The information contained in Appendix H: Application of Design Standards, dated June 2016, has been updated to reflect the December 2018 Errata. The errata incorporates the Nebraska Department of Transportation Policy Letter DES 17-02: "Nominal Shoulder Width for Lateral Offset to Obstruction", which was approved by the FHWA on June 12, 2017, addresses errors, changes in procedure, changes in NDOT department titles, changes in other Roadway Design Manual chapters and other reference material citations occurring since the latest publication of this chapter.

## CONTENTS

## 1. THE CONTROLLING DESIGN CRITERIA

Through research and practical experience, minimum guidance has been established for the geometric design elements of a roadway project. The minimum values for the design criteria are based on such parameters as design speed, roadway location, functional classification of the roadway, traffic volume, and the design vehicle. The Federal Highway Administration (**FHWA**) has adopted the American Association of State Highway and Transportation Officials (**AASHTO**) publication A Policy on Geometric Design of Highways and Streets (*Green Book*) as their source of roadway design guidance.

**FHWA** has identified ten elements of roadway geometry on all Interstate and freeway projects and for high-speed roadways (≥ 50 mph) and two design elements on low-speed roadways (< 50 mph) as being of such importance that when the minimum design standard cannot be attained for a project on the National Highway System (NHS) a design exception will be required. This same rationale was used in the creation of the Minimum Design Standards (*MDS*); if a design criterion on a non-NHS highway project cannot meet the minimum design standard, a relaxation of the *MDS* (design relaxation) will be required.

| **The FHWA Controlling Design Elements for Interstate, Freeway, and High-Speed (≥ 50 mph) Roadways** | | |
|---|---|---|
| | **Element** | **Definition** |
| 1 | **Design Speed** | The speed selected to control the geometric features of the project |
| 2 | **Lane Width** | The appropriate width to be used for the through travel lanes |
| 3 | **Shoulder Width** | The appropriate shoulder width for the roadway |
| 4 | **Horizontal Curve Radius** | The horizontal curvature of the roadway |
| 5 | **Superelevation Rate** | The appropriate cross slope of the roadway through a horizontal curve |
| 6 | **Maximum Grade** | The rate of change in the elevation of a roadway, expressed as a percentage |
| 7 | **Stopping Sight Distance** | The distance required by a driver to see an object on the roadway and to bring the vehicle to a safe stop before colliding with that object |
| 8 | **Cross Slope** | The cross slope aids in draining the roadway and shoulder |
| 9 | **Vertical Clearance** | The clear distance required between the top of the pavement and an overhead object |
| 10 | **Structural Capacity** | The load carrying capacity of a bridge or bridge sized structure |

| **The FHWA Controlling Design Elements for Low-Speed (< 50 mph) Roadways** | | |
|---|---|---|
| | **Element** | **Definition** |
| 1 | **Design Speed** | The speed selected to control the geometric features of the project |
| 2 | **Structural Capacity** | The load carrying capacity of a bridge or bridge sized structure |

The Nebraska Department of Transportation (**NDOT**) has added four controlling design criteria to the *MDS*:

| | | |
|---|---|---|
| 11 | **Vertical Alignment** | The vertical curvature of the roadway |
| 12 | **Horizontal Clear Zone/ Fixed Obstacle Clearance** | Does the project meet the *MDS* recommended distance? |
| 13 | **Lateral Offset to Obstruction** | The distance from the edge of the traveled way to a vertical roadside object; lateral offset to obstruction should not be confused with the roadway clear zone (See Section 1.A) |
| 14 | **Bridge Width** | The width of the lanes and shoulders carried across the bridge, measured from bridge rail to bridge rail or curb to curb |

These four additional items are not **FHWA** design criteria; inability to meet the minimum standard will not require a design exception from the **FHWA** but will require a relaxation of the *MDS* (See Section 2.B).

The 14 controlling design criteria in the *MDS* will apply to all roadway classifications and design speeds.

Three additional items have been determined by **NDOT** to be important to the design of a roadway while not rising to the level of a controlling criterion. These non-controlling items are:

1. **Barrier Crashworthiness:** Do the roadside barriers (e.g. guardrail, bridge rail) meet current standards? Are they NCHRP 350/ MASH compliant?
2. **Hydraulic Design:** Are the components of the drainage system (e.g. culverts, storm sewers, roadway ditches) designed to the appropriate **NDOT** Design Storm Frequency? (See the Drainage Design and Erosion Control Manual, page 1-12)
3. **Pavement Design:** Is the projected life expectancy of the pavement less than the project design year?

An inability to meet the minimum guidance for these items will require written **Unit Head** approval and justification to the project file.

## 1.A Nominal Shoulder Width for Lateral Offset to Obstruction

### 1.A.1 Highways With An ADT < 400 VPD

The lateral offset (nominal shoulder width) is given in EXHIBITS H.1 AND H.2. Roadside barriers may be placed at the outer edge of the shoulder; however, it is desirable to provide a minimum clearance of four feet from the edge of the traveled way to the barrier. No approval is necessary for the design decision.

### 1.A.2 Highways With An ADT ≥ 400 VPD

The lateral offset (nominal shoulder width) is given in EXHIBITS H.1 AND H.2.

- On a paved or a turf only shoulder, the nominal shoulder width is the shoulder width. For example, on a New and Reconstructed Interstate project with high truck traffic, the shoulder widths are four ft. left and 12 ft. right, which is also the nominal shoulder width and the lateral offset to obstruction.
- On a shoulder with both a paved and a turf section, the nominal shoulder width is the total shoulder width. For example, on a New and Reconstructed Major Arterial project with an ADT between 2,000 and 3,999 the shoulder width is eight ft. total with two ft. paved. The nominal shoulder width and the lateral offset to obstruction is eight feet.

