

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

PROPOSED
MULTI-SPECIALITY/ SUPER SPECIALITY HOSPITAL
UNDER NON-BRGF
AT SERAMPORE

Date : 14/10/2014

ALLOWABLE BEARING PRESSURE CALCULATION

Shallow Foundation

(a) *Bearing Capacity Analysis for shallow foundation*

The net ultimate bearing capacity (q_{ult}) of shallow footings as per I.S.Code (I.S.6403-1981) is given by the equation:

$$q_{ult} = C_u \cdot N_c \cdot s_c \cdot d_c \cdot i_c + s(N_q - 1) s_q \cdot i_q \cdot d_q + (1/2) B \cdot \gamma \cdot N_\gamma \cdot s_\gamma \cdot d_\gamma \cdot i_\gamma \cdot W'$$

$$q_{ult} = C_u \cdot N_c \cdot s_c \cdot d_c \cdot i_c \quad \{\text{For } \phi=0, \text{ Cohesive Soil}\}$$

where $N_c = 5.14$ (For, $\phi = 0$)

N_c, N_q, N_γ = Bearing capacity factors (As per I.S.6403-1981)

s_c, s_q, s_γ = Shape factor.

d_c, d_q, d_γ = Depth factor.

i_c, i_q, i_γ = inclination factor.

γ = Bulk unit weight of sub-soil.

W' = Correction factor to account for the effect of water table.

σ = Effective surcharge at the base level of foundation.

B = Width of footings

L = Length of footings

D_f = Depth of foundation

C_u = Undrained shear strength (From Laboratory Test)

N = SPT Values related to consistency of Clay Soil

ϕ = phi (From Field / Laboratory Test)

(b) Settlement for shallow foundation

Settlement=Immediate Settlement +Consolidation Settlement

$$S_f = S_i + S_c$$

$$S_i = q_{net} B^* \{ [1 - \mu^2] / E_s \}^* I_f$$

q_{net} = Net foundation pressure/Intensity of contact pressure

B = Width of footing

E_s = Undrained Modulus of elasticity of soil

μ = Poisson's Ratio of soil

I_f = Influence coefficient, a function of ratio of length to width of footing=1.12

$$S_c = m_v \cdot \Delta p \cdot H.$$

m_v = Coefficient of volume change/compressibility.

Δp = Pressure increment due to foundation loading

$$= (L \times B \times P) / \{ (L + H/2)(B + H/2) \}.$$

H = Thickness of the stratum.

(c) Data Required & Obtained from Laboratory & Field Test Results

$C_u =$	2.90	T/m^2
$\gamma =$	1.80	T/m^3
$\phi =$	0	$^{\circ}$

Allowable Bearing Pressure

Sl. No.	Types of Footing	Footing Size (m x m)	Depth of footing below E.G.L. (m)	Net Safe Bearing Capacity (T/m^2)	Allowable Bearing Pressure ((T/m^2))	Max. Permissible Settlement(mm)
1	Square	1.2 X 1.2	1.5	9.69	9.7	75
2	Square	1.5 X 1.5	1.5	9.30	9.3	75
3	Square	2.0 X 2.0	1.5	8.91	8.9	75
4	Square	2.5 X 2.5	1.5	8.68	8.7	75
5	Square	3.0 X 3.0	1.5	8.53	8.5	75
6	Rectangular	1.5 X 2.5	1.5	8.01	8.0	75
7	Rectangular	2.0 X 3.0	1.5	7.77	7.8	75
8	Rectangular	2.5 X 3.0	1.5	7.79	7.8	75
9	Strip (L/B \leq 5)	1.5 m wide	1.5	7.44	7.4	75
10	Strip (L/B < 5)	2.0 m wide	1.5	7.13	7.1	75
11	Strip (L/B < 5)	2.5 m wide	1.5	6.94	6.9	75
12	Strip (L/B < 5)	3.0 m wide	1.5	6.82	6.8	75

GEOTECHNICAL INVESTIGATION FOR PLANNING, DESIGN AND EXECUTION OF MULTI-SPECIALITY/ SUPERSPECIALITY HOSPITAL UNDER NON-BRGF

Site: Serampore Sub-Divisional Hospital, Hooghly, West Bengal

Method of Boring : Shell & Auger Ground Elevation: E.G.L.

Diameter of Boring : 150 mm Depth of Borehole : 40 m Date of Commencement : 07.09.2014

Water Stuck : 1.0 m Depth of Casing : - Date of Completion : 08.09.2014

SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	0.00						4.00	Soft Greyish Brown Silty Clay/Clayey Silt
DS	0.50							
DS	1.00							
SPT	1.50	1.95	1	1	2	3		
UDS	2.00							
	2.50							
SPT	3.00	3.45	1	2	2	4		
UDS	3.50							
	4.00						12.50	Very Soft to Soft Blackish Grey Silty Clay/Clayey Silt.
SPT	4.50	4.95	1	1	1	2		
UDS	5.00							
	5.50							
SPT	6.00	6.45	1	1	2	3		
UDS	6.50							
	7.00							
SPT	7.50	7.95	0	1	1	2		
UDS	8.00							
	8.50							
SPT	9.00	9.45	1	1	1	2		
UDS	9.50							
	10.00							
SPT	10.50	10.95	1	1	1	2		
UDS	11.00							
	11.50							
SPT	12.00	12.45	1	1	2	3		
UDS	12.50							
	13.00						12.50	Stiff to Very Stiff Brownish Grey Silty Clay/Clayey Silt.
SPT	13.50	13.95	3	4	6	10		
	14.00							
	14.50							
SPT	15.00	15.45	3	5	7	12		

UDS : Undisturbed Sample (U) 08

CS : Core Sample (C)

