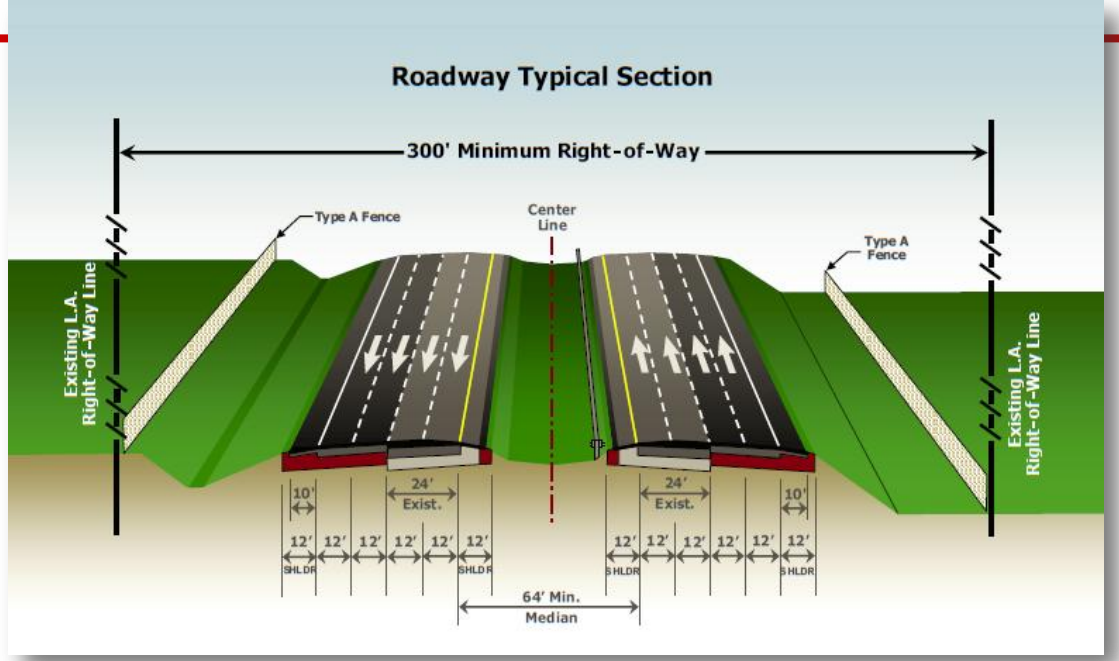
Design 101



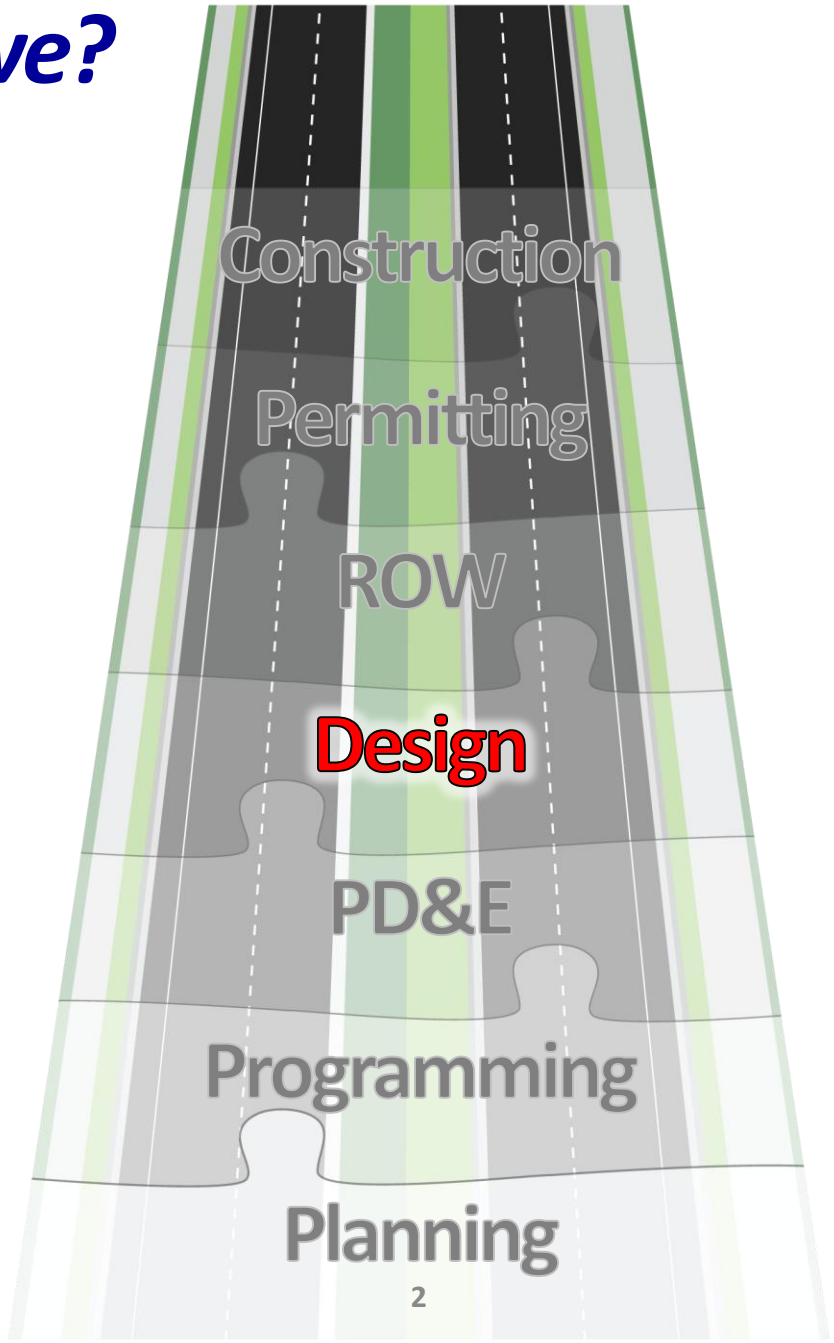
ETAT Workshop 2011

Catherine Bradley, PE

State Project Development Engineer

Environmental Management Office

Where are we?


Construction
Permitting
ROW
Design
PD&E
Programming
Planning

Course Introduction

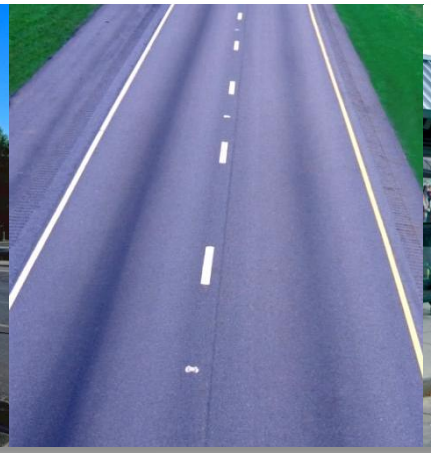
- Purpose and Need
- Right of Way Needs
- Context Sensitive Solutions
- Design Exceptions and Variations
- Post PD&E

Purpose and Need

- Mode
- Traffic
- Facility type

Mode

- Transit
- Rail
- Roadway
- Combination



Traffic

- Design Traffic
  - Design Traffic Volumes
  - Design Speed
  - Lane Call
- Level of Service
- Operations
  - Intersections
  - Interchanges

Facility Type

- Existing Road or New Alignment
- Area Type
  - Urban vs. Rural
- Design Speed
  - High vs. low

Facility Type

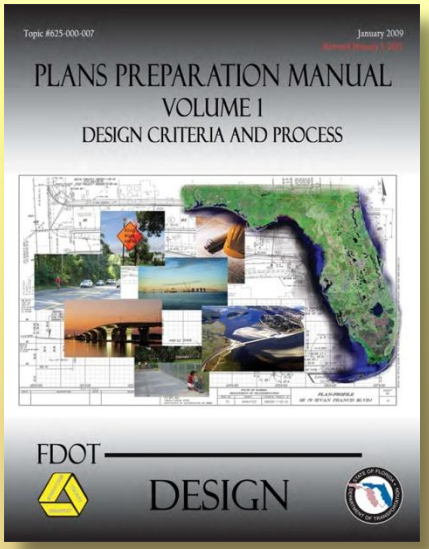
- Functional Classification
  - Interstate
  - Strategic Intermodal System (SIS)
  - Florida Intrastate Highway System (FIHS)
  - Arterial
  - Collector
  - Local

