International Congress on Engineering Science and Sustainable Urban Development
Denmark – Copenhagen
September, 2018

Rocking Vibration of a Foundation on Elastic Soil Based on In-situ Tests and Experimental Results

Amirmohammad Ardalan Khalesi[1], Hossein Ajilchi Mashhad[2], Ali Ahmadi[3*]

1. Toos Institute of Higher Education, Mashhad, Iran, A.ardalan.khalesi94@gmail.com

2. Toos Institute of Higher Education, Mashhad, Iran, Hosseinajilchimashad@gmail.com

3. * PhD Candidate in Geotechnical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran, Ali.ahm001@yahoo.com

Abstract

A number of methods are available to assess the vibration of dynamically loaded single foundations. In this paper, several new relationships are presented to calculate a footing rotation under dynamic moment. Each formula describes the rotation of a foundation owing to rocking vibration, using variables that have been obtained by some in-situ tests and experimental results. For this purpose, an investigate has been performed to discover a correlation between a set of soil features and vibrating rotation of a rigid footing located on the ground surface. This parameter implies the vibration amplitude of a foundation rotation and it has an analytical solution, if the shear strain due to the dynamic loads is low and less than threshold strain, *i.e.* 0.001%. In this case, the magnitude of a soil stiffness equals the maximum shear modulus and the soil behaves as an elastic medium. Therefore, new formulas can be generated by exerting the results of field investigation and experimental low-strain tests into the vibration theories published by previous authors. Access to such relationships is the novelty of current paper. The achieved formulas denote that there is a suitable accordance between the analytical consequences and the results based on experimental and in-situ measurements. Hence, they can be employed to determine the rocking vibration amplitude of a single foundation which is located on a homogeneous layer of elastic soil.

Key words: Single foundation, Rocking vibration, Rotation, Soil stiffness, Elastic soil, Experimental results, In-situ tests

1. Introduction

In general, acceptable design of foundations for vibrating problems is attributed to displacement considerations. Displacement owing to vibratory loading can be classified under two main parts: (a) temporary displacement because of elastic response of the soil-foundation system to the vibrating loading, and (b) permanent displacement resulted from