Impact of the New Functional Context Classifications for KYTC

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Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

in cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

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Research Report

KTC-24-19

Impact of the New Context Functional Classifications for KYTC

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State transportation agencies are adopting an expanded context classification system to inform project development and delivery. This system classifies roadways into one of five categories based on factors such as level of development, building densities and setbacks, multimodal user patterns and requirements, network permeability, and speed. Compared to functional classification, context classification better captures the types of mobility, travel patterns, and user mixes observed in specific contexts. The expanded context classification system is found in AASHTO's A Policy on Geometric Design of Highways and Streets (7th Edition). The forthcoming 8th edition will deepen integration of context classification throughout the design process. Based on knowledge of roadway context, agencies can plan and design context-appropriate facilities that accommodate a wide range of users. The Kentucky Transportation Cabinet's (KYTC) current planning and design activities rely on functional classification (categorizing roads as arterials, collectors, or local and indicating if they are located in an urban or rural area). Functional classification categorizes roads based on their position in a transportation network and the type of service they provide to motor vehicles. KYTC plans to supplement functional classification with context classification so it can better address the needs of different communities and user groups. To facilitate KYTC's agencywide introduction of context classification, this report documents its impacts on project development and delivery, outlines an implementation plan focused on KYTC-specific uses of context classification, and recommends updates to the agency's manuals and guidance.</td></tr>
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Executive Summary

Across the United States transportation agencies are adopting an expanded context classification system to inform roadway project development and delivery. Introduced by Stamatiadis et al. (2018) in NCHRP Report 855, the expanded context classification system assigns roadways to one of five categories (rural, rural town, suburban, urban, urban core) based on several factors, including level of development, building densities and setbacks, multimodal user patterns and requirements, network permeability, and speed. Knowing a roadway's context classification can help transportation practitioners plan and design context-appropriate facilities that accommodate a wide range of users. The expanded context classification system was included in AASHTO's *Policy on Geometric Design of Highways and Street* 7th Edition (*Green Book*). And the forthcoming 8th edition will further integrate context classification into recommended design practices and processes.

The Kentucky Transportation Cabinet (KYTC) commissioned this report to evaluate the potential implications of implementing context classification at the programmatic and project levels. Currently, KYTC's planning and design activities rely on functional classification (categorizing roads as arterials, collectors, or local and indicating if they are in an urban or rural setting). The Federal Highway Administration (FHWA) mandates the use of functional classification and the Cabinet relies on it in several areas. Moving forward, KYTC wants to supplement functional classification with information from the expanded context classification so it can better address a variety of contexts and system users. Based on a review of how other state transportation agencies have introduced expanded context classification systems and conversations with KYTC stakeholders, this report advances a three-phased approach to facilitate agencywide implementation of the expanded context classification system found in AASHTO's *Green Book*:

Phase 1

- Complete network-level context classification.
- Encourage the deliberate use and incorporation of context classification into applicable planning- and design-level processes.

Phase 2

- Introduce context classification agencywide.
- Determine which agency processes can benefit from using context classification.

Phase 3

- Final implementation following the release and adoption of *Green Book 8*.

Table E1 lists recommended actions to implement the expanded context classification system. Appendix H and Appendix K propose updates and modifications to KYTC's *Highway Design Guidance Manual* and *Planning Guidance Manual*, respectively, so these publications can help agency staff and external consultants put the expanded context classification into practice.

Table E1 Phased Approach for Expanded Context Classification System Implementation at KYTC

Phase 1: Immediate and Near-Term Activities	Planning	Design
Designate a network level context classification for all state-maintained roadways using an automated system based on guidance in NCHRP 1022 *Context Classification Application: A Guide*. Use the contexts currently recognized by KYTC - rural, rural town, suburban, urban, and urban core. Determine an appropriate process for making changes to the system.	x	
Update the guidance manuals to include a description of the Context Classification System.	x	x
Update the guidance manuals to emphasize the consideration of context classification when developing the project's purpose and need.	x	x
Address areas of the guidance manuals that discuss project scoping to include consideration of context classifications.	x	x
Identify the project's context classification in planning documentation such as Continuous Highway Analysis Framework (CHAF), planning studies, scoping meeting minutes, and the Data Needs Analysis (DNA) scoping study form.	x	
Update the Common Geometric Practices sheets in the Highway Design Manual with context classification parameters as necessary. All updates will be based on context information in the 7th Edition of the Green Book.		x
Update Design Executive Summary documentation to include the broader application of context classification and identify it on the Pre-Design Conference Minutes.		x
Coordinate with the Complete Streets, Roads, and Highways Manual and Policy to consider recommended facility types by context. Ensure context descriptions and names are the same for all documents referring to context classification.	x	x
Develop improved guidance and options for designing transition zones between contexts.		x
Offer training, as necessary, to help inform KYTC personnel as well as consultants, Local Public Agencies (LPAs), etc.	x	x
Phase 2: Potential Uses After Completion of the Network-Level Context Classification		
Consider opportunities for use in SHIFT prioritization (e.g., prioritization of facilities for all users)		
Easier identification of potential grant funding opportunities for different project types (e.g., pedestrian or bike facilities)		
Potential for more comprehensive HSIP network screening		
Statewide or regional planning of facilities for all users		
Application of future access management policies		
Inclusion of the context classification in the Highway Information System and development of an interactive map of the system.		
Phase 3: After Adoption of the 8th Edition of the Green Book		
KYTC guidance should be updated to reflect updated guidance in the Green Book.		
Develop training on updates as necessary.		

Chapter 1 Introduction

Historically, the federal government and state departments of transportation (DOTs) have tied decision making about road designs to a facility's functional classification. Functional classification categorizes roads based on their position in a transportation network and the type of service they provide to motor vehicles. Although functional classification shines a light on how vehicles utilize and move through road systems, it does not speak directly to the needs of multimodal users (e.g., pedestrians, micromobility users like bicyclists and people who use scooters). Nor does functional classification characterize a road's surrounding environment and context beyond categorizing it as urban or rural.

The purpose of context classification is to categorize roads based on the surrounding environment and how they fit into the community. Transportation agencies are adopting modified functional classification systems that incorporate context to fill these conceptual gaps by using data on development density, land uses, building setbacks, and multimodal users. This develops balanced designs responsive to the needs of all transportation modes.

While variations have been utilized by some transportation agencies for two decades, *NCHRP 855 – An Expanded Functional Classification System for Highways and Streets* formally introduced context classification on a national level. Compared to the traditional functional classification system, context classification offers an improved indicator of mobility and access while considering all modes of travel and users. Context classification is intended to offer flexibility to practitioners to develop more contextually appropriate solutions. The expanded context classification system was introduced in AASHTO's Policy on Geometric Design of Highways and Streets 7th Edition (*Green Book 7*). The Green Book stresses that context classification does not replace functional classification. Under federal law (23 CFR Part 470), state DOTs are responsible for developing and maintaining a statewide functional classification in urban and rural areas, although these agencies are assisted by local governments and Metropolitan Planning Organizations (MPOs). Decisions about federal-aid program funding eligibility are also contingent on functional classification. **Planners and designers should view functional classification and context classification as complementary.**

As KYTC implements context classification, many aspects of the project development process will be impacted. This research project will document the impacts of context classification on KYTC practices, provide an implementation plan, and recommend KYTC-specific uses of an expanded classification system in preparation for adoption of further context-related guidance in the upcoming 8th Edition of AASHTO's *Policy on Geometric Design of Highways and Streets* (*Green Book 8*).

1.1 Functional Classification

Functional classification categorizes roads based on how they convey traffic through a network, specifically the degree to which they support mobility or access. With few opportunities for entry or exit, mobility-oriented roads minimize travel friction, are highly efficient, and support higher travel speeds. Good examples are interstates and freeways. Conversely, a road that prioritizes accessibility gives motorists many opportunities to access adjacent land uses and roads lower in the functional classification hierarchy. This results in greater travel friction, less efficiency, and lower speeds. Roadway functional classifications include freeways, arterials, collectors, and local roadways. Arterials and collectors can be further broken down into minor and major classifications (FHWA 2023).

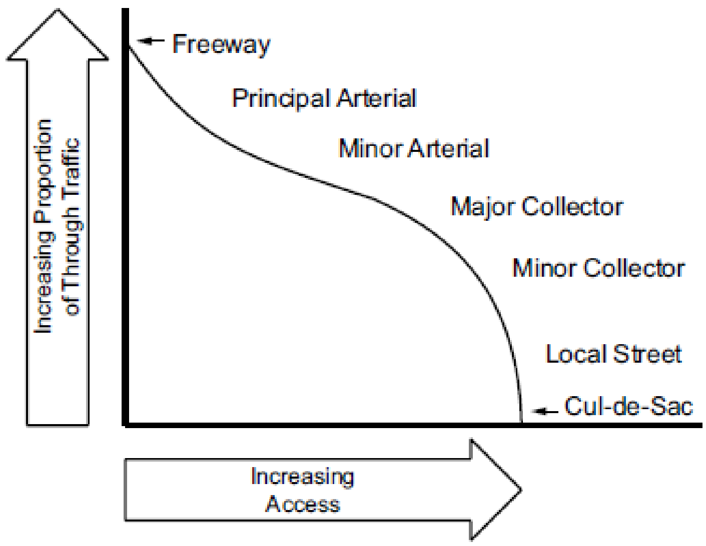

Figure 1.1 Relationship of Functionally Classified Systems Serving Traffic Mobility and Land Access for Motor-Vehicle Traffic
Source: AASHTO Green Book (7^{th} Edition; Figure 1-3)

Roads that provide a high degree of mobility are called arterials. They support efficient travel and often have full or partial access control. Conversely, local roads prioritize accessibility. Collectors balance mobility and accessibility. They collect traffic from local roads and funnel it to arterials or vice versa.

Arterials, collectors, and local roads are further broken down into sub-categories based on facility characteristics and whether they are located in an urban or rural area. The starting point for differentiating urban and rural areas is US Census Bureau maps. The US Census Bureau defines urban areas as developed areas with at least 2,000 housing units or a population greater than or equal to 5,000. The FHWA further stratifies urban areas into three categories — urban, small urban, and urbanized. Under functional classification, the urban – rural distinction is tied to the thresholds of 5,000 people or 2,000 housing units. Under federal law, state DOTs, in collaboration with their local partners (e.g., local governments, MPOs), can adjust urban boundaries outward for transportation planning purposes. Updated boundaries must include the entire area defined by the US Census Bureau as urban. That is, an agency cannot shrink urban area boundaries so that an urban area footprint is smaller than what is defined in US Census Bureau maps.

In general, federal-aid funding is available for: (1) roads classified as urban minor collectors or higher in urban areas, and (2) roads classified as rural major collectors or higher in rural areas.

1.2 Study Background

NCHRP 855 – An Expanded Functional Classification System for Highways and Streets formally introduced context classification on a national level. The traditional functional classification system categorizes roads as interstate/freeway, arterial, collector, or local. Even with a rural or urban designation, this system does not always account for the true context associated with a roadway. The existing system tends to prioritize the needs of motor vehicles and limit focus on other users such as bicyclists and pedestrians. The intent of an expanded functional classification system is to remedy those concerns and provide a framework for practitioners to design and construct facilities that complement the context of their environment and that consider the needs of all users for a particular context.

NCHRP 855 (2018) identifies the following five contexts:

- **Rural** – Areas with lowest density, few houses or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks.
- **Rural Town** – Areas with low density but diverse land uses with commercial main street character, potential for on-street parking and sidewalks, and small setbacks.
- **Suburban** – Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks.
- **Urban** – Areas with high density, mixed land uses and prominent destinations, potential for some on-street parking and sidewalks, and mixed setbacks.
- **Urban Core** – Areas with highest density, mixed land uses within and among predominantly high-rise structures, and small setbacks.

The Expanded Functional Classification System did not address context types for Interstates or Freeways. Designs for these facilities are based on federally developed standards with less flexibility.

It was not the intent of NCHRP 855 to replace the existing functional classification system with context classification and it is not KYTC's intent to do so. Rather, **the context classification system should supplement the functional classification system so that new or reconstructed facilities more properly match their environment and serve their real users**.

Figure 1.2 indicates typical user priorities in an expanded functional classification system that was developed in the NCHRP 855 report. Note the first column identifies the traditional functional class while the top row indicates context.

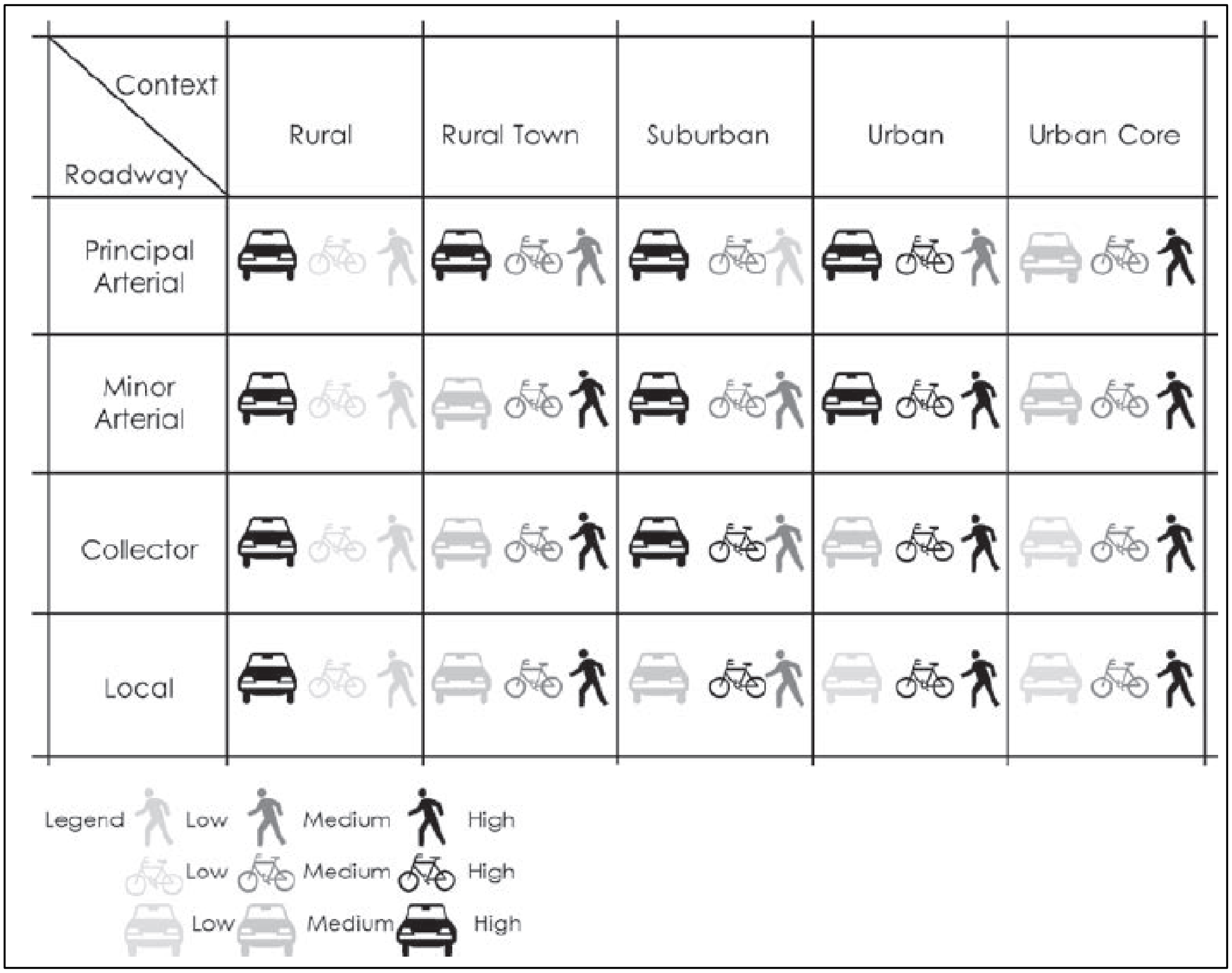

Figure 1.2 Typical User Priorities in the Expanded Functional Classification System
Source: Stamatiadis et al. (2018)

NCHRP 855 presented two case studies to display the intended use of the expanded system. Case Study 1 was prepared for approximately 10.5 miles of Richmond Road (US 25/US 421/KY 418) in Fayette County, Kentucky, and is an excellent example of the intent of the expanded classification.

Figure 1.3 is a map of Fayette County showing functional classification for state routes in the County. Richmond Road, which transitions to Athens Boonesboro Road from Downtown Lexington to I-75, is highlighted. It is categorized as an Urban Principal Arterial throughout that section of the route.

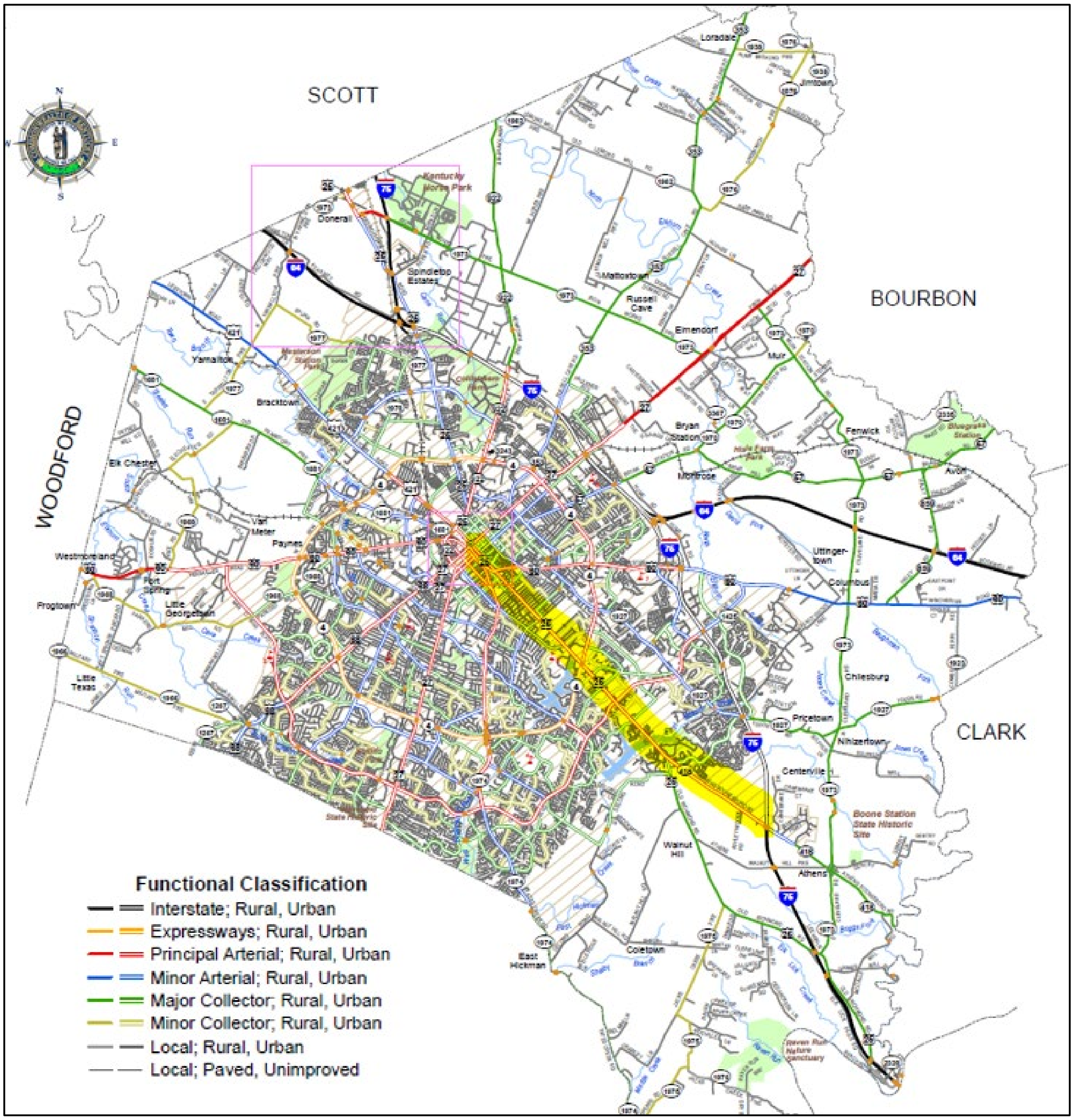

Figure 1.3 Fayette County, Kentucky, Functional Classification Map

Figures 1.4 and 1.5 depict the vast difference in context between Athens Boonesboro Road near I-75 and Richmond Road in Downtown Lexington. Near I-75, Athens Boonesboro Road is a four-lane divided highway with variable width median and partial access control. The area includes turn lanes, paved shoulders, and roadway ditches on both sides. In Downtown Lexington, Richmond Road becomes a one-way pair, generally with three lanes in each direction. Curb and gutter with closed storm sewer systems accommodate drainage and shared lanes/bicycle lanes/sidewalks serve bicyclists and pedestrians. Contexts for these sections of road are clear. However, a significant length of the 10.5-mile section fits neither context well.

Figure 1.4 Athens Boonesboro Road Near I-75

Figure 1.5 Richmond Road in Downtown Lexington

Figure 1.6 Richmond Road between New Circle Road and Downtown

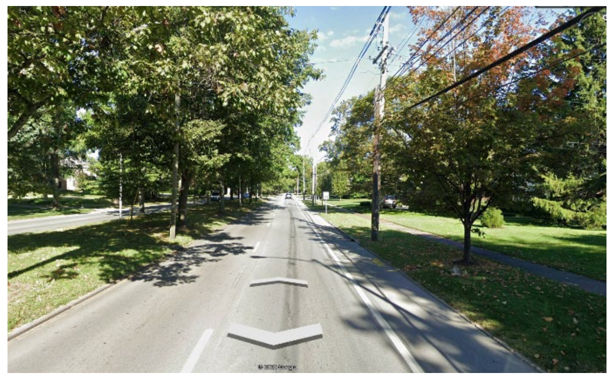

Figure 1.7 Richmond Road between New Circle Road and Man O'War Boulevard

Photo Source: Google © 2023

Figures 1.6 and 1.7 show two more contrasting examples of the same roadway. The first depicts a section of Richmond Road between New Circle Road and Man O' War Boulevard. In that area, Richmond Road is lined with commercial businesses on both sides. The existing roadway includes three lanes in each direction with curb and gutter. A bicycle lane can be seen in the image shown (Figure 1.6). However, no sidewalks exist for most of Richmond Road in this area. Figure 1.7 depicts a section of Richmond Road between New Circle Road and Downtown Lexington. This area is residential in nature and the existing roadway includes two lanes in each direction with deteriorated curb and gutter, bicycle lanes, and sidewalks. Each location presents a wide range of access density.

This example clearly demonstrates the need for an enhanced classification system. While KYTC's *Highway Design Guidance Manual* (HDM) includes guidance for a rural arterial and an urban arterial which is well-defined by the first two photos (Figures 4 and 5), the areas shown in the second pair of photos (Figures 1.6 and 1.7) fit neither context. The additional contexts proposed by NCHRP 855, specifically Suburban and Urban, could be useful along those portions of the route to provide a framework for better accommodation of its users.

1.3 Context Classification Tools Used at Other State DOTs

Several state departments of transportation have already begun the process of implementing the enhanced context classification system. The following provides a summary of the methods used by other states to incorporate an enhanced context classification system.

1.3.1 Florida Department of Transportation

The Florida Department of Transportation (FDOT) published the *FDOT Context Classification Guide* in July 2020, adopting the use of a roadway classification system consisting of eight context classifications for all state routes, not including those with limited access. The combination of context classification and transportation characteristics are used to understand who the roadway users are, determine the regional and local travel demand a facility satisfies, identify the challenges and opportunities for each roadway user type and ultimately, determine key design criteria. Figure 1.8 depicts the eight context classifications utilized by FDOT. For each classification, the general characteristics of the land use, development pattern, and roadway connectivity are described. The intent of each description is to provide cues about the types of users that may use the route. Each context is described as follows:

C1-Natural – Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.
C2-Rural – Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.
C2T-Rural Town – Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns.
C3R-Suburban Residential – Mostly residential uses within large blocks and a disconnected or sparse roadway network.
C3C-Suburban Commercial – Mostly non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network.
C4-Urban General – Mix of uses set within small blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.
C5-Urban Center – Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of a community, town, or city.
C6-Urban Core – Areas with the highest densities and building heights, and within FDOT-classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.

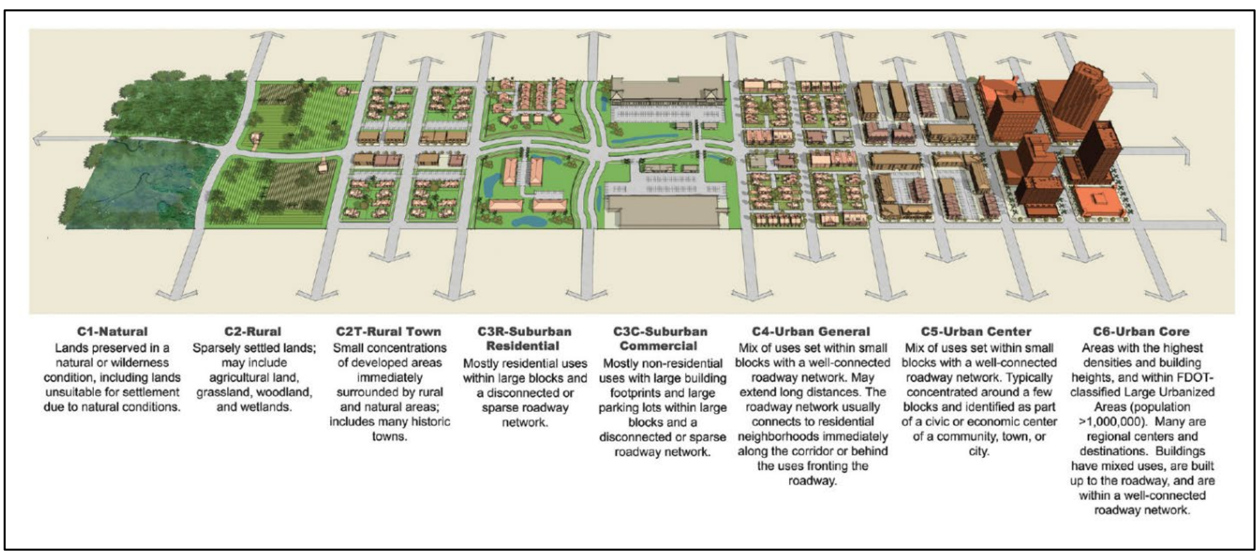

Figure 1.8 Florida DOT Context Classifications
Source: Florida DOT *Context Classification Guide* (2020)

Determining context classification – Each FDOT district office was required to develop preliminary existing and preliminary future context classification designations for the state routes within their respective districts. These were developed based on readily available GIS data, are noted to be preliminary only, serve as a foundation for beginning a project, and should be refined on a project-by-project basis. A database similar to KYTC's Highway Information System (HIS) is used to house the data. FDOT requires that the context classification for a project be determined and/or confirmed at the beginning of each project development phase. When the context classification for a portion of a roadway is determined, the information within FDOT's database is updated for future use. As a result, the database is dynamic and constantly being updated. Table 1.1 identifies the methodologies for determining the four potential context classification designations.

Table 1.1 Florida DOT Context Classification Designations

Methods			
		Preliminary	Project-Level
Time Period	Existing	Districtwide evaluation based on existing conditions, using readily available GIS data	Project specific evaluation based on existing conditions, using the most recent data available
	Future	Districtwide evaluation based on future conditions, using readily available GIS data	Project specific evaluation based on future conditions, using the most recent data available

Source: FDOT *Context Classification Guide* (2020)

Figure 1.9 identifies characteristics for each of FDOT's contexts and provides a framework for making those determinations. The distinguishing characteristics provide a broad description of the land use types and street patterns found in each context while the primary and secondary measures guide more detailed assessments of the existing or future conditions along a route.

TABLE 1 CONTEXT CLASSIFICATION MATRIX

Context Classification	(1) Distinguishing Characteristics	(2 A/B) Primary Measures: Roadway Connectivity – Intersection Density	Block Perimeters	Block Length	Land Use
		Intersections/ Square Mile	Feet	Feet	Description
C1-Natural	Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.	N/A	N/A	N/A	Conservation Land, Open Space, and/or Park
C2-Rural	Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.	<20	N/A	N/A	Agricultural and/ or Single-Family Residential
C2T-Rural Town	Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns.	>100	<3,000	<500	Retail, Office, Single-Family Residential, Multi-Family Residential, Institutional, and/or Industrial
C3R-Suburban Residential	Mostly residential uses within large blocks and a disconnected or sparse roadway network.	<100	N/A	N/A	Single-Family and/ or Multi-Family Residential
C3C-Suburban Commercial	Mostly non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network.	<100	>3,000	>660	Retail, Office, Multi-Family Residential, Institutional, and/or Industrial
C4-Urban General	Mix of uses set within small blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.	>100	<3,000	<500	Single-Family or Multi-Family Residential, Institutional, Neighborhood Scale Retail, and/ or Office
C5-Urban Center	Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of a community, town, or city.	>100	<2,500	<500	Retail, Office, Single-Family or Multi-Family Residential, Institutional, and/or Light Industrial
C6-Urban Core	Areas with the highest densities and building heights, and within FDOT classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.	>100	<2,500	<660	Retail, Office, Institutional, and/ or Multi-Family Residential

The thresholds presented in Table 1 are based on the following sources, with modifications made based on Florida case studies:
1) *2008 Smart Transportation Guidebook: Planning and Designing Highways and Streets that Support Sustainable and Livable Communities*, New Jersey Department of Transportation and Pennsylvania Department of Transportation;
2) *2012 Florida TOD Guidebook*, Florida Department of Transportation;

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(2 C) Secondary Measures

Context Classification	Building Height	Building Placement	Fronting Uses	Location of Off-street Parking	Allowed Residential Density	Allowed Office/ Retail Density	Population Density	Employment Density
	Floor Levels	Description	Yes/No	Description	Dwelling Units/ Acre	Floor-Area Ratio (FAR)	Persons/Acre	Jobs/Acre
C1-Natural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C2-Rural	1 to 2	Detached buildings with no consistent pattern of setbacks	No	N/A	<1	N/A	<2	N/A
C2T-Rural Town	1 to 2	Both detached and attached buildings with no or shallow (<20') front setbacks	Yes	Mostly on side or rear; occasionally in front	>4	>0,25	N/A	>2
C3R-Suburban Residential	1 to 2, with some 3	Detached buildings with medium (20' to 75') front setbacks	No	Mostly in front; occasionally in rear or side	1 to 8	N/A	N/A	N/A
C3C-Suburban Commercial	1 (retail uses) and 1 to 4 (office uses)	Detached buildings with large (>75') setbacks on all sides	No	Mostly in front; occasionally in rear or side	N/A	<0,75	N/A	N/A
C4-Urban General	1 to 3, with some taller buildings	Both detached and attached buildings with no setbacks or up to medium (<75') front setbacks	Yes	Mostly on side or rear; occasionally in front	>4	N/A	>5	>5
C5-Urban Center	1 to 5, with some taller buildings	Both detached and attached buildings with no or shallow (<20') front setbacks	Yes	Mostly on side or rear; occasionally in front, or in shared off-site parking facilities	>8	>0,75	>10	>20
C6-Urban Core	>4, with some shorter buildings	Mostly attached buildings with no or minimal (<10') front setbacks	Yes	Side or rear; often in shared off-site garage parking	>16	>2	>20	>45

3) *2009 SmartCode Version 9.2*, Duany, Andres, Sandy Sorlien, and William Wright; and
4) *2010 Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, Institute of Transportation Engineers and Congress for the New Urbanism.
5) Colors correspond to flowchart in Figure 5.

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Figure 1.9 Florida DOT Context Classification Matrix
Source: Florida DOT *Context Classification Guide* (2020)

It is intended that primary measures can be evaluated through field visits, aerial photography, available street view imagery, or a combination. Secondary measures require more detailed map analysis and determination of future land use and/or zoning information, if available.

Figure 1.10 outlines a step-by-step process to evaluate context classification for a specific project. Generally, a subset of the primary measures can be enough to determine a roadway's context classification. It may not be necessary to evaluate all primary and secondary measures.

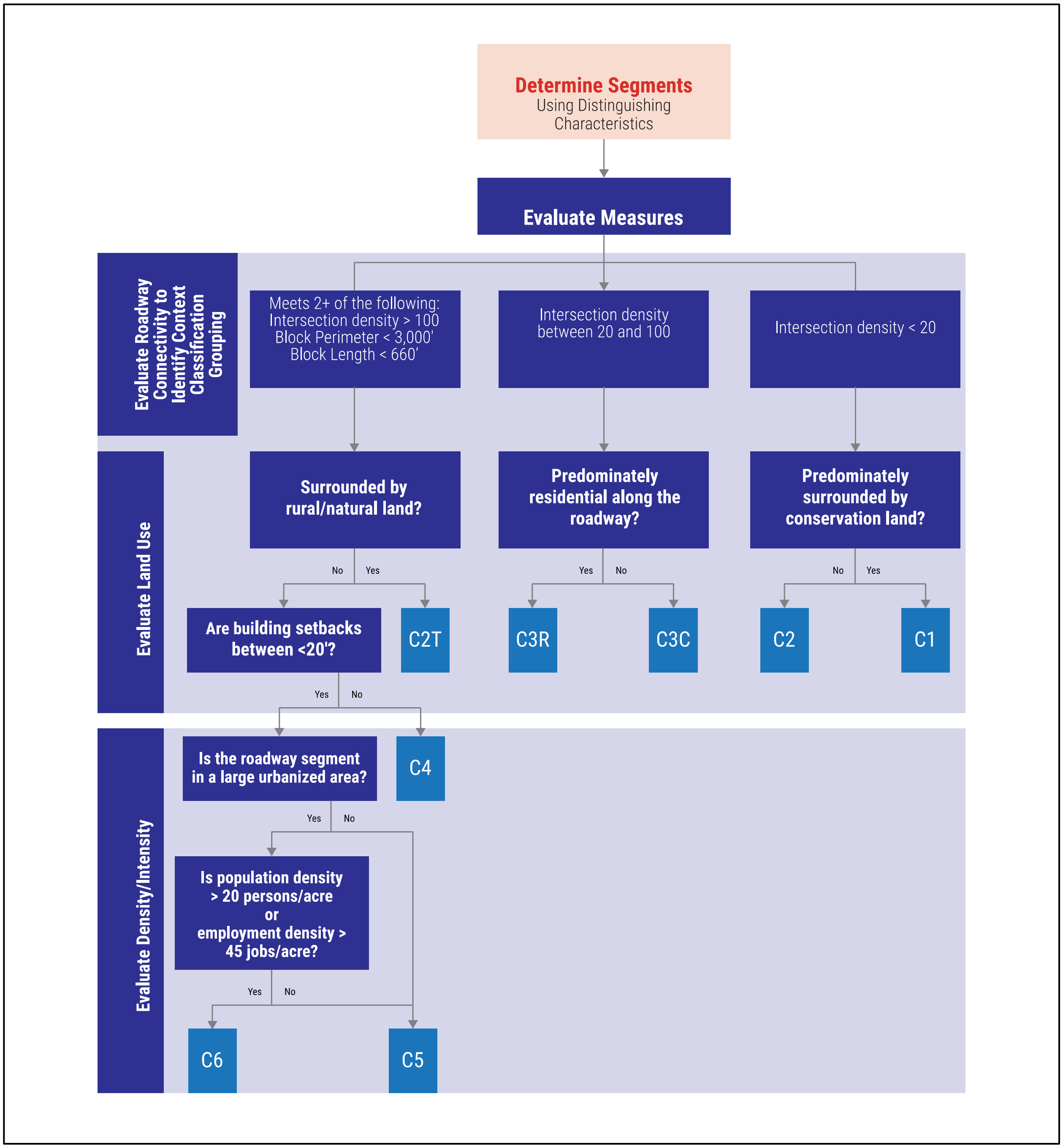

Figure 1.10 A Step-by-Step Guide for Determining Context Classification
Source: Florida DOT *Context Classification Guide* (2020)

Finally, FDOT acknowledges that not all roadways adhere to the standards in the context classification matrix. In those cases, a Special District (SD) context classification can be applied. Some examples may include:

- Military bases
- University campuses
- Airport

- Seaports or riverports
- Rail yards
- Theme parks or other tourist areas
- Sports complexes
- Hospitals
- Freight distribution centers

Typically, a Special District attracts a unique mix of users with unique travel patterns. Planning and engineering judgment are used to understand those situations and determine appropriate design controls and criteria on a case-by-case basis.

Expected user types – The context classification of a segment of a roadway is intended to inform project teams of the types and intensity of users that can be expected. Figure 1.11 illustrates typical user types and intensities for each context classification. The types and intensities of users shown for each context are typical in nature and planners and engineers should confirm the recommendations prior to determining the actual need to accommodate them.

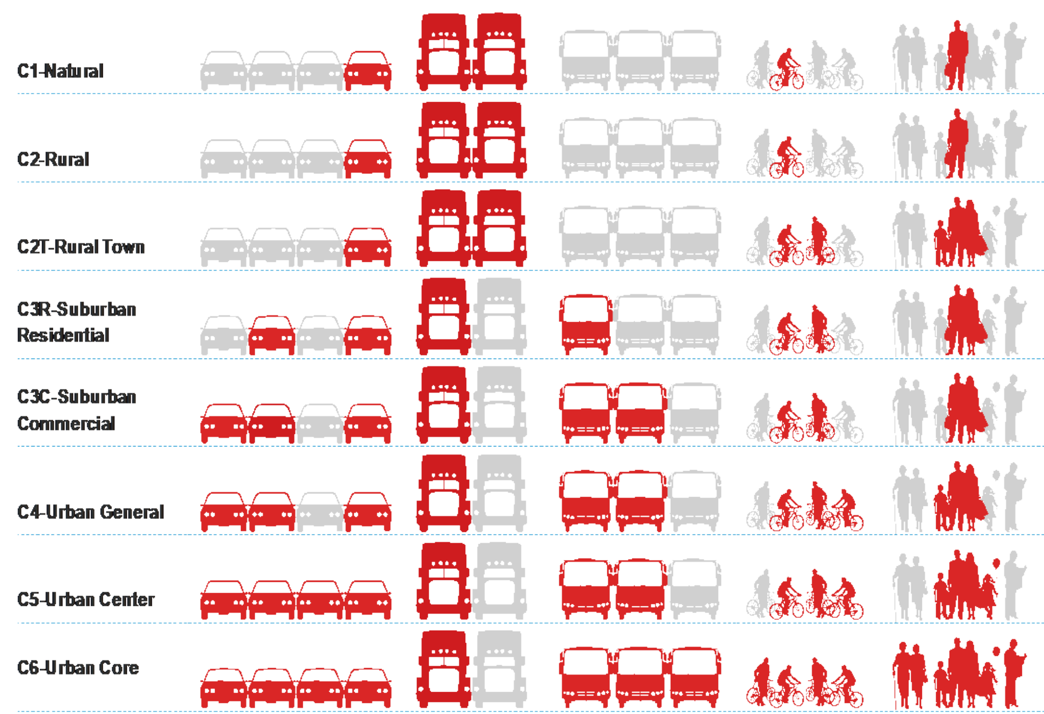

Figure 1.11 Typical User Types and Intensities for Context Classifications
Source: Florida DOT *Context Classification Guide* (2020)

Role of functional classification – FDOT considers functional classification and context classification together when determining the role and function of a roadway within the transportation network. The FDOT Context Classification Guide provides guidance with two specific examples where the combination of the two is appropriate:

- The relationship between functional classification and access needs may be less consistent in more urban context classifications where roadways serve a wider variety of purposes beyond moving motor vehicular traffic.
- In growing suburban areas, retail and commercial businesses usually appear along arterials, requiring access and creating demands for short-distance and local trips for not only vehicles, but also pedestrians and bicyclists.

The example of Richmond Road in Lexington, Kentucky introduced earlier displays both points well. First, the surrounding context of the principal arterial changes significantly while the functional classification does not. Second, as development along Richmond Road has crept away from the urban core of downtown Lexington, the desired access and additional user types generated by surrounding residential neighborhoods benefit from a facility that does not necessarily serve the purpose of minimizing travel time and distance. Those are the typical roles of a principal arterial. These examples are indicative of the importance of layering context classification criteria on top of the use of functional classification.

Design controls – FDOT uses the following key design controls for project development: design speed, design vehicle, design period, traffic volumes, level of service, functional classification, access classification, and context classification. Design speed is a principal design control that determines many of the key design criteria for a project. Table 1.2 depicts the incorporation of context classification into the selection of the allowable design speed range for a non-limited-access facility.

Design speed and target speed – FDOT selects a design speed early in the design process that reflects a target speed. Target speed is the highest speed vehicles should operate on a roadway within in a specific context. FDOT notes the following regarding target speed:

- Target speed should be within the allowable design speed guidance shown in Table 1.2. The Strategic Intermodal System (SIS) is Florida's high-priority network of transportation facilities important to the state's economy and mobility.
- Target speed should allow for an operational speed consistent with the multimodal activity generated by the surrounding context of a facility.
- Target speed may change during project development as information is gathered and decisions are made.
- Target speed for C1 and C2 roadways should be in the higher range of the allowable design speed shown.
- Target speed for C2T through C6 roadways should be in the lower range of the allowable design speed shown with justification required otherwise.
- The 85^{th} percentile speed should be considered when selecting the target speed. They are not required to be the same, however. If the selected target speed is lower than the 85^{th} percentile speed, speed management intervention techniques may be required.
- When target speed and design speed are lower than the posted speed, the posted speed may need to be changed over time.

