

ABSTRACT

The objective of this thesis, which was written for the purposes of the post – graduate studies program «Earthquake Resistant Design of Structures», is the assessment of the building of Hydraulics of Aristotle University of Thessaloniki, which was designed and built in 1963, not only in its present condition but also after being strengthened or/and extended. In particular, the following forms of the building are being analyzed :

- 1.) Existing building considering fixed – base vertical elements.
- 2.) Existing building taking into account the compliance of the supporting soil.
- 3.) Building strengthened by X – bracings.
- 4.) Existing building having an additional storey.
- 5.) Building strengthened by X – bracings and also having an additional storey.

The assessment is carried out using the inelastic static analysis with the aim of SAP2000 v.7.44 computer program, while the recommendations of FEMA356 and the Greek Seismic Code EAK2000 are being followed. The rehabilitation objective that was selected for all the above-mentioned forms of the building is the Basic Safety Objective defined by FEMA356 that achieves the dual rehabilitation goals of Life Safety performance level for the earthquake having a probability of exceedance 10% in 50 years and Collapse Prevention performance level for the earthquake having a probability of exceedance 2% in 50 years. For all analyses two vertical distributions of lateral load are applied : the modal and the uniform one.

The plastic hinge rotation capacities for all critical sections of the building are evaluated after moment – curvatures analyses with the aim of Xtract computer program, according to their geometry and existing reinforcement, and by applying the appropriate model for concrete and reinforcing steel. Yield and ultimate moments for all cross sections of the building are also evaluated with the aim of Xtract computer program, so as the axial force – moment interaction diagrams for the cross sections of all vertical elements of the building.

Comparative diagrams against the results for the existing building (in its present condition) are given for each of the form being analyzed.

As a general conclusion we can mention the inadequacy of the existing building in its longitudinal (flexible) direction, but it is improved a lot by adding the X – bracings, and the adequacy in its transversal (stiff) direction. The compliance of the supporting soil, for the lower bound of soil parameters, so as the additional storey, result adversely mainly in the transverse direction of the building rather than the longitudinal one.