Job No: 421202

REPORT ON

GEOTECHNICAL INVESTIGATION WORK FOR AGARTALA SMART CITY PROJECT, TRIPURA

(Highrise Building for Slum Dwellers, Akhaura)

Client:

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C. E. Testing Company Pvt. Limited An ISO 9001, 14001 & OHSAS 18001 Cerified Company NABL Accredited Laboratory 124A, N. S. C. Bose Road : Kolkata - 700 092 Phones : 2428-6221/6222/6223 Fax : (033) 2428-6220 Email : cetest@cetestindia.com Project: Geotechnical Investigation Work for Agartala Smart City Project, Tripura.

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REPORT ON GEOTECHNICAL INVESTIGATION WORK FOR AGARTALA SMART CITY PROJECT, TRIPURA

1. INTRODUCTION

Government of India plans to implement Smart City Programme to transform 100 Indian Cities to Smart Cities. **TATA Consulting Engineers Limited** have been appointed as Project Management Consultant to design, develop certain parts of Agartala, the capital city of Tripura under **Area based Development.** For layout plan and designing various foundation structures coming under this project, it was necessary to conduct a detailed Geotechnical Investigation work to obtain engineering properties of the underlying soil and **M/s. Tata Consulting Engineers Limited** appointed **M/s. C. E. Testing Company Pvt. Ltd.,** Kolkata as their Geotechnical Consultant.

This is a part of the whole project and deals with soil investigation for **Highrise Building for Slum Dwellers at Akhaura.**

The scope of the work comprises of sinking 02 nos. Boreholes. The bore holes were of 150 mm in diameter. It included advancing the boreholes by Shell and Auger equipment. The scope also included conducting Standard Penetration Tests, collecting disturbed samples at regular intervals for identification and logging purposes, collecting undisturbed tube samples at suitable intervals or at change of strata whichever is earlier and testing these in the laboratory.

Based on the above, this report presents the Bore Logs, Soil Profile, laboratory and field Test Results. On the basis of field tests and laboratory test results and their analysis thereof, the most suitable type of foundation is suggested. The field profile is sometimes changed in the light of laboratory test results.

The subsoil is of very poor to medium quality. It is characterized by filled up soil followed by a very soft to soft, clayey silt / silty clay layer. Below that, a medium, silty clay / clayey silt followed by a medium dense to dense silty sand layer was observed. A stiff to very stiff clayey silt layer appears afterwards. Underlying the above, a very dense, silty sand layer is encountered and that continued up to the termination depth of both the bore holes.

Considering the nature of the subsoil, field tests and laboratory tests, suitable foundation system is suggested. However this is discussed in details later.



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2. FIELD INVESTIGATION

2.1. GENERAL:

In an attempt for optimization in the design of foundation for these proposed structures to be constructed at this site, Geotechnical Investigation was envisaged. The entire Investigation programme had been divided mainly into two parts, I) Field works & II) Laboratory tests.

- I) Field works unfold the sub-surface deposit types and their characteristics and
- II) Laboratory tests part would help determining the relevant physical and geotechnical properties of the sub-surface deposits leading to finalization of foundation depths of the structures and the bearing capacity with particular reference to the sub-surface types and their strength parameters and settlement potentials at the site.

A list of the bore holes with the Co-ordinates, R.L., terminating depth and standing water level below EGL are presented in a tabular form below:-

Bore Hole Co-ordin		nate, (M) R.L.	Terminating	Standing Water	
No.	Easting	Northing	(M)	Depth (m)	Level (m)
BH-01	322352.444	2637779.793	8.453	31.63	2.30
BH-02	322323.929	2637777.575	7.912	30.00	1.80

2.2. BORING:

Boring was carried out by Shell and Auger method to sink nominal 150mm diameter bore holes to depths envisaged by using a mechanical winch. Undisturbed soil samples were collected at suitable intervals or at change of strata whichever is earlier by open drive sampling method since it was intended to ascertain the sub-soil characteristics.

2.3. SAMPLING:

Nominal 100 mm diameter undisturbed samples were recovered. The sampling equipment used consists of a two-tier assembly of sample tubes 450 mm in length fitted at its lower end. The sampling assembly was driven by means of a jarring link to its full length or as far downs as was found practicable. After withdrawal the ends of the tubes were sealed with wax and capped before onward transmission to the laboratory. At close intervals in depth disturbed samples were collected for identification and logging purpose. These were tagged and packed in polythene packets and transported to the laboratory.

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2.4. STANDARD PENETRATION TESTS:

Standard Penetration Tests were conducted in the bore holes at intervals of 1.50M / 3.0M or at change of strata whichever is earlier in depth using a split spoon sampler. The split spoon sampler used is of a Standard design having an outer diameter of 50.8 mm and inner diameter of 35 mm, driving with a monkey weighing 63.5 kgs, falling freely through 75cms advances the spoon. A record of the number of blows required to penetrate every 7.5cms to a maximum depth of 45cms was made. The first 15cm of drive are considered to be seating drive and are neglected. The total blows required for third, fourth, fifth & sixth 7.50cm of penetration is counted and termed as penetration resistance "N". On completion of a test, the split spoon sampler was opened and soil specimens were preserved in polythene bags for logging purpose.

The borehole was sunk with winch. However, raising of hammer for SP Tests was done manually. Hence there will not be any inertia loss and the efficiency of hammer blows should be considered as 100%.

2.5. MEASUREMENT OF WATER TABLE:

Standing water level after 24 hours of removal of casing was noted and shown in the profile.

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3. LABORATORY TESTING

For proper identification and classification of the sub-soil deposits and for deriving adequate information regarding its relevant physical and geotechnical properties at the site under investigation, the following laboratory tests were conducted on the soil samples collected from the exploratory bore holes:

- 1. Grain size analysis (Sieve as well as Hydrometer).
- 2. Determination of Liquid Limit, Plastic Limit & Shrinkage Limit.
- 3. Determination of Natural Moisture Content.
- 4. Determination of Specific Gravity.
- 5. Determination of Bulk & Dry Unit Weight.
- 6. Strength determination by Triaxial Unconsolidated Undrained Test (UU).
- 7. Strength determination by Vane Shear Test.
- 8. Strength Determination of Unconfined Compression Test on "UDS" (UNCONFD).
- 9. Strength Determination of Unconfined Compression Test on REMOULDED samples.
- 10. One-dimensional Consolidation Test for determining settlement potentiality.
- 11. Determination of Free Swell Index & Swelling Pressure.
- 12. Chemical tests on soil samples to determine pH value, Sulphate, Chloride content, organic matter etc.

