



CITY AND COUNTY OF DENVER COMPLETE STREETS DESIGN STANDARDS



2026

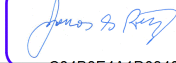
[This page intentionally left blank.]

Complete Streets Design Standards

2026 City and County of Denver Complete Streets Design Standards

APPROVED:

Signed by:



C84B8E4A1D03404...

1/26/2026

James G. Potter, PE, City Engineer

Date

Signed by:



FA114F8235EE4EE...

1/27/2026

Amy Rens, PE, City Traffic Engineer

Date

Complete Streets Design Standards

[This page intentionally left blank.]

Contents

	Page No.
Chapter 1: Introduction.....	1
A. Authority.....	3
B. Resource Standards	4
C. Amendments and Revisions to Standards	4
D. Required Permits	4
Chapter 2: Street Design Framework	5
A. Functional Classification.....	5
i Local Street	5
ii Collector.....	5
iii Arterial.....	5
B. Street Types.....	5
C. Street Design Framework	7
i Pedestrian Realm.....	7
ii Roadway Zone	9
D. Overlays	10
E. Street Design Procedures.....	10
i Design Procedure for New Streets.....	11
ii Design Procedure for Existing Streets	11
iii Design Exceptions.....	12
Chapter 3: Street Design Criteria.....	13
A. Design Speed	13
i New Streets	13
ii Existing Streets.....	13
B. Unobstructed Width	13
C. Lane Widths and Number of Lanes	13
D. Design Vehicle.....	13
i Design Vehicle.....	15
ii Control Vehicle	15
iii Managed Vehicle.....	16
iv Software Design Application.....	16
E. Corner Radius.....	16
i Actual and Effective Radius.....	16
ii Minimum Turning Radius of Vehicles	16
F. Lane Encroachment Policy at Intersections	18
i Managed Vehicle.....	18
ii Design Vehicle	18

Complete Streets Design Standards

- iii Control Vehicle 23
- G. Lane Encroachment Policy at Mid-block.....25
- H. Curb Ramps.....25
- I. Corner Sight Triangles, Intersection Sight Distance, and Daylighting25
 - i Corner Sight Triangles and Intersection Sight Distance..... 25
 - ii Daylighting..... 25
- J. Permanent versus Interim Installations26
- Chapter 4: Street Design Elements 27**
 - A. Truck Aprons.....27
 - B. Curb Extensions28
 - C. Bicycle and EPAMD Parking Areas.....29
 - D. Electric Vehicle Charging Stations30
 - E. On-Street Parking31
 - i Unpaid On-Street Parking 31
 - ii Paid Parking 31
 - F. Mobility Hubs.....32
 - G. Street Trees and Supporting Infrastructure33
 - H. Transit Stop Shelters34
 - I. Diverters for Access Control35
 - J. Bioretention Facilities36
 - K. Pervious Paving.....37
 - L. Hardened Centerlines.....38
 - M. Median Refuge Islands.....40
- Chapter 5: Traffic Calming Treatments..... 42**
 - A. Speed Cushions43
 - B. Raised Crossings and Intersections.....43
 - C. Neighborhood Traffic Circles44
- Chapter 6: References..... 46**

List of Figures

	Page No.
Figure 1-1: Complete Streets Design Standards Organization	2
Figure 1-2: Governing Document Hierarchy	3
Figure 2-1: Street Type by Land Use Intensity.....	6
Figure 2-2: Pedestrian Realm and Roadway Zone.....	7
Figure 3-1: Design Vehicle Types	14
Figure 3-2: Actual vs. Effective Radius	17
Figure 3-3: Design Vehicle Encroachment at Low-Volume Local/Local Intersections	19
Figure 3-4: Design Vehicle Encroachment at Stop-Controlled Minor Leg	20
Figure 3-6: Design Vehicle Encroachment at Signalized Intersection with a Single Receiving Lane on a Local Street	21
Figure 3-7: Design Vehicle Encroachment at Signalized Intersection with Multiple Departing and Receiving Lanes	22
Figure 3-8: Control Vehicle Encroachment at Signalized Intersection with Multiple Departing and Single Receiving Lane on a Local Street.....	24
Figure 4-1: Hardened Centerlines.....	39

List of Tables

	Page No.
Table 3-1: Alternative Design Vehicle and Roadway Existing Conditions.....	15
Table 5-1: Traffic Calming Treatment Minimum Criteria for Installation.....	42

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
CSDG	Complete Streets Design Guidelines
Denver	City and County of Denver
DFD	Denver Fire Department
DPR	Denver Parks & Recreation
DOTI	Department of Transportation and Infrastructure
DRMC	Denver Revised Municipal Code
EPAMD	Electric Personal Assistive Mobility Device
EV	Electric Vehicle
FHWA	Federal Highway Administration
HAWK	High Intensity Activated Crosswalk
MUTCD	Manual on Uniform Traffic Control Devices
PAR	Pedestrian Access Route
PROWAG	Public Right-of-Way Accessibility Guidelines
ROW	Public Right-of-Way
RRFB	Rectangular Rapid Flashing Beacons
RTD	Regional Transportation District
SUDP	Sewer Use and Drainage Permit
Standards	Complete Streets Design Standards
STEP	Safe Transportation for Every Pedestrian
TSD	Transportation Standard Drawings

Glossary

Amenity Zone: A dedicated area within the Pedestrian Realm, distinct from the sidewalk, which provides a dedicated area for streetscape elements.

Americans with Disabilities Act (ADA): The ADA is a civil rights law that prohibits discrimination against individuals with disabilities in many areas of public life, including jobs, schools, transportation, and many public and private places that are open to the public.

Button Hook Turn: A right turn, typically executed by drivers of trailer trucks, where the driver keeps their wheels close to the curb and swings wide after starting the turn so the vehicle does not veer into the lane for oncoming traffic.

Capital Project: A long-term project that involves building new facilities or making significant improvements to existing ones.

Circulation Path: A prepared exterior or interior surface provided for pedestrian use in the public right-of-way.

Cross Section: Defines the location of the standard right-of-way elements (existing and proposed) for a project location.

Curb Space: Part of the Roadway Zone which is not always adjacent to the curb. It can include vehicle and bicycle and/or EPAMD parking, freight loading, parklets, taxi and ride-hailing pick-up and drop-off areas, transit stop amenities, and other uses that activate the street.

Electric Personal Assistive Mobility Device (EPAMD): Bicycle, electric scooter, and personal mobility device equipment.

Frontage Zone: Part of the Pedestrian Realm (when present) for outdoor patios, signage, utilities, and street furniture.

Functional Classification: A method to define streets based on the type of service a street provides, which includes the number of travel lanes, travel purpose, and access. The Functional Classifications are Arterial, Collector, and Local.

General Travelway: Part of the Roadway Zone (does not include gutter pan), which is for the through movement of vehicles, including private motor vehicles, buses, commercial and freight vehicles, bicycles, and/or EPAMD vehicles.

Gutter Pan: Part of a curb and gutter system that forms a barrier that helps to collect water from the street surface and direct it to a drainage point.

Jug Handle Turn: A right turn, typically executed by drivers of trailer trucks, where the driver swings wide into the oncoming traffic lane before starting the turn.

Median: Part of the Roadway Zone, which is a raised or painted element between the two edges of a travelway to separate directions of travel or modes of travel or to provide a transit stop.

Mode-Specific Travelway: Where present, part of the Pedestrian Realm or the Roadway Zone can include dedicated bikeways, transit-only lanes, and/or turn lanes.

Neighborhood Bikeway: Low-volume, low-speed streets designed to prioritize people who are biking, walking, and rolling by using design elements such as signage, pavement markings, speed, and/or volume reduction features, and crossing improvements.

Complete Streets Design Standards

Overlay: A designation or set of designations that a street may have, along with its Street Type, which informs the design. The Overlays are pedestrian, bicycle, transit, historic parkway, ultra-urban green streets, school zone, and regular closure and festival street networks.

Parklet: A below-curb patio.

Pedestrian Access Route: An accessible, continuous, and unobstructed path of travel for use by pedestrians with disabilities within a pedestrian circulation path.

Pedestrian Realm: The area within a street from the property line to the flow line with the gutter pan, including the Frontage Zone, Sidewalk Zone, Amenity Zone, and Mode-Specific Travelway (when present).

Right-of-way (ROW): Land owned or granted by easement to Denver and dedicated as public by City Council for public transportation and utility purposes that typically includes the entire Pedestrian Realm and the Roadway Zone for transportation or utility purposes.

Roadway Zone: The area within a street that includes the General Travelway, Mode-Specific Travelway (when present), Curb Space (when present), and Median (when present).

Sidewalk Zone: Part of the Pedestrian Realm that includes the Pedestrian Access Route.

Street Type: A defined typology (existing or future) used to describe the general design, function, and character of a street design. The Street Types are Downtown, Main Street, Mixed-Use, Industrial, Commercial, and Residential.

Suspended Paving System: A general term for any technology that supports the weight of paving and creates a subsurface void space for soil and root growth.

Throat Width: The distance between curb faces or flowlines at an intersection.

Tree Trench: A system of trees connected by an underground infiltration structure. On the surface, it looks like a row of ordinary street tree pits, but underground, there is a system to manage incoming runoff.

Chapter 1: Introduction

The City and County of Denver (Denver) *Complete Streets Design Standards* (Standards) and the Transportation Standard Drawings (TSD) provide requirements for the design and construction of public transportation improvements in Denver, including streets and roadway features, to help meet Denver's mobility and safety goals. The Standards and the TSD are based on Denver's *Complete Streets Design Guidelines* (CSDG), which the City Council approved in 2020, in addition to other Denver and national documents. The CSDG provides high-level guidance for all the principles and features in this document.

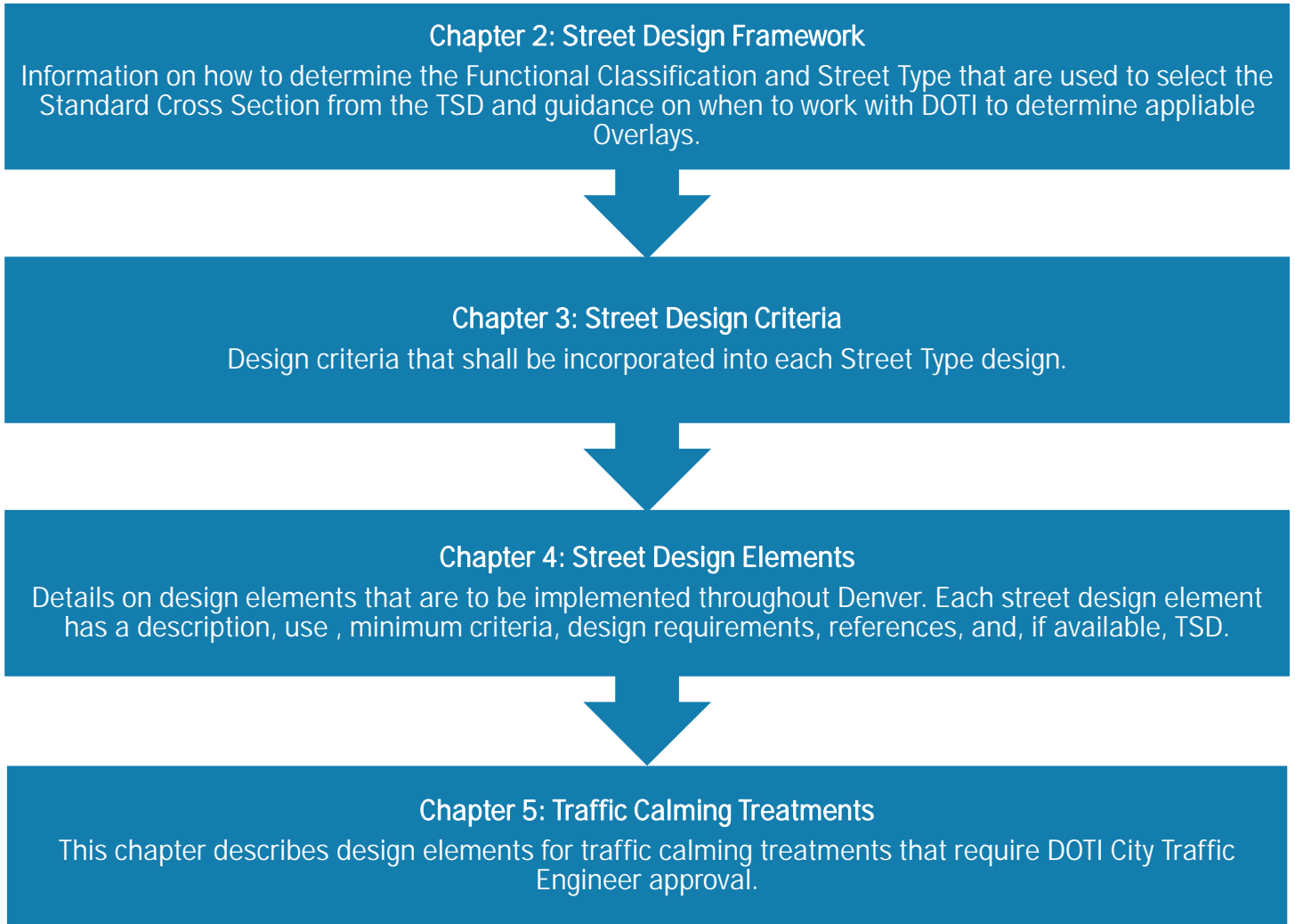
Designers should implement the Standards presented in this document using engineering judgment. In addition to these Standards, Designers should consult Denver's suite of regulatory and policy tools and approved plans, including *Blueprint Denver*, *Denver Moves Everyone*, and the *Curbside Action Plan*, when designing streets. Special situations, as determined by the Department of Transportation and Infrastructure (DOTI), may require alternative design criteria and/or standards.

This document is for use by all parties responsible for the design and implementation of improvements in the public right-of-way (ROW), including Denver staff, private sector consultants, developers, and other agencies, and it is applicable to land areas in the development process. Designers should follow the document in the order of the preferred design process.

DOTI does not regulate private streets in Denver, but Denver encourages the use of these Standards for the design of private streets. Depending on the type of easement, DOTI may require these Standards.

Figure 1-1: Complete Streets Design Standards Organization summarizes the information provided in each chapter of these Standards.

Figure 1-1: Complete Streets Design Standards Organization

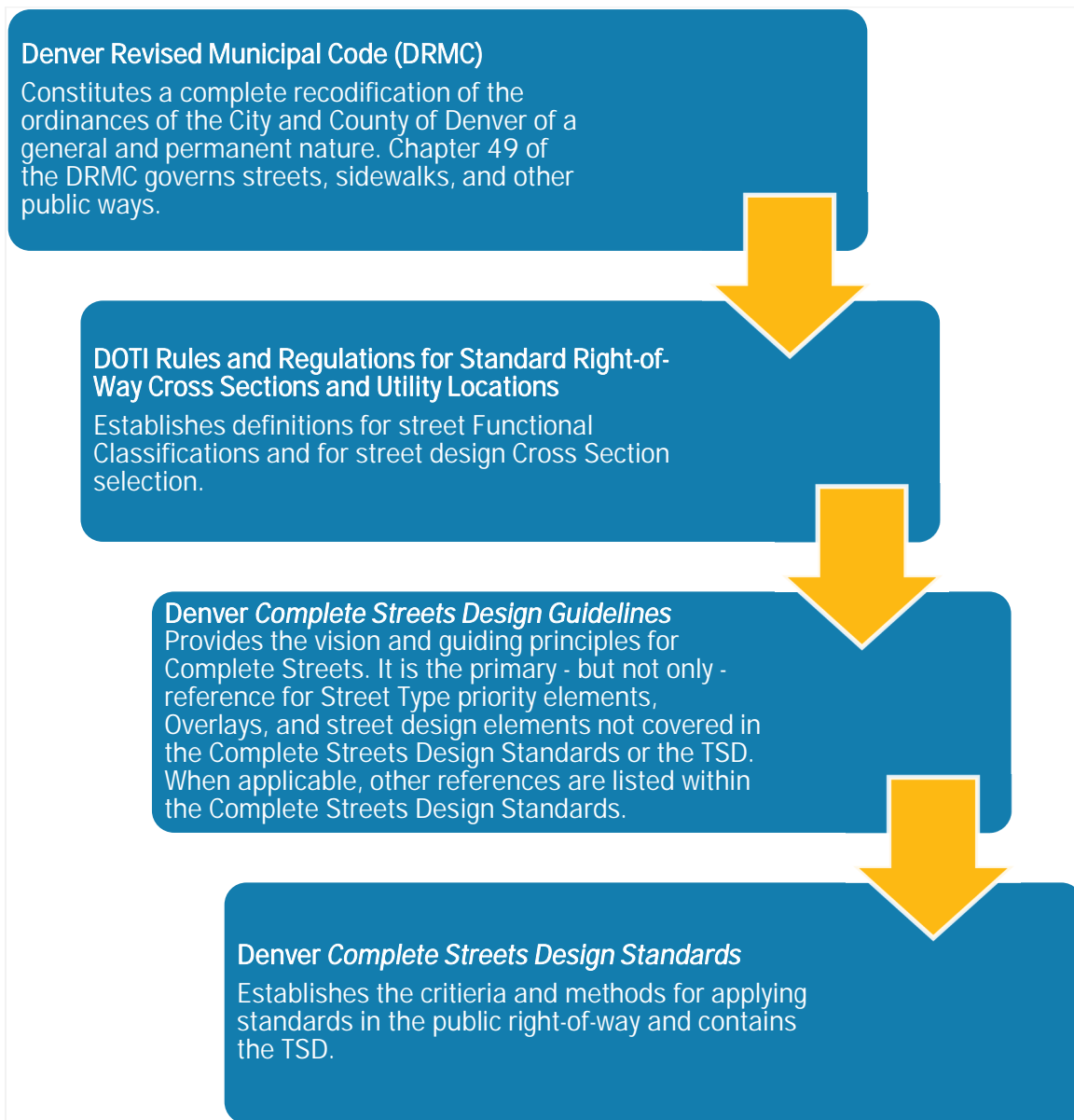


A. Authority

Under the authority of the Denver City Charter, Article II; the Denver Revised Municipal Code (DRMC), Chapter 49; and by other City Ordinances and Regulations, DOTI manages the public ROW and establishes and enforces the standards for construction in the ROW.

