American Association of State Highway and Transportation Officials
AASHTO

AASHTO Highway Safety Manual Second Edition Update

Webinar for State DOTs
June 18, 2024

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Agenda

- Highway Safety Manual 2nd Edition Overview
- New Applications Across the Roadway Lifecycle
- Next Steps to Publishing
- Looking Ahead
  - Implementation Support
  - Ongoing and Future Research

HSM Version 2 Chapter Overview

Ch 1 - Intro and Overview to HSM

Part A – Fundamentals

- Ch 2 - Road Safety Principles
- Ch 3 - Human Factors
- **Ch 4 - Pedestrians & Bicyclists**

Part B – Roadway Safety Management

- **Ch 5 - Areawide Planning**
- Ch 6 - Network Screening
- Ch 7 - Diagnosis
- Ch 8 - Countermeasure Selection
- Ch 9 - Economic Appraisal
- Ch 10 - Project Prioritization
- Ch 11 - Safety Effectiveness Evaluation
- **Ch 12 - Systemic Safety Management**

Part C – Predictive Methods

- **Ch 13 - General Concepts for Applying the Part C Predictive Methods**
- Ch 14 - Rural Two-Lane Roads
- Ch 15 - Rural Multilane Highways
- Ch 16 - Urban & Suburban Arterials
- Ch 17 - Freeways
- Ch 18 – Ramps

Part D – Crash Modification Factor

- **Ch 19 - Selecting CMFs**
- **Ch 20 - Applying CMFs**

NEW HSM2 CHAPTERS

Major Additions and Changes To Individual Chapters

HSM2 – Ch.1 Introduction and Overview to the Highway Safety Manual

- Updated content based on revised outline of HSM2

HSM2 – Ch.2 Road Safety Principles

- Changed title from “Fundamentals” to “Road Safety Principles”
- Added section on Safe System approach
- Fundamental safety performance analysis terms expanded to be more inclusive for bicycles and pedestrians
- Added more content on application of CMFs
- Blended content from several appendices into chapter

