CHAPTER 5C-1 GEOMETRIC DESIGN CRITERIA

A. General

Four design criteria (below) are used by Iowa DOT and local jurisdictions:

No.	Conditions		Normal Design Criteria	Relation to Metro Design Standards
	Route Type	Funding Type		
1.	Primary Highway	Federal Aid (NHS)	FHWA	N/A – Use IDOT Design Criteria
2.	Primary Highway	Non-Federal Aid & Federal Aid (STP)	IDOT Design Criteria	N/A – Use IDOT Design Criteria
3.	Non-Primary Roadway	Federal Aid (STP)	IDOT Urban Design Aids or Alternative Urban Design Guides	Tables in this chapter. May need to prepare design exceptions
4.	Non-Primary Roadway	Non-Federal Aid	City Standards	Tables in this chapter

B. Design Controls and Criteria

The following tables and commentary provide the minimum standards for thoroughfare design for the City of Cedar Rapids (including streets, bikeways, pedestrian facilities and so forth). Design controls are based on roadway classification, design speed, and the location, or context, in which the roadway is being designed. Alternative design standards are available for use on a project specific basis but require the designer prepare and submit design exception documentation for review and approval by the Jurisdictional Engineer prior to deviating from these standards.

C. Design Tables

The following figures illustrate the location of various design elements of the roadway cross-section as specified in the Chapter 5 tables.

TABLE 5C-1.01
ELEMENTS RELATED TO THOROUGHFARE CLASSIFICATION

Classification (Typical)	Arterial (Boulevard or Avenue)						Collector (Avenue)						Local Street (Street)				Rural			Alley (Alley/Lane)
Posted Speed[1] (mph)	25		30		35 and above		25		30		35 and above		25		30		45	50	55	Slow <25 mph
Res, Comm / Indust	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	ALL			
Lane Widths[2]																				
Travel Lane	11' *	11'	11' *	12' **	12'	12'	10'	11'	11' *	11'	12'	12'	10'	11'	10'	11'	12'	12'	12'	15'
Turn Lanes[3]	11' *	11' *	11' *	12' **	12'	12'	10'	11'	11' *	11'	12'	12'	10'	11'	10'	11'	12'	12'	12'	-
Curb and Gutter Width[4]	2'	2'	2'	2'	2'	2'	1.5'	1.5'	1.5'	1.5'	1.5'	1.5'	1'	1'	1'	1'	-	-	-	-
Shoulder Width	N/A						N/A						N/A				8'	8'	10'	2.5'
Vertical Clearance	16.5'						15.5'						14.5'				15.5'			14.5'
Right-of-way Width	80' - 100'						60' - 70'		60' - 70'		80'		60'		60' - 70'		60' - 80'	80'	100'	20'
Parking Allowed?	Yes	Yes	Yes	Yes	No		Yes	Yes	Yes	Yes	No		Yes				No			No
Parking Lane Width																	N/A			
Parallel	10'	10'	10'	10'	N/A		8	9	8	9	N/A		7'	8'	7'	8'	-	-	-	-
Angled[5] 60 deg / 45 deg	17'/15'				-		17'/15'				-		17'/15'				-	-	-	-
Bicycle Lane Width[6]																				
Parking Permitted	5'	5'	5'	5'	Special	Special	5'	5'	5'	5'	Special	Special	5'	5'	5'	5'	N/A	N/A	N/A	N/A
No Parking	5'	5'	5'	5'	Special	Special	5'	5'	5'	5'	Special	Special	5'	5'	5'	5'	N/A	N/A	N/A	N/A
Roadway Width Face-Face of Curb																				
Number of Lanes[7]:	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1(Yield)
With Parking[8] 1 Side / 2 Sides	34'/42'	34'/42'	34'/42'	36'/44'	-	-	29.5'/36'	32.5'/40'	31.5'/38'	32.5'/40'	-	-	27'/27'	31'/38'	27'/27'	31'/38'	-	-	-	-
Without Parking[9]	27	30'	27'	30'	27'	30'	27'	30'	27'	30'	27'	30'	27'	30'	27'	30'	24'	24'	24'	15' Res / 20' Comm.
PCC Min. Depth[10]	Project Specific Design						8"						7"	8"	7"	8"	7"	7"	7"	6"

All design exceptions shall be considered for approval by the City Engineer or City Engineer's designee.

