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NCHRP Project 17-87

Enhancing Pedestrian Volume Estimation and Developing HCM Pedestrian Methodologies for Safe and Sustainable Communities

Implementation Plan

Prepared for:
National Cooperative Highway Research Program

Transportation Research Board
of
The National Academies of Sciences, Engineering, and Medicine

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Implementation of Research Findings and Products

Introduction

NCHRP Project 17-87 investigated how the presence of specific pedestrian safety countermeasures (marked crosswalks, median island refuges, rectangular rapid-flashing beacons [RRFBs], and leading pedestrian intervals [LPIs]) affects pedestrian satisfaction. The project also updated the *Highway Capacity Manual's* (HCM's) pedestrian delay methodologies and developed a recommended approach to measuring the quality of service (QOS) of pedestrian networks ranging in size from a neighborhood or campus to an entire city. The project produced the following products:

- ***Guide to Pedestrian Analysis.*** This guide, intended for publication in the NCHRP Research Report series, will serve as a resource for practitioners, documenting the state-of-the-practice of pedestrian volume counting, pedestrian safety analysis, pedestrian operations analysis, and pedestrian QOS analysis.
- **Updated pedestrian level of service (LOS) procedure for uncontrolled pedestrian crossings.** Using data gathered through intercept surveys and video observations, the project developed a model to estimate pedestrian satisfaction at uncontrolled pedestrian crossings that is sensitive to specific types of safety countermeasure(s) that may exist at the crossing, as well as more generally to the effects of safety countermeasures on reducing crossing distance and improving motorist yielding rates. The new method and accompanying LOS thresholds are described in a proposed update to HCM Chapter 20, illustrated in a proposed updated example problem in HCM Chapter 32, and implemented via an Excel-based computational engine.
- **Updated pedestrian delay methods for signalized and uncontrolled crossings and urban street segments.** The project fixed issues identified with the motorist-yielding component of the current HCM pedestrian delay method for uncontrolled crossings and the "roadway crossing difficulty" factor used in the current HCM urban street pedestrian LOS method. The project also updated the HCM's table of default motorist yielding rates for various safety countermeasures, based on a synthesis of the literature and this project's data collection. Finally, the project expanded the range of crossing scenarios covered by the HCM pedestrian delay method for signalized crosswalks. The new and updated methods are described in proposed updates to HCM Chapters 18–20, illustrated in proposed example problems in HCM Chapters 31 and 32, and implemented via Excel-based computational engines.
- **Recommended approach for measuring pedestrian network QOS.** The project developed proposed text for an update of *NCHRP Report 825: Planning and Preliminary Engineering Applications Guide to the HCM* (PPEAG) describing an approach for measuring network QOS. The project also developed proposed updates to other portions of the PPEAG for consistency with the proposed changes to the HCM.
- **Presentation materials.** The project developed PowerPoint slides that can be used for purposes ranging from a one-hour webinar to a one-day workshop on the *Guide to Pedestrian Analysis* and new HCM pedestrian analysis methods.

The following implementation activities within the scope of NCHRP Project 17-87 have already been performed or are in process:

- A **peer-exchange workshop** to introduce the guide to representatives of more than 25 organizations recognized as leaders in addressing pedestrian transportation needs.
- **Semiannual updates** about the project to the Transportation Research Board (TRB) Committees on Highway Capacity and Quality of Service (HCQS) and Pedestrians, and a **committee workshop** for the HCQS Committee at the 2020 TRB Annual Meeting on the proposed HCM chapter updates.
- A 3–4 minute **video** introducing the guide will be completed prior to the completion of the project.
- A **TRB webinar** slot about the guide and HCM chapter updates has been reserved for spring 2020; a date for the webinar will be scheduled once the guide enters the NCHRP publication process.
- The **draft HCM chapters and computational engines** have been forwarded to the HCQS Committee for review and comment.

