Transportation Design for Communities
Executive Seminar

MODULE 4: Reframing Key Transportation Conventions

Prepared by:
Urban Design & Transportation Studio
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Georgia Institute of Technology
Center for Quality Growth & Regional Development
May 12, 2006
Reframing Key Transportation Conventions

Expect great results
Reframing Key Transportation Conventions
Reframing Key Transportation Conventions
Reframing Key Transportation Conventions
Determine Functional Classification

Hierarchy & Functional Class Context

then

Establish Design Controls

Design Traffic
- The Role of the Regional Model
- Understanding the Travel Patterns – Trip Types
- Vehicle Types
- Defining the Context - Network and Mode Choice
- Role of Micro-Simulation
- Interpreting the Results – Capacity & Travel Time

Design Speed
- Target Speed & Context
- Minimums vs. Maximums
- Freight Routes
- Roadway Safety
- Speed / Flow Relationship
- Speed & Roadway Geometrics

then

Fit Design Elements

Roadway Design Standards
- Geometric (Sight Distance / Stopping Distance)
- Dimensions
- Design Elements – Trees / Parking / Transit Stops
- AASHTO Design Guidelines
- State and Local Design Standards
- Design Variances and Exceptions
Functional Classification
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Reframing Key Transportation Conventions
Hierarchy & Functional Class

- Principal Arterial
- Local
- Collector
- Minor Arterial

Functional Classification
Reframing Key Transportation Conventions
Hierarchy & Functional Class

Functional Class: Intuitive, Popular
Reframing Key Transportation Conventions
Hierarchy & Functional Class

Functional Classification
Determine Functional Classification

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Reframing Key Transportation Conventions

Context

Evolution of Integrated Land Use and Transportation Plans
Reframing Key Transportation Conventions

Context

Urban:

Arterial
Collector
Local

Suburban:

Parkway
Boulevard
Avenue
Main Street
Street
Lane

Rural:
Reframing Key Transportation Conventions

Context

Rural-to-Urban Transect

Drawings by James Wassell
Reframing Key Transportation Conventions

Context

Urban Activity Center

Village Center

Neighborhood Center

Neighborhood

Industrial

Rural Cluster

Rural Agricultural Area

Transect Points
Frontage Elements

Reframing Key Transportation Conventions

Context

Building Siting

Address Street

Enclose Street

Parking

Random

On Premise

Individual

Park-Once
Network Elements

Reframing Key Transportation Conventions

Context

Street Spacing

500-800'

300-500'

Street Access

Private, Uncontrolled

Shared Controlled

Alley
Reframing Key Transportation Conventions

Context

TRANSITION FROM RURAL TO URBAN
Reframing Key Transportation Conventions

Context

TRANSITION FROM RURAL TO URBAN
Reframing Key Transportation Conventions

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TRANSITION FROM RURAL TO URBAN
Reframing Key Transportation Conventions

**Context**

**Urban:** Commercial, Retail, Mixed Use, Residential, Industrial

**Suburban:** Commercial, Retail, Mixed-use, Residential, Industrial

**Rural:** Commercial, Retail, Mixed Use, Residential, Industrial

Highway
Arterial
Collector
Local

Parkway
Boulevard
Avenue
Main Street
Street
Lane

Refining Key Transportation Conventions
Reframing Key Transportation Conventions

TRANSITION WITHIN AN URBAN CONTEXT
Reframing Key Transportation Conventions

Context

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TRANSITION WITHIN AN URBAN CONTEXT
Reframing Key Transportation Conventions

**DESIGN TRAFFIC**

**Determine Functional Classification**
- Hierarchy & Functional Class
- Context

**Establish Design Controls**
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Reframing Key Transportation Conventions

DESIGN TRAFFIC – The Role Of The Regional Model

Land Use

Anticipate

Travel

Forecast
(Based on Speed)

generates

demands

Road Capacity

Accommodate
Reframing Key Transportation Conventions
DESIGN TRAFFIC – The Role Of The Regional Model

Travel

- Forecast (Based on Speed)

Travel demands

Unconstrained Model Run
(Based on a Limited Regional Network)

Vs.

Constrained Model Run
(Based on a Limited Regional Network)

Road Capacity

- Desire
  (as if nothing else mattered)

Vs.

