

## 5.0 Plan Development

### 5.1 Introduction

The plan development section of this manual is intended to assist the LPA and the designer through the preliminary engineering phase of project development. Information in this section should also be considered during the project planning and programming phase so that the project scope can be as accurate as possible from the beginning.

### 5.2 Design References

Project design shall be in accordance with accepted engineering practices and all applicable state, AASHTO and federal criteria. These criteria include, but are not limited to the following references:

1. [“A Policy on Geometric Design of Highways and Streets”](#), AASHTO, current edition (Green Book).
2. [“Guidelines for Geometric Design of Very Low-Volume Local Roads”](#), AASHTO, current edition.
3. [“Roadside Design Guide”](#), AASHTO, current edition.
4. [“Road Design Manual, Volume I, Road Section, Parts A & B”](#), KDOT, current edition
5. [“Drainage Design Manual, Volume I, Road Section, Part C”](#), KDOT, current edition
6. [“LRFD Bridge Design Specifications”](#), AASHTO, current edition.
7. [“LRFD Guide Specifications for Design of Pedestrian Bridges”](#), AASHTO, current edition.
8. [“LRFD Bridge Design Manual, Volume III, Bridge Section”](#), KDOT, current edition.
9. [“Survey Manual, Volume II, Survey Section”](#), KDOT, current edition.
10. “Policies for the Rehabilitation of Highways and Bridges for Other than Interstate and Freeways on the State Highway System of Kansas”, KDOT, dated February 14, 1990, for bridge rails on remain-in-place bridges. Bridge rails for remain-in-place bridges may remain in place if the rail is one of the types listed for remain-in-place. Those bridges identified with a “N/Y” will be considered for upgrading or retrofitting on a case-by-case basis if the current AADT is greater than 750 vpd.
11. [“Guide for the Development of Bicycle Facilities”](#), AASHTO, current edition.
12. [“Guide for the Planning, Design and Operation of Pedestrian Facilities”](#), AASHTO, current edition.
13. [“Manual on Uniform Traffic Control Devices”](#), (MUTCD), current edition.
14. [Americans with Disabilities Act \(ADA\) guidelines and standards](#), various publications including PROWAG and ADAAG, United States Access Board, current edition
15. [“Highway Capacity Manual”](#), (HCM), current edition.
16. “Traffic Engineering Guidelines”, KDOT Bureau of Transportation Safety & Technology.
17. [“Standard Specifications for State Road and Bridge Construction”](#), (including “Special Provisions to the Standard Specifications”), KDOT current edition.
18. [“KDOT Access Management Policy”](#), latest version.
19. [“Pavement Marking Policy”](#), KDOT, latest version.
20. [“KDOT Utility Accommodation Policy”](#), latest version.
21. [“A Guide for Accommodating Utilities Within Highway Right-of-Way”](#), AASHTO, current edition.

22. "Guide on Evaluation and Abatement of Traffic Noise", AASHTO, current edition.
23. "[KDOT Temporary Erosion Control Manual](#)", latest version.
24. "Guide for Design of Pavement Structures", AASHTO, current edition.
25. "[Guidance on Traffic Control Devices at Highway-Rail Grade Crossings](#)", FHWA, November 2002.
26. All current applicable BLP memos.

If not otherwise covered in this Manual, the procedures used shall conform to Federal and Kansas law.

### **5.2.1 AASHTO, FHWA and TRB Design Criteria**

The American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration and Transportation Research Board publish nationally recognized design criteria that are required for use in developing federal aid projects.

#### **5.2.1.1 A Policy on Geometric Design of Highways and Streets (AASHTO Green Book)**

Geometric design for new or completely reconstructed county roads and city streets shall be based on the design criteria included in the AASHTO Green Book (Green Book) or Guidelines for Geometric Design of Very Low-Volume Local Roads, as appropriate, and as noted on the KDOT Project Authorization (KDOT Form 883).

##### **5.2.1.1.1 Design Speed**

The design speed is a selected value that is used to determine the design features of a roadway. For a particular facility, the design speed is based on the functional classification of the road, the topography, adjacent land uses, expected traffic volumes, and anticipated operating speed. The Green Book recommends every effort should be made to use a design speed as high as practicable to attain safety, mobility, and efficiency while under the constraints of environmental quality, economics, aesthetics, and social or political impacts. Once selected, all pertinent features of the roadway, e.g. sight distance, horizontal or vertical curvature, should be designed in accordance with the design speed.

For county projects, the design speed selected should be at least equal to the regulatory or posted speed unless justification exists for a lesser design speed. When the design speed used satisfies the applicable Design Guideline Table in this manual but is less than the regulatory speed, mitigation measure(s) should be considered. As an alternative, the use of an operating speed may be considered in a request for an exception.

##### **5.2.1.1.2 Design Exception/Allowance**

If, during the development of plans for a proposed project, the LPA determines that there are circumstances that may make it impracticable to meet the applicable design guidelines, the LPA shall make a written request to BLP for a "design exception" using a summary format like the form in [Figure 5.1](#). All supporting documentation should be included with the submittal as attachments to the summary form. Supporting

documentation should be consistent with *Section 2.3.4* of the *KDOT Design Manual, Volume 1, Bureau of Road Design*.

A request for a design exception may be made at any time in the design process when sufficient information is available to adequately evaluate the alternative solutions. All design exceptions are subject to approval by the Bureau Chief of BLP. The request may involve one or more of the following controlling criteria:

1. Design speed
2. Lane width
3. Shoulder width
4. Bridge width
5. Horizontal alignment
6. Vertical alignment
7. Grades
8. Stopping sight distances
9. Pavement cross slope
10. Superelevation
11. Vertical clearances
12. Horizontal clearance
13. Structural capacity

Justification for the request shall be included along with cost estimates for reasonable alternates. For guidance on information to be included in a design exception, see *Section 2.3.4* of the *KDOT Design Manual, Volume 1, Bureau of Road Design*.

A design allowance may be requested for necessary deviations from criteria or policy not included in the thirteen controlling criteria requiring a design exception. Requests for design allowances should be submitted and documented in the same manner as a design exception request.

BLP will respond to the LPA approving or denying the design exception/allowance request. Requests made prior to field check will be addressed as a part of the field check discussions. When the request is made after, or because of, the field check, the approval may be made prior to office check plans review if sufficient details are available on the field check plans or if additional details are submitted with the request. Otherwise, the response will be made after office check plan review. Approved exceptions will be reflected in the Design Summary Document.

## KANSAS DEPARTMENT OF TRANSPORTATION

### DESIGN EXCEPTION REQUEST

GENERAL INFORMATION		
Project Number:	County/ City:	Route No or Name:
Project Description:		
PROJECT INFORMATION		
Functional Class:	Traffic Volume:	Traffic Volume Yr:
Current Estimate:	Additional Cost to Meet Criteria:	Funding:
Design Life:	Letting Date:	
DESIGN EXCEPTIONS (CHECK ALL THAT APPLY)		
<input type="checkbox"/> Design Speed	<input type="checkbox"/> Stopping Sight Distance	
<input type="checkbox"/> Lane Width	<input type="checkbox"/> Pavement Cross Slope	
<input type="checkbox"/> Shoulder Width	<input type="checkbox"/> Superelevation	
<input type="checkbox"/> Bridge Width	<input type="checkbox"/> Vertical Clearance	
<input type="checkbox"/> Horizontal Alignment	<input type="checkbox"/> Horizontal Clearance	
<input type="checkbox"/> Vertical Alignment	<input type="checkbox"/> Structural Capacity	
<input type="checkbox"/> Grade	<input type="checkbox"/> Other: _____	
<b>Description of Existing Conditions:</b>		
<b>Proposed design values for the exception element (state resource):</b>		
<b>Relationship of proposed to adjoining sections:</b>		
<b>Crash History and Potential Safety Impacts:</b>		
<b>Reasons for not attaining criteria: (such as cost/benefit, crash history, environmental, etc.)</b>		
<b>Proposed Mitigation:</b>		
PREPARED BY:		
DESIGNER SIGNATURE: _____ DATE: _____		
CONCURRENCE BY:		
OWNER (CITY/COUNTY) SIGNATURE: _____ DATE: _____		
CONCURRENCE BY:		
KDOT PROJECT MANAGER SIGNATURE: _____ DATE: _____		
APPROVED BY:		
KDOT BUREAU CHIEF SIGNATURE: _____ DATE: _____		

Attach all supporting documentation (plan details, studies, reports, etc.)

