Report on
Geotechnical Investigation Work
for
Proposed Coalgas to Methanol Project
at
Sactoria, West Bardhaman (WB)

Principal Client

Eastern Coalfield Limited, Kolkata

Client

Projects & Development India Limited
PDIL Bhawan, A-14, Sector-1, Noida – 201 301
Distt: Gautam Budh Nagar, (UP), India

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A. ✍ Introduction:

It has been proposed by Eastern Coalfield Limited, Kolkata, to construct Coalgas to Methanol Project at Sactoria, West Bardhaman (WB). A detailed geotechnical investigation was needed for this purpose and Eastern Coalfield Limited has appointed M/s Project & Development India Limited (PDIL), PDIL Bhawan, A-14, Sector 1, Noida – 201 301, Gautam Budh Nagar, UP for consultancy, Design & Engineering and site supervision services. M/s PDIL has entrusted M/s Centre for Advanced Engineering of 59/2, Bangur Avenue, Block-C, Kolkata – 700055, possessing their own **ISO/IEC 17025:2017** accredited laboratory by **NABL** as Geotechnical Consultant for carrying out Geotechnical Investigation and to provide recommendation for foundation system.

Location:

The proposed site is located at **Sactoria, West Bardhaman, West Bengal.**

B 🕮 Scope of Investigation:

B1. Field Investigation:

Scope of field investigation work was indicated by **Projects & Development India Limited** vide W.O. No. : **GEMC-511687789798019/7200000729**, Dated: **26.04.2022.** It consists of sinking of fourteen (14) boreholes, two (2) Plate Load Test, two (2) Cyclic Plate Load Test, eleven (11) Electrical Resistivity Test and three (3) Static Cone Penetration Test.

B2. Laboratory Test:

Scope of laboratory test consists of determination of Natural Moisture Content, Bulk & Dry Density, Specific Gravity & Void Ratio, Liquid Limit & Plastic Limit, Grain Size Analysis (Sieve & Hydrometer), Unconfined Compression Test, Direct Shear Test, Triaxial Shear Test – (UU,

CU,CD), Consolidation Test, Swelling Pressure Test, Shrinkage Limit

Density Test, Chemical Test on Soil Sample and Chemical Test on Wat

B3. Recommendation of Foundation System:

Scope of work consists of analysis of soil characteristics based on result obtained from field exploration and laboratory test, recommendation of suitable foundation system.

C. 🕮 Description of Subsoil:

The location of boreholes is shown in the enclosed sketch no: **PC276-0000-0002**. The bore-log indicates the sub-soil condition as 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-log.

Sub- soil profile of the site

The entire area is divided into 18 zones as follows:

1. **Zone 1 – Pump House & Fire Water Storage. (BH-13)**
2. **Zone 2 – Storage Raw Water. (BH-12 & ERT-9)**
3. **Zone 3 – Methanol Storage. (ERT-8)**
4. **Zone 4 – RWTP. (BH-11)**
5. **Zone 5 – DM Water Plant. (ERT-7)**
6. **Zone 6 – Plant Methanol. (BH-10, PLT-1, SCPT-01)**
7. **Zone 7 – Office Maintenance Plant (ERT-11)**
8. **Zone 8 – ETP (ERT-6)**
9. **Zone 9 – Building Technical. (ERT-10)**
10. **Zone 10 – Building Administrative. (BH-14)**
11. **Zone 11 – Cooling Tower for Methanol Plant & Gasification. (BH-9 & SCPT-02)**
12. **Zone 12 – Air Separation Unit. (BH-08, CPLT-02 & ERT-5)**
13. **Zone 13 – Gasification Plant. (BH-6, CPLT-1, SCPT-03 & ERT-1)**
14. **Zone 14 – Gas Cleaning and Purification Plant. (BH-7)**
15. **Zone 15 – Steam Generation Plant. (BH-1, PLT-2 & ERT-2)**
16. **Zone 16 – Ash/ Slag Storage. (BH-2, BH-3 & ERT-3)**
17. **Zone 17 – Fire Station (BH-5)**
18. **Zone 18 – Truck Parking Area with Driver Rest Room. (BH-4 & ERT-4)**

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 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 May 2022.
BH-1	15.000	2.600
BH-2	15.000	2.700
BH-3	15.000	2.500
BH-4	15.000	1.900
BH-5	15.000	2.300
BH-6	15.000	2.200
BH-7	15.000	1.200
BH-8	15.000	1.600
BH-9	15.000	1.900
BH-10	15.000	2.300
BH-11	15.000	1.670
BH-12	15.000	1.800
BH-13	15.000	2.100
BH-14	15.000	1.850

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 October and December 2019.

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

E.📖 Laboratory Testing:

Laboratory tests were conducted on the soil samples collected from

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:

- ☞ Natural Moisture Content
- ☞ Bulk & Dry Density
- ☞ Specific Gravity & Void Ratio.
- ☞ Liquid Limit & Plastic Limit.
- ☞ Grain Size Analysis (Sieve & Hydrometer)
- ☞ Unconfined Compressive Strength.
- ☞ Direct Shear Test
- ☞ Tri-axial Shear Strength (UU, CU & CD.)
- ☞ Consolidation Properties.
- ☞ Swelling Pressure.
- ☞ Shrinkage Limit.
- ☞ Modified Proctor Density Test.
- ☞ Chemical Test on Soil Sample.
- ☞ Chemical Test of Water Sample.

F.🏭 Discussion and Recommendation:-

F1. Foundation system:

In general the top soil is very stiff to hard silty clay/ clayey silt, thus this layer is suitable for resting shallow foundation. Location wise bearing capacity has been calculated for different size and shapes of foundation resting at different depth and the same has been presented in respective chapters.

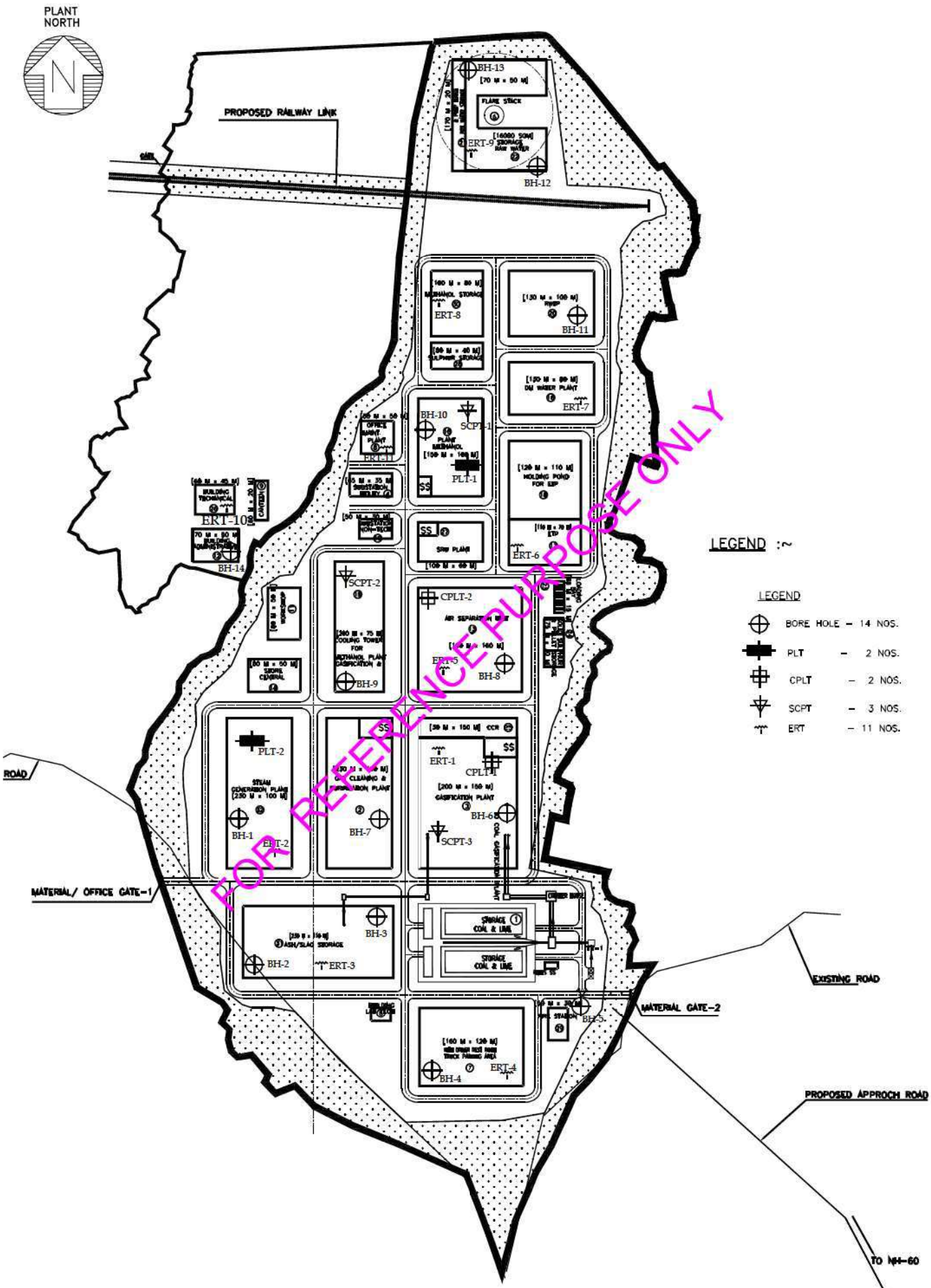
F2. Ground Development:

Ground improvement is not suggested in the report as the founding r
support foundation for medium to heavily loaded structures.

F3. Pile Foundation:

Bored Cast-in-situ Pile foundations have been recommended for structures with heavy load on foundations. Recommended pile capacities have been indicated for different zones in their corresponding chapters.

Chemical tests were performed on a few soil samples and water samples for determining the pH value, Sulphate & Chloride content. It is seen that the values are on a safe side and so no precaution will be required for foundation concrete. Either **Ordinary Portland cement** or **Portland slag cement** or **Portland Pozzolana cement** can be used for the purpose.



Site Plan

Drawing No: PC276-0000-0002

ZONE-1

PUMP HOUSE AND FIRE WATER STORAGE

One (1) borehole was sunk in this area, viz borehole mark
the general sub soil profile it has been observed that the to
to hard brownish/ yellowish grey silty clay/ clayey silt with sand and traces of morrum. The second layer as encountered up to the explored depth isvery dense reddish brown silty sand.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-1).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-1). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-1).

ALLOWABLE BEARING CAPACITY FROM SHE/ SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	56.1	24.20	56	56	56
	2.50	2.50	1.00	50.5	66.81	18	30	50
	5.00	5.00	1.00	48.6	136.51	8	14	26
	7.50	7.50	1.00	48.0	206.14	5	9	17
	10.00	10.00	1.00	47.7	275.72	4	6	12
	1.00	1.00	1.50	60.8	24.74	60	60	60
	2.50	2.50	1.50	52.3	64.92	20	32	52
	5.00	5.00	1.50	49.5	134.96	9	14	27
	7.50	7.50	1.50	48.6	204.72	5	9	17
	10.00	10.00	1.50	48.1	274.08	4	7	13
	1.00	1.00	2.00	65.4	25.62	63	65	65
	2.50	2.50	2.00	54.2	62.81	21	34	54
	5.00	5.00	2.00	50.5	133.56	9	15	28
	7.50	7.50	2.00	49.2	203.22	6	9	18
	10.00	10.00	2.00	48.6	272.95	4	7	13
	1.00	1.00	3.00	74.8	28.00	66	74	74
	2.50	2.50	3.00	57.9	57.64	25	40	57
	5.00	5.00	3.00	52.3	129.77	10	16	30
	7.50	7.50	3.00	50.5	200.34	6	10	18
	10.00	10.00	3.00	49.5	269.92	4	7	13

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	48.9	27.38	44	48	48
	3.75	2.50	1.00	44.0	72.28	15	24	44
	7.50	5.00	1.00	42.4	146.17	7	11	21
	11.25	7.50	1.00	41.8	219.55	4	7	14
	15.00	10.00	1.00	41.5	292.87	3	5	10
	1.50	1.00	1.50	53.0	25.38	52	53	53
	3.75	2.50	1.50	45.6	71.21	16	25	45
	7.50	5.00	1.50	43.2	145.43	7	11	22
	11.25	7.50	1.50	42.4	219.26	4	7	14
	15.00	10.00	1.50	42.0	292.99	3	5	10
	1.50	1.00	2.00	57.0	22.67	57	57	57
	3.75	2.50	2.00	47.3	70.03	16	27	47
	7.50	5.00	2.00	44.0	144.56	7	12	22
	11.25	7.50	2.00	42.9	218.37	4	7	14
	15.00	10.00	2.00	42.4	292.35	3	5	10
	1.50	1.00	3.00	65.2	32.71	49	65	65
	3.75	2.50	3.00	50.5	66.58	18	30	50
	7.50	5.00	3.00	45.6	142.42	8	12	24
	11.25	7.50	3.00	44.0	216.84	5	8	15
	15.00	10.00	3.00	43.2	290.86	3	5	11

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	43.1	47.58	22	36	43
		1.50	1.00	40.7	69.11	14	23	40
		2.00	1.00	39.5	90.55	10	17	32
		2.50	1.00	38.8	112.00	8	13	25
		1.00	1.50	46.7	49.58	23	37	46
		1.50	1.50	43.1	71.37	15	24	43
		2.00	1.50	41.3	92.93	11	17	33
		2.50	1.50	40.2	114.34	8	14	26
		1.00	2.00	50.3	51.29	24	39	50
		1.50	2.00	45.5	73.43	15	24	45
		2.00	2.00	43.1	95.16	11	18	33
		2.50	2.00	41.7	116.85	8	14	26
		1.00	3.00	57.5	53.77	26	42	57
		1.50	3.00	50.3	76.93	16	26	49
		2.00	3.00	46.7	99.17	11	18	35
		2.50	3.00	44.6	121.21	9	14	27

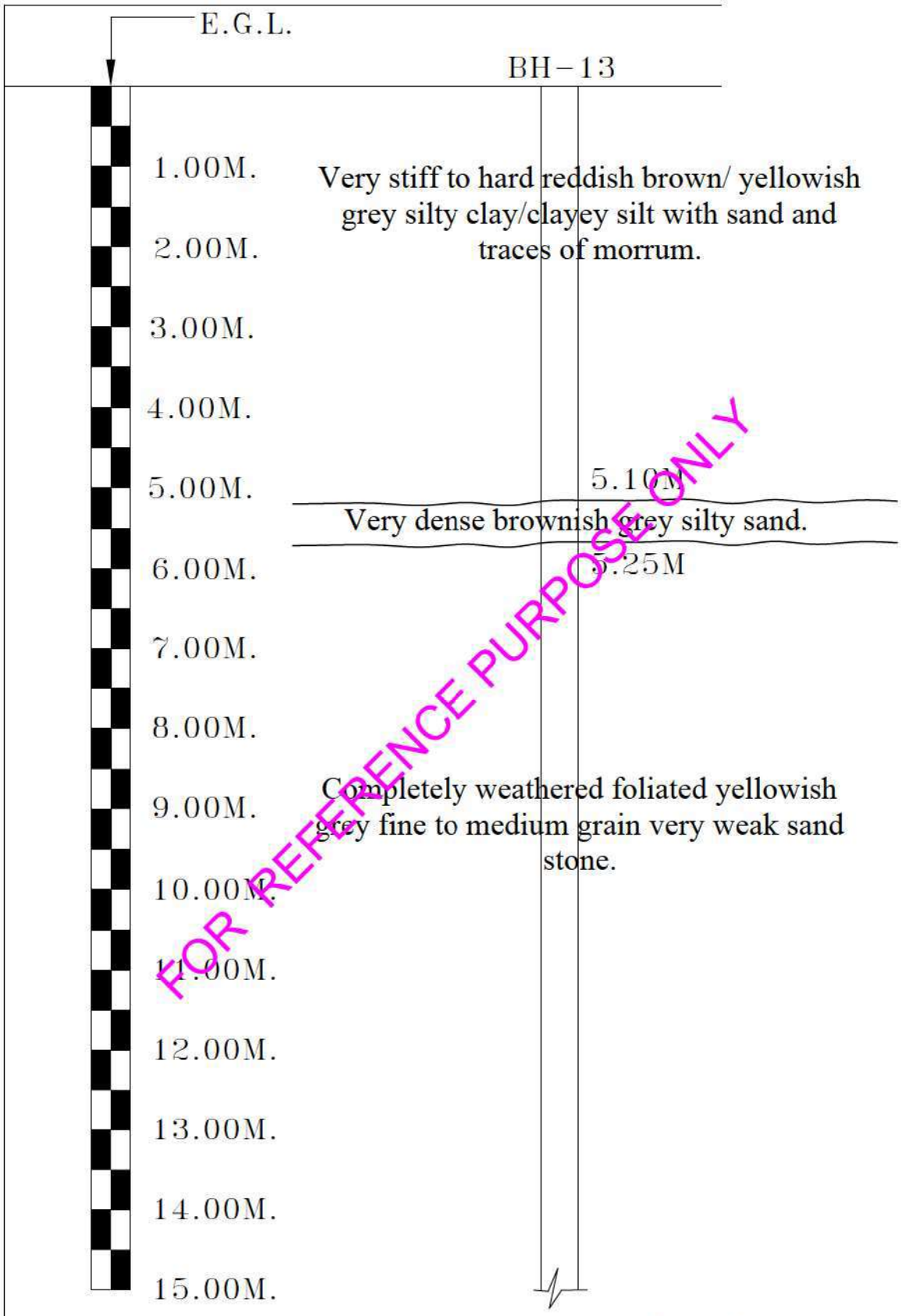
Table-2B (Zone-1).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**49**	**29**	**6**
2	0.750	10.000	2.000	**72**	**38**	**8**
3	1.000	10.000	2.000	**113**	**51**	**11**
4	1.500	10.000	2.000	**220**	**76**	**16**

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:	E.G.L.: 119.354	Unit: Pump House & Fire Water Storage.						Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenc
Depth of Boring	5.250 M.	SPT	3	UDS	2	WS		Completed on : 24.05.2022
Type of Drilling		DCPT		DS	5	RCS	7	Water Struck At : 2.20M
Depth of Drilling	9.750 M.	VST		SCPT				Standing Water Table : 2.10M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard brownish/ yellowish grey silty clay/clayey silt with sand and traces of morrum.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 37	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 55	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.50-4.95M
Very dense reddish brown silty sand.		05	N > 100	SPT3	5.10-5.25M
				DS5	5.10-5.25M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		06		RUN1	5.25-6.50M TCR - 27% RQD - NIL
		07		RUN2	6.50-8.00M TCR - 41% RQD - NIL
		08		RUN3	8.00-9.50M TCR - 48% RQD - NIL
		09		RUN4	9.50-11.00M TCR - 57% RQD - NIL
		10			
		11		RUN5	11.00-12.50M TCR - 57% RQD - NIL
		12			
		13		RUN6	12.50-14.00M TCR - 62% RQD - NIL
		14		RUN7	14.00-15.00M TCR - 67% RQD - NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-13

Sketch No.-SK/PDIL/	Pump House & Fire Water Storage	1678	02	12 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard brownish/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	13	0.50	D																1	39	41	19	1.81	12.59
		13	1.00	D		44	22	11												2	33	45	20	1.79	13.71
		13	1.50	DN	37	41	20	9												4	35	43	18		
		13	2.00	UD		43	21	10	1.91	16.23	2.68	1.64	2.44	UU	1.75	0	0.00-0.10	0.0451	0.000	0	37	45	18		
																	0.10-0.20	0.0392							
														CU	0.14	14	0.20-0.40	0.0328							
																	0.40-0.80	0.0257							
														CD	0.02	27	0.80-1.60	0.0204							
																	1.60-3.20	0.0114							
		13	3.00	DN	55						2.67									0	39	44	17		
		13	4.50	UD		42	22	11		17.9	2.66			DS	0.13	32				0	40	45	15		
II	Very dense reddish brown silty sand	13	5.10	DN	>100						2.65									0	85	11	4		

ZONE-2

STORAGE RAW WATER

Total one (1) borehole was sunk in this area, viz borehole
the general sub soil profile it has been observed that the
hard reddish brown/ yellowish grey silty clay/ clayey silt v
morrumand the second layer as encountered up to the e
dense brownish grey silty sand.

In addition the following field tests have been carried out at this zone and results are being indicated in this chapter.

1. Electrical Resistivity Test:

   One (1) electrical resistivity tests has been carried out at this zone marked as ERT-9.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-2).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-2). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-2).

ALLOWABLE BEARING CAPACITY FROM SHE/ SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWABLE BEARING CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	36.8	19.39	36	36	36
	2.50	2.50	1.00	33.1	53.47	15	24	33
	5.00	5.00	1.00	31.9	109.40	7	11	21
	7.50	7.50	1.00	31.5	165.17	4	7	14
	10.00	10.00	1.00	31.3	220.90	3	5	10
	1.00	1.00	1.50	39.9	19.82	39	39	39
	2.50	2.50	1.50	34.4	52.14	16	26	34
	5.00	5.00	1.50	32.5	108.18	7	12	22
	7.50	7.50	1.50	31.9	164.05	4	7	14
	10.00	10.00	1.50	31.5	219.83	3	5	10
	1.00	1.00	2.00	43.0	20.56	43	43	43
	2.50	2.50	2.00	35.6	50.37	17	28	35
	5.00	5.00	2.00	33.1	106.88	7	12	23
	7.50	7.50	2.00	32.3	162.89	4	7	14
	10.00	10.00	2.00	31.9	218.74	3	5	10
	1.00	1.00	3.00	49.1	22.44	49	49	49
	2.50	2.50	3.00	38.1	46.31	20	32	38
	5.00	5.00	3.00	34.4	104.21	8	13	24
	7.50	7.50	3.00	33.1	160.32	5	8	15
	10.00	10.00	3.00	32.5	216.36	3	6	11

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	32.1	21.98	32	32	32
	3.75	2.50	1.00	28.9	58.08	12	19	28
	7.50	5.00	1.00	27.8	117.25	5	9	17
	11.25	7.50	1.00	27.5	176.71	3	6	11
	15.00	10.00	1.00	27.3	235.70	2	4	8
	1.50	1.00	1.50	34.8	20.38	34	34	34
	3.75	2.50	1.50	30.0	57.32	13	20	30
	7.50	5.00	1.50	28.4	116.97	6	9	18
	11.25	7.50	1.50	27.8	175.88	3	6	11
	15.00	10.00	1.50	27.6	235.55	2	4	8
	1.50	1.00	2.00	37.5	18.25	37	37	37
	3.75	2.50	2.00	31.0	56.15	13	22	31
	7.50	5.00	2.00	28.9	116.16	6	9	18
	11.25	7.50	2.00	28.2	175.61	4	6	12
	15.00	10.00	2.00	27.8	234.50	2	4	8
	1.50	1.00	3.00	42.8	26.27	40	42	42
	3.75	2.50	3.00	33.2	53.55	15	24	33
	7.50	5.00	3.00	30.0	114.63	6	10	19
	11.25	7.50	3.00	28.9	174.24	4	6	12
	15.00	10.00	3.00	28.4	233.93	3	4	9

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	28.3	38.55	18	28	28
		1.50	1.00	26.7	55.94	11	19	26
		2.00	1.00	26.0	73.54	8	14	26
		2.50	1.00	25.5	90.82	7	11	21
		1.00	1.50	30.7	40.22	19	30	30
		1.50	1.50	28.3	57.82	12	19	28
		2.00	1.50	27.1	75.24	9	14	27
		2.50	1.50	26.4	92.65	7	11	21
		1.00	2.00	33.1	41.64	19	31	33
		1.50	2.00	29.9	59.53	12	20	29
		2.00	2.00	28.3	77.09	9	14	27
		2.50	2.00	27.4	94.73	7	11	21
		1.00	3.00	37.8	43.62	21	34	37
		1.50	3.00	33.1	62.46	13	21	33
		2.00	3.00	30.7	80.44	9	15	28
		2.50	3.00	29.3	98.25	7	11	22

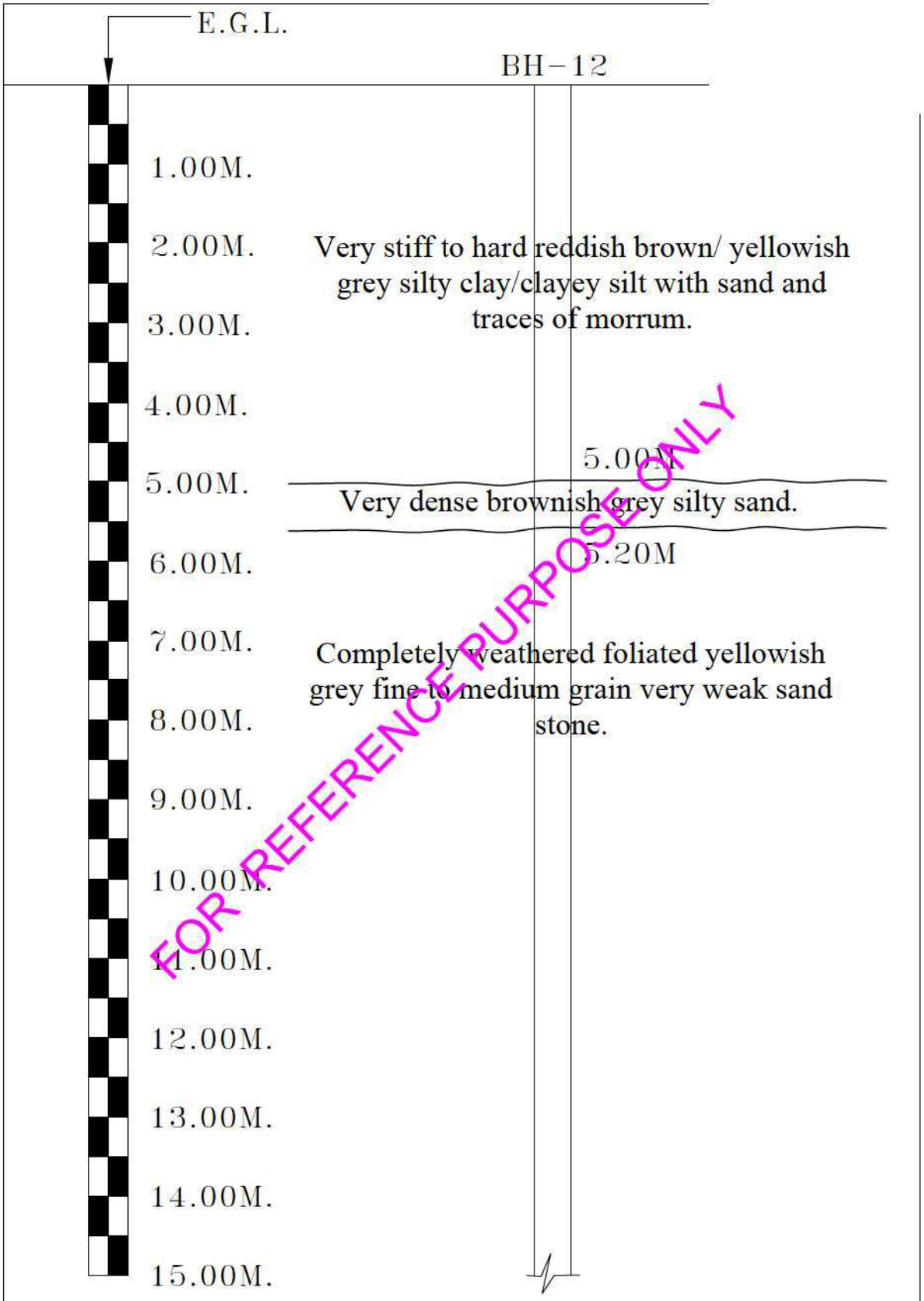
Table-2B (Zone-2).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**47**	**27**	**6**
2	0.750	10.000	2.000	**70**	**36**	**8**
3	1.000	10.000	2.000	**110**	**48**	**11**
4	1.500	10.000	2.000	**216**	**72**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hol
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:118.411	Unit: Storage Raw Water					Bore Hol
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS	Commenc
Depth of Boring	5.200 M.	SPT	4	UDS	2	WS		Completed on : 24.05.2022
Type of Drilling		DCPT		DS	6	RCS	7	Water Struck At : 1.90M
Depth of Drilling	9.800 M.	VST		SCPT				Standing Water Table : 1.80M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard reddish brown/ yellowish grey silty clay/clayey silt with sand and traces of morrum.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 18	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 39	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
			N = 46	SPT3	4.50-4.95M
Very dense brownish grey silty sand.		05		DS5	4.50-4.95M
			N >100	SPT4	5.00-5.20M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				DS6	5.00-5.20M
		06		RUN1	5.20-6.50M TCR - 30% RQD - NIL
		07		RUN2	6.50-8.00M TCR - 35% RQD - NIL
		08		RUN3	8.00-9.50M TCR - 42% RQD - NIL
		09		RUN4	9.50-11.00M TCR - 53% RQD - NIL
		10			
		11		RUN5	11.00-12.50M TCR - 59% RQD - NIL
		12			
		13		RUN6	12.50-14.00M TCR - 68% RQD - NIL
		14		RUN7	14.00-15.00M TCR - 59% RQD - NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-12

Sketch No.-SK/PDIL/	Storage Raw Water	1678	02	11 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

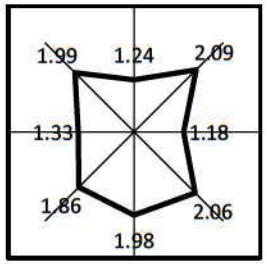
Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard reddish brown/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	12	0.50	D																0	29	49	22	1.79	12.75
		12	1.00	D		45	20	11												0	32	49	19		
		12	1.50	DN	18						2.68									0	35	50	15		
		12	2.00	UD		46	21	13	1.94	14.29	2.69	1.70	2.24	UU	1.15	0	0.00-0.10	0.0439	0.000	0	32	52	16		
																	0.10-0.20	0.0391							
														CU	0.12	15	0.20-0.40	0.0342							
																	0.40-0.80	0.0288							
														CD	0.04	24	0.80-1.60	0.0221							
																	1.60-3.20	0.0132							
		12	3.00	DN	39	55	24	10												0	33	48	19		
		12	4	UD		47	22	12	1.92	12.29	2.67	1.71	2.99	UU	1.57	0	0.00-0.10	0.0399	0.000	0	31	55	14		
																	0.10-0.20	0.0359							
														CU	0.11	16	0.20-0.40	0.0301							
																	0.40-0.80	0.0242							
														CD	0.03	28	0.80-1.60	0.0179							
																	1.60-3.20	0.0116							
		12	4.50	DN	46	44	21	11												0	30	48	22		
II	Very dense brownish grey silty sand	12	5.00	DN	>100				1.80					DS	0.15	33				0	76	18	6		

Table ERT - 9

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Storage Raw Water
Client : Project & Development India Limited
Test Date : 03-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

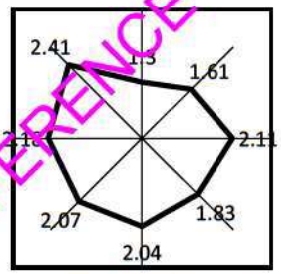
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.24	2.09	1.18	2.06	1.98	1.86	1.33	1.99	7.79	13.13	7.41	12.94	12.44	11.69	8.36	12.50
2	2.0	1.3	1.61	2.11	1.83	2.04	2.07	2.18	2.41	16.34	20.23	26.52	23.00	25.64	26.01	27.39	30.28
3	3.0	2.39	3.12	3.09	2.73	2.55	2.84	2.77	2.32	45.05	58.81	58.25	51.46	48.07	53.53	52.21	43.73
4	5.0	2.93	3.17	2.72	1.15	1.39	3.04	2.07	1.69	92.05	99.59	85.45	36.13	43.67	95.50	65.03	53.09
5	10.0	2.8	2.17	1.98	2.01	2.07	3.55	3.42	1.94	175.93	136.35	124.41	126.29	130.06	223.05	214.88	121.89
6	15.0	1.59	2.19	3.17	2.37	2.84	2.86	3.56	2.88	149.85	206.40	298.77	223.37	267.66	269.55	335.52	271.43
7	20.0	3.07	2.88	3.79	3.19	2.55	2.84	4.18	3.16	385.79	361.91	476.27	400.87	320.44	356.88	525.27	397.10

1.00Mtr.



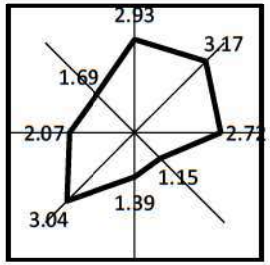
Resistivity = 10.78 ohm-m

2.00Mtr.



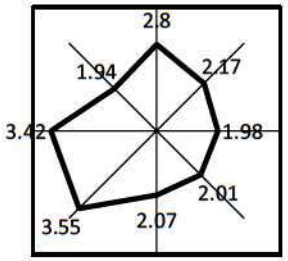
Resistivity = 24.43 ohm-m

5.00Mtr.



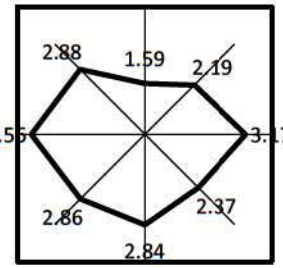
Resistivity = 71.31 ohm-m

10.00Mtr.



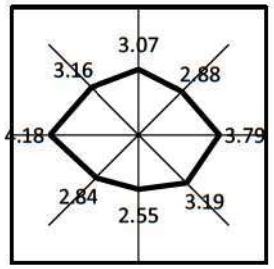
Resistivity = 156.61 ohm-m

15.00Mtr.



Resistivity = 252.82 ohm-m

20.00Mtr.



Resistivity = 403.07 ohm-m

ZONE-3

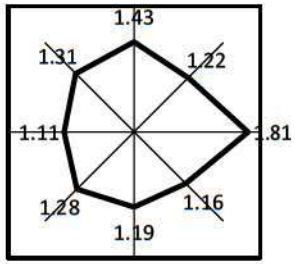
METHANOL STORAGE

Table ERT - 8

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Methanol Storage.
Client : Project & Development India Limited
Test Date : 04-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

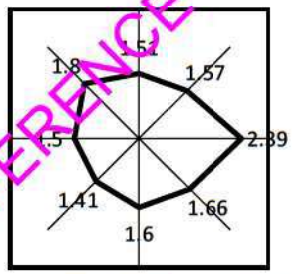
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.43	1.22	1.81	1.16	1.19	1.28	1.11	1.31	8.98	7.67	11.37	7.29	7.48	8.04	6.97	8.23
2	2.0	1.51	1.57	2.39	1.66	1.6	1.41	1.5	1.8	18.98	19.73	30.06	20.86	20.11	17.72	18.85	22.62
3	3.0	2.31	2.17	2.63	2.8	1.77	1.63	2.14	1.49	43.54	40.90	49.57	52.78	33.36	30.72	40.34	28.09
4	5.0	2.93	2.49	2.92	2.35	2.31	2.99	1.84	2.38	92.05	78.23	91.73	73.83	72.57	93.93	57.81	74.77
5	10.0	3.15	2.84	3.19	3.47	3.23	2.14	3.31	2.22	197.92	178.44	200.43	218.03	202.95	134.46	207.97	139.49
6	15.0	3.59	3.11	3.6	2.99	2.86	3.03	2.93	3.61	338.35	293.11	339.29	281.80	269.55	285.57	276.15	340.23
7	20.0	2.95	3.65	3.08	3.51	3.5	3.47	3.07	3.81	370.71	458.67	387.04	441.08	439.82	436.05	385.79	478.78

1.00Mtr.



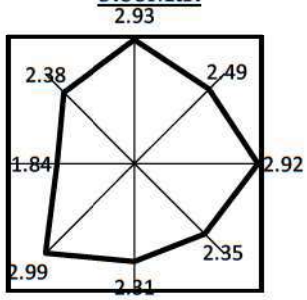
Resistivity = 8.25 ohm-m

2.00Mtr.



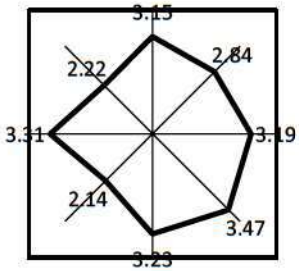
Resistivity = 21.11 ohm-m

5.00Mtr.



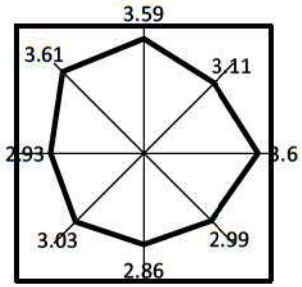
Resistivity = 79.36 ohm-m

10.00Mtr.



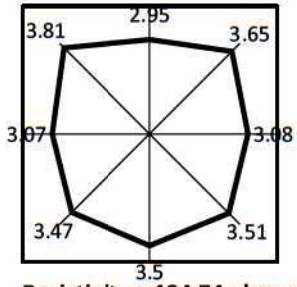
Resistivity = 184.96 ohm-m

15.00Mtr.



Resistivity = 303.01 ohm-m

20.00Mtr.



Resistivity = 424.74 ohm-m

ZONE-4

RWTP

One (1) borehole was sunk in this area, viz borehole mark
the general sub soil profile it has been observed that the to
to hard reddish brown/ brownish grey silty clay/ clayey silt with sand and traces of morrum and the second layer as encountered up to the explored depth is very dense reddish brown silty sand.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-4).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-4). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-4).

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					***ALLOWABLE BEARING CAPACITY***		
FOUNDATION TYPE	**L**	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 25 mm**	**For allowable settlement 40 mm**	**For allowable settlement 75 mm**
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	39.7	21.95	39	39	39
	2.50	2.50	1.00	35.7	60.53	14	23	35
	5.00	5.00	1.00	34.4	123.82	6	11	20
	7.50	7.50	1.00	34.0	187.12	4	7	13
	10.00	10.00	1.00	33.8	250.3[illegible]	3	5	10
	1.00	1.00	1.50	43.0	22.42	43	43	43
	2.50	2.50	1.50	37.1	59.01	15	25	37
	5.00	5.00	1.50	35.1	122.63	7	11	21
	7.50	7.50	1.50	34.4	185.69	4	7	13
	10.00	10.00	1.50	34.1	248.99	3	5	10
	1.00	1.00	2.00	46.3	23.24	46	46	46
	2.50	2.50	2.00	38.4	57.03	16	26	38
	5.00	5.00	2.00	35.7	120.99	7	11	22
	7.50	7.50	2.00	34.9	184.73	4	7	14
	10.00	10.00	2.00	34.4	247.58	3	5	10
	1.00	1.00	3.00	53.0	25.43	52	53	53
	2.50	2.50	3.00	41.0	52.30	19	31	41
	5.00	5.00	3.00	37.1	117.97	7	12	23
	7.50	7.50	3.00	35.7	181.49	4	7	14
	10.00	10.00	3.00	35.1	245.27	3	5	10

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	34.6	24.86	34	34	34
	3.75	2.50	1.00	31.2	65.77	11	18	31
	7.50	5.00	1.00	30.0	132.72	5	9	16
	11.25	7.50	1.00	29.6	199.50	3	5	11
	15.00	10.00	1.00	29.4	266.25	2	4	8
	1.50	1.00	1.50	37.5	23.04	37	37	37
	3.75	2.50	1.50	32.3	64.73	12	19	32
	7.50	5.00	1.50	30.6	132.19	5	9	17
	11.25	7.50	1.50	30.0	199.08	3	6	11
	15.00	10.00	1.50	29.7	265.87	2	4	8
	1.50	1.00	2.00	40.4	20.62	40	40	40
	3.75	2.50	2.00	33.5	63.65	13	21	33
	7.50	5.00	2.00	31.2	131.54	5	9	17
	11.25	7.50	2.00	30.4	198.57	3	6	11
	15.00	10.00	2.00	30.0	265.44	2	4	8
	1.50	1.00	3.00	46.2	29.74	38	46	46
	3.75	2.50	3.00	35.8	60.57	14	23	35
	7.50	5.00	3.00	32.3	129.46	6	9	18
	11.25	7.50	3.00	31.2	197.31	3	6	11
	15.00	10.00	3.00	30.6	264.38	2	4	8

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	30.5	43.46	17	28	30
		1.50	1.00	28.8	63.12	11	18	28
		2.00	1.00	28.0	82.84	8	13	25
		2.50	1.00	27.5	102.45	6	10	20
		1.00	1.50	33.1	45.36	18	29	33
		1.50	1.50	30.5	65.18	11	18	30
		2.00	1.50	29.3	85.09	8	13	25
		2.50	1.50	28.5	104.62	6	10	20
		1.00	2.00	35.6	46.85	18	30	35
		1.50	2.00	32.2	67.06	12	19	32
		2.00	2.00	30.5	86.91	8	14	26
		2.50	2.00	29.5	106.69	6	11	20
		1.00	3.00	40.7	49.13	20	33	40
		1.50	3.00	35.6	70.27	12	20	35
		2.00	3.00	33.1	90.72	9	14	27
		2.50	3.00	31.6	110.84	7	11	21

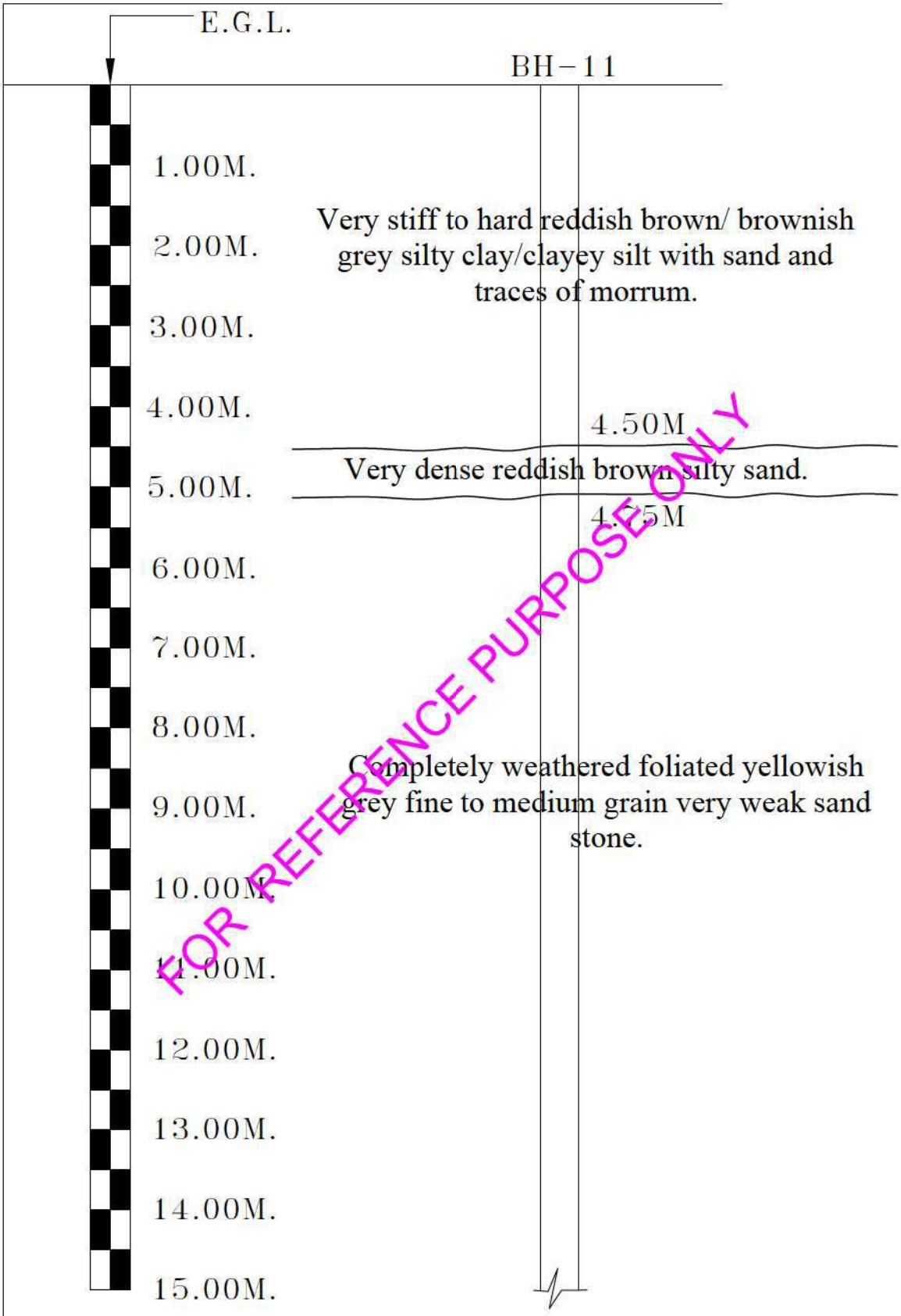
Table-2B (Zone-4).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**47**	**27**	**6**
2	0.750	10.000	2.000	**70**	**36**	**8**
3	1.000	10.000	2.000	**110**	**48**	**11**
4	1.500	10.000	2.000	**217**	**73**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:114.982		Unit: RWTP				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenc
Depth of Boring	4.750 M.	SPT	3	UDS	2	WS		Completed on : 23.05.2022
Type of Drilling		DCPT		DS	5	RCS	7	Water Struck At : 1.85M
Depth of Drilling	10.250 M.	VST		SCPT				Standing Water Table : 1.67M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard reddish brown/ brownish grey silty clay/clayey silt with sand and traces of morrum.		01		DS1	0.50 M
				DS2	1.00 M
			N = 31	SPT1	1.50-1.95M
		02		DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 45	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
Very dense reddish brown silty sand.			N > 100	SPT3	4.50-4.75M
				DS5	4.50-4.75M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		05		RUN1	4.75-6.00M TCR - 27% RQD - NIL
		06		RUN2	6.00-7.50M TCR - 37% RQD - NIL
		07		RUN3	7.50-9.00M TCR - 44% RQD - NIL
		08			
		09		RUN4	9.00-10.50M TCR - 52% RQD - NIL
		10			
		11		RUN5	10.50-12.00M TCR - 62% RQD - NIL
		12		RUN6	12.00-13.50M TCR - 60% RQD - NIL
		13			
		14		RUN7	13.50-15.00M TCR - 57% RQD - NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-11

Sketch No.-SK/PDIL/	RWTP	1678	02	10 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard reddish brown/ brownish grey silty clay/clayey silt with sand and traces of morrum.	11	0.50	D																0	28	53	19	1.77	13.05
		11	1.00	D																0	30	52	18		
		11	1.50	DN	31	46	23	10												0	33	45	22		
		11	2.00	UD		48	24	13	1.89	14.77	2.68	1.65	2.51	UU	1.29	0	0.00-0.10	0.0445	0.000	0	31	54	15		
																	0.10-0.20	0.0407							
														CU	0.17	14	0.20-0.40	0.0363							
																	0.40-0.80	0.0291							
														CD	0.03	26	0.80-1.60	0.0214							
																	1.60-3.20	0.0126							
		11	3.00	DN	45	47	23	11												0	30	48	22		
		11	4.00	UD		43	21	12	1.88	13.52	2.67	1.66	2.43	UU	1.24	0	0.00-0.10	0.0419	0.000	0	35	48	17		
																	0.10-0.20	0.0390							
														CU	0.16	12	0.20-0.40	0.0351							
																	0.40-0.80	0.0294							
														CD	0.05	28	0.80-1.60	0.0211							
																	1.60-3.20	0.0141							
II	Very dense reddish brown silty sand	11	4.50	DN	>100				1.78		2.65			DS	0.16	32				0	79	15	6		

ZONE-5

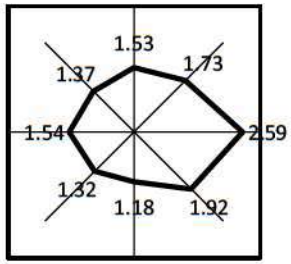
DM WATERPLANT

Table ERT - 7

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : DM Water Plant.
Client : Project & Development India Limited
Test Date : 03-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

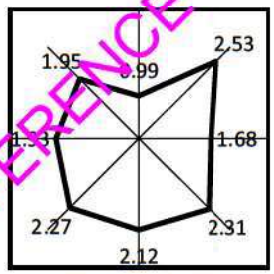
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.53	1.73	2.59	1.92	1.18	1.32	1.54	1.37	9.61	10.87	16.27	12.06	7.41	8.29	9.68	8.61
2	2.0	0.99	2.53	1.68	2.31	2.12	2.27	1.93	1.95	12.44	31.79	21.11	29.03	26.64	28.53	24.25	24.50
3	3.0	1.89	3.64	2.73	2.18	3.03	3.8	2.18	2.73	35.63	68.61	51.46	41.09	57.11	71.63	41.09	51.46
4	5.0	2.84	2.98	2.11	1.83	2.77	2.92	2.64	3.86	89.22	93.62	66.29	57.49	87.02	91.73	82.94	121.27
5	10.0	3.64	3.19	3.04	1.17	3.14	1.99	3.31	4.04	228.71	200.43	191.01	73.51	197.29	125.04	207.97	253.84
6	15.0	3.58	3.04	4.15	3.33	3.91	2.18	3.84	3.84	337.41	286.61	391.13	313.85	368.51	205.46	361.91	361.91
7	20.0	3.91	4.12	3.11	2.86	4.13	2.63	2.98	2.11	491.35	517.73	390.81	359.40	518.99	330.50	374.48	265.15

1.00Mtr.



