GDOT Cross Section Elements

Course ID: GDOT-01

2 PDH Credits

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Chapter 6 Contents

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6. CROSS SECTION ELEMENTS

6.1. Pavement Typical Sections

Roadway typical sections are developed for each different roadway type within the project limits. During the Concept Development Phase, the actual typical section widths, slopes, and other controls to be used will be determined as guided by the current American Association of State Highway and Transportation Officials (AASHTO) *Roadside Design Guide* and Georgia Department of Transportation (GDOT) Design Policy Standards.

GDOT has developed typical section details. If these details are used, they should first be checked to ensure that they meet the specific design standards applicable to the project, including modifications discussed during the Concept Development Phase.

Refer to the current GDOT *Regulations for Driveway and Encroachment Control* (*Driveway Manual*)[1] for further discussion regarding the typical section requirements for driveways.

6.2. Typical Section Geometrics

GDOT has developed standard typical sections that include most designs currently used for Georgia's state roads. The GDOT standard typical sections meet current AASHTO design standards and are maintained and updated by the GDOT Plan Presentation Committee. Plan presentation and electronic data guidelines are available online at: http://www.dot.state.ga.us/dot/preconstruction/r-o-a-d-s/PPC/index.shtml.

The GDOT standard typical sections delineate the approved geometric values to be used for both urban and rural roadways, and are based on functional classification. Also shown are the values for lane widths, shoulder widths, side slopes, and preferred ditch sections. These values, which are listed in the below-listed tables, represent desirable standards:

- **Table 6.1.** GDOT Design Standards for Local Roadways
- **Table 6.2.** GDOT Design Standards for Collectors
- **Table 6.3.** GDOT Design Standards for Arterials
- **Table 6.4.** GDOT Design Standards for Freeways

The standard typical section should be modified by the designer, as necessary, to meet project-specific conditions based on AASHTO guidance set forth in the current AASHTO *A Policy on the Geometric Design of Highways and Streets* (*Green Book*) and the standards set forth in this Manual.

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[1] GDOT. *Regulations for Driveway and Encroachment Control*. 2006
The 2006 version of this publication is available online at: http://www.dot.state.ga.us/dot/preconstruction/r-o-a-d-s/DesignPolicies/index.shtml Note: It is named "GDOT Driveway and Encroachment Control Manual" in the R-O-A-D-S Index.

Table 6.1. GDOT Design Standards for Local Roadways

Item No.	Item	Rural			Urban	
1	Design Speed (mph)[1]	30	40	50	20	30
2	Level of Service (LOS)[2]	C	C	C	C	C
3	Number of Travel Lanes	2	2	2	2	2
4	Width of Travel Lanes[3]	12-ft.	12-ft.	12-ft.	12-ft.	12-ft.
5	Overall Width of Shoulders	6-ft.	6-ft.	10-ft.	n/a	n/a
6	Width of Paved Shoulders	2-ft.	2-ft.	6.5-ft.	n/a	n/a
7	Sidewalks					
	Width of Sidewalk	n/a	n/a	n/a	5-ft.	5-ft.
	Sidewalk Offset from Curb	n/a	n/a	n/a	6-ft.	6-ft.
8	Width of Bike Lanes[4]	n/a	n/a	n/a	4-ft.	4-ft.
9	Fore Slope – Ratio	2:1 max.	2:1 max.	4:1	2:1 max.	2:1 max.
10	Back Slope – Ratio	2:1 max.	2:1 max.	2:1 max.	2:1 max.	2:1 max.
11	Pavement Cross Slope	0.02-ft/ft.	0.02-ft/ft.	0.02-ft/ft.	0.02-ft/ft.	0.02-ft/ft.
12	Stopping Sight Distance[5]	200-ft.	305-ft.	425-ft.	115-ft.	200-ft.
13	Maximum Super Elevation	0.06-ft/ft.	0.06-ft/ft.	0.06-ft/ft.	0.04-ft/ft.	0.04-ft/ft.
14	Minimum Radius					
	Without Superelevation (+ .02)[6]	2,240-ft.	3,770-ft.	5,700-ft	902-ft.	1,880-ft
	Without Superelevation (- .02)[6]	3,130-ft.	5,230-ft.	7,870-ft.	1,410-ft.	2,830-ft.
15	Minimum Radius (w/ Superelevation)[6]	231-ft.	485-ft.	833-ft.	86-ft.	250-ft.
16	Maximum Grade[7]					
	Level	7%	7%	6%	11%	10%
	Rolling	10%	10%	8%	13%	11%
	Mountainous	14%	12%	10%	16%	14%
17	Minimum Vertical Clearance[8]	14.5-ft.	14.5-ft.	14.5-ft.	14.5-ft.	14.5-ft.
18	Minimum Horizontal Clearance[9]					
	From Edge of Travel Lane	26-ft.	26-ft.	26-ft.	n/a	n/a
	From Back of Curb	n/a	n/a	n/a	6-ft.	6-ft.
19	Width of Right of Way (Minimum)[10]	As needed	As needed	As needed	As needed	As needed

Notes:
[1] Refer to the current AASHTO *Green Book* guidelines. Also, see notes 5, 6, and 7 below for design speeds not shown.
[2] LOS D is permissible in heavily developed areas.
[3] May be reduced to 11-ft. for urban type A
[4] Applies to uncurbed sections.
[5] Values shown are for the given design speed. For other design speeds, refer to the current AASHTO *Green Book*, Chapter 3.
[6] Values shown are for the given design speed. For other design speeds, refer to the current AASHTO *Green Book* Chapter 3.
[7] Values shown are for the given design speed. For other design speeds, refer to Chapter 4, Table 4.5. of this Manual.
[8] Minimum values are for vehicular clearances. Refer to the GDOT *Bridge and Structures Policy Manual*[2] for further information, clearances at other facilities and limitations.
[9] Minimum horizontal clearance equals to clear zone plus 4-ft. typical ditch.
[10] Refer to Section 6.10 of this Manual for determination of width of required right-of-way.

