

PROJECT	SUBJECT	DOCUMENT NO.	REV.	SECTION
NLC India Limited NLC Talabira Thermal Power Project- 3x800 MW Jharsuguda, Odisha	Geotechnical Investigation Report Part-4	PE-DC-511-602-C001C	2	
				SHEET NO.
				1



**NLC India Limited
NLC Talabira Thermal
Power Project- 3x800 MW
Jharsuguda, Odisha**

**GEOTECHNICAL INVESTIGATION REPORT
PART-4 BOP AREA**

(Switchyard, PT Plant, ETP, STP, WTP, IDCT, CW system, Raw water system,
Chlorination system, Miscellaneous. Buildings, Raw water reservoir etc.)

BHEL DOCUMENT NO. PE-DC-511-602-C001C
(REVISION R2)









**BHARAT HEAVY ELECTRICALS LIMITED
NEW DELHI**




Geotechnical Investigation Report of 3x800 MW NLC Talabira TPS has been divided in following parts as detailed below:

S. No.	Description	Area covered
1	Part-1	BTG area (Transformer yard to Chimney including FGD)
2	Part-2A & 2B	Compound wall
3	Part-3	Thermal project office building, Main gate complex, security & time office, gates, parking lots, rain water collection ponds & rain water pump houses (outside plant boundary) etc.
4	Part-4	BOP area (Switchyard, PT Plant, ETP, STP, WTP, IDCT, CW system, Raw water system, Chlorination system, Miscellaneous. Buildings, Raw water reservoir etc.)
5	Part-5	CHP & AHP area
6	Part-6	Field test results of all areas (DCPT, SCPT, SRT, Pressure meter test, Cross hole shear test, PLT, CPLT, BVT, Pump in & pump out type field permeability etc.)

This is Geotechnical Investigation Report, Part-4

				3 X 800 MW NLC Talabira Thermal Power Project EPC Package			
COMMENT RESOLUTION SHEET							
DOC TITLE		Geotechnical Investigation Report Part - 4					
BHEL DOC NO.		PE-DC-511-602-C001C					
BHEL UNIT		PEM- NOIDA					
Sl. No.	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00)	BHEL Reply dated 27.06.2025	NLCIL/DCPL Comments: (Rev No. 01)	BHEL Reply dated 18.08.2025		
		Date: 14.05.2025		Date: 25.07.2025			
		Approval Category : - 3		Approval Category : 2			
1	General	In the Geotechnical Investigation report Part-4 for BOP area, presently 72 boreholes are listed. BHEL shall confirm the total number of boreholes envisaged in this volume as boreholes corresponding to some of BOP Buildings like CW pumphouse is not listed presently.	There are total 73 bore holes in Part-4 report. Out of total 73 bore holes, 70 bore holes are completed and included in R1 report. Balance 3 bore holes i.e. BH-151, 152 & 154 related to CW pump house & CW chlorination building area could not be completed due to hinderances at site. The same shall be included in the report after completion at site.	Noted. However, some boreholes have been removed from Part-4 and needs to be added in Part-5. The same shall be confirmed after submission of Part-5.	Confirmed. BH-48 and BH-77 earlier mentioned in Part-4 report are now shifted to Part-5 report.		
2	General	As Geotechnical Investigation report Part-5 is exclusively for CHP and AHP area, BH-45 corresponding to CHP MCC-2 and BH-42 corresponding to AHP compressor house shall be shifted to Part-5 report.	Noted and will be included in Part-5 report.	Noted. However, BH-48 for Coal conveyor near Unit-1 is also to be shifted to Part-5 report. BH-77 for Gypsum storage area is to be repeated in part-5 also as Gypsum Storage shed recommendations are part-5 report.	Confirmed. BH-48 and BH-77 earlier mentioned in Part-4 report are now shifted to Part-5 report.		
3	Layout	Locations of Boreholes BH-55, BH-32, BH-54, BH-95, BH-6, BH-8, BH-28, BH-31, BH-35, BH-16, BH-22, BH-18, BH-38, BH-9, BH-43, BH-34 and BH-141 as per submitted investigation report is not matching with approved Geotechnical investigation layout. For example BH-6 is away from its approved location by 400m. Hence, BHEL shall reconfirm the actual locations of Boreholes executed at NTPPP site to avoid any erroneous recommendations.	There was typographical mistake in the co-ordintaes of Bore holes BH-55, BH-32, BH-54, BH-95, BH-6, BH-28, BH-31, BH-35, BH-16, BH-22, BH-18, BH-38, BH-9, BH-43, BH-34. These bore holes are conducted at site as per the co-ordinates mentioned in approved Geotechnical Investigation layout. Co-ordinates of these 15 bore holes corrected in R1 report. BH-8 related to Bio mass handling system is included in Part 5 report. In addition to this, co-ordinates of BH-39,141,147,161,168 & 175 revised as per site constriants and bore holes were conducted at revised co-ordinates. Hence the corrected co-ordinates of BH-39,147,161,168 & 175 mentioned in R1 report.	Noted. Point closed.	Point closed.		
4	Report	BHEL shall include detailed sample calculation for obtaining bearing capacities of one open foundation instead of tabulation.	Incorporated in R1 report.	Noted. The formula listed in Page 56/603 is corresponding to Net Ultimate bearing capacity. However, it is mentioned as Ultinate bearing capacity. BHEL to correct the same.	Corrected in the revised report.		
5	Report	As per clause 2.00.00, Section-II, Volume-II-G1, Bearing capacities of open foundations and Pile capacities based on contractor's soil investigation shall be compared with recommendations of nearest boreholes as per Owner's soil report and design shall be based on conservative values. Accordingly, BHEL shall check and revise the recommendations for SBC of Open foundations, pile capacities for piles socketed in rocks and pile capacities of piles terminating in soils.	Bore holes mentioned in the Owner's soil report are pertaining to Chimney, Power house, TG, Boiler, Crusher house, Cooling Tower, Raw water reservoir & CHP-1 & 2 area. Geotechnical Investagtion Report Part-4 is for BOP area, in which SBC of open foundations and pile capacities related to Cooling Tower and Raw water reservoir area only to be compared with owner's soil report and the same has been incorporated in R1 report.	It is informed that there is a complete shift of BHEL layout when compared to Tender layout. For example, Borehole for Power house Unit-1 as per tender layout is at Service building location as per BHEL layout. Hence, it is not possible to compare structurewise. BHEL is requested to compare with nearest Boreholes and submit the revised recommendations.	Net SBC recommendation for the structures of Part-4 report are already compared with nearest bore hole of Owner's soil report wherever applicable.		
6	Report	For open foundation, depth of footing shall be not less than 1.0m below virgin soil. Accordingly, in SBC recommendation table for open foundations, Lowest NGL shall be mentioned instead of average NGL for each group.	Noted and incorporated in R1 report.	Noted. Point closed.	Point closed.		
7	Report	For SBC recommendations of open foundations, Depth of foundation below FGL shall be rounded off. For example, Biomass handling area BH-8 recommendation is for 3.87m, 4.87m & 5.87m below FGL.	Noted and will be suitably included in Part-5 report.	Noted. Point closed.	Point closed.		
8	Report	CBR test reports are enclosed in Page 385/550 to 388/550. These shall be removed from this Part-4 report and shall be submitted as a part of Part-6 report.	CBR test reports are removed from Part-4 report.	Noted. Point closed.	Point closed.		

				3 X 800 MW NLC Talabira Thermal Power Project EPC Package			
COMMENT RESOLUTION SHEET							
DOC TITLE		Geotechnical Investigation Report Part - 4					
BHEL DOC NO.		PE-DC-511-602-C001C					
BHEL UNIT		PEM- NOIDA					
Sl. No.	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00)	BHEL Reply dated 27.06.2025	NLCIL/DCPL Comments: (Rev No. 01)	BHEL Reply dated 18.08.2025		
		Date: 14.05.2025		Date: 25.07.2025			
		Approval Category : - 3		Approval Category : 2			
9	Report	NGL reduced levels for BH-173 & BH-174 are not mentioned in bore log data. BHEL to check.	Incorporated in R1 report.	Noted. Point closed.	Point closed.		
10	Report	For open foundations, BHEL shall check the sufficiency of recommendation based on depth of footing and its SBC values for each area/structure. Recommendations at greater depths may be required for CW forebay, IDCTs, underground tanks and switchyard area oil pits.	Noted and incorporated in R1 report.	Noted. Point closed.	Point closed.		
11	Report	In RWR area, SBC recommendations are available upto RL195.63M only. However, Bed level is RL194.00M. Hence, recommendations for greater depth may be required for RWR sump.	Noted and incorporated in R1 report.	Noted. Point closed.	Point closed.		
12	Report	For some structures like weigh bridge control room, SBC recommendations are available only at Clays of High Plasticity (CH soil). BHEL to check the suitability of construction of foundations in all CH soils.	BH-96 Weigh bridge control room pertains to CHP & AHP Area. Hence this structure will be added in Part-5 report and is deleted from Part-4 report. However, it is checked that no foundation is resting in CH soil.	SBC recommendations are still submitted at CH soil levels for Rain water Harvesting pond, Rain water Harvesting Pump house, Transmission line tower, Safety office and First aid center. BHEL to check the suitability of construction of foundations in all CH soils based on swell potential.	CH soils are known to have two different zones i.e. by depth volume change zone up to 2.0m from exposed surface and equilibrium zone below 2.0m. Expansive clays do not change in volume below 2.0m depth onwards due to the Newtonian weight of the soil in overburden coupled with the clay bonds therefore when foundation is kept below 2.0m even in the expansive soils may not have any detrimental effect as a consequence of swelling and shrinking. Additionally at all location where the foundation is below the ground water table may not experience the consequences of swelling and shrinking as the moisture variation may not occur below water table. Similarly any foundation placed within overburden more than 2.0m filling over it to match with the FGL will also not experiences consequence of swelling potential. In the present site and in majority of areas filling is planned to raise the FGL. In those locations there is no hazard expected due to expansive nature of soil and no specific measures are required. In the areas, where cutting is planned to match the FGL, where the foundation is placed below 2.0m recommended from FGL will not have any consequences of swelling and shrinking potential even when foundation is placed directly on clays of high plasticity without any specific measures.		
13	Report	In calculations for open foundations in filling areas, overburderden pressure of filling soil upto FGL is considered in calculations. In general, SBC calculations are as per present soil conditions. However, BHEL has taken the effect for filling works which are yet to be carried out at site. BHEL shall clarify.	As the filling is to be done finally to achieve FGL of the area, hence the depth of foundation is considered from FGL and accordingly, effect of overburden pressure of the depth of filling is considered in calculations.	In line with BHEL Confirmation under S. No. 14, overburden pressure which will not be available till completion of grading shall not be considered in bearing capacity calculations at present. Hence, open foundation recommendations for all filling areas shall be revised accordingly.	Noted. In revised report, Open foundation recommendations for all filling areas have been revised.		
14	Report	BHEL shall confirm whether open foundations works shall be carried out after completion of site grading works or prior to completion.	Open foundations coming in filling area shall be constructed before site garding works.	Noted. Point closed.	Point closed.		
15	Report	In pile capacity calculations for piles terminating in soils, depth of pile is varying from structure to structure. BHEL shall clarify the criteria for fixing termination depth of pile.	Safe pile capacity in vertical compression for Pile terminating in soil strta is 75 MT. Hence length of pile is varying depending on soil strta.	Ok. Noted. BHEL to check the calculation for Piles terminating in Soil. For BH-41 (Service Building), there is an error in safe load calculation. For BH-13 (DM Transfer PH & Storage tank), Safe load is 60.85T as per calculation and 75T is recommended for the same. Also, check recommendation for BH-19 & BH-47.	Checked and corrected in the revised report.		

 		3 X 800 MW NLC Talabira Thermal Power Project EPC Package			
COMMENT RESOLUTION SHEET					
DOC TITLE		Geotechnical Investigation Report Part - 4			
BHEL DOC NO.		PE-DC-511-602-C001C			
BHEL UNIT		PEM- NOIDA			
Sl. No.	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00)	BHEL Reply dated 27.06.2025	NLCIL/DCPL Comments: (Rev No. 01)	BHEL Reply dated 18.08.2025
		Date: 14.05.2025		Date: 25.07.2025	
		Approval Category : - 3		Approval Category : 2	
16	Report	For piles in rocks, pile capacity is ensured by using 3D socketing in rocks. BHEL shall clarify how the same is ensured in piles terminating in soil. BHEL shall confirm the termination criteria for piles terminating in soils for site execution.	Safe pile capacity in vertical compression for Pile terminating in soil strata is 75 MT. Hence length of pile is varying depending on soil strata. The safe pile capacity of pile terminating in soil strata shall be confirmed by initial pile load test and routine pile load tests.	Noted. Types and number of Initial pile load tests and Routine pile load tests to be decided during detail engineering based on the usage of piles terminating in soil.	Noted. Point closed.

Bharat Heavy Electricals Limited (B H E L)

**Technical Report of Geotechnical Investigation for
Proposed Structures in Phase 1 of 3 x 800 MW NLC
Talabira Thermal Power Project (NTTPP) at village
Hirma, Talabira, Odisha**

Part - 4

By:

Prof. (Dr.) K. C. Thaker

Ph.D. (Geotech) (I.I.T., Bombay);

F.I.E. (India); F.I.G.S.

Dr. K. K. Thaker

Ph.D. (Geotech); M.B.A.(Finance);

M.I.E. (India); M.I.G.S; M.G.I.C.E.A.

K.C.T. Consultancy Services[®] LLP

NABL Accredited Laboratory (ISO / IEC: 17025)

ISO : 9001, 2008, State and Central Govt. Approved

KCT House, Sayona Silver Estate-Part 2,
B/h Silver Oak College of Engineering,
Gota, Ahmedabad - 382 481, Gujarat, India

Phone :- 7096034034 / 35035 / 36036, +91 98250 64378

e-mail : kctconser@yahoo.com

March - 2025

Table of Contents

SR No.	Contents	Page No.
1	Introduction	1
2	Field Investigation	1
3	Laboratory investigation	4
4	General geology of site	5
5	Subsurface Soil Conditions	5
6	Computation of safe bearing capacity	5
7	Conclusions	6
8	Limitation	6
9	Recommendations for RCC Bored cast-in-situ Pile Capacity for piles socketed inside rock & Soil	7
10	Summary for RCC Bored cast-in-situ Pile Capacity for piles socketed inside rock & Soil	9
11	Summary of Open foundation	11
12	Summary of design parameter	22
13	Calculation of allowable bearing pressure	56
14	Appendix -1 to 35	78
15	Notations	495
16	References	496
17	Results of laboratory tests	4: 2
18	Investigation Layout Plan	56:
19	Bore log data sheets	56;
20	Site Photographs	639

Report on Geotechnical Investigation for Proposed Structures in Phase 1 of 3 x 800 MW of NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

1.0 Introduction

This report is presented based on limited numbers of geotechnical investigation locations. The detailed scope of work for entire of investigation work was decided by officials of BHEL. A complete geotechnical investigation was undertaken by us to obtain the required subsurface information to study and to indicate the nature and behavior of soil/rock under the application of load of proposed Structures in Phase 1 of 3 x 800 MW of NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha.

For foundation analysis of the structure on the site, it is necessary to determine the soil/rock profile of the site and to know physical properties and strength characteristics of soil/rock at various depths. For this purpose, BHEL entrusted the geotechnical investigation to us.

A report was required to be submitted as per the instructions of the client's officials. This report contains following,

1. Details of 8: Nos. of exploratory bore holes.
2. Details of standard penetration tests at regular interval of 1 m and even closer.
3. Results of tests on disturbed samples and undisturbed samples collected at regular intervals in soils and continuous sampling in rock.
4. Physical properties and strength characteristics of undisturbed and disturbed samples.
5. Interpretation of results, analysis and Conclusions
6. Locating ground water table

Based on the above points the detailed Geotechnical Investigation Program included the following:

(A) Field Investigation

1. Drilling of exploratory bore holes.
2. Collection of soil/rock samples (Disturbed and Undisturbed)
3. Conducting Standard Penetration Test.

(B) Laboratory Investigation

1. Bulk Density and moisture content of soil and rock
2. Grain size analysis and Index properties in soil
3. Shear tests (Triaxial shear test) in soil
4. Consolidation tests in cohesive soil
5. Uniaxial Compressive Test in rock
6. Point load Index in rock

(C) Recommendations

Based on above investigations, the results were obtained. The findings are based on interpretation of results, analysis and computations as per relevant Indian standards.

2.0 Field Investigation

2.1 Exploratory drilling

The exploratory boreholes of 150mm diameter in soils and 76mm diameter (Nx size) in rocks were drilled by rotary drilling method with mud circulation. Drilling was carried out using hydraulic feed drilling machine fitted with soil saw tooth and NX size bit. The locations of boreholes were dictated by client. The bore holes were terminated following the tender specifications and instruction of clients EIC. The details of the exploratory bore holes are as under:

Group No.	Sr. No.	Bore hole nos.	Co-ordinates		NGL (m)	FGL (m)	(-)Cutting/filling(+)	Depth Planned to investigate	Depth Investigated from ground level	Reason for early termination	Building/area
1	1	55	E 1314	N 3230	201.80	202.50	0.70	30.00	21.50	*	CW pipe corridor
	2	62	E 1414	N 3223	203.70	202.50	-1.20	30.00	30.00	-	
	3	81	E 1430	N 3109	203.28	202.50	-0.78	20.00	20.00	-	
	4	83	E 1306	N 3093	200.90	202.50	1.60	30.00	22.00	*	
	5	110	E 1422	N 2931	201.42	202.50	1.08	20.00	19.50	*	
	6	141	E 1425	N 2784	203.95	202.50	-1.45	20.00	20.00	-	
	7	148	E 1610	N 2681	205.52	202.00	-3.52	25.00	25.00	-	
	8	149	E 1423	N 2666	204.62	202.00	-2.62	25.00	25.00	-	
2	9	32	E 1670	N 3419	208.90	202.50	-6.40	20.00	20.00	-	Switchyard area
	10	39	E 1619	N 3343	207.95	202.50	-5.45	25.00	25.00	-	
	11	54	E 1680	N 3246	204.10	202.50	-1.60	20.00	20.00	-	
	12	72	E 1598	N 3160	206.10	202.50	-3.60	30.00	30.00	-	
	13	74	E 1705	N 3142	207.27	202.50	-4.77	30.00	30.00	-	
	14	89	E 1551	N 3047	204.70	202.50	-2.20	30.00	20.50	*	
	15	95	E 1678	N 3020	206.60	202.50	-4.10	20.00	20.00	-	
	16	102	E 1602	N 2997	205.11	202.50	-2.61	30.00	30.00	-	
	17	175	E 1654	N 3106	206.38	202.50	-3.88	20.00	20.00	-	
3	18	41	E 1270	N 3322	202.20	202.50	0.30	20.00	20.00	-	Service building
4	19	12	E 1018	N 3561	195.90	202.50	6.60	25.00	25.00	-	DM Plant
	20	14	E 941	N 3572	195.69	202.50	6.81	25.00	16.50	*	
5	21	13	E 1058	N 3579	197.50	202.50	5.00	25.00	25.00	-	DM transfer pump house, DM storage tank
6	22	6	E 1129	N 3563	199.30	202.50	3.20	25.00	25.00	-	CPU Regen building
7	23	15	E 1238	N 3567	201.15	202.50	1.35	25.00	25.00	-	Pump cum comp house for DSS/DFDS
8	24	19	E 1049	N 3500	195.90	202.50	6.60	20.00	20.00	-	Clarified water tank, clarified water pump house
9	25	17	E 937	N 3501	194.28	202.50	8.22	25.00	16.50	*	Pre treatment plant
	26	20	E 956	N 3493	194.40	202.50	8.10	20.00	16.00	*	
	27	27	E 928	N 3442	194.66	202.50	7.84	25.00	18.00	*	
	28	28	E 1009	N 3416	195.20	202.50	7.30	20.00	18.50	*	
	29	37	E 955	N 3368	195.75	202.50	6.75	20.00	20.00	-	
	30	31	E 1060	N 3388	197.10	202.50	5.40	25.00	25.00	-	
	31	35	E 1010	N 3360	196.34	202.50	6.16	20.00	15.00	*	
10	32	40	E 898	N 3343	194.96	202.50	7.54	20.00	20.00	-	Waste water plant
11	33	44	E 772	N 3336	197.52	202.50	4.98	25.00	18.50	*	Gypsum dewatering building & storage area, Process water tank, Lime stone slurry storage tank & agitator
12	34	47	E 757	N 3288	197.73	202.50	4.77	25.00	18.00	*	Lime stone silo & Ball mill building

Group No.	Sr. No.	Bore hole nos.	Co-ordinates		NGL (m)	FGL (m)	(-)Cutting/filling(+)	Depth Planned to investigate	Depth Investigated from ground level	Reason for early termination	Building/area
13	35	157	E 1500	N 2488	205.40	202.00	-3.40	25.00	25.00	-	CW chlorination cum treatment building
14	36	133	E 825	N 2840	197.69	202.50	4.81	25.00	18.50	*	STP area near Lime stone unloading house
	37	138	E 787	N 2840	197.73	202.50	4.77	25.00	19.50	*	
15	38	159	E 865	N 2449	198.50	202.00	3.50	25.00	25.00	-	Hydrogen generation plant
16	39	160	E 948	N 2413	198.67	202.00	3.33	25.00	25.00	-	Rain water harvesting pond
	40	164	E 1047	N 2339	198.81	202.00	3.19	20.00	20.00	-	
17	41	163	E 885	N 2339	198.57	202.00	3.43	25.00	25.00	-	Rain water harvesting pump house
18	42	169	E 1188	N 1944	199.13	202.00	2.87	20.00	20.00	-	Raw water pump house
19	43	172	E 1185	N 1777	199.40	-	-	20.00	20.00	-	Raw water reservoir
	44	173	E 1185	N 1450	197.65	-	-	20.00	20.00	-	
	45	174	E 1185	N 1167	196.80	-	-	20.00	20.00	-	
20	46	16	E 1151	N 3503	199.30	202.50	3.20	25.00	25.00	-	WTP & ETP
	47	23	E 1157	N 3471	199.40	202.50	3.10	25.00	25.00	-	
	48	33	E 1172	N 3393	199.62	202.50	2.88	25.00	25.00	-	
21	49	43	E 1416	N 3364	200.88	202.50	1.62	20.00	20.00	-	Fire water tank & fire water pump house
22	50	34	E 1457	N 3001	202.77	202.50	-0.27	25.00	20.50	*	Transmission line tower
23	51	22	E 1264	N 3434	202.32	202.50	0.18	25.00	25.00	-	Boiler maintenance building
24	52	46	E 1316	N 3323	202.50	202.50	0.00	25.00	25.00	-	Compressor house
25	53	21	E 1344	N 3488	203.66	202.50	-1.16	25.00	25.00	-	Fuel oil system & foam pump house
	54	25	E 1304	N 3435	202.80	202.50	-0.30	25.00	25.00	-	
	55	30	E 1349	N 3425	203.40	202.50	5.40	25.00	25.00	-	
26	56	18	E 1443	N 3456	206.41	202.50	-3.91	20.00	20.00	-	Permanent store
27	57	38	E 1411	N 3308	204.30	202.50	-1.80	20.00	20.00	-	Auxiliary Boiler
28	58	147	E 1712	N 2709	203.64	202.00	-1.64	25.00	25.00	-	IDCT-1 & switchgear room
	59	155	E 1685	N 2538	203.90	202.00	-1.90	25.00	25.00	-	IDCT-2 & switchgear room
	60	161	E 1576	N 2448	204.90	202.00	-2.90	25.00	25.00	-	
	61	168	E 1425	N 2129	200.99	202.00	1.01	20.00	25.00	*	IDCT-3 & switchgear room
29	62	9	E 1046	N 3637	197.56	202.50	4.94	25.00	25.00	-	Amonia storage & handling system
30	63	117	E 1747	N 2930	206.10	202.50	-3.60	20.00	20.00	-	Fire station
31	64	153	E 1589	N 2547	205.30	202.00	-3.30	25.00	25.00	-	CW Forebay & Channel
	65	156	E 1452	N 2512	204.88	202.00	-2.88	20.00	20.00	-	
32	66	125	E 1557	N 2902	204.63	202.50	-2.13	20.00	20.00	-	Safety office cum store
33	67	118	E 1609	N 2910	204.52	202.50	-2.02	20.00	20.00	-	First aid centre
34	68	119	E 1668	N 2908	205.46	202.50	-2.96	25.00	25.00	-	Canteen building

* As per the note no 2 of approved drawing vide no. PE-DG-511-602-C001, borehole shall be drilled up to the depth indicated against each borehole or up to the depth where more than 75% core recovery is encountered, whichever is earlier.

2.2 Sampling

2.2.1 Disturbed samples

Disturbed samples were collected during boring and from split spoon samplers in SPT. The samples recovered were logged, labeled and placed in polyethylene bags and sent to laboratory for testing.

2.2.2 Undisturbed samples

Undisturbed soil samples were collected in thin walled Shelby tubes as per IS 2132 in overburden. The samples thus collected were sealed with wax, labeled and transported with utmost care.

In rocky stratum, undisturbed samples were collected in rock core form. Sampling was carried out to get continuous samples. The rock core samples from different depths were numbered chronologically and marked with direction of drilling and were stored in core boxes. All this samples were labeled and transported to our laboratory at Gota, Ahmedabad for testing at the earliest.

2.2.3 Standard penetration test

The standard penetration tests is conducted in accordance with IS:2131-1981. The test results show N Value, the blow counts of last 30 cm penetration of split spoon sampler with 63.5 kg hammer falling from 76 cm height. Tests were carried out using the auto-hammer fitted on each drilling rig. The ER (energy ratio) has been maintained at 60 % to get N60. The numbers of blows / minute was maintained as 25 to 30 blows / minute. This test is the most appropriate in sandy soils. In clays the same indicates the consistency. While SPT is one of the important tests in soils, in rock the same is not of much significance as the N values are more than 100 i.e. refusal. In soft and laminated rock SPT was conducted to be utilized for analysis of the deep foundations.

2.2.4 Rock Quality designation

From the cores samples recovered, % core recovery and Rock quality designation RQD were determined on cores having length more than 10cm. Based on the RQD; the rock can be classified from stand point of spacing of discontinuities.

RQD (%)	Rock Classification
100-90	Very good
90-75	Good
75-50	Medium
50-25	Poor
25-0	Very poor

3.0 Laboratory investigation

The following laboratory tests were conducted on undisturbed and disturbed soil samples collected from various depths to find physical properties and strength characteristics.

Tests	Recommended procedure	Type Samples
1. Sample Preparation	IS 2720 Pt 1	DS / UDS
2. Moisture Content	IS 2720 Pt 2	DS / UDS
3. Dry Unit Weight	IS 2720 Pt 29	UDS
4. Specific Gravity	IS 2720 Pt 3	DS
5. Atterberg's Limit	IS 2720 Pt 5	DS
6. Grain Size Analysis	IS 2720 Pt 4	DS
7. Soil Classification	IS 1498	DS / UDS
8. Consolidation	IS 2720 Pt 15	UDS
9. Unconfined Compression Strength	IS 2720 Pt 10	UDS
10. Triaxial Compression Test	IS 2720 Pt 11	UDS
11. Direct Shear Test	IS 2720 Pt 13	

The following tests were conducted on rock sample

Tests	Recommended procedure	Type Samples
1. Sample Preparation	IS 4464	Rock Core
2. Moisture Content	IS 2720 Pt 2	Rock Core
3. Bulk and Dry Unit Weight	IS 13030	Rock Core
4. Specific Gravity	IS 2720 Pt 3	Rock Core
5. Uniaxial Compressive Strength	IS 9143	Rock Core
6. Point load index test	IS 10785	Rock Core
7. Water absorption test	IS 1124	Rock Core

4.0 General Geology of Site

The Sambalpur district houses a wide variety of rock types of different ages. They can broadly be classified into Eastern Ghat Supergroup, Bonai Group, Gangpur Group, Chattisgarh Group, intrusive nepheline syenite, Gondwana Supergroup and Quaternary sediment. The rocks belonging to Gondwana Supergroup are hosted in the fault bounded basins occupying the central portion of the district with a NW-SE trend. They are represented by Talchir Formation, Barakar Formation and Mahadeva Formation.

Quaternary sediments are sporadically distributed in district. They occur as 5-20 m thick medium- to fine-grained soil/alluvium in the pediplains and flood plains followed by Barakar formation shale and sandstone which alternate with one another within individual bodies.

5.0 Subsurface Soil Conditions

At this stage of investigation exact sub soil profiling may not be narrated correctly based on only few borehole results especially in a very vast project site area as in present case. However it can be said that there exists four characterized strata up to the depth investigated i.e. 20 m from NGL.

A superficial clayey sandy soil layer exists up to around 1 m from NGL. Underlying layer comprises of fully saturated silty Clay of intermediate plasticity of stiff to very stiff and even hard consistency. This layer was observed to extend up to 2.5 to 4 m. A very fine grained fully saturated, very stiff to hard clays of high plasticity exists under the second layer and extends up to 3.5 to 8.5 m in different land parcels. Below this a thick layer of fully saturated, dense sandy soils are encountered. Again this layer also varies in depth between 9.5 to 14.5 m. below all these layers, very weak, laminated and foliated shale is encountered.

5.1 Groundwater Conditions

Ground water table was encountered on an average at 1.50 to 5.30m depth from NGL. The ground water can rise up to GL immediately post monsoon. Practically the GWT shall be considered at FGL for all designs.

5.2 Strong Ground Motion

The site is located within a seismically active region (Zone 3; *ref IS 1893*). Liquefaction is unlikely owing to the cohesive soils of stiff to very stiff and hard consistency and dense sandy soils. Hence, soil is not likely to undergo shear strength loss in seismic event.

6.0 Computation of Safe Bearing Capacity

It is proposed to fill up the entire plot premises up to 202.0/202.5 m RL. The filling would on an average about 1.0 to 8.0m. At this stage character of soil for filling is not known. Again, foundation for all important structures may not be kept in filling. Shallow depth of water table from NGL would be another constraint for taking down foundation below NGL. So from all such considerations pile foundations shall be necessary for all important plant structures.

In this report, safe load on piles is calculated which would be the primary foundation option and allowable bearing pressure of open foundation is also calculated. In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud. In present site overburden soils overlay fractured / laminated /

foliated weak shale. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

Allowable bearing capacity and safe load on end bearing piles in compression, uplift and lateral direction is calculated area wise and appended in Appendix 1 to 36 for different areas represented by the boreholes covered in BOP area portion.

7.0 Conclusions

- 1) General stratifications are as described in section 5.0 and as shown in respective borelogs.
- 2) Ground water table was encountered on an average at 1.50 to 5.30 m depth from NGL. The ground water can rise up to GL immediately post monsoon. Practically the GWT shall be considered at FGL for all designs.
- 3) Based on the test results the soil can be classified in class-1 as per Table-4 of IS 456: 2000. Therefore, from the standpoint of sulphite (SO_3) and Chlorides content specific precautions are not required.
- 4) The site is located within a seismically region (Zone 3). Shear strength loss (liquefaction) is unlikely based on screening criteria.
- 5) Considering chemical analysis test results of sub soil samples, existing soil is suitable for filling/backfilling purposes.
- 6) The filling for raising FGL will be a controlled fill assuming that the soil used for raising the EGL to FGL are from local sources and of similar character than the soil would be mostly cohesive in nature and after 95% compaction have very stiff consistency as well. Not with standing very stiff consistency, the safe bearing capacity may safely be assume to be 5 t/m^2 as suggested in presumptive safe bearing capacity of soil in various credible documents. For the ready reference the document suggesting 5 t/m^2 published by Indian railway standard “Code of practice for the design of sub-structures and foundations of bridges”, second revision 2013 may be referred which is also attached in report as Reference-5 for your ready reference. From that table, we have considered the minimum presumptive safe bearing capacity among all types of soil, which is 5 t/m^2 .

Dr. K. K. Thaker

Ph.D. (Geotech); M.B.A (Finance)

Prof. (Dr.) K. C. Thaker

Ph.D. (Geotech–IIT Bombay)

8.0 Limitations

We have prepared this report for the exclusive use of clients and as per the scope and specification instructed by them verbally or in writing. No other use is anticipated or authorized by clients. The report shall be used only by the client for the project and purposes described herein at the locations shown by him and explored by us. The finding and recommendations are valid when the onsite and offsite conditions affecting the structures in project are not changed due to the actions of man or nature.

Professional judgments presented in this report are based on evaluations of the technical information gathered, understanding of the proposed construction, and general experience in the geotechnical field. We have performed according to generally accepted geotechnical engineering practices followed in the project area at the time the services were provided. No warranty is expressed or implied. The report is issued with the understanding that the owner and client choose the risk they decide to incur by the expenditures involved in the engineering and construction.

The findings and recommendations presented in this report are based upon soil conditions inferred from site explorations, interpolation of the soil conditions between exploration locations, and extrapolation of these conditions throughout the proposed site area. The extent of investigation as well as specific exploration locations were dictated by the clients. The findings and recommendations are further based on the assumption that the subsurface conditions do not deviate appreciably from those reported and those assumed. The potential for encountering conditions different from those assumed can never be discounted.

If different subsurface conditions are encountered if any, must be brought to our attention before execution & in a timely manner so that the need for revised recommendations can be evaluated. In the event of changes in design loads or structural characteristics or in location of the structure, clients should review its design based on our recommendation and their applicability to the revision he made in a timely manner.

Recommendation for RCC Bored cast-in-situ piles socketed inside rock as per technical specification

Sr No	Building/ Structure/ Area	Applicable bore hole nos.	Average EGL in RL (m)	FGL in RL (m)	Pile cut off level below FGL (in m)	Diameter of pile (in m)	*Length of pile below cut off level (in m)	Safe pile capacity (in T)			Remarks
								Vertical compression	Lateral (in fixed head condition)	Uplift	
1	DM plant	12,14	195.80	202.5	7.0m or below	0.60	13.00	150.00	7.50	37.50	Pile length includes 3D socketing inside rock
						0.76	13.50	250.00	12.50	62.50	
2	DM transfer pump house, DM storage tank	13	197.50	202.5	5.0m or below	0.60	11.50	150.00	7.50	37.50	
						0.76	12.00	250.00	12.50	62.50	
3	Clarified water tank, clarified water pump house	19	195.90	202.5	7.0m or below	0.60	11.50	150.00	7.50	37.50	
						0.76	12.00	250.00	12.50	62.50	
4	Pre treatment plant	17,20,27,28,37,31,35	195.39	202.5	6.0m or below	0.60	11.50	150.00	7.50	37.50	
						0.76	12.00	250.00	12.50	62.50	
5	Waste water plant	40	194.96	202.5	8.0m or below	0.60	4.00	150.00	7.50	37.50	
						0.76	4.50	250.00	12.50	62.50	
6	Gypsum dewatering building & storage area, Process water tank, Lime stone slurry tank & agitator	44	197.37	202.5	5.0m or below	0.60	11.50	150.00	7.50	37.50	
						0.76	12.00	250.00	12.50	62.50	
7	Lime stone silo & ball mill building	47	197.73	202.5	5.0m or below	0.60	11.50	150.00	7.50	37.50	
						0.76	12.00	250.00	12.50	62.50	
8	STP area near lime stone unloading house	133, 138	197.71	202.5	5.0m or below	0.60	15.50	150.00	7.50	37.50	
						0.76	16.00	250.00	12.50	62.50	

Summary of RCC Bored cast-in-situ Pile Capacity for piles socketed inside rock

Sr No	Building/ Structure/ Area	Applicable bore hole nos.	Average EGL in RL (m)	FGL in RL (m)	Pile cut off level below FGL (in m)	Diameter of pile (in m)	*Length of pile below cut off level (in m)	Safe pile capacity (in T)				Remarks
								Vertical compression	Lateral (in free head condition)	Lateral (in fixed head condition)	Uplift	
1	DM plant	12,14	195.80	202.5	7.0m or below	0.60	13.00	176.00	6.50	17.20	103.00	Pile length includes 3D socketing inside rock
						0.76	13.50	283.00	9.50	25.10	155.00	
2	DM transfer pump house, DM storage tank	13	197.50	202.5	5.0m or below	0.60	11.50	176.00	3.20	8.50	105.00	
						0.76	12.00	283.00	4.70	12.40	157.00	
3	Clarified water tank, clarified water pump house	19	195.90	202.5	7.0m or below	0.60	11.50	176.00	3.40	8.90	124.00	
						0.76	12.00	283.00	4.90	13.00	182.00	
4	Pre treatment plant	17,20,27,28,37,31, 35	195.39	202.5	6.0m or below	0.60	11.50	176.00	6.90	18.40	132.00	
						0.76	12.00	283.00	10.10	26.80	192.00	
5	Waste water plant	40	194.96	202.5	8.0m or below	0.60	4.00	176.00	6.30	16.80	75.00	
						0.76	4.50	283.00	9.20	24.50	118.00	
6	Gypsum dewatering building & storage area	44	197.37	202.5	5.0m or below	0.60	11.50	176.00	7.50	19.90	110.00	
						0.76	12.00	283.00	11.00	29.10	163.00	
7	Lime stone silo & ball mill building	47	197.73	202.5	5.0m or below	0.60	9.50	176.00	5.00	13.10	117.00	
						0.76	10.00	283.00	7.20	19.20	172.00	
8	STP area near lime stone unloading house	133, 138	197.71	202.5	5.0m or below	0.60	15.50	176.00	3.40	9.10	130.00	
						0.76	16.00	283.00	5.00	13.20	189.00	

*Note: Since rock level is varying, pile lengths will also vary as 3D socketing inside rock is to be ensured for each pile

Recommendations for RCC Bored cast-in-situ Pile Terminating in Soil Strata as per technical specification

Sr No	Building/ Structure/ Area	Applicable bore hole nos.	Average EGL in RL (m)	FGL in RL (m)	Pile cut off level below FGL (in m)	Diameter of pile (in m)	Length of pile below cut off level (in m)	Safe pile capacity (in T)		
								Vertical compression	Lateral (in fixed head condition)	Uplift
1	Service building	41	202.20	202.5	1.0m or below	0.60	13.00	75.00	3.75	18.75
2	DM plant	12,14	195.80	202.5	7.0m or below	0.60	11.00	72.00	3.75	18.75
3	CPU Regen building	6	199.30	202.5	4.0m or below	0.60	11.00	75.00	3.75	18.75
4	Pump cum comp house for DSS/DFDS	15	200.20	202.5	3.0m or below	0.60	11.00	75.00	3.75	18.75
5	Clarified water tank, clarified water pump house	19	195.90	202.5	7.0m or below	0.60	9.50	75.00	3.75	18.75
6	Pre treatment plant	17,20,27,28,37,31, 35	195.40	202.5	6.0m or below	0.60	8.00	75.00	3.75	18.75
7	Gypsum dewatering building & storage area	44	197.37	202.5	5.0m or below	0.60	8.00	75.00	3.75	18.75
8	Ball mill building, Lime stone silo	47	197.73	202.5	5.0m or below	0.60	8.00	75.00	3.75	18.75
9	STP area near lime stone unloading house	133, 138	197.71	202.5	5.0m or below	0.60	11.50	75.00	3.75	18.75
10	Hydrogen generation plant	159	198.50	202	4.0m or below	0.60	11.00	75.00	3.75	18.75
11	WTP & ETP	16,23,33	199.44	202.5	3.0m or below	0.60	14.00	75.00	3.75	18.75
12	Aux Boiler	43	200.88	202.5	2.0m or below	0.60	13.00	75.00	3.75	18.75

Summary for RCC Bored cast-in-situ Pile Capacity for Piles Terminating in Soil Strata

Sr No	Building/ Structure/ Area	Applicable bore hole nos.	Average EGL in RL (m)	FGL in RL (m)	Pile cut off level below FGL (in m)	Diameter of pile (in m)	Length of pile below cut off level (in m)	Safe pile capacity (in T)			
								Vertical compression	Lateral (in free head condition)	Lateral (in fixed head condition)	Uplift
1	Service building	41	202.20	202.5	1.0m or below	0.60	13.00	77.00	3.20	8.50	34.00
2	DM plant	12,14	195.80	202.5	7.0m or below	0.60	11.00	72.00	6.50	17.20	33.00
3	CPU Regen building	6	199.30	202.5	4.0m or below	0.60	11.00	81.85	3.60	9.60	40.00
4	Pump cum comp house for DSS/DFDS	15	200.20	202.5	3.0m or below	0.60	11.00	80.00	3.40	8.90	36.00
5	Clarified water tank, clarified water pump house	19	195.90	202.5	7.0m or below	0.60	9.50	75.40	3.40	8.90	33.00
6	Pre treatment plant	17,20,27,28,37,31, 35	195.40	202.5	6.0m or below	0.60	8.00	77.54	6.90	18.40	36.45
7	Gypsum dewatering building & storage area	44	197.37	202.5	5.0m or below	0.60	9.50	76.05	7.50	19.90	32.30
8	Ball mill building, Lime stone silo	47	197.73	202.5	5.0m or below	0.60	8.00	84.19	5.00	13.10	42.82
9	STP area near lime stone unloading house	133, 138	197.71	202.5	5.0m or below	0.60	11.50	78.00	3.40	9.10	37.00
10	Hydrogen generation plant	159	198.50	202	4.0m or below	0.60	11.00	78.00	5.00	13.10	39.00
11	WTP & ETP	16,23,33	199.44	202.5	3.0m or below	0.60	14.00	77.00	3.30	8.90	39.00
12	Aux Boiler	43	200.88	202.5	2.0m or below	0.60	13.00	81.00	3.40	8.90	39.00

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Prssure (in T/m2) for given below permissible settlement	
							25 mm	40 mm
1	CW Pipe corridor	55,62,81,83,110,141,148,149	200.90	202.50	3.00	1.5 m	19.00	-
						>1.5 to ≤ 3 m	16.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					4.00	1.5 m	22.00	-
						>1.5 to ≤ 3 m	17.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
					4.50	1.5 m	23.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
					5.00	1.5 m	24.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
2	Switch yard	32,39,54,72,74,89,95,102,175	204.10	202.50	1.00	1.5 m	13.00	-
						>1.5 to ≤ 3 m	13.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	10.00	-
					2.00	1.5 m	18.00	-
						Up to 3 m	18.00	-
						>3 to ≤ 6 m	19.00	-
						>6 to ≤ 10 m	10.00	-
					3.00	1.5 m	25.00	-
						Up to 3 m	23.00	-
						>3 to ≤ 6 m	17.00	-
						>6 to ≤ 10 m	10.00	-
					4.00	1.5 m	31.00	-
						Up to 3 m	29.00	-
						>3 to ≤ 6 m	17.00	-
						>6 to ≤ 10 m	10.00	-
3	Service building	41	202.20	202.50	1.00	1.5 m	10.00	-
						>1.5 to ≤ 3 m	10.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	3.00	-
					2.50	1.5 m	16.00	-
						>1.5 to ≤ 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					3.00	1.5 m	19.00	-
						Up to 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					3.50	1.5 m	22.00	-
						Up to 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Prssure (in T/m2) for given below permissible settlement	
							25 mm	40 mm
4	CPU Regen building	6	199.30	202.50	5.00	1.5 m	11.00	-
						>1.5 to ≤ 3 m	12.00	-
						>3 to ≤ 6 m	13.00	-
						>6 to ≤ 10 m	8.00	-
					5.50	1.5 m	14.00	-
						Up to 3 m	14.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
					6.00	1.5 m	16.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
5	Pump cum comp house for DSS/DFDS	15	201.15	202.50	3.00	1.5 m	13.00	-
						>1.5 to ≤ 3 m	13.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	10.00	-
					3.50	1.5 m	15.00	-
						Up to 3 m	15.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					4.00	1.5 m	18.00	-
						Up to 3 m	18.00	-
						>3 to ≤ 6 m	17.00	-
						>6 to ≤ 10 m	10.00	-
6	Hydrogen generation plant	159	198.50	202.00	4.50	1.5 m	9.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					5.50	1.5 m	17.00	-
						>1.5 to ≤ 3 m	16.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					6.50	1.5 m	19.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Pressure (in T/m ²) for given below permissible settlement	
							25 mm	40 mm
7	Rain water harvesting pond	160,164	198.67	202.00	4.50	1.5 m	5.00	-
						>1.5 to ≤ 3 m	5.00	-
						>3 to ≤ 6 m	2.00	-
						>6 to ≤ 10 m	2.00	-
					5.50	1.5 m	5.00	-
						>1.5 to ≤ 3 m	5.00	-
						>3 to ≤ 6 m	2.00	-
						>6 to ≤ 10 m	2.00	-
					6.50	1.5 m	6.00	-
						>1.5 to ≤ 3 m	5.00	-
						>3 to ≤ 6 m	2.00	-
						>6 to ≤ 10 m	2.00	-
					8.00	1.5 m	9.00	-
						>1.5 to ≤ 3 m	7.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	3.00	-
					8.50	1.5 m	9.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	3.00	-
					9.00	1.5 m	10.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	3.00	-
					9.50	1.5 m	18.00	-
						>1.5 to ≤ 3 m	14.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	5.00	-
					10.00	1.5 m	19.00	-
						Up to 3 m	14.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	5.00	-
					10.50	1.5 m	20.00	-
						Up to 3 m	14.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
8	Rain water harvesting pump house	163	198.57	202.00	4.50	1.5 m	8.00	-
						>1.5 to ≤ 3 m	7.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	2.00	-
					5.50	1.5 m	10.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	2.00	-
					6.50	1.5 m	11.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	2.00	-
					7.00	1.5 m	19.00	-
						>1.5 to ≤ 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					7.50	1.5 m	20.00	-
						Up to 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					8.00	1.5 m	21.00	-
						Up to 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					8.50	1.5 m	21.00	-
						Up to 3 m	14.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
9	Raw water pump house	169	199.13	202.00	4.00	1.5 m	4.00	-
						>1.5 to ≤ 3 m	4.00	-
						>3 to ≤ 6 m	4.00	-
						>6 to ≤ 10 m	2.00	-
					5.00	1.5 m	17.00	-
						Up to 3 m	15.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					6.00	1.5 m	18.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					7.00	1.5 m	20.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	4.00	-
					8.00	1.5 m	29.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
					9.00	1.5 m	32.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Pressure (in T/m ²) for given below permissible settlement	
							25 mm	40 mm
10	WTP & ETP	16,23,33	199.30	202.50	4.00	1.5 m	11.00	-
						>1.5 to ≤ 3 m	10.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					5.00	1.5 m	12.00	-
						>1.5 to ≤ 3 m	11.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					5.50	1.5 m	13.00	-
						>1.5 to ≤ 3 m	12.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	3.00	-
					6.00	1.5 m	14.00	-
						>1.5 to ≤ 3 m	12.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	3.00	-
					6.50	1.5 m	15.00	-
						Up to 3 m	12.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	3.00	-
					7.00	1.5 m	15.00	-
						Up to 3 m	13.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
11	Fire water tank & fire water pump house	43	200.88	202.50	3.00	1.5 m	8.00	-
						>1.5 to ≤ 3 m	8.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	4.00	-
					4.50	1.5 m	14.00	-
						>1.5 to ≤ 3 m	13.00	-
						>3 to ≤ 6 m	13.00	-
						>6 to ≤ 10 m	8.00	-
					5.00	1.5 m	16.00	-
						Up to 3 m	15.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
					5.50	1.5 m	18.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
					6.00	1.5 m	20.00	-
						Up to 3 m	18.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	9.00	-
					7.00	1.5 m	24.00	-
						Up to 3 m	21.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	9.00	-
					8.00	1.5 m	29.00	-
						Up to 3 m	25.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	9.00	-
12	Transmission line tower	34	202.77	202.50	1.00	1.5 m	7.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					2.00	1.5 m	8.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					3.00	1.5 m	9.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					3.50	1.5 m	18.00	-
						>1.5 to ≤ 3 m	17.00	-
						>3 to ≤ 6 m	13.00	-
						>6 to ≤ 10 m	9.00	-
					4.00	1.5 m	20.00	-
						Up to 3 m	18.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	10.00	-
					4.50	1.5 m	22.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	15.00	-
						>6 to ≤ 10 m	10.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Pressure (in T/m ²) for given below permissible settlement	
							25 mm	40 mm
13	Boiler maintainance building	22	202.32	202.50	1.50	1.5 m	11.00	-
						>1.5 to ≤ 3 m	11.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
					2.50	1.5 m	16.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
					3.50	1.5 m	21.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
					4.00	1.5 m	24.00	-
						Up to 3 m	21.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
					4.50	1.5 m	27.00	-
						Up to 3 m	21.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
					5.00	1.5 m	31.00	-
						Up to 3 m	21.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	6.00	-
14	Compresor House	46	202.50	202.50	1.00	1.5 m	9.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					2.00	1.5 m	10.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					3.00	1.5 m	11.00	-
						>1.5 to ≤ 3 m	7.00	-
						>3 to ≤ 6 m	3.00	-
						>6 to ≤ 10 m	2.00	-
					5.00	1.5 m	25.00	-
						>1.5 to ≤ 3 m	20.00	-
						>3 to ≤ 6 m	10.00	-
						>6 to ≤ 10 m	6.00	-
					5.50	1.5 m	28.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	10.00	-
						>6 to ≤ 10 m	6.00	-
					6.00	1.5 m	31.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	10.00	-
						>6 to ≤ 10 m	6.00	-
15	Fuel oil system & foam pump house	21,25,30	197.10	202.50	1.00	1.5 m	7.00	-
						>1.5 to ≤ 3 m	7.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					1.50	1.5 m	9.00	-
						>1.5 to ≤ 3 m	9.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					2.00	1.5 m	10.00	-
						>1.5 to ≤ 3 m	10.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					2.50	1.5 m	14.00	-
						>1.5 to ≤ 3 m	14.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	11.00	-
					3.50	1.5 m	19.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	17.00	-
						>6 to ≤ 10 m	11.00	-
					4.00	1.5 m	21.00	-
						Up to 3 m	19.00	-
						>3 to ≤ 6 m	18.00	-
						>6 to ≤ 10 m	11.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Prssure (in T/m2) for given below permissible settlement	
							25 mm	40 mm
16	Permanent store	18	206.41	202.50	1.00	1.5 m	18.00	18.00
						>1.5 to ≤ 3 m	19.00	19.00
						>3 to ≤ 6 m	19.00	22.00
						>6 to ≤ 10 m	12.00	18.00
					2.00	1.5 m	27.00	27.00
						Up to 3 m	27.00	27.00
						>3 to ≤ 6 m	19.00	30.00
						>6 to ≤ 10 m	12.00	18.00
					3.00	1.5 m	38.00	38.00
						Up to 3 m	37.00	37.00
						>3 to ≤ 6 m	19.00	31.00
						>6 to ≤ 10 m	12.00	18.00
17	Auxiliary Boiler	38	204.30	202.50	1.00	1.5 m	17.00	-
						>1.5 to ≤ 3 m	10.00	-
						>3 to ≤ 6 m	5.00	-
						>6 to ≤ 10 m	3.00	-
					2.00	1.5 m	19.00	-
						Up to 3 m	12.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
					3.00	1.5 m	22.00	-
						Up to 3 m	12.00	-
						>3 to ≤ 6 m	6.00	-
						>6 to ≤ 10 m	4.00	-
18	IDCT-1,2,3 & switchgear room	147,155,161,168	200.99	202.00	2.00	1.5 m	6.00	-
						>1.5 to ≤ 3 m	6.00	-
						>3 to ≤ 6 m	7.00	-
						>6 to ≤ 10 m	7.00	-
					3.00	1.5 m	9.00	-
						>1.5 to ≤ 3 m	9.00	-
						>3 to ≤ 6 m	9.00	-
						>6 to ≤ 10 m	8.00	-
					3.50	1.5 m	18.00	-
						>1.5 to ≤ 3 m	16.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	8.00	-
					4.00	1.5 m	19.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	12.00	-
						>6 to ≤ 10 m	9.00	-
					4.50	1.5 m	20.00	-
						Up to 3 m	17.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	10.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Pressure (in T/m ²) for given below permissible settlement	
							25 mm	40 mm
19	Ammonia storage & handling system	9	197.56	202.50	6.00	1.5 m	6.00	-
						Up to 3 m	6.00	-
						>3 to ≤ 6 m	8.00	-
						>6 to ≤ 10 m	5.00	-
					7.50	1.5 m	12.00	-
						>1.5 to ≤ 3 m	12.00	-
						>3 to ≤ 6 m	13.00	-
						>6 to ≤ 10 m	8.00	-
					8.00	1.5 m	14.00	-
						Up to 3 m	14.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
					8.50	1.5 m	17.00	-
						Up to 3 m	16.00	-
						>3 to ≤ 6 m	14.00	-
						>6 to ≤ 10 m	8.00	-
20	CW Forebay & Channel	153,156	204.88	202.00	1.00	1.5 m	19.00	-
						>1.5 to ≤ 3 m	19.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					2.00	1.5 m	28.00	-
						Up to 3 m	27.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					3.00	1.5 m	37.00	-
						Up to 3 m	32.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					4.00	1.5 m	48.00	-
						>1.5 to ≤ 3 m	32.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					5.00	1.5 m	60.00	-
						>1.5 to ≤ 3 m	32.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					6.00	1.5 m	64.00	-
						>1.5 to ≤ 3 m	32.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
					8.00-9.00	1.5 m	64.00	-
						>1.5 to ≤ 3 m	32.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	10.00	-
21	Safety office cum store	125	204.63	202.50	1.00	1.5 m	14.00	-
						>1.5 to ≤ 3 m	14.00	-
						>3 to ≤ 6 m	11.00	-
						>6 to ≤ 10 m	7.00	-
					2.00	1.5 m	20.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	12.00	-
						>6 to ≤ 10 m	8.00	-
					3.00	1.5 m	27.00	-
						Up to 3 m	23.00	-
						>3 to ≤ 6 m	13.00	-
						>6 to ≤ 10 m	8.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	FGL in RL (m)	Depth of foundation below FGL (in m)	Width of foundation (in m)	Allowable Bearing Prssure (in T/m2) for given below permissible settlement	
							25 mm	40 mm
22	First aid centre	118	204.52	202.50	1.00	1.5 m	14.00	14.00
						>1.5 to ≤ 3 m	14.00	14.00
						>3 to ≤ 6 m	7.00	12.00
						>6 to ≤ 10 m	5.00	8.00
					2.00	1.5 m	16.00	16.00
						Up to 3 m	14.00	14.00
						>3 to ≤ 6 m	8.00	13.00
						>6 to ≤ 10 m	5.00	8.00
					3.00	1.5 m	18.00	18.00
						Up to 3 m	15.00	15.00
						>3 to ≤ 6 m	9.00	14.00
						>6 to ≤ 10 m	6.00	9.00
23	Canteen building	119	205.46	202.50	1.00	1.5 m	15.00	15.00
						>1.5 to ≤ 3 m	15.00	15.00
						>3 to ≤ 6 m	14.00	17.00
						>6 to ≤ 10 m	8.00	13.00
					2.00	1.5 m	22.00	22.00
						Up to 3 m	22.00	22.00
						>3 to ≤ 6 m	14.00	22.00
						>6 to ≤ 10 m	8.00	13.00
					3.00	1.5 m	30.00	30.00
						Up to 3 m	27.00	29.00
						>3 to ≤ 6 m	14.00	22.00
						>6 to ≤ 10 m	8.00	13.00
24	Fire station	117	206.10	202.50	1.00	1.5 m	20.00	20.00
						>1.5 to ≤ 3 m	21.00	21.00
						>3 to ≤ 6 m	23.00	23.00
						>6 to ≤ 10 m	14.00	22.00
					2.00	1.5 m	29.00	29.00
						Up to 3 m	30.00	30.00
						>3 to ≤ 6 m	23.00	31.00
						>6 to ≤ 10 m	14.00	22.00
					3.00	1.5 m	40.00	40.00
						Up to 3 m	39.00	39.00
						>3 to ≤ 6 m	23.00	36.00
						>6 to ≤ 10 m	14.00	22.00
25	CW chlorination cum treatment building	157	205.40	202.00	1.00	1.5 m	14.00	-
						>1.5 to ≤ 3 m	14.00	-
						>3 to ≤ 6 m	16.00	-
						>6 to ≤ 10 m	11.00	-
					2.00	1.5 m	20.00	-
						Up to 3 m	20.00	-
						>3 to ≤ 6 m	18.00	-
						>6 to ≤ 10 m	11.00	-
					3.00	1.5 m	28.00	-
						Up to 3 m	27.00	-
						>3 to ≤ 6 m	18.00	-
						>6 to ≤ 10 m	11.00	-

Summary of Allowable Bearing Pressure for Various Structures

SR.No.	Building/Structure/Area	Applicable bore hole nos.	Lowest EGL in RL (m)	Depth of foundation below NGL (in m)	Width of foundation (in m)	Allowable Bearing Pressure (in T/m ²) for given below permissible settlement	
						25 mm	40 mm
26	Raw Water Reservoir	172,173,174	196.80	1.80	1.5 m	7.00	-
					>1.5 to ≤ 3 m	7.00	-
					>3 to ≤ 6 m	4.00	-
					>6 to ≤ 10 m	2.00	-
				2.80	1.5 m	8.00	-
					>1.5 to ≤ 3 m	7.00	-
					>3 to ≤ 6 m	4.00	-
					>6 to ≤ 10 m	2.00	-
				3.80	1.5 m	9.00	-
					>1.5 to ≤ 3 m	7.00	-
					>3 to ≤ 6 m	4.00	-
					>6 to ≤ 10 m	2.00	-

Design Parameter

Design Parameter for Group 1 Applicable structure: CW pipe corridor Representative Borehole: BH-55							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 0.70	-	-	-	-	-
0.00-0.30	Brownish, fine to medium grained, clayey sand (SC)	0.70-1.00	-	-	-	-	
0.30-1.50	Reddish yellow, fine to very fine grained, sandy clays of intermediate plasticity with some gravels (CI)	1.00-2.20	-	-	-	4	
1.50-2.50	Yellowish brown, fine to coarse grained, clayey sand with much gravels (SC)	2.20-3.20	0.64	7	1.94	11	
2.50-6.00	Yellowish brown, fine to coarse grained, sandy clays of intermediate plasticity with some to little gravels (CI)	3.20-6.70	1.02	10	1.97	13-26	
6.00-6.50	Yellowish brown, fine to medium grained, sandy clays of high plasticity with some gravels (CH)	6.70-7.20	-	-	-	19	
6.50-7.00	Yellowish brown, fine to coarse grained, clayey sand with little gravels (SC)	7.20-7.70	-	-	-	20	
7.00-10.80	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)	7.70-11.50	-	-	-	18-33	
10.80-15.30	Light greyish brown, fine to very fine grained, indurated silty clays of intermediate plasticity (CI) (Silty stone)	11.50-16.00	-	-	-	50-83	
15.30-17.20	Dark greyish brown, fine to very fine grained, indurated silty clays of intermediate plasticity with some gravels (CI)	16.00-17.90	-	-	-	>100	
17.20-19.00	Slightly weathered, very weak, dark greyish brown, fine to very fine grained, very thinly laminated rock	17.90-19.70	-	-	2.26	>100	-
19.00-21.50	Moderately weathered, very weak, dark greyish brown, fine to very fine grained, thinly bedded rock	19.70-22.20	-	-	2.33	-	46.3

Design Parameter for Group 2 Applicable structure: Switchyard Representative Borehole: BH-54							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.60	Dark yellowish brown, fine to very fine grained, clayey sand (SC)	Up to 1.60m depth from FGL soil in cutting	-	-	-	-	-
0.60-1.60	Dark yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with some too much gravels (CI)		-	-	-	5	
1.60-2.40	Dark yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with some too much gravels (CI)	FGL-0.80	-	-	-	9	
2.40-7.30	Yellowish brown, fine to medium grained, clayey sand with little too much gravels (SC)	0.80-5.70	0.07	29	2.07	28- >100	
7.30-9.40	Light Yellowish brown, fine to medium cemented clayey sand (SC)	5.70-7.80	-	-	-	>100	
9.40-10.00	Light yellowish brown, fine to medium grained, cemented silty sand (SM)	7.80-8.40	-	-	-	>100	
10.00-18.00	Yellowish brown, fine to medium grained, cemented clayey sand with little to occasional gravels (SC)	8.40-16.40	-	-	-	>100	
18.00-20.00	Yellowish brown, fine to medium grained, cemented silty sand with occasional to some gravels (SM)	16.40-18.40	-	-	-	>100	

Design Parameter for Group 3 Applicable structure: Service building Representative Borehole: BH-41							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL-	-	-	-	-	-
0.00-0.40	Brownish, fine to very fine grained, clayey sand (SC)	0.30-0.70	-	-	-	-	
0.40-1.50	Reddish yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)	0.70-1.80	-	-	-	12	
1.50-4.30	Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC)	1.80-4.60	0.07	26	2.00	16-26	
4.30-5.00	Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM)	4.60-5.30	-	-	-	15	
5.00-10.20	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little to some gravels (CI)	5.30-10.50	1.21	7	2.02	16-38	
10.20-14.70	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI)	10.50-15.00	1.89	8	2.09	36- >100	
14.70-20.00	Highly weathered, weak, reddish yellow and yellowish brown, fine to coarse grained, fractured and friable rock	15.00-20.30	/	-	-	-	71.1

Design Parameter for Group 4 Applicable structure: DM Plant Representative Borehole: BH-12							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL-6.6	-	-	-	-	-
0.00-1.50	Yellowish brown, fine to very fine grained, sandy clays of high plasticity (CH)	6.60-8.10	-	-	-	4	
1.50-3.30	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	8.10-9.90	0.17	16	1.93	5-9	
3.3-4.70	Yellowish brown, fine to medium grained, clayey sand with little gravels (SC)	9.90-11.30	-	-	-	13	
4.70-6.30	Yellowish brown, very fine grained, clays of high plasticity (CH)	11.30-12.90	0.75	2	1.95	14-21	
6.30-7.40	Yellowish brown, fine to very fine grained, sandy clays of high plasticity (CH)	12.90-14.00	1.07	6	1.97	22	
7.40-9.30	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)	14.00-15.90	0.04	28	2.01	22-24	
9.30-10.50	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	15.90-17.10	1.10	8	2.03	27	
10.50-11.60	Yellowish brown, fine to medium grained, poorly graded sand and silty sand (SP-SM)	17.10-17.60	-	-	-	29	
11.60-14.50	Highly weathered, very weak, dark brownish, fine to very fine grained, very thinly laminated and foliated rock	17.60-21.10	-	-	2.29	46	-
14.50-18.00	Highly weathered, very weak, dark blackish grey, very fine grained, very thinly laminated rock	21.10-24.60	-	-	2.33	>100	-
18.00-24.0	Highly weathered, very weak, dark greyish black, very fine grained, very thinly bedded rock	24.0-30.60	-	-	2.32	-	40.3
24.00-25.00	Highly weathered, very weak, dark greyish brown, very fine grained, very thinly laminated rock	30.60-31.60	-	-	2.29	>100	-

Design Parameter for Group 5 Applicable structure: DM transfer pump house, DM storage tank Representative Borehole: BH-13							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 5.00	-	-	-	-	-
0.00-1.00	Yellowish brown, fine to coarse grained, silty clayey sand (SM-SC)	5.00-6.00	-	-	-	8	
1.00-3.00	Greyish yellow, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI)	6.00-8.00	0.59	5	1.72	9-16	
3.00-4.00	Reddish yellow, fine to coarse grained, clayey sand with much gravels (SC)	8.00-9.00	0.07	25	1.99	24	
4.00-5.00	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)	9.00-10.00	.08	27	2.01	21	
5.00-7.00	Yellowish brown, fine to medium grained, silty sand with (SM)	10.00-12.00	0	30	2.0	23- >100	
7.00-8.50	Brownish yellow, fine to medium grained, silty sand with little plastic fines (SM)	1.00-13.50	-	-	-	33-36	-
8.50-10.00	Light brownish, fine to medium grained, silty sand (SM)	13.50-15.00	-	-	-	27- >100	-
10.00-13.00	Extremely weathered, to be composed dark brownish, fine to very fine grained, fractured and friable micaceous rock	15.00-18.00	-	-	-	33- >100	-
13.00-14.50	Extremely weathered, decomposed, dark brownish, fine to coarse grained, fractured and friable rock	18.00-19.50	-	-	-	>100	-
14.50-16.00	Extremely weathered, to be composed dark brownish, fine to very fine grained, fractured and friable micaceous rock	19.50-21.00	-	-	-	>100	-
16.00-17.50	Extremely weathered, decomposed, dark brownish, fine to coarse grained, fractured and friable rock	21.00-22.50	/	-	-	-	-
17.50-19.00	Very highly weathered, fractured, reddish brown and black, fine to coarse grained, pebble, cobble and boulder size fractured and highly laminated and foliated rock	22.50-24.00	/	-	-	-	-
19.00-20.50	Moderately weathered, very weak, reddish brown and black, fine to coarse grained, thinly bedded rock	24.00-25.50	/	-	-	-	38.7
20.50-22.00	Moderately weathered, strong, dark brownish black, fine to coarse grained, moderately bedded rock	25.50-27.00	/	-	-	-	-
22.00-24.00	Moderately weathered, strong, dark brownish black, fine to coarse grained, very thinly laminated and foliated rock	27.00-29.00	/	-	-	-	-
24.00-25.00	Moderately weathered, strong, dark brownish black, fine to coarse grained, thinly bedded rock	29.00-30.00	/	-	-	-	815.3

Design Parameter for Group 6 Applicable structure: CPU regen building Representative Borehole: BH-06							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 6.60	-	-	-	-	-
0.00-0.60	Yellowish brown, fine to medium grained, clayey sand (SC)	6.60-7.20	-	-	-		
0.60-1.50	Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with some gravels (CI)	4.20-8.10	-	-	-	14	
1.50-4.10	Reddish yellow, fine to medium grained, clayey sand with much gravels (SC)	8.10-10.70	0.05	27	1.85	20-29	
4.10-6.70	Brownish yellow, fine to medium grained, weakly cemented silty sand with little plastic fines and little gravels (SM)	10.70-13.30	-	-	-	>100	
6.70-7.30	Brownish yellow and white, fine to coarse grained, weakly cemented poorly graded gravels (GP)	13.30-13.90	-	-	-	>100	
7.30-11.70	Yellowish brown, fine to medium grained, weakly cemented clayey sand with little to occasional gravels (SC)	13.90-18.30	-	-	-	>100	
11.70-15.80	Brownish yellow, fine to medium grained, weakly cemented silty clayey sand with little to occasional gravels (SMSC)	18.30-22.40	-	-	-	>100	
15.80-16.80	Brownish yellow, fine to medium grained, weakly cemented clayey sand (SC)	22.40-23.40	-	-	-	>100	
16.80-23.10	Highly weathered, completely fractured disintegrated, yellowish brown and light brownish, very weak and friable fractured rock	23.40-29.70	-	-	-	-	51.60
23.10-25.00	Highly weathered, moderately strong, dark blackish grey, fine to coarse grained, fractured rock	29.70-31.60	-	-	-	-	342.2

Design Parameter for Group 7 Applicable structure: Canteen building Representative Borehole: BH-119							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-1.60	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI)	Up to 2.02m depth from FGL soil in cutting	-	-	-	-	-
1.60-2.02	Yellowish brown, fine to coarse grained, clayey sand (SC)		0.15	27	2.00	33	
2.02-2.80	Yellowish brown, fine to coarse grained, clayey sand (SC)		0.15	27	2.00	33	
2.80-5.30	Reddish yellow, fine to very fine grained, clayey sand (SC)		0.12	28	1.98	16-27	
5.30-8.60	Yellowish brown, fine to medium grained, clayey sand with little to occasional gravels (SC)		0.10	28	2.02	22-26	
8.60-18.70	Brownish red to whitish yellow, fine to medium grained, weakly cemented sand rock	6.58-16.68	-	-	-	>100	-
18.70-23.90	Light whitish yellow and light brownish, fine to coarse grained, weakly cemented sand	16.68-21.88	-	-	-	>102	-
23.90-25.00	Highly weathered, weak, light yellowish brown, fine to coarse grained, fractured rock	21.88-22.98	-	-	2.42	-	-

Design Parameter for Group 8							
Applicable structure: Pump cum comp house for DSS/DFDS							
Representative Borehole: BH-15							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 1.35	-	-	-		-
0.00-3.10	Yellowish brown, fine to medium grained, clayey sand (SC)	1.35-4.45	0.06	27	1.97	14-21	
3.10-4.70	Yellowish brown, fine to medium grained, silty clayey sand (SM-SC)	4.45-6.05	0.02	26	2.00	16-44	
4.70-5.40	Yellowish brown, fine to medium grained, clayey sand (SC)	6.05-6.75	.015	30	2.07	>100	
5.40-8.70	Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM)	6.75-10.05	0	30	2.07	>100	
8.70-12.70	Yellowish brown, fine to medium grained, clayey sand with little gravels(SC)	10.05-14.05	-	-	-	>100	
12.70-14.30	Yellowish brown, fine to medium grained, silty sand (SM)	14.05-15.65	-	-	-	>100	
14.30-15.60	Yellowish brown, fine to medium grained, clayey sand (SC)	15.65-16.95	-	-	-	>100	
15.60-17.50	Highly weathered, completely fractured and dark reddish yellow, fine to coarse grained, gravel, pebble and cobble size angular inter locking fragments of fractured rock	16.95-18.85	-	-	-	>100	-
17.50-22.00	Highly weathered, very weak, dark brownish yellow, fine to coarse grained, fractured rock	18.85-23.35	-	-	2.30	-	-
22.00-23.50	Highly weathered, very weak, dark brownish yellow, fine to coarse grained, fractured rock with white colour quartz vein	23.35-24.85	-	-	2.30	-	-
23.50-25.00	Highly weathered, completely fractured and disintegrated, decomposed, yellowish brown, fine to medium grained, friable fractured rock	24.85-26.35	-	-	2.41	>100	50.5

Design Parameter for Group 9 Applicable structure: Clarified water tank, clarified water pump house Representative Borehole: BH-19							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 6.1	-	-	-	-	-
0.00-2.50	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)	6.10-8.60	0.71	7	1.97	6-12	
2.50-3.30	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI)	8.60-9.40	0.11	27	1.99	18	
3.30-7.30	Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (SC)	9.40-13.40	0.08	28	2.01	15-26	
7.30-9.30	Yellowish brown, fine to medium grained, silty sand (SM)	13.40-15.40	-	-	-	20-28	
9.30-10.60	Greyish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI)	15.40-16.70	-	-	-	>100	96.8
10.60-15.50	Highly weathered, very weak, dark greyish brown, very fine grained, foliated rock	16.70-21.60	-	-	2.69	>100	
15.50-19.60	Slightly weathered, weak, dark brownish grey, very fine grained, thinly laminated rock	21.60-25.70	-	-	2.70	-	120.8
19.60-20.00	Slightly weathered, weak, dark grey, fine grained, massive rock	25.70-26.10	-	-	2.74	-	176.5

Design Parameter for Group 10 Applicable structure: Pre treatment plant Representative Borehole: BH-31							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 5.40	-	-	-	-	-
0.00-0.80	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)	5.40-6.20	-	-	-	-	
0.80-1.60	Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI)	6.20-7.00	-	-	-	7	
1.60-2.90	Dark Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI)	7.00-8.30	0.62	9	1.96	8	
2.90-5.70	Reddish brown to reddish yellow, fine to medium grained, clayey sand with little too much gravels (SC)	8.30-11.10	-	-	-	16-26	
5.70-7.40	Yellowish brown, fine to very fine grained, clays of intermediate plasticity with occasional gravels (CI)	11.10-12.80	-	-	-	26-51	
7.40-10.30	Dark greyish brown, fine to very fine grained, cemented, silty clays of intermediate plasticity - Mud stone	12.80-15.70	4.56	5	2.08	>100	-
10.30-16.50	Highly weathered, very weak, dark brownish grey, fine to very fine grained, very thinly laminated rock	15.70-21.90	-	-	2.16	>100	59.9
16.50-18.00	Moderately weathered, moderately weak, dark black, fine to medium grained, rock with moderately close spacing of discontinuities	21.90-23.40	-	-	2.40	-	124.7
18.00-19.50	Moderately weathered, weak, dark black, fine to medium grained, rock with wide spacing of discontinuities	23.40-24.90	-	-	2.34	-	86.2
19.50-24.00	Moderately weathered, weak, dark black, fine to medium grained, massive rock	24.90-29.40	-	-	2.37	-	93.5
24.00-24.50	Moderately weathered, moderately weak, dark black, very fine grained, rock with close spacing of discontinuities	29.40-29.90	-	-	-	-	-
24.50-25.00	Slightly weathered, moderately weak, dark black, fine grained, massive rock	29.90-30.40	-	-	2.46	-	142.8

Design Parameter for Group 11 Applicable structure: Waste water plant Representative Borehole: BH-40							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 7.54	-	-	-	-	-
0.00-0.60	Brownish, fine to medium grained, clayey sand with little gravels (SC)	7.54-8.14	-	-	-	-	
0.60-1.80	Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI)	8.14-9.34	-	--	-	6	
1.80-3.10	Brownish yellow, fine to very fine grained, clayey sand (SC)	9.34-10.64	0.06	26	1.96	14- >100	
3.10-6.50	Highly weathered, very weak, yellowish brown, fine to medium grained, thinly laminated rock	10.64-14.04	-	-	2.14	-	-
6.50-8.00	Highly weathered, weak, yellowish brown, fine to medium grained, thinly laminated rock	14.04-15.54	-	-	2.29	-	81.4
8.00-9.50	Moderately weathered, weak, yellowish brown, fine to medium grained, rock with very close spacing of discontinuities	15.54-17.04	-	-	2.38	-	99.6
9.50-10.50	Moderately weathered, moderately weak, yellowish brown, fine to medium grained, rock with very wide spacing of discontinuities	17.04-18.04	-	-	2.42	-	156.3
10.50-15.50	Slightly weathered, moderately weak, greyish brown, fine to medium grained, rock with wide spacing of discontinuities	18.04-23.04	-	-	2.35	-	143.6
15.50-18.50	Moderately weathered, moderately weak, greyish brown, fine to medium grained, rock with close spacing of discontinuities	23.04-26.04	-	-	2.45	-	161.1
18.50-20.00	Moderately weathered, weak, dark greyish black, fine to medium grained, massive rock	26.04-27.54	-	-	2.34	-	-

Design Parameter for Group 12							
Applicable structure: Gypsum dewatering building & storage area, process water tank, lime stone slurry storage tank & agitator							
Representative Borehole: BH-44							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 4.98	-	-	-	-	-
0.00-1.00	Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity (CI)	4.98-5.98	-	-	-	-	
1.00-4.50	Light brownish and yellowish brown, very fine grained, clays of intermediate plasticity with occasional gravels (CI)	5.98-9.48	0.72	4	1.96	8-16	
4.50-7.60	Brownish, fine to very fine grained, clayey sand (SC)	9.48-12.58	0.08	26	2.00	14-19	
7.60-9.00	Brownish, fine to very fine grained, silty and clayey sand (SM-SC)	12.58-13.98	-	-	-	>100	
9.00-10.00	Brownish yellow, fine to very fine grained, clayey sand with occasional gravels (SC)	13.98-14.98	-	-	-	>100	
10.00-11.00	Highly weathered, completely fractured and disintegrated, yellowish brown, fine to very fine grained, very thick and friable, fractured rock	14.98-15.98	-	-	-	>100	56.90
11.00-12.50	Highly weathered, weak, dark yellowish brown, fine to very fine grained, rock with closely spaced discontinuities	15.98-17.48	-	-	-	>100	90.10
12.50-14.00	Highly weathered, moderately weak, dark greyish, fine to medium grained, fractured rock	17.48-18.98	-	-	-	>100	138.80
14.00-17.00	Moderately weathered, moderately weak, dark greyish brown, fine to medium grained, rock with moderately wide spaced discontinuities	18.98-21.98	-	-	-	>100	108.40
17.00-18.50	Slightly weathered, moderately weak, dark greyish, fine to medium grained, rock with moderately widely spaced discontinuities	21.98-23.48	-	-	-	>100	162.90

Design Parameter for Group 13 Applicable structure: Lime Stone silo & ball mill building Representative Borehole: BH-47							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 4.77	-	-	-	-	-
0.00-0.80	Light brownish, fine to very fine grained, silty clays of intermediate plasticity (CI)	4.77-5.57	-	-	-	-	
0.80-3.80	Yellowish brown and light brownish, very fine grained, silty clays of high plasticity (CH)	5.57-8.57	0.41	3	1.93	4-9	
3.80-5.20	Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity with occasional gravels (CI)	8.57-9.97	-	-	-	10-31	
5.20-5.90	Reddish yellow, very fine grained, indurated silty clays of low plasticity (CL)	9.97-10.67	1.73	2	2.06	-	
5.90-7.40	Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity (CI)	10.67-12.17	-	-	-	52- >100	
7.40-8.20	Dark greyish, very fine grained, indurated silty clays of low plasticity (CL)	12.17-12.97	-	-	-	>100	
8.20-10.00	Highly weathered, weak, light whitish yellow, fine to medium grained, fractured rock	12.97-14.77	-	-	2.31	-	-
10.00-12.00	Moderately weathered, weak, light brownish yellow, fine to medium grained, rock with closely spaced discontinuities	14.77-16.77	-	-	2.32	-	78.1
12.00-16.00	Slightly weathered, weak, light brownish yellow, fine to medium grained, rock with very widely spaced discontinuities	16.77-20.77	-	-	2.25	-	70.6
16.00-17.00	Slightly weathered, moderately weak, light brownish grey, fine to medium grained, massive rock	20.77-21.77	-	-	2.30	-	146.3
17.00-18.00	Slightly weathered, moderately weak, light brownish grey, fine to medium grained, rock with closely spaced discontinuities	21.77-22.77	-	-	2.32	-	159.8

Design Parameter for Group 14 Applicable structure: CW Chlorination cum treatment building Representative Borehole: BH-157							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-6.50	Brownish, to reddish brown, fine to medium grained, clayey sand with occasional to little gravels (SC)	Up to 3.40m depth from FGL soil in cutting	0.06	25	1.91	15-38	NA
	Brownish, to reddish brown, fine to medium grained, clayey sand with occasional to little gravels (SC)	0.00-3.10	0.07	28	1.98	17-25	
6.50-9.00	Reddish brown, fine to medium grained, cemented silty clayey sand (SM-SC)	3.10-5.60	-	-	-	-	17.90
9.00-12.00	Highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, very weak, friable fractured rock	5.60-8.60	-	-	-	-	45.70
12.00-15.50	Highly weathered, very weak to weak, yellowish brown, fine to coarse grained, friable and fractured rock	8.60-12.10	-	-	-	-	37.90
15.50-18.00	Highly weathered, weak, dark brownish, fine to coarse grained, fractured rock	12.10-14.60	-	-	-	-	98.90
18.00-19.50	Highly weathered, weak, dark brownish, fine to coarse grained, rock with close spacing of discontinuities	14.60-16.10	-	-	-	-	108.20
19.50-22.50	Highly weathered, weak, dark brownish, fine to coarse grained, fractured rock	16.10-19.10	-	-	-	-	124.60
22.50-25.00	Highly weathered, weak, dark reddish brown, fine to coarse grained, rock with moderately close spacing of discontinuities	19.10-21.60	-	-	-	-	155.70

Design Parameter for Group 15 Applicable structure: STP area near lime stone unloading house Representative Borehole: BH-138							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 4.77	-	-	-	-	-
0.00-3.60	Yellowish brown, very fine grained, clays of high plasticity (CH)	4.77-8.37	0.38	3	1.87	3-7	
3.60-5.00	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	8.37-9.77	0.54	6	1.93	9-12	
5.00-9.00	Yellowish brown, fine to medium grained, clayey sand (SC)	9.77-13.77	-	-	-	11-20	
9.00-10.00	Yellowish brown, medium to coarse grained, poorly graded and silty sand with some gravels (SP-SM)	13.77-14.77	-	-	-	14-28	
10.00-11.00	Yellowish brown, fine to medium grained, clayey sand (SC)	14.77-15.77	-	-	-	26	
11.00-12.70	Yellowish brown, fine to medium grained, silty sand with little to occasional gravels (SM)	15.77-17.47	-	-	-	28-32	-
12.70-14.10	Yellowish brown, fine to coarse grained, sandy clays of intermediate plasticity (CI)	17.47-18.87	-	-	-	56- >100	-
14.10-16.00	Highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, gravels, pebbles size fragments of fractured rock with infilled dark brownish, fine to very fine grained, clayey sand	18.87-20.77	-	-	-	>100	-
16.00-17.50	Highly weathered, very weak, blackish grey, fine to very fine grained, moderately thinly bedded rock	20.77-22.27	-	-	2.26	-	59.9
17.50-18.50	Moderately weathered, moderately weak, dark brownish, fine to very fine grained, moderately thickly bedded rock	22.27-23.27	-	-	2.44	-	131.4
18.50-19.50	Slightly weathered, moderately weak, dark brownish grey, fine to medium grained, massive rock	23.27-24.27	-	-	2.42	-	146.2

Design Parameter for Group 16 Applicable structure: Hydrogen generation plant Representative Borehole: BH-159							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 3.50	-	-	-	-	-
0.00-0.10	Brownish, fine to very fine grained, clayey sand (SC)	3.50-3.60	-	-	-	-	
0.10-2.60	Yellowish brown, very fine grained, silty clays of intermediate plasticity with occasional gravels (CI)	3.60-6.10	0.63	5	1.75	4-10	
2.60-6.60	Reddish yellow, fine to very fine grained, clays of intermediate plasticity with occasional gravels (CI)	6.10-10.10	0.87	6	1.99	14-20	
6.60-9.70	Light brownish, fine to medium grained, sandy clays of intermediate plasticity with some to little gravels (CI)	10.10-13.20	0.68	8	1.97	10-21	
9.70-13.20	Yellowish brown and slightly greyish, fine to medium grained, sandy clays of intermediate plasticity with some gravels (CI)	13.20-16.70	0.93	5	2.02	16-30	
13.20-14.60	Yellowish brown, fine to coarse grained, silty and clayey sand with much gravels (SM- SC)	16.70-18.10	-	-	-	54- >100	
14.60-16.30	Light brownish grey, fine to very fine grained, cemented silty clays of low plasticity (CL) (Silty stone)	18.10-19.80	-	-	-	54-58	
16.30-19.10	Light brownish grey, fine to very fine grained, clays of intermediate plasticity (CI) (Mud Stone)	19.80-22.60	-	-	-	>100	
19.10-22.10	Dark brownish and greyish, fine to very fine grained, micaceous silty clays of low plasticity (CL) (Mud Stone)	22.60-25.60	-	-	-	>100	
22.10-25.00	Slightly weathered, weak, greyish brown, fine to very fine grained, massive rock	25.60-28.50	-	-	2.65	-	70.2

Design Parameter for Group 17 Applicable structure: Rain water harvesting pond Representative Borehole: BH-160							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 3.33	-	-	-	-	-
0.00-6.00	Light brownish and yellowish brown, very fine grained, clays of high plasticity (CH)	3.33-9.33	0.29	4	1.88	2-5	
6.00-7.60	Greyish brown, very fine grained, clays of high plasticity (CH) 6.00 to 7.60m	9.33-10.93	0.64	7	1.97	13-20	
7.60-8.50	Yellowishbrown,finetoverfinegrained,sandyclaysofintermediateplasticity(CI)7.60 to 8.50m	10.93-11.83	0.92	2	2.00	16-20	
8.50-9.00	Light brownish, very fine grained, clays of high plasticity (CH) 8.50 to 9.00m	11.83-12.33	-	-	-	19	
9.00-11.80	Yellowishbrownandreddishyellow,finetomediumgrained,clayey sandwithsomegravels (SC)	12.33-15.13	-	-	-	13->100	
11.80-15.60	Yellowishbrown,finetocoarsegrained,cemented sand (Sand rock)	15.13-18.93	-	-	-	>100	
15.60-18.60	Lightbrownishandlightgreyish,finetoverfinegrained,cemented silty clays of low plasticity (Silty stone)	18.93-21.93	-	-	-	58->100	99.10
18.60-21.00	Highly weathered, weak, dark greyish, fine to very fine grained, rock with very closely spaced discontinuities	21.93-24.33	-	-	-	-	
21.00-24.00	Moderatelyweathered,moderatelyweak,darkgreyishanddarkbrownish,finetoverfinegrained,rockwithcloselytomoderatelyclosely spaced discontinuities	24.33-27.33	-	-	-	-	
24.00-25.00	Highlyweathered,weak,darkbrown,finetomediumgrained,rockwithmoderatelyclosely spaced discontinuities	27.33-28.33	-	-	-	-	
							113.60
							100.50

Design Parameter for Group 18 Applicable structure: Rain water harvesting pump house Representative Borehole: BH-163							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 3.43	-	-	-	-	-
0.00-0.20	Brownish, fine to very fine grained, silty clays of intermediate plasticity (CI)	3.43-3.63	-	-	-	-	
0.20-4.50	Yellowish brown, fine to very fine grained, clays of high plasticity (CH)	3.63-7.93	0.53	4	1.94	5-13	
4.50-5.40	Reddish yellow, fine to very fine grained, sandy clays of intermediate plasticity (CI)	7.93-9.33	-	-	-	11	
5.40-7.50	Reddish brown, fine to medium grained, clayey sand (SC)	9.33-10.93	0.11	26	2.00	12	
7.50-9.00	Yellowish brown and reddish brown, fine to very fine grained, clays of high plasticity (CH)	10.93-13.43	0.82	2	2.01	15	
9.00-10.60	Reddish brown, fine to medium grained, sandy clays of intermediate plasticity (CI)	12.43-14.03	-	-	-	16-19	
10.60-12.20	Yellowish brown, fine to medium grained, clayey sand (SC)	14.03-15.63	-	-	-	20-29	
12.20-13.00	Yellowish brown, fine to very fine grained, clays of intermediate plasticity (CI)	15.63-16.43	-	-	-	28-35	
13.00-25.00	Light whitish yellow and light yellowish grey, whitish grey, fine to medium grained, cemented clayey sand	16.43-28.43	-	-	-	35- >100	

Design Parameter for Group 19 Applicable structure: Raw water pump house Representative Borehole: BH-169							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 2.87	-	-	-	-	-
0.00-1.50	Dark reddish brown, fine to medium grained, clayey sand (SC)	2.87-4.37	-	-	-	2	
1.50-3.60	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	4.37-6.47	0.76	3	1.70	9-20	
3.60-13.10	Yellowish brown, fine to medium grained, clayey sand (SC)	6.47-15.97	0.07	26	1.94	13-23	
13.10-18.60	Yellowish brown, fine to medium grained, poorly graded sand and silty sand with occasional gravels (SP-SM)	15.97-21.47	-----	-	-	30-39	
18.60-20.00	Yellowish brown, fine to very fine grained, clayey sand (SC)	21.47-22.87	-	-	-	>100	

Design Parameter for Group 20 Applicable structure: Raw water reservoir Representative Borehole: BH-174							
Depth in m from NGL	Soil Classification	Depth in m from EGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-1.10	Yellowish brown, fine to very fine grained, filled up clay and with little gravels	0.00-1.10	-	-	-	-	
1.10-5.40	Yellowish brown, fine to very fine grained, sandy clay of intermediate plasticity (CI)	1.10-5.40	0.78	6	1.98	7-22	
5.40-6.30	Yellowish brown, fine to medium grained, clayey sand with little gravels (SC)	5.40-6.30	0.08	25	2.00	18-22	
6.30-8.60	Yellowish brown, fine to medium grained, silty sand with little to much gravels (SM)	6.30-8.60	0.00	32	2.07	28-37	
8.6-9.40	Yellowish brown, fine to very fine grained, clayey sand with some gravels (SC)	8.6-9.40	-	-	-	42	
9.40-11.40	Yellowish brown, fine to very fine grained, clayey sand with some gravels (SC)	9.40-11.40	-	-	-	41-53	
11.40-13.60	Yellowish brown, fine to very fine grained, sandy clays of low plasticity with some gravels (CL)	11.40-13.60	-	-	-	23-59	
13.60-17.70	Brownish, fine to very fine grained, weakly cemented, clayey sand (SC)	13.60-17.70	-	-	-	63- >100	
17.70-20.00	Yellowish brown, fine to very fine grained, indurated sandy clays of intermediate plasticity (CI)	17.70-20.00	-	-	-	>100	

Design Parameter for Group 21 Applicable structure: WTP & ETP Representative Borehole: BH-33							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL	-	-	-	-	-
0.00-1.50	Brownish, fine to medium grained, clayey sand (SC)	2.88-4.38	-	-	-	8	
1.50-5.30	Dark reddish brown, fine to medium grained, sandy clays of intermediate plasticity with much gravels	4.38-8.18	0.59	7	1.80	8-21	
5.30-8.30	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)	8.18-11.18	0.08	27	2.00	18-27	
8.30-10.50	Yellowish brown, fine to very fine grained, clayey sand (SC)	11.18-13.38	-	-	-	21-28	
10.50-14.30	Yellowish brown, fine to medium grained, silty sand with little gravels (SM)	13.38-17.18	-	-	-	14-34	
14.30-16.00	Dark greyish brown, fine to medium grained, sandy clays of intermediate plasticity with some gravels	17.18-18.88	-	-	-	>100	56.7
16.00-22.00	Highly weathered, completely fractured and disintegrated, dark brownish grey, very fine grained, rock	18.88-24.88	-	-	2.26	-	
22.00-25.00	Moderately weathered, very weak, dark grey, very fine grained, moderately thickly bedded rock	24.88-27.88	-	-	2.33	-	

Design Parameter for Group 22 Applicable structure: Fire water tank & fire water pump house Representative Borehole: BH-43							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 1.62	-	-	-	-	-
0.00-0.40	Brownish, fine to very fine grained, clayey sand (SC)	1.62-2.02	-	-	-	-	
0.40-1.50	Reddish yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)	2.02-3.12	-	-	-	-	
1.50-4.30	Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC)	3.12-5.92	0.08	27	1.88	12-18	
4.30-5.50	Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM)	5.92-7.12	0.05	29	2.02	20	
5.50-10.2	Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC)	7.12-11.82	-	-	-	29-79	-
10.20-11.70	Yellowish brown, fine to medium grained, silty sand (SM)	11.82-13.32	-	-	-	>100	
11.70-15.70	Yellowish brown, fine to medium grained, clayey sand with occasional too much gravels (SC)	13.32-17.32	-	-	-	>100	
15.70-20.00	Highly weathered, weak, reddish yellow and yellowish brown, fine to coarse grained, fractured and friable rock	17.32-21.62	-	-	2.41	-	53.1

Design Parameter for Group 23 Applicable structure: Transmission line tower Representative Borehole: BH-34							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.27	Yellowish brown, fine to medium grained, clayey sand (SC)	Up to 0.27m depth from FGL soil in cutting	-	-	-	-	-
0.27-0.30	Yellowish brown, fine to medium grained, clayey sand (SC)	FGL-0.03	-	-	-	-	
0.30-2.80	Yellowish brown to light reddish brown, fine to medium grained, sandy clays of intermediate plasticity (CI)	0.03-2.53	0.25	8	1.76	5-6	
2.80-4.70	Brownish yellow, fine to medium grained, clayey sand with little gravels (SC)	2.53-4.43	0.08	24	1.98	11-12	
4.70-6.30	Light greyish yellow, very fine grained, clays of high plasticity (CH)	4.43-6.03	1.09	2	2.01	20-54	
6.30-8.20	Brownish, very fine grained, clays of intermediate plasticity (CI)	6.03-7.93	2.94	1	2.08	60->100	
8.20-10.00	Blackish brown, very fine grained, clays of intermediate plasticity (CI)	7.93-9.73	3.56	3	2.12	>100	-
10.00-11.50	Highly weathered, completely fractured and disintegrated, dark brownish grey and brownish yellow, very fine grained, very weak and friable fractured rock	9.73-11.23	-	-	2.23	-	
11.50-16.00	Highly weathered, completely fractured and disintegrated, dark brownish grey, fine to very fine grained, gravel, pebble and cobble size fragments of fractured rock with infilled dark brownish grey, fine to very fine grained, clayey sand	11.23-15.73	-	-	2.20	-	
16.00-17.50	Highly weathered, very weak, dark brownish grey, fine to very fine grained, fractured rock	15.73-17.23	-	-	2.25	-	
17.50-20.50	Moderately weathered, weak, dark brownish grey, very fine grained, rock with close spacing of discontinuities	17.23-20.23	-	-	2.27	-	

Design Parameter for Group 24 Applicable structure: Boiler maintenance building Representative Borehole: BH-22							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL-0.18	-	-	-	-	-
0.00-0.40	Yellowish brown, fine to medium grained, clayey sand (SC)	0.18-0.58	-	-	-	-	
0.40-7.30	Reddish yellow to reddish brown, fine to medium grained, clayey sand with little to much gravels (SC)	0.58-7.48	0.27	27	1.96	9-45	
7.30-9.60	Dark brownish, fine to medium grained, cemented sand	7.48-9.78	-	-	-	>100	
9.60-10.40	Light yellowish brown, fine to medium grained, cemented clayey sand mica (SC)	9.78-10.58	-	-	-	60	
10.40-11.60	Reddish yellowish brown, fine to medium grained, cemented sand	10.58-11.78	-	-	-	>100	
11.60-13.70	Dark brownish, fine to medium grained, cemented clayey sand (SC)	11.78-13.88	-	-	-	>100	
13.70-16.20	Yellowish brown to dark brownish, fine to medium grained, cemented sand	13.88-16.38	-	-	-	>100	
16.20-17.70	Yellowish brown, fine to medium grained, cemented clayey sand with occasional to much gravels (SC)	16.38-17.88	-	-	-	>100	47.3
17.70-21.50	Highly weathered, very weak, brownish, fine to coarse grained, rock with close spacing of discontinuities	17.88-21.68	-	-	2.27	-	
21.50-22.50	Highly weathered, weak, brownish, fine to coarse grained, rock with moderately close spacing of discontinuities	21.68-22.68	-	-	2.28	-	
22.50-25.00	Highly weathered, very weak, brownish, fine to medium grained, rock with very close spacing of discontinuities	22.68-25.18	-	-	2.28	-	

Design Parameter for Group 25 Applicable structure: Compressor house Representative Borehole: BH-46							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	-	FGL	-	-	-	-	-
0.00-0.40	Yellowish brown, fine to very fine grained, filled up sandy clays of low plasticity	0.00-0.40	-	-	-	-	
0.40-1.50	Yellowish brown, fine to very fine grained, clayey sand with little gravels (SC)	0.40-1.50	-	-	-	5	
1.50-2.90	Dark Yellowish brown, fine to very fine grained, sandy clays of low plasticity with little to some gravels (CL)	1.50-2.90	0.41	8	1.97	8	
2.90-3.70	Dark yellowish brown, fine to medium grained, clayey sand with some too much gravels (SC)	2.90-3.70	-	-	-	10-13	
3.70-4.30	Dark Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with little gravels (CI)	3.70-4.30	-	-	-	12	
4.30-6.60	Dark yellowish brown, fine to medium grained, clayey sand with some gravels (SC)	4.30-6.60	0.04	28	2.00	15-17	-
6.60-7.70	Dark yellowish brown, fine to very fine grained, clayey sand with some gravels (SC)	6.60-7.70	0.03	29	2.03	14	-
7.70-11.60	Yellowish brown, fine to medium grained, weakly clayey sand (SC)	7.70-11.60	0.07	28	2.06	23- >100	-
11.60-13.40	Dark brownish, fine to medium grained, weakly cemented silty sand (SM)	11.60-13.40	-	-	-	>100	-
13.40-16.80	Yellowish brown, fine to medium grained, weakly cemented clayey sand with little gravels (SC)	13.40-16.80	-	-	-	>100	-
16.80-19.00	Highly weathered, weak, light yellowish white, fine to coarse grained, fractured rock	16.80-19.00	-	-	-	>100	-
19.00-20.50	Highly weathered, completely fractured and disintegrated, light yellowish white, fine to coarse grained, gravel, pebble size angular interlocking fragments of fractured	19.00-20.50	-	-	2.56	-	79.3
20.50-23.00	Highly weathered, weak, brownish yellow, fine to coarse grained, fractured rock	20.50-23.00	-	-	2.59	-	99.5
23.00-25.00	Highly weathered, very weak, brownish yellow, fine to coarse grained, fractured rock	23.00-25.00	-	-	2.41	-	36.6

Design Parameter for Group 26 Applicable structure: Fuel oil system & foam pump house Representative Borehole: BH-30							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL	-	-	-	-	-
0.00-3.60	Brownish, fine to medium grained, clayey sand with much gravels (SC)	5.40-9.00	0.08	25	1.71	13-17	
3.60-4.60	Yellowish brown, fine to medium grained, silty clayey sand (SM-SC)	9.00-10.00	0.02	28	1.81	15	
4.60-8.30	Yellowish brown, fine to medium grained, clayey sand with some gravels (SC)	10.00-3.70	0.07	29	2.06	17- >100	
8.30-9.00	Yellowish brown, fine to medium grained, silty sand with little gravels	13.70-14.40	-	-	-	>100	
9.00-10.30	Yellowish brown, fine to medium grained, silty clayey sand with little gravels (SM-SC)	14.40-15.70	-	-	-	>100	
10.30-12.00	Yellowish brown, fine to medium grained, clayey sand (SC)	15.70-17.40	-	-	-	>100	-
12.00-13.60	Yellowish brown, fine to medium grained, silty sand with some gravels (SM)	17.40-19.00	-	-	-	>100	-
13.60-15.70	Yellowish brown, fine to medium grained, silty clayey sand with little gravels (SM-SC)	19.00-21.10	-	-	-	>100	-
15.70-18.60	Yellowish brown, fine to medium grained, clayey sand with some too much gravels (SC)	21.10-24.00	-	-	-	>100	-
18.60-22.00	Highly weathered, weak, dark blackish brown, fine to coarse grains, fractured rock	24.00-27.40	-	-	2.35	>100	51.3
22.00-25.00	Highly weathered, moderately strong, dark yellowish brown, fine to coarse grained, fractured rock	27.40-30.40	-	-	2.66	>100	426.3

Design Parameter for Group 27 Applicable structure: Permanent store Representative Borehole: BH-18							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.0 – 1.50	Yellowish brown, fine to medium grained, clayey sand with little gravels (SC)	Up to 3.91m depth from FGL soil in cutting	-	-	-	32	NA
1.50-3.10	Yellowish brown, fine to medium grained, silty sand with some too much gravels (SM)		-	-	-	-	
3.10-3.91	Yellowish brown, fine to medium grained, clayey sand (SC)		-	-	-	-	
3.91-9.40	Yellowish brown, fine to medium grained, clayey sand (SC)		0.06	27	1.85	18- >100	
9.40-10.50	Yellowish brown, fine to medium grained, silty clayey sand with little gravels (SMSC)		-	-	-	>100	
10.50-12.70	Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC)		-	-	-	>100	
12.70-14.30	Yellowish brown, fine to medium grained, silty sand (SM)		-	-	-	>100	
14.30-20.00	Yellowish brown, fine to medium grained, poorly graded sand (SP)		-	-	-	>100	

Design Parameter for Group 28 Applicable structure: Auxiliary Boiler Representative Borehole: BH-38							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in g/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.80	Dark Yellowish brown, fine to medium grained, silty clayey sand (SM-SC)	Up to 1.80m depth from FGL soil in cutting	-	-	-	-	-
0.80-1.80	Dark Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional too little gravels (CI)		-	-	-	-	
1.80-5.80	Dark Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional too little gravels (CI)	FGL-4.00	0.77	8	2.00	2-19	
5.80-10.20	Yellowish brown, fine to very fine grained, clayey sand (SC)	4.00-8.40	0.07	29	2.08	24->100	
10.20-14.40	Light Yellowish brown, fine to medium fine grained, weakly cemented clayey sand with little to occasional gravels (SC)	8.40-12.30	-	-	-	67->100	
14.40-17.30	Yellowish brown, fine to medium grained, weakly cemented clayey sand with little (SC)	12.30-15.50	-	-	-	>100	
17.30-17.80	Yellowish brown, fine to medium grained, weakly cemented silty sand (SM)	15.50-16.00	-	-	-	>100	
17.80-20.00	Yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC)	16.00-18.20	-	-	-	>100	

Design Parameter for Group 29 Applicable structure: IDCT – 1,2,3 & Switchgear room Representative Borehole: BH-147							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in g/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-1.14	Reddish yellow, fine to medium grained, clayey sand with little to much gravels (SC)	Up to 1.14m depth from FGL soil in cutting	-	-	-	-	-
1.14-3.20	Reddish yellow, fine to medium grained, clayey sand with little to much gravels (SC)	FGL- 2.06	0.07	25	1.75	14-21	
3.20-4.40	Yellowish brown, fine to medium grained, clayey sand (SC)	2.06-3.26	0.03	29	2.03	17-41	
4.40-8.60	Yellowish brwn to reddish brown, fine to medium grained, weakly cemented clayey sand	3.26-7.46	-	-	-	71- >100	
8.60-10.00	Yellowish brown, fine to medium grained, weakly cemented clayey sand	7.46-8.86	-	-	-	>100	
10.00-17.60	Brownish to reddish yellow, fine to medium grained, weakly cemented clayey sand	8.86- 16.46	-	-	-	>100	
17.60-20.00	Highly weathered, completely fractured and disintegrated, reddish brown, fine to coarse grained, fragments of fractured rock with infilled reddish brown, fine to coarse grained, clayey sand	16.46- 18.86	-	-	-		73.10
20.00-25.00	Highly weathered, completely fractured and disintegrated, light pinkish brown and light greyish, fine to coarse grained, weak and friable fractured rock	18.86- 23.86	-	-	-		88.40

Design Parameter for Group 30 Applicable structure: Ammonia storage and handling system Representative Borehole: BH-09							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk Density in gm/cc	SPT N Value	shear strength qc kN/m ²
-	Filled up soil	FGL- 4.94	-	-	-	-	-
0.00-0.50	Yellowish brown, fine to medium grained, clayey sand (SC)	4.94- 5.44	-	-	-	28	-
0.50-1.60	Reddish brown, fine to coarse grained, clayey sand with much gravels (SC)	5.44- 6.54	-	-	-	12	-
1.60-2.45	Yellowish brown, fine to medium grained, clayey sand with much gravels (SC)	6.54- 7.39	-	-	-	12	-
2.45-3.40	Brownish, fine to medium grained, silty clayey sand (SM-SC)	7.39- 8.34	0.02	26	1.84	18	-
3.40-6.45	Light whitish yellow, fine to medium grained, clayey sand with occasional gravels (SC)	8.34- 11.39	0.07	27	2.02	19-33	-
6.45-12.50	Mixture of highly weathered, completely fractured and disintegrated, brownish, fine to very fine grained, micachist, very weak and friable fractured rock with yellowish brown fine to very fine grained, clayey sand	11.39- 17..44	-	-	-	>100	-
12.50-15.50	Highly weathered, moderately weak, dark brownish, fine to coarse grained, fractured rock	17.44- 20.44	-	-	2.38	-	-
15.50-18.50	Highly weathered, very weak, dark brownish, fine to coarse grained, rock with close spacing of discontinuities	20.44- 23.44	-	-	2.38	-	73.4
18.50-21.50	Highly weathered, moderaely weak, ark brownish, fine to coarse grained, rock with close spacing of discontinuities	23.44- 26.44	-	-	2.34	-	-
21.50-25.00	Highly weathered, moderately strong, dark whitish grey, fine to coarse grained, rock with close spacing of discontinuities	26.44- 29.94	-	-	2.45	-	131.9

Design Parameter for Group 31 Applicable structure: Fire station Representative Borehole: BH-117							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.60	Yellowish brown, fine to medium grained, filled up silty and clayey sand with some gravels	Up to 3.6m depth from FGL soil in cutting	-	-	-	-	-
0.60-1.50	Dark brownish red, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)		-	-	-	13	
1.50-3.60	Dark brownish red and light yellowish brown, fine to medium grained, clayey sand (SC)		0.07	27	2.01	19-26	
3.60-4.50	Dark brownish red and light yellowish brown, fine to medium grained, clayey sand (SC)	FGL-1.30	0.08	27	2.05	41	
4.50-7.40	Yellowish brown, fine to medium grained, weakly cemented clayey sand	1.30-3.80	0.08	29	2.12	59->100	
7.40-10.00	Light brownish and dark brownish, fine to medium grained, weakly cemented sand	3.80-6.40	-	-	-	>100	
10.00-14.00	Yellowish brown, fine to medium grained, cemented clayey sand	6.40-10.40	-	-	-	>100	
14.00-18.60	Whitish yellow, dark brownish and yellowish brown, fine to coarse grained, cemented sand	10.40-15.00	-	-	-	>100	
18.60-20.00	Dark brownish, fine to coarse grained, cemented clayey sand (SC)	15.00-16.40	-	-	-	>100	

Design Parameter for Group 32 Applicable structure: CW Forebay & channel Representative Borehole: BH-156							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.60	Brownish, fine to medium grained, clayey sand with occasional gravels (SC)	Up to 2.88m depth from FGL soil in cutting	-	-	-	-	-
0.60-1.70	Yellowish brown, fine to medium grained, clayey sand with little gravels (SC)		-	-	-	8	
1.70-2.88	Reddish brown, fine to coarse grained, clayey sand with much gravels (SC)		-	-	-	18	
2.88-2.90	Reddish brown, fine to coarse grained, clayey sand with much gravels (SC)	FGL-0.02	0.06	28	1.70	-	
2.90-3.40	Reddish yellow, fine to coarse grained, silty and clayey sand with some gravels (SM-SC)	0.02-0.52	-	-	-	29	
3.40-4.80	Yellowish brown, fine to medium grains, clayey sand with little gravels (SC)	0.52-1.92	0.09	28	1.83	22-28	
4.80-7.30	Yellowish brown and slightly greyish, fine to medium grained, silty and clayey sand with little gravels (SM-SC)	1.92-4.42	0.01	30	2.10	24-55	
7.30-8.40	Yellowish brown and brownish, fine to medium grained, micaceous cemented silty and clayey sand (SM-SC)	4.42-5.52	-	-	-	>100	
8.40-9.30	Brownish grey, fine to very fine grained, micaceous cemented clayey sand (SC)	5.52-6.42	-	-	-	>100	
9.30-11.90	Yellowish brown, fine to very fine grained, cemented micaceous clayey sand (SC)	6.42-9.02	-	-	-	>100	
11.90-14.00	Greyish brown, fine to medium grained, cemented micaceous silty sand with occasional gravels (SM)	9.02-11.12	-	-	2.41	-	-
14.00-17.50	Highly weathered, weak, yellowish brown and light whitish brown, fine to coarse grained, fractured rock	11.12-14.62	-	-	2.46	-	
17.50-20.00	Highly weathered, weak, yellowish brown, fine to medium grained, rock with closely spaced discontinuities	14.62-17.12	-	-	2.42	-	149.6

Design Parameter for Group 33 Applicable structure: Safety office cum store Representative Borehole: BH-125							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-0.40	Yellowish brown, fine to medium grained, filled up sandy clays of intermediate plasticity with of occasional gravels	Up to 2.13m depth from FGL soil in cutting	-	-	-	-	-
0.40-2.13	Reddish brown, fine to coarse grained, clayey sand with much gravels (SC)		-	-	-	8	
2.13-2.80	Reddish brown, fine to coarse grained, clayey sand with much gravels (SC)		-	-	-	15-25	
2.80-4.90	Yellowish brown, very fine grained, silty clays of high plasticity with much gravels (CH)		1.50	4	1.99	23-32	
4.90-8.00	Light greyish brown, very fine grained, silty clays of intermediate plasticity (CI) (silty stone)		-	-	-	32->100	
8.00-8.40	Mixture of highly weathered, very weak, light greyish brown, fine to medium grained, pebbles, size rock fragments with widely spaced discontinuities		-	-	-	>100	
8.40-9.90	Boulderous formation of highly weathered, dark brownish and whitish yellow, fine to coarse grained, pebbles, cobbles and boulders size fragments of rock with dark brownish clayey sand		0.10	30	2.08	>100	
9.90-13.40	Yellowish grey, very fine grained, indurated clays of high plasticity (silty stone)	7.77-11.27	-	-	-	-	-
13.40-16.00	Highly weathered, very weak, dark brownish, fine to coarse grained, fractured micaceous rock	11.27-13.87	-	-	-	-	
16.00-18.50	Highly weathered, moderately weak, dark brownish, fine to coarse grained, fractured micaceous rock	13.87-16.37	-	-	-	-	
18.50-20.00	Highly weathered, dark brownish, fine to coarse grained, fractured rock	16.37-17.87	-	-	-	-	

Design Parameter for Group 34 Applicable structure: First aid centre Representative Borehole: BH-118							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm ²	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m ²
0.00-1.00	Yellowish brown, fine to medium grained, sandy clays of low plasticity (CL)	Up to 2.02m depth from FGL soil in cutting	-	-	-	-	-
1.00-2.02	Yellowish brown and brownish, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)		-	-	-	5	
2.02-2.80	Yellowish brown and brownish, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)	FGL-0.78	0.41	6	1.95	6	
2.80-4.80	Yellowish brown, very fine grained, silty clays of high plasticity with some gravels (CH)	0.78-2.78	0.91	3	1.99	9-19	
4.80-6.40	Greyish brown, very fine grained, silty clays of intermediate plasticity (CI)	2.78-4.38	1.66	6	2.06	29-32	
6.40-7.00	Yellowish brown and greyish, very fine grained, clays of high plasticity (CH)	4.38-4.98	1.71	4	2.08	33	
7.00-8.50	Yellowish brown and greyish brown, very fine grained, silty clays of intermediate plasticity with occasional gravels (CI)	4.97-6.48	-	-	-	37-69	-
8.50-14.70	Dark brownish, fine to very fine grained, indurated clays of intermediate plasticity (CI) (Mudstone)	6.48-12.68	-	-	-	78->100	
14.70-18.60	Highly weathered, very weak, dark greyish and greyish brown, very fine grained, very thinly laminated rock	12.68-16.58	-	-	2.27	>100	
18.60-20.00	Highly weathered, moderately strong, greyish brown, fine to coarse grained, friable rock	16.58-17.98	-	-	2.64	>100	-

Calculation of Allowable Bearing Pressure from Shear & Settlement Criteria.

