Highway traffic loading - AS5100 and NZTA Bridge Manual compared to international codes

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1 Abstract

Highway bridge design and assessment (rating) requires the application of notional traffic load models, with the most onerous load patterns being determined using influence surfaces. Software speeds the process of obtaining critical traffic load effects. This paper compares the requirements of – and load effects arising from – AS5100, the NZ Transport Agency Bridge Manual and other international Codes including those used in the US, UK, Canada, China, and the Eurocode.

Keywords: Bridge design, software, traffic loading, codes of practice

2 Introduction

Modern bridge design requires traffic loading determined according to the relevant Code of Practice to be applied to a mathematical model of the structure.

This paper reports on a study of the notional, pseudo-static, gravitational highway traffic load models that are defined in a range of Codes from around the world.

These notional traffic loads are built on considerable assumptions: any basis in measured traffic data may be quite limited, and perhaps 30 or 40 years old [1]. In view of this, the significance of traffic load effects in design, and the commonplace movement of freight across state and national borders, it is perhaps surprising that studies comparing Codes are not more frequently encountered in literature. This study has been facilitated by the implementation of a range of Codes and State Bridge Design Manuals in the LUSAS software starting in 2010 (v14.5) and the involvement of engineers carrying out that work in the drafting of this paper. The findings indicate some large differences in the load effects which arise.

The traffic loading requirements for most Codes of Practice centre upon placement of notional vehicles superimposed upon a notional lane load (UDL) so as to create the most onerous load effect. Differences occur between codes due to magnitude of the loading, definition of notional lanes, dynamic effect factors and simultaneous lane loading factors. The most onerous traffic loading pattern is determined from the influence surface specific to the load effect of interest and the location of interest. The calculations are very much non-trivial – especially when considering multiple span bridges with skew supports or plan curvature, perhaps in conjunction with substructure stiffnesses.

3 Codes of Practice included

This study compares Serviceability Limit State (SLS) – usually unfactored, nominal – load effects arising from the application of 11 different notional load models.

7 load models are from current design codes:

- Australian AS5100.2 with and without use of the Heavy Load Platforms (HLP) [2]
- European EN1991-2 [3].

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