REPORT ON SOIL INVESTIGATION WORK FOR THE PROPOSED MULTISTORIED BUILDING OF M/S BOFAN VYAPAR PVT. LTD. NEAR BUDGE BUDGE STATION UNDER P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

CLIENT: M/S. BOFAN VYAPAR PVT LTD

SOIL INVESTIGATION DONE BY:ASSOCIATED FOUNDATION ENGINEERS
20: K. N. SEN ROAD,
KOLKATA-700 042
DIAL:- 2442-5085 (O)
2418-4018 (R)

98310-69856 (M) 94331-37299 (M)

OCTOBER - 2012

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SOIL INVESTIGATION WORK FOR THE PROPOSED
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PROJECT: Proposed Multistoried Building at FOUNDATION NO.

P.S. & Municipality-Budge Budge, Kolkata 700137 ENGINEERS 1

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REPORT ON
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BUDGE BUDGE STATION UNDER P.S. & MUNICIPALITY- BUDGE BUDGE,
KOLKATA 700137

#### A. GENERAL

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It has been proposed to construct a multistoried building at the above location.

For ascertailing the safe bearing capacity of soil, it was decided to carry out a detailed sub-soil investigation and M/s. Associated Foundation Engineers was awarded this work for suggesting the most suitable type of foundation for the above project.

The scope of the work comprised of sinking 5 nos. .of bore holes (3x20m, 1x22m,1x25m).

The bore holes were of 150mm, in diameter. Standard penetrometer tests were conducted at close intervals of depth. Undisturbed soil samples were recovered at suitable intervals and tested in the laboratory. Disturbed soil samples were also recovered at close intervals of depth for logging & identification purposes.

Depending on the above, this report presents bore logs, soil profiles & laboratory tests results. It is seen that the sub-soils are of poor quality.



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#### B. FIELD INVESTIGATION

The various operations adopted during the coarse of this investigation are discussed in brief below.

#### BORING

For sinking the bore holes, the shell and auger method of boring was adopted. The holes were of 150mm. in diameter. These were advanced up to the required depth. Casing pipes of 150mm. diameter were used initially and bentonite slurry later on for side stabilisation of bore holes.

#### SAMPLING

During the course of boring, undisturbed and disturbed samples were collected at fairly regular intervals. Undisturbed samples of 10cm. diameter were recovered (whenever feasible) by means of open drive sampling using samplers of standard length 45cm. A two tier assembly was used with a cutting shoe attached to the lower end of the tube. This was driven by a jarring link as far as practicable. After withdrawal, both ends of the tubes were sealed with paraffin wax capped, labeled and transported to the laboratory. A number of disturbed samples were also collected at suitable intervals for identification and logging purposes.

#### STANDARD PENETRATION TESTS

A number of standard penetration tests were conducted at regular intervals in the bore holes. The tests were conducted by driving a standard split spoon sampler by means of a monkey of 65kg, weight falling freely from a height of 75cm. The number of blows required for every 7.5cm. Penetration was recorded up to a total penetration of 60cm. The S.P.T. or 'N' value was estimated as the number of blows required for the middle 30cm, penetration.



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The split spoon sampler conformed to I.S. specification with an outer diameter of 50.8mm. and an inner diameter of 35mm. After completion of the test the sampler was withdrawn. It was opened and the soil specimen was preserved for logging and identification purposes.

#### C. LABORATORY TESTING

The following laboratory tests were performed on undisturbed and disturbed samples to determine the engineering properties of the sub-soil at different depths. All the tests were carried out according to Indian standard specifications.

- 1. Natural Moisture Content.
- 2. Atterberg Limits (LL. & PL.)
- 3. Hydrometer and Sieve Analysis.
- 4. Bulk Density (wet & dry)
- 5. Specific Gravity.
- 6. Strength Tests.
- Consolidation.

The results of these tests have been presented systematically in result sheets later on.



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#### D. SUB-SOIL STRATIFICATION AND PROPERTIES

#### I. SUB-SOIL STRATIFICATION

The exploratory borings at the site revealed a poor quality of sub-soil. The generalised soil profile encountered at the site is shown in fig.2 and in the enclosed bore hole log data sheets in the appendix. The variation of 'N' values with depth is shown in figure 3 & in the bore hole log data sheets. The average sub-soil profile with properties are shown in fig. 4. The results of the laboratory tests conducted to determine the engineering properties of the sub-soil are presented in the appendix. The other back-up sheets are also presented therein. Based on visual classification and results of field & laboratory tests seven major strata including filled-up materials are identified.

Brief descriptions of the various soil strata are given below: -

#### TOP - SOIL

The top layer consists of very loose filling of fly ash, clayey silt etc extending down to 1.66 m. depth below the E.G.L.

#### 2. STRATUM - I

Soft light grey to brownish grey clayey silt extends from 1.66 m. down to a depth of 4.1 m. below I .G.L.

The maximum & minimum values of 'N' observed in this layer are 04 & 02 respectively while the average 'N' value is 03.