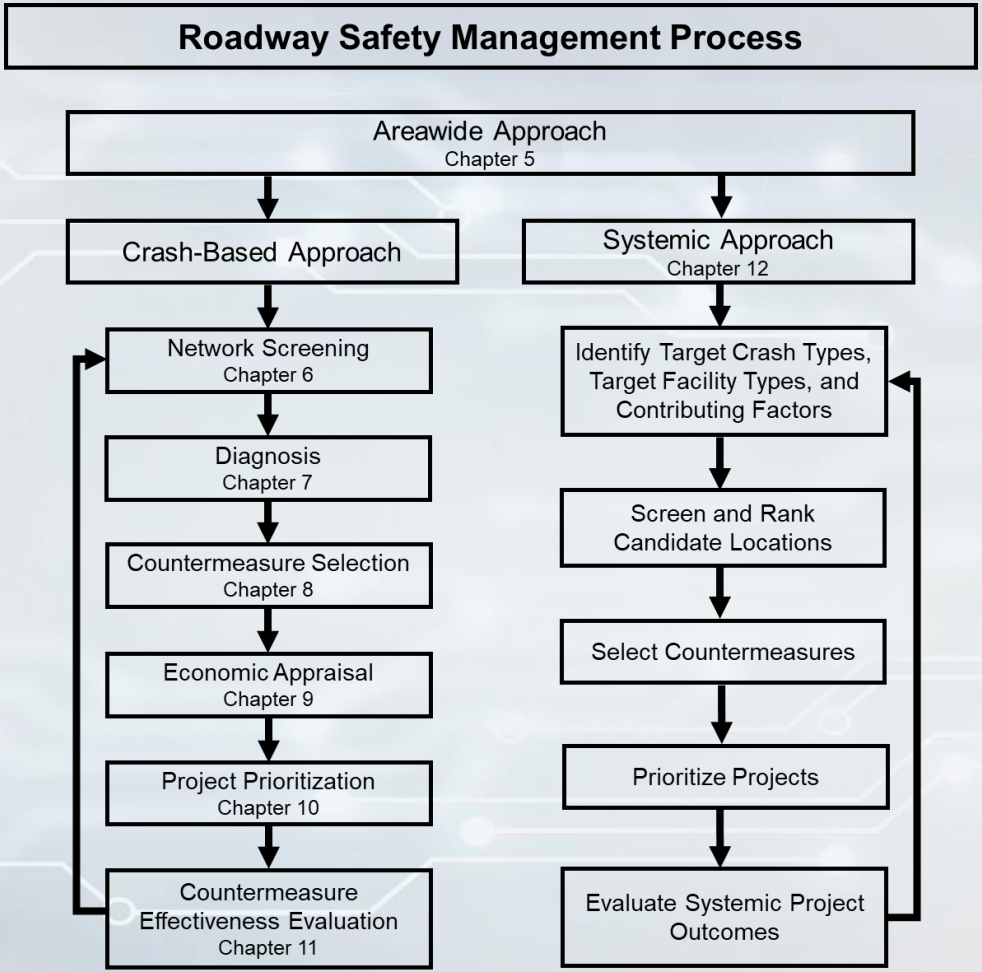
HSM2 – Ch.3 Human Factors

- Revised discussion of human factors to emphasize practical implications of human factors on safety and eliminated narrative that seemed academic.
- Added section on Human Factors vs. Aberrant Driver Behaviors.
- Replaced section on "User Characteristics and Limitations" with "Human Factors and Crash Diagnostics."
- Added new section on countermeasure selection that emphasizes the need to link countermeasures to the diagnostics process and shows how countermeasures for three specific crash types support road users.
- Added several examples.

HSM2 – Ch.4 Pedestrians and Bicyclists (NEW)

- Topics include:
  - Factors contributing to pedestrian and bicycle collisions
  - Safety data for pedestrians and bicyclists
  - Indirect safety measures for pedestrians and bicyclists
  - Integrating pedestrian and bicycle considerations into roadway safety management and predictive methods
  - Special considerations for pedestrians and bicyclists

HSM2 – Part B Roadway Safety Management Process



HSM2 – Ch.5 Areawide Approach to Roadway Safety Management (NEW)

- Chapter presents method to estimate areawide crash totals within geographical areas of various sizes, using predictive method based on macro-level models
- Areawide evaluations can be used to:
  - Compare alternative growth scenarios in a planning process
  - Support analysis of crash frequency and severity performance measures
  - Assess impacts of large-scale developments on crash frequency and severity in different geographical regions
- Areawide approach can serve as first step in roadway safety management process
- Macro-level CPMs available for Census Block Groups
  - For planning areas inside MPO boundaries
  - For planning areas in a state

HSM2 – Ch.6 Network Screening

- New section added that includes network screening level SPFs for:
  - Roadway segments
  - Intersections (including roundabouts)
  - Pedestrian and bicycle collisions

- Removed several less relevant network screening performance measures from chapter
  - Excess predicted average crash frequency using method of moments
  - Excess predicted average crash frequency using SPFs

HSM2 – Ch.7 Diagnosis

- Integrated material to be consistent with information in Chapter 3 on human factors

- Added new sample problem

HSM2 – Ch.8 Countermeasure Selection

- Integrated material to be consistent with information in Chapter 3 on human factors

HSM2 – Ch.9 Economic Appraisal

- Clarified methods for estimating change in crashes for a proposed project
- Updated information on crash costs

HSM2 – Ch.10 Project Prioritization

- No significant changes made

HSM2 – Ch.11 Countermeasure Effectiveness Evaluation

Chapter largely restructured and written to incorporate material on developing CMFs, prepared as part of NCHRP 17-63 (Guidance for the Development and Application of Crash Modification Factors.). Content included:

- Fundamental concepts related to CMFs
- Relevant statistical concepts and terminology
- Study design and analysis approaches to develop CMFs
- Other approaches for developing CMFs
- Crash modification functions
- CMF reporting

