Report on
Geotechnical Investigation
for

Setting up of AIIMS

at

Kalyani

West Bengal

Client
HSCC (India) Limited
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A. ✍ Introduction:

It has been proposed by **HSCC (India) Limited (HSCC), E-6(A), Sector-1, Noida (U.P), – 201 301**, to construct an AIIMS at Kalyani, West Bengal. HSCC has entrusted **M/s Centre for Advanced Engineering (CAE) of 59/2, Bangur Avenue, Block-C, Kolkata – 700055** as Geotechnical Consultant for carrying out Geotechnical Investigation and to provide recommendation for foundation system.

Location:

The proposed site is located at Kalyani, West Bengal.

B 🕮 Scope of Investigation:

B1. Field Investigation:

Scope of field investigation work was indicated by HSCC vide Work Order No: HSCC/D&E/AIIMS-Kalyani/Soil-Survey/2015/05 dated: 18.08.2015. It consists of sinking of Six (06) boreholes for a depth of 20.00Mtr each, One (1) Plate Load Test, Five (05) Static Cone Penetration Test, Five (5) Dynamic Cone Penetration Test, Five (5) Field Density Test and One (1) Soil Resistivity Test.

B2. Laboratory Test:

Scope of laboratory test consists of conducting necessary tests. The scope further includes chemical analysis of soil and water sample.

C. 🕮 Description of Subsoil:

The location of borehole is shown in the enclosed sketch no: SK/HSCC/AIIMS-KALYANI/1491/01. The bore-logs indicate the sub-soil condition encountered during field investigation considering laboratory test results on disturbed and undisturbed soil samples as well as soil samples obtained from split spoon of the Standard Penetration Test (SPT) apparatus. The SPT values (N Values) are indicated in the corresponding bore-logs.

Sub- soil profile of the site

The sub-soil profile up to explored depth is shown in Sketch No SK/HSCC/AIIMS-KALYANI/1491/02 (1 of 2) indicating subsoil profile Through BH2, BH3, BH5 & BH6 and Sketch No SK/HSCC/AIIMS-KALYANI/1491/02 (2 of 2) indicating subsoil profile Through BH4, BH3 & BH1.

Stratum	Description	Range of Thickness (Mtr)	Range of N-Value
Fill	Fill with clay and grass roots.	1.00	-------
I	Medium brownish grey clayey silt with traces of sand and kankar.	3.50 to 4.50	4 to 11
II	Loose to medium grey silty fine sand.	6.50 to 13.00	9 to 28
III	Dense to very dense grey fine to medium sand with traces of silt.	Upto the maximum explored depth of 20.0M	29 to 55

The salient features of subsoil area in this location have been obtained as follows:

i) The stratification is almost uniform over the area excepting at location of BH-03. Immediately below strata-II, a thin layer of clayey silt occurs which continues upto the explored depth of 20.00Mtr. So stratum III is absent at this location.

ii) The deposit of strata I is generally soft to medium with N value varying between 4 to 11.

iii) Deposit of strata III consists materials of medium sand.

D. 🕮 Field Investigation:

D1. Boring:

The exploratory boreholes were sunk using shell and auger/wash boring method. Casing was used up to a depth of 3.000 metres to protect the sides of boreholes against collapse. The boring was conducted as per the guidelines and provisions of IS: 1892. Standard Penetration Test was conducted in the boreholes at all the strata encountered. Undisturbed soil samples were collected from all the boreholes. Disturbed samples were collected from the split spoon sampler at all the test depths and test location of Standard Penetration Test and from different typical strata.

The termination depth of the borehole and depth of water table as observed in the boreholes are indicated below:

Table 1

Bore Hole No.	Termination Depth below EGL (Mtr)	Depth of Water Table Below EGL (Mtr.) Explored during the period September 2015.
BH-1	20.000	2.800
BH-2	20.000	3.100
BH-3	20.000	1.600
BH-4	20.000	3.300
BH-5	20.000	1.400
BH-6	20.000	1.800

D.2. Sampling:

D.2.1 Undisturbed Sampling:

The collection of undisturbed soil sample was done, wherever possible depending on existing soil strata, as per the guidelines of IS: 1892 – Code of Practice for site Investigation for Foundation. The sampling system used was an assembly of sampling tube of 100 mm diameter and 450 mm long, connected with a jarring link. The specification of the tube is as per the provision of IS: 2132, Code of practice for thin walled sampling of soils.

After the samples are collected within the tubes, the tubes are taken out of the borehole. Both the ends of the tube were properly sealed with wax, properly labeled depth-wise and borehole-wise, capped and thus made ready for onward transmission for testing the soil samples in the laboratory.

D.2.2 Disturbed Sampling:

Disturbed samples were collected from cutting shoe and split spoon of the SPT sampler. These samples were collected in polythene bags, properly labeled depth-wise and borehole-wise and were used in the preparation of bore log as well as for general identification & classification purpose of soil as per IS: 1498. The same were then packed and sent to the laboratory for further test.

D3. Standard Penetration Test:

Standard Penetration Test was conducted as per the guidelines and provisions of IS: 2131-Method for standard penetration test for soil, in the borehole at regular intervals or at change of strata with the SPT sampler. In this test, the sampler was driven by falling a weight of 63.5 Kg hammer through a height of 750 mm. The sampler was driven through a depth of 450mm. The number of blows for every 150mm. of penetration was recorded. The first 150 mm. was taken as seating drive, the number of blows for subsequent 300 mm. is the SPT N-value. The observed N–values are indicated in the corresponding bore log.

D4. Recording of Ground Water Table:

The field exploration was carried out during the month of September 2015.

The recorded ground water table is indicated in Table 1 of the report.

D5. Plate Load Test:

Plate Load Test was carried out as per provisions and guidelines of IS: 1888 – 1982) - (Reaffirmed 1997) – Method of load test on soils. One number of Plate Load Test has been carried out at the location as shown as PLT-1in the sketch no. SK/HSCC/AIIMS-KALYANI/1491/01. The depth of test 2.00Mtr below EGL. Reaction loading platform was used as kentledge. The results and curve are shown in the corresponding chapter of plate load test.

D6. Static Cone Penetration Test:

Static Cone Penetration Test was carried out as per provisions and guidelines of IS: 4968 (Part-III) 1976 - (Reaffirmed 2002) – Method for surface sounding for soils. Five numbers of Static Cone Penetration Test has been carried out at the location as shown as SCPT-1 to SCPT-5 in the sketch no. SK/HSCC/AIIMS-KALYANI/1491/01. The depth of test 10.00 Mtr below EGL. The results are shown in the corresponding chapter of Static Cone Penetration Test.

D7. Dynamic Cone Penetration Test:

Dynamic Cone Penetration Test was carried out as per provisions and guidelines of IS: 4968 (Part-II) 1976 - (Reaffirmed 2002) – Method for surface sounding for soils. Five numbers of Dynamic Cone Penetration Test has been carried out at the location as shown as DCPT-1 to DCPT-5 in the sketch no. SK/HSCC/AIIMS-KALYANI/1491/01. The depth of test 10.00 Mtr below EGL. The results are shown in the corresponding chapter of Static Cone Penetration Test.

D8. Field Density Test:

Field Density Test was carried out by core cutter method as per provisions and guidelines of IS: 2720 (Part-XXIX) 1975 - (Reaffirmed 2005) – Methods of tests for soils. Five numbers of Field Density Test has been carried out at the location as shown as FD-1 to FD-5 in the sketch no. SK/HSCC/AIIMS-KALYANI/1491/01. The depth of test were 1.50Mtr, 2.50Mtr and 3.50Mtr below EGL. The results are shown in the corresponding chapter of Field Density Test.

D9. Electrical Resistivity Test:

The location of tests are shown in attached Sketches No.- Drg no. - SK/HSCC/AIIMS-KALYANI/1491/01. The tests were conducted as per provisions and guidelines of IS: 3043-1987 (Reaffirmed 2001), code of Practice for Earthing. The results are shown in the corresponding chapter of Electrical Resistivity Test.

E.🕮 Laboratory Testing:

Laboratory tests were conducted on the soil samples collected from the boreholes. The tests were conducted as per provisions and guidelines of Bureau of Indian Standard laid down in

their different codes and as per requirements of the client. All disturbed and undisturbed samples were opened up in the laboratory for further identification & classification of soil samples.

Various tests were conducted for ascertaining the following engineering and physical properties of the sub-soil:

- ☞ Grain Size Analysis.
- ☞ Liquid Limit and Plastic Limit.
- ☞ Specific Gravity.
- ☞ Natural Moisture Content.
- ☞ Dry Density, Bulk Density.
- ☞ Unconfined Compressive test.
- ☞ Tri-axial Shear Test – Unconsolidated Undrained.
- ☞ Consolidation Test.
- ☞ Chemical Test on Soil Samples.
- ☞ Chemical Test on Water Samples.

F. Discussion and Recommendation for foundation system:

Foundation for the present construction would depend upon the load and the subsoil condition. The load for the present structure would be moderate to high. However from the subsoil condition two essential design criteria are to be satisfied for the satisfactory behavior of the structure.

These two conditions are a) Under any circumstances there should be sufficient factor of safety against possible shear failure of the soil, b) The settlement of the foundation should be within permissible or serviceable limit.

Now based on subsoil condition it may be seen that the top layer is fill with clay, grass roots etc.

The first layer i.e. Layer 1 is medium brownish grey clayey silt having medium properties of shear strength and medium consolidation potential. This layer can support only shallow

foundation for medium to lightly loaded structures. The allowable bearing capacities for such foundations are indicated in following table – 2.

However, foundations of structures imparting medium to high pressure on the sub-soil shall be designed as piled foundation. In such case R.C.C Bored pile is suggested at a depth of 18.0m below existing ground level. Capacity of piles for different shaft diameters has been presented in Table-3 of the report. Although pile capacity for 300mm and 350mm have been shown in the table, such diameters of pile should preferably not be used for the present construction of the structures. Moreover the construction of piles should be done following Direct Mud Circulation technique. In order to avoid Block Failure in a group the minimum distance between the piles in a group should be taken as 2.5 times the diameter of pile and there should be provision of Load Test on Pile as per relevant IS code of practice.

TABLE – 2

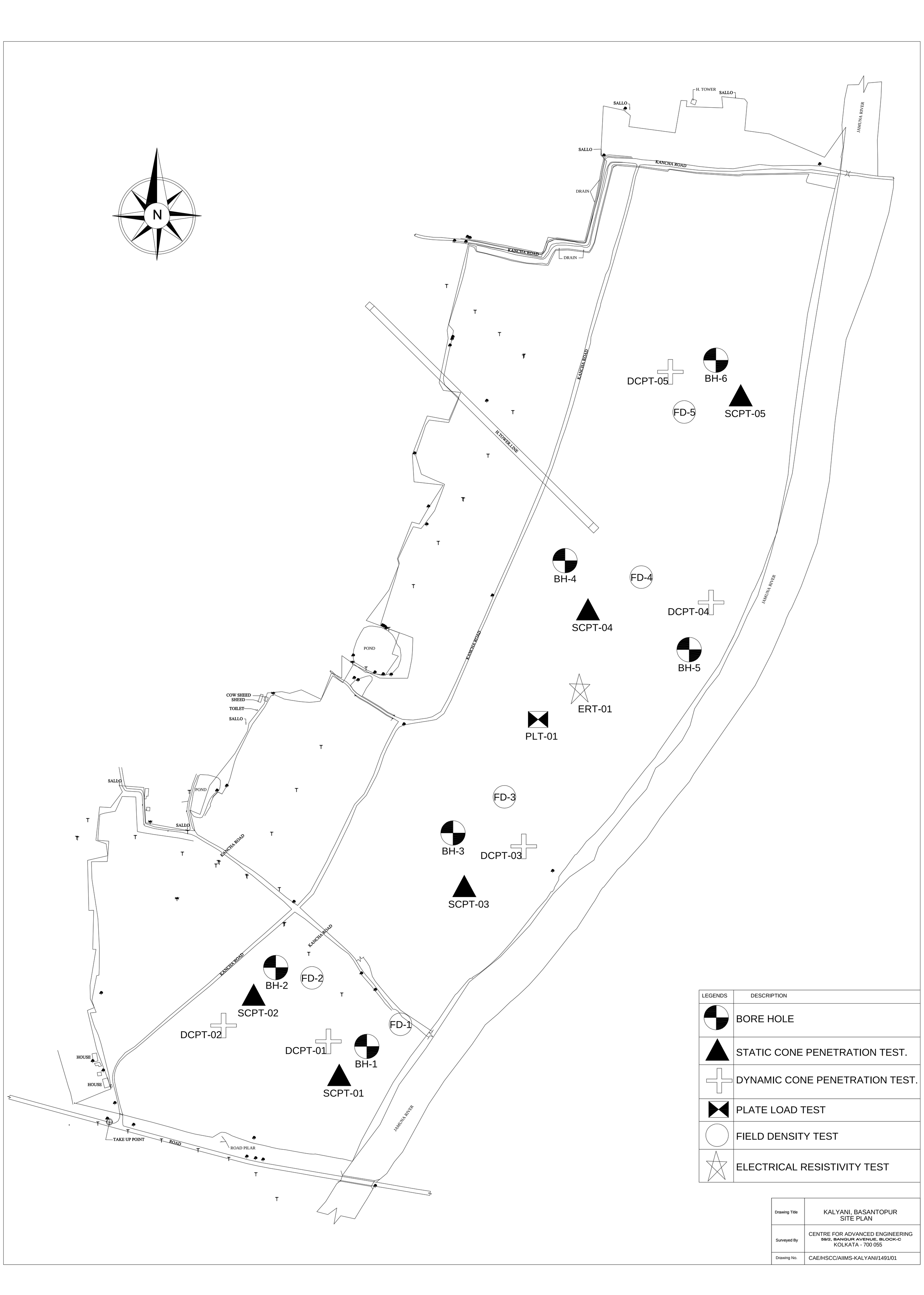
ALLOWABLE BEARING CAPACITY ON EXISTING SUBSOIL

	FOOTING DIMENSIONS					*ALLOWABLE BEARING CAPACITY*		
FOUNDATION TYPE	**L**	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 50 mm**	**For allowable settlement 75 mm**	**For allowable settlement 125 mm**
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	2.00	2.00	1.25	6.6	23.46	6.6	6.6	6.6
	3.00	3.00	1.25	6.3	35.91	6.3	6.3	6.3
	5.00	5.00	1.25	6.1	60.95	5.0	6.1	6.1
	2.00	2.00	1.50	6.7	22.82	6.7	6.7	6.7
	3.00	3.00	1.50	6.4	35.53	6.4	6.4	6.4
	5.00	5.00	1.50	6.2	61.03	5.1	6.2	6.2
	2.00	2.00	1.75	6.9	22.49	6.9	6.9	6.9
	3.00	3.00	1.75	6.5	35.13	6.5	6.5	6.5
	5.00	5.00	1.75	6.2	60.12	5.2	6.2	6.2
ISOLATED RECTANGULAR FOOTINGS	3.00	2.00	1.25	5.7	25.45	5.7	5.7	5.7
	4.50	3.00	1.25	5.5	38.84	5.5	5.5	5.5
	7.50	5.00	1.25	5.3	64.95	4.1	5.3	5.3
	3.00	2.00	1.50	5.8	25.05	5.8	5.8	5.8
	4.50	3.00	1.50	5.6	38.73	5.6	5.6	5.6
	7.50	5.00	1.50	5.4	65.39	4.1	5.4	5.4
	3.00	2.00	1.75	6.0	25.04	6.0	6.0	6.0
	4.50	3.00	1.75	5.7	38.59	5.7	5.7	5.7
	7.50	5.00	1.75	5.4	64.60	4.2	5.4	5.4
CONTINUOUS STRIP FOOTINGS		2.00	1.25	5.0	40.22	5.0	5.0	5.0
		2.50	1.25	4.9	49.72	4.9	4.9	4.9
		3.00	1.25	4.9	60.03	4.1	4.9	4.9
		2.00	1.50	5.2	41.44	5.2	5.2	5.2
		2.50	1.50	5.0	50.36	5.0	5.0	5.0
		3.00	1.50	4.9	59.67	4.1	4.9	4.9
		2.00	1.75	5.3	41.84	5.3	5.3	5.3
		2.50	1.75	5.1	50.99	5.0	5.1	5.1
		3.00	1.75	5.0	60.51	4.1	5.0	5.0
RAFT FOOTINGS	10.00	8.00	2.00	5.5	53.75	5.1	5.5	5.5
	12.00	10.00	2.00	5.4	59.56	4.5	5.4	5.4

TABLE – 3

RECOMMENDED PILE CAPACITY

Sl.No	Pile Dia, D	Total Length of Pile, L	Cut-off Level of Pile	Recommemded Pile Capacity in Compression	Recommemded Pile Capacity in Pull-Out	Recommemded Pile Capacity in Horizontal Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.300	18.000	2.000	**21**	**19**	**0.550**
2	0.350	18.000	2.000	**28**	**24**	**0.710**
3	0.400	18.000	2.000	**37**	**30**	**0.880**
4	0.450	18.000	2.000	**47**	**37**	**1.060**
5	0.500	18.000	2.000	**58**	**45**	**1.260**
6	0.550	18.000	2.000	**70**	**54**	**1.460**



LEGENDS	DESCRIPTION
	BORE HOLE
	STATIC CONE PENETRATION TEST.
	DYNAMIC CONE PENETRATION TEST.
	PLATE LOAD TEST
	FIELD DENSITY TEST
	ELECTRICAL RESISTIVITY TEST

Drawing Title	KALYANI, BASANTOPUR SITE PLAN
Surveyed By	CENTRE FOR ADVANCED ENGINEERING 59/2, BANGUR AVENUE, BLOCK-C KOLKATA - 700 055
Drawing No.	CAE/HSCC/AIIMS-KALYANI/1491/01

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-1 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 10.09.2015
Depth of Boring	20.000 M.	SPT	12	UDS	1	WS	1	Completed on : 11.09.2015
Type of Drilling		DCPT		DS	14	RCS		Water Struck At : 2.90 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 2.80 M.