Laboratory test results are presented in a tabular form in the Appendix. The results are self explanatory except that of consolidation tests. The compressibility for a pressure range has been separated into 2 components through the compression ratio. As a first step dial gauge reading is plotted against square root of time and by extrapolation dial reading at zero time, is obtained. The compression ratio is given as

 $r = (d_i - d_s)/(d_i - d_f)$, where $d_i =$ Initial reading of dial before load application $d_s =$ Dial reading corresponding to theoretical zero time $d_f =$ Final dial reading after 24 hrs. Now we write $m_{vc} = (1 - r) \times m_v$

All the tests were conducted as per relevant Indian Standard Specifications.

4. SUBSOIL CONDITION, PROPERTIES AND STRATIFICATION

4.1. SUB-SOIL CONDITIONS:

The boring records showing the various soils met with are enclosed in the Appendix. These are prepared from field logs after proper modifications in the light of the laboratory test results and observation of disturbed and penetrometer soil samples. The results of the Standard Penetration Tests are given as 'N' values in these boring records. The sub-soil profiles (as obtained from field and Laboratory test results) across the bore holes are shown under Fig. 2 giving description, consistency and colour of each stratum. The "N" values are shown in the profile. The laboratory test results and the backup sheets are presented in the Appendix.

4.2. SUB-SOIL STRATIFICATIONS:

The subsoil is of very poor to medium quality. It is characterized by filled up soil followed by a very soft to soft, clayey silt / silty clay layer. Below that, a medium, silty clay / clayey silt followed by a medium dense to dense silty sand layer was observed. A stiff to very stiff clayey silt layer appears afterwards. Underlying the above, a very dense, silty sand layer is encountered and that continued up to the termination depth of both the bore holes. The layer wise description of each layer is presented below.

4.2.1. FILL:

Filled up soil consists of deep grey, silty clay with debris, garbage & brick bats. The average properties of this layer (which may not be truly representative of this layer) are presented below.

Bulk Density, gms/cc	1.74	Specific gravity	2.58
Dry Density, gms/cc	1.24		
Natural Water Content, %	40	GRAIN SIZE	
TRSH-UU:		Sand %	13
Cohesion kg/sqcm	0.20	Silt %	73
Friction angle °	0	Clay %	14

4.2.2. STRATUM - I:

The soil in this layer consists of very soft to soft, steel grey, clayey silt / silty clay with decomposed wood & organic matter. Average "N" value of this layer is 02. The "UDS" that could be collected from this layer show the following average properties.

Bulk Density, gms/cc	1.50	Specific gravity	2.53
Dry Density, gms/cc	0.80	Void ratio	1.157
Natural Water Content, %	87	Liquid Limit %	47
		Plastic Limit %	27
TRSH-UU:		Plasticity Index %	20
Cohesion kg/sqcm	0.13	Shrinkage Limit %	26
Friction angle °	0	GRAIN SIZE	
UNCONFINED "C"	0.08	Sand %	15
REMOULDED "C"	0.03	Silt %	70
SENSITIVITY	2.67	Clay %	15



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4.2.3. STRATUM - II:

The soil in this layer consists of medium, deep grey, silty clay / clayey silt with fine sand mixture. Decomposed wood & organic matter have been observed in this layer. Average "N" value of this layer is 05. The "UDS" as well as SPT sample that could be collected from this layer show the following average properties.

Bulk Density, gms/cc	1.55	Liquid Limit %	57
Dry Density, gms/cc	0.90	Plastic Limit %	36
Natural Water Content, %	72	Plasticity Index %	21
Specific gravity	2.60	Shrinkage Limit %	28
TRSH-UU:		GRAIN SIZE	
Cohesion kg/sqcm	0.12	Sand %	14
Friction angle °	0	Silt %	50
		Clay %	26

4.2.4. STRATUM - IIA:

The soil in this layer consists of stiff to very stiff, steel grey, clayey silt with sand mixture. Average "N" value of this layer is 15. The "UDS" as well as SPT sample that could be collected from this layer show the following average properties.

Bulk Density, gms/cc	1.88	Specific gravity	2.64
Dry Density, gms/cc	1.40	Liquid Limit %	46
Natural Water Content, %	34	Plastic Limit %	24
TRSH-UU:		Plasticity Index %	22
Cohesion kg/sqcm	0.71	Shrinkage Limit %	15
Friction angle °	0	GRAIN SIZE	
UNCONFINED "C"	0.41	Sand %	25
REMOULDED "C"	0.27	Silt %	60
SENSITIVITY	1.52	Clay %	15

4.2.5. STRATUM - III:

The soil in this layer consists of medium dense to dense, steel grey, silty sand. Clay binders have been observed in this layer. Average corrected "N" value of this layer is 21. A few "SPT" samples that could be collected in this layer show the following average properties.

Specific gravity	2.62
GRAIN SIZE	
Sand %	91
(Silt + Clay) %	09

4.2.6. STRATUM - IV:

The soil in this layer consists of very dense, steel grey, silty sand. Clay binders have been observed in this layer. Average corrected "N" value of this layer is 40. A few "SPT" samples that could be collected in this layer show the following average properties.

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Specific gravity	2.64
GRAIN SIZE	
Sand %	92
(Silt + Clay) %	08

4.3. GRAPHICAL PRESENTATION:

The Laboratory test results in summarised form are presented in Appendix. The backup sheets are presented there given in below.

- *i)* Strength envelopes from Triaxial Tests.
- *ii) e-log p curves from consolidation tests.*
- iii) Grain size distribution curves for Sieve & Hydrometer tests.

The consolidation test results are analysed by numerical methods and only the final output in a tabular form is given. The m_{vc} indicates the time dependent component of m_v and c_v is the co-efficient of consolidation.

4.4. VARIATION OF "N" WITH DEPTH:

The field "N" values are presented in the bore logs. The corrected "N" values are given in a tabular form and also presented separately in Appendix. The "N" values are an important governing factor in calculation of bearing capacity. The strata wise corrected "N" values are given in the following table.

Stratum No.	Corrected "N" values.		
	Average	Maximum	Minimum
FILL	2	2	1
Ι	2	3	0
II	5	7	4
IIA	15	27	7
III	21	27	16
IV	40	44	28

5. DISCUSSION

5.1. GENERAL:

The subsoil is of very poor to medium quality. It is characterized by filled up soil followed by a very soft to soft, clayey silt / silty clay layer. Below that, a medium, silty clay / clayey silt followed by a medium dense to dense silty sand layer was observed. A stiff to very stiff clayey silt layer appears afterwards. Underlying the above, a very dense, silty sand layer is encountered and that continued up to the termination depth of both the bore holes.

Due to very poor subsoil condition, open foundation cannot be used. Considering the subsoil condition and the type of structures to be constructed at the present site, it is suggested to go for deep foundation in from of pile.

