Chapter Thirty-two

GEOMETRIC DESIGN TABLES
(New Construction/Reconstruction)

BUREAU OF LOCAL ROADS AND STREETS MANUAL

Chapter Thirty-two
GEOMETRIC DESIGN TABLES
(New Construction/Reconstruction)

Table of Contents

Section **Page**

32-1 GENERAL ..... 32-1(1)

32-2 GEOMETRIC DESIGN CRITERIA ..... 32-2(1)

32-3 ALIGNMENT CRITERIA ..... 32-3(1)

Chapter Thirty-two
GEOMETRIC DESIGN TABLES
(New Construction/Reconstruction)

32-1 GENERAL

This Chapter presents summary tables of the design criteria for the geometric design of local projects. They apply to new construction and reconstruction projects. The designer should consider the following in the use of these tables:

1. Functional Classification. The selection of design values depends on the functional classification of the highway facility. Functional classification is discussed in Section 27-3. The first step in the design process is to determine the functional classification of the proposed improvement. If the classification is unknown, contact the local IDOT district office.

2. Manual Section References. These tables are intended to provide a concise listing of design values for easy use. However, the designer should review the *Manual* section reference for more information on the design elements.

3. Footnotes. The tables include many footnotes, which are identified by a number in parentheses (e.g., (3)). The information in the footnote is critical to the proper use of these design tables.

4. Cross Section Elements. The designer should realize that some of the cross section elements included in a table (e.g., median width) are not automatically warranted in the project design. The values in the tables will only apply after the decision has been made to include the element in the highway cross section.

5. Bridge Elements. Design criteria for bridge elements are provided in Chapter 36.

6. Controlling Design Criteria. Controlling design criteria are the elements judged to be the most critical indicators of highway safety and overall serviceability. The tables provide an asterisk to indicate controlling design criteria. Section 27-7 discusses this in more detail and presents the process for approving design variances to controlling criteria.

7. Local Agency Criteria. Illinois counties and cities may have developed their own geometric design criteria for local facilities. It may be acceptable to use the local agency criteria where there are conflicts with the criteria listed in this *Manual*. This decision will be made on a case-by-case basis or can be approved as an agency variance acceptable for all projects.

32-2 GEOMETRIC DESIGN CRITERIA

This Section presents the new construction/reconstruction geometric design criteria for various local facilities. Design criteria are provided for the following facilities:

- Figure 32-2A "Geometric Design Criteria for Rural Two-Lane Collectors,"
- Figure 32-2B "Geometric Design Criteria for Rural Two-Lane Local Roads,"
- Figure 32-2C "Geometric Design Criteria for Suburban Arterials,"
- Figure 32-2D "Geometric Design Criteria for Urban Two-Way Arterials,"
- Figure 32-2E "Geometric Design Criteria for Urban One-Way Arterials,"
- Figure 32-2F "Geometric Design Criteria for Urban Two-Way Collectors,"
- Figure 32-2G "Geometric Design Criteria for Urban One-Way Collectors," and
- Figure 32-2H "Geometric Design Criteria for Urban Local Streets."

For criteria on local rural arterials, the designer should review the criteria in Chapter 47 of the *BDE Manual*.

Design Element				Manual Section	Design Volume (veh/day)			
					Under 400 ADT	400 – 750 ADT	750-2000 ADT	Over 2000 ADT
Design Controls	Design Forecast Year			27-6.02	Current	20 Years	20 Years	20 Years
	*Minimum Design Speed (1)	Level		27-5.02	40 mph	50 mph	50 mph	60 mph
		Rolling			30 mph	40 mph	40 mph	50 mph
	*Level of Service			27-6.04	C	C	C	C
Cross Section Elements	*Traveled Way Width			31-1.01	20′	22′	22′	24′ (2)
	Surface Type			Chapter 37	Aggregate Surface/ Bituminous Treated (3)	High-Type Pavement	High-Type Pavement	High-Type Pavement
	*Shoulder Width			31-1.06	2′ (4a)	4′ (4b)	6′ (4b)	8′ (4b)
	Shoulder Type				Turf or Aggregate (5a)		Aggregate/Paved (5b)	
	*Auxiliary Lanes	Lane Width		31-1.03	10′	Des: 11′ Min: 10′	Des: 11′ Min: 10′	Des: 12′ Min: 11′
		Shoulder Width			2′	4′	Des: 6′ Min: 4′	Des: 8′ Min: 4′
	Cross Slope	*Travel Lane (6a)		31-1.08	2% - 4% (6b)	1.5% - 2%	1.5% - 2%	1.5% - 2%
		Shoulder			Turf: 5-8% Agg: 4-6%	Turf: 5-8% Agg: 4-6%	Agg: 4-6% Paved: 4%	Agg: 4-6% Paved: 4%
		Rollover Factor			10%	10%	8%	8%
Roadway Slopes	Side Slopes	Cut Section	Front Slope	31-2.03 31-2.04	1V:3H	1V:3H	1V:3H	1V:4H
			Ditch Width		Min: 2′	Min: 2′	Min: 2′	Min: 2′
			Back Slope		0′-10′: 1V:3H >10′: 1V:2H (7)	0′-10′: 1V:3H >10′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	<15′: 1V:4H 15′-25′: 1V:3H >25′: 1V:2H
		Rock Cut			1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H
		Fill Section			0′-6′: 1V:3H >6′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	0′-25′: 1V:4H >25′: 1V:2H

* Controlling design criteria (see Section 27-7).

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE COLLECTORS
(New Construction/Reconstruction)
Figure 32-2A (US Customary)

Design Element				Manual Section	Design Volume (vehicles/day)			
					Under 400 ADT	400 – 750 ADT	750-2000 ADT	Over 2000 ADT
Design Controls	Design Forecast Year			27-6.02	Current	20 Years	20 Years	20 Years
	*Minimum Design Speed (1)	Level		27-5.02	60 km/h	80 km/h	80 km/h	100 km/h
		Rolling			50 km/h	60 km/h	60 km/h	80 km/h
	*Level of Service			27-6.04	C	C	C	C
Cross Section Elements	*Traveled Way Width			31-1.01	6.0 m	6.6 m	6.6 m	7.2 m (2)
	Surface Type			Chapter 37	Aggregate Surface/ Bituminous Treated (3)	High-Type Pavement	High-Type Pavement	High-Type Pavement
	*Shoulder Width			31-1.06	600 mm (4a)	1.2 m (4b)	1.8 m (4b)	2.4 m (4b)
	Shoulder Type				Turf or Aggregate (5a)		Aggregate/Paved (5b)	
	*Auxiliary Lanes	Lane Width		31-1.03	3.0 m	Des: 3.3 m Min: 3.0 m	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.3 m
		Shoulder Width			600 mm	1.2 m	Des: 1.8 m Min: 1.2 m	Des: 2.4 m Min: 1.2 m
	Cross Slope	* Travel Lane (6a)		31-1.08	2% - 4% (6b)	1.5% - 2%	1.5% - 2%	1.5% - 2%
		Shoulder			Turf: 5-8% Agg: 4-6%	Turf: 5-8% Agg: 4-6%	Agg: 4-6% Paved: 4%	Agg: 4-6% Paved: 4%
		Rollover Factor			10%	10%	8%	8%
Roadway Slopes	Side Slopes	Cut Section	Front Slope	31-2.03 31-2.04	1V:3H	1V:3H	1V:3H	1V:4H
			Ditch Width		Min: 600 mm	Min: 600 mm	Min: 600 mm	Min: 600 mm
			Back Slope		0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H (7)	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	<4.5 m: 1V:4H 4.5 m – 7.5 m: 1V:3H >7.5 m: 1V:2H
		Rock Cut			1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H
		Fill Section			0 m – 1.8 m: 1V:3H >1.8 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m – 7.5 m: 1V:4H >7.5 m: 1V:2H

* Controlling design criteria (see Section 27-7).