[2] GDOT. *Bridge and Structures Policy Manual*. 2006
The current version of this publication is available online at: http://www.dot.state.ga.us/dot/preconstruction/r-o-a-d-s/DesignPolicies/ documents/pdf/GDOT%20Bridge%20and%20Structures%20Policy%20Manual.pdf

Table 6.2. GDOT Design Standards for Collector Roadways

Item No.	Item	Rural			Urban[1]		
1	Design Speed[2]	40 mph	50 mph	60 mph	30 mph	40 mph	45 mph
2	Level of Service[3]	C	C	C	C	C	C
3	Number of Travel Lanes	2 min-4 typ.	2 min-4 typ.	2 min-4 typ.	2	2 min-4 typ.	2 min-4 typ.
4	Width of Travel Lanes[4]	12-ft.	12-ft.	12-ft.	12-ft.	12-ft.	12-ft.
5	Overall Width of Shoulders						
	Outside	10-ft.	10-ft.	10-ft.	n/a	n/a	n/a
	Median[5]	6-ft.	6-ft.	6-ft.	6-ft.	6-ft.	6-ft.
6	Width of Paved Shoulders						
	Outside	6.5-ft.	6.5-ft.	6.5-ft.	n/a	n/a	n/a
	Median[5]	2-ft.	2-ft.	2-ft.	2-ft.	2-ft.	2-ft.
7	Width of Median						
	Depressed	n/a	n/a	32–44-ft.	n/a	n/a	n/a
	Raised	20–24-ft.	20–24-ft.	20–24-ft.	20–24-ft.	Turn Lane[6] plus 8-12-ft.	Turn Lane[6] plus 8-12-ft.
	Flush	14-ft.	14-ft.	14-ft.	14-ft.	14-ft.	14-ft.
8	Sidewalk						
	Width of Sidewalk	n/a	n/a	n/a	5-ft.	5-ft.	5-ft.
	Sidewalk Offset from Curb	n/a	n/a	n/a	6-ft.	6-ft.	6-ft.
9	Width of Bike Lanes[5]	n/a	n/a	n/a	4-ft.	4-ft.	4-ft.
10	Fore Slope – Ratio	2:1 max.	4:1	4:1	2:1 max.	2:1 max.	2:1 max.
11	Back Slope – Ratio	2:1 max.	2:1 max.	2:1 max.	2:1 max.	2:1 max.	2:1 max.
12	Pavement Cross Slope	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.
13	Stopping Sight Distance[7]	305-ft.	425-ft.	570-ft.	200-ft.	305-ft.	360-ft.
14	Maximum Superelevation	0.06-ft./ft.	0.06-ft./ft.	0.06-ft./ft.	0.04-ft./ft.	0.04-ft./ft.	0.04-ft./ft.
15	Minimum Radius						
	Without Superelevation (+ .02)[8]	3,770-ft.	5,700-ft.	8,060-ft.	1,880-ft.	3,220-ft.	4,040-ft.
	Without Superelevation (- .02)[8]	5,230-ft.	7,870-ft.	11,100-ft.	2,830-ft.	4,770-ft.	5,930-ft.
16	Minimum Radius (w/ Superelev.)[8]	485-ft	833-ft.	1,330-ft.	250-ft.	533-ft.	711-ft.
17	Maximum Grade (%)[9]						
	Level	7%	6%	5%	9%	9%	8%
	Rolling	8%	7%	6%	11%	10%	9%
	Mountainous	10%	9%	8%	12%	12%	11%
18	Minimum Vertical Clearance[10]	14.5-ft.	14.5-ft.	14.5-ft.	14.5-ft.	14.5-ft.	14.5-ft.
19	Minimum Horizontal Clearance						
	From Edge of Travel Lane[11]	26-ft.	26-ft.	26-ft.	n/a	n/a	n/a
	Outside (From Back of Curb) (ft.)	n/a	n/a	n/a	6 typ. - 15	6 typ. - 15	6 typ. - 15
	Median (From Back of Curb) (ft.)	n/a	n/a	n/a	4 typ. - 15	4 typ. - 15	4 typ. - 15
20	Minimum Width of Right of Way[12]	As needed	As needed	As needed	As needed	As needed	As needed

Notes: [1]Applies to curbed sections only unless stated otherwise. Use rural standards for uncurbed sections.
[2]See current AASHTO *Green Book* guidelines. Also see notes 6, 7, and 8 below for design speeds not shown
[3]LOS D is permissible in heavily developed areas.
[4] May be reduced to 11-ft. for Urban Type A
[5]Applies to uncurbed sections.
[6] GDOT prefers the use of 24-ft. raised median if there are minimal impacts associated with a wider median
[7]Values shown are for the given design speed. For other design speeds, refer to current AASHTO Green Book, Chapter 3.
[8]Values shown are for the given design speed. For other design speeds, see current AASHTO Green Book, Chapter 3.
[9]Values shown are for the given design speed. For other design speeds, see **Chapter 4** of this Manual.
[10]Minimum values are for vehicular clearances. Please refer to the current GDOT *Bridge and Structures Policy Manual* for further information, clearances at other facilities and limitations.
[11]Minimum horizontal clearance equals to clear zone plus 4-ft. typical ditch.
[12]Please refer to **Section 6.10.** of this Manual for determination of width of required right of way

Table 6.3. GDOT Design Standards for Arterial Roadways

Item No.	Item	Rural				Urban[1]	
		Two-Lane		Four-Lane			
1	Design Speed (mph)[2]	50	60	60	70	40	50
2	Level of Service	B	B	B	B	C[3]	C[3]
3	Number of Travel Lanes	2	2	4	4	2 min-4 typ.	2 min-4 typ.
4	Width of Travel Lanes	12-ft.	12-ft.	12-ft.	12-ft.	12-ft.	12-ft.
5	Overall Width of Shoulders						
	Outside	10-ft.	10-ft.	10-ft.	10-ft.	n/a	n/a
	Median[4]	n/a	n/a	6-ft.	6-ft.	6-ft.	6-ft.
6	Width of Paved Shoulders						
	Outside	6.5-ft.	6.5-ft.	6.5-ft.	6.5-ft.	n/a	n/a
	Median[4]	n/a	n/a		2-ft.	2-ft.	2-ft.
7	Width of Median (ft)						
	Depressed	n/a	n/a	32-44-ft.	32-44-ft.	n/a Turn Lane[5]	n/a Turn Lane[5]
	Raised	n/a	n/a	20-24-ft.	20-24-ft.	plus 8-12-ft.	plus 8-12-ft.
	Flush	n/a	n/a	14-ft.	14-ft.	14-ft.	14-ft.
8	Sidewalks						
	Width of Sidewalk	n/a	n/a	n/a	n/a	5-ft.	5-ft.
	Sidewalk Offset from Curb	n/a	n/a	n/a	n/a	6-ft.	6-ft.
9	Width of Bike Lane[6]	n/a	n/a	n/a	n/a	4-ft.	4-ft.
10	Fore Slope – Ratio	4:1	4:1	4:1	4:1	2:1 max.	4:1
11	Back Slope – Ratio	2:1 max.	2:1 max.	2:1 max.	2:1 max.	2:1 max.	2:1 max.
12	Pavement Cross Slope	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.
13	Stopping Sight Distance[7]	425-ft.	570-ft.	570-ft.	730-ft.	305-ft.	425-ft.
14	Maximum Superelevation	0.06-ft./ft.	0.06-ft./ft.	0.06-ft./ft.	0.08-ft./ft.	0.04-ft./ft.	0.06-ft./ft.
15	Minimum Radius						
	Without Superelevation (+ .02) [8]	5,700-ft.	8,060-ft.	8,060-ft.	10,700-ft.	3,220-ft.	5,700-ft.
	Without Superelevation (- .02) [8]	7,870-ft.	11,100-ft.	11,100-ft.	14,500-ft.	4,770-ft.	7,870-ft.
16	Minimum Radius (With Superelev.)	833-ft.	1,330-ft.	1,330-ft.	1,810-ft.	533-ft.	833-ft.
17	Maximum Grade (%)						
	Level	4%	3%	3%	3%	7%	6%
	Rolling	5%	4%	4%	4%	8%	7%
	Mountainous	7%	6%	6%	5%	10%	9%
18	Minimum Vertical Clearance (ft)[9]	16.75-17.5	16.75-17.5	16.75-17.5	16.75-17.5	14.5	14.5
19	Minimum Horizontal Clearance (ft)						
	From Edge of Travel Lane[10]	26	36	26	36	N/A	N/A
	Outside (From Back of Curb)	n/a	n/a	n/a	n/a	6 typ. – 15	6 typ. – 15
	Median (From Back of Curb)	n/a	n/a	n/a	n/a	4 typ. – 15	4 typ. – 15
20	Minimum Width of Right of Way (ft)[11]	As needed	As needed	As needed	As needed	As needed	As needed

