

Sliding shear failure of fixed shear walls under cyclical loading

Project team Prof. Dr. Harald Schuler
MSc Florian Meier, plus employees of the construction laboratory FHNW

Duration spring 2020 to summer 2023

Goal setting of the project

Within the framework of this research study experimental tests are conducted on fixed reinforced concrete walls. The focus is on researching the individual components of bending, shear and sliding shear, as well as their interaction.

Methodology and approach

For the analysis of the overall behavior of fixed walls under cyclical loading 4 large scale tests are planned, which differ in their geometry and their measures of enhancement. Starting from a basic wall layout the influence of different factors will be examined.

Findings for science, practical work, and the public

Reinforced concrete walls, fixed in the building's basement, are often used to stiffen multi-story buildings against earthquake loads. Beside bending stress, a high stress due to shear and sliding shear occurs at the fixing point of squat walls. A bending crack reduces the sliding shear resistance, whereby a sudden collapse of the wall can occur. The knowledge of when such a failure can occur and of how effective measures of enhancement are, will help to improve the resistance of buildings against horizontal loads.



Figure 1: Failure of a bracing wall at the fixing area in Edificio Los Leos, Chile, after an earthquake 2010 (H. Kato, S. Tajiri, T. Mukai, *Preliminary Reconnaissance Report of the Chile Earthquake 2010*, Japan, 2010)

Importance for research and praxis: innovation

The interaction of bending, shear and sliding shear is hardly investigated to this day. Especially the examination of the fixing area of earthquake-resisting walls in existing structures with low reinforcement ratio is missing. Measures of enhancement are mentioned to compensate too small resistance integrity.