

Redeveloping Roadways for the Urban Core within Constrained Right-of-Ways

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About the Instructor



- Transportation, Water Resources, Land Development, and Aviation Projects
- Recently is focused on improving the safety of our transportation network
- Works on Infrastructure projects throughout the U.S and Abroad
- Experienced in redeveloping roadways to meet multiple modes of transportation
- Assists local and state agencies in making the best use of their public right-of-way

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2

- American Society of Civil Engineers (ASCE)
 - Past-Chair Transportation and Development Institute Tampa West Coast Chapter (2010 – 2013)
 - Member of the Highway Operations Committee
 - Young Professional Engineer of the Year (2014) Tampa West Coast Chapter
- Transportation Research Board (TRB)
 - Hydrology, Hydraulics and Water Quality
 - Low Volume Roads
 - Bicycle Transportation
 - Roundabout
 - Pedestrian Safety
- University of South Florida
 - Adjunct Professor Civil Engineering



1. Overview & Introduction
2. Legacy Issues
3. Approach to Constrained R/W
4. Accommodating Through Segments
5. Accommodating Intersections
6. Overall Summary

- Identify at least 2 challenges for transforming rural to urban
- Describe the 5 main transportation modes
- Given a transportation mode, select one design option to accommodate the facility within a constrained corridor

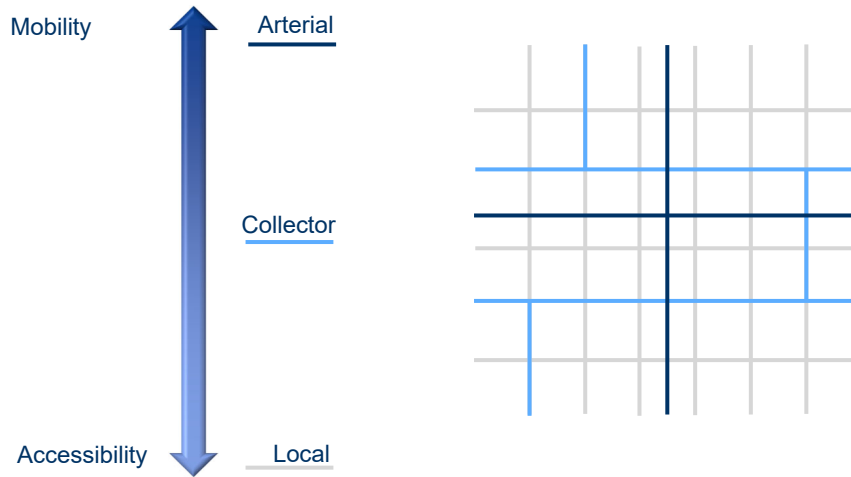


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Overview and Introduction to Roadway Redevelopment

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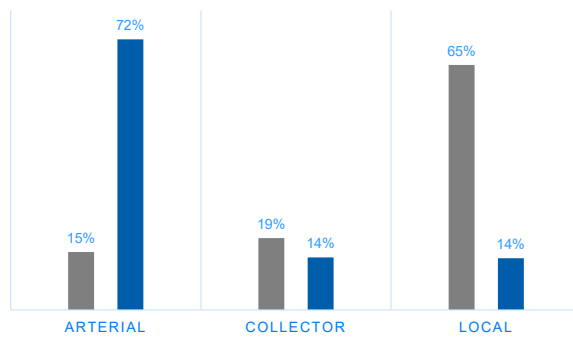
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2020 FHWA STATISTICS OFFICE

■ Lane Miles ■ VMT

- Arterial
- Collector
- Local

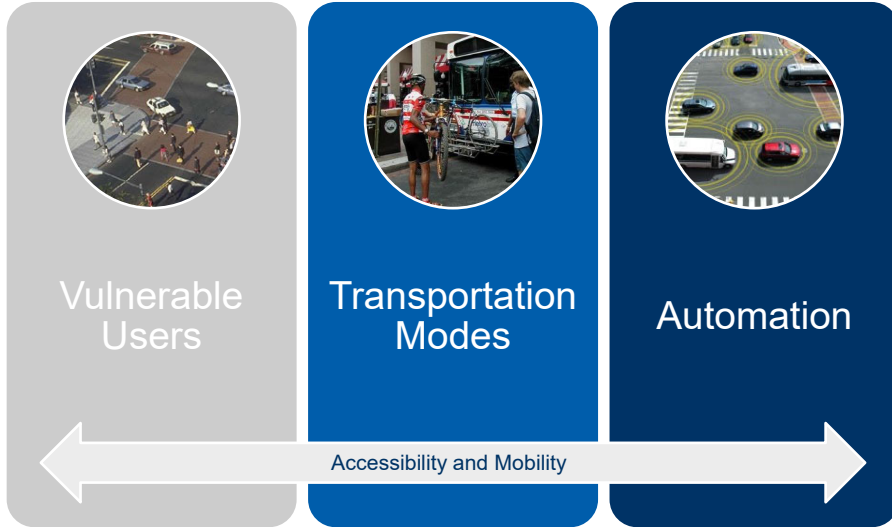


Total Lane Miles 8,832,241

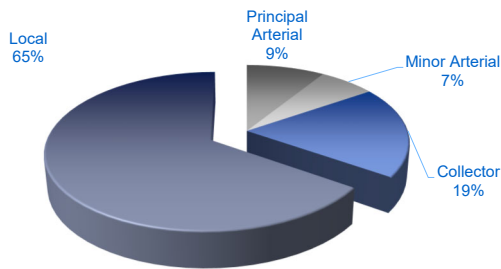
Total Vehicle Miles Travelled 2,917,383 x 10⁶