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE COLLECTORS
(New Construction/Reconstruction)
Figure 32-2A (Metric)

(1) Design Speed. A rural collector may pass through a relatively built-up area. In these sections, a lower design speed may be selected with justification. However, the selected design speed should not be less than 30 mph (50 km/h). Consider the following:

- For low to moderate density areas, the design speed may be reduced 5 mph to 10 mph (10 km/h) below the listed design speed.
- For moderate to high density areas, the design speed may be reduced 10 mph to 15 mph (10 km/h to 20 km/h) below the listed design speed.

(2) Traveled Way Width. On a reconstruction project, an existing 22 ft (6.6 m) traveled way width may be maintained where the alignment and safety records are satisfactory.

(3) Surface Type. A high-type pavement is desirable.

(4) Shoulder Width.

a. Where roadside barriers are included, provide a minimum offset of 4 ft (1.2 m) from the edge of the traveled way to the roadside barrier.

b. Where the rural collector passes through a moderate to high density area, the shoulder width may be 4 ft (1.2 m). This width may include the width of Type B gutter or the gutter flag with curb and gutter at the outside edge of the shoulder.

(5) Shoulder Type.

a. Aggregate shoulders may consist of a nominal 4 in (100 mm) thickness where the ADT is less than 750 vehicles/day.

b. For ADT's > 750 vehicles/day, an aggregate shoulder should be a minimum thickness of 6 in (150 mm) Type A shoulders.

(6) Cross Slopes.

a. Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane. Inside auxiliary lane cross slopes are sloped at 1.5% to 2.0% with high-type pavements.

b. Use 1.5% to 2.0% with high-type pavement.

(7) Back Slopes. For isolated restricted right-of-way, the back slope may be 1V:2H for cut depths of 0 ft to 10 ft (0 m to 3 m) or 1V:1.5H for cut depths greater than 10 ft (3 m).

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE COLLECTORS (New Construction/Reconstruction)

Footnotes to Figure 32-2A

Figure 32-2B (US Customary)

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE LOCAL ROADS (New Construction/Reconstruction)

Design Element				Manual Section	Design Volume (vehicles/day)				
					Under 250 ADT	250 – 400 ADT	400 – 750 ADT	750-2000 ADT	Over 2000 ADT
Design Controls	Design Forecast Year			27-6.02	Current	Current	20 Years	20 Years	20 Years
	*Design Speed (1)	Level		27-5.02	30 mph (1d)	40 mph	50 mph	50 mph	50 mph
		Rolling			30 mph (1c)(1d)	30 mph	40 mph	40 mph	40 mph
	*Level of Service			27-6.04	D	D	D	D	D
Cross Section Elements	*Traveled Way Width			31-1.01	18′ (2a)	20′	22′	22′	24′ (2b)
	Surface Type			Chapter 37	Bituminous Treated or Aggregate (3)		High-Type Pavement		
	*Shoulder Width			31-1.06	2′ (4a)	2′ (4a)	4′ (4b)	6′ (4b)	8′ (4b)
	Shoulder Type				Turf	Turf or Aggregate (5a)		Aggregate/Paved (5b)	
	*Auxiliary Lanes	Lane Width		31-1.03	N/A	10′	Des: 11′ Min: 10′	Des: 11′ Min: 10′	Des: 12′ Min: 10′
		Shoulder Width			N/A	2′	Des: 4′ Min: 2′	Des: 6′ Min: 4′	Des: 8′ Min: 4′
	Cross Slope (6a)	*Travel Lane		31-1.08	2%-4% (6b)	2%-4% (6b)	1.5%-2%	1.5%-2%	1.5%-2%
		Shoulder			Turf: 5-8%	Turf: 5-8% Agg: 4-6%	Turf: 5-8% Agg: 4-6%	Agg: 4-6% Paved: 4%	Agg: 4-6% Paved: 4%
		Rollover Factor			10%	10%	10%	8%	8%
Roadway Slopes	Side Slopes	Cut Section	Front Slope	31-2.03 31-2.04	1V:3H (7a)	1V:3H	1V:3H	1V:3H	1V:4H
			Ditch Width		Min: 2′	Min: 2′	Min: 2′	Min: 2′	Min: 2′
			Back Slope		0′-10′: 1V:3H >10′: 1V:2H (7a)(7b)	0′-10′: 1V:3H >10′: 1V:2H (7b)	0′-10′: 1V:3H >10′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	<15′: 1V:4H 15′-25′: 1V:3H >25′: 1V:2H
		Rock Cut			1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H
		Fill Section			0′-6′: 1V:3H >6′: 1V:2H	0′-6′: 1V:3H >6′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	0′-10′: 1V:3H >10′: 1V:2H	0′-25′: 1V:4H >25′: 1V:2H

* Controlling design criteria (see Section 27-7).

Figure 32-2B (Metric)

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE LOCAL ROADS (New Construction/Reconstruction)

Design Element				Manual Section	Design Volume (vehicles/day)				
					Under 250 ADT	250 – 400 ADT	400 – 750 ADT	750-2000 ADT	Over 2000 ADT
Design Controls	Design Forecast Year			27-6.02	Current	Current	20 Years	20 Years	20 Years
	*Design Speed (1)	Level		27-5.02	50 km/h (1d)	60 km/h	80 km/h	80 km/h	80 km/h
		Rolling			50 km/h (1c)(1d)	50 km/h	60 km/h	60 km/h	60 km/h
	*Level of Service			27-6.04	D	D	D	D	D
Cross Section Elements	*Traveled Way Width			31-1.01	5.4 m (2a)	6.0 m	6.6 m	6.6 m	7.2 m (2b)
	Surface Type			Chapter 37	Bituminous Treated or Aggregate (3)		High-Type Pavement		
	*Shoulder Width			31-1.06	600 mm (4a)	600 mm (4a)	1.2 m (4b)	1.8 m (4b)	2.4 m (4b)
	Shoulder Type				Turf	Turf or Aggregate (5a)		Aggregate/Paved (5b)	
	*Auxiliary Lanes	Lane Width		31-1.03	N/A	3.0 m	Des: 3.3 m Min: 3.0 m	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m
		Shoulder Width			N/A	600 mm	Des: 1.2 m Min: 600 mm	Des: 1.8 m Min: 1.2 m	Des: 2.4 m Min: 1.2 m
	Cross Slope (6a)	*Travel Lane		31-1.08	2%-4% (6b)	2%-4% (6b)	1.5%-2%	1.5%-2%	1.5%-2%
		Shoulder			Turf: 5-8%	Turf: 5-8% Agg: 4-6%	Turf: 5-8% Agg: 4-6%	Agg: 4-6% Paved: 4%	Agg: 4-6% Paved: 4%
		Rollover Factor			10%	10%	10%	8%	8%
Roadway Slopes	Side Slopes	Cut Section	Front Slope	31-2.03 31-2.04	1V:3H (7a)	1V:3H	1V:3H	1V:3H	1V:4H
			Ditch Width		Min: 600 mm	Min: 600 mm	Min: 600 mm	Min: 600 mm	Min: 600 mm
			Back Slope		0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H (7a)(7b)	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H (7b)	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	<4.5 m: 1V:4H 4.5 m - 7.5 m: 1V:3H >7.5 m: 1V:2H
		Rock Cut			1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H	1V:0.25H
		Fill Section			0 m – 1.8 m: 1V:3H >1.8 m: 1V:2H	0 m – 1.8 m: 1V:3H >1.8 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m – 3.0 m: 1V:3H >3.0 m: 1V:2H	0 m - 7.5 m: 1V:4H >7.5 m: 1V:2H

* Controlling design criteria (see Section 27-7).

