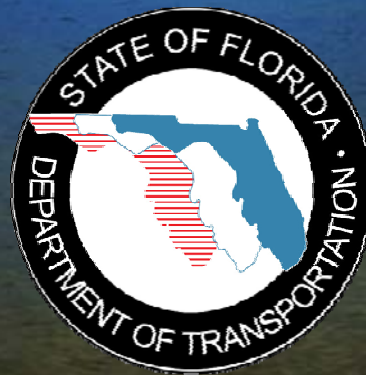


Engineering Issues



Douglas Reed, P.E.

- 30 Design and PD&E Studies since 1990
- Managed and Engineered 15+ PD&E/Feasibility Studies
- QC all PBS&J Engineering Reports
- Peer Reviews for D1, D3, D4, & D7 Engineering Reports
- With PBS&J PD&E Division 10 years

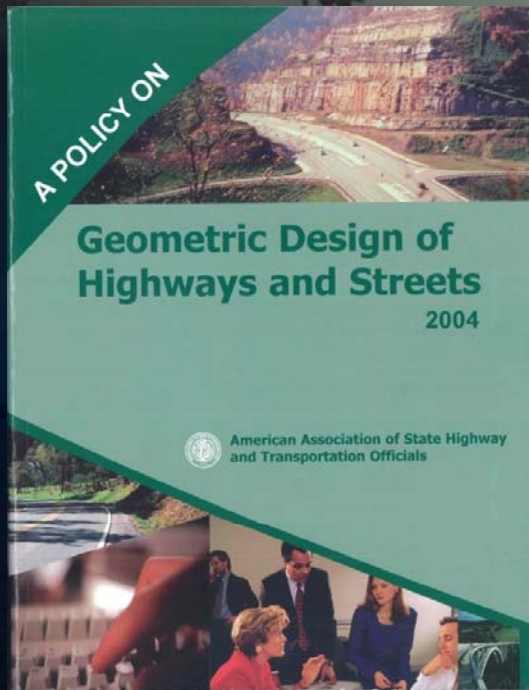


Roadway and Bridges Design Considerations

- Area Type
 - Rural - Flush Shoulders / Open Swales
 - Urban - Curb & Gutter / Closed Drainage
- Design Speed
 - High Speed or Low Speed
- Median
- Lane Widths
- Shoulders
- Bike Lanes
- Border
- Retention / Detention Ponds (SMF)

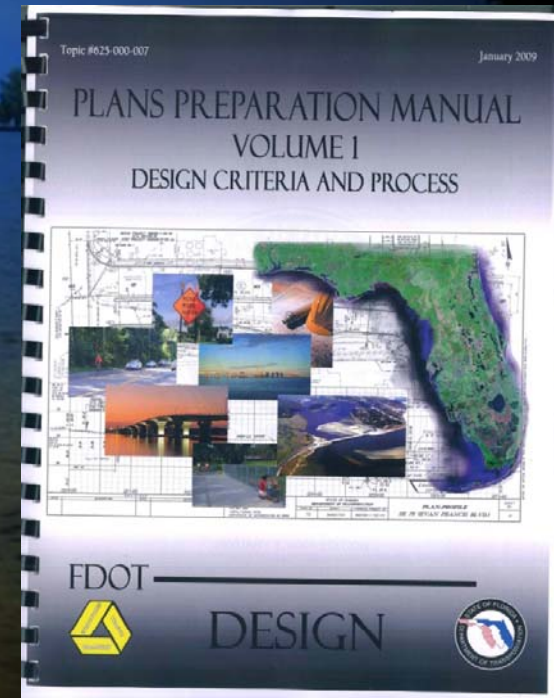
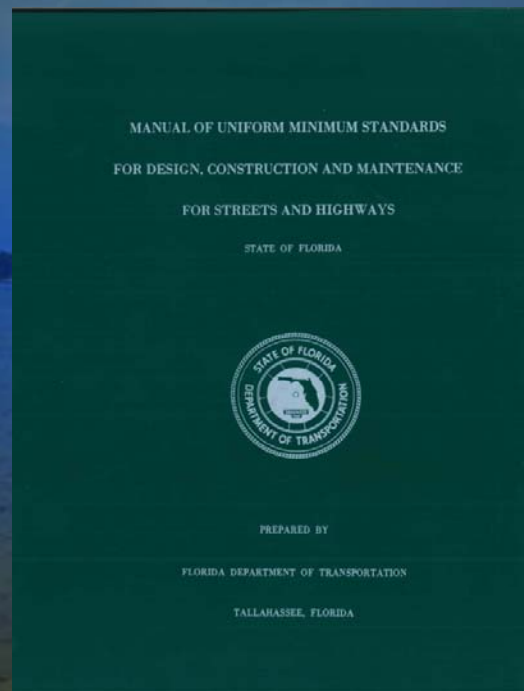