Project: Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Structure: BH-55

➤ **For Square Isolated Foundations:**

Depth of foundation considered from FGL, $D_f = 3.00$ m (201.80 R.L.)

Width of foundation considered, $B_f = 1.50$ m

Length of foundation considered, $L_f = 1.50$ m

Bulk Density $\gamma_b = 1.94$ gm/cm³

Water Table at depth = Considered at F.G.L. for analysis.

Factor of Safety = 2.50

Type of Failure Considered = Mixed shear failure, as $e > 0.55$ & $e < 0.75$

(Ref: Soil mechanics and foundation engineering by DR.K.R.Arora attached in Appendix)

$$q_{nu} = \left[\left(\frac{2}{3} \right) * c N_c d_c S_c i_c + \gamma_d (N_q - 1) S_q d_q i_q W + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma \right],$$

Ref: - (IS 6403, CL-5.1.2a)

Shear Parameters, $c = 0.64$ kg/cm², $\phi = 7^\circ$, $e = 0.72$

Bearing Capacity Factors:

$N_c = 6.49$, $N_q = 1.57$, i.e. $N_q - 1 = 0.57$, $N_\gamma = 0.45$

Shape Factors: (for square footings)

(IS 6403, Table 2)

$S_c = 1.30$, $S_q = 1.20$, $S_\gamma = 0.80$

Depth Factors:

$d_c = 1.43$, $d_q = d_\gamma = 1.00$

(IS 6403, CL-5.1.2.2)

$d_c = 1 + 0.2 D_f/B * \sqrt{N_\phi}$

$d_q = d_\gamma = 1 + 0.1 D_f/B * \sqrt{N_\phi}$ for $\Phi > 10^\circ$

Inclination Factors: (for vertical loading)

$i_c = i_q = i_\gamma = 1.00$

(IS 6403, CL-5.1.2.3)

$i_c = i_q = \left(1 - \frac{\alpha}{90} \right)^2$

$i_\gamma = \left(1 - \frac{\alpha}{\phi} \right)^2$

α = inclination of load to vertical in degrees = 0

Water Table Correction: (W.T at F.G.L.)

$W_q, W_\gamma = 0.5$ & 0.5 respectively,

(IS 6403, CL-5.1.2.4)

Substituting, the values for determination of net ultimate bearing capacity from shear criteria,

$$q_{nu} = \left[\left(\frac{2}{3} \right) * c N_c d_c S_c i_c + \gamma_d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma \right]$$

$$\begin{aligned}
 q_{nu} &= \left[\left(\frac{2}{3} \right) * (0.64 * 10) * 6.49 * 1.43 * 1.30 * 1.00 + (0.56 \right. \\
 &\quad \left. + (1.94 * (3.00))) (1.57 - 1.00) * 1.20 * 1.00 * 1.00 * 0.50 + 0.5 \right. \\
 &\quad \left. * 1.94 * 1.50 * 0.45 * 0.80 * 1.00 * 1.00 * 0.50 \right] \\
 &= \mathbf{53.92 \text{ T / m}^2}
 \end{aligned}$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 21.57 \text{ T / m}^2$$

$$q_{\text{net safe}} = \mathbf{22.00 \text{ T / m}^2} = \mathbf{220.00 \text{ kN/m}^2}$$

Calculation of Allowable Bearing Pressure from Settlement Criteria.

Project: Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Structure: BH-55

$$S_i + S_c = \frac{C_d q_{net} B (1 - \mu^2)}{(E)} + m_v H \Delta P$$

Where,

S = Settlement of 40mm Considered

Q_{net} = Safe Bearing pressure

Factor C_d

E = Modulus of Elasticity

m_v = Co-efficient of Volume Compressibility

μ = Poisson's Ratio

B, L = Width & Length of Foundation respectively

R_f = Rigidity Factor

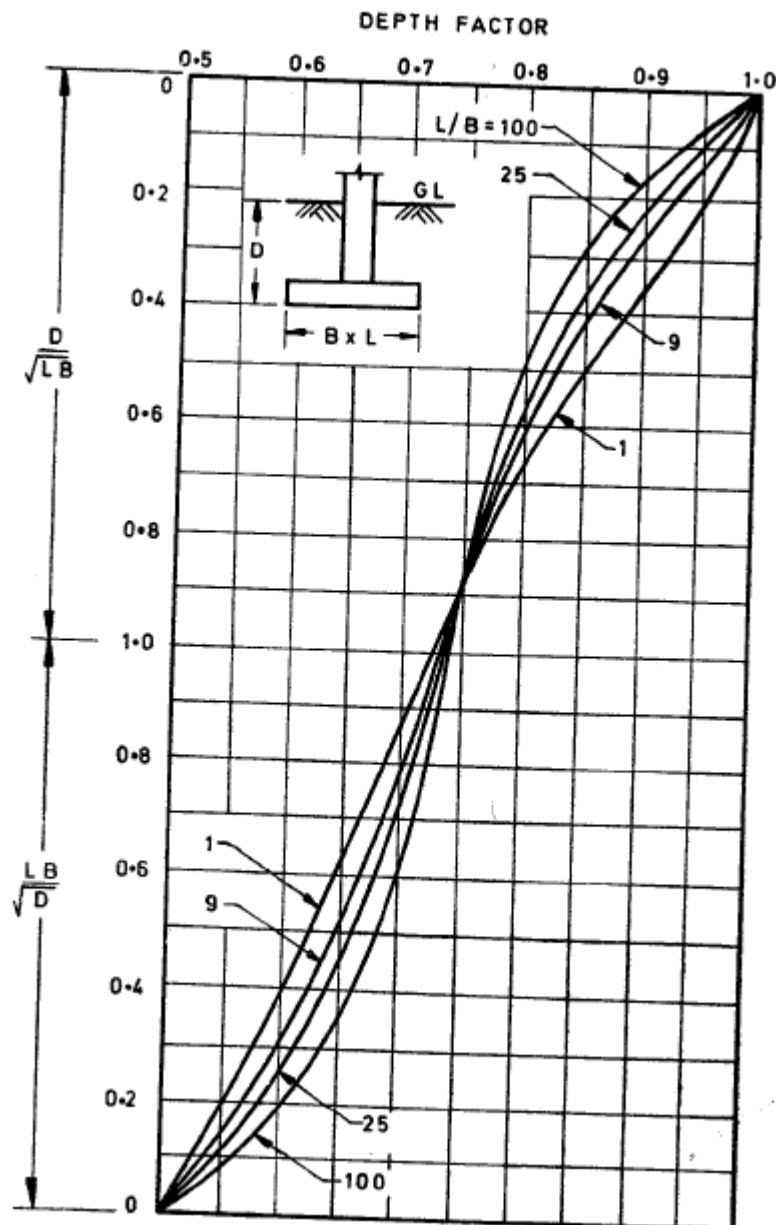
D_f = Depth factor

λ = Factor Related to Pore Pressure

Code of Reference – IS 8009 P-1

For Isolated Foundations:

- Safe Bearing Pressure for 40mm Settlement.
- Depth of foundation considered from EGL, D_f = 3.00 m (201.80m R.L.)
- Width of foundation, considered, B_f = 1.50 m
- Length of foundation, considered, L_f = 1.50 m
- Poisson's ratio, μ = 0.40 (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-7)
- Co-efficient of Volume Compressibility = 0.016 cm²/kg,
- Modulus of Elasticity, E = ((250*0.64)+(750*1.02))/2 = 463kg/cm²
(Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-7)
- Depth of Compressible Stratum, H = 3.0 m
- Rigidity Factor = 0.80
- Dispersion 1:2 – Factor = ((H/2)+B)²/ B² = ((3.00/2)+1.50)²/1.50² = 4.0, (Utilized in calculations)
- Factor Related to Pore Pressure, λ = 0.7 **Ref: - Table – 1, IS 8009, P-1**
- Depth Correction Factor = 0.73 **Ref: - From Fig-12, IS 8009, P-1**
L/B = 1.00, D/(sqrt (L*B)) = (1.00/sqrt(1.00*1.00)) = 1.00



- Factor $C_d = 1.12$ Ref: - Table-2, IS 8009, P-I,

$$\text{Net S.B.P} = 40 / (((100 * 1.12 * 1.50 * (1 - 0.40^2) * 0.80) / 463.0) + (100 * 0.016 * 3.00 * 0.7 * 0.73 * 0.80 / 4.0))$$

$$= 54.47 \text{ T/m}^2$$

$$= 54.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate and Consolidation Settlement is 54.00 T/m^2 .

So, Allowable Bearing Pressure = lower of both the cases, i.e. shear and settlement criteria

$$= \text{Minimum of } 54.00 \text{ T/m}^2 \text{ \& } 22.00 \text{ T/m}^2$$

$$= 22.00 \text{ T/m}^2 = 220.00 \text{ kN/m}^2.$$

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 201.80m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 1.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 1.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	3.70	198.80	1.50	1.50	22	34	54	22	22
3.00	3.70	198.80	2.00	2.00	20	26	41	20	20
3.00	3.70	198.80	2.50	2.50	19	20	33	19	19
3.00	3.70	198.80	3.00	3.00	19	17	27	17	19
3.50	4.20	198.30	1.50	1.50	23	34	54	23	23
3.50	4.20	198.30	2.00	2.00	21	26	41	21	21
3.50	4.20	198.30	2.50	2.50	20	20	33	20	20
3.50	4.20	198.30	3.00	3.00	19	17	27	17	19
4.00	4.70	197.80	1.50	1.50	24	34	54	24	24
4.00	4.70	197.80	2.00	2.00	22	26	41	22	22
4.00	4.70	197.80	2.50	2.50	21	20	33	20	21
4.00	4.70	197.80	3.00	3.00	20	17	27	17	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.1 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.43	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	22
2	2.00	2.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.33	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	20
3	2.50	2.50	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.26	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
4	3.00	3.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
5	1.50	1.50	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.51	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	23
6	2.00	2.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	21
7	2.50	2.50	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	20
8	3.00	3.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
9	1.50	1.50	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.58	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	24
10	2.00	2.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.43	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	22
11	2.50	2.50	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.35	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	21
12	3.00	3.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	20

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.2 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	3.00	198.80	3.70	1.50	1.50	0.40	463	1.12	0.80	0.0160	3.00	0.70	0.73	0.80	34	54
2	3.00	198.80	3.70	2.00	2.00	0.40	463	1.12	0.80	0.0160	4.00	0.70	0.73	0.80	26	41
3	3.00	198.80	3.70	2.50	2.50	0.40	463	1.12	0.80	0.0160	5.00	0.70	0.73	0.80	20	33
4	3.00	198.80	3.70	3.00	3.00	0.40	463	1.12	0.80	0.0160	6.00	0.70	0.73	0.80	17	27
5	3.50	198.30	4.20	1.50	1.50	0.40	463	1.12	0.80	0.0160	3.00	0.70	0.73	0.80	34	54
6	3.50	198.30	4.20	2.00	2.00	0.40	463	1.12	0.80	0.0160	4.00	0.70	0.73	0.80	26	41
7	3.50	198.30	4.20	2.50	2.50	0.40	463	1.12	0.80	0.0160	5.00	0.70	0.73	0.80	20	33
8	3.50	198.30	4.20	3.00	3.00	0.40	463	1.12	0.80	0.0160	6.00	0.70	0.73	0.80	17	27
9	4.00	197.80	4.70	1.50	1.50	0.40	463	1.12	0.80	0.0160	3.00	0.70	0.73	0.80	34	54
10	4.00	197.80	4.70	2.00	2.00	0.40	463	1.12	0.80	0.0160	4.00	0.70	0.73	0.80	26	41
11	4.00	197.80	4.70	2.50	2.50	0.40	463	1.12	0.80	0.0160	5.00	0.70	0.73	0.80	20	33
12	4.00	197.80	4.70	3.00	3.00	0.40	463	1.12	0.80	0.0160	6.00	0.70	0.73	0.80	17	27

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.3 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 201.80m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 1.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 1.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	3.70	198.80	3.50	3.50	18	14	23	14	18
3.00	3.70	198.80	4.00	4.00	18	12	20	12	18
3.00	3.70	198.80	5.00	5.00	18	9	15	9	15
3.00	3.70	198.80	6.00	6.00	17	8	12	8	12
3.50	4.20	198.30	3.50	3.50	19	15	23	15	19
3.50	4.20	198.30	4.00	4.00	18	13	20	13	18
3.50	4.20	198.30	5.00	5.00	18	10	16	10	16
3.50	4.20	198.30	6.00	6.00	18	8	13	8	13
4.00	4.70	197.80	3.50	3.50	19	15	23	15	19
4.00	4.70	197.80	4.00	4.00	19	13	20	13	19
4.00	4.70	197.80	5.00	5.00	18	10	16	10	16
4.00	4.70	197.80	6.00	6.00	18	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.4 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
2	4.00	4.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
3	5.00	5.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
4	6.00	6.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
5	3.50	3.50	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
6	4.00	4.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
7	5.00	5.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
8	6.00	6.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
9	3.50	3.50	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
10	4.00	4.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
11	5.00	5.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
12	6.00	6.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.5 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	3.00	198.80	3.70	3.50	3.50	0.40	463	1.12	0.80	0.0160	7.00	0.70	0.75	0.80	14	23
2	3.00	198.80	3.70	4.00	4.00	0.40	463	1.12	0.80	0.0160	8.00	0.70	0.77	0.80	12	20
3	3.00	198.80	3.70	5.00	5.00	0.40	463	1.12	0.80	0.0160	10.00	0.70	0.82	0.80	9	15
4	3.00	198.80	3.70	6.00	6.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.85	0.80	8	12
5	3.50	198.30	4.20	3.50	3.50	0.40	463	1.12	0.80	0.0160	7.00	0.70	0.73	0.80	15	23
6	3.50	198.30	4.20	4.00	4.00	0.40	463	1.12	0.80	0.0160	8.00	0.70	0.75	0.80	13	20
7	3.50	198.30	4.20	5.00	5.00	0.40	463	1.12	0.80	0.0160	10.00	0.70	0.79	0.80	10	16
8	3.50	198.30	4.20	6.00	6.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.82	0.80	8	13
9	4.00	197.80	4.70	3.50	3.50	0.40	463	1.12	0.80	0.0160	7.00	0.70	0.73	0.80	15	23
10	4.00	197.80	4.70	4.00	4.00	0.40	463	1.12	0.80	0.0160	8.00	0.70	0.73	0.80	13	20
11	4.00	197.80	4.70	5.00	5.00	0.40	463	1.12	0.80	0.0160	10.00	0.70	0.76	0.80	10	16
12	4.00	197.80	4.70	6.00	6.00	0.40	463	1.12	0.80	0.0160	11.50	0.70	0.80	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.6 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 201.80m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 1.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 1.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	3.70	198.80	7.00	7.00	17	6	10	6	10
3.00	3.70	198.80	8.00	8.00	17	6	9	6	9
3.00	3.70	198.80	9.00	9.00	17	5	8	5	8
3.00	3.70	198.80	10.00	10.00	17	5	7	5	7
3.50	4.20	198.30	7.00	7.00	17	7	11	7	11
3.50	4.20	198.30	8.00	8.00	17	6	9	6	9
3.50	4.20	198.30	9.00	9.00	17	5	8	5	8
3.50	4.20	198.30	10.00	10.00	17	5	7	5	7
4.00	4.70	197.80	7.00	7.00	18	7	11	7	11
4.00	4.70	197.80	8.00	8.00	18	6	9	6	9
4.00	4.70	197.80	9.00	9.00	18	5	8	5	8
4.00	4.70	197.80	10.00	10.00	17	5	8	5	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.7 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
2	8.00	8.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
3	9.00	9.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
4	10.00	10.00	3.00	3.70	198.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
5	7.00	7.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
6	8.00	8.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
7	9.00	9.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
8	10.00	10.00	3.50	4.20	198.30	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
9	7.00	7.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
10	8.00	8.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
11	9.00	9.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
12	10.00	10.00	4.00	4.70	197.80	0.64	7	6.49	0.57	0.45	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 201.80m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.8 (For BH-55,62,81,83,110,141,148,149 (CW pipe corridor))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	3.00	198.80	3.70	7.00	7.00	0.40	463	1.12	0.80	0.0160	12.50	0.70	0.87	0.80	6	10
2	3.00	198.80	3.70	8.00	8.00	0.40	463	1.12	0.80	0.0160	12.50	0.70	0.89	0.80	6	9
3	3.00	198.80	3.70	9.00	9.00	0.40	463	1.12	0.80	0.0160	12.50	0.70	0.91	0.80	5	8
4	3.00	198.80	3.70	10.00	10.00	0.40	463	1.12	0.80	0.0160	12.50	0.70	0.92	0.80	5	7
5	3.50	198.30	4.20	7.00	7.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.85	0.80	7	11
6	3.50	198.30	4.20	8.00	8.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.87	0.80	6	9
7	3.50	198.30	4.20	9.00	9.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.89	0.80	5	8
8	3.50	198.30	4.20	10.00	10.00	0.40	463	1.12	0.80	0.0160	12.00	0.70	0.90	0.80	5	7
9	4.00	197.80	4.70	7.00	7.00	0.40	463	1.12	0.80	0.0160	11.50	0.70	0.83	0.80	7	11
10	4.00	197.80	4.70	8.00	8.00	0.40	463	1.12	0.80	0.0160	11.50	0.70	0.85	0.80	6	9
11	4.00	197.80	4.70	9.00	9.00	0.40	463	1.12	0.80	0.0160	11.50	0.70	0.87	0.80	5	8
12	4.00	197.80	4.70	10.00	10.00	0.40	463	1.12	0.80	0.0160	11.50	0.70	0.88	0.80	5	8

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 2.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 2.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	13	66	106	13	13
1.00	201.50	2.00	2.00	13	50	79	13	13
1.00	201.50	2.50	2.50	13	40	63	13	13
1.00	201.50	3.00	3.00	14	33	53	14	14
2.00	200.50	1.50	1.50	18	66	106	18	18
2.00	200.50	2.00	2.00	18	50	79	18	18
2.00	200.50	2.50	2.50	18	40	63	18	18
2.00	200.50	3.00	3.00	18	33	53	18	18
3.00	199.50	1.50	1.50	25	66	106	25	25
3.00	199.50	2.00	2.00	24	50	79	24	24
3.00	199.50	2.50	2.50	23	40	63	23	23
3.00	199.50	3.00	3.00	23	33	53	23	23

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.1 (For BH-32,39,54,72,+(B9,95,102,175 (Switch yard))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.98	0.99	0.50	0.50	13
2	2.00	2.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	13
3	2.50	2.50	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	13
4	3.00	3.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	14
5	1.50	1.50	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
6	2.00	2.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
7	2.50	2.50	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
8	3.00	3.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
9	1.50	1.50	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.98	0.99	0.50	0.50	25
10	2.00	2.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.98	0.99	0.50	0.50	24
11	2.50	2.50	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23
12	3.00	3.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.2 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	1.50	1.12	0.35	312	0.80	66	106
2	1.00	201.50	2.00	1.12	0.35	312	0.80	50	79
3	1.00	201.50	2.50	1.12	0.35	312	0.80	40	63
4	1.00	201.50	3.00	1.12	0.35	312	0.80	33	53
5	2.00	201.50	1.50	1.12	0.35	312	0.80	66	106
6	2.00	201.50	2.00	1.12	0.35	312	0.80	50	79
7	2.00	201.50	2.50	1.12	0.35	312	0.80	40	63
8	2.00	201.50	3.00	1.12	0.35	312	0.80	33	53
9	3.00	201.50	1.50	1.12	0.35	312	0.80	66	106
10	3.00	201.50	2.00	1.12	0.35	312	0.80	50	79
11	3.00	201.50	2.50	1.12	0.35	312	0.80	40	63
12	3.00	201.50	3.00	1.12	0.35	312	0.80	33	53

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.3 (For BH-32,39,54,72,+(99,95,102,175 (Switch yard))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 2.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 2.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	14	28	45	14	14
1.00	201.50	4.00	4.00	15	25	40	15	15
1.00	201.50	5.00	5.00	16	20	32	16	16
1.00	201.50	6.00	6.00	17	17	26	17	17
2.00	200.50	3.50	3.50	19	28	45	19	19
2.00	200.50	4.00	4.00	19	25	40	19	19
2.00	200.50	5.00	5.00	20	20	32	20	20
2.00	200.50	6.00	6.00	21	17	26	17	21
3.00	199.50	3.50	3.50	23	28	45	23	23
3.00	199.50	4.00	4.00	24	25	40	24	24
3.00	199.50	5.00	5.00	25	20	32	20	25
3.00	199.50	6.00	6.00	25	17	26	17	25

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.4 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	3.50	3.50	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	14
2	4.00	4.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	15
3	5.00	5.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
4	6.00	6.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
5	3.50	3.50	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
6	4.00	4.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
7	5.00	5.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
8	6.00	6.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
9	3.50	3.50	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23
10	4.00	4.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.98	0.99	0.50	0.50	24
11	5.00	5.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	25
12	6.00	6.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	25

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.5 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	3.50	1.12	0.35	312	0.80	28	45
2	1.00	201.50	4.00	1.12	0.35	312	0.80	25	40
3	1.00	201.50	5.00	1.12	0.35	312	0.80	20	32
4	1.00	201.50	6.00	1.12	0.35	312	0.80	17	26
5	2.00	201.50	3.50	1.12	0.35	312	0.80	28	45
6	2.00	201.50	4.00	1.12	0.35	312	0.80	25	40
7	2.00	201.50	5.00	1.12	0.35	312	0.80	20	32
8	2.00	201.50	6.00	1.12	0.35	312	0.80	17	26
9	3.00	201.50	3.50	1.12	0.35	312	0.80	28	45
10	3.00	201.50	4.00	1.12	0.35	312	0.80	25	40
11	3.00	201.50	5.00	1.12	0.35	312	0.80	20	32
12	3.00	201.50	6.00	1.12	0.35	312	0.80	17	26

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.6 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 2.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 2.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	18	14	23	14	18
1.00	201.50	8.00	8.00	20	12	20	12	20
1.00	201.50	9.00	9.00	21	11	18	11	18
1.00	201.50	10.00	10.00	22	10	16	10	16
2.00	200.50	7.00	7.00	22	14	23	14	22
2.00	200.50	8.00	8.00	23	12	20	12	20
2.00	200.50	9.00	9.00	25	11	18	11	18
2.00	200.50	10.00	10.00	26	10	16	10	16
3.00	199.50	7.00	7.00	26	14	23	14	23
3.00	199.50	8.00	8.00	27	12	20	12	20
3.00	199.50	9.00	9.00	29	11	18	11	18
3.00	199.50	10.00	10.00	30	10	16	10	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.7 (For BH-32,39,54,72,+ (B9,95,102,175 (Switch yard))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
2	8.00	8.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
3	9.00	9.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
4	10.00	10.00	1.00	201.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
5	7.00	7.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
6	8.00	8.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23
7	9.00	9.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	25
8	10.00	10.00	2.00	200.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	26
9	7.00	7.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	26
10	8.00	8.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	27
11	9.00	9.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	29
12	10.00	10.00	3.00	199.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	30

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.8 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	7.00	1.12	0.35	312	0.80	14	23
2	1.00	201.50	8.00	1.12	0.35	312	0.80	12	20
3	1.00	201.50	9.00	1.12	0.35	312	0.80	11	18
4	1.00	201.50	10.00	1.12	0.35	312	0.80	10	16
5	2.00	201.50	7.00	1.12	0.35	312	0.80	14	23
6	2.00	201.50	8.00	1.12	0.35	312	0.80	12	20
7	2.00	201.50	9.00	1.12	0.35	312	0.80	11	18
8	2.00	201.50	10.00	1.12	0.35	312	0.80	10	16
9	3.00	201.50	7.00	1.12	0.35	312	0.80	14	23
10	3.00	201.50	8.00	1.12	0.35	312	0.80	12	20
11	3.00	201.50	9.00	1.12	0.35	312	0.80	11	18
12	3.00	201.50	10.00	1.12	0.35	312	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 2.9 (For BH-32,39,54,72,+(239,95,102,175 (Switch yard))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 2.10)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 2.11)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	198.50	1.50	1.50	31	66	106	31	31
4.00	198.50	2.00	2.00	30	50	79	30	30
4.00	198.50	2.50	2.50	29	40	63	29	29
4.00	198.50	3.00	3.00	29	33	53	29	29
4.00	198.50	3.50	3.50	28	28	45	28	28
4.00	198.50	4.00	4.00	29	25	40	25	29
4.00	198.50	5.00	5.00	29	20	32	20	29
4.00	198.50	6.00	6.00	30	17	26	17	26
4.00	198.50	7.00	7.00	31	14	23	14	23
4.00	198.50	8.00	8.00	32	12	20	12	20
4.00	198.50	9.00	9.00	33	11	18	11	18
4.00	198.50	10.00	10.00	34	10	16	10	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.10 (For BH-32,39,54,72,+(39,95,102,175 (Switch yard))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	1.50	1.50	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.75	1.38	1.38	1.00	1.00	1.00	1.98	0.99	0.50	0.50	31
2	2.00	2.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.98	0.99	0.50	0.50	30
3	2.50	2.50	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.98	0.99	0.50	0.50	29
4	3.00	3.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.98	0.99	0.50	0.50	29
5	3.50	3.50	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.98	0.99	0.50	0.50	28
6	4.00	4.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	29
7	5.00	5.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.98	0.99	0.50	0.50	29
8	6.00	6.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.98	0.99	0.50	0.50	30
9	7.00	7.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	31
10	8.00	8.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	32
11	9.00	9.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.13	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	33
12	10.00	10.00	4.00	198.50	0.10	28	17.01	7.08	7.72	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	34

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 2.11 (For BH-32,39,54,72,+(89,95,102,175 (Switch yard))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	4.00	198.50	1.50	1.12	0.35	312	0.80	66	106
2	4.00	198.50	2.00	1.12	0.35	312	0.80	50	79
3	4.00	198.50	2.50	1.12	0.35	312	0.80	40	63
4	4.00	198.50	3.00	1.12	0.35	312	0.80	33	53
5	4.00	198.50	3.50	1.12	0.35	312	0.80	28	45
6	4.00	198.50	4.00	1.12	0.35	312	0.80	25	40
7	4.00	198.50	5.00	1.12	0.35	312	0.80	20	32
8	4.00	198.50	6.00	1.12	0.35	312	0.80	17	26
9	4.00	198.50	7.00	1.12	0.35	312	0.80	14	23
10	4.00	198.50	8.00	1.12	0.35	312	0.80	12	20
11	4.00	198.50	9.00	1.12	0.35	312	0.80	11	18
12	4.00	198.50	10.00	1.12	0.35	312	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3 (For BH- 41(Service Building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 3.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 3.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	1.50	1.50	16	26	42	16	16
2.50	200.00	2.00	2.00	16	20	31	16	16
2.50	200.00	2.50	2.50	16	16	25	16	16
2.50	200.00	3.00	3.00	16	13	21	13	16
3.00	199.50	1.50	1.50	19	26	42	19	19
3.00	199.50	2.00	2.00	18	20	31	18	18
3.00	199.50	2.50	2.50	18	16	25	16	18
3.00	199.50	3.00	3.00	18	13	21	13	18
3.50	199.00	1.50	1.50	22	26	42	22	22
3.50	199.00	2.00	2.00	21	20	31	20	21
3.50	199.00	2.50	2.50	20	16	25	16	20
3.50	199.00	3.00	3.00	20	13	21	13	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.1 (For BH- 41(Service Building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ	W _q	W _γ	
	m	m			Kg/cm ²	degree													gm/cc				
1	1.50	1.50	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
2	2.00	2.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
3	2.50	2.50	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
4	3.00	3.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
5	1.50	1.50	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
6	2.00	2.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.41	1.20	1.20	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
7	2.50	2.50	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.33	1.16	1.16	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
8	3.00	3.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
9	1.50	1.50	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.63	1.32	1.32	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
10	2.00	2.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
11	2.50	2.50	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
12	3.00	3.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 3.2 (For BH- 41(Service Building))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	200.00	1.50	1.50	0.35	237	1.12	0.80	0.0150	3.00	0.70	0.73	0.80	26	42
2	2.50	200.00	2.00	2.00	0.35	237	1.12	0.80	0.0150	4.00	0.70	0.73	0.80	20	31
3	2.50	200.00	2.50	2.50	0.35	237	1.12	0.80	0.0150	5.00	0.70	0.73	0.80	16	25
4	2.50	200.00	3.00	3.00	0.35	237	1.12	0.80	0.0150	6.00	0.70	0.75	0.80	13	21
5	3.00	199.50	1.50	1.50	0.35	237	1.12	0.80	0.0150	3.00	0.70	0.73	0.80	26	42
6	3.00	199.50	2.00	2.00	0.35	237	1.12	0.80	0.0150	4.00	0.70	0.73	0.80	20	31
7	3.00	199.50	2.50	2.50	0.35	237	1.12	0.80	0.0150	5.00	0.70	0.73	0.80	16	25
8	3.00	199.50	3.00	3.00	0.35	237	1.12	0.80	0.0150	6.00	0.70	0.73	0.80	13	21
9	3.50	199.00	1.50	1.50	0.35	237	1.12	0.80	0.0150	3.00	0.70	0.73	0.80	26	42
10	3.50	199.00	2.00	2.00	0.35	237	1.12	0.80	0.0150	4.00	0.70	0.73	0.80	20	31
11	3.50	199.00	2.50	2.50	0.35	237	1.12	0.80	0.0150	5.00	0.70	0.73	0.80	16	25
12	3.50	199.00	3.00	3.00	0.35	237	1.12	0.80	0.0150	6.00	0.70	0.73	0.80	13	21

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.3 (For BH- 41(Service Building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 3.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 3.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	3.50	3.50	16	11	17	11	16
2.50	200.00	4.00	4.00	17	9	15	9	15
2.50	200.00	5.00	5.00	17	7	12	7	12
2.50	200.00	6.00	6.00	18	6	10	6	10
3.00	199.50	3.50	3.50	18	11	18	11	18
3.00	199.50	4.00	4.00	18	10	15	10	15
3.00	199.50	5.00	5.00	19	7	12	7	12
3.00	199.50	6.00	6.00	20	6	10	6	10
3.50	199.00	3.50	3.50	20	11	18	11	18
3.50	199.00	4.00	4.00	20	10	16	10	16
3.50	199.00	5.00	5.00	21	8	12	8	12
3.50	199.00	6.00	6.00	22	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.4 (For BH- 41(Service Building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ	W _q	W _γ	
	m	m			Kg/cm ²	degree													gm/cc				
1	3.50	3.50	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
2	4.00	4.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
3	5.00	5.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
4	6.00	6.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
5	3.50	3.50	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
6	4.00	4.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
7	5.00	5.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
8	6.00	6.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
9	3.50	3.50	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
10	4.00	4.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
11	5.00	5.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
12	6.00	6.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 3.5 (For BH- 41(Service Building))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	200.00	3.50	3.50	0.35	237	1.12	0.80	0.0150	7.00	0.70	0.78	0.80	11	17
2	2.50	200.00	4.00	4.00	0.35	237	1.12	0.80	0.0150	8.00	0.70	0.81	0.80	9	15
3	2.50	200.00	5.00	5.00	0.35	237	1.12	0.80	0.0150	10.00	0.70	0.85	0.80	7	12
4	2.50	200.00	6.00	6.00	0.35	237	1.12	0.80	0.0150	11.50	0.70	0.88	0.80	6	10
5	3.00	199.50	3.50	3.50	0.35	237	1.12	0.80	0.0150	7.00	0.70	0.75	0.80	11	18
6	3.00	199.50	4.00	4.00	0.35	237	1.12	0.80	0.0150	8.00	0.70	0.77	0.80	10	15
7	3.00	199.50	5.00	5.00	0.35	237	1.12	0.80	0.0150	10.00	0.70	0.82	0.80	7	12
8	3.00	199.50	6.00	6.00	0.35	237	1.12	0.80	0.0150	11.00	0.70	0.85	0.80	6	10
9	3.50	199.00	3.50	3.50	0.35	237	1.12	0.80	0.0150	7.00	0.70	0.73	0.80	11	18
10	3.50	199.00	4.00	4.00	0.35	237	1.12	0.80	0.0150	8.00	0.70	0.75	0.80	10	16
11	3.50	199.00	5.00	5.00	0.35	237	1.12	0.80	0.0150	10.00	0.70	0.79	0.80	8	12
12	3.50	199.00	6.00	6.00	0.35	237	1.12	0.80	0.0150	10.50	0.70	0.82	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.6 (For BH- 41(Service Building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 3.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 3.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	7.00	7.00	19	5	8	5	8
2.50	200.00	8.00	8.00	20	4	7	4	7
2.50	200.00	9.00	9.00	21	4	6	4	6
2.50	200.00	10.00	10.00	22	4	6	4	6
3.00	199.50	7.00	7.00	21	5	8	5	8
3.00	199.50	8.00	8.00	21	5	7	5	7
3.00	199.50	9.00	9.00	22	4	6	4	6
3.00	199.50	10.00	10.00	23	4	6	4	6
3.50	199.00	7.00	7.00	22	5	8	5	8
3.50	199.00	8.00	8.00	23	5	7	5	7
3.50	199.00	9.00	9.00	24	4	7	4	7
3.50	199.00	10.00	10.00	25	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.7 (For BH- 41(Service Building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		Wq	Wγ	
1	7.00	7.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
2	8.00	8.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
3	9.00	9.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
4	10.00	10.00	2.50	200.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
5	7.00	7.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
6	8.00	8.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	21
7	9.00	9.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
8	10.00	10.00	3.00	199.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23
9	7.00	7.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
10	8.00	8.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.98	0.99	0.50	0.50	23
11	9.00	9.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	24
12	10.00	10.00	3.50	199.00	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	25

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 3.8 (For BH- 41(Service Building))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	200.00	7.00	7.00	0.35	237	1.12	0.80	0.0150	11.50	0.70	0.90	0.80	5	8
2	2.50	200.00	8.00	8.00	0.35	237	1.12	0.80	0.0150	11.50	0.70	0.91	0.80	4	7
3	2.50	200.00	9.00	9.00	0.35	237	1.12	0.80	0.0150	11.50	0.70	0.92	0.80	4	6
4	2.50	200.00	10.00	10.00	0.35	237	1.12	0.80	0.0150	11.50	0.70	0.93	0.80	4	6
5	3.00	199.50	7.00	7.00	0.35	237	1.12	0.80	0.0150	11.00	0.70	0.87	0.80	5	8
6	3.00	199.50	8.00	8.00	0.35	237	1.12	0.80	0.0150	11.00	0.70	0.89	0.80	5	7
7	3.00	199.50	9.00	9.00	0.35	237	1.12	0.80	0.0150	11.00	0.70	0.91	0.80	4	6
8	3.00	199.50	10.00	10.00	0.35	237	1.12	0.80	0.0150	11.00	0.70	0.92	0.80	4	6
9	3.50	199.00	7.00	7.00	0.35	237	1.12	0.80	0.0150	10.50	0.70	0.85	0.80	5	8
10	3.50	199.00	8.00	8.00	0.35	237	1.12	0.80	0.0150	10.50	0.70	0.87	0.80	5	7
11	3.50	199.00	9.00	9.00	0.35	237	1.12	0.80	0.0150	10.50	0.70	0.89	0.80	4	7
12	3.50	199.00	10.00	10.00	0.35	237	1.12	0.80	0.0150	10.50	0.70	0.90	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.9 (For BH- 41(Service Building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 3)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 3.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	10	25	40	10	10
1.00	201.50	2.00	2.00	10	18	29	10	10
1.00	201.50	2.50	2.50	10	14	23	10	10
1.00	201.50	3.00	3.00	11	12	19	11	11
1.00	201.50	3.50	3.50	11	10	16	10	11
1.00	201.50	4.00	4.00	11	9	14	9	11
1.00	201.50	5.00	5.00	12	7	11	7	11
1.00	201.50	6.00	6.00	13	6	9	6	9
1.00	201.50	7.00	7.00	14	5	8	5	8
1.00	201.50	8.00	8.00	15	4	7	4	7
1.00	201.50	9.00	9.00	16	4	6	4	6
1.00	201.50	10.00	10.00	17	3	6	3	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 3.10 (For BH- 41(Service Building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			m	m	Kg/cm ²	degree												gm/cc		W _q	
1	1.50	1.50	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.98	0.99	0.50	0.50	10
2	2.00	2.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.98	0.99	0.50	0.50	10
3	2.50	2.50	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	10
4	3.00	3.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.98	0.99	0.50	0.50	11
5	3.50	3.50	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.98	0.99	0.50	0.50	11
6	4.00	4.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	11
7	5.00	5.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.98	0.99	0.50	0.50	12
8	6.00	6.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	13
9	7.00	7.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	14
10	8.00	8.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	15
11	9.00	9.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
12	10.00	10.00	1.00	201.50	0.08	25	15.25	5.81	6.06	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 3.11 (For BH- 41(Service Building))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	1.50	1.50	0.35	237	1.12	0.80	0.0150	3.00	0.70	0.80	0.80	25	40
2	1.00	201.50	2.00	2.00	0.35	237	1.12	0.80	0.0150	4.00	0.70	0.85	0.80	18	29
3	1.00	201.50	2.50	2.50	0.35	237	1.12	0.80	0.0150	5.00	0.70	0.88	0.80	14	23
4	1.00	201.50	3.00	3.00	0.35	237	1.12	0.80	0.0150	6.00	0.70	0.91	0.80	12	19
5	1.00	201.50	3.50	3.50	0.35	237	1.12	0.80	0.0150	7.00	0.70	0.92	0.80	10	16
6	1.00	201.50	4.00	4.00	0.35	237	1.12	0.80	0.0150	8.00	0.70	0.93	0.80	9	14
7	1.00	201.50	5.00	5.00	0.35	237	1.12	0.80	0.0150	10.00	0.70	0.95	0.80	7	11
8	1.00	201.50	6.00	6.00	0.35	237	1.12	0.80	0.0150	12.00	0.70	0.96	0.80	6	9
9	1.00	201.50	7.00	7.00	0.35	237	1.12	0.80	0.0150	13.00	0.70	0.97	0.80	5	8
10	1.00	201.50	8.00	8.00	0.35	237	1.12	0.80	0.0150	13.00	0.70	0.97	0.80	4	7
11	1.00	201.50	9.00	9.00	0.35	237	1.12	0.80	0.0150	13.00	0.70	0.97	0.80	4	6
12	1.00	201.50	10.00	10.00	0.35	237	1.12	0.80	0.0150	13.00	0.70	0.98	0.80	3	6

Appendix – 3B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH- 41) (Service Building)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 14.00, 15.00m from FGL. |
| 4. Cut off Level | - 1.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 41. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 1.00	Pile cutoff level – No pile						
1.00 to 1.80	0.48	0	0.80	0.91	NA	NA	12
1.80 to 5.30	0.07~0.00*	26	1.00	NA	1.00	26	16-26
5.30 to 15.00	1.55	7~0*	1.05	0.29	NA	NA	15->100
15.00 to 20.30	0.00	34\$	1.09	NA	1.20	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_\gamma + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.09 \cdot 42.90 + 9.08 \cdot 40.00) = 18.35d^3 + 285.11d^2$$

(For Pile terminating at 14.00 to 15.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.91 \cdot 4.80 \cdot \pi d \cdot 0.80 = 10.98 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 2.39 \cdot \tan 26^\circ \cdot \pi d \cdot 3.50 = 12.82 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.29 \cdot 15.50 \cdot \pi d \cdot (\ell - 5.30) = 14.12 d (\ell - 5.30)$$

Substituting, ultimate load

$q_{uf} = 23.80d + 14.12d (\ell - 5.30)$ (For Pile terminating at 14.00 to 15.00m from F.G.L.).

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$q_{uc} = q_{ub} + q_{uf}$

$q_{uc} = 18.35d^3 + 285.11d^2 + 23.80d + 14.12d (\ell - 5.30)$

(For Pile terminating at 14.00 to 15.00m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	13.00	77.28
15.00	14.00	80.61

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	13.00	34.39
15.00	14.00	37.60

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	13.00	5.51
15.00	14.00	5.94

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		2.80
Stiffness factor T in m		2.29
Depth of fixity in m	Free Head	4.40
	Fixed Head	5.00
Allowable Horizontal Force in T	Free Head	3.20
	Fixed Head	8.50
Allowable Moment capacity in Tm	Free Head	4.91
	Fixed Head	17.48

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Appendix – 4A

Calculation of Safe Load carrying capacity of piles socketed inside rock

(Near BH 12,14)

(DM Plant)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 12 show primarily three characterized layers,

1. Overburden comprising of Yellowish brown, fine to very fine grained, sandy clays of high plasticity upto 3.30m (i.e. R.L. 192.60m) followed by Yellowish brown, fine to medium grained, clayey sand with little gravels upto 4.70m (i.e. R.L. 191.20m) followed by Yellowish brown, very fine grained, clays of high plasticity upto 7.40m (i.e. R.L. 188.50m) followed by Yellowish brown, fine to medium grained, clayey sand with occasional gravels upto 9.30m (i.e. R.L. 186.60m) followed by Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity upto 10.50m (i.e. R.L. 185.40m) followed by Yellowish brown, fine to medium grained, poorly graded sand and silty sand upto 11.60m (i.e. R.L. 184.3m).
2. Second characterized layer below the overburden soils consists Highly weathered, very weak, dark brownish, fine to very fine grained, very thinly laminated and foliated rock (i.e. RL 170.90m). Though, rock is not very sound but can be considered for socketing if the pile capacity obtained thereby is adequate against imposed loads.

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 10.00 m below NGL (i.e. RL 187.50 m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 11.60 to 14.50 m (between RL 184.30 to 181.40 m) is > 100 with just 8.0 cm penetration in 50 blows. SPT can be extrapolated for 30 cm i.e. $50 * 30 / 8.00 = 188$.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m^2

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m^2

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.50 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = 3 D

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m²

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 \text{ d}^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 \text{ d}^2 + 1836.9 \text{ d}^2 = 4898.4 \text{ d}^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	20.00	20.48	20.90
Termination level RL in m	182.50	182.02	181.60
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

For 7.00m cutoff from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 12 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 7.00	Pile cutoff level – No pile						
7.00 to 9.90	0.25	7(ignored)	0.91	1.00	NA	NA	4-9
9.90 to 11.30	0.08(ignored)	25	0.94	NA	1.00	25	13
11.30 to 14.00	0.91	4(ignored)	0.96	0.49	NA	NA	14-22
14.00 to 15.90	0.04(ignored)	28	1.01	NA	1.00	28	22-24
15.90 to 17.10	1.10	8(ignored)	1.03	0.40	NA	NA	27
17.10 to 18.20	0.00	34	1.03	NA	1.50	34	29
18.20 to 31.60	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - \$ Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 1.00 * 2.50 * \pi d * 2.90 = 22.78 \text{ d}$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 * 8.90 * \tan 25^\circ * \pi d * 1.40 = 18.25 \text{ d}$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.49 * 9.10 * \pi d * 2.70 = 37.82 \text{ d}$$

$$\text{Fifth Layer} - K_5 P D_5 \tan \delta_5 A_{s5} = 1.00 * 9.65 * \tan 28^\circ * \pi d * 1.90 = 6.09 \text{ d}$$

$$\text{Sixth Layer} - \alpha_6 C_{a6} A_{s6} = 0.40 * 11.00 * \pi d * 1.20 = 16.59 \text{ d}$$

$$\text{Seventh Layer} - K_7 P D_7 \tan \delta_7 A_{s7} = 1.50 * 9.10 * \tan 34^\circ * \pi d * 1.10 = 31.82 \text{ d}$$

Eighth Layer – 1836.9 d² in rock socket

$$\text{Substituting, ultimate load } Q_{uf} = 1333.50 \text{ d} + 1836.9 \text{ d}^2$$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	20.00	20.48	20.90
Termination level RL in m	182.50	182.02	181.60
Safe load in Uplift in kN	981.32	1466.38	1967.95
Self-weight of pile in kN	55.11	91.68	132.57
Safe load in Uplift in T (Considering self-weight of pile)	103.64	155.81	210.05

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		9.00	9.00	9.00
Stiffness factor T in m		1.82	2.19	2.51
Depth of fixity in m	Free Head	3.40	4.20	4.80
	Fixed Head	4.00	4.80	5.50
Allowable Horizontal Force in T	Free Head	6.50	9.50	12.40
	Fixed Head	17.20	25.10	32.90
Allowable Moment capacity in Tm	Free Head	7.83	13.82	20.73
	Fixed Head	27.88	49.17	73.78

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 4B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile.

(Near BH- 12,14)
(DM Plant)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 18.00m from FGL. |
| 4. Cut off Level | - 7.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 12. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 7.00	Pile cutoff level – No pile						
7.00 to 9.90	0.25	7~0*	0.91	1.00	NA	NA	4-9
9.90 to 11.30	0.08~0.00*	25	0.94	NA	1.00	25	13
11.30 to 14.00	0.91	4~0*	0.96	0.49	NA	NA	14-22
14.00 to 15.90	0.04~0.00*	28	1.01	NA	1.00	28	22-24
15.90 to 17.10	1.10	8~0*	1.03	0.40	NA	NA	27
17.10 to 18.20	0.00	34\$	1.03	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_\gamma + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.01 \cdot 42.90 + 8.57 \cdot 40.00) = 17.01d^3 + 269.10d^2$$

(For Pile terminating at 18.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 1.00 \cdot 2.50 \cdot \pi d \cdot 2.90 = 22.78 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 3.30 \cdot \tan 25^\circ \cdot \pi d \cdot 1.40 = 6.77 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.49 \cdot 9.10 \cdot \pi d \cdot 2.70 = 37.82 d$$

$$\text{Fifth Layer} - K_5 P D_5 \tan \delta_5 A_{s5} = 1.00 \cdot 7.51 \cdot \tan 28^\circ \cdot \pi d \cdot 1.90 = 23.84 d$$

$$\text{Sixth Layer} - \alpha_6 C_{a6} A_{s6} = 0.40 \cdot 11.00 \cdot \pi d \cdot 1.20 = 16.59 d$$

Seventh Layer – $K7PD7 \tan \delta 7 As7 = 1.50 \times 8.57 \times \tan 34^\circ \pi d (\ell - 17.10) = 27.24 d (\ell - 17.10)$

Substituting, ultimate load

q_{uf} = 107.80d + 27.24d (ℓ – 17.10) (For Pile terminating at 18.00m from F.G.L.).

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

q_{uc} = q_{ub} + q_{uf}

q_{uc} = 17.01d³ + 269.10d² + 107.80d + 27.24d (ℓ – 17.10)

(For Pile terminating at 18.00m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
18.00	11.00	72.02

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
18.00	11.00	33.69

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
18.00	11.00	7.21

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m ³		9.00
Stiffness factor T in m		1.82
Depth of fixity in m	Free Head	3.40
	Fixed Head	4.00
Allowable Horizontal Force in T	Free Head	6.50
	Fixed Head	17.20
Allowable Moment capacity in Tm	Free Head	7.83
	Fixed Head	27.88

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Appendix - 5A

Calculation of Safe Load carrying capacity of piles socketed inside rock

(Near BH 13)

(DM transfer pump house, DM storage tank)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 13 show primarily three characterized layers,

1. Overburden comprising of Yellowish brown, fine to coarse grained, silty clayey sand upto 1.0m (i.e. R.L. 196.50m) followed by Greyish yellow, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels upto 3.00m (i.e. R.L 194.50) followed by Reddish yellow, fine to coarse grained, clayey sand and silty sand with much gravels upto 10.00m (i.e. R.L. 187.5m).
2. Second characterized layer below the overburden soils consists extremely weathered, to be composed dark brownish, fine to very fine grained, fractured and friable micaceous rock 13.00m (i.e. RL 184.50m). Though, rock is not very sound but can be considered for socketing if the pile capacity obtained thereby is adequate against imposed loads.

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 10.00 m below NGL (i.e. RL 187.50 m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 10.00 to 13.00 m (between RL 187.50 to 184.50 m) is >200.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = $3 D$

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m^2

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 \text{ d}^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 \text{ d}^2 + 1836.9 \text{ d}^2 = 4898.4 \text{ d}^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	16.80	17.28	17.70
Termination level RL in m	185.70	185.22	184.80
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

For 5.00m cutoff from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 13 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm^2	Angle of Internal Friction ϕ	Submerged density in $\text{gm/cc } \gamma_{\text{sub}}$	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 5.00	Pile cutoff level – No pile						
5.00 to 6.00	0.00	25°	0.72	NA	1.00	25	8
6.00 to 8.00	0.59	5~0°	0.72	0.76	NA	NA	8-9
8.00 to 15.00	0.05~0.00°	27	1.01	NA	1.00	27	16->100
15.00 to 30.00	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - ° Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - K_2 P D_2 \tan \delta_2 A_{s2} = 1.00 * 4.36 * \tan 25^\circ * \pi d * 1.00 = 6.39 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.76 * 5.90 * \pi d * 2.00 = 28.17 d$$

$$\text{Fourth Layer} - K_4 P D_4 \tan \delta_4 A_{s4} = 1.00 * 9.59 * \tan 27^\circ * \pi d * 7.00 = 107.46 d$$

Fifth Layer – 1836.9 d^2 in rock socket

Substituting, ultimate load **$q_{uf} = 1420.20 d + 1836.9 \text{ d}^2$**

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	16.80	17.28	17.70
Termination level RL in m	185.70	185.22	184.80
Safe load in Uplift in kN	1002.13	1492.73	1999.16
Self-weight of pile in kN	50.02	83.52	121.13
Safe load in Uplift in T (Considering self-weight of pile)	105.22	157.63	212.03

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		2.80	2.80	2.80
Stiffness factor T in m		2.29	2.77	3.17
Depth of fixity in m	Free Head	4.40	5.30	6.00
	Fixed Head	5.00	6.00	6.90
Allowable Horizontal Force in T	Free Head	3.20	4.70	6.20
	Fixed Head	8.50	12.40	16.30
Allowable Moment capacity in Tm	Free Head	4.91	8.66	12.99
	Fixed Head	17.48	30.82	46.25

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6 (For BH-6 (CPU Regen Building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:199.30m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 6.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 6.2)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	4.70	197.80	1.50	1.50	11	54	86	11	11
1.50	4.70	197.80	2.00	2.00	11	41	65	11	11
1.50	4.70	197.80	2.50	2.50	12	32	52	12	12
1.50	4.70	197.80	3.00	3.00	12	27	43	12	12
2.00	5.20	197.30	1.50	1.50	14	54	86	14	14
2.00	5.20	197.30	2.00	2.00	14	41	65	14	14
2.00	5.20	197.30	2.50	2.50	14	32	52	14	14
2.00	5.20	197.30	3.00	3.00	14	27	43	14	14
2.50	5.70	196.80	1.50	1.50	16	54	86	16	16
2.50	5.70	196.80	2.00	2.00	16	41	65	16	16
2.50	5.70	196.80	2.50	2.50	16	32	52	16	16
2.50	5.70	196.80	3.00	3.00	16	27	43	16	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.1 (For BH-6 (CPU Regen Building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.70	0.85	0.50	0.50	11
2	2.00	2.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.70	0.85	0.50	0.50	11
3	2.50	2.50	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.70	0.85	0.50	0.50	12
4	3.00	3.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.70	0.85	0.50	0.50	12
5	1.50	1.50	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.70	0.85	0.50	0.50	14
6	2.00	2.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.70	0.85	0.50	0.50	14
7	2.50	2.50	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.70	0.85	0.50	0.50	14
8	3.00	3.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.70	0.85	0.50	0.50	14
9	1.50	1.50	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.47	1.23	1.23	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16
10	2.00	2.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.35	1.17	1.17	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16
11	2.50	2.50	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16
12	3.00	3.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.2 (For BH-6 (CPU Regen Building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	4.70	197.80	1.50	1.12	0.35	255	0.80	54	86
2	1.50	4.70	197.80	2.00	1.12	0.35	255	0.80	41	65
3	1.50	4.70	197.80	2.50	1.12	0.35	255	0.80	32	52
4	1.50	4.70	197.80	3.00	1.12	0.35	255	0.80	27	43
5	2.00	5.20	197.80	1.50	1.12	0.35	255	0.80	54	86
6	2.00	5.20	197.80	2.00	1.12	0.35	255	0.80	41	65
7	2.00	5.20	197.80	2.50	1.12	0.35	255	0.80	32	52
8	2.00	5.20	197.80	3.00	1.12	0.35	255	0.80	27	43
9	2.50	5.70	197.80	1.50	1.12	0.35	255	0.80	54	86
10	2.50	5.70	197.80	2.00	1.12	0.35	255	0.80	41	65
11	2.50	5.70	197.80	2.50	1.12	0.35	255	0.80	32	52
12	2.50	5.70	197.80	3.00	1.12	0.35	255	0.80	27	43

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.3 (For BH-6 (CPU Regen Building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:199.30m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 6.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 6.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	4.70	197.80	3.50	3.50	13	23	37	13	13
1.50	4.70	197.80	4.00	4.00	13	20	32	13	13
1.50	4.70	197.80	5.00	5.00	14	16	26	14	14
1.50	4.70	197.80	6.00	6.00	15	14	22	14	15
2.00	5.20	197.30	3.50	3.50	15	23	37	15	15
2.00	5.20	197.30	4.00	4.00	15	20	32	15	15
2.00	5.20	197.30	5.00	5.00	16	16	26	16	16
2.00	5.20	197.30	6.00	6.00	17	14	22	14	17
2.50	5.70	196.80	3.50	3.50	17	23	37	17	17
2.50	5.70	196.80	4.00	4.00	17	20	32	17	17
2.50	5.70	196.80	5.00	5.00	18	16	26	16	18
2.50	5.70	196.80	6.00	6.00	19	14	22	14	19

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.4 (For BH-6 (CPU Regen Building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.70	0.85	0.50	0.50	13
2	4.00	4.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.70	0.85	0.50	0.50	13
3	5.00	5.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.70	0.85	0.50	0.50	14
4	6.00	6.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	15
5	3.50	3.50	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.70	0.85	0.50	0.50	15
6	4.00	4.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.70	0.85	0.50	0.50	15
7	5.00	5.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16
8	6.00	6.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.70	0.85	0.50	0.50	17
9	3.50	3.50	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.70	0.85	0.50	0.50	17
10	4.00	4.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.70	0.85	0.50	0.50	17
11	5.00	5.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.70	0.85	0.50	0.50	18
12	6.00	6.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.70	0.85	0.50	0.50	19

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.5 (For BH-6 (CPU Regen Building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	4.70	197.80	3.50	1.12	0.35	255	0.80	23	37
2	1.50	4.70	197.80	4.00	1.12	0.35	255	0.80	20	32
3	1.50	4.70	197.80	5.00	1.12	0.35	255	0.80	16	26
4	1.50	4.70	197.80	6.00	1.12	0.35	255	0.80	14	22
5	2.00	5.20	197.80	3.50	1.12	0.35	255	0.80	23	37
6	2.00	5.20	197.80	4.00	1.12	0.35	255	0.80	20	32
7	2.00	5.20	197.80	5.00	1.12	0.35	255	0.80	16	26
8	2.00	5.20	197.80	6.00	1.12	0.35	255	0.80	14	22
9	2.50	5.70	197.80	3.50	1.12	0.35	255	0.80	23	37
10	2.50	5.70	197.80	4.00	1.12	0.35	255	0.80	20	32
11	2.50	5.70	197.80	5.00	1.12	0.35	255	0.80	16	26
12	2.50	5.70	197.80	6.00	1.12	0.35	255	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.6 (For BH-6 (CPU Regen Building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:199.30m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 6.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 6.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	4.70	197.80	7.00	7.00	16	12	19	12	16
1.50	4.70	197.80	8.00	8.00	17	10	16	10	16
1.50	4.70	197.80	9.00	9.00	18	9	14	9	14
1.50	4.70	197.80	10.00	10.00	20	8	13	8	13
2.00	5.20	197.30	7.00	7.00	18	12	19	12	18
2.00	5.20	197.30	8.00	8.00	19	10	16	10	16
2.00	5.20	197.30	9.00	9.00	20	9	14	9	14
2.00	5.20	197.30	10.00	10.00	21	8	13	8	13
2.50	5.70	196.80	7.00	7.00	20	12	19	12	19
2.50	5.70	196.80	8.00	8.00	21	10	16	10	16
2.50	5.70	196.80	9.00	9.00	22	9	14	9	14
2.50	5.70	196.80	10.00	10.00	23	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.7 (For BH-6 (CPU Regen Building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	16
2	8.00	8.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	17
3	9.00	9.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.70	0.85	0.50	0.50	18
4	10.00	10.00	1.50	4.70	197.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.70	0.85	0.50	0.50	20
5	7.00	7.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.70	0.85	0.50	0.50	18
6	8.00	8.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	19
7	9.00	9.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	20
8	10.00	10.00	2.00	5.20	197.30	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	21
9	7.00	7.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.70	0.85	0.50	0.50	20
10	8.00	8.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.70	0.85	0.50	0.50	21
11	9.00	9.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.70	0.85	0.50	0.50	22
12	10.00	10.00	2.50	5.70	196.80	0.05	27	17.65	7.55	8.34	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.70	0.85	0.50	0.50	23

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 199.30m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.8 (For BH-6 (CPU Regen Building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	4.70	197.80	7.00	1.12	0.35	255	0.80	12	19
2	1.50	4.70	197.80	8.00	1.12	0.35	255	0.80	10	16
3	1.50	4.70	197.80	9.00	1.12	0.35	255	0.80	9	14
4	1.50	4.70	197.80	10.00	1.12	0.35	255	0.80	8	13
5	2.00	5.20	197.80	7.00	1.12	0.35	255	0.80	12	19
6	2.00	5.20	197.80	8.00	1.12	0.35	255	0.80	10	16
7	2.00	5.20	197.80	9.00	1.12	0.35	255	0.80	9	14
8	2.00	5.20	197.80	10.00	1.12	0.35	255	0.80	8	13
9	2.50	5.70	197.80	7.00	1.12	0.35	255	0.80	12	19
10	2.50	5.70	197.80	8.00	1.12	0.35	255	0.80	10	16
11	2.50	5.70	197.80	9.00	1.12	0.35	255	0.80	9	14
12	2.50	5.70	197.80	10.00	1.12	0.35	255	0.80	8	13

Appendix – 6B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 6) (CPU Regen Building)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 15.00m from FGL. |
| 4. Cut off Level | - 4.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 6. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 4.00	Pile cutoff level – No pile						
4.00 to 4.70	0.56 ^{\$}	3~0*	0.70	0.80	NA	NA	14
4.70 to 7.30	0.05~0.00*	27	0.85	NA	1.0	28	20-29
7.30 to 28.20	0.00	34 ^{\$}	1.00	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_v + P D N_q)$$

A_p = Cross section area of Pile stem at toe = $\pi d^2/4$

D = Diameter of pile = d in m

$N_v = 42.90$

$N_q = 40.00$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.00 \cdot 42.90 + 8.40 \cdot 40.00) = 16.84d^3 + 263.76d^2$$

(For Pile terminating at 15.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

Second Layer – $\alpha_2 C_{a2} A_{s2} = 0.80 \cdot 5.60 \cdot \pi d \cdot 0.70 = 9.85 d$

Third Layer – $K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 1.60 \cdot \tan 27^\circ \cdot \pi d \cdot 2.60 = 6.66 d$

Fourth Layer – $K_4 P D_4 \tan \delta_4 A_{s4} = 1.50 \cdot 6.55 \cdot \tan 34^\circ \cdot \pi d \cdot (\ell - 7.30) = 20.82 d (\ell - 7.30)$

Substituting, ultimate load

$$q_{uf} = 16.51d + 20.82d (\ell - 7.30) \text{ (For Pile terminating at 15.00m from F.G.L.)}$$

Page no.110 of 618

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,
 $q_{uc} = q_{ub} + q_{uf}$

$$q_{uc} = 16.84d^3 + 263.76d^2 + 16.51d + 20.82d(l - 7.30)$$

(For Pile terminating at 15.00m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	81.85

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	40.00

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	4.67

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		3.42
Stiffness factor T in m		2.20
Depth of fixity in m	Free Head	4.20
	Fixed Head	4.80
Allowable Horizontal Force in T	Free Head	3.60
	Fixed Head	9.60
Allowable Moment capacity in Tm	Free Head	5.32
	Fixed Head	18.93

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7 (For BH-119 (Canteen building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 7.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 7.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	15	55	88	15	15
1.00	201.50	2.00	2.00	15	41	66	15	15
1.00	201.50	2.50	2.50	16	33	53	16	16
1.00	201.50	3.00	3.00	17	27	44	17	17
2.00	200.50	1.50	1.50	22	55	88	22	22
2.00	200.50	2.00	2.00	22	41	66	22	22
2.00	200.50	2.50	2.50	22	33	53	22	22
2.00	200.50	3.00	3.00	22	27	44	22	22
3.00	199.50	1.50	1.50	30	55	88	30	30
3.00	199.50	2.00	2.00	29	41	66	29	29
3.00	199.50	2.50	2.50	29	33	53	29	29
3.00	199.50	3.00	3.00	29	27	44	27	29

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.1 (For BH-119 (Canteen building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.99	1.00	0.50	0.50	15
2	2.00	2.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	15
3	2.50	2.50	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	16
4	3.00	3.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	17
5	1.50	1.50	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.39	1.19	1.19	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
6	2.00	2.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.29	1.15	1.15	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
7	2.50	2.50	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
8	3.00	3.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
9	1.50	1.50	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.58	1.29	1.29	1.00	1.00	1.00	1.99	1.00	0.50	0.50	30
10	2.00	2.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.44	1.22	1.22	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
11	2.50	2.50	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.35	1.17	1.17	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
12	3.00	3.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.29	1.15	1.15	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.2 (For BH-119 (Canteen building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	1.50	1.12	0.35	258	0.80	55	88
2	1.00	201.50	2.00	1.12	0.35	258	0.80	41	66
3	1.00	201.50	2.50	1.12	0.35	258	0.80	33	53
4	1.00	201.50	3.00	1.12	0.35	258	0.80	27	44
5	2.00	201.50	1.50	1.12	0.35	258	0.80	55	88
6	2.00	201.50	2.00	1.12	0.35	258	0.80	41	66
7	2.00	201.50	2.50	1.12	0.35	258	0.80	33	53
8	2.00	201.50	3.00	1.12	0.35	258	0.80	27	44
9	3.00	201.50	1.50	1.12	0.35	258	0.80	55	88
10	3.00	201.50	2.00	1.12	0.35	258	0.80	41	66
11	3.00	201.50	2.50	1.12	0.35	258	0.80	33	53
12	3.00	201.50	3.00	1.12	0.35	258	0.80	27	44

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.3 (For BH-119 (Canteen building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 7.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 7.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	17	23	38	17	17
1.00	201.50	4.00	4.00	18	21	33	18	18
1.00	201.50	5.00	5.00	20	16	26	16	20
1.00	201.50	6.00	6.00	21	14	22	14	21
2.00	200.50	3.50	3.50	23	23	38	23	23
2.00	200.50	4.00	4.00	24	21	33	21	24
2.00	200.50	5.00	5.00	25	16	26	16	25
2.00	200.50	6.00	6.00	26	14	22	14	22
3.00	199.50	3.50	3.50	29	23	38	23	29
3.00	199.50	4.00	4.00	29	21	33	21	29
3.00	199.50	5.00	5.00	31	16	26	16	26
3.00	199.50	6.00	6.00	32	14	22	14	22

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.4 (For BH-119 (Canteen building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	17
2	4.00	4.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	18
3	5.00	5.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
4	6.00	6.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	21
5	3.50	3.50	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.99	1.00	0.50	0.50	23
6	4.00	4.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	24
7	5.00	5.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	25
8	6.00	6.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
9	3.50	3.50	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.25	1.12	1.12	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
10	4.00	4.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
11	5.00	5.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.99	1.00	0.50	0.50	31
12	6.00	6.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	32

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.5 (For BH-119 (Canteen building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	3.50	1.12	0.35	258	0.80	23	38
2	1.00	201.50	4.00	1.12	0.35	258	0.80	21	33
3	1.00	201.50	5.00	1.12	0.35	258	0.80	16	26
4	1.00	201.50	6.00	1.12	0.35	258	0.80	14	22
5	2.00	201.50	3.50	1.12	0.35	258	0.80	23	38
6	2.00	201.50	4.00	1.12	0.35	258	0.80	21	33
7	2.00	201.50	5.00	1.12	0.35	258	0.80	16	26
8	2.00	201.50	6.00	1.12	0.35	258	0.80	14	22
9	3.00	201.50	3.50	1.12	0.35	258	0.80	23	38
10	3.00	201.50	4.00	1.12	0.35	258	0.80	21	33
11	3.00	201.50	5.00	1.12	0.35	258	0.80	16	26
12	3.00	201.50	6.00	1.12	0.35	258	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.6 (For BH-119 (Canteen building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 7.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 7.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	23	12	19	12	19
1.00	201.50	8.00	8.00	24	10	16	10	16
1.00	201.50	9.00	9.00	26	9	15	9	15
1.00	201.50	10.00	10.00	28	8	13	8	13
2.00	200.50	7.00	7.00	28	12	19	12	19
2.00	200.50	8.00	8.00	30	10	16	10	16
2.00	200.50	9.00	9.00	31	9	15	9	15
2.00	200.50	10.00	10.00	33	8	13	8	13
3.00	199.50	7.00	7.00	33	12	19	12	19
3.00	199.50	8.00	8.00	35	10	16	10	16
3.00	199.50	9.00	9.00	36	9	15	9	15
3.00	199.50	10.00	10.00	38	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.7(For BH-119 (Canteen building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	23
2	8.00	8.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	24
3	9.00	9.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
4	10.00	10.00	1.00	201.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.99	1.00	0.50	0.50	28
5	7.00	7.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	28
6	8.00	8.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	30
7	9.00	9.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	31
8	10.00	10.00	2.00	200.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	33
9	7.00	7.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	33
10	8.00	8.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	35
11	9.00	9.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	36
12	10.00	10.00	3.00	199.50	0.09	30	19.65	9.10	10.52	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	38

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 7.8 (For BH-119 (Canteen building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	7.00	1.12	0.35	258	0.80	12	19
2	1.00	201.50	8.00	1.12	0.35	258	0.80	10	16
3	1.00	201.50	9.00	1.12	0.35	258	0.80	9	15
4	1.00	201.50	10.00	1.12	0.35	258	0.80	8	13
5	2.00	201.50	7.00	1.12	0.35	258	0.80	12	19
6	2.00	201.50	8.00	1.12	0.35	258	0.80	10	16
7	2.00	201.50	9.00	1.12	0.35	258	0.80	9	15
8	2.00	201.50	10.00	1.12	0.35	258	0.80	8	13
9	3.00	201.50	7.00	1.12	0.35	258	0.80	12	19
10	3.00	201.50	8.00	1.12	0.35	258	0.80	10	16
11	3.00	201.50	9.00	1.12	0.35	258	0.80	9	15
12	3.00	201.50	10.00	1.12	0.35	258	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8 (For BH-15 (Pump cum comp house for DSS/DFDS))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:201.15m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 8.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 8.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	2.85	199.65	1.50	1.50	13	66	106	13	13
1.50	2.85	199.65	2.00	2.00	13	50	80	13	13
1.50	2.85	199.65	2.50	2.50	13	40	64	13	13
1.50	2.85	199.65	3.00	3.00	14	33	53	14	14
2.00	3.35	199.15	1.50	1.50	15	66	106	15	15
2.00	3.35	199.15	2.00	2.00	15	50	80	15	15
2.00	3.35	199.15	2.50	2.50	16	40	64	16	16
2.00	3.35	199.15	3.00	3.00	16	33	53	16	16
2.50	3.85	198.65	1.50	1.50	18	66	106	18	18
2.50	3.85	198.65	2.00	2.00	18	50	80	18	18
2.50	3.85	198.65	2.50	2.50	18	40	64	18	18
2.50	3.85	198.65	3.00	3.00	18	33	53	18	18

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.1 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
2	2.00	2.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
3	2.50	2.50	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
4	3.00	3.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
5	1.50	1.50	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
6	2.00	2.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
7	2.50	2.50	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
8	3.00	3.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
9	1.50	1.50	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.47	1.23	1.23	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
10	2.00	2.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.35	1.17	1.17	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
11	2.50	2.50	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
12	3.00	3.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.2 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	2.85	199.65	1.50	1.12	0.35	313	0.80	66	106
2	1.50	2.85	199.65	2.00	1.12	0.35	313	0.80	50	80
3	1.50	2.85	199.65	2.50	1.12	0.35	313	0.80	40	64
4	1.50	2.85	199.65	3.00	1.12	0.35	313	0.80	33	53
5	2.00	3.35	199.65	1.50	1.12	0.35	313	0.80	66	106
6	2.00	3.35	199.65	2.00	1.12	0.35	313	0.80	50	80
7	2.00	3.35	199.65	2.50	1.12	0.35	313	0.80	40	64
8	2.00	3.35	199.65	3.00	1.12	0.35	313	0.80	33	53
9	2.50	3.85	199.65	1.50	1.12	0.35	313	0.80	66	106
10	2.50	3.85	199.65	2.00	1.12	0.35	313	0.80	50	80
11	2.50	3.85	199.65	2.50	1.12	0.35	313	0.80	40	64
12	2.50	3.85	199.65	3.00	1.12	0.35	313	0.80	33	53

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.3 (For BH-15 (Pump cum comp house for DSS/DFDS))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:201.15m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 8.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 8.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	2.85	199.65	3.50	3.50	14	28	45	14	14
1.50	2.85	199.65	4.00	4.00	15	25	40	15	15
1.50	2.85	199.65	5.00	5.00	16	20	32	16	16
1.50	2.85	199.65	6.00	6.00	17	17	27	17	17
2.00	3.35	199.15	3.50	3.50	16	28	45	16	16
2.00	3.35	199.15	4.00	4.00	17	25	40	17	17
2.00	3.35	199.15	5.00	5.00	18	20	32	18	18
2.00	3.35	199.15	6.00	6.00	19	17	27	17	19
2.50	3.85	198.65	3.50	3.50	19	28	45	19	19
2.50	3.85	198.65	4.00	4.00	19	25	40	19	19
2.50	3.85	198.65	5.00	5.00	20	20	32	20	20
2.50	3.85	198.65	6.00	6.00	21	17	27	17	21

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.4 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
2	4.00	4.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
3	5.00	5.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
4	6.00	6.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
5	3.50	3.50	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
6	4.00	4.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
7	5.00	5.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
8	6.00	6.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
9	3.50	3.50	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
10	4.00	4.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
11	5.00	5.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
12	6.00	6.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.5 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	2.85	199.65	3.50	1.12	0.35	313	0.80	28	45
2	1.50	2.85	199.65	4.00	1.12	0.35	313	0.80	25	40
3	1.50	2.85	199.65	5.00	1.12	0.35	313	0.80	20	32
4	1.50	2.85	199.65	6.00	1.12	0.35	313	0.80	17	27
5	2.00	3.35	199.65	3.50	1.12	0.35	313	0.80	28	45
6	2.00	3.35	199.65	4.00	1.12	0.35	313	0.80	25	40
7	2.00	3.35	199.65	5.00	1.12	0.35	313	0.80	20	32
8	2.00	3.35	199.65	6.00	1.12	0.35	313	0.80	17	27
9	2.50	3.85	199.65	3.50	1.12	0.35	313	0.80	28	45
10	2.50	3.85	199.65	4.00	1.12	0.35	313	0.80	25	40
11	2.50	3.85	199.65	5.00	1.12	0.35	313	0.80	20	32
12	2.50	3.85	199.65	6.00	1.12	0.35	313	0.80	17	27

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.6 (For BH-15 (Pump cum comp house for DSS/DFDS))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:201.15m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 8.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 8.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.50	2.85	199.65	7.00	7.00	18	14	23	14	18
1.50	2.85	199.65	8.00	8.00	19	12	20	12	19
1.50	2.85	199.65	9.00	9.00	21	11	18	11	18
1.50	2.85	199.65	10.00	10.00	22	10	16	10	16
2.00	3.35	199.15	7.00	7.00	20	14	23	14	20
2.00	3.35	199.15	8.00	8.00	21	12	20	12	20
2.00	3.35	199.15	9.00	9.00	23	11	18	11	18
2.00	3.35	199.15	10.00	10.00	24	10	16	10	16
2.50	3.85	198.65	7.00	7.00	22	14	23	14	22
2.50	3.85	198.65	8.00	8.00	23	12	20	12	20
2.50	3.85	198.65	9.00	9.00	25	11	18	11	18
2.50	3.85	198.65	10.00	10.00	26	10	16	10	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.7 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
2	8.00	8.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
3	9.00	9.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
4	10.00	10.00	1.50	2.85	199.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
5	7.00	7.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
6	8.00	8.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
7	9.00	9.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	23
8	10.00	10.00	2.00	3.35	199.15	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	24
9	7.00	7.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
10	8.00	8.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	23
11	9.00	9.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	25
12	10.00	10.00	2.50	3.85	198.65	0.06	27	17.28	7.29	7.99	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	26

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 201.15m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 8.8 (For BH-15 (Pump cum comp house for DSS/DFDS))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.50	2.85	199.65	7.00	1.12	0.35	313	0.80	14	23
2	1.50	2.85	199.65	8.00	1.12	0.35	313	0.80	12	20
3	1.50	2.85	199.65	9.00	1.12	0.35	313	0.80	11	18
4	1.50	2.85	199.65	10.00	1.12	0.35	313	0.80	10	16
5	2.00	3.35	199.65	7.00	1.12	0.35	313	0.80	14	23
6	2.00	3.35	199.65	8.00	1.12	0.35	313	0.80	12	20
7	2.00	3.35	199.65	9.00	1.12	0.35	313	0.80	11	18
8	2.00	3.35	199.65	10.00	1.12	0.35	313	0.80	10	16
9	2.50	3.85	199.65	7.00	1.12	0.35	313	0.80	14	23
10	2.50	3.85	199.65	8.00	1.12	0.35	313	0.80	12	20
11	2.50	3.85	199.65	9.00	1.12	0.35	313	0.80	11	18
12	2.50	3.85	199.65	10.00	1.12	0.35	313	0.80	10	16

Appendix – 8B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 15)

(Pump cum comp house for DSS/DFDS)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 14.00m from FGL. |
| 4. Cut off Level | - 3.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 15. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 3.00	Pile cutoff level – No pile						
3.00 to 10.05	0.03~0.00*	28	1.02	NA	1.0	28	14->100
10.05 to 16.95	0.00	34\$	1.03	NA	1.50	34	29->100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma N_\gamma + P D N_q)$$

A_p = Cross section area of Pile stem at toe = $\pi d^2/4$

D = Diameter of pile = d in m

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.03 \cdot 42.90 + 9.18 \cdot 40.00) = 17.34d^3 + 288.25d^2$$

(For Pile terminating at 14.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

Second Layer – $K_2 P D_2 \tan \delta_2 A_{s2} = 1.00 \cdot 3.60 \cdot \tan 28^\circ \cdot \pi \cdot d \cdot 7.05 = 42.40 d$

Third Layer – $K_3 P D_3 \tan \delta_3 A_{s3} = 1.50 \cdot 9.18 \cdot \tan 34^\circ \cdot \pi \cdot d \cdot (\ell - 10.05) = 29.18 d (\ell - 10.05)$

Substituting, ultimate load

$$q_{uf} = 42.40d + 29.18d (\ell - 10.05) \text{ (For Pile terminating at 14.00m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 17.34d^3 + 288.25d^2 + 42.40d + 29.18d(l - 10.05)$$

(For Pile terminating at 14.00m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	11.00	80.81

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	11.00	36.17

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	11.00	4.67

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		3.00
Stiffness factor T in m		2.26
Depth of fixity in m	Free Head	4.30
	Fixed Head	4.90
Allowable Horizontal Force in T	Free Head	3.40
	Fixed Head	8.90
Allowable Moment capacity in Tm	Free Head	5.05
	Fixed Head	17.97

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

L = length of the socket = $3 D$

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m^2

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 \text{ d}^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 \text{ d}^2 + 1836.9 \text{ d}^2 = 4898.4 \text{ d}^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	17.50	17.98	18.40
Termination level RL in m	185.00	184.52	184.10
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

Cutoff level considered at 6.00m from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 31 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm^2	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 6.00	No contribution considered – Due to cutoff						
6.00 to 8.30	0.62	9(ignored)	0.96	0.72	NA	NA	7-8
8.30 to 11.10	0.00	28	0.96	NA	1.00	28	15->100
11.10 to 15.70	4.56	5(ignored)	1.08	0.28	NA	NA	>100
15.70 to 30.4	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - & data is assumed for filling soils used for raising the FGL from EGL.

\$ Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.72 * 6.20 * \pi d * 2.30 = 32.26 \text{ d}$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 * 8.35 * \tan 28 * \pi d * 2.80 = 39.05 \text{ d}$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.28 * 45.60 * \pi d * 4.60 = 184.51 \text{ d}$$

Fifth Layer - 1836.9 d^2 in rock socket

$$\text{Substituting, ultimate load } q_{uf} = 2558.20 \text{ d} + 1836.9 \text{ d}^2$$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	17.50	17.98	18.40
Termination level RL in m	185.00	184.52	184.10
Safe load in Uplift in kN	1275.25	1838.69	2408.84
Self-weight of pile in kN	48.75	81.48	118.27
Safe load in Uplift in T (Considering self-weight of pile)	132.4	192.0	252.7

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		10.08	10.08	10.08
Stiffness factor T in m		1.78	2.14	2.46
Depth of fixity in m	Free Head	3.40	4.10	4.70
	Fixed Head	3.90	4.70	5.40
Allowable Horizontal Force in T	Free Head	6.90	10.10	13.30
	Fixed Head	18.40	26.80	35.20
Allowable Moment capacity in Tm	Free Head	8.20	14.46	21.69
	Fixed Head	29.18	51.45	77.20

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 9A

Calculation of Safe Load carrying capacity of piles socketed inside rock

(Near BH 19)

(Clarified water tank, clarified water pump house)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 19 show primarily two characterized layers,

1. Overburden comprising of Yellowish brown, fine to medium grained, clayey sand and silty sand upto 2.50m (i.e. RL 193.40m) followed by Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity upto 3.30m (i.e. RL 192.39m) followed by Yellowish brown, fine to very fine grained, clayey sand with occasional gravels upto 7.30m (i.e. RL 188.60) followed by Yellowish brown, fine to medium grained, silty sand upto 9.30m (i.e. RL 186.60) followed by Greyish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels upto 10.60m (i.e. RL 185.30m).
2. Second characterized layer below the overburden soils Highly weathered, very weak, dark greyish brown, very fine grained, foliated rock upto 15.50m (i.e. RL 180.40m).

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 10.60 m below NGL (i.e. RL 185.30 m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 10.60 to 15.50m (between RL 185.30 to 180.40 m) is > 100 with just 9.0 cm penetration in 65 blows. SPT can be extrapolated for 30 cm i.e. $65 * 30 / 9.00 = 216$.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = 3 D

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m²

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 \text{ d}^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 \text{ d}^2 + 1836.9 \text{ d}^2 = 4898.4 \text{ d}^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	19.00	19.48	19.90
Termination level RL in m	183.50	183.02	182.60
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

For 7.00m cutoff from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 19 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 7.00	Pile cutoff level – No pile						
7.00 to 8.60	0.04	28	0.80	NA	1.00	28	6-12
8.60 to 9.40	0.71	7(ignored)	0.97	0.62	NA	NA	18
9.40 to 15.40	0.08	28	1.00	NA	1.00	28	15-28
15.40 to 17.00	6.66	0	1.01	0.28	NA	NA	>100
17.00 to 26.10	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - \$ Weighted average data considered. NA means not applicable.

B Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} + K_2 P D_2 \tan \delta_2 A_{s2} = 1.00 * 0.40 * \pi d * 0.60 + 1.00 * 6.24 * \tan 28 * \pi d * 0.60 = 7.01 \text{ d}$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.62 * 7.10 * \pi d * 0.80 = 11.06 \text{ d}$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} + K_4 P D_4 \tan \delta_4 A_{s4} = 1.00 * 0.80 * \pi d * 6.00 + 1.00 * 9.66 * \tan 28 * \pi d * 6.00 = 111.90 \text{ d}$$

$$\text{Fifth Layer} - \alpha_5 C_{a5} A_{s5} = 0.28 * 66.60 * \pi d * 1.60 = 93.74 \text{ d}$$

Sixth Layer – 1836.90 d² in rock socket

Substituting, ultimate load $q_{uf} = 2237.10 \text{ d} + 1836.9 \text{ d}^2$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	19.00	19.48	19.90
Termination level RL in m	183.50	183.02	182.60
Safe load in Uplift in kN	1198.19	1741.07	2293.25
Self-weight of pile in kN	50.87	84.88	123.04
Safe load in Uplift in T (Considering self-weight of pile)	124.91	182.60	241.63

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		3.00	3.00	3.00
Stiffness factor T in m		2.26	2.73	3.13
Depth of fixity in m	Free Head	4.30	5.20	5.90
	Fixed Head	4.90	6.00	6.80
Allowable Horizontal Force in T	Free Head	3.40	4.90	6.40
	Fixed Head	8.90	13.00	17.00
Allowable Moment capacity in Tm	Free Head	5.05	8.90	13.36
	Fixed Head	17.97	31.69	47.55

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 9B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 19)

(Clarified water tank, clarified water pump house)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 16.50m from FGL. |
| 4. Cut off Level | - 7.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 19. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 7.00	Pile cutoff level – No pile						
7.00 to 8.60	0.04	28	0.80	NA	1.00	28	6-12
8.60 to 9.40	0.71	7(ignored)	0.97	0.62	NA	NA	18
9.40 to 15.40	0.08	28	1.00	NA	1.00	28	15-28
15.40 to 17.00	6.66\$	0	1.01	0.28	NA	NA	>100
17.00 to 26.10	0.00	34\$	1.03	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_\gamma + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.01 \cdot 42.90 + 8.66 \cdot 40.00) = 17.01d^3 + 271.92d^2$$

(For Pile terminating at 16.50m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} + K_2 P D_2 \tan \delta_2 A_{s2} = 1.00 \cdot 0.40 \cdot \pi \cdot d \cdot 1.60 + 1.00 \cdot 0.64 \cdot \tan 28^\circ \cdot \pi \cdot d \cdot 1.60 = 3.72 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.62 \cdot 7.10 \cdot \pi \cdot d \cdot 0.80 = 11.06 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} + K_4 P D_4 \tan \delta_4 A_{s4} = 1.00 \cdot 0.80 \cdot \pi \cdot d \cdot 6.00 + 1.00 \cdot 5.06 \cdot \tan 28^\circ \cdot \pi \cdot d \cdot 6.00 = 65.79 d$$

$$\text{Fifth Layer} - \alpha_5 C_{a5} A_{s5} = 0.28 \cdot 66.60 \cdot \pi \cdot d \cdot (15.40 - 7.00) = 58.58 d \quad (15.40 - 7.00)$$

Substituting, ultimate load

$$q_{uf} = 80.57 + 58.58d (\ell - 15.40) \text{ (For Pile terminating at 16.50m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 17.01d^3 + 271.92d^2 + 80.57d + 58.58d (\ell - 15.40)$$

(For Pile terminating at 16.50m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
16.50	9.50	75.40

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
16.50	9.50	33.00

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
16.50	9.50	4.03

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m ³		3.00
Stiffness factor T in m		2.26
Depth of fixity in m	Free Head	4.30
	Fixed Head	4.90
Allowable Horizontal Force in T	Free Head	3.40
	Fixed Head	8.90
Allowable Moment capacity in Tm	Free Head	5.05
	Fixed Head	17.97

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Appendix – 10B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 17,20,27,28,31,35,37) (Pre Treatment Plant)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 14.00m from FGL. |
| 4. Cut off Level | - 6.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 31. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 6.00	No contribution considered – Due to cutoff						
6.00 to 8.30	0.62	9(ignored)	0.96	0.72	NA	NA	7-8
8.30 to 11.10	0.00	28	0.96	NA	1.00	28	15->100
11.10 to 15.70	4.56	5(ignored)	1.08	0.28	NA	NA	>100
15.70 to 30.40	0.00	34\$	1.08	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_v + P D N_q)$$

A_p = Cross section area of Pile stem at toe = $\pi d^2/4$

D = Diameter of pile = d in m

N_v = 42.90

N_q = 40.00

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.08 \cdot 42.90 + 8.03 \cdot 40.00) = 18.19d^3 + 252.14d^2$$

(For Pile terminating at 14.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

Second Layer – $\alpha_2 C_{a2} A_{s2} = 0.72 \cdot 6.20 \cdot \pi d \cdot 2.30 = 32.26 d$

Third Layer – $K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 3.55 \cdot \tan 28^\circ \cdot \pi d \cdot 2.80 = 16.60 d$

Fourth Layer – $\alpha_4 C_{a4} A_{s4} = 0.28 \cdot 45.60 \cdot \pi d \cdot (\ell - 11.10) = 58.58d (\ell - 11.10)$

Substituting, ultimate load

$$q_{uf} = 48.86d + 58.58d (\ell - 11.10) \text{ (For Pile terminating at 14.00m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 18.19d^3 + 252.14d^2 + 48.86d + 58.58d(\ell - 11.10)$$

(For Pile terminating at 14.00m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	8.00	77.54

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	8.00	36.45

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.00	8.00	3.39

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		10.08
Stiffness factor T in m		1.78
Depth of fixity in m	Free Head	3.40
	Fixed Head	3.90
Allowable Horizontal Force in T	Free Head	6.90
	Fixed Head	18.40
Allowable Moment capacity in Tm	Free Head	8.20
	Fixed Head	29.18

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

Appendix – 11A

Calculation of Safe Load carrying capacity of piles socketed inside rock

(Near BH 40)

(Waste water plant)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 43 show primarily three characterized layers,

1. Overburden comprising of Brownish, fine to medium grained, clayey sand with little gravels and Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels upto 3.10m (i.e. RL 191.86 m). The RL of NGL is 194.96 m.
2. Second characterized layer below the overburden soils Highly weathered, very weak, yellowish brown, fine to medium grained, thinly laminated rock up to 6.50m (i.e. RL 188.46m) Though, rock is not very sound but can be considered for socketing if the pile capacity obtained thereby is adequate against imposed loads.

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 17.40 m below NGL (i.e. RL 183.48m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 17.40 to 20.00 m (between RL 183.48 to 180.88 m) is > 200.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = 3 D

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m²

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 d^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 d^2 + 1836.9 d^2 = 4898.4 d^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	12.44	12.92	13.34
Termination level RL in m	190.06	189.58	189.16
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

Cutoff level considered at 8.00m from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 40 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 8.00	No contribution considered – Due to cutoff						
8.00 to 10.64	0.06(ignored)	26	0.96	NA	1.00	26	6->100
10.64 to 27.54	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - & data is assumed for filling soils used for raising the FGL from EGL.

\$ Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P_{Ditan} \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

Second Layer – $K_3 P_{D3} \tan \delta_3 A_{s3} = 1.00 * 7.67 * \tan 26 * \pi d * 2.64 = 31.03 d$

Third Layer – $1836.9 d^2$ in rock socket

Substituting, ultimate load $q_{uf} = 310.30 d + 1836.9 d^2$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	12.44	12.92	13.34
Termination level RL in m	190.06	189.58	189.16
Safe load in Uplift in kN	735.76	1155.33	1599.60
Self-weight of pile in kN	18.82	33.46	50.93
Safe load in Uplift in T (Considering self-weight of pile)	75.46	118.88	165.05

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		8.64	8.64	8.64
Stiffness factor T in m		1.83	2.21	2.53
Depth of fixity in m	Free Head	3.50	4.20	4.80
	Fixed Head	4.00	4.80	5.50
Allowable Horizontal Force in T	Free Head	6.30	9.20	12.10
	Fixed Head	16.80	24.50	32.10
Allowable Moment capacity in Tm	Free Head	7.71	13.59	20.39
	Fixed Head	27.43	48.38	72.59

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 12A
Calculation of Safe Load carrying capacity of piles socketed inside rock
(Near BH 44,77)
(Gypsum dewatering building and storage area, Process water tank, Lime stone slurry storage tank & agitator)

Project Name: - Proposed structures of thermal power project of NTPP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 Pa/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 96 show primarily two characterized layers,

1. Overburden comprising of Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity Followed by Brownish, fine to very fine grained, silty and clayey sand upto 10.00m (i.e. RL 187.52 m). The RL of NGL is 197.52 m.
2. Second characterized layer below the overburden soils consists of Highly weathered, completely fractured and disintegrated, yellowish brown, fine to very fine grained, very thick and friable, fractured rock followed by Highly weathered, weak, dark yellowish brown, fine to very fine grained, rock with closely spaced discontinuities followed by Highly weathered, moderately weak, dark greyish, fine to medium grained, fractured rock upto 14.00 (i.e. RL 183.52m). Though, rock is not very sound but can be considered for socketing if the pile capacity obtained thereby is adequate against imposed loads.

