DYNAMIC RESPONSE OF FOOTBRIDGES IN EUROCODES: TOWARDS AN ACCURATE ASSESSMENT OF HUMAN-INDUCED VIBRATIONS

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Summary

The design of footbridges is usually strongly conditioned by the dynamic response of the structure. Thus, clear and accurate recommendations are needed by the designers to assess the vibration serviceability limit state. The previous versions of the Eurocodes addressed this issue in a very cursory manner. Nevertheless, several practical guidelines shed light on this absence of technical guidance. Among these practical guidelines, the JRC, SETRA and Fib Bulletin 32 can be found. Based on them, the current Eurocodes include a detail procedure to account for the human-induced vibrations, proposing dynamic load models and factors which depend on the activity exerted. In this paper, the main aspects included in this latter version are explained. Besides, the procedure is applied to obtain the accelerations of a real footbridge modelled in a finite element software. The results are compared with those obtained employing two more advances methods which consider the interaction between the human and the structure: one in time domain and the other in frequency domain (see Fig. 1). The results are not in agreement.

Hence, although a huge effort has been done to develop these normative, further tasks are necessary. In this sense, considering HSI would suppose a great step since it has been demonstrated the relevance of this phenomenon in pedestrian structures. In addition, experimental tests with pedestrians must be carried out to determine the influence of synchronised walking and the uncertainties associated to define the dynamic model of the human body.

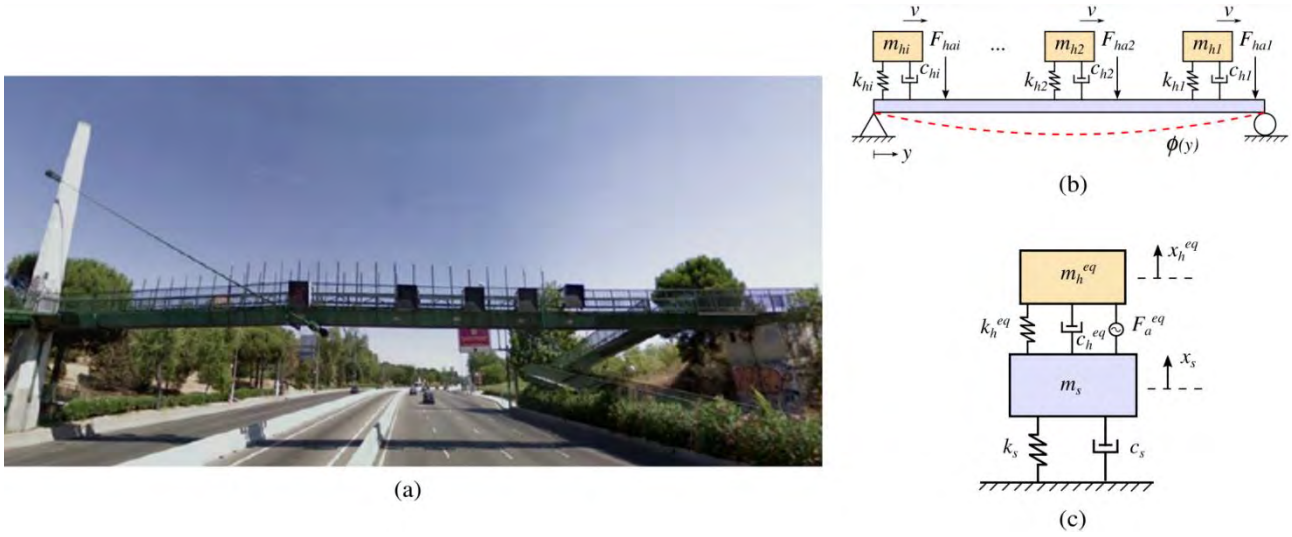

Fig. 1. a) Illustration of the Veterinary footbridge, b) time-domain model and c) frequency-domain model

Keywords: footbridges, Eurocodes, dynamic response, Vibration Serviceability Limit State, human-structure interaction.

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