

Abstract

The present dissertation was elaborated as part of the Post Graduate Programme of studies entitled "Anti-seismic Design of Technical Constructions". The objective of the present paper is to investigate the influence of the infill masonry to the seismic behavior of multi-storey building constructions. For the scope of this dissertation the investigation of the behavior of the 6-storey R.C building of the Prefecture of Pella was examined. The building under examination suffered heavy failures of the masonry infills especially at its low levels, during the seismic event of Grivas (21 December 1990) that was more severe in the prefecture of Pella. For the elastic analysis of the structure, a program capable of performing static, dynamic analysis together with design of R.C. structural members was used (Next v 21.50).

In this work, an investigation was performed to model the behavior of the infilled masonry panels together with the surrounding mortar joint using equivalent diagonal struts. This investigation took place using single storey, one bay, masonry infilled frames that are subject to monotonous horizontal loading. A series of parametric analysis were performed. The parameters that are introduced in the analysis have to do with the degree of confinement of the infills to the surrounding R.C frame, together with the role of openings in the infills. Different heights of frames and cross sectional areas of columns were also studied. The interaction of frame with the infill was taken into account by using joint elements with enhanced non-linear properties in order to model the surrounding mortar joint. The aim of this study is to propose geometric properties for the diagonal struts that can be used for modeling the masonry infills of the 7-storey R.C building of the Prefecture of Pella.

The results of the previous parametric analysis were used for modeling the masonry infills of the 7-storey R.C building of the Prefecture of Pella. The influence of masonry infills on the total behavior was studied by applying two different cases. Initially, a model was constructed, where no infills were modeled (i.e the "bare" structure). Next, in order to estimate the influence of the masonry infills a new model was created, having the infills modeled as diagonal struts. This procedure was followed by a dynamic analysis to determine the dynamic characteristics as resulted for these two cases. A comparison of the stresses on the two structures under a seismic loading with similar characteristics to the ones measured in the seismic event of Grivas was also made. The shear stresses that have obtained from the response spectrum analysis on the masonry infills have been compared to the shear strength obtained from the Eurocode 6 provisions for the particular masonry used in the construction. Areas of predicted failure using the results of simulation are compared to the actual failures observed in the masonry infills of the real structure.