5.2. USE OF R. C. BORED PILE:

Bored cast-in-situ piles are preferred due to availability of construction agencies, ease of construction and less sound pollution. Such piles may be placed at 25M depth below EGL. Pile capacity is calculated based on average soil properties.

At first, the design strength parameters are determined. Thereafter, the pile capacity values are calculated. While determining the pile capacity, the following considerations are made.

- a) Pile capacity is calculated using layer stratification around BH-02 location.
- b) Cut off = 1.00 m.
- c) Assumed Grade of Concrete = M25.
- d) Diameter of pile used = 450, 500, 600 & 750 mm.

5.2.1. DESIGN STRENGTH PARAMETERS:

STRATUM – I:

Average "N" value in this layer = 02. So, estimated cohesion from N value = 0.25 kg/sqcm.

From laboratory TRSH-UU test result, cohesion = 0.13 kg/sqcm and Φ = 0°

Considering the above use, C = 0.15 kg/sqcm and Φ = 0°

Use Adhesion factor, α = 1.000

STRATUM – II:

Average "N" value in this layer = 05. So, estimated cohesion from N value = 0.45 kg/sqcm.

From laboratory TRSH-UU test result, cohesion = 0.12 kg/sqcm and Φ = 0°

Considering the above use, C = 0.25 kg/sqcm and Φ = 0°

Use Adhesion factor, α = 1.000

STRATUM – IIA:

Average "N" value in this layer = 15. So, estimated cohesion from N value = 0.85 kg/sqcm.

From laboratory TRSH-UU test result, cohesion = 0.71 kg/sqcm and Φ = 0°

Considering the above use, C = 0.75 kg/sqcm and Φ = 0°

Use Adhesion factor, α = 0.606

STRATUM – III:

Design corrected "N" in this layer = 21, corresponding Relative Density (D_r) = 51.50 % Fine particle is more than 5%,

Hence, Friction angle Φ_1 = 25+0.15 x D_r = 25+0.15 x 51.50 = 32.73° ≈ 33°

For bored cast-in-situ piles the soil get loosened during boring.

Poulos(1980) suggested that $\Phi = \Phi_1 - 3 = 33 - 3 = 30^{\circ}$

Use, C = 0.00kg/sqcm & Φ = 30° and K_o = 1.00

STRATUM – IV:

Design corrected "N" in this layer = 40,

Use, C = 0.00kg/sqcm & Φ = 34° and K_{o} = 1.20 for this layer.



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		-	SAMPLE PI	LE CAPACITY	<u>ZALCUL</u>	ATION				
Bottom depth o Cut-off I enoth:	of Pile =	27.00	m below Existin	g ground level.						
Due to presence Diameter of Pilo	− e of Filled up soil at the to e =	p, the effect of 4.70m sc 450	jii below cut off mm	towards pile capaci	ty is neglected Critical depth	·	15.00	D		
FOS of Shaft R FOS for End Be	esistance =	2.50			Maximum OV	.P =	4.44	t/sqm		
So, maximum I	Depth upto which pressure	will increase =	6.75	Ш						
Layer No.	Top Depth (M)	Bottom Depth (M)	Eff. Depth (M)	Cohesion (kg/sqcm)	ф (Degree)	Adhesion Factor (α)	K ₀	Eff. Density (gm/cc)	Mean Pressure (t/sqm)	
FILL	1.00	5.70	4.70	1	:	1	ł	0.65	2.18	
Ι	5.70	12.45	6.75	0.15	0	1.000	1.00	0.70	4.38	
Ш	12.45	16.50	4.05	0.00	30	1.000	1.00	06.0	4.44	
Π	16.50	19.00	2.50	0.25	0	1.000	1.00	0.60	4.44	
IIA	19.00	22.00	3.00	0.75	0	0.606	1.00	06.0	4.44	
IV	22.00	27.00	5.00	0.00	34	1.000	1.20	0.90	4.44	
Layer	Eff. Depth	Effective σ_z	$f_{s_1} = \alpha C$	$f_{s2}=K_0\sigma_z tan\Phi$	$f_S = f_{s_1} + f_{s_2}$	Ultimate Shaft	Safe Shaft			
No.	(M)	(t/sqm)			(t/sqm)	Resistance (T)	Resistance (T)			
FILL	4.70	2.18	1	1	1	1	1			
Ι	6.75	4.38	1.50	0.00	1.50	14.31	5.73			
Ш	4.05	4.44	0.00	2.56	2.56	14.68	5.87			
П	2.50	4.44	2.50	0.00	2.50	8.84	3.53			
IIA	3.00	4.44	4.54	0.00	4.54	19.26	7.71			
IV	5.00	4.44	0.00	3.59	3.59	25.40	10.16			
	26.00					82.49	33.00			
For End Beari	ing									
Coh	tesion C=	0	kg/sqcm							
Fric	tion Angle =	34	0							
- pN		42.69								
Eff.	Ovp. Pressure=p(tip)	4.44	t/sqm							
q(ti)	ip) =C.Nc+p(tip).Nq=	189.56	t/sqm							
Ulti	mate End Bearing =	30.15	Т							
Safé Safé	e End Bearing = Schaft Decistance=	12.06	гг							
So, Total Pile C	Capacity =	45.06	I L							
So. Recomme	ended Pile Capacity = .	40 T								

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With reference to the above design data, the vertical pile capacity is calculated. The recommended vertical pile capacity values (with a cut-off = 1.00m below EGL) are given below. A sample calculation sheet is enclosed separately.

Bottom depth of pile below EGL (M)	Pile Dia. (mm)	Recommended Vertical Pile Capacity (T)
	450	35
25	500	45
23	600	65
	750	110
	450	40
27	500	50
27	600	75
	750	120
	450	45
20	500	55
50	600	85
	750	135

5.2.2. DETERMINATION OF LATERAL PILE CAPACITY:

Use C = 0.15 kg/sqcm for lateral pile capacity calculation.

Refer to IS : 2911 (Part I/Sec 2) - 2010, Appendix - C

Constant Factor, $k_1 = 0.54$ kg/cucm corresponding to Cohesion = 0.15 kg/sqcm Now, K = ($k_1/1.5$) x (30/D) which is coming as 0.24 kg/cucm [D = Pile dia in cm] Stiffness factor, R = [EI/KD]^{1/4}

Now, $I = 0.20 \times 10^{6} \text{ cm}^{4}$ [for 450mm dia pile]

E = 5000 x $(f_{ck})^{0.5}$ = 5000 x $(25)^{0.5}$ = 25000 N/sqmm = 2.50 x 10⁵ kg/sqcm Hence, R = 261.27 cm

From Graph (Fig.4), L_f = 1.95 x R = 509.47 cm [Assuming Fixed Head Piles]

Pile Head deflection, Y = H x L_f^3 / 12EI = 2.1899mm for 1T load

So, for 5mm horizontal deflection , H = 2.28T, say 2.25T

Now, Moment = $[H \times L_f/2] = [1 \times 5.09/2] = 2.55t$ -m per T of thrust

The Reduction Factor for computation of Maximum Moment in Pile, m = 0.70

So, the corrected actual moment, $M = 2.55 \times 0.70 = 1.78t$ -m per T of thrust.

