienting to people with vision disabilities, who may mistakenly interpret the patterns as cues for navigation or as stairs or level changes.

Defined crossings: For pedestrians with vision disabilities, the lack of defined crossings, coupled with greater uncertainty about how other road users might respond, complicates the process of determining where and when to cross, which can contribute to a feeling of chaos and make crossing a challenging endeavor.

The degree to which pedestrians with vision disabilities are affected by these challenges depends on the unique context and design of each shared street. Still, shared streets can be designed in a way that mitigates these challenges *(see 8. Shared Streets Design Toolbox)*. The first and most critical step is to acknowledge that challenges exist. The next step is to address them through a planning and design process that includes active engagement with a broad range of stakeholders, including individuals with vision disabilities *(See 6. Planning Shared Streets)*.

5. TACTILE WALKING SURFACE INDICATORS AND DETECTABLE EDGES

Many countries have adopted the use of tactile surfaces to help pedestrians with vision disabilities navigate the built environment. Typically this is a combination of small truncated domes intended to catch the user's attention or indicate a hazard (Figure 9), and parallel flat-topped elongated bars intended to guide the user on a path (Figure 10).

The United States lacks an established term for the guidance pattern, which is referred to as a "directional indicator" in this document. There are currently no specifications for the use of directional indicators in the United States and more research is needed on them; however, directional indicators are used in public rights-of-way internationally.

5.1 Terminology

There is currently no umbrella term for these types of surface treatments in the United States. However, the International Standards Organization (ISO) has adopted the term Tactile Walking Surface Indicators (TWSIs), which is the term that is used in this document.

Different countries use different terms to describe these patterns. In the United States, the attention pattern is called a "detectable warning surface" and its specifications and use are clearly defined in the *Proposed PROWAG*. The use of the detectable warning surface is limited to locations in which there is a vehicular hazard; internationally similar truncated dome surfaces are more widely used to call attention to places where travelers with vision disabilities need to make a decision.

5.2 Research on Detectability

For a surface to be useful in providing warning or guidance to individuals who are blind, the surface must be both consistently detectable and identifiable. Surfaces such as rough granite or grooved concrete have been installed in shared street environments; however, these surfaces are not readily detectable and lack a clear message, rendering them of little value to pedestrians with vision disabilities.

An extensive program of research to identify walking surfaces that could be used to alert people with vision disabilities to the presence of hazards such as streets and platform edges is described in Bentzen, Barlow and Tabor (2000). Many tested surfaces, such as various geometries of grooves in concrete, were found to be minimally detectable or not detectable at all. The

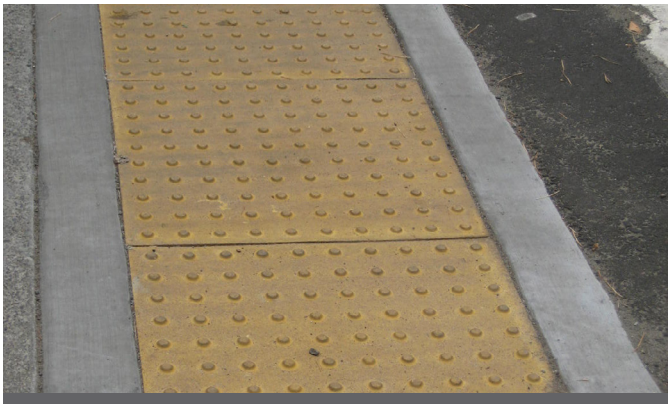


Figure 9: Example of a yellow detectable warning surface used at a shared use path crossing.

Figure 10: Example of a directional indicator.

single surface that was found to be detected by most participants on most trials (approximately 90% of trials across multiple experiments) was the truncated dome detectable warning surface.

5.3 Detectable Warning Surfaces

Specifications for the use of detectable warning surfaces are contained in the *Proposed PROWAG*. Although not an enforceable standard, FHWA recommends the specifications in the *Proposed PROWAG* as a best practice.

Detectable warning surfaces should be a minimum width of 24 inches in the direction of pedestrian travel. They should extend the full width of the flush sidewalk/street interface at pedestrian street crossings, or crosswalks, and their color must contrast with the adjoining surface, either light on dark or dark on light.

When used in public rights-of-way, detectable warning surfaces should be used in pairs that identify the beginning and ending of a crosswalk. When approached from a sidewalk, detectable warning surfaces function like a pedestrian stop line, alerting persons with vision disabilities to the presence of the street or other vehicular travel way.

Detectable warning surfaces are not intended to be used for guidance. Detectable warning surfaces are a hazard warning. Research indicates that few pedestrians who are blind are able to establish accurate headings on the basis of detectable warnings (Scott et al 2011).

5.4 Directional Indicators

There has been no research in the United States on the detectability of directional indicators. However, international research has found directional indicators comprised of raised bars to be highly detectable and identifiable under foot.

If directional indicators are installed, it is best practice to use directional indicators that meet the standard dimensions specified in ISO 23599:2012 and that differ in visual contrast from the adjoining surface, either light on dark or dark on light (Figure 11). Other textures are likely to be less detectable and may be harder to use for guidance.

Detectability and identifiability depend critically on bar spacing and bar height as well as bar width (Tauchi 1998, 2002). ISO 23599:2012 specifies the bar spacing for different bar widths (Figure 12)

A summary of best practice guidance for the use of directional indicators in shared streets is provided on the following page.

Figure 11: Example from the Netherlands of how directional indicators can be used to guide pedestrians to a crossing location. Note how the color of the indicator contrasts visually with the adjoining surface

Top width of flat-topped elongated bars	Spacing (mm)
17	57 to 78
20	60 to 80
25	65 to 83
30	70 to 85

Figure 12: Specifications for bar width and bar spacing. SOURCE: ©ISO. This material is adapted from ISO 23599:2012 with permission of the American National Standards Institute (ANSI) on behalf of ISO. All rights reserved.

Summary of Notable Practices for the Use of Directional Indicators on Shared Streets

- Directional indicators that meet ISO standards are detectable.
- The color of the directional indicator should contrast with the adjoining surface, either light on dark or dark on light.
- Directional indicators are often used internationally to help pedestrians navigate through large open spaces, avoid obstacles, follow an accessible pathway, and find crosswalks, transit stops, and other amenities, when other cues in the built environment do not provide enough guidance.
- Directional indicators should generally be installed in a linear fashion. That is, they should not zig zag back and forth.
- The width of the directional indicator can vary based on use. If the directional indicator is laid out perpendicular to the pedestrian path of travel it must be a minimum of 2' wide to be detectable. If the directional indicator is laid out parallel to the pedestrian path of travel, it can be as narrow as 1' wide if space is limited.
- It is important to consider the impact of directional indicators on pedestrians who use wheelchairs and other mobility devices. When directional indicators are used, designers should seek to maintain a recommended pedestrian access route width of 5' that has a smooth surface and is unobstructed by directional indicators (except where directional indicators perpendicular to the pedestrian path of travel cross over the pedestrian access route).
- When directional indicators are used in the comfort zone of a shared street to guide pedestrians along the street, they should be placed either in the center of the comfort zone (if the comfort zone is more than 11' wide, assuming a 1' wide directional indicator) or nearer to the furniture zone (if the comfort zone is less than 11' wide) to minimize the impact on other users. The term "comfort zone" refers to a pedestrian exclusive area on a shared street. Comfort zone design is discussed in detail on p. 22.
- Directional indicators should not be used to define the edge between exclusive pedestrian space and vehicular lanes (bicycle or motor vehicle) but rather to delineate the path for through pedestrian travel. They also should not be used for aesthetic or general edging purposes as this could confuse the meaning.
- The need for and utility of directional indicators is context sensitive and is influenced by other cues in the built environment, for example the extent to which other features are also incorporated into the design such as rolled curbs, raised intersections, other detectable surfaces, and a thoughtfully arranged furnishing/planting zones.
- Directional indicators should be installed in way that prevents the edges from lifting up. The materials used in directional indicators should be durable enough to withstand expected use.
- There is no regulatory requirement for directional indicators.
- While there is a history of successful applications of directional indicators in other counties, their application in the U.S. is still new and more research is needed.
- People with visual disabilities should be a part of the planning and design process for shared street projects, including when directional indicators are being considered.

5.5 Detectable Edges and Detectable Changes in Surface Texture

Best practice is to provide surfaces or landscaping on either side of pedestrian comfort zones that are sufficiently detectable to travelers with vision disabilities, so that they form detectable boundaries to the comfort zone. Adjoining surfaces need to differ from one another in visual contrast (light beside dark), as well as texture (Figure 13). The surface or landscaping can be either followed by travelers with vision disabilities, or can simply be noted in the same way that the two sides of a sidewalk are detected and enable travelers with vision disabilities to walk within the sidewidth.

Additional research is needed on how to guide selection of walking surfaces that are reliably detected from one another. In the absence of such research, designers are encouraged to experiment informally before finalizing selection of surfaces intended to provide detectable edges or detectable changes in surface texture. The need for such surfaces to be both identifiable and detectable requires careful consideration by the designer and follow-through in construction. While differences in texture of walking surfaces may be detected either under foot or by use of the long white cane, under-foot detection is the most critical, because a majority of pedestrians with vision disabilities do not use a long white cane. Textures that differ from adjoining surfaces in resilience (i.e., in their ability to be compressed) as well as surface texture may be more highly detectable than the same textures that do not differ in resilience. Proposed surfaces to be used together should be subjected to informal evaluation by numerous pedestrians who have vision disabilities, who attempt to discriminate the difference between them and to follow the joint between them using their feet or a long cane. Visual appearance and exploration with hands are poor predictors of detectability and discriminability under foot or by use of a long cane.

Rolled curbs or valley gutters are possible considerations for indicating the edge of the shared portion of the shared street, but their precise geometry will influence how detectable they are (Figure 14). Therefore, they should also undergo informal evaluation by numerous pedestrians with vision disabilities.

When the pedestrian comfort zone cannot be defined by detectably different surfaces, the raised bar directional indicator is recommended.