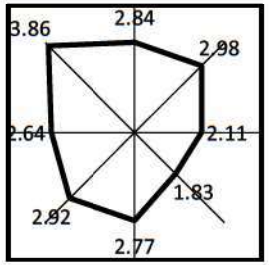
Resistivity = 10.35 ohm-m

2.00Mtr.



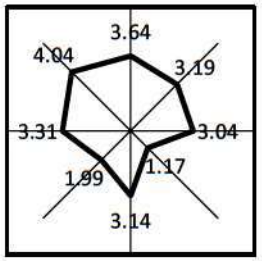
Resistivity = 24.79 ohm-m

5.00Mtr.



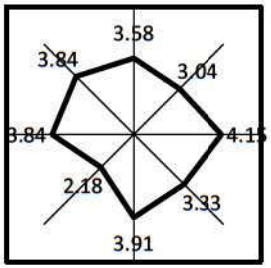
Resistivity = 86.2 ohm-m

10.00Mtr.



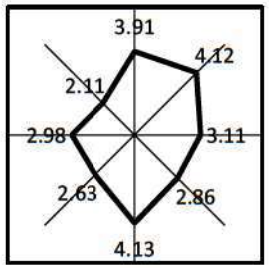
Resistivity = 184.73 ohm-m

15.00Mtr.



Resistivity = 328.34 ohm-m

20.00Mtr.



Resistivity = 406.05 ohm-m

ZONE-6

PLANT

METHANOL

Total one (1) borehole was sunk in this area, viz borehole
the general sub soil profile it has been observed that the
dense yellowish/ brownish grey silty sand with clay bindersand continued up to the explored depth.

In addition the following field tests have been carried out at this zone and results are being indicated in this chapter.

1. Plate Load Test:

   One (1) plate load test has been carried out at this zone marked as PLT-1.

2. Static Cone Penetration Test:

   One (1) static cone penetration test has been carried out at this zone marked as SCPT-1.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-6).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-6). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-6).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	11.3	2.30	11	11	11
	2.50	2.50	1.00	15.3	9.45	15	15	15
	5.00	5.00	1.00	23.0	30.09	19	23	23
	7.50	7.50	1.00	30.7	61.39	12	20	30
	10.00	10.00	1.00	38.6	103.88	9	14	27
	1.00	1.00	1.50	16.3	3.11	16	16	16
	2.50	2.50	1.50	19.4	11.23	19	19	19
	5.00	5.00	1.50	26.8	34.01	19	26	26
	7.50	7.50	1.50	34.5	67.64	12	20	34
	10.00	10.00	1.50	42.2	111.93	9	15	28
	1.00	1.00	2.00	21.8	3.97	21	21	21
	2.50	2.50	2.00	23.8	12.84	23	23	23
	5.00	5.00	2.00	30.7	37.79	20	30	30
	7.50	7.50	2.00	38.3	73.64	13	20	38
	10.00	10.00	2.00	46.0	120.26	9	15	28
	1.00	1.00	3.00	34.5	6.01	34	34	34
	2.50	2.50	3.00	33.1	15.34	33	33	33
	5.00	5.00	3.00	38.9	44.93	21	34	38
	7.50	7.50	3.00	46.1	85.13	13	21	40
	10.00	10.00	3.00	53.6	136.05	9	15	29

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	10.6	2.87	10	10	10
	3.75	2.50	1.00	14.2	11.29	14	14	14
	7.50	5.00	1.00	21.2	35.38	14	21	21
	11.25	7.50	1.00	28.4	72.20	9	15	28
	15.00	10.00	1.00	35.5	121.27	7	11	21
	1.50	1.00	1.50	15.2	3.52	15	15	15
	3.75	2.50	1.50	18.1	13.68	18	18	18
	7.50	5.00	1.50	24.8	40.41	15	24	24
	11.25	7.50	1.50	31.9	79.85	9	15	29
	15.00	10.00	1.50	39.0	131.69	7	11	22
	1.50	1.00	2.00	20.4	3.93	20	20	20
	3.75	2.50	2.00	22.2	15.91	22	22	22
	7.50	5.00	2.00	28.5	45.32	15	25	28
	11.25	7.50	2.00	35.5	87.47	10	16	30
	15.00	10.00	2.00	42.5	141.84	7	11	22
	1.50	1.00	3.00	32.4	7.87	32	32	32
	3.75	2.50	3.00	31.0	19.78	31	31	31
	7.50	5.00	3.00	36.3	54.88	16	26	36
	11.25	7.50	3.00	42.8	102.10	10	16	31
	15.00	10.00	3.00	49.7	161.97	7	12	23

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	10.9	6.75	10	10	10
		1.50	1.00	12.6	12.00	12	12	12
		2.00	1.00	14.4	18.52	14	14	14
		2.50	1.00	16.3	26.40	15	16	16
		1.00	1.50	15.2	9.05	15	15	15
		1.50	1.50	16.4	15.24	16	16	16
		2.00	1.50	18.1	22.85	18	18	18
		2.50	1.50	19.8	31.60	15	19	19
		1.00	2.00	19.9	11.38	19	19	19
		1.50	2.00	20.6	18.65	20	20	20
		2.00	2.00	21.9	27.13	20	21	21
		2.50	2.00	23.5	36.94	15	23	23
		1.00	3.00	30.7	16.11	30	30	30
		1.50	3.00	29.9	25.65	29	29	29
		2.00	3.00	30.4	36.22	20	30	30
		2.50	3.00	31.5	48.03	16	26	31

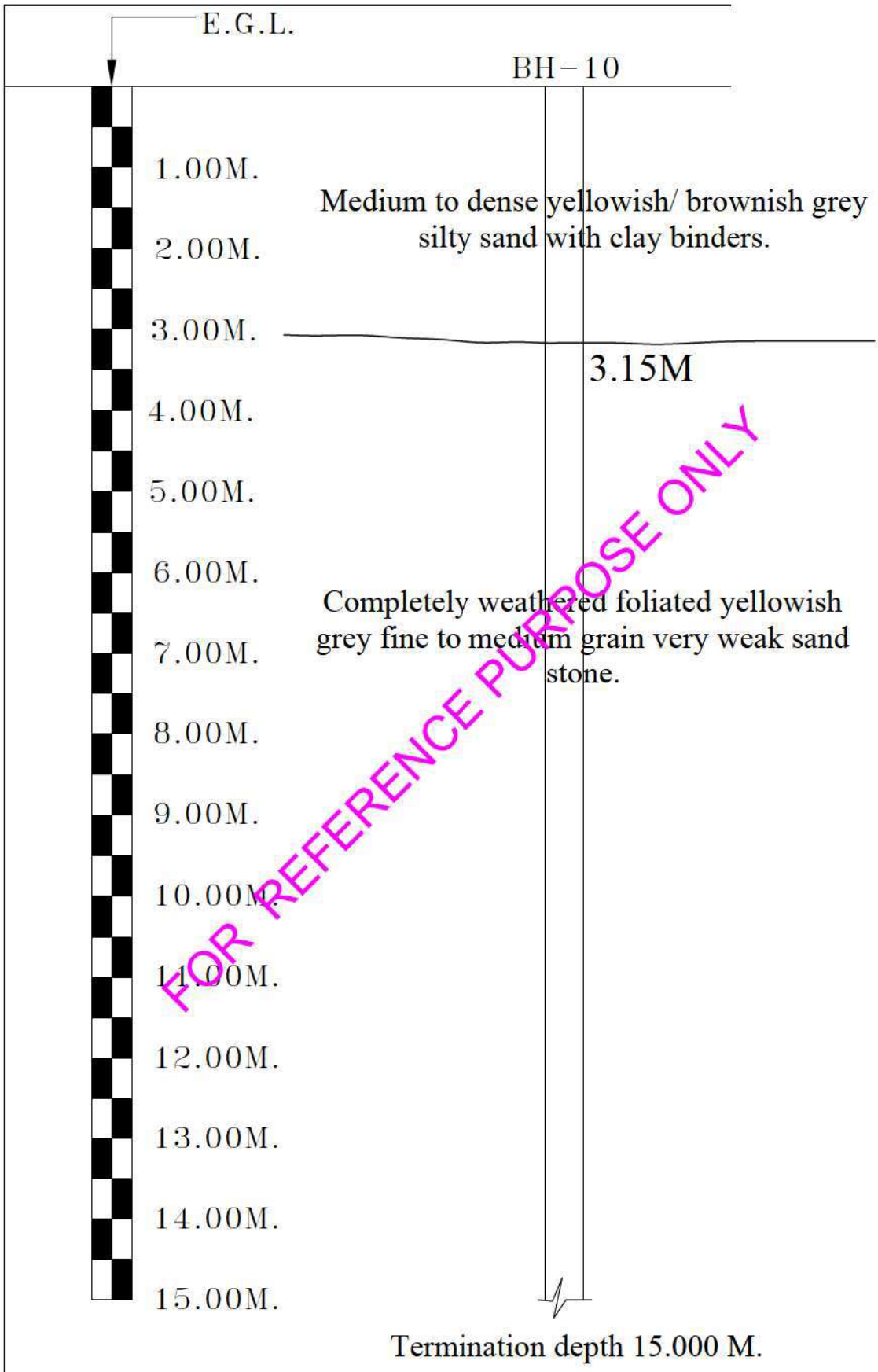
Table-2B (Zone-6).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**41**	**21**	**5**
2	0.750	10.000	2.000	**63**	**29**	**7**
3	1.000	10.000	2.000	**101**	**39**	**12**
4	1.500	10.000	2.000	**232**	**58**	**23**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Ho
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:110.026		Unit: Plant Methanol				Bore Ho
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commen
Depth of Boring	3.150 M.	SPT	2	UDS	1	WS		Completed on : 23.05.2022
Type of Drilling		DCPT		DS	4	RCS	8	Water Struck At : 2.40M
Depth of Drilling	11.850 M.	VST		SCPT				Standing Water Table : 2.30M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Medium to dense yellowish/ brownish grey silty sand with clay binders.		01 02 03	N = 40 N > 100	DS1 DS2 SPT1 DS3 UDS1 SPT2 DS4	0.50 M 1.00 M 1.50-1.95M 1.50-1.95M 2.00-2.45M 3.00-3.15M 3.00-3.15M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		04 05 06 07 08 09 10 11 12 13 14 15		RUN1 RUN2 RUN3 RUN4 RUN5 RUN6 RUN7 RUN8	3.15-4.50M TCR - 24% RQD - NIL 4.50-6.00M TCR - 30% RQD - NIL 6.00-7.50M TCR - 40% RQD - NIL 7.50-9.00M TCR - 49% RQD - NIL 9.00-10.50M TCR - 55% RQD - NIL 10.50-12.00M TCR - 51% RQD - NIL 12.00-13.50M TCR - 65% RQD - NIL 13.50-15.00M TCR - 57% RQD - NIL
Termination Depth 15.000 Mtr.					



Termination depth 15.000 M.

Sub-Soil Profile through BH-10

Sketch No.-SK/PDIL/	Plant Methanol	1678	02	9 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Medium to dense yellowish/ brownish grey silty sand with clay binders.	10	0.50	D																0	59	26	15	1.75	13.69
		10	1.00	D		36	16	10												0	55	27	18		
		10	1.50	DN	40						2.65									0	64	24	12		
		10	2.00	UD		37	17	9	1.80	16.25	2.64	1.55		DS	0.18	33			0.000	0	60	30	10		
		10	3.00	DN	>100				1.79					DS	0.14	35				0	68	24	8		

Modulas of Subgrade Reaction and Modulas of Elasticity have been calculated for Plate Load

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

From Load-Settlement curve of PLT-1, Pressure corresponding to settlement of 1.25mm i

Hence, K = Pressure/ Settlement.
= 2.1/0.125 Kg/Cm3
= 16.8 Kg/Cm3

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

Modulas of Elasticity has been calculated for initial load of 18.3 T/M2 and corresponding settlement of 0.101 cm.

$$Es = \{q*(1-\mu 2)*B*Iw\} / S$$
$$= \{0.36*(1-0.3^2)*75*0.82\}/0.121$$
$$= 811.22 \text{ Kg/Cm2}$$

Where,

Es = Modulas of Elasticity.
q = Pressure = 1.83 Kg/Cm2
μ = Poisson's Ratio = 0.3
B = Least dimension of the plate = 60 Cm
Iw = Influence Factor = 0.8
S = Settlement = 0.1 Cm

Modulas of Subgrade Reaction and Modulas of Elasticity, obtain from Plate Load Test.

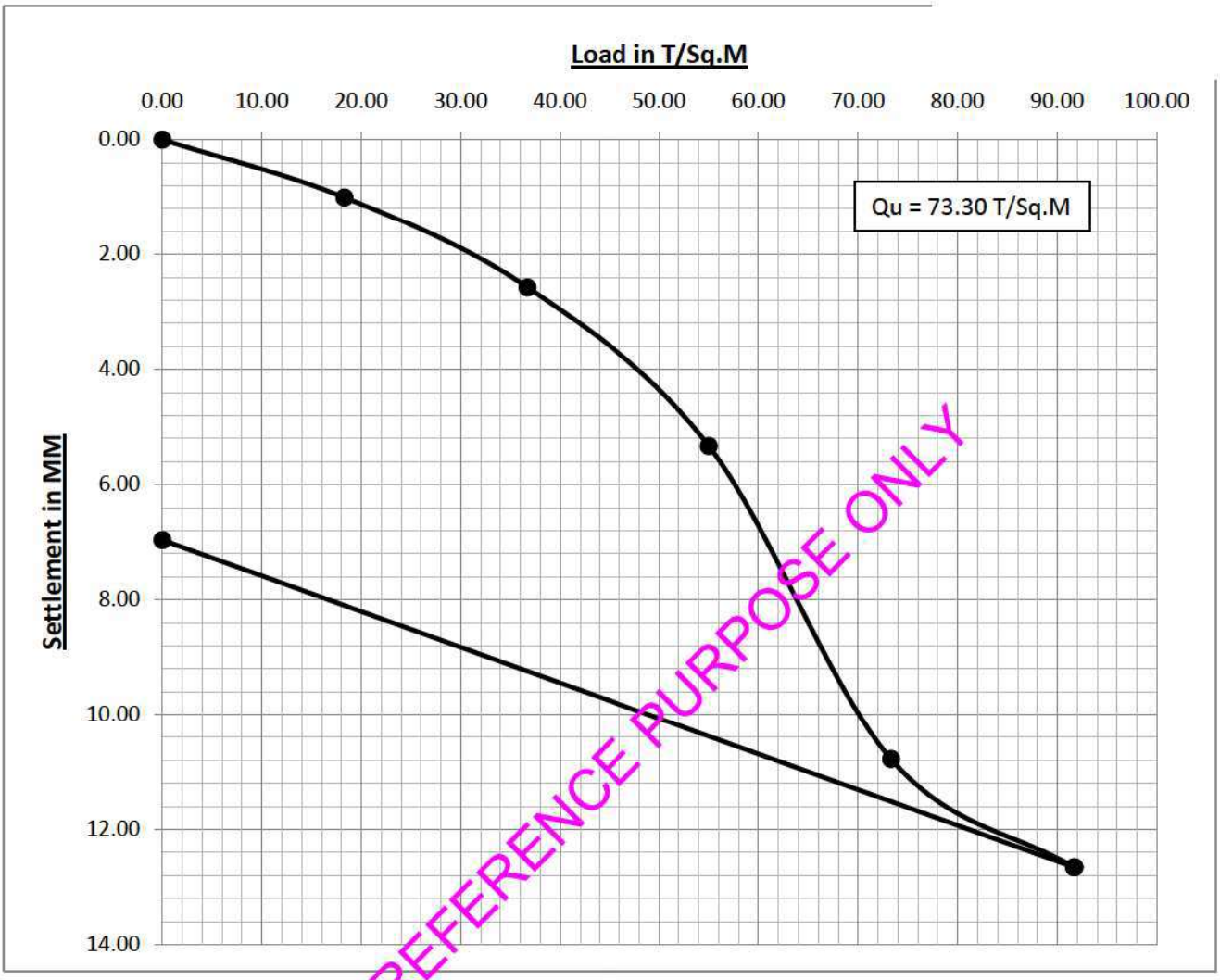
Test No.	Depth of Test	Modulas of Subgrade Reaction, K	Modulas of Elasticity, Es
	(M)	(Kg/Cm3)	(Kg/Cm2)
PLT-1	2	16.8 Kg/Cm3	811.22 Kg/Cm2

PLATE LOAD TEST SITE DATA SHEET

Client : Projects & Development India Limited
Location : Plant Methanol.
Test Number : PLT-1
Plate Size : 60x60 3600 Sqcm
Pit Size : 3.00M X 3.00M X 2.00M
Ground Water Table : Not Encountered
L.C. of Dial Guage : 0.01 mm
Jack Ram Dia : 10.5 cm
Jack Ram Area : 86.59 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-1	DIAL-2		
27-05-2022	14:35:00	0.00	0	1750	2220	0.00	0.00	0.00	
	14:35:00	6600	1.83	1750	2220	0.00	0.00	0.00	
	14:36:00			1718	2189	0.32	0.31	0.32	
	14:37:15			1692	2167	0.58	0.53	0.56	
	14:39:00			1663	2149	0.87	0.71	0.79	
	14:41:15			1660	2140	0.90	0.80	0.85	
	14:44:00			1657	2136	0.93	0.84	0.89	
	14:51:00			1655	2128	0.95	0.92	0.94	
	15:00:00			1653	2120	0.97	1.00	0.99	
	15:35:00			1652	2117	0.98	1.03	**1.01**	
	15:35:00	13200	3.67	1652	2117	0.98	1.03	1.01	
	15:36:00			1613	2090	1.37	1.30	1.34	
	15:37:15			1589	2071	1.61	1.49	1.55	
	15:39:00			1568	2042	1.82	1.78	1.80	
	15:41:15			1542	1993	2.08	2.27	2.18	
	15:44:00			1522	1979	2.28	2.41	2.35	
	15:51:00			1511	1960	2.39	2.60	2.50	
	16:00:00			1505	1955	2.45	2.65	2.55	
	16:35:00			1502	1953	2.48	2.67	**2.58**	
	16:35:00	19800	5.50	1502	1953	2.48	2.67	2.58	
	16:36:00			1314	1780	4.36	4.40	4.38	
	16:37:15			1301	1768	4.49	4.52	4.51	
	16:39:00			1295	1764	4.55	4.56	4.56	
	16:41:15			1294	1762	4.56	4.58	4.57	
	16:44:00			1293	1760	4.57	4.60	4.59	
	16:51:00			1291	1759	4.59	4.61	4.60	
	17:00:00			1289	1757	4.61	4.63	4.62	
	17:35:00			1219	1685	5.31	5.35	**5.33**	

DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)		SETTLEMENT (mm)			
				DIAL-1	DIAL-2	DIAL-1	DIAL-2		
	17:35:00	26400	7.33	1219	1685	5.31	5.35	5.33	
	17:36:00			811	1265	9.39	9.55	9.47	
	17:37:15			809	1260	9.41	9.60	9.51	
	17:39:00			804	1255	9.46	9.65	9.56	
	17:41:15			800	1252	9.50	9.68	9.59	
	17:44:00			798	1250	9.52	9.70	9.61	
	17:51:00			795	1247	9.55	9.73	9.64	
	18:00:00			790	1239	9.60	9.81	9.71	
	18:35:00			645	1170	11.05	10.50	**10.78**	
	18:35:00	33000	9.17	645	1170	11.05	10.50	10.78	
	18:36:00			480	1020	12.70	12.00	12.35	
	18:37:15			475	1017	12.75	12.03	12.39	
	18:39:00			469	1008	12.81	12.12	12.47	
	18:41:15			461	1003	12.89	12.17	12.53	
	18:44:00			458	1000	12.92	12.20	12.56	
	18:51:00			455	995	12.95	12.25	12.60	
	19:00:00			450	990	13.00	12.30	12.65	
	19:35:00			450	989	13.00	12.31	**12.66**	
	19:35:00	0	0	450	989	13.00	12.31	12.66	
	20:35:00			1137	1440	6.13	7.80	**6.97**	



Load Vs Settlement Curve for PLT-1

Table -1

Project: Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB) Client.: Project & Development India Limited

Side ID :

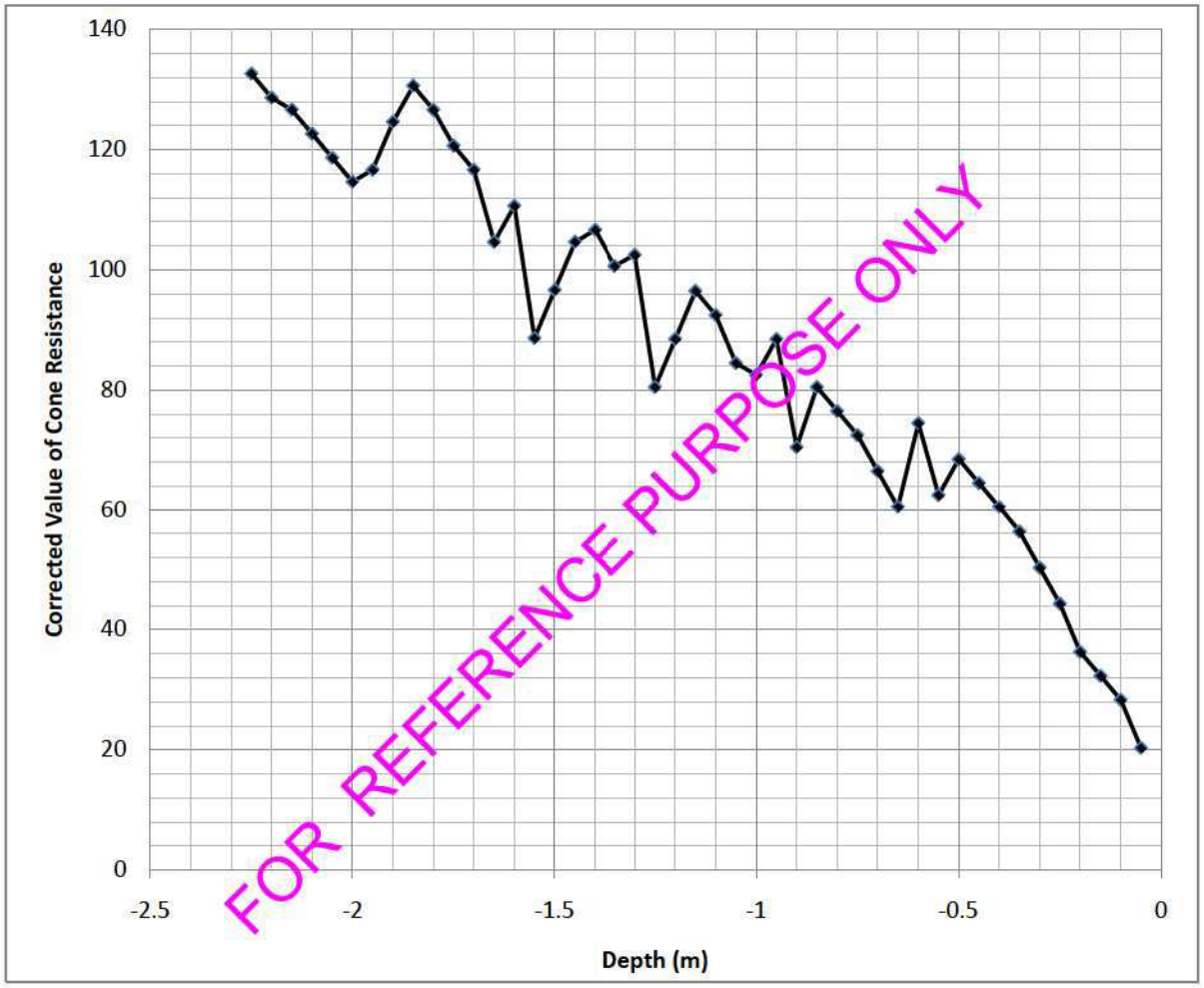
Correction A	
1. Mass of Cone (m)	1.34 Kg
2. Mass of each sounding rod (m1)	1.55 Kg
3. Cone area at Base (b)	10 Sqcm
4. Plunger Area (b')	20 Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289 Kg
6. No of Rod Used (n)	6

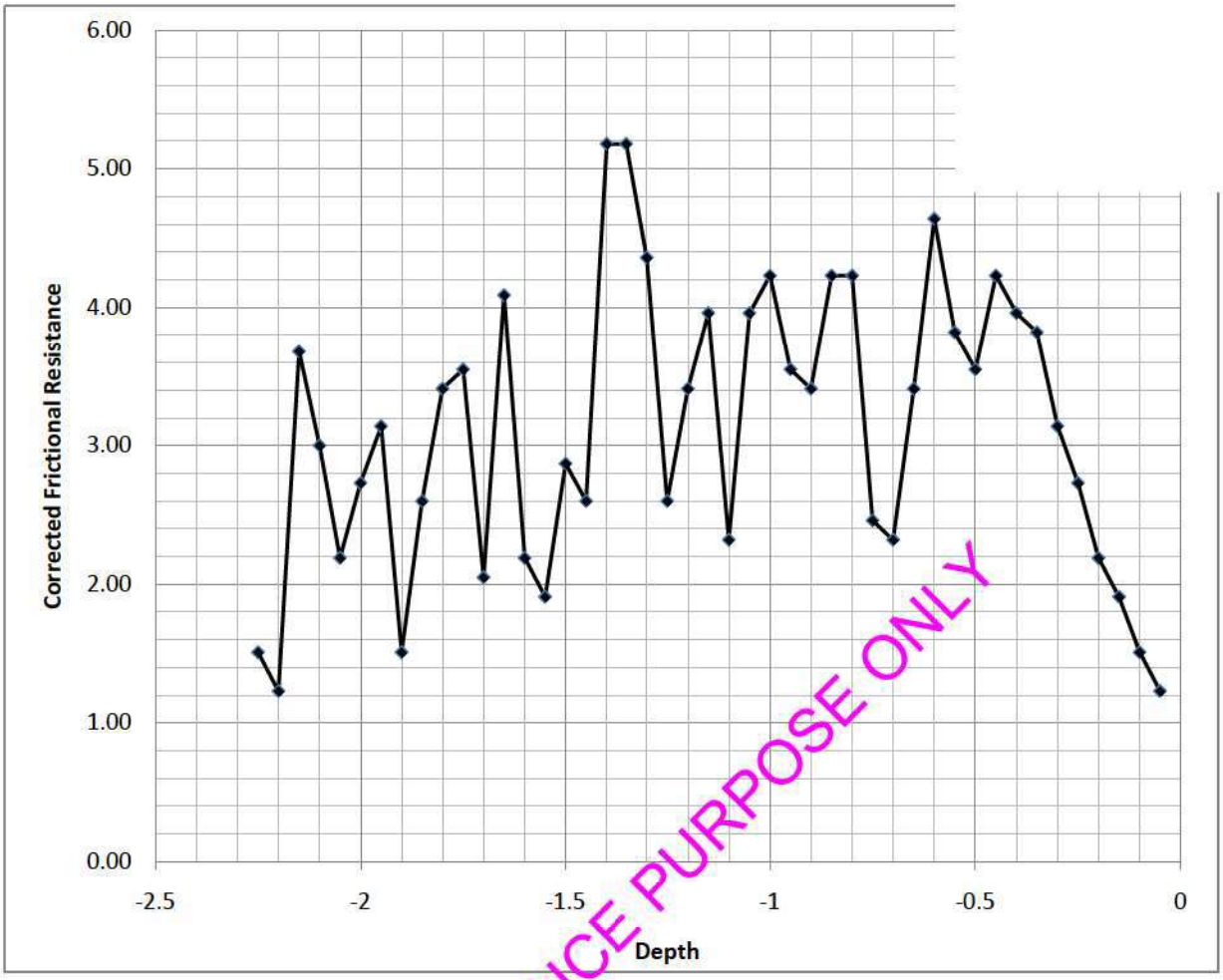
Correction B	
1. Mass of friction Jacket (m_f)	1.345 Kg
2. Outer dia, of Friction Jacket (d)	3.6 cm
3. Length of Friction Jacket (h)	13 Sqcm
4. Surface area of friction jacket (a) = π dh	147 Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01 Kg/ Sqcm
Test Number	SCPT-1

		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)
-0.05	1	10	20	0.29	20.29	19	38	18	1.22	1.23
-0.10	1	14	28	0.29	28.29	25	50	22	1.5	1.51
-0.15	1	16	32	0.29	32.29	30	60	28	1.9	1.91
-0.20	1	18	36	0.29	36.29	34	68	32	2.18	2.19
-0.25	1	22	44	0.29	44.29	42	84	40	2.72	2.73
-0.30	1	25	50	0.29	50.29	48	96	46	3.13	3.14
-0.35	1	28	56	0.29	56.29	56	112	56	3.81	3.82
-0.40	2	30	60	0.44	60.44	59	118	58	3.95	3.96
-0.45	2	32	64	0.44	64.44	63	126	62	4.22	4.23
-0.50	2	34	68	0.44	68.44	60	120	52	3.54	3.55
-0.55	2	31	62	0.44	62.44	59	118	56	3.81	3.82
-0.60	2	37	74	0.44	74.44	71	142	68	4.63	4.64
-0.65	2	30	60	0.44	60.44	55	110	50	3.4	3.41
-0.70	2	33	66	0.44	66.44	50	100	34	2.31	2.32

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)
-0.75	2	36	72	0.44	72.44	54	108	36	2.45	2.46
-0.80	2	38	76	0.44	76.44	69	138	62	4.22	4.23
-0.85	2	40	80	0.44	80.44	71	142	62	4.22	4.23
-0.90	2	35	70	0.44	70.44	60	120	50	3.4	3.41
-0.95	2	44	88	0.44	88.44	70	140	52	3.54	3.55
-1.00	2	41	82	0.44	82.44	72	144	62	4.22	4.23
-1.05	2	42	84	0.44	84.44	71	142	58	3.95	3.96
-1.10	2	46	92	0.44	92.44	63	126	34	2.31	2.32
-1.15	2	48	96	0.44	96.44	77	154	58	3.95	3.96
-1.20	2	44	88	0.44	88.44	69	138	50	3.4	3.41
-1.25	2	40	80	0.44	80.44	59	118	38	2.59	2.60
-1.30	2	51	102	0.44	102.44	83	166	64	4.35	4.36
-1.35	3	50	100	0.6	100.6	88	176	76	5.17	5.18
-1.40	3	53	106	0.6	106.6	91	182	76	5.17	5.18
-1.45	3	52	104	0.6	104.6	71	142	38	2.59	2.60
-1.50	3	48	96	0.6	96.6	69	138	42	2.86	2.87
-1.55	3	44	88	0.6	88.6	58	116	28	1.9	1.91
-1.60	3	55	110	0.6	110.6	71	142	32	2.18	2.19
-1.65	3	52	104	0.6	104.6	82	164	60	4.08	4.09
-1.70	3	58	116	0.6	116.6	73	146	30	2.04	2.05
-1.75	3	60	120	0.6	120.6	86	172	52	3.54	3.55
-1.80	3	63	126	0.6	126.6	88	176	50	3.4	3.41
-1.85	3	65	130	0.6	130.6	84	168	38	2.59	2.6
-1.90	3	62	124	0.6	124.6	73	146	22	1.5	1.51
-1.95	3	58	116	0.6	116.6	81	162	46	3.13	3.14
-2.00	3	57	114	0.6	114.6	77	154	40	2.72	2.73
-2.05	3	59	118	0.6	118.6	75	150	32	2.18	2.19
-2.10	3	61	122	0.6	122.6	83	166	44	2.99	3
-2.15	3	63	126	0.6	126.6	90	180	54	3.67	3.68

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)
-2.20	3	64	128	0.6	128.6	73	146	18	1.22	1.23
-2.25	3	66	132	0.6	132.6	77	154	22	1.5	1.51


140
120
100
80
60
40
20
0
Corrected Value of Cone Resistance
-2.5
-2
-1.5
-1
-0.5
0
Depth (m)
FOR REFERENCE PURPOSE ONLY



ZONE-7

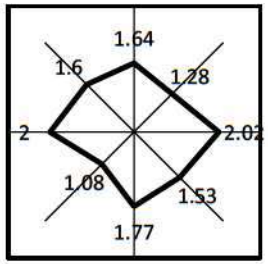
OFFICE MAINTENANCE PLANT

Table ERT - 11

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Office Maintenance Plant.
Client : Project & Development India Limited
Test Date : 04-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

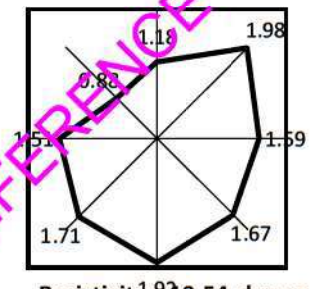
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.64	1.28	2.02	1.53	1.77	1.08	2.00	1.6	10.30	8.04	12.69	9.61	11.12	6.79	12.57	10.05
2	2.0	1.18	1.98	1.59	1.67	1.92	1.71	1.51	0.88	14.83	24.88	19.98	20.99	24.13	21.49	18.98	11.06
3	3.0	2.01	2.59	1.94	2.23	3.01	2.17	1.17	1.49	37.89	48.82	36.57	42.03	56.74	40.90	22.05	28.09
4	5.0	2.39	3.02	2.31	2.76	2.84	2.59	2.31	2.31	75.08	94.88	72.57	86.71	89.22	81.37	72.57	72.57
5	10.0	2.89	3.45	3.52	3.17	3.55	2.66	2.69	3.09	181.58	216.77	221.17	199.18	223.05	167.13	169.02	194.15
6	15.0	3.45	2.81	3.87	4.04	4.21	3.45	3.13	2.81	325.15	264.84	364.74	380.76	396.78	325.15	295.00	264.84
7	20.0	4.01	3.9	3.21	3.16	3.8	3.07	3.59	3.31	503.91	490.09	403.38	397.10	477.52	385.79	451.13	415.95

1.00Mtr.



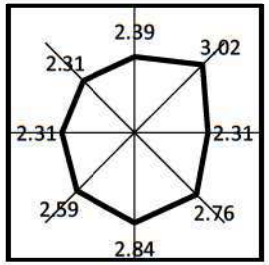
Resistivity = 10.15 ohm-m

2.00Mtr.



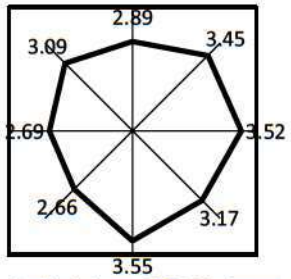
Resistivity = 19.54 ohm-m

5.00Mtr.



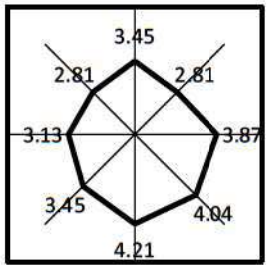
Resistivity = 80.62 ohm-m

10.00Mtr.



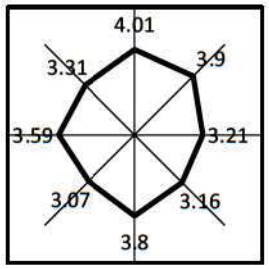
Resistivity = 196.51 ohm-m

15.00Mtr.



Resistivity = 327.16 ohm-m

20.00Mtr.



Resistivity = 440.61 ohm-m

ZONE-8

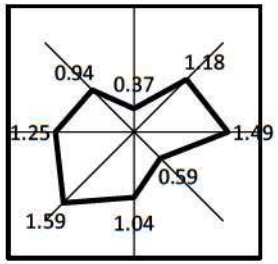
ETP

Table ERT - 6

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : ETP
Client : Project & Development India Limited
Test Date : 02-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

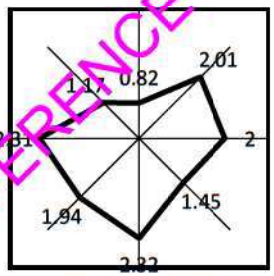
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	0.37	1.18	1.49	0.59	1.04	1.59	1.25	0.94	2.32	7.41	9.36	3.71	6.53	9.99	7.85	5.91
2	2.0	0.82	2.01	2.00	1.45	2.32	1.94	2.31	1.17	10.30	25.26	25.16	18.22	29.15	24.38	29.03	14.70
3	3.0	1.05	1.83	1.18	1.8	3.18	2.31	1.87	1.68	19.79	34.49	22.24	33.93	59.94	43.54	35.25	31.67
4	5.0	1.59	2.32	1.24	2.17	2.54	2.86	3.02	2.31	49.95	72.88	38.96	68.17	79.80	89.85	94.88	72.57
5	10.0	2.34	1.89	1.38	2.57	2.92	3.21	2.53	3.27	147.03	118.75	86.71	161.48	183.47	201.69	158.96	205.46
6	15.0	1.67	3.05	2.46	2.88	3.18	2.89	2.17	2.61	157.39	287.46	231.85	271.43	299.71	272.38	204.52	245.99
7	20.0	2.49	2.83	2.82	3.23	3.49	3.33	3.29	3.04	312.90	355.63	354.37	405.89	438.57	418.46	413.43	382.02

1.00Mtr.



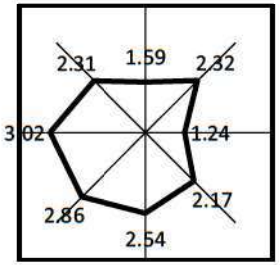
Resistivity = 6.64 ohm-m

2.00Mtr.



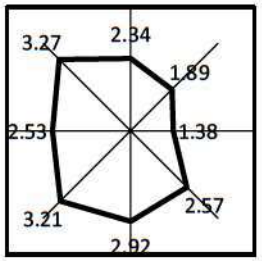
Resistivity = 22.02 ohm-m

5.00Mtr.



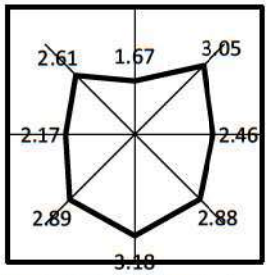
Resistivity = 70.88 ohm-m

10.00Mtr.



