Dynamic Behaviour of Shallow Foundation Using Macro-Element Approach

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Extended Abstract

This paper investigates the dynamic behaviour of soil structure interaction (SSI) for shallow foundation via the macro-element approach.

A square shallow foundation with 3x3 m dimension, resting on a soil with friction angle equal 320, was selected. The structure was subjected to two accelerograms of 0.29 PGA and 0.58 PGA (i.e. double the first load) for 20 seconds duration. The horizontal shake was the primary concern. . The structure possessed four degrees of freedom (4DOF) model: one degree of freedom (1DOF) of superstructure (horizontal displacement), and one macro-element soil foundation which has 3DOF (horizontal displacement, vertical displacement, and rotation). For the superstructure, the linear elastic behaviour was taken into account , while for the soil foundation four base conditions were examined: (i) fixed base (ii) linear elastic performance, (iii) elastic perfectly plastic action, and (iv) elastic hypo-plastic behaviour. The numerical analysis was carried out via the Matlab program, and the results were discussed in terms of displacement, forces, load path, dissipation energy, and yielding surface.

Keywords: Soil structure interaction, fixed base, linearly elastic, elastic perfectly plastic, elastic hypo-plastic, displacement, yielding surface