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A Preliminary Assessment of the 2010 HCM Weaving Methodology

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Abstract

The analysis of freeway weaving section has been a continuing challenge for the developers of the Highway Capacity Manual (HCM) methodologies. With the release of the 2010 HCM, a completely updated methodology is now available to practitioners. This new methodology represents a substantial departure from previous methodologies. In particular, the tabulation of weaving maneuvers is a critical driver, and the maximum length of a weaving section is now a dynamic value.

With the release of the new methodology, transportation agencies and practitioners will be interested in specific assessments of its accuracy and logic. To address that need, this research will present a cross-cutting assessment of the methodology. The assessment was focused on two key attributes:

- Sensitivity of parameters for determining weaving section length, and the differentiation between weaving and basic freeway segments.
- A comparison of results from the 2000 and 2010 HCMs.

The end result is guidance to agencies and practitioners implementing the 2010 HCM weaving procedures.

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1. Introduction

The freeway weaving analysis procedures in the 2010 Highway Capacity Manual (HCM) (1) represent a major departure from the current procedures. The updated procedures are the direct result of National Cooperative Highway Research Program (NCHRP) Project 3-75 (2). The research considered a wide range of options for new procedures, and ultimately focused on an approach that considers required and optional weaving maneuvers, and a dynamic assessment of the length of the weaving area. The true test of the new procedures will be the wide application with the 2010 HCM, but the research suggests that the new procedures will be more accurate and flexible than the previous tools.

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There are benefits to any improved methodology, but also challenges related to the transition. In particular, practitioners will have two broad areas of concern:

- The operational predictions (e.g., density and speed) for weaving sections will be different in the 2010 HCM. Weaving sections that previously were calculated to operate at a particular level of service (LOS) with the 2000 HCM may be found to have a different LOS with the 2010 HCM.
- The 2000 HCM has a maximum weaving length of 2500 feet. The 2010 HCM procedures allow for weaving sections of any length. This dynamic weaving length calculation means that some sections may be considered as weaving sections in the peak periods, but not throughout the day. For practitioners, another issue is that some freeway sections longer than 2500 feet may now be considered weaving sections, so the results will be different.

Note that “different” is not necessarily an issue – updated results are likely more accurate than before. However, practitioners will be concerned about the extent of those differences as they are considering the switch to the new methodology. This paper helps to address some of those concerns.

This paper is a theoretical assessment of a broad range of potential weaving situations. While theoretical, the analysis represents situations that commonly occur in the field, and reflects the range of analysis that can be expected for the new procedures.

The general approach in the paper is to outline the experimental design, and then describe the types of analysis that were conducted. The results focus on differences between the 2000 and 2010 HCM procedures, with conclusions about the results for practitioners as well as researchers considering extensions to the methodology.

2. Body

The focus of the analysis was on Type A weaving sections, where there is an added auxiliary lane between the on- and off-ramps. There is one more lane in the weaving section than in the upstream and downstream sections. This configuration (for a three-lane weaving section) is illustrated in Figure 1, with traffic moving from left to right.

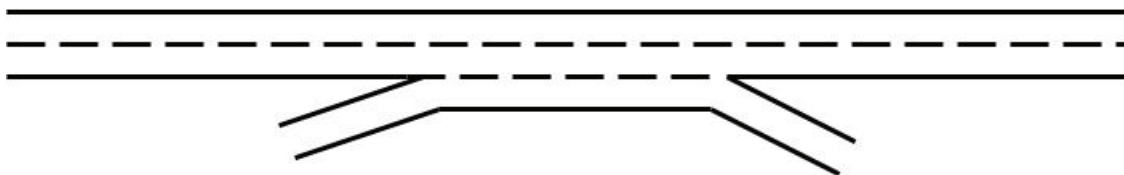


Figure 1: General weaving configuration

2.1 Analysis parameters

The experimental design for the comparative assessment considered a range of weaving conditions. Two different sets of parameters were included: parameters that were varied during the analysis, and parameters that were left unchanged.

Five key parameters were varied during the analysis:

- Number of lanes in the weaving section (3 to 5 lanes)
- Length of the weaving section (500 to 7500 feet, in increments of 1000 feet)
- Entering volumes from the on-ramp (0 to 1200 vehicles/hour, in increments of 300 vehicles/hour)

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