Numerical investigation on stabilization of excavation using the combination of nailing and anchorage systems

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Abstract

These days by the great increase in urban development, large and small pit makings are more common, but unfortunately some minor or major destructions are seen in the walls of the pits or the surrounding structures and buildings. These accidents necessitate applying a proper method and detailed planning. There are different methods of stabilization of the pits like nailing and using anchors. In this article, after a short review on both of them, they are combined together with different arrangements, then they are modeled in the Plaxis software. Finally, the results of vertical and horizontal displacements in the combinatory method are explained and examined.

Keywords: excavation, nailing method, anchorage method, the combinatory method, optimization.

1. INTRODUCTION

At the present one of the important and greatest concerns in urban constructions includes the security and protecting the adjacent buildings next to the excavation sites. If the necessary appliances or procedures are not used or considered in protecting the excavation and the adjacent structures, then irreparable losses will arise, such as the reduction of loading capacity, great subsidence and the deformation. In order to prevent such problems it is needed to provide a secure and stable condition for protecting the adjacent construction, first .The nailing method has remarkable advantages. With its performance rapidity, reasonable costs, quick and easy adaptability with the conditions in different sites, no need to heavy machineries, this is one of the stabilizing methods. Among the other methods of stabilizing of the earth wall is using the stabilizing method with anchorage. The procedure which has been focused in recent years for stabilizing trenches and deep walls is the combinatory method of nailing and anchorage procedures. This combinatory method is a new one in which, both nailing and anchorage are contemporary applied in the excavation walls. By using this method a greater safety factor is obtained, less deformation and displacement are seen, as the resultant stresses that cause the collapse of the excavation, are braced by the combinatory method and it leads to more stabilizing the excavation wall. In the present article, after a brief description about the two methods of nailing and anchorage, their combination is presented. Then its optimization such as the combination arrangement of the anchors, the angle of the nails, etc. are discussed.

2. NAILING METHODS

Soil nailing is an effective and practical means for stabilization slopes and supporting excavations. It has been used extensively in slop improvement works in in Hong Kong since the mid-1990s.[1]
Soil nailing has been proved to be a versatile and cost effective technique in the stabilization of slop and earth retaining structures.[2]
The drilled length is the length of the nail drill hole. The soil nail length is the grouted tendon length, and the tendon length is the total length of the soil nail tendon.