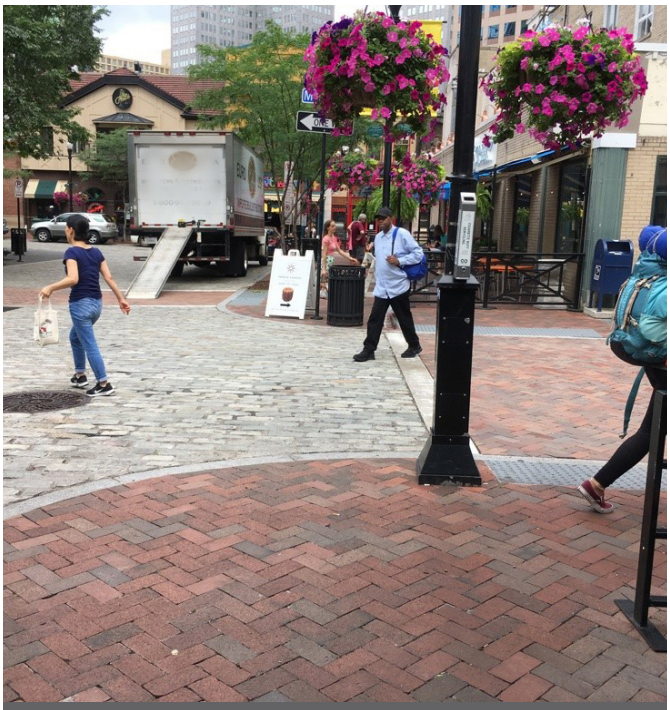


Figure 13: On this shared street, the cobbled surface of the shared zone is detectably different from the smooth bricks used in the comfort zone and crosswalks. The gray of the cobbled surface also contrasts visually from the red bricks. Note that cobbles should not be used in the pedestrian access route. SOURCE: Accessible Design for the Blind

Figure 14: This shared street uses a valley gutter to indicate the edge of shared zone. The detectability of this valley gutter is enhanced because it is made of small granite cobbles. Note that cobbles should not be used in the pedestrian access route. SOURCE: Accessible Design for the Blind

6. PLANNING SHARED STREETS

Ensuring that shared streets work for pedestrians with vision disabilities requires involving key stakeholders in the planning and design process, including individuals with vision disabilities. Project meetings should be held in accessible facilities, preferably locations served by transit, with accommodations provided for a variety of disabilities upon request. Providing accessible project websites, educating people regarding shared street goals and features, and monitoring the performance and programming of shared streets post-construction are also important.

Involve Key Stakeholders

Planners and designers should establish early and ongoing collaboration between local government representatives and key stakeholders, including:

- People with vision disabilities who represent the spectrum of vision disabilities and navigation methods, including people who are deaf-blind.
- Groups that represent people with vision disabilities, such as local chapters of the National Federation for the Blind, American Council of the Blind, and guide dog user groups.
- Orientation and mobility specialists (professionals who teach independent travel skills to people having vision disabilities).
- Groups that represent seniors.
- Groups that represent pedestrians and bicyclists.
- Maintenance and operations staff who are responsible for pavement, vegetation and site furnishings.

Key stakeholders should be engaged at every stage in the planning and design process, from needs assessment to final design.

Ensure Accessibility at Project Meetings and Provide Accessible Project Websites

Planners and designers can take a number of steps to make project meetings more accessible to people with vision disabilities:

- Advertise meetings through agencies serving individuals with vision disabilities and other channels such as local radio reading services.
- Ask invitees well ahead of time whether they will need special accommodations in order for them to participate fully, and arrange for those accommodations.
- Provide advance copies of meeting materials in accessible electronic formats, including detailed presentation notes with image/graphic descriptions.
- Print enlarged copies of presentations for people with low vision, who may be able to read close up but not at a distance.
- Use tactile maps or 3-D models to convey key design concepts (Figure 15). Allow sufficient time for people with vision disabilities to review these materials or make them available in advance.

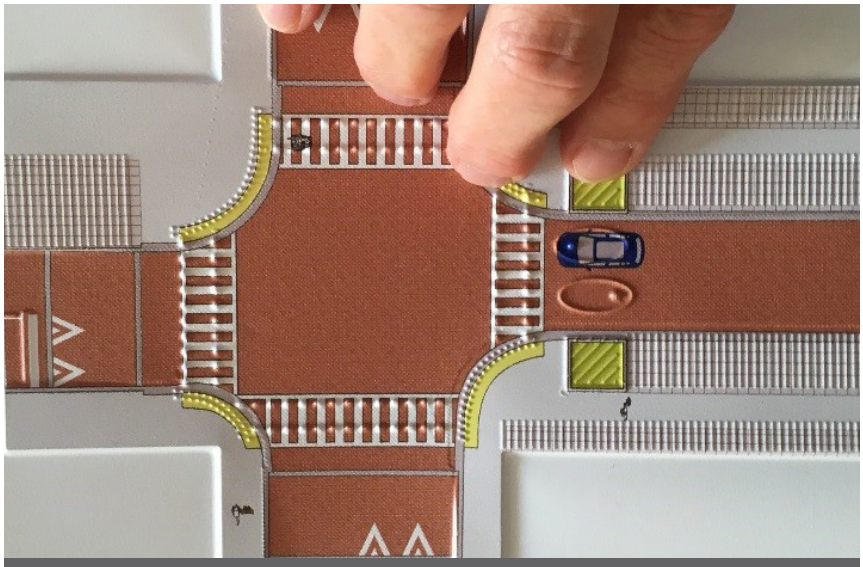


Figure 15: Example of a tactile map showing design of a shared street. SOURCE: Accessible Design for the Blind

- Provide detailed verbal descriptions of visual elements that are important for understanding, such as presentation graphics or images.
- Hire interpreters for deaf-blind attendees and adjust the pace of the presentation to accommodate interpretation.
- Actively engage people with vision disabilities. Ask them to share their experiences navigating the built environment, including the technologies they use.
- Provide an accessible website with accessible project documents.

Accessible websites that comply with Section 508 of the Rehabilitation Act of 1973 can also help engage people with vision disabilities in shared street projects. The website can be used to post basic information about the project, upcoming meeting dates, meeting minutes, information about alternative design scenarios, and other relevant materials.[1]

Educate People Regarding Shared Street Goals and Features

Most people in the United States have limited experience with shared streets, so it is important to educate them about the goals and features of a shared street design before and after construction. Education should target users of all abilities and materials should be provided in formats accessible to people with vision disabilities (e.g., high visibility, large font size, tactile, audible). It may be advantageous to work with partners from the vision disability community and provide guided, explanatory tours of recently constructed shared streets.

Figure 16: After a shared street is constructed, it is important to monitor how well it works for people with vision disabilities and others, and identify any adjustments needed to ensure accessibility.

Monitor the Performance of a Shared Street Post-Construction

Designers have the ability to "tweak" designs once they are implemented and behaviors can be observed. With newer, complex facility types like shared streets, design tweaks can be expected and are not indicative of a failed design.

After a shared street is constructed, it is important to monitor how well it works for people with vision disabilities and others, and identify any adjustments needed to ensure accessibility (Figure 16). A data collection and monitoring protocol is recommended for measuring the effectiveness of designs over time. It is also helpful to capture lessons learned, so they can be incorporated into future shared street planning efforts and designs, or to develop evidence-based guidelines. Monitoring need not be limited to accessibility issues. Issues like safety and economic performance can be useful to evaluate over time as well.

1 It is highly advisable for the material you post to your website to be accessible to people with disabilities. For resources about web accessibility, please see the W3C Web Accessibility Initiative [1] and their Web Contents Accessibility Guidelines (WCAG) 2.0 [2] Level AA which the U.S. Board recently cited as part of their 508 rulemaking.[3]

[1] http://www.w3.org/WAI/gettingstarted/

[2] http://www.w3.org/TR/WCAG20/

[3] http://www.access-board.gov/guidelines-and-standards/communications-and-it/about-the-ict-refresh/overview-of-the-final-rule

7. LESSONS LEARNED FROM SHARED STREET IMPLEMENTATION IN THE UNITED STATES

A number of communities in the United States have converted conventional streets or alleys to shared streets. Several of these streets were reviewed in connection with the development of this resource to gain a better understanding of current practice for accommodating pedestrians with vision disabilities. The following are some key lessons learned.

- **The design of shared streets should respond to the context in which they are situated, including those features intended to assist pedestrians with vision disabilities.** Where the shared street is located, adjacent land uses (rural, suburban, urban), the characteristics of nearby and intersecting conventional streets, available right-of-way and other factors will influence how the shared street is designed (Figure 17). At the same time, it is critical that features intended to assist pedestrians with vision disabilities be consistently applied, and applied in accordance with Federal guidance.

Figure 17: Available right-of-way is an important factor influencing shared street design.

Figure 18: The concrete used on this shared street looks very much like the concrete used on a conventional street.

- **The design of a shared street must distinguish it from conventional streets** through gateway treatments, traffic calming measures, detectable changes in surface texture and color, and other design elements. The combination of these treatments on a shared street should encourage low motor vehicle operating speeds, generally between 5 and 15 mph. One of the shared streets reviewed looked similar to a conventional street and lacked effective gateway treatments to signal to pedestrians, bicyclists, and motor vehicle drivers that they were entering an environment where pedestrians had greater priority and could be expected at any point in the shared zone (Figure 18). The street also lacked a reliably detectable edge treatment, again creating a safety concern.
- **It is very important for transitions from pedestrian-only space to shared zones to be reliably detectable** in a way that enables pedestrians with vision disabilities to correctly interpret the transition. Some

Figure 19: The corduroy pattern used on this street to indicate the boundary of the shared zone is not reliably detectable underfoot or by cane and does not provide enough visual contrast with the adjoining surface.

of the shared street designs reviewed attempted to provide a detectable edge treatment to indicate to pedestrians with vision disabilities that they were about to cross into the shared zone. However, the effectiveness of this treatment was often undermined by the fact that the surface used was not detectable to the full range of pedestrians with vision disabilities (e.g., pedestrians with vision disabilities who do not use canes, or who use touch technique with their cane) or understandable by them as the edge of the shared zone (Figure 19).

- **It is very important for transitions from shared spaces to vehicular lanes on intersecting conventional streets to be reliably detectable** in a way that enables pedestrians with vision disabilities to correctly interpret the transition and to find a designated crossing of the conventional street. It should be assumed that pedestrians with vision disabilities will walk in the shared zone of a shared street and could potentially walk out into the vehicular lane of an intersecting conventional street at an undesignated crossing location if not sufficiently warned. One of the streets reviewed attempted to provide this warning by configuring transitions between the shared zone and intersecting conventional streets as driveway aprons. Unfortunately, the grade of these transitions was often not steep enough for pedestrians with vision disabilities to distinguish them from curb ramps at a crosswalk.
- **If a detectable warning surface is used to indicate the transition between the shared zone and an intersecting conventional street, it should align with a marked crosswalk.** On one of the streets reviewed, a detectable warning surface was placed across a shared alley to warn pedestrians with vision disabilities walking in the shared zone that they were about to enter vehicular space (Figure 20). Detectable warning surfaces are reliably detectable, and pedestrians with vision disabilities interpret

Figure 20: The design of this shared alley includes a detectable warning surface across the alley exit; however, the marked crosswalks are to the right and left of the alley exit.

them as a warning that they have reached the edge of pedestrian space. However, pedestrians with vision disabilities may also interpret detectable warning surfaces to indicate a designated pedestrian crossing. In this case, the marked crosswalks were located to the right and left of the shared zone, meaning that a pedestrian with a vision disability who interpreted the detectable warning surface across the shared zone as a designated crossing would be crossing outside the marked crosswalk.

