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The new Procedures for Diverge, Merge, and Small Weaving Segments in the new Version of German Highway Capacity Manual (HBS 2015)

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Abstract
The chapter for diverge, merge, and small weaving segments in the new German Highway Capacity Manual (HBS, edition 2015) is rewritten in accordance with forthcoming developments in the past 10 years. In this paper, an overview of the chapter in HBS 2015 is presented. Differences between the first edition 2001 and the new edition of the chapter in the German Highway Capacity Manual are indicated and discussed. In addition, the results of two cases which are not yet included in HBS 2015 are presented.

Keywords: Capacity, Merge, Diverge, Small Weaving Segment, Level of Service Concepts

1 Introduction

The first edition of German Highway Capacity Manual (HBS) was published in 2001 (FGSV, 2001). Now, a new edition was published in 2015 (FGSV, 2015). For the new German Highway Capacity Manual, most major chapters were revised and some of them were totally rewritten.

The joint chapter for diverge, merge, and small weaving segments (not longer than 500m) is a new development in accordance with forthcoming research works in the past 10 years. An overview of the chapter in HBS 2015 is presented in this paper. Procedures dealing with performance analyses and Level of Service (LOS) of those segments are introduced both for freeways and rural highways. Differences between the former HBS 2001 and HBS 2015 are indicated and discussed.

In most of the existing highway capacity manuals, LOS of diverge, merge, and small weaving segments is traditionally defined by speed, volume, or density in critical areas (FGSV, 2001; TRB, 2000, 2010). In that traditional concept, several capacity values of different critical areas (diverge, merge, and weaving) as well as upstream and downstream major-road segments within the influence areas are evaluated separately. In HBS 2015, a new model which considers the total diverge, merge, and weaving segment as an entire object is incorporated. A combined volume-to-capacity ratio (freeways) or a combined density (rural highways) is used for defining the LOS of the total segment.

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The parameters of the new procedure are functions of the number of lanes of the major road, the number of lanes in the on-ramp or off-ramp, and the predefined geometric design of those segments. The model parameters are calibrated with field data or defined by experts' experiences within a set of coefficients. With those procedures, the traffic quality (LOS) can be obtained directly as a function of the volumes or densities on the major road and on the on-ramp or off-ramp respectively. The new procedure has the following advantages: a) a uniform function for all types of diverge, merge, and small weaving segments, b) traffic quality assessment for all critical areas under investigation in one step, and c) the procedure can easily be calibrated. For applications in practice, a set of monographs is provided.

The paper is organized as follows. In the following section 2, the chapter dealing with diverge, merge, and small weaving segments on freeways is presented. In this chapter, a short description of the embedded new model is given. In section 3, the chapter dealing with diverge, merge, and small weaving segments on rural highways is presented. In section 4, two additional cases for diverge and merge on 4 lanes carriageways are investigated according to additional data collected. Finally, a summary and outlook is given in the concluding section 5.

2 The Chapter for Diverge, Merge, and Small Waving Segments on Freeways in HBS 2015

In HBS 2015, LOS on freeways is defined according the volume-to-capacity ratio. This applies both for basic freeways segments and for diverge, merge, and small weaving segments. The definition of LOS is given in Table 1.

LOS	volume-to-capacity ratio x [-]
A	≤ 0,30
B	≤ 0,55
C	≤ 0,75
D	≤ 0,90[1)]
E	≤ 1,00
F	> 1,00

[1)] 0,92 for on-ramp types E 1 and E 2 with ramp-metering

Table 1: Volume-to capacity thresholds for defining LOS of freeways in HBS 2015

2.1 The new LOS Model of Combined Volume-to-Capacity Ratio for Diverge, Merge, and Small Waving Segments on Freeways

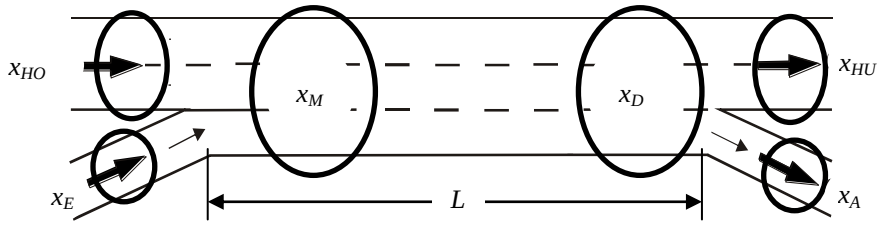

Figure 1: Volume-to-capacity ratios in different areas of on-ramp, off-ramp, and weaving segments