REPORT ON SOIL INVESTIGATION FOR CONSTRUCTION OF NURSING HOME AT ADARSH NAGAR, BAREWAL ROAD, LUDHIANA.

1. **INTRODUCTION:**

   The soil investigation for this project was carried out on August 4, 2015 to find out bearing capacity of soil at proposed foundation level. The soil investigation comprised of performing Standard Penetration Test (S.P. Test), collecting soil samples, analyzing them for bearing capacity parameters and then calculating bearing capacity.

2. **FIELD TESTING:**

   At proposed site one (100-150mm) diameter bore hole was drilled for SP Tests using shell and auger method as per IS: 1892-1979.Casing was used to retain bore holes in sandy layers. During drilling operation S P test was performed at regular intervals as per (IS 2131 –1981) to record N values. Standard split spoon sampler attached to lower end of "A" drill rods was driven in bore holes by standard hammer of 63.5 Kg. falling from a height of 75.0cm. The sampler was driven 45.0cm and numbers of blows required for each 15.0cm penetration were recorded. The number of blows for first 15.0cm. penetration were not taken into account. This was considered as seating drive. The numbers of blows for last 30.0cm penetration were designated as "N" value. Also disturbed / undisturbed soil samples were collected for laboratory investigations. The bore hole logs showing N values at different depths are attached.

3. **LABORATORY TESTING:**

The samples collected were tested in laboratory for Soil Classification (Sieve Analysis), Atterberg's Limits (Liquid Limit and Plastic Limit), Shear Parameters, Natural moisture content, density of soil.

4. **DEPTH OF FOUNDATION:**

As per architectural drawings, proposed structure is having double basement with basement floor level (- 8.5m) below existing ground level. As such bearing capacity is found at 8.5m depth from existing ground level for 5.0m wide foundation.

5. **BEARING CAPACITY CALCULATIONS:**

The bearing capacity is found both on the basis of shear as well as settlement criteria.

Bearing Capacity calculations on the basis of shear:

As per IS 6403 (1981) the net ultimate bearing capacity q_d is given by:

$$q_d = 2/3\ c\ N_c'\ s_c\ d_c + \gamma\ D_f\ (N_q'-1)\ s_q\ d_q + 0.5\ \gamma\ B\ N_\gamma'\ s_\gamma\ d_\gamma\ .W \ \ldots\ldots\ldots..\ldots(1)$$

Where

c   is cohesion,

γ is unit weight of soil,

N_c', N_q' and N_γ' are Bearing capacity factors,

d_c, d_q and d_γ are depth factors

s_c , s_q and s_γ are shape factors,

B is width of the foundations,

D_f is the depth of the foundation,

and W is water table correction factor.

5.1 Bearing Capacity Calculation for 5.0m wide Foundation
(at 8.5m depth below existing ground level):

$$\gamma = 1.76 \text{ g /cc}$$

$$c = 0.00 \text{kg/m}^2$$

$$\phi = 31°$$

B = 5.0m D_f = 1.50m (below basement floor level)

For $\phi = 31°$

N_c', N_q' and N_γ' are:

N_c'=17.2, N_q'= 8.02 and N_γ' = 7.50

s_c =1.0

s_q = 1.0and s_γ = 1.0

$d_c = \{1+0.2 \ (D_f /B) \ \tan \ (45°+\phi')\}$

   $= \{1+0.2 \ (1.5/5.0) \ \tan \ (45°+10.95)\}$

   =1.08

$d_q = d_\gamma = \{1+0.1 \ (D_f /B) \ \tan \ (45°+\phi')\}$

        $= \{1+0.1 \ (1.5/5.0) \ \tan \ (45°+10.95)\}$

$d_q = d_\gamma = 1.04$

   W = 1

Substituting these values in equation (1)

   q_d = 2/3 x 0.00 x 17.2 x 1.0 x 1.08 + 1.76 x 1.5 x 7.02 x 1.0 x 1.04

        + 0.5 x 1.76 x 5.0 x 7.50 x 1.0 x 1.04 x 1

     = 53.59t / m^2

Safe net allowable bearing capacity on basis of shear criteria = 53.59/2.5 = 21.43 t /m^2

                                    ………………1(b)

5.2 **Bearing Capacity based on Settlement for 5.0m wide foundation:**

Depth of foundation = 8.5m (from existing ground level)

Average of Corrected value of N at proposed foundation level = 17.12

Safe net allowable Bearing capacity

[When B = 5.0m, N =17.12, S = 40mm & W = 0.1] = 21.97 t / m^2 ……….2(b)

Safe net allowable bearing capacity at 6.0m depth from existing ground level

is 21.43 t / m^2 taking least of 1(b) and 2(b).

6. **RECOMMENDATIONS:**

(i) **The safe Net Allowable Bearing Capacity at 8.5m depth below existing ground level for 5.0m wide footing is 21.43t /m^2.**

(ii) **Water table was not encountered up to depth investigated.**

(ER. B. S. RUPRA)