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.		01		DS1	0.50 M
				DS2	1.00M
Medium brownish grey clayey silt with traces of sand and kankar.		02	N = 11	SPT1	1.50-1.95M
				DS3	1.50-1.95M
		03 G.W.T	N = 5	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS1	4.50-4.95M
Medium light grey silty fine sand with traces of mica.		05			
		06	N = 11	SPT3	6.00-6.45M
				DS5	6.00-6.45M
		07	N = 15	SPT4	7.50-7.95M
		08		DS6	7.50-7.95M
		09	N = 18	SPT5	9.00-9.45M
				DS7	9.00-9.45M
		10	N = 25	SPT6	10.50-10.95M
		11		DS8	10.50-10.95M
		12	N = 28	SPT7	12.00-12.45M
				DS9	12.00-12.45M
Dense to very dense light grey fine to medium sand with traces of silt.		13			
		14	N = 32	SPT8	13.50-13.95M
				DS10	13.50-13.95M
		15	N = 34	SPT9	15.00-15.45M
				DS11	15.00-15.45M
		16	N = 37	SPT10	16.50-16.95M
		17		DS12	16.50-16.95M
		18	N = 41	SPT11	18.00-18.45M
				DS13	18.00-18.45M
		19			
		20	N = 44	SPT12	19.55-20.00M
Termination Depth 20.000 Mtr.				DS14	19.55-20.00M
		21			
		22			
		23			
		24			

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-2 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 11.09.2015
Depth of Boring	20.450 M.	SPT	12	UDS	1	WS	1	Completed on : 11.09.2015
Type of Drilling		DCPT		DS	14	RCS		Water Struck At : 3.20 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 3.10 M.

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.		01		DS1	0.50 M
				DS2	1.00M
Medium brownish grey clayey silt with traces of sand and kankar.		02		UDS1	2.00-2.45M
		03 G.W.T			
			N = 7	SPT1	3.50-3.95M
		04		DS3	3.50-3.95M
Medium light grey silty fine sand with traces of mica.		05	N = 9	SPT2	5.00-5.45M
				DS4	5.00-5.45M
		06	N = 12	SPT3	6.50-6.95M
		07		DS5	6.50-6.95M
		08	N = 14	SPT4	8.00-8.45M
				DS6	8.00-8.45M
		09	N = 18	SPT5	9.50-9.95M
		10		DS7	9.50-9.95M
		11	N = 20	SPT6	11.00-11.45M
				DS8	11.00-11.45M
		12	N = 21	SPT7	12.50-12.95M
		13		DS9	12.50-12.95M
		14	N = 26	SPT8	14.00-14.45M
				DS10	14.00-14.45M
Dense to very dense light grey fine to medium sand with traces of silt.		15	N = 30	SPT9	15.50-15.95M
		16		DS11	15.50-15.95M
		17	N = 35	SPT10	17.00-17.45M
				DS12	17.00-17.45M
		18	N = 39	SPT11	18.50-18.95M
		19		DS13	18.50-18.95M
		20	N = 47	SPT12	20.00-20.45M
Termination Depth 20.450 Mtr.		21		DS14	20.00-20.45M
		22			
		23			
		24			

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-3 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 12.09.2015
Depth of Boring	20.000 M.	SPT	12	UDS	1	WS	1	Completed on : 12.09.2015
Type of Drilling		DCPT		DS	14	RCS		Water Struck At : 1.70 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 1.60 M.

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.				DS1	0.50 M
Medium brownish grey clayey silt with traces of sand and kankar.		G.W.T		DS2	1.00M
				UDS1	1.50-1.95M
			N = 4	SPT1	3.00-3.45M
				DS3	3.00-3.45M
Medium light grey silty fine sand with traces of mica.			N = 9	SPT2	4.50-4.95M
				DS4	4.50-4.95M
			N = 12	SPT3	6.00-6.45M
				DS5	6.00-6.45M
			N = 15	SPT4	7.50-7.95M
				DS6	7.50-7.95M
			N = 19	SPT5	9.00-9.45M
				DS7	9.00-9.45M
			N = 20	SPT6	10.50-10.95M
				DS8	10.50-10.95M
			N = 20	SPT7	12.00-12.45M
				DS9	12.00-12.45M
			N = 21	SPT8	13.50-13.95M
				DS10	13.50-13.95M
			N = 23	SPT9	15.00-15.45M
				DS11	15.00-15.45M
			N = 24	SPT10	16.50-16.95M
				DS12	16.50-16.95M
Very stiff bluish grey clayey silt with traces of yellowish patches.			N = 26	SPT11	18.00-18.45M
				DS13	18.00-18.45M
			N = 29	SPT12	19.55-20.00M
Termination Depth 20.000 Mtr.				DS14	19.55-20.00M

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-4 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 12.09.2015
Depth of Boring	20.000 M.	SPT	13	UDS	0	WS	1	Completed on : 13.09.2015
Type of Drilling		DCPT		DS	15	RCS		Water Struck At : 3.40 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 3.30 M.

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.				DS1	0.50 M
		01		DS2	1.00M
Medium brownish grey clayey silt with traces of sand and kankar.		02	N = 4	SPT1	1.50-1.95M
				DS3	1.50-1.95M
		03 G.W.T	N = 6	SPT2	3.00-3.45M
		04		DS4	3.00-3.45M
Medium light grey silty fine sand with traces of mica.		05	N = 13	SPT3	4.50-4.95M
				DS5	4.50-4.95M
		06	N = 15	SPT4	6.00-6.45M
		07		DS6	6.00-6.45M
		08	N = 18	SPT5	7.50-7.95M
				DS7	7.50-7.95M
		09	N = 19	SPT6	9.00-9.45M
		10		DS8	9.00-9.45M
		11	N = 28	SPT7	10.50-10.95M
Dense to very dense light grey fine to medium sand with traces of silt.				DS9	10.50-10.95M
		12	N = 35	SPT8	12.00-12.45M
		13		DS10	12.00-12.45M
			N = 41	SPT9	13.50-13.95M
		14		DS11	13.50-13.95M
		15	N = 45	SPT10	15.00-15.45M
		16		DS12	15.00-15.45M
			N = 47	SPT11	16.50-16.95M
		17		DS13	16.50-16.95M
		18	N = 51	SPT12	18.00-18.45M
		19		DS14	18.00-18.45M
			N = 55	SPT13	19.55-20.00M
		20		DS15	19.55-20.00M
Termination Depth 20.000 Mtr.		21			
		22			
		23			
		24			

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-5 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 13.09.2015
Depth of Boring	20.000 M.	SPT	12	UDS	1	WS	1	Completed on : 13.09.2015
Type of Drilling		DCPT		DS	14	RCS		Water Struck At : 1.50 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 1.40 M.

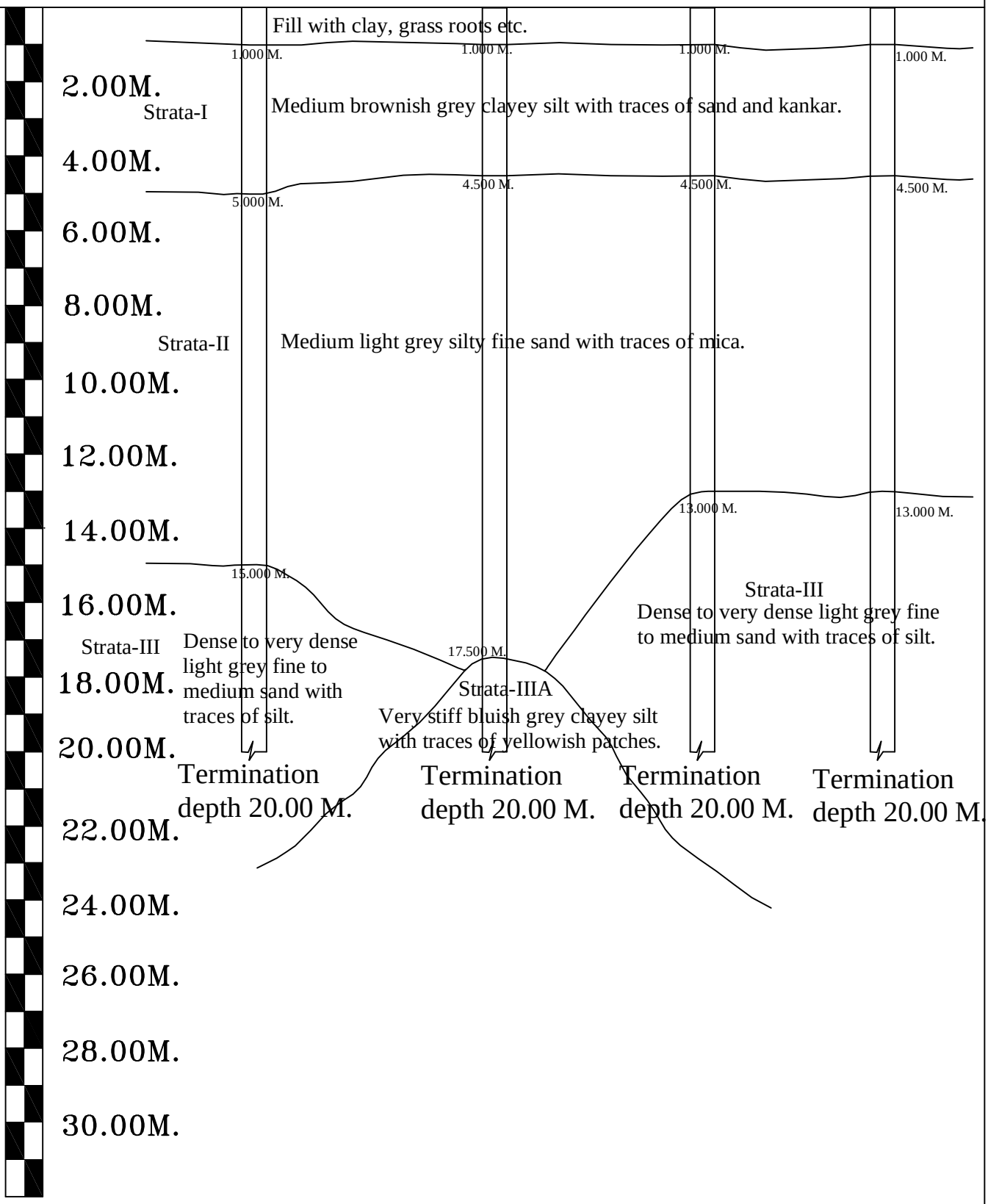
DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.				DS1	0.50 M
Medium brownish grey clayey silt with traces of sand and kankar.		G.W.T		DS2	1.00M
				UDS1	1.50-1.95M
			N = 10	SPT1	3.00-3.45M
				DS3	3.00-3.45M
Medium light grey silty fine sand with traces of mica.			N = 19	SPT2	4.50-4.95M
				DS4	4.50-4.95M
			N = 22	SPT3	6.00-6.45M
				DS5	6.00-6.45M
			N = 24	SPT4	7.50-7.95M
				DS6	7.50-7.95M
			N = 27	SPT5	9.00-9.45M
				DS7	9.00-9.45M
			N = 27	SPT6	10.50-10.95M
				DS8	10.50-10.95M
			N = 28	SPT7	12.00-12.45M
				DS9	12.00-12.45M
Dense to very dense light grey fine to medium sand with traces of silt.			N = 31	SPT8	13.50-13.95M
				DS10	13.50-13.95M
			N = 32	SPT9	15.00-15.45M
				DS11	15.00-15.45M
			N = 35	SPT10	16.50-16.95M
				DS12	16.50-16.95M
			N = 38	SPT11	18.00-18.45M
				DS13	18.00-18.45M
			N = 39	SPT12	19.55-20.00M
Termination Depth 20.000 Mtr.				DS14	19.55-20.00M

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole No.: BH-6 (Sheet 1)
Project: SOIL_HSCC_AIIMS-KALYANI								Job No.: Soil - 1491
Co-ord:		E.G.L.:		Unit:				Bore Hole Dia. : 150 MM.
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenced on : 14.09.2015
Depth of Boring	20.000 M.	SPT	12	UDS	1	WS	1	Completed on : 14.09.2015
Type of Drilling		DCPT		DS	14	RCS		Water Struck At : 1.90 M.
Depth of Drilling		VST		SCPT				Standing Water Table : 1.80 M.

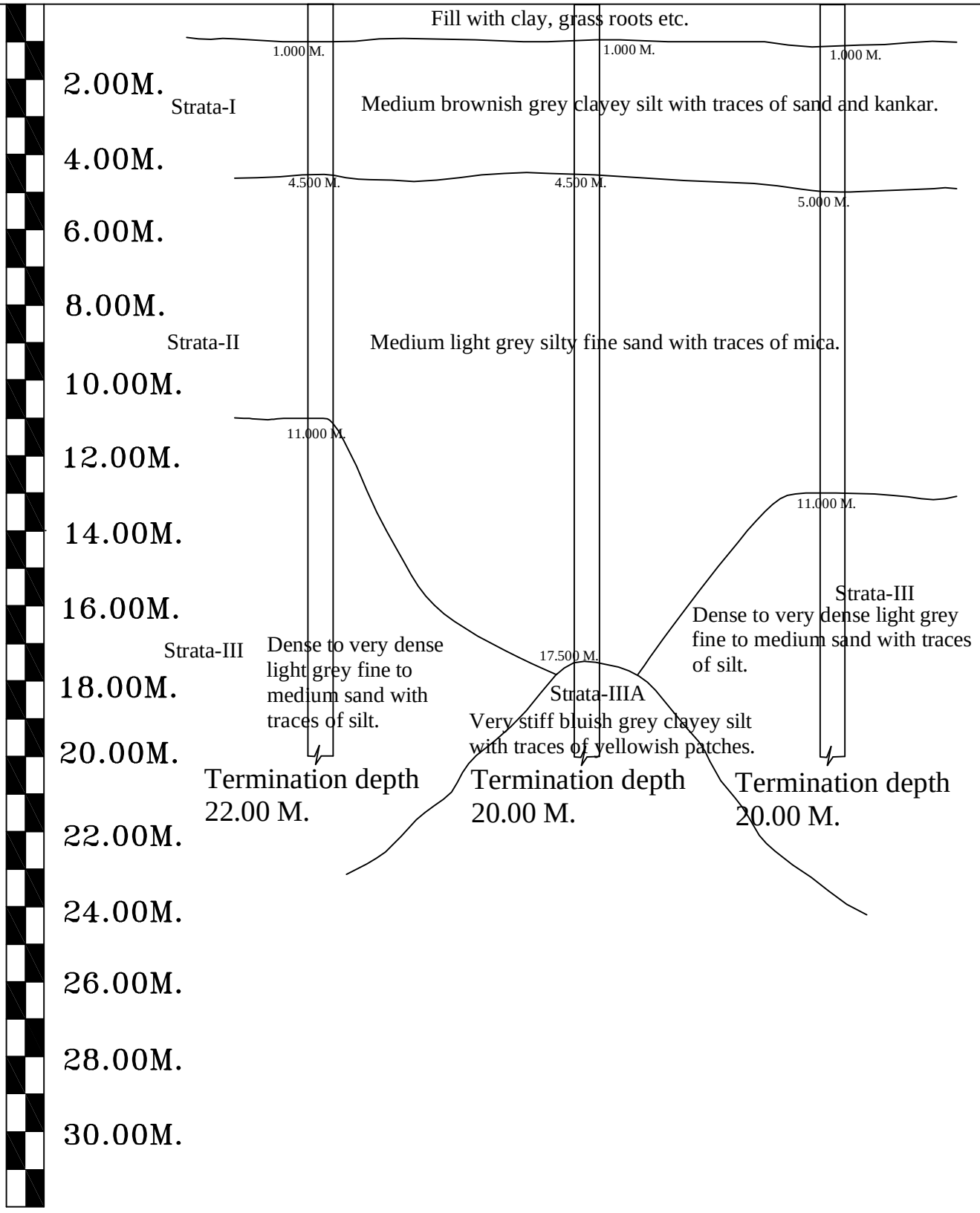
DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Fill with clay, grass roots etc.				DS1	0.50 M
Medium brownish grey clayey silt with traces of sand and kankar.		G.W.T		DS2	1.00M
				UDS1	2.50-2.95M
			N = 4	SPT1	3.00-3.45M
				DS3	3.00-3.45M
Medium light grey silty fine sand with traces of mica.			N = 14	SPT2	4.50-4.95M
				DS4	4.50-4.95M
			N = 17	SPT3	6.00-6.45M
				DS5	6.00-6.45M
			N = 21	SPT4	7.50-7.95M
				DS6	7.50-7.95M
			N = 23	SPT5	9.00-9.45M
				DS7	9.00-9.45M
			N = 25	SPT6	10.50-10.95M
				DS8	10.50-10.95M
			N = 26	SPT7	12.00-12.45M
				DS9	12.00-12.45M
Dense to very dense light grey fine to medium sand with traces of silt.			N = 29	SPT8	13.50-13.95M
				DS10	13.50-13.95M
			N = 32	SPT9	15.00-15.45M
				DS11	15.00-15.45M
			N = 36	SPT10	16.50-16.95M
				DS12	16.50-16.95M
			N = 41	SPT11	18.00-18.45M
				DS13	18.00-18.45M
			N = 45	SPT12	19.55-20.00M
Termination Depth 20.000 Mtr.				DS14	19.55-20.00M

