



Acoustics, Noise & Vibration Control

**Thornton Tomasetti**

## **Vibration Considerations for Building Design**

### **Summary**

Structures can be subjected to several sources of disruptive vibrations, including mechanical equipment, road/rail traffic, construction/demolition and occupant footfall. These vibrations are known to affect the performance of such equipment as magnetic resonance imaging scanners (MRIs) and electron microscopes (EMs), and to disrupt the basic comfort of sitting at a desk or sleeping in a bed. A structure that has vibration levels exceeding the requirements of the space can be rendered unusable, with costly consequences.

This seminar provides an overview of the basics of vibration, and how it causes a structure to react. Vibration criteria for human comfort and ever-improving, sensitive equipment are discussed. The means by which vibration sources are identified in the field are presented, and whether a site can be made suitable for its intended use is discussed. Methods of isolating mechanical equipment are summarized, with several examples illustrated. Basic and advanced methods of predicting footfall-induced vibrations are shown, highlighting the advantages and limitations of each. Tuned mass dampers are discussed, highlighting their value as an alternative to traditional methods of floor-stiffening to control vibration.

Select project examples will be presented which highlight the importance of these issues.

### **Learning Objectives**

1. Develop an understanding of how vibration caused by external and internal sources affects a building.
2. Learn which classifications of vibration criteria are appropriate for given occupancies, and how they alone can drive the architectural and structural design of a building in certain cases.
3. Understand how site-vibration surveys can be used to identify existing problems and avoid those in the future.
4. Become aware of evolving tools that are used to predict footfall-induced vibrations in a building, and the mitigation options available to control them.

Presentation length: 60 minutes.

To schedule a presentation for your firm, email [AcousticEd@ThorntonTomasetti.com](mailto:AcousticEd@ThorntonTomasetti.com).