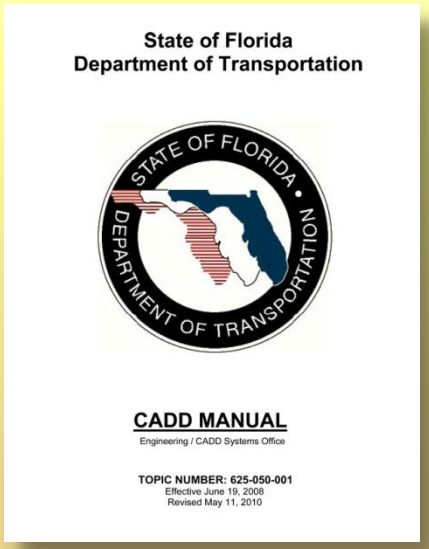
Right of Way Needs

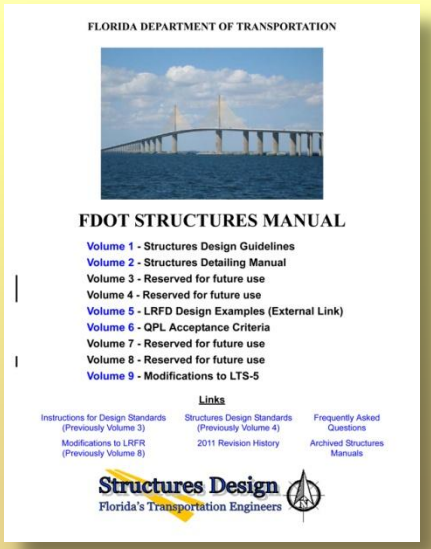
- Design Standards
- Typical Section
- Alignment
- Interchanges/Intersection
- Stormwater Management

Design Standards - Sources

- FDOT Plans Preparation Manual, Volumes I and II
- CADD Manual
- Utility Accommodation Manual
- Structures Manual
- FDOT Right of Way Manual

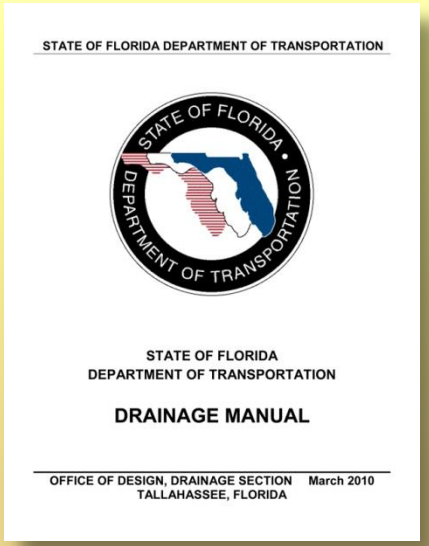


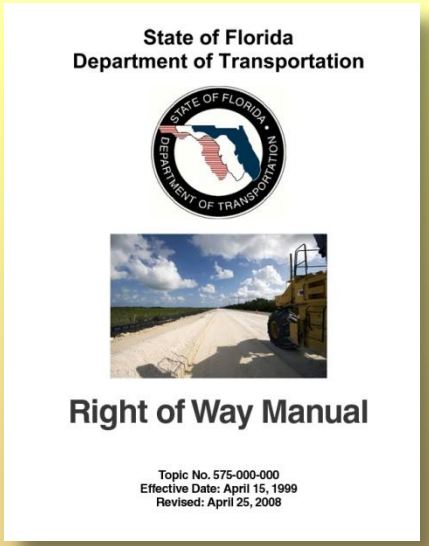


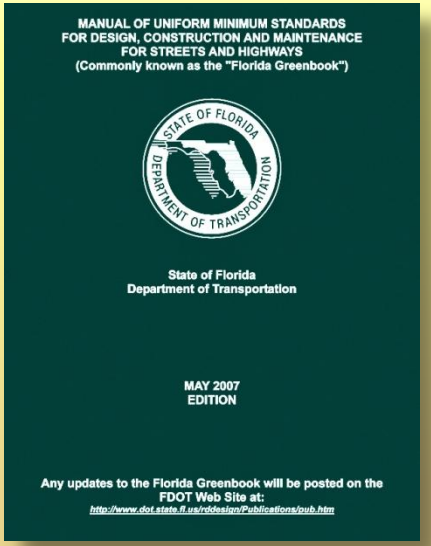


Design Standards - Sources

- Drainage Manual
- Asbestos on Bridges
- Utility Accommodation Manual
- FDOT Right of Way Manual
- Manual of Uniform Minimum Standards

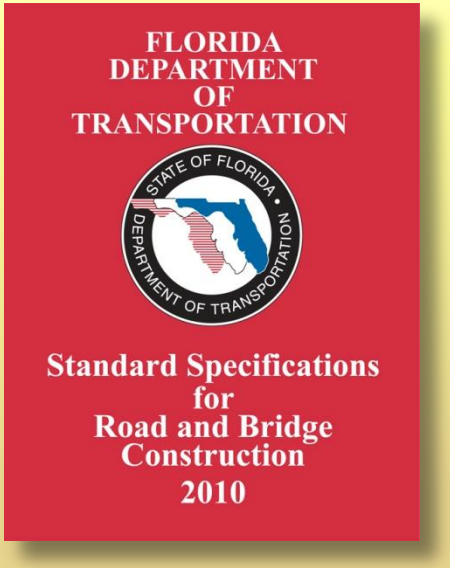






Design Standards - Sources

- Standard Specifications for Road and Bridge Construction
- Pedestrian Facilities Planning and Design Handbook
- Highway Landscape Beautification & Plan Review
- ADA Compliance Facilities Access for Persons with Disabilities



Typical Sections

- Functional Classification
- Design Speed
- Design Controls

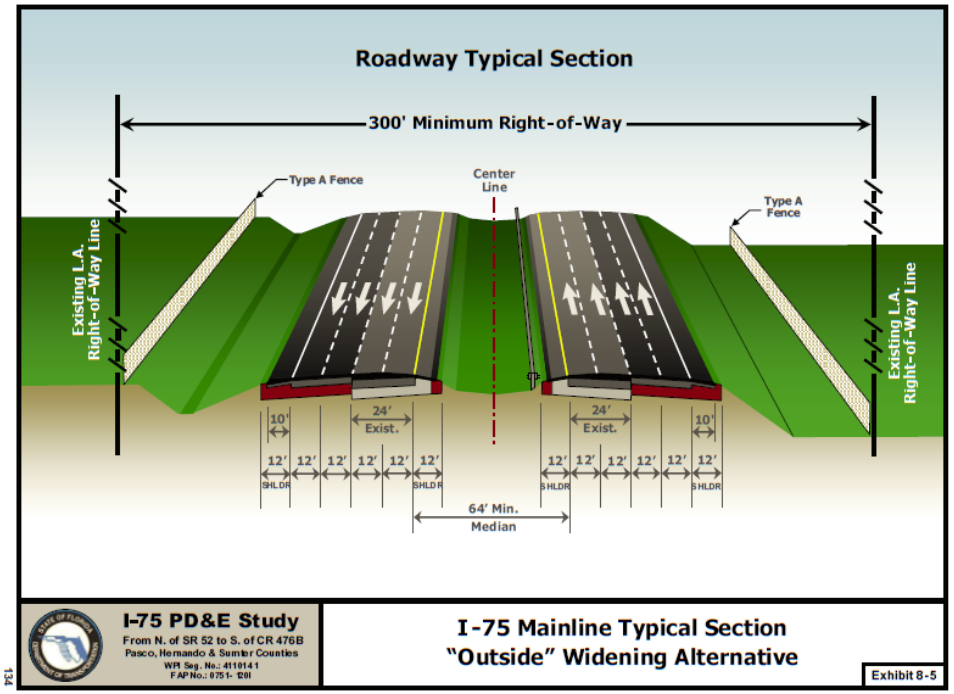
Table 5-1 – Design Controls and Standards for I-75