The average engineering properties are as follows:-

1.82	gm /c.c.
1.46	gm /c.c
24	%
2.70	
0.87	
0.31	kg/sq.cm
00	degree
42	%
23	%
07	%
	1.46 24 2.70 0.87 0.31 0° 42 23



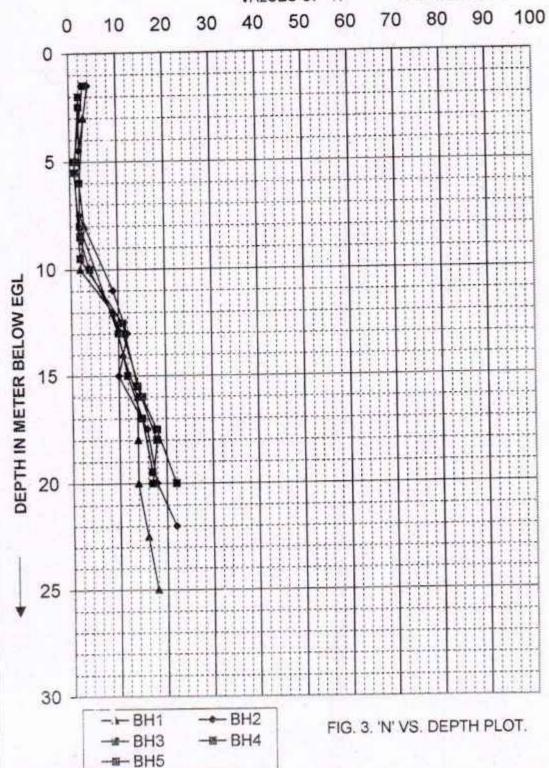
3

PREJECT: PREPERSED MULTISTERIED BUILDING AT P.S. & MUNICIPALITY-BUDGE BUDGE, KELKATA 700137

LOOM PAY ASH, PEANEY SHIP	CI BROWNISH GREY CLAYEY SILT	SOFT LIGHT GREY TO DEEP	GREY CLAYEY SILT WITH	DECATED VEGETALIANS	CI-II	CI STIFF LIGHT GREY CLAYEY SILT GBS. KANKARS. 14.00m	STIFF TO VERY STIFF	LIGHT YELLDVISH GREY	CLAYEY SILT WITH SAND.	angra Smere		
VERY LIDSE FILLING OF FLY ASH, CLAYEY SILT.	3,00m sort Light GREY TO CLAYEY SILT. 4,00m	SDET LIGHT GREY TO DEEP	GREY CLAYEY SILT WITH	DECAYED VEGETATIONS	CI-DI	CI STIFF LIGHT GREY CLAYEY LA.00n	STIFF TO VERY STIFF	LIGHT YELLDVISH GREY	CLAYEY SILT VITH SAND.			
VERY LODSE FILLING OF FLY ASH, CLAYEY SILT.	CI SOFT LIGHT GREY TO BROWNISH GREY CLAYEY SILT.	SOFT LIGHT GREY TO DEEP	GREY CLAYEY SILT VITH	CI-OI	& DRGANIC MATTERS.	CI STIFF LIGHT GREY CLAYEY SILT DBS. KANKARS. 14.00n.	STIFF TO VERY STIFF	LIGHT YELLDVISH GREY	CLAYEY SILT VITH SAND.	SM YELLOVISH GREY SANDY SILT OBS. MICA TRACES.	Hellest Seeon	
VERY LIDSE FILLING DF FLY ASH, CLAYEY SILT.	SOFT LIGHT GREY TO BROWNISH GREY CLAYEY SILT.	SOFT LIGHT GREY TO DEEP	GREY CLAYEY SILT WITH	DECAYED VEGETATIONS	& DREAME MATTERS.	STIFF LIGHT GREY CLAYEY SILT DBS. KANKARS.	STIFF TO VERY STIFF	LIGHT YELLDVISH GREY	CLAYEY SILT WITH SAND.	MODERATE DENSE LIGHT	SILT DBS. MICA TRACES.	VERY STIFF LIGHT YELLDWISH

Project : PROPOSED MULTISTORIED BUILDING AT,
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VALUES OF 'N' → Sheet No:- 08



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PROJECT: Proposed Multistoried Building at P.S. & Municipality-Budge Budge, Kolkata 700137		ASSOCIATED FOUNDATION ENGINEERS	SHEET NO. 9
Silt size particle	62	%	
Clay size particle	31	%	

According to IS classification system, it may be symbolised as CI combination.

#### 3. STRATUM - II

Soft light grey to deep grey clayey silt with decayed vegetations and organic matters extends from 4.1 m. down to a depth of 12.0 m. below E.G.L.

The maximum & minimum values of 'N' observed in this layer are 04 & 01 respectively while the average 'N' value is 03.

The average engineering properties are as follows:-

Bulk density	1.60	gm /c.c.
Dry density	1.16	gm /c.c
Water content	39	%
Specific gravity	2.60	
Void ratio	1.44	
Cohesion	0.21	kg /sq.cm
Friction angle	0°	degree
Liquid limit	43	%
Plastic limit	24	%
Sand size particle	07	%
Silt size particle	64	%
Clay size particle	29	%

According to IS classification system, it may be symbolised as CI-OI combination.

## 4. STRATUM - III

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Stiff light grey clayey silt with kankars extends from 12.0 m. down to a depth of 14.0 m. below E.G.L

The maximum & minimum values of 'N' observed in this layer are 12 & 09 respectively while the average 'N' value is 11.



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The average engineering properties are as follows:-

Bulk density	1.89	gm/c.c.
Dry density	1.57	gm /c.c
Water content	21	%
Specific gravity	2.72	
Void ratio	0.63	
Cohesion	0.53	kg/sq.cm
Friction angle	0°	degree
Liquid limit	48	%
Plastic limit	29	%
Sand size particle	05	%
Silt size particle	55	%
Clay size particle	40	%

According to IS classification system, it may be symbolised as CI combination.

#### 5 STRATUM-IV

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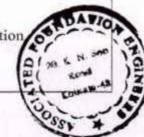
Stiff to very stiff light yellowish grey clayey silt with sand extends from 14.0 m. down to a depth of 20.26 m. below E.G.L.

The maximum & minimum values of 'N' observed in this layer are 18 & 10 respectively while the average 'N' value is 15.