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5.3. SWELLING CHARACTERISTICS:

The swelling pressure and Free Swell Index tests have been performed on a few soil samples over the entire zone of investigation. The swelling pressure is 0.00kg/sqcm and Free Swell Index as found from the test ranges from 7.32% to 9.52%. Thus, the subsoil has low swelling characteristics. <u>So, no problem with respect to the swelling of the subsoil is anticipated.</u>

5.4. CHEMICAL TESTS:

Chemical tests were performed on few soil samples for determining the pH value, Sulphate, Chloride, and organic matter etc. The results are given in a tabular form below:

CHEMICAL TEST RESULTS ON SOIL SAMPLES:-

BH/Sample No.	Depth (m)	pH value	Sulphate as SO₃ (%)	Chloride as Cl (%)	Organic Matter (%)
01 / UDS-02	6.50	5.12	*B.D.L.	0.0070	0.9575
02 / UDS-02	6.50	5.00	*B.D.L.	0.0090	0.7629

*BDL = <u>B</u>elow <u>D</u>etection <u>L</u>imit (<0.050%)

It is seen that the values are within permissible limits (as per IS 456:2000). So no special cement will be required for foundation concrete. **Either Ordinary Portland cement or Portland slag cement or Portland Pozzolana cement can be used for the purpose.**

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6. SUMMARY & CONCLUSIONS

Based on the field & laboratory tests and the foregoing discussion, the following are summarised.

1. The subsoil is of very poor to medium quality. It is characterized by filled up soil followed by a very soft to soft, clayey silt / silty clay layer. Below that, a medium, silty clay / clayey silt followed by a medium dense to dense silty sand layer was observed. A stiff to very stiff clayey silt layer appears afterwards. Underlying the above, a very dense, silty sand layer is encountered and that continued up to the termination depth of both the bore holes.

2. <u>Use of Deep Foundation:</u>

- a. Due to very poor subsoil condition, deep foundation in form of pile is recommended for the proposed structure.
- b. Bored cast in-situ piles are preferred due to availability of construction agencies, ease of construction and low level of noise pollution.
- c. The determination of pile capacity (vertical and lateral) for bored cast-in-situ piles is presented in the previous section. The recommended pile capacity values for different pile diameters are presented below. (Cut-off-1.00m, grade of concrete = M25).

Bottom depth	Pile		Recomn	nended Pile Capacity	
of pile below	Diameter	Vertical	Lateral	Moment (t-m per	Length of
EGL (M)	(mm)	(T)	(T)	T of thrust)	fixity (m)
	450	35	2.25	1.78	5.09
25	500	45	2.50	1.98	5.66
23	600	65	3.00	2.38	6.79
	750	110	3.75	2.97	8.49
	450	40	2.25	1.78	5.09
27	500	50	2.50	1.98	5.66
21	600	75	3.00	2.38	6.79
	750	120	3.75	2.97	8.49
	450	45	2.25	1.78	5.09
30	500	55	2.50	1.98	5.66
50	600	85	3.00	2.38	6.79
	750	135	3.75	2.97	8.49

Note: Pile capacity shall be confirmed by conducting Initial Pile Load Test as per IS: 2911, Part-IV.

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3. Chemical tests were performed on few soil samples to determine the pH value, Sulphate, Chloride, and organic matter. It is seen that the values are within permissible limits (as per IS 456). So no special cement will be required for foundation concrete. **Either Ordinary Portland Cement or Portland slag cement or Portland Pozzolana cement can be used for the purpose.**

For	C.	E.	Testing	Company	Private	Limited.
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(S. NATH)

(DR. M. NAYAK)

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PART I: ALL FIELD TESTS RESULTS

Project : Geotechn Job No : 421202	ical Iı	nvestigation Wor Created by :	k for S.NA	Aga ATH	arta	ala	S Cre	ma eat	art ced	Ci	ty Pr n :	oject 08/10	t, Trip)/2018	oura. CETEST Sheet No:
BORE LOG	DAT	A SHEET	B	OR	E	F	IO	LI	£	Ν	0.1		Co-o	rdinates E=322352.444
Field Test	Nos	Samples		No	s	Сс	mn	nen	cer	nen	t Dat	e :	09/0)9/18
	10	Undisturbed (11		5		С	om	ple	eti	on	Date	e :	11/0)9/18
Penetrometer (SPT)		Penetrometer (SPT)	18	3	BC	ore	HC I I	ole ∩f	Dic		er: N ·	150 8.45 ⁻	mm. 3 m
Cone (Pc)		Disturbed (DS)		19	9	W	ate	er	Sti	ruc	sk A		0.400	5 111.
Vane (V)		Water Sample	(WS)) 0 Standing Water Level : 2.30 m.							m.			
DESCR		J	SYMB	IBOL N-VALUE SA						SAMPLES				
		`				ch T	di	vn.	=7	.50	cm.	Ref. No Depth (m)		
		0.00m.											с 1	0.50
	onci	ata of doop											S-1 S-2	1.00
grey, silty clay wi	th de	ebris, garbage						~	1					1 50 1 05
& brick bats.					0	0	0	0				51		1.50-1.95
		2 80m											S-3	2.50
		2.0011							1				DS-1	3.00-3.45
					0	0	0	0	1	0		SF	PT-2	3.45-3.90
Very soft to soft	, stee hatters	el grey, silty		$\frac{1}{2}$								D	S-4	4.50
	luttert					_	0	1	<u>3</u> 1	1			DT_3	5 00-5 45
							0	1					1-3	5.00-5.45
													S-5	6.00
		6.95m		È					<u>4</u>			UD)S-2	6.50-6.95
					0	0	1	0	1	2		SF	PT-4	6.95-7.40
													S-6	8.00
			HΗ		1	1	1	1	<u>6</u> 2	2			νT_5	8 50-8 95
 Soft to medium. w	vhitisł	n arev. clavev			1		'							0.00 0.00
silt / silty clay	. wit	th fine sand											S-7	9.50
mixture.				И					<u>7</u>	_		UD)S-3	10.00-10.45
					1	1	1	2	2	2		SF	PT-6	10.45-10.90
												D	S-8	11.50
					1	0	1	1	<u>4</u> 1	1		SF	PT-7	12.00-12.45
			ИЮ										<u>د</u> م	17.00
		——— 13.30m.											3-9	13.00
									27			*UI	DS-4	13.50-13.95
Medium den	se	to dense,			3	5	5	6	7	9		SF	PT-8	14.10-14.55
binders.	SUN	a. Obs. Cidy							46			DS	5-10	15.00
					4	6	9	10	12	15		SF	PT-9	15.50-15.95
		16 50m										ng	5-11	16.50
Very dense,steel grey	, silty	sand. Obs. clay			_		1	10	54				T 40	
binders.					Ъ	ŏ	12	12	د ۱	/		^{5P}	1-10	17.00-17.45
		18.00m.										DS	5-12	18.00
 Medium / stiff to verv	/ stiff.	steel grev. siltv							<u>_</u>)S-5	18.50-18.95
clay / clayey silt w	ith fir	ne sand mixture.			1	1	1	2	2	2		SP	T-11	18.95-19.40
		20.00m										DS	5–13	20.00
			L	\mathbf{T}	I				I	I		1		BH-1/Sheet-1