8

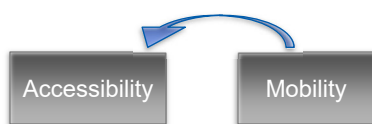
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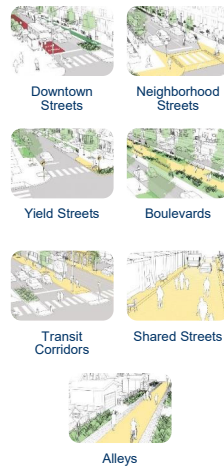
2020 FHWA Statistics Office



Total Lane Miles 8,832,241



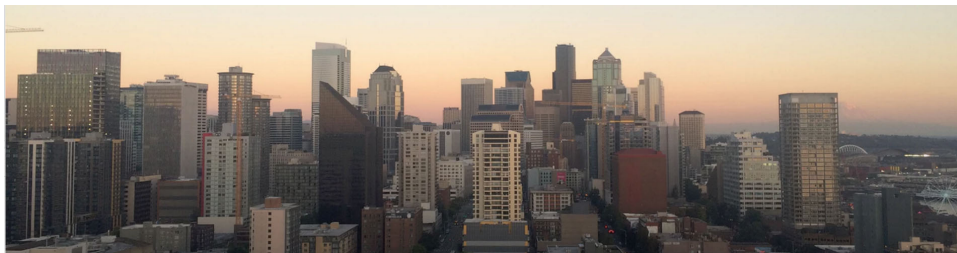
NACTO - Urban Street Guide 2013



Legacy Issues

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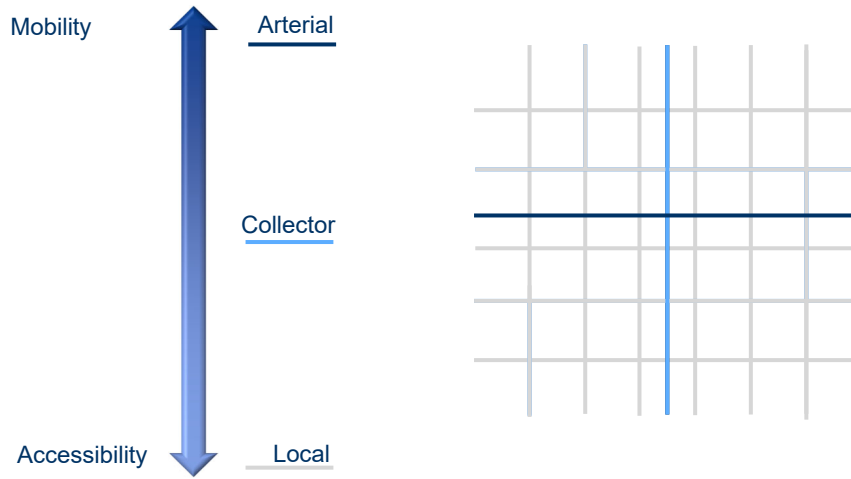
- Rural to Urban
 - Change in functional classification
- Increase in Urban Density
 - More capacity within limited and expensive real estate



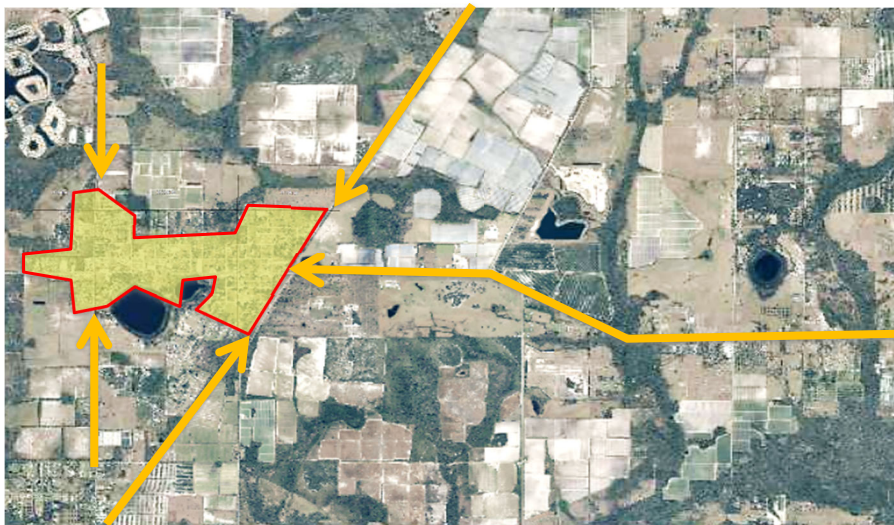
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12