* Design exceptions for less than 11' wide travel lanes will be considered based on project specifics and the context of the neighborhood (e.g., ADA compliance, ability to meet driveway grades, physical features, etc.)

** Design exceptions for travel lanes between 11' and 12' will be considered based on project specifics and the context of the neighborhood (e.g., ADA compliance, ability to meet driveway grades, physical features, etc.)

See Notes on Next Page

Table 5C-1.01 Notes:

Alternate design criteria are available for use on a project specific basis and subject to the context of the neighborhood. Refer to "The Complete Streets Code, A system for Building Livable Thoroughfares", May 13, 2014, Speck & Associates, LLC, available from Cedar Rapids Public Works Department.

1. Design speed should be posted speed +5 mph.

2. 10' wide lanes are the minimum. Adjust lane widths if necessary to accommodate heavy truck or bus traffic. On bus routes, minimum lane width is 11'. Minimum Sharrow width is 13'.

3. Two-way Left Turn Lanes should be 12' wide, minimum.

4. Curb and gutter width dimensions are edge of gutter to face of curb. Where bicycle lanes or shared facilities are present, if the gutter pan area between the longitudinal curb joint and gutter face is 1' or less, it may be used for bicycle lane or sharrow width. As an alternative, the curb and gutter may be poured integrally with the through lane paving without a longitudinal gutter pan joint, or the longitudinal joint could be located outside the bicycle lane (but not in a vehicular wheel path).

5. Through lanes shall be 13' wide next to 60-degree parking and 11' wide next to 45-degree parking. Angled parking only allowed along curbs facing retail property or non-retail properties at least 3 stories in height (averaged along the block face).

6. 5' is the minimum bicycle lane width. In areas of high bicycle use, high parking turnover, high volumes of heavy vehicle traffic, speeds of 35 mph and above, or other site specific conditions, wider bicycle lanes and/or buffering may be needed. Refer to Chapter 12B-3, On-Street bycycle Facilities. Parallel parking lane widths in excess of 8' include bike lane buffer space (either marked or unmarked).

7. Actual number of lanes based on highway capacity. Turn lanes and bike lanes are additive to the following widths. Widths are exclusive of medians.

8. Gutter pan width can be included in the parking lane width. Arterial residential street based on 11' wide through lanes. Local residential street with parking on 2 sides operates as a yield street for two-way traffic when cars are parked across from each other.

9. Minimum width. Additional lanes are additive beyond this minimum width.

10. AASHTO methods shall be used to compare equivalent PCC and HMA sections based on equivalent ESALs.

TABLE 5C-1.02
ELEMENTS RELATED TO DESIGN SPEED

Design Element	**25**		**30**		**35**		**40**		**45**		**50**		**55**		**60**	
Stopping sight distance (ft)[1]	155		200		250		305		360		425		495		570	
Passing sight distance (ft)[2]	450		500		550		600		700		800		900		1000	
Min. Horizontal curve radius (ft)[3]	205		345		530		796		1089		930		1190		1500	
Min. vertical curve length (ft)	75		90		105		120		135		150		165		180	
Min. rate of vertical curvature, Crest (K)	12		19		29		44		61		84		114		151	
Min. rate of vertical curvature, Sag (K)	26		37		49		64		79		96		115		136	
Horizontal Clearance (ft)[4]	3		3		7		7		Roadside Design Guide							
Foreslopes and Backslopes[5]	4:1		4:1		4:1		4:1		Roadside Design Guide							
Shoulder Width (ft)[6]	5		5		5		8		10		10		10		10	
Minimum gradient (percent)	0.6		0.6		0.6		0.6		0.6		0.6		0.6		0.6	
Maximum gradient (percent)[7]	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I	R	C/I
Local	12	8	12	8	11	8	11	8	10	8	9	8	N/A	N/A	N/A	N/A
Collector	12	8	11	8	10	8	10	8	9	8	8	7	N/A	N/A	N/A	N/A
Arterial	9	9	9	9	8	8	8	8	N/A	8	N/A	7	N/A	6	N/A	6