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 10.00 m below NGL (i.e. RL 187.52m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 10.00 to 14.00 m (between RL 186.84 to 182.34 m) is > 200 .
Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²
4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = 3 D

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m²

F_s = Factor of Safety = 6

Therefore, **R_{sf} = 1836.9 d²**

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 d^2 + 1836.9 d^2 = 4898.4 d^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	16.78	17.26	17.68
Termination level RL in m	185.72	185.24	184.82
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

Cutoff level considered at 5.00m from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 44 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 5.00	No contribution- Cutoff level						
5.00 to 9.48	0.72	4(ignored)	0.96	0.61	NA	NA	8-16
9.48 to 12.58	0.08(ignored)	26	1.00	NA	NA	30	14-19
12.58 to 14.98	0	34	1.10	NA	1.50	34	>100
14.98 to 23.48	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - & data is assumed for filling soils used for raising the FGL from EGL.

\$ Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

Q_{uf} = α_i C_{ai} A_{si}

First Layer – No contribution considered – Due to cutoff

Second Layer – α_2 C_{a2} A_{s2} = 0.61 * 7.20 * π d * 4.48 = 61.81 d

Third Layer – K₃PD₃ tan δ_3 A_{s3} = 1.00*10.22*tan26* π d*3.10 = 48.54 d

Fourth Layer – K₄PD₄ tan δ_4 A_{s4} = 1.00*10.22*tan34* π d*2.40 = 51.98 d

Fifth Layer – **1836.9 d²** in rock socket

Substituting, ultimate load **q_{uf} = 1623.30 d + 1836.9 d²**

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	16.78	17.26	17.68
Termination level RL in m	185.72	185.24	184.82
Safe load in Uplift in kN	1050.88	1554.48	2072.28
Self-weight of pile in kN	49.94	83.38	120.94
Safe load in Uplift in T (Considering self-weight of pile)	110.08	163.79	219.32

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		11.52	11.52	11.52
Stiffness factor T in m		1.73	2.09	2.39
Depth of fixity in m	Free Head	3.30	4.00	4.50
	Fixed Head	3.80	4.60	5.20
Allowable Horizontal Force in T	Free Head	7.50	11.00	14.40
	Fixed Head	19.90	29.10	38.10
Allowable Moment capacity in Tm	Free Head	8.65	15.25	22.88
	Fixed Head	30.78	54.28	81.44

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 12B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 44.77)

(Gypsum dewatering building and storage area, Process water tank, Lime stone slurry storage tank & agitator)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 14.50m from FGL. |
| 4. Cut off Level | - 5.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 44. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Adhesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 5.00	No contribution- Cutoff level						
5.00 to 9.48	0.72	4(ignored)	0.96	0.61	NA	NA	8-16
9.48 to 12.58	0.08(ignored)	26	1.00	NA	NA	30	14-19
12.58 to 14.98	0	34\$	1.10	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma N_\gamma + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785 d^2 (0.5 \cdot d \cdot 1.10 \cdot 42.90 + 8.96 \cdot 40.00) = 16.84 d^3 + 255.91 d^2$$

(For Pile terminating at 14.50m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.61 \cdot 7.20 \cdot \pi d \cdot 4.48 = 61.81 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 5.85 \cdot \tan 30^\circ \cdot \pi d \cdot 3.10 = 32.89 d$$

$$\text{Fourth Layer} - K_4 P D_4 \tan \delta_4 A_{s4} = 1.50 \cdot 8.46 \cdot \tan 34^\circ \cdot \pi d \cdot (\ell - 12.58) = 26.89 d (\ell - 12.58)$$

Substituting, ultimate load

$$q_{uf} = 94.70 d + 26.89 d (\ell - 12.58) \text{ (For Pile terminating at 14.50m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 16.84d^3 + 255.91d^2 + 94.70d + 26.89d(l - 12.58)$$

(For Pile terminating at 14.50m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.50	9.50	76.05

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.50	9.50	32.30

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self-weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
14.50	9.50	4.03

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		11.52
Stiffness factor T in m		1.73
Depth of fixity in m	Free Head	3.30
	Fixed Head	3.80
Allowable Horizontal Force in T	Free Head	7.50
	Fixed Head	19.90
Allowable Moment capacity in Tm	Free Head	8.65
	Fixed Head	30.78

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

Appendix – 13A

Calculation of Safe Load carrying capacity of piles socketed inside rock

(Near BH 47)

(Lime stone silo & ball mill building)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 47 show primarily two characterized layers,

1. Overburden comprising of Light brownish, fine to very fine grained, silty clays of intermediate, low, high plasticity upto 8.20m (i.e. RL 189.53 m). The RL of NGL is 197.73 m.
2. Second characterized layer below the overburden soils consists of Highly weathered, weak, light whitish yellow, fine to medium grained, fractured rock followed by Moderately weathered, weak, light brownish yellow, fine to medium grained, rock with closely spaced discontinuities upto 12.00 (i.e. RL 185.73m). Though, rock is not very sound but can be considered for socketing if the pile capacity obtained thereby is adequate against imposed loads.

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 8.20 m below NGL (i.e. RL 189.53m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 10.00 to 16.00 m (between RL 190.88 to 184.88 m) is > 100 with just 7.00cm penetration in 56 blows. SPT can be extrapolated for 30 cm i.e. $56 * 30 / 7.00 = 240$.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = $3 D$

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m^2

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 d^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 d^2 + 1836.9 d^2 = 4898.4 d^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	14.77	15.25	15.67
Termination level RL in m	187.73	187.25	186.83
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

Cutoff level considered at 5.00m from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 47 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm^2	Angle of Internal Friction ϕ	Submerged density in $\text{gm/cc } \gamma_{\text{sub}}$	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 5.00	No contribution- Cutoff level						
5.00 to 8.57	0.32	4(ignored)	0.91	1.00	NA	NA	4-6
8.57 to 10.77	1.11	2(ignored)	1.00	0.40	NA	NA	9-31
10.77 to 12.97	6.67	0	1.06	0.28	NA	NA	52->100
12.97 to 22.77	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - & data is assumed for filling soils used for raising the FGL from EGL.

^s Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 1.00 * 3.20 * \pi d * 3.57 = 35.89 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.40 * 11.10 * \pi d * 2.20 = 30.69 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.28 * 66.70 * \pi d * 2.20 = 129.08 d$$

Fifth Layer – $1836.9 d^2$ in rock socket

$$\text{Substituting, ultimate load } q_{uf} = 1956.59 d + 1836.9 d^2$$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	14.77	15.25	15.67
Termination level RL in m	187.73	187.25	186.83
Safe load in Uplift in kN	1130.87	1655.80	2192.26
Self-weight of pile in kN	41.42	69.71	101.77
Safe load in Uplift in T (Considering self-weight of pile)	117.23	172.55	229.40

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		5.76	5.76	5.76
Stiffness factor T in m		1.99	2.40	2.75
Depth of fixity in m	Free Head	3.80	4.60	5.20
	Fixed Head	4.30	5.20	6.00
Allowable Horizontal Force in T	Free Head	5.00	7.20	9.50
	Fixed Head	13.10	19.20	25.10
Allowable Moment capacity in Tm	Free Head	6.55	11.56	17.34
	Fixed Head	23.32	41.13	61.72

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 13B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 47)

(Lime stone silo & ball mill building)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 13.00m from FGL. |
| 4. Cut off Level | - 5.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 47. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 5.00	No contribution- Cutoff level						
5.00 to 8.57	0.32	4(ignored)	0.91	1.00	NA	NA	4-6
8.57 to 10.77	1.11	2(ignored)	1.00	0.40	NA	NA	9-31
10.77 to 12.97	6.67 ^{\$}	0	1.06	0.28	NA	NA	52->100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_v + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_v = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.06 \cdot 42.90 + 7.81 \cdot 40.00) = 17.85d^3 + 245.23d^2$$

(For Pile terminating at 13.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 1.00 \cdot 3.20 \cdot \pi \cdot d \cdot 3.57 = 35.89 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.40 \cdot 11.10 \cdot \pi \cdot d \cdot 2.20 = 30.69 d$$

$$\text{Fourth Layer} - \alpha_3 C_{a3} A_{s3} = 0.28 \cdot 66.70 \cdot \pi \cdot d \cdot (\ell - 10.77) = 58.67 d (\ell - 10.77)$$

Substituting, ultimate load

$$q_{uf} = 66.58d + 58.67d (\ell - 10.77) \text{ (For Pile terminating at 12.50m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be calculated for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 17.85d^3 + 245.23d^2 + 66.58d + 58.67d(l - 10.77)$$

(For Pile terminating at 12.50m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
13.00	8.00	84.19

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
13.00	8.00	42.82

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self-weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
13.00	8.00	3.39

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m ³		5.76
Stiffness factor T in m		1.99
Depth of fixity in m	Free Head	3.80
	Fixed Head	4.30
Allowable Horizontal Force in T	Free Head	5.00
	Fixed Head	13.10
Allowable Moment capacity in Tm	Free Head	6.55
	Fixed Head	23.32

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14 (For BH-157 (CW chlorination cum treatment building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 14.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 14.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	1.50	1.50	14	72	115	14	14
1.00	201.00	2.00	2.00	14	54	86	14	14
1.00	201.00	2.50	2.50	15	43	69	15	15
1.00	201.00	3.00	3.00	15	36	58	15	15
2.00	200.00	1.50	1.50	20	72	115	20	20
2.00	200.00	2.00	2.00	20	54	86	20	20
2.00	200.00	2.50	2.50	21	43	69	21	21
2.00	200.00	3.00	3.00	21	36	58	21	21
3.00	199.00	1.50	1.50	28	72	115	28	28
3.00	199.00	2.00	2.00	27	54	86	27	27
3.00	199.00	2.50	2.50	27	43	69	27	27
3.00	199.00	3.00	3.00	27	36	58	27	27

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.1 (For BH-157 (CW chlorination cum treatment building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
2	2.00	2.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
3	2.50	2.50	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
4	3.00	3.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
5	1.50	1.50	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
6	2.00	2.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
7	2.50	2.50	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
8	3.00	3.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
9	1.50	1.50	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	1.97	0.99	0.50	0.50	28
10	2.00	2.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.97	0.99	0.50	0.50	27
11	2.50	2.50	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.97	0.99	0.50	0.50	27
12	3.00	3.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.97	0.99	0.50	0.50	27

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from RL 202.00m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.2 (For BH-157 (CW chlorination cum treatment building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	1.50	1.12	0.35	340	0.80	72	115
2	1.00	201.00	2.00	1.12	0.35	340	0.80	54	86
3	1.00	201.00	2.50	1.12	0.35	340	0.80	43	69
4	1.00	201.00	3.00	1.12	0.35	340	0.80	36	58
5	2.00	200.00	1.50	1.12	0.35	340	0.80	72	115
6	2.00	200.00	2.00	1.12	0.35	340	0.80	54	86
7	2.00	200.00	2.50	1.12	0.35	340	0.80	43	69
8	2.00	200.00	3.00	1.12	0.35	340	0.80	36	58
9	3.00	199.00	1.50	1.12	0.35	340	0.80	72	115
10	3.00	199.00	2.00	1.12	0.35	340	0.80	54	86
11	3.00	199.00	2.50	1.12	0.35	340	0.80	43	69
12	3.00	199.00	3.00	1.12	0.35	340	0.80	36	58

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.3 (For BH-157 (CW chlorination cum treatment building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 14.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 14.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	3.50	3.50	16	31	49	16	16
1.00	201.00	4.00	4.00	17	27	43	17	17
1.00	201.00	5.00	5.00	18	22	35	18	18
1.00	201.00	6.00	6.00	20	18	29	18	20
2.00	200.00	3.50	3.50	22	31	49	22	22
2.00	200.00	4.00	4.00	22	27	43	22	22
2.00	200.00	5.00	5.00	23	22	35	22	23
2.00	200.00	6.00	6.00	25	18	29	18	25
3.00	199.00	3.50	3.50	27	31	49	27	27
3.00	199.00	4.00	4.00	28	27	43	27	28
3.00	199.00	5.00	5.00	29	22	35	22	29
3.00	199.00	6.00	6.00	30	18	29	18	29

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.4 (For BH-157 (CW chlorination cum treatment building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
	m	m																			W _q	W _γ	
1	3.50	3.50	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
2	4.00	4.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
3	5.00	5.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
4	6.00	6.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
5	3.50	3.50	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
6	4.00	4.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
7	5.00	5.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	23
8	6.00	6.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	25
9	3.50	3.50	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.97	0.99	0.50	0.50	27
10	4.00	4.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.97	0.99	0.50	0.50	28
11	5.00	5.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	29
12	6.00	6.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	30

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from RL 202.00m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.5 (For BH-157 (CW chlorination cum treatment building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	3.50	1.12	0.35	340	0.80	31	49
2	1.00	201.00	4.00	1.12	0.35	340	0.80	27	43
3	1.00	201.00	5.00	1.12	0.35	340	0.80	22	35
4	1.00	201.00	6.00	1.12	0.35	340	0.80	18	29
5	2.00	200.00	3.50	1.12	0.35	340	0.80	31	49
6	2.00	200.00	4.00	1.12	0.35	340	0.80	27	43
7	2.00	200.00	5.00	1.12	0.35	340	0.80	22	35
8	2.00	200.00	6.00	1.12	0.35	340	0.80	18	29
9	3.00	199.00	3.50	1.12	0.35	340	0.80	31	49
10	3.00	199.00	4.00	1.12	0.35	340	0.80	27	43
11	3.00	199.00	5.00	1.12	0.35	340	0.80	22	35
12	3.00	199.00	6.00	1.12	0.35	340	0.80	18	29

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.6 (For BH-157 (CW chlorination cum treatment building))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 14.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 14.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	7.00	7.00	21	15	25	15	21
1.00	201.00	8.00	8.00	23	14	22	14	22
1.00	201.00	9.00	9.00	25	12	19	12	19
1.00	201.00	10.00	10.00	26	11	17	11	17
2.00	200.00	7.00	7.00	26	15	25	15	25
2.00	200.00	8.00	8.00	28	14	22	14	22
2.00	200.00	9.00	9.00	29	12	19	12	19
2.00	200.00	10.00	10.00	31	11	17	11	17
3.00	199.00	7.00	7.00	31	15	25	15	25
3.00	199.00	8.00	8.00	33	14	22	14	22
3.00	199.00	9.00	9.00	34	12	19	12	19
3.00	199.00	10.00	10.00	36	11	17	11	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.7 (For BH-157 (CW chlorination cum treatment building))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
	m	m																			W _q	W _γ	
1	7.00	7.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
2	8.00	8.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	23
3	9.00	9.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.97	0.99	0.50	0.50	25
4	10.00	10.00	1.00	201.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.97	0.99	0.50	0.50	26
5	7.00	7.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	26
6	8.00	8.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	28
7	9.00	9.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	29
8	10.00	10.00	2.00	200.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.97	0.99	0.50	0.50	31
9	7.00	7.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	31
10	8.00	8.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	33
11	9.00	9.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	34
12	10.00	10.00	3.00	199.00	0.08	27	19.53	8.94	10.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.97	0.99	0.50	0.50	36

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from RL 202.00m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 14.8 (For BH-157 (CW chlorination cum treatment building))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	7.00	1.12	0.35	340	0.80	15	25
2	1.00	201.00	8.00	1.12	0.35	340	0.80	14	22
3	1.00	201.00	9.00	1.12	0.35	340	0.80	12	19
4	1.00	201.00	10.00	1.12	0.35	340	0.80	11	17
5	2.00	200.00	7.00	1.12	0.35	340	0.80	15	25
6	2.00	200.00	8.00	1.12	0.35	340	0.80	14	22
7	2.00	200.00	9.00	1.12	0.35	340	0.80	12	19
8	2.00	200.00	10.00	1.12	0.35	340	0.80	11	17
9	3.00	199.00	7.00	1.12	0.35	340	0.80	15	25
10	3.00	199.00	8.00	1.12	0.35	340	0.80	14	22
11	3.00	199.00	9.00	1.12	0.35	340	0.80	12	19
12	3.00	199.00	10.00	1.12	0.35	340	0.80	11	17

Appendix – 15A
Calculation of Safe Load carrying capacity of piles socketed inside rock
(Near BH 133,138)
(STP area near Lime stone unloading house)

Project Name: - Proposed structures of thermal power project of NTTTP at Hirma, Talabira

1.0 Introduction

In situations where overburden offering low bearing pressure is followed by rock at relatively shallower depths, end bearing piles is the suitable foundation option. Piles in rocks and weathered rocks of varying degree of weathering derive their capacity by end bearing and socket side resistance.

In situations, where, rock strata comprises of highly fragmented rock, as in present case, where RQD is nil or $(CR+RQD)/2$ is less than 30 % or when the crushing strength is less than 10 MPa, the appropriate approach would be of that suggested by Cole & Stroud.

In present site overburden soils overlay fractured / laminated / foliated rock. The founding stratum having highly fragmented rock with nil RQD and $(CR+RQD)/2$ to be less than 30 %, the approach suggested by Cole and Stroud as per Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2 has been used for safe load calculations.

An illustrative calculation of safe load on pile and summary of pile capacities is as follows,

2.0 Sub soil strata Characterization

General stratification at the location of boreholes 138 show primarily two characterized layers,

1. Overburden comprising of Yellowish brown, very fine grained, clays of high to intermediate plasticity upto 5.00m (i.e. RL 192.73m) followed by Yellowish brown, fine to medium grained, clayey sand and silty sand upto 12.70m (i.e. RL 185.03m) followed by Yellowish brown, fine to coarse grained, sandy clays of intermediate plasticity upto 14.10m (i.e. RL 183.63m).
2. Second characterized layer below the overburden soils consists of Highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, gravels, pebbles size fragments of fractured rock with infilled dark brownish, fine to very fine grained, clayey sand upto 16.00m (i.e. RL 181.73m).

3.0 Design Considerations

1. Length of socket considered 3D from depth of rock encountered.
2. The pile is considered to have socket length below 14.10 m below NGL (i.e. RL 183.63 m) depth.
3. For present case of pile terminating in highly weathered rock. SPT at depths between 14.10 to 16.00m (between RL 183.63 to 181.73m) is > 100 with just 2.0 cm penetration in 50 blows. SPT can be extrapolated for 30 cm i.e. $50 * 30 / 2.00 = 750$.

Based on recommendation of fig no. 3 in B 8 in Annex B under clause 6.3.1.1 and 6.3.2 of IS 2911 P1/S2, average shear strength q_c corresponding to assumed SPT of 200 may be taken as 1300 kN/m²

4. Allowable Capacity of pile socketed into rock $Q_a = R_e + R_{sf} = C_{u1} N_c \pi B^2 / 4 (F_s = 3) + \alpha C_{u2} \pi BL / (F_s = 6)$

4.0 Safe Load on Pile in Compression

Where,

End bearing component, $R_e = C_{u1} N_c \pi B^2 / 4 F_s$,

C_{u1} = Shear strength below base of pile = 1300 kN/m²

B = diameter of the pile = d

F_s = Factor of Safety = 3

$N_c = 9$

Therefore, **$R_e = 3061.5 d^2$**

Skin friction component of socketed length of pile, $R_{sf} = \alpha C_{u2} \pi BL / F_s$

$\alpha = 0.9$ (recommended value in IS 2911 P1/S2)

L = length of the socket = $3 D$

C_{u2} = Ultimate shear strength along socket length which shall be restricted to shear capacity of concrete of the pile = 1300 kN/m^2

F_s = Factor of Safety = 6

Therefore, $R_{sf} = 1836.9 d^2$

Thus,

$$Q_a = c_{u1} N_c \cdot \frac{\pi B^2}{4 F_s} + \alpha c_{u2} \cdot \frac{\pi B L}{F_s}$$

$$= 3061.5 d^2 + 1836.9 d^2 = 4898.4 d^2$$

Substituting the values of various diameters and socket lengths equal to 3 times diameter, allowable load on single pile can be summarized as follows,

Summary of the Safe load calculation in Compression

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	20.67	21.15	21.57
Termination level RL in m	181.83	181.35	180.93
End Bearing Component in kN	1102.1	1768.3	2479.8
Friction Component in kN	661.3	1060.9	1487.9
Safe load in Compression in kN	1763.4	2829.3	3967.7
Safe load in Compression in T	176	283	397

5.0 Safe Load on Pile in uplift

For 5.00m cutoff from FGL

The overburden soils, though, will not contribute in compression capacity would offer resistance in uplift capacity. The parameters of BH 138 are considered for calculation of uplift resistance as summarized below,

Depth in m from RL 202.5 m	Cohesion in kg/cm^2	Angle of Internal Friction ϕ	Submerged density in $\text{gm/cc } \gamma_{\text{sub}}$	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 5.00	Pile cutoff level – No pile						
5.00 to 9.77	0.43	3(ignored)	0.89	0.98	NA	NA	3-9
9.77 to 17.47	0.07(ignored)	28	0.93	NA	1.00	28	11-32
17.47 to 18.87	5.20	0	0.93	0.28	NA	NA	56->100
18.87 to 24.27	Rock strata – Resistance would be as per skin friction capacity in socket as already calculated in compression capacity						

Note - \$ Weighted average data considered. NA means not applicable.

Ultimate load in skin friction,

$$Q_{uf} = \alpha_i C_{ai} A_{si} + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.89 * 4.30 * \pi d * 4.77 = 57.35 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 * 9.76 * \tan 28 * \pi d * 7.23 = 117.87 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.28 * 52.00 * \pi d * 1.40 = 64.04 d$$

Fifth Layer – $1836.90 d^2$ in rock socket

$$\text{Substituting, ultimate load } q_{uf} = 2392.60 d + 1836.9 d^2$$

The safe load in uplift is worked out (considering the safety factor of 2.50 for overburden soils) and summarized below,

Safe Load on Piles in Uplift (in Ton)

Pile Diameter in, m	0.60	0.76	0.90
Socketing Length in, m (3 Times Diameter of Pile)	1.80	2.28	2.70
Termination depth of pile below the FGL (i.e. RL 202.50 m)	20.67	21.15	21.57
Termination level RL in m	181.83	181.35	180.93
Safe load in Uplift in kN	1235.51	1788.34	2349.23
Self-weight of pile in kN	66.43	109.84	158.04
Safe load in Uplift in T (Considering self-weight of pile)	130.19	189.82	250.73

6.0 Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60	0.76	0.90
Subgrade reaction in MN/m^3		3.10	3.10	3.10
Stiffness factor T in m		2.25	2.72	3.11
Depth of fixity in m	Free Head	4.30	5.20	5.90
	Fixed Head	4.90	5.90	6.80
Allowable Horizontal Force in T	Free Head	3.40	5.00	6.50
	Fixed Head	9.10	13.20	17.30
Allowable Moment capacity in Tm	Free Head	5.11	9.02	13.53
	Fixed Head	18.20	32.11	48.17

7.0 Notes

1. Pile shall be terminated after socketing 3D inside rock.
2. Initial and routine pile load test is required to verify the actual carrying capacity of pile in compression, uplift and lateral loads.
3. For design and construction, specification of IS: 2911, P1/S2, IS: 456, 2000 shall strictly be followed.

(Dr. K. K. Thaker)

Appendix – 15B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 133,138)

(STP area near Lime stone unloading house)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 17.00m from FGL. |
| 4. Cut off Level | - 6.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 138. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 5.00	Pile cutoff level – No pile						
5.00 to 9.77	0.43	3(ignored)	0.89	0.98	NA	NA	3-9
9.77 to 17.47	0.07(ignored)	28	0.93	NA	1.00	28	11-32
17.47 to 18.87	5.20	0	0.93	0.28	NA	NA	56->100
18.87 to 24.27	0.00	34°	1.03	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_v + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_v = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 0.93 \cdot 42.90 + 8.18 \cdot 40.00) = 15.66d^3 + 256.85d^2$$

(For Pile terminating at 17.50m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.98 \cdot 4.30 \cdot \pi d \cdot 4.77 = 63.15 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 7.83 \cdot \tan 28^\circ \cdot \pi d \cdot 7.70 = 100.71 d$$

$$\text{Fourth Layer} - \alpha_4 C_{a4} A_{s4} = 0.28 \cdot 52.00 \cdot \pi d \cdot (\ell - 17.47) = 45.74(\ell - 17.47) d$$

Substituting, ultimate load

$$q_{uf} = 163.86d + 45.74d(\ell - 17.47) \text{ (For Pile terminating at 17.50m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 15.66d^3 + 256.85d^2 + 163.86d + 45.74d(\ell - 17.47)$$

(For Pile terminating at 17.50m from F.G.L.).

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.50	11.50	78.03

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.50	11.50	37.96

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.50	11.50	4.88

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		3.10
Stiffness factor T in m		2.25
Depth of fixity in m	Free Head	4.30
	Fixed Head	4.90
Allowable Horizontal Force in T	Free Head	3.40
	Fixed Head	9.10
Allowable Moment capacity in Tm	Free Head	5.11
	Fixed Head	18.20

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.1 (For BH- 159 (Hydrogen generation plant))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	9
2	2.00	2.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	9
3	2.50	2.50	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
4	3.00	3.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
5	3.50	3.50	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
6	4.00	4.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
7	5.00	5.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
8	6.00	6.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
9	7.00	7.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
10	8.00	8.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
11	9.00	9.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8
12	10.00	10.00	1.00	4.50	197.50	0.40	2	5.48	0.13	0.10	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	8

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.2 (For BH- 159 (Hydrogen generation plant))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	4.50	197.50	1.50	1.50	0.40	440	1.12	0.80	0.0160	3.00	0.70	0.80	0.80	32	51
2	1.00	4.50	197.50	2.00	2.00	0.40	440	1.12	0.80	0.0160	4.00	0.70	0.85	0.80	23	36
3	1.00	4.50	197.50	2.50	2.50	0.40	440	1.12	0.80	0.0160	5.00	0.70	0.88	0.80	18	28
4	1.00	4.50	197.50	3.00	3.00	0.40	440	1.12	0.80	0.0160	6.00	0.70	0.91	0.80	14	23
5	1.00	4.50	197.50	3.50	3.50	0.40	440	1.12	0.80	0.0160	7.00	0.70	0.92	0.80	12	20
6	1.00	4.50	197.50	4.00	4.00	0.40	440	1.12	0.80	0.0160	8.00	0.70	0.93	0.80	11	17
7	1.00	4.50	197.50	5.00	5.00	0.40	440	1.12	0.80	0.0160	10.00	0.70	0.95	0.80	8	13
8	1.00	4.50	197.50	6.00	6.00	0.40	440	1.12	0.80	0.0160	12.00	0.70	0.96	0.80	7	11
9	1.00	4.50	197.50	7.00	7.00	0.40	440	1.12	0.80	0.0160	13.50	0.70	0.97	0.80	6	9
10	1.00	4.50	197.50	8.00	8.00	0.40	440	1.12	0.80	0.0160	13.50	0.70	0.97	0.80	5	8
11	1.00	4.50	197.50	9.00	9.00	0.40	440	1.12	0.80	0.0160	13.50	0.70	0.97	0.80	5	7
12	1.00	4.50	197.50	10.00	10.00	0.40	440	1.12	0.80	0.0160	13.50	0.70	0.98	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.3 (For BH- 159 (Hydrogen generation plant))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.50m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 16.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 16.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.00	5.50	196.50	1.50	1.50	17	33	54	17	17
2.00	5.50	196.50	2.00	2.00	16	25	40	16	16
2.00	5.50	196.50	2.50	2.50	16	20	31	16	16
2.00	5.50	196.50	3.00	3.00	16	16	25	16	16
2.00	5.50	196.50	3.50	3.50	15	13	21	13	15
2.00	5.50	196.50	4.00	4.00	15	11	18	11	15
2.00	5.50	196.50	5.00	5.00	15	9	14	9	14
2.00	5.50	196.50	6.00	6.00	15	7	12	7	12
2.00	5.50	196.50	7.00	7.00	15	6	10	6	10
2.00	5.50	196.50	8.00	8.00	15	5	9	5	9
2.00	5.50	196.50	9.00	9.00	15	5	8	5	8
2.00	5.50	196.50	10.00	10.00	15	4	7	4	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.4 (For BH- 159 (Hydrogen generation plant))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	17
2	2.00	2.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
3	2.50	2.50	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
4	3.00	3.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
5	3.50	3.50	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
6	4.00	4.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
7	5.00	5.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
8	6.00	6.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
9	7.00	7.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
10	8.00	8.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
11	9.00	9.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
12	10.00	10.00	2.00	5.50	196.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.5 (For BH- 159 (Hydrogen generation plant))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.00	5.50	196.50	1.50	1.50	0.40	440	1.12	0.80	0.0160	3.00	0.70	0.73	0.80	33	54
2	2.00	5.50	196.50	2.00	2.00	0.40	440	1.12	0.80	0.0160	4.00	0.70	0.73	0.80	25	40
3	2.00	5.50	196.50	2.50	2.50	0.40	440	1.12	0.80	0.0160	5.00	0.70	0.76	0.80	20	31
4	2.00	5.50	196.50	3.00	3.00	0.40	440	1.12	0.80	0.0160	6.00	0.70	0.80	0.80	16	25
5	2.00	5.50	196.50	3.50	3.50	0.40	440	1.12	0.80	0.0160	7.00	0.70	0.83	0.80	13	21
6	2.00	5.50	196.50	4.00	4.00	0.40	440	1.12	0.80	0.0160	8.00	0.70	0.85	0.80	11	18
7	2.00	5.50	196.50	5.00	5.00	0.40	440	1.12	0.80	0.0160	10.00	0.70	0.88	0.80	9	14
8	2.00	5.50	196.50	6.00	6.00	0.40	440	1.12	0.80	0.0160	12.00	0.70	0.91	0.80	7	12
9	2.00	5.50	196.50	7.00	7.00	0.40	440	1.12	0.80	0.0160	12.50	0.70	0.92	0.80	6	10
10	2.00	5.50	196.50	8.00	8.00	0.40	440	1.12	0.80	0.0160	12.50	0.70	0.93	0.80	5	9
11	2.00	5.50	196.50	9.00	9.00	0.40	440	1.12	0.80	0.0160	12.50	0.70	0.94	0.80	5	8
12	2.00	5.50	196.50	10.00	10.00	0.40	440	1.12	0.80	0.0160	12.50	0.70	0.95	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.6 (For BH- 159 (Hydrogen generation plant))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.50m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 16.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 16.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	6.50	195.50	1.50	1.50	19	33	54	19	19
3.00	6.50	195.50	2.00	2.00	18	25	40	18	18
3.00	6.50	195.50	2.50	2.50	17	20	32	17	17
3.00	6.50	195.50	3.00	3.00	17	17	27	17	17
3.00	6.50	195.50	3.50	3.50	16	14	23	14	16
3.00	6.50	195.50	4.00	4.00	16	12	19	12	16
3.00	6.50	195.50	5.00	5.00	16	9	15	9	15
3.00	6.50	195.50	6.00	6.00	15	8	12	8	12
3.00	6.50	195.50	7.00	7.00	15	6	10	6	10
3.00	6.50	195.50	8.00	8.00	15	6	9	6	9
3.00	6.50	195.50	9.00	9.00	15	5	8	5	8
3.00	6.50	195.50	10.00	10.00	15	5	7	5	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.7 (For BH- 159 (Hydrogen generation plant))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	19
2	2.00	2.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.32	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	18
3	2.50	2.50	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	17
4	3.00	3.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	17
5	3.50	3.50	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
6	4.00	4.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
7	5.00	5.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	16
8	6.00	6.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
9	7.00	7.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
10	8.00	8.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
11	9.00	9.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15
12	10.00	10.00	3.00	6.50	195.50	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.75	0.88	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 16.8 (For BH- 159 (Hydrogen generation plant))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.00	6.50	195.50	1.50	1.50	0.40	440	1.12	0.80	0.0160	3.00	0.70	0.73	0.80	33	54
2	3.00	6.50	195.50	2.00	2.00	0.40	440	1.12	0.80	0.0160	4.00	0.70	0.73	0.80	25	40
3	3.00	6.50	195.50	2.50	2.50	0.40	440	1.12	0.80	0.0160	5.00	0.70	0.73	0.80	20	32
4	3.00	6.50	195.50	3.00	3.00	0.40	440	1.12	0.80	0.0160	6.00	0.70	0.73	0.80	17	27
5	3.00	6.50	195.50	3.50	3.50	0.40	440	1.12	0.80	0.0160	7.00	0.70	0.75	0.80	14	23
6	3.00	6.50	195.50	4.00	4.00	0.40	440	1.12	0.80	0.0160	8.00	0.70	0.77	0.80	12	19
7	3.00	6.50	195.50	5.00	5.00	0.40	440	1.12	0.80	0.0160	10.00	0.70	0.82	0.80	9	15
8	3.00	6.50	195.50	6.00	6.00	0.40	440	1.12	0.80	0.0160	11.50	0.70	0.85	0.80	8	12
9	3.00	6.50	195.50	7.00	7.00	0.40	440	1.12	0.80	0.0160	11.50	0.70	0.87	0.80	6	10
10	3.00	6.50	195.50	8.00	8.00	0.40	440	1.12	0.80	0.0160	11.50	0.70	0.89	0.80	6	9
11	3.00	6.50	195.50	9.00	9.00	0.40	440	1.12	0.80	0.0160	11.50	0.70	0.91	0.80	5	8
12	3.00	6.50	195.50	10.00	10.00	0.40	440	1.12	0.80	0.0160	11.50	0.70	0.92	0.80	5	7

Appendix – 16B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 159) (Hydrogen generation plant)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 16.00m from FGL. |
| 4. Cut off Level | - 4.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 159. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 4.00	No contribution- Cutoff level						
4.00 to 6.10	0.63	5(ignored)	0.75	0.71	NA	NA	4-10
6.10 to 16.70	0.81	6(ignored)	0.98	0.57	NA	NA	10-22
16.70 to 25.60	3.60	0	1.02	0.28	NA	NA	54->100
25.60 to 28.50	0.00	34°	1.02	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p * N_c * C_p$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_c = 9$$

$$C_p = \text{Cohesion at Pile Tip} = 36.00 \text{ kg/cm}^2$$

$$q_{ub} = 0.785 d^2 * 9 * 36.00 = 254.34 d^2 \text{ (For Pile terminating at 16.00m from F.G.L.).}$$

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - \alpha_2 C_{a2} A_{s2} = 0.71 * 6.30 * \pi d * 2.10 = 29.51 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.57 * 8.10 * \pi d * (\ell - 6.10) = 14.50 d (\ell - 6.10)$$

Substituting, ultimate load

$$q_{uf} = 29.51 d + 14.50 d (\ell - 6.10) \text{ (For Pile terminating at 16.00m from F.G.L.).}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 254.34 d^2 + 29.51 d + 14.50 d (\ell - 6.10) \text{ (For Pile terminating at 16.00m from F.G.L.).}$$

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	78.28

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	39.38

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self-weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	11.00	4.67

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		5.76
Stiffness factor T in m		1.99
Depth of fixity in m	Free Head	3.80
	Fixed Head	4.30
Allowable Horizontal Force in T	Free Head	5.00
	Fixed Head	13.10
Allowable Moment capacity in Tm	Free Head	6.55
	Fixed Head	23.32

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
6.00	9.33	192.67	1.50	1.50	18	28	45	18	18
6.00	9.33	192.67	2.00	2.00	16	21	33	16	16
6.00	9.33	192.67	2.50	2.50	15	17	26	15	15
6.00	9.33	192.67	3.00	3.00	14	14	22	14	14
6.50	9.83	192.17	1.50	1.50	19	28	45	19	19
6.50	9.83	192.17	2.00	2.00	17	21	33	17	17
6.50	9.83	192.17	2.50	2.50	15	17	26	15	15
6.50	9.83	192.17	3.00	3.00	15	14	22	14	15
7.00	10.33	191.67	1.50	1.50	20	28	46	20	20
7.00	10.33	191.67	2.00	2.00	17	21	33	17	17
7.00	10.33	191.67	2.50	2.50	16	17	26	16	16
7.00	10.33	191.67	3.00	3.00	15	14	22	14	15

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.1 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.83	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	18
2	2.00	2.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.62	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	16
3	2.50	2.50	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.50	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	15
4	3.00	3.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
5	1.50	1.50	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.90	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	19
6	2.00	2.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.67	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	17
7	2.50	2.50	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.54	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	15
8	3.00	3.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.45	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	15
9	1.50	1.50	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.97	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	20
10	2.00	2.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.72	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	17
11	2.50	2.50	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.58	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	16
12	3.00	3.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.48	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.2 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	6.00	9.33	192.67	1.50	1.50	0.40	354	1.12	0.80	0.0192	3.00	0.70	0.71	0.80	28	45
2	6.00	9.33	192.67	2.00	2.00	0.40	354	1.12	0.80	0.0192	4.00	0.70	0.73	0.80	21	33
3	6.00	9.33	192.67	2.50	2.50	0.40	354	1.12	0.80	0.0192	5.00	0.70	0.73	0.80	17	26
4	6.00	9.33	192.67	3.00	3.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	14	22
5	6.50	9.83	192.17	1.50	1.50	0.40	354	1.12	0.80	0.0192	3.00	0.70	0.70	0.80	28	45
6	6.50	9.83	192.17	2.00	2.00	0.40	354	1.12	0.80	0.0192	4.00	0.70	0.73	0.80	21	33
7	6.50	9.83	192.17	2.50	2.50	0.40	354	1.12	0.80	0.0192	5.00	0.70	0.73	0.80	17	26
8	6.50	9.83	192.17	3.00	3.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	14	22
9	7.00	10.33	191.67	1.50	1.50	0.40	354	1.12	0.80	0.0192	3.00	0.70	0.69	0.80	28	46
10	7.00	10.33	191.67	2.00	2.00	0.40	354	1.12	0.80	0.0192	4.00	0.70	0.73	0.80	21	33
11	7.00	10.33	191.67	2.50	2.50	0.40	354	1.12	0.80	0.0192	5.00	0.70	0.73	0.80	17	26
12	7.00	10.33	191.67	3.00	3.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.3 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
6.00	9.33	192.67	3.50	3.50	14	12	19	12	14
6.00	9.33	192.67	4.00	4.00	13	10	17	10	13
6.00	9.33	192.67	5.00	5.00	13	9	14	9	13
6.00	9.33	192.67	6.00	6.00	12	7	12	7	12
6.50	9.83	192.17	3.50	3.50	14	12	19	12	14
6.50	9.83	192.17	4.00	4.00	14	10	17	10	14
6.50	9.83	192.17	5.00	5.00	13	9	14	9	13
6.50	9.83	192.17	6.00	6.00	13	7	12	7	12
7.00	10.33	191.67	3.50	3.50	14	12	19	12	14
7.00	10.33	191.67	4.00	4.00	14	11	17	11	14
7.00	10.33	191.67	5.00	5.00	13	9	14	9	13
7.00	10.33	191.67	6.00	6.00	13	8	12	8	12

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.4 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.36	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
2	4.00	4.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13
3	5.00	5.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13
4	6.00	6.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
5	3.50	3.50	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
6	4.00	4.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.34	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
7	5.00	5.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13
8	6.00	6.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13
9	3.50	3.50	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
10	4.00	4.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.36	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	14
11	5.00	5.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13
12	6.00	6.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	13

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.5 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	6.00	9.33	192.67	3.50	3.50	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.73	0.80	12	19
2	6.00	9.33	192.67	4.00	4.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.73	0.80	10	17
3	6.00	9.33	192.67	5.00	5.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.73	0.80	9	14
4	6.00	9.33	192.67	6.00	6.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.73	0.80	7	12
5	6.50	9.83	192.17	3.50	3.50	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	12	19
6	6.50	9.83	192.17	4.00	4.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	10	17
7	6.50	9.83	192.17	5.00	5.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	9	14
8	6.50	9.83	192.17	6.00	6.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	7	12
9	7.00	10.33	191.67	3.50	3.50	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	12	19
10	7.00	10.33	191.67	4.00	4.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	11	17
11	7.00	10.33	191.67	5.00	5.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	9	14
12	7.00	10.33	191.67	6.00	6.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	8	12

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.6 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
6.00	9.33	192.67	7.00	7.00	12	6	10	6	10
6.00	9.33	192.67	8.00	8.00	12	6	9	6	9
6.00	9.33	192.67	9.00	9.00	12	5	8	5	8
6.00	9.33	192.67	10.00	10.00	12	5	7	5	7
6.50	9.83	192.17	7.00	7.00	12	7	10	7	10
6.50	9.83	192.17	8.00	8.00	12	6	9	6	9
6.50	9.83	192.17	9.00	9.00	12	5	8	5	8
6.50	9.83	192.17	10.00	10.00	12	5	8	5	8
7.00	10.33	191.67	7.00	7.00	12	7	11	7	11
7.00	10.33	191.67	8.00	8.00	12	6	10	6	10
7.00	10.33	191.67	9.00	9.00	12	5	9	5	9
7.00	10.33	191.67	10.00	10.00	12	5	8	5	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.7 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
2	8.00	8.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
3	9.00	9.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
4	10.00	10.00	6.00	9.33	192.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
5	7.00	7.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
6	8.00	8.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
7	9.00	9.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
8	10.00	10.00	6.50	9.83	192.17	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
9	7.00	7.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
10	8.00	8.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
11	9.00	9.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12
12	10.00	10.00	7.00	10.33	191.67	0.49	3	5.63	0.20	0.15	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	12

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.8 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	6.00	9.33	192.67	7.00	7.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.75	0.80	6	10
2	6.00	9.33	192.67	8.00	8.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.77	0.80	6	9
3	6.00	9.33	192.67	9.00	9.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.80	0.80	5	8
4	6.00	9.33	192.67	10.00	10.00	0.40	354	1.12	0.80	0.0192	6.50	0.70	0.82	0.80	5	7
5	6.50	9.83	192.17	7.00	7.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.74	0.80	7	10
6	6.50	9.83	192.17	8.00	8.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.76	0.80	6	9
7	6.50	9.83	192.17	9.00	9.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.78	0.80	5	8
8	6.50	9.83	192.17	10.00	10.00	0.40	354	1.12	0.80	0.0192	6.00	0.70	0.80	0.80	5	8
9	7.00	10.33	191.67	7.00	7.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.73	0.80	7	11
10	7.00	10.33	191.67	8.00	8.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.75	0.80	6	10
11	7.00	10.33	191.67	9.00	9.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.77	0.80	5	9
12	7.00	10.33	191.67	10.00	10.00	0.40	354	1.12	0.80	0.0192	5.50	0.70	0.79	0.80	5	8

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.9 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.1)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.50	7.83	194.17	1.50	1.50	9	16	26	9	9
4.50	7.83	194.17	2.00	2.00	8	12	20	8	8
4.50	7.83	194.17	2.50	2.50	8	10	16	8	8
4.50	7.83	194.17	3.00	3.00	7	8	13	7	7
5.00	8.33	193.67	1.50	1.50	9	16	26	9	9
5.00	8.33	193.67	2.00	2.00	8	12	20	8	8
5.00	8.33	193.67	2.50	2.50	8	10	16	8	8
5.00	8.33	193.67	3.00	3.00	8	8	13	8	8
5.50	8.83	193.17	1.50	1.50	10	16	26	10	10
5.50	8.83	193.17	2.00	2.00	9	12	20	9	9
5.50	8.83	193.17	2.50	2.50	8	10	16	8	8
5.50	8.83	193.17	3.00	3.00	8	8	13	8	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.10 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.63	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	9
2	2.00	2.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.47	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
3	2.50	2.50	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
4	3.00	3.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
5	1.50	1.50	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.70	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	9
6	2.00	2.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.52	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
7	2.50	2.50	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
8	3.00	3.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.35	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
9	1.50	1.50	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.77	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	10
10	2.00	2.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.58	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	9
11	2.50	2.50	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.46	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
12	3.00	3.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.11 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	4.50	7.83	194.17	1.50	1.50	0.40	368	1.12	0.80	0.0400	3.00	0.70	0.73	0.80	16	26
2	4.50	7.83	194.17	2.00	2.00	0.40	368	1.12	0.80	0.0400	4.00	0.70	0.73	0.80	12	20
3	4.50	7.83	194.17	2.50	2.50	0.40	368	1.12	0.80	0.0400	5.00	0.70	0.73	0.80	10	16
4	4.50	7.83	194.17	3.00	3.00	0.40	368	1.12	0.80	0.0400	6.00	0.70	0.73	0.80	8	13
5	5.00	8.33	193.67	1.50	1.50	0.40	368	1.12	0.80	0.0400	3.00	0.70	0.73	0.80	16	26
6	5.00	8.33	193.67	2.00	2.00	0.40	368	1.12	0.80	0.0400	4.00	0.70	0.73	0.80	12	20
7	5.00	8.33	193.67	2.50	2.50	0.40	368	1.12	0.80	0.0400	5.00	0.70	0.73	0.80	10	16
8	5.00	8.33	193.67	3.00	3.00	0.40	368	1.12	0.80	0.0400	6.00	0.70	0.73	0.80	8	13
9	5.50	8.83	193.17	1.50	1.50	0.40	368	1.12	0.80	0.0400	3.00	0.70	0.72	0.80	16	26
10	5.50	8.83	193.17	2.00	2.00	0.40	368	1.12	0.80	0.0400	4.00	0.70	0.73	0.80	12	20
11	5.50	8.83	193.17	2.50	2.50	0.40	368	1.12	0.80	0.0400	5.00	0.70	0.73	0.80	10	16
12	5.50	8.83	193.17	3.00	3.00	0.40	368	1.12	0.80	0.0400	6.00	0.70	0.73	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.12 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.32)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.50	7.83	194.17	3.50	3.50	7	7	11	7	7
4.50	7.83	194.17	4.00	4.00	7	6	10	6	7
4.50	7.83	194.17	5.00	5.00	7	5	8	5	7
4.50	7.83	194.17	6.00	6.00	7	4	6	4	6
5.00	8.33	193.67	3.50	3.50	7	7	11	7	7
5.00	8.33	193.67	4.00	4.00	7	6	10	6	7
5.00	8.33	193.67	5.00	5.00	7	5	8	5	7
5.00	8.33	193.67	6.00	6.00	7	4	7	4	7
5.50	8.83	193.17	3.50	3.50	8	7	11	7	8
5.50	8.83	193.17	4.00	4.00	7	6	10	6	7
5.50	8.83	193.17	5.00	5.00	7	5	8	5	7
5.50	8.83	193.17	6.00	6.00	7	4	7	4	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.13 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
2	4.00	4.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
3	5.00	5.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
4	6.00	6.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
5	3.50	3.50	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
6	4.00	4.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.26	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
7	5.00	5.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
8	6.00	6.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
9	3.50	3.50	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.33	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	8
10	4.00	4.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
11	5.00	5.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.23	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
12	6.00	6.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.14 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	4.50	7.83	194.17	3.50	3.50	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.73	0.80	7	11
2	4.50	7.83	194.17	4.00	4.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.73	0.80	6	10
3	4.50	7.83	194.17	5.00	5.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.74	0.80	5	8
4	4.50	7.83	194.17	6.00	6.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.77	0.80	4	6
5	5.00	8.33	193.67	3.50	3.50	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.73	0.80	7	11
6	5.00	8.33	193.67	4.00	4.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.73	0.80	6	10
7	5.00	8.33	193.67	5.00	5.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.73	0.80	5	8
8	5.00	8.33	193.67	6.00	6.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.75	0.80	4	7
9	5.50	8.83	193.17	3.50	3.50	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.73	0.80	7	11
10	5.50	8.83	193.17	4.00	4.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.73	0.80	6	10
11	5.50	8.83	193.17	5.00	5.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.73	0.80	5	8
12	5.50	8.83	193.17	6.00	6.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.74	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.15 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.35)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.50	7.83	194.17	7.00	7.00	7	3	6	3	6
4.50	7.83	194.17	8.00	8.00	6	3	5	3	5
4.50	7.83	194.17	9.00	9.00	6	3	4	3	4
4.50	7.83	194.17	10.00	10.00	6	3	4	3	4
5.00	8.33	193.67	7.00	7.00	7	4	6	4	6
5.00	8.33	193.67	8.00	8.00	7	3	5	3	5
5.00	8.33	193.67	9.00	9.00	7	3	5	3	5
5.00	8.33	193.67	10.00	10.00	7	3	4	3	4
5.50	8.83	193.17	7.00	7.00	7	4	6	4	6
5.50	8.83	193.17	8.00	8.00	7	3	5	3	5
5.50	8.83	193.17	9.00	9.00	7	3	5	3	5
5.50	8.83	193.17	10.00	10.00	7	3	4	3	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.16 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
2	8.00	8.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	6
3	9.00	9.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	6
4	10.00	10.00	4.50	7.83	194.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	6
5	7.00	7.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
6	8.00	8.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
7	9.00	9.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
8	10.00	10.00	5.00	8.33	193.67	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
9	7.00	7.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
10	8.00	8.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
11	9.00	9.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7
12	10.00	10.00	5.50	8.83	193.17	0.25	4	5.81	0.27	0.21	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.89	0.95	0.50	0.50	7

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.17 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	4.50	7.83	194.17	7.00	7.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.80	0.80	3	6
2	4.50	7.83	194.17	8.00	8.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.83	0.80	3	5
3	4.50	7.83	194.17	9.00	9.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.85	0.80	3	4
4	4.50	7.83	194.17	10.00	10.00	0.40	368	1.12	0.80	0.0400	8.00	0.70	0.87	0.80	3	4
5	5.00	8.33	193.67	7.00	7.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.78	0.80	4	6
6	5.00	8.33	193.67	8.00	8.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.81	0.80	3	5
7	5.00	8.33	193.67	9.00	9.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.83	0.80	3	5
8	5.00	8.33	193.67	10.00	10.00	0.40	368	1.12	0.80	0.0400	7.50	0.70	0.85	0.80	3	4
9	5.50	8.83	193.17	7.00	7.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.76	0.80	4	6
10	5.50	8.83	193.17	8.00	8.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.79	0.80	3	5
11	5.50	8.83	193.17	9.00	9.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.81	0.80	3	5
12	5.50	8.83	193.17	10.00	10.00	0.40	368	1.12	0.80	0.0400	7.00	0.70	0.83	0.80	3	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.18 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.28)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.38)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.33	197.67	1.50	1.50	5	10	17	5	5
1.00	4.33	197.67	2.00	2.00	5	7	12	5	5
1.00	4.33	197.67	2.50	2.50	5	6	9	5	5
1.00	4.33	197.67	3.00	3.00	5	5	8	5	5
2.00	5.33	196.67	1.50	1.50	5	11	18	5	5
2.00	5.33	196.67	2.00	2.00	5	8	13	5	5
2.00	5.33	196.67	2.50	2.50	5	6	10	5	5
2.00	5.33	196.67	3.00	3.00	5	5	8	5	5
3.00	6.33	195.67	1.50	1.50	6	11	18	6	6
3.00	6.33	195.67	2.00	2.00	6	8	13	6	6
3.00	6.33	195.67	2.50	2.50	5	7	11	5	5
3.00	6.33	195.67	3.00	3.00	5	5	9	5	5

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.19 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
2	2.00	2.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
3	2.50	2.50	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
4	3.00	3.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
5	1.50	1.50	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
6	2.00	2.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
7	2.50	2.50	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
8	3.00	3.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
9	1.50	1.50	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	6
10	2.00	2.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	6
11	2.50	2.50	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
12	3.00	3.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.20 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	4.33	197.67	1.50	1.50	0.40	158	1.12	0.80	0.0510	3.00	0.70	0.80	0.80	10	17
2	1.00	4.33	197.67	2.00	2.00	0.40	158	1.12	0.80	0.0510	4.00	0.70	0.85	0.80	7	12
3	1.00	4.33	197.67	2.50	2.50	0.40	158	1.12	0.80	0.0510	5.00	0.70	0.88	0.80	6	9
4	1.00	4.33	197.67	3.00	3.00	0.40	158	1.12	0.80	0.0510	6.00	0.70	0.91	0.80	5	8
5	2.00	5.33	196.67	1.50	1.50	0.40	158	1.12	0.80	0.0510	3.00	0.70	0.73	0.80	11	18
6	2.00	5.33	196.67	2.00	2.00	0.40	158	1.12	0.80	0.0510	4.00	0.70	0.73	0.80	8	13
7	2.00	5.33	196.67	2.50	2.50	0.40	158	1.12	0.80	0.0510	5.00	0.70	0.76	0.80	6	10
8	2.00	5.33	196.67	3.00	3.00	0.40	158	1.12	0.80	0.0510	6.00	0.70	0.80	0.80	5	8
9	3.00	6.33	195.67	1.50	1.50	0.40	158	1.12	0.80	0.0510	3.00	0.70	0.73	0.80	11	18
10	3.00	6.33	195.67	2.00	2.00	0.40	158	1.12	0.80	0.0510	4.00	0.70	0.73	0.80	8	13
11	3.00	6.33	195.67	2.50	2.50	0.40	158	1.12	0.80	0.0510	5.00	0.70	0.73	0.80	7	11
12	3.00	6.33	195.67	3.00	3.00	0.40	158	1.12	0.80	0.0510	6.00	0.70	0.73	0.80	5	9

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.21 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.31)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.41)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.33	197.67	3.50	3.50	5	4	6	4	5
1.00	4.33	197.67	4.00	4.00	5	3	6	3	5
1.00	4.33	197.67	5.00	5.00	4	3	4	3	4
1.00	4.33	197.67	6.00	6.00	4	2	4	2	4
2.00	5.33	196.67	3.50	3.50	5	4	7	4	5
2.00	5.33	196.67	4.00	4.00	5	4	6	4	5
2.00	5.33	196.67	5.00	5.00	5	3	5	3	5
2.00	5.33	196.67	6.00	6.00	5	2	4	2	4
3.00	6.33	195.67	3.50	3.50	5	5	7	5	5
3.00	6.33	195.67	4.00	4.00	5	4	6	4	5
3.00	6.33	195.67	5.00	5.00	5	3	5	3	5
3.00	6.33	195.67	6.00	6.00	5	2	4	2	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.22 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
2	4.00	4.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
3	5.00	5.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	4
4	6.00	6.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	4
5	3.50	3.50	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
6	4.00	4.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
7	5.00	5.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
8	6.00	6.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
9	3.50	3.50	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
10	4.00	4.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
11	5.00	5.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
12	6.00	6.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.23 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	4.33	197.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.92	0.80	4	6
2	1.00	4.33	197.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.93	0.80	3	6
3	1.00	4.33	197.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	10.00	0.70	0.95	0.80	3	4
4	1.00	4.33	197.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	11.50	0.70	0.96	0.80	2	4
5	2.00	5.33	196.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.83	0.80	4	7
6	2.00	5.33	196.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.85	0.80	4	6
7	2.00	5.33	196.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	10.00	0.70	0.88	0.80	3	5
8	2.00	5.33	196.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	10.50	0.70	0.91	0.80	2	4
9	3.00	6.33	195.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.75	0.80	5	7
10	3.00	6.33	195.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.77	0.80	4	6
11	3.00	6.33	195.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	9.50	0.70	0.82	0.80	3	5
12	3.00	6.33	195.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	9.50	0.70	0.85	0.80	2	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 17.24 (For BH-160 & 164 (Rain water harvesting pond))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.67m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 17.34)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 17.44)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.33	197.67	3.50	3.50	5	4	6	4	5
1.00	4.33	197.67	4.00	4.00	5	3	6	3	5
1.00	4.33	197.67	5.00	5.00	4	3	4	3	4
1.00	4.33	197.67	6.00	6.00	4	2	4	2	4
2.00	5.33	196.67	3.50	3.50	5	4	7	4	5
2.00	5.33	196.67	4.00	4.00	5	4	6	4	5
2.00	5.33	196.67	5.00	5.00	5	3	5	3	5
2.00	5.33	196.67	6.00	6.00	5	2	4	2	4
3.00	6.33	195.67	3.50	3.50	5	5	7	5	5
3.00	6.33	195.67	4.00	4.00	5	4	6	4	5
3.00	6.33	195.67	5.00	5.00	5	3	5	3	5
3.00	6.33	195.67	6.00	6.00	5	2	4	2	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.25 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
2	4.00	4.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
3	5.00	5.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	4
4	6.00	6.00	1.00	4.33	197.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	4
5	3.50	3.50	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
6	4.00	4.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
7	5.00	5.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
8	6.00	6.00	2.00	5.33	196.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
9	3.50	3.50	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
10	4.00	4.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
11	5.00	5.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5
12	6.00	6.00	3.00	6.33	195.67	0.21	3	5.63	0.20	0.15	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.84	0.92	0.50	0.50	5

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 198.67m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-17.26 (For BH-160 & 164 (Rain water harvesting pond))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	4.33	197.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.92	0.80	4	6
2	1.00	4.33	197.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.93	0.80	3	6
3	1.00	4.33	197.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	10.00	0.70	0.95	0.80	3	4
4	1.00	4.33	197.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	11.50	0.70	0.96	0.80	2	4
5	2.00	5.33	196.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.83	0.80	4	7
6	2.00	5.33	196.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.85	0.80	4	6
7	2.00	5.33	196.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	10.00	0.70	0.88	0.80	3	5
8	2.00	5.33	196.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	10.50	0.70	0.91	0.80	2	4
9	3.00	6.33	195.67	3.50	3.50	0.40	158	1.12	0.80	0.0510	7.00	0.70	0.75	0.80	5	7
10	3.00	6.33	195.67	4.00	4.00	0.40	158	1.12	0.80	0.0510	8.00	0.70	0.77	0.80	4	6
11	3.00	6.33	195.67	5.00	5.00	0.40	158	1.12	0.80	0.0510	9.50	0.70	0.82	0.80	3	5
12	3.00	6.33	195.67	6.00	6.00	0.40	158	1.12	0.80	0.0510	9.50	0.70	0.85	0.80	2	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	6.93	195.07	1.50	1.50	19	26	42	19	19
3.50	6.93	195.07	2.00	2.00	17	20	32	17	17
3.50	6.93	195.07	2.50	2.50	16	16	25	16	16
3.50	6.93	195.07	3.00	3.00	16	13	21	13	16
4.00	7.43	194.57	1.50	1.50	20	26	42	20	20
4.00	7.43	194.57	2.00	2.00	18	20	32	18	18
4.00	7.43	194.57	2.50	2.50	17	16	25	16	17
4.00	7.43	194.57	3.00	3.00	16	13	21	13	16
4.50	7.93	194.07	1.50	1.50	21	26	42	21	21
4.50	7.93	194.07	2.00	2.00	19	20	32	19	19
4.50	7.93	194.07	2.50	2.50	18	16	25	16	18
4.50	7.93	194.07	3.00	3.00	17	13	21	13	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.1 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.49	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
2	2.00	2.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.37	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
3	2.50	2.50	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
4	3.00	3.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
5	1.50	1.50	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.56	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	20
6	2.00	2.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
7	2.50	2.50	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.34	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
8	3.00	3.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
9	1.50	1.50	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.63	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	21
10	2.00	2.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.47	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
11	2.50	2.50	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
12	3.00	3.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.2 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	195.07	6.93	1.50	1.50	0.40	290	1.12	0.80	0.0182	3.00	0.70	0.73	0.80	26	42
2	3.50	195.07	6.93	2.00	2.00	0.40	290	1.12	0.80	0.0182	4.00	0.70	0.73	0.80	20	32
3	3.50	195.07	6.93	2.50	2.50	0.40	290	1.12	0.80	0.0182	5.00	0.70	0.73	0.80	16	25
4	3.50	195.07	6.93	3.00	3.00	0.40	290	1.12	0.80	0.0182	6.00	0.70	0.73	0.80	13	21
5	4.00	194.57	7.43	1.50	1.50	0.40	290	1.12	0.80	0.0182	3.00	0.70	0.73	0.80	26	42
6	4.00	194.57	7.43	2.00	2.00	0.40	290	1.12	0.80	0.0182	4.00	0.70	0.73	0.80	20	32
7	4.00	194.57	7.43	2.50	2.50	0.40	290	1.12	0.80	0.0182	5.00	0.70	0.73	0.80	16	25
8	4.00	194.57	7.43	3.00	3.00	0.40	290	1.12	0.80	0.0182	6.00	0.70	0.73	0.80	13	21
9	4.50	194.07	7.93	1.50	1.50	0.40	290	1.12	0.80	0.0182	3.00	0.70	0.73	0.80	26	42
10	4.50	194.07	7.93	2.00	2.00	0.40	290	1.12	0.80	0.0182	4.00	0.70	0.73	0.80	20	32
11	4.50	194.07	7.93	2.50	2.50	0.40	290	1.12	0.80	0.0182	5.00	0.70	0.73	0.80	16	25
12	4.50	194.07	7.93	3.00	3.00	0.40	290	1.12	0.80	0.0182	6.00	0.70	0.73	0.80	13	21

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.3 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	6.93	195.07	3.50	3.50	15	11	18	11	15
3.50	6.93	195.07	4.00	4.00	15	10	16	10	15
3.50	6.93	195.07	5.00	5.00	15	8	12	8	12
3.50	6.93	195.07	6.00	6.00	14	6	10	6	10
4.00	7.43	194.57	3.50	3.50	16	11	18	11	16
4.00	7.43	194.57	4.00	4.00	15	10	16	10	15
4.00	7.43	194.57	5.00	5.00	15	8	12	8	12
4.00	7.43	194.57	6.00	6.00	15	6	10	6	10
4.50	7.93	194.07	3.50	3.50	16	11	18	11	16
4.50	7.93	194.07	4.00	4.00	16	10	16	10	16
4.50	7.93	194.07	5.00	5.00	15	8	13	8	13
4.50	7.93	194.07	6.00	6.00	15	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.4 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
2	4.00	4.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
3	5.00	5.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
4	6.00	6.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
5	3.50	3.50	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
6	4.00	4.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
7	5.00	5.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
8	6.00	6.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
9	3.50	3.50	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
10	4.00	4.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
11	5.00	5.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
12	6.00	6.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.5 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	195.07	6.93	3.50	3.50	0.40	290	1.12	0.80	0.0182	7.00	0.70	0.73	0.80	11	18
2	3.50	195.07	6.93	4.00	4.00	0.40	290	1.12	0.80	0.0182	8.00	0.70	0.75	0.80	10	16
3	3.50	195.07	6.93	5.00	5.00	0.40	290	1.12	0.80	0.0182	10.00	0.70	0.79	0.80	8	12
4	3.50	195.07	6.93	6.00	6.00	0.40	290	1.12	0.80	0.0182	12.00	0.70	0.82	0.80	6	10
5	4.00	194.57	7.43	3.50	3.50	0.40	290	1.12	0.80	0.0182	7.00	0.70	0.73	0.80	11	18
6	4.00	194.57	7.43	4.00	4.00	0.40	290	1.12	0.80	0.0182	8.00	0.70	0.73	0.80	10	16
7	4.00	194.57	7.43	5.00	5.00	0.40	290	1.12	0.80	0.0182	10.00	0.70	0.76	0.80	8	12
8	4.00	194.57	7.43	6.00	6.00	0.40	290	1.12	0.80	0.0182	12.00	0.70	0.80	0.80	6	10
9	4.50	194.07	7.93	3.50	3.50	0.40	290	1.12	0.80	0.0182	7.00	0.70	0.73	0.80	11	18
10	4.50	194.07	7.93	4.00	4.00	0.40	290	1.12	0.80	0.0182	8.00	0.70	0.73	0.80	10	16
11	4.50	194.07	7.93	5.00	5.00	0.40	290	1.12	0.80	0.0182	10.00	0.70	0.74	0.80	8	13
12	4.50	194.07	7.93	6.00	6.00	0.40	290	1.12	0.80	0.0182	12.00	0.70	0.77	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.6 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	6.93	195.07	7.00	7.00	14	5	8	5	8
3.50	6.93	195.07	8.00	8.00	14	4	7	4	7
3.50	6.93	195.07	9.00	9.00	14	4	6	4	6
3.50	6.93	195.07	10.00	10.00	14	4	6	4	6
4.00	7.43	194.57	7.00	7.00	15	5	8	5	8
4.00	7.43	194.57	8.00	8.00	14	5	7	5	7
4.00	7.43	194.57	9.00	9.00	14	4	6	4	6
4.00	7.43	194.57	10.00	10.00	14	4	6	4	6
4.50	7.93	194.07	7.00	7.00	15	5	9	5	9
4.50	7.93	194.07	8.00	8.00	15	5	7	5	7
4.50	7.93	194.07	9.00	9.00	14	4	7	4	7
4.50	7.93	194.07	10.00	10.00	14	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.7 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
2	8.00	8.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
3	9.00	9.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
4	10.00	10.00	3.50	6.93	195.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
5	7.00	7.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
6	8.00	8.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
7	9.00	9.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
8	10.00	10.00	4.00	7.43	194.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
9	7.00	7.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
10	8.00	8.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
11	9.00	9.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14
12	10.00	10.00	4.50	7.93	194.07	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	14

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.8 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	195.07	6.93	7.00	7.00	0.40	290	1.12	0.80	0.0182	13.50	0.70	0.85	0.80	5	8
2	3.50	195.07	6.93	8.00	8.00	0.40	290	1.12	0.80	0.0182	13.50	0.70	0.87	0.80	4	7
3	3.50	195.07	6.93	9.00	9.00	0.40	290	1.12	0.80	0.0182	13.50	0.70	0.89	0.80	4	6
4	3.50	195.07	6.93	10.00	10.00	0.40	290	1.12	0.80	0.0182	13.50	0.70	0.90	0.80	4	6
5	4.00	194.57	7.43	7.00	7.00	0.40	290	1.12	0.80	0.0182	13.00	0.70	0.83	0.80	5	8
6	4.00	194.57	7.43	8.00	8.00	0.40	290	1.12	0.80	0.0182	13.00	0.70	0.85	0.80	5	7
7	4.00	194.57	7.43	9.00	9.00	0.40	290	1.12	0.80	0.0182	13.00	0.70	0.87	0.80	4	6
8	4.00	194.57	7.43	10.00	10.00	0.40	290	1.12	0.80	0.0182	13.00	0.70	0.88	0.80	4	6
9	4.50	194.07	7.93	7.00	7.00	0.40	290	1.12	0.80	0.0182	12.50	0.70	0.80	0.80	5	9
10	4.50	194.07	7.93	8.00	8.00	0.40	290	1.12	0.80	0.0182	12.50	0.70	0.83	0.80	5	7
11	4.50	194.07	7.93	9.00	9.00	0.40	290	1.12	0.80	0.0182	12.50	0.70	0.85	0.80	4	7
12	4.50	194.07	7.93	10.00	10.00	0.40	290	1.12	0.80	0.0182	12.50	0.70	0.87	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.9 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.1)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
5.00	8.43	193.57	1.50	1.50	21	28	45	21	21
5.00	8.43	193.57	2.00	2.00	19	21	34	19	19
5.00	8.43	193.57	2.50	2.50	18	17	27	17	18
5.00	8.43	193.57	3.00	3.00	17	14	23	14	17
5.00	8.43	193.57	3.50	3.50	17	12	19	12	17
5.00	8.43	193.57	4.00	4.00	16	11	17	11	16
5.00	8.43	193.57	5.00	5.00	16	8	14	8	14
5.00	8.43	193.57	6.00	6.00	15	7	11	7	11
5.00	8.43	193.57	7.00	7.00	15	6	9	6	9
5.00	8.43	193.57	8.00	8.00	15	5	8	5	8
5.00	8.43	193.57	9.00	9.00	15	4	7	4	7
5.00	8.43	193.57	10.00	10.00	15	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-18.10 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.70	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	21
2	2.00	2.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.52	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	19
3	2.50	2.50	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	18
4	3.00	3.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.35	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
5	3.50	3.50	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	17
6	4.00	4.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.26	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
7	5.00	5.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	16
8	6.00	6.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
9	7.00	7.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
10	8.00	8.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
11	9.00	9.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15
12	10.00	10.00	5.00	8.43	193.57	0.59	4	5.92	0.32	0.25	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX 18.11 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	5.00	193.57	8.43	1.50	1.50	0.40	293	1.12	0.80	0.0163	3.00	0.70	0.73	0.80	28	45
2	5.00	193.57	8.43	2.00	2.00	0.40	293	1.12	0.80	0.0163	4.00	0.70	0.73	0.80	21	34
3	5.00	193.57	8.43	2.50	2.50	0.40	293	1.12	0.80	0.0163	5.00	0.70	0.73	0.80	17	27
4	5.00	193.57	8.43	3.00	3.00	0.40	293	1.12	0.80	0.0163	6.00	0.70	0.73	0.80	14	23
5	5.00	193.57	8.43	3.50	3.50	0.40	293	1.12	0.80	0.0163	7.00	0.70	0.73	0.80	12	19
6	5.00	193.57	8.43	4.00	4.00	0.40	293	1.12	0.80	0.0163	8.00	0.70	0.73	0.80	11	17
7	5.00	193.57	8.43	5.00	5.00	0.40	293	1.12	0.80	0.0163	10.00	0.70	0.73	0.80	8	14
8	5.00	193.57	8.43	6.00	6.00	0.40	293	1.12	0.80	0.0163	12.00	0.70	0.75	0.80	7	11
9	5.00	193.57	8.43	7.00	7.00	0.40	293	1.12	0.80	0.0163	12.00	0.70	0.78	0.80	6	9
10	5.00	193.57	8.43	8.00	8.00	0.40	293	1.12	0.80	0.0163	12.00	0.70	0.81	0.80	5	8
11	5.00	193.57	8.43	9.00	9.00	0.40	293	1.12	0.80	0.0163	12.00	0.70	0.83	0.80	4	7
12	5.00	193.57	8.43	10.00	10.00	0.40	293	1.12	0.80	0.0163	12.00	0.70	0.85	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.12 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.32)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.43	197.57	1.50	1.50	8	16	25	8	8
1.00	4.43	197.57	2.00	2.00	8	11	18	8	8
1.00	4.43	197.57	2.50	2.50	8	9	14	8	8
1.00	4.43	197.57	3.00	3.00	8	7	12	7	8
2.00	5.43	196.57	1.50	1.50	10	17	27	10	10
2.00	5.43	196.57	2.00	2.00	9	12	20	9	9
2.00	5.43	196.57	2.50	2.50	9	10	16	9	9
2.00	5.43	196.57	3.00	3.00	9	8	13	8	9
3.00	6.43	195.57	1.50	1.50	11	17	27	11	11
3.00	6.43	195.57	2.00	2.00	10	12	20	10	10
3.00	6.43	195.57	2.50	2.50	9	10	16	9	9
3.00	6.43	195.57	3.00	3.00	9	8	13	8	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-18.13 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
2	2.00	2.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
3	2.50	2.50	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
4	3.00	3.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
5	1.50	1.50	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	10
6	2.00	2.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
7	2.50	2.50	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
8	3.00	3.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
9	1.50	1.50	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	11
10	2.00	2.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	10
11	2.50	2.50	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
12	3.00	3.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX 18.14 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	197.57	4.43	1.50	1.50	0.40	185	1.12	0.80	0.0292	3.00	0.70	0.80	0.80	16	25
2	1.00	197.57	4.43	2.00	2.00	0.40	185	1.12	0.80	0.0292	4.00	0.70	0.85	0.80	11	18
3	1.00	197.57	4.43	2.50	2.50	0.40	185	1.12	0.80	0.0292	5.00	0.70	0.88	0.80	9	14
4	1.00	197.57	4.43	3.00	3.00	0.40	185	1.12	0.80	0.0292	6.00	0.70	0.91	0.80	7	12
5	2.00	196.57	5.43	1.50	1.50	0.40	185	1.12	0.80	0.0292	3.00	0.70	0.73	0.80	17	27
6	2.00	196.57	5.43	2.00	2.00	0.40	185	1.12	0.80	0.0292	4.00	0.70	0.73	0.80	12	20
7	2.00	196.57	5.43	2.50	2.50	0.40	185	1.12	0.80	0.0292	5.00	0.70	0.76	0.80	10	16
8	2.00	196.57	5.43	3.00	3.00	0.40	185	1.12	0.80	0.0292	6.00	0.70	0.80	0.80	8	13
9	3.00	195.57	6.43	1.50	1.50	0.40	185	1.12	0.80	0.0292	3.00	0.70	0.73	0.80	17	27
10	3.00	195.57	6.43	2.00	2.00	0.40	185	1.12	0.80	0.0292	4.00	0.70	0.73	0.80	12	20
11	3.00	195.57	6.43	2.50	2.50	0.40	185	1.12	0.80	0.0292	5.00	0.70	0.73	0.80	10	16
12	3.00	195.57	6.43	3.00	3.00	0.40	185	1.12	0.80	0.0292	6.00	0.70	0.73	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.15 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.35)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.43	197.57	3.50	3.50	8	6	10	6	8
1.00	4.43	197.57	4.00	4.00	8	5	9	5	8
1.00	4.43	197.57	5.00	5.00	8	4	7	4	7
1.00	4.43	197.57	6.00	6.00	8	4	6	4	6
2.00	5.43	196.57	3.50	3.50	8	7	11	7	8
2.00	5.43	196.57	4.00	4.00	8	6	9	6	8
2.00	5.43	196.57	5.00	5.00	8	4	7	4	7
2.00	5.43	196.57	6.00	6.00	8	4	6	4	6
3.00	6.43	195.57	3.50	3.50	9	7	11	7	9
3.00	6.43	195.57	4.00	4.00	9	6	10	6	9
3.00	6.43	195.57	5.00	5.00	9	5	7	5	7
3.00	6.43	195.57	6.00	6.00	8	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-18.16 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
2	4.00	4.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
3	5.00	5.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
4	6.00	6.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
5	3.50	3.50	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
6	4.00	4.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
7	5.00	5.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
8	6.00	6.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
9	3.50	3.50	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
10	4.00	4.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
11	5.00	5.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	9
12	6.00	6.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX 18.17 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	197.57	4.43	3.50	3.50	0.40	185	1.12	0.80	0.0292	7.00	0.70	0.92	0.80	6	10
2	1.00	197.57	4.43	4.00	4.00	0.40	185	1.12	0.80	0.0292	8.00	0.70	0.93	0.80	5	9
3	1.00	197.57	4.43	5.00	5.00	0.40	185	1.12	0.80	0.0292	10.00	0.70	0.95	0.80	4	7
4	1.00	197.57	4.43	6.00	6.00	0.40	185	1.12	0.80	0.0292	12.00	0.70	0.96	0.80	4	6
5	2.00	196.57	5.43	3.50	3.50	0.40	185	1.12	0.80	0.0292	7.00	0.70	0.83	0.80	7	11
6	2.00	196.57	5.43	4.00	4.00	0.40	185	1.12	0.80	0.0292	8.00	0.70	0.85	0.80	6	9
7	2.00	196.57	5.43	5.00	5.00	0.40	185	1.12	0.80	0.0292	10.00	0.70	0.88	0.80	4	7
8	2.00	196.57	5.43	6.00	6.00	0.40	185	1.12	0.80	0.0292	12.00	0.70	0.91	0.80	4	6
9	3.00	195.57	6.43	3.50	3.50	0.40	185	1.12	0.80	0.0292	7.00	0.70	0.75	0.80	7	11
10	3.00	195.57	6.43	4.00	4.00	0.40	185	1.12	0.80	0.0292	8.00	0.70	0.77	0.80	6	10
11	3.00	195.57	6.43	5.00	5.00	0.40	185	1.12	0.80	0.0292	10.00	0.70	0.82	0.80	5	7
12	3.00	195.57	6.43	6.00	6.00	0.40	185	1.12	0.80	0.0292	12.00	0.70	0.85	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 18.18 (For BH-163 (Rain water harvesting pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 198.57m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 18.28)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 18.38)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	4.43	197.57	7.00	7.00	8	3	5	3	5
1.00	4.43	197.57	8.00	8.00	8	3	4	3	4
1.00	4.43	197.57	9.00	9.00	8	2	4	2	4
1.00	4.43	197.57	10.00	10.00	8	2	3	2	3
2.00	5.43	196.57	7.00	7.00	8	3	5	3	5
2.00	5.43	196.57	8.00	8.00	8	3	4	3	4
2.00	5.43	196.57	9.00	9.00	8	2	4	2	4
2.00	5.43	196.57	10.00	10.00	8	2	3	2	3
3.00	6.43	195.57	7.00	7.00	8	3	5	3	5
3.00	6.43	195.57	8.00	8.00	8	3	4	3	4
3.00	6.43	195.57	9.00	9.00	8	2	4	2	4
3.00	6.43	195.57	10.00	10.00	8	2	4	2	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-18.19 (For BH-163 (Rain water harvesting pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
2	8.00	8.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
3	9.00	9.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
4	10.00	10.00	1.00	4.43	197.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
5	7.00	7.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
6	8.00	8.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
7	9.00	9.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
8	10.00	10.00	2.00	5.43	196.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
9	7.00	7.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
10	8.00	8.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
11	9.00	9.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8
12	10.00	10.00	3.00	6.43	195.57	0.37	3	5.64	0.20	0.16	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.91	0.96	0.50	0.50	8

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 198.57m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX 18.20 (For BH-163 (Rain water harvesting pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	197.57	4.43	7.00	7.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.97	0.80	3	5
2	1.00	197.57	4.43	8.00	8.00	0.40	185	1.12	0.80	0.0292	16.00	0.70	0.97	0.80	3	4
3	1.00	197.57	4.43	9.00	9.00	0.40	185	1.12	0.80	0.0292	16.00	0.70	0.97	0.80	2	4
4	1.00	197.57	4.43	10.00	10.00	0.40	185	1.12	0.80	0.0292	16.00	0.70	0.98	0.80	2	3
5	2.00	196.57	5.43	7.00	7.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.92	0.80	3	5
6	2.00	196.57	5.43	8.00	8.00	0.40	185	1.12	0.80	0.0292	15.00	0.70	0.93	0.80	3	4
7	2.00	196.57	5.43	9.00	9.00	0.40	185	1.12	0.80	0.0292	15.00	0.70	0.94	0.80	2	4
8	2.00	196.57	5.43	10.00	10.00	0.40	185	1.12	0.80	0.0292	15.00	0.70	0.95	0.80	2	3
9	3.00	195.57	6.43	7.00	7.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.87	0.80	3	5
10	3.00	195.57	6.43	8.00	8.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.89	0.80	3	4
11	3.00	195.57	6.43	9.00	9.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.91	0.80	2	4
12	3.00	195.57	6.43	10.00	10.00	0.40	185	1.12	0.80	0.0292	14.00	0.70	0.92	0.80	2	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
1.00	3.87	198.13	1.50	1.50	4	16	26	4	4
1.00	3.87	198.13	2.00	2.00	4	12	19	4	4
1.00	3.87	198.13	2.50	2.50	4	9	15	4	4
1.00	3.87	198.13	3.00	3.00	4	8	12	4	4
1.00	3.87	198.13	3.50	3.50	5	7	10	5	5
1.00	3.87	198.13	4.00	4.00	5	6	9	5	5
1.00	3.87	198.13	5.00	5.00	5	5	7	5	5
1.00	3.87	198.13	6.00	6.00	6	4	6	4	6
1.00	3.87	198.13	7.00	7.00	7	3	5	3	5
1.00	3.87	198.13	8.00	8.00	7	3	5	3	5
1.00	3.87	198.13	9.00	9.00	8	2	4	2	4
1.00	3.87	198.13	10.00	10.00	8	2	4	2	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.1 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.66	0.83	0.50	0.50	4
2	2.00	2.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.66	0.83	0.50	0.50	4
3	2.50	2.50	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.66	0.83	0.50	0.50	4
4	3.00	3.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.66	0.83	0.50	0.50	4
5	3.50	3.50	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.66	0.83	0.50	0.50	5
6	4.00	4.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.66	0.83	0.50	0.50	5
7	5.00	5.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.66	0.83	0.50	0.50	5
8	6.00	6.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.66	0.83	0.50	0.50	6
9	7.00	7.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.66	0.83	0.50	0.50	7
10	8.00	8.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.66	0.83	0.50	0.50	7
11	9.00	9.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.66	0.83	0.50	0.50	8
12	10.00	10.00	1.00	3.87	198.13	0.01	25	13.53	4.60	4.54	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.66	0.83	0.50	0.50	8

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.2 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	198.13	3.87	1.50	1.50	0.35	112	1.12	0.80	0.0151	3.00	0.70	0.80	0.80	16	26
2	1.00	198.13	3.87	2.00	2.00	0.35	112	1.12	0.80	0.0151	4.00	0.70	0.85	0.80	12	19
3	1.00	198.13	3.87	2.50	2.50	0.35	112	1.12	0.80	0.0151	5.00	0.70	0.88	0.80	9	15
4	1.00	198.13	3.87	3.00	3.00	0.35	112	1.12	0.80	0.0151	6.00	0.70	0.91	0.80	8	12
5	1.00	198.13	3.87	3.50	3.50	0.35	112	1.12	0.80	0.0151	7.00	0.70	0.92	0.80	7	10
6	1.00	198.13	3.87	4.00	4.00	0.35	112	1.12	0.80	0.0151	8.00	0.70	0.93	0.80	6	9
7	1.00	198.13	3.87	5.00	5.00	0.35	112	1.12	0.80	0.0151	10.00	0.70	0.95	0.80	5	7
8	1.00	198.13	3.87	6.00	6.00	0.35	112	1.12	0.80	0.0151	12.00	0.70	0.96	0.80	4	6
9	1.00	198.13	3.87	7.00	7.00	0.35	112	1.12	0.80	0.0151	14.00	0.70	0.97	0.80	3	5
10	1.00	198.13	3.87	8.00	8.00	0.35	112	1.12	0.80	0.0151	16.00	0.70	0.97	0.80	3	5
11	1.00	198.13	3.87	9.00	9.00	0.35	112	1.12	0.80	0.0151	18.00	0.70	0.97	0.80	2	4
12	1.00	198.13	3.87	10.00	10.00	0.35	112	1.12	0.80	0.0151	18.00	0.70	0.98	0.80	2	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19.3 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.00	4.87	197.13	1.50	1.50	17	32	51	17	17
2.00	4.87	197.13	2.00	2.00	16	24	38	16	16
2.00	4.87	197.13	2.50	2.50	15	19	30	15	15
2.00	4.87	197.13	3.00	3.00	15	15	24	15	15
3.00	5.87	196.13	1.50	1.50	18	32	51	18	18
3.00	5.87	196.13	2.00	2.00	17	24	38	17	17
3.00	5.87	196.13	2.50	2.50	16	19	31	16	16
3.00	5.87	196.13	3.00	3.00	16	16	26	16	16
4.00	6.87	195.13	1.50	1.50	20	32	51	20	20
4.00	6.87	195.13	2.00	2.00	19	24	38	19	19
4.00	6.87	195.13	2.50	2.50	17	19	31	17	17
4.00	6.87	195.13	3.00	3.00	17	16	26	16	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.4 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	17
2	2.00	2.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	16
3	2.50	2.50	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
4	3.00	3.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
5	1.50	1.50	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	18
6	2.00	2.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	17
7	2.50	2.50	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	16
8	3.00	3.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	16
9	1.50	1.50	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.55	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	20
10	2.00	2.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	19
11	2.50	2.50	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.33	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	17
12	3.00	3.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.5 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.00	197.13	4.87	1.50	1.50	0.40	355	1.12	0.80	0.0151	3.00	0.70	0.73	0.80	32	51
2	2.00	197.13	4.87	2.00	2.00	0.40	355	1.12	0.80	0.0151	4.00	0.70	0.73	0.80	24	38
3	2.00	197.13	4.87	2.50	2.50	0.40	355	1.12	0.80	0.0151	5.00	0.70	0.76	0.80	19	30
4	2.00	197.13	4.87	3.00	3.00	0.40	355	1.12	0.80	0.0151	6.00	0.70	0.80	0.80	15	24
5	3.00	196.13	5.87	1.50	1.50	0.40	355	1.12	0.80	0.0151	3.00	0.70	0.73	0.80	32	51
6	3.00	196.13	5.87	2.00	2.00	0.40	355	1.12	0.80	0.0151	4.00	0.70	0.73	0.80	24	38
7	3.00	196.13	5.87	2.50	2.50	0.40	355	1.12	0.80	0.0151	5.00	0.70	0.73	0.80	19	31
8	3.00	196.13	5.87	3.00	3.00	0.40	355	1.12	0.80	0.0151	6.00	0.70	0.73	0.80	16	26
9	4.00	195.13	6.87	1.50	1.50	0.40	355	1.12	0.80	0.0151	3.00	0.70	0.73	0.80	32	51
10	4.00	195.13	6.87	2.00	2.00	0.40	355	1.12	0.80	0.0151	4.00	0.70	0.73	0.80	24	38
11	4.00	195.13	6.87	2.50	2.50	0.40	355	1.12	0.80	0.0151	5.00	0.70	0.73	0.80	19	31
12	4.00	195.13	6.87	3.00	3.00	0.40	355	1.12	0.80	0.0151	6.00	0.70	0.73	0.80	16	26

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19.6 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.00	4.87	197.13	3.50	3.50	15	13	20	13	15
2.00	4.87	197.13	4.00	4.00	14	11	18	11	14
2.00	4.87	197.13	5.00	5.00	14	9	14	9	14
2.00	4.87	197.13	6.00	6.00	14	7	11	7	11
3.00	5.87	196.13	3.50	3.50	15	14	22	14	15
3.00	5.87	196.13	4.00	4.00	15	12	19	12	15
3.00	5.87	196.13	5.00	5.00	15	9	14	9	14
3.00	5.87	196.13	6.00	6.00	15	7	12	7	12
4.00	6.87	195.13	3.50	3.50	16	14	22	14	16
4.00	6.87	195.13	4.00	4.00	16	12	19	12	16
4.00	6.87	195.13	5.00	5.00	15	9	15	9	15
4.00	6.87	195.13	6.00	6.00	15	8	12	8	12

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.7 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
2	4.00	4.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
3	5.00	5.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
4	6.00	6.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
5	3.50	3.50	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
6	4.00	4.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
7	5.00	5.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
8	6.00	6.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
9	3.50	3.50	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.23	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	16
10	4.00	4.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	16
11	5.00	5.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
12	6.00	6.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.8 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.00	197.13	4.87	3.50	3.50	0.40	355	1.12	0.80	0.0151	7.00	0.70	0.83	0.80	13	20
2	2.00	197.13	4.87	4.00	4.00	0.40	355	1.12	0.80	0.0151	8.00	0.70	0.85	0.80	11	18
3	2.00	197.13	4.87	5.00	5.00	0.40	355	1.12	0.80	0.0151	10.00	0.70	0.88	0.80	9	14
4	2.00	197.13	4.87	6.00	6.00	0.40	355	1.12	0.80	0.0151	12.00	0.70	0.91	0.80	7	11
5	3.00	196.13	5.87	3.50	3.50	0.40	355	1.12	0.80	0.0151	7.00	0.70	0.75	0.80	14	22
6	3.00	196.13	5.87	4.00	4.00	0.40	355	1.12	0.80	0.0151	8.00	0.70	0.77	0.80	12	19
7	3.00	196.13	5.87	5.00	5.00	0.40	355	1.12	0.80	0.0151	10.00	0.70	0.82	0.80	9	14
8	3.00	196.13	5.87	6.00	6.00	0.40	355	1.12	0.80	0.0151	12.00	0.70	0.85	0.80	7	12
9	4.00	195.13	6.87	3.50	3.50	0.40	355	1.12	0.80	0.0151	7.00	0.70	0.73	0.80	14	22
10	4.00	195.13	6.87	4.00	4.00	0.40	355	1.12	0.80	0.0151	8.00	0.70	0.73	0.80	12	19
11	4.00	195.13	6.87	5.00	5.00	0.40	355	1.12	0.80	0.0151	10.00	0.70	0.76	0.80	9	15
12	4.00	195.13	6.87	6.00	6.00	0.40	355	1.12	0.80	0.0151	12.00	0.70	0.80	0.80	8	12

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19.9 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 20)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 20.1)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.00	4.87	197.13	7.00	7.00	14	6	9	6	9
2.00	4.87	197.13	8.00	8.00	14	5	8	5	8
2.00	4.87	197.13	9.00	9.00	14	5	7	5	7
2.00	4.87	197.13	10.00	10.00	14	4	7	4	7
3.00	5.87	196.13	7.00	7.00	14	6	10	6	10
3.00	5.87	196.13	8.00	8.00	14	5	8	5	8
3.00	5.87	196.13	9.00	9.00	14	5	7	5	7
3.00	5.87	196.13	10.00	10.00	14	4	7	4	7
4.00	6.87	195.13	7.00	7.00	15	6	10	6	10
4.00	6.87	195.13	8.00	8.00	15	5	9	5	9
4.00	6.87	195.13	9.00	9.00	15	5	8	5	8
4.00	6.87	195.13	10.00	10.00	14	4	7	4	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.10 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
2	8.00	8.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
3	9.00	9.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
4	10.00	10.00	2.00	4.87	197.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
5	7.00	7.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
6	8.00	8.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
7	9.00	9.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
8	10.00	10.00	3.00	5.87	196.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14
9	7.00	7.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
10	8.00	8.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
11	9.00	9.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	15
12	10.00	10.00	4.00	6.87	195.13	0.68	2	5.48	0.14	0.11	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.66	0.83	0.50	0.50	14

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.11 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.00	197.13	4.87	7.00	7.00	0.40	355	1.12	0.80	0.0151	14.00	0.70	0.92	0.80	6	9
2	2.00	197.13	4.87	8.00	8.00	0.40	355	1.12	0.80	0.0151	16.00	0.70	0.93	0.80	5	8
3	2.00	197.13	4.87	9.00	9.00	0.40	355	1.12	0.80	0.0151	17.00	0.70	0.94	0.80	5	7
4	2.00	197.13	4.87	10.00	10.00	0.40	355	1.12	0.80	0.0151	17.00	0.70	0.95	0.80	4	7
5	3.00	196.13	5.87	7.00	7.00	0.40	355	1.12	0.80	0.0151	14.00	0.70	0.87	0.80	6	10
6	3.00	196.13	5.87	8.00	8.00	0.40	355	1.12	0.80	0.0151	16.00	0.70	0.89	0.80	5	8
7	3.00	196.13	5.87	9.00	9.00	0.40	355	1.12	0.80	0.0151	16.00	0.70	0.91	0.80	5	7
8	3.00	196.13	5.87	10.00	10.00	0.40	355	1.12	0.80	0.0151	16.00	0.70	0.92	0.80	4	7
9	4.00	195.13	6.87	7.00	7.00	0.40	355	1.12	0.80	0.0151	14.00	0.70	0.83	0.80	6	10
10	4.00	195.13	6.87	8.00	8.00	0.40	355	1.12	0.80	0.0151	15.00	0.70	0.85	0.80	5	9
11	4.00	195.13	6.87	9.00	9.00	0.40	355	1.12	0.80	0.0151	15.00	0.70	0.87	0.80	5	8
12	4.00	195.13	6.87	10.00	10.00	0.40	355	1.12	0.80	0.0151	15.00	0.70	0.88	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19.12 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.32)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
5.00	7.87	194.13	1.50	1.50	29	32	51	29	29
5.00	7.87	194.13	2.00	2.00	27	24	38	24	27
5.00	7.87	194.13	2.50	2.50	26	19	31	19	26
5.00	7.87	194.13	3.00	3.00	26	16	25	16	25
5.00	7.87	194.13	3.50	3.50	26	14	22	14	22
5.00	7.87	194.13	4.00	4.00	25	12	19	12	19
5.00	7.87	194.13	5.00	5.00	26	10	15	10	15
5.00	7.87	194.13	6.00	6.00	26	8	13	8	13
5.00	7.87	194.13	7.00	7.00	27	7	11	7	11
5.00	7.87	194.13	8.00	8.00	27	6	10	6	10
5.00	7.87	194.13	9.00	9.00	28	5	8	5	8
5.00	7.87	194.13	10.00	10.00	29	5	8	5	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.13 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.92	1.46	1.46	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
2	2.00	2.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.69	1.34	1.34	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
3	2.50	2.50	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.55	1.28	1.28	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
4	3.00	3.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.46	1.23	1.23	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
5	3.50	3.50	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.39	1.20	1.20	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
6	4.00	4.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
7	5.00	5.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
8	6.00	6.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
9	7.00	7.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
10	8.00	8.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
11	9.00	9.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28
12	10.00	10.00	5.00	7.87	194.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.14 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL D m	Depth of Foundation From FGL D m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	5.00	7.87	1.50	1.12	0.35	150	0.80	32	51
2	5.00	7.87	2.00	1.12	0.35	150	0.80	24	38
3	5.00	7.87	2.50	1.12	0.35	150	0.80	19	31
4	5.00	7.87	3.00	1.12	0.35	150	0.80	16	25
5	5.00	7.87	3.50	1.12	0.35	150	0.80	14	22
6	5.00	7.87	4.00	1.12	0.35	150	0.80	12	19
7	5.00	7.87	5.00	1.12	0.35	150	0.80	10	15
8	5.00	7.87	6.00	1.12	0.35	150	0.80	8	13
9	5.00	7.87	7.00	1.12	0.35	150	0.80	7	11
10	5.00	7.87	8.00	1.12	0.35	150	0.80	6	10
11	5.00	7.87	9.00	1.12	0.35	150	0.80	5	8
12	5.00	7.87	10.00	1.12	0.35	150	0.80	5	8

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 19.15 (For BH-169 (Raw water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.13m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 19.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 19.35)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
6.00	8.87	193.13	1.50	1.50	36	32	51	32	36
6.00	8.87	193.13	2.00	2.00	33	24	38	24	33
6.00	8.87	193.13	2.50	2.50	31	19	31	19	31
6.00	8.87	193.13	3.00	3.00	30	16	25	16	25
6.00	8.87	193.13	3.50	3.50	30	14	22	14	22
6.00	8.87	193.13	4.00	4.00	29	12	19	12	19
6.00	8.87	193.13	5.00	5.00	29	10	15	10	15
6.00	8.87	193.13	6.00	6.00	30	8	13	8	13
6.00	8.87	193.13	7.00	7.00	30	7	11	7	11
6.00	8.87	193.13	8.00	8.00	31	6	10	6	10
6.00	8.87	193.13	9.00	9.00	31	5	8	5	8
6.00	8.87	193.13	10.00	10.00	32	5	8	5	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.16 (For BH-169 (Raw water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	2.10	1.55	1.55	1.00	1.00	1.00	1.74	0.87	0.50	0.50	36
2	2.00	2.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.83	1.41	1.41	1.00	1.00	1.00	1.74	0.87	0.50	0.50	33
3	2.50	2.50	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.66	1.33	1.33	1.00	1.00	1.00	1.74	0.87	0.50	0.50	31
4	3.00	3.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.55	1.28	1.28	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
5	3.50	3.50	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.47	1.24	1.24	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
6	4.00	4.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.41	1.21	1.21	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
7	5.00	5.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
8	6.00	6.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
9	7.00	7.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
10	8.00	8.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.74	0.87	0.50	0.50	31
11	9.00	9.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	31
12	10.00	10.00	6.00	8.87	193.13	0.08	26	15.83	6.23	6.59	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	32

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.13m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-19.17 (For BH-169 (Raw water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL D m	Depth of Foundation From FGL D m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	6.00	8.87	1.50	1.12	0.35	150	0.80	32	51
2	6.00	8.87	2.00	1.12	0.35	150	0.80	24	38
3	6.00	8.87	2.50	1.12	0.35	150	0.80	19	31
4	6.00	8.87	3.00	1.12	0.35	150	0.80	16	25
5	6.00	8.87	3.50	1.12	0.35	150	0.80	14	22
6	6.00	8.87	4.00	1.12	0.35	150	0.80	12	19
7	6.00	8.87	5.00	1.12	0.35	150	0.80	10	15
8	6.00	8.87	6.00	1.12	0.35	150	0.80	8	13
9	6.00	8.87	7.00	1.12	0.35	150	0.80	7	11
10	6.00	8.87	8.00	1.12	0.35	150	0.80	6	10
11	6.00	8.87	9.00	1.12	0.35	150	0.80	5	8
12	6.00	8.87	10.00	1.12	0.35	150	0.80	5	8