The average engineering properties are as follows:-

Bulk density	1.90	gm /c.c.
Dry density	1.57	gm/c.c
Water content	21	%
Specific gravity	2.71	
Void ratio	0.61	
Cohesion	0.60	kg/sq.cm
Friction angle	0°	degree
Liquid limit	46	%
Plastic limit	22	%
Sand size particle	08	%
Silt size particle	57	%
Clay size particle	35	%

According to IS classification system, it may be symbolised as CI combination,



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#### 6 STRATUM-V

Moderate dense light yellowish grey sandy silt with mica traces extends from 20.6 m. down to a depth of 24.0 m. below E.G.L.

The maximum & minimum values of 'N' observed in this layer are 22 & 14 respectively while the average 'N' value is 18.

According to IS classification system, it may be symbolised as SM combination.

#### 7 STRATUM-VI

Very stiff light yellowish grey clayey silt extends from 24.0m. down to the termination depth of 25.60 m. below E.G.L.

The value of 'N' observed in this layer is 18.

According to IS classification system, it may be symbolised as CI combination.

From the above, it can be said that the sub-soils are of poor quality.

# II. SUB - SOIL PROPERTIES

The details of laboratory tests results have been presented sequentially in the appendix. The other back-up sheets are given therein as below:-

- 1. Laboratory tests results tables.
- 2. Bore Hole log data sheets/ field records.
- 3. Consolidation characteristics.

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4. Grain size distribution curves from sieve & hydrometer analysis.

Based on the bore logs and the laboratory tests results, the average sub-soil profile with the average properties are presented in fig. 4.



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FIG.-4. AVERAGE SUB-SOIL PROFILE WITH PROPE

25.60m

PROJECT: Proposed Multistoried Building at FOUNDA

P.S. & Municipality-Budge Budge, Kolkata 700137

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# E. FOUNDATION CONSIDERATIONS AND BEARING CAPACITY

The proposed construction would be a multistoried building. Accordingly the loading would be moderate which would depend also on column spacing for the proposed RCC framed structure. However, the foundation design would not only depend on the height and loading but also on the sub-soil condition. For the sub-soil condition the two necessary conditions are to be satisfied i.e. the soil would not fail in shear and the settlement should be within permissible limit.

In view of the existing soft soil deposit at the top, deep foundations in the form of bored cast-in-situ R.C.C. piles have been investigated for the proposed construction. These should rest at (-) 22.0 m. having cut-off at (-) 1.5 m. below the E.G.L. depending on functional requirement.

## PILE CAPACITY DETERMINATION

Ultimate Load Capacity, Pu = Pf + Pt

 $Pf = \pi \times D \times [2.6 \times 3.1 \times 0.85 + 7.9 \times 2.1 \times 0.95 + 2.0 \times 5.3 \times 0.8 + 6.2 \times 6.0 \times 0.75]$ = 185 D

 $Pt = At qt = \pi D^2 / 4 \times 0.7 \times 10 \times (20 - 1) = 104.5 D^2$ 

 $Pu = 185 D + 104.5 D^2$ 

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 $\therefore$  Pall = 74 D + 41.8 D<sup>2</sup> (F.O.S.= 2.5)

For 400 mm. dia pile, Pa = 36 t

The following safe load carrying capacity values may be used depending on requirement:-

PILE DIA, mm.	PILE TIP, m.	CUT-OFF, m.	SAFE CAPACITY, t
400	(-) 22.0	(-)1.5	36
450	(-) 22.0	(-)1.5	42
500	(-) 22.0	(-)1.5	48

However, the actual load carrying capacity should be determined by carrying out load tests at site as per IS code of practice. A minimum distance of 2.5D-3D should be maintained between the center to center of piles, where D is the pile diameter.

SHEET NO-14

E. G. L.			E. G. L.
SOFT LIGHT GREY TO BROWNISH GREY CLAYEY SILT.		CUT-DFF = (-)1.50 C = 0.31 kg/sq.cm Q = 0 Degree	
SOFT LIGHT GREY TO DEEP  GREY CLAYEY SILT WITH  DECAYED VEGETATIONS  & DRGANIC MATTERS.		C = 0.21 kg/sq.cm % = 0 Degree	
STIFF LIGHT GREY CLAYEY SILT DBS. KANKARS.		C = 0.53 kg/sq.cr N = 0 Degree	1
STIFF TO VERY STIFF LIGHT YELLOWISH GREY CLAYEY SILT WITH SAND.		C = 0.60 kg/sq.cr N = 0 Degree	1.
MODERATE DENSE LIGHT YELLOWISH GREY SANDY SILT DBS. MICA TRACES.	20.20m V m00.55	TERMINATION LEV	EL = (-)22.00

FIG. - 5. FOUNDATION DESIGN MODEL FOR DEEP FOL



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#### F. RECOMMENDATIONS

Based on the field and the laboratory tests results and the above discussions, the followings are summarised:-

- 1. The sub-soils are of poor quality.
- The top layer consists of very loose filling of fly ash, clayey silt etc extending down to 1.66 m. depth below the E.G.L.
- Soft light grey to brownish grey clayey silt extends from 1.66 m. down to a depth of 4.1 m. below E.G.L. The strength of this layer is low (C = 0.31 kg/sq.cm.) and compressibility is medium(Mv = 0.033 sq.cm./kg for 0.50 to 1.0 kg/sq.cm. pressure range).
- 4. Soft light grey to deep grey clayey silt with decayed vegetations and organic matters extends from 4.1 m. down to a depth of 12.0 m. below E.G.L. The strength of this layer is low ( C = 0.21 kg/sq.cm.) and compressibility is medium ( Mv = 0.0747 sq.cm./ kg for 0.50 to 1.0 kg/sq.cm. pressure range).
- Stiff light grey clayey silt with kankars extends from 12.0 m. down to a depth of 14.0 m. below E.G.L
- Stiff to very stiff light yellowish grey clayey silt with sand extends from 14.0 m. down to a depth of 20.26 m. below E.G.L.
- Moderate dense light yellowish grey sandy silt with mica traces extends from 20.6 m. dcwn to a depth of 24.0 m. below E.G.L
- Very stiff light yellowish grey clayey silt extends from 24.0m. down to the termination depth of 25.60 m. below E.G.L
- The standing water level was observed at (-) 1.4 m. below the E.G.L. during boring.
- Isolated footings, if used, are suggested to be tied at the foundation level to reduce the differential settlement. <u>Construction in stages is recommended</u>.
- 11. In view of the existing soft soil deposit at the top, deep foundations in the form of bored cast-in-situ R.C.C. piles have been investigated for the proposed construction These should rest at (-) 22.0 m. having cut-off at (-) 1.5 m. below the E.G.L. depending on functional requirement.