Figure 1-2: Governing Document Hierarchy illustrates the relationship and authority of relevant policies and documents used in these Standards. The DRMC is the overarching Policy that gives authority to DOTI to manage the ROW. The documents listed under the DRMC are in the order of highest authority for constructing improvements in ROW.

Figure 1-2: Governing Document Hierarchy



B. Resource Standards

The Designer shall work with DOTI to determine the correct reference when the DOTI Rules and Regulations for Standard Right-of-Way Cross Sections and Utility Locations, Standards, or the TSD does not address design or construction information.

C. Amendments and Revisions to Standards

DOTI may periodically amend the Standards and the TSD as necessary to provide additional clarity or to reflect changes in policy, in construction, or in engineering practice.

D. Required Permits

Designers shall obtain all required permits for work within the ROW. Work shall include, but shall not be limited to, new road construction, changes to existing roads, road cuts for utilities or drainage work, and driveway construction.

To construct utilities within the public ROW, Designers may need to complete a required Utility Plan Review (UPR).

Designers shall refer to the Denver UPR Process for the permit requirements and submittal process, associated fees, guidelines and requirements for submittals, and mandatory notes. If applicable, Designers may need to apply separately for the following approvals:

- Sewer Use and Drainage Permit (SUDP) for floodplain use (aka Floodplain Permit) for any construction within a regulatory floodplain as shown on Denver Maps: <https://www.denvergov.org/Maps/map/floodplain>. When DOTI requires a Floodplain Permit, submit all plans showing floodplain impacts for the entire UPR project, i.e., do not break the Floodplain Permit submittal into multiple plan sets. Specific floodplain permit requirements for Utility Projects, as well as application instructions, are in the Denver Utility Project Floodplain Permit Requirements.
- Erosion Control Permit for any excavation adjacent to receiving waters or if otherwise required by the DOTI Construction Activities Stormwater Discharge Permit (CASDP) Manual.

To construct private improvements within the ROW, known as encroachments, Designers shall refer to the DOTI Rules & Regulations Governing Encroachments & Encumbrances in the Public Right-of-Way for definitions, categories, criteria, and general conditions for placement of encroachments in the ROW.

DOTI may require additional permits not listed above, depending on the project.

Chapter 2: Street Design Framework

This chapter provides information on Functional Classification, Street Type, and the street design framework for designing streets in Denver ROW.

A. Functional Classification

The DOTI Rules and Regulations for Standard Right-of-Way Cross Sections and Utility Locations define the Functional Classifications for Denver's streets. Functional Classification is based on the type of service a street provides, which includes the number of travel lanes, travel purpose, and access. The Designer shall use the Street Centerline layer available in the Denver Open Data Catalog Website (<https://denvergov.org/opendata/>) to determine the Functional Classification designation and confirm with DOTI the designation is correct prior to beginning design. Each Functional Classification has a corresponding Cross Section in the TSD.

i Local Street

A Local Street primarily serves to gain access to the adjacent property.

a) Shared Street

The DOTI City Traffic Engineer must designate a Shared Street, which is a Local Street where pedestrians, bicyclists, and motor vehicles mix in the same space. A Shared Street can carry one- or two-way traffic. A Shared Street prioritizes pedestrian mobility over all other modes and is appropriate where pedestrian activity is high and motor vehicle and transit demand is low.

ii Collector

A Collector serves intra- and inter-community traffic and equally prioritizes through traffic with access.

iii Arterial

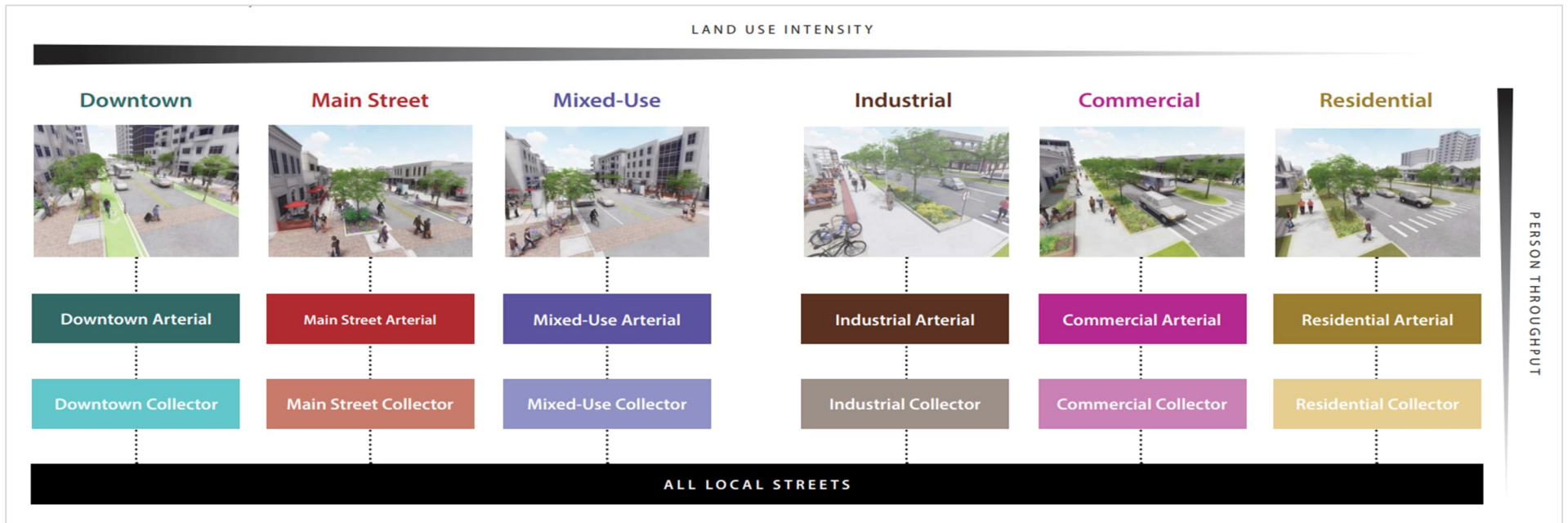
An Arterial serves regional and intra-community traffic and allows continuous travel. It provides access to highways and has restricted access to individual properties.

Transportation Standard Drawings: 2.0 (General Notes for Cross Sections), 2.1 (Local Street Cross Section), 2.2 (Collector Cross Section), 2.3 (Arterial Cross Section), 2.4 (2 Lane Arterial Cross Section), and 2.5 (Shared Street Cross Section).

B. Street Types

A Street Type links design and operation to the character and land use around it. The Designer shall use the *Blueprint Denver* map at [Blueprint Denver - City and County of Denver \(denvergov.org\)](https://denvergov.org/blueprint-denver) to determine the Future Street Type designation and confirm with DOTI the designation is correct prior to beginning design. The Designer should refer to the CSDG for ROW allocation priorities tables for each Street Type and guidance on appropriate Design Elements for each Street Type. Figure 2-1: Street Type by Land Use Intensity illustrates the relationship between land use, intensity, functional classification, and street type. The Street Types are Downtown, Main Street, Mixed-Use, Industrial, Commercial, and Residential.

Figure 2-1: Street Type by Land Use Intensity



Source: <https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Community-Planning-and-Development/Planning/Blueprint-Denver>, 2019, p. 155.

The Right-of-Way Allocation Priorities tables found in the CSDG for Each Street Type provide guidance for which Cross Section elements to prioritize within the street ROW. By considering available or required ROW width, the width between curbs, the width of each desired Cross Section element, and the priorities of each element, the Designer can develop complete streets design options. If Street Type does not have a priority indicated, that means that the street element is not compatible with that Street Type. For example, Medians are not compatible with Downtown One-Way Arterials or Collectors.

The CSDG Design Elements tables list the most appropriate design elements for a particular Street Type. If the Design Elements do not have design parameters in these Standards (Chapter 3), the Designer should consult the CSDG (Chapter 3) for a description of use, design parameters, and other considerations. The Designer may need to consult other documents, such as the *Denver Bikeway Design Manual*, *Denver's Ultra-Urban Green Infrastructure Guidelines*, and *Denver's Curbside Action Plan*.

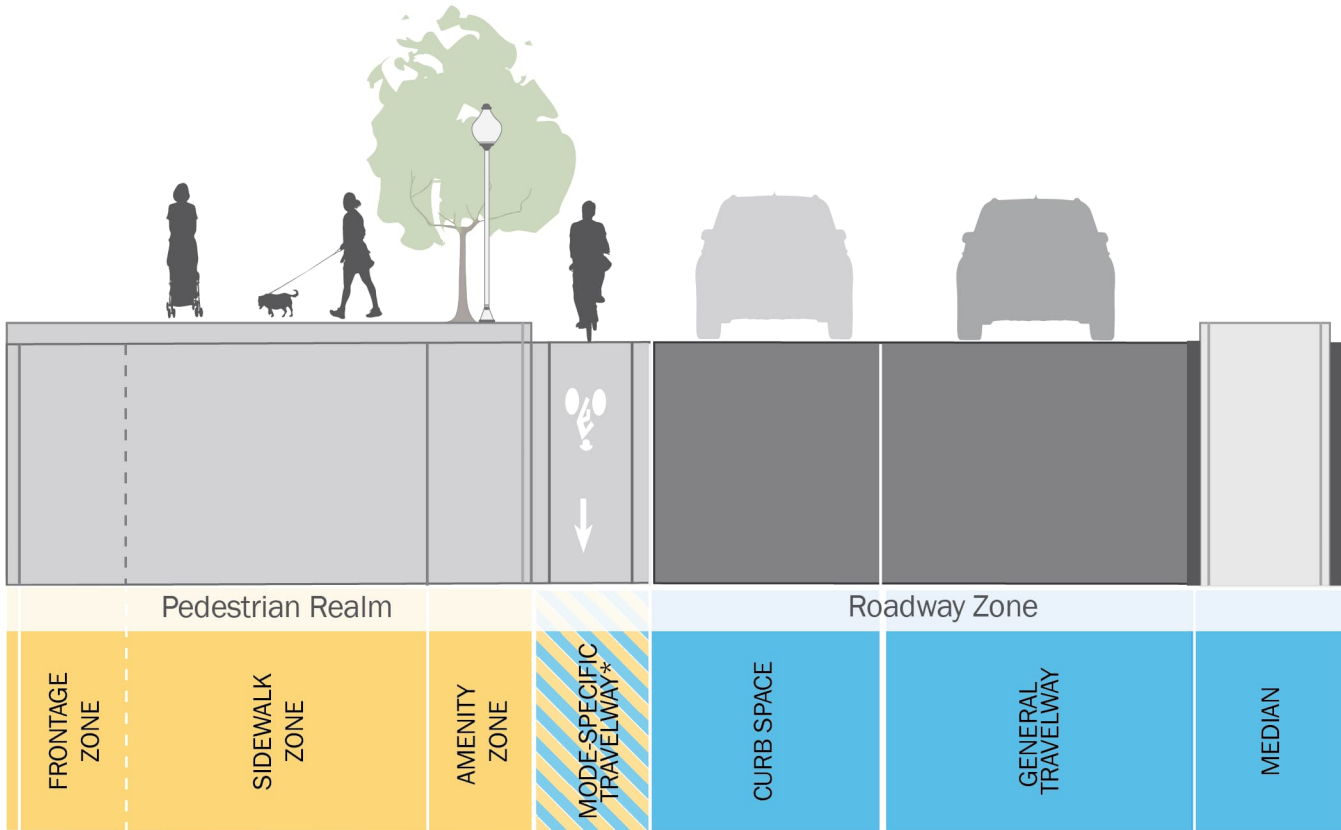
C. Street Design Framework

A street has two areas with distinct characteristics: a Pedestrian Realm and a Roadway Zone. Refer to Figure 2-2: Pedestrian Realm and Roadway Zone for a rendering of the following:

- The Pedestrian Realm includes the Sidewalk Zone, Amenity Zone, Frontage Zone, and, if applicable, the Mode-Specific Travelway.
- The Roadway Zone includes the Curb Space, General Travelway, Median, and, if applicable, the Mode-Specific Travelway.

Each of these zones can contain different street elements depending on the Street Type, surrounding land use, and modal priority (Overlay) for that street.

Figure 2-2: Pedestrian Realm and Roadway Zone



*Mode-Specific Travelway can be above the curb as part of the Pedestrian Realm or below the curb as part of the Roadway Zone.

i Pedestrian Realm

The Pedestrian Realm comprises the Sidewalk Zone, Amenity Zone, Frontage Zone, and, when applicable, the Mode-Specific Travelway. It is the Designer’s responsibility to assign appropriate widths for each zone within the Pedestrian Realm based on the relevant Cross Section.

Complete Streets Design Standards

a) Sidewalk Zone

The Sidewalk Zone is a space between the Amenity Zone and the Frontage Zone that prioritizes the through movement of pedestrians.

Design Considerations

- For a Pedestrian Realm greater than 21 feet wide, regardless of Functional Classification or Street Type, sidewalks shall contain a minimum clear and unobstructed width of eight feet.
- The Sidewalk Zone contains the Americans with Disabilities Act (ADA) *Public Right-of-Way Accessibility Guidelines* (PROWAG) Pedestrian Access Route (PAR) and must meet PROWAG and all Denver accessibility requirements so all people can use and understand it. DOTI must approve the PAR to narrow a sidewalk.
- ROW improvements required during street reconstruction projects or the development of adjacent property shall increase the minimum width of an existing sidewalk in accordance with the TSD Cross Section for the specific Street Type.
- The Designer shall locate raised, aboveground utility features, such as access covers or lids to below-grade utilities, outside the PAR and designed in a manner that does not impact pedestrian use of the Sidewalk Zone. DOTI must approve locations where these utility features need to be within the PAR.
- The sidewalk should follow the alignment of the adjacent street and avoid meandering to the maximum extent possible.
- The Designer shall include curb ramps with detectable warnings at all crosswalks, whether marked or unmarked.
- Where the clear width of the PAR is less than 60 inches, the Designer shall include passing spaces at intervals of 200 feet maximum. Passing spaces shall be 60 inches minimum by 60 inches minimum. DOTI allows passing spaces and the PAR to overlap. As approved by DOTI, the minimum 60-inch continuous clear width of the sidewalk can be reduced to 48 inches at points, such as fixed obstacles that are unreasonable to move, for a maximum distance of six feet. This 48-inch minimum clear width must be clear of any protruding elements, including handrails or doors.

