

## **SECTION 5 STREETS DESIGN CRITERIA**

### **5.1 GENERAL**

These criteria shall be adhered to for the design of all streets within the City.

**5.1.1 Introduction:** The purpose of these criteria is to provide uniform procedures for designing and checking the design of streets in the City. Specific criteria have been developed and are applicable to the types of conditions ordinarily encountered in local urban areas. Other special situations may be encountered that require added criteria or more complex design than included herein.

#### **5.1.2 Abbreviations:**

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
FHWA	U. S. Department of Transportation/Federal Highway Administration
MUTCD	Manual of Uniform Traffic Control Devices
NGVD	National Geodetic Vertical Datum
ITE	Institute of Transportation Engineers
R-O-W	Right-of-way

**5.1.3 Governing Criteria:** Design shall be in accordance with the latest edition of the following publications and the current interim supplements thereto except as modified herein or modified for the specific project:

- A. Policy on Geometric Design of Highways and Streets, AASHTO.
- B. Manual on Uniform Traffic Control Devices for Streets and Highways, FHWA.
- C. Roadside Design Guide, AASHTO.
- D. Design of Pavement Structures, AASHTO.

### **5.2 FUNCTIONAL CLASSIFICATION OF STREETS:**

Streets are divided into seven street functional classifications: Arterial, Collector, Local Commercial, Local Industrial, Local Residential, Frontage Streets, Cul-De-Sacs.

### 5.3 GENERAL STREET DESIGN CRITERIA

**5.3.1 Street Layout:** The arrangement, character, extent, width, grade, and location of all streets shall conform to the City of Junction City Comprehensive Master Plan and shall be considered in their relation to existing and planned streets, topographical, conditions, to public convenience and safety, and their appropriate relation to the proposed uses of the land to be served by such streets.

**5.3.2 Design Criteria:** This section governs the general design requirements for streets by type. See Table JC-1. All street design is subject to approval by the City.

<b>TABLE JC-1</b>									
	<b>Arterial</b>	<b>Collector</b>	<b>Local Commercial</b>	<b>L o c a l I n d u s t r i a l</b>		<b>L o c a l R e s i d e n t i a l</b>		<b>Frontage Streets</b>	<b>Cul-De- Sacs</b>
<b>R-O-W Width</b>	100 feet (2)	80 feet	80 feet		60 feet		60 feet (4)	40 feet	60 feet radius
<b>Roadway Width (1)</b>	53 feet (3)	41 feet	41 feet		41 feet		31 feet	24 feet	45 feet radius
<b>Stopping Sight Distance</b>	600 feet	400 feet	400 feet		600 feet		200 feet	400 feet	NA
<b>Min. K Value, Sag Vert. Curve</b>	64	64	30		30		30	30	5
<b>Min. K Value,</b>	44	44	50		50		20	20	3

<b>Crest Vert. Curve</b>								
<b>Min. Radii for Horizontal Curves</b>	500 feet	250 feet	300 feet		500 feet		200 feet	250 feet
<b>Maximum Grade</b>	6%	8%	6%		6%		10%	8%
<b>Minimum Grade</b>	0.5%	0.5%	0.5%		0.5%		0.5%	0.5% at gutter line
<b>Minimum Curb Return Radius (5)</b>	45 feet	45 feet	45 feet		45 feet		35 feet	35 feet

- A. Street width is measured back-to-back of curb.
- B. Additional right-of-way width may be required on both sides of any intersection with another arterial or collector street.
- C. Arterial roadway width is variable; listed measurement is the minimum.
- D. May be reduced in a residential planned development district.
- E. Radius measured to the back of curb. Radius should accommodate the design vehicle(s), as determined by the City Engineer.

**5.3.3 Alleys:** Alleys shall be a minimum width of twenty (20) feet.

**5.3.4 Cul-de-sacs:** At locations where streets are to be terminated and a vehicular connection between adjacent streets is not required, the termination shall be a cul-de-sac. Cul-de-sacs shall be constructed to the design criteria in Table JC-1.

A. **Street Design Geometry:** The finished cross slopes within the limits of the right-of-way shall be between one quarter (1/4) inch vertical to one (1) foot horizontal, minimum, to one-half (1/2) inch vertical to one (1) foot horizontal, maximum, except for sidewalks which must meet the current ADA requirements. Back slopes shall be 3:1 maximum, 4:1 or flatter desired.

B. **Tangent Length:** Fifty (50) foot tangent lengths shall be required between reverse curves for residential access and residential local streets. The minimum tangent length between reverse curves shall be 100 feet for collector streets and commercial/industrial local streets. Major and minor arterial streets shall comply with current AASHTO guidelines.