**Figure 5.1: Example Design Exception Request Summary Form**

**5.2.1.2      AASHTO Roadside Design Guide (Roadside Safety)**

Aspects of location, design, roadside appurtenances, and traffic control, including the traffic control plan, shall be given due consideration. This enables the designer to fully evaluate roadside conflicts arising from vehicles leaving the roadway out of control. AASHTO presents a hierarchy of design options for the treatment of fixed objects on the roadside. In order of preference they are:

- Remove the fixed object
- Redesign the fixed object so it can be safely traversed
- Relocate the fixed object to a point where it is less likely to be struck
- Reduce the impact severity by making the object breakaway
- Shield the object with a barrier or impact attenuator
- Delineate the object if none of the above options is appropriate

The AASHTO “Roadside Design Guide”, current edition and AASHTO “Guidelines for Geometric Design of Very Low-Volume Local Roads” (where appropriate) shall be used in determining the clear zone width for new or completely reconstructed rural roads. Deviations from the clear zone width shall be based on engineering judgment and accident experience. The Roadside Safety Analysis Program (RSAP) is one tool available to designers to evaluate design features on a benefit/cost basis.

The 4<sup>th</sup> edition of the “Roadside Design Guide” has expanded the discussion of roadside safety in urban or restricted environments. In an urban environment, there is a high density of development, numerous fixed objects (utility poles, fire hydrants, planters, etc.), and frequent intersections (entrances/sideroads) that result in roadways with lower design speeds. In these restricted environments, the application of the clear zone concept may not be practical.

In an urban environment, a clear zone should be provided, but where this is not practical, every effort will be made to clear the roadside of obstacles (e.g., non-breakaway above ground utilities) for a minimum of a six-foot lateral offset from the face of the curb. If, in a very restricted environment, provision of the six-foot lateral offset is not practical, a lesser value will be considered with appropriate documentation.

The presence of a curb alone does not signify an urban environment. Curbs have very limited re-directional capability except at very low speeds. In areas where urban characteristics are not present, regardless of whether the typical section includes curbing, a clear zone as described in Chapter 3 of the “Roadside Design Guide” shall be used.

On projects where a lateral offset is used in lieu of a clear zone do not show the lateral offset as the clear zone distance on the title sheet.

Where feasible, the length of guard rail through fill sections shall be held to a minimum by the use of 3:1 or flatter slopes. Culverts with an opening height of eight feet or more within the clear zone shall normally have guard rail. The need for protection at lower height openings will be based on engineering judgment.

The guard rail design criteria for span bridges and bridge length boxes shall be consistent in determining protection for the area of concern. For projects utilizing the tables in this manual, the minimum length of protection needed for an open-span bridge rail shall be determined with consideration given to the bridge rail as being the hazard. Other considerations of prevailing conditions, e.g., non-traversable slopes, fixed object in clear-zone, etc., will be addressed as needing protection on a project-by-project basis. The minimum length of protection needed for a bridge length box should be determined with consideration given to the far wing or near wing (special case for multiple boxes) as being the area of concern. Other considerations should be addressed on a project-by-project basis using prevailing conditions.

#### **5.2.1.3      AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400)**

On roadways that are ineligible for Surface Transportation Program (STP) funding, AASHTO's Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) may be used to establish criteria for projects that meet the very low-volume definition. The LPA, or the designer, should notify the BLP project manager of the intent to use these guidelines at the site review/field check meeting and to document their use.

#### **5.2.1.4      AASHTO Guide for the Development of Bicycle Facilities**

The Guide for the Development of Bicycle Facilities shall be used to develop projects that provide on-road bike lanes or other off-roadway facilities such as shared use paths or side paths (shared use paths adjacent to the roadway) that are used for multiple modes of non-vehicular transportation. The primary function of bike lanes and shared use paths is transportation as opposed to trails where the primary function is recreational. The primary function for all projects developed under federal Transportation Enhancement/Alternatives funding will be transportation. A facility used by bicycles must be designed for the expected speeds including considerations of horizontal and vertical alignment, path width, clear zone, intersection conflicts and other design considerations similar to what would be considered in the design of a vehicular roadway.

##### **5.2.1.4.1      Design Speed**

Unlike a roadway project where a single design speed is used, the design of a shared used path may require different design speeds for different areas of terrain types such as steep grades or user abilities/age such as school areas. The design speed should be selected based on the criteria in the "Guide for the Development of Bicycle Facilities" and should be shown in the traffic data on the title sheets. If the project includes roadway and shared use path construction, list separate vehicle and bicycle design speeds in the traffic data.

##### **5.2.1.4.2      Clearances**

Similar to a roadway clear zone, a shared use path should provide a 2' clear area beyond the path edge that is clear of fixed objects such as large rocks, utility poles, railings and bridge piers. Path bridges should also provide this clearance resulting in a typical minimum bridge width for a path of 14'-0". If necessary, due to site constrictions, clearances to smooth objects such as a railing may be reduced to 1'-0". When near downward slopes steeper than 3:1, or parallel to water bodies, a wider separation should be considered, and a physical barrier may be required if the separation between the slope and trail is less than 5'. A vertical

clearance of 10' is also required over a shared use path and adjacent clear areas which may require removal or trimming of trees and should be noted on the plans.

Separation between sidepaths and adjacent roadways should be reviewed. A sidepath immediately adjacent to the back of curb is not acceptable as it places a curb high drop-off immediately adjacent to the path. A minimum separation of 5' is desired. If concrete pavement is extended across the separation area to eliminate mowing, an edge line or change in texture should be considered so that the cyclist is aware that this is not additional path width. If parking is allowed on the street adjacent to a sidepath, the vehicle overhang and door swing should be considered in evaluation of clear areas and separation widths.

#### **5.2.1.4.3 Design Exception/Allowance**

Bicycle facilities shall be subject to the same Design Exception/Allowance categories and process as roadways. See [Section 5.2.1.1.2](#) above.

#### **5.2.1.5 FHWA Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)**

The Manual on Uniform Traffic Control Devices for Streets and Highways shall be used to establish minimum criteria for permanent and temporary traffic control items incorporated into projects developed through BLP. This includes items such as warrant analyses for traffic signals as required to determine if the work can be included in the project.

#### **5.2.1.6 FHWA Competitive Bidding Requirements**

FHWA programs (as well as KDOT programs) are based on the concept of open and fair competitive bidding as the best method of providing economical projects to the public. This concept is the basis for the following criteria for plans production:

##### **5.2.1.6.1 Proprietary/Sole Source Items**

The use of proprietary or sole source items does not provide for open competitive bidding and, in general, is not acceptable. Project plans should avoid the use of specifying specific models or brands in the Contract Documents. Generic details showing the requirements of the items are preferred. If it is necessary to show specific manufacturer's designations to clearly show design intent, information from multiple manufacturers plus the phrase "or approved equal" shall be shown in the Contract Documents. Typically, three manufacturers should be shown but there may be cases where two listings are acceptable.

There may be cases where synchronization (for example, consistent use of a manufacturer/model of a traffic signal controller) or replication of a historical feature such as a type of light pole is in the best interest of the public and the project. In these cases, a [Proprietary Product Certification form](#) shall be submitted to BLP for review and concurrence in the use of a synchronization item. See [Section 5.5.8](#) below for more information related to submitting a PIF or Certification request.

**5.2.1.6.2    Unit Prices**

In general, situations that require a special bid item should be based on a unit price rather than a lump sum basis. This allows all Contractors to bid on the same known quantity.

**5.2.1.7        TRB Highway Capacity Manual (HCM)**

The Highway Capacity Manual shall be used for roadway segment and intersection operational analysis. Use of micro simulation software for operational analysis may be requested by the designer and will be approved for use by KDOT on a case by case basis.

**5.2.2    United States Access Board ADA Guidelines**

The U.S. Department of Transportation (DOT) adopted the 2004 ADA Accessibility guideline in a Final Rule dated October 30, 2006 (ADAAG). These guidelines provide consistent usability for buildings and on-site facilities but do not address the public rights-of-way pedestrian environment.

The Public Rights-of Way Accessibility Guidelines (PROWAG) were developed to specifically address designing new or altered public sidewalks, street crossings, and related pedestrian facilities. The PROWAG are not standards until the rule making process is complete but are the recommended best practices for areas not fully addressed by the present ADAAG standards. PROWAG is consistent with the ADA's requirement that all new facilities (and altered facilities to the maximum extent feasible) be designed and constructed to be accessible to and useable by people with disabilities. In this regard DOT (and KDOT) recognized PROWAG as an equivalent facilitation and is the recommended approach for providing consistent usability within public rights-of-way.

Consistency with ADA in the public rights-of-way can be achieved by agencies and designers in several ways.

- Follow the PROWAG.
- \*\*Follow the ADAAG but supplement with PROWAG only where ADAAG is silent.
- \*\*Follow the ADAAG but must have reasonable and consistent policies for accessibility for persons with disabilities where ADAAG is silent.

\*\*Note: Specification section 824 requires the use of PROWAG criteria for ramp construction.