References

- DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way
- PROWAG

Transportation Standard Drawings: 7.0a, 7.0b, and 7.0c (General Notes for Curb Ramps), 7.1 (Curb Ramp Type 1), 7.2a (Curb Ramp Type 2), 7.2b (Curb Ramp Type 2 Modified), 7.3 (Curb Ramp Type 3), 7.4 (Curb Ramp Type 4), 7.5 (Curb Ramp at Downtown Signalized Corner Blended Transition), 7.6a and 7.6b (Curb Ramp Truncated Dome Placement Options), 7.7 (Curb Ramp Typical Section), and 7.8 (Typical Sidewalk Transitions to Curb Ramp Landing).

b) Amenity Zone

The Amenity Zone is a dedicated area within the Pedestrian Realm, distinct from the sidewalk, which provides a dedicated area for streetscape elements. Streetscape elements include but are not limited to, street trees, green infrastructure, bicycle, and/or Electrical Personal Assistive Mobility Device (EPAMD) parking, furnishings, outdoor patios, transit stops and/or shelters, transit amenities, stormwater planters, utilities, lighting, and small cellular towers.

Complete Streets Design Standards

Design Considerations

- Some elements, such as bicycle and/or EPAMD parking and cellular towers, require an Encroachment Permit. See DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way for a complete list.

References

- DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way

c) Frontage Zone

A Frontage Zone is an area between the Sidewalk Zone and the adjacent property line. It can accommodate a wider sidewalk, outdoor patios, signage, utilities, and street furniture.

Design Considerations

- Many elements require an Encroachment Permit. See DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way for a complete list.
- Inclusion of a Frontage Zone shall not reduce the width of a Sidewalk Zone below the minimum required in the TSD Cross Section for the specific Street Type.

Reference

- DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way
- Denver Planning Board *Outdoor Places Private Property Design Guidelines*

Transportation Standard Drawings: 2.0 (General Notes for Cross Sections), 2.1 (Local Street Cross Section), 2.2 (Collector Cross Section), 2.3 (Arterial Cross Section), 2.4 (2 Lane Arterial Cross Section), and 2.5 (Shared Street Cross Section).

ii Roadway Zone

The Roadway Zone includes these components: Curb Space, General Travelway, Median, and, when applicable, the Mode-Specific Travelway. It is the Designer’s responsibility to include the appropriate cross section components of the Roadway Zone based on Functional Classification, Street Type, Overlay, and site-specific design considerations.

a) Curb Space

Curb Space is part of the Roadway Zone that is not always adjacent to the curb and that can include vehicle and bicycle and/or EPAMD parking, freight loading, parklets, taxi and ride-hailing pick-up and drop-off, transit stop amenities, and other uses that activate the street.

Design Considerations

- The Designer should prioritize Curb Space uses to match the intended outcomes of the Street Type and/or Overlay. Curb Space functions require DOTI approval. Refer to the *Curbside Action Plan* for allowable curbside uses.

Reference

- Denver *Curbside Action Plan*
- Denver *Outdoor Places Program*

b) Mode-Specific Travelway

Where present, a Mode-Specific Travelway can include dedicated bikeways, transit lanes, and turn lanes. A Mode-Specific Travelway is sometimes located along the Curb Space, but it can also be located elsewhere within the Roadway Zone or within the Pedestrian Realm.

Complete Streets Design Standards

Design Considerations

- The Designer should prioritize Mode-Specific Travelway uses to match the intended outcomes of the Street Type and/or Overlay. A Mode-Specific Travelway requires DOTI approval.
- Depending on the location of the Mode-Specific Travelway, Roadway Zone, or Pedestrian Realm, it may have unique design criteria.

Reference

- *Denver Curbside Action Plan*
- *Denver Bikeway Design Manual*
- *Denver Transit Design Guidelines*

c) General Travelway

The General Travelway includes general-purpose driving lanes for private motor vehicles, buses, commercial and freight vehicles, bicycles, and/or EPAMD vehicles.

Reference

- *AASHTO A Policy on Geometric Design of Highways and Streets*

d) Median

A Median is a physical or painted element between the two edges of a travelway to separate directions of travel or modes of travel or to provide a transit stop.

Design Considerations

- Designers should consider landscaping and pedestrian refuges.

Reference

- *Denver Uncontrolled Pedestrian Crossing Guidelines*
- PROWAG

Transportation Standard Drawings: 2.0 (General Notes for Cross Sections), 2.1 (Local Street Cross Section), 2.2 (Collector Cross Section), 2.3 (Arterial Cross Section), 2.4 (2 Lane Arterial Cross Section), and 2.5 (Shared Street Cross Section).

D. Overlays

An Overlay is a designation or set of designations that a street may have, along with its Street Type, which informs the design. To accommodate individualized contexts and more nuanced priorities of uses on streets, there are seven Overlays: pedestrian, bicycle, transit, historic parkway, ultra-urban green streets, school zone, and regular closure and festival street networks. If a street has an Overlay, the Designer should refer to the CSDG for detailed Overlay descriptions and applications. DOTI may identify additional overlays in the design procedure process.

E. Street Design Procedures

The Designer should use the following procedures to design streets in Denver. It is important to note that cross-departmental and cross-agency collaboration is important to determine the recommended Cross Section so the Designer can evaluate all needs of a street for the best outcome.

Complete Streets Design Standards

i Design Procedure for New Streets

The procedure for Designers to apply the appropriate TSD Cross Section details for the design of a new street is as follows:

1. DOTI determines the Functional Classification, Street Type, and applicable Overlay(s) for new streets.
2. Select the typical Cross Section in the TSD that corresponds with the designated Functional Classification.
3. Use the CSDG to identify street priority elements for the Street Type and/or Overlay(s) and adjust design parameters using the design guidance in the TSD Cross Section details.
4. Use the street design criteria and street design elements in these Standards to fully develop the street design.

ii Design Procedure for Existing Streets

The procedure for Designers to apply the appropriate TSD Cross Section details for all ROW improvements, either by Denver or developers of adjacent property, to update an existing street to current design standards, often referred to as a retrofit, is as follows:

1. Identify the Street Type Functional Classification based on the DOTI Street Centerline Database and use the corresponding Cross Section details in the TSD.
2. Identify the Street Type using Blueprint Denver's Street Types map, and/or updated Denver plans, and/or DOTI direction. There is design guidance for each Street Type in the TSD Cross Section details.
3. Review DOTI-approved corridor studies and any other relevant Denver planning documents for recommendations that may impact the design. Look for guidance on the roadway width in these documents.
4. Use specified roadway width from Denver planning guidance, or, if there is no guidance, start with the assumption that the existing curb line is set. The Designer must meet the requirements for the Pedestrian Realm and Roadway Zone per the TSD Cross Section. If elements within the Roadway Zone have substandard lane widths, DOTI may require the Designer to adjust the curb line. The Pedestrian Realm shall provide the minimum required PAR widths for the TSD Cross Section.
5. Use the CSDG to identify street priority elements for the Street Type and/or Overlay(s) and adjust design parameters using the design guidance in the TSD Cross Section details. The Overlay may influence any request to reduce the Pedestrian Realm, as there may be a need to move the curb for future corridor improvements, such as transit lanes and bicycle lanes. The Pedestrian Realm shall provide the minimum required PAR widths for the TSD Cross Section.
6. Use the street design criteria and street design elements in these Standards to fully develop the street design.

When the standard Cross Section or ROW width cannot be met because of constrained existing conditions, the standard Cross Section may be administratively modified to narrow or to remove the Frontage Zone only after the Designer has verified that travelway lane widths meet the current standard and no adjustments can be made to striping and/or curb location.

Complete Streets Design Standards

DOTI may evaluate other requests to modify the standard Cross Section beyond the above as a Design Exception. Requests to modify the standard Cross Section shall evaluate all the following:

- Amenity Zone width narrowed from the standard 8 feet to 6 feet.
- Removal of an existing parking lane.
- Removal of a General Travelway lane or Median.

Constrained existing conditions are situations where the location of an existing building, environmental contamination, significant trees as determined by Denver Parks and Recreation, or historic buildings along the same block will remain post-project, and the remainder usable property between the building and curb is narrower than the TSD Cross Section.

At its discretion, DOTI may consider additional constrained conditions.

iii Design Exceptions

A Design Exception is a documented decision to design a street or a street element to design criteria that do not meet minimum values or ranges established in these Standards for the required Street Classification and Street Type. A Design Exception may adversely affect safety and operations, so DOTI requires a thorough analysis of mitigation options and potential adverse impacts. A Design Exception request must have substantive, non-financial reasoning for deviation. In accordance with DOTI variance policies, DOTI will evaluate and approve requests to deviate from these Standards on a case-by-case basis.

Note that Design Exceptions are typically applicable to corridor projects as directed by DOTI. DOTI generally does not allow changes to the Cross Section on a parcel-by-parcel basis. The Designer should refer to the *Curbside Action Plan* when proposing to remove an existing parking lane for guidance on applicability. DOTI City Traffic Engineer must approval all lane removals.

Documentation to substantiate a request for a Design Exception shall include a description of the following:

- Specific Standard or TSD for design exception consideration.
- Existing roadway characteristics.
- Alternative design options considered.
- Comparison of the safety and operational performance of the roadway and other impacts, such as ROW, community, environmental, and usability by all modes of transportation.
- Demonstrate how the exception or proposed design better meets or exceeds the criteria and intent for people-first street design.
- Mitigation measures considered.
- Compatibility with adjacent sections of roadway.

Chapter 3: Street Design Criteria

This chapter outlines the design criteria the Designer shall use to design each Street Type.

A. Design Speed

i New Streets

The posted speed for new streets shall be determined by the DOTI City Traffic Engineer. The design speed for a new street shall be equal to the posted speed limit, except for use in the stopping sight distance and sight triangle calculations, where the design speed should be 5 mph above the posted speed limit.

ii Existing Streets

Public improvements to the ROW resulting from the redevelopment of a single zone lot should allow for the target speed of the existing street, except for use in the stopping sight distance and sight triangle calculations, where the design speed should be 5 mph above the target speed limit. Capital projects that change the context of a roadway segment should follow the procedure for new streets.

Transportation Standard Drawings: 14.0 (Sight Triangles).

B. Unobstructed Width

The Roadway Zone requires a minimum unobstructed width between raised elements in accordance with the latest version of the Denver Fire Code.

C. Lane Widths and Number of Lanes

The default General Travelway lane width is 10 feet, exclusive of the gutter pan. If there are more than 500 vehicles larger than a Single Unit Truck (SU-30) per day, DOTI requires one General Travelway lane width of 11 feet in each direction, exclusive of the gutter pan. Mode-specific travelways have other width considerations, and the Designer should reference the TSD.

The Designer should gather data for existing streets to determine the daily heavy vehicle volume. Designers may use a two percent heavy vehicles percentage for new streets. A larger percentage of heavy vehicles may be determined by DOTI based on land use. DOTI may require additional General Travelway lane width on curved streets to mitigate lane encroachment by longer vehicles. Refer to the Lane Encroachment Policy in these Standards for more information.

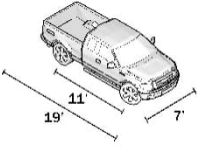
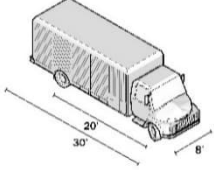
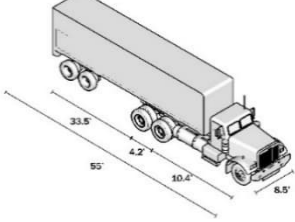
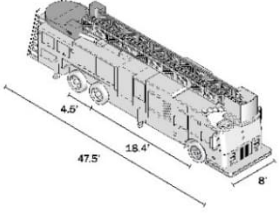
Refer to the applicable TSD Cross Section for the number of lanes based on Street Classification.

D. Design Vehicle

The Design Vehicle type informs minimum street design considerations, such as corner radius and lane width, as well as the type and location of any vertical features. Figure 3-1: Design Vehicle Types illustrates the Design Vehicle types for Denver streets.

Complete Streets Design Standards

Figure 3-1: Design Vehicle Types

	Managed	Design Vehicle	Control Vehicles	
				
Vehicle Type	Passenger Vehicle	SU-30: Single-Unit Truck	WB-50: Intermediate Semi-Trailer	Denver Fire Aerial Platform Truck (Pierce 100)
Overall Length	19.0 feet	30.0 feet	55.0 feet	47.5 feet
Overall Width	7.0 feet	8.0 feet	8.5 feet	8.0 feet
Overall Body Height	4.3 feet	13.5 feet	12.1 feet	10.8 feet
Min. Body Ground Clearance	1.15 feet	1.4 feet	1.3 feet	1.2 feet
Track Width	6.0 feet	8.0 feet	8.5 feet	8.0 feet
Lock-to-Lock Time	4.0 seconds	5.0 seconds	6.0 seconds	4.0 seconds
Wall-to-Wall Turning Radius	N/A	N/A	N/A	44.2 ft
Max. Steering Angle (virtual)	31.6 degrees	31.8 degrees	17.9 degrees	N/A

i Design Vehicle

The Design Vehicle is the least maneuverable vehicle that routinely uses Denver streets. Designers should use a Single-Unit Truck (SU-30) as the Design Vehicle, which is the DOTI standard Design Vehicle for all Street Types.

Designers should design intersection corners so the Design Vehicle can negotiate a turn with a 5-mph turning speed with no lane encroachment. The Designer can include the use of the gutter pan if there are no inlets or inlet grates in the vehicular path. Refer to the Lane Encroachment Policy in these Standards for exceptions.

DOTI may require the use of an Alternative Design Vehicle where DOTI anticipates that 500 or more of the daily vehicles will be larger than a Single-Unit Truck (SU-30), and there is no alternate route that would accommodate larger vehicle turns without compromising pedestrian safety.

DOTI must approve an Alternative Design Vehicle, and the Designer shall submit supporting documentation, including AutoTURN or equivalent turning analyses, to demonstrate the evaluation of the design. Table 3-1: Alternative Design Vehicle and Roadway Existing Conditions shows larger vehicle types that infrequently use Denver streets and the roadway existing conditions that may warrant an Alternative Design Vehicle.

Table 3-1: Alternative Design Vehicle and Roadway Existing Conditions

Potential Alternative Design Vehicle	Common Roadway Existing Conditions
WB-40	Streets with adjacent industrial land use and 500 or more heavy vehicles (WB-40 or larger) per day.
WB-50	
WB-62	
WB-67	
City Bus	Typical 40-foot bus for most bus routes; articulated 60-foot bus for some bus routes (including most BRT routes). Refer to Denver Transit Design Guidelines.
School Bus	Streets with adjacent schools.

ii Control Vehicle

The Control Vehicle is an infrequent but necessary vehicle to use the street. DOTI uses two standard Control Vehicles for all street types:

- Denver Fire Aerial Platform Truck. Fire trucks are exempt from traffic laws when responding to an emergency. The Designer can assume that fire trucks can use all the available roadway.
- The Designer should use a WB-50 when land use dictates, and DOTI has not approved a larger Alternative Design Vehicle. The Designer should consider the location of parked or loading vehicles in the Curb Space and stopped vehicles at signalized intersections.

The Control Vehicle’s use should be infrequent enough that they may use the gutter pan regardless of the presence of inlets in the vehicular path.

Complete Streets Design Standards

Refer to the Lane Encroachment Policy in these Standards for more information.

iii Managed Vehicle

The DOTI standard Managed Vehicle is a passenger vehicle, which is the most common vehicle type to use on the street. Depending on the Street Type and/or Overlay, the Designer should consider street design elements, such as truck aprons, which provide space for the Design Vehicle but slow down the Managed Vehicle to improve safety for other intersection users. DOTI does not allow lane encroachments over centerlines, gutter pans, curb heads, or General Travelway lanes in the design for the Managed Vehicle.

iv Software Design Application

The Designer should complete an analysis using a vehicle swept path software package (i.e., AutoTURN or Autodesk Vehicle Tracking) on all designs to confirm the design meets the criteria in these Standards. The Designer shall use the following guidance when using such software:

- To promote yielding to pedestrians, bicyclists, and motorists within intersections, the Designer should use a 10-mph turning speed for Managed Vehicles and a 5-mph turning speed for all larger vehicles at intersections. Where higher turning speeds are desired, the Designer must submit to DOTI a safety assessment to establish an appropriate turning speed and the resulting Effective Radius and Actual Radius required at the intersection.
- No part of the vehicle may overtop the face of the curb in the turning analysis. If there are existing drainage features in the curb, the Designer must provide an additional 2 feet of clearance from the vehicle path.
- The vehicle should start and end in the center of the exiting and receiving lanes. Refer to the Lane Encroachment Policy in these Standards to determine the allowable exiting and receiving lane encroachments for the target vehicle.
- The Designer should limit the use of multiple node points within the turn that change the turning radius.