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20 (For BH- 172,173,174 (Raw water reservoir))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from EGL (R.L. 196.80m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 20.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 20.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.80	195.00	1.50	1.50	7	16	26	7	7
1.80	195.00	2.00	2.00	7	12	19	7	7
1.80	195.00	2.50	2.50	7	9	15	7	7
1.80	195.00	3.00	3.00	7	8	12	7	7
2.80	194.00	1.50	1.50	8	16	26	8	8
2.80	194.00	2.00	2.00	8	12	19	8	8
2.80	194.00	2.50	2.50	7	10	16	7	7
2.80	194.00	3.00	3.00	7	8	13	7	7
3.80	193.00	1.50	1.50	9	16	26	9	9
3.80	193.00	2.00	2.00	8	12	19	8	8
3.80	193.00	2.50	2.50	8	10	16	8	8
3.80	193.00	3.00	3.00	7	8	13	7	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.1 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
2	2.00	2.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
3	2.50	2.50	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
4	3.00	3.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
5	1.50	1.50	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.37	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	8
6	2.00	2.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	8
7	2.50	2.50	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
8	3.00	3.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
9	1.50	1.50	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.51	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	9
10	2.00	2.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.38	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	8
11	2.50	2.50	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	8
12	3.00	3.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.2 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	1.80	195.00	1.50	1.50	0.40	120	1.12	0.80	0.0198	3.00	0.70	0.73	0.80	16	26
2	1.80	195.00	2.00	2.00	0.40	120	1.12	0.80	0.0198	4.00	0.70	0.74	0.80	12	19
3	1.80	195.00	2.50	2.50	0.40	120	1.12	0.80	0.0198	5.00	0.70	0.78	0.80	9	15
4	1.80	195.00	3.00	3.00	0.40	120	1.12	0.80	0.0198	6.00	0.70	0.82	0.80	8	12
5	2.80	194.00	1.50	1.50	0.40	120	1.12	0.80	0.0198	3.00	0.70	0.73	0.80	16	26
6	2.80	194.00	2.00	2.00	0.40	120	1.12	0.80	0.0198	4.00	0.70	0.73	0.80	12	19
7	2.80	194.00	2.50	2.50	0.40	120	1.12	0.80	0.0198	5.00	0.70	0.73	0.80	10	16
8	2.80	194.00	3.00	3.00	0.40	120	1.12	0.80	0.0198	6.00	0.70	0.74	0.80	8	13
9	3.80	193.00	1.50	1.50	0.40	120	1.12	0.80	0.0198	3.00	0.70	0.73	0.80	16	26
10	3.80	193.00	2.00	2.00	0.40	120	1.12	0.80	0.0198	4.00	0.70	0.73	0.80	12	19
11	3.80	193.00	2.50	2.50	0.40	120	1.12	0.80	0.0198	5.00	0.70	0.73	0.80	10	16
12	3.80	193.00	3.00	3.00	0.40	120	1.12	0.80	0.0198	6.00	0.70	0.73	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.3 (For BH- 172,173,174 (Raw water reservoir))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from EGL (R.L. 196.80m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 20.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 20.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.80	195.00	3.50	3.50	7	7	10	7	7
1.80	195.00	4.00	4.00	6	6	9	6	6
1.80	195.00	5.00	5.00	6	4	7	4	6
1.80	195.00	6.00	6.00	6	4	6	4	6
2.80	194.00	3.50	3.50	7	7	11	7	7
2.80	194.00	4.00	4.00	7	6	9	6	7
2.80	194.00	5.00	5.00	7	5	7	5	7
2.80	194.00	6.00	6.00	6	4	6	4	6
3.80	193.00	3.50	3.50	7	7	11	7	7
3.80	193.00	4.00	4.00	7	6	10	6	7
3.80	193.00	5.00	5.00	7	5	8	5	7
3.80	193.00	6.00	6.00	7	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.4 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTTP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
	m	m																			W _q	W _γ	
1	3.50	3.50	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
2	4.00	4.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
3	5.00	5.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
4	6.00	6.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
5	3.50	3.50	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
6	4.00	4.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
7	5.00	5.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
8	6.00	6.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
9	3.50	3.50	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
10	4.00	4.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
11	5.00	5.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
12	6.00	6.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.5 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	1.80	195.00	3.50	3.50	0.40	120	1.12	0.80	0.0198	7.00	0.70	0.84	0.80	7	10
2	1.80	195.00	4.00	4.00	0.40	120	1.12	0.80	0.0198	8.00	0.70	0.87	0.80	6	9
3	1.80	195.00	5.00	5.00	0.40	120	1.12	0.80	0.0198	10.00	0.70	0.90	0.80	4	7
4	1.80	195.00	6.00	6.00	0.40	120	1.12	0.80	0.0198	12.00	0.70	0.92	0.80	4	6
5	2.80	194.00	3.50	3.50	0.40	120	1.12	0.80	0.0198	7.00	0.70	0.76	0.80	7	11
6	2.80	194.00	4.00	4.00	0.40	120	1.12	0.80	0.0198	8.00	0.70	0.79	0.80	6	9
7	2.80	194.00	5.00	5.00	0.40	120	1.12	0.80	0.0198	10.00	0.70	0.83	0.80	5	7
8	2.80	194.00	6.00	6.00	0.40	120	1.12	0.80	0.0198	11.70	0.70	0.86	0.80	4	6
9	3.80	193.00	3.50	3.50	0.40	120	1.12	0.80	0.0198	7.00	0.70	0.73	0.80	7	11
10	3.80	193.00	4.00	4.00	0.40	120	1.12	0.80	0.0198	8.00	0.70	0.73	0.80	6	10
11	3.80	193.00	5.00	5.00	0.40	120	1.12	0.80	0.0198	10.00	0.70	0.77	0.80	5	8
12	3.80	193.00	6.00	6.00	0.40	120	1.12	0.80	0.0198	10.70	0.70	0.81	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.6 (For BH- 172,173,174 (Raw water reservoir))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from EGL (R.L. 196.80m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 20.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 20.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.80	195.00	7.00	7.00	6	3	5	3	5
1.80	195.00	8.00	8.00	6	3	4	3	4
1.80	195.00	9.00	9.00	6	2	4	2	4
1.80	195.00	10.00	10.00	6	2	4	2	4
2.80	194.00	7.00	7.00	6	3	5	3	5
2.80	194.00	8.00	8.00	6	3	4	3	4
2.80	194.00	9.00	9.00	6	3	4	3	4
2.80	194.00	10.00	10.00	6	2	4	2	4
3.80	193.00	7.00	7.00	7	3	5	3	5
3.80	193.00	8.00	8.00	6	3	5	3	5
3.80	193.00	9.00	9.00	6	3	4	3	4
3.80	193.00	10.00	10.00	6	2	4	2	4

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.7 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	φ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	7.00	7.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
2	8.00	8.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
3	9.00	9.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
4	10.00	10.00	1.80	195.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
5	7.00	7.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
6	8.00	8.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
7	9.00	9.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
8	10.00	10.00	2.80	194.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
9	7.00	7.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	7
10	8.00	8.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
11	9.00	9.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6
12	10.00	10.00	3.80	193.00	0.33	0	5.14	0.00	0.00	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.93	0.97	0.50	0.50	6

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 196.80m.
- 3) Calculations are considering the effect of water table at NGL.
- 4) Shear Parameters are correlated based on SPT N value.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 20.8 (For BH- 172,173,174 (Raw water reservoir))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ²	T / m ²
1	1.80	195.00	7.00	7.00	0.40	120	1.12	0.80	0.0198	12.70	0.70	0.93	0.80	3	5
2	1.80	195.00	8.00	8.00	0.40	120	1.12	0.80	0.0198	12.70	0.70	0.94	0.80	3	4
3	1.80	195.00	9.00	9.00	0.40	120	1.12	0.80	0.0198	12.70	0.70	0.95	0.80	2	4
4	1.80	195.00	10.00	10.00	0.40	120	1.12	0.80	0.0198	12.70	0.70	0.95	0.80	2	4
5	2.80	194.00	7.00	7.00	0.40	120	1.12	0.80	0.0198	11.70	0.70	0.88	0.80	3	5
6	2.80	194.00	8.00	8.00	0.40	120	1.12	0.80	0.0198	11.70	0.70	0.90	0.80	3	4
7	2.80	194.00	9.00	9.00	0.40	120	1.12	0.80	0.0198	11.70	0.70	0.91	0.80	3	4
8	2.80	194.00	10.00	10.00	0.40	120	1.12	0.80	0.0198	11.70	0.70	0.92	0.80	2	4
9	3.80	193.00	7.00	7.00	0.40	120	1.12	0.80	0.0198	10.70	0.70	0.84	0.80	3	5
10	3.80	193.00	8.00	8.00	0.40	120	1.12	0.80	0.0198	10.70	0.70	0.86	0.80	3	5
11	3.80	193.00	9.00	9.00	0.40	120	1.12	0.80	0.0198	10.70	0.70	0.88	0.80	3	4
12	3.80	193.00	10.00	10.00	0.40	120	1.12	0.80	0.0198	10.70	0.70	0.89	0.80	2	4

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 21.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 21.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	5.88	199.50	1.50	1.50	14	25	40	14	14
3.00	5.88	199.50	2.00	2.00	13	19	30	13	13
3.00	5.88	199.50	2.50	2.50	12	15	24	12	12
3.00	5.88	199.50	3.00	3.00	12	13	20	12	12
3.50	6.38	199.00	1.50	1.50	15	25	40	15	15
3.50	6.38	199.00	2.00	2.00	14	19	30	14	14
3.50	6.38	199.00	2.50	2.50	13	15	24	13	13
3.50	6.38	199.00	3.00	3.00	12	13	20	12	12
4.00	6.88	198.50	1.50	1.50	15	25	40	15	15
4.00	6.88	198.50	2.00	2.00	14	19	30	14	14
4.00	6.88	198.50	2.50	2.50	13	15	24	13	13
4.00	6.88	198.50	3.00	3.00	13	13	20	13	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.1 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	14
2	2.00	2.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.32	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	13
3	2.50	2.50	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
4	3.00	3.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
5	1.50	1.50	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.49	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	15
6	2.00	2.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.37	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	14
7	2.50	2.50	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	13
8	3.00	3.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
9	1.50	1.50	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.57	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	15
10	2.00	2.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	14
11	2.50	2.50	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.34	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	13
12	3.00	3.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	13

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.2 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.00	199.50	5.88	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.73	0.80	25	40
2	3.00	199.50	5.88	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.73	0.80	19	30
3	3.00	199.50	5.88	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.73	0.80	15	24
4	3.00	199.50	5.88	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.73	0.80	13	20
5	3.50	199.00	6.38	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.73	0.80	25	40
6	3.50	199.00	6.38	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.73	0.80	19	30
7	3.50	199.00	6.38	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.73	0.80	15	24
8	3.50	199.00	6.38	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.73	0.80	13	20
9	4.00	198.50	6.88	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.73	0.80	25	40
10	4.00	198.50	6.88	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.73	0.80	19	30
11	4.00	198.50	6.88	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.73	0.80	15	24
12	4.00	198.50	6.88	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.73	0.80	13	20

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.3 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 21.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 21.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	5.88	199.50	3.50	3.50	12	11	17	11	12
3.00	5.88	199.50	4.00	4.00	12	9	15	9	12
3.00	5.88	199.50	5.00	5.00	11	7	11	7	11
3.00	5.88	199.50	6.00	6.00	11	6	9	6	9
3.50	6.38	199.00	3.50	3.50	12	11	17	11	12
3.50	6.38	199.00	4.00	4.00	12	9	15	9	12
3.50	6.38	199.00	5.00	5.00	12	7	11	7	11
3.50	6.38	199.00	6.00	6.00	11	6	9	6	9
4.00	6.88	198.50	3.50	3.50	12	11	17	11	12
4.00	6.88	198.50	4.00	4.00	12	9	15	9	12
4.00	6.88	198.50	5.00	5.00	12	7	12	7	12
4.00	6.88	198.50	6.00	6.00	12	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.4 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
2	4.00	4.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
3	5.00	5.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
4	6.00	6.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
5	3.50	3.50	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
6	4.00	4.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
7	5.00	5.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
8	6.00	6.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
9	3.50	3.50	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
10	4.00	4.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
11	5.00	5.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
12	6.00	6.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.5 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.00	199.50	5.88	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.75	0.80	11	17
2	3.00	199.50	5.88	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.77	0.80	9	15
3	3.00	199.50	5.88	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.82	0.80	7	11
4	3.00	199.50	5.88	6.00	6.00	0.40	383	1.12	0.80	0.0227	11.50	0.70	0.85	0.80	6	9
5	3.50	199.00	6.38	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.73	0.80	11	17
6	3.50	199.00	6.38	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.75	0.80	9	15
7	3.50	199.00	6.38	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.79	0.80	7	11
8	3.50	199.00	6.38	6.00	6.00	0.40	383	1.12	0.80	0.0227	11.00	0.70	0.82	0.80	6	9
9	4.00	198.50	6.88	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.73	0.80	11	17
10	4.00	198.50	6.88	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.73	0.80	9	15
11	4.00	198.50	6.88	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.76	0.80	7	12
12	4.00	198.50	6.88	6.00	6.00	0.40	383	1.12	0.80	0.0227	10.50	0.70	0.80	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.6 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 21.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 21.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.00	5.88	199.50	7.00	7.00	11	5	8	5	8
3.00	5.88	199.50	8.00	8.00	11	4	7	4	7
3.00	5.88	199.50	9.00	9.00	11	4	6	4	6
3.00	5.88	199.50	10.00	10.00	11	3	5	3	5
3.50	6.38	199.00	7.00	7.00	11	5	8	5	8
3.50	6.38	199.00	8.00	8.00	11	4	7	4	7
3.50	6.38	199.00	9.00	9.00	11	4	6	4	6
3.50	6.38	199.00	10.00	10.00	11	3	6	3	6
4.00	6.88	198.50	7.00	7.00	11	5	8	5	8
4.00	6.88	198.50	8.00	8.00	11	4	7	4	7
4.00	6.88	198.50	9.00	9.00	11	4	6	4	6
4.00	6.88	198.50	10.00	10.00	11	4	6	4	6

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.7 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
2	8.00	8.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
3	9.00	9.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
4	10.00	10.00	3.00	5.88	199.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
5	7.00	7.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
6	8.00	8.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
7	9.00	9.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
8	10.00	10.00	3.50	6.38	199.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
9	7.00	7.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
10	8.00	8.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
11	9.00	9.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
12	10.00	10.00	4.00	6.88	198.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.8 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.00	199.50	5.88	7.00	7.00	0.40	383	1.12	0.80	0.0227	11.50	0.70	0.87	0.80	5	8
2	3.00	199.50	5.88	8.00	8.00	0.40	383	1.12	0.80	0.0227	11.50	0.70	0.89	0.80	4	7
3	3.00	199.50	5.88	9.00	9.00	0.40	383	1.12	0.80	0.0227	11.50	0.70	0.91	0.80	4	6
4	3.00	199.50	5.88	10.00	10.00	0.40	383	1.12	0.80	0.0227	11.50	0.70	0.92	0.80	3	5
5	3.50	199.00	6.38	7.00	7.00	0.40	383	1.12	0.80	0.0227	11.00	0.70	0.85	0.80	5	8
6	3.50	199.00	6.38	8.00	8.00	0.40	383	1.12	0.80	0.0227	11.00	0.70	0.87	0.80	4	7
7	3.50	199.00	6.38	9.00	9.00	0.40	383	1.12	0.80	0.0227	11.00	0.70	0.89	0.80	4	6
8	3.50	199.00	6.38	10.00	10.00	0.40	383	1.12	0.80	0.0227	11.00	0.70	0.90	0.80	3	6
9	4.00	198.50	6.88	7.00	7.00	0.40	383	1.12	0.80	0.0227	10.50	0.70	0.83	0.80	5	8
10	4.00	198.50	6.88	8.00	8.00	0.40	383	1.12	0.80	0.0227	10.50	0.70	0.85	0.80	4	7
11	4.00	198.50	6.88	9.00	9.00	0.40	383	1.12	0.80	0.0227	10.50	0.70	0.87	0.80	4	6
12	4.00	198.50	6.88	10.00	10.00	0.40	383	1.12	0.80	0.0227	10.50	0.70	0.88	0.80	4	6

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.9 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	3.88	201.50	1.50	1.50	11	24	38	11	11
1.00	3.88	201.50	2.00	2.00	11	17	27	11	11
1.00	3.88	201.50	2.50	2.50	10	13	21	10	10
1.00	3.88	201.50	3.00	3.00	10	11	17	10	10
2.00	4.88	200.50	1.50	1.50	12	25	40	12	12
2.00	4.88	200.50	2.00	2.00	12	19	30	12	12
2.00	4.88	200.50	2.50	2.50	11	15	24	11	11
2.00	4.88	200.50	3.00	3.00	11	12	19	11	11
2.50	5.38	200.00	1.50	1.50	13	25	40	13	13
2.50	5.38	200.00	2.00	2.00	12	19	30	12	12
2.50	5.38	200.00	2.50	2.50	12	15	24	12	12
2.50	5.38	200.00	3.00	3.00	12	12	20	12	12

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.10 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
2	2.00	2.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
3	2.50	2.50	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
4	3.00	3.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
5	1.50	1.50	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
6	2.00	2.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
7	2.50	2.50	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
8	3.00	3.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
9	1.50	1.50	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.35	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	13
10	2.00	2.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
11	2.50	2.50	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12
12	3.00	3.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	12

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.11 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.88	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.80	0.80	24	38
2	1.00	201.50	3.88	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.85	0.80	17	27
3	1.00	201.50	3.88	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.88	0.80	13	21
4	1.00	201.50	3.88	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.91	0.80	11	17
5	2.00	200.50	4.88	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.73	0.80	25	40
6	2.00	200.50	4.88	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.73	0.80	19	30
7	2.00	200.50	4.88	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.76	0.80	15	24
8	2.00	200.50	4.88	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.80	0.80	12	19
9	2.50	200.00	5.38	1.50	1.50	0.40	383	1.12	0.80	0.0227	3.00	0.70	0.73	0.80	25	40
10	2.50	200.00	5.38	2.00	2.00	0.40	383	1.12	0.80	0.0227	4.00	0.70	0.73	0.80	19	30
11	2.50	200.00	5.38	2.50	2.50	0.40	383	1.12	0.80	0.0227	5.00	0.70	0.73	0.80	15	24
12	2.50	200.00	5.38	3.00	3.00	0.40	383	1.12	0.80	0.0227	6.00	0.70	0.75	0.80	12	20

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.12 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 21.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 21.32)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	3.88	201.50	3.50	3.50	10	9	15	9	10
1.00	3.88	201.50	4.00	4.00	10	8	13	8	10
1.00	3.88	201.50	5.00	5.00	10	6	10	6	10
1.00	3.88	201.50	6.00	6.00	10	5	8	5	8
2.00	4.88	200.50	3.50	3.50	11	10	16	10	11
2.00	4.88	200.50	4.00	4.00	11	8	14	8	11
2.00	4.88	200.50	5.00	5.00	11	7	11	7	11
2.00	4.88	200.50	6.00	6.00	11	5	9	5	9
2.50	5.38	200.00	3.50	3.50	11	10	16	10	11
2.50	5.38	200.00	4.00	4.00	11	9	14	9	11
2.50	5.38	200.00	5.00	5.00	11	7	11	7	11
2.50	5.38	200.00	6.00	6.00	11	6	9	6	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.13 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
2	4.00	4.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
3	5.00	5.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
4	6.00	6.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
5	3.50	3.50	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
6	4.00	4.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
7	5.00	5.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
8	6.00	6.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
9	3.50	3.50	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
10	4.00	4.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
11	5.00	5.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
12	6.00	6.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.14 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.88	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.92	0.80	9	15
2	1.00	201.50	3.88	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.93	0.80	8	13
3	1.00	201.50	3.88	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.95	0.80	6	10
4	1.00	201.50	3.88	6.00	6.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.96	0.80	5	8
5	2.00	200.50	4.88	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.83	0.80	10	16
6	2.00	200.50	4.88	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.85	0.80	8	14
7	2.00	200.50	4.88	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.88	0.80	7	11
8	2.00	200.50	4.88	6.00	6.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.91	0.80	5	9
9	2.50	200.00	5.38	3.50	3.50	0.40	383	1.12	0.80	0.0227	7.00	0.70	0.78	0.80	10	16
10	2.50	200.00	5.38	4.00	4.00	0.40	383	1.12	0.80	0.0227	8.00	0.70	0.81	0.80	9	14
11	2.50	200.00	5.38	5.00	5.00	0.40	383	1.12	0.80	0.0227	10.00	0.70	0.85	0.80	7	11
12	2.50	200.00	5.38	6.00	6.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.88	0.80	6	9

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 21.15 (For BH-33,16,23 (WTP & ETP))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 199.62m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 21.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 21.35)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	3.88	201.50	7.00	7.00	10	4	7	4	7
1.00	3.88	201.50	8.00	8.00	10	4	6	4	6
1.00	3.88	201.50	9.00	9.00	10	3	6	3	6
1.00	3.88	201.50	10.00	10.00	10	3	5	3	5
2.00	4.88	200.50	7.00	7.00	11	5	7	5	7
2.00	4.88	200.50	8.00	8.00	11	4	6	4	6
2.00	4.88	200.50	9.00	9.00	11	4	6	4	6
2.00	4.88	200.50	10.00	10.00	11	3	5	3	5
2.50	5.38	200.00	7.00	7.00	11	5	7	5	7
2.50	5.38	200.00	8.00	8.00	11	4	7	4	7
2.50	5.38	200.00	9.00	9.00	11	4	6	4	6
2.50	5.38	200.00	10.00	10.00	11	3	5	3	5

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.16 (For BH-33,16,23 (WTP & ETP))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ																	
	m	m				Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	7.00	7.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
2	8.00	8.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
3	9.00	9.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
4	10.00	10.00	1.00	3.88	201.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	10
5	7.00	7.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
6	8.00	8.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
7	9.00	9.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
8	10.00	10.00	2.00	4.88	200.50	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
9	7.00	7.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
10	8.00	8.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
11	9.00	9.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11
12	10.00	10.00	2.50	5.38	200.00	0.45	5	6.02	0.36	0.28	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.67	0.84	0.50	0.50	11

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 199.62m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-21.17 (For BH-33,16,23 (WTP & ETP))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.88	7.00	7.00	0.40	383	1.12	0.80	0.0227	13.50	0.70	0.97	0.80	4	7
2	1.00	201.50	3.88	8.00	8.00	0.40	383	1.12	0.80	0.0227	13.50	0.70	0.97	0.80	4	6
3	1.00	201.50	3.88	9.00	9.00	0.40	383	1.12	0.80	0.0227	13.50	0.70	0.97	0.80	3	6
4	1.00	201.50	3.88	10.00	10.00	0.40	383	1.12	0.80	0.0227	13.50	0.70	0.98	0.80	3	5
5	2.00	200.50	4.88	7.00	7.00	0.40	383	1.12	0.80	0.0227	12.50	0.70	0.92	0.80	5	7
6	2.00	200.50	4.88	8.00	8.00	0.40	383	1.12	0.80	0.0227	12.50	0.70	0.93	0.80	4	6
7	2.00	200.50	4.88	9.00	9.00	0.40	383	1.12	0.80	0.0227	12.50	0.70	0.94	0.80	4	6
8	2.00	200.50	4.88	10.00	10.00	0.40	383	1.12	0.80	0.0227	12.50	0.70	0.95	0.80	3	5
9	2.50	200.00	5.38	7.00	7.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.90	0.80	5	7
10	2.50	200.00	5.38	8.00	8.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.91	0.80	4	7
11	2.50	200.00	5.38	9.00	9.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.92	0.80	4	6
12	2.50	200.00	5.38	10.00	10.00	0.40	383	1.12	0.80	0.0227	12.00	0.70	0.93	0.80	3	5

Appendix – 21B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 16, 33, 23) (WTP & ETP)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 17.00m from FGL. |
| 4. Cut off Level | - 3.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 33. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerged density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
0.00 to 3.00	Pile cutoff level – No pile						
3.00 to 4.38	0.00	25	0.67	NA	1.00	25	8
4.38 to 8.18	0.59	7~0(Ignored)	0.80	0.76	NA	NA	8-21
8.18 to 17.18	0.04(Ignored)	28	1.00	NA	1.00	25	17-28
17.18 to 18.88	4.00	0	1.00	0.28	NA	NA	14-34
18.88 to 27.88	0.00	34\$	1.00	NA	1.50	34	>100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma \cdot N_\gamma + P D N_q)$$

$$A_p = \text{Cross section area of Pile stem at toe} = \pi d^2 / 4$$

$$D = \text{Diameter of pile} = d \text{ in m}$$

$$N_\gamma = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.00 \cdot 42.90 + 7.78 \cdot 40.00) = 16.84d^3 + 244.29d^2$$

(For Pile terminating at 17.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – (Within Cutoff Level).

$$\text{Second Layer} - K_2 P D_2 \tan \delta_2 A_{s2} = 1.00 \cdot 0.46 \cdot \tan 25^\circ \cdot \pi \cdot d \cdot 1.38 = 0.93 d$$

$$\text{Third Layer} - \alpha_3 C_{a3} A_{s3} = 0.76 \cdot 5.90 \cdot \pi \cdot d \cdot 3.80 = 53.53 d$$

$$\text{Fourth Layer} - K_4 P D_4 \tan \delta_4 A_{s4} = 1.00 \cdot 7.78 \cdot \tan 28^\circ \cdot \pi \cdot d \cdot (\ell - 8.18) = 13.00d (\ell - 8.18)$$

Substituting, ultimate load

$$q_{uf} = 54.46d + 13.00d (\ell - 17.18) \text{ (For Pile terminating at 17.00m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 16.84d^3 + 244.29d^2 + 54.46d + 13.00d (\ell - 8.18)$$

(For Pile terminating at 17.00m from F.G.L.)

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.00	14.00	77.27

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.00	14.00	39.79

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
17.00	14.00	5.94

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m ³		2.98
Stiffness factor T in m		2.27
Depth of fixity in m	Free Head	4.30
	Fixed Head	4.90
Allowable Horizontal Force in T	Free Head	3.30
	Fixed Head	8.90
Allowable Moment capacity in Tm	Free Head	5.03
	Fixed Head	17.92

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	4.12	198.38	1.50	1.50	14	56	90	14	14
2.50	4.12	198.38	2.00	2.00	13	42	67	13	13
2.50	4.12	198.38	2.50	2.50	13	34	54	13	13
2.50	4.12	198.38	3.00	3.00	13	28	45	13	13
3.00	4.62	197.88	1.50	1.50	16	56	90	16	16
3.00	4.62	197.88	2.00	2.00	15	42	67	15	15
3.00	4.62	197.88	2.50	2.50	15	34	54	15	15
3.00	4.62	197.88	3.00	3.00	15	28	45	15	15
3.50	5.12	197.38	1.50	1.50	18	56	90	18	18
3.50	5.12	197.38	2.00	2.00	17	42	67	17	17
3.50	5.12	197.38	2.50	2.50	16	34	54	16	16
3.50	5.12	197.38	3.00	3.00	16	28	45	16	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.1 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.76	0.88	0.50	0.50	14
2	2.00	2.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
3	2.50	2.50	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
4	3.00	3.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
5	1.50	1.50	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
6	2.00	2.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.41	1.20	1.20	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
7	2.50	2.50	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.33	1.16	1.16	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
8	3.00	3.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
9	1.50	1.50	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.63	1.32	1.32	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
10	2.00	2.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17
11	2.50	2.50	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
12	3.00	3.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.2 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	4.12	198.38	1.50	1.12	0.35	265	0.80	56	90
2	2.50	4.12	198.38	2.00	1.12	0.35	265	0.80	42	67
3	2.50	4.12	198.38	2.50	1.12	0.35	265	0.80	34	54
4	2.50	4.12	198.38	3.00	1.12	0.35	265	0.80	28	45
5	3.00	4.62	198.38	1.50	1.12	0.35	265	0.80	56	90
6	3.00	4.62	198.38	2.00	1.12	0.35	265	0.80	42	67
7	3.00	4.62	198.38	2.50	1.12	0.35	265	0.80	34	54
8	3.00	4.62	198.38	3.00	1.12	0.35	265	0.80	28	45
9	3.50	5.12	198.38	1.50	1.12	0.35	265	0.80	56	90
10	3.50	5.12	198.38	2.00	1.12	0.35	265	0.80	42	67
11	3.50	5.12	198.38	2.50	1.12	0.35	265	0.80	34	54
12	3.50	5.12	198.38	3.00	1.12	0.35	265	0.80	28	45

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.3 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	4.12	198.38	3.50	3.50	13	24	39	13	13
2.50	4.12	198.38	4.00	4.00	13	21	34	13	13
2.50	4.12	198.38	5.00	5.00	14	17	27	14	14
2.50	4.12	198.38	6.00	6.00	14	14	22	14	14
3.00	4.62	197.88	3.50	3.50	15	24	39	15	15
3.00	4.62	197.88	4.00	4.00	15	21	34	15	15
3.00	4.62	197.88	5.00	5.00	15	17	27	15	15
3.00	4.62	197.88	6.00	6.00	16	14	22	14	16
3.50	5.12	197.38	3.50	3.50	16	24	39	16	16
3.50	5.12	197.38	4.00	4.00	16	21	34	16	16
3.50	5.12	197.38	5.00	5.00	16	17	27	16	16
3.50	5.12	197.38	6.00	6.00	17	14	22	14	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.4 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	3.50	3.50	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
2	4.00	4.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
3	5.00	5.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	14
4	6.00	6.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.76	0.88	0.50	0.50	14
5	3.50	3.50	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
6	4.00	4.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
7	5.00	5.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
8	6.00	6.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
9	3.50	3.50	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
10	4.00	4.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
11	5.00	5.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
12	6.00	6.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.5 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	4.12	198.38	3.50	1.12	0.35	265	0.80	24	39
2	2.50	4.12	198.38	4.00	1.12	0.35	265	0.80	21	34
3	2.50	4.12	198.38	5.00	1.12	0.35	265	0.80	17	27
4	2.50	4.12	198.38	6.00	1.12	0.35	265	0.80	14	22
5	3.00	4.62	198.38	3.50	1.12	0.35	265	0.80	24	39
6	3.00	4.62	198.38	4.00	1.12	0.35	265	0.80	21	34
7	3.00	4.62	198.38	5.00	1.12	0.35	265	0.80	17	27
8	3.00	4.62	198.38	6.00	1.12	0.35	265	0.80	14	22
9	3.50	5.12	198.38	3.50	1.12	0.35	265	0.80	24	39
10	3.50	5.12	198.38	4.00	1.12	0.35	265	0.80	21	34
11	3.50	5.12	198.38	5.00	1.12	0.35	265	0.80	17	27
12	3.50	5.12	198.38	6.00	1.12	0.35	265	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.6 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	4.12	198.38	7.00	7.00	15	12	19	12	15
2.50	4.12	198.38	8.00	8.00	15	11	17	11	15
2.50	4.12	198.38	9.00	9.00	16	9	15	9	15
2.50	4.12	198.38	10.00	10.00	17	8	13	8	13
3.00	4.62	197.88	7.00	7.00	16	12	19	12	16
3.00	4.62	197.88	8.00	8.00	17	11	17	11	17
3.00	4.62	197.88	9.00	9.00	17	9	15	9	15
3.00	4.62	197.88	10.00	10.00	18	8	13	8	13
3.50	5.12	197.38	7.00	7.00	17	12	19	12	17
3.50	5.12	197.38	8.00	8.00	18	11	17	11	17
3.50	5.12	197.38	9.00	9.00	18	9	15	9	15
3.50	5.12	197.38	10.00	10.00	19	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.7 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
2	8.00	8.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.76	0.88	0.50	0.50	15
3	9.00	9.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
4	10.00	10.00	2.50	4.12	198.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17
5	7.00	7.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.76	0.88	0.50	0.50	16
6	8.00	8.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17
7	9.00	9.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17
8	10.00	10.00	3.00	4.62	197.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
9	7.00	7.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	17
10	8.00	8.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
11	9.00	9.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
12	10.00	10.00	3.50	5.12	197.38	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	19

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.8 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	4.12	198.38	7.00	1.12	0.35	265	0.80	12	19
2	2.50	4.12	198.38	8.00	1.12	0.35	265	0.80	11	17
3	2.50	4.12	198.38	9.00	1.12	0.35	265	0.80	9	15
4	2.50	4.12	198.38	10.00	1.12	0.35	265	0.80	8	13
5	3.00	4.62	198.38	7.00	1.12	0.35	265	0.80	12	19
6	3.00	4.62	198.38	8.00	1.12	0.35	265	0.80	11	17
7	3.00	4.62	198.38	9.00	1.12	0.35	265	0.80	9	15
8	3.00	4.62	198.38	10.00	1.12	0.35	265	0.80	8	13
9	3.50	5.12	198.38	7.00	1.12	0.35	265	0.80	12	19
10	3.50	5.12	198.38	8.00	1.12	0.35	265	0.80	11	17
11	3.50	5.12	198.38	9.00	1.12	0.35	265	0.80	9	15
12	3.50	5.12	198.38	10.00	1.12	0.35	265	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.9 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 23) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 23.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
1.00	2.62	199.88	1.50	1.50	8	29	46	8	8
1.00	2.62	199.88	2.00	2.00	8	21	34	8	8
1.00	2.62	199.88	2.50	2.50	9	17	27	9	9
1.00	2.62	199.88	3.00	3.00	9	14	23	9	9
1.00	2.62	199.88	3.50	3.50	9	12	20	9	9
1.00	2.62	199.88	4.00	4.00	9	11	17	9	9
1.00	2.62	199.88	5.00	5.00	10	9	14	9	10
1.00	2.62	199.88	6.00	6.00	11	7	11	7	11
1.00	2.62	199.88	7.00	7.00	11	6	10	6	10
1.00	2.62	199.88	8.00	8.00	12	5	9	5	9
1.00	2.62	199.88	9.00	9.00	13	5	8	5	8
1.00	2.62	199.88	10.00	10.00	13	4	7	4	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.10 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
2	2.00	2.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
3	2.50	2.50	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
4	3.00	3.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
5	3.50	3.50	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
6	4.00	4.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
7	5.00	5.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.76	0.88	0.50	0.50	10
8	6.00	6.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.76	0.88	0.50	0.50	11
9	7.00	7.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.76	0.88	0.50	0.50	11
10	8.00	8.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.76	0.88	0.50	0.50	12
11	9.00	9.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13
12	10.00	10.00	1.00	2.62	199.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.76	0.88	0.50	0.50	13

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.11 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	2.62	199.88	1.50	1.12	0.35	135	0.80	29	46
2	1.00	2.62	199.88	2.00	1.12	0.35	135	0.80	21	34
3	1.00	2.62	199.88	2.50	1.12	0.35	135	0.80	17	27
4	1.00	2.62	199.88	3.00	1.12	0.35	135	0.80	14	23
5	1.00	2.62	199.88	3.50	1.12	0.35	135	0.80	12	20
6	1.00	2.62	199.88	4.00	1.12	0.35	135	0.80	11	17
7	1.00	2.62	199.88	5.00	1.12	0.35	135	0.80	9	14
8	1.00	2.62	199.88	6.00	1.12	0.35	135	0.80	7	11
9	1.00	2.62	199.88	7.00	1.12	0.35	135	0.80	6	10
10	1.00	2.62	199.88	8.00	1.12	0.35	135	0.80	5	9
11	1.00	2.62	199.88	9.00	1.12	0.35	135	0.80	5	8
12	1.00	2.62	199.88	10.00	1.12	0.35	135	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.12 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.32)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	5.62	196.88	1.50	1.50	20	58	93	20	20
4.00	5.62	196.88	2.00	2.00	19	43	69	19	19
4.00	5.62	196.88	2.50	2.50	18	35	56	18	18
4.00	5.62	196.88	3.00	3.00	18	29	46	18	18
5.00	6.62	195.88	1.50	1.50	24	58	93	24	24
5.00	6.62	195.88	2.00	2.00	22	43	69	22	22
5.00	6.62	195.88	2.50	2.50	22	35	56	22	22
5.00	6.62	195.88	3.00	3.00	21	29	46	21	21
6.00	7.62	194.88	1.50	1.50	29	58	93	29	29
6.00	7.62	194.88	2.00	2.00	27	43	69	27	27
6.00	7.62	194.88	2.50	2.50	25	35	56	25	25
6.00	7.62	194.88	3.00	3.00	25	29	46	25	25

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.13 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ	N _c	N _q - 1	N _{γ}	S _c	S _q	S _{γ}	d _c	d _q	d _{γ}	i _c	i _q	i _{γ}	γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.72	1.36	1.36	1.00	1.00	1.00	1.76	0.88	0.50	0.50	20
2	2.00	2.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.76	0.88	0.50	0.50	19
3	2.50	2.50	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.43	1.22	1.22	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
4	3.00	3.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
5	1.50	1.50	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.91	1.45	1.45	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
6	2.00	2.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.68	1.34	1.34	1.00	1.00	1.00	1.76	0.88	0.50	0.50	22
7	2.50	2.50	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.76	0.88	0.50	0.50	22
8	3.00	3.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
9	1.50	1.50	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	2.09	1.54	1.54	1.00	1.00	1.00	1.76	0.88	0.50	0.50	29
10	2.00	2.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.81	1.41	1.41	1.00	1.00	1.00	1.76	0.88	0.50	0.50	27
11	2.50	2.50	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.65	1.33	1.33	1.00	1.00	1.00	1.76	0.88	0.50	0.50	25
12	3.00	3.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.76	0.88	0.50	0.50	25

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.14 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	4.00	5.62	196.88	1.50	1.12	0.35	273	0.80	58	93
2	4.00	5.62	196.88	2.00	1.12	0.35	273	0.80	43	69
3	4.00	5.62	196.88	2.50	1.12	0.35	273	0.80	35	56
4	4.00	5.62	196.88	3.00	1.12	0.35	273	0.80	29	46
5	5.00	6.62	196.88	1.50	1.12	0.35	273	0.80	58	93
6	5.00	6.62	196.88	2.00	1.12	0.35	273	0.80	43	69
7	5.00	6.62	196.88	2.50	1.12	0.35	273	0.80	35	56
8	5.00	6.62	196.88	3.00	1.12	0.35	273	0.80	29	46
9	6.00	7.62	196.88	1.50	1.12	0.35	273	0.80	58	93
10	6.00	7.62	196.88	2.00	1.12	0.35	273	0.80	43	69
11	6.00	7.62	196.88	2.50	1.12	0.35	273	0.80	35	56
12	6.00	7.62	196.88	3.00	1.12	0.35	273	0.80	29	46

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.15 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.35)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	5.62	196.88	3.50	3.50	18	25	40	18	18
4.00	5.62	196.88	4.00	4.00	18	22	35	18	18
4.00	5.62	196.88	5.00	5.00	18	17	28	17	18
4.00	5.62	196.88	6.00	6.00	18	14	23	14	18
5.00	6.62	195.88	3.50	3.50	21	25	40	21	21
5.00	6.62	195.88	4.00	4.00	21	22	35	21	21
5.00	6.62	195.88	5.00	5.00	21	17	28	17	21
5.00	6.62	195.88	6.00	6.00	21	14	23	14	21
6.00	7.62	194.88	3.50	3.50	24	25	40	24	24
6.00	7.62	194.88	4.00	4.00	24	22	35	22	24
6.00	7.62	194.88	5.00	5.00	24	17	28	17	24
6.00	7.62	194.88	6.00	6.00	24	14	23	14	23

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.16 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.31	1.16	1.16	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
2	4.00	4.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
3	5.00	5.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
4	6.00	6.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.76	0.88	0.50	0.50	18
5	3.50	3.50	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.39	1.19	1.19	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
6	4.00	4.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
7	5.00	5.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
8	6.00	6.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
9	3.50	3.50	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.47	1.23	1.23	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
10	4.00	4.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.41	1.20	1.20	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
11	5.00	5.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.33	1.16	1.16	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
12	6.00	6.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.17 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	4.00	5.62	196.88	3.50	1.12	0.35	273	0.80	25	40
2	4.00	5.62	196.88	4.00	1.12	0.35	273	0.80	22	35
3	4.00	5.62	196.88	5.00	1.12	0.35	273	0.80	17	28
4	4.00	5.62	196.88	6.00	1.12	0.35	273	0.80	14	23
5	5.00	6.62	196.88	3.50	1.12	0.35	273	0.80	25	40
6	5.00	6.62	196.88	4.00	1.12	0.35	273	0.80	22	35
7	5.00	6.62	196.88	5.00	1.12	0.35	273	0.80	17	28
8	5.00	6.62	196.88	6.00	1.12	0.35	273	0.80	14	23
9	6.00	7.62	196.88	3.50	1.12	0.35	273	0.80	25	40
10	6.00	7.62	196.88	4.00	1.12	0.35	273	0.80	22	35
11	6.00	7.62	196.88	5.00	1.12	0.35	273	0.80	17	28
12	6.00	7.62	196.88	6.00	1.12	0.35	273	0.80	14	23

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 22.18 (For BH-43 (Fire water tank & fire water pump house))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:200.88m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 22.28)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 22.38)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	5.62	196.88	7.00	7.00	19	12	20	12	19
4.00	5.62	196.88	8.00	8.00	19	11	17	11	17
4.00	5.62	196.88	9.00	9.00	20	10	15	10	15
4.00	5.62	196.88	10.00	10.00	20	9	14	9	14
5.00	6.62	195.88	7.00	7.00	21	12	20	12	20
5.00	6.62	195.88	8.00	8.00	22	11	17	11	17
5.00	6.62	195.88	9.00	9.00	22	10	15	10	15
5.00	6.62	195.88	10.00	10.00	23	9	14	9	14
6.00	7.62	194.88	7.00	7.00	24	12	20	12	20
6.00	7.62	194.88	8.00	8.00	24	11	17	11	17
6.00	7.62	194.88	9.00	9.00	25	10	15	10	15
6.00	7.62	194.88	10.00	10.00	25	9	14	9	14

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.19 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	19
2	8.00	8.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	19
3	9.00	9.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.76	0.88	0.50	0.50	20
4	10.00	10.00	4.00	5.62	196.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.76	0.88	0.50	0.50	20
5	7.00	7.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.76	0.88	0.50	0.50	21
6	8.00	8.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	22
7	9.00	9.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	22
8	10.00	10.00	5.00	6.62	195.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.76	0.88	0.50	0.50	23
9	7.00	7.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
10	8.00	8.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.76	0.88	0.50	0.50	24
11	9.00	9.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.76	0.88	0.50	0.50	25
12	10.00	10.00	6.00	7.62	194.88	0.09	25	13.75	4.75	4.73	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.76	0.88	0.50	0.50	25

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.88m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-22.20 (For BH-43 (Fire water tank & fire water pump house))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	4.00	5.62	196.88	7.00	1.12	0.35	273	0.80	12	20
2	4.00	5.62	196.88	8.00	1.12	0.35	273	0.80	11	17
3	4.00	5.62	196.88	9.00	1.12	0.35	273	0.80	10	15
4	4.00	5.62	196.88	10.00	1.12	0.35	273	0.80	9	14
5	5.00	6.62	196.88	7.00	1.12	0.35	273	0.80	12	20
6	5.00	6.62	196.88	8.00	1.12	0.35	273	0.80	11	17
7	5.00	6.62	196.88	9.00	1.12	0.35	273	0.80	10	15
8	5.00	6.62	196.88	10.00	1.12	0.35	273	0.80	9	14
9	6.00	7.62	196.88	7.00	1.12	0.35	273	0.80	12	20
10	6.00	7.62	196.88	8.00	1.12	0.35	273	0.80	11	17
11	6.00	7.62	196.88	9.00	1.12	0.35	273	0.80	10	15
12	6.00	7.62	196.88	10.00	1.12	0.35	273	0.80	9	14

Appendix – 22B

Calculation of Safe Load on Uniform Diameter Bored Cast in situ Pile. (Near BH 43) (Aux Boiler)

The safe load is calculated as follows,

1) Design Stipulations

- | | |
|---|---|
| 1. Type of pile | - Bored cast in situ uniform diameter pile. |
| 2. Pile diameter considered | - 0.60m |
| 3. Termination depth of pile considered | - 15.00m from FGL. |
| 4. Cut off Level | - 2.00m from FGL. |
| 5. Factor of Safety | - 2.50 |
| 6. Depth of Water table | - Considered at FGL. |
| 7. Ref | - IS 2911 P-I, Sec-II, 2021. |

2) Test Data

The parameters are based on BH 43. For evaluation of safe load on piles following characterized layers are considered as described in table below,

Depth in m from RL 202.5 m	Cohesion in kg/cm ²	Angle of Internal Friction ϕ	Submerge d density in gm/cc γ_{sub}	Reduction Factor α	Earth pressure coefficient K	Angle of wall friction $\delta = \phi$	SPT N Value
FGL to 2.00	No contribution considered – Due to cutoff						
2.00 to 11.20	0.06(ignored)	28	0.95	NA	1.00	28	12-34
11.20 to 19.40	0.00	34	1.03	NA	1.50	34	66->100

Notes: - Layers are characterized based on classification and the state of soil in that stratum.

* - In cohesive soils the contribution of the angle of internal friction being insignificant is ignored.

Shear parameters are the most representative for the layer. NA means not applicable. Characterized N values are considered for each layer.

- Weighted Average of the parameters falling in the same layer has been considered

\$-Parameters are correlated based on SPT value N.

3) Ultimate Load in Compression

3.1) Ultimate load in Compression by Bearing

Ultimate load on pile in end bearing,

$$q_{ub} = A_p (0.5 \cdot D \cdot \gamma N_v + P D N_q)$$

A_p = Cross section area of Pile stem at toe = $\pi d^2/4$

D = Diameter of pile = d in m

$$N_v = 42.90$$

$$N_q = 40.00$$

$$q_{ub} = 0.785d^2 (0.5 \cdot d \cdot 1.03 \cdot 42.90 + 8.55 \cdot 40.00) = 17.34d^3 + 268.47d^2$$

(For Pile terminating at 15.00m from F.G.L.)

Note: As the pile terminating just above rock level, we have considered parameter for end bearing component based on rock strata.

3.2) Ultimate Load in Compression by Skin Friction

Ultimate load in skin friction,

$$q_{uf} = \alpha_i C_{ai} A_i + K_i P D_i \tan \delta_i A_{si}$$

First Layer – No contribution considered – Due to cutoff

$$\text{Second Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.00 \cdot 4.37 \cdot \tan 28^\circ \cdot \pi \cdot d \cdot 9.20 = 67.16 d$$

$$\text{Third Layer} - K_3 P D_3 \tan \delta_3 A_{s3} = 1.50 \cdot 8.55 \cdot \tan 34^\circ \cdot \pi \cdot d \cdot (\ell - 11.20) = 27.18 d(\ell - 11.20)$$

Substituting, ultimate load

$$q_{uf} = 67.16d + 27.18d(\ell - 11.20) \text{ (For Pile terminating at 15.00m from F.G.L.)}$$

Where, ℓ is the pile length and d is diameter of piles, substituting

Ultimate load by both bearing and friction can be as follows for various lengths of piles,

$$q_{uc} = q_{ub} + q_{uf}$$

$$q_{uc} = 17.34d^3 + 268.47d^2 + 67.16d + 27.18d(l - 11.20) \text{ (For Pile terminating at 15.00m from F.G.L.)}$$

By substituting various diameters of piles having various lengths, the safe load is worked out considering the safety factor of 2.50 and are given in table below,

Safe Load on Piles in Compression (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	13.00	81.04

3.3) Ultimate Load in Uplift

Considering skin friction for determination of uplift

Safe Load on Piles in Uplift (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	13.00	39.58

Note: Self weight of pile is considered in calculation of ultimate load in uplift.

Self-weight of Pile (in Ton)

Termination Depth of Pile in m, from FGL	Termination Depth of Pile in m, from cut-off	Diameter of Pile in, m
		0.60
15.00	13.00	5.51

3.4) Lateral Pile Capacity

Pile would be long and elastic (i.e. $L > 4T$). For a prescribed deflection of 5mm and with M 30 grade of concrete, the lateral load and moment were worked out as follows,

Diameters in m		0.60
Subgrade reaction in MN/m^3		3.00
Stiffness factor T in m		2.26
Depth of fixity in m	Free Head	4.30
	Fixed Head	4.90
Allowable Horizontal Force in T	Free Head	3.40
	Fixed Head	8.90
Allowable Moment capacity in Tm	Free Head	5.05
	Fixed Head	17.97

4) Notes:

1) Initial and Routine pile load tests shall be carried out as per IS 2911, P-4 on the piles to confirm the capacity of pile worked out theoretically. For design and construction, specifications of IS 2911, P-I, S-2, shall strictly be followed. Termination depth of pile shall be from FGL.

Dr. K. K. Thaker

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - & (For BH- 34(Transmission line tower))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 23.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 23.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	199.00	1.50	1.50	18	50	80	18	18
3.50	199.00	2.00	2.00	17	38	60	17	17
3.50	199.00	2.50	2.50	17	30	48	17	17
3.50	199.00	3.00	3.00	17	25	41	17	17
4.00	198.50	1.50	1.50	20	50	80	20	20
4.00	198.50	2.00	2.00	19	38	60	19	19
4.00	198.50	2.50	2.50	18	30	49	18	18
4.00	198.50	3.00	3.00	18	26	41	18	18
4.50	198.00	1.50	1.50	22	50	80	22	22
4.50	198.00	2.00	2.00	21	38	60	21	21
4.50	198.00	2.50	2.50	20	31	49	20	20
4.50	198.00	3.00	3.00	20	26	42	20	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - &' .1 (For BH- 34(Transmission line tower))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.62	1.31	1.31	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
2	2.00	2.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.46	1.23	1.23	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
3	2.50	2.50	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
4	3.00	3.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.31	1.15	1.15	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
5	1.50	1.50	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.71	1.35	1.35	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
6	2.00	2.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.53	1.26	1.26	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
7	2.50	2.50	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
8	3.00	3.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.35	1.18	1.18	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
9	1.50	1.50	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.79	1.40	1.40	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
10	2.00	2.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.60	1.30	1.30	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
11	2.50	2.50	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
12	3.00	3.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.40	1.20	1.20	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - & .2 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	199.00	1.50	1.50	0.35	681	1.12	0.80	0.0106	3.00	0.70	0.73	0.80	50	80
2	3.50	199.00	2.00	2.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	38	60
3	3.50	199.00	2.50	2.50	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.73	0.80	30	48
4	3.50	199.00	3.00	3.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.73	0.80	25	41
5	4.00	198.50	1.50	1.50	0.35	681	1.12	0.80	0.0106	3.00	0.70	0.73	0.80	50	80
6	4.00	198.50	2.00	2.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	38	60
7	4.00	198.50	2.50	2.50	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	30	49
8	4.00	198.50	3.00	3.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	26	41
9	4.50	198.00	1.50	1.50	0.35	681	1.12	0.80	0.0106	3.00	0.70	0.73	0.80	50	80
10	4.50	198.00	2.00	2.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.73	0.80	38	60
11	4.50	198.00	2.50	2.50	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.73	0.80	31	49
12	4.50	198.00	3.00	3.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.73	0.80	26	42

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - & ' .3 (For BH- 34(Transmission line tower))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 23.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 23.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	199.00	3.50	3.50	17	22	36	17	17
3.50	199.00	4.00	4.00	17	20	31	17	17
3.50	199.00	5.00	5.00	17	16	25	16	17
3.50	199.00	6.00	6.00	17	13	22	13	17
4.00	198.50	3.50	3.50	18	23	36	18	18
4.00	198.50	4.00	4.00	18	20	32	18	18
4.00	198.50	5.00	5.00	18	17	27	17	18
4.00	198.50	6.00	6.00	19	14	23	14	19
4.50	198.00	3.50	3.50	20	23	37	20	20
4.50	198.00	4.00	4.00	20	21	33	20	20
4.50	198.00	5.00	5.00	20	18	28	18	20
4.50	198.00	6.00	6.00	20	15	24	15	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - &' .4 (For BH- 34(Transmission line tower))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	Sc	S _q	S _γ	dc	d _q	d _γ	ic	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	3.50	3.50	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.26	1.13	1.13	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
2	4.00	4.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.23	1.12	1.12	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
3	5.00	5.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
4	6.00	6.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
5	3.50	3.50	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.30	1.15	1.15	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
6	4.00	4.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.26	1.13	1.13	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
7	5.00	5.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
8	6.00	6.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
9	3.50	3.50	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
10	4.00	4.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.30	1.15	1.15	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
11	5.00	5.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
12	6.00	6.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - & .5 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	199.00	3.50	3.50	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.73	0.80	22	36
2	3.50	199.00	4.00	4.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.75	0.80	20	31
3	3.50	199.00	5.00	5.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.79	0.80	16	25
4	3.50	199.00	6.00	6.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.82	0.80	13	22
5	4.00	198.50	3.50	3.50	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	23	36
6	4.00	198.50	4.00	4.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.73	0.80	20	32
7	4.00	198.50	5.00	5.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.76	0.80	17	27
8	4.00	198.50	6.00	6.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.80	0.80	14	23
9	4.50	198.00	3.50	3.50	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.73	0.80	23	37
10	4.50	198.00	4.00	4.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.73	0.80	21	33
11	4.50	198.00	5.00	5.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.74	0.80	18	28
12	4.50	198.00	6.00	6.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.77	0.80	15	24

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - &'.6 (For BH- 34(Transmission line tower))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 23.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 23.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	199.00	7.00	7.00	18	12	19	12	18
3.50	199.00	8.00	8.00	18	11	17	11	17
3.50	199.00	9.00	9.00	19	10	16	10	16
3.50	199.00	10.00	10.00	20	9	15	9	15
4.00	198.50	7.00	7.00	19	13	20	13	19
4.00	198.50	8.00	8.00	20	11	18	11	18
4.00	198.50	9.00	9.00	20	10	17	10	17
4.00	198.50	10.00	10.00	21	10	15	10	15
4.50	198.00	7.00	7.00	21	13	21	13	21
4.50	198.00	8.00	8.00	21	12	19	12	19
4.50	198.00	9.00	9.00	22	11	18	11	18
4.50	198.00	10.00	10.00	22	10	16	10	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - &' .7 (For BH- 34(Transmission line tower))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
2	8.00	8.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
3	9.00	9.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
4	10.00	10.00	3.50	199.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
5	7.00	7.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.97	0.99	0.50	0.50	19
6	8.00	8.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
7	9.00	9.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	20
8	10.00	10.00	4.00	198.50	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
9	7.00	7.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
10	8.00	8.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	21
11	9.00	9.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22
12	10.00	10.00	4.50	198.00	0.07	23	13.10	4.33	4.25	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.97	0.99	0.50	0.50	22

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - & .8 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	3.50	199.00	7.00	7.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.85	0.80	12	19
2	3.50	199.00	8.00	8.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.87	0.80	11	17
3	3.50	199.00	9.00	9.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.89	0.80	10	16
4	3.50	199.00	10.00	10.00	0.35	681	1.12	0.80	0.0106	4.50	0.70	0.90	0.80	9	15
5	4.00	198.50	7.00	7.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.83	0.80	13	20
6	4.00	198.50	8.00	8.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.85	0.80	11	18
7	4.00	198.50	9.00	9.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.87	0.80	10	17
8	4.00	198.50	10.00	10.00	0.35	681	1.12	0.80	0.0106	4.00	0.70	0.88	0.80	10	15
9	4.50	198.00	7.00	7.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.80	0.80	13	21
10	4.50	198.00	8.00	8.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.83	0.80	12	19
11	4.50	198.00	9.00	9.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.85	0.80	11	18
12	4.50	198.00	10.00	10.00	0.35	681	1.12	0.80	0.0106	3.50	0.70	0.87	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 23.9 (For BH- 34(Transmission line tower))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	7	12	19	7	7
1.00	201.50	2.00	2.00	7	9	14	7	7
1.00	201.50	2.50	2.50	7	7	11	7	7
1.00	201.50	3.00	3.00	7	6	9	6	7
2.00	200.50	1.50	1.50	8	13	20	8	8
2.00	200.50	2.00	2.00	8	9	15	8	8
2.00	200.50	2.50	2.50	8	7	12	7	8
2.00	200.50	3.00	3.00	7	6	10	6	7
3.00	199.50	1.50	1.50	9	13	20	9	9
3.00	199.50	2.00	2.00	9	9	15	9	9
3.00	199.50	2.50	2.50	8	8	12	8	8
3.00	199.50	3.00	3.00	8	6	10	6	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.10 (For BH- 34(Transmission line tower))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
2	2.00	2.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
3	2.50	2.50	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
4	3.00	3.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
5	1.50	1.50	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
6	2.00	2.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
7	2.50	2.50	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
8	3.00	3.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
9	1.50	1.50	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.44	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
10	2.00	2.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.33	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	9
11	2.50	2.50	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.26	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
12	3.00	3.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from RL 202.50m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.11 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	1.50	1.50	0.35	135	1.12	0.80	0.0364	3.00	0.70	0.80	0.80	12	19
2	1.00	201.50	2.00	2.00	0.35	135	1.12	0.80	0.0364	4.00	0.70	0.85	0.80	9	14
3	1.00	201.50	2.50	2.50	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.88	0.80	7	11
4	1.00	201.50	3.00	3.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.91	0.80	6	9
5	2.00	200.50	1.50	1.50	0.35	135	1.12	0.80	0.0364	3.00	0.70	0.73	0.80	13	20
6	2.00	200.50	2.00	2.00	0.35	135	1.12	0.80	0.0364	4.00	0.70	0.73	0.80	9	15
7	2.00	200.50	2.50	2.50	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.76	0.80	7	12
8	2.00	200.50	3.00	3.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.80	0.80	6	10
9	3.00	199.50	1.50	1.50	0.35	135	1.12	0.80	0.0364	3.00	0.70	0.73	0.80	13	20
10	3.00	199.50	2.00	2.00	0.35	135	1.12	0.80	0.0364	4.00	0.70	0.73	0.80	9	15
11	3.00	199.50	2.50	2.50	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.73	0.80	8	12
12	3.00	199.50	3.00	3.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.73	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 23.12 (For BH- 34(Transmission line tower))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 23.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 23.32)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	7	5	8	5	7
1.00	201.50	4.00	4.00	7	4	7	4	7
1.00	201.50	5.00	5.00	7	3	5	3	5
1.00	201.50	6.00	6.00	7	3	4	3	4
2.00	200.50	3.50	3.50	7	5	8	5	7
2.00	200.50	4.00	4.00	7	4	7	4	7
2.00	200.50	5.00	5.00	7	4	6	4	6
2.00	200.50	6.00	6.00	7	3	5	3	5
3.00	199.50	3.50	3.50	8	5	9	5	8
3.00	199.50	4.00	4.00	8	5	8	5	8
3.00	199.50	5.00	5.00	8	4	6	4	6
3.00	199.50	6.00	6.00	8	3	5	3	5

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.13 (For BH- 34(Transmission line tower))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
																					W _q	W _γ	
1	3.50	3.50	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
2	4.00	4.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
3	5.00	5.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
4	6.00	6.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
5	3.50	3.50	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
6	4.00	4.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
7	5.00	5.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
8	6.00	6.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
9	3.50	3.50	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
10	4.00	4.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
11	5.00	5.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
12	6.00	6.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.14 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.50	3.50	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.92	0.80	5	8
2	1.00	201.50	4.00	4.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.93	0.80	4	7
3	1.00	201.50	5.00	5.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.95	0.80	3	5
4	1.00	201.50	6.00	6.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.96	0.80	3	4
5	2.00	200.50	3.50	3.50	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.83	0.80	5	8
6	2.00	200.50	4.00	4.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.85	0.80	4	7
7	2.00	200.50	5.00	5.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.88	0.80	4	6
8	2.00	200.50	6.00	6.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.91	0.80	3	5
9	3.00	199.50	3.50	3.50	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.75	0.80	5	9
10	3.00	199.50	4.00	4.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.77	0.80	5	8
11	3.00	199.50	5.00	5.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.82	0.80	4	6
12	3.00	199.50	6.00	6.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.85	0.80	3	5

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.16 (For BH- 34(Transmission line tower))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
2	8.00	8.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
3	9.00	9.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
4	10.00	10.00	1.00	201.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
5	7.00	7.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
6	8.00	8.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
7	9.00	9.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
8	10.00	10.00	2.00	200.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	7
9	7.00	7.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
10	8.00	8.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
11	9.00	9.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8
12	10.00	10.00	3.00	199.50	0.25	8	6.65	0.64	0.51	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.76	0.88	0.50	0.50	8

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-23.17 (For BH- 34(Transmission line tower))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	7.00	7.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.97	0.80	2	4
2	1.00	201.50	8.00	8.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.97	0.80	2	4
3	1.00	201.50	9.00	9.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.97	0.80	2	3
4	1.00	201.50	10.00	10.00	0.35	135	1.12	0.80	0.0364	7.00	0.70	0.98	0.80	2	3
5	2.00	200.50	7.00	7.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.92	0.80	3	4
6	2.00	200.50	8.00	8.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.93	0.80	2	4
7	2.00	200.50	9.00	9.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.94	0.80	2	3
8	2.00	200.50	10.00	10.00	0.35	135	1.12	0.80	0.0364	6.00	0.70	0.95	0.80	2	3
9	3.00	199.50	7.00	7.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.87	0.80	3	4
10	3.00	199.50	8.00	8.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.89	0.80	3	4
11	3.00	199.50	9.00	9.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.91	0.80	2	4
12	3.00	199.50	10.00	10.00	0.35	135	1.12	0.80	0.0364	5.00	0.70	0.92	0.80	2	3

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	1.18	201.32	1.50	1.50	11	42	67	11	11
1.00	1.18	201.32	2.00	2.00	11	32	51	11	11
1.00	1.18	201.32	2.50	2.50	12	25	40	12	12
1.00	1.18	201.32	3.00	3.00	12	21	34	12	12
2.00	2.18	200.32	1.50	1.50	16	42	67	16	16
2.00	2.18	200.32	2.00	2.00	16	32	51	16	16
2.00	2.18	200.32	2.50	2.50	16	25	40	16	16
2.00	2.18	200.32	3.00	3.00	16	21	34	16	16
3.00	3.18	199.32	1.50	1.50	21	42	67	21	21
3.00	3.18	199.32	2.00	2.00	21	32	51	21	21
3.00	3.18	199.32	2.50	2.50	20	25	40	20	20
3.00	3.18	199.32	3.00	3.00	20	21	34	20	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.1 (For BH-22 (Boiler maintenance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	11
2	2.00	2.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	11
3	2.50	2.50	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	12
4	3.00	3.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	12
5	1.50	1.50	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
6	2.00	2.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
7	2.50	2.50	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
8	3.00	3.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
9	1.50	1.50	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	1.74	0.87	0.50	0.50	21
10	2.00	2.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.74	0.87	0.50	0.50	21
11	2.50	2.50	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.74	0.87	0.50	0.50	20
12	3.00	3.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	20

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.2 (For BH-22 (Boiler maintainance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	1.18	201.32	1.50	1.12	0.35	199	0.80	42	67
2	1.00	1.18	201.32	2.00	1.12	0.35	199	0.80	32	51
3	1.00	1.18	201.32	2.50	1.12	0.35	199	0.80	25	40
4	1.00	1.18	201.32	3.00	1.12	0.35	199	0.80	21	34
5	2.00	2.18	201.32	1.50	1.12	0.35	199	0.80	42	67
6	2.00	2.18	201.32	2.00	1.12	0.35	199	0.80	32	51
7	2.00	2.18	201.32	2.50	1.12	0.35	199	0.80	25	40
8	2.00	2.18	201.32	3.00	1.12	0.35	199	0.80	21	34
9	3.00	3.18	201.32	1.50	1.12	0.35	199	0.80	42	67
10	3.00	3.18	201.32	2.00	1.12	0.35	199	0.80	32	51
11	3.00	3.18	201.32	2.50	1.12	0.35	199	0.80	25	40
12	3.00	3.18	201.32	3.00	1.12	0.35	199	0.80	21	34

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.3 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.5)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	1.18	201.32	3.50	3.50	13	18	29	13	13
1.00	1.18	201.32	4.00	4.00	13	16	25	13	13
1.00	1.18	201.32	5.00	5.00	14	13	20	13	14
1.00	1.18	201.32	6.00	6.00	15	11	17	11	15
2.00	2.18	200.32	3.50	3.50	16	18	29	16	16
2.00	2.18	200.32	4.00	4.00	17	16	25	16	17
2.00	2.18	200.32	5.00	5.00	18	13	20	13	18
2.00	2.18	200.32	6.00	6.00	19	11	17	11	17
3.00	3.18	199.32	3.50	3.50	21	18	29	18	21
3.00	3.18	199.32	4.00	4.00	21	16	25	16	21
3.00	3.18	199.32	5.00	5.00	22	13	20	13	20
3.00	3.18	199.32	6.00	6.00	22	11	17	11	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.4 (For BH-22 (Boiler maintenance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.74	0.87	0.50	0.50	13
2	4.00	4.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.74	0.87	0.50	0.50	13
3	5.00	5.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.74	0.87	0.50	0.50	14
4	6.00	6.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.74	0.87	0.50	0.50	15
5	3.50	3.50	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
6	4.00	4.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	17
7	5.00	5.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	18
8	6.00	6.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	19
9	3.50	3.50	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.74	0.87	0.50	0.50	21
10	4.00	4.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.74	0.87	0.50	0.50	21
11	5.00	5.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	22
12	6.00	6.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	22

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.5 (For BH-22 (Boiler maintenance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	1.18	201.32	3.50	1.12	0.35	199	0.80	18	29
2	1.00	1.18	201.32	4.00	1.12	0.35	199	0.80	16	25
3	1.00	1.18	201.32	5.00	1.12	0.35	199	0.80	13	20
4	1.00	1.18	201.32	6.00	1.12	0.35	199	0.80	11	17
5	2.00	2.18	201.32	3.50	1.12	0.35	199	0.80	18	29
6	2.00	2.18	201.32	4.00	1.12	0.35	199	0.80	16	25
7	2.00	2.18	201.32	5.00	1.12	0.35	199	0.80	13	20
8	2.00	2.18	201.32	6.00	1.12	0.35	199	0.80	11	17
9	3.00	3.18	201.32	3.50	1.12	0.35	199	0.80	18	29
10	3.00	3.18	201.32	4.00	1.12	0.35	199	0.80	16	25
11	3.00	3.18	201.32	5.00	1.12	0.35	199	0.80	13	20
12	3.00	3.18	201.32	6.00	1.12	0.35	199	0.80	11	17

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.6 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.8)		Allowable Bearing Pressure suggested (<u>Min. of Shear and Settlement Criterion</u>)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	1.18	201.32	7.00	7.00	16	9	14	9	14
1.00	1.18	201.32	8.00	8.00	17	8	13	8	13
1.00	1.18	201.32	9.00	9.00	18	7	11	7	11
1.00	1.18	201.32	10.00	10.00	19	6	10	6	10
2.00	2.18	200.32	7.00	7.00	20	9	14	9	14
2.00	2.18	200.32	8.00	8.00	21	8	13	8	13
2.00	2.18	200.32	9.00	9.00	22	7	11	7	11
2.00	2.18	200.32	10.00	10.00	23	6	10	6	10
3.00	3.18	199.32	7.00	7.00	23	9	14	9	14
3.00	3.18	199.32	8.00	8.00	24	8	13	8	13
3.00	3.18	199.32	9.00	9.00	25	7	11	7	11
3.00	3.18	199.32	10.00	10.00	26	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.7 (For BH-22 (Boiler maintainance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.74	0.87	0.50	0.50	16
2	8.00	8.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.74	0.87	0.50	0.50	17
3	9.00	9.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.74	0.87	0.50	0.50	18
4	10.00	10.00	1.00	1.18	201.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.74	0.87	0.50	0.50	19
5	7.00	7.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.74	0.87	0.50	0.50	20
6	8.00	8.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.74	0.87	0.50	0.50	21
7	9.00	9.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.74	0.87	0.50	0.50	22
8	10.00	10.00	2.00	2.18	200.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
9	7.00	7.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
10	8.00	8.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	24
11	9.00	9.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
12	10.00	10.00	3.00	3.18	199.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.8 (For BH-22 (Boiler maintainance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	1.18	201.32	7.00	1.12	0.35	199	0.80	9	14
2	1.00	1.18	201.32	8.00	1.12	0.35	199	0.80	8	13
3	1.00	1.18	201.32	9.00	1.12	0.35	199	0.80	7	11
4	1.00	1.18	201.32	10.00	1.12	0.35	199	0.80	6	10
5	2.00	2.18	201.32	7.00	1.12	0.35	199	0.80	9	14
6	2.00	2.18	201.32	8.00	1.12	0.35	199	0.80	8	13
7	2.00	2.18	201.32	9.00	1.12	0.35	199	0.80	7	11
8	2.00	2.18	201.32	10.00	1.12	0.35	199	0.80	6	10
9	3.00	3.18	201.32	7.00	1.12	0.35	199	0.80	9	14
10	3.00	3.18	201.32	8.00	1.12	0.35	199	0.80	8	13
11	3.00	3.18	201.32	9.00	1.12	0.35	199	0.80	7	11
12	3.00	3.18	201.32	10.00	1.12	0.35	199	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.9 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.10)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.11)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	3.68	198.82	1.50	1.50	24	42	67	24	24
3.50	3.68	198.82	2.00	2.00	23	32	51	23	23
3.50	3.68	198.82	2.50	2.50	23	25	40	23	23
3.50	3.68	198.82	3.00	3.00	23	21	34	21	23
4.00	4.18	198.32	1.50	1.50	27	42	67	27	27
4.00	4.18	198.32	2.00	2.00	26	32	51	26	26
4.00	4.18	198.32	2.50	2.50	25	25	40	25	25
4.00	4.18	198.32	3.00	3.00	25	21	34	21	25
4.50	4.68	197.82	1.50	1.50	31	42	67	31	31
4.50	4.68	197.82	2.00	2.00	29	32	51	29	29
4.50	4.68	197.82	2.50	2.50	28	25	40	25	28
4.50	4.68	197.82	3.00	3.00	27	21	34	21	27

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.10 (For BH-22 (Boiler maintenance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.65	1.33	1.33	1.00	1.00	1.00	1.74	0.87	0.50	0.50	24
2	2.00	2.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.49	1.24	1.24	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
3	2.50	2.50	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.39	1.20	1.20	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
4	3.00	3.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.33	1.16	1.16	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
5	1.50	1.50	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.74	1.37	1.37	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
6	2.00	2.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
7	2.50	2.50	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.45	1.22	1.22	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
8	3.00	3.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
9	1.50	1.50	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.84	1.42	1.42	1.00	1.00	1.00	1.74	0.87	0.50	0.50	31
10	2.00	2.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.63	1.31	1.31	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
11	2.50	2.50	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.50	1.25	1.25	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28
12	3.00	3.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.11 (For BH-22 (Boiler maintainance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	3.50	3.68	198.82	1.50	1.12	0.35	199	0.80	42	67
2	3.50	3.68	198.82	2.00	1.12	0.35	199	0.80	32	51
3	3.50	3.68	198.82	2.50	1.12	0.35	199	0.80	25	40
4	3.50	3.68	198.82	3.00	1.12	0.35	199	0.80	21	34
5	4.00	4.18	198.82	1.50	1.12	0.35	199	0.80	42	67
6	4.00	4.18	198.82	2.00	1.12	0.35	199	0.80	32	51
7	4.00	4.18	198.82	2.50	1.12	0.35	199	0.80	25	40
8	4.00	4.18	198.82	3.00	1.12	0.35	199	0.80	21	34
9	4.50	4.68	198.82	1.50	1.12	0.35	199	0.80	42	67
10	4.50	4.68	198.82	2.00	1.12	0.35	199	0.80	32	51
11	4.50	4.68	198.82	2.50	1.12	0.35	199	0.80	25	40
12	4.50	4.68	198.82	3.00	1.12	0.35	199	0.80	21	34

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.12 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.13)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.14)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	3.68	198.82	3.50	3.50	23	18	29	18	23
3.50	3.68	198.82	4.00	4.00	23	16	25	16	23
3.50	3.68	198.82	5.00	5.00	24	13	20	13	20
3.50	3.68	198.82	6.00	6.00	24	11	17	11	17
4.00	4.18	198.32	3.50	3.50	25	18	29	18	25
4.00	4.18	198.32	4.00	4.00	25	16	25	16	25
4.00	4.18	198.32	5.00	5.00	26	13	20	13	20
4.00	4.18	198.32	6.00	6.00	26	11	17	11	17
4.50	4.68	197.82	3.50	3.50	27	18	29	18	27
4.50	4.68	197.82	4.00	4.00	27	16	25	16	25
4.50	4.68	197.82	5.00	5.00	28	13	20	13	20
4.50	4.68	197.82	6.00	6.00	28	11	17	11	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.13 (For BH-22 (Boiler maintenance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
2	4.00	4.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.74	0.87	0.50	0.50	23
3	5.00	5.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.74	0.87	0.50	0.50	24
4	6.00	6.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	24
5	3.50	3.50	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
6	4.00	4.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
7	5.00	5.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
8	6.00	6.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
9	3.50	3.50	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
10	4.00	4.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.31	1.16	1.16	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
11	5.00	5.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.25	1.13	1.13	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28
12	6.00	6.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.14 (For BH-22 (Boiler maintenance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	3.50	3.68	198.82	3.50	1.12	0.35	199	0.80	18	29
2	3.50	3.68	198.82	4.00	1.12	0.35	199	0.80	16	25
3	3.50	3.68	198.82	5.00	1.12	0.35	199	0.80	13	20
4	3.50	3.68	198.82	6.00	1.12	0.35	199	0.80	11	17
5	4.00	4.18	198.82	3.50	1.12	0.35	199	0.80	18	29
6	4.00	4.18	198.82	4.00	1.12	0.35	199	0.80	16	25
7	4.00	4.18	198.82	5.00	1.12	0.35	199	0.80	13	20
8	4.00	4.18	198.82	6.00	1.12	0.35	199	0.80	11	17
9	4.50	4.68	198.82	3.50	1.12	0.35	199	0.80	18	29
10	4.50	4.68	198.82	4.00	1.12	0.35	199	0.80	16	25
11	4.50	4.68	198.82	5.00	1.12	0.35	199	0.80	13	20
12	4.50	4.68	198.82	6.00	1.12	0.35	199	0.80	11	17

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.15 (For BH-22 (Boiler maintainance building))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.32m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 24.16)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 24.17)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
3.50	3.68	198.82	7.00	7.00	25	9	14	9	14
3.50	3.68	198.82	8.00	8.00	26	8	13	8	13
3.50	3.68	198.82	9.00	9.00	27	7	11	7	11
3.50	3.68	198.82	10.00	10.00	28	6	10	6	10
4.00	4.18	198.32	7.00	7.00	27	9	14	9	14
4.00	4.18	198.32	8.00	8.00	28	8	13	8	13
4.00	4.18	198.32	9.00	9.00	29	7	11	7	11
4.00	4.18	198.32	10.00	10.00	30	6	10	6	10
4.50	4.68	197.82	7.00	7.00	29	9	14	9	14
4.50	4.68	197.82	8.00	8.00	30	8	13	8	13
4.50	4.68	197.82	9.00	9.00	31	7	11	7	11
4.50	4.68	197.82	10.00	10.00	32	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.16 (For BH-22 (Boiler maintainance building))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	25
2	8.00	8.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	26
3	9.00	9.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
4	10.00	10.00	3.50	3.68	198.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28
5	7.00	7.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	27
6	8.00	8.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	28
7	9.00	9.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
8	10.00	10.00	4.00	4.18	198.32	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
9	7.00	7.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.74	0.87	0.50	0.50	29
10	8.00	8.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.74	0.87	0.50	0.50	30
11	9.00	9.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.74	0.87	0.50	0.50	31
12	10.00	10.00	4.50	4.68	197.82	0.08	27	17.18	7.21	7.89	1.30	1.20	0.80	1.13	1.06	1.06	1.00	1.00	1.00	1.74	0.87	0.50	0.50	32

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.32m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 24.17 (For BH-22 (Boiler maintenance building))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	3.50	3.68	198.82	7.00	1.12	0.35	199	0.80	9	14
2	3.50	3.68	198.82	8.00	1.12	0.35	199	0.80	8	13
3	3.50	3.68	198.82	9.00	1.12	0.35	199	0.80	7	11
4	3.50	3.68	198.82	10.00	1.12	0.35	199	0.80	6	10
5	4.00	4.18	198.82	7.00	1.12	0.35	199	0.80	9	14
6	4.00	4.18	198.82	8.00	1.12	0.35	199	0.80	8	13
7	4.00	4.18	198.82	9.00	1.12	0.35	199	0.80	7	11
8	4.00	4.18	198.82	10.00	1.12	0.35	199	0.80	6	10
9	4.50	4.68	198.82	7.00	1.12	0.35	199	0.80	9	14
10	4.50	4.68	198.82	8.00	1.12	0.35	199	0.80	8	13
11	4.50	4.68	198.82	9.00	1.12	0.35	199	0.80	7	11
12	4.50	4.68	198.82	10.00	1.12	0.35	199	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25 (For BH-46 (Compressor House))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
5.00	197.50	1.50	1.50	25	40	64	25	25
5.00	197.50	2.00	2.00	24	30	48	24	24
5.00	197.50	2.50	2.50	23	24	39	23	23
5.00	197.50	3.00	3.00	23	20	32	20	23
5.50	197.00	1.50	1.50	28	40	64	28	28
5.50	197.00	2.00	2.00	26	30	48	26	26
5.50	197.00	2.50	2.50	25	24	39	24	25
5.50	197.00	3.00	3.00	25	20	32	20	25
6.00	196.50	1.50	1.50	31	40	64	31	31
6.00	196.50	2.00	2.00	29	30	48	29	29
6.00	196.50	2.50	2.50	28	24	39	24	28
6.00	196.50	3.00	3.00	27	20	32	20	27

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.1 (For BH-46 (Compressor House))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.89	1.45	1.45	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
2	2.00	2.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.67	1.33	1.33	1.00	1.00	1.00	2.00	1.00	0.50	0.50	24
3	2.50	2.50	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	2.00	1.00	0.50	0.50	23
4	3.00	3.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.45	1.22	1.22	1.00	1.00	1.00	2.00	1.00	0.50	0.50	23
5	1.50	1.50	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.98	1.49	1.49	1.00	1.00	1.00	2.00	1.00	0.50	0.50	28
6	2.00	2.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.74	1.37	1.37	1.00	1.00	1.00	2.00	1.00	0.50	0.50	26
7	2.50	2.50	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.59	1.29	1.29	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
8	3.00	3.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.49	1.25	1.25	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
9	1.50	1.50	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	2.07	1.54	1.54	1.00	1.00	1.00	2.00	1.00	0.50	0.50	31
10	2.00	2.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.80	1.40	1.40	1.00	1.00	1.00	2.00	1.00	0.50	0.50	29
11	2.50	2.50	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.64	1.32	1.32	1.00	1.00	1.00	2.00	1.00	0.50	0.50	28
12	3.00	3.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.2 (For BH-46 (Compressor House))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	5.00	197.50	1.50	1.12	0.35	189	0.80	40	64
2	5.00	197.50	2.00	1.12	0.35	189	0.80	30	48
3	5.00	197.50	2.50	1.12	0.35	189	0.80	24	39
4	5.00	197.50	3.00	1.12	0.35	189	0.80	20	32
5	5.50	197.50	1.50	1.12	0.35	189	0.80	40	64
6	5.50	197.50	2.00	1.12	0.35	189	0.80	30	48
7	5.50	197.50	2.50	1.12	0.35	189	0.80	24	39
8	5.50	197.50	3.00	1.12	0.35	189	0.80	20	32
9	6.00	197.50	1.50	1.12	0.35	189	0.80	40	64
10	6.00	197.50	2.00	1.12	0.35	189	0.80	30	48
11	6.00	197.50	2.50	1.12	0.35	189	0.80	24	39
12	6.00	197.50	3.00	1.12	0.35	189	0.80	20	32

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.3 (For BH-46 (Compressor House))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
5.00	197.50	3.50	3.50	23	17	28	17	23
5.00	197.50	4.00	4.00	23	15	24	15	23
5.00	197.50	5.00	5.00	23	12	19	12	19
5.00	197.50	6.00	6.00	24	10	16	10	16
5.50	197.00	3.50	3.50	25	17	28	17	25
5.50	197.00	4.00	4.00	25	15	24	15	24
5.50	197.00	5.00	5.00	25	12	19	12	19
5.50	197.00	6.00	6.00	25	10	16	10	16
6.00	196.50	3.50	3.50	27	17	28	17	27
6.00	196.50	4.00	4.00	27	15	24	15	24
6.00	196.50	5.00	5.00	27	12	19	12	19
6.00	196.50	6.00	6.00	27	10	16	10	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.4 (For BH-46 (Compressor House))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	3.50	3.50	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	2.00	1.00	0.50	0.50	23
2	4.00	4.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	2.00	1.00	0.50	0.50	23
3	5.00	5.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00	2.00	1.00	0.50	0.50	23
4	6.00	6.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	2.00	1.00	0.50	0.50	24
5	3.50	3.50	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
6	4.00	4.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.37	1.18	1.18	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
7	5.00	5.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.29	1.15	1.15	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
8	6.00	6.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.25	1.12	1.12	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
9	3.50	3.50	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.46	1.23	1.23	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27
10	4.00	4.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.40	1.20	1.20	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27
11	5.00	5.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27
12	6.00	6.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.5 (For BH-46 (Compressor House))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	5.00	197.50	3.50	1.12	0.35	189	0.80	17	28
2	5.00	197.50	4.00	1.12	0.35	189	0.80	15	24
3	5.00	197.50	5.00	1.12	0.35	189	0.80	12	19
4	5.00	197.50	6.00	1.12	0.35	189	0.80	10	16
5	5.50	197.50	3.50	1.12	0.35	189	0.80	17	28
6	5.50	197.50	4.00	1.12	0.35	189	0.80	15	24
7	5.50	197.50	5.00	1.12	0.35	189	0.80	12	19
8	5.50	197.50	6.00	1.12	0.35	189	0.80	10	16
9	6.00	197.50	3.50	1.12	0.35	189	0.80	17	28
10	6.00	197.50	4.00	1.12	0.35	189	0.80	15	24
11	6.00	197.50	5.00	1.12	0.35	189	0.80	12	19
12	6.00	197.50	6.00	1.12	0.35	189	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.6 (For BH-46 (Compressor House))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
5.00	197.50	7.00	7.00	24	9	14	9	14
5.00	197.50	8.00	8.00	25	8	12	8	12
5.00	197.50	9.00	9.00	26	7	11	7	11
5.00	197.50	10.00	10.00	26	6	10	6	10
5.50	197.00	7.00	7.00	26	9	14	9	14
5.50	197.00	8.00	8.00	27	8	12	8	12
5.50	197.00	9.00	9.00	27	7	11	7	11
5.50	197.00	10.00	10.00	28	6	10	6	10
6.00	196.50	7.00	7.00	28	9	14	9	14
6.00	196.50	8.00	8.00	28	8	12	8	12
6.00	196.50	9.00	9.00	29	7	11	7	11
6.00	196.50	10.00	10.00	30	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.7 (For BH-46 (Compressor House))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTTP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
	m	m																			W _q	W _γ	
1	7.00	7.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	2.00	1.00	0.50	0.50	24
2	8.00	8.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	2.00	1.00	0.50	0.50	25
3	9.00	9.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	2.00	1.00	0.50	0.50	26
4	10.00	10.00	5.00	197.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	2.00	1.00	0.50	0.50	26
5	7.00	7.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	2.00	1.00	0.50	0.50	26
6	8.00	8.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27
7	9.00	9.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	2.00	1.00	0.50	0.50	27
8	10.00	10.00	5.50	197.00	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	2.00	1.00	0.50	0.50	28
9	7.00	7.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	2.00	1.00	0.50	0.50	28
10	8.00	8.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	2.00	1.00	0.50	0.50	28
11	9.00	9.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	2.00	1.00	0.50	0.50	29
12	10.00	10.00	6.00	196.50	0.04	24	14.93	5.58	5.76	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	2.00	1.00	0.50	0.50	30

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.8 (For BH-46 (Compressor House))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	5.00	197.50	7.00	1.12	0.35	189	0.80	9	14
2	5.00	197.50	8.00	1.12	0.35	189	0.80	8	12
3	5.00	197.50	9.00	1.12	0.35	189	0.80	7	11
4	5.00	197.50	10.00	1.12	0.35	189	0.80	6	10
5	5.50	197.50	7.00	1.12	0.35	189	0.80	9	14
6	5.50	197.50	8.00	1.12	0.35	189	0.80	8	12
7	5.50	197.50	9.00	1.12	0.35	189	0.80	7	11
8	5.50	197.50	10.00	1.12	0.35	189	0.80	6	10
9	6.00	197.50	7.00	1.12	0.35	189	0.80	9	14
10	6.00	197.50	8.00	1.12	0.35	189	0.80	8	12
11	6.00	197.50	9.00	1.12	0.35	189	0.80	7	11
12	6.00	197.50	10.00	1.12	0.35	189	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.9 (For BH- 46 (Compressor House))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.10)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.11)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	9	13	20	9	9
1.00	201.50	2.00	2.00	8	9	15	8	8
1.00	201.50	2.50	2.50	8	7	12	7	8
1.00	201.50	3.00	3.00	8	6	10	6	8
2.00	200.50	1.50	1.50	10	13	21	10	10
2.00	200.50	2.00	2.00	9	10	16	9	9
2.00	200.50	2.50	2.50	9	8	12	8	9
2.00	200.50	3.00	3.00	9	6	10	6	9
3.00	199.50	1.50	1.50	11	13	21	11	11
3.00	199.50	2.00	2.00	10	10	16	10	10
3.00	199.50	2.50	2.50	10	8	13	8	10
3.00	199.50	3.00	3.00	9	7	11	7	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.10 (For BH- 46 (Compressor House))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
2	2.00	2.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
3	2.50	2.50	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
4	3.00	3.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
5	1.50	1.50	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	10
6	2.00	2.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
7	2.50	2.50	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
8	3.00	3.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
9	1.50	1.50	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	11
10	2.00	2.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	10
11	2.50	2.50	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	10
12	3.00	3.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.11 (For BH- 46 (Compressor House))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	1.50	1.50	0.35	90	1.12	0.80	0.0192	3.00	0.70	0.80	0.80	13	20
2	1.00	201.50	2.00	2.00	0.35	90	1.12	0.80	0.0192	4.00	0.70	0.85	0.80	9	15
3	1.00	201.50	2.50	2.50	0.35	90	1.12	0.80	0.0192	5.00	0.70	0.88	0.80	7	12
4	1.00	201.50	3.00	3.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.91	0.80	6	10
5	2.00	200.50	1.50	1.50	0.35	90	1.12	0.80	0.0192	3.00	0.70	0.73	0.80	13	21
6	2.00	200.50	2.00	2.00	0.35	90	1.12	0.80	0.0192	4.00	0.70	0.73	0.80	10	16
7	2.00	200.50	2.50	2.50	0.35	90	1.12	0.80	0.0192	5.00	0.70	0.76	0.80	8	12
8	2.00	200.50	3.00	3.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.80	0.80	6	10
9	3.00	199.50	1.50	1.50	0.35	90	1.12	0.80	0.0192	3.00	0.70	0.73	0.80	13	21
10	3.00	199.50	2.00	2.00	0.35	90	1.12	0.80	0.0192	4.00	0.70	0.73	0.80	10	16
11	3.00	199.50	2.50	2.50	0.35	90	1.12	0.80	0.0192	5.00	0.70	0.73	0.80	8	13
12	3.00	199.50	3.00	3.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.73	0.80	7	11

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.12 (For BH- 46 (Compressor House))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.13)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.14)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	8	5	8	5	8
1.00	201.50	4.00	4.00	8	5	7	5	7
1.00	201.50	5.00	5.00	8	4	6	4	6
1.00	201.50	6.00	6.00	8	3	5	3	5
2.00	200.50	3.50	3.50	9	5	9	5	9
2.00	200.50	4.00	4.00	9	5	8	5	8
2.00	200.50	5.00	5.00	8	4	6	4	6
2.00	200.50	6.00	6.00	8	3	5	3	5
3.00	199.50	3.50	3.50	9	6	9	6	9
3.00	199.50	4.00	4.00	9	5	8	5	8
3.00	199.50	5.00	5.00	9	4	6	4	6
3.00	199.50	6.00	6.00	9	3	5	3	5

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.13 (For BH- 46 (Compressor House))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		Wq	Wγ	
1	3.50	3.50	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
2	4.00	4.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
3	5.00	5.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
4	6.00	6.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
5	3.50	3.50	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
6	4.00	4.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
7	5.00	5.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
8	6.00	6.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
9	3.50	3.50	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
10	4.00	4.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
11	5.00	5.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
12	6.00	6.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.14 (For BH- 46 (Compressor House))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.50	3.50	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.92	0.80	5	8
2	1.00	201.50	4.00	4.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.93	0.80	5	7
3	1.00	201.50	5.00	5.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.95	0.80	4	6
4	1.00	201.50	6.00	6.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.96	0.80	3	5
5	2.00	200.50	3.50	3.50	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.83	0.80	5	9
6	2.00	200.50	4.00	4.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.85	0.80	5	8
7	2.00	200.50	5.00	5.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.88	0.80	4	6
8	2.00	200.50	6.00	6.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.91	0.80	3	5
9	3.00	199.50	3.50	3.50	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.75	0.80	6	9
10	3.00	199.50	4.00	4.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.77	0.80	5	8
11	3.00	199.50	5.00	5.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.82	0.80	4	6
12	3.00	199.50	6.00	6.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.85	0.80	3	5

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.15 (For BH- 46 (Compressor House))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 25.16)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 25.17)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	8	3	4	3	4
1.00	201.50	8.00	8.00	8	2	4	2	4
1.00	201.50	9.00	9.00	8	2	3	2	3
1.00	201.50	10.00	10.00	8	2	3	2	3
2.00	200.50	7.00	7.00	8	3	4	3	4
2.00	200.50	8.00	8.00	8	2	4	2	4
2.00	200.50	9.00	9.00	8	2	3	2	3
2.00	200.50	10.00	10.00	8	2	3	2	3
3.00	199.50	7.00	7.00	9	3	5	3	5
3.00	199.50	8.00	8.00	9	2	4	2	4
3.00	199.50	9.00	9.00	9	2	4	2	4
3.00	199.50	10.00	10.00	9	2	3	2	3

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 25.16 (For BH- 46 (Compressor House))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			m	m	Kg/cm ²	degree											gm/cc		Wq	Wγ	
1	7.00	7.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
2	8.00	8.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
3	9.00	9.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
4	10.00	10.00	1.00	201.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
5	7.00	7.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
6	8.00	8.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
7	9.00	9.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
8	10.00	10.00	2.00	200.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	8
9	7.00	7.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
10	8.00	8.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
11	9.00	9.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9
12	10.00	10.00	3.00	199.50	0.36	4	5.88	0.30	0.24	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	9

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 25.17 (For BH- 46 (Compressor House))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	7.00	7.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.97	0.80	3	4
2	1.00	201.50	8.00	8.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.97	0.80	2	4
3	1.00	201.50	9.00	9.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.97	0.80	2	3
4	1.00	201.50	10.00	10.00	0.35	90	1.12	0.80	0.0192	8.00	0.70	0.98	0.80	2	3
5	2.00	200.50	7.00	7.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.92	0.80	3	4
6	2.00	200.50	8.00	8.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.93	0.80	2	4
7	2.00	200.50	9.00	9.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.94	0.80	2	3
8	2.00	200.50	10.00	10.00	0.35	90	1.12	0.80	0.0192	7.00	0.70	0.95	0.80	2	3
9	3.00	199.50	7.00	7.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.87	0.80	3	5
10	3.00	199.50	8.00	8.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.89	0.80	2	4
11	3.00	199.50	9.00	9.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.91	0.80	2	4
12	3.00	199.50	10.00	10.00	0.35	90	1.12	0.80	0.0192	6.00	0.70	0.92	0.80	2	3

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 26.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 26.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	1.50	1.50	14	70	113	14	14
2.50	200.00	2.00	2.00	14	53	85	14	14
2.50	200.00	2.50	2.50	14	42	68	14	14
2.50	200.00	3.00	3.00	14	35	56	14	14
3.50	199.00	1.50	1.50	19	70	113	19	19
3.50	199.00	2.00	2.00	18	53	85	18	18
3.50	199.00	2.50	2.50	17	42	68	17	17
3.50	199.00	3.00	3.00	17	35	56	17	17
4.00	198.50	1.50	1.50	21	70	113	21	21
4.00	198.50	2.00	2.00	20	53	85	20	20
4.00	198.50	2.50	2.50	19	42	68	19	19
4.00	198.50	3.00	3.00	19	35	56	19	19

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.1 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
																					W _q	W _γ	
1	1.50	1.50	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
2	2.00	2.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
3	2.50	2.50	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
4	3.00	3.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
5	1.50	1.50	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.63	1.32	1.32	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
6	2.00	2.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
7	2.50	2.50	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
8	3.00	3.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
9	1.50	1.50	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.72	1.36	1.36	1.00	1.00	1.00	1.71	0.86	0.50	0.50	21
10	2.00	2.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.71	0.86	0.50	0.50	20
11	2.50	2.50	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.43	1.22	1.22	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
12	3.00	3.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50\m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.2 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	1.50	1.12	0.35	332	0.80	70	113
2	2.50	2.00	1.12	0.35	332	0.80	53	85
3	2.50	2.50	1.12	0.35	332	0.80	42	68
4	2.50	3.00	1.12	0.35	332	0.80	35	56
5	3.50	1.50	1.12	0.35	332	0.80	70	113
6	3.50	2.00	1.12	0.35	332	0.80	53	85
7	3.50	2.50	1.12	0.35	332	0.80	42	68
8	3.50	3.00	1.12	0.35	332	0.80	35	56
9	4.00	1.50	1.12	0.35	332	0.80	70	113
10	4.00	2.00	1.12	0.35	332	0.80	53	85
11	4.00	2.50	1.12	0.35	332	0.80	42	68
12	4.00	3.00	1.12	0.35	332	0.80	35	56

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.3 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 26.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 26.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	3.50	3.50	14	30	48	14	14
2.50	200.00	4.00	4.00	14	26	42	14	14
2.50	200.00	5.00	5.00	15	21	34	15	15
2.50	200.00	6.00	6.00	15	18	28	15	15
3.50	199.00	3.50	3.50	17	30	48	17	17
3.50	199.00	4.00	4.00	17	26	42	17	17
3.50	199.00	5.00	5.00	18	21	34	18	18
3.50	199.00	6.00	6.00	18	18	28	18	18
4.00	198.50	3.50	3.50	19	30	48	19	19
4.00	198.50	4.00	4.00	19	26	42	19	19
4.00	198.50	5.00	5.00	19	21	34	19	19
4.00	198.50	6.00	6.00	20	18	28	18	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50\m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.4 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
																					W _q	W _γ	
1	3.50	3.50	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
2	4.00	4.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.71	0.86	0.50	0.50	14
3	5.00	5.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
4	6.00	6.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
5	3.50	3.50	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
6	4.00	4.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
7	5.00	5.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
8	6.00	6.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
9	3.50	3.50	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.31	1.16	1.16	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
10	4.00	4.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
11	5.00	5.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
12	6.00	6.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.71	0.86	0.50	0.50	20

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50\m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.5 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	3.50	1.12	0.35	332	0.80	30	48
2	2.50	4.00	1.12	0.35	332	0.80	26	42
3	2.50	5.00	1.12	0.35	332	0.80	21	34
4	2.50	6.00	1.12	0.35	332	0.80	18	28
5	3.50	3.50	1.12	0.35	332	0.80	30	48
6	3.50	4.00	1.12	0.35	332	0.80	26	42
7	3.50	5.00	1.12	0.35	332	0.80	21	34
8	3.50	6.00	1.12	0.35	332	0.80	18	28
9	4.00	3.50	1.12	0.35	332	0.80	30	48
10	4.00	4.00	1.12	0.35	332	0.80	26	42
11	4.00	5.00	1.12	0.35	332	0.80	21	34
12	4.00	6.00	1.12	0.35	332	0.80	18	28

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.6 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 26.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 26.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	200.00	7.00	7.00	16	15	24	15	16
2.50	200.00	8.00	8.00	17	13	21	13	17
2.50	200.00	9.00	9.00	17	12	19	12	17
2.50	200.00	10.00	10.00	18	11	17	11	17
3.50	199.00	7.00	7.00	19	15	24	15	19
3.50	199.00	8.00	8.00	19	13	21	13	19
3.50	199.00	9.00	9.00	20	12	19	12	19
3.50	199.00	10.00	10.00	21	11	17	11	17
4.00	198.50	7.00	7.00	20	15	24	15	20
4.00	198.50	8.00	8.00	21	13	21	13	21
4.00	198.50	9.00	9.00	21	12	19	12	19
4.00	198.50	10.00	10.00	22	11	17	11	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.7 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
2	8.00	8.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
3	9.00	9.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
4	10.00	10.00	2.50	200.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
5	7.00	7.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
6	8.00	8.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
7	9.00	9.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	20
8	10.00	10.00	3.50	199.00	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	21
9	7.00	7.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.71	0.86	0.50	0.50	20
10	8.00	8.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	21
11	9.00	9.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.71	0.86	0.50	0.50	21
12	10.00	10.00	4.00	198.50	0.08	25	14.75	5.46	5.62	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	22

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from the RL 202.50\m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 26.8 (For BH-21,25,30 (Fuel oil system & foam pumphouse))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	7.00	1.12	0.35	332	0.80	15	24
2	2.50	8.00	1.12	0.35	332	0.80	13	21
3	2.50	9.00	1.12	0.35	332	0.80	12	19
4	2.50	10.00	1.12	0.35	332	0.80	11	17
5	3.50	7.00	1.12	0.35	332	0.80	15	24
6	3.50	8.00	1.12	0.35	332	0.80	13	21
7	3.50	9.00	1.12	0.35	332	0.80	12	19
8	3.50	10.00	1.12	0.35	332	0.80	11	17
9	4.00	7.00	1.12	0.35	332	0.80	15	24
10	4.00	8.00	1.12	0.35	332	0.80	13	21
11	4.00	9.00	1.12	0.35	332	0.80	12	19
12	4.00	10.00	1.12	0.35	332	0.80	11	17

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 26.9 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 27)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 27.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	7	22	35	7	7
1.00	201.50	2.00	2.00	7	16	26	7	7
1.00	201.50	2.50	2.50	7	13	21	7	7
1.00	201.50	3.00	3.00	8	11	17	8	8
1.50	201.00	1.50	1.50	9	22	35	9	9
1.50	201.00	2.00	2.00	9	16	26	9	9
1.50	201.00	2.50	2.50	9	13	21	9	9
1.50	201.00	3.00	3.00	9	11	17	9	9
2.00	200.50	1.50	1.50	10	22	35	10	10
2.00	200.50	2.00	2.00	10	16	26	10	10
2.00	200.50	2.50	2.50	10	13	21	10	10
2.00	200.50	3.00	3.00	10	11	17	10	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50\m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.10 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
																					W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
2	2.00	2.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
3	2.50	2.50	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
4	3.00	3.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	8
5	1.50	1.50	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.26	1.13	1.13	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
6	2.00	2.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
7	2.50	2.50	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
8	3.00	3.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
9	1.50	1.50	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.35	1.17	1.17	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
10	2.00	2.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.26	1.13	1.13	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
11	2.50	2.50	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
12	3.00	3.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 202.50\m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.11 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	1.50	1.12	0.35	102	0.80	22	35
2	1.00	2.00	1.12	0.35	102	0.80	16	26
3	1.00	2.50	1.12	0.35	102	0.80	13	21
4	1.00	3.00	1.12	0.35	102	0.80	11	17
5	1.50	1.50	1.12	0.35	102	0.80	22	35
6	1.50	2.00	1.12	0.35	102	0.80	16	26
7	1.50	2.50	1.12	0.35	102	0.80	13	21
8	1.50	3.00	1.12	0.35	102	0.80	11	17
9	2.00	1.50	1.12	0.35	102	0.80	22	35
10	2.00	2.00	1.12	0.35	102	0.80	16	26
11	2.00	2.50	1.12	0.35	102	0.80	13	21
12	2.00	3.00	1.12	0.35	102	0.80	11	17

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 26.12 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 26.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 26.32)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	8	9	15	8	8
1.00	201.50	4.00	4.00	8	8	13	8	8
1.00	201.50	5.00	5.00	9	7	10	7	9
1.00	201.50	6.00	6.00	9	5	9	5	9
1.50	201.00	3.50	3.50	9	9	15	9	9
1.50	201.00	4.00	4.00	9	8	13	8	9
1.50	201.00	5.00	5.00	10	7	10	7	10
1.50	201.00	6.00	6.00	10	5	9	5	9
2.00	200.50	3.50	3.50	10	9	15	9	10
2.00	200.50	4.00	4.00	10	8	13	8	10
2.00	200.50	5.00	5.00	11	7	10	7	10
2.00	200.50	6.00	6.00	11	5	9	5	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50\m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.13 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	3.50	3.50	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	8
2	4.00	4.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	8
3	5.00	5.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
4	6.00	6.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
5	3.50	3.50	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
6	4.00	4.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
7	5.00	5.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
8	6.00	6.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
9	3.50	3.50	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.15	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
10	4.00	4.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
11	5.00	5.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
12	6.00	6.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 202.50m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.14 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	3.50	1.12	0.35	102	0.80	9	15
2	1.00	4.00	1.12	0.35	102	0.80	8	13
3	1.00	5.00	1.12	0.35	102	0.80	7	10
4	1.00	6.00	1.12	0.35	102	0.80	5	9
5	1.50	3.50	1.12	0.35	102	0.80	9	15
6	1.50	4.00	1.12	0.35	102	0.80	8	13
7	1.50	5.00	1.12	0.35	102	0.80	7	10
8	1.50	6.00	1.12	0.35	102	0.80	5	9
9	2.00	3.50	1.12	0.35	102	0.80	9	15
10	2.00	4.00	1.12	0.35	102	0.80	8	13
11	2.00	5.00	1.12	0.35	102	0.80	7	10
12	2.00	6.00	1.12	0.35	102	0.80	5	9

