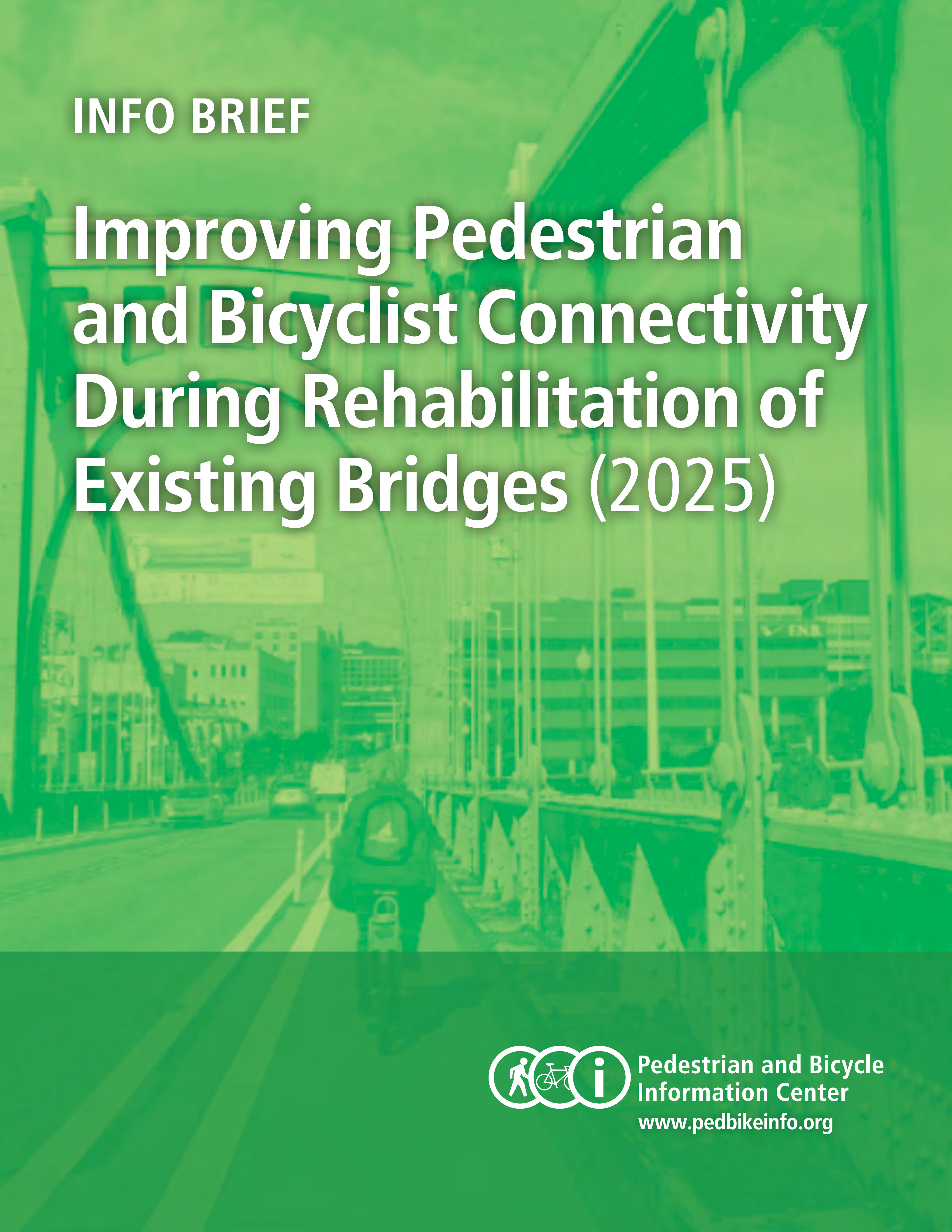

INFO BRIEF

Improving Pedestrian and Bicyclist Connectivity During Rehabilitation of Existing Bridges (2025)

Pedestrian and Bicycle Information Center
www.pedbikeinfo.org

FIGURE 1 (COVER IMAGE): Separate motorist, bicyclist, and pedestrian spaces on the Roberto Clemente Bridge in Pittsburgh, PA. *Source: Toole Design.*

Introduction

The purpose of this Info Brief is to describe how to improve pedestrian and bicyclist connectivity during the rehabilitation of existing bridges. Bridge rehabilitations are major mobility infrastructure projects designed to extend the life of a bridge. The infrequent and complex nature of bridge rehabilitation projects, combined with the role of bridges in connecting areas over natural or built barriers, means that these projects offer a unique opportunity to improve connectivity for a wide variety of users— especially active transportation users such as pedestrians, people riding bicycles, or people using micromobility devices. A focus on these projects is timely, given the significant Federal funding available for bridge projects as part of the Infrastructure Investment and Jobs Act (IIJA), passed at a time when more than 42,000 bridges across the United States (U.S.) were rated to be in "Poor" condition and in need of rehabilitation or replacement (FHWA, 2023b). In addition, all projects with Federal financial participation that replace or rehabilitate a highway bridge deck are required to provide safe accommodation of pedestrians or bicyclists as part of the project if these modes operate at each end of the bridge and such accommodation can be provided at reasonable cost (23 U.S.C. 217(e)).

Currently, many bridges across the U.S. are designed solely to support the flow of motor vehicles and fail to provide connections for active transportation users. Bridges with pedestrian or bicycle facilities, such as sidewalks or bike lanes, are often constrained by limited widths, poor surface conditions, or other design features that make them inadequate for pedestrian or bicyclist use (e.g. structural beams, low guardrails). High motor vehicle speeds and volumes often encourage people to bike on sidewalks, which may be unlawful in some localities and may present new safety risks, including conflicts with pedestrians. Railings designed for pedestrians can be significantly lower than those necessary for bicycle facilities, increasing the risk of bicyclists falling over the railing. Exposure to these conditions can cause users to feel unsafe and uncomfortable and avoid these connections. Including active transportation facilities on bridges can help reduce conflicts between modes, thereby increasing safety, and reducing exposure to uncomfortable conditions for all users.

Benefits of Bicyclist and Pedestrian Facilities

There are nine types of benefits that can be gained by providing active transportation facilities on bridges (Cohn & Sperling, 2016):

Connectivity – For pedestrians, bicyclists, and motorists alike, bridges provide important connections across physical barriers to travel.

Safety – Implementing dedicated active transportation facilities on bridges can significantly improve safety and comfort for these users. Physical separation between vehicles and other road users reduces the conflicts between various modes, thereby decreasing the likelihood of crashes.

Access – Creating high-quality active transportation facilities can increase access to jobs, schools, health care, libraries, business districts, and other essential services and destinations. These facilities and multimodal connections offer more options for people to travel and move around their community, and are particularly critical for children, older adults, people with disabilities, and others who may not be able to operate or afford a vehicle.