References

- AASHTO *A Policy on Geometric Design of Highways and Streets* for specific guidance on turn templates
- Denver Fire Department *100' Heavy-Duty Aluminum Aerial Platform*

E. Corner Radius

Corner radius design has a significant impact on how well an intersection serves the diversity of roadway users. The Designer Corner must consider corner radius design, both the Effective Radius and the Actual Radius, at the intersection of all streets and alleys.

i Actual and Effective Radius

Actual Radius refers to the curve that the face of the curb line makes at the corner, while Effective Radius refers to the curve that motor vehicles follow when turning, which may be increased by Mode-Specific Travelway uses, such as bicycle lanes, and/or Curb Space uses, such as on-street parking and transit stops.

ii Minimum Turning Radius of Vehicles

The minimum radius of the inside vehicle path will be equal to the Effective Radius required at a location where the Designer expects vehicles to turn from a curb side lane into a curb side lane. At these locations, the minimum inside turning radii will inform the minimum Actual Radius required.

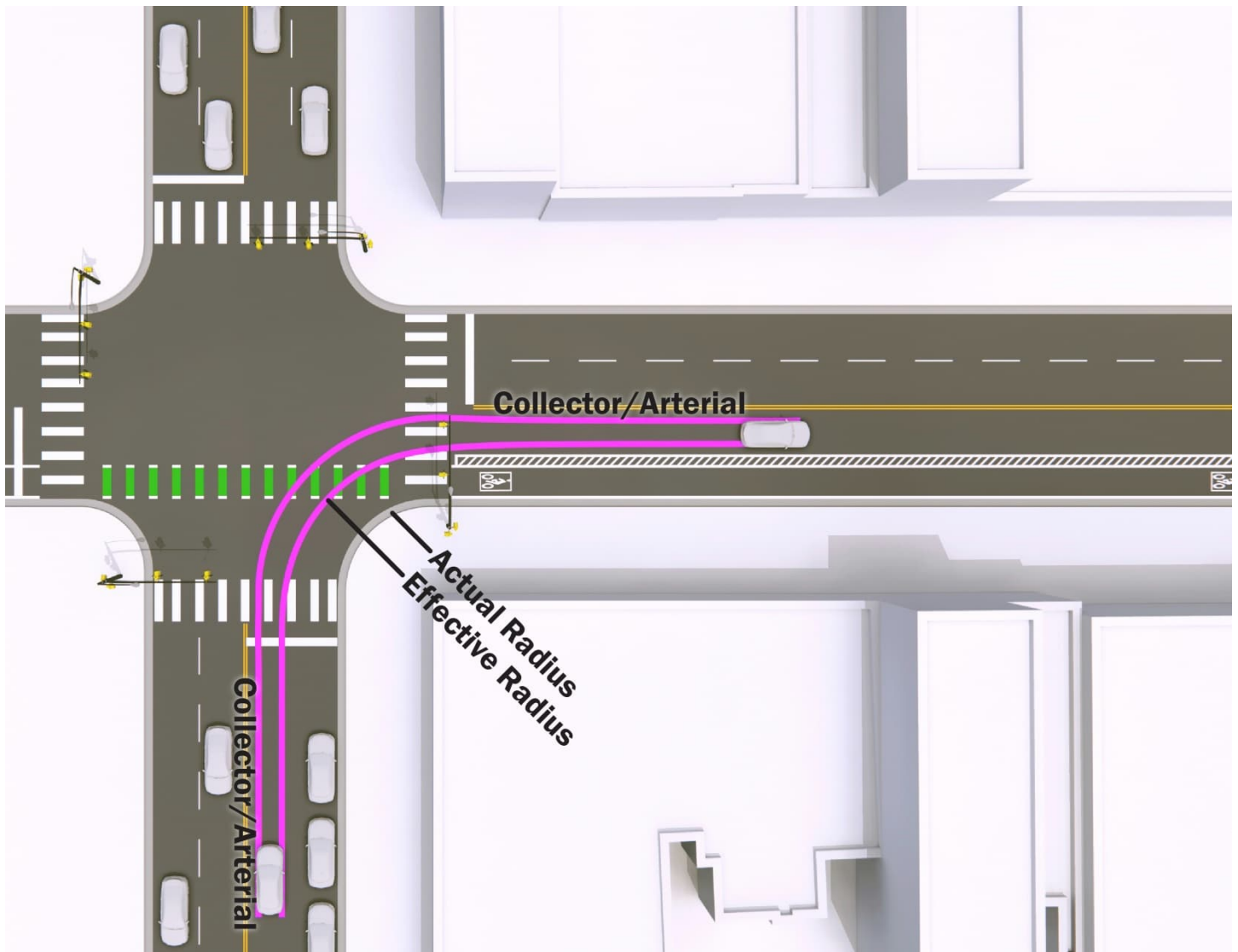
The Actual Radius will be determined by evaluating the Effective Radius. To determine the Effective Radius, the

Complete Streets Design Standards

Designer will use the identified Functional Classification, Street Type, Roadway Zone uses, and Design Vehicle, and apply the Lane Encroachment Policy. On Denver streets, the minimum Actual Radius is 5 feet, and the maximum Effective Radius is 34 feet. The Designer should confirm with DOTI the minimum radius for intersections with State Highways. The Design should select the smallest Actual Radius to accommodate the required Effective Radius of the target vehicle, considering the allowed lane encroachment. If the difference between the Effective Radius and the Actual Radius is fifteen feet or more, the Designer should consider street design elements, such as corner islands, turn wedges, curb extensions, and truck aprons, to achieve the minimum Effective Radius and the smallest Actual Radius. In situations where there is a future Mode-Specific Travelway and/or Curb Space use recommended in Denver planning documents, the Designer should confirm with DOTI whether to incorporate the future use in the design prior to selecting the Effective Radius.

Figure 3-2: Actual vs. Effective Radius illustrates the Actual Radius and the Effective Radius at an intersection.

Figure 3-2: Actual vs. Effective Radius Compound Curve Corners



When the Designer needs to accommodate the turning movements of tractor-trailer vehicles at an intersection, the Designer may use two or three curves at the corner to best match the swept path of the vehicle. This design

technique allows for smaller radius corners while also allowing larger vehicles to turn. This is especially useful when the Effective Radius and Actual Radius are the same or close to the same size.

Reference

AASHTO *A Policy on Geometric Design of Highways and Streets*, Three Centered Curve

F. Lane Encroachment Policy at Intersections

Lane encroachment occurs when a vehicle overlaps into adjacent or oncoming General Travelway lanes. The Designer should apply the Lane Encroachment Policy while also considering Functional Classification, Street Type, Mode-Specific Travelway uses, and/or Curb Space uses. DOTI organized this section by smallest to largest Design Vehicle, and it outlines when DOTI allows each vehicle type to encroach into adjacent or oncoming General Travelway lanes, enabling the Designer to use the smallest Actual Radius at an intersection corner. Table 3-2: Lane Encroachment Matrix shows a summary of the Lane Encroachment Policy. When considering allowable lane encroachments, DOTI prefers button hook turns versus jug handle, as the preference is to have encroachment occur on the lower volume roadway.

Table 3-2: Lane Encroachment Matrix

Intersection Street Classification & Control	Allowed Encroachment		
	Managed Vehicle	Design Vehicle	Control Vehicle
Low Volume Local/Local Intersections	None	Entire width of departing and receiving general travelway lanes, including oncoming general travelway lanes.	Entire width of departing and receiving general travelway lanes, including oncoming general travelway lanes.
Stop-Controlled Minor Leg	None	Entire width of departing and receiving general travelway lanes of the minor leg.	Adjacent departing and receiving general travelway lanes of the minor leg.
Signalized Intersection with a Local Street	None	None	Adjacent general travelway lanes on the departing and receiving street.
Signalized Intersection with Multiple Departing Lanes and a Local Street	None	None	Adjacent general travelway lanes on the departing and receiving streets.
Signalized Intersection with Multiple Departing and Receiving Lanes	None	Entire width of receiving general travelway lanes.	Adjacent general travelway lanes on the departing and receiving streets.

i Managed Vehicle

The Designer shall design intersection corners so that the Managed Vehicle can negotiate a turn without lane encroachment, with no exceptions.

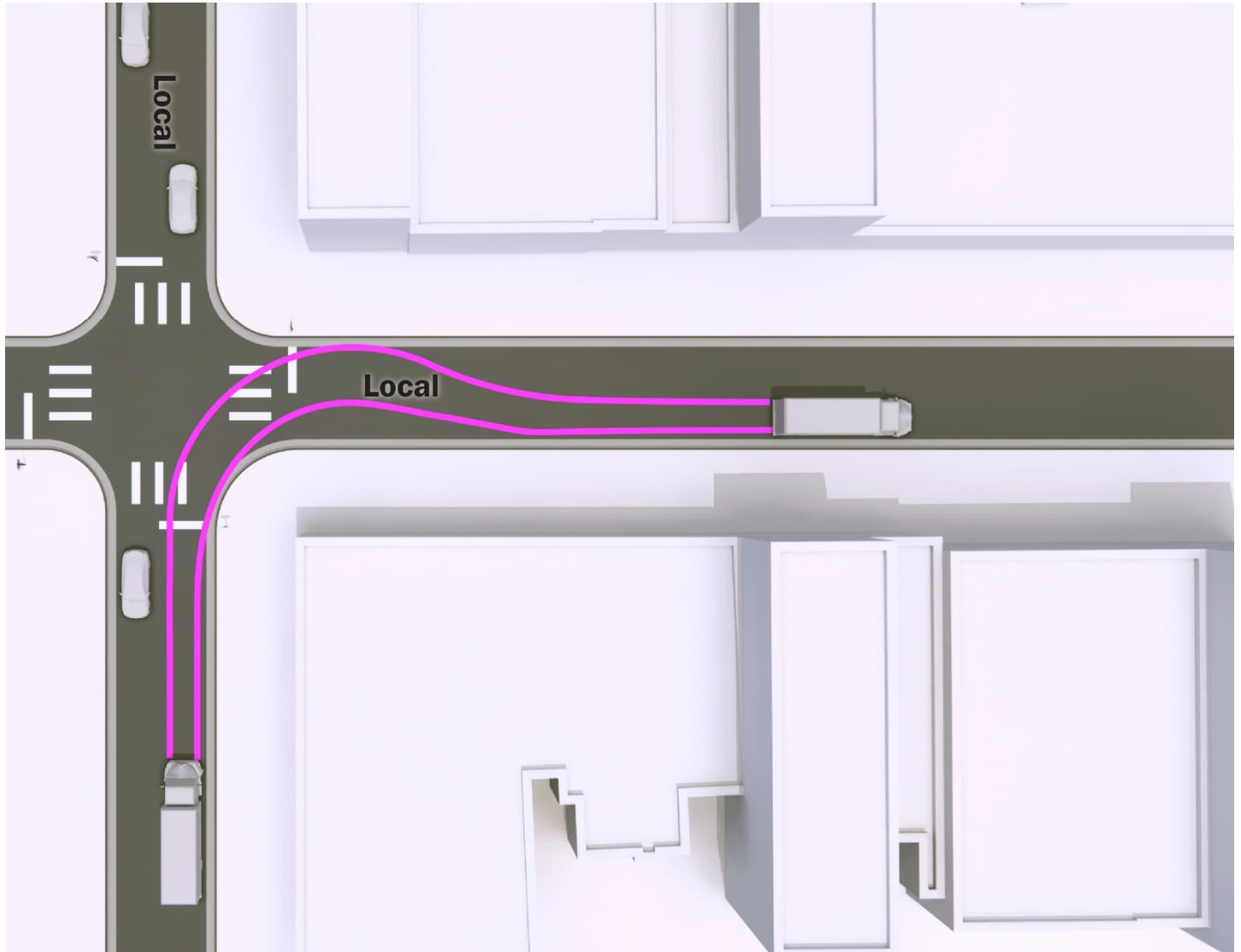
ii Design Vehicle

The Designer shall design the intersection corner so that the Design Vehicle can negotiate a turn without lane encroachment into an adjacent or oncoming General Travelway lane, with the following exceptions:

a) Low Volume Local/Local Intersections

Local/Local Intersections with two-way traffic, the Design Vehicle can use the entire width of the departing and receiving lanes, including oncoming travel lanes, to negotiate the turn. The minimum throat width controls the Local/Local intersection dimensions, resulting in zero encroachment for managed vehicles, and the standard design vehicle is less common at Local/Local intersections. Local/Local intersections also have lower ADTs. Refer to Figure 3-3: Design Vehicle Encroachment at Low-Volume Local/Local Intersections.

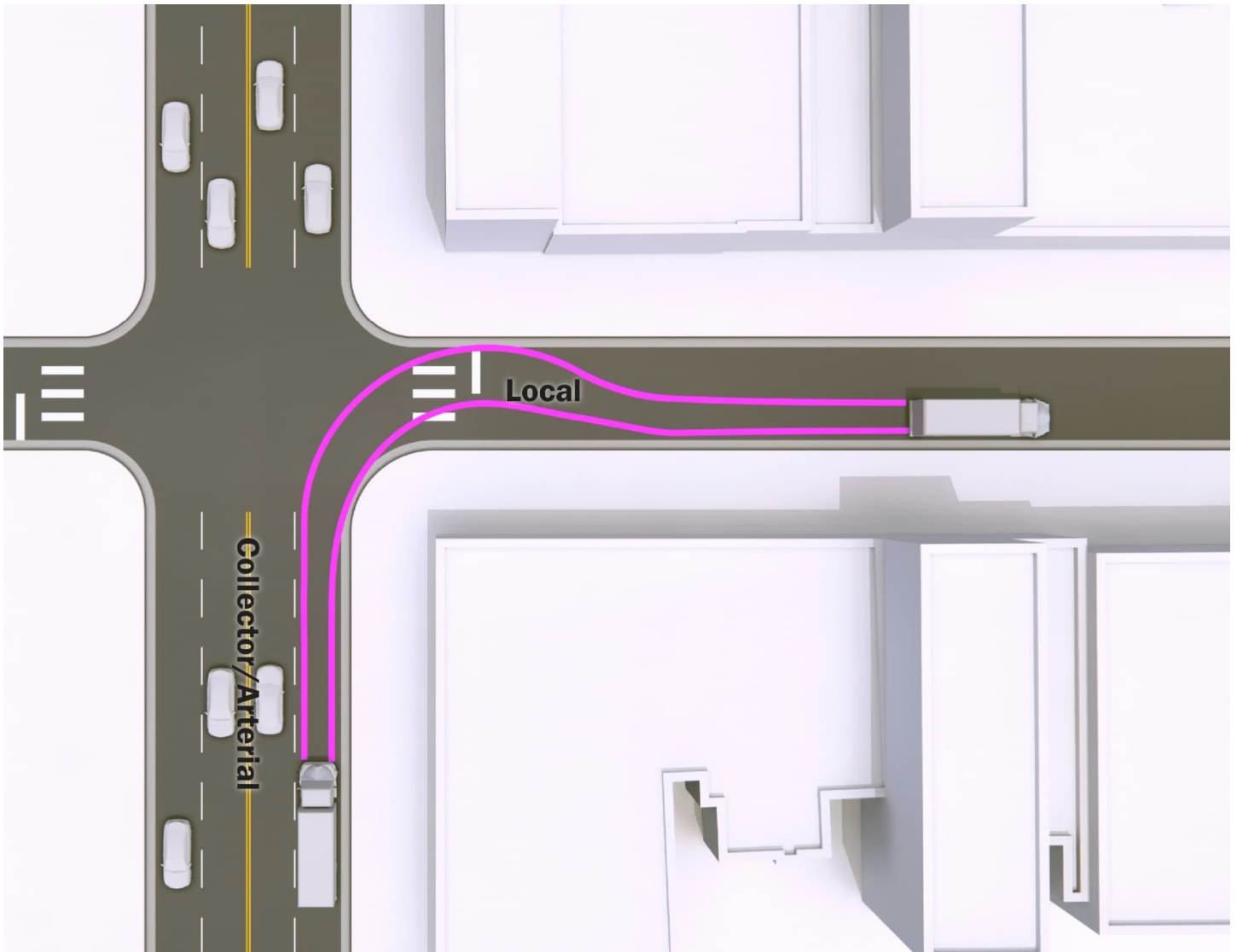
Figure 3-3: Design Vehicle Encroachment at Low-Volume Local/Local Intersections



b) Stop-Controlled Minor Leg

At intersections where the minor leg is a local street and stop controlled, and the major leg is uncontrolled, the Design Vehicle can use the entire width of the minor leg, including oncoming travel lanes, for receiving to negotiate the turn from the major leg. The Design Vehicle can also use the entire width of the minor leg, including oncoming traffic lanes, for departing to negotiate the turn to the major leg. Refer to Figure 3-4: Design Vehicle Encroachment at Stop-Controlled Minor Leg.

