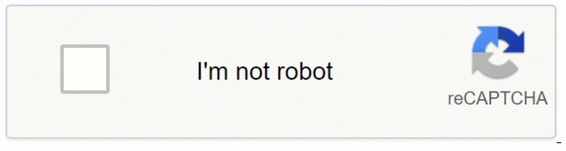

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Methods of determining bearing capacity of soil pdf

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COHESIONLESS SOIL PROPERTIES IMPROVEMENT USING BENTONITE

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ABSTRACT

Construction of building structures on very weak or soft soil is considered as unstable and unsafe. Improvement of the soil strength may be tackled by different subgrade improvement methods or techniques; bentonite has been selected as the binding material which was used in the enhancement of the soil randomly at five different bentonite content, i.e. 3 %, 6 %, 9 %, 12% and 15% by weight of soil. The task of the present work is the strengthening or improvement of cohesionless soil engineering properties by using bentonite. The selected improved soil properties are maximum dry unit weight and shear strength which affects the bearing capacity of structure foundations and their stability. After improvement, cohesionless has gain some apparent cohesion by rearrangement of soil grains and decrease the voids between the grain and increase the density by adding fine grains and then the required properties can be improved. The soil grain size distribution and the unified soil classification system are used to distinguish the soil sample. The tested soil is classified or named as (sandy poorly graded) in this work. The experimental program consists of standard Proctor tests, and direct shear tests which were conducted on the cohesionless soil-bentonite mixtures to study their properties. Based on the result obtained, the short coming of this treatment is the increasing in maximum dry density and shear strength with acceptable amount. It is found that the 9 % of bentonite content is the optimum value which gives the better results obtained in this study.

Keywords: Bentonite, cohesionless, experimental, soil improvement.

1. INTRODUCTION

Civil engineering building constructions in the site with weak or soft soils are one of the major common problems that face the engineer. The stabilization soil means the development or improvement of one or more engineering properties of soils, through mechanical or chemical process or means, to enhance the engineering soil as a material to give the required properties. Soils are stabilized to enlarge strength and durability or to prevent erosion, generation of dust, and reduce volume changes. In spite of the reason to carry soil stabilization, the required result is the development of a soil material that will remain stable under the design use condition for the expected project design life [Highway Design manual (1990)].

Civil or geotechnical engineers are main persons who are responsible for specifying or selecting the correct soil improvement method or technique, and amount of added improvement materials. The major part for the success in soil improvement or stabilization is soil testing procedure. The selected method or technique for soil improvement must be checked or verified through laboratory soil testing before the start of construction and preferably before choosing suitable materials. [Highway Design manual (1990)].

Generally the precautions taken in this field may be divided into:

a) By-pass the site.
b) Soil replacement.

The high cost of soil replacement has lead or driven engineers to search for other methods, and the process of soil stabilization is one of these alternative methods.

In past years, different advanced scientific techniques have been used to improve or stabilize soil. The soil improvements techniques are sometimes use the additives such as cement, lime or industrial products for soil stabilization. Previous research studies investigated the improvement or stabilization of soils using additives [Basha, *et al.*, (2005)]. Improvement of pavement subgrade has previously depend on soil treatment with, special additives such as pozzolanic materials and lime and cement. Pozzolanic waste materials such as Fly Ash, Silica Fume and Rice Husk Ash, were used previously in the research of Yoder and Witczak, (1975) for soil improvement. And many other substances may be used for stabilization such as emulsified asphalt and tire chip and others.