## NEW AND RECONSTRUCTED RURAL

| State Functional Classification | National Functional Classification | Lateral Offset to Obstruction |
|---|---|---|
| Interstate | Interstate | The paved shoulder width |
| Expressway (Access Only at Interchanges) | Other Freeways and Expressways | The paved shoulder width |
| Expressway | Other Freeways and Expressways | Left = 4 ft./ Right = 8 ft. |
| Major Arterial | Other Principal Arterials or Minor Arterial | ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD: 4 ft. |
| Major Arterial | Major Collector, Minor Collector or Local | ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD: 4 ft. |
| Scenic Recreation – Major Arterial | Other Principal Arterials, Minor Arterial, Major Collector or Minor Collector | Design Speed ≥ 50 mph: 6 ft.<br>Design Speed < 50 mph:<br>4 ft. desirable<br>2 ft. minimum |

## NEW AND RECONSTRUCTED MUNICIPAL

| State Functional Classification | National Functional Classification | Lateral Offset to Obstruction |
|---|---|---|
| Interstate | Interstate | The paved shoulder width |
| Expressway (Access Only at Interchanges) | Other Freeways and Expressways | The paved shoulder width |
| Expressway | Other Freeways and Expressways | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed:<br>Left = 4 ft.<br>Right = 8 ft. |
| Major Arterial | Other Principal Arterials or Minor Arterial | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed:<br>ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD: 4 ft. |
| Major Arterial | Major Collector or Minor Collector | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed:<br>ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD:<br>4 ft. desirable<br>2 ft. minimum |

**Exhibit H.1 Lateral Offset to Obstruction – New and Reconstructed Projects**

## RESURFACING, RESTORATION AND REHABILITATION (3R) RURAL

| State Functional Classification | National Functional Classification | Lateral Offset to Obstruction |
|---|---|---|
| Interstate | Interstate | The paved shoulder width |
| Expressway | Other Freeways and Expressways | The paved shoulder width |
| Major Arterial | Other Principal Arterials or Minor Arterial | ADT ≥ 2,000 VPD: 6 ft.<br>ADT < 2,000 VPD:<br>4 ft. desirable<br>2 ft. minimum |
| Major Arterial | Major Collector, Minor Collector or Local | ADT ≥ 2,000 VPD: 6 ft.<br>ADT < 2,000 VPD:<br>4 ft. desirable<br>2 ft. minimum |
| Scenic Recreation – Major Arterial | Other Principal Arterials, Minor Arterial, Major Collector or Minor Collector | 4 ft. desirable<br>2 ft. minimum |

## RESURFACING, RESTORATION AND REHABILITATION (3R) MUNICIPAL

| State Functional Classification | National Functional Classification | Lateral Offset to Obstruction |
|---|---|---|
| Interstate | Interstate | The paved shoulder width |
| Expressway | Other Freeways and Expressways | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed: 8 ft. |
| Major Arterial | Other Principal Arterials or Minor Arterial | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed:<br>ADT ≥ 4,000 VPD: 8 ft.<br>ADT 2,000 – 3,999 VPD: 5 ft.<br>ADT < 2,000 VPD:<br>4 ft. desirable<br>2 ft. minimum |
| Major Arterial | Major Collector or Minor Collector | Curbed: 1.5 ft. from the face of the curb<br>Non-Curbed:<br>ADT ≥ 4,000 VPD: 8 ft.<br>ADT 2,000 – 3,999 VPD: 5 ft.<br>ADT < 2,000 VPD:<br>4 ft. desirable<br>2 ft. minimum |

**Exhibit H.2 Lateral Offset to Obstruction – Resurfacing, Restoration and Rehabilitation (3R) Projects**

## 2. DEPARTURE FROM STANDARDS

If the minimum design standards cannot be attained, a design exception for Projects of Division Interest (PoDI) and/ or a relaxation of the *MDS* will be required, unless the project is classified as a maintenance resurfacing project. The design exception and/ or relaxation documentation will be included in the project file.

### 2.A Design Exceptions for Projects of Division Interest

#### 2.A.1 Oversight Authority for Departure from Standards

**FHWA PROJECT APPROVAL AUTHORITY: FHWA** retains full oversight and approval authority for design exceptions to the controlling design criteria for any project on the NHS which has been designated as a PoDI.

The designer should check Clarity© to determine if a project is a PoDI.

**NDOT PROJECT APPROVAL AUTHORITY:** Under the terms of the NDOT/FHWA Stewardship & Oversight Agreement (http://roads.nebraska.gov/media/6796/steward-oversight-agr.pdf), **NDOT** assumes oversight and approval authority for design exceptions to the controlling design criteria for any project which is designated as a PoDI which is not on the NHS.

#### 2.A.2 Design Exception Documentation for PoDIs

**PoDIs Which Are On The NHS:** For projects that do not meet the guidance found in the "AASHTO Minimum Design Guidance" (pg. H-8), the *Green Book*, or the *I-State Green Book* a design exception document will be prepared for formal **FHWA** approval following the **FHWA** design exception format (See Mitigation Strategies for Design Exceptions, (http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/fhwa_sa_07011.pdf)). If the project also does not meet the design standards found in the *MDS*, the designer will request a design relaxation of the *MDS* as detailed in Section 2.B *after* obtaining **FHWA** approval.

**PoDIs Which Are Not On The NHS:** For projects which are not on the NHS that do not meet the guidance found in the "AASHTO Minimum Design Guidance" (pg. H-8), the *Green Book*, or the *I-State Green Book* a design exception document will be prepared following the **FHWA** design exception format (See Mitigation Strategies for Design Exceptions) for both the project file and for approval by the **Deputy Director-Engineering**. This documentation does not need to be submitted to the **FHWA** for formal approval but will be transmitted to the appropriate **FHWA Transportation Engineer** for review and comment. If the project also does not meet the design standards found in the *MDS* the designer will request a design relaxation as detailed in Section 2.B.

**PoDIs Which Meet the Minimum Standards:** A document will be placed in the project file stating that "This project meets the controlling design criteria."

