;;JUNCER'FAINTIES IN THE PERFORMANCE OF FLIGHT AUGER BORED PILES

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ABST~CT .

'Flight auger bored piles are formed by a continuous flight auger into the ground, and.pumping cement/sand, i'grout or concrete down the hollow stem of the auger as its withdrawn. Four loading tests on concrete piles ''are described. The stability plot method is used to drive the shaft friction and end bearing load components of the pile capacity. This paper outlines features of crucial construction factors that affect the geotechnical

.' capacity of this type of piles. These factors include, vertical speed of auger during boring, grout factor, grout pressure, number of reborings; type of material, and slump of concrete used to form the piles. Two of these factors are highlighted inthis paper. It was found that, shaft resistance is independent of grout factor, whilst point resistance increases as grout factor increases. Nevertheless the engineer should decide the safe pile load associated With the most 'economical grout factor. High vertical speed of auger during boring of piles may cause disaster for the adjacent buildings, due to soil decompression.

INTRODUCTION

The technique of continuous flight auger bored piles has been evolved in the late 194Os, and becomes wide spreed all over'the world since 1973.

These piles are formed by boring' a continuous flight auger 'Into'<the ground down to the required depth, foIlClwedu-bY'puinping down cement / sand grout or

encrete 'through: a hollow stem of the -auger as it is withdrown. During drilling the auger is advanced, usually, at a steady rate without over loading the power source unless hard soils are encountered. On reaching the required depth, of the pile, the auger is raised up to a certain distance to blown of the stopper in the discharge outlet, this distance is rebored after filling with grout. Sometimes carbide cutting teeth are incorporated to the bottom end of the auger 'to 'facilitate the advance of the auger through hard soils. Thus it is clear that the success of auger cast piling method depends, uniquely, 'on the operator skill. The method-has the advantageous of using

a compacted, - and 'easy to mobilize machinary, less workers; fast performance and vibrationless. But on the other>handthe method has disadvantegeous as it is sensitive to operator control during all different phases of pile Construction. 'Also the auger can not proceed, easily, through filling layers containing boulders of size larger than 'about a third of the diameter of the auger, so the locations' of the piles need to predrilled by percussion, to break off the boulders into small fragments. The method-becomes drastic,' from economical point of view, if the soil formation contains gallaries, caves, and voids. As an example, it was happend once that the engineer pumped

23 cubic meters of concrete to form a pile of 13 m length and 600 mm in diameter, which confirms, without any, doubt that the auger goes into a gallory or cave such an unanticipated problems which can arise during construction, cause dispute between engineer, contractor, and owner.

The technique for predicting pile capacity has received a great deal of the attention in the past, and with some success, According to this technique, the geotechnical ultimate load of completed pile is usually calculated as the sum of shaft friction and end bearing load components as;

$$P_u = f_s \quad A_s \ + \ q_b \ A_b \qquad (1)$$

r=L

$$P_u = E \ U'ot \ As \ ks \ tank \ S + Ab \ N_q \ U'ot \qquad (2)$$

1=0

where;

As; Ab are the surface area of shaft and the .base area of pile.

u'o/' u'ol are the vertical effective stress at depth I

and pile base; ,

N_q Bearing capacity factor;

k, lateral coefficient of earth pressure,

{, Angle of wall friction.

The persistent uncertainties in the above equation are in the effect of pile installation on the factor N s , the value of k, tan {, and the distribution of vertical effective stress *a' 01* along the pile shaft. The factor N_q depends upon