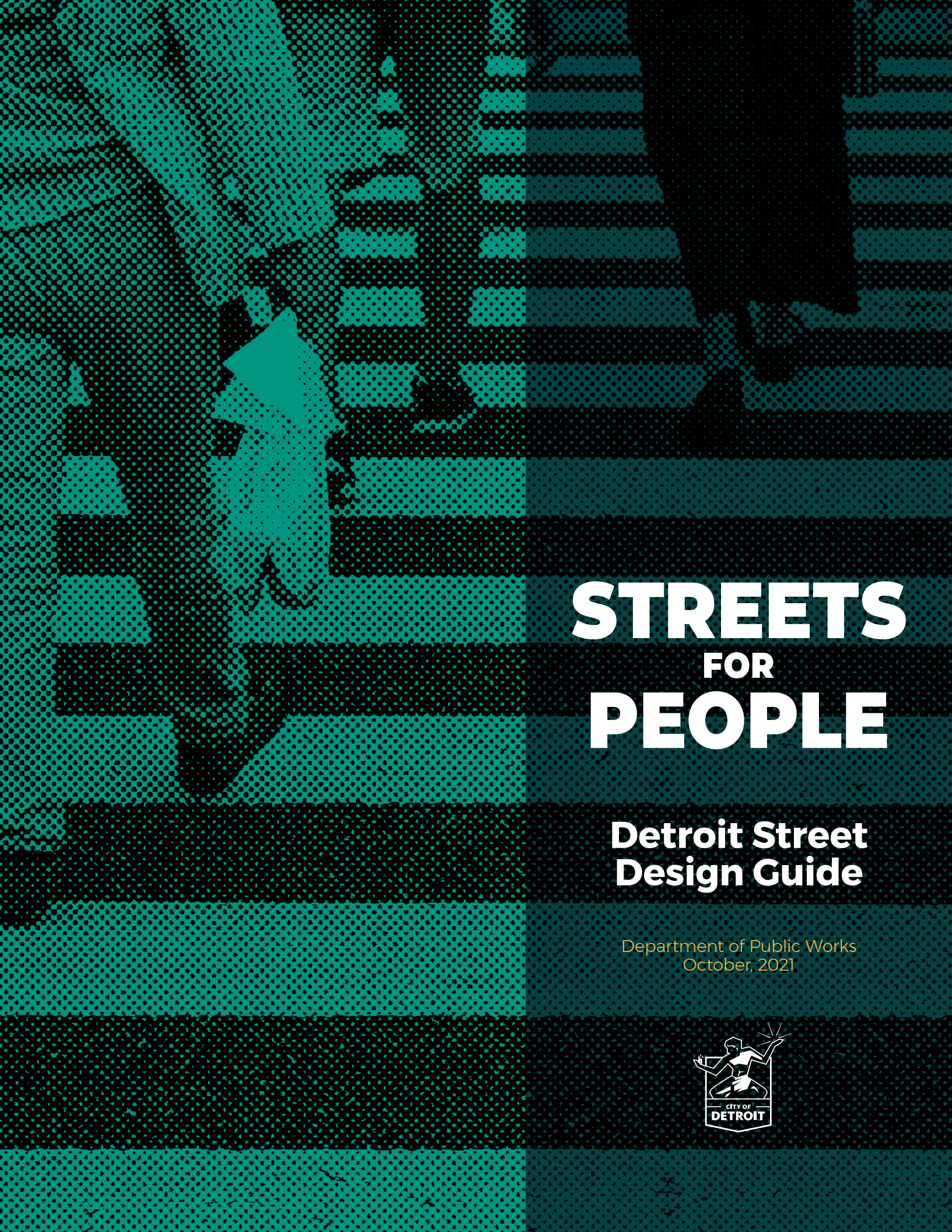

STREETS FOR PEOPLE

Detroit Street Design Guide

Department of Public Works
October, 2021

CITY OF DETROIT

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CONTENTS


EASTERN

1: INTRODUCTION

1 INTRODUCTION

Detroit's streets serve critical functions: while their primary purpose might be to help people and goods move, our streets also serve as places for socializing, shopping, and exercising. They are places for artistic expression and community gathering. Detroit's streets fundamentally impact people's quality of life, health, mobility, and safety. Recognizing the important role that Detroit's streets play in the lives of our residents and visitors, the City of Detroit is introducing the Streets for People (SFP) Detroit Street Design Guide to provide guidance and recommendations on all aspects of street design in Detroit.

The Vision for Our Streets

SFP will make it easier and safer for all Detroiters to move around the city. SFP is focused on ensuring that no matter where you live or travel in Detroit, you will have multiple safe, affordable, high-quality transportation choices to get where you want to go, even if you don't drive a car. By 2030, all residents should have access to jobs and civic life; safe, healthy, green, and livable streets; and the opportunity to shape their neighborhoods in collaboration with a responsive, productive city government. Our streets should be beautiful, reflect the rich history of Detroit, and honor the expression, creativity, and identities of all who have and will call Detroit home.

SFP Values

We will implement the SFP Vision through guidance that follows and fosters the five SFP Values:

Safety First

Provide a safe travel experience for all by designing and stewarding Complete Streets that eliminate preventable traffic deaths and severe injuries and enable people to move freely without fear of harm.

Economic Opportunity

Strengthen the neighborhoods by advancing inclusive economic opportunity and job creation through capital investments.

Equity, Dignity, and Transparency

Increase equity and dignity for all residents and visitors to Detroit through transparent transportation decision-making processes and rigorous community engagement.

Access for All

Serve people of all ages and abilities with multiple high-quality mobility options.

Public Health and Environment

Preserve and protect Detroit'senvironment and improve health by providing opportunities for walking and biking, reducing vehicle miles traveled, and decreasing pollution caused by motor vehicles.

Streets for People

Streets for People (SFP) is Detroit's transportation master plan. The plan and other resources can be found at detroitmi.gov/streetsforpeople

Purpose

The Streets for People Detroit Design Guide (the/this Guide) communicates expectations regarding the design of Detroit's public streets. The intent of this Guide is to ensure that Detroit's streets serve all users: pedestrians, people on bikes, transit users, and drivers of all ages, abilities, and identities.

Who Should Use this Guide

The Guide is primarily intended as a resource for City engineering and planning staff, but it is also a resource for residents, decision-makers, developers, advocates, and neighborhood groups.

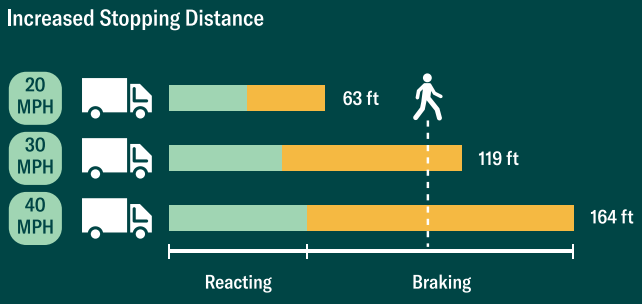
The Guide should also serve as a reference for the Michigan Department of Transportation (MDOT) and the Wayne County Department of Public Services when designing or improving streets under their jurisdiction within the City of Detroit. Consistent application of the context-sensitive design guidance found in the following chapters will fulfill shared goals of accessibility and safety.

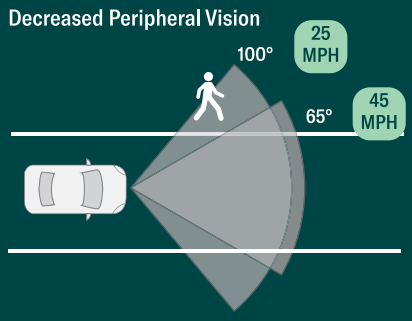
Designing Streets for Safety

Our highest priority is to design streets that are safe for all users. From 2014 – 2018, 435 pedestrians, people on bikes, drivers, and passengers died in traffic crashes in Detroit and 1,639 more were seriously injured. Our goal is to eliminate these preventable, life-altering tragedies, acknowledging that the responsibility for traffic safety is shared between designers and users. We will use this guide to design streets where all people feel safe, secure, and welcome.

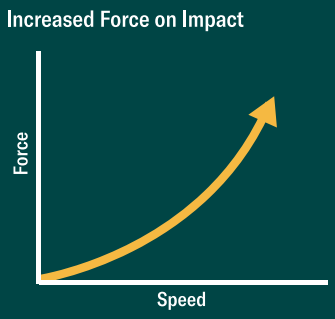
Designing for Safer Speeds

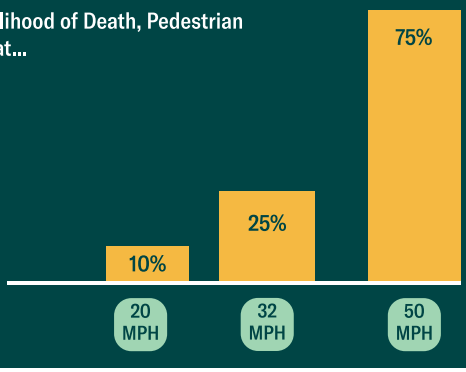
HIGHER SPEEDS = HIGHER LIKELIHOOD OF A CRASH





HIGHER SPEEDS = HIGHER LIKELIHOOD OF DEATH





Source: NACTO City Limits - Setting Safe Speed Limits on Urban Streets

The Context

Over the last half of the twentieth century, street design, both in Detroit and nationwide, centered on the mobility of people driving. Although safety was an important consideration, design practices focused on moving vehicles and prioritizing motorist convenience, often at the expense of those who could not or did not choose to drive, such as pedestrians and people on bikes.

Street design affects safety by influencing how people interact with the street and each other. For example, wide roads with plentiful travel lanes and large corner radii encourage high vehicular operating speeds, which increases the risk of severe crashes and death.

Ways We Will Increase Street Safety

We will take a Safe System approach to street design. We accept that people make mistakes. Therefore, we will use design practices that are proven to reduce crashes and the risk of severe injury or death when crashes do occur. Since we have the engineering, education, and encouragement tools, we cannot accept any deaths from traffic crashes. To that end, we will:

- **Design all streets for the most vulnerable users** particularly people walking, children, seniors, and people with physical and cognitive differences. Streets that are safe for the most vulnerable users are safe for all users.
- **Choose safety over convenience** when we can't achieve both. We will design streets for the most vulnerable users at all times over traffic efficiency at peak hours.

- **Reduce and manage speeds** along our roadways, including at intersections, midblock crossings, and other conflict points by designing for maximum target speeds and setting speed limits that reduce the risk of serious injury and death.
- **Increase visibility and awareness** of pedestrians and other vulnerable users.
- **Minimize vulnerable users' exposure** to motor vehicles by creating compact intersections, shortening crossing lengths, reducing turning conflicts, and providing separated facilities where necessary.

Establishing Safety through Inclusion

Our concept of street safety extends beyond eliminating severe traffic crashes. We acknowledge that many people, especially the most vulnerable in our society, may feel unsafe or excluded in public spaces. We will design spaces in which residents and visitors to Detroit of all backgrounds and identities feel safe from harm, welcomed, and uplifted.

- **Engage local residents and vulnerable groups** early and often in the design process.
- **Create inclusive public spaces** that are joyful, accessible, welcoming, and respectful to everyone.
- **Prioritize** the safety needs of the most vulnerable such as women, children, elders, LGBTQ+ people, people with disabilities, people experiencing homelessness, and other marginalized populations.
- **Preserve history, art, and cultural memories** to increase community ownership and provide space for expression and civic engagement.
- **Empower people to define what safety looks like on their streets** understanding that residents experience safety and comfort differently depending on their unique identities and communities.
- **Cultivate active, alluring** spaces that people take pride in, that will be cared for over time, and sustained.

Additional Resources

- FHWA Safe System Approach
- ITE Safe System Resources
- NACTO City Limits: Setting Safe Speed Limits on Urban Streets
- NTSB Reducing Speeding-Related Crashes Involving Passenger Vehicles
- Crash Modification Factors Clearinghouse

How to Use this Guide

This Guide is intended to support decision-making for street planning, design, and engineering. The Guide integrates design flexibility to support all modes of transportation and presents minimum, maximum, and preferred criteria that vary by street type and context. All guidance should be implemented using engineering judgment. The Guide should be used in conjunction with the SFP Project Development Checklist and local, state, and federal standards. The Guide will occasionally be updated to address new issues that arise and to reflect the latest best practices.

Within the Guide, users will find a street typology comprising eight street types based on the Federal Highway Administration's functional classifications for roadways. Street types are categorized and described according to size, land use, operations, and character so that the key features of a street type may be consistently applied to create complete networks integrated with surrounding land uses.

Design guidance and recommendations are provided for the three main components of Detroit's streets: Sidewalks, Roadways, and Intersections. Overarching design principles are introduced for each portion, followed by individual design elements that fall under each topic, such as seating in the Sidewalks chapter or Accessible Pedestrian Signals in the Intersections chapter. Requirements and Considerations are included for each design element.

SFP Project Development Process

Begin SFP Project Development Checklist

Define Purpose and Need

In consultation with the community, internal, and external stakeholders, determine opportunities, priorities, existing performance, and crash patterns.

Identify Project Scope

Based on project needs and funding sources, set project timeline, budget, impacts, and stakeholders.

Identify Project Priorities

Using the SFP Design Guide, street typology, citywide networks, and equity areas, assess ROW trade-offs and priorities.

Chapter 2: Typology

Select Improvements

Using the purpose and need, scope, and priorities, set cross section and select improvements in line with Requirements and Considerations.

Chapter 2: Typology
Chapter 3: Sidewalks
Chapter 4: Roadways
Chapter 5: Intersections

Design and Construct

Once conceptual design has been confirmed, execute design engineering and move to construction.

Check Our Work

Assess the conceptual design to determine whether the design fits within scope, reflects priorities, and responds to purpose and need.

Finalize SFP Project Development Checklist

City of Detroit & MDOT References

City of Detroit

- Department of Public Works Right of Way Permits and Standards

MDOT: Michigan Department of Transportation

- Michigan Manual on Uniform Traffic Control Devices (MMUTCD)
- Road Design Manual

Note: on City jurisdiction streets, the Road Design Manual supplements guidance in the SFP Design Guide. Where the guides conflict, the SFP Design Guide shall rule.

Federal Laws & National Guidelines

Streets in Detroit must also meet federal laws and should follow national best practices for street design and traffic control.

FHWA: Federal Highway Administation

- Manual on Uniform Traffic Control Devices (MUTCD)
- FHWA Achieving Multimodal Networks: Applying Design Flexibility & Reducing Conflicts

ADA: Americans with Disabilities Act (ADA)

- United States Access Board's 2010 ADA Standards for Accessible Design
- 2011 (Proposed) Public Rights-of-Way Accessibility Guidelines (PROWAG)

AASHTO: American Association of State Highway and Transportation Officials

- Policy on Geometric Design of Highways and Streets
- Guide for the Development of Bicycle Facilities
- Guide for the Planning, Design and Operation of Pedestrian Facilities

NACTO: The National Association of City Transportation Officials (NACTO)

- Urban Bikeway Design Guide
- Urban Street Design Guide
- Transit Street Design Guide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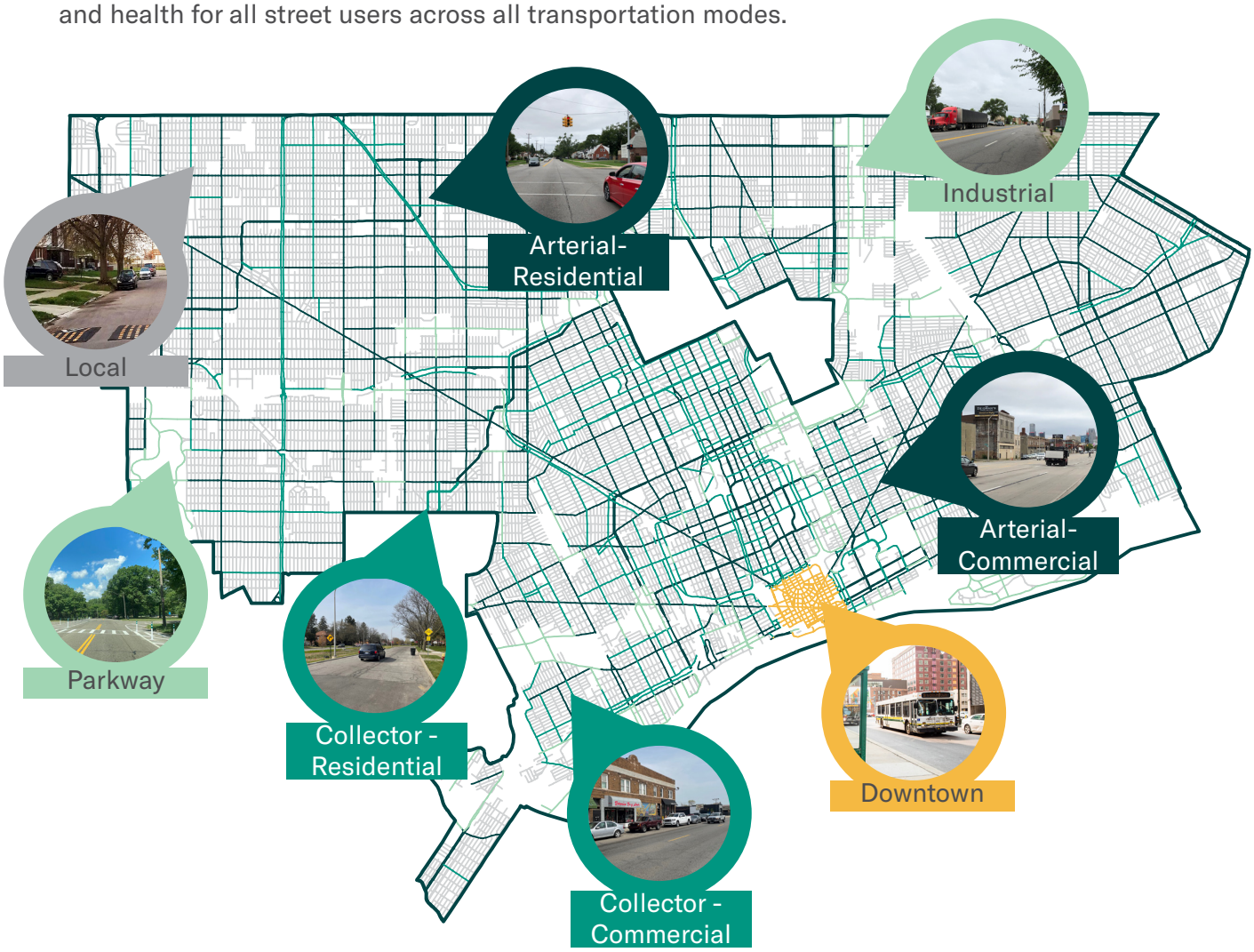
2: TYPOLOGY

2 TYPOLOGY

Detroit's streets have conventionally been classified according to how they function for motor vehicles. The Streets for People Design Guide offers a more inclusive street classification typology, or group of street types, that reflects SFP Values to support safety, economic opportunity, equity, access, and health for all street users across all transportation modes.



Street Types

Under the SFP system, streets are classified according to both multimodal function and adjacent land use to capture how streets should function given the industries, homes, institutions, and/or businesses they are meant to support. A broad range of street characteristics and dimensions may fit under one street type, and street types might change along the full length of a street.

Detroit SFP street types include:

- Arterial – commercial
- Arterial – residential
- Collector – commercial
- Collector – residential
- Local
- Parkway
- Industrial
- Downtown

This new classification should be used as a foundation for understanding street character and the role of a street within Detroit's wider transportation network. As Right-of-Way (ROW) is generally fixed and cannot meet every demand for street use, this typology informs the dimensions, design features, and trade-offs to be made according to each street type and its modal priorities. Street type recommendations also consider the guiding principles for a Safe System approach.

The aforementioned information is provided in Street Type Design Profiles detailed in this chapter.

Design fundamentals and features mentioned in this chapter are detailed in design elements pages throughout the Sidewalks, Roadways, and Intersections chapters.

Modal priorities should be established in coordination with the Citywide Networks section of the Detroit Transportation Master Plan.

Project Type

Street design work could fall under one of several project types, including new construction or reconstruction, retrofits (any project that does not change ROW or curb to curb width), resurfacing, and intersection or utility improvements. These project types require different timelines, budgets, and levels of coordination, but all should seek to address safety and comfort issues on Detroit's streets to the extent possible. For instance, while resurfacing and retrofit projects may not be able to widen sidewalks to support future levels of pedestrian activity, these projects can help rebalance curb-to-curb uses, increase safety at intersections, and fill multimodal network gaps in the interim.

The information within this typology chapter is meant to provide enough design flexibility to apply across all project types.

Balancing Street Priorities

Modal priorities most strongly inform the design of streets beyond planning vision, budgets that determine the breadth and depth of street work, and City and community goals. Given spatial limits and the need to meet so many demands on a street, design trade-offs must be made between modes. These are communicated by each street type profile, but design fundamentals that apply across **all** street types are:

- **Design streets from edges inward.** Designing streets that prioritize people walking, biking and taking transit requires that attention and resources be devoted to sidewalk space, bike facilities, and accommodations for transit users. More flexibility can also be built into the curbside zone so it serves multiple users.
- **Reallocate space between the curbs.** As streets have conventionally been designed for the convenience of motor vehicles, space should be reallocated from vehicular travel lanes to other modes as part street design projects where needs exist.
- **Repurpose curbside space for higher-demand uses.** Detroit generally has an ample supply of on-street parking that exceeds demand. While some on-street parking should be maintained for anticipated growth, repurposing curbside space to the highest priority uses should be an option for roadway projects where restriping occurs, whether for intersection improvements or along the entire length of a street segment.

Additional Resources

- NACTO Urban Street Design Guide
- (Proposed) Public Rights-of-Way Accessibility Guidelines (PROWAG) 2011

STREET TYPE DESIGN PROFILES

This section contains design profiles for each street type in the SFP typology. The design profiles provide a general starting point for design, including operational parameters, modal priorities, design considerations, and street zone widths to inform streetscape designs in concert with current and future users, behaviors, existing functional classification, and adjacent land use.

1 ARTERIAL - COMMERCIAL

Arterial - Commercial streets serve high volumes of people across all modes while forming the backbone of the transit, auto, and freight networks. These streets provide the most direct connections between neighborhoods, services, places of work, and civic and open spaces. Some commercial segments are auto- and freight-oriented, with larger building setbacks and only safety-focused elements for vulnerable users. With limited or no building setbacks, many segments are transit- and pedestrian-oriented - with comfortable bus stops and sidewalks that are activated with storefronts, outdoor dining, art, and vegetation.

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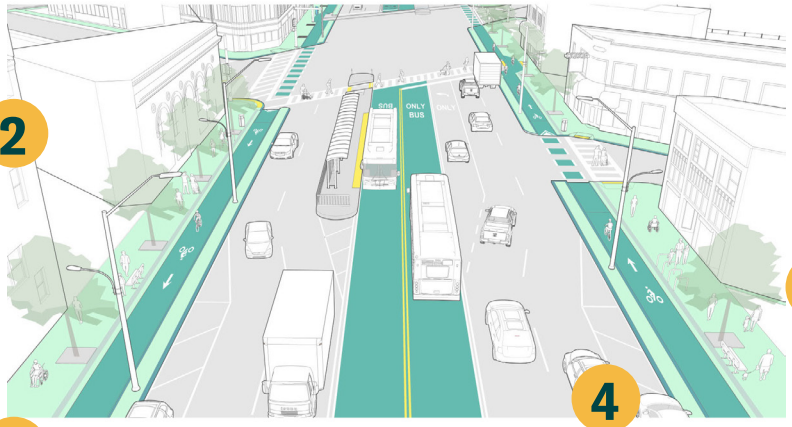

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3

Quick Look

Right-of-way	80' to 120'
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators, and/or transit stops and mid-block crossings. Enhance crossings with safety treatments.
Bicycle facilities	Protected preferred, or alternate parallel route
Transit accommodations	Bus-only lanes, queue jumps, bus stops with amenities, and enhanced crosswalks on high-frequency routes
Design speed	25-30 mph
Through lanes (each direction)	1-2
Average vehicles per day	10,000 - 30,000
Driveway frequency	Requires access management to reduce driveway frequency
Freight loading location	On-site/alley preferred; on-street where parking is available

Examples

- Gratiot Ave
  St Aubin St to Mt Elliott St
- Livernois Ave
  McNichols Rd to 7 Mile Rd
- Grand Blvd
  3rd St to Brush St

5

Modal Priorities & Design Considerations

high — Activate sidewalk with pedestrian-scale lighting, sidewalk cafés, public art, and stormwater planters. Use preferred frontage, pedestrian, and amenity zone widths and minimal or no building setback during (re)construction. Provide safe and convenient crossings with minimized delay at high-demand intersections and mid-block crossings.

low — Install protected facilities or, when ROW is constrained, provide alternate parallel routes. Provide curb-protected or raised bike lanes during (re)construction. Run bikeways behind bus stops unless constrained. Install bike parking in the amenity zone or curbside zone. Consider signal separation at intersections.

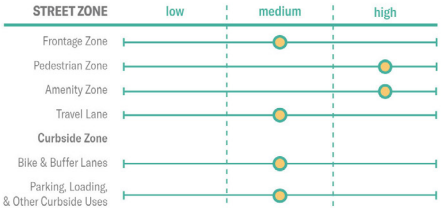
med — Provide amenities at bus stops. Ensure adequate lighting, safe crossings, and connections to other modes at stops. Consider bus-only lanes and signal priority on high-frequency routes.

high — Right-size roadways by considering 5:3, 4:3, or 4:2 conversions (removing travel lanes), narrowing travel lanes, and/or adding medians. Reduce delay by adding left turn lanes and protected phases at intersections as justified and adding center turn lanes with pedestrian refuge islands where driveway frequency is high.

med — Design adequate turning radii where freight network routes intersect (otherwise, design for pedestrians and passenger vehicles). Provide on-street loading locations for businesses where on-site or alley locations are not available.

6

Width Allocation Priorities for Street Zones



7

Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0'	6'	3'	10'*	7'*	5'	1.5' - 3'
Preferred	2' - 4'	8' - 12'	6' - 10'	11'	8'	6' - 7'	3'
Maximum	6'	12'	12'	11'	9'	7'	4'

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3' when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

Typology 1 2 3 4 5

1 Street Type & Description

The street description explains the street's role in the transportation network modal focus, land uses, form and setbacks, and curbside uses.

2 Typical Cross Section

The cross section illustrates a reconstructed street with design features and streetscape elements that are typical for the street type. The treatment shown is meant to provide a quick overview only and should be adapted to meet project scope, budget, and goals.

3 Quick Look

Quick Look gives a brief overview of operational parameters for a street type. It also includes key accommodations for people walking, biking, taking transit, driving, and making deliveries.

Typology 1 2 3 4 5

4 Street Examples

This section provides examples of existing street segments that fall under the functional class, land use, and basic characteristics of the street type. As these examples are existing conditions they may not fully meet the vision and design principles of SFP.

5 Modal Priorities & Design Considerations

This section expresses the modal priorities for a street among Detroit's walking, biking, transit, auto, and freight networks. Priorities, or levels of accommodation, are expressed with the following color designations:

high — Accommodate to high standards, with array of features for safety, comfort, and convenience

med — Accommodate to variable standards, ensuring safety first

low — Provide basic accommodations, ensuring safety first where included

This section also helps the designer to determine key considerations and trade-offs for different street users given limited space and resources.

6 Width Allocation Priorities for Street Zones

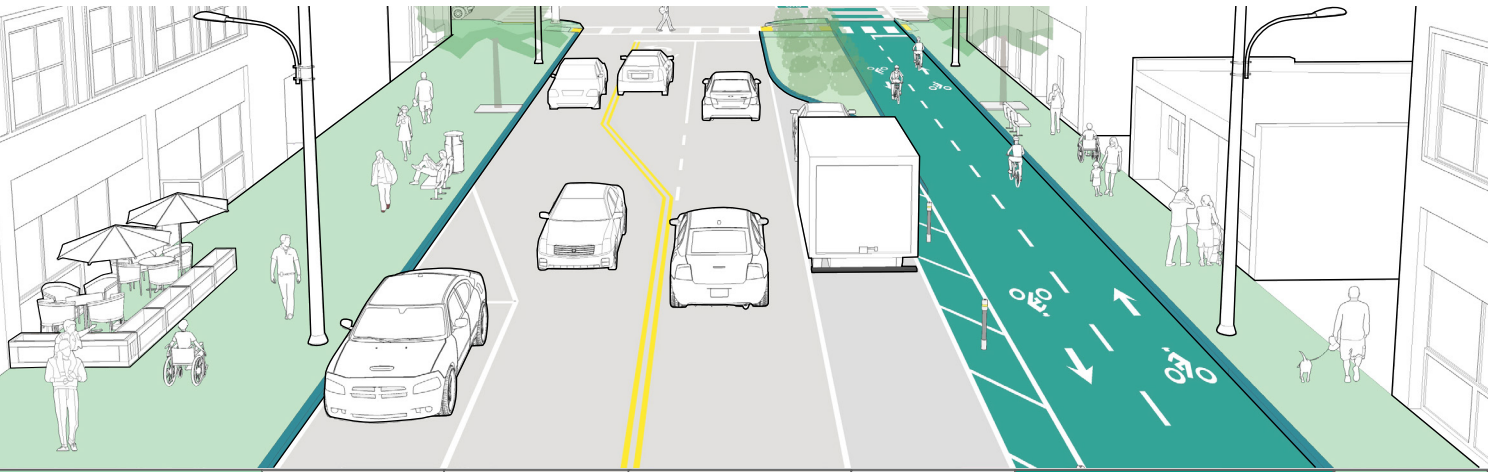
In this section, the slider chart expresses where to prioritize allocating preferred widths to different street zones within a cross section. The sliders may vary from the modal priority rankings and considerations due to a more limited focus on width allocation. Roadway width may be reallocated from motor vehicles to other modes, so the sliders express that rebalance of street space.

7 Street Zone Dimensions

The street zone dimensions table provides minimum, preferred, and maximum widths for each street zone. See the graphic below for clarification of the different zones that make up a street. Preferred widths should be used whenever possible.

PLEASE NOTE:

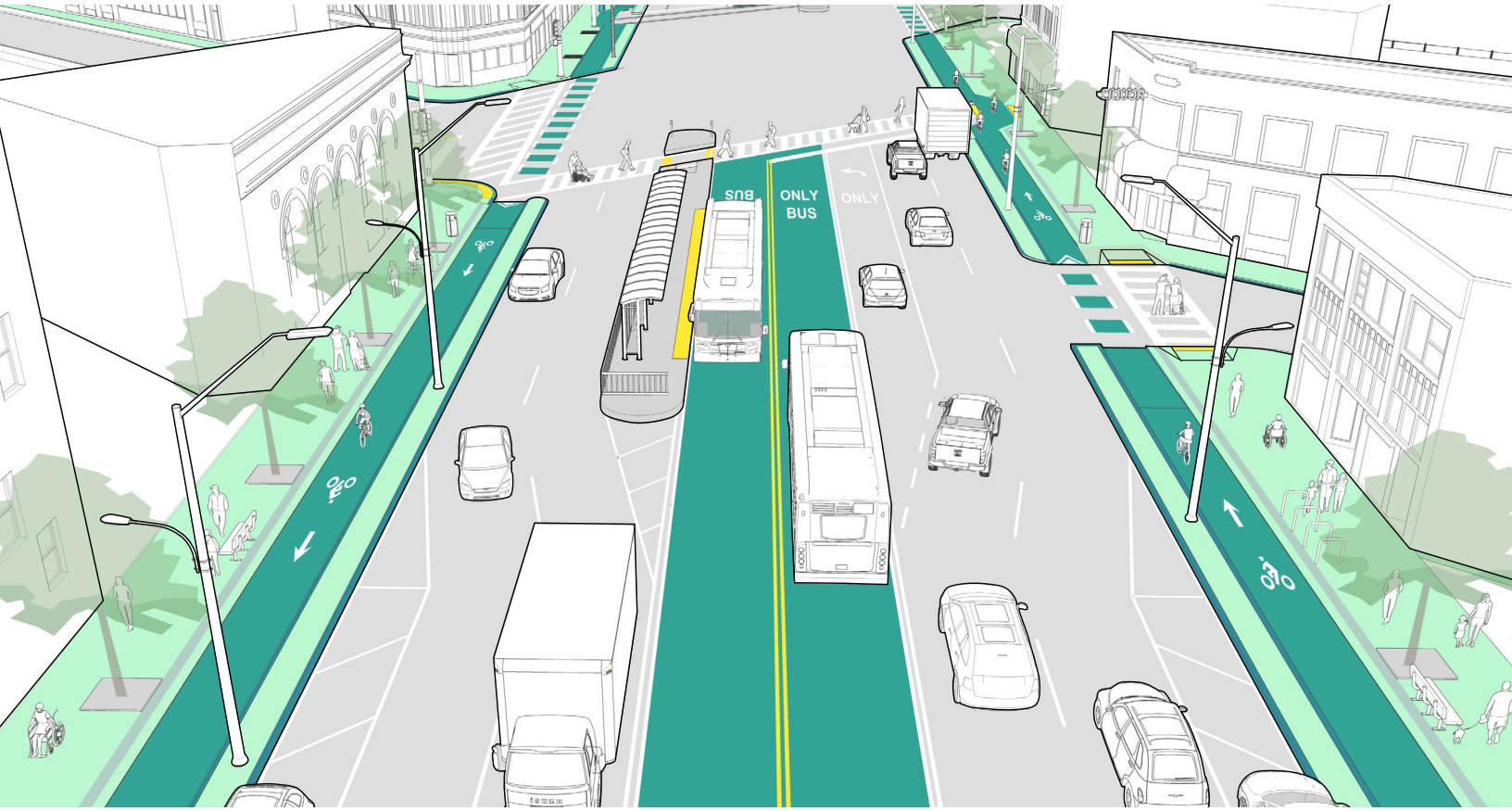
- Bike lane widths are expressed for one-way only.
- Bus lane widths are not included as these are atypical and would be limited to a handful of streets in the City.



