White Paper Series

Improving Pedestrian and Bicycle Connectivity During Rehabilitation of Existing Bridges

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DISCLAIMER

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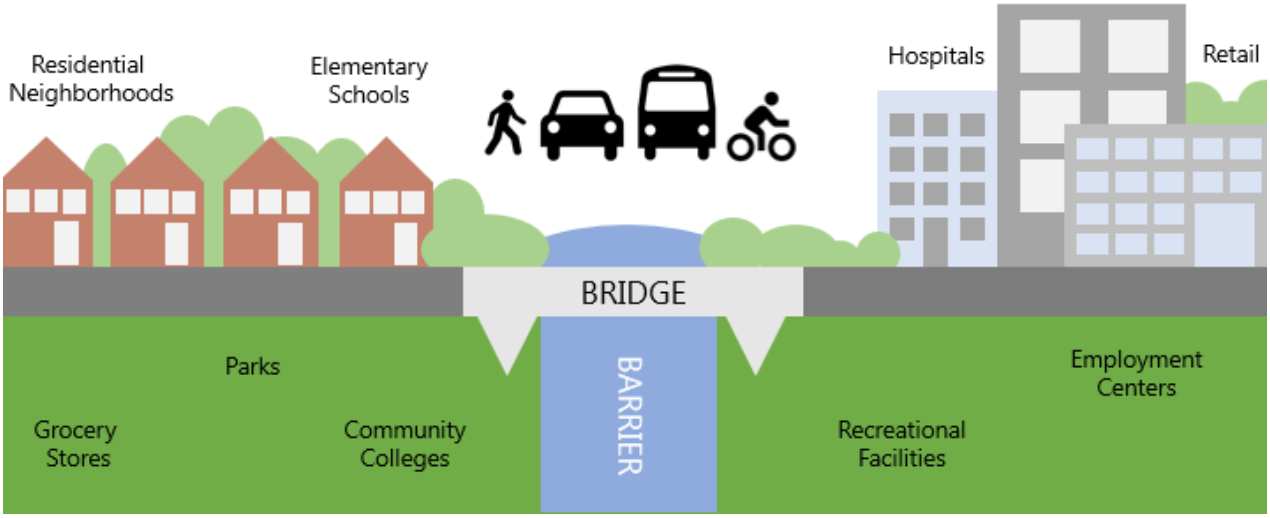
INTRODUCTION

Bridges connect destinations in communities and provide access to emergency and essential services, yet many of the nation's existing bridges do not provide safe and comfortable accommodations for people walking and biking. Bridges that lack pedestrian and bicycle accommodations can force substantial detours or sever routes entirely, discouraging or eliminating the option to walk and bike for transportation. Those who do travel on bridges without proper accommodations may increase their risk of being involved in a crash. Incorporating pedestrian and bicycle facilities as part of bridge rehabilitation projects can improve safety for everyone, while providing all road users direct and safe connections to schools, jobs, parks, health care services, and other destinations.



As noted in the 2013 *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance* report, 11.7 percent of bridges were classified as structurally deficient in 2010, and 14.2 percent were classified as functionally obsolete.[1] Bridge rehabilitation projects are opportunities to create critical connections in existing pedestrian and bicycle networks or provide safer and more comfortable facilities for nonmotorized users. Bridge projects are also high-profile, large-scale projects, and the inclusion of bicycle and pedestrian facilities can serve as recognition of the role of bicycling and walking in transportation networks.

[1] http://www.fhwa.dot.gov/policy/2013cpr/chap3.cfm#13

The purpose of this white paper is to:

1. Acknowledge that pedestrian and bicycle considerations should be addressed at the State, local, and regional planning levels per the USDOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations,
2. Demonstrate that providing pedestrian and bicycle facilities as part of bridge rehabilitation projects is a win-win for communities for a broad range of reasons, and
3. Share case studies summarizing the positive effects of providing new and improved bicycle and pedestrian connections.

These themes and case studies will help to demonstrate the need for investing in bicycle and pedestrian facilities during bridge rehabilitation projects and they will assist transportation practitioners and decision makers planning these infrastructure upgrades. Bridges are critical links in the pedestrian and bicycle network and given complexity and technical constraints, it's especially important for practitioners to consider multimodal access and accommodations early in the planning process. This white paper focuses on improving pedestrian and bicycle accommodations on existing bridges through the bridge rehabilitation process. It is not intended to be a comprehensive resource for the full range of multimodal bridge issues so, for example, it doesn't address things like rail to pedestrian/bicycle bridge conversions, new bridges, tolled bridges, design solutions to improve comfort and safety, and strategies for linking to surrounding multimodal networks. Questions that practitioners should consider in the planning and design process are highlighted at the end of this white paper to encourage ongoing conversation and dialogue about improving multimodal access on bridges. The resources highlighted on Page 9 provide more information.

