

PROCEEDINGS

Dynamic Behavior of a Historic Metallic Bridge under Metro Vehicles Based on Advanced Interaction Models

D. Ribeiro^{1,*}, B. Costa², P. Montenegro² and R. Calçada²

¹ CONSTRUCT-LESE, School of Engineering, Polytechnic of Porto, Porto, 4785-999, Portugal

² CONSTRUCT-LESE, Faculty of Engineering, University of Porto, Porto, 4785-999, Portugal

*Corresponding Author: Diogo Ribeiro. Email: drr@isep.ipp.pt

ABSTRACT

The present article focuses on the evaluation of the dynamic behaviour of a centenary steel arch bridge, located in Portugal, under light railway traffic loads. The work aims to assess the dynamic behaviour of the bridge subjected to an alternative type of railway vehicle, more specifically, a typical underground vehicle that is currently in service in the Lisbon Metro. The dynamic response of the system has been evaluated using two distinct methodologies, namely a moving loads model and a vehicle-bridge interaction model. To achieve this goal, finite element (FE) models from both the bridge and the vehicle have been developed and a comprehensive study has been carried to evaluate the influence of distinct factors in the dynamic response of the bridge-train system, namely the methodology used to assess the dynamic response, the location of the response reference point in the deck, the train speed and the vehicle configuration (single or double vehicle). Moreover, both the traffic safety, passenger comfort and pedestrian comfort have also been evaluated using normative criteria based on acceleration responses. The results shown that the normative limits related to traffic safety and passenger comfort were never exceeded in any condition analysed in the study. However, the pedestrian comfort was jeopardized when the train speed exceeded 20 km/h.

KEYWORDS

Centenary bridge; dynamic behaviour; metro traffic actions; parametric study; limit states verification.



This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.