- Removed discussion of experimental design from chapter

HSM2 – Ch.12 Systemic Approach to Roadway Safety Management (NEW)

- Topics include:
  - Overview of Systemic Approach to Roadway Safety Management
    - General steps of the systemic approach
    - Benefits of implementing a systemic approach
    - Considerations in implementing a systemic approach
  - Allocating funds between systemic and crash-based projects
  - Data used for the systemic approach
  - Sample problems

Ch. 13 General Concepts for Applying the Part C Predictive Methods (NEW)

- Topics include:
  - General steps of the Part C predictive methods
  - Use of safety performance functions (SPFs) and adjustment factors (AFs)
  - Assignment of crashes
  - The Empirical Bayes (EB) method
  - Calibration
  - Development of jurisdiction-specific SPFs
  - Methods for estimating the change in crashes for a proposed project

Ch 14. Predictive Method for Two-Lane, Two-Way Highways

- Added new SPFs for total crashes, KABC crashes, and KAB crashes from NCHRP 17-62 to replace HSM1 SPFs for two-lane roadway segments and three intersection types
- Added new SPFs for three intersection types (3STT, 3SG, and 4AST) from NCHRP 17-68
- Added roundabout SPFs and AFs from NCHRP 17-70
- Added pedestrian and bicycle predictive methods from NCHRP 17-84
- SPFs have been calibrated, where appropriate, to a common state
- Updated materials to agree with HSM2 conventions
  - For example, talks about AFs rather than CMFs; the term CMF remains only when talking about clearinghouse/Part D CMFs

Ch 15. Predictive Method for Rural Multilane Highways

- Added new SPFs for total crashes, KABC crashes, and KAB crashes from NCHRP 17-62 to replace the HSM1 SPFs for undivided roadway segments, divided roadway segments, and three intersection types
- Added new SPFs for one intersection type (3SG) from NCHRP 17-68
- Added roundabout SPFs and AFs from NCHRP 17-70
- Added pedestrian and bicycle predictive methods from NCHRP 17-84
- SPFs have been calibrated, where appropriate, to a common state
- Updated materials to agree with HSM2 conventions
  - For example, talks about AFs rather than CMFs; the term CMF remains only when talking about clearinghouse/Part D CMFs

Ch 16. Predictive Method for Urban and Suburban Arterials

- Added new SPFs for total crashes to replace HSM1 SPFs for two-way arterials with five lanes or less from NCHRP 17-62
- Added new SPFs and AFs for two-way arterials with six lanes or more from NCHRP 17-58
- Added new SPFs and AFs for one-way arterials from NCHRP 17-58
- Added new SPFs and AFs for five new intersection types from NCHRP 17-68
- Added new SPFs and AFs for four intersection types on two-way arterials with six or more lanes and on one-way arterials from NCHRP 17-58
- Added roundabout SPFs and AFs from NCHRP 17-70
- Added pedestrian and bicycle predictive methods from NCHRP 17-84
- SPFs have been calibrated, where appropriate, to a common state
- Updated materials to agree with HSM2 conventions
  - For example, talks about AFs rather than CMFs; the term CMF remains only when talking about clearinghouse/Part D CMFs

Ch 17. Predictive Method for Directional Freeway Segments

- Changed title from "Predictive Method for Freeways" to "Predictive Method for Directional Freeway Segments"
- Changed bidirectional models to directional models
- Reorganized to group SPFs, AFs, SDFs, and collision type proportions together for:
  - Directional freeway segments
  - Directional freeway segments containing speed-change lanes
- Removed AF for shoulder rumble strips
- Updated materials to agree with HSM2 conventions
  - For example, talks about AFs rather than CMFs; the term CMF remains only when talking about clearinghouse/Part D CMFs

