

Predicting footfall induced vibration of structures

4.4.1.2 Incorporating the stiffness and mass contribution of adjacent bays
For floors with an adjacent row of parallel bays, the modal mass and frequency should be further multiplied by factors K_{mm} and K_f respectively from Figures 4.10a and 4.10b.

Here the main bay under consideration has span L_a and the adjacent bay has span L_b . It is assumed that the mass per unit area, m , of the two bays is the same. The degree of interaction between the bays is related to the ratio of their natural frequencies, f_b/f_a , in the span direction. In general, this may be expressed as:

$$\frac{f_b}{f_a} = \sqrt{\frac{D_{a,b} L_a^2}{D_{b,a} L_b^2}} \quad (4.18)$$

where the suffixes a and b refer to the two spans.

And so, for floor arrangements such as type ii) in Figure 4.8:

$$f_i = K_{mm} K_f f_o \quad (4.19)$$

$$\text{and } \ddot{m} = \frac{m L A K_{mm}}{4} \quad (4.20)$$

Figure 4.10a
Modal mass factors for a bay with an adjacent parallel bay.



Figure 4.10b
Natural frequency factors for a bay with an adjacent parallel bay.



Design Guide For Footfall Induced Vibration

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Designers' Guide to Eurocode 5: Design of Timber Buildings Jack Porteous,Alexander Porteous,Peter Ross,Haig Gulvanessian,2013-04-26 Interprets and assists in the use of EN 1995 1 1 structural timber This guide shows typical material properties and dimensions modifiers and structural responses It also explains relationships with other Eurocodes particularly those for EN 1990 Basis of Design *Footfall-induced Floor Vibration Modeling* Hermon Berhane Russom,2010 Excessive floor vibration is a common serviceability problem in modern floor systems Refined methods in structural analysis and design and improved materials and construction techniques have led to the use of materials with high strength to weight ratios These effects have resulted in decreased structural mass Coincidentally offices are becoming more paperless using lighter office furniture and partitions that are also lighter with less damping all of which can lead to floors that are susceptible to transient vibrations induced by footfall from normal walking The research objective is to develop a rigorous modeling approach to determine the dynamic response of the floor to incorporate time histories based on footfall at various locations within a floor and its response to footfall induced load Three dimension model software SAP 2000 was used to model floor system AISC Design Guide No 11 provides guidance for simplified procedures however such procedures might be enhanced with a more refined and rigorous model for the structural system and the loads Also architectural requirements for many floor systems fall well beyond the typical assumptions in Design Guide No 11 where no practical modeling guidelines exist Finally some floor system design requirements are extremely demanding for vibration limits e g medical facilities and manufacturing plant etc Better methods are needed Previous field tests are combined with new measurement of a building under construction on the UW campus Business Building to confirm the modeling approach The outcome is to develop a well defined approach to modeling footfall load using contemporary structural modeling methods The approach will benefit building designers helping to avoid service problems in general structures and meet extreme limits in more demanding applications **The Journal of the Acoustical Society of America** Acoustical Society of America,2002 **The British National Bibliography** Arthur James Wells,2009 **Buildings for Nanoscale Research and Beyond** Hal Amick,Society of Photo-Optical Instrumentation Engineers,2005 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature **Semiconductor Manufacturing Handbook** Hwaiyu Geng,2005-05-18 This handbook will provide engineers with the principles applications and solutions needed to design and manage semiconductor manufacturing operations Consolidating the many complex fields of semiconductor fundamentals and manufacturing into one volume by deploying a team of world class specialists it allows the quick look up of specific manufacturing reference data across many subdisciplines **The Structural Engineer** ,2006 Semiconductor

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