- Need
  (Based on Capacity & the Network)

Accommodate
Reframing Key Transportation Conventions

DESIGN TRAFFIC – The Role Of The Regional Model

Travel

Unconstrained Model Run
(Based on a Limited Regional Network)

Vs.

Constrained Model Run
(Based on a Limited Regional Network)

Road Capacity

Forecast
(Based on Speed)

Desire
(as if nothing else mattered)

Vs.

Reality
(Based on Capacity & the Network)

Accommodate
Reframing Key Transportation Conventions
DESIGN TRAFFIC – The Role Of The Regional Model

Land Use generates Travel Forecast demands Road Capacity

Regional Scale (Based on a Limited Regional Network)

Region Solution (as if nothing else mattered)
Can’t Be Improved Further
Reframing Key Transportation Conventions
DESIGN TRAFFIC – The Role Of The Regional Model

Land Use generates

Travel Forecast demands

Road Capacity
Order of Magnitude

Regional Scale
(Based on a Limited Regional Network)

Informs

Corridor Scale
(Based on Expanded Corridor Network)

Corridor Based Solution
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Understanding Travel Patterns

Determine Functional Classification
Hierarchy & Functional Class
Context

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Reframing Key Transportation Conventions

DESIGN TRAFFIC - Understanding Travel Patterns

- **Internal Travel** – Preserve the capacity and quality of local streets for travel made entirely within the City.

- **Local Travel** – Make selective, precisely targeted capacity improvements, on the City’s own terms, for trips beginning in (by residents of) Roswell and trips ending in (by visitors to) Roswell.

- **Through Travel** – For regional through trips - neither beginning nor ending in the City.
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Understanding Travel Patterns

Local Trips within the Corridor: 7%
Trips That Start or End in Corridor: 52%
Through Trips Corridor: 41%
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Understanding Travel Patterns

Local Trips within the Corridor: 7%
Trips That Start or End in Corridor: 52%
Through Trips Corridor: 41%
Reframing Key Transportation Conventions
DESIGN TRAFFIC – Vehicle Types

Determine Functional Classification
Hierarchy & Functional Class Context

then

Establish Design Controls
Design Traffic
- The Role of the Regional Model
- Understanding the Travel Patterns – Trip Types
- **Vehicle Types**
  - Defining the Context - Network and Mode Choice
  - Role of Micro-Simulation
  - Interpreting the Results – Capacity & Travel Time

  Design Speed
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Reframing Key Transportation Conventions

DESIGN TRAFFIC – Vehicle Types

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Design Vehicle</th>
<th>Passenger Car</th>
<th>Single Unit Truck</th>
<th>Tractor-Trailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Collector</td>
<td>○</td>
<td></td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Local</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Design Vehicles

- Arterial
  - 11.0 ft
  - 20.0 ft
- Collector
  - 21.3 ft
  - 35.8 ft
- Local
  - 42.5 ft
  - 50.0 ft
  - 55+ ft
Single Unit ("SU") Truck Turning Radius

Reframing Key Transportation Conventions
DESIGN TRAFFIC – Vehicle Types
Types of Encroachment

Reframing Key Transportation Conventions
DESIGN TRAFFIC – Vehicle Types

#1: Use full departure leg
#2: Use full approach and departure leg
#3: Encroach across departure centerline
#4: Encroach across departure and departure centerline

<table>
<thead>
<tr>
<th>From (Approach Street)</th>
<th>To (Departure Street)</th>
<th>Art</th>
<th>Col</th>
<th>Loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial (Art)</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Collector (Col)</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Local (Loc)</td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Permissible Encroachments
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Vehicle Types

% Truck Traffic
Influences Roadway Geometrics & Design Speed
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Defining the Context

Determine Functional Classification

Hierarchy & Functional Class Context

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Reframing Key Transportation Conventions

DESIGN TRAFFIC - Defining the Context

Same Total Lanes

More Capacity
- VMT
- Turns
- Clearance Time
- Signal Phase

Benefits of Network
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Defining the Context

Inside the R-O-W
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Defining the Context

Adjacent Network
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Defining the Context

Inside the R-O-W
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Defining the Context

Future Desired Network
Determine Functional Classification

Hierarchy & Functional Class
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Reframing Key Transportation Conventions

