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FREQUENCY-AMPLITUDE OF VIBRATION OF MODERN AESTHETIC FOOTBRIDGES FOR WALKING AND CYCLING

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New urban developments are changing the traditional footbridges by contemplating (i) the new cyclic functionality of these structures, (ii) the wood and other light structural materials and, in many cases, (iii) the introduction of aesthetics.

Previous studies were made on pedestrian footbridges composed by a simple supported beam with uniform distributed characteristics. The main objective of those footbridges was to pass pedestrians across, safe and comfortably, with minimal cost of construction but without much aesthetics.

Nowadays, footbridges appeal to the best architects and engineering consortiums and each new one is viewed as entering in an aesthetic contest. The objective is similar as referred before but, besides adding the cycling vehicles, the new footbridges should look into aesthetics and in the environmental context. They span larger distances making use of more adequate materials. However, the dynamic characteristics are always a problem due to proximity of frequencies of the structure with the rhythm of the stepping of crossing.

As they are in general very flexible structures we were able to measure *in-situ* modal frequencies and amplitudes with a unique mobile phone with three components, recording the motion at various locations, for various loadings which deem to be representatives of what might be the “traffic” crossing.

We have looked into several cases in Portugal and Spain and, after describing briefly their main geometric and mechanical characteristics, we present the most important frequencies and amplitude of vibration for various loadings, representatives of what might be the “traffic” crossing. Cycling does not cause a problem. But caution should be exercised not to excite resonance. We present a case study of one of these structures which do not present any problem.

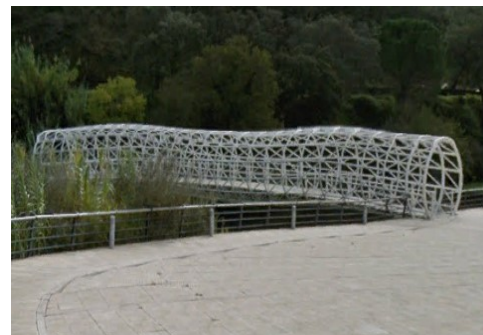
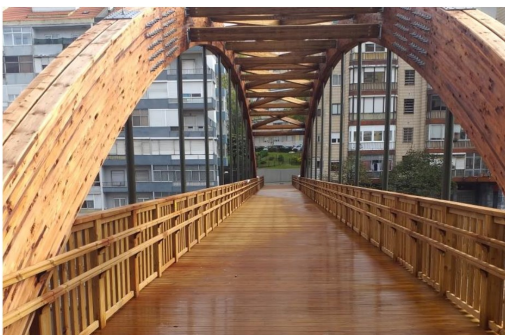


Fig. 1. Two types of new footbridges reflecting the use of new materials and designs