Sidewalk			Curbside Zone - Access	Travel Lane	Travel Lane	Curbside Zone - Access	Curbside Zone - Mobility			Sidewalk
Frontage Zone	Pedestrian Zone	Amenity Zone					Buffer	Bike Lane	Bike Lane	

ARTERIAL - COMMERCIAL

Arterial - Commercial streets serve high volumes of people across all modes while forming the backbone of the transit, auto, and freight networks. These streets provide the most direct connections between neighborhoods, services, places of work, and civic and open spaces. Some commercial segments are auto- and freight-oriented, with larger building setbacks and only safety-focused elements for vulnerable users. With limited or no building setbacks, many segments are transit- and pedestrian-oriented - with comfortable bus stops and sidewalks that are activated with storefronts, outdoor dining, art, and vegetation.



Quick Look

Right-of-way	80' to 120'
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators, and/or transit stops and mid-block crossings. Enhance crossings with safety treatments.
Bicycle facilities	Protected preferred, or alternate parallel route
Transit accommodations	Bus-only lanes, queue jumps, bus stops with amenities, and enhanced crosswalks on high-frequency routes
Design speed	25-30 mph
Through lanes (each direction)	1-2
Average vehicles per day	10,000 - 30,000
Driveway frequency	Requires access management to reduce driveway frequency
Freight loading location	On-site/alley preferred; on-street where parking is available

Examples

- Gratiot Ave
  St Aubin St to Mt Elliott St
- Livernois Ave
  McNichols Rd to 7 Mile Rd
- Grand Blvd
  3rd St to Brush St

Typology

1
2
3
4
5

Modal Priorities & Design Considerations

high

Activate sidewalk with pedestrian-scale lighting, sidewalk cafés, public art, and stormwater planters. Use preferred frontage, pedestrian, and amenity zone widths and minimal or no building setback during (re)construction. Provide safe and convenient crossings with minimized delay at high-demand intersections and mid-block crossings.

low

Install protected facilities or, when ROW is constrained, provide alternate parallel routes. Provide curb-protected or raised bike lanes during (re)construction. Run bikeways behind bus stops unless constrained. Install bike parking in the amenity zone or curbside zone. Consider signal separation at intersections.

med

Provide amenities at bus stops. Ensure adequate lighting, safe crossings, and connections to other modes at stops. Consider bus-only lanes and signal priority on high-frequency routes.

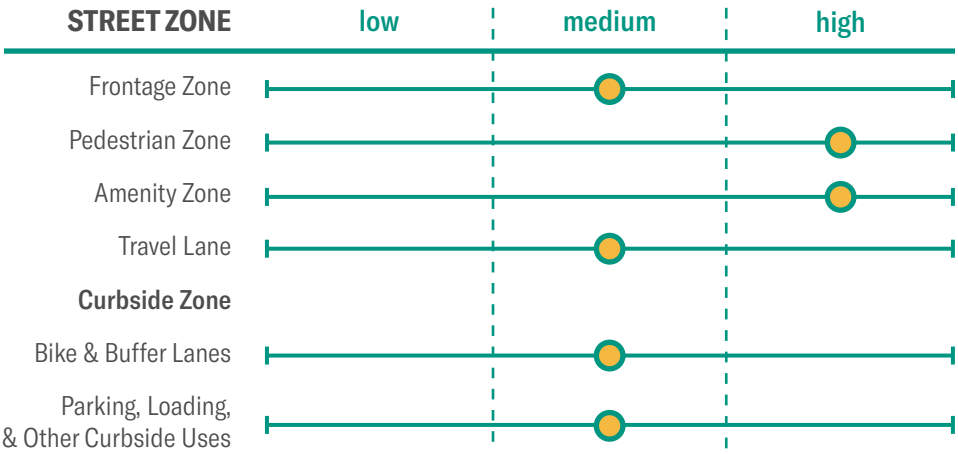
high

Right-size roadways by considering 5:3, 4:3, or 4:2 conversions (removing travel lanes), narrowing travel lanes, and/or adding medians. Reduce delay by adding left turn lanes and protected phases at intersections as justified and adding center turn lanes with pedestrian refuge islands where driveway frequency is high.

med

Design adequate turning radii where freight network routes intersect (otherwise, design for pedestrians and passenger vehicles). Provide on-street loading locations for businesses where on-site or alley locations are not available.

Width Allocation Priorities for Street Zones



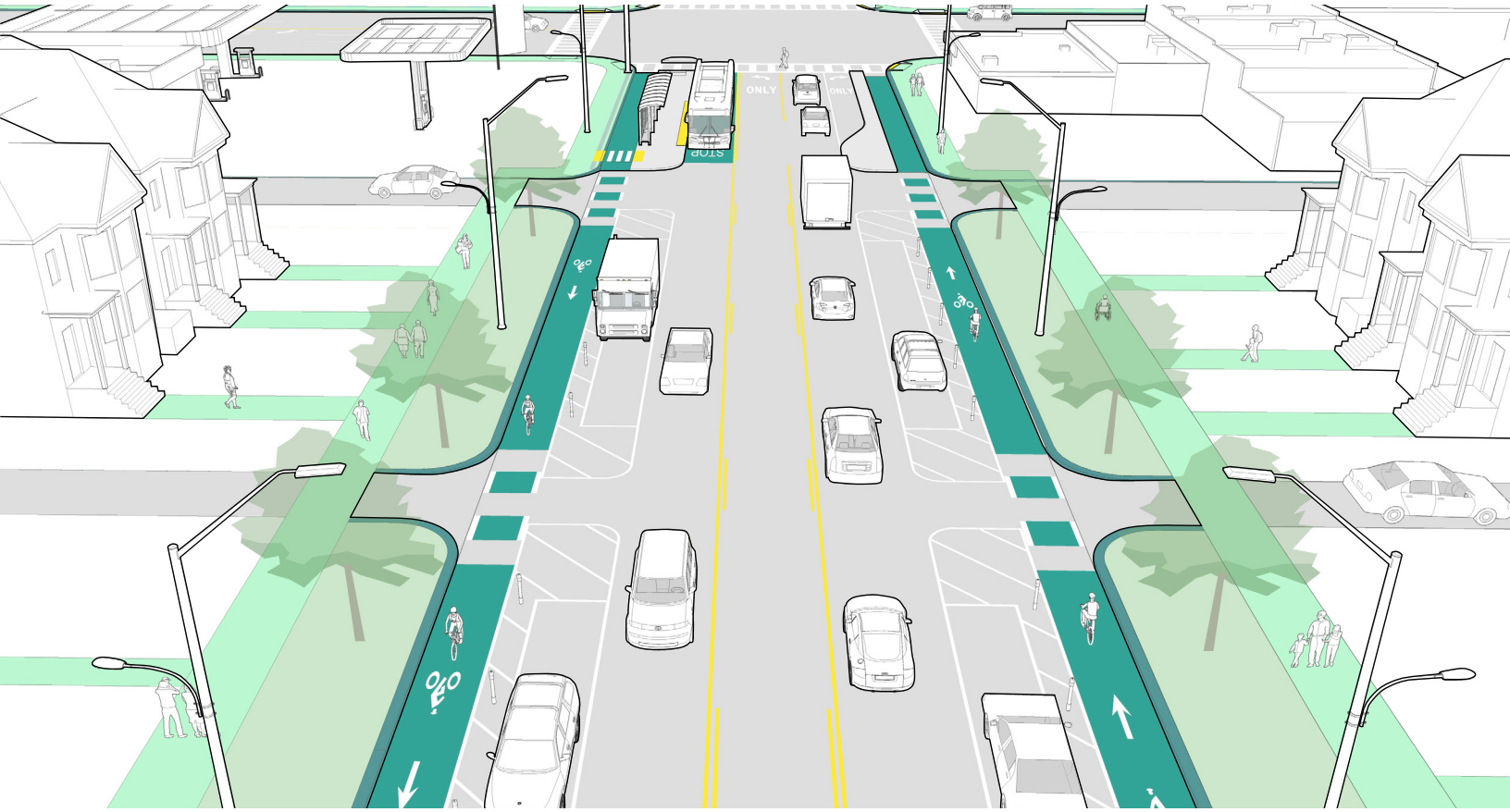
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3’	10'*	7'*	5’	1.5’ - 3’
Preferred	2’ - 4’	8’ - 12’	6’ - 10’	11'	8’	6’ - 7’	3’
Maximum	6'	12’	12’	11'	9’	7’	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

ARTERIAL - RESIDENTIAL

Residential segments of Arterials serve primarily residences while interspersed with Arterial - Commercial segments. Arterial - Residential streets support high volumes of people across all modes, with curbside uses particularly serving pedestrian, auto, and transit networks. With moderate setbacks and amenity zones consisting largely of lawns and trees, these segments are pedestrian-focused.



Quick Look

Right-of-way	50’ to 100’
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators and/or transit stops, and mid-block crossings. Enhance crossings with safety treatments.
Bicycle facilities	Protected preferred, or alternate parallel route
Transit accommodations	Bus-only lanes, queue jumps, bus stops with amenities, and enhanced crosswalks on high-frequency routes
Design speed	25-30 mph
Through lanes (each direction)	1-2
Average vehicles per day	10,000 - 20,000
Driveway frequency	High; center turn lanes as justified
Freight loading location	Parcel delivery on-street where parking is available

Examples

- Greenfield Rd
  McNichols Rd to Pembroke Ave
- Alter Rd
  Mack Ave to Warren Ave
- 3rd St
  Martin Luther King Jr Blvd to Forest Ave

Typology

1 **2** 3 4 5

Modal Priorities & Design Considerations

high

Provide an adequate buffer between moving vehicles and pedestrians in the amenity and curbside zones through trees, lawn, and rain gardens. Use preferred pedestrian and amenity zone widths during (re)construction. Provide safe and convenient crossings with minimized delay at high-demand intersections and mid-block crossings.

low

Install protected facilities or, when right-of-way is constrained, provide striped or buffered bike lanes or alternate parallel routes. Provide curb-protected or raised bike lanes during (re)construction. Run bikeways behind bus stops unless constrained. Install bike parking in the amenity zone. Consider safety and signal separation at intersections.

med

Provide amenities at bus stops. Ensure adequate lighting, safe crossings, and connections to other modes at stops. Consider bus-only lanes and signal priority on high-frequency routes.

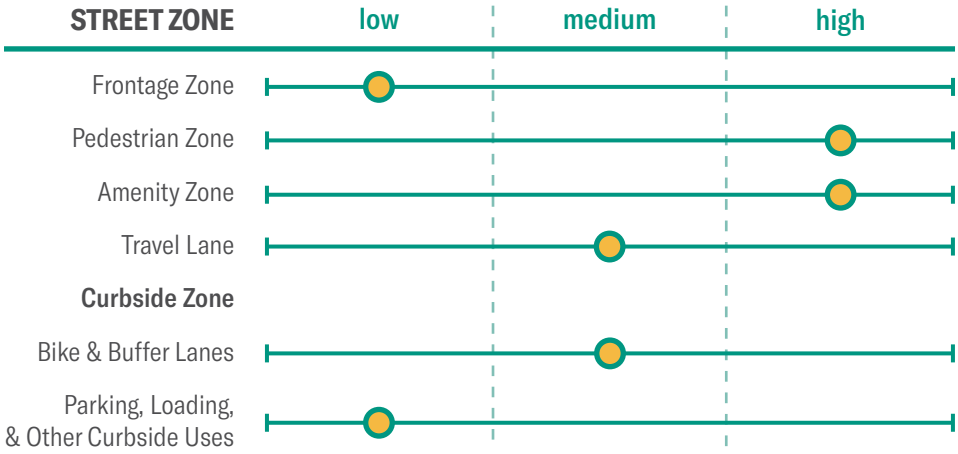
high

Right-size roadways by considering 5:3, 4:3, or 4:2 conversions (removing travel lanes), narrowing travel lanes, and/or adding medians. Reduce delay by adding left turn lanes at intersections as justified and adding center turn lanes with pedestrian refuge islands where driveway frequency is high.

low

Design adequate turning radii where freight network routes intersect (otherwise, design for pedestrians and passenger vehicles). Provide on-street locations for residential parcel delivery where on-site or alley locations are not available.

Width Allocation Priorities for Street Zones



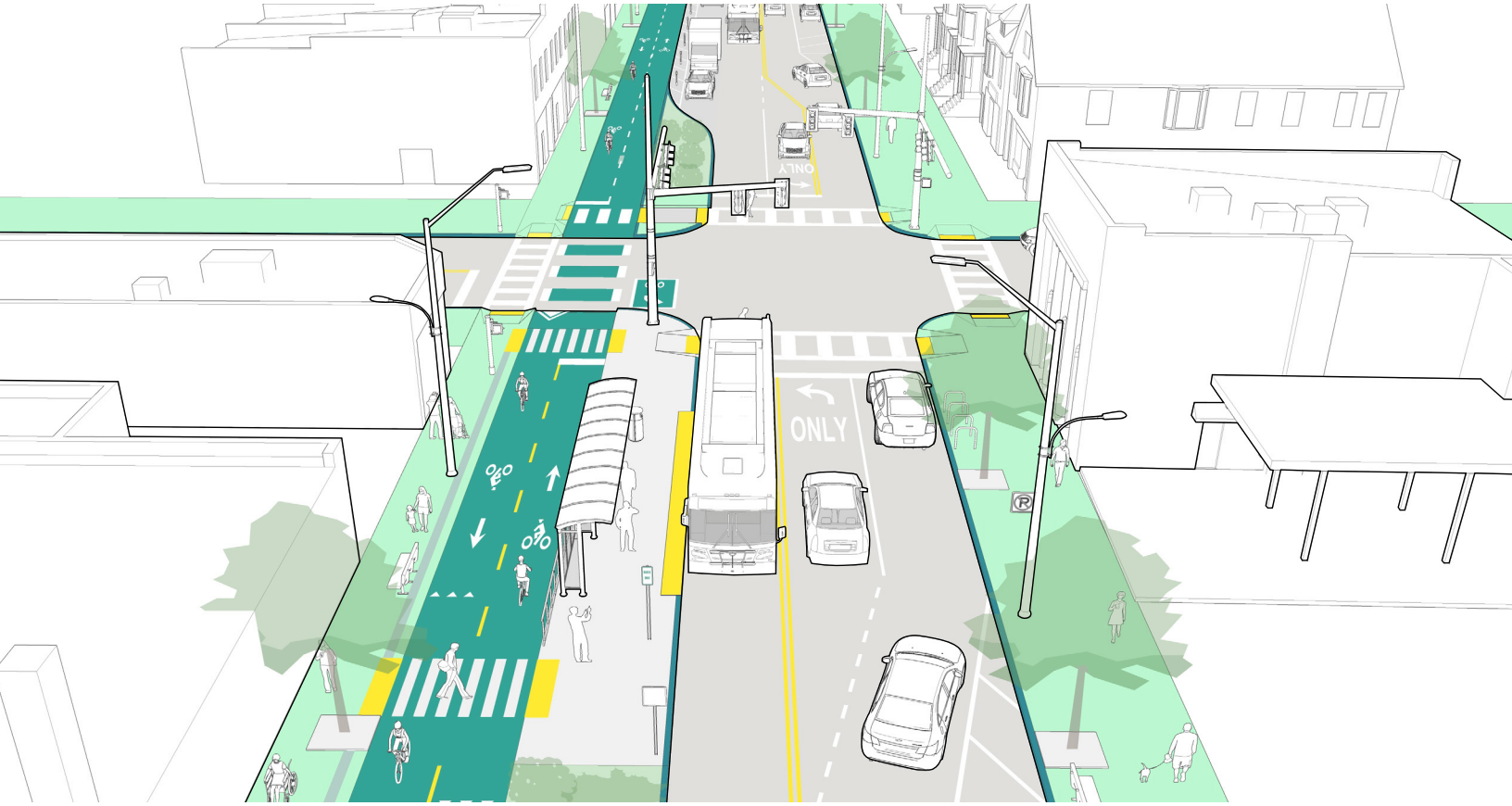
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3'	10'*	7'*	5’	1.5’ - 3’
Preferred	0'	6’ - 8’	6’ - 10’	10' - 11'	7' - 8’	6’ - 7’	3’
Maximum	2'	12’	12’	11'	9’	7’	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

COLLECTOR - COMMERCIAL

Commercial sections of Collectors provide links between neighborhoods and connect people to dining, retail, services, and larger roadways, but carry fewer people than Arterials. Collectors prioritize the walking, biking, and transit networks and have restricted to no building setbacks. These streets may contain seating, vegetation, and art. Collectors have narrower right-of-ways (ROW) than arterials, so more spatial trade-offs may be needed between modes in order to meet ROW constraints.



Quick Look

Right-of-way	50' to 80'
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators and/or transit stops, and mid-block crossings.
Bicycle facilities	Protected preferred. Otherwise, striped, buffered, or parallel route.
Transit accommodations	Queue jumps and bus bulbs or transit islands with amenities on high-frequency routes
Design speed	25 mph
Through lanes (each direction)	1
Average vehicles per day	2,000 - 8,000
Driveway frequency	Low to moderate; consolidate to reduce driveway frequency
Freight loading location	On-site/alley preferred; on-street where parking is available

Examples

- Lawndale St
  W Vernor Hwy to I-75
- Shoemaker St
  McClellan St to Conner St
- Kercheval Ave
  Mt Elliott Ave to Van Dyke St

Modal Priorities & Design Considerations

high — Activate sidewalk with pedestrian-scale lighting, street furniture, trees, and stormwater planters. Use preferred frontage, pedestrian, and amenity zone widths during reconstruction. Provide safe and convenient crossings.

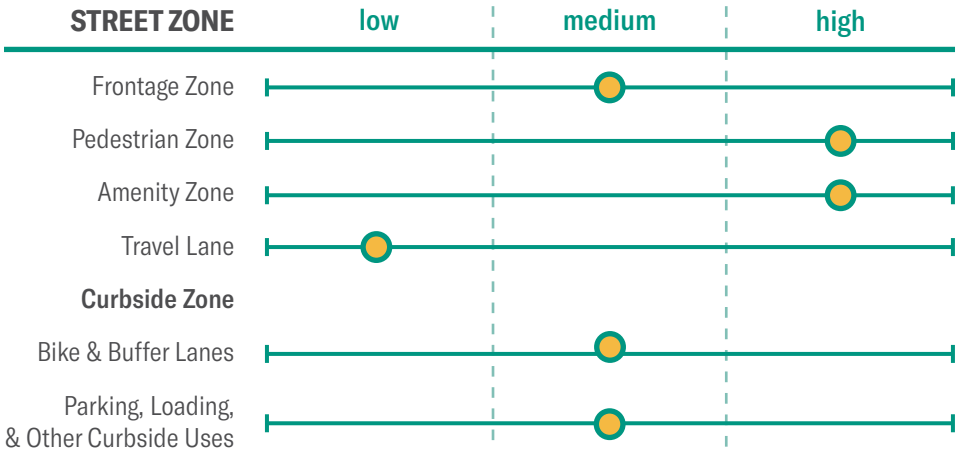
med — Install protected facilities or, when right-of-way is constrained, provide striped or buffered bike lanes or alternate parallel routes. Install bike parking in the amenity zone or, where there is enough space, the curbside zone.

med — Meet DDOT standards for bus stops. Ensure adequate lighting, safe crossings, and connections to other modes at stops. Consider in-lane bus stops with bus bulbs and amenities on high-frequency routes.

med — Reallocate some parking to bike lanes, transit, or other curbside uses for people walking and biking. Incorporate additional streetscape elements with this space (e.g., street furniture, bike parking, planters).

low — Design adequate turning radii for small freight vehicles from collectors to arterials (otherwise, design for pedestrians and passenger vehicles). Provide on-street loading locations for businesses where on-site or alley locations are not available.

Width Allocation Priorities for Street Zones



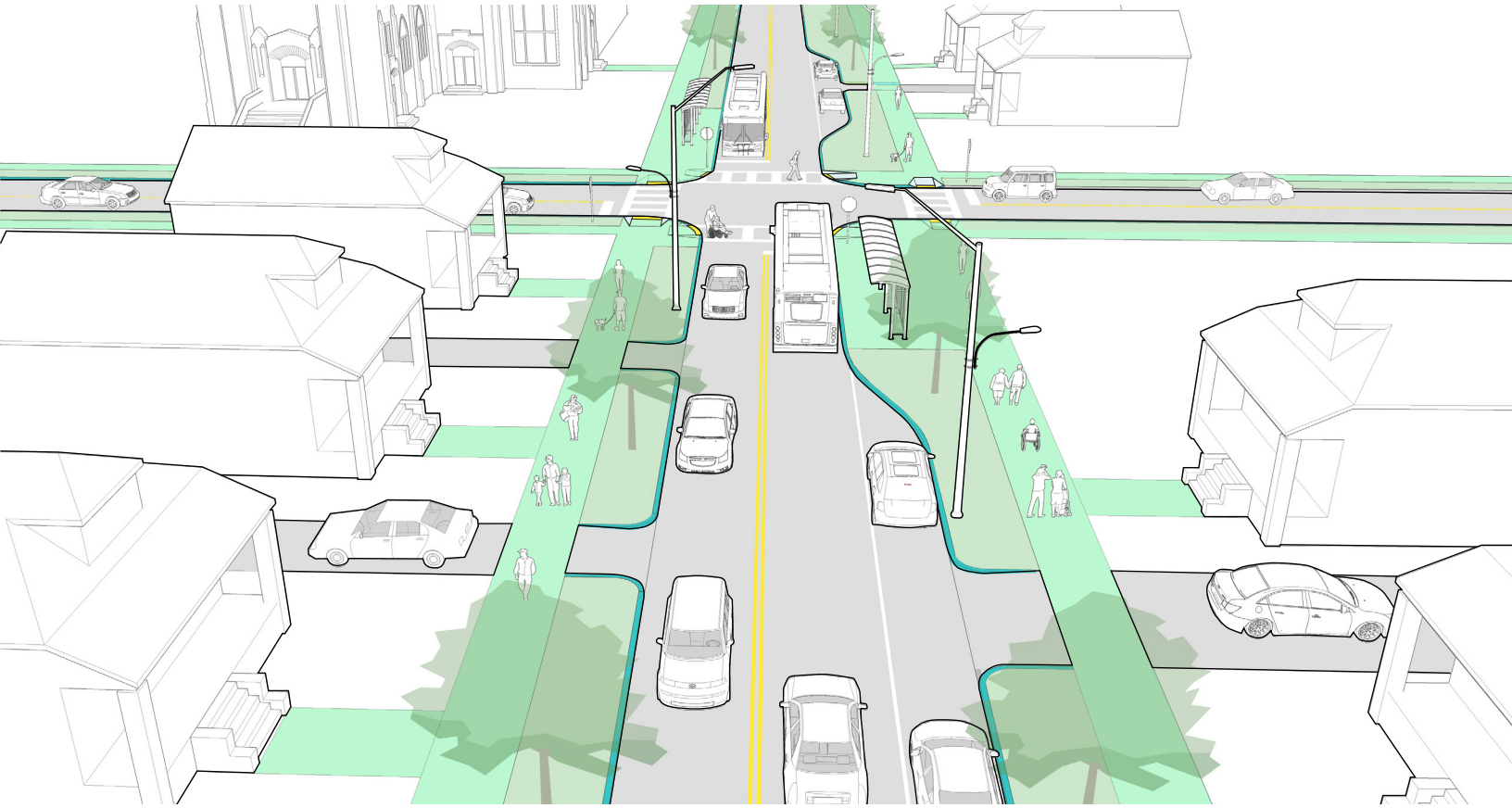
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3’	10'*	7'*	5’	1.5’ - 3’
Preferred	2' - 4'	8’ - 12’	6’ - 8’	11'	8’	6’ - 7’	3’
Maximum	6'	12’	12’	11'	9’	7’	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

COLLECTOR - RESIDENTIAL

Collector - Residential streets connect people between their homes and schools, outdoor spaces, and to commercial and/or larger streets. Homes are set back with lawns and trees. Space in the ROW prioritizes the safety and comfort of people walking, riding bikes, and using transit.



Quick Look

Right-of-way	30' to 80'
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators and/or transit stops, and mid-block crossings.
Bicycle facilities	Protected preferred. Otherwise, striped, buffered, or alternate parallel route
Transit accommodations	Queue jumps and bus bulbs or transit islands with amenities on high-frequency routes
Design speed	20-25 mph
Through lanes (each direction)	1
Average vehicles per day	<2,000 - 8,000
Driveway frequency	High
Freight loading location	Parcel delivery in on-street parking lane where available

Examples

- Seymour St
  Gratiot Ave to Kelly Rd
- Euclid St
  Dexter Blvd to Rosa Parks Blvd
- Tireman Ave
  Evergreen Rd to Southfield Fwy

Modal Priorities & Design Considerations

high — Provide an adequate buffer between moving vehicles and pedestrians in the amenity and curbside zones through trees, lawn, and rain gardens. Provide safe and convenient crossings.

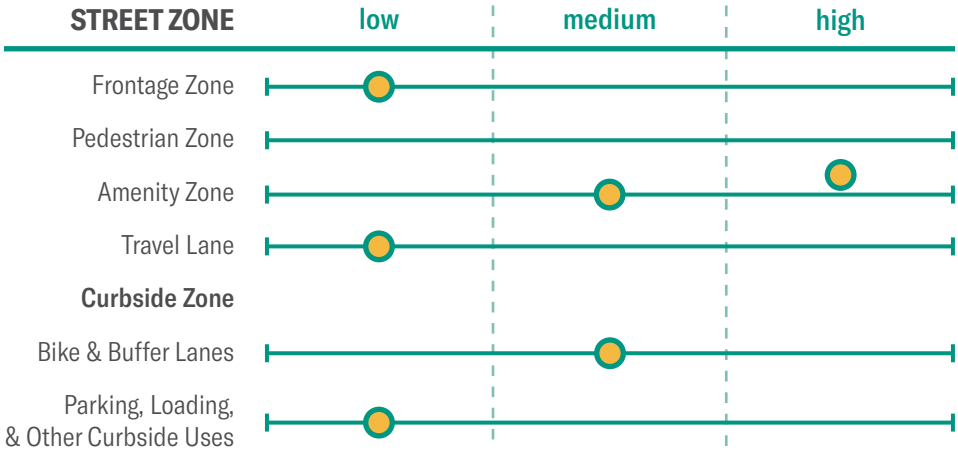
med — Install protected facilities or, when right-of-way is constrained, provide striped or buffered bike lanes or alternate parallel routes. Install bike parking in the amenity zone.

med — Meet DDOT standards for bus stops. Ensure adequate lighting, safe crossings, and connections to other modes at stops. Consider in-lane bus stops with bus bulbs and amenities on high-frequency routes.

med — Reallocate some parking to bike lanes and transit.

low — Design roadway and streetscape, primarily, for pedestrians and passenger vehicles. Secondly, design adequate turning radii for small freight vehicles to connect between collectors and arterials. Provide on-street locations for residential parcel delivery where on-site or alley locations are not available.

Width Allocation Priorities for Street Zones



Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3'	10'*	7'*	5’	1.5’ - 3’
Preferred	0'	6’ - 8’	6’ - 8’	10' - 11'	7' - 8’	6’ - 7’	3’
Maximum	2'	10'	12’	11'	9’	7’	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

LOCAL

Local streets make up a large part of the pedestrian and bicycle networks in residential areas through neighborhood Slow Streets. These streets have high property access but prioritize slow speeds through traffic calming such as curb extensions and raised crosswalks. They are where neighbors mingle and play.

Quick Look

Right-of-way	30' to 60'
Pedestrian crossings	Mark at intersections with arterials and collectors.
Bicycle facilities	Slow Streets
Transit accommodations	DDOT standards for bus stops
Design speed	20-25 mph
Through lanes (each direction)	1
Average vehicles per day	<2,000
Driveway frequency	High
Freight loading location	Limit parcel delivery to available on-street parking, not blocking traffic lanes

Examples

- Mettetal St
  Grand River Ave to Fenkell Ave
- Joann Ave
  State Fair Ave to 8 Mile Rd
- Chalmers St
  Scripps St to Jefferson Ave

Typology
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Modal Priorities & Design Considerations

high

Provide a high-comfort walking environment through elements, such as trees and rain gardens (where maintenance partners can be identified), that provide shade and visual interest. Take a slow streets approach through traffic calming treatments (e.g., curb extensions, flashing beacons). Use preferred pedestrian and amenity zone widths during (re)construction to offer space for play and socialization.

high

Create a traffic calmed, shared-use roadway suitable for use by children and families through a slow streets approach. Use traffic calming measures (e.g., chicanes, traffic circles) for routes in the bike network. Use trees to provide shade.

low

Meet DDOT standards for bus stops and ensure adequate lighting.

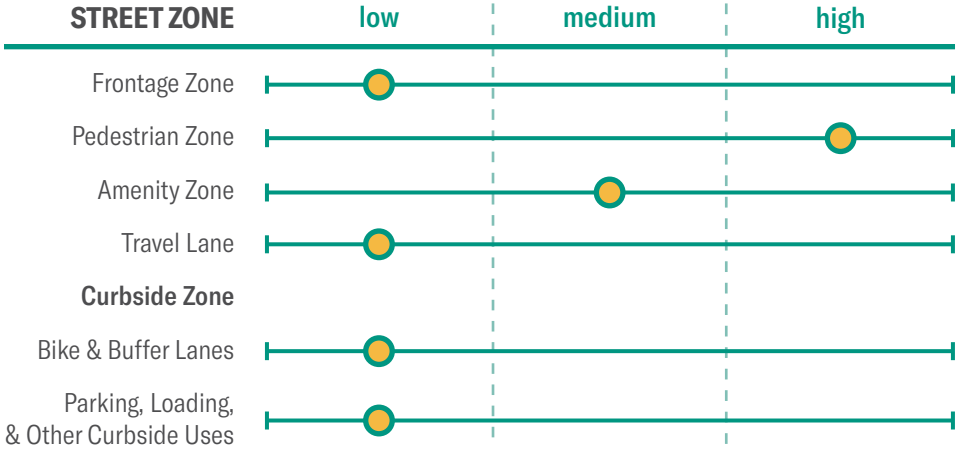
low

Reduce vehicular speed using a range of traffic calming measures including narrowing, lateral shifts, and vertical shifts (e.g., curb extensions, and raised crossings).

low

Accommodate parcel delivery.

Width Allocation Priorities for Street Zones



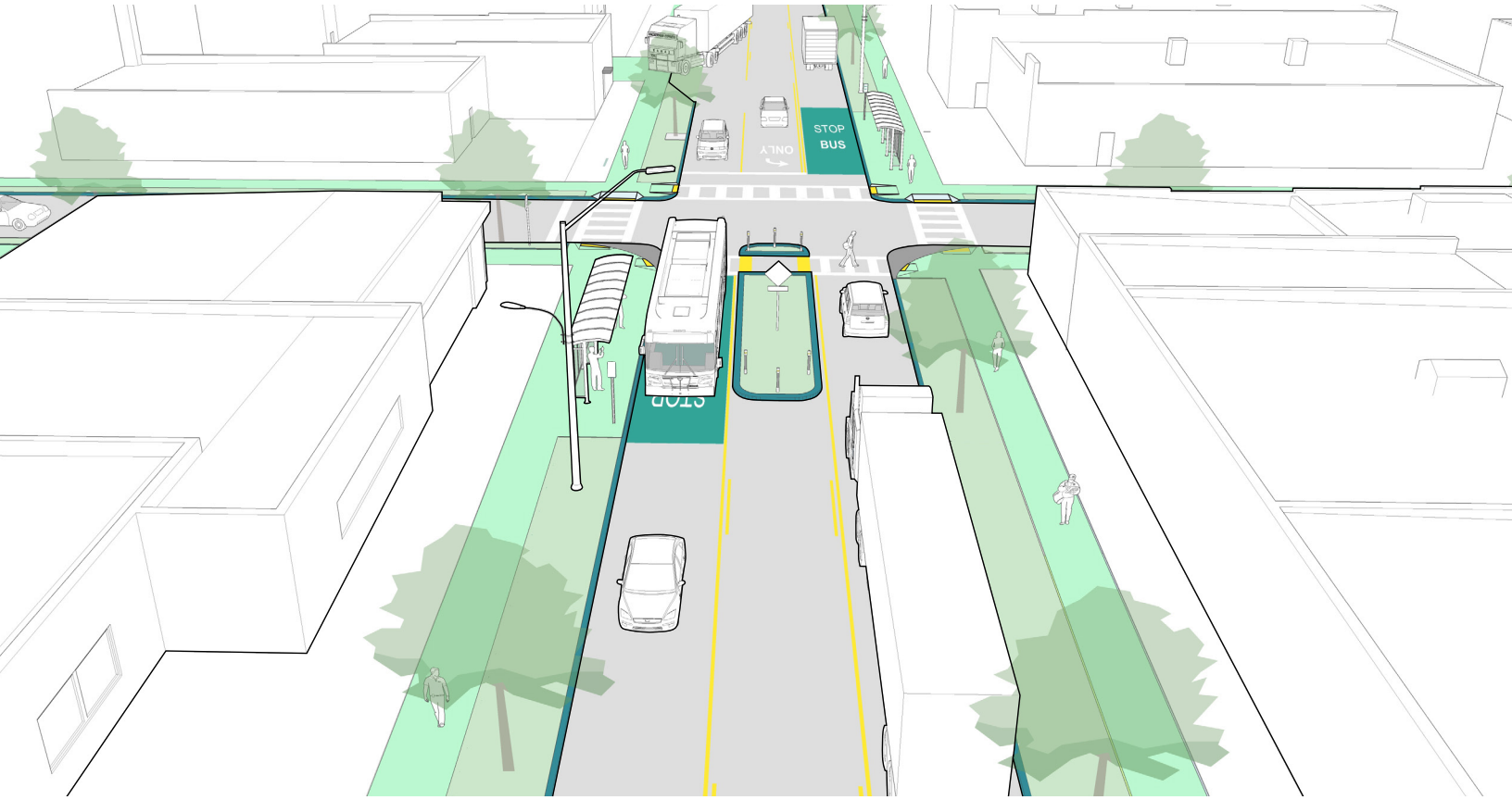
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer*
Minimum	0'	6'	3'	10'	7'	5'	1.5' - 3'
Preferred	0'	6'	6' - 8'	10' - 11'	7' - 8'	5' - 6'	3'
Maximum	2'	8'	12'	11'	9'	7'	4'

*Bike buffers should be 3' when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

INDUSTRIAL

Industrial streets are a key part of the freight network and may be Arterials or connect into Arterials. The streets may be solely industrial or mixed with other uses, like residential, so access is balanced with safety. Industrial streets support worker access through walking and transit, and biking to a lesser degree. Industrial streets provide adequate space for larger vehicles to travel and turn. In general, there are large building setbacks and the ROW can support rain gardens, trees, shared use paths, and comfortable waiting spaces for transit riders.



