



The Effect of Vertical Loads and the Pile Shape on Pile Group Response under Lateral Two-Way Cyclic Loading

Aseel K. Mahmood ^a, Jasim M. Abbas ^{b*}

^a M.Sc. Student, College of Engineering, University of Diyala, Baqubah, Daiyla, Iraq.

^b Assistant Prof, College of Engineering, University of Diyala, Baqubah, Daiyla, Iraq.

Received 26 July 2019; Accepted 13 October 2019

Abstract

This paper is presented the lateral dynamic response of pile groups embedded in dry sand under influence of vertical loads and the pile shape in-group, which are subjected to the lateral two-way cyclic loads. The laboratory typical tests with pile groups (2×1) have an aluminum-pipe (i.e. circular, square) pile, embedded length to diameter of pile ratio ($L/D=40$) and spacing to diameter ratio (S/D) of 3, 5, 7 and 9 are used with different cyclic-load ratio (CLR) 0.4, 0.6 and 0.8. The experimental results are revealed that both the vertical and lateral pile capacity and displacement is significantly affected by the cyclic-loading factors i.e. (number of cycles, cyclic load ratio, and shape of pile). In this study, important design references are presented. Which are explained that the response of the pile groups under cyclic lateral loading are clear affected by the attendance of vertical load and pile shape. Where, it is reduction the lateral displacement of group piles head and increase lateral capacity about (50) % compared without vertical loads. On the other side, the pile shape is a well affected to the pile response where the level of decline in lateral displacement at the pile groups head in the square pile is more than circular pile about 20 % at the same load intensity.

Keywords: Pile Groups; Cyclic Load; Combined Load; Shape Influence; Spacing; Configuration.

1. Introduction

Large structures, for example offshore platforms, high-rise buildings, bridges, wind turbine foundations and railway embankments is resting on compressible soil and supporting by piles foundation. Apart from the usual loads applied by these structures, the piles are subjected to vertical, lateral, and torsional types of cyclic loading arising from the actions of waves, ship impacts, and moving vehicles [1]. Such cyclic loads on piles led to the reversal of stresses in the adjacent soils, initiating progressive degradation in strength and stiffness that, in turn, caused decline in pile capacity with large irreversible deformation that leads to unsuccessful consequences in significant situations [2]. The main reasons that identify the soil dilapidation are gradual rearrangement particles in the immediate adjacent of the pile surface. In the past, significant donations were prepared to the analysis of the single pile and pile groups in different kinds of soil, under lateral cyclic load, including experimental studies [3-7]. Also theoretical approaches [8-12]. In addition, below some of the latest studies of the lateral loads.

The behavior of pile under lateral combined load embedded in sand and clay soil was studied by using finite element. it was explained that the axial load was effected on the lateral response behavior [13].

Single aluminum pile models with different slenderness ratio and two-shape (i.e. circular and square) embedded in

* Corresponding author: jasimalshamary@yahoo.com



<http://dx.doi.org/10.28991/cej-2019-03091418>



© 2019 by the authors. Licensee C.E.J, Tehran, Iran. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).