Additional guidance provided by the Department of Justice (DOJ) clearly defines alterations and action that must be taken due to alterations. That guidance is summarized in the following chart:



**Joint Technical Assistance**

- Distinguishes alterations from maintenance based on the type of road treatment:

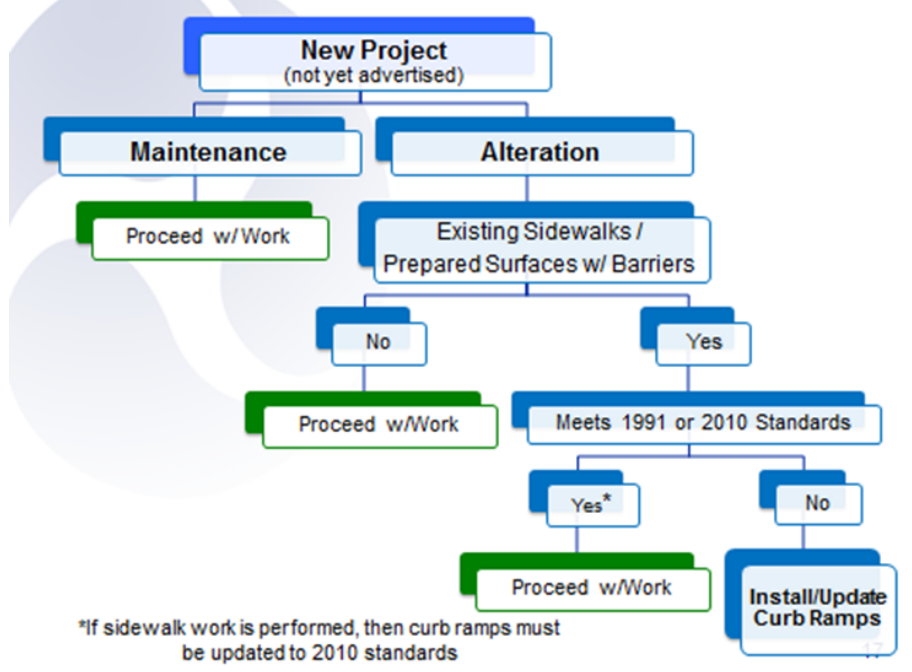
**MAINTENANCE**

Chip Seals	Fog Seals	Scrub Sealing
Crack Filling and Sealing	Joint Crack Seals	Slurry Seals
Diamond Grinding	Joint repairs	Spot High-Friction Treatments
Dowel Bar Retrofit	Pavement Patching	Surface Sealing

**ALTERATION**

Addition of New Layer of Asphalt	Mill & Fill / Mill & Overlay
Cape Seals	New Construction
Hot In-Place Recycling	Open-graded Surface Course
Microsurfacing / Thin-Lift Overlay	Rehabilitation and Reconstruction

12

**Curb Ramp Update Guidance Chart**

It is important to note that these guidelines extend to temporary work zone conditions. The temporary traffic control plans must consider the ability of pedestrians, both able and disabled, to travel safely through or around the construction site. The temporary traffic control plans within the Design Plans shall include the designer's plan for handling multi-modal traffic during construction, including detour routes and road/sidewalk closings, if necessary, and installation of alternate or temporary pedestrian accessible paths to

pedestrian facilities in the public rights-of-way. The temporary traffic control plan, including the accessibility aspects, must be in conformance with the latest version of the MUTCD.

### **5.2.3 KDOT Design Manuals**

#### **5.2.3.1 The most current editions of manuals, guidelines and policies published by KDOT should be used during project development and design. Policy & Informational Memos**

Project development should also be consistent with the most current and applicable KDOT policies and informational memos.

##### **5.2.3.1.1 Pipe Materials**

KDOT has developed a [Pipe Policy](#) to identify the materials that will be allowed in various situations and locations around the State.

##### **5.2.3.2 Surveys**

With the increasing availability of public domain GIS data, it is possible to generate a document that closely represents a set of design plans by overlaying several data sets over a common base. However, many of these sources were developed as administrative or planning tools. Although these overlays would suffice for concept plans or the delineation of drainage areas, BLP does not consider these data sets sufficiently precise for use as design plans, particularly where permanent or temporary land rights are being acquired or projects that require grading or surfacing.

Many of the KDOT standards bid items or tables used to summarize quantities are based on a traditional Station and Offset layout. For linear transportation projects, the use of coordinate only plans are discouraged.

Alignment control and ties to the public land system shall be provided on the project in accordance with the [“Survey Monument Guidelines for Project/Plan Development”](#) located in [Appendix A](#) below. Horizontal control points and benchmarks, including references for recovery, shall be provided on the project site. The establishment of the control points should be established with the same equipment limitations and accuracy requirements as would be required for the bid item “Contractor Construction Staking” to avoid issues in accuracy between the design and construction surveys. The bid item “Contractor Construction Staking” does not allow the use of GPS for the vertical component of control point, finish staking, or critical bridge member staking.

##### **5.2.3.3 Bid Items**

On State-let projects, standard KDOT bid items shall be used whenever possible including the proper use of bid item syntax as described in the specification. It is also helpful if the options allowed by the bid item are in a configuration that is currently listed in the [KDOT Bid Item List](#). Where it is not possible to use an existing bid items, the designer will be required to prepare a Project Special Provision. See [Section 5.5.2.1.2](#) below.

**5.2.3.4     Non-bridge Structures**

All non-standard structures, including drainage structures, walls and other miscellaneous structures, should be designed and reviewed by a structural engineer.

The height of retaining walls in this section refers to the height from the top of footing or leveling pad to the top of the wall cap. Retaining walls less than three feet in height are not required to be designed or reviewed by a structural engineer. LRFD Design will be required for retaining walls greater than six feet in height. Retaining walls greater than six feet in height and on KDOT R/W are required to have a serial number. The LPA or the designer should request a serial number in accordance with [Section 17.0 Bridge Design](#) in this Manual.

Walls less than six feet in height may be bid as “Landscape Retaining Wall” and utilize the design criteria of the National Concrete Masonry Association Design Standards if they meet all geometric criteria in the Specification and are on the Bureau of Materials and Research list of approved systems (or alternatively, provide additional documentation as described in the specification). This landscape retaining wall specification is limited to MSEW and MBW systems. Walls less than 6 feet in height that are not MSEW or MBW systems shall be designed by LRFD criteria and may require preparation of a project special provision.

All cast-in-place concrete structures including conventional retaining walls, integral sidewalk retaining walls, new RCB structures, RCB modifications, wingwall extensions and other miscellaneous structures, will be bid by the individual quantities for concrete, reinforcing steel and excavation (and any other necessary pay items). Plans shall include the appropriate details and material schedules (Bill of Reinforcing Steel) to develop the appropriate quantities.

**5.2.4     Design Criteria Tables**

The tables of design criteria in this section were developed in compliance with all applicable AASHTO criteria and, where applicable, KDOT Design Manuals. When a conflict exists between the criteria tables and other KDOT references, the information contained herein shall control except as supplemented by BLP Memos.

VI.1A COUNTY DESIGN GUIDELINES - NEW OR COMPLETELY RECONSTRUCTED  
MAJOR COLLECTOR ROADS (English Units)

(1) DESIGN ELEMENT																		
(2) AADT	0 - 100			101 - 250			251 - 400			401 - 1500			1501 - 2000			OVER 2000		
(3) TERRAIN ###	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H
DESIGN SPEED (MIN.) mph	40	30	25	40	30	25	40	30	25	50	40	30	50	40	30	60	50	40
STOPPING SIGHT DISTANCE ft.	305	200	155	305	200	155	305	200	155	425	305	200	425	305	200	570	425	305
RATE OF CURVATURE (K)-CREST --	44	19	12	44	19	12	44	19	12	84	44	19	84	44	19	151	84	44
RATE OF CURVATURE (K)-SAG --	64	37	26	64	37	26	64	37	26	96	64	37	96	64	37	136	96	64
(4) ROADBED/RCB CULVERT WIDTH ft.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
(5) WIDTH OF TRAVELED WAY ft.	20	20	20	20	20	20	20	20	20	22	22	20	22	22	22	24	24	24
(6) SHOULDER WIDTH ft.	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.0 <sup>(13)</sup>	5.0 <sup>(13)</sup>	5.0 <sup>(13)</sup>	6.0	6.0	6.0	8.0	8.0	8.0
(14) PAVEMENT CROWN (HIGH TYPE SURF) %	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
(14) PAVEMENT CROWN (LOW TYPE SURF) %	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0
(7) FORESLOPE --	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:4H	1V:4H	1V:3H	1V:4H	1V:4H	1V:3H	1V:4H	1V:4H	1V:3H
(8) BACKSLOPE --	1V:2H	1V:2H	1V:2H	1V:2H	1V:2H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H
(9) MAXIMUM GRADE %	7	9	10	7	9	10	7	9	10	6	8	9	6	8	9	5	7	8
(10) BRIDGE WIDTH - NEW & < 100 ft. ft.	24	24	24	24	24	24	24	24	24	28	28	26	30	30	30	40	40	40
(10) BRIDGE WIDTH - NEW & ≥ 100 ft. ft.	24	24	24	24	24	24	24	24	24	28	28	26	28	28	28	30	30	30
(11) BRIDGE WIDTH - EXISTING ft.	22	22	22	22	22	22	22	22	22	22	22	22	24	24	24	28	28	28
(12) CLEAR ZONE ft.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

### F=Flat, R=Rolling, H=Hilly

References:

"A Policy on Geometric Design of Highways and Streets", AASHTO, 2011

"Roadside Design Guide", AASHTO, 2011

NOTES:

(1) Design elements common to all roadways:

Maximum superelevation = 8%

Normal ditch is 8 ft. x 2 ft. or as needed to accommodate the drainage.

