City of Lawrence
Public Works

Plans Preparation &
Design Criteria

SECTION 1 - PLAN SUBMITTAL REQUIREMENTS

1.1 Initial Plan Submittal: The initial plan submittal shall include all of the following documentation: one (1) set of plans, the draft final plat or parcel legal description if the property will not be platted, and one (1) copy of the project specifications. In addition, all plan submittal documentation shall be provided on a CD-ROM, DVD, or equivalent media in portable document format (pdf).

The submittal will not be reviewed if any of the items listed above are incomplete or omitted from the submittal.

1. Plan Sets: One (1) set of plans shall be submitted with the initial submittal. All plan sheets in the initial submittal shall be submitted by a Professional Engineer (P.E.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. Plans will not be reviewed if they are not submitted by a Professional Engineer (P.E.) licensed in the State of Kansas. All references to the Engineer in this document shall be to the Professional Engineer (P.E.) preparing the plans.

2. Draft Final Plat or Parcel Legal Description: The draft final plat shall be provided with the initial plan submittal. The property legal description shall be included on the layout sheet if the property will not be platted. The legal description shall be signed, sealed, and dated by a Professional Surveyor (P.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. It is recommended that draft written easements be submitted with the initial plan submittal.

3. Project Specifications: One (1) copy of the draft project specifications shall be provided with the initial submittal. The Engineer shall identify any special conditions that warrant deviation from the current edit of the City of Lawrence Public Works Standard Technical Specifications.

4. Comments: The initial submittal and all subsequent submittals shall be reviewed by the City of Lawrence. The City of Lawrence shall provide written comments as well as plan “mark-ups” to the Engineer. The Engineer is encouraged to schedule a meeting with staff to review comments following the initial submittal. The Engineer must address all comments by revisions to the initial submittals or by written response as applicable. Plans will not be released for construction until all comments have been addressed by the Engineer.

1.2 Intermediate Submittals: Intermediate submittals shall include all of the following documentation: one (1) set of plans, one (1) copy of the draft final plat or parcel legal description if the property will not be platted, one (1) draft copy of any written easements (if required), one (1) copy of the project specifications (if required), one (1) copy of a written response to comments, and original “mark-ups” as provided to the Engineer with the review of the previous submittal. In addition, all plan submittal

documentation shall be provided on a CD-ROM, DVD, or equivalent media in portable document format (pdf).

The submittal will not be reviewed if any of the items listed above are incomplete or omitted from the submittal.

1. Plan Sets: One (1) set of plans shall be submitted with the initial submittal. All plan sheets in the initial submittal shall be submitted by a Professional Engineer (P.E.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. Plans will not be reviewed if they are not submitted by a Professional Engineer (P.E.) licensed in the State of Kansas. All references to the Engineer in this document shall be to the Professional Engineer (P.E.) preparing the plans.

2. Draft Final Plat or Parcel Legal Description: One (1) copy of the draft final plat shall be provided with intermediate plan submittals. The draft final plat shall fully address all comments from the previous submittal. The property legal description shall be included on the layout sheet if the property will not be platted. The legal description shall be signed, sealed, and dated by a Professional Surveyor (P.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements.

3. Written Easements: One (1) draft copy of all easements required for the project shall be submitted with intermediate submittals. The written easements shall be signed, sealed, and dated by a Professional Surveyor (P.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements.

4. Project Specifications: One (1) copy of the project specifications shall be provided with the intermediate submittal. The Engineer shall fully address all comments from the previous submittal.

5. Written Response to Comments and "Mark-Ups": The engineer shall prepare a written response to all comments received from the previous submittal. The Engineer shall return "mark-ups" received from the previous submittal with corrective actions taken noted on the "mark-up".

1.3 Final Submittal Requirements: Final plan submittal shall include two (2) sets of full-size complete plans, three (3) sets of half-size complete plans, two (2) sets of the project specifications, and one (1) CD-ROM, DVD, or equivalent media containing all final plan submittal documentation in portable document format (pdf). All plan sheets shall be sealed, signed and dated by the Professional Engineer (P.E.) preparing the plans. A project summary letter should accompany the final plan submittal.

