

Energy Efficient Construction and the Seismic Resistance of Passive Houses

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Abstract : Recently, an increasing trend of passive and low-energy buildings transferring from non earthquake-prone to earthquake-prone regions has thrown out the question about the seismic safety of such buildings. The paper describes the most commonly used thermal insulating materials and the special details, which could be critical from the point of view of earthquake resistance. The most critical appeared to be the cases of buildings founded on the RC foundation slab lying on a thermal insulation (TI) layer made of extruded polystyrene (XPS). It was pointed out that in such cases the seismic response of such buildings might differ to response of their fixed based counterparts. The main parameters that need special designers' attention are: the building's lateral top displacement, the ductility demand of the superstructure, the foundation friction coefficient demand, the maximum compressive stress in the TI layer and the percentage of the uplifted foundation. The analyses have shown that the potentially negative influences of inserting the TI under the foundation slab could be expected only for slender high-rise buildings subjected to severe earthquakes. Oppositely it was demonstrated for the foundation friction coefficient demand which could exceed the capacity value yet in the case of low-rise buildings subjected to moderate earthquakes. Some suggestions to prevent the horizontal shifts are also given.

Keywords : earthquake response, extruded polystyrene (XPS), low-energy buildings, foundations on thermal insulation layer

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