Ch 18. Predictive Method for Ramps

- Added models for single-point diamond interchange and tight diamond interchange from NCHRP Project 17-68
- Reorganized to group SPFs, AFs, SDFs, and collision type proportions together for:
  - Ramp segments
  - Crossroad ramp terminals
- Chapter directs user to Chapter 16 to evaluate crossroad ramp terminals with roundabout configuration
- Updated materials to agree with HSM2 conventions
  - For example, talks about AFs rather than CMFs; the term CMF remains only when talking about clearinghouse/Part D CMFs

Ch 19. Selecting CMFs (NEW)

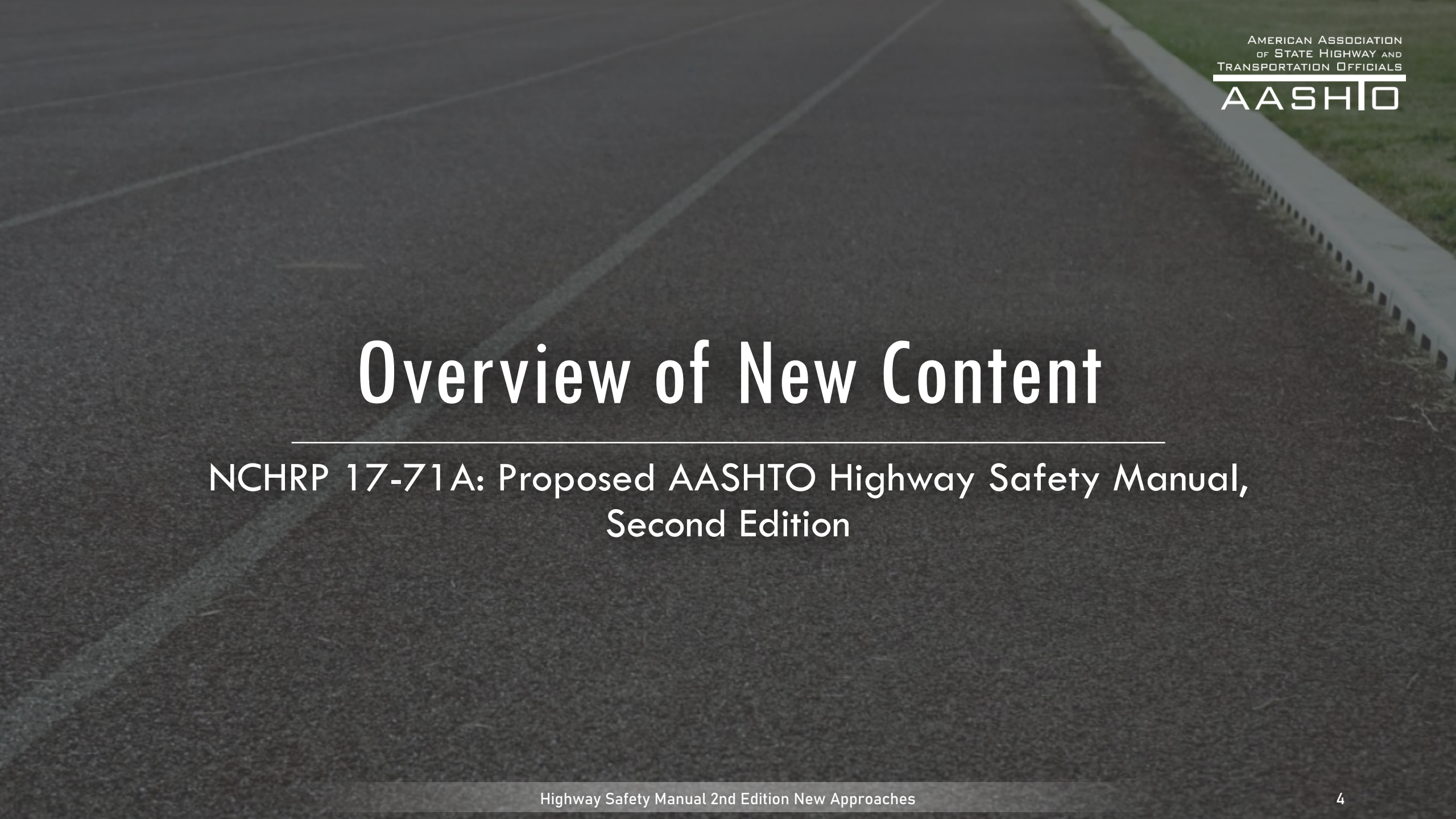
- Topics include:
  - Identifying the most appropriate CMF
  - Converting CMFs for appropriate application
  - Searching for CMFs
  - Developing a custom CMF list
  - Estimating countermeasure effects without applicable, high-quality CMFs