## 2.B Design Relaxations of the Nebraska Minimum Design Standards (*MDS*)

Requests for relaxation of the *MDS* will be prepared in the same format as a **FHWA** design exception (See Mitigation Strategies for Design Exceptions). The relaxation request will be routed through the appropriate **Division Head** and **District Engineer** and requires the approval of the **Deputy Director-Engineering**. After this approval is obtained, the request will be sent to the **Secretary of the Board of Public Roads Classifications and Standards** at least ten working days prior to the board meeting where it will be presented to the **Board of Public Roads** for their approval.

A design relaxation request letter will have the following attachments:

- The existing typical section
- The proposed typical section
- The typical section required by the *MDS*
- Crash history and analysis, stamped as "Confidential, for NDOT use only" (The analysis should include location or identifying hazardous locations, accident clusters, or accident trends within the project limits).

The request for a relaxation of the *MDS* will be presented to the **Board of Public Roads Classifications and Standards** in a power point format. The power point presentation will include location maps, aerial views of the locations, pictures of the sites or project, typical sections of the existing, proposed, and standard sections, slides concerning crashes (not protected information), costs to obtain standards, environmental impacts, etc. A meeting will be scheduled at least two weeks in advance of the board meeting to present the power point to the **Roadway Design Engineer**.

## 2.C Procedure for When Desirable Conditions Cannot be Attained

In those instances where it is not possible to meet the desirable design condition (see pg. H-31), a decision document will be created (the "Design Decision Documentation Sheet", Form DR-335, may be used for this purpose). This document should be reviewed and signed by the affected Divisions (e.g. **Project Development**, **Traffic Engineering**) and by the appropriate level of supervision (such as the **Unit Head** or the **Assistant Design Engineer**) and placed in the project file. For example: where it is not possible to design a temporary roadway to a design speed 10 mph less than the existing posted speed limit, the designer will detail the reasons why a lower design speed is necessary, obtain approval from the **Unit Head**, and have **Traffic Engineering** review and sign the letter. This does not need to be a routed letter; an e-mail from **Traffic Engineering** stating that the design has been reviewed and approved would suffice.

## 3. INSTRUCTIONS FOR COMPLETING FORM DR-76:

### 3.A Sources

1. **Design Guidance from the *MDS***. The designer should use the *MDS* to obtain the minimum design values for all projects.

2. **AASHTO Minimum Design Guidance** (pg. H-8). This guidance has been consolidated from A Policy on Geometric Design of Highways and Streets (2011), A Policy on Design Standards Interstate System (2005), and Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation (1987). Some items in the "AASHTO Minimum Design Guidance" may be less restrictive than the guidance found in the *MDS*, the designer may use the design guidance for these items to avoid requesting a design exception on NHS projects and as a justification for using a lower standard when requesting a design relaxation on non-NHS and state projects.

3. **Nebraska Desirable Design Guidance** (pg. H-31). This is design guidance from the Nebraska Roadway Design Manual and from Roadway Design Division Policy Letters. This listing gives the **NDOT** preferred guidance for certain design categories. This is the design value to be used on all projects, where possible.

### 3.B Instructions

Prior to filling out Form DR-76, the designer must determine whether the project is a PoDI and if it is on the NHS. The designer may view maps showing the NHS routes in Nebraska at http://www.fhwa.dot.gov/planning/national_highway_system/nhs_maps/nebraska/. PoDIs will require a design exception from the **FHWA** or approval by the **Deputy Director - Engineering** (See Section 2.A.2) if the **AASHTO** minimum design guidance cannot be attained. All other projects will require a relaxation of the *MDS* from the **Board of Public Roads Classifications and Standards** when the minimum design value cannot be met.

Form DR-76 will be completed using the same format for all projects regardless of the level of approval authority.

The designer, in consultation with the **Unit Head**, will determine the design values to be used on a project for each of the controlling design criteria. Placing a design value which is less than the minimum design value in Form DR-76 will require written **Unit Head** approval and justification to the project file. The applicable minimum design value will be entered in Form DR-76, in parenthesis, after the chosen design value. This will highlight any departure from the minimum design guidance requiring a design exception and/ or relaxation.

**PoDIs on the NHS:** The designer should use the design values from the *MDS* as the minimum condition. By exceeding or meeting these values the designer will not need to request either a design exception or relaxation. If the designer cannot meet the minimum *MDS* value for a design element, the "AASHTO Minimum Design Guidance" (pg. H-8) should be reviewed to see if that value may be used. If using the **AASHTO** value, the designer is responsible for ascertaining whether the design value from the *MDS* has been met or if a design relaxation will be required.

**PoDIs not on the NHS and State Highway Projects:** The designer will use the design guidance from the *MDS* as the minimum condition. If the minimum design values cannot be attained, the designer will need to request a relaxation of the *MDS*. A copy of the approval of a design relaxation for non-NHS PoDIs will be transmitted to the appropriate **FHWA Transportation Engineer** for review and comment.

Note: When entering the appropriate minimum values into Form DR-76, the source of the guidance should be given. The designer will enter the following abbreviations on the form:

- "Minimum Design Standards" = (*MDS*)
- "AASHTO Minimum Design Guidance" = (*GB*)

**All projects:** When choosing the design values to be used on a project, the designer and **Unit Head** should refer the "Nebraska Desirable Design Guidance" (pg. H-31), the Roadway Design Manual, and the "Roadway Design Division Policy Letters" for additional guidance. Deviation from these guidelines will require approval from the appropriate **Roadway Design Division** level of authority.