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.15 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from FGL (R.L. 202.5m)	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 26.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 26.35)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	10	5	7	5	7
1.00	201.50	8.00	8.00	10	4	6	4	6
1.00	201.50	9.00	9.00	11	4	6	4	6
1.00	201.50	10.00	10.00	11	3	5	3	5
1.50	201.00	7.00	7.00	11	5	7	5	7
1.50	201.00	8.00	8.00	11	4	6	4	6
1.50	201.00	9.00	9.00	12	4	6	4	6
1.50	201.00	10.00	10.00	12	3	5	3	5
2.00	200.50	7.00	7.00	12	5	7	5	7
2.00	200.50	8.00	8.00	12	4	6	4	6
2.00	200.50	9.00	9.00	12	4	6	4	6
2.00	200.50	10.00	10.00	13	3	5	3	5

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.16 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
																					W _q	W _γ	
1	7.00	7.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
2	8.00	8.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
3	9.00	9.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
4	10.00	10.00	1.00	201.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
5	7.00	7.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
6	8.00	8.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
7	9.00	9.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
8	10.00	10.00	1.50	201.00	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
9	7.00	7.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
10	8.00	8.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
11	9.00	9.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
12	10.00	10.00	2.00	200.50	0.09	22	12.61	4.01	3.88	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	13

Note :-**1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 202.50\m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-26.17 (For BH-21,25,30 (Fuel oil system & foam pumphouse))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation from NGL m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
							For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	7.00	1.12	0.35	102	0.80	5	7
2	1.00	8.00	1.12	0.35	102	0.80	4	6
3	1.00	9.00	1.12	0.35	102	0.80	4	6
4	1.00	10.00	1.12	0.35	102	0.80	3	5
5	1.50	7.00	1.12	0.35	102	0.80	5	7
6	1.50	8.00	1.12	0.35	102	0.80	4	6
7	1.50	9.00	1.12	0.35	102	0.80	4	6
8	1.50	10.00	1.12	0.35	102	0.80	3	5
9	2.00	7.00	1.12	0.35	102	0.80	5	7
10	2.00	8.00	1.12	0.35	102	0.80	4	6
11	2.00	9.00	1.12	0.35	102	0.80	4	6
12	2.00	10.00	1.12	0.35	102	0.80	3	5

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27 (For BH-18 (Permenant store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 27.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 27.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	18	77	123	18	18
1.00	201.50	2.00	2.00	19	58	92	19	19
1.00	201.50	2.50	2.50	20	46	74	20	20
1.00	201.50	3.00	3.00	21	38	62	21	21
2.00	200.50	1.50	1.50	27	77	123	27	27
2.00	200.50	2.00	2.00	27	58	92	27	27
2.00	200.50	2.50	2.50	28	46	74	28	28
2.00	200.50	3.00	3.00	29	38	62	29	29
3.00	199.50	1.50	1.50	38	77	123	38	38
3.00	199.50	2.00	2.00	37	58	92	37	37
3.00	199.50	2.50	2.50	37	46	74	37	37
3.00	199.50	3.00	3.00	37	38	62	37	37

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.1 (For BH-18 (Permenant store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.90	0.95	0.50	0.50	18
2	2.00	2.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.90	0.95	0.50	0.50	19
3	2.50	2.50	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.90	0.95	0.50	0.50	20
4	3.00	3.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.90	0.95	0.50	0.50	21
5	1.50	1.50	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.90	0.95	0.50	0.50	27
6	2.00	2.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.90	0.95	0.50	0.50	27
7	2.50	2.50	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.90	0.95	0.50	0.50	28
8	3.00	3.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.90	0.95	0.50	0.50	29
9	1.50	1.50	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	1.90	0.95	0.50	0.50	38
10	2.00	2.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.90	0.95	0.50	0.50	37
11	2.50	2.50	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.90	0.95	0.50	0.50	37
12	3.00	3.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.90	0.95	0.50	0.50	37

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.2 (For BH-18 (Permenant store))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	1.50	1.12	0.35	363	0.80	77	123
2	1.00	201.50	2.00	1.12	0.35	363	0.80	58	92
3	1.00	201.50	2.50	1.12	0.35	363	0.80	46	74
4	1.00	201.50	3.00	1.12	0.35	363	0.80	38	62
5	2.00	201.50	1.50	1.12	0.35	363	0.80	77	123
6	2.00	201.50	2.00	1.12	0.35	363	0.80	58	92
7	2.00	201.50	2.50	1.12	0.35	363	0.80	46	74
8	2.00	201.50	3.00	1.12	0.35	363	0.80	38	62
9	3.00	201.50	1.50	1.12	0.35	363	0.80	77	123
10	3.00	201.50	2.00	1.12	0.35	363	0.80	58	92
11	3.00	201.50	2.50	1.12	0.35	363	0.80	46	74
12	3.00	201.50	3.00	1.12	0.35	363	0.80	38	62

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.3 (For BH-18 (Permenant store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 27.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 27.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	22	33	53	22	22
1.00	201.50	4.00	4.00	23	29	46	23	23
1.00	201.50	5.00	5.00	25	23	37	23	25
1.00	201.50	6.00	6.00	28	19	31	19	28
2.00	200.50	3.50	3.50	30	33	53	30	30
2.00	200.50	4.00	4.00	31	29	46	29	31
2.00	200.50	5.00	5.00	33	23	37	23	33
2.00	200.50	6.00	6.00	35	19	31	19	31
3.00	199.50	3.50	3.50	38	33	53	33	38
3.00	199.50	4.00	4.00	38	29	46	29	38
3.00	199.50	5.00	5.00	40	23	37	23	37
3.00	199.50	6.00	6.00	42	19	31	19	31

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.4 (For BH-18 (Permenant store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	3.50	3.50	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.90	0.95	0.50	0.50	22
2	4.00	4.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.90	0.95	0.50	0.50	23
3	5.00	5.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.90	0.95	0.50	0.50	25
4	6.00	6.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.90	0.95	0.50	0.50	28
5	3.50	3.50	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.90	0.95	0.50	0.50	30
6	4.00	4.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.90	0.95	0.50	0.50	31
7	5.00	5.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.90	0.95	0.50	0.50	33
8	6.00	6.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.90	0.95	0.50	0.50	35
9	3.50	3.50	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.90	0.95	0.50	0.50	38
10	4.00	4.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.90	0.95	0.50	0.50	38
11	5.00	5.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.90	0.95	0.50	0.50	40
12	6.00	6.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.90	0.95	0.50	0.50	42

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.5 (For BH-18 (Permenant store))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	3.50	1.12	0.35	363	0.80	33	53
2	1.00	201.50	4.00	1.12	0.35	363	0.80	29	46
3	1.00	201.50	5.00	1.12	0.35	363	0.80	23	37
4	1.00	201.50	6.00	1.12	0.35	363	0.80	19	31
5	2.00	201.50	3.50	1.12	0.35	363	0.80	33	53
6	2.00	201.50	4.00	1.12	0.35	363	0.80	29	46
7	2.00	201.50	5.00	1.12	0.35	363	0.80	23	37
8	2.00	201.50	6.00	1.12	0.35	363	0.80	19	31
9	3.00	201.50	3.50	1.12	0.35	363	0.80	33	53
10	3.00	201.50	4.00	1.12	0.35	363	0.80	29	46
11	3.00	201.50	5.00	1.12	0.35	363	0.80	23	37
12	3.00	201.50	6.00	1.12	0.35	363	0.80	19	31

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.6 (For BH-18 (Permenant store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 27.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 27.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	30	16	26	16	26
1.00	201.50	8.00	8.00	32	14	23	14	23
1.00	201.50	9.00	9.00	35	13	21	13	21
1.00	201.50	10.00	10.00	37	12	18	12	18
2.00	200.50	7.00	7.00	37	16	26	16	26
2.00	200.50	8.00	8.00	39	14	23	14	23
2.00	200.50	9.00	9.00	42	13	21	13	21
2.00	200.50	10.00	10.00	44	12	18	12	18
3.00	199.50	7.00	7.00	44	16	26	16	26
3.00	199.50	8.00	8.00	47	14	23	14	23
3.00	199.50	9.00	9.00	49	13	21	13	21
3.00	199.50	10.00	10.00	51	12	18	12	18

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.7 (For BH-18 (Permenant store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	7.00	7.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.90	0.95	0.50	0.50	30
2	8.00	8.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.90	0.95	0.50	0.50	32
3	9.00	9.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.90	0.95	0.50	0.50	35
4	10.00	10.00	1.00	201.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.90	0.95	0.50	0.50	37
5	7.00	7.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.90	0.95	0.50	0.50	37
6	8.00	8.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.90	0.95	0.50	0.50	39
7	9.00	9.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.90	0.95	0.50	0.50	42
8	10.00	10.00	2.00	200.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.90	0.95	0.50	0.50	44
9	7.00	7.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.90	0.95	0.50	0.50	44
10	8.00	8.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.90	0.95	0.50	0.50	47
11	9.00	9.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.90	0.95	0.50	0.50	49
12	10.00	10.00	3.00	199.50	0.07	27	25.52	13.36	16.00	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.90	0.95	0.50	0.50	51

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 27.8 (For BH-18 (Permenant store))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	7.00	1.12	0.35	363	0.80	16	26
2	1.00	201.50	8.00	1.12	0.35	363	0.80	14	23
3	1.00	201.50	9.00	1.12	0.35	363	0.80	13	21
4	1.00	201.50	10.00	1.12	0.35	363	0.80	12	18
5	2.00	201.50	7.00	1.12	0.35	363	0.80	16	26
6	2.00	201.50	8.00	1.12	0.35	363	0.80	14	23
7	2.00	201.50	9.00	1.12	0.35	363	0.80	13	21
8	2.00	201.50	10.00	1.12	0.35	363	0.80	12	18
9	3.00	201.50	7.00	1.12	0.35	363	0.80	16	26
10	3.00	201.50	8.00	1.12	0.35	363	0.80	14	23
11	3.00	201.50	9.00	1.12	0.35	363	0.80	13	21
12	3.00	201.50	10.00	1.12	0.35	363	0.80	12	18

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28 (For BH-38 (Auxiliary Boiler))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 28.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 28.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	17	23	37	17	17
1.00	201.50	2.00	2.00	16	16	26	16	16
1.00	201.50	2.50	2.50	16	13	20	13	16
1.00	201.50	3.00	3.00	16	10	17	10	16
2.00	200.50	1.50	1.50	19	25	40	19	19
2.00	200.50	2.00	2.00	18	19	30	18	18
2.00	200.50	2.50	2.50	18	14	23	14	18
2.00	200.50	3.00	3.00	17	12	19	12	17
3.00	199.50	1.50	1.50	22	25	40	22	22
3.00	199.50	2.00	2.00	20	19	30	19	20
3.00	199.50	2.50	2.50	19	15	24	15	19
3.00	199.50	3.00	3.00	19	12	20	12	19

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28.1 (For BH-38 (Auxiliary Boiler))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	1.50	1.50	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
2	2.00	2.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
3	2.50	2.50	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
4	3.00	3.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
5	1.50	1.50	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.29	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
6	2.00	2.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
7	2.50	2.50	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
8	3.00	3.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
9	1.50	1.50	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.44	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	22
10	2.00	2.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.33	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	20
11	2.50	2.50	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.26	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19
12	3.00	3.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.22	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	19

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 28.2 (For BH-38 (Auxiliary Boiler))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details			Immidiata Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	1.50	1.50	0.40	637	1.12	0.80	0.0270	3.00	0.70	0.80	0.80	23	37
2	1.00	2.00	2.00	0.40	637	1.12	0.80	0.0270	4.00	0.70	0.85	0.80	16	26
3	1.00	2.50	2.50	0.40	637	1.12	0.80	0.0270	5.00	0.70	0.88	0.80	13	20
4	1.00	3.00	3.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.91	0.80	10	17
5	2.00	1.50	1.50	0.40	637	1.12	0.80	0.0270	3.00	0.70	0.73	0.80	25	40
6	2.00	2.00	2.00	0.40	637	1.12	0.80	0.0270	4.00	0.70	0.73	0.80	19	30
7	2.00	2.50	2.50	0.40	637	1.12	0.80	0.0270	5.00	0.70	0.76	0.80	14	23
8	2.00	3.00	3.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.80	0.80	12	19
9	3.00	1.50	1.50	0.40	637	1.12	0.80	0.0270	3.00	0.70	0.73	0.80	25	40
10	3.00	2.00	2.00	0.40	637	1.12	0.80	0.0270	4.00	0.70	0.73	0.80	19	30
11	3.00	2.50	2.50	0.40	637	1.12	0.80	0.0270	5.00	0.70	0.73	0.80	15	24
12	3.00	3.00	3.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.73	0.80	12	20

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28.3 (For BH-38 (Auxiliary Boiler))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 28.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 28.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	16	9	14	9	14
1.00	201.50	4.00	4.00	16	8	12	8	12
1.00	201.50	5.00	5.00	16	6	10	6	10
1.00	201.50	6.00	6.00	16	5	8	5	8
2.00	200.50	3.50	3.50	17	10	15	10	15
2.00	200.50	4.00	4.00	17	8	13	8	13
2.00	200.50	5.00	5.00	17	7	10	7	10
2.00	200.50	6.00	6.00	17	6	9	6	9
3.00	199.50	3.50	3.50	18	10	17	10	17
3.00	199.50	4.00	4.00	18	9	14	9	14
3.00	199.50	5.00	5.00	18	7	11	7	11
3.00	199.50	6.00	6.00	18	6	10	6	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28.4 (For BH-38 (Auxiliary Boiler))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ			
	m	m																			m	m	
1	3.50	3.50	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
2	4.00	4.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
3	5.00	5.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
4	6.00	6.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
5	3.50	3.50	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
6	4.00	4.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
7	5.00	5.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
8	6.00	6.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
9	3.50	3.50	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
10	4.00	4.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
11	5.00	5.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18
12	6.00	6.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	18

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 28.5 (For BH-38 (Auxiliary Boiler))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details			Immidiata Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	3.50	3.50	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.92	0.80	9	14
2	1.00	4.00	4.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.93	0.80	8	12
3	1.00	5.00	5.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.95	0.80	6	10
4	1.00	6.00	6.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.96	0.80	5	8
5	2.00	3.50	3.50	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.83	0.80	10	15
6	2.00	4.00	4.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.85	0.80	8	13
7	2.00	5.00	5.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.88	0.80	7	10
8	2.00	6.00	6.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.91	0.80	6	9
9	3.00	3.50	3.50	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.75	0.80	10	17
10	3.00	4.00	4.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.77	0.80	9	14
11	3.00	5.00	5.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.82	0.80	7	11
12	3.00	6.00	6.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.85	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28.6 (For BH-38 (Auxiliary Boiler))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 28.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 28.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	16	5	7	5	7
1.00	201.50	8.00	8.00	16	4	6	4	6
1.00	201.50	9.00	9.00	16	4	6	4	6
1.00	201.50	10.00	10.00	16	3	6	3	6
2.00	200.50	7.00	7.00	17	5	8	5	8
2.00	200.50	8.00	8.00	17	4	7	4	7
2.00	200.50	9.00	9.00	17	4	6	4	6
2.00	200.50	10.00	10.00	17	4	6	4	6
3.00	199.50	7.00	7.00	17	5	8	5	8
3.00	199.50	8.00	8.00	17	5	8	5	8
3.00	199.50	9.00	9.00	17	4	7	4	7
3.00	199.50	10.00	10.00	17	4	7	4	7

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 28.7 (For BH-38 (Auxiliary Boiler))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTTP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
2	8.00	8.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
3	9.00	9.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
4	10.00	10.00	1.00	201.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	16
5	7.00	7.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
6	8.00	8.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
7	9.00	9.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
8	10.00	10.00	2.00	200.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
9	7.00	7.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
10	8.00	8.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
11	9.00	9.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17
12	10.00	10.00	3.00	199.50	0.60	8	6.86	0.74	0.59	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.98	0.99	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 28.8 (For BH-38 (Auxiliary Boiler))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details			Immidiata Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	7.00	7.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.97	0.80	5	7
2	1.00	8.00	8.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.97	0.80	4	6
3	1.00	9.00	9.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.97	0.80	4	6
4	1.00	10.00	10.00	0.40	637	1.12	0.80	0.0270	8.00	0.70	0.98	0.80	3	6
5	2.00	7.00	7.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.92	0.80	5	8
6	2.00	8.00	8.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.93	0.80	4	7
7	2.00	9.00	9.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.94	0.80	4	6
8	2.00	10.00	10.00	0.40	637	1.12	0.80	0.0270	7.00	0.70	0.95	0.80	4	6
9	3.00	7.00	7.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.87	0.80	5	8
10	3.00	8.00	8.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.89	0.80	5	8
11	3.00	9.00	9.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.91	0.80	4	7
12	3.00	10.00	10.00	0.40	637	1.12	0.80	0.0270	6.00	0.70	0.92	0.80	4	7

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29 (For BH-147,155,161,168 (IDCT-1,2,3))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 29.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 29.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	3.51	198.49	1.50	1.50	18	40	65	18	18
2.50	3.51	198.49	2.00	2.00	17	30	49	17	17
2.50	3.51	198.49	2.50	2.50	17	25	40	17	17
2.50	3.51	198.49	3.00	3.00	16	21	33	16	16
3.00	4.01	197.99	1.50	1.50	19	40	65	19	19
3.00	4.01	197.99	2.00	2.00	18	31	49	18	18
3.00	4.01	197.99	2.50	2.50	17	25	41	17	17
3.00	4.01	197.99	3.00	3.00	17	22	35	17	17
3.50	4.51	197.49	1.50	1.50	20	41	65	20	20
3.50	4.51	197.49	2.00	2.00	19	32	50	19	19
3.50	4.51	197.49	2.50	2.50	18	26	42	18	18
3.50	4.51	197.49	3.00	3.00	17	23	37	17	17

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29.1 (For BH-147,155,161,168 (IDCT-1,2,3))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.35	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
2	2.00	2.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
3	2.50	2.50	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
4	3.00	3.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
5	1.50	1.50	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
6	2.00	2.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.32	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
7	2.50	2.50	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
8	3.00	3.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
9	1.50	1.50	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.49	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	20
10	2.00	2.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.37	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	19
11	2.50	2.50	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.30	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	18
12	3.00	3.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.2 (For BH-147,155,161,168 (IDCT-1,2,3))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	198.49	3.51	1.50	1.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	40	65
2	2.50	198.49	3.51	2.00	2.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.73	0.80	30	49
3	2.50	198.49	3.51	2.50	2.50	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.73	0.80	25	40
4	2.50	198.49	3.51	3.00	3.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.75	0.80	21	33
5	3.00	197.99	4.01	1.50	1.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	40	65
6	3.00	197.99	4.01	2.00	2.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	31	49
7	3.00	197.99	4.01	2.50	2.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	25	41
8	3.00	197.99	4.01	3.00	3.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	22	35
9	3.50	197.49	4.51	1.50	1.50	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.73	0.80	41	65
10	3.50	197.49	4.51	2.00	2.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.73	0.80	32	50
11	3.50	197.49	4.51	2.50	2.50	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.73	0.80	26	42
12	3.50	197.49	4.51	3.00	3.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.73	0.80	23	37

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29.3 (For BH-147,155,161,168 (IDCT-1,2,3))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 29.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 29.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	3.51	198.49	3.50	3.50	16	18	29	16	16
2.50	3.51	198.49	4.00	4.00	16	16	25	16	16
2.50	3.51	198.49	5.00	5.00	15	13	21	13	15
2.50	3.51	198.49	6.00	6.00	15	11	18	11	15
3.00	4.01	197.99	3.50	3.50	16	19	31	16	16
3.00	4.01	197.99	4.00	4.00	16	17	28	16	16
3.00	4.01	197.99	5.00	5.00	16	14	23	14	16
3.00	4.01	197.99	6.00	6.00	15	12	20	12	15
3.50	4.51	197.49	3.50	3.50	17	21	33	17	17
3.50	4.51	197.49	4.00	4.00	16	19	30	16	16
3.50	4.51	197.49	5.00	5.00	16	16	25	16	16
3.50	4.51	197.49	6.00	6.00	16	14	22	14	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29.4 (For BH-147,155,161,168 (IDCT-1,2,3))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
2	4.00	4.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
3	5.00	5.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
4	6.00	6.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
5	3.50	3.50	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
6	4.00	4.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
7	5.00	5.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.13	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
8	6.00	6.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
9	3.50	3.50	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	17
10	4.00	4.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.19	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
11	5.00	5.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
12	6.00	6.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.5 (For BH-147,155,161,168 (IDCT-1,2,3))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	198.49	3.51	3.50	3.50	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.78	0.80	18	29
2	2.50	198.49	3.51	4.00	4.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.81	0.80	16	25
3	2.50	198.49	3.51	5.00	5.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.85	0.80	13	21
4	2.50	198.49	3.51	6.00	6.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.88	0.80	11	18
5	3.00	197.99	4.01	3.50	3.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.75	0.80	19	31
6	3.00	197.99	4.01	4.00	4.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.77	0.80	17	28
7	3.00	197.99	4.01	5.00	5.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.82	0.80	14	23
8	3.00	197.99	4.01	6.00	6.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.85	0.80	12	20
9	3.50	197.49	4.51	3.50	3.50	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.73	0.80	21	33
10	3.50	197.49	4.51	4.00	4.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.75	0.80	19	30
11	3.50	197.49	4.51	5.00	5.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.79	0.80	16	25
12	3.50	197.49	4.51	6.00	6.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.82	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29.6 (For BH-147,155,161,168 (IDCT-1,2,3))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of foundation from FGL	RL of Foundation from FGL	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 29.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 29.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	3.51	198.49	7.00	7.00	15	10	16	10	15
2.50	3.51	198.49	8.00	8.00	15	9	15	9	15
2.50	3.51	198.49	9.00	9.00	15	9	14	9	14
2.50	3.51	198.49	10.00	10.00	15	8	13	8	13
3.00	4.01	197.99	7.00	7.00	15	11	18	11	15
3.00	4.01	197.99	8.00	8.00	15	10	16	10	15
3.00	4.01	197.99	9.00	9.00	15	10	15	10	15
3.00	4.01	197.99	10.00	10.00	15	9	14	9	14
3.50	4.51	197.49	7.00	7.00	16	12	20	12	16
3.50	4.51	197.49	8.00	8.00	15	11	18	11	15
3.50	4.51	197.49	9.00	9.00	15	11	17	11	15
3.50	4.51	197.49	10.00	10.00	15	10	16	10	15

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 29.7 (For BH-147,155,161,168 (IDCT-1,2,3))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	7.00	7.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
2	8.00	8.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
3	9.00	9.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
4	10.00	10.00	2.50	3.51	198.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
5	7.00	7.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
6	8.00	8.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
7	9.00	9.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
8	10.00	10.00	3.00	4.01	197.99	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
9	7.00	7.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	16
10	8.00	8.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
11	9.00	9.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15
12	10.00	10.00	3.50	4.51	197.49	0.63	5	6.04	0.37	0.29	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.71	0.86	0.50	0.50	15

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.8 (For BH-147,155,161,168 (IDCT-1,2,3))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :-

Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Depth of foundation from FGL	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	2.50	198.49	3.51	7.00	7.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.90	0.80	10	16
2	2.50	198.49	3.51	8.00	8.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.91	0.80	9	15
3	2.50	198.49	3.51	9.00	9.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.92	0.80	9	14
4	2.50	198.49	3.51	10.00	10.00	0.35	769	1.12	0.80	0.0152	3.50	0.70	0.93	0.80	8	13
5	3.00	197.99	4.01	7.00	7.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.87	0.80	11	18
6	3.00	197.99	4.01	8.00	8.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.89	0.80	10	16
7	3.00	197.99	4.01	9.00	9.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.91	0.80	10	15
8	3.00	197.99	4.01	10.00	10.00	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.92	0.80	9	14
9	3.50	197.49	4.51	7.00	7.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.85	0.80	12	20
10	3.50	197.49	4.51	8.00	8.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.87	0.80	11	18
11	3.50	197.49	4.51	9.00	9.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.89	0.80	11	17
12	3.50	197.49	4.51	10.00	10.00	0.35	769	1.12	0.80	0.0152	2.50	0.70	0.90	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.9 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 30) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 30.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	2.01	199.99	1.50	1.50	6	38	60	6	6
1.00	2.01	199.99	2.00	2.00	6	27	43	6	6
1.00	2.01	199.99	2.50	2.50	7	21	33	7	7
1.00	2.01	199.99	3.00	3.00	7	17	28	7	7
2.00	3.01	198.99	1.50	1.50	9	40	65	9	9
2.00	3.01	198.99	2.00	2.00	9	30	48	9	9
2.00	3.01	198.99	2.50	2.50	9	24	38	9	9
2.00	3.01	198.99	3.00	3.00	9	19	31	9	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.10 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.71	0.86	0.50	0.50	6
2	2.00	2.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	6
3	2.50	2.50	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
4	3.00	3.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
5	1.50	1.50	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
6	2.00	2.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.27	1.14	1.14	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
7	2.50	2.50	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
8	3.00	3.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.11 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	2.01	199.99	1.50	1.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.80	0.80	38	60
2	1.00	2.01	199.99	2.00	2.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.85	0.80	27	43
3	1.00	2.01	199.99	2.50	2.50	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.88	0.80	21	33
4	1.00	2.01	199.99	3.00	3.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.91	0.80	17	28
5	2.00	3.01	198.99	1.50	1.50	0.35	769	1.12	0.80	0.0152	3.00	0.70	0.73	0.80	40	65
6	2.00	3.01	198.99	2.00	2.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.73	0.80	30	48
7	2.00	3.01	198.99	2.50	2.50	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.76	0.80	24	38
8	2.00	3.01	198.99	3.00	3.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.80	0.80	19	31

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.12 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 29.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 29.32)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	2.01	199.99	3.50	3.50	7	15	24	7	7
1.00	2.01	199.99	4.00	4.00	7	13	21	7	7
1.00	2.01	199.99	5.00	5.00	8	11	17	8	8
1.00	2.01	199.99	6.00	6.00	8	9	15	8	8
2.00	3.01	198.99	3.50	3.50	9	17	27	9	9
2.00	3.01	198.99	4.00	4.00	10	15	24	10	10
2.00	3.01	198.99	5.00	5.00	10	12	20	10	10
2.00	3.01	198.99	6.00	6.00	11	11	17	11	11

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.13 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
2	4.00	4.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	7
3	5.00	5.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	8
4	6.00	6.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	8
5	3.50	3.50	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
6	4.00	4.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
7	5.00	5.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
8	6.00	6.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.14 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	2.01	199.99	3.50	3.50	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.92	0.80	15	24
2	1.00	2.01	199.99	4.00	4.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.93	0.80	13	21
3	1.00	2.01	199.99	5.00	5.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.95	0.80	11	17
4	1.00	2.01	199.99	6.00	6.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.96	0.80	9	15
5	2.00	3.01	198.99	3.50	3.50	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.83	0.80	17	27
6	2.00	3.01	198.99	4.00	4.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.85	0.80	15	24
7	2.00	3.01	198.99	5.00	5.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.88	0.80	12	20
8	2.00	3.01	198.99	6.00	6.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.91	0.80	11	17

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 29.15 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (R.L. 200.99m)	Depth of Foundation from FGL (R.L. 202.00m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 29.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 29.35)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	2.01	199.99	7.00	7.00	9	8	14	8	9
1.00	2.01	199.99	8.00	8.00	10	8	12	8	10
1.00	2.01	199.99	9.00	9.00	10	7	12	7	10
1.00	2.01	199.99	10.00	10.00	11	7	11	7	11
2.00	3.01	198.99	7.00	7.00	11	10	15	10	11
2.00	3.01	198.99	8.00	8.00	12	9	14	9	12
2.00	3.01	198.99	9.00	9.00	12	8	13	8	12
2.00	3.01	198.99	10.00	10.00	13	8	12	8	12

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.16 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	9
2	8.00	8.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
3	9.00	9.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.71	0.86	0.50	0.50	10
4	10.00	10.00	1.00	2.01	199.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
5	7.00	7.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.71	0.86	0.50	0.50	11
6	8.00	8.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
7	9.00	9.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	12
8	10.00	10.00	2.00	3.01	198.99	0.06	25	13.30	4.44	4.34	1.30	1.20	0.80	1.05	1.03	1.03	1.00	1.00	1.00	1.71	0.86	0.50	0.50	13

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 200.99m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-29.17 (For BH- 147,155,161,168 (IDCT-1,2,3, & Switchgear room))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details					Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D from NGL	Depth D from FGL	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	2.01	199.99	7.00	7.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.97	0.80	8	14
2	1.00	2.01	199.99	8.00	8.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.97	0.80	8	12
3	1.00	2.01	199.99	9.00	9.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.97	0.80	7	12
4	1.00	2.01	199.99	10.00	10.00	0.35	769	1.12	0.80	0.0152	5.00	0.70	0.98	0.80	7	11
5	2.00	3.01	198.99	7.00	7.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.92	0.80	10	15
6	2.00	3.01	198.99	8.00	8.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.93	0.80	9	14
7	2.00	3.01	198.99	9.00	9.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.94	0.80	8	13
8	2.00	3.01	198.99	10.00	10.00	0.35	769	1.12	0.80	0.0152	4.00	0.70	0.95	0.80	8	12

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30 (For BH-9 (Amonia storage and handling system))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:197.56m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 30.1) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 30.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	7.44	195.06	1.50	1.50	12	54	87	12	12
2.50	7.44	195.06	2.00	2.00	12	41	65	12	12
2.50	7.44	195.06	2.50	2.50	12	33	52	12	12
2.50	7.44	195.06	3.00	3.00	12	27	44	12	12
3.00	7.94	194.56	1.50	1.50	14	54	87	14	14
3.00	7.94	194.56	2.00	2.00	14	41	65	14	14
3.00	7.94	194.56	2.50	2.50	14	33	52	14	14
3.00	7.94	194.56	3.00	3.00	14	27	44	14	14
3.50	8.44	194.06	1.50	1.50	17	54	87	17	17
3.50	8.44	194.06	2.00	2.00	16	41	65	16	16
3.50	8.44	194.06	2.50	2.50	16	33	52	16	16
3.50	8.44	194.06	3.00	3.00	16	27	44	16	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.1 (For BH-9 (Amonia storage and handling system))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5 γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.46	1.23	1.23	1.00	1.00	1.00	1.84	0.92	0.50	0.50	12
2	2.00	2.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.84	0.92	0.50	0.50	12
3	2.50	2.50	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.84	0.92	0.50	0.50	12
4	3.00	3.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.84	0.92	0.50	0.50	12
5	1.50	1.50	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.55	1.28	1.28	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14
6	2.00	2.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.41	1.21	1.21	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14
7	2.50	2.50	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14
8	3.00	3.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14
9	1.50	1.50	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.64	1.32	1.32	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
10	2.00	2.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16
11	2.50	2.50	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.39	1.19	1.19	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16
12	3.00	3.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.2 (For BH-9 (Amonia storage and handling system))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	7.44	195.06	1.50	1.12	0.35	257	0.80	54	87
2	2.50	7.44	195.06	2.00	1.12	0.35	257	0.80	41	65
3	2.50	7.44	195.06	2.50	1.12	0.35	257	0.80	33	52
4	2.50	7.44	195.06	3.00	1.12	0.35	257	0.80	27	44
5	3.00	7.94	195.06	1.50	1.12	0.35	257	0.80	54	87
6	3.00	7.94	195.06	2.00	1.12	0.35	257	0.80	41	65
7	3.00	7.94	195.06	2.50	1.12	0.35	257	0.80	33	52
8	3.00	7.94	195.06	3.00	1.12	0.35	257	0.80	27	44
9	3.50	8.44	195.06	1.50	1.12	0.35	257	0.80	54	87
10	3.50	8.44	195.06	2.00	1.12	0.35	257	0.80	41	65
11	3.50	8.44	195.06	2.50	1.12	0.35	257	0.80	33	52
12	3.50	8.44	195.06	3.00	1.12	0.35	257	0.80	27	44

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.3 (For BH-9 (Amonia storage and handling system))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:197.56m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 30.4) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 30.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
(m)	(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
2.50	7.44	195.06	3.50	3.50	13	23	37	13	13
2.50	7.44	195.06	4.00	4.00	13	20	33	13	13
2.50	7.44	195.06	5.00	5.00	14	16	26	14	14
2.50	7.44	195.06	6.00	6.00	15	14	22	14	15
3.00	7.94	194.56	3.50	3.50	15	23	37	15	15
3.00	7.94	194.56	4.00	4.00	15	20	33	15	15
3.00	7.94	194.56	5.00	5.00	16	16	26	16	16
3.00	7.94	194.56	6.00	6.00	17	14	22	14	17
3.50	8.44	194.06	3.50	3.50	16	23	37	16	16
3.50	8.44	194.06	4.00	4.00	17	20	33	17	17
3.50	8.44	194.06	5.00	5.00	17	16	26	16	17
3.50	8.44	194.06	6.00	6.00	18	14	22	14	18

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.4 (For BH-9 (Amonia storage and handling system))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	3.50	3.50	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.84	0.92	0.50	0.50	13
2	4.00	4.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.17	1.09	1.09	1.00	1.00	1.00	1.84	0.92	0.50	0.50	13
3	5.00	5.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14
4	6.00	6.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.84	0.92	0.50	0.50	15
5	3.50	3.50	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.84	0.92	0.50	0.50	15
6	4.00	4.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.84	0.92	0.50	0.50	15
7	5.00	5.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16
8	6.00	6.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
9	3.50	3.50	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16
10	4.00	4.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
11	5.00	5.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.19	1.10	1.10	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
12	6.00	6.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.84	0.92	0.50	0.50	18

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.5 (For BH-9 (Amonia storage and handling system))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	7.44	195.06	3.50	1.12	0.35	257	0.80	23	37
2	2.50	7.44	195.06	4.00	1.12	0.35	257	0.80	20	33
3	2.50	7.44	195.06	5.00	1.12	0.35	257	0.80	16	26
4	2.50	7.44	195.06	6.00	1.12	0.35	257	0.80	14	22
5	3.00	7.94	195.06	3.50	1.12	0.35	257	0.80	23	37
6	3.00	7.94	195.06	4.00	1.12	0.35	257	0.80	20	33
7	3.00	7.94	195.06	5.00	1.12	0.35	257	0.80	16	26
8	3.00	7.94	195.06	6.00	1.12	0.35	257	0.80	14	22
9	3.50	8.44	195.06	3.50	1.12	0.35	257	0.80	23	37
10	3.50	8.44	195.06	4.00	1.12	0.35	257	0.80	20	33
11	3.50	8.44	195.06	5.00	1.12	0.35	257	0.80	16	26
12	3.50	8.44	195.06	6.00	1.12	0.35	257	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.6 (For BH-9 (Amonia storage and handling system))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:197.56m)	Depth of Foundation from FGL (RL:202.50m)	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 30.7) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 30.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
2.50	7.44	195.06	7.00	7.00	16	12	19	12	16
2.50	7.44	195.06	8.00	8.00	17	10	16	10	16
2.50	7.44	195.06	9.00	9.00	18	9	15	9	15
2.50	7.44	195.06	10.00	10.00	19	8	13	8	13
3.00	7.94	194.56	7.00	7.00	17	12	19	12	17
3.00	7.94	194.56	8.00	8.00	18	10	16	10	16
3.00	7.94	194.56	9.00	9.00	19	9	15	9	15
3.00	7.94	194.56	10.00	10.00	20	8	13	8	13
3.50	8.44	194.06	7.00	7.00	19	12	19	12	19
3.50	8.44	194.06	8.00	8.00	20	10	16	10	16
3.50	8.44	194.06	9.00	9.00	21	9	15	9	15
3.50	8.44	194.06	10.00	10.00	22	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.7 (For BH-9 (Amonia storage and handling system))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	7.00	7.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	16
2	8.00	8.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
3	9.00	9.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.84	0.92	0.50	0.50	18
4	10.00	10.00	2.50	7.44	195.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.84	0.92	0.50	0.50	19
5	7.00	7.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.84	0.92	0.50	0.50	17
6	8.00	8.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	18
7	9.00	9.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	19
8	10.00	10.00	3.00	7.94	194.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.84	0.92	0.50	0.50	20
9	7.00	7.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.84	0.92	0.50	0.50	19
10	8.00	8.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.84	0.92	0.50	0.50	20
11	9.00	9.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	21
12	10.00	10.00	3.50	8.44	194.06	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	22

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.8 (For BH-9 (Amonia storage and handling system))

Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	2.50	7.44	195.06	7.00	1.12	0.35	257	0.80	12	19
2	2.50	7.44	195.06	8.00	1.12	0.35	257	0.80	10	16
3	2.50	7.44	195.06	9.00	1.12	0.35	257	0.80	9	15
4	2.50	7.44	195.06	10.00	1.12	0.35	257	0.80	8	13
5	3.00	7.94	195.06	7.00	1.12	0.35	257	0.80	12	19
6	3.00	7.94	195.06	8.00	1.12	0.35	257	0.80	10	16
7	3.00	7.94	195.06	9.00	1.12	0.35	257	0.80	9	15
8	3.00	7.94	195.06	10.00	1.12	0.35	257	0.80	8	13
9	3.50	8.44	195.06	7.00	1.12	0.35	257	0.80	12	19
10	3.50	8.44	195.06	8.00	1.12	0.35	257	0.80	10	16
11	3.50	8.44	195.06	9.00	1.12	0.35	257	0.80	9	15
12	3.50	8.44	195.06	10.00	1.12	0.35	257	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 30.9 (For BH-9 (Amonia storage and handling system))

SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION**Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTP) at village- Hirma, Talabira, Odisha

Depth of Foundation from NGL (RL:197.56m) (m)	Depth of Foundation from FGL (RL:202.50m) (m)	RL of Foundation (m)	Length of Foundation (m)	Width of Foundation (m)	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 31) (t / m ²)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 31.1)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
						For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)	For 25 mm Settlement (t / m ²)	For 40 mm Settlement (t / m ²)
1.00	5.94	196.56	1.50	1.50	6	35	56	6	6
1.00	5.94	196.56	2.00	2.00	6	26	42	6	6
1.00	5.94	196.56	2.50	2.50	7	21	34	7	7
1.00	5.94	196.56	3.00	3.00	7	17	28	7	7
1.00	5.94	196.56	3.50	3.50	8	15	24	8	8
1.00	5.94	196.56	4.00	4.00	8	13	21	8	8
1.00	5.94	196.56	5.00	5.00	9	10	17	9	9
1.00	5.94	196.56	6.00	6.00	10	9	14	9	10
1.00	5.94	196.56	7.00	7.00	11	7	12	7	11
1.00	5.94	196.56	8.00	8.00	12	7	10	7	10
1.00	5.94	196.56	9.00	9.00	13	6	9	6	9
1.00	5.94	196.56	10.00	10.00	14	5	8	5	8

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-30.10 (For BH-9 (Amonia storage and handling system))

Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha**For Square Isolated Foundation**

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	Depth of Foundation from FGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width				C	ϕ													γ	0.5γ			
	m	m				Kg/cm ²	degree													gm/cc		W _q	W _{γ}	
1	1.50	1.50	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.84	0.92	0.50	0.50	6
2	2.00	2.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.84	0.92	0.50	0.50	6
3	2.50	2.50	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.84	0.92	0.50	0.50	7
4	3.00	3.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.84	0.92	0.50	0.50	7
5	3.50	3.50	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.84	0.92	0.50	0.50	8
6	4.00	4.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.84	0.92	0.50	0.50	8
7	5.00	5.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.84	0.92	0.50	0.50	9
8	6.00	6.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.84	0.92	0.50	0.50	10
9	7.00	7.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.84	0.92	0.50	0.50	11
10	8.00	8.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.84	0.92	0.50	0.50	12
11	9.00	9.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.84	0.92	0.50	0.50	13
12	10.00	10.00	1.00	5.94	196.56	0.02	26	15.96	6.31	6.71	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.84	0.92	0.50	0.50	14

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.56m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX-30.11 (For BH-9 (Amonia storage and handling system))
 Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	Depth of foundation from FGL m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
									For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	5.94	196.56	1.50	1.12	0.35	165	0.80	35	56
2	1.00	5.94	196.56	2.00	1.12	0.35	165	0.80	26	42
3	1.00	5.94	196.56	2.50	1.12	0.35	165	0.80	21	34
4	1.00	5.94	196.56	3.00	1.12	0.35	165	0.80	17	28
5	1.00	5.94	196.56	3.50	1.12	0.35	165	0.80	15	24
6	1.00	5.94	196.56	4.00	1.12	0.35	165	0.80	13	21
7	1.00	5.94	196.56	5.00	1.12	0.35	165	0.80	10	17
8	1.00	5.94	196.56	6.00	1.12	0.35	165	0.80	9	14
9	1.00	5.94	196.56	7.00	1.12	0.35	165	0.80	7	12
10	1.00	5.94	196.56	8.00	1.12	0.35	165	0.80	7	10
11	1.00	5.94	196.56	9.00	1.12	0.35	165	0.80	6	9
12	1.00	5.94	196.56	10.00	1.12	0.35	165	0.80	5	8

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31 (For BH-117 (Fire Station))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 31.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 31.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	20	91	145	20	20
1.00	201.50	2.00	2.00	21	68	109	21	21
1.00	201.50	2.50	2.50	21	54	87	21	21
1.00	201.50	3.00	3.00	22	45	72	22	22
2.00	200.50	1.50	1.50	29	91	145	29	29
2.00	200.50	2.00	2.00	29	68	109	29	29
2.00	200.50	2.50	2.50	30	54	87	30	30
2.00	200.50	3.00	3.00	30	45	72	30	30
3.00	199.50	1.50	1.50	40	91	145	40	40
3.00	199.50	2.00	2.00	39	68	109	39	39
3.00	199.50	2.50	2.50	39	54	87	39	39
3.00	199.50	3.00	3.00	39	45	72	39	39

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.1 (For BH-117 (Fire Station))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	2.07	1.04	0.50	0.50	20
2	2.00	2.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	2.07	1.04	0.50	0.50	21
3	2.50	2.50	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	2.07	1.04	0.50	0.50	21
4	3.00	3.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	2.07	1.04	0.50	0.50	22
5	1.50	1.50	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	2.07	1.04	0.50	0.50	29
6	2.00	2.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	2.07	1.04	0.50	0.50	29
7	2.50	2.50	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	2.07	1.04	0.50	0.50	30
8	3.00	3.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	2.07	1.04	0.50	0.50	30
9	1.50	1.50	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	2.07	1.04	0.50	0.50	40
10	2.00	2.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	2.07	1.04	0.50	0.50	39
11	2.50	2.50	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	2.07	1.04	0.50	0.50	39
12	3.00	3.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	2.07	1.04	0.50	0.50	39

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.2 (For BH-117 (Fire Station))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	1.50	1.12	0.35	427	0.80	91	145
2	1.00	201.50	2.00	1.12	0.35	427	0.80	68	109
3	1.00	201.50	2.50	1.12	0.35	427	0.80	54	87
4	1.00	201.50	3.00	1.12	0.35	427	0.80	45	72
5	2.00	201.50	1.50	1.12	0.35	427	0.80	91	145
6	2.00	201.50	2.00	1.12	0.35	427	0.80	68	109
7	2.00	201.50	2.50	1.12	0.35	427	0.80	54	87
8	2.00	201.50	3.00	1.12	0.35	427	0.80	45	72
9	3.00	201.50	1.50	1.12	0.35	427	0.80	91	145
10	3.00	201.50	2.00	1.12	0.35	427	0.80	68	109
11	3.00	201.50	2.50	1.12	0.35	427	0.80	54	87
12	3.00	201.50	3.00	1.12	0.35	427	0.80	45	72

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.3 (For BH-117 (Fire Station))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 31.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 31.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	23	39	62	23	23
1.00	201.50	4.00	4.00	25	34	54	25	25
1.00	201.50	5.00	5.00	27	27	43	27	27
1.00	201.50	6.00	6.00	29	23	36	23	29
2.00	200.50	3.50	3.50	31	39	62	31	31
2.00	200.50	4.00	4.00	32	34	54	32	32
2.00	200.50	5.00	5.00	34	27	43	27	34
2.00	200.50	6.00	6.00	36	23	36	23	36
3.00	199.50	3.50	3.50	39	39	62	39	39
3.00	199.50	4.00	4.00	40	34	54	34	40
3.00	199.50	5.00	5.00	42	27	43	27	42
3.00	199.50	6.00	6.00	44	23	36	23	36

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.4 (For BH-117 (Fire Station))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	3.50	3.50	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	2.07	1.04	0.50	0.50	23
2	4.00	4.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	2.07	1.04	0.50	0.50	25
3	5.00	5.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	2.07	1.04	0.50	0.50	27
4	6.00	6.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	2.07	1.04	0.50	0.50	29
5	3.50	3.50	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	2.07	1.04	0.50	0.50	31
6	4.00	4.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	2.07	1.04	0.50	0.50	32
7	5.00	5.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	2.07	1.04	0.50	0.50	34
8	6.00	6.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	2.07	1.04	0.50	0.50	36
9	3.50	3.50	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	2.07	1.04	0.50	0.50	39
10	4.00	4.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	2.07	1.04	0.50	0.50	40
11	5.00	5.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	2.07	1.04	0.50	0.50	42
12	6.00	6.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	2.07	1.04	0.50	0.50	44

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.5 (For BH-117 (Fire Station))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	3.50	1.12	0.35	427	0.80	39	62
2	1.00	201.50	4.00	1.12	0.35	427	0.80	34	54
3	1.00	201.50	5.00	1.12	0.35	427	0.80	27	43
4	1.00	201.50	6.00	1.12	0.35	427	0.80	23	36
5	2.00	201.50	3.50	1.12	0.35	427	0.80	39	62
6	2.00	201.50	4.00	1.12	0.35	427	0.80	34	54
7	2.00	201.50	5.00	1.12	0.35	427	0.80	27	43
8	2.00	201.50	6.00	1.12	0.35	427	0.80	23	36
9	3.00	201.50	3.50	1.12	0.35	427	0.80	39	62
10	3.00	201.50	4.00	1.12	0.35	427	0.80	34	54
11	3.00	201.50	5.00	1.12	0.35	427	0.80	27	43
12	3.00	201.50	6.00	1.12	0.35	427	0.80	23	36

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.6 (For BH-117 (Fire Station))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 31.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 31.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	31	19	31	19	31
1.00	201.50	8.00	8.00	34	17	27	17	27
1.00	201.50	9.00	9.00	36	15	24	15	24
1.00	201.50	10.00	10.00	38	14	22	14	22
2.00	200.50	7.00	7.00	38	19	31	19	31
2.00	200.50	8.00	8.00	41	17	27	17	27
2.00	200.50	9.00	9.00	43	15	24	15	24
2.00	200.50	10.00	10.00	45	14	22	14	22
3.00	199.50	7.00	7.00	46	19	31	19	31
3.00	199.50	8.00	8.00	48	17	27	17	27
3.00	199.50	9.00	9.00	50	15	24	15	24
3.00	199.50	10.00	10.00	52	14	22	14	22

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.7 (For BH-117 (Fire Station))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation from NGL m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length m	Width m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	7.00	7.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	2.07	1.04	0.50	0.50	31
2	8.00	8.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	2.07	1.04	0.50	0.50	34
3	9.00	9.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	2.07	1.04	0.50	0.50	36
4	10.00	10.00	1.00	201.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	2.07	1.04	0.50	0.50	38
5	7.00	7.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	2.07	1.04	0.50	0.50	38
6	8.00	8.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	2.07	1.04	0.50	0.50	41
7	9.00	9.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	2.07	1.04	0.50	0.50	43
8	10.00	10.00	2.00	200.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	2.07	1.04	0.50	0.50	45
9	7.00	7.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	2.07	1.04	0.50	0.50	46
10	8.00	8.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	2.07	1.04	0.50	0.50	48
11	9.00	9.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	2.07	1.04	0.50	0.50	50
12	10.00	10.00	3.00	199.50	0.09	27	23.87	12.15	14.40	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	2.07	1.04	0.50	0.50	52

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 31.8 (For BH-117 (Fire Station))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.50	7.00	1.12	0.35	427	0.80	19	31
2	1.00	201.50	8.00	1.12	0.35	427	0.80	17	27
3	1.00	201.50	9.00	1.12	0.35	427	0.80	15	24
4	1.00	201.50	10.00	1.12	0.35	427	0.80	14	22
5	2.00	201.50	7.00	1.12	0.35	427	0.80	19	31
6	2.00	201.50	8.00	1.12	0.35	427	0.80	17	27
7	2.00	201.50	9.00	1.12	0.35	427	0.80	15	24
8	2.00	201.50	10.00	1.12	0.35	427	0.80	14	22
9	3.00	201.50	7.00	1.12	0.35	427	0.80	19	31
10	3.00	201.50	8.00	1.12	0.35	427	0.80	17	27
11	3.00	201.50	9.00	1.12	0.35	427	0.80	15	24
12	3.00	201.50	10.00	1.12	0.35	427	0.80	14	22

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	1.50	1.50	19	64	102	19	19
1.00	201.00	2.00	2.00	19	48	77	19	19
1.00	201.00	2.50	2.50	20	38	61	20	20
1.00	201.00	3.00	3.00	21	32	51	21	21
2.00	200.00	1.50	1.50	28	64	102	28	28
2.00	200.00	2.00	2.00	27	48	77	27	27
2.00	200.00	2.50	2.50	28	38	61	28	28
2.00	200.00	3.00	3.00	28	32	51	28	28
3.00	199.00	1.50	1.50	37	64	102	37	37
3.00	199.00	2.00	2.00	36	48	77	36	36
3.00	199.00	2.50	2.50	36	38	61	36	36
3.00	199.00	3.00	3.00	36	32	51	32	36

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.1 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width																					
	m	m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	1.50	1.50	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.83	0.92	0.50	0.50	19
2	2.00	2.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.83	0.92	0.50	0.50	19
3	2.50	2.50	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.83	0.92	0.50	0.50	20
4	3.00	3.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.83	0.92	0.50	0.50	21
5	1.50	1.50	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.83	0.92	0.50	0.50	28
6	2.00	2.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.83	0.92	0.50	0.50	27
7	2.50	2.50	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.83	0.92	0.50	0.50	28
8	3.00	3.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.83	0.92	0.50	0.50	28
9	1.50	1.50	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.83	0.92	0.50	0.50	37
10	2.00	2.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.83	0.92	0.50	0.50	36
11	2.50	2.50	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.83	0.92	0.50	0.50	36
12	3.00	3.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.83	0.92	0.50	0.50	36

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.2 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	1.50	1.12	0.35	302	0.80	64	102
2	1.00	201.00	2.00	1.12	0.35	302	0.80	48	77
3	1.00	201.00	2.50	1.12	0.35	302	0.80	38	61
4	1.00	201.00	3.00	1.12	0.35	302	0.80	32	51
5	2.00	201.00	1.50	1.12	0.35	302	0.80	64	102
6	2.00	201.00	2.00	1.12	0.35	302	0.80	48	77
7	2.00	201.00	2.50	1.12	0.35	302	0.80	38	61
8	2.00	201.00	3.00	1.12	0.35	302	0.80	32	51
9	3.00	201.00	1.50	1.12	0.35	302	0.80	64	102
10	3.00	201.00	2.00	1.12	0.35	302	0.80	48	77
11	3.00	201.00	2.50	1.12	0.35	302	0.80	38	61
12	3.00	201.00	3.00	1.12	0.35	302	0.80	32	51

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.3 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	3.50	3.50	22	27	44	22	22
1.00	201.00	4.00	4.00	23	24	38	23	23
1.00	201.00	5.00	5.00	25	19	31	19	25
1.00	201.00	6.00	6.00	27	16	26	16	26
2.00	200.00	3.50	3.50	29	27	44	27	29
2.00	200.00	4.00	4.00	30	24	38	24	30
2.00	200.00	5.00	5.00	32	19	31	19	31
2.00	200.00	6.00	6.00	34	16	26	16	26
3.00	199.00	3.50	3.50	37	27	44	27	37
3.00	199.00	4.00	4.00	37	24	38	24	37
3.00	199.00	5.00	5.00	39	19	31	19	31
3.00	199.00	6.00	6.00	41	16	26	16	26

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.4 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width																					
	m	m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	3.50	3.50	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.83	0.92	0.50	0.50	22
2	4.00	4.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.83	0.92	0.50	0.50	23
3	5.00	5.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.83	0.92	0.50	0.50	25
4	6.00	6.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.83	0.92	0.50	0.50	27
5	3.50	3.50	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.83	0.92	0.50	0.50	29
6	4.00	4.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.83	0.92	0.50	0.50	30
7	5.00	5.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.83	0.92	0.50	0.50	32
8	6.00	6.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.83	0.92	0.50	0.50	34
9	3.50	3.50	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.83	0.92	0.50	0.50	37
10	4.00	4.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.83	0.92	0.50	0.50	37
11	5.00	5.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.83	0.92	0.50	0.50	39
12	6.00	6.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.83	0.92	0.50	0.50	41

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.5 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	3.50	1.12	0.35	302	0.80	27	44
2	1.00	201.00	4.00	1.12	0.35	302	0.80	24	38
3	1.00	201.00	5.00	1.12	0.35	302	0.80	19	31
4	1.00	201.00	6.00	1.12	0.35	302	0.80	16	26
5	2.00	201.00	3.50	1.12	0.35	302	0.80	27	44
6	2.00	201.00	4.00	1.12	0.35	302	0.80	24	38
7	2.00	201.00	5.00	1.12	0.35	302	0.80	19	31
8	2.00	201.00	6.00	1.12	0.35	302	0.80	16	26
9	3.00	201.00	3.50	1.12	0.35	302	0.80	27	44
10	3.00	201.00	4.00	1.12	0.35	302	0.80	24	38
11	3.00	201.00	5.00	1.12	0.35	302	0.80	19	31
12	3.00	201.00	6.00	1.12	0.35	302	0.80	16	26

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.6 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.00	7.00	7.00	29	14	22	14	22
1.00	201.00	8.00	8.00	32	12	19	12	19
1.00	201.00	9.00	9.00	34	11	17	11	17
1.00	201.00	10.00	10.00	36	10	15	10	15
2.00	200.00	7.00	7.00	36	14	22	14	22
2.00	200.00	8.00	8.00	38	12	19	12	19
2.00	200.00	9.00	9.00	40	11	17	11	17
2.00	200.00	10.00	10.00	42	10	15	10	15
3.00	199.00	7.00	7.00	43	14	22	14	22
3.00	199.00	8.00	8.00	45	12	19	12	19
3.00	199.00	9.00	9.00	47	11	17	11	17
3.00	199.00	10.00	10.00	49	10	15	10	15

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.7 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.83	0.92	0.50	0.50	29
2	8.00	8.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.83	0.92	0.50	0.50	32
3	9.00	9.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.83	0.92	0.50	0.50	34
4	10.00	10.00	1.00	201.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.83	0.92	0.50	0.50	36
5	7.00	7.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.83	0.92	0.50	0.50	36
6	8.00	8.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.83	0.92	0.50	0.50	38
7	9.00	9.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.83	0.92	0.50	0.50	40
8	10.00	10.00	2.00	200.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.83	0.92	0.50	0.50	42
9	7.00	7.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.83	0.92	0.50	0.50	43
10	8.00	8.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.83	0.92	0.50	0.50	45
11	9.00	9.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.83	0.92	0.50	0.50	47
12	10.00	10.00	3.00	199.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.83	0.92	0.50	0.50	49

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.8 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m ²	For 40 mm Settlement T / m ²
1	1.00	201.00	7.00	1.12	0.35	302	0.80	14	22
2	1.00	201.00	8.00	1.12	0.35	302	0.80	12	19
3	1.00	201.00	9.00	1.12	0.35	302	0.80	11	17
4	1.00	201.00	10.00	1.12	0.35	302	0.80	10	15
5	2.00	201.00	7.00	1.12	0.35	302	0.80	14	22
6	2.00	201.00	8.00	1.12	0.35	302	0.80	12	19
7	2.00	201.00	9.00	1.12	0.35	302	0.80	11	17
8	2.00	201.00	10.00	1.12	0.35	302	0.80	10	15
9	3.00	201.00	7.00	1.12	0.35	302	0.80	14	22
10	3.00	201.00	8.00	1.12	0.35	302	0.80	12	19
11	3.00	201.00	9.00	1.12	0.35	302	0.80	11	17
12	3.00	201.00	10.00	1.12	0.35	302	0.80	10	15

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.9 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.10)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.11)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
8.00	194.00	1.50	1.50	137	64	64
8.00	194.00	2.00	2.00	124	48	48
8.00	194.00	2.50	2.50	116	38	38
8.00	194.00	3.00	3.00	112	32	32
8.50	193.50	1.50	1.50	147	64	64
8.50	193.50	2.00	2.00	133	48	48
8.50	193.50	2.50	2.50	124	38	38
8.50	193.50	3.00	3.00	119	32	32
9.00	193.00	1.50	1.50	159	64	64
9.00	193.00	2.00	2.00	142	48	48
9.00	193.00	2.50	2.50	133	38	38
9.00	193.00	3.00	3.00	127	32	32

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.10 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTTP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ													γ	0.5 γ			
	m	m			Kg/cm ²	degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	gm/cc		W _q	W _γ	
1	1.50	1.50	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.51	1.75	1.75	1.00	1.00	1.00	2.10	1.05	0.50	0.50	137
2	2.00	2.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.13	1.57	1.57	1.00	1.00	1.00	2.10	1.05	0.50	0.50	124
3	2.50	2.50	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.91	1.45	1.45	1.00	1.00	1.00	2.10	1.05	0.50	0.50	116
4	3.00	3.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.75	1.38	1.38	1.00	1.00	1.00	2.10	1.05	0.50	0.50	112
5	1.50	1.50	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.60	1.80	1.80	1.00	1.00	1.00	2.10	1.05	0.50	0.50	147
6	2.00	2.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.20	1.60	1.60	1.00	1.00	1.00	2.10	1.05	0.50	0.50	133
7	2.50	2.50	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.96	1.48	1.48	1.00	1.00	1.00	2.10	1.05	0.50	0.50	124
8	3.00	3.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.80	1.40	1.40	1.00	1.00	1.00	2.10	1.05	0.50	0.50	119
9	1.50	1.50	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.70	1.85	1.85	1.00	1.00	1.00	2.10	1.05	0.50	0.50	159
10	2.00	2.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.27	1.64	1.64	1.00	1.00	1.00	2.10	1.05	0.50	0.50	142
11	2.50	2.50	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	2.02	1.51	1.51	1.00	1.00	1.00	2.10	1.05	0.50	0.50	133
12	3.00	3.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.85	1.42	1.42	1.00	1.00	1.00	2.10	1.05	0.50	0.50	127

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.11 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	8.00	194.00	1.50	1.12	0.35	302	0.80	64
2	8.00	194.00	2.00	1.12	0.35	302	0.80	48
3	8.00	194.00	2.50	1.12	0.35	302	0.80	38
4	8.00	194.00	3.00	1.12	0.35	302	0.80	32
5	8.50	194.00	1.50	1.12	0.35	302	0.80	64
6	8.50	194.00	2.00	1.12	0.35	302	0.80	48
7	8.50	194.00	2.50	1.12	0.35	302	0.80	38
8	8.50	194.00	3.00	1.12	0.35	302	0.80	32
9	9.00	194.00	1.50	1.12	0.35	302	0.80	64
10	9.00	194.00	2.00	1.12	0.35	302	0.80	48
11	9.00	194.00	2.50	1.12	0.35	302	0.80	38
12	9.00	194.00	3.00	1.12	0.35	302	0.80	32

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.12 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.13)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.14)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
8.00	194.00	3.50	3.50	109	27	27
8.00	194.00	4.00	4.00	108	24	24
8.00	194.00	5.00	5.00	106	19	19
8.00	194.00	6.00	6.00	107	16	16
8.50	193.50	3.50	3.50	116	27	27
8.50	193.50	4.00	4.00	114	24	24
8.50	193.50	5.00	5.00	112	19	19
8.50	193.50	6.00	6.00	112	16	16
9.00	193.00	3.50	3.50	123	27	27
9.00	193.00	4.00	4.00	121	24	24
9.00	193.00	5.00	5.00	119	19	19
9.00	193.00	6.00	6.00	118	16	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.13 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	3.50	3.50	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.65	1.32	1.32	1.00	1.00	1.00	2.10	1.05	0.50	0.50	109
2	4.00	4.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	2.10	1.05	0.50	0.50	108
3	5.00	5.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	2.10	1.05	0.50	0.50	106
4	6.00	6.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	2.10	1.05	0.50	0.50	107
5	3.50	3.50	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.69	1.34	1.34	1.00	1.00	1.00	2.10	1.05	0.50	0.50	116
6	4.00	4.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.60	1.30	1.30	1.00	1.00	1.00	2.10	1.05	0.50	0.50	114
7	5.00	5.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.48	1.24	1.24	1.00	1.00	1.00	2.10	1.05	0.50	0.50	112
8	6.00	6.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.40	1.20	1.20	1.00	1.00	1.00	2.10	1.05	0.50	0.50	112
9	3.50	3.50	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.73	1.36	1.36	1.00	1.00	1.00	2.10	1.05	0.50	0.50	123
10	4.00	4.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.64	1.32	1.32	1.00	1.00	1.00	2.10	1.05	0.50	0.50	121
11	5.00	5.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.51	1.25	1.25	1.00	1.00	1.00	2.10	1.05	0.50	0.50	119
12	6.00	6.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	2.10	1.05	0.50	0.50	118

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.14 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	8.00	194.00	3.50	1.12	0.35	302	0.80	27
2	8.00	194.00	4.00	1.12	0.35	302	0.80	24
3	8.00	194.00	5.00	1.12	0.35	302	0.80	19
4	8.00	194.00	6.00	1.12	0.35	302	0.80	16
5	8.50	194.00	3.50	1.12	0.35	302	0.80	27
6	8.50	194.00	4.00	1.12	0.35	302	0.80	24
7	8.50	194.00	5.00	1.12	0.35	302	0.80	19
8	8.50	194.00	6.00	1.12	0.35	302	0.80	16
9	9.00	194.00	3.50	1.12	0.35	302	0.80	27
10	9.00	194.00	4.00	1.12	0.35	302	0.80	24
11	9.00	194.00	5.00	1.12	0.35	302	0.80	19
12	9.00	194.00	6.00	1.12	0.35	302	0.80	16

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.15 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.16)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.17)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
8.00	194.00	7.00	7.00	108	14	14
8.00	194.00	8.00	8.00	109	12	12
8.00	194.00	9.00	9.00	111	11	11
8.00	194.00	10.00	10.00	113	10	10
8.50	193.50	7.00	7.00	113	14	14
8.50	193.50	8.00	8.00	114	12	12
8.50	193.50	9.00	9.00	116	11	11
8.50	193.50	10.00	10.00	118	10	10
9.00	193.00	7.00	7.00	119	14	14
9.00	193.00	8.00	8.00	120	12	12
9.00	193.00	9.00	9.00	121	11	11
9.00	193.00	10.00	10.00	123	10	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.16 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	7.00	7.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	2.10	1.05	0.50	0.50	108
2	8.00	8.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	2.10	1.05	0.50	0.50	109
3	9.00	9.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.25	1.13	1.13	1.00	1.00	1.00	2.10	1.05	0.50	0.50	111
4	10.00	10.00	8.00	194.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	2.10	1.05	0.50	0.50	113
5	7.00	7.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	2.10	1.05	0.50	0.50	113
6	8.00	8.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.30	1.15	1.15	1.00	1.00	1.00	2.10	1.05	0.50	0.50	114
7	9.00	9.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00	2.10	1.05	0.50	0.50	116
8	10.00	10.00	8.50	193.50	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	2.10	1.05	0.50	0.50	118
9	7.00	7.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	2.10	1.05	0.50	0.50	119
10	8.00	8.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	2.10	1.05	0.50	0.50	120
11	9.00	9.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	2.10	1.05	0.50	0.50	121
12	10.00	10.00	9.00	193.00	0.09	28	27.62	15.09	18.57	1.30	1.20	0.80	1.25	1.13	1.13	1.00	1.00	1.00	2.10	1.05	0.50	0.50	123

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.17 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	8.00	194.00	7.00	1.12	0.35	302	0.80	14
2	8.00	194.00	8.00	1.12	0.35	302	0.80	12
3	8.00	194.00	9.00	1.12	0.35	302	0.80	11
4	8.00	194.00	10.00	1.12	0.35	302	0.80	10
5	8.50	194.00	7.00	1.12	0.35	302	0.80	14
6	8.50	194.00	8.00	1.12	0.35	302	0.80	12
7	8.50	194.00	9.00	1.12	0.35	302	0.80	11
8	8.50	194.00	10.00	1.12	0.35	302	0.80	10
9	9.00	194.00	7.00	1.12	0.35	302	0.80	14
10	9.00	194.00	8.00	1.12	0.35	302	0.80	12
11	9.00	194.00	9.00	1.12	0.35	302	0.80	11
12	9.00	194.00	10.00	1.12	0.35	302	0.80	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.18 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.19)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.20)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	198.00	1.50	1.50	48	64	48
4.00	198.00	2.00	2.00	46	48	46
4.00	198.00	2.50	2.50	45	38	38
4.00	198.00	3.00	3.00	45	32	32
5.00	197.00	1.50	1.50	60	64	60
5.00	197.00	2.00	2.00	56	48	48
5.00	197.00	2.50	2.50	55	38	38
5.00	197.00	3.00	3.00	54	32	32
6.00	196.00	1.50	1.50	73	64	64
6.00	196.00	2.00	2.00	68	48	48
6.00	196.00	2.50	2.50	65	38	38
6.00	196.00	3.00	3.00	63	32	32

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.19 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width																					
	m	m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	1.50	1.50	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.75	1.38	1.38	1.00	1.00	1.00	1.83	0.92	0.50	0.50	48
2	2.00	2.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.83	0.92	0.50	0.50	46
3	2.50	2.50	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.45	1.23	1.23	1.00	1.00	1.00	1.83	0.92	0.50	0.50	45
4	3.00	3.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.38	1.19	1.19	1.00	1.00	1.00	1.83	0.92	0.50	0.50	45
5	1.50	1.50	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.94	1.47	1.47	1.00	1.00	1.00	1.83	0.92	0.50	0.50	60
6	2.00	2.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.71	1.35	1.35	1.00	1.00	1.00	1.83	0.92	0.50	0.50	56
7	2.50	2.50	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.83	0.92	0.50	0.50	55
8	3.00	3.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.47	1.24	1.24	1.00	1.00	1.00	1.83	0.92	0.50	0.50	54
9	1.50	1.50	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	2.13	1.57	1.57	1.00	1.00	1.00	1.83	0.92	0.50	0.50	73
10	2.00	2.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.85	1.42	1.42	1.00	1.00	1.00	1.83	0.92	0.50	0.50	68
11	2.50	2.50	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.68	1.34	1.34	1.00	1.00	1.00	1.83	0.92	0.50	0.50	65
12	3.00	3.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.83	0.92	0.50	0.50	63

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.20 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	4.00	198.00	1.50	1.12	0.35	302	0.80	64
2	4.00	198.00	2.00	1.12	0.35	302	0.80	48
3	4.00	198.00	2.50	1.12	0.35	302	0.80	38
4	4.00	198.00	3.00	1.12	0.35	302	0.80	32
5	5.00	198.00	1.50	1.12	0.35	302	0.80	64
6	5.00	198.00	2.00	1.12	0.35	302	0.80	48
7	5.00	198.00	2.50	1.12	0.35	302	0.80	38
8	5.00	198.00	3.00	1.12	0.35	302	0.80	32
9	6.00	198.00	1.50	1.12	0.35	302	0.80	64
10	6.00	198.00	2.00	1.12	0.35	302	0.80	48
11	6.00	198.00	2.50	1.12	0.35	302	0.80	38
12	6.00	198.00	3.00	1.12	0.35	302	0.80	32

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.21 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.22)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.23)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	198.00	3.50	3.50	45	27	27
4.00	198.00	4.00	4.00	45	24	24
4.00	198.00	5.00	5.00	46	19	19
4.00	198.00	6.00	6.00	48	16	16
5.00	197.00	3.50	3.50	53	27	27
5.00	197.00	4.00	4.00	53	24	24
5.00	197.00	5.00	5.00	54	19	19
5.00	197.00	6.00	6.00	55	16	16
6.00	196.00	3.50	3.50	62	27	27
6.00	196.00	4.00	4.00	62	24	24
6.00	196.00	5.00	5.00	62	19	19
6.00	196.00	6.00	6.00	63	16	16

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.22 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	3.50	3.50	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.83	0.92	0.50	0.50	45
2	4.00	4.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.83	0.92	0.50	0.50	45
3	5.00	5.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.83	0.92	0.50	0.50	46
4	6.00	6.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.83	0.92	0.50	0.50	48
5	3.50	3.50	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.40	1.20	1.20	1.00	1.00	1.00	1.83	0.92	0.50	0.50	53
6	4.00	4.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.35	1.18	1.18	1.00	1.00	1.00	1.83	0.92	0.50	0.50	53
7	5.00	5.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.83	0.92	0.50	0.50	54
8	6.00	6.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.83	0.92	0.50	0.50	55
9	3.50	3.50	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.49	1.24	1.24	1.00	1.00	1.00	1.83	0.92	0.50	0.50	62
10	4.00	4.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.83	0.92	0.50	0.50	62
11	5.00	5.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.34	1.17	1.17	1.00	1.00	1.00	1.83	0.92	0.50	0.50	62
12	6.00	6.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.83	0.92	0.50	0.50	63

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.23 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	4.00	198.00	3.50	1.12	0.35	302	0.80	27
2	4.00	198.00	4.00	1.12	0.35	302	0.80	24
3	4.00	198.00	5.00	1.12	0.35	302	0.80	19
4	4.00	198.00	6.00	1.12	0.35	302	0.80	16
5	5.00	198.00	3.50	1.12	0.35	302	0.80	27
6	5.00	198.00	4.00	1.12	0.35	302	0.80	24
7	5.00	198.00	5.00	1.12	0.35	302	0.80	19
8	5.00	198.00	6.00	1.12	0.35	302	0.80	16
9	6.00	198.00	3.50	1.12	0.35	302	0.80	27
10	6.00	198.00	4.00	1.12	0.35	302	0.80	24
11	6.00	198.00	5.00	1.12	0.35	302	0.80	19
12	6.00	198.00	6.00	1.12	0.35	302	0.80	16

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.24 (For BH-153 & 156 (CW Forebay & Channel))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 32.25)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 32.26)	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)
4.00	198.00	7.00	7.00	50	14	14
4.00	198.00	8.00	8.00	51	12	12
4.00	198.00	9.00	9.00	53	11	11
4.00	198.00	10.00	10.00	55	10	10
5.00	197.00	7.00	7.00	57	14	14
5.00	197.00	8.00	8.00	58	12	12
5.00	197.00	9.00	9.00	60	11	11
5.00	197.00	10.00	10.00	62	10	10
6.00	196.00	7.00	7.00	64	14	14
6.00	196.00	8.00	8.00	66	12	12
6.00	196.00	9.00	9.00	67	11	11
6.00	196.00	10.00	10.00	69	10	10

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.25 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width																					
	m	m			C Kg/cm ²	ϕ degree	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ gm/cc	0.5 γ	W _q	W _γ	
1	7.00	7.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.83	0.92	0.50	0.50	50
2	8.00	8.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.83	0.92	0.50	0.50	51
3	9.00	9.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.13	1.06	1.06	1.00	1.00	1.00	1.83	0.92	0.50	0.50	53
4	10.00	10.00	4.00	198.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.83	0.92	0.50	0.50	55
5	7.00	7.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.20	1.10	1.10	1.00	1.00	1.00	1.83	0.92	0.50	0.50	57
6	8.00	8.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.83	0.92	0.50	0.50	58
7	9.00	9.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.83	0.92	0.50	0.50	60
8	10.00	10.00	5.00	197.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.83	0.92	0.50	0.50	62
9	7.00	7.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.83	0.92	0.50	0.50	64
10	8.00	8.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.83	0.92	0.50	0.50	66
11	9.00	9.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.83	0.92	0.50	0.50	67
12	10.00	10.00	6.00	196.00	0.09	28	24.30	12.58	15.18	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.83	0.92	0.50	0.50	69

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.00m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 32.26 (For BH-153 & 156 (CW Forebay & Channel))****Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm**

$$S_i = C_d q_{net} B \{ (1 - \mu^2) / E \}$$

Project:- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Depth of Foundation D m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio μ	Modulus of Elasticity of Soil E Kg / cm ²	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m ²
1	4.00	198.00	7.00	1.12	0.35	302	0.80	14
2	4.00	198.00	8.00	1.12	0.35	302	0.80	12
3	4.00	198.00	9.00	1.12	0.35	302	0.80	11
4	4.00	198.00	10.00	1.12	0.35	302	0.80	10
5	5.00	198.00	7.00	1.12	0.35	302	0.80	14
6	5.00	198.00	8.00	1.12	0.35	302	0.80	12
7	5.00	198.00	9.00	1.12	0.35	302	0.80	11
8	5.00	198.00	10.00	1.12	0.35	302	0.80	10
9	6.00	198.00	7.00	1.12	0.35	302	0.80	14
10	6.00	198.00	8.00	1.12	0.35	302	0.80	12
11	6.00	198.00	9.00	1.12	0.35	302	0.80	11
12	6.00	198.00	10.00	1.12	0.35	302	0.80	10

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33 (For BH-125 (Safety office cum store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 33.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 33.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	14	42	67	14	14
1.00	201.50	2.00	2.00	14	30	49	14	14
1.00	201.50	2.50	2.50	15	24	38	15	15
1.00	201.50	3.00	3.00	15	20	32	15	15
2.00	200.50	1.50	1.50	20	43	70	20	20
2.00	200.50	2.00	2.00	20	33	52	20	20
2.00	200.50	2.50	2.50	20	26	42	20	20
2.00	200.50	3.00	3.00	20	22	35	20	20
3.00	199.50	1.50	1.50	27	44	70	27	27
3.00	199.50	2.00	2.00	26	33	53	26	26
3.00	199.50	2.50	2.50	26	27	44	26	26
3.00	199.50	3.00	3.00	26	23	38	23	26

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33.1 (For BH-125 (Safety office cum store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	1.50	1.50	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.99	1.00	0.50	0.50	14
2	2.00	2.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	14
3	2.50	2.50	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	15
4	3.00	3.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	15
5	1.50	1.50	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.37	1.19	1.19	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
6	2.00	2.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
7	2.50	2.50	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.22	1.11	1.11	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
8	3.00	3.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
9	1.50	1.50	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.56	1.28	1.28	1.00	1.00	1.00	1.99	1.00	0.50	0.50	27
10	2.00	2.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
11	2.50	2.50	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
12	3.00	3.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 33.2 (For BH-125 (Safety office cum store))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	1.50	1.50	0.35	364	1.12	0.80	0.0082	3.00	0.70	0.80	0.80	42	67
2	1.00	201.50	2.00	2.00	0.35	364	1.12	0.80	0.0082	4.00	0.70	0.85	0.80	30	49
3	1.00	201.50	2.50	2.50	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.88	0.80	24	38
4	1.00	201.50	3.00	3.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.91	0.80	20	32
5	2.00	200.50	1.50	1.50	0.35	364	1.12	0.80	0.0082	3.00	0.70	0.73	0.80	43	70
6	2.00	200.50	2.00	2.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.73	0.80	33	52
7	2.00	200.50	2.50	2.50	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.76	0.80	26	42
8	2.00	200.50	3.00	3.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.80	0.80	22	35
9	3.00	199.50	1.50	1.50	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.73	0.80	44	70
10	3.00	199.50	2.00	2.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.73	0.80	33	53
11	3.00	199.50	2.50	2.50	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.73	0.80	27	44
12	3.00	199.50	3.00	3.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.73	0.80	23	38

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33.3 (For BH-125 (Safety office cum store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 33.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 33.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	16	17	27	16	16
1.00	201.50	4.00	4.00	16	15	24	15	16
1.00	201.50	5.00	5.00	18	12	20	12	18
1.00	201.50	6.00	6.00	19	11	17	11	17
2.00	200.50	3.50	3.50	21	19	30	19	21
2.00	200.50	4.00	4.00	21	16	26	16	21
2.00	200.50	5.00	5.00	22	13	22	13	22
2.00	200.50	6.00	6.00	24	12	18	12	18
3.00	199.50	3.50	3.50	26	20	33	20	26
3.00	199.50	4.00	4.00	26	18	29	18	26
3.00	199.50	5.00	5.00	27	15	24	15	24
3.00	199.50	6.00	6.00	28	13	20	13	20

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33.4 (For BH-125 (Safety office cum store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		Wq	Wγ	
1	3.50	3.50	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	16
2	4.00	4.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	16
3	5.00	5.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	18
4	6.00	6.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	19
5	3.50	3.50	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.16	1.08	1.08	1.00	1.00	1.00	1.99	1.00	0.50	0.50	21
6	4.00	4.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	21
7	5.00	5.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
8	6.00	6.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	24
9	3.50	3.50	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
10	4.00	4.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.21	1.10	1.10	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
11	5.00	5.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.17	1.08	1.08	1.00	1.00	1.00	1.99	1.00	0.50	0.50	27
12	6.00	6.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.99	1.00	0.50	0.50	28

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 33.5 (For BH-125 (Safety office cum store))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.50	3.50	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.92	0.80	17	27
2	1.00	201.50	4.00	4.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.93	0.80	15	24
3	1.00	201.50	5.00	5.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.95	0.80	12	20
4	1.00	201.50	6.00	6.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.96	0.80	11	17
5	2.00	200.50	3.50	3.50	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.83	0.80	19	30
6	2.00	200.50	4.00	4.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.85	0.80	16	26
7	2.00	200.50	5.00	5.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.88	0.80	13	22
8	2.00	200.50	6.00	6.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.91	0.80	12	18
9	3.00	199.50	3.50	3.50	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.75	0.80	20	33
10	3.00	199.50	4.00	4.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.77	0.80	18	29
11	3.00	199.50	5.00	5.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.82	0.80	15	24
12	3.00	199.50	6.00	6.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.85	0.80	13	20

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33.6 (For BH-125 (Safety office cum store))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 33.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 33.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	20	9	15	9	15
1.00	201.50	8.00	8.00	22	8	14	8	14
1.00	201.50	9.00	9.00	23	8	12	8	12
1.00	201.50	10.00	10.00	25	7	11	7	11
2.00	200.50	7.00	7.00	25	10	16	10	16
2.00	200.50	8.00	8.00	26	9	15	9	15
2.00	200.50	9.00	9.00	27	8	13	8	13
2.00	200.50	10.00	10.00	29	8	12	8	12
3.00	199.50	7.00	7.00	29	11	18	11	18
3.00	199.50	8.00	8.00	31	10	16	10	16
3.00	199.50	9.00	9.00	32	9	15	9	15
3.00	199.50	10.00	10.00	33	8	13	8	13

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 33.7 (For BH-125 (Safety office cum store))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	φ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree														gm/cc		W _q	
1	7.00	7.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	20
2	8.00	8.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	22
3	9.00	9.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	1.99	1.00	0.50	0.50	23
4	10.00	10.00	1.00	201.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.03	1.01	1.01	1.00	1.00	1.00	1.99	1.00	0.50	0.50	25
5	7.00	7.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	25
6	8.00	8.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	26
7	9.00	9.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	27
8	10.00	10.00	2.00	200.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
9	7.00	7.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.99	1.00	0.50	0.50	29
10	8.00	8.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	31
11	9.00	9.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.99	1.00	0.50	0.50	32
12	10.00	10.00	3.00	199.50	0.10	27	18.11	7.90	8.80	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.99	1.00	0.50	0.50	33

Note :-

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 33.8 (For BH-125 (Safety office cum store))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	7.00	7.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.97	0.80	9	15
2	1.00	201.50	8.00	8.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.97	0.80	8	14
3	1.00	201.50	9.00	9.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.97	0.80	8	12
4	1.00	201.50	10.00	10.00	0.35	364	1.12	0.80	0.0082	4.50	0.70	0.98	0.80	7	11
5	2.00	200.50	7.00	7.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.92	0.80	10	16
6	2.00	200.50	8.00	8.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.93	0.80	9	15
7	2.00	200.50	9.00	9.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.94	0.80	8	13
8	2.00	200.50	10.00	10.00	0.35	364	1.12	0.80	0.0082	3.50	0.70	0.95	0.80	8	12
9	3.00	199.50	7.00	7.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.87	0.80	11	18
10	3.00	199.50	8.00	8.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.89	0.80	10	16
11	3.00	199.50	9.00	9.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.91	0.80	9	15
12	3.00	199.50	10.00	10.00	0.35	364	1.12	0.80	0.0082	2.50	0.70	0.92	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34 (For BH-118 (First aid centre))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 34.1)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 34.2)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	1.50	1.50	14	33	53	14	14
1.00	201.50	2.00	2.00	14	24	38	14	14
1.00	201.50	2.50	2.50	14	18	29	14	14
1.00	201.50	3.00	3.00	14	15	24	14	14
2.00	200.50	1.50	1.50	16	35	57	16	16
2.00	200.50	2.00	2.00	15	27	42	15	15
2.00	200.50	2.50	2.50	15	21	33	15	15
2.00	200.50	3.00	3.00	14	17	26	14	14
3.00	199.50	1.50	1.50	18	35	57	18	18
3.00	199.50	2.00	2.00	17	27	42	17	17
3.00	199.50	2.50	2.50	16	21	34	16	16
3.00	199.50	3.00	3.00	15	18	28	15	15

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34.1 (For BH-118 (First aid centre))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation m	RL of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity t / m ²
	Length	Width			C	ϕ	N _c	N _q - 1	N _γ	S _c	S _q	S _γ	d _c	d _q	d _γ	i _c	i _q	i _γ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		W _q	W _γ	
1	1.50	1.50	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
2	2.00	2.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
3	2.50	2.50	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
4	3.00	3.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
5	1.50	1.50	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
6	2.00	2.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
7	2.50	2.50	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.16	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
8	3.00	3.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
9	1.50	1.50	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	18
10	2.00	2.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.31	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	17
11	2.50	2.50	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.25	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	16
12	3.00	3.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 34.2 (For BH-118 (First aid centre))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	1.50	1.50	0.40	648	1.12	0.80	0.0174	3.00	0.70	0.80	0.80	33	53
2	1.00	201.50	2.00	2.00	0.40	648	1.12	0.80	0.0174	4.00	0.70	0.85	0.80	24	38
3	1.00	201.50	2.50	2.50	0.40	648	1.12	0.80	0.0174	5.00	0.70	0.88	0.80	18	29
4	1.00	201.50	3.00	3.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.91	0.80	15	24
5	2.00	200.50	1.50	1.50	0.40	648	1.12	0.80	0.0174	3.00	0.70	0.73	0.80	35	57
6	2.00	200.50	2.00	2.00	0.40	648	1.12	0.80	0.0174	4.00	0.70	0.73	0.80	27	42
7	2.00	200.50	2.50	2.50	0.40	648	1.12	0.80	0.0174	5.00	0.70	0.76	0.80	21	33
8	2.00	200.50	3.00	3.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.80	0.80	17	26
9	3.00	199.50	1.50	1.50	0.40	648	1.12	0.80	0.0174	3.00	0.70	0.73	0.80	35	57
10	3.00	199.50	2.00	2.00	0.40	648	1.12	0.80	0.0174	4.00	0.70	0.73	0.80	27	42
11	3.00	199.50	2.50	2.50	0.40	648	1.12	0.80	0.0174	5.00	0.70	0.73	0.80	21	34
12	3.00	199.50	3.00	3.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.73	0.80	18	28

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34.3 (For BH-118 (First aid centre))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 34.4)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 34.5)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	3.50	3.50	13	13	20	13	13
1.00	201.50	4.00	4.00	13	11	18	11	13
1.00	201.50	5.00	5.00	13	9	14	9	13
1.00	201.50	6.00	6.00	13	7	12	7	12
2.00	200.50	3.50	3.50	14	14	22	14	14
2.00	200.50	4.00	4.00	14	12	19	12	14
2.00	200.50	5.00	5.00	14	9	15	9	14
2.00	200.50	6.00	6.00	14	8	13	8	13
3.00	199.50	3.50	3.50	15	15	24	15	15
3.00	199.50	4.00	4.00	15	13	21	13	15
3.00	199.50	5.00	5.00	14	10	16	10	14
3.00	199.50	6.00	6.00	14	9	14	9	14

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34.4 (For BH-118 (First aid centre))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		Wq	Wγ	
1	3.50	3.50	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
2	4.00	4.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
3	5.00	5.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
4	6.00	6.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
5	3.50	3.50	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
6	4.00	4.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
7	5.00	5.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
8	6.00	6.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
9	3.50	3.50	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.18	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
10	4.00	4.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.15	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	15
11	5.00	5.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
12	6.00	6.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.10	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 34.5 (For BH-118 (First aid centre))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	3.50	3.50	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.92	0.80	13	20
2	1.00	201.50	4.00	4.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.93	0.80	11	18
3	1.00	201.50	5.00	5.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.95	0.80	9	14
4	1.00	201.50	6.00	6.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.96	0.80	7	12
5	2.00	200.50	3.50	3.50	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.83	0.80	14	22
6	2.00	200.50	4.00	4.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.85	0.80	12	19
7	2.00	200.50	5.00	5.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.88	0.80	9	15
8	2.00	200.50	6.00	6.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.91	0.80	8	13
9	3.00	199.50	3.50	3.50	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.75	0.80	15	24
10	3.00	199.50	4.00	4.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.77	0.80	13	21
11	3.00	199.50	5.00	5.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.82	0.80	10	16
12	3.00	199.50	6.00	6.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.85	0.80	9	14

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34.6 (For BH-118 (First aid centre))****SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from FGL	RL of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria (See Appendix 34.7)	Safe Bearing Pressures calculated based on Settlement Criteria (See Appendix 34.8)		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
(m)	(m)	(m)	(m)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)	(t / m ²)
1.00	201.50	7.00	7.00	13	6	10	6	10
1.00	201.50	8.00	8.00	13	6	9	6	9
1.00	201.50	9.00	9.00	13	5	9	5	9
1.00	201.50	10.00	10.00	13	5	8	5	8
2.00	200.50	7.00	7.00	14	7	11	7	11
2.00	200.50	8.00	8.00	13	6	10	6	10
2.00	200.50	9.00	9.00	13	6	9	6	9
2.00	200.50	10.00	10.00	13	5	8	5	8
3.00	199.50	7.00	7.00	14	8	12	8	12
3.00	199.50	8.00	8.00	14	7	11	7	11
3.00	199.50	9.00	9.00	14	6	10	6	10
3.00	199.50	10.00	10.00	14	6	9	6	9

Notes :

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.50m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad**APPENDIX - 34.7 (For BH-118 (First aid centre))****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C - ϕ**

$$q_u = 1 / FS [2 / 3 C N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma]$$

Project : Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

For Square Isolated Foundation

Sr. No.	Size of Foundation		Depth of Foundation	RL of Foundation	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity
	Length	Width			C	ϕ	Nc	Nq - 1	Nγ	Sc	Sq	Sγ	dc	dq	dγ	ic	iq	iγ	γ	0.5 γ			
	m	m			Kg/cm ²	degree													gm/cc		Wq	Wγ	
1	7.00	7.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
2	8.00	8.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
3	9.00	9.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
4	10.00	10.00	1.00	201.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
5	7.00	7.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
6	8.00	8.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
7	9.00	9.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.05	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
8	10.00	10.00	2.00	200.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.04	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	13
9	7.00	7.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
10	8.00	8.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
11	9.00	9.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.07	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14
12	10.00	10.00	3.00	199.50	0.65	2	5.53	0.15	0.12	1.30	1.20	0.80	1.06	1.00	1.00	1.00	1.00	1.00	1.97	0.99	0.50	0.50	14

Note :-

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from RL 202.50m.

3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 34.8 (For BH-118 (First aid centre))
Calculation of Safe Bearing Pressure for Settlement of 25 and 40 mm

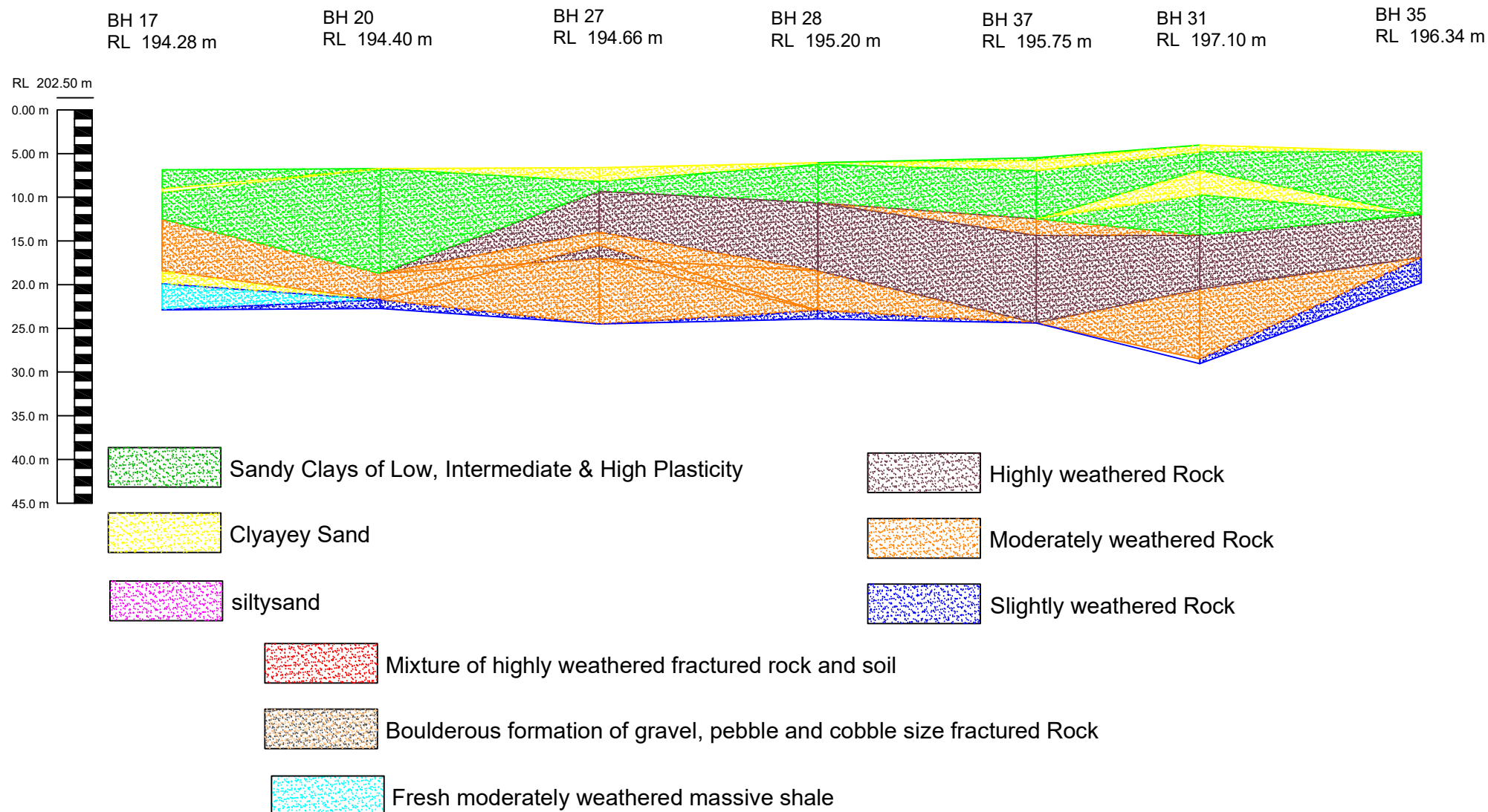
Project :- Proposed Structures in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth D	RL of Foundation	Width B	Length L	Poissons ratio μ	Modulus of Elasticity E	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility	Depth of Compressible Stratum H	λ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement	For 40 mm Settlement
	m	m	m	m		kg/cm ²			cm ² /kg	m				T / m ³	T / m ²
1	1.00	201.50	7.00	7.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.97	0.80	6	10
2	1.00	201.50	8.00	8.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.97	0.80	6	9
3	1.00	201.50	9.00	9.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.97	0.80	5	9
4	1.00	201.50	10.00	10.00	0.40	648	1.12	0.80	0.0174	8.00	0.70	0.98	0.80	5	8
5	2.00	200.50	7.00	7.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.92	0.80	7	11
6	2.00	200.50	8.00	8.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.93	0.80	6	10
7	2.00	200.50	9.00	9.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.94	0.80	6	9
8	2.00	200.50	10.00	10.00	0.40	648	1.12	0.80	0.0174	7.00	0.70	0.95	0.80	5	8
9	3.00	199.50	7.00	7.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.87	0.80	8	12
10	3.00	199.50	8.00	8.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.89	0.80	7	11
11	3.00	199.50	9.00	9.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.91	0.80	6	10
12	3.00	199.50	10.00	10.00	0.40	648	1.12	0.80	0.0174	6.00	0.70	0.92	0.80	6	9

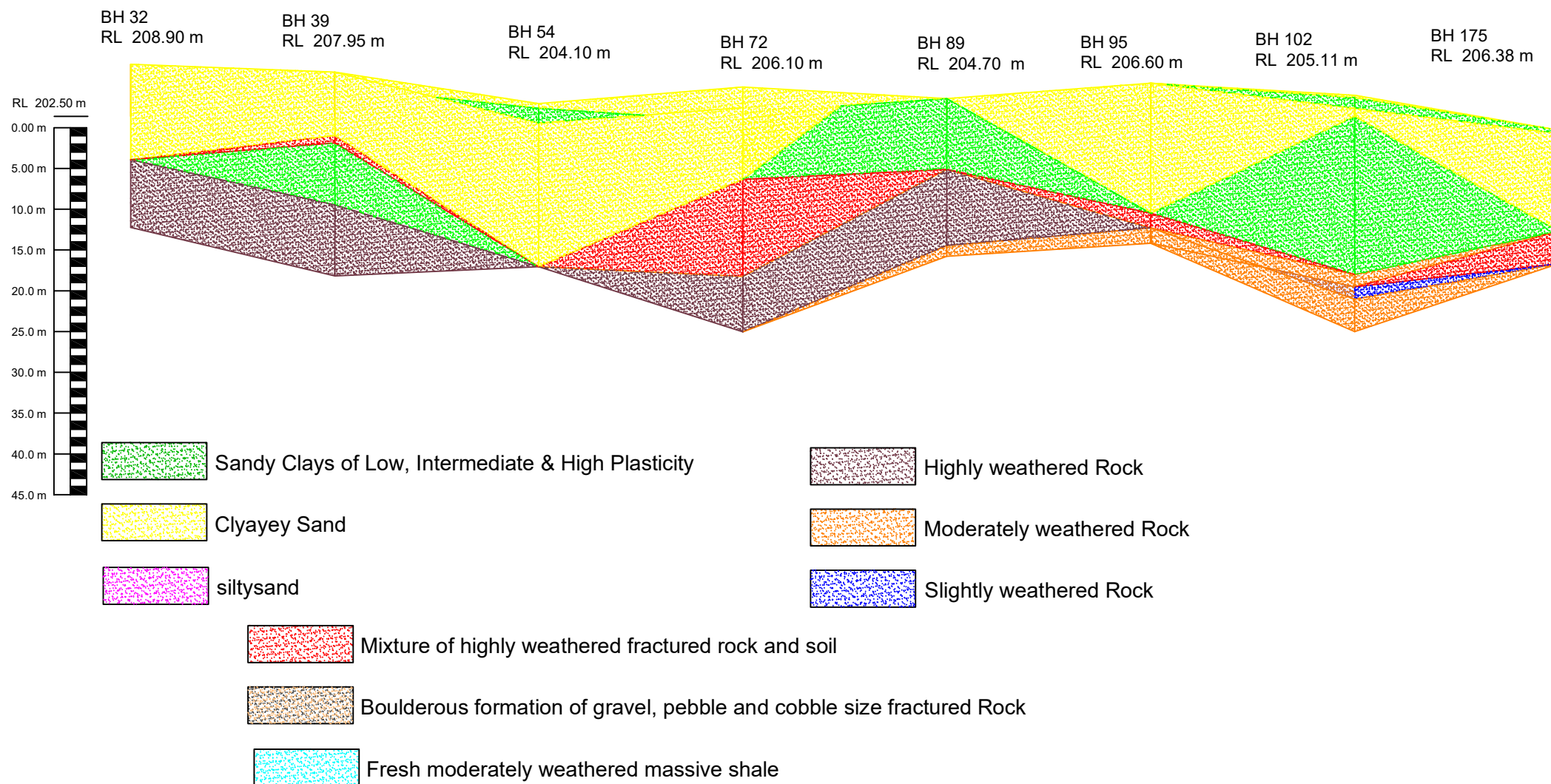
RESULTS OF CHEMICAL ANALYSIS

Sr. No.	Borehole no.	Result			
		pH	Total Dissolved Solids	Sulphate (SO ₃) (mg/l)	Chloride (mg/l)
			Inorganic		
1	BH-34	7.52	278	187	297
2	BH-43	7.55	347	214	277

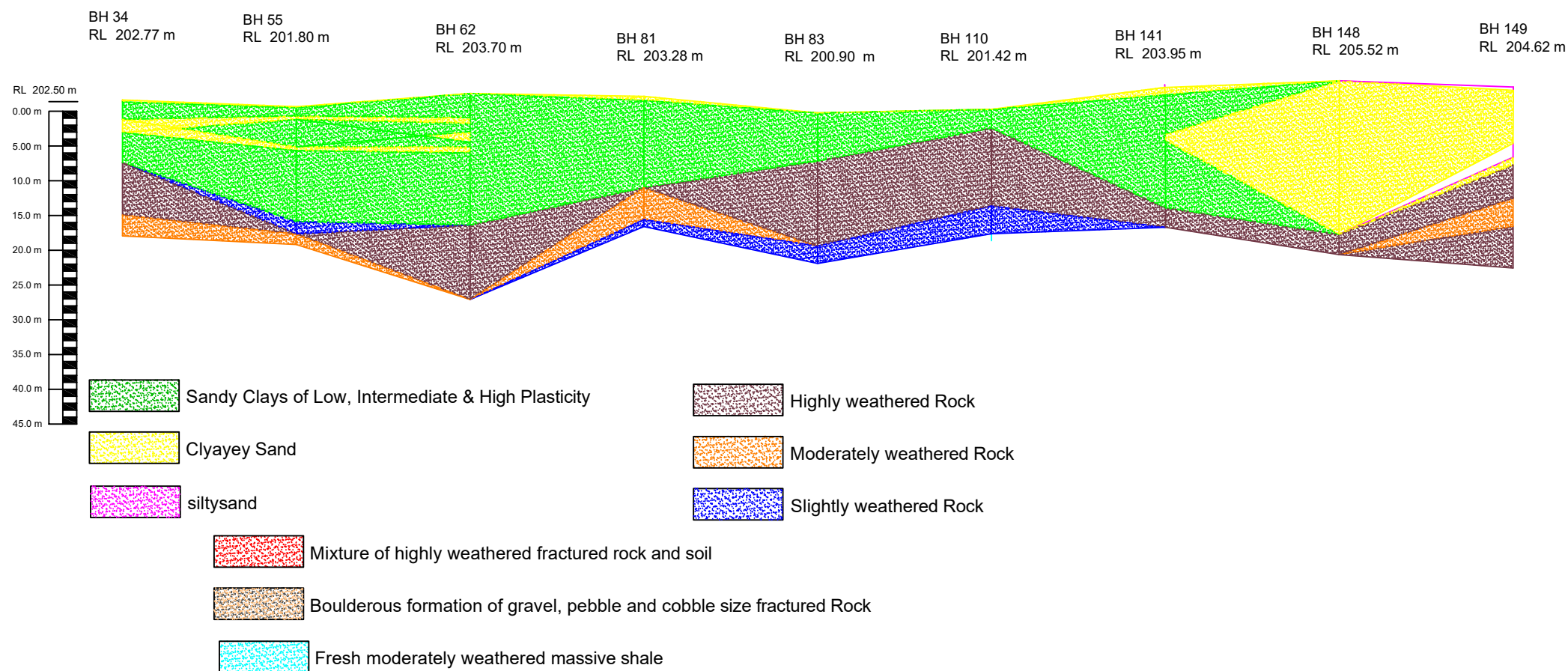
Cross Section Profile of Sub Soil - Hirma, Talabira(Pre Treatment plant)



Cross Section Profile of Sub Soil - Hirma, Talabira (Switchyard area)



Cross Section Profile of Sub Soil - Hirma, Talabira (CW pipe corridor)



NOTATIONS

C	Cohesion
ϕ	Angle of internal friction of soil
DS	Disturbed Sample
UDS	Undisturbed Sample
NMC	Natural Moisture Content
NP	Non Plastic Soils
G	Specific Gravity
G	Gravel Content
M	Silt Content
S	Sand Content
C	Clay Content
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
Cc	Compression Index
K	Coefficient of Permeability
UCS	Unconfined Compression
N	SPT Value
BH	Bore Hole
Suffix	The Number of Bore Holes
Nc, Nq, N γ	Bearing Capacity Factor
Sc, Sq, S γ	Shape Factors
γ	Density of Soil
D	Depth of foundation
FS	Factor of Safety
mv	Coefficient of volume compressibility
UU	Unconsolidated undrained triaxial test
CU	Consolidated undrained triaxial test
CD	Consolidated drained triaxial test
GC	Clayey Gravels
GM	Silty Gravels
GP	Poorly Graded Gravels
GW	Well Graded Gravels
SC	Clayey Sand
SM	Silty Sand
SW	Well Graded Sand
SP	Poorly Graded Sand
CH	Clays of High Plasticity
CI	Clays of Intermediate Plasticity
CL	Clays of Low Plasticity
MH	Silts of High Plasticity
MI	Silts of Intermediate Plasticity
ML	Silts of Low Plasticity

Reference

Indian Standards

IS 2720 Pt 2, 3, 4, 5, 8, 11, 12, 13, 15, 16, 31, 27, 25,

IS 1498,

IS 6403,

IS 1904,

IS 8009,

IS 2911 Pt1/S2, Pt 4,

IS 1892

Bowles J. E., “Foundation Analysis and Design”

Murthy V.N.S., “Principals and Practice of Soil Mechanics and Foundation engineering”

Peck, R.S., Hanson W.E., “Foundation Engineering”

Nayak, N.V., “Foundation Design Manual”

Kaniraj S.R., “Design Aids in soil mechanics and Foundation Engineering”

Alam Singh, “Soil Engineering in theory and practice”

Kramer, S.L., “Geotechnical Earthquake Engineering”

Look, B. G., “Handbook of Geotechnical Investigation and Design Tables.”