Importance of Planning

In general, major capital projects at a bridge location are infrequent, with many years or decades between infrastructure upgrades. Given the long lifespans of bridges compared to the typical section of road, it is especially important that bridge rehabilitation projects consider bicycle and pedestrian access and connectivity. Bridges can be upgraded in locations where facilities like sidewalks or greenways are planned, but not yet present with the understanding that surrounding multimodal network connections will improve over time. Bicycle and pedestrian facilities can be added in bridge retrofits during project alternatives analysis and identified as part of the public engagement process. It is critical to consider these bridges not as standalone structures, but as elements of the pedestrian and bicycle network. Planning nonmotorized networks should involve identifying key barriers, such as waterways, railroads, and major roadways and noting that the bridges spanning these features are a key element of multimodal network-improvement strategies.

Early consideration of bicycle and pedestrian elements in the bridge planning project can ensure that the upgraded facility sufficiently meets the needs of all road users. Pedestrian and bicycle needs should be considered early in the planning and project development process as this is often when it is most feasible to include substantial safety-related improvements. Delaying consideration of these components until the final design or construction phases may limit the accommodations that are possible for nonmotorized road users.

Federal Policy

The United States Department of Transportation (USDOT) *Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations* (2010) identifies sections of the United States Code (U.S.C.) that pertain to walking and bicycling and how transportation agencies may improve bicyclist and pedestrian safety and accessibility.[2] The policy statement addresses accommodations on bridges for nonmotorized users in two locations:

1) **Recommended Actions:** USDOT encourages States, local governments, and other government agencies to adopt similar policy statements on bicycle and pedestrian accommodation including: "*Integrating bicycle and pedestrian accommodation on new, rehabilitated, and limited-access bridges*: DOT encourages bicycle and pedestrian accommodation on bridge projects including facilities on limited-access bridges with connections to streets or paths."

2) **Key Statutes and Regulations Regarding Walking and Bicycling:** Specifically, 23 U.S.C. 217(e) emphasizes the need to address bicycle accommodations during bridge replacement and rehabilitation projects:

   "In any case where a highway bridge deck being replaced or rehabilitated with Federal financial participation is located on a highway on which bicycles are permitted to operate at each end of such bridge, and the Secretary determines that the safe accommodation of bicycles can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations."

   Although this statutory requirement only mentions bicycles, the policy statement notes that DOT encourages State and local governments to apply this same policy to pedestrian facilities as well.

[2] http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/policy_accom.cfm

Benefits of Bicycle and Pedestrian Accommodation

Providing bicycle and pedestrian accommodation on bridges leads to two **direct benefits**:

Connectivity – Bridges are often pinch-points in the road network. Well-designed, interconnected bicycle and pedestrian facilities allow all users to safely and conveniently get where they want to go.

Safety – Implementation of bicycle and pedestrian facilities on bridges often improves the safety of these modes, decreasing the likelihood of collisions or conflicts with other road users.

In addition to the direct benefits of safety and connectivity, an infrastructure improvement often leads to increases in bicycling and walking, called induced demand. As a result of this induced demand, communitywide **indirect benefits** may occur, including:

Access – Accommodation for bicyclists and pedestrians on bridges can enhance access to jobs, schools, health care, and other essential services.

Health – Comprehensive, comfortable nonmotorized networks may increase the numbers of people walking and bicycling. By increasing residents' access to opportunities for physical activity, these facilities can lead to improved health outcomes.

Sustainability – Bridges complete critical links in the transportation network, and including bicycle and pedestrian facilities on these links makes nonmotorized transportation a safer, more comfortable option, especially for short trips. Improved nonmotorized facilities can lead to a decreased dependency on personal vehicles, contributing to decreases in greenhouse gas emissions, potential reduction in congestion, and increased environmental sustainability within a community.

