

## ABSTRACT

The object of this post – graduate thesis is the design of a composite 4-storey building according to E.C.3, E.C.8 and E.A.K.2000 (Greek Code concerning the Earthquake Resistant Structures). The structural analysis has been performed with the SAP2000 analysis program. Excel has been used for the calculations. The analysis method which has been applied was the Dynamic Spectra Method.

The loads and the imperfections of the moment frames have been calculated in the corresponding diploma thesis, where the building, consisting of Moment Resisting Frames (MRFs) only, has been studied here for a fully elastic response. The results of the diploma thesis are compared with the corresponding ones of this post – graduate thesis, in which the structure is studied for different types of vertical static systems taking over the seismic force. In particular, these are Concentric Braced Frames (CBFs) and Eccentric Braced Frames (EBFs).

The 1<sup>st</sup> chapter includes the description of the structural models that have been studied and of the sections that have been used, along with a reference of the assumptions made for the simulation of the structural models. The eccentricities and the dynamic characteristics have been also calculated, as defined by E.A.K.2000

In the 2<sup>nd</sup> chapter, the behavior of the building consisting only of Moment Resisting Frames (MRFs) is checked against 2<sup>nd</sup> class phenomena. Further, the behavior of all the structural models is checked against the control of fill elements.

The 3<sup>rd</sup> chapter includes the description of the composite column that is being used, its resistances and geometric characteristics are calculated as well. The most crucial column is also checked.

The 4<sup>th</sup> chapter concerns checking of the crucial beams for different types of sections, either the beams belong to the vertical static systems taking over the seismic force, or not.

In the 5<sup>th</sup> chapter different structural models are studied with structural systems consisting of Concentric Braced Frames (CBFs), both for fully elastic response and for plastic response.

In the 6<sup>th</sup> the procedure of the previous chapter is followed for structural models with structural systems consisting of Eccentric Braced Frames (EBFs).

In the 7<sup>th</sup> chapter different connections are checked.

The 8<sup>th</sup> chapter includes comments, comparisons and conclusions from the study of the building under consideration.

Finally, the member diagrams M, Q, N for the gravity force combination  $G + 0,30Q$  and for the seismic combination E (earthquake only) of the crucial frame 1x for different types of structures are displayed in the appendix.