Table 1.2 Florida DOT Design Speed Guidance

Limited Access Facilities (Interstates, Freeways, and Expressways)		
Area	**Allowable Range (mph)**	**SIS Minimum (mph)**
Rural and Urban	70	70
Urbanized	50-70	60
Arterials and Collectors		
Context Classification	**Allowable Range (mph)**	**SIS Minimum (mph)**
C1 Natural	55-70	65
C2 Rural	55-70	65
C2T Rural Town	25-45	40
C3 Suburban	35-55	50
C4 Urban General	25-45	45
C5 Urban Center	25-35	35
C6 Urban Core	25-30	30

Notes:

(1) SIS Minimum Design Speed may be reduced to 35 mph for C2T Context Classification when appropriate design elements are included to support the 35-mph speed, such as on-street parking.

(2) SIS Minimum Design Speed may be reduced to 45 mph for curbed roadways within C3 Context Classification.

(3) For SIS facilities on the State Highway System, a selected Design Speed less than the SIS Minimum Design Speed requires a Design Variation as outlined in ***SIS Procedure (Topic No. 525-030-260)***.

(4) For SIS facilities not on the State Highway System, a selected Design Speed less than the SIS Minimum Design Speed may be approved by the District Design Engineer following a review by the District Planning (Intermodal Systems Development) Manager.

Source: Florida DOT *Design Manual* (2022)

In Florida, most other key design criteria are primarily controlled by the selected design speed with secondary contributing factors. However, the FDOT Design Manual specifically incorporates context classification into the selection of the following design features:

- Lane widths
- Median width on divided roadways with design speeds of 45 MPH or greater
- Minimum border width
- Maximum grades

Pedestrian and bicycle facilities – The FDOT Design Manual states that sidewalks should be provided on curbed roadways except where prohibited by statute. Sidewalks are also not required within C1 or C2 context classification and when no other connecting pedestrian facilities exist. The manual also states that sidewalks should be provided on high speed curbed and paved shoulder roadways with C2T, C3R, C4, C5, or C6 context classifications and along roadways with C1, C2, or C3C context classifications with a demonstrated demand for use. Standard sidewalk widths are provided as shown in Table 1.3.

Table 1.3 Florida DOT Context Classification Matrix Standard Sidewalk Widths

Context Classification		Sidewalk Width (feet)
C1	Natural	5
C2	Rural	5
C2T	Rural Town	6
C3	Suburban	6
C4	Urban General	6
C5	Urban Center	10
C6	Urban Core	12

Notes:

(1) For C2T, C3 and C4, sidewalk width may be increased up to 8 feet when the demand is demonstrated.

(2) For C5 and C6, when standard sidewalk width cannot be attained, provide the greatest attainable width possible, but not less than 6 feet.

(3) For RRR projects, unaltered sidewalk with width 4 feet or greater may be retained within any context classification.

(4) See ***FDM 260.2.2*** for sidewalk width requirements on bridges.

Source: Florida DOT *Design Manual* (2022)

Regarding pedestrian and bicycle facilities, context classification is also mentioned as a determining factor in the following situations:

- Paved shoulders should be marked with bicycle lane arrow markings within C4, C5, and C6 context classifications, or within C3 when demand is demonstrated. This is only one of several criteria which must be met.
- Shared use path may be substituted for sidewalks or a bicycle lane when the design speed is 35 MPH or greater and the context classification is C1, C2, or C3.

- An urban side path may be used in C2T, C4, C5, and C6 context classifications when the roadway design speed is 35 MPH or less. In C5 and C6 contexts, a separate sidewalk must be provided along with the urban side path to accommodate pedestrian demand.
- A separated bicycle lane and sidewalk should be utilized in C2T, C4, C5, or C6 contexts when non-motorist volumes are expected to be high and higher than usual numbers of more vulnerable users such as the elderly or disabled are anticipated.

1.3.2 Washington Department of Transportation

The Washington Department of Transportation (WSDOT) states that it is "committed to context-appropriate, multimodal, performance-based designs". The July 2017 Design Manual update included guidance for determining context for non-freeway facilities. WSDOT defines context as the "environmental, economic, and social features that influence livability and travel characteristics". Context informs the selection of design controls such as target speed and modal priority. For WSDOT, context is divided into two categories: land use and transportation.

WSDOT chose to utilize four land use categories. Those four categories along with their key characteristics are rural, suburban, urban, and urban core. They are further described below.

Rural – Land use ranges from no development to some light development, with sparse residential and other structures mostly associated with farms. Land is primarily used for outdoor recreation, agriculture, farms, and/or resource extraction. Occasional small communities may include a few residential and commercial structures. Rural is further defined by these characteristics:

- No or few pedestrians except in outdoor recreation areas or where socioeconomic factors suggest walking to be an essential form of transportation,
- Recreational bicycle use except for potential commutes between communities or where socioeconomic factors suggest bicycling to be an essential form of transportation,
- Commercial uses include general stores, restaurants, and gas stations, normally at crossroads,
- Large setbacks except in small communities, and
- Limited transit service availability.

Suburban – Locations classified as suburban are usually connected and integrated with an urban area and include a diverse range of commercial and residential uses with low or medium density. Multi-story buildings with off-street parking tend to exist. Sidewalks will usually exist, and facilities may include bicycle lanes. Suburban areas may include big box commercial, light industrial, health services, gas stations, restaurants, schools, and libraries. Suburban is further defined by these characteristics:

- Heavy reliance on passenger vehicles,
- Transit services may be available,
- May include single and/or multi-family residential structures,
- May include planned facilities for multimodal activities such as walking and biking, and
- Schools and parks may be integrated with residential and commercial areas.

Urban – Urban locations are high density with multi-story and low to medium rise residential and commercial buildings. Some light and heavy industrial use may exist. Many structures accommodate mixed use and specialized structures for entertainment, athletics, or social events or conferences may exist. Urban is further defined by these characteristics:

- Various public use structures, including government, typically exist.
- Varying setbacks and streets typically include on-street parking.
- Wide sidewalks accommodate greater pedestrian traffic.
- Bicycle lanes and transit typically exist.
- Off-street parking in multi-level buildings is integrated with commercial and residential uses.

Urban Core – Urban core locations are the densest, with mixed residential and commercial use in high-rise structures. Time-restricted on-street parking is utilized along with parking in multi-level structures shared with commercial and residential use. Urban core areas are accessible to passenger vehicles, commercial delivery vehicles, bicycles, pedestrians, and transit. Urban Core is further defined by these characteristics:

- Sidewalks and plazas accommodate pedestrians,
- Bicycle facilities and transit facilities are common,
- Mixed land use includes commercial, residential, government, and institutional,
- Mixed use high-rise structures, and
- Minimal setbacks due to high land values.

Determining land use and transportation context – WSDOT provides specific guidance for determining both the land use and transportation contexts for a project and notes that a project may need to be broken into segments if more than one category applies within the project limits. Designers are directed to use the Context and Modal Accommodation Report and accompanying learner's guide in conjunction with the Basis of Design form when making these determinations. Figure 1.12 depicts a general overview of the process to determine modal priorities for a project based on land use and transportation contexts.

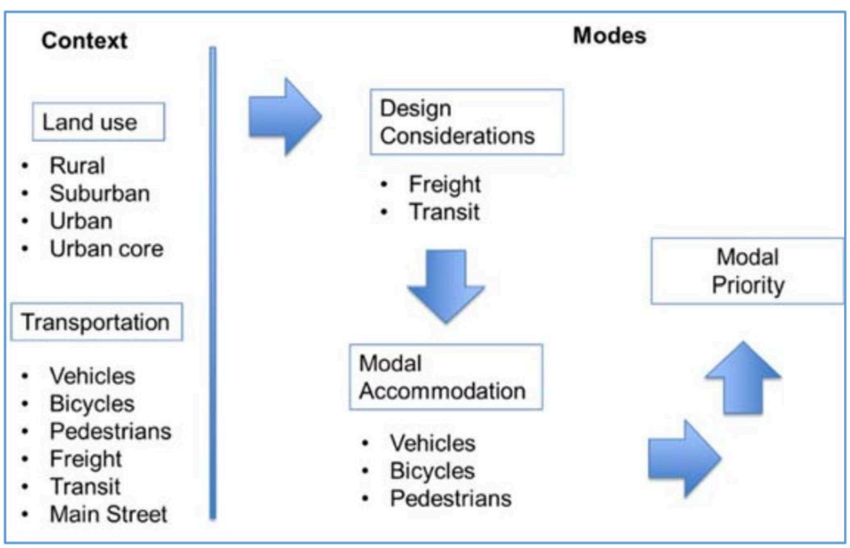

Figure 1.12 Washington DOT Context Documentation Process
Source: Washington DOT *Context and Modal Accommodation Report* (2019)

Table 1.4 Washington DOT Factors for Determining Initial Land Use Context

Factor	Criteria
Land Use	Land uses within ½ mi of roadway
Density	Housing units / acre
Density	Jobs / acre
Density	Intersections per sq. mi.
Density	Typical building height
Setback	Typical building setback
Setback	Parking (on street or off street)

Source: Washington DOT *Design Manual* (2022)

The factors shown in Table 1.4 are used to determine the initial land use category. The first step involves determining the initial land use context category for the current state, or existing conditions. The factors shown can be quantified based on readily available data. Second, the project team should consult with local agency staff and review available planning documents to determine whether any potential changes to the surrounding land use warrant a change in the initial land use context category for the future conditions. Finally, the final land use context category for both the current and future conditions is established and takes into account any additional considerations, such as information gained through community engagement, as well as professional judgement. WSDOT includes a Land Use Context Worksheet to aid in determining the land use context category within their *Context and Modal Accommodation Report*. See Figure 1.13.

Context and Modal Accommodation Report   Version 2.2 (10/24/2019)

LAND USE CONTEXT WORKSHEET

1. Review indicators (far left column) to define Current and future context (rural, suburban, urban/town, urban core).
2. Check one box in each row based on Current condition and another box in each row based on future condition.
3. Split segments by mileposts if indicators change significantly. Use one sheet for each milepost range.

Indicator	Relevance	Rural	Suburban	Urban/Town	Urban Core	Source (Current)	Source (Future)
Land Use	Within ½ mile of roadway	Agricultural uses with some isolated residential and commercial Current ☐ Future ☐	Single uses (divided into residential, commercial, institutional or industrial uses) Current ☐ Future ☐	Mixed-uses (includes 2+ residential, commercial, institutional and/or industrial uses) Current ☐ Future ☐	Mixed uses except industrial and agriculture Current ☐ Future ☐	Aerial Photos	City or County Comprehensive Plan. Zoning & Land Use Designations
Housing Units/Acre	Polygons adjacent to roadway	< 1 unit/acre Current ☐ Future ☐	1-4 units/acre Current ☐ Future ☐	4-15 units/acre Current ☐ Future ☐	15+ units/acre Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Jobs/Acre	Polygons adjacent to roadway	0-1 jobs/acre Current ☐ Future ☐☐	1-10 jobs/acre Current ☐ Future ☐	10-50 jobs/acre Current ☐ Future ☐	50+ jobs/acre Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Street Intersection Density	Polygons adjacent to roadway	< 15 intersections/ square mile Current ☐ Future ☐	15-75 intersections per square mile Current ☐ Future ☐	75-150 intersections per square mile Current ☐ Future ☐	150+ intersections/ square mile Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Typical Building Height	Visible from roadway	N/A Current ☐ Future ☐	Mostly 1 to 2 story Current ☐ Future ☐	Mostly 2 to 4 story Current ☐ Future ☐	Mostly 4+ stories Current ☐ Future ☐	Google Maps Streetview	City or County Zoning Code
Setbacks	Visible from roadway	Varies Current ☐ Future ☐	24 ft min (arterial) 12 ft min (non-arterial) Current ☐ Future ☐	6 ft min to 18 ft max Current ☐ Future ☐	2 ft min to 12 ft max Current ☐ Future ☐	Aerial Photos	City or County Zoning Code
Parking	Visible from roadway	Off-street (on-street rare) Current ☐ Future ☐	On-street residential, off-street commercial Current ☐ Future ☐	On-street common supplemented by off-street surface Current ☐ Future ☐	Mostly on-street with some off-street structures Current ☐ Future ☐	Aerial Photos	City or County Comprehensive Plan

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Figure 1.13 Washington DOT Land Use Context Worksheet

Context and Modal Accommodation Report   Version 2.2 (10/24/2019)

RESULTS:

Beginning MP	Ending MP	Current Context (Initial)	Future Context (Initial)	Current Context (Final)	Future Context (Final)
		☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core	☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core	☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core	☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core
Sources/interpretations made in these determinations not captured in the table:					

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Figure 1.13 Continued

Source: Washington DOT *Context and Modal Accommodation Report* (2019)

The transportation context is the basis for modal priority decisions for a project and are based on the following:

- Roadway type - Functional classification,
- Bicycle route type – Based on the trip purpose and network connectivity a facility provides,
- Pedestrian route type – Described in terms of estimated current and potential future volumes,
- Freight route type – Could be an identified freight route or based on amount of use,
- Transit use considerations – Depends on type and volume of service provided, and
- Complete streets and main street highways – Previously designated routes.

The *Context and Modal Accommodation Report* provides additional worksheets for context determination. All the above modes are addressed and lead to a determination of the initial modal priority for a project. Figure 1.14 depicts typical modal priorities based on route type and land use context.

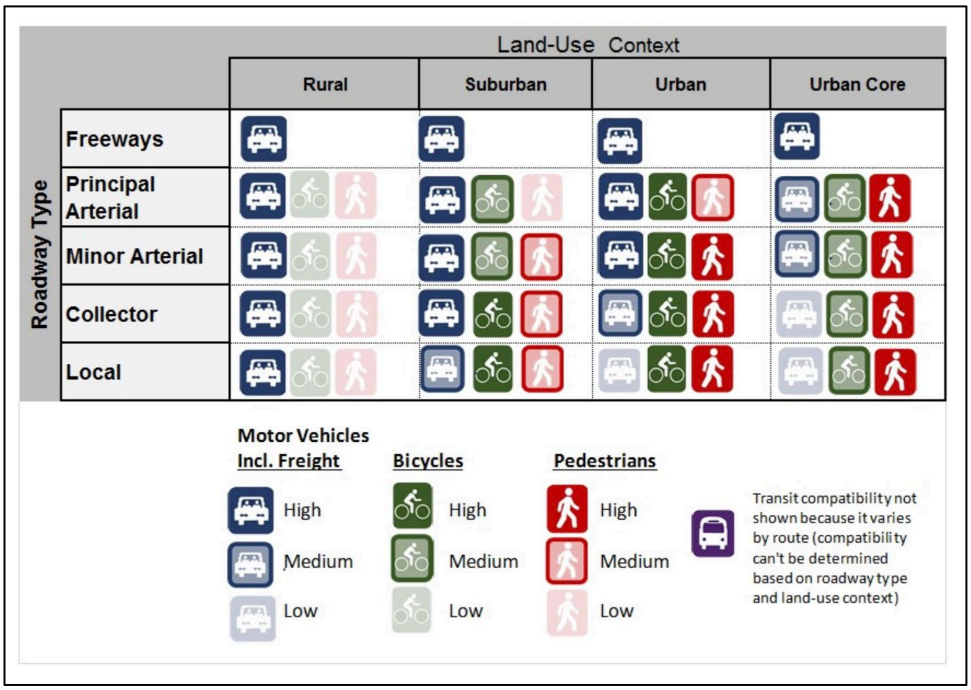


Figure 1.14 Washington DOT Initial Modal Accommodation Table
Source: Washington DOT *Context and Modal Accommodation Report* (2019)

Following selection of the initial modal priority, the *Context and Modal Accommodation Report* (Appendix A) provides worksheets intended to assist with assessing the need to increase or decrease the priority needed for motor vehicles, bicycles, and pedestrians. Following completion of those worksheets, the final modal priority for each mode will be determined for both existing and future conditions. The results and justification are recorded in the project Basis of Design document.

Design controls – The modal priority for a project becomes one of five key design controls along with design year, access control type, design speed, and terrain classification. Unlike FDOT, WSDOT design guidance does not prescribe the use of certain features to accommodate particular modes. WSDOT recommends that sidewalks will typically be considered in suburban, urban, and urban core contexts. The designer is expected to document priority of modes on the Basis of Design document, which is similar to KYTC's Design Executive Summary, and requires approval near the 30% design stage. The Basis of Design will document the design elements selected by the project team that accommodate those modes being prioritized. See Appendix B for WSDOT's Basis of Design form.

WSDOT also utilizes target speed and provides recommendations based on land use context and roadway type as shown in Table 1.5. Low speed is 35 MPH or less. Intermediate speeds are 40 and 45 MPH. High speed is 50 MPH and above.

Table 1.5 Land-Use Context for Roadway Types

		Land-Use Context			
Roadway Type		Rural	Suburban	Urban	Urban Core
	Freeways	High	High	High	High
	Principal Arterial	High	Intermediate / High	Low / Intermediate	Low
	Minor Arterial	High	Low / Intermediate	Low / Intermediate	Low
	Collector	Low / Intermediate	Low/ Intermediate	Low	Low
	Local	Low / Intermediate	Low	Low	Low

Source: Washington DOT *Context and Modal Accommodation Report* (2019)

The goal of the target speed approach is that the posted speed for a project is the same as the design speed and operating speed while considering existing and proposed context, modal priority, access control selection, performance need, and other important contributing factors specific to a project.

1.3.3 Minnesota Department of Transportation

The Minnesota Department of Transportation (MnDOT) *Facilities Design Guide* (2022) includes the identification of context categories for a project. MnDOT chose to utilize nine land use context categories. Those categories along with their key characteristics are described below.

Natural – Describes primarily undeveloped land that exists in its original state. Any buildings have very large setbacks and may not be visible.

Rural – Applies to farmland, forestry, mining, or very low density residential or commercial areas. Buildings have large setbacks and small pockets of natural context may be interspersed with rural developments.

Rural crossroad – Small developed areas at the intersections of two rural highways. May be a small community or unincorporated town. Land use is typically residential, commercial, industrial, institutional, and agricultural. Typical one-story buildings with varying setbacks.

Suburban commercial – Consists of large, developed parcels for commercial, office, institutional, and entertainment uses. Businesses may have large on-site parking lots and on-street parking may be available. Buildings are typically large, but not multi-story.

Suburban residential – Consists of mostly single-family houses with some multi-family. May include parks and natural spaces and a small amount of commercial and institutional uses.

Industrial/warehouse/port – Usually consists of industry and manufacturing, storage, and shipping, commercial, or air, rail, or water ports. Typically includes large buildings on large lots separated by parking areas.

Urban commercial – Densely developed area with a mix of commercial, retail, office, institutional, public/civic, and some residential. Building heights will vary. Parking lots and on-street parking are typical with parking structures in the denser areas.

Urban residential – Consists of single and multi-family homes and some commercial uses. May include parks and natural spaces and a small amount of commercial and institutional uses. Buildings have little or no setbacks and parking is typically on-street or in lots or garages accessed by alleys.

Urban core – Densely developed area of mixed uses including commercial/office, residential, public/civic, special event, and parks or open space. Most common in moderate or large cities. Lot sizes vary, buildings typically share walls, and buildings may be multi-story. Parking structures are common with some on-street parking and dedicated lots.

Figure 1.15 is from Exhibit 3C-2 in MnDOT's Facility Design Guide (2022). The exhibit provides additional detail on the selection of context for MnDOT projects.

Context Category	Description	Land Use
Natural	- Sparsely developed or not developed. - If present, scale of development is typically small. - Wetlands, forests, prairies, lakes, waterways, steep slopes, historic areas.	Resource conservation/ preservation, scenic, recreational areas, parks, open space, water (with or without public access), forest.
Rural	- Sparsely developed. - Scale of development may be large (e.g., farm land). - Low intensity of use.	Agriculture, forestry, mining, some industrial, park/recreation, water (with or without public access), sparse residential or commercial.
Rural Crossroad	- A developed area with small scale and moderate density. - A variety of land use types typically resulting in moderate intensity of use.	Commercial (e.g., corner bar, gas), institutional (e.g., church), public/civic, (e.g., town hall, post office), park, open space. Often intermixed with agriculture, forestry, or industrial.
Suburban Commercial	- Low to moderate density of development - Typically, one type of land use (commercial) resulting in low to medium intensity of use. - Large scale land uses (e.g., big box retailers) are common.	Commercial, retail & big box, office parks, entertainment venues, some public/civic buildings (e.g., city hall), parks, institutional (e.g., community college). Some suburban commercial areas include a moderate density and mix of land uses centered on either historic or recently created town centers.
Suburban Residential	- Low density of development (e.g., few residences per acre). - Typically, one type of land use (residential) resulting in low intensity of use.	Single family houses, some multi-family buildings, some public/civic (e.g., school, library), parks/open spaces, small retail nodes (e.g., gas station, convenience store) adjacent to or along the edge.
Industrial/ Warehouse/ Port	- May be in an isolated location in a rural area or intermixed with suburban or urban settings. - Typically large scale developments with a low to moderate intensity of use.	Manufacturing, logistics, warehouse, intermodal facilities (air, water, rail)
Urban Commercial	- Moderate to high density of development, typically at a small or moderate scale. - A variety of land uses (including some residential) resulting in high intensity of use.	Often mixed use, including office, retail, large event centers, residential, regional public/civic (e.g., court house, county or state government, universities).
Urban Residential	- Moderate to high density of development (e.g. many residences per acre). - Typically one type of land use (residential) resulting in low intensity of use.	A mix of single-family houses and multi-family buildings, some public/civic (e.g., school, library), parks/open space uses, small retail nodes (e.g., corner store).
Urban Core	- Extremely densely developed, often including vertical density. - Typically high intensity of use. - All varieties of land use may be present. - All scales of land use.	Mixed retail, commercial, office, residential, institutional, event & sports centers, local and regional public/civic (e.g., library, court house) Open spaces are typically plazas.

Figure 1.15 Minnesota DOT Context Category Matrix
Source: Minnesota DOT *Facility Design Guide* (2022)

Context Category	Density	Buildings	Setback
Natural	Zero to very low	- Rare. - Mostly single-use. - 1 to 2 stories tall.	Very large
Rural	Low	- Sparse. - Mostly single-use. - 1 to 2 stories tall.	Large
Rural Crossroad	Low to medium	- Concentrated. - Often mixed-use. - 1 to 2 stories tall.	Small to medium
Suburban Commercial	Low to medium, higher in town centers	- Frequent buildings. - Large lots, buildings are separated by parking lots. - Mostly single-use, some mixed use. - 1 to 4 stories tall.	Medium to large
Suburban Residential	Low to medium	- Frequent buildings. - Medium-sized lots, buildings are separated by lawns or yards. - Single-use. - 1 to 3 stories tall.	Medium to large
Industrial/ Warehouse/ Port	Medium	- Sparse buildings. - Very large lots, buildings are separated by parking lots or outdoor uses. - Mostly single use. - Typically 1 story tall.	Medium to large
Urban Commercial	Medium to high	- Frequent buildings. - Small lots with little or no separation between buildings. - Typically mixed use. - Building height depend on size of community. - 1 to 6 stories tall.	None to small
Urban Residential	Medium to high	- Frequent buildings. - Small lots, buildings have shared walls or are separated by lawns. - Single use. - Single-unit or duplex houses (1 to 2 stories). - Multi-unit buildings (2 to 5 stories).	None (multi-unit) to small (single-unit/ duplex)
Urban Core	High	- Frequent buildings. - Lot sizes vary, but buildings typically have shared walls. - In large cities, one building may occupy an entire blocks. - Building height depends on size of community but ranges from 1 story to 30 stories.	Typically none

Figure 1.15 Continued

Context Category	Frontage	Facilities
Natural	- Natural areas. - Parking lots in vicinity of buildings.	- Roadway and shoulders used by all modes. - Some shared-use paths, few sidewalks. - Some on-demand or shuttle transit, no fixed route service.
Rural	- Mostly farm or natural. - Private yards, parking lots, or both in vicinity of buildings.	- Roadway and shoulders used by all modes. - Some shared-use paths, few sidewalks. - Some on-demand or shuttle transit, no fixed route service.
Rural Crossroad	- Landscaped buffers or small parking lots.	- Roadway and shoulders typically used by drivers and bicyclists, may be used by pedestrians in absence of sidewalks. - Occasional sidewalk or shared-use path. - Some on-demand or shuttle transit, no fixed route service.
Suburban Commercial	- Landscaped buffers and/or large parking lots.	- Roadway typically used by drivers only. - Shoulders may or may not be present. - Sidewalks or shared-use paths. - Served by on-demand transit. - Some fixed-route transit service. - Park and rides access to commuter transit routes.
Suburban Residential	- Private yard and/or driveway.	- Roadway typically used by drivers and bicyclists. - Occasional sidewalks or shared-use paths. - Served by on-demand transit. - Some fixed-route transit service. - Park and rides access to commuter transit routes.
Industrial/ Warehouse/ Port	- Landscaped buffers, some fences, parking lots.	- Roadway and shoulders typically used by drivers and bicyclists. - Occasional sidewalks or shared-use paths. - Facilities where cargo is transferred from one mode to another (e.g., from train to ship). - Some fixed route transit service.
Urban Commercial	- If present, frontage may be landscaped or paved area for use as seating, retail, or access to storefront.	- Street typically used by drivers and bicyclists; alleys used by all modes. - Sidewalks. - Bike lanes or separated bike lanes. - Fixed route transit service.
Urban Residential	- If present, multi-unit residential frontage may be private yard, or a small landscaped or paved area for use by residents. - Single unit/duplex frontage is typically a private yard.	- Street typically used by drivers and bicyclists; alleys used by all modes. - Sidewalks. - Bike lanes or bike boulevards. - Fixed route transit service.
Urban Core	- If present, frontage may be landscaped or paved area for use as seating, retail, or access to storefront.	- Street typically used by drivers and bicyclists; alleys used by all modes. - Sidewalks. - Bike lanes or bike boulevards. - Fixed route transit service.

Figure 1.15 Continued

Context Category	Parking	Minnesota Examples
Natural	- Mainly surface lot, some on highway shoulder.	- TH 1 Superior National Forest - TH 38 Chippewa National Forest - TH 74 Whitewater State Park
Rural	- Mainly surface lot, some on highway shoulder.	- TH 52 in Goodhue County - TH 61 along the north shore of Lake Superior
Rural Crossroad	- Mainly surface lot, some on-street parking or on highway shoulder.	- TH 210/CR 6-16 in Tamarack - TH 38/CR 5 in Effie - TH 19/10th Ave in Stanton - TH 61 in Miesville (transitional)
Suburban Commercial	- Large surface lots, occasional on-street and structure parking.	- Division St in Saint Cloud - Robert St in West Saint Paul - Excelsior Blvd in Saint Louis Park
Suburban Residential	- Private garage, private driveway, occasional on-street parking.	- Chippewa Park neighborhood in Woodbury - Northern Hills neighborhood in Rochester
Industrial/ Warehouse/ Port	- Large surface lots.	- Terminal Drive industrial area in Eagan - Industrial Drive area in north Faribault- - ConAgra Foods area in New Prague - Port of Duluth - Various airports statewide
Urban Commercial	- Small surface lots or on-street parking. - Structure parking (in larger communities)."	- Superior St E in Duluth - University Ave in Minneapolis and Saint Paul - Grand Ave in Saint Paul - Many downtown main streets
Urban Residential	- Private garage or surface parking accessed via alley, on-street parking. - Large multi-unit buildings may have structure parking."	- Lyndale Ave in Minneapolis - 66th St in Richfield - East Hillside neighborhood in Duluth - Older residential areas of some small towns
Urban Core	- Structure parking is common, some on-street parking, some small surface lots.	- Downtown Minneapolis and Saint Paul - Downtown Duluth - Downtown Rochester

Figure 1.15 Continued

1.3.4 Oregon Department of Transportation

The Oregon Department of Transportation (ODOT) published the *Blueprint for Urban Design* in January 2020 which incorporated context classification into project development. ODOT updated their *Highway Design Manual* in January 2023 incorporating the *Blueprint for Urban Design.*

ODOT recognizes that context includes the adjacent land use and the context of the roadway itself. The roadway context, or the intended function of the road, using functional classification, provides input to the overall context of a roadway. Urban contexts defined by ODOT are based on current and future land use, development patterns, roadway classification and connectivity, and overall community goals for an area. ODOT recognizes six context classifications for non-limited access roadways. Those six classifications along with their key characteristics are described below.

Traditional downtown/central business district – Buildings are generally located at the back of sidewalk with minimal setbacks and access is provided from the sidewalk. Land use is mostly commercial and retail with some mixed residential, park areas, or other small recreational areas. Block sizes are generally small with on-street or parking behind buildings. The street grid system is usually well-developed.

Urban Mix – Building setbacks are mixed, but generally shallow and adjacent to the sidewalk or with a pedestrian pathway from sidewalk to building. Land use is commercial, retail, or professional offices and may include some residential. Older residential may be mixed in with newer development. Parking is mainly behind or beside buildings with some on-street parking. Block sizes are small to medium with a connected street grid system.

Commercial Corridor – Consists primarily of large commercial, retail, or industrial properties typically along major, high-speed arterials. A street grid system is not usually present. Building setbacks are medium to large with large parking areas between sidewalk and the building entrances. Large parking lots for employees and customers are typical.

Residential Corridor – Similar to a commercial corridor except with higher density of residential. May also be located along a higher speed arterial, but pedestrian, bicycle, and transit users will be more prevalent. This context typically has a better street grid network due to the existence of residential neighborhoods. Mixed commercial, retail, and light industrial land uses may support the residential area. Access to the main route is usually through public street connections.

Suburban Fringe – This context is the area of transition from higher speed rural roads to lower speed urban settings entering communities. Focus is on speed control. Building setbacks vary with generally larger properties and smaller buildings resulting in open green space. Residential, farming, commercial, retail, and industrial may all exist. Parking is primarily off the street.

Rural Community – Established for small communities with a major route being the primary through route. Will typically consist of small, concentrated areas of development surrounded by undeveloped areas. Building setbacks are generally shallow with parking along the edge of the road. Land use is mixed with primarily residential and small commercial. Facilities such as post offices, parks, schools, and recreational facilities are common.

Determining Urban Context – Figure 1.16 depicts the general criteria for each context as defined by ODOT. General guidelines for building setback, building orientation, land use, building coverage, parking location, and block size are provided.

Land Use Context	**Building Setbacks** Distance from the building to the property line	**Building Orientation** Buildings with front doors that can be accessed from the sidewalks along a pedestrian path	**Land Use** Existing or future mix of land uses	**Building Coverage** Percent of area adjacent to right-of-way with buildings, as opposed to parking, landscape, or other uses	**Parking** Location of parking in relation to the buildings along the right-of-way	**Block Size** Average size of blocks adjacent to the right-of-way
Traditional Downtown/ CBD	Shallow/ None	Yes	Mixed (Residential, Commercial, Park/Recreation)	High	On-street/ garage/ shared in back	Small, consistent block structure
Urban Mix	Shallow	Some	Commercial fronting, residential behind or above	Medium	Mostly off-street/Single row in front/ In back/ On side	Small to medium blocks
Commercial Corridor	Medium to Large	Sparse	Commercial, Institutional, Industrial	Low	Off-street/In front	Large blocks, not well defined
Residential Corridor	Shallow	Some	Residential	Medium	Varies	Small to medium blocks
Suburban Fringe	Varies	Varies	Varied, interspersed development	Low	Varies	Large blocks, not well defined
Rural Community	Shallow/ None	Some	Mixed (Residential, Commercial, Institutional, Park/Recreation)	Medium	Single row in front/ In back/ On side	Small to medium blocks

Figure 1.16 Oregon DOT Urban Context Matrix
Source: Oregon DOT *Highway Design Manual* (2023)

Expected user types – Figure 1.17 identifies the typical significance of each mode of transportation for each context. ODOT notes that the table is a starting point and that final context determinations should be made on a project-by-project basis with analysis of the unique circumstances of each individual project.

Land Use Context	Motorist	Freight	Transit	Bicyclist	Pedestrian
Traditional Downtown/CBD	Low	Low	High	High	High
Urban Mix	Medium	Low	High	High	High
Commercial Corridor	High	High	High	Medium	Medium
Residential Corridor	Medium	Medium	Low	Medium	Medium
Suburban Fringe	High	High	Varies	Low	Low
Rural Community	Medium	Medium	Varies	High	High

High: Highest level facility should be considered and prioritized with other modal treatments.

Medium: Design elements should be considered; trade-offs may exist based on desired outcomes and user needs.

Low: Incorporate design elements as space permits.

Figure 1.17 Oregon DOT General Modal Considerations in Each Context
Source: Oregon DOT *Highway Design Manual* (2023)

Role of functional classification – Figure 1.18 provides general guidance for design criteria for the following: typical speed range, travel lanes, turn lanes, shy distance, median, bicycle facility, sidewalk, pedestrian crossing spacing, and parking. These figures provide criteria for each context and for functional classification. In some circumstances where context and functional classification overlap, the designer is advised to reference the criteria for both.

Context	Typical Speed Ranges (MPH)[4]	Travel Lanes[1,2]	Turn Lanes[1,2]	Shy Distance[1,3]	Median[1,2]	Bicycle Facility[1,2,5]	Sidewalk	Target Pedestrian Crossing Spacing Range (feet)[6]	On-street parking[1]
Urban and Rural Freeways (including interstates	50-70 mph	Start with standard	Not Applicable	Start with standard	Start with standard	Generally, Not Applicable (only in specific cases)	Not Applicable	Not Applicable	Not Applicable
Grade Separated Urban and Rural Expressways	45-70 mph	Start with standard	Not Applicable for Grade Separations/ Start with standard	Not Applicable for Grade Separations/ Start with standard	Start with standard	Generally, Not Applicable (only in specific cases)	Not Applicable	Not Applicable	Not Applicable
At-Grade Urban and Rural Expressways	45-70 mph	Urban - Use Context Rural - Start With Standard	Urban - Use Context Rural - Start With Standard	Urban - Use Context Rural - Start With Standard	Urban - Use Context Rural - Start With Standard	Urban - Use Context Rural - Start With Standard See Part 900	Urban - Use Context Rural - Start With Standard See Part 800, 900	Urban - Use Context Rural - Start With Standard	Urban - Use Context Rural - Start With Standard

Figure 1.18 Design Guidance based on Context and Roadway Classification
Source: Oregon DOT *Highway Design Manual* (2023)

Context	Typical Speed Ranges (MPH)[4]	Travel Lanes[1,2]	Turn Lanes[1,2]	Shy Distance[1,3]	Median[1,2]	Bicycle Facility[1,2,5]	Sidewalk	Target Pedestrian Crossing Spacing Range (feet)[6]	On-street parking[1]
Rural Arterials/ Collectors/ Local Route	45-70 mph	Start with standard	Start with standard	When applicable, Start with standard	Start with standard	Start with standard	When applicable, Start with standard	When applicable, Start with standard	When applicable, Start with standard
Traditional Downtown/ CBD	20-25	Evaluate, start with preferred widths, wider by roadway characteristics	Minimize additional crossing width at intersections	Minimal	Optional, use as pedestrian crossing refuge	Start with separated bicycle facility	Ample space for sidewalk activity (e.g., sidewalk cafes, transit shelters)	250-550 (1-2 blocks)	Include on-street parking if possible
Urban Mix	25-30	Evaluate, start with preferred widths, wider by roadway characteristics	Minimize additional crossing width at intersections	Minimal	Optional, use as pedestrian crossing refuge	Start with separated bicycle facility, consider roadway characteristics	Ample space for sidewalk activity (e.g., sidewalk cafes, transit shelters)	250-550 (1-2 blocks)	Consider on-street parking if space allows

Figure 1.18 Continued

Context	Typical Speed Ranges (MPH)[4]	Travel Lanes[1,2]	Turn Lanes[1,2]	Shy Distance[1,3]	Median[1,2]	Bicycle Facility[1,2,5]	Sidewalk	Target Pedestrian Crossing Spacing Range (feet)[6]	On-street parking[1]
Commercial Corridor	30-35	Evaluate, start with preferred widths, wider by roadway characteristics	Balance crossing width and operations depending on desired use	Consider roadway characteristics, desired speeds	Typically used for safety/ operational management	Start with separated bicycle facility, consider roadway characteristics	Continuous and buffered sidewalks, with space for transit stations	500-1,000	Not Applicable
Residential Corridor	30-35	Evaluate, start with preferred widths, wider by roadway characteristics	Balance crossing width and operations depending on desired use	Consider roadway characteristics, desired speeds	Optional, use as pedestrian crossing refuge	Start with separated bicycle facility, consider roadway characteristics	Continuous and buffered sidewalks	500-1,000	Generally Not Applicable, Consider roadway character
Suburban Fringe	35-40	Evaluate, start with preferred widths, wider by roadway characteristics	Balance crossing width and operations depending on desired use	Consider roadway characteristics, desired speeds	Optional, use as pedestrian crossing refuge	Start with separated bicycle facility, consider roadway characteristics	Continuous and buffered sidewalks	750-1,500	Not typical

Figure 1.18 Continued

Context	Typical Speed Ranges (MPH)[4]	Travel Lanes[1,2]	Turn Lanes[1,2]	Shy Distance[1,3]	Median[1,2]	Bicycle Facility[1,2,5]	Sidewalk	Target Pedestrian Crossing Spacing Range (feet)[6]	On-street parking[1]
Rural Community	25 - 35	Evaluate, start with preferred widths, wider by roadway characteristics	Balance crossing width and operations depending on desired use	Consider roadway characteristics, desired speeds	Optional, use as pedestrian crossing refuge	Start with separated bicycle facility, consider roadway characteristics	Continuous and buffered sidewalks, sized for desired use	250-750	Consider on-street parking if space allows

[1] Design decisions consider the presence and volumes of freight and transit activity. Follow the Reduction Review Route policy and process.

[2] Design decisions must consider the existing level of access management and/or the driveway density.

[3] Shy distance: the lateral distance from the edge of the travel way beyond which a roadside object will not be perceived as an immediate hazard by the typical driver.

[4] Section 207.10, (Target Speed) provides the approach and strategies associated with target speed.

[5] Section 306 and Part 900 provide guidance to determine appropriate bicycle facility selection.

[6] Section 307 and Part 800 provide guidance for pedestrian crossing locations and pedestrian facilities.

Figure 1.18 Continued

Design controls – Figure 1.19 provides design speed guidance based on functional classification and context. For ODOT's urban contexts, the concept of target speed is utilized. Desirably, in urban areas, the target speed, posted speed, and design speed should be the same and a roadway should encourage an actual operating speed equal to the target speed. ODOT recommends specific design treatments to encourage operations at the target speed when the target speed is less than the posted speed and design speed.

Urban Context	Target Speed (MPH)	Design Treatments
Traditional Downtown/CBD	20-25	Roundabouts, lane narrowing, speed feedback signs, on-street parking[1], street trees[2], median islands, curb extensions, chicanes[3], textured surface, coordinated signal timing, speed tables[3], road diets
Urban Mix	25-30	Roundabouts, lane narrowing, speed feedback signs, on-street parking[1], street trees[2], median islands, curb extensions, chicanes[3], textured surface, coordinated signal timing, road diets
Commercial Corridor	30-35	Roundabout, lane narrowing, speed feedback signs, landscaped median Islands, coordinated signal timing, road diets
Residential Corridor	30-35	Roundabout, lane narrowing, speed feedback signs, landscaped median Islands, coordinated signal timing, road diets
Suburban Fringe*	35-40	Roundabouts, transverse pavement markings, lane narrowing, speed feedback signs, road diets, entry treatments
Rural Community	25-35	Roundabouts, lane narrowing, speed feedback signs, on-street parking[1], street trees[2], median islands, curb extensions, chicanes[3], speed tables[3], road diets, entry treatment

Figure 1.19 Oregon DOT Design Speed Selection
Source: Oregon DOT *Highway Design Manual* (2023). See Figure 1.20 for footnotes.

ODOT separates a project typical section into areas based on intended function. Those areas and their descriptions are as follows:

- Land use realm – Adjacent to and outside of the roadway right of way
- Pedestrian realm – Includes sidewalk and buffer zone
- Transition realm – Area between the curb and sidewalk
- Travel way realm – Travel lanes, turn lanes, etc., used for vehicular travel

The ODOT Highway Design Manual provides general guidance for the consideration of various improvements for each realm. Figure 1.20 is an example of guidance for the realms.

Realm	Design Element	Width
Pedestrian Realm	Frontage Zone	4′ to 2′
	Pedestrian Zone	10′ to 8′
	Buffer/Furniture Zone	6′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[6]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer[2]	3′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3,5]	2′ to 0′
	On-Street Parking	7′ to 8′
Travelway Realm[5]	Travel Lane[4,5]	11′
	Right Turn Lane (including Shy Distances)	11′ to 12′
	Left Turn Lane[4]	11′
	Left Side / Right Side Shy Distance	1′ to 0′
	Two-Way-Left-Turn Lane	11′ to 12′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/separator (includes 16″ separator & Shy Distances)	12′ to 14′

[1] Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

[2] Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane is allowed only with a street buffer. When a raised buffer is used to protect the bicycle lane, the width should be 6′ if parking is adjacent or if signs or other features are anticipated.

[3] Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as the right-side shoulder. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs.

[4] 11-foot lane width preferred; 12-foot lane optional, where needed; 10-foot lane width requires a formal design exception from the State Roadway Engineer. On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

[6] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

Figure 1.20 Oregon DOT Cross Section Realms
Source: Oregon DOT *Highway Design Manual* (2023)

ODOT provides detailed guidance for the design of elements pertinent to each realm for each context. Figure 1.21 is an example of guidance for all three realms or zones for the Pedestrian Realm.

