

## Structural Vibration Analysis and Solutions

### How Xi Identifies and Removes Unwanted Structural Vibrations

When it comes to structural stability and exposure levels for personnel and machinery within building, structural vibrations can become a very serious issue. Undesirable levels of noise and vibration can be caused by building and plant services, such as heating systems or rotating machinery, which can easily excite resonances within a structure. Even simple excitation from a foot fall or external excitation from wind loading can result in problematic vibration, causing disturbances and issues with sensitive equipment. This can be particularly problematic when low vibration criteria are required, such as those outlined by BS-5228 or the American ASHRAE standards.

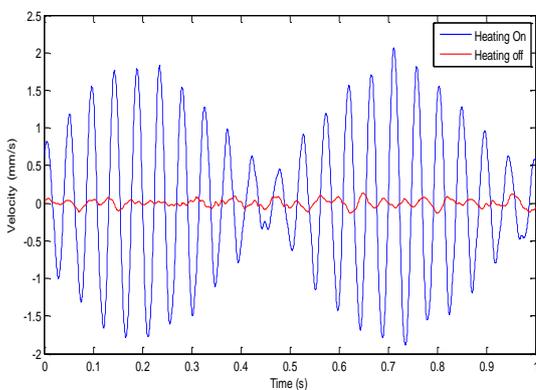
It is therefore vital to be able to characterise these vibrations to identify and break vibration pathways, either through isolation techniques or innovative solution design. Xi Engineering Consultants have been solving both ground borne and structural noise and vibration issues for many years through detailed measurement, modelling and bespoke solution design.

**STAGE 1  
MEASURE** Xi's rigorous solution design begins with a walk around evaluation of the building and problem areas, followed by a specialised vibration measurement and analysis campaign. Depending on the size, scale and complexity of the campaign this can take anything from a single day to a week of measurements to accurately characterise both the structure and the vibrations.

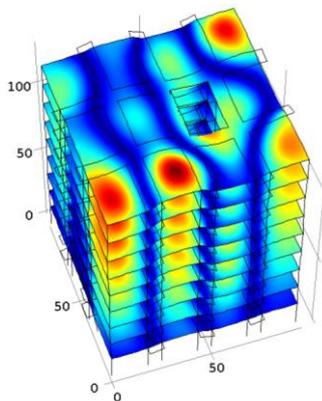
**STAGE 2  
MODEL** Following the measurements, Xi will determine any problem frequencies and structural resonances along with the source of vibration and possible pathways through the structure. Depending on the requirements of the project, Xi can also design a detailed computational model to simulate the dynamics of the structure and to evaluate its response to different isolation or dampening techniques. This allows a fast and cost effective solution design, avoiding a trial and error approach to finding a solution.

**STAGE 3  
SOLUTION** Using the results of the measurement and modelling Xi will establish the best course of action to remove or manage vibrations depending on the source of excitation and desired level of reduction. Xi have developed many solutions ranging from satisfying human comfort conditions to providing the absolute lowest levels of vibration performance for the most sensitive of optical and laser machinery. Solutions include; tuned mass dampers for large floor spans, seismic trenches, bespoke isolation for roof mounted wind turbines through to laboratory cleanrooms, satisfying vibration levels lower than  $3\mu\text{m/s}$  for sensitive laser and nanofabrication equipment.

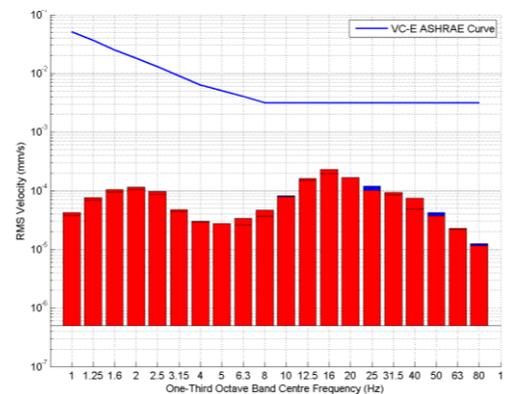
1 MEASURE



2 MODEL



3 SOLUTION



Call Xi's Engineering Team to discuss in confidence how to optimise your building's vibration response