Notes:
[1] Applies to curbed sections only unless stated otherwise. Use rural standards for uncurbed sections.
[2] See current AASHTO Green Book, Chapter 7, Design Speed. Also see notes 6, 7, and 8 below for design speeds not shown
[3] LOS D is permissible in heavily developed areas.
[4] Applies to uncurbed sections.
[5] GDOT prefers the use of 24-ft. raised median if there are minimal impacts associated with a wider median.
[6] Values shown are for the given design speed. For other design speeds, refer to current AASHTO *Green Book*, Chapter 3.
[7] Values shown are for the given design speed. For other design speeds, see current AASHTO *Green Book*, Chapter 3.
[8] Values shown are for the given design speed. For other design speeds, see **Chapter 4** of this Manual.
[9] Minimum values are for vehicular clearances. Please refer to GDOT *Bridge and Structures Policy Manual* for further information, clearances at other facilities and limitations.
[10] Minimum horizontal clearance equals to clear zone plus 4-ft. typical ditch.
[11] Please refer to **Section 6.10.** of this Manual for determination of width of required right-of-way

Table 6.4. GDOT Design Standards for Freeways

Item No.	Item	Rural	Urban	
1	Design Speed (mph)[1]	70	55	65
2	Level of Service (LOS)	B [2]	C[3]	C [3]
3	Number of Travel Lanes [4]	6	6	6
4	Width of Travel Lanes	12-ft.	12-ft.	12-ft.
5	Overall Width of Shoulders Outside Inside [5]	 14-ft. 12-ft.	 14-ft. 12-ft.	 14-ft. 12-ft.
6	Width of Paved Shoulders Outside Inside [5]	 12-ft. 10-ft.	 12-ft. 10-ft.	 12-ft. 10-ft.
7	Width of Median (ft) Depressed Continuous Barrier (6 lane) Continuous Barrier (8 lane)	 52 - 64 n/a n/a	 n/a 30 - 40 28 - 30	 n/a 30 - 40 28 - 30
8	Fore Slope Ratio	4:1	4:1	4:1
9	Back Slope Ratio	2:1 max.	2:1 max.	2:1 max.
10	Pavement Cross Slope	0.02-ft./ft.	0.02-ft./ft.	0.02-ft./ft.
11	Stopping Sight Distance[6]	730-ft.	495-ft.	645-ft.
12	Maximum Superelevation	0.08-ft./ft.	0.06-ft./ft.	0.06-ft./ft.
13	Minimum Radius (with superelevation)[7]	1,810-ft.	1,060-ft.	1,660-ft.
14	Maximum Grade (%)[8] Level Rolling Mountainous	 3% 4% 5%	 4% 5% 6%	 3% 4% 5%
15	Minimum Vertical Clearance (ft) [9]	16.75 - 17.5	16.75 -17.5	16.75 -17.5
16	Horizontal Clearance (from edge of travel lane) [10] 4:1 Foreslope 6:1 Foreslope	 n/a 38	 36 30	 n/a 38
17	Minimum Width of Right-of-Way (ft)[11]	As needed	As needed	As needed

Notes: [1] See current AASHTO *Green Book*, chapter 8, Design Speed. Also see notes 6,7, and 8 for design speeds not shown

[2]LOS C is permissible for urban conditions and auxiliary facilities in rural areas.

[3]LOS D is permissible in highly developed urban areas.

[4]Consider widening from existing 4 lanes to 6 lanes.

[5]On Freeways with six or more lanes and with truck traffic more than 250 vph, use 12-ft. inside shoulders.

[6]Values shown are for the given design speed. For other design speeds, refer to the AASHTO *Green Book*, Chapter 3.

[7]Values shown are for the given design speed. For other design speeds, refer to the AASHTO *Green Book*, Chapter 3.

[8]Values shown are for the given design speed. For other design speeds, refer to **Chapter 4** of this Manual.

[9]Minimum values are for vehicular clearances. Please refer to the GDOT *Bridge and Structures Design Policy Manual* for further information, clearances at other facilities, and limitations.

[10]Minimum horizontal clearance equals to clear zone plus 4-ft. typical ditch.

[11]Refer to **Section 6.10** for determination of width of required right of way.

As previously noted, the Concept Development Phase will set the approved values and typical sections to be used. Should any proposed value be less than AASHTO Design Standards, a design exception will be required. Refer to the GDOT *Plan Development Process*[3] for further guidance on completing design exceptions. On Federally funded projects, the typical section is subject to Federal Highway Administration (FHWA) approval.

6.2.1. Lane Widths

GDOT's standard for lane widths is 12-ft., except as noted in Table 6.5. The values presented in Table 6.5. represent typical values used by GDOT and are not a complete list of all lane and shoulder widths used.

