

SUMMARY

This is a project involving the earthquake resistant design and assessment of a straight bridge with three spans and total length equal to 100m. The bridge was designed according to the provisions of EAK2000 and E39/99. Firstly, the structure was analyzed using the multi-modal response spectrum analysis with the program SAP2000, version 8.1.1. The flexural design of the piers of the bridge was carried out according to the provisions of EAK2000 and E39/99. The shear failure of columns is the most dangerous failure pattern that typically can result in the collapse of the bridge. Thus, design to prevent shear failure is of particular importance. So, the shear strength of the piers was also evaluated according to the provisions of E39/99, for adequate shear resistance, confinement and prevention of buckling of the longitudinal bars.

Bridge engineers in recent years have used static pushover analyses as an effective and simple method when assessing the performance of existing or new bridge structures under seismic loads. Given the proper conditions, this approximate alternative method can be as reliable as the more accurate and complex ones. In this essay, the seismic behavior of the designed bridge was assessed using the non-linear static pushover analysis. The inelastic behavior of the critical cross- sections of the piers of the bridge, the plastic hinges and the plasticity models were evaluated using the programs RCCOLA-98 and USC-RC. Then, the parametric analyses were carried out in order to estimate the influence of various parameters of the static non- linear analysis to the assessment results. Finally, the structure was assessed in both directions using the model that was considered as the best, in order to investigate the influence of the selection of the direction of the lateral load.

From the results of the parametric non- linear static analysis, it was found out that the seismic performance of the bridge was satisfactory, even for motions twice as strong as the design earthquake. However, it was also found out the sensitivity of the analytical procedure to the various parameters. This shows, that the additional measures need to be taken in some cases to allow a more realistic assessment of reinforced concrete bridges.