- **Where there is sufficient right-of-way, the provision of pedestrian-exclusive "comfort zones" can benefit pedestrians with vision disabilities,** who are likely to be less comfortable in shared space than pedestrians with 20/20 vision due to the way that right-of-way is negotiated on shared streets. However, it is important that these comfort zones be designed with pedestrians with vision disabilities in mind. Surfaces that are reliably detectable and identifiable should be used to define a linear, obstacle-free pedestrian access route through the comfort zone. Several of the streets reviewed included comfort zones; however, in some cases the pedestrian circulation path was not reliably detectable, zig-zagged back and forth, or was obstructed by sandwich boards, low-hanging signs, café seating, bicycle parking, and other elements (Figure 21). In other cases, shared streets with comfort zones also included designated mid-block crossing areas, but provided no method by which a pedestrian with a vision disability walking through the comfort zone could find these crossings let alone properly align to cross, which is another important consideration.
- **If tactile surfaces are intended to provide navigational information to pedestrians with vision disabilities, they must be reliably detectable** by pedestrians with a range of vision disabilities, including pedestrians who are blind and use different types of canes, pedestrians who are blind and use guide dogs, pedestrians who are color blind, and pedestrians with low vision. Some of the shared street designs reviewed included surfaces that appeared intended to help pedestrians with vision disabilities navigate but which were not reliably detectable under foot or detectable with a cane. In other cases, tactile surfaces were used that did not provide sufficient visual contrast from adjoining surfaces. Visual contrast is a critical element of detectability for pedestrians with low vision and color blindness.
- **If tactile surfaces are intended to provide navigational information, they must be consistently applied.** On some of the shared streets reviewed the same tactile surface was used at one location to provide navigational information to pedestrians with vision disabilities and at another location for purely decorative purposes. Such inconsistent application of tactile surfaces is likely to be extremely confusing to pedestrians with vision disabilities.
- **If motor vehicle parking is provided on a shared street, its location and design needs to be carefully considered** and the edge of the parking lane should be set off from pedestrian space by a detectable edge. In some cases, the streets reviewed provided parking along the shared street but there was not enough space to enable deployment of a wheelchair ramp without obstructing the comfort zone.
- **Low motor vehicle speeds and volumes are essential in the shared street environment.** Shared streets are generally designed to produce motor vehicle operating speeds between 5 and 15 mph. In one case, a street was converted to a shared street but traffic volumes on the street continued to be relatively high. Although measures are planned to divert through motor vehicle traffic away from the street, the street currently operates as a curbless street with most pedestrians avoiding the shared zone. The problem for pedestrians with vision disabilities is that the edge treatment used to mark the boundary of the shared zone is not reliably detectable. As a consequence, it is possible that a pedestrian with a vision disability might inadvertently walk in the shared zone at a point where a motor vehicle driver does not expect them, creating a safety and wayfinding concern.

Figure 21: This shared street includes a comfort zone; however, the café seating encroaches on the pedestrian access route and may also encroach on the State Right-of-Way. SOURCE: Accessible Design for the Blind

8. SHARED STREETS DESIGN TOOLBOX

8.1 Guiding Design Principles for Shared Streets

Context Sensitivity and Treatment Levels

Every shared street has a unique mix of land use (rural, suburban, urban), vehicle, bicycle, and pedestrian circulation patterns, amongst other factors, and its design should respond to the specific context while anticipating the needs of all users of the street. Treatment levels should also take into account the function of the street and the street's role within the larger network, along with every day and occasional uses.

Layers of Information

The abilities and needs of pedestrians with vision disabilities are varied and shared street designs should respond by providing navigational information in a variety of ways. For example, directional indicators must be raised in order to be detected by pedestrians who are visually disabled, but they should also have good light/dark contrast so they are visible to pedestrians with low vision. Vision loss may be accompanied by collateral disabilities that may detract from a user's perceptions and ability to orient themselves in unfamiliar environments. Compromised balance, limited depth perception, reduced sensitivity to contrast, difficulty with both low light and glare, hearing loss, or difficulty reading signs may accompany low vision, particularly in older pedestrians with vision disabilities.

Furthermore, both design and environmental conditions can affect the ability of pedestrians with vision disabilities to navigate a shared street on a day to day basis, particularly for people who rely on audible cues. Shared streets may create traffic patterns that are difficult to discern by ear, and quieter users of the street like electric vehicles and bicyclists can be challenging to detect. Conditions like rain and snow can dampen the sound of traffic patterns and make it more difficult to detect changes in texture.

For all these reasons, it is important to provide layers of navigational and environmental information to help pedestrians use shared streets safely and comfortably. Navigational cues can be provided by the following streetscape elements, and should be used in combination where possible:

- Alignment of the pedestrian access route and other streetscape features
- Tactile walking surface indicators, detectable edges, and detectable changes in surface texture
- Appropriate and consistent use of detectable warning surfaces
- Materials and texture, in addition to color and tonal contrast
- Signs and markings

Figure 22

- Audible information (e.g., accessible pedestrian signals, and environment information)
- Electronic wayfinding information or tactile maps (i.e., maps with raised features that people who are blind can use for interpretation)

Consistency and Predictability

It is critical that tactile walking surface indicators and other treatments intended to provide navigational information to pedestrians with vision disabilities be applied consistently. Street light poles, pedestrian push buttons, seating and bike racks, and crossing treatments (if present) are examples of other elements that should be arranged in a predictable way.

Visual contrast can be a very helpful guidance cue, but needs to be used in a consistent manner to be useful. For example, decorative bars of different colors or textures across the sidewalk may be mistaken for steps. Some colors do not contrast in the expected manner to persons who have low vision or those who are color blind. Red and black may look very different to a person with "normal' vision but appear essentially the same to someone with some types of visual conditions or colorblindness. Taking a photo of surfaces and displaying it in black and white can sometimes be a helpful way to see whether surfaces actually contrast visually.

Universal Design for All

It is important to keep in mind that decisions about the ground plane and surfacing also need to work for people with a range of physical abilities, including people with limited mobility, children, people who have a hearing disability, and people using mobility devices. As noted previously, the best source for general guidance on creating accessible pedestrian spaces in the public right-of-way is the United States Access Board's 2011 *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (Proposed PROWAG)*. Because these proposed guidelines have not yet been finalized by the Access Board and adopted by the U.S. Department of Justice or the U.S. Department of Transportation, they are not enforceable standards. The draft guidelines may, however, provide a useful framework to help public entities meet their obligations to make their programs, services, and activities in the public rights-of-way readily accessible to and usable by individuals with disabilities.

It is advisable to field test treatments with people of diverse abilities to ensure that designs meet the needs of all users. It is especially important to field test

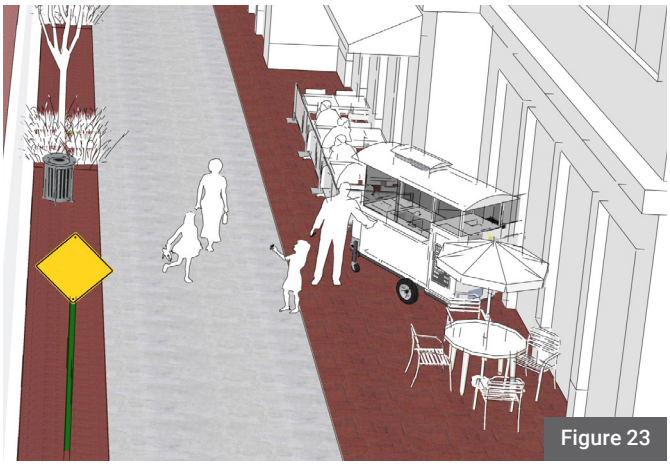


Figure 23

surfaces for detectability both under foot and by use of a long white cane, if they are to be used to define edges such as between the comfort zone and the shared zone.

Programming

Shared streets can provide a setting for farmers' markets, festivals, special events, and other public uses. Maintaining an accessible path of travel for pedestrians with vision disabilities, as well as for pedestrians with other disabilities, at all times is critical. The design of shared streets should address these occasional uses. Ideally, treatments that work for both typical and special use should be used and kept clear during programmed events.

Operations and Maintenance

Shared streets often feature non-standard materials and treatments, which may require more care in installation and special upkeep. The usefulness of these treatments, and the success of the shared space for pedestrians with vision disabilities, may depend greatly on the durability of materials choices and maintenance regime. Regular street cleanings, replacement of lost or damaged site furnishings and streetscape elements, and maintenance of plantings and trees will keep shared spaces looking good, but extra effort may be required to maintain accessibility for all users. For example, materials may lose their color contrast and tactile walking surface indicators may become less detectable over time, depending on their durability and use. Also, in climates where snow is possible, consideration should be given to how snow will be removed from pedestrian access routes, including pedestrian access routes in the comfort zone, if provided. Operational and maintenance costs and efforts must be addressed at all stages of the planning and design of shared streets.

8.2 Shared Street Components

Streetscape elements within a shared street should be organized in a way that facilitates navigation by pedestrians with vision disabilities. The defining feature of a shared street is a shared zone where pedestrians, bicyclists, and motor vehicles can safely interact in the same space. If there is sufficient right-of-way, shared streets may also have a pedestrian-only comfort zone.

Figure 24

Frontage Zone varies	Comfort Zone 6' min, more preferred	Furniture Zone	Shared Zone
Landscaping, front stoops, door swings, awnings, café seating, retail signage and displays	Pedestrian access route (NOTE: If there is insufficient right-of-way for a comfort zone of at least 6'-wide, consider the shared alley design shown in Figure 25.)	Lights, signs, utility poles and boxes, trees, bicycle racks, parking meters, transit stops, benches, stormwater facilities and snow storage	Shared circulation for pedestrians, bicycles, vehicles

8.3 Shared Zone

Designate a shared zone where users can expect to encounter each other, using treatments that communicate pedestrian priority.