Table 6.5. Typical Lane and Shoulder Widths(1)

Lane Type	Lane Width (ft)	Inside Shoulder (ft) No Curb and Gutter		Outside Shoulder (ft) No Curb and Gutter		Outside Shoulder With Curb and Gutter (ft)
		Overall(2)	Paved	Overall(2)	Paved	
Arterial or Collector	12	6	2	10	6.5	16
Urban Type A	11					16
Urban Type B	12					
Local Roads (if ADT<400, refer to AASHTO *Green Book*)	12	6	2	10	6.5	
Shared Bike Routes	14					
Designated Bike Routes	4					
Channelized Turn Lane	16 (min.)					
HOV	14					
Two Way Left Turn Lane (TWLTL)	14					
TWLTL with provision for future 20-ft.raised median	14	*See special details for other roadway dimensions*				
One-Way Roadway, Single Lane	16					
One-Way Roadway, Multilane	12					
Loop Ramp						
Free Flow Ramps						
Single Lane Entrance/Exit Ramps	16	6	4	12	10	
Multi Lane Entrance/Exit Ramps	12	6	4	12	10	
Interstates & Freeways	12	Refer to the current AASHTO publication, *A Policy on Design Standards -- Interstate System*[4]				

(1) The need for additional widening shall be determined in accordance with AASHTO recommendations.
(2) Overall shoulder width does not include additional width required for the installation of barrier.

[3] GDOT. *Plan Development Process*. 2004
The current version of this document is available on the GDOT Repository for Online Access to Documentation and Standards (R-O-A-D-S) web page at: http://www.dot.state.ga.us/dot/preconstruction/r-o-a-d-s/Other%20Resources/index.shtml

[4] AASHTO. *A Policy on Design Standards---Interstate System, 5th Edition.* 2005

In applying these lane width guidelines, two applications are defined; the confined, restricted right-of-way urban area, “Urban Area Type A” and the less confined “Urban Area Type B”. Generally, no single defining criteria, such as speed limit or functional classification, determines lane widths. Instead, a combination of characteristics define the applicable areas.

The characteristics below are representative of and define urban area types, and, in turn, determine the minimum allowable lane width:

Urban Area Type A

- speed limit 35 mph or less
- curb and sidewalk
- central business district (CBD) / historic districts / overlay streetscape
- zoning /corridor continuity characteristics
- building face to curb typically less than 10-ft.
- low percentage of trucks
- lane widths may be reduced to no less than 11-ft.

Urban Area Type B

- speed limit greater than 35 mph but not greater than 45 mph
- curb and sidewalk
- less confined, less urbanized area, generally automobile dependent, numerous driveways
- building face to curb typically less than 10-ft.
- lane widths shall be 12-ft.; design variances will be required for lane width reductions

The standard pavement cross-slope adopted by GDOT for travel lanes is 2% (0.020 ft/ft). Roadways with three or more lanes should break the cross-slope between lane 2 and lane 3 from 2% to 3% (lanes are numbered from inside to outside).

6.2.2. Shoulders

All interstate ramp shoulders should be a full-depth, full-width paved shoulder. The standard shoulder cross-slope for total shoulder width and paved shoulder width adopted by the GDOT applies to all roadway classifications. As noted in the opening paragraphs of this Section, this can vary depending on project specifics. For instance, on some projects the paved shoulder cross-slope matches the roadway cross-slope.

On four-lane divided highways, the cross-slope on the median shoulder in tangent section is controlled by the cross-over crown restrictions described in **Section 6.4** of this Manual. Similarly, the outside shoulder cross-slopes (the convex side of the curve) on superelevated roadways will be controlled by the cross-over crown restrictions. As a result, the slope will depend on the superelevation rate.

On superelevated roadways, the inside shoulder will maintain its normal crown slope for superelevation rates equal to or less than the normal shoulder slope. For superelevation rates greater than the normal shoulder rate, the inside shoulder slope is the same as the superelevation rate of the roadway. For additional discussion of the superelevation, refer to **Chapter 4. Elements of Design, Section 4.5.**

Rumble Strips shall be used as follows:

- rumble strips are to be the milled-in type
- dimensions - 16 inches width, 7 inches length, ½ inch depth, 5 inches space between
- skip pattern - 28-ft. of rumble strips, 12-ft. clear space

Table 6.6. describes appropriate placement of rumble strips.

Refer to GDOT Construction Detail S-8 for drawings of 4-ft. and 6.5-ft. shoulders, each showing the placement of the rumble strips. The 6.5-ft. shoulder shall accommodate bicyclists based on AASHTO Guidelines and shall be the one shoulder consistently used on multi-lane widening and/or reconstruction projects with rural shoulders.

Under special circumstances, GDOT Construction Details T-19, T-23 and T-24 provide other applications for various rumble strip/rumble patch devices

Table 6.6. Rumble Strip Placement

Roadway Type	Rumble Strip Placement
Interstate / Freeway(1)	Continuous
Multi-Lane Rural Section (design speed >50 mph)	Skip pattern
Two-Lane Rural Section (>400 ADT & >50 mph)	
2-ft. Paved Shoulder	No rumble strip
>4-ft. Paved Shoulder	Skip pattern
(1) *Where bicycles are NOT allowed*	

6.2.3. Roadway Slopes

The AASHTO *Roadside Design Guide* specifies the maximum (steepest) side slope that can be used on a project in order to meet clear zone requirements. Where a range of slopes is given, while slopes as steep as the maximum are allowed, the Designer should strive to provide as flat a slope as feasible.

All front slopes should be 4:1 or flatter. GDOT discourages the use of 2:1 front slopes with guardrail unless economics (construction costs), right-of-way impacts or environmental impacts outweigh the positives of a 4:1 front slope.

GDOT prefers the use of 6:1 front slopes on ditch sections with speed designs equal to or greater than 65 mph, but 4:1 front slopes are allowed as long as clear zone requirements are met.

While the use of a “barn roof” side slope is allowed by GDOT, it is not recommended. A “barn roof” side slope is defined as a 4:1 or flatter front slope extended to the clear zone where a break in slope is provided at a 2:1 side slope rate. From that point, the 2:1 front slope can be used until it intercepts the existing ground or proposed ditch grade. This will help to minimize embankment and right-of-way requirements while eliminating the need for barrier.

In addition to the safety benefits, in urban and residential areas, slopes 4:1 or flatter can be mowed easily with a lawnmower. Efforts to save trees and other items sometimes complicate this procedure, and each residential lot should be addressed separately. Configurations should result in both a pleasing appearance and an easily maintainable configuration.

Refer to **Chapter 5, Roadside Safety and Horizontal Clearance** of this manual and the AASHTO *Roadside Design Guide,* Chapter 3 for further discussion about roadway slopes.

6.3. Pavement Type Determination

The designer should refer to the current GDOT *Pavement Design Manual*[5] for additional guidance relating to the determination of pavement type.