(1) Design Speed. A rural local road may pass through a relatively built-up area. In these sections, a lower design speed may be selected with justification. However, the selected design speed should not be less than 20 mph (30 km/h). Consider the following:

(a) For low to moderate density areas, the design speed may be reduced 5 mph to 10 mph (10 km/h) below the listed design speed.
(b) For moderate to high density areas, the design speed may be reduced 10 mph to 15 mph (10 km/h to 20 km/h) below the listed design speed.
(c) For ADT's under 50 vehicles/day the design speed may be 20 mph (30 km/h).
(d) For projects constructed with other than Federal funds on the district road system with ADT's under 150 vehicles/day, no design speed is required.

(2) Traveled Way Width.

(a) For projects constructed with other than Federal funds on the district road system with ADT's under 150 vehicles/day, the minimum width is 16 ft (4.8 m).
(b) On a reconstruction project, an existing 22 ft (6.6 m) traveled way may be maintained where the alignment and safety records are satisfactory.

(3) Surface Type. A high-type pavement may be provided.

(4) Shoulder Width.

(a) Where roadside barriers are included, provide a minimum offset of 4 ft (1.2 m) from the edge of the traveled way to the roadside barrier.
(b) Where the rural local road passes through a moderate to high density area, the shoulder width may be 4 ft (1.2 m). This width may include the width of Type B gutter or the gutter flag with curb and gutter at the edge of the shoulder.

(5) Shoulder Type.

(a) Aggregate shoulders may consist of a nominal 4 in (100 mm) thickness where the ADT is less than 750 vehicles/day.
(b) For ADT's > 750 vehicles/day, an aggregate shoulder should be a minimum thickness of 6 in (150 mm) Type A shoulders.

(6) Cross Slopes.

(a) Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane.
(b) Use 1.5% to 2.0% for high-type pavement.

(7) Side Slopes.

(a) For district road systems constructed with other than Federal funds, front slopes may be 1V:2H and back slopes may be 1V:1.5H.
(b) For isolated restricted right-of-way, the back slope may be 1V:2H for cut depths of 0 ft to 10 ft (0 m to 3 m) or 1V:1.5H for cut depths greater than 10 ft (3 m).

GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE LOCAL ROADS (New Construction/Reconstruction)

Footnotes to Figure 32-2B

Design Element			Manual Section	Two-Way DHV < 1250 (1)	Two-Way DHV 1250-2050 (1)	Two-Way DHV 2050-2900 (1)
Design Controls	Highway Type		—	TWS-2	TWS-4	TWS-6
	Design Forecast Year		27-6.02	20 Years		
	* Design Speed (2)		27-5.02	40 mph – 50 mph		
	* Level of Service		27-6.04	C		
Cross Section Elements	Traveled Way	Number of Travel Lanes	31-1.02	2	4	6
		*Travel Lane Width	31-1.01	12′		
		Traveled Lane Width (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′		
	* Shoulder Width (3)	Right	31-1.06	8′ Paved		
		Left		N/A	6′ (4′ Paved)	
	* Auxiliary Lanes	Lane Width	31-1.03	Single Left & Right: 12′ Dual Lefts & Rights: 24′		
		Shoulder/Curb Type and Width		Shoulder: 4′ and/or B-6.24 CC&G (4)		
	Cross Slope (5a)	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%		
		Auxiliary Lanes		(5b)		
	Median Width	Flush	31-1.05	N/A	Range: 4′/14′	
		Flush TWLTL		Des: 12’ Range: 10’/14’		
		Traversable		N/A	16′	
		Raised-Curb		N/A	18′	
	Sidewalk Width		31-2.02	Des: 5′ Min: 4′		
Roadway Slopes	Side Slopes	Cut Section (Uncurbed)	31-2.03	1V:4H		
		Rock Cut		1V:0.25H		
		Fill Section (Uncurbed)		1V:4H		
	Median Slopes	Concrete Surface/Traversable	31-1.05	N/A	1.5%	
		Flush/TWLTL Surface		1.5%		
		Grass/Landscaped Surface		N/A	5% (Towards C&G)	

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR SUBURBAN ARTERIALS (New Construction/Reconstruction)

Figure 32-2C (US Customary)

Design Element			Manual Section	Two-Way DHV < 1250 (1)	Two-Way DHV 1250-2050 (1)	Two-Way DHV 2050-2900 (1)
Design Controls	Highway Type		—	TWS-2	TWS-4	TWS-6
	Design Forecast Year		27-6.02	20 Years		
	* Design Speed (2)		27-5.02	60 km/h – 80 km/h		
	* Level of Service		27-6.04	C		
Cross Section Elements	* Traveled Way	Number of Travel Lanes	31-1.02	2	4	6
		*Travel Lane Width	31-1.01	3.6 m		
		Travel Lane Width (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m		
	* Shoulder Width (3)	Right	31-1.06	2.4 m (Paved)		
		Left		N/A	1.8 m (1.2 m Paved)	
	* Auxiliary Lanes	Lane Width	31-1.03	Single Left & Right: 3.6 m Dual Lefts& Rights: 7.2 m		
		Shoulder/Curb Type and Width		Shoulder: 1.2 m and/or B-15.60 CC&G (4)		
	Cross Slope (5a)	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%		
		Auxiliary Lanes		(5b)		
	Median Width	Flush	31-1.05	N/A	Range: 1.2 m/4.2 m	
		Flush TWLTL		Des: 3.6m Range: 3.0 m/4.2 m		
		Traversable		N/A	4.8 m	
		Raised-Curb		N/A	5.5 m	
	Sidewalk Width		31-2.02	Des: 1.5 m Min: 1.2 m		
Roadway Slopes	Side Slopes	Cut Section (Uncurbed)	31-2.03	1V:4H		
		Rock Cut		1V:0.25H		
		Fill Section (Uncurbed)		1V:4H		
	Median Slopes	Concrete Surface/Traversable	31-1.05	N/A	1.5%	
		Flush/TWLTL Surface		1.5%		
		Grass/Landscaped Surface		N/A	5% (Towards C&G)	

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR SUBURBAN ARTERIALS (New Construction/Reconstruction)

Figure 32-2C (Metric)

(1) Traffic Volumes. The design hourly volumes (DHV) are calculated using a PHF = 1.0; these values may be adjusted using local peak-hour factors. For more information, see the *Highway Capacity Manual*.

(2) Design Speed. A 60 mph (100 km/h) design speed may be considered in open-suburban areas.

(3) Shoulder Width.

(a) CC&G may be placed on the outside edge of the shoulder, especially if sidewalks will be placed along the shoulder. The gutter flag may be included in the shoulder width.

(b) Where the design speed is less than 50 mph (80 km/h), the shoulder may be replaced with a B-6.24 (B-15.60) CC&G.

(4) Auxiliary Lane. Under restricted conditions, the gutter width adjacent to the edge of the turn lane may be narrowed or eliminated adjacent to a 12 ft (3.6 m) turn lane.

(5) Cross Slope.

(a) Use 2.0% minimum cross slopes for travel lanes not adjacent to the crown.

(b) Curbed left-turn lanes may be sloped at 1.5% to 2.0% away from the median. TWLTL and flush left-turn lanes are sloped at the same rate as the adjacent traveled way. Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane.

