ALABAMA

Department of Transportation

Local Public Agency (LPA) Road Design Policy

Recommended for Approval

ALDOT State Local Transportation Engineer — Date: 15 April 22

Approved

ALDOT Chief Engineer — Date: 4/20/22

Chapter 10
Design Policies

Table of Contents

Note: Roundabouts shall be designed in accordance with the Alabama Department of Transportation (ALDOT) *Roundabout Planning, Design, and Operations Manual, current edition*. The approach roadways to the roundabout will be designed in accordance with Section 3 and/or Section 4 noted in this chapter.

Section 1

General Design Policies

Any design feature not meeting the pertinent design criteria presented in this policy must be evaluated by the entity responsible for the design, construction, and maintenance of the facility (Project Representative) on a case by case basis, based upon sound engineering judgement, considering the safety of the traveling public and available funding, and be concurred with by the State Local Transportation Engineer. Justification must be provided as to why a certain feature cannot meet the required design criteria based upon on-site evaluations. Evaluations should include crash data, cost feasibility, and/or any other site-specific safety factors. Any variance from the pertinent design criteria should be described in the Scope of Work (Pavement Preservation) or the Project Engineering Record (3R or New Construction and Reconstruction).

All table and page number references, as noted in the following guidelines, are referenced from the AASHTO publication, *A Policy on Geometric Design of Highways and Streets*, *2018 7th Edition*, unless otherwise noted.

This source will also be referred to as the "2018 AASHTO Green Book".

Section 2

Design Criteria for Pavement Preservation

Pavement Preservation projects do not involve any of the roadway being placed on new alignment and the existing pavement is either fully or partially retained. The basic roadway cross section is not changed, meaning the proposed improvements are contained within the existing roadway (lanes and shoulders or between curbs). Project types that would utilize this design criteria are resurfacing projects in which the existing pavement is still in fair condition and therefore not needing a substantial amount of patching and/or leveling. **If widening is required to meet the minimum lane widths shown in Guideline 3 of Section 3, the roadway will not be eligible for pavement preservation. In such cases, the LPA shall refer to the "3R" design procedures found in Section 3 of this document.**

Pavement Preservation projects shall be designed in accordance with this design criteria, which is based on general guidelines and procedures from ALDOT *Pavement Preservation Policy*, approved by the Federal Highway Administration (FHWA) on 7/2/19, and adapted for the specific needs of Local Public Agencies. Consideration is also given to the discussion, guidance and criteria, and design standards/administrative control sections found in ALDOT *Performance-Based, Practical Design Guide, Version 1.0, September 2020*. AASHTO publications, ALDOT manuals, *ALDOT Special & Standard Highway Drawings*, and ALDOT procedures will be used as needed to supplement these sources.

Before developing construction plans, the designer shall prepare a Scope of Work (Pavement Preservation) based on these guidelines. Additional information regarding specific elements, not addressed in this section, should be included in the scope. The scope will also serve as the official **Project Engineering Record** and **Materials Report** for all Pavement Preservation projects.

This document shall be submitted to the Area Local Transportation Engineer for concurrence and then forwarded to the State Local Transportation Engineer for approval.

Current Conditions

Guideline 1: Designers should assess existing physical and operational conditions affecting safety by:

- Conducting a thorough site inspection of all physical elements and geometry within the project limits.

- Analyzing existing roadway functional classification, ADT, and design speed. In general, the design speed should be equal to or greater than the posted speed. In urban environments, a design speed less than the posted speed may be used in some cases. Rather than lowering the design speed, the designer should seek to obtain design exceptions for elements that cannot meet the appropriate speed.

- Analyzing crash data, to include field inspection, and concerns expressed by the public to determine site-specific locations where crash data may indicate the need for additional improvements.

  Note: If there is an existing railroad-highway grade crossing within or near the project limits, then Railroad Coordination may be required. See Chapter 13 of the *Procedural Guidelines for LPA Projects* for additional guidance.

Project Scope

Guideline 2: The LPA Representative is required to conduct a scope of work review in conjunction with the Area Representative. During this review, the designer shall consider the following directives:

- The LPA and Area Representatives shall grade the roadway based upon the Guidelines for Grading LPA Roads. Only roadway elements containing a score of 13 or higher should utilize this design criteria.

- Pavement Preservation projects **shall** not exceed an overlay of 225 lbs/sy with no more than 50% of the existing roadway requiring spot leveling and/or patching. All overlays shall conform to the laydown rate requirements found in the Alabama Department of Transportation's Guidelines for Operations, Section 6-10.

- Planing the existing pavement to provide depth for the required overlay is acceptable under this design criteria.

Cross Slopes

Guideline 3: The designer should develop consistent procedures for evaluating existing cross slopes on traveled ways, parking lanes, bike lanes, and shoulders, with the following objectives:

- The traveled way, parking lane, and bike lane cross slope should match existing, except for the allowable leveling to correct pavement distresses (rutting, settlement, etc.) stated in guideline 2. If superelevation corrections are needed, the LPA shall refer to the "3R" design procedures found in Section 3 of this document.

- The shoulder cross slope or curb and gutter should allow rainfall to drain the roadway. Paved shoulder cross slopes shall match existing, while unpaved shoulders are typically 6.0%. If shoulder cross slope corrections are needed, the LPA shall refer to the "3R" design procedures found in Section 3 of this document.

Typical Cross Sections

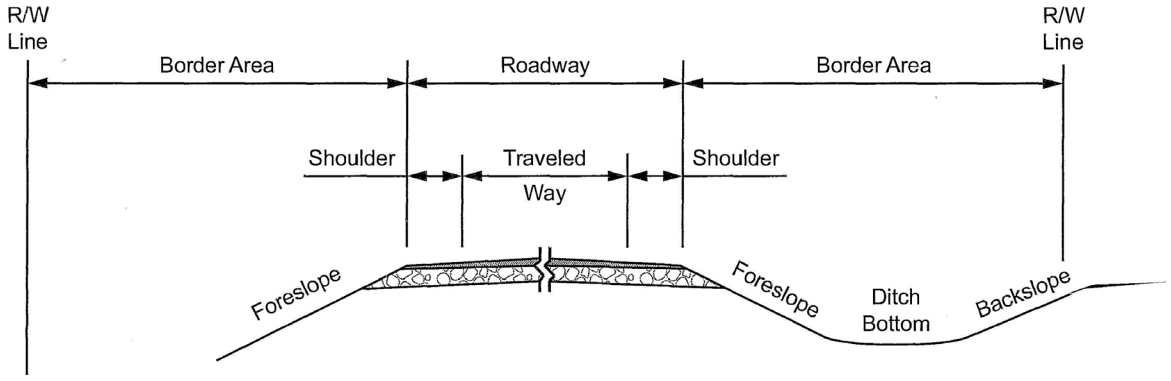


Figure 2-1: Rural Area

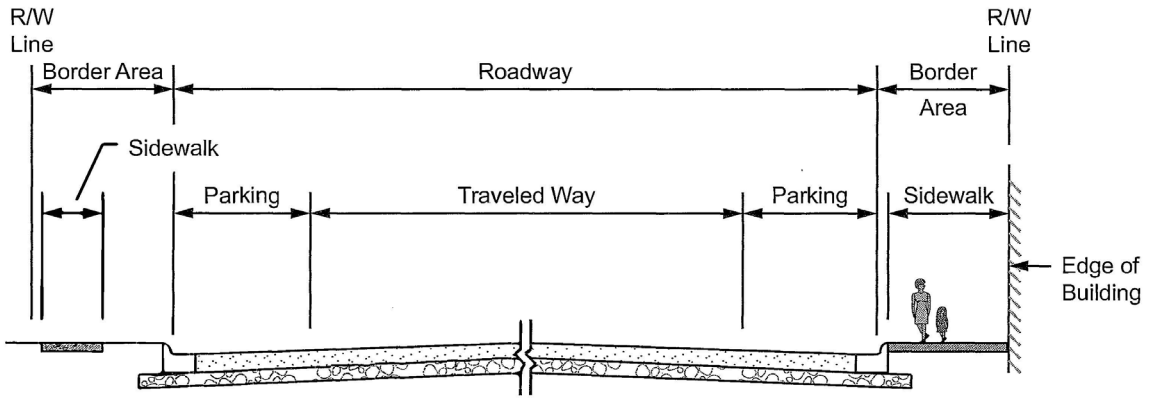


Figure 2-2: Urban Area with On-Street Parking and Sidewalks

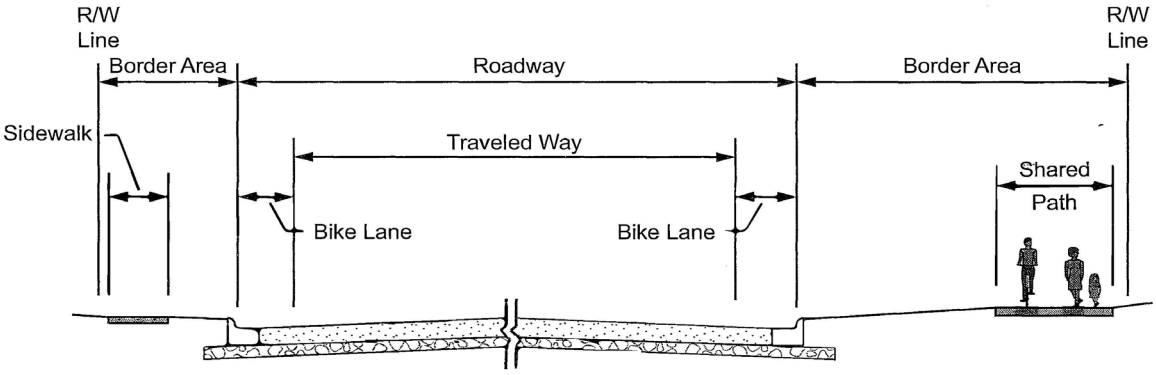


Figure 2-3: Urban Area with Bike Lanes, Sidewalks, and Shared Use Paths

Note: The figures shown above are taken from page 4-3 in the 2018 AASHTO Green Book and are for pictorial purposes only.