SPT - Standard Penetration Test DCPT - Dynamic Cone Penetration Test.	VST- Vane Shear Test UDS - Undisturbed Sample	DS - Disturbed Sample SCPT-Static Cone Penetration Test.	WS - Water Sample RCS - Rock Core Sample



Sub-Soil Profile through BH-2, BH-3, BH-5 & BH-6

Sketch No.-SK/HSCC/	AIIMS-KALYANI	1491	02	1 of 2



Sub-Soil Profile through BH-4, BH-3 & BH-1

Sketch No.-SK/HSCC/	AIIMS-KALYANI	1491	02	2 of 2

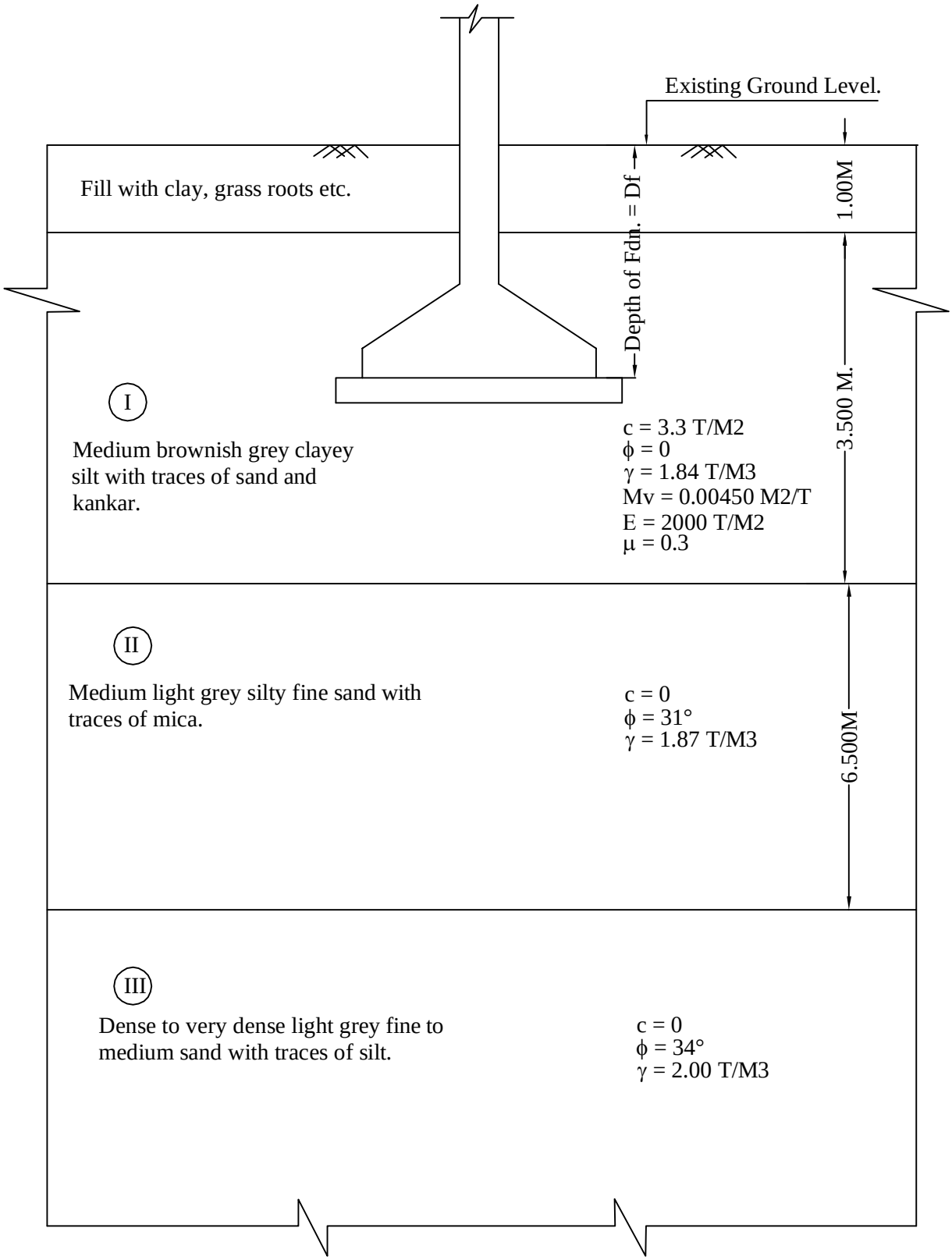
SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Setting up of AIIMS at Kalyani, West Bengal

Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Grading			
						LL	PL	PI						Type of Test	Cohesion in kg/sqcm	Friction angle in degree			Gravel (> 4.75 mm) %	Sand (0.075 - 4.75 mm)	Silt (0.002 - 0.075 mm)	Clay (< 0.002 mm)
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/UC/DS	C	ϕ			%	%	%	%
I	Medium brownish grey clayey silt with traces of sand and kankar.	1	1.50	DN	11	46	20	26			2.67								0	88	12	0
		1	4.50	UD		42	22	20	1.84	27.29	2.66	1.45	0.66	UU	3.40	0	0.00-0.25	0.0616	0	10	72	18
																	0.25-0.50	0.0527				
																	0.50-1.00	0.0450				
																	1.00-2.00	0.0337				
																	2.00-4.00	0.0232				
II	Medium light grey silty fine sand with traces of mica.	1	12.00	DN	28	NP					2.64			DS	0.04	32			0	85	15	0
I	Medium brownish grey clayey silt with traces of sand and kankar.	2	2.00	UD		48	20	28	1.80	27.11	2.66	1.42	0.7	UU	0.36	0	0.00-0.25	0.0618	0	9	69	22
																	0.25-0.50	0.0533				
																	0.50-1.00	0.0417				
																	1.00-2.00	0.0319				
																	2.00-4.00	0.0215				
		2	3.50	DN	7	NP					2.63			DS	0.09	31			0	76	21	3
II	Medium light grey silty fine sand with traces of mica.	2	14.00	DN	26	NP			1.87		2.65			DS	0.04	31			0	88	12	0
I	Medium brownish grey clayey silt with traces of sand and kankar.	3	1.50	UD		46	21	25	1.83	26.43	2.67	1.45	0.72	UU	0.37	0	0.00-0.25	0.0611	0	13	68	19
																	0.25-0.50	0.0526				
																	0.50-1.00	0.0400				
																	1.00-2.00	0.0300				
																	2.00-4.00	0.0203				
II	Medium light grey silty fine sand with traces of mica.	3	16.50	DN	24	NP			1.86		2.64			DS	0.05	32			0	86	14	0
III	Very stiff bluish grey clayey silt with traces of yellowish patches.	3	18.00	DN	26	54	19	35			2.68								0	2	62	36

Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Grading			
						LL	PL	PI						Type of Test	Cohesion in kg/sqcm	Friction angle in degree			Gravel (> 4.75 mm) %	Sand (0.075 - 4.75 mm)	Silt (0.002 - 0.075 mm)	Clay (< 0.002 mm)
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/UC/DS	C	ϕ			%	%	%	%
II	Medium light grey silty fine sand with traces of mica.	4	6.00	DN	15	NP			1.87		2.65			DS	0.04	33			0	79	21	0
		4	9.00	DN	19	NP			1.86		2.65			DS	0.02	32			0	83	17	0
III	Dense to very dense light grey fine to medium sand with traces of silt.	4	18.00	DN	51	NP			1.98		2.64			DS	0.01	36			0	89	11	0
I	Medium brownish grey clayey silt with traces of sand and kankar.	5	1.50	UD		45	23	22	1.82	26.06	2.66	1.44	0.72	UU	0.37	1	0.00-0.25	0.0568	0	3	76	21
																	0.25-0.50	0.0463				
																	0.50-1.00	0.0316				
																	1.00-2.00	0.0221				
																	2.00-4.00	0.0161				
II	Medium light grey silty fine sand with traces of mica.	5	4.50	DN	19	NP					2.63			DS	0.02	35			0	85	15	0
III	Dense to very dense light grey fine to medium sand with traces of silt.	5	16.50	DN	35	NP			2.01		2.64			DS	0.07	36			0	90	10	0
I	Medium brownish grey clayey silt with traces of sand and kankar.	6	2.50	UD		47	22	25	1.80	26.81	2.66	1.42	0.74	UU	0.39	1	0.00-0.25	0.0579	0	7	71	22
																	0.25-0.50	0.0472				
																	0.50-1.00	0.0331				
																	1.00-2.00	0.0228				
																	2.00-4.00	0.0173				
II	Medium light grey silty fine sand with traces of mica.	6	7.50	DN	21	NP			1.88		2.64			DS	0.08	32			0	84	16	0
III	Dense to very dense light grey fine to medium sand with traces of silt.	6	19.55	DN	45	NP			2.00		2.64			DS	0.06	34			0	87	13	0



Foundation Model

Scale :- N.T.S.

Sketch No.-SK/HSCC/	AIIMS-KALYANI	1491	03	1 of 2

SUMMARY OF FIELD/LABORATORY DATA AND CONSIDERED DESIGN PARAMETERS

Sub-soil Srtatification & Properties considered in foundation model

	Description of layer	Layer Thickness	Field N Observed		Corrected N Value
			Depth	Value	
		Meter	Meter		
Strata1	Fill with clay, grass roots etc.	1.00			
Strata 2	Medium brownish grey clayey silt with traces of sand and kankar.	3.50	3	4	5
Strata 3	Medium light grey silty fine sand with traces of mica.	6.50	5	9	10
Strata4	Dense to very dense light grey fine to medium sand with traces of silt.	9.00	13.5	29	22
Strata5	Not explored				
Strata6	Not explored				
Strata7	Not explored				
Strata8	Not explored				

Depth of water Table from EGL = 3.300 Meter

LABORATORY RESULTS

	Description of layer	Cohesion in T/sqm	Friction angle in degree	Bulk Density in T/cum	Co-eff. of volume compressibility in sqm/T
		C	ϕ	γ	$\mathbf{m_v}$
Strata1	Fill with clay, grass roots etc.				
Strata 2	Medium brownish grey clayey silt with traces of sand and kankar.	3.3	0	1.84	0.0045
Strata 3	Medium light grey silty fine sand with traces of mica.	0	31	1.87	
Strata4	Dense to very dense light grey fine to medium sand with traces of silt	0	34	2	
Strata5	NA				
Strata6	NA				
Strata7	NA				
Strata8	NA				

DESIGN PARAMETERS

C	ϕ	Depth of Water Table from EGL*	γ	$\mathbf{m_v}$	**E**	μ
T/sqm	Degrees	meter	T/Cum	Sqm/T	T/sqm	
3.3	0	0	1.84	0.00450	2000	0.3

* For design purpose, Ground Water Table has been considered as at EGL due to seasonal variation in GWT

CHECK FOR TYPE OF SHEAR FAILURE

Design value of ϕ, in degrees = 0

Friction Angle<=28degrees, Local Shear Failure

As per IS 6403-1981, cl. No. 5.1.2, the Ultimate Net Safe Bearing Capacity (Net q(ult))

1 For General Shear Failure, $q(ult) = cNcscdcic + q(Nq-1)sqdqiq+0.5\gamma BN\gamma s\gamma d\gamma i\gamma W'$

2 For Local Shear Failure, $q(ult) = c'N'cscdcic + q(N'q-1)sqdqiq+0.5\gamma BN'\gamma s\gamma d\gamma i\gamma W'$

3 For Intermediate Shear Failure, q(ult) = Value in between the General & Local Shear Failure

CALCULATION OF NET SAFE BEARING CAPACITY FROM SHEAR CRITERIA

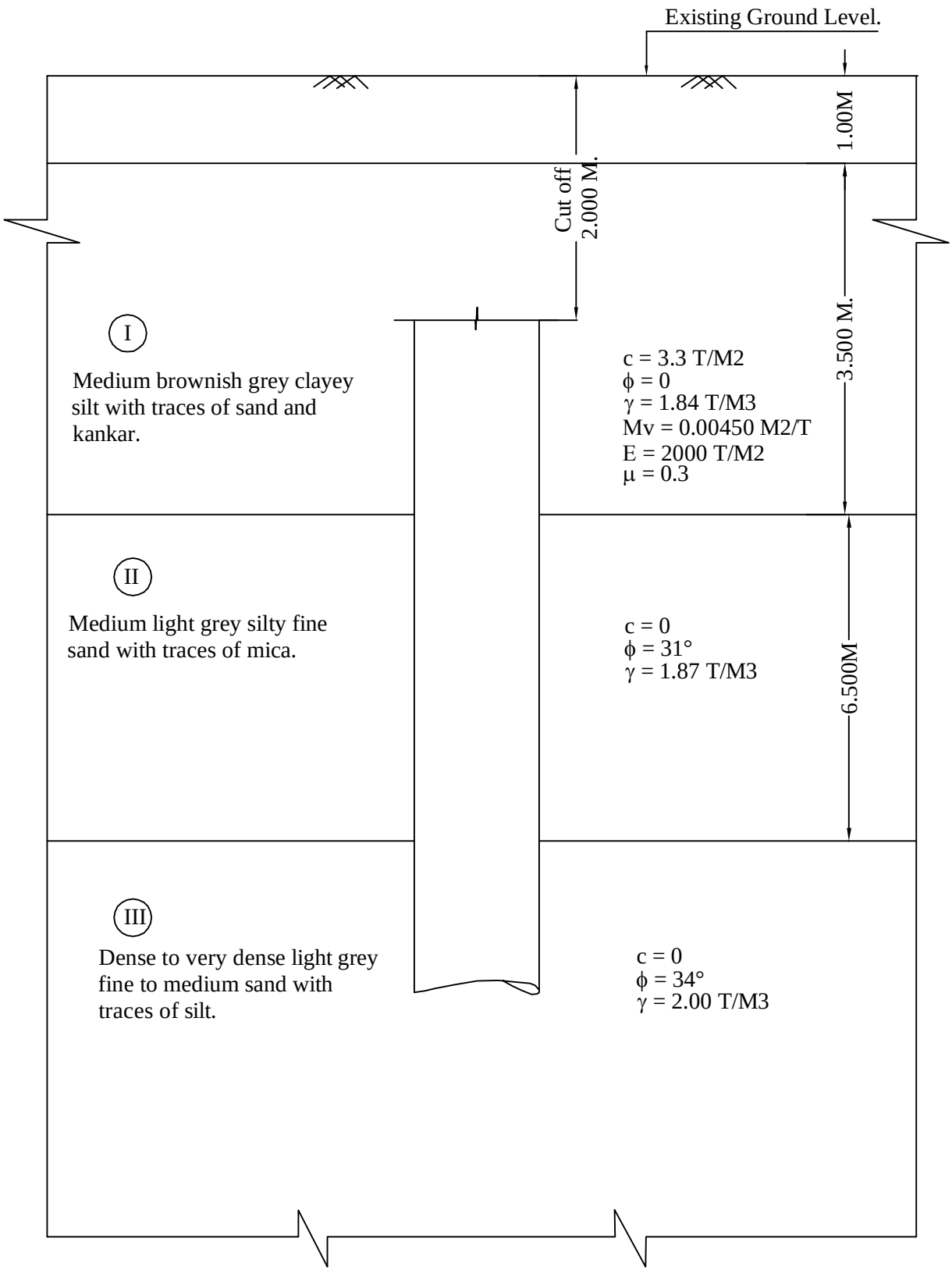
	FOOTING DIMENSIONS			Load inclination w.r.t. Vertical (α)	SOIL PARAMETERS					BEARING CAPACITY FACTORS			SHAPE FACTORS			DEPTH FACTORS			INCLINATION FACTORS			Water Table Correction Factor	Factor of safety	NET SAFE BEARING CAPACITY
	L	B	Df		C	C'	ϕ	ϕ'	γ															
	Meter	Meter	Meter	Degree	T/sqm	T/sqm	Deg.	Deg.	T/cum	Nc	N_q	N_γ	s_c	s_q	s_γ	d_c	d_q	d_γ	i_c	i_q	i_γ	W'	F	Qnet safe in T/sqm
ISOLATED SQUARE FOOTINGS	2.00	2.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.13	1.00	1.00	1	1	1	0.5	2.5	6.6
	3.00	3.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.08	1.00	1.00	1	1	1	0.5	2.5	6.3
	5.00	5.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.05	1.00	1.00	1	1	1	0.5	2.5	6.1
	2.00	2.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.15	1.00	1.00	1	1	1	0.5	2.5	6.7
	3.00	3.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.10	1.00	1.00	1	1	1	0.5	2.5	6.4
	5.00	5.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.06	1.00	1.00	1	1	1	0.5	2.5	6.2
	2.00	2.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.18	1.00	1.00	1	1	1	0.5	2.5	6.9
	3.00	3.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.12	1.00	1.00	1	1	1	0.5	2.5	6.5
	5.00	5.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.30	1.20	0.80	1.07	1.00	1.00	1	1	1	0.5	2.5	6.2
ISOLATED RECTANGULAR FOOTINGS	3.00	2.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.13	1.00	1.00	1	1	1	0.5	2.5	5.7
	4.50	3.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.08	1.00	1.00	1	1	1	0.5	2.5	5.5
	7.50	5.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.05	1.00	1.00	1	1	1	0.5	2.5	5.3
	3.00	2.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.15	1.00	1.00	1	1	1	0.5	2.5	5.8
	4.50	3.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.10	1.00	1.00	1	1	1	0.5	2.5	5.6
	7.50	5.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.06	1.00	1.00	1	1	1	0.5	2.5	5.4
	3.00	2.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.18	1.00	1.00	1	1	1	0.5	2.5	6
	4.50	3.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.12	1.00	1.00	1	1	1	0.5	2.5	5.7
	7.50	5.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.13	1.13	0.73	1.07	1.00	1.00	1	1	1	0.5	2.5	5.4
CONTINUOUS STRIP FOOTINGS		2.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.13	1.00	1.00	1	1	1	0.5	2.5	5
		2.50	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.10	1.00	1.00	1	1	1	0.5	2.5	4.9
		3.00	1.25	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.08	1.00	1.00	1	1	1	0.5	2.5	4.9
		2.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.15	1.00	1.00	1	1	1	0.5	2.5	5.2
		2.50	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.12	1.00	1.00	1	1	1	0.5	2.5	5
		3.00	1.50	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.10	1.00	1.00	1	1	1	0.5	2.5	4.9
		2.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.18	1.00	1.00	1	1	1	0.5	2.5	5.3
		2.50	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.14	1.00	1.00	1	1	1	0.5	2.5	5.1
		3.00	1.75	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.00	1.00	1.00	1.12	1.00	1.00	1	1	1	0.5	2.5	5
RAFT FOOTINGS	10.00	8.00	2.00	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.16	1.16	0.68	1.05	1.00	1.00	1	1	1	0.5	2.5	5.5
	12.00	10.00	2.00	0	3.3	2.20	0	0.00	1.84	5.14	1.00	0.00	1.17	1.17	0.67	1.04	1.00	1.00	1	1	1	0.5	2.5	5.4

