

Definition of Seismic Action relevant for Non-structural Earthquake Damage – Case studies from KnowRISK test sites

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The EU - project KnowRISK focuses on non-structural damages which are known to be the main source of economical loss caused by earthquakes. Non-structural damages involve failure or loss of functionality of all non-load bearing elements of a building and its contents. Beside economic aspects, non-structural damage poses risk of severe, sometimes fatal injury to occupants and other people in the surrounding, and may lead to disruption of services due to physical damage to building utilities such as heating and ventilation system, water and sanitary systems, etc. Injury due to falling objects is a major concern during earthquakes, especially in countries where provision of elaborate structural design codes somewhat limits the chances of structural collapse. The failure of lifelines brings additional harm and disruption. The KnowRISK project aims at filling the gap of common ground motion and response parameters, shifting the focus from those used to characterize structural damage in many seismic building codes (e. g., EC8, US Uniform building code), to those that are more relevant to non-structural damages. These codes regard the protection against structural damage and failure of buildings but offer limited insight for the prevention of the overall damage and disruption caused by earthquakes.

An important issue in characterizing seismic hazard to non-structural components is the definition of the seismic action (characteristics of the free-field ground motion). Besides the conventional parameters commonly used in ground motion estimation we envisage to consider additional signal characteristics whose identification can be facilitated by experimental tests on a shaking table using full-scale models of furnished rooms in buildings. This contribution presents some preliminary results from the KnowRISK test sites (Portugal, Mt Etna / Italy and SE Iceland) where plenty of instrumental and macroseismic information is available. In these areas, the relevant seismic scenarios are understood fairly well. We shall consider both instrumental records as well as synthetic simulations which allow incorporating site effects and building response.