Pavement Edge Drop and Shoulder Type

Guideline 4: The designer should develop consistent procedures for evaluating pavement edge drop problems and the type of shoulder construction, with the following objectives:

- All shoulders shall be flushed up to the required pavement utilizing any number of applicable shoulder construction applications. Constructing a beveled or tapered pavement edge shape is eligible. No shoulder widening will be permissible under the pavement preservation policy, except for required shoulder widening for guardrail and/or guardrail end treatment installation.

- The addition of paved shoulders at points where out-of-lane vehicle excursions and pavement edge drop problems are likely to develop (e.g., at horizontal curves) may be eligible. Such additions will be evaluated on a case by case basis and approved by the State Local Transportation Engineer.

Bridge Width

Guideline 5: The designer should evaluate existing bridge widths based upon the guidance below:

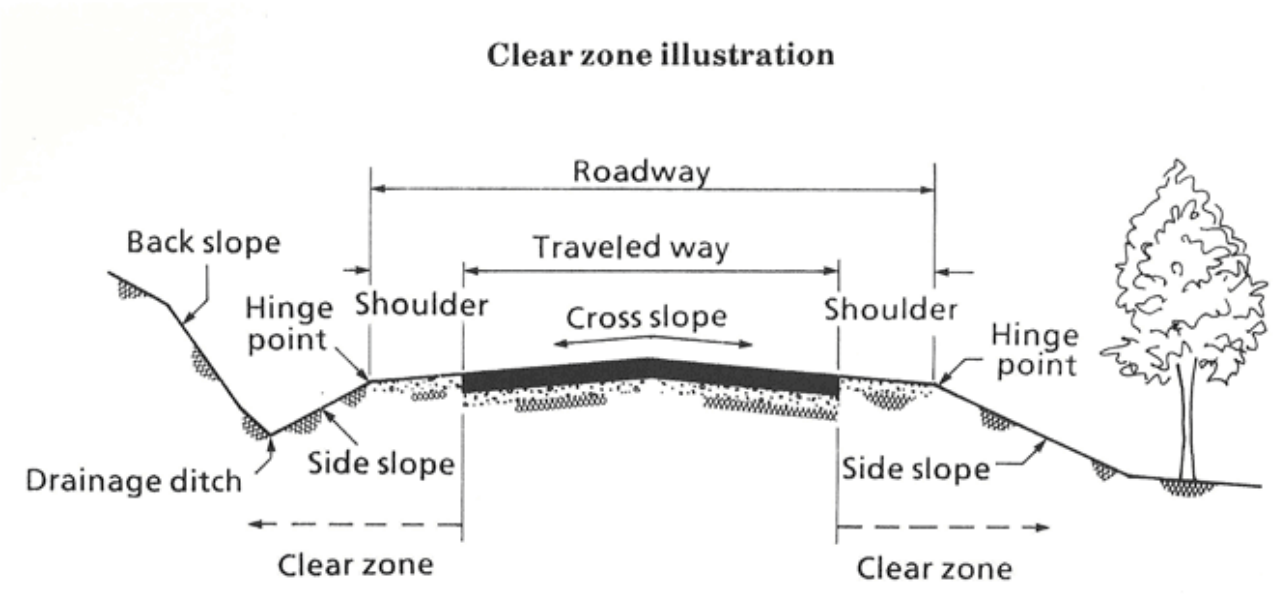
- Existing bridges should remain in place unless (1) there is a structural need to replace the bridge or (2) there is a documented pattern of crashes at the bridge that can potentially be reduced by widening or replacing the bridge.

- Narrow bridges are defined as bridges with curb to curb widths less than the combined width of the approach roadway (lanes and shoulders). Warning signs (narrow bridge) should be placed at all narrow bridges. When guardrail improvements are necessary at narrow bridges, it may be beneficial to flare guardrail approaching these structures per the appropriate ALDOT *Special & Standard Highway Drawings*.

Sides Slopes and Clear Zones

Guideline 6: The designer should develop consistent procedures for evaluating side slopes and clear zones with the following objectives:

- Side slopes and clear zones are not a required consideration except when shoulders are widened for guardrail and/or guardrail end treatment installation, as described in guideline 4. When this occurs, shoulder widths and side slopes shall be as shown in the appropriate ALDOT *Special & Standard Highway Drawings*.



Hinge Point	Point where the slope rate changes.
Clear Zone	A traversable area that starts at the edge of the traffic lane, includes the shoulder, and extends laterally a sufficient distance to allow a driver to stop or return to the road before encountering a hazard or overturning

Figure 2.4 - Clear Zone Illustration

Guardrail

Guideline 7: The designer should develop consistent procedures for evaluating the need for guardrail improvements, with the following considerations:

- On routes with design speeds greater than 45 MPH (40 MPH recommended), guardrail that contains steel blockouts and/or a rail height of less than 26 ½" should be replaced or reset.

- Guardrail that is not damaged and complies with the guidance above should remain in place. Damaged guardrail shall be replaced as necessary.

Note: All new guardrail shall be installed utilizing the appropriate ALDOT *Special & Standard Highway Drawings* to comply with MASH 2016. If guardrail is to be reset due to its height (24"- 26" height currently), please refer to the ALDOT "Guardrail Height Adjustment" drawing for more information. Guardrail with a rail height less than 24" must be replaced.

Bridge Rails and Guardrail to Bridge Rail Connections

Guideline 8: The designer should develop consistent procedures for evaluating the need for bridge rail and guardrail to bridge rail connection improvements, with the following considerations:

Bridge Rails

- Bridge rail improvements are not a required consideration.

Guardrail to Bridge Rail Connections

- On NHS routes, guardrail to bridge rail connections that are not present or not compliant with NCHRP 350 shall be installed or replaced with MASH 2016 compliant connections where possible. If the bridge contains steel w-beam guardrail, please contact the Design Section of the Local Transportation Bureau to receive a recommendation for the site-specific application.

Note: All new bridge rail and guardrail to bridge rail connections shall be installed per the appropriate ALDOT *Special & Standard Highway Drawings* and/or special project details to comply with MASH 2016 where possible.

Guardrail End Treatments

Guideline 9: The designer should develop consistent procedures for evaluating the need for guardrail end treatment improvements, with the following considerations:

- Any guardrail end treatment that is not present, damaged, or does not comply with NCHRP 350 shall be installed or replaced with MASH 2016 compliant devices.

Note: All new guardrail end treatments shall be installed per the appropriate ALDOT *Special & Standard Highway Drawings* to comply with MASH 2016.

Guardrail Length of Need

Guideline 10: *If guardrail end treatments are replaced or installed*, the guardrail system must conform to the applicable length of need requirements shown below:

Definition – Length of Need: The total length of a longitudinal barrier needed to shield an area of concern.

- On routes with **design speeds of 45 mph or less and design year traffic of 2,500 ADT or less**, the guardrail *length of need* requirement is waived, and the approach guardrail length is dictated by the type of end treatments used, appropriate ALDOT *Special & Standard Highway Drawings*, and warranted areas of protection (steep slopes or other hazardous locations).

- On routes with **design speeds greater than 45 mph or design year traffic greater than 2,500 ADT**, a 75-foot guardrail *length of need* is applicable. ALDOT *Special & Standard Highway Drawings* and warranted areas of protection (steep slopes or other hazardous locations) may indicate a system requirement that would supersede this length.

The required length of need must be met even if all guardrail, bridge rail, and guardrail end treatments are compliant with NCHRP 350 or MASH 2016, as applicable.

Right-of-Way Encroachments

Guideline 11: The designer should evaluate right-of-way encroachments based upon the following definition and guidelines:

Definition - Encroachment: An item that occupies or utilizes the LPA's right-of-way without authorization from the LPA.

A fence that meets the following criteria is not considered an encroachment:

1. The fence is determined to be in the public interest and serves a transportation related purpose, and;

2. The fence shall not impair or interfere with the free and safe flow of traffic, and;

3. The fence is located outside of the clear zone as defined in the AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 2018 7th Edition*.

The LPA should also provide notice to the adjacent land owner of any fence that will be allowed to remain in the LPA's right-of-way. This notification should specify the terms and conditions under which the use will be authorized. This notice shall remain in the project file and be available for review (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.41).

Identify and Remove Encroachments - LPAs should diligently review their right-of-way to prevent new items from being placed within the right-of-way limits. Prior to the scope of work review, the Project Representative shall review the project for any encroachments placed within the LPA's right-of-way.

Mailboxes and utilities are authorized to be within the clear zone. Non-breakaway mailboxes shall be removed and replaced with a breakaway type structure that meets U.S Postal Service Specifications.

During the scope of work review, the Project Representative shall identify to the Area Local Transportation Engineer any encroachments that will be removed prior to project authorization. Plan preparation and review shall not be contingent on receipt of the Right-Of-Way Encroachment Certification letter (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.60) from the LPA. However, receipt of the Encroachment Certification letter will be required prior to project authorization.