CALCULATION OF FOUNDATION SETTLEMENT

	FOOTING DIMENSIONS															
	L	B	Df	Foundation presure, p	Poisson's Ratio μ	Youngs Modulus, E	Cvoefficient of consolidation, m_v	pressure increment, Δp	Layer thickness H	Influence Factor I	Elastic settlement $Si = pB\{(1-\mu^2)/E\}I$	Consolidation Settlement $Sc = Sm_v\Delta pH$	total settlement, $S_t = S_i + S_c$	Depth Factor Dfact	Rigidity factor Rfact	total corrected settlement, $S_{t(correct)} = S_t * DFact*Rfact$
	Meter	Meter	Meter	T/m^2		T/M^2	m^2/T	T/m^2	Meter		mm	mm	mm			mm
ISOLATED SQUARE FOOTINGS	2.00	2.00	1.25	6.6	0.3	2000	0.0045	1.65	4.00	0.95	5.71	29.70	35.41	0.828	0.8	23.46
	3.00	3.00	1.25	6.3	0.3	2000	0.0045	1.58	6.00	0.95	8.17	42.53	50.69	0.885	0.8	35.91
	5.00	5.00	1.25	6.1	0.3	2000	0.0045	1.53	10.00	0.95	13.18	68.63	81.81	0.931	0.8	60.95
	2.00	2.00	1.50	6.7	0.3	2000	0.0045	1.68	4.00	0.95	5.79	30.15	35.94	0.794	0.8	22.82
	3.00	3.00	1.50	6.4	0.3	2000	0.0045	1.60	6.00	0.95	8.30	43.20	51.50	0.863	0.8	35.53
	5.00	5.00	1.50	6.2	0.3	2000	0.0045	1.55	10.00	0.95	13.40	69.75	83.15	0.918	0.8	61.03
	2.00	2.00	1.75	6.9	0.3	2000	0.0045	1.73	4.00	0.95	5.97	31.05	37.02	0.759	0.8	22.49
	3.00	3.00	1.75	6.5	0.3	2000	0.0045	1.63	6.00	0.95	8.43	43.88	52.30	0.84	0.8	35.13
	5.00	5.00	1.75	6.2	0.3	2000	0.0045	1.55	10.00	0.95	13.40	69.75	83.15	0.904	0.8	60.12
ISOLATED RECTANGULAR FOOTINGS	3.00	2.00	1.25	5.7	0.3	2000	0.0045	1.71	4.00	1.2	6.22	30.78	37.00	0.86	0.8	25.45
	4.50	3.00	1.25	5.5	0.3	2000	0.0045	1.65	6.00	1.2	9.01	44.55	53.56	0.906	0.8	38.84
	7.50	5.00	1.25	5.3	0.3	2000	0.0045	1.59	10.00	1.2	14.47	71.55	86.02	0.944	0.8	64.95
	3.00	2.00	1.50	5.8	0.3	2000	0.0045	1.74	4.00	1.2	6.33	31.32	37.65	0.832	0.8	25.05
	4.50	3.00	1.50	5.6	0.3	2000	0.0045	1.68	6.00	1.2	9.17	45.36	54.53	0.888	0.8	38.73
	7.50	5.00	1.50	5.4	0.3	2000	0.0045	1.62	10.00	1.2	14.74	72.90	87.64	0.933	0.8	65.39
	3.00	2.00	1.75	6	0.3	2000	0.0045	1.80	4.00	1.2	6.55	32.40	38.95	0.804	0.8	25.04
	4.50	3.00	1.75	5.7	0.3	2000	0.0045	1.71	6.00	1.2	9.34	46.17	55.51	0.869	0.8	38.59
	7.50	5.00	1.75	5.4	0.3	2000	0.0045	1.62	10.00	1.2	14.74	72.90	87.64	0.921	0.8	64.60
CONTINUOUS STRIP FOOTINGS		2.00	1.25	5	0.3	2000	0.0045	2.34	4.00	2.289	10.42	42.19	52.60	0.956	0.8	40.22
		2.50	1.25	4.9	0.3	2000	0.0045	2.30	5.00	2.289	12.76	51.68	64.44	0.964	0.8	49.72
		3.00	1.25	4.9	0.3	2000	0.0045	2.30	6.00	2.289	15.31	62.02	77.33	0.97	0.8	60.03
		2.00	1.50	5.2	0.3	2000	0.0045	2.44	4.00	2.289	10.83	43.88	54.71	0.947	0.8	41.44
		2.50	1.50	5	0.3	2000	0.0045	2.34	5.00	2.289	13.02	52.73	65.76	0.957	0.8	50.36
		3.00	1.50	4.9	0.3	2000	0.0045	2.30	6.00	2.289	15.31	62.02	77.33	0.964	0.8	59.67
		2.00	1.75	5.3	0.3	2000	0.0045	2.48	4.00	2.289	11.04	44.72	55.76	0.938	0.8	41.84
		2.50	1.75	5.1	0.3	2000	0.0045	2.39	5.00	2.289	13.28	53.79	67.07	0.95	0.8	50.99
		3.00	1.75	5	0.3	2000	0.0045	2.34	6.00	2.289	15.63	63.28	78.91	0.959	0.8	60.51
RAFT FOOTINGS	10.00	8.00	2.00	5.5	0.3	2000	0.0045	4.23	2.50	1.2	24.02	47.57	71.59	0.939	0.8	53.75
	12.00	10.00	2.00	5.4	0.3	2000	0.0045	4.35	2.50	1.2	29.48	48.91	78.39	0.95	0.8	59.56

ALLOWABLE BEARING CAPACITY FROM SHEAR AND SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	**L**	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 50 mm**	**For allowable settlement 75 mm**	**For allowable settlement 125 mm**
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	2.00	2.00	1.25	6.6	23.46	6.6	6.6	6.6
	3.00	3.00	1.25	6.3	35.91	6.3	6.3	6.3
	5.00	5.00	1.25	6.1	60.95	5.0	6.1	6.1
	2.00	2.00	1.50	6.7	22.82	6.7	6.7	6.7
	3.00	3.00	1.50	6.4	35.53	6.4	6.4	6.4
	5.00	5.00	1.50	6.2	61.03	5.1	6.2	6.2
	2.00	2.00	1.75	6.9	22.49	6.9	6.9	6.9
	3.00	3.00	1.75	6.5	35.13	6.5	6.5	6.5
	5.00	5.00	1.75	6.2	60.12	5.2	6.2	6.2
ISOLATED RECTANGULAR FOOTINGS	3.00	2.00	1.25	5.7	25.45	5.7	5.7	5.7
	4.50	3.00	1.25	5.5	38.84	5.5	5.5	5.5
	7.50	5.00	1.25	5.3	64.95	4.1	5.3	5.3
	3.00	2.00	1.50	5.8	25.05	5.8	5.8	5.8
	4.50	3.00	1.50	5.6	38.73	5.6	5.6	5.6
	7.50	5.00	1.50	5.4	65.39	4.1	5.4	5.4
	3.00	2.00	1.75	6.0	25.04	6.0	6.0	6.0
	4.50	3.00	1.75	5.7	38.59	5.7	5.7	5.7
	7.50	5.00	1.75	5.4	64.60	4.2	5.4	5.4
CONTINUOUS STRIP FOOTINGS		2.00	1.25	5.0	40.22	5.0	5.0	5.0
		2.50	1.25	4.9	49.72	4.9	4.9	4.9
		3.00	1.25	4.9	60.03	4.1	4.9	4.9
		2.00	1.50	5.2	41.44	5.2	5.2	5.2
		2.50	1.50	5.0	50.36	5.0	5.0	5.0
		3.00	1.50	4.9	59.67	4.1	4.9	4.9
		2.00	1.75	5.3	41.84	5.3	5.3	5.3
		2.50	1.75	5.1	50.99	5.0	5.1	5.1
		3.00	1.75	5.0	60.51	4.1	5.0	5.0
RAFT FOOTINGS	10.00	8.00	2.00	5.5	53.75	5.1	5.5	5.5
	12.00	10.00	2.00	5.4	59.56	4.5	5.4	5.4



Pile Foundation Model

Scale :- N.T.S.

Sketch No.-SK/HSCC/	AIIMS-KALYANI	1491	03	2 of 2

Ultimate skin friction capacity in clayey soil

Project: Setting up of AIIMS at Kalyani West Bengal

Location: Kalyani West Bengal

Layer No: 1

Soil Description : Medium brownish grey clayey silt with traces of sand and kankar.

Sl.No	Pile Dia , **D**	Total Length of Pile, **L**	Depth of layer top from EGL	Depth of layer bottom from EGL	Reduction factor, **α** (Note1 IS 2911(Part1/Sec2)	Average Cohesion along the length of the pile in this layer, **C**	Unit Skin Friction Fs = **αC**, limited to maximum 10T/M^2	Surface area of the pile shaft in this layer, A_s	Ultimate Skin friction capacity of the shaft in this layer, Q_{su} = α*C*A_S
	Mtr	Mtr.	Mtr	Mtr.		T/M^2	T/M^2	M^2	T
1	0.300	18.000	2.000	4.500	1	3.30	3.3	2.356	7.775
2	0.350	18.000	2.000	4.500	1	3.30	3.3	2.749	9.071
3	0.400	18.000	2.000	4.500	1	3.30	3.3	3.142	10.367
4	0.450	18.000	2.000	4.500	1	3.30	3.3	3.534	11.663
5	0.500	18.000	2.000	4.500	1	3.30	3.3	3.927	12.959
6	0.550	18.000	2.000	4.500	1	3.30	3.3	4.320	14.255

Ultimate skin friction capacity

Project: Setting up of AIIMS at Kalyani West Bengal

Location: Kalyani West Bengal

Layer No: 2

Soil Description : Medium light grey silty fine sand with traces of mica.

Sl.No	Pile Dia , D	Total Length of Pile, L	Depth of layer top, from EGL	Depth of layer bottom, from EGL	Water table	ϕ	ϕ adopted =(ϕ -3)^{o}considering loosening effect	N_c	N_q	N_γ	Unit weight, γ	Effective unit weight, γ'	k- Value, as per note 3 IS 2911 part 1/ Sec2-1979	Limiting L/D for calcn. Of maxm. Effective overburden press. At pile tip	P_{Di} at layer top	$\delta = \phi$	Unit friction, f_s = K*Pdi*tanδ - at layer top, maximum = 10T/M^2	P_{Di} at layer bottom	Unit friction, f_s = K*Pdi*tanδ - at layer bottom, maximum = 10T/M^2	Average unit friction, adopted for shaft friction capacity.	A_{Si}	Shaft friction, F
	Mtr	Mtr.	Mtr	Mtr.	Mtr.	Degree	Degree				T/M^3	T/M^3			T/M^2	Radian	T/M^2	T/M^2	T/M^2	T/M^2	M^2	T
1	0.300	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	3.915	2.706	2.706	6.126	**16.578**
2	0.350	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	4.568	3.157	2.932	7.147	**20.953**
3	0.400	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	5.22	3.608	3.157	8.168	**25.788**
4	0.450	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	5.873	4.059	3.383	9.189	**31.084**
5	0.500	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	6.525	4.510	3.608	10.210	**36.840**
6	0.550	18.000	4.500	11.000	1.000	31	28	25.80	14.72	16.72	1.87	0.87	1.3	15	3.915	0.49	2.706	7.178	4.961	3.834	11.231	**43.057**

Ultimate skin friction capacity

Project: Setting up of AIIMS at Kalyani West Bengal

Location: Kalyani West Bengal

Layer No: 3

Soil Description : Dense to very dense light grey fine to medium sand with traces of silt.

Sl.No	Pile Dia , D	Total Length of Pile, L	Depth of layer top, from EGL	Depth of layer bottom, from EGL	Water table	ϕ	ϕ adopted =(ϕ -3)^{o}considering loosening effect	N_c	N_q	N_γ	Unit weight, γ	Effective unit weight, γ'	k- Value, as per note 3 IS 2911 part 1/ Sec2-1979	Limiting L/D for calcn. Of maxm. Effective overburden press. At pile tip	P_{Di} at layer top	$\delta = \phi$	Unit friction, f_s = K*Pdi*tanδ - at layer top, maximum = 10T/M^2	P_{Di} at layer bottom	Unit friction, f_s = K*Pdi*tanδ - at layer bottom, maximum = 10T/M^2	Average unit friction, adopted for shaft friction capacity.	A_{Si}	Shaft friction, F
	Mtr	Mtr.	Mtr	Mtr.	Mtr.	Degree	Degree				T/M^3	T/M^3			T/M^2	Radian	T/M^2	T/M^2	T/M^2	T/M^2	M^2	T
1	0.300	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	4.5	0.54	3.515	4.5	3.515	3.515	6.597	**23.190**
2	0.350	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	5.25	0.54	4.101	5.25	4.101	4.101	7.697	**31.564**
3	0.400	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	6	0.54	4.687	6	4.687	4.687	8.796	**41.226**
4	0.450	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	6.75	0.54	5.273	6.75	5.273	5.273	9.896	**52.177**
5	0.500	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	7.5	0.54	5.858	7.5	5.858	5.858	10.996	**64.416**
6	0.550	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2.00	1	1.3	15	8.25	0.54	6.444	8.25	6.444	6.444	12.095	**77.944**

Ultimate end bearing capacity

Project: Setting up of AIIMS at Kalyani West Bengal

Location: Kalyani West Bengal

Layer No: 3

Soil Description : Dense to very dense light grey fine to medium sand with traces of silt.

Sl.No	Pile Dia , D	Total Length of Pile, L	Depth of layer top, from EGL	Depth of layer bottom, from EGL	Water table	ϕ	ϕ adopted =(ϕ -3)^{o}considering loosening effect	N_c	N_q	N_γ	Unit weight, γ	Effective unit weight, γ'	Limiting L/D for calcn. Of maxm. Effective overburden press. At pile tip	P_{Di} at pile tip	A_P	End Bearing
	Mtr	Mtr.	Mtr	Mtr.	Mtr.	Degree	Degree				T/M^3	T/M^3			M^2	T
1	0.300	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	4.5	0.071	**6.838**
2	0.350	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	5.25	0.096	**10.858**
3	0.400	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	6	0.126	**16.209**
4	0.450	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	6.75	0.159	**23.078**
5	0.500	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	7.5	0.196	**31.657**
6	0.550	18.000	11.000	18.000	1.000	34	31	32.67	20.63	25.99	2	1	15	8.25	0.238	**42.136**

Recommended Pile Capacity

Project: Setting up of AIIMS at Kalyani West Bengal

Location: Kalyani West Bengal

Sl.No	Pile Dia , **D**	Total Length of Pile, **L**	Skin friction from layer 1	Skin friction from layer 2	Skin friction from layer 3	End Bearing	Total	F.O.S	Allowable Pile Capacity	Recommemded Pile Capacity in Compression	Recommemded Pile Capacity in Pull-Out
	Mtr	Mtr.	T	T		T	T	T	T	T	T
1	0.300	18.000	7.775	16.578	23.190	6.838	**54.381**	2.5	21.753	**21**	**19**
2	0.350	18.000	9.071	20.953	31.564	10.858	**72.447**	2.5	28.979	**28**	**24**
3	0.400	18.000	10.367	25.788	41.226	16.209	**93.590**	2.5	37.436	**37**	**30**
4	0.450	18.000	11.663	31.084	52.177	23.078	**118.003**	2.5	47.201	**47**	**37**
5	0.500	18.000	12.959	36.840	64.416	31.657	**145.873**	2.5	58.349	**58**	**45**
6	0.550	18.000	14.255	43.057	77.944	42.136	**177.392**	2.5	70.957	**70**	**54**

Horizontal Shear Capacity of Pile

Reference : Code of Practice for Design and Construction of Pile Foundation - IS 2911 (Part1/Sec2)

Sample Calculation:-

C Value	=	0.33	Kg/CM^2	
	=	32.4	Kn/M^2	
Length of Pile (L)	=	18.00	Mtr.	
Cut-off Level of Pile	=	2.00	Mtr.	
Dia of Pile (D)	=	0.450	Mtr.	
fck	=	25	N/MM^2	
$E=E_{conc}$=Young's modulas	=	2500000	T/M^2	
	=	25000000	KN/M^2	
	=	24525	MN/M^2	
I (Moment of inertia of the pile cross-section)	=	0.00201289	M^4	
Neglecting the effect of steel we get EI	=	5032.22397	T/M^2	
	=	49.3661172	MN/M^2	
n_h = Modulas of Subgrade Reaction (if top of the soil is clay) (Table3)	=	0.200	MN/M^3	
T (Stiffness Factor)	=	3.01	Mtr.	[Where $T = (EI/nh)^{1/5}$]
Embeddment Length of the Pile (Le)	=	16.00	Mtr.	
Hence, As per Table-5 pile is a	**LONG ELASTIC PILE**			Since Le>= 4T
Where L1 = free head of Pile above ground	=	0.00	Mtr.	
And for fixed head file Lf/T (as per IS Code)	=	2.20	Mtr.	
Where Lf is the length of fixicity below cut-off level of pile =	=	6.621	Mtr.	
Therefore, Lf	=	6.621	Mtr.	
L1	=	0.000	Mtr.	