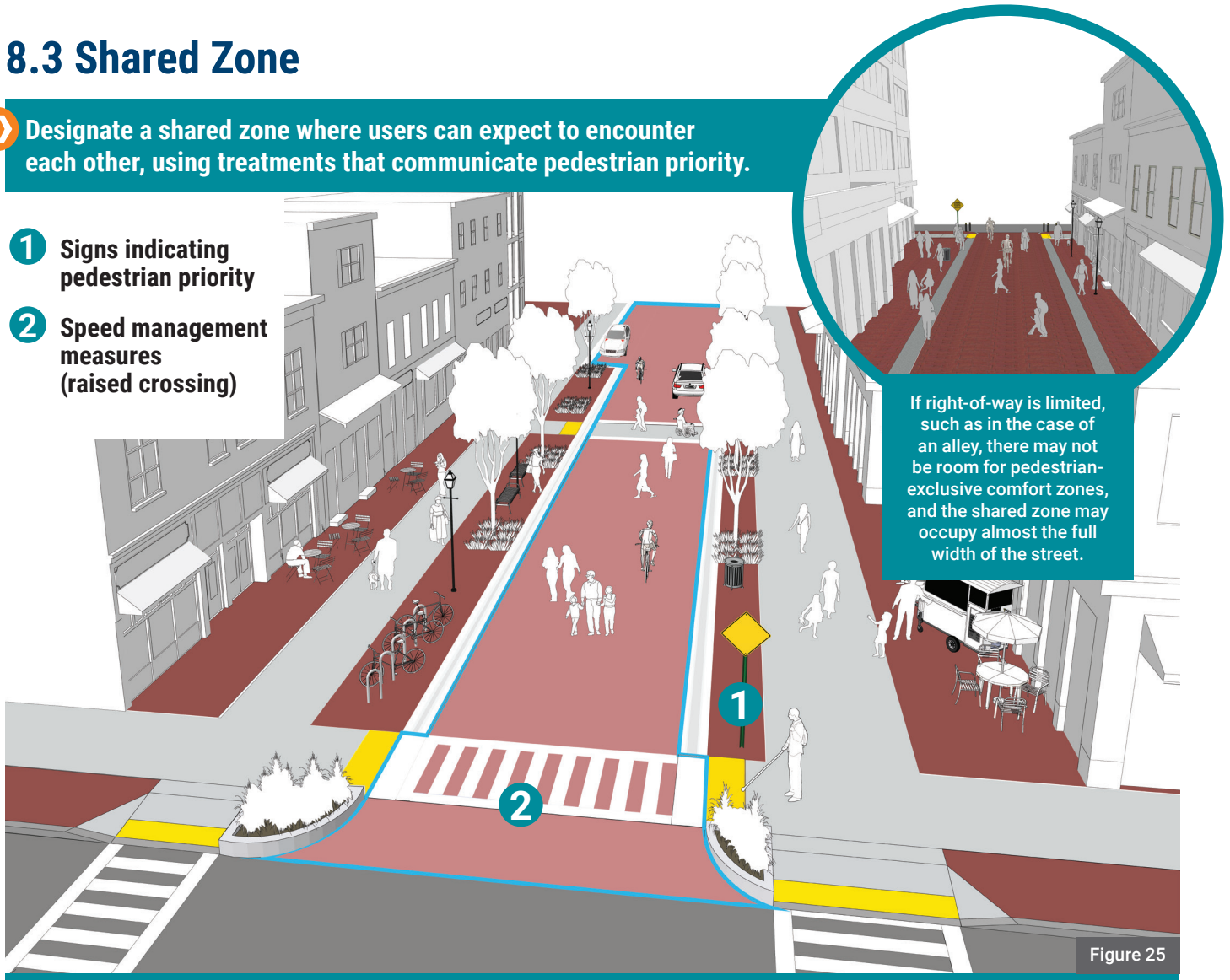


Figure 25

Design Strategy

- Motorists tend to travel in the center of shared streets where the space is otherwise undefined, so a centrally-located shared zone may be the most intuitive location.
- In concert with defined gateway treatments which distinguish the shared street from adjacent conventional streets, shared zones should reinforce the shared nature of the street by being visually distinct. (See *8.4 Comfort Zones* and *8.5 Defined Gateways*)
- The edges of shared zones must be apparent and demarcated for pedestrians with vision disabilities. Edges can be defined with the furniture zone and streetscape elements, or with detectable edge treatments. (See *8.8 Organization and Furniture*)
- Traffic calming measures like vertical deflection (e.g., raised crossings), horizontal deflection (e.g., chicanes), textured paving (e.g., cobbles) which introduce friction, as well as physical and visual narrowing of the field of vision for drivers should be used to slow vehicle speeds and reduce volumes.
- Service and delivery areas and on-street parking may be located within the shared zone or used to define the shared zone as distinct from the comfort zone. Frequency and timing of supply deliveries for adjacent businesses should be considered in the planning and design of shared streets. Other freight-related strategies include exploring delivery access points that aren't on the shared street, timing deliveries during low shared street activity times, or looking for opportunities to provide delivery parking areas on adjacent streets (if off-street loading/unloading areas are not provided at the business).

8.4 Comfort Zones

Create an obstacle-free pedestrian route(s) where pedestrians can move through the space without risk of conflict with other users or obstacles.

Figure 26

Design Strategy

- Comfort zones should be continuous, clearly-defined, straight, direct, and without barriers. Pedestrians may be free to use the entire shared street, but can choose to travel within the comfort zone.
- Comfort zones should provide a pedestrian access route that is at least 6' wide to enable pedestrians to walk side by side in one direction while comfortably passing a pedestrian traveling in the opposite direction. Additional space will be needed to account for doors, awnings, sidewalk cafes, and other obstacles.
- Comfort zones should provide connections to all important destinations within the shared street. Where space allows, providing comfort zones on both sides of a shared street will provide enhanced access to the destinations on each side. Pedestrians can cross anywhere on a shared street, so if a comfort zone is only provided on one side, additional consideration should be given to destination access on the side without a comfort zone or alternatively, a larger shared zone that occupies almost the full width of the street can be considered, as is shown on p. 21.
- Where possible and logical, align the comfort zone in proximity with building edges or other linear features to provide additional orientation, while also allowing space for a frontage zone. Directional indicators can be used to provide a secondary cue to pedestrians with vision disabilities to help them stay within the comfort zone, and may be particularly helpful when the comfort zone shifts in alignment. For information about the specifications and use of directional indicators, see *5.4 Directional Indicators*. See also *8.7 Tactile Walking Surface Indicators and Detectable Edges*.

Comfort Zones

Define the comfort zone with contrasting materials, colors and detectable changes in surface texture to enable people who are blind or have low vision to distinguish the comfort zone from the shared zone. Street furnishings, landscaping, directional indicators, and other streetscape elements can also be used to define the space and help pedestrians with vision disabilities navigate through it.

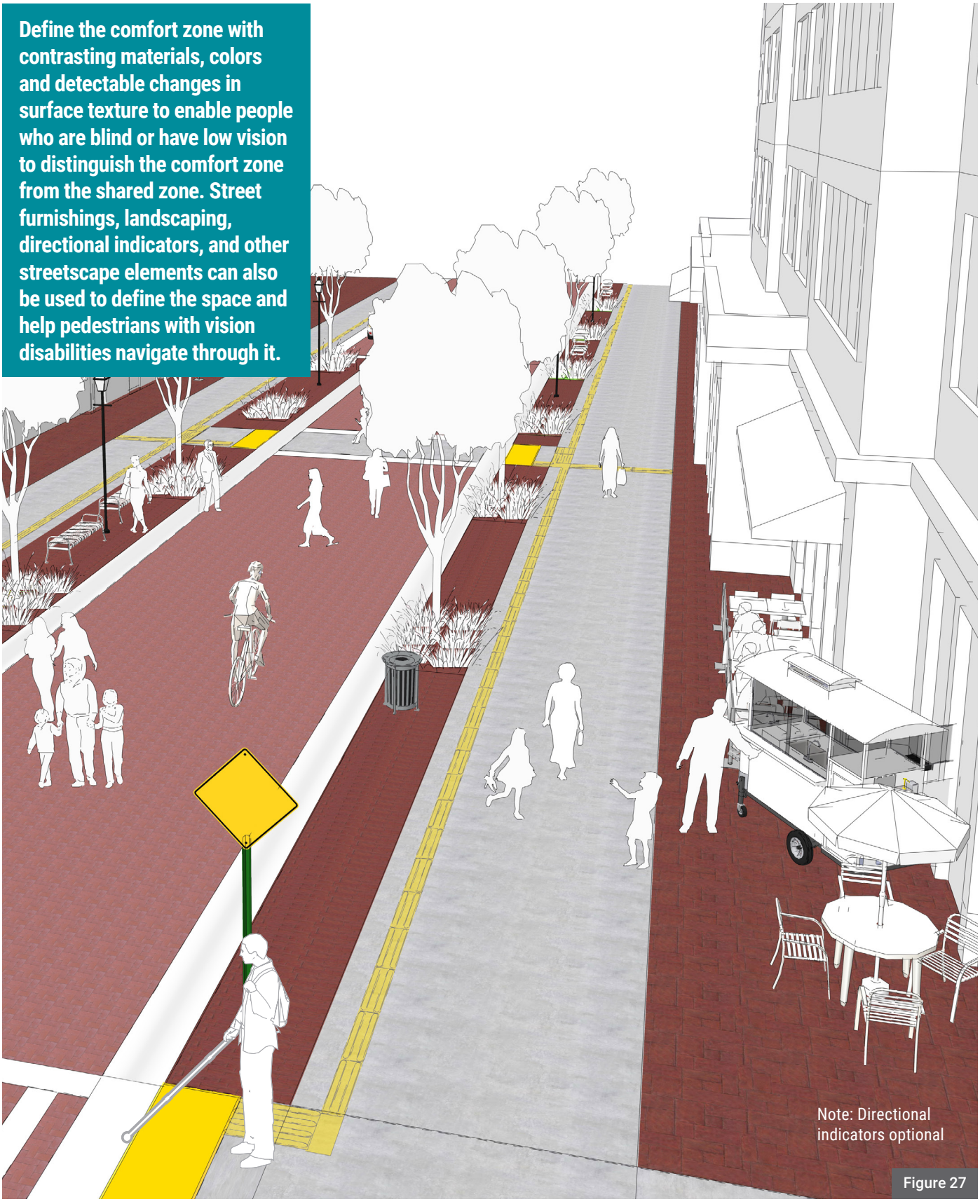


Figure 27

8.5 Crossings and Connections

Provide defined crossing opportunities, using treatments that respond to the needs of the users of the street and are appropriate to the context.