Bridge loading -- New - HS-20, Existing - H-15

R/W width shall be sufficient to accommodate the grading section.

(2) Use design year AADT. Design year is typically 20 years from the time of design/construction.

(3) Prevailing slopes of natural ground are: Flat--3% or less, Rolling--between 3% and 9%, Hilly--9% or greater.

(4) Roadbed/culvert width shall be sufficient to accommodate proposed surface, shoulders, planned future base and, if necessary, guardrail. An approximate clear zone should also be provided in accordance with the AASHTO "Roadside Design Guide".

(5) Roadway may be surfaced full roadway width which includes shoulders.

(6) Minimum width of shoulder is 4 ft. if roadside barrier is used.

(7) For paved roads, when the fill exceeds 6 ft., the slope may be 1V:3H regardless of terrain or traffic volumes.

(8) For paved roads, when the ditch cut exceeds 5 ft., the back slope may be steepened.

(9) Maximum grade may be increased by one percent (1%) for short distances (less than 500 ft.).

(10) a. Where the approach roadway is surfaced for the full width, that surfaced width shall be carried across the structure.

b. RCB bridge width shall not be less than the roadway.

(11) a. Structures over 100 ft. in length will be analyzed individually considering clear width provided, crash history, traffic volumes, remaining structure life, design speed, and other factors.

b. Clear width between curbs or railings, whichever is less, should be equal to or greater than the approach traveled way width, wherever practical.

(12) Clear zone shall be determined in accordance with the latest version of the AASHTO "Roadside Design Guide".

(13) Shoulder width may be reduced for design speeds greater than 30 mph as long as a minimum roadway width of 30 ft. is maintained.

(14) High types surfaces are generally concrete or bituminous surfaced. Low type surfaces include earth, crushed stone, or other similar material.

General Comment:

Each design element should reflect the most practicable and economically justified value. Values below the design criteria set out in the current edition of AASHTO "A Policy on Geometric Design of Highways and Streets" (Green Book), Chapter 6 will only be considered on a project-by-project basis, provided that a design exception is justified to KDOT. Under favorable conditions, the use of more liberal design criteria is encouraged.

Figure 5.2: Design Guidelines for New or Completely Reconstructed Major Collector Roads



VI.2A COUNTY DESIGN GUIDELINES - NEW OR COMPLETELY RECONSTRUCTED MINOR COLLECTOR ROADS (English Units)																		
DESIGN ELEMENT	0 - 100			101 - 250			251 - 400			401 - 1500			1501 - 2000			OVER 2000		
AADT																		
TERRAIN ###	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H
DESIGN SPEED (MIN.) mph	40	30	25	40	30	25	40	30	25	50	40	30	50	40	30	60	50	40
STOPPING SIGHT DISTANCE ft	215	135	115	215-250 <sup>(13)</sup>	135-165 <sup>(13)</sup>	115-125 <sup>(13)</sup>	250	165	125	425	305	200	425	305	200	570	425	305
RATE OF CURVATURE (K)-CREST --	22	9	7	22-29 <sup>(13)</sup>	9-13 <sup>(13)</sup>	7-8 <sup>(13)</sup>	29	13	8	84	44	19	84	44	19	151	84	44
RATE OF CURVATURE (K)-SAG --	64	37	28	64	37	28	64	37	28	96	64	37	96	64	37	136	96	64
ROADBED/RCB CULVERT WIDTH ft	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WIDTH OF TRAVELED WAY ft	20	20	20	20	20	20	20	20	20	22	22	20	22	22	22	24	24	24
SHOULDER WIDTH ft	2	2	2	2	2	2	2	2	2	5 <sup>(14)</sup>	5 <sup>(14)</sup>	5 <sup>(14)</sup>	6	6	6	8	8	8
PAVEMENT CROWN (HIGH TYPE SURF) %	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
PAVEMENT CROWN (LOW TYPE SURF) %	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0
FORESLOPE --	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:3H	1V:4H	1V:4H	1V:3H	1V:4H	1V:4H	1V:3H	1V:4H	1V:4H	1V:3H
BACKSLOPE --	1V:2H	1V:2H	1V:2H	1V:2H	1V:2H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H	1V:3H	1V:3H	1V:2H
MAXIMUM GRADE %	7	9	10	7	9	10	7	9	10	6	8	9	6	8	9	5	7	8
BRIDGE WIDTH - NEW & < 100 ft ft	24	24	24	24	24	24	24	24	24	28	28	26	30	30	30	40	40	40
BRIDGE WIDTH - NEW & ≥ 100 ft ft	24	24	24	24	24	24	24	24	24	28	28	26	28	28	28	30	30	30
BRIDGE WIDTH - EXISTING ft	22	22	22	22	22	22	22	22	22	22	22	22	24	24	24	28	28	28
CLEAR ZONE m	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

### F=Flat, R=Rolling, H=Hilly

NOTES:

(1) Design elements common to all roadways:  
Maximum superelevation = 8%  
Normal ditch is 8 ft. x 2 ft. or as needed to accommodate the drainage.  
Bridge loading – New - HS-20, Existing - H-15  
R/W width shall be sufficient to accommodate the grading section.

(2) Use design year AADT. Design year is typically 20 years from the time of design/construction.

(3) Prevailing slopes of natural ground are: Flat--3% or less, Rolling--between 3% and 9%, Hilly--9% or greater.

(4) Roadbed/culvert width shall be sufficient to accommodate proposed surface, shoulders, planned future base and, if necessary, guardrail. An approximate clear zone should also be provided in accordance with the AASHTO "Roadside Design Guide".

(5) Roadway may be surfaced full roadway width which includes shoulders.

(6) Minimum width of shoulder is 4 ft. if roadside barrier is used.

(7) For paved roads, when the fill exceeds 6 ft., the slope may be 1V:3H regardless of terrain or traffic volumes.

(8) For paved roads, when the ditch cut exceeds 5 ft., the back slope may be steepened.

(9) Maximum grade may be increased by one percent (1%) for short distances (less than 500 ft.).

(10) a. Where the approach roadway is surfaced for the full width, that surfaced width shall be carried across the structure.  
b. RCB bridge width shall not be less than the roadway.  
c. For AADT<400, bridges greater than 100 ft. in length should be evaluated individually to determine the appropriate bridge width.

(11) a. Structures over 100 ft. in length will be analyzed individually considering clear width provided, crash history, traffic volumes, remaining structure life, design speed, and other factors.  
b. Clear width between curbs or railings, whichever is less, should be equal to or greater than the approach traveled way width, wherever practical.  
c. For AADT <400, existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem related to the width of the bridge.

(12) Clear zone shall be determined in accordance with the latest version of the AASHTO "Roadside Design Guide" or AASHTO "Guidelines for Geometric Design for Very Low-Volume Local Roads".

(13) Use low end of range for lower risk locations, e.g., away from intersections, narrow bridges, railroad-highway grade crossings, sharp curves, and steep downgrades.  
Use high end of range for higher risk locations, e.g., near intersections, narrow bridges, railroad-highway grade crossings, sharp curves, and steep downgrades.

(14) Shoulder width may be reduced for design speeds greater than 30 mph as long as a minimum roadway width of 30 ft. is maintained.

(15) High types surfaces are generally concrete or bituminous surfaced. Low type surfaces include earth, crushed stone, or other similar material.

General Comments:

Design values in this table for AADT less than 400 vpd are based on the AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads". These values are considered minimums for application on roads driven primarily by familiar drivers. An important component of these guidelines is the incorporation of substantial design flexibility based on a knowledge of highway design principles, traffic engineering, safety engineering and specific knowledge of local conditions. This flexibility is intended to be exercised only by a qualified professional engineer. In all other cases, the design should be based on the criteria contained in the AASHTO "A Policy on Geometric Design of Highways and Streets".

Each design element should reflect the most practicable and economically justified value. Values below the design criteria set out in the current edition of AASHTO "A Policy on Geometric Design of Highways and Streets" (Green Book), Chapter 5 or AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads" will only be considered on a project-by-project basis, provided that a design exception is justified to KDOT. Under favorable conditions, the use of more liberal design criteria is encouraged.

