ABSTRACT

Purpose of this diploma thesis is the check of the seismic adequacy of an existing structure which is part of a building group of an industry according to the existing Greek Codes E.K.O.S. 2000 and E.A.K. 2000 and the proposal of possible ways and types of strengthening its structural system.

This group of buildings of the industry under the firm "M.E.L." is situated within the Industry Park Kato Gefiras of the prefecture of Thessaloniki and in present form it is consisted of 6 in a row structures that are considered to be independent due to the prediction of separation joints between them.

The existing design study of the structures towards static and dynamic loading was based on the method of Allowable Stresses and the B.D. of 1959 and its construction was completed in the late 70's.

Considered both the high service limit state loading values and the bad quality of the soil the group of buildings is founded on large number of friction piles and in compliance with caps and beams of the foundation system make the assumption of the building being fully fixed on the foundation level seem realistic.

The building III of the group , the main one with which this present thesis deals with , is being modelled on SAP 2000 και and analyzed by dynamic spectral method according to the principles imposed by the E.A.K. 2000 , the Greek Code for Earthquake Resistant Structures , assuming that its behavior factor q equal to 1,50 .

This assumption is attributed to the fact that the defined as old type existing structures present low deformability which coincides with lack of their capability to absorb energy through inelastic behaviour and hysteretic loops in a forthcoming intense ground shake.

According to the results of the checks of adequacy that are being held for the sections of all reinforced concrete columns and walls of the building it is rather obvious in most cases the lack of their existing reinforcement.

In addition , the fact that the check of the radial deformations is not being satisfied demonstrates the important problem of the lack of the reinforced concrete walls in the Y - Y direction of the structure , problem that gets really intense on its 2nd and 3rd floor.

These results form the leading path for the solutions that are being proposed in the following sections and which focus on reduction of the displacements as well as lending strength and rigidity on the structural system of the existing structure.

Before any decision of strengthening is being made for the structural system of the existing building the capacity all of its columns is being checked under the scenario of lightening the 3rd floor by removing all mechanical parts that are out of use the late years , followed by the change its of use.

Regarding the results of the analysis , it is clear that the percentage of inadequacies for the columns of the existing structure is being reduced and the scenario is adopted on behalf of improving its seismic response.

Having accepted this scenario in the following steps of the analysis , two strengthening plans of the structural system of the existing building III are being proposed from which one is based on reinforced concrete and the other on steel members.

The first strengthening plan of the structural system of the building is based on infilled reinforced concrete walls in openings of plane frames that coincide with its serviceability needs along with reinforced concrete jackets for a limited number of columns.

The second strengthening plan is based on placing steel braces with eccentricity in openings of the plane frames so that both serviceability needs of the building and the

required geometric conditions for the braces are being satisfied. Additionally , a limited number of columns are being strengthened with the use of reinforced concrete jackets.

Both strengthening plans are being attributed in the model of the structural system of the lightened building and then they are analyzed according to the same method and design spectra.

According to the results of these two strengthened structural models of the building it is rather than obvious the compliance with the existing Greek Codes of almost all of reinforced concrete columns and walls that were mentioned as inadequate in the beginning of this session.

Afterwards , calculations of the required reinforcement for the concrete members are being presented as well as the check of adequacy of the steel sections which were selected before the analyses were held.

In the end , a comparison regarding the behavior of the structural system of the building III during the steps of this diploma thesis is being presented as well as an estimation of the cost of both strengthening plans proposed.