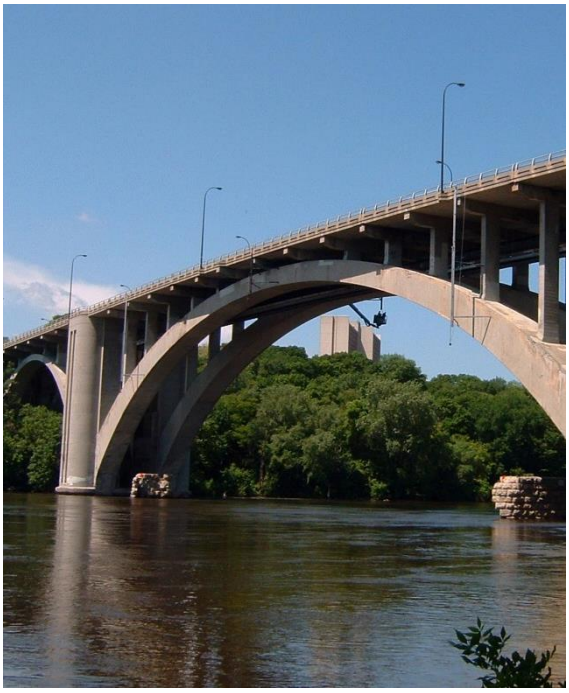
Cost Savings – Constructing a bicycle or pedestrian facility during a bridge upgrade project will almost always be more cost effective than providing the same facility on a completed project or constructing a standalone bicycle and pedestrian bridge.

Social Equity – Rivers, freeways, and railroad tracks may serve as barriers between neighborhoods with different socioeconomic makeups and different levels of access to jobs and other opportunities. Providing nonmotorized access over these barriers can promote equity, access to opportunity, economic development, and public health.[3]

[3] All icons are sourced from http://www.thenounproject.com, artists Edward Boatman, Joris Hoogendoorn, Gubi Mann, and Joao Proncax

Minneapolis Bridge Upgrade as a Cost Saver

The Franklin Avenue Bridge in Minneapolis, MN, is a historic arch bridge constructed in 1923. A previous rehabilitation project, completed in 1970, replaced the bridge cross beams. The current bridge rehabilitation aims to upgrade the bridge while returning its original 1923 design. The redesign replaces the inadequate existing pedestrian conditions with a 14-foot multi-use path with physical separation. The project is more cost effective than a full bridge replacement, and it will extend the life of the bridge by 50 to 75 years. By including bicycle and pedestrian accommodations as part of the broader project, Hennepin County is spending less on these nonmotorized facilities than a standalone bicycle or pedestrian improvement.
Image Source: Wikipedia



Ithaca Historic Bridge Serves as Multimodal Connection to University

The City of Ithaca and the New York State Department of Transportation rehabilitated the historic Thurston Avenue Bridge in Ithaca, NY, to meet today's multimodal transportation needs without compromising the historic structure. Originally a trolley bridge, the bridge now serves more than 34,000 students, faculty, and staff at Cornell University. Severe congestion was causing vehicle delays at the approach intersection, and pedestrians were walking in the vehicle travel lanes. The bridge's capacity had to be increased, while still respecting its historical features. The resulting bridge design widened the bridge by 12 feet by adding new arches at each side to provide support for 10-foot sidewalks and 5-foot bicycle lanes.

Image Sources: Laura Kozlowski (left), and FHWA (right)

Context Sensitivity

Including bicycle and pedestrian facilities on bridges is not always possible. Each bridge is unique, with different infrastructure, surrounding land use, community support, and context-specific challenges. These facilities cannot be accommodated in all bridge rehabilitation projects, and when they are included, the extent and configuration of the bicycle and pedestrian facility should match the need and opportunity. In addition, the decision to include a sidewalk, path, or bicycle lane on a bridge should account for the surrounding bicycle and pedestrian network.

Case Studies

The following pages include three case studies summarizing the planning process for providing new and improved bicycle and pedestrian connections during bridge rehabilitations. These case studies highlight the benefits of integrating nonmotorized facilities into these bridge projects. Additional case studies highlighting the role of bridges are available at the Pedestrian and Bicycle Information Center and at http://contextsensitivesolutions.org/content/case_studies (Keyword: bridge).

MADISON STREET BRIDGE

Image source: The Missoulian, 1/2016

PROJECT INFORMATION

Location: Missoula, Montana
Status: Under Construction
Project Type: Rehabilitation
Key Benefits:

PROJECT SUMMARY

The four-lane Madison Street Bridge in Missoula, MT, serves as a gateway between the downtown community and the University of Montana, and it attracts significant pedestrian and bicycle traffic between these two key destinations. The existing bridge has bicycle lanes and sidewalks, though both are narrow. Spalling – deterioration of concrete caused by freeze-and-thaw cycles – caused safety hazards on the sidewalks lining the bridge. In January 2016, a block of concrete fell from the bridge deck sidewalk on to the riverfront trail below. While the bridge was not slated for an upgrade until 2020, this incident led to this project being prioritized within the region. The bridge rehabilitation project aims to both improve the bridge structure and to reconfigure its use to better serve multimodal demand.