**AASHTO MINIMUM DESIGN GUIDANCE**
STATE FUNCTIONAL CLASSIFICATION
[NATIONAL FUNCTIONAL CLASSIFICATION]

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: INTERSTATE<br>STATE FUNCTIONAL CLASSIFICATION: INTERSTATE<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – INTERSTATE | |
|---|---|
| **Design Speed** | 70 mph |
| **Lane Width** | 12 ft. |
| **Shoulder Width** | Right = 10 ft.<br>4-Lane: Left = 4 ft.<br>≥ 6-Lane: Left = 10 ft.<br>Truck Traffic > 250 DDHV: Right & Left = 12 ft.<br>(Note: All shoulder widths are paved). |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 1,810 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 247 |
| **Sag K Value** | 181 |
| **Maximum Grade** | 3% Level<br>4% Rolling |
| **Stopping Sight Distance** | 730 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% (A) |
| **Shoulder** | 2% to 6% paved (B) |
| **Lateral Offset to Obstruction** | The paved shoulder width. |
| **Vertical Clearance (1)** | 16 ft.<br>Sign trusses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway including paved shoulders.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the nearest traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Design Standards Interstate System, January 2005 and A Policy on Geometric Design of Highways and Streets, 2011

(1) Over the entire roadway, including the width of paved shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: RURAL FREEWAY<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY (ACCESS ONLY AT INTERCHANGES)<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS | |
|---|---|
| **Design Speed** | 50 mph |
| **Lane Width** | 12 ft. |
| **Shoulder Width** | Right = 10 ft.<br>4-Lane: Left = 4 ft.<br>≥ 6-Lane: Left = 10 ft.<br>Truck Traffic > 250 DDHV: Right & Left = 12 ft.<br>(Note: All shoulder widths are paved). |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 758 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 84 |
| **Sag K Value** | 96 |
| **Maximum Grade** | 4% Level<br>5% Rolling |
| **Stopping Sight Distance** | 425 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (C) |
| **Lateral Offset to Obstruction** | The normal shoulder width. |
| **Vertical Clearance (2)** | 16 ft.<br>Sign trusses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(C) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent roadway lane and can be at least 1% greater.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: RURAL DIVIDED ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL | |
|---|---|
| **Design Speed** | 50 mph |
| **Lane Width** | 12 ft. (11 ft. may be retained based on alignment and crash history) |
| **Shoulder Width** | 8 ft. Right/ 4 ft. Left (both paved) |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 758 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 84 |
| **Sag K Value** | 96 |
| **Maximum Grade (3)** | 4% Level<br>5% Rolling |
| **Stopping Sight Distance** | 425 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 16 ft. (14 ft. may be retained if allowed by local statute).<br>Sign trusses: Structure clearance +1 ft. |
| **Bridge Width** | Full width of the approach roadway including paved shoulders.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the nearest traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(3) Grade may be up to 1% steeper for tangent length less than 500 ft.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: RURAL ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: ARTERIAL | |
|---|---|
| **Design Speed** | 50 mph |
| **Lane Width** | ADT ≥ 400 VPD: 12 ft.<br>ADT < 400 VPD: 11 ft. |
| **Shoulder Width** | ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD: 4 ft. |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 758 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 84 |
| **Sag K Value** | 96 |
| **Maximum Grade (3)** | 4% Level<br>5% Rolling |
| **Stopping Sight Distance** | 425 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 16 ft. (14 ft. may be retained if allowed by local statute).<br>Sign Trusses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway including paved shoulders.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(3) Grade may be up to 1% steeper for tangent length less than 500 ft.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: RURAL COLLECTOR<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR/ LOCAL | | | | |
|---|---|---|---|---|
| | **ADT > 2,000** | **ADT 1,500 – 1,999** | **ADT 400 – 1,499** | **ADT < 400** |
| **Design Speed** | 50 mph | 40 mph | 40 mph | 30 mph |
| **Lane Width** | 12 ft. | 11 ft. | 11 ft. | 10 ft. |
| **Shoulder Width** | 8 ft. | 6 ft. | 5 ft. | 2 ft. |
| **Horizontal Alignment** | | | | |
| **Superelevation** | $e_{max}$ = 8% | $e_{max}$ = 8% | $e_{max}$ = 8% | $e_{max}$ = 8% |
| **Minimum Radius (Based on Max. Superelevation)** | 758 ft. | 444 ft. | 444 ft. | 214 ft. |
| **Vertical Alignment** | | | | |
| **Crest K Value** | 84 | 44 | 44 | 19 |
| **Sag K Value** | 96 | 64 | 64 | 37 |
| **Maximum Grade (4)** | 6% Level<br>7% Rolling | 7% Level<br>8% Rolling | 7% Level<br>8% Rolling | 7% Level<br>9% Rolling |
| **Stopping Sight Distance** | 425 ft. | 305 ft. | 305 ft. | 200 ft. |
| **Cross Slope** | | | | |
| **Lane** | 1.5% - 2% | 1.5% - 2% | 1.5% - 2% | 1.5% - 2% |
| **Shoulder** | 2% - 6% paved (B)<br>6% - 8% turf | 2% - 6% paved (B)<br>6% - 8% turf | 2% - 6% paved (B)<br>6% - 8% turf | 2% - 6% paved (B)<br>6% - 8% turf |
| **Lateral Offset to Obstruction** | The greater of the shoulder width or 4 ft. from the edge of the travelled way. | The greater of the shoulder width or 4 ft. from the edge of the travelled way. | The greater of the shoulder width or 4 ft. from the edge of the travelled way. | The greater of the shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 14 ft.<br>Sign Trusses: Structure clearance + 1 ft. | 14 ft.<br>Sign Trusses: Structure clearance + 1 ft. | 14 ft.<br>Sign Trusses: Structure clearance + 1 ft. | 14 ft.<br>Sign Trusses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway.<br>Bridge L > 100 ft.: Traveled way + 3 ft. on each side. | Traveled way + 4 ft. on each side.<br>Bridge L > 100 ft.: Traveled way + 3 ft. on each side. | Traveled way + 3 ft. on each side. | Traveled way + 2 ft. on each side. |
| **Structural Capacity** | HL93 | HL93 | HL93 | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(4) Grade may be up to 2% steeper for tangent length less than 500 ft.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS |
| --- |
| STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL – SCENIC RECREATION<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR/ LOCAL |