Design Element	Considerations
Frontage Zone	The frontage zone is located between the pedestrian zone and the right-of-way. Depending on the available space, this zone may include items such as sandwich boards (if sidewalk locally owned), bicycle racks, and benches. This area is used by window shoppers and is where people enter and exit buildings. • The width of the frontage zone is needed to prevent adjacent property owners from installing a fence at the back of walk, or for maintenance personnel to make sidewalk repairs. • In a Traditional Downtown/CBD context, additional width is needed to provide space for merchandise and sidewalk cafés (if sidewalk is locally owned and permitted), and opening doors (typically needs 4 feet).
Pedestrian Zone	What is the travel speed next to the sidewalk? Is the street a high priority for pedestrian activity, based on community input and local jurisdiction planning efforts? • If so, prioritize serving pedestrians with a high-quality facility (width and buffer). What level of pedestrian activity is occurring today? Is there a desire or potential for higher pedestrian activity? • Select sidewalk widths with sufficient space to accommodate anticipated/desired level of activity. What is the target pedestrian level-of-traffic-stress for this location? A pedestrian accessible route is provided in the pedestrian zone.
Buffer Zone	People walking need to be buffered from motor vehicle movement. Ensure that a buffer is provided within the pedestrian realm or the transition realm, or that generous sidewalk width provides sufficient space for buffering if sidewalk is curb-tight. Permitted items such as sandwich boards, bicycle racks, and other street furniture are typically placed in this zone. Additional design elements to consider in sidewalk design include: • Pedestrian scale lighting • Utility pole placement Do transit stops need extra buffer? • Where vehicle speeds or volumes are high, sufficient buffer is important. • Downtown area may have parked cars that can serve as a buffer. Suburban areas have no parking but may include a planter strip.

Figure 1.21 Oregon DOT Design Element Considerations within the Pedestrian Realm
Source: Oregon *Highway Design Manual* (2023)

Finally, ODOT developed an Urban Design Concurrence document (Appendix C) similar to KYTC's DES that serves as a tool to:

- Document selection of the proposed context for a project,
- Document the extent to which each mode of travel shall be accommodated by a project, and
- Document dimensions for specific proposed design elements.

1.3.5 Maryland Department of Transportation

The Maryland Department of Transportation (MDOT) State Highway Administration (SHA) published *Context Driven Access & Mobility for All Users* in 2020. It is a "planning and design resource offering practitioners guidelines centered on establishing safe and effective multimodal transportation systems". MDOT SHA emphasizes that "land use context should be a primary factor in the design of a transportation project".

In the guide, MDOT identifies the following six contexts along with their key characteristics:

Urban Core – This context is the typical downtown or central business district, defined by diversity of uses including multi-family residential, office, retail, entertainment, civic, and cultural facilities. Development is dense with high-rise structures with minimal setbacks and off-street parking. This land use pattern generates a high proportion of walking, transit, and bicycle trips.

Urban Center – Similar to Urban Core, this context includes diverse uses such as multi-family residential, office, retail, entertainment, civic, and cultural facilities. Development is dense with mid-rise structures with minimal setbacks and off-street parking. This land use pattern generates a moderate to high volume of non-vehicular trips.

Traditional Town Center – Development in this context is less dense than Urban Core or Urban Center and characterized by a high diversity of uses including residential, office, retail, civic, and cultural facilities. Mid to low-rise buildings with minimal setbacks are typical with on-street parking often provided.

Suburban Activity Center – This context is typically located outside Urban Centers and along major arterials. Land use includes both multi-family and single-family residential, office and retail. Development density is less than Urban Core, Urban Center, or Traditional Town Center. Low-rise structures with varying setbacks are typical along with off-street parking between the structures and road. This context usually serves a variety of trip types.

Suburban – Diversity of use is considered moderate to low in this context and may include single-family residential development. Office parks and small commercial strip retail may be scattered throughout along with neighborhood-level civic and cultural facilities. Developments are typically larger and serve a single use which discourages non-vehicular trips. Buildings are primarily oriented toward off-street parking.

Rural – Development density is lowest in this context. Agricultural use and green spaces are common. Some residential clusters with large lot sizes may exist. Trip distances are long, discouraging non-vehicular travel.

While the goals are the same, MDOT's approach to context classification and associated design elements is very different than other DOTs. The MDOT SHA is less prescriptive than other DOTs in its application of context to the design process. Their context guide "provides a process for balancing the needs of Maryland's transportation system as a whole with the accessibility, mobility, and safety needs of individual communities". Maryland approaches context classification through the lens of balancing access and mobility and improving safety, specifically stating this should be accomplished by "countering the different types of crash risks that occur in different context zones". To that end, the *MDOT SHA Context Driven Toolkit* (2020) identifies potential countermeasures and defines which are typically appropriate for a given context. The toolkit is included as Appendix D.

For each of the six contexts, MDOT developed a framework for a typical scenario. Each framework defines the balance between access and mobility that should be necessary. Each framework also provides information regarding potential countermeasures that are applicable to each context and typical areas of need that represent common purpose and need elements in each context. Figure 1.22 depicts this framework for MDOT's Traditional Town Center context. See Appendix E for the remaining five context frameworks.

Figure 1.22 Maryland Traditional Town Center Context Framework

Finally, MDOT has developed an ArcGIS platform that:

- Provides mapping of the existing contexts for the entire state to be used as a starting point for project development, and
- Provides interactive mapping for the public to identify locations where walking and biking conditions are challenging as well as where opportunities for both walking and biking exist, but facilities are not provided.

1.3.6 Tennessee Department of Transportation

The Tennessee Department of Transportation (TDOT) published its *Multimodal Project Scoping Manual* (2018) to require the consideration of safe access and mobility for all roadway users. It utilizes three primary land use contexts — rural, suburban, and urban — but provides additional descriptions when necessary for rural town and urban core contexts. The manual states that the designer should:

- Consider existing conditions and future plans for the area by reviewing planning and zoning documents. Project travel demand for all modes in the project limits should also be evaluated.
- Acknowledge design characteristics may vary in transition zones between contexts.
- Identify current and future levels of pedestrian, bicycle, and transit activity.

TDOT's *Highway System Access Manual* (2021) references the contexts in Stamatiadis et al. (2018) and includes varying driveway spacing by suburban, urban, and urban core context as well as functional classification. Minimum spacing of median openings varies by context and functional classification.

Chapter 2 National Guidance and Research

2.1 NCHRP 855 – An Expanded Functional Classification System for Highways and Streets

NCHRP 855 – An Expanded Functional Classification System for Highways and Streets formally introduced context classification on a national level. The intent of an expanded functional classification system is to provide a framework for practitioners to design and construct facilities that match the context of their environment and that consider the needs of all appropriate users for a particular context.

Context is generally defined by density of development, type of land use, and building setback. *NCHRP 855* identifies five contexts.

- **Rural** – Areas with the lowest density, few houses or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks.
- **Rural Town** – Areas with low density but diverse land uses with a commercial main street character, potential for on-street parking and sidewalks, and small setbacks.
- **Suburban** – Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks.
- **Urban** – Areas with high density, mixed land uses and prominent destinations, potential for some on-street parking and sidewalks, and mixed setbacks.
- **Urban Core** – Areas with the highest density, mixed land uses within and among predominantly high-rise structures, and small setbacks.

These five contexts typically represent unique land use patterns that require different geometric design practices in terms of operating speeds, mobility and access demands, and facility user groups. Combining these contexts with traditional functional classes that identify the intended function of a roadway yields a matrix of user priorities for each combination. Potential users include motor vehicles, bicyclists, and pedestrians. Figure 2.1 depicts typical user priority in an expanded functional classification system.

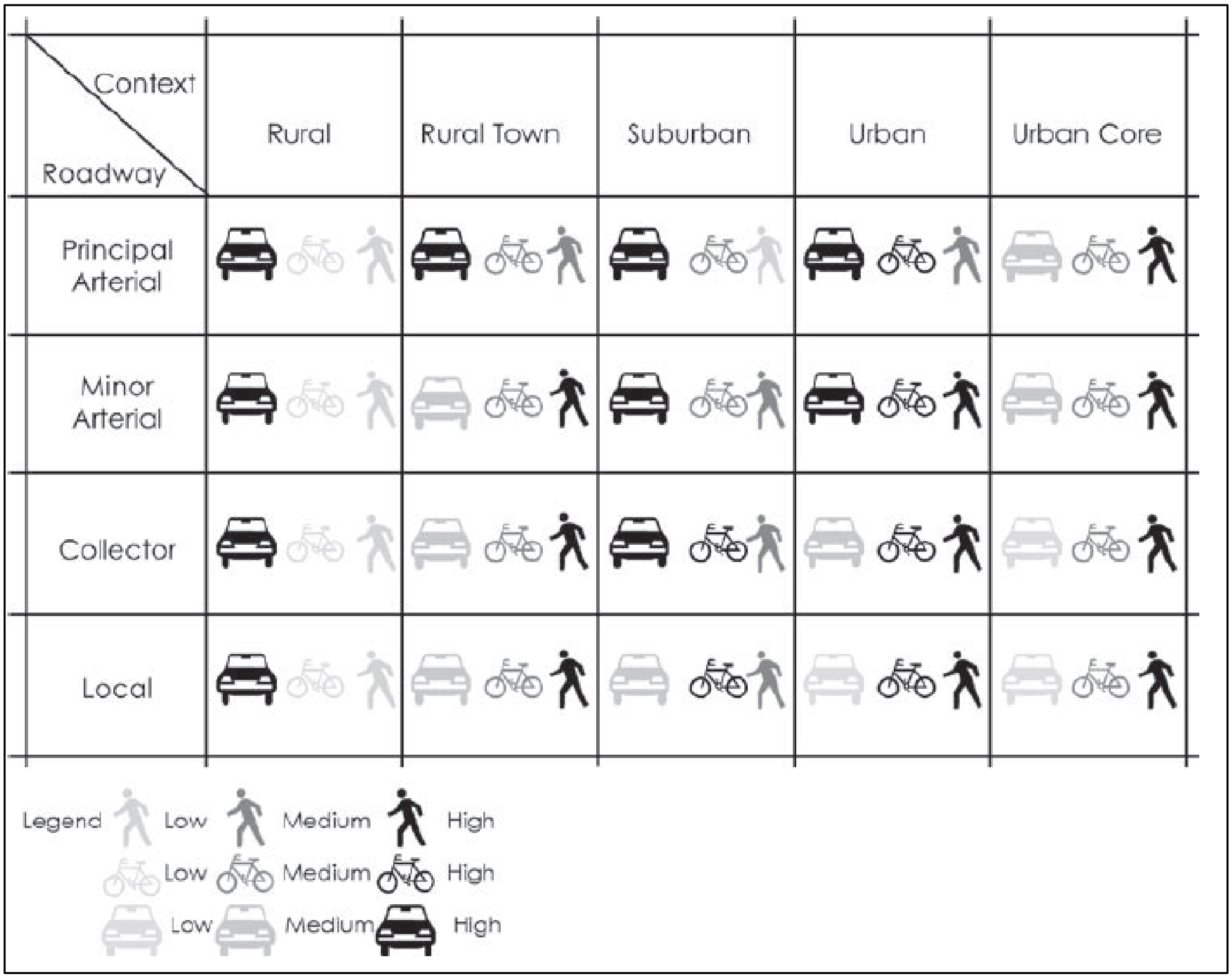


Figure 2.1 Typical User Priority Matrix of an Expanded Functional Classification System
Source: Stamatiadis et al. (2018)

Motor vehicle accommodation – Target operating speed and the balance between mobility and access define the context-roadway interaction for drivers. Figure 2.2 summarizes those interactions across the same matrix. Note: High is >45 mph, Medium is 30-45 mph, Low is <30 mph.

Roadway \ Context	Rural	Rural Town	Suburban	Urban	Urban Core
Principal Arterial	H speed H mobility- L access	L/M speed M mobility- H access	M/H speed M mobility- M access	L/M speed M mobility- M access	L speed M mobility- M access
Minor Arterial	H speed H mobility- M access	L/M speed M mobility- H access	M speed M mobility- M access	L/M speed M mobility- M/H access	L speed M mobility- M/H access
Collector	M speed M mobility- M access	L speed M mobility- H access	M speed M mobility- H access	L speed M mobility- H access	L speed M mobility- H access
Local	M speed M mobility- M access	L speed M mobility- H access	L speed L mobility- H access	L speed L mobility- H access	L speed L mobility- H access

H = high, M = medium, L = low

Figure 2.2 Expanded Functional Classification System Driver Interaction Matrix
Source: Stamatiadis et al. (2018)

In general, speed decreases from left to right and top to bottom across the matrix. Speeds are typically higher in rural areas and along arterials than in urban areas and along local roads. The need for mobility generally decreases from left to right and top to bottom and is higher in rural areas and along arterials than in urban areas and along local roads. The need for access provision typically increases from left to right and top to bottom as rural arterials are generally less accessible than local, urban routes.

Bicyclist accommodation – NCHRP 855 provides general guidance regarding the treatment of bicyclists within an expanded functional classification system. The primary consideration for bicycle facilities is the level of separation between them and vehicular traffic. Level of separation depends on the amount of bicycle traffic on the facility, the speed of vehicles on the adjacent roadway, and the volume of traffic on the adjacent roadway. In general, these facilities can be categorized as follows:

- High separation—provides physical separation from traffic in the form of a physical barrier or lateral buffer
- Medium separation—provides a dedicated space adjacent to motorized traffic
- Low/No separation—provides joint-use facilities for motorized and non-motorized traffic

Potential treatments for each of these separation levels are:

- Low or no separation
  - No specific treatment for cases with rare or occasional bicycle traffic
  - Sharrows when a bicycle lane is not feasible. Can be used with narrow lanes, ensuring that a driver cannot pass a cyclist except very slowly
- Medium separation
  - Bike lanes for separating bicycles from vehicular traffic
- High separation treatments

- ○ Buffered bike lane/cycle track for cases with high bicycle volume
- ○ Multi-use path for cases with high bicycle and pedestrian traffic

To further signify the priority and network importance of bicycle facilities, NCHRP 855 identifies three distinct classes of bicycle facilities. A citywide connector (CC) connects the city or major activity centers and can be several miles in length. A neighborhood connector (NC) connects neighborhoods or other smaller areas and connects those areas to higher-order facilities or local activity centers. A local connector (LC) provides internal connections of short lengths within neighborhoods.

Roadway \ Context	Rural	Rural Town	Suburban	Urban	Urban Core
Principal Arterial	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC: M/H separation; CC: H separation	LC: L separation; NC: M separation; CC: M separation
Minor Arterial	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: M separation; CC: M separation
Collector	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: L separation; CC: M separation	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: M separation; CC: M separation	LC: L separation; NC: L separation; CC: M separation
Local	LC: L separation; NC: L separation; CC: L separation	LC: L separation; NC: L separation; CC: L separation	LC: L separation; NC: L separation; CC: L separation	LC: L separation; NC: L separation; CC: L separation	LC: L separation; NC: L separation; CC: L separation

Bicycle facility class: CC = citywide connector, NC = neighborhood connector, LC = local connector
Separation level: H = high, M = medium, L = low

Figure 2.3 Bicyclist Interaction Matrix for an Expanded Functional Classification System
Source: Stamatiadis et al. (2018)

Figure 2.3 depicts the bicyclist interaction matrix for an expanded functional classification system based on roadway type, context, and bicycle facility class. In general, the need to accommodate bicyclists and the level of facility to potentially be utilized increases from left to right and top to bottom.

Pedestrian accommodation – NCHRP 855 provides general guidance regarding the treatment of pedestrians within an expanded functional classification system. Pedestrian facilities can generally be categorized based on and in order of increasing width as follows:

- Minimum width – based on ADA requirements,
- Wide width – additional width beyond minimum, and
- Enhanced width – additional width to accommodate groups of people and/or street furniture.

The necessary width to accommodate pedestrians generally relies upon the amount of pedestrian traffic, the speed of vehicles on the adjacent roadway and width of separation, and the volume of traffic on the adjacent roadway.

Roadway \ Context	Rural	Rural Town	Suburban	Urban	Urban Core
Principal Arterial	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4: Enhanced
Minor Arterial	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4: Enhanced
Collector	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4: Enhanced
Local	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P1: *; P2: Min; P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4: Enhanced

Pedestrian traffic levels: P1 = rare/occasional, P2 = low, P3 = medium, P4 = high

Pedestrian facility width: * = site specific, Min = minimum, Wide = greater than minimum, Enhanced = wide for large congregating pedestrian groups

Pedestrian facility separation should be considered in conjunction with driver target speeds.

Figure 2.4 Pedestrian Interaction Matrix for an Expanded Functional Classification System
Source: Stamatiadis et al. (2018)

The research report identified four classifications of pedestrian volume. These include: P1 - rare or occasional volume, P2 - low volume measured in pedestrians per day, P3 - medium volume measured in pedestrians per hour, and P4 - high volume measured in pedestrians per hour over a short period of time. Each of these volumes will require a different facility based on the context–roadway interaction. Figure 2.4 depicts the pedestrian interaction matrix for an expanded functional classification system based on roadway type, context, and pedestrian classification. In general, the need to accommodate pedestrians and the width of facility to potentially be utilized increases from left to right.

Transit and freight – NCHRP 855 recognizes that transit and freight must be considered along with other users. Neither may require additional or improved facilities beyond those already being provided by a project. When transit or freight routes are involved, a designer should consider the impacts each may have on facilities provided for bicyclists and pedestrians. Facilities that accommodate bicyclists and pedestrians may be somewhat different when transit or freight routes exist.

2.2 AASHTO's A Policy on Geometric Design of Highways and Streets 7th Edition

This most recently published edition of the Green Book incorporates the research from NCHRP 855 and introduces the five context classifications from the research report as elements of the geometric design process. The policy supports flexible design, encouraging project teams to focus on project-specific conditions and roadway performance rather than meeting specific design criteria. It is stressed that the "functional and context classes provide a classification framework that designers can use to identify and organize many of the needs for specific transportation modes that should be addressed in projects. This framework provides a tool that can be used by the designer to organize information about user needs for various transportation modes and seek an appropriate balance among those needs."

Green Book 7 utilizes target speed as the highest speed at which vehicles should operate on a roadway in a specific context. The target speed should be consistent with the level of multimodal activity along the roadway and should provide a balance of mobility for motor vehicles and a desirable environment for pedestrians, bicyclists, and transit users. Target speed is intended to be the posted limit. As stated previously, in some cases, the posted speed may be higher than the target speed and the general approach should be to develop a design that encourages an operating speed that equals the target speed.

General guidelines for design speed are provided for different functional class routes in different contexts and are similar to those discussed previously in this report. *Green Book 7* also includes guidance on design level of service (Table 2.1) and grades for collectors in urban and urban core contexts (Table 2.2)..

Table 2.1 Guidelines for Selection of Design Level of Service

Functional Class	Customary Level of Service for Specified Combination of Context and Terrain Type			
	Rural Level	Rural Rolling	Rural Mountainous	Suburban, Urban, Urban Core, and Rural Town
Freeway	B	B	C	C or D
Arterial	B	B	C	C or D
Collector	C	C	D	D
Local	D	D	D	D

Source: AASHTO A Policy on Geometric Design of Highways and Streets (7th Edition)

Table 2.2 Maximum Grades for Collectors in Urban and Urban Core Contexts

Type of Terrain	U.S. Customary: Maximum Grade (%) for Specified Design Speed (mph)									Metric: Maximum Grade (%) for Specified Design Speed (km/h)							
	20	25	30	35	40	45	50	55	60	30	40	50	60	70	80	90	100
Level	9	9	9	9	9	8	7	7	6	9	9	9	9	8	7	7	6
Rolling	12	12	11	10	10	9	8	8	7	12	12	11	10	9	8	8	7
Mountainous	14	13	12	12	12	11	10	10	9	14	13	12	12	11	10	10	9

Source: AASHTO A Policy on Geometric Design of Highways and Streets (7th Edition)

2.3 NCHRP 1022 – Context Classification: A Guide

Published in 2022, the purpose of NCHRP 1022 is to provide a guide to assist state, regional, and local planners in identifying the appropriate context classification or classifications for an area or transportation project. The guide describes the context classification framework proposed in *NCHRP Research Report 855: An Expanded Functional*

Classification System for Highways and Streets and included in *Green Book 7*. It includes an additional context, Special Context, which may be applied to unique environments that do not fit within the five defined contexts. It also includes expected movements based on an area's current and future context and methods and measures used to identify users.

NCHRP 1022 defines the term *transportation expectations*. Transportation expectations describe how users are expected to travel within an area with a certain land use and development pattern. Project data is used to (1) define fundamental project features, (2) verify that projects are scoped to address all intended outcomes, and (3) confirm that all user needs are addressed. The following questions are posed for each expectation:

- **Users/Vehicles.** What is the anticipated range of users or vehicles in the context?
- **Movement (mobility).** What is the ease of movement for each mode?
- **Permeability (access).** How accessible are other elements of the transportation network and adjacent land use to each mode?
- **Network.** Are alternative routes available for each mode within the transportation system?
- **Speed.** What is the target vehicle speed of the roadway?

Table 2.3 summarizes Transportation Expectations for each context.

Table 2.3 Transportation Expectations by Context

Transportation Expectations	Context				
	Rural	**Rural Town**	**Suburban**	**Urban**	**Urban Core**
Users/Vehicles	• High frequency of motor vehicles/freight • Limited or no pedestrian activity • Potential for recreational cyclists • Potential for agricultural vehicles	• Regional vehicular/freight traffic • Moderate pedestrian activity • Potential for some bicyclists	• Regional traffic on primary roadways mixed with local vehicular traffic and transit • Low to moderate pedestrian activity, which may be concentrated around commercial areas and/or transit • Increased potential for recreational walking/running in residential areas • Increased potential for recreational/commuter bicyclists	• Moderate to high pedestrian activity • High potential for commuter bicyclists • High potential for transit interaction • Primarily local users	• High pedestrian activity with congregation and pedestrian activity zones • High potential for commuter bicyclists • High transit presence • High potential for micromobility • Primarily local traffic
Movement	• High desired movement (primarily for vehicles) with high quality of service • Minimal disruptions limited to peak times of day and/or seasons	• Moderate quality of service and slower traffic • Delays acceptable to local traffic • High quality of service for non-motorized users due to street-oriented development patterns	• Moderate to low vehicular quality of service during peak periods • Lower movement for non-motorized users due to higher vehicular speeds and longer travel distances	• Lower vehicular quality of service and slower travel speeds through majority of the day • Increased movement for non-motorized users due to increased activity densities and crossing opportunities	• Low vehicular quality of service and low travel speeds through most periods of the day • High mobility for non-motorized and micromobility users due to increased density, high crossing potential, and pedestrian-oriented development
Permeability	• Direct vehicular access to land uses • Lack of opportunities for pedestrian access • Minimal crossing opportunities for all users	• High vehicular, bicyclist, and pedestrian access opportunities • Direct pedestrian access to land uses • Vehicular and bicyclist access may be provided on adjacent roadways within the network	• Low to moderate access opportunities for all users • Primarily vehicle-oriented access with opportunities for localized pedestrian-oriented access	• High access opportunities for most users (vehicles, bicyclists, and pedestrians) • Access for freight movement may be restricted	• High access opportunities for non-motorized and micro-mobility users • Street-oriented businesses increase access for non-motorized users, while limited parking areas may decrease access for motorized users
Network	• No redundant roadway network • May have cross streets/ intersections accessing dispersed locations	• Expanded street network within a limited area serving immediate land uses • May include cross streets accessing dispersed areas in surrounding rural area(s) • Through traffic concentrated on primary roadway	• Limited supporting roadway network • Parallel streets may be present but disjointed • Alternative routes between destinations may exist but likely on different roadway types • Large intersection spacing (~1/2 mile)	• High level of supporting roadway network with parallel and cross streets • Network supports localized area, but may be disjointed due to natural/built boundaries • Alternative routes between destinations exist • Regional traffic may have bypass alternatives	• Cohesive and dense surrounding street network with multiple parallel and cross streets • Multiple alternative routes exist on similar roadway types • Regional traffic may have bypass alternative
Target Vehicular Speed (mph)	35+	25-35	30-45	20-35	≤25

Source: Stamatiadis et al. (2022)

NCHRP 1022 discusses three levels of applying context classification.

- **Statewide**. Using national or statewide datasets (e.g., U.S Census data). Information is reviewed or refined at the project level.
- **Regional.** Evaluation by a local or regional agency using data that may be available at a regional level. It is typically reviewed and refined at the project level.
- **Project level.** The most detailed evaluation. Uses local data sources and remotely sensed data or windshield surveys. Project-level evaluations serve as the basis for applying the forthcoming *Green Book 8*'s planning and design guidance.

The report notes that context classification and transportation expectations were developed with a focus on major collectors and arterials. Functional classification (sometimes referred to as roadway or facility type) may refine a facility's final transportation expectation. During the project-level context review, practitioners must revisit operational speeds based on the functional classification or facility type.

A case study is included with step-by-step instructions for an automated context classification on a statewide level using U.S. Census data, building density, intersection density, and building area density. Figure 2.5 depicts the process.

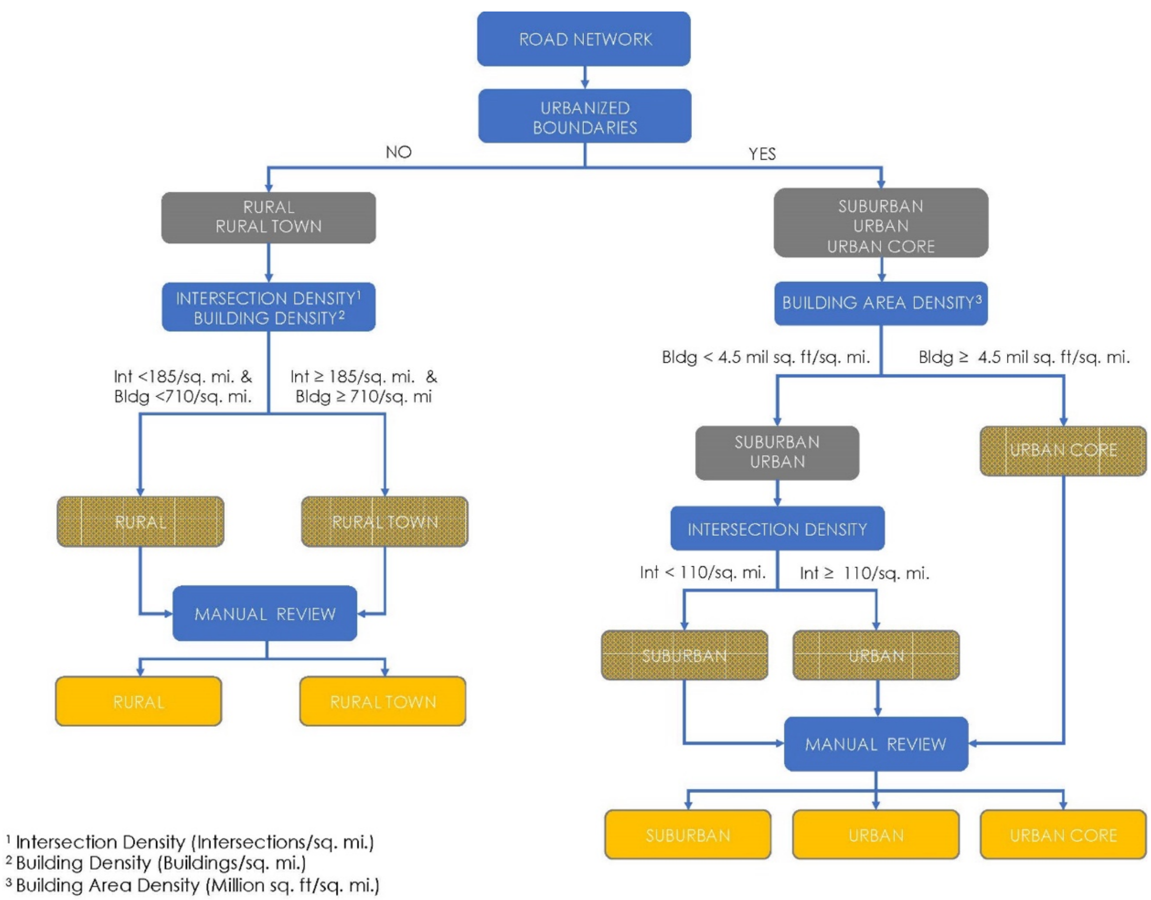


Figure 2.5 Automated Context Classification Approach – Statewide Level
Source: Stamatiadis et al. (2022)

The case study details the application of a GIS-based context classification at the regional level. The TIGER/Line Roadway Network data (i.e. readily available roadway network GIS data) for KYTC District 7 was used to test the methodology and determine context measures that could be utilized to automate context classification. The TIGER/Line Roadway Network data was separated into urbanized contexts (Suburban, Urban, Urban Core) and rural contexts (Rural, Rural Town) based on U.S. Census Urbanized Area and Urban Cluster boundaries.

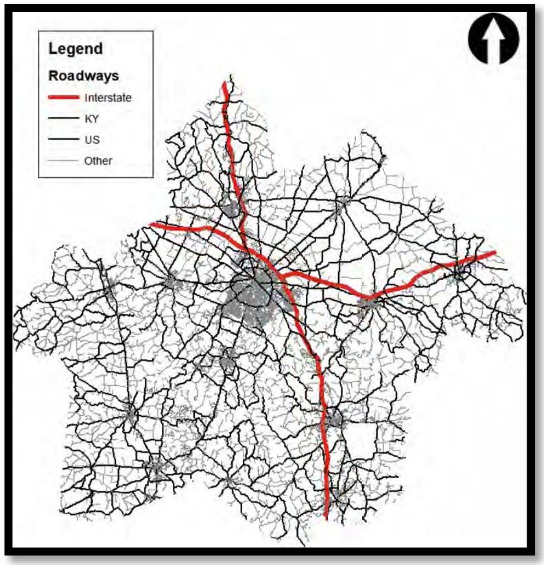


Figure 2.6 KYTC District 7 Roadway Network
Source: Stamatiadis et al. (2022)

ArcGIS was used to calculate intersection density, building density, building area density, employment density, population density, block length, street density, building setback, and block perimeter for roadway segments of varying lengths and buffer widths. Table 2.4 shows a summary of the data sources used for the analysis.

Table 2.4 Data Sources Used for Automated Context Classification

Measure	Data Source
Building Density	Microsoft Maps U.S. Building Footprint database
Building Area Density	Microsoft Maps U.S. Building Footprint database
Intersection Density Block Length	TIGER/Line Street Network

Source: Stamatiadis et al. (2022)

Each measure was tested to determine how well context was identified, resulting in the thresholds in Table 2.5.

Table 2.5 Context Classification Thresholds

Urbanized Areas		
Context	Building Area Density	Intersection Density
Urban Core	> 5,600,000 sq. ft/sq. mi.	--
Urban	< 5,600,000 sq. ft/sq. mi.	> 110 intersections/sq. mi.
Suburban	< 5,600,000 sq. ft/sq. mi.	< 110 intersections/sq. mi.
Non-Urbanized Areas		
Context	Building Area Density	Intersection Density

Rural Town	> 710 buildings/sq. mi.	> 185 intersections/sq. mi.
Rural	All remaining non-urbanized segments	

Source: Stamatiadis et al. (2022)

Once automated context classification is complete, practitioners should refine the results through a manual review. This review can be undertaken using aerial photography, land-use data, Google Street View, and local knowledge. A manual review of the study area (with over 7,000 miles of roadway) was completed in under 3 hours by a two-person team.

2.4 NCHRP Web-Only Document 320 – Aligning Geometric Design with Roadway Context

NCHRP 320 is a Conduct of Research Report for NCHRP Project 15-77. The objective of NCHPR 15-77 research was to draft Part IV – Facility Design in Context of the upcoming 8th edition of the Green Book. Part IV will build upon the context classifications envisioned in NCHRP 855 and Chapter 1 of the 7th edition of the Green Book. The AASHTO Technical Committee on Geometric Design adopted the following outline to support a flexible, multimodal, performance based, and context sensitive design process.

- Part I—Introduction
  - Chapter 1 – Overview
  - Chapter 2 – Performance-Based Concepts
  - Chapter 3 – Design Decision-Making
- Part II—Performance- Based Evaluations
  - Chapter 4 – Performance Metrics
  - Chapter 5 – Design Model
  - Chapter 6 – Applying a Performance-Based Process Framework
- Part III—Geometric Elements and Configurations
  - Chapter 7 – Design Information and Sources
  - Chapter 8 – Elements of Design
  - Chapter 9 – Cross-Section Elements
  - Chapter 10 – Intersection Fundamentals
  - Chapter 11 – Freeways and Controlled Access Fundamentals
  - Chapter 12 – Interchange Fundamentals
- Part IV—Facility Design in Context
  - Chapter 13 – Context and Facility Type Considerations
  - Chapter 14 – Rural and Natural Areas
  - Chapter 15 – Rural Towns
  - Chapter 16 – Suburban Roadways
  - Chapter 17 – Urban Roadways

  Chapter 18 – Urban Core Roadways

  Chapter 19 – Industrial, Warehouse, or Port Roads

While the purpose of this research project was to draft Part IV chapters, only chapter outlines were publicly available at the time this report was written. Since they are in draft form and the release of *Green Book 8* is not expected until at least 2025, we do not address them here.

2.5 KYTC's Highway Design Manual

In 2020, KYTC updated its *Highway Design Manual* (HDM) to correspond with the updates and changes in *Green Book 7*. The updates to the HDM included context classification as one of the design controls. It listed the following contexts to consider for geometric design:

- Rural
- Rural town
- Suburban
- Urban
- Urban Core

The HDM included context classification as one of the factors to consider when selecting a proposed design speed and typical section. Context was mentioned as a consideration for the design of clear zones. The manual also cautioned designers to be aware of transitions between areas with different contexts. The HDM referenced *Green Book 7* as a resource for more information on context classifications.

2.6 KYTC's Complete Streets, Roads, and Highways Policy and Manual

KYTC adopted a Complete Streets, Roads, and Highways Policy through official order in 2022. The policy lists context as one of several factors to consider when identifying accommodations for all users of the transportation network. It states that a "one size fits all" strategy based on functional roadway classification does not work. Using a Complete Streets approach should provide a flexible design based on context and need.

Discussion of context in the *Complete Streets, Roads, and Highways Manual* (CSRHM) focuses on land use (e.g., who is travelling the transportation network, where they are going and why). It refers to context zones, which generally align with the context classifications adopted by the *Green Book 7* and the current version of the HDM. The use of small town for a context zone in the CSRHM is used instead of the rural town classification described in *Green Book 7* and the HDM. The CSRHM includes Table 2.6, which describes transportation expectations by context and includes a range of target vehicular speeds for each context.

Table 2.6 Transportation Expectations by Context

TRANSPORTATION EXPECTATIONS	CONTEXT: RURAL	RURAL TOWN	SUBURBAN	URBAN	URBAN CORE
USERS/ VEHICLES	• High frequency of motor vehicles/freight • Limited or no pedestrian activity • Potential for recreational cyclists • Potential for agricultural vehicles	• Regional vehicular/ freight traffic • Moderate pedestrian activity • Potential for some bicyclists	• Regional traffic on primary roadways mixed with local vehicular traffic and transit • Low-to-moderate pedestrian activity, which may be concentrated around commercial areas and/or transit • Increased potential for recreational walking/running in residential areas • Increased potential for recreational/ commuter bicyclists	• Moderate-to-high pedestrian activity • High potential for commuter bicyclists • High potential for transit interaction • Primarily local users	• High pedestrian activity with congregation and pedestrian activity zones • High potential for commuter bicyclists • High transit presence • High potential for micromobility • Primarily local traffic
MOVEMENT	• High desired movement (primarily for vehicles) with high quality of service • Minimal disruptions limited to peak times of day and/or seasons	• Moderate quality of service and slower traffic • Delays acceptable to local traffic • High quality of service for non-motorized users because of street-oriented development patterns	• Moderate-to-low vehicular quality of service during peak periods • Lower movement for non-motorized users because of higher vehicular speeds and longer travel distances	• Lower vehicular quality of service and slower travel speeds through majority of the day • Increased movement for non-motorized users because of increased activity densities and crossing opportunities	• Low vehicular quality of service and low travel speeds through most periods of the day • High mobility for non-motorized and micromobility users because of increased density, high crossing potential, and pedestrian-oriented development
PERMEABILITY	• Direct vehicular access to land uses • Lack of opportunities for pedestrian access • Minimal crossing opportunities for all users	• High vehicular, bicyclist, and pedestrian access opportunities • Direct pedestrian access to land uses • Vehicular and bicyclist access may be provided on adjacent roadways within the network	• Low-to-moderate access opportunities for all users • Primarily vehicle-oriented access with opportunities for localized pedestrian-oriented access	• High access opportunities for most users (vehicles, bicyclists, and pedestrians) • Access for freight movement may be restricted	• High access opportunities for non-motorized and micromobility users • Street-oriented businesses increase access for non-motorized users, while limited parking areas may decrease access for motorized users
NETWORK	• No redundant roadway network • May have cross streets/ intersections accessing dispersed locations	• Expanded street network within a limited area serving immediate land uses • May include cross streets accessing dispersed areas in surrounding rural area(s) • Through traffic concentrated on primary roadway	• Limited supporting roadway network • Parallel streets may be present but disjointed • Alternative routes between destinations may exist but likely on different roadway types • Large intersection spacing (~1/2 mi)	• High level of supporting roadway network with parallel and cross streets • Network supports localized area, but may be disjointed because of natural/built boundaries • Alternative routes between destinations exist • Regional traffic may have bypass alternatives	• Cohesive and dense surrounding street network with multiple parallel and cross streets • Multiple alternative routes exist on similar roadway types • Regional traffic may have bypass alternative
TARGET VEHICULAR SPEED (MPH)	35 +	25–35	30–45	20–35	<25

Source: *KYTC Complete Streets, Roads, and Highways Manual*

The manual includes a description of the context zones, typical users, and the user accommodations that may be considered. It also identifies context as a consideration when selecting a target speed for urban and suburban environments and recommends the planning and design of transition zones between contexts to inform driver behavior and influence safety outcomes for all users.

2.7 NCHRP 07-29 and the 8th Edition of AASHTO's Policy on Geometric Design of Highways and Streets

NCHRP 07-29 is developing a draft *Green Book 8* — in progress as of this writing. A greater emphasis on the consideration of context is expected to be included. The new edition is envisioned to shift focus towards multimodal transportation and provide structured guidance for land use contexts. The exact set of context classifications that will be incorporated is yet to be finalized, but it is anticipated that it will closely follow the system developed by NCHRP 855 which includes the five original contexts (rural, rural town, suburban, urban, urban core) as well as a Special District context.

Chapter 3 Kentucky's Reliance on Functional Classification

Kentucky currently uses functional classification in varying degrees for processes and decision making within many areas of the Cabinet. While not the only factor considered, it can play a significant role. As part of this study, a stakeholders meeting was held with representatives from several KYTC Divisions and Districts to retrieve information on the current use of functional classification throughout the Cabinet. Planning and Highway Design workflows were the initial focus, but the research team incorporated a range of other perspectives (e.g., Division of Program Management, Division of Traffic Operations, and Division of Maintenance-Permits Branch). Appendix F includes a summary of the Cabinet's use of functional classification in the collection and reporting of data and in KYTC's processes and policies. In addition to functional classification, a separate effort identified areas where the Cabinet uses Urban and Rural contexts in their workflow. This information is summarized in Appendix G.

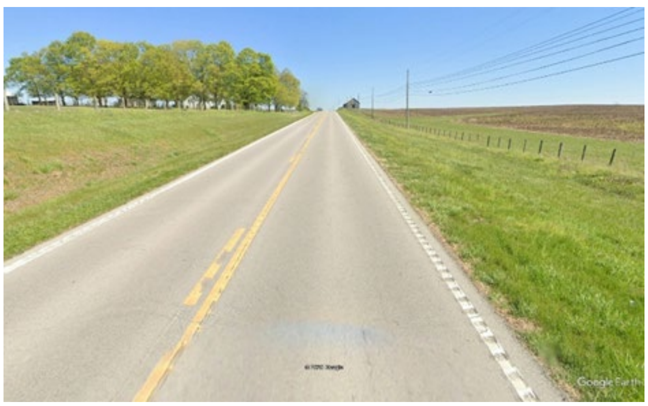
There are no known plans for FHWA to discontinue the use of the functional classification system (e.g., arterial, collector, and local roads). Due to KYTC's reliance on the current functional classification system and the federal requirements for its use, KYTC processes will continue to rely upon functional classifications to some extent in the near-term. There is a need for a broader application of contexts which will supplement the functional classification system to better address a variety of contexts and users of the systems. The functional classification represents the appropriate role of roadways in serving vehicles. Context classification helps planners and designers serve community needs and the needs of non-motorized users. KYTC currently recognizes the use of the following contexts for highway design: rural, rural town, suburban, urban, and urban core.

Chapter 4 Kentucky-Specific Context Classification Recommendations

Context classification gives planners and designers baseline information about a road's environmental context, road functions, and user needs. With this knowledge, they can understand what roles roads play within their communities, their relationship to broader transportation networks, and how the needs of different users should be prioritized.

It is recommended that KYTC continue to use the five contexts described in *Green Book 7* and NCHRP Report 1022 — rural, rural town, suburban, urban, and urban core. Contexts are defined based on development density, land uses, and building setbacks. Table 4.1 lists the primary characteristics of each context and provides accompanying visuals.

Table 4.1 Road Context Characteristics

Road Type	Features
Rural 	• Areas with the lowest densities, few houses or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks. • Common land uses include agriculture, natural resource preservation, and outdoor recreation.
Rural Town 	• Areas with low density but diverse land uses with commercial main street character, potential for on-street parking and sidewalks and small setbacks.