1.4 Review Period: Review time for the initial and subsequent submittals shall be ten (10) business days.

SECTION 2 - PLAN REQUIREMENTS

2.1 General: The following is intended to provide a uniform system of plan preparation that will aid the engineer in preparing plans for the City of Lawrence.

1. All plans shall include all information necessary to build and check the design of streets, storm sewer, sidewalk and bike/pedestrian facilities, and other related work. If any atypical circumstances surround a proposed project additional information and analysis beyond the minimum requirements set out below may be required.

2. A set of engineering drawings must be submitted to the City Engineer for approval for all improvements in the public right-of-way and for improvements that will be maintained by the city once construction is completed. No public improvement projects may be constructed in the City of Lawrence without approval of the City Engineer.

3. The City of Lawrence plan review is to check for conformance with city specifications and city code. It is not responsible for the accuracy of the design, dimensions, and elevations of plans after they are approved. All private improvements shown on public improvement plans shall be clearly identified as such and will not be maintained by the City of Lawrence.

4. The project name and project number shall appear on each sheet in a set of plans with the exception of the cross sections and City of Lawrence standard detail sheets. Any special detail sheets showing improvements unique to a particular job shall also have the project name and project number noted on them. All full size plans shall be 24 inches x 36 inches. All public improvement plans are approved for one year, after which they become void and must be resubmitted for approval by the city engineer before construction.

5. The plans shall consist of:
    a. Title Sheet
    b. General Layout, General Notes & Summary of Quantities
    c. Typical Sections
    d. Plan and Profile
    e. Intersection Details
    f. Traffic Control
    g. Storm sewer plan and profile
    h. Erosion and Sedimentation Control Plan
    i. Standard Details
    j. Cross-Sections

2.2 Title Sheet: This section establishes the minimum standards relating to all items that must be included on the title sheet for the project.

1. Project Title: The plat name and phase number, if applicable, shall be included in the project title. If the project will not be platted the physical address shall be used in the project title.

2. Project number. (provided by Public Works Department)

3. Index of sheets: A numerical list of plan sheets

4. General Location Map: A general location map shall be included on the cover sheet. The location map shall show the nearest north-south and east-west arterial streets surrounding the section, township, and range and those in the immediate vicinity of the project area must be shown and labeled. The scale of the vicinity map shall be, at a minimum, 1"=2000'. A north arrow and scale for the map must be noted. The project area shall be labeled and shaded. The section, township, and range where the project is located shall be noted on the general location map.

5. Name and telephone number of the consulting engineer and owner/developer if not the City of Lawrence.

6. Utility Information: The following information shall be provided for all utilities providing service to the project area:

    a. Utility Name
    b. Address
    c. Phone Number
    d. Fax Number
    e. Contact Person
    f. Contact Email Address

7. Signature and Date Lines: Signature and date lines shall be provided for the following personnel:

    a. City Engineer
    b. City Utility Engineer if applicable
    c. City of Lawrence Fire Marshall if applicable

8. Signature and stamp of Professional Engineer registered in the state of Kansas.

2.3 General Notes, General Layout, and Quantities: This section establishes the minimum standards relating to all items that must be included following the title sheet for the project.

1. General notes. The following shall be considered for general notes:

    a. Plans are initially approved for a period of one (1) year, after which they automatically become void and must be updated and re-approved by the City before any construction will be permitted.

