SDOF MODEL IN SEISMIC ANALYSIS

Morić, D.; Hadzima-Nyarko, M. & Čanžar, D.

Abstract: This paper is based on following hypothesis: Seismic response analysis of regular structure is quite correct if it is done as simplified non-liner analysis with time history function of ground motion, as input load, and SDOF model with known weight, elastic stiffness, damping, elastic base shear capacity and post-elastic stiffness, representing the structure.

Weight of structure is known, elastic stiffness can be defined by static push analysis and dumping can be assumed depending of type of structure (5% for RC structures). Most important step in described approach is definition of elastic base shear capacity and post-elastic stiffness. Both parameters depend of failure mechanism and potentional of non-linear deformation absorption capacity.

Three cases are described in paper: Regular structure with RC walls tested by Camus working group named as Camus3 experiment (July 2000), Regular RC frame and RC grider bridge in longitudinal direction.

Good conformity of the Camus 3 experiment results with numeric simulation, as well as comparators of results given by space model and SDOF model in the other two cases, shows that such simplified seismic analysis is quite acceptable. Procedure is rather quick and easy with extremely simplified structure modelling.

Results shows that seismic response of regular structures (symmetric plans and constant vertical stiffness) can be well interpreted by using SDOF system as a mathematical model of the structures. In cases when ductile failure mechanism (plastic hinge, plastic rotation) is possible this approach can be used. That condition has to be check by preliminary steps. Aim of all preliminary steps is to confirm obligatory condition and to find out working diagram envelope of SDOF system representing real structure. Good confirmations of results shows that simplified seismic analysis is quite acceptable for regular structures in engineering practice.

Key words: Structure, SDOF model, seismic analysis.

Authors' data: Prof. Morić, D.[ragan], Ph. D., University of Osijek Faculty of Civil Engineering, Crkvena 21, Osijek, Croatia, dmoric@gfos.hr; Hadzima-Nyarko, M.[arijana], M. Sc., University of Osijek Faculty of Civil Engineering, Crkvena 21, Osijek, Croatia, mhadzima@gfos.hr; Čanžar, D.[avor], B. Sc., Civil Engineering Institute of Croatia, Drinska 14, Osijek, Croatia.