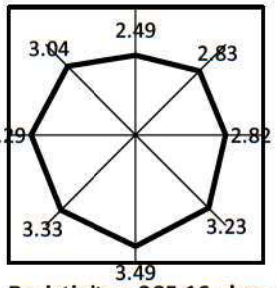
Resistivity = 157.94 ohm-m

15.00Mtr.



Resistivity = 246.34 ohm-m

20.00Mtr.



Resistivity = 385.16 ohm-m

ZONE-9

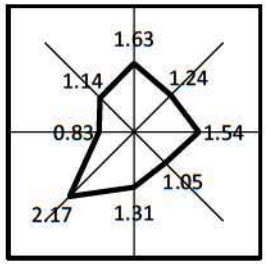
BUILDING TECHNICAL

Table ERT - 10

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Building Technical.
Client : Project & Development India Limited
Test Date : 04-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

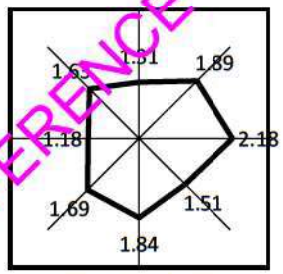
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.63	1.24	1.54	1.05	1.31	2.17	0.83	1.14	10.24	7.79	9.68	6.60	8.23	13.63	5.22	7.16
2	2.0	1.31	1.89	2.18	1.51	1.84	1.69	1.18	1.63	16.46	23.75	27.39	18.98	23.12	21.24	14.83	20.48
3	3.0	2.17	2.31	2.59	2.35	1.57	2.71	1.69	2.09	40.90	43.54	48.82	44.30	29.59	51.08	31.86	39.40
4	5.0	3.04	2.73	2.71	2.86	2.91	3.46	2.41	2.79	95.50	85.77	85.14	89.85	91.42	108.70	75.71	87.65
5	10.0	2.94	2.53	3.35	3.39	3.53	2.77	2.15	2.5	184.73	158.96	210.49	213.00	221.80	174.04	135.09	157.08
6	15.0	3.14	3.42	3.82	2.87	2.97	3.64	2.77	3.03	295.94	322.33	360.03	270.49	279.92	343.06	261.07	285.57
7	20.0	2.83	3.11	2.79	3.68	3.74	4.02	2.53	3.44	355.63	390.81	350.60	462.44	469.98	505.17	317.93	432.28

1.00Mtr.



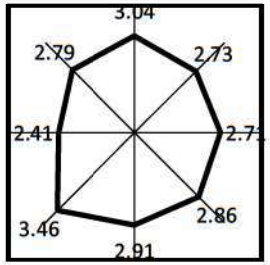
Resistivity = 8.57 ohm-m

2.00Mtr.



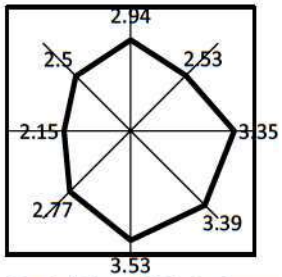
Resistivity = 20.78 ohm-m

5.00Mtr.



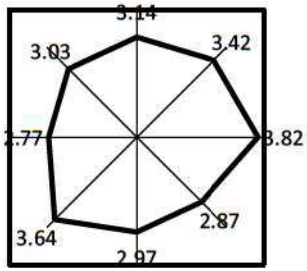
Resistivity = 89.97 ohm-m

10.00Mtr.



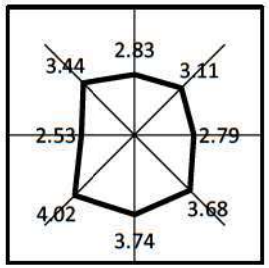
Resistivity = 181.9 ohm-m

15.00Mtr.



Resistivity = 302.3 ohm-m

20.00Mtr.



Resistivity = 410.61 ohm-m

ZONE-10

BUILDING

ADMINISTRATIVE

One (1) borehole was sunk in this area, viz borehole mark
the general sub soil profile it has been observed that the to
to hard yellowish grey silty clay/ clayey silt with sand and the second layer as encountered up to the explored depth is very dense yellowish greysilty sand.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-10).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-10). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-10).

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	43.9	24.52	43	43	43
	2.50	2.50	1.00	39.5	67.67	14	23	39
	5.00	5.00	1.00	38.0	138.21	6	10	20
	7.50	7.50	1.00	37.5	208.54	4	7	13
	10.00	10.00	1.00	37.3	279.20	3	5	10
	1.00	1.00	1.50	47.6	25.08	47	47	47
	2.50	2.50	1.50	41.0	65.90	15	24	41
	5.00	5.00	1.50	38.8	136.98	7	11	21
	7.50	7.50	1.50	38.0	207.27	4	7	13
	10.00	10.00	1.50	37.7	278.17	3	5	10
	1.00	1.00	2.00	51.2	25.97	49	51	51
	2.50	2.50	2.00	42.4	63.63	16	26	42
	5.00	5.00	2.00	39.5	135.28	7	11	21
	7.50	7.50	2.00	38.5	205.93	4	7	14
	10.00	10.00	2.00	38.0	276.36	3	5	10
	1.00	1.00	3.00	58.5	28.36	51	58	58
	2.50	2.50	3.00	45.4	58.52	19	31	45
	5.00	5.00	3.00	41.0	131.74	7	12	23
	7.50	7.50	3.00	39.5	202.91	4	7	14
	10.00	10.00	3.00	38.8	273.97	3	5	10

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	38.3	27.80	34	38	38
	3.75	2.50	1.00	34.4	73.27	11	18	34
	7.50	5.00	1.00	33.1	147.95	5	8	16
	11.25	7.50	1.00	32.7	222.68	3	5	11
	15.00	10.00	1.00	32.5	297.37	2	4	8
	1.50	1.00	1.50	41.4	25.70	40	41	41
	3.75	2.50	1.50	35.7	72.28	12	19	35
	7.50	5.00	1.50	33.8	147.53	5	9	17
	11.25	7.50	1.50	33.1	221.93	3	5	11
	15.00	10.00	1.50	32.8	296.67	2	4	8
	1.50	1.00	2.00	44.6	23.00	44	44	44
	3.75	2.50	2.00	37.0	71.03	13	20	37
	7.50	5.00	2.00	34.4	146.53	5	9	17
	11.25	7.50	2.00	33.6	221.75	3	6	11
	15.00	10.00	2.00	33.1	295.90	2	4	8
	1.50	1.00	3.00	51.0	33.17	38	51	51
	3.75	2.50	3.00	39.5	67.53	14	23	39
	7.50	5.00	3.00	35.7	144.57	6	9	18
	11.25	7.50	3.00	34.4	219.80	3	6	11
	15.00	10.00	3.00	33.8	295.06	2	4	8

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	33.8	48.63	17	27	33
		1.50	1.00	31.9	70.60	11	18	31
		2.00	1.00	30.9	92.31	8	13	25
		2.50	1.00	30.4	114.36	6	10	19
		1.00	1.50	36.6	50.65	18	28	36
		1.50	1.50	33.8	72.94	11	18	33
		2.00	1.50	32.3	94.72	8	13	25
		2.50	1.50	31.5	116.76	6	10	20
		1.00	2.00	39.4	52.35	18	30	39
		1.50	2.00	35.6	74.87	11	19	35
		2.00	2.00	33.8	97.26	8	13	26
		2.50	2.00	32.6	119.05	6	10	20
		1.00	3.00	45.0	54.85	20	32	45
		1.50	3.00	39.4	78.53	12	20	37
		2.00	3.00	36.6	101.29	9	14	27
		2.50	3.00	34.9	123.61	7	11	21

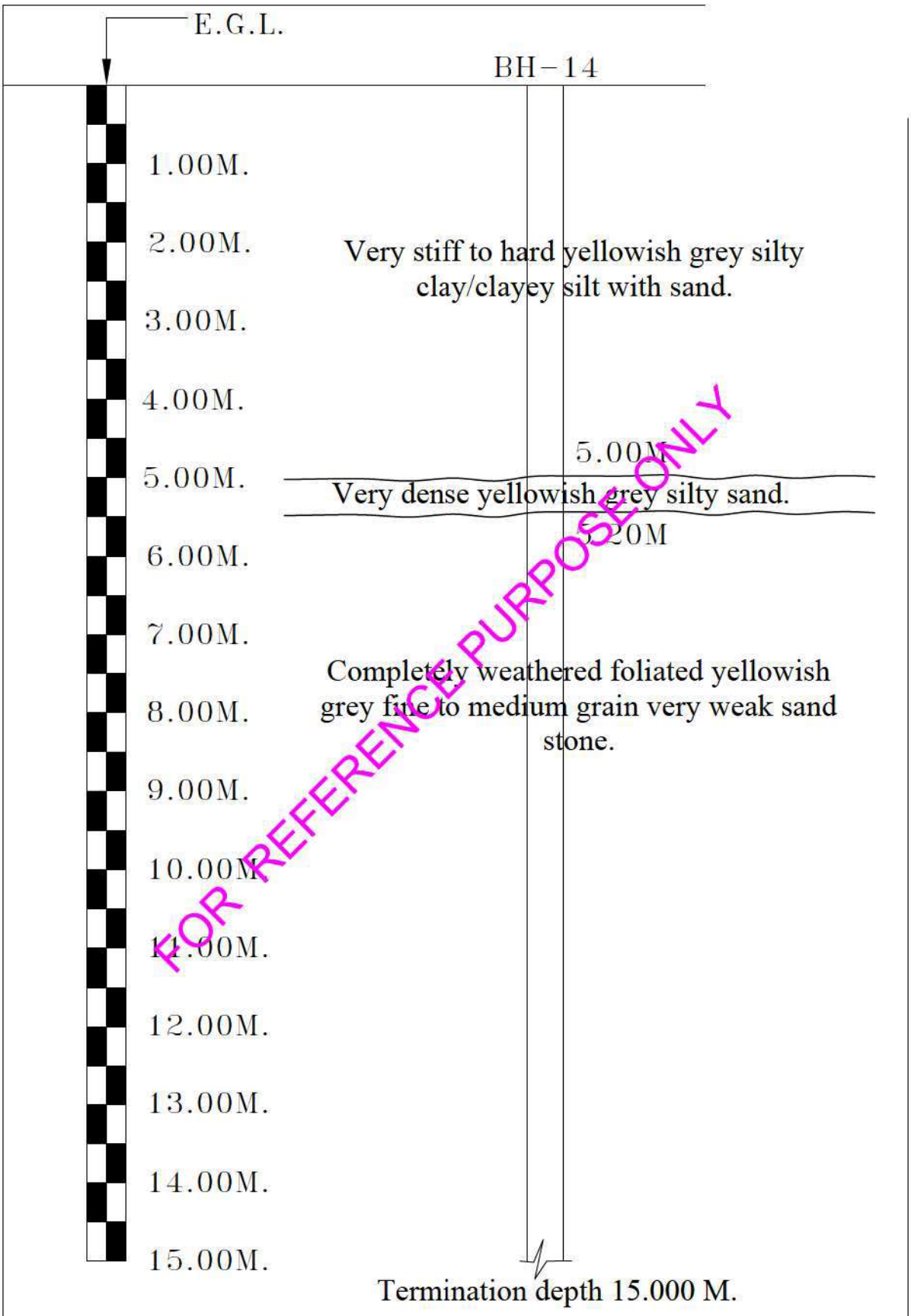
Table-2B (Zone-10).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**49**	**29**	**6**
2	0.750	10.000	2.000	**72**	**38**	**8**
3	1.000	10.000	2.000	**113**	**51**	**11**
4	1.500	10.000	2.000	**220**	**76**	**16**

BORE LOG SHEET	Centre for Advanced Engineering							Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:	E.G.L.: 112.090	Unit: Building Administrative						Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	5.200 M.	SPT	4	UDS	2	WS		Completed on : 24.05.2022
Type of Drilling		DCPT		DS	6	RCS	7	Water Struck At : 2.00M
Depth of Drilling	9.800 M.	VST		SCPT				Standing Water Table : 1.85M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard yellowish grey silty clay/clayey silt with sand.				DS1	0.50 M
		01		DS2	1.00 M
			N = 24	SPT1	1.50-1.95M
				DS3	1.50-1.95M
		02		UDS1	2.00-2.45M
		03	N = 32	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
Very dense yellowish grey silty sand.			N = 40	SPT3	4.50-4.95M
		05		DS5	4.50-4.95M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.			N >100	SPT4	5.00-5.20M
				DS6	5.00-5.20M
		06		RUN1	5.20-6.50M TCR-22% RQD-NIL
		07		RUN2	6.50-8.00M TCR-35% RQD-NIL
		08		RUN3	8.00-9.50M TCR-45% RQD-NIL
		09		RUN4	9.50-11.00M TCR-49% RQD-NIL
		10			
		11		RUN5	11.00-12.50M TCR-44% RQD-NIL
		12		RUN6	12.50-14.00M TCR-53% RQD-NIL
		13			
		14		RUN7	14.00-15.00M TCR-63% RQD-NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-14

Sketch No.-SK/PDIL/	Building Administrative	1678	02	13 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard yellowish grey silty clay/clayey silt with sand.	14	0.50	D																0	27	50	23	1.79	14.00
		14	1.00	D		45	21	10												0	30	48	22		
		14	1.50	DN	24						2.67									0	26	56	18		
		14	2.00	UD		47	22	13	1.93	13.99	2.66	1.69	2.69	UU	1.37	0	0.00-0.10	0.0436	0.000	0	28	55	17		
																	0.10-0.20	0.0394							
														CU	0.15	15	0.20-0.40	0.0349							
																	0.40-0.80	0.0299							
														CD	0.03	29	0.80-1.60	0.0205							
																	1.60-3.20	0.0143							
		14	3.00	DN	32	46	21	12												0	33	43	24		
		14	4.00	UD		45	20	11			2.67									0	32	57	11		
		14	4.50	DN	40				1.81					DS	0.11	34				0	29	55	16		
II	Very dense yellowish grey silty sand	14	5.00	DN	>100						2.64									0	82	14	4		

ZONE-11

COOLING TOWER FOR METHANOL PLANT AND GASIFICATION

Total one (1) borehole was sunk in this area, viz borehole n
general sub soil profile it has been observed that the top s
mottled yellowish/ bluish grey silty clay/ clayey silt with sand and continues up to the explored depth.

In addition the following field test has been carried out at this zone and results are being indicated in this chapter.

1. Static Cone Penetration Test:

   One (1) static cone penetration test has been carried out at this zone marked as SCPT-2.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-11).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-11). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-11).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	45.2	21.19	45	45	45
	2.50	2.50	1.00	40.7	58.49	17	27	40
	5.00	5.00	1.00	39.1	119.30	8	13	24
	7.50	7.50	1.00	38.6	180.08	5	8	16
	10.00	10.00	1.00	38.4	241.12	3	6	11
	1.00	1.00	1.50	48.9	21.61	48	48	48
	2.50	2.50	1.50	42.2	56.90	18	29	42
	5.00	5.00	1.50	39.9	118.17	8	13	25
	7.50	7.50	1.50	39.1	178.91	5	8	16
	10.00	10.00	1.50	38.8	240.16	4	6	12
	1.00	1.00	2.00	52.7	22.42	52	52	52
	2.50	2.50	2.00	43.7	55.01	19	31	43
	5.00	5.00	2.00	40.7	116.93	8	13	26
	7.50	7.50	2.00	39.6	177.68	5	8	16
	10.00	10.00	2.00	39.1	238.55	4	6	12
	1.00	1.00	3.00	60.2	24.48	60	60	60
	2.50	2.50	3.00	46.7	50.50	23	36	46
	5.00	5.00	3.00	42.2	113.75	9	14	27
	7.50	7.50	3.00	40.7	175.39	5	9	17
	10.00	10.00	3.00	39.9	236.34	4	6	12

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	39.4	24.05	39	39	39
	3.75	2.50	1.00	35.4	63.41	13	22	35
	7.50	5.00	1.00	34.1	128.19	5	10	19
	11.25	7.50	1.00	33.7	193.01	4	6	13
	15.00	10.00	1.00	33.5	257.78	3	5	9
	1.50	1.00	1.50	42.7	22.29	42	42	42
	3.75	2.50	1.50	36.7	62.50	14	23	36
	7.50	5.00	1.50	34.8	127.75	6	10	20
	11.25	7.50	1.50	34.1	192.29	4	7	13
	15.00	10.00	1.50	33.8	257.11	3	5	9
	1.50	1.00	2.00	45.9	19.91	45	45	45
	3.75	2.50	2.00	38.1	61.51	15	24	38
	7.50	5.00	2.00	35.4	126.82	6	11	20
	11.25	7.50	2.00	34.6	192.05	4	7	13
	15.00	10.00	2.00	34.1	256.38	3	5	9
	1.50	1.00	3.00	52.5	28.72	45	52	52
	3.75	2.50	3.00	40.7	58.52	17	27	40
	7.50	5.00	3.00	36.7	124.99	7	11	22
	11.25	7.50	3.00	35.4	190.23	4	7	13
	15.00	10.00	3.00	34.8	255.49	3	5	10

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	34.7	42.43	20	32	34
		1.50	1.00	32.8	61.69	13	21	32
		2.00	1.00	31.8	80.74	9	15	29
		2.50	1.00	31.3	100.07	7	12	23
		1.00	1.50	37.6	44.22	21	34	37
		1.50	1.50	34.7	63.64	13	21	34
		2.00	1.50	33.3	82.99	10	16	30
		2.50	1.50	32.4	102.07	7	12	23
		1.00	2.00	40.5	45.74	22	35	40
		1.50	2.00	36.7	65.60	13	22	36
		2.00	2.00	34.7	84.86	10	16	30
		2.50	2.00	33.6	104.28	8	12	24
		1.00	3.00	46.3	47.96	24	38	46
		1.50	3.00	40.5	68.60	14	23	40
		2.00	3.00	37.6	88.44	10	17	31
		2.50	3.00	35.9	108.06	8	13	24

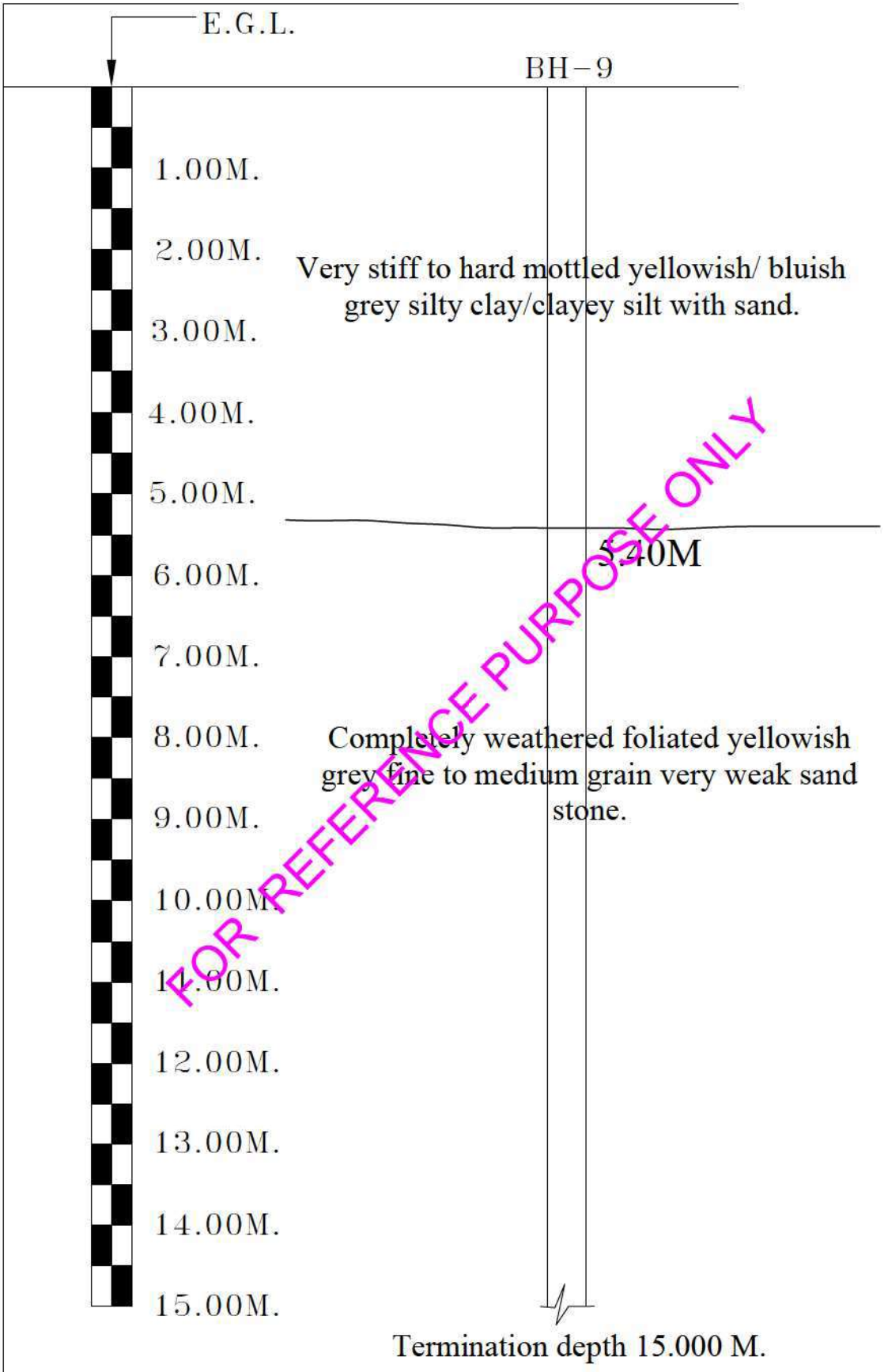
Table-2B (Zone-11).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended l Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**50**	**30**	**6**
2	0.750	10.000	2.000	**74**	**39**	**8**
3	1.000	10.000	2.000	**115**	**53**	**11**
4	1.500	10.000	2.000	**223**	**79**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:114.304		Unit: Cooling Tower				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	5.400 M.	SPT	4	UDS	2	WS		Completed on : 23.05.2022
Type of Drilling		DCPT		DS	6	RCS	7	Water Struck At : 2.00M
Depth of Drilling	9.600 M.	VST		SCPT				Standing Water Table : 1.90M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard mottled yellowish/ bluish grey silty clay/clayey silt with sand.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 24	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 28	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
		05	N = 41	SPT3	4.50-4.95M
				DS5	4.50-4.95M
			N >100	SPT4	5.25-5.40M
				DS6	5.25-5.40M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		06		RUN1	5.40-6.50M TCR-18% RQD-NIL
		07		RUN2	6.50-8.00M TCR-29% RQD-NIL
		08		RUN3	8.00-9.50M TCR-34% RQD-NIL
		09		RUN4	9.50-11.00M TCR-43% RQD-NIL
		10			
		11		RUN5	11.00-12.50M TCR-53% RQD-NIL
		12			
		13		RUN6	12.50-14.00M TCR-63% RQD-NIL
		14		RUN7	14.00-15.00M TCR-56% RQD-NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-9

Sketch No.-SK/PDIL/	Cooling Tower for Methanol Plant & Gasification	1678	02	8 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard mottled yellowish/ bluish grey silty clay/clayey silt with sand.	9	0.50	D																0	28	49	23	1.76	12.64
		9	1.00	D		46	19	10												0	24	51	25	1.77	13.27
		9	1.50	DN	24						2.67									0	35	51	14		
		9	2.00	UD		43	18	11	1.94	15.25	2.66	1.68	2.78	UU	1.41	0	0.00-0.10	0.0457	0.000	0	37	41	22		
																	0.10-0.20	0.0392							
														CU	0.12	14	0.20-0.40	0.0345							
																	0.40-0.80	0.0269							
														CD	0.04	27	0.80-1.60	0.0194							
																	1.60-3.20	0.0112							
		9	3.00	DN	28	45	17	9												0	31	43	26		
		9	4.00	UD		44	20	12	1.91	18.36	2.66	1.61	3.00	UU	1.55	0	0.00-0.10	0.0429	0.000	0	42	39	19		
																	0.10-0.20	0.0377							
														CU	0.11	12	0.20-0.40	0.0308							
																	0.40-0.80	0.0246							
														CD	0.01	26	0.80-1.60	0.0179							
																	1.60-3.20	0.0108							
		9	4.50	DN	41				1.82					DS	0.18	34				0	38	48	14		
		9	5.20	DN	N>100						2.67									0	48	36	16		

Table -1

Project: Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB) Client.: Project & Development India Limited

Side ID :

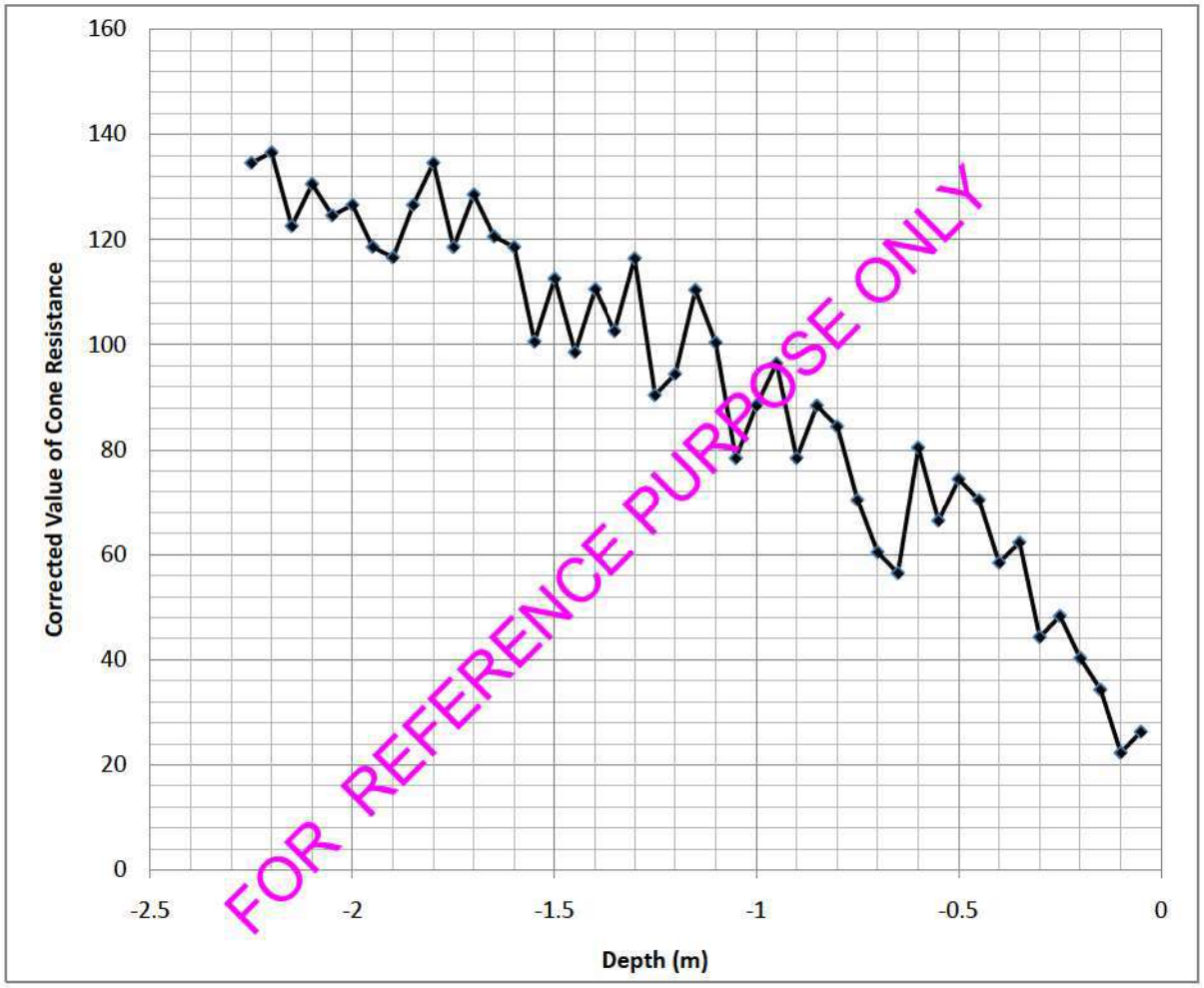
Correction A	
1. Mass of Cone (m)	1.34 Kg
2. Mass of each sounding rod (m1)	1.55 Kg
3. Cone area at Base (b)	10 Sqcm
4. Plunger Area (b')	20 Sqcm
5. Correction factor to be added to gauge reading C1 = (m+nm1)/10	0.289 Kg
6. No of Rod Used (n)	6

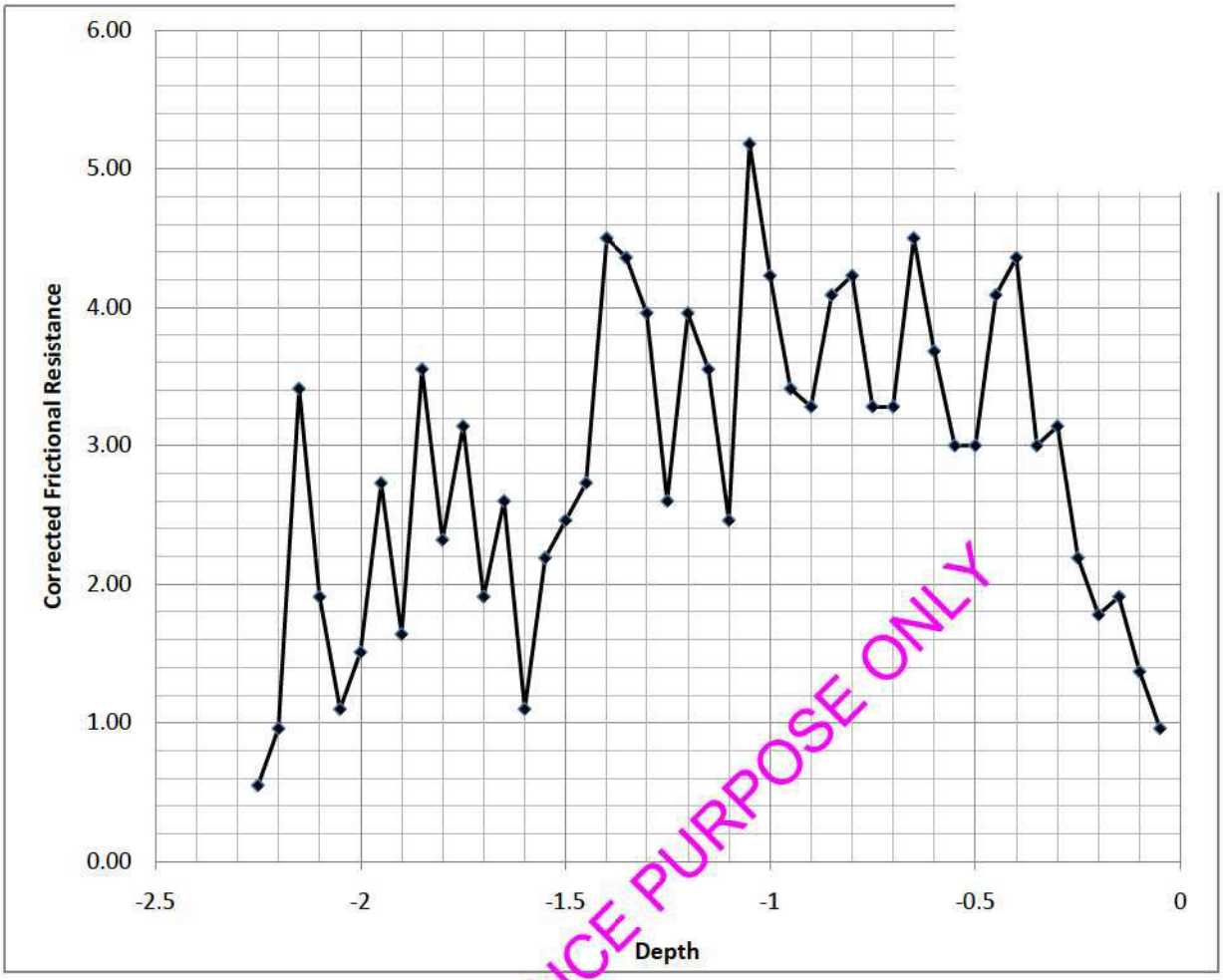
Correction B	
1. Mass of friction Jacket (m_f)	1.345 Kg
2. Outer dia, of Friction Jacket (d)	3.6 cm
3. Length of Friction Jacket (h)	13 Sqcm
4. Surface area of friction jacket (a) = π dh	147 Sqcm
5. Correction factor to be added to gauge reading C2 = (m_f/a)	0.01 Kg/ Sqcm
Test Number	SCPT-2

		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)
-0.05	1	13	26	0.29	26.29	20	40	14	0.95	0.96
-0.10	1	11	22	0.29	22.29	21	42	20	1.36	1.37
-0.15	1	17	34	0.29	34.29	31	62	28	1.9	1.91
-0.20	1	20	40	0.29	40.29	33	66	26	1.77	1.78
-0.25	1	24	48	0.29	48.29	40	80	32	2.18	2.19
-0.30	1	22	44	0.29	44.29	45	90	46	3.13	3.14
-0.35	1	31	62	0.29	62.29	53	106	44	2.99	3.00
-0.40	2	29	58	0.44	58.44	61	122	64	4.35	4.36
-0.45	2	35	70	0.44	70.44	65	130	60	4.08	4.09
-0.50	2	37	74	0.44	74.44	59	118	44	2.99	3.00
-0.55	2	33	66	0.44	66.44	55	110	44	2.99	3.00
-0.60	2	40	80	0.44	80.44	67	134	54	3.67	3.68
-0.65	2	28	56	0.44	56.44	61	122	66	4.49	4.50
-0.70	2	30	60	0.44	60.44	54	108	48	3.27	3.28

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)
-0.75	2	35	70	0.44	70.44	59	118	48	3.27	3.28
-0.80	2	42	84	0.44	84.44	73	146	62	4.22	4.23
-0.85	2	44	88	0.44	88.44	74	148	60	4.08	4.09
-0.90	2	39	78	0.44	78.44	63	126	48	3.27	3.28
-0.95	2	48	96	0.44	96.44	73	146	50	3.4	3.41
-1.00	2	44	88	0.44	88.44	75	150	62	4.22	4.23
-1.05	2	39	78	0.44	78.44	77	154	76	5.17	5.18
-1.10	2	50	100	0.44	100.44	68	136	36	2.45	2.46
-1.15	2	55	110	0.44	110.44	81	162	52	3.54	3.55
-1.20	2	47	94	0.44	94.44	76	152	58	3.95	3.96
-1.25	2	45	90	0.44	90.44	64	128	38	2.59	2.60
-1.30	2	58	116	0.44	116.44	87	174	58	3.95	3.96
-1.35	3	51	102	0.6	102.6	83	166	64	4.35	4.36
-1.40	3	55	110	0.6	110.6	88	176	66	4.49	4.50
-1.45	3	49	98	0.6	98.6	69	138	40	2.72	2.73
-1.50	3	56	112	0.6	112.6	74	148	36	2.45	2.46
-1.55	3	50	100	0.6	100.6	66	132	32	2.18	2.19
-1.60	3	59	118	0.6	118.6	67	134	16	1.09	1.10
-1.65	3	60	120	0.6	120.6	79	158	38	2.59	2.60
-1.70	3	64	128	0.6	128.6	78	156	28	1.9	1.91
-1.75	3	59	118	0.6	118.6	82	164	46	3.13	3.14
-1.80	3	67	134	0.6	134.6	84	168	34	2.31	2.32
-1.85	3	63	126	0.6	126.6	89	178	52	3.54	3.55
-1.90	3	58	116	0.6	116.6	70	140	24	1.63	1.64
-1.95	3	59	118	0.6	118.6	79	158	40	2.72	2.73
-2.00	3	63	126	0.6	126.6	74	148	22	1.5	1.51
-2.05	3	62	124	0.6	124.6	70	140	16	1.09	1.1
-2.10	3	65	130	0.6	130.6	79	158	28	1.9	1.91
-2.15	3	61	122	0.6	122.6	86	172	50	3.4	3.41

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)
-2.20	3	68	136	0.6	136.6	75	150	14	0.95	0.96
-2.25	3	67	134	0.6	134.6	71	142	8	0.54	0.55


160
140
120
100
80
60
40
20
0
Corrected Value of Cone Resistance
-2.5
-2
-1.5
-1
-0.5
0
Depth (m)
FOR REFERENCE PURPOSE ONLY



ZONE-12

AIR SEPARATION UNIT

Total one (1) borehole was sunk in this area, viz borehole n
general sub soil profile it has been observed that the top s
yellowish grey silty clay/ clayey silt with grass roots, morrum, sand and traces of coal and continues up to the explored depth.

In addition the following field test has been carried out at this zone and results are being indicated in this chapter.

1. Cyclic Plate Load Test:

   One (1) cyclic plate load test has been carried out at this zone marked as CPLT-2.

2. Electrical Resistivity Test:

   One (1) electrical resistivity test has been carried out at this zone marked as ERT-5.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-12).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-12). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-12).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	35.6	17.42	35	35	35
	2.50	2.50	1.00	32.0	47.99	16	26	32
	5.00	5.00	1.00	30.8	98.06	7	12	23
	7.50	7.50	1.00	30.4	147.98	5	8	15
	10.00	10.00	1.00	30.2	197.86	3	6	11
	1.00	1.00	1.50	38.5	17.76	38	38	38
	2.50	2.50	1.50	33.2	46.71	17	28	33
	5.00	5.00	1.50	31.4	97.03	8	12	24
	7.50	7.50	1.50	30.8	147.04	5	8	15
	10.00	10.00	1.50	30.5	196.97	3	6	11
	1.00	1.00	2.00	41.5	18.42	41	41	41
	2.50	2.50	2.00	34.4	45.19	19	30	34
	5.00	5.00	2.00	32.0	95.92	8	13	25
	7.50	7.50	2.00	31.2	146.06	5	8	16
	10.00	10.00	2.00	30.8	196.06	3	6	11
	1.00	1.00	3.00	47.4	20.11	47	47	47
	2.50	2.50	3.00	36.7	41.41	22	35	36
	5.00	5.00	3.00	33.2	93.37	8	14	26
	7.50	7.50	3.00	32.0	143.88	5	8	16
	10.00	10.00	3.00	31.4	194.06	4	6	12

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	31.0	19.73	31	31	31
	3.75	2.50	1.00	27.9	52.11	13	21	27
	7.50	5.00	1.00	26.8	105.05	6	10	19
	11.25	7.50	1.00	26.5	158.25	4	6	12
	15.00	10.00	1.00	26.3	211.06	3	4	9
	1.50	1.00	1.50	33.6	18.29	33	33	33
	3.75	2.50	1.50	28.9	51.31	14	22	28
	7.50	5.00	1.50	27.4	104.87	6	10	19
	11.25	7.50	1.50	26.5	157.57	4	6	12
	15.00	10.00	1.50	26.6	210.98	3	5	9
	1.50	1.00	2.00	36.2	16.37	36	36	36
	3.75	2.50	2.00	30.0	50.50	14	23	30
	7.50	5.00	2.00	27.9	104.22	6	10	20
	11.25	7.50	2.00	27.2	157.42	4	6	12
	15.00	10.00	2.00	26.8	210.10	3	5	9
	1.50	1.00	3.00	41.3	23.55	41	41	41
	3.75	2.50	3.00	32.0	47.97	16	26	32
	7.50	5.00	3.00	28.9	102.63	7	11	21
	11.25	7.50	3.00	27.9	156.33	4	7	13
	15.00	10.00	3.00	27.4	209.75	3	5	9

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	27.3	34.71	19	27	27
		1.50	1.00	25.8	50.46	12	20	25
		2.00	1.00	25.1	66.27	9	15	25
		2.50	1.00	24.6	81.78	7	12	22
		1.00	1.50	29.6	36.20	20	29	29
		1.50	1.50	27.3	52.07	13	20	27
		2.00	1.50	26.2	67.90	9	15	26
		2.50	1.50	25.5	83.54	7	12	22
		1.00	2.00	31.9	37.46	21	31	31
		1.50	2.00	28.9	53.72	13	21	28
		2.00	2.00	27.3	69.42	9	15	27
		2.50	2.00	26.4	85.20	7	12	23
		1.00	3.00	36.5	39.32	23	36	36
		1.50	3.00	31.9	56.19	14	22	31
		2.00	3.00	29.6	72.40	10	16	29
		2.50	3.00	28.2	88.27	7	12	23

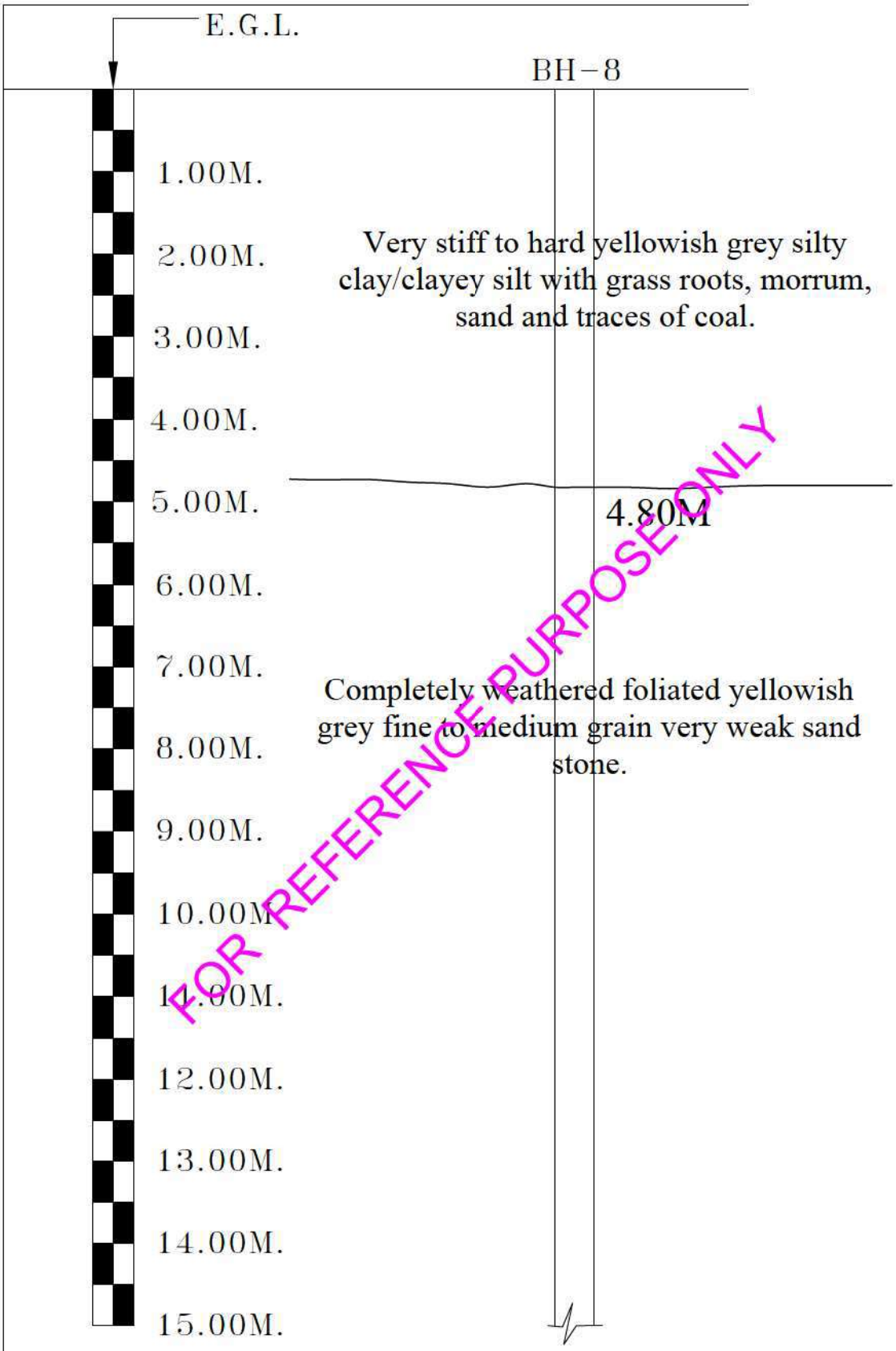
Table-2B (Zone-12).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**46**	**26**	**6**
2	0.750	10.000	2.000	**69**	**35**	**8**
3	1.000	10.000	2.000	**109**	**47**	**11**
4	1.500	10.000	2.000	**214**	**70**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:111.890		Unit: Air Separation Unit				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	4.800 M.	SPT	3	UDS	2	WS		Completed on : 22.05.2022
Type of Drilling		DCPT		DS	5	RCS	8	Water Struck At : 1.70M
Depth of Drilling	10.200 M.	VST		SCPT				Standing Water Table : 1.60M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard yellowish grey silty clay/clayey silt with grass roots, morrum, sand and traces of coal.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 28	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 39	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
			N > 100	SPT3	4.50-4.80M
				DS5	4.50-4.80M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		05		RUN1	4.80-5.50M TCR-17% RQD-NIL
		06		RUN2	5.50-7.00M TCR-26% RQD-NIL
		07		RUN3	7.00-8.50M TCR-34% RQD-NIL
		08		RUN4	8.50-10.00M TCR-41% RQD-NIL
		09			
		10		RUN5	10.00-11.50M TCR-51% RQD-NIL
		11			
		12		RUN6	11.50-13.00M TCR-47% RQD-NIL
		13		RUN7	13.00-14.50M TCR-63% RQD-NIL
		14		RUN8	14.50-15.00M TCR-71% RQD-NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-8