b. The City of Lawrence plan review is only for general conformance with City of Lawrence Design Criteria and City Code. The City of Lawrence is not responsible of the accuracy or adequacy of the design. The City of Lawrence through the approval of this document assumes no responsibility other than stated above for the completeness and/or accuracy of this document.
c. The Contractor shall have one (1) signed copy of the plans (approved by the City of Lawrence) and one (1) copy of the Project Specifications on site at all times.
d. All Construction shall conform to the City of Lawrence Complete Standard Technical Specifications in effect on the City's approval date shown on these plans.
e. All workmanship and materials regulated by the City shall be subject to the inspection and approval by City personnel.
f. The contractor is responsible for providing erosion and sediment control to prevent sediment from reaching paved areas, storm sewer systems, drainage courses and adjacent properties. In the event the prevention measures are not effective, the contractor shall remove any debris, silt, or mud and restore all disturbed areas to original or better condition.
g. Maintenance of drainage shall be the contractor's responsibility. Dewatering shall be subsidiary to related items of work.
h. The contractor shall comply with Chapter 9, section 903 of the code of the City of Lawrence regarding storm water pollution prevention. All work related to this will be paid for in the bid item "storm water pollution prevention." This shall include, but not be limited to items such as street cleaning, protecting piled soils from eroding, temporary seeding, etc.
i. The contractor shall notify the appropriate utility companies for location of existing utilities. Any damage to utility lines caused by the contractor's construction operations shall be repaired at the contractor's expense.
j. Utility information shown herein is based on the best information available to the engineer at the time of design. The contractor shall be responsible for verifying, identifying and making their own determinations of utility locations, depths, sizes, etc.
k. The removal of abandoned utilities shall be considered subsidiary to other bid items unless noted otherwise on the plans.
l. All traffic control devices shall be provided, installed, and maintained in accordance with the latest addition of the M.U.T.C.D. If the contractor wishes to develop their own traffic control plan it must be approved by the engineer before it can be implemented on this project.
m. The traffic control requirements shown on these plans are minimum requirements only and do not attempt to address in depth the variety of situations that may occur once construction has started. In no way do the requirements shown on these plans relieve the contractor of his responsibility for selecting the proper traffic control devices and implementation procedures that will assure the safety of motorist, bicyclists, pedestrians, and workers at all times.
n. The contractor shall contact the City of Lawrence Traffic Division at 832-3035 to remove and replace traffic signs which are in conflict with the proposed improvements, but are not specified to be removed as a part of this project.
o. All asphalt and concrete to be removed shall be neatly saw cut. Saw cuts shall be full depth and shall be subsidiary to related bid items. If the contractor exceeds the

pavement removal limits without approval from the engineer, it shall be at the constrictor's expense.

p. All disposal sites must be approved by the Kansas Department of Health and Environment. Materials either stockpiled or disposed of in a flood plain would require a Kansas State Board of Agriculture Permit. Any material dumped in waters of the United States or Wetlands is subject to U.S. Corps of Engineers permitting regulations.
q. Geological information as shown herein was completed with the best information available to the engineer at the time of plan preparation. The contractor shall be responsible for verifying, identifying and making their own determinations of subsurface conditions. All excavation shall be unclassified. No direct payment will be made for rock or pavement excavation. All work shall be considered subsidiary unless otherwise shown in the plans.
r. Flowable fill shall be used to backfill all excavations within two feet of existing or proposed pavement areas. Flowable fill shall be placed to the top of the subgrade.
s. All concrete for publicly maintained infrastructure shall be KCMMB unless otherwise noted in the plans.
t. All work shall be confined done within the construction limits, right of way, easements, or city property as shown in the plans. Any damage to adjacent surfacing, pavement markings, curb, sidewalks, bikeways, driveways, streetlights, signal poles, or other objects within or out of the right of way shall be repaired at the contractor's expense.
u. All manholes, utility valves, and meter pits shall be adjusted or rebuilt to grade as required and set in concrete if in roadway for field adjustment.
v. All sidewalk and sidewalk ramps constructed will be required to comply with the Americans with Disabilities Act (ADA).
w. The contractor shall notify all property owners a minimum of 48 hours in advance of all work pertaining to their entrances.

2. Summary of Quantities: A summary of quantities for the project shall be provided and shall include all items of work for the project.

3. A General Layout should be included with the following:

    a. A legend of symbols
    b. North arrow and scale. Scale of the general layout map shall be a minimum of one inch (1") equals 100 feet (100'), unless otherwise approved.
    c. Names of subdivision
    d. Block designation and lot designation, or proposed block and lots.
    e. All street names.
    f. Boundary line of project area.
    g. Project control benchmarks shall be identified as to location and elevation.
    h. Accurate tie to at least one quarter section corner for platted tract. An unplatted tract shall have an accurate tie to at least two quarter section corners.

4. Project Control Points

a. A minimum of two (2) permanent benchmarks shall be referenced for the project.
b. A minimum of three (3) horizontal control points shall be reference for the project.
c. All benchmarks and control points shall include a verbal description and the location of shall be noted on the general layout sheet.
d. Methodology of topographic map obtainment must be described (Ground survey, LIDAR, etc.).
e. All points shall be surveyed in State Plane Kansas North (feet) NAD 83 for horizontal control and NAVD 88 for vertical control.