GEOMETRIC DESIGN CRITERIA FOR SUBURBAN ARTERIALS
(New Construction/Reconstruction)

Footnotes for Figure 32-2C

Design Element			Manual Section	Two-Way DHV < 1250 (1)	Two-Way DHV 1250-2050 (1)	Two-Way DHV 2050-2900 (1)
Design Controls	Highway Type		—	TWS-2	TWS-4	TWS-6
	Design Forecast Year		27-6.02	20 Years	20 Years	20 Years
	* Design Speed		27-5.02	30 mph – 40 mph	30 mph – 40 mph	30 mph – 40 mph
	* Level of Service (2)		27-6.04	C		
Cross Section Elements	* Surface Width	Number of Travel Lanes	31-1.02	2	4	6
		Travel Lane	31-1.01	Des: 12′ Min: 11′ (3)	Des: 12′ Min: 11′	
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′		
		Parking Lane (4)	31-1.04	Des: 10′ Min: 8′		
		Auxiliary Lane	31-1.03	Single Left & Right: Des: 12′, Min: 11′ Dual Lefts & Rights: Des: 24′, Min: 22′		
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2% (5a)	
		Auxiliary Lanes		2% (5b)	(5b)	
	Outside Curb and Gutter Type		31-1.07	B-6.24, B-6.18 or B-6.12 CC&G (6)		
	Median Width	Flush	31-1.05	N/A	Range: 4′/14′	
		Flush TWLTL		Des: 12′ Range: 10′/14′		
		Traversable		N/A	16′	
		Raised-Curb		N/A	18′	
	Sidewalk Width (7)		31-2.02	Des: 5′ Min: 4′		
	* Clear Zone (8)		35-2	1.5′		
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—
	Median Slopes	Concrete Surface/Traversable	31-1.05	N/A	1.5%	
		Flush/TWLTL Surface		1.5%		
		Grass/Landscape Surface		N/A	5% (Towards C&G)	

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY ARTERIALS (New Construction/Reconstruction)
Figure 32-2D (US Customary)

Design Element			Manual Section	Two-Way DHV < 1250 (1)	Two-Way DHV 1250-2050 (1)	Two-Way DHV 2050-2900 (1)
Design Controls	Highway Type		—	TWS-2	TWS-4	TWS-6
	Design Forecast Year		27-6.02	20 Years	20 Years	20 Years
	* Design Speed		27-5.02	50 km/h – 60 km/h	50 km/h – 60 km/h	50 km/h – 60 km/ h
	* Level of Service (2)		27-6.04	C		
Cross Section Elements	* Surface Width	Number of Travel Lanes	31-1.02	2	4	6
		Travel Lane	31-1.01	Des: 3.6 m Min: 3.3 m (3)	Des: 3.6 m Min: 3.3 m	
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m		
		Parking Lane (4)	31-1.04	Des: 3.0 m Min: 2.4 m		
		Auxiliary Lane	31-1.03	Single Left & Right: Des: 3.6 m, Min: 3.3 m Dual Lefts & Rights: Des: 7.2 m, Min: 6.6 m		
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2% (5a)	
		Auxiliary Lanes		2% (5b)	(5b)	
	Outside Curb and Gutter Type		31-1.07	B-15.60, B-15.45 or B-15.30 CC&G (6)		
	Median Width	Flush	31-1.05	N/A	Range: 1.2 m/4.2 m	Range: 1.2 m/4.2 m
		Flush TWLTL		Des: 3.6 m Range: 3.0 m/4.2 m		
		Traversable		N/A	4.8 m	
		Raised-Curb		N/A	5.5 m	
	Sidewalk Width (7)		31-2.02	Des: 1.5 m Min: 1.2 m		
	* Clear Zone (8)		35-2	450 mm		
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—
	Median Slopes	Concrete Surface/Traversable	31-1.05	N/A	1.5%	
		Flush/TWLTL Surface		1.5%		
		Grass/Landscape Surface		N/A	5% (Towards C&G)	

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY ARTERIALS (New Construction/Reconstruction)
Figure 32-2D (Metric)

(1) Traffic Volumes. The design hourly volumes (DHV) are calculated using a PHF = 1.0; these values may be adjusted using local peak-hour factors. For more information, see the *Highway Capacity Manual*.

(2) Level of Service. A Level of Service D may be used in heavily developed sections of metropolitan areas.

(3) Surface Width. Provide a minimum width of 30 ft (9.0 m) face-of-curb to face-of-curb.

(4) Parking Lane Width. The desirable width of the parking lane is 10 ft (3.0 m) and includes the gutter width. If the parking lane may be used as future travel lane, the 10 ft (3.0 m) width should be in addition to the gutter width. An 8 ft (2.4 m) width may be used where it is unlikely the parking lane will be used as through or turning lane in the future.

(5) Cross Slope.

(a) Use 2.0% minimum cross slopes for travel lanes not adjacent to the crown.

(b) Curbed left-turn lanes may be sloped at 1.5% to 2.0% away from the median. TWLTL and flush left-turn lanes are sloped at the same rate as the adjacent traveled way. Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane.

(6) Gutter Width. Under restricted conditions, the gutter width adjacent to the edge of a 12 ft (3.6 m) turn lane may be eliminated.

(7) Sidewalk Width. Include a 2 ft to 3 ft (600 mm to 1.0 m) buffer strip between the curb and sidewalk. For sidewalks without a buffer strip, provide a 6 ft (1.8 m) sidewalk width behind the curb.

(8) Clear Zone. Distance is measured from the face of the curb.

(9) Side Slopes. Side slopes to be determined on a case-by-case basis considering roadside development and right-of-way restrictions.

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY ARTERIALS (New Construction/Reconstruction)

Footnotes for Figure 32-2D

Figure 32-2E (U.S. Customary)

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY ARTERIALS (New Construction/Reconstruction)

Design Element			Manual Section	One-Way DHV < 1300 (1)	One-Way DHV 1300-1850 (1)	One-Way DHV > 1850 (1)
Design Controls	Highway Type		—	OWS-2	OWS-3	OWS-4
	Design Forecast Year		27-6.02	20 Years	20 Years	20 Years
	*Design Speed		27-5.02	30 mph – 40 mph	30 mph – 40 mph	30 mph – 40 mph
	*Level of Service (2)		27-6.04	C	C	C
Cross Section Elements	*Surface Width	Number of Travel Lanes	31-1.02	2	3	4
		Travel Lane	31-1.01	Des: 12′ Min: 11′	Des: 12′ Min: 11′	Des: 12′ Min: 11′
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′	Des: 14′ Min: 13′	Des: 14′ Min: 13′
		Parking Lane (3)	31-1.04	Des: 10′ Min: 8′	Des: 10′ Min: 8′	Des: 10′ Min: 8′
		Auxiliary Lane	31-1.03	Single Left & Right: Des: 12′, Min: 11′		Dual Lefts: Des: 24′, Min: 22′
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% (4a)	1.5% (4a)	1.5% (4a)
		Auxiliary Lanes		2% (4b)	(4b)	(4b)
	Outside Curb and Gutter Type		31-1.07	B-6.12, B-6.18, or B-6.24 CC&G (5)		
	Sidewalk Width (6)		31.2.02	Des: 5′ Min: 4′	Des: 5′ Min: 4′	Des: 5′ Min: 4′
	*Clear Zone (7)		35-2	1.5′	1.5′	1.5′
Roadway Slopes	Side Slopes (8)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). OWS = One-Way Street

Figure 32-2E (Metric)

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY ARTERIALS (New Construction/Reconstruction)