Encourage Active Travel – Dedicated and protected spaces for people to walk, bike, or roll can increase active travel volumes. About 51 to 56 percent of the U.S. population are interested in biking but concerned about their comfort and safety (Dill & McNeil, 2013; 2016). A dedicated, protected travel space may encourage some people to consider bicycling or walking.

Health – Active transportation provides an opportunity for people to incorporate exercise into their daily routines. Improved access, connections, and safety all contribute to increased use of active transportation facilities and improve the overall health of the community.

Expand Travel Choices – Safe and comfortable active transportation facilities on bridges, along with well-designed connections at both ends, provide more options for people to walk, bike, or use other mobility devices. Adding these facilities gives people more flexibility in how they travel, making it easier to choose active transportation for shorter trips.

Resilience – Bridges with active transportation facilities enhance network connections and provide more opportunities for safe, comfortable, nonmotorized trips and decrease dependencies on motor vehicles, which can promote resilience and connections to trails.

Cost Savings – Constructing active transportation facilities during bridge deck replacement or rehabilitation provides an opportunity to update infrastructure at little additional cost and is therefore a key strategy for improving safe access for all road users. Designs for rehabilitated bridges should be proactive in their consideration of future bicycle, micromobility, and pedestrian demand, as well as connections to existing and future active transportation facilities.

Economic and Social Opportunity – Providing nonmotorized access over physical barriers can provide new access to jobs, resources, and education. Furthermore, road users are provided opportunities for expanded modal choice for their trips and are less reliant on owning a vehicle or dependent on public transit.

Bridges that are safe, accessible, and comfortable for people walking, biking, and rolling provide vital connections between neighborhoods and contribute to community cohesion. Physical barriers such as waterways, highways, and railroads often define the edges of developed areas. By providing multimodal connections across these barriers, bridges can create links to a wide variety of services, jobs, and people. Additionally, creating or restoring these connections can address the challenges created by past infrastructure projects that divided neighborhoods and limited travel options. Rehabilitating bridges with active transportation facilities expands connectivity benefits beyond motor vehicle users, providing safe and reliable travel options for all.

This Info Brief provides planners, engineers, advocates, and members of the public with an easy-to-read resource detailing how to plan and design safe and comfortable multimodal infrastructure on bridges. The brief includes essential design principles and associated rationale to improve the connectivity, safety, accessibility, and comfort of people walking, biking, and rolling on bridges. This document informs planning and design conversations within agencies throughout the U.S., particularly those pursuing bridge rehabilitation projects supported by recent Federal transportation investments.

Planning for Active Transportation

The following section outlines the approach for incorporating active transportation considerations into the project selection, facility selection, and funding processes. The steps below build on other selection criteria, such as the condition of the structure and relative importance of the bridge to the roadway network. Refer to guidance on access considerations and design criteria outlined in the FHWA Review of State Geometric Design Procedures or Design Criteria for Resurfacing, Restoration, and Rehabilitation (3R) Projects on the National Highway System for more information (FHWA, 2023a).

Project Selection and Evaluation

Project selection should consider the factors that influence nonmotorized travel across the bridge, as well as local plans to rehabilitate the bridge and incorporate it into the multimodal transportation network. Evaluation and candidate project selection factors are presented in the questions below, which build on the FHWA guidance to staff regarding the review of State 3R standards submitted for FHWA (FHWA, 2023a).

1. Is the bridge included in a Capital Improvement Plan (CIP)?

Identify bridges that are deemed to be in poor condition and likely to be rehabilitated in the near term, as these structures are more likely to be considered for inclusion in the local Capital Improvement Program, or CIP. A CIP details and prioritizes a locality’s infrastructure investment and spending plans for the next 5 to 10 years, with a focus on large-scale infrastructure projects like bridge replacement or rehabilitation, roadway modifications, or upgrades to transit stations and amenities. Bridge rehabilitation or replacement projects may also be included in the Transportation Improvement Program (TIP) for the local Metropolitan Planning Organization (MPO) or in a Statewide TIP (STIP), especially if they are under consideration for Federal funding.

Ideally, the CIP, TIP, or STIP request for each bridge should evaluate and determine whether multimodal facilities are appropriate to ensure that adequate funding is allocated to support them. As the project selection process continues, the bridges identified in these improvement plans will be cross-referenced with local bicycle and pedestrian plans, networks, and potential demand for trips.

2. Is the bridge included in local bicycle and/or pedestrian plans or part of American with Disabilities Act (ADA) Transition Plans?

To evaluate the need for multimodal facilities, cross-reference the bridges identified for rehabilitation and/or programmed in the CIP with the local bicycle and pedestrian plans that have proposed bicycle or pedestrian facilities on bridges, or nearby connections that would be served by the proposed bridge projects. For bridges with existing active transportation facilities, review the ADA Transition Plan to identify if the bridge is referenced for ADA noncompliance or as a barrier to accessibility.

If no relevant active transportation plans exist, or if the plans are outdated, review how the identified bridge relates to the existing bicycle and pedestrian network to identify gaps.

3. Are bicycles, pedestrians, and micromobility users allowed to operate at each end of the bridge? Is there latent demand for trips that could be served by active transportation and other modes?

Consider the surrounding context of the bridge, and how the bridge could strengthen local connections for people walking, biking, or rolling. At a minimum, determine if pedestrians or other active transportation users are allowed to operate at each end of the bridge, including on nearby roads or trails, and if these connections are suitable for active transportation (e.g., do the connecting roadways or trails allow bicycle, pedestrian, or micromobility access, have existing facilities, or allow for safe and comfortable nonmotorized trips?).

Next, determine if the adjacent land uses and destinations are supportive of walking, biking, or rolling. This may include the density or proximity of local destinations, the built environment, and other important information such as if there are other characteristics that have potential to generate trips served by walking, biking, or using micromobility options. Understanding the surrounding environment is key to estimating the potential and demand for a multimodal connection.

4. Would an improvement help achieve complete travel networks for various types of road users?

While the previous questions look at the existing infrastructure and surroundings and identify gaps, this selection question factors in the future impacts for the full travel network. Bridges are large and generational projects in service for 50 or more years and require planning efforts to be proactive in considering future mobility and land use changes. The FHWA 3R Guidance recommends a Complete Streets design model and emphasizes safety for all road users. Even a bridge rehabilitation project on a limited-access facility such as an Interstate highway may be a once-in-a-lifetime opportunity to create new bicycle and pedestrian connections across a barrier that currently has few to no options for active transportation users.

If the answers to these questions suggest a bridge project meets these criteria (e.g., inclusion in the CIP and local active transportation plans, suitable surrounding uses, and opportunities to close existing multimodal gaps), the authority responsible for the bridge should evaluate opportunities to include multimodal facilities as part of the project initiation and scoping.

