



Chapter 32

GEOMETRIC DESIGN TABLES
(New Construction/Reconstruction)

BUREAU OF LOCAL ROADS AND STREETS MANUAL

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Chapter 32
GEOMETRIC DESIGN TABLES
(New Construction/Reconstruction)

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Chapter 32

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 Illinois Department of Transportation (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 Public Agency (LPA) 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 Minor Arterials,”
- Figure 32-2B “Geometric Design Criteria for Rural Two-Lane Collectors,”
- Figure 32-2C “Geometric Design Criteria for Rural Two-Lane Local Roads,”
- Figure 32-2D “Geometric Design Criteria for Suburban Arterials,”
- Figure 32-2E “Geometric Design Criteria for Urban Two-Way Arterials,”
- Figure 32-2F “Geometric Design Criteria for Urban One-Way Arterials,”
- Figure 32-2G “Geometric Design Criteria for Urban Two-Way Collectors,”
- Figure 32-2H “Geometric Design Criteria for Urban One-Way Collectors,” and
- Figure 32-2I “Geometric Design Criteria for Urban Local Streets.”

For criteria on local rural two-lane principal arterials, the designer should review the criteria in [Chapter 47](#) of the *Bureau of Design and Environment (BDE) Manual*. Local rural two-lane principal arterial projects should be brought to early coordination for discussion.

Design Element		Manual Section	Design Volume (Two-Way DHV)		
			New Construction / Reconstruction DHV < 1050 (2)		
Design Controls	Design Forecast Year		27-6.02	20 Years	
	Minimum Design Speed * (1a)	Level	27-5.02	60 mph (3a)	100 km/h (3a)
		Rolling		55 mph (3a)	90 km/h (3a)
	Access Control		35-1 BDE	Controlled by Regulations (4)	
Level of Service (LOS) *		27-6.04	C		
Cross Section Elements	Traveled Way Width *		31-1.01	24'	7.2 m
	Surface Type		Chapter 44	High Type Pavement	
	Shoulder Width *			10'	3.0 m
	Shoulder Type		31-1.06	4' Paved w/ Remainder Aggregate	1.2 m Paved w/ Remainder Aggregate
	Auxiliary Lanes *	Lane Width		12'	3.6 m
		Shoulder Width	31-1.03	4' (Paved)	1.2 m (Paved)
	Flush / TWLTL Widths		31-1.05	14'	4.2 m
	Cross Slope	Travel Lane *			1.5% (5a)
Shoulder		31-1.08	Paved 4% / Aggregate 6% (5b)		
Rollover Factor			8%		
Roadway Slopes	Side Slope (Maximum)	Cut Section	31-2.03 31-2.04	1V:6H	
				Ditch Width	4' (6)
		Back Slope		≤10' 1V:3H >10' 1V:2H (7)	≤3.0 m 1V:3H >3.0 m 1V:2H (7)
	Rock Cut			1V:0.25H	
	Fill Section			1V:6H to Clear Zone (8) 1V:3H (max) to Toe of Slope (8)	

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

DHV = Design Hourly Volume

**GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE MINOR ARTERIALS
(New Construction/Reconstruction)**

Figure 32-2A (US Customary / Metric)

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Footnotes:

- (1) Design Criteria. The criteria for the minimum cross-section elements allowed to remain in place (see [Chapter 33](#)) provided it is cost effective and the safety record is satisfactory.
- (2) Traffic Volumes. The design hourly volumes (DHV) assumes base conditions (except for 8% heavy vehicles) and a PHF = 1 for LOS shown. Adjust these values according to the actual factors. [Section 27-6](#) further discusses capacity methodology and traffic volumes.
- (3) Design Speed.
 - a. In rolling terrain, a minimum design speed of 55 mph (90 km/h) may be considered with study and justification.
 - b. To determine the minimum design speed allowed to remain in place, consider the following:
 - i. Existing horizontal curves may remain in place provided they have a comfortable operating speed of 60 mph (100 km/h) (level) or 50 mph (80 km/h) (rolling) and there is no history of crashes.
 - ii. Existing sag vertical curves may remain in place if they have a design speed of 50 mph (80 km/h) or greater and do not have a history of crashes. If not, reconstruct the sag vertical curve to a design speed of 60 mph (100 km/h).
 - iii. Existing crest vertical curves may remain in place if they have a design speed of 50 mph (80 km/h) or greater and do not have a history of crashes. If not, reconstruct the crest vertical curve to a design speed of 60 mph (100 km/h).
 - iv. Consider the relationship between horizontal and vertical alignments simultaneously to obtain a desirable condition. [Chapter 33](#) of the *BDE Manual* discusses these relationships and their effect on aesthetics and safety.
- (4) Access Control. For bypass routes on new alignment, design the roadway with partial access control. See [Section 35-1](#) of the *BDE Manual*.
- (5) Cross Slopes.
 - a. Cross slopes for outside auxiliary lanes will be at least 2.0% and should be 0.5% greater than the adjacent travel lane.
 - b. Where an aggregate shoulder is part of the shoulder width, slope the aggregate portion of the shoulder at 6%.
- (6) Ditch Bottom Width. Provide a wider outside ditch bottom where detention storage of storm water is a consideration.
- (7) Back Slope. Where the height of cut exceeds 10 ft (3.0 m), consider using a 1V:2H back slope beyond the clear zone. Also, for heights of cut greater than 30 ft (9.0 m), consider the use of benching.
- (8) Fill Slope. For fill heights greater than 30 ft (9.0 m), use a 1V:2H uniform slope with a roadside barrier. Also, for heights greater than 30 ft (9.0 m), consider the use of benching.