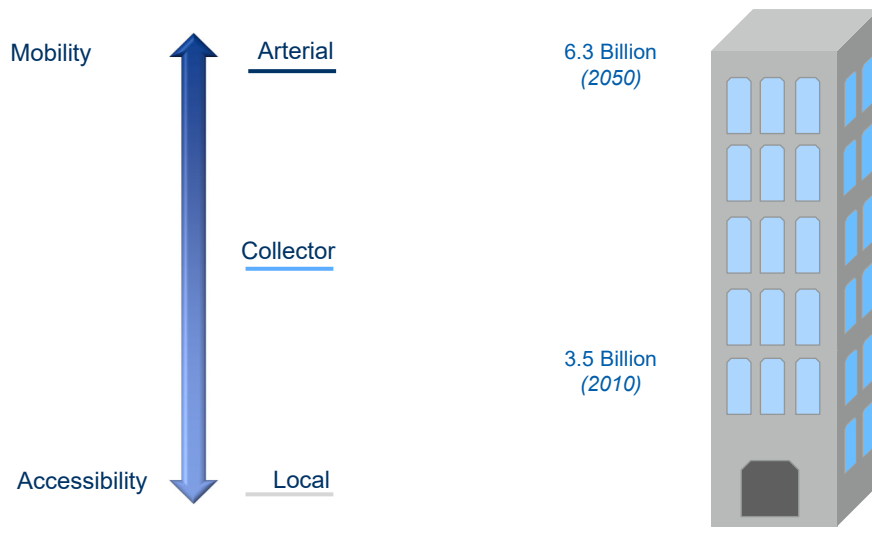
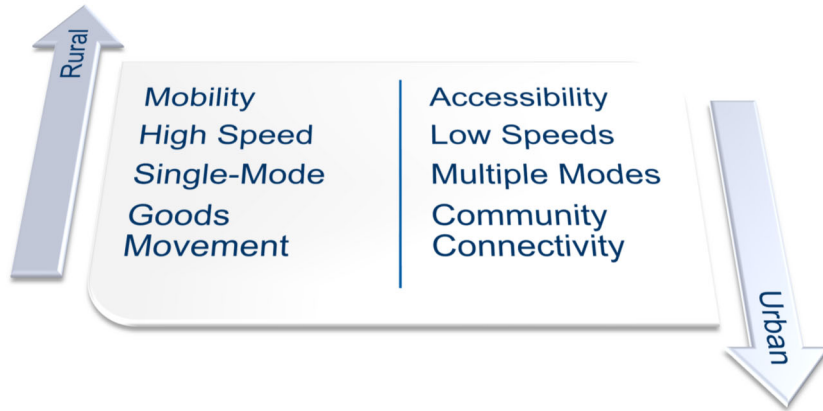




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- Limited Space
 - Costly Real Estate
- Narrow Lanes
- On-Street Parking
- Short Radii Returns
- No Utility Strip
- Single Mode Facilities
 - No Sidewalks
 - No Bike Lanes
- No Loading Areas
 - Bus
 - Freight



Approach to Constrained Right of Ways

- Rural to Urban Change
 - Change in functional use
- Increasing Capacity to Urban Facilities
 - Adding non-automobile transportation modes



- Recognize the change in functional use
 - From mobility to accessibility
- New functional use mindset allows for:
 - More connectivity
 - Lower speeds
 - Additional transportation modes



- Recognize the change in population
- New mindset on population needs allows for:
 - Multi-use zoning districts
 - Increased connectivity
 - Additional transportation modes



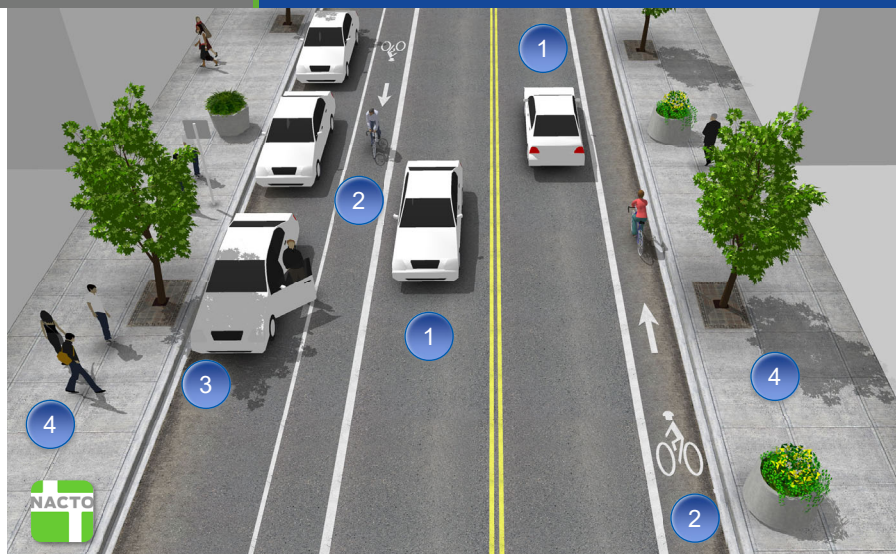
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Accommodating Through Segments within Constrained Corridors

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- AASHTO Greenbook (2018)
 - Through Lanes
 - >45 mph: 11ft
 - ≤ 45 mph: 10ft
 - Low volume: 9ft (<250 veh/day)
 - Auxiliary Lanes
 - Minimum 10ft
- NACTO USDG (2013)
 - Through Lanes
 - Regular traffic: 10ft
 - Truck/Bus traffic: 11ft

Restrictive policies that favor the use of wider travel lanes have no place in constrained urban settings, where every foot counts. – NACTO 2013 USDG

- NACTO UBDG (2014)
 - Bike Lanes
 - Ridable surface 3ft min
 - Next to curb 6ft
 - Next to parking 5ft
 - + 2ft clearance for barriers
- Buffered Bike Lanes
 - Part of bike lane
 - Min 1.5ft
 - < 2ft no hatching
 - > 3ft + hatching

BICYCLIST DESIGN USER PROFILES

<p>Interested but Concerned 51%-56% of the total population</p> <p>Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided, prefer off-street or separated bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.</p> <p>LOW STRESS TOLERANCE</p>	<p>Somewhat Confident 5-9% of the total population</p> <p>Generally prefer more separated facilities, but are comfortable riding in bicycle lanes or on paved shoulders if need be.</p>	<p>Highly Confident 4-7% of the total population</p> <p>Comfortable riding with traffic, will use roads without bike lanes.</p>
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The AASHTO Guide has been rewritten to support inclusive bicycling for All Ages and Abilities serving the widest spectrum of bicyclists.