Ch 20. Applying CMFs (NEW)

- Topics include:
  - Applying CMFs to baseline crashes
  - Estimating a confidence interval
  - Using results
  - Common misapplications of CMFs

New NCHRP Research

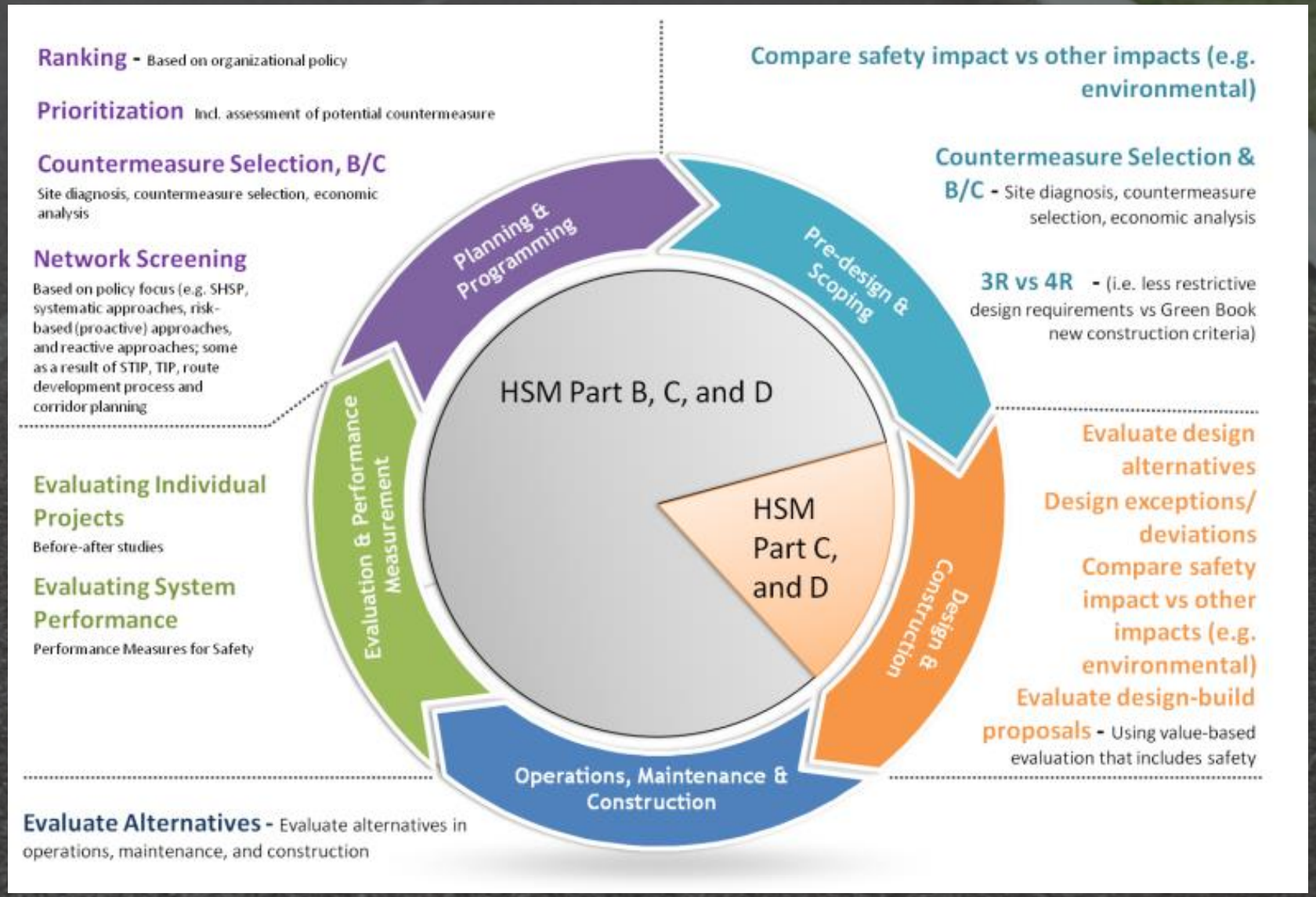
- 17-50: Lead States Initiative for Implementing the HSM
- 17-58: CPMs for Six-Lane and One-Way Urban and Suburban Arterials
- 17-62: Improved Prediction Models for Crash Types & Severities
- 17-63: Guidance for the Development and Application of CMFs
- 17-68: Intersection Crash Prediction Methods for 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
- 17-78: Understanding and Communicating Reliability of CPMs
- 17-81: Proposed Macro-Level Safety Planning Analysis Chapter for HSM
- 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