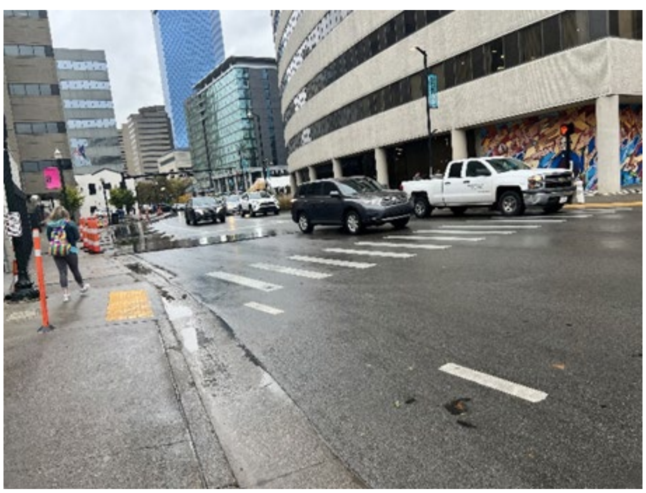
Suburban 	• Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks. Sidewalks are often present. Most parking is off street.
Urban 	• Areas with high density, mixed land uses and prominent destinations, potential for some on-street parking and sidewalks, and mixed setbacks.
Urban Core 	• Areas with the highest densities, mixed land uses within and among predominately high-rise structures, and small setbacks. Sidewalks are abundant.

Photo Source (All Except Rural Town and Urban Core): Google © 2023

With the delay of the publication of *Green Book 8*, a phased implementation plan is proposed. In the near term, a linkage between the functional classification system and context classifications will need to be provided to maintain current processes that rely on functional classification and to address the accessibility and mobility of the roadway system for motorists. In preparation of further direction on the context classification of roadways expected in *Green Book 8*, and to better address the transportation expectations and needs of all users, the expanded context classification should supplement the functional classification. Projects will have a context and functional classification (e.g., suburban arterial or urban core collector).

A *Summary Implementation of Context Classifications for KYTC* was developed using the information from the Literature Review and input from the KYTC stakeholders and the Study Advisory Committee (SAC) for this study. Implementation recommendations are in three phases. Table 4.2 provides a breakdown.

Phase 1

- Complete network-level context classification.
- Encourage the deliberate use and incorporation of context classification into applicable planning- and design-level processes.

Phase 2

- Introduce context classification agencywide.
- Determine which agency processes can benefit from using context classification.

Phase 3

- Final implementation following the release and adoption of *Green Book 8*.

Table 4.2 Recommended Implementation Plan for the Context Classification System at KYTC

Phase 1: Immediate and Near-Term Activities	Planning	Design
Designate a network level context classification for all state-maintained roadways using an automated system based on guidance in NCHRP 1022 *Context Classification Application: A Guide*. Use the contexts currently recognized by KYTC - rural, rural town, suburban, urban, and urban core. Determine an appropriate process for making changes to the system.	x	
Update the guidance manuals to include a description of the Context Classification System.	x	x
Update the guidance manuals to emphasize the consideration of context classification when developing the project's purpose and need.	x	x
Address areas of the guidance manuals that discuss project scoping to include consideration of context classifications.	x	x
Identify the project's context classification in planning documentation such as the Continuous Highway Analysis Framework (CHAF), planning studies, scoping meeting minutes, and the Data Needs Analysis (DNA) scoping study form.	x	
Update the Common Geometric Practices sheets in the Highway Design Manual with context classification parameters as necessary. All updates will be based on context information in the 7th Edition of the Green Book.		x
Update Design Executive Summary documentation to include the broader application of context classification and identify it on the Pre-Design Conference Minutes.		x
Coordinate with the Complete Streets, Roads, and Highways Manual and Policy to consider recommended facility types by context. Ensure context descriptions and names are the same for all documents referring to context classification.	x	x
Develop improved guidance and options for designing transition zones between contexts.		x
Offer training, as necessary, to help inform KYTC personnel as well as consultants, LPAs, etc.	x	x
Phase 2: Potential Uses After Completion of the Network Level Context Classification		
Consider opportunities for use in SHIFT prioritization (e.g., prioritization of facilities for all users)		
Easier identification of potential grant funding opportunities for different project types (e.g., pedestrian or bike facilities)		
Potential for more comprehensive HSIP network screening		
Statewide or regional planning of facilities for all users		
Application of future access management policies		
Inclusion of the context classification in the Highway Information System and development of an interactive map of the system.		
Phase 3: After Adoption of the 8th Edition of the Green Book		
KYTC guidance should be updated to reflect updated guidance in the Green Book.		
Develop training on updates as necessary.		

4.1 Immediate to Near-Term Phase

This section includes detailed recommendations for the summary of the near-term items in the Implementation Plan. These tasks can be completed immediately and are focused on planning and highway design guidance and processes. As needed, short, informational webinars or conference presentations could be offered to educate planners and designers on context classification. Context classification was presented at the general session of the 2023 ACEC-KY/FHWA/KYTC Partnering Conference.

4.1.1 Division of Planning

Develop a network-level context classification system for all state-maintained roadways. Assign all roadways to one of the five context classifications (Rural, Rural Town, Suburban, Urban, Urban Core). Apply the methodology described in NCHRP Report 1022 (Context Classification Application: A Guide), which classifies facilities based on:

- Urbanized area boundaries as identified by the U.S. Census Bureau
- Intersection density
- Building density/building area density

Depending on resource and staff availability, initial classification may be done in-house or through a consultant contract. A manual review of the network, as detailed in NCHRP 1022, should be completed by District staff in coordination with local ADDs and MPOs familiar with the roadways in the district and the context descriptions. Establish a process to change or update the context classification system.

Document and consider the context classification at the project level in DNA and Planning Studies. Include context classification in scoping meeting discussions for planning studies. Incorporate context classification into purpose and need discussions. Include an entry on the DNA form for Design Context Classification that allows for the selection (e.g., dropdown or check boxes) of the contexts. This can be implemented immediately at the project level before the network-level classification is complete.

Coordinate context classification with Complete Streets implementation. KYTC's *Complete Streets, Roads, and Highways Manual* uses context classifications to recommend facility types. There is an inconsistency in the name of one of the classifications. The *Green Book 7* and the KYTC Division of Highway Design use *Rural Town*, and the Complete Streets guidance uses *Small Town*. To avoid confusion, the classification should be updated in the Complete Streets guidance to *Rural Town*. Continue to use context classification when considering Complete Streets applications in the planning and design process.

4.1.2 Division of Highway Design

Update the Highway Design Guidance Manual (HDM) to include a description of context classifications (see Appendix H). HD-703.5 in the HDM lists the five contexts. Add the following definitions from the *Green Book 7* to HD-703.5:

- Rural: Areas with the lowest densities, few houses, or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks.
- Rural town: Areas with low density but diverse land uses with commercial main street character, potential for on-street parking and sidewalks and small setbacks.
- Suburban: Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks.
- Urban: Areas with high density, mixed land uses and prominent destination, potential for some on-street parking and sidewalks, and mixed setbacks.
- Urban Core: Areas with the highest densities, mixed land uses within and among predominately high-rise structures, and small setbacks.

Consider context classification when defining the purpose and need and during project scoping. Project-level context classification can be applied prior to network-level classification. Local knowledge of the area, zoning maps, and comprehensive plans should be examined to understand ongoing and upcoming projects that may change land-use conditions. If the network-level assignment of context is complete, it can be used as a starting point. But each project should be evaluated to determine a context classification that will be used for project design. Network-level context classification, when available, should remain as originally established. This is similar to the current design process that identifies existing, network-level functional classification while the Project Development Team (PDT) identifies design functional classification for the proposed conditions.

Using knowledge of the project context to determine what user types should be accommodated and including an estimated cost for potential improvements in the initial cost estimate for the project will help ensure context is considered throughout the project development process. Appendix H includes recommended changes to Sections 202 and 203 of the HDM in red text.

Update common geometric practices. The HDM includes Common Geometric Practices as exhibits. These sheets provide recommendations for design speed and roadway geometrics based on the roadway's functional classification. *Green Book 7* includes guidance on design speeds for each context classification and a few other context-related geometric recommendations. Proposed updates to the HDM's Common Geometric Practices are noted in red in Appendix I. The updates reflect guidance provided in *Green Book 7*. The proposed sheets include Exhibits for the following classifications:

- Local — Rural
- Local and Collector — Rural Town, Suburban, Urban, and Urban Core
- Collector – Rural
- Arterial – Rural and Rural Town
- Arterial – Suburban, Urban, and Urban Core

Identify context classification in project documentation. Add new entry fields to forms or templates on Pre-Design Conference minutes and the Design Executive Summary (DES) where the project's context classification is identified along with the other general project information. For example, the DES has a field for *Design Functional Classification* (Figure 4.1) that could be revised and expanded to accommodate the newly adopted context classifications.

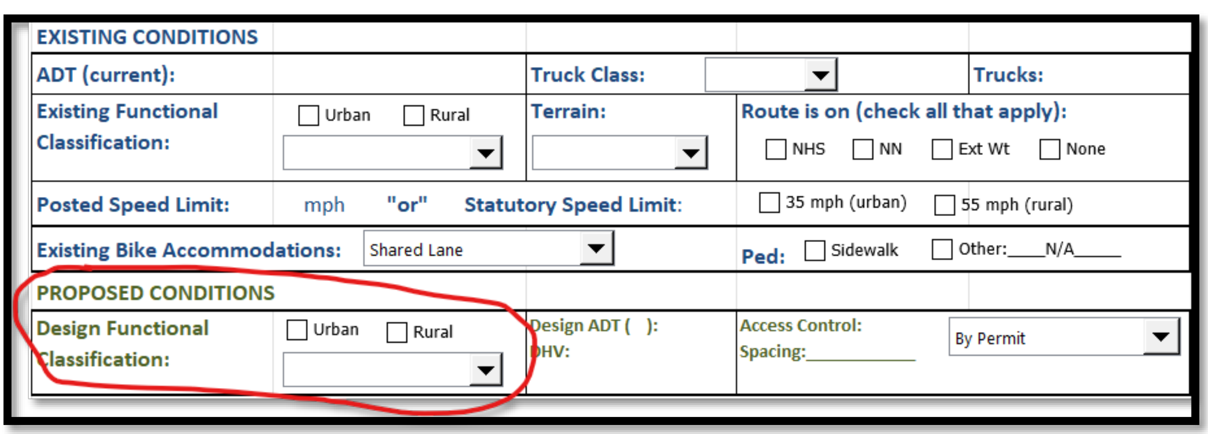


Figure 4.1 Documentation of Design Functional Classification (KYTC Design Executive Summary form)

Identifying context in project documentation increases the likelihood that context will be considered in decision making throughout the project development process.

***Provide options for design transitions between contexts*.** The use of context classification allows for the opportunity to place a stronger focus on design transitions between areas with different contexts. Transitions should alert drivers of the need to adjust their speeds to match the needs of the adjacent land use, roadway users, community, and roadway network. Appendix J includes speed-reduction applications and best practices for designing transition zones.

4.2 After Completion of the Network-Level Classification

Develop an interactive map or map overlay of context classifications like the functional classification map (https://maps.kytc.ky.gov/functionalclass/). Also, include the Context Classification System in HIVEi.

Update the Planning Guidance Manual to include information on Context Classification System. Appendix K includes proposed edits to the *KYTC Planning Guidance Manual*. Edits are shown in red. Implementation of edits should coincide with development of the network-level context classification system.

Consider how a network-level context classification may benefit other KYTC activities or processes. Potential areas to consider include:

a. SHIFT prioritization (e.g., prioritization of facilities for all users)
b. Statewide or regional planning of facilities for all users
c. More comprehensive HSIP network screening
d. Development of more accurate preliminary cost estimates that take into consideration facilities for all users
e. Potential applications for future access management policies
f. Updated design recommendation based on context

4.3 After KYTC's Adoption of the 8th Edition of the Green Book

***Review KYTC guidance and update as needed*.** The 8th Edition of the Green Book is expected to include substantial changes to design guidance that are tied to context classification. Evaluate *Green Book 8* and determine if the Cabinet needs to update its guidance and develop training.

Chapter 5 Conclusion

This report reviewed research, national guidance, and state DOT strategies on context classification; discussed KYTC's reliance on the functional classification system; and advanced recommendations for implementing context classification at the Cabinet. Incorporating context classifications — rural, rural town, suburban, urban, urban core — into KYTC's guidance and project development process will help practitioners critically evaluate the mobility and access needs of all user types. Chapter 4 outlined a three-step process the Divisions of Planning and Highway Design can take to implement context classification:

Phase 1

- Complete network-level context classification.
- Encourage the deliberate use and incorporation of context classification into applicable planning- and design-level processes.

Phase 2

- Introduce context classification agencywide.
- Determine which agency processes can benefit from using context classification.

Phase 3

- Final implementation following the release and adoption of *Green Book 8*.

Members of the project's Study Advisory Committee and the research team will assist with implementation. Use of context classification may begin at the project level immediately. Applying context classification to all state-maintained roads will open up opportunities to improve the safety, mobility, and accessibility of all users at the network level. To realize the full benefits of context classification, KYTC needs to coordinate its implementation with other recent initiatives (e.g., Complete Streets, Safe System Approach, Human Factors in Design, Intersection Control Evaluation).

References

American Association of State Highway & Transportation Officials (AASHTO). (2018). *Policy on Geometric Design of Highways and Streets*, 7th Edition, Green Book-7. Washington DC.

Code of Federal Regulations, Highway Systems, 23 CFR Part 470. (2024). https://www.ecfr.gov/current/title-23/chapter-I/subchapter-E/part-470#:~:text=https%3A//www.ecfr.gov/current/title%2D23/part%2D470

Florida Department of Transportation (FDOT). (2020). *Context Classification Guide.* https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/completestreets/files/fdot-context-classification.pdf

Florida Department of Transportation (FDOT). (2022). FDOT Design Manual. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/completestreets/files/fdot-context-classification.pdf

Federal Highway Administration (FHWA). (2023). *Highway Functional Classification Concepts, Criteria and Procedures, 2023 Edition*. https://www.fhwa.dot.gov/planning/processes/statewide/related/hwy-functional-classification-2023.pdf

Kentucky Transportation Cabinet. (2022). *KYTC Complete Streets, Roads, and Highways Policy and Manual*. https://transportation.ky.gov/BikeWalk/Documents/Complete%20Streets,%20Roads,%20and%20Highways%20Manual.pdf

Kentucky Transportation Cabinet. (2022). *KYTC Highway Design Guidance Manual.* https://transportation.ky.gov/Organizational-Resources/Policy%20Manuals%20Library/Highway%20Design.pdf

Maryland Department of Transportation State Highway Administration. (2020). *Context Driven Access & Mobility For All Users.*

Maryland Department of Transportation State Highway Administration. (2020). *Context Driven Toolkit*.

Minnesota Department of Transportation. (2022). MnDOT's *Facility Design Guide*.

National Academies of Sciences, Engineering, and Medicine. (2022). *NCHRP Web-Only Document 320 – Aligning Geometric Design with Roadway Context*. Washington, DC: The National Academies Press.

National Academies of Sciences, Engineering, and Medicine. (2018). *NCHRP 855 - An Expanded Functional Classification System for Highways and Streets*. Washington, DC: The National Academies Press. https://doi.org/10.17226/24775.

National Academies of Sciences, Engineering, and Medicine. (2022). *NCHRP 1022 – Context Classification: A Guide*. Washington, DC: The National Academies Press.

Oregon Department of Transportation. (2020). *ODOT Blueprint for Urban Design*.

Oregon Department of Transportation. (2023). *ODOT Highway Design Manual*. https://www.oregon.gov/ODOT/Engineering/Pages/Hwy-Design-Manual.aspx.

Stamatiadis, N., Kirk, A., Hartman, D., Jasper, J., Wright, S., King, M., & Chellman, R. (2018). *An Expanded Functional Classification System for Highways and Streets* (No. Project 15-52).

Stamatiadis N., Kirk A., Steyn, H., Musselman, J., and Raulerson, M. (August 1 2022). *Context Classification and Associated Transportation Expectations in Support of Contextual Roadway Design.* Transportation Research Record Volume 2677, Issue #2. Transportation Research Board, Washington, D.C.

Tennessee Department of Transportation. (2021). *Highway System Access Manual.* https://www.tn.gov/content/dam/tn/tdot/traffic-engineering/TDOT%20HSAM%20Vol%203%20Design%20Criteria.pdf

Tennessee Department of Transportation. (2018). *Multimodal Project Scoping Manual.* https://www.tn.gov/content/dam/tn/tdot/roadway-design/documents/additional-resource/TDOT%20Multimodal%20Project%20Scoping%20Manual%20-%20041018.pdf

Washington State Department of Transportation. (2019). *WSDOT Context and Modal Accommodation Report*.

Wisconsin Department of Transportation. (2022). *WSDOT Design Manual*. https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/design-manual

Appendix A Washington DOT Context and Modal Accommodation Report

Context and Modal Accommodation Report Version 2.2 (10/24/2019)

(For use in conjunction with a Basis of Design form on non-freeway projects)

Project Title:

PIN:

Date:

Planning Document Summary

Has a Corridor Sketch been completed for the roadway(s)? ☐ **Yes** ☐ **No**

Notes:

List any applicable planning and environmental reports or studies (optional: highlight major considerations):

General Project Information

Route Information	SR	NHS (Y/N)	Functional Class	Current Posted Speed	Truck %	Current ADT
Project Information	Begin MP	End MP	County	Within City?	Within UGA?	Funding
	Existing Access Control	WSDOT Planned Access Control	Current Year	Forecast (aka Future) Year		
Brief Project Description						

Community Engagement

Describe Community Engagement and Summarize Major Commitments or Expectations	

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Context and Modal Accommodation Report   Version 2.2 (10/24/2019)

Section 2 Context Determination

Roadway ______ MP _____ to MP _____

[If the land use or transportation context vary significantly within the project boundaries, divide the roadway into smaller segments and duplicate this section as necessary to record the context for each segment]

Note: Fields in purple directly relate to Basis of Design entries

Land Use Context (Non-Freeways – Use Attached Land Use Context Worksheet)	**CURRENT** ☐ **Rural** ☐ **Suburban** ☐ **Urban/Town** ☐ **Urban Core**		**FUTURE** ☐ **Rural** ☐ **Suburban** ☐ **Urban/Town** ☐ **Urban Core**
Roadway Type	**Current Federal Functional Class**	☐ **Principal Arterial** ☐ **Minor Arterial** ☐ **Collector** ☐ **Local**	
	Future Function Based on Local, Regional & State Plans (note: does not change Federal Functional Class)	☐ **Principal Arterial (Regionally important corridor connecting large activity centers)** ☐ **Minor Arterial (Locally important corridor connecting activity centers)** ☐ **Collector (Roadways connecting arterials and local roads)** ☐ **Local**	
	If Current and Future Roadway Type are different, provide your reasoning here:		
Bicycle Route Type	☐ **Citywide Connector** ☐ **Neighborhood Connector** ☐ **Local Connector** ☐ **N/A**		
Pedestrian Route Type	☐ **P-1 (rare)** ☐ **P-2 (low volume)** ☐ **P-3 (medium volume)** ☐ **P-4 (high volume)**		

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Freight Use

General *(mark any that apply)*

☐ Freight route present (Circle one: present/planned)
Freight route type: ☐ **T-1** ☐ **T-2** ☐ **T-3** ☐ **T-4** ☐ **T-5**
☐ Freight vehicles turning (high/low volume)
☐ Freight rail crossings
☐ Other (Specify) ______________________________________
☐ Other (Specify) ______________________________________
☐ Other (Specify) ______________________________________

Are any boxes checked above? ☐ Yes ☐ No (If Yes then special design considerations may apply)

Transit Use

General *(mark any that apply)*

☐ Transit route (Circle one: present/planned)
☐ Transit route type (Circle one: local/limited/express)
☐ High frequency route (15 minute or less headways)
☐ BRT or Light Rail present
☐ Primary transit lane (Circle one: outside/inside)
☐ In lane bus stops or bus pullouts (Circle one: present/planned)
☐ Transit vehicles turning (Circle one: high/low volume)
☐ Transit signal priority (Circle one: present/planned)
☐ Intermodal connections (Circle one: present/planned)
☐ Presence of facilities for people with specialized transportation needs (e.g. hospitals, senior centers, schools, transit-dependent populations)
☐ Other (Specify) ______________________________________
☐ Other (Specify) ______________________________________
☐ Other (Specify) ______________________________________

Are any boxes checked above? ☐ Yes ☐ No (If Yes then special design considerations may apply)

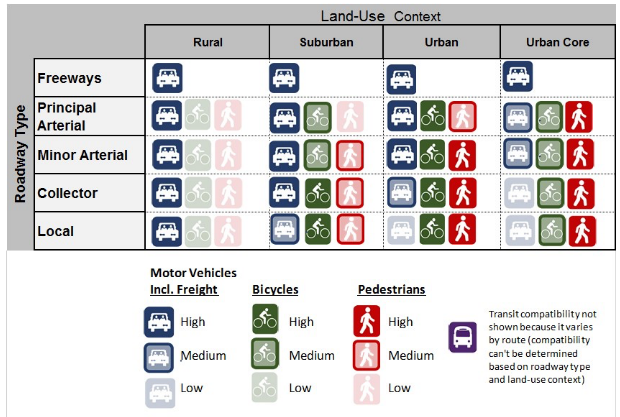
☐ **Designated Main Street Highway** (see Appendix B: Identification of State Highways as Main Streets (http://www.wsdot.wa.gov/research/reports/fullreports/733.1.pdf)

☐ **A Local Complete Streets Ordinance** applies to the project location (http://www.tib.wa.gov/grants/Grants.cfm)

Section 3 Design Controls

Initial Modal Accommodation

Use table at right and record in next row



Initial Modal Accommodation (Current):	Initial Modal Accommodation (Future):
Motor Vehicles ☐ High ☐ Medium ☐ Low	Motor Vehicles ☐ High ☐ Medium ☐ Low
Bicycles ☐ High ☐ Medium ☐ Low	Bicycles ☐ High ☐ Medium ☐ Low
Pedestrians ☐ High ☐ Medium ☐ Low	Pedestrians ☐ High ☐ Medium ☐ Low

Context and Modal Accommodation Report Version 2.2 (10/24/2019)

Modal Accommodation – Motor Vehicles				
	Use adjustment factors below to assess need to increase or decrease demand for modal accommodation:			
		Factor (Check box for factors you use)	Conditions That Decrease Motor Vehicle Accommodation	Conditions That Increase Motor Vehicle Accommodation
	Strategic Factors	☐ Access Classification	Lower classifications (3, 4, and 5) ☐ Current ☐ Future	Higher classifications (1,2, and 3) ☐ Current ☐ Future
	Strategic Factors	☐ Strategic Freight Corridor	None, T-3, T-4, T-5 ☐ Current ☐ Future	T1, T2 ☐ Current ☐ Future
	Strategic Factors	☐ Local Goals to Reduce SOV Mode	Local plan includes goal to reduce SOV travel ☐ Current ☐ Future	Local plan does not include goal to reduce SOV travel ☐ Current ☐ Future
	Strategic Factors	☐ Availability of Transit	High or medium frequency transit is available in the corridor ☐ Current ☐ Future	Minimal or no transit available in the corridor ☐ Current ☐ Future
	Suitability Factors	☐ Mobility	V/C or vehicle LOS within designated target range ☐ Current ☐ Future	V/C or Vehicle LOS outside designated target range ☐ Current ☐ Future
	Suitability Factors	☐ Presence of Bicyclists and Pedestrians	Bicyclists and/or pedestrians use or cross the corridor ☐ Current ☐ Future	Bicyclists and/or pedestrians rarely use or cross the corridor ☐ Current ☐ Future
	Suitability Factors	☐ Traffic Speed (see DM 1103.05(1))	Lower speeds ☐ Current ☐ Future	Intermediate and Higher speeds ☐ Current ☐ Future
	Other (Specify)	☐ Other (Specify):	☐ Current ☐ Future	☐ Current ☐ Future
	Other (Specify)	☐ Other (Specify):	☐ Current ☐ Future	☐ Current ☐ Future
	Provide your reasoning for adjusting the initial vehicle modal accommodation here, noting any need for strategic crossings and/or investments in off-system alternative routes:			
	Motor Vehicle Accommodation (Current) Initial ☐ High ☐ Medium ☐ Low (see pg 3) Final ☐ **High** ☐ **Medium** ☐ **Low**		Motor Vehicle Accommodation (Future) Initial ☐ High ☐ Medium ☐ Low (see pg 3) Final ☐ **High** ☐ **Medium** ☐ **Low**	

Context and Modal Accommodation Report Version 2.2 (10/24/2019)

		Use adjustment factors below to assess need to increase or decrease demand for modal accommodation:		
		Factor (Check box for factors you use)	Conditions That Decrease Bicycle Accommodation	Conditions That Increase Bicycle Accommodation
Modal Accommodation - Bicycles	Strategic Factors	☐ Bicycle Route Type (see Page 2 above)	Local connector or not identified ☐ Current ☐ Future	Citywide or neighborhood connector ☐ Current ☐ Future
		☐ Local & Regional Bicycle Plans	Not in local or regional bicycle network ☐ Current ☐ Future	Planned or developed bicycle route ☐ Developed ☐ Planned
		☐ Distance to Major Bicycle Destinations (e.g. work, recreation, school, services)	Long Distance (> 15 miles) ☐ Current ☐ Future	Short (<3 miles) to Medium (3-15 miles) Distance Identify Destinations: ☐ Current ☐ Future
		☐ Distance to Transit Stop	Long Distance (> 3 miles) ☐ Current ☐ Future	Short (< 1mile) to Medium (1-3 miles) Distance ☐ Current ☐ Future
		☐ Alternative Bicycle Route within ½ Mile	Planned or developed suitable alternative route. Identify Route: ☐ Current ☐ Future	No alternative route ☐ Developed ☐ Planned
		☐ Disadvantaged Populations	Below 50th Percentile Nationally ☐ Current ☐ Future	Above 50th Percentile Nationally ☐ Current ☐ Future
	Suitability Factors	☐ Traffic Speed	Higher Speed (35 mph +) ☐ Current ☐ Future	Low (25 mph or less) to Medium Speeds (30 mph) ☐ Current ☐ Future
		☐ Traffic Volume (with bicycle lanes)	High Volume (> 20,000) ☐ Current ☐ Future	Low (< 9,000) to Medium (9,000-20,000) Volume ☐ Current ☐ Future
		☐ Traffic Volume (without bicycle lanes)	High Volume (> 7,000) ☐ Current ☐ Future	Low (<2,000) to Medium (2,000-7,000) Volume ☐ Current ☐ Future
		☐ Truck Volume (%)	Higher Volumes (> 2.5%) ☐ Current ☐ Future	Lower Volumes (< 2.5%) ☐ Current ☐ Future
		☐ Bicycle Volume	Rare ☐ Current ☐ Future	Occasional or Frequent ☐ Current ☐ Future
		☐ Bicycle Facility Type	None ☐ Current ☐ Future	Designated or physically separated bike lanes ☐ Current ☐ Future
		☐ Width of Bike & Parking Lanes (Combined)	Narrow (13.5 ft or less) ☐ Current ☐ Future	Moderate (14-14.5 feet) or Wide (15 ft or more) ☐ Current ☐ Future
		☐ Bicycle Lane Width (No Parking)	Narrow (< 3 ft) ☐ Current ☐ Future	Moderate (3-5 ft) or Wide (6 ft +) ☐ Current ☐ Future
		☐ Bicycle Lane Blockage	Frequent ☐ Current ☐ Future	Rare or Occasional ☐ Current ☐ Future
		☐ Pavement Condition	Poor or Fair ☐ Current ☐ Future	Good or Excellent ☐ Current ☐ Future

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Context and Modal Accommodation Report Version 2.2 (10/24/2019)

<table>
<tr><td rowspan="5"></td><td></td><td>☐ Through lanes per direction</td><td>2 or more (no median)
☐ Current ☐ Future</td><td>1 or 2 with raised median
☐ Current ☐ Future</td></tr>
<tr><td rowspan="2">Other (Specify)</td><td>☐ Other (Specify):</td><td>☐ Current ☐ Future</td><td>☐ Current ☐ Future</td></tr>
<tr><td>☐ Other (Specify):</td><td>☐ Current ☐ Future</td><td>☐ Current ☐ Future</td></tr>
<tr><td colspan="4">Provide your reasoning for adjusting the initial bicycle accommodation here, noting any need for strategic crossings and/or investments in off-system alternative routes:</td></tr>
<tr><td colspan="2">Bicycle Accommodation (Current)
Initial ☐ High ☐ Medium ☐ Low (see pg 3)
Final ☐ **High** ☐ **Medium** ☐ **Low**</td><td colspan="2">Bicycle Accommodation (Future)
Initial ☐ High ☐ Medium ☐ Low (see pg 3)
Final ☐ **High** ☐ **Medium** ☐ **Low**</td></tr>
</table>

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Context and Modal Accommodation Report Version 2.2 (10/24/2019)

Modal Accommodation - Pedestrians	Use adjustment factors below to assess need to increase or decrease demand for modal accommodation:				
			Factor (Check box for factors you use)	Conditions That Decrease Pedestrian Accommodation	Conditions That Increase Pedestrian Accommodation
	Strategic Factors	☐	Pedestrian Route Type (see Page 2 above)	P-1 or P-2 ☐ Current ☐ Future	P-3 or P-4 ☐ Current ☐ Future
		☐	Local & Regional Pedestrian Plans	Not in local or regional pedestrian plan ☐ Current ☐ Future	Planned and/or developed pedestrian route ☐ Developed ☐ Planned
		☐	Distance to Major Pedestrian Destinations (e.g. work, recreation, school, services)	>0.5 mile ☐ Current ☐ Future	< 0.5 mile ☐ Current ☐ Future
		☐	Disadvantaged Populations	Below 50th Percentile Nationally ☐ Current ☐ Future	Above 50th Percentile Nationally ☐ Current ☐ Future
	Suitability Factors	☐	Pedestrian Safety	Vehicle speeds > 35 mph and pedestrian traffic best measured in pedestrians/day ☐ Current ☐ Future	Vehicle speeds ≤ 35 mph or pedestrian traffic measured in pedestrians/hour ☐ Current ☐ Future
		☐	Distance to Transit Stop	> 0.5 mile ☐ Current ☐ Future	< 0.5 mile ☐ Current ☐ Future
		☐	Block Length	> 600 feet ☐ Current ☐ Future	< 600 feet ☐ Current ☐ Future
		☐	Comfort	TBD ☐ Current ☐ Future	TBD ☐ Current ☐ Future
		☐	Other (Specify):	☐ Current ☐ Future	☐ Current ☐ Future
		☐	Other (Specify):	☐ Current ☐ Future	☐ Current ☐ Future
	Provide your reasoning for adjusting the initial bicycle accommodation here, noting any need for strategic crossings and/or investments in off-system alternative routes:				
	Pedestrian Accommodation (Current) Initial ☐ High ☐ Medium ☐ Low (see pg 3) Final ☐ **High** ☐ **Medium** ☐ **Low**			Pedestrian Accommodation (Future) Initial ☐ High ☐ Medium ☐ Low (see pg 3) Final ☐ **High** ☐ **Medium** ☐ **Low**	

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Context and Modal Accommodation Report Version 2.2 (10/24/2019)

Approval Signatures

REGION	Date
REGION	Date
REGION	Date
REGION	Date

Context & Modal Accommodation Report Form Date: 12-31-2017

Context and Modal Accommodation Report Version 2.2 (10/24/2019)

LAND USE CONTEXT WORKSHEET

1. **Review indicators (far left column) to define Current and future context (rural, suburban, urban/town, urban core).**
2. **Check one box in each row based on Current condition and another box in each row based on future condition.**
3. **Split segments by mileposts if indicators change significantly. Use one sheet for each milepost range.**

Indicator	Relevance	Rural	Suburban	Urban/Town	Urban Core	Source (Current)	Source (Future)
Land Use	Within ½ mile of roadway	Agricultural uses with some isolated residential and commercial Current ☐ Future ☐	Single uses (divided into residential, commercial, institutional or industrial uses) Current ☐ Future ☐	Mixed-uses (includes 2+ residential, commercial, institutional and/or industrial uses) Current ☐ Future ☐	Mixed uses except industrial and agriculture Current ☐ Future ☐	Aerial Photos	City or County Comprehensive Plan. Zoning & Land Use Designations
Housing Units/Acre	Polygons adjacent to roadway	< 1 unit/acre Current ☐ Future ☐	1-4 units/acre Current ☐ Future ☐	4-15 units/acre Current ☐ Future ☐	15+ units/acre Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Jobs/Acre	Polygons adjacent to roadway	0-1 jobs/acre Current ☐ Future ☐☐	1-10 jobs/acre Current ☐ Future ☐	10-50 jobs/acre Current ☐ Future ☐	50+ jobs/acre Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Street Intersection Density	Polygons adjacent to roadway	< 15 intersections/ square mile Current ☐ Future ☐	15-75 intersections per square mile Current ☐ Future ☐	75-150 intersections per square mile Current ☐ Future ☐	150+ intersections/ square mile Current ☐ Future ☐	EPA Smart Location Database	City or County Comprehensive Plan
Typical Building Height	Visible from roadway	N/A Current ☐ Future ☐	Mostly 1 to 2 story Current ☐ Future ☐	Mostly 2 to 4 story Current ☐ Future ☐	Mostly 4+ stories Current ☐ Future ☐	Google Maps Streetview	City or County Zoning Code
Setbacks	Visible from roadway	Varies Current ☐ Future ☐	24 ft min (arterial) 12 ft min (non-arterial) Current ☐ Future ☐	6 ft min to 18 ft max Current ☐ Future ☐	2 ft min to 12 ft max Current ☐ Future ☐	Aerial Photos	City or County Zoning Code
Parking	Visible from roadway	Off-street (on-street rare) Current ☐ Future ☐	On-street residential, off-street commercial Current ☐ Future ☐	On-street common supplemented by off-street surface Current ☐ Future ☐	Mostly on-street with some off-street structures Current ☐ Future ☐	Aerial Photos	City or County Comprehensive Plan

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Context and Modal Accommodation Report   Version 2.2 (10/24/2019)

RESULTS:

Beginning MP	**Ending MP**	**Current Context (Initial)**	**Future Context (Initial)**	**Current Context (Final)**	**Future Context (Final)**
		☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core	☐ Rural ☐ Suburban ☐ Urban/Town ☐ Urban Core	☐ **Rural** ☐ **Suburban** ☐ **Urban/Town** ☐ **Urban Core**	☐ **Rural** ☐ **Suburban** ☐ **Urban/Town** ☐ **Urban Core**
Sources/interpretations made in these determinations not captured in the table:					

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Appendix B Washington DOT Basis of Design Form

Basis of Design

Project Title:

PIN:

Date:

PRACTICAL DECISION MAKING

Practical decision making is a philosophy that considers each situation, aligns with our financially constrained budget environment, and encourages incremental, flexible, and sustainable investments by focusing on identified performance needs and engaging stakeholders at the right time.

There are six core principles that capture the essence of practical decision making:

- ☐ Starts with a clear purpose and need
- ☐ Considers resource constraints and life cycle cost
- ☐ Engages stakeholder and looks for partnerships
- ☐ Considers overall system performance
- ☐ Considers incremental, phase solutions
- ☐ Applies innovation and creativity

Where the six core principles are incorporated into this form are noted along the right side of this form. Consider all of the core principles as you progress through completing this Basis of Design.

NOTE TO DESIGNERS

There are tips provided in red italics text. This text along with the BOD instructions are intended to help you fill out this document. Delete the red text [including this note] in the final version of the document.

Related Documents and Technical Reports

Insert a list of documents and reports that were integral to the origination of this project. Include enough information so the document may be found at a later date.

Community Engagement

Community Engagement	*Describe past and planned community engagement.*	Engage Stakeholders

General Project Information

Route Information	**SR**	**NHS (Y/N)**	**Functional Class**	**City**		**County**		Clear Purpose and Need
Project Information	**Begin SRMP**	**End SRMP**	**Budget**	**Funding Sub-Program**	**Posted Speed**	**AADT**	**Truck %**	
Brief Project Description								
Important Project History or Background								
Future and Related Projects								
Major Environmental Considerations	*If an Environmental Review Summary is available, summarize the highlights here. If not, conduct a GIS review of the project area to evaluate the following:* • *Chronic Environmental Deficiencies* • *Climate vulnerability* • *Fish passage barriers* • *Habitat connectivity* • *Historic bridges* • *Noise walls* • *Stormwater retrofits* • *Wetland mitigation sites* • *Other considerations: Are any streams, wetlands, water bodies, or other critical areas present that could be impacted?* *IMPORTANT: Verify information with the Region Environmental Office. Seek ESO assistance if needed.*							

Basis of Design Version 1.2, November 2021 — **Page 1 of 7**

Basis of Design

Project Title:

PIN:

Date:

Section 1) Project Needs		
Baseline Need (BN)	**BN1 Statement:** *Describe the first baseline need* Metric: Target:	Clear Purpose and Need
	Contributing Factors: *What are the contributing factors to each Baseline Need?*	
	BN# Statement: *Describe BN2, BN3, BN4, etc. Delete if not applicable.* Metric: Target:	
	Contributing Factors: *What are the contributing factors to each Baseline Need?*	
Contextual Need (CN)	**CN1 Statement:** *Describe the contextual need* Metric: Target:	Consider Resource Constraints Engage Stakeholders
	Contributing Factors: *What are the contributing factors to each Contextual Need?*	
	CN# Statement: *Describe additional contextual needs using CN2, CN3, CN4, etc. Delete if not applicable.* Metric: Target:	
	Contributing Factors: *What are the contributing factors to each Contextual Need?*	
Safety Analysis	☐ No ☐ Yes *If YES, enter the title and date. If NO enter why it was not needed. See DM Chapter 321 and the Safety Analysis Guide.*	Consider Overall System Performance

Basis of Design

Project Title:
PIN:
Date:

Section 2) Context

Roadway _______ MP ______ to MP ______

[Duplicate this section as necessary to reflect distinct segments with different context]

Multidisciplinary Team Members	List the agencies, community stakeholders, and divisions involved in determining the context for this project.	Engage Stake-holders

Land Use Context

Freeway		☐ Rural ☐ Urban	☐ Interstate ☐ Non-Interstate
Non-Freeway	Existing	☐ Rural ☐ Suburban ☐ Urban ☐ Urban Core	
	Future	☐ Rural ☐ Suburban ☐ Urban ☐ Urban Core	

Transportation Context — Consider Overall System Performance

Bicycles

Accommodation	Prohibited	Low	Med	High	Involve Multidisciplinary Team Members
Current	☐	☐	☐	☐	
Future	☐	☐	☐	☐	
Comments	Describe any special design considerations that apply. Utilize the Context and Modal Accommodation Report (CMAR) to fill in this information.				

Primary User Type	Interested but Concerned	Somewhat Confident	Highly Confident	Involve Multidisciplinary Team Members
Current	☐	☐	☐	
Future	☐	☐	☐	
Comments	Record the most common user type anticipated. For definitions of User Types see the FHWA Bikeway Selection Guide (Page 12-13). See Design Manual Chapter 1520 for guidance on the application of User Types in design.			

Pedestrians

Accommodation	Prohibited	Low	Med	High	Involve Multidisciplinary Team Members
Current	☐	☐	☐	☐	
Future	☐	☐	☐	☐	
Comments	Describe any special design considerations that apply here. Utilize the Context and Modal Accommodation Report (CMAR) to fill in this information.				

Freight

Classification	T-1	T-2	T-3	T-4	T-5	See Truck Freight Classification
Current	☐	☐	☐	☐	☐	
Future	☐	☐	☐	☐	☐	
Comments	Coordinate with Multidisciplinary Team Members. Describe any special design considerations that apply here.					

Transit

Fixed route type	None	Local	Limited Stops	Express	Transit Agencies
Current	☐	☐	☐	☐	List all transit agencies that operate within the project limits.
Future	☐	☐	☐	☐	
Comments	See DM 1102.03(5). Coordinate with Multidisciplinary Team, describe special design considerations. Utilize the Context and Modal Accommodation Report (CMAR) to fill in this information.				

Main Street Highway	☐ No ☐ Yes Has the location been designated a Main Street highway (see State Highways as Main Streets: A Study of Community Design and Visioning)? Consult with the region planning office when making this determination. Refer to case studies in Washington's Complete Streets & Main Street Highways Program for design concepts consistent with State Highways as Main Streets.
Complete Streets	☐ No ☐ Yes Does the local jurisdiction have a Complete Street ordinance? Consult with the region planning office and local plans or ordinances when making this determination. See Design Manual Chapter 1231 for design criteria that are consistent with complete street goals.
Existing Design Variance	Are there existing Design Variances within the Project Limits? ☐ No ☐ Yes If YES, can this project correct any of the existing design variances? Request a list of known variances from your ASDE. Go through this list and see if you have the opportunity to correct or change the elements associated with the design variance.