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

Footnotes to Figure 32-2A

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Design Element		Manual Section	Design Volume (ADT)					
			ADT < 400	400 to 750	750 to 2000	ADT > 2000		
Design Controls	Design Forecast Year	27-6.02	Current	20 Years				
	Minimum Design Speed * (1a)	27-5.02	Level	40 mph (1b)	50 mph (1b)	50 mph	60 mph	
			Rolling	30 mph (1b)	40 mph (1b)		50 mph	
Level of Service (LOS) *		27-6.04	C					
Cross Section Elements	Traveled Way Width *		31-1.01	20'	22'	24' (2)		
	Surface Type		Chapter 44	Aggregate Surface or Bituminous Treated (3)	High Type Pavement			
	Shoulder Width *		31-1.06	2' (4a)	4' (4b)	6' (4b)	8' (4b)	
	Shoulder Type			Turf or Aggregate (5a)		Aggregate or Paved (5b)		
	Auxiliary Lanes *	Lane Width	31-1.03	10'	Desired 11' Minimum 10'		Desired 12' Minimum 11'	
		Shoulder Width		2'	4'	Desired 6' Minimum 4'	Desired 8' Minimum 4'	
	Cross Slope	Travel Lane * (6a)		31-1.08	2.0% - 4% (6b)		1.5% - 2.0%	
		Shoulder			Turf 5% - 8% / Aggregate 4% - 6%		Aggregate 4% - 6% / Paved 4%	
Rollover Factor		10%			8%			
Roadway Slopes	Side Slope (Maximum)	Cut Section	31-2.03 31-2.04	1V:3H		1V:4H		
				Minimum 2'				
				≤10' 1V:3H (7) >10' 1V:2H (7)		≤10' 1V:3H >10' 1V:2H		<15' 1V:4H 15' - 25' 1V:3H >25' 1V:2H
		Rock Cut		1V:0.25H				
		Fill Section		≤6' 1V:3H >6' 1V:2H		≤10' 1V:3H >10' 1V:2H		≤25' 1V:4H >25' 1V:2H

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

ADT = Average Daily Traffic

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

Figure 32-2B (US Customary)

Design Element		Manual Section	Design Volume (ADT)				
			ADT < 400	400 to 750	750 to 2000	ADT > 2000	
Design Controls	Design Forecast Year		27-6.02	Current	20 Years		
	Minimum Design Speed * (1a)	Level	27-5.02	60 km/h (1b)	80 km/h (1b)	80 km/h	100 km/h
		Rolling		50 km/h (1b)	60 km/h (1b)		80 km/h
Level of Service (LOS) *		27-6.04	C				
Cross Section Elements	Traveled Way Width *		31-1.01	6.0 m	6.6 m	7.2 m (2)	
	Surface Type		Chapter 44	Aggregate Surface or Bituminous Treated (3)	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 or Paved (5b)	
	Auxiliary Lanes *	Lane Width	31-1.03	3.0 m	Desired 3.3 m Minimum 3.0 m		Desired 3.6 m Minimum 3.3 m
		Shoulder Width		600 mm	1.2 m	Desired 1.8 m Minimum 1.2 m	Desired 2.4 m Minimum 1.2 m
	Cross Slope	Travel Lane * (6a)		31-1.08	2.0% - 4% (6b)	1.5% - 2.0%	
		Shoulder			Turf 5% - 8% / Aggregate 4% - 6%		Aggregate 4% - 6% / Paved 4%
Rollover Factor		10%			8%		
Roadway Slopes	Side Slope (Maximum)	Cut Section	Front Slope	1V:3H		1V:4H	
			Ditch Width	Minimum 600 mm			
			Back Slope	31-2.03 31-2.04	≤3.0 m 1V:3H (7) >3.0 m 1V:2H (7)	≤3.0 m 1V:3H >3.0 m 1V:2H	<4.5 m 1V:4H 4.5 - 7.5 m 1V:3H >7.5 m 1V:2H
		Rock Cut		1V:0.25H			
		Fill Section			≤1.8 m 1V:3H >1.8 m 1V:2H	≤3.0 m 1V:3H >3.0 m 1V:2H	≤7.5 m 1V:4H >7.5 m 1V:2H

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

ADT = Average Daily Traffic

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

Figure 32-2B (Metric)

Footnotes:

- (1) Design Speed.
 - a. 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:
 - i. 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.
 - ii. 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.
 - b. For rural bridge projects, the design speed may be increased to the posted or regulatory speed limit to avoid a deficient NBIS rating for approach roadway alignment appraisal. All elements of the project will be designed to the chosen design speed. The chosen design speed will be certified by the County Engineer.
- (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. When the 4 ft (1.2 m) width cannot be met because of a proposed or an existing bridge width (see [Section 36-5](#)), [Section 35-4](#) shall be followed to flare the roadside barrier until the 4 ft (1.2 m) width is met or until the length of need is exceeded.
 - 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 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 32-2B

Design Element			Manual Section	Design Volume (ADT)				
				ADT < 250	250 to 400	400 to 750	750 to 2000	ADT > 2000
Design Controls	Design Forecast Year		27-6.02	Current		20 Years		
	Minimum Design Speed * (1)	Level	27-5.02	30 mph (1c/d)	40 mph (1d)	50 mph		
		Rolling	27-5.02	30 mph (1b-d)	30 mph (1d)	40 mph (1d)		
Level of Service (LOS) *			27-6.04	D				
Cross Section Elements	Traveled Way Width *		31-1.01	18 (2a)	20'	22'		24' (2b)
	Surface Type		Chapter 44	Aggregate Surface or Bituminous Treated (3)		High Type Pavement		
	Shoulder Width *		31-1.06	2' (4a)		4' (4b)	6' (4b)	8' (4b)
	Shoulder Type		31-1.06	Turf	Turf or Aggregate (5a)		Aggregate, Paved, or Comb. (5b)	
	Auxiliary Lanes *	Lane Width	31-1.03	N/A	10'	Desired 11' Minimum 10'		Desired 12' Minimum 11'
		Shoulder Width	31-1.03	N/A	2'	Desired 4' Minimum 2'	Desired 6' Minimum 4'	Desired 8' Minimum 4'
	Cross Slope (6a)	Travel Lane *		31-1.08	2.0% - 4% (6b)		1.5% - 2.0%	
		Shoulder		31-1.08	Turf 5% - 8%	Turf 5% - 8% / Aggregate 4% - 6%		Aggregate 4% - 6% / Paved 4%
Rollover Factor		31-1.08	10%		8%			
Roadway Slopes	Side Slope (Maximum)	Cut Section	31-2.03 31-2.04	Front Slope	1V:3H (7a)	1V:3H		1V:4H
				Ditch Width	Desired 2'	Minimum 2'		
		Back Slope		≤10' 1V:3H >10' 1V:2H (7a/b)	≤10' 1V:3H >10' 1V:2H (7b)	≤10' 1V:3H >10' 1V:2H		<15' 1V:4H 15 - 25' 1V:3H >25' 1V:2H
	Rock Cut			1V:0.25H				
	Fill Section			≤6' 1V:3H >6' 1V:2H	≤10' 1V:3H >10' 1V:2H		≤25' 1V:4H >25' 1V:2H	

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

ADT = Average Daily Traffic

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

Figure 32-2C (US Customary)

Design Element			Manual Section	Design Volume (ADT)				
				ADT < 250	250 to 400	400 to 750	750 to 2000	ADT > 2000
Design Controls	Design Forecast Year		27-6.02	Current		20 Years		
	Minimum Design Speed * (1)	Level	27-5.02	50 km/h (1c/d)	60 km/h (1d)	80 km/h		
		Rolling	27-5.02	50 km/h (1b-d)	50 km/h (1d)	60 km/h (1d)		
Level of Service (LOS) *			27-6.04	D				
Cross Section Elements	Traveled Way Width *		31-1.01	5.4 m (2a)	6.0 m	6.6 m		7.2 m (2b)
	Surface Type		Chapter 44	Aggregate Surface or Bituminous Treated (3)		High Type Pavement		
	Shoulder Width *		31-1.06	0.6 m (4a)		1.2 m (4b)	1.8 m (4b)	2.4 m (4b)
	Shoulder Type			Turf	Turf or Aggregate (5a)		Aggregate, Paved, or Comb. (5b)	
	Auxiliary Lanes *	Lane Width	31-1.03	N/A	3.0 m	Desired 3.3 m Minimum 3.0 m		Desired 3.6 m Minimum 3.0 m
		Shoulder Width		N/A	0.6 m	Desired 1.2 m Minimum 0.6 m	Desired 1.8 m Minimum 1.2 m	Desired 2.4 m Minimum 1.2 m
	Cross Slope (6a)	Travel Lane *		31-1.08	2.0% - 4% (6b)		1.5% - 2.0%	
		Shoulder			Turf 5% - 8%	Turf 5% - 8% / Aggregate 4% - 6%		Aggregate 4% - 6% / Paved 4%
Rollover Factor		10%			8%			
Roadway Slopes	Side Slope (Maximum)	Cut Section	31-2.03 31-2.04	Front Slope	1V:3H (7a)	1V:3H		1V:4H
				Ditch Width	Desired 0.6 m	Minimum 0.6 m		
		Back Slope		≤3.0 m 1V:3H >3.0 m 1V:2H (7a/b)	≤3.0 m 1V:3H >3.0 m 1V:2H (7b)	≤3.0 m 1V:3H >3.0 m 1V:2H		<4.5 m 1V:4H 4.5 - 7.5 m 1V:3H >7.5 m 1V:2H
	Rock Cut			1V:0.25H				
	Fill Section			≤1.8 m 1V:3H >1.8 m 1V:2H	≤3.0 m 1V:3H >3.0 m 1V:2H		≤7.5 m 1V:4H >7.5 m 1V:2H	

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

ADT = Average Daily Traffic

**GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE LOCAL ROADS
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Figure 32-2C (Metric)

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Footnotes:

(1) Design Speed.