Sketch No.-SK/PDIL/	Air Separation Unit	1678	02	7 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

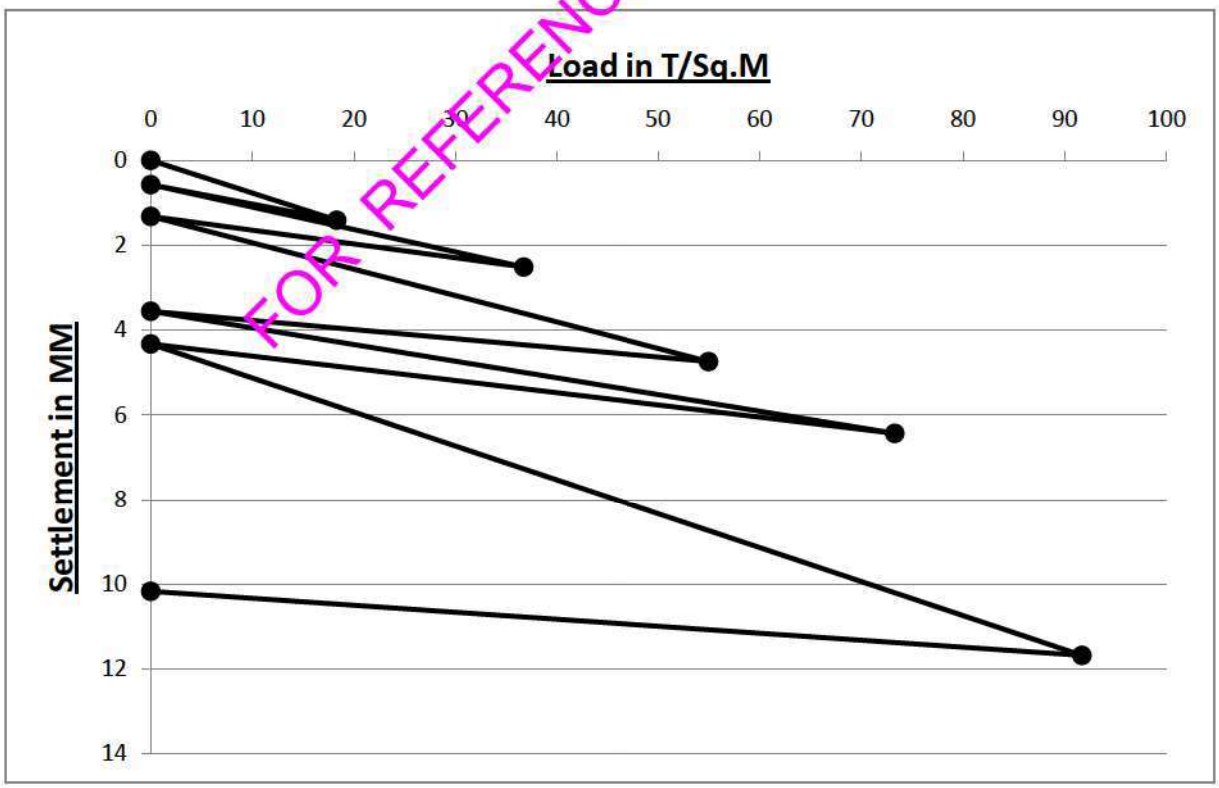
Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard yellowish grey silty clay/clayey silt with grass roots, morrum, sand and traces of coal.	8	0.50	D																2	34	46	18	1.74	14.88
		8	1.00	D		44	19	11												4	30	44	22		
		8	1.50	DN	28	48	21	10												4	32	40	24		
		8	2.00	UD		46	22	14	1.95	17.55	2.67	1.66	2.14	UU	1.11	0	0.00-0.10	0.0467	0.000	8	31	40	21		
																	0.10-0.20	0.0408							
														CU	0.13	15	0.20-0.40	0.0354							
																	0.40-0.80	0.0281							
														CD	0.05	26	0.80-1.60	0.0190							
																	1.60-3.20	0.0119							
		8	3.00	DN	39						2.66									7	32	43	18		
		8	4.00	UD		45	21	13	1.88	16.34	2.68	1.62	2.74	UU	1.39	0	0.00-0.10	0.0449	0.000	5	37	42	16		
																	0.10-0.20	0.0392							
														CU	0.09	16	0.20-0.40	0.0337							
																	0.40-0.80	0.0269							
														CD	0.03	30	0.80-1.60	0.0180							
																	1.60-3.20	0.0106							
		8	4.50	DN	N>100						2.66									0	48	35	17		

CYCLIC PLATE LOAD TEST SITE DATA SHEET

Client : Projects & Development India Limited
Location : Air Seperation Unit.
Test Number : CPLT-2
Plate Size : 60 X 60 = 3600 Sqcm
Pit Size : 3.00M X 3.00M X 2.50M
Ground Water Table : Not Encountered
L.C. of Dial Guage : 0.01 mm
Jack Ram Dia : 10.5 cm
Jack Ram Area : 86.59 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-1	DIAL-2		
30-05-2022	11:00:00	0.00	0	2431	2352	0.00	0.00	0.00	
	11:00:00	6600	1.83	2431	2352	0.00	0.00	0.00	
	11:01:00			2381	2293	0.50	0.59	0.55	
	11:02:15			2352	2271	0.79	0.81	0.80	
	11:04:00			2321	2260	1.10	0.92	1.01	
	11:06:15			2296	2241	1.35	1.11	1.23	
	11:09:00			2284	2230	1.47	1.22	1.35	
	11:16:00			2282	2226	1.49	1.26	1.38	
	11:25:00			2280	2223	1.51	1.29	1.40	
	12:01:00			2279	2221	1.52	1.31	**1.42**	
	12:01:00	0	0	2279	2221	1.52	1.31	1.42	
	13:01:00			2357	2311	0.74	0.41	**0.58**	
	13:01:00	13200	3.67	2357	2311	0.74	0.41	0.58	
	13:02:00			2268	2259	1.63	0.93	1.28	
	13:03:15			2233	2217	1.98	1.35	1.67	
	13:05:00			2198	2183	2.33	1.69	2.01	
	13:07:15			2176	2157	2.55	1.95	2.25	
	13:10:00			2163	2139	2.68	2.13	2.41	
	13:17:00			2155	2134	2.76	2.18	2.47	
	13:26:00			2150	2132	2.81	2.20	2.51	
	14:01:00			2149	2131	2.82	2.21	**2.52**	
	14:01:00	0	0	2149	2131	2.82	2.21	2.52	
	15:01:00			2277	2242	1.54	1.10	**1.32**	
	15:01:00	19800	5.50	2277	2242	1.54	1.10	1.32	
	15:02:00			2148	2070	2.83	2.82	2.83	
	15:03:15			2040	2014	3.91	3.38	3.65	
	15:05:00			1979	1982	4.52	3.70	4.11	
	15:07:15			1967	1956	4.64	3.96	4.30	
	15:10:00			1957	1921	4.74	4.31	4.53	
	15:17:00			1949	1899	4.82	4.53	4.68	
	15:26:00			1946	1890	4.85	4.62	4.74	
	16:01:00			1945	1889	4.86	4.63	**4.75**	
	16:01:00	0	0	1945	1889	4.86	4.63	4.75	

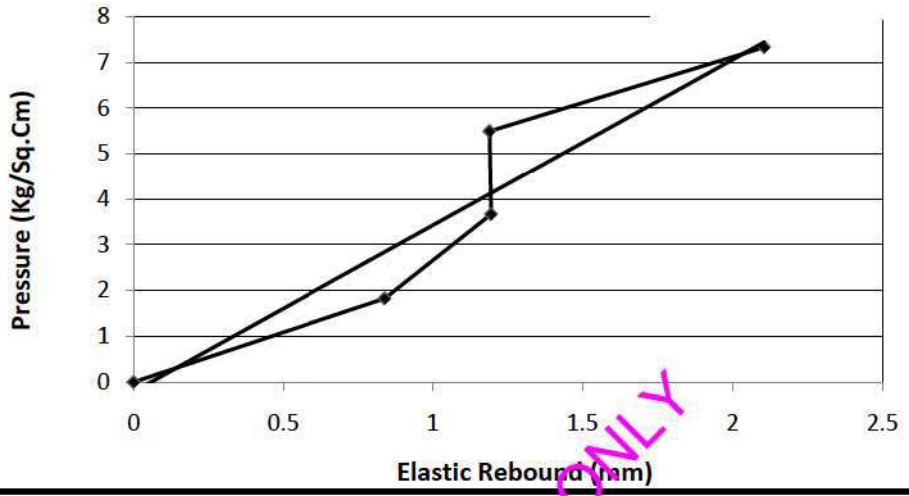
DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)		SETTLEMENT (mm)			
				DIAL-1	DIAL-2	DIAL-1	DIAL-2		
	17:01:00			2058	2014	3.73	3.38		
	17:01:00	26400	7.33	2058	2014	3.73	3.38		
	17:02:00			1961	1890	4.70	4.62	4.66	
	17:03:15			1889	1809	5.42	5.43	5.43	
	17:05:00			1853	1784	5.78	5.68	5.73	
	17:07:15			1814	1753	6.17	5.99	6.08	
	17:10:00			1797	1733	6.34	6.19	6.27	
	17:17:00			1786	1723	6.45	6.29	6.37	
	17:26:00			1780	1719	6.51	6.33	6.42	
	18:01:00			1779	1718	6.52	6.34	**6.43**	
	18:01:00	0	0	1779	1718	6.52	6.34	6.43	
	19:01:00			2042	1876	3.89	4.76	**4.33**	
	19:01:00	33000	9.17	2042	1876	3.89	4.76	4.33	
	19:02:00			1821	1711	6.10	6.41	6.26	
	19:03:15			1620	1537	8.11	8.15	8.13	
	19:05:00			1264	1277	11.67	10.75	11.21	
	19:07:15			1240	1262	11.91	10.90	11.41	
	19:10:00			1229	1250	12.02	11.02	11.52	
	19:17:00			1218	1244	12.13	11.08	11.61	
	19:26:00			1214	1238	12.17	11.14	11.66	
	20:01:00			1213	1234	12.18	11.18	**11.68**	
	20:01:00	0	0	1213	1234	12.18	11.18	11.68	
	21:01:00			1426	1329	10.11	10.23	**10.17**	



Load Vs Settlement Curve for CPLT-2

Evaluation of Dynamic Properties of Soil

Elastic Rebound (mm)	Pressure (Kg/Sq.Cm)
0	0
0.84	1.83
1.20	3.67
1.19	5.50
2.11	7.33



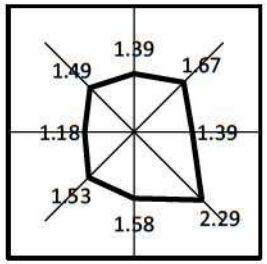
Computed dynamic properties of soil	
Coefficient of elastic uniform compression (Cu) kg/cm3	34.822
Coefficient of elastic uniform shear (Cτ) kg/cm3	17.411
Coefficient of elastic non-uniform compression (Cϕ) kg/cm3	60.242
Coefficient of elastic non-uniform shear (Cψ) kg/cm3	26.117

Table ERT - 5

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Air Separation Unit.
Client : Project & Development India Limited
Test Date : 01-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

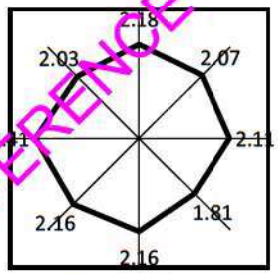
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.39	1.67	1.39	2.29	1.58	1.53	1.18	1.49	8.73	10.49	8.73	14.39	9.93	9.61	7.41	9.36
2	2.0	2.18	2.07	2.11	1.81	2.16	2.16	2.41	2.03	27.39	26.01	26.52	22.75	27.14	27.14	30.28	25.51
3	3.0	2.16	2.87	1.65	2.35	3.02	3.08	2.65	1.54	40.72	54.10	31.10	44.30	56.93	58.06	49.95	29.03
4	5.0	2.81	3.52	2.13	4.02	2.96	2.14	2.93	2.77	88.28	110.58	66.92	126.29	92.99	67.23	92.05	87.02
5	10.0	3.36	3.98	3.57	3.16	2.19	3.54	4.00	3.19	211.12	250.07	224.31	198.55	137.60	222.42	251.33	200.43
6	15.0	3.54	4.09	2.59	3.22	3.24	2.39	3.85	3.88	333.64	385.47	244.10	303.48	305.36	225.25	362.85	365.68
7	20.0	3.88	2.63	3.85	2.91	2.88	3.14	2.70	2.98	487.58	330.50	483.81	365.68	361.91	394.58	339.29	374.48

1.00Mtr.



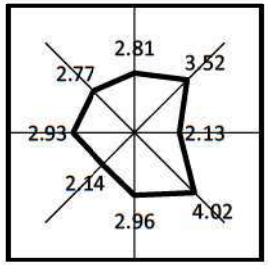
Resistivity = 9.83 ohm-m

2.00Mtr.



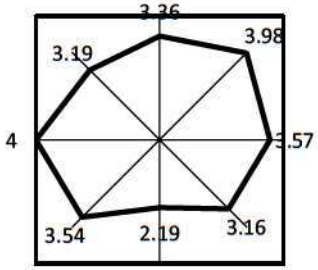
Resistivity = 26.59 ohm-m

5.00Mtr.



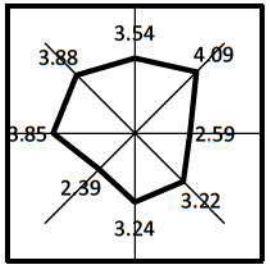
Resistivity = 91.42 ohm-m

10.00Mtr.



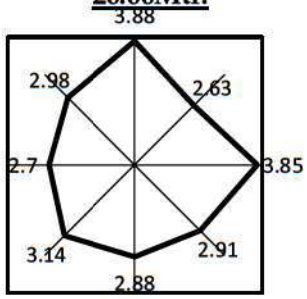
Resistivity = 211.98 ohm-m

15.00Mtr.



Resistivity = 315.73 ohm-m

20.00Mtr.



Resistivity = 392.23 ohm-m

ZONE-13

GASIFICATION PLANT

Total one (1) borehole was sunk in this area, viz borehole n
general sub soil profile it has been observed that the top s
reddish brown/ brownish grey silty clay/ clayey silt with kankar and sandandthe second layer as encountered up to the explored depth is dense reddish brown silty sand with clay binders.

In addition the following field test has been carried out at this zone and results are being indicated in this chapter.

1. Cyclic Plate Load Test:

   One (1) cyclic plate load test has been carried out at this zone marked as CPLT-1.

2. Static Cone Penetration Test:

   One (1) static cone penetration test has been carried out at this zone marked as SCPT-3.

3. Electrical Resistivity Test:

   One (1) electrical resistivity test has been carried out at this zone marked as ERT-1.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-13).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-13). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-13).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	48.4	21.12	48	48	48
	2.50	2.50	1.00	43.5	58.19	18	29	43
	5.00	5.00	1.00	41.9	118.99	8	14	26
	7.50	7.50	1.00	41.4	179.77	5	9	17
	10.00	10.00	1.00	41.1	240.21	4	6	12
	1.00	1.00	1.50	52.4	21.56	52	52	52
	2.50	2.50	1.50	45.2	56.73	19	31	45
	5.00	5.00	1.50	42.7	117.71	9	14	27
	7.50	7.50	1.50	41.9	178.45	5	9	17
	10.00	10.00	1.50	41.5	239.09	4	6	13
	1.00	1.00	2.00	56.5	22.38	56	56	56
	2.50	2.50	2.00	46.8	54.84	21	34	46
	5.00	5.00	2.00	43.5	116.32	9	14	28
	7.50	7.50	2.00	42.5	177.49	5	9	17
	10.00	10.00	2.00	41.9	237.93	4	7	13
	1.00	1.00	3.00	64.5	24.41	64	64	64
	2.50	2.50	3.00	50.0	50.33	24	39	50
	5.00	5.00	3.00	45.2	113.40	9	15	29
	7.50	7.50	3.00	43.5	174.48	6	9	18
	10.00	10.00	3.00	42.7	235.42	4	7	13

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	42.2	23.95	42	42	42
	3.75	2.50	1.00	37.9	63.13	15	24	37
	7.50	5.00	1.00	36.5	127.59	7	11	21
	11.25	7.50	1.00	36.1	192.26	4	7	14
	15.00	10.00	1.00	35.8	256.17	3	5	10
	1.50	1.00	1.50	45.7	22.19	45	45	45
	3.75	2.50	1.50	39.4	62.39	15	25	39
	7.50	5.00	1.50	37.2	126.98	7	11	21
	11.25	7.50	1.50	36.5	191.39	4	7	14
	15.00	10.00	1.50	36.2	256.06	3	5	10
	1.50	1.00	2.00	49.2	19.84	49	49	49
	3.75	2.50	2.00	40.8	61.25	16	26	40
	7.50	5.00	2.00	37.9	126.26	7	12	22
	11.25	7.50	2.00	37.0	190.97	4	7	14
	15.00	10.00	2.00	36.5	255.18	3	5	10
	1.50	1.00	3.00	56.2	28.59	49	56	56
	3.75	2.50	3.00	43.6	58.29	18	29	43
	7.50	5.00	3.00	39.4	124.78	7	12	23
	11.25	7.50	3.00	37.9	189.38	5	8	15
	15.00	10.00	3.00	37.2	253.96	3	5	10

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	37.2	42.13	22	35	37
		1.50	1.00	35.1	61.15	14	22	35
		2.00	1.00	34.1	80.20	10	17	31
		2.50	1.00	33.5	99.21	8	13	25
		1.00	1.50	40.3	43.90	22	36	40
		1.50	1.50	37.2	63.20	14	23	37
		2.00	1.50	35.7	82.41	10	17	32
		2.50	1.50	34.7	101.26	8	13	25
		1.00	2.00	43.4	45.40	23	38	43
		1.50	2.00	39.3	65.07	15	24	39
		2.00	2.00	37.2	84.27	11	17	33
		2.50	2.00	36.0	103.49	8	13	26
		1.00	3.00	49.6	47.59	26	41	49
		1.50	3.00	43.4	68.10	15	25	43
		2.00	3.00	40.3	87.80	11	18	34
		2.50	3.00	38.4	107.07	8	14	26

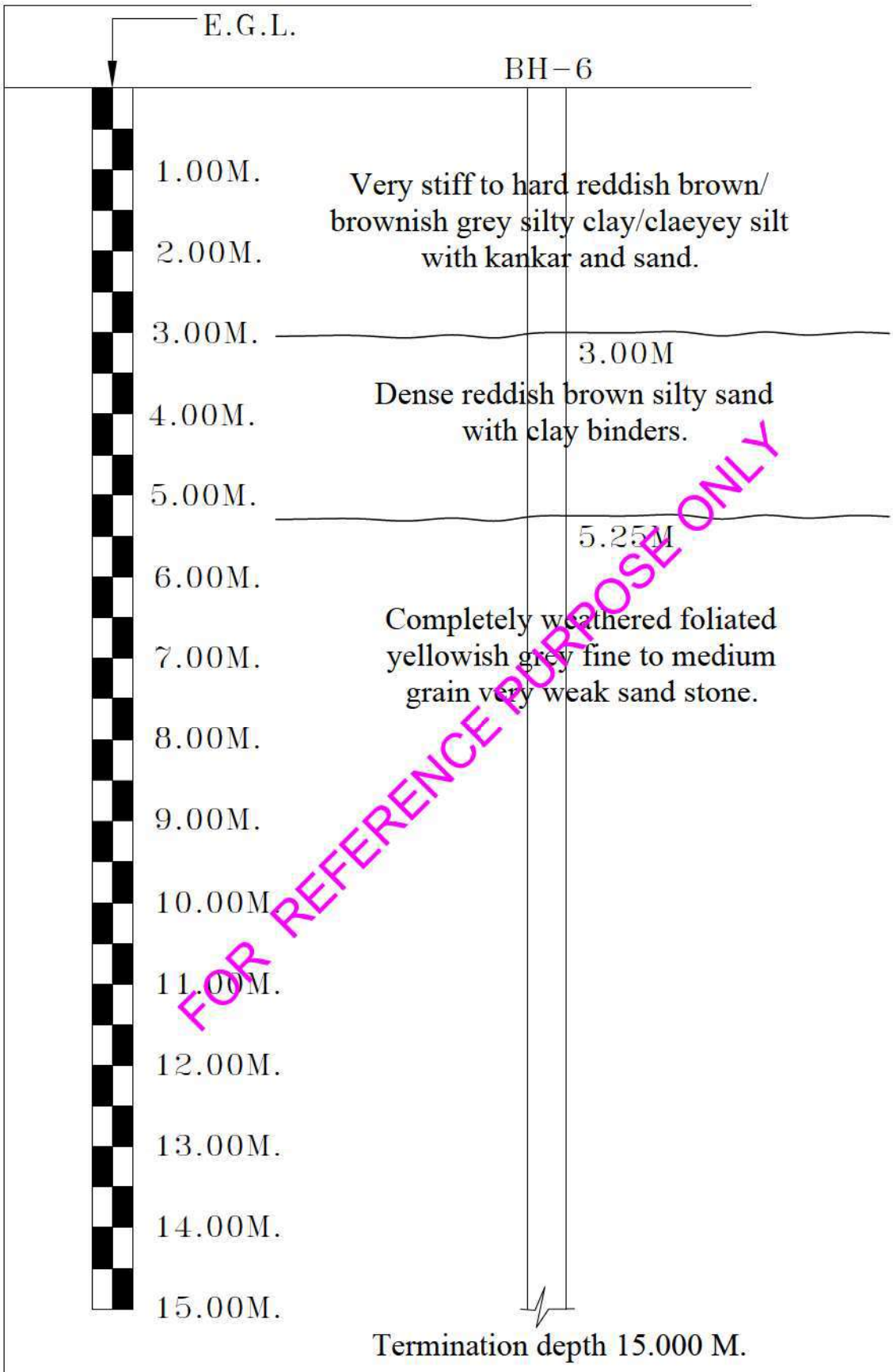
Table-2B (Zone-13).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended l Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**43**	**23**	**6**
2	0.750	10.000	2.000	**66**	**32**	**8**
3	1.000	10.000	2.000	**104**	**42**	**11**
4	1.500	10.000	2.000	**208**	**64**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.: S
Co-ord:		E.G.L.: 114.116		Unit: Gasification Plant				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS	Commence
Depth of Boring	5.250 M.	SPT	4	UDS	2	WS		Completed on : 22.05.2022
Type of Drilling		DCPT		DS	6	RCS	7	Water Struck At : 2.30M
Depth of Drilling	9.750 M.	VST		SCPT				Standing Water Table : 2.20M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard reddish brown/ brownish grey silty clay/claeyey silt with kankar and sand.		01 02	N = 37	DS1 DS2 SPT1 DS3 UDS1	0.50 M 1.00 M 1.50-1.95M 1.50-1.95M 2.00-2.45M
Dense reddish brown silty sand with clay binders.		03 04 05	N = 42 N = 45 N >100	SPT2 DS4 UDS2 SPT3 DS5 SPT4 DS6	3.00-3.45M 3.00-3.45M 4.00-4.45M 4.50-4.95M 4.50-4.95M 5.00-5.25M 5.00-5.25M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		06 07 08 09 10 11 12 13 14 15		RUN1 RUN2 RUN3 RUN4 RUN5 RUN6 RUN7	5.25-6.50M TCR-20% RQD-NIL 6.50-8.00M TCR-31% RQD-NIL 8.00-9.50M TCR-40% RQD-NIL 9.50-11.00M TCR-47% RQD-NIL 11.00-12.50M TCR-40% RQD-NIL 12.50-14.00M TCR-65% RQD-NIL 14.00-15.00M TCR-68% RQD-NIL
Termination Depth 15.000 Mtr.					



Sub-Soil Profile through BH-6

Sketch No.-SK/PDIL/	Gasification Plant	1678	02	5 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

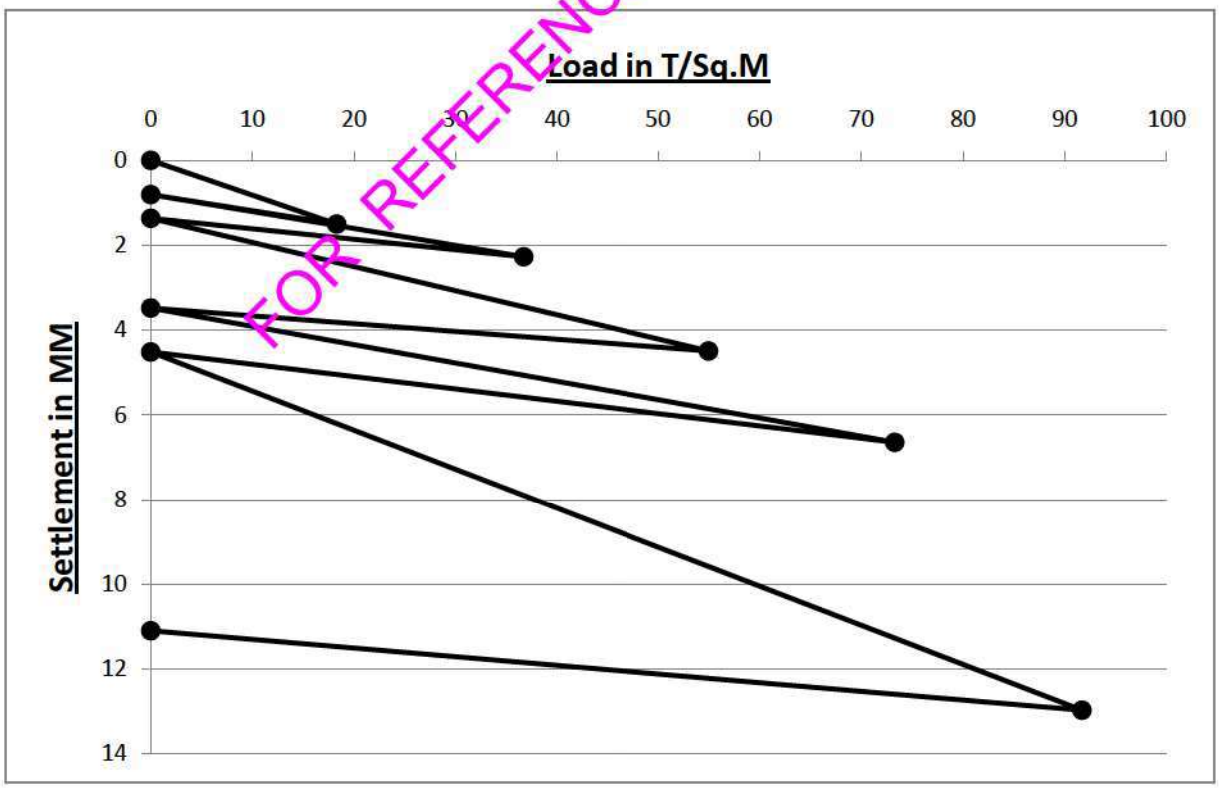
Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard reddish brown/ brownish grey silty clay/claeyey silt with kankar and sand.	6	0.50	D																6	25	51	18	1.78	12.57
		6	1.00	D							2.69									9	28	52	11		
		6	1.50	DN	37	46	18													7	30	43	20		
		6	2.00	UD		49	20	11	1.93	16.82	2.67	1.65	2.98	UU	1.51	0	0.00-0.10	0.0441	0.000	0	32	50	18		
																	0.10-0.20	0.0386							
														CU	0.13	15	0.20-0.40	0.0319							
																	0.40-0.80	0.0231							
														CD	0.04	31	0.80-1.60	0.0159							
																	1.60-3.20	0.0107							
II	Dense reddish brown silty sand with clay	6	3.00	DN	42						2.65									0	77	17	6		
		6	4.00	UD		40	17		1.82	15.47	2.65			DS	0.13	33				0	75	18	7		
		6	4.50	DN	45						2.64									0	77	18	5		
		6	5.00	DN	N>100				1.79					DS	0.14	32				0	72	21	7		

CYCLIC PLATE LOAD TEST SITE DATA SHEET

Client : Projects & Development India Limited
Location : Gassification Plant
Test Number : CPLT-1
Plate Size : 60 X 60 = 3600 Sqcm
Pit Size : 3.00M X 3.00M X 2.50M
Ground Water Table : Not Encountered
L.C. of Dial Guage : 0.01 mm
Jack Ram Dia : 10.5 cm
Jack Ram Area : 86.59 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-1	DIAL-2		
28-05-2022	14:00:00	0.00	0	2069	2089	0.00	0.00	0.00	
	14:00:00	6600	1.83	2069	2089	0.00	0.00	0.00	
	14:01:00			1965	1907	1.04	1.82	1.43	
	14:02:15			1962	1903	1.07	1.86	1.47	
	14:04:00			1961	1901	1.08	1.88	1.48	
	14:06:15			1961	1901	1.08	1.88	1.48	
	14:09:00			1960	1900	1.09	1.89	1.49	
	14:16:00			1959	1900	1.10	1.89	1.50	
	14:25:00			1958	1899	1.11	1.90	1.51	
	15:01:00			1958	1899	1.11	1.90	**1.51**	
	15:01:00	0	0	1958	1899	1.11	1.90	1.51	
	16:01:00			2022	1974	0.47	1.15	**0.81**	
	16:01:00	13200	3.67	2022	1974	0.47	1.15	0.81	
	16:02:00			1833	1894	2.36	1.95	2.16	
	16:03:15			1830	1890	2.39	1.99	2.19	
	16:05:00			1828	1888	2.41	2.01	2.21	
	16:07:15			1826	1886	2.43	2.03	2.23	
	16:10:00			1824	1884	2.45	2.05	2.25	
	16:17:00			1823	1883	2.46	2.06	2.26	
	16:26:00			1822	1882	2.47	2.07	2.27	
	17:01:00			1821	1882	2.48	2.07	**2.28**	
	17:01:00	0	0	1821	1882	2.48	2.07	2.28	
	18:01:00			1918	1967	1.51	1.22	**1.37**	
	18:01:00	19800	5.50	1918	1967	1.51	1.22	1.37	
	18:02:00			1632	1721	4.37	3.68	4.03	
	18:03:15			1626	1714	4.43	3.75	4.09	
	18:05:00			1616	1705	4.53	3.84	4.19	
	18:07:15			1614	1703	4.55	3.86	4.21	
	18:10:00			1612	1701	4.57	3.88	4.23	
	18:17:00			1610	1699	4.59	3.90	4.25	
	18:26:00			1608	1697	4.61	3.92	4.27	
	19:01:00			1585	1675	4.84	4.14	**4.49**	
	19:01:00	0	0	1585	1675	4.84	4.14	4.49	

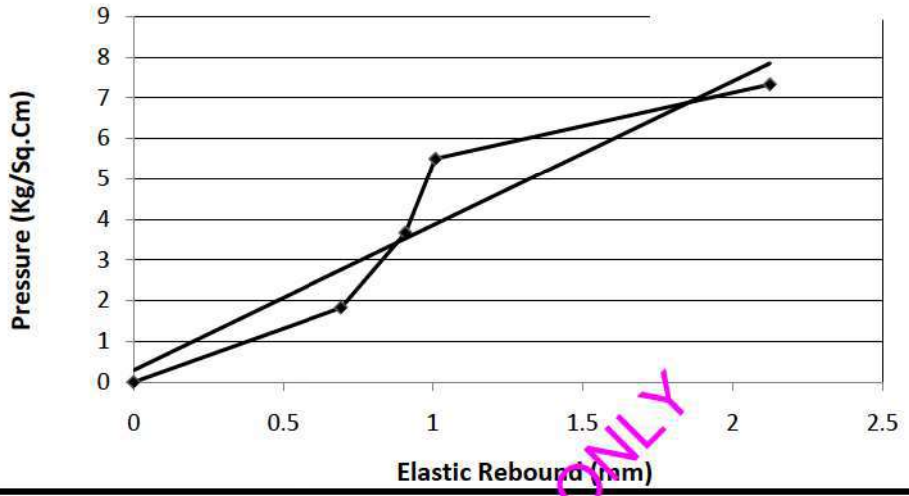
DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)		SETTLEMENT (mm)			
				DIAL-1	DIAL-2	DIAL-1	DIAL-2		
	20:01:00			1696	1766	3.73	3.23		
	20:01:00	26400	7.33	1696	1766	3.73	3.23		
	20:02:00			1445	1452	6.24	6.37	[illegible]	
	20:03:15			1435	1441	6.34	6.48	6.41	
	20:05:00			1429	1436	6.40	6.53	6.47	
	20:07:15			1425	1432	6.44	6.57	6.51	
	20:10:00			1421	1425	6.48	6.64	6.56	
	20:17:00			1419	1423	6.50	6.66	6.58	
	20:26:00			1417	1421	6.52	6.68	6.60	
	21:01:00			1413	1417	6.56	6.72	**6.64**	
	21:01:00	0	0	1413	1417	6.56	6.72	6.64	
	22:01:00			1591	1664	4.78	4.25	**4.52**	
	22:01:00	33000	9.17	1591	1664	4.78	4.25	4.52	
	22:02:00			945	1080	11.24	10.09	10.67	
	22:03:15			924	1062	11.45	10.27	10.86	
	22:05:00			913	1050	11.56	10.39	10.98	
	22:07:15			809	947	12.60	11.42	12.01	
	22:10:00			742	885	13.27	12.04	12.66	
	22:17:00			717	862	13.52	12.27	12.90	
	22:26:00			714	858	13.55	12.31	12.93	
	23:01:00			710	855	13.59	12.34	**12.97**	
	23:01:00	0	0	710	855	13.59	12.34	12.97	
	0:01:00			903	1037	11.66	10.52	**11.09**	



Load Vs Settlement Curve for CPLT-1

Evaluation of Dynamic Properties of Soil

Elastic Rebound (mm)	Pressure (Kg/Sq.Cm)
0	0
0.70	1.83
0.91	3.67
1.01	5.50
2.13	7.33



Computed dynamic properties of soil	
Coefficient of elastic uniform compression (Cu) kg/cm3	34.494
Coefficient of elastic uniform shear (Cτ) kg/cm3	17.247
Coefficient of elastic non-uniform compression (Cϕ) kg/cm3	59.675
Coefficient of elastic non-uniform shear (Cψ) kg/cm3	25.871

Table -1

Project: Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB) Client.: Project & Development India Limited

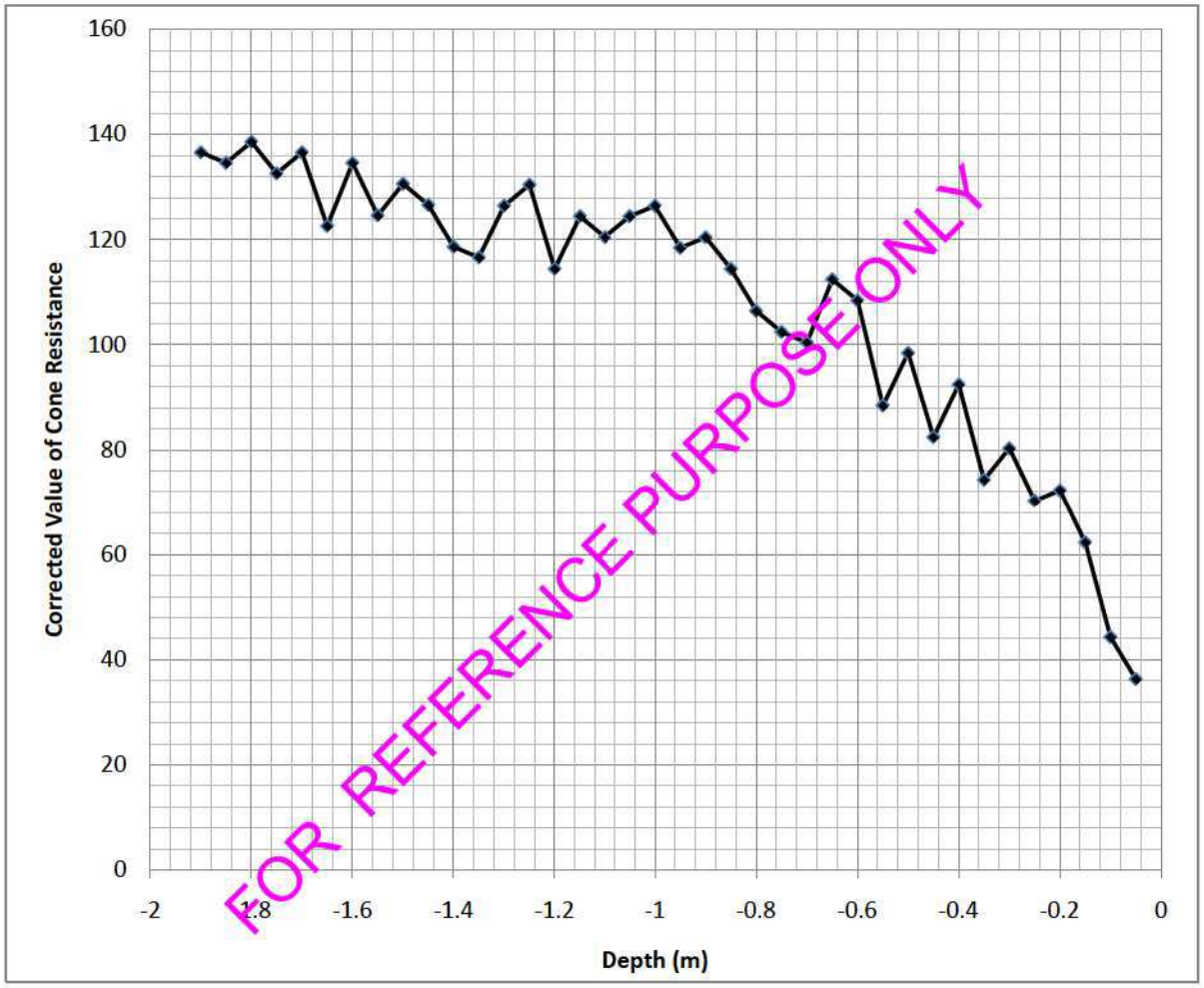
Side ID :

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)	6

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)
-0.05	1	18	36	0.29	36.29	34	68	32	2.18	2.19
-0.10	1	22	44	0.29	44.29	40	80	36	2.45	2.46
-0.15	1	31	62	0.29	62.29	53	106	44	2.99	3.00
-0.20	1	36	72	0.29	72.29	66	132	60	4.08	4.09
-0.25	1	35	70	0.29	70.29	68	136	66	4.49	4.50
-0.30	1	40	80	0.29	80.29	72	144	64	4.35	4.36
-0.35	1	37	74	0.29	74.29	59	118	44	2.99	3.00
-0.40	2	46	92	0.44	92.44	67	134	42	2.86	2.87
-0.45	2	41	82	0.44	82.44	69	138	56	3.81	3.82
-0.50	2	49	98	0.44	98.44	83	166	68	4.63	4.64
-0.55	2	44	88	0.44	88.44	69	138	50	3.4	3.41
-0.60	2	54	108	0.44	108.44	69	138	30	2.04	2.05
-0.65	2	56	112	0.44	112.44	71	142	30	2.04	2.05
-0.70	2	50	100	0.44	100.44	74	148	48	3.27	3.28

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)
-0.75	2	51	102	0.44	102.44	72	144	42	2.86	2.87
-0.80	2	53	106	0.44	106.44	80	160	54	3.67	3.68
-0.85	2	57	114	0.44	114.44	79	158	44	2.99	3.00
-0.90	2	60	120	0.44	120.44	84	168	48	3.27	3.28
-0.95	2	59	118	0.44	118.44	78	156	38	2.59	2.60
-1.00	2	63	126	0.44	126.44	77	154	28	1.9	1.91
-1.05	2	62	124	0.44	124.44	80	160	36	2.45	2.46
-1.10	2	60	120	0.44	120.44	89	178	58	3.95	3.96
-1.15	2	62	124	0.44	124.44	85	170	46	3.13	3.14
-1.20	2	57	114	0.44	114.44	83	166	52	3.54	3.55
-1.25	2	65	130	0.44	130.44	86	172	42	2.86	2.87
-1.30	2	63	126	0.44	126.44	85	170	44	2.99	3.00
-1.35	3	58	116	0.6	116.6	79	158	42	2.86	2.87
-1.40	3	59	118	0.6	118.6	78	156	38	2.59	2.60
-1.45	3	63	126	0.6	126.6	73	146	20	1.36	1.37
-1.50	3	65	130	0.6	130.6	78	156	26	1.77	1.78
-1.55	3	62	124	0.6	124.6	75	150	26	1.77	1.78
-1.60	3	67	134	0.6	134.6	81	162	28	1.9	1.91
-1.65	3	61	122	0.6	122.6	82	164	42	2.86	2.87
-1.70	3	68	136	0.6	136.6	80	160	24	1.63	1.64
-1.75	3	66	132	0.6	132.6	85	170	38	2.59	2.6
-1.80	3	69	138	0.6	138.6	91	182	44	2.99	3
-1.85	3	67	134	0.6	134.6	90	180	46	3.13	3.14
-1.90	3	68	136	0.6	136.6	89	178	42	2.86	2.87


160
140
120
100
80
60
40
20
0
Corrected Value of Cone Resistance
-2
-1.8
-1.6
-1.4
-1.2
-1
-0.8
-0.6
-0.4
-0.2
0
Depth (m)
FOR REFERENCE PURPOSE ONLY

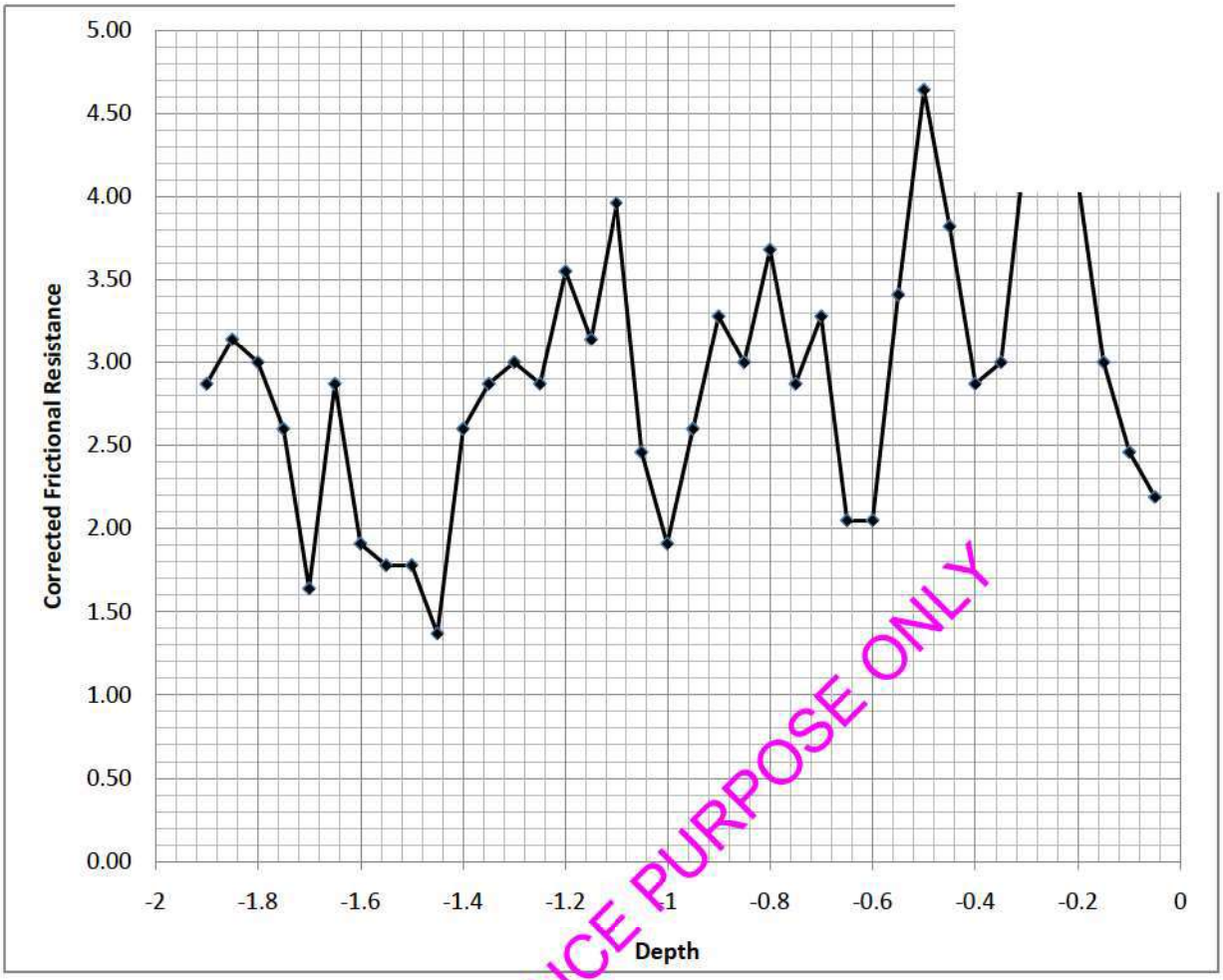
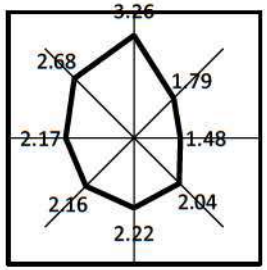


Table ERT - 1

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Gasification Plant.
Client : Project & Development India Limited
Test Date : 01-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

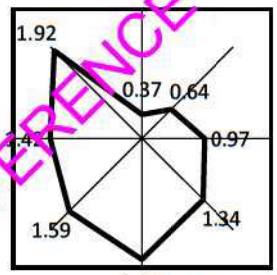
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	3.26	1.79	1.48	2.04	2.22	2.16	2.17	2.68	20.48	11.25	9.30	12.82	13.95	13.57	13.63	16.84
2	2.0	0.37	0.64	0.97	1.34	1.87	1.59	1.42	1.92	4.65	8.04	12.19	16.84	23.50	19.98	17.84	24.13
3	3.0	3.40	2.92	2.22	2.44	1.97	1.39	1.53	3.66	64.09	55.04	41.85	45.99	37.13	26.20	28.84	68.99
4	5.0	3.43	2.57	2.02	1.49	1.16	1.94	2.62	2.78	107.76	80.74	63.46	46.81	36.44	60.95	82.31	87.34
5	10.0	3.35	2.28	1.61	1.31	1.08	1.79	2.49	0.97	210.49	143.26	101.16	82.31	67.86	112.47	156.45	60.95
6	15.0	0.61	1.68	2.62	1.92	1.34	1.72	2.25	0.96	57.49	158.34	246.93	180.96	126.29	162.11	212.06	90.48
7	20.0	4.74	3.18	2.75	2.94	1.75	3.17	4.06	1.21	595.65	399.61	345.58	369.45	219.91	398.35	510.19	152.05

1.00Mtr.



