

Highway Capacity Manual 2010 Overview

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 TRANSPORTATION RESEARCH BOARD



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- Questions can be asked via the Question Pod/Chat Pod.
- Questions & answer session at the end of the presentation or at specific time during the presentation.
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Instructor

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Overview of Webinar Series

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- HCM 2010 Overview: Now in four volumes
- New Active Traffic Management chapter
- Changes to the unsignalized intersection methods
- New multimodal urban streets method: ped, bike, transit modes
- New signalized intersection method

Overview of Webinar Series

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- New multimodal urban streets method: auto mode
- New material on the use of alternative tools
- New freeway weaving method
- Enhancements to the freeway facilities method
- Enhanced planning methods and applications

Presentation Overview

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- Summary of significant changes
- HCM organization
- Chapter details
- Navigating Volume 4

Webinar Objectives

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- Learn about what's new in the HCM 2010
- Familiarize users with the four-volume organization
- Learn how to navigate Volume 4

Summary of Significant Changes

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- Incorporation of new research
- Integrated multimodal approach
- Increased emphasis on alternative tools
- Four-volume presentation

Incorporation of New Research

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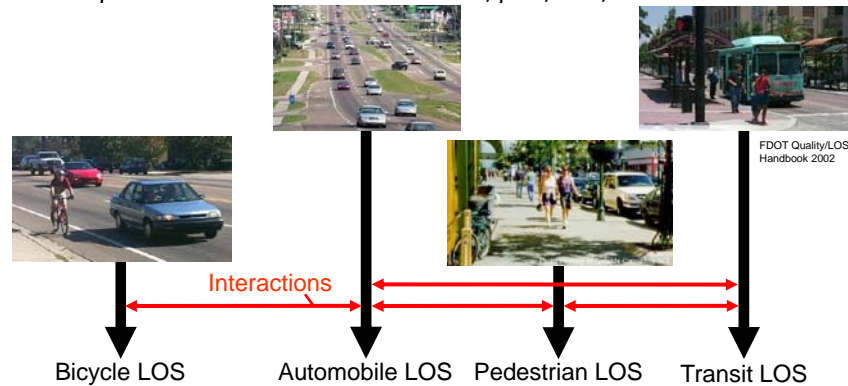
- More than \$5 million of funded research results
 - NCHRP 3-65 (Roundabouts in the United States)
 - NCHRP 3-70 (Multimodal Arterial Level of Service)
 - NCHRP 3-75 (Analysis of Freeway Weaving)
 - NCHRP 3-79 (Predicting Travel Speeds for Urban Streets)
 - NCHRP 3-82 (Default Values for HCM)
 - NCHRP 3-85 (Guidelines for the Use of Alternative Traffic Analysis Tools)
 - NCHRP 3-92 (HCM 2010 Production)

Multimodal Approach

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□ Multimodal evaluation for urban streets

- Emphasizes combined evaluation of auto, ped., bike, and transit modes



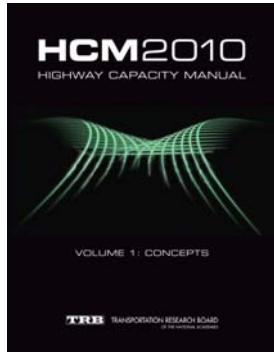
More Emphasis on Alternative Tools

12

- Recognition that HCM analytical procedures may not always be the best choice
- Range of alternative tools
 - Deterministic tools (e.g., TRANSYT-7F for arterial performance)
 - Stochastic tools (e.g., CORSIM or VISSIM for network performance)
- Example applications

Volume 1: Concepts


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1. HCM User's Guide
2. Applications
3. Modal Characteristics
4. Traffic Flow & Capacity Concepts
5. Quality and LOS Concepts
6. HCM & Alternative Analysis Tools
7. Interpreting HCM and Alternative Tool Results
8. HCM Primer
9. Glossary and Symbols

Chapter 1: HCM User's Guide

16

- Starting point for learning how to use the 2010 HCM
- Outline:
 - Evolution of the HCM
 - Purpose, objectives, intended use, target users
 - Format, structure 
 - International use
 - Research basis, methodology changes
 - Companion documents



Chapter 2: Applications

17

- Introduction to the range of analyses that the 2010 HCM can be applied to
- Outline:
 - Levels of analysis
 - Operational, design, planning and preliminary engineering
 - Roadway system elements
 - Points, segments, facilities, corridors, areas, systems
 - Travel modes
 - Operating conditions
 - Interrupted/uninterrupted flow, over/undersaturated
 - HCM analysis as part of a broader process

Chapter 3: Modal Characteristics

18

- Basic characteristics of the four major modes addressed by the 2010 HCM
 - Auto, pedestrian, bike, transit (on urban streets) 
- Outline by mode:
 - Vehicle and human factors
 - Volume and demand characteristics **Updated**
 - Facility types **Updated**
 - Interactions with other modes 


Chapter 4: Traffic Flow & Capacity Concepts

19

- Basic speed, flow & capacity concepts by mode
 - Detailed information (e.g., speed-flow curves) for system elements appear in Volume 2 & 3 chapters
- Outline by mode:
 - Flow parameters, operational performance measures
 - For example: volume, flow rate, speed, density, headway, space, saturation flow, delay, queuing
 - Capacity concepts
- Updated material in the ped., bike, and transit sections

