

An aerial photograph of a two-lane asphalt road stretching into the distance. The road is flanked by grassy fields and some trees. In the background, there are some buildings and utility poles. The sky is a mix of orange, pink, and purple, indicating sunset or sunrise. The overall scene is rural and quiet.

AASHTO

**Technical Committee on
Geometric Design**

Research Proposals and Oversight

- Design Speed Alternatives for Selecting Geometric Criteria
- One – and Multi-Lane Loop Ramp Design
- Designing Roadway Transitions from Rural Highways to Urban/Suburban Highways or Streets

Research Proposals and Oversight

- Updated Headlamp Design Criteria for SAG Vertical Curves
- Superelevation Criteria for Sharp Horizontal Curves on Steep Grades
- Accommodating Oversize/Overweight Vehicles at Roundabouts

A Policy on Geometric Design of Highways and Streets

(Green Book)

Chapter 1

Highway Functions

Changes to Chapter 1

- Designer Consideration of the Context of the Project Area
- Highlights the Flexibility Available to Encourage Choosing Design Criteria:
 - Consistent with the Context of the Project
 - Needs and Value of the Community
 - With Respect to Economic Limitations

Research Utilized for Chapter 1

- There was no new research information used in the update to Chapter 1.
- Potential Areas of Research for Future Updates of the Green Book:
 - Review of the functional classification system which is based upon definitions used by FHWA.

Chapter 2

Design Controls and Criteria

Changes to Chapter 2

- Adding SU-40 Single Unit Truck (3-axle)
- Removing WB-50 Semitrailer Truck and Replacing with WB-62
- Adding WB-92B – Rocky Mountain Double

Research Utilized for Changes to Chapter 2

- AASHTO Strategic Highway Safety Plan
- AASHTO Roadside Design Guide (2006)
- AASHTO Safety Manual
- FHWA Interactive Highway Safety Design Model
- NCHRP Report 505-Review of Truck Characteristics as Factors in Roadway Design
- U.S. Access Board Public Rights-of-Way Accessibility Guidelines

Potential Areas of Research for Next Update

■ Vehicle Performance

- Update NCHRP Report 270 (published in 1984)
- Information regarding acceleration and deceleration rates may already be out of date.

Chapter 3

Elements of Design

Changes to Chapter 3

- Stopping Sight Distance Tables Clarified Whether on Level, Wet Weather, or Grades
- Passing Sight Distance for Two-Lane Highways Revised (NCHRP Report 605)
- Height of Object will Include Discussion About Decision Sight Distance

Proposed Changes continued

- Revision Method for “Lane Drop Taper Length” for Passing Lane Sections
- Design Controls for Crest Vertical Curves Based on NCHRP research Digest 275
- Lighting – Updated to Conform to the Roadway Lighting Guide

Research Utilized for Changes to Chapter 3

- NCHRP Report 605 – Passing Sight Distance for Two-Lane Highways
- NCHRP 505 – Lane Drop Taper Length for Passing Lanes
- NCHRP Digest 275 – 2+1 Roadways

Potential Areas of Research for Next Update

- Superelevation of steep grades
- Affect of cross-slope break on trucks and relationship to vehicle tracking, traveled-way widening and lane widening on curves
- Changes to headlights and the affect on sag vertical curves
- Vertical alignment of driveway entrances – grade and vertical curvature, lowest threshold for design vehicles, affects on speed of entering/exiting vehicle and affects on mainline operations.

Chapter 4

Cross Section Elements

Changes to Chapter 4

- Traveled Way Definition Revised to be Consistent with Roadside Design Guide
- Rumble Strip Section Added Based on State Experience and TRB/FHWA Research

Proposed Changes continued

- Roadside Design Discussion Provided in a More Consistent Format with the Roadside Design Guide
- Sidewalks and Curb Ramps – Updating Discussion to Conform to AASHTO Pedestrian Guide and ADAAG

Researched Utilized for Changes to Chapter 4

- No new research was utilized in Chapter 4. The majority of alterations were related to language clarity and updating photos.

Potential Areas of Research for Next Update

- Updating the AASHTO 2001 Guidelines for Geometric Design of Very Low-Volume Local Roads

Chapter 5

Local Roads and Streets

Changes to Chapter 5

- Updated Reference to AASHTO LRFD Bridge Design Specifications
- Reorganized Clear Zone Discussion to Roadside Design
- Added Discussion of Level of Service in Rural/Urban
- Chapter Reorganized to Generally Follow Other Functional Chapters

Research Utilized for Changes to Chapter 5

- No new research was utilized for Chapter 5 in the 2011 update.

