Structural vibration can subtly undermine an otherwise successful project.

- In workplaces or meeting venues, it can cause people to be distracted, reducing productivity or enjoyment.
- In high-tech environments, it can degrade the performance of susceptible equipment, causing operational or profitability issues.
- For flexible structures such as bridges and grandstands, synchronized movement of pedestrians can cause disconcerting and even dangerous motion in the structure.

**Our Service**

We help you understand vibration issues in your project and how they can be mitigated.

Solutions we propose may include the following:

- Structural changes
- Architectural changes
- Operational changes
- Tuned mass dampers (TMDs).

Operational changes might include setting occupancy limits for dance floors and aerobics rooms or prescribing whether or not a footbridge can be used for marathons. Mass damping (TMDs) can be effective to control vibration at a wide range of frequencies and scales, from long-span floors to the Grand Canyon Skywalk to the 632-meter-tall Shanghai Tower.

Through our work on vibration-related projects—damper design, floor vibration, ground-borne vibration, wind-induced vibration, bridge analysis, acoustics and aeroacoustics—we have gained a broad range of experience in vibration issues. This experience means we are able to collaborate with you to determine the most accurate and cost-effective type of mitigation for your specific project. It also gives the breadth of expertise needed to consult effectively on unique, “outside-the-box” projects.
RWDI is a valuable partner to clients seeking to...

Explore Innovations
• Create innovative light and flexible structures while maintaining safety and a positive user experience

Create Opportunities
• Develop high-value assets by providing pleasing, comfortable spaces

Meet Challenges
• Solve trade-offs among incompatible combinations of vibration source, path and receiver (human or machine)
• Manage mitigation and retrofitting costs by finding an optimum solution tailored to the situation

Fulfill Expectations
• Assure stakeholders that vibration issues are addressed

How we work

Broad perspective
We look beyond code recommendations and explore the principles behind the issue. In addition to traditional acousticians, our team includes experts in structural dynamics. These experts have a broad range of educational and research backgrounds in dynamics and extensive vibration-related project experience. Working together we can evaluate properties such as damping, stiffness, mass, mode shapes and degrees of freedom and apply dynamic principles to unique and challenging projects.

In-depth consulting experience
Our experience in many vibration projects world-wide gives us the ability to look at a project and quickly understand where vibration-related issues may arise and what type of analysis may be necessary. For example, we can often tell, just by looking at the structural design of a floor or footbridge, whether or not vibration will be an issue. We have a broad understanding of both industry-standard criteria and emerging research on how vibrations affect both equipment and people. This knowledge allows us to make informed decisions and recommendations on applying vibration constraints.

Analysis tools
We apply a range of tools depending on the type and complexity of issues we identify.

• A simplified desktop analysis can provide a high-level view of expected vibration issues while minimizing the cost to you.

• We maintain in-house software that produces advanced analysis of footfall-induced vibrations on footbridges and floors. This software allows us to provide the most accurate vibration predictions available. With these predictions, we help you develop targeted mitigation that minimizes mitigation cost.
We implement data collection strategies using a wide range of vibration-measurement sensors and data acquisition systems. Such strategies draw on our advanced understanding of signal processing techniques.

When needed to evaluate unique vibration challenges, we develop a custom analysis methodology.

Representative Projects

- Footfall-induced vibration affecting
  - Sensitive high-tech equipment
  - Human comfort on pedestrian bridges
  - Human comfort on long span floors and suspended staircases
- Synchronized crowd movement resulting in disconcerting (and sometimes dangerous motions) in athletic facilities, grandstands, bridges and dance floors
- Equipment-, pedestrian- or wind-induced vibrations causing fatigue failures in structures and cables