

# Updating the Authoritative Guide on Capacity

The *Highway Capacity Manual* is the go-to source for information about evaluating the capacity of transportation facilities. The latest edition provides practitioners with the most up-to-date analytical tools by incorporating more than \$5 million in NCHRP research and drawing on a broad collaborative effort by the transportation community.

## Responding to Evolving Practices

For more than 60 years, the Transportation Research Board's *Highway Capacity Manual* (HCM) has provided engineers with state-of-the-art techniques for analyzing the capacity and level of service for transportation facilities, including roadways, intersections, and roundabouts. The HCM is the definitive guide for transportation engineers worldwide who wish to determine how much traffic a transportation facility can safely accommodate at a prescribed level of service, defined by such performance measures as average traffic speed and travel time.

However, as methods for evaluating capacity and level of service evolve, updates to the HCM are needed to provide transportation practitioners with the best available analytical tools. Since its first publication in 1950, the HCM has seen five editions, the most recent issued in 2010 ([www.trb.org/Main/Blurbs/164718.aspx](http://www.trb.org/Main/Blurbs/164718.aspx)). TRB's 2010 update to the HCM:

- For the first time, provides users with a method for an integrated multimodal analysis of urban streets.
- Addresses active traffic management such as managed lanes and smart lanes.
- Gives planners the tools to quickly determine the size of future facilities.
- Includes an electronic volume with comprehensive case studies.

## Paths to Practice

### Incorporating a broad range of NCHRP research findings

The 2010 HCM was a major undertaking, incorporating more than \$5 million in

research from 10 NCHRP projects and two FHWA projects.

One of these projects, NCHRP Project 03-82, improved default values for analyzing capacity and level of service. Engineers use default input values—pedestrian and road and vehicle flow rates, or road and signal geometries—when there is insufficient local field data for an analysis. The defaults in the previous edition of the HCM did not fully reflect the variety of traffic conditions across the United States and sometimes yielded analyses of limited usefulness.

“NCHRP 03-82 helped improve the accuracy of the most significant default values for the HCM by revising them based on field data from around the United States,” says John Zegeer, principal investigator for NCHRP 03-82, and senior principal engineer at Kittelson & Associates. “This makes analyses of capacity and level of service much more reliable.”

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Another project, NCHRP 03-64, developed a companion guide to the HCM to show how to apply its methodologies to real-world problems. “Prior to the 2000 edition, the HCM only provided simple example problems to illustrate methodologies,” says Tom

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Creasey, transportation planning manager with Stantec. Creasey chaired the NCHRP 03-64 panel and is secretary of the TRB Highway Capacity and Quality of Service (HCQS) Committee, which oversees the HCM. “The companion guide educates users on how to use the HCM for complex problems that require more than plugging numbers into formulas,” Creasey says.

Creasey was also a member of the panel for NCHRP 03-70, which incorporated

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## Implementation Strategies AT A GLANCE

- **Cooperative National Effort:** Updating the Highway Capacity Manual involved broad collaboration among TRB, AASHTO, FHWA, and other transportation stakeholders.
- **An Ongoing Research Commitment:** Refining and building on previous work facilitated the implementation of past successful research.
- **Keeping Users in Mind:** Transportation practitioners were consulted at multiple stages of the revision process to make sure the new HCM would meet their needs.
- **Dissemination through Partners:** TRB's capacity committee and the Institute of Transportation Engineers used webinars and other channels to share updates and facilitate use of the new HCM.

## NCHRP—Transportation research that works

Objective national highway research since 1962 • Focused on practical problems of state DOTs • Contract researchers competitively selected • Overseen by balanced panels of technical experts • Reviewed by TRB highway specialists

methods for the multimodal analysis of urban streets. “The HCM’s new multimodal analysis tools look at the urban environment from the point of view not just of traffic engineers but of travelers,” he says. “The mathematical models were created based on how drivers, pedestrians, bicyclists, and transit users rated their experience of trips.” The update will make the HCM far more useful to planners, helping them to evaluate the trade-offs involved in how various modes share an urban street.