Recommendations for Putting Research Products into Practice

Guide to Pedestrian Analysis

As mentioned above, implementation activities related to the guide have already started, by raising awareness of the guide with potential early implementers via the peer exchange workshop, and by developing material for a TRB webinar that will reach a broader audience. Additional potential implementation activities for the guide include:

- **Additional workshops.** A series of workshops could be held in selected metropolitan areas around the U.S., to train practitioners from state departments of transportation (DOTs), metropolitan planning organizations (MPOs), local governments, academics, and private consultants on applications of the guide. The workshops could also include hands-on practice in using the new and updated HCM pedestrian procedures.
- **Conference and meeting presentations.** Potential organizations that could be targeted for presentations include:
  - **Institute of Transportation Engineers (ITE) Annual Meeting** (August 2020, New Orleans). ITE is reserving a slot for a presentation on NCHRP Project 17-87 in a session on pedestrian safety.
  - **American Association of State Highway and Transportation Officials (AASHTO) Active Transportation Council Meeting** (summer 2020, location to be determined). A presentation would expose active transportation leaders at state DOTs to the guide, as well as demonstrate an outcome of AASHTO-funded research.
  - **Walk/Bike/Places Conference** (August 2020, Indianapolis) and/or **Association of Pedestrian and Bicycle Professionals (APBP) webinar or meeting.** Presentations would expose a variety of active transportation professionals to the guide.
  - **TRB Annual Meeting** (January 2021, Washington, DC). Existing presentation material could be adapted for use in a half-day Sunday or Thursday workshop.

HCM Chapter Updates

Implementation began with HCQS Committee updates and posting the draft chapters, supporting working papers, and computational engines on the HCQS Committee's chapter review website. A commenting deadline has been set for mid-March 2020. Following receipt of committee comments (and panel comments, if any), the research team will prepare and post responses to each comment and post

adoption draft versions of the chapters on the committee review website. The committee will vote to approve the chapters at their midyear meeting in June 2020. Based on the most recent information we have from TRB, all updates to the HCM 6th Edition that have already been approved or that are approved no later than the midyear meeting will be bundled together into a HCM "Version 6.1" update that will enter the TRB editing process, with publication expected in late 2020.

The process for issuing updates to printed HCM chapters (Chapters 1–24) has not yet been determined. Updates to online-only HCM chapters (Chapters 25 and up) will be posted on the online HCM Volume 4 (hcmvolume4.org), which is accessible to all. An e-mail will be sent to all registered users of HCM Volume 4 notifying them of the availability of the new material. The computational engines will also be posted on HCM Volume 4 and will become a committee responsibility to maintain. The committee will also be responsible for addressing user questions on the new material as they are submitted.

Potential awareness-raising implementation activities for the new chapters include all those listed above for the guide, plus the following:

- **TRB webinar** on the HCM Version 6.1 updates, once available, of which the pedestrian methods would be a part. This webinar would reach an audience of transportation planners, engineers, and researchers.
- **TRB paper(s)** on the development of the HCM pedestrian crossing satisfaction LOS method, the updates to the HCM uncontrolled crossing pedestrian delay method, and/or the extensions to the signalized crosswalk pedestrian delay methods.
- ***ITE Journal* article(s)** about the HCM Version 6.1 updates and/or the *Guide to Pedestrian Analysis.*

PPEAG Updates

Two potential avenues are available for making the proposed PPEAG updates available to practitioners relatively quickly. The first and easier, although less-desirable, option would be to incorporate the updates into the existing PPEAG errata and updates document posted on HCM Volume 4. The second option would be to incorporate the updates directly into the PDF version of *NCHRP Report 825* and post the updated version on the TRB Publications website, with a link to it from HCM Volume 4. Because NCHRP is not set up to issue updates to reports once published, the second option may not be feasible, although it would result in a more practitioner-friendly outcome with the PPEAG becoming a living document. Because NCHRP Project 17-87 is the first project to develop updates specifically for the PPEAG, the HCQS Committee will need to develop a process to approve the updated material.