Design Element			Manual Section	One-Way DHV < 1300 (1)	One-Way DHV 1300-1850 (1)	One-Way DHV > 1850 (1)
Design Controls	Highway Type		—	OWS-2	OWS-3	OWS-4
	Design Forecast Year		27-6.02	20 Years	20 Years	20 Years
	*Design Speed		27-5.02	50 km/h - 60 km/h	50 km/h - 60 km/h	50 km/h – 60 km/h
	*Level of Service (2)		27-6.04	C	C	C
Cross Section Elements	*Surface Width	Number of Travel Lanes	31-1.02	2	3	4
		Travel Lane	31-1.01	Des: 3.6 m Min: 3.3 m	Des: 3.6 m Min: 3.3 m	Des: 3.6 m Min: 3.3 m
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m
		Parking Lane (3)	31-1.04	Des: 3.0 m Min: 2.4 m	Des: 3.0 m Min: 2.4 m	Des: 3.0 m Min: 2.4 m
		Auxiliary Lane	31-1.03	Single Left & Right: Des: 3.6 m, Min: 3.3 m		Dual Lefts: Des: 7.2 m, Min: 6.6 m
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% (4a)	1.5% (4a)	1.5% (4a)
		Auxiliary Lanes		2% (4b)	(4b)	(4b)
	Outside Curb and Gutter Type		31-1.07	B-15.30, B-15.45, or B-15.60 CC&G (5)		
	Sidewalk Width (6)		31.2.02	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m
	*Clear Zone (7)		35-2	450 mm	450 mm	450 mm
Roadway Slopes	Side Slopes (8)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). OWS = One-Way Street

(1) Traffic Volumes. The design hourly volumes (DHV) are calculated using a PHF = 1.0; these values may be adjusted using local peak-hour factors. For more information, see the *Highway Capacity Manual*.

(2) Level of Service. A Level of Service D may be used in heavily developed sections of metropolitan areas.

(3) Parking Lane Width. The desirable width of the parking lane is 10 ft (3.0 m) and includes the gutter width. If the parking lane may be used as a future travel lane, the 10 ft (3.0 m) width should be in addition to the gutter flag. An 8 ft (2.4 m) width may be used where it is unlikely the parking lane will be used as through or turning lane in the future.

(4) Cross Slope.

(a) Use 2.0% minimum cross slopes for travel lanes not adjacent to the crown.

(b) Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane.

(5) Gutter Width. Under restricted conditions, the gutter width adjacent to the edge of a 12 ft (3.6 m) turn lane may be eliminated.

(6) Sidewalk Width. Include a 2 ft to 3 ft (600 mm to 1.0 m) buffer strip between the curb and sidewalk. For sidewalks without a buffer strip, provide a 6 ft (1.8 m) sidewalk width behind the curb.

(7) Clear Zone. Distance is measured from the face of the curb.

(8) Side Slopes. Side slopes are determined on a case-by-case basis considering roadside development and right-of-way restrictions.

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY ARTERIALS
(New Construction/Reconstruction)

Footnotes for Figure 32-2E

Design Element			Manual Section	Two-Way ADT < 5000	Two-Way ADT ≥ 5000 and DHV <1400 (1)	DHV 1400 – 2400 (1)
Design Controls	Highway Type		—	TWS-2	TWS-2	TWS-4
	Design Forecast Year		27-6.02	Current	20 Years	
	* Design Speed (2)		27-5.02	30 mph	30 mph – 40 mph	
	* Level of Service		27-6.04	Des: C Min: D		
Cross Section Elements	* Surface Width	Number of Travel Lanes	31-1.02	2	2	4
		Travel Lane	31-1.01	Des: 11′ Min: 10′	Des: 12′ Min: 10′ (3)	Des: 12′ Min: 10′
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′		
		Parking Lane (4)	31-1.04	Min: 8′	Des: 10′ Min: 8′	
		Auxiliary Lane	31-1.03	Des: 11′ Min: 10′	Des: 12′ Min: 10′	
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%		1.5% - 2% (5a)
		Auxiliary Lanes		(5b)		
	Outside Curb and Gutter Type		31-1.07	B-6.24, B-6.18 or B-6.12 CC&G (6)		
	Median Width	Flush	31-1.05	N/A	N/A	4′
		Flush TWLTL		Des: 12′ Range: 10′/14′		
	Sidewalk Width (7)		31-2.02	Des: 5′ Min: 4′		
	Clear Zone (8)		35-2	1.5′		
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY COLLECTORS (New Construction/Reconstruction)
Figure 32-2F (US Customary)

Design Element			Manual Section	Two-Way ADT < 5000	Two-Way ADT ≥ 5000 and DHV < 1400 (1)	DHV 1400 – 2400 (1)
Design Controls	Highway Type		—	TWS-2	TWS-2	TWS-4
	Design Forecast Year		27-6.02	Current	20 Years	
	* Design Speed (2)		27-5.02	50 km/h	50 km/h – 60 km/h	
	Level of Service		27-6.04	Des: C Min: D	Des: C Min: D	
Cross Section Elements	* Surface Width	Number of Travel Lanes	31-1.02	2	2	4
		Travel Lane	31-1.01	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m (3)	Des: 3.6 m Min: 3.3 m
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m		
		Parking Lane (4)	31-1.04	Min: 2.4 m	Des: 3.0 m Min: 2.4 m	
		Auxiliary Lane	31-1.03	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m	
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%		1.5% - 2% (5a)
		Auxiliary Lanes		(5b)		
	Outside Curb and Gutter Type		31-1.07	B-15.60, B-15.45 or B-15.30 CC&G (6)		
	Median Width	Flush	31-1.05	N/A	N/A	1.2 m
		TWLTL		4.2 m		
	Sidewalk Width (7)		31-2.02	Des: 1.5 m Min: 1.2 m		
	Clear Zone (8)		35-2	450 mm		
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY COLLECTORS (New Construction/Reconstruction)
Figure 32-2F (Metric)

(1) Travel Volumes. The design hourly volumes (DHV) are calculated using a PHF = 1.0; these values may be adjusted using local peak-hour factors. For more information, see the *Highway Capacity Manual*.

(2) Design Speed. A 45 mph (70 km/h) design speed may be used in fringe areas and outlying business districts.

(3) Surface Width. Provide a minimum width of 30 ft (9.0 m) face-of-curb to face-of-curb.

(4) Parking Lane. The minimum width of the parking lane is 8 ft (2.4 m) and includes the gutter width.

(5) Cross Slope.

(a) Use 2.0% minimum cross slopes for travel lanes not adjacent to the crown.

(b) Curbed left-turn lanes may be sloped at 1.5% to 2.0% away from the median. TWLTL and flush left-turn lanes are sloped at the same rate as the adjacent traveled way. Cross slopes for outside auxiliary lanes will be at least 2.0% and desirably should be 0.5% greater than the adjacent travel lane.

(6) Gutter Width. Under restricted conditions, the gutter width adjacent to the edge of a 12 ft (3.6 m) turn lane may be eliminated.

(7) Sidewalk Width. Include a 2 ft to 3 ft (600 mm to 1.0 m) buffer strip between the curb and sidewalk. For sidewalks without a buffer strip, provide a 6 ft (1.8 m) sidewalk width behind the curb.

(8) Clear Zone. Distance is measured from the face of the curb.

(9) Side Slopes. Side slopes are determined on a case-by-case basis considering roadside development and right-of-way restrictions.