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### A collaborative effort by the transportation community

The HCM is a definitive guide that embodies decades of research. Updating it was an enormous effort that involved the cooperation of TRB, AASHTO, and FHWA over a number of years. “The manual is larger than any one committee,” says Ray Derr,

## NCHRP and FHWA Research for the 2010 HCM Update

- NCHRP Project 03-60, Capacity and Quality of Service of Interchange Ramp Terminals
- NCHRP Project 03-60A, Validation and Enhancement of the *Highway Capacity Manual's* Interchange Ramp Terminal Methodology
- NCHRP Project 03-64, *Highway Capacity Manual Applications Guide*
- NCHRP Project 03-65, Applying Roundabouts in the United States
- NCHRP Project 03-70, Multimodal Level of Service Analysis for Urban Streets
- NCHRP Project 03-75, Analysis of Freeway Weaving Sections
- NCHRP Project 03-79, Measuring and Predicting the Performance of Automobile Traffic on Urban Streets
- NCHRP Project 03-82, Default Values for Capacity and Quality of Service Analyses
- NCHRP Project 03-85, Guidance for the Use of Alternative Traffic Analysis Tools in Highway Capacity Analyses
- NCHRP Project 03-92, Production of the Year 2010 *Highway Capacity Manual*
- Two FHWA projects: Evaluation of Safety, Design, and Operation of Shared-Use Paths; and Active Traffic Management Measures for Increasing Capacity and Improving Performance

TRB senior program officer on NCHRP 03-92, the umbrella project for updating the manual. “Updating it required extensive involvement from the transportation community as a whole.”

Part of that effort involved consulting transportation professionals to make sure the 2010 update would meet their needs. As part of project 03-92, researchers conducted focus groups with HCM users in Florida, Maryland, and Oregon. “These focus groups provided critical insights into the content and organization of the manual,” Derr says.

As it was completed, the HCM was also vetted in a yearlong review process by more than 300 TRB professionals and TRB HCQS Committee members. “The HCQS Committee reviewed results of each project and made an independent determination as to whether they were valid and should be included,” Zegeer says. “Their oversight was critical.” The HCQS also obtained feedback through joint summer meetings with the Institute of Transportation Engineers (ITE) as well as focus groups sponsored by the ITE.

### The HCM has a wide reach

Derr, Creasey, and Zegeer agree that the impact of the HCM on transportation infrastructure in the United States cannot be emphasized enough. Its methods are used to determine everything from the number of lanes on streets to the timing of traffic signals. It is also highly influential on the content of capacity manuals worldwide.

“This manual has a huge amount of weight, setting the commonly accepted standards for level of service,” Derr says. “It’s widely used by both local agencies and state DOTs to determine how to keep traffic moving. It is also frequently cited in local regulations.”

To ensure the HCM’s continued relevance, the HCQS was very active in sharing the results of the 2010 update. That included numerous webinars, several of which were

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Among many other updates, the 2010 *Highway Capacity Manual* gives users tools to incorporate bicycle and pedestrian planning into their traffic engineering decisions.

co-hosted by ITE, as well as ITE meetings, according to Derr. “The HCQS is a very busy committee,” he says. “Dissemination is a big part of their job.”

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Another major route for the impact of the HCM is companion software developed and maintained by the University of Florida’s McTrans Center. “The Highway Capacity Software is frequently updated and faithfully implements HCM procedures,” Derr says, “giving transportation professionals an important tool for applying HCM methodologies.”

### Implementation Success

Because of its wide use and impact on transportation professionals worldwide, the HCM is a standout example of a successful implementation of NCHRP research. “It would be hard to think of a better implemented project than the HCM,” Creasey says. “Not only does it meet a demonstrated need, but it has met the challenge of accommodating more and more needs in response to feedback from the user community.”

The result is a manual that is increasingly useful to engineers with each update. “This latest edition significantly changes how engineers evaluate the possible effects of highway projects,” says Zegeer. “It gives them better tools than ever for evaluating capacity and quality of service.”

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