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12. The following safe load carrying capacity values may be used depending on requirement:-

PILE DIA, mm.	PILE TIP, m.	CUT-OFF, m.	SAFE CAPACITY, 1
400	(-) 22.0	(-)1.5	36
450	(-) 22.0	(-)1.5	42
500	(-) 22.0	(-)1.5	48

However, the actual load carrying capacity should be determined by carrying out load tests at site as per IS code of practice. A minimum distance of 2.5D - 3D should be maintained between the center to center of piles, where D is the pile diameter.

FOR ASSOCIATED FOUNDATION ENGINEERS

(ASIM SARKAR)

ASIM SARKAR BCE, ME (SOIL), MIGS



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	A	P	P	E	N	D	1	X	1/- 3
	-	-	-	*	-		-	ed l	
LAB	ORA	ATC	RY	TE	STS	RE	SU	LTS_TABLE	18
BOR	ΕF	IOL	E L	.OG	DA	TA	SH	EETS/FIELD RECORDS	19 - 23
CON	SOI	LID	ATI	ON	СН	ARA	AC7	TERISTICS	24 - 33
GRA	IN S	SIZE	E DI	STR	IBU	TIO	N (	CURVES	34 - 38



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5.00	Municipality	P.S. & Municipality - Budge Budge , Kolkata-1	e, Kolkata-	137.										
ABLE	1. LABC	1. LABORATORY TESTS RESULT	SIS KESUL											
BORE	SAMPLE	DEPTH (M.)	BULK	DRY	>	9	eo	ပ	00	П	PL	SAND	SILT	CLAY
HOLE	ON		(gms/c.c.)	DENSITY (gms/cc)	%			(kg/sqc m)	(Degree)	%	%	%	%	%
RH.1	IIDS-1	1 50-1 95	180	1 44	25	2.70	0.839	0.30	00	44	24	7	62	31
器二	UDS-2	4 50-4 95		1.12	42	2.60	1.820	0.20	00	45	27	4	63	33
BH-1	UDS-3	7.50-7.95	1.64	1.22	34	2.61	1.034	0.22	°o	43	25	5	64	31
BH-1	UDS-4	15.00-15.45	1.90	1.57	21	2.70	0.607	09'0	00	45	20	9	69	35
BH-2	UDS-1	3.00-3.45	1.81	1.46	24	2.70	0.839	0.30	00	42	25	5	63	32
BH-2	UDS-2	6.00-6.45	1.74	1.34	30	2.64	0.926	0.24	°o	44	26	7	63	30
BH-2	UDS-3	12.50-12.95		1.58	20	2.71	0.629	0.52	00	48	29	5	99	39
BH-2	UDS-4	17.00-17.45	1.92	1.59	21	2.70	0.593	0.62	00	46	20	7	69	34
BH-3	UDS-1	4.00-4.45	1.50	1.02	47	2.58	1.905	0.19	စ	41	17	8	64	28
BH-3	UDS-2	10.00-10.45		0.97	52	2.55	2.104	0.18	0.	40	16	12	69	19
BH-3	UDS-3	14.50-14.95		1.54	22	2.70	0.630	0.52	°	46	24	8	53	39
BH-4	UDS-1	2.50-2.95		1.47	24	2.70	0.827	0.32	.0	42	25	9	61	33
BH4	UDS-2	7.50-7.95		1.20	35	2.61	1.197	0.22	00	44	26	5	64	31
BH-4	UDS-3	12.00-12.45	1.89	1.55	22	2.72	0.621	0.54	00	48	29	4	99	40
BH4	UDS-4	17 00-17 45		1.57	21	2.70	0.587	0.61	00	47	22	80	53	39
BH-5	UDS-1	150-195		1.48	23	2.70	0.963	0.32	°°	42	24	2	63	32
BH-5	UDS-2	3.50-3.95		1.46	25	2.68	0.869	0.32	00	40	17	12	61	27
BH-5	UDS-3	8.00-8.45	1.63	1.22	34	2.62	1.124	0.22	0،	45	26	11	59	30
BH-5	UDS-4	15.50-15.95		1.58	20	2.74	0.619	0.59	00	47	29	6	59	32
BH-5	UDS-5	17 00-17 45	1 90	1.59	21	2.70	0.598	0.65	°0	45	18	10	26	34