GEOMETRIC DESIGN CRITERIA FOR URBAN TWO-WAY COLLECTORS (New Construction/Reconstruction)

Footnotes for Figure 32-2F

Figure 32-2G (US Customary)

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY COLLECTORS (New Construction/Reconstruction)

Design Element			Manual Section	One-Way ADT < 5000	One-Way ADT ≥ 5000 and DHV < 1450 (1)	DHV 1450 – 2150 (1)
Design Controls	Highway Type		—	OWS-2	OWS-2	OWS-3
	Design Forecast Year		27-6.02	Current	20 Years	20 Years
	*Design Speed (2)		27-5.02	30 mph	30 - 40 mph	30 - 40 mph
	*Level of Service		27-6.04	Des: C Min: D	Des: C Min: D	Des: C Min: D
Cross Section Elements	*Surface Width	Number of Travel Lanes	31-1.02	2	2	3
		Travel Lane	31-1.01	Des: 11′ Min: 10′	Des: 12′ Min: 10′ (3)	Des: 12′ Min: 10′
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′	Des: 14′ Min: 13	Des: 14′ Min: 13
		Parking Lane (4)	31-1.04	Min: 8′	Des: 10′ Min: 8′	Des: 10′ Min: 8′
		Auxiliary Lane	31-1.03	Des: 11′ Min: 10′	Des: 12′ Min: 10′	Des: 12′ Min: 10′
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2%	1.5% - 2% (5a)
		Auxiliary Lanes		(5b)	(5b)	(5b)
	Outside Curb and Gutter Type		31-1.07	B-6.12, B-6.18, or B-6.24 CC&G (6)		
	Sidewalk Width (7)		31-2.02	Des: 5′ Min: 4′	Des: 5′ Min: 4′	Des: 5′ Min: 4′
	*Clear Zone (8)		35-2	1.5′	1.5′	1.5′
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). OWS = One-Way Street

Figure 32-2G (Metric)

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY COLLECTORS (New Construction/Reconstruction)

Design Element			Manual Section	One-Way ADT < 5000	One-Way ADT ≥ 5000 and DHV < 1450 (1)	DHV 1450 – 2150 (1)
Design Controls	Highway Type		—	OWS-2	OWS-2	OWS-3
	Design Forecast Year		27-6.02	Current	20 Years	20 Years
	*Design Speed (2)		27-5.02	50 km/h	50 - 60 km/h	50 - 60 km/h
	*Level of Service		27-6.04	Des: C Min: D	Des: C Min: D	Des: C Min: D
Cross Section Elements	*Surface Width	Number of Travel Lanes	31-1.02	2	2	3
		Travel Lane	31-1.01	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m (3)	Des: 3.6 m Min: 3.0 m
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m
		Parking Lane (4)	31-1.04	Min: 2.4 m	Des: 3.0 m Min: 2.4 m	Des: 3.0 m Min: 2.4 m
		Auxiliary Lane	31-1.03	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2%	1.5% - 2% (5a)
		Auxiliary Lanes		(5b)	(5b)	(5b)
	Outside Curb and Gutter Type		31-1.07	B-15.30, B-15.45, or B-15.60 CC&G (6)		
	Sidewalk Width (7)		31.2.02	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m
	*Clear Zone (8)		35-2	450 mm	450 mm	450 mm
Roadway Slopes	Side Slopes (9)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). OWS = One-Way Street

(1) Traffic Volumes. The design hourly volumes (DHV) are calculated using a PHF = 1.0; these values may be adjusted using local peak-hour factors. For more information, see the *Highway Capacity Manual*.

(2) Design Speed. A 45 mph (70 km/h) design speed may be used in fringe areas and outlying business districts.

(3) Surface Width. Provide a minimum width 30 ft (9.0 m) width face-of-curb to face-of-curb.

(4) Parking Lane. The minimum width of the parking lane is 8 ft (2.4 m) and includes the gutter width.

(5) Cross Slope.

(a) Use 2.0% for lanes away from the crown.
(b) For turn lanes use 2.0% or greater. If the turn lane is adjacent to the crown, use 1.5%.

(6) Gutter Width. Under restricted conditions, the gutter width adjacent to the edge of the turn lane may be eliminated adjacent to a 12 ft (3.6 m) lane.

(7) Sidewalk Width. Include a 2 ft to 3 ft (600 mm to 1.0 m) buffer strip between the curb and sidewalk. For sidewalks without a buffer strip, provide a 6 ft (1.8 m) sidewalk width behind the curb.

(8) Clear Zone. Distance is measured from the face of the curb.

(9) Side Slopes. Side slopes are determined on a case-by-case basis considering roadside development and right-of-way restrictions.

GEOMETRIC DESIGN CRITERIA FOR URBAN ONE-WAY COLLECTORS
(New Construction/Reconstruction)

Footnotes for Figure 32-2G

Figure 32-2H (US Customary)

GEOMETRIC DESIGN CRITERIA FOR URBAN LOCAL STREETS (New Construction/Reconstruction)

Design Element			Manual Section	ADT < 1000	ADT 1000 - 5000	ADT > 5000
Design Controls	Highway Type		—	TWS-2/OWS-2	TWS-2/OWS-2	TWS-2/OWS-2
	Design Forecast Year		27-6.02	Current	Current	20 Years
	* Design Speed		27-5.02	30 mph (1)	30 mph	30 mph
	* Level of Service		27-6.04	D	D	D
Cross Section Elements	Surface Width	Number of Travel Lanes	31-1.02	2	2	2
		*Travel Lane	31-1.01	Min: 10′	Min: 11′	12′ (2)
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 14′ Min: 13′	Des: 14′ Min: 13′	Des: 14′ Min: 13′
		Parking Lane (3)	31-1.04	Min: 8′	Min: 8′	Min: 8′
		Auxiliary Lane	31-1.03	10′	Des: 11′ Min: 10′	Des: 12′ Min: 10′
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2%	1.5% - 2%
		Auxiliary Lanes		(4)	(4)	(4)
	Outside Curb and Gutter Type		31-1.07	B-6.24, B-6.18 or B-6.12 CC&G (5)		
	Sidewalk Width		31-2.02	Des: 5′ Min: 4′	Des: 5′ Min: 4′	Des: 5′ Min: 4′
	* Clear Zone (6)		35-2	1.5′	1.5′	1.5′
Roadway Slopes	Side Slopes (7)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street OWS = One-Way Street

Figure 32-2H (Metric)

GEOMETRIC DESIGN CRITERIA FOR URBAN LOCAL STREETS (New Construction/Reconstruction)

Design Element			Manual Section	ADT < 1000	ADT 1000 – 5000	ADT > 5000
Design Controls	Highway Type		—	TWS/OWS-2	TWS-2/OWS-2	TWS-2/OWS-2
	Design Forecast Year		27-6.02	Current	Current	20 Years
	* Design Speed		27-5.02	50 km/h (1)	50 km/h	50 km/h
	Level of Service		27-6.04	D	D	D
Cross Section Elements	* Surface Width	Number of Travel Lanes	31-1.02	2	2	2
		Travel Lane	31-1.01	Min: 3.0 m	Min: 3.3 m	3.6 m (2)
		Travel Lane (Shared with Bicycles)	42-3.02	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m	Des: 4.2 m Min: 4.0 m
		Parking Lane (3)	31-1.04	Min: 2.4 m	Min: 2.4 m	Min: 2.4 m
		Auxiliary Lane	31-1.03	3.0 m	Des: 3.3 m Min: 3.0 m	Des: 3.6 m Min: 3.0 m
	Cross Slope	*Travel Lanes (Minimum)	31-1.08	1.5% - 2%	1.5% - 2%	1.5% - 2%
		Auxiliary Lanes		(4)	(4)	(4)
	Outside Curb and Gutter Type		31-1.07	B-15.60, B-15.45 or B-15.30 CC&G (5)		
	Sidewalk Width		31-2.02	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m	Des: 1.5 m Min: 1.2 m
	Clear Zone (6)		35-2	450 mm	450 mm	450 mm
Roadway Slopes	Side Slopes (7)	Cut Section (Curbed)	31-2.03	—	—	—
		Rock Cut		—	—	—
		Fill Section (Curbed)		—	—	—

* Controlling design criteria (see Section 27-7). TWS = Two-Way Street OWS = One-Way Street

(1) Design Speed. A 20 mph (30 km/h) design speed may be used where the posted speed limit is 20 mph.