- a. A rural local road may pass through a relatively built-up area. In these areas, for highway projects with no bridges, 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:
 - i. 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.
 - ii. 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.
- b. For highway projects with no bridges with ADT's less than 50 vehicles/day, the design speed may be 20 mph (30 km/h).
- c. For projects constructed with no bridges, other than Federal funds on the district road system with ADT's less than 150 vehicles/day, no design speed is required.
- d. For rural bridge projects, minimum design speed shall be as determined by the ADT. However, the design speed may be increased to the posted or regulatory speed limit to avoid a deficient NBIS rating for approach roadway alignment appraisal. All elements of the project will be designed to the chosen design speed. The chosen speed will be certified by the County Engineer.

(2) Traveled Way Width.

- a. For projects constructed with other than Federal funds on the district road system with ADT's less than 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. When the 4 ft (1.2 m) width cannot be met because of a proposed or an existing bridge width (see [Section 36-5](#)), [Section 35-4](#) shall be followed to flare the roadside barrier until the 4 ft (1.2 m) width is met or until the length of need is exceeded.
- 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 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 32-2C

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Design Element		Manual Section	Design Volume (DHV)			
			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 (LOS) *	27-6.04	C			
Cross Section Elements	Traveled Way	Number of Travel Lanes	31-1.02	2	4	6
		Traveled Way Width *	31-1.01	12'		
		Traveled Lane Width (Shared with Bicycles)	42-3.02	See Section 42-3.02		
	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 Lane (Minimum) *	31-1.08	1.5% - 2.0%		
		Auxiliary Lane		(5b)		
	Median Width	Flush	31-1.05	N/A	Range 4' to 14'	
		Flush (TWLTL)		Desired 12' Range 10' to 14'		
		Traversable		N/A	16'	
Raised Curb		N/A		18'		
Sidewalk Width		31-2.02	Desired 5' / Minimum 4'			
Roadway Slopes	Side Slope (Maximum)	Cut Section (Uncurbed)	1V:4H			
		Rock Cut	31-2.03			
		Fill Section (Uncurbed)	1V:0.25H			
	Median Slope	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](#)).

DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2D (US Customary)

Design Element		Manual Section	Design Volume (DHV)			
			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 (LOS) *	27-6.04	C			
Cross Section Elements	Traveled Way	Number of Travel Lanes	31-1.02	2	4	6
		Traveled Way Width *	31-1.01	3.6 m		
		Traveled Lane Width (Shared with Bicycles)	42-3.02	See Section 42-3.02		
	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 Lane (Minimum) *	31-1.08	1.5% - 2.0%		
		Auxiliary Lane		(5b)		
	Median Width	Flush	31-1.05	N/A	Range 1.2 m to 4.2 m	
		Flush (TWLTL)		Desired 3.6 m Range 3.0 m to 4.2 m		
		Traversable		N/A	4.8 m	
Raised Curb		N/A		5.5 m		
Sidewalk Width		31-2.02	Desired 1.5 m / Minimum 1.2 m			
Roadway Slopes	Side Slope (Maximum)	Cut Section (Uncurbed)	1V:4H			
		Rock Cut	31-2.03			
		Fill Section (Uncurbed)	1V:0.25H			
	Median Slope	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](#)).

DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2D (Metric)

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Footnotes:

- (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 (HCM)*.
- (2) Design Speed. A 60 mph (100 km/h) design speed may be considered in open-suburban areas.
- (3) Shoulder Width.
 - a. Concrete Curb & Gutter (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 45 mph (70 km/h) or less, 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. Two Way Left Turn Lane (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 32-2D

Design Element		Manual Section	Design Volume (DHV)			
			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 *	27-5.02	30 mph – 40 mph			
	Level of Service (LOS) * (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	Desired 12' Minimum 11' (3)	Desired 12' Minimum 11'	
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Desired 10' Minimum 8'		
		Auxiliary Lane	31-1.03	Single Left & Right – Desired 12' / Minimum 11' Dual Lefts & Rights – Desired 24' / Minimum 22'		
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%	1.5% - 2.0% (5a)	
		Auxiliary Lanes		2.0% (5b)	(5b)	
	Outside Curb and Gutter Type	31-1.07	B-6.12, B-6.18, or B-6.24 CC&G (6)			
	Median Width	Flush	31-1.05	N/A	Range 4' to 14'	
		Flush (TWLTL)		Desired 12' Range 10' to 14'		
		Traversable		N/A	16'	
		Raised Curb		N/A	18'	
	Sidewalk Width (7)	31-2.02	Desired 5' / Minimum 4'			
Obstruction Free Zone * (8)	35-2	1.5'				
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03	---		
		Fill Section (Curbed)	---			
	Median Slope	Concrete Surface / Traversable		N/A	1.5%	
		Flush / TWLTL Surface	31-1.05	1.5%		
Grass/ Landscape Surface			N/A	5% (Towards C&G)		