C. **Off-Center Street Intersections:** Street jogs are to be avoided on arterial and collector streets. On local streets with right-of-way of sixty (60) feet or less, centerline offsets of less than one hundred (100) feet shall be avoided

D. **Intersection Angle:** It is desirable for all intersections to meet at approximately a ninety degrees (90°) angle. Skewed intersections should be avoided and in no case should the angle be more than one hundred degrees (100°) nor less than eighty degrees (80°).

E. **Intersecting Minor/Major Arterial Streets:** Where any minor or major arterial streets intersect each other, the crowns of both streets shall be uniformly transitioned into a plane at the intersection. Changes from one cross slope to another should be gradual.

F. **Curb Radii:** When two streets of different classification intersect, the higher classification street shall govern the curb radii dimension listed in Table JC-1. Equivalent three-center compound curves may be used in lieu of a single radius curve if the design vehicle can be accommodated. Curb ends facing the flow of traffic shall have a five-foot taper from full height to matching existing condition.

**G. Sight Distance at Intersecting Streets:** Sight distance triangles at intersecting side streets shall be in accordance with the current edition of A Policy on Geometric Design of Highways and Streets, AASHTO. Every effort shall be made to select intersection locations so that the maximum sight distance is possible.

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**H. Considerations for Connection to Existing and Future Streets:** Consideration shall be given to the horizontal and vertical alignment of streets where they connect to existing streets or where streets may be extended in the future.

**5.3.6 Driveways:**

A. All driveway approaches within public R-O-W shall be constructed of concrete. Driveways maybe constructed of concrete or asphalt.

B. Driveway grades shall conform to the typical section of the street within the R-O-W. Driveways shall attain a minimum elevation of six (6) inches above the gutter elevation within the R-O-W with a maximum grade of 8%. The algebraic difference in grades at the R-O-W on crest drives shall be 8% maximum and on sag drives shall be 12% maximum.

C. Grades of driveway approaches shall also be constructed to accommodate required sidewalks. Cross slopes on driveways in line with sidewalks must meet the current ADA requirements.

D. Driveway widths shall be constructed to the dimensions and widths as indicated on the City Standard Detail Sheets, with special provisions being required for driveway greater than 30 feet in width. Special provisions shall be a maximum of 36 foot interior lot separation. Cul-de-sac and corner lot driveway widths maybe constructed up to 36 feet in width at the R-O-W, subject to the special provision of a 5 foot interior lot separation.

**5.3.7 Pavement Transitions:** Reduction in pavement width in the direction of traffic flow shall be accomplished by a taper. The minimum length for merging taper shall be determined by the formula  $L=WxSxS/60$  where posted speeds are 45 mph or less. The formula  $L=WxS$  should be used for roadways having a posted speed limit greater than 45 mph. Under either formula, L=taper length in feet, W=width of the transition, and S=design speed in mph.

**5.3.8 Access for the Disabled:** Ramps shall be required at all planned sidewalk-curb intersections in accordance with standard practice and current ADA requirements. Non-standard driveways and alleys will also be designed to the current ADA requirements.

**5.3.9 Storm Drainage:** All storm drainage shall be designed in accordance with Section 4, Storm Systems.

**5.3.10 Survey Monument Boxes:** Monument boxes shall be installed at all quarter section corners involved in the street construction. The monument boxes shall be set by a Registered Land Surveyor licensed in the State of Kansas.

**5.3.11 Obstructions:** Rigid structures such as poles, signs and hydrants shall be placed a minimum horizontal distance of 1.5 feet from the back of curb to edge of obstruction. When required, guardrail and barricades shall be installed in accordance with the latest AASHTO Roadside Design Guide or as required by the City. Vertical clearance of 14.5 feet shall be provided. Along sidewalks, a minimum vertical clearance of seven feet shall be provided.

**5.3.12 Other Design Criteria:** Design criteria not covered by this document shall be in accordance with the most current edition of A Policy on Geometric Design of Highways and Streets by the American Association of State Highway and Transportation Officials (AASHTO) or other AASHTO design guides.

## **5.4 PAVEMENT DESIGN STANDARDS**

**5.4.1 Minimum Pavement Sections:** The pavement thicknesses shown in Tables JC-2 and JC-3 are the minimum allowed for all street types. All pavement sections shall be constructed on a stabilized subgrade with a minimum CBR of ten (10). Methods to achieve the required subgrade CBR may include: mechanical compaction and/or soil modification with fly-ash, cement, or lime addition. The use of geo-grid reinforced granular sub-base may also be considered.

For Arterial, Collector, and Industrial streets a pavement design shall be completed by a Licensed Professional Engineer within the State of Kansas, and shall be based upon project specific traffic and geotechnical engineering studies.