Bridge-Specific Evaluation Criteria

In comparison to active transportation facilities on typical roadways, bridges introduce several special considerations in the design process. First and foremost is the spatial constraint of bridges. The usable space on a bridge is limited to the width of the bridge deck. To add a new sidewalk or shared use path will require the expansion of the bridge deck, reallocation of existing space on the deck, or a combination of both. Widening a bridge deck can provide adequate space for active transportation facilities with fewer impacts on existing travel lanes, however, this approach can significantly increase the cost and time of rehabilitation or modification due to the amount of engineering and construction work required. It may also not be feasible depending on the bridge type.

While redistributing the allocation of space on an existing bridge deck may seem more ideal of the two options, this process can require significant engineering and review if new loads are introduced by new or expanded active transportation facilities or added safety barriers. Structural engineering analyses are required to evaluate these impacts and to ensure that the new facilities can be implemented safely given the existing structure.

Therefore, it is critical to initiate these conversations early in the design process, ideally within the scoping phase. Planners should communicate and incorporate active transportation recommendations as soon as possible so that the structural needs of a new sidewalk, bike lane, or shared use path are integrated into preliminary engineering decisions. In return, this proactive approach will help keep design costs to a minimum and ensure adequate funding is allocated for the new facilities.

Facility Selection

As part of the scoping process for a bridge rehabilitation project, it may be useful to identify the appropriate combination of active transportation facilities based on the characteristics of the traffic carried by the bridge. If the facility type has not been identified in a bicycle or pedestrian plan, consult resources such as the FHWA Bikeway Selection Guide (2019). The Guide recommends designing facilities that are appealing to people of all ages and abilities to cater to the widest range of users, with a focus on physically delineated or separated facilities that reduce interaction and conflict between active and motorized modes where speeds or volumes are high.

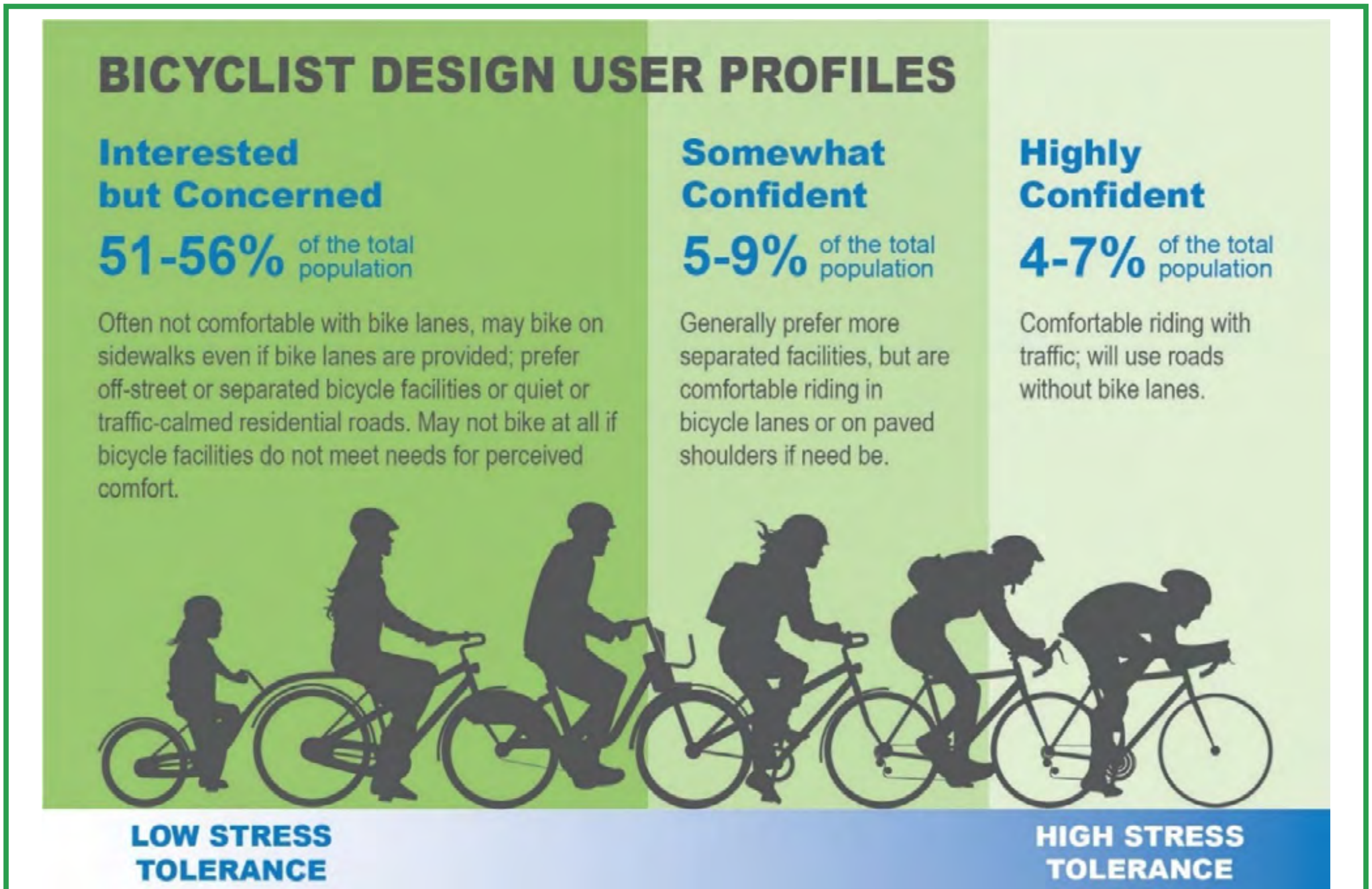

FIGURE 2: Designing facilities for all ages and abilities maximizes potential users and benefits of a project.
Source: FHWA Bikeway Selection Guide, 2019.

Bicycle/Pedestrian Facility	Lower Motor Vehicle Speed/ Volume[1] and Low Bike/Ped Use[3,5]	Lower Motor Vehicle Speed/ Volume[1] and High Bike/Ped Use[4,5]	Higher Motor Vehicle Speed/ Volume[2] and High Bike/Ped Use[3,5]	Higher Motor Vehicle Speed/ Volume[2] and High Bike/Ped Use[4,5]
Within Existing Bridge				
Sidewalk Only (Bikes use motor vehicle lane)	Acceptable	In Constrained Situations Only	Not Recommended	Not Recommended
Sidewalk and Bike Lane	Acceptable	Acceptable	Not Recommended	Not Recommended
Shared Use Path (SUP)	Typically Preferred	Acceptable	Acceptable	Acceptable (Recommend maximizing total potential width of SUP)
Sidewalk and Separated BL	Preferred	Preferred	Preferred	Preferred
Outside Existing Bridge				
SUP on Cantilevered Structure	If Existing Bridge Deck Cannot Accommodate Multimodal Service			
SUP on Hanging Structure				
SUP on Free-Standing Structure				

TABLE 1: Bicyclist and pedestrian facility types for bridges based on motor vehicle speed/volume and bicyclist and pedestrian volumes.