Overview of New Content

NCHRP 17-71A: Proposed AASHTO Highway Safety Manual, Second Edition

HSM Supports Transportation Safety Decisions



Source: FHWA HSM Implementation Guide for Managers, September 2011

Roadway Lifecycle

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New! Areawide Planning
Systemic Safety Analysis

Planning & Programming
- Network screening
- Diagnosis
- Countermeasure selection
- Economic Analysis
- Evaluation

New! **Updated Safety Effectiveness Evaluation**

Evaluation and Performance Management
- Evaluate effectiveness of individual projects and treatments
- Evaluating system performance

Understanding Transportation Safety
- Improves overall understanding of transportation safety
- Expanded human factors focus
- Pedestrian and bicyclist safety principles and practice

New! **Developing, Calibrating, and Using SPFs**

Pre-Design & Scoping
- Compare safety impacts of alternatives Countermeasure selection and diagnosis
- Alternatives and design scoping
- Design decision making
- 3R versus 4R

New! **Incorporating Pedestrian and Bicyclist Considerations into Safety Management**

New! *Selecting and Applying CMFs*

Operations & Maintenance
- Evaluate operations and maintenance options
- Improve decision making to optimize operations

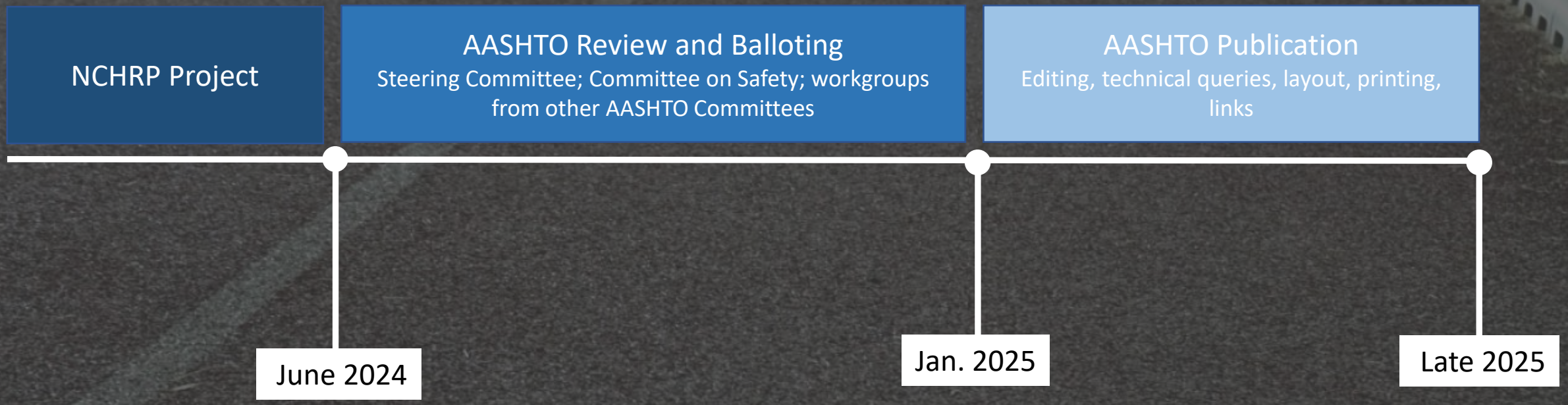
Design & Construction
- Evaluate design alternatives
- Compare impacts of alternatives
- Design exceptions and deviations
- Evaluate design build