Sand or clay sometimes is added to treat the lack of grading of a soil. Sand may be added as improvement to clayey soils and clay to sandy soils. The engineering properties such as the sandy soil strength and cohesion are increased through adding clay. While moisture transition or movement in clayey soil is minimized when sand is added. The improvement of soil material grading will not strength or stabilize the soil well, but will reduce the effect of other stabilizers. The clayey soil must be smashed or pulverized before mixing with the sandy soil, [Highway design manual 1990)]. The cohesionless or sandy soil can gain some cohesion strength through the rearrangement or redistribution of grains or particles in soil and minimize or decrease the voids between them through using fine particles between them. Also, this will decrease voids and

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Assessment of SPT-based methods of pile bearing capacity-Analysis of a database

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ABSTRACT: It is nowadays recognised the *in-situ* tests–based methods are the most appropriate to predict pile foundations bearing capacity. In foundation design codes as well as in the literature are prescribed several SPT-based design methods, most of them being empirical. The paper presents a database consisting of 46 axial pile loading tests carried out in 27 sites in the United Arab Emirates with comprehensive geotechnical data. The piles are bored in slightly silty sandy soils. An evaluation of some currently used methods for the calculation of pile bearing capacity in sandy soils on the basis of SPT test was made. Comparison of predicted values to the ones experimentally derived from pile tests has led to rank these approaches with respect to their predictive capability for the bearing capacity of bored piles in sand.

1 INTRODUCTION

The *in-situ* tests are nowadays widely used in geotechnical projects to characterise soil materials. They are faster and cheaper than those carried out in laboratory and do not necessitate any sampling. Standard Penetration Test (SPT) is appropriate to estimate the resistance and density of sandy media and is largely practised in the Arabian gulf region within the scope of foundation projects. It should be however mentioned that the diversity of empirical interpretations of SPT and the dependence of this latter on the test procedure and the device features are source of uncertainties and discrepancies between methods aimed to evaluate bearing capacity and settlement of foundations.

These uncertainties in geotechnical pile design, notably within the scope of big sized projects, often lead to carry out static pile loading tests in order to experimentally determine pile bearing capacity and settlements as well.

Although the SPT-based pile design literature is wealthy one needs to be aware of local geotechnical conditions from which several empirical formulas were derived. Caution is then necessary when using any SPT-based method.

Several studies on pile tests databases were undertaken to empirically derive methods of pile design (Meyerhof 1956, Robert,1997) or to assess existing methods (Briaud and Tucker 1988, Bustamante et Al 1991).

This paper is aimed to present the results of an evaluation study of bored piles behaviour in relation with local geotechnical conditions in the U.A.E. The quality of prediction of ten commonly used design methods is assessed through a database including 27 silty sandy sites and 46 static pile loading tests.

2 FEATURES OF THE DATABASE

2.1 *Pile loading test*

Piles studied are usually cast in-situ bored with either casing method (for large diameter piles) or continuous flying auger method (for medium diameter piles in stable soils). Slurry products like bentonite are sometimes used for maintaining the borehole of pile.

Piles subjected to axial loading test are usually non-instrumented by strain gauges or sliding extensometers. They are simply connected at the top with four dial gauges, with a usual sensitivity of 0.01 mm for the settlement reading. The load is usually applied in increments by a hydraulic jack and pump assembly fitted with pressure gauge, against weighted platform. The testing programme consists of two cycles of loading. One up to the working load (design load) and the other one up to 1.5 to 2.0 times the working load. Each load increment is usually maintained until the rate of settlement is less than 0.25 mm/hour.

Pile diameter B ranges between 0.45 and 1.10 m. The slenderness ratio D/B (Length/Diameter) varies from 10 to 36.7. Pile concrete compressive strength usually ranges between 20 and 40 MPa.

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Bearing capacity analysis of helical pile foundation on peat

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Abstract. Peat is a kind of soil with a very low bearing capacity and high compressibility. Generally, a building construction on peat is done by using a wooden pile foundation. However, the length of the wooden piles is sometimes limited and causes the friction strength between the soil and wooden piles to became suboptimal. In order to enhance the bearing capacity of the foundation, the cross-sectional area of the foundation needs to be enlarged. One of the solutions for this problem is through helical piles. There are two methods to determine the helical pile's bearing capacity, i.e. individual bearing and cylindrical shear methods. In this paper, bearing capacity prediction was discussed. A foundation load test was thoroughly done by a constant rate of penetration. This test consisted of compression and tension tests. The result was analyzed by individual bearing and cylindrical shear methods and next compared to each other. The result of the analysis has shown that the individual bearing method was more suitable in predicting helical piles' bearing capacity since it produced the lowest error rate, with a magnitude of 21,31%.
Keywords: helical pile foundation, peat, individual bearing and cylindrical shear method

1 Introduction

The texture of peat is dominated by voids and large amounts of water. This condition causes great compressibility. Due to the high-water content, peat can be categorized as very soft soil with a very low bearing capacity.