- AASHTO Bike Guide (2012)
 - Next to curb <45 mph 5ft
 - Next to curb >45 mph 6ft
 - <45 mph, no gutter, constrained R/W 4ft
 - Next to parking 5ft
 - High volume parking 7ft

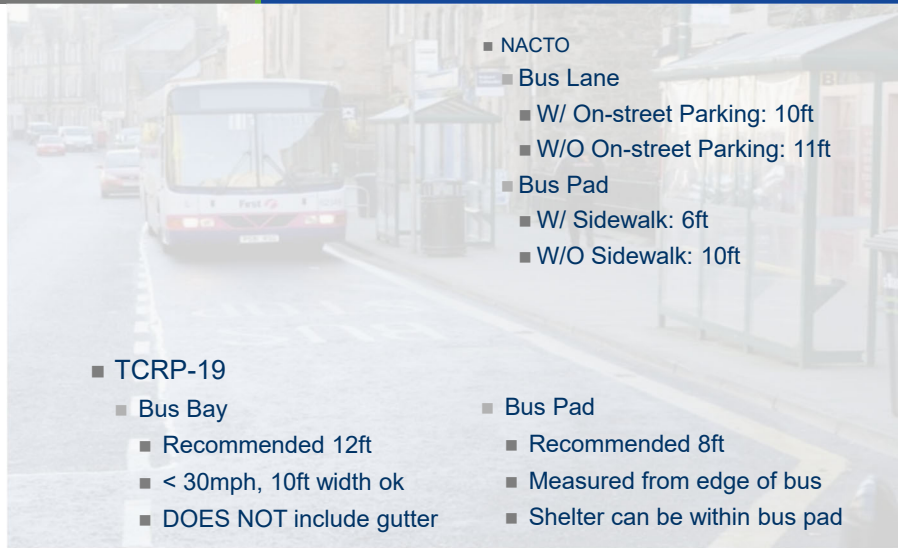


Design Speed 40 mph
Truck & Buses 4%



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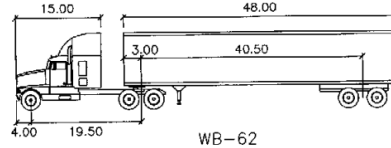
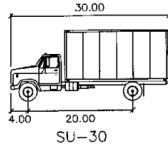


- NACTO
 - Bus Lane
 - W/ On-street Parking: 10ft
 - W/O On-street Parking: 11ft
 - Bus Pad
 - W/ Sidewalk: 6ft
 - W/O Sidewalk: 10ft

- TCRP-19
 - Bus Bay
 - Recommended 12ft
 - < 30mph, 10ft width ok
 - DOES NOT include gutter
 - Bus Pad
 - Recommended 8ft
 - Measured from edge of bus
 - Shelter can be within bus pad

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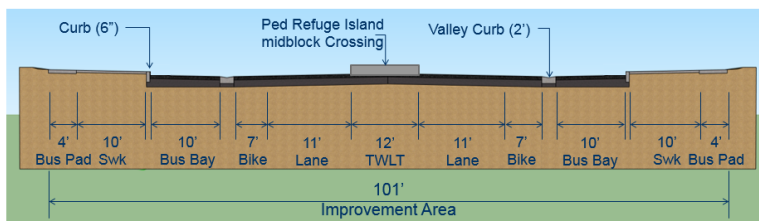
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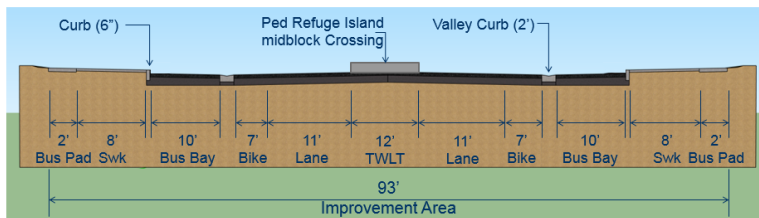
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110' to 150' R/W



< 110' R/W



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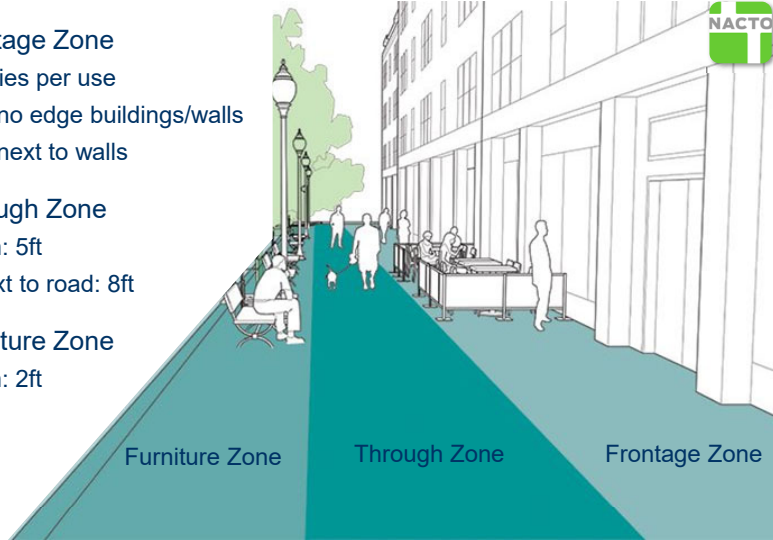


