

Vibration control of footbridges

*Mentor Lljunji dipl.-ing *)*

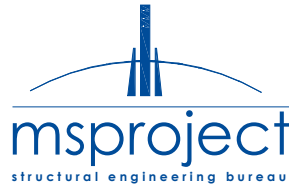
Abstract

Longer spans of new footbridges and aesthetic requirements for greater slenderness are resulting in footbridge structures prone to vibrations. Stiffness and mass have decreased which has led to increased sensitivity to dynamic loadings.

Although the problem of vibration is already elaborated time ago, in the last few years there had been several bridges that experienced excessive sway motions caused by pedestrians. One of the most elaborated is infamous Millennium Bridge in London as the prime example of the vibration serviceability problem of footbridges. Although designed by world famous designers (Foster & Arup), Millennium was designed as a bridge with little or no damping capacity. There are many solutions to this and similar vibration problem, but most effective is to increase damping by installing a various types of damping systems.

This paper gives a brief classification and presentation of damping measures and devices usually used in footbridges. Vibration control is explained through most famous cases of footbridges that experienced this type of serviceability problem.

**) principal structural engineer at -msproject-Montenegro*



Reference

- 1 Elasa C. **Footbridge vibration design**
Publisher: CRC Press, Taylor & Francis Group-2009
2. Strasky J. **Stress ribbon and cable –supported pedestrian bridges**
Thomas Telford Publishing- 2005
3. Hauksson F. **Dynamic behaviour of footbridges subjected to pedestrian-induced vibration** - Master's dissertation Lund University-2005
4. Živanović, S., Pavić, A. and Reynolds, P. (2005) **Vibration serviceability of footbridges under human-induced excitation**. *Journal of Sound and Vibration*, Vol. 279, No. 1-2, pp. 1-74
5. Dallard, P.; Fitzpatrick, A.; Flint, A.; Low, A.; Smith, R. and Willford, M. **London Millennium Bridge. Pedestrian induced lateral vibration**. *Journal of Bridge Engineering*, ASCE, 6 (6), 2001, p. 412-417.
6. Nakamura, S. and Fujino, Y. **Lateral vibration on a pedestrian cable-stayed bridge**. *Structural Engineering International*, 12 (4), 2002, p. 295-300.
7. **Analyse et suivi dynamique de la passerelle Solferino**. LCPC. *Rapport générale d'activité*, 2002, Paris, 15 p.
8. Pimentel, R.L.; Pavic, A. and Waldron, P. **Evaluation of design requirements for footbridges excited by vertical forces from walking**. *Canadian Journal of Civil Engineering*, 25 (5), 2001, p. 769-778.
9. Kazakevich, M.L.; Kulyabko, V.V. **Stabilization of a cablestayed footbridge. Extending the Lifespan of Structures**. IABSE Symposium, San Francisco, 1995, p. 1099-1104.
10. **European standard. EN 1990 – Eurocode: Basis of structural design. Annex A2: Application for bridges** (Normative). CEN, Brussels, 2001. 30 p.