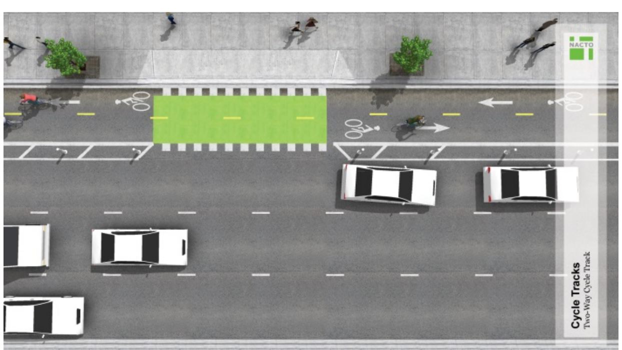
CYCLE TRACKS

Description

Protected bike lanes, also known as cycle tracks, combine the user experience of a separated path with the access and visibility of an on-street facility. Cycle tracks are most often implemented in urban contexts, are physically separated from motor traffic, and distinct from the sidewalk.[1] The image at right shows a one-way protected cycle track, but they can also be designed with raised profiles above the street level or as two-way facilities. Though various designs have been spreading through Europe since the 1960s, protected bike lanes are relatively new in the United States.[2]

Though they typically cost more than traditional bike lanes, protected bike lanes have been shown to have lower vehicle-bicycle crash rates compared with other roadways in the United States,[3] and a recent nationwide study showed an increase in ridership between 21 percent and 171 percent within one year.[4]

Some designs integrate vehicle parking as a buffer and provide space for doors to open without danger of hitting a bicyclist, as depicted below.



North American City Transportation Officials *Urban Bikeway Design Guide*

Recent research indicates protected bicycle lanes are more comfortable to occasional or novice bicyclists than traditional bike lanes, which may expand the population of those willing to ride a bicycle often.[5, 6]

Cost:	●●○○○
Time:	**Moderate**
Impact:	**Local**
Who:	**City/State**
Hurdles:	**Roadway Design**

Since cycle tracks may increase the space dedicated for bicyclists in a roadway right-of-way, they are most often developed in urban areas to maximize the person throughput of a street while reducing crashes.

Target Market

Protected bicycle lanes can be effective anywhere there are potential roadway conflicts between bicyclists and motorists, and are particularly helpful on roadways exceeding 3,000 vehicles per day or with posted speeds exceeding 30 mph.[2] The degree that they reduce vehicle congestion by attracting new bicyclists is likely related to population densities.[7] Indeed, most implementations in the United States to date have been in urban areas, such as Austin, Atlanta, Minneapolis, New York, Portland, Washington, D.C., and San Francisco. Dallas also has a well-traveled cycle track on the Jefferson Street Viaduct.[8]

Though some bicyclists feel confident bicycling in almost any situation, recent research confirms that protected bike lanes can serve a larger population than the brave minority. Jennifer Dill evaluated a 4-tiered typology of cyclists, finding infrastructure such as cycle tracks may increase levels of comfort and cycling rates among the "interested but concerned."[5] Some studies have shown women to be more sensitive to the real and perceived safety of roadways.[9] Pucher and Buehler report "…getting children, seniors, and women on bikes requires provision of safer and more comfortable cycling conditions than currently existing in most North American…cites."[10]

How Will This Help?

- Reduces vehicle congestion by providing an alternative for shorter trips.
- Improves air quality for communities through reduced hydrocarbon use, and micro-climate air quality for bicyclists and pedestrians separated from vehicles.
- Reduces bicyclist-vehicle crashes by separating traffic and highlighting conflict points.

Application Techniques and Principles

The North American City Transportation Officials (NACTO) Urban Bikeway Design Guide is the primary resource for designing cycle tracks.[1] For one-way cycle tracks, it recommends a minimum 5 to 7 foot protected lane width and 12 feet for a two-way cycle track. Both include a 3 foot buffer from vehicles and applicable traffic control signage and markings from the Manual on Uniform Traffic Control Devices (MUTCD) relating to bike lanes.