For Fixed Head Pile, deflection at the pile head,

$Y = H(L1+Lf)^3/12EI$	=	0.005	Mtr. (Adopt)
Horizontal Force = H	=	10.404	KN
H_{design}	=	**1.060**	**T**

PLATE LOAD TEST

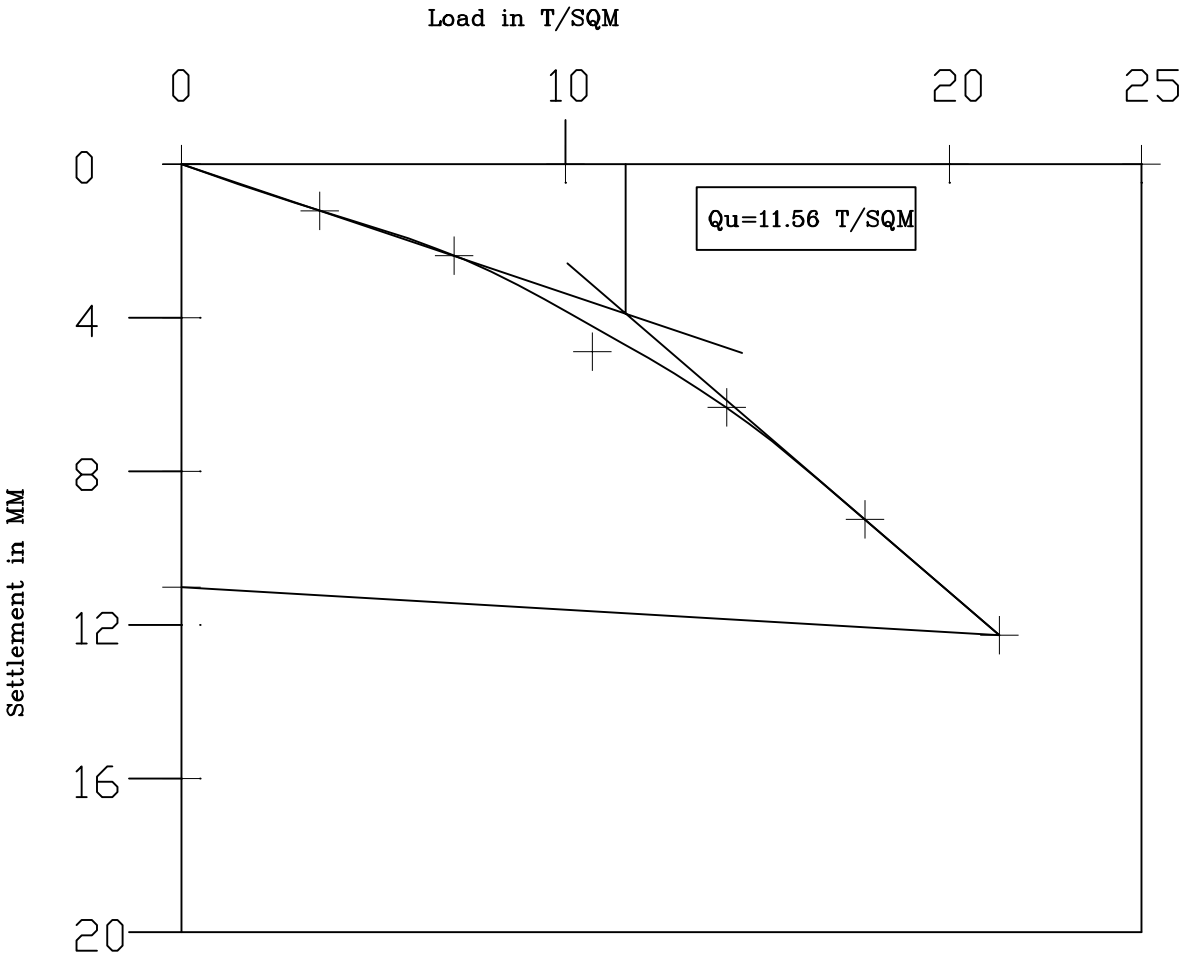
PLATE LOAD TEST SITE DATA SHEET

Client : HSCC (India) Limited
Location : Kalyani, West Bengal
Test Number : PLT-1
Plate Size : 75 X 75 = 5625 Sqcm
Pit Size : 2.00 X 2.00 X 2
Ground Water Table : Not Encountered
L.C. of Dial Guage : 0.01 mm
Jack Ram Dia : 9.5 cm
Jack Ram Area : 70.88 Sqcm

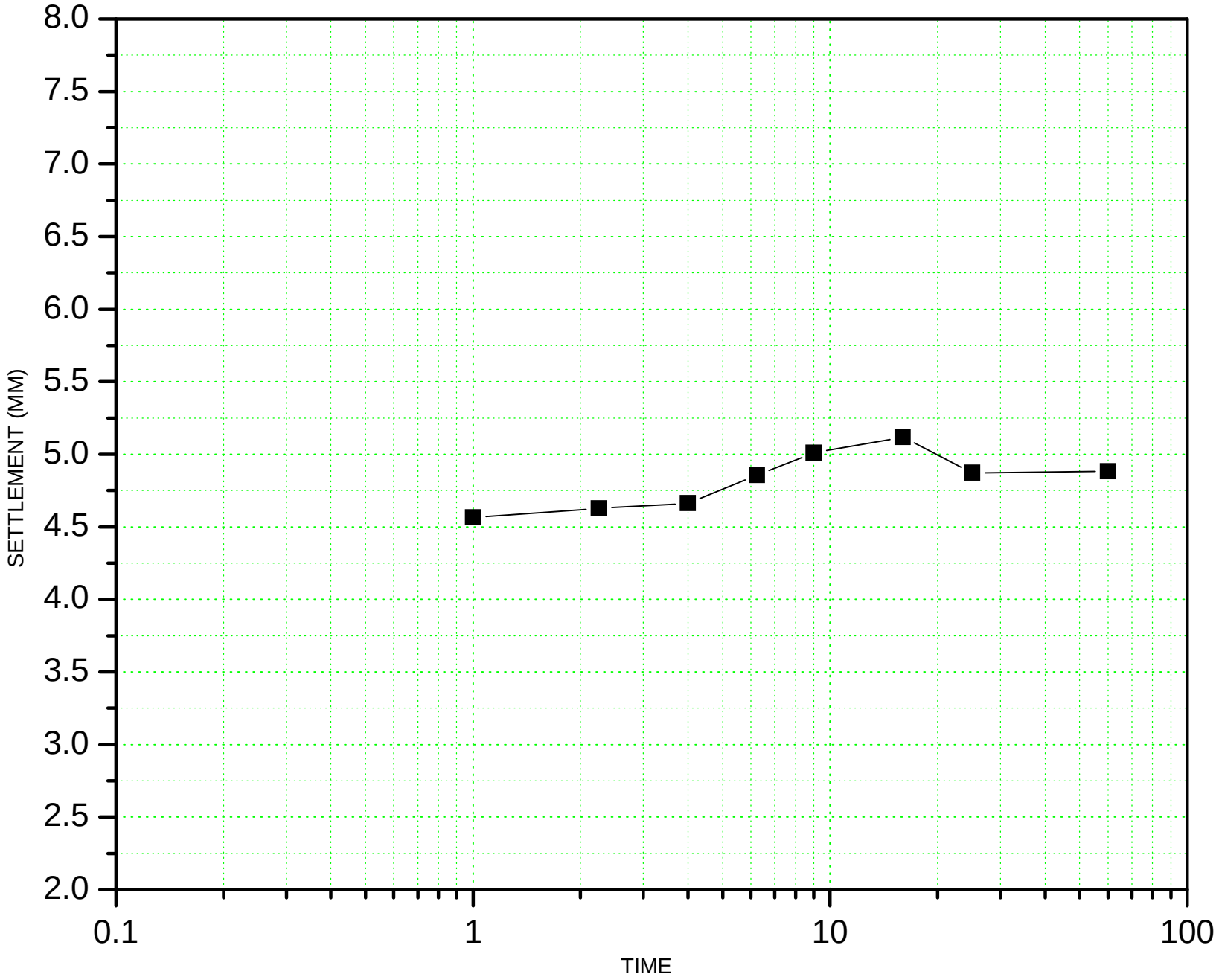
DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)			SETTLEMENT (mm)			MEAN SETTLEMENT (mm)	REMARKS
				DIAL-1	DIAL-2	DIAL-3	DIAL-1	DIAL-2	DIAL-3		
29.09.2015	11:00:00 AM	0.00	0	25.00	25.00	25.00	0.00	0.00	0.00	0.00	
	11:01:00 AM	2000	0.36	23.34	24.65	23.89	1.66	0.35	1.11	1.04	
	11:02:15 AM			23.31	24.64	23.86	1.69	0.36	1.14	1.06	
	11:04:00 AM			23.26	24.59	23.82	1.74	0.41	1.18	1.11	
	11:06:15 AM			23.24	24.52	23.79	1.76	0.48	1.21	1.15	
	11:09:00 AM			23.23	24.51	23.79	1.77	0.49	1.21	1.16	
	11:16:00 AM			23.21	24.51	23.77	1.79	0.49	1.23	1.17	
	11:25:00 AM			23.20	24.45	23.75	1.80	0.55	1.25	1.20	
	12:00:00 PM			23.19	24.44	23.74	1.81	0.56	1.26	**1.21**	
	12:00:00 PM	4000	0.71	23.19	24.44	23.74					
	12:01:00 PM			22.11	23.61	22.86	2.89	1.39	2.14	2.14	
	12:02:15 PM			22.06	23.55	22.8	2.94	1.45	2.20	2.20	
	12:04:00 PM			22.05	23.51	22.77	2.95	1.49	2.23	2.22	
	12:06:15 PM			22.02	23.5	22.74	2.98	1.50	2.26	2.25	
	12:09:00 PM			21.99	23.47	22.71	3.01	1.53	2.29	2.28	
	12:16:00 PM			21.95	23.44	22.67	3.05	1.56	2.33	2.31	
	12:25:00 PM			21.93	23.38	22.62	3.07	1.62	2.38	2.36	
	1:00:00 PM			21.92	23.37	22.61	3.08	1.63	2.39	**2.37**	
	1:00:00 PM	6000	1.07	21.92	23.37	22.61					
	1:01:00 PM			19.91	20.6	20.8	5.09	4.40	4.20	4.56	
	1:02:15 PM			19.82	20.55	20.75	5.18	4.45	4.25	4.63	
	1:04:00 PM			19.76	20.52	20.73	5.24	4.48	4.27	4.66	
	1:06:15 PM			19.6	20.38	20.45	5.40	4.62	4.55	4.86	
	1:09:00 PM			19.44	20.23	20.3	5.56	4.77	4.70	5.01	
	1:16:00 PM			19.36	20.09	20.2	5.64	4.91	4.80	5.12	
	1:25:00 PM			19.3	20.9	20.18	5.70	4.10	4.82	4.87	
	2:00:00 PM			19.29	20.88	20.18	5.71	4.12	4.82	**4.88**	
	2:00:00 PM	8000	1.42	19.29	20.88	20.18					
	2:01:00 PM			18.67	19.39	18.68	6.33	5.61	6.32	6.09	
	2:02:15 PM			18.55	19.29	18.56	6.45	5.71	6.44	6.20	
	2:04:00 PM			18.51	19.25	18.54	6.49	5.75	6.46	6.23	
	2:06:15 PM			18.49	19.24	18.5	6.51	5.76	6.50	6.26	
	2:09:00 PM			18.48	19.21	18.49	6.52	5.79	6.51	6.27	
	2:16:00 PM			18.46	19.19	18.47	6.54	5.81	6.53	6.29	
	2:25:00 PM			18.42	19.17	18.46	6.58	5.83	6.54	6.32	

DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)			SETTLEMENT (mm)			MEAN SETTLEMENT (mm)	REMARKS
				DIAL-1	DIAL-2	DIAL-3	DIAL-1	DIAL-2	DIAL-3		
	3:00:00 PM			18.41	19.16	18.45	6.59	5.84	6.55	**6.33**	
	3:00:00 PM	10000	1.78	18.41	19.16	18.45					
	3:01:00 PM			16.1	17.80	16.39	8.90	7.20	8.61	8.24	
	3:02:15 PM			15.55	17.29	15.93	9.45	7.71	9.07	8.74	
	3:04:00 PM			15.45	17.19	15.87	9.55	7.81	9.13	8.83	
	3:06:15 PM			15.37	17.09	15.79	9.63	7.91	9.21	8.92	
	3:09:00 PM			15.29	16.98	15.71	9.71	8.02	9.29	9.01	
	3:16:00 PM			15.2	16.89	15.6	9.80	8.11	9.40	9.10	
	3:25:00 PM			15.06	16.75	15.46	9.94	8.25	9.54	9.24	
	4:00:00 PM			15.07	16.73	15.45	9.93	8.27	9.55	**9.25**	
	4:00:00 PM	12000	2.13	15.07	16.73	15.45					
	4:01:00 PM			13.48	13.1	13.81	11.52	11.90	11.19	11.54	
	4:02:15 PM			12.85	13.65	13.59	12.15	11.35	11.41	11.64	
	4:04:00 PM			12.71	13.6	13.54	12.29	11.40	11.46	11.72	
	4:06:15 PM			12.49	13.39	13.35	12.51	11.61	11.65	11.92	
	4:09:00 PM			12.41	13.3	13.27	12.59	11.70	11.73	12.01	
	4:16:00 PM			12.29	13.17	13.06	12.71	11.83	11.94	12.16	
	4:25:00 PM			12.22	13.09	12.98	12.78	11.91	12.02	12.24	
	5:00:00 PM			12.2	13.07	12.96	12.80	11.93	12.04	**12.26**	
	5:00:00 PM	0	0.00	12.2	13.07	12.96					
	6:00:00 PM			14.42	13.4	14.16	10.58	11.60	10.84	**11.01**	**Elastic Rebound = 1.25mm**

Location: Kalyani, West Bengal



LOAD SETTLEMENT CURVE FOR PLT-1



TYPICAL TIME SETTLEMENT CURVE OF PLT-1 FOR LOAD INCREMENT 3 TO 4 T

Routine Plate Load Test have been carried out at one no. of locations viz. PLT-1. Records of field tests, load-Settlement and Time-Settlement curves for plate load test have been presented in this chapter.

Modulas of Subgrade Reaction and Modulas of Elasticity have been calculated for Plate Load Test as follows.

Calculation for Modulas of Subgrade Reaction (K) for PLT-1.

From Load-Settlement curve of PLT-1, Pressure corresponding to settlement of 1.25mm is P= 0.37Kg/Cm^2.

Hence, K = Pressure/ Settlement.
= 0.37/0.125 Kg/Cm^3
= 2.96 Kg/Cm^3

Calculation for Modulas of Elasticity (Es) for PLT-1.

Modulas of Elasticity has been calculated for initial load of 3.60T/M^2 and corresponding settlement of 0.121cm.

Es = {q*(1-μ^2)*B*Iw} / S
= {0.36*(1-0.3^2)*75*0.82}/0.121
= 166.50 Kg/Cm^2

Where, Es = Modulas of Elasticity.
q = Pressure = 0.36 Kg/Cm^2
μ = Poisson's Ratio = 0.3
B = Least dimension of the plate = 75 Cm
Iw = Influence Factor = 0.82
S = Settlement = 0.121 Cm.

