ABSTRACT

The present dissertation that was written in the context of the post-graduate programme entitled "Earthquake Resistant Design of Structures", has as objective the vulnerability of Thessaloniki's bridges. For the estimation of the vulnerability the method of Hazus is used. This method is one of the methods used in the USA for the development of seismic scenarios and for the estimation of seismic risk in buildings, lifelines and transportation systems. This method is applied in a sample of 84 Thessaloniki's bridges. The classification of these bridges is done according to the number of spans, the type of the piers, the continuity or not of the superstructure and the year of built. The assessment of the seismic behavior is done for three seismic scenarios with return period equal to 100, 475 and 1000 years. The probability of being in a particular damage state is calculated for the three seismic scenarios. There are also maps showing the dominant damage state for each one of the bridges.

In order to evaluate the results from the application of the method of Hazus in Thessaloniki's bridges, the fragility curves of three typical bridges are estimated using an analytical method. For the estimation of the fragility curves the nonlinear static method of analysis (Pushover Analysis) is used in combination with the method of demand and capacity spectra. Five damage states are defined. The analysis is done for one pier and not for the entire bridge. For this reason, only the fragility curves of the analysis in the longitudinal direction can represent adequately the behaviour of the whole bridge. For the nonlinear static analysis the programme SAP2000 is used and for the inelastic analysis of reinforced concrete cross-sections the programme RCCOLA-90 is used.

Particularly, it is analysed the bridge in Lagadikia, which has spread footings and is conventionally designed (year of built 1984). Also, two bridges with pile foundation are analysed. The bridge in Barbarobasi is conventionally designed (year of built 1985) and the bridge in Axios is seismic designed (year of built 1996). For each one of the above bridges the calculated fragility curves are compared to the ones proposed by the method of Hazus.