Quick Look

Right-of-way	40’ to 100’
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators and/or transit stops, and mid-block crossings.
Bicycle facilities	Protected preferred, or alternate parallel route
Transit accommodations	DDOT standards for bus stops
Design speed	25-30 mph
Through lanes (each direction)	1
Average vehicles per day	2,000 - 8,000
Driveway frequency	Low
Freight loading location	On-site only

Examples

- Mt Elliott St
  7 Mile Rd to 8 Mile Rd
- Fort St
  Green St to Livernois Ave
- Lyndon St
  Schaefer Hwy to Wyoming Ave

Typology

1 2 3 4 5

Modal Priorities & Design Considerations

med — Provide adequate pedestrian and amenity zones to buffer people walking from vehicles in the roadway. Mark crosswalks at transit stops, intersections, and where demand exists.

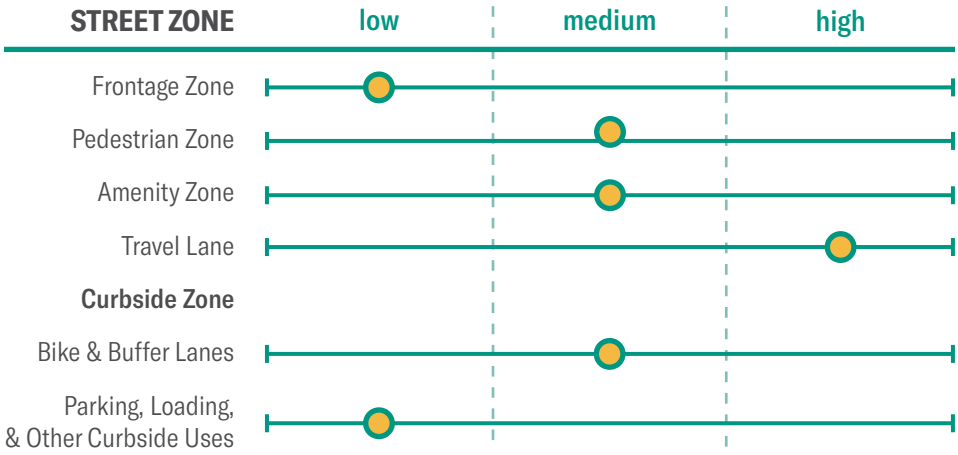
low — Install protected facilities or provide alternate parallel routes. Give extra consideration to driveway treatments and intersections due to presence of large vehicles and associated blind spots and turning movements.

low — Meet DDOT standards for bus stops and ensure adequate lighting.

low — Reallocate parking to provide adequate buffer between vehicles in roadway and pedestrians and/or people on bikes.

high — Design adequate turning radii for large freight vehicles. Provide on-street loading locations where on-site is not available.

Width Allocation Priorities for Street Zones



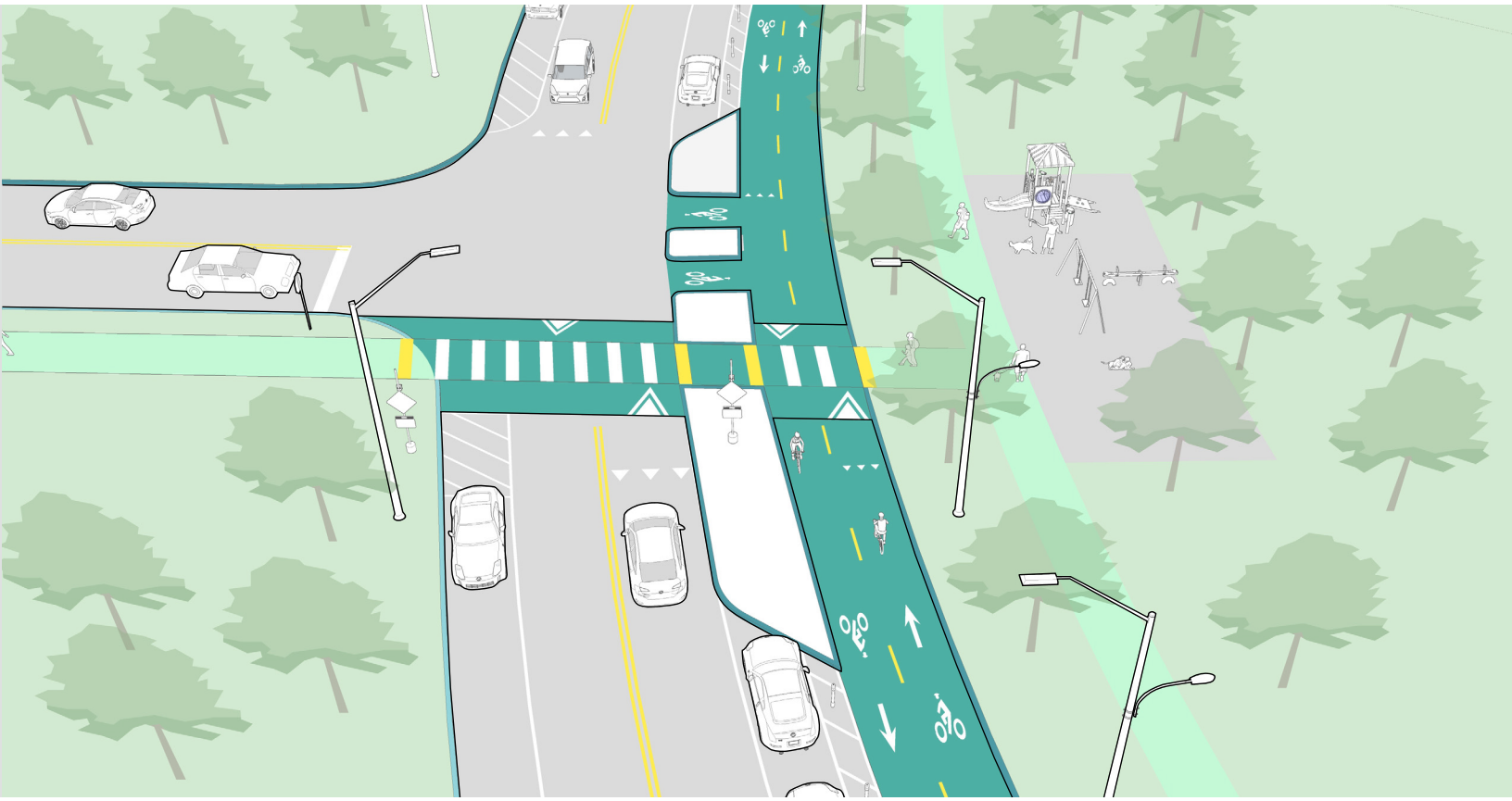
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3'	10'*	7'*	5’	1.5’ - 3’
Preferred	0'	6’	6’ - 8’	11' - 12'	8'	6’ - 7’	3’
Maximum	3'	12'	12'	11' - 12'	9'	7’	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

PARKWAY

Parkways run alongside and through parks, connecting people walking, biking, taking transit, and driving to nature and recreation. Parkways have both off-street trails and on-street facilities to support walking and biking. Safe access to parks for pedestrians and people on bikes is prioritized.



Quick Look

Right-of-way	50' to 100'
Pedestrian crossings	Mark at high-demand unsignalized crossings or at unsignalized or midblock crossings where a major trail or greenway crosses the roadway
Bicycle facilities	Protected or shared use path
Transit accommodations	DDOT standards for bus stops. In-lane stops preferred.
Design speed	25-30 mph
Through lanes (each direction)	1
Average vehicles per day	2,000 - 8,000
Driveway frequency	Very low
Freight loading location	N/A

Examples

- Pontchartrain Blvd
  Merrill Plaisance to 7 Mile Rd
- Spinoza Drive
  Joy Rd to Tireman Ave
- Chandler Park Dr
  Conner St to Dickerson Ave

Typology

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Modal Priorities & Design Considerations

high — Provide a high-comfort walking environment through elements, such as trees and rain gardens, that provide shade and visual interest. Use preferred pedestrian and amenity zone widths during (re)construction. Consider the use of a shared use path, which should exceed the width guidance for the pedestrian zone and bike lane. Provide safe and convenient crossings at high activity areas. See XXX section for enhanced crossing treatments.

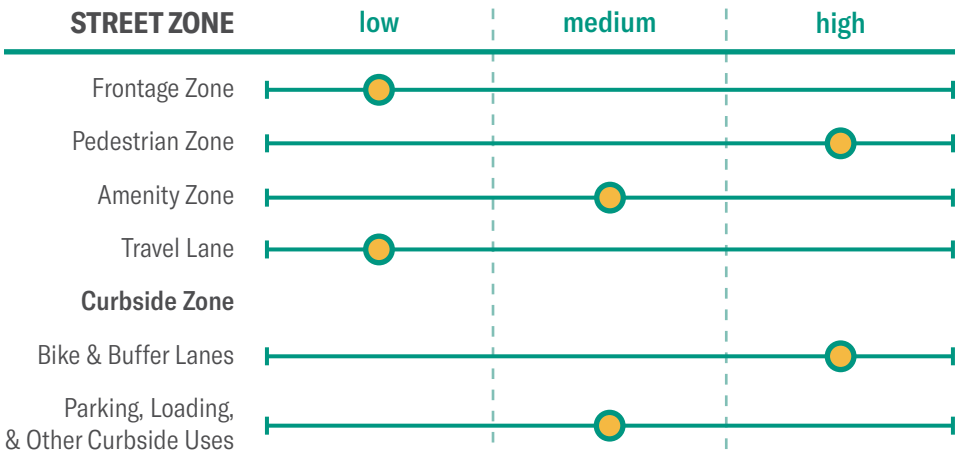
high — Provide protected facilities or, when right-of-way is constrained, a shared use path. Install bike parking at entry and exit points to the parkway and parks and in high activity areas.

med — Meet DDOT standards for bus stops and ensure adequate lighting.

med — Reallocate travel lanes and narrow travel lanes. Reallocate space to biking and transit uses.

low — Accommodate parcel delivery.

Width Allocation Priorities for Street Zones



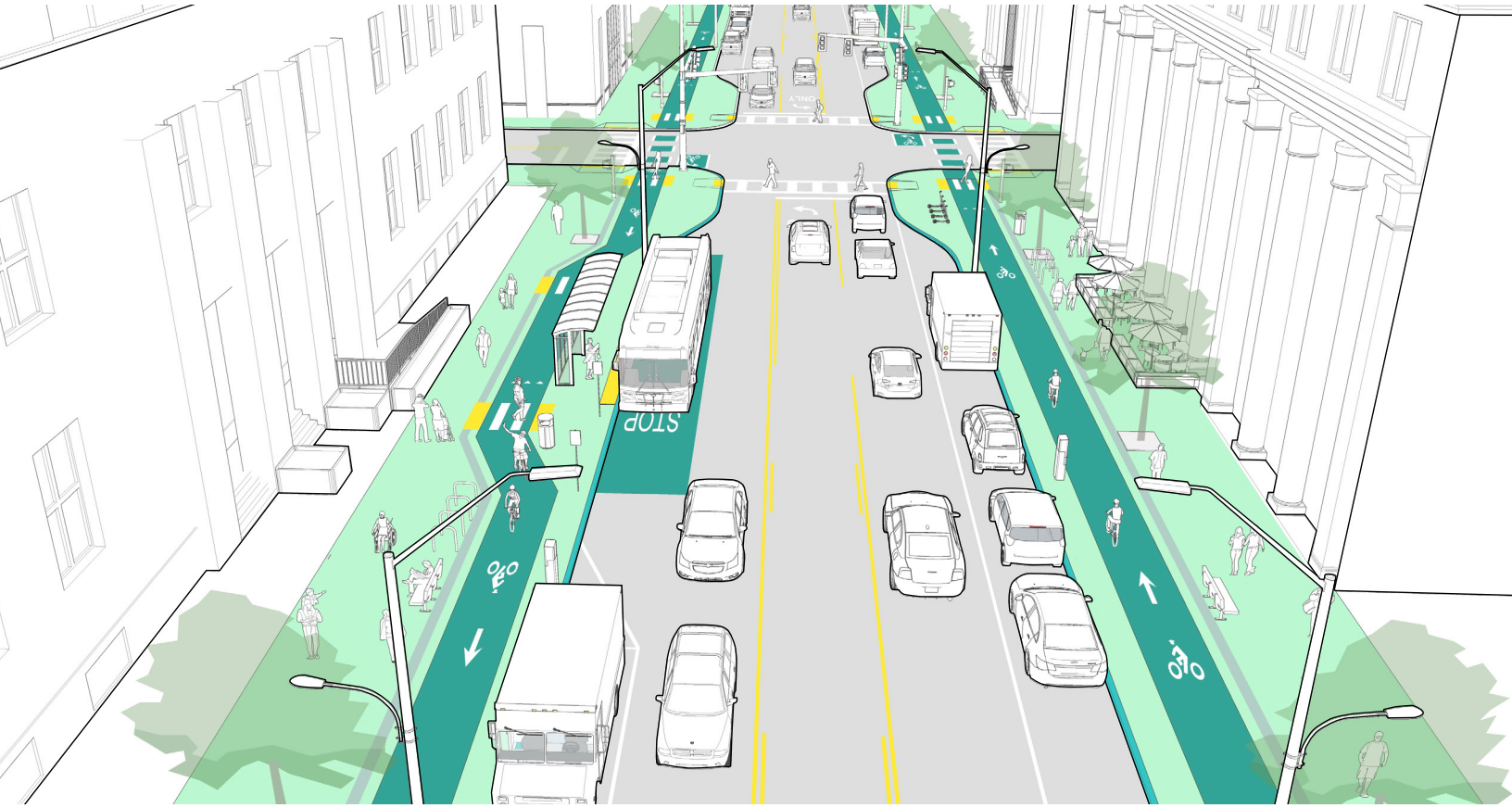
Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	6’	3'	10'*	7'*	5’	1.5’ - 3’
Preferred	0'	6’ - 10'	6' -	11'	7' - 8'	6’ - 8'	3’
Maximum	8'	12'	-	11'	9'	8'	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

DOWNTOWN

Downtown streets connect Detroiters to work, shopping, dining, and entertainment. They primarily serve the pedestrian, bicycle, and transit networks. Flexible use of curbside space support the high demand for transit, deliveries, ridehail, and parking for special events. Downtown streets have limited to no building setbacks, wide sidewalks, and are activated with storefronts, outdoor dining, seating, art, and green stormwater infrastructure.



Quick Look

Right-of-way	50' to 120'
Pedestrian crossings	Mark at signalized intersections, unsignalized intersections with pedestrian generators and/or transit stops, and mid-block crossings. Enhance crossings with safety treatments.
Bicycle facilities	Protected on main corridors
Transit accommodations	Bus-only lanes, bus stops with amenities, and enhanced crosswalks on high-frequency routes
Design speed	25 mph
Through lanes (each direction)	1-2
Average vehicles per day	2,000 - 12,000
Driveway frequency	Use access management to keep driveway frequency low
Freight loading location	On-site or alley preferred; on-street where parking is available

Examples

- Randolph St
  Gratiot Ave to E Fort St
- Fort St
  3rd Ave to Griswold St
- Broadway St
  Witherell St to Gratiot Ave

Modal Priorities & Design Considerations

high

Activate sidewalk with pedestrian-scale lighting, sidewalk cafés, street furniture, public art, and stormwater planters. Use preferred frontage, pedestrian, and amenity zone widths to accommodate high levels of pedestrian activity and minimal or no building setback during (re)construction.

med

Provide protected facilities on main corridors. Provide curb-protected or raised bike lanes during reconstruction. Install bike parking in the amenity zone or, where there is enough space, the curbside zone.

high

Provide amenities at bus and light rail stops and ensure adequate lighting. Consider bus-only lanes and signal priority on high-frequency routes.

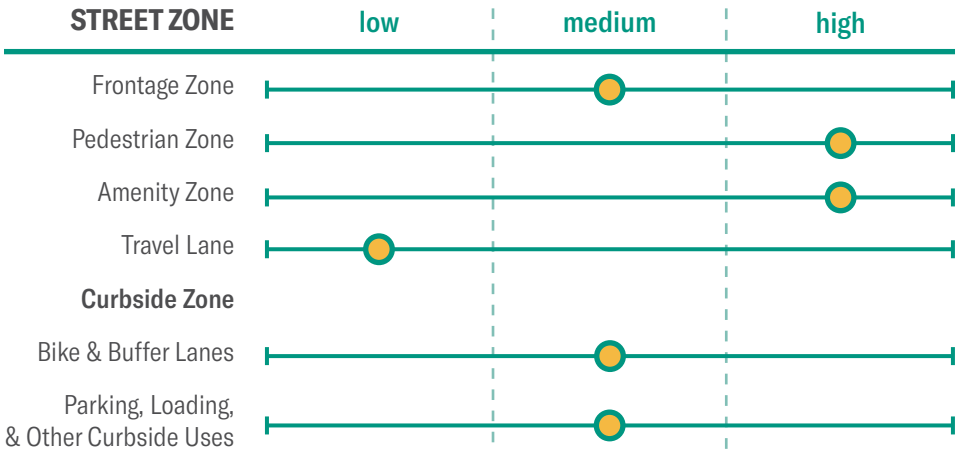
low

Reallocate some parking to other curbside uses. Incorporate additional streetscape elements with this space (e.g., street furniture, bike parking, trees, stormwater planters, ridehail, pick-up/drop-off, and valet).

med

Design adequate turning radii where freight routes intersect (otherwise, design for pedestrians and passenger vehicles). Provide on-street loading locations for businesses where on-site or alley locations are not available.

Width Allocation Priorities for Street Zones



Street Zone Dimensions

	Frontage Zone	Pedestrian Zone	Amenity Zone	Travel Lane	Parking & Loading	Bike Lane	Bike Buffer**
Minimum	0’	8’	3'	10'*	7'*	5’	1.5’ - 3’
Preferred	2' - 4'	8' - 12'	6' - 10'	11'	8'	6’ - 7'	3’
Maximum	10'	12'	12'	11'	9'	7'	4’

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.
** Bike buffers should be 3’ when adjacent to parking to prevent people on bikes from being doored by people exiting their vehicles.

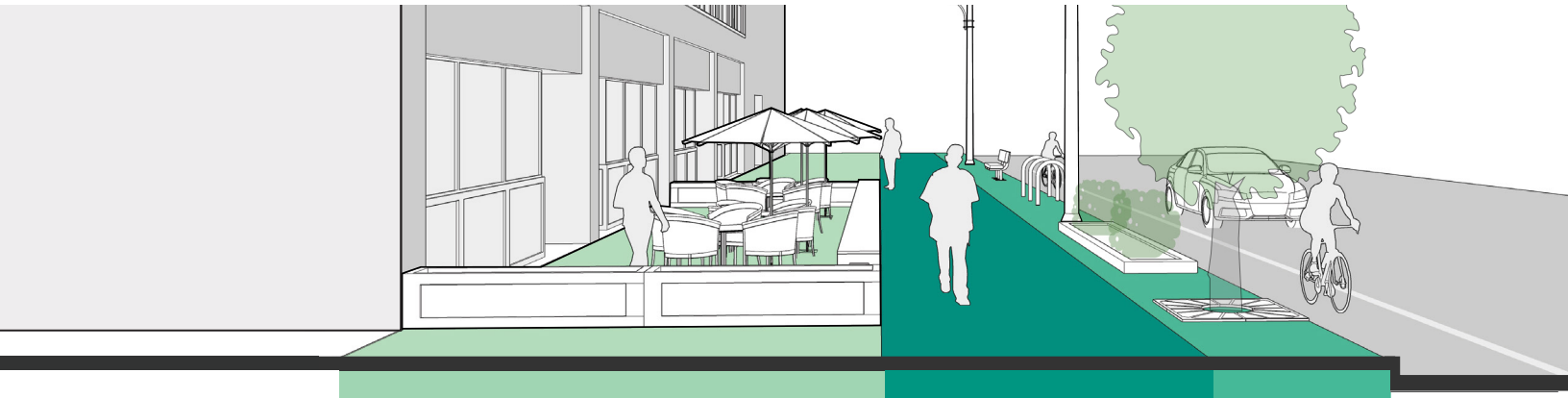

MIKE'S
Better Food
MEAT &
N GLOW
BEAUTY BOUTIQUE

3: SIDEWALKS

3 SIDEWALKS

Sidewalks play a critical role in the character, function, and accessibility of streets. They provide space for people to walk safely, sit under the shade of trees, dine at outdoor cafes, wait for the bus, and more. Zones and accessibility are overarching topics that should be considered when using various sidewalk design elements.

Minimum and Maximum Dimensions (each side of street)



Street Type	Frontage Zone	Pedestrian Zone	Amenity Zone	Total Width
Arterial-Commercial	0' - 6'	6' - 12'	3' - 12'	9' - 30'
Arterial-Residential	0' - 2'	6' - 12'	3' - 12'	9' - 26'
Collector-Commercial	0' - 6'	6' - 12'	3' - 12'	9' - 30'
Collector-Residential	0' - 2'	6' - 12'	3' - 12'	9' - 26'
Local	0' - 2'	6' - 8'	3' - 12'	9' - 22'
Industrial	0' - 3'	6' - 12'	3' - 12'	9' - 27'
Parkway	0' - 8'	6' - 12'	6' -	12' -
Downtown	0' - 10'	8' - 12'	3' - 12'	11' - 34'

Sidewalk Zones

Detroit sidewalks may contain up to four sidewalk zones – Frontage, Pedestrian, Amenity, and Curbside Access. The number of zones, design, and width vary according to street type. Zone characteristics based on street type, and properties and requirements, are shown to the right.

Frontage Zone

- Used for sidewalk cafés, outdoor retail displays, display boards, and/or small planters.
- Buffers pedestrians from doors, walls, and fences.
- Abuts and provides a transition to private property.
- Do not allow elements within Frontage Zone to obstruct Pedestrian Zone.

Pedestrian Zone

- Used for active travel.
- Located between frontage and amenity zone (where present).
- Provides a level, stable and slip-resistant pathway.
- Is kept clear of obstacles and overhangs, including sidewalk amenities.
- Do not interrupt with kiosks, utility access boxes, and wayfinding.
- Set width to comfortably accommodate expected pedestrian volumes.

Amenity Zone

- Buffers pedestrians from the roadway and provides shade, seating, lighting, and other amenities.
- Helps transition people from the roadway to the sidewalk and vice versa.
- Accomodates bike parking.
- Provides snow storage.
- Do not allow elements within Amenity Zone to obstruct Pedestrian Zone.

Curbside Access Zone

- Flexible space that supports access to the sidewalk and adjacent properties from parking spaces, buses, and bikes in the roadway.
- Consists of the sidewalk curb and the space in the roadway between the curb and travel lanes.
- Can incorporate pick-up/drop-off, bus waiting and loading, vehicle or bike parking, and freight loading.
- May also include parklets, which extend sidewalk seating into the roadway.
- For more information on curbside uses and priorities, refer to the SFP Plan.
- See Chapter 4: Roadways for information on the related Curbside Mobility Zone.

Accessibility

It is of the utmost importance that sidewalks are accessible for all users, which includes but is not limited to people with mobility impairments, people using mobility aids, and people with hearing loss/deafness, low vision, or who are blind. Sidewalks must support people in reaching destinations and transitioning from parking, drop-off areas, or buses. Where social amenities are provided, such as benches or parklets, these amenities must also support access for all users.

ADA is the current standard. Where possible, attempt to meet the accessibility standards in PROWAG in the design of sidewalk zones and elements. At minimum, the following requirements must be met:

- Provide a continuous Pedestrian Zone, without obstructions and with clear sightlines.
- Provide a smooth, stable, and slip-resistant surface with minimal gaps, rough surfaces, and vibration-causing features.

Sidewalk Design Elements

The following pages contain streetscape elements that enhance sidewalk function and provide a sense of place. They help enhance people's safety, comfort, and experience of Detroit streets. Project-level conditions and goals, as well as engineering judgment and community engagement should dictate which street design elements are most appropriate. Collaboration with communities to design streetscapes enable expression of neighborhood priorities and showcasing of art and culture.

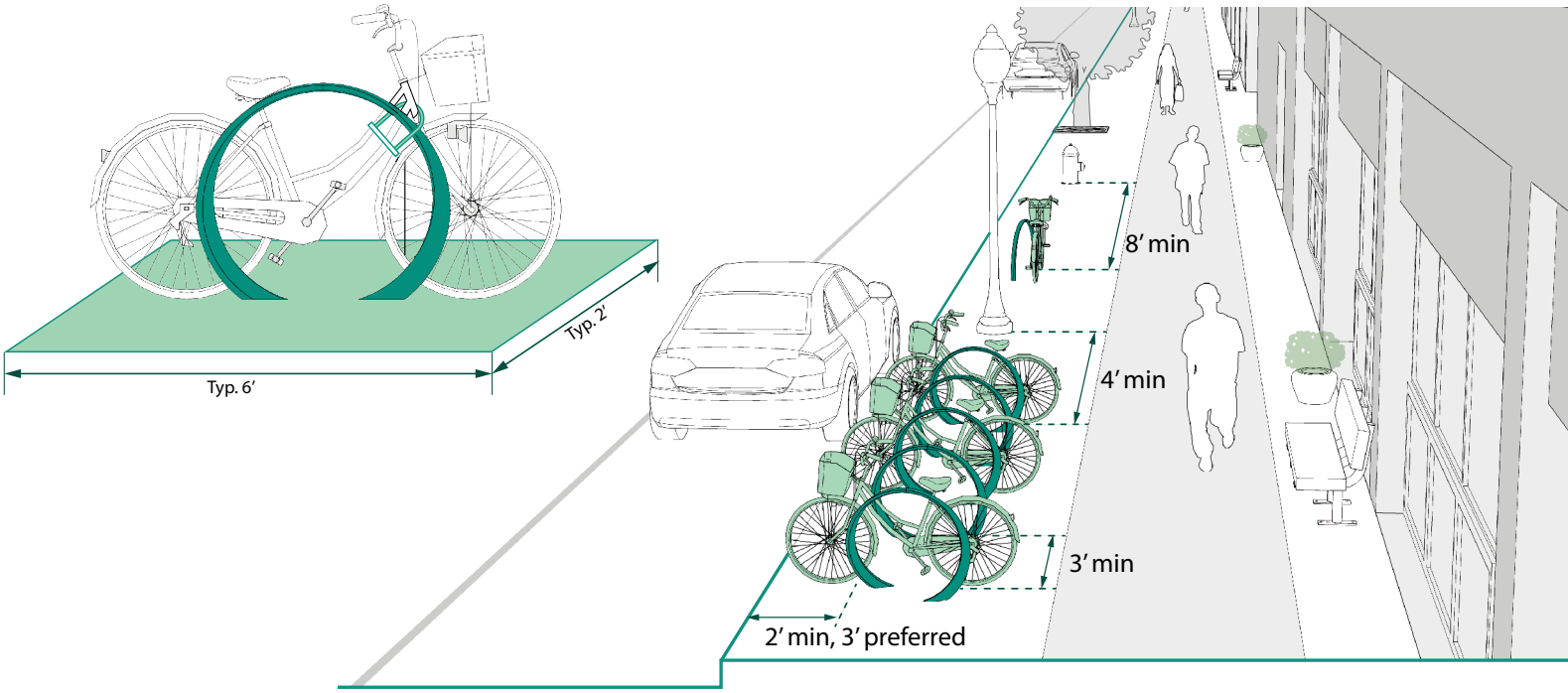
Additional Resources

- NACTO Urban Street Design Guide (2013)
- (Proposed) Public Rights-of-Way Accessibility Guidelines (PROWAG) 2011

Bike Parking

Bike parking enables people to lock and leave their bicycles, enhancing the usefulness of bike networks for daily commuting, errands, and recreational trips. Bike parking design should be secure and simple to use while maximizing capacity and maintaining an orderly appearance.

Bike Rack Dimensions and Placement



Requirements

- Install in Amenity or Curbside Zone.
- Ensure that parked bikes will not obstruct the clear width of the Pedestrian Zone (6' min., 8' min. downtown).
- Allow 2'x6' parking spaces and set racks 2'-3' back from the curb.
- Place racks at a min. of 8' from fire hydrants.
- Place racks at least 3' apart (4' for parallel racks) and 4' from streetscape elements and building corners.
- Permanently affix to paved, level surfaces with in-ground mounting (preferred for durability) or bolts.
- Developers must file an encroachment permit petition with the City Clerk and obtain City Council approval.

Additional Resources

- APBP Essentials of Bike Parking (2015)

Considerations

- Provide on commercial, downtown, and parkway streets, as well as residential streets with multi-family housing.
- Locate in well-lit areas, at busy bus stops, and within 50' of the entrance it is intended to serve.
- Style should allow bikes of all shapes and sizes to be locked through the frame and at least one wheel.
- Install bike corrals in the Curbside Access Zone where sidewalk space is limited, where potential demand for bike parking is high, and/or to daylight crossings. One vehicle parking space can hold 8-10 bikes. Prevent vehicle encroachment with parking stops or flexposts.
- Where bike repair stands are present, place racks beyond the reach of attached tools.

Bus Stops & Shelters

Bus stops provide critical connections to and from transit. Bus stops may include a range of features to enhance comfort and provide connections to other forms of transportation. To be useful, bus stops must provide accessible waiting space and loading areas.

Requirements for Bus Stops

- Provide a minimum of 5’ x 8’ for boarding and alighting areas (landing pads), with the shorter side parallel to the curb.
- Build curb extensions to accommodate minimum widths for landing pads and shelters on narrow sidewalks where a Curbside Zone is present.
- Provide level landing pads, constructed of paved concrete, for front and rear doors. Consider whether 40’ and/or 60’ articulated buses pass through.
- Maintain a 6’ wide minimum Pedestrian Zone behind landing pads.
- Provide accessible boarding with a maximum vertical step between the sidewalk and vehicle ramp of 5/8” and maximum horizontal gap of 3”.
- Provide a bus stop sign and lighting.
- Follow City pavement marking standards for all bus stops. Where possible, demarcate length of no parking zone (see table on following page) with rectangular 12” red striping with inset BUS STOP text.
- Follow City pavement marking standards for incorporating bikeways into bus stops.
- Provide a floating bus stop where the bus stop intersects a separated two-way bikeway (see Floating Bus Stop section).
- On routes where a level-boarding standard is in place, platform curb height shall be constructed at the identified height.

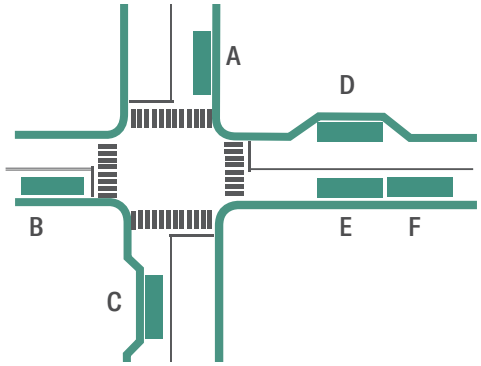
Requirements for Bus Shelters

- DDOT determines shelter placement through level of service, stops shared by multiple routes, proximity to major destinations, and distribution of shelters, among other things.
- Bus shelters should be 5’ x 12’ and follow City specifications for design and installation.
- Provide 4’ minimum accessible path between the shelter and curb and do not obstruct the 6’ minimum pedestrian zone.
- Maintain a minimum 30” x 48” clear floor space under shelters.
- Provide a 32” minimum opening for shelters.
- Maintain 15’ between the edge of shelters at near-side bus stops and crosswalks for adequate visibility.
- Minimize conflicts with trees and amenities by providing at least 6’ between the edge of the shelter and other vertical design elements.
- Offset at least 10’ from fire hydrants.
- Make the inside and outside of shelters visible through the shelter. People waiting inside the shelter should be able to see when a bus is approaching.