Roadway Standards



<https://bookstore.transportation.org/home.aspx>

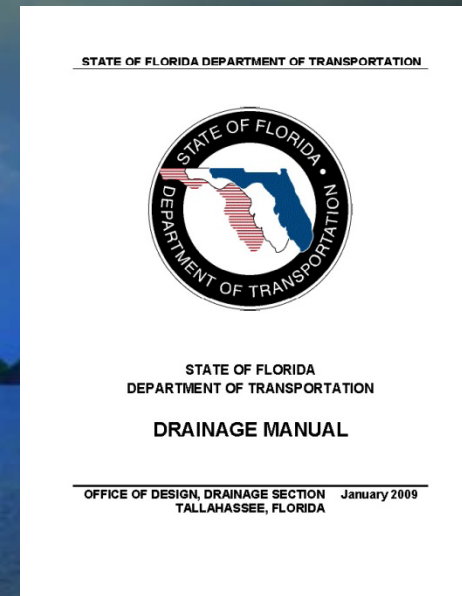
<http://www.dot.state.fl.us/rddesign/FloridaGreenbook/2007/2007FloridaGreenbook.pdf>



<http://www.dot.state.fl.us/rddesign/PPMManual/2009/PPM2009.shm>

Engineering Standards

<http://www.dot.state.fl.us/rddesign/rd/rtds/10/2010Standards.shtm>



<http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm>

<http://www.dot.state.fl.us/structures/StructuresManual/CurrentRelease/StructuresManual.htm>