- ITE Walkable Thoroughfares
 - Regular Spaces: 8ft
 - Residential Spaces: 7ft
 - Includes gutter width

- PROWAG
 - < 14ft of R/W Accessible Spaces at end of the block
 - > 14ft of R/W Provide 5ft wide access route



- Frontage Zone
 - Varies per use
 - 0ft no edge buildings/walls
 - 1ft next to walls
- Through Zone
 - Min: 5ft
 - Next to road: 8ft
- Furniture Zone
 - Min: 2ft



35



Edge Furnishings Throughway Frontage

36

Table 8.1 Recommended Streetside Zone Dimensions

Sidewalk Zone ⁽¹⁾	C-6 and C-5	C-4 w/ Predominantly Commercial Ground Floor Use	C-4 w/ Predominantly Residential Frontage	C-3 w/ Predominantly Commercial Ground Floor Use	C-3 w/ Predominantly Residential Frontage
Boulevard					
Edge	1.5 feet 2.5 feet at diagonal parking	1.5 feet 2.5 feet at diagonal parking	1.5 feet	1.5 feet 2.5 feet at diagonal parking	1.5 feet
Plantings	7 feet (trees in tree wells)	7 feet (trees in tree wells)	8 feet (landscape strip w/ trees and grasses or groundcover)	7 feet (trees in tree wells)	8 feet (landscape strip w/ trees and grasses or groundcover)
Throughway	10 feet	8 feet	8 feet	8 feet	8 feet
Frontage	3 feet	2.5 feet	8 feet along base and groundcover 1 foot along low walls, fences and hedges 1.5 feet along landscaping, tall walls and fences	1.5 feet	8 feet along base and groundcover 1 foot along low walls, fences and hedges 1.5 feet along landscaping, tall walls and fences
Avenue					
Edge	1.5 feet 2.5 feet at diagonal parking	1.5 feet 2.5 feet at diagonal parking	1.5 feet	1.5 feet 2.5 feet at diagonal parking	1.5 feet
Plantings	6 feet (trees in tree wells)	6 feet (trees in tree wells)	6 feet	6 feet (trees in tree wells)	6 feet (landscape strip w/ trees and grasses or groundcover)
Throughway	9 feet	6 feet	6 feet	6 feet	6 feet
Frontage	3 feet	2.5 feet	8 feet along base and groundcover 1.5 feet along landscaping, tall walls and fences	2.5 feet	8 feet along base and groundcover 1 foot along low walls, fences and hedges 1.5 feet along landscaping, tall walls and fences
Street					
Edge	1.5 feet 2.5 feet at diagonal parking	1.5 feet 2.5 feet at diagonal parking	1.5 feet	1.5 feet 2.5 feet at diagonal parking	1.5 feet
Plantings	6 feet (trees in tree wells)	6 feet (trees in tree wells)	6 feet (landscape strip w/ trees and grasses or groundcover)	6 feet (trees in tree wells)	6 feet (landscape strip w/ trees and grasses or groundcover)
Throughway	8 feet	8 feet	8 feet	8 feet	8 feet
Frontage	2.5 feet	2.5 feet	8 feet along base and groundcover 1 foot along low walls, fences and hedges 1.5 feet along landscaping, tall walls and fences	1.5 feet	8 feet along base and groundcover 1 foot along low walls, fences and hedges 1.5 feet along landscaping, tall walls and fences

Minimum Total Sidewalk Width

9ft Residential

12ft Commercial





35mph
1% Truck Traffic

Redevelopment Wish List

- 5-foot bike lanes
- On-street parking on one side
- Keep 2-foot wide curb and gutter
- 4-foot wide furniture zone
- 6-foot wide sidewalk
- Maintain driveway access

A 3D architectural rendering of a street scene, similar to the one on page 39. The street is a two-lane road with a double yellow center line and white edge lines. On either side of the road are multi-story buildings with colorful facades. A semi-transparent blue box is overlaid on the scene, containing text. Below the text, there are two horizontal arrows indicating the width of the right-of-way. The inner arrow is labeled "Existing 72' Right of Way" and the outer arrow is labeled "90' Full Widening Right of Way".