Micro-Simulation

Suburban Travel Distribution
Reframing Key Transportation Conventions

Micro-Simulation

Land Use Solution
Reframing Key Transportation Conventions

Micro-Simulation

Hourly Traffic Volume (both directions)

Urban Travel Distribution
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Micro-Simulation

N-S CLV

E-W CLV

Total CLV:
Less than 900 free flow
900-1200 normal midday
1200-1400 typical peak hour
1400-1500 near saturation
Over 1500 loaded cycles
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Micro-Simulation
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Micro-Simulation
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Interpreting the Results

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Reframing Key Transportation Conventions
DESIGN TRAFFIC - Interpreting the Results

Capacity of Streets
LEVEL OF SERVICE DEFINITIONS

SERVICE

LEVEL  DEFINITION – Operating Speed
A  Free Flow: Users unaffected by others in the traffic stream.
B  Stable Flow: Slight decline in the freedom to maneuver from LOS “A”
C  Stable Flow: Operation of the vehicle becomes significantly affected by the interaction of others in the traffic system.
D  Approaching Unstable Flow: High volumes of traffic, speeds adversely affected, and the freedom to maneuver is severely restricted.
E  Unstable Flow: Operating conditions are at, or very near capacity. All speeds are low and the freedom to maneuver is extremely difficult.
F  Exceeding Capacity: Point at which arrival flows exceed discharge flows causing queuing delays. Stoppages may occur for long periods of time because of the downstream congestion. Travel times are also substantially increased.
Reframing Key Transportation Conventions

DESIGN TRAFFIC - Interpreting the Results

Intersections Improved
- Orlando/Park
- Orlando/Solana
- Orlando/Lee
- Orlando/Webster
- Orlando/Orange
- Denning/Webster

Overall Increase in Mobility

**Northbound**
From 5.3 mph to 5.7 mph
95 seconds saved over the corridor

**Southbound**
From 8.1 mph to 9.1 mph
98 seconds saved over the corridor
### Summary Table

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>4 Way @ Holden</th>
<th>4 Way @ Gatlin</th>
<th>Town Square</th>
<th>Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intersection Level of Service (LOS)</strong></td>
<td>D</td>
<td>E</td>
<td>(Very Poor)</td>
<td>(Poor)</td>
<td>(Poor)</td>
</tr>
<tr>
<td><strong>Orange Avenue Capacity</strong></td>
<td>(Poor)</td>
<td>(Fair)</td>
<td>(Fair)</td>
<td>(Very Good)</td>
<td>(Very Good)</td>
</tr>
<tr>
<td><strong>Holden / Gatlin Movement</strong></td>
<td>Fair</td>
<td>Very Good</td>
<td>Very Good</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td><strong>Pedestrians</strong></td>
<td>Very Poor</td>
<td>Poor</td>
<td>Poor</td>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Very Poor</td>
<td>Good</td>
<td>Good</td>
<td>fair</td>
<td>Very Good</td>
</tr>
<tr>
<td><strong>Gateway, Town Center</strong></td>
<td>Poor</td>
<td>Very Poor</td>
<td>Very Good</td>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td><strong>New Frontage</strong></td>
<td>Poor</td>
<td>Good</td>
<td>Good</td>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td><strong>West Property Access East</strong></td>
<td>Poor</td>
<td>Fair</td>
<td>Very Good</td>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td><strong>Urban Design</strong></td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td>Good</td>
</tr>
</tbody>
</table>
Reframing Key Transportation Conventions
DESIGN TRAFFIC - Interpreting the Results

- Retain and enhance the natural appearance of the landscape
- Provide a distinctive corridor identity
- Provide safe vehicular and emergency access to, from and across the corridor
- Provide safe bicycle and pedestrian crossings and circulation
- Minimize noise impacts in a context-sensitive manner
- Provide accommodation for wildlife
- Minimize light pollution of the night sky
- Minimize right-of-way requirements
- Minimize air quality impacts
- Provide motorists with a reliable transportation system and reasonably predictable travel times, within the constraints of the external network
- Accommodate a public transportation system
- Constructability

Evaluation Criteria
Total Travel Time of Route 29 NB Corridor = 21m57s
Difference Between Existing and Proposed = 2m01s
“Highway design is too important to be left to Highway Engineers.”