Intersections are a particular concern for protected bike lanes, since they are the likely conflict points between bicyclists and motorists. To improve visibility at driveways and intersections, the desirable no-parking area is 30 feet from each side of the crossing.[1] Colored pavement, yield lines, and "Yield to Bikes" signage should be used to identify the conflict area.[1]

The addition of barriers, such as vehicle parking between automotive traffic and bicyclists, has an added benefit of bicyclists' reduced exposure to ultrafine particles.[11] This option could retain or improve motor vehicle parking while making conditions better for bicyclists.

Protective barriers also prevent bicyclists from crossing adjacent lanes mid-block in preparation for a left turn. Methods to accommodate bicyclist turning movements include median refuge islands, bike boxes, cycle track intersection approaches, combination bike lane/turn lanes, median refuge islands, and two-stage turn queue boxes.

Two-stage turn queue boxes use a protected bike lane's buffer space to provide bicyclists with a separate intersection queuing area to turn left by first stopping and turning from the cycle track, then proceeding through the intersection with the next signal phase. The image below illustrates the two-state turn queue box in green.

North American City Transportation Officials *Urban Bikeway Design Guide*

The Federal Highway Administration recently determined that cycle tracks are not traffic control devices, so there are no federal restrictions on their use through the MUTCD.[12] The green pavement markings at conflict points have received interim approval through the Federal Highway Administration (FHWA), as a provision not currently specifically described in the MUTCD.[13] Though the 2012 Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities does not explicitly include cycle tracks and several other innovative designs, a research problem statement was submitted by the AASHTO Technical Committee on Nonmotorized Transportation as a National Cooperative Highway Research Program problem statement.[13]

Issues

In order to retrofit new protected bike lanes in existing rights-of-way, roadway space may have to be re-allocated from vehicle parking, underutilized vehicle lanes, or excess lane width. These changes require analysis of multimodal trends on a given corridor in order to ensure plans suit the given situation. Often called a "road diet," the conversion of 4-lane roadways to 2 general purpose lanes with bike lanes added may be feasible with average daily traffic of 20,000 or less.[14] Some caution use of road diets on roadways with bi-directional peak hour vehicle volume over 1,000 vehicles per hour could cause some increases in vehicle delay. One mitigating technique to maintain capacity at intersections is using intermittent turn lanes and signal timing adjustments.[15]

Changing parking configurations can affect business and residential use and should include adequate public involvement to address existing and anticipated roadway needs. The image below shows an example of a protected bike lane installed on Barton Springs Road in Austin, Texas, by re-allocating median and through-lane widths.

City of Austin photos used by Monsere et al. [4]

Who Is Responsible?

Transportation agencies that design and manage roadway space are responsible for implementing bicycle facilities such as cycle tracks. Cities often work with state departments of transportation on these projects, particularly when crossing state right-of-way, to provide a continuous facility for all road users.

Project Timeframe

Assuming funding availability, individual protected bike lane projects can take over a year for planning and public involvement, design, and construction. However, if a community has a well-vetted plan identifying system configuration and project feasibility, projects can be implemented in concert with roadway resurfacing projects on an ongoing basis.

Cost

Implementation costs vary widely on context, including right-of-way constraints and potential utility re-location. Much of the cost of cycle tracks beyond a traditional bike lane is the barrier, which can range from $19,152 per mile for flexible bollard posts to $17.6 million per mile to rebuild the street with a raised sidewalk-style track for biking.[15]

Data Needs

In addition to traditional data used in transportation planning and design such as multimodal traffic counts and crash histories, designers should analyze bicycle intersection crossing times and directions to optimize signal phases. Though before-and-after construction studies have confirmed general ridership-inducing and safety benefits of protected bicycle lanes,[4] these count data can be a useful performance measure for local agencies and identify local discrepancies.