PROJECT: PROPOSED				FOL	SOCIATE UNDATIO SINEERS	N	SHEET NO 19
BORE LI	og .	DATA SHEET			BORE	HOLE	NO + 1
PENETROMETER (SPT)	NDS.		NDS.	COMMENCE	D DN :		11-05-2012
PENETROMETER (SPT) CONE ( PC ) VANE (V)	11	UNDISTURBED (UDS) PENETROMETER (SPT) DISTURBED (DS)	11 1		E DIA :	1	
			N - 1	VALUE	SA	MPL	ES
DESCRIFT	IDN	SYMBOL	6	12 18 24	REF ND.		DEPTH (M)
SOFT LIGHT GREY TO BROWNISH GREY CLAYEY SILT DECAYED VEGETATION OF THE STREET OF THE S	AYEY S TO DEE WITH ONS S.	ILT. 9.50m. P	N =3 N =2 N =2	<b>V</b> =9	DS - 1  UDS - 1  SPT - 1  UDS - 2  SPT - 2  UDS - 3  SPT - 4  SPT - 5	1 3 4 4 6 6 7 7 8 8 8 8 8 1	.00 .50 - 1.95 3.00 - 3.60 4.50 - 4.95 5.00 - 6.60 7.50 - 7.95 3.00 - 8.60 10.00 - 10.60 12.00 - 12.60
STIFF LIGHT GRIY SILT DBS. KANKARS		4.00m		N =11	SPT - 6		14.00 - 14.60
STIFF TO VERY ST	IFF			M = M	UDS - 4	3 3	15.00 - 15.45
LIGHT YELLOWISH				N =14	SPT - 7	7 1	16.00 - 16.60
CLAYEY SILT WITH				• N =14	SPT - E	3 1	18.00 - 18.60
MDDERATE DENSE L	IGHT	20,00m		N =14	SPT - 9	9 1	20.00- 20.60
YELLOWISH GREY S SILT DBS. MICA TR	ACES.	24.00	N	=16	SPT - 1	27 1	22.50 - 23.10
VERY STIFF LIGHT GREY CLAYEY SILT	YELLD	24.00m WISH 25.60m	N	=18	SPT - 1	1 3	25.00 - 25.60

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PROJECT: PROPOSED				FD	SOCIATED UNDATION GINEERS	SHEET ND 20
BORE L	.DG	DATA SHEET			BORE HO	DLE ND : 2
PENETROMETER (SPT)	NDS.		NOS.	COMMENC	ED DN :	12-05-2012
PENETROMETER (SPT) CONE ( PC ) VANE (V)	9	UNDISTURBED (UDS) PENETROMETER (SP DISTURBED (DS)	CV 25	BORE HO R.L. OF ( WATER S	ED DN : LE DIA : GROUND : STRUCK AT : G WATER LEV	150mm 1.50m
	* = **		N - \	ALUE	SAM	PLES
DESCRIPT	1 U N	SYMBOL	6 1	2 18 2	4 REF NO.	DEPTH (M)
VERY LODSE FILLING FLY ASH, CLAYEY STIFF LIGHT GREY CLAYEY SILT DECAYED VEGETATION OF THE STIFF LIGHT GREY SILT DBS. KANKARS	AYEY S AYEY S TO DEE WITH TONS S, ——————————————————————————————————	ILT. 1.00m P	N =4  Z	N =9 N =12 N =10	DS - 1 SPT - 1 UDS - 1 SPT - 2 UDS - 2 SPT - 3 SPT - 4 UDS - 3 SPT - 5 SPT - 6	0.60 1.50 - 2.10 3.00 - 3.45 4.50 - 5.10 6.00 - 6.45 7.50 - 8.10 11.00 - 11.60 12.50 - 12.95 13.00 - 13.60 15.00 - 15.60
STIFF TO VERY ST LIGHT YELLOWISH O CLAYEY SILT WI'H	GREY SAND.			N =16	UDS - 4 SPT - 7	17.00 - 17.45 17.50 - 18.10
MODERATE DENSE L YELLOWISH GREY S SILT DBS. MICA TR	IGHT ANDY	2.60n		=1B	SPT - 8 SPT - 9	20.00 - 22.60

ASSOCIATED PROJECT: PROPOSED MULTISTURIED BUILDING AT SHEET FOUNDATION NO P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 ENGINEERS 21 BORE HOLE ND I 3 BORE LDG DATA SHEET PENETROMETER (SP1) NOS. COMMENCED ON 1 13-05-2012 NOS. 14-05-2012 COMPLETED ON : 3 UNDISTURBED (UDS) PENETROMETER (SP1) 7 150mm BORE HOLE DIA : CONE ( PC ) PENETROMETER (SPT) 7 R.L. DF GROUND : VANE (V) DISTURBED (DS) 5 1.50m WATER STRUCK AT I STANDING WATER LEVEL : 1.50m N - VALUE SAMPLES SYMBOL DESCRIPTION 6 12 18 24 REF NO. DEPTH (M) DS - 1 1.00 VERY LODSE FILLING OF 2.00 FLY ASH, CLAYEY SILT. DS - 5 2.50 - 3.10 SPT - 1 N =2 SOFT LIGHT GREY TO BROWNISH GREY CLAYEY SILT. 4.00 - 4.45 UDS - 1 SOFT LIGHT GREY TO DEEP 6.00 - 6.60 SPT - 2 N =P GREY CLAYEY SILT WITH 8.00 - 8.60 SPT - 3 DECAYED VEGETATIONS & DRGANIC MATTERS. 10.00 - 10.45UDS - 2 12.00m STIFF LIGHT GREY CLAYEY 13.00 - 13.60 SPT - 4 N =10 SILT DBS. KANKARS. -14.00mUDS - 3 14.50 - 14.95 STIFF TO VERY STIFF 15.00 - 15.60SPT - 5 N =15 LIGHT YELLOWISH GREY SPT - 6 17.00 - 17.60 CLAYEY SILT WITH SAND. SPT - 7 19.50 - 20.10 N =17 20.10m