Basis of Design

Project Title:
PIN:
Date:

Section 3) Design Controls

Roadway ______ MP _____ to MP _____

[Duplicate this section as necessary to align with the Context described in Section 2]

Design Year	*Design year and selection rational*				Incremental Phased Solutions
Modal Accommodation Priorities *Priority 1,2,3 etc. 1 is highest*	Mode	Priority Current	Priority Future	Notes	Consider Overall System Performance
	Automobiles				
	Transit				
	Freight				
	Pedestrians				
	Bicyclists				
	Other				
I/S Design Vehicle	*Describe the intersection design vehicles for all intersections that will be modified by the project. State the Design Vehicle for each leg of the intersection.*				
Terrain	☐ **Level** ☐ **Rolling** ☐ **Mountainous**				
Access Control	**Existing**	See Access Master Plan Database			
	Planned	See Access Master Plan Database			
	Proposed				
Target Speed	*State the Target Speed and how you it was determined.*				

Basis of Design

Project Title:

PIN:

Date:

Section 4) Alternative Analysis

		Alternative Name and Description
Alternatives Considered (circle the preferred alternative)	**A**	*Provide a brief description of each alternative considered. Talk about key elements of the alternative that came into consideration when selecting the preferred alternative. Include cost.*
	B	
	C	
	D	

Preferred Alternative ____ was selected because:

Describe why you selected the preferred alternative. Attach copies or provide information (title, date, etc.) regarding alternatives analysis, trade-offs comparison, or similar exercises that have been completed for this project, such as an ALTERNATIVES COMPARISON TABLE. If the prime considerations for selecting an alternative were documented in another document, you do not need to go into detail here. Instead, provide a summary, reference the document, and include it in the Design Approval.

Consider Resource Constraints and Life Cycle Cost
Consider Incremental Phased Solutions
Apply Innovation and Creativity

Basis of Design Version 1.2, November 2021

Basis of Design

Project Title:
PIN:
Date:

Section 5) Design Elements Changed

*For each design element below, identify the design elements that will have dimensions changed in the **preferred alternative** for each alignment or location. You can group alignments into a single location if desired. You may need to add or delete columns.*

Design Element	Alignment #1	Alignment #2	Alignment #3	Alignment #4	Alignment #5	Alignment #6
1. Lane						
2. Median / Buffer						
3. Shoulder						
4. Streetside / Roadside Zone						
5. Pedestrian Facility						
6. Bicycle Facility						
7. Bridges and Buried Structures						
8. Horizontal Alignment						
9. Vertical Alignment						
10. Cross Slope						
11. Side Slope						
12. Clear Zone						
13. Barrier, Guardrail & Rumble Strips						
14. Signals, Illumination, and ITS						
15. Signing and Delineation						
16. On/Off Connections						
17. Intersection / Ramp Terminal						
18. Road Approaches						
19. Roundabout						
20. Access Control						

Basis of Design
Project Title:
PIN:
Date:

Prepared by	
[Insert name of Project Engineer or person who oversaw the development of the BOD] *[Insert title]* *[Insert name of Region/Program]*	**Date**
Approval Signature	
[Insert name of Region/Program designated signee] *[Insert title]* *[Insert name of Region/Program]*	**Date**
Concurrence Signature	
[Insert name of ASDE. If not applicable, delete this signature block.] **Assistant State Design Engineer** **Headquarters**	**Date**

Basis of Design Version 1.2, November 2021 **Page 7 of 7**

Appendix C Oregon DOT Urban Design Concurrence Document

OREGON DEPARTMENT OF TRANSPORTATION
Urban Design Concurrence
CONTEXT AND MODAL INTEGRATION

Date:
Project/Corridor Title:
Key Number:
EA:

Planning Document Summary
List any applicable planning or environmental reports, plans or studies

General Project Information

	Rt. No.	Hwy No.	NHS	Functional Classification	State Classification	Reduction Review Rt	Truck %	Posted Speed	Current ADT
Route Information			Yes ☐ No ☐			Yes ☐ No ☐			

	Funding Category	City and County	Begin MP	End MP	Speed	Future ADT
Project Information					Design Target	

	Building Setback	Adjacent Land Use (Existing / Future)	Pedestrian Crossings	On-Street Parking	# Accesses Per Block
Defining Character	None ☐ Shallow ☐ Medium ☐ Large ☐	Comm/Industrial ☐ ☐ Retail ☐ ☐ Residential ☐ ☐ Mixed ☐ ☐ Park/Rec ☐ ☐ Other: ☐ ☐ _______________	Spacing: Type:	Yes ☐ / No ☐	
			Bicycle Facility	**Type**	**Block Size**
			None ☐ Shared Lane ☐ Std. Lane ☐ Width _____ Other: ☐ _____________	Parallel ☐ Diagonal ☐ Back-in ☐	

Form Updated: 31March 2020 Page 1 of 5

OREGON DEPARTMENT OF TRANSPORTATION
Urban Design Concurrence
CONTEXT AND MODAL INTEGRATION

Project Goals and Outcomes	
Brief Project Description	

Community Engagement	
Describe Community Outreach Summarize Commitments, Expectations	

Modal Integration		
Determine Modal Integration	**Existing Modal Integration** Pedestrians ☐ High ☐ Medium ☐ Low Bicycles ☐ High ☐ Medium ☐ Low Transit ☐ High ☐ Medium ☐ Low Freight/Motor Vehicles ☐ High ☐ Medium ☐ Low	**Future Modal Integration** Pedestrians ☐ High ☐ Medium ☐ Low Bicycles ☐ High ☐ Medium ☐ Low Transit ☐ High ☐ Medium ☐ Low Freight/Motor Vehicles ☐ High ☐ Medium ☐ Low

Context
Traditional Downtown/CBD ☐ Urban Mix ☐ Commercial Corridor ☐ Residential Corridor ☐ Suburban Fringe ☐ Rural Community ☐
Context Discussion
Additional information for determination of appropriate context:

Form Updated: 31March 2020 Page 2 of 5

OREGON DEPARTMENT OF TRANSPORTATION
Urban Design Concurrence
DESIGN DECISION DOCUMENTATION

Section Name:						Route No.:	
Highway Name:						Highway No.:	
County Name:		Region:		Key No.:		EA No.:	
Begin MP:		RDWY ID:	1 ☐ 2 ☐		Mileage Type:		0 ☐ Z ☐
End MP:		Mileage Overlap Code:			0 ☐ 1 ☐ 2 ☐		

PROJECT DATA

Functional Classification:				State Classification:			
Current ADT (Year):				Design ADT (Year):			
% Trucks:		Vertical Clearance / Reduction Review Route:		☐ Yes ☐ No			
Posted Speed:		Design Speed:			Target Speed:		
Funding:							
Current Estimate:			Context				
Federal Highway Approval (PODI) Required:	Yes ☐ No ☐	Design Category	3R ☐ 1R ☐ 4R ☐ SF ☐	NHS: ☐ Non NHS: ☐		Top 10% SPIS Site:	Yes ☐ No ☐

Design Element Summary Table		Width (ft.) **
Pedestrian Realm	Frontage Zone	
	Pedestrian Zone	
	Buffer Zone	
	Curb/Gutter	
Transition Realm	Separated Bicycle Lane (Curb Constrained Facility)	
	On-Street Bicycle Lane (Not Including Buffer)	
	Bicycle/Street Buffer	
	Right Side Shoulder (If Travel Lane Directly Adjacent to Curb	
	On-street Parking	
Travelway Realm	Travel Lane	
	Right Turn Lane (Including Shy)	
	Left Turn Lane	
	Left Side/Right Side Shy Distance	
	Two-Way Left Turn Lane	
	Raised Median – No Turn Lane (Including Shy Distances)	
	Left-Turn Lane with Raised Curbed Median/Separator (Includes 16" Separator and Shy Distance	

**For dimensions less than range defined in the Blueprint for Urban Design, a design exception is required

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OREGON DEPARTMENT OF TRANSPORTATION
Urban Design Concurrence
DESIGN DECISION DOCUMENTATION

Modal Integration	
Appropriate Modal Integration	Pedestrians ☐ High ☐ Medium ☐ Low Bicycles ☐ High ☐ Medium ☐ Low Transit ☐ High ☐ Medium ☐ Low Freight/Motor Vehicles ☐ High ☐ Medium ☐ Low
Briefly Discuss Final Modal Integration Decisions	

Pedestrian Realm	
Discuss final Dimensions of Pedestrian Realm Elements	Include enough information to establish reasons and justification for the widths chosen for Frontage Zone, Pedestrian Zone, Buffer Zone and Curb/Gutter. May need to correlate with Transition Zone elements. Identify and substantiate tradeoffs between elements and realms.

Transition Realm	
Discuss final Dimensions of Transition Realm Elements	Include enough information to establish reasons and justification for the widths chosen for Separated Bicycle Lane, On-Street Bicycle Lane, Bicycle/Street Buffer, Right Side Shoulder and On-Street Parking. May need to correlate with Pedestrian Zone elements. Identify and substantiate tradeoffs between elements and realms.

Travelway Realm	
Discuss final Dimensions of Travelway Realm Elements	Include enough information to establish reasons and justification for the widths chosen for Travel Lanes, Right and/or Left Turn Lanes, Shy Distances and Median Treatments. May need to correlate with Transition Zone elements. Identify and substantiate tradeoffs between elements and realms.

Form Updated: 31March 2020 Page 4 of 5

OREGON DEPARTMENT OF TRANSPORTATION
Urban Design Concurrence
DESIGN DECISION DOCUMENTATION

Design Element Less Than Approved Range	
Final Design Elements Less Than Approved Range Dimension	**Are Any Final Design Elements Less Than the Approved Dimension Range?** **No** ☐ **Yes** ☐ **If yes, list the elements below and attach an approved design exception for each**

Signatures

Prepared By: ______________________ **Date:** ____________
Prepare By

Company Name:	

Concurred By: ______________________ **Date:** ____________
(ODOT Region Maintenance Manager or Region Maintenance Operations Manager

____
(Print Name)

Approved By: ______________________ **Date:** ____________
(Region Technical Center Manager)

____
(Print Name)

Appendix D Maryland DOT Context Driven Toolkit

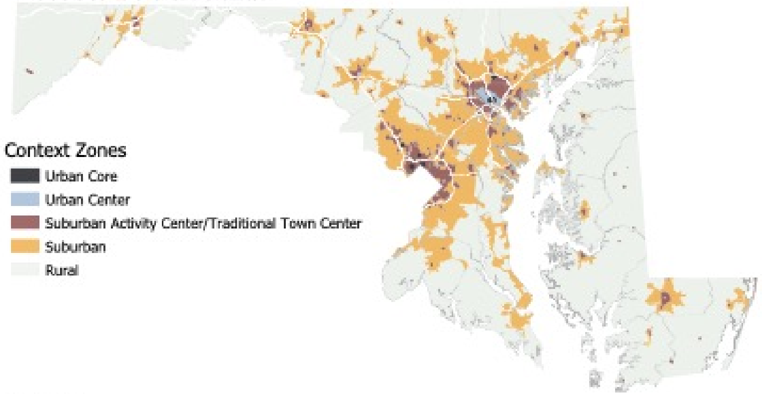
INTRODUCTION

CONTEXT DRIVEN TOOLKIT

The Context Driven Toolkit ("the Toolkit") is part of the Context Driven initiative, which emphasizes that land use context should be a primary factor in the design of a transportation project. The Maryland Department of Transportation State Highway Administration (MDOT SHA) initiated this effort in Spring 2019, and since then over 200 projects have incorporated the Context Driven approach. An example of the types of Context Zones outlined in the *Context Driven Guide* are shown on these pages, in addition to a map of where each Context Zone is located in Maryland.

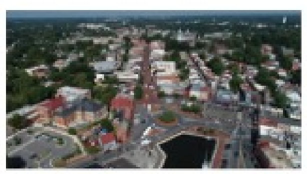
The Context Driven approach is based on the concept that our streets should be designed for safety in a way that supports the land uses that surround them. This means that the design of a street in densely-populated downtown Frederick that is in an "Urban Center" Context Zone should be different from the design of a road in a quiet part of Allegany County that is in a "Rural" Context Zone. This is because the users of those transportation facilities have different needs: pedestrians in downtown Frederick could benefit from slower vehicle traffic, more frequent street crossings, wider sidewalks, and dedicated street space for bikes. However, those same considerations may not be appropriate for a road in rural Allegany County, where population density is low and where the road is not likely to experience high volumes of pedestrian travel.

Where the Context Zones are located

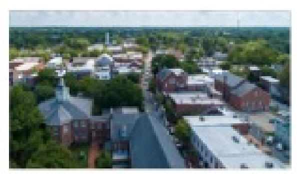


MDOT SHA Contexts

Urban Core



Urban Center



Traditional Town Center

1

Components of Context Driven relating to this Toolkit

CONTEXT DRIVEN

Context Driven Guide — *The **Context Driven Guide** defines the Context Zones.*

Context Driven Toolkit — *This **Context Driven Toolkit** determines what countermeasures are most appropriate for the context zones in the Context Guide.*

Pedestrian Safety Action Plan — *The **Pedestrian Safety Action Plan** identifies areas most in need of improvements for vulnerable users, using the contexts and countermeasures outlined in the Guide and the Toolkit.*

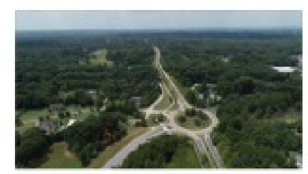
In this Toolkit, road and street design elements such as safety measures are referred to as *countermeasures*. The term refers to the need to improve safety by countering the different types of crash risks that occur in different Context Zones.

Mitigating crash risks may result in adverse impacts to motor vehicle operations. It is important that the needs and safety of all road users be taken into consideration when evaluating potential countermeasures, which may require further evaluation to balance traffic operations.

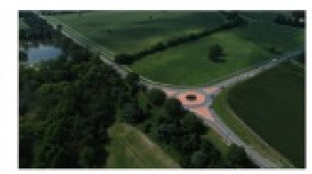
The selection and assessment of each countermeasure in this Toolkit is rooted in MDOT SHA's Context Driven initiative. The diagram above shows how the Toolkit relates to the other components of Context Driven. Countermeasures in the Toolkit are directly informed by federal and state engineering standards, as well as guidance from national best practices.

MDOT SHA Contexts

Suburban Activity Center



Suburban



Rural

2

GUIDANCE & STANDARDS

Engineering guidance and standards at the state and national level have influenced the types of countermeasures included in the Toolkit and their recommended design elements. Considering existing engineering standards and guidance is not only required; it ensures that the countermeasures benefit from insights and lessons learned.

One of the main purposes of the Toolkit is to create an innovative handbook of countermeasures that both works for Maryland's unique circumstances and introduces new practices that will improve mobility and safety outcomes. Striking this balance between consistency and innovation requires consulting a variety of existing guides and standards. The sections below outline the standards and guidance that were considered when selecting and formulating the countermeasures.

FEDERAL

The **Federal Highway Administration (FHWA)** provides funding for surface transportation projects to states that is accompanied by requirements that include design criteria, with special criteria for projects on the National Highway System (NHS). FHWA also provides national best practice design guidance for various types of facilities and user groups. This type of guidance was consulted in the development of several countermeasures in this Toolkit.

The **Manual on Uniform Traffic Control Devices (MUTCD)** is another important element of federal design conditions, which contains standards, guidance, and optional specifications for traffic control devices (signage, lane markings, traffic signals, etc.). The State of Maryland has its own additions to the MUTCD discussed in the next section.

The countermeasures in this Toolkit were selected and formulated with design guidance and criteria from FHWA in mind. However designs used for each project should always be reviewed for consistency with FHWA requirements.

STATE OF MARYLAND

The State of Maryland builds upon federal design guidance with its own design criteria that is intended to address requirements unique to this state. Each project utilizing these countermeasures should consult the following design guidance from the State of Maryland, in addition to the latest guidance cited by MDOT SHA:

» **Maryland MUTCD (MDMUTCD)**: This is the adaptation of the MUTCD that provides standards specific to Maryland.

» **Traffic Control Devices Design Manual**: To be used in conjunction with the MdMUTCD, this manual is intended to guide development of signing and pavement marking plans, signal plans, and lighting plans.

» **Book of Standards for Highways and Incidental Structures, most recent revisions**: This book provides a complete catalog of standards for highways, incidental structures and traffic control applications.

» **Accessibility Policy and Guidelines for Pedestrian Facilities along State Highways**: This provides guidance in designing public sidewalks and crossings that comply with the Americans with Disabilities Act (ADA).

» **Bicycle Policy and Design Guidelines:** This document provides guidance for designing bicycling facilities in Maryland.

The countermeasures in this Toolkit are intended to build upon the statewide guidance in the documents above, and in many cases improve upon them with Maryland-specific applications of national best practices. However, each project should consult these manuals and coordinate with MDOT SHA as appropriate to ensure all required design standards are met.

OTHER GUIDANCE

The **National Association of City Transportation Officials (NACTO)** is a national organization that publishes guidance for transportation facilities based on emerging best practices, with a particular focus on pedestrian and bike safety and mobility. This Toolkit draws on guidance from this organization in many instances. In addition, the **Institute of Transportation Engineers (ITE)** is a national knowledge-sharing organization for the transportation engineering field that was consulted in the development of this Toolkit.

The **American Association of State Highway Transportation Officials (AASHTO)** is another important source of national engineering guidance. This includes, but is not limited to, the AASHTO "Green Book" that provides widely-referenced guidance.

A **Crash Modification Factor (CMF)** is a multiplicative factor that indicates the proportion of crashes that would be expected after implementing a countermeasure. Another way of representing the

3

safety effect of a countermeasure is through a Crash Modification Function (CMFunction). A CMFunction is an equation used to calculate a CMF based on the characteristics of the site where it will be applied. Available information can be found in the searchable database, CMF Clearinghouse (http://www.cmfclearinghouse.org/). The CMF Clearinghouse provides a searchable database of CMFs, funded by FHWA and maintained by the University of North Carolina Highway Safety Research Center.

HOW TO USE THIS TOOLKIT

The Context Driven Toolkit is intended to be a guide that illustrates countermeasures in a way that is intuitive to both professionals and the general public. The sample countermeasure spread below highlights each informational element of the Toolkit and how to interpret it.

4

BARRIER SEPARATED BIKE LANES

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
Rural

DEFINITION AND DESCRIPTION

A barrier separated bike lane is an exclusive facility for bicyclists that is located within or directly adjacent to the roadway and is physically separated from motor vehicle traffic by a vertical element. They are differentiated from shared use paths because they are bike-only facilities. Barrier separated bike lanes are also referred to as "cycle tracks" or "protected bike lanes." These treatments have been used in Maryland by Baltimore City and Montgomery County, and nearby in Washington DC.

Vertical elements in the barrier area provide an increased sense of comfort and safety for users of the bike lane. Selection of vertical element can be based on the presence of on-street parking, overall street and barrier width, cost, durability, aesthetics, traffic speeds and volumes, potential for bike lane encroachment, emergency vehicle and service access, and maintenance. Examples of vertical elements include delineator posts, bollards, concrete barriers, raised medians, or elevating the facility to intermediate or sidewalk grade.

CONSIDERATIONS

» Streets that naturally draw cyclists, even in the absence of any bike facility, are likely to draw more bicyclists if a protected bike lane is constructed.

» A protected bike lane that improves connections between and among high-demand destinations such as schools, parks, transit stops, commercial areas, residential clusters, and other attractions will better serve a community than if it is located at random without these considerations.

» Consider the relationship with surrounding communities, ensuring connections between origins and destinations in a low-stress environment.

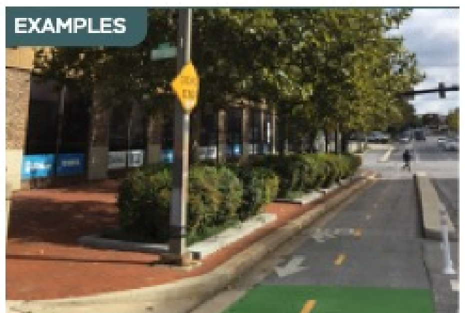
» Existing roadway drainage patterns can be considered for retrofit installations.

» Appropriate signing and pavement markings shall be provided to designate and regulate the separated bike lane.

» Specific vertical elements to be used along a corridor will depend on the context zone and target speed of the roadway.

» Placement and type of vertical elements should be consistent with the guidance in the Roadside Design Guide.

EXAMPLES



Mount Royal Avenue, Baltimore, MD

Woodglen Drive, North Bethesda, MD

5

APPLICATIONS

Separated bike lanes are well-suited for installation along roadways with higher vehicular volumes and/or operating speeds, or where high levels of both bike and pedestrian activity are expected to provide separate facilities for each road user. They can provide useful bike network connections to off-road trail facilities. Separated bike lanes often require reallocation of existing street space, which may involve narrowing travel lanes, removing lanes, and/or reconfiguring on-street parking.

A separated bike lane may provide single direction or bi-directional bike travel. Single direction may run in the same direction with automobile travel, or contraflow to accommodate bike access on a one-way street.

Separated bike lanes are important when speeds of vehicles are high, leading to a higher probability of lateral shifts in the vehicular path particularly when large trucks are present, and in urban environments where many visual cues demand the attention of vehicle operators.

Additional scenarios where separated bike facilities are appropriate may include:

» High bike / pedestrian volume road segments

» Areas where children are expected to regularly use the facility

» Bike-related crash history

» Segments with lower densities of driveways / access points

» Steep roadway grades resulting in greater speed differentials between motor vehicles and bikes

» Roads in the vicinity of bike generators (transit hubs, schools, central business districts, etc.)

1 Barrier widths will vary based on material used. Special consideration may be given to buffers when adjacent to parking lanes.

2 Bike lanes are designated for exclusive use by bicyclists, and may be configured for one-way or two-way travel. Highlighting of conflicts is preferred, or bicyclist transitions that occur along the separated bike lane may be accommodated using complementary countermeasures.

COMPLEMENTARY COUNTERMEASURES

» Reduced curb radii

» Green pavement markings

» Road diet

» Protected signal phases

» Leading pedestrian intervals

» Roadway lighting

» Protected intersections

TYPICAL APPLICATION

REFERENCES

» Maryland Department of Transportation State Highway Administration (MDOT SHA) Bicycle Policy & Design Guidelines

» National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide

» Federal Highway Administration (FHWA) - Separated Bike Lane Planning and Design Guide

» FHWA Small Town and Rural Multimodal Networks

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CONTINENTAL CROSSWALKS

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
Rural

DEFINITION AND DESCRIPTION

Continental (Longitudinal Bar) crosswalks are a type of high-visibility crosswalk markings. Continental crosswalk markings use thick striping oriented parallel to the approach travel lanes to increase the visibility of pedestrian crossings for both pedestrians and motorists. Motorists are warned to expect pedestrian crossings while approaching the intersection and to stop for crossing pedestrians because these pavement markings can be detected sooner than traditional parallel line crosswalk markings. At uncontrolled locations, continental crosswalks identify a preferred crossing location for pedestrians. At midblock locations, crosswalk markings legally establish the crosswalk. In March 2019, Maryland Department of Transportation State Highway Administration (MDOT SHA) published Typical No. 550.02 detailing line width and spacing ranges for installation along MDOT SHA roadways.

EXAMPLES

Philadelphia Ave. and 13th St, Ocean City, MD

Georgia Ave, Wheaton, MD

CONSIDERATIONS

- Continental crosswalk markings are recommended for all crossings in school zones, serving trails, at uncontrolled crossings, midblock crossings, or crossings in a central business district.
- Crossings with motor vehicle speeds above 30 MPH, more than one lane in one direction, or an Annual Average Daily Traffic (AADT) above 9,000 can supplement continental crosswalk markings with additional treatments.
- Supplemental warning signage should be installed at uncontrolled crossings.
- Crosswalk markings at uncontrolled crossings must have appropriate sight lines to ensure adequate visibility, and induce motorist stopping.
- Crosswalk marking locations are preferred to be convenient for pedestrian access and accommodate the desirable path where practical.
- Crosswalk markings must be placed to include the limits of the depressed curb for a sidewalk ramp. All ramps must be compliant with the Americans with Disabilities Act (ADA).
- At controlled intersections, mark all legs where possible to reduce crossing exposure for pedestrians.
- Implement parking restrictions on the crosswalk approach at all pedestrian crossings to maintain sight lines. This may require a Memorandum of Agreement (MOA) with the jurisdiction responsible for parking enforcement.

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APPLICATIONS

Continental (Longitudinal Bar) crosswalks consist of 16-inch to 24-inch wide pavement marking lines oriented parallel to the approaching travel way with 20-inch to 36-inch spacing.

1. Crosswalk lines typically consist of 24-inch wide markings, 10 feet in length, spaced at 36 inches between lines. It is preferred that markings avoid wheel paths where possible.
2. A minimum crosswalk width of 8 feet is preferred, and the maximum width may vary based on pedestrian demand and desirable paths within central business districts.

COMPLEMENTARY COUNTERMEASURES

- Pedestrian Hybrid Beacon (PHB) or Rectangular Rapid-Flashing Beacon (RRFB)
- Advance STOP HERE FOR PEDESTRIANS (R1-5b or R1-6a(3)) sign and stop line
- Median pedestrian refuge island
- Raised crosswalk (speed table)
- Curb extensions
- IN-STREET PEDESTRIAN CROSSINGS (R1-6a(1)) sign
- ADA compliant curb ramps

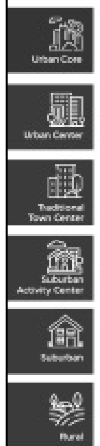
TYPICAL APPLICATION

REFERENCES

- National Cooperative Highway Research Program (NCHRP) Research Report 926
- NCHRP Research Report 893
- NCHRP Research Report 841
- National Association of City Transportation Officials (NACTO) Urban Street Design Guide

8

GREEN PAVEMENT FOR BIKE LANES



DEFINITION AND DESCRIPTION

Colored pavement within a bike lane increase visibility of the facility, highlight potential areas of conflict, and reinforce that drivers must yield to bicyclists when entering a conflict area. Green-colored pavement is used to designate locations where bicyclists are expected to operate, and areas where bicyclists and other roadway traffic might have potentially conflicting weaving or crossing movements. This may include a bike box, extension lines through an intersection or across driveways, turning queue boxes or protected intersections. Consistent application of color within a roadway corridor is important to promote clear understanding by all users.

Green-colored pavement have Interim Approval (IA-14) through Federal Highway Administration (FHWA) for use pending revision to the Manual on Uniform Traffic Control Devices (MUTCD) conditions. This provides guidance for the optional use of green-colored pavement in marked bike lanes and in extensions of bike lanes through intersections and other conflict areas.

Benefits of colored pavement markings within bike lanes include:

» Enhances the multi-modal character of a corridor.
» Increases the visibility of bicyclists.
» Discourages illegal parking, stopping or standing in the bike lane.
» When used in conflict areas, raises motorist and bicyclist awareness to potential areas of conflict.
» Increases bicyclist comfort through clearly delineated space.
» Increases motorist yielding behavior.
» Helps reduce bike conflicts with turning motorists.

CONSIDERATIONS

» Green-colored pavement shall only be used within bike facilities in accordance with FHWA Interim Approvals.
» Can be considered at conflict areas such as vehicle right-turn lanes (pocket lane transitions).
» Can be considered at intersections, particularly through wide or complex intersection where the bike path may be unclear, and conflicts with medium or high permissive turning volumes.
» Can be considered at driveways and Stop- or Yield-controlled streets where there are medium or high conflicting turn movements from the mainline.
» Where typical vehicle movements frequently encroach into bike space, such as approaches and departures to intersections.
» Facility designers can match application strategy to desired design outcomes of projects.
» Because the effectiveness of markings depends entirely on their visibility, maintaining markings must be a high priority.
» Pavement within bike facilities must be maintained to remain free of potholes, broken glass, and other debris.

EXAMPLE

2nd Ave, Silver Spring, MD

APPLICATIONS

Green-colored pavement may be used within any designated bike facility – cycle track, bike lane, bike box, or conflict areas.

1. Green-colored pavement may be used to highlight areas where drivers entering a turn lane cross a bike lane.
2. Green-colored pavement may be used to highlight areas where drivers turning at intersections with public or private streets, and commercial entrances will cross a bike lane.
3. Green-colored pavement may be appropriate crossing minor driveways or alleys where drivers may not expect to encounter bike traffic.

COMPLEMENTARY COUNTERMEASURES

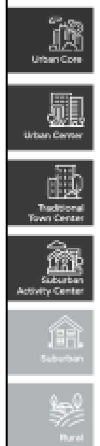
» In-lane floating bus stops
» Raised crosswalks
» Barrier separated and buffered bike lanes
» Road diet
» Protected intersections

TYPICAL APPLICATION

REFERENCES

» NACTO Urban Bikeway Design Guide
» FHWA MUTCD - Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14)
» FHWA MUTCD - Interim Approval for Optional Use of an Intersection Bicycle Box (IA-18)
» FHWA MUTCD - Interim Approval for Optional Use of Two-Stage Bicycle Turn Boxes (IA-20)

HARDENED CENTERLINES



DEFINITION AND DESCRIPTION

Hardened centerlines are roadway treatments that slow left-turning vehicle traffic by "hardening" (creating a physical barrier) between opposing travel directions. The hardened centerline may also extend past the crosswalk to provide an even greater safety benefit.

Hardened centerlines can slow down left-turning vehicles by discouraging motorists from over-steering through a turning movement. This is achieved by forcing the left-turning vehicle to navigate around the hardened centerline, and by making it more difficult for the left-turning vehicle to use parts of the crosswalk and opposing vehicle lanes to execute a wider, higher speed left turn. The smaller turn radius not only slows the left-turning vehicle down, but also increases the visibility of pedestrians in the crosswalk, improves motorist reaction time to pedestrians in the crosswalk, and reduces serious injury risk in the event of a collision.

Reducing the left-turning vehicle's speed and increasing visibility through a tighter turn radius improves safety for crossing pedestrians, bicycles traveling in the roadway, vehicles in the opposing travel lane, and the left-turning vehicle itself. The New York City Department of Transportation (NYCDOT) has shown that pedestrian injuries at intersections have decreased by 20% where hardened centerlines have been implemented, and 85th percentile left turn speeds at those intersections have decreased by 59.8%. A study of similar hardened centerline treatments in Washington, DC resulted in a more modest 5.6% reduction of 85th percentile left turn speeds (from 18mph to 17mph).

Installing hardened centerlines can involve relatively low-cost temporary curbing materials such as rubber curbs and flexible delineators, and can be used at both signalized and unsignalized intersections.

EXAMPLE

G Street SE, Washington, D.C.

CONSIDERATIONS

- » Hardened centerline treatments can be installed using temporary curbing materials, which may consist of a rubber curb and rubber speed bumps meeting MDOT SHA specifications or per the Qualified Products List (QPL). NYCDOT uses 6', 10', and 19' rubber speed bumps.
- » A hardened centerline may extend into the intersection, provided that the crosswalks and vehicle lanes remain clear.
- » Striping the rubber curb border in yellow or using products with high visibility features, such as flexible delineators, may increase the visibility of the hardened centerline.
- » Left turn volume, pedestrian and/or bicyclist crash history, and field-observed pedestrian-vehicle conflicts can be used to identify and prioritize locations for hardened centerlines.
- » Centerline hardening treatments cannot be used in lieu of required KEEP RIGHT (R4-7 or R4-7(1)) and OBJECT MARKER (OM1-3) signs where median noses are present.
- » Hardened centerlines may be installed using products with mountable heights to allow vehicles with larger turn radii to proceed unobstructed through intersections with this treatment.
- » While no maximum posted speed limit has been established for the use of hardened centerlines, operating speed for the intersection can be considered during implementation.
- » Where opposing concurrent left turn movements are present, perform an AutoTurn analysis to ensure that resulting turning paths do not conflict. Larger design vehicles may encroach on centerline treatments in some scenarios.

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APPLICATIONS

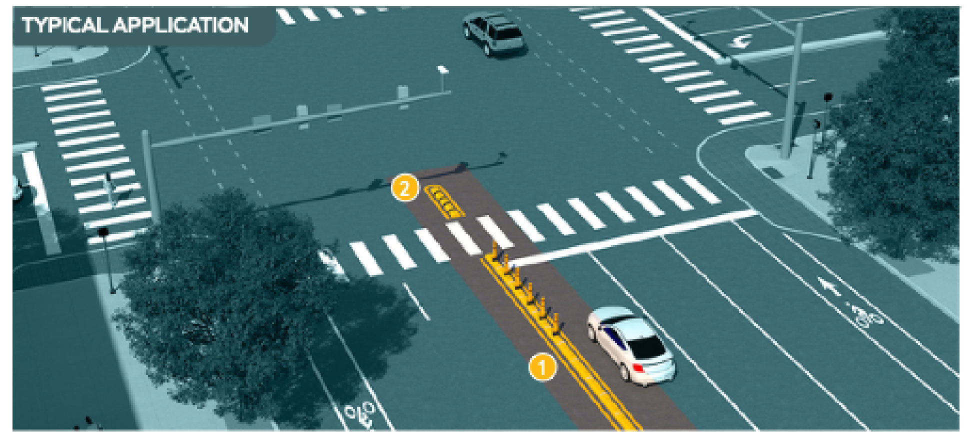
1. The hardened centerline up to the stop line may consist of cast-in-place curbing materials such as concrete, but may also be installed using temporary or "quick-build" curbing materials such as rubber curbs or flexible delineators. Striping the border of the hardened curb or installing flexible delineators will increase the visibility of the treatment. A physical median is preferred, however it is *not* required for use of centerline hardening.

2. An additional centerline treatment is preferred to extend beyond the crosswalk and into the intersection, to provide a greater safety benefit by further slowing left-turning vehicles. Similar to the hardened centerline up to the stop line, this treatment may be constructed with cast-in-place curbing materials or "quick-build" materials as appropriate. Striping around the curbing material will increase visibility.

COMPLEMENTARY COUNTERMEASURES

- » Continental-style crosswalks
- » Lead Pedestrian Interval (LPI) phasing
- » TURNING TRAFFIC YIELD TO PEDESTRIANS (R10-15) signage
- » In-street pedestrian warning signs
- » Median pedestrian refuge islands

TYPICAL APPLICATION



REFERENCES

- » NYCDOT Turn Calming Program
- » National Cooperative Highway Research Program (NCHRP) Research Report 926
- » Insurance Institute for Highway Safety (IIHS), "Simple infrastructure changes make left turns safer for pedestrians"

12

IN-LANE FLOATING BUS STOPS

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
Rural

DEFINITION AND DESCRIPTION

An in-lane floating bus stop consists of a raised platform that allows buses to pick up passengers without pulling out of traffic lanes. Bike facilities such as bike lanes are diverted behind the bus stop amenities. This configuration allows transit vehicles to stay in their own lane without crossing the bike paths, and gives cyclists added protection from vehicular traffic at the bus stop.

Benefits to an in-lane floating bus stop include:

» Where transit vehicles stop in the travel lane, dwell times can be reduced, which improves reliability. Enhanced reliability can increase transit usage and reduce overall roadway congestion.

» Eliminate bus-bike conflicts at stops where buses merge across or into bike travel path at stops, causing bikes to merge into general traffic to pass the stopped bus, only to be passed again as the bus accelerates.

» Islands provide more space for transit passengers and amenities while maintaining a clear pedestrian path on the sidewalk.

EXAMPLE

2nd Ave, Silver Spring, MD

CONSIDERATIONS

» Streets with moderate to high transit frequency, transit ridership, pedestrian volume, or bicycling volume can utilize boarding islands to maintain in-lane stops and provide separation to more users.

» Island stops must maintain continuity of the bike lanes if bike facilities exist.

» Platforms can be configured for level or near-level boarding.

» If sidewalk width permits, boarding islands may be applied to streets with curbside transit operations and a bike facility.

» Boarding islands usually require less complex drainage modifications than boarding bulbs.

» Proper markings and signing can be provided at pedestrian-bike conflict points. Bike approaches can be required to yield right-of-way to pedestrians where crossings are provided.

» Grading in the boarding island and bike lane must ensure positive drainage into the roadway to prevent pooling and sediment from settling in the bike facility.

» Bus stops near closely spaced driveways or other vehicular access points are not candidate locations for floating bus stops.

» Special considerations are required for in-lane floating bus stops located at signalized intersections, including bike and pedestrian signal controls.

» It is not preferred for an uncontrolled bike or pedestrian movement to cross a signal-controlled bike or pedestrian movement.

» Boarding islands must be designed to permit accessible boarding.

» Detectable warning surfaces must be placed on both sides of every crossing over the bike lane.

» Americans with Disabilities Act (ADA) requirements must be met.

» Railings can help reduce pedestrian-bike conflict points.

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APPLICATIONS

It is preferred that in-lane floating bus stops include proper bus stop signage located at every stop in the network, marking where passengers can stand to wait and where the bus operator should stop, with supplemental curb restriction signs as needed. Transit signing, shelters and other amenities should follow Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) or relevant transit agency guidance. The curbed island must meet ADA requirements.

1 A minimum 5-ft x 8-ft level landing is required for boarding and alighting.

2 An accessible route is required from the sidewalk to the boarding and alighting area, ADA-compliant ramps, if grade changes are required.

3 The bike path are preferred to be clearly marked with the appropriate bike facility pavement markings and signs.

4 Where a pedestrian path crosses the bike facility, crosswalk markings and yield lines are preferred.

5 Railings may be installed along the bike lane curb line, as determined by the transit agency.

COMPLEMENTARY COUNTERMEASURES

» Continental (Longitudinal Bar) crosswalks

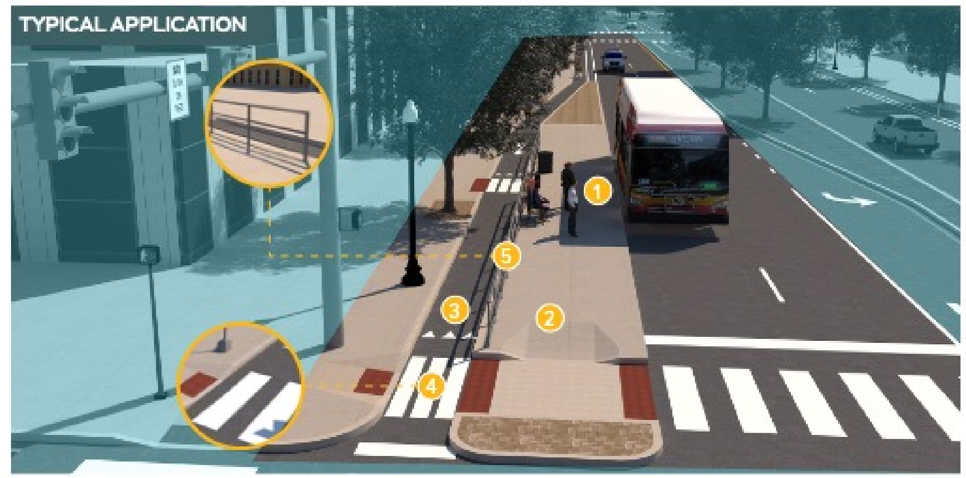
» Raised crosswalks

» Green pavement markings

» Protected phasing (bike signal phases)

» Separated Bike Lane

TYPICAL APPLICATION



REFERENCES

» National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide

» NACTO Transit Streets Design Guide

14

LANE WIDTH REDUCTION

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
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DEFINITION AND DESCRIPTION

Where safety and speeding concerns are identified, or where travel lanes are wide or not defined with markings, a lane width reduction or "lane diet" may be used to reallocate road space. Lane width reductions often occur during a resurfacing or roadway improvement project, and may include re-purposing of additional paved space with markings, or by physically removing unused paved areas.

Lane diets provide multiple benefits, including encouraging reduced vehicle operating speeds in denser context environments, reducing crossing distances for pedestrians to decrease exposure to motor vehicle traffic, allowing for compact intersection geometry that facilitates shorter signal cycles, reducing paved surfaces to decrease stormwater impacts, and reallocating roadway space for other uses. American Association of State Highway and Transportation Officials (AASHTO) outlines minimum and recommended lane widths that vary, depending on the roadway classification, with additional consideration of surrounding land uses and community context.

CONSIDERATIONS

» Lane widths of 10 feet may be appropriate in urban areas and have a positive impact on a street's safety without impacting traffic operations.

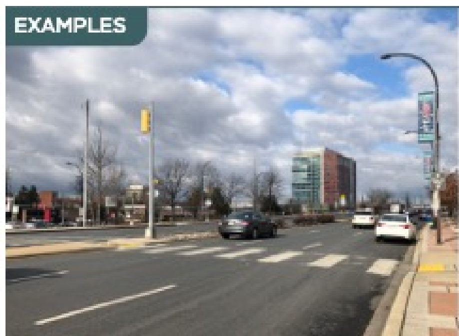
» Along truck and bus routes, 11 foot lanes may be necessary to accommodate larger vehicles. On multi-lane roads, a wider outside lane is often provided. Identification of transit vehicles and truck classifications along the segment may be needed to determine the appropriate minimums.

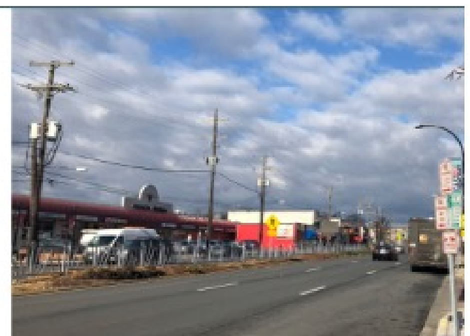
» Additional lane width may be necessary to accommodate turning movements, or along tight curves.

» Lane width reductions cannot be considered along expressways or freeways, except for work zone activities.

» Lane width reductions must properly transition to existing lane widths at the limits of the improved segment.