Das B. M., “Geotechnical Engineering Handbook.”

Publications of F.H.W.A and D.O.T. available in public domain

Reference - 1

Soil Mechanics And Foundation Engineering by Dr.K.R.Arora
(For Mixed shear failure reference)

SOIL MECHANICS AND FOUNDATION ENGINEERING

600

and

$$N_c = 57.8, N_q = 41.4 \text{ and } N_\gamma = 42.4$$

$$N'_c = 25.2, N'_q = 12.6 \text{ and } N'_\gamma = 10.1$$

Difference $(N_c)_d = 32.6, (N_q)_d = 28.8 \text{ and } (N_\gamma)_d = 32.3$.

As the actual value of ϕ' is 35° which is 6° more than the value of ϕ' corresponding to local shear failure (viz. 29°), the proportional difference to be added to the values of N'_c, N'_q and N'_γ is $6/7$ times the total difference. Thus, the required values are

$$N_c = 25.2 + 6/7 \times 32.6 = 53.14$$

$$N_q = 12.6 + 6/7 \times 28.8 = 37.29$$

$$N_\gamma = 10.1 + 6/7 \times 32.3 = 37.79$$

(2) If the failure of the specimen of the soil occurs at a relatively small strain, say less than 5%, the failure of the footing would be by general shear failure. If the stress-strain curve does not show a peak and is a continuously rising curve even upto a strain of 10 to 20%, local shear failure would occur in the footing.

(3) If the relative density (D_r) is greater than about 70%, general shear failure would occur. If it is less than 35%, local shear failure is more likely.

(4) If the standard penetration test (SPT) value is more than 30, the general shear failure would occur. However, if it is less than 5, the local shear failure is more likely.

(5) If e is less than 0.55, the general shear failure occurs. If e is greater than 0.75, the local shear failure occurs.

23.10. EFFECT OF WATER TABLE ON BEARING CAPACITY

Eq. 23.25 for the ultimate bearing capacity has been developed based on the assumption that the water table is located at a great depth. If the water table is located close to the foundation, the bearing capacity equation needs modification, as explained below.

Case I Water table located above the base of footing [Fig. 23.11 (a)]

The effective surcharge is reduced as the effective weight below the water table is equal to the submerged unit weight. Therefore,

$$q = D_w \gamma + a \gamma'$$

where D_w = depth of water table below the ground surface,
 a = height of water table above the base of footing.

Alternatively, Eq. 23.30 can be written as, substituting $a = D_f - D_w$,

$$q = \gamma' D_f + (\gamma - \gamma') D_w$$

Moreover, the unit weight in the third term of Eq. 23.25 is equal to the submerged unit weight. Thus Eq. 23.25 becomes

$$q_u = c' N_c + [\gamma' D_f + (\gamma - \gamma') D_w] N_q + 0.5 \gamma' B N_\gamma$$

If $D_w = 0$ (i.e. $a = D_f$),

$$q_u = c' N_c + \gamma' D_f N_q + 0.5 \gamma' B N_\gamma$$

If $a = 0$ (i.e. $D_f = D_w$),

$$q_u = c' N_c + \gamma D_f N_q + 0.5 \gamma' B N_\gamma$$

(a) (b)

Fig. 23.11.

... (23.30)

... (23.31)

... (23.32)

... (23.33)

... (23.34)

Reference - 2

Soil Mechanics And Foundation Engineering by V.N.S. Murthy (For Modulus of Elasticity reference)

676

Chapter 18

tests in 900 mm diameter bored holes in London clay. Marsland found that the average moduli determined from the loading tests were between 1.8 to 4.8 times those obtained from undrained triaxial tests. A suggestion to obtain the more realistic value for E_s is,

1. Undisturbed samples obtained from the field must be reconsolidated under a stress system equal to that in the field (K_0 -condition),
2. Samples must be reconsolidated isotropically to a stress equal to 1/2 to 2/3 of the *in-situ* vertical stress.

It may be noted here that reconsolidation of disturbed sensitive clays would lead to significant change in the water content and hence a stiffer structure which would lead to a very high E_s .

Because of the many difficulties faced in selecting a modulus value from the results of laboratory tests, it has been suggested that a correlation between the modulus of elasticity of soil and the undrained shear strength may provide a basis for settlement calculation. The modulus E_s may be expressed as

$$E_s = Ac_u \quad (18.51)$$

where the value of A for inorganic stiff clay varies from about 500 to 1500 (Bjerrum, 1972) and c_u is the undrained cohesion. It may generally be assumed that highly plastic clays give lower values for A , and low plasticity give higher values for A . For organic or soft clays the value of A may vary from 100 to 500. The undrained cohesion c_u can be obtained from any one of the field tests mentioned below and also discussed in Chapter 17.

Field methods

Field methods are increasingly used to determine the soil strength parameters. They have been found to be more reliable than the ones obtained from laboratory tests. The field tests that are normally used for this purpose are:

1. Plate load tests (PLT)
2. Standard penetration test (SPT)
3. Static cone penetration test (CPT)
4. Pressuremeter test (PMT)
5. Flat dilatometer test (DMT)

TABLE 18.7

Equations for computing E_s by making use of SPT and CPT values (in kPa)

Soil	SPT	CPT
Sand (normally consolidated)	$500 (N_{cor} + 15)$ $(35000 \text{ to } 50000) \log N_{cor}$ (U.S.S.R. Practice)	2 to 4 q_c $(1 + D_r^2) q_c$
Sand (saturated)	$250 (N_{cor} + 15)$	
Sand (overconsolidated)	—	6 to 30 q_c
Gravelly sand and gravel	$1200 (N_{cor} + 6)$	
Clayey sand	$320 (N_{cor} + 15)$	3 to 6 q_c
Silty sand	$300 (N_{cor} + 6)$	1 to 2 q_c
Soft clay	—	3 to 8 q_c

Reference - 3

Soil Mechanics And Foundation Engineering by V.N.S. Murthy
(For Poisson's Ratio reference)

678

Chapter 18

corresponding value of E_s has to be determined. Table 18.8 gives typical values for μ as suggested by Bowles (1996).

I_f is a function of the L/B ratio of the foundation, and the thickness H of the compressible layer. Terzaghi has given a method of calculating I_f from curves derived by Steinbrenner (1934),

for Poisson's ratio of 0.5, $I_f = F_1$,

for Poisson's ratio of zero, $I_f = F_1 + F_2$,

where F_1 and F_2 are factors which depend upon the ratios of H/B and L/B .

For intermediate values of μ , the value of I_f can be computed by means of interpolation or by the equation

$$I_f = \left[F_1 + \frac{(1-\mu-2\mu^2)F_2}{1-\mu^2} \right] \quad (18.52b)$$

The values of F_1 and F_2 are given in Fig. 18.19a. The elastic settlement at any point N (Fig. 18.19b) is given by

$$S_e \text{ at point } N = \frac{q_n(1-\mu^2)}{E_s} [I_{f1}B_1 + I_{f2}B_2 + I_{f3}B_3 + I_{f4}B_4] \quad (18.52c)$$

To obtain the settlement at the center of the loaded area, the principle of superposition is followed. In such a case N in Fig. 18.19b will be at the center of the area when $B_1 = B_4 = L_2 = B_3$ and $B_2 = L_1$. Then the settlement at the centre is equal to four times the settlement at any one corner. The curves in Fig. 18.19a are based on the assumption that the modulus of deformation is constant with depth.

In the case of a rigid foundation, the immediate settlement at the center is approximately 0.8 times that obtained for a flexible foundation at the center. A correction factor is applied to the immediate settlement to allow for the depth of foundation by means of the depth factor d_f . Fig. 18.20

gives Fox's (1948) correction curve for depth factor. The final elastic settlement is

$$S_{ef} = C_r d_f S_e \quad (18.53)$$

where, S_{ef} = final elastic settlement

TABLE 18.8

Typical range of values for Poisson's ratio (Bowles, 1996)

Type of soil	μ
Clay, saturated	0.4–0.5
Clay, unsaturated	0.1–0.3
Sandy clay	0.2–0.3
Silt	0.3–0.35
Sand (dense)	0.2–0.4
Coarse (void ratio = 0.4 to 0.7)	0.15
Fine grained (void ratio = 0.4 to 0.7)	0.25
Rock	0.1–0.4

Reference - 4

(For Modulus of Volume Compressibility, Angle of Internal friction and Cohesion reference)

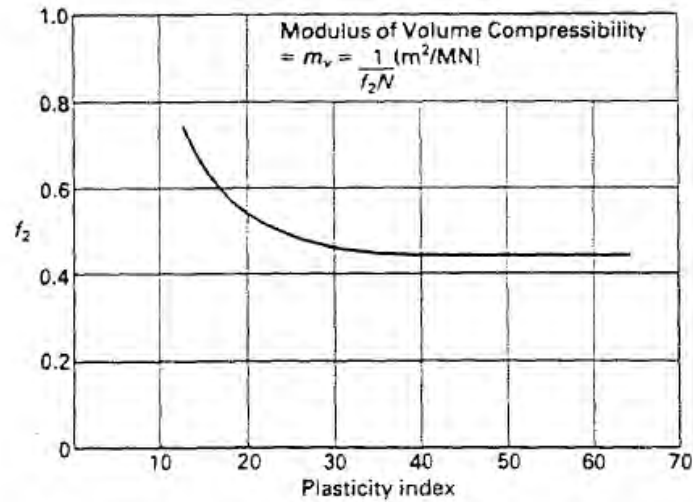


Figure 8. Relationship between Mass Shear Strength, Modulus of Volume Compressibility, Plasticity Index, and SPT-N values (after Stroud, 1975)

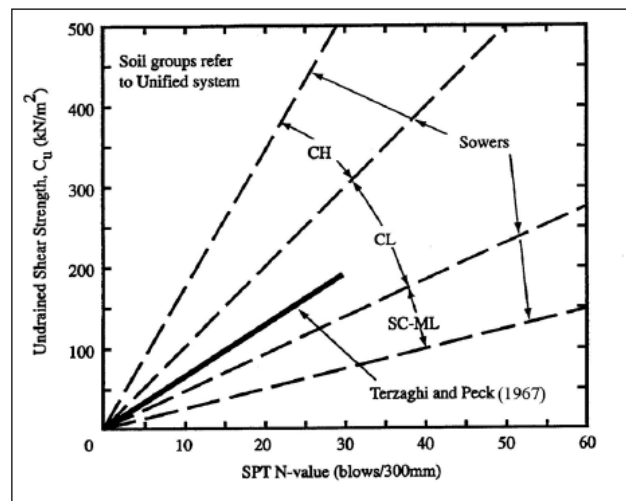


Figure 9. Approximate Correlation between Undrained Shear Strength and SPT-N values (After Sowers, 1979)

Hatanaka and Uchida (1996); $\phi' = \sqrt{20N} + 20^\circ$

$$\phi' = \sqrt{12N_{45}} + 20^\circ$$

A lower bound for the above equation is given as;

$$\phi' = \sqrt{12N_{45}} + 15^\circ$$

Reference - 5

TABLE 6
PRESUMPTIVE SAFE BEARING CAPACITY OF SOIL

Sr. No	Types of Rocks/Soils	Safe bearing capacity KN/m ² /t/ m ²	Remarks
(1)	(2)	(3)	(4)
	(a) Rocks		
1.	Rocks (hard) without lamination and defects, for example , granite, trap and diorite	3,240 (330.39)	..
2.	Laminated rocks, for example, stone and lime stone in sound condition	1,620 (165.19)	..
3.	Residual deposits of shattered and broken bed rock and hard shale cemented material	880 (89.73)	..
4.	Soft Rock	440 (44.87)	..
	(b) Non-cohesive soils:		..
5.	Gravel, sand and gravel, compact and offering high resistance to penetration when excavated by tools	440 (44.87)	(See Note 2)
6.	Coarse sand, compact and dry	440 (44.87)	Dry means that the ground water level is at a depth not less than the width of foundation below the base of the foundation
7.	Medium sand, compact and dry	245 (24.98)	..
8.	Fine sand, silt (dry lumps easily pulverized by the fingers).	150 (15.30)	..
9.	Loose gravel or sand gravel mixture loose coarse to medium sand, dry	245 (24.98)	(See Note 2)
10	Fine sand, loose and dry.	100 (10.20)	
	(c) Cohesive soils:		
11.	Soft shale, hard or stiff clay in deep bed, dry	440 (44.87)	This group is susceptible to long term consolidation settlement
12.	Medium clay, readily indented with a thumb nail	245 (24.98)	..
13	Moist clay and sand clay mixture which can be indented with strong thumb pressure	150 (15.30)	..
14	Soft clay indented with moderate thumb pressure	100 (10.20)	..
15.	Very soft clay which can be penetrated several centimeters with the thumb	50 (5.10)	..
16.	Black cotton soil or other shrinkable or expansive clay in dry condition (50 percent saturation)	..	See Note 3. To be determined after investigation
	(d) Peat:		
17.	Peat	..	See Note 3 and Note 4. To be determined after investigation
	(e) Made-up Ground:		
18.	Fills or made-up ground	..	See Note 2 and Note 4. To be determined after investigation

Note: 1- Value listed in the Table are from shear consideration only

Note:2- Values are very much rough due to the following reasons:

- (a) Effect of characteristics of foundations (that is, effect of depth, width, shape, roughness, etc.) has not been considered.
- (b) Effect of range of soil properties (that is, angle of frictional resistance, cohesion, water table, density, etc) has not been considered.
- (c) Effect of eccentricity and indication of loads has not been considered.

Note:3 – For non-cohesive soils, the values listed in the Table shall be reduced by 50% if the water table is above or near the base of footing

Note 4: Compactness of non-cohesive soils may be determined by driving the cone of 65 mm dia and 60 apex angle by a hammer of 65 kg falling from 75 cm. If corrected number of blows (N) for 30 cm penetration are less than 10, the soil is called loose, if N lies between 10 and 30, it is medium, if more than 30, the soils is called as dense.

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 6

Co-Ordinate :- E 1129, N 3563

Reduced Level :- 199.30 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	64	36		24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	39	38	23	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-
3	2.00	SPT	-	-	-	-	16	57	27		40	21	19	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
4	2.50	UDS	1.70	1.60	6.54	2.67	17	68	15		37	18	19	-	-	-	SC	0.03	26	-	-	DSU	-	-	-	-	-	0.67	40.2
5	3.00	SPT	-	-	-	-	0	74	26		41	20	21	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
6	3.50	UDS	2.00	1.60	24.81	2.66	12	64	24		35	17	18	-	-	-	SC	0.06	27	-	-	DSU	-	-	-	-	-	0.66	39.8
7	4.00	SPT	-	-	-	-	8	72	20		29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	29	-	-	-
8	4.50	SPT	-	-	-	-	8	75	17		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
9	5.00	SPT	-	-	-	-	6	77	17		20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
10	5.50	SPT	-	-	-	-	2	76	22		28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
11	6.00	SPT	-	-	-	-	22	57	21		22	18	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	16	71	13		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	50	48	2		NP	NP	NP	-	-	-	GP	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	81	19		28	18	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	2	70	28		33	19	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	8	65	27		30	20	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	71	29		35	21	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	4	75	21		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	72	28		32	17	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	5	78	17		28	19	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	74	26		31	18	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	2	82	16		24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	82	18		26	20	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	72	28		31	24	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	10	66	24		28	21	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	14	66	20		24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	14	63	23		29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	UDS	2.06	1.69	22.09	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	53.5	UCS	-	-	-	-	-	0.59	37.3
31	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
33	21.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
34	23.00	UDS	2.12	1.78	19.18	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	51.6	UCS	-	-	-	-	-	0.52	34.1
35	23.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
36	25.00	UDS	2.14	1.79	19.71	2.76	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	342.2	UCS	-	-	-	-	-	0.54	35.2

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 9

Co-Ordinate :- E - 1046, N - 3637

Reduced Level :- 197.56m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	61	39	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	24	49	27	25	15	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-
3	2.00	SPT	-	-	-	-	16	54	30	34	16	18	-	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-
4	2.50	UDS	1.84	1.58	16.31	2.67	0	83	17	22	16	6	-	-	-	-	SM-SC	0.02	26	-	-	DSU	-	-	-	-	-	0.69	40.7
5	3.00	SPT	-	-	-	-	2	66	32	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	18	-	-	-
6	3.50	UDS	2.00	1.60	24.81	2.66	2	59	39	30	16	14	-	-	-	-	SC	0.08	27	-	-	DSU	-	-	-	-	-	0.66	39.8
7	4.00	SPT	-	-	-	-	0	66	34	32	15	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
8	4.50	UDS	2.03	1.65	23.27	2.67	3	78	19	24	14	10	-	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	0.62	38.3
9	5.00	SPT	-	-	-	-	4	64	32	37	19	18	-	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
10	5.50	SPT	-	-	-	-	10	70	20	26	18	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	29	-	-	-
11	6.00	SPT	-	-	-	-	8	59	33	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	33	-	-	-
12	6.50	SPT	-	-	-	-	0	60	40	36	22	14	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	16	60	24	29	21	8	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	2	80	18	26	16	10	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	67	33	32	19	13	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	4	56	40	34	20	14	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	4	72	24	33	21	12	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	4	66	30	34	18	16	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	70	30	35	17	18	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	66	34	37	16	21	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	8	50	42	36	18	18	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	UDS	2.34	2.12	10.43	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	120.3	UCS	-	-	-	-	-	0.28	22.1
23	14.00	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	132.6	UCS	-	-	-	-	-	0.23	18.5
24	15.50	UDS	2.49	2.34	6.35	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	73.4	-	UCS	-	-	-	-	7.33	0.17	14.9
25	17.00	UDS	2.26	2.01	12.69	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	89.1	-	UCS	-	-	-	-	7.33	0.34	25.4
26	18.50	UDS	2.31	2.08	11.03	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	80.5	UCS	-	-	-	-	-	0.30	22.9
27	20.00	UDS	2.36	2.16	9.50	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	149.6	UCS	-	-	-	-	-	0.26	20.5
28	21.50	UDS	2.37	2.16	9.63	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	131.9	-	UCS	-	-	-	-	8.66	0.26	20.8
29	23.00	UDS	2.48	2.29	8.15	2.82	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	455.6	-	UCS	-	-	-	-	21.33	0.23	18.7
30	25.00	UDS	2.50	2.33	7.14	2.80	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	429.8	-	UCS	-	-	-	-	10.50	0.20	16.7

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 12

Co-Ordinate :- E 1018, N 3561

Reduced Level :- 195.9 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	32	31	37	54	21	33	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	36	32	32	52	23	29	-	-	-	CH	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	0	48	30	22	38	19	19	-	-	-	CI	-	-	-	-	-	-	-	-	5	-	-	-
4	2.50	UDS	1.91	1.46	30.69	2.65	8	40	29	23	43	22	21	-	-	-	CI	0.25	7	-	-	TUU	0.24	0.0377	0.46	-	-	0.81	44.8
5	3.00	SPT	-	-	-	-	7	41	28	24	39	19	20	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
6	3.50	UDS	1.94	1.51	28.50	2.65	5	51	44	31	17	14	-	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.76	43.0
7	4.00	SPT	-	-	-	-	0	63	37	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-
8	4.50	DS	-	-	-	-	0	53	47	33	18	15	-	-	-	-	SC	-	33	-	-	-	-	-	-	-	-	-	-
9	5.00	SPT	-	-	-	-	0	11	55	34	54	24	30	-	-	-	CH	-	-	-	-	-	-	-	-	14	-	-	-
10	5.50	UDS	1.95	1.54	26.62	2.61	0	10	51	39	56	23	33	-	-	-	CH	0.75	2	-	-	TUU	0.16	0.0149	2.02	-	-	0.69	41.0
11	6.00	SPT	-	-	-	-	0	35	33	32	52	25	27	-	-	-	CH	-	-	-	-	-	-	-	-	21	-	-	-
12	6.50	UDS	1.97	1.57	25.87	2.63	0	22	41	37	55	23	32	-	-	-	CH	1.07	6	-	-	TUU	0.15	0.0097	2.94	-	-	0.68	40.5
13	7.00	SPT	-	-	-	-	0	46	22	32	51	22	29	-	-	-	CH	-	-	-	-	-	-	-	-	22	-	-	-
14	7.50	DS	-	-	-	-	3	57	40	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	53	47	32	15	17	-	-	-	-	SC	-	32	-	-	-	-	-	-	24	-	-	-
16	8.50	UDS	2.01	1.62	24.19	2.66	0	76	24	26	17	9	-	-	-	-	SC	0.04	28	-	-	DSU	-	-	-	-	-	0.64	39.2
17	9.00	SPT	-	-	-	-	0	71	29	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
18	9.50	UDS	2.03	1.65	22.71	2.65	0	48	30	22	38	19	19	-	-	-	CI	1.10	8	-	-	TUU	0.12	0.0081	3.13	-	-	0.60	37.6
19	10.00	SPT	-	-	-	-	0	49	35	16	37	22	15	-	-	-	CI	-	-	-	-	-	-	-	-	27	-	-	-
20	11.00	DS	-	-	-	-	0	91	9	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-
21	11.50	SPT	-	-	-	-	0	90	10	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	29	-	-	-
22	12.50	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
23	13.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	46	-	-	-
24	14.50	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	38.9	UCS	-	-	-	-	-	0.31	23.7
25	14.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
26	16.00	UDS	2.34	2.14	9.47	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	49.6	UCS	-	-	-	-	-	0.25	20.2
27	17.50	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.8	UCS	-	-	-	-	-	0.29	22.5
28	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	19.00	UDS	2.33	2.11	10.30	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	40.3	-	UCS	-	-	-	-	7.33	0.28	21.8
30	19.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.50	UDS	2.35	2.14	9.84	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	57.0	-	UCS	-	-	-	-	8.66	0.27	21.1
32	22.00	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	44.3	-	UCS	-	-	-	-	6.60	0.29	22.5
33	23.50	UDS	2.30	2.07	10.91	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	42.9	UCS	-	-	-	-	-	0.29	22.6
34	23.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
35	25.00	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	39.9	UCS	-	-	-	-	-	0.31	23.7
36	25.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 13

Co-Ordinate :- E 1058, N 3579

Reduced Level :- 197.50 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters				SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²					
1	0.00	DS	-	-	-	-	0	63	37	24	17	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	4	30	46	20	43	26	17	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-	-
3	2.00	SPT	-	-	-	-	5	21	45	29	47	22	25	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-	-
4	2.50	UDS	1.72	1.52	13.10	2.63	3	26	47	24	42	20	22	-	-	-	CI	0.59	5	-	-	TUU	0.16	0.0157	0.42	-	-	0.73	42.2	-
5	3.00	SPT	-	-	-	-	19	51	30		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-	-
6	3.50	UDS	1.99	1.59	25.44	2.66	15	49	36		30	17	13	-	-	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	0.68	40.4	-
7	4.00	SPT	-	-	-	-	4	64	32		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-	-
8	4.50	UDS	2.01	1.62	23.91	2.65	0	60	40		32	16	16	-	-	-	SC	0.08	27	-	-	DSU	-	-	-	-	-	0.63	38.8	-
9	5.00	SPT	-	-	-	-	0	82	18		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	21	-	-	-	-
10	5.50	UDS	2.03	1.65	22.99	2.66	0	78	22		NP	NP	NP	-	-	-	SM	0.00	30	-	-	DSU	-	-	-	-	-	0.61	38.0	-
11	6.00	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	22	-	-	-	-
12	6.50	DS	-	-	-	-	0	81	19		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
13	7.00	SPT	-	-	-	-	0	74	26		23	18	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	DS	-	-	-	-	0	71	29		24	20	4	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	72	28		20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	33	-	-	-	-
16	8.50	SPT	-	-	-	-	0	80	20		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	36	-	-	-	-
17	9.00	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	27	-	-	-	-
18	9.50	DS	-	-	-	-	0	81	19		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
19	10.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	33	-	-	-	-
21	13.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	14.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	17.50	UDS	2.27	2.02	12.29	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	29.6	UCS	-	-	-	-	-	0.33	24.9	-
25	19.00	UDS	2.26	2.01	12.44	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	36.4	UCS	-	-	-	-	-	0.33	25.0	-
26	20.50	UDS	2.29	2.05	11.77	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	38.7	-	UCS	-	-	-	-	26.70	0.32	24.1	-
27	22.00	UDS	2.61	2.51	4.01	2.79	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	718.6	UCS	-	-	-	-	-	0.11	10.1	-
28	23.50	UDS	2.58	2.47	4.34	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	651.7	UCS	-	-	-	-	-	0.12	10.7	-
29	25.00	UDS	2.60	2.49	4.26	2.79	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	815.3	-	UCS	-	-	-	-	7.30	0.12	10.6	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structure in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 14

Co-Ordinate :- E 941, N 3572

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
	m		gm / cc	gm / cc	%		%	%	%	%	%	%	%	Kg/cm ²	%		Kg/cm ²	Degree	Kg/cm ²	Kg/cm ²			cm ² /kg	kg/cm ²		%		%	
1	0.00	DS	-	-	-	-	0	71	29	23	14	9	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	9	38	30	23	38	18	20	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-	-
3	2.00	SPT	-	-	-	-	1	46	36	17	37	22	15	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-	-
4	2.50	UDS	1.96	1.54	27.12	2.65	10	39	17	34	48	19	29	-	-	CI	0.62	7	-	-	TUU	0.14	0.0170	0.46	-	-	0.72	41.8	
5	3.00	SPT	-	-	-	-	1	47	22	30	45	20	25	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-	-
6	3.50	UDS	1.99	1.59	25.44	2.66	0	48	30	22	37	17	20	-	-	CI	0.59	8	-	-	TUU	0.12	0.0154	0.59	-	-	0.68	40.4	
7	4.00	SPT	-	-	-	-	0	46	28	26	39	16	23	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-	-
8	4.50	UDS	2.00	1.60	24.81	2.66	0	47	32	21	38	19	19	-	-	CI	0.68	6	-	-	TUU	0.11	0.0130	0.70	-	-	0.66	39.8	
9	5.00	SPT	-	-	-	-	0	62	38		33	17	16	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-	-
10	5.50	UDS	2.03	1.65	23.27	2.67	0	64	36	30	16	14	-	-	SC	8.00	26	-	-	DSU	-	-	-	-	-	0.62	38.3		
11	6.00	SPT	-	-	-	-	0	79	21	25	21	4	-	-	SM	-	-	-	-	-	-	-	-	-	21	-	-	-	-
12	6.50	UDS	2.05	1.68	22.12	2.67	0	85	15	NP	NP	NP	-	-	SM	0.00	29	-	-	DSU	-	-	-	-	-	0.59	37.1		
13	7.00	SPT	-	-	-	-	0	73	27	27	22	5	-	-	SM	-	-	-	-	-	-	-	-	-	27	-	-	-	-
14	7.50	UDS	2.08	1.75	19.08	2.62	0	20	57	23	45	25	20	-	-	CI	1.46	5	-	-	TUU	0.10	0.0067	2.26	-	-	0.50	33.3	
15	8.00	SPT	-	-	-	-	0	8	62	30	49	23	26	-	-	CI	-	-	-	-	-	-	-	-	59	-	-	-	-
16	9.00	UDS	2.39	2.21	8.26	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	70.4	UCS	-	-	-	-	-	0.22	18.2	
17	10.50	UDS	2.40	2.21	8.40	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	83.9	UCS	-	-	-	-	-	0.23	18.6	
18	12.00	UDS	2.46	2.31	6.32	2.71	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	77.1	UCS	-	-	-	-	-	0.17	14.6	
19	13.50	UDS	2.20	1.91	14.93	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	39.1	-	UCS	-	-	-	-	8.00	0.40	28.6	
20	15.00	UDS	2.21	1.93	14.75	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	29.8	-	UCS	-	-	-	-	38.66	0.40	28.4	
21	16.50	UDS	2.38	2.18	9.06	2.72	-	-	-	-	-	-	-	-	-	ROCK	-	-	69.7	-	UCS	-	-	-	-	58.66	0.25	19.8	

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 15

Co-Ordinate :- E - 1238, N - 3567

Reduced Level :- 201.15 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	67	33	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	61	39	31	15	16	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-	-
3	2.00	SPT	-	-	-	-	0	72	28	26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-	-
4	2.50	UDS	1.97	1.57	25.87	2.63	0	71	29	29	16	13	-	-	-	SC	0.06	27	-	-	DSU	-	-	-	-	-	-	0.68	40.5
5	3.00	SPT	-	-	-	-	0	76	24	25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-	-
6	3.50	UDS	2.00	1.61	24.53	2.65	0	79	21	23	17	6	-	-	-	SM-SC	0.02	26	-	-	DSU	-	-	-	-	-	-	0.65	39.4
7	4.00	SPT	-	-	-	-	0	68	32	29	22	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	44	-	-	-	-
8	4.50	UDS	2.04	1.67	21.85	2.64	0	74	26	27	21	6	-	-	-	SM-SC	0.03	29	-	-	DSU	-	-	-	-	-	-	0.58	36.6
9	5.00	SPT	-	-	-	-	0	64	36	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	41	-	-	-	-
10	5.50	UDS	2.07	1.71	20.73	2.66	3	79	18	NP	NP	NP	-	-	-	SM	0.00	30	-	-	DSU	-	-	-	-	-	-	0.55	35.5
11	6.00	SPT	-	-	-	-	6	82	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
12	6.50	DS	-	-	-	-	0	81	19	19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
13	7.00	SPT	-	-	-	-	3	80	17	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	16	-	-	-	-
14	7.50	DS	-	-	-	-	0	76	24	23	19	4	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	86	14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	5	83	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	6	70	24	23	14	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	4	69	27	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	7	75	18	22	14	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	3	71	26	25	13	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	0	69	31	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	SPT	-	-	-	-	5	60	35	30	15	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	79	21	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.50	SPT	-	-	-	-	0	63	37	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	15.50	SPT	-	-	-	-	0	67	33	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	16.00	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-	-
27	17.50	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-	-
28	19.00	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	34.4	UCS	-	-	-	-	-	-	0.33	24.6
29	20.50	UDS	2.31	2.07	11.74	2.73	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	46.8	UCS	-	-	-	-	-	-	0.32	24.3
30	22.00	UDS	2.30	2.06	11.40	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	59.7	UCS	-	-	-	-	-	-	0.31	23.5
31	23.50	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	46.3	UCS	-	-	-	-	-	-	0.31	23.7
32	23.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
33	25.00	UDS	2.41	2.24	7.62	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	50.5	-	UCS	-	-	-	-	29.00	0.21	17.1	

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 16

Co-Ordinate :- E 1151, N 3503

Reduced Level :- 199.300 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	59	41		28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	27	50	23	39	18	21	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
3	2.00	SPT	-	-	-	-	0	19	53	28	41	17	24	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
4	2.50	UDS	1.81	1.56	16.34	2.60	3	9	48	40	57	21	36	12	0.41	59	CH	1.03	1	-	-	TUU	0.14	0.0114	0.46	-	-	0.67	40.2
5	3.00	SPT	-	-	-	-	6	12	46	36	54	23	31	-	-	-	CH	-	-	-	-	-	-	-	-	25	-	-	-
6	3.50	UDS	2.00	1.61	23.95	2.63	1	10	53	36	55	22	33	13	0.27	56	CH	1.41	2	-	-	TUU	-	-	-	-	-	0.63	38.7
7	4.00	SPT	-	-	-	-	8	22	38	32	53	25	28	-	-	-	CH	-	-	-	-	-	-	-	-	27	-	-	-
8	4.50	UDS	1.99	1.59	24.87	2.64	6	9	44	41	56	21	35	-	-	-	CH	1.31	2	-	-	TUU	0.13	0.0091	0.70	-	-	0.66	39.6
9	5.00	SPT	-	-	-	-	2	17	38	43	58	20	38	-	-	-	CH	-	-	-	-	-	-	-	-	20	-	-	-
10	5.50	UDS	1.98	1.57	25.80	2.65	0	59	41		41	24	17	-	-	-	SC	0.08	26	-	-	DSU	-	-	-	-	-	0.68	40.6
11	6.00	SPT	-	-	-	-	0	67	33		30	20	10	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
12	6.50	UDS	1.97	1.56	26.16	2.64	0	63	37		32	16	16	-	-	-	SC	0.06	27	-	-	DSU	-	-	-	-	-	0.69	40.9
13	7.00	SPT	-	-	-	-	0	61	39		31	18	13	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
14	7.50	UDS	1.98	1.58	24.93	2.62	0	20	48	32	54	25	29	14	0.25	52	CH	1.08	5	-	-	TUU	0.13	0.0102	1.01	-	-	0.65	39.5
15	8.00	SPT	-	-	-	-	0	19	39	42	59	23	36	-	-	-	CH	-	-	-	-	-	-	-	-	28	-	-	-
16	8.50	DS	-	-	-	-	0	15	43	42	60	21	39	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
17	9.00	SPT	-	-	-	-	0	16	46	38	58	24	34	-	-	-	CH	-	-	-	-	-	-	-	-	41	-	-	-
18	9.50	UDS	2.02	1.66	21.87	2.60	0	14	40	46	61	22	39	9	0.34	68	CH	1.51	3	-	-	TUU	0.12	0.0076	2.07	-	-	0.57	36.3
19	10.00	SPT	-	-	-	-	0	18	45	37	59	26	33	-	-	-	CH	-	-	-	-	-	-	-	-	25	-	-	-
20	10.50	UDS	2.04	1.67	21.85	2.64	0	21	46	33	56	27	29	-	-	-	CH	1.46	5	-	-	TUU	-	-	-	-	-	0.58	36.6
21	11.00	SPT	-	-	-	-	0	18	50	32	55	26	29	-	-	-	CH	-	-	-	-	-	-	-	-	30	-	-	-
22	11.50	SPT	-	-	-	-	0	20	42	38	57	23	34	-	-	-	CH	-	-	-	-	-	-	-	-	33	-	-	-
23	12.00	SPT	-	-	-	-	0	15	40	45	59	21	38	-	-	-	CH	-	-	-	-	-	-	-	-	29	-	-	-
24	12.50	SPT	-	-	-	-	0	16	49	35	54	24	30	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
25	13.00	DS	-	-	-	-	0	25	43	32	53	25	28	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
26	13.50	SPT	-	-	-	-	0	30	43	27	51	27	24	-	-	-	CH	-	-	-	-	-	-	-	-	31	-	-	-
27	14.00	DS	-	-	-	-	0	25	43	32	53	23	30	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
28	14.50	SPT	-	-	-	-	0	23	39	38	54	22	32	-	-	-	CH	-	-	-	-	-	-	-	-	24	-	-	-
29	15.00	DS	-	-	-	-	0	26	41	33	53	24	29	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
30	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
31	17.50	UDS	2.38	2.17	9.52	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	196.3	UCS	-	-	-	-	-	0.26	20.7
32	19.00	UDS	2.41	2.22	8.77	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	229.4	UCS	-	-	-	-	-	0.24	19.4
33	20.50	UDS	2.82	2.75	2.60	2.96	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	454.3	-	UCS	-	-	-	-	13.33	0.08	7.1
34	22.00	UDS	2.93	2.89	1.38	3.01	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	510.2	-	UCS	-	-	-	-	20.00	0.04	4.0
35	23.50	UDS	2.99	2.97	0.83	3.04	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	520.9	-	UCS	-	-	-	-	37.33	0.03	2.5
36	25.00	UDS	2.91	2.87	1.40	2.99	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	397.4	UCS	-	-	-	-	-	0.04	4.0

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests
NP - Non Plastic

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test
UCS - Unconfined Compression Strength

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 17

Co-Ordinate :- E -937, N 3501

Reduced Level :- 194.280 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters				SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	0	31	46	23	40	20	20	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	28	44	28	43	19	24	-	-	-	CI	-	-	-	-	-	-	-	-	37	-	-	-	-
3	2.00	SPT	-	-	-	-	0	27	52	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	41	-	-	-	-
4	2.50	DS	-	-	-	-	5	91	4	NP	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	-	-	-	-	-
5	3.00	SPT	-	-	-	-	3	9	50		38	55		22	33	-	-	-	CH	-	-	-	-	-	-	-	-	41	-	-
6	3.50	SPT	-	-	-	-	5	13	68	14	28	16	12	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
7	4.00	SPT	-	-	-	-	6	19	63	12	26	15	11	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
8	4.50	UDS	2.14	1.84	16.34	2.63	3	15	68	14	28	16	12	-	-	-	CL	-	-	10.13	-	UCS	-	-	-	-	-	-	0.43	30.1
9	5.00	SPT	-	-	-	-	4	10	72	14	30	17	13	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
10	5.50	SPT	-	-	-	-	3	13	73	11	29	19	10	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
11	6.00	SPT	-	-	-	-	7	21	58	14	28	16	12	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
12	7.50	UDS	2.29	2.06	11.28	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	34.1	UCS	-	-	-	-	-	-	0.30	23.2
13	9.00	UDS	2.32	2.10	10.66	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	37.2	UCS	-	-	-	-	-	-	0.29	22.4
14	10.50	UDS	2.30	2.07	11.15	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	40.6	UCS	-	-	-	-	-	-	0.30	23.1
15	12.00	UDS	2.33	2.11	10.30	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	49.5	-	UCS	-	-	-	-	8.00	0.28	21.8	
16	13.50	UDS	2.34	2.12	10.43	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	49.8	-	UCS	-	-	-	-	33.00	0.28	22.1	
17	15.00	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	42.1	-	UCS	-	-	-	-	46.00	0.33	24.6	
18	16.50	UDS	2.28	2.03	12.40	2.71	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	56.8	-	UCS	-	-	-	-	89.00	0.34	25.1	

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 18

Co-Ordinate :- E - 1443, N - 3456

Reduced Level :- 206.41 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	59	41	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	10	55	35	28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	42	-	-	-	-
3	2.00	SPT	-	-	-	-	25	56	19	20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	54	-	-	-	-
4	2.50	UDS	2.01	1.89	6.34	2.66	6	81	13	NP	NP	NP	-	-	-	SM	0.00	30	-	-	DSU	-	-	-	-	-	0.41	28.9	-
5	3.00	SPT	-	-	-	-	5	80	15	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	63	-	-	-	-
6	3.50	UDS	1.96	1.80	8.64	2.65	1	78	21	26	15	11	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.47	31.9	-
7	4.00	SPT	-	-	-	-	0	80	20	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	49	-	-	-	-
8	4.50	UDS	1.90	1.74	8.92	2.65	0	75	25	28	15	13	-	-	-	SC	0.07	27	-	-	DSU	-	-	-	-	-	0.52	34.2	-
9	5.00	SPT	-	-	-	-	0	72	28	29	14	15	-	-	-	SC	-	-	-	-	-	-	-	-	34	-	-	-	-
10	5.50	UDS	1.79	1.67	7.46	2.64	1	71	28	27	16	11	-	-	-	SC	0.04	27	-	-	DSU	-	-	-	-	-	0.58	36.9	-
11	6.00	SPT	-	-	-	-	0	73	27	30	15	15	-	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-	-
12	6.50	SPT	-	-	-	-	0	74	26	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	0	68	32	31	14	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	SPT	-	-	-	-	0	75	25	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
15	8.00	SPT	-	-	-	-	0	76	24	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	0	71	29	30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	0	71	29	28	18	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	10	65	25	24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	16	68	16	21	15	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	0	60	40	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	2	68	30	26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	SPT	-	-	-	-	1	65	34	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	87	13	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	0	88	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	0	95	5	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	0	96	4	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	0	95	5	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	SPT	-	-	-	-	0	96	4	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	0	99	1	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	0	96	4	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	0	97	3	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	0	99	1	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 19

Co-Ordinate :- E - 1049, N - 3500

Reduced Level :- 195.90 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	0	66	34		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	3	52	45		32	17	15	-	-	-	SC	-	-	-	-	-	-	-	-	6	-	-	-	-
3	2.00	SPT	-	-	-	-	4	48	48		33	16	17	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-	-
4	2.50	UDS	1.97	1.56	26.16	2.64	0	32	40	28	44	20	24	-	-	-	CI	0.71	7	-	-	TUU	0.14	0.0143	0.43	-	-	0.69	40.9	-
5	3.00	SPT	-	-	-	-	0	46	35	19	40	23	17	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-	-
6	3.50	UDS	1.99	1.59	25.16	2.65	0	55	45		32	17	15	-	-	-	SC	0.11	27	-	-	DSU	-	-	-	-	-	0.67	40.0	-
7	4.00	SPT	-	-	-	-	5	59	36		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-	-
8	4.50	UDS	2.01	1.62	24.19	2.66	3	64	33		28	17	11	-	-	-	SC	0.07	28	-	-	DSU	-	-	-	-	-	0.64	39.2	-
9	5.00	SPT	-	-	-	-	0	62	38		30	18	12	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-	-
10	5.50	UDS	2.00	1.60	24.81	2.66	0	65	35		28	17	11	-	-	-	SC	0.09	27	-	-	DSU	-	-	-	-	-	0.66	39.8	-
11	6.00	SPT	-	-	-	-	0	57	43		32	15	17	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-	-
12	6.50	UDS	2.01	1.62	24.19	2.66	0	68	32		28	16	12	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.64	39.2	-
13	7.00	SPT	-	-	-	-	0	57	43		31	18	13	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-	-
14	7.50	SPT	-	-	-	-	0	86	14		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	22	-	-	-	-
15	8.00	SPT	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	20	-	-	-	-
16	8.50	SPT	-	-	-	-	0	85	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	24	-	-	-	-
17	9.00	SPT	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	28	-	-	-	-
18	9.50	SPT	-	-	-	-	0	30	45	25	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	1	33	48	18	40	24	16	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	10.50	SPT	-	-	-	-	2	28	46	24	43	21	22	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	12.00	UDS	2.69	2.69	0.00	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	29.8	UCS	-	-	-	-	-	0.00	0.0	-
22	12.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.50	UDS	2.70	2.71	-0.44	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	33.1	UCS	-	-	-	-	-	-0.01	-1.2	-
24	13.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	15.00	UDS	2.68	2.66	0.88	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	96.8	-	UCS	-	-	-	-	7.33	0.02	2.3	-
26	16.50	UDS	2.69	2.67	0.87	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	134.5	-	UCS	-	-	-	-	18.66	0.02	2.3	-
27	18.00	UDS	2.68	2.64	1.52	2.75	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	120.8	-	UCS	-	-	-	-	44.66	0.04	4.0	-
28	19.50	UDS	2.72	2.70	0.84	2.76	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	142.7	-	UCS	-	-	-	-	62.66	0.02	2.3	-
29	20.00	UDS	2.74	2.72	0.83	2.78	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	176.5	-	UCS	-	-	-	-	70.00	0.02	2.2	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 20

Co-Ordinate :- E 956, N 3493

Reduced Level :- 194.40 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	8	33	46	13	28	17	11	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	11	19	49	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
3	2.00	SPT	-	-	-	-	10	14	49	27	43	19	24	-	-	-	CI	-	-	-	-	-	-	-	-	30	-	-	-
4	2.50	UDS	1.99	1.59	24.87	2.64	12	9	51	28	44	18	26	-	-	-	CI	0.72	2	-	-	TUU	0.12	0.0143	0.44	-	-	0.66	39.6
5	3.00	SPT	-	-	-	-	9	13	56	22	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	38	-	-	-
6	3.50	UDS	2.03	1.65	22.71	2.65	10	15	57	18	39	23	16	-	-	-	CI	0.95	4	-	-	TUU	0.11	0.0088	0.56	-	-	0.60	37.6
7	4.00	SPT	-	-	-	-	8	16	55	21	38	20	18	-	-	-	CI	-	-	-	-	-	-	-	-	55	-	-	-
8	4.50	UDS	2.07	1.73	19.62	2.62	12	9	54	25	42	19	23	-	-	-	CI	1.06	5	-	-	TUU	0.09	0.0087	0.64	-	-	0.51	34.0
9	5.00	SPT	-	-	-	-	10	16	52	22	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
10	5.50	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
11	6.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.50	UDS	2.19	1.89	15.62	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	109.8	UCS	-	-	-	-	-	0.42	29.6
21	13.00	UDS	2.32	2.09	10.90	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	163.1	-	UCS	-	-	-	-	7.00	0.30	22.8
22	14.50	UDS	2.36	2.14	10.20	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	180.8	-	UCS	-	-	-	-	19.00	0.28	21.8
23	16.00	UDS	2.16	1.85	16.99	2.69	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	46.2	-	UCS	-	-	-	-	84.00	0.46	31.4

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 21

Co-Ordinate :- E - 1344, N - 3488

Reduced Level :- 203.66 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	5	70	25		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	7	41	27	25	41	19	22	-	-	-	CI	-	-	-	-	-	-	-	-	2	-	-	-
3	2.00	SPT	-	-	-	-	18	50	32		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.64	1.50	9.68	2.65	8	59	33		32	16	16	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.77	43.6
5	3.00	SPT	-	-	-	-	0	60	40		38	17	21	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
6	3.50	SPT	-	-	-	-	4	64	32		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
7	4.00	SPT	-	-	-	-	4	53	43		33	18	15	-	-	-	SC	-	-	-	-	-	-	-	-	30	-	-	-
8	4.50	UDS	1.85	1.71	8.43	2.66	1	74	25		23	19	4	-	-	-	SM	0.00	30	-	-	DSU	-	-	-	-	-	0.56	35.9
9	5.00	SPT	-	-	-	-	5	75	20		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	43	-	-	-
10	5.50	UDS	1.92	1.74	10.13	2.66	0	70	30		29	16	13	-	-	-	SC	0.06	29	-	-	DSU	-	-	-	-	-	0.53	34.5
11	6.00	SPT	-	-	-	-	0	73	27		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	35	-	-	-
12	6.50	UDS	2.10	1.76	19.41	2.67	0	74	26		25	16	9	-	-	-	SC	0.05	29	-	-	DSU	-	-	-	-	-	0.52	34.1
13	7.00	SPT	-	-	-	-	16	53	31		30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	11	60	29		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	7	71	22		24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	4	68	28		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	2	69	29		29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	82	18		23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	67	33		29	14	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	74	26		24	19	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	4	63	33		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	68	32		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	17	54	29		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	68	32		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	26	58	16		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.00	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
28	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
30	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.00	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
33	21.50	UDS	2.29	2.05	11.77	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	56.4	UCS	-	-	-	-	-	0.32	24.1
34	21.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
35	23.00	UDS	2.34	2.13	9.71	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	71.1	UCS	-	-	-	-	-	0.26	20.7
36	23.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
37	24.50	UDS	2.41	2.24	7.38	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	89.6	UCS	-	-	-	-	-	0.20	16.6
38	24.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
39	25.00	UDS	2.35	2.14	9.60	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	41.3	UCS	-	-	-	-	-	0.26	20.6
40	25.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 22

Co-Ordinate :- E - 1264, N - 3434

Reduced Level :- 202.32m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	62	38	22	13	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	51	43	36	17	19	-	-	-	-	SC	-	-	-	-	-	-	-	-	9	-	-	-
3	2.00	SPT	-	-	-	-	2	50	48	37	16	21	-	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
4	2.50	UDS	1.74	1.59	9.23	2.68	22	49	29	40	18	22	-	-	-	-	SC	0.08	27	-	-	DSU	-	-	-	-	-	0.68	40.6
5	3.00	SPT	-	-	-	-	10	48	42	36	19	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
6	3.50	UDS	2.00	1.60	25.09	2.67	15	51	34	35	17	18	-	-	-	-	SC	0.14	27	-	-	DSU	-	-	-	-	-	0.67	40.1
7	4.00	SPT	-	-	-	-	8	56	36	35	19	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
8	4.50	UDS	2.01	1.61	24.47	2.67	12	57	31	41	17	24	-	-	-	-	SC	0.10	28	-	-	DSU	-	-	-	-	-	0.65	39.5
9	5.00	SPT	-	-	-	-	0	72	28	34	19	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
10	5.50	UDS	2.04	1.67	22.13	2.65	0	55	45	36	20	16	-	-	-	-	SC	0.15	26	-	-	DSU	-	-	-	-	-	0.59	37.0
11	6.00	SPT	-	-	-	-	6	70	24	34	19	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
12	6.50	UDS	2.05	1.68	21.84	2.66	0	75	25	34	18	16	-	-	-	-	SC	0.08	28	-	-	DSU	-	-	-	-	-	0.58	36.7
13	7.00	SPT	-	-	-	-	2	74	24	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	45	-	-	-
14	7.50	SPT	-	-	-	-	0	80	20	25	20	5	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	88	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	78	22	21	17	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	84	16	19	15	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	81	19	26	21	5	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	68	32	36	20	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	60	-	-	-
20	11.00	SPT	-	-	-	-	20	64	16	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	82	18	20	16	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	72	28	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	2	81	17	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	84	16	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	82	18	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	22	60	18	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	70	30	24	20	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	74	26	32	19	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	13	63	24	29	20	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	UDS	2.29	2.06	11.28	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	47.3	-	UCS	-	-	-	-	16.25	0.30	23.2
31	20.00	UDS	2.25	1.99	13.09	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	35.6	UCS	-	-	-	-	-	0.35	26.0
32	21.50	UDS	2.28	2.03	12.40	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	61.9	-	UCS	-	-	-	-	26.00	0.34	25.1
33	23.00	UDS	2.35	2.14	9.60	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	90.6	-	UCS	-	-	-	-	8.66	0.26	20.6
34	24.50	UDS	2.24	1.98	13.24	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	73.1	-	UCS	-	-	-	-	16.00	0.35	26.2
35	25.00	UDS	2.25	1.99	13.09	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	61.2	UCS	-	-	-	-	-	0.35	26.0

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 23

Co-Ordinate :- E - 1157, N - 3471

Reduced Level :- 199.40 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %		
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²							
1	0.00	DS	-	-	-	-	0	64	36	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	1.00	SPT	-	-	-	-	0	40	30	30	44	18	26	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-	-	
3	2.00	SPT	-	-	-	-	0	44	33	23	39	19	20	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-	-	
4	2.50	DS	-	-	-	-	0	61	39	32	20	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	3.00	SPT	-	-	-	-	0	65	35	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	-	17	-	-	-	-	
6	3.50	DS	-	-	-	-	0	59	41	33	17	16	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	4.00	SPT	-	-	-	-	0	40	35	25	43	21	22	-	-	-	CI	-	-	-	-	-	-	-	-	-	19	-	-	-	-
8	4.50	DS	-	-	-	-	0	44	38	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	5.00	SPT	-	-	-	-	0	48	36	16	38	24	14	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-	-	
10	5.50	DS	-	-	-	-	0	61	39	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	6.00	SPT	-	-	-	-	0	66	34	27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	23	-	-	-	-	
12	6.50	SPT	-	-	-	-	0	59	41	32	18	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	22	-	-	-	-	
13	7.00	SPT	-	-	-	-	0	68	32	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	24	-	-	-	-	
14	7.50	UDS	1.99	1.59	25.44	2.66	0	71	29	25	15	10	-	-	-	SC	0.05	27	-	-	DSU	-	-	-	-	-	-	-	0.68	40.4	
15	8.00	SPT	-	-	-	-	0	69	31	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	-	25	-	-	-	-	
16	8.50	UDS	2.00	1.60	25.09	2.67	0	74	26	25	15	10	-	-	-	SC	0.04	28	-	-	DSU	-	-	-	-	-	-	-	0.67	40.1	
17	9.00	SPT	-	-	-	-	0	18	51	31	51	24	27	-	-	-	CH	-	-	-	-	-	-	-	-	35	-	-	-	-	
18	9.50	UDS	2.02	1.65	22.45	2.62	0	14	48	38	54	22	32	-	-	-	CH	1.89	2	-	-	TUU	0.11	0.0058	4.06	-	-	-	0.59	37.0	
19	10.00	SPT	-	-	-	-	0	16	51	33	53	23	30	-	-	-	CH	-	-	-	-	-	-	-	-	25	-	-	-	-	
20	11.00	UDS	2.05	1.69	21.00	2.63	0	20	47	33	51	22	29	-	-	-	CH	1.34	1	-	-	TUU	0.10	0.0082	4.82	-	-	-	0.55	35.6	
21	11.50	SPT	-	-	-	-	0	19	46	35	56	24	32	-	-	-	CH	-	-	-	-	-	-	-	-	39	-	-	-	-	
22	12.50	UDS	2.06	1.71	20.73	2.64	0	24	42	34	55	26	29	-	-	-	CH	2.07	6	-	-	TUU	0.10	0.0052	4.98	-	-	-	0.55	35.4	
23	13.00	SPT	-	-	-	-	0	38	47	15	29	16	13	-	-	-	CL	-	-	-	-	-	-	-	-	43	-	-	-	-	
24	14.00	UDS	2.08	1.73	19.92	2.65	0	40	50	10	27	18	9	-	-	-	CL	2.20	8	-	-	TUU	0.08	0.0029	5.29	-	-	-	0.53	34.5	
25	14.50	SPT	-	-	-	-	0	39	45	16	30	16	14	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-	
26	15.50	SPT	-	-	-	-	0	44	37	19	36	19	17	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-	
27	16.00	SPT	-	-	-	-	0	38	40	22	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-	
28	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-	
29	19.00	UDS	2.24	1.98	12.99	2.67	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	48.0	UCS	-	-	-	-	-	-	0.35	25.7	
30	20.50	UDS	2.31	2.09	10.54	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	36.7	-	UCS	-	-	-	-	7.00	0.28	22.0		
31	22.00	UDS	2.37	2.19	8.44	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	34.8	-	UCS	-	-	-	-	14.00	0.23	18.5		
32	23.50	UDS	2.36	2.16	9.02	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	81.6	UCS	-	-	-	-	-	-	0.24	19.5	
33	25.00	UDS	2.37	2.18	8.68	2.69	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	51.3	-	UCS	-	-	-	-	45.00	0.23	18.9		

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 25

Co-Ordinate :- E - 1304, N - 3435

Reduced Level :- 202.80 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters				SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity / Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	0	66	34	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	10	59	31	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	3	-	-	-	-
3	2.00	SPT	-	-	-	-	3	64	33	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	15	-	-	-	-
4	2.50	UDS	1.69	1.54	9.98	2.66	12	56	32	28	18	10	-	-	-	SC	0.05	26	-	-	DSU	-	-	-	-	-	-	0.73	42.2	-
5	3.00	SPT	-	-	-	-	5	62	33	31	16	15	-	-	-	SC	-	-	-	-	-	-	-	-	-	14	-	-	-	-
6	3.50	UDS	1.96	1.54	27.12	2.65	4	58	38	36	15	21	-	-	-	SC	0.07	26	-	-	DSU	-	-	-	-	-	-	0.72	41.8	-
7	4.00	SPT	-	-	-	-	5	64	31	34	17	17	-	-	-	SC	-	-	-	-	-	-	-	-	-	15	-	-	-	-
8	4.50	SPT	-	-	-	-	0	68	32	37	16	21	-	-	-	SC	-	-	-	-	-	-	-	-	-	19	-	-	-	-
9	5.00	SPT	-	-	-	-	8	56	36	35	18	17	-	-	-	SC	-	-	-	-	-	-	-	-	-	26	-	-	-	-
10	5.50	SPT	-	-	-	-	9	54	37	40	21	19	-	-	-	SC	-	-	-	-	-	-	-	-	-	32	-	-	-	-
11	6.00	SPT	-	-	-	-	4	63	33	33	25	8	-	-	-	SC	-	-	-	-	-	-	-	-	-	37	-	-	-	-
12	6.50	SPT	-	-	-	-	0	68	32	34	24	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	16	-	-	-	-
13	7.00	SPT	-	-	-	-	3	63	34	36	21	15	-	-	-	SC	-	-	-	-	-	-	-	-	-	16	-	-	-	-
14	7.50	SPT	-	-	-	-	4	57	39	38	20	18	-	-	-	SC	-	-	-	-	-	-	-	-	-	19	-	-	-	-
15	8.00	SPT	-	-	-	-	10	54	36	33	23	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	37	-	-	-	-
16	8.50	SPT	-	-	-	-	6	60	34	29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	39	-	-	-	-
17	9.00	SPT	-	-	-	-	4	59	37	34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	0	68	32	31	23	8	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	0	78	22	20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	0	81	19	18	14	4	-	-	-	SM	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	0	80	20	19	14	5	-	-	-	SM	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	DS	-	-	-	-	0	83	17	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	13.50	SPT	-	-	-	-	12	57	31	28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.50	SPT	-	-	-	-	6	61	33	34	19	15	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	15.50	SPT	-	-	-	-	0	68	32	37	18	19	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	16.50	SPT	-	-	-	-	0	67	33	29	20	9	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	18.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	18.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	20.00	UDS	2.30	2.07	11.15	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	34.6	-	UCS	-	-	-	-	-	16.66	0.30	23.1	-
31	21.50	UDS	2.34	2.14	9.47	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	39.8	-	UCS	-	-	-	-	-	20.00	0.25	20.2	-
32	21.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	>100	-	-	-	-
33	23.00	UDS	2.61	2.51	4.01	2.79	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	413.5	-	UCS	-	-	-	-	-	9.33	0.11	10.1	-
34	25.00	UDS	2.69	2.63	2.32	2.80	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	467.2	-	UCS	-	-	-	-	-	10.00	0.07	6.1	-
35	25.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	>100	-	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 27

Co-Ordinate :- E - 928, N - 3442

Reduced Level :- 194.66 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %		
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction φ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	3	59	38		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	1.00	SPT	-	-	-	-	8	63	29		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	10	-	-	-	-	
3	2.00	SPT	-	-	-	-	0	39	38	23	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	61	-	-	-	-	
4	2.50	SPT	-	-	-	-	0	33	41	26	43	19	24	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-	
5	3.00	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	4.50	UDS	2.26	2.01	12.69	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	39.6	UCS	-	-	-	-	-	0.34	25.4	-	
7	4.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-	
8	6.00	UDS	2.28	2.03	12.15	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	48.2	UCS	-	-	-	-	-	0.33	24.7	-	
9	7.50	UDS	2.33	2.11	10.54	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	91.4	UCS	-	-	-	-	-	0.29	22.2	-	
10	9.00	UDS	2.39	2.18	9.42	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	137.4	UCS	-	-	-	-	-	0.26	20.6	-	
11	10.50	UDS	2.24	1.97	13.49	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	65.8	-	UCS	-	-	-	-	-	15.33	0.36	26.6	-
12	12.00	UDS	2.42	2.24	8.22	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	120.4	-	UCS	-	-	-	-	-	42.00	0.23	18.4	-
13	13.50	UDS	2.30	2.06	11.64	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	100.5	-	UCS	-	-	-	-	-	29.33	0.32	24.0	-
14	15.00	UDS	2.36	2.15	9.97	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	132.6	-	UCS	-	-	-	-	-	46.66	0.27	21.4	-
15	16.50	UDS	2.25	1.99	13.33	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	110.4	-	UCS	-	-	-	-	-	18.66	0.36	26.5	-
16	18.00	UDS	2.31	2.08	11.03	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	146.3	-	UCS	-	-	-	-	-	58.66	0.30	22.9	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 28

Co-Ordinate :- E 1009, N 3416

Reduced Level :- 195.20 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility m _v	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	72	28	21	13	8	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	5	44	30	21	38	20	18	-	-	-	CI	-	-	-	-	-	-	-	-	6	-	-	-
3	2.00	SPT	-	-	-	-	2	46	35	17	36	21	15	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
4	2.50	UDS	1.97	1.56	26.16	2.64	0	29	58	13	27	16	11	-	-	-	CL	0.63	6	-	-	TUU	0.12	0.0093	0.43	-	-	0.69	40.9
5	3.00	SPT	-	-	-	-	0	29	54	17	29	15	14	-	-	-	CL	-	-	-	-	-	-	-	-	21	-	-	-
6	3.50	UDS	1.98	1.58	24.93	2.62	0	20	64	16	31	16	15	-	-	-	CL	1.13	4	-	-	TUU	0.11	0.0071	0.54	-	-	0.65	39.5
7	4.00	SPT	-	-	-	-	0	27	62	11	27	17	10	-	-	-	CL	-	-	-	-	-	-	-	-	28	-	-	-
8	4.50	SPT	-	-	-	-	0	29	62	9	26	18	8	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
9	5.00	UDS	2.13	1.80	18.16	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	78.6	UCS	-	-	-	-	-	0.49	32.7
10	5.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
11	6.50	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	86.1	UCS	-	-	-	-	-	0.31	23.7
12	8.00	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	90.2	-	UCS	-	-	-	-	8.00	0.29	22.5
13	9.50	UDS	2.58	2.47	4.55	2.78	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	376.1	UCS	-	-	-	-	-	0.13	11.2
14	11.00	UDS	2.56	2.46	3.99	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	120.6	-	UCS	-	-	-	-	14.66	0.11	9.8
15	12.50	UDS	2.31	2.07	11.51	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	112.0	UCS	-	-	-	-	-	0.31	23.8
16	14.00	UDS	2.33	2.09	11.48	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	157.9	-	UCS	-	-	-	-	24.00	0.32	24.0
17	15.50	UDS	2.54	2.41	5.39	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	364.6	-	UCS	-	-	-	-	27.33	0.15	13.0
18	17.00	UDS	2.51	2.35	6.65	2.79	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	361.8	-	UCS	-	-	-	-	18.67	0.19	15.6
19	18.50	UDS	2.42	2.24	8.00	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	100.5	-	UCS	-	-	-	-	85.33	0.22	17.9

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 30

Co-Ordinate :- E - 1349, N - 3425

Reduced Level :- 203.4 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	16	51	33	30	16	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	21	49	30	27	15	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
3	2.00	SPT	-	-	-	-	24	53	23	26	17	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-
4	2.50	SPT	-	-	-	-	6	51	43	31	16	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
5	3.00	SPT	-	-	-	-	11	53	36	29	18	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
6	3.50	UDS	1.71	1.56	9.43	2.65	0	57	43	33	17	16	-	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.70	41.0
7	4.00	SPT	-	-	-	-	0	86	14	21	15	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	15	-	-	-
8	4.50	UDS	1.81	1.58	14.75	2.67	0	81	19	23	17	6	-	-	-	-	SM-SC	0.02	28	-	-	DSU	-	-	-	-	-	0.69	40.9
9	5.00	SPT	-	-	-	-	0	62	38	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
10	5.50	SPT	-	-	-	-	0	55	45	33	18	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
11	6.00	SPT	-	-	-	-	0	66	34	31	19	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
12	6.50	UDS	2.06	1.70	21.28	2.66	0	64	36	32	15	17	-	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.57	36.1
13	7.00	SPT	-	-	-	-	6	71	23	27	17	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	68	32	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	72	28	28	18	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	9	74	17	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	18	50	32	28	21	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	7	68	25	24	18	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	6	82	12	21	15	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	72	28	28	17	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	64	36	30	15	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	8	80	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	18	65	17	16	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	6	69	25	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	4	81	15	22	16	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	3	77	20	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	11	58	31	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	31	49	20	25	17	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	35	47	18	24	15	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	81	19	28	17	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.50	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	51.3	UCS	-	-	-	-	-	0.29	22.5
33	20.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
34	22.00	UDS	2.38	2.20	8.11	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	63.4	UCS	-	-	-	-	-	0.22	17.9
35	22.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
36	23.50	UDS	2.63	2.54	3.52	2.79	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	426.3	UCS	-	-	-	-	-	0.10	8.9
37	23.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
38	25.00	UDS	2.68	2.62	2.14	2.78	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	482.7	UCS	-	-	-	-	-	0.06	5.6
39	25.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 31

Co-Ordinate :- E - 1060, N - 3388

Reduced Level :- 197.10 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	2	58	40		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	4	39	34	23	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-
3	2.00	SPT	-	-	-	-	2	40	37	21	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
4	2.50	UDS	1.96	1.54	27.41	2.66	18	28	31	23	40	19	21	-	-	-	CI	0.62	9	-	-	TUU	0.15	0.0347	0.43	-	-	0.73	42.2
5	3.00	SPT	-	-	-	-	10	61	29		33	18	15	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
6	3.50	SPT	-	-	-	-	16	54	30		36	16	20	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
7	4.00	SPT	-	-	-	-	9	76	15		28	19	9	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-
8	4.50	SPT	-	-	-	-	11	69	20		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
9	5.00	SPT	-	-	-	-	12	64	24		33	17	16	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
10	5.50	SPT	-	-	-	-	16	62	22		30	19	11	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-
11	6.00	SPT	-	-	-	-	2	21	51	26	44	20	24	-	-	-	CI	-	-	-	-	-	-	-	-	31	-	-	-
12	6.50	SPT	-	-	-	-	0	29	49	22	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	26	-	-	-
13	7.00	SPT	-	-	-	-	1	20	54	25	42	19	23	-	-	-	CI	-	-	-	-	-	-	-	-	51	-	-	-
14	7.50	SPT	-	-	-	-	0	29	50	21	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
15	9.00	UDS	2.08	1.73	19.92	2.65	0	27	50	23	40	19	21	-	-	-	CI	4.56	5	-	-	TUU	-	-	-	-	-	0.53	34.5
16	9.00	SPT	-	-	-	-	0	30	51	19	37	20	17	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
17	10.50	UDS	2.15	1.83	17.20	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	34.1	UCS	-	-	-	-	-	0.46	31.5
18	12.00	UDS	2.16	1.85	16.99	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	38.5	UCS	-	-	-	-	-	0.46	31.4
19	13.50	UDS	2.13	1.80	18.16	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	30.6	UCS	-	-	-	-	-	0.49	32.7
20	13.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
21	15.00	UDS	2.18	1.87	16.32	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	48.6	UCS	-	-	-	-	-	0.44	30.6
22	15.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
23	16.50	UDS	2.19	1.89	15.62	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	59.9	-	UCS	-	-	-	-	22.33	0.42	29.6
24	18.00	UDS	2.40	2.21	8.63	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	124.7	-	UCS	-	-	-	-	38.00	0.24	19.1
25	19.50	UDS	2.34	2.11	10.89	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	86.2	-	UCS	-	-	-	-	50.00	0.30	23.0
26	21.00	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	93.5	-	UCS	-	-	-	-	56.66	0.29	22.5
27	22.50	UDS	2.38	2.20	8.11	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	109.5	-	UCS	-	-	-	-	56.00	0.22	17.9
28	24.00	UDS	2.41	2.25	6.91	2.67	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	156.3	-	UCS	-	-	-	-	18.66	0.18	15.6
29	25.00	UDS	2.46	2.30	6.77	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	142.8	-	UCS	-	-	-	-	81.00	0.18	15.6

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 32

Co-Ordinate :- E - 1670, N - 3419

Reduced Level :- 208.90 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	58	42	29	13	16	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	13	61	26	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-	-
3	2.00	SPT	-	-	-	-	20	54	26	33	16	17	-	-	-	SC	-	-	-	-	-	-	-	-	42	-	-	-	-
4	2.50	UDS	1.85	1.75	5.64	2.67	22	62	16	30	24	6	-	-	-	SM-SC	0.01	31	-	-	DSU	-	-	-	-	-	0.52	34.4	-
5	3.00	SPT	-	-	-	-	20	60	20	32	25	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	43	-	-	-	-
6	3.50	UDS	2.10	1.77	18.87	2.65	0	64	36	34	27	7	-	-	-	SM-SC	0.02	30	-	-	DSU	-	-	-	-	-	0.50	33.3	-
7	4.00	SPT	-	-	-	-	2	81	17	28	22	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
8	4.50	SPT	-	-	-	-	0	75	25	29	24	5	-	-	-	SM	-	-	-	-	-	-	-	-	47	-	-	-	-
9	5.00	SPT	-	-	-	-	20	62	18	27	22	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
10	5.50	SPT	-	-	-	-	5	77	18	28	24	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
11	6.00	SPT	-	-	-	-	3	80	17	25	21	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
12	6.50	SPT	-	-	-	-	28	53	19	28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	0	74	26	29	24	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	SPT	-	-	-	-	11	77	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
15	8.00	SPT	-	-	-	-	4	83	13	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	0	62	38	34	29	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	4	68	28	26	22	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	7	74	19	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	0	58	42	34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	3	69	28	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	0	70	30	32	17	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	UDS	2.30	2.07	10.91	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	43.3	UCS	-	-	-	-	-	0.29	22.6	-
23	12.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	40.1	UCS	-	-	-	-	-	0.31	23.7	-
25	14.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	UDS	2.39	2.21	8.26	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	38.7	UCS	-	-	-	-	-	0.22	18.2	-
29	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	UDS	2.41	2.24	7.38	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	55.6	UCS	-	-	-	-	-	0.20	16.6	-
31	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	UDS	2.40	2.23	7.70	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	62.1	UCS	-	-	-	-	-	0.21	17.2	-
33	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 33

Co-Ordinate :- E - 1172, N - 3393

Reduced Level :- 199.62 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	60	40		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	8	51	41		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	8	-	-	-
3	2.00	SPT	-	-	-	-	13	31	28	28	38	14	24	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
4	2.50	UDS	1.67	1.51	10.34	2.63	6	29	34	31	43	16	27	-	-	-	CI	0.45	5	-	-	TUU	0.16	0.0227	0.41	-	-	0.74	42.5
5	3.00	SPT	-	-	-	-	2	47	29	22	37	17	20	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-
6	3.50	UDS	1.73	1.54	12.46	2.65	1	44	29	26	42	20	22	-	-	-	CI	0.54	7	-	-	TUU	0.14	0.0175	0.57	-	-	0.72	42.0
7	4.00	SPT	-	-	-	-	0	46	36	18	41	24	17	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
8	4.50	UDS	1.99	1.59	25.16	2.65	0	43	29	28	45	20	25	-	-	-	CI	0.79	10	-	-	TUU	0.13	0.0125	0.71	-	-	0.67	40.0
9	5.00	SPT	-	-	-	-	21	28	30	21	40	22	18	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
10	5.50	SPT	-	-	-	-	0	58	42		31	16	15	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
11	6.00	SPT	-	-	-	-	2	51	47		35	15	20	-	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-
12	6.50	UDS	2.00	1.60	24.81	2.66	1	56	43		33	17	16	-	-	-	SC	0.08	27	-	-	DSU	-	-	-	-	-	0.66	39.8
13	7.00	SPT	-	-	-	-	0	62	38		28	18	10	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
14	7.50	SPT	-	-	-	-	0	61	39		30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
15	8.00	SPT	-	-	-	-	0	64	36		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	27	-	-	-
16	8.50	SPT	-	-	-	-	0	72	28		26	13	13	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
17	9.00	SPT	-	-	-	-	0	74	26		24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-
18	9.50	SPT	-	-	-	-	0	79	21		23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-
19	10.00	SPT	-	-	-	-	0	76	24		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
20	11.00	SPT	-	-	-	-	8	79	13		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	14	-	-	-
21	11.50	SPT	-	-	-	-	0	82	18		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	15	-	-	-
22	12.50	SPT	-	-	-	-	0	85	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	23	-	-	-
23	13.00	SPT	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	24	-	-	-
24	14.00	SPT	-	-	-	-	2	85	13		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	34	-	-	-
25	14.50	SPT	-	-	-	-	17	29	30	24	39	19	20	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
26	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.50	DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	-	-	-	-
28	19.00	UDS	2.21	1.93	14.49	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	43.2	UCS	-	-	-	-	-	0.39	28.0
29	20.50	UDS	2.24	1.97	13.49	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	48.9	UCS	-	-	-	-	-	0.36	26.6
30	22.00	UDS	2.32	2.10	10.66	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	56.7	-	UCS	-	-	-	-	55.00	0.29	22.4
31	23.50	UDS	2.34	2.13	9.71	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	34.9	-	UCS	-	-	-	-	40.00	0.26	20.7
32	25.00	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	68.4	-	UCS	-	-	-	-	60.00	0.29	22.5

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 34

Co-Ordinate :- E -1457, N 3001

Reduced Level :- 202.77 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	70	30	27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	47	29	24	36	16	20	-	-	-	CI	-	-	-	-	-	-	-	6	-	-	-	-
3	2.00	SPT	-	-	-	-	0	32	40	28	43	18	25	-	-	-	CI	-	-	-	-	-	-	-	5	-	-	-	-
4	2.50	UDS	1.76	1.52	15.56	2.65	0	43	34	23	37	17	20	16	0.17	32	CI	0.25	8	-	-	TUU	0.15	0.0364	0.42	-	-	0.74	42.5
5	3.00	SPT	-	-	-	-	8	50	42	36	15	21	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-	-
6	3.50	UDS	1.97	1.56	26.45	2.65	9	47	44	48	21	27	-	-	-	SC	0.07	23	-	-	DSU	-	-	-	-	-	0.70	41.2	
7	4.00	SPT	-	-	-	-	0	56	44	46	23	23	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-	-
8	4.50	UDS	1.99	1.59	25.44	2.66	4	51	45	42	17	25	-	-	-	SC	0.09	24	-	-	DSU	-	-	-	-	-	0.68	40.4	
9	5.00	SPT	-	-	-	-	0	7	61	32	51	22	29	-	-	-	CH	-	-	-	-	-	-	-	20	-	-	-	-
10	5.50	UDS	2.01	1.63	23.05	2.62	0	6	58	36	54	21	33	13	0.32	67	CH	1.09	2	-	-	TUU	0.10	0.0106	0.81	-	-	0.60	37.7
11	6.00	SPT	-	-	-	-	0	8	58	34	52	23	29	-	-	-	CH	-	-	-	-	-	-	-	54	-	-	-	-
12	6.50	UDS	2.08	1.75	18.80	2.61	0	5	69	26	46	24	22	16	0.19	42	CI	2.94	1	-	-	TUU	0.08	0.0035	2.46	-	-	0.49	32.9
13	7.00	SPT	-	-	-	-	0	6	70	24	42	21	21	-	-	-	CI	-	-	-	-	-	-	-	60	-	-	-	-
14	7.50	SPT	-	-	-	-	0	4	66	30	46	20	26	-	-	-	CI	-	-	-	-	-	-	-	66	-	-	-	-
15	8.00	SPT	-	-	-	-	0	5	62	33	48	19	29	-	-	-	CI	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	UDS	2.10	1.77	18.60	2.64	0	12	61	27	39	16	23	-	-	-	CI	3.56	3	-	-	TUU	0.07	0.0019	2.79	-	-	0.49	32.9
17	8.50	SPT	-	-	-	-	0	15	59	26	38	15	23	-	-	-	CI	-	-	-	-	-	-	-	>100	-	-	-	-
18	10.00	UDS	2.14	1.81	17.94	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	44.0	UCS	-	-	-	-	-	0.48	32.5
19	10.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.50	UDS	2.23	1.96	13.90	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.6	UCS	-	-	-	-	-	0.37	27.2
21	13.00	UDS	2.20	1.91	14.93	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	49.8	UCS	-	-	-	-	-	0.40	28.6
22	14.50	UDS	2.22	1.94	14.32	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	46.4	-	UCS	-	-	-	-	6.66	0.39	27.8
23	16.00	UDS	2.17	1.86	16.52	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	45.3	-	UCS	-	-	-	-	6.66	0.44	30.8
24	17.50	UDS	2.25	1.99	13.09	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	45.8	-	UCS	-	-	-	-	40.66	0.35	26.0
25	19.00	UDS	2.26	1.99	13.42	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	75.3	-	UCS	-	-	-	-	16.66	0.37	26.7
26	20.50	UDS	2.27	2.00	13.27	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	79.0	-	UCS	-	-	-	-	48.00	0.36	26.6

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 35

Co-Ordinate :- E - 1010, N - 3360

Reduced Level :- 196.340m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	2	46	38	14	26	14	12	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	41	33	20	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
3	2.00	SPT	-	-	-	-	0	34	35	31	45	19	26	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-
4	2.50	UDS	1.95	1.53	27.51	2.64	0	36	39	25	43	20	23	-	-	-	CI	0.65	7	-	-	TUU	0.15	0.0160	0.45	-	-	0.73	42.1
5	3.00	SPT	-	-	-	-	8	21	39	32	46	19	27	-	-	-	CI	-	-	-	-	-	-	-	-	19	-	-	-
6	3.50	UDS	1.96	1.55	26.24	2.62	9	23	41	27	44	21	23	-	-	-	CI	1.02	7	-	-	TUU	0.13	0.0103	0.69	-	-	0.69	40.7
7	4.00	SPT	-	-	-	-	0	18	55	27	45	20	25	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
8	4.50	UDS	1.97	1.57	25.28	2.61	4	16	47	33	47	18	29	-	-	-	CI	1.24	5	-	-	TUU	0.12	0.0089	1.44	-	-	0.66	39.8
9	5.00	SPT	-	-	-	-	0	15	72	13	31	20	11	-	-	-	CL	-	-	-	-	-	-	-	-	40	-	-	-
10	5.50	SPT	-	-	-	-	0	19	71	10	30	21	9	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
11	6.00	SPT	-	-	-	-	0	22	56	22	42	23	19	-	-	-	CI	-	-	-	-	-	-	-	-	52	-	-	-
12	6.50	SPT	-	-	-	-	0	18	53	29	45	20	25	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	0	18	56	26	46	24	22	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	UDS	2.10	1.75	20.20	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	63.9	UCS	-	-	-	-	-	0.55	35.3
15	9.00	UDS	2.26	1.99	13.42	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	50.4	-	UCS	-	-	-	-	8.00	0.37	26.7
16	10.50	UDS	2.31	2.07	11.74	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	144.1	-	UCS	-	-	-	-	6.00	0.32	24.3
17	12.00	UDS	2.25	1.98	13.58	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	138.2	-	UCS	-	-	-	-	6.00	0.37	26.9
18	13.50	UDS	2.34	2.12	10.43	2.72	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	110.2	-	UCS	-	-	-	-	37.00	0.28	22.1
19	15.00	UDS	2.35	2.12	10.77	2.75	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	119.7	-	UCS	-	-	-	-	46.00	0.30	22.9

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 37

Co-Ordinate :- E - 955, N - 3368

Reduced Level :- 195.75 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction φ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	4	41	34	21	37	18	19	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	36	47	17		28	19	9	-	-	-	SC	-	-	-	-	-	-	-	8	-	-	-	-
3	2.00	SPT	-	-	-	-	0	46	40	14	29	17	12	-	-	-	CL	-	-	-	-	-	-	-	18	-	-	-	-
4	2.50	UDS	1.97	1.56	26.45	2.65	0	41	39	20	32	15	17	-	-	-	CL	0.65	9	-	-	TUU	0.14	0.0135	0.42	-	-	0.70	41.2
5	3.00	SPT	-	-	-	-	0	46	42	12	28	17	11	-	-	-	CL	-	-	-	-	-	-	-	10	-	-	-	-
6	3.50	UDS	1.97	1.57	25.87	2.63	0	39	47	14	31	19	12	-	-	-	CL	0.79	7	-	-	TUU	0.14	0.0074	0.51	-	-	0.68	40.5
7	4.00	SPT	-	-	-	-	2	43	31	24	38	16	22	-	-	-	CI	-	-	-	-	-	-	-	25	-	-	-	-
8	4.50	UDS	2.04	1.67	22.13	2.65	0	42	37	21	40	21	19	-	-	-	CI	1.56	8	-	-	TUU	0.11	0.0062	1.17	-	-	0.59	37.0
9	5.00	SPT	-	-	-	-	0	48	35	17	36	20	16	-	-	-	CI	-	-	-	-	-	-	-	35	-	-	-	-
10	5.50	UDS	2.11	1.80	17.54	2.62	0	29	43	28	44	19	25	-	-	-	CI	2.07	5	-	-	TUU	0.08	0.0053	2.51	-	-	0.46	31.5
11	6.00	SPT	-	-	-	-	0	22	47	31	46	18	28	-	-	-	CI	-	-	-	-	-	-	-	66	-	-	-	-
12	6.50	SPT	-	-	-	-	0	12	56	32	48	21	27	-	-	-	CI	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	6	36	38	20	41	23	18	-	-	-	CI	-	-	-	-	-	-	-	>100	-	-	-	-
14	8.00	UDS	2.22	1.94	14.57	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	37.8	-	UCS	-	-	-	-	7.10	0.39	28.2
15	9.50	UDS	2.18	1.88	15.81	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	41.0	UCS	-	-	-	-	-	0.42	29.8
16	9.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-
17	11.00	UDS	2.32	2.10	10.42	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	53.6	UCS	-	-	-	-	-	0.28	21.9
18	12.50	UDS	2.36	2.17	8.78	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	44.8	UCS	-	-	-	-	-	0.24	19.0
19	14.00	UDS	2.35	2.14	9.60	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.9	UCS	-	-	-	-	-	0.26	20.6
20	15.50	UDS	2.30	2.05	12.12	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	67.5	-	UCS	-	-	-	-	19.30	0.33	24.9
21	17.00	UDS	2.33	2.11	10.54	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	54.9	UCS	-	-	-	-	-	0.29	22.2
22	18.50	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	60.2	-	UCS	-	-	-	-	8.66	0.23	18.5
23	20.00	UDS	2.45	2.28	7.30	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	97.4	UCS	-	-	-	-	-	0.20	16.7

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 38

Co-Ordinate :- E - 1411, N 3308

Reduced Level :- 204.30m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	80	20	20	14	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	4	38	32	26	39	17	22	-	-	-	CI	-	-	-	-	-	-	-	-	2	-	-	-
3	2.00	SPT	-	-	-	-	6	42	29	23	38	18	20	-	-	-	CI	-	-	-	-	-	-	-	-	2	-	-	-
4	2.50	UDS	1.98	1.57	26.09	2.66	13	34	29	24	36	15	21	-	-	-	CI	0.35	9	-	-	TUU	0.14	0.0270	0.42	-	-	0.69	41.0
5	3.00	SPT	-	-	-	-	6	41	26	27	40	17	23	-	-	-	CI	-	-	-	-	-	-	-	-	17	-	-	-
6	3.50	UDS	2.00	1.60	24.81	2.66	13	35	27	25	41	19	22	-	-	-	CI	0.85	8	-	-	TUU	0.12	0.0111	0.60	-	-	0.66	39.8
7	4.00	SPT	-	-	-	-	8	40	30	22	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
8	4.50	UDS	2.03	1.65	22.71	2.65	5	44	31	20	37	19	18	-	-	-	CI	0.91	6	-	-	TUU	0.11	0.0097	0.66	-	-	0.60	37.6
9	5.00	SPT	-	-	-	-	11	35	26	28	40	16	24	-	-	-	CI	-	-	-	-	-	-	-	-	19	-	-	-
10	5.50	UDS	2.05	1.68	21.84	2.66	0	49	27	24	39	18	21	-	-	-	CI	0.96	7	-	-	TUU	0.11	0.0099	0.81	-	-	0.58	36.7
11	6.00	SPT	-	-	-	-	0	73	27		35	21	14	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
12	6.50	UDS	2.08	1.73	20.46	2.67	0	62	38		36	20	16	-	-	-	SC	0.07	28	-	-	DSU	-	-	-	-	-	0.55	35.3
13	7.00	SPT	-	-	-	-	0	73	27		39	22	17	-	-	-	SC	-	-	-	-	-	-	-	-	35	-	-	-
14	7.50	UDS	2.09	1.75	19.39	2.65	0	53	47		43	21	22	-	-	-	SC	0.09	28	-	-	DSU	-	-	-	-	-	0.51	33.9
15	8.00	SPT	-	-	-	-	0	78	22		36	22	14	-	-	-	SC	-	-	-	-	-	-	-	-	33	-	-	-
16	8.50	UDS	2.08	1.73	20.19	2.66	0	72	28		42	24	18	-	-	-	SC	0.06	30	-	-	DSU	-	-	-	-	-	0.54	34.9
17	9.00	SPT	-	-	-	-	0	69	31		44	20	24	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	66	34		46	21	25	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	63	37		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	8	66	26		35	22	13	-	-	-	SC	-	-	-	-	-	-	-	-	67	-	-	-
21	11.50	SPT	-	-	-	-	0	68	32		31	21	10	-	-	-	SC	-	-	-	-	-	-	-	-	83	-	-	-
22	12.50	SPT	-	-	-	-	2	69	29		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	2	68	30		30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	7	65	28		26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	5	71	24		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	6	62	32		37	17	20	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	70	30		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	2	62	36		35	15	20	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	82	18		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	73	27		36	18	18	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	76	24		29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	66	34		39	18	21	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 39

Co-Ordinate :- E - 1619, N - 3343

Reduced Level :- 207.95m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	62	38	29	13	16	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	60	40	34	14	20	-	-	-	SC	-	-	-	-	-	-	-	-	2	-	-	-	-
3	2.00	SPT	-	-	-	-	43	37	20	32	16	16	-	-	-	GC	-	-	-	-	-	-	-	-	31	-	-	-	-
4	2.50	UDS	2.03	1.64	23.55	2.68	42	33	25	34	15	19	-	-	-	GC	0.06	30	-	-	DSU	-	-	-	-	-	0.63	38.7	-
5	3.00	SPT	-	-	-	-	15	55	30	36	16	20	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-	-
6	3.50	UDS	2.05	1.68	21.84	2.66	10	53	37	37	18	19	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.58	36.7	-
7	4.00	SPT	-	-	-	-	18	66	16	33	21	12	-	-	-	SC	-	-	-	-	-	-	-	-	65	-	-	-	-
8	4.50	SPT	-	-	-	-	6	77	17	34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
9	5.00	SPT	-	-	-	-	6	72	22	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
10	5.50	SPT	-	-	-	-	0	76	24	37	21	16	-	-	-	SC	-	-	-	-	-	-	-	-	36	-	-	-	-
11	6.00	SPT	-	-	-	-	0	71	29	40	20	20	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-	-
12	6.50	SPT	-	-	-	-	7	75	18	26	19	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	0	87	13	22	16	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	UDS	2.14	1.82	17.67	2.68	22	61	17	28	22	6	-	-	-	SM-SC	0.03	30	-	-	DSU	-	-	-	-	-	0.47	32.1	-
15	8.00	SPT	-	-	-	-	0	59	41	38	21	17	-	-	-	GC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	0	63	37	36	20	16	-	-	-	GC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	0	58	42	40	18	22	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	0	76	24	34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	2	80	18	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	0	59	41	35	17	18	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	0	67	33	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	SPT	-	-	-	-	0	74	26	24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	24	55	21	22	14	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	0	72	28	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	13	67	20	23	13	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	18	68	14	22	14	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	42	45	13	21	12	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	UDS	2.15	1.83	17.71	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	41.3	UCS	-	-	-	-	-	-	0.48	32.4
29	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	20.00	UDS	2.15	1.83	17.46	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	41.1	UCS	-	-	-	-	-	-	0.47	32.0
31	20.00	UDS	2.23	1.95	14.15	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	52.6	UCS	-	-	-	-	-	-	0.38	27.6
32	21.50	UDS	2.38	2.18	9.06	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	119.2	UCS	-	-	-	-	-	-	0.25	19.8
33	23.00	UDS	2.16	1.85	16.99	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	47.4	-	UCS	-	-	-	-	8.00	0.46	31.4	-
34	25.00	UDS	2.44	2.27	7.60	2.74	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	119.3	-	UCS	-	-	-	-	10.00	0.21	17.2	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 40

Co-Ordinate :- E - 898, N - 3343

Reduced Level :- 194.960 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction φ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	6	45	49	38	20	18	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	1	26	43	30	40	14	26	-	-	-	CI	-	-	-	-	-	-	-	-	6	-	-	-
3	2.00	SPT	-	-	-	-	0	53	47	36	15	21	-	-	-	SC	-	-	-	-	-	-	-	-	-	14	-	-	-
4	2.50	UDS	1.96	1.54	27.12	2.65	2	60	38	29	16	13	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	-	0.72	41.8
5	3.00	SPT	-	-	-	-	0	56	44	36	15	21	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
6	3.50	UDS	2.10	1.75	19.94	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	40.6	UCS	-	-	-	-	-	-	0.54	34.9
7	5.00	UDS	2.15	1.83	17.71	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	46.5	UCS	-	-	-	-	-	-	0.48	32.4
8	6.50	UDS	2.16	1.85	16.73	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	52.8	UCS	-	-	-	-	-	-	0.45	31.0
9	8.00	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	81.4	-	UCS	-	-	-	-	-	40.66	0.33	24.6
10	9.50	UDS	2.38	2.18	9.29	2.73	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	99.6	-	UCS	-	-	-	-	-	44.66	0.25	20.2
11	11.00	UDS	2.42	2.24	8.22	2.74	-	-	-	-	-	-	-	-	-	ROCK	-	-	156.3	-	UCS	-	-	-	-	-	44.00	0.23	18.4
12	12.50	UDS	2.39	2.21	8.26	2.70	-	-	-	-	-	-	-	-	-	ROCK	-	-	148.2	-	UCS	-	-	-	-	-	26.66	0.22	18.2
13	14.00	UDS	2.41	2.23	8.08	2.72	-	-	-	-	-	-	-	-	-	ROCK	-	-	177.2	-	UCS	-	-	-	-	-	31.33	0.22	18.0
14	15.50	UDS	2.24	1.97	13.74	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	143.6	-	UCS	-	-	-	-	-	14.66	0.37	27.1
15	17.00	UDS	2.43	2.26	7.68	2.73	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	161.1	-	UCS	-	-	-	-	-	35.33	0.21	17.3
16	18.50	UDS	2.46	2.29	7.22	2.75	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	178.9	-	UCS	-	-	-	-	-	52.00	0.20	16.6
17	20.00	UDS	2.34	2.13	9.95	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	98.9	UCS	-	-	-	-	-	-	0.27	21.2

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 41

Co-Ordinate :- E - 1270, N - 3322

Reduced Level :- 202.20m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	7	50	43		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	39	36	25	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
3	2.00	SPT	-	-	-	-	3	52	45		36	21	15	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
4	2.50	UDS	1.98	1.57	25.80	2.65	4	50	46		38	19	19	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.68	40.6
5	3.00	SPT	-	-	-	-	3	49	48		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-
6	3.50	UDS	2.01	1.62	23.91	2.65	0	53	47		32	16	16	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	0.63	38.8
7	4.00	SPT	-	-	-	-	12	43	45		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-
8	4.50	SPT	-	-	-	-	6	65	29		25	20	5	-	-	-	SM	-	-	-	-	-	-	-	-	15	-	-	-
9	5.00	SPT	-	-	-	-	8	35	34	23	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
10	5.50	SPT	-	-	-	-	0	14	56	30	48	21	27	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
11	6.00	SPT	-	-	-	-	0	19	55	26	47	23	24	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
12	6.50	UDS	1.99	1.60	24.58	2.63	4	23	41	32	48	20	28	-	-	-	CI	0.93	5	-	-	TUU	-	-	-	-	-	0.65	39.3
13	7.00	SPT	-	-	-	-	0	49	33	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
14	7.50	SPT	-	-	-	-	3	45	29	23	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
15	8.00	SPT	-	-	-	-	0	47	35	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	25	-	-	-
16	8.50	UDS	2.05	1.69	21.56	2.65	3	46	27	24	41	20	21	-	-	-	CI	1.49	8	-	-	TUU	-	-	-	-	-	0.57	36.4
17	9.00	SPT	-	-	-	-	0	24	45	31	46	19	27	-	-	-	CI	-	-	-	-	-	-	-	-	31	-	-	-
18	9.50	SPT	-	-	-	-	0	49	34	17	38	22	16	-	-	-	CI	-	-	-	-	-	-	-	-	38	-	-	-
19	10.00	SPT	-	-	-	-	0	21	53	26	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	35	-	-	-
20	11.00	UDS	2.08	1.74	19.64	2.64	0	47	33	20	39	21	18	-	-	-	CI	1.79	9	-	-	TUU	-	-	-	-	-	0.52	34.1
21	11.50	SPT	-	-	-	-	0	20	50	30	46	20	26	-	-	-	CI	-	-	-	-	-	-	-	-	36	-	-	-
22	12.50	UDS	2.09	1.76	18.84	2.63	0	38	40	22	43	23	20	-	-	-	CI	1.98	6	-	-	TUU	-	-	-	-	-	0.50	33.1
23	13.00	SPT	-	-	-	-	0	49	33	18	38	22	16	-	-	-	CI	-	-	-	-	-	-	-	-	40	-	-	-
24	14.00	SPT	-	-	-	-	0	16	55	29	46	21	25	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
25	15.50	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	59.3	UCS	-	-	-	-	-	0.33	24.6
26	17.00	UDS	2.32	2.08	11.38	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	71.1	-	UCS	-	-	-	-	13.33	0.31	23.7
27	18.50	UDS	2.30	2.06	11.40	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	85.2	-	UCS	-	-	-	-	22.66	0.31	23.5
28	20.00	UDS	2.34	2.11	10.66	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	92.6	-	UCS	-	-	-	-	6.50	0.29	22.5

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 43

Co-Ordinate :- E - 1416, N - 3364

Reduced Level :- 200.88 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²					
1	0.00	DS	-	-	-	-	10	46	44	30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	DS	-	-	-	-	4	39	31	26	38	15	23	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
3	2.00	SPT	-	-	-	-	22	44	34	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	12	-	-	-	-	-
4	2.50	UDS	1.76	1.54	14.26	2.65	0	51	49	32	15	17	-	-	-	SC	0.09	25	-	-	DSU	-	-	-	-	-	0.72	41.9	
5	3.00	SPT	-	-	-	-	12	59	29	34	16	18	-	-	-	SC	-	-	-	-	-	-	-	15	-	-	-	-	-
6	3.50	UDS	2.00	1.60	25.09	2.67	28	48	24	34	15	19	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.67	40.1	
7	4.00	SPT	-	-	-	-	0	64	36	35	14	21	-	-	-	SC	-	-	-	-	-	-	-	18	-	-	-	-	-
8	4.50	UDS	2.02	1.64	23.31	2.65	10	49	41	38	18	20	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.62	38.2	
9	5.00	SPT	-	-	-	-	8	54	38	30	17	13	-	-	-	SC	-	-	-	-	-	-	-	20	-	-	-	-	-
10	5.50	UDS	2.03	1.65	22.99	2.66	5	78	17	23	19	4	-	-	-	SM-SC	0.03	29	-	-	DSU	-	-	-	-	-	0.61	38.0	
11	6.00	SPT	-	-	-	-	0	68	32	40	18	22	-	-	-	SC	-	-	-	-	-	-	-	29	-	-	-	-	-
12	6.50	SPT	-	-	-	-	0	64	36	41	17	24	-	-	-	SC	-	-	-	-	-	-	-	30	-	-	-	-	-
13	7.00	SPT	-	-	-	-	0	54	46	45	20	25	-	-	-	SC	-	-	-	-	-	-	-	34	-	-	-	-	-
14	7.50	SPT	-	-	-	-	0	64	36	39	22	17	-	-	-	SC	-	-	-	-	-	-	-	33	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	71	29	25	19	6	-	-	-	SM-SC	-	-	-	-	-	-	-	34	-	-	-	-	-
16	8.50	SPT	-	-	-	-	0	62	38	29	22	7	-	-	-	SM-SC	-	-	-	-	-	-	-	36	-	-	-	-	-
17	9.00	SPT	-	-	-	-	0	70	30	35	20	15	-	-	-	SC	-	-	-	-	-	-	-	71	-	-	-	-	-
18	9.50	SPT	-	-	-	-	0	68	32	37	18	19	-	-	-	SC	-	-	-	-	-	-	-	66	-	-	-	-	-
19	10.00	SPT	-	-	-	-	12	68	20	22	16	6	-	-	-	SC	-	-	-	-	-	-	-	79	-	-	-	-	-
20	11.00	SPT	-	-	-	-	0	69	31	29	15	14	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
21	11.50	SPT	-	-	-	-	20	60	20	24	16	8	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
22	12.50	SPT	-	-	-	-	6	60	34	31	18	13	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
23	13.00	SPT	-	-	-	-	0	66	34	32	16	16	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
24	14.00	SPT	-	-	-	-	0	95	5	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
25	14.50	SPT	-	-	-	-	0	99	1	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
26	15.50	SPT	-	-	-	-	34	61	5	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
27	16.00	SPT	-	-	-	-	0	96	4	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
28	17.00	SPT	-	-	-	-	4	93	3	NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
29	17.50	UDS	2.72	2.69	1.25	2.78	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	164.3	UCS	-	-	-	-	-	0.03	3.4	
30	19.00	UDS	2.24	1.97	13.49	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	53.1	-	UCS	-	-	-	-	8.00	0.36	26.6	
31	20.00	UDS	2.28	2.03	12.15	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	68.2	-	UCS	-	-	-	-	11.00	0.33	24.7	