DS : Disturbed Sample (D) 27

WS : Water Sample (W)

SPT : Standard Penetration Test (P) 25

VS : Vane Shear Test (V)

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SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	15.50						23.00	Stiff to Very Stiff Brownish Grey Silty Clay/Clayey Silt.
SPT	16.50	16.95	4	6	6	12		
	17.00							
	17.50							
SPT	18.00	18.45	4	6	7	13		
	18.50							
	19.00							
SPT	19.50	19.95	5	6	8	14		
	20.00							
	20.50							
SPT	21.00	21.45	5	7	9	16		
	21.50							
	22.00							
SPT	22.50	22.95	9	12	18	30		
	23.00							
	23.50							
SPT	24.00	24.45	10	13	19	32		Dense to Very Dense Brownish Grey Fine Silty Sand/Sandy Sand with Traces of Mica
	24.50							
	25.00							
SPT	25.50	25.95	14	21	27	48		
	26.00							
	26.50							
SPT	27.00	27.45	15	29	35	64		
	27.50							
	28.00							
SPT	28.50	28.95	17	33	47	80		
	29.00							
	29.50							
SPT	30.00	30.45	23	35	46	81		

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Method of Boring : Shell & Auger Ground Elevation: E.G.L.

Diameter of Boring : 150 mm Depth of Borehole : 40 m Date of Commencement : 07.09.2014

Water Stuck : 1.0 m Depth of Casing : - Date of Completion : 08.09.2014

SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	31.00						Dense to Very Dense Brownish Grey Fine Silty Sand/Sandy Sand with Traces of Mica	
	31.50							
SPT	32.00	32.45	33	50		50		
	32.50							
	33.00							
	33.50							
SPT	34.00	34.45	42	54		54		
	34.50							
	35.00							
	35.50							
SPT	36.00	36.45	5	9	11	20		
	36.50							
	37.00							
	37.50							
SPT	38.00	38.45	8	14	15	29		
	38.50							
	39.00							
	39.50							
SPT	40.00	40.45	11	13	19	32		

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Site: Serampore Sub-Divisional Hospital, Hooghly, West Bengal

Method of Boring : Shell & Auger Ground Elevation: E.G.L.

Diameter of Boring : 150 mm Depth of Borehole : 40 m Date of Commencement : 09.09.2014

Water Stuck : 1.2 m Depth of Casing : - Date of Completion : 10.09.2014

SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	0.00						4.00	Soft Greyish Brown Silty Clay/Clayey Silt
DS	0.50							
DS	1.00							
SPT	1.50	1.95	1	2	1	3		
UDS	2.00							
	2.50							
SPT	3.00	3.45	2	2	2	4		
UDS	3.50							
	4.00						12.50	Very Soft to Soft Blackish Grey Silty Clay/Clayey Silt.
SPT	4.50	4.95	2	1	2	3		
UDS	5.00							
	5.50							
SPT	6.00	6.45	1	1	1	2		
UDS	6.50							
	7.00							
SPT	7.50	7.95	0	1	1	2		
UDS	8.00							
	8.50							
SPT	9.00	9.45	2	1	2	3		
UDS	9.50							
	10.00							
SPT	10.50	10.95	1	2	1	3		
UDS	11.00							
	11.50							
SPT	12.00	12.45	1	2	2	4		
UDS	12.50							
	13.00						Stiff to Very Stiff Brownish Grey Silty Clay/Clayey Silt.	
SPT	13.50	13.95	3	5	7	12		
	14.00							
SPT	14.50							
	15.00	15.45	4	6	8	14		

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Water Stuck : 1.2 m Depth of Casing : - Date of Completion : 10.09.2014

SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	15.50						Stiff to Very Stiff Brownish Grey Silty Clay/Clayey Silt.	
	16.00							
SPT	16.50	16.95	5	6	7	13		
	17.00							
	17.50							
SPT	18.00	18.45	4	5	8	13		
	18.50							
	19.00							
SPT	19.50	19.95	6	7	9	16		
	20.00							
	20.50							
SPT	21.00	21.45	5	8	9	17		
	21.50							
	22.00							
SPT	22.50	22.95	10	15	19	34		
	23.00							
	23.50							
SPT	24.00	24.45	12	14	21	35		
	24.50							
	25.00							
SPT	25.50	25.95	15	22	26	48		
	26.00							
	26.50							
SPT	27.00	27.45	16	30	36	66		
	27.50							
	28.00							
SPT	28.50	28.95	18	35	48	83		
	29.00							
	29.50							
SPT	30.00	30.45	24	27	47	74		
	30.50							

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Water Stuck : 1.2 m **Depth of Casing :** - **Date of Completion :** 10.09.2014

SAMPLE DETAILS							Thickness/Depth of Layer(m)	DESCRIPTION
Type	DEPTH(M)		SPT: No Blows					
	From	To	0-15 cm	15-30 cm	30-45 cm	N' Value		
	31.00						Dense to Very Dense Brownish Grey Fine Silty Sand/Sandy Sand with Traces of Mica	
	31.50							
SPT	32.00	32.45	38	51		51		
	32.50							
	33.00							
	33.50							
SPT	34.00	34.45	45	55		55		
	34.50							
	35.00							
	35.50							
SPT	36.00	36.45	6	10	13	23		
	36.50							
	37.00							
	37.50							
SPT	38.00	38.45	9	13	16	29		
	38.50							
	39.00							
	39.50							
SPT	40.00	40.45	12	14	20	34		
						40.0		

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**SITE PLAN SHOWING LOCATION OF BOREHOLES AT SITE
SRERAMPORE SD HOSPITAL, SRERAMPORE DIST-HOOGHLY**

