BRIDGE LIFETIME TRAFFIC DYNAMICS

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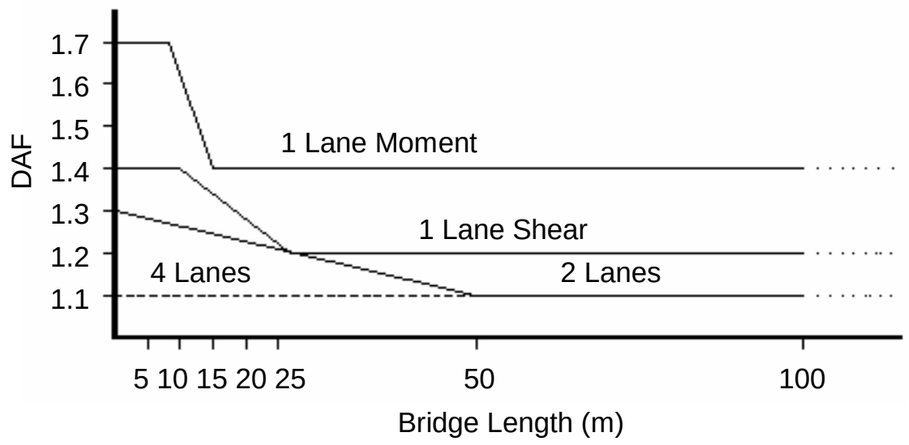
BACKGROUND

The Eurocode for Highway Bridge Loading (EC1.3) provides an allowance for the dynamic effects that result from interaction of the superstructure with passing traffic. Different Dynamic Amplification Factors (DAFs) are used for different types of bridges and load effect.

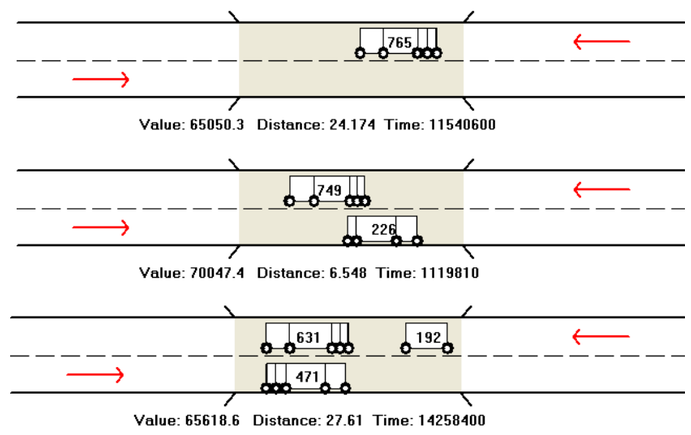


PURPOSE OF RESEARCH

In the assessment of existing bridges, reducing the DAF can result in substantial savings as overall loading is reduced. Also, it is intuitively reasonable that as trucks weights increase, the dynamic proportion of the load decreases.

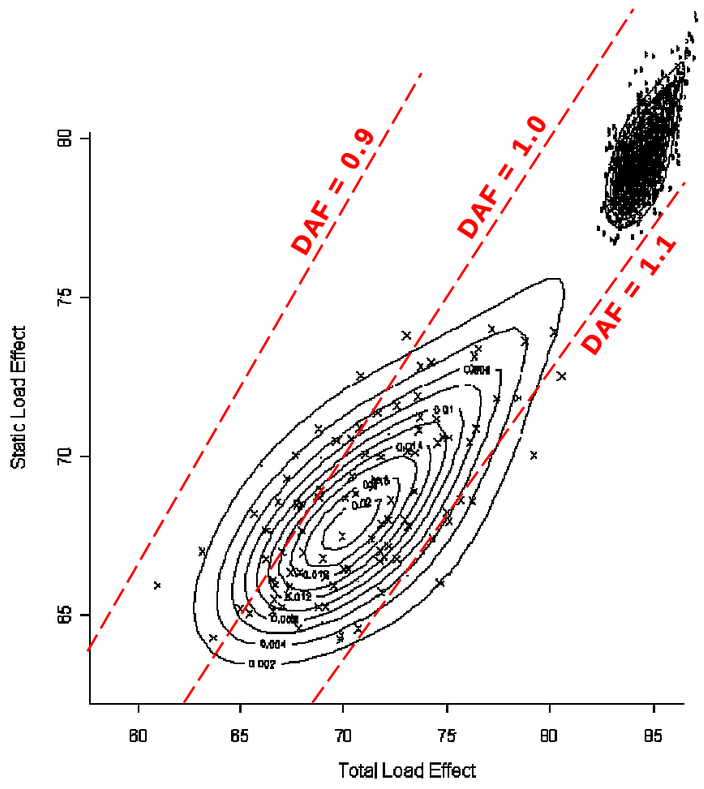
APPROACH

A finite element model of the Mura River Bridge, Slovenia was calibrated using field measurements.



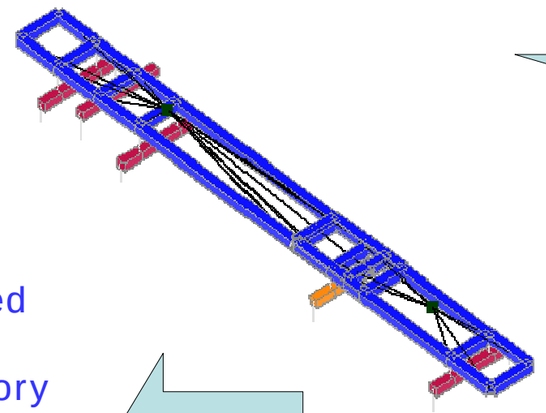
Weigh-In-Motion measurements were used as the basis for traffic simulations.

10 years of static simulations were performed, and monthly maximum (critical) loading events were identified.

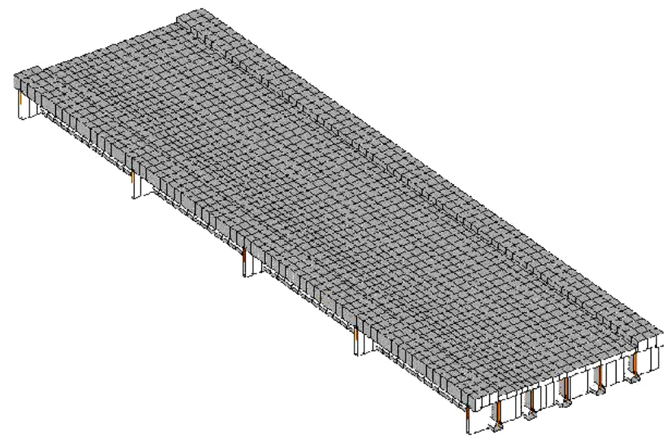


The results were statistically modelled using Bivariate Extreme Value Theory

Extrapolations were performed using parametric bootstrapping



3-D finite element vehicle-bridge interaction models were used to derive the total load effect (static and dynamic components) that result from these critical loading events.



CONCLUSIONS

- ➔ *There is a statistical dependence between static and total load effect which is not adequately explained using standard correlation models*
- ➔ ***Dynamic interaction reduces significantly as total load effect increases***
- ➔ *The dynamic allowance required at bridge lifetime levels of load effect are considerably less than those currently allowed for*
- ➔ *These results are site- and model-specific, though the method is generally applicable*