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Effect of Depth and Shape of Footing on Bearing Capacity of Soil Near Atigre, Kolhapur, Maharashtra

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Abstract*: *The bearing capacity of soil is defined as its capacity to sustain the load coming from from structure without undergoing shear failure of excessive settlement. It is an important property of soil. The bearing capacity of soil near Atigre, Maharashtra is calculated in this paper. The properties of soil have been determined in the field. These properties are used to calculate bearing capacity of soil. For calculating the same Terzaghi's approach has been used.
Keywords: Bearing capacity, soil, Terzaghi, cohesion, building

I. INTRODUCTION

The bearing capacity of soil is defined as its capacity to sustain the load coming from from structure without undergoing shear failure of excessive settlement. The pressure which the soil can easily withstand against load is called allowable bearing pressure. The soil near Atigre, Maharashtra is assessed for design of a two-storied building. Suitable type, shape and depth of footing is suggested in this paper.

II. LITERATURE REVIEW

Many approaches have been presented to calculate bearing capacity of soil. Some of the popular approaches are: Prandtl (1920) (See Murthy, 1990), Terzaghi (1943), Meyerhof (1951) Hansen (1970), Vesic (1973), IS 6403 (1981), Manjunath and Reddy (1997), Hajiani and Hatef (2003) and many more approaches.

Prandtl (1920) presented analytical solution for the bearing capacity of a soil under a limit pressure causing kinematic failure of the weightless infinite half-space underneath. The strength of the half-space is governed by the angle of internal friction, ϕ , and the cohesion, c. Later more rational aprrpach was developed by Terzaghi (1943). Terzaghi (1943P presented bearing capacity for general shear failure and strip footing. Later it was extended for other shapes of footings. IS 6403 (1981) method considers all these shapes, effect of water table on bearing capacity of shallow foundations. IS 6403 (1981) method is used in this analysis.

Manjunath and Reddy (1997) presented effect of depth and water table on bearing capacity of rectangular footing. Manjunath and Reddy (1997) observed that, with increase in depth of foundation, bearing capacity increases. Also, it was observed that, bearing capacity increases with increase in dry density and decrease in optimum moisture content.

Hajiani and Hataf (2003) carried out experimental work and numerical analysis to study the bearing capacity circular footing resting on reinforced sand. The effects of various parameters like depth of reinforcement, reinforcement layer etc. was studied on bearing capacity of the soil.

II. LABORATORY RESULTS

On the sample collected from field, tests were performed and following results were obtained.

A. Unit weight of soil = 17.5 kN/m^3
B. Water content = 15%
C. Specific gravity of soil solids = 2.60
D. Cohesion = 30 kN/m^2
E. Angle of internal friction = 15°

III.THEORETICAL BACKGROUND

Bearing capacity of the soil based on above parameters is calculated by various approaches. In this paper Terzaghi's analysis is used.

The bearing capacity given by Terzaghi (1943) for strip footing is,

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$$q_u = cN_c + qN_q + 0.5\gamma BN_\gamma$$

in which q_u is the ultimate bearing capacity of soil, c is the cohesion of soil, γ is the unit weight of soil, q is the overburden pressure, B is the foundation width, N_c, N_q, N_γ are Terzaghi's bearing capacity factors.

IV. RESULTS AND DISCUSSIONS

The bearing capacity factors N_c, N_q and N_γ are the dimensionless numbers which are dependant on the angle of internal friction. The bearing capacity values calcul;ated by Terzaghis method are tabulated in Table I.