5. Typical section for all cross sections with applicable stationing, right of way, and lane width.

2.4 Plan and Profile

1. The plan and profile may be shown on the same sheet with the profile view directly below the plan view. For plan drawings, the minimum scale shall be 1" = 50'.

2. Plan sheets shall include the following:

a. North arrow and scale.
b. Stationing and centerline marked at 100 foot increments, side roads and driveways, and at pertinent locations.
c. Elevation and location of all applicable bench marks.
d. Existing and final contours not to exceed 5 (five) feet.
e. Existing and proposed streets with names and widths.
f. Horizontal curve data.
g. All pavement including sidewalks, bikeways, alleys, driveways, and edge of pavement.
h. Locations and widths of existing and proposed sidewalks and ramps, and dimension from the back of the curb.
i. Station and grade at curb returns (at 1/4 points), unless detailed on Intersection Detail Sheet.
j. All existing and proposed public and private utilities.
k. Location of test borings.
l. Property lines, Right of way, utility easements, drainage easements, pedestrian easements and, construction limits.
m. Trees, buildings, fences, bodies of water, landscaping, signs, lights, traffic signals, and other items of note within 20 feet of the project limits.
n. All trees, landscaping storm sewer structures, pavement, curb, and other items to be removed shall be clearly noted on the plan sheets or on a demolition sheet showing all demolition and removals.

3. The profile view shall include the following:

a. Preferred scale of 1" = 20' horizontal and 1" = 5' vertical. The minimum allowable drawing scale is 1" = 50' horizontal and 1" = 10' vertical.
b. Proposed surface at the centerline of the road.

c. The grade of proposed surface
d. Borings (if applicable).
e. Existing surface (if different than proposed).
f. Elevations of proposed and existing at a minimum of 50 intervals for new construction or reconstruction with grade changes.
g. For new construction or reconstruction with a new profile PVI stations, PVI elevations, K values, length of vertical curves, high and low point stations and elevations, and beginning and end of vertical curves shall be shown.

2.5 Storm Sewer Plan and Profile, Drainage Area Map, and Design Information

1. All design, calculation methods, and construction plan requirements must follow the Stormwater Management Criteria.

2. All construction plans shall be prepared as follows:

   a. Storm system plan and profile views may be shown on the same sheet. The profile limits must match the plan limits on each sheet. All construction notes referencing the drainage system must be provided on the storm system plan and profile sheets only.
   b. Design information must be provided per the attached format. One table per element shall be provided on the profile view. Additional design information is not required unless specifically requested.
   c. The drainage area map must show existing contours, proposed contours, proposed streets, property lines and easements. Drainage areas must be identified for each point of discharge to the drainage system. Drainage areas must be labeled with the receiving structure number. Calculations are not necessary on the drainage area map.

3. Insert this table on the profile near each pipe

PIPE name

DA	0.00	ac	n	0.000	
C	0.0		Q_{full}	0.0	cfs
T_c	0.0	m			
Q_{10}	0.0	cfs	V_{10}	0.0	fps
Q_{100}	0.0	cfs	V_1	0.0	fps

NOTES:

DA	total drainage area to pipe
C	composite C for total DA
T_c	Tc for total DA to pipe
Q_{10}	10-year peak (minimum design)
Q_{100}	100-year peak (must be within R/W or D/E)
n	pipe roughness
Q_{full}	pipe full capacity
V_{10}	actual velocity for Q_{10} (used for outlet structure requirements)
V_1	actual velocity for Q_1 (3 fps min or pipe slope min per table)

Size, slope and material must be listed in construction notes
HGL lines must be plotted on profile for design storm
Substitute Q_{50} for Q_{10} where 50-year minimum design required

4. Insert this table on the profile near each overflow channel

OVERFLOW CHANNEL name

Q_{100}	0.0	cfs
n	0.000	
d_{100}	0.0	ft

NOTES:

Q_{100}	total100-year bypass to overflow channel
n	roughness for uniform channel reach
d_{100}	depth for 0100 (verify D/E width)