New! **Expanded Facilities with Crash Prediction Models**

Draft HSM2 Reviews

- NCHRP Project Panel
  - Public, academic, and consultant perspectives
- AASHTO HSM2 Steering Committee
  - Additional practitioner and research perspective
  - External subject matter experts reviewed draft HSM2 for technical content, consistency between chapters and parts, language, and sample problems.

HSM2 Balloting & Publishing Process



HSM2 Publication Schedule

	2024								2025											
	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Steering Committee Q/C																			
Committee Review																			
Address Review Comments																			
Steering Committee Ballot																			
Address Ballot Comments																			
Committee Ballot																			
Address Ballot Comments																			
Publications																			

Committee Review Guidance

- Use your technical expertise to help ensure the accuracy of the HSM:
  - Focus on the new materials and changes we have identified.
  - Be as specific as possible with questions or comments.
  - Recommend clarifications.
- Don't focus on editorial or typographical issues unless it impacts the technical meaning.

Committee Review Guidance

- Possible areas of consideration:
  - Part A: Review the connection of Chapter 3 Human Factors and (new) Chapter 4 Ped and Bicyclists with Part B and Part C methods.
  - Part B: Review the new Areawide and Network Screening models and sample problems for understanding and clarity.
  - Part C:
    - Review the new arterial segment and intersection site types, including roundabouts, for differences with HSM 1 site types.
    - Review Pedestrian and Bicycle predictive methods and examples.
    - Since the freeway chapter methods are now directional, are the changes understandable?
  - Part D: Review selecting and applying CMFs with reference to using the FHWA Clearinghouse and project evaluations.

Committee Review

- Download HSM2 files from AASHTO Portal
  - We will be sending invitation emails to create an account on the Portal.
- Upload comment files to AASHTO Portal
  - Committee on Safety: One comment file per state
  - Other committee representatives: one file each
- Review schedule
  - Estimated start July 1, 2024
  - 4-week review period