6.4. Pavement Crowns

There are four categories of pavement crowns:

- **One-way Tangent Crown:** A one-way tangent crown slopes downward from left to right as viewed by the driver. It is used for all roadways providing one-way traffic, except as noted in the following paragraphs.
- **Two-way Tangent Crown:** A two-way tangent crown has a high point in the middle of the roadway and slopes downward toward both edges. It is used for all roadways providing two-way traffic. For undivided multi-lane highways, the pavement is sloped downward and away from the median centerline, or from the left or right edge line of the median lane on a five-lane section.
- **Two-way Crown Converted to One-way Use:** When an existing roadway with a two-way crown is converted from two-way to one-way use, the existing crown shape can remain. However, if possible, it is desirable to utilize leveling to adjust cross-slope in order to obtain a constant cross-slope.
- **Cross-over Crown Break:** The cross-over crown break between main lanes is limited to an algebraic difference of 4% (0.04 ft/ft). This applies at the break point of a two-way crown. The algebraic difference between the main roadway cross-slope and shoulder cross-slope should not exceed 8% (0.08 ft/ft).

6.5. Curbs – Outside Shoulders

The type and location of curbs affects driver behavior and the safety and utility of a highway. Curbs serve any or all of the following purposes:

- drainage control
- pavement edge delineation
- right-of-way reduction
- aesthetics
- delineation of pedestrian walkways
- reduction of maintenance operations
- assistance in orderly roadside development

In the interest of safety, curbs should not be used on rural highways if these objectives can be attained by other means. Sloped curbs may be used in rural areas with posted speeds greater than 45 mph if right-of-way and/or environmental impacts can be minimized or drainage issues need to be addressed.

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[5] GDOT. *GDOT Pavement Design Manual.* 2007
he current version of this document is available on the GDOT Repository for Online Access to Documentation and Standards (R-O-A-D-S) web page at: http://www.dot.state.ga.us/dot/preconstruction/R-O-A-D-S/DesignPolicies/index.shtml

Sloped curbs on outside shoulders should be located a minimum distance of 10-ft. from the edge of outside travel lane or back of useable shoulder as required by the AASHTO *Green Book* (2004). Curbs on inside shoulders shall be offset at least 4-ft. from the inside edge of travel lane to face of curb.

Curbs may be constructed by a variety of methods. Typical shapes and dimensions for various types of curbs, including curb and gutter, are shown in *GDOT Construction Standards and Details*[6] Ga. Std. 9032B.

Table 6.7. Curb Types Allowed for Various Types Of Roads

Curb Type(1)	Road Type					
	Interstate	Urban Type A	Urban Type B	State Route Design Speed ≤ 45 mph	State Route Design Speed > 45 mph	Other Off Roadway Classification
Concrete Curb and Gutter						
Type 1						X
Type 2		X	X	X		X
Type 3						X
Type 4						X
Type 7		X	X	X	X	X
Concrete Header Curb						
Type 1						X
Type 2		X	X	X		X
Type 3						X
Type 4						X
Type 7		X	X	X	X	X
Type 8		X	X	X	X	
Raised Median						
Type 1						
Type 2				X		
Type 7	X	X	X	X	X	
Raised Island						
Type 1						
Type 2				X		
Type 7		X	X	X	X	
V Gutter	X	X	X			

(1) Typical shapes and dimensions for various types of curbs, including curb and gutter, are shown in Ga. Std. 9032B. Four-inch sloped Type I curbs placed at the back of the usable shoulder may be used on high speed facilities.

[6] GDOT. *Construction Standards and Details*. 2006
Note: Current Construction Standards and Details may be downloaded from:
http://tomcat2.dot.state.ga.us/stds_dtls/index.jsp

6.5.1. Outside Curb Location Relative to Travel Lanes, Guardrail, etc.

For a typical roadway section with curb and gutter, the curb is offset from the through travel lane as shown in Chapter 5 of the AASHTO *Roadside Design Guide* (2006). When used to delineate raised islands, like those commonly placed at Intersections, the curb should be offset from the travel lane as discussed in **Section 6.5.5**. of this Manual. Additional discussion on the location of curbs is provided in Chapters 4 and 9 of the AASHTO *Green Book* (2004).

The relationship of curb-to-guardrail is critical. If the curb is not properly located, the guardrail will not function as intended. Chapter 5 of the AASHTO *Roadside Design Guide* (2006) discusses the location of curb with respect to the face of the guardrail. For additional information, refer to GDOT *Construction Standards and Details*, Ga. Std. 4280.

6.5.2. Curb Types

Sloped Curbs or Barrier Curbs

Curb shapes are generally classified as either sloped or barrier curbs. The sloped curb has a flat sloping face. The barrier curb is characteristic of a steep face.

- Generally, barrier curb is only used when sidewalks are provided and in the curb return of turnouts to intersecting streets. See **Table 6.7** for proper use of curb.

Concrete or Asphaltic Curbs

Portland cement concrete is used for most curbs. Asphaltic curbs are limited primarily to header curbs in parking areas. Asphaltic curbs are also used to control runoff and erosion on high fills (>20-ft.) with 2:1 side slopes or in guardrail sections along rural roadways. See GDOT *Construction Standards and Details,* Construction Detail S-4 for information regarding the placement of asphaltic curbs behind guardrail.

6.5.3. Methods of Construction

Integral

For concrete pavements, integral curb is preferred to curb and gutter because of economy in initial construction and maintenance. With this method, the concrete curb is poured when the concrete slab for the roadway is still in a plastic state. This creates an integral bond between the roadway and the curb. An alternate, and more popular, method of construction is to place tie bars in the concrete of the roadway slab. Later, when the pavement has hardened, the curb is poured so that the tie bars hold the curb firmly in place on the roadway. Although not truly integral with the pavement, this curb is commonly referred to as integral/tied curb. The depth of integral/tied curb should match the depth of the roadway slab.

Curb and Gutter

Concrete curb and gutter, as shown in the *GDOT Construction Standards and Details*, Ga. Std. 9032B, is generally used with asphaltic concrete pavement. Under this method, both the curb and the gutter are poured together, but not at the same time as the roadway pavement. The GDOT standard curb and gutter width is 2.5-ft. for both sloped and barrier type curb and gutter. Where curb and gutter is placed adjacent to concrete pavement on curbed sections, tie bars should be used to connect the curb and gutter to the adjacent pavement. This prevents separation of the curb and gutter from the edge of the pavement.

6.5.4. Raised Median Noses

To prevent vehicles from breaking the curb in the nose of raised medians, a monolithic section of curb and median pavement should be constructed. See *GDOT Construction Standards and Details*, Construction Details of Median Crossovers (M-3).

6.5.5. Raised Channelizing Islands

Raised channelizing islands help control and direct the movement of traffic by reducing excess pavement areas, and channelizing turning movements at intersections. In urban locations, a sloped curb is generally used in conjunction with striping to delineate the island. In rural locations where higher speeds are likely, islands are typically delineated with a sloped curb and offset appropriately. In areas with crosswalks where raised islands will be used for pedestrian refuge, the geometry of the intersection and the right turn lanes may need to be modified to ensure that the raised islands are large enough to accommodate ramps and pedestrian refuge areas, along with support for pedestrian signals and control buttons, that are compliant with the Americans with Disabilities Act[8] (ADA) guidelines.