EXAMPLES


Georgia Ave, Wheaton, MD


Georgia Ave, Wheaton, MD

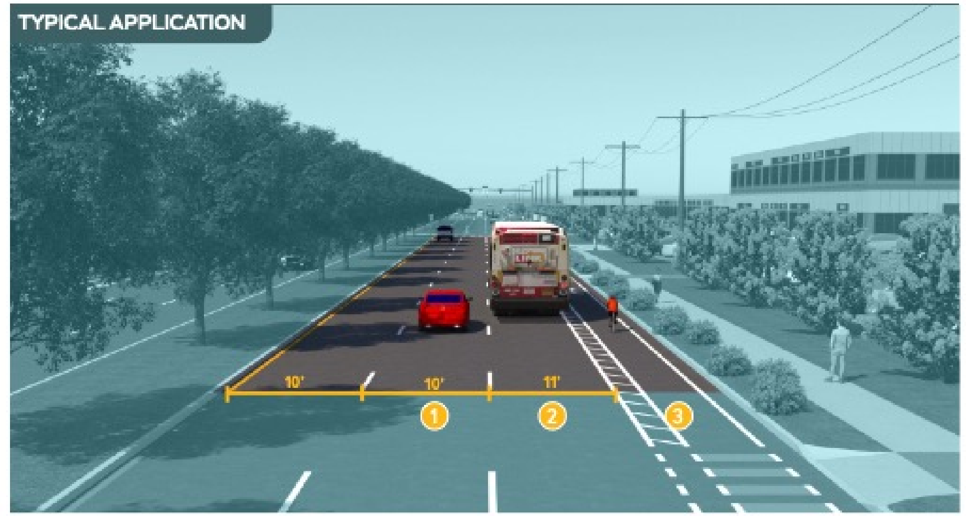
APPLICATIONS

1. 10-foot lane widths may be desirable to encourage reduced speeds and enhance safety.
2. 11-foot lanes may be desired by transit agencies, or required for corridors with high volumes of buses and heavy vehicles.
3. Additional paved areas that are not designated for vehicular use may be marked as shoulders, bike lanes, painted buffers, parking lanes, or removed to accommodate construction of other roadside facilities.

COMPLEMENTARY COUNTERMEASURES

» Posted speed limit reduction
» Road diet
» Barrier-separated or buffered bike lanes
» Curb extensions

TYPICAL APPLICATION



REFERENCES

» American Association of State Highway Transportation Officials (AASHTO) Green Book - A Policy on Geometric Design of Highways and Streets

» National Association of City Transportation Officials (NACTO) Urban Street Design Guide – Lane Width

» Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)

LEADING PEDESTRIAN INTERVALS

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
Rural

DEFINITION AND DESCRIPTION

A leading pedestrian interval (LPI) is the presence of a pedestrian phase prior to any vehicular phase when crossing at a signalized intersection. The interval allows the pedestrian the opportunity to enter an intersection 4 to 7 seconds (7 seconds preferred) before any vehicles are given a green signal indication. This extra time provides pedestrians with an opportunity to establish their presence in the crosswalk before motorists start turning and provides additional crossing time for those who need it. This head start increases the percentage of motorists who yield the right-of-way to pedestrians and can reduce conflicts between pedestrians crossing a roadway and turning vehicles. Consideration will be given to balancing vehicle capacity at each location where the treatments are being considered.

Additional benefits of a LPI include:

» Increased visibility of crossing pedestrians.
» Enhanced safety for pedestrians who may be slower to start into the intersection.
» Provide prioritization to vulnerable road users.

LPIs can be provided automatically with each phase (passive) or be provided only when actuated (active).

EXAMPLE

Wayne Ave, Silver Spring, MD

CONSIDERATIONS

» At locations where driver yielding is observed to be low, a LPI can be considered to improve compliance.
» Crossings with low pedestrian volumes may result in drivers not expecting pedestrians at a given location.
» An LPI may be considered at all signalized intersections.
» An LPI can be considered where there are medium to high volumes of turning vehicles conflicting with high pedestrian volumes, and at locations with particularly high elderly populations, a history of pedestrian collisions involving turning vehicles, or at school crosswalks.
» An LPI duration may be extended, if desired, or an exclusive pedestrian walk phase may be considered instead of an LPI.
» Pedestrian crossings providing LPI can operate on pedestrian recall.
» Where pedestrian volumes are so high that motorists are unable to turn across the crosswalk, an exclusive turn phase can be considered.
» Conflicting right-turn movements may be restricted with a No Turn on Red.
» Left turning traffic can use Protected phasing, or approaches phasing can be split to avoid potential confusion caused by permissive left turn phasing. A LPI with protected-permissive turn phasing should be avoided.

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APPLICATIONS

1. The LPI can consist of a 4 to 7 second Walk phase (4 second minimum) prior to the corresponding parallel vehicular phase. The LPI phase may be on pedestrian recall or actuated.
2. Turn on red restrictions may be installed to ensure leading pedestrian movements are protected and provide vulnerable road users to establish their presence in the crosswalk.
3. TURNING VEHICLES YIELD TO PEDESTRIANS (R10-15) sign may be provided to reinforce pedestrian priority in the crosswalk.

COMPLEMENTARY COUNTERMEASURES

» Continental (Longitudinal Bar) crosswalks
» Protected left-turn phasing
» Right turn on red restrictions
» Hardened centerlines
» Curb extensions
» Lighting

TYPICAL APPLICATION

REFERENCES

» National Cooperative Highway Research Program (NCHRP) Research Report 926
» National Association of City Transportation Officials (NACTO) Urban Street Design Guide
» PEDSAFE - Pedestrian Safety Guide and Countermeasure Selection System
» Federal Highway Administration (FHWA) Proven Safety Countermeasures

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MIDBLOCK CROSSWALKS

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DEFINITION AND DESCRIPTION

Midblock Crosswalks designate appropriate locations for pedestrians to cross a road at non-intersection locations, and include appropriate traffic control devices to manage conflicts and improve safety. These facilities may be provided where significant pedestrian generators are located on opposite sides of a road, or where a pedestrian or bike path is located away from intersections, like a regional trail. Frequent applications include midblock bus stops, metro stations, parks, plazas, or entrances to key destinations.

The location and placement of midblock crosswalks are subject to a variety of factors, including context, intersection spacing, roadway width, traffic volume and speed, stopping sight distance, presence of pedestrian generators, and reported safety concerns. Because midblock crosswalks are located away from intersections, where motorists traditionally expect to encounter pedestrians crossing the road, design of the crosswalk must include appropriate traffic control features. Where conflicts are uncontrolled, the design must allow drivers to recognize potential conflicts, and stop for pedestrians in or entering the crosswalk.

CONSIDERATIONS

» Midblock crosswalks can be provided where there is evidence of a pedestrian desire line, including pedestrian generators, trails, or observed road user behaviors, and where diversion to other crosswalks is unlikely.

» Midblock crosswalks can include complimentary countermeasures that address traffic characteristics, and increase potential driver compliance.

» Where crosswalks are provided across multi-lane approaches, additional traffic controls are necessary to make the crossing location and pedestrians in the crosswalk more visible to approaching drivers.

» Midblock crosswalks can be located outside of the influence of nearby intersections.

» Roadway lighting may be provided at the crossing location. The lighting designer should ensure the ramps are illuminated as well as the roadway crossing itself.

» Americans with Disabilities Act (ADA)-complaint ramps are required.

EXAMPLES

Colesville Road, Silver Spring, MD

Bethesda Avenue, Bethesda, MD

APPLICATIONS

1. Continental (Longitudinal Bar) crosswalk markings improve driver recognition that a crosswalk is present, and must be provided at all uncontrolled midblock crosswalk locations. These markings may be appropriate for controlled midblock crosswalks, and often meet other Maryland Department of Transportation State Highway Administration (MDOT SHA) criteria for use of high-visibility crosswalks, such as trail crossings or school crossings.

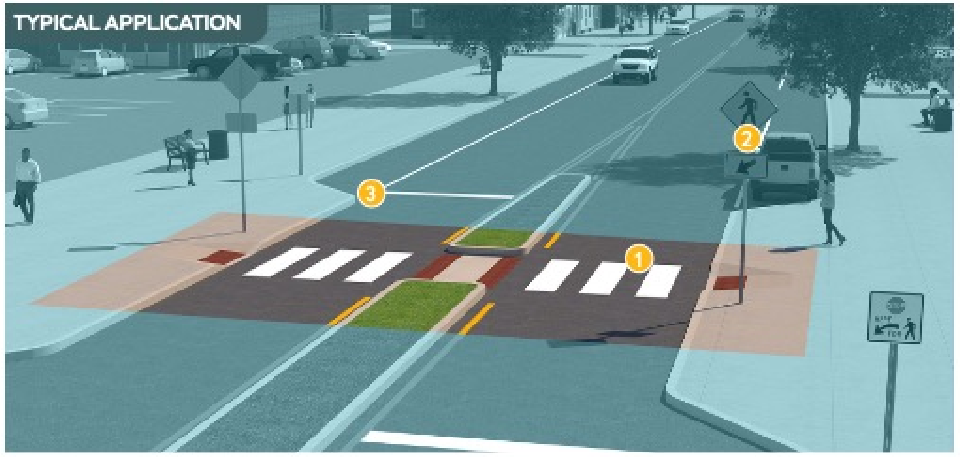
2. Appropriate warning sign assemblies and in-road pedestrian crosswalk signs may be provided. Actuated traffic control devices like Pedestrian Hybrid Beacon (PHB) or Rectangular Rapid-Flashing Beacon (RRFB) are appropriate for crosswalks on higher speed or volume roads.

3. Advance stop lines and STOP HERE FOR PEDESTRIANS (R1-5b or R1-6a(3)) signs may be provided to increase visibility of pedestrians in the crosswalk.

COMPLEMENTARY COUNTERMEASURES

» Continental (Longitudinal Bar) crosswalk markings
» PHB or RRFB
» Curb extensions
» Raised crosswalk
» Median pedestrian refuge islands
» In-street pedestrian crossing signs

TYPICAL APPLICATION



REFERENCES

» MDOT SHA Accessibility Policy & Guidelines for Pedestrian Facilities along State Highways

» National Cooperative Highway Research Program (NCHRP) Research Report 926

» Federal Highway Safety Administration (FHWA) Safety for Every Pedestrian (STEP) Resources

NO TURN ON RED

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
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DEFINITION AND DESCRIPTION

A No Turn On Red (NTOR) restriction is designated by a posted NO TURN ON RED (R10-11b) sign at the signalized intersection for any approach where the restriction may improve safety. The purpose of this treatment is to eliminate conflicts between turning vehicles and pedestrians or bicyclists during a concurrent walk (or bike signal) phase, and to mitigate sight line restrictions.

EXAMPLES


Reisterstown Road, Pikesville, MD


Annapolis Road, Baltimore, MD


MD 97 at Forest Glen Rd, Silver Spring, MD

CONSIDERATIONS

- Intersections with exclusive pedestrian phases, leading pedestrian intervals, bike boxes or left-turn queue boxes may need restrictions to avoid conflicts with pedestrians or bicyclists.
- School crossings are appropriate locations to restrict turns on red to improve student safety.
- Turns across two-way separated bike lanes may be restricted due to increased complexity of conflicting movements.
- Part-time NTOR restrictions may be appropriate during the busiest times of the day.
- It is preferred for signs to be clearly visible to turning motorists and positioned near the signal face associated with the turning movement.
- Restricting turning movements to provide enhanced vulnerable road user safety may result in reduced vehicular capacity.
- Implementation of NTOR requires a Memorandum of Agreement (MOA) with the enforcing jurisdiction.

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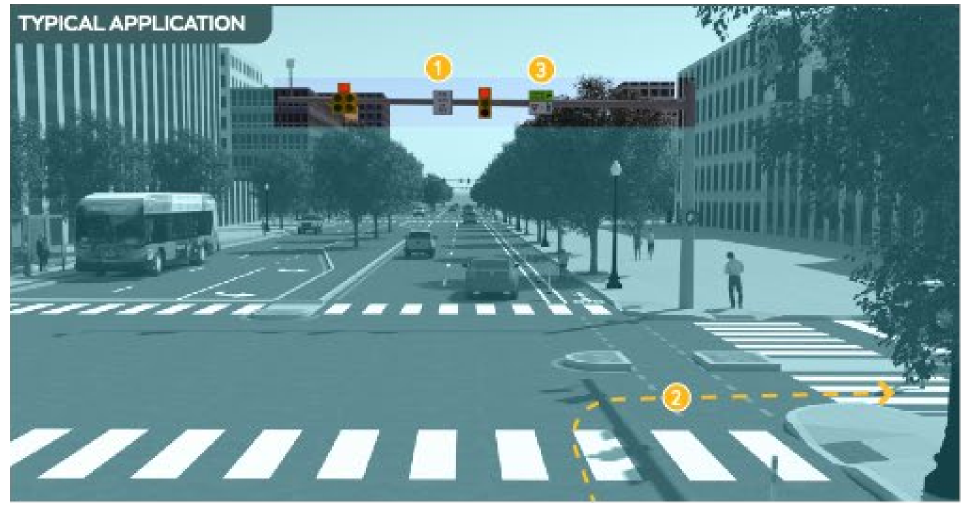
APPLICATIONS

1. A NO TURN ON RED (R10-11b) sign is preferred to be positioned overhead and close to the signal face associated with the turning movement. Alternative sign locations must be clearly visible from the approach, preferably on the far side of the intersection.
2. Geometric features that reinforce the turn restriction are preferred, including compact approach geometry that considers the appropriate design vehicle.
3. Additional signing and/or pavement markings that emphasize conflicting pedestrian or bike traffic may be used to reinforce the purpose of the restriction.

COMPLEMENTARY COUNTERMEASURES

- Leading pedestrian intervals
- Exclusive pedestrian phase
- Buffered or barrier-separated bike lanes
- Protected intersections

TYPICAL APPLICATION



REFERENCES

- National Cooperative Highway Research Program (NCHRP) Research Report 926
- Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)
- Bicycle Safety Guide and Countermeasure Selection System (BIKESAFE)
- Highway Safety Manual 1st Ed. 2010

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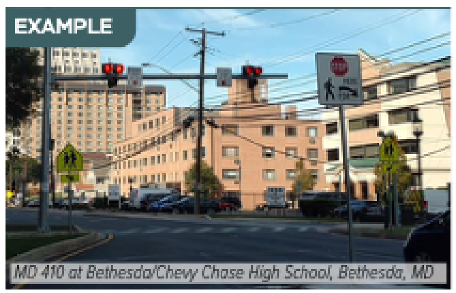
PEDESTRIAN HYBRID BEACON

DEFINITION AND DESCRIPTION

Pedestrian Hybrid Beacons (PHBs), also called the High-intensity activated crosswalk (HAWK), are traffic control devices that are installed at crossings of major streets that provide a controlled opportunity for pedestrians to cross the street. The beacon is different from a conventional traffic signal because it includes a three-section triangular signal display, with two red signal faces side-by-side, above a yellow signal face below and centered between the red signals. It also remains "dark" until a pedestrian that desires to cross the street is detected. The signal activates with an initial yellow to red lighting sequence that directs motorists to slow and come to a stop. The pedestrian signal then displays WALK to allow the pedestrian to begin their crossing. At conclusion of the WALK interval, the red signals begin flashing in an alternating wig-wag pattern, and the pedestrian signal displays Flashing Don't Walk, and upraised hand symbols for the pedestrian clearance interval. During this time, drivers are permitted to treat the beacon under a stop-and-go operation, yielding to any pedestrians in the crosswalk, or proceeding if the crosswalk is clear. After the pedestrian clearance is complete , the hybrid beacon reverts to a dark display.

A 2010 FHWA study found that PHBs can reduce pedestrian crashes by 69% and all crashes by 29%. PHBs were granted interim approval for use by SHA on November 1, 2017.

EXAMPLE


MD 410 at Bethesda/Chevy Chase High School, Bethesda, MD

CONSIDERATIONS

- PHBs may be appropriate where traffic signals are unwarranted.
- PHBs may be used at intersection or midblock locations.
- At midblock crossing locations where posted speed limits are equal to or greater than 40 MPH, PHBs may be strongly considered.
- PHBs are beneficial at uncontrolled locations with safety concerns or high frequency of pedestrian crashes, long pedestrian delay due to few available gaps in traffic, and near schools, parks, and senior centers.
- The preferred design is to place the beacon over or near the crosswalk. This configuration increases distance between the stop line and crosswalk, increasing visibility of crosswalk users and potential for driver compliance.
- PHBs may be placed outside of the functional area of signalized intersections.
- Some cities use PHBs along heavily used bike routes to help bicyclists cross major streets.
- Research indicates that PHBs are most effective at roads with three or more lanes with Average Annual Daily Traffic (AADTs) above 9,000.
- Rectangular Rapid Flashing Beacons (RRFB) cannot be installed with PHBs.
- PHBs are preferred to operate free, calling a phase promptly after being actuated by a pedestrian, rather than as part of a systemized corridor to limit pedestrian delay and provide greater compliance from all road users.
- Americans with Disabilities Act (ADA)-compliant facilities, including ramps and Accessible Pedestrian Signals (APS)/ Countdown Pedestrian Signals (CPS) are required with all PHB installations.
- Median widths over 16 feet may need to evaluate APS/CPS placement in the median if a pedestrian refuge is provided.

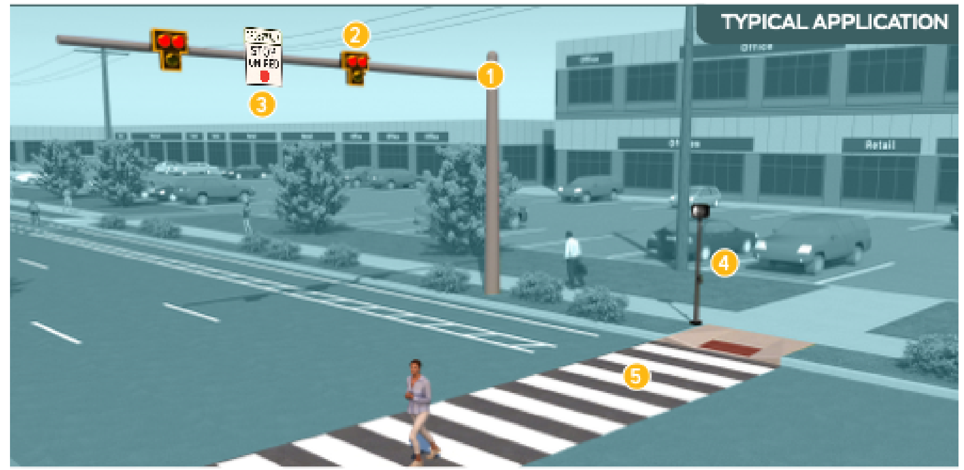
APPLICATIONS

1. PHB installations are to include overhead signal displays mounted on mast arms.
2. Per Chapter 4F of Maryland Manual on Uniform Traffic Control Devices (MdMUTCD), signal displays are a three-section assembly, with a circular yellow centered below two horizontally aligned circular red indications. At least two signal displays are required for each approach.
3. CROSSWALK, STOP ON RED (R10-23) or STOP ON RED-PROCEED ON FLASHING RED WHEN CLEAR (R10-23a) sign is required for each approach.
4. APS detection is required to activate the beacon. CPS may be located on a mast arm pole upright or pedestal post.
5. Provide continental crosswalk markings.

PHB installations require stop lines for each approach. For midblock applications, it is preferred that advance stop lines be placed at least 20 feet in advance of the crosswalk, 40 feet in advance of the signal displays, and be supplemented with STOP HERE ON RED (R10-6a) signs.

COMPLEMENTARY COUNTERMEASURES

- Continental (Longitudinal Bar) crosswalks
- Curb extensions
- Reduced lane widths
- Median pedestrian refuge islands
- Driver education



REFERENCES

- National Cooperative Highway Research Program (NCHRP) Research Report 926
- Federal Highway Administration (FHWA) Proven Countermeasures
- FHWA Safety for Every Pedestrian (STEP) Guide

POSTED SPEED LIMIT REDUCTION

Urban Core
Urban Center
Traditional Town Center
Suburban Activity Center
Suburban
Rural

DEFINITION AND DESCRIPTION

Posted speed limits notify drivers of the maximum safe speed, established either by statute or through an engineering study to establish a speed zone, based on a variety of operational, safety and roadside factors. On roadways with observed safety challenges, where reducing operating speeds would reduce the frequency of collisions, and reduce the severity of collisions that do occur, a posted speed limit reduction may be utilized to improve safety.

The Insurance Institute for Highway Safety (IIHS) examined long-term changes associated with statewide maximum posted speed limit changes between 1993 and 2017. They determined that a 5 MPH increase in the maximum posted state speed limit was associated with an 8% increase in roadway fatalities on interstates and freeways and a 3% increase on other roads.

In denser context areas, a reduction in the posted speed limit may have a significant impact on safety for more vulnerable users, including pedestrians and bicyclists. Higher operating speeds reduce a driver's ability to react when they encounter these users in the road, and result in higher severity outcomes when collisions occur.

As part of the proactive treatments aimed at increasing safety for vulnerable road users, Maryland Department of Transportation State Highway Administration (MDOT SHA) has the option, particularly within the highlighted context zones, to consider posted speed limit reductions if speed is identified as a factor in pedestrian- or cyclist-related crashes along a corridor. Posted speed limit reductions require study as part of the application, but engineering judgment may be used to identify safety concerns and potential geometric modifications to complement the reduction in posted speed limit.

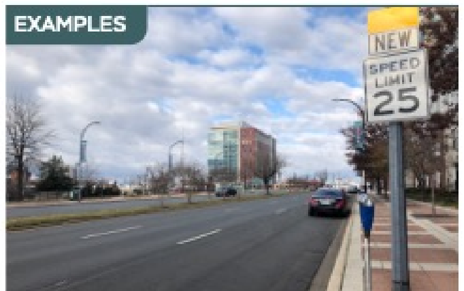
CONSIDERATIONS

» Posted speed limit reductions may be reinforced with other roadway design elements that are self-enforcing and encourage motorists to travel at or below the target speed (operating speed that the designer intends for drivers to use) to maximize the safety benefit.

» If incorporating the necessary roadway design elements to achieve the desired target speed is cost prohibitive, automated speed enforcement may be considered. Applicable environments for automated speed enforcement are established by state statute, and may not be permitted on all roadways.

» Changes to posted speed limits may require documentation in the form of a Memorandum of Agreement or Memorandum of Understanding with the local jurisdiction.

EXAMPLES



Georgia Ave, Wheaton, MD

25

APPLICATIONS

SPEED LIMIT (R2-1) signs are posted at the point where the reduced posted speed limit begins. Post signs on both sides of the travelway where a median is present.

New posted speed limit sign assemblies may be supplemented with NEW (W16-14(1)) plaques for a period of 30 to 90 days to notify drivers of the change.

Driver education using variable message boards can be considered, prior to enacting the posted speed limit reduction and during the initial 30 to 90 day period.

According to the Maryland Manual on Uniform Traffic Control Devices (MdMUTCD), REDUCED SPEED LIMIT AHEAD (W3-5) signs are to be posted approaching the segment of road where the posted speed limit has been reduced by more than 10 MPH. Within a reduced speed zone along a State, arterial or major highway, a second SPEED LIMIT (R2-1) should be placed within 800 feet beyond the first sign for lower speeds (35 mph or less) or within 1500 feet for higher speeds (40mph and higher).

COMPLEMENTARY COUNTERMEASURES

» Automated Enforcement
» Lane width reduction
» Road diet
» Raised Crosswalks
» Reduced curb radii

TYPICAL APPLICATION

REFERENCES

» National Cooperative Highway Research Program (NCHRP) Research Report 926
» National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide
» Federal Highway Administration (FHWA) Speed Management Safety Initiative
» National Conference of State Legislatures - Transportation Review - Speeding and Speed Limits

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PROTECTED INTERSECTIONS

DEFINITION AND DESCRIPTION

A protected intersection maintains physical separation between vehicular and bicyclist movements through an intersection. A corner protection island, forward queuing area, and recessed bike and pedestrian crossings reduces vehicular turning speeds, increases visibility of bicyclists or pedestrians crossing the street, and provides space to yield while vulnerable users clear the intersection. This treatment is most effective at locations with high volumes of bicyclists and motorists, or medium to high volumes of bicyclists, motorists, and pedestrians. Protected intersections are a preferred treatment for separated bike lanes in an urban context. At signalized intersections, signal timing may provide leading or protected phasing to further reduce potential conflicts.

EXAMPLES


Spring Street, Silver Spring, MD


Spring Street, Silver Spring, MD


Spring Street, Silver Spring, MD

CONSIDERATIONS

» Mountable truck aprons can reduce turning speeds for passenger vehicles while accommodating the off-tracking of larger vehicles where a larger corner radius is necessary.

» Use clear markings and signs to direct users.

» Protected intersections may require greater clear space along the intersection approach than conventional intersections to improve drivers visibility and recognition of bicyclists when approaching the intersection.

» Americans with Disabilities Act (ADA) compliance and Accessible Pedestrian Signals (APS) guidelines will require detailed design to ensure accessibility criteria can be achieved.

» It is preferred that rights-of-way at pedestrian-bike conflict points are clearly defined and reinforced with proper traffic control devices and signal phasing. Yield-controlled crossings cannot conflict with a signal-controlled crossing.

» Bike detection is required, except where the bike approach is served by a recall phase.

» On-street parking restrictions may be established to provide adequate sight lines.

» No Turn on Red restrictions are recommended.

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APPLICATIONS

1. Corner Islands may consist of curb, or paint and vertical separation material like flex posts. Curb radii can be minimized to encourage slow turning speeds. Mountable truck aprons may be used to accommodate infrequent larger design vehicles, but still promote safe turning behaviors by smaller passenger vehicles.

2. It is desirable for approaches to the protected intersection to include a clear space of 40 to 60 feet in the buffer to provide a clear view of approaching bicyclists to turning motorists.

3. Green-colored pavement may be used to designate the bike lane within the intersection. Green conflict zone markings can be provided through the intersection to further emphasize the conflict between turning motorists and through bicyclists.

4. No Turn on Red restrictions can reduce potential conflicts. Where 2-way bike lanes are provided, the restriction is required.

5. Continental crosswalks are preferred where pedestrian paths cross bike facilities.

Bike signal indications may be used where phase separation eliminates motor vehicle conflicts or where extra emphasis on bike priority is desired. If bike signal indications are not provided, it may be appropriate to use signing to direct bicyclists to use pedestrian signals.

COMPLEMENTARY COUNTERMEASURES

» Bike lanes/barrier-separated bike lanes
» Leading Pedestrian Interval (LPI)
» Protected phasing (bike signal phasing)
» Green-colored pavement
» Median pedestrian refuge islands
» Continental (Longitudinal Bar) crosswalk markings
» No Turn on Red restrictions

TYPICAL APPLICATION

REFERENCES

» National Cooperative Highway Research Program (NCHRP) Research Report 926

» Federal Highway Administration (FHWA) Separated Bike Lane Planning and Design Guide

» National Association of City Transportation Officials (NACTO) Don't Give Up at the Intersection Guide

» FHWA MUTCD - Interim Approval for Optional Use of a Bicycle Signal Face (IA-16)

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RECTANGULAR RAPID FLASHING BEACON

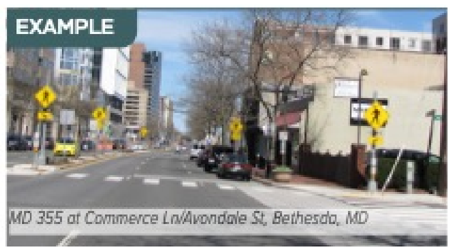
DEFINITION AND DESCRIPTION

Rectangular Rapid Flashing Beacons (RRFBs) are a pedestrian-actuated visual enhancement device, used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled marked crosswalks. The RRFBs are placed on both sides of an uncontrolled crosswalk supplementing an applicable warning sign. The beacons differ from standard flashing beacons because the device utilizes a rapid flash frequency (approximately 75 flashing sequences per minute), and brighter light intensity display. RRFBs can be activated by passive or pedestrian-actuated detection.

RRFBs have been shown to significantly increase motorist compliance at uncontrolled crosswalks, with motorist compliance rates ranging from 34% to over 90%. Similar benefits would be expected for bicyclists in crosswalks serving shared-use facilities.

Federal Highway Administration (FHWA) granted interim approval to RRFBs for optional use in limited circumstances in March 2018 in accordance with *Interim Approval for Optional Use of Pedestrian-Actuated Rectangular Rapid-Flashing Beacons at Uncontrolled Marked Crosswalks (IA-21)*. The interim approval allows for usage as a pedestrian-actuated visibility enhancement to supplement standard pedestrian crossing signs, school crossing signs, or combination bicycle and pedestrian crossing signs at uncontrolled marked crosswalks.

EXAMPLE



MD 355 at Commerce Ln/Avondale St, Bethesda, MD

CONSIDERATIONS

- RRFBs are most effective along roadways with low-to-medium vehicle volumes, and at roadways with posted speeds less than 40 MPH.
- The crosswalk approach may not be controlled by a YIELD sign, STOP sign, or traffic control signal.
- RRFBs may be used to supplement crossings of a roundabout.
- RRFBs are appropriate for two-lane streets. Careful consideration must be given to installation on multi-lane roadways to avoid multiple-threat crash risk.
- If multiple RRFBs are needed in close proximity, consider redesigning the roadway to address systemic safety challenges.
- If sight distance is a concern, IA-21 permits installation of supplemental advanced RRFB assemblies to provide upstream warning. However, other treatments may be more appropriate.
- An RRFB can be installed in the median rather than the far side of the roadway if there is a pedestrian refuge or other type of median.
- Advance stop line pavement markings and signs may be used to supplement RRFBs.
- Solar equipped RRFB units can be used to eliminate the need for a wired power source.
- Americans with Disabilities Act (ADA)-compliant ramps and Accessible Pedestrian Signals (APS) pushbuttons are required.
- RRFB units are typically installed supplementing ground-mounted sign assemblies on pedestal poles with breakaway bases, but may be installed in overhead mast arm mounted applications for specific site constraint conditions.

APPLICATIONS

All RRFB installations must comply with the requirements of FHWA IA-21.

1. A RRFB consists of two rapidly flashed rectangular-shaped yellow indications with an LED-array-based light source. RRFB units must supplement a PEDESTRIAN (W11-2), SCHOOL (S1-1), or COMBINATION BIKE AND PEDESTRIAN CROSSING (W11-15) sign, which may be mounted overhead, or post-mounted with a supplemental diagonal downward arrow.
2. Post-mounted RRFB units are required on both the right and left sides of the travelway. For median-divided roadways, place the left side unit in the median, or if the median width is insufficient, the device may be placed on the left side of the road.
3. APS pushbuttons are required for pedestrian detection.

COMPLEMENTARY COUNTERMEASURES

- Continental (Longitudinal Bar) crosswalks
- Raised crosswalk
- Curb extensions
- In-street pedestrian warning signs
- Median pedestrian refuge islands
- Reduced lane widths

TYPICAL APPLICATION

REFERENCES

- FHWA Manual on Uniform Traffic Control Devices (MUTCD) - Interim Approval for Optional Use of Pedestrian-Actuated Rectangular Rapid-Flashing Beacons at Uncontrolled Marked Crosswalks (IA-21)
- Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)
- National Cooperative Highway Research Program (NCHRP) Research Report 926
- FHWA Safety for Every Pedestrian (STEP) Guide

Appendix E Maryland DOT Context Frameworks

URBAN CORE

Considered the typical downtown or central business district area, the ***Urban Core*** context is defined by a high diversity of uses, including multi-family residential, office, retail, entertainment, civic, and cultural facilities. Development is high-density and includes high-rise structures with minimal setbacks, high street wall frontage, and minimal building gaps. Off-street parking is typically included. Because of its development density and diversity of uses, this land-use pattern generates a high proportion of non-motorized trips, including walking, transit, and bicycling. While the need for mobility through these areas does exist, it is far exceeded by the need for internal circulation within the context. The Urban Core represents less than 0.1% of the land area in the State.

Urban Core

In the Urban Core, multiple modes of transportation and a compact road network help travelers reach points of interest located throughout the area.

Locations in Maryland

- Baltimore
- Bethesda
- Friendship Village
- Rockville
- Silver Spring
- Towson
- Wheaton Triangle

SAMPLE SCENARIO COUNTERMEASURES

25-MPH SPEED LIMIT

(Maximum speed within this context) Decreasing speed limits to 25 mph significantly reduces the possibility of a pedestrian fatality[4]

PROTECTED INTERSECTION

Provides a higher degree of comfort and safety for bicyclists by keeping bicycles physically separated from motor vehicles at the intersection[5]

PROTECTED BICYCLE LANE

Has the lowest injury risk of all urban bicycle facilities[6]

LEADING PEDESTRIAN INTERVAL

Reduces pedestrian crashes by 60%[7] and can also provide prioritization to bicycles

FLOATING BUS STOP

Confers the highest priority to transit operations at most signalized intersections[8]

CONTINENTAL CROSSWALK STRIPING

(For all crosswalks in this context) Promotes the highest driver compliance and is the most visible of all crosswalk markings[9]

RIGHT-ON-RED RESTRICTION

Reduces right-turn injury crashes by 38%[10]

SAMPLE SCENARIO
SAFETY AND OPERATIONAL CHALLENGES

In an urban environment, pedestrian activity is high and destinations are frequent. Slowing traffic is key to providing a safe space for the most frequent users.

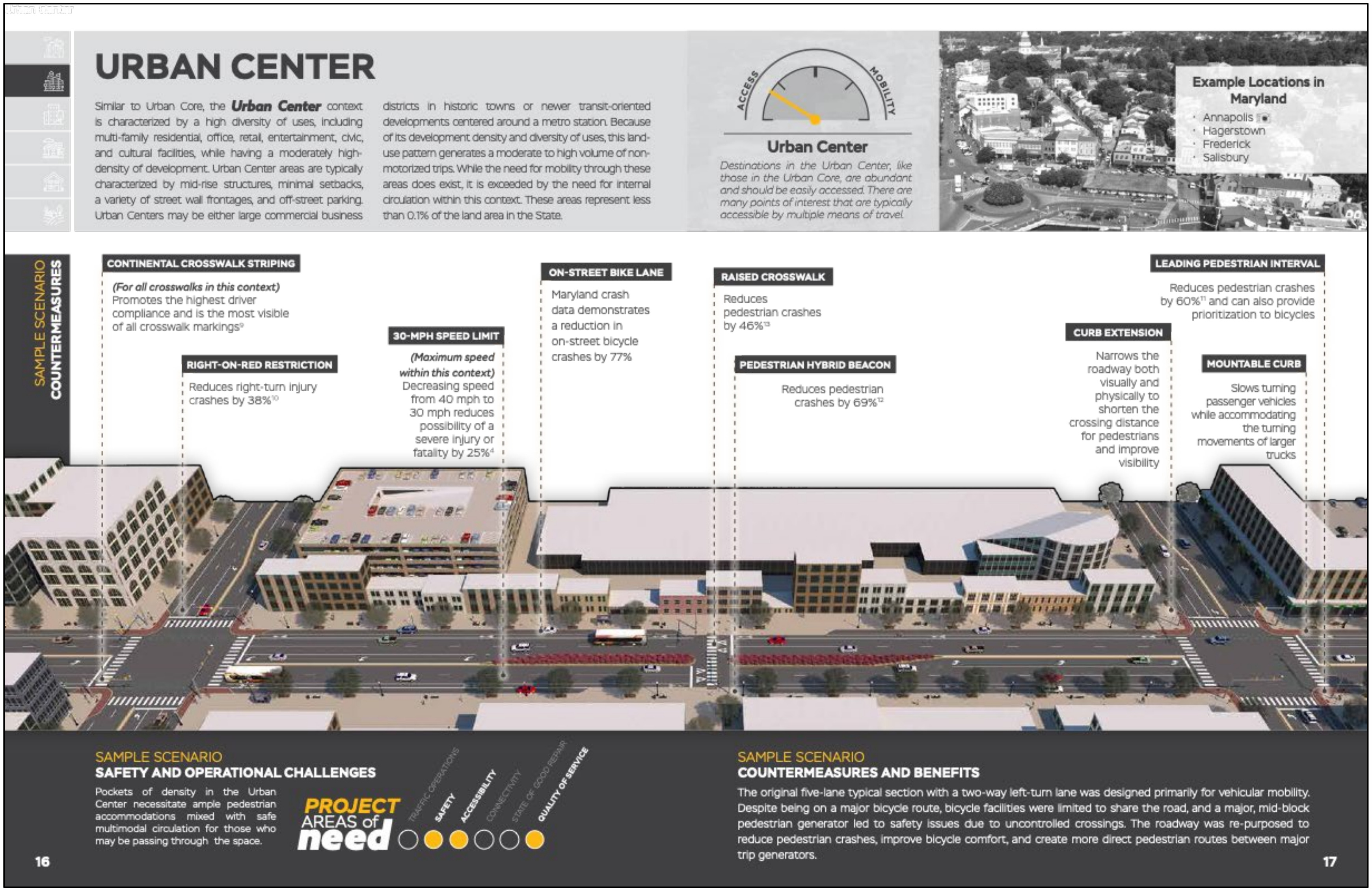
PROJECT AREAS of need

TRAFFIC OPERATIONS · SAFETY · ACCESSIBILITY · CONNECTIVITY · STATE OF GOOD REPAIR · QUALITY OF SERVICE

SAMPLE SCENARIO
COUNTERMEASURES AND BENEFITS

The six-lane undivided section with a center turn-lane resulted in both a high vehicular and pedestrian crash rate. Community members didn't feel comfortable crossing the street on foot or traveling to the metro station by bicycle. The roadway was reconstructed to reduce crashes, improve bicycle level of traffic stress (LTS), and create more direct pedestrian routes between major trip generators.

14 15



URBAN CENTER

Similar to Urban Core, the ***Urban Center*** context is characterized by a high diversity of uses, including multi-family residential, office, retail, entertainment, civic, and cultural facilities, while having a moderately high-density of development. Urban Center areas are typically characterized by mid-rise structures, minimal setbacks, a variety of street wall frontages, and off-street parking. Urban Centers may be either large commercial business districts in historic towns or newer transit-oriented developments centered around a metro station. Because of its development density and diversity of uses, this land-use pattern generates a moderate to high volume of non-motorized trips. While the need for mobility through these areas does exist, it is exceeded by the need for internal circulation within this context. These areas represent less than 0.1% of the land area in the State.

ACCESS MOBILITY

Urban Center

Destinations in the Urban Center, like those in the Urban Core, are abundant and should be easily accessed. There are many points of interest that are typically accessible by multiple means of travel.

Example Locations in Maryland

- Annapolis
- Hagerstown
- Frederick
- Salisbury

SAMPLE SCENARIO **COUNTERMEASURES**

CONTINENTAL CROSSWALK STRIPING

(For all crosswalks in this context) Promotes the highest driver compliance and is the most visible of all crosswalk markings[9]

RIGHT-ON-RED RESTRICTION

Reduces right-turn injury crashes by 38%[10]

30-MPH SPEED LIMIT

(Maximum speed within this context) Decreasing speed from 40 mph to 30 mph reduces possibility of a severe injury or fatality by 25%[4]

ON-STREET BIKE LANE

Maryland crash data demonstrates a reduction in on-street bicycle crashes by 77%

RAISED CROSSWALK

Reduces pedestrian crashes by 46%[13]

PEDESTRIAN HYBRID BEACON

Reduces pedestrian crashes by 69%[12]

CURB EXTENSION

Narrows the roadway both visually and physically to shorten the crossing distance for pedestrians and improve visibility

LEADING PEDESTRIAN INTERVAL

Reduces pedestrian crashes by 60%[11] and can also provide prioritization to bicycles

MOUNTABLE CURB

Slows turning passenger vehicles while accommodating the turning movements of larger trucks

SAMPLE SCENARIO
SAFETY AND OPERATIONAL CHALLENGES

Pockets of density in the Urban Center necessitate ample pedestrian accommodations mixed with safe multimodal circulation for those who may be passing through the space.

PROJECT AREAS of **need**

TRAFFIC OPERATIONS, **SAFETY**, **ACCESSIBILITY**, CONNECTIVITY, STATE OF GOOD REPAIR, **QUALITY OF SERVICE**

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SAMPLE SCENARIO
COUNTERMEASURES AND BENEFITS

The original five-lane typical section with a two-way left-turn lane was designed primarily for vehicular mobility. Despite being on a major bicycle route, bicycle facilities were limited to share the road, and a major, mid-block pedestrian generator led to safety issues due to uncontrolled crossings. The roadway was re-purposed to reduce pedestrian crashes, improve bicycle comfort, and create more direct pedestrian routes between major trip generators.

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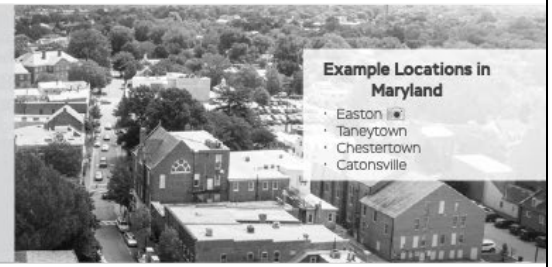
TRADITIONAL TOWN CENTER

While smaller and less dense than either of the urban contexts, the ***Traditional Town Center*** is characterized by a high diversity of uses, including residential, office, retail, civic, and cultural facilities. Structures are typically late 19th to early 20th century, mid- to low-rise and oriented toward the street with no setbacks. Parking is often provided on-street along the main thoroughfare, with additional parking at the rear of the building accessible by alleys or other minor streets. Typically laid out before the advent of the automobile, these areas often serve the dual purpose of accommodating both short trips in the areas surrounding the commercial corridor as well as longer pass-through trips. While the need for mobility through these areas exists, it is somewhat exceeded by the need for internal circulation within the context. This area constitutes roughly 1% of the land area in the State.

Traditional Town Center

The many points of interest in Traditional Town Centers are mostly clustered along historic Main Streets. These should be easily accessed while recognizing the role these corridors play in regional mobility.