Figure 3-4: Design Vehicle Encroachment at Stop-Controlled Minor Leg

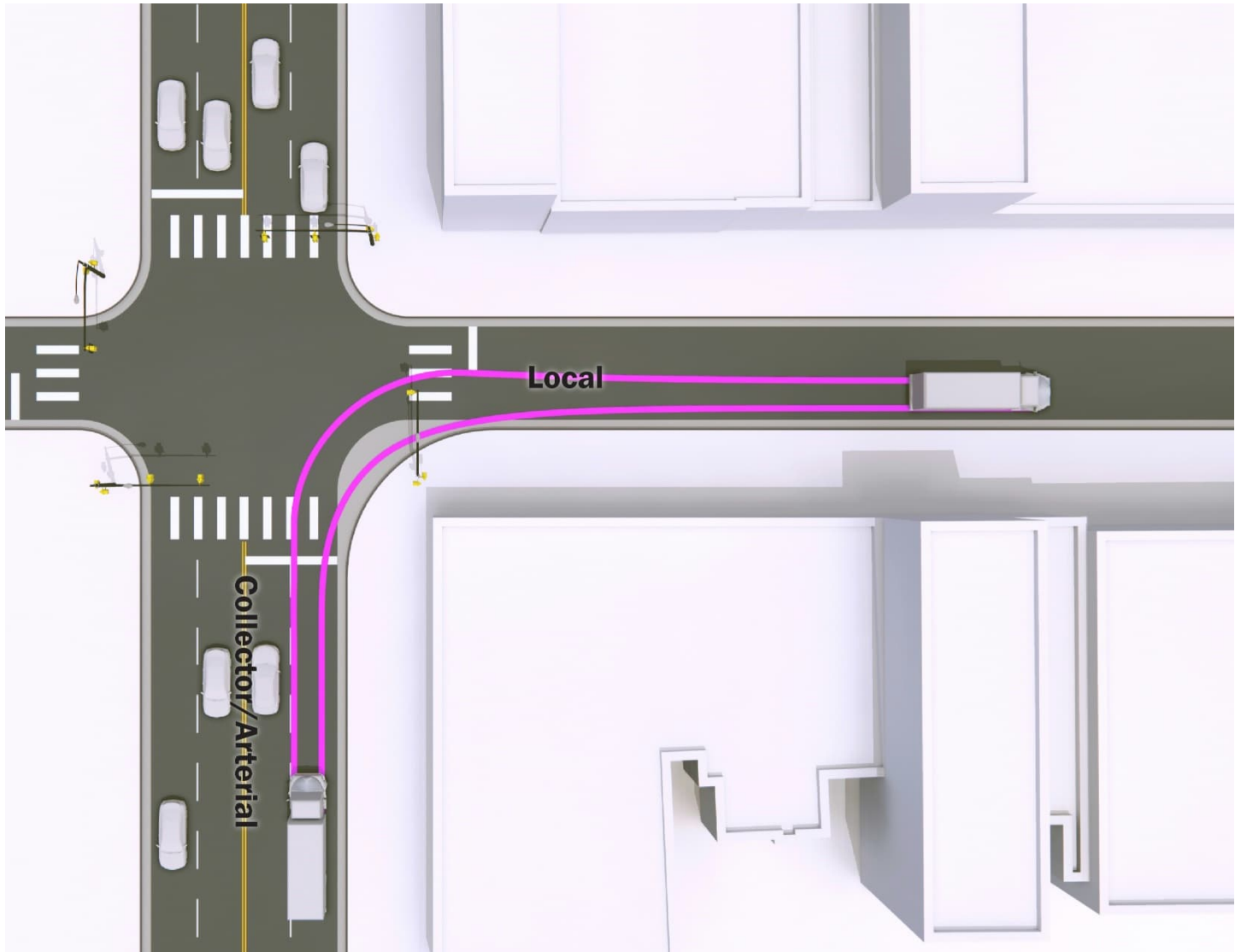


c) Signalized Intersection with a Single Receiving Lane on a Local Street

At a signalized intersection where the receiving street is a local street with a single receiving lane, DOTI does not permit lane encroachment into the opposing traffic lane. Refer to Figure 3-5: Design Vehicle Encroachment at Signalized Intersection with a Single Receiving Lane on a Local Street.

In some cases, the Designer may use a mountable truck apron or a channelized right-turn lane with a raised crossing and a right-angle approach to help provide an increased Effective Radius for the Design Vehicle when other options are not feasible.

Figure 3-5: Design Vehicle Encroachment at Signalized Intersection with a Single Receiving Lane on a Local Street

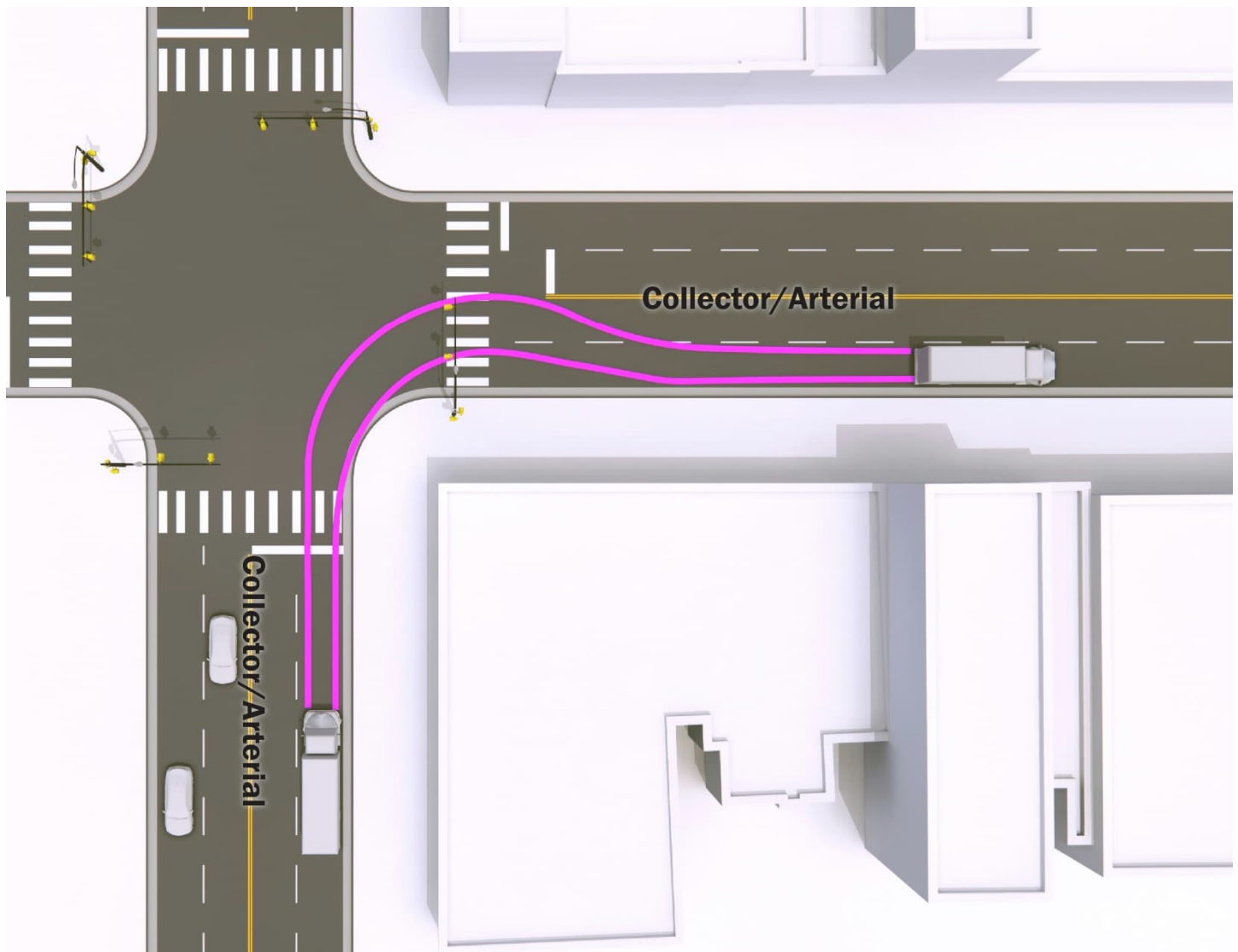


d) Signalized Intersection with Multiple Departing and Receiving Lanes

At a signalized intersection where the receiving street has multiple receiving lanes, the Design Vehicle can utilize multiple receiving lanes. On a street with a single departure lane, DOTI does not permit lane encroachment into the opposing traffic lane. On a street with multiple departure lanes, DOTI does not permit lane encroachment into the adjacent travel lane.

It may be necessary to recess a stop bar or a portion of a stop bar on the intersecting street if the Design Vehicle makes regular turns at the intersection. The Designer should only use this strategy at locations where vehicle encroachment over a stop bar would occur regularly and present operational or safety issues if not corrected. The maximum stop bar setback is 15 feet, measured from the approach edge of the marked crosswalk. Refer to Figure 3-6: Design Vehicle Encroachment at Signalized Intersection with Multiple Departing and Receiving Lanes.

Figure 3-6: Design Vehicle Encroachment at Signalized Intersection with Multiple Departing and Receiving Lanes



iii Control Vehicle

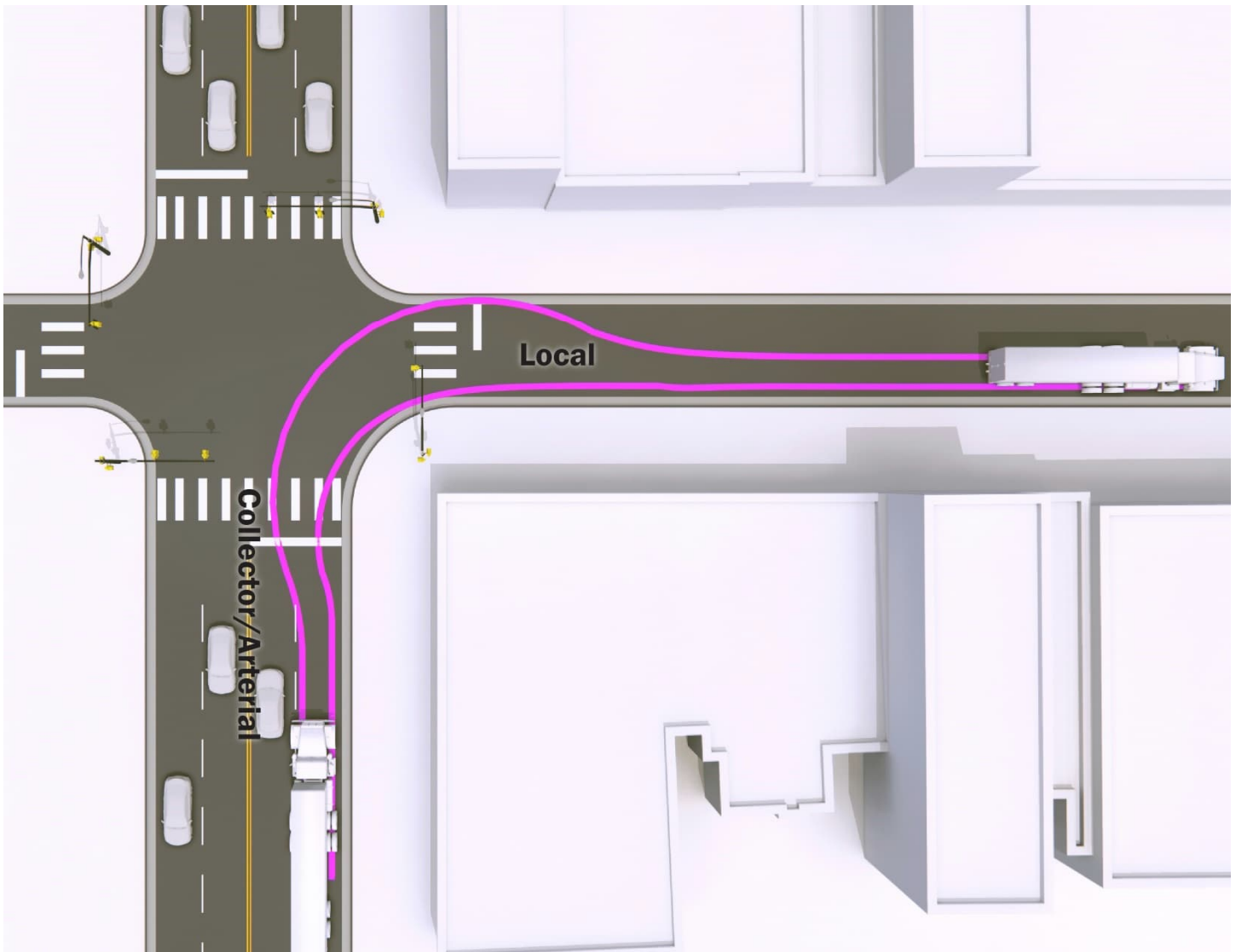
The Designer shall design the intersection corner so that the Control Vehicle can negotiate a turn with lane encroachment. DOTI allows the Control Vehicle to use adjacent lanes on the departing and receiving street at all intersections.

- Emergency vehicles can use the curb-to-curb width to negotiate turns, including all adjacent and oncoming travel lanes.
- At a skewed intersection, Denver Fire Aerial Platform Truck needs to be able to make all turns. The additional Control Vehicle, WB-50, needs to be able to make either a left- or right-turn from the minor approach.
- Restricting turns may be necessary for acute angle turns at skewed intersections or when considering the use of traffic calming elements on a Local Street.
- In some cases, the Designer may use a mountable truck apron or a channelized right-turn lane with a raised crossing and a right-angle approach to help provide an increased Effective Radius for the Control Vehicle when other options are not feasible.

a) **Signalized Intersection with Multiple Departing Lanes and a Single Receiving Lane on a Local Street**

Control Vehicle may use the entire curb-to-curb width on a Local Street and encroach into the adjacent departing lane upon initiating the turn. Refer to Figure 3-7: Control Vehicle Encroachment at Signalized Intersection with Multiple Departing and Single Receiving Lane on a Local Street.

Figure 3-7: Control Vehicle Encroachment at Signalized Intersection with Multiple Departing and Single Receiving Lane on a Local Street



G. Lane Encroachment Policy at Mid-block

Mid-block lane encroachment is important to review when designing roadways with horizontal curvature. Lane widths through the curved section of the roadway may need to be wider depending upon the size of the Design and Control Vehicles, the posted speed of the roadway, and the size of the horizontal curvature. The Designer must meet the following mid-block lane encroachment criteria:

- No portion of the Design or Control Vehicle may overhang beyond the face of the curb.
- The wheel path of the Design Vehicle may not utilize the gutter pans where an inlet is present.
- The Designer must provide at least one foot of lateral clearance from the Design and Control Vehicle body to the roadway centerline or any obstruction.

H. Curb Ramps

A curb ramp is a solid ramp graded down from the top surface of a sidewalk to the surface of an adjoining street.

Design Considerations

- The Designer must include Curb Ramps at all crosswalks, whether marked or unmarked, where there is a pedestrian route.

