

The effect of constraining measures for road traffic on highway bridges

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Abstract

The current German guideline for reassessment of existing road bridges (*Nachrechnungsrichtlinie*) allows for constraining measures for road traffic in order to reduce the load impact on bridge structures. However, quantification of this reduction is specified only for selected cases in the guideline. This paper presents results from analysis of the effect of different constraining measures for unidirectional road traffic, such as no passing of motor trucks, minimum inter-vehicular distance regulation, and modification of traffic routing, on the resulting structural demands for selected highway bridges. The results are compared to the reference case of normal, unconstrained traffic to demonstrate the effectivity of different constraining measures. Findings from this analysis can serve as base for calibration of modified load models for bridge reassessment when enforcing the respective constraining measures for road traffic.

Keywords: constraining measures, reassessment, road traffic, load model, traffic simulation, extreme load effect, highway bridge

1 Introduction

In recent years, the reassessment of existing highway bridges in Germany according to the current guideline for reassessment of existing road bridges (*Nachrechnungsrichtlinie*) revealed distinct calculative deficiencies for many structures [1]. This is the consequence of an extensive but aging infrastructure network, with about two thirds of the bridges older than 30 years. Originally, the structures have been designed for a load level significantly lower than the one represented by the current load models specified in *Nachrechnungsrichtlinie* [2], [3].

One possible strategy to deal with these deficiencies concentrates on the structural resistance of existing bridges. Multiple research efforts have been initiated, with the objective of a more precise and realistic description of different aspects of the actual structural behaviour and

resistance (e.g. [4]). Moreover, strengthening or partial reconstruction can increase the structural resistance, and thus eliminate the calculative deficiencies. However, such measures can be consuming in time and cost.

Another option is to focus on the load impact on structures, in case of highway bridges load impact due to road traffic passing the structures. Based on local traffic data, site-specific traffic load models for reassessment of existing bridges can be developed [5]. Additionally, different constraining measures related to road traffic on bridges can be implemented to reduce the load impact. Such approaches can be quite effective, and are usually less expensive and faster in their implementation.

The *Nachrechnungsrichtlinie* as current guideline for reassessment of existing road bridges in Germany provides a legal framework for such