An example notification letter is provided for landowners who have encroachments that must be removed from the LPA's right-of way (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.6)

Bicycle/Pedestrian Facilities

Guideline 12: The designer should develop consistent procedures for evaluating bicycle/pedestrian facilities, with the following objectives:

- Where bicycle/pedestrian facilities exist, upgrade **pedestrian crossings** (as necessary) per guidance shown in the 2018 AASHTO Green Book to ensure they are *Americans with Disabilities Act* (ADA) compliant.

- Evaluate the project limits for evidence of bicyclist and/or pedestrian activity. If there is evidence, consider providing a facility that will meet the needs of the bicyclists and/or pedestrians in the area. Consult the 2018 AASHTO Green Book to ensure they are ADA compliant.

  Note: If only the following pavement treatments are being applied in the project, then bicycle/pedestrian facilities within the project limits are not required to be upgraded to comply with ADA:

  - Crack filling and Sealing
  - Surface Sealing
  - Chip Seals, Slurry Seals, Fog Seals, Scrub Seals, and Joint Crack Seals
  - Joint Repairs
  - High Friction Treatments (Spot Locations)
  - Diamond Grinding
  - Concrete Grooving
  - Pavement Patching

Section 3

Design Criteria for Resurfacing, Restoration and Rehabilitation (3R)

3R projects do not involve a substantial amount (more than an isolated horizontal or vertical curve) of the project being placed on a new alignment, and the pavement structure may or may not be removed down to the subgrade. The basic roadway cross section is not changed, but side slopes and ditches may need to be reconstructed. Project types that would utilize this design criteria include resurfacing with substantial patching and/or leveling, minor widening and resurfacing, full depth reclamation, intersection improvements (turn lanes, roundabouts, traffic signals, roadway lighting, etc.), general safety improvements, slide corrections, bridge rehabilitation and /or bridge painting, and pile encasements.

3R projects shall be designed in accordance with this design criteria, which is based on general guidelines and procedures from *NCHRP Report 876, Guidelines for Integrating Safety and Cost-Effectiveness into Resurfacing, Restoration, and Rehabilitation (3R) Projects* and adapted for the specific needs of Local Public Agencies. Consideration is also given to the discussion, guidance and criteria, and design standards/administrative control sections found in the ALDOT *Performance-Based, Practical Design Guide, Version 1.0, September 2020.* **The** Spreadsheet Tool 1 **should be used to determine the benefit/cost ratios for each applicable improvement as described in this design criteria. When the anticipated safety benefit equals or exceeds the cost (benefit/cost = 1.0 or higher) the improvement should be included.** AASHTO publications, ALDOT manuals, ALDOT *Special & Standard Highway Drawings*, and ALDOT procedures will be used as needed to supplement these sources.

Before developing construction plans, the designer shall prepare a Scope of Work and Project Engineering Record (PER) based on the guidelines shown below. Additional information regarding specific elements, not addressed in this section, should be included in this report.

This document shall be submitted to the Area Local Transportation Engineer for concurrence and then forwarded to the State Local Transportation Engineer for approval.

Current Conditions

Guideline 1: Designers should assess existing physical and operational conditions affecting safety by:

- Conducting a thorough site inspection of all physical elements and geometry within the roadway limits.

- Analyzing existing roadway functional classification, ADT, and design speed. In general, the design speed should be equal to or greater than the posted speed. In urban environments, a design speed less than the posted speed may be used in some cases. Rather than lowering the design speed, the designer should seek to obtain design exceptions for elements that cannot meet the appropriate speed.

- Analyzing crash data, to include field inspection, and concerns expressed by the public to determine site-specific locations where crash data may indicate the need for additional improvements.

  Note: If there is an existing railroad-highway grade crossing within or near the project limits, then Railroad Coordination may be required. See Chapter 13 of the *Procedural Guidelines for LPA Projects* for additional guidance.

Project Scope

Guideline 2: The LPA Representative is required to conduct a scope of work review in conjunction with the Area Representative (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, pages 16.61 – 16.62). During this review, the designer should:

- Determine site-specific locations where physical elements should be replaced or improved (driveways, intersections, curves, bridges, headwalls, obstructions within the right-of-way, etc.).

- Include low cost safety improvements to be performed by contractor or LPA forces.

Lane and Shoulder Widths

Guideline 3: The designer should determine the appropriate lane and shoulder widths from the table below:

Design Year ADT [a]	Lane Width [c d e]	Shoulder Width [c d e]
Under 400 [b]	9 ft	2 ft
400 - 2,000 [b]	10 ft	2 ft
2,001 - 7,500 [b]	11 ft	3 ft
Over 7,500 [b]	12 ft	3 ft

Table 3-1: Recommended Lane and Shoulder Widths

Note: Values are based upon benefit/cost analysis utilizing Spreadsheet Tool 1 with ALDOT cost and safety data.

[a] Design Year ADT shall be based on a 10 year projection.

[b] The analysis used to determine these values involved shoulder widening and front slope reconstruction when lanes were widened from 10 ft to 11 ft. When widening shoulders, front slopes should be no steeper than 3:1 due to side slope and clear zone requirements stated in guideline 9. See Figure 3-1 along with an example calculation for additional details on how fills were estimated.

[c] Values less than what is shown may be used if widening the lane and/or shoulder is not cost beneficial based upon a project specific benefit/cost analysis.

[d] Rural multi-lane highways (divided and undivided) shall maintain the existing lane and shoulder widths if they are greater than these values. Paved shoulders shall also be maintained where present.

[e] In urban areas, lane widths of 10 feet or greater and existing shoulders/curb and gutter may be retained unless crash history indicates that widening will increase safety. Urban areas shall be as defined by the applicable Metropolitan Planning Organization (MPO) in conjunction with characteristics described in the 2018 AASHTO Green Book.

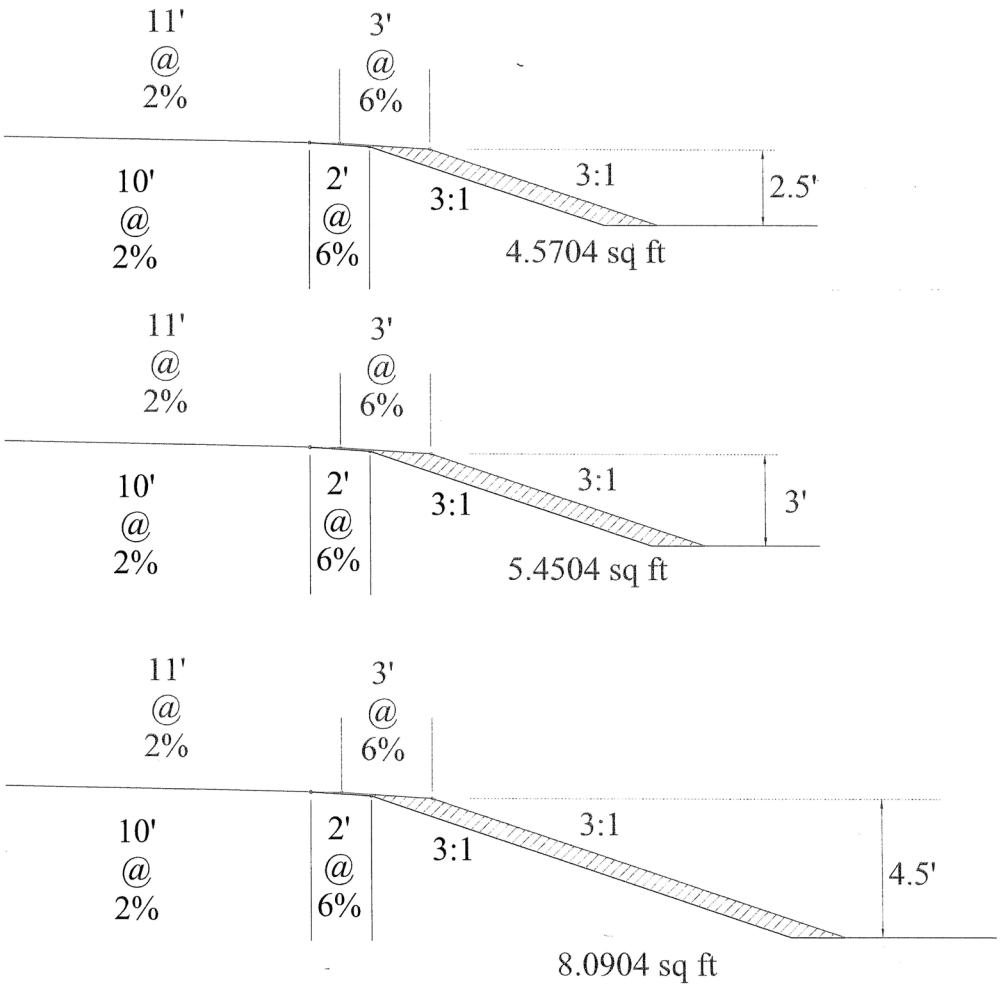


Figure 3-1: Estimated Fill Areas for Shoulder Widening and Slope Reconstruction

Example Calculations

Utilizing the figure above, the cost of the needed embankment to widen a roadway with 10 ft lanes and 2 ft shoulders to a roadway with 11 ft lanes and 3 ft shoulders with an embankment height of 3 ft over a 1 mile (5,280 ft) long section would cost:

5.4504 sq ft X 5,280 ft = 28,778.12 cu ft = 1,065.85 cu yds
1,065.85 cu yds X $21.26/cu yd = $22,659.97

Both sides of roadway = $22,659.97 X 2 = **$45,319.94**

Note: The price of borrow excavation used in this example is based upon average ALDOT bid history prices and should be updated/revised as necessary.