Example Locations in Maryland

- Easton
- Taneytown
- Chestertown
- Catonsville

SAMPLE SCENARIO
COUNTERMEASURES

CURB EXTENSION

Narrows the roadway (both visually and physically) to shorten the crossing distance, improve visibility for pedestrians, and slow turning speeds

CONTINENTAL CROSSWALK STRIPING

(For all crosswalks in this context)
Promotes the highest driver compliance and is the most visible of all crosswalk markings[9]

RECTANGULAR RAPID-FLASHING BEACON (RRFB)

Increases vehicle yielding compliance from 18% to 81%[14] and can reduce pedestrian crashes by 47%[15]

MID-BLOCK CROSSING

Facilitates safer crossings to places people want to go but that are not well served by the existing traffic network[16]

PEDESTRIAN-SCALE LIGHTING

Lower than street lamps, pedestrian-scale fixtures cast light on the sidewalks

SAMPLE SCENARIO
SAFETY AND OPERATIONAL CHALLENGES

Complimentary land uses should have pedestrian connectivity in the Traditional Town Center while the roadway should be in a state of good repair to support multimodal travel.

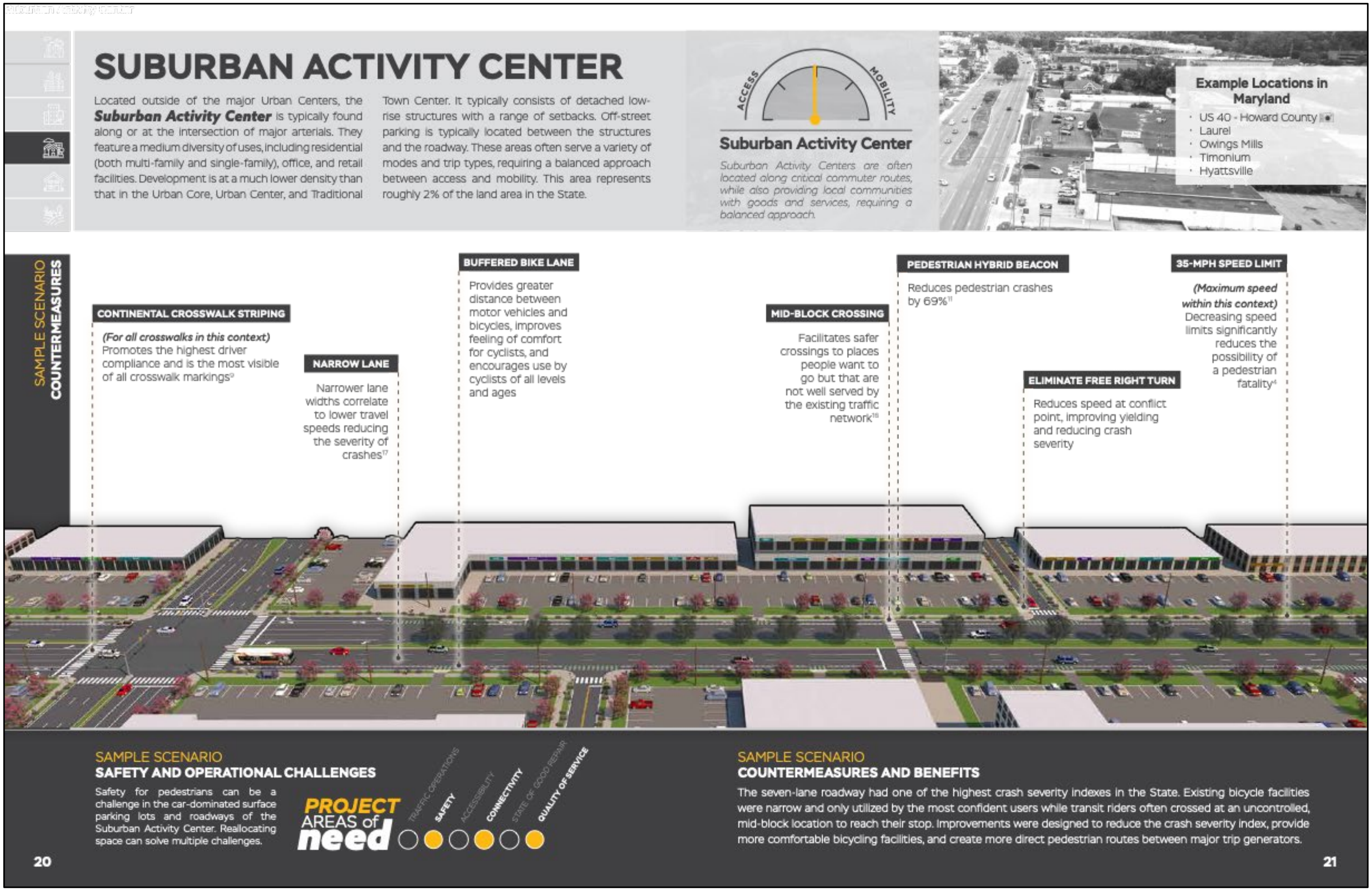
PROJECT AREAS of need

TRAFFIC OPERATIONS ● SAFETY ● ACCESSIBILITY ● CONNECTIVITY ● STATE OF GOOD REPAIR ● QUALITY OF SERVICE ○

SAMPLE SCENARIO
COUNTERMEASURES AND BENEFITS

The original two-lane typical section with a two-way left-turn lane was in a state of disrepair, largely due to underground drainage issues. Sidewalks were not ADA compliant and a new shopping center lacked pedestrian connectivity, causing both operational and safety issues. Countermeasures were applied to improve vehicular Level of Service (LOS), return fixed assets to a state of good repair, reduce crashes, and improve pedestrian connectivity between major generators.

18 19


SUBURBAN ACTIVITY CENTER

Located outside of the major Urban Centers, the ***Suburban Activity Center*** is typically found along or at the intersection of major arterials. They feature a medium diversity of uses, including residential (both multi-family and single-family), office, and retail facilities. Development is at a much lower density than that in the Urban Core, Urban Center, and Traditional Town Center. It typically consists of detached low-rise structures with a range of setbacks. Off-street parking is typically located between the structures and the roadway. These areas often serve a variety of modes and trip types, requiring a balanced approach between access and mobility. This area represents roughly 2% of the land area in the State.

Suburban Activity Center

Suburban Activity Centers are often located along critical commuter routes, while also providing local communities with goods and services, requiring a balanced approach.

Example Locations in Maryland

- US 40 - Howard County
- Laurel
- Owings Mills
- Timonium
- Hyattsville

SAMPLE SCENARIO
COUNTERMEASURES

CONTINENTAL CROSSWALK STRIPING
(For all crosswalks in this context) Promotes the highest driver compliance and is the most visible of all crosswalk markings[9]

NARROW LANE
Narrower lane widths correlate to lower travel speeds reducing the severity of crashes[17]

BUFFERED BIKE LANE
Provides greater distance between motor vehicles and bicycles, improves feeling of comfort for cyclists, and encourages use by cyclists of all levels and ages

MID-BLOCK CROSSING
Facilitates safer crossings to places people want to go but that are not well served by the existing traffic network[18]

PEDESTRIAN HYBRID BEACON
Reduces pedestrian crashes by 69%[11]

ELIMINATE FREE RIGHT TURN
Reduces speed at conflict point, improving yielding and reducing crash severity

35-MPH SPEED LIMIT
(Maximum speed within this context) Decreasing speed limits significantly reduces the possibility of a pedestrian fatality[4]

SAMPLE SCENARIO
SAFETY AND OPERATIONAL CHALLENGES

Safety for pedestrians can be a challenge in the car-dominated surface parking lots and roadways of the Suburban Activity Center. Reallocating space can solve multiple challenges.

PROJECT AREAS of **need**: TRAFFIC OPERATIONS, **SAFETY**, ACCESSIBILITY, **CONNECTIVITY**, STATE OF GOOD REPAIR, **QUALITY OF SERVICE**

SAMPLE SCENARIO
COUNTERMEASURES AND BENEFITS

The seven-lane roadway had one of the highest crash severity indexes in the State. Existing bicycle facilities were narrow and only utilized by the most confident users while transit riders often crossed at an uncontrolled, mid-block location to reach their stop. Improvements were designed to reduce the crash severity index, provide more comfortable bicycling facilities, and create more direct pedestrian routes between major trip generators.

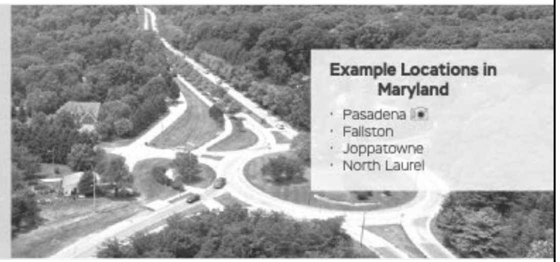
20 21

SUBURBAN

With a moderate to low diversity of uses, the ***Suburban*** context typically contains primarily single-family residential development on lot sizes ranging from one-eighth of an acre to one acre. Office parks and small commercial strip retail are scattered throughout the area, along with neighborhood-level civic and cultural facilities. Developments are typically larger in the area and are single-use, discouraging non-automobile trips. Buildings are primarily oriented toward parking, which is usually provided off-street. This context represents approximately 21% of the land area in the State.

Suburban

The configuration of the roadway network offers increased mobility in Suburban context, while these areas have fewer destinations accessible by foot or bike.



Example Locations in Maryland

- Pasadena
- Fallston
- Joppatowne
- North Laurel

SAMPLE SCENARIO
COUNTERMEASURES

SAMPLE SCENARIO
SAFETY AND OPERATIONAL CHALLENGES

The Suburban context is peppered with housing that lacks pedestrian connectivity. Trails provide great opportunities to close gaps and create separate spaces for multiple modes.

PROJECT AREAS of need: TRAFFIC OPERATIONS, SAFETY, ACCESSIBILITY, CONNECTIVITY, STATE OF GOOD REPAIR, QUALITY OF SERVICE

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SAMPLE SCENARIO
COUNTERMEASURES AND BENEFITS

The four-lane roadway had both operational and safety issues due to vehicle demand generated from a new mixed-use development located directly east of the corridor. The section of roadway was also the missing segment in a regional trail system. Improvements were designed to reduce crashes, improve traffic operations, and improve walking and bicycling comfort by providing connectivity to the trail system via a shared-use path.

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Appendix F KYTC's Use of Functional Classification

KYTC's Use of Functional Classification

Document	Page	Topic	Who?	What?	Why?	When?
Planning Guidance Manual	203-5	Highway Information System (HIS)	Data Management and Transportation Systems	KYTC's Functional Classification System is an important planning tool that groups streets and highways according to the character of travel service they provide. Modifications require approval of the KYTC Secretary through the Official Order process.	FHWA Criteria and Procedures	Continuously monitored and updates are made as community growth and changes in travel patterns necessitate.
KYTC Website	Web	Highway Information System (HIS)	Data Management and Transportation Systems	Functional Classification Maps and Reports, GIS Data	FHWA Criteria and Procedures	Continuously monitored and updates are made as community growth and changes in travel patterns necessitate.
Planning Guidance Manual	503-1	Official Highway System Records	Transportation Systems	Notify all necessary personnel of approved revisions to functional classification system	Conformity	Upon approval.
Planning Guidance Manual & Title 23 USC 101(a)(6)	503-11	Federal-aid funding and eligibility	Program Management	Functional classification determines funding eligibility	FHWA Criteria	Continuous. Reimbursement and matching.
Planning Guidance Manual	503-11	Traffic modeling	Modal Programs	Statewide modeling	Planning	Continuous
Planning Guidance Manual	503-11	Reporting of highway statistics	Data Management	Statistics such as VMT per classification	Planning and funding	Annually
Planning Guidance Manual	504-8	Automatic traffic counting	Traffic and Equipment Management	ATR stations should be located using a combination of functional classification and geographic location of roadways.	Sufficient number of sites are located	Reviewed annually.

Document	Page	Topic	Who?	What?	Why?	When?
					within each factor.	
Planning Guidance Manual	505-1	Highway Performance Monitoring System	Data Management	Submittal of certified public road mileage to FHWA used in the analysis of highway system conditions, performance, and investment needs.	Biennial condition and performance reports to Congress.	Report submitted annually.
Planning Guidance Manual	703-15	SHIFT scoring for traffic congestion	Planning	Vehicle hours of delay is used for scoring traffic congestion and a functional classification adjustment factor is applied.	Project prioritization	Biannually.
Planning Guidance Manual	801-7	Air Quality Planning	Planning Air Quality Coordinator	Average Speed Distribution (by roadway functional classification) is established using either direct TDM outputs or data from KTC report.	Regional conformity analysis supporting State Implementation Plans for non-attainment areas	LRTP or TIP is updated.
Highway Design Manual	Multiple	Design Criteria	Designers	Various design criteria guidance based on functional classification in Green Book	Guidance for new and reconstructed roadways	As needed.
Highway Design Manual	702-8	Typical cross section	Designers	Functional classification is one of seven basic design controls (*context classification is also one of seven*)	Guidance for new and reconstructed roadways	As needed.

Document	Page	Topic	Who?	What?	Why?	When?
Highway Design Manual	703-1	Design guidance	Designers	Proposed functional classification for a project	Guidance for new and reconstructed roadways	As needed.
Traffic Operations Guidance Manual	504-3	Pedestrian safety countermeasures	Designers	One of several factors in evaluating need for crosswalk markings and appropriate countermeasures	Intersection and pedestrian safety design guidance	As needed.
Traffic Operations Guidance Manual	709-2	Intersection lighting	Designers	Average maintained illuminance values are based on functional classification	Countermeasure	As needed.
Complete Streets, Roads, and Highways Manual and Policy	Section 4.4	Complete streets implementation	Designers	Functional classification is defined as a relevant factor in determination of operating speed	Guidance for new and reconstructed roadways	As needed.

Appendix G KYTC's Use of Context

KYTC's Use of Context (Rural and Urban)

Document	Section	Topic	Who?	What?	Why?	When?
Highway Design Manual & AASHTO's Policy on Geometric Design of Highways and Streets	Various	Design	Designers	Various design criteria are influenced by rural or urban context and the functional classification	Typical operating speed, project context, accessibility and mobility expectations	Project planning and design
Highway Design Manual & KRS 177.315	HD-1101.2	Design	Design / Permits	Minimum distance between access points on partial control of access facilities for rural vs urban	Access / mobility balance	Design or permit requests
Highway Design Manual & A policy on Design Standards - Interstate System	HD-1101.5	Design	Designers / Permits	Minimum distance between first access point and interchange ramp terminal	Access / mobility / safety	Design or permit requests
Highway Design Manual	HD-1501	Design	Designers	Common practices for pedestrian facilities based on rural or urban	Multimodal accommodation	Project planning and design
Highway Design Manual	HD-1501	Design	Designers	Common practices for bicycle facilities based on rural or urban	Multimodal accommodation	Project planning and design
Planning Guidance Manual	PL-503.4	State Primary Route System	Planning	Rural secondary route system	Maintenance responsibility	Continuous
Planning Guidance Manual	PL-503.5	Context & Functional Classification System	Planning	Routes are designated as rural or urban based on FHWA Adjusted Urban Area Boundaries. Functional classification is based on FHWA criteria and procedures but relies on state and local planners to assign.	Funding eligibility / maintenance responsibility	Continuous. Reimbursement and matching.
Planning Guidance Manual	PL-504.4	Traffic counting	Planning - Traffic and	Assists in determination of location and number of ATR stations	Monitor traffic growth	Continuous

Document	Section	Topic	Who?	What?	Why?	When?
			Equipment Management			
Planning Guidance Manual	PL-505.2	Highway Performance Monitoring System	Data Management	Submittal of certified public road mileage to FHWA used in the analysis of highway system conditions, performance, and investment needs.	Biennial condition and performance reports to Congress.	Report submitted annually.
Traffic Operations Guidance Manual	TO-402-5	Sign Spacing	Traffic Ops	Spacing based on rural or urban for some signs.	Focus application on context	Continuous monitoring
Traffic Operations Guidance Manual	TO-403-10	Signs	Traffic Ops	Signs only used in rural.	Focus application on context	Continuous monitoring
Traffic Operations Guidance Manual	TO-504	Pedestrian safety countermeasures	Designers	One of several factors in evaluating need for crosswalk markings and appropriate countermeasures	Intersection and pedestrian safety design guidance	As needed.
Traffic Operations Guidance Manual	TO-708	Lighting	Traffic Ops	Need for lighting and also based on ADT	Safety	As needed.
Complete Streets Roads and Highways Manual	Section 2.1	Complete Street Examples	Planners & Designers	Provides examples of Complete Street strategies for each context.	Safe and equitable transportation strategies	Project planning and design
Complete Streets Roads and Highways Manual	Section 3.1	Relationship to Land Use	Planners & Designers	Provides transportation expectations by context.	Safe and equitable transportation strategies	Project planning and design

Document	Section	Topic	Who?	What?	Why?	When?
Complete Streets Roads and Highways Manual	Section 3.3	Project Planning and Prioritization	Planners	Used to determine appropriate facilities and target speeds.	Safe and equitable transportation strategies	Project planning and design
Complete Streets Roads and Highways Manual	Section 5.3	Bicycle Facility Selection	Planners	Used to determine appropriate bicycle facilities.	Safe and equitable transportation strategies	Project planning and design
Complete Streets Roads and Highways Manual	Section 6.6	Mid-Block and Other Uncontrolled Crossings	Planners & Designers	Mid-Block crossing recommendations for urban contexts.	Safe and equitable transportation strategies	Project planning and design
Complete Streets Roads and Highways Manual	Section 8.1	Tactical Urbanism	Planners & Designers	Appropriate application of tactical urbanism	Safe and equitable transportation strategies	Project planning and design

Appendix H KYTC's Proposed Context Classification Edits to the Highway Design Manual

Proposed Edits – Division of Highway Design

The following are proposed edits to the Highway Design Manual to better incorporate context classification. The edits are in red text.

HD-202.6 PRE-DESIGN COORDINATION

The PDM should review project data (see HD-202.3) and evaluate the existing context classification of the project area. After project authorization, the PDM should coordinate with other project team members to review the issues faced by the project. The primary focus of this coordination is to address the following:

- Performance Measures
- Purpose and Need
- Project Scope
- Schedule and Milestones
- Additional Resources
- Additional Mapping
- Environmental Overview
- Traffic Forecasting
- Public Involvement

HD-202.6.1 through **HD-202.6.9** details these discussion points.

HD-202.6.3 Project Scope

Properly scoping a project is essential to its successful development. All projects regardless of size, location, complexity, or funding require scoping in order to discuss the needs and challenges associated with the project, develop the tasks and schedule for preliminary engineering, assess the level of environmental studies required to obtain clearances, and to estimate preliminary costs for comparison to programmed costs. The project should be clearly defined and should address the following:

- Type of project (New Route, Reconstruction, Construction of Existing Roads)
- Project description and limits (project location, study area including context, magnitude and length, classification, current AADT, etc.)
- Performance Based Flexible Design (aspects of roadway performance identified and need of improvement/s determined
- Draft purpose and need statement including clear description of objectives
- Roadway characteristics including the context classification and facility type
- Users/Design Vehicles
- Potential options to consider (without preference to meet purpose and need and to fit context)
- Design criteria
- Proposed access control
- Current project estimate, programmed budget and possible funding types
- Potential environmental impacts and constraints
- Right-of-way requirements
- Utility impacts
- Constructability and MOT
- Number and types of structures anticipated

For quantitative performance measures, it is imperative in determining a project's scope to gather existing data (safety, traffic, etc.) to assess current performance and identify issues affecting the project. Future performance with improvements and without improvements should be forecasted to compare the impacts of the proposed improvements. For analyzing safety and capacity performance, please refer to methodologies in the Highway Safety Manual and the Highway Capacity Manual. Ultimately, the project manager should rely on the data and the resources available, and the engineering judgement of the project team and subject matter experts. Some projects may benefit from taking the time to scope different project types, i.e., reconstruction and spot improvements. This would allow the project team to compare the effectiveness of each project type and determine the appropriate value to address the identified needs.

HD-203.5 PRELIMINARY LINE & GRADE (PL&G) MEETING MINUTES

The PL&G meeting minutes are a critical part of the Design Executive summary and will serve as the main body of the DES. These minutes should document most, if not all, of the design decisions prior to moving into final design. The PL&G meeting minutes should include at a minimum:

- Project identification
- Meeting location and date
- Meeting attendees
- Purpose and need (needs should be documented with supporting data)
- Project overview and existing conditions
- Description of proposed alternatives (including no-build alternative)
- Consideration of all users, including bicycle and pedestrian facilities discussion (HD-1501)
- Discussion of alternatives
    - Discussions that assist in the recommendation
    - Performance of each alternative (how well each alternative addresses the need, may include traffic analysis, safety analysis, etc., as applicable)
    - R/W, Utility, and Environmental impacts for each alternative
- Traffic control schemes
- Cost Comparison Tables for D, R, U, & C for each alternative (include Highway Plan Funding and potential environmental mitigation fees)
- Recommended Alternative
- Reason for cost overrun (if estimated costs exceed the Six-Year Highway Plan budget costs for all phases by 15 percent or more)
- Discussion of Clear Zone
- Design Exceptions/Variances discussion (if applicable per HD-704 guidelines) and mitigation strategies
- Discussion of low cost maintenance improvements while working toward long term solution (If applicable)
- Listing of considerations to address the Water Related Impacts Summary (BMP Discussion)
- Tentative list by station and size of all structures, if applicable

HD-703.4 FUNCTIONAL CLASSIFICATION

The purpose of functional classification or facility type is to categorize ~~The "functional classification" of a roadway is the grouping together of~~ roadways ~~by~~ based on the type of service they provide ~~based upon land use and type of traffic being generated along a corridor~~ and their position in the transportation network. Functional classification establishes a shared vocabulary that transportation professionals can use to quickly characterize the way in which a facility ~~This classification has been developed as a means of communication within the transportation industry.~~ balances mobility and access for motor-vehicle traffic. The determination of a facility's functional classification is one of the first steps in the design process. However, information on a roadway's functional classification is not enough to implement design strategies capable of delivering a facility that balances with the community context while addressing the needs of non-motorized users. See HD-703.5 for more information on roadway context classification and how it is used with functional classification in the design process.

~~Note: Over time, the functional classification of a highway can change depending on the intensity of development and the type of traffic being generated by the development of the corridor. Recognizing this, the designer can choose to use a different functional classification to better fit the intended function of the highway. Any changes to the existing functional classification should be documented in the DES.~~

The basic types of functional classifications are:

- Rural/Urban Local Roads and Streets: Local roads and streets have relatively short trip lengths, and because property access is their main function, there is limited need for mobility or high operating speeds. The use of a lower design speed and level of service reflects this function. Local roads and streets are discussed in Chapter 5 of AASHTO's A Policy on Geometric Design of Highways and Streets.
- Rural/Urban Collectors: Collectors serve a dual function in accommodating shorter trips and feeding arterials. They must also provide some degree of mobility and serve abutting property. Thus, an intermediate design speed and level of service are appropriate. Collectors are discussed in Chapter 6 of AASHTO's A Policy on Geometric Design of Highways and Streets.
- Rural/Urban Arterials: Arterials provide a high degree of mobility for longer trip lengths. Therefore, they may provide a high operating speed and level of service. Since access to abutting property is not their primary function, some degree of access control is desirable to enhance mobility. Arterials are discussed in Chapter 7 of AASHTO's A Policy on Geometric Design of Highways and Streets.
- Freeways: A freeway is normally classified as a principal arterial that has unique geometric criteria. Freeways are discussed in Chapter 8 of AASHTO's A Policy on Geometric Design of Highways and Streets.
- Interstate: The interstate system is the most important highway system in the United States. It carries more traffic per mile than any of the other comparable highway systems. Interstates are designed to provide safety and mobility with fully controlled access. For guidance on interstates refer, to AASHTO's A Policy on Design Standards Interstate System, current edition.

The geometric design of -low-volume roads presents a unique challenge, as the very low traffic volumes and reduced frequency of crashes make designs normally applied on higher-volume roads less cost-effective. The guidance by AASHTO's Geometric Design of Low-Volume Roadways addresses the unique needs of such roads and the geometric designs appropriate to meet those needs. These guidelines can be considered on local and collector roads that have a design average daily traffic volume of 2,000 vehicles per day or less.

Chapter 1 of AASHTO's A Policy on Geometric Design of Highways and Streets gives a more detailed discussion of roadway classifications.

HD-703.5 CONTEXT CLASSIFICATION

There are five contexts to consider for geometric design criteria:

- Rural: Areas with the lowest density, few houses or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks.
- Rural town: Areas with low density but diverse land uses with a commercial main street character, potential for on-street parking and sidewalks and small setbacks.
- Suburban: Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks.
- Urban: Areas with high density, mixed land uses and prominent destinations, potential for some on-street parking and sidewalks, and mixed setbacks.
- Urban Core: Areas with the highest density, mixed land uses within and among predominately high-rise structures, and small setbacks.

~~These contexts are defined based on development density, land uses, and building setbacks.~~ The context classifications ~~supplement, but do not replace,~~ overlay with the functional classification system used in geometric design. Chapter 1 of AASHTO's A Policy on Geometric Design of Highways and Streets gives a more detailed discussion of context classifications.

Note: Over time, the functional and context classifications of a highway can change depending on the intensity of development and the user types being generated by the development of the corridor. Recognizing this, the designer, with input from the PM and PDT, should review the assigned classification to ensure it matches the context and expectations for mobility and accessibility. Use project information, local zoning maps and comprehensive plans to determine if the design should be based on an updated functional and/or context classification that better fits the highway's intended function. The classification used for design should be documented in the DES.

Note: A project may include segments with different functional and/or context classifications. It is critical to design transition zones in these areas that alert users to downstream changes in roadway character.

HD-703.8 DESIGN SPEED

Design speed is the selected speed used to determine the various geometric design features of the roadway. Factors that are considered when selecting the design speed for a project include, but are not limited to, project type, anticipated operating speed, topography, functional classification, context classification, and modal mix. When selecting the design speed every effort should be made to attain a desired combination of safety, mobility, and efficiency for a facility's users within the constraints of environmental quality, economics, aesthetics, and social or political impacts. AASHTO's A Policy on Geometric Design of Highways and Streets provides further discussion on the philosophy of design speed.

Below is the method of selecting the design speed based on project type (HD 703.6):

- For projects that are considered new construction the starting place for selecting a design speed should be the minimum design criteria as set forth in AASHTO's A Policy on Geometric Design of Highways and Streets, AASHTO's Guidelines for Geometric Design of Low-Volume Roads, or AASHTO's A Policy on Design Standards-Interstate System, whichever is applicable.

The design criteria can then be adjusted up or down with the appropriate justification and/or design exceptions to the controlling criteria. It is important to utilize engineering judgement when considering the use of "all" minimums for the geometric criteria of a project, which could result in a project that does not meet the purpose and need. It is also important consider the facility's users and the context when selecting a design speed.

- For projects that are considered reconstruction projects the designer must first determine the existing and proposed functional classification and context classification of the roadway within the project area.
    - If the project proposes keeping the existing functional and context classification the designer should first evaluate the project area and determine the existing design speed based upon the existing geometrics. This should be the starting point for evaluating and choosing the proposed design speed. After a review of crash data, typical roadway widths and shoulder widths, sight distance restrictions, possible drainage issues, and a review of the existing corridor the designer can then use engineering judgement to "design up" from the existing conditions to better meet the purpose and need of the project. Any changes in design speed from existing should also consider the overall roadway system.
    - If the project proposes changing the functional and/or context classification from the existing conditions then the starting place for selecting a design speed should be the minimum design criteria as set forth in AASHTO's A Policy on Geometric Design of Highways and Streets, AASHTO's Guidelines for Geometric Design of Low-Volume Roads, or AASHTO's A Policy on Design Standards-Interstate System, whichever is applicable. The design criteria can then be adjusted up or down with the appropriate justification and/or design exceptions to the controlling criteria. It is important to utilize engineering judgement when considering the use of "all" minimums for the geometric criteria of a project, which could result in a project that does not meet the purpose and need. It is also important to select design speeds that consider the users and the context of the facility.

- For projects that are considered construction on existing roads (spot improvements), the designer should first evaluate the project area and determine the existing design speed based upon the existing geometrics.

This should be the starting point for evaluating and choosing the proposed design speed. After a review of crash data, typical roadway widths and shoulder widths, sight distance restrictions, possible drainage issues, and a review of the existing corridor the designer can then use engineering judgement to “design up” from the existing conditions to better meet the purpose and need of the project. Any changes in design speed from existing should also consider the overall roadway system.

Designers should be aware of context classification transitional zones between rural collector or arterial roads and rural town contexts. These transitional areas should be effectively designed to encourage speed reduction because, if drivers do not appropriately reduce speeds, they may create conflicts with other vehicles, pedestrians, and bicyclists and may adversely affect community livability. AASHTO’s A Policy on Geometric Design of Highways and Streets provides further guidance and design treatments that may be implemented to help high-speed to low-speed transition zones function more effectively.

Justification for design speeds should be documented in the Design Executive Summary (HD-704). This justification should consider all project conditions including maximum service and safety benefits for the dollar invested, compatibility with adjacent sections of the existing roadway, and the probable time before reconstruction of the adjacent sections due to increased traffic demands or changed conditions. When requesting exceptions, include a discussion of safety analysis and the related crash data associated with the site. Mitigation measures should be considered when the design speeds are less than the regulatory or posted speed.

Appendix I Revised Common Geometric Practice Sheets

COMMON GEOMETRIC PRACTICES RURAL LOCAL ROADS ⑫						EXHIBIT 700-01
		TRAFFIC VOLUME				
	TERRAIN	UNDER 50 A.D.T.	50-250 A.D.T.	250-400 A.D.T.	400-2000 A.D.T.	OVER 2000 A.D.T.
MINIMUM DESIGN SPEED (M.P.H.) ⑥ ⑦	LEVEL	30		40	50	
	ROLLING	20	30		40	
	MOUNTAIN	20			30	

	DESIGN SPEED	UNDER 400 A.D.T.	400-2000 A.D.T.	OVER 2000 A.D.T
LANE WIDTH (FEET) ④ ⑧	15 MPH	9	10 ⑨	11
	20 MPH			
	25 MPH			
	30 MPH			
	40 MPH			
	45 MPH	10	11	
	50 MPH			
	55 MPH	11		11 ⑩
	60 MPH			
	65 MPH			
MIN. USABLE SHOULDER WIDTH (FEET) ⑤	ALL SPEEDS	2	3 ⑨	6
MIN. CLEAR ROADWAY WIDTH OF NEW AND RECONSTRUCTED BRIDGES	ALL SPEEDS	TOTAL WIDTH OF LANES +2' (EACH SIDE)	TOTAL WIDTH OF LANES +3' (EACH SIDE)	TOTAL WIDTH OF LANES + USABLE SHOULDER WIDTHS ⑪
MINIMUM RADIUS (FEET)	DESIGN SPEED	eMAX, 4%	eMAX, 6%	eMAX, 8%
	20 MPH	86	81	76
	25 MPH	154	144	134
	30 MPH	250	231	214
	35 MPH	371	340	314
	40 MPH	533	485	444
	45 MPH	711	643	587
	50 MPH	926	833	758
NORMAL PAVEMENT CROSS SLOPES ③	RATE OF CROSS SLOPE = 2%			
NORMAL SHOULDER CROSS SLOPES	EARTH = 8%		PAVED = 4%	

MAXIMUM GRADE (PERCENT)	M.P.H.	15	20	25	30	35	40	45	50	55	60
	LEVEL	9	8	7					6		5
	ROLLING	12	11		10			9	8	7	6
	MOUNTAIN	17	16	15	14		13	12	10		—
MINIMUM STOPPING SIGHT DISTANCE (FEET) ①		80	115	155	200	250	305	360	425	495	570
MINIMUM PASSING SIGHT DISTANCE (FEET) ②		—	400	450	500	550	600	700	800	900	1000

① MINIMUM STOPPPING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 2.0 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGNMENTS.

② MINIMUM PASSING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 3.5 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGNMENTS.

③ NORMAL PAVEMENT CROSS SLOPES ON BRIDGES IS 2%.

④ CONSIDER CURVE WIDENEING ON PROJECT WHEN TRUCKS AND/OR HORIZONTAL CURVATURE INDICATE A NEED.

⑤ FOR SLOPES 4:1 OR FLATTER, USABLE WIDTH IS GRADED WIDTH, FOR SLOPES STEEPER THAN 4:1, USABLE WIDTH TERMINATES AT THE SLOPE ROUNDING.

⑥ WHERE SELECTED DESIGN SPEED IS > 50 MPH, USE COMMON GEOMETRIC PRACTICES EXHIBIT 700-02 FOR RURAL COLLECTOR ROADS.

⑦ JUSTIFICATION FOR THE CHOSEN DESIGN SPEED SHOULD BE DOCUMENTED IN THE DESIGN EXECUTIVE SUMMARY.

⑧ FOR ROADS ≤ 2000 ADT, REFER TO AASHTO'S "GUIDELINES FOR GEOMETRIC DESIGN OF LOW-VOLUME ROADS.

⑨ FOR ROADS IN MOUNTAINOUS TERRAIN WITH DESIGN VOLUME OF 400 TO 600 VEH/DAY, 9 FT LANE WIDTH MAY BE USED.

⑩ CONSIDER USING A LANE WIDTH OF 12 FT WHERE SUBSTANTIAL TRUCK VOLUMES ARE PRESENT OR AGRICULTURAL EQUIPMENT FREQUENTLY USES THE ROAD.

⑪ FOR BRIDGES IN EXCESS OF 100 FT IN LENGTH, THE MINIMUM WIDTH OF LANES + 3 FT (ON EACH SIDE) MAY BE ACCEPTABLE.

⑫ FOR RURAL TOWN LOCAL ROADS, SEE EXHIBIT 700-02 FOR COMMON PRACTICES OF LOCAL URBAN AND SUBURBAN STREETS.

COMMON GEOMETRIC PRACTICES **EXHIBIT 700-02**

SUBURBAN, RURAL TOWN, URBAN AND URBAN CORE LOCAL & COLLECTOR ROADWAYS ⑰

		LOCAL ① ③		**COLLECTOR** ② ③			
		SUBURBAN, RURAL TOWN	URBAN, URBAN CORE	SUBURBAN	**RURAL** TOWN	URBAN	URBAN **CORE**
DESIGN SPEED ~~⑭~~-⑬		LESS THAN RURAL LOCAL	20 M.P.H. -30 M.P.H.	35-50 M.P.H.	≤ 45 M.P.H.	**30-40** M.P.H.	**25-35** M.P.H.
NUMBER OF LANES		DESIRABLE 2 ④		MINIMUM 2 ④			
LANE WIDTH ⑨	**RESIDENTIAL**	MIN. 9'		MIN. 10'			
	COMMERICAL	MIN. 10'		MIN. 10'			
	INDUSTRIAL	MIN. 11'		MIN. 12'			
SIDEWALK ⑱		MINIMUM 4' DESIRABLE 8' ⑭					
MIN. CLEAR ROADWAY WIDTH OF NEW AND RECONSTRUCTED BRIDGES ⑪		MINIMUM CURB TO CURB WIDTH					
BORDER AREA ⑤ ⑲		10' DESIRABLE	10' DESIRABLE ⑯	12' MINIMUM			
MINIMUM RADIUS (FEET)		⑥	100'	⑥			
MAXIMUM GRADE (PERCENT)		**RESIDENTIAL: 15** **COMMERICAL: 8** ⑫ **INDUSTRIAL: 8**		⑮	(see grades below)		
NORMAL PAVEMENT CROSS SLOPE ⑧		RATE OF CROSS SLOPE = 2%					
NORMAL SHOULDER CROSS SLOPE		EARTH 8% PAVED 4%					
SUPERELEVATION		⑩ 4% MAX.		8% MAX.	6% MAX.		

M.P.H.	**30**	**35**	**40**	**45**	**50**
LEVEL		**9**		**8**	**7**
ROLLING	**11**	**10**		**9**	**8**
MOUNTAIN		**12**		**11**	**10**

MINIMUM STOPPING SIGHT DISTANCE (FEET) ⑦									
M.P.H.	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**
MIN.	**115**	**155**	**200**	**250**	**305**	**360**	**425**	**495**	**570**

① TURNING LANES 9' MINIMUM-12' DESIRED; PARKING LANES: RESIDENTIAL-7' MINIMUM; COMMERICAL & INDUSTRIAL-8' MINIMUM.

② TURNING LANES 10' MINIMUM-12' DESIRED: PARKING LANES: RESIDENTIAL-7'-8'; COMMERCIAL & INDUSTRIAL-8'-11'.

③ VERTICAL CURBS WITH HEIGHTS OF 4" OR GREATER ADJACENT TO TRAVELED WAY SHOULD BE OFFSET A MINIMUM OF 1 FOOT. WHEN A CURB AND GUTTER SECTION IS PROVIDED, THE GUTTER PAN WIDTH, NORMALLY 2 FEET, SHOULD BE USED AS THE OFFSET DISTANCE.

④ THE NUMBER OF LANES TO BE PROVIDED ON STREETS WITH CURRENT ADT OF 2000 OR GREATER SHOULD BE DETERMINED BY A HIGHWAY CAPACITY ANALYSIS OF THE DESIGN TRAFFIC VOLUMES. SUCH ANALYSIS SHOULD BE MADE FOR FUTURE DESIGN TRAFFIC. (DESIRABLE)

⑤ THE BORDER AREA, MEASURED FROM THE FACE OF CURB, BETWEEN THE ROADWAY AND THE RIGHT-OF-WAY LINE SHOULD BE WIDE ENOUGH TO SERVE SEVERAL PURPOSES, INCLUDING SERVING AS A BUFFER SPACE BETWEEN PEDESTRIANS AND VEHICULAR TRAFFIC; A SIDEWALK; AND AN AREA FOR UTILITIES.

⑥ REFER TO CHAPTER 3 OF AASHTO'S "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", CURRENT EDITION.

⑦ MINIMUM STOPPING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 2.0 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGHMENTS.

⑧ NORMAL PAVEMENT CROSS SLOPES ON BRIDGES SHALL BE 2%.

⑨ WHERE PARALLEL PARKING LANES ARE PRESENT, THEY SHOULD BE A MIN OF 7' IN RESIDENTIAL AREAS AND 8' IN COMMERCIAL AND INDUSTRIAL **AREAS**

~~⑨ ARTERIALS WITH LARGE NUMBER OF TRUCKS AND OPERATING NEAR CAPACTIY SHOULD CONSIDER GRADES FLATTER THAN THOSE IN RURAL SECTIONS TO AVOID UNDESIRABLE REDUCTIONS IN SPEED.~~

⑩ SUPERELEVATION MAY NOT BE REQUIRED ON LOCAL STREETS IN RESIDENTIAL, COMMERICAL, AND INDUSTRIAL AREAS.

⑪ THE BRIDGE WIDTH FOR ~~URBAN~~ ROADWAYS WITH SHOULDERS SHOULD NOT BE LESS THAN WIDTHS SHOWN FOR RURAL ROADS APPROVED ROADWAY WIDTHS.

⑫ MAXIMUM GRADES OF SHORT LENGTHS (LESS THAN 500') AND ON ONE-WAY DOWN GRADES MAY BE TWO PERCENT STEEPER.

~~⑬ FOR GUIDANCE ON FREEWAYS, REFER TO AASHTO'S, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", CURRENT EDITION.~~

⑬ INTERMEDIATE DESIGN SPEEDS (5 MPH INCREMENTS) MAY BE APPROPIRATE WHERE TERRAIN AND OTHER ENVIRONMENTAL CONDITIONS DICTATE.

⑭ REFER TO AASHTO'S "GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES", CURRENT EDITION, WHEN COMBINING A PEDESTRIAN SIDEWALK WITH A BICYCLE PATH.

⑮ USE RURAL COLLECTOR MAX GRADES IN EXHIBIT 700-03.

⑯ WHERE RIGHT-OF-WAY IS LIMITED, A BORDER AREA OF 2 FT MAY BE TOLERATED WHERE NO SIDEWALK IS PRESENT.

⑰ FOR ADDITIONAL GUIDANCE FOR ROADS < 2000 ADT, REFER TO "GUIDELINES FOR GEOMETRIC DESIGN OF LOW-VOLUME ROADS",

⑱ REFER to AASHTO'S "GUIDE FOR THE PLANNING, DESIGN, AND OPERATION OF PEDESTRIAN FACILITIES, CURRENT EDITION.

⑲ REFER TO RURAL COMMON PRACTICES FOR SHOULDER WIDTH ON ROADWAYS WITHOUT CURB.