1. <30 MPH and <6500 ADT (Schultheiss et al., 2019)
2. >30 MPH and >6500 ADT (Schultheiss et al., 2019)
3. Under 300 users per hour per direction during peak hour (Patten et al., 2006)
4. Over 300 users per hour per direction during peak hour (Patten et al., 2006)
5. Assumption: Path width is 12', mode split is 55% adult bicyclists/20% pedestrians/10% runners/10% in-line skaters/5% child bicyclists, and has an equal number of trail users in each direction (Patten et al., 2006)

While project-specific conditions should factor into facility selection, Table 1 presents a general framework for preferred facility types based on a synthesis of the Bikeway Selection Guide (FHWA, 2019), Alternatives for Providing a Safe Passage for Nonmotorized Traffic across an Existing Highway Bridge (Attanayake & Lopez, 2015), and Practices for Adding Bicycle and Pedestrian Access on Existing Vehicle Bridges (Zhang & Dobrovolny, 2023). It includes the range of expected volumes and speeds of motor vehicles on bridges, which tend to carry highways, arterials, or collector streets.

Sidewalks on bridges are often adjacent to concrete barriers, fences, and other vertical elements and as such should often be wider than the sidewalks that approach the bridge. The American Association of State Highway and Transportation Officials (AASHTO) Guide for Planning, Design, and Operation of Pedestrian Facilities, Second Edition (2021) recommends a minimum sidewalk width of 5 feet on bridges and a clear width of at least 6 feet if the sidewalk is directly adjacent to the curb. Wider sidewalks are recommended if the bridge has high foot traffic, such as those in urban areas, and especially if the bridge features a scenic vista where people are likely to stop and linger, to enjoy the views of a river or skyline.

Typically, both sides of the bridge should have active transportation facilities to eliminate the need for users to cross the road. Planners should also consider active transportation infrastructure to enable existing or future connections underneath the bridge, such as a future riverside trail or shared use path project. If such facilities exist or are planned for future construction, logical accessible connections to the active transportation facilities on the bridge should be provided. Finally, clear and accessible wayfinding to the facilities on bridges from the street or trail network is important to maximize the utility of these connections.

Unique bridge requirements, such as space and weight restrictions, may prohibit the implementation of desired active transportation facilities. If it is not practical to incorporate the desired facilities, the Bikeway Selection Guide (FHWA, 2019) recommends either downgrading the facility or exploring parallel route options. Parallel routes may be feasible in contexts where multiple bridges cross the same barrier in close proximity but may not be possible if there is only one major bridge in the area. In this situation, active transportation facilities may be downgraded to provide the best option that is compatible with the space available. For example, if installing a concrete barrier to protect a bike lane would exceed the load limits of the bridge, flex posts could be the downgraded option. Additionally, traffic calming devices could be considered on approach roads to reduce motor vehicle speeds and create a safer environment for pedestrians, bicyclists, and micromobility users on the bridge. While downgraded facilities from the preferred choice reduces the appeal of a route for people of all ages and abilities, a new connection could still provide a new route for confident bicyclists or micromobility users and an adequate facility for pedestrians. Regardless, all rehabilitated or otherwise altered pedestrian facilities must be accessible to and usable by individuals with disabilities to the maximum extent feasible (28 CFR 35.151(b)). Alternatively, a separate bridge for active transportation may be considered but is outside of the scope of this resource.

Funding the Project

Funding opportunities for bridge replacement and rehabilitation projects have increased significantly with the enactment of the IIJA in 2021. In addition to the National Highway Performance Program and Surface Transportation Block Grant (STBG) Program, which can fund a variety of transportation projects, bridge replacement and rehabilitation projects are eligible for dedicated funding through the Bridge Replacement and Rehabilitation (BRR) Program, Bridge Formula Program (BFP), and the Bridge Investment Program (BIP). The BRR is an annually appropriated funding program which is distributed to the States. The BFP and BIP are new sources of funding created by the IIJA and will provide nearly $8 billion annually for bridge construction during fiscal years 2022-2026 (FHWA, 2022a, 2022b). While the BFP will be distributed to States with a minimum set-aside of 15 percent for bridges outside of the Federal-aid highway system ("off-system bridges"), the BIP is a new, competitive, and discretionary grant program that provides a way for agencies other than States, such as Metropolitan Planning Organizations and localities, to be direct recipients of FHWA funds for bridge rehabilitation.

To receive Federal funding, projects that replace or rehabilitate a highway bridge deck must include pedestrian or bicycle facilities if they meet the following conditions (FHWA, 2023c):

- "The bridge is located on a highway on which pedestrians or bicyclists are permitted to operate at each end of such bridge," and
- "FHWA determines that safe accommodation [i.e., pedestrian and bicycle facilities] can be provided at a reasonable cost as part of the replacement or rehabilitation... The FHWA will presume, that safe accommodation for bicyclists and pedestrians can be provided at reasonable cost for all BFP projects absent an affirmative showing by the project sponsor that the cost of such accommodation would exceed twenty percent of the cost of the larger transportation project. For instances where such accommodation exceeds twenty percent,

the addition of bicyclist and pedestrian accommodation is not required, but FHWA encourages States to consider providing for such accommodation" (FHWA, 2023c).

While projects that meet both conditions are required to include bicycle and pedestrian facilities, other bridge projects designed to include these facilities are also eligible for Federal funding dedicated for bridges (e.g., such as those where adding bicycle and pedestrian facilities exceeds 20 percent of the total cost). Federally funded bridge replacement or rehabilitation projects must demonstrate failure to meet either of the criteria if they do not include bicycle or pedestrian facilities. In cases where the preferred facility type may be cost-prohibitive, planners and designers should consider whether a reduced level of accommodation for bicyclists or pedestrians is possible. Bicycle and pedestrian-only bridges are ineligible for Bridge Program funds (i.e., BRR, BFP, and BIP) but are eligible for STBG funds, including the Transportation Alternatives Set-Aside.

Design Principles

FHWA recommends the use of a Complete Streets Design Model in all rehabilitation projects, as outlined in the **FHWA guidance to staff** regarding the review of State 3R standards submitted for FHWA approval (2023a). A complete streets design model prioritizes safety, comfort, and connectivity for all users of the roadway, including but not limited to pedestrians, bicyclists, micromobility users, motorists, and transit riders of all ages and abilities. In general, this design model includes careful consideration of measures to set and design for appropriate speeds; separation of various users in time and space; improvement of connectivity and access for pedestrians, active transportation users, and transit riders, including for people with disabilities; and implementation of safety countermeasures.