References:

"A Policy on Geometric Design of Highways and Streets", AASHTO, 2011

"Guidelines for Geometric Design of Very Low Volume Local Roads (ADT ≤ 400)", AASHTO, 2001

"Roadside Design Guide", AASHTO, 2011

Figure 5.3: Design guidelines for New or Completely Reconstructed Minor Collector Roads

LPA Project Development Manual

January 2018 Edition

5-13



**M.3A COUNTY DESIGN GUIDELINES - NEW OR COMPLETELY RECONSTRUCTED  
LOCAL ROADS (English Units)**

DESIGN ELEMENT	0 - 50			51 - 250			251 - 400			401 - 1500			1501 - 2000			OVER 2000		
AADT	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H
TERRAIN ###	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H	F	R	H
DESIGN SPEED (MIN.) mph	30	20	20	30	30	20	40	30	20	50	40	30	50	40	30	50	40	30
STOPPING SIGHT DISTANCE ft	135	90	90	135-165 <sup>(1)</sup>	135-165 <sup>(1)</sup>	90-95 <sup>(1)</sup>	250	165	95	425	305	200	425	305	200	425	305	200
RATE OF CURVATURE (K)-CREST --	9	4	4	9-13 <sup>(1)</sup>	9-13 <sup>(1)</sup>	4-6 <sup>(1)</sup>	29	13	5	84	44	19	84	44	19	84	44	19
RATE OF CURVATURE (K)-SAG --	37	17	17	37	37	17	64	37	17	96	64	37	96	64	37	96	64	37
ROADBED/RCB CULVERT WIDTH ft	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WIDTH OF TRAVELED WAY ft	20	20	20	20	20	20	20	20	20	22	20	20	22	22	22	24 <sup>(1)(5)</sup>	24 <sup>(1)(5)</sup>	24 <sup>(1)(5)</sup>
SHOULDER WIDTH ft	2	2	2	2	2	2	2	2	2	5 <sup>(4)</sup>	5 <sup>(4)</sup>	5 <sup>(4)</sup>	6	6	6	8	8	8
PAVEMENT CROWN (HIGH TYPE SURF) %	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0	1.5-2.0
PAVEMENT CROWN (LOW TYPE SURF) %	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0	2.0-6.0
FORESLOPE --	3:1	3:1	3:1	3:1	3:1	3:1	3:1	3:1	3:1	4:1	4:1	3:1	4:1	4:1	3:1	4:1	4:1	3:1
BACKSLOPE --	2:1	2:1	2:1	2:1	2:1	2:1	3:1	3:1	2:1	3:1	3:1	2:1	3:1	3:1	2:1	3:1	3:1	2:1
MAXIMUM GRADE %	7	11	11	7	10	11	7	10	11	6	10	10	6	10	10	6	10	10
BRIDGE WIDTH - NEW & < 100 ft	24	24	24	24	24	24	24	24	24	28	26	26	28	28	28	40	40	40
BRIDGE WIDTH - NEW & ≥ 100 ft	24	24	24	24	24	24	24	24	24	28	26	26	28	28	28	30	30	30
BRIDGE WIDTH - EXISTING	20	20	20	20	20	20	22	22	22	22	22	22	24	24	24	28	28	28
CLEAR ZONE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NORMAL DITCH	2 ft. x 2 ft.			4 ft. x 2 ft.			6 ft. x 2 ft.			8 ft. x 2 ft.			8 ft. x 2 ft.			8 ft. x 2 ft.		

### F=Flat, R=Rolling, H=Hilly

References:

"A Policy on Geometric Design of Highways and Streets", AASHTO, 2011

"Guidelines for Geometric Design of Very Low Volume Local Roads", AASHTO, 2001

"Roadside Design Guide", AASHTO, 2011

**NOTES:**

(1) Design elements common to all roadways:  
 Maximum superelevation = 8%  
 Bridge loading -- New - HS-20, Existing - H-15  
 R/W width shall be sufficient to accommodate the grading section.

(2) Use design year AADT. Design year is typically 20 years from the time of design/construction.

(3) Prevailing slopes of natural ground are: Flat--3% or less, Rolling--between 3% and 9%, Hilly--9% or greater.

(4) Roadbed/culvert width shall be sufficient to accommodate proposed surface, shoulders, planned future base and, if necessary, guardrail. An approximate clear zone should also be provided in accordance with the AASHTO "Roadside Design Guide".

(5) Roadway may be surfaced full roadway width which includes shoulders.

(6) Minimum width of shoulder is 4 ft. if roadside barrier is used.

(7) For paved roads, when the fill exceeds 6 ft., the slope may be 3:1 regardless of terrain or traffic volumes.

(8) For paved roads, when the ditch cut exceeds 5 ft., the back slope may be steepened.

(9) Maximum grade may be increased by one percent (1%) for short distances (less than 500 ft.).

(10) a. Where the approach roadway is surfaced for the full width, that surfaced width shall be carried across the structure.  
 b. RCB bridge width shall not be less than the roadway.  
 c. For AADT < 400, bridges greater than 100 ft. in length should be evaluated individually to determine the appropriate bridge width.

(11) a. Structures over 100 ft. in length will be analyzed individually considering clear width provided, crash history, traffic volumes, remaining structure life, design speed, and other factors.  
 b. Clear width between curbs or railings, whichever is less, should be equal to or greater than the approach traveled way width, wherever practical.  
 c. For AADT < 400, existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem related to the width of the bridge.

(12) Clear zone shall be determined in accordance with the latest version of the AASHTO "Roadside Design Guide".

(13) Use low end of range for lower risk locations, e.g., away from intersections, narrow bridges, railroad-highway grade crossings, sharp curves, and steep downgrades.  
 Use high end of range for higher risk locations, e.g., near intersections, narrow bridges, railroad-highway grade crossings, sharp curves, and steep downgrades.

(14) Shoulder width may be adjusted to achieve a minimum roadway width of 30 ft. for design speeds greater than 40 mph.

(15) Where the width of the traveled way is shown as 24 ft., the width may remain at 22 ft. on reconstructed roadways where alignment and safety records are satisfactory.

(16) High types surfaces are generally concrete or bituminous surfaced. Low type surfaces include earth, crushed stone, or other similar material.

**General Comments:**

Design values in this table for AADT less than 400 vpd are based on the AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads". These values are considered minimums for application on roads driven primarily by familiar drivers. An important component of these guidelines is the incorporation of substantial design flexibility based on a knowledge of highway design principles, traffic engineering, safety engineering and specific knowledge of local conditions. This flexibility is intended to be exercised only by a qualified professional engineer. In all other cases, the design should be based on the criteria contained in the AASHTO "A Policy on Geometric Design of Highways and Streets".

The subclass used for the criteria is the agricultural access road. If the designer determines a different subclass is appropriate for a specific site, the criteria should be modified accordingly.

Each design element should reflect the most practicable and economically justified value. Values below the design criteria set out in the current edition of AASHTO "A Policy on Geometric Design of Highways and Streets" (Green Book), Chapter 5 or AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads" will only be considered on a project-by-project basis, provided that a design exception is justified to KDOT. Under favorable conditions, the use of more liberal design criteria is encouraged.

Figure 5.4: Design guidelines for New or Completely Reconstructed Local Roads

VII.1A COUNTY AND NON URBAN (CITIES LESS THAN 5,000 POPULATION)  
DESIGN GUIDELINES - NEW OR COMPLETELY RECONSTRUCTED  
MAJOR COLLECTOR, MINOR COLLECTOR, OR LOCAL  
CURB AND GUTTER ROADS AND STREETS (English Units)

DESIGN ELEMENT		COLLECTOR	LOCAL
<sup>(1)</sup> AADT/DESIGN TRAFFIC VOLUME		10 - 20 YR. VOLUME	10 - 20 YR. VOLUME
<sup>(2)</sup> DESIGN SPEED (MIN.)	mph	--	--
<sup>(11)</sup> PAVEMENT CROWN	%	1.5 TO 2.0	1.5 TO 2.0
<sup>(2)</sup> SUPERELEVATION -- MAXIMUM	%	4	4
<sup>(3)</sup> NUMBER OF LANES		2	2
<sup>(4)</sup> LANE WIDTH	ft.	10 TO 12	10 TO 12
<sup>(5)</sup> PARKING LANE	ft.	7 TO 10	7 TO 10
CURB CUT RAMPS		YES	YES
<sup>(6)</sup> SHOULDERS/CURB & GUTTER		--	--
<sup>(7)</sup> HORIZONTAL CLEARANCE -- CURB	ft.	--	--
<sup>(7)</sup> HORIZONTAL CLEARANCE -- SHO.	ft.	SAME AS RURAL	SAME AS RURAL
<sup>(8)</sup> MAXIMUM GRADE	%	9	11
BRIDGE WIDTH -- NEW (CURB)	ft.	FACE OF CURBS	FACE OF CURBS
BRIDGE WIDTH -- NEW (SHOULDER)	ft.	SAME AS RURAL	SAME AS RURAL
<sup>(9)</sup> BRIDGE WIDTH -- EXISTING	ft.	EXISTING ROADWAY	EXISTING ROADWAY
BRIDGE LOADING -- NEW		HS-20	HS-20
BRIDGE LOADING -- EXISTING		SAME AS RURAL	SAME AS RURAL
CURBS, DRAINAGE, SIDEWALK, ETC.		SEE GREEN BOOK	SEE GREEN BOOK
<sup>(10)</sup> RIGHT OF WAY	ft.	--	--
<sup>(12)</sup> CLEAR ZONE	ft.	--	--