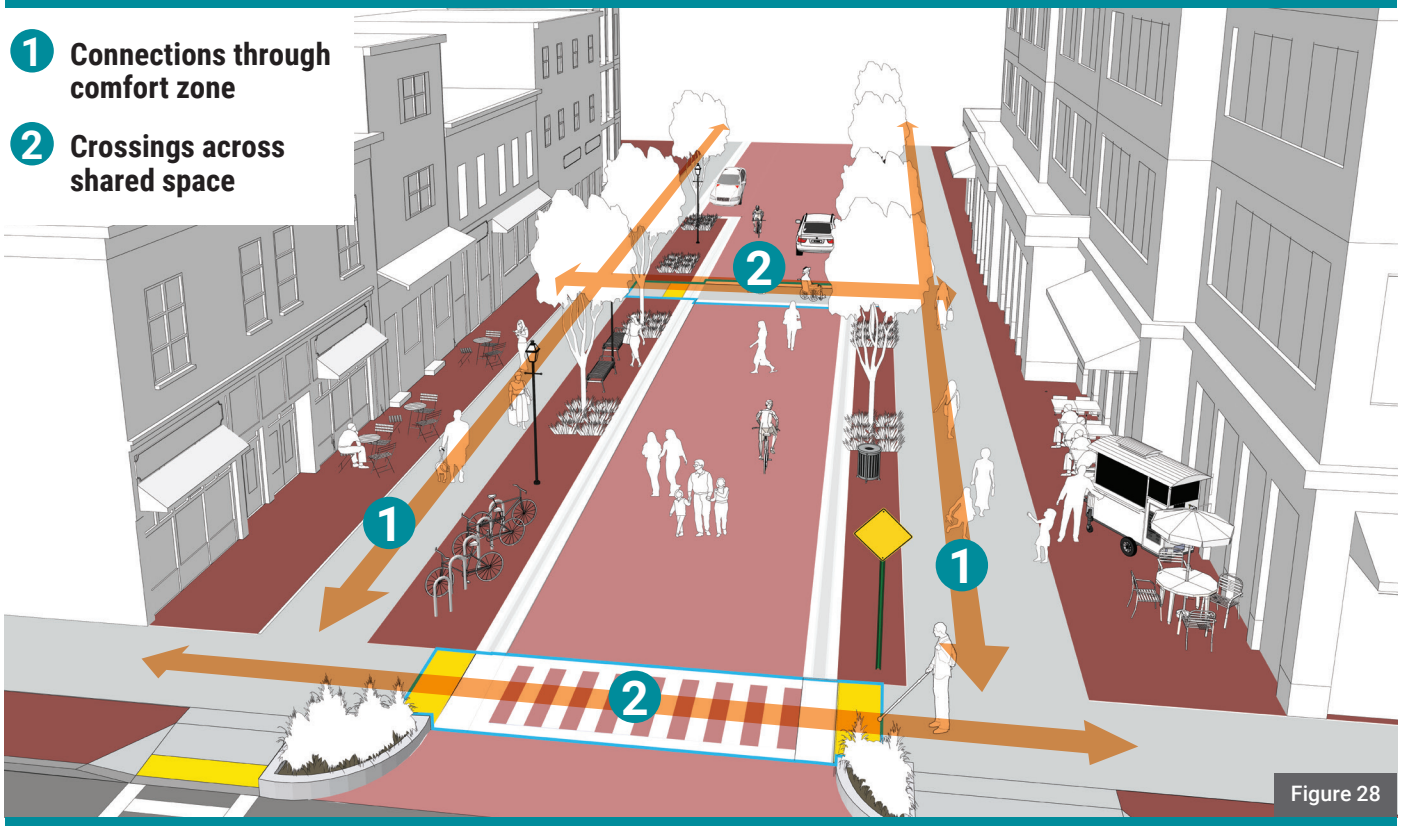


Figure 28

Design Strategy

- Link comfort zones directly with designated crossings. Creating a predictable "ladder-grid" pattern of linear segments (rails) and connected crossings (rungs) can make it easier for pedestrians with vision disabilities to navigate shared streets.
- Designated crossings should be located at the entry/exit points of the shared street.
- The design of the shared street may allow pedestrians to freely cross the shared street at any location but it may also be advisable to provide "courtesy crossings" in certain circumstances, such as to link important destinations.
- White crosswalk markings that meet Manual of Uniform Traffic Control Devices (MUTCD) should be used to designate crossings at shared street gateway locations. MUTCD compliant crosswalk markings are also required at courtesy crossings, unless state or local law gives pedestrians the right-of-way on shared streets. The white crosswalk markings may be composed of white-colored pavers to help distinguish them from conventional street crosswalks markings; however, they must be retroreflective, or ambient illumination must be provided to ensure that the markings are adequately visible.
- In addition to white crosswalk markings, use changes in paving, texture, or color to distinguish crossings from comfort zones and shared zones. Directional indicators can also be employed to enable pedestrians with vision disabilities to more easily locate crossings. Detectable warning surfaces should be used to indicate the boundary of the shared zone at designated crossings.
- All designated shared street crossings should be at least 6' wide. If pedestrian signals are provided, they must be accessible to persons with disabilities.

Crossings and Connections

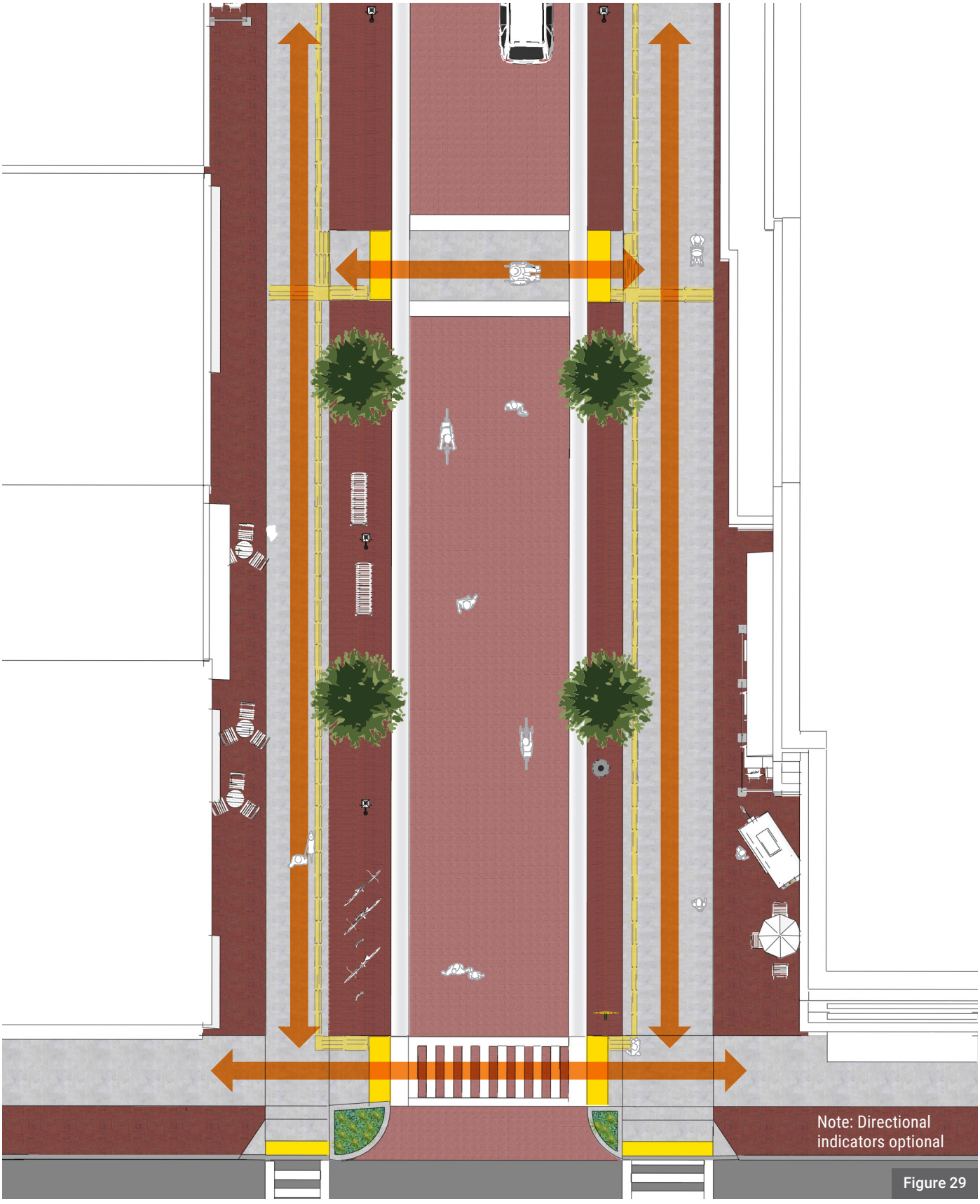


Figure 29

8.6 Defined Gateways

Clearly define, to both drivers and pedestrians, the shared street's entry and exit points through physical and visual means that distinguish the shared street from conventional streets and communicate pedestrian priority.

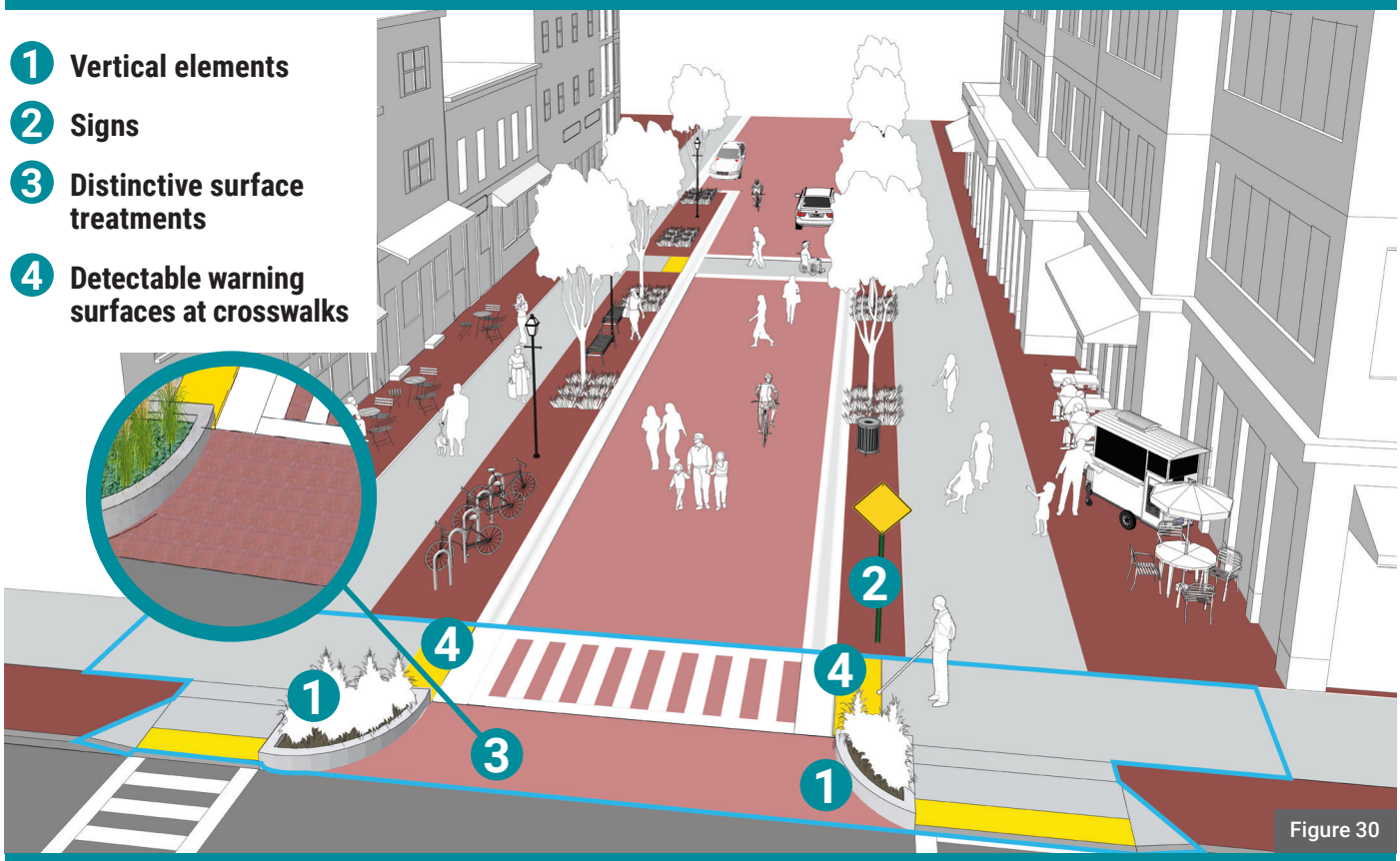


Figure 30

Design Strategy

- Establish the shared use operational protocol with distinctive treatments that increase awareness of vulnerable users and reduce motor vehicle speeds to between 5 and 15 mph.
- Gateway treatments should slow motor vehicle traffic through changes in surfacing, raised crossings, and vertical elements (e.g., trees, landscaping, or light posts) that physically narrow the space as well as the field of vision for drivers.
- Signs to encourage lower motor vehicle speeds and promote courteous behaviors by motorists may be used.
- Moveable elements such as planters and removable bollards may also be used to temporarily block entry/exit points for certain uses or times of day. These elements should not be placed in the crosswalks or the pedestrian access route.
- The gateway should be designed in a way that enables pedestrians with vision disabilities to detect an intersecting conventional street and navigate to a designated pedestrian crossing of the conventional street. The specific design treatment will depend on site-specific factors, such as the width of the shared street, whether it has comfort zones, the number of intersection legs, and other site-specific factors. If the gateway is configured as a driveway apron, the slope of the apron should exceed 8 percent, so that a person with a vision disability walking in the shared zone can detect it and understand that it is not a pedestrian ramp leading to a designated pedestrian crossing. If the gateway does not include a driveway apron, consider the option presented in Figure 33 on p. 28.