Design Element	I-75 Mainline	I-75 Ramps
Existing Functional Classification	Principal Arterial – Interstate Rural	N/A
Access Management Classification - Interchange Spacing	Access Class 1 – Area Type 3 3.0 miles	Access Class 1 – Area Type 3 N/A
Design Classification	Rural Freeway - Interstate	Ramp Interstate
Speed: - Posted - Design	 70 mph 70 mph	 N/A 30 mph (Loop), 45 mph (Diamond)
Design Vehicle	WB-62FL	WB-62FL
Horizontal Alignment - Max curvature - Max curvature with NC - Max superelevation - Slope ratios - Min curve length in full superelevation - Max deflection w/o curve - Length of curve	 3° 00' 00" 0° 15' 00" 0.10 ft/ft 1:250, 100' min. 200' 0° 45' 00" 2,100'(1,050'min)	 24° 45'00" (30 mph), 10° 15'00" (45 mph) 1° 30' 00" (30 mph), 0° 30' 00" (45 mph) 0.10 ft/ft 1:100 (30 mph), 1:200 (45 mph) 200' N/A 900' (450'min) 30 mph 1,350' (675' min) 40 mph
Vertical Alignment - Max Grade - Max change in grade w/o curve - Min stopping sight distance [1] - Min "K" for crest curve - Min "K" for sag curve - Min crest curve length - Min sag curve length	 3% 0.2% 820' 506 206 1,000' open highway 1,800' within interchanges 800'	 5-7% (25-30 mph), 3-5% (45-50 mph) 1.0% (30 mph), 0.7% (45 mph) 200' (30 mph), 360' (45 mph) 31 (30 mph), 98 (45 mph) 37 (30 mph), 79 (45 mph) 90' (30 mph), 135' (45 mph) 90' (30 mph), 135' (45 mph)
Cross Section Elements - Travel lane width - Auxiliary lane - Outside shoulder width (mainline) - Outside shoulder width (bridge) - Inside shoulder width (mainline) - Inside shoulder width (bridge) - Median width w/o barrier wall - Median width w/ barrier wall - Travel lane cross slope - Outside shoulder cross slope - Inside shoulder cross slope - Max rollover at ramp terminal - Max rollover between travel lanes	 12' 12' 12' (10' paved) 10' 12' (10' paved) 10' 64' 26' 2.0% (3.0% max) 6.0% 5.0% 5.0% 4.0%	 15' (single lane) [2] N/A 6' (4' paved) 6' 6' (2' paved) 6' N/A N/A 2.0% 6.0% 5.0% 5.0% N/A
Roadside Slopes - Front slopes - Back slopes - Transverse slopes	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:10	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:4
Border Width	94'	94'

[1] Lengths to be adjusted for grade (PPM, Table 2.7.1)
[2] See PPM Table 2.14.1 for ramps w/ curvature R < 500'

Elements of Typical Sections

- Number of Lanes
- Lane widths
- Shoulder Widths
- Clear Zones / Border Width
- Side Slopes
- Pedestrian and Bicycle Accommodations
- Swales
- Curb/Gutter



Lane Width

- 12 ft Standard
  - IN SPECIAL CIRCUMSTANCES
- 11 ft Arterials
- 10 ft Local and Auxiliary Lanes
  - i.e. turn lanes, deceleration lanes

Plans Preparation Manual

Lane Widths

Table 2.1.1 Lane Widths

LANE WIDTHS (FEET)						
FACILITY		THROUGH OR TRAVEL	AUXILIARY			
TYPE	AREA		SPEED CHANGE	TURNING (LT/RT/MED)	PASSING	CLIMBING
FREEWAY	Rural	12	12	----	----	12
	Urban	12	12	----	----	12
ARTERIAL	Rural	12	12	12	12	12
	Urban	12 [1]	12 [1]	12 [1,4]	12 [1]	12
COLLECTOR	Rural	12 [6]	11 [2]	11 [2,4]	11 [2,5]	12
	Urban	11 [3]	11 [3]	11 [3,4]	11 [3]	12

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.

Medians

- Separation = Safety!
- 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 Median
  - 40 ft Minimum
  - 64 ft Interstate (70 mph)

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Meridian Widths

Table 2.2.1 Median Widths

MEDIAN WIDTHS (FEET)	
TYPE FACILITY	WIDTH
FREEWAYS	
Interstate, Without Barrier	64 [1]
Other Freeways, Without Barrier	---
Design Speed ≥ 60 mph	60
Design Speed < 60 mph	40
All, With Barrier, All Design Speeds	26 [2]
ARTERIAL AND COLLECTORS	
Design Speed > 45 mph	40
Design Speed ≤ 45 mph	22 [3]
Paved And Painted For Left Turns	12 [4]

Median width is the distance between the inside (median) edge of the travel lane of each roadway.

1. 88 ft. when future lanes planned.
2. Based on 2 ft. median barrier and 12 ft. shoulder.
3. On reconstruction projects where existing curb locations are fixed due to severe right of way constraints, the minimum width may be reduced to 19.5 ft. for design speeds = 45 mph, and to 15.5 ft. for design speeds ≤ 40 mph.
4. Restricted to 5-lane sections with design speeds ≤ 40 mph. On reconstruction projects where existing curb locations are fixed due to severe right of way constraints, the minimum width may be reduced to 10 ft. These flush medians are to include sections of raised or restrictive median for pedestrian refuge and to conform to *Section* 2.2.2 of this volume and the Access Management Rules.

Bike/Pedestrians

- 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

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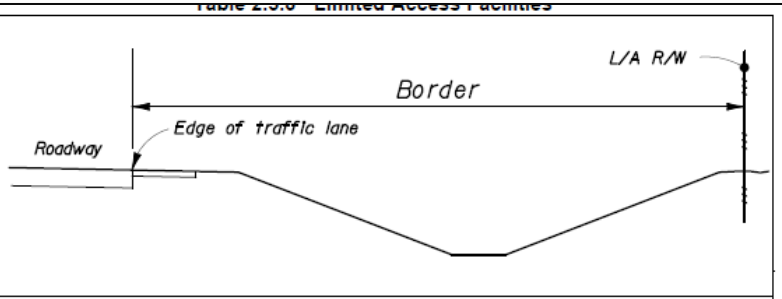
Border

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

Border

Freeways

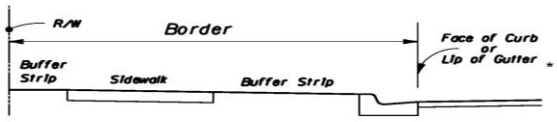


BORDER

TYPE FACILITY	WIDTH (FEET)
FREEWAYS (INCLUDING INTERCHANGE RAMPS)	94

Urban and Suburban Arterials

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

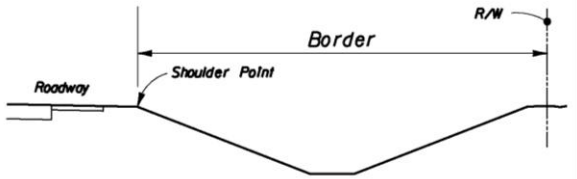


* Border width measured from lip of gutter (shown) or from face of curb when there is not a gutter.

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

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

Plans Preparation Manual

Shoulders

Table 2.3.1 Shoulder Widths and Slopes - Freeways

HIGHWAY TYPE		WIDTH (FEET)								SLOPES	
		WITHOUT SHOULDER GUTTER				WITH SHOULDER GUTTER					
		FULL WIDTH		PAVED WIDTH		FULL WIDTH		PAVED WIDTH		NORMAL [1]	
		Outside	Median or Left	Outside	Median or Left	Outside	Median or Left	Outside	Median or Left	Outside	Median or Left
FREEWAYS (Lanes One Way)	4-Lane or More	12	12	10	10	15.5	15.5	8	8	0.06	0.05
	3-Lane	12	12	10	10	15.5	15.5	8	8		
	2-Lane	12	8	10	4	15.5	13.5	8	6		
	HOV Lane	N/A[4]	14	N/A[4]	10	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	0.05[2]
	1-lane Barrier-Separated HOV Lane[5]	6	4[3]	6	4[3]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	Same as Lane	Same as Lane[3]
	2-lane Barrier-Separated HOV Lane[5]	10	6[3]	10	6[3]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	Same as Lane	Same as Lane[3]
	1-Lane Ramp	6	6	4	2	11.5	11.5	4[3]	4	0.06	0.05
	2-Lane Ramp Non-Interstate	10	8	8	4	15.5	13.5	8	6		
	2-Lane Ramp Interstate	12	8	10	4	15.5	13.5	8	6		
	C-D Road 1-Lane	6	6	4	2	11.5	11.5	4	4		
	C-D Road 2-Lane	12	8	10	4	15.5	13.5	8	6		
	C-D Road 3-Lane	12	12	10	10	15.5	15.5	8	8		
	C-D Road > 3-Lane	12	12	10	10	15.5	15.5	8	8		0.06
	Auxiliary Lane Climbing & Weaving	12	N/A[4]	10	N/A[4]	15.5	N/A[4]	8	N/A[4]		N/A[4]
	Auxiliary Lane Mainline Terminal: 1-Lane Ramp 2-Lane Ramp	12 12	N/A[4] N/A[4]	10 10	N/A[4] N/A[4]	15.5 15.5	N/A[4] N/A[4]	8 8	N/A[4] N/A[4]		N/A[4] N/A[4]
	Frontage Road	See COLLECTORS *Table 2.3.4.* For local roads and streets see the FDOT *Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways.*									

1. Shoulders shall extend 4 ft. beyond the back of shoulder gutter and at a 0.06 slope back toward the gutter.
2. 0.06 when 4 lanes or more combined.
3. Shoulder pavement less than 6 ft. in width that adjoins shoulder gutter shall be the same type, depth and slope as the ramp pavement.
4. This does not mean that a shoulder is unnecessary; rather, shoulder is not typically present at this location (i.e., it is not required when adjacent to the through lane).
5. If median side of HOV lane is not barrier-separated, use median shoulder requirements for a standard HOV lane. Refer to AASHTO's *Guide for High-Occupancy Vehicle Facilities* for additional information.