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Project : Geotechni Job No : 421202	ical Ir	vestigation Wor Created by :	k for S.NA	Aga ATH	arta	ala (Sm Crea	art C ted c	ity Pi on :	roject 08/10	., Trip)/2018	oura. CETEST Sheet No:
BORE LOG	DAT	A SHEET	B	DR.	E	Η	OL	E N	0.1		Co-0	rdinates N=2637779 793
Field Test	Nos	Samples		No	s	Cor	nme	nceme	nt Dat	te :	09/0	N=20J779.793)9/18
Penetrometer (SPT)	18	Undisturbed (U	DS)	5		Co	mр са Ц	letion	i Dat	e:	11/C	9/18 mm
		SPT)	18	3	Le	vel	Of G	3 m.				
Cone (Pc)		Disturbed (DS)		19	9	Wc	iter	Stru	ck A	t :		
Vane (V)		Water Sample	(WS)	0		Sto	ndin	g Wate	er Lev	el :	2.30	m.
			SAMB				N-V	ALUE/			Ç	SAMPLES
DESCR					Eac	ch	divn	.=7.5	0cm.	Ref	. No	Depth (m)
Medium / stiff to very clay / clayey silt wi Very dense, steel Obs. clay binders.	stiff, th fin	20.00m steel grey, silty e sand mixture. 22.90m 7, silty sand. 31.63m			2 2 4 8 10 14 22 36 5	2 2 8 111 2 4 7 5 5 5 5 5 5 5 5 5 5 5 5 5	2 2 3 3 11 1 1 (19 2 39 5 20 3 5 20 3 5 20 3 5 20 3 5 20 3 5 20 3 5 20 3 5 2 39 5 2 39 5 3 39 5 2 39 5 3 39 5 3 39 5 3 39 5 3 39 5 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	$ \begin{array}{c cccccccccccccccccccccccccccccccccc$	1 2 mtn. tn.	SP ¹ DS UDS SP ¹ DS SP ¹ DS SP ¹ DS SP ¹ DS SP ¹ DS SP ¹	$\Gamma - 12$ - 14 S - 06 $\Gamma - 13$ - 15 $\Gamma - 14$ - 16 $\Gamma - 15$ - 17 $\Gamma - 16$ - 17 $\Gamma - 18$ $\Gamma - 17$ - 19 $\Gamma - 18$ $\Gamma - 17$ - 19 $\Gamma - 18$ $\Gamma - 17$ - 19 $\Gamma - 19$ $\Gamma - 19$	20.50-20.95 21.50 22.00-22.45 22.45-22.90 23.50 24.00-24.45 25.00 25.50-25.95 26.50 27.00-27.37 28.00 28.50-28.80 29.50 30.00-30.22 31.00 31.50-31.63
N.B. — '*' means be recovered.	samp	ble could not										

Project : Geotechn Job No : 421202	ical Ir	vestigati Create	on Worl d bv :	k for S.NA	★ Aga ATH	arta	ala	. S Cre	ma eat	art .ed	Cit	ty Pr n :	oject 08/10	t, Trip)/2018	ura. CETEST Sheet No:
BORE LOG	DAT	A SHE	ET	BC	DRI	E	Ή	[0	LI	£	N	0.2		Co-o	rdinates E=322323.929
Field Test	Nos	Sc	Imples	_	Nos	S	Со	mn	nen	icer	nen	t Dat	e :	12/0	9/18
	1100		bod (III		6		Сс	om	ple	eti	on	Date	e :	14/0	9/18
Penetrometer (SPI)	18	Ponotror	ped (UI	, сс Срт)	18		Bo	re	Нс	ble	Die	amete	er :	150	mm.
Cone (Pc)		Disturbe	d (DS)	3517	20	, ,	Le	eve atc		0t S+1	Gr	ound	1 : 	7.912	2 m.
Vane (V)		Water S	ample ((WS)) 0 Standing Water Level : 1.8 m.							m.			
				<u></u>	N-VALUE										SAMPLES
DESCR	(PHON			SYMB		Eac	:h	di	vn.	=7	.50	cm.	Ref	. No	Depth (m)
			0.00m:										D D	S-1 S-2	0.50 1.00
						1	0	0	1	<u>2</u> 0	1		SF	PT-1	1.50-1.95
Filled up soil con	sists	of deep	grey,										D	S-3	2.50
brick bats.	eoris	, yarba	ye &			0	0	0	1	<u>2</u> 0	1		UE SF)S-1 PT-2	3.00-3.45 3.45-3.90
										1			D	S-4	4.50
						0	0	0	0	<u> </u> 1	0		SF	PT−3	5.00-5.45
Deep grey, silty	clay.	Obs.or	-5.70m. ganıc										D	S-5	6.00
6.50m						1 (0	1	0	<u>3</u> 1	1		UD SF)S-2 PT-4	6.50-6.95 6.95-7.40
									4			D	S-6	8.00	
			- • 1 4			0	0	0	0	$\frac{1}{0}$	1		SF	°T−5	8.50-8.95
soft to very soft clay.	, stee	el grey,	sılty										D	S-7	9.50
						0	0	0	0	<u>0</u> 0	0		UD SF)S-3 PT-6	10.00-10.45 10.45-10.90
										7			D	S-8	11.50
			12.45m.			0	0	1	0	<u>)</u> 1	1		SF	PT-7	12.00-12.45
													D	S-9	13.00
Medium dense to	dens	e eteel	arev							20			*U[DS-4	13.50-13.95
silty sand. Obs. clay	/ bind	ers.	yr⊂y,			2	3	4	4	5	7		SF	PT-8	14.15-14.60
										33			DS	5-10	15.00
						4	4	6	7	9	11		SF	PT-9	15.50-15.95
			16.50m										DS	5–11	16.50
Medium, steel gre decomposed wood.	ey, si	lty clay.	Obs.			1	1	1	1	<u>5</u> 1	2		UD SP)S-5 T-10	17.00-17.45 17.45-17.90
·			40.05		\mathcal{H}					1.3			DS	5-12	18.50
Stiff to very stiff, bro	wnish	grey, claye	19.00m. ey silt			2	2	3	3	3	4		SP	T—11	19.00-19.45
with sand mixture.			20.00m	· i h j									DS	5–13	20.00