Reference

- PROWAG

Transportation Standard Drawings: 7.0a, 7.0b, and 7.0c (General Notes for Curb Ramps), 7.1 (Curb Ramp Type 1), 7.2a (Curb Ramp Type 2), 7.2b (Curb Ramp Type 2 Modified), 7.3 (Curb Ramp Type 3), 7.4 (Curb Ramp Type 4), 7.5 (Curb Ramp at Downtown Signalized Corner Blended Transition), 7.6a and 7.6b (Curb Ramp Truncated Dome Placement Options), 7.7 (Curb Ramp Typical Section), and 7.8 (Typical Sidewalk Transitions to Curb Ramp Landing).

I. Corner Sight Triangles, Intersection Sight Distance, and Daylighting

i Corner Sight Triangles and Intersection Sight Distance

A Corner Sight Triangle is a triangular-shaped area on the corner of an intersection formed by measuring the prescribed distance from the intersection of the approach street and cross street, an intersecting alley, or an intersecting driveway and connecting the lines diagonally across the property, making an approximate 90-degree triangle, where obstructions are prohibited to ensure visibility in the sight triangle.

Intersection Sight Distance is the unobstructed distance a motorist can see approaching vehicles at an intersection. The driver of a vehicle approaching or departing from a stopped position at an intersection should have an unobstructed view of the intersection, including any traffic control devices, and sufficient lengths along the intersecting roadway to permit the driver to anticipate and avoid potential collisions.

ii Daylighting

Daylighting improves visibility for drivers at intersections and crosswalks by increasing the distance it is legal to park a vehicle near the intersection.

Complete Streets Design Standards

Design Considerations

The Designer shall apply the following minimum distances per the DRMC on any street with on-street parking near the intersection.

- 20 feet from stop sign when present.
- 20 feet from edge of curb ramp.
- 10 feet from fire hydrants.
- 5 feet from curb cuts and alleys.

References

- Denver Revised Municipal Code
- DOTI Rules and Regulations Governing Encroachment & Encumbrances in the Public Right-of-Way
- DOTI Rules and Regulations Pertaining to the Administration of a Bicycle Parking Program by the DOTI City Traffic Engineer
- AASHTO *A Policy on Geometric Design of Highways and Streets*

Transportation Standard Drawings: 14.0 (Sight Triangles).

J. Permanent versus Interim Installations

The Designer should use permanent materials (e.g., concrete curb for curb extensions) that have preferred dimensions for street improvements. However, DOTI recognizes that existing site constraints, project limits, project types (reconstruction vs. retrofit), maintenance considerations, and the project sponsor (e.g., Denver or private developer) will influence the selection of a preferred design strategy. While DOTI prefers permanent treatments for all projects, DOTI may install interim treatments to achieve its modal and safety goals or to address urgent safety needs. DOTI must approval all interim treatments.

Chapter 4: Street Design Elements

This chapter contains various street design elements that may be appropriate to achieve Street Type and/or Overlay priorities. The Designer should reference the CSDG for information on which street design elements may be appropriate for each Street Type and/or Overlay. Site-specific conditions and goals, as well as engineering judgment, should dictate which street design elements are most appropriate.

Each street design element listed below has the following components:

- Description: Brief explanation of the physical characteristic of the street design element.
- Use: Benefits of the design element installation.
- Minimum Criteria: Provides information on when and/or where DOTI prohibits a street design element or if there is a specific condition warranting the treatment.
- Design Requirements: Minimum design considerations before the Designer to consider in addition to the TSD, if provided.
- Reference: Additional policies and or guidance the Designer should consult when considering incorporation of a street design element.
- Transportation Standard Drawing (TSD): The drawing number.
- Graphic or Photo: Provided for illustrative purposes only when no TSD is available.

For design elements not explicitly addressed in these Standards or referenced in other Denver standards, DOTI may direct the Designer to use national guides to supplement these Standards.

DOTI is more likely to approve pilot treatments that use interim materials. DOTI must approve the design and materials for the installation of pilot treatments.

A. Truck Aprons

A truck apron offers tighter turning radii for the Managed Vehicle while still allowing large trucks to mount the apron and maneuver through turns.

Use

- Increase the Effective Radius where a smaller Actual Radius for the Managed Vehicle is desired.
- Reduce conflicts between turning motorists and people bicycling, walking, or using EPAMDs at intersections with large actual radii corners.
- At intersections where motor vehicles turn and cross a protected bikeway. Refer to the *Denver Bikeway Design Manual* for more information.

Minimum Criteria

- The Designer may consider a truck apron on any Street Type and classification.

Complete Streets Design Standards

Design Requirements

- Corner radius design must meet the design criteria described in Chapter 3.D. Design Vehicle and Chapter 3.E. Corner Radius.
- The Effective Radius should accommodate the Design Vehicle and establish the full-height curb along the back of the apron.
- The Actual Radius should accommodate the Managed Vehicle and establish the front of the apron.
- The Designer should ensure that the Control Vehicle will not mount or overhang any portion of the pedestrian areas at a corner with a truck apron.
- The Designer should carefully consider ADA requirements with curb ramps and truck aprons. Curb ramp locations should not be excessively set back from the intersection to accommodate truck aprons.

Reference

- *Denver Bikeway Design Manual*

Transportation Standard Drawings: 5.1 (Truck Apron).

B. Curb Extensions

A curb extension extends the curb line and sidewalk area into the roadway at an intersection. A curb extension can be a corner island, a raised area inside an intersection, or a wedge. Turn Wedges are similar to corner islands but use interim materials, such as paint, flex posts, and rubber speed cushions at street level.

Use

- Shorten crosswalk length.
- Improve visibility between people using the sidewalk and motorists.
- Reduce right-turning motor vehicle speed.
- Provide additional space for directional ramps.
- Prevent motorists from parking or stopping illegally.
- Provide amenity space.
- Improve emergency access by restricting parking at intersection corners and by providing easy access to fire hydrants.
- Provide bus bulb.

Minimum Criteria

- The Designer may consider a curb extension on any Street Type and classification.
- Meet minimum throat width dimensions at two-way, single-lane intersection approaches:
 - Striping only: 20 feet minimum
 - Striping plus vertical elements (flex posts): 20 feet minimum plus 2-foot offset for flex posts from striping (24 feet)
 - Hard vertical curb faces: minimum 25 feet (two-way), 20 feet (one-way)

Complete Streets Design Standards

Design Requirements

- Corner radius design must meet the design criteria described in Chapter 3.D. Design Vehicle and Chapter 3.E. Corner Radius.
- Review Overlays and Denver Plans for future mobility needs.
- The Designer should consider motorists looking to overtake right- or left-turning vehicles waiting to make turns when setting the width of the extension. DOTI must approve treatment materials (i.e., permanent vs. interim).
- The Designer must include new inlets and storm drains for any new low points created by a curb extension. DOTI may require storm analysis, and the Designer should consider the use of green infrastructure.
- When used with a bikeway, refer to the Denver *Bikeway Design Manual*.
- When used as a bus bulb, the Designer should extend the curb extension for the full length of a bus stop boarding area with appropriate curb height.

Reference

- *Denver Bikeway Design Manual*
- *Denver Uncontrolled Pedestrian Crossing Guidelines*
- DOTI Traffic Signal, Sign, & Marking Standards
- *RTD Bus Infrastructure Design Guidelines and Criteria*
- *RTD Bus Infrastructure Standard Drawings*
- *Denver Transit Design Guidelines*

Transportation Standard Drawings: 5.0 (Curb Extension).

C. Bicycle and EPAMD Parking Areas

Bicycle and Electrical Personal Assistive Device (EPAMD) parking areas are designated areas for people to securely park and lock bicycles or EPAMDs, such as e-bicycles and scooters, for short-term uses.

Use

- Encourage bicycling and other non-vehicular motorized modes.

Minimum Criteria

- The Designer can consider bicycle and EPAMD parking areas on all street types.
- The Designer must meet minimum placement criteria per DOTI Traffic Signal, Sign, & Marking Standards.
- DOTI recommends short-term bicycle/EPAMD parking in areas zoned mixed-use, near existing bicycle infrastructure, and on bicycle routes.

Complete Streets Design Standards

Design Requirements

- Bicycle racks may be in the Amenity Zone per DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right-of-Way.
- Bicycle corrals may be in the Curb Space when there is insufficient Amenity Zone space and when there is a buffer between the Curb Space and the General Travelway lane.
- Bicycle corrals may be in a protected bikeway buffer when there is sufficient space within the buffer.
- Re-constructed Amenity Zone or Curb Space adjacent to bicycle lanes should include consideration for below or above-curb bicycle parking.

References

- DOTI Rules and Regulations Pertaining to the Administration of a Bicycle Parking Program by the DOTI City Traffic Engineer
- DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right-of-Way
- Denver *Curbside Action Plan*
- DOTI Traffic Signal, Sign, & Marking Standards

D. Electric Vehicle Charging Stations

An electric vehicle charging station is a designated parking area where drivers can charge electric vehicles.

Use

- To encourage electric vehicles.

Minimum Criteria

- The Designer may consider an electric vehicle charging station on Arterials and Collectors only.
- In locations with high parking demand.
- In locations where DOTI allows on-street parking.
- Utility feeder lines and transformers must be available.

Design Requirements

- The Designer shall install charging units in the Amenity Zone and mount them directly on the pavement or on a pole and place the units no more than 10 inches behind the curb.
- The Designer shall coordinate with the adjacent property owners and seek an Encroachment Permit, which specifies ownership and maintenance responsibilities.
- Charging stations shall use a Level 2 charger or better and DC chargers when possible.
- The Designer shall include signs to delineate electric vehicle parking and provide instructions for use and time limits.
- The Designer shall incorporate proper cord management systems to mitigate safety hazards.

References

- Denver *Electric Vehicle (EV) Action Plan*
- DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right of Way

E. On-Street Parking

i Unpaid On-Street Parking

On-street parking is an area for vehicles to park on a public street, typically where parking lots or limited off-street parking spaces.

Use

- Provide parking in high-demand parking areas with limited off-street parking.

Minimum Criteria

- The Designer may consider unpaid on-street parking on any Street Type with sufficient travel demand, street width, and satisfied modal priorities.
- To add or to remove on-street parking, the Designer must submit a parking utilization study for DOTI approval.
- To use on-street parking, available Curb Space must be 8 feet in width or greater. The Designer can consider a 7-foot-wide Curb Space on-street parking when adjacent to an 11' general travelway lane.
- DOTI must approve the removal of on-street parking to meet other Street Type and/or Overlay priorities.

Design Requirements

- When designing on-street parking adjacent to a conventional or protected bicycle lane, the Designer must consult the *Denver Bikeway Design Manual* for design requirements.
- When Daylighting an intersection, the Designer must place signs to prohibit parking in accordance with DOTI policy statements and intersection Sight Triangles.
- DOTI must approve head-in angled parking.
- Back-in angled parking shall be 9 feet wide, measured across the perpendicular angle, and 22 feet long, measured from edge of stripe perpendicular to face of curb, inclusive of a 2-foot buffer from edge line of parking to face of curb, and have a 60-degree angle. The Designer should place parking signs a minimum of 30 inches behind the curb in these locations for ease of maintenance.

References

- *Denver Curbside Action Plan*
- Americans with Disabilities Act of 1990
- *Denver Bikeway Design Manual*
- DOTI Traffic Signal, Sign, & Marking Standards

Transportation Standard Drawings: 14.0 (Sight Triangles).

ii Paid Parking

Paid parking is a parking management program to provide parking space turnover in areas with significant parking demand and to increase the likelihood that 1 to 2 parking spaces are available per block.

Use

- Encourage parking turnover in high-demand parking areas where residents and businesses need parking to access goods or services.
- Encourage the use of non-vehicle modes of transportation.

Complete Streets Design Standards

Minimum Criteria

- The Designer may consider paid parking on Arterial and Collector streets.
- The *Curbside Action Plan* can help the Designer determine where paid parking is appropriate.

Design Requirements

- If using individual meters, the Designer shall place a 38-inch pole within 3 feet of the front or rear of the parking space, and the controls shall align with the centerline of the pole.
- The Designers shall place meters, or mobile payment application signs a minimum of 36 inches behind the face of the curb and not adjacent to trees.
- If required, the Designer shall place pay stations throughout every block within the middle of the parking spaces they serve so pay stations are easy to locate.

References

- *Denver Curbside Action Plan*
- Neighborhood-level Curbside Action Plans
- DOTI Traffic Signal, Sign, & Marking Standards
- DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right of Way

F. Mobility Hubs

A mobility hub is a place of connectivity where different travel options – walking, biking, transit, and shared mobility – come together. It provides an integrated suite of mobility services, amenities, and supporting technologies to better connect high-frequency transit to an individual's origin of destination. Mobility hubs may also incorporate layover spaces for transit vehicles as well as transit operator break areas.

Use

- Encourage transit ridership.

Minimum Criteria

- The Designer may consider mobility hubs on Downtown, Main Street, Mixed Use, and Commercial Street Types.
- As a minimum, the cross section should include an Amenity Zone meeting the TSD Street Type minimum width.

Design Requirements

- The Designer shall place a mobility hub in the Amenity Zone with large buffer areas, within curb extensions and pedestrian plazas, and near high-frequency transit stops.
- The Designer shall provide two feet between the mobility hub amenities and the face of the curb.
- The Designer shall provide two feet between the mobility hub and the pedestrian path on sidewalks in high-volume pedestrian areas.
- The Designer shall provide three feet of clearance between the edge of a mobility hub and the designated parking area or other vertical streetscape element.

Complete Streets Design Standards

- The Designer should not place a mobility hub below the curb, especially on a high-volume street; however, DOTI allows hub components in parking lanes when there is not adequate room in the Daylighting areas. Refer to Bicycle and EPAMD Parking for more information.
- Mobility hub elements shall not obstruct the ADA front and rear door boarding areas for buses.
- The Designer should clearly delineate a mobility hub with wayfinding and other signage or, where more architecturally developed, by placemaking elements, such as structures, landscaping, and pavement materials.

References

- *Denver Curbside Action Plan*
- DOTI Rules and Regulations Pertaining to the Administration of a Bicycle Parking Program by the DOTI City Traffic Engineer
- DOTI Traffic Signal, Sign, & Marking Standards
- DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right of Way
- *RTD Bus Infrastructure Design Guidelines and Criteria*
- *RTD Bus Infrastructure Standard Drawings*
- *Denver Transit Design Guidelines*

G. Street Trees and Supporting Infrastructure

Through the development and permitting process, the city forester may require the planting of trees on the public ROW or other public places in the city, per DRMC Sec. 57-19.

Use

- Trees provide a wide range of environmental, social, and economic benefits to Denver’s residents, visitors, and the community.

Minimum Criteria

- The Designer should consider street trees and supporting infrastructure on all streets.

Design Requirements

- Tree locations must accommodate emergency vehicles, sight triangles, transit stops, and utility equipment requirements.
- DOTI and the OCF must approve the use of tree grates.
- Where used, all grates must be slip-resistant and are not part of the ADA PAR.
- The Designer should incorporate the installation of soil media at the completion of other sitework to prevent premature compaction and clogging and provide an executed maintenance plan.
- The Designer shall consider new plantings that are responsive to the original design intent of the streetscape while also providing species diversity.

Complete Streets Design Standards

- The Designer should incorporate existing tree preservation in all proposals. Tree condition, size, and species shall be the primary determining factors for preservation.
- If planted within an established district, such as a Business Improvement District or a Local Maintenance District, the Designer acknowledges that the installation of new plantings that yield new or unique maintenance tasks will require review and coordination with the district and may require an Encroachment Permit.

References

- Denver *Game Plan for a Healthy City*
- Denver Office of the City Forester *Rules and Regulations*
- DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right-of-Way

Transportation Standard Drawings: 14.0 (Sight Triangles).

H. Transit Stop Shelters

An enclosure to provide a designated waiting/rest area and to safeguard commuters from weather conditions. Benches, trash, recycling receptacles, and bicycle parking are other amenities that are often co-located with transit stop shelters to provide additional comfort and functionality to the public transit system.

Use

- Encourage transit ridership.

Minimum Criteria

- The Designer may consider transit stop shelters Arterials and Collectors, and on Local streets with DOTI approval.
- The Designer should install transit stop shelters near schools, community and senior centers, and hospitals.