8.7 Tactile Walking Surface Indicators and Detectable Edges

Use tactile walking surface indicators (such as detectable warnings and directional indicators) to facilitate movement through and across shared streets. Use detectable edges and detectable changes in surface texture to define the pedestrian comfort zone.

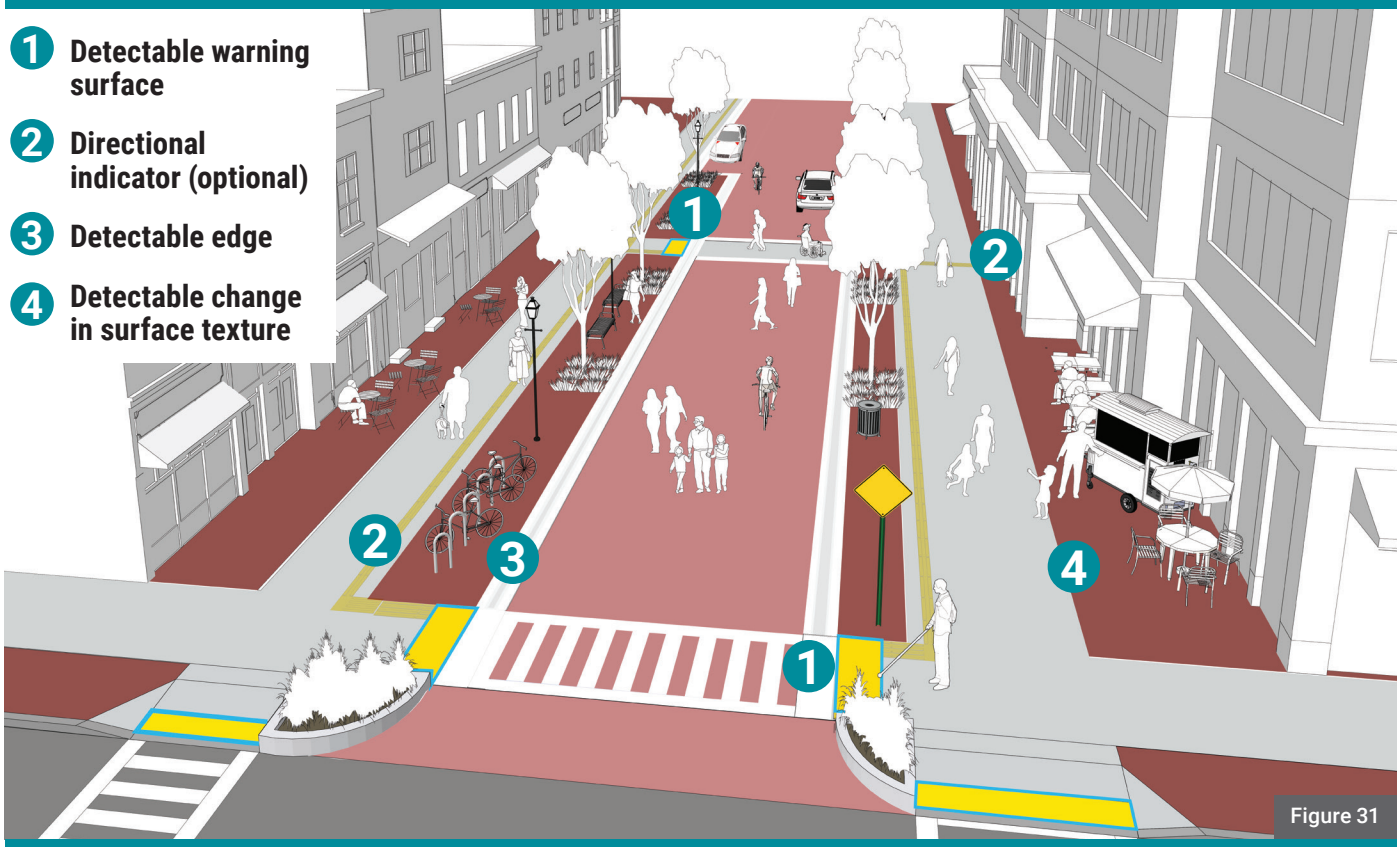
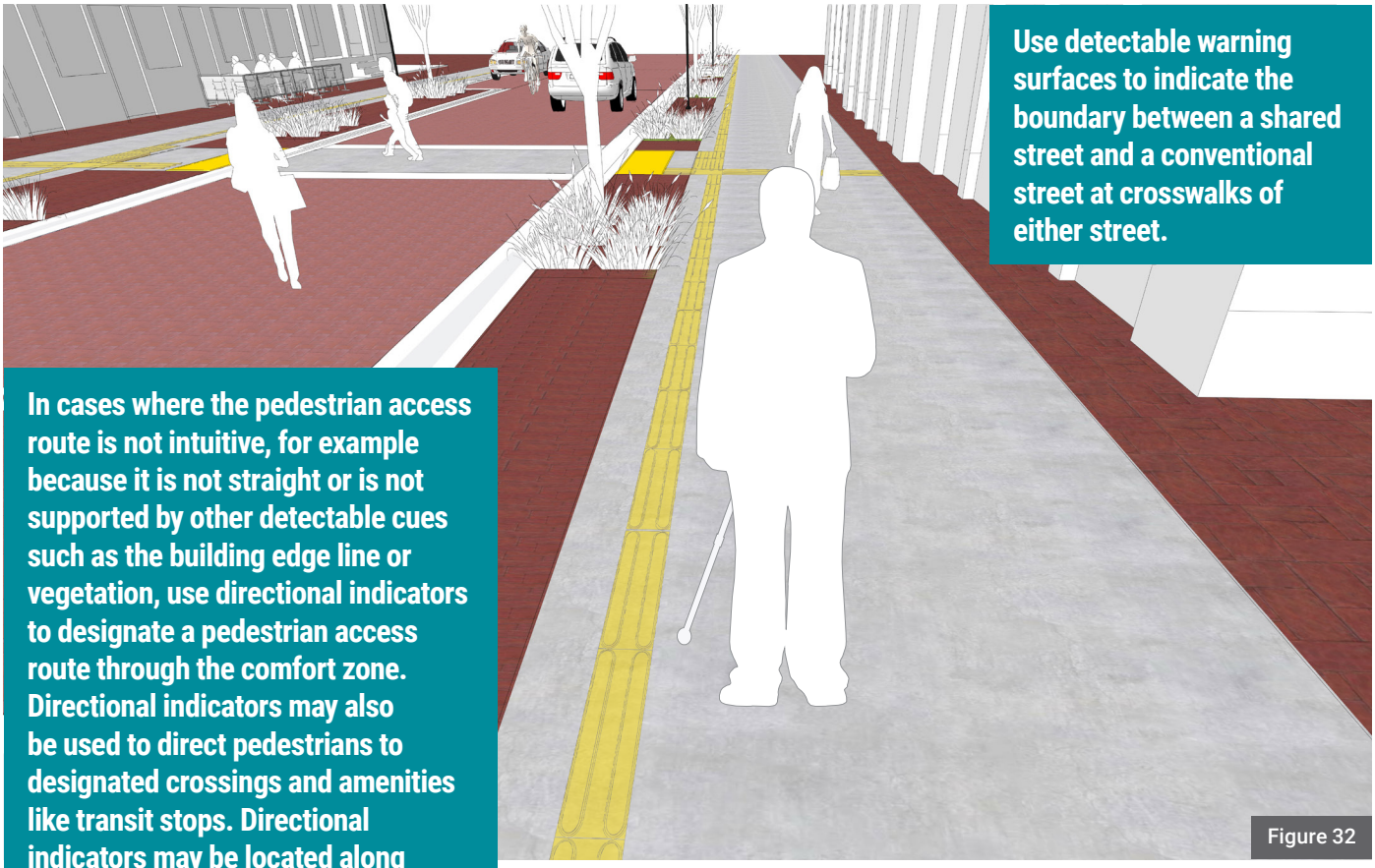


Figure 31

Design Strategy

- As conventional navigational cues can be limited or absent in shared streets, establish an alternative design language that is applied in a consistent manner to enable pedestrians with vision disabilities to understand and navigate the street.
- Pedestrian access routes should have a smooth surface that contrasts visually with adjoining surfaces.
- Surfaces adjoining pedestrian access routes should contrast visually with the pedestrian access route, either light on dark or dark on light, and should have a detectably different surface texture. *(See 5.5 Detectable Edges and Detectable Changes in Surface Texture)*
- Detectable edge treatments can be used to help pedestrians with vision disabilities distinguish the edge of the shared zone. (See *5.5 Detectable Edges and Detectable Changes in Surface Texture*)
- Directional indicators can be used to help pedestrians with vision disabilities navigate through the comfort zone and find designated crossings. (See *5.4 Directional Indicators*)
- Provide layers of navigational information to supplement and/or complement other design features. This could include audible treatments or other visual or tactile elements.
- Consider providing kiosks, tactile maps, or other technological tools to indicate to pedestrians with vision disabilities that they are entering a shared street and to provide information on the layout and navigation of the street. If possible, provide information about the shared nature of the street to app/map providers.

Tactile Walking Surface Indicators and Detectable Edges



Use detectable warning surfaces to indicate the boundary between a shared street and a conventional street at crosswalks of either street.

