

ABSTRACT

The main object of this thesis is to investigate the possibility to improve the seismic response of a building through the intervention in the foundation soil. The intervention examined is the construction of vertical trenches infilled with soft material around the perimeter of the foundation. The soil - structure interaction phenomenon has been taken into account through the adoption of a finite element model including the soil, the foundation (considered to be rigid) and the building (as a single degree of freedom oscillator). Dynamic analysis has been carried out in the time domain for harmonic excitation.

Various combinations of the excitation period, the intervention depth, the mass, as well as the period of the building have been examined. Afterwards, the model has also been analysed considering, instead of harmonic, seismic excitation at its base (suitably modified) and instead of a single degree oscillator a multi-degree one. The aim of each analysis is the computation of the time history of each parameter – indicator of the response of the model (acceleration, moment, rotation, drift). The results have been presented as curves. Each point of the curves represents a fraction the numerator of which is the maximum value of the examined parameter after the intervention, while the denominator is the maximum value of the parameter before the intervention (initial conditions) for a special value of the period of excitation. In this way, a fraction having a value smaller than 1 expresses improved response for the respective period of excitation.

The analytical results have demonstrated the feasibility of the flexible trenches in the reduction of the response within a specific space of values of the period of excitation, different in each case. The same trend has been observed according to the results of the series of parametric analysis where a seismic excitation has been considered, as well as according to those coming out considering a multi-degree of freedom oscillator. Due to the fact that the problem examined depends on a great number of parameters, it seems that each case has to be examined as a special one, at least based on the results of this study. What is more, the study has to

be extended, so as to include the influence of more parameters (as, for example, the characteristics of the soil profile)