TRB paper Number 18-05624 presented at TRB 97th Annual Meeting and accepted for publication

DEVELOPMENT OF LIVE LOAD MODEL FOR STRENGTH II LIMIT STATE IN AASHTO LRFD DESIGN SPECIFICATIONS

Peng Lou, Ph.D., Research Associate
RIME Office Tel: 848-445-5858; Email: penglou@rutgers.edu
Hani Nassif, P.E., Ph.D., Professor and Director
Office Tel: 848-445-4414; Fax: 732:445-8268; Email: nassif@soe.rutgers.edu
Rutgers Infrastructure Monitoring and Evaluation (RIME) Group, Department of Civil and Environmental Engineering, Rutgers, the State University of New Jersey
96 Frelinghuysen Rd, Piscataway, NJ 08854

Paul Truban, PE, PTOE, AICP, Manager
Bureau of Freight Planning and Services, New Jersey Department of Transportation
P.O. Box 600, 1035 Parkway Avenue, Trenton, NJ 08625
Office Tel: 609-530-3521; Email: Paul.Truban@dot.nj.gov

ABSTRACT

The AASHTO LRFD Bridge Design Specifications defines Strength II limit state for agencies to consider the load combination by owner-specified special design vehicles, evaluation permit vehicles, or both. The configuration and characteristics of permit vehicles vary from state to state. Additionally, the code calibration process performed in 1994 for the development of the live load factors, was applied only to the Strength I limit state. In New Jersey, the design permit vehicle was not developed based on actual permit records or weigh-in-motion (WIM) data. Recently, with the development of permit issuing management and WIM technology, there is a need to evaluate the effectiveness of design permit vehicles.

This study aims to develop a live load model for the assessment of Strength II limit state for New Jersey Department of Transportation (NJDOT). Five years of permit vehicle records are provided by NJDOT for the development of the live load model. The distribution of Gross Vehicle Weight (GVW) is best described as the Generalized Extreme Value (GEV) distribution. Load effects are simulated for different span lengths. The mean and standard deviation (STD) of the 75-year maximum loads are predicted using different extrapolation approaches. The results show that NJDOT Design Permit Vehicle provides stable mean and STD of bias ratio at 75-year level. In comparison with the current AASHTO live load factor of 1.35, the averages of the bias ratios at the 75-year level are found to be 1.31, 1.23, and 1.16 for the positive moment, shear, and negative moment, respectively.

Key Words: Bridge Design, Strength II Limit State, Permit Vehicle Data, Live Load Prediction

ACKNOWLEDGEMENTS

This study is sponsored by NJDOT. The help and support from Andrew Ludasi in Bureau of Freight Planning and Services, Xiaohua "Hannah" Cheng, Ph.D., P.E and Eddy Germain in Bureau of Structural Design and Evaluation are greatly appreciated. The help and support from graduate students He Zhang and Dongjian Gao are also appreciated.