Proceedings of the
4th European Workshop on the Seismic Behaviour of Irregular and Complex Structures
26-27 August, Thessaloniki, Greece
Paper No. 06

A REFINED COMPUTATIONAL FRAMEWORK FOR THE ASSESSMENT OF THE INELASTIC RESPONSE OF AN IRREGULAR BUILDING THAT WAS DAMAGED DURING THE LEFKADA EARTHQUAKE

A. SEXTOS
Structural Division, Civil Engineering Department
Aristotle University Thessaloniki, GREECE

K. PITILAKIS
Geotechnical Engineering Division, Civil Engineering Department
Aristotle University Thessaloniki, GREECE

E. KIRTAS
Geotechnical Engineering Division, Civil Engineering Department
Aristotle University Thessaloniki, GREECE

V. FOTAKI
Geotechnical Engineering Division, Civil Engineering Department
Aristotle University Thessaloniki, GREECE

ABSTRACT

This paper presents a comprehensive numerical study of a 4-storey RC building which was heavily damaged during the Lefkada, Greece earthquake in 2003. This is one of the few cases where all important earthquake input and structural configuration and response data where both available and reliable (i.e. recorded ground motion, in-situ measured soil properties, structural design drawings and observed damage). The structure is supported on pile foundation due to the very soft and potentially liquefiable soil profile and it has been designed according to the 1959 Greek Seismic code. It is also of particular interest that its irregularities in plan and height lead to a complex dynamic behavior that is primarily characterized by torsion. Towards the evaluation of the earthquake performance of the structure, the analysis approach employs advanced modeling techniques for a) the assessment of the actual, varying with depth, seismic input based on the available records and accounting for the site amplification as well as the presence of liquefiable layers b) the simulation of the complete foundation below the building and the relative stiffness interplay between the piles and the soil layers c) the inelastic dynamic response of the structure accounting for plastic hinge development and short column failure. The results indicate that a number of parameters affect the seismic response of the building. At the same time, they highlight the importance of structural configuration and regularity that, independently of the modeling refinement adopted, are proved to be of paramount importance to the overall structural behavior.