References:  
"A Policy on Geometric Design of Highways and Streets", AASHTO, 2011  
  
"Roadside Design Guide", AASHTO, 2011

- NOTES:
- <sup>(1)</sup> Use current AADT for low traffic volumes (less than 600 AADT/100 DHV)
  - <sup>(2)</sup> Design speed should be equal to or greater than the posted or regulatory speed. Adjustments in the design speed may be considered to be consistent with the roadway cross-section, available right of way, terrain, adjacent development or other area controls.
  - <sup>(3)</sup> Provide two through-traffic lanes. Additional lanes may be considered if traffic volumes warrant. Refer to Green Book for adding additional lanes.
  - <sup>(4)</sup> Desirable traffic lane width in industrial areas or locations with high volumes of trucks is 12 ft. where feasible; use 11 ft. minimum width for these locations. Turning lane widths should range from 10 to 12 ft.
  - <sup>(5)</sup> Parking lanes are to be provided where necessary, however federal aid may not pay for this item.
  - <sup>(6)</sup> The width of the shoulder or curb & gutter should be consistent with the remainder of the cross section.
  - <sup>(7)</sup> A minimum operational clearance of 1.5 ft. should be provided beyond the face of curb to any obstruction. An effort should be made to provide greater distance, up to the appropriate clear zone, where practicable.
  - <sup>(8)</sup> Maximum grades may be increased by one percent (1%) for short distances.
  - <sup>(9)</sup> a. Structures over 100 ft. long will be evaluated individually.  
b. The existing structure widths should fit the proposed alignment, profile, and cross section. The clear width between curbs or handrails shall not be less than the approach traveled way.
  - <sup>(10)</sup> Right of way width shall be sufficient to accommodate the grading section.
  - <sup>(11)</sup> Pavement cross slopes may be increased if necessary to limit inundation to about one-half of a traffic lane for an appropriate design storm.
  - <sup>(12)</sup> Clear zone recommendations should be evaluated from the AASHTO "Roadside Design Guide".

General Comment:  
Each design element should reflect the most practical and economically justified value. Values below the design criteria set out in the current edition of the AASHTO "A Policy on Geometric Design of Highways and Streets" (Green Book), Chapters 5 and 6, will only be considered on a project-by-project basis, provided that a design exception is justified to KDOT. Where conditions permit, the use of higher design criteria is encouraged.

Figure 5.5: Design Guidelines for New or Completely Reconstructed Major Collector, Minor Collector, and Local Curb and Gutter Roads and Streets



### 5.2.5 3R – KDOT Policy

The goal of Rehabilitation, Restoration and Resurfacing (3R) projects is to preserve and extend the service life of existing highways, streets or bridges. Available funding is insufficient to improve existing roads to geometric requirements desirable for new construction. Many bridges may continue to function with only bridge painting or minor deck repair. Road constructed to previous design criteria are still capable of performing a useful transportation service. The guidelines contained in this section (including the criteria tables) are provided to assist in the design of 3R projects on county roads and streets.

The three R's are defined as follows:

REHABILITATION: - - The traffic service improvement and safety needs may be of equal importance to the need for improving the riding quality. Projects may involve intersection reconstruction; pavement widening; pavement replacement; shoulder widening; flattening of foreslopes; drainage improvements; and reconstruction of substandard grades, curves or sight distance. Some additional right-of-way may be necessary.

RESTORATION: -- This category is primarily for major resurfacing or overlays, which add a considerable amount of structure to the existing pavement. Usually resurfacing or overlays of a nominal four inches or more are included. In addition, some pavement widening, short sections of pavement reconstruction, shoulder widening, flattening of slopes in high fills and intersection reconstruction or an isolated bridge improving isolated grades, curves, or sight distance by construction or traffic control measure. In some cases, minor ROW acquisitions or easements may be required. Normal bridge painting only projects will be considered maintenance type work and minimum effort to consider other upgrade features will be necessary.

RESURFACING: -- Pavement resurfacing or overlays of less than four inches fall within this category. Other types of work such as pavement patching or short areas of reconstruction, joint replacement or repair, and shouldering may be included. Usually no additional right-of-way is required.

Safety enhancement is a consideration in most 3R projects. Criteria for consideration and/or to be addressed in project development are as follows:

1. All bridge ends which presently do not have advance traffic barriers (guardrail) should be analyzed according to the current version of the AASHTO "Roadside Design Guide".
2. Signing and marking should be in conformance with the current MUTCD.
3. The accident history should be analyzed with respect to number, rate, location, type and severity of crashes to identify safety considerations that should be addressed.
4. Bridges narrower than traveled way width (as defined by AASHTO) must have prior approval from KDOT to remain in place. If a bridge narrower than the traveled way is approved, a guardrail transition should be constructed, and object markers installed to delineate the end of the bridge rail. Also, the narrow bridge signs should be installed in accordance with the current MUTCD.



5. Bridge rails and guardrails on existing bridges should be reviewed for structural adequacy and conformance with current crash tested designs. If the bridge rails and/or guardrails are found to be structurally inadequate or functionally obsolete such that they cannot adequately contain and redirect vehicles without snagging, penetrating or vaulting, they should be considered for upgrading. Projects that include only bridge painting may be considered maintenance and do not require upgrading of bridge rails or guardrails.
6. When the scope of the project is limited to a 3R type road or highway improvement, the conditions and criteria noted in the following paragraph will apply for determining design speed. It is not considered appropriate to use regulatory speed limit signs at isolated locations where the design speed is approximately the operating speed as determined with consideration of the environmental conditions and terrain. The use of warning signs and advisory speed plates at horizontal curves (latest version of the MUTCD to be used as guide) should provide the traveling public adequate information to negotiate a roadway constructed to a 3R design of less than the regulatory speed limit; therefore, a design exception is not necessary. A design exception will only be required when the design speed for a vertical curve is more than 20 mph less than the regulatory speed. A design exception will not be required at locations where warning and advisory speed plate signs have been installed for a horizontal curve(s). These recommendations are supported by Transportation Research Board, National Research Council, Special Report 214 "Designing Safer Roads".
7. Obstructions within the clear zone for 3R projects should be reviewed for removal or relocation of the obstacle, installation of a traffic barrier, or do-nothing as determined by a cost-effective evaluation.

VI.4A COUNTY DESIGN GUIDELINES - RESURFACING, RESTORATION AND REHABILITATION (3R) OF MAJOR COLLECTOR ROADS (English Units)

DESIGN ELEMENT		Under 400		400 - 749		750 - 1499		1500 - 2000		Over 2000	
AADT -- CURRENT YEAR											
<sup>(1)</sup> TERRAIN ###		F	R&H	F	R&H	F	R&H	F	R&H	F	R&H
<sup>(2)</sup> DESIGN SPEED (MIN.)	mph	--	--	--	--	--	--	--	--	--	--
<sup>(3)</sup> STOPPING SIGHT DISTANCE	ft.	--	--	--	--	--	--	--	--	--	--
<sup>(4)</sup> MINIMUM HORIZ. CURVE RADIUS	ft.	--	--	--	--	--	--	--	--	--	--
<sup>(5)</sup> MAXIMUM GRADE	%	--	--	--	--	--	--	--	--	--	--
<sup>(6)</sup> PAVEMENT WIDTH	ft.	20	20	20	20	22	22	22	22	22	22
SHOULDER WIDTH	ft.	2	2	2	2	2	2	2	2	4	4
<sup>(7)</sup> BRIDGE WIDTH -- EXISTING	ft.	20	20	20	20	24	24	24	24	26	26
<sup>(8)</sup> BRIDGE LOADING -- EXISTING	--	--	--	--	--	--	--	--	--	--	--
<sup>(9)</sup> FORESLOPES	--	2:1	2:1	2:1	2:1	3:1	3:1	3:1	3:1	3:1	3:1
<sup>(10)</sup> CLEAR ZONE	ft.	10	10	10	10	10	10	10	10	10	10

### F = FLAT, R = ROLLING, H = HILLY

References:

"A Policy on Geometric Design of Highways and Streets", AASHTO, 2011

Special Report 214, "Designing Safer Roads Practices for Resurfacing, Restoration and Rehabilitation", TRB, 1987

"Policies for the Rehabilitation of Highways and Bridges for Other than Interstate and Freeways on the State Highway System in Kansas", KDOT, 1990

"Roadside Design Guide", AASHTO, 2011

NOTES:

- <sup>(1)</sup>Prevailing (over 50%) slopes of natural ground are: Flat - 3% or less, Rolling & Hilly - over 3%.
- <sup>(2)</sup>Design speed shall be equal to the posted or regulatory speed limit.
- <sup>(3)</sup>Crest vertical curves should be evaluated for reconstruction when: (a.) the design speed of the hill crest (based on minimum stopping sight distance provided) is more than 20 mph below the posted or regulatory speed limit; (b.) the AADT is greater than 1500 vpd; and (c.) the hill crest hides an intersection, sharp horizontal curve, narrow bridge, or other feature that requires a specific driver response.
- <sup>(4)</sup>Improvements to horizontal curves should be considered under the following conditions:
  - (a.) Superelevation should be increased when the design speed of the curve is below the posted or regulatory speed limit and the existing superelevation is below the maximum allowable specified in the Greenbook.
  - (b.) Reconstruction of the curve should be considered when the design speed of the existing curve is more than 15 mph below the posted or regulatory speed limit and the AADT is greater than 750 vpd.
- <sup>(5)</sup>The existing grade may remain unless there is a specific history of accidents that are related to the steep grade.
- <sup>(6)</sup>Wider lane and shoulder widths should be considered at locations where trucks make up more than 10% of the total traffic volume.
- <sup>(7)</sup>Narrower bridge widths may be considered acceptable to remain in place if they are equal to the approach pavement width. See BLP Memo 03-05 for guidance on requirements for bridge redeck projects. Whether or not bridge widening is warranted, installation of transition guardrails, rehabilitated or new bridge rails, and warning signs should be considered.
- <sup>(8)</sup>Legal load limit and not posted.
- <sup>(9)</sup>Flatter slopes should be used if there is a history of run-off-road accidents or at locations where run-off-road accidents are likely to occur (e.g., on the outside of sharp horizontal curves).
- <sup>(10)</sup>Distance measured from edge of through traffic lane.

General Comment:

These guidelines are provided to assist in the 3R design of rural secondary roads. Each project must be considered individually to determine what improvements are feasible to extend the useful life of the existing roads. Bridge painting only projects should be considered as maintenance and upgrading of other features would not be required. Values below those shown in this table will be considered on a project-by-project basis provided that a design exception is justified to KDOT.

Figure 5.6: Design Guidelines for Rehabilitation, Restoration, and Resurfacing (3R) of Major Collector Roads

### **5.3 Preliminary Scoping/Site Review**

For projects with very short development schedules, or those that have unique aspects, it may be prudent to conduct a preliminary project scoping site review. Some preliminary engineering work should be performed to arrive at a concept with or without alternatives. The LPA should coordinate (or have their Consultant coordinate) an onsite meeting with BLP. The meeting will include a discussion of project scope and limits and should include design alternatives that have been considered. The intent of the meeting is to select the best alternative for which to develop plans.

### **5.4 Field Check**

#### **5.4.1 Introduction**

The development of field check plans by the LPA shall be performed in accordance with accepted engineering practices and all applicable state, AASHTO, and federal criteria. A summary of the various guidelines that may apply to a project is given in this manual. KDOT's *Design Manual, Volume I, Bureau of Road Design, Section 2.3, FIELD CHECK PLANS*, is the guide for developing the plans to field check stage. In addition, geometric design guidelines, based on design traffic volume, design speed, functional classification and other pertinent criteria, are given in this manual.

#### **5.4.2 Required Documents**

Required documents to be submitted at Field Check Stage:

- Field Check Plans
- Project Cost Estimate
- Hydraulic Assessment Checklist (HAC) (on applicable projects)

The required documents shall be submitted to BLP in accordance with BLP [E-Plan Requirements](#).

#### **5.4.3 Plan Review**

The LPA and/or its Consultant shall be responsible for the completeness and accuracy of the plans. Plans that are not considered to be adequately complete or accurate for field check may be returned to the LPA and/or its Consultant for additional development or revision. BLP's (and others as deemed necessary by the PM) review of field check plans will be for general compliance with the prevailing state, AASHTO and federal criteria for purposes of maintaining federal funding eligibility and ensuring sufficient information is available for a contractor to develop a fair and reasonable bid. This review is not a thorough design review and does

not relieve the LPA and/or its Consultant of the duty to provide a design that is well conceived and plans that are complete and accurate.

Field check plans will be reviewed by BLP and other appropriate KDOT Sections, comments will be made, and the review comments will be made available upon return to the LPA.

#### **5.4.4 Railroad Coordination**

During the site review/field check it should be determined if the proposed project will have a potential impact on rail facilities. If it appears that work will be near or on railroad right-of-way, the LPA should submit electronic plans detailing the work on or near railroad R/W to the PM. The PM will make the plans available to KDOT Coordinating Section for distribution to the affected railroad for their review. This submittal would occur after all site review/field check comments have been addressed and can be coordinated with the office check submittal. KDOT Coordinating Section will work with the railroad to determine the need for flagging, liability insurance, agreements, and a possible diagnostic review. The LPA will be responsible for providing railroad liability insurance quantities if they are required. Railroad liability insurance quantities should be developed in accordance with *Section 2.6.16 of the KDOT Design Manual, Volume 1, Bureau of Road Design*.

#### **5.4.5 Field Check Meeting/Report**

The field check is an on-site and/or office review of the plans for the proposed improvement to assess project eligibility, appropriateness of scope of work, constructability, safety, and other issues relevant to the project. The PM will schedule a field check meeting after plans have been reviewed and determined to be at an appropriate level of detail.

After the site review/field check has been conducted, the PM will complete a field check report to document the meeting. The report will be distributed to the LPA, designer, and KDOT District and Area offices.

### **5.5 Office Check**

Plans should be submitted for office check after the designer has addressed all plan issues, developed all details, and computed all quantities. All markups/comments which have been made by BLP on the Field Check submittal are made to improve the plans by suggesting or requiring changes. These do not override design decisions made by the designer or the owner. The designer's or owner's choice to disregard any BLP markups shall be discussed with the BLP PM and approved prior to Office Check plan submittal. At this stage, the designer should consider the plans to be complete and, in their opinion, ready for construction letting. Quality control checks should have been performed by the LPA and/or its Consultant to ensure the completeness and accuracy of the plans.

### **5.5.1 Required Documents**

Required documents to be submitted at Office Check Stage:

- Office Check Plans
- Updated Cost Estimate
- KDOT Form 1307, List of Permits and Status of Same
- Traffic Warrants or Studies (if required)
- Design Exception/Variance Request (if required)
- Geology/Soils Reports (if available)
- Updated Hydraulic Assessment Checklist (HAC) (if applicable)
- Any other applicable project/exploratory reports

### **5.5.2 Plan Requirements**

Field Check revisions made in accordance with the archived Field Check plans and Field Check Report will be reflected on the Office Check Plans. The plans at office check stage should be considered a complete checked set of plans. All details and quantities should be completed by the designer, and the plans should have undergone a thorough review by the engineer in charge to assure that the information shown is accurate and complete prior to submittal.

#### **5.5.2.1 General Requirements**

Guidance on items to be included in office check plans is in the *KDOT Design Manual, Volume 1, Bureau of Road Design, Section 2.6*.

If environmental mitigation is involved, the PM may forward electronic plans to the ESS so that copies can be sent to the appropriate regulatory and resource agencies. If the project involves construction near a railroad, office check submittal may be used by the KDOT Coordinating Section to determine railroad requirements for the project.

Plans are received and reviewed for general compliance to design guidelines and bid letting requirements by BLP. Detailed review of the plans to ensure that all applicable criteria are met and that the plans have been developed in accordance with KDOT procedures is the responsibility of the project design engineer, whether designed by LPA or Consultant. Plans marked for revision are returned to the LPA or the designer for necessary plan revisions and continuation of the project development process. If the plan review process reveals that the plans are not complete due to errors or omissions, the plans will be returned to the designer with a notification that a subsequent office check will be required. The designer will need to address the comments made on the plans and perform additional quality control checks to ensure that the plans have met the expectations of office check for the next submittal. It is important that these checks be performed prior to the initial office check to avoid the risk of impacting project schedules.



**5.5.2.1.1 KDOT Bid Items**

All bid items for pay included in the project plans shall be standard KDOT bid items whenever possible. For the list of valid KDOT bid items, please see the list at: <https://kdotapp.ksdot.org/BidItemList/BidItemList.aspx>

**5.5.2.1.2 Non-Standard KDOT Bid Items**

Three classes of specifications are used in the development of a KDOT project. These specification classes are:

- Standard Specifications - The standard specifications are the current edition of KDOT's "Standard Specifications for State Road and Bridge Construction", current edition.
- Special Provisions – These are approved supplementary provisions, additions or revisions to the Standard Specification. Essentially these are interim updates to the Standard Specifications and are prepared by Bureau of Construction and Materials. There may be multiple revisions of a Special Provision active at any given time. Typically, the newest version will be included in the project when the Contract Proposal documents are assembled by the BOCM. The proposal documents will identify the specific revision used for the project. The older versions of the Special Provision will be kept active until construction is complete on all projects that have used the older version.
- Project Special Provisions – These are approved supplementary provisions, additions or revisions to the Standard Specifications that address conditions specific to an individual project.