In order to overcome these problems, lightweight building constructions on peat are generally done either by wooden piles or conventional piles. To keep it economical, pile foundations were embedded without reaching the bed rock layer. Hence, the compressive bearing capacity of the foundations rely on the friction between the soil layer and foundations, which make the foundation's bearing capacity not optimal. One of the ways to enhance the foundation's bearing capacity is by enlarging the cross-sectional area of foundations, using helical plate installation on the edge of pile foundations.

There is still a lack of information and research about the utilization of helical pile foundations on peat. There are two methods to calculate the bearing capacity of helical pile

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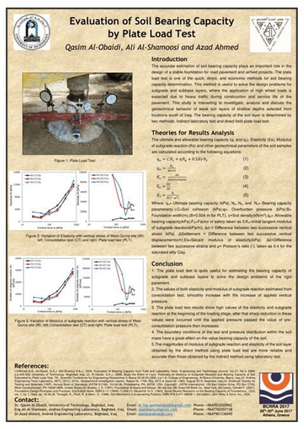
Test No.	Pile test #1		Pile test #2		Pile test #3		Pile test #4	
Metod	Qult (kN)	F.S.	Qult (kN)	F.S.	Qult (kN)	F.S.	Qult (kN)	F.S.
Egyptian Code settlement	2769.53	2.77	2551.3	2.55	2843.48	2.84	3008.35	3.01
Tangent	3450	3.45	3000	3.00	3200	3.20	2750	2.75
Hansen (1963)	3726.78	3.73	5423.26	5.42	2635.23	2.64	9805.81	9.81
Chin (1970)	6313.3	6.31	6127.45	6.13	5995.2	6.00	5341.88	5.34
Decourt's (1999)	3030	3.03	3320	3.32	3800	3.80	1850	1.85
Proposed Method by the author at Ep = 19677.40	2253.88	225	2213.155	2.22	2259.24	2.26	619.571	0.62



Methods of determining bearing capacity of soil pdf. How is soil bearing capacity determined. How do you determine soil load bearing capacity. Bearing capacity of soil methods. How do you measure soil bearing capacity. Methods of determining bearing capacity of soil ppt. Analytical methods of determining bearing capacity of soil.

