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Transportation for Livable Communities Initiative (TLCI)
Design Flexibility Guidelines

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NOACA Transportation for Livable Communities (TLCI) Design Flexibility Guidelines

This document is intended to provide clarity regarding flexibility within design standards (federal, state, and local) and how that flexibility can be applied to achieve the goals of the overall Transportation for Livable Communities Initiative (TLCI), as well as project-specific goals.

TLCI Program Objectives

NOACA's Transportation for Livable Communities Initiative provides assistance to communities and public agencies for integrated transportation and land-use planning and implementation projects that strengthen community livability. TLCI advances the goals of NOACA's Regional Strategic Plan by focusing on the following objectives:

- Develop transportation projects that provide more travel options through complete streets and context sensitive solutions, increasing user safety and supporting positive public health impacts
- Promote reinvestment in underused or vacant/abandoned properties through development concepts supported by multimodal transportation systems
- Support economic development through place-based transportation and land-use recommendations, and connect these proposals with existing assets and investments
- Ensure that the benefits of growth and change are available to all members of a community by integrating principles of accessibility and environmental justice into projects
- Enhance regional cohesion by supporting collaboration between regional and community partners
- Provide people with safe and reliable transportation choices that enhance their quality of life

TLCI Design Philosophy

The TLCI planning process should strive to incorporate and **focus on low-cost recommendations** from start to finish. Prioritization of recommendations should focus on short-term, low-cost retrofit solutions, with identification of longer-term, higher-cost reconstruction or new construction solutions. Low-cost solutions can also be implemented as a final product or as an interim alternative to longer-term, higher-cost solutions.

- Examples of low-cost recommendations include roadway restriping, retiming traffic signals, signage, flexible delineator posts and crosshatch striping, wayfinding, bicycle boulevards, minor signal equipment upgrades, crosswalk safety enhancements, and standard street furniture (bike parking, benches, etc.).

- Examples of typical high-cost recommendations include off-road trails, streetscapes, bike/pedestrian bridges, roadway reconstruction, roundabouts, utility replacement, signal system replacement, custom street furniture (bike parking, benches, etc.).

Designs should be context sensitive and considerate of all roadway users outlined in the project goals (e.g., pedestrians, bicyclists, transit users, drivers, trucks, emergency vehicles, rural nonmotorized transportation). For example, wide travel lanes can degrade or improve safety, depending on the context. On high-speed roads, maintaining wide lanes can improve safety by reducing the chance of center-crossing and sideswipe crashes. On low-speed roads, however, maintaining wide lanes can degrade safety by encouraging speeding and may impede the ability to implement safety countermeasures for other modes. It is paramount to consider design impacts comprehensively for all travel modes and the community in which a project is being proposed.

Determining that complete streets countermeasures are infeasible due to impedance to motor vehicle traffic has a direct impact on a community's ability to be livable. Multimodal safety should be considered equally and could result in a reduction in vehicular capacity as a result of a more balanced transportation approach. Sometimes the geographic scope of a TLCI study includes roads with excess capacity. In other cases, the scope includes roads with high volumes of cars because of desirable destinations. **Making these destinations safely and easily accessible by foot, bike, or transit is the essence of the TLCI program. These changes may result in adverse operational impacts to motor vehicle traffic, but should still be considered when balancing the transportation needs and livability of the community.**

Design Flexibility

Design flexibility refers to the concept of allowing deviation from the standard design values and allowing the use of nonstandard design manuals to better achieve project goals. Alternatives to be considered need not be limited only to those that are explicitly allowed per standard design practices enumerated in the Ohio Department of Transportation’s (ODOT's) Location & Design (L&D) Manual Volume 1, American Association of State Highway and Transportation Officials’ (AASHTO’s) Green Book, Manual of Uniform Traffic Control Devices (MUTCD), Highway Capacity Manual, and the AASHTO Guide for the Development of Bicycle Facilities.

Many other design guides and resources, such as the National Association of City Transportation Officials’ (NACTO’s) Urban Street Design Guide, NACTO Bikeway Design Guide, NACTO Transit Street Design Guide, Federal Highway Administration’s (FHWA’s) Separated Bike Lane Planning & Design Guide, Institute of Transportation Engineers’ (ITE’s) Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, and FHWA’s Non-Motorized User Safety Guide, provide alternative solutions that can be implemented using the flexibility allowed within the standard resources. A comprehensive listing of bicycle and pedestrian planning and engineering references can be found on NOACA’s website.