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 44

Co-Ordinate :- E - 772, N - 3336

Reduced Level :- 197.52 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	16	61	23	36	16	20	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	10	55	29	46	21	25	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
3	2.00	SPT	-	-	-	-	6	16	47	31	45	17	28	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.95	1.54	26.92	2.62	0	15	59	26	42	20	22	-	-	-	CI	0.65	4	-	-	TUU	0.15	0.0157	0.44	-	-	0.71	41.4
5	3.00	SPT	-	-	-	-	0	10	62	28	40	16	24	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
6	3.50	UDS	1.97	1.57	25.87	2.63	0	19	47	34	43	14	29	-	-	-	CI	0.79	5	-	-	TUU	0.14	0.0136	0.56	-	-	0.68	40.5
7	4.00	SPT	-	-	-	-	0	23	47	30	41	16	25	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
8	4.50	UDS	1.99	1.59	25.16	2.65	0	54	46	36	17	19	-	-	-	-	SC	0.10	25	-	-	DSU	-	-	-	-	-	0.67	40.0
9	5.00	SPT	-	-	-	-	0	52	48	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
10	5.50	UDS	2.00	1.61	24.53	2.65	0	53	47	29	14	15	-	-	-	-	SC	0.09	26	-	-	DSU	-	-	-	-	-	0.65	39.4
11	6.00	SPT	-	-	-	-	0	61	39	26	16	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
12	6.50	SPT	-	-	-	-	0	51	49	27	18	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
13	7.00	SPT	-	-	-	-	0	60	40	25	13	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
14	7.50	UDS	2.01	1.62	24.19	2.66	4	63	33	24	14	10	-	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	0.64	39.2
15	8.00	SPT	-	-	-	-	0	56	44	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	62	38	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	3	53	44	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	34	40	26	24	15	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	UDS	2.29	2.05	11.77	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	56.9	-	UCS	-	-	-	-	10.00	0.32	24.1
21	12.50	UDS	2.43	2.27	6.99	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	90.1	UCS	-	-	-	-	-	0.19	15.9
22	14.00	UDS	2.46	2.30	6.77	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	138.8	-	UCS	-	-	-	-	36.00	0.18	15.6
23	15.50	UDS	2.40	2.22	8.17	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	108.4	-	UCS	-	-	-	-	6.66	0.22	18.1
24	17.00	UDS	2.47	2.31	6.70	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	162.9	-	UCS	-	-	-	-	38.66	0.18	15.5
25	18.50	UDS	2.49	2.34	6.35	2.75	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	195.4	-	UCS	-	-	-	-	53.33	0.17	14.9

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 46

Co-Ordinate :- E - 1316, N - 3323

Reduced Level :- 202.50m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	10	38	38	14	26	13	13	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	72	28		23	14	9	-	-	-	SC	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	0	44	37	19	33	16	17	-	-	-	CL	-	-	-	-	-	-	-	-	8	-	-	-
4	2.50	UDS	1.97	1.55	26.74	2.66	9	43	27	21	34	15	19	-	-	-	CL	0.41	8	-	-	TUU	0.13	0.0192	0.07	-	-	0.71	41.6
5	3.00	SPT	-	-	-	-	18	53	29		36	16	20	-	-	-	SC	-	-	-	-	-	-	-	-	10	-	-	-
6	3.50	SPT	-	-	-	-	30	42	28		34	15	19	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-
7	4.00	SPT	-	-	-	-	8	32	36	24	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
8	4.50	SPT	-	-	-	-	16	51	33		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	7	-	-	-
9	5.00	SPT	-	-	-	-	14	50	36		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
10	5.50	SPT	-	-	-	-	16	55	29		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
11	6.00	SPT	-	-	-	-	24	51	25		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
12	6.50	UDS	2.00	1.60	25.09	2.67	15	57	28		27	16	11	-	-	-	SC	0.04	28	-	-	DSU	-	-	-	-	-	0.67	40.1
13	7.00	SPT	-	-	-	-	0	56	44		30	18	12	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
14	7.50	UDS	2.03	1.64	23.55	2.68	30	39	31		28	19	9	-	-	-	SC	0.03	29	-	-	DSU	-	-	-	-	-	0.63	38.7
15	8.00	SPT	-	-	-	-	0	78	22		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-
16	8.50	UDS	2.06	1.70	21.00	2.65	0	61	39		37	18	19	-	-	-	SC	0.07	28	-	-	DSU	-	-	-	-	-	0.56	35.8
17	9.00	SPT	-	-	-	-	0	80	20		33	19	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	82	18		34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	71	29		36	18	18	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.50	SPT	-	-	-	-	0	70	30		37	17	20	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	12.50	SPT	-	-	-	-	0	87	13		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
22	13.00	SPT	-	-	-	-	0	82	18		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	14.00	SPT	-	-	-	-	0	81	19		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.50	SPT	-	-	-	-	26	47	27		37	22	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	15.50	SPT	-	-	-	-	0	84	16		26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	16.00	SPT	-	-	-	-	0	83	17		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.50	SPT	-	-	-	-	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
28	19.00	SPT	-	-	-	-	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	20.50	UDS	2.56	2.47	3.55	2.71	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	79.3	UCS	-	-	-	-	-	0.10	8.8
30	22.00	UDS	2.59	2.51	3.23	2.73	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	99.5	UCS	-	-	-	-	-	0.09	8.1
31	23.50	UDS	2.43	2.27	6.99	2.70	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	41.2	UCS	-	-	-	-	-	0.19	15.9
32	25.00	UDS	2.38	2.20	8.35	2.69	-	-	-		-	-	-	-	-	-	W.ROCK	-	-	-	36.6	UCS	-	-	-	-	-	0.22	18.3

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 47

Co-Ordinate :- E - 757, N - 3288

Reduced Level :- 197.73 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	12	66	22	37	18	19	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	6	56	38	55	23	32	-	-	-	CH	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	0	10	56	34	51	22	29	-	-	-	CH	-	-	-	-	-	-	-	-	6	-	-	-
4	2.50	UDS	1.91	1.47	29.78	2.62	10	6	49	35	53	21	32	-	-	-	CH	0.32	4	-	-	TUU	0.17	0.0340	0.42	-	-	0.78	43.8
5	3.00	SPT	-	-	-	-	0	8	60	32	52	23	29	-	-	-	CH	-	-	-	-	-	-	-	-	9	-	-	-
6	3.50	UDS	1.94	1.52	27.31	2.61	0	7	54	39	54	20	34	-	-	-	CH	0.49	2	-	-	TUU	0.14	0.0236	0.63	-	-	0.71	41.6
7	4.00	SPT	-	-	-	-	6	14	64	16	37	23	14	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-
8	4.50	SPT	-	-	-	-	0	12	62	26	43	20	23	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
9	5.00	SPT	-	-	-	-	0	32	44	24	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	31	-	-	-
10	5.50	UDS	2.06	1.72	19.59	2.60	0	7	80	13	33	21	12	-	-	-	CL	1.73	2	-	-	TUU	0.09	0.0036	1.70	-	-	0.51	33.8
11	6.00	SPT	-	-	-	-	0	22	58	20	37	19	18	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	0	12	73	15	36	22	14	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	0	10	70	20	42	24	18	-	-	-	CI	-	-	-	-	-	-	-	-	52	-	-	-
14	7.50	SPT	-	-	-	-	0	8	77	15	33	20	13	-	-	-	CL	-	-	-	-	-	-	-	-	>1000	-	-	-
15	8.00	SPT	-	-	-	-	1	25	63	11	29	19	10	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
16	9.00	UDS	2.31	2.08	11.27	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	77.3	UCS	-	-	-	-	-	0.31	23.4
17	10.50	UDS	2.34	2.12	10.43	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	78.1	-	UCS	-	-	-	-	18.00	0.28	22.1
18	12.00	UDS	2.40	2.20	8.86	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	93.8	-	UCS	-	-	-	-	54.00	0.24	19.5
19	13.50	UDS	2.29	2.04	12.49	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	82.2	-	UCS	-	-	-	-	38.00	0.34	25.4
20	15.00	UDS	2.21	1.92	15.00	2.70	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	70.6	-	UCS	-	-	-	-	22.66	0.40	28.8
21	16.50	UDS	2.30	2.06	11.88	2.72	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	146.3	-	UCS	-	-	-	-	66.66	0.32	24.4
22	18.00	UDS	2.32	2.08	11.61	2.74	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	159.8	-	UCS	-	-	-	-	13.33	0.32	24.1

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 54

Co-Ordinate :- E - 1680, N - 3246

Reduced Level :- 204.10m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	60	40		24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	46	35	19	35	18	17	-	-	-	CI	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	13	33	33	21	36	17	19	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.98	1.57	26.37	2.67	22	50	28		36	19	17	-	-	-	SC	0.10	28	-	-	DSU	-	-	-	-	-	0.70	41.3
5	3.00	SPT	-	-	-	-	0	82	18		33	18	15	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-
6	3.50	UDS	2.05	1.68	21.84	2.66	3	72	25		36	19	17	-	-	-	SC	0.08	28	-	-	DSU	-	-	-	-	-	0.58	36.7
7	4.00	SPT	-	-	-	-	0	74	26		31	22	9	-	-	-	SC	-	-	-	-	-	-	-	-	31	-	-	-
8	4.50	UDS	2.08	1.73	20.46	2.67	11	67	22		33	21	12	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.55	35.3
9	5.00	SPT	-	-	-	-	0	82	18		34	19	15	-	-	-	SC	-	-	-	-	-	-	-	-	64	-	-	-
10	5.50	UDS	2.11	1.77	18.90	2.67	8	73	19		33	21	12	-	-	-	SC	0.05	30	-	-	DSU	-	-	-	-	-	0.50	33.5
11	6.00	SPT	-	-	-	-	0	80	20		32	21	11	-	-	-	SC	-	-	-	-	-	-	-	-	51	-	-	-
12	6.50	UDS	2.12	1.79	18.13	2.66	0	82	18		34	22	12	-	-	-	SC	0.05	29	-	-	DSU	-	-	-	-	-	0.48	32.5
13	7.00	SPT	-	-	-	-	0	79	21		35	21	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	DS	-	-	-	-	0	71	29		36	20	16	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	64	36		40	23	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	66	34		35	22	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	66	34		33	21	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	72	28		36	20	16	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	68	32		37	18	19	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	76	24		35	19	16	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	83	17		25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.50	SPT	-	-	-	-	0	72	28		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	76	24		26	14	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	66	34		28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	8	73	19		24	16	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	24	50	26		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	72	28		29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	SPT	-	-	-	-	0	76	24		20	15	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
30	19.00	SPT	-	-	-	-	4	78	18		16	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.00	SPT	-	-	-	-	12	68	20		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 55

Co-Ordinate :- E - 1314, N - 3230

Reduced Level :- 201.80m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	2	53	45		23	13	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	2	46	30	22	36	16	20	-	-	-	CI	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	17	40	43		38	15	23	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
4	2.50	UDS	1.94	1.52	27.61	2.62	9	38	28	25	42	20	22	16	0.12	39	CI	0.64	7	-	-	TUU	0.15	0.0160	0.43	-	-	0.72	42.0
5	3.00	SPT	-	-	-	-	4	41	28	27	40	17	23	-	-	-	CI	-	-	-	-	-	-	-	-	13	-	-	-
6	3.50	UDS	1.96	1.55	26.83	2.64	0	43	33	24	39	18	21	17	0.12	38	CI	0.76	10	-	-	TUU	0.14	0.0126	0.51	-	-	0.71	41.5
7	4.00	SPT	-	-	-	-	0	35	33	32	43	16	27	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
8	4.50	UDS	1.98	1.58	25.22	2.63	2	33	35	30	44	18	26	-	-	-	CI	1.27	9	-	-	TUU	0.12	0.0085	0.66	-	-	0.66	39.9
9	5.00	SPT	-	-	-	-	0	12	57	31	49	21	28	-	-	-	CI	-	-	-	-	-	-	-	-	26	-	-	-
10	5.50	SPT	-	-	-	-	0	17	51	32	47	20	27	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
11	6.00	SPT	-	-	-	-	0	40	25	35	53	23	30	-	-	-	CH	-	-	-	-	-	-	-	-	13	-	-	-
12	6.50	SPT	-	-	-	-	0	54	46		37	19	18	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
13	7.00	SPT	-	-	-	-	0	47	28	25	43	21	22	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
14	7.50	SPT	-	-	-	-	0	14	62	24	44	24	20	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
15	8.00	SPT	-	-	-	-	0	8	65	27	47	23	24	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
16	8.50	SPT	-	-	-	-	0	4	71	25	45	22	23	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
17	9.00	SPT	-	-	-	-	0	22	46	32	49	20	29	-	-	-	CI	-	-	-	-	-	-	-	-	33	-	-	-
18	9.50	SPT	-	-	-	-	0	6	67	27	46	22	24	-	-	-	CI	-	-	-	-	-	-	-	-	33	-	-	-
19	10.00	SPT	-	-	-	-	0	16	61	23	44	23	21	-	-	-	CI	-	-	-	-	-	-	-	-	23	-	-	-
20	11.00	SPT	-	-	-	-	0	6	73	21	43	25	18	-	-	-	CI	-	-	-	-	-	-	-	-	50	-	-	-
21	11.50	SPT	-	-	-	-	0	5	76	19	40	23	17	-	-	-	CI	-	-	-	-	-	-	-	-	83	-	-	-
22	12.50	SPT	-	-	-	-	0	2	75	23	44	24	20	-	-	-	CI	-	-	-	-	-	-	-	-	81	-	-	-
23	13.00	SPT	-	-	-	-	0	8	68	24	46	25	21	-	-	-	CI	-	-	-	-	-	-	-	-	77	-	-	-
24	14.00	SPT	-	-	-	-	0	5	73	22	44	24	20	-	-	-	CI	-	-	-	-	-	-	-	-	67	-	-	-
25	14.50	SPT	-	-	-	-	0	3	73	24	46	25	21	-	-	-	CI	-	-	-	-	-	-	-	-	54	-	-	-
26	15.50	SPT	-	-	-	-	0	5	73	22	43	24	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	1	70	29	48	23	25	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	6	30	43	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	UDS	2.26	2.01	12.69	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	52.4	UCS	-	-	-	-	-	0.34	25.4
30	20.00	UDS	2.33	2.11	10.30	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	46.3	-	UCS	-	-	-	-	8.66	0.28	21.8
31	21.50	UDS	2.32	2.10	10.42	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	63.9	-	UCS	-	-	-	-	52.66	0.28	21.9

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 62

Co-Ordinate :- E - 1414, N - 3223

Reduced Level :- 203.70m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	49	39	12	27	16	11	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	42	37	15	29	15	14	-	-	-	CL	-	-	-	-	-	-	-	-	3	-	-	-
3	2.00	SPT	-	-	-	-	18	30	35	17	31	16	15	-	-	-	CL	-	-	-	-	-	-	-	6	-	-	-	-
4	2.50	UDS	1.95	1.53	27.81	2.65	10	37	36	17	34	18	16	-	-	-	CL	0.33	7	-	-	TUU	0.15	0.0278	0.43	-	-	0.74	42.4
5	3.00	SPT	-	-	-	-	11	36	37	16	32	17	15	-	-	-	CL	-	-	-	-	-	-	-	-	8	-	-	-
6	3.50	UDS	1.98	1.56	26.65	2.68	16	41	43	31	18	13	-	-	-	-	SC	0.07	28	-	-	DSU	-	-	-	-	-	0.71	41.7
7	4.00	SPT	-	-	-	-	26	42	32	29	17	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-
8	4.50	UDS	2.00	1.61	24.30	2.64	2	39	41	18	33	16	17	-	-	-	CL	1.14	7	-	-	TUU	0.11	0.0082	0.62	-	-	0.64	39.1
9	5.00	SPT	-	-	-	-	0	47	35	18	31	15	16	-	-	-	CL	-	-	-	-	-	-	-	-	24	-	-	-
10	5.50	SPT	-	-	-	-	16	52	32	30	16	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
11	6.00	SPT	-	-	-	-	0	62	38	34	18	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
12	6.50	SPT	-	-	-	-	13	53	34	31	19	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
13	7.00	SPT	-	-	-	-	4	43	40	13	28	17	11	-	-	-	CL	-	-	-	-	-	-	-	-	26	-	-	-
14	7.50	SPT	-	-	-	-	0	38	43	19	33	16	17	-	-	-	CL	-	-	-	-	-	-	-	-	21	-	-	-
15	8.00	SPT	-	-	-	-	4	62	34	32	17	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-
16	8.50	SPT	-	-	-	-	0	59	41	36	19	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-
17	9.00	SPT	-	-	-	-	0	12	53	35	51	21	30	-	-	-	CH	-	-	-	-	-	-	-	-	25	-	-	-
18	9.50	SPT	-	-	-	-	0	10	40	50	63	20	43	-	-	-	CH	-	-	-	-	-	-	-	-	18	-	-	-
19	10.00	SPT	-	-	-	-	0	7	41	52	65	19	46	-	-	-	CH	-	-	-	-	-	-	-	-	38	-	-	-
20	11.00	SPT	-	-	-	-	0	21	42	37	54	23	31	-	-	-	CH	-	-	-	-	-	-	-	-	36	-	-	-
21	11.50	SPT	-	-	-	-	0	16	48	36	55	22	33	-	-	-	CH	-	-	-	-	-	-	-	-	46	-	-	-
22	12.50	SPT	-	-	-	-	0	37	34	29	53	27	26	-	-	-	CH	-	-	-	-	-	-	-	-	93	-	-	-
23	13.00	SPT	-	-	-	-	0	22	44	34	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	-	68	-	-	-
24	14.00	SPT	-	-	-	-	0	20	44	36	55	24	31	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	26	46	28	52	27	25	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	24	44	32	53	24	29	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	20	46	34	56	25	31	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	22	49	29	51	26	25	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	8	53	39	55	22	33	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	26	41	33	51	21	30	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	14	48	38	54	20	34	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	UDS	2.23	1.95	14.15	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	50.5	UCS	-	-	-	-	-	0.38	27.6
33	21.50	UDS	2.24	1.98	13.24	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	54.5	UCS	-	-	-	-	-	0.35	26.2
34	23.00	UDS	2.19	1.90	15.36	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	51.4	UCS	-	-	-	-	-	0.41	29.2
35	23.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
36	24.50	UDS	2.19	1.89	15.62	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.7	UCS	-	-	-	-	-	0.42	29.6
37	24.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
38	26.00	UDS	2.22	1.94	14.32	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	53.6	-	UCS	-	-	-	-	22.00	0.39	27.8
39	27.50	UDS	2.59	2.49	4.09	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	313.0	UCS	-	-	-	-	-	0.11	10.2
40	27.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
41	29.00	UDS	2.55	2.43	5.12	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	320.2	UCS	-	-	-	-	-	0.14	12.4
42	30.00	UDS	2.53	2.39	5.66	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	359.9	UCS	-	-	-	-	-	0.16	13.6

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 72

Co-Ordinate :- E - 1598, N - 3160

Reduced Level :- 206.10 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	19	39	42		34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	12	50	38		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	12	29	37	22	41	21	20	-	-	-	CI	-	-	-	-	-	-	-	17	-	-	-	-
4	2.50	UDS	1.98	1.57	26.37	2.67	15	53	32		30	16	14	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.70	41.3
5	3.00	SPT	-	-	-	-	2	75	23		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
6	3.50	UDS	2.01	1.62	24.19	2.66	7	68	25		28	17	11	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.64	39.2
7	4.00	SPT	-	-	-	-	0	81	19		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
8	4.50	SPT	-	-	-	-	4	74	22		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	32	-	-	-
9	5.00	SPT	-	-	-	-	0	76	24		30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	43	-	-	-
10	5.50	SPT	-	-	-	-	0	79	21		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	36	-	-	-
11	6.00	SPT	-	-	-	-	0	72	28		31	15	16	-	-	-	SC	-	-	-	-	-	-	-	-	40	-	-	-
12	6.50	SPT	-	-	-	-	4	80	16		26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	43	-	-	-
13	7.00	SPT	-	-	-	-	7	75	18		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	6	70	24		25	18	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	78	22		21	15	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	72	28		27	20	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	82	18		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	80	20		20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	10	74	16		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	74	26		24	16	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	62	38		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	82	18		22	14	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	76	24		26	16	10	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	80	20		23	15	8	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.00	SPT	-	-	-	-	0	77	23		26	16	10	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	76	24		28	14	14	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	65	35		31	16	15	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	66	34		30	18	12	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	21	61	18		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	78	22		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	4	64	32		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
33	20.50	SPT	-	-	-	-	0	76	24		26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
34	21.50	SPT	-	-	-	-	5	68	27		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
35	22.00	SPT	-	-	-	-	0	80	20		21	17	4	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
36	23.00	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
37	24.50	UDS	2.32	2.10	10.42	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	56.3	UCS	-	-	-	-	-	0.28	21.9
38	24.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
39	25.50	UDS	2.39	2.21	8.02	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	61.4	UCS	-	-	-	-	-	0.22	17.8
40	25.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
41	27.00	UDS	2.40	2.23	7.46	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	84.2	UCS	-	-	-	-	-	0.20	16.7
42	27.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
43	28.50	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	187.2	-	UCS	-	-	-	-	9.33	0.23	18.5
44	30.00	UDS	2.60	2.48	4.67	2.81	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	363.9	UCS	-	-	-	-	-	0.13	11.6

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests

Page no.515 of 618
NP - Non Plastic
UCS - Unconfined Compression Strength

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structure in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 74

Co-Ordinate :- E 1705, N 3142

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
	m		gm / cc	gm / cc	%		%	%	%	%	%	%	%	Kg/cm ²	%		Kg/cm ²	Degree	Kg/cm ²	Kg/cm ²			cm ² /kg	kg/cm ²		%		%	
1	0.00	DS	-	-	-	-	0	71	29	27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	17	52	31	29	13	16	-	-	-	SC	-	-	-	-	-	-	-	-	31	-	-	-	-
3	2.00	SPT	-	-	-	-	15	59	26	28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	30	-	-	-	-
4	2.50	UDS	1.98	1.57	26.37	2.67	14	57	29	30	17	13	-	-	-	SC	0.06	27	-	-	DSU	-	-	-	-	-	0.70	41.3	-
5	3.00	SPT	-	-	-	-	12	61	27	32	16	16	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-	-
6	3.50	UDS	2.00	1.60	24.81	2.66	14	58	28	29	15	14	-	-	-	SC	0.09	28	-	-	DSU	-	-	-	-	-	0.66	39.8	-
7	4.00	SPT	-	-	-	-	8	60	32	31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	32	-	-	-	-
8	4.50	SPT	-	-	-	-	0	79	21	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
9	5.00	SPT	-	-	-	-	0	66	34	34	18	16	-	-	-	SC	-	-	-	-	-	-	-	-	77	-	-	-	-
10	5.50	UDS	2.06	1.70	21.00	2.65	0	64	36	37	17	20	-	-	-	SC	0.11	27	-	-	DSU	-	-	-	-	-	0.56	35.8	-
11	6.00	SPT	-	-	-	-	0	67	33	35	19	16	-	-	-	SC	-	-	-	-	-	-	-	-	68	-	-	-	-
12	6.50	UDS	2.11	1.77	18.90	2.67	14	63	23	30	18	12	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.50	33.5	-
13	7.00	SPT	-	-	-	-	0	62	38	34	17	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	UDS	2.15	1.83	17.20	2.68	16	67	17	29	20	9	-	-	-	SC	0.04	31	-	-	DSU	-	-	-	-	-	0.46	31.5	-
15	8.00	SPT	-	-	-	-	7	49	44	39	21	18	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	2	69	29	32	19	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	4	74	22	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	4	86	10	NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	13	76	11	NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	5	70	25	31	16	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	0	84	16	21	13	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	SPT	-	-	-	-	0	78	22	24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	78	22	28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	0	83	17	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	0	81	19	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	0	84	16	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	0	88	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	SPT	-	-	-	-	0	81	19	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	0	68	32	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	0	86	14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	6	82	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	0	79	21	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
33	21.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
34	22.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
35	24.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	25.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
37	27.00	UDS	2.49	2.35	6.12	2.74	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	78.4	-	UCS	-	-	-	-	27.33	0.17	14.4	-

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests
NP - Non Plastic

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test
UCS - Unconfined Compression Strength

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 81

Co-Ordinate :- E 1430, N 3109

Reduced Level :- 203.28 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	68	32	29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	20	51	29	48	23	25	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-
3	2.00	SPT	-	-	-	-	0	34	42	24	45	24	21	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
4	2.50	UDS	1.71	1.55	9.98	2.62	0	19	49	32	49	22	27	-	-	-	CI	0.69	4	-	-	TUU	0.14	0.0157	0.44	-	-	0.69	40.7
5	3.00	SPT	-	-	-	-	0	31	50	19	41	24	17	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
6	3.50	UDS	1.98	1.58	25.51	2.64	0	23	51	26	43	21	22	-	-	-	CI	1.04	3	-	-	TUU	0.13	0.0099	0.55	-	-	0.67	40.2
7	4.00	SPT	-	-	-	-	0	20	51	29	45	20	25	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
8	4.50	SPT	-	-	-	-	0	12	55	33	57	28	29	-	-	-	CH	-	-	-	-	-	-	-	-	18	-	-	-
9	5.00	SPT	-	-	-	-	0	11	53	36	59	26	33	-	-	-	CH	-	-	-	-	-	-	-	-	20	-	-	-
10	5.50	UDS	2.00	1.61	23.95	2.63	0	21	48	31	56	27	29	-	-	-	CH	1.19	4	-	-	TUU	0.12	0.0093	0.96	-	-	0.63	38.7
11	6.00	SPT	-	-	-	-	0	19	60	21	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	24	-	-	-
12	6.50	UDS	2.03	1.67	21.57	2.61	0	15	61	24	42	20	22	-	-	-	CI	1.43	2	-	-	TUU	0.10	0.0074	1.39	-	-	0.56	36.0
13	7.00	SPT	-	-	-	-	0	16	62	22	41	22	19	-	-	-	CI	-	-	-	-	-	-	-	-	30	-	-	-
14	7.50	SPT	-	-	-	-	0	11	63	26	47	23	24	-	-	-	CI	-	-	-	-	-	-	-	-	38	-	-	-
15	8.00	SPT	-	-	-	-	0	9	65	26	48	25	23	-	-	-	CI	-	-	-	-	-	-	-	-	39	-	-	-
16	8.50	SPT	-	-	-	-	0	23	55	22	42	23	19	-	-	-	CI	-	-	-	-	-	-	-	-	43	-	-	-
17	9.00	SPT	-	-	-	-	0	16	54	30	53	26	27	-	-	-	CH	-	-	-	-	-	-	-	-	41	-	-	-
18	9.50	UDS	2.09	1.76	18.56	2.62	0	12	60	28	45	20	25	-	-	-	CI	2.47	2	-	-	TUU	0.09	0.0044	3.34	-	-	0.49	32.7
19	10.00	SPT	-	-	-	-	0	21	60	19	39	22	17	-	-	-	CI	-	-	-	-	-	-	-	-	58	-	-	-
20	11.00	SPT	-	-	-	-	0	19	59	22	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	48	-	-	-
21	11.50	SPT	-	-	-	-	0	22	56	22	38	19	19	-	-	-	CI	-	-	-	-	-	-	-	-	54	-	-	-
22	12.50	SPT	-	-	-	-	0	10	65	25	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	58	-	-	-
23	13.00	SPT	-	-	-	-	0	9	64	27	46	23	23	-	-	-	CI	-	-	-	-	-	-	-	-	78	-	-	-
24	14.00	SPT	-	-	-	-	0	9	67	24	45	24	21	-	-	-	CI	-	-	-	-	-	-	-	-	78	-	-	-
25	14.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.50	UDS	2.41	2.23	7.85	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	142.6	UCS	-	-	-	-	-	0.21	17.5
29	18.50	UDS	2.46	2.30	7.00	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	139.4	-	UCS	-	-	-	-	30.66	0.19	16.1
30	20.00	UDS	2.71	2.66	1.88	2.80	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	378.5	-	UCS	-	-	-	-	51.00	0.05	5.0

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests
NP - Non Plastic

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test
UCS - Unconfined Compression Strength

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 83

Co-Ordinate :- E - 1306, N -3093

Reduced Level :- 200.90m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction φ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	6	53	41		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	1	36	40	23	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	3	37	40	20	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	-	5	-	-	-
4	2.50	UDS	1.96	1.54	27.12	2.65	0	35	37	28	44	20	24	-	-	-	CI	0.59	6	-	-	TUU	0.14	0.0178	0.44	-	-	0.72	41.8
5	3.00	SPT	-	-	-	-	1	40	41	18	38	22	16	-	-	-	CI	-	-	-	-	-	-	-	-	13	-	-	-
6	3.50	SPT	-	-	-	-	4	36	36	24	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
7	4.00	SPT	-	-	-	-	3	22	47	28	46	22	24	-	-	-	CI	-	-	-	-	-	-	-	-	11	-	-	-
8	4.50	SPT	-	-	-	-	0	21	55	24	45	23	22	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
9	5.00	SPT	-	-	-	-	1	25	54	20	42	24	18	-	-	-	CI	-	-	-	-	-	-	-	-	15	-	-	-
10	5.50	SPT	-	-	-	-	5	29	44	22	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
11	6.00	SPT	-	-	-	-	6	28	40	26	43	20	23	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
12	6.50	SPT	-	-	-	-	0	32	47	21	40	22	18	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
13	7.00	SPT	-	-	-	-	1	26	50	23	41	21	20	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-
14	7.50	SPT	-	-	-	-	3	38	37	22	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	39	-	-	-
15	8.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	UDS	2.26	2.00	12.93	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	101.6	UCS	-	-	-	-	-	0.35	25.9
17	10.00	UDS	2.19	1.89	15.62	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	79.5	UCS	-	-	-	-	-	0.42	29.6
18	11.50	UDS	2.30	2.06	11.40	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	94.5	UCS	-	-	-	-	-	0.31	23.5
19	13.00	UDS	2.68	2.61	2.55	2.80	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	402.6	-	UCS	-	-	-	-	8.66	0.07	6.7
20	14.50	UDS	2.67	2.59	2.98	2.81	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	388.9	-	UCS	-	-	-	-	6.66	0.08	7.7
21	16.00	UDS	2.25	1.99	12.84	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.1	UCS	-	-	-	-	-	0.34	25.6
22	17.50	UDS	2.19	1.89	15.62	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	39.4	-	UCS	-	-	-	-	20.00	0.42	29.6
23	19.00	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	43.3	-	UCS	-	-	-	-	55.33	0.31	23.7
24	20.50	UDS	2.39	2.22	7.78	2.68	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	114.8	-	UCS	-	-	-	-	61.33	0.21	17.3
25	22.00	UDS	2.34	2.13	9.95	2.70	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	134.6	-	UCS	-	-	-	-	68.66	0.27	21.2

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 89

Co-Ordinate :- E 1551, N 3047

Reduced Level :- 204.7 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity	
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure					
																														%
1	0.00	DS	-	-	-	-	0	29	50	21	39	20	19	-	-	-	Filled up Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	21	54	25	41	19	22	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-	-
3	2.00	SPT	-	-	-	-	0	20	49	31	49	22	27	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-	-
4	2.50	UDS	1.91	1.47	29.78	2.62	0	26	46	28	45	21	24	-	-	-	CI	0.69	6	-	-	TUU	0.18	0.0154	0.39	-	-	0.78	43.8	-
5	3.00	SPT	-	-	-	-	0	29	49	22	39	20	19	-	-	-	CI	-	-	-	-	-	-	-	-	27	-	-	-	-
6	3.50	UDS	1.95	1.54	26.62	2.61	0	20	50	30	48	22	26	-	-	-	CI	1.05	2	-	-	TUU	0.14	0.0105	0.53	-	-	0.69	41.0	-
7	4.00	SPT	-	-	-	-	0	18	35	47	61	21	40	-	-	-	CH	-	-	-	-	-	-	-	-	15	-	-	-	-
8	4.50	UDS	1.98	1.58	24.93	2.62	0	11	43	46	66	24	42	-	-	-	CH	1.29	5	-	-	TUU	0.12	0.0091	0.61	-	-	0.65	39.5	-
9	5.00	SPT	-	-	-	-	0	14	46	40	60	25	35	-	-	-	CH	-	-	-	-	-	-	-	-	40	-	-	-	-
10	5.50	UDS	2.06	1.71	20.73	2.64	0	16	49	35	57	27	30	-	-	-	CH	1.67	6	-	-	TUU	0.10	0.0067	1.49	-	-	0.55	35.4	-
11	6.00	SPT	-	-	-	-	0	11	53	36	62	29	33	-	-	-	CH	-	-	-	-	-	-	-	-	26	-	-	-	-
12	6.50	SPT	-	-	-	-	0	9	48	43	65	27	38	-	-	-	CH	-	-	-	-	-	-	-	-	32	-	-	-	-
13	7.00	SPT	-	-	-	-	0	12	57	31	56	28	28	-	-	-	CH	-	-	-	-	-	-	-	-	65	-	-	-	-
14	7.50	SPT	-	-	-	-	0	16	53	31	54	27	27	-	-	-	CH	-	-	-	-	-	-	-	-	59	-	-	-	-
15	8.00	SPT	-	-	-	-	0	18	52	30	52	26	26	-	-	-	CH	-	-	-	-	-	-	-	-	85	-	-	-	-
16	8.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	10.00	UDS	2.29	2.05	11.53	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	37.9	UCS	-	-	-	-	-	-	0.31	23.7
19	11.50	UDS	2.33	2.11	10.30	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	45.1	UCS	-	-	-	-	-	-	0.28	21.8
20	13.00	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	46.0	UCS	-	-	-	-	-	-	0.29	22.5
21	14.50	UDS	2.29	2.06	11.28	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	52.5	-	UCS	-	-	-	-	-	8.66	0.30	23.2
22	16.00	UDS	2.33	2.11	10.30	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	64.7	-	UCS	-	-	-	-	-	33.33	0.28	21.8
23	17.50	UDS	2.31	2.08	11.27	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	52.6	-	UCS	-	-	-	-	-	6.66	0.31	23.4
24	19.00	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	88.9	-	UCS	-	-	-	-	-	6.60	0.23	18.5
25	20.50	UDS	2.45	2.28	7.30	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	97.3	-	UCS	-	-	-	-	-	45.33	0.20	16.7

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 95

Co-Ordinate :- E 1678, N - 3020

Reduced Level :- 206.60 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity	
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure					
																														%
1	0.00	DS	-	-	-	-	0	65	35	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	12	52	36	32	15	17	-	-	-	-	SC	-	-	-	-	-	-	-	16	-	-	-	-	
3	2.00	SPT	-	-	-	-	24	42	34	31	16	15	-	-	-	-	SC	-	-	-	-	-	-	-	21	-	-	-	-	
4	2.50	UDS	2.01	1.62	24.19	2.66	7	68	25	45	18	27	-	-	-	-	SC	0.08	26	-	-	DSU	-	-	-	-	-	0.64	39.2	-
5	3.00	SPT	-	-	-	-	8	60	32	37	16	21	-	-	-	-	SC	-	-	-	-	-	-	-	14	-	-	-	-	
6	3.50	UDS	1.99	1.58	25.73	2.67	0	80	20	31	19	12	-	-	-	-	SC	0.04	25	-	-	DSU	-	-	-	-	-	0.69	40.7	-
7	4.00	SPT	-	-	-	-	0	68	32	36	20	16	-	-	-	-	SC	-	-	-	-	-	-	-	22	-	-	-	-	
8	4.50	UDS	2.03	1.65	22.71	2.65	2	50	48	40	18	22	-	-	-	-	SC	0.10	27	-	-	DSU	-	-	-	-	-	0.60	37.6	-
9	5.00	SPT	-	-	-	-	2	79	19	29	17	12	-	-	-	-	SC	-	-	-	-	-	-	-	38	-	-	-	-	
10	5.50	UDS	2.08	1.73	20.19	2.66	9	61	30	31	18	13	-	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.54	34.9	-
11	6.00	SPT	-	-	-	-	0	56	44	33	17	16	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
12	6.50	SPT	-	-	-	-	0	80	20	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	96	-	-	-	-	
13	7.00	SPT	-	-	-	-	0	58	42	34	27	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	
14	7.50	SPT	-	-	-	-	0	62	38	28	21	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	
15	8.00	SPT	-	-	-	-	0	81	19	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	
16	8.50	SPT	-	-	-	-	0	66	34	29	22	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	
17	9.00	SPT	-	-	-	-	31	58	11	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	>100	-	-	-	-	
18	9.50	SPT	-	-	-	-	14	76	10	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	>100	-	-	-	-	
19	10.00	SPT	-	-	-	-	0	82	18	20	16	4	-	-	-	-	SM	-	-	-	-	-	-	-	>100	-	-	-	-	
20	11.00	SPT	-	-	-	-	18	66	16	18	14	4	-	-	-	-	SM	-	-	-	-	-	-	-	>100	-	-	-	-	
21	11.50	SPT	-	-	-	-	10	70	20	21	16	5	-	-	-	-	SM	-	-	-	-	-	-	-	>100	-	-	-	-	
22	12.50	SPT	-	-	-	-	0	68	32	28	18	10	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
23	13.00	SPT	-	-	-	-	2	69	29	26	17	9	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
24	14.00	SPT	-	-	-	-	0	64	36	29	19	10	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
25	14.50	SPT	-	-	-	-	0	74	26	24	16	8	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
26	15.50	SPT	-	-	-	-	0	72	28	29	18	11	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
27	16.00	SPT	-	-	-	-	0	56	44	31	17	14	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
28	17.00	SPT	-	-	-	-	36	38	26	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
29	17.50	SPT	-	-	-	-	14	69	17	22	14	8	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	
30	18.50	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	61.3	UCS	-	-	-	-	-	0.33	24.6	-
31	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-	
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-	

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 102

Co-Ordinate :- E - 1602, N - 2997

Reduced Level :- 205.11 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	0	58	42	22	12	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	47	34	19	34	18	16	-	-	-	CL	-	-	-	-	-	-	-	-	3	-	-	-	-
3	2.00	SPT	-	-	-	-	10	52	38	40	19	21	-	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-	-	-
4	2.50	UDS	1.78	1.61	10.65	2.68	36	48	16	34	18	16	-	-	-	SC	0.05	25	-	-	DSU	-	-	-	-	-	-	0.67	40.0	
5	3.00	SPT	-	-	-	-	0	3	69	28	52	28	24	-	-	-	CH	-	-	-	-	-	-	-	22	-	-	-	-	-
6	3.50	UDS	1.95	1.54	26.62	2.61	0	2	67	31	55	27	28	13	0.36	58	CH	1.21	1	-	-	TUU	0.14	0.0091	0.89	-	-	0.69	41.0	
7	4.00	SPT	-	-	-	-	0	6	60	34	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	18	-	-	-	-	-
8	4.50	UDS	1.99	1.60	24.58	2.63	0	10	58	32	55	27	28	14	0.38	63	CH	0.99	3	-	-	TUU	0.12	0.0111	1.31	-	-	0.65	39.3	
9	5.00	SPT	-	-	-	-	0	4	65	31	51	23	28	-	-	-	CH	-	-	-	-	-	-	-	24	-	-	-	-	-
10	5.50	UDS	2.01	1.63	23.05	2.62	0	6	65	29	53	26	27	-	-	-	CH	1.30	2	-	-	TUU	0.11	0.0083	2.82	-	-	0.60	37.7	
11	6.00	SPT	-	-	-	-	0	4	69	27	50	25	25	-	-	-	CH	-	-	-	-	-	-	-	46	-	-	-	-	-
12	6.50	UDS	2.05	1.71	20.15	2.60	0	1	68	31	52	24	28	15	0.42	59	CH	2.53	1	-	-	TUU	-	-	-	-	-	0.52	34.4	
13	7.00	SPT	-	-	-	-	0	2	68	30	51	26	25	-	-	-	CH	-	-	-	-	-	-	-	42	-	-	-	-	-
14	7.50	UDS	2.04	1.69	21.00	2.61	0	2	71	27	50	27	23	-	-	-	CH	2.32	1	-	-	TUU	-	-	-	-	-	0.55	35.4	
15	8.00	SPT	-	-	-	-	0	0	69	31	54	26	28	-	-	-	CH	-	-	-	-	-	-	-	47	-	-	-	-	-
16	8.50	UDS	2.08	1.74	19.36	2.63	0	9	56	35	51	21	30	-	-	-	CH	2.57	4	-	-	TUU	-	-	-	-	-	0.51	33.7	
17	9.00	SPT	-	-	-	-	0	6	57	37	62	30	32	-	-	-	CH	-	-	-	-	-	-	-	48	-	-	-	-	-
18	9.50	UDS	2.05	1.69	21.28	2.64	0	10	59	31	53	27	26	-	-	-	CH	2.64	3	-	-	TUU	-	-	-	-	-	0.56	36.0	
19	10.00	SPT	-	-	-	-	0	6	61	33	51	21	30	-	-	-	CH	-	-	-	-	-	-	-	44	-	-	-	-	-
20	11.00	UDS	2.04	1.69	21.00	2.61	0	4	65	31	52	26	26	-	-	-	CH	2.43	2	-	-	TUU	-	-	-	-	-	0.55	35.4	
21	11.50	SPT	-	-	-	-	0	14	52	34	51	22	29	-	-	-	CH	-	-	-	-	-	-	-	60	-	-	-	-	-
22	12.50	SPT	-	-	-	-	0	3	57	40	56	21	35	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
23	13.00	SPT	-	-	-	-	0	4	55	41	55	20	35	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
24	14.00	SPT	-	-	-	-	0	11	57	32	51	23	28	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
25	14.50	SPT	-	-	-	-	0	2	61	37	54	22	32	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
26	15.50	SPT	-	-	-	-	0	9	59	32	52	24	28	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
27	16.00	SPT	-	-	-	-	0	5	60	35	53	23	30	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
28	17.00	SPT	-	-	-	-	4	10	54	32	52	25	27	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
29	17.50	SPT	-	-	-	-	0	16	57	27	50	26	24	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
30	18.50	SPT	-	-	-	-	0	10	56	34	56	25	31	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
31	19.00	SPT	-	-	-	-	0	6	52	42	60	21	39	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
32	20.00	SPT	-	-	-	-	14	20	33	33	52	24	28	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
33	20.50	SPT	-	-	-	-	8	32	26	34	54	23	31	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
34	21.50	SPT	-	-	-	-	0	6	54	40	56	22	34	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
35	22.00	SPT	-	-	-	-	4	8	54	34	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	>100	-	-	-	-	-
36	23.00	UDS	2.57	2.47	4.17	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	352.4	-	UCS	-	-	-	-	6.66	0.11	10.3	
37	24.50	UDS	2.54	2.42	5.18	2.76	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	325.0	-	UCS	-	-	-	-	39.33	0.14	12.5	
38	26.00	UDS	2.35	2.13	10.31	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	142.3	-	UCS	-	-	-	-	7.33	0.28	22.0	
39	27.50	UDS	2.44	2.28	6.92	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	157.9	UCS	-	-	-	-	-	0.19	15.8	
40	29.00	UDS	2.44	2.28	6.92	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	129.9	-	UCS	-	-	-	-	46.00	0.19	15.8	
41	30.00	UDS	2.20	1.91	15.18	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	52.2	-	UCS	-	-	-	-	11.00	0.41	29.0	

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 110

Co-Ordinate :- E 1422, N 2931

Reduced Level :- 201.42 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²						
1	0.00	DS	-	-	-	-	0	31	40	29	46	21	25	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	35	43	22	42	23	19	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-	-
3	2.00	SPT	-	-	-	-	0	18	35	47	69	29	40	-	-	-	CH	-	-	-	-	-	-	-	-	19	-	-	-	-
4	2.50	UDS	1.97	1.56	26.16	2.64	0	16	38	46	70	30	40	-	-	-	CH	0.96	5	-	-	TUU	0.13	0.0117	0.45	-	-	0.69	40.9	-
5	3.00	SPT	-	-	-	-	0	18	57	25	45	24	21	-	-	-	CI	-	-	-	-	-	-	-	-	24	-	-	-	-
6	3.50	SPT	-	-	-	-	0	15	56	29	48	23	25	-	-	-	CI	-	-	-	-	-	-	-	-	28	-	-	-	-
7	4.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
8	4.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
9	6.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
10	7.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
11	9.00	UDS	2.21	1.92	15.00	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	47.9	UCS	-	-	-	-	-	0.40	28.8	-
12	10.50	UDS	2.20	1.91	15.18	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	54.3	UCS	-	-	-	-	-	0.41	29.0	-
13	12.50	UDS	2.18	1.87	16.57	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	38.3	-	UCS	-	-	-	-	6.66	0.45	31.0	-
14	13.50	UDS	2.21	1.91	15.50	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	55.5	-	UCS	-	-	-	-	6.66	0.42	29.7	-
15	15.00	UDS	2.22	1.93	15.31	2.73	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	88.3	-	UCS	-	-	-	-	50.67	0.42	29.5	-
16	16.50	UDS	2.30	2.04	12.59	2.75	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	95.6	-	UCS	-	-	-	-	62.67	0.35	25.7	-
17	18.00	UDS	2.29	2.03	12.73	2.74	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	82.1	-	UCS	-	-	-	-	50.67	0.35	25.9	-
18	19.50	UDS	2.34	2.12	10.43	2.72	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	-	93.7	UCS	-	-	-	-	-	0.28	22.1	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 117

Co-Ordinate :- E - 1747, N - 2930

Reduced Level :- 206.10 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	9	79	12		23	17	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	8	38	29	25	39	18	21	-	-	-	CI	-	-	-	-	-	-	-	-	13	-	-	-
3	2.00	SPT	-	-	-	-	2	65	33		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-
4	2.50	UDS	2.00	1.60	24.81	2.66	0	68	32		27	15	12	-	-	-	SC	0.08	26	-	-	DSU	-	-	-	-	-	0.66	39.8
5	3.00	SPT	-	-	-	-	0	72	28		25	17	8	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
6	3.50	UDS	2.02	1.64	23.31	2.65	5	63	32		27	18	9	-	-	-	SC	0.06	27	-	-	DSU	-	-	-	-	-	0.62	38.2
7	4.00	SPT	-	-	-	-	0	70	30		26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	41	-	-	-
8	4.50	UDS	2.07	1.71	20.73	2.66	0	68	32		29	16	13	-	-	-	SC	0.09	27	-	-	DSU	-	-	-	-	-	0.55	35.5
9	5.00	SPT	-	-	-	-	0	72	28		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	59	-	-	-
10	5.50	UDS	2.11	1.77	18.90	2.67	1	74	25		24	16	8	-	-	-	SC	0.05	28	-	-	DSU	-	-	-	-	-	0.50	33.5
11	6.00	SPT	-	-	-	-	2	69	29		27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	65	-	-	-
12	6.50	UDS	2.12	1.80	17.86	2.65	0	65	35		29	15	14	-	-	-	SC	0.10	29	-	-	DSU	-	-	-	-	-	0.47	32.1
13	7.00	SPT	-	-	-	-	0	70	30		26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	81	19		21	16	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	86	14		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	85	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	79	21		20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	64	36		28	14	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	70	30		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	62	38		29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	61	39		30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	73	27		28	19	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	97	3		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	95	5		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	95	5		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	96	4		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	96	4		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	95	5		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	97	3		NP	NP	NP	-	-	-	SP	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	67	33		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	71	29		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 118

Co-Ordinate :- E - 1609, N - 2910

Reduced Level :- 204.52m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	36	50	14	29	17	12	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	38	33	23	40	21	19	19	-	35	CI	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	9	39	33	19	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	6	-	-	-
4	2.50	UDS	1.95	1.53	27.81	2.65	5	34	40	21	44	25	19	18	0.29	39	CI	0.41	6	-	-	TUU	0.15	0.0223	0.44	-	-	0.74	42.4
5	3.00	SPT	-	-	-	-	11	13	39	37	55	22	33	-	-	-	CH	-	-	-	-	-	-	-	-	9	-	-	-
6	3.50	UDS	1.97	1.57	25.58	2.62	9	19	39	33	53	23	30	13	0.37	58	CH	0.65	2	-	-	TUU	0.12	0.0174	0.66	-	-	0.67	40.1
7	4.00	SPT	-	-	-	-	12	24	36	28	51	26	25	-	-	-	CH	-	-	-	-	-	-	-	-	19	-	-	-
8	4.50	UDS	2.01	1.63	23.34	2.63	6	20	40	34	54	25	29	12	0.39	60	CH	1.17	3	-	-	TUU	0.10	0.0091	3.26	-	-	0.61	38.0
9	5.00	SPT	-	-	-	-	0	22	57	21	43	24	19	-	-	-	CI	-	-	-	-	-	-	-	-	29	-	-	-
10	5.50	UDS	2.06	1.71	20.73	2.64	0	26	54	20	40	23	17	-	-	-	CI	1.66	6	-	-	TUU	0.09	0.0056	3.76	-	-	0.55	35.4
11	6.00	SPT	-	-	-	-	0	17	62	21	42	23	19	-	-	-	CI	-	-	-	-	-	-	-	-	32	-	-	-
12	6.50	UDS	2.08	1.75	19.08	2.62	0	16	44	40	55	21	34	13	0.49	59	CH	1.71	4	-	-	TUU	0.08	0.0064	4.69	-	-	0.50	33.3
13	7.00	SPT	-	-	-	-	2	23	55	20	41	24	17	-	-	-	CI	-	-	-	-	-	-	-	-	33	-	-	-
14	7.50	SPT	-	-	-	-	6	25	53	16	36	22	14	-	-	-	CI	-	-	-	-	-	-	-	-	39	-	-	-
15	8.00	SPT	-	-	-	-	1	20	61	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	37	-	-	-
16	8.50	SPT	-	-	-	-	4	26	54	16	38	24	14	-	-	-	CI	-	-	-	-	-	-	-	-	69	-	-	-
17	9.00	SPT	-	-	-	-	0	20	57	23	42	22	20	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	6	28	42	24	41	20	21	-	-	-	CI	-	-	-	-	-	-	-	-	78	-	-	-
19	10.00	SPT	-	-	-	-	2	31	48	19	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	2	34	49	15	37	24	13	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	7	26	47	20	40	22	18	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	30	52	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	6	26	44	24	42	21	21	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	1	31	52	16	38	24	14	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	33	51	16	37	23	14	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	UDS	2.26	2.01	12.69	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	38.7	UCS	-	-	-	-	-	0.34	25.4
27	17.00	UDS	2.25	1.99	12.84	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	40.1	UCS	-	-	-	-	-	0.34	25.6
28	18.50	UDS	2.31	2.09	10.54	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	52.5	UCS	-	-	-	-	-	0.28	22.0
29	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
30	20.00	UDS	2.64	2.55	3.69	2.81	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	410.6	UCS	-	-	-	-	-	0.10	9.4
31	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 119

Co-Ordinate :- E - 1668, N - 2908

Reduced Level :- 205.46 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	6	20	50	24	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	39	39	22	42	22	20	-	-	-	CI	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	32	44		24	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	33	-	-	-
4	2.50	UDS	2.00	1.61	24.53	2.65	0	51		49	61	29	32	-	-	-	SC	0.15	27	-	-	DSU	-	-	-	-	-	0.65	39.4
5	3.00	SPT	-	-	-	-	0	56		44	42	25	17	-	-	-	SC	-	-	-	-	-	-	-	-	27	-	-	-
6	3.50	UDS	1.99	1.58	26.01	2.68	31	39		30	46	24	22	-	-	-	SC	0.09	30	-	-	DSU	-	-	-	-	-	0.70	41.1
7	4.00	SPT	-	-	-	-	0	56		44	42	26	16	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
8	4.50	UDS	1.97	1.55	26.74	2.66	0	52		48	42	24	18	-	-	-	SC	0.14	25	-	-	DSU	-	-	-	-	-	0.71	41.6
9	5.00	SPT	-	-	-	-	1	64		35	40	23	17	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
10	5.50	UDS	1.99	1.59	25.16	2.65	5	51		44	41	25	16	-	-	-	SC	0.12	25	-	-	DSU	-	-	-	-	-	0.67	40.0
11	6.00	SPT	-	-	-	-	10	52		38	40	25	15	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
12	6.50	UDS	2.01	1.62	24.19	2.66	2	60		38	41	24	17	-	-	-	SC	0.09	28	-	-	DSU	-	-	-	-	-	0.64	39.2
13	7.00	SPT	-	-	-	-	2	53		45	42	22	20	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
14	7.50	UDS	2.02	1.63	23.87	2.67	0	71		29	36	24	12	-	-	-	SC	0.06	29	-	-	DSU	-	-	-	-	-	0.64	38.9
15	8.00	SPT	-	-	-	-	0	56		44	42	25	17	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-
16	8.50	UDS	2.06	1.70	21.00	2.65	0	57		43	34	22	12	-	-	-	SC	0.12	29	-	-	DSU	-	-	-	-	-	0.56	35.8
17	9.00	SPT	-	-	-	-	0	79		21	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	78		22	20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	2	84		14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	7	75		18	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	4	68		28	24	20	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	8	64		28	25	20	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	79		21	20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	2	73		25	23	19	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	2	73		25	25	20	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	73		27	27	22	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	72		28	28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	0	86		14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	70		30	28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	6	68		26	26	21	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	2	73		25	24	20	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	82		18	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
33	20.50	SPT	-	-	-	-	0	88		12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
34	21.50	SPT	-	-	-	-	0	74		26	23	19	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
35	22.00	SPT	-	-	-	-	0	87		13	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
36	23.00	SPT	-	-	-	-	0	80		20	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
37	23.50	SPT	-	-	-	-	0	76		24	22	18	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
38	25.00	UDS	2.42	2.25	7.77	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	67.3	UCS	-	-	-	-	-	0.21	17.4

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 125

Co-Ordinate :- E - 1557, N - 2902

Reduced Level :- 204.63 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	2	39	37	22	37	18	19	-	-	-	Filled up Soil	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	32	43	25	25	14	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	8	-	-	-
3	2.00	SPT	-	-	-	-	28	46	26	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
4	2.50	SPT	-	-	-	-	35	44	21	22	13	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
5	3.00	SPT	-	-	-	-	16	11	39	34	57	27	30	-	-	-	CH	-	-	-	-	-	-	-	-	23	-	-	-
6	3.50	UDS	1.99	1.59	25.44	2.66	25	14	30	31	55	28	27	11	0.29	56	CH	1.35	5	-	-	TUU	0.12	0.0082	2.61	-	-	0.68	40.4
7	4.00	SPT	-	-	-	-	0	5	64	31	56	27	29	-	-	-	CH	-	-	-	-	-	-	-	-	29	-	-	-
8	4.50	UDS	1.98	1.58	24.93	2.62	4	10	56	30	52	25	27	12	0.29	54	CH	1.65	2	-	-	TUU	0.11	0.0068	2.88	-	-	0.65	39.5
9	5.00	SPT	-	-	-	-	0	12	66	22	41	21	20	-	-	-	CI	-	-	-	-	-	-	-	-	32	-	-	-
10	5.50	SPT	-	-	-	-	0	8	61	31	46	20	26	15	-	44	CI	-	-	-	-	-	-	-	-	>100	-	-	-
11	6.00	SPT	-	-	-	-	0	7	62	31	49	22	27	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	0	18	59	23	46	26	20	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	13	19	43	25	44	21	23	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
14	8.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-
15	9.00	Remoulded	2.08	1.72	21.06	2.69	40	34	26	26	14	12	-	-	-	-	Boulders	0.10	30	-	-	DSU	-	-	-	-	-	0.57	36.2
16	10.00	DS	-	-	-	-	2	10	53	35	53	22	31	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
17	10.00	SPT	-	-	-	-	13	7	42	38	56	21	35	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
18	11.00	SPT	-	-	-	-	0	18	46	36	55	23	32	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
19	11.50	SPT	-	-	-	-	0	31	37	32	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
20	12.50	SPT	-	-	-	-	0	29	25	42	63	26	25	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
21	13.00	SPT	-	-	-	-	0	31	31	41	60	25	25	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
22	14.50	UDS	2.34	2.13	9.71	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	43.3	UCS	-	-	-	-	-	0.26	20.7
23	16.00	UDS	2.29	2.05	11.77	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	40.8	UCS	-	-	-	-	-	0.32	24.1
24	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
25	17.50	UDS	2.46	2.30	7.00	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	147.5	UCS	-	-	-	-	-	0.19	16.1
26	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	19.00	UDS	2.49	2.34	6.35	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	94.6	UCS	-	-	-	-	-	0.17	14.9
28	19.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	20.00	UDS	2.32	2.09	11.14	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	87.0	UCS	-	-	-	-	-	0.30	23.3
30	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 133

Co-Ordinate :- E - 825, N - 2840

Reduced Level :- 197.69 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity	
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure					
																														%
1	0.00	DS	-	-	-	-	0	20	46	34	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	18	42	40	57	23	34	12	-	61	CH	-	-	-	-	-	-	-	-	3	-	-	-	-
3	2.00	SPT	-	-	-	-	0	17	49	34	55	25	30	-	-	-	CH	-	-	-	-	-	-	-	-	4	-	-	-	-
4	2.50	UDS	1.93	1.50	28.32	2.62	0	14	46	40	58	22	36	12	0.27	65	CH	0.38	2	-	-	TUU	0.18	0.0298	0.42	-	-	0.74	42.6	-
5	3.00	SPT	-	-	-	-	0	34	30	36	51	20	31	-	-	-	CH	-	-	-	-	-	-	-	-	11	-	-	-	-
6	3.50	UDS	1.99	1.58	26.01	2.68	20	52	28	30	16	14	-	-	-	-	SC	0.05	28	-	-	DSU	-	-	-	-	-	0.70	41.1	-
7	4.00	SPT	-	-	-	-	6	58	36	39	17	22	-	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-	-
8	4.50	UDS	1.98	1.57	25.80	2.65	5	47	48	43	19	24	18	0.12	39	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	0.68	40.6	-
9	5.00	SPT	-	-	-	-	9	59	32	41	21	20	-	-	-	-	SC	-	-	-	-	-	-	-	-	10	-	-	-	-
10	5.50	UDS	1.99	1.59	25.44	2.66	1	72	27	29	16	13	-	-	-	-	SC	0.04	28	-	-	DSU	-	-	-	-	-	0.68	40.4	-
11	6.00	SPT	-	-	-	-	12	58	30	37	15	22	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-	-
12	6.50	UDS	2.00	1.60	24.81	2.66	2	63	35	36	18	18	-	-	-	-	SC	0.05	27	-	-	DSU	-	-	-	-	-	0.66	39.8	-
13	7.00	SPT	-	-	-	-	4	74	22	32	19	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-	-
14	7.50	SPT	-	-	-	-	5	66	29	38	17	21	-	-	-	-	SC	-	-	-	-	-	-	-	-	5	-	-	-	-
15	8.00	SPT	-	-	-	-	17	63	20	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	8	-	-	-	-
16	8.50	SPT	-	-	-	-	0	59	41	30	18	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-	-
17	9.00	SPT	-	-	-	-	0	82	18	25	17	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	18	-	-	-	-
18	9.50	SPT	-	-	-	-	0	63	37	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-	-
19	10.00	SPT	-	-	-	-	7	64	29	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	23	-	-	-	-
20	11.00	SPT	-	-	-	-	7	77	16	24	18	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	27	-	-	-	-
21	11.50	SPT	-	-	-	-	0	82	18	22	18	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	26	-	-	-	-
22	12.50	SPT	-	-	-	-	0	86	14	21	17	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	30	-	-	-	-
23	13.00	SPT	-	-	-	-	0	82	18	23	18	5	-	-	-	-	SM	-	-	-	-	-	-	-	-	36	-	-	-	-
24	14.00	SPT	-	-	-	-	0	73	27	25	20	5	-	-	-	-	SM	-	-	-	-	-	-	-	-	37	-	-	-	-
25	15.50	UDS	2.29	2.04	12.25	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	71.7	-	UCS	-	-	-	-	46.00	0.33	25.0	-
26	17.00	UDS	2.38	2.17	9.75	2.75	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	122.8	-	UCS	-	-	-	-	55.00	0.27	21.1	-
27	18.50	UDS	2.38	2.17	9.52	2.74	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	146.1	-	UCS	-	-	-	-	94.00	0.26	20.7	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 138

Co-Ordinate :- E 787, N 2840

Reduced Level :- 197.73 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	16	53	31	52	25	27	14	-	48	CH	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	11	57	32	56	27	29	-	-	-	CH	-	-	-	-	-	-	-	-	3	-	-	-
3	2.00	SPT	-	-	-	-	0	21	50	29	51	25	26	-	-	-	CH	-	-	-	-	-	-	-	-	5	-	-	-
4	2.50	UDS	1.87	1.40	33.52	2.64	0	16	52	32	53	26	27	14	0.31	52	CH	0.33	3	-	-	TUU	0.25	0.0340	0.39	-	-	0.89	47.0
5	3.00	SPT	-	-	-	-	0	10	59	31	55	28	27	-	-	-	CH	-	-	-	-	-	-	-	-	7	-	-	-
6	3.50	UDS	1.88	1.43	31.78	2.61	0	9	58	33	56	26	30	13	0.34	56	CH	0.43	2	-	-	TUU	0.22	0.2599	0.49	-	-	0.83	45.3
7	4.00	SPT	-	-	-	-	0	28	50	22	41	21	20	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
8	4.50	UDS	1.93	1.49	29.21	2.65	0	31	47	22	39	20	19	18	0.12	31	CI	0.54	6	-	-	TUU	0.18	0.0182	0.57	-	-	0.77	43.6
9	5.00	SPT	-	-	-	-	0	67	33	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-
10	5.50	SPT	-	-	-	-	0	69	31	26	17	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
11	6.00	SPT	-	-	-	-	0	66	34	30	16	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
12	6.50	SPT	-	-	-	-	0	65	35	29	18	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
13	7.00	SPT	-	-	-	-	0	71	29	26	16	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
14	7.50	SPT	-	-	-	-	0	73	27	25	17	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
15	8.00	SPT	-	-	-	-	0	68	32	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
16	8.50	SPT	-	-	-	-	0	64	36	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
17	9.00	SPT	-	-	-	-	10	81	9	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	20	-	-	-
18	9.50	SPT	-	-	-	-	9	80	11	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	28	-	-	-
19	10.00	SPT	-	-	-	-	0	64	36	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
20	11.00	SPT	-	-	-	-	4	72	24	21	16	5	-	-	-	-	SM	-	-	-	-	-	-	-	-	26	-	-	-
21	11.50	SPT	-	-	-	-	5	75	20	20	16	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	28	-	-	-
22	12.50	SPT	-	-	-	-	5	76	19	16	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	32	-	-	-
23	13.00	SPT	-	-	-	-	0	36	41	23	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	56	-	-	-
24	14.00	SPT	-	-	-	-	0	19	54	27	44	21	23	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.50	UDS	2.26	2.00	13.18	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	59.9	-	UCS	-	-	-	-	24.00	0.36	26.3
28	18.00	UDS	2.44	2.27	7.60	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	131.4	-	UCS	-	-	-	-	36.00	0.21	17.2
29	19.50	UDS	2.42	2.23	8.68	2.76	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	146.2	-	UCS	-	-	-	-	60.00	0.24	19.3

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests
NP - Non Plastic

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test
UCS - Unconfined Compression Strength

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 141

Co-Ordinate :- E 1425, N -2784

Reduced Level :- 203.95 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	Filled up Soil	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	2	54	44		33	17	16	-	-	-	SC	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	8	37	29	26	37	15	22	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-
4	2.50	UDS	1.95	1.53	27.81	2.65	9	39	29	23	36	16	20	16	0.11	35	CI	0.53	5	-	-	TUU	0.15	0.0185	0.42	-	-	0.74	42.4
5	3.00	SPT	-	-	-	-	0	28	47	25	36	15	21	-	-	-	CI	-	-	-	-	-	-	-	-	22	-	-	-
6	3.50	UDS	1.98	1.57	25.80	2.65	0	34	39	27	42	18	24	15	0.12	46	CI	0.90	5	-	-	TUU	0.13	0.0118	0.51	-	-	0.68	40.6
7	4.00	SPT	-	-	-	-	0	2	64	34	56	27	29	-	-	-	CH	-	-	-	-	-	-	-	-	11	-	-	-
8	4.50	UDS	1.96	1.56	25.64	2.60	0	5	56	39	59	25	34	11	0.33	64	CH	0.58	1	-	-	TUU	0.12	0.0193	0.68	-	-	0.67	40.0
9	5.00	SPT	-	-	-	-	0	10	59	31	55	28	27	-	-	-	CH	-	-	-	-	-	-	-	-	20	-	-	-
10	5.50	UDS	2.02	1.65	22.45	2.62	5	18	41	36	54	23	31	12	0.33	58	CH	1.08	3	-	-	TUU	0.10	0.0104	1.10	-	-	0.59	37.0
11	6.00	SPT	-	-	-	-	0	34	29	37	51	19	32	-	-	-	CH	-	-	-	-	-	-	-	-	23	-	-	-
12	6.50	SPT	-	-	-	-	4	51	45		32	16	16	-	-	-	SC	-	-	-	-	-	-	-	-	27	-	-	-
13	7.00	SPT	-	-	-	-	1	56	43		46	25	21	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
14	7.50	SPT	-	-	-	-	0	4	65	31	52	25	27	-	-	-	CH	-	-	-	-	-	-	-	-	19	-	-	-
15	8.00	SPT	-	-	-	-	0	2	62	36	55	22	33	-	-	-	CH	-	-	-	-	-	-	-	-	77	-	-	-
16	8.50	SPT	-	-	-	-	0	1	53	46	61	20	41	-	-	-	CH	-	-	-	-	-	-	-	-	96	-	-	-
17	9.00	SPT	-	-	-	-	0	5	60	35	53	23	30	-	-	-	CH	-	-	-	-	-	-	-	-	71	-	-	-
18	9.50	SPT	-	-	-	-	0	8	60	32	51	24	27	-	-	-	CH	-	-	-	-	-	-	-	-	76	-	-	-
19	10.00	SPT	-	-	-	-	0	7	60	33	52	23	29	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	16	58	26	50	26	24	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	5	60	35	55	24	31	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	4	56	40	57	23	34	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	6	63	31	53	25	28	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	2	62	36	58	26	32	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	1	57	42	60	24	36	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	6	65	29	53	27	26	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	2	63	35	57	25	32	-	-	-	CH	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
30	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 147

Co-Ordinate :- E - 1712, N - 2709

Reduced Level :- 203.64m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	11	56	33	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	24	49	27	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-	-
3	2.00	SPT	-	-	-	-	10	66	24	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-	-
4	2.50	UDS	1.75	1.58	10.89	2.66	0	69	31	28	15	13	-	-	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	-	0.69	40.7
5	3.00	SPT	-	-	-	-	0	76	24	25	14	11	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-	-
6	3.50	UDS	2.03	1.65	23.27	2.67	0	80	20	24	15	9	-	-	-	SC	0.03	29	-	-	DSU	-	-	-	-	-	-	0.62	38.3
7	4.00	SPT	-	-	-	-	0	74	26	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-	-
8	4.50	SPT	-	-	-	-	0	76	24	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	41	-	-	-	-
9	5.00	SPT	-	-	-	-	0	74	26	28	13	15	-	-	-	SC	-	-	-	-	-	-	-	-	71	-	-	-	-
10	5.50	SPT	-	-	-	-	0	70	30	29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
11	6.00	SPT	-	-	-	-	0	62	38	32	17	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
12	6.50	SPT	-	-	-	-	0	76	24	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	8	79	13	21	13	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	SPT	-	-	-	-	0	74	26	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
15	8.00	SPT	-	-	-	-	0	71	29	27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	DS	-	-	-	-	39	42	19	24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
17	10.00	SPT	-	-	-	-	0	80	20	25	13	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	11.00	SPT	-	-	-	-	2	84	14	22	12	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	11.50	SPT	-	-	-	-	0	76	24	27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	12.50	SPT	-	-	-	-	0	74	26	28	13	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	13.00	SPT	-	-	-	-	0	70	30	28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	14.00	SPT	-	-	-	-	0	69	31	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	14.50	SPT	-	-	-	-	0	58	42	30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	15.50	SPT	-	-	-	-	0	70	30	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	16.00	SPT	-	-	-	-	0	67	33	27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	17.00	SPT	-	-	-	-	0	72	28	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	17.50	SPT	-	-	-	-	0	76	24	23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	18.50	UDS	2.31	2.07	11.51	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	73.1	-	UCS	-	-	-	-	-	11.11	0.31	23.8
29	20.00	UDS	2.26	2.01	12.69	2.69	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	91.6	UCS	-	-	-	-	-	-	0.34	25.4
30	21.50	UDS	2.30	2.06	11.40	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	88.4	UCS	-	-	-	-	-	-	0.31	23.5
31	23.00	UDS	2.31	2.08	11.03	2.70	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	90.6	UCS	-	-	-	-	-	-	0.30	22.9
32	25.00	UDS	2.35	2.13	10.31	2.73	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	101.4	-	UCS	-	-	-	-	-	5.50	0.28	22.0

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 148

Co-Ordinate :- E - 1610, N - 2681

Reduced Level :- 205.52m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²					
1	0.00	DS	-	-	-	-	4	59	37	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	17	52	31	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	29	-	-	-	-	-
3	2.00	SPT	-	-	-	-	10	67	23	24	14	10	-	-	-	-	SC	-	-	-	-	-	-	-	16	-	-	-	-	-
4	2.50	UDS	1.82	1.65	10.48	2.66	0	70	30	26	17	9	-	-	-	-	SC	0.03	25	-	-	DSU	-	-	-	-	-	0.61	38.0	-
5	3.00	SPT	-	-	-	-	9	78	13	23	14	9	-	-	-	-	SC	-	-	-	-	-	-	-	13	-	-	-	-	-
6	3.50	UDS	1.80	1.59	13.27	2.67	11	71	18	28	15	13	-	-	-	-	SC	0.02	28	-	-	DSU	-	-	-	-	-	0.68	40.3	-
7	4.00	SPT	-	-	-	-	12	73	15	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	39	-	-	-	-	-
8	4.50	SPT	-	-	-	-	8	72	20	26	16	10	-	-	-	-	SC	-	-	-	-	-	-	-	16	-	-	-	-	-
9	5.00	SPT	-	-	-	-	5	71	24	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	22	-	-	-	-	-
10	5.50	SPT	-	-	-	-	3	68	29	31	16	15	-	-	-	-	SC	-	-	-	-	-	-	-	26	-	-	-	-	-
11	6.00	SPT	-	-	-	-	5	59	36	32	14	18	-	-	-	-	SC	-	-	-	-	-	-	-	27	-	-	-	-	-
12	6.50	SPT	-	-	-	-	0	74	26	24	17	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
13	7.00	SPT	-	-	-	-	0	80	20	19	13	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
14	7.50	SPT	-	-	-	-	0	76	24	22	16	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	75	25	23	16	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	62	-	-	-	-	-
16	8.50	SPT	-	-	-	-	0	63	37	25	18	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
17	9.00	SPT	-	-	-	-	0	68	32	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
18	9.50	SPT	-	-	-	-	0	81	19	20	14	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	57	-	-	-	-	-
19	10.00	SPT	-	-	-	-	0	76	24	25	18	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
20	11.00	SPT	-	-	-	-	0	74	26	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
21	11.50	SPT	-	-	-	-	0	71	29	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
22	12.50	SPT	-	-	-	-	0	70	30	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
23	13.00	SPT	-	-	-	-	0	59	41	28	21	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
24	14.00	SPT	-	-	-	-	0	68	32	27	21	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
25	14.50	SPT	-	-	-	-	0	64	36	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
26	15.50	SPT	-	-	-	-	0	70	30	24	17	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
27	16.00	SPT	-	-	-	-	0	79	21	22	16	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
28	17.00	SPT	-	-	-	-	0	70	30	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
29	17.50	SPT	-	-	-	-	0	68	32	27	20	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
30	18.50	SPT	-	-	-	-	0	74	26	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
31	19.00	SPT	-	-	-	-	5	63	32	30	18	12	-	-	-	-	SC	-	-	-	-	-	-	-	>100	-	-	-	-	-
32	20.00	SPT	-	-	-	-	11	85	4	NP	NP	NP	-	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
33	20.50	SPT	-	-	-	-	10	86	4	NP	NP	NP	-	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
34	21.50	SPT	-	-	-	-	8	87	5	NP	NP	NP	-	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
35	22.00	SPT	-	-	-	-	12	85	3	NP	NP	NP	-	-	-	-	SP	-	-	-	-	-	-	-	>100	-	-	-	-	-
36	23.00	UDS	2.18	1.87	16.32	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	58.1	UCS	-	-	-	-	-	0.44	30.6	-
37	23.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-	-
38	24.00	UDS	2.26	1.99	13.42	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	70.2	UCS	-	-	-	-	-	0.37	26.7	-
39	24.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-	-
40	25.00	UDS	2.28	2.04	11.91	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	73.5	UCS	-	-	-	-	-	0.32	24.3	-
41	25.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	>100	-	-	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 149

Co-Ordinate :- E - 1423, N - 2666

Reduced Level :- 204.62 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	11	67	22	24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	24	46	30	33	16	17	-	-	-	SC	-	-	-	-	-	-	-	-	6	-	-	-	-
3	2.00	SPT	-	-	-	-	10	64	26	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	8	-	-	-	-
4	2.50	UDS	1.96	1.54	27.12	2.65	0	70	30	31	16	15	-	-	-	SC	0.06	25	-	-	DSU	-	-	-	-	-	0.72	41.8	-
5	3.00	SPT	-	-	-	-	0	75	25	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	10	-	-	-	-
6	3.50	UDS	1.97	1.55	26.74	2.66	0	79	21	24	14	10	-	-	-	SC	0.03	25	-	-	DSU	-	-	-	-	-	0.71	41.6	-
7	4.00	SPT	-	-	-	-	0	72	28	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	9	-	-	-	-
8	4.50	UDS	1.96	1.54	27.41	2.66	0	77	23	25	15	10	-	-	-	SC	0.04	28	-	-	DSU	-	-	-	-	-	0.73	42.2	-
9	5.00	SPT	-	-	-	-	0	73	27	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-	-
10	5.50	UDS	2.00	1.61	24.53	2.65	0	68	32	30	16	14	-	-	-	SC	0.06	29	-	-	DSU	-	-	-	-	-	0.65	39.4	-
11	6.00	SPT	-	-	-	-	0	61	39	33	15	18	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-	-
12	6.50	SPT	-	-	-	-	0	80	20	19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	8	79	13	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	81	-	-	-	-
14	7.50	SPT	-	-	-	-	0	76	24	22	18	4	-	-	-	SM	-	-	-	-	-	-	-	-	91	-	-	-	-
15	8.00	SPT	-	-	-	-	0	75	25	23	18	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	36	42	22	20	16	4	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	0	81	19	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	2	84	14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	UDS	2.18	1.88	15.81	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	42.1	UCS	-	-	-	-	-	0.42	29.8	-
20	11.50	UDS	2.20	1.92	14.67	2.67	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	46.3	-	UCS	-	-	-	-	8.00	0.39	28.1	-
21	13.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	14.50	UDS	2.18	1.88	15.81	2.68	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	30.6	UCS	-	-	-	-	-	0.42	29.8	-
23	16.00	UDS	2.25	1.98	13.82	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	91.3	-	UCS	-	-	-	-	20.00	0.38	27.3	-
24	17.50	UDS	2.36	2.14	10.20	2.74	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	79.6	-	UCS	-	-	-	-	44.00	0.28	21.8	-
25	19.00	UDS	2.25	1.98	13.82	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	88.2	-	UCS	-	-	-	-	11.00	0.38	27.3	-
26	20.50	UDS	2.44	2.26	8.05	2.76	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	168.9	UCS	-	-	-	-	-	0.22	18.2	-
27	22.00	UDS	2.46	2.29	7.22	2.75	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	192.7	UCS	-	-	-	-	-	0.20	16.6	-
28	23.50	UDS	2.45	2.29	6.85	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	156.0	-	UCS	-	-	-	-	7.00	0.19	15.7	-
29	25.00	UDS	2.41	2.22	8.77	2.75	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	147.7	UCS	-	-	-	-	-	0.24	19.4	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 153

Co-Ordinate :- E - 1589, N - 2547

Reduced Level :- 205.30 m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	2	63	35	30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	18	60	22	24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	32	-	-	-	-
3	2.00	SPT	-	-	-	-	9	59	32	27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	31	-	-	-	-
4	2.50	UDS	1.95	1.77	10.30	2.65	10	64	26	25	16	9	-	-	-	SC	0.05	29	-	-	DSU	-	-	-	-	-	0.50	33.3	-
5	3.00	SPT	-	-	-	-	7	73	20	23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-	-
6	3.50	SPT	-	-	-	-	2	38	40	27	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	25	-	-	-	-
7	4.00	SPT	-	-	-	-	0	63	37	33	20	13	-	-	-	SC	-	-	-	-	-	-	-	-	51	-	-	-	-
8	4.50	SPT	-	-	-	-	5	70	25	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	54	-	-	-	-
9	5.00	SPT	-	-	-	-	7	59	34	32	18	14	-	-	-	SC	-	-	-	-	-	-	-	-	59	-	-	-	-
10	5.50	SPT	-	-	-	-	0	52	48	34	16	18	-	-	-	SC	-	-	-	-	-	-	-	-	55	-	-	-	-
11	6.00	SPT	-	-	-	-	0	68	32	29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	57	-	-	-	-
12	6.50	SPT	-	-	-	-	2	64	34	32	16	16	-	-	-	SC	-	-	-	-	-	-	-	-	55	-	-	-	-
13	7.00	SPT	-	-	-	-	0	70	30	28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
14	7.50	SPT	-	-	-	-	4	68	28	25	14	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
15	8.00	SPT	-	-	-	-	0	73	27	26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	1	71	28	30	15	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	3	72	25	24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	7	63	30	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	2	69	29	28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	0	71	29	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
21	11.50	SPT	-	-	-	-	2	62	36	30	18	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
22	12.50	SPT	-	-	-	-	1	64	35	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	67	33	27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	UDS	2.19	1.88	16.37	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	89.1	UCS	-	-	-	-	-	0.45	30.8	-
25	15.50	UDS	2.24	1.96	14.47	2.73	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	102.4	UCS	-	-	-	-	-	0.40	28.3	-
26	15.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	17.00	UDS	2.20	1.90	15.68	2.71	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	79.3	UCS	-	-	-	-	-	0.43	29.8	-
28	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	18.50	UDS	2.25	1.98	13.82	2.72	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	119.5	UCS	-	-	-	-	-	0.38	27.3	-
30	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	20.00	UDS	2.68	2.62	2.14	2.78	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	340.6	UCS	-	-	-	-	-	0.06	5.6	-
32	21.50	UDS	2.67	2.62	1.95	2.76	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	329.1	UCS	-	-	-	-	-	0.05	5.1	-
33	21.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
34	23.00	UDS	2.73	2.68	1.84	2.82	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	554.7	UCS	-	-	-	-	-	0.05	4.9	-
35	23.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	24.00	UDS	2.70	2.62	2.90	2.84	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	507.6	UCS	-	-	-	-	-	0.08	7.6	-
37	25.00	UDS	2.75	2.70	2.01	2.85	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	551.9	UCS	-	-	-	-	-	0.06	5.4	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 155

Co-Ordinate :- E -1685 , N - 2538

Reduced Level :- 203.9 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	72	28		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	78	22		25	19	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	22	-	-	-
3	2.00	SPT	-	-	-	-	0	76	24		26	19	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	24	-	-	-
4	2.50	UDS	1.98	1.57	26.09	2.66	0	70	30		29	22	7	-	-	-	SM-SC	0.03	28	-	-	DSU	-	-	-	-	-	0.69	41.0
5	3.00	SPT	-	-	-	-	0	80	20		26	20	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	20	-	-	-
6	3.50	UDS	2.00	1.60	24.81	2.66	0	76	24		29	22	7	-	-	-	SM-SC	0.02	29	-	-	DSU	-	-	-	-	-	0.66	39.8
7	4.00	SPT	-	-	-	-	0	83	17		25	19	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	27	-	-	-
8	4.50	UDS	2.01	1.61	24.47	2.67	0	76	24		27	20	7	-	-	-	SM-SC	0.02	29	-	-	DSU	-	-	-	-	-	0.65	39.5
9	5.00	SPT	-	-	-	-	0	77	23		25	19	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	23	-	-	-
10	5.50	SPT	-	-	-	-	0	83	17		16	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	36	-	-	-
11	6.00	SPT	-	-	-	-	0	78	22		28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	62	-	-	-
12	6.50	UDS	2.16	1.85	16.47	2.67	0	81	19		24	20	4	-	-	-	SM	0.00	32	-	-	DSU	-	-	-	-	-	0.44	30.5
13	7.00	SPT	-	-	-	-	0	83	17		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	85	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	69	31		28	21	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	72	28		26	20	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	84	16		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	71	29		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	65	35		30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	70	30		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	73	27		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	80	20		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	2	71	27		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	1	74	25		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	77	23		25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	6	73	21		23	14	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	5	80	15		24	16	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	4	68	28		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	9	72	19		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	3	76	21		28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	1	67	32		29	14	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	69	31		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
33	20.50	SPT	-	-	-	-	1	70	29		26	17	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
34	21.50	UDS	2.34	2.11	10.66	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	156.3	UCS	-	-	-	-	-	0.29	22.5
35	23.00	UDS	2.46	2.29	7.44	2.76	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	207.4	UCS	-	-	-	-	-	0.21	17.0
36	25.00	UDS	2.49	2.34	6.35	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	245.6	UCS	-	-	-	-	-	0.17	14.9

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 156

Co-Ordinate :- E - 1452, N - 2512

Reduced Level :- 204.88m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction φ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	3	59	38	31	16	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	9	63	28	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	7	-	-	-
3	2.00	SPT	-	-	-	-	17	58	25	26	18	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
4	2.50	UDS	1.70	1.58	7.83	2.67	21	52	27	29	19	10	-	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.69	41.0
5	3.00	SPT	-	-	-	-	11	68	21	24	18	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	29	-	-	-
6	3.50	UDS	1.83	1.69	8.45	2.66	6	61	33	29	16	13	-	-	-	-	SC	0.09	28	-	-	DSU	-	-	-	-	-	0.58	36.6
7	4.00	SPT	-	-	-	-	8	58	34	30	15	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-
8	4.50	SPT	-	-	-	-	3	70	27	26	16	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
9	5.00	SPT	-	-	-	-	4	79	17	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	25	-	-	-
10	5.50	SPT	-	-	-	-	7	74	19	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	24	-	-	-
11	6.00	SPT	-	-	-	-	8	72	20	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	55	-	-	-
12	6.50	Remoulded	2.10	1.76	19.41	2.67	4	70	26	28	21	7	-	-	-	-	SM-SC	0.01	30	-	-	DSU	-	-	-	-	-	0.52	34.1
13	7.00	SPT	-	-	-	-	3	78	19	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	28	-	-	-
14	7.50	SPT	-	-	-	-	0	76	24	28	21	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	81	19	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	65	35	30	18	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	63	37	31	17	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	70	30	28	18	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	62	38	33	20	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	71	29	30	19	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	69	31	31	16	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	2	82	16	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	4	84	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	91.4	UCS	-	-	-	-	-	0.23	18.5
25	15.50	UDS	2.46	2.29	7.22	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	124.1	UCS	-	-	-	-	-	0.20	16.6
26	17.00	UDS	2.45	2.29	7.07	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	120.3	UCS	-	-	-	-	-	0.19	16.2
27	18.50	UDS	2.39	2.20	8.73	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	149.6	-	UCS	-	-	-	-	6.66	0.24	19.2
28	20.00	UDS	2.44	2.26	8.05	2.76	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	205.5	UCS	-	-	-	-	-	0.22	18.2

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 157

Co-Ordinate :- E - 1500, N - 2488

Reduced Level :- 205.4 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	64	36	28	13	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	6	65	29	34	13	21	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
3	2.00	SPT	-	-	-	-	0	56	44	31	19	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	38	-	-	-
4	2.50	UDS	1.91	1.62	17.98	2.66	4	70	26	29	20	9	-	-	-	-	SC	0.06	25	-	-	DSU	-	-	-	-	-	0.64	39.1
5	3.00	SPT	-	-	-	-	0	71	29	31	18	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
6	3.50	UDS	1.85	1.60	15.96	2.65	0	61	39	43	24	19	-	-	-	-	SC	0.09	26	-	-	DSU	-	-	-	-	-	0.66	39.8
7	4.00	SPT	-	-	-	-	5	60	35	42	20	22	-	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
8	4.50	UDS	1.97	1.63	21.19	2.66	2	67	31	44	24	20	-	-	-	-	SC	0.08	27	-	-	DSU	-	-	-	-	-	0.64	38.9
9	5.00	SPT	-	-	-	-	6	59	35	46	23	23	-	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
10	5.50	UDS	2.04	1.67	22.41	2.66	2	68	30	43	24	19	-	-	-	-	SC	0.06	29	-	-	DSU	-	-	-	-	-	0.60	37.3
11	6.00	SPT	-	-	-	-	0	75	25	36	19	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
12	6.50	UDS	2.05	1.68	22.12	2.67	0	79	21	30	20	10	-	-	-	-	SC	0.05	29	-	-	DSU	-	-	-	-	-	0.59	37.1
13	7.00	SPT	-	-	-	-	0	80	20	30	23	7	-	-	-	-	Sand Rock	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	UDS	2.19	1.90	15.11	2.67	4	78	18	27	21	6	-	-	-	-	Sand Rock	-	-	-	21.3	UCS	-	-	-	-	-	0.40	28.7
15	9.00	UDS	2.18	1.89	15.55	2.67	2	83	15	24	18	6	-	-	-	-	Sand Rock	-	-	-	17.9	UCS	-	-	-	-	-	0.42	29.3
16	9.00	SPT	-	-	-	-	1	81	18	28	21	7	-	-	-	-	Sand Rock	-	-	-	-	-	-	-	-	>100	-	-	-
17	10.50	UDS	2.24	1.97	13.49	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	45.7	UCS	-	-	-	-	-	0.36	26.6
18	10.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
19	12.00	UDS	2.28	2.03	12.15	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	51.0	UCS	-	-	-	-	-	0.33	24.7
20	12.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
21	13.50	UDS	2.31	2.09	10.78	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	37.9	UCS	-	-	-	-	-	0.29	22.5
22	13.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
23	15.00	UDS	2.29	2.04	12.01	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	79.1	UCS	-	-	-	-	-	0.33	24.6
24	15.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
25	16.50	UDS	2.39	2.19	8.96	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	110.6	-	UCS	-	-	-	-	10.00	0.24	19.7
26	18.00	UDS	2.36	2.16	9.50	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	98.9	-	UCS	-	-	-	-	6.66	0.26	20.5
27	19.50	UDS	2.32	2.10	10.42	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	108.2	UCS	-	-	-	-	-	0.28	21.9
28	21.00	UDS	2.35	2.14	9.60	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	124.6	UCS	-	-	-	-	-	0.26	20.6
29	22.50	UDS	2.36	2.16	9.50	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	165.3	-	UCS	-	-	-	-	26.00	0.26	20.5
30	24.00	UDS	2.41	2.24	7.62	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	155.7	-	UCS	-	-	-	-	24.00	0.21	17.1
31	25.00	UDS	2.42	2.24	8.00	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	186.9	-	UCS	-	-	-	-	29.00	0.22	17.9

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 159

Co-Ordinate :- E - 865, N - 2449

Reduced Level :- 198.50 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²					
1	0.00	DS	-	-	-	-	0	65	35	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	3	16	58	23	39	18	21	-	-	-	CI	-	-	-	-	-	-	-	-	4	-	-	-	-
3	2.00	SPT	-	-	-	-	3	20	57	20	37	19	18	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-	-
4	2.50	UDS	1.75	1.51	15.64	2.62	2	19	56	23	38	17	21	-	-	-	CI	0.63	5	-	-	TUU	0.15	0.0160	0.42	-	-	0.73	42.2	-
5	3.00	SPT	-	-	-	-	5	16	52	27	44	20	24	-	-	-	CI	-	-	-	-	-	-	-	-	17	-	-	-	-
6	3.50	UDS	1.97	1.57	25.87	2.63	4	20	55	21	43	24	19	-	-	-	CI	0.83	6	-	-	TUU	0.13	0.0114	0.55	-	-	0.68	40.5	-
7	4.00	SPT	-	-	-	-	5	24	51	20	40	23	17	-	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-	-
8	4.50	UDS	1.98	1.58	25.22	2.63	2	21	53	24	42	20	22	-	-	-	CI	0.90	6	-	-	TUU	0.12	0.0113	0.66	-	-	0.66	39.9	-
9	5.00	SPT	-	-	-	-	6	18	51	25	44	21	23	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-	-
10	5.50	UDS	2.00	1.61	24.24	2.64	4	23	52	21	41	23	18	-	-	-	CI	1.02	7	-	-	TUU	0.11	0.0089	0.76	-	-	0.64	39.0	-
11	6.00	SPT	-	-	-	-	3	24	52	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	19	-	-	-	-
12	6.50	UDS	1.99	1.60	24.29	2.62	3	22	52	23	42	22	20	-	-	-	CI	0.73	6	-	-	TUU	0.11	0.0130	0.88	-	-	0.64	38.9	-
13	7.00	SPT	-	-	-	-	8	29	45	18	41	25	16	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-	-
14	7.50	UDS	1.95	1.53	27.81	2.65	12	34	38	16	38	24	14	-	-	-	CI	0.46	9	-	-	TUU	0.15	0.0143	0.96	-	-	0.74	42.4	-
15	8.00	SPT	-	-	-	-	5	31	34	30	47	21	26	-	-	-	CI	-	-	-	-	-	-	-	-	10	-	-	-	-
16	8.50	UDS	1.97	1.56	26.45	2.65	4	37	34	25	44	23	21	-	-	-	CI	0.67	8	-	-	TUU	0.14	0.0123	1.05	-	-	0.70	41.2	-
17	9.00	SPT	-	-	-	-	12	29	31	28	45	20	25	-	-	-	CI	-	-	-	-	-	-	-	-	21	-	-	-	-
18	9.50	UDS	1.99	1.59	25.16	2.65	10	34	32	24	42	21	21	-	-	-	CI	0.91	6	-	-	TUU	0.13	0.0103	1.17	-	-	0.67	40.0	-
19	10.00	SPT	-	-	-	-	9	29	36	26	43	20	23	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-	-
20	11.00	UDS	2.02	1.64	23.02	2.64	8	28	34	30	45	19	26	-	-	-	CI	0.93	5	-	-	TUU	0.10	0.0107	1.33	-	-	0.61	37.8	-
21	11.50	SPT	-	-	-	-	10	36	34	20	41	23	18	-	-	-	CI	-	-	-	-	-	-	-	-	22	-	-	-	-
22	12.50	SPT	-	-	-	-	8	34	34	24	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	28	-	-	-	-
23	13.00	SPT	-	-	-	-	12	30	33	25	41	18	23	-	-	-	CI	-	-	-	-	-	-	-	-	30	-	-	-	-
24	14.00	SPT	-	-	-	-	20	62	18	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	54	-	-	-	-
25	14.50	SPT	-	-	-	-	15	65	20	27	20	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	0	19	66	15	29	16	13	-	-	-	CL	-	-	-	-	-	-	-	-	54	-	-	-	-
27	16.00	SPT	-	-	-	-	0	24	66	10	26	17	9	-	-	-	CL	-	-	-	-	-	-	-	-	58	-	-	-	-
28	17.00	SPT	-	-	-	-	0	18	54	28	39	15	24	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	0	21	56	23	37	17	20	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	0	23	57	20	36	18	18	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	0	16	55	29	42	16	26	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	0	19	67	14	30	18	12	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
33	20.50	SPT	-	-	-	-	0	21	67	12	28	17	11	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
34	21.50	SPT	-	-	-	-	0	18	67	15	29	16	13	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
35	22.00	SPT	-	-	-	-	0	16	69	15	31	17	14	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	23.50	UDS	2.59	2.48	4.30	2.78	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	95.3	-	UCS	-	-	-	-	75.33	0.12	10.7	-
37	25.00	UDS	2.71	2.67	1.68	2.79	-	-	-	-	-	-	-	-	-	-	ROCK	-	-	70.2	-	UCS	-	-	-	-	54.00	0.05	4.5	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 160

Co-Ordinate :- E - 948, N - 2413

Reduced Level :- 198.67 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	16	54	30	51	23	28	-	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	9	58	33	53	24	29	-	-	-	CH	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	0	6	55	39	59	23	36	-	-	-	CH	-	-	-	-	-	-	-	-	2	-	-	-
4	2.50	UDS	1.84	1.36	35.12	2.61	0	8	56	36	55	25	30	-	-	-	CH	0.21	3	-	-	TUU	0.24	0.0510	0.40	-	-	0.92	47.8
5	3.00	SPT	-	-	-	-	0	2	62	36	57	26	31	-	-	-	CH	-	-	-	-	-	-	-	-	4	-	-	-
6	3.50	UDS	1.87	1.40	33.22	2.63	0	9	61	30	54	28	26	-	-	-	CH	0.20	2	-	-	TUU	0.22	0.0490	0.49	-	-	0.87	46.6
7	4.00	SPT	-	-	-	-	0	20	51	29	52	27	25	-	-	-	CH	-	-	-	-	-	-	-	-	4	-	-	-
8	4.50	UDS	1.89	1.43	31.92	2.64	0	19	52	29	51	24	27	-	-	-	CH	0.25	4	-	-	TUU	0.20	0.0400	0.54	-	-	0.84	45.7
9	5.00	SPT	-	-	-	-	0	14	55	31	54	25	29	-	-	-	CH	-	-	-	-	-	-	-	-	5	-	-	-
10	5.50	UDS	1.93	1.49	29.21	2.65	0	46	26	28	50	26	24	-	-	-	CH	0.49	9	-	-	TUU	0.17	0.0192	0.66	-	-	0.77	43.6
11	6.00	SPT	-	-	-	-	0	26	42	32	53	24	29	-	-	-	CH	-	-	-	-	-	-	-	-	13	-	-	-
12	6.50	UDS	1.97	1.56	26.45	2.65	4	41	24	31	50	23	27	-	-	-	CH	0.64	7	-	-	TUU	0.13	0.0151	0.73	-	-	0.70	41.2
13	7.00	SPT	-	-	-	-	0	44	28	28	51	25	26	-	-	-	CH	-	-	-	-	-	-	-	-	14	-	-	-
14	7.50	SPT	-	-	-	-	0	9	54	37	56	24	32	-	-	-	CH	-	-	-	-	-	-	-	-	20	-	-	-
15	8.00	SPT	-	-	-	-	0	8	72	20	43	25	18	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
16	8.50	UDS	2.00	1.62	23.37	2.61	0	6	59	35	55	24	31	-	-	-	CH	0.92	2	-	-	TUU	0.10	0.0113	2.17	-	-	0.61	37.9
17	9.00	SPT	-	-	-	-	0	59	41	29	16	13	13	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
18	9.50	SPT	-	-	-	-	0	54	46	43	18	25	13	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-
19	10.00	SPT	-	-	-	-	0	57	43	41	19	22	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	76	24	28	16	12	12	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
21	11.50	SPT	-	-	-	-	0	81	19	25	15	10	10	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
22	12.50	SPT	-	-	-	-	0	85	15	NP	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	2	86	12	NP	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	74	26	23	19	4	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	69	31	25	20	5	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	77	23	21	17	4	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	41	49	10	28	19	9	-	-	-	CL	-	-	-	-	-	-	-	-	58	-	-	-
28	17.00	SPT	-	-	-	-	0	44	44	12	30	20	10	-	-	-	CL	-	-	-	-	-	-	-	-	68	-	-	-
29	17.50	SPT	-	-	-	-	0	42	45	13	29	18	11	-	-	-	CL	-	-	-	-	-	-	-	-	65	-	-	-
30	18.50	SPT	-	-	-	-	0	39	51	10	26	17	9	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.50	UDS	2.21	1.93	14.75	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	99.1	-	UCS	-	-	-	-	24.44	0.40	28.4
32	21.00	UDS	2.35	2.13	10.54	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	113.6	-	UCS	-	-	-	-	42.66	0.29	22.4
33	22.50	UDS	2.39	2.18	9.64	2.76	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	151.4	-	UCS	-	-	-	-	20.66	0.27	21.0
34	24.00	UDS	2.34	2.10	11.58	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	136.4	-	UCS	-	-	-	-	26.00	0.32	24.3
35	25.00	UDS	2.29	2.04	12.25	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	100.5	-	UCS	-	-	-	-	11.00	0.33	25.0

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 161

Co-Ordinate :- E - 1587, N - 2429

Reduced Level :- 204.90m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility m _v	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	69	31	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	64	36	29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-	-
3	2.00	SPT	-	-	-	-	6	53	41	30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-	-
4	2.50	UDS	1.72	1.58	8.91	2.65	4	62	34	27	14	13	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	0.68	40.4	-
5	3.00	SPT	-	-		-	0	80	20	23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	45	-	-	-	-
6	3.50	UDS	2.03	1.65	22.99	2.66	6	72	22	24	14	10	-	-	-	SC	0.05	28	-	-	DSU	-	-	-	-	-	0.61	38.0	-
7	4.00	SPT	-	-	-	-	0	81	19	25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	43	-	-	-	-
8	4.50	SPT	-	-	-	-	0	74	26	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	34	-	-	-	-
9	5.00	SPT	-	-	-	-	2	76	22	28	18	10	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-	-
10	5.50	SPT	-	-	-	-	0	82	18	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-	-
11	6.00	SPT	-	-	-	-	46	26	28	31	16	15	-	-	-	GC	-	-	-	-	-	-	-	-	58	-	-	-	-
12	6.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	GC	-	-	-	-	-	-	-	-	>100	-	-	-	-
13	7.00	SPT	-	-	-	-	39	31	30	26	14	12	-	-	-	GC	-	-	-	-	-	-	-	-	40	-	-	-	-
14	7.50	SPT	-	-	-	-	48	25	27	29	16	13	-	-	-	GC	-	-	-	-	-	-	-	-	32	-	-	-	-
15	8.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	GC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	0	75	25	25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	0	80	20	24	16	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
18	9.50	SPT	-	-	-	-	0	76	24	26	14	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
19	10.00	SPT	-	-	-	-	0	69	31	29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
20	11.00	SPT	-	-	-	-	0	74	26	25	15	10	-	-	-	SC	-	-	-	-	-	-	-	-	56	-	-	-	-
21	11.50	SPT	-	-	-	-	0	85	15	24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	77	-	-	-	-
22	12.50	SPT	-	-	-	-	0	80	20	26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	86	14	25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	0	78	22	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	0	79	21	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	0	84	16	27	15	12	-	-	-	SC	-	-	-	-	-	-	-	-	30	-	-	-	-
27	16.00	SPT	-	-	-	-	0	88	12	24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	SPT	-	-	-	-	0	78	22	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
33	20.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
34	21.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
35	22.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	22.50	UDS	2.34	2.12	10.19	2.71	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	74.1	-	UCS	-	-	-	-	14.00	0.28	21.6	-
37	24.00	UDS	2.54	2.41	5.61	2.78	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	394.6	UCS	-	-	-	-	-	0.16	13.5	-
38	25.00	UDS	2.52	2.39	5.28	2.74	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	200.5	-	UCS	-	-	-	-	17.00	0.14	12.6	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 163

