ABSTRACT

The objective of this thesis, which was written for the partial fulfillment of the requirements of the postgraduate studies programme «Earthquake Resistant Design of Structures», is the assessment of a three-story reinforced concrete (R/C) building with a basement, which was designed and built, according to available information, 70 years ago.

The main structural system of the building consistes of an R/C frame, with T-beams as horizontal members and rectangular columns as vertical structural members. An important structural characteristic of the building is the presence of several brick masonry infill walls, so that the building' s structural system is not only a frame system but rather a mixed one, consisting of R/C and masonry (it could also qualify as "confined" masonry). The strength and (especially) the stiffness of this mixed system are considerably higher than that of the bare frame system. For this reason the building' s assessment is made both ignoring and taking into account the infill walls.

The assesssment of the building was carried for Performance level "Life Safety" and for the case of no damages in the structural members. The analysis method used was the elastic one (static and dynamic), in both of its versions specified in the 2004 Draft Greek Code for Assessment and Interventions (KAN.EPE), i.e. the global behaviour factor (q-factor) approach, and the partial behaviour (m-factors) approach.

Member stiffness was calculating considering fully cracked properties (ratio of yield moment M_y at critical section to corresponding yield curvature $(1/r)_y$), as well as the effect of bond slip and shear deformations. Member yield moments and curvatures were calculated using the rerationships given in the Greek Code for Assessment and Interventions.

For the calculation of structural member resistances, the material strengths found in existing technical reports (written 4 years ago) were used.

Verifications (carried out in all cases considered) included flexural and shear strength of R/C beams and columns, shear strength of joints, and 2^{nd} order effects.

The general conclusion is that, as expected, the assessed building has inadequate seismic resistance. All the R/C structural members (beams, columns, joints) checks show that for the design earthquake there will be damages in many beams and columns as well as in many joints, whereas there is a possibility of even global failure of the building, which is much more the case when PD effects are taken into account.