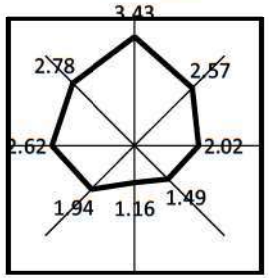
Resistivity = 13.98 ohm-m

2.00Mtr.



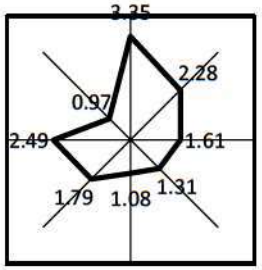
Resistivity = 15.9 ohm-m

5.00Mtr.



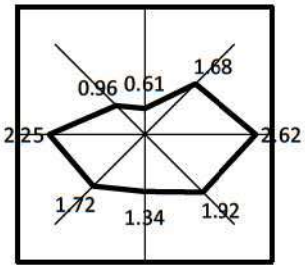
Resistivity = 70.73 ohm-m

10.00Mtr.



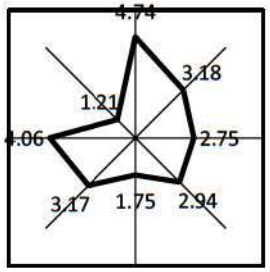
Resistivity = 116.87 ohm-m

15.00Mtr.



Resistivity = 154.33 ohm-m

20.00Mtr.



Resistivity = 373.85 ohm-m

ZONE-14

GAS CLEANING AND PURIFICATION PLANT

One (1) borehole was sunk in this area, viz borehole mar
the general sub soil profile it has been observed that the to
to hard reddish brown/ brownish grey silty clay/ clayey silt with kankar and sand. The second layer as encountered up to the explored depth is dense reddish brown silty sand with clay binders.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-14).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-14). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-14).

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					***ALLOWABLE BEARING CAPACITY***		
FOUNDATION TYPE	**L**	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 25 mm**	**For allowable settlement 40 mm**	**For allowable settlement 75 mm**
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	43.2	21.00	43	43	43
	2.50	2.50	1.00	38.9	57.99	16	26	38
	5.00	5.00	1.00	37.5	118.67	7	12	23
	7.50	7.50	1.00	37.0	179.03	5	8	15
	10.00	10.00	1.00	36.8	239.6	3	6	11
	1.00	1.00	1.50	46.9	21.50	46	46	46
	2.50	2.50	1.50	40.4	56.50	17	28	40
	5.00	5.00	1.50	38.2	117.34	8	13	24
	7.50	7.50	1.50	37.5	177.97	5	8	15
	10.00	10.00	1.50	37.1	238.17	3	6	11
	1.00	1.00	2.00	50.5	22.29	50	50	50
	2.50	2.50	2.00	41.8	54.58	19	30	41
	5.00	5.00	2.00	38.9	115.91	8	13	25
	7.50	7.50	2.00	38.0	176.84	5	8	16
	10.00	10.00	2.00	37.5	237.29	3	6	11
	1.00	1.00	3.00	57.7	24.34	57	57	57
	2.50	2.50	3.00	44.7	50.13	22	35	44
	5.00	5.00	3.00	40.4	112.94	8	14	26
	7.50	7.50	3.00	38.9	173.87	5	8	16
	10.00	10.00	3.00	38.2	234.68	4	6	12

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	37.7	23.86	37	37	37
	3.75	2.50	1.00	33.9	62.94	13	21	33
	7.50	5.00	1.00	32.7	127.42	6	10	19
	11.25	7.50	1.00	32.2	191.16	4	6	12
	15.00	10.00	1.00	32.0	255.26	3	5	9
	1.50	1.00	1.50	40.8	23.08	40	40	40
	3.75	2.50	1.50	35.2	62.13	14	22	35
	7.50	5.00	1.50	33.3	126.71	6	10	19
	11.25	7.50	1.50	32.7	191.14	4	6	12
	15.00	10.00	1.50	32.4	255.48	3	5	9
	1.50	1.00	2.00	44.0	19.78	44	44	44
	3.75	2.50	2.00	36.4	60.92	14	23	36
	7.50	5.00	2.00	33.9	125.89	6	10	20
	11.25	7.50	2.00	33.1	190.44	4	6	13
	15.00	10.00	2.00	32.7	254.85	3	5	9
	1.50	1.00	3.00	50.3	28.52	44	50	50
	3.75	2.50	3.00	39.0	58.12	16	26	39
	7.50	5.00	3.00	35.2	124.27	7	11	21
	11.25	7.50	3.00	33.9	188.83	4	7	13
	15.00	10.00	3.00	33.3	253.42	3	5	9

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	33.3	42.11	19	31	33
		1.50	1.00	31.4	61.08	12	20	31
		2.00	1.00	30.5	80.09	9	15	28
		2.50	1.00	29.9	98.86	7	12	22
		1.00	1.50	36.0	43.78	20	32	36
		1.50	1.50	33.3	63.16	13	21	33
		2.00	1.50	31.9	82.22	9	15	29
		2.50	1.50	31.0	101.00	7	12	23
		1.00	2.00	38.8	45.31	21	34	38
		1.50	2.00	35.1	64.88	13	21	35
		2.00	2.00	33.3	84.22	9	15	29
		2.50	2.00	32.1	103.03	7	12	23
		1.00	3.00	44.4	47.56	23	37	44
		1.50	3.00	38.8	67.97	14	22	38
		2.00	3.00	36.0	87.57	10	16	30
		2.50	3.00	34.4	107.09	8	12	24

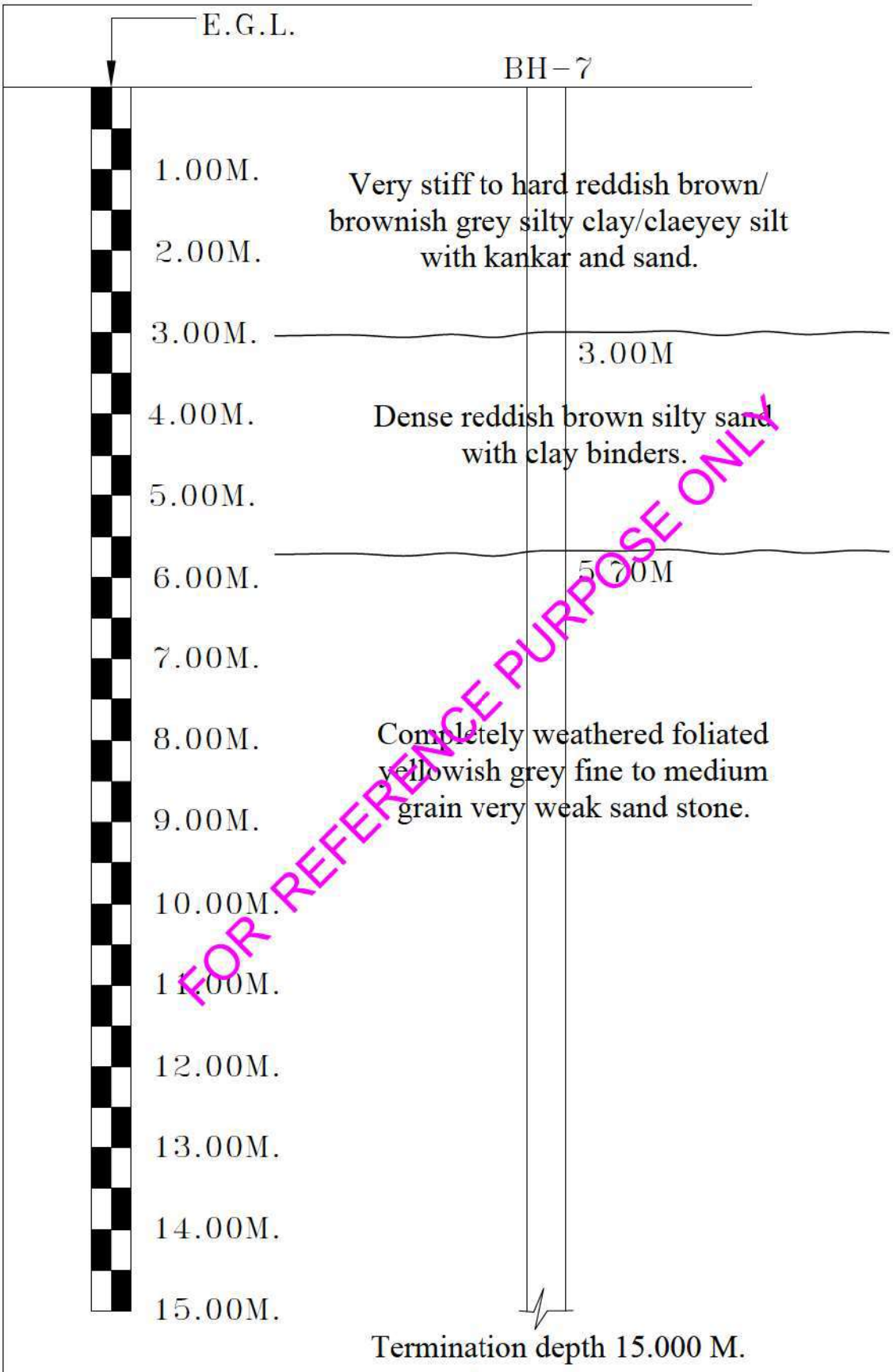
Table-2B (Zone-14).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**44**	**24**	**6**
2	0.750	10.000	2.000	**67**	**32**	**8**
3	1.000	10.000	2.000	**105**	**43**	**11**
4	1.500	10.000	2.000	**209**	**65**	**16**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:	E.G.L.:116.414	Unit: Gas Cleaning & Purification Plant.						Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	5.700 M.	SPT	4	UDS	3	WS		Completed on : 22.05.2022
Type of Drilling		DCPT		DS	6	RCS	7	Water Struck At : 1.40M
Depth of Drilling	9.300 M.	VST		SCPT				Standing Water Table : 1.30M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff to hard reddish brown/ brownish grey silty clay/claeyey silt with kankar and sand.		01 02	N = 39	DS1 DS2 SPT1 DS3 UDS1	0.50 M 1.00 M 1.50-1.95M 1.50-1.95M 2.00-2.45M
Dense reddish brown silty sand with clay binders.		03 04 05	N = 41 N = 45	SPT2 DS4 UDS2 SPT3 DS5 UDS3	3.00-3.45M 3.00-3.45M 4.00-4.45M 4.50-4.95M 4.50-4.95M 5.00-5.45M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		06 07 08 09 10 11 12 13 14	N >100	SPT4 DS6 RUN1 RUN2 RUN3 RUN4 RUN5 RUN6 RUN7	5.55-5.70M 5.55-5.70M 5.70-7.00M TCR-22% RQD-NIL 7.00-8.50M TCR-32% RQD-NIL 8.50-10.00M TCR-41% RQD-NIL 10.00-11.50M TCR-49% RQD-NIL 11.50-13.00M TCR-55% RQD-NIL 13.00-14.50M TCR-51% RQD-NIL 14.50-15.00M TCR-61% RQD-NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-7

Sketch No.-SK/PDIL/	Gas Cleaning & Purification Plant	1678	02	6 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff to hard reddish brown/ brownish grey silty clay/ claeyey silt with kankar and sand.	7	0.50	D																0	26	54	20	1.82	11.27
		7	1.00	D		47	21	11												0	28	49	23	1.78	12.00
		7	1.50	DN	39						2.67									0	30	58	12		
		7	2.00	UD		46	20	12	1.90	14.98	2.68	1.65	2.64	UU	1.35	0	0.00-0.10	0.0448	0.000	0	27	57	16		
																	0.10-0.20	0.0390							
														CU	0.09	12	0.20-0.40	0.0319							
																	0.40-0.80	0.0265							
														CD	0.03	27	0.80-1.60	0.0189							
																	1.60-3.20	0.0118							
II	Dense reddish brown silty sand with clay binders.	7	3.00	DN	41															0	76	18	6		
		7	4.00	UD		37	17	10	1.89	13.74	2.65	1.66	2.48	DS	0.04	34			0.000	0	74	16	10		
		7	4.50	DN	45				1.83					DS	0.08	35				0	68	18	14		
		7	5.00	UD						12.12	2.65									0	71	17	12		
		7	5.55	DN	N>100				1.81					DS	0.11	36				0	77	15	8		

ZONE-15

STEAM GENERATION PLANT

Total one (1) borehole was sunk in this area, viz borehole n
general sub soil profile it has been observed that the top soil is medium to dense reddish brown silty sand with clay binders and continues up to the explored depth.

In addition the following field test has been carried out at this zone and results are being indicated in this chapter.

1. Plate Load Test:

   One (1) plate load test has been carried out at this zone marked as PLT-2.

2. Electrical Resistivity Test:

   One (1) electrical resistivity test has been carried out at this zone marked as ERT-2.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-15).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-15). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-15).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	8.7	1.77	8	8	8
	2.50	2.50	1.00	11.7	7.23	11	11	11
	5.00	5.00	1.00	17.4	22.77	17	17	17
	7.50	7.50	1.00	23.2	46.40	12	19	23
	10.00	10.00	1.00	29.0	78.05	9	14	27
	1.00	1.00	1.50	12.6	2.41	12	12	12
	2.50	2.50	1.50	14.9	8.63	14	14	14
	5.00	5.00	1.50	20.4	25.89	19	20	20
	7.50	7.50	1.50	26.1	51.17	12	20	26
	10.00	10.00	1.50	31.9	84.61	9	15	28
	1.00	1.00	2.00	16.9	3.08	16	16	16
	2.50	2.50	2.00	18.3	9.87	18	18	18
	5.00	5.00	2.00	23.5	28.93	20	23	23
	7.50	7.50	2.00	29.1	55.95	13	20	29
	10.00	10.00	2.00	34.8	90.98	9	15	28
	1.00	1.00	3.00	26.7	4.65	26	26	26
	2.50	2.50	3.00	25.6	11.86	25	25	25
	5.00	5.00	3.00	29.9	34.53	21	29	29
	7.50	7.50	3.00	35.2	65.00	13	21	35
	10.00	10.00	3.00	40.8	103.56	9	15	29

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	8.2	2.22	8	8	8
	3.75	2.50	1.00	10.9	8.67	10	10	10
	7.50	5.00	1.00	16.1	26.87	14	16	16
	11.25	7.50	1.00	21.4	54.41	9	15	21
	15.00	10.00	1.00	26.7	91.21	7	11	21
	1.50	1.00	1.50	11.8	2.73	11	11	11
	3.75	2.50	1.50	13.9	10.51	13	13	13
	7.50	5.00	1.50	18.9	30.80	15	18	18
	11.25	7.50	1.50	24.1	60.32	9	15	24
	15.00	10.00	1.50	29.4	99.28	7	11	22
	1.50	1.00	2.00	15.8	3.04	15	15	15
	3.75	2.50	2.00	17.1	12.26	17	17	17
	7.50	5.00	2.00	21.8	34.67	15	21	21
	11.25	7.50	2.00	27.0	66.52	10	16	27
	15.00	10.00	2.00	32.2	107.47	7	11	22
	1.50	1.00	3.00	25.1	6.09	25	25	25
	3.75	2.50	3.00	24.0	15.32	24	24	24
	7.50	5.00	3.00	27.9	42.18	16	26	27
	11.25	7.50	3.00	32.7	78.00	10	16	31
	15.00	10.00	3.00	37.9	123.52	7	12	23

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	8.4	5.20	8	8	8
		1.50	1.00	9.6	9.15	9	9	9
		2.00	1.00	11.0	14.15	11	11	11
		2.50	1.00	12.3	19.92	12	12	12
		1.00	1.50	11.7	6.97	11	11	11
		1.50	1.50	12.6	11.71	12	12	12
		2.00	1.50	13.8	17.42	13	13	13
		2.50	1.50	15.1	24.10	15	15	15
		1.00	2.00	15.3	8.75	15	15	15
		1.50	2.00	15.9	14.40	15	15	15
		2.00	2.00	16.8	20.81	16	16	16
		2.50	2.00	18.0	28.30	15	18	18
		1.00	3.00	23.7	12.43	23	23	23
		1.50	3.00	23.0	19.73	23	23	23
		2.00	3.00	23.4	27.88	20	23	23
		2.50	3.00	24.2	36.90	16	24	24

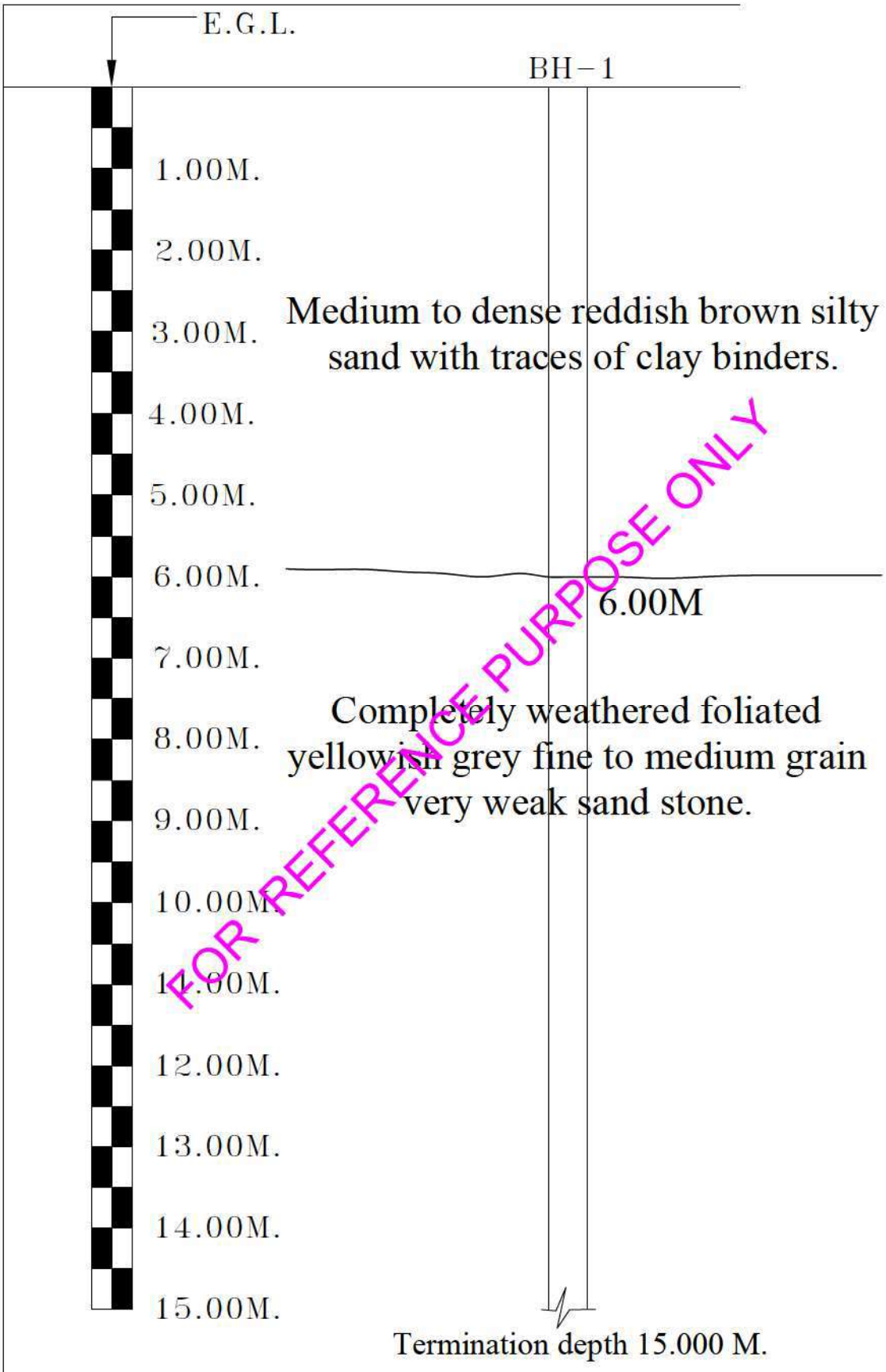
Table-2B (Zone-15).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**34**	**14**	**5**
2	0.750	10.000	2.000	**54**	**19**	**7**
3	1.000	10.000	2.000	**88**	**26**	**12**
4	1.500	10.000	2.000	**183**	**39**	**23**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hol
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:	E.G.L.: 119.511	Unit: Steam Generation Plant						Bore Hol
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenc
Depth of Boring	6.000 M.	SPT	4	UDS	3	WS		Completed on : 19.05.2022
Type of Drilling		DCPT		DS	6	RCS	6	Water Struck At : 2.70M.
Depth of Drilling	9.000 M.	VST		SCPT				Standing Water Table : 2.60M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Medium to dense reddish brown silty sand with clay binders.				DS1	0.50 M
		01		DS2	1.00 M
			N = 28	SPT1	1.50-1.95M
				DS3	1.50-1.95M
		02		UDS1	2.00-2.45M
		03	N = 34	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
			N = 43	SPT3	4.50-4.95M
		05		DS5	4.50-4.95M
				UDS3	5.00-5.45M
			N >100	SPT4	5.80-6.00M
		06		DS6	5.80-6.00M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				RUN1	6.00-7.50M TCR-28% RQD-NIL
		07			
				RUN2	7.50-9.00M TCR-38% RQD-NIL
		08			
		09		RUN3	9.00-10.50M TCR-55% RQD-NIL
		10			
				RUN4	10.50-12.00M TCR-63% RQD-NIL
		11			
		12		RUN5	12.00-13.50M TCR-73% RQD-NIL
		13			
				RUN6	13.50-15.00M TCR-68% RQD-NIL
		14			
		15			
Termination Depth 15.000 Mtr.					



Sub-Soil Profile through BH-1

Sketch No.-SK/PDIL/	Steam Generation Plant	1678	02	1 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Medium to dense reddish brown silty sand with clay binders.	1	0.50	D		NP														0	58	24	18	1.78	13.00
		1	1.00	D		NP														0	61	23	16	1.79	12.58
		1	1.50	DN	28	NP														0	60	25	15		
		1	2.00	UD		NP			1.81	16.26	2.66	1.56		DS	0.13	32				0	55	25	20		
		1	3.00	DN	34	NP														0	67	21	12		
		1	4.00	UD		NP			1.78	17.00	2.65	1.52		DS	0.08	35				0	61	26	13		
		1	4.50	DN	43	NP					2.65									0	80	15	5		
		1	5.00	UD		NP			1.82	13.25	2.64			DS	0.18	34				0	78	17	5		
		1	5.80	DN	>100	NP			1.81		2.66			DS	0.17	33				0	77	16	7		

Modulas of Subgrade Reaction and Modulas of Elasticity have been calculated for Plate Load

Calculation for Modulas of Subgrade Reaction (K) for PLT-2

From Load-Settlement curve of PLT-2, Pressure corresponding to settlement of 1.25mm i

Hence, K = Pressure/ Settlement.
= 1.06/0.125 Kg/Cm3
= 8.48 Kg/Cm3

Calculation for Modulas of Elasticity (Es) for PLT-2.

Modulas of Elasticity has been calculated for initial load of 18.3 T/M2 and corresponding settlement of 0.137 cm.

Es = {q*(1-μ2)*B*Iw} / S
= {0.36*(1-0.3^2)*75*0.82}/0.121
= 598.05 Kg/Cm2

Where,

Es = Modulas of Elasticity.
q = Pressure = 1.83 Kg/Cm2
μ = Poisson's Ratio = 0.3
B = Least dimension of the plate = 60 Cm
Iw = Influence Factor = 0.8
S = Settlement = 0.1 Cm

Modulas of Subgrade Reaction and Modulas of Elasticity, obtain from Plate Load Test.

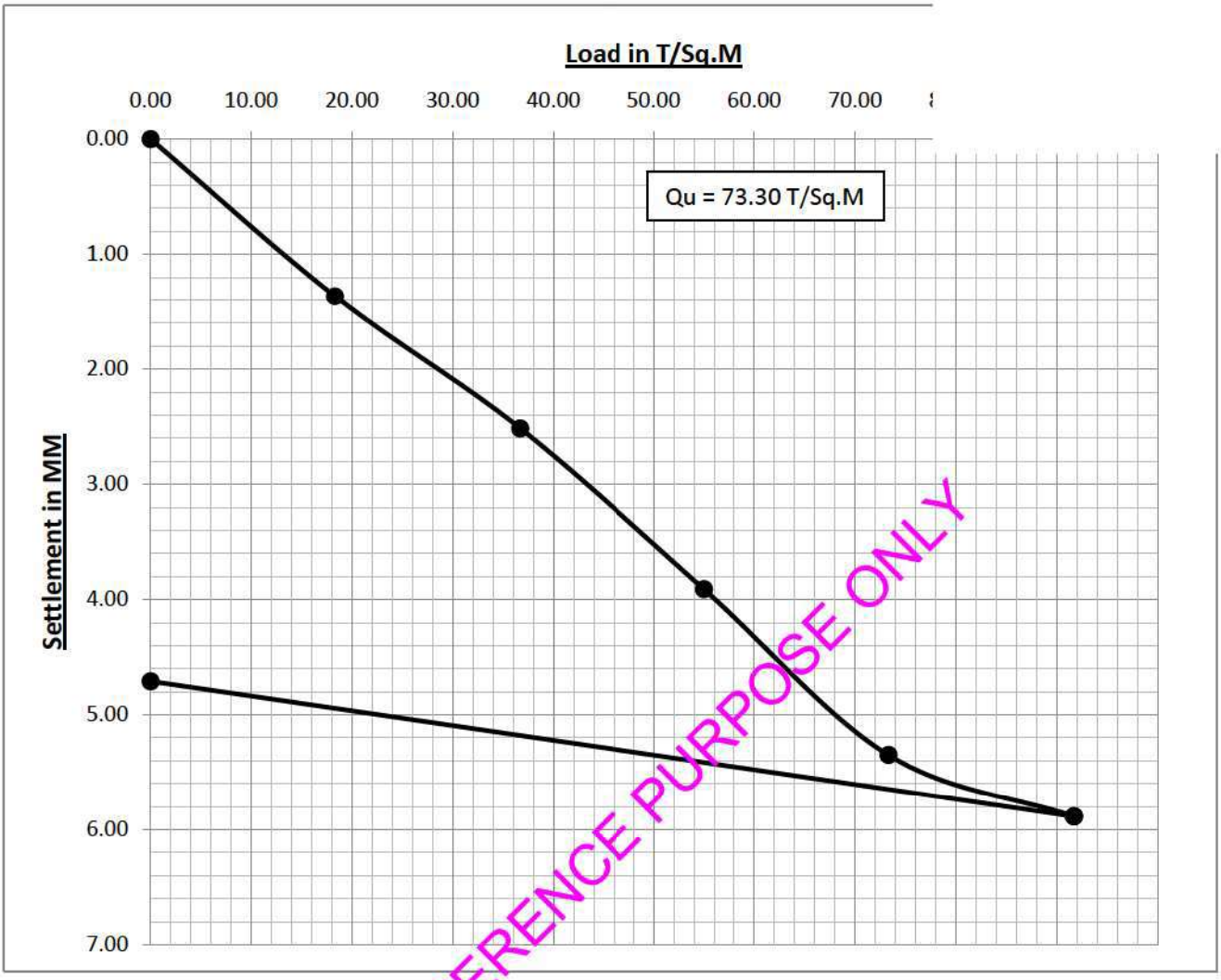
Test No.	Depth of Test	Modulas of Subgrade Reaction, K	Modulas of Elasticity, Es
	(M)	(Kg/Cm3)	(Kg/Cm2)
PLT-2	2	8.48 Kg/Cm3	598.05 Kg/Cm2

PLATE LOAD TEST SITE DATA SHEET

Client	: Projects & Development India Limited
Location	: Steam Generation Plant
Test Number	: PLT-2
Plate Size	: 60x60 3600 Sqcm
Pit Size	: 3.00M X 3.00M X 2.00M
Ground Water Table	: Not Encountered
L.C. of Dial Guage	: 0.01 mm
Jack Ram Dia	: 10.5 cm
Jack Ram Area	: 86.59 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-1	DIAL-2		
29-05-2022	13:40:00	0.00	0	2245	2267	0.00	0.00	0.00	
	13:40:00	6600	1.83	2245	2267	0.00	0.00	0.00	
	13:41:00			2069	2197	1.76	0.70	1.23	
	13:42:15			2066	2190	1.79	0.77	1.28	
	13:44:00			2065	2189	1.80	0.78	1.29	
	13:46:15			2065	2188	1.80	0.79	1.30	
	13:49:00			2064	2187	1.81	0.80	1.31	
	13:56:00			2063	2186	1.82	0.81	1.32	
	14:05:00			2062	2184	1.83	0.83	1.33	
	14:40:00			2058	2181	1.87	0.86	**1.37**	
	14:40:00	13200	3.67	2058	2181	1.87	0.86	1.37	
	14:41:00			2000	2026	2.45	2.41	2.43	
	14:42:15			1998	2024	2.47	2.43	2.45	
	14:44:00			1997	2022	2.48	2.45	2.47	
	14:46:15			1996	2021	2.49	2.46	2.48	
	14:49:00			1995	2020	2.50	2.47	2.49	
	14:56:00			1995	2018	2.50	2.49	2.50	
	15:05:00			1995	2016	2.50	2.51	2.51	
	15:40:00			1994	2015	2.51	2.52	**2.52**	
	15:40:00	19800	5.50	1994	2015	2.51	2.52	2.52	
	15:41:00			1932	1856	3.13	4.11	3.62	
	15:42:15			1931	1854	3.14	4.13	3.64	
	15:44:00			1915	1842	3.30	4.25	3.78	
	15:46:15			1908	1834	3.37	4.33	3.85	
	15:49:00			1907	1831	3.38	4.36	3.87	
	15:56:00			1907	1831	3.38	4.36	3.87	
	16:05:00			1905	1829	3.40	4.38	3.89	
	16:40:00			1903	1827	3.42	4.40	**3.91**	
	16:40:00	26400	7.33	1903	1827	3.42	4.40	3.91	
	16:41:00			1801	1740	4.44	5.27	4.86	

DATE	TIME (Hrs)	LOAD IN (KG)	PRESSURE IN Kg/Sqcm	DIAL GUAGE READING (mm)		SETTLEMENT (mm)			
				DIAL-1	DIAL-2	DIAL-1	DIAL-2		
	16:42:15			1798	1725	4.47	5.42		
	16:44:00			1781	1714	4.64	5.53	5.09	
	16:46:15			1765	1705	4.80	5.62	5.21	
	16:49:00			1760	1701	4.85	5.66	5.26	
	16:56:00			1758	1698	4.87	5.69	5.28	
	17:05:00			1755	1694	4.90	5.73	5.32	
	17:40:00			1751	1691	4.94	5.76	**5.35**	
	17:40:00	33000	9.17	1751	1691	4.94	5.76	5.35	
	17:41:00			1718	1658	5.27	6.09	5.68	
	17:42:15			1715	1655	5.30	6.12	5.71	
	17:44:00			1713	1652	5.32	6.15	5.74	
	17:46:15			1708	1644	5.37	6.23	5.80	
	17:49:00			1706	1641	5.39	6.26	5.83	
	17:56:00			1704	1638	5.41	6.29	5.85	
	18:05:00			1703	1636	5.42	6.31	5.87	
	18:40:00			1701	1634	5.44	6.33	**5.89**	
	18:40:00	0	0	1701	1634	5.44	6.33	5.89	
	19:40:00			1802	1768	4.43	4.99	**4.71**	



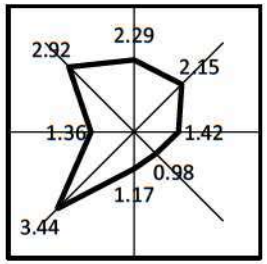
Load Vs Settlement Curve for PLT-2

Table ERT - 2

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Steam Generation Plant.
Client : Project & Development India Limited
Test Date : 01-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

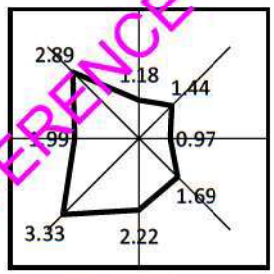
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	2.29	2.15	1.42	0.98	1.17	3.44	1.36	2.92	14.39	13.51	8.92	6.16	7.35	21.61	8.55	18.35
2	2.0	1.18	1.44	0.97	1.69	2.22	3.33	1.99	2.89	14.83	18.10	12.19	21.24	27.90	41.85	25.01	36.32
3	3.0	2.45	2.18	2.22	2.13	1.51	1.31	2.34	3.11	46.18	41.09	41.85	40.15	28.46	24.69	44.11	58.62
4	5.0	3.18	1.77	2.02	2.7	1.39	2.89	3.62	2.59	99.90	55.61	63.46	84.82	43.67	90.79	113.73	81.37
5	10.0	3.57	2.09	1.61	1.63	0.95	1.62	1.45	1.29	224.31	131.32	101.16	102.42	59.69	101.79	91.11	81.05
6	15.0	1.19	1.59	2.62	1.08	2.62	2.38	1.17	2.08	112.15	149.85	246.93	101.79	246.93	224.31	110.27	196.04
7	20.0	3.29	4.72	2.75	3.17	3.46	2.72	3.92	2.89	413.43	593.13	345.58	398.35	434.80	341.81	492.60	363.17

1.00Mtr.



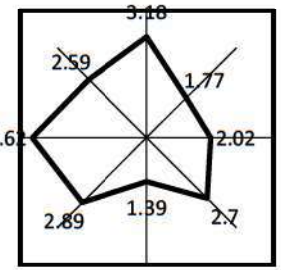
Resistivity = 12.35 ohm-m

2.00Mtr.



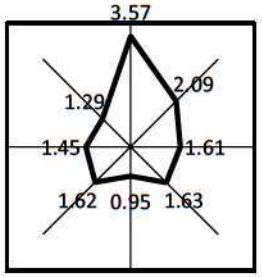
Resistivity = 24.68 ohm-m

5.00Mtr.



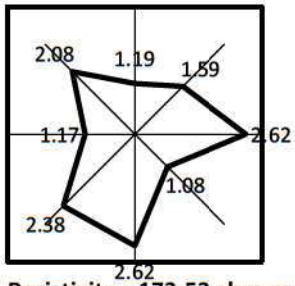
Resistivity = 79.17 ohm-m

10.00Mtr.



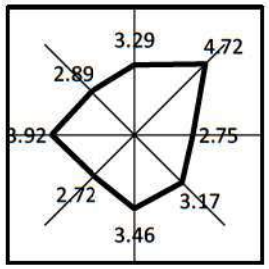
Resistivity = 111.61 ohm-m

15.00Mtr.



Resistivity = 173.53 ohm-m

20.00Mtr.



Resistivity = 422.86 ohm-m

ZONE-16

ASH/ SLAG STORAGE

Total two (2) boreholeswere sunk in this area, viz boreh
BH-3. From the general sub soil profile it has been ob
reddish brown silty clay/ clayey silt with morrum is present up to 1.50M depth at the location of BH-2, however this layer is absent at the location of BH-3. Dense silty sand layer has been observed at both the location and continues up to the explored depth.

In addition the following field test has been carried out at this zone and results are being indicated in this chapter.

1. Electrical Resistivity Test:

   One (1) electrical resistivity test has been carried out at this zone marked as ERT-3.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-16).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-16). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-16).

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	11.4	1.94	11	11	11
	2.50	2.50	1.00	15.5	7.98	15	15	15
	5.00	5.00	1.00	23.1	25.19	22	23	23
	7.50	7.50	1.00	31.0	51.66	15	24	31
	10.00	10.00	1.00	38.8	87.02	11	17	33
	1.00	1.00	1.50	16.4	2.61	16	16	16
	2.50	2.50	1.50	19.6	9.46	19	19	19
	5.00	5.00	1.50	27.0	28.55	23	27	27
	7.50	7.50	1.50	34.7	56.70	15	24	34
	10.00	10.00	1.50	42.5	93.94	11	18	33
	1.00	1.00	2.00	22.0	3.34	22	22	22
	2.50	2.50	2.00	24.0	10.79	24	24	24
	5.00	5.00	2.00	31.0	31.80	24	31	31
	7.50	7.50	2.00	38.6	61.85	15	24	38
	10.00	10.00	2.00	46.3	100.87	11	18	34
	1.00	1.00	3.00	34.9	5.07	34	34	34
	2.50	2.50	3.00	33.5	12.94	33	33	33
	5.00	5.00	3.00	39.3	37.83	25	39	39
	7.50	7.50	3.00	46.5	71.55	16	25	46
	10.00	10.00	3.00	54.1	114.43	11	18	35

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	10.7	2.42	10	10	10
	3.75	2.50	1.00	14.4	9.54	14	14	14
	7.50	5.00	1.00	21.4	29.76	17	21	21
	11.25	7.50	1.00	28.6	60.59	11	18	28
	15.00	10.00	1.00	35.8	101.91	8	14	26
	1.50	1.00	1.50	15.4	2.97	15	15	15
	3.75	2.50	1.50	18.3	11.53	18	18	18
	7.50	5.00	1.50	25.0	33.95	18	25	25
	11.25	7.50	1.50	32.1	66.96	11	19	32
	15.00	10.00	1.50	39.3	110.59	8	14	26
	1.50	1.00	2.00	20.7	3.32	20	20	20
	3.75	2.50	2.00	22.4	13.38	22	22	22
	7.50	5.00	2.00	28.8	38.17	18	28	28
	11.25	7.50	2.00	35.7	73.30	12	19	35
	15.00	10.00	2.00	42.8	119.04	8	14	26
	1.50	1.00	3.00	32.8	6.64	32	32	32
	3.75	2.50	3.00	31.3	16.65	31	31	31
	7.50	5.00	3.00	36.6	46.11	19	31	36
	11.25	7.50	3.00	43.2	85.87	12	20	37
	15.00	10.00	3.00	50.1	136.06	9	14	27

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	11.0	5.68	11	11	11
		1.50	1.00	12.7	10.08	12	12	12
		2.00	1.00	14.5	15.54	14	14	14
		2.50	1.00	16.4	22.13	16	16	16
		1.00	1.50	15.3	7.59	15	15	15
		1.50	1.50	16.6	12.85	16	16	16
		2.00	1.50	18.2	19.15	18	18	18
		2.50	1.50	20.0	26.60	18	20	20
		1.00	2.00	20.1	9.58	20	20	20
		1.50	2.00	20.8	15.69	20	20	20
		2.00	2.00	22.1	22.81	22	22	22
		2.50	2.00	23.7	31.05	19	23	23
		1.00	3.00	31.1	13.60	31	31	31
		1.50	3.00	30.2	21.59	30	30	30
		2.00	3.00	30.7	30.48	25	30	30
		2.50	3.00	31.8	40.40	19	31	31

Table-2B (Zone-16).

