ABSTRACT

The objective of this thesis, submitted in partial fulfillment of the requirements for the MsC degree of the Graduate studies program "Earthquake Resistant Design of Structures" was the assessment of a block of seasonal residences located in the Chalkidiki area. This block includes three similar buildings, which were designed and constructed following the 1959 official Seismic Code.

An earlier assessment, followed by a proposal for strengthening the building, was done by K. Stylianidis and C. Ignatakis, Professor and Associate Professor of A.U.TH respectively. Based on empirical methods applied, they presented evidence on deviations between Design and Construction. In this research work the possibility to apply the KAN.EPE. was studied in an attempt to reach an integrated assessment taking into account the deviations already found. Specifically the analysis included:

1. The initial design
2. The final construction ("as built")

The elastic static analysis with the method of q-factor, using the ETABS v.8.1.4 computer program, was used at first for the assessments. The first analysis which was carried out for q=1.0 indicated that not all requirements for the application of this method were fulfilled. Despite that fact, the method was further applied in order to enable an evaluation of the validity of assumptions set by the Code. The main analysis was run for q=1.3. In this small value of q was incorporated the unfavorable existence of the walls because of the soft first storey (pilotis). The simulation of the cracked cross-sections of the frame elements was done following the rules provided in the Greek Seismic Code (EAK2000).

As a second attempt, the assessment was carried out using the inelastic static analysis, using the SAP v.7.44 computer program instead of ETABS previously used, in order to avoid some difficulties with the software of ETABS. A 3-D analysis of the building was carried out for two load cases: One for a modal distribution and the other for a uniform distribution, at which the seismic loads are proportional to the mass of each storey. These seismic loads were applied in the two main directions of the building (100% in the one direction and 30% in the other, successively for the two directions). The check of the general safety inequality of the building was based on the plastic rotations of the frame elements. The calculation of the plastic rotations was based on the analytical equations of KAN.EPE. In addition to that a shear check was performed, based on the comparison of the shear forces at the target displacement with the shear forces that each element can withstand.

The rehabilitation objective that was selected for all the above-mentioned forms of the building is the "Life Safety" performance level.

Based on our data, elastic static analysis indicated that the building responded poorly in both forms (Design – Construction) and its safety is inadequate. Thus its strengthening is necessary. On the contrary the application of the inelastic static analysis indicated a more favorable building response since only few of the elements, both in Design and Construction, were found inadequate.