ABSTRACT

Capacity evaluation of existing building and storey adding.

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The subject of the present diploma thesis, which is conducted in the frameworks of the postgraduate studies in the field ‘Antiseismic design of technical structures’ is the capacity evaluation of an existing building and the design of an added storey.

The building in study is located in the region of Thessalonica. Its load resisting system consists of a spatial moment frame and it was constructed in 1987, according to the modified provisions of 1985. The structural materials are: concrete B 225, steel of longitudinal reinforcements StIII and steel traverse reinforcements StI. The capacity evaluation was performed according to the requirements of E.A.K.2000 and E.K.O.S.2000 for A = 0,16 g. The analyses results showed efficiency of the most structural resisting elements except very few ones. The inefficiencies were limited, and spotted mainly to some beams due to the lack of longitudinal reinforcement in the top.

Then the new storey that had the same geometry of existing one was added to the model. The new analysis results showed inefficiencies in almost all of the existing beams due to the additional stress caused from the walls of the new storey. Moreover inefficiencies to some columns were produced.

The strengthening of the existing structural elements using reinforced concrete jackets to all the existing beams and to four of the columns was decided. The strengthening materials were steel S 500 and concrete C 20. The new reinforced model was reanalysed and the new structural resisting elements were designed, using the new results.

Finally the capacity evaluation of the building under the design earthquake was performed using inelastic static analysis. Furthermore a dynamic inelastic

analysis for the accelerograms of Athens 1999 (Sepolia) earthquake was carried out. The analyses were carried out by using the programm SAP2000 v10.0.7, while the moment-rotation and P-M-M interaction curves were computed using the program Xtract.

The analyses results showed very good behaviour for both the design earthquake and the real ground motion of Athens earthquake. In both cases many cross sections yielded but only to a small extend. The results were sufficient due to the energy dissipation in many elements and the fulfilment of the seismic code provisions for small and repaired damages under the design earthquake was achieved.