



Realistic traffic-data based load models for existing road bridges

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Abstract

In the context of an increased importance of reassessment of existing bridge structures and the resulting need for more realistic and precise descriptions of traffic load impact on bridges, a research project has been initiated, aiming for development of site-specific traffic load models and evaluation of their potential when applied within the scope of reassessment. The object of investigation is the federal highway BAB A92 in Bavaria, Germany. Based on large sets of recorded traffic data provided from permanent measurement stations, extensive numerical traffic simulations are performed. By evaluation of the structural response for selected bridge systems due to this simulated traffic and subsequent statistical extrapolation to extreme load effects, characteristic values of traffic load effects with defined return periods in accordance with requirements from the Eurocode are obtained, serving as base for calibration of site-specific load models.

Keywords: bridge, reassessment, traffic, load model, traffic simulation, extreme load effect

1 Introduction

For highly developed countries like Germany, the traffic infrastructure – especially the network of federal highways – is of essential importance to ensure mobility, quality of life, and economical performance and efficiency. Commonly, bridge structures pose critical points in this infrastructure network. Restrictions or even deficiencies of their utilization result in considerable and extensive consequences.

With the majority of the bridges constructed in the period from the 1960s to the 1980s, great parts of the bridge inventory of the German federal highway network are of considerable age, with about two thirds of the structures being older than 30 years [1]. Shortcomings in past structural design, structural deterioration, and increased traffic volumes give rise to a need for reassessment of the bridge structure under

current conditions and development of efficient and sustainable strategies for dealing with the aging infrastructure.

For this purpose, a special guideline has been introduced (“Nachrechnungsrichtlinie”, [2]), providing a framework for the reassessment of existing road bridges. Reanalysis according to this guideline has been performed for numerous bridge structures, yet in many cases calculative deficiencies in the reassessment were identified [3]. These findings initiated multiple research efforts, mainly aimed at describing the actual structural behaviour (“resistances”) in a more precise and realistic manner.

Within this previously described context, a research project has been initiated in cooperation with the Highways Authority of Southern Bavaria, aimed at investigating the potential of more realistic and precise description of the load impact