FHWA encourages taking advantage of this flexibility, and the Ohio Department of Transportation's (ODOT's) design exception process allows for exercising this flexibility.

Flexibility at the Federal Level

Several memos, reports, and guidebooks have been released by FHWA, AASHTO and others that address design flexibility within federal design guides, and encourage thoughtful design.

- FHWA Report *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts* (August 2016)
- FHWA Memo *Revisions to the Controlling Criteria for Design and Documentation for Design Exceptions* (May 5, 2016)
- FHWA Report *Bicycle and Pedestrian Funding, Design, and Environmental Review: Addressing Common Misconceptions* (August 20, 2015)
- FHWA Memo *Bicycle and Pedestrian Design Flexibility* (August 20, 2013)
- AASHTO's *A Guide for Achieving Flexibility in Highway Design* (May 2004)

Flexibility at the State Level

ODOT's statewide roadway geometric design manual (L&D, Volume 1) incorporates design flexibility directly into the manual. Below are some excerpts from the L&D manual that demonstrate how design flexibility is encouraged for a variety of roadway characteristics that affect bicycle and pedestrian safety. The key to a successful design is balancing these ideas with other factors, such as project context, effect on motor vehicle traffic, local preference, etc. More detail on these subjects can be found in the L&D manual (formatting emphasis within the quotations below is added by NOACA staff).

Curb radii (L&D 401.8): "The size of a corner radius can also have a significant effect on the overall operation and safety of an intersection. **Large corner turning radii promote higher turning speeds**, as well as increasing the pedestrian crossing distance and exposure time. Large curb radii also reduce the space for pedestrians waiting to cross, move pedestrians out of the turning motorists' line of sight, and make it harder for the pedestrian to see turning cars."

"The radius used at urban and suburban locations at both signalized and unsignalized intersections, where there may be pedestrian conflicts, must consider the safety and convenience aspects of both the motorist and pedestrian. **The radius should be the smallest possible for the circumstances rather than design for the largest possible design vehicle, which often accounts for less than 2 percent of the total users**. A large radius can increase the speed of turning motorists and the crossing distance for pedestrians, creating increased exposure risks."

Lane width (Exhibit 301-4E): 10' lane widths are allowed without design exception on roads designated as Urban Collector or Local streets in areas that are primarily residential (as opposed to industrial/commercial).

Lane width and Level of Service (LOS) (L&D 308.6.2): "In most cases, travel lane widths can be reduced without any significant changes in levels of service for motorists. Before a reduction or reallocation in the number of travel lanes or their widths shall be considered, an operational study should be performed to evaluate the impact of the proposed changes on the level of service of the facility. **One benefit is that bicycle LOS will be improved. Creating shoulders or bike lanes on roadways can improve pedestrian conditions as well by providing a buffer between the sidewalk and the roadway.**"

Multilane roundabouts (L&D 401.2.3) "A roundabout constructed with a wide cross section (multilane) can negatively impact user (pedestrian, bicycle, unfamiliar drivers) movements. Therefore, **a phased implementation on multilane roundabouts is required** if the single lane construction of the roundabout can meet acceptable levels of service based on opening day traffic."

Parking lane width next to bike lane (L&D 308.5.5) "Where bike lanes are installed adjacent to parallel parking, **the recommended width of a marked parking lane is 8 ft., and the minimum width is 7 ft.** Where parallel parking is permitted but a parking lane line or stall markings are not utilized, the recommended width of the shared bicycle and parking lane is 13 ft. If parking usage is low and turnover is infrequent a minimum width of 12 ft. may be satisfactory."

Reverse angle parking (L&D 308.5.5) "The use of back-in diagonal parking can help mitigate the conflicts normally associated with bike lanes adjacent to angled parking."

Road Diets & LOS (L&D 308.6.2) "A traffic study should be conducted to evaluate potential reductions in crash frequency and severity, to evaluate motor vehicle capacity and level of service, **to evaluate bicycle LOS**, and to identify appropriate signalization modifications and lane assignment at intersections before implementing a road diet."

Rumble strips (605.1.6) "Rumble strips generally should not be used on the shoulders of roadways designated as bicycle routes or having substantial volumes of bicycle traffic, unless the shoulder is wide enough to accommodate the rumble strips and still provide a minimum clear path of 4 feet from the rumble strip to the outside edge of the paved shoulder or 5 feet to adjacent guardrail, curb or other obstacle. In areas designated as bicycle routes or having substantial volumes of bicycle traffic, the rumble strip pattern should not be continuous but should consist of an alternating pattern of gaps and strips, each 10 feet in length. Also, gaps should be provided in the rumble strip pattern ahead of intersections, crosswalks, driveway openings, and at other locations where bicyclists are likely to cross the shoulder."

