

Multiplication bending moment factor for AASHTO live Loads adopted in Jordan

Abstract

The live load in the American Association of State Highway and Transportation Officials (AASHTO) is used in the design of bridges in Jordan. AASHTO LFD live loads is multiplied by 1.8 and used in Jordan to encounter the unexpected heavy live loads running on these bridges. The new code AASHTO LRFD for live loads is also used in the design of bridges. A Comparison between the bending moment obtained by 1.8 LFD live loads, and LRFD live loads were carried out to determine the coefficient which should the LRFD live loads be multiplied to give the same moment as 1.8 LFD live loads produced. A Comparison of 1.8 AASHTO LFD and AASHTO LRFD live loads for the bending moment of simply supported 30m bridge span with one lane in each direction showed that the LRFD HL-93 loadings should be multiplied by 1.35 to have the same moment as 1.8 multiplied by HS20-44 in LFD.

This result will be used for the design of highway bridges in Jordan, and it will be a reference number for the Arab Countries also for such subject.

Keywords: AASHTO specification, AASHTO LRFD, AASHTO LFD, loadings, bridges, highway

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Introduction

AASHTO LFD¹ live loads are used in Jordan, most of the Arab Countries and USA. In Jordan, the AASHTO LFD live load is increased to encounter the unexpected live loads. This increase is a multiplication factor of 1.8 to the live loads of AASHTO LFD. AASHTO LRFD² is the recent Code in designing bridges. Ministry of Public Works and Housing, and Ministry of Transportation³⁻⁴ studied the axle weight in Jordan. Al Saqaba'a⁵ studied the loading adopted for bridge design in Jordan in 1994. Qaqish⁶ presented load capacity evaluation of T-Beam bridges. Qaqish⁷ presented stress distribution at the corners of skew bridges. Qaqish⁸ illustrated a Comparison between one dimensional and three-dimensional models of one span box Girder Bridge. Qaqish⁹ illustrated a Comparison between one dimensional and three-dimensional models of two continuous spans of box, Girder Bridge. Qaqish¹⁰ illustrated the finite element analysis of two continuous skew spans of box Girder Bridge and the reaction distribution at the edges with 49 degrees skew angle. Campisi¹¹ illustrated the review of load rating highway bridges in accordance with load and resistance factor rating method. Deng¹² studied the numerical simulations to study the dynamic IFs of both simply supported and continuous bridges due to vehicle loading. Deng¹³ studied the impact factors for different bridge responses, including deflection, bending moment and shear. The results showed that the impact factors due to vehicle braking could be notably larger than those due to the vehicles moving at constant speeds and could exceed the impact factor specified in the AASHTO bridge design code. Leahy¹⁴ examined the HL-93 current bridge traffic load model in the United States. Li¹⁵ studied a three-dimensional nonlinear dynamic analysis framework for RC bridges based on the force analogy method (FAM).¹⁶

Live loads

The live loads of the AASHTO specifications (LFD) consist of

standards trucks or off-lane loads as shown in Figure 1. While the live loads of the AASHTO specifications (2) LRFD is HL-93 which consists of truck loading and distributed load of 9.3 kN/m as shown in Figure 2. The impact factor for LFD is calculated from:

While the Dynamic load allowance is considered 33% for LRFD,

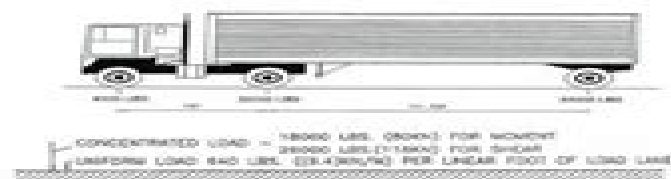


Figure 1 Truck HS20-44 and equivalent.



Figure 2(A) Truck loading of HL-93.

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