STUDY OF PEDESTRIAN-INDUCED VIBRATIONS ON TIMBER FOOTBRIDGES♣

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In Brazil, studies about pedestrian-induced vibrations on footbridges have been carried out since the early 1990s, for concrete and steel footbridges. However, there is no record of such studies and the Brazilian Standard NBR 7190 (1997) for the design of timber structures only presents design requirements for static loads, in the case of timber footbridges. Therefore, this paper aims to general theoretical analysis, numerical and experimental simply-supported beams timber footbridges, with a view to proposing recommendations for projects related to human comfort in these structures. This study was developed from the study of standard guidelines and criteria suggested by several authors, the theoretical analysis of footbridges design according to the criteria of the NBR 7190 (1997), numerical models using finite element and experimental tests on reduced models. Among the conclusions reached, it is emphasized that the formulation of Euler-Bernoulli is suitable for calculating the first natural frequency in vertical and lateral directions simply-supported beams timber footbridges; however, special attention should be given to the evaluation of lateral bending stiffness. Finally, we have suggested a proposal serviceability limit state verification due to pedestrian-induced vibrations on simply-supported beams timber footbridges, concerning the calculation of frequencies and accelerations to be included in a future review of the Brazilian Standard for the design of timber structures.

Keywords: timber footbridges. pedestrian-induced vibrations. serviceability limit state. reduced model. modal analysis.