Chapter 5: Quality & LOS Concepts

20

- LOS/QOS concepts & service measures
 - LOS tables presented in Volume 2 & 3 chapters
- Outline:
 - Quality of Service (QOS) concept, Level of Service (LOS) concept
 - Service measure types
 - Flow-based, traveler satisfaction/perception-based 
 - Service measures by mode and system element




Chapter 6: HCM & Alternative Tools

21

- Overviews the range of available analysis tools, from the very generalized to the microscopic
- Incorporates NCHRP 3-85 work
- Outline:
 - HCM-based tools
 - Service volume tables, planning-level (with defaults), operations-level
 - Alternative tools
 - Traffic modeling terminology and concepts
 - Appropriate use, application framework, guidelines
 - Performance measures
 - Tool selection criteria
 - Application guidelines

Chapter 7: Interpreting & Presenting Results

22

- Guidance to analysts on the use of HCM and alternative tool analysis results
- Outline:
 - Uncertainty and variability
 - Overview of performance measures
 - Trajectory analysis 
 - Stochastic aspects of simulation 
 - Comparing HCM results with alternative tools 
 - Results presentation

Chapter 8: HCM Primer

23

- Capacity concepts
- Quality & LOS concepts
- Analysis process
- Decision-making considerations

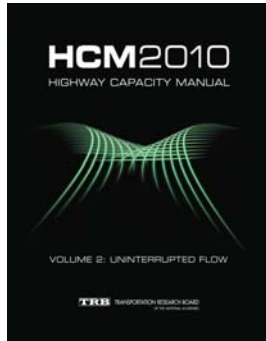
Audience Interaction

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- Questions about Volume 1?

Volume 2: Uninterrupted Flow

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10. Freeway Facilities
11. Basic Freeway Segments
12. Freeway Weaving Segments
13. Freeway Merge & Diverge Segments
14. Multilane Highways
15. Two-Lane Highways


Chapter 10: Freeway Facilities

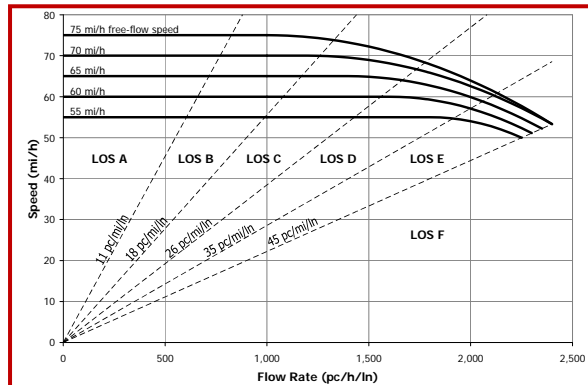
26

- Incorporates new NCHRP 3-75 weaving segment procedure **Updated**
- LOS measure and table **NEW**
- Impacts of weather and work zones **Updated**
- Analysis of oversaturated conditions
 - Multi-period analysis

Chapter 11: Basic Freeway Segments


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- Revised speed-flow curves 
- Improved free-flow speed prediction model **Updated**



Chapter 12: Freeway Weaving Segments

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- Incorporates NCHRP 3-75 research 
- New ways to consider length, width and configuration
- Lane-changing used as a measure of turbulence; methodology predicts total lane-changing activity
- New speed-prediction algorithms
- New approach to weaving capacity



Chapter 13: Merge & Diverge Segments

29

- No major changes to base methodology
- “Reasonableness check” added to initial predictions of flow in Lanes 1 and 2
- Two minor changes in predictive equations for v_{12} to avoid discrepancies in extreme cases **Updated**



Chapter 14: Multilane Highways

30

- No major changes in base methodology
- Added analysis procedure for bicycles on multilane highways **NEW**



Photo: Lee Rodegerdt

Chapter 15: Two-Lane Highways

31

- Two-way analysis methodology deleted
- Some basic characteristic curves and tables were revised and updated **Updated**
- Third class of two-lane highway added as an alternative procedure: two-lane highways in built-up areas (FDOT procedure used) **NEW!**
- Bicycle LOS **NEW!** procedure added



Photo: Lee Rodriguez

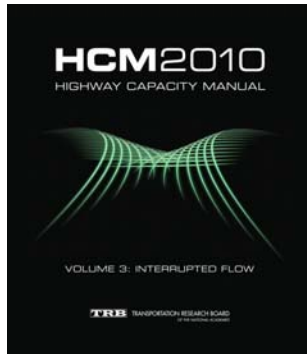
Audience interaction

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- Questions about Volume 2?