STATIC CONE PENETRATION TEST

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Table -1

Project: Setting up of AIIMS at Kalyani, West Bengal Client.: HSCC (India) Limited

Side ID :

Correction A		
1. Mass of Cone (m)	1.34	Kg
2. Mass of each sounding rod (m1)	1.55	Kg
3. Cone area at Base (b)	10	Sqcm
4. Plunger Area (b')	20	Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289	Kg
6. No of Rod Used (n)		

Correction B		
1. Mass of friction Jacket (m_f)	1.345	Kg
2. Outer dia, of Friction Jacket (d)	3.6	cm
3. Length of Friction Jacket (h)	13	Sqcm
4. Surface area of friction jacket (a) = π dh	147	Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01	Kg/ Sqcm
Test Number	SCPT-1	

		CONE				**JACKET**				
Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-0.30	1	2	4	0.29	4.29	5	10	6	0.41	0.42
-0.60	1	3	6	0.29	6.29	5	10	4	0.27	0.28
-0.90	1	5	10	0.29	10.29	10	20	10	0.68	0.69
-1.20	2	5	10	0.44	10.44	10	20	10	0.68	0.69
-1.50	2	6	12	0.44	12.44	10	20	8	0.54	0.55
-1.80	2	7	14	0.44	14.44	10	20	6	0.41	0.42
-2.10	3	7	14	0.6	14.6	10	20	6	0.41	0.42
-2.40	3	8	16	0.6	16.6	10	20	4	0.27	0.28
-2.70	3	9	18	0.6	18.6	15	30	12	0.82	0.83
-3.00	4	10	20	0.75	20.75	15	30	10	0.68	0.69
-3.30	4	11	22	0.75	22.75	15	30	8	0.54	0.55
-3.60	4	12	24	0.75	24.75	15	30	6	0.41	0.42
-3.90	4	12	24	0.75	24.75	15	30	6	0.41	0.42

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-4.20	5	14	28	0.91	28.91	20	40	12	0.82	0.83
-4.50	5	15	30	0.91	30.91	20	40	10	0.68	0.69
-4.80	5	16	32	0.91	32.91	20	40	8	0.54	0.55
-5.10	6	17	34	1.06	35.06	20	40	6	0.41	0.42
-5.40	6	18	36	1.06	37.06	25	50	14	0.95	0.96
-5.70	6	19	38	1.06	39.06	25	50	12	0.82	0.83
-6.00	7	20	40	1.22	41.22	25	50	10	0.68	0.69
-6.30	7	21	42	1.22	43.22	25	50	8	0.54	0.55
-6.60	7	22	44	1.22	45.22	25	50	6	0.41	0.42
-6.90	7	23	46	1.22	47.22	30	60	14	0.95	0.96
-7.20	8	24	48	1.37	49.37	30	60	12	0.82	0.83
-7.50	8	25	50	1.37	51.37	30	60	10	0.68	0.69
-7.80	8	25	50	1.37	51.37	30	60	10	0.68	0.69
-8.10	9	25	50	1.53	51.53	30	60	10	0.68	0.69
-8.40	9	26	52	1.53	53.53	30	60	8	0.54	0.55
-8.70	9	27	54	1.53	55.53	35	70	16	1.09	1.10
-9.00	10	27	54	1.68	55.68	35	70	16	1.09	1.10
-9.30	10	28	56	1.68	57.68	35	70	14	0.95	0.96
-9.60	10	29	58	1.68	59.68	35	70	12	0.82	0.83
-9.90	10	29	58	1.68	59.68	35	70	12	0.82	0.83

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Table -1

Project: Setting up of AIIMS at Kalyani, West Bengal

Client.: HSCC (India) Limited

Side ID :

Correction A		
1. Mass of Cone (m)	1.34	Kg
2. Mass of each sounding rod (m1)	1.55	Kg
3. Cone area at Base (b)	10	Sqcm
4. Plunger Area (b')	20	Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289	Kg
6. No of Rod Used (n)		

Correction B		
1. Mass of friction Jacket (m_f)	1.345	Kg
2. Outer dia, of Friction Jacket (d)	3.6	cm
3. Length of Friction Jacket (h)	13	Sqcm
4. Surface area of friction jacket (a) = π dh	147	Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01	Kg/ Sqcm
Test Number	SCPT-2	

		CONE				**JACKET**				
Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-0.30	1	2	4	0.29	4.29	5	10	6	0.41	0.42
-0.60	1	3	6	0.29	6.29	5	10	4	0.27	0.28
-0.90	1	4	8	0.29	8.29	5	10	2	0.14	0.15
-1.20	2	4	8	0.44	8.44	5	10	2	0.14	0.15
-1.50	2	5	10	0.44	10.44	10	20	10	0.68	0.69
-1.80	2	6	12	0.44	12.44	10	20	8	0.54	0.55
-2.10	3	8	16	0.6	16.6	10	20	4	0.27	0.28
-2.40	3	9	18	0.6	18.6	15	30	12	0.82	0.83
-2.70	3	10	20	0.6	20.6	15	30	10	0.68	0.69
-3.00	4	12	24	0.75	24.75	15	30	6	0.41	0.42
-3.30	4	13	26	0.75	26.75	15	30	4	0.27	0.28
-3.60	4	14	28	0.75	28.75	20	40	12	0.82	0.83
-3.90	4	15	30	0.75	30.75	20	40	10	0.68	0.69

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-4.20	5	16	32	0.91	32.91	20	40	8	0.54	0.55
-4.50	5	17	34	0.91	34.91	20	40	6	0.41	0.42
-4.80	5	18	36	0.91	36.91	20	40	4	0.27	0.28
-5.10	6	18	36	1.06	37.06	20	40	4	0.27	0.28
-5.40	6	19	38	1.06	39.06	25	50	12	0.82	0.83
-5.70	6	21	42	1.06	43.06	25	50	8	0.54	0.55
-6.00	7	22	44	1.22	45.22	25	50	6	0.41	0.42
-6.30	7	24	48	1.22	49.22	30	60	12	0.82	0.83
-6.60	7	24	48	1.22	49.22	30	60	12	0.82	0.83
-6.90	7	25	50	1.22	51.22	30	60	10	0.68	0.69
-7.20	8	26	52	1.37	53.37	30	60	8	0.54	0.55
-7.50	8	26	52	1.37	53.37	30	60	8	0.54	0.55
-7.80	8	27	54	1.37	55.37	30	60	6	0.41	0.42
-8.10	9	28	56	1.53	57.53	35	70	14	0.95	0.96
-8.40	9	29	58	1.53	59.53	35	70	12	0.82	0.83
-8.70	9	29	58	1.53	59.53	35	70	12	0.82	0.83
-9.00	10	30	60	1.68	61.68	35	70	10	0.68	0.69
-9.30	10	31	62	1.68	63.68	35	70	8	0.54	0.55
-9.60	10	32	64	1.68	65.68	35	70	6	0.41	0.42
-9.90	10	33	66	1.68	67.68	35	70	4	0.27	0.28

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Table -1

Project: Setting up of AIIMS at Kalyani, West Bengal

Client.: HSCC (India) Limited

Side ID :

Correction A		
1. Mass of Cone (m)	1.34	Kg
2. Mass of each sounding rod (m1)	1.55	Kg
3. Cone area at Base (b)	10	Sqcm
4. Plunger Area (b')	20	Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289	Kg
6. No of Rod Used (n)		

Correction B		
1. Mass of friction Jacket (m_f)	1.345	Kg
2. Outer dia, of Friction Jacket (d)	3.6	cm
3. Length of Friction Jacket (h)	13	Sqcm
4. Surface area of friction jacket (a) = π dh	147	Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01	Kg/ Sqcm
Test Number	SCPT-3	

		CONE				**JACKET**				
Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-0.30	1	1	2	0.29	2.29	5	10	8	0.54	0.55
-0.60	1	1	2	0.29	2.29	5	10	8	0.54	0.55
-0.90	1	1	2	0.29	2.29	5	10	8	0.54	0.55
-1.20	2	1	2	0.44	2.44	5	10	8	0.54	0.55
-1.50	2	2	4	0.44	4.44	5	10	6	0.41	0.42
-1.80	2	2	4	0.44	4.44	5	10	6	0.41	0.42
-2.10	3	3	6	0.6	6.6	5	10	4	0.27	0.28
-2.40	3	3	6	0.6	6.6	5	10	4	0.27	0.28
-2.70	3	4	8	0.6	8.6	10	20	12	0.82	0.83
-3.00	4	4	8	0.75	8.75	10	20	12	0.82	0.83
-3.30	4	6	12	0.75	12.75	10	20	8	0.54	0.55
-3.60	4	8	16	0.75	16.75	10	20	4	0.27	0.28
-3.90	4	11	22	0.75	22.75	15	30	8	0.54	0.55

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-4.20	5	13	26	0.91	26.91	15	30	4	0.27	0.28
-4.50	5	15	30	0.91	30.91	20	40	10	0.68	0.69
-4.80	5	16	32	0.91	32.91	20	40	8	0.54	0.55
-5.10	6	18	36	1.06	37.06	20	40	4	0.27	0.28
-5.40	6	19	38	1.06	39.06	25	50	12	0.82	0.83
-5.70	6	20	40	1.06	41.06	25	50	10	0.68	0.69
-6.00	7	22	44	1.22	45.22	25	50	6	0.41	0.42
-6.30	7	23	46	1.22	47.22	25	50	4	0.27	0.28
-6.60	7	25	50	1.22	51.22	30	60	10	0.68	0.69
-6.90	7	25	50	1.22	51.22	30	60	10	0.68	0.69
-7.20	8	28	56	1.37	57.37	30	60	4	0.27	0.28
-7.50	8	30	60	1.37	61.37	35	70	10	0.68	0.69
-7.80	8	30	60	1.37	61.37	35	70	10	0.68	0.69
-8.10	9	32	64	1.53	65.53	35	70	6	0.41	0.42
-8.40	9	33	66	1.53	67.53	35	70	4	0.27	0.28
-8.70	9	35	70	1.53	71.53	40	80	10	0.68	0.69
-9.00	10	36	72	1.68	73.68	40	80	8	0.54	0.55
-9.30	10	37	74	1.68	75.68	40	80	6	0.41	0.42
-9.60	10	39	78	1.68	79.68	45	90	12	0.82	0.83
-9.90	10	39	78	1.68	79.68	45	90	12	0.82	0.83

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Table -1

Project: Setting up of AIIMS at Kalyani, West Bengal Client.: HSCC (India) Limited

Side ID :

Correction A		
1. Mass of Cone (m)	1.34	Kg
2. Mass of each sounding rod (m1)	1.55	Kg
3. Cone area at Base (b)	10	Sqcm
4. Plunger Area (b')	20	Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289	Kg
6. No of Rod Used (n)		

Correction B		
1. Mass of friction Jacket (m_f)	1.345	Kg
2. Outer dia, of Friction Jacket (d)	3.6	cm
3. Length of Friction Jacket (h)	13	Sqcm
4. Surface area of friction jacket (a) = π dh	147	Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01	Kg/ Sqcm
Test Number	SCPT-4	

		CONE				**JACKET**				
Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-0.30	1	2	4	0.29	4.29	5	10	6	0.41	0.42
-0.60	1	4	8	0.29	8.29	5	10	2	0.14	0.15
-0.90	1	5	10	0.29	10.29	10	20	10	0.68	0.69
-1.20	2	6	12	0.44	12.44	10	20	8	0.54	0.55
-1.50	2	7	14	0.44	14.44	10	20	6	0.41	0.42
-1.80	2	9	18	0.44	18.44	15	30	12	0.82	0.83
-2.10	3	10	20	0.6	20.6	15	30	10	0.68	0.69
-2.40	3	10	20	0.6	20.6	15	30	10	0.68	0.69
-2.70	3	11	22	0.6	22.6	15	30	8	0.54	0.55
-3.00	4	12	24	0.75	24.75	15	30	6	0.41	0.42
-3.30	4	13	26	0.75	26.75	15	30	4	0.27	0.28
-3.60	4	15	30	0.75	30.75	20	40	10	0.68	0.69
-3.90	4	18	36	0.75	36.75	20	40	4	0.27	0.28

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-4.20	5	22	44	0.91	44.91	25	50	6	0.41	0.42
-4.50	5	25	50	0.91	50.91	30	60	10	0.68	0.69
-4.80	5	26	52	0.91	52.91	30	60	8	0.54	0.55
-5.10	6	26	52	1.06	53.06	30	60	8	0.54	0.55
-5.40	6	27	54	1.06	55.06	30	60	6	0.41	0.42
-5.70	6	29	58	1.06	59.06	35	70	12	0.82	0.83
-6.00	7	30	60	1.22	61.22	35	70	10	0.68	0.69
-6.30	7	31	62	1.22	63.22	35	70	8	0.54	0.55
-6.60	7	32	64	1.22	65.22	35	70	6	0.41	0.42
-6.90	7	34	68	1.22	69.22	40	80	12	0.82	0.83
-7.20	8	35	70	1.37	71.37	40	80	10	0.68	0.69
-7.50	8	36	72	1.37	73.37	40	80	8	0.54	0.55
-7.80	8	37	74	1.37	75.37	40	80	6	0.41	0.42
-8.10	9	37	74	1.53	75.53	40	80	6	0.41	0.42
-8.40	9	38	76	1.53	77.53	40	80	4	0.27	0.28
-8.70	9	38	76	1.53	77.53	40	80	4	0.27	0.28
-9.00	10	38	76	1.68	77.68	45	90	14	0.95	0.96
-9.30	10	39	78	1.68	79.68	45	90	12	0.82	0.83
-9.60	10	41	82	1.68	83.68	45	90	8	0.54	0.55
-9.90	10	42	84	1.68	85.68	45	90	6	0.41	0.42

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Table -1

Project: Setting up of AIIMS at Kalyani, West Bengal Client.: HSCC (India) Limited

Side ID :

Correction A		
1. Mass of Cone (m)	1.34	Kg
2. Mass of each sounding rod (m1)	1.55	Kg
3. Cone area at Base (b)	10	Sqcm
4. Plunger Area (b')	20	Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289	Kg
6. No of Rod Used (n)		

Correction B		
1. Mass of friction Jacket (m_f)	1.345	Kg
2. Outer dia, of Friction Jacket (d)	3.6	cm
3. Length of Friction Jacket (h)	13	Sqcm
4. Surface area of friction jacket (a) = π dh	147	Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01	Kg/ Sqcm
Test Number	SCPT-5	

		CONE				**JACKET**				
Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-0.30	1	2	4	0.29	4.29	5	10	6	0.41	0.42
-0.60	1	3	6	0.29	6.29	5	10	4	0.27	0.28
-0.90	1	5	10	0.29	10.29	10	20	10	0.68	0.69
-1.20	2	6	12	0.44	12.44	10	20	8	0.54	0.55
-1.50	2	8	16	0.44	16.44	10	20	4	0.27	0.28
-1.80	2	10	20	0.44	20.44	15	30	10	0.68	0.69
-2.10	3	11	22	0.6	22.6	15	30	8	0.54	0.55
-2.40	3	14	28	0.6	28.6	15	30	2	0.14	0.15
-2.70	3	16	32	0.6	32.6	20	40	8	0.54	0.55
-3.00	4	18	36	0.75	36.75	20	40	4	0.27	0.28
-3.30	4	21	42	0.75	42.75	25	50	8	0.54	0.55
-3.60	4	25	50	0.75	50.75	30	60	10	0.68	0.69
-3.90	4	26	52	0.75	52.75	30	60	8	0.54	0.55

STATIC CONE PENETRATION TEST RESULTS (SCPT)

Depth	Number of Rod in Use	Gauge Reading of Cone Penetration	Cone Penetration Resistance	Correction Factor	Corrected Value of Cone Resistance	Gauge Reading of Cone + Jacket Resistance	Cone + Jacket Resistance	Total Resistance - Cone Resistance	Frictional Resistance	Corrected Frictional Resistance
		Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm	Kg/ Sqcm
m	n	Y	y=Y*(b'/b)	C1	R_c=y+C1	X	x=X*(b'/b)	x-y	Z=(x-y)*(b/a)	Rf= Z+(mf/a)
-4.20	5	30	60	0.91	60.91	35	70	10	0.68	0.69
-4.50	5	35	70	0.91	70.91	40	80	10	0.68	0.69
-4.80	5	36	72	0.91	72.91	40	80	8	0.54	0.55
-5.10	6	38	76	1.06	77.06	40	80	4	0.27	0.28
-5.40	6	40	80	1.06	81.06	45	90	10	0.68	0.69
-5.70	6	41	82	1.06	83.06	45	90	8	0.54	0.55
-6.00	7	42	84	1.22	85.22	45	90	6	0.41	0.42
-6.30	7	43	86	1.22	87.22	45	90	4	0.27	0.28
-6.60	7	44	88	1.22	89.22	50	100	12	0.82	0.83
-6.90	7	46	92	1.22	93.22	50	100	8	0.54	0.55
-7.20	8	47	94	1.37	95.37	50	100	6	0.41	0.42
-7.50	8	48	96	1.37	97.37	50	100	4	0.27	0.28
-7.80	8	50	100	1.37	101.37	55	110	10	0.68	0.69
-8.10	9	50	100	1.53	101.53	55	110	10	0.68	0.69
-8.40	9	52	104	1.53	105.53	55	110	6	0.41	0.42
-8.70	9	53	106	1.53	107.53	55	110	4	0.27	0.28
-9.00	10	54	108	1.68	109.68	60	120	12	0.82	0.83
-9.30	10	54	108	1.68	109.68	60	120	12	0.82	0.83
-9.60	10	54	108	1.68	109.68	60	120	12	0.82	0.83
-9.90	10	55	110	1.68	111.68	60	120	10	0.68	0.69