Existing 72' Right of Way

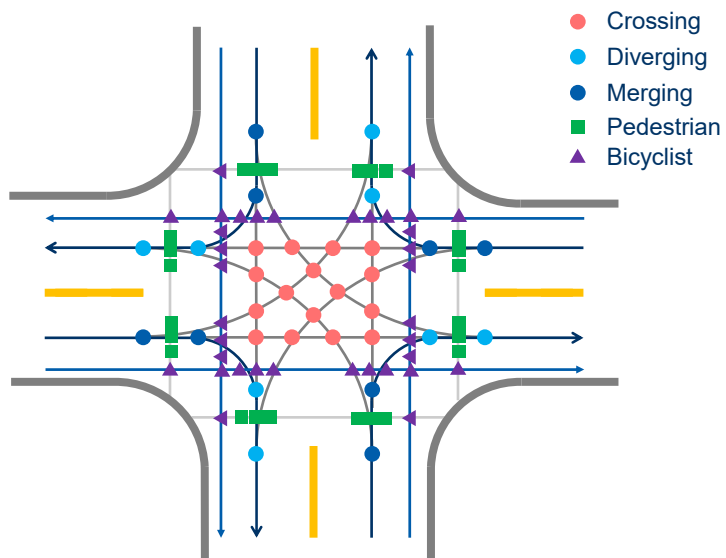
90' Full Widening Right of Way

- No longer functioning as a major collector – 4-12ft lanes (48ft)
- Step 1: Remove one lane
- Step 2: Use middle lane for left turns to preserve driveway access
- Step 3: Narrow lanes from 12ft to 10ft (30ft)
- Step 4: Add on-street parking 8ft wide (38ft)
- Step 5: Add Bike Lanes 5ft wide – Total pavement width 48ft
- Step 6: Curb and Gutter remain in place (52ft)
- Step 7: Add Streetside elements, Furniture zone + Sidewalk (20ft)
- Total width needed 72ft – Total R/W Available 72ft



Accommodating Intersections within Constrained Right of Ways

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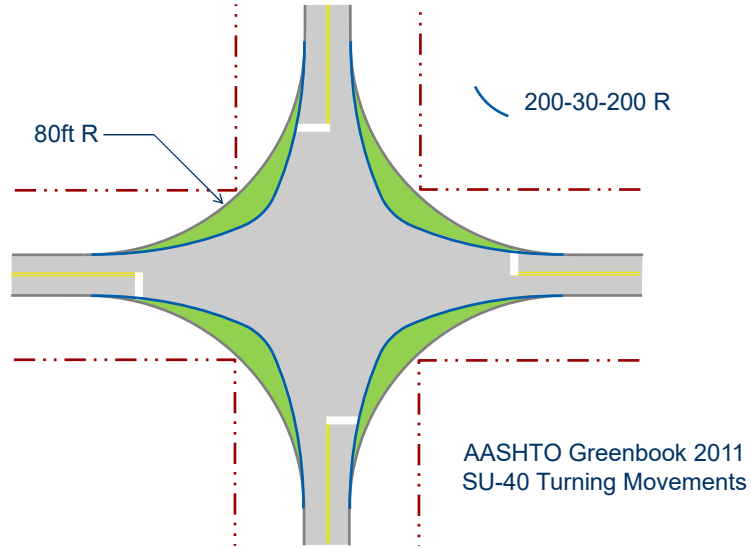


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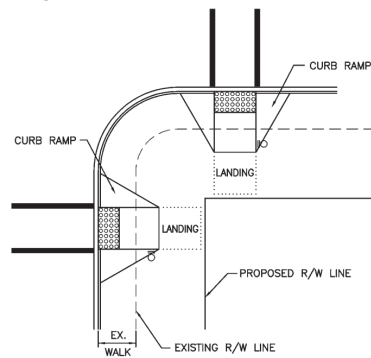
44

	Vehicular	Transit	Freight	Pedestrian	Bicyclist
Vehicular	Driveways, Parking	Bus Loading, Driveways, Parking	Loading Areas, Driveways, Parking	Driveways, Parking, Crosswalks	Bike lanes, Driveways, Parking
Transit		Bus Loading	Loading Areas, Driveways, Parking	Bus Loading, Driveways, Crosswalks	Bus Loading, Driveways, Bike Lanes
Freight			Loading Areas, Driveways, Parking	Loading Areas, Driveways, Parking	Loading Areas, Driveways, Parking
Pedestrian				Sidewalks, Crosswalks, Driveways	Sidewalks, Crosswalks, Driveways
Bicyclist					Bike lanes, Driveways

