Highway Safety Manual Updates

An overview of resources, updates, and plans for the next edition
Agenda

- HSM Overview
- Content Comparison
- New Chapters
- New Predictive Models
- New Research Resources
- HSM Application Tools
- Looking Forward
HSM Overview

An overview of the new document being developed by AASHTO
HSM Background

“The Highway Safety Manual (HSM) is the premier guidance document for incorporating quantitative safety analysis in the highway transportation project development process.”
HSM Background

- First Edition Published in 2010 by AASHTO
- Provides guidance on
  - Human Factors and safety fundamentals
  - Roadway Safety Management Process
  - Predictive methods for safety improvement project development
- All these elements will be enhanced in HSM2
HSM Background
The HSM2 Will...

- **Expand** upon the methodologies in HSM1
- **Incorporate** new models and research completed since HSM1
- **Modify** practices and guidance based on user experiences and needs
Content Comparison
Differences in the HSM1 and the HSM2
## HSM 2 Chapters: Preface and Intro.

<table>
<thead>
<tr>
<th>Part</th>
<th>Chapter Subject</th>
<th>Chapter Number (HSM1)</th>
<th>Chapter Number (HSM2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface &amp; Other</td>
<td>Preface</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Introduction &amp; Overview to the HSM</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Glossary</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
## HSM 2 Chapters: Part A

<table>
<thead>
<tr>
<th>Part</th>
<th>Chapter Subject</th>
<th>Chapter Number (HSM1)</th>
<th>Chapter Number (HSM2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Part A Intro</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Road Safety Principles (Fundamentals)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Human Factors</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pedestrians &amp; Bicyclists</td>
<td>(new)</td>
<td>4</td>
</tr>
</tbody>
</table>
# HSM 2 Chapters: Part B

<table>
<thead>
<tr>
<th>Part</th>
<th>Chapter Subject</th>
<th>Chapter Number (HSM1)</th>
<th>Chapter Number (HSM2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Part B Intro</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Areawide Planning</td>
<td>(new)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Network Screening</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Diagnosis</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Countermeasure Selection</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Economic Appraisal</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Project Prioritization</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Safety Effectiveness Evaluation</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Systemic Safety Management</td>
<td>(new)</td>
<td>12</td>
</tr>
</tbody>
</table>
## HSM 2 Chapters: Part C

<table>
<thead>
<tr>
<th>Part</th>
<th>Chapter Subject</th>
<th>Chapter Number (HSM1)</th>
<th>Chapter Number (HSM2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Part C Intro</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Developing, Calibrating, and Using SPFs and CPMs</td>
<td>(new)</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Rural Two-Lane Roads</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Rural Multilane Highways</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Urban &amp; Suburban Arterials</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Freeways</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Ramps</td>
<td>19</td>
<td>18</td>
</tr>
</tbody>
</table>
## HSM 2 Chapters: Part D

<table>
<thead>
<tr>
<th>Part</th>
<th>Chapter Subject</th>
<th>Chapter Number (HSM1)</th>
<th>Chapter Number (HSM2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Roadway Segment CMFs</td>
<td>13</td>
<td>(removed)*</td>
</tr>
<tr>
<td></td>
<td>Intersection CMFs</td>
<td>14</td>
<td>(removed)*</td>
</tr>
<tr>
<td></td>
<td>Interchange CMFs</td>
<td>15</td>
<td>(removed)*</td>
</tr>
<tr>
<td></td>
<td>Special Facility CMFs</td>
<td>16</td>
<td>(removed)*</td>
</tr>
<tr>
<td></td>
<td>Road Network CMFs</td>
<td>17</td>
<td>(removed)*</td>
</tr>
<tr>
<td></td>
<td>Part D Intro</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Selecting CMFs</td>
<td>(new)</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Applying CMFs</td>
<td>(new)</td>
<td>20</td>
</tr>
</tbody>
</table>

* Superseded by CMF Clearinghouse
New Chapters

What to expect in the HSM2
Bike & Pedestrian Safety

• Chapter 4
• Provide an overview of methods for incorporating bike & pedestrian considerations in safety management
• Bike & pedestrian predictive models will be in Part C
Areawide Planning

• Chapter 5
• Overview of macro-level quantitative safety planning
• Considers demographics, geography, land use, and more
• Based on NCHRP 17-81
Systemic Safety