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

DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2E (US Customary)

Design Element		Manual Section	Design Volume (DHV)			
			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 *	27-5.02	50 km/h – 60 km/h			
	Level of Service (LOS) * (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	Desired 3.6 m Minimum 3.3 m (3)	Desired 3.6 m Minimum 3.3 m	
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Desired 3.0 m Minimum 2.4 m		
		Auxiliary Lane	31-1.03	Single Left & Right – Desired 3.6 m / Minimum 3.3 m Dual Lefts & Rights – Desired 7.2 m / Minimum 6.6 m		
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%	1.5% - 2.0% (5a)	
		Auxiliary Lanes		2.0% (5b)	(5b)	
	Outside Curb and Gutter Type		31-1.07	B-15.30, B-15.45, or B-15.60 CC&G (6)		
	Median Width	Flush	31-1.05	N/A	Range 1.2 m to 4.2 m	
		Flush (TWLTL)		Desired 3.6 m Range 3.0 m to 4.2 m		
		Traversable		N/A	4.8 m	
		Raised Curb		N/A	5.5 m	
	Sidewalk Width (7)		31-2.02	Desired 1.5 m / Minimum 1.2 m		
Obstruction Free Zone * (8)		35-2	450 mm			
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03			
		Fill Section (Curbed)	---			
	Median Slope	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](#)).

DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2E (Metric)

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Footnotes:

- (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 (LOS). A LOS D may be used in heavily developed sections of metropolitan areas.
- (3) Surface Width. The minimum surface width is 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. Two Way Left Turn Lane (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, a minimum 6 ft (1.8 m) sidewalk width behind the curb must be provided.
- (8) Obstruction-Free Zone. Distance is measured from the face of the curb. Hazards behind curbs should be located outside of the clear zone shown for uncurbed roadways as discussed in [Section 35-2.02\(f\)](#).
- (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 32-2E

Design Element		Manual Section	Design Volume (DHV)			
			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			
	Design Speed *	27-5.02	30 mph – 40 mph			
	Level of Service (LOS) * (2)	27-6.04	C			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	3	4
		Travel Lane	31-1.01	Desired 12' Minimum 11'		
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (3)	31-1.04	Desired 10' Minimum 8'		
		Auxiliary Lane	31-1.03	Single Left & Right – Desired 12' / Minimum 11' Dual Lefts & Rights – Desired 24' / Minimum 22'		
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% (4a)		
		Auxiliary Lanes		2.0% (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	Desired 5' / Minimum 4'			
	Obstruction Free Zone * (7)	35-2	1.5'			
Roadway Slopes	Side Slope (8) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03			
		Fill Section (Curbed)	---			

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

DHV = Design Hourly Volume / OWS = One-Way Street

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

Figure 32-2F (US Customary)

Design Element		Manual Section	Design Volume (DHV)			
			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			
	Design Speed *	27-5.02	50 km/h – 60 km/h			
	Level of Service (LOS) * (2)	27-6.04	C			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	3	4
		Travel Lane	31-1.01	Desired 3.6 m Minimum 3.3 m		
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (3)	31-1.04	Desired 3.0 m Minimum 2.4 m		
		Auxiliary Lane	31-1.03	Single Left & Right – Desired 3.6 m / Minimum 3.3 m Dual Lefts & Rights – Desired 7.2 m / Minimum 6.6 m		
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% (4a)		
		Auxiliary Lanes		2.0% (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	Desired 1.5 m / Minimum 1.2 m			
	Obstruction Free Zone * (7)	35-2	450 mm			
Roadway Slopes	Side Slope (8) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03	---		
		Fill Section (Curbed)	---			

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

DHV = Design Hourly Volume / OWS = One-Way Street

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

Figure 32-2F (Metric)

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Footnotes:

- (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 (LOS). A LOS 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, a minimum 6 ft (1.8 m) sidewalk width behind the curb must be provided.
- (7) Obstruction-Free Zone. Distance is measured from the face of the curb. Hazards behind curbs should be located outside of the clear zone shown for uncurbed roadways as discussed in [Section 35-2.02\(f\)](#).
- (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 32-2F