The quality of active transportation facilities is important to ensure that they are safe, comfortable, and easy to use by people of all ages and abilities. The following design principles specific to bridge projects ensure that the facility is appropriate for the context, comfortable for all users, and consistent with existing or future connecting facilities at each end of the bridge:

1. **Consider Separation between Active Transportation Modes**
2. **Incorporate Shared Use Path Design Best Practices**
3. **Provide Safe and Accessible Transitions to the Bridge**
4. **Ensure Network Connectivity and Continuity**

1. Consider Separation between Active Transportation Modes

In most cases, it is preferable to separate bicyclists and pedestrians from motor vehicle traffic on a bridge due to the needs of different users and the tendency of vehicle speeds to increase on longer bridges. While a shared-use path separates active transportation users from vehicles, separation of pedestrians from bicyclists and other active transportation users further reduces conflicts between users traveling at different speeds. Continuation of separate pedestrian and bicycle facilities at bridge connections limits the potential for conflicts, reduces mixing zones between users, and provides continuity for each facility type.

Dedicated spaces for pedestrians and for people biking or rolling should be considered in most cases, especially if the bridge will be heavily used by both user groups. Additional factors that may lead to the need for further separation between modes includes high volumes of users who are children, older adults, or people with disabilities who tend to move slower; pedestrians making up over 30 percent of active transportation users; or high volumes of bicyclists or those riding at higher than usual speeds (e.g., bicycling commuting corridors and use of electric-assist bicycles) (AASHTO, 2024; FHWA, 2006).

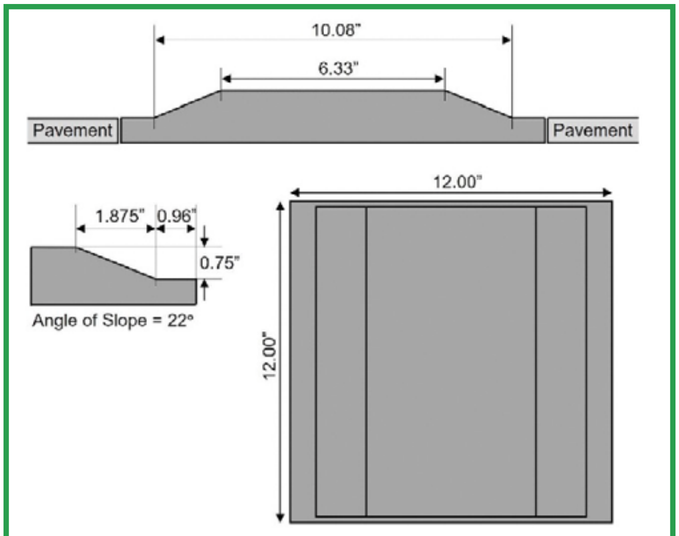

FIGURE 3: Example Trapezoidal Tactile Warning Delineator Dimensions. *Source: Bentzen et al., 2020.*

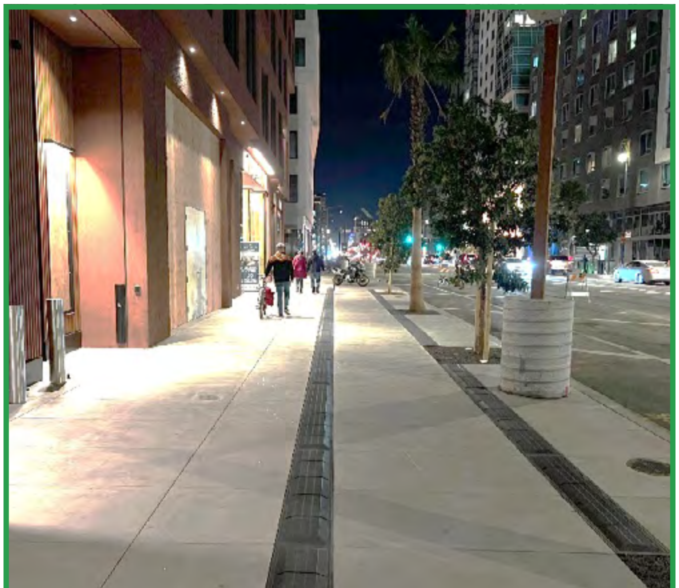

FIGURE 4: Example of Trapezoidal TWD Delineating Edges of Bicycle Lane. *Source: Toole Design.*

Building a separated bike lane next to an existing sidewalk or shared use path is the preferred combination of facilities that accommodates separation between active transportation modes on a bridge (see Table 1). Guidance for building separated bike lanes is plentiful. Consult FHWA's Separated Bike Lane Planning and Design Guide (2015) and Separated Bike Lanes on Higher Speed Roadways: A Toolkit and Guide (2024) as starting points for more detailed guidance and direction to other references.

Ideally, the separated bike lane is not on the same level as the sidewalk to make the separation between modes clear and provide a detectable curb edge. In cases where that is not possible, a separated bike lane and a sidewalk could be on the same level as the sidewalk if the pedestrian and bicyclist spaces are delineated using pavement markings and physical design elements. People with vision disabilities often rely on curbs and other detectable edges to stay in the pedestrian space. Without detectable edges, people with vision disabilities may end up in spaces intended for bicycle or micromobility use without realizing it. Detectable edges may also serve as visual cues that can support compliance with the intended separation of modes when the separated bike lane is flush with the sidewalk.

Effective separation tools involve vertical delineation with design elements such as Jersey barriers, parking stops, or street furniture. These should be placed continuously or close to each other in a way that people are unlikely to cross between pedestrian and bicyclist spaces. In cases where vertical delineation may not be possible, trapezoidal tactile warning delineators (TWDs) are an experimental treatment that some North American agencies have installed to provide a detectable edge between parallel, flush pedestrian and bicycle facilities. Research has shown that TWDs following the dimensions in Figure 3 are both detectable and identifiable by people with vision disabilities both underfoot and with a long white cane (Bentzen et al., 2020; O'Brien et al., 2024). Another alternative to vertical delineation is providing a softscape buffer (e.g., grass) at least 2 feet wide, but this may be challenging to construct on a bridge span.

2. Incorporate Shared Use Path Design Best Practices

While it is generally preferable to separate pedestrians and bicyclists, on many bridge rehabilitation projects, a shared use path may be the most achievable option. In these cases, it is critical to account for key factors in the shared use path design process, including operating space, shy space, and barrier type. The **operating space** is defined as the physical space occupied by a bicyclist or pedestrian as well as the lateral space needed to account for the side-to-side motion of a bicyclist while pedaling (AASHTO, 2024). Figure 5 illustrates the minimum operating space of a typical adult bicyclist as 42 inches, however, an operating space of 48 to 60 inches or more can be beneficial on steep grades and higher volume paths to account for more side-to-side movement. Pedestrians have an operating space of 36 inches, and it can overlap with the operating space necessary for bicyclists on shared use paths.