Plans Preparation Manual

Shoulders

Table 2.3.1 Shoulder Widths and Slopes - Freeways

HIGHWAY TYPE		WIDTH (FEET)								SLOPES	
		WITHOUT SHOULDER GUTTER				WITH SHOULDER GUTTER					
		FULL WIDTH		PAVED WIDTH		FULL WIDTH		PAVED WIDTH		NORMAL [1]	
		Outside	Median or Left	Outside	Median or Left	Outside	Median or Left	Outside	Median or Left	Outside	Median or Left
	4-Lane or More	12	12	10	10	15.5	15.5	8	8	0.06	0.06
	3-Lane	12	12	10	10	15.5	15.5	8	8		0.05
	2-Lane	12	8	10	4	15.5	13.5	8	6		
	HOV Lane	N/A [4]	14	N/A [4]	10	N/A [4]	N/A [4]	N/A [4]	N/A [4]	N/A [4]	0.05 [3]
	1-lane Barrier-Separated HOV Lane [5]	6	4 [5]	6	4 [5]	N/A [4]	N/A [4]	N/A [4]	N/A [4]	Same as Lane	Same as Lane [5]

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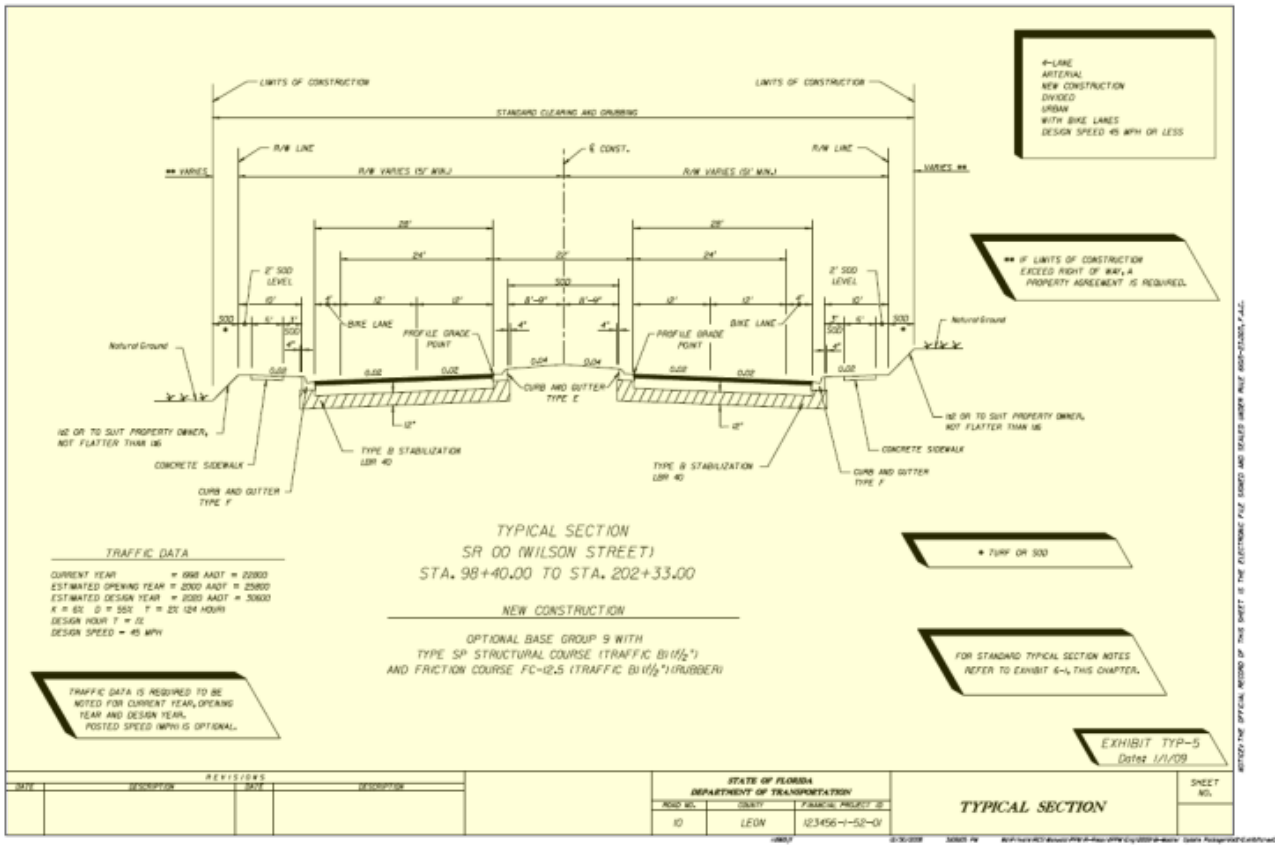
4 Lane Arterial Divided, Typical

Lane Width
Median Width
Shoulders
Border Cross Slopes



Plans Preparation Manual

Lane Widths

Table 2.1.1 Lane Widths

LANE WIDTHS (FEET)						
FACILITY		THROUGH OR TRAVEL	AUXILIARY			
TYPE	AREA		SPEED CHANGE	TURNING (LT/RT/MED)	PASSING	CLIMBING
FREEWAY	Rural	12	12	----	----	12
	Urban	12	12	----	----	12
ARTERIAL	Rural	12	12	12	12	12
	Urban	12 [1]	12 [1]	12 [1,4]	12 [1]	12
COLLECTOR	Rural	12 [6]	11 [2]	11 [2,4]	11 [2,5]	12
	Urban	11 [3]	11 [3]	11 [3,4]	11 [3]	12

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.

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Plans Preparation Manual

Shoulders

Table 2.3.2 Shoulder Widths and Slopes - Arterials Divided

HIGHWAY TYPE		WIDTH (FEET)								SLOPES	
		WITHOUT SHOULDER GUTTER				WITH SHOULDER GUTTER					
		FULL WIDTH		PAVED WIDTH		FULL WIDTH		PAVED WIDTH		NORMAL [1]	
		Outside	Median or Left	Outside [2]	Median or Left	Outside	Median or Left	Outside	Median or Left	Outside	Median or Left
ARTERIALS Divided (Lanes One Way)	4-Lane	12 10 8	12 10 8	5 5 5	4 4 4	15.5 15.5 15.5	15.5 15.5 13.5	8 8 6	8 8 6	0.06	0.06
	3-Lane	12 10 8	12 10 8	5 5 5	0 [4] 0 [4] 0 [4]	15.5 15.5 13.5	15.5 15.5 13.5	8 8 6	8 8 6		
	2-Lane	12 10 8	8 8 6	5 5 5	0 [4] 0 [4] 0 [4]	15.5 15.5 13.5	13.5 13.5 11.5	8 8 6	6 6 4		
	1-Lane Ramp	6	6	5	2	11.5	11.5	4 [3]	4		0.06
	2-Lane Ramp	10	6	5	2	15.5	13.5	8	6		
	C-D Road 1-Lane	6	6	5	2	11.5	11.5	4	4		
	C-D Road 2-Lane	8	6	5	0	13.5	11.5	6	4		
	Auxiliary Lane Climbing & Weaving	Same As Travel Lanes	N/A [5]	Same As Travel Lanes	N/A [5]	Same As Travel Lanes	N/A [5]	Same As Travel Lanes	N/A [5]		N/A [5]
	Auxiliary Lane Mainline Terminal: 1-Lane Ramp 2-Lane Ramp	8 12	N/A [5] N/A [5]	5 10	N/A [5] N/A [5]	11.5 15.5	N/A [5] N/A [5]	4 8	N/A [5] N/A [5]		N/A [5] N/A [5]
	Auxiliary Lane At-Grade Intersection	Same As Travel Lanes	Same As Travel Lanes	5	0	11.5	N/A [5]	4	N/A [5]		0.05 - 0.06
	Frontage Road	See Collectors *Table 2.3.4*. For local roads and streets see the FDOT *Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways*.									

1. Shoulders shall extend 4 ft. beyond the back of shoulder gutter and have a 0.06 slope back toward the gutter.
2. Shoulder shall be paved full width through rail-highway at-grade crossings, extending a minimum distance of 50 ft. on each side of the crossing measured from the outside rail. For additional information see the *Design Standards, Index No. 560 and 17882*.
3. Shoulder pavement less than 6 ft. in width and adjoining shoulder gutter shall be the same type, depth and slope as the ramp pavement.
4. Paved 2 ft. wide where turf is difficult to establish. Paved 4 ft. wide (a) in sag vertical curves, 100 ft. minimum either side of the low point, and (b) on the low side of superelevated traffic lanes extending through the curves and approximately 300 ft. beyond the PC and PT.