DYNAMIC CONE PENETRATION TEST

DYNAMIC CONE PENETRATION TEST

Test No. - DCPT-01

Sl. No.	DEPTH (Mtr)	Nc VALUE
1	0.00-0.30	6
2	0.30-0.60	5
3	0.60-0.90	5
4	0.90-1.20	6
5	1.20-1.50	6
6	1.50-1.80	5
7	1.80-2.10	4
8	2.10-2.40	5
9	2.40-2.70	4
10	2.70-3.00	6
11	3.00-3.30	7
12	3.30-3.60	9
13	3.60-3.90	8
14	3.90-4.20	8
15	4.20-4.50	10
16	4.50-4.80	9
17	4.80-5.10	8
18	5.10-5.40	11
19	5.40-5.70	10
20	5.70-6.00	16
21	6.00-6.30	17
22	6.30-6.90	18
23	6.90-7.20	20
24	7.20-7.50	22
25	7.50-7.80	24
26	7.80-8.10	23
27	8.10-8.40	24
28	8.40-8.70	25
29	8.70-9.00	27
30	9.00-9.30	29
31	9.30-9.60	32
32	9.60-9.90	34
33	9.90-10.20	37

DYNAMIC CONE PENETRATION TEST

Test No. - DCPT-02

Sl. No.	DEPTH (Mtr)	Nc VALUE
1	0.00-0.30	2
2	0.30-0.60	4
3	0.60-0.90	3
4	0.90-1.20	5
5	1.20-1.50	4
6	1.50-1.80	3
7	1.80-2.10	4
8	2.10-2.40	5
9	2.40-2.70	6
10	2.70-3.00	5
11	3.00-3.30	6
12	3.30-3.60	7
13	3.60-3.90	7
14	3.90-4.20	8
15	4.20-4.50	7
16	4.50-4.80	8
17	4.80-5.10	9
18	5.10-5.40	11
19	5.40-5.70	13
20	5.70-6.00	12
21	6.00-6.30	16
22	6.30-6.90	18
23	6.90-7.20	19
24	7.20-7.50	17
25	7.50-7.80	20
26	7.80-8.10	21
27	8.10-8.40	23
28	8.40-8.70	24
29	8.70-9.00	22
30	9.00-9.30	25
31	9.30-9.60	27
32	9.60-9.90	28
33	9.90-10.20	29

DYNAMIC CONE PENETRATION TEST

Test No. - DCPT-03

Sl. No.	DEPTH (Mtr)	Nc VALUE
1	0.00-0.30	2
2	0.30-0.60	2
3	0.60-0.90	3
4	0.90-1.20	2
5	1.20-1.50	3
6	1.50-1.80	3
7	1.80-2.10	4
8	2.10-2.40	3
9	2.40-2.70	3
10	2.70-3.00	4
11	3.00-3.30	4
12	3.30-3.60	5
13	3.60-3.90	7
14	3.90-4.20	8
15	4.20-4.50	9
16	4.50-4.80	11
17	4.80-5.10	13
18	5.10-5.40	14
19	5.40-5.70	16
20	5.70-6.00	18
21	6.00-6.30	19
22	6.30-6.90	18
23	6.90-7.20	20
24	7.20-7.50	22
25	7.50-7.80	23
26	7.80-8.10	24
27	8.10-8.40	26
28	8.40-8.70	27
29	8.70-9.00	28
30	9.00-9.30	27
31	9.30-9.60	29
32	9.60-9.90	28
33	9.90-10.20	30

DYNAMIC CONE PENETRATION TEST

Test No. - DCPT-04

Sl. No.	DEPTH (Mtr)	Nc VALUE
1	0.00-0.30	2
2	0.30-0.60	3
3	0.60-0.90	2
4	0.90-1.20	3
5	1.20-1.50	4
6	1.50-1.80	5
7	1.80-2.10	6
8	2.10-2.40	5
9	2.40-2.70	4
10	2.70-3.00	6
11	3.00-3.30	8
12	3.30-3.60	9
13	3.60-3.90	11
14	3.90-4.20	12
15	4.20-4.50	13
16	4.50-4.80	15
17	4.80-5.10	17
18	5.10-5.40	19
19	5.40-5.70	20
20	5.70-6.00	22
21	6.00-6.30	24
22	6.30-6.90	26
23	6.90-7.20	25
24	7.20-7.50	27
25	7.50-7.80	28
26	7.80-8.10	29
27	8.10-8.40	27
28	8.40-8.70	26
29	8.70-9.00	28
30	9.00-9.30	30
31	9.30-9.60	34
32	9.60-9.90	39
33	9.90-10.20	42

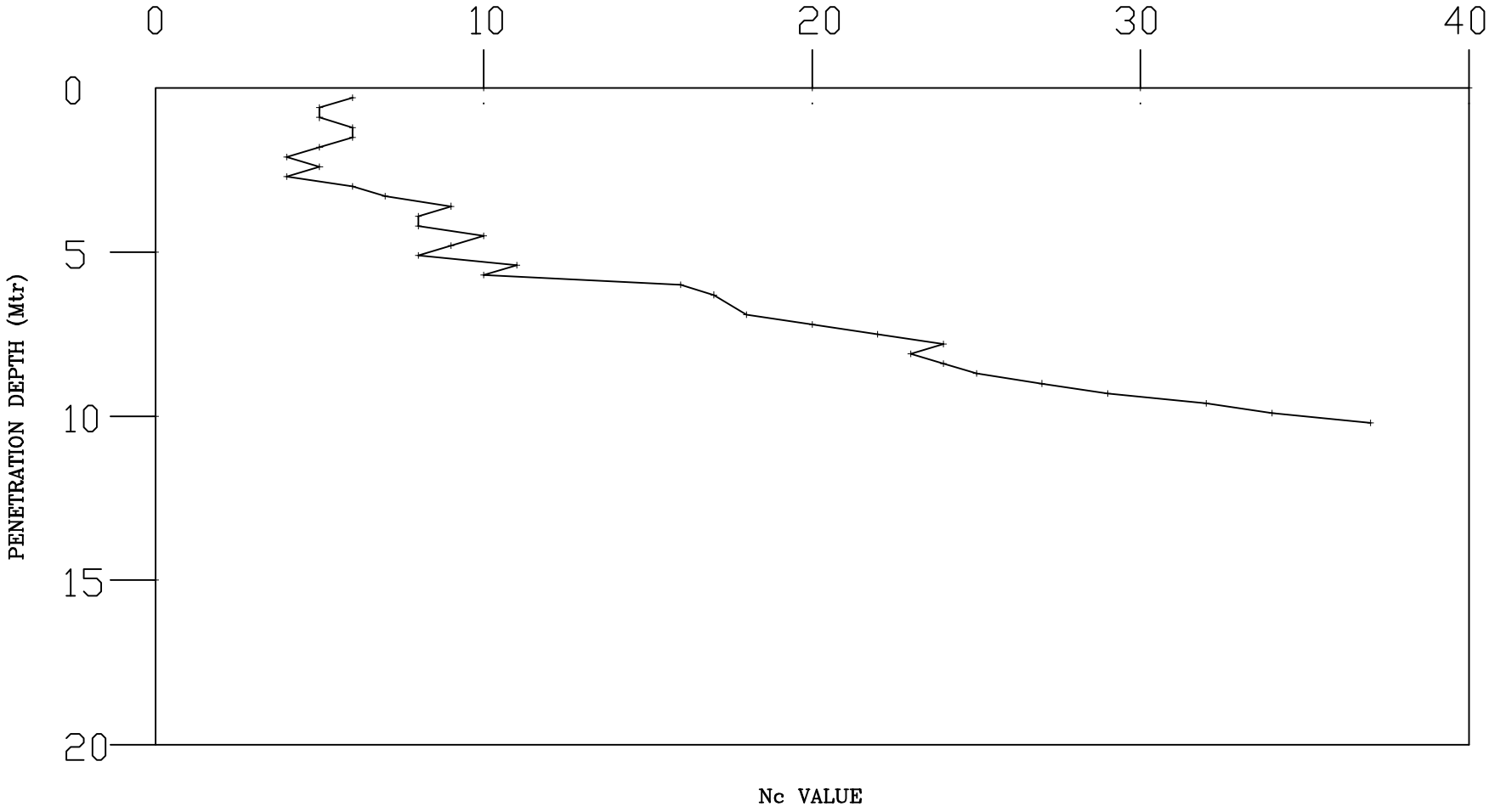
DYNAMIC CONE PENETRATION TEST

Test No. - DCPT-05

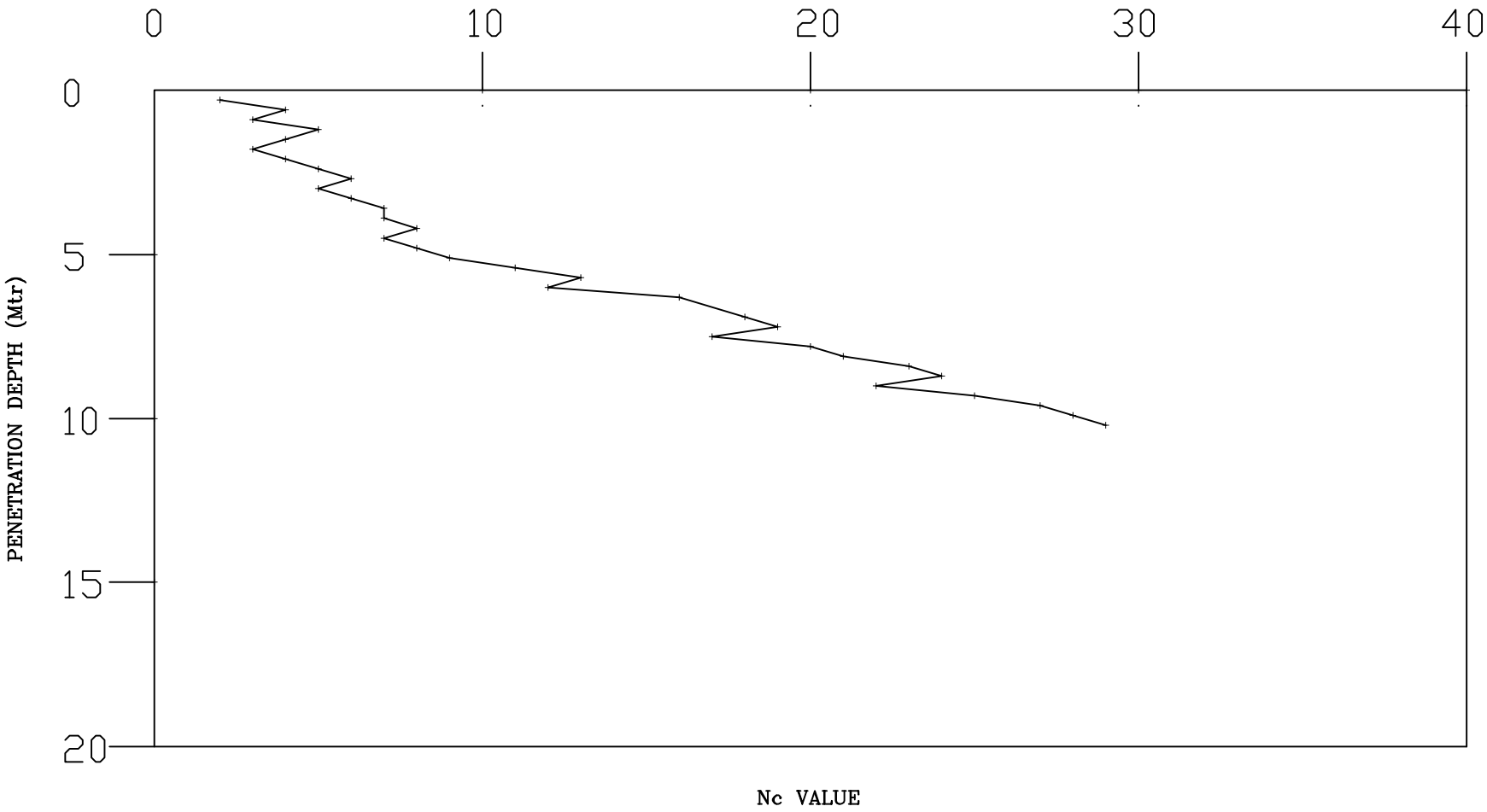
Sl. No.	DEPTH (Mtr)	Nc VALUE
1	0.00-0.30	3
2	0.30-0.60	2
3	0.60-0.90	4
4	0.90-1.20	5
5	1.20-1.50	7
6	1.50-1.80	6
7	1.80-2.10	8
8	2.10-2.40	7
9	2.40-2.70	9
10	2.70-3.00	10
11	3.00-3.30	11
12	3.30-3.60	14
13	3.60-3.90	15
14	3.90-4.20	17
15	4.20-4.50	19
16	4.50-4.80	22
17	4.80-5.10	25
18	5.10-5.40	27
19	5.40-5.70	31
20	5.70-6.00	33
21	6.00-6.30	34
22	6.30-6.90	33
23	6.90-7.20	35
24	7.20-7.50	36
25	7.50-7.80	38
26	7.80-8.10	40
27	8.10-8.40	39
28	8.40-8.70	40
29	8.70-9.00	41
30	9.00-9.30	41
31	9.30-9.60	42
32	9.60-9.90	43
33	9.90-10.20	43