Volume 3: Interrupted Flow

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16. Urban Street Facilities
17. Urban Street Segments
18. Signalized Intersections
19. Two-Way STOP-Controlled (TWSC) Intersections
20. All-Way STOP-Controlled (AWSC) Intersections
21. Roundabouts
22. Interchange Ramp Terminals
23. Off-Street Pedestrian & Bicycle Facilities

Chapter 16: Urban Street Facilities





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- Separate analysis for auto, ped, bike & transit modes
- Aggregates key segment performance measures
- Demonstrates integrated multimodal evaluation process



Chapter 17: Urban Street Segments





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- Incorporates NCHRP 3-79 operational methodologies 
 - Improved prediction of average travel speed
- Incorporates NCHRP 3-70 LOS methodologies 
 - Multi-modal LOS methodology
- Segment (= link + boundary intersection)
 - Signal, TWSC, AWSC, or roundabout boundary intersection
- Separate methodology for each travel mode






Chapter 18: Signalized Intersections

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- New method for calculating uniform delay term 
- Actuated controller operation modeling procedure added 
- Left-turn pocket overflow check added 
- Ped & bike LOS incorporates NCHRP 3-70 research 

Chapter 19: TWSC Intersections

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- Gap acceptance parameters for six-lane streets added 
- Interface with urban street segment methodology for upstream signal effects 
- Pedestrian crossing LOS method 
 - Considers various types of crossing treatments and associated driver yielding behavior

Chapter 20: AWSC Intersections

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- Restructured to improve user understanding
- Explicit incorporation of details to calculate AWSC operation with three-lane approaches 
- Queuing model added 



Photo: Lee Rodegerdtis

Chapter 21: Roundabouts

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- Incorporates NCHRP 3-65 methodologies for evaluating roundabout performance
- LOS table for roundabouts
- Lane-by-lane analysis of multilane roundabouts



Photo: Casey Bergh

Chapter 22: Interchange Ramp Terminals

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- Chapter completely updated, based on NCHRP 3-60 results **Updated**
- Operational evaluation of signalized & roundabout ramp-crossroad intersections
- Quick estimation method for interchange type selection 
- Methodology addresses auto mode only

Chapter 23: Off-Street Pedestrian & Bicycle Facilities

41

- New bicycle and multi-use path procedures based on FHWA research **NEW!**
- Guidance on applying pedestrian methodologies to a wider variety of facility types



Photo: Lee Rodegerdt

Audience interaction

42

- Questions about Volume 3?

Volume 4: Applications Guide

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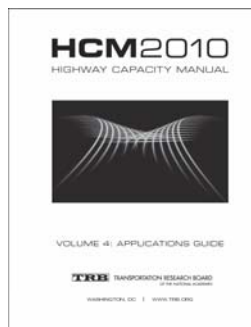
The screenshot shows the table of contents for the HCM2010 Volume 4 Applications Guide. It lists the following sections and their page numbers:

Section	Page
METHODOLOGICAL DETAILS	
CHAPTER 4: TRAFFIC FLOW AND CAPACITY CONCEPTS	101
CHAPTER 7: INTEGRATING HCM AND ALTERNATE TOOL RESULTS	107
CHAPTER 10: FREEMAN FACILITIES	109

- Methodological Details
- Interpretations & Errata
- Technical Reference Library
- HCM Applications Guidebook
- Discussion Forum

Methodological Details

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- Supplemental chapters
- Emerging topics chapters
- Computational engines

Chapters 24-34

45

- Supplemental material for HCM chapters in Volumes 1–3
- Supplemental chapters may include:
 - Greater level of detail regarding certain methods (useful for advanced users, researchers, or software developers)
 - Additional example problems
 - Alternative tool application examples

Chapter 35: Active Traffic Management

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- Emerging topics chapter focusing on:
 - Ramp metering
 - Congestion pricing
 - Traveler information systems
 - Managed lanes
 - Traffic signal control
 - Speed harmonization
- Other chapters may be added in the future as research is completed (e.g., travel time variability)



Interpretations & Errata

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- Frequently asked questions
- Interpretations & clarifications
 - Official Highway Capacity Committee responses to questions of interest to a broad range of users
- Errata
 - Official corrections to the HCM
- Also see the Discussion Forum section of the website
 - Unofficial, but quicker, answers to questions

Technical Reference Library

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- Provides electronic versions of selected documents referenced by the HCM
 - For example, original research reports for HCM methodologies

HCM Applications Guidebook

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- Case study examples of HCM & alternative tool applications to real-world issues
 - Focus is on process, not computational steps
 - Developed by NCHRP 3-64 & 3-85 projects
- Case studies consist of:
 - Intersection analysis
 - Traffic impact analysis
 - Rural/suburban roadway
 - Freeway
 - Urban street
 - Freeway corridor, using simulation

Navigating Volume 4

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Demonstrate features of Volume 4

www.hcm2010.org

Summary

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- HCM 2010 incorporates the results of more than \$5 million in funded research since the HCM2000
- It incorporates a number of changes desired by the user community
- It continues the HCM's evolution toward a more multimodal approach to addressing transportation issues
- It is designed to continue to be relevant to users in an age of increasing reliance on software tools

Questions?

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- Please send your additional questions and comments to:
 - Mark Vandehey (mvandehey@kittelsohn.com)

Thank You

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Please provide your feedback. A link to an online evaluation will follow in an e-mail to site registrants. Please distribute this email to participants at your site. The assessment and evaluation will close in one week.

Questions/Comments

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