TABLE I
EFFECT OF SHAPE AND DEPTH ON BEARING CAPACITY OF SOIL

Footing	Strip	Square	Circular
2 m depth	656.75	754.2	745.5
3 m depth	786.25	883.7	874.95
4 m depth	915.75	1013.2	1004.45

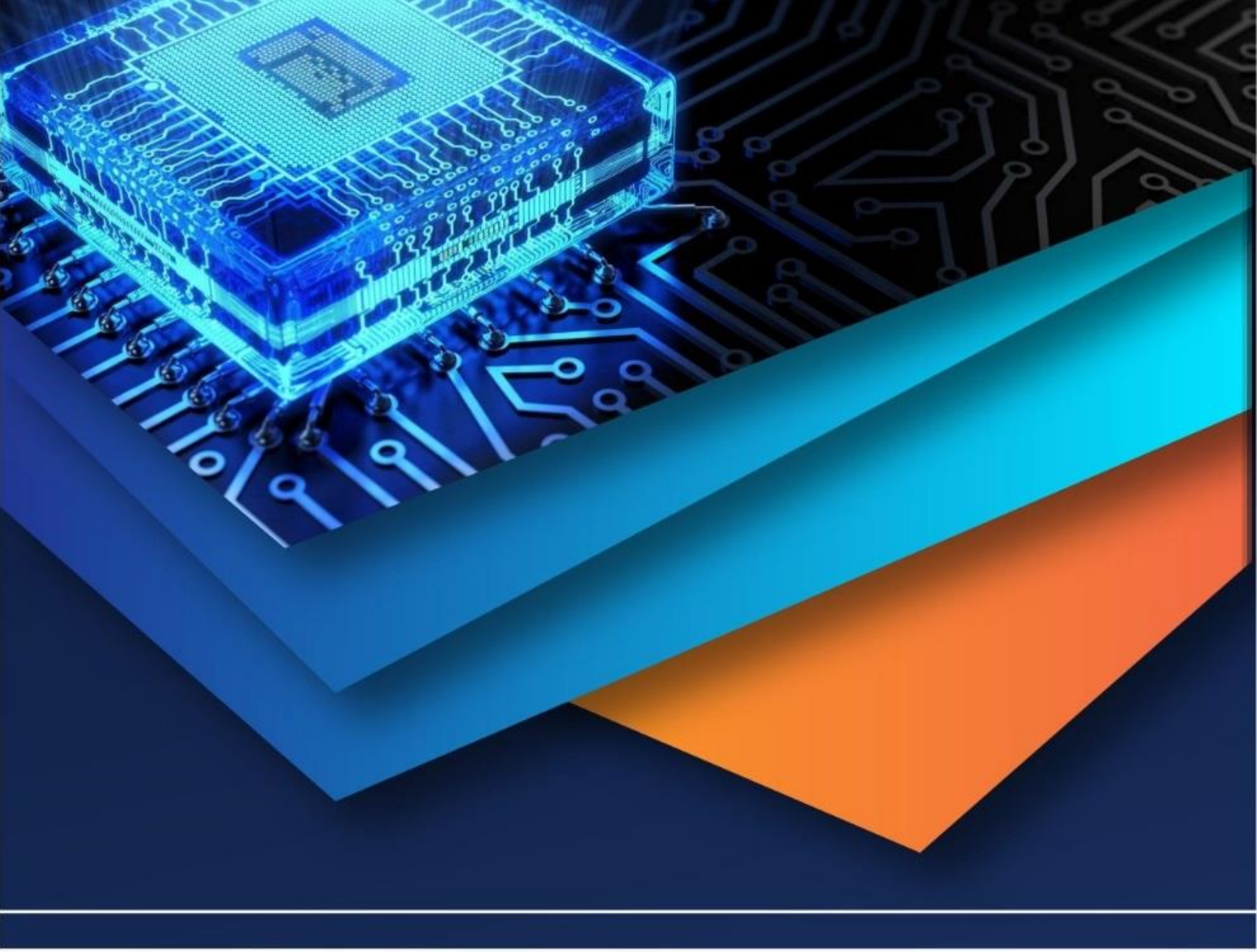
V. CONCLUSION

It is observed that, in Terzaghi'ss theory the bearing capacity, the bearing capacity is found maximum for square footing followed by strip footing. Bearing capacity is least for circular footing. Also, it is observed that, with increase in depth, there is increase in bearing capacity for given type of soil. This is due to fact that, with increase in depth, there is increase in overburden pressure and hence the soil becomes stiffer due to increase in overburden.

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