**THERE IS NO AASHTO GUIDANCE FOR SCENIC RECREATION.**
**USE THE DESIGN STANDARDS FOUND IN THE NEBRASKA MINIMUM DESIGN STANDARDS.**

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: INTERSTATE<br>STATE FUNCTIONAL CLASSIFICATION: INTERSTATE<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – INTERSTATE | |
|---|---|
| **Design Speed** | 50 mph |
| **Lane Width** | 12 ft. |
| **Shoulder Width** | Right = 10 ft.<br>4-Lane: Left = 4 ft.<br>≥ 6-Lane: Left = 10 ft.<br>Truck Traffic > 250 DDHV: Right & Left = 12 ft.<br>(Note: All shoulder widths are paved). |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 758 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 84 |
| **Sag K Value** | 96 |
| **Maximum Grade** | 4% Level<br>5% Rolling<br>(Grades may be up to 1% steeper) |
| **Stopping Sight Distance** | 425 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% (A) |
| **Shoulder** | 2% to 6% paved (B) |
| **Lateral Offset to Obstruction** | The paved shoulder width. |
| **Vertical Clearance (1)** | 16 ft. for at least one route and 14 ft. for other routes (including paved shoulders).<br>Sign trusses and pedestrian overpasses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway including paved shoulders.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the nearest traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Design Standards Interstate System, January 2005 and A Policy on Geometric Design of Highways and Streets, 2011

(1) Over the entire roadway, including the width of paved shoulders

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: URBAN FREEWAY<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY (ACCESS ONLY AT INTERCHANGES)<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS | |
|---|---|
| **Design Speed** | 50 mph |
| **Lane Width** | 12 ft. |
| **Shoulder Width** | Right = 10 ft.<br>4-Lane: Left = 4 ft.<br>≥ 6-Lane: Left = 10 ft.<br>Truck Traffic > 250 DDHV: Right & Left = 12 ft.<br>(Note: All shoulder widths are paved). |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 758 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 84 |
| **Sag K Value** | 96 |
| **Maximum Grade** | 4% Level<br>5% Rolling<br>(Grades 1% steeper may be provided) |
| **Stopping Sight Distance** | 425 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (C) |
| **Lateral Offset to Obstruction** | The normal shoulder width. |
| **Vertical Clearance (2)** | 16 ft. for at least one route and 14 ft. for other routes (including auxiliary lanes and paved shoulders).<br>Sign trusses and pedestrian overpasses: Structure clearance + 1 ft. |
| **Bridge Width** | Full width of the approach roadway. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(C) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent roadway lane and can be at least 1% greater.

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: URBAN ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS | |
|---|---|
| **Design Speed** | 30 mph |
| **Lane Width** | 11 ft. |
| **Shoulder Width** | Curbed: Not Applicable<br>8 ft. Right/ 4 ft. Left (both paved) |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 214 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 19 |
| **Sag K Value** | 37 |
| **Maximum Grade (3)** | 8% level<br>9% Rolling |
| **Stopping Sight Distance** | 200 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | Curbed: 1.5 ft. from face of the curb (3 ft. at intersections).<br>Non-curbed: The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 16 ft. for one route & 14 ft. for other routes (including auxiliary lanes & paved shoulders).<br>Sign Trusses and pedestrian overpasses: Structure clearance + 1 ft. |
| **Bridge Width** | Curb to curb width of street, including sidewalks and bike lanes.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the nearest traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(3) Grade may be up to 1% steeper for tangent lengths less than 500 ft.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: URBAN ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: ARTERIAL | |
|---|---|
| **Design Speed** | 30 mph |
| **Lane Width** | 11 ft. |
| **Shoulder Width** | Curbed: Not Applicable<br>ADT ≥ 2,000 VPD: 8 ft.<br>ADT 400 – 1,999 VPD: 6 ft.<br>ADT < 400 VPD: 4 ft. |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | 214 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 19 |
| **Sag K Value** | 37 |
| **Maximum Grade (3)** | 8% level<br>9% Rolling |
| **Stopping Sight Distance** | 200 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 3% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | Curbed: 1.5 ft. from face of the curb (3 ft. at intersections).<br>Non-curbed: The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 16 ft. for one route & 14 ft. for other routes (including auxiliary lanes & paved shoulders).<br>Sign Trusses and pedestrian overpasses: Structure clearance + 1 ft. |
| **Bridge Width** | Curb to curb width of street, including sidewalks and bike lanes.<br>Bridge L > 200 ft.: Offsets to parapet, rail or barrier from the edge of the nearest traffic lane shall be at least 4 ft. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(3) Grade may be up to 1% steeper for tangent lengths less than 500 ft.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS<br>AASHTO CLASSIFICATION: URBAN COLLECTOR<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR | |
|---|---|
| **Design Speed** | 30 mph |
| **Lane Width** | 10 ft. |
| **Shoulder Width** | Curbed: Not Applicable<br>ADT ≥ 2,000 VPD: 8 ft.<br>ADT 1,500 – 1,999 VPD: 6 ft.<br>ADT 400 – 1,499 VPD: 5 ft.<br>ADT < 400 VPD: 2 ft. |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 6% |
| **Minimum Radius (Based on Maximum Superelevation)** | 231 ft. |
| **Vertical Alignment** | |
| **Crest K Value** | 19 |
| **Sag K Value** | 37 |
| **Maximum Grade (4)** | 9% level<br>11% Rolling |
| **Stopping Sight Distance** | 200 ft. |
| **Cross Slope** | |
| **Lane** | 1.5% to 3% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | Curbed: 1.5 ft. from face of the curb (3 ft. at intersections).<br>Non-curbed: The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 14 ft.<br>Sign Trusses and pedestrian overpasses: Structure clearance + 1 ft. |
| **Bridge Width** | Curb to curb width of street or the full width of the approach roadway (including shoulders and sidewalks).<br>Non-curbed: The full width of the approach roadway. |
| **Structural Capacity** | HL93 |