Cross Slopes

Guideline 4: The designer should develop consistent procedures for evaluating existing cross slopes on traveled ways, parking lanes, bike lanes, and shoulders, with the following objectives:

- The traveled way, parking lane, and bike lane cross slope may match existing. Cross slope corrections are eligible and shall meet requirements shown in Chapters 5, 6, or 7 in the 2018 AASHTO Green Book, as applicable.

- The shoulder cross slope or curb and gutter should allow rainfall to drain the roadway. Paved shoulder cross slopes may match existing or be 4.0%. Unpaved shoulders are typically 6.0%. Paved and/or unpaved shoulder cross slope corrections are eligible and shall meet requirements shown on pages 4-13 and 4-14 in the 2018 AASHTO Green Book.

Typical Cross Sections

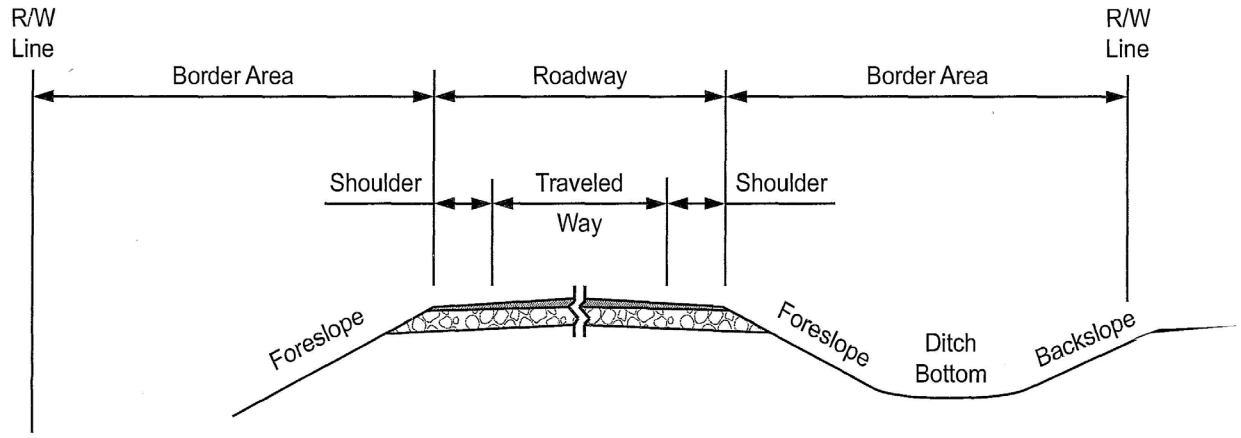


Figure 3-2: Rural Area

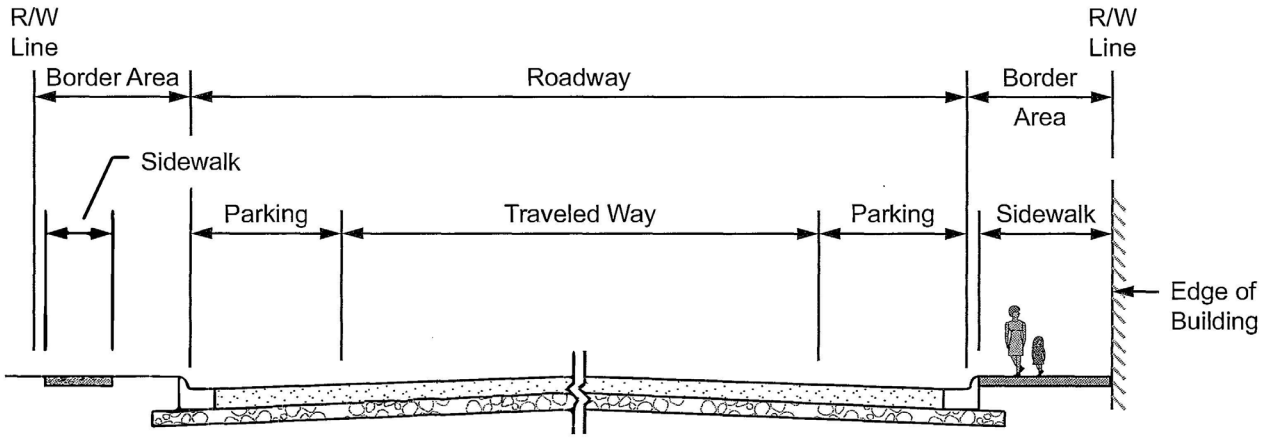


Figure 3-3: Urban Area with On-Street Parking and Sidewalks

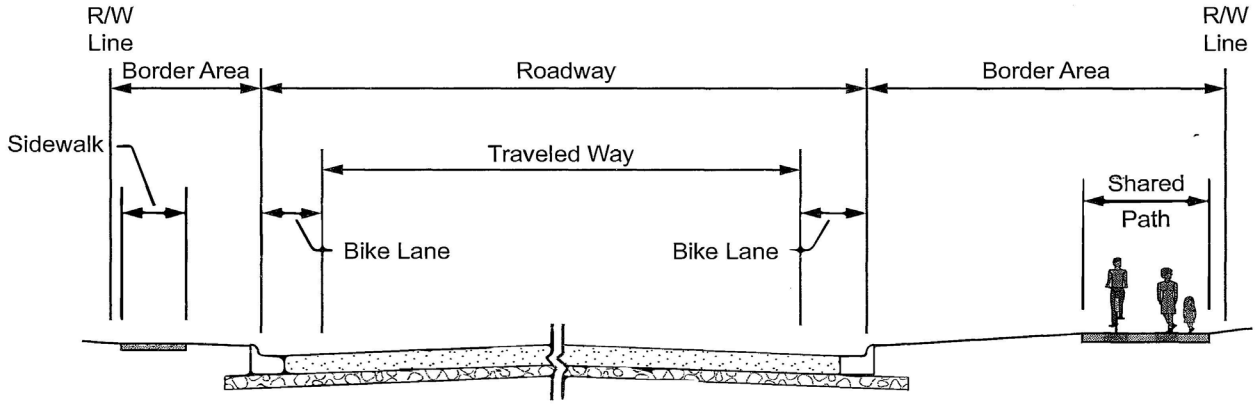


Figure 3-4: Urban Area with Bike Lanes, Sidewalks, and Shared Use Paths

Note: Figures 3-2 through 3-4 are taken from page 4-3 in the 2018 AASHTO Green Book and are for pictorial purposes only.

Pavement Edge Drop and Shoulder Type

Guideline 5: The designer should develop consistent procedures for evaluating pavement edge drop problems and the type of shoulder construction, with the following objectives:

- All shoulders shall be flushed up to the required pavement utilizing any number of applicable shoulder construction applications.

- Selectively pave shoulders at points where out-of-lane vehicle excursions and pavement edge drop problems are likely to develop (e.g., at horizontal curves).

  OR

- Construct a beveled or tapered pavement edge shape at points where out-of-lane excursions and pavement edge drop problems are likely to develop (e.g., at horizontal curves).

Horizontal Curvature and Superelevation

Guideline 6: The designer should review each horizontal curve to determine the appropriate action that may be required. Action may include, but is not limited to:

- Adjusting the existing cross section with increased superelevation to meet the design speed until the maximum superelevation rate is reached based on new roadway standards, when deemed appropriate by a benefit-cost analysis*****.

***Procedure for Performing Benefit/Cost Analysis**

Based upon Rieker or other data, the designer determines that a curve with the following characteristics does not meet the design speed (has a posted advisory speed) and needs to be evaluated for superelevation corrections:

Design Speed = 20 MPH
PC = Sta 8+73.14
PT = Sta 9+79.46
L = PT-PC = 106.32
Radius = 170'
Lane Width = 9'

Based upon the appropriate ALDOT *Special & Standard Highway Drawing(s),* it is determined that 6.4 % "e" is required for this curve with a Superelevation Transition Length (STL) of 110'. The designer checks the existing "e" at three (3) locations along the curve (1/3, 1/2, and 2/3 of the distance between the PC and the PT). Based upon the **lowest** value, the existing "e" is 2.5%, which is a variance of 3.9% from what is required based upon new roadway standards. The curve information is then input into the Required Leveling Spreadsheet or a similar spreadsheet produced by the designer. Once the required leveling is determined, this value is input into the Spreadsheet Tool 1 calculation tab in the "Superelevation Improvement" category to determine if correcting the superelevation will be cost beneficial. Repeat this process as necessary within the project limits. If more information or assistance is needed, please consult the Design Section of the Local Transportation Bureau.

- Evaluating the realignment of an isolated horizontal curve when increasing the superelevation is still not adequate. Horizontal curve realignment is typically not cost beneficial. Unless there is evidence of a site-specific safety problem, the sponsor should increase the superelevation and/or select an acceptable substitute as a countermeasure. If realignment is needed based upon further review, the sponsor may apply for Highway Safety Improvement Program (HSIP) Funds for this work. Consult the Design Bureau, Traffic and Safety Operations Section for more information. If HSIP funds are awarded, this work may be performed under a separate project or as part of the planned 3R project.