Figure 32

Note: Directional indicators optional

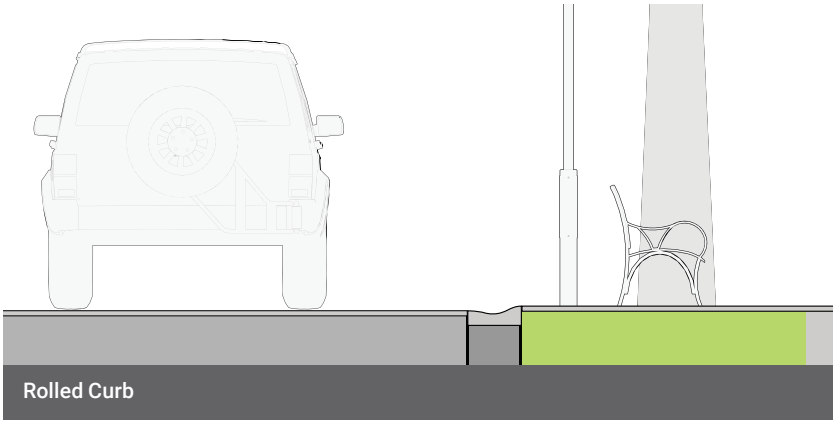
In cases where the pedestrian access route is not intuitive, for example because it is not straight or is not supported by other detectable cues such as the building edge line or vegetation, use directional indicators to designate a pedestrian access route through the comfort zone. Directional indicators may also be used to direct pedestrians to designated crossings and amenities like transit stops. Directional indicators may be located along the middle or edge of the comfort zone, depending on the context and width of the comfort zone. Designers should seek to maintain a recommended pedestrian access route width of 5' that has a smooth surface and is unobstructed by directional indicators (except where directional indicators oriented perpendicular to the pedestrian path of travel cross over the pedestrian access route) to accommodate wheelchair users. When used for designated crossings, directional indicators should be placed at the outside edge of the crossing rather than in the middle of the crossing, so that wheelchair users can more easily avoid the indicators when using the crossing.

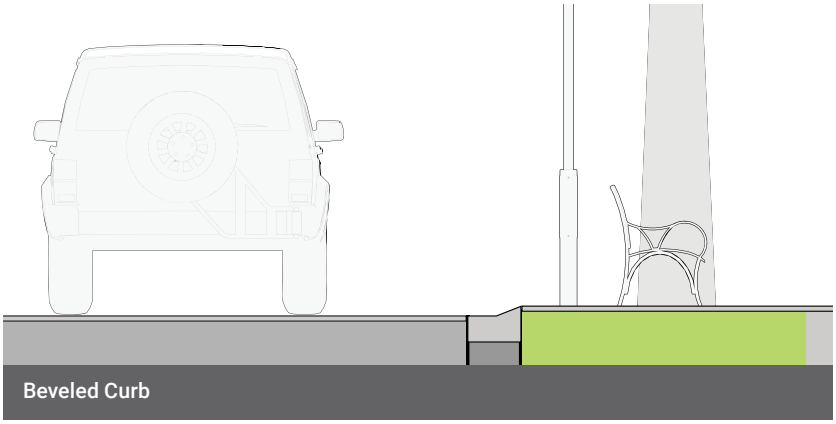
Figure 33

OPTION: If the connection to the major street is not detectable due to low slope, a directional indicator across the shared street could potentially provide a cue to someone walking in the shared zone regarding the location of designated crossings across intersecting conventional streets. More research is needed on this application. If used, agencies should carefully monitor wear and tear from motor vehicles to ensure that it doesn't become a tripping hazard.

Tactile Walking Surface Indicators and Detectable Edges

When considering detectable edge treatments, designers should consider the needs of both pedestrians with vision disabilities and pedestrians with mobility disabilities.





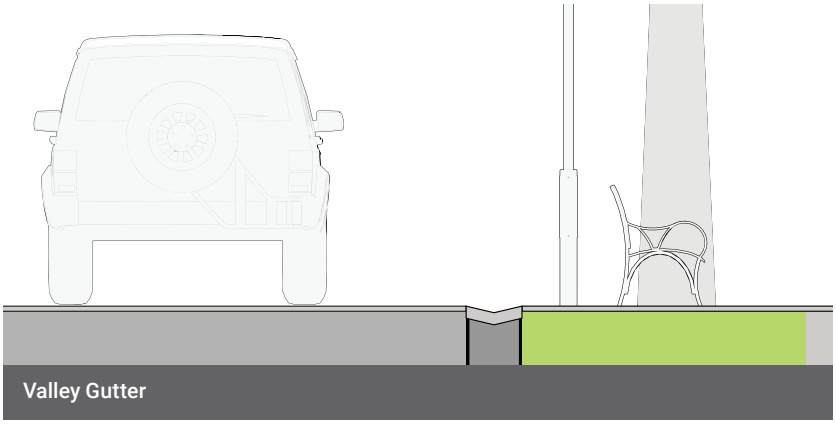


Figure 34

Detectable Edge Options

- Rolled curbs, beveled curbs, and valley gutters are possible options for indicating the edge of the shared zone. The precise geometry of these options will influence how detectable they are and should be subjected to informal evaluation by pedestrians with a wide range of vision disabilities and navigational techniques prior to installation.
- The color of detectable edge treatments should contrast with the color of adjoining surfaces, either light on dark or dark on light. It is also important to provide adequate, even lighting levels to ensure such treatments are visible to pedestrians with low vision at all times of the day and night.
- Shared streets must accommodate pedestrians with mobility disabilities. If a detectable edge is used to indicate the edge of the shared zone, designers must consider how it will impact pedestrians with mobility disabilities and adjust the design to ensure convenient pedestrian access routes along and across the street for pedestrians with mobility disabilities.
- When the pedestrian comfort zone cannot be defined by detectably different surfaces, landscaping or directional indicators can be used to help pedestrians with vision disabilities stay within the comfort zone and locate designated crossings.

8.8 Organization and Furniture Zone

Organize the streetscape elements to create an easily understood space where people with vision disabilities can find their way and move through the street unimpeded by potential obstacles such as street furnishings.