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Project : Geotechn Job No : 421202	ical Ir	vestigation Wor Created by	k for S NA	★ Agart	ala S	Smart reated	City Pr	oject, Trip 08/10/2018	ura. CETEST Sheet No:
BORE LOG	DAT	A SHEET	B	ORE	H()LE	$\frac{3n}{N0.2}$	Co-01	dinates N=26777777 575
Field Test	Nos	Samples		Nos	Com	mencem	ent Dat	e : 12/0	9/18
Penetrometer (SPT)	18	Undisturbed (U	DS)	6	Bore	npietio Hole	n Date Diamete	e: 14/0 er: 150	9710 mm.
C_{opo} (Pc)		Penetrometer (SPT)	18	Lev	el Of	Ground	d : 7.912	2 m.
		Disturbed (DS)		20	Wat	er Str	uck A	t :	
Vane (V)		Water Sample	(WS)	0	Stan	ding Wa	ter Leve	el: 1.8 m	n.
DESCR			SYMB		<u> </u>	I-VALUI	<u> </u>		SAMPLES
		20.00.00			ch d	ıvn.=/. ⊤	50cm.	Ref. No	Depth (m)
Stiff to very stiff, bro	wnish	20.00m grey, clayey silt				27		*UDS-6	20.50-20.95
with sand mixture.				3	3 4	5 7	11	SPT-12	21.15-21.60
		22.00m						DS-14	22.00
				5	6 8	1216	19	SPT-13	22.50-22.95
								DS-15	23.50
				8	9 14	19274	14	SPT-14	24.00-24.45
						>100		DS-16	25.00
				11	23 35	553		SPT-15	25.50-25.80
Very dense, steel	grey	r, silty sand.				>100		DS-17	26.50
UDS. Clay binders.					39 58	Bonto		SPT-16	27.00-27.22
				/.0	CIII	renun.		DS-18	28.00
				25	56	$ \frac{>100}{}$	<u>)</u>	SPT-17	28.50-28.62
					4.5		entn.		29.50
		30.00m		42	52	<u>>100</u>	<u>)</u>	SPT-18	30 00-30 10
					2.5	cm P	entn.		
N.B. — '*' means be recovered.	samp	ole could not							
			1						BH_2/Sheet_

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Project: Geotechnical Investigation Work for Agartala Smart City Project, Tripura.	Т
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Job No. : 421202

Sheet No.

Bore	Starting	Ending	Average	Field 'N'	Cor. 'N' for Ovp.	Reduced	Stratum
Hole	Depth	Depth	Depth	Values	& Dilatancy	Level	
No:	(M)	(M)	(M)		(if reqd)	(M)	
BH01	1.50	1.95	1.73	1	01	6.73	Fill
BH01	3.45	3.90	3.68	1	01	4.78	Ι
BH01	5.00	5.45	5.23	3	03	3.23	Ι
BH01	6.95	7.40	7.18	4	04	1.28	II
BH01	8.50	8.95	8.73	6	06	-0.27	II
BH01	10.45	10.90	10.68	7	07	-2.22	II
BH01	12.00	12.45	12.23	4	04	-3.77	II
BH01	14.10	14.55	14.33	27	19	-5.87	III
BH01	15.50	15.95	15.73	46	27	-7.27	III
BH01	17.00	17.45	17.23	54	29	-8.77	IV
BH01	18.95	19.40	19.18	7	07	-10.72	IIA
BH01	20.50	20.95	20.73	10	10	-12.27	IIA
BH01	22.45	22.90	22.68	16	16	-14.23	IIA
BH01	24.00	24.45	24.23	67	32	-15.77	IV
BH01	25.50	25.95	25.73	>100	43	-17.27	IV
BH01	27.00	27.37	27.19	>100	43	-18.73	IV
BH01	28.50	28.80	28.65	>100	43	-20.20	IV
BH01	30.00	30.22	30.11	>100	43	-21.66	IV
BH01	31.50	31.63	31.57	>100	43	-23.11	IV
BH02	1 50	1 95	1 73	2	02	6 10	Fill
BH02	3 45	3 90	3.68	2	02	1 24	Fill
BH02	5.40	5 4 5	5.00	2 1	02	2 69	Fill
BH02	6.95	7 40	7 18	3	03	0.74	T
BH02	8 50	8 95	8 73	1	01	-0.81	I
BH02	10.45	10.90	10.68	0	00	-2 76	I
BH02	12.00	12 45	12 23	3	03	-4 31	I
BH02	14 15	14 60	14.38	20	16	-6.46	Ш
BH02	15 50	15.95	15 73	33	21	-7 81	III
BH02	17 45	17.90	17 68	5	05	-9 76	II
BH02	19.00	19 45	19.23	13	13	-11 31	IIA
BH02	21.15	21.60	21.38	27	27	-13.46	IIA
BH02	22.50	22.95	22.73	55	28	-14.81	IV
BH02	24.00	24.45	24.23	>100	44	-16.31	IV
BH02	25.50	25.80	25.65	>100	44	-17.74	IV
BH02	27.00	27.22	27.11	>100	44	-19.20	IV
BH02	28.50	28.62	28.56	>100	44	-20.65	IV
BH02	30.00	30.10	30.05	>100	44	-22.14	IV

CORRECTION FOR STANDARD PENETRATION TEST VALUES



Project: Geotechnical Investigation Work for Agartala	a Smart City Project, Tripura.
Job No. : 421202	Sheet No.

PART II: LABORATORY TEST RESULTS



An ISO 9001, 14001 & OHSAS 18001 Certified Company C. E. Testing Company Pvt. Ltd.

(AN NABL ACCREDITED TESTING LABORATORY AS PER ISO/IEC 17025) Sardarpara, Brahmapur,Kolkata-700 096,Tel: (033) 2410 5085/9813 E-mail: cetest.lab@gmail.com •Web: www.cetestindia.com CIN: U74920WB1988PTC045778



Format No: CET/FM/42

TEST REPORT

TEST REPORT NO

421202

DATE: 13/10/2018

ULR:

TC68401800000007P

Name and Address of Customer: TATA Consulting Engineers Limited,

Unit No.- NB 1502 & SB 1501, 15th Floor,

Empire Tower, Cloud City Campus, Village E

Kalwa Industrial Est, Thane Belapur Road, Airoli

Navi Mumbai – 400708, Maharashtra, India.