   LEGEND FOR VALUES
   X.....High Volume Highways
   X.....Normal Volume Highways
   X.....Low Volume Highways
5. This does not mean that a shoulder is unnecessary; rather, shoulder is not typically present at this location (i.e., it is not required when adjacent to through lane).

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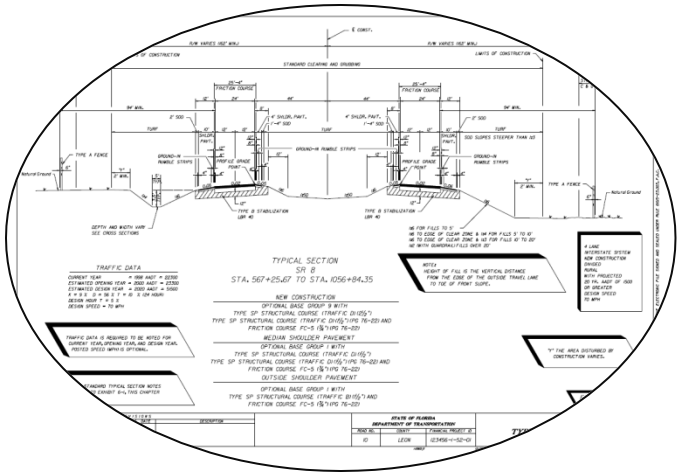
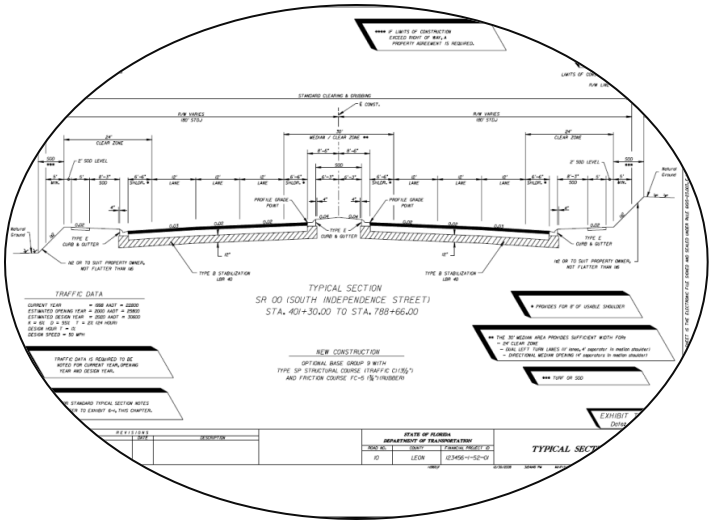
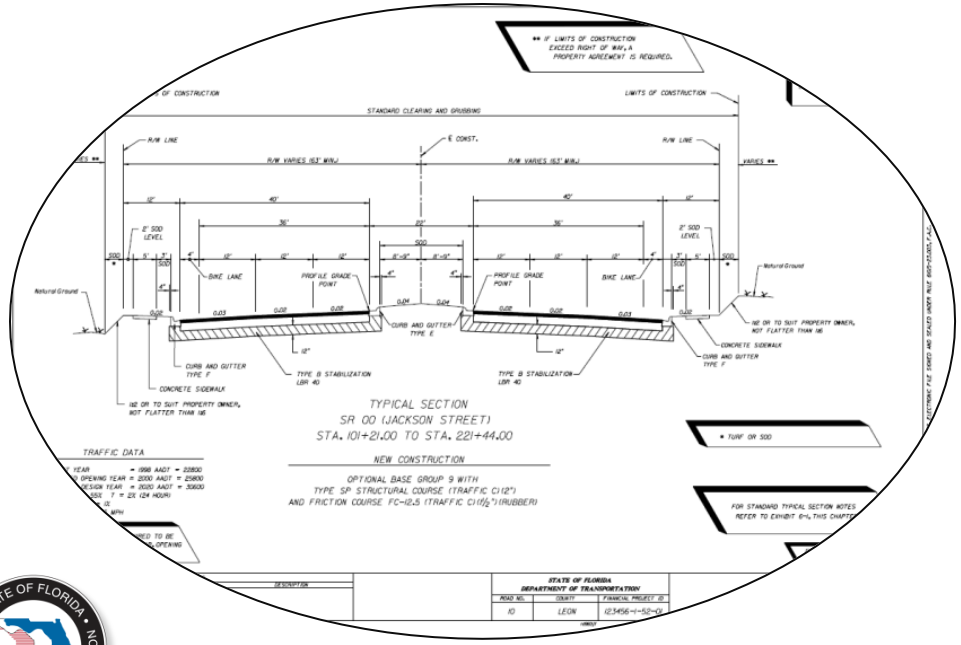
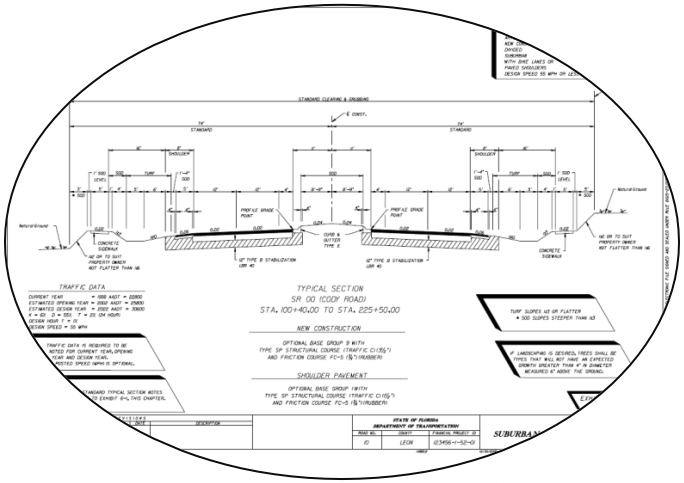
Typical Section from Plans Preparation Manual









Horizontal Alignment

- Horizontal Alignment
  - Curve Radius
  - Curve Length
  - Superelevation
  - Left / Right / Center / Best Fit
    - Set to Minimize Overall Impacts

Table 5-1 – Design Controls and Standards for I-75

Design Element	I-75 Mainline	I-75 Ramps
Existing Functional Classification	Principal Arterial – Interstate Rural	N/A
Access Management Classification - Interchange Spacing	Access Class 1 – Area Type 3 3.0 miles	Access Class 1 – Area Type 3 N/A
Design Classification	Rural Freeway - Interstate	Ramp Interstate
Speed: - Posted - Design	 70 mph 70 mph	 N/A 30 mph (Loop), 45 mph (Diamond)
Design Vehicle	WB-62FL	WB-62FL
Horizontal Alignment - Max curvature - Max curvature with NC - Max superelevation - Slope ratios - Min curve length in full superelevation Max deflection w/o curve - Length of curve	 3° 00' 00" 0° 15' 00" 0.10 ft/ft 1:250, 100' min. 200' 0° 45' 00" 2,100'(1,050'min)	 24° 45' 00" (30 mph), 10° 15' 00" (45 mph) 1° 30' 00" (30 mph), 0° 30' 00" (45 mph) 0.10 ft/ft 1:100 (30 mph), 1:200 (45 mph) 200' N/A 900' (450'min) 30 mph 1,350' (675' min) 40 mph
Vertical Alignment - Max Grade - Max change in grade w/o curve - Min stopping sight distance [1] - Min "K" for crest curve - Min "K" for sag curve - Min crest curve length - Min sag curve length	 3% 0.2% 820' 506 206 1,000' open highway 1,800' within interchanges 800'	 5-7% (25-30 mph), 3-5% (45-50 mph) 1.0% (30 mph), 0.7% (45 mph) 200' (30 mph), 360' (45 mph) 31 (30 mph), 98 (45 mph) 37 (30 mph), 79 (45 mph) 90' (30 mph), 135' (45 mph) 90' (30 mph), 135' (45 mph)
Cross Section Elements - Travel lane width - Auxiliary lane - Outside shoulder width (mainline) - Outside shoulder width (bridge) - Inside shoulder width (mainline) - Inside shoulder width (bridge) - Median width w/o barrier wall - Median width w/ barrier wall - Travel lane cross slope - Outside shoulder cross slope - Inside shoulder cross slope - Max rollover at ramp terminal - Max rollover between travel lanes	 12' 12' 12' (10' paved) 10' 12' (10' paved) 10' 64' 26' 2.0% (3.0% max) 6.0% 5.0% 5.0% 4.0%	 15' (single lane) [2] N/A 6' (4' paved) 6' 6' (2' paved) 6' N/A N/A 2.0% 6.0% 5.0% 5.0% N/A
Roadside Slopes - Front slopes - Back slopes - Transverse slopes	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:10	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:4
Border Width	94'	94'

[1] Lengths to be adjusted for grade (PPM, Table 2.7.1)
[2] See PPM Table 2.14.1 for ramps w/ curvature R < 500'