Shy space is the space between a bicyclist's operating space and adjacent vertical elements that are fixed in place (AASHTO, 2024). Shy space represents the space that bicyclists naturally seek along their path of travel to feel comfortable and avoid striking objects with their handlebars, pedals, or body. Pedestrians similarly prefer to have some space from vertical elements. Vertical elements may be continuous, such as a railing or bridge barrier, or intermittent, such as a light post, signpost, or utility pole. The recommended shy space from both continuous and intermittent elements is 24 to 36 inches. In constrained conditions, the shy space for continuous and intermittent elements may be reduced to 12 and zero inches respectively, but this negatively affects active transportation users' safety and comfort. The path shall not have any temporary or permanent objects protruding onto the path area since such objects are dangerous hazards for bicyclists and pedestrians.

Based on the operating space and shy space for bicyclists and pedestrians, the width of the shared use path can begin to take shape. The practical minimum width for a shared use path on a bridge is 11 feet, with a recommended width of 12-15 feet. These widths allows for three operational lanes for people walking and biking which accounts for side-by-side walking or biking as well as passing (AASHTO, 2024). Where feasible, a wider path will allow more comfortable operating

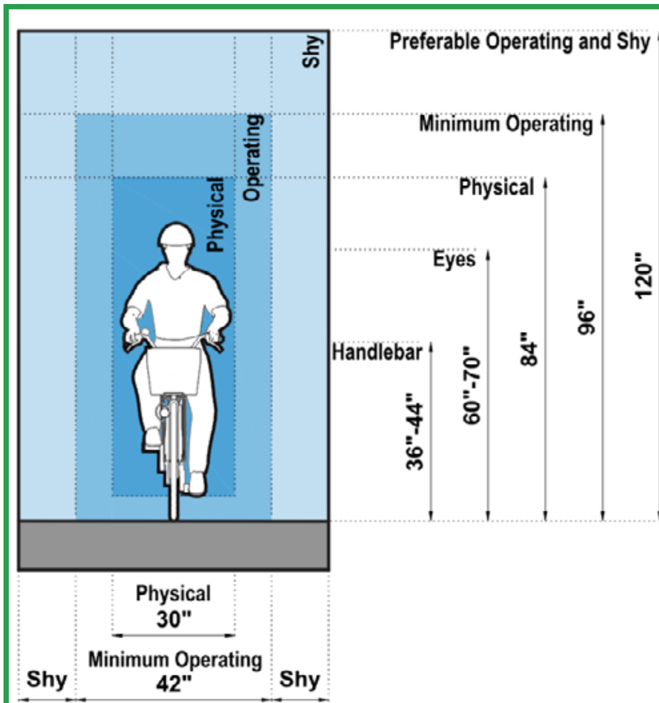

FIGURE 5: Typical adult bicyclist operating space. *Source: Toole Design.*

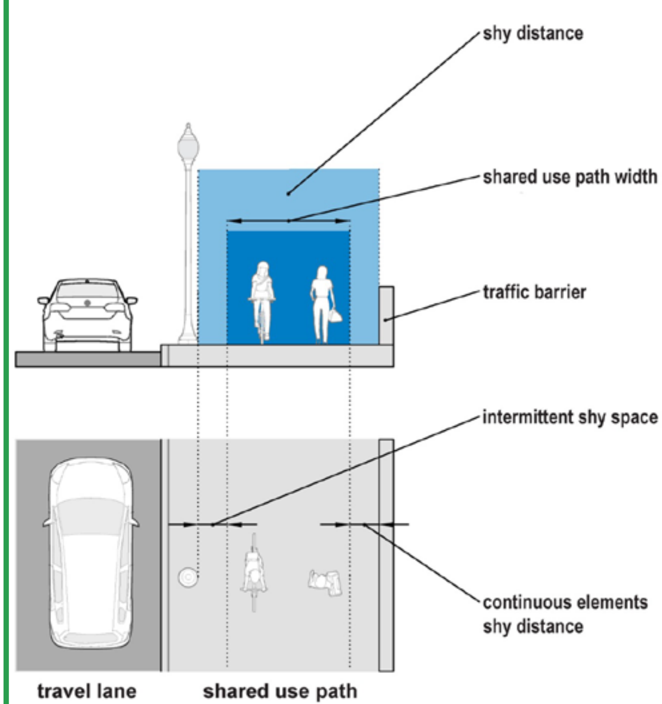

FIGURE 6: Diagram showing bicycle and pedestrian shy space from intermittent and continuous elements on a bridge. *Source: Toole Design.*

space and easily facilitate mixed bicycle and pedestrian passing movements in either direction. The practical minimum width for a shared use path is 8 feet wide which does not accommodate side-by-side riding and allows only limited passing movements. The path widths must be exclusive of the necessary shy spaces from continuous and intermittent objects on the bridge as those spaces cannot be safely used by bicyclists; as such, the physically paved width in the shared use path area will be wider than the noted path width.

Railings, barriers, and fences along bridges are important elements to define and separate modes and protect users from falling from the bridge (AASHTO, 2024). The design of a bridge's railings and barriers must be compliant with the AASHTO Manual on Assessing Safety Hardware (2016). The railings or barriers that separate motorist spaces from the shared use path are generally 32 to 42 inches tall. Outer-facing railings for pedestrians should be a minimum of 42 inches tall and up to 54 inches tall if they serve bicyclists.

Per the ADA, newly constructed pedestrian facilities must be accessible to and usable by individuals with disabilities to the extent that it is not structurally impracticable (28 CFR 35.151(a)(2)(ii)). Altered pedestrian facilities must be accessible to and usable by people with disabilities to the maximum extent feasible (28 CFR 35.151(b)). In addition, a public entity's provision of pedestrian facilities must, when viewed in its entirety, be accessible to and usable by people with disabilities (28 CFR 35.150(a)). The U.S. Access Board published new guidelines in 2023 under the ADA and the Architectural Barriers Act (ABA) that address accessibility of sidewalks and streets, crosswalks, curb ramps, pedestrian signals, on-street parking, and other pedestrian facilities in the public right-of-way, including shared-use paths (U.S. Access Board, 2023). These guidelines are often referred to as the Public Right-of-Way Accessibility Guidelines, or PROWAG. The PROWAG will not become enforceable until the U.S. Department of Justice (DOJ) and the U.S. Department of Transportation (DOT) adopt accessibility standards that are "consistent with" the PROWAG through separate rulemaking procedures. Until DOT and DOJ adopt accessibility standards for pedestrian facilities in the public right-of-way, public entities have some degree of flexibility in determining how they will comply with the general obligation under Title II of the ADA to ensure that their facilities are "accessible to and usable by" individuals with disabilities. Public entities are not required to adopt the Final PROWAG at this time but may turn to different resources for guidance when determining how to ensure accessibility, including the Final PROWAG, DOJ's 2010 ADA Standards for buildings and sites for guidance on similar issues that arise in the public right-of-way, or other accessibility resources.