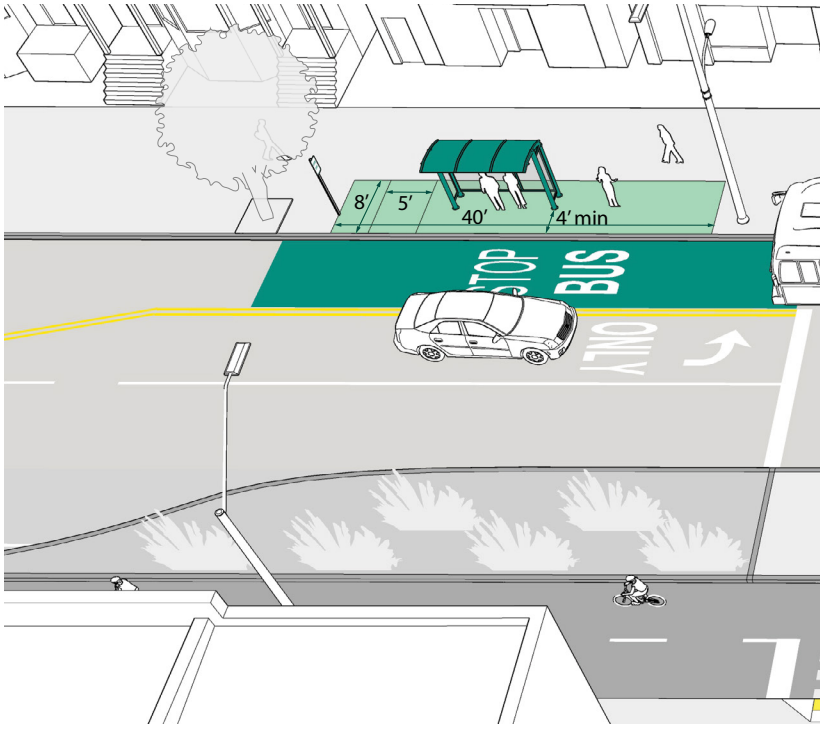
Bus Stops & Shelters

Typical Bus Stop Lengths

	Type	Bus Length	Total No Parking
A	Far-side (*pref.*)	40’ - 60’	80’ - 120’
B	Near-side	40’ - 60’	100’ - 130’
C	Bump-out	40’ - 60’	80’ - 100’
D	Closed Bay	40’ - 60’	80’ - 120’
E	Mid-block	40’ - 60’	80’ - 120’
E+F	Mid-block (stacked)	40’ - 120’	200’



Bus Stop with Shelter



Requirements for Floating Bus Stops

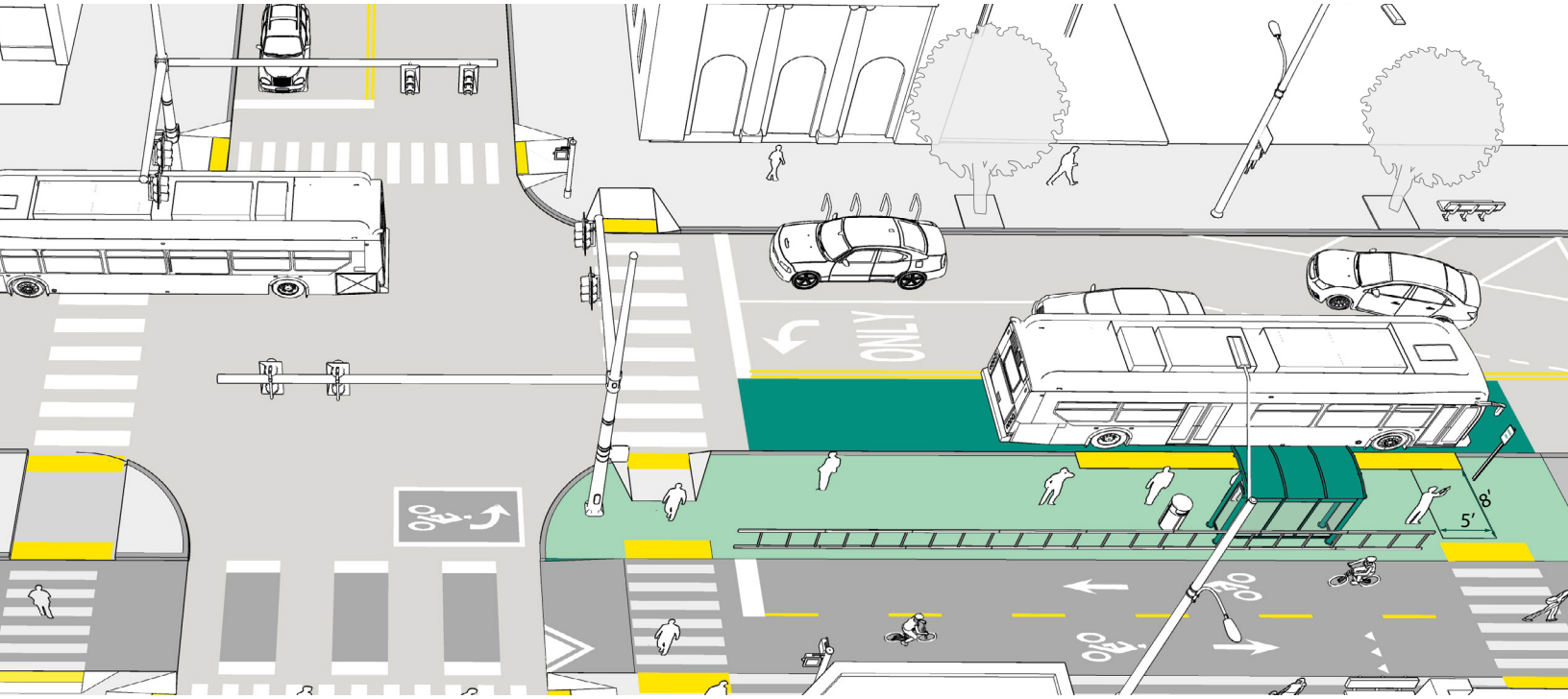
- Ensure that stops are at least as long as the length of one bus. A length of two buses is preferred at busy stops.
- Provide a landing pad that is at least 8’ deep (perpendicular to roadway). A sidewalk-level bike lane may run through a portion of the 5x8 door access area, including in a floating island, but a 4’ wide step-off zone dedicated to pedestrians must be maintained.
- Use detectable edges to delineate boarding zone.
- At crossings, provide a marked, level pedestrian path with detectable edges.
- Provide curb ramps or raise the bike lane to sidewalk level where pedestrians must cross from the sidewalk to the stop.
- Provide a maximum slope of 1:12 where bike lanes rise to meet the sidewalk at grade.
- Where floating bus stops use shelters, place shelters on floating island.
- Ensure proper drainage.
- Use a 1:10 taper ratio to route bike lanes behind the stop, where needed (maximum taper ratio is 1:5).
- Offset shelters and other vertical elements 12” from the bike lane.

Considerations

- Add seating, shelters, and bike parking for comfort and convenience. Incorporate these features at stops with at least 40 passenger boardings a day. Also consider installing these features near schools, community and senior centers, and medical facilities.
- Provide waste receptacles at stops where a shelter is present, stops averaging 7 or more boardings per day, or stops where trash accumulation persists.
- Designate snow storage areas, and keep landing zones clear and accessible.

Bus Stops & Shelters

Floating Bus Stop



- Provide map, route, and schedule info.
- Provide real-time information on arrivals and delays at major hubs, connection corners, and high volume stops.
- Lighting, sight-lines, safety pylons with panic buttons, and other measures should be considered to create a safe, comfortable waiting experience for all riders.
- Incorporate art and wayfinding within bus shelters. Refer to Detroit's *On Board with Art: Establishing a Creative Bus Shelter.*

Stop Siting

- Far-side stops are preferred for safety and operations, especially where there are sight distance challenges, where traffic flow is heavy, and where buses turn left.
- Bus stops may be located near-side where traffic flow is lower or where transit riders can more easily cross the street to a destination.
- Bus stops may be placed mid-block where major passenger generators exist or where space is limited at intersections. Enhanced midblock pedestrian crossings may be considered based on an engineering study.
- In-lane stops may be considered to facilitate bus operations, accomodate shelters on existing sidewalks, and narrow crossing distances (where bus islands or bus bulbs are installed) contingent upon an analysis of number of available lanes, capacity, user volumes, and traffic control devices.

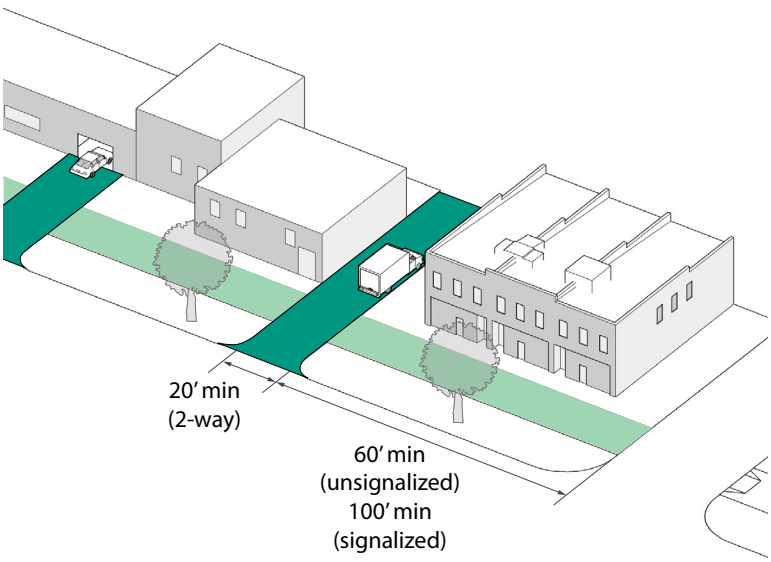
Additional Resources

- FHWA Achieving Multimodal Networks (2016)
- PROWAG
- DDOT Service Standards 2018/2019/2020
- On Board with Art: Establishing a Creative Bus Shelter

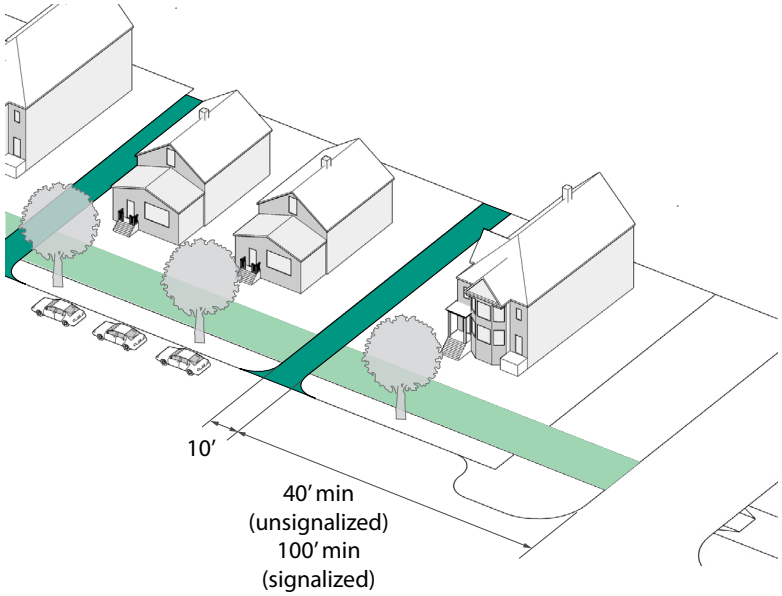
Driveways

Driveways provide access to private property from public streets. Driveways should be designed to reduce conflict between vehicles and people on sidewalks and between vehicles and people on bikes, buses, and other vehicles in the roadway.

Driveway Accessibility & Visibility



Commercial Street



Residential Street

Requirements

- Follow City ordinances for driveway quantity, installation, and permitting.
- Maintain the Pedestrian Zone as a level and continous path across driveways.
- New or reconstructed commercial driveway openings shall not exceed 30’ and shall not be less than 20’ for a two-way drive nor less than 12’ for a one-way drive. The radius of the driveway shall be maximum 10’ unless justification is provided.
- Set driveways back 100’ from signalized intersections, under high traffic conditions, or where two-way bikeways are present.
- Set back residential driveways at least 40’ from unsignalized intersections and commercial driveways at least 60’.
- Where bikeways are present, locate parking 20’ from driveways on commercial and high-volume streets and 5’ from driveways on residential streets. Prevent parked cars from blocking views of people on bikes with pavement markings and vertical delineators.

Considerations

- Only use driveways when alley or shared access points are not available; consolidate or minimize driveways on commercial and downtown street types.
- Consolidate driveways during reconstruction or retrofit projects where alternate access is available in coordination with owner.
- Minimize commercial driveway apron radii to 2’ where a bikeway runs adjacent to sidewalk.
- Provide cautionary yield signs, convex mirrors, and/or audible warnings at driveways with limited sight distances and at high-use driveways, particularly downtown.
- Mark bike lanes at driveways according to City pavement marking standards.

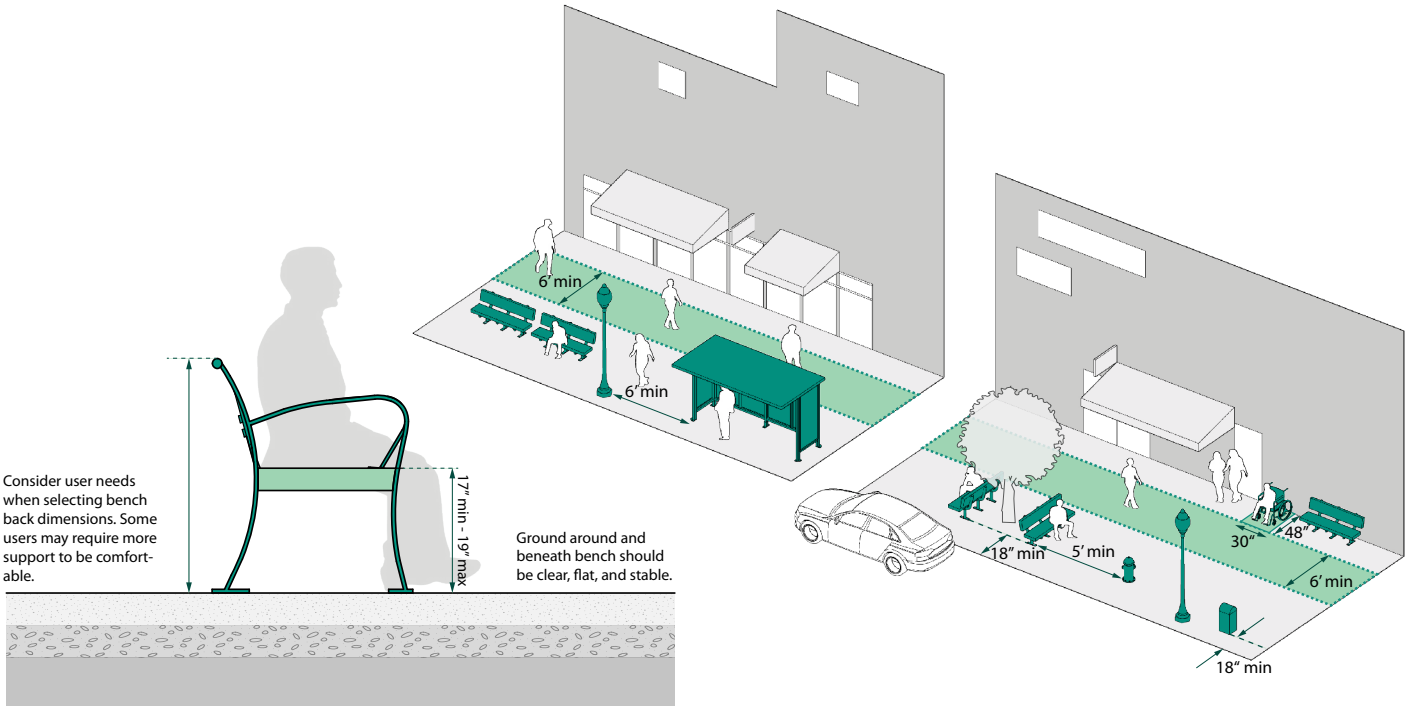
Additional Resources

- Detroit Driveway Approaches and Curb Cuts

Furniture

Street furniture, which may include seating and waste receptacles, provide added comfort and a sense of place on sidewalks. Seating provides a place to rest and socialize, while waste receptacles help to keep streets clean. Seating may include benches, chairs, or raised planters.

Streetscape Amenities



Requirements

- Locate seating and waste receptacles in the Amenity Zone. Seating may also be placed in the Frontage Zone.
- Maintain a minimum 6' Pedestrian Zone (8' Downtown).
- Do not obstruct bus landing pads, doorways, or access to utilities/manholes.
- Provide seating for a minimum of two people in one location.
- Provide at least 5' clearance from fire hydrants, 3' from waste receptacles, and 1' from other amenities.
- Provide a 30"x48" space to at least one end of each bench for universal accessibility.
- Provide at least 18" between the curb and benches or trash receptacles.
- Developers must file an encroachment permit petition with the City Clerk and obtain City Council approval.

Considerations

- Provide furniture on Commercial, Downtown, and Parkway street types.
- Consider proximity to adjacent land uses and sidewalk features, such as restaurants/ cafés and bus stops to determine locations for furniture.
- Coordinate furniture styles to uphold streetscape/neighborhood character.
- Select durable, low-maintenance materials.
- Install benches with armrests and backs for comfort and accessibility.
- Where space allows, provide seating that allows people in groups to face one another.
- Place waste receptacles every 300' on commercial corridors.

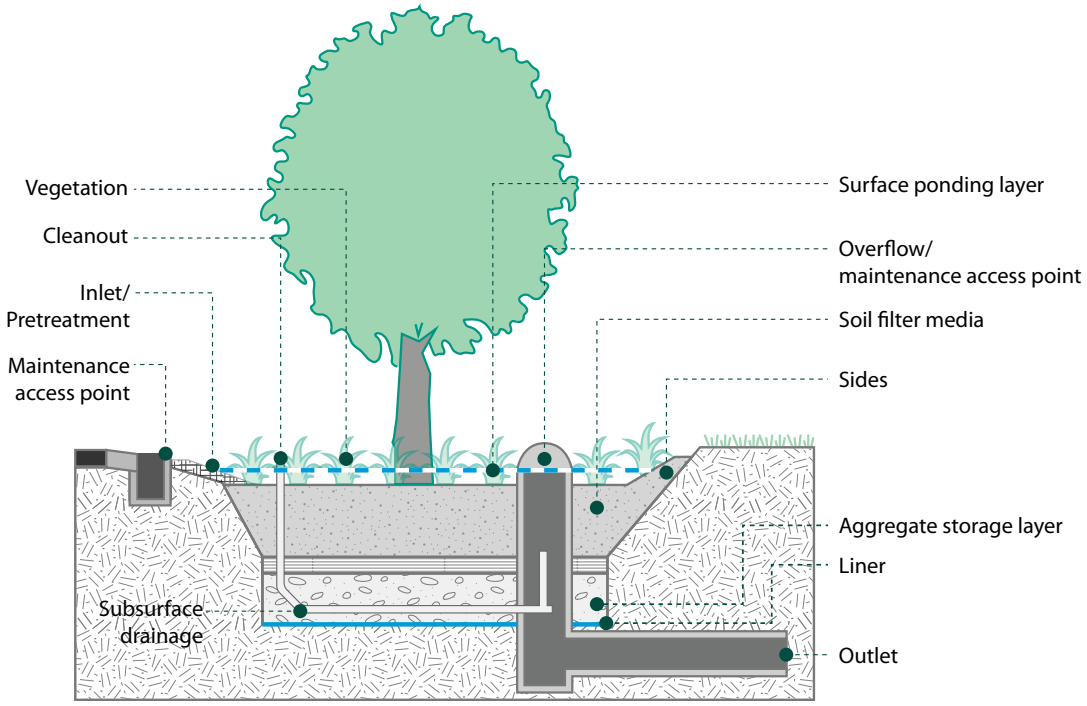
Additional Resources

- PROWAG

Green Stormwater Infrastructure (GSI)

GSI is designed to collect and treat runoff from surrounding impervious areas. It can provide environmental and economic benefits by reducing burden on stormwater infrastructure, creating and preserving habitat, and making rain events less damaging.

GSI General Design Principles (Detroit Water and Sewerage Department)



Strategic GSI can restore natural drainage patterns, pre-treat runoff for improved water quality, and recharge aquifers. The following are general requirements for all GSI. Two GSI treatments, rain gardens and stormwater planters, are detailed on the next page.

Requirements

- Locate within Amenity Zone, curb extensions, and raised medians Do not locate GSI in the Pedestrian Zone.
- Detention areas should drain surface water within 24-72 hours. Facilities that do not drain out within 72 hours reduce the life of adjacent pavement.
- Provide a minimum width of 5’ of treatment area between back of curb and edge of Pedestrian Zone.
- Select plant species based on benefits for native wildlife and pollinators, regional hardiness (USDA Zone 6a and 6b), soil conditions and drainage, progeny, tolerance of urban conditions, seasonal color, biodiversity, and root structure.
- Select plants that are tolerant of short periods of inundation and long dry periods, as well as salt-tolerant if capturing runoff from streets or sidewalks.
- Use low-growing plants (under 30”) where sight distance must be preserved (e.g. crosswalk locations and locations where personal safety is a concern).
- Understand and plan for maintenance when considering GSI in any Sidewalk Zone.

Green Stormwater Infrastructure (GSI)

Rain Gardens

Rain gardens are recessed planting beds that appear like conventional landscaped areas.

Stormwater Planters

Stormwater planters are enclosed planters with structural elements such as curbs, overflow pipes, and underdrains that connect into stormdrains.

Considerations for Rain Gardens

- Use engineered soil to allow stormwater to permeate and dense vegetative cover to prevent erosion.
- Pretreat runoff with filter strips where space allows,
- Use on any street type but consider available space, desired aesthetic, and ability to maintain, particularly on Local streets.
- Infiltration treatments located adjacent to building foundations should consider building and roof drainage, waterproofing, and underground utilities.
- Sample and test subsurface soil, geology, and groundwater table to ensure adequare drainage capacity.

Considerations for Stormwater Planters

- Construct an overflow structure for stormwater planters to handle excess runoff during large storms.
- Drop grade by 2” between curb cut inlets and stormwater planter surface for effective drainage.
- Pretreat runoff from streets and parking lots through flowing through a sump or sediment capture area (runoff from rooftops, sidewalks, and pedestrian plazas do not need pretreatment).
- May be located adjacent to buildings. Ensure waterproofing to prevent flooding into foundations.
- Design with curbs and inlets to withstand snow plows and street sweepers.
- Provide breaks where on-street parking exists to help people transition from vehicles to the Pedestrian Zone.

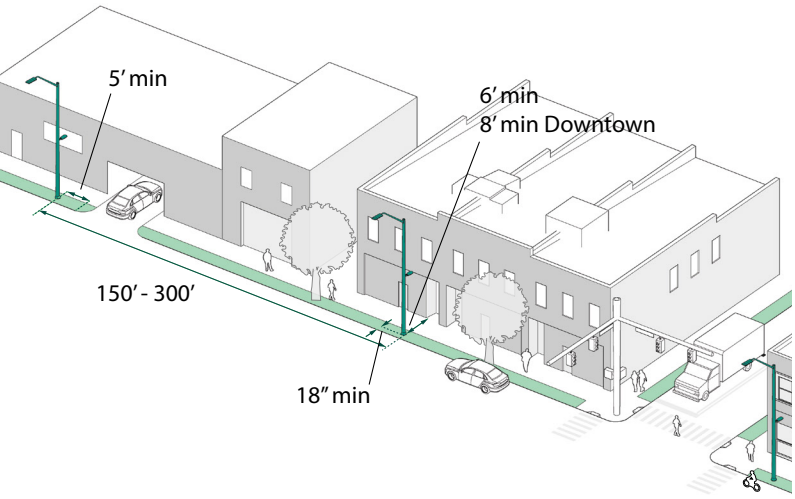
Additional Resources

- DWSD Stormwater Management Design Manual
- Eastern Market Neighborhood Framework
- Joe Louis Greenway Framework Plan

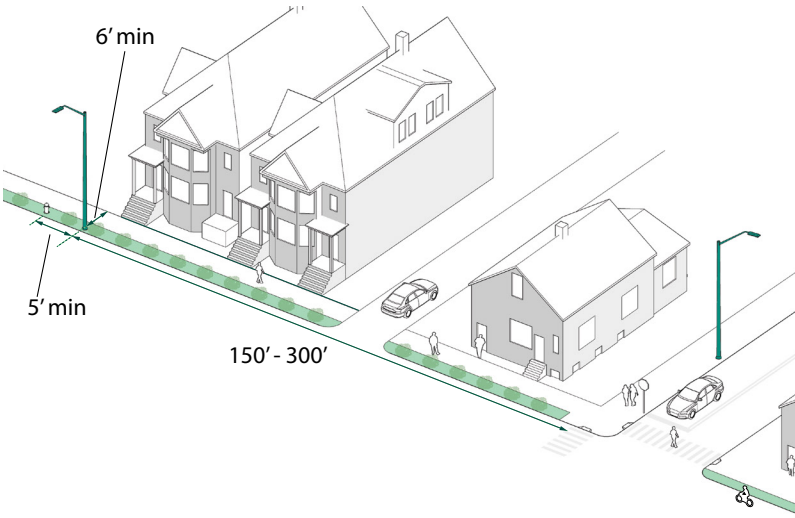
Lighting

Lighting improves visibility and provides a sense of safety while lending character to a street. It illuminates squares and public spaces, encouraging nighttime use. Pedestrian lighting may be used to supplement or replace roadway-scale lighting.

Spacing and Offsets



Commercial Street



Residential Street

Requirements

- Keep clear of the Pedestrian Zone where possible. If there is not enough space, leave a 4’ minimum clear accessible path.
- Ensure illuminance levels are compliant with Table 3-5a in the 2018 AASHTO Roadway Lighting Design Guide. The minimum lighting level shall be one foot candle.
- Provide one light at minimum at all intersections and dead ends. In order to increase lighting uniformity and prevent dark spots, provide additional midblock lights at regular intervals of 150’-300’.
- Locate on sidewalks where there is no conflict with existing trees or GSI assets.
- Ensure adequate horizontal and vertical clearance from utilities, stormwater features, and trees (at mature size).
- Place at a minimum of 18” from curb face (3’ if next to parking) and 5’ from fire hydrants and curb cuts.
- Use dark-sky compliant fixtures constructed to reduce energy use, light pollution, and impact of unnatural light on environment.

Requirements for Pedestrian Lighting

- Increase illumination at intersections, ramps, crosswalks, transit stops, and seating areas that may be used at night.
- Locate to front-light crosswalks, with the light source situated between the crosswalk and the motor vehicle in the direction of vehicle travel.
- Pedestrian lighting fixtures shall be 11’-20’ in height (and may be piggyback fixtures attached to roadway-scale lighting poles).
- Spacing shall depend on context such as tree spacing, fixture selection, setback of adjacent buildings, and light intrusion into residential properties.

Lighting

Typical Streetscape Fixture

String Lighting

Considerations

- Provide on on all streets. Use pedestrian lighting on commercial, downtown, and high-density residential streets.
- Taller poles will cast light over a larger area and will be generally more uniform, while shorter poles will need to be spaced closer together to achieve desired illumination levels and uniformity.
- Use pedestrian scale lighting in combination with roadway lighting in high-activity areas.
- Provide additional lighting near high pedestrian or bicycle areas (e.g. schools, parks, neighborhood centers, greenways), areas with high use at night, or areas where personal safety is a concern.
- Place pedestrian lighting between buildings rather than in front of buildings or windows.
- String lights may be strung over roadways to create ambiance. Maintain enough clearance for vehicles that are allowed on the street, including freight, transit, fire, emergency, and waste service vehicles.
- Install motion sensors and/or timer controls to provide lighting only when people are present or during certain times, and install photocells on controller cabinets to shut off lights during daylight hours.
- Look for opportunities to mount lighting fixtures on existing utility poles or traffic signals to reduce cost and maintenance with permission from asset owner.
- Stagger poles to reduce the number of lights needed and to improve uniformity.
- Use staggered arrangements over lighting one side of a street if nighttime uses exist on both sides.
- Consider requisite transformer, meter, and control box when spacing poles and fixtures.
- Create recognizable street types and spaces through lighting types and appearance.
- Poles may be furnished with decorative banners (minimum clearance height 15’), signage, and seasonal displays.
- Receptacles (electrical outlets) may be provided on poles along active commerical corridors for use during holidays and festivals.

Additional Resources

- Public Lighting Authority - Legal Description
- AASHTO Roadway Lighting Design Guide

Materials

Materials can maximize the accessibility, sustainability, and drainage of a sidewalk while helping to define a street. Proper selection, good detailing, and quality installation helps to create a smooth, stable, durable, and slip-resistant sidewalk.

Demarcating Zones and Uses

Vary material (using color, texture, or edging) to differentiate between different sidewalk uses/zones

Requirements

- Select materials to minimize gaps, discontinuities, or rough surfaces.
- Construct sidewalks with cement concrete or solid concrete interlocking paving units.
- Establish or reinforce neighborhood identity and street type through consistent materials.
- Construct driveways crossing sidewalk space with concrete from the curbline to the lot line.
- Refer to Detroit City Code for materials used in Historic Districts.
- Understand and plan for maintenance when considering materials other than concrete in any Sidewalk Zone.

Considerations

- Use a single material for narrow sidewalks.
- Use varying materials to differentiate between sidewalk zones on wider sidewalks or to embellish special areas (e.g. building entrances, trail approaches, plaza edges, transit stops, sidewalk-level bike lanes) while ensuring a continuous and accessible Pedestrian Zone.
- Use permeable paving materials to allow stormwater runoff to infiltrate through the sidewalk and increase traction when wet.

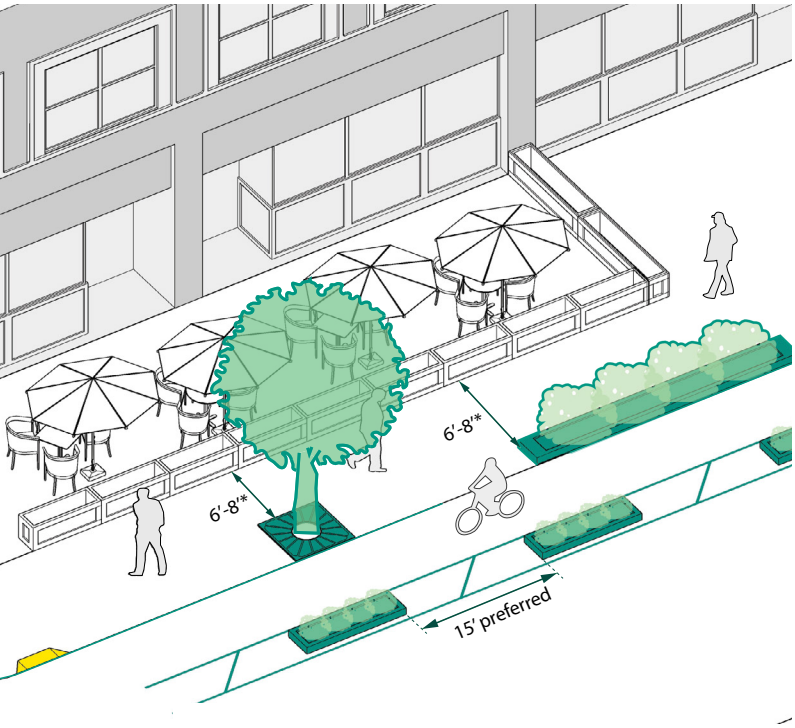
Additional Resources

- Detroit City Code - Historic Districts
- Detroit Historic District Commission
- City of Detroit Street and Alley Standards

Planters

Planters contain live plants and are a cost-effective way to add visual charm and beauty to an area. They also help to define borders for a variety of spaces, including bike lanes and bike parking, curb extensions, sidewalk cafés, and seating areas.

Typical Dimensions



Planter Selection

Select low-growing plants to maintain sight lines

Requirements

- Maintain a minimum 6' Pedestrian Zone (8' Downtown), and do not allow material to protrude into the Pedestrian Zone.
- Use live plants. Do not use artificial plants. Replace dead or unhealthy material with healthy material.
- In bike lane buffers, space at a maximum distance of 15' (edge to edge) to prevent vehicle parking or encroachment.
- Do not locate in areas that will obstruct vehicle visibility. Select plants that will not grow beyond 3' tall.
- Where planters directly abut travel lanes, mature plant height shall not exceed 1.5' in excess of the planter.
- See Detroit's Outdoor Dining Café Guidebook for guidance on planter and plant selection.
- Developers must file an encroachment permit petition with the City Clerk and obtain City Council approval to install ROW planters.

Considerations

- Locate in Frontage and Amenity Zones.
- Provide on commercial, residential, and downtown streets.
- Select aesthetic/style to create recognizable street types and spaces.
- Select plants that are hardy to USDA Zone 5a/5b, a zone colder than the Detroit region, due to the lack of ground insulation.
- Select plant species for tolerance of urban conditions and seasonal color.
- Alternate planters and other vertical elements in buffers to reduce costs and allow emergency vehicle access.
- Create a maintenance plan or agreement to ensure adequate upkeep and plant health. Partner with nearby businesses, organizations, or community groups.

Additional Resources

- Outdoor Dining Café Guidebook

Public Art / Street Murals

Public art creates inviting spaces and showcases the talent of Detroit artists. It can encourage physical activity, build community partnerships, and provide broader access to the arts. Public art also highlights the values and identity of the community.

Examples

Requirements

- Must be created with the permission of the property owner(s) when located on private property.
- Maintain artwork (subject to Detroit's property maintenance code). Artwork showing obvious wear (such as peeling paint) or that is vandalized or altered from the original art needs to be addressed by the property owner.
- Adhere to ADA standards for sidewalk design elements and at intersections.
- Community groups must submit a proposal through the City's Paint the Street Program to paint street murals and crosswalks.