Dr. Thomas D. Larson
Federal Highway Administration
Reframing Key Transportation Conventions

**DESIGN SPEED**

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Hierarchy & Functional Class
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  - Roadway Safety
  - Freight Routes
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  - Minimums vs. Maximums
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DESIGN SPEED - Speed / Flow Relationship

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Reframing Key Transportation Conventions

DESIGN SPEED - Speed / Flow Relationship

Maximum Volume 25-30 Miles Per Hour

Free flow Condition
Reframing Key Transportation Conventions

**DESIGN SPEED** - Roadway Safety

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Hierarchy & Functional Class Context

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DESIGN SPEED - Roadway Safety
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Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

WIDTH OF GRADING, 70 MPH
OVER 2X WIDTH @ 50 MPH

WIDTH OF GRADING, 50 MPH

MATERIAL EXCAVATED: 70 MPH IS 5X GREATER THAN 50 MPH

FINAL CROSS SECTIONS
Impact of Road Widening
Impact of Road Widening
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

30 MPH Posted Speed

15% Speeding
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

30 MPH Posted Speed

15% Speeding

Raise to 40 MPH

15% Speeding
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

Livable Transportation – Hot Topic
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

30 mph                    25 mph
20 mph                  15 mph
<table>
<thead>
<tr>
<th>SPEED</th>
<th>( p(\text{killing pedestrian}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 mph</td>
<td>3.5%</td>
</tr>
<tr>
<td>31 mph</td>
<td>37.0%</td>
</tr>
<tr>
<td>44 mph</td>
<td>83.0%</td>
</tr>
</tbody>
</table>
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

OUR TOWN  U.D.O.T. RECALIBRATES THE SIGNAL LIGHTS...

T-SHIRT SHOPEE

OPEN

O.K. LET'S SEE IF YOU CAN DO IT IN 3.5 SECONDS

Nick Haugeen 603
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety
Reframing Key Transportation Conventions
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DRIVEWAY CONSOLIDATION
129 Driveways
23 Immediate Opportunities
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

- Reduce Driveway Width
- Consolidate Driveways (2 to 1)
- Brick Turn Lane
- Consolidate Driveway (2 to 1)
- New Traffic Signal
Reframing Key Transportation Conventions
DESIGN SPEED - Roadway Safety

- Brick Turn Lane
- Reduce Driveway Width
- Consolidate Driveway (2 to 1)
- Consolidate Driveways (2 to 1)
Reframing Key Transportation Conventions

DESIGN SPEED - Roadway Safety
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Freight, Goods and Services Mobility Strategy Plan

Executive Summary
June 2002
Reframing Key Transportation Conventions
DESIGN SPEED - Target Speed & Context

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Reframing Key Transportation Conventions
DESIGN SPEED - Target Speed & Context

SR 415, Volusia County: Corridor Transect
Reframing Key Transportation Conventions
DESIGN SPEED - Target Speed & Context

Context Changes
Context Changes
Maximum Design Speed, Not Minimum

i.e. Target Speed

Reframing Key Transportation Conventions
DESIGN SPEED - Target Speed & Context
Design Elements
Reframing Key Transportation Conventions

**DESIGN ELEMENTS**

**Determine Functional Classification**

Hierarchy & Functional Class

Context

then

**Establish Design Controls**

Design Traffic

- The Role of the Regional Model
- Understanding the Travel Patterns – Trip Types
- Vehicle Types
- Defining the Context - Network and Mode Choice
- Role of Micro-Simulation
- Interpreting the Results – Capacity & Travel Time

Design Speed

- Speed / Flow Relationship
- Roadway Safety
- Freight Routes
- Target Speed & Context

then

**Fit Design Elements**

Roadway Design Standards

- Geometric (Sight Distance / Stopping Distance)
- Dimensions
- Design Elements – Trees / Parking / Transit Stops
- AASHTO Design Guidelines
- State and Local Design Standards
- Design Variances and Exceptions
Determine Functional Classification

Hierarchy & Functional Class
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then

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then

Fit Design Elements

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Reframing Key Transportation Conventions
DESIGN ELEMENTS - Geometrics