Chapter 6

Collector Roads and Streets

Proposed Changes

- Chapter Reformatted to Provide Some Consistency with other Functional Classification Chapters
- Adding Text About Selection of LOS for this Functional Classification
- Roadside Design Discussion

Research Utilized for Chapter 6

- No new research was utilized for Chapter 6 in the 2011 update.

Chapter 7

Arterials

(Rural & Urban)

Proposed Changes

- **Added Discussion About Characteristics of Urban Arterials**
- **Added Discussion About LOS Selection for Urban Arterials**
- **Revised Discussion About the Relationship Between Design Speed and Lane Width**

Proposed Changes Continued

- **Benefits of Medians to Pedestrians in Urban Areas**
- **Added Discussion About Off-Setting Left Turn Lanes When Selecting Median Widths**

Research Utilized for Changes to Chapter 7

- NCHRP Report 605 – Passing Sight Distance
- “Relationship of Lane Width to Safety for Urban and Suburban Arterials;” Potts, Harwood and Richard, 2007.
- NCHRP 20-07, Task 171 – Identification of Conflicts with AASHTO Publications Related to Clear Zone

Potential Areas of Research for Next Update

- Parking lane width.
- The 2004 edition may be a little excessive, but there is no solid basis for either the current or proposed values other than the committee's judgment.
- Possible research articles
 - TRR 2190 (Bicycles 2010) had an article, "Parking Lane Width and Bicycle Operating Space," but that was geared toward drivers' parking habits given particular parking lane widths.
 - "Cross Section Width for Parallel Parking;" Gattis, Dammalapati, Cotton and Cotton, 2007 (which Joe Ruffer assisted with).
- NCHRP project (15-42) that is looking at the of varying bike and parking lane widths on the operation of both bicycles and adjacent motor vehicles.

Chapter 8

Freeways

Proposed Changes

- **Added Discussion on Superelevation Rates on Freeways Considering Snow/Ice, Viaducts, and Section Consistency**
- **Reformat to Generally Sequence Other Functional Classification Chapters**
- **Reorganize Clear Zone Discussion to Roadside Design**

Research Utilized for Chapter 8

- **NCHRP 20-7 / Task 171, FY 2003, Identification of Conflicts with AASHTO Publications Related to Clear Zone** (CH2M Hill, Timothy R. Newman).
 - This study identified conflicts and inconsistencies on clear zone guidance contained in AASHTO publications and present the findings to the relevant AASHTO Committees so they can revise the publications.
- **Based on the above research and a clear zone working group, changed section heading from “Horizontal Clearance to Obstructions” to “Roadside Design”. Also, changed references to “Lateral Clearance to “Lateral Offset”**
 - NCHRP Report 659: Guide for the Geometric Design of Driveways. NCHRP, TRB, Washington, DC, 2010. (related to driveways)

Potential Areas of Research for Next Update

- **NCHRP 3-88 [Complete] Guidelines for Ramp and Interchange Spacing**
 - The objective of this research is to develop guidelines for selecting appropriate ramp and interchange spacing based on safety and operational impacts. Research Agency: Kittelson & Assoc. (Brian Ray)
- **NCHRP 15-31A [Active] Design Guidance for Freeway Mainline Ramp Terminals**
 - The objective of this research is to develop improved design guidance for freeway mainline ramp terminals suitable for inclusion in the AASHTO Green Book. As appropriate, the guidance should also address issues related to the design of the gore area and any transitional area to the ramp proper. Completion Date 6/10/11 Research Agency: MRI. (NCHRP Staff: Ray Derr)

Potential Areas of Research for Next Update

- **NCHRP 20-7 / Task 237, [Active] Incorporation of Lane Management and Toll Plaza Design Issues in the AASHTO Green Book**
 - This study will identify best practices for the use of lane management strategies and toll plaza design to include in the next update of the AASHTO Green Book (NCHRP Staff: Ray]
- Chapter 8 does have a section called “Special Freeway Designs”,
 - Perhaps consider the addition of a section on Managed Lanes observed during the International SCAN in the “Special Freeway Design” section.