Additional Resources

- Detroit Property Maintenance Code
- Detroit Public Art and Graffiti
- Detroit Paint the Street Program

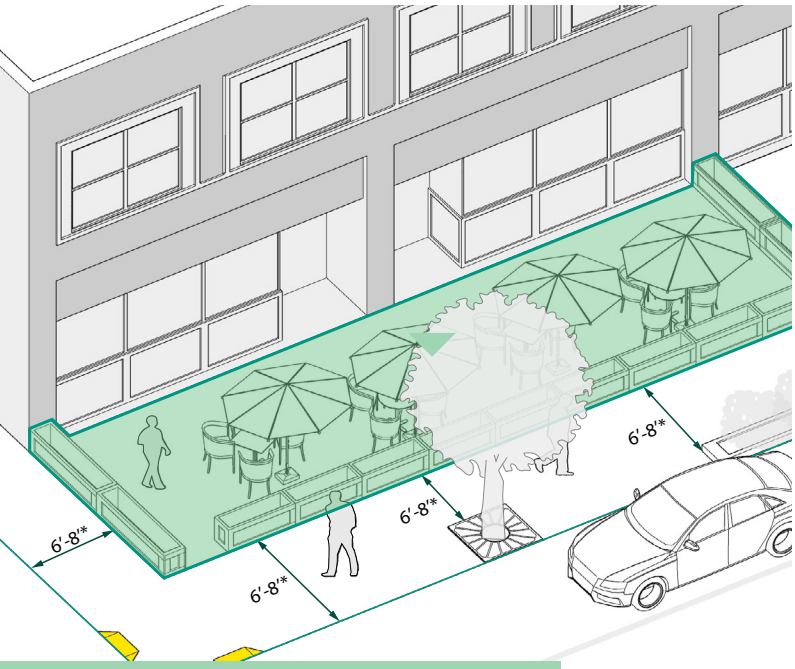
Considerations

- May include murals, painted sidewalks, painted crosswalks, painted asphalt, barrier beautification, and other art forms.
- Locate on Commercial, Residential, Local, and Downtown street types. Paint the Street artwork is only eligible on Local streets.
- Ensure that the Pedestrian Zone remains accessible through smooth, stable, and slip resistant surfaces.
- Do not create art that could be mistaken for holes in the sidewalk.
- If painting crosswalks, ensure that either retroreflective transverse white lines or longitudinal white stripes are maintained.
- A wide range of artwork styles are invited. In-street artwork should contrast with pavement and other materials.
- Register artwork to proactively resolve any violations. Registration can be done through the Public Art and Graffiti webpage.

Sidewalk Cafés / Retail

Sidewalk cafés are an extension of restaurant business into the public right-of-way that brings activity and energy to the public realm. They must be carefully designed to ensure sidewalks stay functional. Generally, businesses maintain sidewalk cafés.

Typical Sidewalk Café Clearances



Locate cafe in Frontage or Amenity Zone

Parklet Café Installation

Requirements

- Locate sidewalk cafés within the Frontage or Amenity Zone. Do not locate within the Pedestrian Zone.
- Maintain 6’ minimum unobstructed path through Pedestrian Zone (*8’ Downtown)
- Maintain 3’ minimum for a clear path to the front door of the dining establishment.
- Maintain 3’ minimum between rows of tables.
- For at least 5% of tables (or at least one table if <20 tables), ensure ADA compliance (surface height of 28”-34”; minimum height of 27” and width of 19” for knee clearance; clear floor area of 30”x48” for seating).
- Use tables with a maximum height of 36”.
- Provide a barrier (fence or planter permitted) if alcohol is served.
- Refer to the Outdoor Dining Café Guidebook for permitting and additional requirements.
- Parklets shall conform to the Outdoor Dining Café Guidebook requirements.

Considerations

- Provide on commercial and downtown streets.
- Use colorful, weather-resistant, and attractive furniture (e.g. metals, finish grade woods, sturdy recycled materials, water-resistant textiles).
- Provide umbrellas between 7’-10’ in height to increase customer comfort.
- Install decorative lights to add ambiance. Ensure lighting is securely fastened and does not create a hazard. Illumination systems must be approved by BSEED.
- Heat lamps may be used to extend the outdoor dining season.

Additional Resources

- Outdoor Dining Café Guidebook

Signage

Signage provides warnings regarding crossings, bike lanes, and mixing zones. It also communicates parking regulations or directions to a location. Wayfinding signage may also be used to mark an area, landmark, or building.

Signage Examples

Requirements

- Typical sign categories include regulatory, warning, and guide signs. All traffic signs shall conform to the MMUTCD and accessibility requirements.
- Maintain minimum unobstructed clearance through Pedestrian Zone.
- Use signs to draw attention to crossings on the sidewalk, including for bike crossings and pedestrian crossings across the bike lane.
- Ensure visibility to the intended user (pedestrian, bicyclist, and/or driver), and place advanced warning signs where necessary.
- Offset 4’ from bike parking, 6’ from bus shelters, 1’ from furniture (3’ from waste receptacles), and 5’ from fire hydrants.

Considerations

- Prevent clutter through careful placement, by removing redundant and unnecessary signs, and by using pavement markings instead of signs where feasible.
- Keep signs simple, concise, and consistent in design. Use pictographs and symbols instead of text where possible.
- Install wayfinding signs to direct people to popular areas on downtown, commercial, and parkway streets, as well as to/from transit hubs, parking areas, and gateways. Follow MMUTCD standards for vehicular and bike signs. Consult a wayfinding designer for pedestrian signs.
- Considerations may be needed for the inclusion of Braille and other languages.
- Bicycle wayfinding signs should direct people to high-comfort routes, such as greenways and Slow Streets.

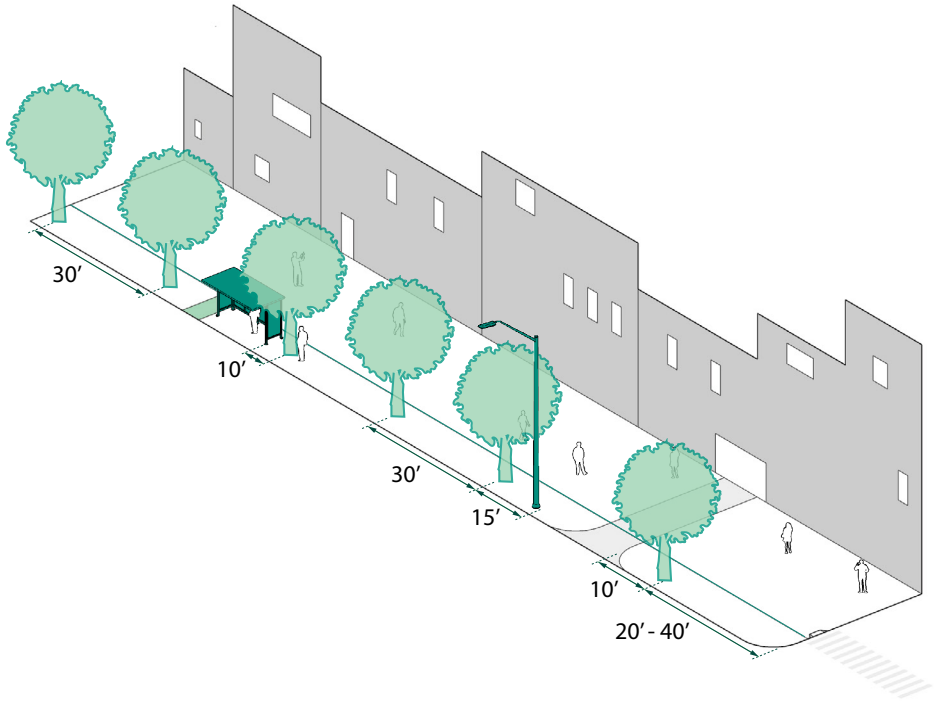
Trees

Trees provide social, environmental, and economic benefits. They provide shade and filter air pollutants and particulates, reducing the impacts of the urban heat island effect. Trees also define the character of a street and contribute to the ambiance of the public realm.

Sample Species Selection* and Spacing

Common Name	Size
Crabapple	Small
Ivory Silk Tree Lilac	Small
Eastern Hop-Hornbeam	Medium
Frontier Elm	Medium
Gingko (male)	Medium
Inermis Hawthorn	Medium
Hackberry	Large
Kentucky Coffee Tree	Large

*species selection depends on soil conditions, existing species selection, salt tolerance, and other considerations.



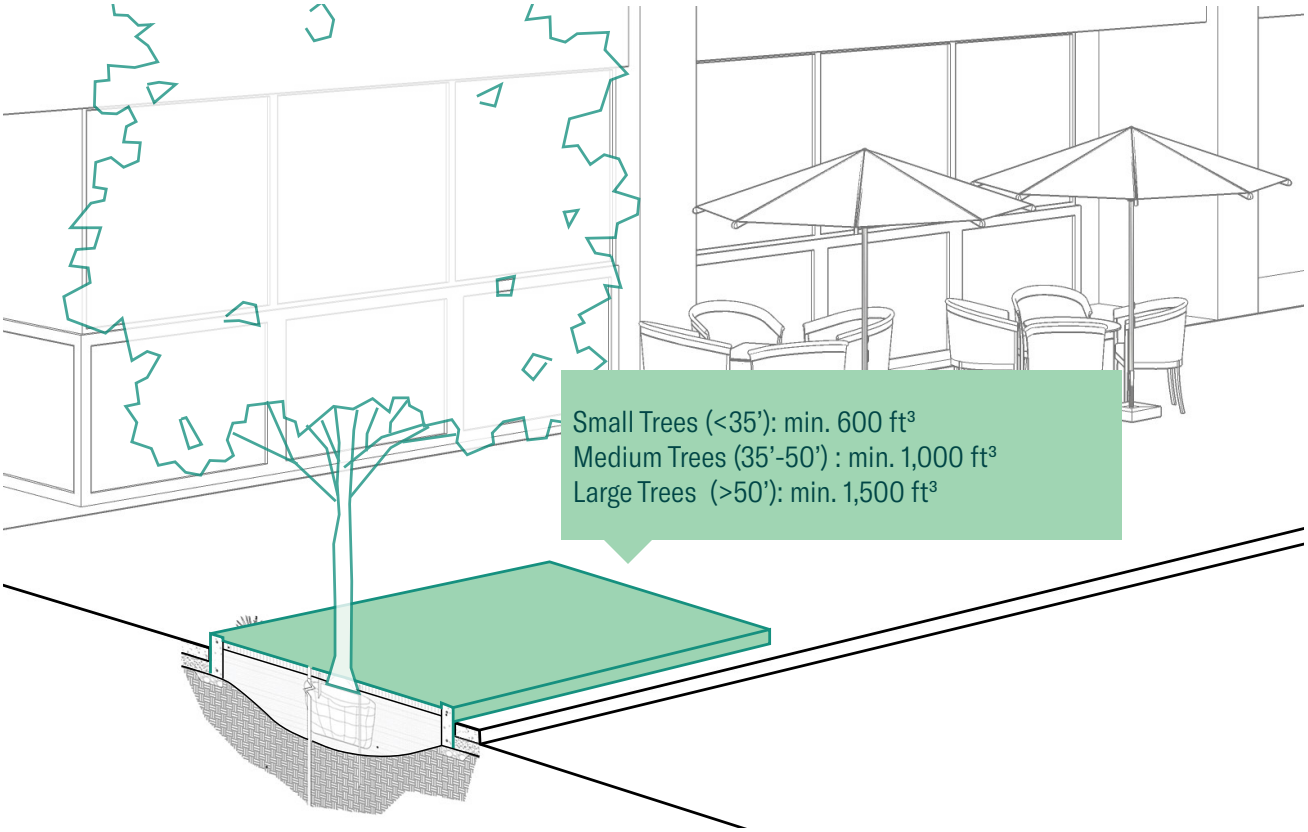
Requirements

- Where there is sufficient space in the Amenity Zone, plant continuous rows of street trees with 30’ typical spacing on all street types, including Industrial streets.
- Provide a minimum soil volume of 600 cubic feet within a 16’ radius to accommodate small trees.
- Select tree species based on benefits for climate change and native wildlife, regional hardiness (USDA Zone 6a and 6b) and microclimate conditions (e.g., soil contamination, soil drainage), progeny, tolerance of urban conditions, seasonal color, biodiversity, and root structure.
- Do not locate trees within 10’ of bus stop landing pads.
- Ensure street tree canopy does not overhang into bike facilities or block views of arriving transit vehicles.

Considerations

- Determine the necessary soil volume in creating dimensions of rooting space. Large trees (greater than 50’ height at maturity) need 1,500 cubic feet of soil within a 27’ radius. Medium trees (35’-50’ height at maturity) need 1,000 cubic feet of soil within a 22’ radius. Small trees (less than 35’ height at maturity) need 600 cubic feet of soil within a 16’ radius. Where radii for adjacent trees overlap, up to 25% of required soil volume per tree may be shared.
- Provide additional or shared rooting areas to support long-term tree growth as larger trees have a significantly larger impact on ecosystem function.
- Caution should be exercised in selecting most native tree species as the street environment differs significantly from that found in native conditions.

Trees



- On Commercial or Downtown street types, tree grates may be appropriate for use. Follow City standards for tree grate selection and detailing. Plan for maintenance as tree grates can choke, girdle, or otherwise damage trees when not properly maintained, and roots can dislodge grates.
- Use supplemental perennial and low-growing shrub plantings to buffer pedestrians from the roadway.
- Coordinate locations with emergency vehicle parking spaces, sight lines, utility equipment, driveways, loading zones, and bus stop landing pads.
- Consider use of trees in stormwater planters to store and infiltrate stormwater runoff.
- Use shallow rooted species near sewer or drainage pipes and species with deeper roots and small trunk flares adjacent to pavements.

Additional Resources

- City of Detroit General Services Department Tree Services
- MI Dept of Natural Resources Urban and Community Forestry Program
- The Greening of Detroit List of Recommended Trees for the City of Detroit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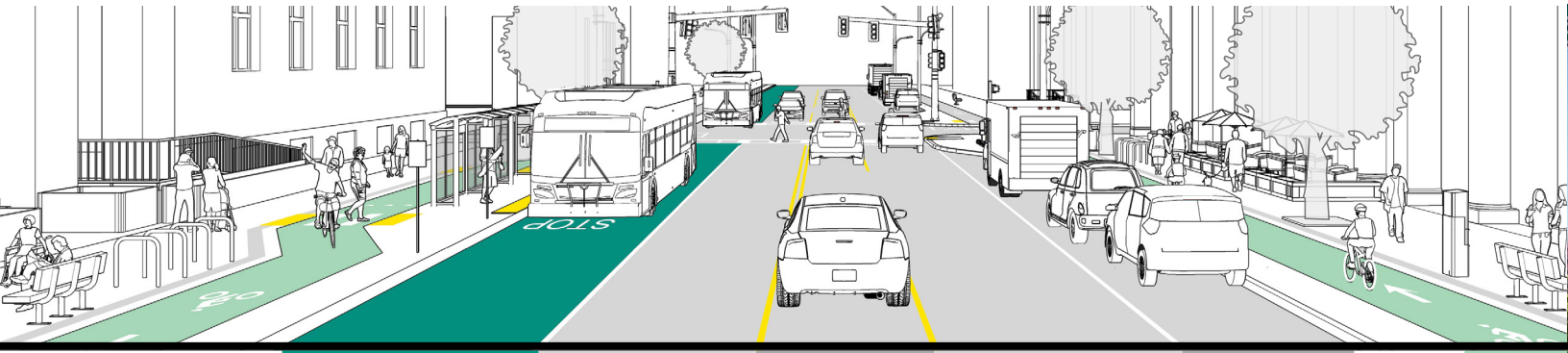
4: ROADWAYS

4 ROADWAYS

Detroit's roadways should be designed to ensure safety for all users as people move around the city. Safety improvements can be achieved through design elements, described in this chapter, that encourage motorists to operate at safe speeds. As the City develops multimodal networks, roadway space should also be rebalanced to support the comfort and convenience of bicyclists and transit riders in addition to personal vehicle and freight drivers.



Street Type	Bus Lane	Travel Lane	Turn Lane	Travel Lane	Parking Lane		Bike Lane
Arterial-Commercial	11' - 12'	10'* - 11'	10' - 11'	10'* - 11'	7'* - 9'		See Pages 64 -67 for widths for one-way and two-way bike lanes
Arterial-Residential	11' - 12'	10'* - 11'		10'* - 11'			
Collector-Commercial	11' - 12'	10'* - 11'		10'* - 11'			
Collector-Residential	11' - 12'	10'* - 11'		10'* - 11'			
Local	n/a	10' - 11'		10' - 11'			
Industrial	11' - 12'	11' - 12'		11' - 12'			
Parkway	11' - 12'	10'* - 11'		10'* - 11'			
Downtown	11' - 12'	10'* - 11'		10'* - 11'			

* On streets with one travel lane in each direction and no center turn lane or median, 11' travel lanes shall be the minimum to accommodate passing buses. 8' parking lanes shall be the minimum on transit streets where the bus does not stop in the travel lane.

Roadway Zones

Detroit roadway zones include the Curbside Zone and Travel Lanes. The Curbside Zone can be used for travel and access and is included in this chapter for travel purposes. See Chapter 2: Sidewalks for access-based curbside uses. The number of zones, design, and width vary according to street type and available right-of-way. Zone characteristics based on street type, features, and requirements, are shown at right.

Curbside Zone - Mobility

- Used for active travel by bicyclists and are more common on Arterial, Collector, Parkway, and Downtown street types.
- Consists of separated bike lanes with vertical separation elements.
- May be additionally buffered from vehicular travel lanes with vehicle parking, curb extensions, and/or floating bus stops.
- Adjacent to the sidewalk and may be sidewalk-level or roadway-level.
- Buffers pedestrians from vehicular traffic and the main travelway.

Multi-modal Roadways

Travel Lanes

- Used for travel by motorists, transit riders, freight operators, and by bicyclists on low-volume and low-speed streets.
- May be used as a dedicated travelway for transit on high-frequency transit routes.
- Located toward the center of the roadway, adjacent to the Curbside Zone.
- May include left/right dedicated turn lanes, center turn lanes, medians, pedestrian refuge islands, in-lane transit stops, and/or bus stops for dedicated bus lanes.

Multimodal Function

As Detroit seeks to balance space for bicyclists, transit riders, and pedestrians in addition to motorists, existing travel lane widths and travel lane quantity may be reduced. Travel lane space may be reallocated to install wider sidewalks, bicycle facilities, dedicated bus lanes, pedestrian refuge islands, landscaped medians, and/or green stormwater infrastructure.

Public Health and Environment

In support of the SFP Value to protect public health and environment, roadway designs should support transit and active transportation in an effort to reduce greenhouse gas emissions and pollutants contributed by motor vehicles. Designs may maximize sustainability by reducing impervious surfaces through material choices and by reallocating curbside space to green infrastructure. Roadway materials should also be long-lasting as well as locally sourced, reused, or recycled where possible.

Safe Speeds

Target and Design Speeds

Following the Safe System approach, speed reduction is of paramount importance for lowering injury and fatality rates in the transportation system and balancing the needs of users across a mix of modes. As recommended by the National Transportation Safety Board, practitioners should design streets according to target speed, the desired top speed that people should drive. Design speed, the speed used to determine geometric features of a roadway, should match the target speed, and both the target and design speeds should match the posted speed limit. This is to ensure design matches driver expectation.

In Detroit, a target speed of 25 mph is appropriate and preferred for all street types, and a maximum target speed of 30 mph may be considered for arterials, industrial, and parkway streets.

It is important to note that Michigan Vehicle Code currently designates statutory speeds of 25 mph for business districts, public parks (unless set lower by the jurisdiction), and residential areas. School zones are required to be no less than 25 mph. The Code also requires that speeds are otherwise set through 85th percentile speed studies. At the time of writing this guide, changes to the law are that would provide more flexibility for the City to set speeds according to other criteria are under consideration.

Designing for Lower Speed

Design measures for reducing speeds should be considered where existing roadway geometry, signal timing, or other factors result in design speeds being higher than target speeds. The Institute of Traffic Engineers (ITE) identified a short list of measures for reducing speeds through street design. This list has been modified for Detroit, but some recommendations may not be appropriate for every street type.

- Set signal timing for 30 mph or less.
- Use narrower travel lanes.
- Use physical measures to narrow the roadway. In Detroit these can include the reduction of travel lanes, relocation of parking, plus the addition of curb extensions, pedestrian refuge islands or medians, and transit islands.
- On Local streets, apply traffic calming measures that include vertical and/or horizontal deflection. See the Traffic Calming section later in this chapter.
- Create side friction with planters, trees, and curbside uses such as parklets and bikeshare. Parking can also create friction.
- Eliminate superelevation (banking of the roadway).
- Eliminate shoulders, except for bicycle lanes.
- Use smaller curb radii to slow turning vehicles.
- Eliminate channelized right-turn lanes
- Use paving materials with texture. This includes high visibility crosswalk and other markings that signal the presence of pedestrians at intersections.
- Properly use speed limit, warning, and advisory signs and devices.

Roadway Design Elements

Roadway design elements are detailed throughout this chapter. The elements support functionality for different modes and safety for each road user. Elements and their details will be determined for each project according to modal priorities, engineering judgment, and community goals.

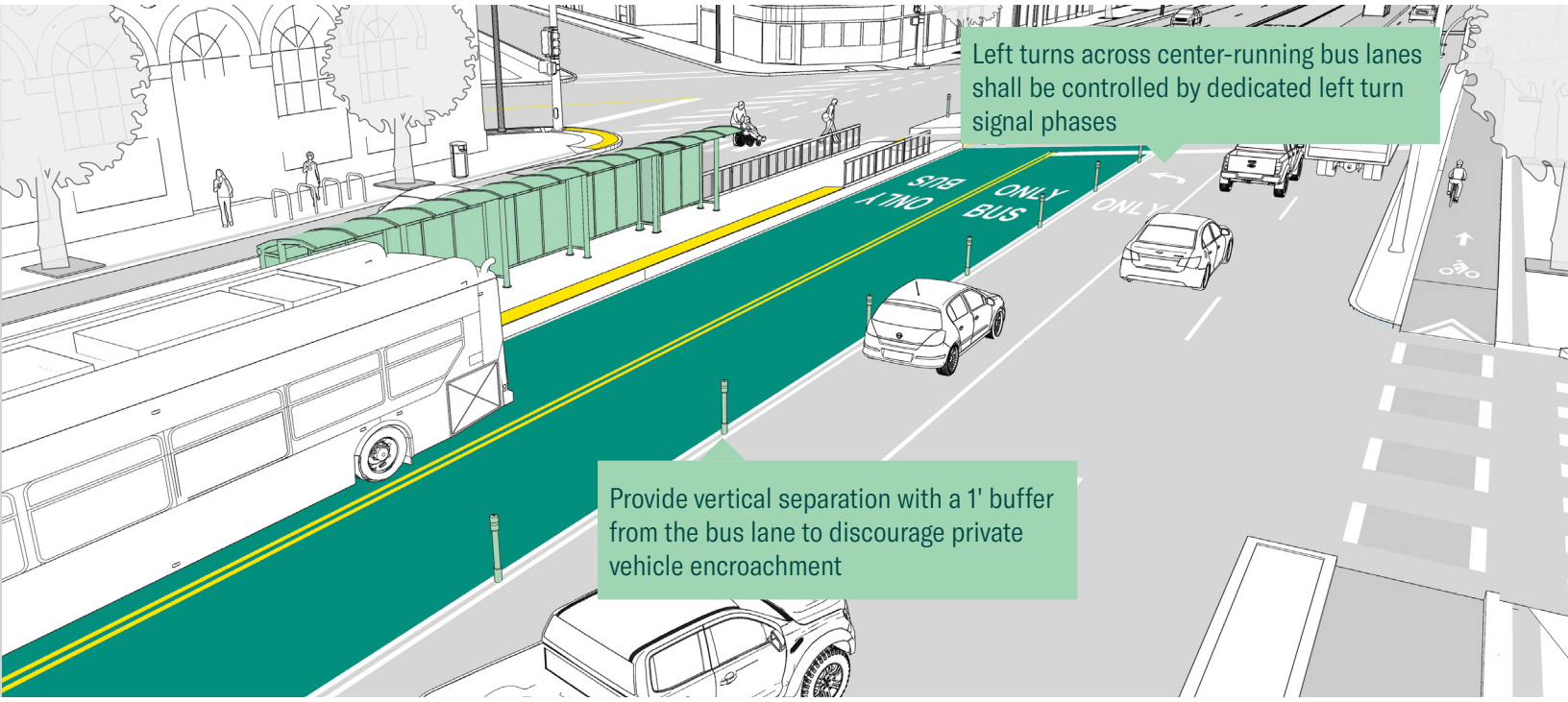
Additional Resources

- NACTO City Limits: Setting Safe Speeds on Urban Streets
- NTSB Safety Study: Reducing Speeding-Related Crashes Involving Passenger Vehicles

Bus Lanes

Dedicated bus lanes provide the opportunity to increase service reliability and service frequency by separating transit operations from general traffic and enabling Bus Rapid Transit. They are a major component for providing convenient and reliable public transit, especially in combination with other transit operational strategies, such as transit signal priority, choice of vehicle type, and station design.

Center-running Bus Lane



Requirements

- Provide a minimum bus lane width of 11'.
- Deter private vehicle encroachment with colored pavement and pavement markings.
- Bus stops along bus lanes shall be minimum 100' in length, depending on the size of vehicles run on route and number of vehicles that will regularly be present.
- Follow City pavement marking standards for bus stops. Stops should be bounded with a 12" red line border with "BUS" and "STOP" marked 8' in length, spaced 15' apart in the middle of the stop facing approaching buses.

Considerations

- Provide on high-frequency bus routes in conjunction with queue jumps, bus stop amenities, and enhanced crosswalks.
- Do not place adjacent to parking, where possible, to avoid delays from crossings and parking maneuvers.
- If bus lanes are not feasible, consider pocket lanes at bottlenecks.
- Use signalization and signage to reduce conflicts with right-turning vehicles and opposing left-turning vehicles.
- Center-running bus lanes are preferred as curbside bus lanes are difficult to keep clear of vehicles on streets with heavy right-turn volumes and high demands on curb access.
- Provide space on perpedicular streets for delivery and passenger pick-up and drop-off to mitigate encroachment.
- Stop spacing on center-running bus lanes should be greater than on typical routes to provide faster, more efficient service and reduce operational impacts except where major pedestrian generators are present.
- Stops should meet PROWAG guidelines for accessibility and accommodate typical loading volumes. See Chapter 2 for guidance.

Additional Resources

- APTA Designing Bus Rapid Transit Running Ways
- NACTO Transit Street Design Guide

Materials

Roadway materials impact traffic safety and speed, stormwater management, and the urban heat island. Materials also affect user comfort, roadway noise level, and maintenance needs and costs. Materials may be used as an expression of neighborhood character.

Mixed Materials

Requirements

- Provide smooth, stable, slip-resistant materials to create an accessible path at pedestrian crossings. See the Crosswalks section in Chapter 5: Intersections for more information.
- Avoid materials that create slippery conditions for pedestrians and bicyclists (e.g. smooth granite, tile, brick).
- Ensure that materials do not settle to different heights through appropriate subgrade design, site preparation, and installation.
- Avoid using concrete where utility access is frequently needed.
- Understand and plan for maintenance when considering installing materials other than standard asphalt, concrete, and pavement markings in any Roadway Zone.

Considerations

- In selection of material, consider constructability, ease of maintenance, smoothness, durability, porosity, reflectivity, and color.
- Consider materials that resist heaving and rutting in locations that are susceptible to wear, such as high-volume intersections or where there is a high percentage of heavy vehicles and/or known heavy vehicle users. Use concrete bus pads on high frequency bus routes to withstand wear.
- Colored pavement may be used for artistic purposes. Colored pavement for traffic control (communicating a regulatory, warning, or guidance message) must follow MMUTCD standards.
- Use paving materials or colored pavement to define street character.
- Use permeable materials to allow stormwater infiltration where appropriate based on street context, grades, subsoils, drainage characteristics, and groundwater conditions. Permeable materials may also need fewer treatments for ice control.
- Pavers may be considered for use in the Curbside Zone to bolster street character and/or provide permeability, but do not use them in crosswalks. Their use in travel lanes should be limited to shared streets and short segments within business, arts, and historic districts.
- Consider using a different paving treatment in the Curbside Zone to visually reduce the width of the roadway and reduce vehicle speeds.
- Avoid materials that produce vibrations for bicyclists (e.g. pavers and rumble strips).

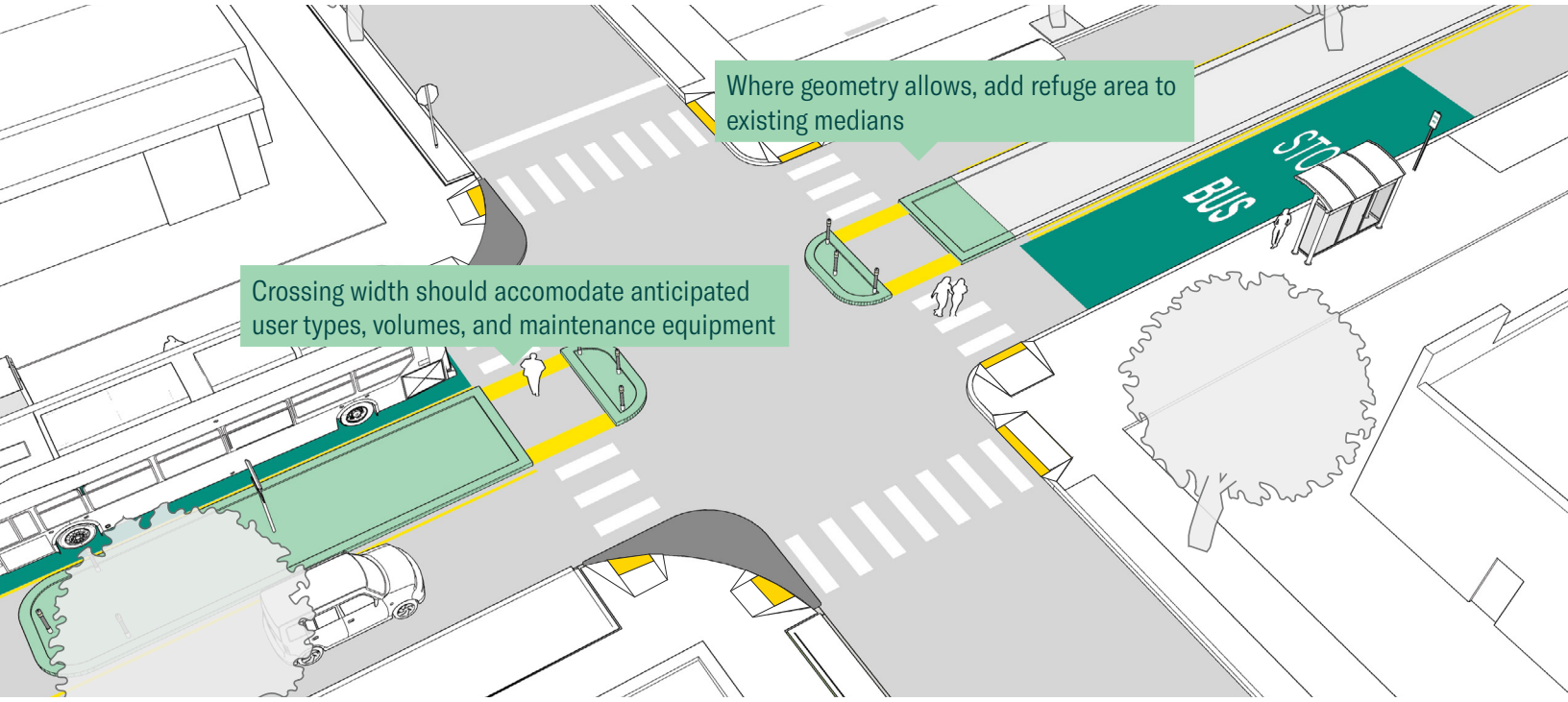
Additional Resources

- City of Detroit Street and Alley Standard Plans
- City of Detroit Standard Specifications
- MDOT Road Design Manual

Pedestrian Refuge Islands

Pedestrian refuge islands provide safer crossings for people walking by increasing pedestrian visibility, reducing pedestrian exposure time, and allowing for crossing one direction of travel at a time. They narrow the roadway and reduce motor vehicle speeds. They are also potential locations for utilities, trees, and stormwater elements.

Typical Refuge Island Layout



Requirements

- Install where excess roadway width exists, but not at the expense of minimum bike lane widths.
- Provide a minimum curb-curb width of 6'.
- Provide a minimum crossing opening of 8'.
- Use flush, accessible paths through the island to minimize the need for ramps.
- Install detectable warning strips at the entrance and exit of islands.
- Provide vertical separators, whether flexposts or concrete noses on both ends of the waiting area to protect pedestrians.
- Orient pedestrian signals to be visible to people using the island. Follow ADA standards and consult PROWAG guidelines for accessible pedestrian signals and pushbutton placement (see section on Accessible Pedestrian Signals in Chapter 5: Intersections).
- Ensure proper drainage.
- Follow MMUTCD standards for signage, signalization, and pavement markings.

Considerations

- Provide on streets where crossings are over 40' long or where more than one travel lane exists per direction. Also consider where people feel unsafe or unable to cross, or are slower at crossing.
- Where budgets are constrained, install paint/post curb extension as an interim measure until additional capital funds are available.
- Provide a curb-curb width of 8' to 10' to increase comfort, especially for people with strollers or bicycles.
- At dedicated bicycle crossings, increase crossing opening width beyond minimum.
- Install plantings and GSI where space allows. Ensure plantings do not interfere with sight distance or pedestrian visibiity.
- Convert existing landscaped medians to pedestrian refuge islands where feasible.