Cross-section, slope and fining material must be listed in construction notes

5. Insert this table on the profile near each curb inlet

CURB INLET name

DA	0.00	ac	s road	0.0000	ft/ft
C	0.0		L	0.0	ft
T_i	0.0	m			
Q_{10}	0.0	cfs	Q_{i10}	0.0	cfs
Q_{100}	0.0	cfs	Q_{i100}	0.0	cfs
R_{10}	0.0	cfs	B_{10}	0.0	cfs
R_{100}	0.0	cfs	B_{100}	0.0	cfs

NOTES:

DA	total drainage area to inlet
C	composite C for total DA
T_i	Ti for total DA to inlet
Q_{10}	10-year peak to inlet (add bypass from other inlets)
Q_{100}	100-year peak to inlet (add bypass from other inlets)
R_{10}	allowable 10-year street flow for road slope
R_{100}	allowable 100-year street flow for road slope
s road	road slope or zero for sump
L	inlet length (5' minimum)
Q_{i10}	inlet capacity with 10-year gutter spread
Q_{i100}	inlet capacity with 100-year gutter spread
B_{10}	bypass flow from Q_{10}
B_{100}	bypass flow from Q_{100}

6. Insert this table on the profile near each field inlet

FIELD INLET name

DA	0.00	ac	L	0	ft
C	0.0		Q_i	0.0	cfs
T_i	0.0	m			
Q_{10}	0.0	cfs			
Q_{100}	0.0	cfs	B_{100}	0.0	cfs

NOTES:

DA	total drainage area to inlet
C	composite C for total DA
T_i	Ti for total DA to inlet
Q_{10}	10-year peak to inlet (add bypass from other inlets)
Q_{100}	100-year peak to inlet (add bypass from other inlets)
L	inlet length
Q_i	inlet capacity
B_{100}	bypass flow from Q_{100}

7. Insert this table on the profile near each open channel reach

OPEN CHANNEL name

DA	0.00	ac	n	0.000	
C	0.0		V_{10}	0.0	fps
T_c	0.0	m	d_{10}	0.0	ft
Q_{10}	0.0	cfs	d_{100}	0.0	ft
Q_{100}	0.0	cfs			

NOTES:

DA	total drainage area to channel
C	composite C for total DA
T_c	Tc for total DA to channel
Q_{10}	10-year peak
Q_{100}	100-year peak
n	channel roughness
V_{10}	velocity for Q_{10} (use for lining design)
d_{10}	depth for Q_{10} (use for lining design)
d_{100}	depth for Q_{100} (verify D/E width)

Cross-section, slope and lining material must be listed in construction notes

8. Insert this table on the profile near each culvert

CULVERT name

DA	0.00	ac	K_e	0.0	elev
C	0.0		n	0.000	
T_c	0.0	m			

Q_{10}	0.0	cfs	h_{10}	0000.00	elev
Q_{100}	0.0	cfs	h_{100}	0000.00	elev
TW	0000.00	elev	h_{road}	0000.00	elev

NOTES:

DA	total drainage area to culvert
C	composite C for total DA
T_c	Tc for total DA to culvert
Q_{10}	10-year peak
Q_{100}	100-year peak
TW	assumed tailwater elev
K_e	assumed entrance loss coefficient
n	pipe roughness
h_{10}	headwater elevation for Q_{10}
h_{100}	headwater elevation for Q_{100}
h_{road}	lowest elevation for overtopping

Size, slope and material must be listed in construction notes
Substitute Q_{50} for Q_{10} where 50-year minimum design required

9. A drainage calculations design table providing a stand-alone summery of all information for all items included above is an acceptable alternative to individual design tables.

2.6 Traffic Control

1. A traffic control plan shall be provided for all phases of all projects and shall conform to the latest edition of the *Manual on Uniform Traffic Control Devices*. If a street closure is necessary for construction a signed detour plan shall be included in the traffic control plan.