If an item is required to be part of the project and cannot be covered by a standard KDOT bid item, the designer shall be responsible for preparing the project special provision. Proposed project special provisions should be submitted to the PM as soon as possible to enable adequate time for the BOCM to review, approve, and assign a special provision number. Project special provisions shall be submitted no later than the PS&E stage of project development.

In determining the need for a project special provision, the following approach should be considered:

1. Check existing specification. Verify that the standard specifications do not cover the information needed.
2. When possible, use notes on plans rather than creating a special provision.
3. If a new bid item is needed, there must be a project special provision to cover it.

If a project special provision is required, it shall conform to KDOT's format for special provisions. Information regarding the preparation of a project special provision can be found in the ["Guidelines for Development, Review and Approval of: Standard Specifications for State Road and Bridge Construction and Special Provisions to the Standard Specifications for State Road and Bridge Construction"](#).

### **5.5.3 Design Exception/Allowance**

The need for a Design Exception/Allowance should be determined no later than the office check stage of project development. Design Exceptions/Allowances should be documented and requested in accordance with the guidance given in this Manual.

### **5.5.4 Railroad Coordination**

If work on the project will encroach on railroad rights of way, an agreement with the affected company may be required. In some cases where temporary or permanent easement is required, the railroad may require a legal description of the needed tract. This requirement should be anticipated when the LPA scopes the project for design since additional survey work and project development time may be required.

In some cases, the proposed work may cause the need for a railroad flagger to be present during portions of the construction.

Quantities for railroad protective liability insurance may also be required if work is done within certain limits of the track(s). For more information regarding railroad protective liability insurance reference *Section 2.6.16* of the *KDOT Design Manual, Volume 1, Bureau of Road Design*.

The need for an agreement, flagger and liability insurance will be determined with the assistance of the KDOT Coordinating Section during the project development process.

### **5.5.5 Design Summary**

KDOT's ESS issues a "Status of Environmental Concerns – Final" memorandum after all environmental clearances have been obtained and all necessary documentation has been completed. This document will also indicate which permits may be required for the project. For additional information on the environmental requirements and documentation for a project see [Section 4.0 Environmental](#) of this Manual.

Once ESS has issued the final environmental memo, BLP will issue a Design Summary Document that confirms the final determination of the project's design criteria, environmental classification and indicates that all clearances and approvals have been obtained. The Design Summary Document will also indicate if any Design Exceptions have been approved for the project and confirm that the project is programmed on the STIP and/or MPO TIP.

Note, for LPA Administered projects, the LPA is responsible for developing the Design Summary.

### **5.5.6 Traffic Signal Warrants**

An engineering study may be required to demonstrate warrants are satisfied for modification of existing traffic signals. New traffic signals must meet warrants to be included in the project. Warrants should be submitted as early as possible in the plan development process to the PM. Work proposed for traffic signals that do not satisfy warrants will not be eligible for inclusion in the project.

### **5.5.7 Operational Analysis**

An operational analysis may be required when a proposed project modifies an existing condition on or adjacent to a state or federal highway. An operational analysis may also be required to validate preferred design alternatives and/or justify expenditure of federal or state funds on the local system. A copy of the operational analysis should be submitted as early as possible in the plan development process to the PM for review.

### **5.5.8 Public-Interest Findings and KDOT Certifications**

Proprietary or sole source items should not be specified unless necessary on the project. The LPA shall be responsible for providing a PIF to BLP when it is necessary to specify proprietary products for reasons other than “project specific” or synchronization, use public equipment or materials, or award contracts on a basis other than competitive low bid. PIFs should be completed as early as possible to allow for BLP review and concurrence as outlined in this Manual.

FHWA guidance regarding PIFs can be found online at: <https://www.fhwa.dot.gov/federal-aidessentials/catmod.cfm?id=43>.

FHWA must approve all PIFs. A specific form is not required for the PIF and the request may take the form of a letter documenting the request. The request for a PIF review on Local Projects should be sent to the PM and will be reviewed by BLP. The LPA will be notified of the approval or denial of the PIF request.

The use of proprietary or sole source items for reasons of synchronization or architectural consistency may be allowed. The LPA may submit a [Proprietary Product Certification form](#) to KDOT for approval.

## **5.6 Final Check**

The purpose of final check is to ensure that all office check comments have been addressed and the plans are ready for PS&E. All markups/comments which have been made by BLP on previous submittals are made to improve the plans by suggesting or requiring changes. These do not override design decisions made by the designer or the owner. The designer’s or owner’s choice to disregard any BLP markups shall be discussed with the BLP PM and approved prior to Final Check plan submittal. If design changes have occurred since the previous office check, the submittal is a subsequent office check.



### **5.6.1 Required Documents**

Required documents to be submitted at Final Check Stage:

- Final Check Plans
- Updated Cost Estimate
- KDOT Form 1307 (List of Permits and Status of Same)
- Electronic copies of all permits obtained to date
- Drafts or final versions of required project special provisions
- Any other reports or project documentation not previously submitted

### **5.6.2 Plan Requirements**

The LPA and/or its Consultant will address all comments made during the office check of the project. When the designer has addressed all comments from office check and considers the plans to be complete, the plans and other required documentation should be submitted to BLP for final check. Submittal of any project and exploratory reports that have not been previously submitted should also occur at this time. A draft of any project special provisions needed, including any environmental restrictions on the project should also be submitted to BLP at final check to allow for KDOT review and finalization prior to PS&E.

## **5.7 PS&E**

For PS&E requirements, please refer to [Section 9.0 PS&E](#) in this Manual.

**(This Page Intentionally Left Blank)**

## Appendix A

### **SURVEY MONUMENT GUIDELINES FOR PROJECT/PLAN DEVELOPMENT**

The following guidelines will aid in the project/plan development of projects processed through the KDOT Bureau of Local Projects. These guidelines represent the minimum requirement for an engineered project and are intended to supplement sound engineering and surveying practice and standards of care. The intent of these guidelines is to provide a project that can be constructed independently by the information contained on the project plans and that it meets all Local, State, and Federal statutes and regulations, which is a requirement for federal aid eligibility. These guidelines should be reviewed by the consultant in developing a “Scope of Services” proposal for LPA’s and by the LPA to determine if a sufficient “Scope of Services” is being provided by consultants during the Preliminary Engineering Consultant selection process.

The alignment defining the existing right-of-way corridor shall be researched, retraced, and monumented to accommodate the construction effort and/or right of way acquisition on projects meeting any one of the following conditions:

1. The project requires acquisition of new rights of way or easements.
2. The project includes grading or excavation.
3. A new permanent pavement (e.g., concrete or asphalt) is to be constructed.
4. The project includes installation or construction of drainage structures (e.g., bridges, concrete box culverts, roadway culverts, entrance pipes).

The manner of replicating and monumenting an existing corridor is detailed in the current *KDOT Bureau of Design, Survey Manual, Section 2.2*, and is incorporated into this guideline by reference. Research shall include original road records, subdivision plats, adjacent deeds, any available road plans, survey records, and land survey reference reports. The section corners and quarter section corners necessary to establish and write legal descriptions for the new rights-of-way shall be recovered or established by a professional land surveyor. This will afford the opportunity to reference the existing right of way to the proposed construction. Appropriate land survey monument ties, to be determined by the adjacent deeds and ownership, shall be made and noted on the plans. This will necessitate the recovery, or perpetuation of PLSS (Public Land Survey System) corners, and/or subdivision plat monuments along or adjacent to the project for the development of proposed right of way descriptions. All land survey activities associated with the project development shall conform to the [Kansas Minimum Standards for Boundary Surveys](#) as adopted by the Kansas State Board of Technical Professions.

Projects that are a planned improvement on an entirely new alignment shall be established/monumented in a manner as described in the current *KDOT Bureau of Design, Survey Manual, Section 2.2* as noted above. The project plan should include sufficient ties to the appropriate land survey monuments that control the new right of way descriptions as noted above. This will be determined based upon the adjacent ownership deeds that the acquisition will be based upon.

**Survey Monument Guidelines (continued)**

Projects that are limited to work within the roadbed and do not require section lines for project control, such as recycling, paving and overlays may still endanger PLSS corners. In order for the construction surveyor to follow the laws on endangered corners, the design consultant or the LPA is required to locate all endangered corners and file the Land Survey Reference Reports prior to submittal of the field check plans. If a PLSS corner cannot be located the Land Survey Reference Report should be filed describing the efforts made to locate the corner. On projects with plan sheets the location and ties to endangered corners shall be included in the plans.

Projects that include grading and/or drainage structures shall reflect the vertical datum for the project, the datum bench mark description and elevation, and shall reflect bench marks established for the project in accordance with the current *KDOT Bureau of Design, Survey Manual, Section 2.3* which is incorporated into this guideline by reference.

Project plans that do not meet the minimum criteria described above will be returned to the submitting firm/agency for corrective action.