Composite construction is widely used for high-rise building structures, in which concrete shear walls are designed as the main lateral load resisting element and steel frames the main gravity load resisting element. Earthquake-induced inertia forces, mainly caused by the floor masses, must be securely transferred to the shear wall. Due to a staged construction process – the concrete wall is built before the concrete in the composite floor is poured. The connection between the concrete floor and shear wall may not securely transfer the inertia force, leaving the connection between steel girders and concrete shear wall the only firmly connected element. This connection requires concrete anchors or steel bars embedded in concrete.

The tensile force on girder-wall connections is usually ignored in design. However, in an earthquake, the seismic force is generated by the mass resource, which is usually 1.0D (dead load) + 0.5L (live load). In a high-rise composite structure, the shear force will be eventually transferred to columns and shear walls. The share carried by columns is relatively small because they are relatively flexible, while shear walls will carry most of the load. Therefore, the tensile force on the girder-wall connections can be significant.

In this study, we built models of a steel frame-concrete wall high-rise building using SAP2000. Both of the codes, GB50011-2012 and AISC 7-10, were used. We also had a time history analysis.

**RESULT**

- In the first group of models, the shear wall is linked to concrete slabs, similar to what engineers would normally do. We found that, in this case, the slab transfers most of the inertia force to the shear wall directly through the sheared nodes and the tensile force on girder-wall connections is small. We also built models to take the staged construction into consideration, in which the shear wall is partially linked to the floor. In this case, we have seen high tensile forces on the girder-wall connections.

- Further studies must be conducted, including test of large-scale building models on a shake table (also known as an earthquake simulator), to revise the current design practice.

- Earthquakes are natural disasters that pose the greatest threat to high-rise structures. This study provides a better understanding of the response of composite structures under earthquakes, thereby avoiding structural insecurity caused by over-simplified assumptions in seismic design. This is critical for enhancing human ability to withstand natural disasters.