Design Requirements

- The Designer should include transit stop shelters at any transit stop location but shall include stops with 40 or more passenger boardings per day.
- All new and relocated transit stops and shelters must meet ADA requirements for boarding/alighting areas and shelter access.
- The Designer shall meet the requirements of the Transit and RTD *Bus Infrastructure Standard Drawings*.
- The Designer shall preserve a clear pedestrian access aisle of a minimum of 5 feet wide behind or in front of the bus shelter.
- The Designer shall provide at least 15 feet between the edge of the shelter and the crosswalks to maintain adequate visibility.
- For accessible bus boarding, the vertical step between the sidewalk or platform and the vehicle ramp must be less than 5/8 inch.
- The Designer should consult with DOTI to identify additional transit stop amenities to include.
- Designer should confirm the maintenance responsibility of proposed transit stop shelters and other amenities.

Complete Streets Design Standards

- Signs prohibiting parking shall be located at least 30 feet ahead of the transit stop signage and 45 feet behind the transit stop signage or 65 feet behind signage on routes with articulated buses.
- The Designer shall consult the Denver Bikeway Design Manual for design requirements relating to transit stops along bikeways.

References

- *RTD Bus Infrastructure Design Guidelines and Criteria*
- *RTD Bus Infrastructure Standard Drawings*
- *Denver Bikeway Design Manual*
- *Denver Transit Design Guidelines*

Transportation Standard Drawings: 9.0a (Typical Concrete Bus Pullout with Detached Sidewalk), 9.0b (Typical Concrete Bus Pullout with Attached Sidewalk), and 9.1 (Typical Concrete Bus Pad in Asphalt Roadway).

I. Diverters for Access Control

A diverter is a vertical delineation built within a street that controls certain access through and/or turning movements at an intersection.

Use

- To shift traffic to higher capacity streets, such as Collector or Arterial streets, where lower volume streets have traffic volumes that exceed those recommended for that street based on classification and function.
- To encourage walking, bicycling, and other forms of mobility.

Minimum Criteria

- The Designer may consider diverters on Local Streets where volumes are above 3,000 vehicles per day with an analysis and DOTI City Traffic Engineer approval and on Shared Street with volumes greater than 400 vehicles per day.
- The Designer may consider a diverter on streets with neighborhood bikeways with volumes greater than 2,000 vehicles per day.
- DOTI must approve the use of diverters on all street classifications. A diversion traffic study may be required.

Design Requirements

- Diverter designs may restrict one or more directions of travel but must provide at least one of a left-turn, right-turn, and/or through movement for all vehicle intersection approaches.
- A dead end or a cul-de-sac is not a diverter.
- The Designer must provide accessible routes through the diverter for people using mobility devices.
- The Designer may need to accommodate the passage of fire and other emergency vehicles through the diverter with a space that is mountable and clear of landscaping and rigid vertical elements for emergency through vehicle movement.
- If the street is also a bikeway, refer to the Denver Bikeway Design Manual.

Complete Streets Design Standards

- The Designer may use a mountable curb to keep motor vehicle routes narrow and to provide enough space for emergency vehicles, larger delivery vehicles, and maintenance vehicle turning movements.
- The Designer shall use bicycle and pedestrian crossing warning signs (W11-2 or W11-15) when warranted by the Denver *Uncontrolled Pedestrian Crossing Guidelines*.

Reference

- Denver *Bikeway Design Manual*
- Denver *Uncontrolled Pedestrian Crossing Guidelines*

J. Bioretention Facilities

Landscaped depressions that use engineered soils and specific plants to store, infiltrate, and filter stormwater and to remove pollutants.

Use

- To control stormwater runoff.
- To improve the environment.
- To mitigate urban heat island effects.

Minimum Criteria

- The Designer can consider bioretention on any street.
- The Designer shall consider the integration of bioretention into all street designs within curb extensions or the Amenity Zone.
- The Designer may use bioretention to improve water quality as required on some projects or without water quality requirements. DOTI requires drainage calculations to demonstrate impacts on the overall drainage system.
- A bioretention facility must consider safety risks to pedestrians and motor vehicles when adding depressed areas, vertical curbs, and/or walls with blunt ends and potential trip hazards.
- A maintenance plan is required.

Design Requirements

- A bioretention facility must not interfere with the PAR when proposed within existing Tree Protection Zones.
- DOTI will require most projects disturbing greater than 1.0 acre of soil to provide post-construction water quality treatment on-site and bioretention as a pathway for compliance.
- The Designer shall use native pollinator plants when the design includes vegetation to support beneficial insects important to ecosystem health.
- Vegetation shall be suited to the conditions of the site and maintenance requirements.
- If planted within an established district, such as a Business Improvement District or a Local Maintenance District, the Designer acknowledges that the installation of new plantings that yield new or unique maintenance tasks will require review and coordination with the district and may require an Encroachment Permit.
- The Designer must design bioretention facilities to prioritize safety, aesthetics, and long-term maintenance,

Complete Streets Design Standards

in addition to functionality.

- Bioretention infiltration treatments located adjacent to building foundations shall consider impermeable lines, building drainage infrastructure, roof drainage and runoff, waterproofing of the foundation, and existing underground utilities.
- Bioretention facilities should not infiltrate water into the subbase or base course of a roadway.
- The Designer shall calculate treatments and design for the expected volume of stormwater, including overflow underdrain piping mechanisms where necessary.
- Bioretention facilities should drain surface water within 12 hours after storm events to prevent insect habitat and bacteria accumulation.
- The Designer shall provide inlet curb cut openings to effectively channel stormwater into the adjacent stormwater feature by achieving at least a 2-inch drop in grade between the uninterrupted flowline of the street at the curb cut and the finished surface of the feature and an inlet width of at least 18 inches should be provided to reduce the likelihood of clogging. The curb cut surface area should slope downward into the feature.
- The Designer shall check dams or serpentine swale alignments to control stormwater flow within linear swales on longitudinal slopes of 2 to 5 percent.

References

- Denver *Ultra-Urban Green Infrastructure Guidelines*
- Mile High Flood District *Urban Storm Drainage Criteria Manual*
- Denver *Green Continuum Streets Guidelines*
- *City and County of Denver Storm Drainage Design & Technical Criteria*

Transportation Standard Drawings: 14.0 (Sight Triangles).

K. Pervious Paving

Pervious paving is a paving material that allows water to pass into the ground. It is a component of green infrastructure, especially in urban areas, where hardscape features provide access.

Use

- To provide stormwater infiltration and reduce surface runoff in areas that require hardscape or paved surfaces.
- To help eliminate puddling and freezing and may reduce winter salt and sand use, as pervious paving allows snow and ice melt to infiltrate directly into the paving surface.

Minimum Criteria

- The Designer may consider pervious paving where slopes do not exceed 5 percent and only at the following locations within the ROW:
 - Gutters or parking lanes along the curb that are not part of the allowable lane encroachment or as transit stops.
 - Suspended paving systems and Amenity Zones paving.
- A DOTI approved plan for the short- and long-term maintenance of the pervious paving is required.

Complete Streets Design Standards

Design Requirements

- The Designer should consider pervious paving in the Amenity Zone where longitudinal slopes are less than 5 percent.
- Extreme weather climates can hamper the pervious effectiveness by the accumulation of particulates (sand, dirt, salt), reducing the ability of the pavement to mitigate runoff. Design should include maintenance of system to mitigate particulates and maintain permeability.
- The Designer shall tie underdrains into traditional drainage systems or filtration areas for control of extreme stormwater inundation.
- The Designer must adjust the number and dimensions of pervious paving installations according to stormwater management goals for the streetscape.
- The Designer must design pervious paving surface area and underground volume according to calculated runoff volume requirements for the streetscape.
- DOTI does not allow pervious paving as the PAR; PAR must be concrete sidewalks.
- The Designer should consider whether infiltration from pervious pavers will impact structures and roadway elements.

References

- Denver *Ultra Urban Green Infrastructure Guidelines*
- Mile High Flood District *Urban Storm Drainage Criteria Manual* Denver *Green Continuum Streets Guidelines*
- *City and County of Denver Storm Drainage Design & Technical Criteria*

Transportation Standard Drawings: 13.0 (Tree Planter (Raised Curb)), 13.1 (Tree Planter (Grates)), 13.2 (Flush Tree Planter (Grates)), and 13.3 (Flush Tree Planter (Without Grates)).

L. Hardened Centerlines

A hardened centerline is a vertical element, such as a curb or flex post.

Use

- To encourage turning drivers to slow down.
- To discourage drivers from crossing double yellow lines when making turning movements.
- To improve sight lines for drivers and to increase the available time to react to pedestrians within a crosswalk.
- A hardened centerline may provide additional access control at driveways near intersections. In this case, DOTI may require additional signing at curb cuts.

Minimum Criteria for Installation

- The Designer can only consider hardened centerline treatments on streets that are eligible for striping.
- The Designer should include a hardened centerline at intersections with instances of crashes involving people walking or rolling and left-turning motor vehicles, or with high volumes of people walking, rolling, or biking crossing the street.

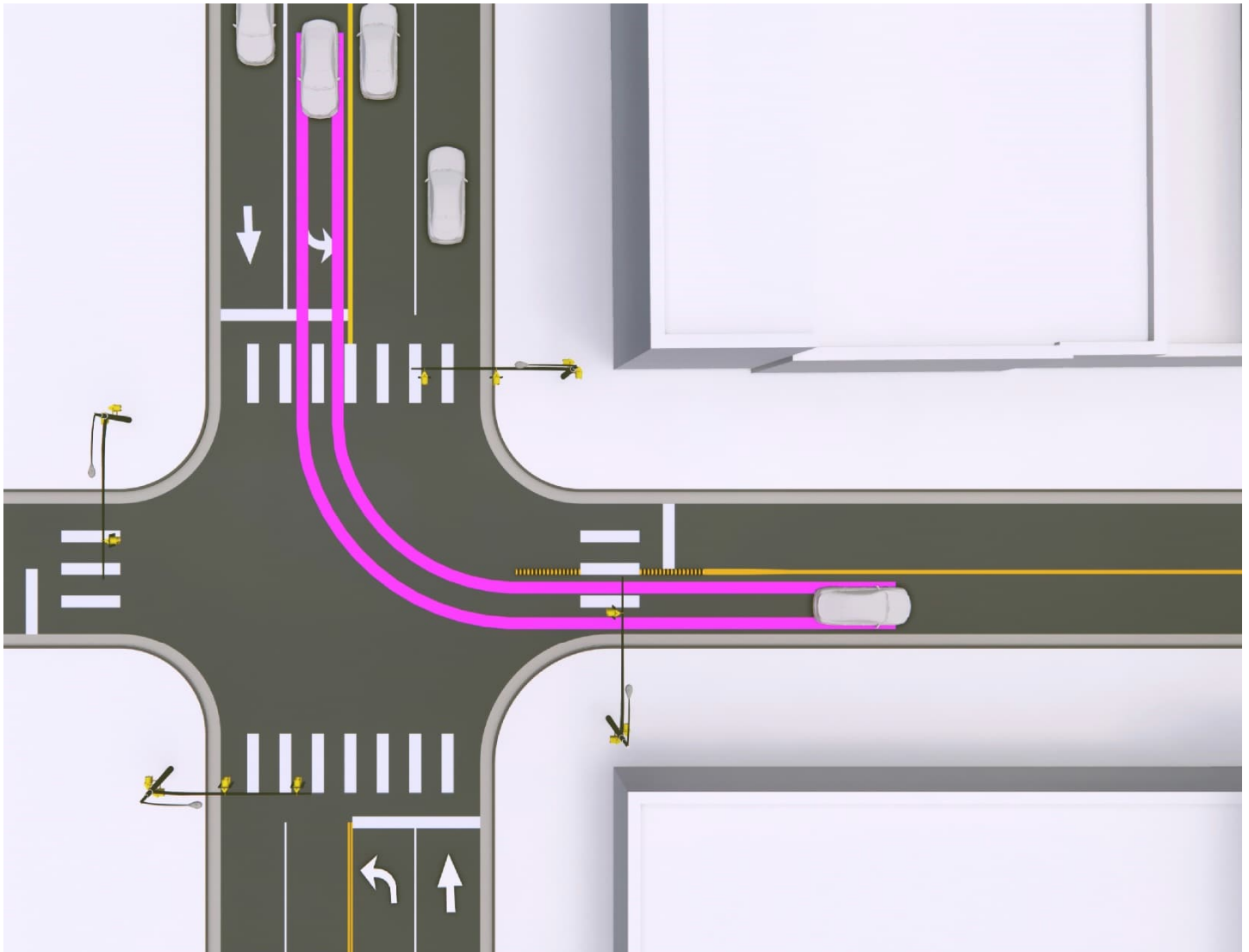
Complete Streets Design Standards

- The Designer should include a hardened centerline at intersections where motor vehicles are frequently turning across double yellow lines or turning at high speeds.
- Vehicular turning paths must prevent head-on collisions between opposing left-turning motorists.

Design Requirements

- The Designer can include any combination of concrete or plastic curbing, median paving, rubber speed bumps, and flex posts depending on turning radius and lane widths.
- Whenever possible, considering turning templates, the Designer should extend a hardened centerline into the intersection side of the crosswalk. Refer to Figure 4-1: Hardened Centerlines.

Figure 4-1: Hardened Centerlines



M. Median Refuge Islands

A median refuge island is a protected space placed in the center of the street to facilitate pedestrian and EPAMD crossings.

Use

- To provide an important safety element for pedestrians and EPAMD users by allowing them to cross the street in two phases. A median refuge island is particularly important and helpful on streets with multiple lanes of traffic.

Minimum Installation Criteria

- The Designer should consider a median refuge island on Arterials and Collectors.
- The Designer should consider a median refuge island at intersection crossings where the roadway width or observed motor vehicle speeds make people crossing the street feel unsafe or where there is a history of pedestrian crashes.
- The Designer should use a median refuge island at intersections with traffic volumes that discourage people from crossing the roadway, in accordance with the FHWA STEP Guide.
- A median refuge island can exacerbate a negative left-turn offset, which may be a significant safety consideration at signalized intersections with permissive left-turn phasing. The Designer must consider the crash history of an intersection and signal phasing when adding a median refuge island.
- The Designer may combine a median refuge island with improved pedestrian crossings, such as Rectangular Rapid Flashing Beacons (RRFB) and Pedestrian Hybrid Beacon (PHB), if warranted by the Denver Uncontrolled Pedestrian Crossing Guidelines.
- The Designer should consider a median refuge island at intersection crossings that require a person to walk across more than one lane of traffic per direction on two-way streets.
- The Designer should consider a median refuge island on a Local Street at intersections with high pedestrian demand or high traffic speeds.

Design Requirements

- The Designer shall match the minimum median refuge island width with the width of the crosswalk or the largest curb ramp on either end of the pedestrian path and shall provide detectable warning strips at the entrance and exit to the median refuge island. Landings shall meet ADA requirements.
- At signalized intersections, pedestrian signal heads must be oriented and timed to serve people in the median refuge island. Where pedestrian signalization is not on automatic recall, and there is no pedestrian detection, the Designer should provide elements such as pedestrian detection or a push button in the median refuge island.
- The Designer should consider the availability of street lighting at midblock crosswalk locations.
- The Designer shall follow the Uncontrolled Pedestrian Crossing Guidelines for warning signage, signals, and pavement markings on the island approach.
- At crossings on a bicycle route, consult the *Denver Bikeway Design Manual*.

Complete Streets Design Standards

References

- FHWA Safe Transportation for Every Pedestrian (STEP) Guide
- Denver *Uncontrolled Pedestrian Crossing Guidelines*
- DOTI Traffic Signal, Sign, & Marking Standards
- Denver Bikeway Design Manual

Transportation Standard Drawings: 5.2 (Median Refuge Islands).

Chapter 5: Traffic Calming Treatments

This chapter describes design elements for traffic calming treatments that require DOTI City Traffic Engineer approval. All traffic calming treatments should be coordinated with the Denver Fire Department through the standard review process. DOTI may require data collection before and after their installation to determine whether the design elements can be permanent. Refer to Table 5-1: Traffic Calming Treatment Minimum Criteria for Installation.

Table 5-1: Traffic Calming Treatment Minimum Criteria for Installation

Treatment*	Street Classification/ Type	Existing 85 th Percentile Speed	Transit Allowed	Grade Constraints (%)
Speed Cushions	Local/25 MPH (posted) Collector	Greater than or equal to 6 MPH above the posted speed limit	Yes**	<8
Raised Crossing or Intersection	Local/Collector/Arterial Slip Lanes	Any	Yes	<8
Neighborhood Traffic Circle	Local	Any	No	No

* DOTI may require additional consideration and/or not allow Street Design Elements and Pilot Traffic Calming features that change flow patterns or are located within a 100-year floodway. Features proposed in the 100-year floodplain will require a Floodplain Permit. Coordinate with DOTI Floodplain Group prior to proposing features in the floodplain.