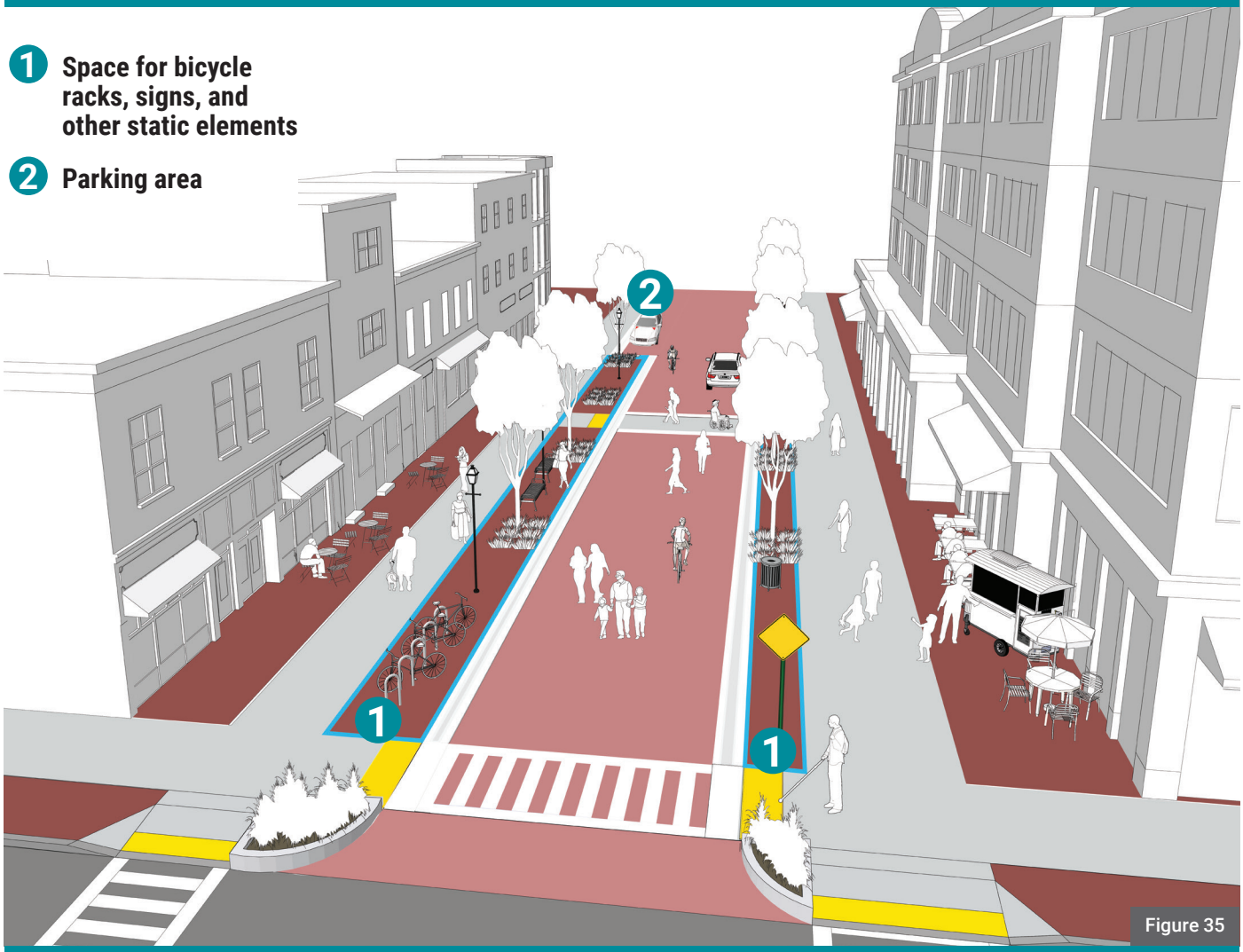


Figure 35

Design Strategy

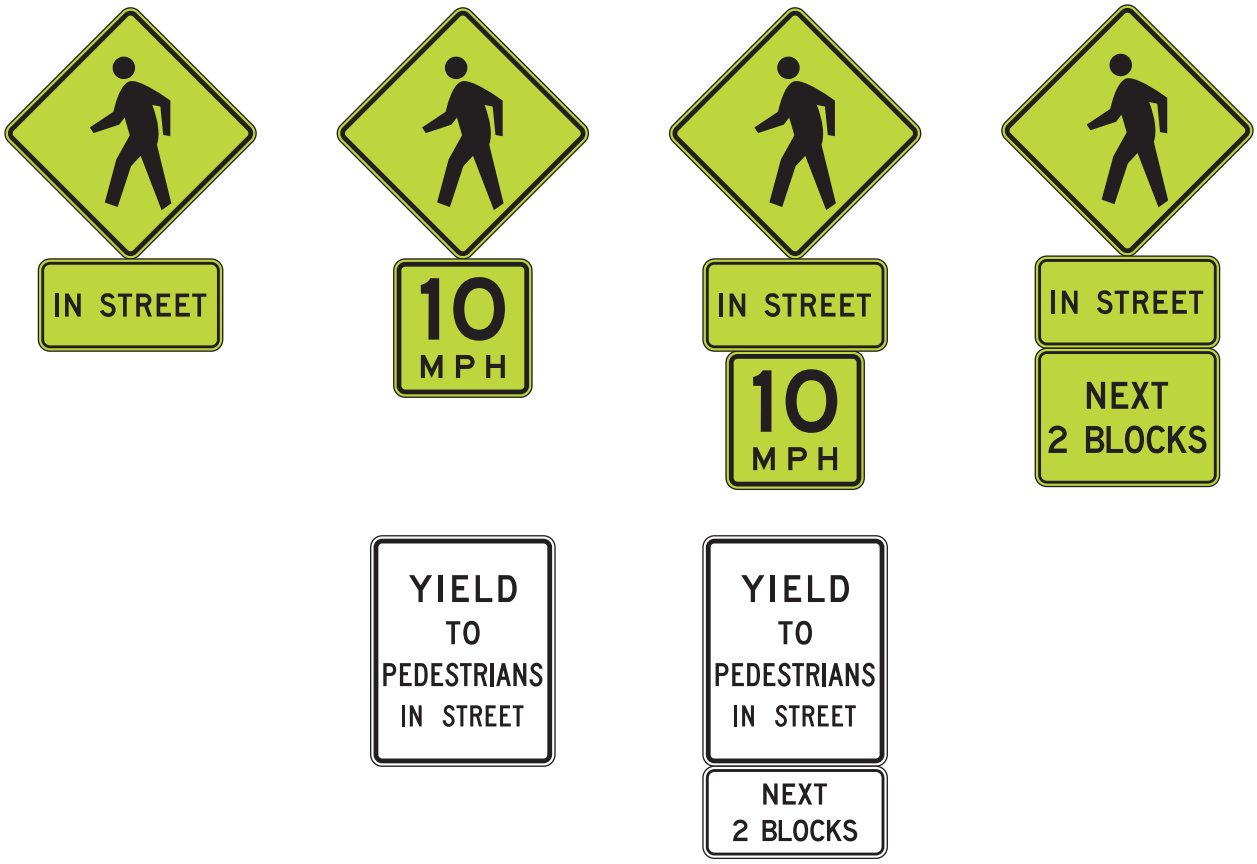
- Cluster naturally compatible elements together (e.g., benches and bike racks) to distinguish active and static uses of the public space.
- At roadway intersections within a shared space, design crosswalks to be directly in line with the approach on the pedestrian access route, not offset in any way.
- Where possible, elements should be arranged in a continuous linear fashion.
- Where possible, physically combine elements to minimize poles and clutter (e.g., attach signs to light poles).
- Place freestanding elements like bike racks out of the pedestrian circulation path.
- Site motor vehicle parking and loading zones outside of the comfort zone and separate them from the comfort zone with a detectable edge. These functions can be located adjacent to the comfort zone and used to define it; however, they should not encroach upon the comfort zone. Avoid the use of wheel stops as they can be a tripping hazard. Instead, consider using site furnishings or surface changes that are detectable to indicate parking areas.

Organization and Furniture Zone

Figure 36

8.9 MUTCD Compliant and Other Signs Currently in Use

MUTCD Compliant Sign Options



Other Signs Currently In Use

Note: Research is underway to identify the most effective signing and pavement marking for shared streets. Official Experimentation under Section 1A.10 of the MUTCD is available for potential traffic control device concepts that might not comply with the MUTCD. Among the signs being studied for recognition and comprehension are symbol signs used internationally and various word legends including SHARED STREET and PEDESTRIAN ZONE. Consult with the FHWA Office of Transportation Operations MUTCD Team and visit mutcd.fhwa.dot.gov to learn more about signing and pavement marking options and the most recent developments.

Figure 37

9. CONCLUSION

Figure 38

Interest in shared street design is on the rise in the United States due to recognition of their many potential benefits, including improved safety for all roadway users, improved access for pedestrians with mobility disabilities, and the ability to use the street for a range of social, economic, and cultural activities. There are dozens of shared street examples that already exist, many of which have been around for a long time. However, there is a need for additional guidance on accessible shared street design in the United States, particularly as it relates to the needs of people with vision disabilities.

This guide helps to fill this gap in existing guidance. Key takeaways include:

- The need to involve pedestrians with a range vision disabilities and their advocates at every stage in the planning and design of a shared street, so that shared street designs address the navigational challenges faced by pedestrians with a vision disabilities. This guide details those challenges and provides a toolbox of strategy ideas for addressing them.
- The importance of detectability, discriminability, and consistency when using tactile surfaces to provide navigational information to pedestrians with vision disabilities.
- The importance of using detectable warning surfaces consistent with the practices outlined in the *Proposed PROWAG* (e.g., not as a guidance surface or directional indicator).
- The need for additional U.S. research and guidance regarding the appropriate physical characteristics and use of directional indicators. Until this guidance is developed, practitioners should refer to the ISO for guidance and should involve numerous pedestrians with vision disabilities and orientation and mobility specialists in determining the detectability and discriminability of potential surfaces.
- The need for ongoing management, operations and maintenance of shared streets to ensure usability and safety.
- The need for additional research on shared street design, user perception, and operations.
- The need for more research on the Shared Street sign and on other signs and markings relating to shared streets.

BIBLIOGRAPHY

Accessibility Design Guide: Universal design principles for Australia's aid program. AusAID, January 2013. Accessed from http://dfat.gov.au/about-us/publications/documents/accessibility-design-guide.pdf

Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts. FHWA, 2016. Accessed from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

Bentzen, Ph.D., Billie Louise, Janet M. Barlow, COMS, Lee S. Tabor, architect. *Detectable Warnings: Synthesis of U.S. and International Practice.* Accessible Design for the Blind/U.S. Access Board, 2002. Accessed from http://contextsensitivesolutions.org/content/reading/dw_synthesis/resources/Detectable%20Warnings%20Synthesis/

Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, and Gregg Vanderheiden. *The Principles of Universal Design*. The National Institute on Disability and Rehabilitation Research, U.S. Department of Education, North Carolina State University, The Center for Universal Design, 1997. Accessed from https://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm

Brault, Matthew W. *Americans With Disabilities: 2010*. US Census Bureau, 2012. Accessed from https://www.census.gov/library/publications/2012/demo/p70-131.html

Deichmann, J., Winterberg, B., and Bredmose, A. *Shared Space > Safe Space. Meeting the Needs of the Blind and Partially Sighted People in a Shared Space.* Guide Dogs for the Blind Association. Accessed from https://www.guidedogs.org.uk/media/1497826/Shared_space_-_safe_space_Ramboll_Nyvig_report.pdf

Guidance on the Use of Tactile Paving Surfaces. United Kingdom Department of Environment, Transportation and the Regions, 2007. Accessed from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289245/tactile-paving-surfaces.pdf

Hamilton-Baillie, Ben. "Shared Space: Reconciling People, Place and Traffic". *Built Environment*, vol. 34, no. 2 (2008). Accessed from http://www.jstor.org/stable/23289804

Havik, Dr. Else M. and Dr. Bart J. M. Melis-Dankers. *Shared Spaces for Blind and Partially Sighted People: A Challenge for Designers. Issues and Advice for Accessible Public Spaces.* Royal Dutch Visio, Center of Expertise for Blind and partially sighted people. Accessed from http://www.eccolo.nl/shared-space/english/#/home/

Jurewicz, Chris, Amir Sobhani, Jeremy Woolley, Jeff Dutschke, and Bruce Corben. "Exploration of Vehicle Impact Speed – Injury Severity Relationships for Application in Safer Road Design." *Transportation Research Procedia* 14 (2016): 4247-256.

Local Transport Note 1/11: Shared Space, UK Department for Transport, 2011. Accessed from https://www.gov.uk/government/publications/shared-space

Lord Holmes of Richmond MBE. *Accidents by Design: The Holmes Report on "Shared Space" in the United Kingdom.* 2015. Accessed from http://chrisholmes.co.uk/wp-content/uploads/2015/07/Holmes-Report-on-Shared-Space-.pdf

Manual for Streets. UK Department for Transport, 2007. Accessed from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341513/pdfmanforstreets.pdf

Manual for Streets 2: Wider Application of the Principles. Chartered Institution of Highways and Transportation, UK, 2010. Accessed from http://www.ciht.org.uk/en/document-summary/index.cfm/docid/055693F6-8DB0-4BBE-AA9FF1B5BC5E9412

Manual of Uniform Traffic Control Devices, FHWA, 2009. Accessed from https://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

Moody, S. and Melia, S. "Shared space: Research, policy and problems. 2014. Proceedings of the Institution of Civil Engineers - Transport, 167 (6). pp. 384-392. ISSN 0965-092X. Accessed from http://eprints.uwe.ac.uk/17937

Norton, Peter D. *Fighting Traffic: The Dawn of the Motor Age in the American City.* MIT Press, 2008.

Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way. United States Access Board, 2011. Accessed from https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines

Saviskas, S. *Taking Back our Streets: Demystifying Shared Space Streets in America.* Master's Professional Report, 2015. Department of City and Regional Planning, University of California, Berkeley. Accessed from http://www.hamilton-baillie.co.uk/_files/_publications/55-1.pdf

Small Town and Rural Multimodal Networks. FHWA, 2016. Accessed from https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

Summary Health Statistics: National Health Interview Survey. Centers for Disease Control and Prevention, 2015. Accessed from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2015_SHS_Table_A-6.pdf

Tauchi, M. Kizuka, Y., Sakamoto, Y., Sueda, O. & T. Tanaka. *Report of Fundamental Research on Standardization Relating to Tactile Tiles for Guiding the Visually Impaired.* Ministry of International Trade and Industry, National Institute for Technology and Evaluation, Japan, 1998

Tefft, Brian C. "Impact Speed and a Pedestrians Risk of Severe Injury or Death." *Accident Analysis and Prevention* 50 (2013): 871-78.

The Burden of Vision Loss. Vision Health Initiative. Centers for Disease Control. Accessed from https://www.cdc.gov/visionhealth/risk/burden.htm

The International Organization for Standardization. Assistive Products for Blind and Vision-Impaired Persons—Tactile Walking Surface Indicators., ISO 23599, Technical Committee ISO/TC 173, Assistive products for persons with disability, 2012. Accessed from https://www.iso.org/obp/ui/#iso:std:iso:23599:ed-1:v1:en

TNS-BMRB for Guide Dogs for the Blind. Inclusive Mobility: The impact of Shared Surface Streets and Shared Use Pedestrian/Cycle Paths on the Mobility and Independence of Blind and Partially Sighted People: Executive Summary. TNS-BMRB Report JN:197369 March 2010. Accessed from https://www.guidedogs.org.uk/media/1497871/TNS_Impact_Report_for_Guide_Dogs_2010.pdf

Urban Street Design Guide. National Association of City Transportation Officials, 2013. Accessed from https://nacto.org/publication/urban-street-design-guide/streets/residential-shared-street/

Van Veen, Dick, "Shared Space: Possible Solutions for the Accessibility for Visually Impaired People." Mobycon. Accessed from http://www.ictct.org/migrated_2014/ictct_document_nr_777_Dick%20van%20Veen%20Shared%20Space%20possible%20solutions%20for%20the%20access.pdf

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