For additional information see A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(4) Grade may be up to 2% steeper for tangent length less than 500 ft.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON RURAL STATE HIGHWAYS | |
|---|---|
| **AASHTO CLASSIFICATION: INTERSTATE<br>STATE FUNCTIONAL CLASSIFICATION: INTERSTATE<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL** | |
| **Design Speed** | Posted Speed Limit |
| **Lane Width** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Shoulder Width** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Vertical Alignment** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Grade** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Stopping Sight Distance** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2.5% (A) |
| **Shoulder** | Paved shoulder = 2% to 6% (B) |
| **Lateral Offset to Obstruction** | The paved shoulder width. |
| **Vertical Clearance (1)** | 16 ft.<br>17 ft. clearance for sign trusses and pedestrian overpasses |
| **Bridge Width** | Bridge may remain in place if the cross section consists of 12 ft. lanes, a 10 ft. shoulder right, and a 3.5 ft. shoulder left.<br>For long bridges the minimum width is from the outside edge of travel lane to the outside edge of travel lane plus 3.5 ft. on each side. |
| **Structural Capacity** | A bridge can remain in place if the operating capacity can safely service the system for an additional 20 years. |

For additional information see A Policy On Design Standards Interstate System, January 2005 and Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(1) Over the entire roadway, including the width of paved shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON RURAL STATE HIGHWAYS |
| --- |
| AASHTO CLASSIFICATION: RURAL FREEWAY<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY (ACCESS ONLY AT INTERCHANGES)<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS |

**THERE ARE NO 3R STANDARDS FOR FREEWAYS.**
**USE THE DESIGN STANDARDS FOR NEW AND RECONSTRUCTED PROJECTS.**

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON RURAL STATE HIGHWAYS |
| --- |
| AASHTO CLASSIFICATION: RURAL DIVIDED ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXPRESSWAYS |

**THERE IS NO AASHTO 3R GUIDANCE FOR EXPRESSWAY.**
**USE THE 3R DESIGN STANDARDS FOUND IN THE NEBRASKA MINIMUM DESIGN STANDARDS.**

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON RURAL STATE HIGHWAYS | |
|---|---|
| **AASHTO CLASSIFICATION: RURAL ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: ARTERIAL** | |
| **Design Speed** | Posted Speed Limit |
| **Lane Width** | ADT > 750 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT ≤ 750 VPD:<br>10 ft. |
| **Shoulder Width** | ADT > 2,000 VPD = 6 ft.<br>ADT 751 – 2,000 VPD = 3 ft.<br>ADT ≤ 750 VPD = 2 ft. |
| **Horizontal Alignment** | |
| **Superelevation** | Increase the superelevation when the design speed is below the running speed and the existing superelevation is less than the maximum from the *Green Book*. |
| **Minimum Radius (Based on Maximum Superelevation)** | Evaluate reconstruction when the design speed is more than 15 mph below the running speed and the ADT is > 750. |
| **Vertical Alignment** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. |
| **Grade** | Existing |
| **Stopping Sight Distance** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2% (A) |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf |
| **Lateral Offset to Obstruction** | The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. |
| **Vertical Clearance (2)** | 14 ft. if allowed by local statute.<br>Sign Trusses: Structure clearance + 1 ft. |
| **Bridge Width** | ADT > 4,000 VPD: Width of approach lanes + 3 ft. clearance/ side.<br>ADT 2,000 – 3,999 VPD: Width of approach lanes + 2 ft. clearance/ side.<br>ADT 751 – 1,999 VPD: Width of approach lanes + 1 ft. clearance/ side.<br>ADT ≤ 750 VPD: Width of approach lanes. |
| **Structural Capacity** | Use in Place: Existing. (D)<br>Rehabilitated: H15 with a service life of 15 years or more. (E) |

For additional information see Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

(D) "Use in Place" includes any bridge work short of razing the entire superstructure (e.g. overlay, new railing, re-decking, widening, girder replacement in kind, etc.)

(E) Rehabilitation is the replacement of the existing deck and superstructure and can include repairs to the existing substructure.

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON RURAL STATE HIGHWAYS | | |
|---|---|---|
| **AASHTO CLASSIFICATION: RURAL COLLECTOR<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR/ LOCAL** | | |
| **Design Speed** | Posted Speed Limit | |
| **Lane Width** | Design Speed ≥ 50 mph:<br>ADT > 750 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT ≤ 750 VPD:<br>10 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT 751 – 2,000 VPD:<br>≥ 10% Trucks = 11 ft.<br>< 10% Trucks = 10 ft.<br>ADT ≤ 750 ADT:<br>≥ 10% Trucks = 10 ft.<br>< 10% Trucks = 9 ft. |
| **Shoulder Width** | Design Speed ≥ 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT 751 – 2,000 VPD = 3 ft.<br>ADT ≤ 750 VPD = 2 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT ≤ 2,000 VPD = 2 ft. |
| **Horizontal Alignment** | | |
| **Superelevation** | Increase the superelevation when the design speed is below the running speed and the existing superelevation is less than the maximum from the *Green Book*. | |
| **Minimum Radius (Based on Maximum Superelevation)** | Evaluate reconstruction when the design speed is more than 15 mph below the running speed and the ADT is > 750. | |
| **Vertical Alignment** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Grade** | Existing | |
| **Stopping Sight Distance** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Cross Slope** | | |
| **Lane** | 1.5% to 2% | |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf | |
| **Lateral Offset to Obstruction** | The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. | |
| **Vertical Clearance (2)** | 14 ft. if allowed by local statute.<br>Sign Trusses: Structure clearance + 1 ft. | |
| **Bridge Width** | ADT > 2,000 VPD: 28 ft.<br>ADT 1,500 – 1,999 VPD: 24 ft.<br>ADT < 1,500 VPD: 22 ft. | |
| **Structural Capacity** | Use in Place: Existing. (D)<br>Rehabilitated: H15 with a service life of 15 years or more. (D) | |

For additional information see Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

(D) "Use in Place" includes any bridge work short of razing the entire superstructure (e.g. overlay, new railing, redecking, widening, girder replacement in kind, etc.)