PLANNING PROCESS

A 2014 Missoula bridges planning study recommended the Madison Street Bridge be rehabilitated with new decks and the Montana Department of Transportation expedited this project. The contracted design-build firm held meetings with local-, regional-, and State-level stakeholders, leading to a quickly established consensus for the bridge concept design. The new deck would remove the three-foot center median, reduce vehicle lanes from 12 feet to 11 feet, widen sidewalks from four feet to five and one-half feet, and widen bicycle lanes from four feet to five feet.

> *In-kind replacement is not a successful model in this day-and-age in Montana. We have much more interest now in connectivity, multimodalism, aesthetics, and that is the model going forward.*
> - Ed Toavs, Missoula District Administrator at Montana Department of Transportation

IDENTIFIED BENEFITS

Structural safety concerns instigated the project. In addition to improving the structure, this rehabilitation project facilitates safer and more comfortable travel by bicyclists and pedestrians due to the widened facilities. As mentioned by Ed Toavs, "It's just really hard to prioritize anything higher than [safety]."

Cost savings have also been identified by agency partners as a key benefit. As a result of the center median removal and reduced vehicle lane widths, the City of Missoula anticipates reduced maintenance cost for plowing in the winter months.

RICHMOND-SAN RAFAEL BRIDGE

Image Source: Metropolitan Transportation Commission, 9/2015

PROJECT INFORMATION

Location	Richmond, CA
Status:	Project Approval
Project Type:	Rehabilitation
Key Benefits:	

PROJECT SUMMARY

The six-mile Richmond-San Rafael, California, bridge opened in 1956, linking Marin and Contra Costa counties in the San Francisco Bay Area and replacing ferry service between the two counties. The bridge is multilevel – with two eastbound lanes on the upper level and two westbound lanes below – with no existing bicycle or pedestrian accommodation on the bridge aside from a wide shoulder. Two bridge modifications will convert the eastbound shoulder to a third travel lane, and convert the westbound shoulder to a two-way shared use path using a narrow movable barrier.

PLANNING PROCESS

Prior to this project, a seismic retrofit was completed on the bridge in the late 1990s. At the time, the Bay Conservation and Development Commission (BCDC) noted the need for bicycle and pedestrian facilities with this bridge upgrade. BCDC emphasized that California State Code requires maximum feasible public access and that bicycle and pedestrian accommodations were feasible improvements for this corridor. Through BCDC and advocacy efforts of Bike East Bay, the bicycle and pedestrian facilities are a central part of the current bridge upgrade.

"We wouldn't be having these conversations if the Bay Conservation and Development Commission didn't exist. Through engagement efforts this bicycle and pedestrian addition was able to happen, and happen much sooner." – Dave Campbell, Bike East Bay Advocacy Director

IDENTIFIED BENEFITS

The bridge modification will provide a bicycle and pedestrian connection to local bicycling and walking routes in Marin and Contra Costa counties. The bridge improvements are a key connection on the Bay Trail, a 500 mile trail of the San Francisco Bay coastline.

While the bridge improvements are considered two distinct projects (eastbound capacity increase and westbound bicycle and pedestrian enhancements), the Bay Area Toll Authority is implementing these projects simultaneously as a cost and time savings measure. Permitting and environmental work for the two improvements are being completed concurrently. This allows for both projects to be implemented at lower costs than if they were completed independently. The project will be implemented first as a pilot, which will be evaluated by a local university.

HAWTHORNE BRIDGE

Image Source: Bicycle Tucson, 7/2010

PROJECT INFORMATION

Location: Portland, Oregon
Status: Complete
Project Type: Rehabilitation
Key Benefits:

PROJECT SUMMARY

Constructed in 1910, the Hawthorne Bridge is the oldest operating vertical lift bridge in the United States, and one of the most traveled bridges in Portland, OR. It carries 30,000 cars and trucks, 800 buses, 8,000 bicyclists, and significant pedestrian traffic on a daily basis. In 1999, average daily bicycle traffic over the bridge was about 3,150 bicyclists. In 1999, the bridge was rehabilitated to ensure the structure could accommodate possible future use by streetcars or light rail. The improvement project included steel deck replacement and upgrades to the traffic gates, signals, and bridge controls. In addition to these improvements, the bridge's multi-use path was widened from six to 10 feet, sidewalks and ramps were added to the west approach to improve access for pedestrians, bicycles, and people with disabilities.

PLANNING PROCESS

As early as 1996, Multnomah County convened representatives of 14 agencies to consider the project design and challenges. The design team throughout the process considered the needs of river traffic, passenger and commercial vehicles, buses, bicyclists, and pedestrians. Widening the multi-use path required extending steel supports under the bridge and installing lighter panels on the lift span. Federal Surface Transportation Program funding and Oregon Department of Transportation nonmotorized transportation grants covered the cost of this improvement. The public supported widening the sidewalk further, but this was not feasible while maintaining the original bridge structure and it would have compromised the other modes – principally transit – using the bridge.