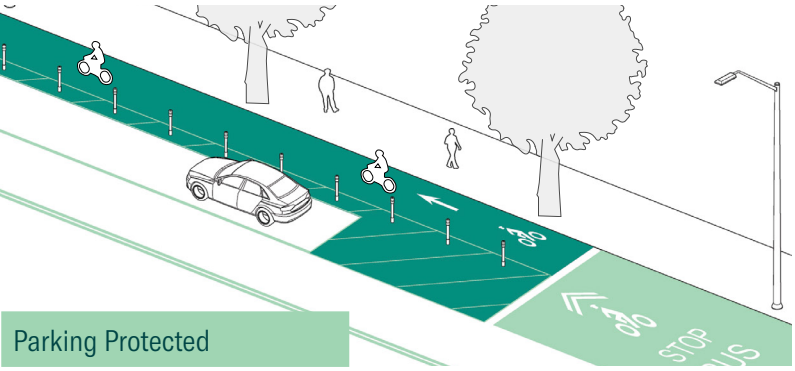
Additional Resources

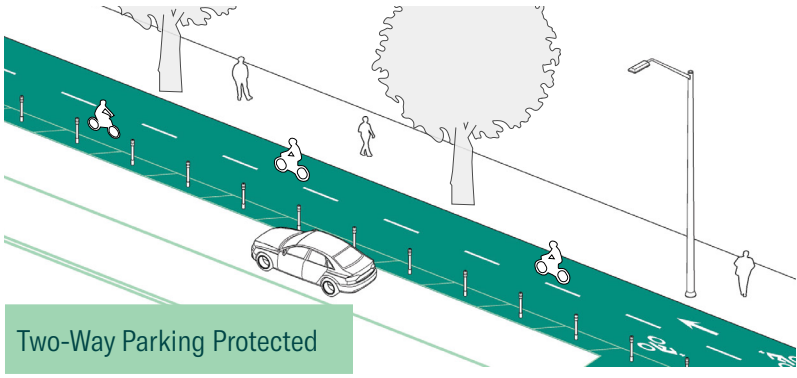
- FHWA Safe Transportation for Every Pedestrian

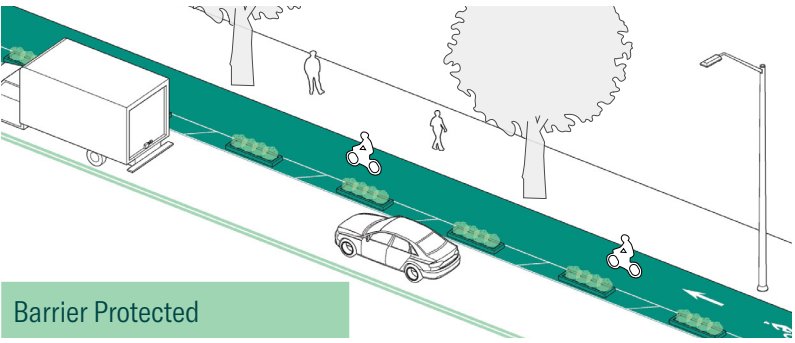
Separated Bike Lanes

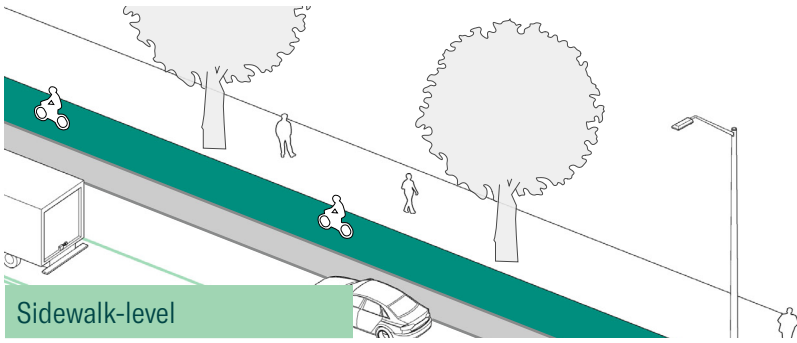
Bike lanes reduce stress for people on bikes by increasing safety and comfort. Bike lanes are located within the Curbside Zone, between the Travel Lanes and sidewalk, and may be sidewalk- or roadway-level. They are separated from motor vehicles by horizontal and vertical elements.

Separated Bike Lane Types







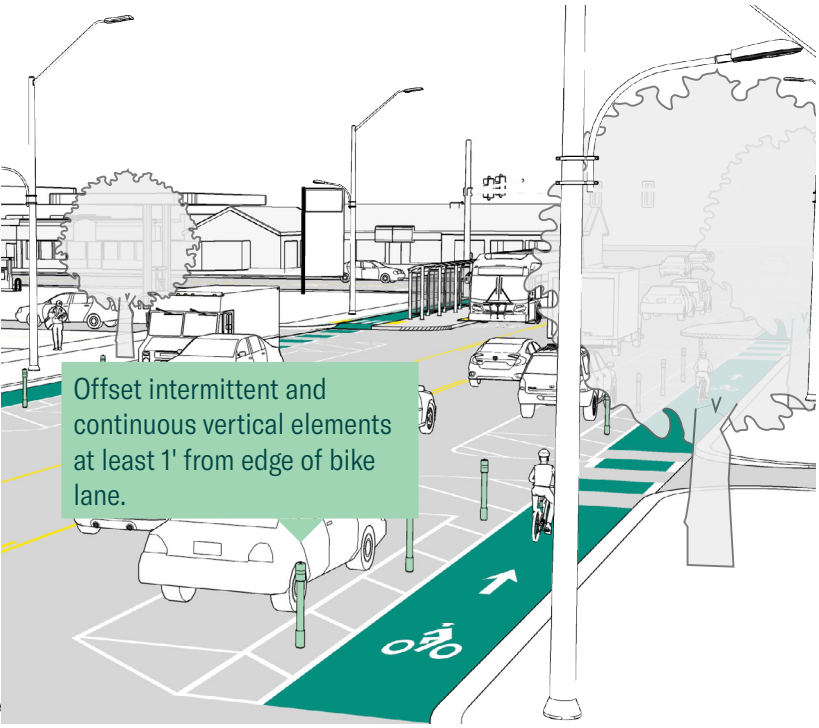


Requirements

- Use vertical separation to prevent vehicle encroachment. Material options include flex posts, bollards, parking stops, concrete barriers, planters, raised concrete curb, landscaped medians, or parking.
- Space flex posts 20' apart midblock, and space 5' apart upon approaches to intersections and high-use driveways.
- Where widths are constrained, minimize buffer width before bike lane width. Bike lane widths may be reduced for short distances around transit stops, accessible parking spaces, or access aisles (see following pages on One-Way and Two-Way bike lanes).
- At floating bus stops, provide yield and conflict markings and raise the bike lane to sidewalk level where pedestrians must cross to the stop. Provide a ramp slope of 1:24 minimum to 1:12 maximum.
- Bike lanes may be horizontally tapered using a ratio of 1:10 preferred to 1:5 maximum.
- Provide clearances to vertical elements, or shy spaces, located outside the bike lane. Offset bike lanes 1' from the face of intermittent objects (e.g. trees, flexposts, poles) and 1' to 2' from the face of continuous objects (e.g. fence or railing).
- Select solid vertical separation materials that prevent parking in bike lanes where there are high levels of illegal parking or standing.
- Use roadway-level bike lanes where a high volume of pedestrians and constrained sidewalks may encourage pedestrians to travel in bike lanes.
- For sidewalk-level bike lanes, follow ADA standards regarding access and materials, Buffer from the Pedestrian Zone.
- Ensure smooth riding surfaces and drainage inlets free of wheel catches or other hazards given that people on bikes are more vulnerable to broken or uneven pavement, drainage structures, and utility access covers.
- Where curbs or other continuous vertical separators are used, ensure proper drainage.

Separated Bike Lanes

Vertical Separation



Floating Transit Island with Bike Lanes

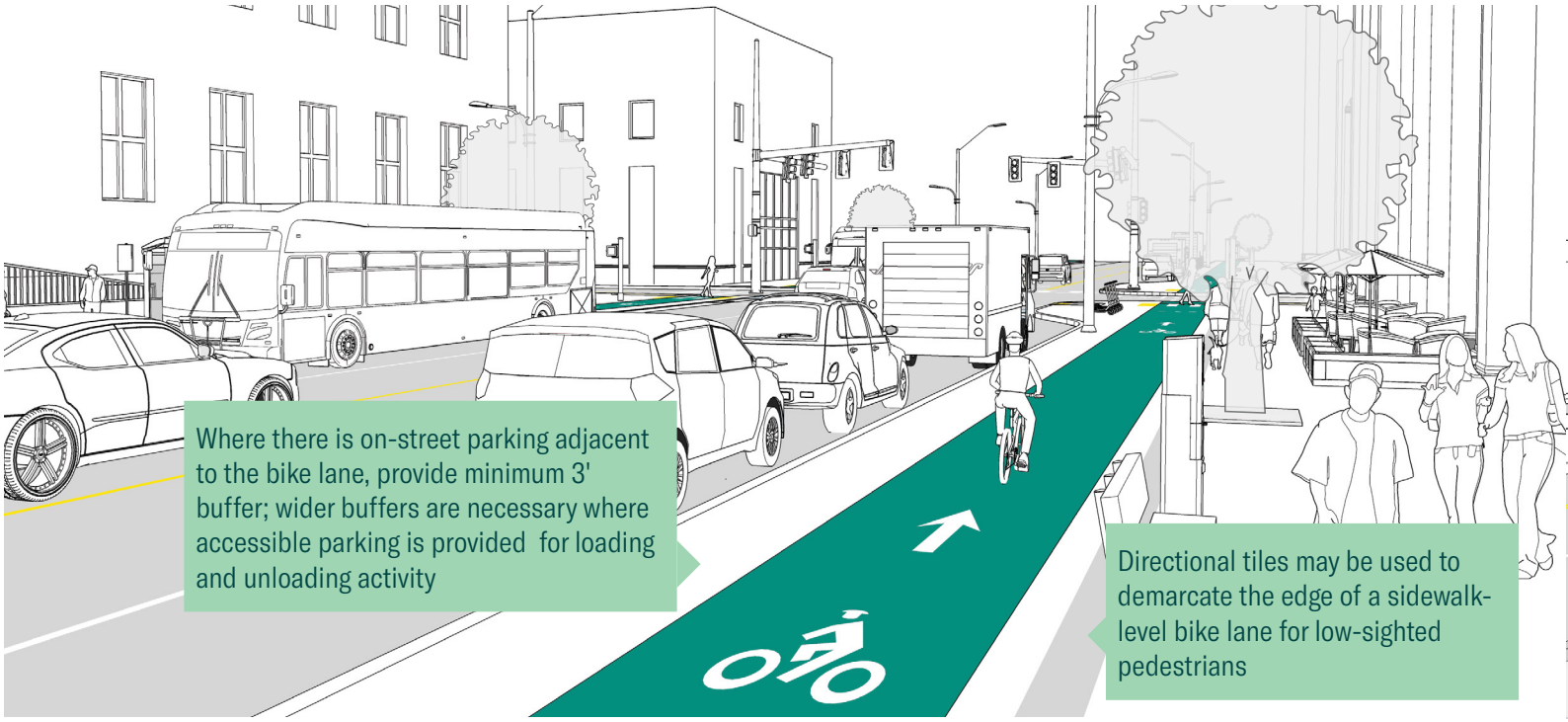
Considerations

- Appropriate for all street types, although Local streets may use shared lane markings instead of separated bike lanes where low vehicle and/or bike volumes exist.
- Provide a consistent facility design along corridors and when connecting new bike lanes to existing facilities to the maximum extent possible.
- On one-way streets, consider installing a one-way contraflow lane in the opposite direction of motor vehicle traffic or a two-way bike lane to reduce out-of-direction travel.
- Provide colored pavement and markings to increase awareness of bicycle facilities at the beginning of each block and at locations with regular pedestrian and vehicular conflicts (including crossings, commercial driveways, and alleys). Pay special attention to two-way facilities, where motorists may not expect bicyclists from both directions.
- Use bike lane symbols to indicate the best path of travel around a bus stop.
- On sidewalk-level bike lanes in areas with moderate pedestrian volumes, implement vertical separation such as planters between bike lanes and Pedestrian Zones.
- Where parking stops, curbs, planters, or other barriers are used, flexposts, object markers, or median signage may be added at the beginning of the facility.
- Where on-street parking is provided consider adding one accessible parking space sited near key destinations per block face designed in accordance with PROWAG Table R214.
- Monitor bike lanes regularly to ensure prompt removal of debris and build-up, especially around green stormwater infrastructure. Procure street maintenance equipment for lanes narrower than 8' (including the buffer).
- For winter precipitation events, treat lanes with ice control treatments to reduce slippery conditions. Maintain a clear width of 4' per direction.

Separated Bike Lanes: One-Way

One-way bike lanes move bike traffic in the direction of motorized travel on a street. One-way bike lanes are more consistent with driver expectation than two-way lanes and are often easier to integrate into existing roadway operations and facilitate simpler transitions to existing bike lanes.

One-Way Sidewalk-Level Separated Bike Lane



Requirements for One-Way Bike Lanes

- Preferred width is 6.5' to 7' to enable bicyclists to pass each other. Width up to 8' is preferred on Parkways (see preferred dimensions in Chapter 2: Typology).
- Provide a minimum lane width of 5'. Where constrained widths exist, 4' lanes may be installed for short distances to navigate around transit stops, accessible parking spaces, or other obstacles.
- For buffers with paint and flexposts, provide a buffer width of 1.5' to 3'. Do not exceed 3' so that vehicles are discouraged from parking in bike lanes. The preferred width for constructed buffer (e.g. concrete, pavers, planters) is 3' or greater.
- Provide a buffer width of at least 3' next to parking to prevent dooring. In constrained conditions, a 2' buffer may be used. Do not use parking protected lanes where buffer width would be less than 2'.

Considerations for One-Way Bike Lanes

- Bike lanes should be paired, with one lane in each direction along both sides of the roadway. One-way bike lanes may be installed on each side of the street or, atypically, along either side of a median where this arrangement serves desirable bike movements.
- Consider using one-way (versus two-way) lanes in areas of high driveway use where space allows. This helps reduce conflict with drivers, who often do not expect cyclists approaching from two directions.
- Provide a minimum lane width of 7' where more than 150 bicyclists are anticipated during the peak hour.

Separated Bike Lanes: Two-Way

Two-way bike lanes move bike traffic in both directions along a single side of the street. They have the advantage of requiring only one buffer versus one-way paired lanes with separate buffers. Two-way bike lanes also provide space for people on bikes to ride two-abreast and socialize.

Two-Way Curb Separated Bike Lane

Requirements for Two-Way Bike Lanes

- Lane width of 10' to 12' (collectively for both directions) is preferred. Provide a minimum lane width of 8' and a buffer width of 1.5' to 3' for paint and flexpost buffers. The preferred width for a constructed buffer (e.g. concrete, pavers, planters) is 3' or greater.
- Provide a buffer width of 3' adjacent to parking to prevent dooring. In constrained conditions, a 2' buffer may be used. Do not use parking protected lanes where buffer width would be less than 2'.
- Bike lanes may be installed on either side of the roadway or in a wide median. In deciding placement, consider parking configurations and turnover, presence of medians, continuity of the facility, and configuration and complexity of turning movements at intersections - particularly uncontrolled intersections.
- Use a dashed yellow centerline to separate bicycles traveling in opposing directions.

Considerations for Two-Way Bike Lanes

- Two-way bike lanes may be installed where there is not enough width for one-way protected bike lanes on both sides of the street.
- Two-way bike lanes are typically installed on streets with longer blocks, fewer intersections, and in lower driveway use areas, though they may be appropriate for any context with proper pavement markings, signage, and signaling measures at intersections.
- Provide a lane width of 10' to enable bicyclists to pass each other.
- Provide wider lane widths (12' to 14') where more than 150 bidirectional bicyclists are anticipated during the peak hour.

Additional Resources

- NACTO Urban Bikeway Design Guide
- FHWA Separated Bike Lane Planning and Design Guide

Traffic Calming

Traffic calming is a system of treatments or tools that aim to increase safety and perception of safety for all street users. Traffic calming tools primarily work by reducing vehicle speeds or volumes on a street or street network. Some traffic calming treatments can be used to contribute to a sense of place through planting, signage, or art.

Traffic calming tools use physical design to deter dangerous driving behaviors, decreasing the need for in-person enforcement. The measures make walking, biking, and taking transit safer, more comfortable, and more enjoyable. Traffic calming is appropriate for use on Local streets, low volume Collectors, and is particularly encouraged for use on streets in the Slow Streets network. Refer to the Streets for People Plan for more information on the Slow Streets network.

Requirements

- Set design speed the same as target speed and posted speed; designing higher than the posted speed limit encourages faster driving.
- Design for a speed of 15mph where there are frequent conflicts between vulnerable road users and motorists (e.g. school zones, shared streets) and 20-25mph where there are moderate conflicts, including streets with bike lanes. Place advisory speed signs where design speed is under 25 mph.
- Ensure traffic calming for everyone by designing for people walking, biking, in a wheelchair, pushing a stroller, or scootering.
- Apply treatments that maintain safe speeds throughout an entire street or network by installing a series or set of midblock or intersection treatments rather than disconnected stand-alone treatments.
- Engage the community surrounding the area to determine the traffic safety issues and solicit feedback on design measures.

Considerations

- Supplement physical measures with visual measures to raise awareness and help with navigation.
- Use treatments to complement or help beautify the street as determined through discussions with the community.
- Incorporate green stormwater infrastructure where feasible.
- Make network-level design decisions to avoid diverting traffic from one street to another.
- Consider design and maintenance needs and utilities when determining traffic calming tools for a project.
- Use tactical, or quick-build, installations to pilot or create low-cost changes. This may include the use of paint and tape to reimagine spaces, as well as cones and flex posts to delineate spaces.
- Use planters and art elements to improve aesthetics.

Toolkit

The next few pages contain traffic calming treatments that may be applied on Detroit streets. Generally, each project location needs to be evaluated for potential traffic calming by considering the following:

- Crashes, reports of speeding, and other traffic safety concerns
- Points of conflict between different transportation modes
- Pedestrian, bicycle, and vehicular traffic activity and destinations
- Community engagement
- Proportion of children and older adults living or traveling on the street
- Available space and competing priorities in street amenities
- Street geometry
- Street grade
- Drainage
- Cost feasibility

Physical Measures

The following are physical traffic calming measures that reduce vehicle speed and/or volumes and reduce cut-through traffic via reductions in roadway width, horizontal deflection (lateral shifts or changes to the roadway cross-section), and/or vertical deflection (vertical shifts or changes in pavement elevation). Some measures are more fully detailed in other chapters, as noted below.

Speed Cushion / Speed Hump

Raised roadway features to slow vehicles. Speed humps are a single feature, while cushions include multiple features with gaps between them to allow emergency vehicles to pass.

- Consider for use on Collector-Residential and Local streets and streets 25 mph or below.
- Locate mid-block and space 250' to 400' apart in a series with a sign at the start. Pref. spacing 150' from intersection (100' min.)
- Taper edge near curb to allow for drainage.
- Length varies; typically 3" to 4" in height.
- Space cushions or humps a maximum of 2.5' from the curb.
- Install two or more cushions at each location, spacing them a maximum of 3' apart.
- Cushion separation is more comfortable for people on bikes and can be spaced for clear bus passage.

Raised Crosswalk

Raised marked crosswalk at sidewalk level that slows drivers.

- Appropriate for streets with speed limit of 35 mph or less and on emergency vehicle routes
- Typical approach ramp width 10'. Typical crosswalk width 15', minimum 10' with 6" height. Consider bicyclist comfort and frequency of emergency vehicle or freight use when grading.
- Advanced warning signs are required. Signage and pavement markings should follow the MMUTCD.
- Consider drainage impacts in design.
- Width of flat area should span the full width of pedestrian and bike crossing markings.

Raised Intersection

Intersection raised to sidewalk level,with ramps on vehicular approaches.

- Appropriate on Collector and Local street types with high pedestrian use, with bike facilities, and on emergency vehicle routes.
- Locate at intersections, including stop-controlled, with a max speed limit of 35 mph.
- Typical approach ramp width 10'; typical raised intersection height 6".

Seattle, WA

Chicane / Lateral Shift

Alternating curb extensions / single shift in alignment of an otherwise straight street.

- Appropriate on streets with bike facilities.
- Most appropriate for streets with speed limit of 35 mph or less.
- Locate with street lights; do not co-locate with crosswalks.
- Shift street parking for a similar effect.

Curb Extension: Choker & Corner

Extension of sidewalk into the Curbside Zone to narrow the roadway. Called a corner extension at intersections or choker at midblock locations.

- Appropriate for all streets types, with bike lanes, and on bus or emergency vehicle routes.
- Used with parking or other Curbside Zone programming. Curb extension widths should be 1' less than width of Curbside Zone.
- See Curb Extensions in Chapter 5 for more information.

Vancouver, BC Richard Drudle

Median Barriers (for use on long-term projects)

Raised islands used at intersections on Arterials and Collectors to restrict a cut-through traffic on Local streets.

- Barriers may consist of landscaped islands, mountable features, bollards, or anything smaller than the width of a car but that allows pedestrians and bicyclists through.
- Can be designed to allow emergency access.
- Extend beyond intersection to discourage improper/illegal turn movements.

Boston, MA

Mini Traffic Circles (for use on long-term projects)

Used at unsignalized intersections on Collector and Local street types to slow to drivers.

- Permit one lane for each direction entering the intersection.
- Controlled by YIELD signs on all approaches.
- Appropriate where there is on-street parking and bike lanes. May not be appropriate on streets with bus routes due to larger turning radii.

Visual Measures

Visual measures do not physically change the roadway, but they are important for making people aware that they are entering Slow Streets, aid wayfinding, and they may have some impact on speed. Visual measures include:

- Signs
- Pavement markings
- Radar speed feedback signs
- Planting at intersections to serve as gateways
- Trees and parked cars to create visual/side friction on the street

Measures for People on Bikes

The aforementioned physical and visual traffic calming measures may be used to create slower streets for people on bikes. Additional measures may also be implemented to draw attention to bicyclists, particularly on streets that parallel major travel corridors and are designed to be part of the bike network. Bike Boulevards are designed to encourage low speeds and vehicle volumes and to prioritize bicycling alongside walking.

Portland, OR

Bike Boulevards

- Maximum vehicle volume on bike boulevards is 3,000 vpd; max speed should be 25 mph.
- Provide signs, often called wayfinding, confirmation, or identity signs, that identify the route or a destination to assure people that they are on their chosen route. These signs may be used alone or in conjunction with turn arrows or decision signs.
- Provide signs that help cyclists navigate complex turning movements and jogs in their route.
- Ensure that street name signs are visible to cyclists at intersections with larger streets.
- Place shared lane markings (sharrows) to direct bicyclists to the middle of the travel lane, the most visible position. Use dashed longitudinal lines and/or colored pavement with sharrows to bring more attention to them.
- Use symbols to overcome language barriers in signage. Consider symbols for transit centers, key destinations, and amenities.
- People biking usually move at a speed of 10+ mph and have limited time to spot and read signs. Wayfinding signs must be visible and clearly readable at a distance (consider size, color, contrast, retroflectivity, text and symbol layout).

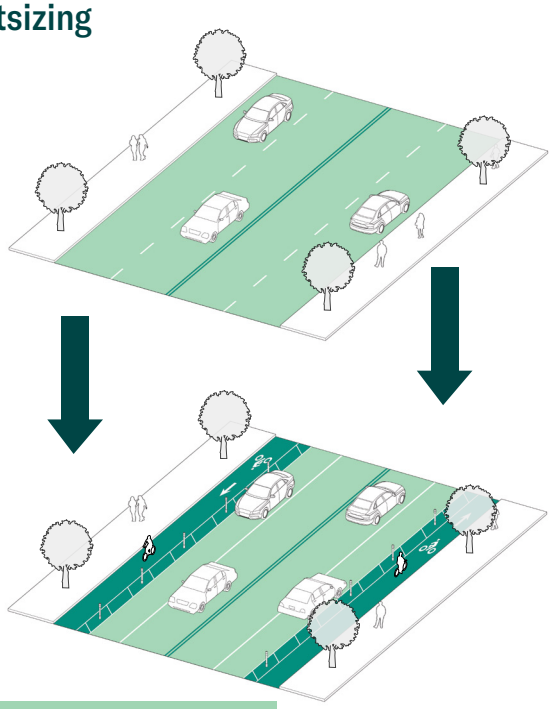
Additional Resources

- ITE Traffic Calming Measures
- FHWA Traffic Calming ePrimer
- Tactical Urbanist's Guide to Materials and Design

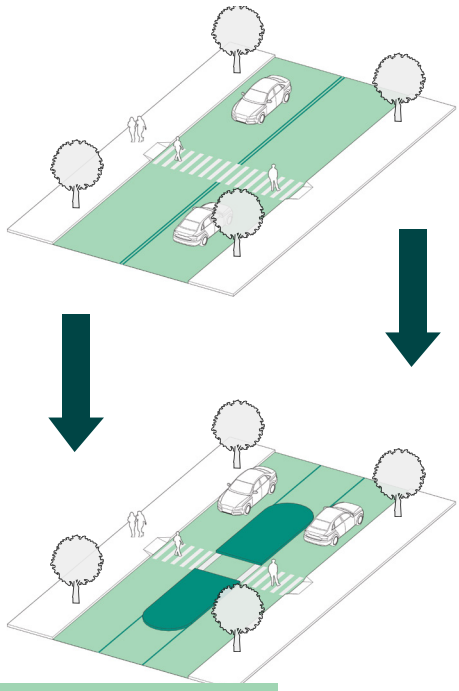
Travel Lanes

Travel lanes support the movement of people and goods by accommodating personal vehicles, buses, and freight trucks. While travel lanes are an important component of Detroit's streets, their width and quantity should balance safety, comfort, and multimodal use over driver convenience alone. Roadway rightsizing may be necessary and is guided in this section.

Rightsizing



4:2 Lane Reduction



Lane Narrowing

Requirements

Street Type	Min / Pref / Max Width
Arterial - Commercial	10' / 10' - 11' / 11'
Arterial - Residential	10' / 10' - 11' / 11'
Collector - Commercial	10' / 10' - 11' / 11'
Collector - Residential	10' / 10' - 11' / 11'
Local	10' / 10' - 11' / 11'
Industrial	10' / 11' - 12' / 11' - 12'
Parkway	10' / 11' / 11'
Downtown	10' / 10' - 11' / 11'

On streets with one travel lane in each direction and no center turn lane or median, 11' lanes shall be the minimum to accommodate passing buses.

On non-industrial street types, only consider 12' lanes if heavy vehicles (freight trucks and buses), make >8% of total vehicular volume.

Considerations

- The number and width of travel lanes should be determined according to multimodal priorities, available right-of-way space, land use context, user volumes, and roadway target speeds.
- Travel lanes may incorporate turn lanes where warranted to reduce speed differentials and crash frequency at signalized intersections. However, consider transit and bike user safety and convenience in balance with that of motorists. Do not displace bus stops further from the intersection or change bikeway design continuity unless necessary for safety.
- Prioritize access management in areas with frequent, closely spaced driveways. Two-way left turn lanes (TWLTLs) may be provided on roadways with operating speeds of 30mph or less and where driveway consolidation, medians with left turn pockets, or other methods of access control cannot be achieved. Provide pedestrian refuge islands along TWLTLs. See the Pedestrian Refuge Islands section on page 63.

Travel Lanes

Rightsizing

Per the FHWA, rightsizing increases street safety and may provide operational benefits. Street environments may also be enhanced for pedestrians and people on bikes. Rightsizing can be achieved through lane reduction and/or lane narrowing.

Lane Reduction

Conversions to narrower roadways by reducing lane quantity should be considered when one or more of the following criteria are met:

- Multiple lanes exist on each approach and pedestrians are affected by exposure to double threat scenarios at uncontrolled crossings
- Severe or frequent crashes are occurring
- Where high vehicle speeds are observed or perceived
- Where the street has a high density of uncontrolled driveways
- Where there is a high demand for bus lanes or bike lanes

Also consider rightsizing when there are gaps in the walking or bicycling network. Consider lane conversions according to existing vehicle volumes:

Vehicle Volume per Day	Candidate for Conversion
< 10,000	Good candidate for four-lane to two-lane. On corridors with high turning opportunities (e.g. commercial areas, gas stations, and medical complexes), use access management or a four-lane to three-lane conversion with two-way left turn lane as an interim treatment.
10,000 – 20,000	May be good candidate for four-lane to three-lane convesion. Where vehicle volumes are low and/or access management strategies can be implemented, a four-lane to two-lane conversion may be appropriate. Traffic analysis likely needed.
20,000+	May be good candidate for lane reduction, particularly if there are more than four travel lanes. Traffic analysis needed.

Projects using federal-aid funding identified as a Project of Division Interest (PODI) should also reference the MDOT Road Diet SOP.

Lane Narrowing

The majority of roadway vehicles includes passenger sedans and SUVs - vehicles of modest width whose drivers will ldrive faster when provided with wider lanes. Narrowing is appropriate on Arterial, Collector, Downtown, and Parkway street types under 45 mph.

Narrowing is also appropriate on City streets with transit and/or freight. Lane widths of 10'-11' fully support larger vehicles when roads are designed to limit speeds to 45 mph or less, as larger vehicles do not require as much space when operating at lower speeds. While it is not necessary to provide "extra" lane width for buses and freight vehicles, care should be taken:

- not to establish 10' wide travel lanes against 7' wide parking lanes.
- not to set 10' lanes abutting the curb edge without shy space or without a center turn lane on roadways with freight or buses.

As stated in the FHWA Achieving Multimodal Networks guide, "narrow lanes can contribute to lower speeds when integrated as part of an urban street design." Consult the dimensions criteria for each street type on the previous page and in Chapter 2: Typology to set lane widths and manage speeds.

Additional Resources

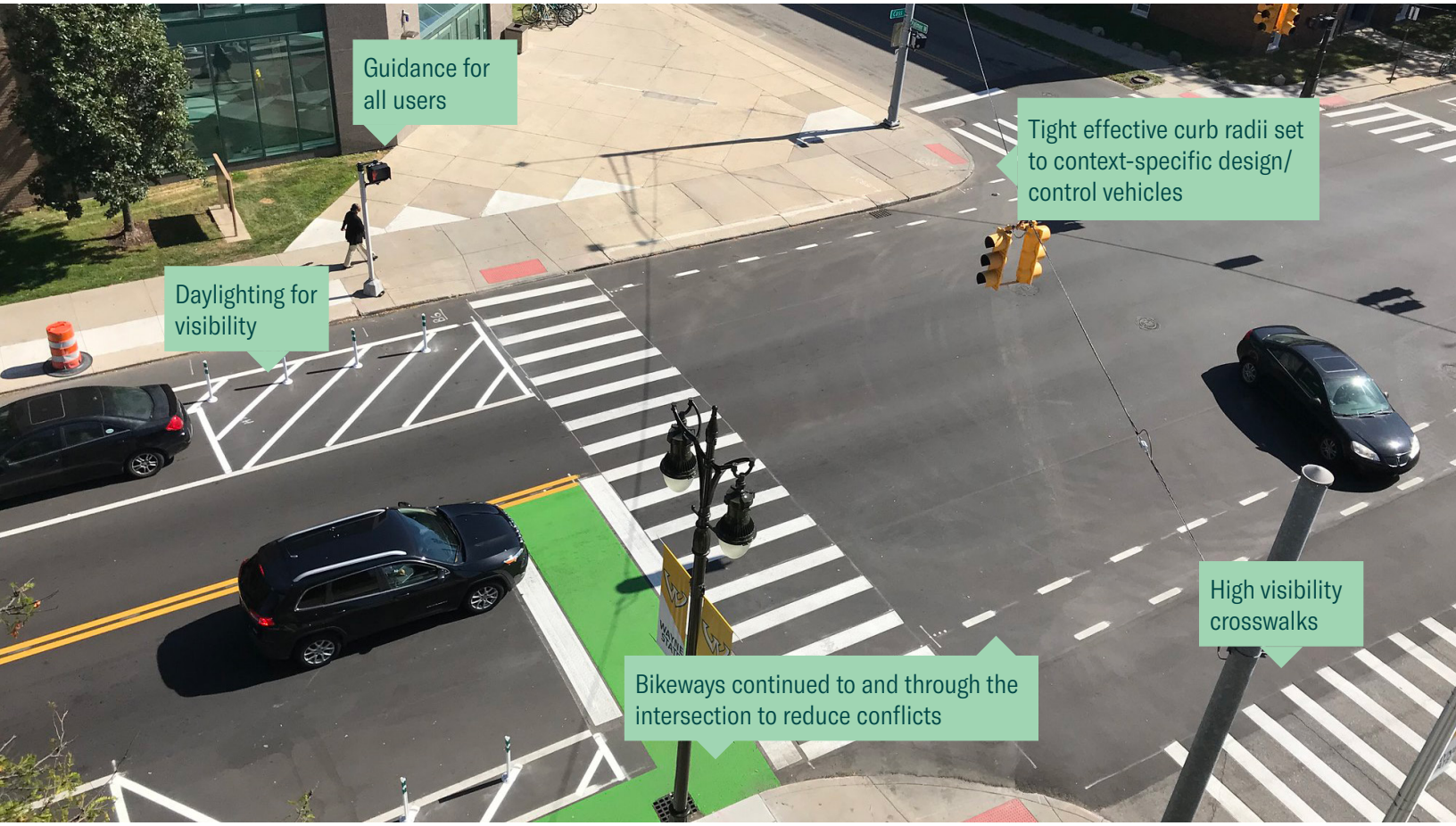
- FHWA Achieving Multimodal Networks Guide
- FHWA Road Diet Informational Guide
- MDOT PODI Road Diet SOP


WATCH FOR PEDESTRIANS WHILE TURNING
NO TURN ON RED
7 AM - 7 PM
MON. THRU FRI
ONE WAY
Warren
NO TURNS

5: INTERSECTIONS

5 INTERSECTIONS

Intersections are critical connection points between sidewalks, bike lanes, transit lanes, and travel lanes. Often, they are where all modes converge and where the most potential conflict occurs between pedestrians, bicyclists, and motorists. Safety and accessibility for all users are important priorities of intersection design.



Design Considerations

Multimodal Use

- Reallocate space for vehicular travel to other modes to balance the needs of pedestrians, bicyclists, transit riders, and motorists.
- Daylight intersections and midblock crossings to increase visibility of vulnerable road users. Use the excess space to provide curb extensions, protected bike intersections, and floating bus stops to create comfortable and inviting spaces for all.
- Minimize curb radii to support safe pedestrian and bicycle crossings. See following section on Design and Control Vehicle.

Predictable Travel

- Provide simple geometry with clear sightlines that makes intersections easy to navigate. Give careful thought to safety with skewed intersections and T-intersections. Modify skewed intersections to 90 degrees, where possible.
- Ensure that the expected path of travel is clear of built obstacles for all modal users.
- Facilitate predictable movements to encourage people to follow traffic laws.
- Provide clear regulatory and wayfinding instructions through signage, pavement markings, and signalization.

