

ABSTRACT

The present thesis evaluates the provisions concerning “simple unreinforced masonry buildings”, for which, according to Chapter 9 of Eurocode 8 (EC8), which refers to masonry buildings, and in particular paragraph 9.7, a certain safety verification is not mandatory.

Corresponding to several seismic zones, nine (one four-storey, two three-storey, three two-storey and three single-storey) buildings were formed. The allowable number of storeys defers depending on the product $a_g \cdot S$ at the site; that is four (4), three (3) and two (2) for $a_g \cdot S \leq 0.07 \cdot g$, $\leq 0.10 \cdot g$ and $\leq 0.15 \cdot g$ respectively. The plan configuration of the buildings (shape, length ratio, projections and recesses), the location, arrangement and thickness of the shear walls were chosen in such ways that meet the provisions of EC8 mentioned above.

The buildings were analyzed undergoing vertical and seismic loads, according to Eurocode 8 (prEN 1998-1, Draft No 6 - Stage 49 - Version for translation). The design spectrum of EC8 for elastic analysis was used for all five (5) ground types (A, B, C, D and E), for the three (3) seismic zones, where “simple unreinforced masonry buildings” are permitted to be built.

The piers and zones of the lintels of the buildings were modeled using frame elements. The modeling of masonry sections in the zones of the lintels between the piers was one of the parameters of this investigation. These zones ensure the frame coupling of the piers only if sufficiently reinforced elements (straps) exist at the levels of lintels and floors. On the contrary, the absence of such elements leads easily to the cracking of lintels. (results to premature cracking of the lintels). In that case, the modeling of the building resemble a system, formed by cantilevers that are coupled through low-strength elements at the levels of the diaphragms of the floors. Both types of modeling were used and the two groups of nine buildings were analyzed using SAP2000.

The safety verification of the buildings, according to Eurocode 6, showed that all of the models, in every floor, on every ground type and for every seismic zone suffered extended failures (bending and shear). In particular the damages were more severe in cases that lintels were cracked, which means absence of straps. Thus, the use of such elements is highly recommended.

In conclusion, the extent of failures is alarming. On the basis of these observations, it is obvious that the exception provisions of Eurocode 8 for the design of “simple unreinforced masonry buildings” have to be reconsidered and possibly revised towards a stricter direction, after a thorough investigation of the issue.