(D) Rehabilitation is the replacement of the existing deck and superstructure and can include repairs to the existing substructure.

| NEW AND RECONSTRUCTED RURAL STATE HIGHWAYS |
| --- |
| STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL – SCENIC RECREATION<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR/ LOCAL |

**THERE IS NO AASHTO 3R GUIDANCE FOR SCENIC RECREATION.**
**USE THE 3R DESIGN STANDARDS FOUND IN THE NEBRASKA MINIMUM DESIGN STANDARDS.**

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON MUNICIPAL STATE HIGHWAYS | |
|---|---|
| **AASHTO CLASSIFICATION: INTERSTATE<br>STATE FUNCTIONAL CLASSIFICATION: INTERSTATE<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – INTERSTATE** | |
| **Design Speed** | Posted Speed Limit |
| **Lane Width** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Shoulder Width** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Horizontal Alignment** | |
| **Superelevation** | $e_{max}$ = 8% |
| **Minimum Radius (Based on Maximum Superelevation)** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Vertical Alignment** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Grade** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Stopping Sight Distance** | AASHTO standards in effect at time of latest New or Reconstructed project on the section of the Interstate. |
| **Cross Slope** | |
| **Lane** | 1.5% to 2.5% (A) |
| **Shoulder** | Paved shoulder = 2% to 6% (B) |
| **Lateral Offset to Obstruction** | The paved shoulder width. |
| **Vertical Clearance (1)** | 16 ft. for at least one route and 14 ft. for other routes.<br>Sign Trusses: Structure clearance + 1 ft. |
| **Bridge Width** | Bridge may remain in place if the cross section consists of 12 ft. lanes, a 10 ft. shoulder right, and a 3.5 ft. shoulder left.<br>For long bridges the minimum width is from the outside edge of travel lane to the outside edge of travel lane plus 3.5 ft. on each side. |
| **Structural Capacity** | A bridge can remain in place if the operating capacity can safely service the system for an additional 20 years. |

For additional information see A Policy On Design Standards Interstate System, January 2005 and Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(1) Over the entire roadway, including the width of paved shoulders.

(A) On roadways where there are more than two lanes inclined in the same direction, the cross slope may be increased by 0.5% to 1% for each additional lane, up to a maximum of 3%.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON MUNICIPAL STATE HIGHWAYS |
| --- |
| AASHTO CLASSIFICATION: URBAN FREEWAY<br>STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY (ACCESS ONLY AT INTERCHANGES)<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS |

**THERE ARE NO 3R STANDARDS FOR FREEWAYS.**
**USE THE DESIGN STANDARDS FOR NEW AND RECONSTRUCTED PROJECTS.**

| NEW AND RECONSTRUCTED MUNICIPAL STATE HIGHWAYS |
| --- |
| STATE FUNCTIONAL CLASSIFICATION: EXPRESSWAY<br>NATIONAL FUNCTIONAL CLASSIFICATION: PRINCIPAL ARTERIAL – OTHER FREEWAYS AND EXPRESSWAYS |

**THERE IS NO AASHTO 3R GUIDANCE FOR MUNICIPAL EXPRESSWAY.**
**USE THE 3R DESIGN STANDARDS FOUND IN THE NEBRASKA MINIMUM DESIGN STANDARDS.**

| **RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON MUNICIPAL STATE HIGHWAYS** | | |
|---|---|---|
| **AASHTO CLASSIFICATION: URBAN ARTERIAL<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: ARTERIAL** | | |
| **Design Speed** | Posted Speed Limit | |
| **Lane Width** | Design Speed ≥ 50 mph:<br>ADT > 750 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT ≤ 750 VPD:<br>10 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT 751 – 2,000 VPD:<br>≥ 10% Trucks = 11 ft.<br>< 10% Trucks = 10 ft.<br>ADT ≤ 750 ADT:<br>≥ 10% Trucks = 10 ft.<br>< 10% Trucks = 9 ft. |
| **Shoulder Width** | Curbed: Not Applicable | |
| | Design Speed ≥ 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT 751 – 2,000 VPD = 3 ft.<br>ADT ≤ 750 VPD = 2 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT ≤ 2,000 VPD = 2 ft. |
| **Horizontal Alignment** | | |
| **Superelevation** | Increase the superelevation when the design speed is below the running speed and the existing superelevation is less than the maximum from the *Green Book*. | |
| **Minimum Radius (Based on Maximum Superelevation)** | Evaluate reconstruction when the design speed is more than 15 mph below the running speed and the ADT is > 750. | |
| **Vertical Alignment** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Grade** | Existing | |
| **Stopping Sight Distance** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Cross Slope** | | |
| **Lane** | 1.5% to 3% | |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf | |
| **Lateral Offset to Obstruction** | Curbed: 1.5 ft. from the edge of the curb (3 ft. at intersections).<br>Non-curbed: The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. | |
| **Vertical Clearance (2)** | 14 ft. if allowed by local statute.<br>Sign Trusses: Structure clearance + 1 ft. | |
| **Bridge Width** | ADT > 4,000 VPD: Width of approach lanes + 3 ft. clearance/ side.<br>ADT 2,000 – 3,999 VPD: Width of approach lanes + 2 ft. clearance/ side.<br>ADT 751 – 1,999 VPD: Width of approach lanes + 1 ft. clearance/ side.<br>ADT ≤ 750 VPD: Width of approach lanes. | |
| **Structural Capacity** | Use in Place: Existing. (D)<br>Rehabilitated: H15 with a service life of 15 years or more. (D) | |

For additional information see Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

(D) "Use in Place" includes any bridge work short of razing the entire superstructure (e.g. overlay, new railing, re-decking, widening, girder replacement in kind, etc.)