Although it is not yet an enforceable standard, PROWAG R302 provides that the cross slope on a shared use path should not exceed 2.1 percent at any given point, except as permitted at certain crosswalks, and the surface should be stable, firm, and slip resistant (U.S. Access Board, 2023). If the shared use path is part of a bridge that serves motor vehicles, the grade of the shared use path may follow the grade of the road across the bridge. In these instances, introducing specific design elements can mitigate the safety and comfort impacts for bicyclists and pedestrians. For example, warning signs can inform users of steep grades, increased shy distances can provide additional space, and resting intervals—flat sections that break up a steep grade—can provide users areas to rest.

For shared use paths with separate bicycle and pedestrian paths, the method of separation should be detectable underfoot and with a white cane, and have a contrasting color to prevent inadvertent crossings of people who are blind or have low vision into the bicycle path. Facilities designed exclusively for bicycle use are not required to be accessible to pedestrians, except where pedestrian crossings occur.

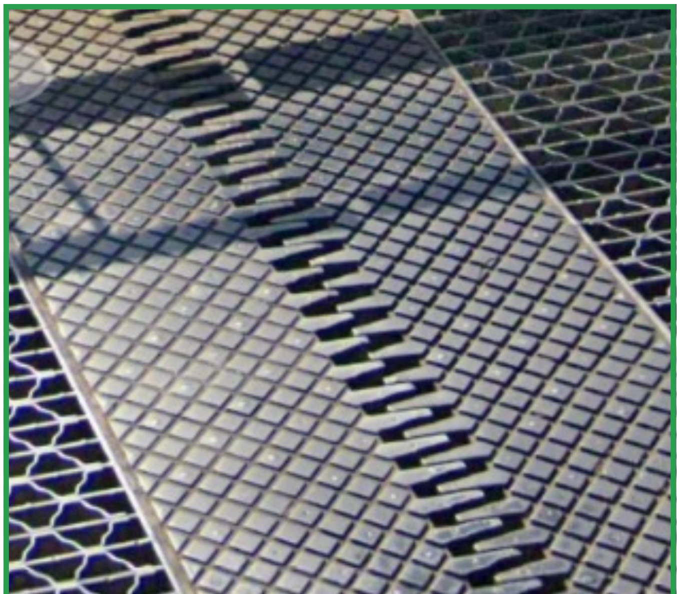

FIGURE 7: An example of an expansion joint– that can catch bicycle tires between the teeth with the potential to cause injury or flat tires. *Source: Google Maps.*

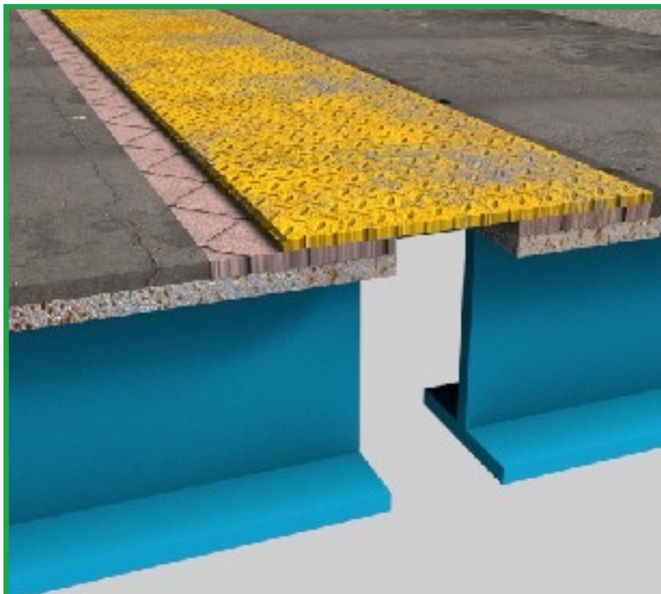

FIGURE 8: An example of a bicycle-compatible bridge expansion joint anti-slip surface and minimal grade differences. *Source: New York City Dept. of Transportation.*

3. Provide Safe and Accessible Transitions to the Bridge

Safe and accessible transitions on and off the bridge are key to users' safety and mobility. Unsafe or inaccessible transitions to a bridge, even one with quality active transportation facilities, will degrade the safety and comfort of active transportation users and potentially limit the number of users that access the bridge. People traveling on paths, sidewalks, and bike lanes must be visible to each other and to motorists when crossing or transitioning from a path to the street. Poor sight distances, sight lines, and lighting can create uncomfortable and dangerous conflicts with motor vehicles that can put all users at risk.

Certain common bridge-related features can present challenges for people riding bicycles, using mobility aids such as canes or crutches, or using micromobility. For example, the tip of a cane or the tires of a bicycle can become caught in expansion joints (see Figure 7), with potential to result in injury or flat tires. Joints that are at an angle (e.g., not perpendicular to the path of travel) can result in falls as tires become caught within the joint, similar to a skewed rail crossing.

These challenges can be mitigated by using an approach slab that minimizes exposure to the joint and/or bicycle-compatible expansion joints (Figure 8) with anti-slip material, and reducing grade differences between the slab and path at interface point (AASHTO, 2024). For accessibility, changes in level should be limited to a quarter of an inch maximum if it is vertical, or a half of an inch if it is beveled 2H:1V (50 percent). Horizontal openings should not allow the passage of a sphere larger than 1/2 inch (13 mm) in diameter (U.S. Access Board, 2023). For bridges that have a vertical element above active transportation facilities, such as trusses or overhead signage, the vertical clearance should be at least 10 feet to accommodate bicyclists and, according to PROWAG guidelines, at least 80 inches for pedestrian accessibility.

Bridges with intersections located on either end of the approach should be designed to provide crossings that minimize conflicts and ensure that bicyclists and pedestrians can safely access the bridge. Intersection crossings should feature high visibility crosswalk markings and, where applicable, green bicycle conflict markings to denote bicycle crossing locations (AASHTO, 2024).