Another, lengthier option for making the PPEAG updates would be to fund a project to update the PPEAG, incorporating not only this project's products, but developing planning guidance for other material being considered for the HCM Version 6.1 update (e.g., two-lane highways, capacity adjustment factors for connected and automated vehicles, freeway–arterial interactions) and potentially other topics not able to be addressed in the original PPEAG. Under this option, a PPEAG 2nd edition would be issued as a new NCHRP report.

Follow-up Research

The project's draft final report identifies potential follow-up research activities that would expand the range of situations covered by this project's methodologies. Of these, the following are the highest priority:

- Additional intercept survey efforts to increase the number of pedestrian safety countermeasures directly addressed by the project's pedestrian satisfaction methodology for uncontrolled crossings. Of these, addressing pedestrian hybrid beacons (HAWK signals) and curb extensions

are the most important, based on the input received from the project's stakeholder interviews. Although the project's methodology accounts for these and other countermeasures indirectly through their effects on motorist yielding rates and crossing distance, the research found that the specific type of countermeasure in use affected satisfaction over and above its effects on pedestrian delay. Without accounting for these measure-specific effects, the countermeasures studied by this project (median islands and RRFBs) would have an advantage over other countermeasures in applications involving prioritizing locations for treatment in part based on the forecasted improvement in pedestrian satisfaction.

- Additional intercept survey efforts to create a broadly usable pedestrian satisfaction method for signalized crosswalks that would be a counterpart to the uncontrolled crossing method. This project's research focused on signalized crosswalks with leading pedestrian intervals (LPIs) and control sites with similar characteristics (typically compact urban intersections with relatively high pedestrian volumes). However, there are many other characteristics that, due to the study focus on LPIs, were not studied (e.g., wide intersections, long cycle lengths, channelized right-turn presence) and could affect pedestrian crossing satisfaction at signalized intersections.
- Simulation modeling to validate the proposed extensions to the HCM pedestrian delay method for signalized intersections to address crosswalk closures, exclusive pedestrian phases (e.g., Barnes dance), and pedestrian-friendly actuated signal timing. Although these proposed extensions have a good theoretical basis, they are more likely to be accepted by the HCQS Committee and practitioners if they have been validated.
- Additional delay studies at uncontrolled crossings that involve crossing right- or left-turn lanes, or both. This project's validation work found that although the proposed delay method reasonably estimated average delay for these crossings, the prediction error for any given crossing with turn lanes was greater than for crossings without turn lanes, indicating that there are other, unaccounted-for factors at work. The results from this study would be used to update the delay methodology to provide reliable results in a greater variety of real-world situations.

Potential Organizations to Lead Implementation Efforts

The previous section identified several potential organizations that could help implement NCHRP Project 17-87 products:

- **TRB,** though a webinar and potential Annual Meeting workshop, by publicizing the guide through its weekly e-newsletter, and by posting the project video on its social media channels.
- **AASHTO,** by funding an implementation phase that could include workshops, presentations, and/or follow-up research.
- **ITE, ABPB,** and similar organizations, through their conferences and member publications.

Potential Issues Affecting Implementation

The introduction of a new publication system within NCHRP's publication office, and the associated learning curve for editors, has created a backlog of reports to be edited and published. If this backlog continues, the publication of the guide could be delayed for a number of months. Providing the report as soon as possible in a pre-publication version would get the guide into users' hands in a timely manner, while the editing process is underway.

Because of the HCM's long history as a source of LOS standards for the motor vehicle mode, many pedestrian professionals may not be aware of its multimodal content. Therefore, the new and updated methodologies proposed for the HCM have also been included as an appendix to the guide, to make them more visible to pedestrian planners. In addition, the proposed webinars and presentations will raise awareness of the methods among non-users of the HCM.

Methods to Identify and Measure Impacts

Potential methods to measure the use of NCHRP Project 17-87's products include:

- Measuring the distribution of the guide (online downloads plus distribution of printed copies).
- Monitoring the number of times the guide and the project final report are referenced in future published literature.
- HCQS Committee volunteer activities to monitor the usage of the updated procedures in actual projects.