



# Understanding and Using New Pedestrian and Bicycle Facilities

## Background

Fatalities involving pedestrians and bicyclists continue to rise. Over the decade 2011 to 2020 the number of pedestrian fatalities increased 46% and the number of bicyclist fatalities increased 38% (NCSA, 2021a, 2021b; Stewart, 2022). In addition to education and enforcement, elements to be considered for effective pedestrian and bicycle safety programs include infrastructure and engineering countermeasures. Research has explored the benefits of innovative pedestrian and bicycle facilities, such as leading pedestrian intervals, rectangular rapid flashing beacons, and contraflow bike lanes. However, these facilities are new to many road users. Improving road users' understanding of pedestrian and bicyclist facilities has the potential to improve safety. This report synthesizes information about how people understand and use infrastructure with the aim of developing better ways to communicate with the public about new facilities to ultimately improve safety.

The report provides information on new pedestrian and bicycle treatments and (1) the behavior and knowledge of pedestrians, bicyclists, and drivers traversing through, on, and around the new facilities, and (2) enforcement activity around the facilities. The information will be used to develop and improve countermeasure programs to help reduce the number of pedestrian and bicyclist injuries and fatalities.

## Method

To meet this goal the research team conducted a systematic literature review of facilities from domestic and international sources as well as a review of current U.S. outreach practices. A total of 114 articles on 17 facilities were reviewed, organized by primary road user type.

### Facilities used primarily by bicyclists

- bike boxes
- two-stage turn boxes
- bicycle signals and detectors
- advisory bike lanes
- buffered bike lanes
- contraflow bike lanes

**Figure 1. Bike Box in Portland, Oregon**



Source: NACTO, 2014

**Figure 2. Rectangular Rapid Flashing Beacon In Davis, California**



Source:  
[www.pedbikeimages.org /](http://www.pedbikeimages.org/)  
Lara Justine

### Facilities used primarily by pedestrians

- leading pedestrian intervals
- offset crossings
- pedestrian scrambles
- puffin crossings
- raised crosswalks
- rectangular rapid flashing beacons
- refuge islands

### Facilities used by multiple road user types (both pedestrians and bicyclists)

- protected intersections
- roundabouts
- shared use paths
- pedestrian and bicyclist wayfinding signage

Findings on each facility were organized into various components.

- use, compliance, and safety
- attitudes, beliefs, and perceptions
- education strategies
- knowledge and comprehension

To supplement the literature review that identified gaps in knowledge about what might be effective at improving the understanding and use of facilities, a review of current public outreach practices (i.e., educating the public about facilities and efforts to disseminate information) was conducted. The review included a sampling of public agencies and advocacy groups at various levels – national, state, and local.

## Results

The breadth and depth of research varies by road user facility. Much of the research identified focuses on use, compliance, and safety, while relatively little research directly explores education or enforcement strategies and their potential impacts on use and understanding. Generally, road users use new transportation facilities safely, if not entirely as intended. For example, motorists may not always yield when they should, but pedestrians and bicyclists take precautions to avoid injury regardless. Confusion can occur when expectations differ from reality, such as when movement patterns are changed by bike boxes or two-stage left turn boxes.

Generally, pedestrians and bicyclists express positive attitudes (e.g., reduced delays, improved routes, increased safety) about pedestrian and bicycle facilities. These facilities are often designed to promote non-motorized traffic and, in doing so, increase pedestrians' and bicyclists' presence and improve their travel in some way. Motorists share these sentiments unless they perceive inconveniences or unexpected behaviors such as bicyclists riding in buffered and contraflow lanes.

Little published research has explored education strategies for specific facilities. Some facilities are more interactive than others, needing direct action from road users (e.g., pushing a button) and some road users may require guidance for the interactive components. It appears that the general practice is to use established signage. Experimenting with new and potentially more effective methods, such as intuitive design principles or media campaigns, to communicate with road users is occurring continuously.

This review identified one study evaluating the effects of enforcement activities on driver yielding rates. Enforcement—whether by visible patrol, citations, sting operations or otherwise—is likely to positively influence compliance among all road users but is not well documented in the research community.



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Practitioners and others are making considerable efforts to improve access and safety through education, even if those efforts have not been scientifically evaluated. Local agencies and advocacy groups are responsible for much of the educational outreach to the public regarding pedestrian and bicycle facilities. Larger organizations, such as professional associations, federal agencies, and national advocacy groups, tend to deliver more broad, general safety messages (e.g., safe habits, proper equipment use) or technical specifications and implementation guidelines. While these are important for planners, more localized organizations appear better positioned to deliver relevant messages to prospective users.

Although little research directly evaluated education surrounding specific facilities, the team identified a small number of studies into broader educational campaigns. These studies indicate that multichannel communication to a highly localized audience is the most successful strategy for improving safety through behavioral change. More research is needed to quantify the success of the educational campaigns.

## References

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## How to Order

The final report *Understanding and Using New Pedestrian and Bicycle Facilities* (Report No. DOT HS 813 317) was prepared by Toxcel. It can be downloaded at <https://rosap.nhtl.bts.gov/>. Kristie Johnson, Ph.D., was the task order manager for this project.

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