(2) Surface Width. The minimum surface width is 30 ft (9.0 m) face-of-curb to face-of-curb.

(3) Parking Lane. The minimum width of the parking lane is 8 ft (2.4 m) and includes the gutter width.

(4) Cross Slope. Use 2.0% minimum for lanes away from the crown.

(5) Curb and Gutter. Under restricted conditions, the gutter width adjacent to the edge of an 11 ft (3.3 m) turn lane may be eliminated. A shallow gutter may be used in place of CC&G.

(6) Clear Zone. Distance is measured from the face of the curb.

(7) Side Slopes. Side slopes are determined on a case-by-case basis considering roadside development and right-of-way restrictions.

GEOMETRIC DESIGN CRITERIA FOR URBAN LOCAL STREETS
(New Construction/Reconstruction)

Footnotes for Figure 32-2H

32-3 ALIGNMENT CRITERIA

This Section presents the new construction/reconstruction alignment criteria for various rural and urban facilities based on design speed. Alignment tables are provided for the following:

- Figure 32-3A “Alignment Criteria for Rural Two-Lane Highways,”
- Figure 32-3B “Alignment Criteria for Suburban/Urban Arterials,” and
- Figure 32-3C “Alignment Criteria for Urban Collectors/Local Streets.”

Figure 32-3A (US Customary)

ALIGNMENT CRITERIA FOR RURAL TWO-LANE HIGHWAYS

Design Element		Manual Section	Design Speed								
			20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph
*Stopping Sight Distance		28-1	115′	155′	200′	250′	305′	360′	425′	495′	570′
Passing Sight Distance		28-2	710′	900′	1090′	1280′	1470′	1625′	1835′	1985′	2135′
*Intersection Sight Distance (1)		28-3	225′	280′	335′	390′	445′	500′	555′	610′	665′
*Minimum Radii	e_{max} = 8%	29-2.03	105′	170′	250′	350′	465′	600′	760′	965′	1205′
	e_{max} = 6%		115′	185′	275′	380′	510′	660′	835′	1065′	1340′
	e_{max} = 4%		125′	205′	300′	420′	565′	730′	930′	1190′	1505′
*Maximum Superelevation Rate		29-3.01	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	8%	8%	8%
Superelevation Transition Length (2)	e_{max} = 8%	29-3.02	141′	150′	159′	169′	179′	195′	209′	222′	232′
	e_{max} = 6%		111′	118′	125′	133′	142′	154′	165′	176′	184′
	e_{max} = 4%		81′	87′	92′	98′	104′	113′	121′	129′	135′
*Vertical Curvature (K-values based on SSD)	Crest	30-2.01	7	12	19	29	44	61	84	114	151
	Sag	30-2.02	17	26	37	49	64	79	96	115	136
Vertical Curvature (K-values based on PSD)	Crest	30-2.01	180	289	424	585	772	943	1203	1407	1628
*Maximum Grade (3)	Level	30-1.02	8%	7%	7%	7%	7%	7%	6%	6%	5%
	Rolling		11%	10%	9%	9%	8%	8%	7%	7%	6%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.0%								

* Controlling design criteria (see Section 27-7).

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed for the major road. Increase these distances 10% for grades > 3.0% on the minor road.

(2) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates. Table values are based on the minimum radii for the given design speed, maximum superelevation rate, 11 ft travel lanes, and a 1.5% cross slope for the normal crown section.

(3) Maximum Grade.

(a) Grades 1.0% steeper may be used for existing roadways to remain in place.
(b) Grades 1.0% to 2.0% steeper may be used on local roads and low-volume rural collectors (ADT < 400).

Figure 32-3A (Metric)

ALIGNMENT CRITERIA FOR RURAL TWO-LANE HIGHWAYS

Design Element		Manual Section	Design Speed							
			30 km/h	40 km/h	50 km/h	60 km/h	70 km/h	80 km/h	90 km/h	100 km/h
*Stopping Sight Distance		28-1	35 m	50 m	65 m	85 m	105 m	130 m	160 m	185 m
Passing Sight Distance		28-2	200 m	270 m	345 m	410 m	485 m	540 m	615 m	670 m
*Intersection Sight Distance (1)		28-3	65 m	85 m	105 m	130 m	150 m	170 m	190 m	210 m
*Minimum Radii	e_{max} = 8%	29-2.03	30 m	50 m	80 m	125 m	175 m	230 m	305 m	395 m
	e_{max} = 6%		30 m	55 m	90 m	135 m	195 m	250 m	335 m	435 m
	e_{max} = 4%		35 m	60 m	100 m	150 m	215 m	280 m	375 m	490 m
*Maximum Superelevation Rate		29-3.01	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	Paved: 8% Agg: 4%	8%	8%	8%
Superelevation Transition Length (2)	e_{max} = 8%	29-3.02	42 m	45 m	47 m	52 m	57 m	63 m	67 m	71 m
	e_{max} = 6%		33 m	35 m	37 m	41 m	45 m	50 m	53 m	56 m
	e_{max} = 4%		25 m	26 m	27 m	30 m	33 m	36 m	39 m	41 m
*Vertical Curvature (K-values based on SSD)	Crest	30-2.01	2	4	7	11	17	26	39	52
	Sag	30-2.02	6	9	13	18	23	30	38	45
Vertical Curvature (K-values based on PSD)	Crest	30-2.01	46	84	138	195	272	338	438	520
*Maximum Grade (3)	Level	30-1.02	8%	7%	7%	7%	7%	6%	6%	5%
	Rolling		11%	10%	9%	8%	8%	7%	7%	6%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.0%							

* Controlling design criteria (see Section 27-7).

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed for the major road. Increase these distances 10% for grades > 3.0% on the minor road.

(2) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates. Table values are based on the minimum radii for the given design speed, maximum superelevation rate, 3.3 m travel lanes, and a 1.5% cross slope for the normal crown section.

(3) Maximum Grade.

(a) Grades 1.0% steeper may be used for existing roadways to remain in place.
(b) Grades 1.0% to 2.0% steeper may be used on local roads and low-volume rural collectors (ADT < 400).

Figure 32-3B (US Customary)

ALIGNMENT CRITERIA FOR SUBURBAN/URBAN ARTERIALS

Design Element		Manual Section	Design Speed						
			30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph
*Stopping Sight Distance		28-1	200′	250′	305′	360′	425′	495′	570′
*Intersection Sight Distance (1)		28-3	335′	390′	445′	500′	555′	610′	665′
*Minimum Radii	e_{max} = 6% (open roadway)	29-2.03	275′ (2)	380′ (2)	510′ (2)	660′ (2)	835′	1065′	1340′
	e_{max} = 4% (open roadway)	29-2.03	300′	420′	565′	730′	930′	1190′	1505′
	e_{max} = 4% (low-speed)	29-4.03	230′	345′	490′	665′	—	—	—
*Maximum Superelevation Rate		29-3.01	4% (3)	4% (3)	4% (3)	4% (3)	6%	6%	6%
Superelevation Transition Length	e_{max} = 6% (4a) (open roadway)	29-3.02	136′	145′	155′	166′	180′	191′	200′
	e_{max} = 4% (4b) (open roadway)	29-3.02	92′	98′	104′	112′	121′	129′	135′
	e_{max} = 4% (4b) (low-speed)	29-4.04	75′	80′	84′	91′	—	—	—
*Vertical Curvature (K-values based	Crest	30-2.01	19	29	44	61	84	114	151
	Sag	30-2.02	37	49	64	79	96	115	136
*Maximum Grade	Level	30-1.02	8%	7%	7%	6%	6%	5%	5%
	Rolling		9%	8%	8%	7%	7%	6%	6%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.3% (with Curb and Gutter)						

* Controlling design criteria (see Section 27-7).