ASSOCIATED SHEET PROJECT: PROPOSED MULTISTORIED BUILDING AT FOUNDATION ND P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 ENGINEERS 55 BORE HOLE NO : DATA SHEET LDG BORE COMMENCED ON : 14-05-2012 NDS. PENETROMETER (SPT) NDS. 15-05-2012 COMPLETED ON : UNDISTURBED (UDS) 7 PENETROMETER (SPT) 150mm BORE HOLE DIA : PENETROMETER (SPT) 7 CONE ( PC ) R.L. DF GROUND : DISTURBED (DS) 1 VANE (V) 1.40m WATER STRUCK AT : STANDING WATER LEVEL : 1.40m SAMPLES N - VALUE SYMBOL BESCRIPTION 12 18 24 DEPTH (M) REF NO. VERY LODSE FILLING OF 0.50 DS - 1 FLY ASH, CLAYEY SILT. 1.50 - 2.10- 1.00m SPT - 1 =3 M SOFT LIGHT GREY TO 2.50 - 2.95UDS - 1 BROWNISH GREY CLAYEY SILT. 5.00 - 5.60 SPT - 2 \_\_\_\_ 4.00m N =1 SOFT LIGHT GREY TO DEEP 7.50 - 7.95S - San GREY CLAYEY SILT WITH 9.50 - 10.10 SPT - 3 N =2 DECAYED VEGETATIONS 12.00 - 12.45 UDS - 3 & DRGANIC MATTERS. -12.00m12.50 - 13.10 STIFF LIGHT GREY CLAYEY SPT - 4 N =11 SILT DBS. KANKARS. 15.50 - 16.10 UDS - 4 STIFF TO VERY STIFF 17.00 - 17.45 SPT - 5 N =14 LIGHT YELLOWISH GREY 18.00 - 18.60SPT - 6 N =18 CLAYEY SILT WITH SAND. 20.00 - 20.60 SPT - 7 N =17 20.60m

PROJECT: PROPOSED					F	SSOCIATE DUNDATIO NGINEERS	N ND
BORE L	DG	DATA	SHEET			BORE	HOLE NO : 4
PENETROMETER (SPT)	NDS.			NDS.	COMMEN	CED ON :	
PENETROMETER (SPT) CONE ( PC ) VANE (V)	7	PEN	STURBED (UDS) ETROMETER (SP TURBED (DS)		BORE H	TED ON : IDLE DIA : GROUND : STRUCK AT NG WATER L	150mm
				N - 1	/ALUE	S A	MPLES
DESCRIPT	ION		SYMBOL	6	12 18	24 REF ND.	DEPTH (M)
SOFT LIGHT GREY CL	TO AYEY S	.30m		N =2		UDS - 1 SPT - 1 UDS - 2 SPT - 2	2000
SDFT LIGHT GREY GREY CLAYEY SILT		Р				UDS - 3	
DECAYED VEGETATI	IDNS			N =5		SPT - 3	8.50 - 9.10
& DRGANIC MATTER				N =		SPT - 4	10.00 - 10.60
STIFF LIGHT GREY	CLAYE	13.00m Y		N		UDS - 4	13.00 - 13.6
SILT DBS, KANKARS	a C	14.00m		1	N =11	SPT - 5	15.50 - 15.9
STIFF TO VERY ST	IFF					UDS - 5	16.00 - 16.6
LIGHT YELLOWISH	GREY				N =	5 SPT - 6	17.00 - 17.4
CLAYEY SILT WITH	SAND.			N	=18	SPT - 7	17.50 - 18.1
		20.60m		N	=82	SPT - 8	TOA VIO

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SHEET ASSOCIATED PROJECT: PROPOSED MULTISTORIED BUILDING AT NO. FOUNDATION P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 24 ENGINEERS p CURVE LDG VS BORE HOLE UDS ND \_\_\_ 1.50m DEPTH ( M )\_\_\_\_ 0.839 44 LIQUID LIMIT %\_ 0.83 24 PLASTIC LIMIT % 0.81 0.79 0.77 0.75 0.73 0.71 0.69 0.67 0.65 0.63 0.61 0.59 2.0 4.0 8.0 0.25 0.5 1.0 0.1 PRESSURE RANGE KG/SQ.CM

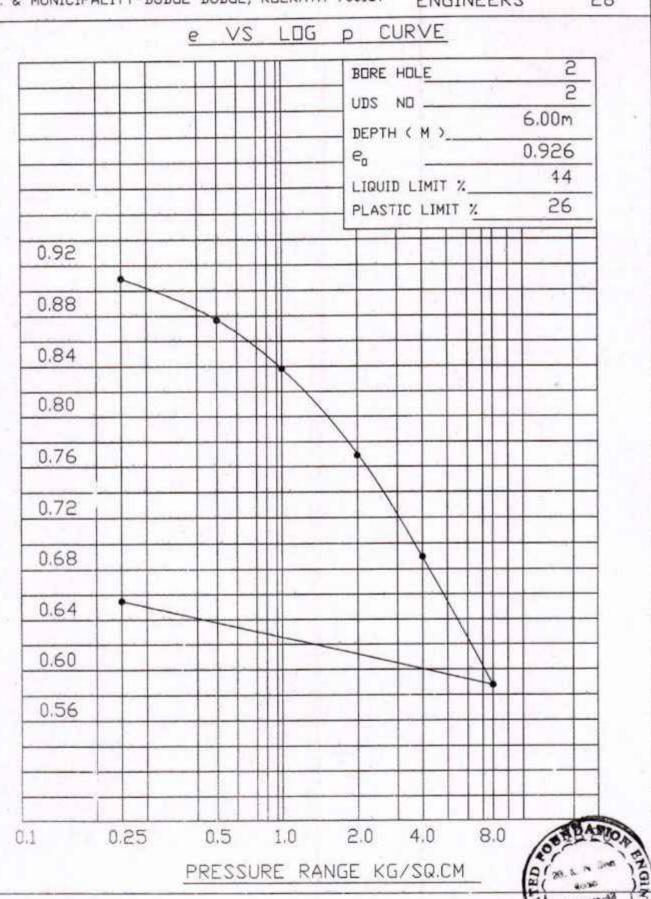
SHEET ASSUCIATED PROJECT: PROPOSED MULTISTORIED BUILDING AT FOUNDATION NO. P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 ENGINEERS 25 VS LOG P CURVE BORE HOLE UDS NO \_\_\_\_ 4.50m DEPTH ( M )\_\_\_\_ 1.820 e, 1.82 45 LIQUID LIMIT %\_ 27 PLASTIC LIMIT % 1.76 1.70 1.64 1.58 1.52 1.46 1.40 1.34 1.28 1.22 1.16 1.10 0.25 0.1 0.5 1.0 2.0 4.0 8.0