Design Element		Manual Section	Design Volume (ADT / DHV)			
			Two-Way ADT < 5000	Two-Way ADT ≥ 5000 and DHV < 1400 (1)	Two-Way DHV 1400 - 2400 (1)	
Design Controls	Highway Type	---	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 (LOS) *	27-6.04	Desired C / Minimum D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	4	
		Travel Lane	31-1.01	Desired 11' Minimum 10'	Desired 12' Minimum 10' (3)	Desired 12' Minimum 10'
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Minimum 8'	Desired 10' Minimum 8'	
		Auxiliary Lane	31-1.03	Desired 11' Minimum 10'	Desired 12' Minimum 10'	
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		1.5% - 2.0% (5a)
		Auxiliary Lanes		(5b)		
	Outside Curb and Gutter Type	31-1.07	B-6.12, B-6.18, or B-6.24 CC&G (6)			
	Median Width	Flush	31-1.05	N/A		4'
		Flush (TWLTL)		Desired 12' Range 10' to 14'		
Sidewalk Width (7)	31-2.02	Desired 5' / Minimum 4'				
Obstruction Free Zone * (8)	35-2	1.5'				
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	---			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2G (US Customary)

Design Element		Manual Section	Design Volume (ADT / DHV)			
			Two-Way ADT < 5000	Two-Way ADT ≥ 5000 and DHV < 1400 (1)	Two-Way DHV 1400 - 2400 (1)	
Design Controls	Highway Type	---	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 (LOS) *	27-6.04	Desired C / Minimum D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	4	
		Travel Lane	31-1.01	Desired 3.3 m Minimum 3.0 m	Desired 3.6 m Minimum 3.0 m (3)	Desired 3.6 m Minimum 3.0 m
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Minimum 2.4 m	Desired 3.0 m Minimum 2.4 m	
		Auxiliary Lane	31-1.03	Desired 3.3 m Minimum 3.0 m	Desired 3.6 m Minimum 3.0 m	
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		1.5% - 2.0% (5a)
		Auxiliary Lanes		(5b)		
	Outside Curb and Gutter Type	31-1.07	B-15.30, B-15.45, or B-15.60 CC&G (6)			
	Median Width	Flush	31-1.05	N/A		1.2 m
		Flush (TWLTL)		Desired 3.6 m Range 3.0 m to 4.2 m		
	Sidewalk Width (7)	31-2.02	Desired 1.5 m / Minimum 1.2 m			
Obstruction Free Zone * (8)	35-2	450 mm				
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / DHV = Design Hourly Volume / TWS = Two-Way Street

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

Figure 32-2G (Metric)

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Footnotes:

- (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. The minimum surface width is 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. Two Way Left Turn Lane (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, a minimum 6 ft (1.8 m) sidewalk width behind the curb must be provided.
- (8) Obstruction-Free Zone. Distance is measured from the face of the curb. Hazards behind curbs should be located outside of the clear zone shown for uncurbed roadways as discussed in [Section 35-2.02\(f\)](#).
- (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 32-2G

Design Element		Manual Section	Design Volume (ADT / DHV)			
			One-Way ADT < 5000	One-Way ADT ≥ 5000 and DHV < 1450 (1)	One-Way DHV 1450 - 2150 (1)	
Design Controls	Highway Type	---	OWS-2		OWS-3	
	Design Forecast Year	27-6.02	Current	20 Years		
	Design Speed * (2)	27-5.02	30 mph	30 mph – 40 mph		
	Level of Service (LOS) *	27-6.04	Desired C / Minimum D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	3	
		Travel Lane	31-1.01	Desired 11' Minimum 10'	Desired 12' Minimum 10' (3)	
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Minimum 8'	Desired 10' Minimum 8'	
		Auxiliary Lane	31-1.03	Desired 11' Minimum 10'	Desired 12' Minimum 10'	
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		1.5% - 2.0% (5a)
		Auxiliary Lanes		(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	Desired 5' / Minimum 4'		
	Obstruction Free Zone * (8)		35-2	1.5'		
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	---			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / DHV = Design Hourly Volume / OWS = One-Way Street

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

Figure 32-2H (US Customary)

Design Element		Manual Section	Design Volume (ADT / DHV)			
			One-Way ADT < 5000	One-Way ADT ≥ 5000 and DHV < 1450 (1)	One-Way DHV 1450 - 2150 (1)	
Design Controls	Highway Type	---	OWS-2		OWS-3	
	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 (LOS) *	27-6.04	Desired C / Minimum D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2	3	
		Travel Lane	31-1.01	Desired 3.3 m Minimum 3.0 m	Desired 3.6 m Minimum 3.0 m (3)	
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (4)	31-1.04	Minimum 2.4 m	Desired 3.0 Minimum 2.4	
		Auxiliary Lane	31-1.03	Desired 3.3 m Minimum 3.0 m	Desired 3.6 m Minimum 3.0 m	
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		1.5% - 2.0% (5a)
		Auxiliary Lanes		(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	Desired 1.5 m / Minimum 1.2 m		
	Obstruction Free Zone * (8)		35-2	450 mm		
Roadway Slopes	Side Slope (9) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	---			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / DHV = Design Hourly Volume / OWS = One-Way Street

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

Figure 32-2H (Metric)

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Footnotes:

- (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. The minimum surface width is 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% 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, a minimum 6 ft (1.8 m) sidewalk width behind the curb must be provided.
- (8) Obstruction-Free Zone. Distance is measured from the face of the curb. Hazards behind curbs should be located outside of the clear zone shown for uncurbed roadways as discussed in [Section 35-2.02\(f\)](#).
- (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 32-2H