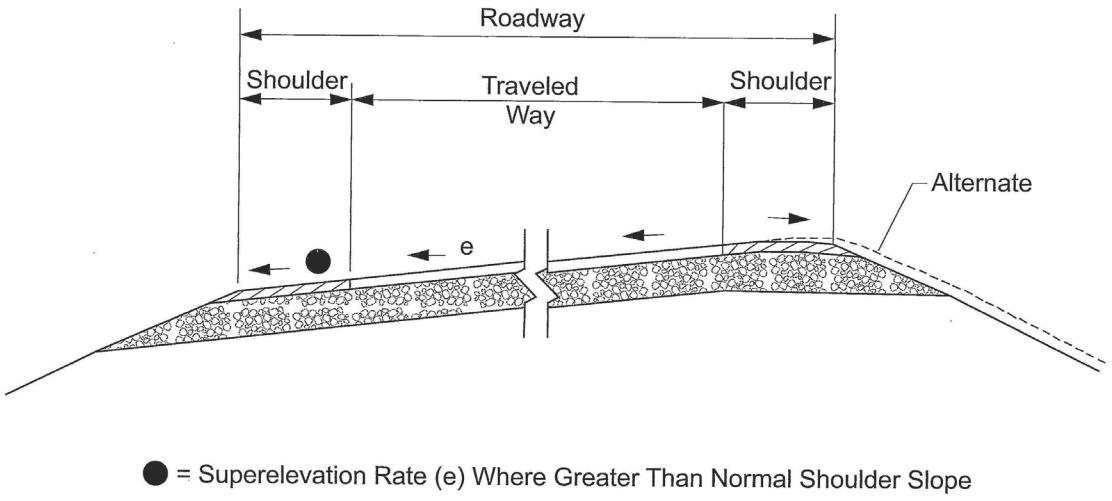


Figure 3-5: Typical Superelevated Cross Section

Note: Figure taken from page 4-4 of 2018 AASHTO Green Book. Provided for pictorial purposes only.

Acceptable Substitute(s) for Curve Realignment or Superelevation Corrections

1) Measures to reduce speed (signing, pavement markings, rumble strips, traffic control devices, etc.)

2) Measures to improve the roadside (clearing slopes, flattening steep side-slopes, removing, relocating, or shielding obstacles, etc.)

3) Measures to improve the roadway (widening lane width, widening shoulder width, paving shoulders, scoring, etc.)

Vertical Curvature and Stopping Sight Distance

Guideline 7: The designer should evaluate realigning a crest vertical curve when:

- It hides from view major hazards such as intersections, horizontal curves, or driveways.

- Crash history shows a pattern of crashes potentially related to limited stopping sight distance.

- Vertical curve realignment is typically not cost beneficial. Unless there is evidence of a site-specific safety problem, the sponsor should select an acceptable substitute as a countermeasure. If realignment is needed based upon further review, the sponsor may apply for Highway Safety Improvement Program (HSIP) Funds for this work. Consult the Design Bureau, Traffic and Safety Operations Section for more information. If HSIP funds are awarded, this work may be performed under a separate project or as part of the planned 3R project.

Acceptable Substitute(s) for Curve Realignment

1) Measures to reduce speed (signing, traffic control devices, etc.)

2) Measures to improve the roadside (removing, relocating, or shielding driveways, intersections, sharp horizontal curves, etc.)

Bridge Width

Guideline 8: The designer should evaluate existing bridge widths based upon the guidance below:

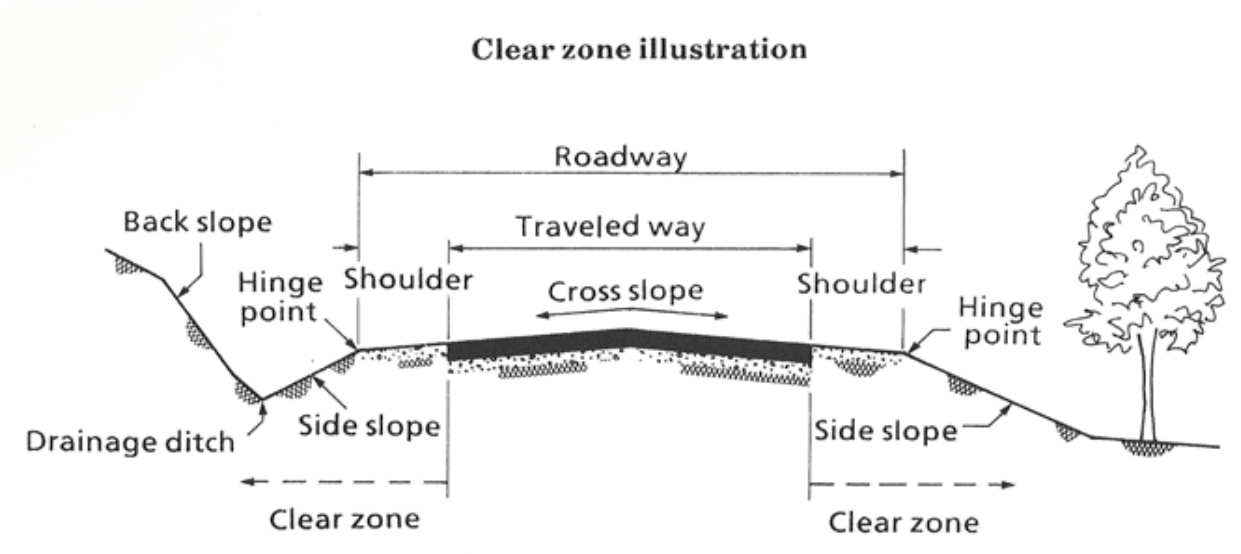
- Existing bridges should remain in place unless (1) there is a structural need to replace the bridge or (2) there is a documented pattern of crashes at the bridge that can potentially be reduced by widening or replacing the bridge.

- Narrow bridges are defined as bridges with curb to curb widths less than the combined width of the approach roadway (lanes and shoulders/face of curb). Warning signs (narrow bridge) should be placed at all narrow bridges. When guardrail improvements are necessary at narrow bridges, it may be beneficial to flare guardrail approaching these structures per the appropriate ALDOT *Special & Standard Highway Drawings*.

Side Slopes and Clear Zones

Guideline 9: The designer should develop consistent procedures for evaluating and improving roadside features with the following objectives:

- The desirable clear zone width for 3R projects shall be as defined in the AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 2018 7th Edition*, based upon the setting and functional classification of the road or street (Chapters 5, 6, and 7).



Hinge Point	Point where the slope rate changes.
Clear Zone	A traversable area that starts at the edge of the traffic lane, includes the shoulder, and extends laterally a sufficient distance to allow a driver to stop or return to the road before encountering a hazard or overturning

Figure 3-6: Clear Zone Illustration

- A clear zone of any width should provide some contribution to safety; thus the designer should evaluate providing clear zone improvements based upon a benefit/cost analysis utilizing Spreadsheet Tool 1. Most often this will involve flattening side slopes or removing roadside obstacles. The recommended method is to isolate the section that is to be improved (700' of slope flattening from 2:1 to 3:1 for example) and analyze its benefit and cost separately from any other project improvements. If more information or assistance is needed, please contact the Design Section of the Local Transportation Bureau. Please see the following figure with example calculations concerning the cost of flattening side slopes steeper than 3:1:

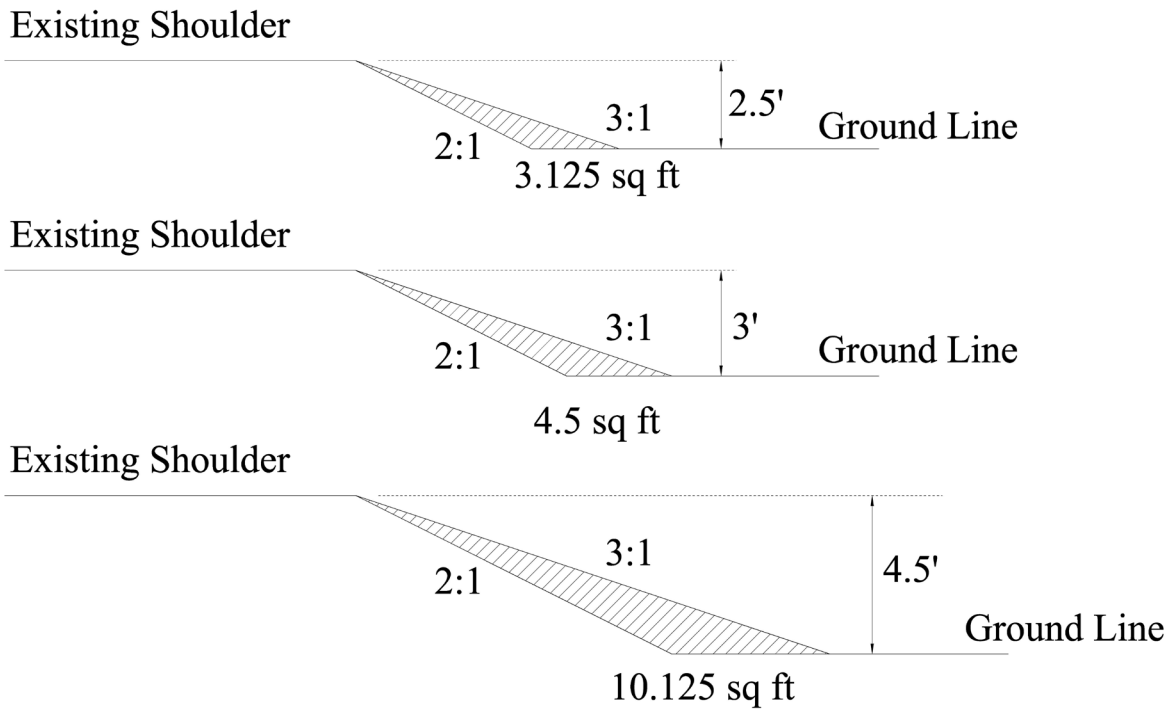


Figure 3-7: Flattening 2:1 Side Slopes to 3:1 with Estimated Areas of Fill

Example Calculations

Utilizing the figure above, the cost of flattening a 2:1 side slope to 3:1 with an embankment height of 3 ft over a 700 ft long section would cost:

4.5 sq ft X 700 ft = 3,150 cu ft = 116.67 cu yds
116.67 cu yds X $21.26/cu yd = **$2,480.40**

Note: The price of borrow excavation used in this example is based upon average ALDOT bid history prices and should be updated/revised as necessary.