<b>TABLE JC-2: MINIMUM BITUMINOUS ASPHALT PAVEMENT SECTION</b>					
<b>Street Classificatio n</b>	<b>Pavemen t Option</b>	<b>Asphal t Surfac e (in.)</b>	<b>Asphal t Base (in.)</b>	<b>Granula r Subbas e (in.)</b>	<b>Subgrade Stabilization (in.)</b>
Arterial	A	2	4	12	8
	B	2	7.5	--	12
Collector	A	2	4	12	8
	B	2	7.5	--	12
Local Industrial	A	2	4	12	8
	B	2	7.5	--	12
Local Commercial	A	2	4	12	8
	B	2	5.5	--	12
Local Residential	A	2	4	11	8
	B	2	5.5	--	12
Alleys and Private Parking Lots	A	2	2	11	8
	B	2	5.5	--	12

<b>TABLE JC-3: MINIMUM PORTLAND CEMENT CONCRETE (PCC) PAVMENT SECTIONS</b>			
Street Classification	PCC Surface (in.)	Granular Base (in.)	Subgrade Stabilization (in.)
Arterial	8	6	8
Collector	8	6	8
Local Industrial	8	6	8
Local Commercial	7	6	8
Local Residential	6	6	8
Alleys and private Parking Lots	6	6	8

#### 5.4.2 Pavement Design Criteria:

- A. Minimum AASHTO pavement design parameters for arterial and collector streets are as follows:
  1. Design Life: 35-years.
  2. ADT: Based upon traffic study.
  3. Truck Traffic: Percentage of truck traffic shall be based upon traffic study
  4. Subgrade Support: CBR and k values shall be determined by the project specific geotechnical report.
  5. Stabilized Subgrade: Stabilized subgrade shall not be used as the subgrade soil strength. It shall be treated as “sub-base” layer, and the underlying native soils shall be used for subgrade values.
  6. Terminal Serviceability (pt): 2.5
  7. Reliability: 95% (ZR = -1.645).
- B. The pavement design report must show all the actual parameters used for the design, as well as the design method used.



- C. Arterial and collector street pavements shall include stabilized subgrade. Subgrade stabilization shall be (a) fly-ash treated subgrade, (b) lime treated subgrade or (c) geogrid-reinforced aggregate base or City approved alternative.
- D. Arterial and Collector Street Widening
  - 1. Uncurbed or Interim Street Sections – The widened pavement shall use the crushed aggregate option for subgrade stabilization and have a minimum of 10 inches of bituminous asphalt or City approved alternative.
  - 2. Curbed or improved Streets – The widened pavement shall be the same type as the existing pavement.
- E. Minimum thicknesses for bituminous asphalt pavement are shown in Table JC-2 and Portland Cement Concrete (PCC) pavement are shown in Table JC-3.
- G. Concrete pavement joint details and joint layout patterns, dowelling and tie bar layout shall be per the City Standards.

## **5.5 SIDEWALK DESIGN STANDARDS**

### **5.5.1 General Sidewalk Design**

- A. Sidewalks shall be constructed on both sides of the street and located one (1) foot inside of the ROW line.
- B. Sidewalk cross slope shall be 2% maximum, sloped toward the street. When the running slope of the sidewalk is greater than 5%, the cross slope shall be reduced to 1% maximum.
- C. The standard cross slope between the sidewalk and back of curb is ½” per foot but may be modified with the approval of the City Engineer.
- D. Curb-cut ramps shall be provided at all crosswalks and shall be in accordance with the latest revisions of the Americans with Disabilities Act.
- E. ADA compliant detectible warning areas shall be placed on all ramps at street crossings and at commercial driveways.
- F. Sidewalks shall be constructed of four (4) inch minimum Portland Cement concrete pavement.
- G. Sidewalk ramps shall be constructed of six (6) inch minimum Portland Cement concrete pavement.

### **5.5.2 Sidewalk Widths**

- A. Sidewalks shall have a minimum width of Five (5) feet.
- B. Sidewalks within the Central Business district shall have sidewalks full width from back of curb to building face. Modifications for streetscaping features may be allowed upon approval of the City Engineer.

## **5.6 INSTALLATION**

- A. The installation of streets and sidewalks within the City shall be require inspection by the City Engineer at the following stages:
  - 1. After the sub grade has been rough cut to plan elevation.
  - 2. After the placement of aggregate base.
  - 3. Full-time during the placement of the bituminous asphalt or concrete pavements.
  
- B. The developer or his engineer/ contractor shall be responsible to provide an independent testing firm to certify that the sub-base, aggregate base and bituminous asphalt or concrete meets compaction/ density/ design requirements.