

Wind and Earthquake Shear Load in Asymmetrical Loadbearing Masonry Buildings

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Abstract:

Loadbearing masonry buildings often incorporate slip joints in the interfaces between walls and slabs, to allow for long term relative displacements caused by brick growth, concrete shrinkage, and thermal expansion and contraction. The distribution of wind and earthquake action in the shear wall system of that building initially depends on the elastic stiffness and arrangement of the walls. However, once either softening of masonry or slip in the joints occur, a redistribution of shear loads will result. The redistribution of shear is a complex process and is influenced by many factors, such as the nonlinear behaviour of masonry and slip joints, the compressive stress level in the walls, and the wall arrangement. Current design procedures rely on linear elastic analysis, which do not consider this redistribution of shear. Hence, those procedures may lead to inaccurate predictions of shear distribution in the building wall system. This paper presents an investigation of the wind and earthquake shear distribution in asymmetrical loadbearing masonry buildings taking into account possible joint slip and nonlinear masonry behaviour. A numerical study of six multi-storeyed buildings, designed with different arrangement of walls and shapes is carried out. The results of this analysis were compared with the results predicted by the current standard elastic analysis procedures. It is shown that current standard procedures may lead to inaccurate predictions of shear loads in the wall system.

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