Acceptable Substitute(s) When Full Width Clear Zone is Not Cost Beneficial

1) Flatten side slopes steeper than 3:1 at site-specific locations where run-off- road crashes are likely to occur (e.g., on the outside of sharp horizontal curves) or other areas identified in the scope of work review.

2) Remove, relocate, or shield isolated roadside objects within the clear zone that are greater than 4 inches in diameter and not of breakaway design. Identify site-specific areas that pose safety concerns and shield them appropriately (see guideline 14 for additional information).

3) In urban areas, provide the greatest lateral offset possible, but at no point less than the minimum described in the AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 2018 7th Edition.* In general, urban streets with design speeds of 20 to 35 MPH should provide, at minimum, the 1.5 feet lateral offset from an unyielding object to the face of curb. Urban streets with design speeds of 40 to 45 MPH should provide an "enhanced lateral offset" of 4 to 6 feet.

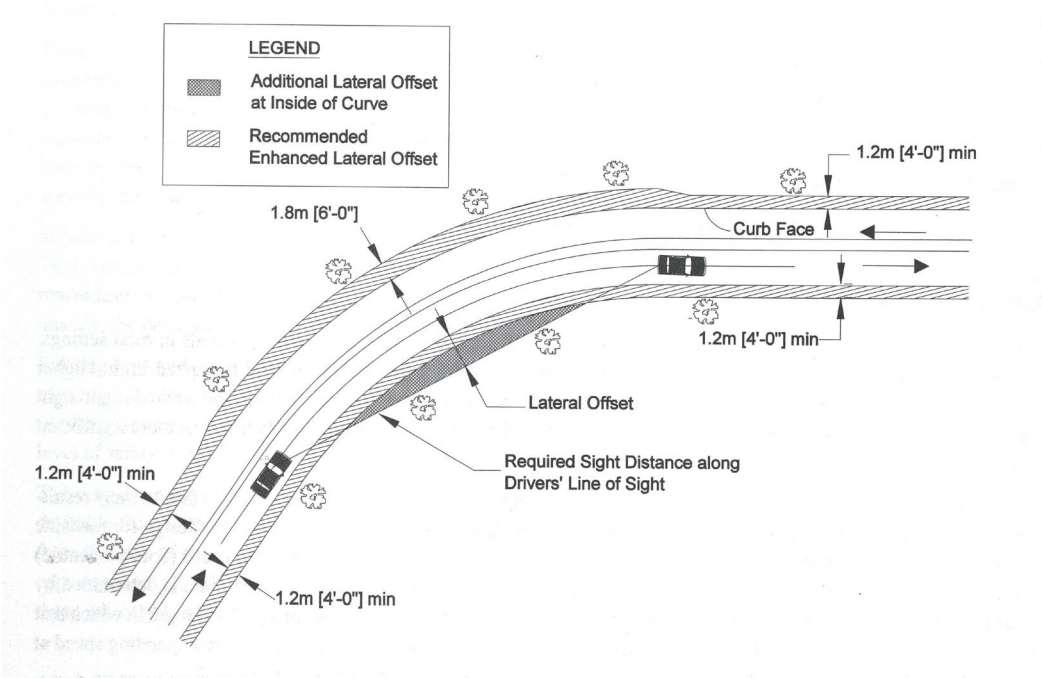


Figure 3-8: Lateral Offset for Objects at Horizontal Curves on Curbed Facilities

Note: Figure taken from page 10-4 of the AASHTO Roadside Design Guide, 2011 4th Edition.

Note: Slopes steeper than 3:1 cannot be included in the clear zone, since they are not traversable by vehicles. Clear zone or lateral offset improvements may be performed by contract or LPA forces.

Guardrail

Guideline 10: The designer should develop consistent procedures for evaluating the need for guardrail improvements, with the following considerations:

- On routes with design speeds greater than 45 MPH (40 MPH recommended), guardrail that contains steel blockouts and/or a rail height of less than 26 ½" should be replaced or reset.

- Guardrail that is not damaged and complies with the guidance above should remain in place. Damaged guardrail shall be replaced as necessary.

  Note: All new guardrail shall be installed utilizing the appropriate ALDOT *Special & Standard Highway Drawings* to comply with MASH 2016. If guardrail is to be reset due to its height (24"- 26" height currently), please refer to the ALDOT "Guardrail Height Adjustment" drawing for more information. Guardrail with a rail height less than 24" must be replaced.

Bridge Rails and Guardrail to Bridge Rail Connections

Guideline 11: The designer should develop consistent procedures for evaluating the need for bridge rail and guardrail to bridge rail improvements, with the following considerations:

Bridge Rails

- Bridge rails on NHS routes that are not compliant with NCHRP 350 shall be improved to comply with MASH 2016 where possible. If the bridge contains steel w-beam guardrail, please contact the Design Section of the Local Transportation Bureau to receive a recommendation for the site-specific application.

- The face of the bridge rail should be flush or within 1" +/- of the face of the bridge brush curb (steel w-beam guardrail applications).

- Bridge rail that is not damaged and complies with the guidance above should remain in place. Damaged bridge rail shall be replaced as necessary.

Guardrail to Bridge Rail Connections

- Guardrail to bridge rail connections that are not present or are not compliant with NCHRP 350 shall be installed or replaced with MASH 2016 compliant connections where possible. If the bridge contains steel w-beam guardrail, please contact the Design Section of the Local Transportation Bureau to receive a recommendation for the site-specific application.

Note: All new bridge rail and guardrail to bridge rail connections shall be installed per the appropriate ALDOT *Special & Standard Highway Drawings* and/or special project details to comply with MASH 2016 where possible.

Guardrail End Treatments

Guideline 12: The designer should develop consistent procedures for evaluating the need for guardrail end treatment improvements, with the following considerations:

- Any guardrail end treatment that is not present, damaged, or does not comply with NCHRP 350 shall be installed or replaced with MASH 2016 compliant devices.

Note: All new guardrail end treatments shall be installed per the appropriate ALDOT *Special & Standard Highway Drawings* to comply with MASH 2016.

Guardrail Length of Need

Guideline 13: The designer should develop consistent procedures for evaluating the appropriate guardrail length of need, with the following considerations:

Definition – Length of Need: The total length of a longitudinal barrier needed to shield an area of concern.

- On routes with **design speeds of 45 mph or less and design year traffic of 2,500 ADT or less**, the guardrail **length of need* requirement is waived, and the approach guardrail length is dictated by the type of end treatments used, appropriate ALDOT *Special & Standard Highway Drawings*, and warranted areas of protection (steep slopes or other hazardous locations).

- On routes with **design speeds greater than 45 mph or design year traffic greater than 2,500 ADT**, a 75-foot guardrail **length of need* is applicable. ALDOT *Special & Standard Highway Drawings* may indicate a system requirement that would supersede this length.

  The required length of need must be met even if all guardrail, bridge rail, and guardrail end treatments are compliant with NCHRP 350 or MASH 2016, as applicable.

Guardrail Need for Steep Slopes, Culverts, and Bridges

Guideline 14: The designer should develop consistent procedures for evaluating the need for guardrail, with the following considerations:

- Front slopes steeper than 3:1 are considered critical. If slopes steeper than 3:1 are proposed, they should be stabilized with erosion control product or riprap and protected with guardrail and guardrail end treatments per the "guardrail warranty for embankment criteria" found in the appropriate ALDOT *Special & Standard Highway Drawings*.

- Clear zone encroachments (e.g. culvert parapet walls) shall be shielded.

- Bridges and site-specific safety locations shall be identified and protected.

Right-of-Way Encroachments

Guideline 15: The designer should evaluate right-of-way encroachments based upon the following definition and guidelines:

Definition - Encroachment: An item that occupies or utilizes the LPA's right-of-way without authorization from the LPA.

A fence that meets the following criteria is not considered an encroachment:

1. The fence is determined to be in the public interest and serves a transportation related purpose, and;

2. The fence shall not impair or interfere with the free and safe flow of traffic, and;

3. The fence is located outside of the clear zone as defined in the AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 2018 7th Edition*.

The LPA should also provide notice to the adjacent land owner of any fence that will be allowed to remain in the LPA's right-of-way. This notification should specify the terms and conditions under which the use will be authorized. This notice shall remain in the project file and be available for review (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.41).

Identify and Remove Encroachments - LPAs should diligently review their right-of-way to prevent new items from being placed within the right-of-way limits. Prior to the scope of work review, the Project Representative shall review the project for any encroachments placed within the LPA's right-of-way.

Mailboxes and utilities are authorized to be within the clear zone. Non-breakaway mailboxes shall be removed and replaced with a breakaway type structure that meets U.S Postal Service Specifications.