(E) Rehabilitation is the replacement of the existing deck and superstructure and can include repairs to the existing substructure.

| RESURFACING, RESTORATION AND REHABILITATION (3R) PROJECTS ON MUNICIPAL STATE HIGHWAYS | | |
|---|---|---|
| **AASHTO CLASSIFICATION: URBAN COLLECTOR<br>STATE FUNCTIONAL CLASSIFICATION: MAJOR ARTERIAL<br>NATIONAL FUNCTIONAL CLASSIFICATION: COLLECTOR** | | |
| **Design Speed** | Posted Speed Limit | |
| **Lane Width** | Design Speed ≥ 50 mph:<br>ADT > 750 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT ≤ 750 VPD:<br>10 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD:<br>≥ 10% Trucks = 12 ft.<br>< 10% Trucks = 11 ft.<br>ADT 751 – 2,000 VPD:<br>≥ 10% Trucks = 11 ft.<br>< 10% Trucks = 10 ft.<br>ADT ≤ 750 ADT:<br>≥ 10% Trucks = 10 ft.<br>< 10% Trucks = 9 ft. |
| **Shoulder Width** | Curbed: Not Applicable | |
| | Design Speed ≥ 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT 751 – 2,000 VPD = 3 ft.<br>ADT ≤ 750 VPD = 2 ft. | Design Speed < 50 mph:<br>ADT > 2,000 VPD = 6 ft.<br>ADT ≤ 2,000 VPD = 2 ft. |
| **Horizontal Alignment** | | |
| **Superelevation** | Increase the superelevation when the design speed is below the running speed and the existing superelevation is less than the maximum from the *Green Book*. | |
| **Minimum Radius (Based on Maximum Superelevation)** | Evaluate reconstruction when the design speed is more than 15 mph below the running speed and the ADT is > 750. | |
| **Vertical Alignment** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Grade** | Existing | |
| **Stopping Sight Distance** | Evaluate reconstructing hill crests when: the crest hides major hazards, the ADT > 1500, and the design speed is more than 20 mph below the running speed. | |
| **Cross Slope** | | |
| **Lane** | 1.5% to 2% | |
| **Shoulder** | 2% to 6% paved (B)<br>6% to 8% turf | |
| **Lateral Offset to Obstruction** | Curbed: 1.5 ft. from the edge of the curb (3 ft. at intersections).<br>The greater of the paved shoulder width or 4 ft. from the edge of the travelled way. | |
| **Vertical Clearance (2)** | 14 ft. if allowed by local statute.<br>Sign Trusses: Structure clearance + 1 ft. | |
| **Bridge Width** | ADT > 2,000 VPD: 28 ft.<br>ADT 1,500 – 1,999 VPD: 24 ft.<br>ADT < 1,500 VPD: 22 ft. | |
| **Structural Capacity** | Use in Place: Existing. (D)<br>Rehabilitated: H15 with a service life of 15 years or more. (E) | |

For additional information see Special Report 214: Designing Safer Roads – Practices for Resurfacing, Restoration, and Rehabilitation as cited in A Policy on Geometric Design of Highways and Streets, 2011

(2) Over the entire roadway, including usable shoulders.

(B) The surfaced shoulder cross slope should not be less than the cross slope of the adjacent lane.

(D) "Use in Place includes any bridge work short of razing the entire superstructure (e.g. overlay, new railing, redecking, widening girder replacement in kind, etc.)

(E) Rehabilitation is the replacement of the existing deck and superstructure and can include repairs to the existing substructure.

## NEBRASKA DESIRABLE DESIGN GUIDANCE

(For additional information see the Roadway Design Manual (*RDM*) and the Roadway Design Division Policy Letters)

### NEW AND RECONSTRUCTED PROJECTS

**Design Speed:** "The desirable design speed for a roadway project is 5 mph greater than the anticipated posted speed limit for the roadway." (See the *RDM*, Chapter One: Design Standards, Section 6.B).

**Superelevation:** The desirable maximum superelevation for rural roadways and for bridges is 6%; the use of 8% requires **Assistant Design Engineer** approval. (See the *RDM*, Chapter Three: Roadway Alignment, Section 2.B and EXHIBIT 3.2).

**Vertical Alignment and Stopping Sight Distance:** The desirable K values for crest and sag vertical curves and the desirable stopping sight distance includes intersection sight distance (See the *RDM*, Chapter Three: Roadway Alignment, Sections 3.B.2, 3.C, and 3.D and EXHIBITS 3.9 AND 3.14). The use of less than the desirable K value or stopping sight distance requires **Unit Head** approval.

**Vertical Clearance:** "It is desirable to include 0.50 feet allowance for future resurfacing." (See the *RDM*, Chapter Ten: Miscellaneous Design Issues, EXHIBIT 10.4).

### 3R PROJECTS

(See the *RDM*, Chapter Seventeen: Resurfacing, Restoration and Rehabilitation (3R) Projects, Section 2)

**Design Speed:** "The design speed to be used is the speed limit determined by **Traffic** to be posted at the completion of the project."

**Superelevation:**

- The designer should check the existing superelevation using the as-built $e_{max}$. In the event no as-built information is available, the $e_{max}$ = 6% table (*RDM* Chapter Three, EXHIBIT 3.3c) can be used and, if necessary, the existing superelevation should be corrected to match the table. If the existing superelevation rate is over 6%, the existing superelevation should be checked using the $e_{max}$ = 8% table (**TABLE 3-10b** of the *Green Book*). An 8% superelevation will not be exceeded without the approval of the **Roadway Design Engineer**.
- For low-speed urban applications (V ≤ 45 mph) the designer should check the superelevation using the $e_{max}$ = 4% table (*RDM* Chapter Three, EXHIBIT 3.3d & **TABLE 3-13b** of the *Green Book*).