• Chapter 12
• Provides an introduction to the systemic safety method
• How to incorporate systemic safety in your roadway safety management program
• Includes systemic methods for pedestrian and bicycle application
SPF Calibration

• Chapter 13
• Methods for calibrating safety performance functions with state/regional data
• The importance of calibration and when it is needed
Restructured Part D

• New chapters on selecting, creating, and using CMFs
• All CMFs will be housed on the CMF Clearinghouse website (www.cmfclearinghouse.org)
New Predictive Models

What to expect in the HSM2
Ch 14. Predictive Method for Rural Two-Lane, Two-Way Roads (Facility Types)

Roadway Segments
- 2-lane undivided (2U)

Intersections
- 3-leg minor-road stop control (3ST)
- 3-leg turning (3STT)
- 3-leg signal control (3SG)
- 3-leg single-lane roundabout (31R)
- 3-leg two-lane roundabout (32R)
- 4-leg minor-road stop control (4ST)
- 4-leg all-way stop control (4aST)
- 4-leg signal control (4SG)
- 4-leg single-lane roundabout (41R)
- 4-leg two-lane roundabout (42R)

* New facility types planned for HSM2  ^ Expanded facility types planned for HSM2
Ch 15. Predictive Method for Rural Multilane Highways
(Facility Types)

Roadway Segments
• 4-lane undivided (4U) *
• 4-lane divided (4D) *

Intersections
• 3-leg minor-road stop control (3ST) *
• 3-leg signal control (3SG) *
• 3-leg single-lane roundabout (31R) *
• 3-leg two-lane roundabout (32R) *
• 4-leg minor-road stop control (4ST) *
• 4-leg signal control (4SG) *
• 4-leg single-lane roundabout (41R) *
• 4-leg two-lane roundabout (42R) *

* New facility types planned for HSM2
^ Expanded facility types planned for HSM2

Roadway Segments

- 2-lane undivided (2U)
- 3-lane with center TWLTL (3T)
- 4-lane undivided (4U)
- 4-lane divided (4D)
- 5-lane with center TWLTL (5T)
- 6-lane undivided (6U) *
- 6-lane divided (6D) *
- 7-lane with center TWLTL (7T) *
- 8-lane divided (8D) *
- 2-lane one-way (2O) *
- 3-lane one-way (3O) *
- 4-lane one-way (4O) *

* New facility types planned for HSM2
^ Expanded facility types planned for HSM2
Ch 16. Predictive Method for Urban and Suburban Arterials (Facility Types – Intersections)

**Intersections (3-leg)**
- Minor-road stop control (3ST) ^
- Minor-road stop control, high speed (3ST-HS) *
- All-way stop control (3aST) *
- Turning (3STT) *
- Signal control (3SG) ^
- Signal control, high speed (3SG-HS) *
- Single-lane roundabout (31R) *
- Two-lane roundabout (32R) *

**Intersections (4-leg, 5-leg)**
- Minor-road stop control (4ST) ^
- Minor-road stop control, high speed (4ST-HS) *
- All-way stop control (4aST) *
- Signal control (4SG) ^
- Signal control, high speed (4SG-HS) *
- Single-lane roundabout (41R) *
- Two-lane roundabout (42R) *
- Signal control (5SG) *

* New facility types planned for HSM2  ^ Expanded facility types planned for HSM2
Ch 17. Predictive Method for Freeways (Facility Types)

**Rural Freeways**
- 4-lane
- 6-lane
- 8-lane

**Urban Freeways**
- 4-lane (PTSU, HOV, HOT)
- 6-lane (PTSU, HOV, HOT)
- 8-lane (PTSU, HOV, HOT)
- 10-lane (PTSU, HOV, HOT)

Note: Part-time shoulder use (PTSU); High occupancy vehicle lane (HOV); High occupancy toll lane (HOT)

* New facility types planned for HSM2
^ Expanded facility types planned for HSM2
Ch 18. Predictive Method for Ramps (Facility Types)

Ramp Segments

Rural
- 1-lane entrance (1EN)
- 1-lane exit (1EX)

Urban
- 1-lane entrance (1EN)
- 1-lane exit (1EX)
- 2-lane entrance (2EN)
- 2-lane exit (2EX)