Conflict Reduction

Intersections should be designed to minimize conflict between users of different modes. Safe speeds should be maintained through design elements that reduce intersection size. Adequate sight distance must be provided between people walking, biking, and driving. Right-of-way priority should also be established through visual cues that communicate expected yielding behavior and transit operations. Removing slip lanes or channelized turn lanes may help reduce conflicts between vulnerable street users and people driving. Driveways are also locations where careful consideration should be given to reduce conflicts between different travel modes. Many of the design elements in this chapter detail methods for conflict reduction, including information on pedestrian and bike crossings, signage, and signal strategies.

Accessibility

It is necessary to meet the ADA Standards for Accessible Design in the design of intersections, particularly for curb ramps, high-visibility crosswalks, and pedestrian signals. However, consider meeting accessibility best practice guidance under PROWAG, where possible. Aditionally, consider weather and seasonal needs by ensuring that designs prevent accumulation of rainwater at ramps and allows space for snow storage outside of accessible paths of travel.

Design and Control Vehicles and Encroachment

Under a Safe System approach, streets are designed for the most vulnerable user rather than the largest vehicle (see Chapter 1). Thus, caution must be used when selecting the design and control vehicles around which the physical characteristics and operations of a street will be based. This particularly affects intersections and the curb radii selected, as smaller curb radii support safer pedestrian crossings. See Page 79 for more information on curb radii design.

Design Vehicle

The Design Vehicle is the least maneuverable frequent user of the street and should be determined on an intersection by intersection basis according to converging street types (e.g. arterial/arterial, collector/arterial). Designers should select the smallest appropriate design vehicle to support safer pedestrian crossings while still accommodating motor vehicle turns. The following are design vehicles to use as a starting point for responding to varying street design contexts:

- DL-23, the size of a delivery vehicle, for turns onto and from local streets
- SU-30 for turns onto or from all other types of streets, except Industrial streets
- WB-50 for turns onto or from Industrial streets

Special routes and known turning movements may warrant exceptions:

- WB-50, WB-62, WB-67 at select intersections where large trucks are expected to turn frequently
- BU-40 (A-BUS on Connect10 routes) where buses are expected to make frequent turns; do not use buses as a design vehicle where buses go straight through an intersection
- S-BUS-36 on school bus routes with turns

If alternate design vehicles are sought, document and justify the deviation with detailed turning analyses.

Control Vehicle

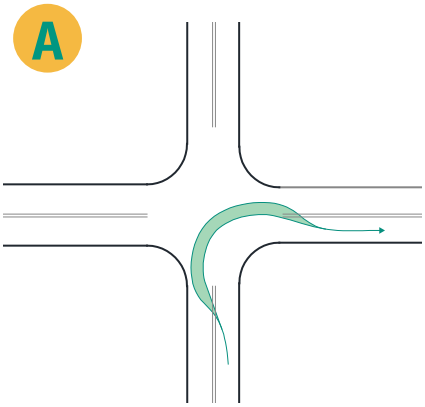
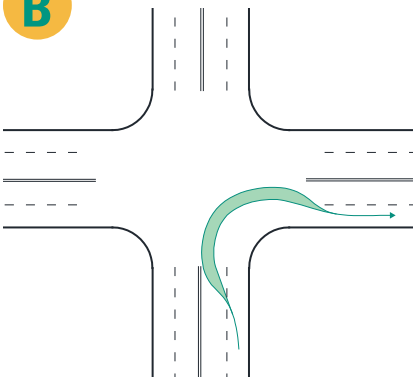
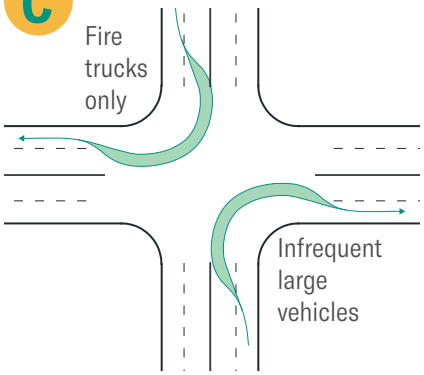
The control vehicle is a necessary but infrequent user of the street. While it may be necessary to accommodate the turning movements of control vehicles, intersections should not be designed entirely for their movement, as larger turning radii will lengthen pedestrian crossings and increase the turning speeds of most drivers.

For most streets and across all street types, the control vehicle for intersection design is a fire truck. At intersections where large freight vehicles are expected to make infrequent turns, the control vehicle may match the largest truck.

Encroachment

Encroachment is the use of roadway space outside of a designated travel lane to navigate a turning movement. Encroachment can occur on single lane and multilane roadways but does not include tracking over curbs, sidewalks, separated

Encroachment Policy

Design Vehicle		Control Vehicle
local/local	**to/from all other street types**	
A	B	C
		
Use of full intersection	Use of full width on approach and departure without crossing centerline Includes large trucks when they are the design vehicle	Accomodate turns with recessed stop bars and signal phasing at signalized intersections Fire trucks should be expected to use full intersection

bike facilities, or any areas where bicyclists are expected to queue. Allowing encroachment helps keep curb radii smaller.

First, consider whether network planning to route larger vehicles on particular streets is a better solution than accommodating control vehicles in all intersections. If a large control vehicle must be accommodated, the vehicle may be permitted to encroach according to the three scenarios shown in the graphic above and described below:

Scenario A (Design Vehicle)

The design vehicle may cross centerlines from local to local streets.

Scenario B (Design Vehicle)

The design vehicle may use the full width on approach and departure in the same direction without crossing centerlines. This applies:

- from arterial to arterial
- from arterial to collector or local
- from collector to arterial or local
- from local to arterial or collector

Scenario C (Control Vehicle)

The fire truck can be assumed to use full encroachment at all intersections, including across centerlines. Other large infrequent vehicles are permitted to cross centerlines at unsignalized intersections. At signalized intersections, safety must be ensured. Use engineering judgement to determine when to use No Right on Red restrictions, dashed centerlines, recessed stop bars on the receiving street, and/or mountable truck aprons.

Consider signal phasing when designing for scenarios B and C. For instance, ensure that the inner approach lane has the green at the same time to clear the way.

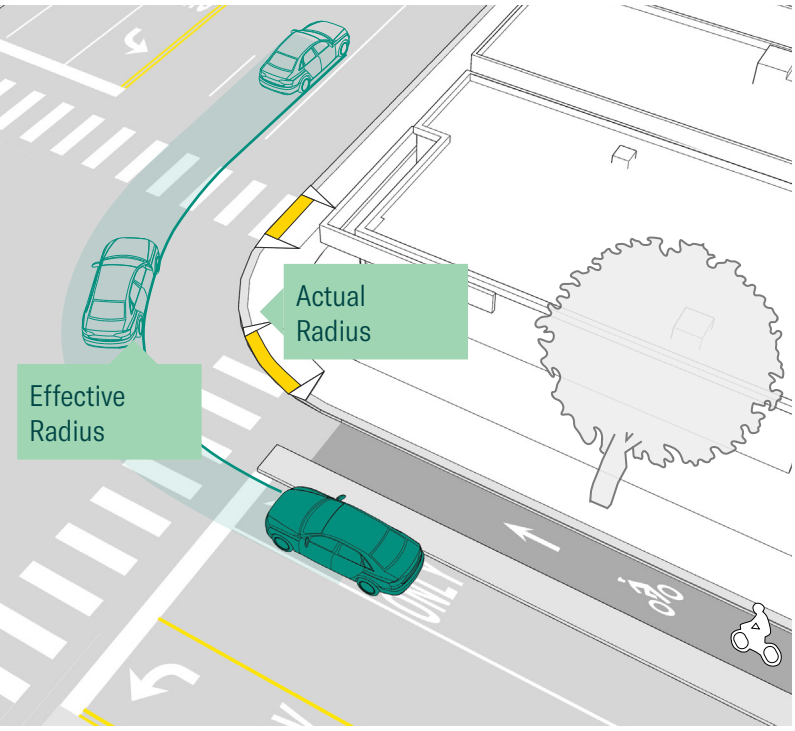
Additional Resources

- AASHTO Guide for the Development of Bicycle Facilities
- NACTO Urban Street Design Guide
- PROWAG

Corners / Curb Radii

Corner/curb radii affect speeds and the safety and comfort of vulnerable users. Tightening curb radii can help slow turning vehicles while reducing pedestrian crossing distances and providing more space for pedestrians waiting to cross. Cyclist positioning and visibility is also affected by corner radii.

Effective and Actual Radii

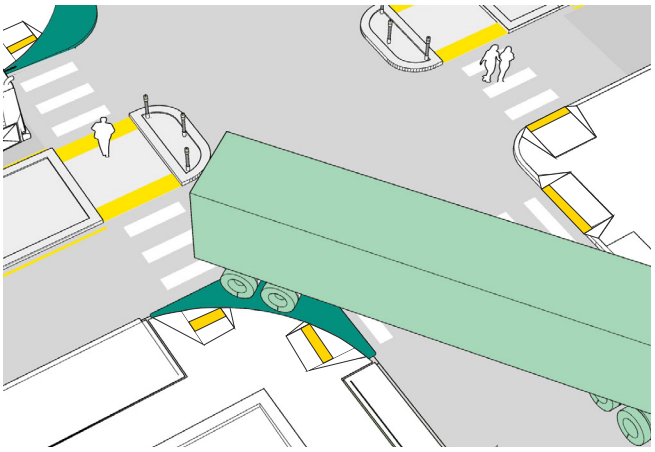


Actual radius involves the curve that the face of the curb line makes at the corner. **Effective radius** refers to the real curve created by motor vehicles in turning and is enlarged from the actual radius by the presence of on-street parking, bike lanes, and other features.

Requirements

- Design for the effective corner radius in addition to actual radius.
- Design the smallest actual curb radius to slow speeds, especially given the often larger effective radius. Actual curb radii on Local streets should be between 5' and 10'. Actual curb radii for all other streets should not exceed 15' except where there are larger design or control vehicles justifying a larger radii. Larger curb radii, between 15' to 35' may be used, as needed, in primary fire, transit, and freight routes intersections. See Considerations for potential design features to reduce turning speeds for other drivers.

Mountable Truck Aprons



- Follow requirements for actual curb radius on corners with curb extensions in the same way as on corners without curb extensions. While many retrofit projects will maintain existing curb lines due to drainage impacts, painted or constructed curb extensions should establish a smaller actual radius to ensure the effective radius is also small.
- Design with pedestrian volume, vehicle volume, street type, angle of intersection, presence of curb extensions, and number and width of receiving lanes in mind.

Considerations

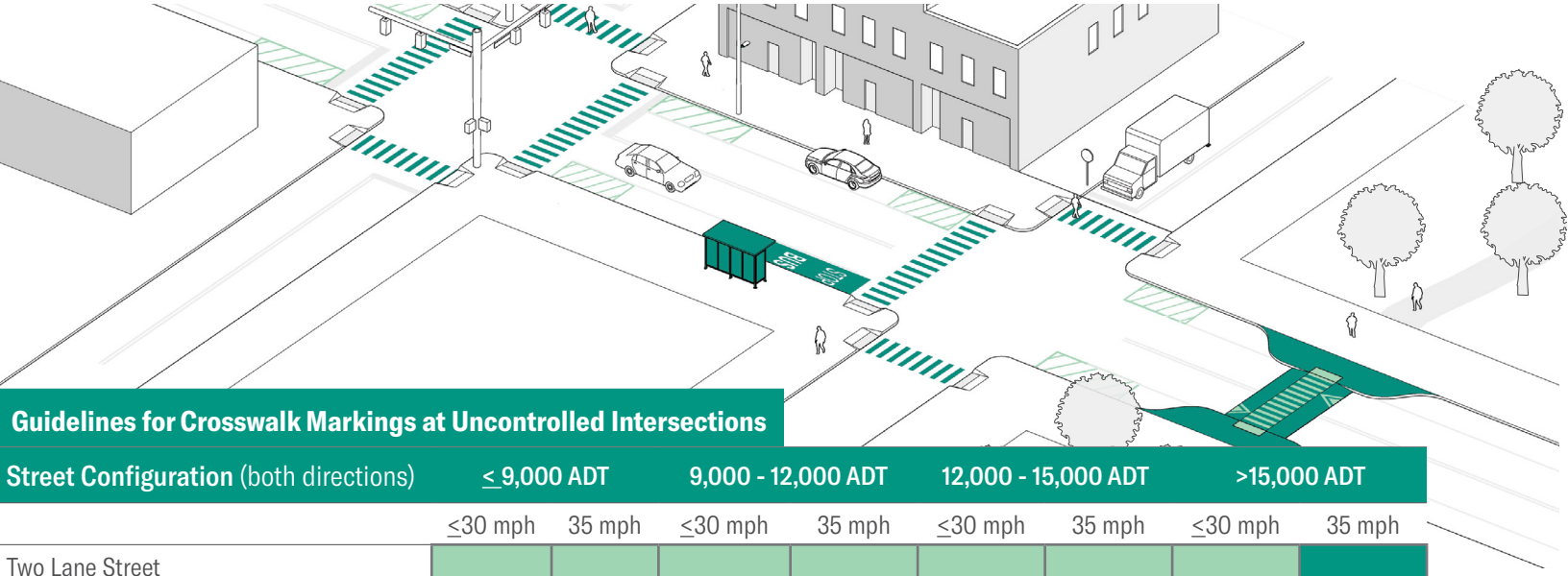
- Smaller curb radii may be achieved through treatments for encroachment. Consider recessing and using advanced stop bars on the receiving street, restricting right turns on red, marking a dashed centerline, and installing mountable curbs on corners (outside of curb ramps).
- Install truck aprons or turn wedges to discourage high-speed turns while permitting turns by larger motor vehicles.
- Using a network-level approach, restricting access, and prohibiting particular movements for freight travel make it easier to design pedestrian-friendly intersections where needed.

Additional Resources

- NACTO Urban Street Design Guide

Crosswalks

Per Michigan Vehicle Code, crosswalks are extensions of the sidewalk through intersections, with or without markings. Crosswalk design must prioritize the safety and comfort of pedestrians, minimizing pedestrians' exposure to vehicles while maximizing their visibility to drivers.



Guidelines for Crosswalk Markings at Uncontrolled Intersections

Street Configuration (both directions)	≤ 9,000 ADT		9,000 - 12,000 ADT		12,000 - 15,000 ADT		>15,000 ADT	
	≤30 mph	35 mph	≤30 mph	35 mph	≤30 mph	35 mph	≤30 mph	35 mph
Two Lane Street								
Three Lane Street								
Four + Lane Street with Raised Median								
Four + Lane Street, no Raised Median								

Candidate for marked crosswalk

Probable candidate for marked crosswalk

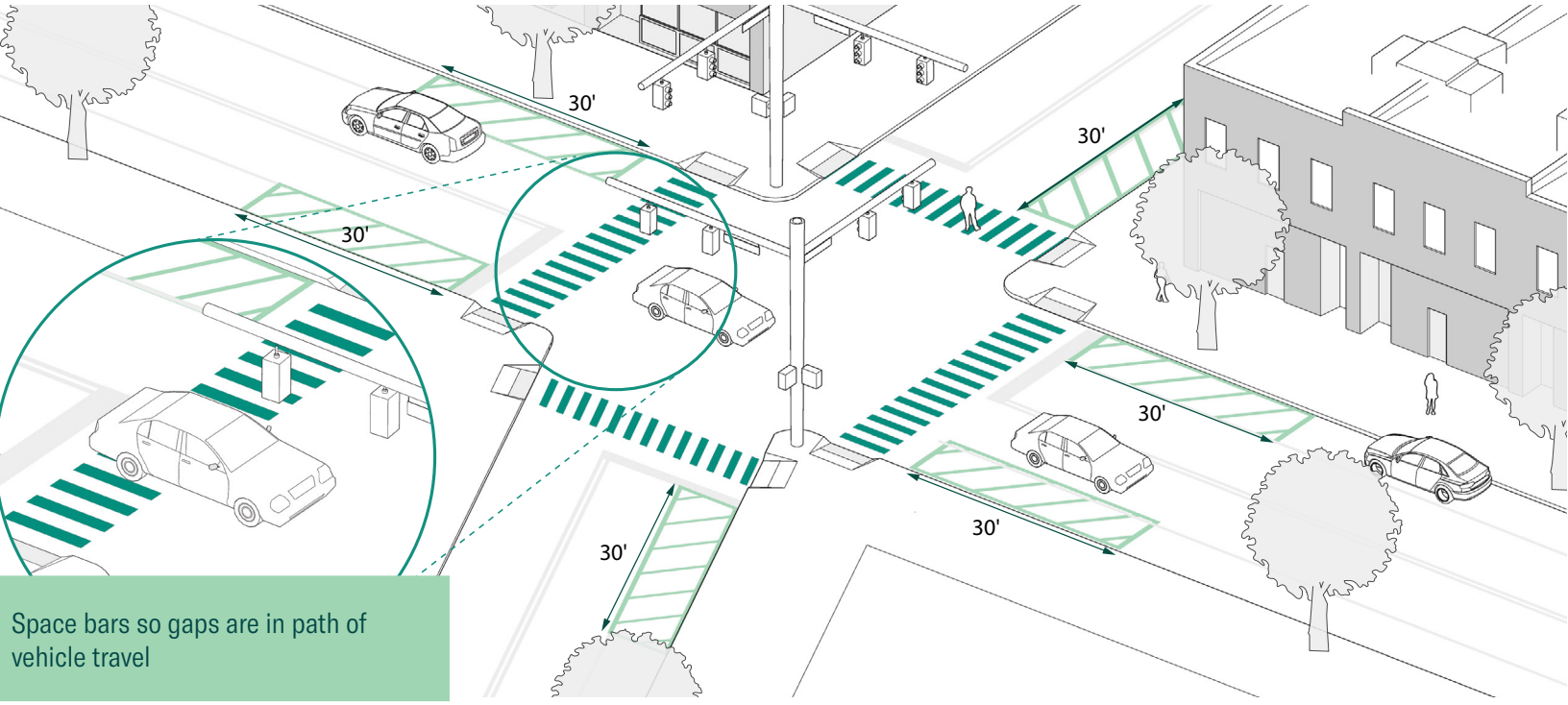
Markings alone insufficient

Requirements

- For all street types, mark crosswalks on all legs at signalized and high-demand unsignalized intersections and at mid-block crossings. Crosswalks should generally be marked across the minor leg of every unsignalized intersection through commercial areas, and crosswalks across the major leg should be marked where pedestrian crossing demand exists.
- Always mark crosswalks where demand exists at uncontrolled intersections (e.g. trail crossings, transit stops, parks, schools, senior centers, and places of worship). Pedestrians are sensitive to out-of-direction travel and may choose the most direct path even if there is no marked crosswalk.
- Intersections of two or more local streets need only be marked where high pedestrian crossing volumes exist or where crosswalks may be less visible to drivers.
- Use high-visibility (also called: continental, zebra, longitudinal) markings according to the pattern shown above. Orient longitudinal bars parallel to the path of vehicular travel. Do not use transverse lines except in select cases that incorporate art.
- Install at a minimum width of 10' (e.g. from end-to-end of longitudinal bars).
- At unsignalized intersections, restrict motor vehicle parking at least 20' from the crosswalk. At signalized intersections, restrict parking at least 30' from the crosswalk. At intersections that are stop-controlled or include a flashing beacon, restrict parking at least 30' from the sign or beacon.
- Install yield markings on any separated bike lane approaches to a crosswalk.
- Mark crosswalks with non-skid and retroreflective thermoplastic or cold plastic pavement markings. Recess markings so they are flush with the roadway.
- Artistic crosswalks must incorporate white transverse lines at minimum. Integrated high-visibility striping is preferred.

Crosswalks

Crosswalk Layout and Daylighting - Signalized Intersection



Space bars so gaps are in path of vehicle travel

Considerations

- As pedestrians will cross wherever they have a destination to reach, marking a crosswalk does not decrease safety. However, marked crosswalks alone may be insufficient to address pedestrian safety. Consider whether additional treatments should be used to increase visibility, provide advance warning, and reduce driver speeds based on pedestrian and vehicle volumes, roadway speeds, and lane count. Also consider crossing distances, crash history, distance from other crosswalks, geometry and sight distance, and availability of street lighting.
- Use perpendicular crosswalks and eliminate skew where possible to minimize crossing distances and clarify direction.
- Diagonal crossings may be used at signals with exclusive pedestrian phases.
- Front-light crosswalks with the light source placed in advance of the crosswalk in the direction of motor vehicle travel.
- Crosswalk width may vary up to 25' wide where high pedestrian volumes exist, but should not extend past the sidewalk edge.
- For information on raised crosswalks, see Traffic Calming under Chapter 4: Roadways.

Mid-block Crosswalks

- Locate midblock crosswalks where intersection spacing is excessive and natural desire lines exist for the pedestrian's path of travel (min 300' from signalized crossing or marked unsignalized crossing) or where:
  - Distance from nearest adjacent signalized intersection exceeds 600'
  - A greenway intersects a street midblock.
  - Major transit stops are located midblock.
  - Existing or proposed pedestrian generators demonstrate a need (e.g. parking lot and office building on opposite sides of the roadway)
- Enhance with street lighting and safety treatments such as raised crosswalks, refuge islands, curb extensions, RRFBs, and PHBs.

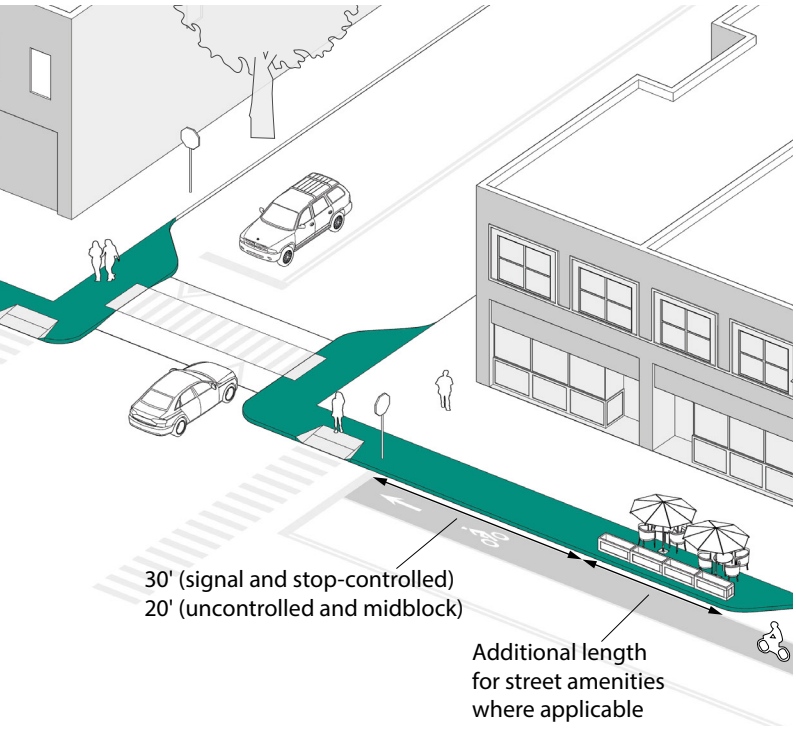
Additional Resources

- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- MUTCD / MMUTCD
- Michigan Vehicle Code

Curb Extensions

Curb extensions are extensions of the sidewalk at corners or mid-block locations. They calm traffic and increase safety by increasing pedestrian visibility and shortening crossing distances. They also provide extra space for pedestrians waiting to cross, amenities, and green stormwater infrastructure.

Curb Extension Layout



Curb Extension with Planter and Seating

Requirements

- Shadow curb extension with bike corrals, parklets, loading zones, vehicle parking, or other Curb Access Zone activities.
- Restrict parking at intersections per the Michigan Vehicle Code.
- Provide a curb extension with a tangent length at least the width of the crosswalk and 1' less than the width of the Curbside Zone.
- Do not reduce bike lanes or travel lanes to an unsafe width when installing.
- Ensure proper drainage if moving curb line.

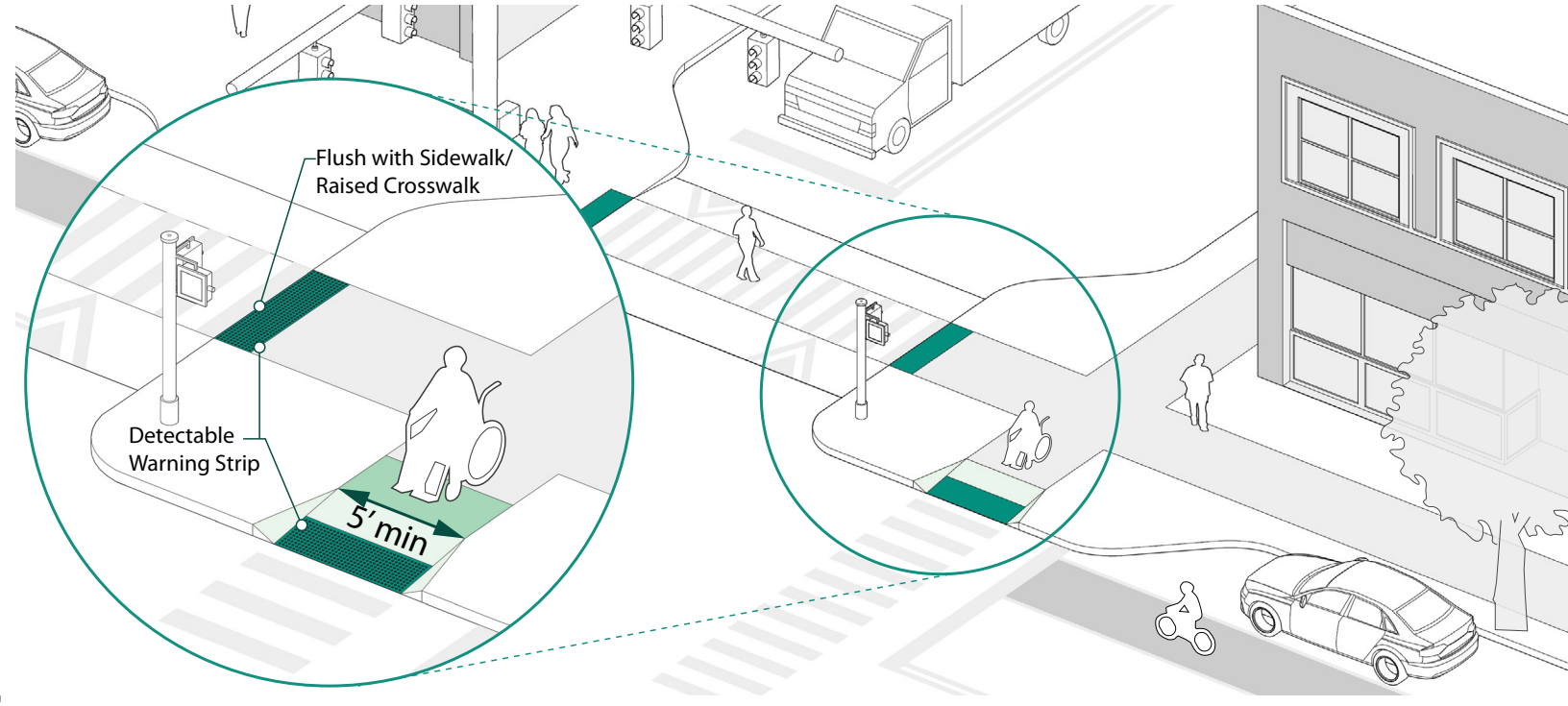
Considerations

- Appropriate for all street types.
- Where budgets are constrained, install paint/post curb extension as an interim measure until additional capital funds are available.
- Where the width of the curb extension would make turns for large vehicles infeasible, reduce the width of the curb extension rather than not installing. Evaluate effective corner radius, and keep corner radius as small as possible.
- At misaligned or offset intersections, install extensions at corners that mitigate, rather than worsen, the misalignment.
- Install where there are high volumes of pedestrians, near schools, at uncontrolled or midblock crosswalks, or where there are known pedestrian safety issues.
- Install GSI, planters, bicycle parking, and/or other street amenities. Ensure that they do not interfere with pedestrian flow, emergency access, or visibility of pedestrians.
- Length may vary depending on use and included amenities.
- Installation may require relocation of storm drainage inlets and above ground utilities.
- Installation may impact underground utilities, delivery access, garbage removal, snow removal, and street maintenance.
- In constrained locations, a curb extension may help meet the accessibility requirements of curb ramps.

Curb Ramps

Curb ramps provide a smooth transition for pedestrians from the sidewalk to the street. They provide access across intersections and at mid-block locations. They provide essential transitions for people with mobility and vision disabilities and make it easier for people with strollers, grocery carts, and suitcases.

Curb Ramp Layout



Requirements

- At corners, align with perpendicular crosswalks, providing two directional curb ramps instead of a diagonal curb ramp.
- Provide a ramp at least 4' wide.
- Use a ramp slope no greater than 8.3%.
- Install a 2' detectable warning strip across the full width of the ramp at the bottom of the ramp and immediately behind the curb. Use City standard brick red color.
- Provide a clear level landing zone that is 5' by 5' at the sidewalk level behind the ramp and with no greater than 2% slope in any direction (a 4' by 4' landing is acceptable in constrained locations).
- Design curb ramps following ADA standards at minimum. Use PROWAG where possible.
- In the winter, clear snow from curb ramps to provide an accessible route.

Considerations

- Curb ramps are unnecessary at raised crosswalks and intersections. However, detectable warning strips are still required.
- Lengthen ramp and reduce slope beyond required standards where possible.
- Widen ramp to accommodate multiple user types when connecting to a shared use path or sidewalk level bikeway.
- Design to avoid the accumulation of water or debris.
- Provide a ramp that is the width of the pedestrian zone on the approaching sidewalk.
- In constrained locations, a curb extension may help meet accessibility requirements.

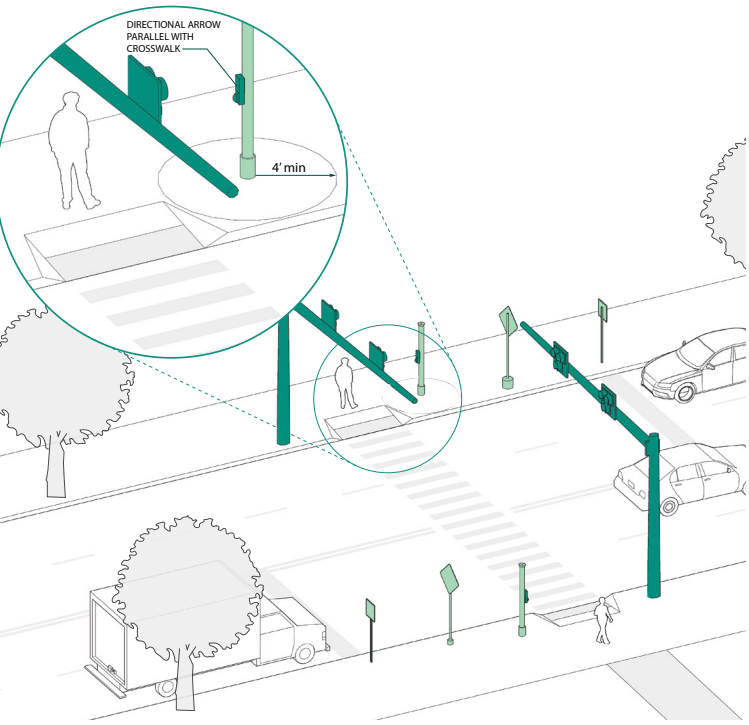
Additional Resources

- City of Detroit ADA Ramp Details
- PROWAG

Pedestrian Hybrid Beacons

Pedestrian hybrid beacons (PHBs), also known as high-intensity activated crosswalk beacons (HAWKs) allow pedestrians and bicyclists to stop traffic in order to safely cross high-volume or multilane roadways. They are proven to significantly reduce pedestrian crashes.

Pedestrian Hybrid Beacon Placement



Drivers	
Indication	Action
	Proceed with caution
	Slow down
	Prepare to stop
	STOP, pedestrian in crosswalk
	STOP, proceed with caution
	Proceed if cross-walk is clear

Pedestrians	
Indication	Action
	Push button to activate beacon
	Don't cross
	Don't cross
	Start crossing, watch for drivers
10	Finish crossing
	Push button to activate beacon

Requirements

- Follow MMUTCD guidance on permitted locations and installation requirements.
- Locate pedestrian pushbutton according to PROWAG guidelines for accessibility.
- Install two PHBs for each approach of a street.
- Install stop lines, marked crosswalks, and warning signage at locations with PHB signal heads. Use advance stop lines to reduce the potential for multiple-threat crashes.
- Calculate pedestrian clearance time with the same method as pedestrian signals, using the crossing distance and a pedestrian walking speed of 3.5 feet per second. Include a buffer of at least 3 seconds.

Additional Resources

- MUTCD 2009 Edition Chapter 4F. Pedestrian Hybrid Beacons
- FHWA Pedestrian Hybrid Beacon Guide

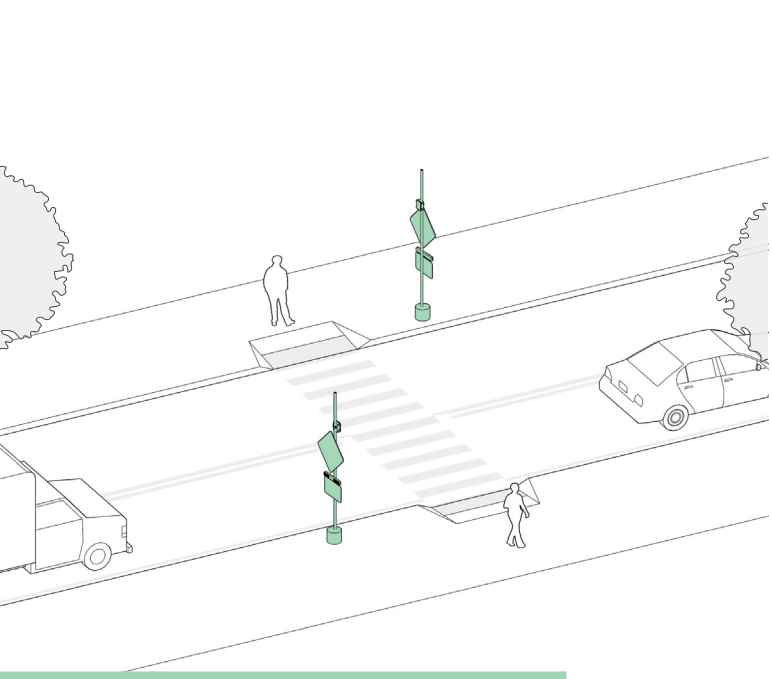
Considerations

- Consider for locations where traditional crosswalk signage and markings do not result in adequate motorist yield rates and where a full traffic signal is not warranted, including midblock crossings and major midblock transit stops.
- Consider for all arterial crossings in the bicycle network and for greenways if other engineering measures are found inadequate to create safe crossings. Device is intended for pedestrians, but may be used for bicyclists. The provision of bicycle signal heads requires permission from FHWA.
- Pushbutton actuators should respond immediately when pressed to reduce the potential for pedestrian non-compliance.
- Passive signal activation (e.g. video or infrared detection) may be installed in place of manual pushbuttons.
- Restrict parking 100' from an intersection in all directions to allow adequate sight distance.