IDENTIFIED BENEFITS

The Hawthorne Bridge is now a true multimodal structure, with accommodation for auto, transit, bicycle, and pedestrian users. Providing facilities for so many modes allows residents to reduce their dependency on personal automobiles, and travel in a variety of ways. This project broadened transportation options within Portland and improved its sustainability.

This bridge has undergone several improvements; however, the most significant increase in nonmotorized use occurred after this improvement.

MOVING FORWARD

Practitioners are encouraged to think about the following questions and use them to foster an ongoing dialogue about improving multimodal access on bridges as part of the transportation planning process.

- What additional resources are needed to help practitioner's navigate between different sources of existing information relating to pedestrian and bicycle accommodations on bridges?
- How can the planning process help to ensure that existing and planned pedestrian and bicycle accommodations on bridges are linked to the existing and planned multimodal network in the surrounding area?
- What are the most common technical challenges involved in modifying an existing bridge to accommodate pedestrians and bicyclists?
- Where does the issue of design flexibility come up as it relates to pedestrian and bicycle accommodations on bridges?
- What are things to consider in the evaluation of "reasonable cost" as it relates to safe accommodations on bridges?
- What additional planning and design resources are needed relating to pedestrian and bicycle accommodation on bridges?
- Can pedestrian and bicycle access be maintained when a bridge is posted with load or use limits for vehicles?

RELEVANT RESOURCES

The following resources provide further guidance on accommodating bicyclists and pedestrians as part of bridge repair and reconstruction projects:

Guide for the Development of Bicycle Facilities, 4th Edition: This resource from the American Association of State Highway and Transportation Officials (AASHTO), published in 2012, provides bicycle facility design guidance for on-road bikeways and shared use paths, as well as information regarding bikeway maintenance and operation.

Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts. This report will help practitioners address topics such as multimodal bridge access, intersection design, road diets, pedestrian crossing treatments, transit and school access, freight, and accessibility. It highlights ways to apply design flexibility, while focusing on reducing multimodal conflicts and achieving connected networks.

Incorporating On-Road Bicycle Networks into Resurfacing Projects: This FHWA workbook provides recommendations for how roadway agencies can integrate bicycle facilities into their resurfacing programs. The workbook also provides methods for fitting bicycle facilities onto existing roadways, cost considerations, and case studies.

LRFD (Load and Resistance Factor Design) Bridge Design Specifications, 7th Edition: This AASHTO technical guidebook that provides bridge design specifications, and incorporates the latest recognized practices regarding bridge design. These design specifications are mandated by FHWA for use on all bridges using Federal funding.

Case Studies in Delivering Safe, Comfortable, and Connected Bicycle Pedestrian Networks: This 2015 FHWA report provides an overview of pedestrian and bicycle network principles and highlights examples from communities across the country.

Bridging the Gaps in Bicycling Networks: This League of American Bicyclists report identifies some of the common objections to bridge accommodations for biking and walking and offers suggestions on how to answer them. It also contains recommendations based on the experience of several successful and ongoing advocacy campaigns.

Bicycle Safety Guide and Countermeasure Selection System: Chapter 6 of this National Association of City Transportation Officials (NACTO) guide provides State and local case studies in a range of contexts and includes specific strategies to improve bicycling conditions.

Case Study Compendium: This Pedestrian and Bicycle Information Center (PBIC) resource provides examples of successful and innovative pedestrian and bicycle projects that emphasize education, engineering, and planning elements.

Pursuing Equity in Pedestrian and Bicycle Planning: This PBIC resource discusses equity considerations in the pedestrian and bicycle planning process.

REFERENCES

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(2) Interview with Ed Toavs at Montana Department of Transportation on 06/08/2016

(3) http://www.sfgate.com/bayarea/article/Richmond-San-Rafael-Bridge-closer-to-getting-new-6076247.php

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(6) http://www.bcdc.ca.gov/cm/2009/02-05_bicycle-pedestrian_rsf.pdf

(7) https://multco.us/bridges/hawthorne-bridge-painting-and-deck-replacement

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(9) http://www.bikeleague.org/sites/default/files/bikeleague/bikeleague.org/resources/reports/pdfs/bridges.pdf

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(12) http://www.cityofames.org/government/departments-divisions-i-z/public-works/sixth-street-bridge-replacement/project-faqs

(13) Interview with Justin Clausen at City of Ames on 06/07/2016

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