During the scope of work review, the Project Representative shall identify to the Area Local Transportation Engineer any encroachments that will be removed prior to project authorization. Plan preparation and review shall not be contingent on receipt of the Right-Of-Way Encroachment Certification letter (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.60) from the LPA. However, receipt of the Encroachment Certification letter will be required prior to project authorization.

An example notification letter is provided for landowners who have encroachments that must be removed from the LPA's right-of way (See Chapter 16 of the *Procedural Guidelines for LPA Projects*, page 16.6)

Bicycle/Pedestrian Facilities

Guideline 16: The designer should develop consistent procedures for evaluating bicycle/pedestrian facilities, with the following objectives:

- Where bicycle/pedestrian facilities exist, upgrade **pedestrian crossings** (as necessary) per guidance shown in the 2018 AASHTO Green Book to ensure they are ADA compliant.

- Evaluate the project limits for evidence of bicyclist and/or pedestrian activity. If there is evidence, consider providing a facility that will meet the needs of the bicyclists and/or pedestrians in the area. Consult the 2018 AASHTO Green Book to ensure they are ADA compliant.

Intersection Improvements

Guideline 17: The designer should develop consistent procedures for evaluating intersection improvements, with the following objectives:

- Review crash data to identify crash locations, type, cause, severity, time of occurrence, and weather conditions.

- Field review of the intersection to detect hazards not apparent from collision and condition diagrams or crash data.

- Consider intersection improvements to site-specific safety problem areas.

  Improvements may be organized on three primary design objectives:

  1) Reduction of potential conflicts (traffic signals, turn lanes, roundabouts, etc.)

  2) Improve driver decision-making (longer lines of sight, lane markings, etc.)

  3) Improve the braking capability of the vehicle (warning signs, increased pavement skid resistance, etc.).

  Note: When an intersection is improved (traffic signals, turn lanes, roundabouts, etc.) the capacity and level of service of the intersection will be evaluated based upon guidance found in the 2018 AASHTO Green Book.

Section 4

Design Criteria for New Construction and Reconstruction

New construction typically consists of projects on new alignment where no highway facility has previously existed. Some projects on existing roads will be classified as new construction if:

- A new alignment or cross section is developed for the facility, and
- The new alignment and cross section are not substantially constrained by development along the existing road.

Reconstruction projects include projects on existing roads that are not considered new construction and in which:

- A substantial portion (more than an isolated horizontal or vertical curve) of the existing alignment is modified, or the basic roadway cross section is changed. Changes in the basic roadway cross section include widening a roadway to provide additional through lanes or adding a raised or depressed median where none exists, and where these changes cannot be accomplished within the existing roadway width (including shoulders).

Project types that would utilize this design criteria include bridge replacements, grade, drain, base and pave, and significant widening projects.

New construction and reconstruction projects shall be designed in accordance with this design criteria, which is based on the AASHTO publication, *A Policy on Geometric Design of Highways and Streets, 2018 7th Edition*. Consideration is also given to the discussion, guidance and criteria, and design standards/administrative control sections found in the ALDOT *Performance-Based, Practical Design Guide, Version 1.0, September 2020*. **Roads that are functionally classified as a local road or minor collector containing a design year ADT of 2,000 vehicles per day or less may also utilize the AASHTO publication, *Guidelines for Geometric Design of Low-Volume Roads, 2019 2nd Edition*.** Other AASHTO publications, ALDOT manuals, ALDOT *Special & Standard Highway Drawings*, and ALDOT procedures will be used as needed to supplement these sources.

Before developing construction plans, the designer shall prepare a Scope of Work (if applicable) and Project Engineering Record (PER) based on the guidelines shown below. Additional information regarding specific elements, not mentioned below, should be included in this report.

This document shall be submitted to the Area Local Transportation Engineer for concurrence and then forwarded to the State Local Transportation Engineer for approval.

4.1 Controlling Design Criteria

Per this policy, the following criteria are considered controlling for the design of new construction and reconstruction LPA projects along NHS and non-NHS routes:

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Horizontal Curve Radius
5. Superelevation Rate
6. Stopping Sight Distance (excludes sag vertical curves)
7. Maximum Grade
8. Cross Slope
9. Vertical Clearance
10. Design Loading Structural Capacity

The designer should strive to provide values inside the indicated ranges found in the 2018 AASHTO Green Book for all design elements. Any value outside of the indicated ranges for the controlling design criteria will require a formal design exception. Design exceptions will be evaluated utilizing guidance found in the ALDOT *Performance-Based, Practical Design Guide, Version 1.0, September 2020* to ensure that waivers are reviewed consistently and are based upon existing roadway characteristics, alternatives, safety and operational performance vs. impacts, mitigation measures, and compatibility with other sections of the roadway. For ease of use and identification, the controlling design criteria will be in **bold text** throughout the rest of this section. Although non-controlling design criteria will not require a formal design exception, documentation of the design decision-making process must be provided.

4.2 Local Roads and Streets

(Guidelines based on Chapter 5 of 2018 AASHTO Green Book)

General Design Considerations

Guideline 1: Designers should consider appropriate design values for their overall design by:

- **Selecting the appropriate design speed for the road or street based on Table 5-1 for rural settings or guidance from page 5-14 in urban areas.**
- Analyzing traffic volumes projected 20 years in the future for rural settings and urban areas, based on guidance from pages 5-3 or 5-14, as applicable.
- **Ensuring maximum grades don't exceed values based on Table 5-2 for rural settings or guidance from page 5-15 in urban areas.**
- **Selecting an appropriate cross slope for both paved and unpaved surfaces by seeking guidance from page 5-4 in rural setting or from page 5-15 in urban areas.**
- **Examining the horizontal alignment to ensure horizontal curves meet the minimum standards for superelevation rates and superelevation runoff based on the ALDOT *Special & Standard Highway Drawings* for rural settings or guidance from page 5-15 in urban areas.**
- **Examining the vertical alignment to ensure minimum stopping sight distances are met based on Table 5-3 for rural settings or guidance from page 5-16 in urban areas.**

Cross-Sectional Elements

Guideline 2: Designers should consider appropriate design values for each cross-sectional element by:

- **Determining the appropriate widths for the road or street based on Table 5-5 for rural settings or guidance from page 5-16 in urban areas.**
- Determining the number of lanes required based on guidance from pages 5-6 or 5-16, as applicable.
- Examining guidance for parking lanes, medians, and curbs per pages 5-16 and 5-17 in urban areas.

- Determining if the existing right-of-way is sufficient to accommodate the design or if additional right-of-way is needed based on guidance from pages 5-7 or 5-17, as applicable.

- Determining the need for bicycle/pedestrian facilities based on guidance from pages 5-8 or 5-18 and 5-19, as applicable.

Structures

Guideline 3: Designers should evaluate the design characteristics of structure(s) by:

- **Determining the minimum clear roadway width (curb to curb) and structural capacity of required structure(s) based on Table 5-6 or guidance from page 5-22 and 5-23, as applicable.**

- **Ensuring existing and required structures have adequate vertical clearance based on guidance from pages 5-9 or 5-23, as applicable.**

Roadside Design

Guideline 4: Designers should consider safety in their roadside design by:

- Determining the desirable clear zone based on guidance from pages 5-10 or 5-23, as applicable.

- Evaluating the lateral offset based on guidance from pages 5-10 or 5-23, as applicable.

- Ensuring that frontslopes and/or backslopes are as flat as practical for rural settings based on guidance from pages 5-10 and 5-11. Slopes steeper than 3:1 should be stabilized with erosion control product or riprap and protected with guardrail and guardrail end treatments per the "guardrail warranty for embankment criteria" found in the appropriate ALDOT *Special & Standard Highway Drawings*.

  Note: All new guardrail, bridge rail, guardrail to bridge rail connections, and guardrail end treatments shall be installed to comply with MASH 2016 and shall meet the length of need as defined in the 3R Design Criteria earlier in this chapter. These criteria should also be used to evaluate any existing rail, connections and end treatments within the project limits.

Intersection Design

Guideline 5: Designers should consider safety in their intersection design by:

- Evaluating intersection locations, angles, radii, and sight distances based on guidance from pages 5-11 or 5-23 to 5-24, as applicable.

Railroad-Highway Grade Crossings

Guideline 6: Designers should account for railroad-highway grade crossings when an at grade railroad crossing is within or near the project limits by:

- Providing appropriate warning devices, adequate sight distance, and proper approach roadway widths based on guidance from pages 5-11 and 5-12 or 5-25, as applicable.

- Starting the Railroad Coordination process as early as possible is beneficial in keeping a project on schedule for the desired letting date. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for additional guidance.

  Note: Bridge projects over railroads will involve Railroad Coordination. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for additional guidance.

Traffic Control Devices

Guideline 7: Designers should provide all required traffic control devices by:

- Seeking guidance found in the *Manual on Uniform Traffic Control Devices (MUTCD), current edition* and the appropriate ALDOT *Special & Standard Highway Drawings*.

Roadway Lighting

Guideline 8: Designers should provide appropriate roadway lighting by:

- Seeking guidance found on pages 5-25 and 5-26 in urban settings.

Drainage

Guideline 9: Designers should evaluate drainage by:

- Seeking guidance found in the ALDOT Hydraulic Manual and referring to the appropriate ALDOT *Special & Standard Highway Drawings*.

Erosion Control and Landscaping

Guideline 10: Designers should provide an appropriate erosion control plan by:

- Seeking guidance from pages 5-12 or 5-26 to 5-27, as applicable and by referring to the ALDOT *Special & Standard Highway Drawings*.

NOTE: Other chapters and/or sections of AASHTO's A Policy on Geometric Design of Highways and Streets, 2018 7th Edition may apply.