Raised islands should be offset from the travel lane as shown in the current GDOT *Regulations for Driveway and Encroachment Control*. Refer to Chapter 9 of the current AASHTO *Green Book* for additional information. Raised islands should be offset 4-ft. from travel lanes when posted speeds are $\leq$ 45 mph and 10-ft. from travel lanes when posted speeds are > 45 mph.

6.6. Sidewalks

Sidewalks shall be provided wherever curb and gutter is utilized along the outside edges of pavement of the mainline roadway, i.e., urban sections. A sidewalk may be omitted on side road tie-ins where there is no existing sidewalk and the additional widening of shoulders for sidewalk would result in excessive impacts as determined by the design team on a case by case basis. Sidewalks are not required in rural areas where curb and gutter is placed at the back of the useable shoulder for the purpose of reducing construction limits. Refer to GDOT *Construction Standards and Details*, Construction Details A-1, A-2, A-3, A-4 and the GDOT *Pedestrian and Streetscape Guide*[9] for additional information regarding the location of sidewalks and ramps.

The current interim details for concrete sidewalk and curb cut ramps shows the section which has a 2-ft. typical, 6-ft. desirable dimension from the back of the curb to the sidewalk as the preferred section. A 16-ft. shoulder is recommended when there is sufficient space for the use of a 6-ft. grass strip.

6.6.1. Location

Sidewalks should be at least 5-ft. wide. Sidewalks should be offset a minimum of 2-ft. from the back of curb (6-ft. desirable), with a grass strip usually separating the curb and sidewalk. A different material may be used to separate the curb from the sidewalk, as long as the alternative material has sufficient contrasting color and texture from the sidewalk. The city or authority responsible for

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[8] Visit the following FHWA web page for additional information relating to Americans with Disabilities Act (ADA) requirements http://www.fhwa.dot.gov/environment/te/te_ada.htm

[9] GDOT/Otak. *Pedestrian and Streetscape Guide*. 2003
This publication is available online at: http://www.dot.state.ga.us/dot/plan-prog/planning/projects/bicycle/ped_streetscape_guide/index.shtml

sidewalk maintenance (including the grass strip, if required) may choose a location and width greater than the minimum values.

6.6.2. Cross-Slope

In accordance with the Americans with Disabilities Act (ADA), sidewalk cross-slopes shall not exceed (maximum allowable slope) 2.0% (positive or negative). Refer to **Chapter 4. Elements of Design** of this Manual for further discussion regarding maximum slopes for sidewalks.

6.6.3. Handicap Ramps

In order to comply with the Americans with Disabilities Act (ADA), handicap ramps shall be included on all projects that contain both sidewalks and curbs.

6.6.4. Bridges

A sidewalk shall be used to provide transition from the roadway cross section to the bridge cross section before the approach slab. This may be accomplished by eliminating the grass strip or area of contrasting color and texture in advance of the bridge at this point, a wide sidewalk may be tapered to match the bridge shoulder. This is typically done in an area 50-ft. to 100-ft. in advance of the bridge. Where guardrail is used on the bridge approaches, the sidewalk transition should match the guardrail offset transitions.

6.7. Barriers

Chapters 5 and 6 of the AASHTO *Roadside Design Guide* provide details on the application and design of various barriers, including guardrail and concrete median barriers. Recommendations on the layout and type of barrier to be used are usually obtained from the Office of Bridge and Structural Design when bridges are involved. All other applications are the responsibility of the designer.

6.7.1. Barrier Types

The following barrier types shall be used under the various stated conditions:

- **Cable Barrier** – This is a flexible barrier capable of deflecting 12-ft. or more when impacted. Barrier is typically used in the grassed medians of interstates and freeways. The designer shall account for the deflection when determining the location of the barrier.
- **W-Beam Guardrail** – A semi-flexible barrier that will deflect up to 5-ft. W-Beam may be used to prevent vehicles from crossing medians, traversing steep slopes or striking objects. Cannot be used ≤ 8-ft. from curb face. Refer to the *GDOT Construction Standards and Detail*s for additional guidance for placement of guardrail behind curbs.
- **T-Beam Guardrail** – Similar to W-Beam guardrail, but deflects only 3-ft. T-Beam is used on transitions from W-Beam to a Concrete Barrier. Refer to the *GDOT Construction Standards and Details* for additional guidance for placement of guardrail behind curbs.
- **Double Faced Guardrail** – Semi-Flexible barrier capable of deflecting 5-ft. Used in medians and other locations to prevent errant vehicles from crossing into opposing traffic.
- **Single Slope Concrete Barrier** – A rigid barrier with little or no deflection. Used for medians or side barrier directly in front of rigid objects that are near the traveled way. This includes walls and bridge bents. This is the preferred barrier for Interstates and new construction where Jersey shape barrier is not being retained.

- **Jersey Shaped Concrete Barrier** – Same uses as single slope concrete barriers. May be used on projects where portions of existing Jersey barrier can be retained to provide a consistent design and appearance. Jersey barrier cannot be retained when construction raises the pavement surface by 3-inches or higher than the bottom lip of the barrier.

Temporary Barriers

The design, installation and maintenance of temporary barriers is discussed in the following documents:

- AASHTO *Roadside Design Guide*, Chapter 9
- FHWA *Manual on Uniform Traffic Control Devices (MUTCD)*[10], part 6
- DOT Specifications, Section 150
- GDOT *Construction Standards and Detail*s, Details of Precast Temporary Barrier (Ga. Std. 4961).

Two methods of temporary barrier are used:

Method 1 - Must be certified compliant with National Cooperative Highway Research Program (NCHRP) Report 350[11] "Test Level 3" approved or meets the requirements of Ga. Std. 4961. Method 1 barrier is not suitable on bridges where the distance from the centerline of the barrier to the free edge of the bridge deck is less than or equal to 6-ft., measured normal to the barrier.

Method 2 - Must be certified compliant with National Cooperative Highway Research Program (NCHRP) *Procedures for the Safety Performance Evaluation of Highway Features* (Report 350) "Test Level 3" and does not deflect more than 1-ft. under NCHRP test conditions. A Method 2 barrier shall be used on bridges and bridge approaches where the distance from the centerline of the barrier to the free edge of the bridge deck is less than or equal to 6-ft. measured normal to the barrier.

Refer to the current AASHTO *Roadside Design Guide* for further discussion on the properties and uses of these barriers.