PRESSURE RANGE KG/SQ.CM

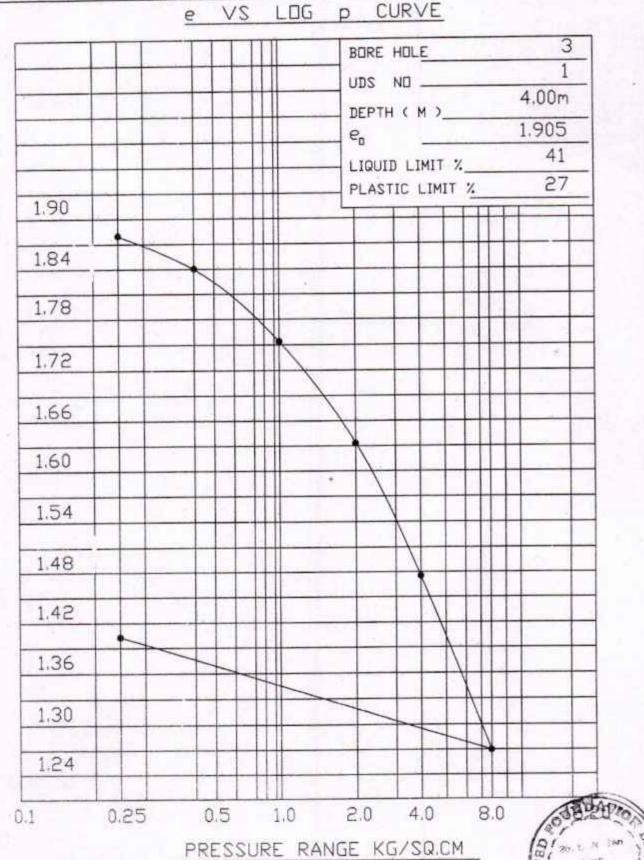
PROJECT: PROPOSED MULTISTORIED BUILDING AT
P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

ASSOCIATED FOUNDATION ENGINEERS

SHEET ND. 26



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SHEET

NO.

27

ASSOCIATED SHEET PROJECT: PROPOSED MULTISTORIED BUILDING AT FOUNDATION NO. P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 **ENGINEERS** 28 VS LOG CURVE P BORE HOLE UDS NO \_\_\_\_ 2.50m DEPTH ( M )\_\_\_\_ 0.827 e, 42 LIQUID LIMIT %\_ 0.82 25 PLASTIC LIMIT % 0.80 0.78 0.76 0.74 0.72 0.70 0.68 0.66 0.64 0.62 0.60 0.58 0.25 0.5 2.0 4.0 8.0 0.1 1.0

PRESSURE RANGE KG/SQ.CM

SHEET ASSUCIATED PROJECT: PROPOSED MULTISTORIED BUILDING AT ND. FOUNDATION P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 29 **ENGINEERS** p CURVE e VS LOG BORE HOLE UDS ND \_ 12.00m DEPTH ( M )\_ 0.621 60 48 LIQUID LIMIT %\_ 29 PLASTIC LIMIT % 0.62 0.61 0.60 0.59 0.58 0.25 0.1 0.5 1.0 2.0 4.0 8.0

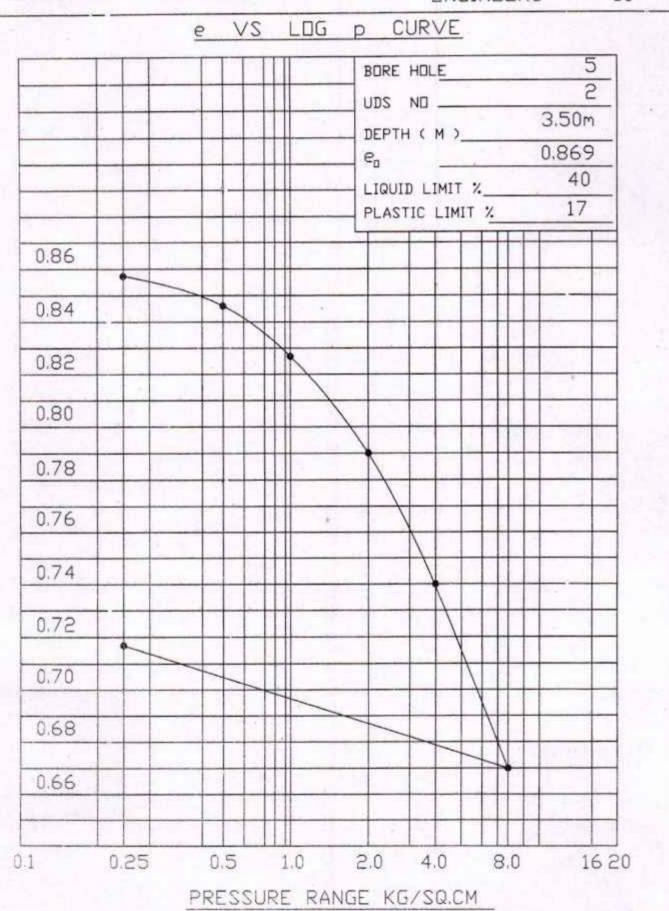
PRESSURE RANGE KG/SQ.CM

SHEET ASSUCIATED PROJECT: PROFOSED MULTISTORIED BUILDING AT FOUNDATION NO. P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 **ENGINEERS** 30 CURVE VS LOG 5 BORE HOLE UDS ND \_\_\_ 1.50m DEPTH ( M )\_\_\_ 0.863 6 42 LIQUID LIMIT %\_\_ 24 PLASTIC LIMIT % 0.86 0.84 0.82 0.80 0.78 0.76 0.74 0.72 0.1 0.25 0.5 1.0 2.0 4.0 8.0 PRESSURE RANGE KG/SQ.CM