It is further driven through 30 cm and the number of shots needed for this Ã¨ counted. The Ã method is only useful when you encounter a better pad layer at greater depth .Ã #2. In this article, we are going deep dive into ciÃ² which¨ the capacity and how to improve it in order to build a safe structure on the ground. This number of hits Ã¨ is called penetration resistance N. To support the sides of the hole, a casing or a drilling mud must be used. Capacity estimation methods safe carrier The capacity the ground carrier may be determined by the following methods: Methods of analysis involving use soil parameters Plate load test in ground penetration test Assumed capacity values methods to determine the load capacity Several analytical methods to determine the load capacity of the final ground load rating. Capacity end carrier (qf) The final ground carrier¨ defined as the minimum gross pressure at the base of the foundation where the soil cannot shear. The term capacity bodywork is defined after adding some qualifying prefixes as follows : 1. Replace poor soil Replace poor quality soil management¨ one of the corrective measures to improve the to bear. When the vibroflot sinks, the clean sand is added to a crater that develops on the surface. The cone is carried to the end lower of a steel bar passing through a steel tube (mantle) with an external diameter equal to the base of the cone. Ground voids are very small, resulting in reduced settlements. The capacity of the soil can be improved in many ways Sometimes, the pressure of safety of the ground¨ so low that the size of the feet turns out to be very large and uneconomical. conducting the feasibility study the soil characteristics if the soil on which Ã¨ able to carry its load. CiÃ² leads to an increase in the soil load-bearing value. These methods use two important soil cutting parameters: (i) Inner friction angle Ã and (ii) cohesion c. The sampler is first passed for 15 cm as a seating control. The capacity value soil carrier used to design the foundation (i.e. to determine the size of the foundations) Ã is determined on the basis of the two above criteria. #3. Land drainage Ã a well-known fact that the presence of water decreases the load-bearing power of the soil, especially when Ã is saturated. A large area can be covered by this process, without the help of sophisticated vibrating equipment. ASSUMED CAPACITY BUILDING CODE BEARING For the design of foundations of lightweight structures and for preliminary design of any structure, presumed capacity may be used of safe bearing. These parameters shall be determined in a laboratory by cutting tests on soil samples (preferably undisturbed samples) taken from drills or test pits. Capacity safe bearing (qs) The maximum pressure that the ground can safely withstand without the risk of failure Ã¨ called capacity of safe bearing. In such a situation, it becomes essential to improve the safety carrier pressure, which can be done with the following methods Increase depth Foundation Compaction of soil Drainage of soil Confinement of soil Replacement of poor soil Chemical treatment of Grouting. This tendency to lateral movement can be verified by confining the ground, outside the perimeter of the foundation zone, by the operation of sheetmetal poles, thus forming an enclosure and confining the ground. A heavy cylinder, known as vibroflot Ã¨ inserted into the ground (ground) etneugesnoc etneugesnoc noc ,atlam al noc itipmeir ¬Ãsoc onos itarts ilged erussef el e itouv i ,eperc eL .etnator ocirtnecce osep nu id asuac a arbiv ordnilic li increase in bearing value. Dutch cone test This test is used to obtain a continuous record of the resistance of the soil by constantly penetrating under static pressure a cone with a base of 10 cm2 (3.6 cm in diameter) and an angle of 60 Â° at the apex. Compaction by preparing this method Ã¨ useful when the foot Ã¨ is based on clay soils that cause long-term settlements. Chemical treatment. # 1. Sometimes the pressure of the safe bearing of the land Ã¨ low due to the resulting settlements due to the lateral movement of the loose granular soil. The drainage results in a decrease in the Voids ratio and an improvement in bearing power. A water jet at the tip of the vibroflot provides a large amount of water pressure water. Therefore, if D Ã¨ the depth of the footing qn = Q-Î³D where Y Ã¨ the weight of the above the contamination level. Ã # 4. Ã equal to the capacity net of safe bearings plus¹ the original overload pressure Ã qsÃ¢ = qns + Î³ d = (qnf / f) + Î³ d at times, the capacity of the safe bearing is also indicated as the maximum capacity of QF bearing divided by a Safety Factor F. 2. With Nick Ã Â· 18 May 2021 The capacity ground floor space¨ a term frequently heard in civil and geotechnical engineering. Maximum capacity of QF Ã ground bearing and capacity of the net bearing QNF Ã¨ evidently linked by the relationship QF = QNF + Î³ D 5. # 7. However, this is not cheap since the cost of construction increases with depth. Authors have an experience improving the power of desert land bearing with this method in many locations where Ã was required to support heavy loads. This method is very useful in sandy soils or soft soils. # 5. This Ã¨ due to the low pivoting strength of the ground in the presence excess water. In addition, the load on the Foundation also increases with an increase in depth. Net Ultimate Capacity of bearings (QNF) Ã the the minimum net pressure causing failure when cutting the soil. The ground of the Ã¨ foundation is moistened and then compacted The help of markers or mechanical vibrators. The heavy vibrating rollers and compactors can compact a layer of granular soil to a depth of 1-3 m. The loose or marshy soil can be removed and replaced by good compacting materials such as filling sand or soils Murrums.