Recommended Pile Capacity

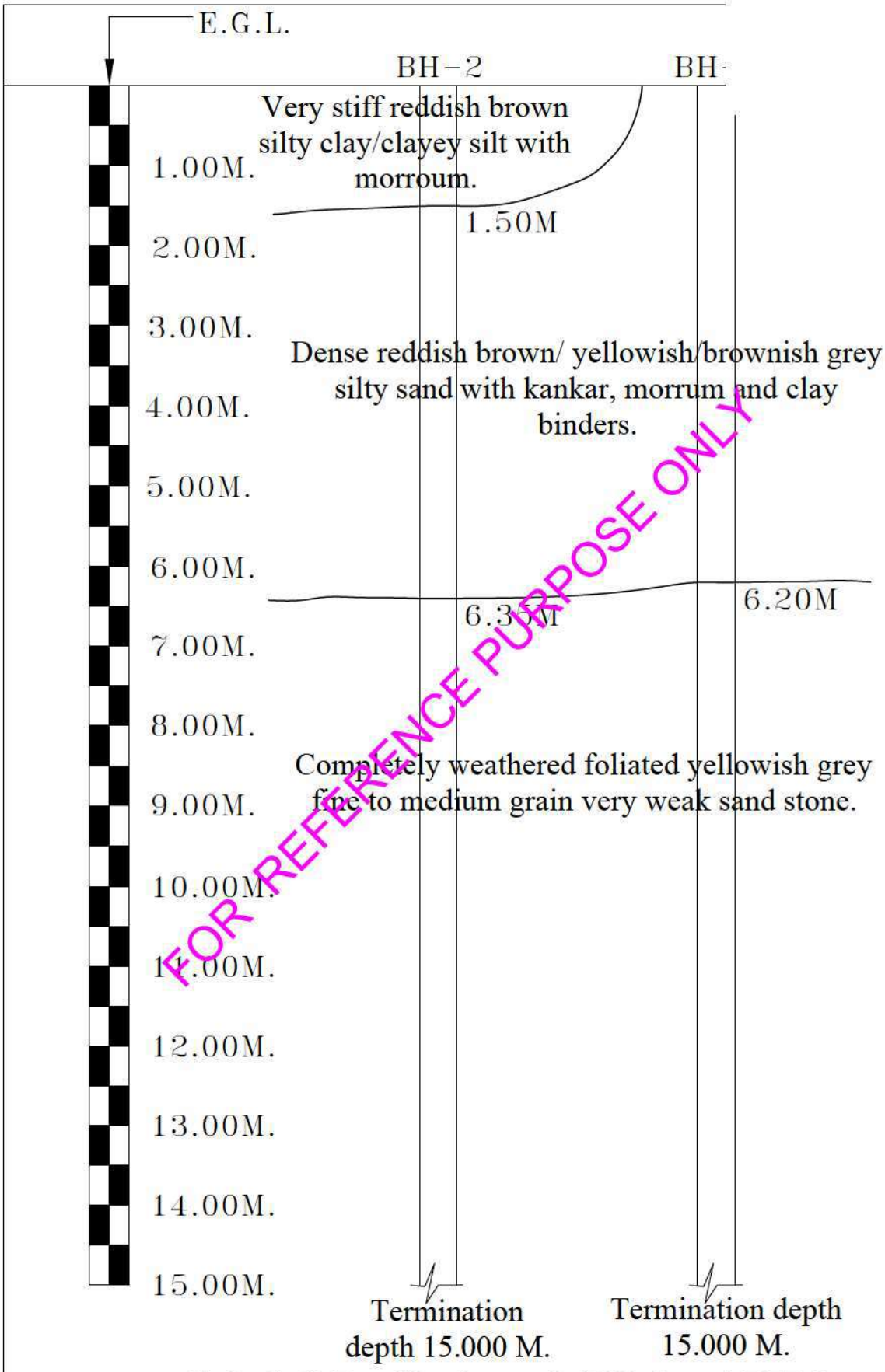
Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended Pile Capacity in Horizonta Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**33**	**13**	**5**
2	0.750	10.000	2.000	**52**	**18**	**7**
3	1.000	10.000	2.000	**86**	**24**	**12**
4	1.500	10.000	2.000	**160**	**36**	**23**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:117.204		Unit: Ash/ Slag Storage				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenc
Depth of Boring	6.350 M.	SPT	4	UDS	3	WS		Completed on : 20.05.2022
Type of Drilling		DCPT		DS	6	RCS	6	Water Struck At : 2.80M
Depth of Drilling	8.650 M.	VST		SCPT				Standing Water Table : 2.70M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff reddish brown silty clay/clayey silt with morroum.		01		DS1 DS2	0.50 M 1.00 M
Dense reddish brown silty sand with traces of clay binders.		02 03 04 05 06	N = 38 N = 40 N = 42 N >100	SPT1 DS3 UDS1 SPT2 DS4 UDS2 SPT3 DS5 UDS3 SPT4 DS6	1.50-1.95M 1.50-1.95M 2.00-2.45M 3.00-3.45M 3.00-3.45M 4.00-4.45M 4.50-4.95M 4.50-4.95M 5.00-5.45M 6.00-6.35M 6.00-6.35M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		07 08 09 10 11 12 13 14		RUN1 RUN2 RUN3 RUN4 RUN5 RUN6	6.35-7.50M TCR-23% RQD-NIL 7.50-9.00M TCR-40% RQD-NIL 9.00-10.50M TCR-53% RQD-NIL 10.50-12.00M TCR-58% RQD-NIL 12.00-13.50M TCR-65% RQD-NIL 13.50-15.00M TCR-73% RQD-NIL
Termination Depth 15.000 Mtr.		15			

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:118.006		Unit: Ash/ Slag Storage				Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	6.200 M.	SPT	4	UDS	3	WS		Completed on : 20.05.2022
Type of Drilling		DCPT		DS	6	RCS	6	Water Struck At : 2.60M
Depth of Drilling	8.800 M.	VST		SCPT				Standing Water Table : 2.50M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Dense yellowish/brownish grey silty sand with kankar, morrum and clay binders.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 32	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 38	SPT2	3.00-3.45M
				DS4	3.00-3.45M
		04		UDS2	4.00-4.45M
		05	N = 42	SPT3	4.50-4.95M
				DS5	4.50-4.95M
				UDS3	5.00-5.45M
		06	N >100	SPT4	6.00-6.20M
				DS6	6.00-6.20M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		07		RUN1	6.20-7.50M TCR-27% RQD-NIL
		08		RUN2	7.50-9.00M TCR-37% RQD-NIL
		09		RUN3	9.00-10.50M TCR-50% RQD-NIL
		10		RUN4	10.50-12.00M TCR-55% RQD-NIL
		11			
		12		RUN5	12.00-13.50M TCR-61% RQD-NIL
		13		RUN6	13.50-15.00M TCR-60% RQD-NIL
		14			
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-2 and BH-3

Sketch No.-SK/PDIL/	Ash/ Slag Storage	1678	02	2 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

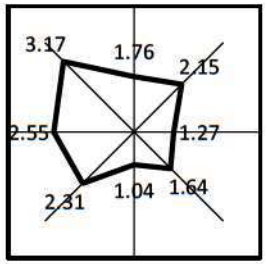
Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Very stiff reddish brown silty clay/clayey silt with morroum.	2	0.50	D																				1.76	13.25
		2	1.00	D							2.65									10	45	36	9		
II	Dense reddish brown silty sand with traces of clay binders.	2	1.50	DN	38																				
		2	2.00	UD		NP			1.81	14.27	2.66	1.58	2.75	DS	0.11	33			0.000	0	55	38	7		
		2	3.00	DN	40						2.66									0	54	41	5		
		2	4.00	UD		NP			1.79	16.82	2.65	1.53	2.86	DS	0.18	34			0.000	0	52	42	6		
		2	4.50	DN	42																				
		2	5.00	UD		NP			1.81	12.79	2.64			DS	0.15	32				0	70	21	9		
		2	6.00	DN	>100	NP			1.79		2.65			DS	0.14	34				0	73	20	7		
I	Dense yellowish/ brownish grey silty sand with kankar, morrum and clay binders.	3	0.50	D																				1.81	11.34
		3	1.00	D							2.66									0	68	21	11	1.79	12.56
		3	1.50	DN	32																				
		3	2.00	UD						12.22															
		3	3.00	DN	38						2.65									0	66	27	7		
		3	4.00	UD		NP			1.78	15.14	2.65	1.55	2.85	DS	0.14	35			0.000	0	53	35	12		
		3	4.50	DN	42				[illegible]					DS	0.16	34									
		3	5.00	UD		NP			1.80	14.72	2.66			DS	0.17	33				0	69	25	6		
		3	6.00	DN	>100						2.65									0	67	24	9		

Table ERT - 3

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Ash/ Slag Storage.
Client : Project & Development India Limited
Test Date : 01-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

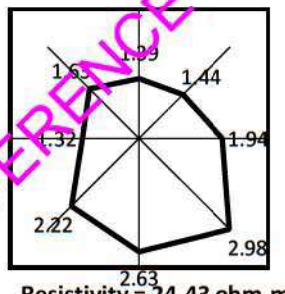
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.76	2.15	1.27	1.64	1.04	2.31	2.55	3.17	11.06	13.51	7.98	10.30	6.53	14.51	16.02	19.92
2	2.0	1.39	1.44	1.94	2.98	2.63	2.22	1.32	1.63	17.47	18.10	24.36	37.45	33.05	27.90	16.59	20.48
3	3.0	2.48	2.18	1.62	1.77	1.48	1.94	3.38	2.07	46.75	41.09	30.54	33.36	27.90	36.57	63.71	39.02
4	5.0	3.54	1.77	2.56	3.66	2.31	1.18	2.64	1.57	111.21	55.61	80.42	114.98	72.57	37.07	82.94	49.32
5	10.0	2.33	2.09	3.39	2.39	1.99	1.68	1.18	1.18	146.40	131.32	213.00	150.17	125.04	105.56	74.14	74.14
6	15.0	2.11	1.59	1.78	1.71	3.39	2.32	3.62	2.64	198.86	149.85	167.76	161.16	319.50	218.65	341.18	248.81
7	20.0	3.17	2.54	2.41	2.88	3.27	3.81	2.69	3.18	398.35	319.19	302.85	361.91	410.92	478.78	338.04	399.61

1.00Mtr.



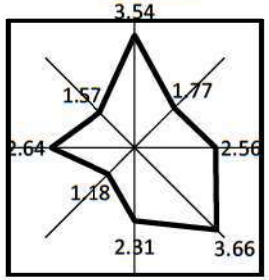
Resistivity = 12.48 ohm-m

2.00Mtr.



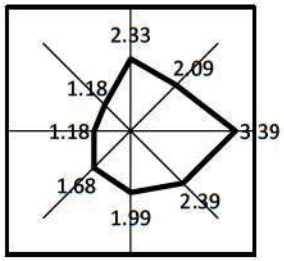
Resistivity = 24.43 ohm-m

5.00Mtr.



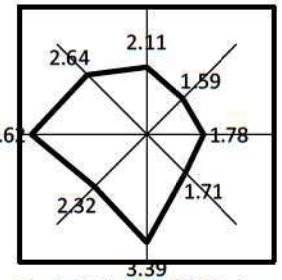
Resistivity = 75.52 ohm-m

10.00Mtr.



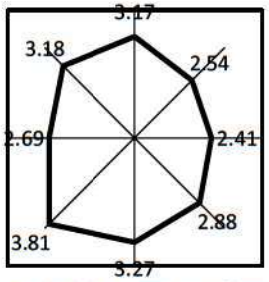
Resistivity = 127.47 ohm-m

15.00Mtr.



Resistivity = 225.72 ohm-m

20.00Mtr.



Resistivity = 376.21 ohm-m

ZONE-17

FIRE STATION

One (1) borehole was sunk in this area, viz borehole mar
the general sub soil profile it has been observed that the to
very dense yellowish grey silty sand with clay binders and continues up to the explored depth.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-17).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-17). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-17).

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					***ALLOWABLE BEARING CAPACITY***		
FOUNDATION TYPE	**L**	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 25 mm**	**For allowable settlement 40 mm**	**For allowable settlement 75 mm**
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	11.2	1.90	11	11	11
	2.50	2.50	1.00	15.2	7.83	15	15	15
	5.00	5.00	1.00	22.8	24.87	22	22	22
	7.50	7.50	1.00	30.5	50.83	15	24	30
	10.00	10.00	1.00	38.3	85.90	11	17	33
	1.00	1.00	1.50	16.1	2.57	16	16	16
	2.50	2.50	1.50	19.3	9.32	19	19	19
	5.00	5.00	1.50	26.6	28.13	23	26	26
	7.50	7.50	1.50	34.2	55.88	15	24	34
	10.00	10.00	1.50	41.9	92.61	11	18	33
	1.00	1.00	2.00	21.5	3.27	21	21	21
	2.50	2.50	2.00	23.5	10.56	23	23	23
	5.00	5.00	2.00	30.5	31.29	24	30	30
	7.50	7.50	2.00	38.0	60.88	15	24	38
	10.00	10.00	2.00	45.6	99.34	11	18	34
	1.00	1.00	3.00	34.1	4.95	34	34	34
	2.50	2.50	3.00	32.8	12.67	32	32	32
	5.00	5.00	3.00	38.6	37.15	25	38	38
	7.50	7.50	3.00	45.7	70.32	16	25	45
	10.00	10.00	3.00	53.2	112.53	11	18	35

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	10.5	2.37	10	10	10
	3.75	2.50	1.00	14.1	9.34	14	14	14
	7.50	5.00	1.00	21.1	29.34	17	21	21
	11.25	7.50	1.00	28.2	59.74	11	18	28
	15.00	10.00	1.00	35.3	100.49	8	14	26
	1.50	1.00	1.50	15.1	2.92	15	15	15
	3.75	2.50	1.50	17.9	11.28	17	17	17
	7.50	5.00	1.50	24.6	33.40	18	24	24
	11.25	7.50	1.50	31.6	65.92	11	19	31
	15.00	10.00	1.50	38.7	108.90	8	14	26
	1.50	1.00	2.00	20.2	3.24	20	20	20
	3.75	2.50	2.00	22.0	13.14	22	22	22
	7.50	5.00	2.00	28.3	37.50	18	28	28
	11.25	7.50	2.00	35.2	72.27	12	19	35
	15.00	10.00	2.00	42.2	117.37	8	14	26
	1.50	1.00	3.00	32.1	6.50	32	32	32
	3.75	2.50	3.00	30.7	16.33	30	30	30
	7.50	5.00	3.00	35.9	45.23	19	31	35
	11.25	7.50	3.00	42.5	84.48	12	20	37
	15.00	10.00	3.00	49.3	133.89	9	14	27

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWAB CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	10.8	5.57	10	10	10
		1.50	1.00	12.5	9.92	12	12	12
		2.00	1.00	14.3	15.33	14	14	14
		2.50	1.00	16.1	21.73	16	16	16
		1.00	1.50	15.0	7.45	15	15	15
		1.50	1.50	16.3	12.62	16	16	16
		2.00	1.50	17.9	18.83	17	17	17
		2.50	1.50	19.6	26.06	18	19	19
		1.00	2.00	19.7	9.39	19	19	19
		1.50	2.00	20.4	15.39	20	20	20
		2.00	2.00	21.7	22.40	21	21	21
		2.50	2.00	23.3	30.52	19	23	23
		1.00	3.00	30.4	13.29	30	30	30
		1.50	3.00	29.5	21.09	29	29	29
		2.00	3.00	30.1	29.88	25	30	30
		2.50	3.00	31.2	39.64	19	31	31

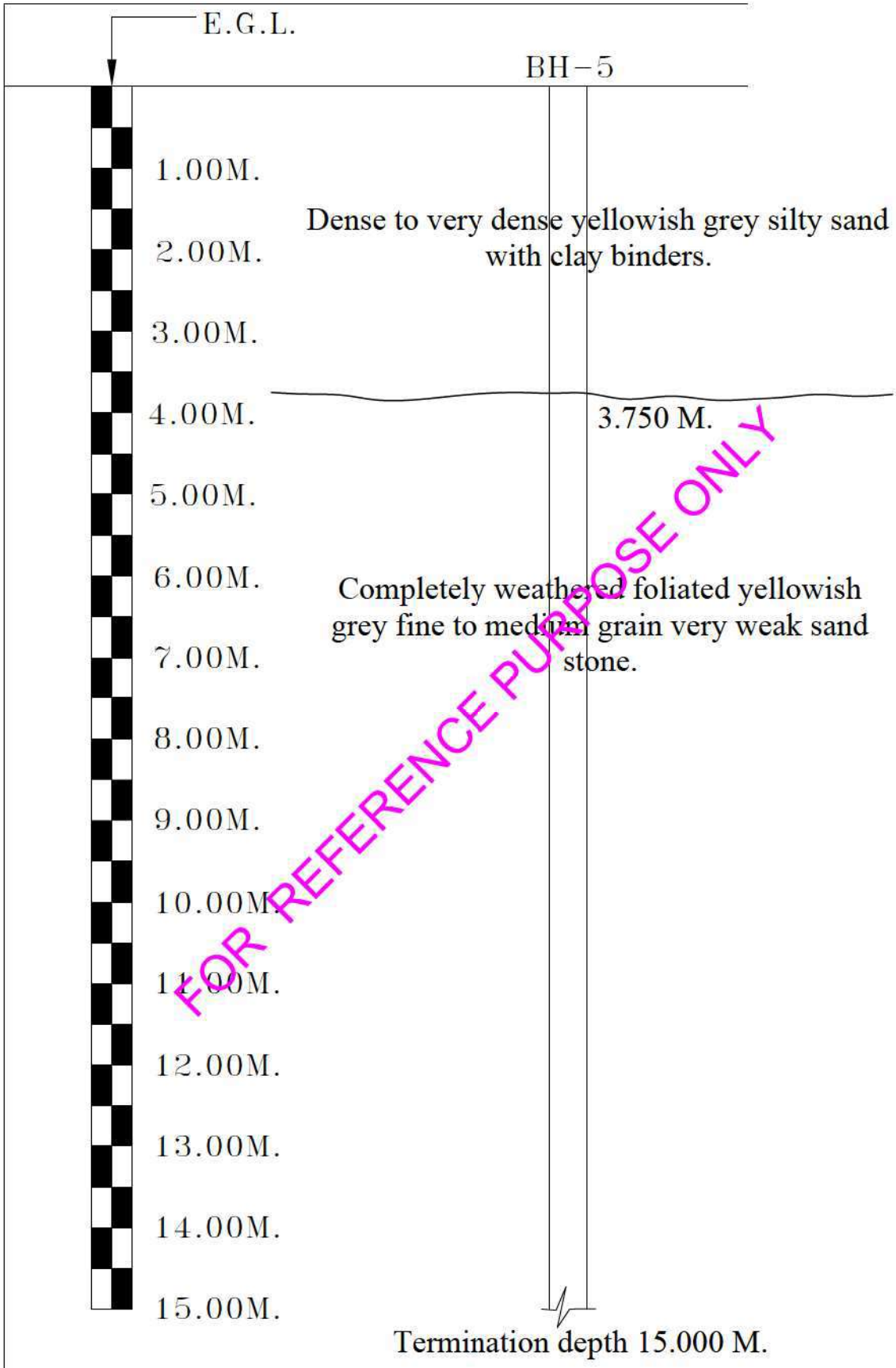
Table-2B (Zone-17).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**39**	**19**	**5**
2	0.750	10.000	2.000	**60**	**26**	**7**
3	1.000	10.000	2.000	**97**	**35**	**12**
4	1.500	10.000	2.000	**196**	**52**	**23**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hol
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:		E.G.L.:112.094	Unit: Fire Station.					Bore Hol
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commenc
Depth of Boring	3.750 M.	SPT	3	UDS	1	WS		Completed on : 20.05.2022
Type of Drilling		DCPT		DS	5	RCS	5	Water Struck At : 2.40M
Depth of Drilling	11.250 M.	VST		SCPT				Standing Water Table : 2.30M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Dense to very dense yellowish grey silty sand with clay binders.		01		DS1	0.50 M
				DS2	1.00 M
		02	N = 48	SPT1	1.50-1.95M
				DS3	1.50-1.95M
				UDS1	2.00-2.45M
		03	N = 70	SPT2	3.00-3.45M
				DS4	3.00-3.45M
			N > 100	SPT3	3.60-3.75M
		04		DS5	3.60-3.75M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				RUN1	3.75-5.00M TCR-18% RQD-NIL
		05		RUN2	5.00-6.50M TCR-25% RQD-NIL
		06		RUN3	6.50-8.00M TCR-37% RQD-NIL
		07			
		08		RUN4	8.00-9.50M TCR-47% RQD-NIL
		09		RUN5	9.50-11.00M TCR-54% RQD-NIL
		10			
		11		RUN6	11.00-12.50M TCR-58% RQD-NIL
		12		RUN7	12.50-14.00M TCR-66% RQD-NIL
		13			
		14		RUN8	14.00-15.00M TCR-74% RQD-NIL
Termination Depth 15.000 Mtr.		15			



Sub-Soil Profile through BH-5

Sketch No.-SK/PDIL/	Fire Station	1678	02	4 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

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	Sweling Pressure in kg/sqcm	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				%	%	%	%	gm/cc	%
I	Dense to very dense yellowish grey silty sand with clay binders.	5	0.50	D																				1.77	13.02
		5	1.00	D																				1.75	14.72
		5	1.50	DN	48															0	62	29	9		
		5	2.00	UD					1.79	17.44	2.68	1.52	3.05	DS	0.07	33				0	59	30	11		
		5	3.00	DN	70						2.65									0	74	18	8		
		5	3.60	DN	>100				1.80		2.64			DS	0.15	36				0	75	19	6		

ZONE-18

TRUCK PARKING AREA WITH DRIVER REST ROOM

Total one (1) borehole was sunk in this area, viz borehole n
general sub soil profile it has been observed that the top s
brown silty clay/ clayey silt with sand and the second layer as encountered up to the explored depth is very dense yellowish grey silty sand with clay binders.

In addition the following field tests have been carried out at this zone and results are being indicated in this chapter.

1. Electrical Resistivity Test:

   One (1) electrical resistivity tests has been carried out at this zone marked as ERT-4.

Discussion and Recommendation:

Based on the sub-soil condition, shallow foundation has been recommended for foundation system of medium to heavily loaded structures. Bearing capacities for different size and shapes of foundations are indicated in the Table-2A (Zone-18).

Pile Foundation has also been recommended for foundation of heavily loaded structures. Pile Capacities for different dia of pile are indicated in the Table-2B (Zone-18). It is further recommended to carry out initial pile load test for load under compression, pull-out and horizontal shear, in order to confirm the recommended pile capacities and to take corrective measures, if required.

Table-2A (Zone-18).

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	51.9	24.62	51	51	51
	2.50	2.50	1.00	46.7	67.94	17	27	46
	5.00	5.00	1.00	45.0	128.23	8	14	26
	7.50	7.50	1.00	44.4	173.13	6	10	19
	10.00	10.00	1.00	44.1	209.94	5	8	15
	1.00	1.00	1.50	56.2	25.14	55	56	56
	2.50	2.50	1.50	48.4	65.94	18	29	48
	5.00	5.00	1.50	45.8	123.54	9	14	27
	7.50	7.50	1.50	45.0	166.29	6	10	20
	10.00	10.00	1.50	44.5	200.99	5	8	16
	1.00	1.00	2.00	60.6	26.11	58	60	60
	2.50	2.50	2.00	50.2	63.43	19	31	50
	5.00	5.00	2.00	46.7	118.42	9	15	29
	7.50	7.50	2.00	45.6	158.70	7	11	21
	10.00	10.00	2.00	45.0	191.76	5	9	17
	1.00	1.00	3.00	69.2	28.49	60	69	69
	2.50	2.50	3.00	53.6	56.12	23	38	53
	5.00	5.00	3.00	48.4	105.36	11	18	34
	7.50	7.50	3.00	46.7	140.57	8	13	24
	10.00	10.00	3.00	45.8	169.97	6	10	20

ALLOWABLE BEARING CAPACITY FROM SHE/
SETTLEMENT CRITERIA

	FOOTING DIMENSIONS					ALLOWABLE BEARING CAPACITY		
FOUNDATION TYPE	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	45.2	27.93	40	45	45
	3.75	2.50	1.00	40.7	73.79	13	22	40
	7.50	5.00	1.00	39.2	132.09	7	11	22
	11.25	7.50	1.00	38.7	175.33	5	8	16
	15.00	10.00	1.00	38.5	211.62	4	7	13
	1.50	1.00	1.50	49.0	25.89	47	49	49
	3.75	2.50	1.50	42.2	72.08	14	23	42
	7.50	5.00	1.50	40.0	127.78	7	12	23
	11.25	7.50	1.50	39.1	168.58	5	9	17
	15.00	10.00	1.50	38.8	202.81	4	7	14
	1.50	1.00	2.00	52.8	23.18	52	52	52
	3.75	2.50	2.00	43.7	69.76	15	25	43
	7.50	5.00	2.00	40.7	122.44	8	13	24
	11.25	7.50	2.00	39.7	161.13	6	9	18
	15.00	10.00	2.00	39.2	193.88	5	8	15
	1.50	1.00	3.00	60.3	33.39	45	60	60
	3.75	2.50	3.00	46.8	63.10	18	29	46
	7.50	5.00	3.00	42.2	109.61	9	15	28
	11.25	7.50	3.00	40.7	143.87	7	11	21
	15.00	10.00	3.00	40.0	173.80	5	9	17

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWAB CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
CONTINUOUS STRIP FOOTINGS		1.00	1.00	39.9	49.34	20	32	39
		1.50	1.00	37.7	71.72	13	21	37
		2.00	1.00	36.6	93.98	9	15	29
		2.50	1.00	35.9	116.08	7	12	23
		1.00	1.50	43.2	51.38	21	33	43
		1.50	1.50	39.9	74.02	13	21	39
		2.00	1.50	38.3	96.54	9	15	29
		2.50	1.50	37.3	115.28	8	12	24
		1.00	2.00	46.6	53.22	21	35	46
		1.50	2.00	42.1	76.11	13	22	41
		2.00	2.00	39.9	98.69	10	16	30
		2.50	2.00	38.6	113.39	8	13	25
		1.00	3.00	53.2	55.73	23	38	53
		1.50	3.00	46.6	79.84	14	23	43
		2.00	3.00	43.2	94.23	11	18	34
		2.50	3.00	41.3	107.10	9	15	28

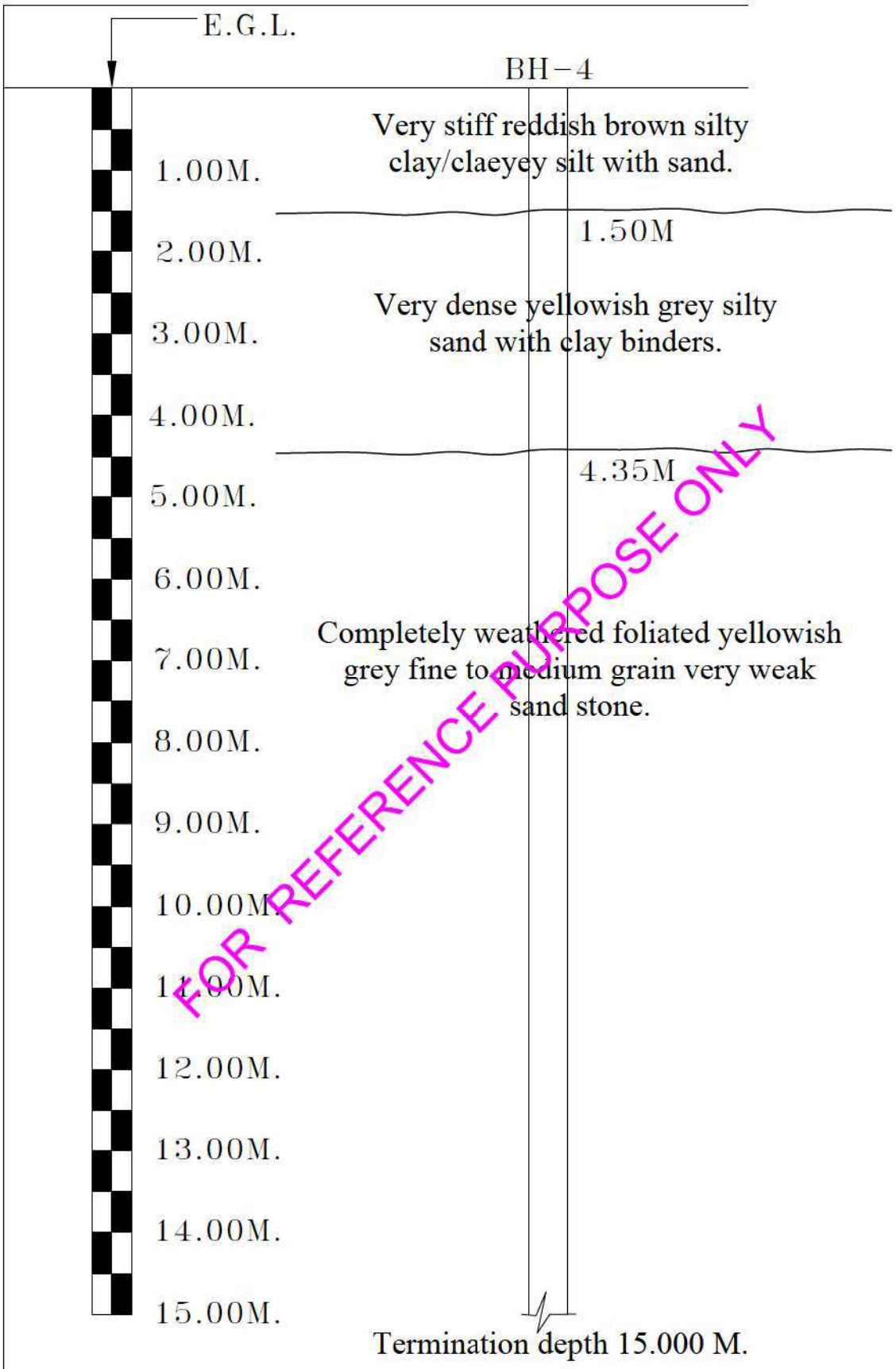
Table-2B (Zone-18).

Recommended Pile Capacity

Sl.No	Pile Dia , D	Total Length of Pile, L	Cut-off Level	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended I Capacity in Horiz Shear
	Mtr	Mtr.	Mtr.	T	T	T
1	0.600	10.000	2.000	**38**	**18**	**5**
2	0.750	10.000	2.000	**59**	**25**	**7**
3	1.000	10.000	2.000	**95**	**33**	**12**
4	1.500	10.000	2.000	**193**	**49**	**23**

BORE LOG SHEET		Centre for Advanced Engineering						Bore Hole
Project: SOIL_PDIL_ECL SANCTORIA								Job No.:
Co-ord:	E.G.L.: 117.107	Unit: Truck Parking with Rest Room.						Bore Hole
Type of Boring	Shell & Auger	FIELDTEST	NOS.	SAMPLES	NOS.	SAMPLES	NOS.	Commence
Depth of Boring	4.350 M.	SPT	3	UDS	1	WS		Completed on : 20.05.2022
Type of Drilling		DCPT		DS	5	RCS	8	Water Struck At : 2.00M
Depth of Drilling	10.650 M.	VST		SCPT				Standing Water Table : 1.90M

DESCRIPTION	SYMBOL	DEPTH	N-VALUE	SAMPLE NO.	SAMPLE DEPTH
Very stiff reddish brown silty clay/claeyey silt with sand.		01		DS1 DS2	0.50 M 1.00 M
Very dense yellowish grey silty sand with clay binders.		02 03 04	N = 59 N = 68 N > 100	SPT1 DS3 UDS1 SPT2 DS4 SPT3 DS5	1.50-1.95M 1.50-1.95M 2.00-2.45M 3.00-3.45M 3.00-3.45M 4.00-4.35M 4.00-4.35M
Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.		05 06 07 08 09 10 11 12 13 14 15		RUN1 RUN2 RUN3 RUN4 RUN5 RUN6 RUN7 RUN8	4.35-5.50M TCR-22% RQD-NIL 5.50-7.00M TCR-30% RQD-NIL 7.00-8.50M TCR-43% RQD-NIL 8.50-10.00M TCR-59% RQD-NIL 10.00-11.50M TCR-52% RQD-NIL 11.50-13.00M TCR-66% RQD-NIL 13.00-14.50M TCR-70% RQD-NIL 14.50-15.00M TCR-60% RQD-NIL
Termination Depth 15.000 Mtr.					



Sub-Soil Profile through BH-4

Sketch No.-SK/PDIL/	Truck Parking with Rest Room	1678	02	3 of 13

SUMMARY OF LABORATORY TEST RESULTS

Table-4

Project: Geotechnical Investigation Work for Proposed Coalgas to Methanol Project at Sactoria, West Bardhaman (WB)

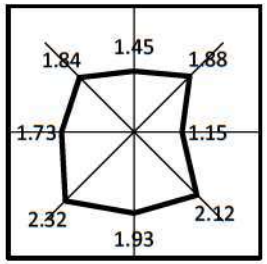
Layer No.	Description of layer	Bore Hole No.	Depth	Sample Type - UD/D/ DN	SPT VALUE (N)	Atterberg Limits			Bulk Density in gm/cc	Water Content in %	Specific Gravity	Dry Density in gm/cc	Unconfined Test in Kg/sqcm	Shear Test			Pressure (Kg/sqcm)	Co-eff. of volume compressibility in sqcm/kg	Sweling Pressure in kg/sqcm	Void Ratio	Grading				Modified Proctor Density	
						LL	PL	SL						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)	MDD	OMC
			Meter			%	%	%	γ_b	m	G	γ_d	q_u	UU/CU/ DS	C	ϕ				e	%	%	%	%	gm/cc	%
I	Very stiff reddish brown silty clay/ claeyey silt with sand	4	0.50	D																					1.80	12.79
		4	1.00	D							2.66										0	32	54	14		
II	Very dense yellowish grey silty sand with clay binders.	4	1.50	DN	59	37	21	7													0	49	40	11		
		4	2.00	UD		38	22	8	1.95	16.16	2.66	1.68	3.12	UU	1.62	0	0.00-0.10	0.0419	0.000		0	48	44	8		
																	0.10-0.20	0.0381								
														CU	0.14	11	0.20-0.40	0.0317								
																	0.40-0.80	0.0259								
														CD	0.02	26	0.80-1.60	0.0169								
																	1.60-3.20	0.0114								
		4	3.00	DN	68						2.67										0	45	43	12		
		4	4.00	DN	>100				1.80		2.65		DS	0.14	32						0	71	22	7		

Table ERT - 4

Project : Geo-Technical investigation work for proposed coalgas to methanol project at Sanctoria, West Bardhaman (W.B.)
Location : Truck Parking Area with Driver Rest Room.
Client : Project & Development India Limited
Test Date : 01-06-2022
Instrument : Metravi ERT-1501, SL. No.: 10109809

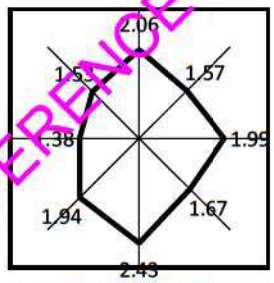
Sl. No.	Electrode Spacing 's' m	Measured Resistance "R" (Ω)								Apparent Resistivity "ρ" (Ω-m")							
		North	North-East	East	East-South	South	South-West	West	North-West	North	North-East	East	East-South	South	South-West	West	North-West
1	1.0	1.45	1.88	1.15	2.12	1.93	2.32	1.73	1.84	9.11	11.81	7.23	13.32	12.13	14.58	10.87	11.56
2	2.0	2.06	1.57	1.99	1.67	2.43	1.94	1.38	1.53	25.89	19.73	25.01	20.99	30.54	24.38	17.34	19.23
3	3.0	1.95	2.38	1.38	2.06	3.11	2.99	2.02	1.86	36.76	44.86	26.01	38.83	58.62	56.36	38.08	35.06
4	5.0	2.33	3.31	1.73	3.12	2.87	1.91	2.8	3.89	73.20	103.99	54.35	98.02	90.16	60.00	87.96	122.21
5	10.0	3.45	4.18	3.34	2.47	1.99	2.83	3.92	2.63	216.77	262.64	209.86	155.19	125.04	177.81	246.30	165.25
6	15.0	4.09	3.89	2.84	3.68	2.49	1.95	4.04	3.57	385.47	366.62	267.66	346.83	234.68	183.78	380.76	336.46
7	20.0	3.96	2.77	4.66	1.78	2.44	3.72	2.86	4.01	497.63	348.09	585.59	223.68	306.62	467.47	359.40	503.91

1.00Mtr.



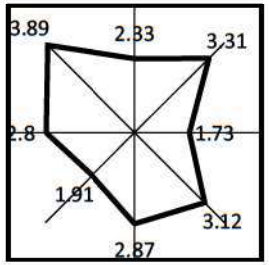
Resistivity = 11.33 ohm-m

2.00Mtr.



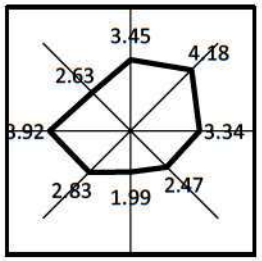
Resistivity = 22.89 ohm-m

5.00Mtr.



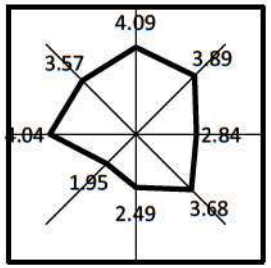
Resistivity = 86.24 ohm-m

10.00Mtr.



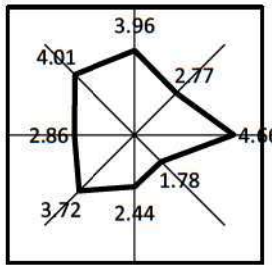
Resistivity = 194.86 ohm-m

15.00Mtr.



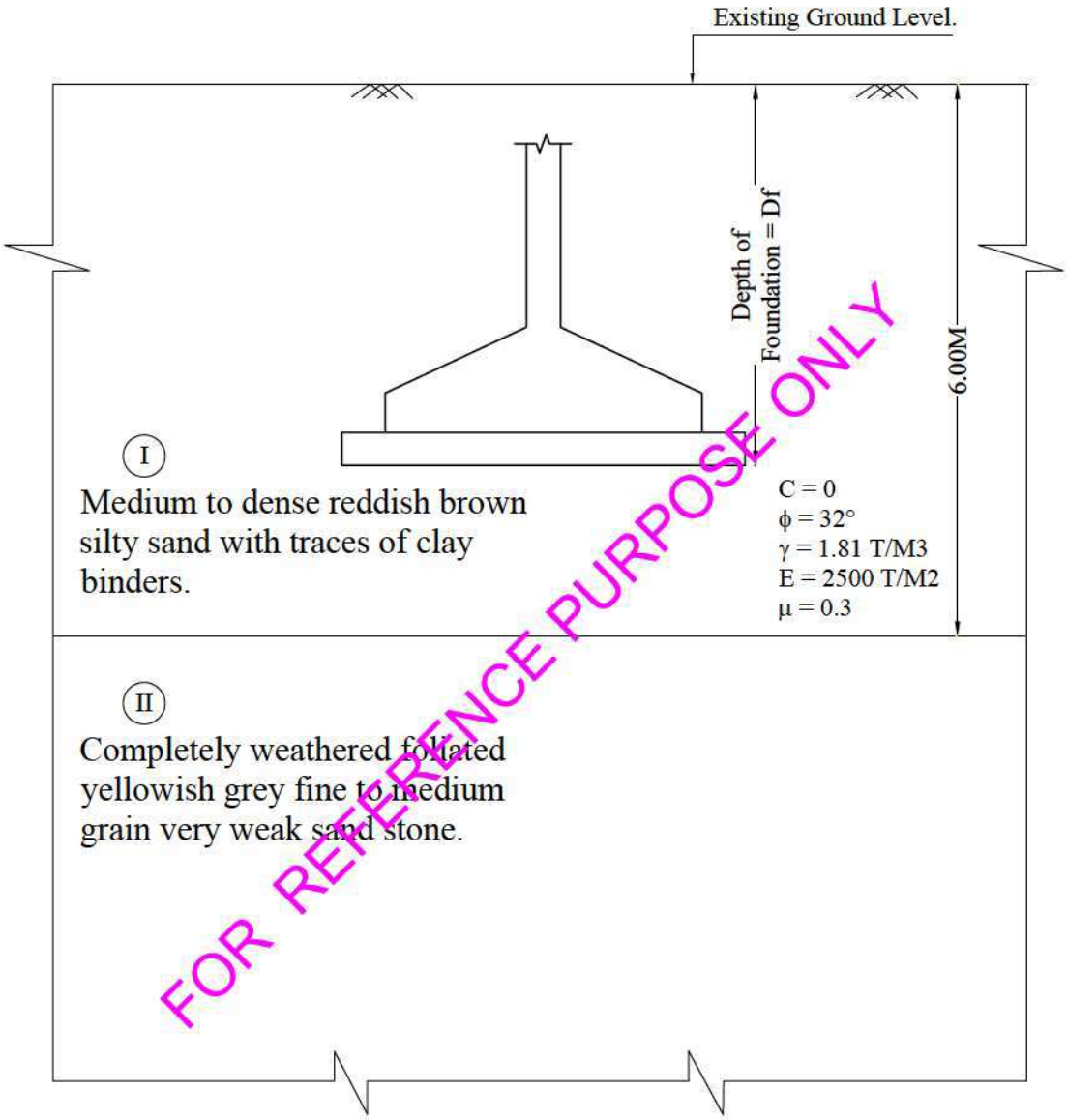
Resistivity = 312.78 ohm-m

20.00Mtr.



Resistivity = 411.55 ohm-m

SAMPLE CALCULATION OF BEARING CAPACITY AT THE LOCATION OF STEAM GENERATION PLANT



Foundation Model at the Location of BH-1

Scale :- N.T.S.