Basic Road Design Guidelines
Determine Functional Classification

Hierarchy & Functional Class
Context

then

Establish Design Controls

Design Traffic
- The Role of the Regional Model
- Understanding the Travel Patterns – Trip Types
- Vehicle Types
- Defining the Context - Network and Mode Choice
- Role of Micro-Simulation
- Interpreting the Results – Capacity & Travel Time

Design Speed
- Speed / Flow Relationship
- Roadway Safety
- Freight Routes
- Target Speed & Context

then

Fit Design Elements

Roadway Design Standards
- Geometric (Sight Distance / Stopping Distance)
- **Dimensions**
- Design Elements – Trees / Parking / Transit Stops
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Reframing Key Transportation Conventions
DESIGN ELEMENTS – Dimensions

ROADWAY DESIGN ELEMENTS

INTERSECTIONS

Where ROW permits, bike lane should terminate at stop bar or crosswalk.

Special pavement treatment may be used to designate pedestrian crossing.

Example: Intersection of Arterial Street with Collector Street

BICYCLE LANE AT INTERSECTION

CURB RETURN Radius

<table>
<thead>
<tr>
<th>Type</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local - Local</td>
<td>18&quot;</td>
<td>25&quot;</td>
</tr>
<tr>
<td>Local - Collector</td>
<td>15&quot;</td>
<td>25&quot;</td>
</tr>
<tr>
<td>Collector - Collector</td>
<td>18&quot;</td>
<td>25&quot;</td>
</tr>
<tr>
<td>Collector - Arterial</td>
<td>20&quot;</td>
<td>50&quot;</td>
</tr>
<tr>
<td>Arterial - Arterial</td>
<td>20&quot;</td>
<td>50&quot;</td>
</tr>
<tr>
<td>Arterial - Farm-to-Market</td>
<td>20&quot;</td>
<td>50&quot;</td>
</tr>
</tbody>
</table>

Note: The dashed lines in cases "A" and "B" are optional (see case "C"). Source: AASHTO Guide for the Development of Bicycle Facilities

* Allow encroachment into adjacent lane by design vehicle when turning on low volume streets.

EFFECTIVE CURB Radius

Intersection design should safely accommodate both vehicles and pedestrians.

To comfortably accommodate pedestrians, minimize the curb return radius and intersection pavement width to the greatest extent possible.

KEY

R1 = Curb radius defined as the outer edge of the curb
R2 = Effective Radius
R3 = Curved radius defined as the inner edge of the curb

Source: ADA Standards for Accessible Design

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Reframing Key Transportation Conventions
DESIGN ELEMENTS – Dimensions

ROADWAY DESIGN ELEMENTS

MEDIANs

Continuous Left-Turn
Used on arterial streets in commercial areas with frequent driveways. Blocks are larger than 600', place pedestrian crossing with special treatment as well as pedestrian refuge island at intervals of 600' to 1400' (where possible).

Narrow Median
Use on collector and arterial streets with infrequent driveways and intersections. Most commonly used for retrofit projects where there is limited ROW. Landscape where feasible.

Wide Median
Use on arterial streets with less frequent driveways and intersections.

Rural Median

<table>
<thead>
<tr>
<th>Optional In</th>
<th>Continuous Left-Turn</th>
<th>Narrow Median</th>
<th>Wide Median</th>
<th>Rural Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban Activity Center</td>
<td>11'- 14'</td>
<td>4'- 6'</td>
<td>12'- 30'</td>
<td>24'- 50'</td>
</tr>
<tr>
<td>Industrial</td>
<td>12'- 14'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Cluster</td>
<td>10'-12'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Agricultural</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban Activity Center</td>
<td>10'-12'</td>
<td>4'- 6'</td>
<td>10'-16'</td>
<td></td>
</tr>
<tr>
<td>Rural Cluster</td>
<td>10'-12'</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PLANTING IN MEDIANs

Distance from face of non-mountable curb, when tree diameter is greater than 4 inches measured 6 inches off the ground.
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Dimensions

ROADWAY DESIGN ELEMENTS

WIDTH OF SIDEWALKS

<table>
<thead>
<tr>
<th>Less Intense Development</th>
<th>More Intense Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Off Curb</strong></td>
<td><strong>On Curb</strong></td>
</tr>
<tr>
<td>Sidewalk (see table)</td>
<td>Sidewalk (see table)</td>
</tr>
<tr>
<td>6' Min. Planting Set-up</td>
<td>6' Min. Planting Set-up</td>
</tr>
<tr>
<td>Horizontal Clearance</td>
<td>Horizontal Clearance</td>
</tr>
</tbody>
</table>

LOCATION AND DESIGN OF SIDEWALKS

On arterial and collector streets, sidewalks should be located at the outside edge of the road right-of-way, except at intersections where they should be located as shown in the adjacent graphic.