ã, # 6. and internal diameter of 35 mm two commonly used penetration tests are the standard penetration test of the Dutch cone. Standard penetration test The test (IS: 2131-1981) is performed in a clean hole, of a diameter between 55 and 150 mm. The chemical should have properties to make solid soil and help get an early strength. The resistors are empirically related to some engineering soil properties, such as the density index, bearing capacity, etc. 6. A plastic balance status is reached below the level. Types of capacity of soil bearing (kg / m2) bearing capacity (kn / m2) soft clay, wet or muddy 5000 50 springs clay 10000 100 fine sand, loose and dry 10000 100 black cotton soil 15000 150 damp clay and sand - clay mixture 15000 150 sciolta gravel 250 clay 25000 250 medium sand, compact and dry 25000 250 compact clay 45000 450 compact sand 45000 450 compact gravel 45000 450 soft rocks 45000 450 Rocks laminated as sandstone and limestone 165000 1650 Rocks hard as granite, diorite, p 330000 3300 What are the methods to improve soil support capacity? The holes in sufficient numbers are pushed into the ground and the cement mortar is forced through these under pressure. The conclusion, in this post above we discussed in detail on the load capacity of the soil and several tests to determine the value of the load capacity of the soil and various methods to improve it. The chemical must be such as to solidify and acquire an early force. There conical q. 4. Plate load test The loading test on the plate is a practical test to determine the final load capacity of the soil and the probable settlement below Load given. Net safety capacity (QNS) The net safety capacity is the net net load capacity divided by a safety factor F: qnsÃ = qns / f ã, 6. In this method, some chemicals are grounded Instead of cement mortar. To find out the resistance of the cone, the only cone is first forced down for a distance of 8 cm and the maximum resistance value is recorded. Compacting of rubble in the ground A layer of 30-45 cm thickness of well-calibrated rubble is spread over the level of foundation and well spurred. The method is very effective in improving the safe endurance pressure of the dunari sands, which otherwise cannot be effectively compacted. Of the various theories developed, only two are briefly given here: i) analysis of rankineÃ ¢ â € ™ and ii) analysis of terzagosÃ ¢ â € ™. The method is very useful when the foundation is needed to support heavy loads scattered on a larger area. Soil compaction can be effectively obtained with the following means :. These tubes are then gradually removed, filling and spinning the sand in the hole, with a consequent formation of sandstones. When the load on the foot increases and approaches a QNF value. The foundation must be designed to satisfy two essential conditions: it must have a certain specific security against the final failure. The assay of the cone is considered very useful for determining the capacity of detection of the ground being in soils without cohesion, particularly in the fine density sands. A thick wall with divided tube sampler, external diameter of 50.8 mm. Settlements under workloads should not exceed the eligible limits for the superstructure. Connect the ground. The minimum sampler opening length must be 60 cm. This translates into the compaction of the land Among the adjacent tubes. It is led into the uninterrupted soil on the bottom of the hole under the shots of 65 kg driving weight with 75 cm of free fall. Admissible load pressure (QA) is the net load intensity to which which one the soil has no shears or there is an excessive settlement harmful to the structure in question. After flooding the ground, so that the penetration of the humidity whether of at least 1-2 m, shape vibrators or platform vibrators (about 1 m X 1,5 m base surface, with a pair of engines with eccentric load) can be slipped on the sand surface with the help of two workers. Grouting This method is useful in loose gravel and slatted rock layers. Compaction of the soil It is found that compaction of natural (loose) or man-made deposits of the soil leads to improvement of the capacity and the reduction of the resulting settlements. Intensity of gross pressure (q) The of gross pressure q Ã¨ the total pressure at the base of the foot due to the weight of the superstructure, the weight of the foot itself and the weight of any earth filling. The cone or