Ramp Terminals

- 3-leg terminals with diagonal entrance ramp (D3en)
- 3-leg terminals with diagonal exit ramp (D3ex)
- 4-leg terminals with diagonal ramps (D4)
- 4-leg terminals at four-quadrant partial cloverleaf A (A4)
- 4-leg terminals at four-quadrant partial cloverleaf B (B4)
- 3-leg terminals at two-quadrant partial cloverleaf A (A2)
- 3-leg terminals at two-quadrant partial cloverleaf B (B2)
- Single-point diamond interchanges (SP) *
- Tight diamond interchanges (TD) *

* New facility types planned for HSM2  
^ Expanded facility types planned for HSM2
New Research Resources

How to access and implement new research going into the HSM2
New NCHRP Research

- 17-50: Lead States Initiative for Implementing the HSM
- 17-58: CPMs for Six-Lane and One-Way Urban and Suburban Arterials
- 17-62: Improved Prediction Models for Crash Types & Severities
- 17-63: Guidance for the Development and Application of CMFs
- 17-68: Intersection Crash Prediction Methods for the HSM
- 17-70: Development of Roundabout CPMs and Methods
- 17-72: Update of Crash Modification Factors
- 17-73: Systemic Pedestrian Safety Analyses
- 17-77: Guide for Quantitative Approaches to Systemic Safety Analysis
New NCHRP Research (cont.)

- 17-78: Understanding and Communicating Reliability of CPMs
- 17-81: Proposed Macro-Level Safety Planning Analysis Chapter for HSM
- 17-83: Briefings and Training Materials for Implementation
- 17-84: Pedestrian and Bicycle Safety Performance Functions for the HSM
- 17-89: Safety Performance of Part-Time Shoulder Use on Freeways
- 17-89A: HOV/HOT Freeway CPMs for HSM
New Available Research Summary

• HSM2 Research Resources web page
  • Contains an index of research projects related to the Highway Safety Manual from NCHRP and FHWA
  • Research results may be included in HSM2 or future versions
  • highwaysafetymanual.org/Pages/ResearchResources.aspx
Application Tools & Resources

Software, tools, and case studies for applying HSM methods
Crash Prediction Spreadsheets

- Simple spreadsheet tools for running Part C predictive crash analyses
- Available for all roadway and intersection facility types included in HSM1 and the supplement
  - Rural two-lane
  - Rural multilane
  - Urban/suburban arterials
  - Freeways and ramps
- Access the latest tools:
  - [http://www.highwaysafetymanual.org/Pages/Tools.aspx](http://www.highwaysafetymanual.org/Pages/Tools.aspx)
Interactive Highway Safety Design Model (IHSDM)

• FHWA standalone software tool for predictive crash analysis and visualization

• Includes all predictive models in HSM1 and the supplement, with additional facilities including:
  • Rural and urban all-way stop controlled intersections
  • Rural three-leg signalized intersections
  • Urban/suburban high-speed intersections
  • Urban five-leg signalized intersections
  • Single-point and tight diamond interchange terminals
  • And more...

• Sunsetting in 2024 but will still be available
  • Access the latest version [here]
AASHTOWare Safety

• Web-based safety analysis suite powered by Numetric
  • Supersedes SafetyAnalyst
  • Annual cost is context-dependent

• Includes modules for segment, intersection, and trend analysis

• Features for network screening, crash querying, SPF development, visualization, and more

• Learn more at https://numetric.com/
Crash Modification Factor (CMF) Clearinghouse

• Searchable database of research-driven crash modification factors
• Provides guidance and resources for using CMFs in practices
• CMFs are rated based on quality to help users find the most appropriate values
• Quarterly email newsletter for updates
• Visit http://cmfclearinghouse.org/
HSM Application Webinars

• AASHTO sponsors periodic webinars on HSM methods and research

• Recent and upcoming webinars include:
  • Transportation Safety Evaluation
  • Predictive Network Screening Tools
  • Applications of recently completed research

• Video recordings and slides are available on the HSM website’s implementation page
Highway Safety Manual Website

• All these resources and more can be found on the highway safety manual website

• highwaysafetymanual.org
Looking Forward

When and where the HSM2 will be available
Publication Timeline

- Estimated HSM2 publication in 2024
- Website for updates and additional information
  - www.highwaysafetymanual.org
- Questions? Contact Kelly Hardy
  - info@highwaysafetymanual.org
Questions?

Thank you for your attention.

For more information, please contact Kelly Hardy at info@highwaysafetym manual.org