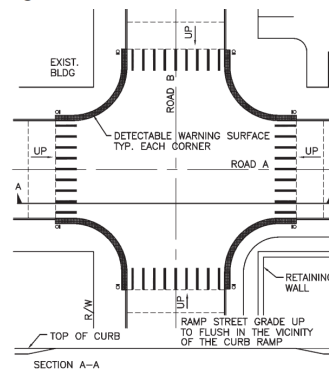




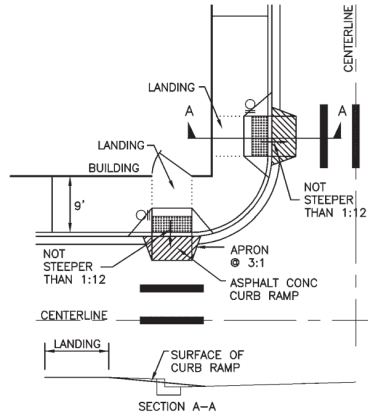
Design Solution 1.01



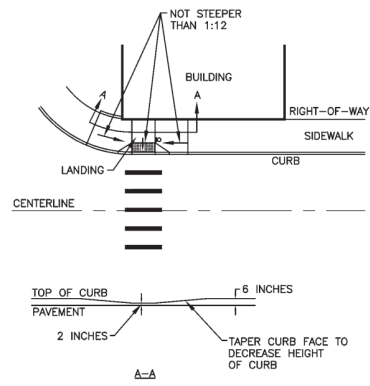
Design Solution 1.02



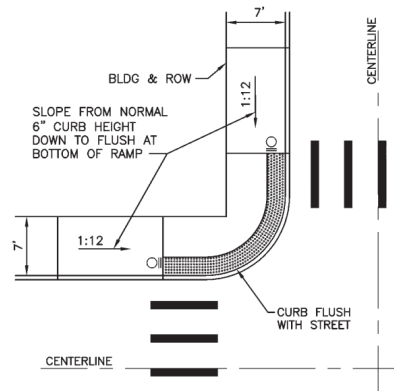
Design Solution 1.03



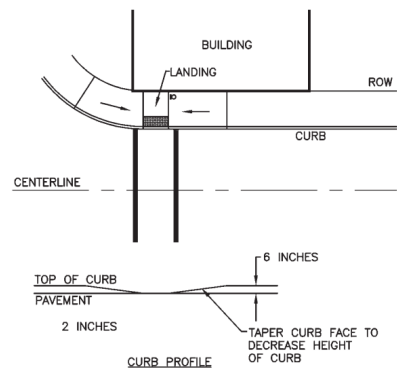
Design Solution 1.04



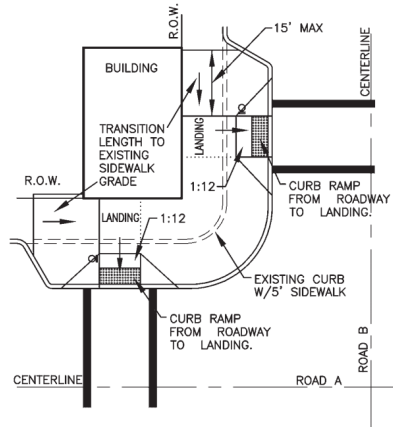
Design Solution 1.05



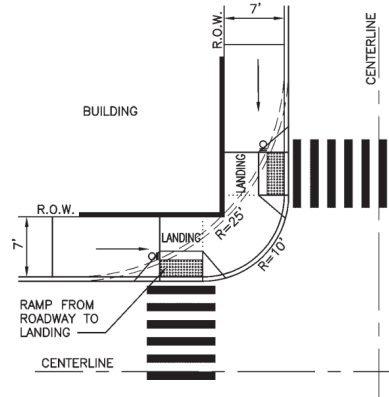
Design Solution 1.06



Design Solution 1.07

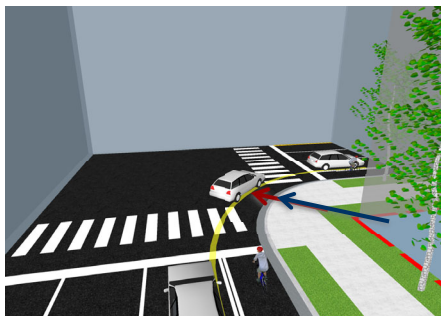


Design Solution 1.08



51

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- Effective Turning Radius
 - Auxiliary Lanes
 - Bike Lanes
 - On-Street Parking
 - Curb Return Radius = 20ft
 - Effective Radius = 30ft

- Large Vehicles
 - Low Volume
 - Acceptable to encroach adjacent lanes with same direction
 - May be acceptable to encroach opposing lanes*

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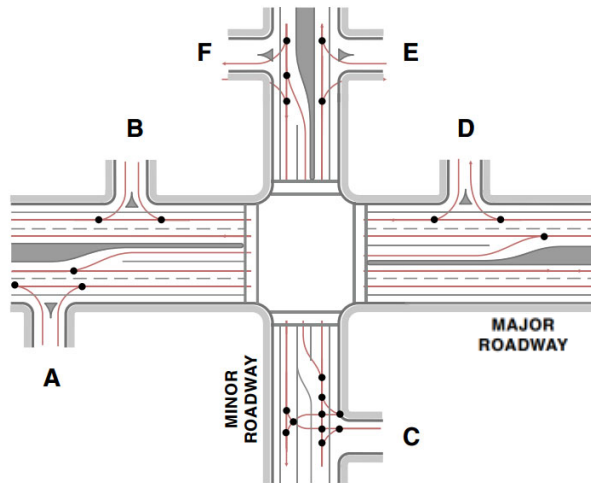
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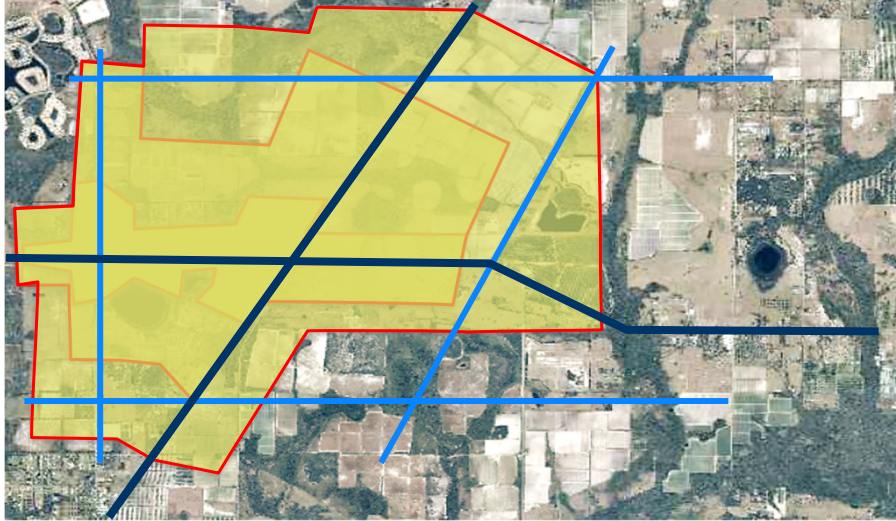


In designing walkable urban thoroughfares, the selection of curb returns ranging from 5 to 25 feet in radius is preferable to shorten pedestrian crossings and slow vehicle-turning speeds to increase safety for all users.