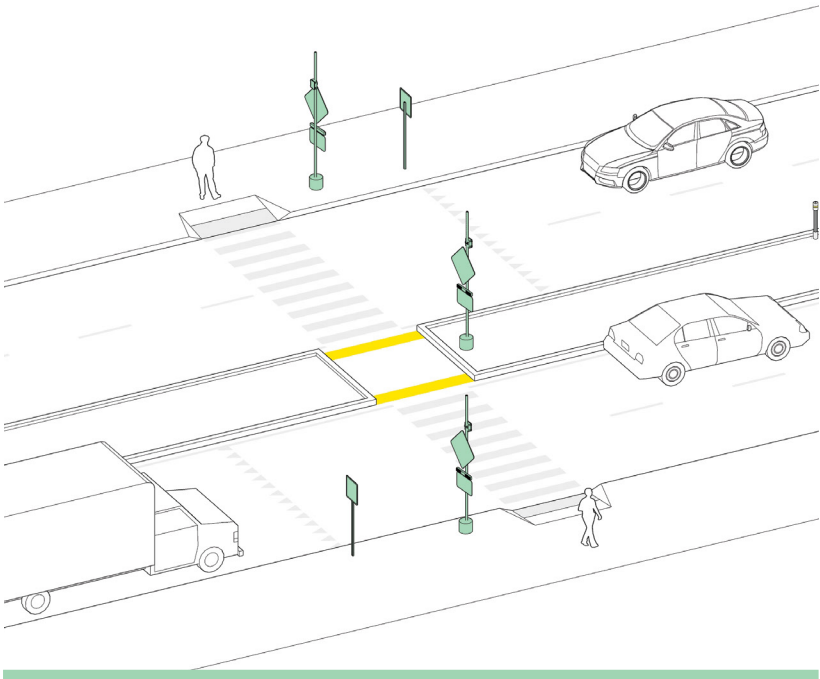
Rectangular Rapid Flashing Beacons

Rectangular rapid flashing beacons (RRFBs) increase safety for crossing pedestrians at locations where vehicle speeds and poor pedestrian visibility make it less likely for drivers to yield. RRFBs have been proven to be successful in improving motorist yielding compliance.

Rectangular Rapid Flashing Beacon Placement



Single travel lane - curbside installation



Multiple travel lanes - place additional RRFB on available median

Requirements

- Follow FHWA guidance on permitted locations and installation requirements.
- Use in locations where a signal or PHB is not warranted. Do not use at intersections with signals or stop signs. However, RRFBs may be used as close as 100 feet from signals at high pedestrian volume crossings.
- Install on both sides of the roadway at opposite ends of the crosswalk. Beacons should typically be placed on the vehicular approach side of the crosswalk. Install an additional beacon on a pedestrian refuge island or median where one exists.
- Use in conjunction with a marked crosswalk and advance yield lines and signage.
- If pedestrian pushbuttons, rather than passive detection, are used to actuate the RRFB, mount an instruction sign with the legend "PUSH BUTTON TO TURN ON WARNING LIGHTS" adjacent to or integral with each pushbutton.
- Use audible messages telling pedestrians to wait to cross until cars have stopped.

Considerations

- Can be installed with solar-power panels to eliminate need for power source.
- Typically implemented at high-volume pedestrian crossings, but may be considered for priority bicycle route crossings or midblock locations with bicycle facilities.
- Install at uncontrolled intersections and midblock crossings, and two-lane or multilane roadways.
- Passive signal activation (e.g., video or infrared detection) may be installed in place of manual pushbuttons.
- In locations with sight distance constraints that limit the motorists' ability to see pedestrians on the approach to the crosswalk, install RRFBs in advance of RRFBs at the crosswalk.

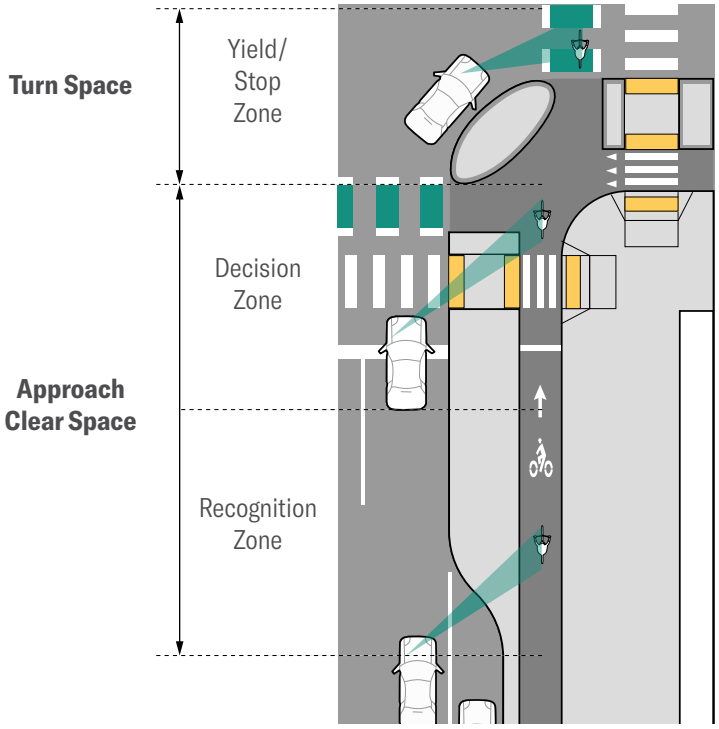
Additional Resources

- FHWA Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)

Separated Bike Lanes

Intersections designed for bike lanes reduce conflict between bicyclists and motor vehicles by increasing visibility and clearly denoting who has the right-of-way to proceed. Intersection treatments can also improve safe queuing and merging maneuvers for bicyclists.

Separated Bike Lane Intersection Zones



Motor Vehicles Per Hour Turning Across Separated Bike Lane (Threshold for Bicycle Signal Phase)				
	Two-Way Street			One-Way Street
	Right Turn	Left Turn Across One Lane	Left Turn Across Two Lanes	Right or Left Turn
One-Way Separated Bike Lane	150	100	50	150
Two-Way Separated Bike Lane or Shared Use Path	100	50	0	100

Requirements

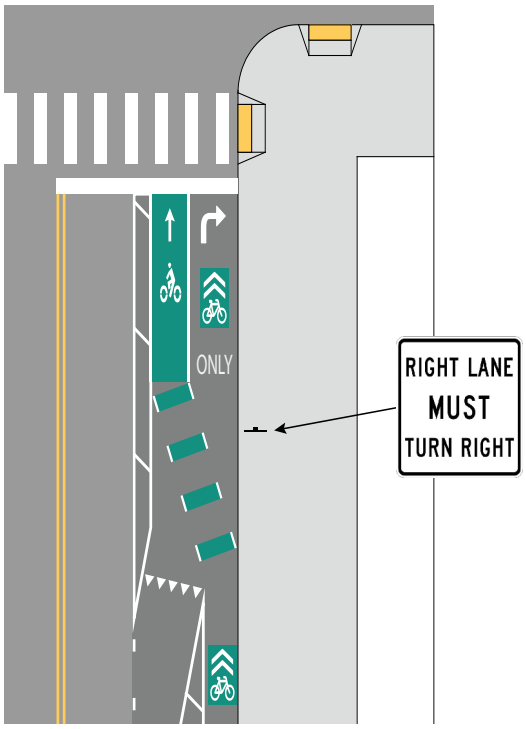
- Continue separated bike lanes up to the intersection to minimize exposure for bicyclists. Where that is not possible, provide bike lanes or mixing zones (see graphic) with bikeway conflict markings, shared lane markings (for mixing zones), and signage.
- Maintain continuity of bicycle facility type through intersections where possible.
- Mark bike crossings at intersections and driveways according to City pavement marking standards. Apply a green-backed bike symbol at high use driveways.
- Ensure that new actuated signals automatically detect bicycles as well as motor vehicles. If needed, install bike detection devices within bike lanes or bike boxes, and marked with a detector symbol and signage.
- Restrict parking spaces back from intersections to increase visibility of people biking and driving. Provide approach clear space based off these vehicular turning design speeds:

Turning Design Speed	Approach Clear Space
10 mph	40 ft
15 mph	50 ft
20 mph	60 ft

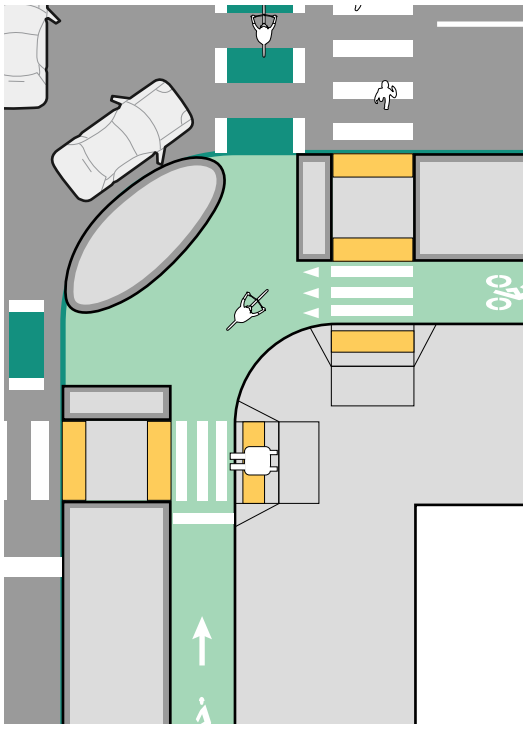
- Provide bicycle signals and dedicated phasing at intersections where unique or high volume bike movements occur, or where there are high volumes of conflicting movements. See the table above for when to add bike phases based on vehicular turning thresholds. Position signals to maximize visibility to bicyclists. Coordinate signal timing with concurrent movements to minimize delay and extend green intervals to allow more bicyclists through.

Separated Bike Lanes

Intersection Approaches andMixing Zones



Protected Intersection



Requirements (continued)

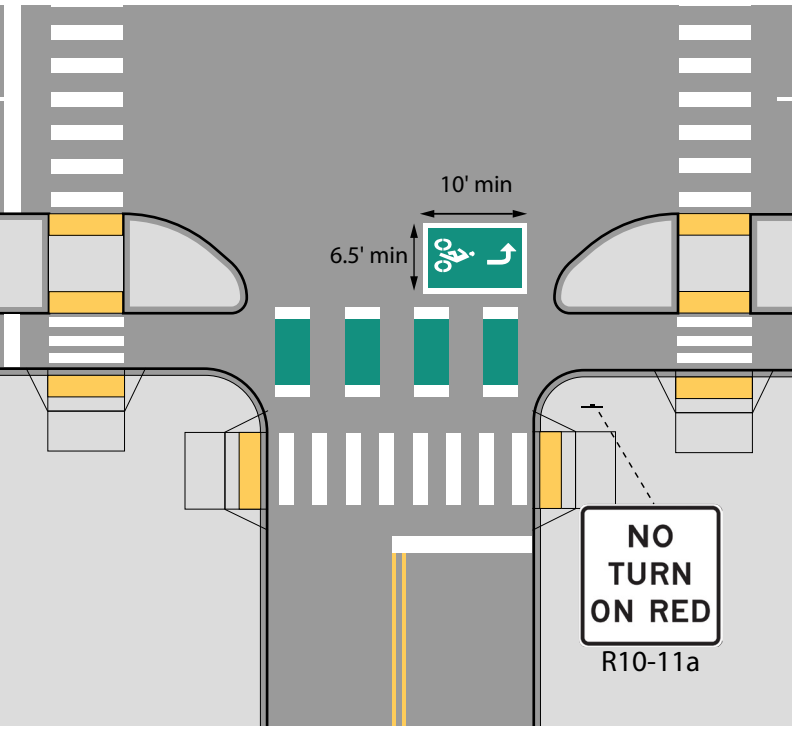
- At signalized and stop-controlled intersections, provide a stop bar on intersection approaches. At other pedestrian crossings, provide yield markings on crossing approaches.
- Provide detectable warning strips for pedestrians at crossings and locations where conflicts between bicyclists and pedestrians are expected.
- Provide a pedestrian island as a space for pedestrians to wait to cross the street after crossing the bike lane.
- Locate stop bars on side streets at least 20' away from bike lanes.
- Restrict parking 20' from active commercial or multi-family residential driveways and alleyways to maintain visibility between turning vehicles and people on bikes.
- Where curbs or other continuous vertical separating are used, ensure proper drainage.

Considerations

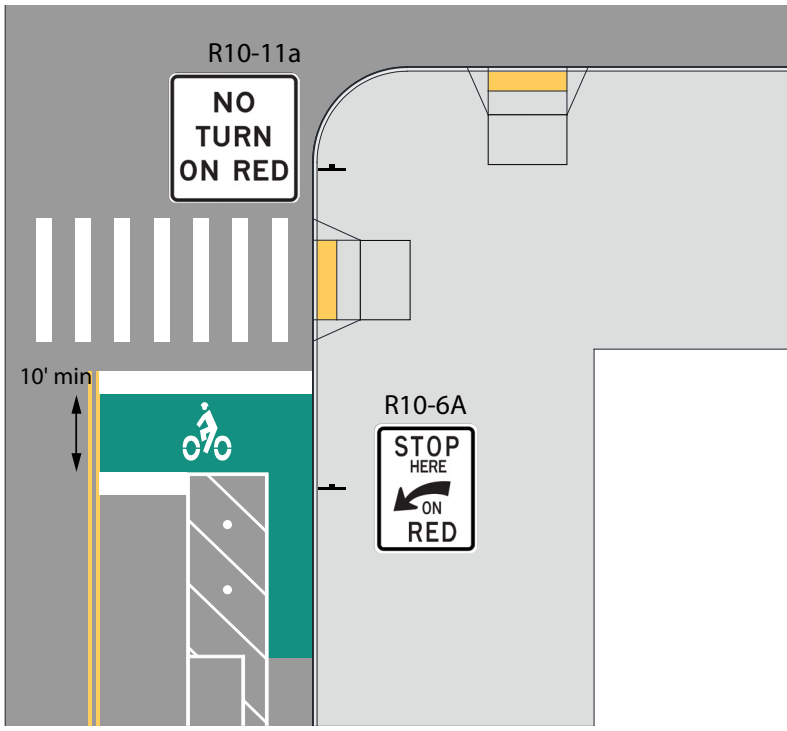
- Provide a protected intersection using raised concrete corner islands or temporary materials such as flexposts (see graphic). Refer to Additional Resources.
- Where protected turns cannot be installed, install two-stage bicycle turn boxes at signalized intersections to provide space outside the path of traffic for bicyclists to wait to turn in a different direction. Boxes should be a minimum of 10' wide and 6.5' deep with a bicycle symbol and arrow.
- For transitions between one-way and two-way bike lanes, provide clear directions for the transition and route to follow. Consider the use of bicycle signals for bicyclists moving from a two-way to one-way facility. Consider the use of a two-stage bicycle turn box for bicyclists moving from a one-way to two-way facility.
- For contraflow facilities (one-way and two-way), give careful consideration to traffic control and conflicts with motorists.

Separated Bike Lanes: One-Way & Two-Way

Two-stage Bicycle Turn Box



Bicycle Box



Considerations for One-Way Bike Lanes

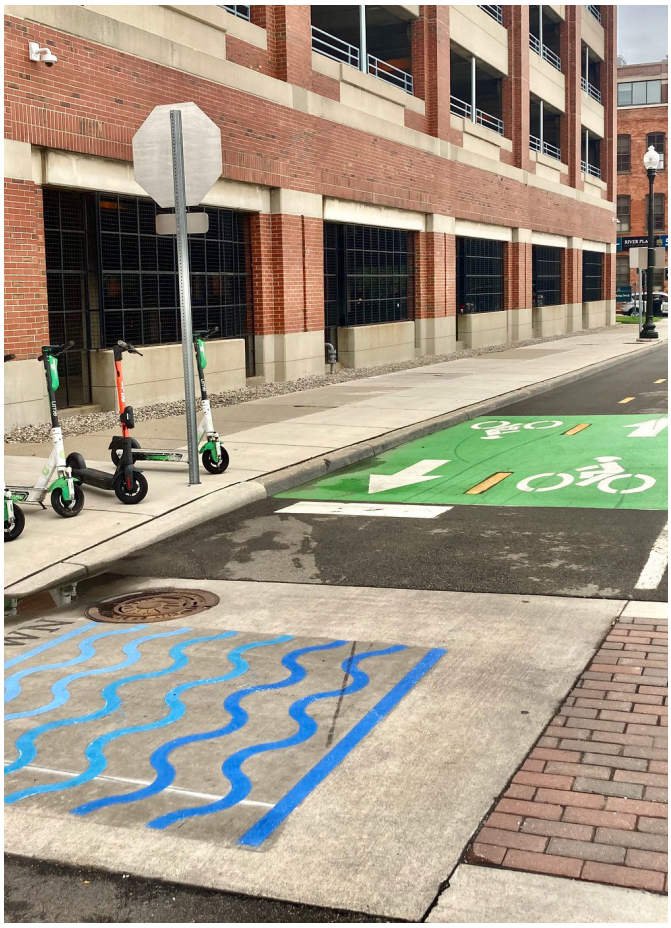
- Install bicycle boxes to faclitate bicyclist positioning during the red light at signalized intersections. Bicyclists may position for left turns or in front of vehicles who are turning right. Boxes should be a minimum of 10' deep and take up the width of entire travel lane(s) with a bicycle symbol for each lane.

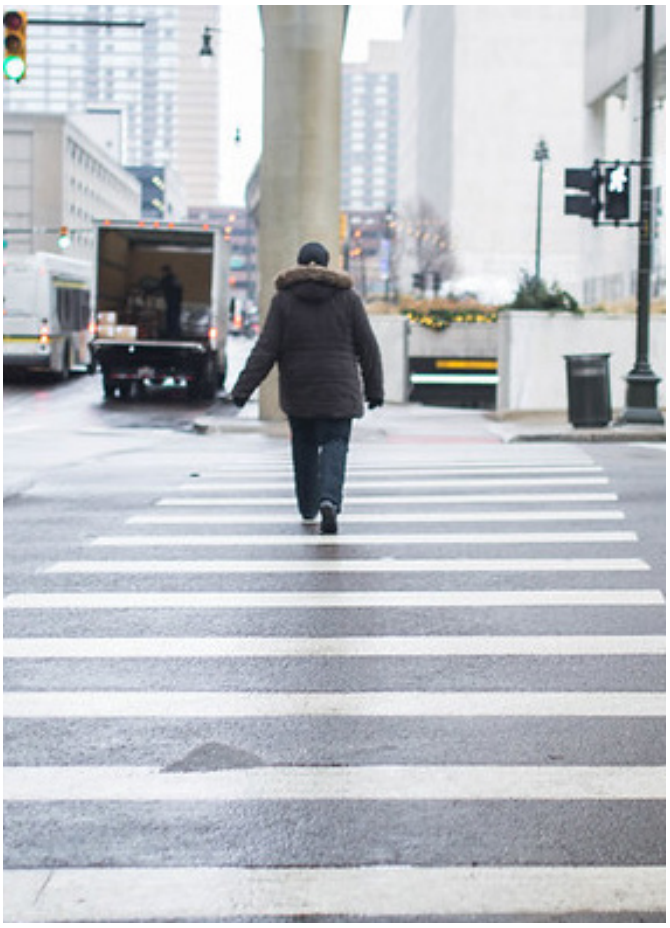
Considerations for Two-Way Bike Lanes

- Drivers turning left are unlikely to be looking for cyclists approaching from behind. Supplement bike crossings with green surfacing, install R10-15 alt signs (see Signage), or consider raising or recessing the crossing. Also consider restricting left turns. It may be necessary to reevaluate whether a two-way separated bike lane is appropriate in some cases.
- Balance signal timing needs as bicyclists have different timing than motorists - especially at locations with higher vehicular speeds and longer crossing distances.
- Install raised intersections where appropriate (see Traffic Calming in Chapter 4: Roadways) to increase safety at crossings. Bikeway ramps should be installed with a 4% to 5% slope for comfort (and may require 12' in length when the curb is 6" high). Stop lines should be placed at the bottom of ramps or at the top of the ramp if 6' of length is available.

Additional Resources

- FHWA Traffic Analysis and Intersection Considerations to Inform Bikeway Selection
- NACTO Don't Give Up at the Intersection
- MUTCD Interim Approval for Optional Use of an Intersection Bicycle Box
- MUTCD Interim Approval for Optional Use of Two-Stage Bicycle Turn Boxes






CHURROS
TAMALES

Signage

Signage communicates to bicyclists and motorists about when to yield and stop at crossings and provides advance warnings before crossings. Supplement signage with pavement markings and, as appropriate, signals or beacons.

Typical Signage Uses

R10-11a

- Bike boxes
- Two-stage bicycle turn boxes
- Leading pedestrian intervals

W17-1

- Raised crosswalks
- Raised Intersections
- Speed humps and cushions

R4-7

- Pedestrian refuge islands

W11-15 & W16-7p

- RRFBs
- Midblock trail crossings and locations where motorist may not expect crossing pedestrians or cyclists

R10-10b

- Raised crosswalks
- Raised Intersections
- Speed humps and cushions

R4-4

- Where motorists merge with separated bike lanes

Requirements

- Typical sign categories include regulatory, warning, and guide signs. All traffic signs should conform to the MMUTCD and accessibility requirements.
- Mount signage at heights and horizontal distances specified in the MMUTCD.
- Do not block visibility of pedestrians to approaching drivers and bicyclists.
- Band mount to existing fixtures (e.g. utility poles) where possible. Where necessary, obtain perfmission from asset owner.
- At intersections with high conflicts between motorists and pedestrians or bicyclists, history of right-turn pedestrian crashes, and at intersection corners with bike boxes and two-stage bike turn boxes, install a No Turn on Red sign (R10-11A) and leading pedestrian interval.
- For midblock raised crossings, install a speed hump warning (W17-1) and advisory speed sign at least 100' in advance, increasing distance according to MMUTCD guidance.
- Install W11-15 and W16-7P signs with rectangular rapid flashing beacons (RRFBs). Provide advance RRFB warning with W11-15 and W16-9P.
- Where curb extensions are installed, install/relocate signage at the new curb line.

Considerations

- Where there are bike signals or signals are shared with pedestrians, install "bike signal" sign (R10-10B).
- Where motorists merge with separated bike lanes, use "Begin right turn lane yield to bikes" sign (R4-4) at the beginning of the merge point.
- Install Bicycle/Pedestrian warning signs (W11-15) at locations where motorists may not be expecting to cross bicycle or pedestrian crossing.
- Where center turn lanes turn into pedestrian refuge islands, install R4-7 sign.

Signage

Typical Signage Uses

W11-1 & W1-7alt

- In advance of uncontrolled bicycle crossings
- In advance of separated bike lanes (at two-way bike lanes add W1-7alt)

R4-11

- Where priority shared lane markings are used

R1-5a

- Where yield markings are used - install R1-5 alt where motorists must yield to cyclists or cyclists and pedestrians

R10-15

- Where motorists must yield and permissive turns are allowed - install R10-15 alt where turns cross separated, particularly two-way, bike lanes

- Where priority shared lane markings are used, install a Bikes "may use full lane" sign (R4-11).
- Install a W11-15 & W16-9p/supplemental speed sign assembly 100’ to 500' in advance of uncontrolled midblock and intersection crossings and other warning signage.
- Place Bicycle Warning sign (W11-1) at, or in advance of, uncontrolled crossings or separated bike lanes. Mount as close as possible to intersection and limit use of signs to where bike lanes are unexpected. Where there are two-way bike facilities (except stop-controlled intersections), use a Two-Way plaque (W1-7 alt). If used as a warning, use a supplemental Next Right or Next Left plaque below the W11-1 and locate sign at least 100' before the crossing.
- At locations where yield lines are provided for motorists, install "Yield here to bicycles" or "Yield here to bicycles and pedestrians" sign (R1-5 alt) adjacent to yield markings.
- Use "Turning vehicles yield to bicycles and pedestrians" (R10-15 alt) sign to notify permissive left or right turning motorists of requirement to yield at crossing, particularly for two-way bike lanes. Mount on far side of intersection.
- Signage can contribute to clutter and increased maintenance, but consider the safety needs of pedestrians and cyclists before excluding signs. Give particular consideration to installing signage where a movement may be unexpected, sight distance is limited, and/or intersections are skewed.

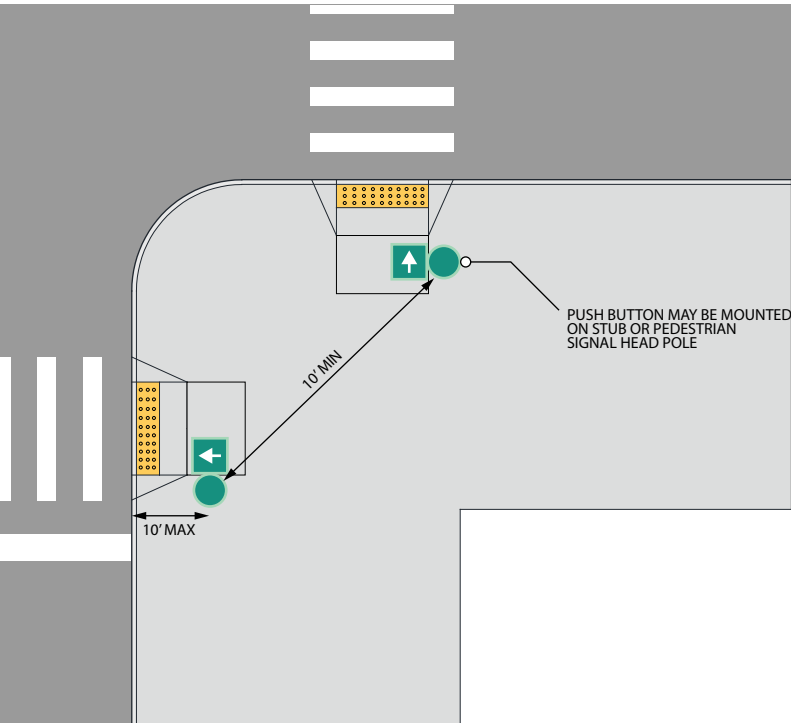
Additional Resources

- Manual on Uniform Traffic Control Devices (MUTCD)
- Michigan Manual on Uniform Traffic Control Devices (MMUTCD)

Signals: Accessible Pedestrian Signals

Accessible pedestrian signals (APS) communicate information about the pedestrian phase to pedestrians with visual and/or hearing disabilities. They include audible tones, speech messages, detectable arrow indicators, and/or vibrating surfaces.

Detectable Arrow Indicator Placement



Peterborough, ON

Requirements

- For reconstruction or when modernizing pedestrian signals, install APS consistent with PROWAG.
- For automatic pedestrian recall phases, use pushbuttons to activate APS features (e.g., detectable arrow indicators, speech messages).
- Locate the pedestrian pushbutton as close as possible to the curb ramp while providing a clear space that is a minimum of 2.5' by 4'. Provide an unobstructed reach for pedestrian pushbuttons that are 1.25' to 4' in height.
- Locate vibrotactile arrows on pushbuttons to point in the same direction as the crosswalk.
- Program audible walk indicators to have the same duration as the visual walk indication. If the visual indication rests, the audible indication should be provided in the first 7 seconds of the WALK interval.
- Follow MMUTCD and PROWAG for installing accessible pedestrian signals and pedestrian pushbuttons.

Considerations

- Use APS to provide information on the direction of crossing through the direction of the pushbutton and surrounding plate, location of destination sidewalk through audible beaconing, and the beginning of the WALK interval through speech messages.
- Use APS to provide information on intersection street names in Braille or raised print, intersection signalization with speech messages, and/or intersection geometry through detectable maps, diagrams, or speech messages.
- Use pushbutton locator tones to let pedestrians know where to push the button to actuate the WALK interval and safely wait to cross.

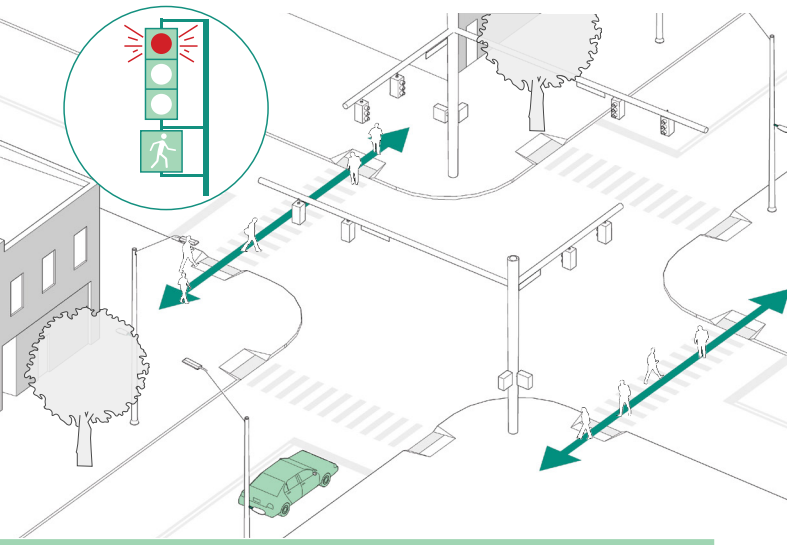
Additional Resources

- MUTCD
- MMUTCD
- PROWAG

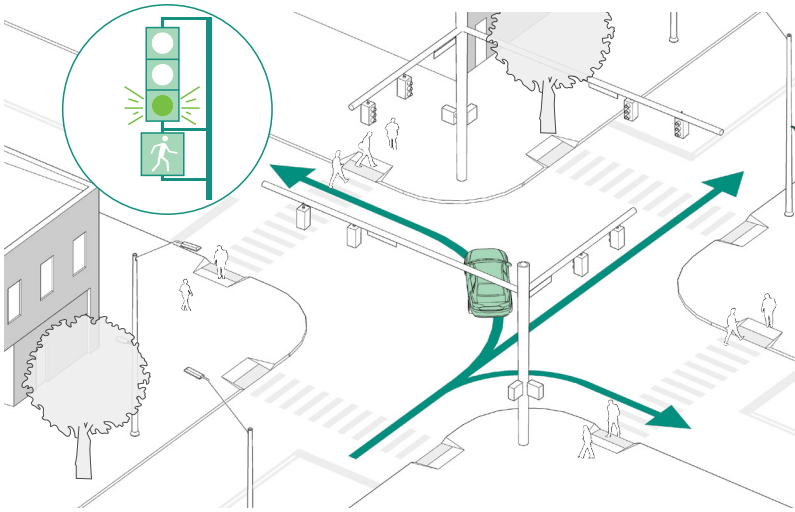
Signals: Pedestrian Signal Phasing

Pedestrian signal phasing communicates safe crossing times to pedestrians for all crosswalks at signalized intersections. Pedestrian signal phasing can minimize exposure of people walking, minimize delay for people waiting to cross, and reduce noncompliant and unsafe crossing behavior.

Leading Pedestrian Interval Phasing



Pedestrians given walk signal to enter crosswalk ahead of waiting driver to increase visibility and reduce delay



Driver given green light while pedestrians finish crossing; driver must yield to pedestrians in crosswalk before completing turn

Requirements

- Pedestrian signal phasing may be concurrent, exclusive, or a hybrid. Concurrent phasing allows crossing at the same time and in the same direction as motor vehicle traffic. Exclusive phasing provides a separate phase for crossing that prohibits all motor vehicle movements, which eliminates conflicts but creates longer delays for all modes. Hybrid phasing uses concurrent phasing on legs where conflicts are minimal, while also providing an exclusive phase.
- When upgrading pedestrian signals, install signals with countdown timers.
- Allow crossing whenever possible by using all available non-conflicting phases.
- Calculate pedestrian clearance time using the crossing distance and a pedestrian walking speed of 3.5 feet per second. Include a buffer of at least 3 seconds. Provide a longer clearance time where there are high volumes of pedestrians, seniors, and/or people with disabilities.

Considerations

- Keep pedestrian delays to 30 seconds or less to reduce chance of non-compliance.
- Pedestrian phases should be on a fixed cycle. Actuation may be used where there are very low anticipated pedestrian volumes.
- Use concurrent phasing whenever possible. Use exclusive or hybrid phasing at intersections with conflicting turning movement volumes (250 or more per hour); restricted sight lines; complex geometry; and nearby schools, elderly housing, recreational areas, or medical facilities.
- With concurrent phasing, 1) use leading pedestrian intervals (LPIs) to give people crossing a 3 to 7 second head start before drivers may proceed in a conflicting direction (restrict right turns on red), and 2) use lagging left turns to reduce pedestrian delay.

Additional Resources

- NACTO Urban Street Design Guide

City of Detroit
Department of Public Works

detroitmi.gov/streetsforpeople

Coleman A. Young Municipal Center
2 Woodward Ave
Detroit, MI 48226

October, 2021