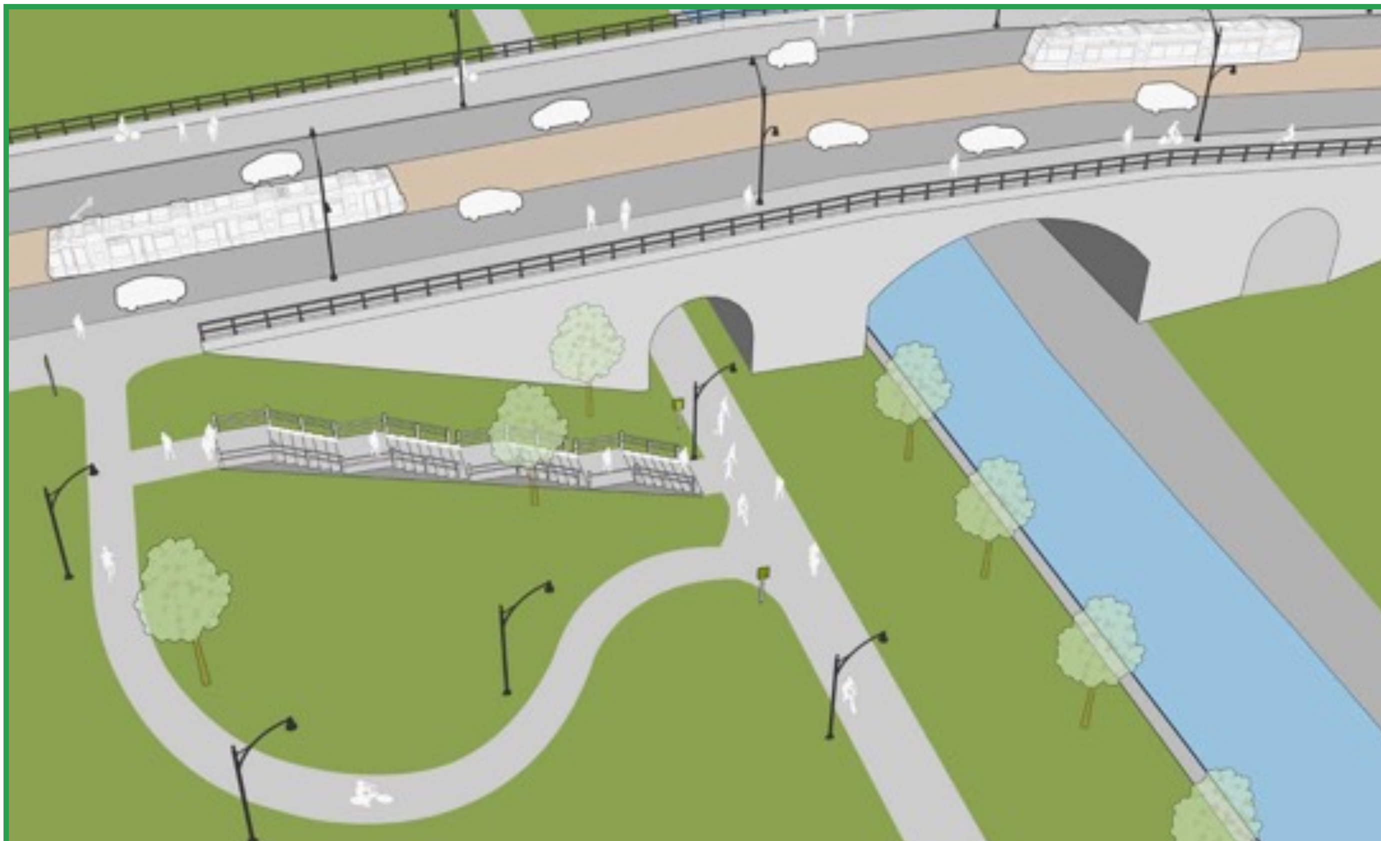

FIGURE 9: Bicycle and pedestrian routes under the bridge should be considered and, where present, designed to link with on-bridge facilities. *Source: FHWA.*

At intersections, lighting and signage can alert motorists to the presence of all users. A "Turning Vehicles Yield To Pedestrians" sign (i.e., Manual on Uniform Traffic Control Devices (MUTCD) R10-15) is a good example of a sign that can be implemented to remind motorists of the right-of-way rules and alert them to potential path, bike lane, and sidewalk users (AASHTO, 2024). Other devices and design elements may include warning lights, intersection control such as stop or yield signs, In-Street Pedestrian or Trail Crossing signs (R1-6 series) placed within the road, and traffic signal phasing. Signalization strategies include the installation of bicycle signals that include either separate phasing for crossing or a leading interval that gives active transportation users a head-start on crossing. For pedestrian accessibility, accessible pedestrian signals communicate the pedestrian signal phasing to individuals with disabilities in multiple formats, including audible and vibrotactile. Other warning lights or beacons (e.g., Rectangular Rapid Flashing Beacons or Pedestrian Hybrid Beacons) activated by active transportation users may also be an option when a full traffic signal is not warranted.

4. Ensure Network Connectivity and Continuity

Bridge rehabilitation or replacement projects should consider elements beyond the bridge itself, such as connections to nearby major walking and biking routes or paths that comfortably allow for active transportation travel over or under the bridge (as shown in Figure 9) if applicable, with direct access to the bridge facilities where feasible (FHWA, 2016). Other funding programs may need to be explored to make such connections.

Facilities designed for users of all ages and abilities should be direct, intuitive, and easy to navigate, with connections to existing networks that support walking and biking. Clear and accessible wayfinding helps active transportation users navigate efficiently and safely between the bridge and the surrounding network (AASHTO, 2024). Accessibility guidelines for wayfinding and other signage, such as the size of characters and finish and contrast of signs, is established in PROWAG R410 (US Access Board, 2023).

Emphasis should be placed on connecting trails, sidewalks, and bikeways that support economic and social opportunity and serve socioeconomically disadvantaged areas that have suffered from decades of motor vehicle-centric transportation planning and design. New and improved active transportation facilities can create safer, more affordable, and healthier travel options while making it easier to reach jobs, education, healthcare, and other destinations.

FIGURE 10: Bicycle and pedestrian wayfinding signs help to direct users to the bridge from the surrounding network. *Source: Toole Design.*

Conclusion

Bridges represent critical connections in the transportation network, but too often fail to provide connections for pedestrians and other active transportation users due to a lack of multimodal facilities. Transportation agencies have opportunities to improve multimodal networks by including safe facilities for walking, bicycling, and micromobility as part of bridge rehabilitation projects. In doing so, these projects can advance the development of safe, comfortable, and connected multimodal networks.

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Since its inception in 1999, the Pedestrian and Bicycle Information Center's mission has been to improve the quality of life in communities through the increase of safe walking and bicycling as a viable means of transportation and physical activity. The Pedestrian and Bicycle Information Center is maintained by the University of North Carolina Highway Safety Research Center with funding from the U.S. Department of Transportation Federal Highway Administration.

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