Cycle Tracks Best Practice

- Type of Location: Streets with either moderate to higher speeds or traffic volumes. Greater demand is likely in urban, mixed-use areas.
- Agency Practices: Review updated design guidance against existing agency practices. Include experienced designers to expand staff knowledge of new facilities.
- Frequency of Reanalysis: Annual review of volumes and crash data supports accurate performance measurement, controlling for seasonality.
- Supporting Policies or Actions Needed: Designer education on cycle track best practices; public education on new roadway features; and consider integration or adoption of NACTO guidance.
- Complementary Strategies: Bike sharing, Bicycle/Pedestrian Education and Encouragement, Bike Lanes, Active Demand Management, Trip Reduction Ordinances.

For More Information

1. National Association of City Transportation Officials. *NACTO Urban Bikeway Design Guide*. Island Press, Washington, D.C., 2014.

2. Furth, P. Bicycling Infrastructure for Mass Cycling: A Transatlantic Comparison. In *City Cycling* (J. Pucher and R. Buehler, eds.), MIT Press, Cambridge, MA, pp. 105–139.

3. Lusk, A. C., P. Morency, L. F. Miranda-Moreno, W. C. Willett, and J. T. Dennerlein. Bicycle Guidelines and Crash Rates on Cycle Tracks in the United States. *American journal of public health*, Vol. 103, No. 7, May 2013.

4. Chris Monsere, Jennifer Dill, Nathan McNeil, Kelly Clifton, Nick Foster, Tara Goddard, Matt Berkow, Joe Gilpin, Kim Voros, Drusilla van Hengel, J. P. *Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U . S .* Portland, OR, 2014, p. 177.

5. Dill, J., and N. McNeil. Four Types of Cyclists? Examination of Typology for Better Understanding of Bicycling Behavior and Potential. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2387, Dec. 2013, pp. 129–138.

6. Damant-Sirois, G., M. Grimsrud, and A. M. El-Geneidy. What's your type: a multidimensional cyclist typology. *Transportation*, Apr. 2014.

7. Krizek, K. J., and et al. *NCHRP Report 552 Guidelines for Analysis of Investments in Bicycle Facilities*. 2006.

8. Wilonsky, R. Dallas has a new bicycle coordinator who's very eager to roll out the bike plan (from 2011). http://cityhallblog.dallasnews.com/2014/05/dallas-has-a-new-bicycle-coordinator-whos-very-eager-to-roll-out-the-bike-plan-from-2011.html/.

9. Twaddle, H., F. Hall, and B. Bracic. Latent Bicycle Commuting Demand and Effects of Gender on Commuter Cycling and Accident Rates. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2190, Dec. 2010, pp. 28–36.

10. Pucher, J. R., and R. Buehler. *City cycling*. MIT Press, Cambridge, MA, 2012.

11. Kendrick, C. M., A. Moore, A. Haire, A. Bigazzi, M. Figliozzi, C. M. Monsere, and L. George. Impact of Bicycle Lane Characteristics on Exposure of Bicyclists to Traffic-Related Particulate Matter. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2247, Dec. 2011, pp. 24–32.

12. U.S. Federal Highway Administration. Bicycle Facilities and the Manual on Uniform Traffic Control Devices. http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm.

13. U.S. Federal Highway Administration. Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). http://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/.

14. U.S. Federal Highway Administration. *"Road Diet" (Roadway Configuration) Proven Safety Countermeasures, # FHWA-SA-12-013*. Washington, D.C., 2013, p. 2.

15. Thomas, L. *Road Diet Conversions: A Synthesis of Safety Research*. Chapel Hill, NC, 2013.

16. Andersen, M. Wonktastic Chart Rates 15 Different Ways to Protect Bike Lanes. http://www.peopleforbikes.org/blog/entry/wonktastic-chart-rates-15-different-ways-to-protect-bike-lanes.