6.7.2. Glare Screens

Glare screens are required on all interstate concrete median barriers. Glare screens for concrete barriers are typically constructed as concrete extensions but alternate materials may be used on a case by case basis.

A glare screen is required between the mainline and frontage roads with opposing traffic flows. Where concrete barriers are not used, a glare screen such as landscaping materials, fencing with inserts or walls may be used to minimize glare. With offsets greater than 40-ft., glare screens are not required, but should be evaluated to determine if needed.

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[10] FHWA. *Manual on Uniform Traffic Control Devices (MUTCD)*. 2003
The 2003 version of the MUTCD is available online at: http://mutcd.fhwa.dot.gov/kno-2003r1.htm

[11] TRB. National Cooperative Highway Research Program (NCHRP) Report 350, Procedures for the Safety Performance Evaluation of Highway Features. 1992
Available online at: http://safety.fhwa.dot.gov/roadway_dept/road_hardware/nchrp_350.htm

6.7.3. End Treatments

All blunt approach ends of barriers should be protected in one of the following methods:

- **Guardrail transition with a Type 12 anchorage** – the Type 12 is a gating or non gating guardrail terminal. This end treatment requires a wider shoulder than the guardrail it is attaching to, so the designer must ensure that additional shoulder width is included for the Type 12 treatment.

- **Energy absorption end treatment** - attenuators must be installed in accordance to the manufacturer's recommendations. In general, attenuators should not be placed on a raised median. The median must be tapered so a stray vehicle impacts the barrier without being vaulted by the curb.

- **Flared beyond the clear zone** – see GDOT *Construction Standards and Details* for flare rates.

- **Temporary end treatments** – should be used in work zones, where warranted.

Blunt ends are acceptable in urban areas where the blunt end is equal to or beyond the horizontal clearance specified in **Chapter 5, Roadside Safety and Horizontal Clearance** of this Manual. For this condition, it is desirable that the end be tapered with a 6:1 slope.

For additional information, refer to **Chapter 5, Roadside Safety and Horizontal Clearance** of this Manual**;** the current AASHTO *Roadside Design Guide,* Chapter 8; and all applicable GDOT *Construction Standards and Details* .

6.8. Medians

Several factors will be considered when determining the applicable median treatments, such as classification of roadway, number of lanes, base year traffic, design year traffic, posted speed limit, design speed limit and accident/crash data. Below are the roadway classifications and the median guidelines for those classifications.

6.8.1. Interstate Medians

All interstates shall require a depressed median, as specified in the AASHTO *Green Book*, or positive barrier separation in areas of right-of-way restrictions. Positive barrier separation is required for all median widths ≤ 52-ft. or where mutually exclusive clear zone for each direction of traffic cannot be obtained. Positive barrier separation will not be required for median widths > 64-ft. Median barrier is optional for median widths between 52-ft. and 64-ft. Positive barrier separation should be considered for all existing medians where there is a history of cross median type accidents.

6.8.2. Arterial (Non-GRIP) Medians

The required medians for arterials (non-GRIP) with posted speeds or design speeds less than or equal to 45 mph are described in **Table 6.8.**

Table 6.8. Medians for Non-GRIP Arterials with Posted Speeds or Design Speeds ≤ 45 mph

Median	ADT (Base Year)	ADT (Design Year)
5- lane section (flush median)	≤ 18,000	≤ 24,000
5-lane section (flush median)(1)	≤ 18,000	> 24,000
20-ft. raised median (2)	> 18,000	> 24,000

(1) The project shall be designed to incorporate a future 20-ft. raised median or preferably a 24-ft. raised median depending on impacts. Right-of-way shall be purchased for footprint determined by raised 20-ft. or 24-ft. median typical section. The need and implementation of a raised median section shall be determined by monitoring of accidents and traffic volumes on a five-year cycle by the Safety Engineer in the GDOT Office of Traffic Operations.

(2) GDOT prefers the use of a 24-ft. raised median if there are minimal impacts associated with a wider median.

Raised medians shall be constructed on multi-lane facilities at intersections that exhibit one of the following characteristics:

- high turning volumes relating to 18,000 ADT (base year) and 24,000 ADT (design year)
- accident rate greater than the state average for its classification
- excessive queue lengths (as determined by District Traffic Engineer) in conjunction with excessive number of driveways

All arterials with design speeds greater than 45 mph will require:

- A 24-ft. raised median with a sloped curb (Type 7 curb-face), which will require a 2-ft. additional paved shoulder offset from the edge of travel to the edge of the gutter (4-ft. inside shoulder width from the edge of travel to the face of the curb).

- A 44-ft. depressed median or a positive barrier system depending upon functional classification, the type of development along the corridor, type of access management and right-of-way impacts.

All multi-lane facilities with three or more lanes in each direction shall include positive separation of opposing traffic using a median. The type of median required shall depend on guidelines stated above.

All rural multi-lane roadways interchanging with an interstate highway shall have a raised median for a minimum distance of 1,000-ft. from the ramp termini or the first major intersection. A median break may be provided in accordance with the GDOT's access guidelines, which are described in **Chapter 3, Design Controls** of this Manual.

6.8.3. GRIP Corridors (Rural Arterials)

GRIP corridors (rural arterials) shall have medians as described in **Table 6.9.**

Table 6.9. Medians for GRIP Corridors (Rural Arterials)

Median	ADT (Base Year)	ADT (Design Year)
Design Speeds ≤ 45 mph		
5-lane section (flush median)	≤ 18,000	≤ 24,000
20-ft. raised median*	> 18,000	> 24,000
Design Speeds > 45 mph		
44-ft. depressed median	n/a	n/a
* If there are minimal impacts associated with a wider median, the use of a 24-ft. raised median is preferred.		

6.8.4. Medians at Pedestrian Crossings

Locations where a significant number of pedestrians are likely to be crossing the roadway at mid-block may warrant positive separation of opposing traffic using a median for pedestrian refuge. Signals are not typically warranted at these locations. Two-phase pedestrian crossings may be required when the roadway width requires excessive pedestrian crossing time (i.e. 6-lane section with dual left turn lanes and a right turn lane, etc). In the case of a two-phase pedestrian crossing, the median shall be wide enough to provide an ADA-compliant pedestrian refuge area.

6.9. Frontage Roads and Access Roads

AASHTO defines a frontage road as "a road that segregates local traffic from higher speed through-traffic and intercepts driveways of residences, commercial establishments, and other individual properties along the highway" (*Green Book,* 2004).

Frontage roads provide numerous functions depending on the type of arterial they serve and the character of the surrounding area. Frontage roads may be used to control access to the arterial, to provide access to adjoining property, and to maintain traffic circulation on each side of the arterial. Frontage roads segregate local traffic from the higher-speed through traffic and intercept driveways from residences and commercial establishments along the highway. Most existing frontage roads were built along interstate or major arterial routes to provide control-of-access to the highway and access to property that would otherwise be land-locked. Frontage roads typically run parallel to the mainline roadway while access roads provide access to individual properties and may not run parallel to the mainline.