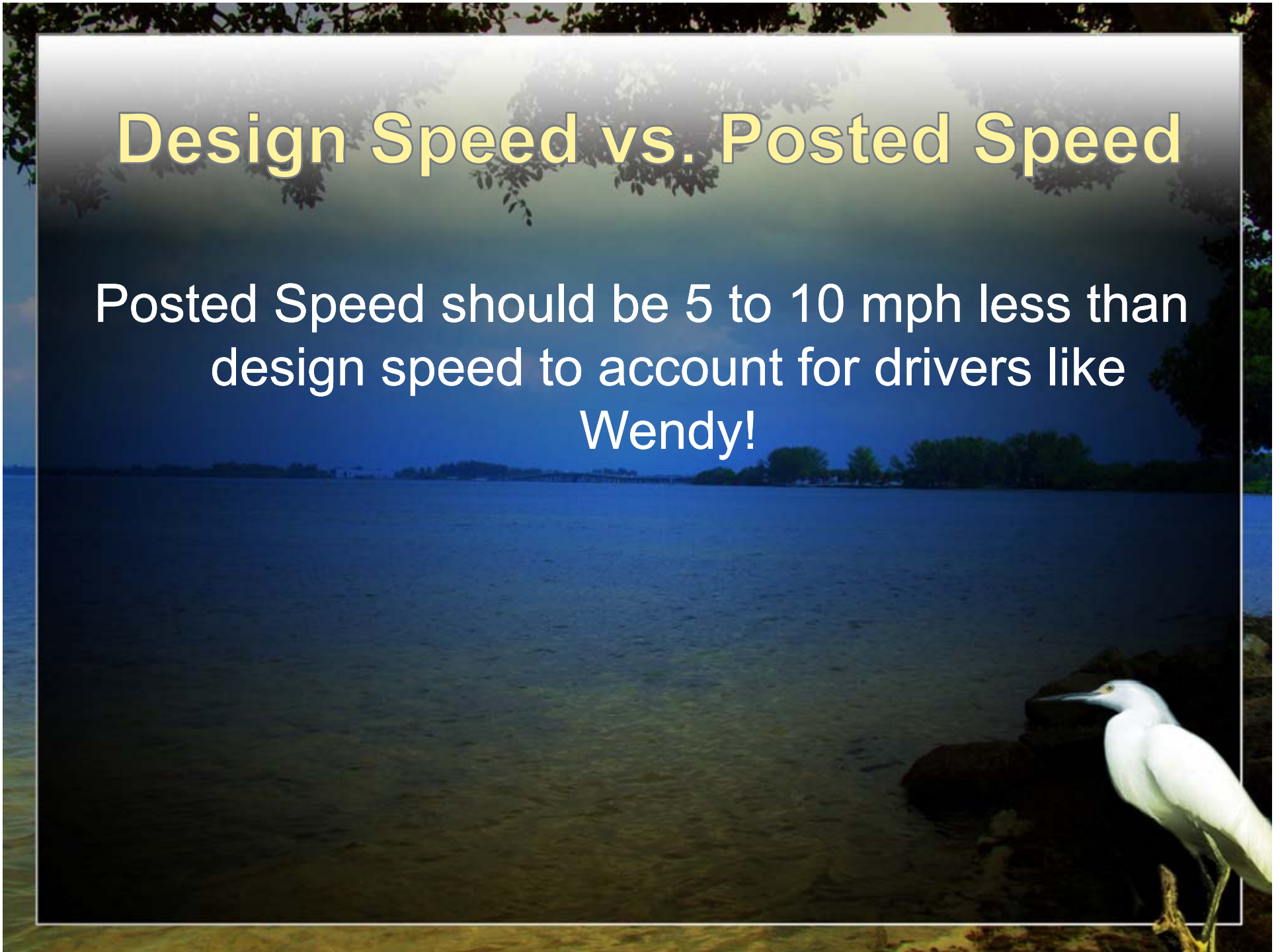
Functional Classification

- Interstate
 - Strategic Intermodal System (SIS)
 - Florida Intrastate Highway System (FIHS)
 - Arterial
 - Collector
 - Local
- ◉ High Speed
 - ◉ (70 mph)
 - ◉ Low Speed
 - ◉ (35 mph)



Design Speed vs. Posted Speed

Posted Speed should be 5 to 10 mph less than design speed to account for drivers like Wendy!



Right-of-Way Requirements

$$\begin{aligned} & \text{Median Width} \\ & + \text{Travel Lane Width} \\ & + \text{Shoulder Width} \\ & + \text{Border Width} \\ & + \text{Stormwater Management Facilities} \\ & = \text{Right-of-Way (R/W) Needs} \end{aligned}$$



Medians

- Separation = Safety!
- Unrestrictive Median
 - Center Two-Way Left Turn Lane
 - Low Speed Four-Lane Roadways ≤ 40 mph
 - 14 feet (ft) Standard Width
- Restrictive Median: High Speed ≤ 45 mph
 - Access Control: Reduce Conflict Points
 - Protected Left Turn Lanes
 - Raised Median
 - 22 ft Standard
 - 15.5 ft Minimum
 - Depressed
 - 40 ft Minimum
 - 64 ft Interstate (70 mph)



Travel Lane Widths

- 12 ft Standard
- 11 ft Arterials
- 10 ft Local and Auxiliary Lanes
(i.e. turn lanes, deceleration lanes)

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January 1, 2009

1. 11 ft. permitted on non-FIHS/SIS roads if one of these conditions exist:
 - a. R/W and existing conditions are stringent controls
 - b. Facility operates on interrupted flow conditions
 - c. Design speed 40 mph or less
 - d. Intersection capacity not adversely affected
 - e. Truck volume 10% or less
2. 12 ft. lanes for all 2-lane rural.
3. 12 ft. lanes in industrial areas when R/W is available.
4. With severe R/W controls, 10 ft. turning lanes may be used where design speeds are 40 mph or less and the intersection is controlled by traffic signals. Median turn lanes shall not exceed 15 ft.
5. 12 ft. when truck volume more than 10%.
6. 11 ft. for low volume AADT.



Shoulder Width

- Depends on:
 - Functional Classification
 - Design Speed
 - Traffic Volumes
 - High Volume
 - Normal Volume
 - Low Volume
- Paved Width



Bicycle & Pedestrian Features

- Bike Lanes
 - 4 ft On-Road with Curb & Gutter
 - 5 ft Paved Shoulder
- Sidewalks
 - 5 ft Standard
 - 6 ft when Adjacent to Curb & Gutter
- Shared Use Path
 - 6 ft One Way Path
 - 12 ft Two-Way Path



Borders

- Curb & Gutter (2 ft)
- Driveway Connections
- Sidewalks & Shared-Use Paths
- Drainage Ditches
 - Front & Back Slopes
 - Ditch Bottom
- Utilities
- Landscaping
- Noise Walls

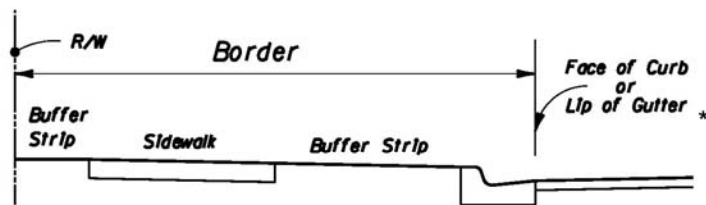


Borders

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Table 2.5.2 Highways with Curb or Curb and Gutter in Urban Areas



* Border width measured from lip of gutter (shown) or from face of curb when there is not a gutter.