Shared-use lanes (L&D 308.3) "There are no bicycle-specific designs or dimensions for shared lanes or roadways, but various design features can make shared lanes more compatible with bicycling, such as adequate sight distance **and roadway designs that encourage lower speeds.**"

Turn lane width (L&D 401.6) The width of right- or left-turn lanes should generally be equal to the normal through lane width for the facility; however, a minimum width of 10 feet may be provided in low-speed areas, regardless of roadway classification.

Urban Lateral Clearance (600.2.2) "On very low speed curbed facilities (35 mph and less), the Operational Offset as described in **600.2.3** (18") is acceptable for design features that are functionally necessary (non-breakaway signs and luminaire supports, utility poles, fire hydrants, bus stops, etc.)."

Wide bike lanes (L&D 308.5.4) "The preferred operating bicycle lane width is 5 ft. **Wider bicycle lanes may be desirable** under the following conditions:

- Adjacent to a parking lane (7 ft.) with a high turnover (such as those servicing restaurants, shops, or entertainment venues), a wider bicycle lane (6-7 ft.) provides more operating space for bicyclists to ride out of the area of opening vehicle doors.
- In areas with high bicycle use and without on-street parking, a bicycle lane width of 6 to 8 ft. makes it possible for bicyclists to ride side-by-side or pass each other without leaving the lane.
- On high-speed (greater than 45 mph) and high-volume roadways, or where there is a substantial volume of heavy vehicles, a wide bicycle lane provides additional lateral separation between motor vehicles and bicycles to minimize wind blast and other effects."

Wide shoulders (L&D 308.4) "Bicyclist accommodations on roadways with higher speeds or traffic volumes can be greatly improved by adding, improving or expanding paved shoulders."

Wide roads encourage speeding (L&D 308.6.1) "**Widening must be weighed against the possibility that vehicle speeds will increase**, which may adversely impact bicyclists and pedestrians."

Flexibility at the Local Level

On locally funded projects, communities are able to use design values beyond the ranges recommended in state and federal manuals at their own discretion. In addition, if a local jurisdiction formally adopts local standards, these can be used on projects involving state and/or federal funds. For more information, see page 6 in the Project Development & Design guidance section of the ODOT Locally Administered Transportation Projects Manual of Procedures. Additional resources include:

- Cuyahoga County Complete Streets Toolkit
- City of Cleveland Complete and Green Streets Ordinance, and Complete and Green Streets Typologies Plan

Flexibility at the Community Level

Public input and community preference are important tools for planning and designing a comprehensive, well-balanced transportation system. Information obtained from public engagement provides insight into the experiences and perceptions of the facility's users. However, direct incorporation of public input or preference alone may lead to less goal-oriented decisions and outcomes. Public feedback should be evaluated to determine whether the comments are based more on opposition to change or whether they are concerns, perceived risks or conceptual alternatives that warrant additional consideration and analysis. For example, public comments regarding

- on-street parking concerns could be addressed by conducting a parking study to determine parking supply and demand. The result of the study may or may not indicate that on-street parking is truly needed. If on-street parking is not needed, pointing out reasonable, existing alternatives is an adequate way of addressing this public concern. Articulating the pros and cons of trade-offs in different alternatives is important in meeting project goals.
- traffic flow concerns for a road diet proposal could be addressed by assessing feasibility using existing traffic volumes and design manual guidance, and/or performing a traffic analysis. If the analysis results demonstrate adequate traffic flow, communicating these results to the public is an adequate way of addressing this public concern.
- additional bicycle, pedestrian, and transit facilities could be addressed by estimating latent demand and/or safety benefits. These facilities may not be appropriate on every roadway. Identifying origins/destinations, how the segment in question would fit in to a larger network, and/or considering the context of the project are adequate ways of addressing this public concern.

Addressing public comments in this way allows for the concerns to be incorporated into the design process, and for recommendations to be data-driven.

Approval for Deviation from Design Standards

Achieving adequate flexibility sometimes requires going beyond what is commonly allowed by design guides and standards. The design exception process allows the designer to document project constraints and explain why unconventional methods were used to best mitigate these challenges. Various forms of design exception processes and the corresponding design criteria that commonly conflict with implementing bicycle and pedestrian best practices are listed below.