Chapter 9

Intersections

Proposed Changes

- Chapter Being Reformatted to Provide Better Sequence of Design Material
- Adding Discussion of Intersection Capacity Based on HCM
- Updating Discussion of Roundabouts and Adding Discussion of Continuous Flow Intersections

Proposed Changes continued

- Expanding the Discussion of Indirect Left Turns and U-turns
- Based on TRB Access Management Manual:
 - Definition of Functional Area
 - Components of Auxiliary Lanes
 - Deceleration Length Discussion
- Adding Design Criteria for Double/Triple Left Turns – NCHRP 505

Research Utilized for Chapter 9

- NCHRP Report 659: Guide for the Geometric Design of Driveways. NCHRP, TRB, Washington, DC, 2010. (related to driveways)
- Relationships between Roundabout Geometry and Accident Rates. Queensland, Australia: Infrastructure Design of Technology Division of QMDR, April 1998. (related to roundabouts)
- Arterial Intersection Design, Management, and Operations Strategies. PBQ&D, Inc., Charlotte, NC, July 2004. (related to unconventional intersections)
- Signalized intersections: Informational Guide. FHWA-HRT-04-091. FHWA, USDOT, McLean, VA, August 2004. (related to alternative left turn treatments / unconventional intersections)

Research Utilized for Chapter 9

- NCHRP Report 672: Roundabouts: An Informational Guide, 2nd Edition. NCHRP, TRB, Washington, DC, 2010. (related to roundabouts)
- NCHRP Report 572: Roundabouts in the United States. NCHRP, TRB, Washington, DC, 2007 (related to roundabouts)
- Roundabout Geometric Design Guidelines. Research Project #65A0229, CA DOT, Sacramento, CA, May 2007.

Potential Areas of Research for Next Update

- Roundabout design and function
 - Research is needed on pedestrian conflicts on single lane and multi-lane approaches
 - effect on roundabout operation of pedestrian signals for crosswalks on multi-lane roundabout approaching and leaving roadways
 - lane encroachment and/or sideswipe crashes on multi-lane roundabouts.
- Comparison of pedestrian safety (conflicts, crashes, injuries, etc.) for intersections with:
 - Right-turn channelization island with YIELD condition for right turn lane at cross street and signalized crosswalk across main street with no median refuge
 - Signalized crosswalk across main street with median refuge at center of intersection with no right turn channelization island
 - Right-turn channelization island with YIELD condition for right turn lane at cross street and signalized crosswalk across main street with median

Potential Areas of Research for Next Update

- Evaluation of operation and crash history of intersections with indirect left turn treatments including jug-handle or loop, displaced left turns, and median U-turn crossovers as compared to intersections with direct left turn movements.
- Comparison of pedestrian crossings of low speed and high speed arterial streets at intersections and at mid-block locations with various treatments (mid-street refuge passive warning devices, hybrid signal/beacon devices, and signals) on pedestrian safety and pedestrian and motor vehicle delay and operation.
- Comparison of crashes with use of bicycle lanes versus shared lanes on low-speed roadways (less than 40 mph)

Chapter 10

Grade Separations and Interchanges

Proposed Changes

- Updating Exhibits for Directional/Semi-directional Interchanges
- Including an Exhibit for Diamond Interchange with Roundabout Intersection Control
- Providing Discussion of Two-lane Loop Ramp Design
- Providing Additional Guidance on Ramp Metering

Research Utilized for Chapter 10

- Added reference document to supplement access control discussion.
 - Document is NCHRP Synthesis 332, Access Management on Crossroads in the Vicinity of Interchanges.
- Added discussion on Double Roundabout Interchanges.
 - Information included in this section is similar to text in NCHRP Report 672 "Roundabouts: An Information Guide".
- Two-Lane Loop Ramps. Text added on subject.
 - Research used ITE Freeway and Interchange Geometric Design Handbook. There is a current research project for two lane loop ramps.

Potential Areas of Research for Next Update

- NCHRP Report 687 (Guidelines for Ramp and Interchange Spacing) just came out.
- Two Lane Loops- Topic currently being researched.
- Freeway Mainline Ramp Terminals.

The image features a title slide for the AASHTO Technical Committee on Geometric Design. The background is a photograph of a road at sunset or sunrise, with a car driving away and road signs visible. The text is overlaid in white with a drop shadow.

AASHTO

Technical Committee on Geometric Design