Design Element		Manual Section	Design Volume (ADT)			
			ADT < 1000	1000 - 5000	ADT > 5000	
Design Controls	Highway Type	---	TWS-2 / OWS-2			
	Design Forecast Year	27-6.02	Current		20 Years	
	Design Speed *	27-5.02	30 mph (1)	30 mph		
	Level of Service (LOS) *	27-6.04	D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2		
		Travel Lane *	31-1.01	Minimum 10'	Minimum 11'	Minimum 12' (2)
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (3)	31-1.04	Minimum 8'		
		Auxiliary Lane	31-1.03	10'	Desired 11' Minimum 10'	Desired 12' Minimum 10'
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		
		Auxiliary Lanes		(4)		
	Outside Curb and Gutter Type	31-1.07	B-6.12, B-6.18, or B-6.24 CC&G (5)			
	Sidewalk Width	31-2.02	Desired 5' / Minimum 4'			
	Obstruction Free Zone * (6)	35-2	1.5'			
Roadway Slopes	Side Slope (7) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / TWS = Two-Way Street / OWS = One-Way Street

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

Figure 32-2I (US Customary)

Design Element		Manual Section	Design Volume (ADT)			
			ADT < 1000	1000 - 5000	ADT > 5000	
Design Controls	Highway Type	---	TWS-2 / OWS-2			
	Design Forecast Year	27-6.02	Current		20 Years	
	Design Speed *	27-5.02	50 km/h (1)	50 km/h		
	Level of Service (LOS) *	27-6.04	D			
Cross Section Elements	Surface Width *	Number of Travel Lanes	31-1.02	2		
		Travel Lane *	31-1.01	Minimum 3.0 m	Minimum 3.3 m	Minimum 3.6 m (2)
		Travel Lane (Shared with Bicycles)	42-3.02	See Section 42-3.02		
		Parking Lane (3)	31-1.04	Minimum 2.4 m		
		Auxiliary Lane	31-1.03	3.0 m	Desired 3.3 m Minimum 3.0 m	Desired 3.6 m Minimum 3.0 m
	Cross Slope	Travel Lane (Minimum) *	31-1.08	1.5% - 2.0%		
		Auxiliary Lanes		(4)		
	Outside Curb and Gutter Type	31-1.07	B-15.30, B-15.45, or B-15.60 CC&G (5)			
	Sidewalk Width	31-2.02	Desired 1.5 m / Minimum 1.2 m			
	Obstruction Free Zone * (6)	35-2	450 mm			
Roadway Slopes	Side Slope (7) (Maximum)	Cut Section (Curbed)	---			
		Rock Cut	31-2.03			
		Fill Section (Curbed)	---			

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

ADT = Average Daily Traffic / TWS = Two-Way Street / OWS = One-Way Street

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

Figure 32-2I (Metric)

BUREAU OF LOCAL ROADS & STREETS
GEOMETRIC DESIGN TABLES

August 2016

32-2-27

Footnotes:

- (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) Obstruction-Free Zone. Distance is measured from the face of the curb. Hazards behind curbs should be located outside of the clear zone shown for uncurbed roadways as discussed in [Section 35-2.02\(f\)](#).
- (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 32-2I

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.”

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 (SSD) *		28-1	115'	155'	200'	250'	305'	360'	425'	495'	570'
Passing Sight Distance (PSD)		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	76'	134'	214'	314'	444'	587'	758'	960'	1200'
	e _{max} = 6%		81'	144'	231'	340'	485'	643'	833'	1060'	1330'
	e _{max} = 4%		86'	154'	250'	371'	533'	711'	926'	1190'	1500'
Maximum Superelevation Rate *		29-3.01	Paved 8% / Aggregate 4%						8%		
Superelevation Transition Length (2)	e _{max} = 8%	29-3.02	141'	150'	159'	169'	179'	194'	209'	222'	232'
	e _{max} = 6%		111'	118'	125'	133'	142'	153'	165'	176'	184'
	e _{max} = 4%		81'	87'	92'	98'	104'	112'	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%				6%		5%	
	Rolling		11%	10%	9%	8%	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).

ALIGNMENT CRITERIA FOR RURAL TWO-LANE HIGHWAYS

Figure 32-3A (US Customary)

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 (SSD) *		28-1	35 m	50 m	65 m	85 m	105 m	130 m	160 m	185 m
Passing Sight Distance (PSD)		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	20 m	41 m	73 m	113 m	168 m	229 m	304 m	394 m
	$e_{max} = 6\%$		21 m	43 m	79 m	123 m	184 m	252 m	336 m	437 m
	$e_{max} = 4\%$		22 m	47 m	86 m	135 m	203 m	280 m	375 m	492 m
Maximum Superelevation Rate *		29-3.01	Paved 8% / Aggregate 4%					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%			6%		5%	
	Rolling		11%	10%	9%	8%	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).