Access roads may also be used to provide access to landlocked parcels. Access roads and frontage roads should be offset from the highway to allow required clear zone and future roadway widening, if anticipated.

6.10. Right-of-Way Controls

Establishing right-of-way widths that adequately accommodate construction, utilities, drainage, and proper highway maintenance is an important part of the overall design. The border area between the roadway and the right-of-way line should be wide enough to serve several purposes, including provision of a buffer space between pedestrians and vehicular traffic (if applicable), roadway drainage, sidewalk space, horizontal clearance, clear zone (if applicable), and an area for both underground and aboveground utilities. A wide right-of-way width allows construction of gentle

slopes and also allows for utility poles to be offset further from the road, which in turn results in greater safety for motorists as well as easier and more economical maintenance of the right-of-way.

6.10.1. Rural

In hilly terrain, construction limits vary considerably as the roadway passes through cut and fill sections. In these situations, the required right-of-way will likely vary, so it may be impractical to use a constant right-of-way width.

In flat terrain, it is usually both practical and desirable to establish a minimum right-of-way width that can be used throughout most of the project length. Required right-of-way widths should be set at even offsets from the centerline, typically multiples of 5-ft., unless some physical feature requires otherwise.

Transitions in width, where required, should be as long as practical. If frequent breaks in the right-of-way line are required to increase the width by only 5-ft., for example, serious consideration should be given to increasing the minimum width by 5-ft. for the entire project length.

As a general rule, the required right-of-way line should be set a minimum of 7-ft. to 10-ft. beyond the proposed limits of construction in cut and 10-ft. to 15-ft. beyond the proposed limits of construction in fill. In areas of high fills a minimum of 20-ft. should be provided beyond the construction limits to provide room for adequate Best Management Practices (BMPs) that are necessary to minimize sediment transport. Extra right-of-way at the top of cut slopes should be provided for the construction of ditches that will intercept surface drainage and minimize slope erosion.

If a future project will potentially connect to either end of the proposed project, the required right-of-way line is extended to the nearest property line beyond the extent of construction, if practical. This is done to avoid buying right-of-way from the property owner on two different occasions. In this case, the project limit will correspond to the limit of the required right-of-way.

6.10.2. Urban

In urban areas, right-of-way widths are governed primarily by economic considerations, physical obstructions, or environmental considerations. Along any route, development and terrain conditions may vary affecting the availability of right-of-way.

It is desirable to set right-of-way in urban areas a minimum of 1-ft beyond the shoulder break point or 2-ft. beyond the greatest required horizontal clearance specified in **Chapter 5. Roadside Safety and Horizontal Clearance.** However, property or environmental impacts may limit the amount of right-of-way that can realistically be acquired. If existing utilities are in conflict within areas of restricted right-of-way, discussions should be held at the Field Plan Reviews to determine how to adequately accommodate utility relocations.

6.10.3. Special Types of Right-of-Way

Construction Easement

Construction easement is called for on the plans when an area outside the required right-of-way line is needed only during construction of the project. The most common example of this is for construction of a temporary detour road.

A permanent feature should not be placed in a construction easement. The decision to obtain permanent right-of-way or construction easement is made after considering the circumstances of each project.

The property owner is paid a fee during the time the construction easement is needed. Where applicable, the owner is also paid for damages that may be incurred during the construction process such as for removal of trees or shrubbery.

Permanent Drainage Easement

Drainage easement is required when a new lateral outfall ditch is to be constructed beyond the right-of-way or when an existing lateral outfall ditch is to be improved outside of the right-of-way. Drainage easement is obtained when construction of these laterals is critical to proper drainage of the project. As with a construction easement the property owner is paid for use of the drainage easement, and for damages resulting from construction. However, with drainage easements GDOT reserves the right of permanent access to the drainage structure for maintenance purposes.

Control of Access

Limited access is purchased from property owners along major highways such as freeways. No highway access crossing the limited access is allowed and the property owner is compensated for such restrictions. Where limited access is used along a highway, it typically extends down intersecting roadways to enhance traffic flow at the intersection.

6.10.4. Accommodating Utilities

In addition to primarily serving vehicular traffic, right-of-way for streets and highways may accommodate public utility facilities in accordance with state law or municipal ordinance.

The use of right-of-way by utilities should cause the least interference with traffic using the street. If existing utilities are in conflict within areas of restricted right-of-way, discussions should be held at the Field Plan Review to determine how to adequately accommodate utility relocations. Utility features, such as power poles and fire hydrants, should be located as close to the right-of-way line as feasible for safety reasons.

Utilities located within the limits of construction for the roadway and drainage structures of a project may require relocation, adjustment, or encasement. The surveys should identify the utility locations, elevations, types, sizes, and owners. The plans and cross-sections will then be used to inform utility owners of how the project will impact their facilities.

Relocated utilities should normally be accommodated within the required right-of-way. This should be considered in setting required right-of-way limits.

Refer to the GDOT Office of Utilities (http://www.dot.state.ga.us/dot/operations/utilities/index.shtml) for further guidance.

6.11. Parking Lanes

Generally, parking on arterial highways is prohibited because on-street parking decreases through capacity, impedes traffic flow, and increases accident potential. At the request of the local governing authority, consideration may be given to the inclusion of parking adjacent to the roadway in special situations if the following conditions are met:

- parking currently exists adjacent to the roadway
- adequate off-street parking facilities are unavailable or unfeasible
- the subsequent reduction in highway capacity will be insignificant
- the local governing authority has agreed to pay for the additional costs associated with the on-street parking, such as additional right-of-way, construction costs, etc.

Final approval of on-street parking on arterial highways shall be obtained from the GDOT Chief Engineer.

When on-street parking is allowed on a roadway, parallel parking is the preferred type of on-street parking. Under certain circumstances, angled parking is allowed. However, angled parking presents sight distance problems due to the varying length of vehicles, such as vans and recreational vehicles. The extra length of these vehicles may also interfere with the traveled way. The type of on-street parking selected should depend on the specific function and width of the street, adjacent land uses and traffic volume, as well as existing and anticipated traffic operations.

6.12. Bicycle Lanes

Bicycle lanes and related improvements shall be incorporated into all widening and reconstruction projects when there is an existing bikeway or if the project is on an approved Bicycle Route. An interactive map of the state bicycle route network and local bicycle maps are available online at: http://www.dot.state.ga.us/dot/plan-prog/planning/projects/bicycle/maps/index.shtml

Chapter 6 Index