Environmental Management Office

Vertical Alignment

- Vertical Profile
  - Grade
    - Topography
    - Drainage
    - Equalize Cut and Fill
  - Vertical Curve Length
  - Stopping Sight Distance

Table 5-1 – Design Controls and Standards for I-75

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Vertical Alignment - Max Grade - Max change in grade w/o curve - Min stopping sight distance [1] - Min "K" for crest curve - Min "K" for sag curve - Min crest curve length - Min sag curve length	 3% 0.2% 820' 506 206 1,000' open highway 1,800' within interchanges 800'	 5-7% (25-30 mph), 3-5% (45-50 mph) 1.0% (30 mph), 0.7% (45 mph) 200' (30 mph), 360' (45 mph) 31 (30 mph), 98 (45 mph) 37 (30 mph), 79 (45 mph) 90' (30 mph), 135' (45 mph) 90' (30 mph), 135' (45 mph)
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Roadside Slopes - Front slopes - Back slopes - Transverse slopes	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:10	 1:6 for 0-5' height 1:6 to CZ then 1:4 for 5-10' height 1:6 to CZ then 1:3 for 10-20' height 1:2 with guardrail for height over 20' 1:4 desir. (1:3 min w/ 1:6 front slope) 1:4
Border Width	94'	94'

[1] Lengths to be adjusted for grade (PPM, Table 2.7.1)
[2] See PPM Table 2.14.1 for ramps w/ curvature R < 500'

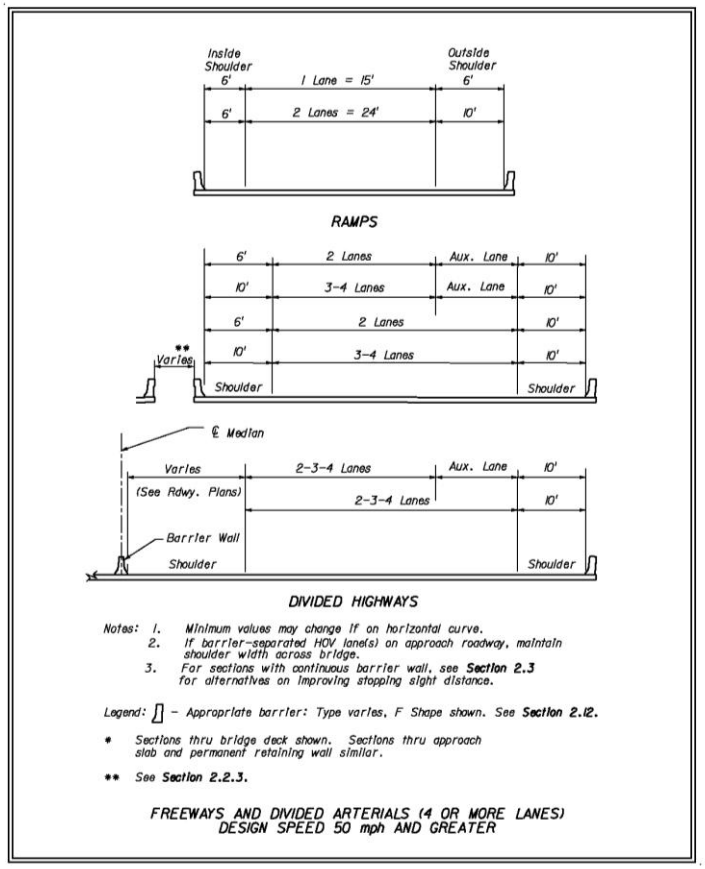
Environmental Management Office

Bridges

- Clearances
  - Vertical Clearances
    - Over water
    - Over road/rails etc.
  - Navigation Requirements
  - Wave height
- Widen vs. New Construction
  - Existing Bridge Rating

Bridge Typical Section

Figure 2.0.1 Partial Bridge Sections *



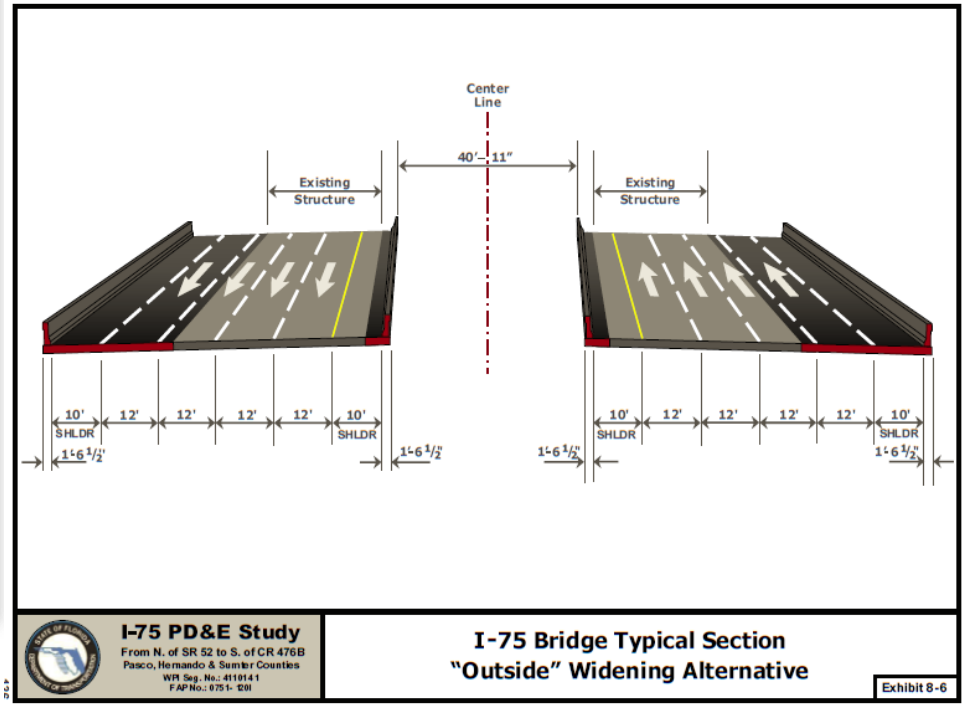
Notes: 1. Minimum values may change if on horizontal curve.
2. If barrier-separated HOV lane(s) on approach roadway, maintain shoulder width across bridge.
3. For sections with continuous barrier wall, see **Section 2.3** for alternatives on improving stopping sight distance.

Legend: [F] – 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



I-75 PD&E Study
From N. of SR 52 to S. of CR 476B
Pasco, Hernando & Sumter Counties
WPI Seg. No.: 4110141
FAP No.: 0751-201

I-75 Bridge Typical Section
"Outside" Widening Alternative

Exhibit 8-6

Environmental Management Office

Interchanges

- Traffic
  - Design Traffic
  - Design Speed
  - Lane Call
  - Affect on receiving road
- Spacing
  - Urban vs. Rural
- Operations
  - Type / Foot Print
  - Weaving

Environmental Management Office

Stormwater Management

Section 373.4596, Florida Statutes

Requires the Department of Transportation to fully comply with state, water management district and, when delegated by the State, local government stormwater management programs.

Stormwater Management

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) permit program is administered by the U. S. Environmental Protection Agency. (delegated to FDEP) This program requires permits for stormwater discharges into waters of the United States from industrial activities (including construction); and from large, medium and small municipal separate stormwater systems

Stormwater Management

Chapter 62-40, Florida Administrative Code

Rules of the Florida Department of Environmental Protection outlines basic goals and requirements for surface water protection and management to be implemented and enforced by the Florida Department of Environmental Protection and Water Management Districts.

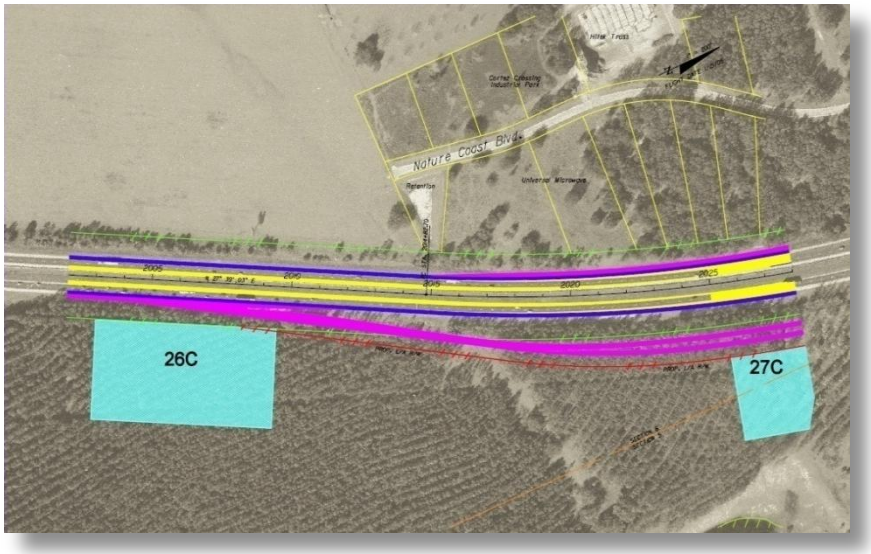
Topic No. 625-040-002-b

Effective: January 2005

Drainage Manual Revised January 2008 45

Stormwater Management

- Pond Siting Evaluation
  - Alternate Sites
  - Right of Way
  - Water Quality and Quantity Volumes
  - Soil Conditions and Impacts
- Drainage Map
- Regulatory
- Pre/Post Runoff



