



## Indicative implied safety level in ULS of a suspension bridge deck

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### Abstract

The main deck of a suspension bridge with a main span in excess of 1000m was analysed probabilistically to determine the implied safety level for the deck with utilization ratios in ULS scaled to 1. The scaling was necessary because other design criteria influence the design as well. The cross-section of the bridge is a closed steel box. Structural reliability analysis was performed in which detailed consideration was given to stochastic modelling of resistance and load variables and of their associated uncertainties. Emphasis was placed on accurate and appropriate modelling of the considered limit states as well as on the traffic loading on the structure. In this regard weigh-in-motion data was employed to develop site-specific live loading models for comparison with design models and load effects. In this way the sensitivity of design assumptions and their influence on the implied safety was assessed. The detailed sensitivities of wind-induced section forces from a full dynamic analysis are utilized, and appropriate stochastic models have been found for the influencing parameters. The paper details all aspects of the reliability analysis and provides information on the evaluated implied safety level of the bridge deck. The results of the sensitivity analysis are instructive in understanding the influence of uncertainties on the results, especially the parameters used in the wind-induced response analysis and the assumptions of the traffic load model.

**Keywords:** Suspension bridge; structural reliability; implied safety, traffic loads.

### 1 Introduction

The purpose of this paper is to assess the implied safety level in a suspension bridge deck via a probabilistic analysis. For this purpose a structure

with span of the order of 1100m was modelled. The investigations were performed for an existing bridge. The client and bridge names are not disclosed for confidentiality reasons. The considered cross section is as illustrated in Figure 1.