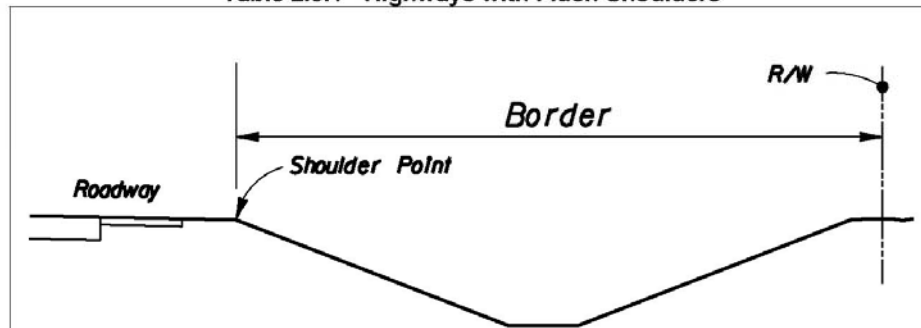
BORDER

TYPE FACILITY	MINIMUM WIDTH (FEET)	
	TRAVEL LANES AT CURB OR CURB AND GUTTER	BICYCLE LANES OR OTHER AUXILIARY LANES AT CURB OR CURB AND GUTTER
ARTERIALS COLLECTORS Design Speed ≥ 45 mph	14	12
ARTERIALS COLLECTORS Design Speed ≤ 40 mph	12	10
URBAN COLLECTOR STREETS Design Speed ≤ 30 mph	10	8

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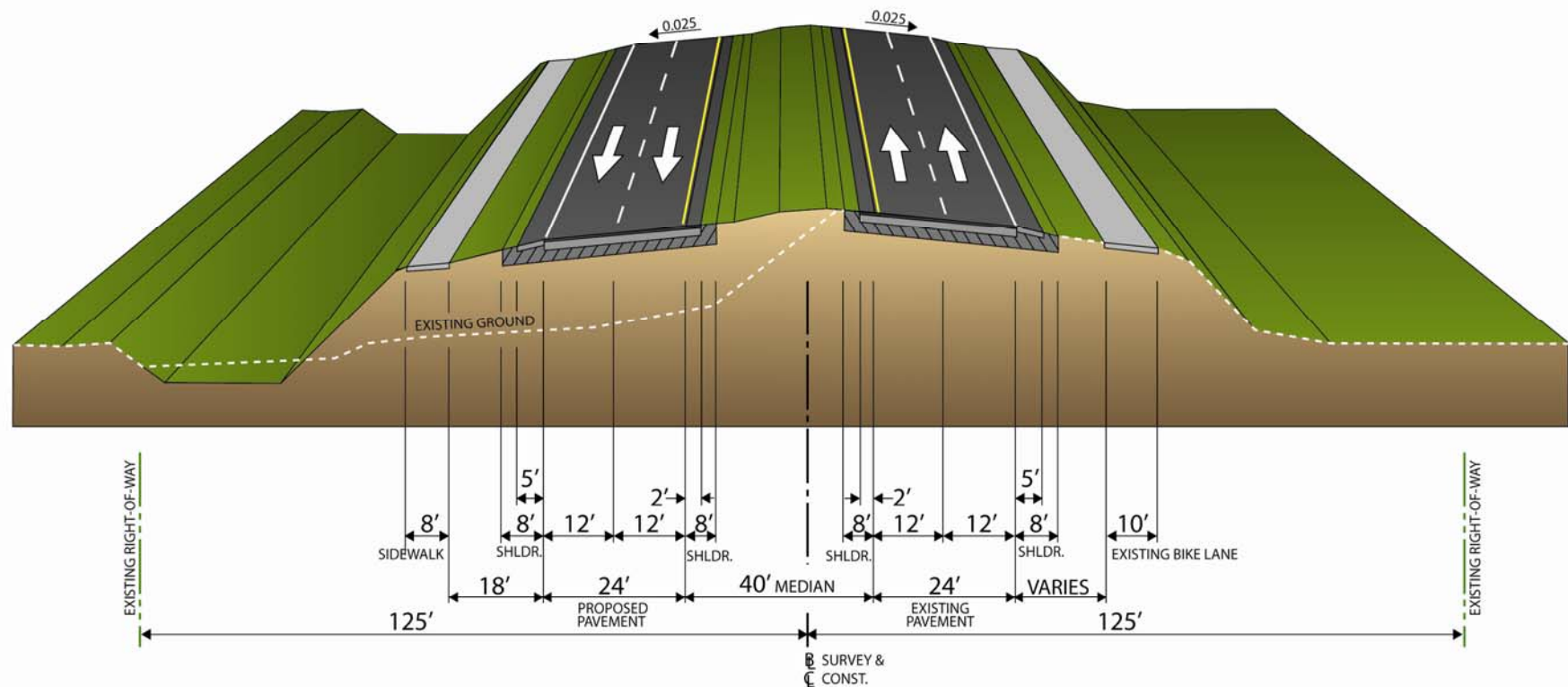
Table 2.5.1 Highways with Flush Shoulders