Pond Size

- Typical Section/Impervious Area
- Retention/Detention volume – varies with Water Management District Permit
  - **5.2.1 Volumetric Requirements (SFWMD criteria)**
  - (a) Retention, detention, or both retention and detention in the overall system, including swales, lakes, canals, greenways, etc., shall be provided for one of the three following criteria or equivalent combinations thereof:

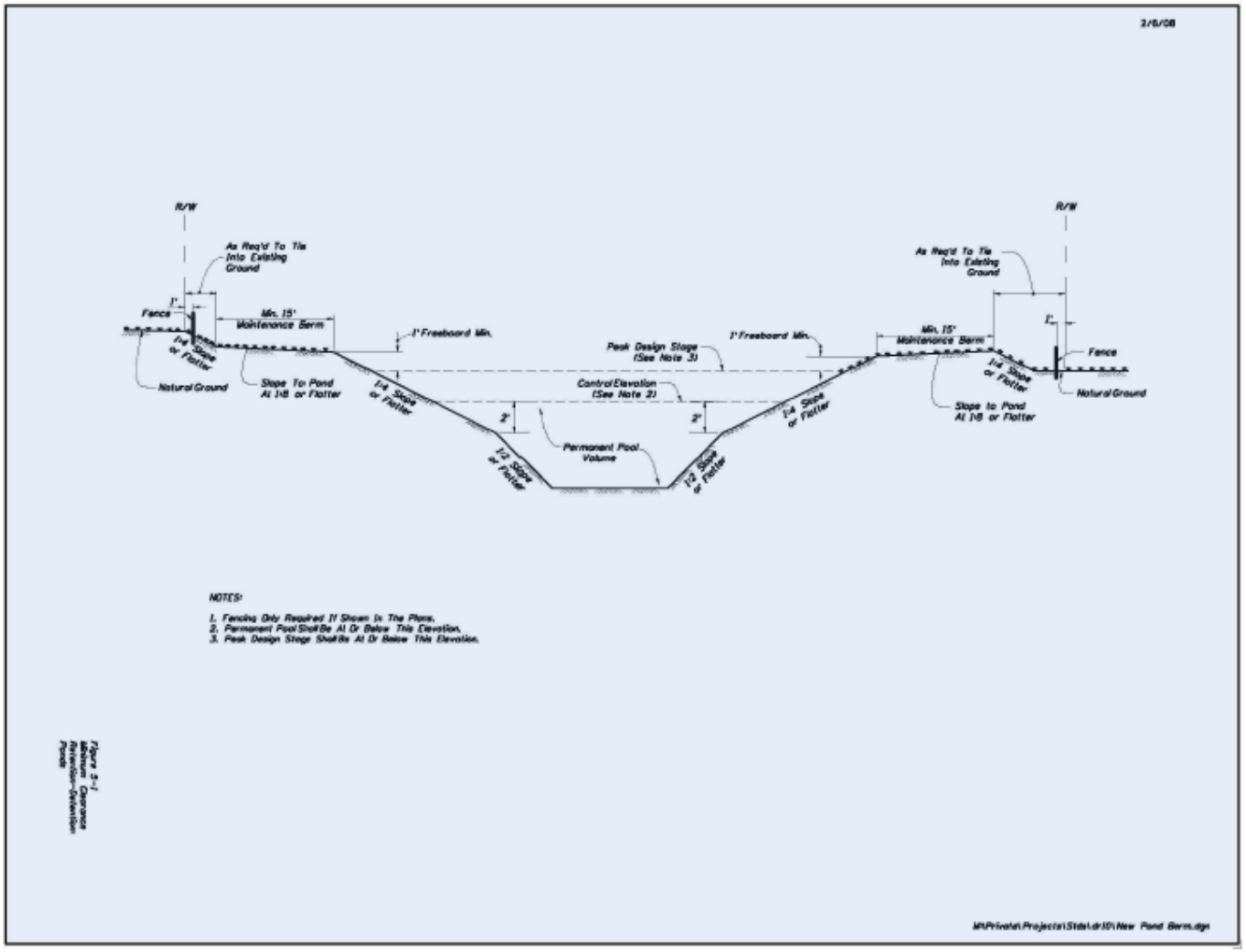
    1. Wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater.

    2. Dry detention volume shall be provided equal to 75 percent of the above amounts computed for wet detention.

    3. Retention volume shall be provided equal to 50 percent of the above amounts computed for wet detention. Retention volume included in flood protection calculations requires a guarantee of long term operation and maintenance of system bleed-down ability.

Pond Typical Section

Berm
Sideslopes
Control
Elevation



Pond Size Changing Times

- New Stormwater Rule
- Total Maximum Daily Loads
- NPDES Permits

Context Sensitive Solutions

- In order to plan, design, construct, maintain and operate the State Transportation System "Context Sensitive Solutions" should be considered in all projects
- This design philosophy seeks transportation solutions that improve mobility and safety while complementing and enhancing community values and objectives.
- Context sensitive solutions are reached through joint effort involving all stakeholders

Exceptions and Variations

- Design Variations – Below Department Criteria but are not an exception
- Design Exceptions – Below both Department and AASHTO Criteria
- Approval required by FDOT Chief Engineer and State Transportation Planner for changes in Design Speed on SIS or FIHS facility
- Approval required by District Design Engineer for all other Exceptions or Variations
- For FHWA projects approval by Division Administrator on all Exceptions.

Environmental Management Office

Exceptions

Below Department and AASHTO Criteria:

- Design Speed
- Lane Width
- Shoulder Width
- Bridge Width
- Structural Capacity
- Vertical Clearance
- Grades
- Cross Slopes
- Superelevation
- Horizontal Alignment
- Vertical Alignment
- Stopping Sight Distance
- Horizontal Clearance

Submittal Requirements

23.6 Central Office Submittal and Approval

- Submittals, when complete, shall contain 3 parts, and shall be compiled in the same order as addressed below:
  - Part 1 shall consist of a cover letter.
  - Part 2 shall consist of the justification or report proper including all signed and sealed documents.
  - Part 3 shall consist of any support documents to facilitate an understanding of Part 2.

Submittal Requirements

- Project Description (general project information, typical section, begin/end milepost, county section number).
- Description of the exception/variation element and applicable criteria (AASHTO and Department value or standard).
- Detailed explanation of why the criteria or standard cannot be complied with or is not applicable.
- Description of any proposed value for project and why it is appropriate.

Submittal Requirements

- Location map or description,
- Typical section,
- Aerial or Photo logs when they best illustrate the element issues,
- Crash History and analysis,
- Plan sheets in the area of the exception/variation elements,
- Profiles in the area of vertical alignment exception/variation elements

Submittal Requirements

- Tabulation of pole offsets for horizontal clearance exception/variation,
- Any Applicable Signed and Sealed Engineering Support Documents.
- Amount and character of traffic using the facility. Description of the anticipated impact on Operations, Adjacent Sections, Level Of Service, Safety, Long and Short Term Effects. (Is the Exception temporary or permanent?)
- Description of the anticipated Cumulative Effects.

Environmental Management Office

Submittal Requirements

- A plan view or aerial photo of the exception location, showing right of way lines, and property lines of adjacent property.
- A photo of the area.
- Typical section or cross-section of exception location.
- The milepost and station location of the exception.
- Any related work programmed or in future work plans.

Submittal Requirements

- The Project Schedule Management (PSM) Project Schedule Activities maintained by the Finance Management Office.
- All mitigating efforts. An explanation of what if any associated existing or future limitations as a result of public or legal commitments. Description and explanation of any practical alternatives, the selected treatment and why.
- Comments on the most recent 5-year crash history including all pertinent crash reports.

Submittal Requirements

- Description of the anticipated Cost (Social and to the Department - Benefit/Cost)
- Summary Conclusions
- For the specified conditions the following additional documentation is required:
- For design speed on FIHS/SIS, provide typical sections at mid blocks and at intersections.
- For lane width, provide locations of alternative routes that meet criteria and a proposal for handling drainage, the proposed signing and pavement markings.

Submittal Requirements

- For shoulder width, provide a proposal for handling stalled vehicles and a proposal for handling drainage.
- For bridge width, provide a plan view of the approaching roadways and existing bridge plans (these may be submitted electronically).
- For a bridge with a design inventory load rating less than 1.0, a written evaluation and recommendation by the Office of Maintenance is required. Provide the load rating calculations for the affected structure.