The sidewalk grade should remain consistent along a roadway corridor. At locations where a driveway crosses a sidewalk, the grade of the driveway shall match that of the sidewalk.

<table>
<thead>
<tr>
<th>SIDEWALK WIDTH</th>
<th>Off Curb</th>
<th>On Curb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (Feet)</td>
<td>Max. (Feet)</td>
<td>Min. (Feet)</td>
</tr>
<tr>
<td>Arterial</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Urban Activity Center</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Rural Cluster</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Industrial</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Collector</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Street</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Main Street</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Urban Activity Center</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Village Center</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Neighborhood Center</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Rural Cluster</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Rural Agriculture</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Minimum Horizontal Clearance Width

- Posted Speed < 25 mph: 1.5 feet from face of curb
- Posted Speed ≥ 25 mph: 4 feet* from face of curb

* 1.5 feet under constrained conditions

ROADWAY RECONSTRUCTION

Provide sidewalks on both sides of the roadway for:
- Arterials in Urban Activity Centers and Rural Clusters
- Collectors in Urban Activity Centers, Village Centers, and Rural Clusters
- Neighborhood streets in Urban Activity Centers, Village Centers, and Neighborhood Centers

If ROW is constrained, may provide sidewalks on only one side of the roadway for:
- Arterials in Industrial land use type
- Collectors in Industrial land use type
- Neighborhood streets in Neighborhoods, Rural Clusters, and Rural Agricultural land use types
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Dimensions

ROADWAY DESIGN ELEMENTS

TREE SPACING IN SIGHT TRIANGLE

<table>
<thead>
<tr>
<th>Description</th>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Maximum caliper (diameter) within limits of sight window (mm)</td>
<td>&gt; 4” ≤ 11”</td>
</tr>
<tr>
<td>Minimum spacing (c. to c. of trunk) (ft)</td>
<td>22</td>
</tr>
</tbody>
</table>

Source: FDOT

Sizes and spacing are based on the following conditions:
A. A single line of trees in the median parallel to but not necessarily colinear with the centerline.
B. A straight approaching mainline within skew limits.
C. Trees with diameters ≤ 11” in diameter casting a vertical 6’ wide shadow based on a vehicle entering at stop bar location when viewed by mainline driver beginning at distance ‘d’.
D. Sabal palms with diameters > 11” ≤ 18” spaced at intervals providing a second full view of entering vehicle at stop bar location when viewed by mainline driver beginning at distance ‘d’ (see perception diagram).

Location of Shade Trees
Shade trees shall be located to provide shade to users of the sidewalks and multi-use trails. On arterial and collector roadways, shade trees should be located between the travel lane and the sidewalk. To provide personal security, users of the sidewalk must be visible from vehicles in the travel lane. Landscaping located between the travel lanes and the sidewalk must not block these views. Therefore, shrubs and tree canopies should be pruned to allow visibility from vehicles in the travel lane to users of the sidewalk.

Location of Traffic Control Devices, Light Poles, and Above Ground Utilities
Traffic Control Devices will be designed and located in accordance with the Manual of Uniform Traffic Control Devices and Roadway and Traffic Design Standards.

Light Poles and Utilities if not placed underground:
No Curb - Outside of Clear Zone
Curb Present - Outside of Horizontal Clearance area. If placed in sidewalk, must maintain 4 feet of unobstructed sidewalk area.
CORRIDOR TYPE: ARTERIAL