1. Stopping sight distance on level roadway. Refer to AASHTO for design values on grades.
2. Refer to Table 3-4, AASHTO 2011
3. Refer to Table 3-13b, AASHTO 2011 based on e= -0.025. On Speed Flow thoroughfares, superelevation should be considered.
4. Horizontal clearance measured from back of curb.
5. Foreslopes and backslopes can be steeper than 4:1 with design exception. Slopes flatter than 4:1 are desirable.
6. Shoulder widths for rural sections in urban areas. 5' minimum width accommodates bicycle traffic.
7. Maximum grades in commercial or industrial areas is 8%. Desirable grades for all areas is 5% or less. Maximum gradients noted above
   a) Increased gradient is on a horizontal alignment tangent for distances less than 500 feet with no intersecting streets.
   b) Intersection grades shall not be increased.
   c) Increased gradients are not allowed on dead-end streets or streets with a cul-de-sac.

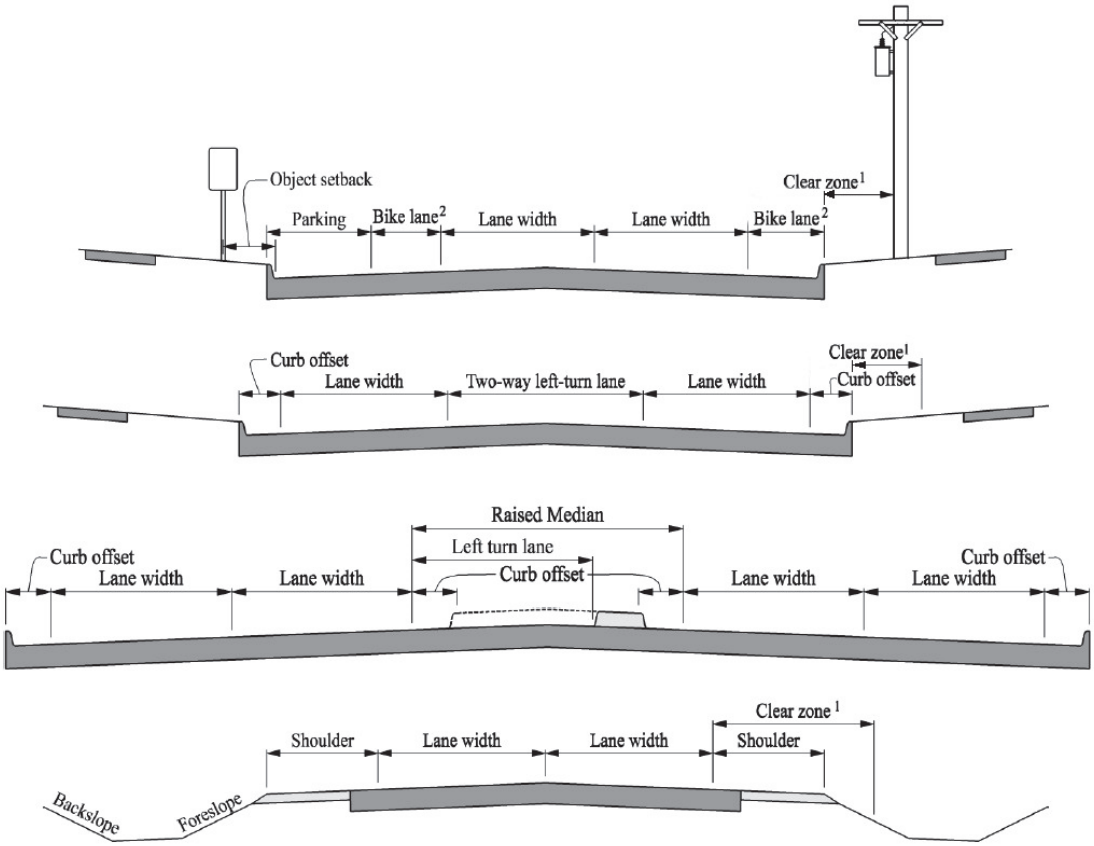

FIGURE 5C-1.01
ROADWAY DESIGN ELEMENTS

[1] Clear zone is measured from the back of curb.
[2] See Chapter 12 for bike lane requirements.