Submittal Requirements

- For vertical clearance, provide locations of alternative routes that meet criteria.
- For cross-slope, provide a proposal for handling drainage and details on how the cross slope impacts intersections.
- For conditions that may adversely affect the roadway's capacity, provide the comments on compatibility of the design and operation with the adjacent sections. Effects on capacity (proposed criteria vs. AASHTO) using an acceptable capacity analysis procedure and calculate reduction for design year, level of service).

Submittal Requirements

- For superelevation, provide the side friction factors for the curve for each lane of different cross-slope at the PC of the curve, the point of maximum cross-slope, and the PT of the curve.
- For areas with crash histories or when a benefit to cost analysis is requested, provide a time value analysis between the benefit to society quantified in dollars and the costs to society quantified in dollars over the life of the exception.

Submittal Requirements

- The report justifying and documenting a request is to be sealed by the Responsible Engineer in accordance with ***Chapter 19 of this volume***.
- Design Engineer then approves or denies the request and notifies the Responsible Engineer.
- will forward the Submittal/Approval Letter and Sealed Report to the State Roadway Design Office.
- The State Roadway Design Office will assign reference numbers to each request. The request will be reviewed then forwarded for approval to the Chief Engineer…

Post PD&E

- Design Phase
- Right of Way
- Permitting
- Construction

Design Phase

- Design Submittals
- Phase I
- Phase II
- Phase III
- Phase IV

Figure 2.1 Summary of Phase Submittals

ITEM	PHASE I	PHASE* II	PHASE III	PHASE IV
Key Sheet	P	P	C	F
Summary of Pay Items		P	C	F
Drainage Map	P	P	C	F
Interchange Drainage Map	P	P	C	F
Typical Section	P	C	C	F
Summary of Quantities			C	F
Summary of Drainage Structures			C	F
Optional Materials Tabulation		P	C	F
Project Layout	P	C	C	F
Roadway Plan-Profile	P	P	C	F
Special Profile	P	P	C	F
Back-of-Sidewalk Profile	P	C	C	F
Interchange Layout	P	P	C	F
Ramp Terminal Details		P	C	F
Intersection Layout/Detail	P	P	C	F
Drainage Structures		P	C	F
Three-Sided/Box Culvert Details			C	F
Lateral Ditch Plan-Profile		P	C	F
Lateral Ditch Cross Section		P	C	F
Retention/Detention Ponds		P	C	F
Cross Section Pattern		P	C	F
Roadway Soil Survey		P	C	F
Cross Sections	P	P	C	F
Stormwater Pollution Prevention Plan		P	C	F
Traffic Control Plans	P	P	C	F
Utility Adjustment		P	C	F
Selective Clearing and Grubbing		P	C	F
Developmental Design Standards		C	C	F
Mitigation Plans		P	C	F
Miscellaneous Structures Plans		P	C	F
Signing and Pavement Marking Plans		P	C	F
Signalization Plans		P	C	F
Intelligent Transportation System (ITS) Plans		P	C	F
Lighting Plans		P	C	F
Landscape Plans	P	P	C	F
Utility Joint Participation Agreement Plans			C	F
Computation Book			C	F
Contract Time			P	F

Status Key:
P - Preliminary
C - Complete but subject to change
F - Final

* Projects which have a structures plans component are required to submit the latest set of structures plans with the Phase II roadway submittal.

Design Phase

- Phase I Submittal
  - Preliminary Project Layout
  - Preliminary Drainage
  - Preliminary Profiles
  - Preliminary Landscape Plans

Design Phase

- Phase II Submittal
  - Complete typical
    - Layout
    - Profile
    - Design Standards
  - Preliminary
    - Traffic Control Plans
    - Ditch Profile
    - Mitigation Plans

Design Phase

- Phase III
  - All plans complete ready for review
  - Contract Time/Duration is Preliminary

- Phase IV
  - All changes made and ready for letting

Right of Way

- Eminent Domain, allows the taking of private property for a public purpose without the concurrence of the property owner.
- Article X, Section 6(a), of the Florida Constitution says: “No property shall be taken except for a public purpose and with full compensation therefore paid to each owner.
- The culmination or goal of the R/W phase is the right of way certification prior to letting

Right of Way

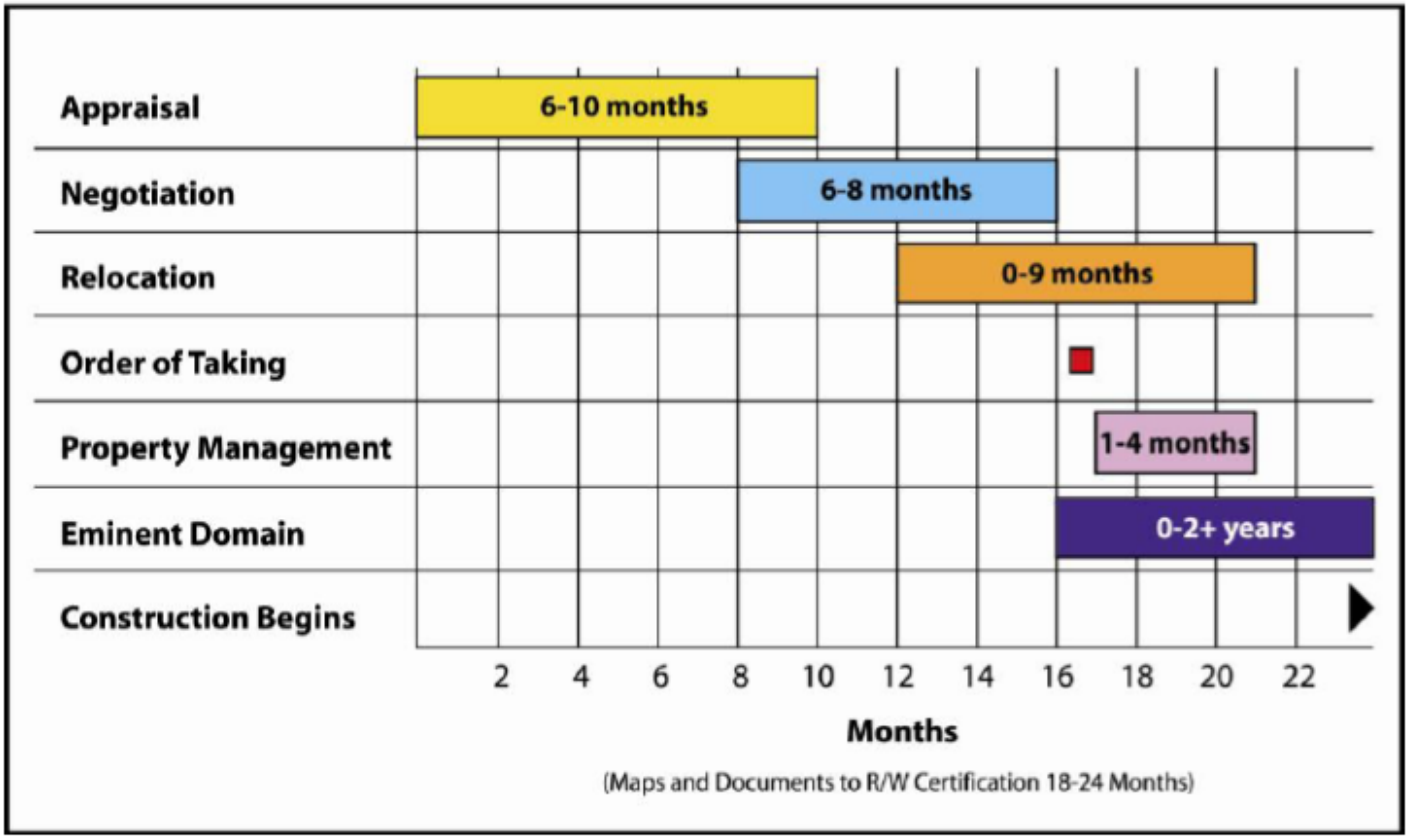
- Pre-Right of Way Activities -
  - The R/W PM should assist the PD&E and the design PM
- Conceptual Stage R/W Planning.
- R/W Cost Estimates.
- R/W limits identified.

Environmental Management Office

Right of Way Phase

Figure 3

Right of Way Acquisition Process



Showing typical durations for key right of way activities

Right of Way Certification

Figure 1
Right of Way Certification

A right of way certification is required for all projects, even if the planned construction is within current right of way.

Construction

- Environmental Certification (Before)
- Coordination with Design PM
- Public Involvement
- Plan Revision
- Adhere to Permit Conditions and Obtain Remaining Permits
- Other Commitments
- Coordination with Maintenance

For More Information

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