Location: Kalyani, West Bengal

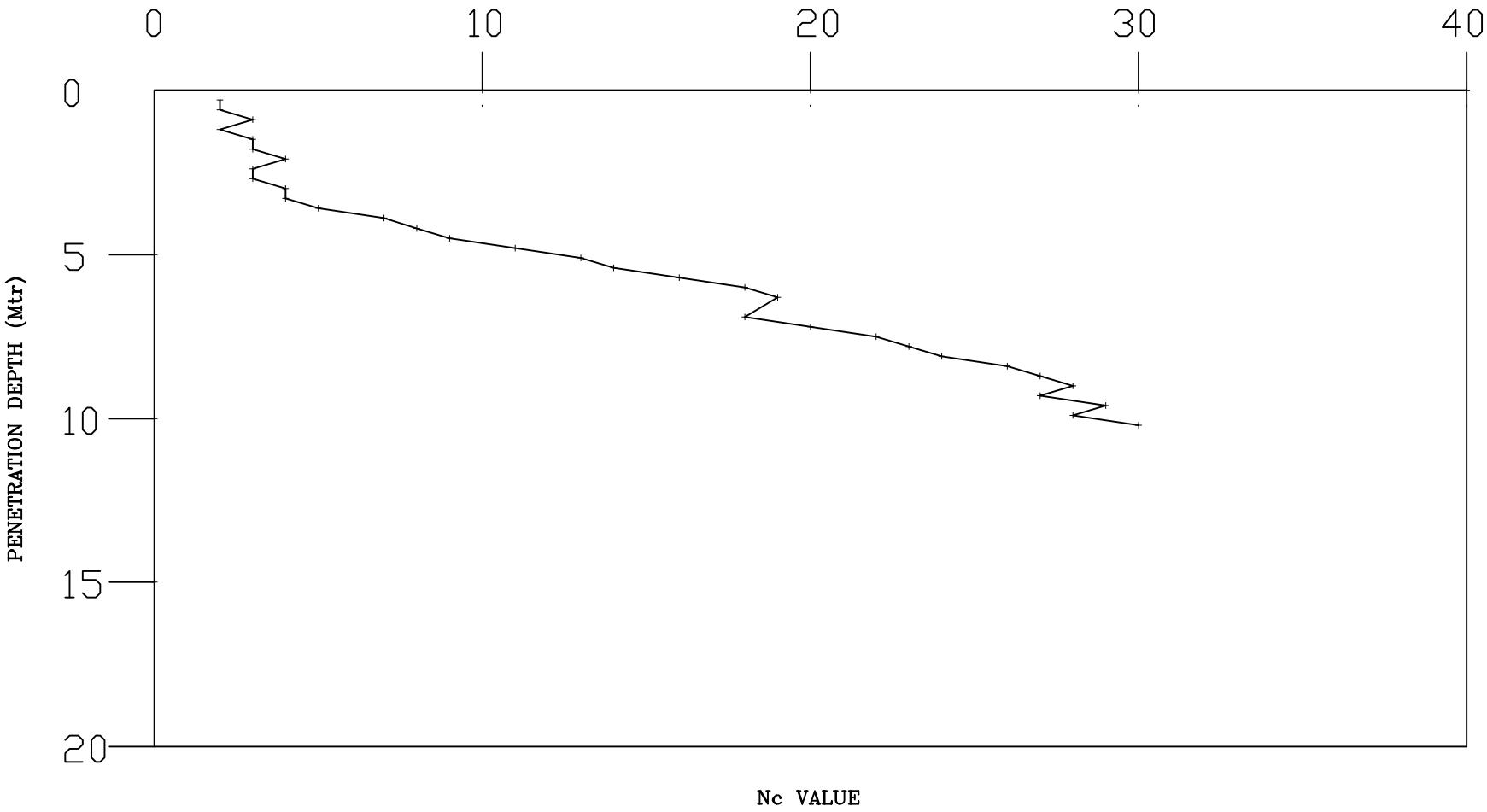
TEST NO. – DCPT–01



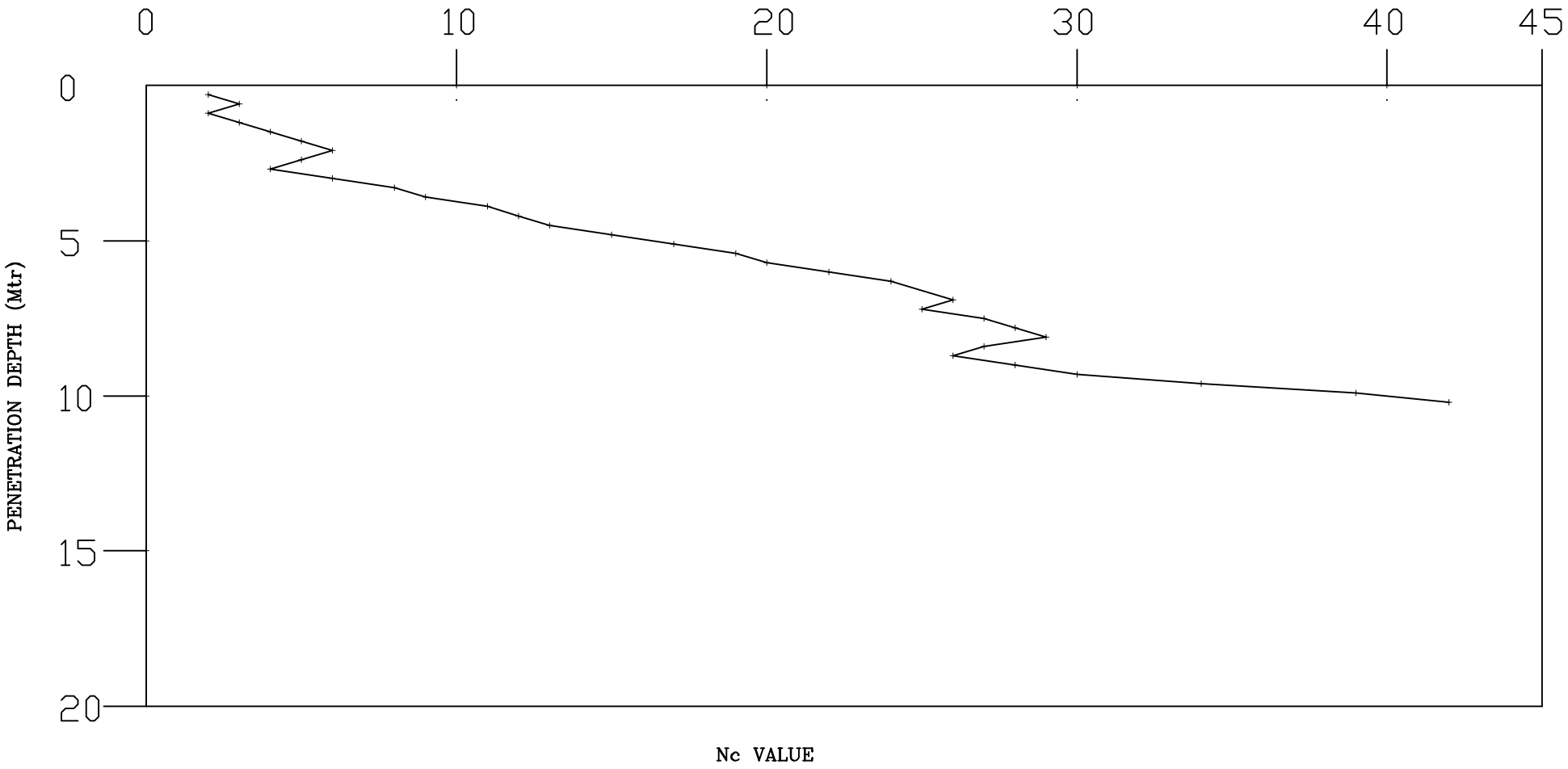
Location: Kalyani, West Bengal
TEST NO. – DCPT–02



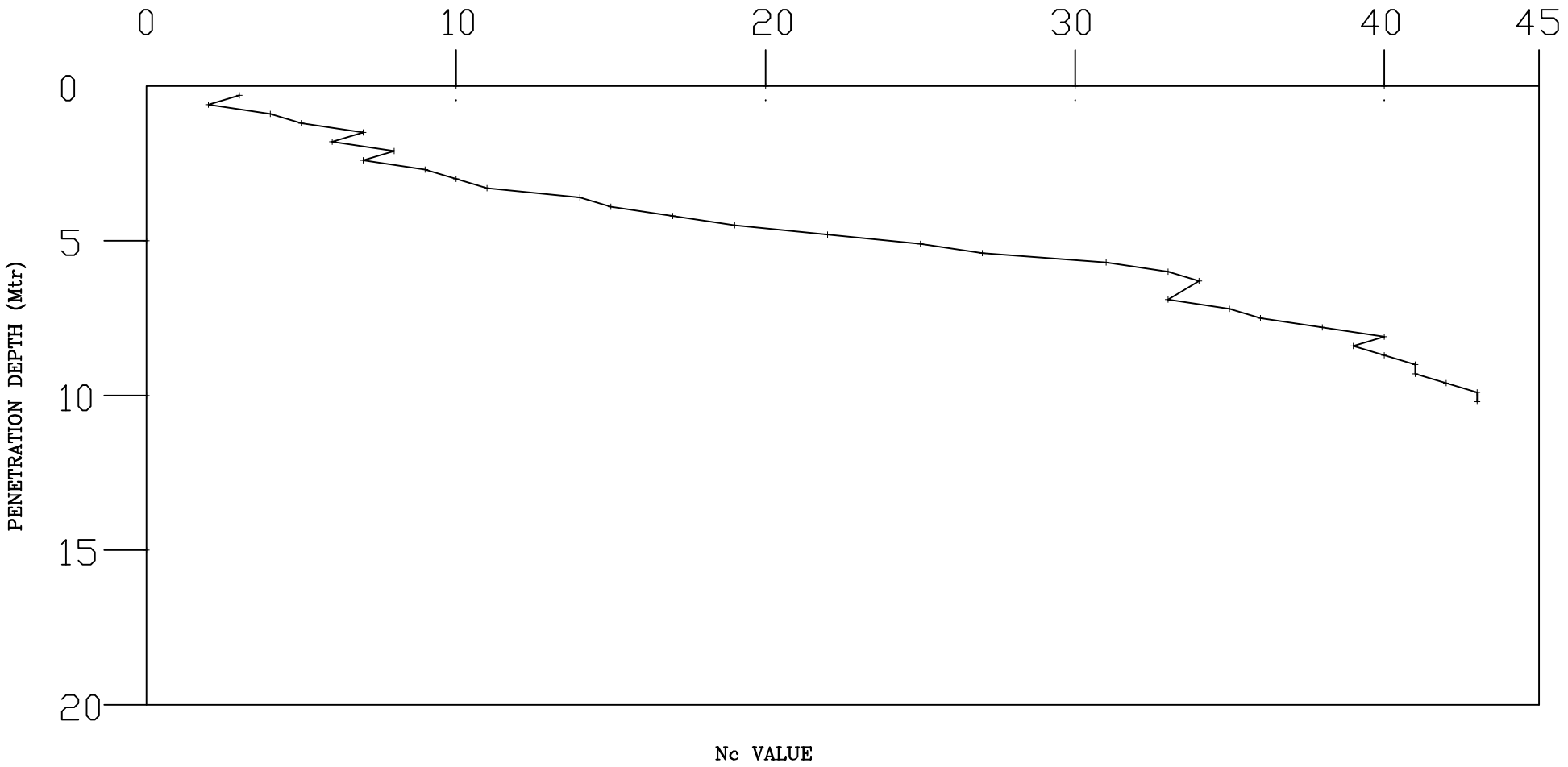
Location: Kalyani, West Bengal
TEST NO. – DCPT–03



Location: Kalyani, West Bengal
TEST NO. – DCPT–04



Location: Kalyani, West Bengal
TEST NO. – DCPT–05



FIELD DENSITY TEST

FIELD DENSITY TEST BY CORE CUTTER METHOD

Project: AIIMS-KALYANI, WEST BENGA;L

Location: KALYANI, WEST BENGAL

Field Density - 01

SL NO	DESCRIPTION	DETERMINATION NO
		1.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	2897.76
6	weight of soil(Ws -Wc) in g	1767.76
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.73
8	Water. content container No.	34
9	Weight of container with lid(W 1), in g	23.74
10	Weight of container with lid and wet soil(w2) in g	58.90
11	Weight of container with lid and dry soil (w3) in g	50.57
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	31.05
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.32

SL NO	DESCRIPTION	DETERMINATION NO
		2.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	2997.76
6	weight of soil(Ws -Wc) in g	1867.76
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.83
8	Water. content container No.	12
9	Weight of container with lid(W 1), in g	22.73
10	Weight of container with lid and wet soil(w2) in g	62.09
11	Weight of container with lid and dry soil (w3) in g	52.64
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	31.59
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.39

SL NO	DESCRIPTION	DETERMINATION NO
		3.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3057.76
6	weight of soil(Ws -Wc) in g	1927.76
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.89
8	Water. content container No.	14
9	Weight of container with lid(W 1), in g	24.15
10	Weight of container with lid and wet soil(w2) in g	65.19
11	Weight of container with lid and dry soil (w3) in g	56.21
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	28.01
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.48

FIELD DENSITY TEST BY CORE CUTTER METHOD

Project: AIIMS-KALYANI, WEST BENGA;L

Location: KALYANI, WEST BENGAL

Field Density - 02

SL NO	DESCRIPTION	DETERMINATION NO
		1.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	2959.15
6	weight of soil(Ws -Wc) in g	1829.15
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.79
8	Water. content container No.	31
9	Weight of container with lid(W 1), in g	22.93
10	Weight of container with lid and wet soil(w2) in g	57.65
11	Weight of container with lid and dry soil (w3) in g	50.17
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	27.46
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.41

SL NO	DESCRIPTION	DETERMINATION NO
		2.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3017.76
6	weight of soil(Ws -Wc) in g	1887.76
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.85
8	Water. content container No.	15
9	Weight of container with lid(W 1), in g	24.12
10	Weight of container with lid and wet soil(w2) in g	59.17
11	Weight of container with lid and dry soil (w3) in g	51.33
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	28.81
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.44

SL NO	DESCRIPTION	DETERMINATION NO
		3.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3033.58
6	weight of soil(Ws -Wc) in g	1903.58
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.87
8	Water. content container No.	1
9	Weight of container with lid(W 1), in g	23.78
10	Weight of container with lid and wet soil(w2) in g	64.29
11	Weight of container with lid and dry soil (w3) in g	55.36
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	28.28
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.46

FIELD DENSITY TEST BY CORE CUTTER METHOD

Project: AIIMS-KALYANI, WEST BENGAL

Location: KALYANI, WEST BENGAL

Field Density - 03

SL NO	DESCRIPTION	DETERMINATION NO
		1.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	2939.15
6	weight of soil(Ws -Wc) in g	1809.15
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.77
8	Water. content container No.	2
9	Weight of container with lid(W 1), in g	21.66
10	Weight of container with lid and wet soil(w2) in g	54.44
11	Weight of container with lid and dry soil (w3) in g	47.18
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	28.45
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.38

SL NO	DESCRIPTION	DETERMINATION NO
		2.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3031.49
6	weight of soil(Ws -Wc) in g	1901.49
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.87
8	Water. content container No.	3
9	Weight of container with lid(W 1), in g	24.55
10	Weight of container with lid and wet soil(w2) in g	55.34
11	Weight of container with lid and dry soil (w3) in g	48.29
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	29.70
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.44

SL NO	DESCRIPTION	DETERMINATION NO
		3.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3055.42
6	weight of soil(Ws -Wc) in g	1925.42
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.89
8	Water. content container No.	4
9	Weight of container with lid(W 1), in g	24.33
10	Weight of container with lid and wet soil(w2) in g	63.94
11	Weight of container with lid and dry soil (w3) in g	54.98
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	29.23
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.46

FIELD DENSITY TEST BY CORE CUTTER METHOD

Project: AIIMS-KALYANI, WEST BENGAL

Location: KALYANI, WEST BENGAL

Field Density - 04

SL NO	DESCRIPTION	DETERMINATION NO
		1.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3015.23
6	weight of soil(Ws -Wc) in g	1885.23
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.85
8	Water. content container No.	5
9	Weight of container with lid(W 1), in g	23.44
10	Weight of container with lid and wet soil(w2) in g	48.44
11	Weight of container with lid and dry soil (w3) in g	43.12
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	27.03
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.46

SL NO	DESCRIPTION	DETERMINATION NO
		2.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3031.49
6	weight of soil(Ws -Wc) in g	1901.49
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.87
8	Water. content container No.	6
9	Weight of container with lid(W 1), in g	22.94
10	Weight of container with lid and wet soil(w2) in g	49.56
11	Weight of container with lid and dry soil (w3) in g	43.12
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	31.91
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.41

SL NO	DESCRIPTION	DETERMINATION NO
		3.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3012.67
6	weight of soil(Ws -Wc) in g	1882.67
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.85
8	Water. content container No.	7
9	Weight of container with lid(W 1), in g	19.34
10	Weight of container with lid and wet soil(w2) in g	57.95
11	Weight of container with lid and dry soil (w3) in g	49.67
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	27.30
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.45

FIELD DENSITY TEST BY CORE CUTTER METHOD

Project: AIIMS-KALYANI, WEST BENGAL

Location: KALYANI, WEST BENGAL

Field Density - 05

SL NO	DESCRIPTION	DETERMINATION NO
		1.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3081.11
6	weight of soil(Ws -Wc) in g	1951.11
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.91
8	Water. content container No.	8
9	Weight of container with lid(W 1), in g	22.78
10	Weight of container with lid and wet soil(w2) in g	47.15
11	Weight of container with lid and dry soil (w3) in g	42.01
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	26.73
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.51

SL NO	DESCRIPTION	DETERMINATION NO
		2.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3059.91
6	weight of soil(Ws -Wc) in g	1929.91
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.89
8	Water. content container No.	9
9	Weight of container with lid(W 1), in g	19.72
10	Weight of container with lid and wet soil(w2) in g	48.88
11	Weight of container with lid and dry soil (w3) in g	42.56
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	27.67
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.48

SL NO	DESCRIPTION	DETERMINATION NO
		3.50 Mtr. Depth
1	Internal Dia of Core Cutter In MM	100
2	Intenal Height of core cutter	129.75
3	Volume of Cutter(V_C) in cc	1019.46
4	Weight of core cutter (Wc) in g	1130
5	Weight of core cutter + Soil (Ws) in g	3100.09
6	weight of soil(Ws -Wc) in g	1970.09
7	Bulk Density of soil ¥ =(Ws-Wc)/Vc g/cc	1.93
8	Water. content container No.	11
9	Weight of container with lid(W 1), in g	25.23
10	Weight of container with lid and wet soil(w2) in g	58.83
11	Weight of container with lid and dry soil (w3) in g	51.37
12	Water content (W), in percent =(w2-w3)/(w3-w1) x 100	28.54
13	Dry density of soil ¥d =100¥/(100+w)g/cc	1.50

REPORT OF ELECTRICAL RESISTIVITY TEST

Wenner's four electrode method, as recommended in IS: 3043-1987 (Reaffirmed 2001) has been adopted for field test. In this method, four electrodes are driven into earth along a straight line at equal intervals. A current I is passed through the two outer electrodes in the earth as shown in Fig A. The inner electrodes are used as Potential electrodes. The current I flowing into the earth produces an electric field proportional to it's density to the resistivity of the soil. The Voltage measured between the two inner electrodes is, therefore, proportional to the ratio of the voltage to current.

The instrument used for the field test comprises the current source and meter in a single instrument and directly read the resistance.

The resistivity was calculated from the expression given below:

$$\rho = 2\pi SR$$

Where, ρ = Resistivity of soil in ohm-meters

S = Distance between successive electrodes in meters, and

R = Instrument reading in Ohms

A. ✎ Test Procedure:

At the selected site, in the chosen direction, four electrodes are driven into the earth along a straight line at equal intervals, S. The depth of the electrodes in the ground was 100 mm to 150 mm. The Instrument is placed on a steady and approximately level base, the link between the terminals P1 and C1 opened and the four electrodes are connected to the instrument terminals as shown in Figure. A. An approximate range on the instrument is thus selected to obtain clear readings avoiding the two ends of the scale as far as possible. The value of R is recorded and Resistivity is calculated from the above expression by putting the value of R as recorded and the distances between successive electrodes in meters.

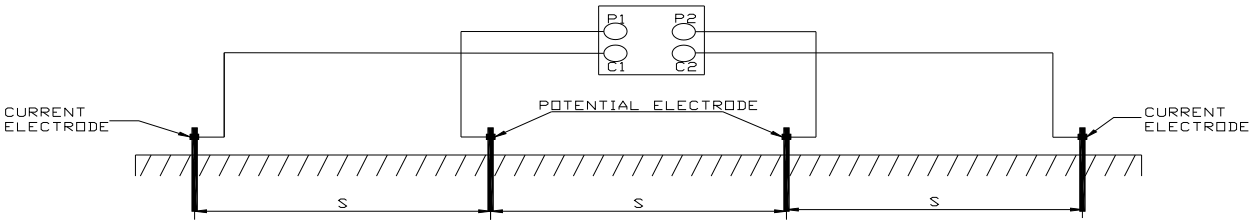


FIGURE A

Resistivity Test Set Up

The result is shown in the table ERT-01.

Table ERT 1

Location of site : Kalyani, West Bengal
Client : HSCC (India) Limited.
Test Point : ERT-1
Test Date : 26/09/2015

Sl No	Electrode Spacing In (S)	Meter Reading Line Direction (N-S)	Meter Reading Line Direction (E-W)	Resistivity of soil	
				(N-S)	(E-W)
	Mtr.	Ohm	Ohm	Ohm-Mtr	Ohm-Mtr
1	0.50	81	77	254.47	241.90
2	1.00	43	68	270.18	427.26
3	2.00	40	63	502.65	791.68
4	3.00	31	58	584.34	1093.27