BORDER

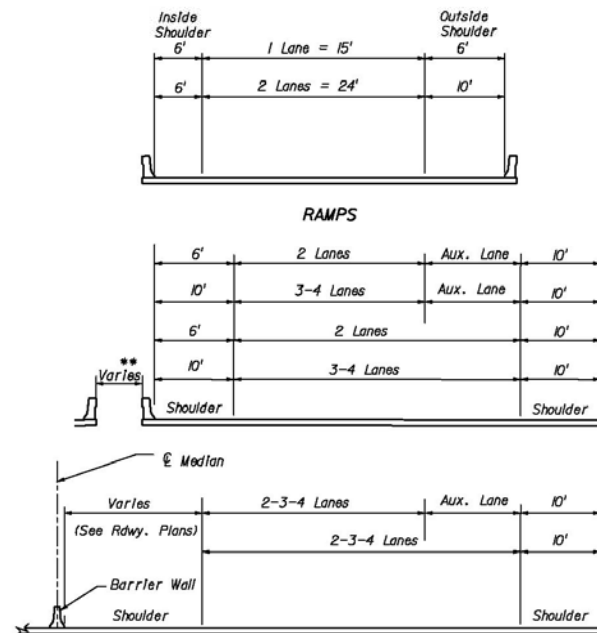
TYPE FACILITY	WIDTH (FEET)
ARTERIALS COLLECTORS Design Speed > 45 mph	40
ARTERIALS COLLECTORS Design Speed ≤ 45 mph	33

Roadway Typical Sections



Bridge Typical Sections

Figure 2.0.1 Partial Bridge Sections *



- Notes: 1. Minimum values may change if on horizontal curve.
 2. If barrier-separated HOV lane(s) on approach roadway, maintain shoulder width across bridge.
 3. For sections with continuous barrier wall, see Section 2.3 for alternatives on improving stopping sight distance.

Legend: [] - Appropriate barrier: Type varies, F Shape shown. See Section 2.12.

* Sections thru bridge deck shown. Sections thru approach slab and permanent retaining wall similar.

** See Section 2.2.3.

**FREEWAYS AND DIVIDED ARTERIALS (4 OR MORE LANES)
 DESIGN SPEED 50 mph AND GREATER**

Alignment

- Horizontal Alignment
 - Curve Radius
 - Curve Length
 - Superelevation
 - Left / Right / Center / Best Fit
 - Set to Minimize *Overall* Impacts
- Vertical Profile
 - Grade
 - Topography
 - Drainage - i.e. "Sawcut" Profile or Ditch Grade
 - Equalize Cut and Fill
 - Vertical Curve Length
 - Stopping Sight Distance



Alternatives Evaluation

- Typical Section – Urban vs. Rural
- Alignment – L / R / C / Best Fit
- Impacts
 - Natural - Wetlands, T&E, Air & Water Quality, Floodplains, Coastal & Marine
 - Cultural - Historical and Archaeological
 - Social - Community Facilities, Parks, Relocations, Emergency Facilities, Evacuation, Economics
 - Physical - Noise, Contamination, Navigation
 - Cost - Construction and R/W



Impact Avoidance & Minimization

- Design Speed
- Urban vs. Rural Design
- Change Horizontal Alignment
- Minimum Median/Lane Widths
- Reduce Border Width
 - Steeper Ditch Front & Back Slopes
 - Narrow Ditch Bottom
 - Gravity Wall
- Joint Use Ponds



A photograph of a calm lake under a dark, overcast sky. In the foreground, a white egret stands on a rocky shore, looking towards the water. The water is still, reflecting the dark sky. In the background, a line of trees and distant buildings are visible on the opposite shore. The overall mood is quiet and contemplative.

Questions?