Customer Reference No : 421202

Customer Reference Date : 04/10/2018

Date of Sample Received at Lab : 29/09/2018

Date of Starting of Test : 04/10/2018

Date of Completion of Test : 11/10/2018

Sample ID Nos

: 421202/BH-01/SPT-01 to 421202/BH-02/SPT-17

Please refer the page no. A10 of A25 to A12 of A25 of the Report for the following:

- 1. Sample Description
- 2. Test methods used
- 3. Test results

Further to note that the test parameters are mentioned at the header of test result table.

* The report related to the particular sample(s) tested under stated condition.

* All tests are based as per IS/ASTM specifications

* Any discrepancy in this report should be brought to the notice within 15 (fifteen) days from the date of certificate

* Full/Partial use of this test results could not be done without the written permission of authorized signatory.

Head Office: 124-A, N.S.C Bose Road, Kolkata-700092 Project Office: Agartala•Patna•Ranchi•Hyderabad



Test	Method		**See the	Note	Do				Do				Do					ć	2		Do		Do	2											Do					Do	
	Clay	%	14		16				15				33		T			1.01	uay)		ay)	+	13	2	T															ay)	T
ize	Silt	%	73		76				59				63		t					+	(Silt+Cla	╡	81	5	+														_	(Silt+Cl	+
Grain S	Sand	%	13		8				26				4					100	- 00		92 8	+	9	,	+						-									95 5	+
	Gravl	%																																							
S	assifi	ation											T						5		A-SP																			1-SP	
	SL SL	% C			25 MI				26 MI				30 CF					Ū	ō		ง		16 CI	2											14 CI					S	
. Limits	Ч	%			28				29				41										25	ì											22						
Atter	L	%			47				47	-			59										47	:											45						
	Frictn	Deg.			0				0				0										0	,			0				0				0						
Results	ohesn	t/sqcm			0.07				0.09				0.21						+			T	0.64		+		0.41				0.27				0.78						+
th Test	ear C	qcm kç			1	85	0/	46		03	95	62		60	8 8	70	70							53	37	25	2	18	11	01		78	59	73		91	78	71			
Streng	She	n kg/s			NN-HS	0.0	0.0	0.0	NN-HS	0.1	0.0	0.0	UU-HS	0.2									NU-HS		0.0	0.0	CONFD	4.0	0.4	4.0	MOULD	0.2	0.2	0.2	NN-HS	0.7	0.7	0.7			
	Pc/Pn	kg/sqcr			TR	3.0	Z.U	1.0	TR	3.0	2.0	1.0	ТR	3.0		0 C							TR		0.0 0	10	NN NN	0.0	0.0	0.0	RE	0'0	0.0	0.0	TR	3.0	2.0	1.0			
Void	Ratio				1.268				0.888																																
Nat.	Mois.	%			53 S	50 1	D DG		113 S	142 T	48 C		82 S	74 T									36 S	26 T	- 00										32 S	30 T					
Spec.	Grav.		2.51		2.71				2.30				2.58					7 67	2.02				2.62												2.65					2.63	
Drv	Dens.	gms/cc			1.14				0.56				0.87										1.38	0											1.46						
Bulk	Dens.	gms/cc			1.70				1.30				1.52										1.86	202											1.90						
			ey silt	xture.					lt with	8			lt with	Ĭ	5			7			.pu														lt with		_			.pu	
iption			ey claye	sand mi	yey silt.				layey si	MOOD	-		lavev si	nic matt				oo telio t	/ siiry sa		/ silty sa		vev silt.	yey one.											layey si	l mixture			i	/ silty sa	
le Descr			nish gre	aces of	grey cla				grey cl	nposed	ir matte		arev c	of orda	2000			ioh anoi	(all liel		hish grey		arev cla	מיכז ממ											grey cl	s of sand			i	nish grey	
Samp			Browr	with tr	Deep				Deep	decon	Ordan	0.94	Deep	traces						1	Brown		Steel	200	1) Steel	traces				Browr	
Depth	Σ		1.50		3.00				6.50				10.00					1110	- 		17.00		18.50	2000											22.00				-	25.50	
Sample	Number		SPT01		UDS01				UDS02				UDS03					C DTO O	01 100		SPT10		UDS05												UDS06					SPT15	
Bore	Hole		BH01		BH01				BH01				BH01								BH01		BH01												BH01					BH01	

Page A10/A25

Tect	Method		Do	Do			Do								Do	Do			ı	no		ı	Do		1	Do		Do	
┢	Clay	%)lay)	ay)	+		13							+	ay)	15				Jay)		-	Clay)			ay)	$\left \right $	ay)	
θZ	Silt	%	(Silt+C	Silt+Cl			75								Silt+Cl	58)+1 <u>></u>			(Silt+C			Silt+Ci	Π	Silt+Ci	
Grain Si	Sand	%	89 11	93 7 (12								93 7 (27			0	12 88			44 56			94 6 (919(
	Gravl	%																										-	
<u>v</u>	lassifi	cation	M-SP	M-SP							*IO-I				M-SP	HO-H				н-Сн,		1	*		10	ЧS-М		M-SP	
	SL SL	%	S	S			28 C				S				S	25 M				≥		(0		(ν N		S	
Limits	Ъ	%					25									31											\square	_	
Atter.	LL	%					47									54													
_	Frictn	Deg.			0		0									0													
Results	Cohesn	g/sqcm			0.20		0.24				ST	/sqcm	/sqcm			0.04													
Strength Test	Shear (kg/sqcm k			sH-UU 0.212	0.204 0.184	NU-H	0.248	0.235		JE SHEAR TE	= 0.08 kg	= 0.03 kg			NU-Hi	0.042	0.033											
-	o Pc/Pn	kg/sqcm			3.0 3.0	2.0	5 TRS	3.0	2.0	2	VAN	NCONFD "c'	EMOULD "c'			TRS	3.0	1.0											
Voic	Rati						1.31					⊃	R																
Nat	Mois.	%			38 S 42 T		47 S	52 T	50 C		130 S	165 T				66 S	64 T												
Spec	Grav.				2.65		2.69				2.40					2.61										2.64			
Drv	Dens.	gms/cc			1.23		1.18				0.47					0.96													erties
Bulk	Dens.	gms/cc			1.74		1.79				1.22					1.58													ver prop
ample Description			rownish grey silty sand.	rownish grey silty sand.	eep grey silty clay with		teel grey clayey silt.				eep grey clayey silt with	scay decomposed wood	nd organic matter.		rownish grey silty sand.	eep grey clayey silt. Obs.	ecomposed wood.			ark grey clayey silt with	ganic matter.		rownish grey clayey silt	ith sand mixture.		rownish grey silty sand.		rownish grey silty sand.	ico ic hased on average la
Denth Sa	Σ		28.50 BI	31.50 Bi	3.00 D		6.50 St				10.00 D	đ	a	\dagger	14.15 Bi	17.00 D	Ď			17.45 D	o o	1	21.15 Bi	>		24.10 B	$\left \right $	28.50 B	in this ca
Sample [Jumber		SPT17	SPT19	1DS01		JDS02				JDS03				SPT08	JDS05				0110			SP112			SP114		SPT17	ification
Bore S	Hole		BH01 S	BH01	BH02 (BH02 L				BH02 L				BH02	BH02 L				BHUZ		0	BH02			BH02		BH02 (* - Class