Sketch No.-SK/PDIL/	Steam Generation Plant	1678	03	1 of 2

SUMMARY OF FIELD/LABORATORY DATA AND CONSIDERED D

Sub-soil Srtatification & Properties considered in foundation model

	Description of layer	Layer Thickness	Field N Observed		Corrected N Value
			Depth	Value	
		Meter	Meter		
Strata1	Medium to dense reddish brown silty sand with clay binders.	6.00	1.50	28	41
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.	9.00			
Strata 3	Not explored				
Strata4	Not explored				
Strata5	Not explored				
Strata6	Not explored				
Strata7	Not explored				
Strata8	Not explored				

Depth of water Table from EGL = 2.600 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	m_v
Strata1	Medium to dense reddish brown silty sand with clay binders.	0	32	1.81	
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				
Strata 3	NA				
Strata4	NA				
Strata5	NA				
Strata6	NA				
Strata7	NA				
Strata8	NA				

DESIGN PARAMETERS

c	ϕ	Depth of Water Table from EGL*	γ	m_v	E	μ
T/sqm	Degrees	meter	T/Cum	Sqm/T	T/sqm	
0	32	0	1.81	0.00000	2500	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 = 32

Friction Angle>=32degrees, General 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+0.5γBNγsγdγiγW'

2 For Local Shear Failure, q(ult) = c'N'cscdcic + q(N'q-1)sqdqiq+0.5γBN'γsγdγiγW'

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	1.00	1.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.33	1.17	1.17	1	1	1	0.5	2.5	8.7
	2.50	2.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.13	1.07	1.07	1	1	1	0.5	2.5	11.7
	5.00	5.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	17.4
	7.50	7.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.04	1.02	1.02	1	1	1	0.5	2.5	23.2
	10.00	10.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.03	1.02	1.02	1	1	1	0.5	2.5	29.0
	1.00	1.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.50	1.25	1.25	1	1	1	0.5	2.5	12.6
	2.50	2.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.20	1.10	1.10	1	1	1	0.5	2.5	14.9
	5.00	5.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.10	1.05	1.05	1	1	1	0.5	2.5	20.4
	7.50	7.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	26.1
	10.00	10.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.05	1.02	1.02	1	1	1	0.5	2.5	31.9
	1.00	1.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.66	1.33	1.33	1	1	1	0.5	2.5	16.9
	2.50	2.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.27	1.13	1.13	1	1	1	0.5	2.5	18.3
	5.00	5.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.13	1.07	1.07	1	1	1	0.5	2.5	23.5
	7.50	7.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.09	1.04	1.04	1	1	1	0.5	2.5	29.1
	10.00	10.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	34.8
	1.00	1.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.99	1.50	1.50	1	1	1	0.5	2.5	26.7
	2.50	2.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.40	1.20	1.20	1	1	1	0.5	2.5	25.6
	5.00	5.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.20	1.10	1.10	1	1	1	0.5	2.5	29.9
	7.50	7.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.13	1.07	1.07	1	1	1	0.5	2.5	35.2
	10.00	10.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.10	1.05	1.05	1	1	1	0.5	2.5	40.8

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 RECTANGULAR FOOTINGS	1.50	1.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.33	1.17	1.17	1	1	1	0.5	2.5	8.2
	3.75	2.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.13	1.07	1.07	1	1	1	0.5	2.5	10.9
	7.50	5.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.07	1.03	1.03	1	1	1	0.5	2.5	16.1
	11.25	7.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.04	1.02	1.02	1	1	1	0.5	2.5	21.4
	15.00	10.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.03	1.02	1.02	1	1	1	0.5	2.5	26.7
	1.50	1.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.50	1.25	1.25	1	1	1	0.5	2.5	11.8
	3.75	2.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.20	1.10	1.10	1	1	1	0.5	2.5	13.9
	7.50	5.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.10	1.05	1.05	1	1	1	0.5	2.5	18.9
	11.25	7.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.07	1.03	1.03	1	1	1	0.5	2.5	24.1
	15.00	10.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.05	1.02	1.02	1	1	1	0.5	2.5	29.4
	1.50	1.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.66	1.33	1.33	1	1	1	0.5	2.5	15.8
	3.75	2.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.27	1.13	1.13	1	1	1	0.5	2.5	17.1
	7.50	5.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.13	1.07	1.07	1	1	1	0.5	2.5	21.8
	11.25	7.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.09	1.04	1.04	1	1	1	0.5	2.5	27.0
	15.00	10.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.07	1.03	1.03	1	1	1	0.5	2.5	32.2
	1.50	1.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.99	1.50	1.50	1	1	1	0.5	2.5	25.1
	3.75	2.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.40	1.20	1.20	1	1	1	0.5	2.5	24.0
	7.50	5.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.20	1.10	1.10	1	1	1	0.5	2.5	27.9
	11.25	7.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.13	1.07	1.07	1	1	1	0.5	2.5	32.7
	15.00	10.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.10	1.05	1.05	1	1	1	0.5	2.5	37.9

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
CONTINUOUS STRIP FOOTINGS		1.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.33	1.17	1.17	1	1	1	0.5	2.5	8.4
		1.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.22	1.11	1.11	1	1	1	0.5	2.5	9.6
		2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.17	1.08	1.08	1	1	1	0.5	2.5	11.0
		2.50	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.13	1.07	1.07	1	1	1	0.5	2.5	12.3
		1.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.50	1.25	1.25	1	1	1	0.5	2.5	11.7
		1.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.33	1.17	1.17	1	1	1	0.5	2.5	12.6
		2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.25	1.12	1.12	1	1	1	0.5	2.5	13.8
		2.50	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.20	1.10	1.10	1	1	1	0.5	2.5	15.1
		1.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.66	1.33	1.33	1	1	1	0.5	2.5	15.3
		1.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.44	1.22	1.22	1	1	1	0.5	2.5	15.9
		2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.33	1.17	1.17	1	1	1	0.5	2.5	16.8
		2.50	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.27	1.13	1.13	1	1	1	0.5	2.5	18.0
		1.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.99	1.50	1.50	1	1	1	0.5	2.5	23.7
		1.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.66	1.33	1.33	1	1	1	0.5	2.5	23.0
		2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.50	1.25	1.25	1	1	1	0.5	2.5	23.4
		2.50	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.00	1.00	1.00	1.40	1.20	1.20	1	1	1	0.5	2.5	24.2

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 $Sc = m_v \Delta pH$	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	1.00	1.00	1.00	8.7	0.3	2500	0.000	2.18	2.00	0.95	3.01	0.00	3.01	0.725	0.8	1.77
	2.50	2.50	1.00	11.7	0.3	2500	0.000	2.93	5.00	0.95	10.11	0.00	10.11	0.89	0.8	7.23
	5.00	5.00	1.00	17.4	0.3	2500	0.000	7.73	5.00	0.95	30.08	0.00	30.08	0.945	0.8	22.77
	7.50	7.50	1.00	23.2	0.3	2500	0.000	13.05	5.00	0.95	60.17	0.00	60.17	0.963	0.8	46.40
	10.00	10.00	1.00	29	0.3	2500	0.000	18.56	5.00	0.95	100.28	0.00	100.28	0.973	0.8	78.05
	1.00	1.00	1.50	12.6	0.3	2500	0.000	3.15	2.00	0.95	4.36	0.00	4.36	0.684	0.8	2.41
	2.50	2.50	1.50	14.9	0.3	2500	0.000	4.13	4.50	0.95	12.88	0.00	12.88	0.835	0.8	8.63
	5.00	5.00	1.50	20.4	0.3	2500	0.000	9.70	4.50	0.95	35.27	0.00	35.27	0.918	0.8	25.89
	7.50	7.50	1.50	26.1	0.3	2500	0.000	15.44	4.50	0.95	67.69	0.00	67.69	0.945	0.8	51.17
	10.00	10.00	1.50	31.9	0.3	2500	0.000	21.26	4.50	0.95	110.31	0.00	110.31	0.959	0.8	84.61
	1.00	1.00	2.00	16.9	0.3	2500	0.000	4.23	2.00	0.95	5.84	0.00	5.84	0.659	0.8	3.08
	2.50	2.50	2.00	18.3	0.3	2500	0.000	5.65	4.00	0.95	15.82	0.00	15.82	0.78	0.8	9.87
	5.00	5.00	2.00	23.5	0.3	2500	0.000	11.99	4.00	0.95	40.63	0.00	40.63	0.89	0.8	28.93
	7.50	7.50	2.00	29.1	0.3	2500	0.000	18.14	4.00	0.95	75.47	0.00	75.47	0.927	0.8	55.95
	10.00	10.00	2.00	34.8	0.3	2500	0.000	24.17	4.00	0.95	120.34	0.00	120.34	0.945	0.8	90.98
	1.00	1.00	3.00	26.7	0.3	2500	0.000	6.68	2.00	0.95	9.23	0.00	9.23	0.63	0.8	4.65
	2.50	2.50	3.00	25.6	0.3	2500	0.000	10.00	3.00	0.95	22.13	0.00	22.13	0.67	0.8	11.86
	5.00	5.00	3.00	29.9	0.3	2500	0.000	17.69	3.00	0.95	51.70	0.00	51.70	0.835	0.8	34.53
	7.50	7.50	3.00	35.2	0.3	2500	0.000	24.44	3.00	0.95	91.29	0.00	91.29	0.89	0.8	65.00
	10.00	10.00	3.00	40.8	0.3	2500	0.000	30.85	3.00	0.95	141.09	0.00	141.09	0.918	0.8	103.56

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 $Sc = m_v \Delta pH$	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 RECTANGULAR FOOTINGS	1.50	1.00	1.00	8.2	0.3	2500	0.000	2.46	2.00	1.2	3.58	0.00	3.58	0.775	0.8	2.22
	3.75	2.50	1.00	10.9	0.3	2500	0.000	3.27	5.00	1.2	11.90	0.00	11.90	0.91	0.8	8.67
	7.50	5.00	1.00	16.1	0.3	2500	0.000	8.05	5.00	1.2	35.16	0.00	35.16	0.955	0.8	26.87
	11.25	7.50	1.00	21.4	0.3	2500	0.000	13.13	5.00	1.2	70.11	0.00	70.11	0.97	0.8	54.41
	15.00	10.00	1.00	26.7	0.3	2500	0.000	18.31	5.00	1.2	116.63	0.00	116.63	0.978	0.8	91.21
	1.50	1.00	1.50	11.8	0.3	2500	0.000	3.34	2.00	1.2	5.15	0.00	5.15	0.663	0.8	2.73
	3.75	2.50	1.50	13.9	0.3	2500	0.000	4.57	4.50	1.2	15.18	0.00	15.18	0.865	0.8	10.51
	7.50	5.00	1.50	18.9	0.3	2500	0.000	10.03	4.50	1.2	41.28	0.00	41.28	0.933	0.8	30.80
	11.25	7.50	1.50	24.1	0.3	2500	0.000	15.45	4.50	1.2	78.95	0.00	78.95	0.955	0.8	60.32
	15.00	10.00	1.50	29.4	0.3	2500	0.000	20.87	4.50	1.2	128.42	0.00	128.42	0.966	0.8	99.28
	1.50	1.00	2.00	15.8	0.3	2500	0.000	4.74	2.00	1.2	6.90	0.00	6.90	0.551	0.8	3.04
	3.75	2.50	2.00	17.1	0.3	2500	0.000	6.20	4.00	1.2	18.67	0.00	18.67	0.82	0.8	12.26
	7.50	5.00	2.00	21.8	0.3	2500	0.000	12.29	4.00	1.2	47.61	0.00	47.61	0.91	0.8	34.67
	11.25	7.50	2.00	27	0.3	2500	0.000	18.10	4.00	1.2	88.45	0.00	88.45	0.94	0.8	66.52
	15.00	10.00	2.00	32.2	0.3	2500	0.000	23.68	4.00	1.2	140.65	0.00	140.65	0.955	0.8	107.47
	1.50	1.00	3.00	25.1	0.3	2500	0.000	7.53	2.00	1.2	10.96	0.00	10.96	0.695	0.8	6.09
	3.75	2.50	3.00	24	0.3	2500	0.000	10.71	3.00	1.2	26.21	0.00	26.21	0.731	0.8	15.32
	7.50	5.00	3.00	27.9	0.3	2500	0.000	17.88	3.00	1.2	60.93	0.00	60.93	0.865	0.8	42.18
	11.25	7.50	3.00	32.7	0.3	2500	0.000	24.04	3.00	1.2	107.13	0.00	107.13	0.91	0.8	78.00
	15.00	10.00	3.00	37.9	0.3	2500	0.000	29.96	3.00	1.2	165.55	0.00	165.55	0.933	0.8	123.52

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 $Sc = m_v \Delta pH$	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
CONTINUOUS STRIP FOOTINGS		1.00	1.00	8.4	0.3	2500	0.000	3.94	2.00	2.289	7.00	0.00	7.00	0.929	0.8	5.20
		1.50	1.00	9.6	0.3	2500	0.000	4.50	3.00	2.289	12.00	0.00	12.00	0.953	0.8	9.15
		2.00	1.00	11	0.3	2500	0.000	5.16	4.00	2.289	18.33	0.00	18.33	0.964	0.8	14.15
		2.50	1.00	12.3	0.3	2500	0.000	5.77	5.00	2.289	25.63	0.00	25.63	0.972	0.8	19.92
		1.00	1.50	11.7	0.3	2500	0.000	5.48	2.00	2.289	9.75	0.00	9.75	0.893	0.8	6.97
		1.50	1.50	12.6	0.3	2500	0.000	5.91	3.00	2.289	15.75	0.00	15.75	0.929	0.8	11.71
		2.00	1.50	13.8	0.3	2500	0.000	6.47	4.00	2.289	23.00	0.00	23.00	0.947	0.8	17.42
		2.50	1.50	15.1	0.3	2500	0.000	7.50	4.50	2.289	31.46	0.00	31.46	0.957	0.8	24.10
		1.00	2.00	15.3	0.3	2500	0.000	7.17	2.00	2.289	12.75	0.00	12.75	0.858	0.8	8.75
		1.50	2.00	15.9	0.3	2500	0.000	7.45	3.00	2.289	19.88	0.00	19.88	0.905	0.8	14.40
		2.00	2.00	16.8	0.3	2500	0.000	7.88	4.00	2.289	28.00	0.00	28.00	0.929	0.8	20.81
		2.50	2.00	18	0.3	2500	0.000	9.49	4.00	2.289	37.50	0.00	37.50	0.943	0.8	28.30
		1.00	3.00	23.7	0.3	2500	0.000	11.11	2.00	2.289	19.75	0.00	19.75	0.787	0.8	12.43
		1.50	3.00	23	0.3	2500	0.000	10.78	3.00	2.289	28.75	0.00	28.75	0.858	0.8	19.73
		2.00	3.00	23.4	0.3	2500	0.000	12.73	3.00	2.289	39.00	0.00	39.00	0.893	0.8	27.88
		2.50	3.00	24.2	0.3	2500	0.000	14.54	3.00	2.289	50.42	0.00	50.42	0.915	0.8	36.90

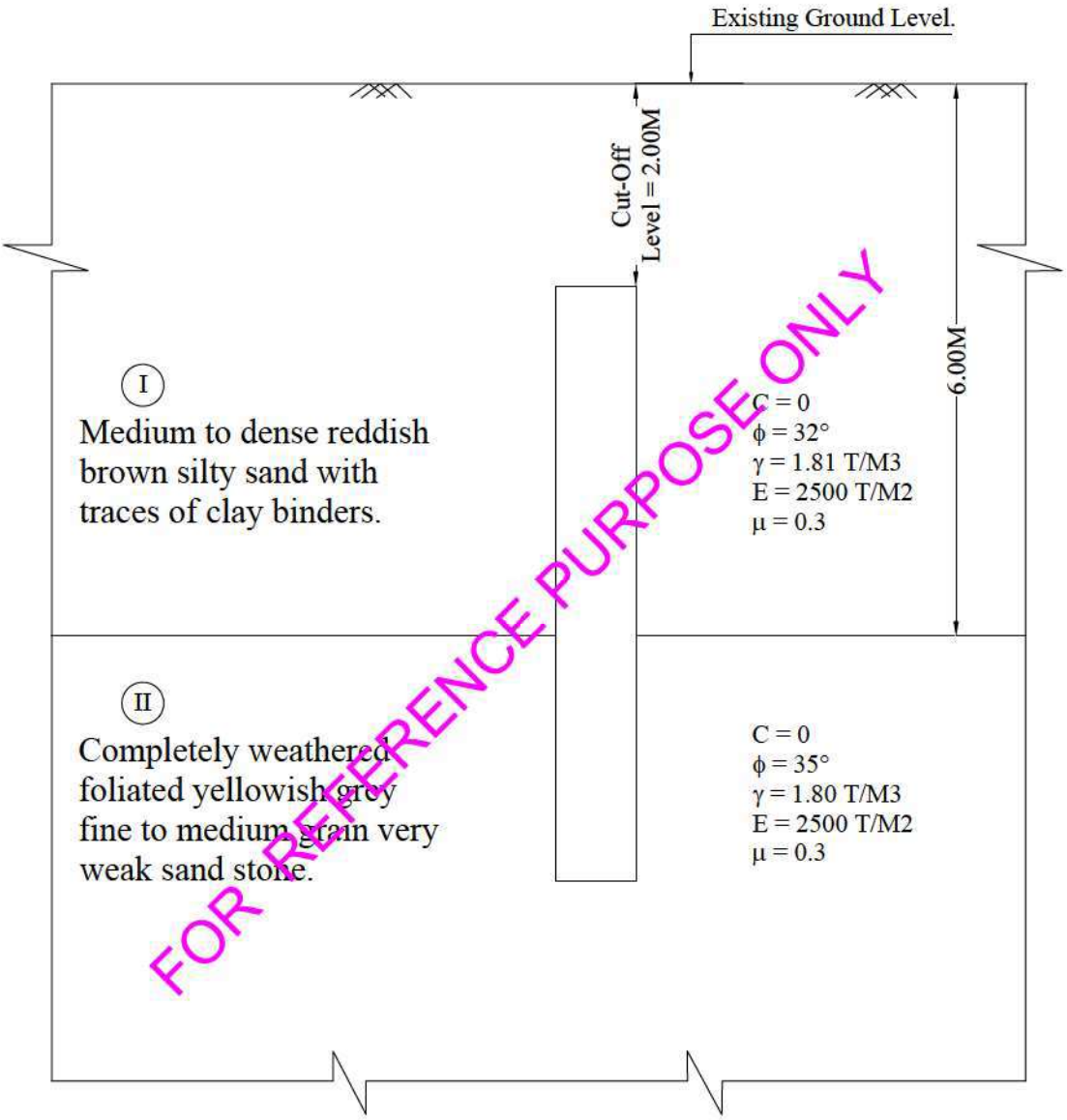
ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS			NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	ALLOWABLE BEARING CAPACITY		
	L	B	Df			For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	1.00	1.00	1.00	8.7	1.77	8	8	8
	2.50	2.50	1.00	11.7	7.23	11	11	11
	5.00	5.00	1.00	17.4	22.77	17	17	17
	7.50	7.50	1.00	23.2	46.40	12	19	23
	10.00	10.00	1.00	29.0	78.05	9	14	27
	1.00	1.00	1.50	12.6	2.41	12	12	12
	2.50	2.50	1.50	14.9	8.63	14	14	14
	5.00	5.00	1.50	20.4	25.89	19	20	20
	7.50	7.50	1.50	26.1	51.17	12	20	26
	10.00	10.00	1.50	31.9	84.61	9	15	28
	1.00	1.00	2.00	16.9	3.08	16	16	16
	2.50	2.50	2.00	18.3	9.87	18	18	18
	5.00	5.00	2.00	23.5	28.93	20	23	23
	7.50	7.50	2.00	29.1	55.95	13	20	29
	10.00	10.00	2.00	34.8	90.98	9	15	28
	1.00	1.00	3.00	26.7	4.65	26	26	26
	2.50	2.50	3.00	25.6	11.86	25	25	25
	5.00	5.00	3.00	29.9	34.53	21	29	29
	7.50	7.50	3.00	35.2	65.00	13	21	35
	10.00	10.00	3.00	40.8	103.56	9	15	29

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOW CAPACITY		
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
ISOLATED RECTANGULAR FOOTINGS	1.50	1.00	1.00	8.2	2.22	8	8	8
	3.75	2.50	1.00	10.9	8.67	10	10	10
	7.50	5.00	1.00	16.1	26.87	14	16	16
	11.25	7.50	1.00	21.4	54.41	9	15	21
	15.00	10.00	1.00	26.7	91.21	7	11	21
	1.50	1.00	1.50	11.8	2.73	11	11	11
	3.75	2.50	1.50	13.9	10.51	13	13	13
	7.50	5.00	1.50	18.9	30.80	15	18	18
	11.25	7.50	1.50	24.[illegible]	60.32	9	15	24
	15.00	10.00	1.50	29.4	99.28	7	11	22
	1.50	1.00	2.00	15.8	3.04	15	15	15
	3.75	2.50	2.00	17.1	12.26	17	17	17
	7.50	5.00	2.00	21.8	34.67	15	21	21
	11.25	7.50	2.00	27.0	66.52	10	16	27
	15.00	10.00	2.00	32.2	107.47	7	11	22
	1.50	1.00	3.00	25.1	6.09	25	25	25
	3.75	2.50	3.00	24.0	15.32	24	24	24
	7.50	5.00	3.00	27.9	42.18	16	26	27
	11.25	7.50	3.00	32.7	78.00	10	16	31
	15.00	10.00	3.00	37.9	123.52	7	12	23
CONTINUOUS STRIP FOOTINGS		1.00	1.00	8.4	5.20	8	8	8
		1.50	1.00	9.6	9.15	9	9	9
		2.00	1.00	11.0	14.15	11	11	11
		2.50	1.00	12.3	19.92	12	12	12
		1.00	1.50	11.7	6.97	11	11	11
		1.50	1.50	12.6	11.71	12	12	12
		2.00	1.50	13.8	17.42	13	13	13
		2.50	1.50	15.1	24.10	15	15	15
		1.00	2.00	15.3	8.75	15	15	15
		1.50	2.00	15.9	14.40	15	15	15
		2.00	2.00	16.8	20.81	16	16	16
		2.50	2.00	18.0	28.30	15	18	18
		1.00	3.00	23.7	12.43	23	23	23
		1.50	3.00	23.0	19.73	23	23	23
		2.00	3.00	23.4	27.88	20	23	23
		2.50	3.00	24.2	36.90	16	24	24

SAMPLE CALCULATION OF PILE CAPACITY AT THE LOCATION OF STEAM GENERATION PLANT



Pile Model at the Location of BH-1

Scale :- N.T.S.

Sketch No.-SK/PDIL/	Steam Generation Plant	1678	03	2 of 2

Ultimate skin friction capacity

Project: Proposed Coalgas to Methanol Project.

Location: Sactoria, West Bardhaman (WB)

Layer No: 1

Soil Description : Medium to dense reddish brown silty sand with traces of clay binders.

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 $=(\phi-3)^{o}$ 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, $f_s = K*Pdi*\tan\delta$ - at layer top, maximum = $10T/M^2$	P_{Di} at layer bottom	Unit friction, $f_s = K*Pdi*\tan\delta$ - 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	0.600	10.000	2.000	6.000	1.000	32	29	27.86	16.44	19.34	1.81	0.81	1.3	15	1.62	0.51	1.167	4.86	3.502	2.335	7.540	**17.604**
2	0.750	10.000	2.000	6.000	1.000	32	29	27.86	16.44	19.34	1.81	0.81	1.3	15	1.62	0.51	1.167	4.86	3.502	2.335	9.425	**22.004**
3	1.000	10.000	2.000	6.000	1.000	32	29	27.86	16.44	19.34	1.81	0.81	1.3	15	1.62	0.51	1.167	4.86	3.502	2.335	12.566	**29.339**
4	1.500	10.000	2.000	6.000	1.000	32	29	27.86	16.44	19.34	1.81	0.81	1.3	15	1.62	0.51	1.167	4.86	3.502	2.335	18.850	**44.009**

Ultimate skin friction capacity

Project: Proposed Coalgas to Methanol Project.

Location: Sactoria, West Bardhaman (WB)

Layer No: 2

Soil Description : Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.

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)°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, $f_s = k*Pdi*\tan\delta$ - at layer top, maximum = 10T/M^2	P_{Di} at layer bottom	Unit friction, $f_s = k*Pdi*\tan\delta$ - 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	0.600	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.80	0.8	1.3	15	4.8	0.56	3.899	7.2	5.849	4.874	7.540	**36.749**
2	0.750	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.80	0.8	1.3	15	4.8	0.56	3.899	8	6.499	5.199	9.425	**48.999**
3	1.000	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.80	0.8	1.3	15	4.8	0.56	3.899	8	6.499	5.199	12.566	**65.331**
4	1.500	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.80	0.8	1.3	15	4.8	0.56	3.899	8	6.499	5.199	18.850	**97.997**

Ultimate end bearing capacity

Project: Proposed Coalgas to Methanol Project.

Location: Sactoria, West Bardhaman (WB)

Layer No: 2

Soil Description : Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.

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)°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	0.600	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.8	0.8	15	7.2	0.283	**49.232**
2	0.750	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.8	0.8	15	8	0.442	**85.918**
3	1.000	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.8	0.8	15	8	0.785	**155.116**
4	1.500	10.000	6.000	10.000	1.000	35	32	35.49	23.18	30.21	1.8	0.8	15	8	1.767	**359.690**

Horizontal Shear Capacity of Pile

Reference : Code of Practice for Design and Construction of Pile Foundation - IS 291

Sample Calculation:-

L (Length of Pile)	=	10.00 Mtr.	
Cut-off Level of Pile	=	2.00 Mtr.	
Dia of Pile (D)	=	0.600 Mtr.	
fck	=	25 N/MM^2	
$E=E_{conc}$=Young's modulas	=	25000 MN/M^2	
I (Moment of inertia of the pile cross-section)	=	0.00636 M^4	
Neglecting the effect of steel we get **EI**	=	159 KN/M^6	
n_h = Modulas of Subgrade Reaction (if top of the soil is sand) (Table3)	=	1.400 MN/M^3	
T (Stiffness Factor)	=	2.577 Mtr.	[Where T = $(EI/\eta_h)^{1/5}$]
Le (Embeddment Length of the Pile)	=	8.00 Mtr.	
Hence, As per Table-5 pile is a SHORT RIGID PILE			Since Le< 4T
Where **L1** = free head of Pile above ground	=	0.000 Mtr.	
And for fixed head file **Lf/T** (as per IS Code)	=	2.200	
Where **Lf** is the length of fixicity below cut-off level of pile =	=	5.669 Mtr.	
Therefore, **Lf**	=	5.669 Mtr.	
L1	=	0.000 Mtr.	
For Fixed Head Pile, deflection at the pile head,			
$Y = H(e+zf)^3/12EI$	=	0.005 Mtr.	(Adopt)
Lateral Load = **H**	=	52.35 Kn	
Horizontal Shear Capacity = H_{design}	=	**5.34 T**	

Recommended Pile Capacity

Project: Proposed Coalgas to Methanol Project.

Location: Sactoria, West Bardhaman (WB)

Sl.No	Pile Dia , D	Total Length of Pile, L	Skin friction from layer 1	Skin friction from layer 2	End Bearing	Total	F.O.S	Allowable Pile Capacity	Recommended Pile Capacity in Compression	Recommended Pile Capacity in Pull-Out	Recommended Pile Capacity in Horizontal Shear
	Mtr	Mtr.	T	T	T	T	T	T	T	T	T
1	0.600	10.000	0.506	36.749	49.232	**86.488**	2.5	34.595	**34**	**14**	**5**
2	0.750	10.000	0.506	48.999	85.918	**135.423**	2.5	54.169	**54**	**19**	**7**
3	1.000	10.000	0.506	65.331	155.116	**220.954**	2.5	88.382	**88**	**26**	**12**
4	1.500	10.000	0.506	97.997	359.690	**458.194**	2.5	183.277	**183**	**39**	**23**

CHEMICAL TEST RESULT

Chemical Test on Soil Samples

PROJECT: Proposed Coalgas to Methanol Project at Sactoria, West Bardham

Location	Description of Soil	Type of Chemical Test	Result
BH-1 Depth: 1.50-1.95M	Medium to dense reddish brown silty sand with traces of clay binders.	pH Value	6.5
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.041%
BH-1 Depth: 3.00-3.45M	Medium to dense reddish brown silty sand with traces of clay binders.	pH Value	6.7
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.048%
BH-2 Depth: 1.50-1.95M	Dense reddish brown silty sand with traces of clay binders.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.043%
BH-2 Depth: 3.00-3.45M	Dense reddish brown silty sand with traces of clay binders.	pH Value	6.6
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.045%
BH-3 Depth: 1.50-1.95M	Dense yellowish/brownish grey silty sand with kankar, morrum and clay binders.	pH Value	6.7
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.051%
BH-3 Depth: 3.00-3.45M	Dense yellowish/brownish grey silty sand with kankar, morrum and clay binders.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.054%
BH-4 Depth: 1.50-1.95M	Very dense yellowish grey silty sand with clay binders.	pH Value	6.8
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.038%
BH-4 Depth: 3.00-3.45M	Very dense yellowish grey silty sand with clay binders.	pH Value	6.9
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.043%
BH-5 Depth: 1.50-1.95M	Dense to very dense yellowish grey silty sand with clay binders.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.043%
BH-5 Depth: 3.00-3.45M	Dense to very dense yellowish grey silty sand with clay binders.	pH Value	6.8
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.048%

Location	Description of Soil	Type of Chemica	
BH-6 Depth: 1.50-1.95M	Very stiff to hard reddish brown/ brownish grey silty clay/claeyey silt with kankar and sand.	pH Value	
		Sulphite Content	
		Chloride Conten	
BH-6 Depth: 3.00-3.45M	Dense reddish brown silty sand with clay binders.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.039%
BH-7 Depth: 1.50-1.95M	Very stiff to hard reddish brown/ brownish grey silty clay/claeyey silt with kankar and sand.	pH Value	6.6
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.044%
BH-7 Depth: 3.00-3.45M	Dense reddish brown silty sand with clay binders.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.046%
BH-8 Depth: 1.50-1.95M	Very stiff to hard yellowish grey silty clay/clayey silt with grass roots, morrum, sand and traces of coal.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.049%
BH-8 Depth: 3.00-3.45M	Very stiff to hard yellowish grey silty clay/clayey silt with grass roots, morrum, sand and traces of coal.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.039%
BH-9 Depth: 2.00-2.45M	Very stiff to hard mottled yellowish/ bluish grey silty clay/clayey silt with sand.	pH Value	6.7
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.038%
BH-9 Depth: 4.00-4.45M	Very stiff to hard mottled yellowish/ bluish grey silty clay/clayey silt with sand.	pH Value	6.8
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.049%
BH-10 Depth: 1.50-1.95M	Medium to dense yellowish/ brownish grey silty sand with clay binders.	pH Value	6.7
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.048%
BH-10 Depth: 2.00-2.45M	Medium to dense yellowish/ brownish grey silty sand with clay binders.	pH Value	6.9
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.046%
BH-11 Depth: 1.50-1.95M	Very stiff to hard reddish brown/ brownish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.040%

Location	Description of Soil	Type of Chemica	
BH-11 Depth: 3.00-3.45M	Very stiff to hard reddish brown/ brownish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	
		Sulphite Content	
		Chloride Conten	
BH-11 Depth: 4.00-4.45M	Very stiff to hard reddish brown/ brownish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	6.9
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.048%
BH-12 Depth: 1.50-1.95M	Very stiff to hard reddish brown/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.044%
BH-12 Depth: 3.00-3.45M	Very stiff to hard reddish brown/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	6.9
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.049%
BH-13 Depth: 1.50-1.95M	Very stiff to hard brownish/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.051%
BH-13 Depth: 3.00-3.45M	Very stiff to hard brownish/ yellowish grey silty clay/clayey silt with sand and traces of morrum.	pH Value	7.0
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.053%
BH-14 Depth: 1.50-1.95M	Very stiff to hard yellowish grey silty clay/clayey silt with sand.	pH Value	6.7
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.045%
BH-14 Depth: 3.00-3.45M	Very stiff to hard yellowish grey silty clay/clayey silt with sand.	pH Value	6.8
		Sulphite Content as SO_3	Absent
		Chloride Content as Cl	0.048%

Chemical Test on Water Samples

PROJECT: Proposed Coalgas to Methanol Project at Sactoria, West Bardhama

Location	Description	Type of Chemical Test	Result
BH-1	Water Collected from Borehole Marked BH-1	pH value	6.9
		Sulphate SO_3	13.2
		Chloride as Cl	16.4
BH-2	Water Collected from Borehole Marked BH-2	pH value	7.0
		Sulphate SO_3	12.4
		Chloride as Cl	16.9
BH-3	Water Collected from Borehole Marked BH-3	pH value	7.1
		Sulphate SO_3	13.4
		Chloride as Cl	18.2
BH-4	Water Collected from Borehole Marked BH-4	pH value	7.2
		Sulphate SO_3	13.2
		Chloride as Cl	16.9
BH-5	Water Collected from Borehole Marked BH-5	pH value	7.4
		Sulphate SO_3	13.1
		Chloride as Cl	17.1
BH-6	Water Collected from Borehole Marked BH-6	pH value	7.3
		Sulphate SO_3	12.8
		Chloride as Cl	18.1
BH-7	Water Collected from Borehole Marked BH-7	pH value	7.2
		Sulphate SO_3	12.9
		Chloride as Cl	17.4
BH-8	Water Collected from Borehole Marked BH-8	pH value	7.5
		Sulphate SO_3	13.4
		Chloride as Cl	16.8
BH-9	Water Collected from Borehole Marked BH-9	pH value	7.4
		Sulphate SO_3	13.5
		Chloride as Cl	17.3

Location	Description	Type of Chemical Test	
BH-10	Water Collected from Borehole Marked BH-10	pH value	
		Sulphate SO_3	
		Chloride as Cl	
BH-11	Water Collected from Borehole Marked BH-11	pH value	7.1
		Sulphate SO_3	13.2
		Chloride as Cl	17.5
BH-12	Water Collected from Borehole Marked BH-12	pH value	7.6
		Sulphate SO_3	13.3
		Chloride as Cl	18.0
BH-13	Water Collected from Borehole Marked BH-13	pH value	7.2
		Sulphate SO_3	13.4
		Chloride as Cl	17.9
BH-14	Water Collected from Borehole Marked BH-14	pH value	7.4
		Sulphate SO_3	14.1
		Chloride as Cl	17.4

SAMPLE CALCULATION OF BEARING CAPACITY FOR RAFT AT THE LOCATION OF STEAM GENERATION PLANT

SUMMARY OF FIELD/LABORATORY DATA AND CONSIDERED D

Sub-soil Srtatification & Properties considered in foundation model

	Description of layer	Layer Thickness	Field N Observed		Corrected N Value
			Depth	Value	
		Meter	Meter		
Strata1	Medium to dense reddish brown silty sand with clay binders.	6.00	1.50	28	41
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.	9.00			
Strata 3	Not explored				
Strata4	Not explored				
Strata5	Not explored				
Strata6	Not explored				
Strata7	Not explored				
Strata8	Not explored				

Depth of water Table from EGL = 2.600 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	m_v
Strata1	Medium to dense reddish brown silty sand with clay binders.	0	32	1.81	
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				
Strata 3	NA				
Strata4	NA				
Strata5	NA				
Strata6	NA				
Strata7	NA				
Strata8	NA				

DESIGN PARAMETERS

c	ϕ	Depth of Water Table from EGL*	γ	m_v	E	μ
T/sqm	Degrees	meter	T/Cum	Sqm/T	T/sqm	
0	32	0	1.81	0.00000	2500	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 = 32

Friction Angle>=32degrees, General 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+0.5γBNγsγdγiγW'

2 For Local Shear Failure, q(ult) = c'N'cscdcic + q(N'q-1)sqdqiq+0.5γBN'γsγdγiγW'

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	10.00	10.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.03	1.02	1.02	1	1	1	0.5	2.5	29.0
	15.00	15.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.02	1.01	1.01	1	1	1	0.5	2.5	40.6
	20.00	20.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.02	1.01	1.01	1	1	1	0.5	2.5	52.3
	10.00	10.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.05	1.02	1.02	1	1	1	0.5	2.5	31.9
	15.00	15.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.03	1.02	1.02	1	1	1	0.5	2.5	43.5
	20.00	20.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.02	1.01	1.01	1	1	1	0.5	2.5	55.2
	10.00	10.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	34.8
	15.00	15.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.04	1.02	1.02	1	1	1	0.5	2.5	46.4
	20.00	20.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.03	1.02	1.02	1	1	1	0.5	2.5	58.0
	10.00	10.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.10	1.05	1.05	1	1	1	0.5	2.5	40.8
	15.00	15.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	52.2
	20.00	20.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.05	1.02	1.02	1	1	1	0.5	2.5	63.8
ISOLATED RECTANGULAR FOOTINGS	10.00	5.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.07	1.03	1.03	1	1	1	0.5	2.5	16.9
	30.00	20.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.02	1.01	1.01	1	1	1	0.5	2.5	48.1
	10.00	5.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.10	1.05	1.05	1	1	1	0.5	2.5	19.7
	30.00	20.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.02	1.01	1.01	1	1	1	0.5	2.5	50.8
	10.00	5.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.13	1.07	1.07	1	1	1	0.5	2.5	22.5
	30.00	20.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.03	1.02	1.02	1	1	1	0.5	2.5	53.5
	10.00	5.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.20	1.10	1.10	1	1	1	0.5	2.5	28.5
	30.00	20.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.05	1.02	1.02	1	1	1	0.5	2.5	58.9

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 $S_i = pB\{(1-\mu^2)/E\}I$	Consolidation Settlement $Sc = m_v \Delta pH$	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	10.00	10.00	1.00	29	0.3	2500	0.000	13.79	9.00	0.95	100.28	0.00	100.28	0.973	0.8	78.05
	15.00	15.00	1.00	40.6	0.3	2500	0.000	24.02	9.00	0.95	210.59	0.00	210.59	0.982	0.8	165.42
	20.00	20.00	1.00	52.3	0.3	2500	0.000	34.85	9.00	0.95	361.71	0.00	361.71	0.986	0.8	285.42
	10.00	10.00	1.50	31.9	0.3	2500	0.000	15.71	8.50	0.95	110.31	0.00	110.31	0.959	0.8	84.64
	15.00	15.00	1.50	43.5	0.3	2500	0.000	26.41	8.50	0.95	225.63	0.00	225.63	0.973	0.8	175.57
	20.00	20.00	1.50	55.2	0.3	2500	0.000	37.55	8.50	0.95	381.76	0.00	381.76	0.979	0.8	299.11
	10.00	10.00	2.00	34.8	0.3	2500	0.000	17.76	8.00	0.95	120.34	0.00	120.34	0.945	0.8	90.98
	15.00	15.00	2.00	46.4	0.3	2500	0.000	28.92	8.00	0.95	240.68	0.00	240.68	0.963	0.8	185.48
	20.00	20.00	2.00	58	0.3	2500	0.000	40.28	8.00	0.95	401.13	0.00	401.13	0.973	0.8	312.08
	10.00	10.00	3.00	40.8	0.3	2500	0.000	22.39	7.00	0.95	141.09	0.00	141.09	0.918	0.8	103.56
	15.00	15.00	3.00	52.2	0.3	2500	0.000	34.32	7.00	0.95	270.76	0.00	270.76	0.945	0.8	204.70
	20.00	20.00	3.00	63.8	0.3	2500	0.000	46.21	7.00	0.95	441.24	0.00	441.24	0.959	0.8	338.43
ISOLATED RECTANGULAR FOOTINGS	10.00	5.00	1.00	16.9	0.3	2500	0.000	6.13	9.00	1.31	40.29	0.00	40.29	0.961	0.8	30.98
	30.00	20.00	1.00	48.1	0.3	2500	0.000	34.14	9.00	1.2	420.20	0.00	420.20	0.989	0.8	332.39
	10.00	5.00	1.50	19.7	0.3	2500	0.000	7.47	8.50	1.31	46.97	0.00	46.97	0.942	0.8	35.38
	30.00	20.00	1.50	50.8	0.3	2500	0.000	36.70	8.50	1.2	443.79	0.00	443.79	0.983	0.8	349.05
	10.00	5.00	2.00	22.5	0.3	2500	0.000	8.93	8.00	1.31	53.64	0.00	53.64	0.922	0.8	39.58
	30.00	20.00	2.00	53.5	0.3	2500	0.000	39.34	8.00	1.2	467.38	0.00	467.38	0.978	0.8	365.51
	10.00	5.00	3.00	28.5	0.3	2500	0.000	12.42	7.00	1.31	67.95	0.00	67.95	0.883	0.8	48.02
	30.00	20.00	3.00	58.9	0.3	2500	0.000	44.89	7.00	1.2	514.55	0.00	514.55	0.966	0.8	397.78

ALLOWABLE BEARING CAPACITY FROM SHEAR AND
CRITERIA

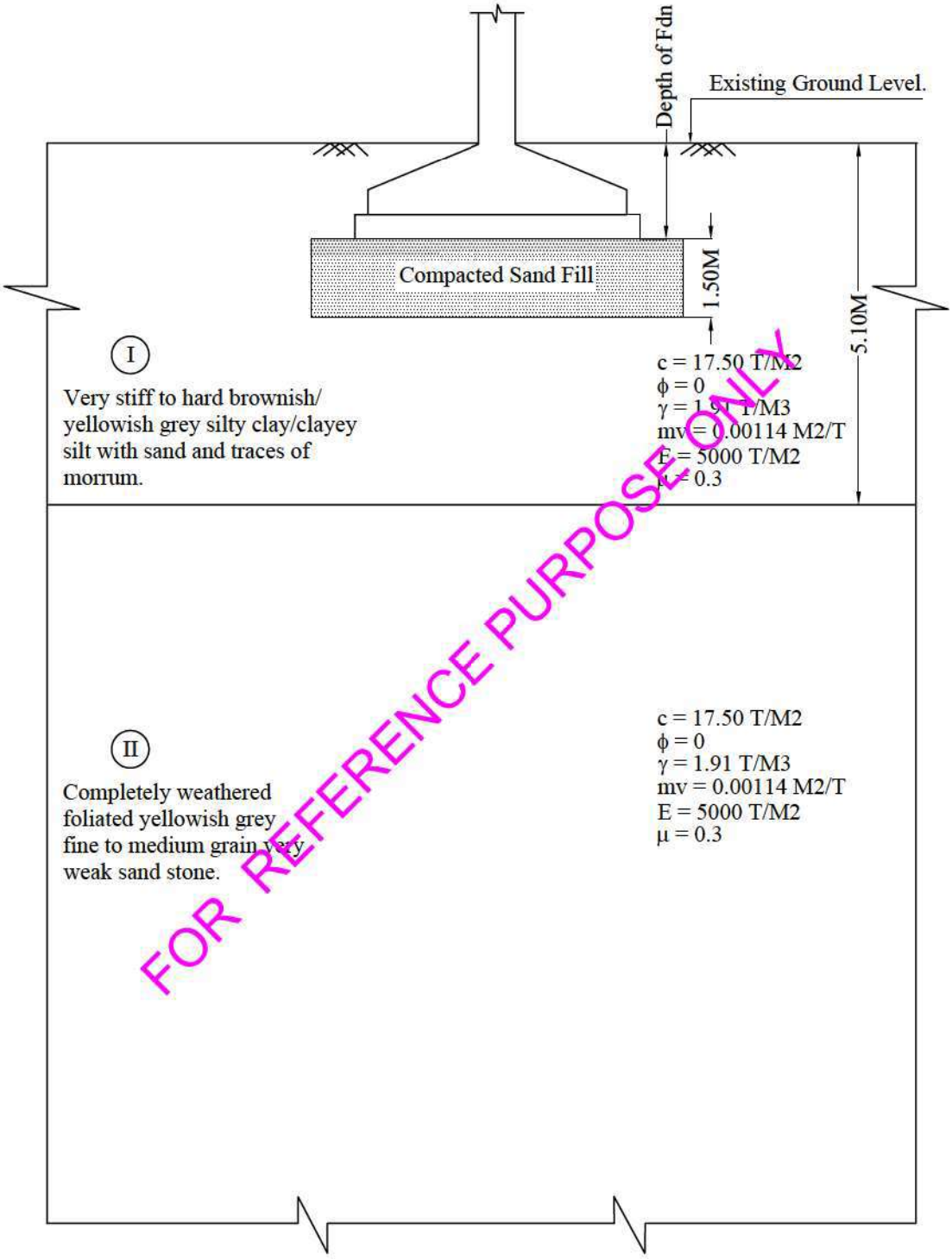
FOUNDATION TYPE	FOOTING DIMENSIONS					ALLOWA CAPACITY			
	L	B	Df	NET SAFE BEARING CAPACITY	total corrected settlement, $S_{tcorrect}$	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 175 mm
	Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm	T/Sqm
ISOLATED SQUARE FOOTINGS	10.00	10.00	1.00	29.0	78.05	9	14	27	29
	15.00	15.00	1.00	40.6	165.42	6	9	18	30
	20.00	20.00	1.00	52.3	285.42	4	7	13	22
	10.00	10.00	1.50	31.9	84.64	9	15	28	31
	15.00	15.00	1.50	43.5	175.57	6	9	18	30
	20.00	20.00	1.50	55.2	299.11	4	7	13	23
	10.00	10.00	2.00	34.8	90.98	9	15	28	34
	15.00	15.00	2.00	46.4	185.48	6	10	18	31
	20.00	20.00	2.00	58.0	312.08	4	7	13	23
	10.00	10.00	3.00	40.8	103.56	9	15	29	40
	15.00	15.00	3.00	52.2	204.70	6	10	19	31
	20.00	20.00	3.00	63.6	338.43	4	7	14	23
ISOLATED RECTANGULAR FOOTINGS	10.00	5.00	1.00	16.9	30.98	13	16	16	16
	30.00	20.00	1.00	48.1	332.39	3	5	10	18
	10.00	5.00	1.50	19.7	35.38	13	19	19	19
	30.00	20.00	1.50	50.8	349.05	3	5	10	18
	10.00	5.00	2.00	22.5	39.58	14	22	22	22
	30.00	20.00	2.00	53.5	365.51	3	5	10	18
	10.00	5.00	3.00	28.5	48.02	14	23	28	28
	30.00	20.00	3.00	58.9	397.78	3	5	11	18

