Modelling of truck traffic for long span bridges

Eui-Seung HWANG
Professor
Kyung Hee University
Yongin, Korea
eshwang@khu.ac.kr

Eui-Seung Hwang, born 1959, received his civil engineering Ph. D. degree from the Univ. of Michigan in 1990.

Ki-Tae LEE
Engineer
B&G Consultant,
Seoul, Korea
tiamo0818@naver.com

Ki-Tae Lee, born 1980, received his civil engineering MS degree from Kyung Hee Univ. in 2012.

Do-Young KIM
Graduate Student
Kyung Hee University
Yongin, Korea
ddang0127@khu.ac.kr

Do-Young Kim, born 1983, received her civil engineering bachelor degree from the Kyung Hee Univ. in 2011.

Summary

This paper deals with the development of live load model for long span bridges. New live load model reflects truck traffic in Korea using Weigh-In-Motion system that was installed on the road with the heaviest truck traffic volume. By using collected WIM data, various truck traffic scenarios are assumed. To analyze the load effect, typical long span bridge such as a suspension bridge and a cable stayed bridge are modelled. Based on traffic scenarios, equivalent uniformly distributed load are calculated and loaded to the selected bridge. The results of load effects are compared with other load model in internationally renowned design code such as AASHTO LRFD, Honshu-Shikoku bridge design code and existing Korea Bridge Design Code. Based on the results of analyses, new live load model for long span bridges is proposed.

1. Introduction

Current design code is mainly focusing on conventional bridge types with span length up to about 200m. Live load model in design code was also developed for these bridges. However, in Korea, with development of western and southern coast area where many islands are located, many long span bridges are being built or planned. With the urgent need of design code for long span bridges, Design Guideline for Steel Cable Bridges was developed in 2005 but live load model was based on limited truck data. The purpose of this study is to develop rational design live load model for long span bridges with span length up to 2,000m.
New live load model reflects real truck traffic data in Korea using Weigh-In-Motion system that was installed on the road with the heaviest truck traffic volume. By using collected WIM data, various truck traffic scenarios are assumed based on congestion condition. To analyze the load effects, typical long span bridge such as a suspension bridge and a cable stayed bridge are modelled by the structural analysis program. Based on traffic scenarios, equivalent uniformly distributed load are calculated and loaded to the selected bridge. The results of load effects are compared with other load model in internationally renowned design code such as AASHTO LRFD(2007), Honshu-Shikoku bridge design code(1989) and current Korea Bridge Design Code(2010). Based on the results of analyses, new live load model for long span bridges is proposed.

2. Data collection from WIM system

2.1 WIM system

In this study truck weight data are collected using WIM (Weigh-In-Motion) system. The WIM system measured each truck axle weight from piezo sensors installed in the surface of the pavement, as shown in Figure 1. The sensors include two piezo sensors and one loop sensor. Weight data and other information are stored in the main unit and can be downloaded to computer. WIM system was installed in January, 2010 on national road in Pohang area where heavy truck traffic is one of the highest in Korea.

Fig 1: WIM(Weigh-In-Motion) system installation.

https://doi.org/10.2749/222137912805111555
Distributed by structurae