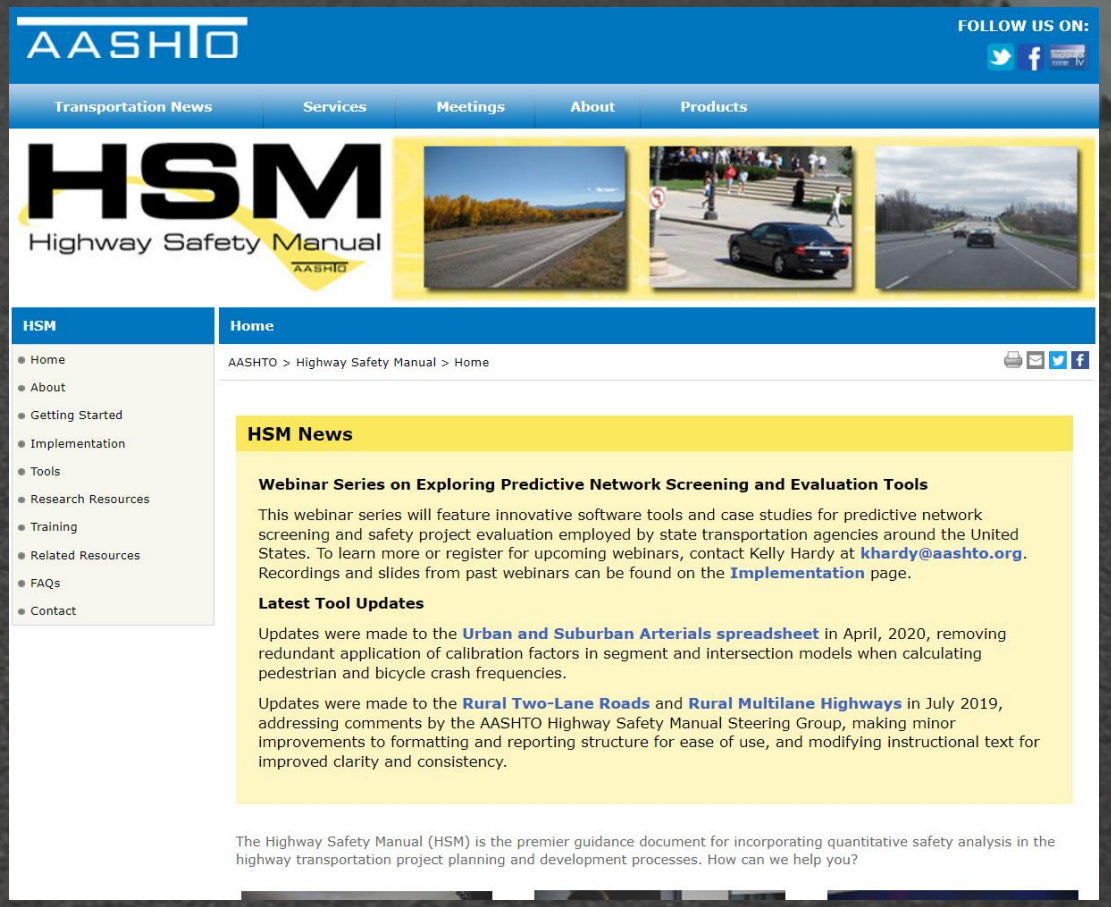
HSM Implementation Support

- We are looking for input on HSM2 needs:
  - Outreach
  - Training
  - Tools
  - Noteworthy Examples
- Emphasis on the importance of calibrating to local conditions
  - Calibrating existing SPFs and developing jurisdiction-specific SPFs

HSM Website

- HSM website will be updated with new resources

www.highwaysafetymanual.org



Future Research

- NCHRP Research
  - 17-104: Enhancement of Roadside Design Safety Prediction Models for the Highway Safety Manual
  - 17-126: Intersection Crash Prediction Models for Future Editions of the Highway Safety Manual
  - 17-127: Practitioner's Application Guide to the Highway Safety Manual
  - 20-123 (17): Highway Safety Manual Development and Roadmap
- Roadmap project and TRB ASC20 committee will support prioritizing new research.
- Continued coordination with FHWA and ITE safety partners to identify HSM2 training and support.

Future Research

- Guide for Research Resulting in Practical Implementation of the HSM
  - Compatibility with existing research
  - Model scope, sensitivity testing and edge cases
  - Pilot testing of models and tools
  - Frequently asked questions
  - Implementation planning
- Posted on www.highwaysafetymanual.org

Thank you.

Questions?

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HSM2 Steering Committee

Thank you to our dedicated Steering Group members!

- Stephen Read, Chair (Virginia DOT)*
- Bonnie Polin, Co-Chair (Massachusetts DOT)*
- Saroja Devarakonda (Arizona DOT)
  - Kerry Wilcoxon
- Jason Hershock (Pennsylvania DOT)*
- Christina McDaniel-Wilson (Oregon DOT)
  - Jiguang Zhao
- Jianming Ma (Texas DOT)
- John Milton (Washington DOT)*
- Dibakar Saha (Florida DOT)
- Jason Siwula (Kentucky TC)
- Jerry Roche*, Derek Troyer*, Matthew Hinshaw (FHWA)
- Kelly Hardy (AASHTO)*

* 17-71A Panel Members