

EXECUTIVE SUMMARY

The Highway Capacity Manual (HCM), published by the Transportation Research Board, is the definitive document for the measurement of level of service (LOS) on American transportation facilities. The pedestrian LOS as defined and calculated in the HCM has advantages in providing a standardized method for pedestrian analysis in the United States. The HCM provides clear instruction as to what kinds of data need to be collected and how it is to be collected, and LOS is straightforward to calculate.

However, New York City is unique in the United States with regard to its heterogeneity of transportation modes, particularly in its relatively large proportion of walking trips. Although the HCM's methodology may be perfectly adequate for measuring pedestrian LOS in much of the United States, it appears to be underdeveloped for the analysis of New York City's sidewalks, as it does not accurately reflect the complex pedestrian experience in this city. This conclusion has been supplemented by a review of current and historical literature and by the experience of using the HCM in pedestrian studies within this department.

The objectives of this study are to evaluate the HCM pedestrian LOS methodology in terms of its suitability for pedestrian planning in New York City, to compile a pedestrian characteristics database, and to make recommendations for changes in pedestrian LOS analysis in New York City.

After surveying relevant literature and collecting

and analyzing pedestrian data, the New York City Department of City Planning, Transportation Division (TD) identified the strengths and weaknesses of the HCM methodology, and outlined possible solutions for the shortcomings. One inadequacy of the HCM is the lack of location specific pedestrian and environmental characteristics. Furthermore, the HCM lacks a clear definition of "shy distance," which is used in the determination of the effective width of sidewalks, an important measurement in LOS calculation. Fruin, Pushkarev, Zupan, and others discuss the space that pedestrians tend to keep between themselves and obstacles on the edges of the sidewalk—the so-called shy distance. But few empirical studies that the TD has found have been undertaken to determine what this shy distance is for different types of obstacles and how it changes with different levels of sidewalk density. In addition, the frictional force induced by opposing pedestrian flow is not addressed in the HCM's methodology. There are studies that have demonstrated the influence of this frictional force on pedestrian flow and speed.

The TD designed and tested several new methods of collecting pedestrian data to develop a pedestrian characteristics database. These included a speed and delay walk, video analysis of pedestrian behavior around obstacles, and a pedestrian speed and characteristics survey in the field. The TD's data collection efforts included 50 speed and delay walks over a 1.66 mile route in Lower Manhattan; pedestrian surveys of over sixty locations in Lower Manhattan;

the collection of the characteristics of approximately 9,000 pedestrians; and 30 hours of pedestrian counts. The TD also conducted 7-day pedestrian and vehicle counts to study their relationship, and gathered video footage at various locations for pedestrian behavior analysis.

As the data the TD collected was summarized and analyzed, the TD created a database that would catalog Lower Manhattan pedestrian characteristics, such as speed versus gender, age, trip purpose and size, among others. One important finding the TD reached while conducting this study was that the proportion of pedestrians observed to be impeded (by obstacles or by other pedestrians) at a location is an excellent predictor of overall pedestrian speed and of the TD's subjective interpretation of the sidewalk's level of service. The TD also found that the concept of pedestrian delay is useful as a method of evaluating LOS.

The TD believes that the HCM pedestrian LOS methodology could be improved for New York City with an enhanced focus on the characteristics of pedestrians, and on a more accurate quantification of the physical makeup of the city's sidewalks. This report does not attempt to address the qualitative side of sidewalk design, such as attractiveness, comfort, convenience, safety, security, system coherence, and system continuity, as some researchers have done. This report concentrates on the quantitative aspects of pedestrians, like HCM, to present a tool for planners and engineers to analyze pedestrian facilities' effectiveness through mathematical modeling.

This report serves as the first step in recommending an improved HCM pedestrian LOS methodology. With the preliminary data compiled and analyzed, the document was reviewed by a Technical Advisory Committee consisting of interested transportation academics and professionals. Subsequently, the TD will seek academic and industry partnerships in carrying out the next phase of the project, which will include further data collection and analysis. The final report will then be presented to the Transportation Research Board for review.