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (In T/Sqm)																			
				Zone-1 Pump House & Fire Water Storage				**Zone-2** Storage Raw Water				**Zone-4** RWTP				**Zone-6** Plant Methanol				**Zone-10** Building Administrative			
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm
1	10.00	10.00	1.00	4	7	14	24	3	6	11	19	3	6	11	18	9	14	27	38	3	5	11	18
2	15.00	15.00	1.00	3	5	11	18	2	4	8	14	2	4	8	14	6	9	18	30	2	4	8	14
3	20.00	20.00	1.00	3	4	9	15	2	3	7	12	2	3	7	11	4	7	13	22	2	3	7	11
4	10.00	10.00	1.50	5	8	15	25	4	6	12	20	3	6	11	19	9	15	28	42	3	6	11	19
5	15.00	15.00	1.50	3	6	11	18	3	4	9	15	2	4	8	14	6	9	18	30	2	4	8	14
6	20.00	20.00	1.50	3	5	9	15	2	4	7	12	2	3	7	12	4	7	13	23	2	3	7	12
7	10.00	10.00	2.00	5	8	15	25	4	6	12	21	4	6	12	20	9	15	28	46	3	6	11	19
8	15.00	15.00	2.00	3	6	11	19	3	5	9	15	3	4	9	15	6	10	18	31	2	4	8	14
9	20.00	20.00	2.00	3	5	9	16	2	4	7	13	2	4	7	12	4	7	13	23	2	3	7	12
10	10.00	10.00	3.00	5	8	16	27	4	7	13	21	4	6	12	21	9	15	29	49	4	6	12	21
11	15.00	15.00	3.00	4	6	12	21	3	5	10	16	3	5	9	16	6	10	19	31	3	5	9	16
12	20.00	20.00	3.00	3	5	10	17	2	4	8	14	2	4	8	13	4	7	14	23	2	4	8	13
13	10.00	5.00	1.00	6	10	19	27	5	8	16	18	5	8	15	19	13	21	22	22	5	8	15	21
14	30.00	20.00	1.00	2	4	8	13	2	3	6	10	2	3	6	10	3	5	10	18	2	3	6	10
15	10.00	5.00	1.50	6	10	20	27	5	8	16	18	5	8	15	19	13	22	25	25	5	8	15	21
16	30.00	20.00	1.50	2	4	8	13	2	3	6	11	2	3	6	10	3	5	10	18	2	3	6	10
17	10.00	5.00	2.00	7	11	21	28	5	9	17	18	5	8	16	20	14	22	29	29	5	8	16	22
18	30.00	20.00	2.00	2	4	8	14	2	3	6	11	2	3	6	10	3	5	10	18	2	3	6	10
19	10.00	5.00	3.00	7	12	22	29	6	9	18	19	5	9	17	20	14	23	37	37	5	9	17	23
20	30.00	20.00	3.00	3	4	9	15	2	3	7	12	2	3	7	11	3	5	11	18	2	3	6	11

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (In T/Sqm)																			
				Zone-11 Cooling Tower for Methanol Plant & Gasification				**Zone-12** Air Separation Unit				**Zone-13** Gasification Plant				**Zone-14** Gas Cleaning & Purification Plant				**Zone-15** Steam Generation Plant			
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm
1	10.00	10.00	1.00	4	7	13	22	4	6	12	20	4	7	14	23	4	6	12	21	9	14	27	29
2	15.00	15.00	1.00	3	5	9	16	3	5	9	15	3	5	10	17	3	5	9	15	6	9	18	30
3	20.00	20.00	1.00	2	4	8	13	2	4	7	13	2	4	8	14	2	4	7	13	4	7	13	22
4	10.00	10.00	1.50	4	7	13	22	4	6	13	20	4	7	14	24	4	7	13	21	9	15	28	31
5	15.00	15.00	1.50	3	5	10	16	3	5	9	16	3	5	10	18	3	5	9	16	6	9	18	30
6	20.00	20.00	1.50	2	4	8	13	2	4	8	13	3	4	9	15	2	4	8	13	4	7	13	23
7	10.00	10.00	2.00	4	7	14	23	4	7	13	20	5	8	15	25	4	7	13	22	9	15	28	34
8	15.00	15.00	2.00	3	5	10	17	3	5	10	16	3	6	11	18	3	5	10	16	6	10	18	31
9	20.00	20.00	2.00	2	4	8	14	2	4	8	13	3	5	9	15	2	4	8	13	4	7	13	23
10	10.00	10.00	3.00	5	8	15	25	4	7	14	20	5	8	16	27	4	7	14	24	9	15	29	40
11	15.00	15.00	3.00	3	5	11	18	3	5	10	18	4	6	12	20	3	5	10	18	6	10	19	31
12	20.00	20.00	3.00	3	4	9	15	2	4	8	14	3	5	10	16	2	4	8	14	4	7	14	23
13	10.00	5.00	1.00	6	9	18	22	5	9	17	17	6	10	19	23	5	9	17	21	13	16	16	16
14	30.00	20.00	1.00	2	3	7	11	2	3	6	11	2	4	7	12	2	3	6	11	3	5	10	18
15	10.00	5.00	1.50	6	9	18	22	5	9	17	17	6	10	20	24	6	9	18	21	13	19	19	19
16	30.00	20.00	1.50	2	3	7	12	2	3	7	11	2	4	7	13	2	3	7	11	3	5	10	18
17	10.00	5.00	2.00	6	10	19	22	6	9	18	18	6	11	20	24	6	9	18	21	14	22	22	22
18	30.00	20.00	2.00	2	3	7	12	2	3	7	12	2	4	8	13	2	3	7	12	3	5	10	18
19	10.00	5.00	3.00	6	11	20	23	6	10	18	18	7	11	22	25	6	10	20	22	14	23	28	28
20	30.00	20.00	3.00	2	4	7	13	2	4	7	12	2	4	8	14	2	4	7	12	3	5	11	18

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (In T/Sqm)											
				Zone-16 Ash Slag Storage				**Zone-17** Fire Station				**Zone-18** Truck Parking Area with Driver Rest Room			
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 125 mm
1	10.00	10.00	1.00	11	17	33	38	11	17	33	38	4	6	13	21
2	15.00	15.00	1.00	7	11	22	36	7	11	22	36	3	5	9	16
3	20.00	20.00	1.00	5	8	16	27	5	8	16	27	2	4	8	13
4	10.00	10.00	1.50	11	18	33	42	11	18	33	41	4	7	13	22
5	15.00	15.00	1.50	7	11	22	37	7	11	22	37	3	5	10	16
6	20.00	20.00	1.50	5	8	16	27	5	8	16	27	2	4	8	13
7	10.00	10.00	2.00	11	18	34	46	11	18	34	45	4	7	13	23
8	15.00	15.00	2.00	7	12	22	37	7	12	22	37	3	5	10	17
9	20.00	20.00	2.00	5	8	16	27	5	8	16	27	2	4	8	14
10	10.00	10.00	3.00	11	18	35	54	11	18	35	53	4	7	14	24
11	15.00	15.00	3.00	7	12	22	38	7	12	22	38	3	5	11	18
12	20.00	20.00	3.00	5	9	16	28	5	9	16	28	3	4	9	15
13	10.00	5.00	1.00	16	22	22	22	16	22	22	22	5	9	17	25
14	30.00	20.00	1.00	4	6	13	21	4	6	13	21	2	3	7	11
15	10.00	5.00	1.50	16	26	26	26	16	25	25	25	6	9	18	25
16	30.00	20.00	1.50	4	6	13	21	4	6	13	21	2	3	7	12
17	10.00	5.00	2.00	17	27	29	29	17	27	29	29	6	10	19	26
18	30.00	20.00	2.00	4	7	13	21	4	7	13	21	2	3	7	12
19	10.00	5.00	3.00	17	28	37	37	17	28	36	36	6	10	20	27
20	30.00	20.00	3.00	4	7	13	22	4	7	13	22	2	4	7	13

SAMPLE CALCULATION FOR SHALLOW FOUNDATION ON IMPROVED SOIL BY SAND REPLACEMENT



Foundation Model on Improved Soil

Scale :- N.T.S.

Sketch No.-SK/PDIL	SACTORIA	1678	04

COMPUTATION OF BEARING CAPACITY WITH SAND BA

Square Footing

Size (m x m)	2.00 x 2.00	2.50 x 2.50	3.00 x 3.00
B (m)	2.00	2.50	3.00
D_f (m)	1.50	1.50	1.50
C (T/M^2)	0.00	0.00	0.00
ϕ (degree)	33	33	33
ϕ' (degree)	29.82	29.82	29.82
γ (T/M^3)	1.80	1.80	1.80
q (T/M^2)	1.20	1.20	1.20
α (Degree)	0.00	0.00	0.00
Bearing Capacity Factor			
Nc	29.71	29.71	29.71
Nq	18.03	18.03	18.03
$N\gamma$	21.81	21.81	21.81
Shape Factor			
Sc	1.30	1.30	1.30
Sq	1.20	1.20	1.20
$S\gamma$	0.80	0.80	0.80
Depth Factor			
d_c	1.26	1.21	1.17
d_q	1.13	1.10	1.09
d_γ	1.13	1.10	1.09
Inclination			
i_c	1.00	1.00	1.00
i_q	1.00	1.00	1.00
i_γ	1.00	1.00	1.00
W'	0.50	0.50	0.50
$0.67cN_cS_cd_ci_c$	0.00	0.00	0.00
$q(Nq-1)S_qd_qi_q$	27.69	27.06	26.64
$0.5B_\gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$	17.74	21.66	25.59
N.U.B.C	**45.43**	**48.72**	**52.23**
F.O.S	2.50	2.50	2.50
N.S.B.C	**18.17**	**19.49**	**20.89**

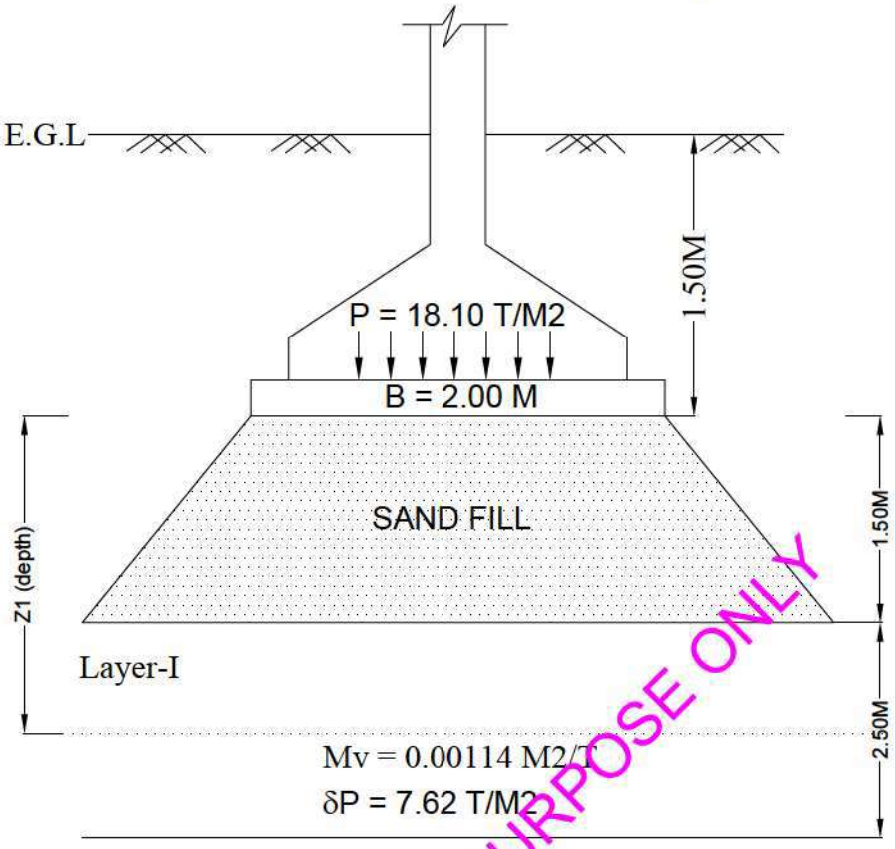
Retengular Footing

Size (m x m)	2.00 x 3.00	2.50 x 3	
L (m)	3.00	3.75	4.50
B (m)	2.00	2.50	3.00
D_f (m)	1.50	1.50	1.50
C (T/M^2)	0.00	0.00	0.00
ϕ (degree)	33	33	33
ϕ' (degree)	29.82	29.82	29.82
γ (T/M^3)	1.80	1.80	1.80
q (T/M^2)	1.20	1.20	1.20
α (Degree)	0.00	0.00	0.00
Bearing Capacity Factor			
Nc	29.71	29.71	29.71
Nq	18.03	18.03	18.03
$N\gamma$	21.81	21.81	21.81
Shape Factor			
Sc	1.13	1.13	1.13
Sq	1.13	1.13	1.13
$S\gamma$	0.73	0.73	0.73
Depth Factor			
d_c	1.26	1.21	1.17
d_q	1.13	1.10	1.09
d_γ	1.13	1.10	1.09
Inclination			
i_c	1.00	1.00	1.00
i_q	1.00	1.00	1.00
i_γ	1.00	1.00	1.00
W'	0.50	0.50	0.50
$0.67cN_cS_cd_ci_c$	0.00	0.00	0.00
$q(Nq-1)S_qd_qi_q$	26.16	25.56	25.16
$0.5B_\gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$	16.26	19.86	23.46
N.U.B.C	**42.42**	**45.41**	**48.61**
F.O.S	2.50	2.50	2.50
N.S.B.C	**16.97**	**18.17**	**19.45**

Strip Footing

Size (m x m)	1.50	2.00	
B (m)	1.50	2.00	2.50
D_f (m)	1.50	1.50	1.50
C (T/M^2)	0.00	0.00	0.00
ϕ (degree)	33	33	33
ϕ' (degree)	29.82	29.82	29.82
γ (T/M^3)	1.80	1.80	1.80
q (T/M^2)	1.20	1.20	1.20
α (Degree)	0.00	0.00	0.00
Bearing Capacity Factor			
Nc	29.71	29.71	29.71
Nq	18.03	18.03	18.03
$N\gamma$	21.81	21.81	21.81
Shape Factor			
Sc	1.00	1.00	1.00
Sq	1.00	1.00	1.00
$S\gamma$	1.00	1.00	1.00
Depth Factor			
d_c	1.35	1.26	1.21
d_q	1.17	1.13	1.10
d_γ	1.17	1.13	1.10
Inclination			
i_c	1.00	1.00	1.00
i_q	1.00	1.00	1.00
i_γ	1.00	1.00	1.00
W'	0.50	0.50	0.50
$0.67cN_cS_cd_ci_c$	0.00	0.00	0.00
$q(Nq-1)S_qd_qi_q$	23.96	23.08	22.55
$0.5B_\gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$	17.26	22.17	27.08
N.U.B.C	**41.22**	**45.25**	**49.63**
F.O.S	2.50	2.50	2.50
N.S.B.C	**16.49**	**18.10**	**19.85**

Settlement Calculation for Strip Fo



Layer-I

δP at the centre of the compressible layer = P x B/(B+Z1)
= 18.10 x 2/(2+2.75) T/M2
= 7.62 T/M2

Layer-I

So, S = Mv x δP x H
= 0.00114 x 7.62 x 2.50 x 1000
= 21.72mm

Corrected Settlement = 21.72 x 0.80 = 17.38mm < 75mm
Bearing Capacity of 2.00M wide strip = 18.10 T/M2

Similary Settlement of 2.50M wide strip = 27.54mm < 75mm
Hence, Bearing Capacity of 2.50M wide strip for 75mm settlement = 19.85 T/M2

Bearing Capacity of Soil after Ground Improvement with Co

TYPE OF FOOTINGS	SIZE OF FOUNDATION (m)			THICKNESS OF COMPACTED SAND FILL BELOW FOUNDATION (m)	SAFE BEARING CAPACITY OF COMPACTED SAND FILL AT FOUNDATION DEPTH (m)	ESTIMATED SETTLEMENT (mm)	PRESSURE ON VERGINE SOIL AT A LEVEL BELOW COMPACTED SAND FILL (t/m2)	ALLOWABLE BEARING CAPACITY OF VERGINE SOIL (t/m2)	ADOPTED PRESSURE AT TOP OF VERGINE SOIL (t/m2) (LOWER OF THE VALUES OF vii &	DESIGN SBC OF FOUNDATION ON OF SAND FILL (t/m2)
	B	L	Df							
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)
ISOLATED SQUARE FOOTINGS	2.00	2.00	1.50	1.50	18.17	9.18	5.93	20.00	5.93	18.17
	2.50	2.50	1.50	1.50	19.49	14.68	7.61	20.00	7.61	19.49
	3.00	3.00	1.50	1.50	20.89	21.19	9.28	20.00	9.28	20.89
ISOLATED RECTANGULAR FOOTINGS	2.00	3.00	1.50	1.50	16.97	8.57	6.46	20.00	6.46	16.97
	2.50	3.75	1.50	1.50	18.17	13.71	8.11	20.00	8.11	18.17
	3.00	4.50	1.50	1.50	19.45	19.71	9.72	20.00	9.72	19.45
CONTINUOUS STRIP FOOTINGS	1.50		1.50	1.50	16.49	9.02	8.24	8.00	8.00	16.00
	2.00		1.50	1.50	18.10	17.38	10.34	8.00	8.00	14.00
	2.50		1.50	1.50	19.85	27.54	12.41	8.00	8.00	12.80

SAMPLE CALCULATION OF BEARING CAPACITY OF ISOLATED FOUNDATION OF SIZES UPTO 1 TO 10M LENGTH AND A FIXED WIDTH AT THE LOCATION OF STEAM GENERATION PLANT

SUMMARY OF FIELD/LABORATORY DATA AND CONSIDERED D

Sub-soil Srtatification & Properties considered in foundation model

	Description of layer	Layer Thickness	Field N Observed		Corrected N Value
			Depth	Value	
		Meter	Meter		
Strata1	Medium to dense reddish brown silty sand with clay binders.	6.00	1.50	28	41
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.	9.00			
Strata 3	Not explored				
Strata4	Not explored				
Strata5	Not explored				
Strata6	Not explored				
Strata7	Not explored				
Strata8	Not explored				

Depth of water Table from EGL = 2.600 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	m_v
Strata1	Medium to dense reddish brown silty sand with clay binders.	0	32	1.81	
Strata 2	Completely weathered foliated yellowish grey fine to medium grain very weak sand stone.				
Strata 3	NA				
Strata4	NA				
Strata5	NA				
Strata6	NA				
Strata7	NA				
Strata8	NA				

DESIGN PARAMETERS

c	ϕ	Depth of Water Table from EGL*	γ	m_v	E	μ
T/sqm	Degrees	meter	T/Cum	Sqm/T	T/sqm	
0	32	0	1.81	0.00000	2500	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 = 32

Friction Angle>=32degrees, General 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+0.5γBNγsγdγiγW'

2 For Local Shear Failure, q(ult) = c'N'cscdcic + q(N'q-1)sqdqiq+0.5γBN'γsγdγiγW'

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
2.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.17	1.08	1.08	1	1	1	0.5	2.5	10.6
3.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.17	1.08	1.08	1	1	1	0.5	2.5	9.9
4.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.17	1.08	1.08	1	1	1	0.5	2.5	10.2
5.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.08	1.08	0.84	1.17	1.08	1.08	1	1	1	0.5	2.5	10.3
6.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.07	1.07	0.87	1.17	1.08	1.08	1	1	1	0.5	2.5	10.4
7.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.06	1.06	0.89	1.17	1.08	1.08	1	1	1	0.5	2.5	10.5
8.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.05	1.05	0.90	1.17	1.08	1.08	1	1	1	0.5	2.5	10.6
9.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.91	1.17	1.08	1.08	1	1	1	0.5	2.5	10.6
10.00	2.00	1.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.92	1.17	1.08	1.08	1	1	1	0.5	2.5	10.6
2.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.25	1.12	1.12	1	1	1	0.5	2.5	13.9
3.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.25	1.12	1.12	1	1	1	0.5	2.5	13.0
4.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.25	1.12	1.12	1	1	1	0.5	2.5	13.2
5.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.08	1.08	0.84	1.25	1.12	1.12	1	1	1	0.5	2.5	13.3
6.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.07	1.07	0.87	1.25	1.12	1.12	1	1	1	0.5	2.5	13.4
7.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.06	1.06	0.89	1.25	1.12	1.12	1	1	1	0.5	2.5	13.5
8.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.05	1.05	0.90	1.25	1.12	1.12	1	1	1	0.5	2.5	13.5
9.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.91	1.25	1.12	1.12	1	1	1	0.5	2.5	13.5
10.00	2.00	1.50	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.92	1.25	1.12	1.12	1	1	1	0.5	2.5	13.6
2.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.33	1.17	1.17	1	1	1	0.5	2.5	17.5
3.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.73	1.33	1.17	1.17	1	1	1	0.5	2.5	16.4
4.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.33	1.17	1.17	1	1	1	0.5	2.5	16.5
5.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.08	1.08	0.84	1.33	1.17	1.17	1	1	1	0.5	2.5	16.6
6.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.07	1.07	0.87	1.33	1.17	1.17	1	1	1	0.5	2.5	16.6
7.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.06	1.06	0.89	1.33	1.17	1.17	1	1	1	0.5	2.5	16.6
8.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.05	1.05	0.90	1.33	1.17	1.17	1	1	1	0.5	2.5	16.7
9.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.91	1.33	1.17	1.17	1	1	1	0.5	2.5	16.7
10.00	2.00	2.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.92	1.33	1.17	1.17	1	1	1	0.5	2.5	16.7
2.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.30	1.20	0.80	1.50	1.25	1.25	1	1	1	0.5	2.5	25.2

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
3.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.13	1.13	0.75	1.50	1.25	1.25	1	1	1	0.5	2.5	23.6
4.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.10	1.10	0.80	1.50	1.25	1.25	1	1	1	0.5	2.5	23.6
5.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.08	1.08	0.84	1.50	1.25	1.25	1	1	1	0.5	2.5	23.6
6.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.07	1.07	0.87	1.50	1.25	1.25	1	1	1	0.5	2.5	23.5
7.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.06	1.06	0.89	1.50	1.25	1.25	1	1	1	0.5	2.5	23.5
8.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.05	1.05	0.90	1.50	1.25	1.25	1	1	1	0.5	2.5	23.5
9.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.91	1.50	1.25	1.25	1	1	1	0.5	2.5	23.5
10.00	2.00	3.00	0	0	0.00	32	27.76	1.81	25.34	14.34	16.14	1.04	1.04	0.92	1.50	1.25	1.25	1	1	1	0.5	2.5	23.5

CALCULATION OF FOUNDATION SETTLEMEN

FOOTING DIMENSIONS															
L	B	Df	Foundation p presure,	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 $Sc= m_v\Delta pH$	total settlem $S_t= S_i + S$	Depth Fact Dfact	Rigidity fac Rfact	total correc settlemen $S_{t(correct)}= S$ DFact*Rfa
Meter	Meter	Meter	T/m^2		T/M^2	m^2/T	T/m^2	Meter		mm	mm	mm			mm
2.00	2.00	1.00	10.6	0.3	2500	0.000	2.65	4.00	0.95	7.33	0.00	7.33	0.86	0.8	5.06
3.00	2.00	1.00	9.9	0.3	2500	0.000	2.97	4.00	1.20	8.65	0.00	8.65	0.89	0.8	6.14
4.00	2.00	1.00	10.2	0.3	2500	0.000	3.40	4.00	1.31	9.73	0.00	9.73	0.90	0.8	7.03
5.00	2.00	1.00	10.3	0.3	2500	0.000	3.68	4.00	1.40	10.47	0.00	10.47	0.91	0.8	7.65
6.00	2.00	1.00	10.4	0.3	2500	0.000	3.90	4.00	1.48	11.23	0.00	11.23	0.92	0.8	8.27
7.00	2.00	1.00	10.5	0.3	2500	0.000	4.08	4.00	1.57	12.00	0.00	12.00	0.93	0.8	8.90
8.00	2.00	1.00	10.6	0.3	2500	0.000	4.24	4.00	1.66	12.78	0.00	12.78	0.93	0.8	9.52
9.00	2.00	1.00	10.6	0.3	2500	0.000	4.34	4.00	1.74	13.45	0.00	13.45	0.94	0.8	10.06
10.00	2.00	1.00	10.6	0.3	2500	0.000	4.42	4.00	1.83	14.12	0.00	14.12	0.94	0.8	10.60
2.00	2.00	1.50	13.9	0.3	2500	0.000	3.48	4.00	0.95	9.61	0.00	9.61	0.79	0.8	6.10
3.00	2.00	1.50	13	0.3	2500	0.000	3.90	4.00	1.20	11.36	0.00	11.36	0.83	0.8	7.56
4.00	2.00	1.50	13.2	0.3	2500	0.000	4.40	4.00	1.31	12.59	0.00	12.59	0.85	0.8	8.60
5.00	2.00	1.50	13.3	0.3	2500	0.000	4.75	4.00	1.40	13.52	0.00	13.52	0.87	0.8	9.41
6.00	2.00	1.50	13.4	0.3	2500	0.000	5.03	4.00	1.48	14.47	0.00	14.47	0.88	0.8	10.20
7.00	2.00	1.50	13.5	0.3	2500	0.000	5.25	4.00	1.57	15.43	0.00	15.43	0.89	0.8	10.98
8.00	2.00	1.50	13.5	0.3	2500	0.000	5.40	4.00	1.66	16.28	0.00	16.28	0.90	0.8	11.68
9.00	2.00	1.50	13.5	0.3	2500	0.000	5.52	4.00	1.74	17.13	0.00	17.13	0.90	0.8	12.37
10.00	2.00	1.50	13.6	0.3	2500	0.000	5.67	4.00	1.83	18.12	0.00	18.12	0.91	0.8	13.16
2.00	2.00	2.00	17.5	0.3	2500	0.000	4.38	4.00	0.95	12.10	0.00	12.10	0.73	0.8	7.02
3.00	2.00	2.00	16.4	0.3	2500	0.000	4.92	4.00	1.20	14.33	0.00	14.33	0.78	0.8	8.89
4.00	2.00	2.00	16.5	0.3	2500	0.000	5.50	4.00	1.31	15.74	0.00	15.74	0.81	0.8	10.14
5.00	2.00	2.00	16.6	0.3	2500	0.000	5.93	4.00	1.40	16.88	0.00	16.88	0.83	0.8	11.15
6.00	2.00	2.00	16.6	0.3	2500	0.000	6.28	4.00	1.48	17.93	0.00	17.93	0.84	0.8	12.06
7.00	2.00	2.00	16.6	0.3	2500	0.000	6.46	4.00	1.57	18.97	0.00	18.97	0.85	0.8	12.95
8.00	2.00	2.00	16.7	0.3	2500	0.000	6.68	4.00	1.66	20.14	0.00	20.14	0.86	0.8	13.90
9.00	2.00	2.00	16.7	0.3	2500	0.000	6.83	4.00	1.74	21.19	0.00	21.19	0.87	0.8	14.76
10.00	2.00	2.00	16.7	0.3	2500	0.000	6.96	4.00	1.83	22.25	0.00	22.25	0.88	0.8	15.61
2.00	2.00	3.00	25.2	0.3	2500	0.000	6.30	4.00	0.95	17.43	0.00	17.43	0.59	0.8	8.19
3.00	2.00	3.00	23.6	0.3	2500	0.000	7.08	4.00	1.20	20.62	0.00	20.62	0.66	0.8	10.94
4.00	2.00	3.00	23.6	0.3	2500	0.000	7.87	4.00	1.31	22.51	0.00	22.51	0.71	0.8	12.75
5.00	2.00	3.00	23.6	0.3	2500	0.000	8.43	4.00	1.40	24.00	0.00	24.00	0.74	0.8	14.19
6.00	2.00	3.00	23.5	0.3	2500	0.000	8.81	4.00	1.48	25.38	0.00	25.38	0.76	0.8	15.47
7.00	2.00	3.00	23.5	0.3	2500	0.000	9.14	4.00	1.57	26.86	0.00	26.86	0.78	0.8	16.75
8.00	2.00	3.00	23.5	0.3	2500	0.000	9.40	4.00	1.66	28.34	0.00	28.34	0.79	0.8	18.00
9.00	2.00	3.00	23.5	0.3	2500	0.000	9.61	4.00	1.74	29.82	0.00	29.82	0.81	0.8	19.22
10.00	2.00	3.00	23.5	0.3	2500	0.000	9.79	4.00	1.83	31.31	0.00	31.31	0.82	0.8	20.43

ALLOWABLE BEARING CAPACITY FROM SHE
SETTLEMENT CRITERIA

FOOTING DIMENSIONS					***ALLOWABLE CAPA***		
L	**B**	**Df**	**NET SAFE BEARING CAPACITY**	**total corrected settlement, $S_{tcorrect}$**	**For allowable settlement 25 mm**	**For allowable settlement 40 mm**	**For allowable settlement 75 mm**
Meter	Meter	Meter	Qnet safe in T/sqm	mm	T/Sqm	T/Sqm	T/Sqm
2.00	2.00	1.00	10.6	5.06	10	10	10
3.00	2.00	1.00	9.9	6.14	9	9	9
4.00	2.00	1.00	10.2	7.03	10	10	10
5.00	2.00	1.00	10.3	7.65	10	10	10
6.00	2.00	1.00	10.4	8.27	10	10	10
7.00	2.00	1.00	10.5	8.90	10	10	10
8.00	2.00	1.00	10.6	9.52	10	10	10
9.00	2.00	1.00	10.6	10.06	10	10	10
10.00	2.00	1.00	10.6	10.60	10	10	10
2.00	2.00	1.50	13.9	6.10	13	13	13
3.00	2.00	1.50	13.0	7.56	13	13	13
4.00	2.00	1.50	13.2	8.60	13	13	13
5.00	2.00	1.50	13.3	9.41	13	13	13
6.00	2.00	1.50	13.4	10.20	13	13	13
7.00	2.00	1.50	13.5	10.98	13	13	13
8.00	2.00	1.50	13.5	11.68	13	13	13
9.00	2.00	1.50	13.5	12.37	13	13	13
10.00	2.00	1.50	13.6	13.16	13	13	13
2.00	2.00	2.00	17.5	7.02	17	17	17
3.00	2.00	2.00	16.4	8.89	16	16	16
4.00	2.00	2.00	16.5	10.14	16	16	16
5.00	2.00	2.00	16.6	11.15	16	16	16
6.00	2.00	2.00	16.6	12.06	16	16	16
7.00	2.00	2.00	16.6	12.95	16	16	16
8.00	2.00	2.00	16.7	13.90	16	16	16
9.00	2.00	2.00	16.7	14.76	16	16	16
10.00	2.00	2.00	16.7	15.61	16	16	16
2.00	2.00	3.00	25.2	8.19	25	25	25
3.00	2.00	3.00	23.6	10.94	23	23	23
4.00	2.00	3.00	23.6	12.75	23	23	23
5.00	2.00	3.00	23.6	14.19	23	23	23
6.00	2.00	3.00	23.5	15.47	23	23	23
7.00	2.00	3.00	23.5	16.75	23	23	23
8.00	2.00	3.00	23.5	18.00	23	23	23
9.00	2.00	3.00	23.5	19.22	23	23	23
10.00	2.00	3.00	23.5	20.43	23	23	23

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (								
				Zone-1 Pump House & Fire Water Storage			**Zone-2** Storage Raw Water					
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
1	2.00	2.00	1.00	24	34	34	19	22	22	19	24	24
2	3.00	2.00	1.00	19	29	29	15	19	19	15	21	21
3	4.00	2.00	1.00	17	27	29	14	19	19	13	20	20
4	5.00	2.00	1.00	16	25	28	13	18	18	12	19	20
5	6.00	2.00	1.00	15	24	28	12	18	18	11	18	19
6	7.00	2.00	1.00	14	23	27	11	18	18	11	17	19
7	8.00	2.00	1.00	13	22	27	11	18	18	10	17	19
8	9.00	2.00	1.00	13	21	27	10	17	18	10	16	19
9	10.00	2.00	1.00	12	20	27	10	16	18	10	16	19
10	2.00	2.00	1.50	26	35	35	21	23	23	20	25	25
11	3.00	2.00	1.50	20	31	31	17	20	20	16	22	22
12	4.00	2.00	1.50	18	29	30	14	19	19	14	21	21
13	5.00	2.00	1.50	16	26	29	13	19	19	13	20	21
14	6.00	2.00	1.50	15	25	29	12	19	19	12	19	20
15	7.00	2.00	1.50	14	23	29	12	19	19	11	18	20
16	8.00	2.00	1.50	14	22	28	11	18	19	11	17	20
17	9.00	2.00	1.50	13	22	28	11	18	18	10	17	20
18	10.00	2.00	1.50	13	21	28	10	17	18	10	16	20
19	2.00	2.00	2.00	29	37	37	23	24	24	22	26	26
20	3.00	2.00	2.00	22	32	32	18	21	21	17	23	23
21	4.00	2.00	2.00	19	31	31	15	20	20	15	22	22
22	5.00	2.00	2.00	17	28	31	14	20	20	13	22	22
23	6.00	2.00	2.00	16	26	30	13	20	20	12	20	21
24	7.00	2.00	2.00	15	24	30	12	20	20	12	19	21
25	8.00	2.00	2.00	14	23	30	12	19	19	11	18	21
26	9.00	2.00	2.00	14	22	30	11	18	19	11	17	21
27	10.00	2.00	2.00	13	22	29	11	18	19	10	17	21
28	2.00	2.00	3.00	35	40	40	26	26	26	27	28	28
29	3.00	2.00	3.00	26	35	35	21	23	23	20	25	25
30	4.00	2.00	3.00	22	34	34	18	22	22	17	24	24
31	5.00	2.00	3.00	19	31	33	16	22	22	15	23	23
32	6.00	2.00	3.00	18	29	33	14	21	21	14	22	23
33	7.00	2.00	3.00	17	27	32	13	21	21	13	21	23
34	8.00	2.00	3.00	16	25	32	13	21	21	12	20	23
35	9.00	2.00	3.00	15	24	32	12	20	21	12	19	23
36	10.00	2.00	3.00	14	23	32	12	19	21	11	18	22

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (								
				Zone-6 Plant Methanol			**Zone-10** Building Administrative					
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
1	2.00	2.00	1.00	13	13	13	18	26	26	22	27	27
2	3.00	2.00	1.00	12	12	12	15	23	23	17	24	24
3	4.00	2.00	1.00	13	13	13	13	21	22	15	23	23
4	5.00	2.00	1.00	13	13	13	12	19	22	14	22	22
5	6.00	2.00	1.00	13	13	13	11	18	22	13	22	22
6	7.00	2.00	1.00	13	13	13	11	17	21	13	21	22
7	8.00	2.00	1.00	13	13	13	10	17	21	12	20	22
8	9.00	2.00	1.00	13	13	13	10	16	21	12	19	22
9	10.00	2.00	1.00	14	14	14	9	15	21	11	18	22
10	2.00	2.00	1.50	18	18	18	20	28	28	24	28	28
11	3.00	2.00	1.50	16	16	16	16	24	24	19	25	25
12	4.00	2.00	1.50	17	17	17	14	22	23	16	24	24
13	5.00	2.00	1.50	17	17	17	12	20	23	15	24	24
14	6.00	2.00	1.50	17	17	17	12	19	23	14	23	23
15	7.00	2.00	1.50	17	17	17	11	18	22	13	21	23
16	8.00	2.00	1.50	17	17	17	11	17	22	13	21	23
17	9.00	2.00	1.50	17	17	17	10	17	22	12	20	23
18	10.00	2.00	1.50	17	17	17	10	16	22	12	19	23
19	2.00	2.00	2.00	22	22	22	22	29	29	26	30	30
20	3.00	2.00	2.00	21	21	21	17	25	25	20	26	26
21	4.00	2.00	2.00	21	21	21	14	23	24	17	25	25
22	5.00	2.00	2.00	21	21	21	13	21	24	16	25	25
23	6.00	2.00	2.00	21	21	21	12	20	24	15	24	24
24	7.00	2.00	2.00	21	21	21	12	19	23	14	22	24
25	8.00	2.00	2.00	21	21	21	11	18	23	13	21	24
26	9.00	2.00	2.00	21	21	21	11	17	23	13	20	24
27	10.00	2.00	2.00	21	21	21	10	17	23	12	20	24
28	2.00	2.00	3.00	32	32	32	27	31	31	32	32	32
29	3.00	2.00	3.00	30	30	30	20	27	27	23	28	28
30	4.00	2.00	3.00	30	30	30	17	26	26	20	27	27
31	5.00	2.00	3.00	30	30	30	15	24	26	18	27	27
32	6.00	2.00	3.00	30	30	30	14	22	26	16	26	26
33	7.00	2.00	3.00	30	30	30	13	21	25	15	25	26
34	8.00	2.00	3.00	30	30	30	12	20	25	14	23	26
35	9.00	2.00	3.00	30	30	30	11	19	25	14	22	26
36	10.00	2.00	3.00	28	30	30	11	18	25	13	21	26

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (								
				Zone-12 Air Separation Unit			**Zone-13** Gasification Plant					
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
1	2.00	2.00	1.00	21	21	21	24	29	29	21	26	26
2	3.00	2.00	1.00	17	18	18	19	25	25	17	23	23
3	4.00	2.00	1.00	15	18	18	17	25	25	15	22	22
4	5.00	2.00	1.00	14	18	18	15	24	24	14	21	21
5	6.00	2.00	1.00	13	17	17	14	23	24	13	21	21
6	7.00	2.00	1.00	12	17	17	14	22	24	12	20	21
7	8.00	2.00	1.00	12	17	17	13	21	23	12	19	21
8	9.00	2.00	1.00	11	17	17	13	21	23	11	18	21
9	10.00	2.00	1.00	11	17	17	12	20	23	11	18	21
10	2.00	2.00	1.50	22	22	22	26	30	30	23	27	27
11	3.00	2.00	1.50	18	19	19	20	26	26	18	24	24
12	4.00	2.00	1.50	16	19	19	18	26	26	16	23	23
13	5.00	2.00	1.50	14	18	18	16	25	25	14	22	22
14	6.00	2.00	1.50	13	18	18	15	24	25	13	22	22
15	7.00	2.00	1.50	13	18	18	14	23	25	13	21	22
16	8.00	2.00	1.50	12	18	18	14	22	25	12	20	22
17	9.00	2.00	1.50	12	18	18	13	21	24	12	19	22
18	10.00	2.00	1.50	11	18	18	13	21	24	11	18	22
19	2.00	2.00	2.00	23	23	23	28	32	32	25	28	28
20	3.00	2.00	2.00	19	20	20	22	28	28	19	25	25
21	4.00	2.00	2.00	17	20	20	19	27	27	17	24	24
22	5.00	2.00	2.00	15	19	19	17	26	26	15	23	23
23	6.00	2.00	2.00	14	19	19	16	26	26	14	23	23
24	7.00	2.00	2.00	13	19	19	15	24	26	13	22	23
25	8.00	2.00	2.00	13	19	19	14	23	26	13	21	23
26	9.00	2.00	2.00	12	19	19	14	22	25	12	20	23
27	10.00	2.00	2.00	12	18	18	13	21	25	12	19	23
28	2.00	2.00	3.00	25	25	25	34	34	34	31	31	31
29	3.00	2.00	3.00	22	22	22	25	30	30	23	27	27
30	4.00	2.00	3.00	19	21	21	21	29	29	19	26	26
31	5.00	2.00	3.00	17	21	21	19	29	29	17	25	25
32	6.00	2.00	3.00	16	21	21	17	28	28	16	25	25
33	7.00	2.00	3.00	15	20	20	16	26	28	15	24	25
34	8.00	2.00	3.00	14	20	20	15	25	28	14	22	25
35	9.00	2.00	3.00	13	20	20	15	24	28	13	21	25
36	10.00	2.00	3.00	13	20	20	14	23	27	13	21	25

Sl. No.	Footing Dimensions (in Mtr)			ALLOWABLE BEARING CAPACITY (								
				Zone-16 Ash Slag Storage			**Zone-17** Fire Station					
	L	B	Df	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm	For allowable settlement 25 mm	For allowable settlement 40 mm	For allowable settlement 75 mm
1	2.00	2.00	1.00	14	14	14	13	13	13	22	31	31
2	3.00	2.00	1.00	13	13	13	12	12	12	17	27	27
3	4.00	2.00	1.00	13	13	13	13	13	13	15	25	26
4	5.00	2.00	1.00	13	13	13	13	13	13	14	23	26
5	6.00	2.00	1.00	13	13	13	13	13	13	13	21	26
6	7.00	2.00	1.00	13	13	13	13	13	13	13	20	25
7	8.00	2.00	1.00	14	14	14	13	13	13	12	19	25
8	9.00	2.00	1.00	14	14	14	13	13	13	12	19	25
9	10.00	2.00	1.00	14	14	14	13	13	13	11	18	25
10	2.00	2.00	1.50	18	18	18	17	17	17	24	33	33
11	3.00	2.00	1.50	17	17	17	16	16	16	18	28	28
12	4.00	2.00	1.50	17	17	17	17	17	17	16	26	28
13	5.00	2.00	1.50	17	17	17	17	17	17	15	24	27
14	6.00	2.00	1.50	17	17	17	17	17	17	14	22	27
15	7.00	2.00	1.50	17	17	17	17	17	17	13	21	27
16	8.00	2.00	1.50	17	17	17	17	17	17	12	20	26
17	9.00	2.00	1.50	17	17	17	17	17	17	12	19	26
18	10.00	2.00	1.50	17	17	17	17	17	17	12	19	26
19	2.00	2.00	2.00	22	22	22	22	22	22	26	34	34
20	3.00	2.00	2.00	21	21	21	21	21	21	20	30	30
21	4.00	2.00	2.00	21	21	21	21	21	21	17	28	29
22	5.00	2.00	2.00	21	21	21	21	21	21	16	25	28
23	6.00	2.00	2.00	21	21	21	21	21	21	14	23	28
24	7.00	2.00	2.00	21	21	21	21	21	21	14	22	28
25	8.00	2.00	2.00	21	21	21	21	21	21	13	21	27
26	9.00	2.00	2.00	21	21	21	21	21	21	12	20	27
27	10.00	2.00	2.00	21	21	21	21	21	21	12	19	27
28	2.00	2.00	3.00	32	32	32	32	32	32	32	37	37
29	3.00	2.00	3.00	30	30	30	30	30	30	23	32	32
30	4.00	2.00	3.00	30	30	30	30	30	30	20	31	31
31	5.00	2.00	3.00	30	30	30	30	30	30	17	28	31
32	6.00	2.00	3.00	30	30	30	30	30	30	16	26	30
33	7.00	2.00	3.00	30	30	30	30	30	30	15	24	30
34	8.00	2.00	3.00	30	30	30	30	30	30	14	23	30
35	9.00	2.00	3.00	30	30	30	30	30	30	13	22	30
36	10.00	2.00	3.00	30	30	30	30	30	30	13	21	30