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed for the major road. Increase these distances 10% for grades > 3.0% on the minor road.

(2) Minimum Radii. For urban streets with design speeds less than 50 mph, use e_{max} = 4% (low speed).

(3) Superelevation Rate. For urban/suburban reconstruction projects, existing horizontal curves may remain in place with a superelevation rate up to 6.0%.

(4) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates.

(a) Values are based on the minimum radii for the given design speed, maximum superelevation rate of 6.0%, 12 ft travel lanes, and a 1.5% cross slope for the normal crown section.

(b) Values are based on the minimum radii for the given design speed, maximum superelevation rate of 4.0%, 11 ft travel lanes, and a 1.5% cross slope for the normal crown section.

Figure 32-3B (Metric)

ALIGNMENT CRITERIA FOR SUBURBAN/URBAN ARTERIALS

Design Element		Manual Section	Design Speed					
			50 km/h	60 km/h	70 km/h	80 km/h	90 km/h	100 km/h
*Stopping Sight Distance		28-1	65 m	85 m	105 m	130 m	160 m	185 m
*Intersection Sight Distance (1)		28-3	105 m	130 m	150 m	170 m	190 m	210 m
*Minimum Radii	e_{max} = 6% (open roadway)	29-2.03	90 m (2)	135 m (2)	195 m (2)	250 m	335 m	435 m
	e_{max} = 4% (open roadway)	29-2.03	100 m	150 m	215 m	280 m	375 m	490 m
	e_{max} = 4% (low-speed)	29-4.03	80 m	125 m	190 m	—	—	—
*Maximum Superelevation Rate		29-3.01	4% (3)	4% (3)	4% (3%)	6%	6%	6%
Superelevation Transition Length	e_{max} = 6% (4a) (open roadway)	29-3.02	—	—	—	50 m	53 m	56 m
	e_{max} = 4% (4b) (open roadway)	29-3.02	27 m	30 m	33 m	36 m	39 m	41 m
	e_{max} = 4% (4b) (low-speed)	29-4.04	23 m	25 m	27 m	—	—	—
*Vertical Curvature (K-values)	Crest	30-2.01	7	11	17	26	39	52
	Sag	30-2.02	12	17	23	30	38	45
*Maximum Grade	Level	30-1.02	8%	7%	6%	6%	5%	5%
	Rolling		9%	8%	7%	7%	6%	6%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.3% (with Curb and Gutter)					

* Controlling design criteria (see Section 27-7).

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed for the major road. Increase these distances 10% for grades > 3.0% on the minor road.

(2) Minimum Radii. For urban streets with design speeds less than 80 km/h, use e_{max} = 4% (low speed).

(3) Superelevation Rate. For urban/suburban reconstruction projects, existing horizontal curves may remain in place with a superelevation rate up to 6.0%.

(4) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates.

(a) Values are based on the minimum radii for the given design speed, maximum superelevation rate of 6.0%, 3.6 m travel lanes, and a 1.5% cross slope for the normal crown section.

(b) Values are based on the minimum radii for the given design speed, maximum superelevation rate of 4.0%, 3.3 m travel lanes, and a 1.5% cross slope for the normal crown section.

Figure 32-3C (US Customary)

ALIGNMENT CRITERIA FOR URBAN COLLECTORS/LOCAL STREETS

Design Element		Manual Section	Design Speed					
			20 mph	25 mph	30 mph	35 mph	40 mph	45 mph
*Stopping Sight Distance		28-1	115′	155′	200′	250′	305′	360′
*Intersection Sight Distance (1)		28-3	225′	280′	335′	390′	445′	500′
*Minimum Radii	e_{max} = 4% (low-speed)	29-4.03	80′	145′	230′	345′	490′	665′
Minimum Radius with Normal Crown	(low-speed)	29-4.03	95′	175′	295′	450′	655′	915′
*Maximum Superelevation Rate (2)		29-3.01	4%	4%	4%	4%	4%	4%
Superelevation Transition Length (3)	e_{max} = 4% (low-speed)	29-4.04	62′	67′	75′	80′	84′	91′
*Vertical Curvature (K-values)	Crest	30-2.01	7	12	19	29	44	61
	Sag	30.2.02	17	26	37	49	64	79
*Maximum Grade (4)	Level	30-1.02	9%	9%	9%	9%	9%	8%
	Rolling		12%	12%	11%	10%	10%	9%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.3% (with Curb and Gutter)					

* Controlling design criteria (see Section 27-7).

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed of the major road. Increase these values 10% for grades > 3.0% on the minor road.

(2) Superelevation Rate. For reconstruction projects, existing horizontal curves may remain in place with a superelevation rate up to 6.0%.

(3) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates. Table values are based on the minimum radii for the given design speed, maximum superelevation rate, 11 ft travel lanes, and a 1.5% cross slope for the normal crown section.

(4) Maximum Grade.

Collectors. Grades 1.0% to 2.0% steeper may be used on low-volume collectors and on grades less than 500 ft in length.
Local. Grades on local residential streets should be less than 15.0%.

Figure 32-3C (Metric)

ALIGNMENT CRITERIA FOR URBAN COLLECTORS/LOCAL STREETS

Design Element		Manual Section	Design Speed				
			30 km/h	40 km/h	50 km/h	60 km/h	70 km/h
*Stopping Sight Distance		28-1	35 m	50 m	65 m	85 m	105 m
*Intersection Sight Distance (1)		28-3	65 m	85 m	105 m	130 m	150 m
*Minimum Radii	e_{max} = 4% (low-speed)	29-4.03	20 m	45 m	80 m	125 m	190 m
Minimum Radius with Normal Crown	(low-speed)	29-4.03	25 m	55 m	100 m	165 m	260 m
*Maximum Superelevation Rate (2)		29-3.01	4%	4%	4%	4%	4%
Superelevation Transition Length (3)	e_{max} = 4% (low-speed)	29-4.04	18 m	21 m	23 m	25 m	27 m
*Vertical Curvature (K-values)	Crest	30-2.01	2	4	7	11	17
	Sag	30-2.02	6	9	13	18	23
*Maximum Grade (4)	Level	30-1.02	9%	9%	9%	9%	8%
	Rolling		12%	12%	11%	10%	9%
Minimum Grade		30-1.03	Desirable: 0.5% Minimum: 0.3% (with Curb and Gutter)				

* Controlling design criteria (see Section 27-7)

(1) Intersection Sight Distance. Table values are for passenger cars at a stop-controlled intersection on a level grade based on the design speed of the major road. Increase these values 10% for grades > 3.0% on the minor road.

(2) Superelevation Rate. For reconstruction projects, existing horizontal curves may remain in place with a superelevation rate up to 6.0%.

(3) Superelevation Transition Length. Superelevation transition rates will vary according to design speed, radii, and superelevation rates. Table values are based on the minimum radii for the given design speed, maximum superelevation rate, 3.3 m travel lanes and a 1.5% cross slope for the normal crown section.

(4) Maximum Grade.

(a) Collectors. Grades 1.0% to 2.0% steeper may be used on low-volume collectors and on grades less than 150 m in length.
(b) Local. Grades on local residential streets should be less than 15.0%.