LAND USE CLASSIFICATION: URBAN ACTIVITY CENTER

<table>
<thead>
<tr>
<th>REQUIRED</th>
<th>OPTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curbs and center</td>
<td>On-street parking</td>
</tr>
<tr>
<td>Street and pedestrian scale lighting</td>
<td>Planting strip</td>
</tr>
<tr>
<td>Shade trees</td>
<td>Mid block pedestrian crossing</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>Raised median</td>
</tr>
<tr>
<td>Transit stops with benches (if service is provided)</td>
<td>Continuous left turn lane</td>
</tr>
<tr>
<td>Pedestrian activated crossing signal at signalized intersections</td>
<td>Bus Shelters</td>
</tr>
<tr>
<td>Bicycle lane or wide outside travel lane</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESIGN ELEMENT</th>
<th>MINIMUM WIDTH (feet)</th>
<th>MAXIMUM WIDTH (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle lanes (when bicycle lane is present)</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Outside vehicle lane (no bicycle lane present)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Raised median</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>- infrequent driveways and intersections</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>- short blocks, left turn lanes</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Continuous left turn lanes</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Bicycle lane</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Parking lane</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>- with bicycle lane</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>- no bicycle lane</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Planting strip</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>- on curb</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>- off curb</td>
<td>80</td>
<td>130</td>
</tr>
<tr>
<td>ROW width</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Design Speed: 35 mph - 45 mph

Note: Where ROW permits, it is always preferred to provide a bicycle lane.
## Reframing Key Transportation Conventions

### DESIGN ELEMENTS – Dimensions

**CORRIDOR TYPE:** COLLECTOR STREET

**LAND USE CONTEXT:** Urban Activity Center

<table>
<thead>
<tr>
<th>Required</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike lanes</td>
<td>Median</td>
</tr>
<tr>
<td>Curb and gutter</td>
<td>Parking</td>
</tr>
<tr>
<td>Planting strip</td>
<td>Bulbouts and medians</td>
</tr>
<tr>
<td>Pedestrian scale lighting</td>
<td>Bulbouts and medians (when parking is provided)</td>
</tr>
<tr>
<td>Shade trees</td>
<td>Bus Shelter</td>
</tr>
<tr>
<td>Sidewalks</td>
<td></td>
</tr>
<tr>
<td>Making stop with benches, where transit service is provided</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Element</th>
<th>Minimum Width (feet)</th>
<th>Maximum Width (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle lanes</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Bike lanes</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>(without parking)</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Bike lanes</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>(with parking)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrow Median</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Continuous left turn lane</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Raised Median</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Parking</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>- Planting strip</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>- Sidewalk</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>- ROW Width</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Dimensions

CORRIDOR TYPE: COLLECTOR STREET

LAND USE CONTEXT: RURAL AGRICULTURAL/INDUSTRIAL

<table>
<thead>
<tr>
<th>REQUIRED</th>
<th>OPTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bike lanes or bikeway</td>
<td>• Curb and gutter</td>
</tr>
<tr>
<td></td>
<td>• Planting strip</td>
</tr>
<tr>
<td></td>
<td>• Lighting</td>
</tr>
<tr>
<td></td>
<td>• Shade trees</td>
</tr>
<tr>
<td></td>
<td>• Sidewalk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESIGN ELEMENT</th>
<th>MINIMUM Width (feet)</th>
<th>MAXIMUM Width (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- bike lane in travelway</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>- outside lane, no bike lane in travelway</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Bike lane (curb)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Bike lane (no curb)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Multiuse trail</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ROW</td>
<td>50</td>
<td>80</td>
</tr>
</tbody>
</table>

Bikeway (Separate Multiuse Trail Optional)
Design Speed: 30-35 mph
Design Volume: LESS THAN 1500 VPD

Bicycle Lane
Design Speed: 30-35 mph
Design Volume: LESS THAN 1500 VPD

Parallel Bicycle Facility to Roadway

Bicycle Facility in Roadway

Rural Agricultural Area - Collector Street
**CORRIDOR TYPE:** COLLECTOR STREET

**LAND USE CONTEXT:** RURAL CLUSTER

<table>
<thead>
<tr>
<th><strong>REQUIRED</strong></th>
<th><strong>OPTIONAL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bike lanes</td>
<td>• Median</td>
</tr>
<tr>
<td>• Planting strip</td>
<td>• Parking</td>
</tr>
<tr>
<td>• Shade trees</td>
<td>• Curb and gutter</td>
</tr>
<tr>
<td>• Sidewalks</td>
<td>• Bulbs and medians (When parking is provided)</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian scale lighting at intersections</td>
</tr>
</tbody>
</table>

