THE EFFECT OF SOIL PERMEABILITY ON THE LIQUFACATION BEHAVIOR OF SAND SUBJECTED TO CYCLIC LOADING

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ABSTRACT

Liquefaction is accompanied by large lateral displacement, increasing excess pore water pressure and noticeable strains in soils. Soil excitation due to external loading is as vital parameter as soil inherent characteristics in the liquefaction. In order to investigate the effect of soil permeability in conjunction with loading parameters on the liquefaction occurrence in sandy soils, a numerical parametric study has been done. It is shown that soil permeability and the amplitude of cyclic acceleration are main component on the liquefaction, while the number of cycles has no effect.

INTRODUCTION

Liquefaction is one of the most complicated issues that earthquake and soil parameters play key role in its occurrence and devastating consequences of this phenomenon. Peak ground acceleration and the numbers of cycles of an earthquake record are main parameters of proposed analytical approaches in the literature to investigate the probability of soil liquefaction, when the soil is in the range of liquefiable soils (Kramer and Elgamal, 2001). On the other hand, to study the liquefaction, soil permeability is one of the substantial characteristics that should be taken into consideration. Comprehensive previous numerical studies related to the effect of permeability on the soil liquefaction have been described by Rahmani et al. (2012). The ongoing challenge in numerical modelling of soil liquefaction numerically is adopting approprite soil model as asserted by Cheng et al. (2007).

In this paper, numerical procedures have been implemented to investigate the influence of soil permeability in conjunction with loading parameters such as number of cycles and load amplitude on the liquefaction potential of sandy soils using the Finite Element software OpenSees (Mazzoni et al., 2006).

NUMERICAL MODELLING

The numerical 2D-model has consisted of a 10 m column of sand that can be capable of moving horizontally and vertically . The sand column was restrained at the base in every direction that is subjected to cyclic load (Figure 1). Besides, to consider the effect of the amplitude and number of cycles of sinusoidal