ALIGNMENT CRITERIA FOR RURAL TWO-LANE HIGHWAYS

Figure 32-3A (Metric)

Design Element	Manual Section	Design Speed							
		30 mph	35 mph	40 mph	45 mph	50 mph	55 mph	60 mph	
Stopping Sight Distance (SSD) *	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	231' (2)	340' (2)	485' (2)	643' (2)	833'	1060'	1330'
	$e_{max} = 4\%$ (Open Roadway)		250'	371'	533'	711'	926'	1190'	1500'
	$e_{max} = 4\%$ (Low speed)	29-4.03	250'	371'	533'	711'	---	---	---
Maximum Superelevation Rate *	29-3.01	4% (3)				6%			
Superelevation Transition Length	$e_{max} = 6\%$ (4a) (Open Roadway)	29-3.02	125'	133'	142'	153'	165'	176'	184'
	$e_{max} = 4\%$ (4b) (Open Roadway)		92'	98'	104'	112'	121'	129'	135'
	$e_{max} = 4\%$ (4b) (Low speed)	29-4.04	89'	95'	99'	107'	---	---	---
Vertical Curvature (K-values based on SSD) *	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%		6%		5%	
	Rolling		9%	8%		7%		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.

ALIGNMENT CRITERIA FOR SUBURBAN / URBAN ARTERIALS

Figure 32-3B (US Customary)

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 (SSD) *		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	79 m (2)	123 m (2)	184 m (2)	252 m	336 m	437 m
	$e_{max} = 4\%$ (Open Roadway)		86 m	135 m	203 m	280 m	375 m	492 m
	$e_{max} = 4\%$ (Low speed)	29-4.03	86 m	135 m	203 m	---	---	---
Maximum Superelevation Rate *		29-3.01	4% (3)			6%		
Superelevation Transition Length	$e_{max} = 6\%$ (4a) (Open Roadway)	29-3.02	37 m	41 m	45 m	50 m	53 m	56 m
	$e_{max} = 4\%$ (4b) (Open Roadway)		27 m	30 m	33 m	36 m	39 m	41 m
	$e_{max} = 4\%$ (4b) (Low speed)	29-4.04	28 m	30 m	33 m	---	---	---
Vertical Curvature (K-values based on SSD) *	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%		5%	
	Rolling		9%	8%	7%		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.

ALIGNMENT CRITERIA FOR SUBURBAN / URBAN ARTERIALS

Figure 32-3B (Metric)

Design Element	Manual Section	Design Speed							
		20 mph	25 mph	30 mph	35 mph	40 mph	45 mph		
Stopping Sight Distance (SSD) *	28-1	115'	155'	200'	250'	305'	360'		
Intersection Sight Distance * (1)	28-3	225'	280'	335'	390'	445'	500'		
Minimum Radii *	29-4.03	$e_{max} = 4\%$ (Low speed)		86'	154'	250'	371'	533'	711'
Minimum Radii w/ Normal Crown (Low speed)		105'	194'	324'	495'	736'	1000'		
Maximum Superelevation Rate * (2)	29-3.01	4%							
Superelevation Transition Length (3)	29-4.04	$e_{max} = 4\%$ (Low speed)		74'	71'	89'	95'	99'	107'
Vertical Curvature (K-values based on SSD) *		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%				8%	
		Rolling		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, 11 ft 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 500 ft in length.
 - b. Local. Grades on local residential streets should be less than 15.0%.

ALIGNMENT CRITERIA FOR URBAN COLLECTORS / LOCAL STREETS

Figure 32-3C (US Customary)

Design Element		Manual Section	Design Speed				
			30 km/h	40 km/h	50 km/h	60 km/h	70 km/h
Stopping Sight Distance (SSD) *		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	22 m	47 m	86 m	135 m	203 m
Minimum Radii w/ Normal Crown (Low speed)			27 m	59 m	113 m	183 m	286 m
Maximum Superelevation Rate * (2)		29-3.01	4%				
Superelevation Transition Length (3)	e _{max} = 4% (Low speed)	29-4.04	22 m	25 m	28 m	30 m	33 m
Vertical Curvature (K-values based on SSD) *	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%				8%
	Rolling		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%.

ALIGNMENT CRITERIA FOR URBAN COLLECTORS / LOCAL STREETS

Figure 32-3C (Metric)

32-4 ACRONYMS

This is a summary of the acronyms used within this chapter.

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
BDE	Bureau of Design and Environment
C&G	Curb & Gutter
CC&G	Concrete Curb & Gutter
DHV	Design Hourly Volume
HCM	Highway Capacity Manual
IDOT	Illinois Department of Transportation
LPA	Local Public Agency
OWS	One Way Street
PSD	Passing Sight Distance
SSD	Stopping Sight Distance
TWLTL	Two Way Left Turn Lane
TWS	Two Way Street

32-5 REFERENCES

1. *A Policy on Geometric Design of Highways and Streets*, AASHTO, 2011.
2. *HCM 2010 Highway Capacity Manual*, TRB, 2010
3. [Chapter 47](#) "Rural Two-Lane / Multilane State Highways (New Construction / Reconstruction)", *BDE Manual*, IDOT.