**Design Speed:** 30-35 mph

<table>
<thead>
<tr>
<th><strong>Design Element</strong></th>
<th><strong>Minimum Width (ft)</strong></th>
<th><strong>Maximum Width (ft)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vehicle lanes</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>• Median</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>(continuous left-turn lane)</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>• Raised Median</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>• Bike lanes</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>(without parking)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bike lanes</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>(with parking)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>• Parking</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>• Planting strip</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>• Sidewalks</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>• ROW Width</td>
<td>50</td>
<td>80</td>
</tr>
</tbody>
</table>
Reframing Key Transportation Conventions

DESIGN ELEMENTS – Dimensions

LAND USE CONTEXT:
URBAN ACTIVITY CENTER/ VILLAGE CENTER/ RURAL CLUSTER

REQUIRED

- On-street parking
- Bulb-outs with landscaping
- Gutter
- Shade trees
- Pedestrian scale lighting
- Shelter at bus stop (if served by transit)
- Pedestrian crosswalk treatment

OPTIONAL

- Bicycle lane
- Curb

SIZING & SPACING

- Vehicle lane width
- Bicycle lane
- Parallel parking
- - with bike lane
- - without bike lane
- Angled parking
- - length
- - width
- Sidewalk
- (C/W width)

**CORRIDOR TYPE: MAIN STREET**

PARKING OPTIONS

PARALLEL PARKING

FRONT END ANGLED PARKING

REAR END ANGLED PARKING

SIDEWALK OPTIONS

STREET

- Allows for 2-way pedestrian and amenities such as benches and trash receptacles

PLAZA

- Provides space for outdoor dining or cafe

DESIGN SPEED: 25-30 MPH

Note: Width of parking lane may be measured from line of curb, and may include all or a portion of the gutter.
Reframing Key Transportation Conventions

**DESIGN ELEMENTS – Design Elements**

### Determine Functional Classification

- **Hierarchy & Functional Class**
- **Context**

**then**

### Establish Design Controls

- **Design Traffic**
  - The Role of the Regional Model
  - Understanding the Travel Patterns – Trip Types
  - Vehicle Types
  - Defining the Context - Network and Mode Choice
  - Role of Micro-Simulation
  - Interpreting the Results – Capacity & Travel Time

- **Design Speed**
  - Speed / Flow Relationship
  - Roadway Safety
  - Freight Routes
  - Target Speed & Context

**then**

### Fit Design Elements

- **Roadway Design Standards**
  - Geometric (Sight Distance / Stopping Distance)
  - Dimensions
  - **Design Elements – Trees / Parking / Transit Stops**
  - AASHTO Design Guidelines
  - State and Local Design Standards
  - Design Variances and Exceptions
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

People
Buildings
Reframing Key Transportation Conventions

DESIGN ELEMENTS – Design Elements

Trees

People

Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

- Lights
- Trees
- People
- Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

Paving Material

Lights

Trees

People

Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

Drainage
Paving Material
Lights
Trees
People
Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

- Speed
- Drainage
- Paving Material
- Lights
- Trees
- People
- Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

- Parking
- Speed
- Drainage
- Paving Material
- Lights
- Trees
- People
- Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

Sidewalks

Parking

Speed

Drainage

Paving Material

Lights

Trees

People

Buildings
Reframing Key Transportation Conventions
DESIGN ELEMENTS – Design Elements

Determine Functional Classification
Hierarchy & Functional Class
Context

then

Establish Design Controls
Design Traffic
- The Role of the Regional Model
- Understanding the Travel Patterns – Trip Types
- Vehicle Types
- Defining the Context - Network and Mode Choice
- Role of Micro-Simulation
- Interpreting the Results – Capacity & Travel Time

Design Speed
- Speed / Flow Relationship
- Roadway Safety
- Freight Routes
- Target Speed & Context

then

Fit Design Elements
Roadway Design Standards
- Geometric (Sight Distance / Stopping Distance)
- Dimensions
- Design Elements – Trees / Parking / Transit Stops
- AASHTO Design Guidelines
- State and Local Design Standards
- Design Variances and Exceptions
Reframing Key Transportation Conventions

**DESIGN ELEMENTS – State & Local Design Standards**

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November 2002
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DESIGN ELEMENTS – Design Variance & Exceptions

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