

2006 Fall Meeting  
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HR: 1340h

AN: **S23B-0160**

**Engineering Implications of Rotational Sensitivity of Translational Accelerometers**

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**A**Several studies have indicated that nominal linear translational accelerometers are strongly sensitive to rotation motions, especially around their horizontal axis. It has been theoretically and experimentally demonstrated that this situation affects the acceleration record and severely limits appropriate velocity and displacement determination. More importantly the common believe that filtering long periods signals could "clean" the acceleration record from this unwanted effect has been shown inadequate by the author this abstract and collaborators using experimental testing. Rotational effects are still present on filtered records unless the complete frequency bandwidth that composes the rotation motion is filtered out. In civil engineering structures rotations are nearly always present. Typical examples are foundation rocking, beam bending, floor slab deformation and overall rotation of structures due to relative large loads or damage. Two real cases were rotation of a relative flexible structure strongly influence the linear accelerometer responses are presented and later experimentally reproduce in a shake table controlled situation. The first one corresponds to a bridge with a contiguous 383 meter simple supported beam rested on rubber bearing that suffered the rotational related distortions due to the passing of a heavy truck at the end of a seismic event. The second event corresponds to the vibration recording of vertical motions on an industrial bridge that is exposed to forced vibration of a large motor. Both examples indicate that in certain conditions motion records from structural instruments are subjected to distortions effects that could make acceleration, velocity and displacement (temporarily or permanent) measurements not reliable.

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