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Assessment of Parameters Effecting Stability of Secant piles wall Using Plaxis 3D

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Abstract

Secant piles wall is one of the suitable methods of wall construction, when deep vertical excavations are involved; is cast in situ before excavation is carried out. Technical and economical advantageous are considered for this technique. These piles are constructed in various forms, of them is secant form. In this paper, initially the stress and moment generated along the length and interface of soil-pile and being placed close to each other are presented. In continuation, parametric study of parameters effecting on behaviour of secant piles using Plaxis 3D Foundation software (Ver. 1.5) is conducted subsequently. Obtained results reveal the following points: Use of secant piles around trench specially with increasing internal friction angle (φ) cause reduction of displacements. Variation of displacements obey a constant trend, when value of φ≥40. Increase of value of parameters such as embedded depth (with lateral rigidity factor>0.01) and diameter of secant piles will result into reduction of their displacements. Value of piles spacing (s) increase with respect to their diameter (D) till value of s= 2.5D and then turn up to decreasing trend and finally reaches a constant value at s≥8D.

Keywords: Secant piles, model geometry, piles pattern and interface, lateral rigidity factor

1. INTRODUCTION

Increase of tall structures construction has led severe problems for sides of deep vertical excavation of soil in the vicinity of these buildings. This caused civil engineers with progress of growing technology to explore effective and economical strategies to solve this problem. Among different types of soil retaining options, retaining walls is considered as primary option for engineers of different types of retaining wall that can be used on sides of pit, one of the suitable methods for pits sides in terms of construction time and unique efficient features, is retaining pile wall as used tangential (if water proofing is needed) or close to each other (in absence of pore water pressure). The reason for using them is to increase stability of the soil.

2. INPUT DATA AND GEOMETRIC DIMENDIONS

The input data used in a paper presented by Kayalar et..al. (2009)[1] is used in model analysis of present research paper. System studied in the present study includes seven main parts and five rigid walls. Two piles of aluminium tube have been modelled in uniform non-cohesive soil. Material properties and geometric dimensions of the model components are present in table 1 and figure 1.

Figure 1, shows Three-dimensional finite element model components made in PLAXIS. In order to simulate boundary conditions, in the middle of the tank, fixity line is created in middle of plane. Lateral distributed loading has imposed to soil medium.