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Bore Hole	Sample	Depth (M)	Description	Free Swell	Swelling	PI	Test Method
No.	No.			Index, (%)	Pressure,	(%)	
BH-01	UDS-01	3.00-3.45	Deep grey clayey silt.	9.52	0.00	19	*See the note
BH-01	UDS-02	6.50-6.95	Deep grey clayey silt with decomposed wood & organic matter.	9.09	0.00	18	Do
BH-01	UDS-03	10.00-10.45	Deep grey clayey silt with traces of organic matter.	7.69		18	Do
BH-01	UDS-05	18.50-1895	Steel grey clayey silt.	7.32		22	Do
BH-02	UDS-02	6.50-6.95	Steel grey clayey silt.	7.32	0.00	22	Do
BH-02	UDS-05	17.00-17.45	Deep grey clayey silt. Obs. Decomposed wood.	8.33		23	Do

SWELLING TEST RESULTS

**Note: Test Methods

Bulk Density & Dry Density: Ref. CET/SOP/01, Issue No. 01 Grain size analysis: IS 2720 (Part 4) Liquid Limit & Plastic Limit: IS 2720 (Part 5) Shrinkage Limit: IS 2720 (Part 6) Unconfined Compressive Strength Test of Soil: IS 2720 (Part 10) Consolidation Properties (Void Ratio): IS 2720 (Part 15)

Vane Shear Test : Out of NABL scope

Natural Moisture Content: IS 2720 (Part 2) Specific Gravity: IS 2720 (Part 3). Free Swell Index: IS 2720 (Part 40) Swelling Pressure: IS 2720 (Part 41) Triaxial Test (TRSH-UU): IS 2720 (Part 11)

C.E.Testing Company Pvt. Ltd.

Prepared By

Indranil Chowdhury

(Indranil Chowdhury) Dy. Technical Manager

Sudsp Nalen

Checked & Approved By

Sudip Nath Technical Manager

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PART III: CHARTS & GRAPHS



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CONSOLIDATION TEST RESULTS

Sample Numbe	r:BH-01/0	JDS-01			Depth :3-3	.45 meter	s
Description	:Light g	rey claye	y silt.				
Water conten	t:Initial	L =49 .7%	Final =3	0.6%	Initial Vo	id Ratio	=1.268
₽ ₁ -₽ ₂ Kg/Sqcm	Dial Change	Void Ratio	M _v Sqcm/kg	Comprn %	M _{vc} sqcm/kg	T90 Sec	1000.C _v sqcm/sec
0.00 - 0.10	175	1.229	0.1750				
0.10 - 0.25	242	1.174	0.1642	11.16	0.1459	806.4	0.930
0.25 - 0.50	266	1.113	0.1110	10.90	0.0989	1054.2	0.637
0.50 - 1.00	316	1.042	0.0678	14.56	0.0580	978.5	0.599
1.00 - 2.00	343	0.964	0.0381	16.29	0.0319	1291.8	0.385
2.00 - 4.00	382	0.877	0.0221	19.63	0.0177	1506.0	0.271
4.00 - 8.00	509	0.762	0.0154	14.15	0.0132	803.7	0.385
8.00 - 0.25	341	0.839	0.0057				



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CONSOLIDATION TEST RESULTS

Sample Numbe	er:BH-01/1	JDS-02			Depth :6.5	-6.95 met	ers
Description	: Light o	grey clay	ey silt wit	ch traces	of decompo	sed wood	& sand mixtur
Water conten	t:Initia	1=47.8%	Final =3	2.6%	Initial Vo	id Ratio	=0.888
$P_1 - P_2$	Dial	Void	M_v	Comprn	M _{vc}	т90	1000.C _v
Kg/Sqcm	Change	Ratio	Sqcm/kg	90	sqcm/kg	Sec	sqcm/sec
0.00 - 0.10	18	0.871	0.0900				
0.10 - 0.25	27	0.845	0.0908	8.51	0.0831	515.2	1.543
0.25 - 0.50	41	0.807	0.0839	2.44	0.0819	584.1	1.267
0.50 - 1.00	56	0.754	0.0585	19.64	0.0470	633.8	1.050
1.00 - 2.00	64	0.693	0.0345	18.75	0.0280	489.7	1.181
2.00 - 4.00	89	0.609	0.0248	7.87	0.0229	357.8	1.330
4.00 - 8.00	107	0.508	0.0157	19.63	0.0126	337.0	1.067
8.00 - 0.25	65	0.570	0.0053				



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CONSOLIDATION TEST RESULTS

Sample Number:BH-02/UDS-02
Description : Light grey clayey silt.
Water content:Initial=50.4% Final =3

.....

Depth :6.5-6.95 meters

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Final =33.7% Initial Void Ratio =1.315

₽ ₁ -₽ ₂ Kg/Sqcm	Dial Change	Void Ratio	M _v Sqcm/kg	Comprn %	M _{vc} sqcm/kg	T90 Sec	1000.C _v sqcm/sec
0.00 - 0.10	45	1.263	0.2256				
0.10 - 0.25	50	1.205	0.1710	14.00	0.1470	2152.8	0.339
0.25 - 0.50	56	1.140	0.1179	4.00	0.1132	1275.1	0.508
0.50 - 1.00	66	1.063	0.0716	7.58	0.0662	1242.2	0.452
1.00 - 2.00	69	0.983	0.0388	8.70	0.0354	883.9	0.534
2.00 - 4.00	95	0.873	0.0278	13.68	0.0240	936.2	0.399
4.00 - 8.00	110	0.745	0.0170	14.55	0.0146	718.3	0.372
8.00 - 0.25	76	0.833	0.0065				











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PART IV: PHOTOGRAPHS





