

Ludhiana Gill Road

April 9, 2015

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA
Accredited by NBA (AICTE), New Delhi (ISO 9001:2000 Certified)
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SOIL INVESTIGATION REPORT

1. **Date of Testing** : 2015-03-04
2. **Type of Structure** : OHSR
3. **Site location** : Latitude : 22 Longitude : 22
4. **Tested in Presence of** : Hitesh
Harry
5. **Seema** : Rajan
6. **Report Prepared by** : Dr. J. N. Jha
Prof. Kulbir Singh Gill
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1 Introduction

The soil investigation for the proposed **Ludhiana Gill Road** had been taken up on request of **Seema , Rajan , Yadvir** . The field soil investigation as per requirements was carried out on **2015-03-04** by testing team of this institution in the presence of **Hitesh & Harry** . Contractor of the concerned department.

The purpose of this soil investigation was to determine the nature of the subsoil stratum and the safe net allowable bearing capacity of the soil.

2 Field Soil Investigation

Standard Penetration Test (S.P.T) was carried out at the proposed site for field soil investigation. The S.P. Test was carried out as per I.S. Code 2131-1981 in the soil deposits at the foundation level or at an interval of 1.5 m or at the location where change of soil strata takes place during the testing process. The samples of the soil both disturbed and tube samples were collected at different depths and were properly sealed in air-tight plastic bags after labelling them carefully to maintain the natural moisture content for laboratory testing.

3 Laboratory Testing

The various samples (disturbed and tube) collected during field soil investigation were tested in the laboratory (as per Standard Methods) for finding.

1. Grain size analysis and wet analysis
2. Atterberg's limits
3. Field moisture content
4. Bulk density
5. Direct/triaxial shear/Unconfined compression tests

4 Safe bearing capacity

As per I.S. Code 6403-1981, the least of the following shall be taken as safe net allowable bearing capacity of the soil.

1. The safe net allowable bearing capacity from shear considerations is obtained by dividing net ultimate bearing capacity by a suitable factor of safety.
2. The safe net allowable bearing pressure that can be imposed on the base of the foundation without the settlement exceeding a permissible value is calculated either from settlement analysis or from the Standard Penetration Test Values(N) whichever is applicable depending upon the nature of sub soil strata.

5 Underground Water Table

The underground (i.e. sub-soil) water was encountered at a depth 3.6 m at the time of field soil investigation.

6 Proposed Structure or Substructure

The substructure i.e. foundation of the proposed OHSR is taken in the form of circular raft of diameter 2.5 to be laid at a depth of m. Thus for calculations of raft foundation following data is considered.

$$\begin{array}{lcl} \text{Depth of foundation} & = & D_f = 2.3 \\ \text{Diameter of circular raft foundation} & = & B = 2.5 \end{array}$$

The data obtained from the field soil investigation and the laboratory tests have been used in the preparation of this report.

7 Bearing Capacity Calculations

7.1 Bearing Capacity Based on Shear Considerations

(As per I.S.Code - 6403:1981)

$$\begin{aligned} \text{Depth of foundation} &= D_f = 2.3 \\ \text{Diameter of circular raft foundation} &= B = 2.5 \end{aligned}$$

The soil properties at the foundation level i.e. at 2.3 m depth are:

$$\begin{aligned} \gamma &= 2.6 \text{ kN/m}^3, & c &= 2.7 \text{ kN/m}^2 \\ \phi &= 2.8^\circ, & \phi' &= 2.9^\circ \end{aligned}$$

Bearing Capacity factors are:

$$N_c' = 3.1, N_q' = 3.2 \quad \text{and} \quad N_{\gamma}' = 3.3$$

Shape factors are:

$$S_c = 1.3, S_q = 1.2, S_{\gamma} = 0.6$$

Depth factors are:

$$d_c = 3.4, d_q = d_{\gamma} = 3.5$$

Water table correction factor, $w' = 3.6$

$$\begin{aligned} \text{Ultimate net bearing capacity, } q_u' &= 0.67 \times 2.7 \times 3.1 \times 1.3 \times 3.4 + 2.6 \times 2.3 \times (1 - 3.2) \times 1.2 \times 3.5 + 0.5 \\ &\times 2.6 \times 2.5 \times 3.3 \times 3.5 \times 0.6 \times 3.6 \\ &= 3.7 = 3.8 \text{ kN/m}^2 \end{aligned}$$

$$\text{Safe net allowable bearing capacity} = q_u'/2.5 = 3.8/2.5 = 3.9 \text{ kN/m}^2$$

8 Bearing Capacity Based on Standard Penetration Test Value

(As per I.S. Code -6403:1981)

Sr No.	Depth(m)	Overburden pressure (kN/m ²)	Correction Factor	Observed Value of N	Corrected Value of N
1	4.4	4.5	4.6	4.7	4.8

$$\begin{aligned} \text{Depth of foundation} &= D_f = 2.3 \\ \text{Diameter of circular raft foundation} &= B = 2.5 \end{aligned}$$

Safe net allowable bearing pressure for

$$B = 2.5, N = 4.0, S = \quad \& w' = 3.6] = 4.2 \text{ kN/m}^2$$

$$\text{Taking least of A \& B the safe net allowable bearing capacity} = \text{nvalue kN/m}^2$$

9 Remarks:

1. The bore hole log showing the nature of sub-soil stratum along with standard penetration test values(N) at different depths & laboratory test results is attached.
2. The safe **net** allowable bearing capacity for circular raft 2.5 m diameter at a depth of 2.3 m from existing surface is 4.0 kN/m²
3. The sub-soil water was encountered at a depth 3.6 m at the time of field soil.

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