Designing Walkable Urban Thoroughfares:
A Context Sensitive Approach

- Radii of 5 to 10ft
 - Arterial and Collectors in Urban Contexts
 - Trucks and Buses Turning Speed of 5-10 mph and low volume
 - Streets with Bike Lanes, Parking Lanes or wide receiving lanes (12ft)
 - Occasional large vehicle encroachment to opposing lane is acceptable
- Minimum 5ft Radii
 - Urban Centers/Core
- Bus and Truck Routes
 - Based radii on effective turn radius
 - >50ft R use, channelized turn lanes
 - Use 3-Centered Compound Curve



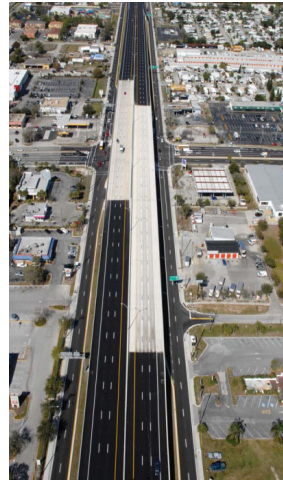




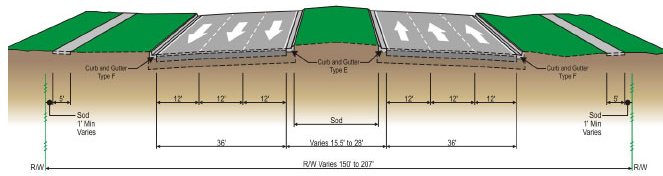
Two-Way-Left-Turn Lanes
Kentucky Transportation Cabinet



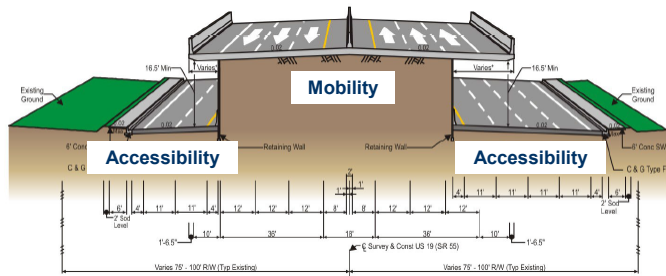
Roundabout Corridor
Golden, Colorado

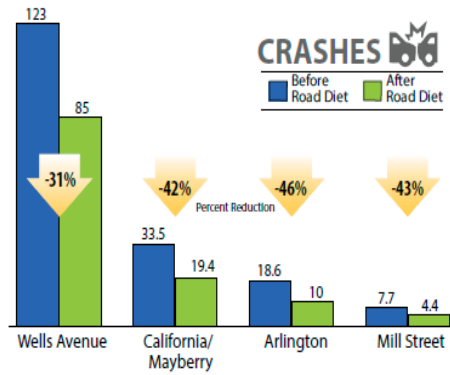
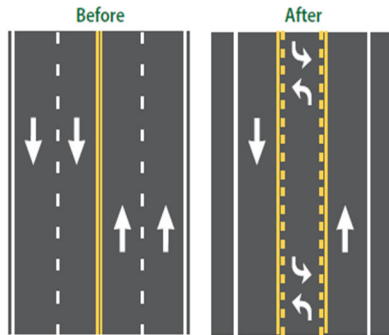


US-19 – Frontage Road
Florida DOT



EXISTING TYPICAL SECTION





Nebraska Avenue – Tampa, FL

AADT Before = 19,500
 AADT 1yr After = 15,800 (19%)
 AADT 3yr After = 17,100 (12%)



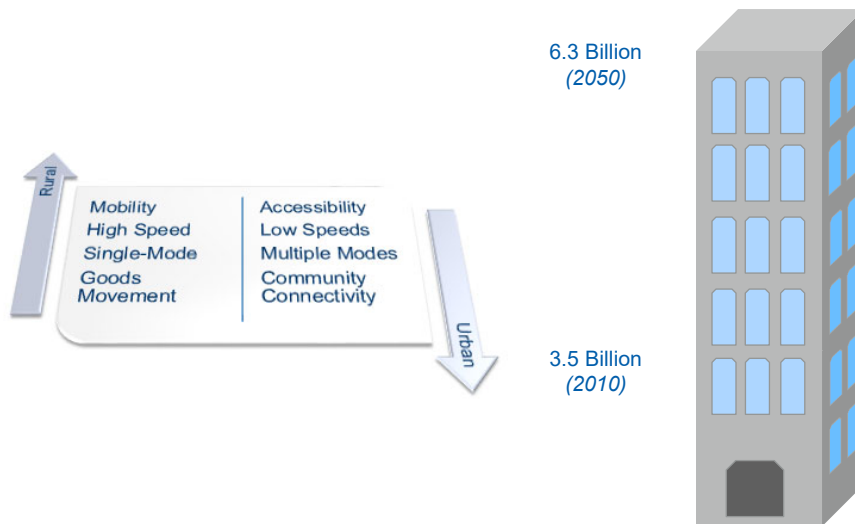


Course Summary



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End User

- American Association of State Highway Transportation Officials (AASHTO). *A Policy on Geometric Design of Highways and Streets* (2018 ed.). Washington, DC
- AASHTO. *Guide for the Development of Bicycle Facilities* (2012 ed.). Washington, DC
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Questions

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