FHWA Process for the Reduction of Lane Width on the National Network (aka Truck Route)

In 2011, the FHWA developed a process called the National Network Safety Analysis that can be used to obtain approval for deviating from the federal requirement to provide one 12' lane in each direction on National Network Federal Truck Routes. This FHWA process requires more effort than a typical ODOT design exception.

MUTCD Experimentation and Interim Approval

ODOT has obtained statewide interim approval for the following bike/pedestrian treatments:

- Rectangular rapid flashing beacon
- Green colored pavement for bike lanes
- Bicycle Box

Interim approval needs to be sought at the local level for the following:

- Bicycle signal faces
- Alternate design for the U.S. bicycle route sign

- Two-stage turn box

Permission to experiment needs to be sought at the local level for the following:

- Dashed bicycle lanes
- Destination guide signs for shared-use paths
- Green colored pavement for use with shared-lane marking

For more information, see the FHWA's Bicycle Facilities and the Manual for Uniform Traffic Control Devices.

ODOT Formal Design Exception Process

Lane width, shoulder width, and lateral clearance are design features that commonly conflict with implementing bicycle and pedestrian best practices. Traditionally, design exceptions would be required to deviate from the standard design criteria. With FHWA's recent changes in design controlling criteria for low-speed roads (45 mph or less), formal design exceptions are only required for structural design criteria. Deviations from standard design for lane width, shoulder width, and lateral clearance on low-speed roads no longer require a formal design exception, but do require ODOT approval. For more details on the design exception process, see Section 105 of ODOT's L&D Volume 1.

ODOT Design Approval Process (not a formal design exception)

Vehicular Level of Service (LOS): Standards for vehicular LOS in the NOACA region are "D" in urban areas and "C" in rural areas. These performance measure targets are stated in NOACA's 2002 Congestion Management System Manual of Practice. ODOT's L&D Volume 1 refers to this on page 3-1 and in Exhibit 301-1E.

Regional and statewide performance measure targets for multimodal LOS do not exist at this time, but could be developed for a specific project as part of a TLCI planning study.

Case Studies

Below are case studies from Ohio where some form of unconventional design flexibility was used to implement national best practices for bicycle and pedestrian safety.

FHWA National Network of Truck Routes Case Study

Summit Street (US-23) Protected Bike Lanes (PID 86661). A safety analysis was completed to show that 11' travel lanes would be sufficient on Summit Street (US-23), in Columbus, Ohio. Summit Street is a designated National Network Truck Route, which would normally require at least one 12' travel lane in each direction. The safety analysis results were required for the FHWA lane width design exception to be approved. The space saved by using narrower travel lanes allowed inclusion of two-way, separated bike lanes.

MUTCD Permission to Experiment Case Study

Walnut Avenue Contraflow Bike Lane. This project on Walnut Avenue in Canton, Ohio, included a contraflow bike lane, bike signals, two-stage turn boxes, green paint, and reverse angle parking. MUTCD permission to experiment was approved for use of bike signals and two-stage turn boxes.

Developing Local Standards Case Study

Belvoir Avenue Raised Pedestrian Crossing. This project in University Heights, Ohio, included the development of a local standard to construct the raised pedestrian crossing. Developing a local standard was necessary because the desired design did not meet existing county or state design standards.

Low-Cost, Temporary Installation Case Study

Lakewood Traffic Calming Chicanes Trial. The City of Lakewood, Ohio, implemented low-cost, temporary chicanes on Woodward Avenue for the purpose of monitoring their impact on travel speeds and for consideration of permanent installation at a later date. Chicanes are a traffic calming device that have been shown to calm traffic, but have not yet been permanently implemented in the NOACA region. Installing traffic calming devices in this manner allowed the city to assess their effectiveness, without the higher cost of permanent installation.

Community Flexibility Case Study

Lakewood Pedestrian Hybrid Beacon. Based on results of a traffic analysis, the City of Lakewood, Ohio, removed a traffic signal (Detroit Avenue at Manor Park) that did not meet signal warrants, but was considered a desirable place to cross by the public. As a compromise, the City installed a pedestrian hybrid beacon to assist with pedestrian crossings on an as-needed basis, without regularly disrupting traffic flow.

For More Information

The ideas, references, and guidance presented in this document are intended to provide those involved with the TLCI planning process (consultants, local staff, community members, etc.) with the resources they need to take advantage of the design flexibility that is already allowed in existing processes and design documents when applicable. For more information, contact:

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