** Speed cushions are not allowed on bus priority routes or Bus Rapid Transit routes.

A. Speed Cushions

A speed cushion is a hump placed across the roadway zone that includes wheel cutouts to allow emergency vehicles to pass unaffected.

Use

- To reduce the speed of drivers of all vehicles except for emergency vehicles.

Minimum Criteria

- The Designer may only use a speed cushion on Local Streets or on Collectors with a 25 MPH speed limit.
- The Designer should consider speed cushions on streets that have higher than desired vehicular speeds.
- The existing 85th percentile vehicular speed is greater than or equal to 6 mph above the posted speed limit.
- Streets with longitudinal slopes under 8 percent.

Design Requirements

- A speed cushion should not be within 20 feet of the edge of driveways, alley curb cuts, or intersections. A speed cushion should not be located within 100 feet of an intersection.
- A speed cushion should be located periodically along the corridor every 250 feet to 400 feet or in combination with other traffic calming treatments to accomplish target speed.

[Transportation Standard Drawings: 5.6 \(Speed Cushion\).](#)

B. Raised Crossings and Intersections

Ramped speed tables that span the entire width of a roadway or an arterial slip lane.

Use

- To reduce vehicle speeds and alert drivers to a different environment, typically a pedestrian crossing or entrance to a commercial or main street area of increased activity.

Minimum Criteria for Installation

- The Designer may only consider a raised intersection on Local and Shared Streets.
- The Designer may use a raised crossing across through lanes only on Local or other streets with DOTI City Engineer approval.
- The Designer may use a raised crossing across a right-turn slip lane from any Street Type.
- The Designer may consider a raised intersection and/or raised crossing on streets that have higher than expected vehicular speeds.
- The Designer should utilize a raised crossing or raised intersection to slow traffic and reduce conflicts between motorists and people walking, bicycling, or using EPAMDs on or to cross the street.
- The Designer shall not use a raised crosswalk or raised intersection on streets with a steep roadway longitudinal slope (higher than 8 percent).
- A raised crosswalk or raised intersection cannot be located within 20 feet of driveway aprons.

Complete Streets Design Standards

Design Requirements

- The Designer must include a detectable warning strip at the sidewalk edge to indicate to pedestrians that they are exiting and entering the street at a raised crosswalk.
- DOTI restricts parking and loading within 20 feet before and after the marked crosswalk to provide adequate sight distance and visibility between people crossing and people driving. The Designer must supplement parking restrictions with signage, pavement markings, and vertical elements, such as flexible delineators, bollards, or planters.
- The Designer shall include triangular warning pavement markings for drivers on transition aprons and RAISED CROSSWALK or RAISED INTERSECTION signs at the crossing and in advance of the crossing.
- Transition apron slopes shall be between 5 percent and 8 percent.
- The Designer must address drainage with any newly raised elements and meet the *City and County of Denver Storm Drainage Design & Technical Criteria* requirements.
- The Designer should limit the height of the raised crosswalk or intersection to 3 inches where motor vehicles with low-height wheelbases are likely (e.g., lowboy trailers).
- The Designer may need to modify the table to accommodate a transit vehicle.

References

- *City and County of Denver Storm Drainage Design & Technical Criteria*
- DOTI Traffic Signal, Sign, & Marking Standards
- Denver *Uncontrolled Pedestrian Crossing Guidelines*

Transportation Standard Drawings: Standard Drawing 5.4 (Raised Crossing).

C. Neighborhood Traffic Circles

A neighborhood traffic circle is a circular island installed in the center of an intersection.

Use

- To reduce vehicular speeds and crash severity at intersections.
- Improve the aesthetics of the street and the surrounding area.

Minimum Criteria

- The Designer may consider a neighborhood traffic circle on low-volume residential neighborhood streets where vehicular speeding or crashes are an issue.
- The Designer may consider a neighborhood traffic circle at intersections along neighborhood bikeway corridors.
- The Designer may consider a neighborhood traffic circle at the intersection of Local Streets.
- Heavy vehicles comprise less than 2 percent of total ADT.
- There must be directional curb ramps at all intersection pedestrian crossings. DOTI does not allow diagonal ramps, and the Designer should evaluate replacing the existing diagonal curb ramps with directional curb ramps if a traffic circle is desired.

Complete Streets Design Standards

Design Requirements

- The Designer may mitigate small offsets at an intersection by adjusting the center island to an oval shape or by installing curb extensions to narrow one of the intersecting streets.
- The center island shall be traversable with a mountable curb and interior paving materials to accommodate larger vehicles.
- There shall be a minimum of 15.5 feet of clearance from intersection corners to the edge of the traffic circle, which may include a mountable truck apron. The Designer shall use the largest traffic circle radius possible to encourage slower speeds. The Designer shall increase this clearance width to 17.5 feet if a corner inlet is present.
- The Designer should assume the Managed Vehicle can maneuver all turns through an intersection without needing to mount the center island. The Design Vehicle's left-turn path may go over the top of the traffic circle but must avoid all signage. The Control Vehicle should be able to drive straight through an intersection with a traffic circle, encroaching onto the center island as necessary, but the design should not accommodate right- or left-turn movements for the Control Vehicle. The Designer may sign turn restrictions for the Control Vehicle if expected or found to be an issue. Emergency vehicles should be able to turn right and should be able to turn left before the circle.
- The Designer shall install yield control at all traffic circle intersections.
- The Designer shall design traffic circles to be visible at night utilizing reflective materials and/or street lighting.
- The center island should be hardscaped. DOTI must approve landscaping and stormwater elements within the center island, and the Designer must address maintenance and sight distance requirements for DOTI consideration and approval.
- Marked crosswalks are warranted on all legs at traffic circles if pedestrian ramps are present.

References

- *Denver Bikeway Design Manual*

Transportation Standard Drawings: 5.5a and 5.5b (Neighborhood Traffic Circle) and 14.0 (Sight Triangles).

Chapter 6: References

It is the responsibility of the Designer to verify that the documents are the more recent publications.

American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*:

A policy document that contains the current design research and practices for highway and street geometric design.

<https://store.transportation.org/item/collectiondetail/180>

Americans with Disabilities Act (ADA):

A federal civil rights law that prohibits discrimination against people with disabilities in everyday activities.

<https://www.ada.gov/>

Denver Bikeway Design Manual:

Robust design standards that provide the key dimensional characteristics of bikeway facility design and provide contextual guidance for facility selection.

<https://denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Department-of-Transportation-and-Infrastructure/Documents/Standards-Details>

Denver *Blueprint Denver* Map:

Interactive map providing Blueprint Denver's recommendations.

[Blueprint Denver - City and County of Denver \(denvergov.org\)](https://denvergov.org/Blueprint-Denver-City-and-County-of-Denver)

Denver Building and Fire Code:

The purpose of this Code is to provide minimum standards to provide a reasonable level of safety, health, and general welfare through structural strength, means of egress, stability, sanitation, light and ventilation, energy conservation, and providing a reasonable level of life safety and property protection from the hazards of fire, explosion, or dangerous conditions, and to provide a reasonable level of safety to firefighters and emergency responders during emergency operations by regulating and controlling the design, construction, quality of materials, use, occupancy, location and maintenance of all buildings and structures, and certain equipment specifically regulated herein within the City and County of Denver.

[Building and Fire Code - City and County of Denver \(denvergov.org\)](https://denvergov.org/Building-and-Fire-Code-City-and-County-of-Denver)

Denver *Complete Streets Design Guidelines*:

The *Complete Street Design Guidelines* are the guiding principles for the city's public right of way, detailing how Denver allocates space to transportation, utilities, and other public infrastructure.

[Complete Streets Design Guidelines - City and County of Denver \(denvergov.org\)](https://denvergov.org/Complete-Streets-Design-Guidelines-City-and-County-of-Denver)

Denver *Curbside Action Plan*:

The *Curbside Action Plan* provides a framework for making curbside use and management decisions by street type to support city transportation and mobility goals when there is curb space available to accommodate static curbside needs.

[Citywide Curbside Action Plan - City and County of Denver \(denvergov.org\)](https://denvergov.org/Citywide-Curbside-Action-Plan-City-and-County-of-Denver)

Complete Streets Design Standards

Denver Electric Vehicle (EV) Action Plan:

This plan provides a path forward to increase EV adoption in Denver and help CCD achieve its EV and climate goals.

[Denver Electric Vehicle \(EV\) Action Plan \(denvergov.org\)](https://denvergov.org)

Denver Fire Department 100' Heavy-Duty Aluminum Aerial Platform

Standard fire truck for Denver Fire Department.

<https://www.piercemfg.com/customers/new-deliveries/denver-fire-department-aerial-33961>

Denver Game Plan for a Healthy City:

Denver Parks and Recreation's vision for creating parks, gathering places, activities, and more that are easily accessed, well-maintained, and equitable in every neighborhood.

[Game Plan for a Healthy City - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Denver Green Continuum Streets Guidelines:

These guidelines expand the extent and rate of implementation of green infrastructure, in large part to mitigate and adapt to our increasingly changing climate.

[Standards, Details, Manuals, Guidelines - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Denver Moves Everyone:

A city-wide transportation plan aimed at moving everyone and everything equitably, safely, and sustainably and reflects the vision and values of Denverites for building a world-class transportation system between now and 2050.

<https://denvermoveseveryone.com/>

Denver Office of the City Forester Rules and Regulations:

The Office of the City Forester is responsible for the direct maintenance of public trees within parks and designated parkways, along with oversight of privately maintained trees per Municipal Code, Chapter 57, and the overall quality of Denver's urban tree canopy.

[Office of the City Forester - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Denver Outdoor Places Program:

A program that allows businesses to use private and public space for outdoor operations.

[Denver Outdoor Places Program - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Denver Public Works Transportation Standards and Details for the Engineering Division:

Set of templates that contain standard notes and details that Designers can use in construction projects.

[Standards, Details, Manuals, Guidelines - City and County of Denver \(denvergov.org\)](https://denvergov.org)

Complete Streets Design Standards

Denver Revised Municipal Code (DRMC):

Constitutes a complete recodification of the ordinances of the City and County of Denver of a general and permanent nature. Chapter 49 of the DRMC governs streets, sidewalks, and other public ways.

https://library.municode.com/co/denver/codes/code_of_ordinances

Denver Rules and Regulations Establishing the Dimensional and Equipment Standards for Bicycle Parking Areas:

Set of templates that contain standard notes and details that the Designer can use in construction projects.

https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/Zoning/other_regulations/Equipment_Standards_for_Bicycle_Parking_Areas.pdf

Denver Storm Drainage Design & Technical Criteria:

The purpose of these criteria is to provide requirements and guidance for the selection, design, and maintenance of publicly and privately owned and publicly or privately constructed drainage, flood control, and water quality facilities.

<https://www.denvergov.org/content/dam/denvergov/Portals/711/documents/StormMasterPlan/StormDrainageDesignTechnicalCriteria.pdf>

Denver Transit Design Guidelines:

Guidance how to design transit facilities and transit-associated infrastructure. These guidelines are in development at the time of the finalization of this document.

Denver Ultra-Urban Green Infrastructure Guide:

Guidance on how to make green infrastructure a fundamental part of the city's long-term stormwater management strategy by looking at ways to incorporate large-scale green infrastructure with small or site-scale green infrastructure.

<https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Department-of-Transportation-and-Infrastructure/Documents/Standards-Details>

Denver Uncontrolled Pedestrian Crossing Guidelines:

The Uncontrolled Pedestrian Crossing Guidelines serve as the policy document that guides staff in determining where and how to improve an uncontrolled crosswalk within the City and County of Denver on City and County of Denver-owned and maintained streets.

https://www.denvergov.org/files/assets/public/v/2/doti/documents/standards/doties-015.2-uncontrolled_pedestrian_crossing_guidelines.pdf

Denver Utility Plan Review (UPR) Process:

The purpose of this document is to provide guidance and procedures to utility company applicants who propose to construct utilities within the public right-of-way (ROW). This document identifies when DOTI requires a UPR, the Permit Requirements and submittal process, associated fees, guidelines and requirements for submittals, and mandatory notes.

<https://www.denvergov.org/files/assets/public/doti/documents/permits/pwpt-121.2-utility-plan-review-requirements.pdf>

Complete Streets Design Standards

Denver Utility Project Floodplain Permit Requirements:

All utility work within the regulatory floodplain requires a Floodplain Permit per City Ordinance. This includes dry utilities such as electric, gas, telephone, cable, and fiber optic, and wet utilities such as storm, sanitary, potable water, and recycled water.

<https://www.denvergov.org/files/assets/public/v/3/doti/documents/programsservices/flood/utility-project-floodplain-requirements.pdf>

DOTI Rules and Regulations Governing Encroachments & Encumbrances in the Public Right-of-Way:

The intent of this document is to define and categorize Encroachments and establish criteria and general conditions for the placement of Encroachments in the ROW.

https://www.denvergov.org/files/assets/public/v/2/doti/documents/regulations/dotirr-025.4-encroachments_in_the_public_row.pdf

DOTI Rules and Regulations Pertaining to the Administration of a Bicycle Parking Program by the DOTI City Traffic Engineer:

This document supports the implementation of a robust bicycle parking program as established by the Strategic Transportation Plan and the goals and objectives of Denver Moves.

https://denvergov.org/files/assets/public/v/1/doti/documents/regulations/pwrr-031.0-administration_of_a_bicycle_parking_program_by_the_city_traffic_engineer.pdf

DOTI Rules and Regulations for Standard Right-of-Way Cross Sections and Utility Locations:

The purpose of these Rules and Regulations is to establish standards that entities that design and build streets to be owned by the City and County of Denver have the knowledge needed to perform the proper design of the right-of-way.

https://www.denvergov.org/files/assets/public/v/1/doti/documents/regulations/pwrr-027.1-standard_right_of_way_cross_sections_and_utility_locations.pdf

DOTI Construction Activities Stormwater Discharge Permit (CASDP) Manual:

Compliance with the City & County of Denver Revised Municipal Code and Department of Public Works Rules & Regulations concerning the discharge of pollutants in storm-generated runoff from construction sites to "Receiving Waters" via the Municipal Separate Storm Sewer System (MS4).

<https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Department-of-Transportation-and-Infrastructure/Programs-Services/Wastewater-Management/Infrastructure/Engineering>

DOTI Street Centerline:

Dataset that shows the centerlines of Denver streets and alleys.

<https://denvergov.org/opendata/>

Complete Streets Design Standards

DOTI Transportation Design Signal, Sign, & Marking Standards:

Standard drawings for traffic signal, sign, and pavement markings in Denver.

<https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Department-of-Transportation-and-Infrastructure/Documents/Standards-Details>

FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*:

The Federal Highway Administration publishes the MUTCD, which defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel.

<https://mutcd.fhwa.dot.gov/>

FHWA Safe Transportation for Every Pedestrian (STEP):

An initiative supported by the Federal Highway Administration to promote specific countermeasures to improve pedestrian crossing locations and reduce crashes.

<https://highways.dot.gov/safety/pedestrian-bicyclist>

Mile High Flood District *Urban Storm Drainage Criteria Manual*:

A set of criteria for adoption by communities as well as guidance for engineers, planners, landscape architects, developers, and contractors within the Denver Metro region.

<https://mhfd.org/resources/criteria-manual/>

Public Right-of-Way Accessibility Guidelines (PROWAG)

Accessibility guidelines for the design, construction, and alteration of pedestrian facilities in the public right-of-way.

<https://highways.dot.gov/safety/pedestrian-bicyclist/safety-tools/r3062-public-right-way-accessibility-guidelines-prowag>

RTD *Bus Infrastructure Design Guidelines and Criteria*:

Set of general guidelines and specific criteria used in the preparation and implementation of planning, design, and construction of new bus transit facilities, including improvement to existing facilities.

<https://www.rtd-denver.com/doing-business-with-rtd/construction-engineering/engineering-design-and-review>

RTD *Bus Infrastructure Standard Drawings*:

Set of templates that contain standard notes and details that Designers can use in construction projects.

<https://www.rtd-denver.com/doing-business-with-rtd/construction-engineering/engineering-design-and-review>