PROJECT: PROPOSED MULTISTORIED BUILDING AT
P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

ASSOCIATED FOUNDATION ENGINEERS

SHEET ND. 31



ASSUCIATED SHEET PROJECT: PROPOSED MULTISTORIED BUILDING AT FOUNDATION NO. P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 32 ENGINEERS VS LOG p CURVE BORE HOLE UDS NO \_\_\_ 8.00m DEPTH ( M )\_\_\_ 1.124 6 45 LIQUID LIMIT %\_ 26 PLASTIC LIMIT % 1.12 1.06 1.00 0.94 0.88 0.82 0.76 0.70 0.64 0.58

PRESSURE RANGE KG/SQ.CM

2.0

4.0

8.0

0.5 1.0

0.25

0.1

PROJECT: PROPOSED MULTISTORIED BUILDING AT

P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

ASSOCIATED FOUNDATION ENGINEERS

SHEET ND. 33

			I BUKE H	DLE		5
			UDS N			5
			The second secon	( M )	17.00	m
			e <sub>n</sub>		0.598	3
				LIMIT %	45	5
				C LIMIT %	0.00	
			-		-	
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0,07						
0.57						
0.55						
0.53		++-				
0.33	-++			$+\mathcal{M}$		
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						$\mathbf{H}$
	- No. 10	111				
						MATTO
.1 0.25	0.5	1.0	2.0	4.0 8.	0 6	200 4

PROJECT: PROPOSED MULTISTORIED BUILDING AT ASSUCIATED SHEET FOUNDATION NO. **ENGINEERS** P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 34 GRAIN SIZE DISTRIBUTION 10,0 CLAY GRAVE 33 31 5.0 COARSE 64 SIL % SAND 5 9 GRAVEL % SAND SILT FINE DESCRIPTION CLAYEY CLAYEY z SIZE

GRAIN

CLASSI-FICATION

DEPTH

BORE

SAMPLE NUMB. 1.50m

T

SIGN

0.02

0.01

9000

0.002

1000

20

10

60

LINER

20

40

PERCENTAGE

30

SANDY

SANDY

7.50m

CDARSE

MEDIUM

FINE

CLAY

001

90

80

SIL

FOUNDATION ND. **ENGINEERS** P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137 35 GRAIN SIZE DISTRIBUTION 10.0 CLAY GRAVEL 39 325 5.3 CDARSE 63 56 SAND 50 S MEDIUM 9 GRAVEL 7. SAND SILT SILT FINE DESCRIPTION CLAYEY CLAYEY CDARSE SANDY SANDY CLASSI-FICATION MEDIUM × 0.01 0.006 12.50m DEPTH 3.00m FINE CLAY BORE CU 0.001 30 20 100 90 60 50 10 80 SAMPLE NUMB. 1 SIL PERCENTAGE FINER

PROJECT: PROPOSED MULTISTORIED BUILDING AT

ASSUCIATED

SHEET

PROJECT: PROPOSED MULTISTORIED BUILDING AT

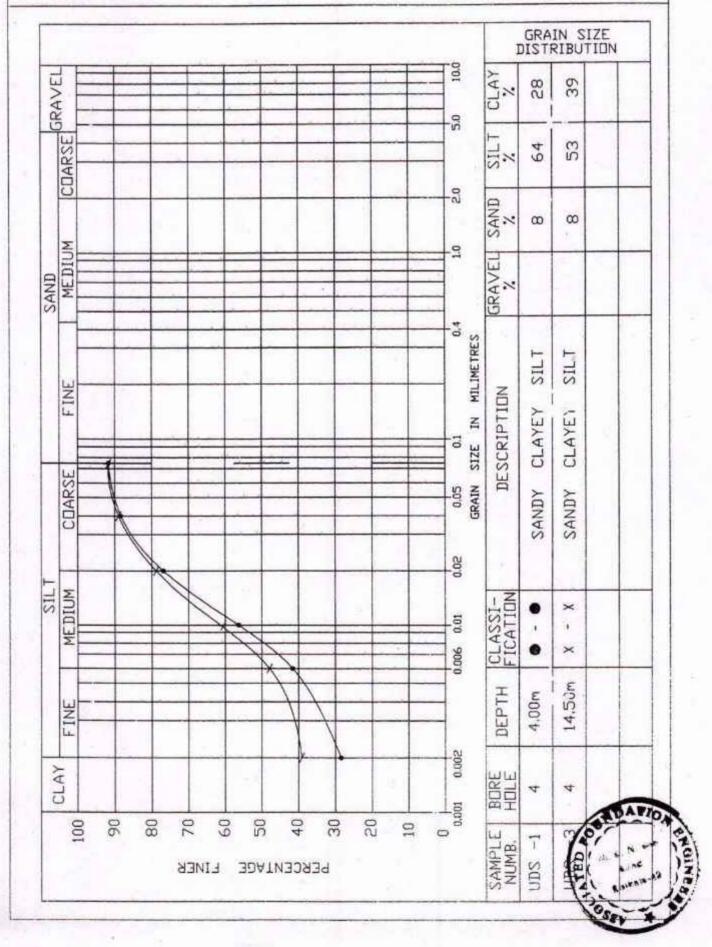
ASSOCIATED FOUNDATION

SHEET NO.

P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

**ENGINEERS** 

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PROJECT: PROPOSED MULTISTORIED BUILDING AT

ASSOCIATED FOUNDATION

SHEET ND.

P.S. & MUNICIPALITY-BUDGE BUDGE, KOLKATA 700137

ENGINEERS

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