Effects of Increasing Truck Weight Limits on Highway Bridges in Thailand

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Summary

Any increasing of truck weight limits would affect an existing bridge safety. Besides, the increasing weight would shorten the time of repair and replacement of many bridges. Thai truck weights specified by Department of Highways were raised according to several government gazettes. This paper aimed to study the safety factors of the bridges due to the increasing of Thai truck weights compared with those from the design live loads of selected bridges. As indicated in the bridge standard drawings from Department of Highways, the reinforced concrete bridges with the span length ranging from 5 to 30 meters were studied. It was found that the average of maximum bridge responses from Thai truck weights were approximately 25% to 18% greater than those from the design live loads for moment and shear, respectively. Without bridge strengthening, the safety factors of the bridges were reduced due to the increase in truck weights especially for 5 to 8 meters span lengths. The results of this study would be used as a reference data for bridge strengthening in Thailand in order to maintain the bridge safety level consistent with the standard specifications.

Keywords: Thai Trucks, Weight Limits, Bridge Design, Safety Factors

1. Introduction

Loads on bridges play increasingly important role in the development of design and evaluation criteria. The bridges are considered to resist all loads that are possibly occurred over the lifetime. However, the main load components of highway bridges are dead loads and vehicular loads. Most of bridges in Thailand were designed by using the highway live loadings, so called HS20-44, specified by the American Association of State Highway and Transportation Officials (AASHTO) standard specifications (AASHTO (STD)) [1]. The total loads, axle loads and configurations of Thai trucks are legally defined in many of the government gazettes and declarations issued by the Department of Highways (DOH) [2-5]. AASHTO(STD) highway loads, however, are different from those of Thai trucks. According to AASHTO (STD) design specifications, the designated loads shall be proportionally adjusted in case the vehicular design loads may differ from code-specified loads. Thus, the engineers could intentionally multiply the designated loads by the correction factors in the design process.

Since, the designated loads and code-specified loads were dissimilar, the effects of bridge design due to the differences of configurations together with total weights of Thai Trucks and AASHTO (STD) live loadings (HS20-44) were studied. It was discovered that, for particular bridge spans or types of trucks, bridge responses calculated from HS20-44 were shown in insufficient of bridge safety on when the real truck had been moving. The standard design loadings should be calibrated in order to reflect the realistic behavior of the bridges for some specific areas [6]. For Thailand, Sritanet et al. [7] studied the safety of girder-type bridges (span length up to 38 m) by comparing the bridge responses due to Thai truck convoys with HS20-44. Thai trucks were selected in 7 configurations (72 characteristics according to the DOH declarations). The analytical results revealed that stresses in bridge girders due to semi-trailer (38 tons total weight) and trailer (35 tons

https://doi.org/10.2749/222137814814028151