2.7 Intersection and Drive Details

1. An intersection or driveway detail shall be shown for all reconstructed intersections, approaches to intersections, and for all drives with any grade change. The intersection and drive detail shall include the following:

   a. Elevations of all four corners of ramp landings (if applicable).
   b. Top of curb elevations (TOC) at a minimum of 15 foot increments and at the beginning and end of curves.
   c. TOC elevations at the tie in to the existing pavement, at any point where the grade changes, and any other points that would be needed by the contractor for construction.
   d. Jointing pattern including all dimensions needed for construction with the contraction, isolation, and dowel joints shown shall be provided (for concrete).
   e. Radius points with station, offset, northing, and easting.
   f. Elevation points or contour lines with enough detail to show drainage, crown, flowline, and cross slope for pedestrians in between sidewalk ramps.

g. Curb type shall be clearly labeled including areas of dry curb or transitions from city curb to match private curb.

A profile of the top of curb may be submitted as an alternative for top of curb elevation points.

2.8 Erosion and Sediment Control

1. Stormwater Pollution Prevention Plans (SWP3) and Erosion Control Plans (ECP)

2. For grading which disturbs more than an acre of ground a stamped approved Notice of Intent (NOI) from the Kansas Department of Health & Environment (KDHE) must be submitted to the City of Lawrence Public Works Stormwater Division as well as the corresponding SWP3.

3. For grading disturbing less than an acre of ground an ECP must be submitted to the City of Lawrence Public Works Stormwater Division for review and approval.

2.9 Cross Sections

1. Cross sections shall be provided for all new construction projects and other projects with construction limits outside of the existing curb. The cross section shall include a minimum of 10' beyond right-of-way or 10' beyond the construction limits.

2. Cross sections shall be shown at a minimum of every 50' and at all intersection streets and driveways. Additional cross sections shall be shown as required to clearly describe the extent of construction.

3. Each cross section shall include:

   a. Existing grade shown by dashed lines and proposed grade by a solid line.
   b. Centerline elevation of top of pavement.
   c. Cross slope of pavement and sidewalk.
   d. Elevations of top of curb and sidewalk. (Elevations may be shown on another sheet at a minimum of every 50’ and at all intersection streets and driveways)
   e. Slope of grades.
   f. Right of way.

SECTION 3 - DESIGN CRITERIA

3.1 Governing Specifications

1. Design shall be in accordance with the latest edition of the following specification:

   a. A Policy on Geometric Designs of Highways and Streets. AASHTO (Green Book)

   b. Manual on Uniform Traffic Control Devices for Streets and Highways. FHWA (MUTCD)

   c. Urban Street Design Guide. NACTO

   d. Urban Bikeway Design Guide. NACTO

   e. Transit Street Design Guide. NACTO

   f. Guide for the Development of Bicycle Facilities. AASHTO

   g. Essentials of Bike Parking. APBP

   h. Roadside Design Guide

   i. Highway Capacity Manual

   j. KDOT's Project Development Manual for Non-National Highway System Local Government Road and Street Projects

   k. Kansas Roundabout Guide

   l. Public Rights-of-Way Accessibility Guidelines. (PROWAG)

   m. City of Lawrence Stormwater Management Criteria

3.2 Classifications of Streets

1. Principal Arterial: Principal arterials are streets and highways that serve major activity centers, typically carry the highest traffic volumes, and provide for long-length trips. These roads often define the edges of neighborhoods. They are also often the major roads serving large employment and/or commercial land use clusters. Examples of principle arterials include 6th Street, Iowa Street, and 23rd Street in Lawrence.

2. Minor Arterial: Minor arterials such as 19th Street in Lawrence serve to interconnect with the principal arterial system to provide trips of moderate length and to carry lower traffic volumes. These roads may run through neighborhoods or define neighborhood boundaries, and they may connect major activity centers in neighborhoods (e.g., schools, small commercial centers) to the principal arterial network.

3. Collector: Collector streets provide the connection between local roads and the arterial road system. They are the roads that have about half mobility function and about half property access function. These roads may look similar to some minor arterial streets, but collectors usually have more direct access points to adjoining properties. These roads in other cases may look similar to local roads, but collectors often have much higher traffic volumes than nearby local roads. Collectors are divided into two classes (Major and Minor) for Functional classification purposes. Examples of collectors include Harvard Road between Kasold and Wakarusa in Lawrence.