COMMON GEOMETRIC PRACTICES **EXHIBIT 700-03**

RURAL CONNECTOR ROADS ⑫

<table>
<tr><td colspan="2"></td><td></td><td colspan="3">TRAFFIC VOLUME</td></tr>
<tr><td colspan="2"></td><td>TERRAIN</td><td>UNDER 400 A.D.T</td><td>400-2000 A.D.T.</td><td>OVER 2000 A.D.T</td></tr>
<tr><td rowspan="3">MINIMUM DESIGN SPEED (M.P.H.) ⑦</td><td rowspan="3">RURAL</td><td>LEVEL</td><td>40</td><td>50</td><td>60</td></tr>
<tr><td>ROLLING</td><td>30</td><td>40</td><td>50</td></tr>
<tr><td>MOUNTAIN</td><td>20</td><td>30</td><td>40</td></tr>
<tr><td colspan="2" rowspan="11">LANE WIDTH (FEET) ① ⑧</td><td>DESIGN SPEED</td><td>UNDER 400 A.D.T</td><td>400-2000 A.D.T.</td><td>OVER 2000 A.D.T</td></tr>
<tr><td>20 MPH</td><td rowspan="5">10 ⑨</td><td rowspan="3">10</td><td rowspan="7">11</td></tr>
<tr><td>25 MPH</td></tr>
<tr><td>30 MPH</td></tr>
<tr><td>35 MPH</td><td rowspan="7">11</td></tr>
<tr><td>40 MPH</td></tr>
<tr><td>45 MPH</td><td rowspan="2">10</td></tr>
<tr><td>50 MPH</td></tr>
<tr><td>55 MPH</td><td rowspan="3">11</td><td rowspan="3">11 ⑩</td></tr>
<tr><td>60 MPH</td></tr>
<tr><td>65 MPH</td></tr>
<tr><td colspan="2">MINIMUM USABLE SHOULDER WIDTH (FEET) ⑥ ⑬</td><td>ALL SPEEDS</td><td>2</td><td>4</td><td>6</td></tr>
<tr><td colspan="2">MIN. CLEAR ROADWAY WIDTH OF NEW AND RECONSTRUCTED BRIDGES</td><td>ALL SPEEDS</td><td>TOTAL WIDTH OF LANES + 2' (EACH SIDE)</td><td>TOTAL WIDTH OF LANES + 4' (EACH SIDE)</td><td>TOTAL WIDTH OF LANES + USABLE SHOULDER WIDTHS</td></tr>
<tr><td colspan="2" rowspan="10">MINIMUM RADIUS (FEET)</td><td>DESIGN SPEED</td><td>eMAX 4%</td><td>eMAX 6%</td><td>eMAX 8%</td></tr>
<tr><td>20 MPH</td><td>86</td><td>81</td><td>76</td></tr>
<tr><td>25 MPH</td><td>154</td><td>144</td><td>134</td></tr>
<tr><td>30 MPH</td><td>250</td><td>231</td><td>214</td></tr>
<tr><td>35 MPH</td><td>371</td><td>340</td><td>314</td></tr>
<tr><td>40 MPH</td><td>533</td><td>485</td><td>444</td></tr>
<tr><td>45 MPH</td><td>711</td><td>643</td><td>587</td></tr>
<tr><td>50 MPH</td><td>926</td><td>833</td><td>758</td></tr>
<tr><td>55 MPH</td><td>1190</td><td>1060</td><td>960</td></tr>
<tr><td>60 MPH</td><td>1500</td><td>1330</td><td>1200</td></tr>
<tr><td colspan="2">NORMAL PAVEMENT CROSS SLOPES ④</td><td colspan="4">RATE OF CROSS SLOPE = 2%</td></tr>
<tr><td colspan="2">NORMAL SHOULDER CROSS SLOPES</td><td colspan="4">EARTH = 8% PAVED = 4%</td></tr>
</table>

<table>
<tr><td rowspan="4">MAXIMUM GRADE (PERCENT) ⑤</td><td>M.P.H.</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td><td>55</td><td>60</td><td>65</td></tr>
<tr><td>LEVEL</td><td colspan="6">7</td><td colspan="2">6</td><td>5</td><td>-</td></tr>
<tr><td>ROLLING</td><td colspan="2">10</td><td colspan="2">9</td><td colspan="2">8</td><td colspan="2">7</td><td>6</td><td>-</td></tr>
<tr><td>MOUNTAIN</td><td>12</td><td>11</td><td colspan="4">10</td><td colspan="2">9</td><td>8</td><td>-</td></tr>
<tr><td>MINIMUM STOPPING SIGHT DISTANCE ②</td><td>(FEET)</td><td>115</td><td>155</td><td>200</td><td>250</td><td>305</td><td>360</td><td>425</td><td>495</td><td>570</td><td>645</td></tr>
<tr><td>MINIMUM PASSING SIGHT DISTANCE ③</td><td>(FEET)</td><td>400</td><td>450</td><td>500</td><td>550</td><td>600</td><td>700</td><td>800</td><td>900</td><td>1000</td><td>1100</td></tr>
</table>

① WIDEN PAVEMNT ON CURVES IN ACCORDANCE WITH APPROVED DESIGN STANDARDS. REFER TO CURRENT STANDARD DRAWING FOR ADDITIONAL DETAIL.

② MINIMUM STOPPING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 2.0 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGNMENTS.

③ MINIMUM PASSING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 3.5 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGNMENTS.

④ NORMAL PAVEMENT CROSS SLOPES ON BRIDGES IS 2% .

⑤ MAY USE ONE PERCENT STEEPER MAXIMUM GRADES ON SHORT LENGTHS (LESS THAT 500 FT) AND ON ONE-WAY DOWN GRADES; FOR LOW-VOLUME RURAL COLLECTORS (AADT LESS THAN 2,000 VEH/DAY), THE MAXIMUM GRADE MAY BE 2% STEEPER.

⑥ FOR SLOPES 4:1 OR FLATTER, USABLE WIDTH IS GRADED WIDTH. FOR SLOPES STEEPER THAN 4:1 USABLE WIDTH TERMINATES AT THE SLOPE ROUNDING.

⑦ JUSTIFICATION FOR THE SELECTED DESIGN SPEED SHOULD BE DOCUMENTED IN THE DESIGN EXECUTIVE SUMMARY.

⑧ ON ROADSWAYS TO BE RECONSTRUCTED, 11 FT LANES MAY BE RETAINED WHERE SAFETY RECORDS AND ALIGNMENT ARE SATISFACTORY.

⑨ 18 FT MINIMUM WIDTH (9 FT LANES) MAY BE USED FOR ROADWAYS WITH DESIGN VOLUMES UNDER 250 A.D.T.

⑩ CONSIDER USING A LANE WIDTH OF 12 FT WHERE SUBSTANTIAL TRUCK VOLUMES ARE PRESENT OR AGRICULTURAL EQUIPMENT FREQUENTLY USES THE ROAD.

⑪ FOR BRIDGES IN EXCESS OF 100 FT IN LENGTH, THE MINIMUM WIDTH OF LANES + 3 FT (ON EACH SIDE) MAY BE ACCEPTABLE.

⑫ COMMON PRACTICES FOR RURAL TOWN COLLECTORS MAY BE FOUND IN EXHIBIT 700-02.

⑬ MAY BE APPLIED ON RURAL TOWN COLLECTORS WITHOUT CURB.

<table>
<tr><td colspan="15">COMMON GEOMETRIC PRACTICES — EXHIBIT 700-04
RURAL & RURAL TOWN ARTERIAL ROADS (OTHER THAN FREEWAYS) ④ ⑦</td></tr>
<tr><td></td><td></td><td colspan="2">TERRAIN</td><td colspan="11"></td></tr>
<tr><td rowspan="4">DESIGN SPEED (M.P.H.) ⑥</td><td rowspan="3">RURAL</td><td colspan="2">LEVEL</td><td colspan="11">50-75</td></tr>
<tr><td colspan="2">ROLLING</td><td colspan="11">50-65</td></tr>
<tr><td colspan="2">MOUNTAIN</td><td colspan="11">45-60</td></tr>
<tr><td colspan="3">RURAL TOWN</td><td colspan="11">20-45</td></tr>
<tr><td></td><td></td><td colspan="13">TRAFFIC VOLUME</td></tr>
<tr><td rowspan="9">LANE WIDTH (FEET) ⑧ ⑫</td><td>DESIGN SPEED</td><td colspan="4">UNDER 400 A.D.T. ⑪</td><td colspan="5">400-2000 A.D.T</td><td colspan="4">OVER 2000 A.D.T</td></tr>
<tr><td>40 MPH</td><td colspan="4" rowspan="2">10</td><td colspan="5" rowspan="3">11</td><td colspan="4" rowspan="8">12</td></tr>
<tr><td>45 MPH</td></tr>
<tr><td>50 MPH</td><td colspan="4" rowspan="6">11</td></tr>
<tr><td>55 MPH</td><td colspan="5" rowspan="5">12</td></tr>
<tr><td>60 MPH</td></tr>
<tr><td>65 MPH</td></tr>
<tr><td>70 MPH</td></tr>
<tr><td>75 MPH</td></tr>
<tr><td>MIN. USABLE SHOULDER WIDTH (FEET) ⑤ ⑨</td><td>ALL SPEEDS</td><td colspan="4">4</td><td colspan="5">6</td><td colspan="4">8</td></tr>
<tr><td>MIN. CLEAR ROADWAY WIDTH OF NEW AND RECONSTRUCTED</td><td>ALL SPEEDS</td><td colspan="13">TOTAL WIDTH OF LANES + USABLE SHOULDER WIDTHS ⑩</td></tr>
<tr><td rowspan="11">MINIMUM RADIUS (FEET)</td><td>DESIGN SPEED</td><td colspan="4">eMAX. 4%</td><td colspan="5">eMAX. 6%</td><td colspan="4">eMAX. 8%</td></tr>
<tr><td>30 MPH</td><td colspan="4">250</td><td colspan="5">231</td><td colspan="4">214</td></tr>
<tr><td>35 MPH</td><td colspan="4">371</td><td colspan="5">340</td><td colspan="4">314</td></tr>
<tr><td>40 MPH</td><td colspan="4">533</td><td colspan="5">485</td><td colspan="4">444</td></tr>
<tr><td>45 MPH</td><td colspan="4">711</td><td colspan="5">643</td><td colspan="4">587</td></tr>
<tr><td>50 MPH</td><td colspan="4">926</td><td colspan="5">833</td><td colspan="4">758</td></tr>
<tr><td>55 MPH</td><td colspan="4">1190</td><td colspan="5">1060</td><td colspan="4">960</td></tr>
<tr><td>60 MPH</td><td colspan="4">1500</td><td colspan="5">1330</td><td colspan="4">1200</td></tr>
<tr><td>65 MPH</td><td colspan="4">—</td><td colspan="5">1660</td><td colspan="4">1480</td></tr>
<tr><td>70 MPH</td><td colspan="4">—</td><td colspan="5">2040</td><td colspan="4">1810</td></tr>
<tr><td>75 MPH</td><td colspan="4">—</td><td colspan="5">2500</td><td colspan="4">2210</td></tr>
<tr><td>NORMAL PAVEMENT CROSS SLOPES ③</td><td colspan="14">RATE OF CROSS SLOPES = 2%</td></tr>
<tr><td>NORMAL SHOULDER CROSS SLOPES</td><td colspan="14">EARTH = 8% PAVED = 4%</td></tr>
<tr><td rowspan="4">MAXIMUM GRADE (PERCENT)</td><td>M.P.H.</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td><td>55</td><td>60</td><td>65</td><td>70</td><td>75</td><td>80</td></tr>
<tr><td>LEVEL</td><td colspan="6">5</td><td colspan="2">4</td><td colspan="5">3</td></tr>
<tr><td>ROLLING</td><td colspan="2">8</td><td colspan="2">7</td><td colspan="2">6</td><td colspan="2">5</td><td colspan="5">4</td></tr>
<tr><td>MOUNTAIN</td><td>10</td><td>9</td><td colspan="3">8</td><td colspan="2">7</td><td colspan="2">6</td><td colspan="4">5</td></tr>
<tr><td>MINIMUM STOPPING SIGHT DISTANCE ①</td><td>(FEET)</td><td>115</td><td>155</td><td>200</td><td>250</td><td>305</td><td>360</td><td>425</td><td>495</td><td>570</td><td>645</td><td>730</td><td>820</td><td>910</td></tr>
<tr><td>MINIMUM PASSING SIGHT DISTANCE ②</td><td>(FEET)</td><td>400</td><td>450</td><td>500</td><td>550</td><td>600</td><td>700</td><td>800</td><td>900</td><td>1000</td><td>1100</td><td>1200</td><td>1300</td><td>1400</td></tr>
</table>

① MINIMUM STOPPING SIGHT DISANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 2.0 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL **ALIGNMENTS.**

② MINIMUM PASSING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 3.5 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL **ALIGNMENTS.**

③ NORMAL PAVEMENT CROSS SLOPES ON BRIDGES IS 2% .

④ FOR GUIDANCE ON FREEWAYS, REFER TO AASHTO'S, "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", CURRENT EDITION.

⑤ FOR SLOPES 4:1 OR FLATTER, USABLE WIDTH IS THE SAME AS GRADED WIDTH, FOR SLOPES STEEPER THAN 4:1, USABLE WIDTH TERMINATES AT SLOPE ROUNDING.

⑥ JUSTIFICATION FOR THE SELECTED DESIGN SPEED SHOULD BE DOCUMENTED IN THE DESIGN EXECUTIVE SUMMARY.

⑦ FOR GUIDANCE ON INTERSTATES, REFER TO AASHTO, "A POLICY ON DESIGN STANDARDS INTERSTATE SYSTEM", CURRENT EDITION.

⑧ ON ROADWAYS TO BE RECONSTRUCTED, EXISTING 11 FT LANES MAY BE RETAINED WHERE THE SAFETY RECORDS AND ALIGNMENT ARE SATISFACTORY.

⑨ PREFERABLY, USABLE SHOULDERS ON ARTERIALS SHOULD BE PAVED; HOWEVER, WHERE VOLUMES ARE LOW OR IN AREAS WHERE WIDE PAVED SHOULDERS ARE UNDESIRABLE, THE PAVED PORTION MAY BE A MINIMUM OF 2 FT, PROVIDED BICYCLE ACCOMMODATIONS ARE NOT BEING PROVIDED.

⑩ ON BRIDGES IN EXCESS OF 200FT IN LENGTH, OFFSET TO PARAPET, RAIL, OR BARRIER MAY BE AT A MINIMUM OF 4 FT FROM EDGE OF TRAVELED WAY ON BOTH SIDES.

⑪ WHERE FREQUENT USE BY TRUCKS IS ANTICIPATED, ADDITIONAL TRAVELED-WAY SHOULD BE CONSIDERED.

⑫ MIN WIDTH FOR ROADWAYS IN RURAL TOWNS IS THE WIDTH FOR THE 45 MPH AND BELOW DESIGN SPEED. IN LOW SPEED CONDITIONS AND ON ROADWAYS WITH LOW TRUCK VOLUMES IN RURAL TOWNS, 10 FT LANES MAY BE USED AT ADTS HIGHER THAN 400.

COMMON GEOMETRIC PRACTICES **EXHIBIT 700-05**

SUBURBAN, URBAN, & URBAN CORE ARTERIAL ROADWAYS (OTHER THAN FREEWAYS) ⑬ ⑯

	SUBURBAN	URBAN	URBAN CORE
DESIGN SPEED ⑭	30 M.P.H – 55 M.P.H	25 M.P.H. – 45 M.P.H.	≤ 30 M.P.H.
NUMBER OF LANES	MINIMUM 2 ④		
LANE WIDTH ② ③	10': < 35 MPH SPEEDS AND LOW TRUCK AND BUS VOLUME 11': ≤ 45 MPH (INTERRUPTED FLOW CONDITIONS) 12': > 45 MPH DESIRABLE ON HIGH SPEED, FREE FLOWING, PRINCIPAL ARTERIALS		
SIDEWALK	MINIMUM 4' DESIRABLE 8' ⑮		
MIN. CLEAR ROADWAY WIDTH OF NEW AND RECONSTRUCTED BRIDGES ⑪	MINIMUM CURB TO CURB WIDTH		
BORDER AREA ① ⑤	8' MINIMUM		
MINIMUM RADIUS (FEET)	⑥		
NORMAL PAVEMENT CROSS SLOPE ⑧	RATE OF CROSS SLOPE = 2%		
NORMAL SHOULDER CROSS SLOPE	EARTH 8%	PAVED 4%	
SUPERELEVATION	⑥		

MAXIMUM GRADE (PERCENT)

M.P.H.	20	25	30	35	40	45-50	55	60
LEVEL	8	7				6	5	
ROLLING	10		9	8		7	6	
MOUNTAIN	13	12	11	10		9	8	

MINIMUM STOPPING SIGHT DISTANCE (FEET) ⑦

M.P.H.	20	25	30	35	40	45	50	55	60
MIN.	115	155	200	250	305	360	425	495	570

① REFER TO RURAL ARTERIAL COMMON PRACTICES (EXHIBIT 700-04) FOR SHOULDER WIDTH ON ROADWAYS WITHOUT CURB.

② TURNING LANES: 10' MINIMUM – 12' DESIRED: PARKING LANES: RESIDENTIAL – 7'-8'; COMMERCIAL & INDUSTRIAL – 8'-11'.

③ VERTICAL CURBS WITH HEIGHTS OF 4" OR GREATER ADJACENT TO TRAVELED WAY SHOULD BE OFFSET A MINIMUM OF 1 FOOT. WHEN A CURB AND GUTTER SECTION IS PROVIDED, THE GUTTER PAN WIDTH, NORMALLY 2 FEET, SHOULD BE USED AS THE OFFSET DISTANCE.

④ THE NUMBER OF LANES TO BE PROVIDED ON STREETS WITH CURRENT ADT OF 2000 OR GREATER SHOULD BE DETERMINED BY A HIGHWAY CAPACITY ANALYSIS OF THE DESIGN TRAFFIC VOLUMES. SUCH ANALYSIS SHOULD BE MADE FOR FUTURE DESIGN TRAFFIC. (DESIRABLE)

⑤ THE BORDER AREA, MEASURED FROM THE FACE OF CURB, BETWEEN THE ROADWAY AND THE RIGHT-OF-WAY LINE SHOULD BE WIDE ENOUGH TO SERVE SEVERAL PURPOSES, INCLUDING SERVING AS A BUFFER SPACE BETWEEN PEDESTRIANS AND VEHICULAR TRAFFIC, A SIDEWALK, AND AN AREA FOR UTILITIES.

⑥ REFER TO CHAPTER 3 OF AASHTO'S "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", CURRENT EDITION.

⑦ MINIMUM STOPPING SIGHT DISTANCE BASED ON AN EYE HEIGHT OF 3.5 FT AND AN OBJECT HEIGHT OF 2.0 FT. CONSIDER BOTH HORIZONTAL AND VERTICAL ALIGNMENTS.

⑧ NORMAL PAVEMENT CROSS SLOPES ON BRIDGES SHALL BE 2%.

⑨ ARTERIALS WITH LARGE NUMBER OF TRUCKS AND OPERATING NEAR CAPACITY SHOULD CONSIDER GRADES FLATTER THAN THOSE IN RURAL SECTIONS TO AVOID UNDESIRABLE REDUCTIONS IN SPEED.

⑩ SUPERELEVATION MAY NOT BE REQUIRED ON LOCAL STREETS IN RESIDENTIAL, COMMERICAL, AND INDUSTRIAL AREAS.

⑪ THE BRIDGE WIDTH FOR URBAN ROADWAYS WITH SHOULDERS SHOULD NOT BE LESS THAN WIDTHS SHOWN FOR RURAL ROADS APPROVED ROADWAY WIDTHS.

⑫ MAXIMUM GRADES OF SHORT LENGTHS (LESS THAN 500') AND ON ONE-WAY DOWN GRADES MAY BE TWO PERCENT STEEPER.

⑬ FOR GUIDANCE ON FREEWAYS, REFER TO AASHTO'S "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", CURRENT EDITION.

⑭ INTERMEDIATE DESIGN SPEEDS (5 MPH INCREMENTS) MAY BE APPROPRIATE WHERE TERRAIN AND OTHER ENVIRONMENTAL CONDITIONS DICTATE.

⑮ REFER TO AASHTO'S "GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES", CURRENT EDITION, WHEN COMBINING A PEDESTRIAN SIDEWALK WITH A BICYCLE PATH.

⑯ FOR GUIDANCE ON INTERSTATES, REFER TO AASHTO'S "A POLICY ON DESIGN STANDARDS INTERSTATE SYSTEM", CURRENT EDITION.

⑰ WHERE RIGHT-OF-WAY IS LIMITED, A BORDER AREA OF 2 FT MAY BE TOLERATED WHERE NO SIDEWALK IS PRESENT.

⑱ FOR ADDITIONAL GUIDANCE FOR ROADS < 2000 ADT, REFER TO "GUIDELINES FOR GEOMETRIC DESIGN OF LOW-VOLUME ROADS", 2019 EDITION.

⑲ REFER to AASHTO'S "GUIDE FOR THE PLANNING, DESIGN, AND OPERATION OF PEDESTRIAN FACILITIES, CURRENT EDITION.

Appendix J Designing for Transitions Between Contexts

Adopting context classification enables a deeper focus on designing transition zones — areas that join roadway segments with different context classifications. Transitions should alert drivers of the impending change in context so they can adjust their speeds to match the needs of the adjacent land use, roadway users, community, and roadway network.

Transition Applications

Below are brief descriptions of some of the applications that can encourage the use of appropriate speeds for the context of the transition area. It is not an all-inclusive list but does provide options that can be used for different project types. Some options may be more feasible on new or reconstruction projects.

- **Roundabouts.** Roundabouts are typically designed for entry speeds of 25-35 mph. They are often used as a gateway into a community, providing users with a visual indication of a change in context. On high-speed approaches to a roundabout, consider implementing additional speed reduction countermeasures. For more information on designing for high-speed approaches at roundabouts, see KYTC's Roundabout Design Guidance.

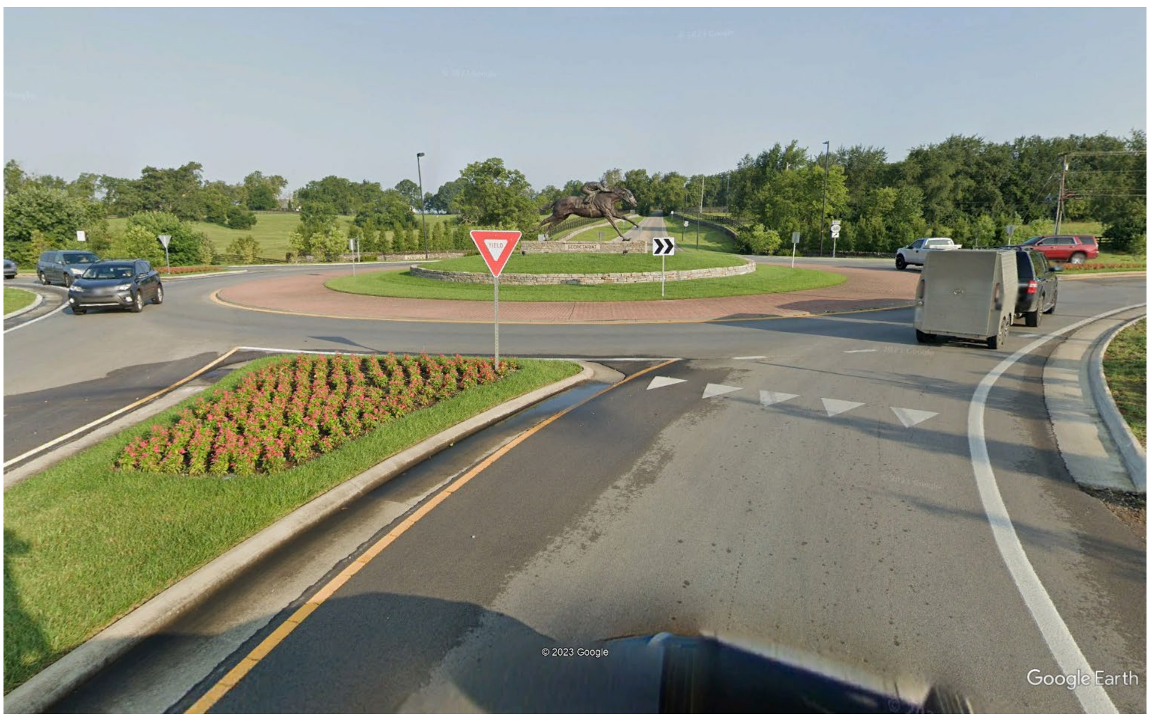


Figure 1 Roundabout at KY 1681 and Alexandria Dr. (Fayette County)
Photo Source: Google © 2023

- **Speed Reduction Markings.** Optical speed bars are transverse pavement markings that can increase rate of speed limit compliance. For more information on the application of speed reduction markings, see Figure 3B-28 in the MUTCD. Figure 2 shows the use of optical speed bars on a high-speed approach to a roundabout.

Figure 2 Optical Speed Bars on US 60 (Bath County)
Photo Source: Google © 2023

- **Chicanes or Horizontal Deflection.** A series of horizontal deflections can be installed on a relatively straight roadway. Consider operating speeds at entry when designing curves and superelevation rates. Details for designing a series of successively smaller curves are available in KYTC's Roundabout Design Guidance.
- **Center Island/Raised Median**. A median may be created by combining striping with raised curbs, landscaping, and other features. Details on the application of markings for short median lengths are similar to Figure 3B-15 in the MUTCD.

  https://mutcd.fhwa.dot.gov/htm/2009/part3/fig3b_15_1_longdesc.htm.

- **Traveled Way Narrowing**. Multiple methods can be used to narrow a roadway.
  - If there is enough available capacity to reduce the number of lanes, traveled way narrowing may be done as part of a **Road Diet** or roadway reconfiguration.
  - Lane width narrowing may be done with **striping** or curb extensions.
  - Physically reduce the roadway width. This may include transitions from roadways with shoulders and clear zone to cross sections with narrower lanes and curb and gutter.

Excess width may be repurposed for other uses (e.g., bike or pedestrian facilities).

- **Curb Extensions.** Curb extensions may extend out at crosswalk areas and are usually 1-2 ft narrower than on-street parking. They increase the visibility of vulnerable roadway users and reduce pedestrian crossing times. Consider other applications if within the turning path of an area that regularly accommodates large trucks.

Figure 3 Curb Extensions, Paducah
Photo Source: Google © 2023

- **Addition of Bicycle and/or Pedestrian Facilities**. For more information on the transportation expectations and types of facilities that may be considered for different roadway contexts, see KYTC's *Complete Streets, Roads and Highways Manual*. Figure 4 shows a transition from a rural to a suburban context. A shared use path (SUP) was added to the facility.

Figure 4 Addition of SUP and Raised Median on US 60, Shelby County
Photo Source: Google © 2023

- **Transverse Rumble Strips**. Transverse rumble strips, which are perpendicular to the direction of travel, may be beneficial when approaching an intersection or clusters of development and transitioning from different contexts. When installed near residential dwellings, consider potential noise impacts.
- **Speed-Activated Feedback Signs**. Dynamic speed feedback signs are traffic control devices that are often used to reduce vehicle speeds (Figure 5).

Figure 5 Speed-Activated Feedback Sign

- **Speed Tables**. Speed tables are traffic-calming devices used on **low-speed** facilities and often include raised pedestrian crossings. Slopes are not greater than 1:10 or less than 1:25. Vertical height is 3-3.5 inches. They are around 22 ft long — 6 ft. approaches and a 10 ft. plateau (see Figure 6).

Figure 6 Speed Table in Lexington, KY

- **Raised Crosswalks**. Raised crosswalks are often placed on top of the flat part of a speed table. Figure 3B-30 of the MUTCD illustrates typical dimensions and markings for speed tables with crosswalks. When used at mid-block or uncontrolled crossings, KYTC's *Complete Streets, Roads, and Highways Manual* recommends their use on facilities with posted speeds ≤ 30 mph and AADT < 9,000.
- **Signs.** Signs that indicate downstream speed reductions (W3-5 and W3-5a) and advisory speeds are available. Welcome signs may also alert roadway users of a downstream change in context.
- **Gateways.** Gateways are a combination of applications that indicate a change in context. They are typically located at the entry of a community or town and may include some combination of lane narrowing, welcome signs, raised medians, and roundabouts.

Combinations of treatments are more effective than a single treatment at reducing speeds and minimizing crashes within a transition zone.

Context Application of Transitions

When transitioning from a roadway context with a higher operating speed to contexts with lower speed, not all treatments or applications are appropriate. The designer should consider the users of the facility, the transportation expectations for the area, and the feasibility of the application.

Rural

Rural contexts usually have the highest operating speeds. Transitions may be needed within the rural context classification if there are locations (e.g., intersections, school zones) that would benefit. Advisory signs, dynamic speed feedback signs, transverse rumble strips, roundabouts, traveled way narrowing, horizontal deflection, and speed reduction markings may be appropriate for these areas.

Figure 7 Rural Road, US 421, Woodford County
Photo Source: Google © 2023

Rural Town

Roadways transitioning from a high-speed, Rural context into a Rural Town may use the following design treatments, when appropriate: raised medians, roundabouts, roadway narrowing, lane reductions, and transverse pavement markings. Transitions may also include changes in typical section from roadways with shoulders and clear zone to roadways with narrower lanes and curb and gutter. Combining treatments can create a gateway into a community that encourages slower speeds and preserves the character of the Rural Town.

Figure 8 Rural Town, US 62, Grayson County
Photo Source: Google © 2023

The Green Book (7th Edition) breaks the transition zone into two areas — the perception-reaction area, and the deceleration area (Figure 9). Before selecting a treatment, consider the two areas that make up the transition zone. In the perception-reaction area, warning treatments (e.g., signs and pavement markings) are appropriate. In the deceleration area, physical treatments should be installed. Consider prohibiting passing in transitions zones.

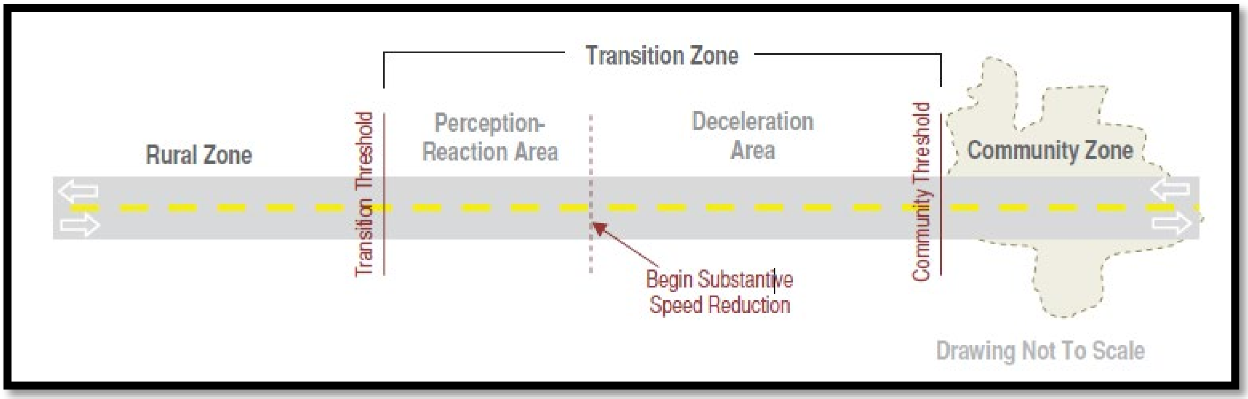


Figure 9 Transition Zone
(Source: AASHTO's *A Policy on Geometric Design of Highway and Streets* (2018))

Suburban

Suburban roadways may serve as transition areas between rural roadways (Rural) and urban roadways (Urban/Urban Core). Treatments used to address speed changes from Rural areas to Suburban areas may be similar to those used when transitioning from Rural areas to Rural Towns. The roadway cross section and roadside design will transition within the Suburban context to match the predominant land uses and facility users.

Figure 10 Suburban Road, US 60, Franklin County
Photo Source: Google © 2023

Urban

Urban roadways may transition into Urban Core contexts or may serve as the city center in a smaller town. Speed transitions should be established on segments that approach Urban roadways from Suburban and Rural contexts. Urban roadways often have higher bicycle, pedestrian and transit activity. Transitions may include changes in typical section from roadways with shoulders or shared-use-paths to roadways with narrower lanes, curb and gutter, and bicycle and pedestrian facilities. Curb extensions or raised crosswalks may be considered.

Figure 11 Urban Road (Jefferson County)
Photo Source: Google © 2023

Urban Core

When transitioning from a higher-speed context to an Urban Core context, consider the following:

- Raised crosswalks, curb extensions, and tight corner radii at intersections
- Reduce lane widths and eliminate unnecessary travel lanes, reallocating space for bicycle facilities, wider sidewalks, curb extensions, and other uses.
- Use of landscaped or raised medians to facilitate mid-block pedestrian crossings
- Limit superelevation, usually to normal or reverse crown, to encourage lower speeds
- Horizontal clearance may be narrower since speeds are lower.
- Roadway illumination for overall or pedestrian-scale lighting

Figure 12 Urban Core

As segments transition into an Urban Core, pedestrian crossings are typically provided at every block.

Appendix K Proposed Context Classification Edits to the Planning Manual

Proposed Edits – Division of Planning Guidance Manual

The following are proposed edits to the Planning Manual to better incorporate context classification. The edits are in red.

PL-503.5 FUNCTIONAL CLASSIFICATION

How is the Functional Classification system defined?

Functional classification is the process of grouping streets and highways according to the character of travel service they provide. This classification system recognizes that travel involves movement through a hierarchical system of facilities that progress from lower classifications handling short, locally oriented trips, to higher classifications that serve longer-distance travel at a higher level of mobility. The function performed by a roadway within this hierarchical system determines its classification. Functional classification is an important transportation planning tool used for programs such as federal-aid funding and eligibility, traffic modeling, reporting of highway statistics, highway and pavement design, and measurement of highway system performance.

For federal funding and other federal requirements, ~~A~~a roadway's classification is further defined as either urban or rural, based upon its location within one of the FHWA Adjusted Urban Area Boundaries. All public roadways, including those maintained by non-state agencies, are assigned one of the following functional classifications:

- Interstates: Roadways that comprise the Dwight D. Eisenhower National System of Interstate and Defense Highways and other interstates as designated by the U. S. Secretary of Transportation
- Other Freeways & Expressways: Non-interstate roadways with access points limited to on-ramp and off-ramp locations and directional travel lanes usually separated by a physical barrier
- Other Principal Arterials: Roadways that provide a high level of traffic mobility for substantial statewide travel, or serving major activity centers and the longest trip demands within urban areas
- Minor Arterials: Roadways that serve trips of moderate length to smaller geographic areas and at slightly lower level of traffic mobility than principal arterials
- Major Collectors: Roadways that distribute and channel trips between roadways with lower classifications and the arterial systems
- Minor Collectors: Roadways that distribute and channel trips between local roads and roadways with higher classifications at a lower level of traffic mobility than major collectors
- Local Roads: Roadways that primarily provide direct access to adjacent land and are not intended for use in long distance travel

FHWA establishes classification criteria and procedures but relies on state and local transportation planning professionals to assign the classifications. Further guidance is accessible from FHWA's Highway Functional Classification Concepts, Criteria and Procedures.

What input is required to maintain the Functional Classification System?

KYTC's Division of Planning, Transportation Systems Branch and Data Management Branch, ensure functional classifications of Kentucky's roadways are updated regularly. In concert with ADDs and MPOs, KYTC reviews its highway systems every 10 years to coincide with the decennial census and the adjusted urban area boundary update cycle.

What forms are used?

There are no official TC 59 planning forms for this process.

What are the steps in maintaining the Functional Classification System?

This maintenance process involves ongoing coordination with local planning partners to identify roadways that require changes to their functional classification due to changes in transportation network and land use patterns.

These changes can involve:

- Adding newly constructed or extended roadways to the network, which can in turn affect the functional classification of connecting or nearby roadways
- Upgrading the functional classification of an existing roadway due to land use changes or an improvement made to the roadway
- Downgrading the functional classification of an existing roadway due to land use changes, traffic controls that discourage through traffic, or other controls that limit the speed and capacity of a road

KYTC maintains the functional classification attributes of roadways to reduce effort needed for periodic updates. Issues related to functional classification are kept in mind as KYTC works with local transportation planning partners on various initiatives, such as long-range planning activities and project programming and development.

It is useful to consider the following questions when determining if a classification change may be necessary:

- Have new significant roadways been constructed that may warrant arterial or collector status?
- Has any previously non-divided principal arterial roadway been reconstructed as a divided facility?
- Has any new major development (such as an airport, regional shopping center, or major medical facility) been built in a location that has caused traffic patterns to change?
- Has there been significant overall growth that may have caused some roadways to serve more access or mobility needs than they have previously?
- Have any arterial or collector roadways been extended or realigned in such a way as to attract more through-trip movements?
- Has a roadway experienced a significant growth in daily traffic volumes?

Should a change in functional classification be deemed necessary, KYTC's Division of Planning, Transportation Systems Branch, prepares and processes an official order in accordance with PL-600. The change is made when the official order is signed by the Secretary of Transportation.

When is Functional Classification System maintenance complete?

KYTC's Division of Planning, Transportation Systems Branch, manages functional classification maintenance, with day-to-day interactions under the direct purview of the branch manager. The approval chain for the preparation of official orders approving functional classification systems modifications follows the approval chain outlined in PL-600. Any specific data concerns or issues encountered within the functional classification system maintenance process may be elevated at any time to KYTC's Division of Planning Director.

PL-503.9 CONTEXT CLASSIFICATION FOR GEOMETRIC DESIGN

How is the Context Classification defined?
Rural and urban boundaries used to determine functional classification are further broken down into the following classifications:

Rural areas:

- Rural context: Areas with the lowest density, few houses or structures (widely dispersed or no residential, commercial, and industrial uses), and usually large setbacks.
- Rural town context: Areas with low density but diverse land uses with a commercial main street character, potential for on-street parking, and sidewalks and small setbacks.

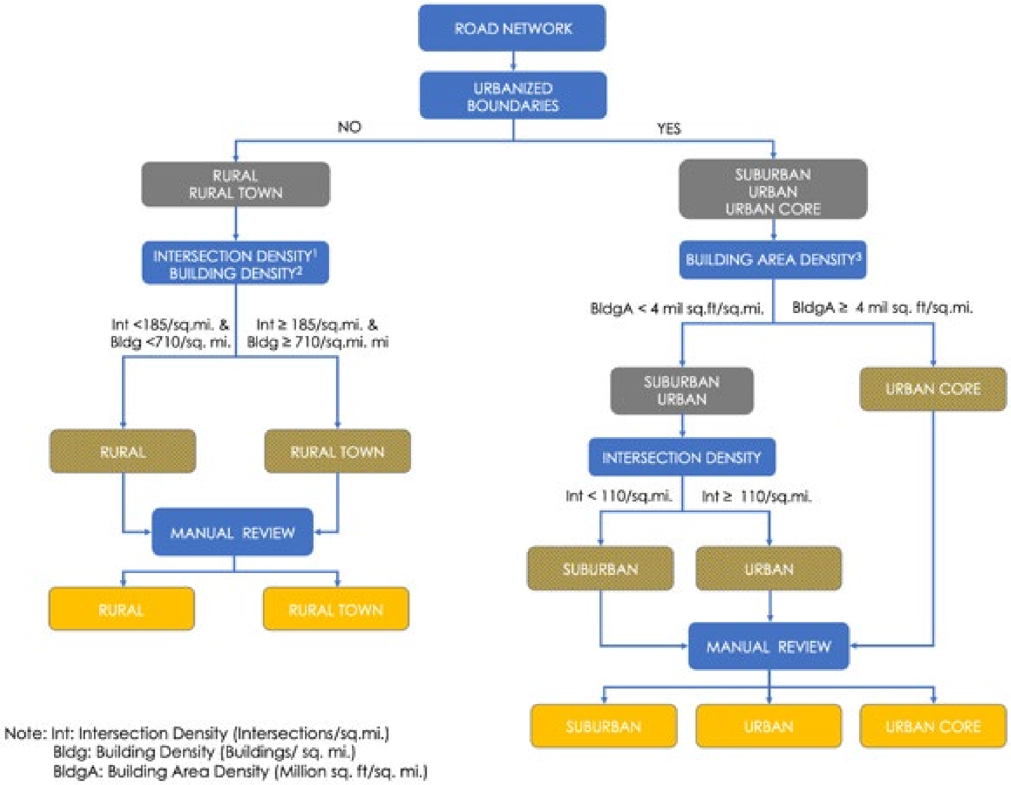
Urban areas

- Suburban context: Areas with medium density, mixed land uses within and among structures (including mixed-use town centers, commercial corridors, and residential areas), and varied setbacks.
- Urban context: Areas with high density, mixed land uses and prominent destinations, potential for some on-street parking and sidewalks, and mixed setbacks.
- Urban core context: Areas with the highest density, mixed land uses within and among predominately high-rise structures, and small setbacks.

AASHTO's *A Policy on Geometric Design of Highways and Streets* recommends criteria for context classification, which are to be applied by state and local transportation planning professionals. Additional guidance is available in NCHRP Report 1022 (*Context Classification Application: A Guide*).

Context classification is an overlay used with function classification for geometric design. Functional classification categorizes roadways based on the balance between motor vehicle mobility and access afforded by a facility. The four principal functional classifications are principal arterials (for main movement), minor arterials (distributors), collectors, and local roads and streets.

What input is required to maintain the Context Classification?
At the statewide level, the U.S. Census urban boundaries, a road network database, and a database that can be used to determine building density and setbacks (e.g., Microsoft Maps U.S. Building Footprint database) are analyzed to determine context classification. The flowchart below illustrates the methodology described in NCHRP 1022 *Context Classification Application: A Guide* for performing context classification at the network scale.



At the project level, in addition to local data sources, knowledge of the project area or a site visit (e.g., to evaluate development type, density, building setbacks) that may not be available in regional or statewide databases. Review of local zoning maps and comprehensive plans to identify ongoing and upcoming projects in the area will help clarify future potential network conditions. These can serve as a basis for applying context classification in geometric design.

What forms are used?
No official TC 59 planning forms are used for this process.

What are the steps in maintaining the Context Classification System?
Maintenance involves routine review of the databases used to develop classifications at the statewide level network as well as ongoing coordination with local planning partners to identify roadways whose context classification should be updated to reflect changes in the transportation network and evolving land use patterns.

Include the identification of the Project-Level Context Classification on the DNA form. When the Network of Context Classification is complete, that can also be included.

Other recommended changes to the Planning Guidance Manual after completion of the network-level context classification include:

- On Figures 15 and 16, include a step in the flowchart, "Determine project-level context classification."
- Update Table 2. Planning Activity Matrix in PL-203 to include the following row:

Planning Topic	What is done?	Why is it done?	When is it done?	Who does this?
Context Classification	KYTC's Context Classification System is an important planning tool that groups streets and highways according to the character of travel service they provide. It is developed using an automated system based on development density, land uses, and building setbacks.	Supports AASHTO guidance for designing for all users.	Context Classification System data is continuously monitored, and updates are made as community growth and changes in travel patterns necessitate.	Data Management and Transportation Systems