4.3 Collector Roads and Streets

(Guidelines based on Chapter 6 of 2018 AASHTO Green Book)

General Design Considerations

Guideline 1: Designers should consider appropriate design values for their overall design by:

- **Selecting the appropriate design speed for the road or street based on Table 6-1 for rural settings or guidance from pages 6-13 to 6-14 in urban areas.**

- Analyzing traffic volumes projected 20 years in the future for rural settings and urban areas, based on guidance from pages 6-3 or 6-14, as applicable.

- **Ensuring maximum grades don't exceed values based on Table 6-2 for rural settings or Table 6-7 in urban areas.**

- **Selecting an appropriate cross slope for both paved and unpaved surfaces by seeking guidance from page 6-4 or 6-15, as applicable.**

- **Examining the horizontal alignment to ensure horizontal curves meet the minimum standards for superelevation rates and superelevation runoff based on ALDOT *Special & Standard Highway Drawings* for rural settings or guidance from page 6-15 in urban areas.**

- **Examining the vertical alignment to ensure minimum "K" values are met in Table 6-3 for rural settings or by seeking guidance found on page 6-15 in urban areas.**

Cross-Sectional Elements

Guideline 2: Designers should consider appropriate design values for each cross-sectional element by:

- **Determining the appropriate widths for the road or street based on Table 6-5 for rural settings or guidance from page 6-16 in urban areas.**

- Determining the number of lanes required based on guidance from pages 6-6 or 6-16, as applicable.

- Examining guidance for parking lanes, medians, and curbs per pages 6-16 through 6-18 in urban areas.

- Determining if existing right-of-way is sufficient to accommodate the design or if additional right-of-way is needed based on guidance from page 6-7 or pages 6-18 to 6-19, as applicable.

- Determining the need for bicycle/pedestrian facilities based on page 6-7 or pages 6-19 to 6-20, as applicable.

Structures

Guideline 3: Designers should evaluate the design characteristics of structure(s) by:

- **Determining the minimum clear roadway width (curb to curb) and structural capacity of required structure(s) based on Table 6-6 or guidance from page 6-20, as applicable.**

- **Ensuring required and existing structures have adequate vertical clearance based on guidance from pages 6-8 or 6-20, as applicable.**

Roadside Design

Guideline 4: Designers should consider safety in their roadside design by:

- Determining the desirable clear zone based on guidance from pages 6-8 or 6-21, as applicable.

- Evaluating the lateral offset based on guidance from pages 6-8 to 6-9 or 6-21 to 6-22, as applicable.

- Ensuring that frontslopes and/or backslopes are as flat as practical for rural settings based on guidance from page 6-9. Slopes steeper than 3:1 shall be stabilized with erosion control product or riprap and protected with guardrail and guardrail end treatments per the "guardrail warranty for embankment criteria" found in the appropriate ALDOT *Special & Standard Highway Drawings*.

  Note: All new guardrail, bridge rail, guardrail to bridge rail connections, and guardrail end treatments shall be installed to comply with MASH 2016 and length of need as defined in the 3R Design Criteria earlier in this chapter. These criteria should also be used to evaluate any existing rail, connections and end treatments within the project limits.

Intersection Design

Guideline 5: Designers should consider safety in their intersection design by:

- Evaluating intersection locations, angles, radii, and sight distances based on guidance found on pages 6-9 to 6-10 or 6-22, as applicable.

Railroad-Highway Grade Crossings

Guideline 6: Designers should account for Railroad–Highway Grade Crossings when an at grade railroad crossing is within or near the project limits by:

- Providing appropriate warning devices, adequate sight distance, and proper approach roadway widths based on guidance from pages 6-10 or 6-23, as applicable.

- Starting the Railroad Coordination process as early as possible is beneficial in keeping a project on schedule for the desired letting date. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for additional guidance.

  Note: Bridge projects over railroads will involve Railroad Coordination. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for guidance.

Traffic Control Devices

Guideline 7: Designers should provide all required traffic control devices by:

- Seeking guidance found in the *Manual on Uniform Traffic Control Devices (MUTCD), current edition* and the appropriate ALDOT *Special & Standard Highway Drawings*.

Roadway Lighting

Guideline 8: Designers should provide appropriate roadway lighting by:

- Seeking guidance found on pages 6-23 and 6-24 in urban settings.

Drainage

Guideline 9: Designers should evaluate drainage by:

- Seeking guidance found in the ALDOT Hydraulic Manual and the appropriate ALDOT *Special & Standard Highway Drawings*.

Erosion Control and Landscaping

Guideline 10: Designers should provide an appropriate erosion control plan by:

- Seeking guidance from pages 6-11 or 6-24, as applicable and by referring to the appropriate ALDOT *Special & Standard Highway Drawings*.

NOTE: Other chapters and/or sections of AASHTO's A Policy on Geometric Design of Highways and Streets, 2018 7th Edition may apply.

4.4 Rural and Urban Arterials

(Guidelines based on Chapter 7 of 2018 AASHTO Green Book)

General Design Considerations

Guideline 1: Designers should consider appropriate design values for their overall design by:

- **Selecting the appropriate design speed for the road or street based on guidance from pages 7-3 or 7-36, as applicable.**

- Analyzing traffic volumes projected 20 years in the future based on either Average Daily Traffic (ADT) or Design Hourly Volume (DHV) as appropriate based on guidance from pages 7-3 to 7-4 or 7-36, as applicable.

- **Providing minimum sight distances for rural and urban arterials based on Table 7-1.**

- **Ensuring maximum grades don't exceed values based on Table 7-2 for rural settings or Table 7-4a in urban areas.**

- **Selecting an appropriate cross slope for both paved and unpaved surfaces by seeking guidance from pages 7-6 or 7-38 to 7-39, as applicable.**

- **Examining the horizontal alignment to ensure horizontal curves meet the minimum standards for superelevation rates and superelevation runoff based on the ALDOT *Special & Standard Highway Drawings* for rural settings or guidance from page 7-38 in urban areas.**

Cross-Sectional Elements

Guideline 2: Designers should consider appropriate design values for each cross-sectional element by:

- **Determining the appropriate widths for the road or street based on Table 7-3 for rural settings or guidance from pages 7-39 to 7-40 in urban areas.**

- Determining the number of lanes required based on guidance from pages 7-7 or 7-40, as applicable.

- Examining guidance for parking lanes, medians, and curbs and shoulders per pages 7-40 through 7-46 in urban areas.

- Determining if the existing right-of-way is sufficient to accommodate the design or if additional right-of-way is needed based on guidance from pages 7-7 to 7-8 or 7-48 to 7-49, as applicable.

Structures

Guideline 3: Designers should evaluate the design characteristics of structure(s) by:

- **Determining the minimum clear roadway width (curb to curb) and structural capacity of required structure(s) based on guidance from pages 7-9 or 7-50 to 7-51, as applicable.**

- **Ensuring existing and required structures have adequate vertical clearance based upon guidance from pages 7-9 or 7-51, as applicable.**

Roadside Design

Guideline 4: Designers should consider safety in the roadside design by:

- Determining the desirable clear zone based on guidance from pages 7-8 or 7-49, as applicable.

- Evaluating the lateral offset based on guidance from pages 7-8 or 7-49 to 7-50, as applicable.

  Note: All new guardrail, bridge rail, guardrail to bridge rail connections, and guardrail end treatments shall be installed to comply with MASH 2016 and length of need as defined in the 3R Design Criteria earlier in this chapter. These criteria should also be used to evaluate any existing rail, connections and end treatments within the project limits.

Intersection Design

Guideline 5: Designers should consider safety in their intersection design by:

- Evaluating intersections and interchanges based on guidance from pages 7-29 or 7-56, as applicable.

Railroad-Highway Grade Crossings

Guideline 6: Designers should account for Railroad–Highway Grade Crossings when an at grade railroad crossing is within or near the project limits by:

- Providing appropriate warning devices, adequate sight distance, and proper approach roadway widths based on guidance from pages 7-31 or 7-51, as applicable.

- Starting the Railroad Coordination process as early as possible is beneficial in keeping a project on schedule for the desired letting date. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for additional guidance.

  Note: Bridge projects over railroads will involve Railroad Coordination. See Chapter 12 of the *Procedural Guidelines for LPA Projects* for additional guidance.

Traffic Control Devices

Guideline 7: Designers should provide all required traffic control devices by:

- Seeking guidance found in the *Manual on Uniform Traffic Control Devices (MUTCD), current edition* and the appropriate ALDOT *Special & Standard Highway Drawings*.

Roadway Lighting

Guideline 8: Designers should provide appropriate roadway lighting by:

- Seeking guidance found on pages 7-31 to 7-32 and 7-64 to 7-65, as applicable.

Drainage

Guideline 9: Designers should evaluate drainage by:

- Seeking guidance found in the ALDOT Hydraulic Manual and the appropriate ALDOT *Special & Standard Highway Drawings*.

Erosion Control

Guideline 10: Designers should provide an appropriate erosion control plan by:

- Seeking guidance from pages 7-9 or 7-64, as applicable and referring to the applicable ALDOT *Special & Standard Highway Drawings*.

Bicycle and Pedestrian Facilities

Guideline 11: Designers should consider bicycle and pedestrian facilities by:

- Seeking guidance from pages 7-30 or 7-54 to 7-56, as applicable.

NOTE: Other chapters and/or sections of AASHTO's A Policy on Geometric Design of Highways and Streets, 2018 7th Edition may apply.