4. Local Road: Local roads provide direct access to adjacent property. Through traffic is discouraged. The overwhelming function of this type of road is property access, and many residential and commercial driveways connect to this class of roadway. Frequent long distance trips made on this road class and/or high speed travel on these roads often indicates that there is a problem with the network, especially nearby collector and arterial streets. Highways, streets and roads are functionally classified to establish their importance to the overall roadway network, qualification for funding, necessary access control measures, corridor preservation needs, and design standards.

5. The layout of new streets shall conform to the City of Lawrence Land Development Code. http://www.lawrenceks.org/assets/pds/planning/documents/DevCode.pdf

6. A map of Major Thoroughfares can be found at https://assets.lawrenceks.org/assets/mpo/T2040/Thoroughfares.pdf

3.3 Bikeway Plan

1. Bikeway elements at a minimum must comply with the Countywide Bikeway Plan. https://lawrenceks.org/assets/mpo/study/reports/lawrencebikemap.pdf

3.4 Design Criteria Table

	Major Arterial	Minor Arterial	Collector	Residential
Number of Through Lanes	4-5	3-5	2-4	2
Minimum Width of Traffic Lanes	11	11	10	10
Minimum R/W Width (Development Code Article 8)	150'	100' (for 3 lane)	80' 60' Residential	50' 60' Cul-de-sac
Minimum Design Speed	35-45 mph	35-45 mph	30-35 mph	25 mph
Minimum Stopping Sight Distance (grades 3% or less)	250' - 360'	250' - 360'	200' -250'	200' - 155'
Minimum K Crest Vertical Curve	29 - 61	29 - 61	19 - 29	12 - 19
Minimum K Sag Vertical Curve	49 - 79	49 - 79	37 - 49	26 - 37
Minimum Radii Horizontal Curve (no super elevation)	510' - 1039'	510' - 1039'	375' - 583'	219' - 375'
Maximum Grade (Development Code Article 8)	5%	5%	8%	10%
Minimum Grade (Development Code Article 8)	1.0%	1.0%	1.0%	1.0%
Sidewalk Width (Development Code Article 8)	6' on one side 10' Bicycle/Recreation Path on the other side	6' on one side 10' Bicycle/Recreation Path on the other side	5' minimum	5' minimum width. 4' allowed in the Original Townsite area
Curb Return Radius	25' minimum	25' minimum	25' minimum	15' minimum
Minimum Distance from Intersection of R/W to Driveway Curb-cut	300' & in accordance with Access Management Plan	300'	300' Signalized 250' Non-signalized	25'
Intersection Sight Distance	Per AASHTO Requirements			
Maximum Grade at Intersection w/stop			3% within 50'	5% within 25'
Cross Slope	2.0%	2.0%	4.0% (max)	4.0% (max)
Cul-de-sac Radius				39' min

3.5 Maximum and Minimum Grade

1. The City Engineer, as applicable, shall be authorized to approve minor deviations for short distances from these grade standards when it is determined that compliance with these standards is impracticable. Maximum grade of streets serving industrial areas shall be 5% regardless of street classification.

3.5 Intersecting Streets

1. Where any two arterial streets intersect the crowns of both streets shall be uniformly transitioned into a plane at the intersection unless otherwise approved. The changes from one cross slope to another shall be gradual.

2. Local streets intersection opposite sides of another local or collector street when offset shall be offset 300 feet or more.

3. Streets should intersect as nearly as possible at right angles.

3.6 Local Street Length

1. Local streets should be less than 1,320 feet in length. Local streets exceeding 800 feet in length shall include Traffic Calming devices, shown in an adopted City of Lawrence Traffic Calming Policy document.

2. Cul-de-sac lengths shall not exceed 10 times the required minimum lot width of the base zoning district or 1,000 feet (1,320 feet in Unincorporated Area), whichever is less. More information is available in the City of Lawrence Development Code.

3.7 Pavement Section

1. Pavement sections shall be installed in accordance with the asphalt street detail sheet or the concrete sheet detail sheet. Any variances form these standard detail sheets must be approved by the City Engineer.

3.8 Pavement Transition

1. Reduction in pavement width in the direction of traffic flow shall be accomplished by a taper. The minimum desirable length for merging taper shall be determined by the formula $L=WS^2/60$ 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 = taper offset in feet, and S = design speed in mph.