tube, or both together, can be forced into the ground by means of a jack. PENETRATION TESTS These tests involve the measurement of the resistance to penetration of a sampling spoon, cone or other tool shaped under dynamic or static loads. RankineÃ ④ Â Às Depth Calculation Formula minimum size of the Ã¨ foundation expressed by. (kg/emÃ ¨ ÂÂ) Ã¨ approximately 5-10 times the resistance to penetration N. Hollow tubes are conducted in the ground at close intervals. The test consists essentially of loading a rigid plate (usually of steel) at the foundation level and determining the sediments corresponding to each load increment. Intensity pressure (qn) It is defined as the excess pressure or the difference in intensity the gross pressure after construction of the structure and the original overload pressure. In general, the support power of a soil or rock Ã¨ as capacity support. The permissible load pressure thus depends on both the ground and the type of building concerned and Ã¨ generally lower, and never higher, than safety Capacity soil. 3. The alleged safe bearings of various types of land are given in the table given by the national building code. Rankinit's analysis ranking it considered the equilibrium of two soil elements, one immediately below the foundation (one element I) and the other just beyond the edge of the foot (element II), but adjacent to element I. the pressure of very loose bearings can be increased by flooding the ground. Depth minimum foundation Dmin = P / W (1-Sin Ã | / 1 + Sin Ã |) 2 where P = Capacity of the gross bearing W = Density ground level Ã | = Response angle of the Terzaghi soil analysis an analysis of the conditions of the complete capacity failure of the bearing, usually defined as the general cutting failure Ã¨ was carried out by Terzaghi assuming that the soil behaves like an ideally plastic material. 7. Pre-loading results in accelerated consolidation, so that settlements are achieved well before the real foot is put. The steel tube is then pushed already¹ to the cone, and both together are further penetrated through a depth 20 cm to give the total resistance of the cone and resistance to the air through the tube. Chemical treatment The chemical treatment of the soil is a process of stucking certain chemicals to the ground instead of the concrete mortar. Tags: soil flow If the flood method and therefore vibration is used, the sandy soil can be very effectively compacted, resulting in increased safe bearing power and decreased settlements when the super structure loads are on the ground. The load used for this process is removed before the foot is built. Increase depth foundation was found that in granular terrain, the capacity Bearing increases with the depth due to the border weight of the overlying material. It is a commercial method that combines the effect of vibrations and jet. NC, NQ, NR: TERZAGHI bearing capacity factors depend on the corner of soil friction, Ã¯ â €. TERZAGHI gave the IL .yllaunam .yllaunam demmar llew dna daerps si elbbur kciht mc 51 fo reyal rehtona)esool yrev si ti nehw yllaicepse(lios eht ni deirub steg elbbur fo reyal siht fI ?yticapaC gniraeB lioS roF tseT ehA tahW tneiciffeoc erusserp evissap=rpK Ã)1- ÂÃ ³ ³ ³ ³ ³ ³ ³ ³ ³ ³ ³ 2soc rpK (Â ht sa nekat neht si yticapac gniraeb etamitlu ehT .gnitoof eht fo htdiw :B ,gnitoof fo htped :D ,lios fo thgiew tinu :ÂTO, lios fo noisehoC :C ,erehW ÂλabN B ÂTO, 3.0 + qN D ÂTO, 3.1 + cN = uQ :sgnitoof ralucriC Â ÃTO, · N B ÂλE³ 4.0 + qN D ÂTTTOTOCY + cN c 3.1 = uQ :sgnitoof erauqS]1.1[ÂTO CYyticapacB sÂTOEoCYoC :eruliaf raehs lacol rof nof itach

Methods in determining the angle of repose. The measured angle of repose may vary with the method used. Tilting box method. This method is appropriate for fine-grained, non-cohesive materials with individual particle size less than 10 mm. The material is placed within a box with a transparent side to observe the granular test material. Bearing capacity equation (undrained) Bearing capacity equation (drained) Factor of safety; The ultimate bearing capacity of a foundation is calculated from an equation that incorporates appropriate soil parameters (e.g. shear strength, unit weight) and details about the size, shape and founding depth of the footing. Terzaghi (1943) stated the ultimate bearing capacity of a ... The soil classification and bearing capacity of the soil must be determined before the foundation is constructed and anchored. The soil classification and bearing capacity must be determined by one or more of the following methods, unless the soil bearing capacity is established as permitted in paragraph (f) of this section: (a) Soil tests. Soil tests that are in accordance with ... SPT Test is most widely used to check various parameters and properties of soil on the construction site.For any building foundation, design and construction soil testing are essential.. The test is extremely useful for determining the bearing capacity, density, and angle of shearing resistance of any soil. It can be used to determine the properties of cohesive and cohesionless ...

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