Co-Ordinate :- E - 885, N - 2339

Reduced Level :- 198.57m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility m _v	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	16	68	16	33	19	14	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	10	60	30	54	26	28	-	-	-	CH	-	-	-	-	-	-	-	5	-	-	-	-
3	2.00	SPT	-	-	-	-	0	6	56	38	57	25	32	-	-	-	CH	-	-	-	-	-	-	-	6	-	-	-	-
4	2.50	UDS	1.91	1.50	27.55	2.61	0	8	58	34	53	22	31	-	-	-	CH	0.37	3	-	-	TUU	0.16	0.0292	0.46	-	-	0.74	42.6
5	3.00	SPT	-	-	-	-	0	2	61	37	55	23	32	-	-	-	CH	-	-	-	-	-	-	-	9	-	-	-	-
6	3.50	UDS	1.94	1.56	24.62	2.63	0	9	61	30	52	25	27	-	-	-	CH	0.59	4	-	-	TUU	0.14	0.0182	0.65	-	-	0.69	40.8
7	4.00	SPT	-	-	-	-	0	19	52	29	51	26	25	-	-	-	CH	-	-	-	-	-	-	-	13	-	-	-	-
8	4.50	UDS	1.97	1.56	26.16	2.64	0	20	54	26	43	21	22	-	-	-	CI	0.62	6	-	-	TUU	0.13	0.0163	0.97	-	-	0.69	40.9
9	5.00	SPT	-	-	-	-	0	14	54	32	48	19	29	-	-	-	CI	-	-	-	-	-	-	-	11	-	-	-	-
10	5.50	UDS	1.99	1.59	25.16	2.65	0	54	46	44	21	23	-	-	-	SC	0.10	27	-	-	DSU	-	-	-	-	-	0.67	40.0	
11	6.00	SPT	-	-	-	-	0	56	44	42	20	22	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-	-
12	6.50	UDS	2.00	1.61	24.53	2.65	4	49	47	44	18	26	-	-	-	SC	0.11	25	-	-	DSU	-	-	-	-	-	0.65	39.4	
13	7.00	SPT	-	-	-	-	0	61	39	41	19	22	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-	-
14	7.50	UDS	2.01	1.63	23.05	2.62	0	9	58	33	51	22	29	-	-	-	CH	0.71	2	-	-	TUU	0.10	0.0146	1.28	-	-	0.60	37.7
15	8.00	SPT	-	-	-	-	0	8	60	32	56	28	28	-	-	-	CH	-	-	-	-	-	-	-	15	-	-	-	-
16	8.50	UDS	2.00	1.62	23.37	2.61	0	6	58	36	54	23	31	-	-	-	CH	0.93	1	-	-	TUU	0.10	0.0120	1.33	-	-	0.61	37.9
17	9.00	SPT	-	-	-	-	0	10	62	28	46	21	25	-	-	-	CI	-	-	-	-	-	-	-	18	-	-	-	-
18	9.50	SPT	-	-	-	-	0	46	33	21	38	20	18	-	-	-	CI	-	-	-	-	-	-	-	16	-	-	-	-
19	10.00	SPT	-	-	-	-	0	43	28	29	41	16	25	-	-	-	CI	-	-	-	-	-	-	-	19	-	-	-	-
20	11.00	SPT	-	-	-	-	0	76	24	29	17	12	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-	-
21	11.50	SPT	-	-	-	-	0	81	19	26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	29	-	-	-	-
22	12.50	SPT	-	-	-	-	0	20	54	26	43	20	23	-	-	-	CI	-	-	-	-	-	-	-	35	-	-	-	-
23	13.00	SPT	-	-	-	-	2	69	29	24	13	11	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-	-
24	14.00	SPT	-	-	-	-	0	74	26	32	19	13	-	-	-	SC	-	-	-	-	-	-	-	-	38	-	-	-	-
25	14.50	SPT	-	-	-	-	0	63	37	33	18	15	-	-	-	SC	-	-	-	-	-	-	-	-	35	-	-	-	-
26	15.50	SPT	-	-	-	-	0	75	25	38	22	16	-	-	-	SC	-	-	-	-	-	-	-	-	62	-	-	-	-
27	16.00	SPT	-	-	-	-	0	72	28	34	20	14	-	-	-	SC	-	-	-	-	-	-	-	-	85	-	-	-	-
28	17.00	SPT	-	-	-	-	0	78	22	32	21	11	-	-	-	SC	-	-	-	-	-	-	-	-	100	-	-	-	-
29	17.50	SPT	-	-	-	-	0	72	28	33	19	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	0	66	34	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	0	70	30	27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	0	77	23	26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	89	-	-	-	-
33	20.50	SPT	-	-	-	-	0	68	32	30	20	10	-	-	-	SC	-	-	-	-	-	-	-	-	97	-	-	-	-
34	21.50	SPT	-	-	-	-	0	70	30	31	22	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
35	22.00	SPT	-	-	-	-	0	72	28	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	23.00	SPT	-	-	-	-	0	74	26	27	19	8	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-	-
37	23.50	SPT	-	-	-	-	0	68	32	29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	43	-	-	-	-
38	24.50	SPT	-	-	-	-	0	74	26	24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-	-
39	25.00	SPT	-	-	-	-	0	67	33	30	16	14	-	Page no. 540 of 618			SC	-	-	-	-	-	-	-	75	-	-	-	-

UDS - Undisturbed Sample
DS - Disturbed Sample
SPT - Standard Penetration Tests

NP - Non Plastic
UCS - Unconfined Compression Strength

TUU - Triaxial Unconsolidated Undrained
TCU - Triaxial Consolidated Undrained
DSU - Direct Shear Test

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 164

Co-Ordinate :- E - 1047, N - 2339

Reduced Level :- 198.81m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	4	14	62	20	38	20	18	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	10	57	33	52	22	30	13	-	56	CH	-	-	-	-	-	-	-	-	5	-	-	-
3	2.00	SPT	-	-	-	-	0	4	53	43	57	19	38	-	-	-	CH	-	-	-	-	-	-	-	-	6	-	-	-
4	2.50	UDS	1.79	1.50	19.62	2.61	0	8	58	34	53	24	29	12	0.29	59	CH	0.43	2	-	-	TUU	0.18	0.0255	0.44	-	-	0.74	42.7
5	3.00	SPT	-	-	-	-	0	4	55	41	58	22	36	-	-	-	CH	-	-	-	-	-	-	-	-	9	-	-	-
6	3.50	UDS	1.89	1.53	23.65	2.62	0	9	54	37	56	23	33	9	0.33	74	CH	0.64	3	-	-	TUU	0.16	0.0174	0.66	-	-	0.71	41.7
7	4.00	SPT	-	-	-	-	0	8	65	27	48	25	23	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
8	4.50	UDS	2.01	1.62	23.91	2.65	0	33	41	26	44	20	24	18	0.14	42	CI	0.80	7	-	-	TUU	0.13	0.0125	0.82	-	-	0.63	38.8
9	5.00	SPT	-	-	-	-	0	56		44	37	17	20	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
10	5.50	UDS	2.00	1.60	24.81	2.66	12	51		37	35	19	16	-	-	-	SC	0.10	27	-	-	DSU	-	-	-	-	-	0.66	39.8
11	6.00	SPT	-	-	-	-	4	34	36	26	38	16	22	-	-	-	CI	-	-	-	-	-	-	-	-	16	-	-	-
12	6.50	SPT	-	-	-	-	0	38	33	29	47	21	26	-	-	-	CI	-	-	-	-	-	-	-	-	26	-	-	-
13	7.00	SPT	-	-	-	-	12	28	26	34	54	23	31	-	-	-	CH	-	-	-	-	-	-	-	-	21	-	-	-
14	7.50	UDS	2.03	1.66	22.15	2.63	0	16	51	33	51	22	29	13	0.26	54	CH	0.93	4	-	-	TUU	0.12	0.0113	2.49	-	-	0.58	36.8
15	8.00	SPT	-	-	-	-	0	9	48	43	65	27	38	-	-	-	CH	-	-	-	-	-	-	-	-	15	-	-	-
16	8.50	UDS	2.01	1.64	22.76	2.61	0	7	61	32	56	28	28	11	0.27	57	CH	0.86	2	-	-	TUU	0.12	0.0125	3.16	-	-	0.59	37.3
17	9.00	SPT	-	-	-	-	0	6	61	33	52	22	30	-	-	-	CH	-	-	-	-	-	-	-	-	16	-	-	-
18	9.50	UDS	2.04	1.69	20.71	2.60	0	4	60	36	56	24	32	-	-	-	CH	1.02	1	-	-	TUU	0.11	0.0107	3.45	-	-	0.54	35.0
19	10.00	SPT	-	-	-	-	0	14	52	34	52	22	30	-	-	-	CH	-	-	-	-	-	-	-	-	22	-	-	-
20	11.00	UDS	2.09	1.76	18.56	2.62	0	20	49	31	51	23	28	-	-	-	CH	1.83	6	-	-	TUU	0.10	0.0058	3.87	-	-	0.49	32.7
21	11.50	SPT	-	-	-	-	48	30		22	21	17	4	-	-	-	GM	-	-	-	-	-	-	-	-	69	-	-	-
22	12.50	SPT	-	-	-	-	60	25		15	NP	NP	NP	-	-	-	GM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	48	27		25	23	19	4	-	-	-	GM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	88		12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	0	86		14	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	56	31		13	NP	NP	NP	-	-	-	GM	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	42	29		29	24	20	4	-	-	-	GM	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	48	31		21	20	16	4	-	-	-	GM	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	UDS	2.31	2.07	11.74	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	86.5	-	UCS	-	-	-	-	25.00	0.32	24.3
30	20.00	UDS	2.26	2.00	13.18	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	71.2	-	UCS	-	-	-	-	8.00	0.36	26.3

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 168

Co-Ordinate :- E - 1425, N - 2129

Reduced Level :- 200.99m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	52	48		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	58	42		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	6	-	-	-
3	2.00	SPT	-	-	-	-	26	46	28		25	17	8	-	-	-	SC	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.71	1.52	12.57	2.63	0	27	51	22	40	20	20	-	-	-	CI	0.63	5	-	-	TUU	0.15	0.0152	0.41	-	-	0.73	42.2
5	3.00	SPT	-	-	-	-	0	28	52	20	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	-	17	-	-	-
6	3.50	UDS	1.99	1.61	23.36	2.62	0	23	52	25	43	20	23	-	-	-	CI	1.12	4	-	-	TUU	0.11	0.0090	0.62	-	-	0.62	38.4
7	4.00	SPT	-	-	-	-	0	24	55	21	41	23	18	-	-	-	CI	-	-	-	-	-	-	-	-	26	-	-	-
8	4.50	UDS	2.04	1.68	21.29	2.62	1	23	56	20	40	22	18	-	-	-	CI	2.02	5	-	-	TUU	0.09	0.0047	1.95	-	-	0.56	35.8
9	5.00	SPT	-	-	-	-	0	45	37	18	36	20	16	-	-	-	CI	-	-	-	-	-	-	-	-	51	-	-	-
10	5.50	UDS	2.07	1.74	18.76	2.59	2	28	57	13	40	29	11	-	-	-	MI	1.75	8	-	-	TUU	0.08	0.0032	2.83	-	-	0.49	32.7
11	6.00	SPT	-	-	-	-	4	34	49	13	30	18	12	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	0	36	53	11	29	19	10	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	0	47	43	10	26	17	9	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	31	54	15	30	16	14	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	36	49	15	28	15	13	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	54	46		26	14	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	10	46	44		24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	9	44	47		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	10	35	35	20	39	21	18	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	5	23	45	27	43	20	23	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	2	14	55	29	45	19	26	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	17	60	23	44	23	21	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	2	27	50	21	42	24	18	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	39	42	19	40	23	17	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	6	28	44	22	43	24	19	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	22	27	32	19	39	22	17	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	UDS	2.41	2.24	7.62	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	84.1	UCS	-	-	-	-	-	0.21	17.1
29	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	UDS	2.46	2.32	6.09	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	75.6	UCS	-	-	-	-	-	0.16	14.1
31	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	UDS	2.40	2.22	8.17	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	91.2	UCS	-	-	-	-	-	0.22	18.1
33	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 169

Co-Ordinate :- E 1188, N 1944

Reduced Level :- 199.132 m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	71	29	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	63	37	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	2	-	-	-
3	2.00	SPT	-	-	-	-	0	26	51	23	41	21	20	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.66	1.52	9.34	2.62	0	22	51	27	46	22	24	-	-	-	CI	0.68	2	-	-	TUU	0.15	0.0151	0.43	-	-	0.73	42.1
5	3.00	SPT	-	-	-	-	0	30	51	19	40	23	17	-	-	-	CI	-	-	-	-	-	-	-	-	20	-	-	-
6	3.50	UDS	1.73	1.56	11.14	2.64	0	28	45	27	44	19	25	-	-	-	CI	0.84	4	-	-	TUU	0.13	0.0125	0.55	-	-	0.70	41.0
7	4.00	SPT	-	-	-	-	0	70	30	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	15	-	-	-
8	4.50	UDS	1.74	1.57	10.58	2.66	0	61	39	33	17	16	-	-	-	-	SC	0.08	26	-	-	DSU	-	-	-	-	-	0.69	40.8
9	5.00	SPT	-	-	-	-	0	66	34	29	19	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
10	5.50	UDS	1.99	1.59	25.16	2.65	0	64	36	30	16	14	-	-	-	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	0.67	40.0
11	6.00	SPT	-	-	-	-	0	72	28	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
12	6.50	UDS	2.00	1.60	24.81	2.66	0	69	31	30	18	12	-	-	-	-	SC	0.05	26	-	-	DSU	-	-	-	-	-	0.66	39.8
13	7.00	SPT	-	-	-	-	0	71	29	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
14	7.50	DS	-	-	-	-	0	75	25	23	14	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
15	8.00	SPT	-	-	-	-	0	68	32	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	13	-	-	-
16	8.50	UDS	1.98	1.58	25.51	2.64	0	58	42	30	16	14	-	-	-	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	0.67	40.2
17	9.00	SPT	-	-	-	-	0	56	44	31	15	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-
18	9.50	DS	-	-	-	-	0	63	37	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
19	10.00	SPT	-	-	-	-	0	67	33	26	18	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-
20	11.00	UDS	1.98	1.57	25.80	2.65	0	59	41	32	16	16	-	-	-	-	SC	0.06	26	-	-	DSU	-	-	-	-	-	0.68	40.6
21	11.50	SPT	-	-	-	-	0	62	38	29	15	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
22	12.50	DS	-	-	-	-	0	70	30	27	14	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
23	13.00	SPT	-	-	-	-	0	73	27	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-
24	14.00	DS	-	-	-	-	3	89	8	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-
25	14.50	SPT	-	-	-	-	6	85	9	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	30	-	-	-
26	15.50	DS	-	-	-	-	3	89	8	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-
27	16.00	SPT	-	-	-	-	0	94	6	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	36	-	-	-
28	17.00	DS	-	-	-	-	5	86	9	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-
29	17.50	SPT	-	-	-	-	8	82	10	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	39	-	-	-
30	18.50	DS	-	-	-	-	4	89	7	NP	NP	NP	-	-	-	-	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-
31	19.00	SPT	-	-	-	-	0	72	28	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	79	21	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 172

Co-Ordinate :- E - 1185, N - 1777

Reduced Level :- 199.40m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	68	32	23	13	10	-	-	-	-	Filled up Soil	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	DS	-	-	-	-	0	56	44	35	19	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
3	2.00	DS	-	-	-	-	0	53	47	38	18	20	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
4	2.50	UDS	1.96	1.54	27.41	2.66	0	55	45	37	16	21	-	-	-	-	SC	0.12	25	-	-	DSU	0.15	0.0154	0.43	-	-	0.73	42.2
5	3.00	SPT	-	-	-	-	0	53	47	41	17	24	-	-	-	-	SC	-	-	-	-	-	-	-	-	14	-	-	-
6	3.50	UDS	1.95	1.53	27.81	2.65	0	51	49	36	16	20	-	-	-	-	SC	0.15	23	-	-	DSU	0.15	0.0152	0.53	-	-	0.74	42.4
7	4.00	SPT	-	-	-	-	0	46	28	26	39	15	24	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
8	4.50	UDS	1.99	1.59	25.16	2.65	5	53	42	35	14	21	-	-	-	-	SC	0.12	24	-	-	DSU	-	-	-	-	-	0.67	40.0
9	5.00	SPT	-	-	-	-	0	58	42	33	16	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
10	5.50	UDS	2.02	1.63	23.59	2.66	10	66	24	31	17	14	-	-	-	-	SC	0.07	25	-	-	DSU	-	-	-	-	-	0.63	38.6
11	6.00	SPT	-	-	-	-	4	74	22	32	15	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
12	6.50	SPT	-	-	-	-	8	73	19	21	15	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	30	-	-	-
13	7.00	SPT	-	-	-	-	14	60	26	27	20	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	24	-	-	-
14	7.50	SPT	-	-	-	-	14	62	24	26	20	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	26	-	-	-
15	8.00	SPT	-	-	-	-	14	67	19	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	22	-	-	-
16	8.50	SPT	-	-	-	-	8	68	24	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	20	-	-	-
17	9.00	SPT	-	-	-	-	12	58	30	27	20	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	29	-	-	-
18	9.50	SPT	-	-	-	-	2	72	26	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	17	-	-	-
19	10.00	SPT	-	-	-	-	29	51	20	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	23	-	-	-
20	11.00	SPT	-	-	-	-	8	68	24	25	18	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	34	-	-	-
21	11.50	SPT	-	-	-	-	15	66	19	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	40	-	-	-
22	12.50	SPT	-	-	-	-	8	75	17	22	16	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	40	-	-	-
23	13.00	SPT	-	-	-	-	18	29	28	25	40	17	23	-	-	-	CI	-	-	-	-	-	-	-	-	37	-	-	-
24	14.00	SPT	-	-	-	-	0	46	30	24	37	16	21	-	-	-	CI	-	-	-	-	-	-	-	-	44	-	-	-
25	14.50	SPT	-	-	-	-	0	48	30	22	36	17	19	-	-	-	CI	-	-	-	-	-	-	-	-	44	-	-	-
26	15.50	SPT	-	-	-	-	0	69	31	30	19	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	80	-	-	-
27	16.00	SPT	-	-	-	-	0	64	36	32	20	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	91	-	-	-
28	17.00	SPT	-	-	-	-	0	70	30	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	76	24	25	15	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	72	28	32	17	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	66	34	31	19	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	72	28	30	17	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 173

Co-Ordinate :- E - 1185, N - 1450

Reduced Level :- 197.65m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility m _v cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	0	44	37	19	32	15	17	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	42	35	23	40	19	21	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
3	2.00	SPT	-	-	-	-	0	32	43	25	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	12	-	-	-
4	2.50	UDS	1.78	1.54	15.65	2.64	0	31	43	26	43	19	24	16	0.16	39	CI	0.65	7	-	-	TUU	0.15	0.0128	0.45	-	-	0.72	41.7
5	3.00	SPT	-	-	-	-	0	38	36	26	42	20	22	-	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-
6	3.50	UDS	1.99	1.59	25.16	2.65	0	39	36	25	40	17	23	17	0.12	35	CI	0.75	6	-	-	TUU	0.12	0.0110	0.61	-	-	0.67	40.0
7	4.00	SPT	-	-	-	-	0	48	23	29	43	18	25	-	-	-	CI	-	-	-	-	-	-	-	-	25	-	-	-
8	4.50	UDS	2.03	1.65	22.99	2.66	16	62	22	34	17	17	-	-	-	-	SC	0.07	29	-	-	DSU	-	-	-	-	-	0.61	38.0
9	5.00	SPT	-	-	-	-	4	58	38	37	14	23	-	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-
10	6.00	SPT	-	-	-	-	20	56	24	31	15	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	20	-	-	-
11	6.50	UDS	2.04	1.67	22.13	2.65	10	64	26	28	14	14	-	-	-	-	SC	0.06	28	-	-	DSU	-	-	-	-	-	0.59	37.0
12	7.00	SPT	-	-	-	-	9	61	30	32	17	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-
13	7.50	SPT	-	-	-	-	0	76	24	31	14	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	31	-	-	-
14	8.00	SPT	-	-	-	-	36	46	18	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	32	-	-	-
15	8.50	SPT	-	-	-	-	8	70	22	29	14	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	25	-	-	-
16	9.00	SPT	-	-	-	-	38	39	23	26	19	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	35	-	-	-
17	9.50	SPT	-	-	-	-	40	45	15	23	17	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	29	-	-	-
18	10.00	SPT	-	-	-	-	28	57	15	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	39	-	-	-
19	11.00	SPT	-	-	-	-	7	80	13	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	32	-	-	-
20	11.50	SPT	-	-	-	-	40	48	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	35	-	-	-
21	12.50	SPT	-	-	-	-	16	72	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	40	-	-	-
22	13.00	SPT	-	-	-	-	15	71	14	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	43	-	-	-
23	14.00	SPT	-	-	-	-	0	70	30	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	81	-	-	-
24	14.50	SPT	-	-	-	-	11	64	25	24	15	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	15.50	SPT	-	-	-	-	4	70	26	26	16	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	16.00	SPT	-	-	-	-	19	65	16	23	15	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.00	SPT	-	-	-	-	38	47	15	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.50	SPT	-	-	-	-	42	34	24	24	20	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	SPT	-	-	-	-	39	46	15	23	15	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	19.00	SPT	-	-	-	-	33	49	18	29	14	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.00	SPT	-	-	-	-	9	60	31	30	16	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-

KCT Consultancy Services LLP, Ahmedabad

RESULTS OF LABORATORY TEST

Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 174

Co-Ordinate :- E -1185, N - 1167

Reduced Level :- 196.80m

Sr No	Depth of Sample m	Type of Sample	Field Bulk Density gm / cc	Field Dry Density gm / cc	Natural Moisture Content %	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit %	Swelling Pressure Kg/cm ²	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm ²	UCS by Point Load Index in rock Kg/cm ²	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation %	Void Ratio	Porosity %
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plastic Limit %	Plasticity Index %					Cohesion C Kg/cm ²	Angle of Internal Friction ϕ Degree				Compression Index C _c	Coefficient of Volume Compressibility mv cm ² /kg	Pre-consolidation Pressure kg/cm ²				
1	0.00	DS	-	-	-	-	10	59	31		24	15	9	-	-	-	Filled up Soil	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	33	35	32		25	14	11	-	-	-	SC	-	-	-	-	-	-	-	-	7	-	-	-
3	2.00	SPT	-	-	-	-	0	22	55	23	38	17	21	-	-	-	CI	-	-	-	-	-	-	-	-	5	-	-	-
4	2.50	UDS	1.93	1.50	28.32	2.62	0	28	52	20	36	18	18	-	-	-	CI	0.48	6	-	-	TUU	0.16	0.0198	0.42	-	-	0.74	42.6
5	3.00	SPT	-	-	-	-	0	32	43	25	37	16	21	-	-	-	CI	-	-	-	-	-	-	-	-	13	-	-	-
6	3.50	UDS	1.99	1.59	25.16	2.65	0	34	44	22	36	17	19	-	-	-	CI	0.80	7	-	-	TUU	0.12	0.0119	0.51	-	-	0.67	40.0
7	4.00	SPT	-	-	-	-	0	22	53	25	37	15	22	-	-	-	CI	-	-	-	-	-	-	-	-	22	-	-	-
8	4.50	UDS	2.01	1.63	23.34	2.63	0	25	55	20	36	18	18	-	-	-	CI	1.07	6	-	-	TUU	0.10	0.0089	0.62	-	-	0.61	38.0
9	5.00	SPT	-	-	-	-	7	41	34	18	35	19	16	-	-	-	CI	-	-	-	-	-	-	-	-	18	-	-	-
10	5.50	UDS	2.00	1.61	24.53	2.65	9	50	41		34	16	18	-	-	-	SC	0.08	25	-	-	DSU	-	-	-	-	-	0.65	39.4
11	6.00	SPT	-	-	-	-	0	55	45		38	18	20	-	-	-	SC	-	-	-	-	-	-	-	-	22	-	-	-
12	6.50	UDS	2.07	1.71	21.27	2.68	29	51	20		21	17	4	-	-	-	SM	0.00	32	-	-	DSU	-	-	-	-	-	0.57	36.3
13	7.00	SPT	-	-	-	-	7	78	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	33	-	-	-
14	7.50	SPT	-	-	-	-	12	68	20		22	17	5	-	-	-	SM	-	-	-	-	-	-	-	-	28	-	-	-
15	8.00	SPT	-	-	-	-	15	70	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	37	-	-	-
16	8.50	SPT	-	-	-	-	14	53	33		28	23	5	-	-	-	SM	-	-	-	-	-	-	-	-	32	-	-	-
17	9.00	SPT	-	-	-	-	20	57	23		27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	42	-	-	-
18	9.50	SPT	-	-	-	-	11	71	18		21	12	9	-	-	-	SC	-	-	-	-	-	-	-	-	41	-	-	-
19	10.00	SPT	-	-	-	-	8	70	22		22	14	8	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-
20	11.00	SPT	-	-	-	-	5	49	46		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	53	-	-	-
21	11.50	SPT	-	-	-	-	30	18	38	14	30	18	12	-	-	-	CL	-	-	-	-	-	-	-	-	59	-	-	-
22	12.50	SPT	-	-	-	-	17	32	39	12	27	16	11	-	-	-	CL	-	-	-	-	-	-	-	-	23	-	-	-
23	13.00	SPT	-	-	-	-	0	24	54	22	34	15	19	-	-	-	CL	-	-	-	-	-	-	-	-	47	-	-	-
24	14.00	SPT	-	-	-	-	18	65	17		29	14	15	-	-	-	SC	-	-	-	-	-	-	-	-	63	-	-	-
25	14.50	SPT	-	-	-	-	0	52	48		35	21	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	0	59	41		33	18	15	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	64	36		34	17	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	8	53	39		36	18	18	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	61	39		37	20	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	30	48	22	39	19	20	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	38	43	19	38	21	17	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	48	34	18	36	20	16	-	-	-	CI	-	-	-	-	-	-	-	-	>100	-	-	-

RESULTS OF LABORATORY TEST

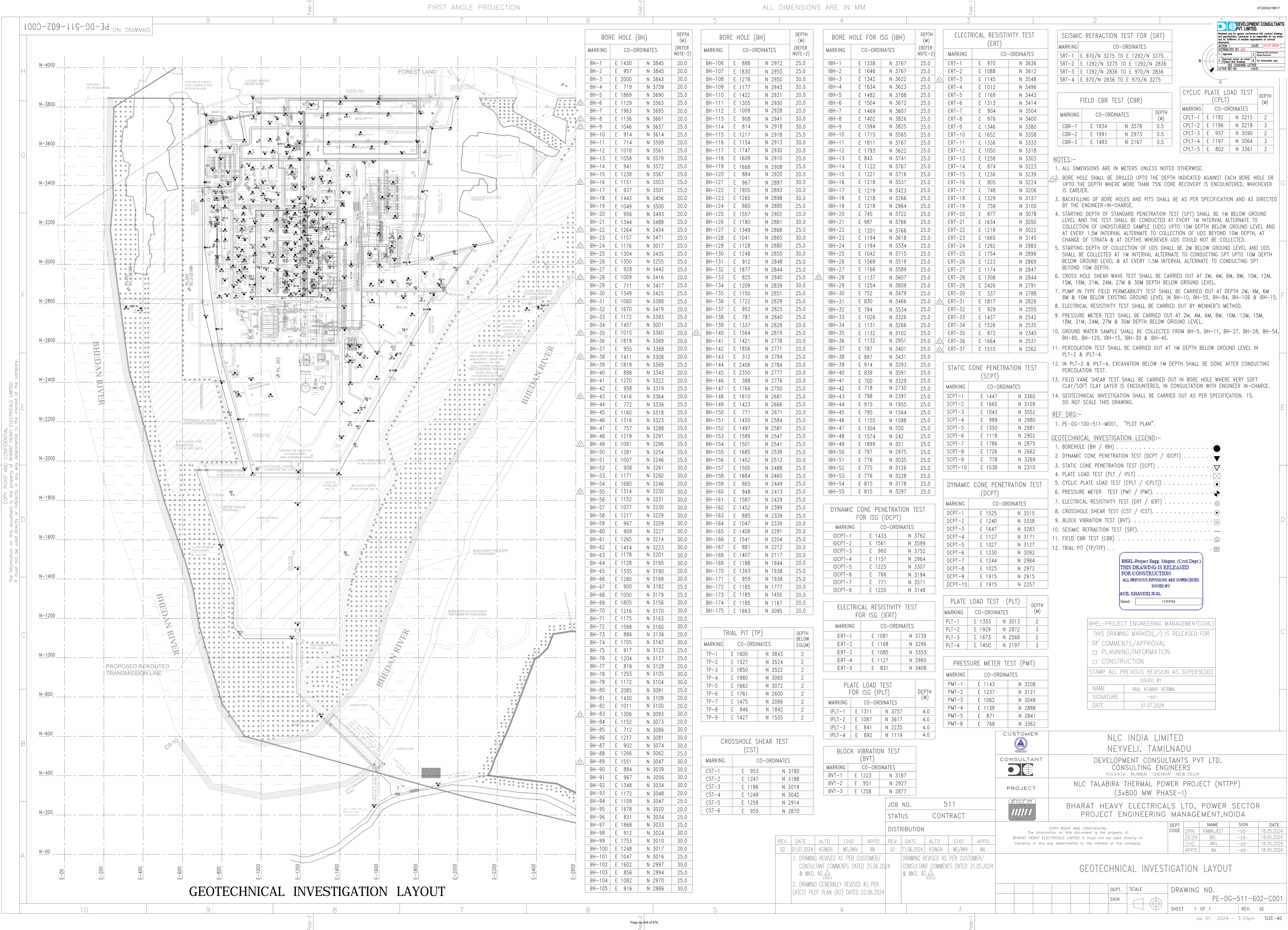
Project :- Proposed structures in Phase 1 of 3 x 800 MW NLC Talabira Thermal Power Project (NTTPP) at village Hirma, Talabira, Odisha

BH No. :- 175

Co-Ordinate :- E - 1654, N - 3106

Reduced Level :- 206.38m

Sr No	Depth of Sample	Type of Sample	Field Bulk Density	Field Dry Density	Natural Moisture Content	Specific Gravity	Grain Size Analysis				Consistency limits			Shrinkage Limit	Swelling Pressure	Free Swell Index	Soil Classification	Shear Parameter		Unconfined Compression Test	UCS by Point Load Index in rock	Type of Shear Test	Consolidation Parameters			SPT N Value	Rock Quality Designation	Void Ratio	Porosity
							Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion C	Angle of Internal Friction ϕ				Compression Index C _c	Coefficient of Volume Compressibility mv	Pre-consolidation Pressure				
1	0.00	DS	-	-	-	-	0	59	41	30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	8	49	43	32	15	17	-	-	-	SC	-	-	-	-	-	-	-	-	16	-	-	-	-
3	2.00	SPT	-	-	-	-	34	36	30	28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	36	-	-	-	-
4	2.50	UDS	1.76	1.70	3.62	2.68	35	39	26	27	17	10	-	-	-	SC	0.05	30	-	-	DSU	-	-	-	-	-	0.58	36.6	-
5	3.00	SPT	-	-	-	-	0	75	25	24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	33	-	-	-	-
6	3.50	UDS	2.00	1.61	24.53	2.65	7	54	39	27	20	7	-	-	-	SM-SC	0.04	27	-	-	DSU	-	-	-	-	-	0.65	39.4	-
7	4.00	SPT	-	-	-	-	2	64	34	29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-	-
8	4.50	UDS	1.97	1.56	26.16	2.64	0	52	48	34	16	18	-	-	-	SC	0.11	25	-	-	DSU	-	-	-	-	-	0.69	40.9	-
9	5.00	SPT	-	-	-	-	0	79	21	24	15	9	-	-	-	SC	-	-	-	-	-	-	-	-	19	-	-	-	-
10	5.50	UDS	2.01	1.62	24.19	2.66	0	81	19	22	14	8	-	-	-	SC	0.04	27	-	-	DSU	-	-	-	-	-	0.64	39.2	-
11	6.00	SPT	-	-	-	-	2	83	15	21	13	8	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-	-
12	6.50	UDS	2.07	1.72	20.45	2.65	0	75	25	29	16	13	-	-	-	SC	0.07	26	-	-	DSU	-	-	-	-	-	0.54	35.2	-
13	7.00	SPT	-	-	-	-	0	82	18	27	17	10	-	-	-	SC	-	-	-	-	-	-	-	-	61	-	-	-	-
14	7.50	UDS	2.09	1.74	19.93	2.67	15	70	15	NP	NP	NP	-	-	-	SM	0.00	30	-	-	DSU	-	-	-	-	-	0.53	34.7	-
15	8.00	SPT	-	-	-	-	0	84	16	23	17	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
16	8.50	SPT	-	-	-	-	2	69	29	28	21	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
17	9.00	SPT	-	-	-	-	0	80	20	25	19	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	84	-	-	-	-
18	9.50	SPT	-	-	-	-	0	83	17	24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	74	-	-	-	-
19	10.00	SPT	-	-	-	-	0	66	34	29	22	7	-	-	-	SM-SC	-	-	-	-	-	-	-	-	41	-	-	-	-
20	11.00	SPT	-	-	-	-	0	76	24	32	17	15	-	-	-	SC	-	-	-	-	-	-	-	-	28	-	-	-	-
21	11.50	SPT	-	-	-	-	0	83	17	29	19	10	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-	-
22	12.50	SPT	-	-	-	-	0	86	14	23	17	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
23	13.00	SPT	-	-	-	-	0	85	15	24	18	6	-	-	-	SM-SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	2	74	24	28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	0	80	20	26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	0	88	12	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-
31	19.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	Boulderous	-	-	-	-	-	-	-	-	>100	-	-	-	-



Project : BHEL

Bore Hole No. : 6

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1129, N 3563

Depth of Water Table : Encountered at 3.70 m depth during investigation

Date of Start: 05-08-2024

Date of Completion: 09-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 199.3 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50			Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with some gravels (CI) 0.60 to 1.50m	1.00	1.00	2.00	SPT	4	6	8	14	-	-			
	1.00			Reddish yellow, fine to medium grained, clayey sand with much gravels (SC) 1.50 to 4.10m	2.00	2.00	2.50	SPT	6	8	12	20	-	-			
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-			
	2.00				3.00	3.00	3.50	SPT	8	9	11	20	-	-			
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-			
	3.00				4.00	4.00	4.50	SPT	11	13	16	29	-	-			
	3.50			Brownish yellow, fine to medium grained, weakly cemented silty sand with little plastic fines and little gravels (SM) 4.10 to 6.70m	4.50	4.50	5.00	SPT	56/8cm	-	-	>100	-	-			
	4.00				5.00	5.00	5.50	SPT	51/7cm	-	-	>100	-	-			
	4.50				5.50	5.50	6.00	SPT	51/10cm	-	-	>100	-	-			
	5.00				6.00	6.00	6.50	SPT	65/9cm	-	-	>100	-	-			
	5.50				6.50	6.50	7.00	SPT	55/4cm	-	-	>100	-	-			
	6.00			Brownish yellow and white, fine to coarse grained, weakly cemented poorly graded gravels (GP) 6.70 to 7.30m	7.00	7.00	7.50	SPT	51/3cm	-	-	>100	-	-			
	6.50				7.50	7.50	8.00	UDS	58/7cm	-	-	>100	-	-			
	7.00				8.00	8.00	8.50	SPT	55/8cm	-	-	>100	-	-			
	7.50				8.50	8.50	9.00	SPT	51/10cm	-	-	>100	-	-			
	8.00				9.00	9.00	9.50	SPT	61/12cm	-	-	>100	-	-			
	8.50			Yellowish brown, fine to medium grained, weakly cemented clayey sand with little to occasional gravels (SC) 7.30 to 11.70m	9.50	9.50	10.00	SPT	36	65/7cm	-	>100	-	-			
	9.00				10.00	10.00	11.00	SPT	42	59/8cm	-	>100	-	-			
	9.50				11.00	11.00	11.50	SPT	68/13 cm	-	-	>100	-	-			
	10.00				11.50	11.50	12.50	SPT	61/12 cm	-	-	>100	-	-			
	10.50				12.50	12.50	13.00	SPT	62/9 cm	-	-	>100	-	-			
	11.00			Brownish yellow, fine to medium grained, weakly cemented silty clayey sand with little to occasional gravels (SM-SC) 11.70 to 15.80m	13.00	13.00	14.00	SPT	55/11 cm	-	-	>100	-	-			
	11.50				14.00	14.00	14.50	SPT	56/8 cm	-	-	>100	-	-			
	12.00				14.50	14.50	15.50	SPT	61/9 cm	-	-	>100	-	-			
	12.50				15.50	15.50	16.00	SPT	56/8 cm	-	-	>100	-	-			
	13.00				16.00	16.00	17.00	SPT	71/9 cm	-	-	>100	-	-			
	13.50			Brownish yellow, fine to medium grained, weakly cemented clayey sand (SC) 15.80 to 16.80m	17.00	17.00	17.50	SPT	55/8 cm	-	-	>100	-	-			
	14.00				17.50	17.50	17.56	SPT	56/6 cm	-	-	>100	-	-			
	14.50				18.50	17.56	18.50	CORE	-	-	-	-	9.00	-			
	15.00				18.50	18.50	18.53	SPT	51/3 cm	-	-	>100	-	-			
	15.50				20.00	18.53	20.00	SPT	61/6 cm	-	-	>100	-	-			
	16.00			Not USED		Highly weathered, completely fractured disintegrated, yellowish brown and light brownish, very weak and friable fractured rock 16.80 to 23.10m	21.50	20.00	21.50	SPT	65/7 cm	-	-	>100	-	-	
	16.50						23.00	21.50	23.00	CORE	-	-	-	-	3.33	-	
	17.00						23.00	23.00	23.04	SPT	61/4 cm	-	-	>100	-	-	
	17.50						25.00	23.04	25.00	CORE	-	-	-	-	22.50	-	
	18.00						23.10 to 25.00m										
18.50																	
19.00																	
19.50																	
20.00																	
20.50																	
21.00																	
21.50																	
22.00																	
22.50																	
23.00																	
23.50																	
24.00																	
24.50																	
25.00																	

Project : BHEL

Bore Hole No. : 9

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1046, N 3637

Depth of Water Table : Encountered at 3.40 m depth during investigation

Date of Start: 01-08-2024

Date of Completion: 07-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 197.560

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Reddish brown, fine to coarse grained, clayey sand with much gravels (SC) 0.50 to 1.60m	1.00	1.00	2.00	SPT	8	12	16	28	-	-	
	1.00			Yellowish brown, fine to medium grained, clayey sand with much gravels (SC) 1.60 to 2.45m	2.00	2.00	2.50	SPT	3	5	7	12	-	-	
	1.50			Brownish, fine to medium grained, silty clayey sand (SM-SC) 2.45 to 3.40m	2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00				3.00	3.00	3.50	SPT	5	8	10	18	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00				4.00	4.00	4.50	SPT	6	8	11	19	-	-	
	3.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.00				5.00	5.00	5.50	SPT	8	11	14	25	-	-	
	4.50				5.50	5.50	6.00	SPT	9	13	16	29	-	-	
	5.00				6.00	6.00	6.50	SPT	10	15	18	33	-	-	
	5.50				6.50	6.50	7.00	SPT	36	50/13cm	-	>100	-	-	
	6.00				7.00	7.00	7.50	SPT	41	50/10cm	-	>100	-	-	
	6.50				7.50	7.50	8.00	UDS	50/10cm	-	-	>100	-	-	
	7.00	Not USED			8.00	8.00	8.50	SPT	29	48	50/7cm	>100	-	-	
	7.50				8.50	8.50	9.00	SPT	34	50/14cm	-	>100	-	-	
	8.00				9.00	9.00	9.50	SPT	55/14cm	-	-	>100	-	-	
	8.50				9.50	9.50	10.00	SPT	55/13cm	-	-	>100	-	-	
	9.00				10.00	10.00	11.00	SPT	55/8cm	-	-	>100	-	-	
	9.50				11.00	11.00	11.50	SPT	55/10 cm	-	-	>100	-	-	
	10.00				11.50	11.50	12.50	SPT	55/9 cm	-	-	>100	-	-	
	10.50				12.50	12.50	13.00	CORE	-	-	-	-	38.75	-	
	11.00				13.00	13.00	14.00	CORE	-	-	-	-	25.33	-	
	11.50				14.00	14.00	14.50	CORE	-	-	-	-	30.66	7.33	
	12.00				15.00	15.00	16.00	CORE	-	-	-	-	30.00	7.33	
	12.50				15.50	15.50	16.00	CORE	-	-	-	-	31.33	-	
	13.00				16.00	16.00	17.00	CORE	-	-	-	-	28.66	-	
	13.50				16.50	16.50	17.50	CORE	-	-	-	-	29.33	8.66	
	14.00				17.00	17.00	17.50	CORE	-	-	-	-	30.66	21.33	
	14.50				18.00	18.00	18.50	CORE	-	-	-	-	32.00	10.50	
	15.00				18.50	17.56	18.50	CORE	-	-	-	-			
	15.50				19.00	18.53	20.00	CORE	-	-	-	-			
	16.00				19.50	20.00	20.00	CORE	-	-	-	-			
	16.50				20.00	20.00	20.00	CORE	-	-	-	-			
	17.00				20.50	20.00	21.50	CORE	-	-	-	-			
	17.50				21.00	20.00	21.50	CORE	-	-	-	-			
	18.00				21.50	20.00	21.50	CORE	-	-	-	-			
	18.50				22.00	21.50	23.00	CORE	-	-	-	-			
	19.00				22.50	21.50	23.00	CORE	-	-	-	-			
	19.50				23.00	21.50	23.00	CORE	-	-	-	-			
	20.00				23.50	21.50	23.00	CORE	-	-	-	-			
	20.50				24.00	21.50	23.00	CORE	-	-	-	-			
	21.00				24.50	21.50	23.00	CORE	-	-	-	-			
	21.50				25.00	23.04	25.00	CORE	-	-	-	-			

21.50 to 25.00m

Project : BHEL

Bore Hole No. : 12

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1018, N 3561

Depth of Water Table : Encountered at 1.00 m depth during investigation

Date of Start: 04-07-2024

Date of Completion: 08-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 195.90

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to very fine grained, sandy clays of high plasticity (CH) 0.00 to 1.50m	0.00	0.00	1.50	DS	-	-	-	-	-	-			
	0.50																
	1.00				1.00	1.00	2.00	SPT	2	2	2	4	-	-			
	1.50			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 1.50 to 3.30m													
	2.00				2.00	2.50	SPT	2	2	3	5	-	-				
	2.50				2.50	2.00	UDS	-	-	-	-	-	-				
	3.00			3.00	3.40	SPT	3	4	5	9	-	-					
	3.50			Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 3.30 to 4.70m	3.50	3.50	4.00	UDS	-	-	-	-	-	-			
	4.00				4.00	4.50	SPT	4	5	8	13	-	-				
	4.50				4.50	5.00	DS	-	UDS attempted but not recovered				-	-			
	5.00			Yellowish brown, very fine grained, clays of high plasticity (CH) 4.70 to 6.30m	5.00	5.00	5.50	SPT	5	6	8	14					
	5.50				5.50	6.00	UDS	-	-	-	-	-	-				
	6.00				6.00	6.50	SPT	6	8	13	21	-	-				
	6.50			Yellowish brown, fine to very fine grained, sandy clays of high plasticity (CH) 6.30 to 7.40m	6.50	6.50	7.00	UDS	-	-	-	-	-	-			
	7.00				7.00	7.50	SPT	7	8	14	22	-	-				
	7.50				7.50	8.00	DS	-	UDS attempted but not recovered				-	-			
	8.00			Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 7.40 to 9.30m	8.00	8.00	8.50	SPT	6	12	12	24					
	8.50				8.50	9.00	UDS	-	-	-	-	-	-				
	9.00				9.00	9.50	SPT	7	10	12	22	-	-				
	9.50			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 9.30 to 10.50m	9.50	9.50	10.00	UDS	-	-	-	-	-	-			
	10.00				10.00	11.50	SPT	11	13	14	27	-	-				
	10.50																
	11.00			Yellowish brown, fine to medium grained, poorly graded sand and silty sand (SP-SM) 10.50 to 11.60m	11.00	11.00	11.50	DS	-	-	-	-	-	-			
	11.50				11.50	12.50	SPT	9	14	15	29	-	-				
	12.00																
	12.50			Highly weatherd, very weak, dark brownish, fine to very fine grained, very thinly lamianted and foliated rock	12.50	12.50	13.00	DS	-	-	-	-	-	-			
	+ 13.00				13.00	13.00	13.45	SPT	10	22	24	46	-	-			
	13.50																
	14.00			11.60 to 14.50m													
	14.50			Highly weathered, very weak, dark blackish grey, very fine grained, very thinly lamanited rock	14.50	13.45	14.50	Core	-	-	-	-	16.66	-			
	15.00				14.50	14.50	14.58	SPT	50/8 cm	-	-	>100	-	-			
	15.50																
	16.00			Highly weathered, very weak, dark blackish grey, very fine grained, very thinly lamanited rock	16.00	14.58	16.00	Core	-	-	-	-	22.00	-			
	16.50																
	17.00																
	17.50			14.50 to 18.00m				17.50	16.00	17.50	Core	-	-	-		16.66	-
18.00	Highly weathered, very weak, dark greyish black, very fine grained, very thinly bedded rock	17.50	17.50	17.56	SPT	50/6 cm	-	-	>100	-	-						
18.50																	
19.00		19.00	17.50	19.00	Core	-	-	-	-	19.33	7.33						
19.50	Not used		Highly weathered, very weak, dark greyish black, very fine grained, very thinly bedded rock	19.00	19.00	19.05	SPT	50/5 cm	-	-	>100	-	-				
20.00																	
20.50				20.50	19.00	20.50	Core	-	-	-	-	30.66	8.66				
21.00																	
21.50																	
22.00			Highly weathered, very weak, dark greyish brown, very fine grained, very thinly laminated rock	22.00	20.50	22.00	Core	-	-	-	-	28.66	6.60				
22.50																	
23.00																	
23.50				23.50	22.00	23.50	Core	-	-	-	-	13.33	-				
24.00			Highly weathered, very weak, dark greyish brown, very fine grained, very thinly laminated rock	23.50	23.50	23.54	SPT	50/4 cm	-	-	>100	-	-				
24.50																	
25.00				25.00	23.50	25.00	Core	-	-	-	-	14.00	-				
24.00 to 25.00m					25.00	25.00	25.06	SPT	50/6 cm	-	-	>100	-	-			

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 13

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1058, N 3579

Depth of Water Table : Encountered at 3.20 m depth during investigation

Date of Start: 17-06-2024

Date of Completion: 20-06-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 197.50

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to coarse grained, silty clayey sand (SM-SC) 0.00 to 1.00m	0.00	0.00	1.50	DS	-	-	-	-	-	-				
	0.50																	
	1.00				1.00	2.00	SPT	3	4	4	8	-	-					
	1.50				Greyish yellow, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 1.00 to 3.00m	2.00	2.00	2.50	SPT	3	3	6	9	-	-			
	2.50					2.50	2.00	UDS	-	-	-	-	-	-	-			
	3.00						Reddish yellow, fine to coarse grained, clayey sand with much gravels (SC) 3.00 to 4.00m	3.00	3.00	3.40	SPT	6	8	8	16	-	-	
	3.50			3.50	4.00			UDS	-	-	-	-	-	-	-			
	4.00				Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 4.00 to 5.00m	4.00	4.00	4.50	SPT	7	10	14	24	-	-			
	4.50					4.50	5.00	UDS	-	-	-	-	-	-	-			
	5.00				Yellowish brown, fine to medium grained, silty sand with (SM) 5.00 to 7.00m	5.00	5.00	5.50	SPT	8	10	11	21	-	-			
	5.50					5.50	6.00	UDS	-	-	-	-	-	-	-			
	6.00					6.00	6.50	SPT	12	15	17	22	-	-	-			
	6.50					6.50	7.00	DS	-	UDS attempted but not recovered				-				
	7.00						Brownish yellow, fine to medium grained, silty sand with little plastic fines (SM) 7.00 to 8.50m	7.00	7.00	7.50	SPT	32	50/12 cm	-	>100	-	-	
	7.50							7.50	8.00	DS	-	UDS attempted but not recovered				-		
	8.00							8.00	8.50	SPT	10	15	18	33	-	-		
	8.50						Light brownish, fine to medium grained, silty sand (SM) 8.50 to 10.00m	8.50	8.50	9.00	SPT	11	17	19	36	-	-	
	9.00							9.00	9.50	SPT	10	15	22	27	-	-		
	9.50							9.50	10.00	DS	-	UDS attempted but not recovered				-		
	10.00			10.00	11.50			SPT	50/9 cm	-	-	>100	-	-				
	10.50				Extremely weathered, to be composed dark brownish, fine to very fine grained, fractured and friable micaceous rock 10.00 to 13.00m	11.00												
	11.50					11.50	13.00	SPT	10	14	19	33	-	-				
	12.00																	
	12.50																	
	+ 13.00						Extremely weathered, decomposed, dark brownish, fine to coarse grained, fractured and friable rock 13.00 to 14.50m	13.00	13.00	14.50	SPT	50/10 cm	-	-	>100	-	-	
	13.50																	
	14.00				Extremely weathered, to be composed dark brownish, fine to very fine grained, fractured and friable micaceous rock 14.50 to 16.00m	14.50	14.50	14.60	SPT	50/11 cm	-	-	>100	-	-			
	15.00																	
	15.50																	
	16.00						Extremely weathered, decomposed, dark brownish, fine to coarse grained, fractured and friable rock 16.00 to 17.50m	16.00	16.00	16.06	SPT	50/9 cm	-	-	>100	-	-	
	16.50																	
	17.00						Very highly weathered, fractured, reddish brown and black, fine to coarse grained, pebble, cobble and boulder size fractured and highly laminated and foliated rock 17.50 to 19.00 m	17.50	16.06	17.50	Core	-	-	-	-	38.66	-	
17.50																		
18.00																		
18.50																		
19.00						Moderately weathered, very weak, reddish brown and black, fine to coarse grained, thinly bedded rock 19.00 to 20.50m	19.00	17.50	19.00	Core	-	-	-	-	30.00	-		
19.50																		
20.00																		
20.50			Moderately weathered, strong, dark brownish black, fine to coarse grained, moderately bedded rock 20.50 to 22.00m	20.50	19.00		20.50	Core	-	-	-	-	62.00	26.66				
21.00																		
21.50																		
22.00					Moderately weathered, strong, dark brownish black, fine to coarse grained, very thinly laminated and foliated rock 22.00 to 24.00m		22.00	20.50	22.00	Core	-	-	-	-	37.33	-		
22.50																		
23.00																		
23.50		23.50	22.00				23.50	Core	-	-	-	-	50.00	-				
24.00		Moderately weathered, strong, dark brownish black, fine to coarse grained, thinly bedded rock	24.50															
24.50																		
25.00			25.00	23.50	25.00	Core	-	-	-	-	44.66	7.33						
				24.00 to 25.00m														

24.00 to 25.00m

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 14

Location : Hirma, Talabira

Depth of Termination : 16.5

Co-ordinates: E 941, N 3572

Depth of Water Table : Encountered at 0.50 m depth during investigation

Date of Start: 19-04-2025

Date of Completion: 22-04-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level:195.69

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth Sample m	Drill Run		Type Sample of	SPT N Value/Penetration of S.S.S				Core Recov- ery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method with Hydraulic feed	0.00	Used		Light brownish, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.50	DS	-	-	-	-	-	-				
	0.50					1.00	1.00	2.00	SPT	2	3	4	7	-	-			
	1.00																	
	1.50																	
	2.00																	
	2.50																	
	3.00																	
	3.50																	
	4.00																	
	4.50																	
	5.00				Light greyish brown, fine to medium grained, clayey sand (SC) 4.80 to 5.70m	5.00	5.00	5.50	SPT	5	6	12	18	-	-			
	5.50						5.50	5.50	6.00	UDS	-	-	-	-	-	-		
	6.00						6.00	6.00	6.50	SPT	6	8	13	21	-	-		
	6.50						6.50	6.50	7.00	UDS	-	-	-	-	-	-		
	7.00			Not used		Reddish yellow, fine to medium grained, silty sand (SM) 5.70 to 7.30m	7.00	7.00	7.50	SPT	9	12	15	27				
	7.50							7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	8.00							8.00	8.00	8.40	SPT	16	28	31	59			
	8.50																	
	9.00					9.00	8.40	9.00	Core	-	-	-	-	18.33	-			
	9.50																	
	10.00																	
	10.50																	
	11.00					10.50	9.00	10.50	Core	-	-	-	-	11.33				
	11.50																	
	12.00																	
	12.50																	
	13.00					12.00	10.50	12.00	Core	-	-	-	-	24.66	-			
	13.50																	
	14.00																	
	14.50																	
	15.00					13.50	12.00	13.50	Core	-	-	-	-	30.66	8.00			
	15.50																	
	16.00																	
	16.50																	
					15.00 to 16.50m													

Project : BHEL

Bore Hole No. : 15

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1238, N 3567

Depth of Water Table : Encountered at 4.60m depth during investigation

Date of Start: 04-07-2024

Date of Completion: 09-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 201.15 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 3.10m	0.00	0.00	1.50	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	2.00	SPT	6	6	8	14	-	-		
	1.50														
	2.00			Yellowish brown, fine to medium grained, silty clayey sand (SM-SC) 3.10 to 4.70m	2.00	2.00	2.50	SPT	7	8	13	21	-	-	
	2.50				2.50	2.00	UDS	-	-	-	-	-	-		
	3.00				3.00	3.40	SPT	5	7	9	16	-	-		
	3.50				3.50	4.00	UDS	-	-	-	-	-	-		
	4.00			Yellowish brown, fine to medium grained, clayey sand (SC) 4.70 to 5.40m	4.00	4.00	4.50	SPT	12	21	23	44	-	-	
	4.50														
	5.00				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.50				5.00	5.00	5.50	SPT	7	14	27	41	-	-	
	6.00			Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM) 5.40 to 8.70m	5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.50				6.00	6.00	6.50	SPT	25	75/7 cm	-	>100	-	-	
	7.00				6.50	6.50	7.00	DS	-	UDS attempted but not recovered				-	
	7.50				7.00	7.00	7.50	SPT	12	8	8	16	-	-	
	8.00				7.50	7.50	8.00	DS	-	UDS attempted but not recovered				-	
	8.50				8.00	8.00	8.50	SPT	25	65/12 cm	-	>100	-	-	
	9.00				8.50	8.50	9.00	SPT	51/12 cm	-	-	-	-	-	
	9.50				9.00	9.00	9.50	SPT	51/7 cm	-	-	>100	-	-	
	10.00			Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 8.70 to 12.70m	9.50	9.50	10.00	SPT	37	63/12 cm	-	>100	-	-	
	10.50				10.00	10.00	11.50	SPT	31	70/13 cm	-	>100	-	-	
	11.00				11.00	11.00	11.50	SPT	51/7 cm	-	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	51/9 cm	-	-	>100	-	-	
	12.00			Yellowish brown, fine to medium grained, silty sand (SM) 12.70 to 14.30m	12.50	12.50	13.00	SPT	51/7 cm	-	-	>100	-	-	
	13.00				13.00	13.00	14.50	SPT	51/6 cm	-	-	>100	-	-	
	14.00														
	14.50														
	15.00			Yellowish brown, fine to medium grained, clayey sand (SC) 14.30 to 15.60m	14.50	14.50	15.50	SPT	51/7 cm	-	-	>100	-	-	
	15.50														
	16.00				15.50	15.50	15.55	SPT	51/5 cm	-	-	>100	-	-	
	16.50														
	17.00	Not used		Highly weathered, completely fractured and dark reddish yellow, fine to coarse grained, gravel, pebble and cobble size angular interlocking fragments of fractured rock 15.60 to 17.50m	16.00	15.55	16.00	DS	-	-	-	-	-	-	
16.50															
17.00															
17.50	17.50				16.00	17.50	DS	-	-	-	-	-	-		
18.00	Highly weathered, very weak, dark brownish yellow, fine to coarse grained, fractured rock 17.50 to 22.00m														
18.50															
19.00				19.00	17.50	19.00	Core	-	-	-	-	9.33	-		
19.50															
20.00															
20.50				20.50	19.00	20.50	Core	-	-	-	-	11.33	-		
21.00	Highly weathered, very weak, dark brownish yellow, fine to coarse grained, fractured rock with white colored quartz vein 22.00 to 23.50m														
21.50															
22.00				22.00	20.50	22.00	Core	-	-	-	-	8.66	-		
22.50															
23.00	Highly weathered, completely fractured and disintegrated, decomposed, yellowish brown, fine to medium grained, friable fractured rock														
23.50				23.50	22.00	23.50	Core	-	-	-	-	9.33	-		
24.00				23.50	23.50	23.53	SPT	51/3 cm	-	-	>100	-	-		
24.50															
25.00				25.00	23.53	25.00	Core	-	-	-	-	39.33	29.0		
23.50 to 25.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 16

Location : Hirma, Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1151, N 3503

Depth of Water Table : Encountered at 3.60 m depth during investigation

Date of Start: 17-06-2024

Date of Completion: 20-06-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 199.300 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.80m	0.00	0.00	1.50	DS	-	-	-	-	-	-	
	0.50														
	1.00			Dark pinkish yellow, fine to very fine grained, sandy clays of intermediate plasticity (CI) 0.80 to 2.50m	1.00	1.00	2.00	SPT	5	7	8	15	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	6	8	8	16	-	-	
	2.50				2.50	2.50	2.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.40	SPT	7	10	15	25	-	-	
	3.50			Dark brownish yellow, very fine grained, clays of high plasticity with occasional gravels (CH) 2.50 to 5.50m	3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	6	11	16	27	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	7	10	10	20	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00			Brownish yellow, fine to medium grained, clayey sand (SC) 5.50 to 7.50m	6.00	6.00	6.50	SPT	9	11	13	24	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	5	7	8	15	-	-	
	7.50				7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	8.00				8.00	8.00	8.50	SPT	10	12	16	28	-	-	
	8.50				8.50	8.50	9.00	DS	-	UDS attempted but not recovered				-	-
	9.00				9.00	9.00	9.50	SPT	16	19	22	41	-	-	
	9.50				9.50	9.50	10.00	UDS	-	-	-	-	-	-	
	10.00				10.00	10.00	10.50	SPT	7	11	14	25	-	-	
	10.50				10.50	10.50	11.00	UDS	-	-	-	-	-	-	
	11.00			Light brownish yellow to Reddish yellow, very fine grained, clays of high plasticity (CH) 7.50 to 16.00m	11.00	11.00	11.50	SPT	11	13	17	30	-	-	
	11.50				11.50	11.50	12.00	SPT	10	14	19	33	-	-	
	12.00				12.00	12.00	12.50	SPT	9	13	16	29	-	-	
	12.50				12.50	12.50	13.00	SPT	31	50/7 cm	-	>100	-	-	
	+ 13.00				13.00	13.00	13.50	DS	-	UDS attempted but not recovered				-	
	13.50				13.50	13.50	14.00	SPT	11	14	17	31	-	-	
	14.00				14.00	14.00	14.50	DS	-	UDS attempted but not recovered				-	
	14.50				14.50	14.50	14.60	SPT	9	11	17	24	-	-	
	15.00				15.00	15.00	15.50	DS	-	UDS attempted but not recovered				-	
	15.50														
	16.00	Not used		Highly weathered, completely fractured and disintegrated, reddish brown and black, fine to coarse grained, gravel, pebble and cobble size, fractured, foliated, thinly laminated rock with infilled sandy clays 16.00 to 17.50m	16.00	16.00	16.06	SPT	50/6 cm	-	-	>100	-	-	
	16.50														
	17.00														
	17.50				17.50	16.06	17.50	Core	-	-	-	-	14.00	-	
	18.00														
	18.50			Highly weathered, moderately weak, dark brownish and blackish brown, fine to coarse grained, fractured rock 17.50 to 20.50m	19.00	17.50	19.00	Core	-	-	-	-	23.33	-	
	19.00														
	19.50														
	20.00														
	20.50				20.50	19.00	20.50	Core	-	-	-	-	32.00	13.33	
	21.00														
	21.50														
	22.00			Moderately weathered, moderately strong, dark reddish and blackish brown, fine to coarse grained, rock with close spacing of discontinuities	22.00	20.50	22.00	Core	-	-	-	-	62.33	20.00	
	22.50														
	23.00														
	23.50				23.50	22.00	23.50	Core	-	-	-	-	55.33	37.33	
	24.00														
	24.50														
	25.00				25.00	23.50	25.00	Core	-	-	-	-	88.66	-	

20.50 to 25.00m

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 17

Location : Hirma, Talabira

Depth of Termination : 16.5

Co-ordinates: E 937, N 3501

Depth of Water Table : Encountered at 1.00 m depth during investigation

Date of Start: 17-06-2024

Date of Completion: 23-06-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 194.28 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 0.00 to 2.20m	0.00	0.00	1.50	DS	-	-	-	-	-	-				
	0.50				1.00	1.00	2.00	SPT	7	15	22	37	-	-				
	1.00																	
	1.50																	
	2.00			Yellowish brow, fine to coarse grained, poorly graded sand with occasional gravels (SP) 2.20 to 2.60m	2.00	2.00	2.50	SPT	9	16	25	41	-	-				
	2.50																	
	3.00			Light greyish brown, fine to very fine grained, silty clays of high plasticity with occasional gravels (CH) 2.60 to 3.50m	2.50	2.50	2.00	DS	-	UDS attempted but not recovered				-		-		
	3.00				3.00	3.40	SPT	10	13	28	41	-	-					
	3.50				3.50	4.00	SPT	37	50/2 cm	-	>100	-	-					
	4.00			Greyish brown, fine to very fine grained, silty clays of low plasticity with occasional gravels (CL) 3.50 to 6.10m	4.00	4.00	4.50	SPT	44	50/1 cm	-	>100	-	-				
	4.50				4.50	5.00	UDS	-	-	-	-	-	-					
	5.00				5.00	5.50	SPT	50/6 cm	-	-	>100	-	-					
	5.50				5.50	6.00	SPT	50/6 cm	-	-	>100	-	-					
	6.00				6.00	6.10	SPT	41	50/4 cm	-	>100	-	-					
	6.50				Not used		Highly weathered, very weak, dark greyish, fine grained, very thinly bedded SHALE 6.10 to 12.00m	7.00	7.50	6.10	7.50	Core	-	-		-	-	24.00
	7.50																	
	8.00																	
	8.50																	
	9.00																	
	9.50	9.00	7.50	9.00				Core	-	-	-	-	36.00	-				
	10.00																	
	10.50																	
	11.00																	
	11.50																	
	12.00	Not used		Moderately weathred, very weak, dark greyish, fine grained, very thinly bedded rock 12.00 to 13.50m	12.00	10.50	12.00	Core	-	-	-	-	30.00	8.00				
	12.50																	
	13.00																	
	13.50																	
	14.00																	
	14.50			Fresh, very weak, dark greyish black, fine grained, massive SHALE	15.00	13.50	15.00	Core	-	-	-	-	92.00	46.00				
	15.00																	
	15.50																	
	16.00																	
	16.50															16.50	15.00	16.50
	13.50 to 16.50m																	

Project : BHEL

Bore Hole No. : 18

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1443, N 3456

Depth of Water Table : Encountered at 8.10 m depth during investigation

Date of Start: 15-07-2024

Date of Completion: 16-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 206.41

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method ▼	0.00	Not used		Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 0.00 to 1.50m	0.00	0.00	1.50	DS	-	-	-	-	-	-				
	0.50				1.00	1.00	2.00	SPT	5	18	24	42	-	-				
	1.00																	
	1.50			Yellowish brown, fine to medium grained, silty sand with some to much gravels (SM) 1.50 to 3.10m												2.00	2.00	2.50
	2.50				2.50	2.00	UDS	-	-	-	-	-	-	-				
	3.00				3.00	3.40	SPT	10	26	37	63	-	-					
	3.50		3.50	4.00	UDS	-	-	-	-	-	-	-	-					
	4.00		4.00	4.50	SPT	11	26	23	49	-	-							
	4.50		4.50	5.00	UDS	-	-	-	-			-	-					
	5.00		5.00	5.50	SPT	5	14	20	34									
	5.50		5.50	6.00	UDS	-	-	-	-	-	-	-	-					
	6.00		6.00	6.50	SPT	12	10	8	18	-	-							
	6.50		6.50	7.00	SPT	50/10 cm	-	-	>100	-	-							
	7.00		7.00	7.50	SPT	50/12 cm	-	-	>100	-	-							
	7.50		7.50	8.00	SPT	50/7 cm	-	-	>100									
	8.00		8.00	8.50	SPT	50/8 cm	-	-	>100									
	8.50		8.50	9.00	SPT	22	50/8 cm	-	>100	-	-							
	9.00		9.00	9.50	SPT	33	50/9 cm	-	>100									
	9.50		9.50	10.00	SPT	24	58	42/8 cm	>100									
	10.00		10.00	11.00	SPT	50/7 cm	-	-	>100	-	-							
	10.50			Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 10.50 to 12.70m	11.00	11.00	11.50	SPT	50/13 cm			-	-	>100				
	11.50				11.50	12.50	SPT	50/10 cm	-			-	>100					
	12.00					Yellowish brwon, fine to medium grained, silty sand (SM) 12.70 to 14.30m	12.50	12.50	13.00	SPT	50/5 cm	-	-	>100				
	13.00		13.00	14.00			SPT	50/5 cm	-	-	>100							
	13.50		14.00	14.00			14.50	SPT	50/7 cm	-	-	>100						
	14.50				14.50	15.00							SPT	50/7 cm		-	-	>100
	15.00				15.50	15.00							15.03	SPT		50/6 cm	-	-
	16.00		16.00	15.50	16.00	SPT	50/4 cm	-	-	>100	-	-						
	16.50			Yellowish brown, fine to medium grained, poorly graded sand (SP)	17.00	17.00	17.50	SPT	50/4 cm	-			-	>100				
	17.50				17.50	18.50	SPT	50/4 cm	-	-			>100					
	18.00				18.50	18.50	19.00	SPT	50/3 cm	-			-	>100				
	18.50																	
19.00																		
19.50	19.00	19.00			20.00	SPT	50/4 cm	-	-	>100			30.20	-				
20.00	20.00	20.00			20.03	SPT	50/3 cm	-	-	>100								
14.30 to 20.00m																		

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 19

Location : Hirma, Talabira

Depth of Termination : 20

Co-ordinates: E 1049, N 3500

Depth of Water Table : Encountered at 1.40m depth during investigation

Date of Start: 06-07-2024

Date of Completion: 10-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 195.90

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 0.00 to 2.50m	0.00	0.00	1.50	DS	-	-	-	-	-	-		
	0.50				1.00	1.00	2.00	SPT	2	3	3	6	-	-		
	1.00															
	1.50															
	2.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 2.50 to 3.30m	2.00	2.00	2.50	SPT	3	5	7	12	-	-		
	2.50				2.50	2.50	2.00	UDS	-	-	-	-	-	-		
	3.00				3.00	3.00	3.40	SPT	5	7	11	18	-	-		
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-		
	4.00			Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (SC) 3.30 to 7.30m	4.00	4.00	4.50	SPT	5	8	12	20	-	-		
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-		
	5.00				5.00	5.00	5.50	SPT	9	11	12	23	-	-		
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-		
	6.00				6.00	6.00	6.50	SPT	5	6	9	15	-	-		
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-		
	7.00				7.00	7.00	7.50	SPT	6	11	15	26	-	-		
	7.50				7.50	7.50	8.00	SPT	6	10	12	22	-	-		
	8.00			Yellowish brown, fine to medium grained, silty sand (SM) 7.30 to 9.30m	8.00	8.00	8.50	SPT	7	9	11	20	-	-		
	8.50				8.50	8.50	9.00	SPT	8	9	15	24	-	-		
	9.00				9.00	9.00	9.50	SPT	10	12	16	28	-	-		
	9.50				9.50	9.50	10.00	SPT	60/10cm	-	-	>100	-	-		
	10.00	Greyish brwon, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 9.30 to 10.60m	10.00	10.00	10.50	SPT	60/8cm	-	-	>100	-	-				
	10.50		10.50	10.50	10.59	SPT	65/9cm	-	-	>100	-	-				
	11.00		Not used		Highly weathered, very weak, dark greyish brown, very fine grained, foliated rock 10.60 to 15.50m	12.00	10.59	12.00	Core	-	-	-	-	5.33		-
	12.50	12.00				12.00	12.08	SPT	50/8cm	-	-	>100	-	-		
	+ 13.00	13.50				12.08	13.50	Core	-	-	-	-	16.00	-		
	13.50	13.50				13.50	13.06	SPT	50/6cm	-	-	>100	-	-		
	14.00	Slightly weathered, weak, dark brownish grey, very fine grained, thinly laminated rock 15.50 to 19.60m				15.00	13.06	15.00	Core	-	-	-	-	27.66		7.33
	15.50					16.50	15.00	16.50	Core	-	-	-	-	70.66		18.66
	16.00															
	16.50															
	17.00	Slightly weathered, weak, dark grey, fine grained, massive rock	18.00	16.50	18.00	Core	-	-	-	-	74.00	44.66				
	17.50															
18.00																
18.50																
19.00	19.50	18.00	19.50	Core	-	-	-	-	62.66	62.66						
19.50																
20.00	20.00	19.50	20.00	Core	-	-	-	-	82.00	70.00						
19.60 to 20.00m																

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 20

Location : Hirma, Talabira

Depth of Termination : 16.0 m

Co-ordinates: E 956, N 3493

Depth of Water Table : Encountered at 1.00 m depth during investigation

Date of Start: 17-06-2024

Date of Completion: 19-06-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 194.40 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to medium grained, sandy clays of low plasticity with some gravels (CL) 0.00 to 0.60m	0.00	0.00	1.50	DS	-	-	-	-	-	-	
	0.50														
	1.00			Brownish yellow, very fine grained, silty clays of intermediate plasticity with some gravels (CI) 0.60 to 5.50m	1.00	1.00	2.00	SPT	4	6	9	15	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	8	13	17	30	-	-	
	2.50				2.50	2.50	2.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.40	SPT	10	13	25	38	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	11	24	31	55	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			5.00	5.00	5.50	SPT	50/13 cm	-	-	>100	-	-		
	5.50			Brownish yellow, very fine grained, very finely laminated/foliated SHALE and greyish brown, very fine grained, silty clays of intermediate plasticity 5.50 to 6.50m	5.50	5.50	6.00	DS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	44	63/14 cm	-	>100	-	-	
	6.50				6.50	6.50	7.00	SPT	67/15cm	-	-	>100	-	-	
	7.00				7.00	7.00	7.50	SPT	53/15 cm	-	-	>100	-	-	
	7.50				7.50	7.50	8.00	SPT	50/14 cm	-	-	>100	-	-	
	8.00				8.00	8.00	8.50	SPT	50/9 cm	-	-	>100	-	-	
	8.50				8.50	8.50	9.00	SPT	50/11 cm	-	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	50/6 cm	-	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/7 cm	-	-	>100	-	-	
	10.00				10.00	10.00	10.20	SPT	50/4 cm	-	-	>100	-	-	
	10.50			Not used											
	11.00														
	11.50	11.50	10.20			11.50	Core	-	-	-	-	23.00	-		
	12.00														
	12.50														
	+ 13.00	Moderately weathered, moderately weak, dark blackish grey, fine grained, thinly bedded SHALE 12.00 to 15.00m	13.00			11.53	13.00	Core	-	-	-	-	59.00	7.00	
	13.50														
14.00															
14.50	14.50		13.05			14.50	Core	-	-	-	-	65.00	19.00		
15.00															
15.50	Slightly weathered, very weak, dark black, fine grained, massive rock														
16.00		16.00	14.50			16.00	Core	-	-	-	-	97.00	84.00		
15.00 to 16.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 21

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1344, N 3488

Depth of Water Table : Encountered at 7.10m depth during investigation

Date of Start: 07-07-2024

Date of Completion: 09-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 203.66

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Used		Brownish, fine to very fine grained, clayey sand (SC) 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50			Reddish yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI) 0.40 to 1.50m	1.00	1.00	2.00	SPT	1	1	1	2	-	-		
	1.00															
	1.50															
	2.00															
	2.50			Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC) 1.50 to 4.30m	2.00	2.00	2.50	SPT	5	4	5	9	-	-		
	2.50				2.50	3.00	UDS	-	-	-	-	-	-			
	3.00				3.00	3.50	SPT	10	6	9	15	-	-			
	3.50				3.50	4.00	SPT	10	12	10	22	-	-			
	4.00				4.00	4.50	SPT	11	17	13	30	-	-			
	4.50			Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM) 4.30 to 5.50m	4.50	4.50	5.00	UDS								
	5.00				5.00	5.50	SPT	14	26	17	43	-	-			
	5.50				5.50	6.00	UDS					-	-			
	6.00				6.00	6.50	SPT	9	13	22	35	-	-			
	6.50				6.50	7.00	UDS	-	-	-	-	-	-			
	7.00	Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC) 5.50 to 10.20m	7.00	7.00	7.50	SPT	50/12cm	-	-	>100	-	-				
	7.50		7.50	8.00	SPT	50/10cm	-	-	>100	-	-					
	8.00		8.00	8.50	SPT	50/13cm	-	-	>100	-	-					
	8.50		8.50	9.00	SPT	50/9cm	-	-	>100	-	-					
	9.00		9.00	9.50	SPT	50/4cm	-	-	>100	-	-					
	9.50		9.50	10.00	SPT	50/7cm	-	-	>100	-	-					
	10.00		10.00	11.00	SPT	50/13cm	-	-	>100	-	-					
	11.00		Yellowish brown, fine to medium grained, silty sand (SM) 10.20 to 11.70m	11.00	11.00	11.50	SPT	50/7cm	-	-	>100	-	-			
	11.50			11.50	12.50	SPT	50/3cm	-	-	>100	-	-				
	12.00			Yellowish brown, fine to medium grained, clayey sand with occasional to much gravels (SC) 11.70 to 15.70m	12.50	12.50	13.00	SPT	50/6cm	-	-	>100	-	-		
	+ 13.00	13.00			14.00	SPT	50/8cm	-	-	>100	-	-				
	13.50	Yellowish brown, fine to medium grained, clayey sand with occasional to much gravels (SC) 11.70 to 15.70m			14.00	14.00	14.50	SPT	50/5cm	-	-	>100	-	-		
	14.50		14.50		15.50	SPT	50/5cm	-	-	>100	-	-				
	15.00		15.50		15.56	SPT	50/6cm	-	-	>100	-	-				
	16.00		Highly weathered, weak, reddish yellow and yellowish brown, fine to coarse grained, fractured and friable rock	17.00	17.00	17.00	Core	-	-	-	-	3.00	-			
	17.50			17.00	17.02	SPT	50/2 cm	-	-	>100						
	18.00	18.50		18.50	Core	-	-	-	-	2.00	-					
	18.50	18.50		18.58	SPT	50/8 cm	-	-	>100							
	19.00	15.70 to 23.50m		20.00	18.58	20.00	Core	-	-	-	-	5.00	-			
	20.50			20.00	20.02	SPT	50/2 cm	-	-	>100						
21.00	21.50			20.02	21.50	Core	-	-	-	-	26.00	-				
22.00	21.50			21.50	21.52	SPT	50/2cm	-	-	>100						
22.50	23.00			20.52	23.00	Core	-	-	-	-	12.00	-				
23.50	Highly weathered, very weak, reddish yellow and brownish yellow, fine to coarse grained, fractured and friable rock	23.00		23.00	23.02	SPT	50/2cm	-	-	>100						
24.00		23.50 to 25.00m	24.50	23.02	24.50	Core	-	-	-	-	17.00	-				
24.50			24.50	24.53	SPT	50/3cm	-	-	>100							
25.00			24.53	25.00	Core	-	-	-	-	10.00	-					
			25.00	25.02	SPT	50/2cm	-	-	>100							

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 22

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1264, N 3434

Depth of Water Table : Encountered at 3.80m depth during investigation

Date of Start: 07-08-2024

Date of Completion: 10-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.32 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine o medium grained, clayey sand (SC) 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00			1.00	1.00	2.00	SPT	4	4	5	9	-	-		
	1.50														
	2.00			2.00	2.00	2.50	SPT	6	7	9	16	-	-		
	2.50			2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00			3.00	3.00	3.50	SPT	6	6	10	16	-	-		
	3.50			Reddish yellow to reddish brown, fine to medium grained, clayey sand with little to much gravels (SC) 0.40 to 7.30m	3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	7	8	11	19	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	7	7	12	19	-	-	
	5.50				5.50	5.50	6.00	UDS					-	-	
	6.00				6.00	6.00	6.50	SPT	8	10	12	22	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	15	20	25	45	-	-	
	7.50				7.50	7.50	8.00	SPT	30	50/8cm	-	>100	-	-	
	8.00			Dark brownish, fine to medium grained, cemented sand 7.30 to 9.60m	8.00	8.00	8.50	SPT	50/10cm	-	-	>100	-	-	
	8.50				8.50	8.50	9.00	SPT	50/12cm	-	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	50/11cm	-	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/11cm	-	-	>100	-	-	
	10.00			Light yellowish brwon, fine to medium grained, cemented clayey sand mica (SC) 9.60 to 10.40m	10.00	10.00	11.00	SPT	18	25	35	60	-	-	
	10.50			Reddish yellowish brown, fine to medium grained, cemented sand 10.40 to 11.60m											
	11.00				11.00	11.00	11.50	SPT	50/13cm	-	-	>100	-	-	
	11.50			Dark brownish, fine to emdium grained, cemented clayey sand (SC) 11.60 to 13.70m	11.50	11.50	12.50	SPT	50/12cm	-	-	>100	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	50/9cm	-	-	>100	-	-	
	+ 13.00				13.00	13.00	14.00	SPT	50/9cm	-	-	>100	-	-	
	13.50			Yellowish brown to dark brownish, fine to medium grained, cemented sand 13.70 to 16.20m											
	14.00				14.00	14.00	14.50	SPT	50/6cm	-	-	>100	-	-	
	14.50				14.50	14.50	15.50	SPT	50/8cm	-	-	>100	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/10cm	-	-	>100	-	-	
	16.00			Yellowish brown, fine to medum grained, cemented clayey sand with occasional to much gravels (SC) 16.20 to 17.70m	16.00	16.00	17.00	SPT	50/10cm	-	-	>100	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	50/9cm	-	-	>100	-	-	
	17.50				17.50	17.50	17.59	SPT	50/9cm	-	-	>100	-	-	
18.00	Not used		Highly weathered, very weak, brownish, fine to coarse grained, rock with close spacing of discontinuties 17.70 to 21.50m												
18.50				18.50	17.59	18.50	Core	-	-	-	-	21.25	16.25		
19.00															
19.50															
20.00			Highly weathered, weak, brownish, fine to coarse grained, rock with moderately close spacing of discontinuties 21.50 to 22.50m	20.00	18.50	20.00	Core	-	-	-	-	16.66	-		
20.50															
21.00															
21.50				21.50	20.00	21.50	Core	-	-	-	-	37.33	26.00		
22.00			Highly weathered, very weak, brownish, fine to medium grained, rock with very close spacing of discontinuties												
22.50															
23.00				23.00	21.50	23.00	Core	-	-	-	-	13.33	8.66		
23.50															
24.00															
24.50				24.50	23.00	24.50	Core	-	-	-	-	24.66	16.00		
25.00				25.00	24.50	25.00	Core	-	-	-	-	28.00	-		
22.50 to 25.00m															

Project : BHEL

Bore Hole No. : 23

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1157, N 3471

Depth of Water Table : Encountered at 4.60m depth during investigation

Date of Start: 04-07-2024

Date of Completion: 08-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 199.40 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 0.50 to 2.30m	1.00	1.00	2.00	SPT	3	4	5	9	-	-		
	1.50															
	2.00			2.00	2.00	2.50	SPT	5	7	8	15	-	-			
	2.50			2.50	2.50	3.00	DS	-	UDS attempted but not recovered				-			
	3.00			Yellowish brown, fine to medium grained, clayey sand (SC) 2.30 to 4.00m	3.00	3.00	3.50	SPT	4	7	10	17	-	-		
	3.50			3.50	3.50	4.00	DS	-	UDS attempted but not recovered				-			
	4.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 4.00 to 5.30m	4.00	4.00	4.50	SPT	6	8	11	19	-	-		
	4.50			4.50	4.50	5.00	DS	-	UDS attempted but not recovered				-			
	5.00			5.00	5.00	5.50	SPT	8	10	11	21	-	-			
	5.50			5.50	5.50	6.00	DS	-	UDS attempted but not recovered				-			
	6.00			6.00	6.00	6.50	SPT	7	10	13	23	-	-			
	6.50			6.50	6.50	7.00	SPT	9	10	12	22	-	-			
	7.00			Yellowish brown, fine to medium grained, clayey sand (SC) 5.30 to 9.00m	7.00	7.00	7.50	SPT	10	12	12	24	-	-		
	7.50				7.50	7.50	8.00	SPT	-	-	-	-	-	-		
	8.00				8.00	8.00	8.50	SPT	7	9	16	25	-	-		
	8.50				8.50	8.50	9.00	UDS	-	-	-	-	-	-		
	9.00				9.00	9.00	9.50	SPT	10	15	20	35	-	-		
	9.50				Yellowish brown, fine to very fine grained, clays of high plasticity (CH) 9.00 to 10.40m	9.50	9.50	10.00	UDS	-	-	-	-	-	-	
	10.00					10.00	10.00	11.00	SPT	10	11	14	25	-	-	
	10.50															
	11.00				Yellowish brown, fine to very fine grained, sandy clays of high plasticity (CH) 10.40 to 12.60m	11.00	11.00	11.50	UDS	-	-	-	-	-	-	
	11.50				11.50	11.50	12.50	SPT	12	14	25	39	-	-		
	12.00															
	12.50			Yellowish brown, fine to medium grained, sandy clays of low plasticity (CL) 12.60 to 14.60m	12.50	12.50	13.00	UDS	-	-	-	-	-	-		
	13.00				13.00	13.00	14.00	SPT	9	19	24	43	-	-		
	13.50															
	14.00				14.00	14.00	14.50	UDS	-	-	-	-	-	-		
	14.50			14.50	14.50	15.50	SPT	27	50/10cm	-	>100	-	-			
	15.00			Dark greyish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 14.60 to 16.00m	15.50	15.50	16.00	SPT	50/10cm	-	-	>100	-	-		
	15.50				16.00	16.00	16.15	SPT	50/9cm	-	-	>100	-	-		
	16.00															
16.50		Highly weathered, completely fractured and disintegrated, dark blackish grey to yellowish brown, very fine grained, rock 16.00 to 20.50m	17.50	17.50	17.53	SPT	50/3 cm	-	-	>100	-					
17.00																
17.50																
18.00			Not used			19.00	17.53	19.00	Core	-	-	-	-	7.00	-	
18.50																
19.00																
19.50																
20.00					Highly weathered, weak, dark brownish, fine to very fine grained, rock with close spacing of discontinuities 20.50 to 23.00m	20.50	19.00	20.50	Core	-	-	-	-	26.00	7.00	
20.50																
21.00																
21.50																
22.00			22.00	20.50	22.00	Core	-	-	-	-	48.00	14.00				
22.50																
23.00			Highly weathered, weak, dark brownish grey, fine to very fine grained, fractured rock 23.00 to 24.50m	23.50	22.00	23.50	Core	-	-	-	-	43.00	-			
23.50																
24.00																
24.50					Highly weathered, weak, dark brownish, fine to very fine grained, rock with wide spacing of discontinuities 24.50 to 25.00m	25.00	23.50	25.00	Core	-	-	-	-	82.00	45.00	
25.00																
24.50 to 25.00m																

Page no.562 of 618

Project : BHEL

Bore Hole No. : 25

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1304, N 3435

Depth of Water Table : Encountered at 7.20m depth during investigation

Date of Start: 08-07-2024





Date of Completion: 11-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.80 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Reddish Yellowish brown, fine to medium grained, clayey sand with some gravels (SC) 0.00 to 2.80m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00				1.00	1.00	2.00	SPT	1	1	2	3	-	-			
	1.50																
	2.00				2.00	2.00	2.50	SPT	6	7	8	15	-	-			
	2.50			2.50	2.50	3.00	UDS	-	-	-	-	-	-				
	3.00			3.00	3.00	3.50	SPT	6	7	7	14	-	-				
	3.50			3.50	3.50	4.00	UDS	-	-	-	-	-	-				
	4.00			4.00	4.00	4.50	SPT	4	7	8	15	-	-				
	4.50			4.50	4.50	5.00	SPT	6	8	11	19	-	-				
	5.00			5.00	5.00	5.50	SPT	6	11	15	26	-	-				
	5.50			5.50	5.50	6.00	SPT	10	15	17	32	-	-				
	6.00			6.00	6.00	6.50	SPT	10	16	21	37	-	-				
	6.50			6.50	6.50	7.00	SPT	6	8	8	16	-	-				
	7.00			7.00	7.00	7.50	SPT	6	7	9	16	-	-				
	7.50			7.50	7.50	8.00	SPT	4	8	11	19	-	-				
	8.00			8.00	8.00	8.50	SPT	5	15	22	37	-	-				
	8.50			8.50	8.50	9.00	SPT	8	18	21	39	-	-				
	9.00			9.00	9.00	9.50	SPT	51/8cm	-	-	>100	-	-				
	9.50			9.50	9.50	10.00	SPT	51/11cm	-	-	>100	-	-				
	10.00			10.00	10.00	11.00	SPT	51/8cm	-	-	>100	-	-				
	10.50			Yellowish brown, fine to medium grained, silty sand (SM) 9.60 to 12.70m	11.00	11.00	11.50	SPT	51/7cm	-	-	>100	-	-			
	11.00				11.50	11.50	12.50	SPT	51/6cm	-	-	>100	-	-			
	11.50																
	12.00																
	12.50																
	13.00			Not used		Yellowish brown, fine to medium grained, clayey sand with some gravels (SC) 12.70 to 17.30m	12.50	12.50	13.50	DS	-	-	-	-		-	-
	13.50						13.50	13.50	14.50	SPT	51/6cm	-	-	>100		-	-
	14.00																
	14.50						14.50	14.50	15.50	SPT	51/7cm	-	-	>100		-	-
	15.00																
	15.50					15.50	15.50	16.50	SPT	51/8cm	-	-	>100	-		-	
	16.00																
16.50	16.50					16.50	17.50	SPT	51/8cm	-	-	>100	-	-			
17.00																	
17.50	Highly weathered, weak, dark yellowish brown, fine to coarse grained, fractured rock 17.30 to 20.00m	17.50	17.50			17.56	SPT	51/6cm	-	-	>100	15.00	-				
18.00		18.00	17.56	18.00	Core	-	-	-	-								
18.50		18.00	18.00	18.53	SPT	51/3cm	-	-	>100								
19.00																	
19.50																	
20.00	Highly weathered, very weak, yellowish white brown, fine to coarse grained, rock with closely spaced discontinuities 20.00 to 22.00m		20.00	18.53	20.00	Core	-	-	-	-	18.66	16.66					
20.50																	
21.00			21.50	20.10	21.50	Core	-	-	-	-	38.66	20.00					
21.50			21.50	21.50	21.53	SPT	51/3cm	-	-	>100							
22.00																	
22.50	Highly weathered, moderately strong, dark brownish, fine to coarse grained, rock with closely spaced discontinuities 22.00 to 25.00m			23.00	21.53	23.00	Core	-	-	-	-	10.66	9.33				
23.00																	
23.50																	
24.00																	
24.50																	
25.00				25.00	23.00	25.00	Core	-	-	-	-	39.50	10.00				
22.00 to 25.00m					25.00	25.00	25.03	SPT	51/3cm	-	-	>101					

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 27

Location : Talabira

Depth of Termination : 18.0 m

Co-ordinates: E 928, N 3442

Depth of Water Table : Encountered at 0.50m depth during investigation

Date of Start: 01-01-2025



Date of Completion: 02-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 194.66 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 0.00 to 0.70m	0.00	0.00	1.00	DS	-	-	-	-	-	-				
	0.50																	
	1.00			Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (sc) 0.70 to 1.60m	1.00	1.00	2.00	SPT	3	4	6	10	-	-				
	1.50			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 1.60 to 2.40m	2.00	2.00	2.50	SPT	11	23	38	61	-	-				
	2.00			Yellowish brown, fine to very fine grained, cemented silty clays of intermediate plasticity (CI) Silt stone 2.40 to 2.80m	2.50	2.50	2.80	SPT	31	50/10 cm	-	>100	-	-				
	2.50																	
	3.00	Not used		Highly weathered, very weak, greyish brown, fine to very fine grained, very thinly laminated rock 2.80 to 4.50m	3.00	2.80	3.00	DS	-	-	-	-	-	-				
	3.50																	
	4.00																	
	4.50			Highly weathered, very weak, greyish brown, fine to very fine grained, thinly laminated rock 4.50 to 6.00m	4.50	3.00	4.50	Core	-	-	-	-	16.66	-				
	5.00				4.50	4.50	4.53	SPT	50/3 cm	-	-	>100	-	-				
	5.50																	
	6.00			Highly weathered, weak, Brownish yellow, fine to very fine grained, very thinly laminated rock 6.00 to 7.50m	6.00	4.53	6.00	Core	-	-	-	-	33.33	-				
	6.50																	
	7.00																	
	7.50																	
	8.00			Moderately weathered, weak, Brownish yellow, fine to very fine grained, very thinly laminated rock 7.50 to 9.00m	7.50	6.00	7.50	Core	-	-	-	-	62.66	-				
	8.50																	
	9.00			Highly weathered, very weak, greyish brown, fine to very fine grained, thinly laminated rock 9.00 to 10.50m	9.00	7.50	9.00	Core	-	-	-	-	44.66	-				
	9.50																	
	10.00																	
	10.50			Moderately weathered, moderately weak, dark blackish, fine to very fine grained, rock with close spacing of discontinuities 10.50 to 12.00m	10.50	9.00	10.50	Core	-	-	-	-	54.66	15.33				
	11.00																	
	11.50																	
	12.00							12.00	10.50	12.00	Core	-	-	-	-	60.66	42.00	
	12.50																	
	+ 13.00																	
	13.50																	
	14.00																	
	14.50																	
	15.00					15.00	13.50	15.00	Core	-	-	-	-	61.33	46.66			
	15.50																	
	16.00																	
	16.50																	

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 28

Location : Talabira

Depth of Termination : 18.5

Co-ordinates: E 1009, N 3416

Depth of Water Table : Encountered at 1.30m depth during investigation

Date of Start: 24-12-2024

Date of Completion: 25-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 195.20 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, clayey sand with little gravels (SC) 0.00 to 0.20m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with little gravels (CI) 0.20 to 2.10m	1.00	1.00	2.00	SPT	2	3	3	6	-	-	
	1.00				2.00	2.00	2.50	SPT	7	6	6	12	-	-	
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00				3.00	3.00	3.50	SPT	9	10	11	21	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00			Yellowish brown, fine to very fine grained, silty clays of low plasticity (CL) 2.10 to 4.70m	4.00	4.00	4.50	SPT	12	13	15	28	-	-	
	3.50				4.50	4.50	4.70	SPT	32	50/7 cm	-	>100	-	-	
	4.00				5.00	4.70	5.00	Core	-	-	-	-	10.00	-	
	4.50				5.00	5.00	5.02	SPT	50/2 cm	-	-	>100	-	-	
	5.00	Not used		Highly weathered, weak, greyish brown, fine to very fine grained, thinly laminated rock 4.70 to 8.00m	6.50	5.02	6.50	Core	-	-	-	-	20.66	-	
	5.50				8.00	6.50	8.00	Core	-	-	-	-	28.66	8.00	
	6.00			Highly weathered, moderately strong, dark greyish brown, fine to medium grained, fractured rock 8.00 to 9.50m	9.50	8.00	9.50	Core	-	-	-	-	22.00	-	
	6.50				11.00	9.50	11.00	Core	-	-	-	-	36.66	14.66	
	7.00			Highly weathered, weak, yellowish brown, fine to medium grained, rock with moderately close spacing of discontinuities 9.50 to 11.00m	12.50	11.00	12.50	Core	-	-	-	-	30.00	-	
	7.50				14.00	12.50	14.00	Core	-	-	-	-	57.33	24.00	
	8.00			Moderately weathered, moderately strong, dark greyish black, fine to medium grained, rock with moderately wide spacing of discontinuities 14.00 to 15.50m	15.50	14.00	15.50	Core	-	-	-	-	46.66	27.33	
	8.50				17.00	15.50	17.00	Core	-	-	-	-	56.66	18.66	
	9.00			Moderately weathered, moderately strong, dark greyish black, fine to medium grained, rock with moderately wide spacing of discontinuities 15.50 to 17.00,	18.50	17.00	18.50	Core	-	-	-	-	85.33	85.33	
	9.50				17.00 to 18.50m										
	10.00			Slightly weathered, moderately weak, dark greyish black, fine to medium grained, massive rock											
	10.50														
	11.00														
	11.50														
	12.00														
	12.50														
	13.00														
	13.50														
	14.00														
	14.50														
	15.00														
	15.50														
	16.00														
	16.50														
	17.00														
	17.50														
	18.00														
	18.50														

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 30

Location : Hirma, Talabira

Depth of Termination : 25

Co-ordinates: E 1349, N 3425

Depth of Water Table : Encountered at 6.60m depth during investigation

Date of Start: 09-07-2024

Date of Completion: 12-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 203.40

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method with Hydraulic feed	0.00	Used		Brownish, fine to medium grained, clayey sand with much gravels (SC) 0.00 to 3.60m	0.00	0.00	1.50	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	5	8	9	17			
	1.50														
	2.00				2.00	2.00	2.50	SPT	3	6	7	13			
	2.50				2.50	2.50	2.00	SPT	6	6	8	14			
	3.00				3.00	3.00	3.40	SPT	6	8	9	17			
	3.50			Yellowish brown, fine to medium grained, silty clayey sand (SM-SC) 3.60 to 4.60m	3.50	3.50	4.00	UDS	-	-	-	-			
	4.00				4.00	4.00	4.50	SPT	3	5	10	15			
	4.50				4.50	4.50	5.00	UDS	-	-	-	-			
	5.00			Yellowish brown, fine to medium grained, clayey sand with some gravels (SC) 4.60 to 8.30m	5.00	5.00	5.50	SPT	5	10	12	22			
	5.50				5.50	5.50	6.00	SPT	5	7	10	17			
	6.00				6.00	6.00	6.50	SPT	7	10	14	24			
	6.50				6.50	6.50	7.00	UDS	-	-	-	-			
	7.00				7.00	7.00	7.50	SPT	26	50/12cm	-	>100			
	7.50				7.50	7.50	8.00	SPT	50/14cm	-	-	>100			
	8.00				8.00	8.00	8.50	SPT	50/6cm	-	-	>100			
	8.50			Yellowish brown, fine to medium grained, silty sand with little gravels (SM) 8.30 to 9.00m	8.50	8.50	9.00	SPT	19	50/7cm	-	>100			
	9.00				9.00	9.00	9.50	SPT	50/13cm	-	-	>100			
	9.50				9.50	9.50	10.00	SPT	50/8cm	-	-	>100			
	10.00			Yellowish brown, fine to medium grained, silty clayey sand with little gravels (SM-SC) 9.00 to 10.30m	10.00	10.00	11.00	SPT	39	50/3cm	-	>100			
	10.50														
	11.00				11.00	11.00	11.50	SPT	23	50/2cm	-	>100			
	11.50			Yellowish brown, fine to medium grained, clayey sand (SC) 10.30 to 12.00m	11.50	11.50	12.50	SPT	37	50/2cm	-	>100			
	12.00														
	12.50				12.50	12.50	13.00	SPT	29	50/11cm	-	>100			
	13.00			Yellowish brown, fine to medium grained, silty sand with some gravels (SM) 12.00 to 13.60m	13.00	13.00	14.00	SPT	19	19	25	44			
	13.50														
	14.00				14.00	14.00	14.50	SPT	16	22	36	58			
	14.50			Yellowish brown, fine to medium grained, silty clayey sand with little gravels (SM-SC) 13.60 to 15.70m	14.50	14.50	15.50	SPT	50/13cm	-	-	>100			
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/6cm	-	-	>100			
	16.00			Yellowish brown, fine to medium grained, clayey sand with some to much gravels (SC) 15.70 to 18.60m	16.00	16.00	17.00	SPT	50/7cm	-	-	>100			
	16.50														
	17.00				17.00	17.00	17.50	SPT	50/3cm	-	-	>100			
	17.50				17.50	17.50	18.50	SPT	50/5cm	-	-	>100			
	18.00														
	18.50				18.50	18.50	19.00	SPT	50/3cm	-	-	>100			
	19.00			Highly weathered, weak, dark blackish brown, fine to coarse grained, fractured rock 18.60 to 22.00m	19.00	19.00	19.03	SPT	50/3cm	-	-	>100			
	19.50														
	20.00				20.00	20.00	20.02	SPT	50/2cm	-	-	>100			
	20.50				20.50	20.50	20.02	SPT	50/2cm	-	-	>100			
	21.00														
	21.50														
	22.00	Not used		Highly weathered, moderately strong, dark yellowish brown, fine to coarse grained, fractured rock	22.00	20.02	22.00	Core	-	-	-	-	13.00	-	
	22.50				22.00	22.00	22.02	SPT	50/2cm	-	-	>100	-	-	
	23.00														
	23.50				23.50	22.02	23.50	Core	-	-	-	-	8.00	-	
	24.00				23.50	23.50	23.53	SPT	50/3cm	-	-	>100	-	-	
	24.50														
	25.00				25.00	23.53	25.00	Core	-	-	-	-	12.00	9.00	
					25.00	23.53	25.02	SPT	50/2cm	-	-	>100	-	-	

Reduced Level: 197.10 M

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 0.00 to 0.80m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00				Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 0.80 to 1.60m	1.00	1.00	2.00	SPT	3	3	4	7	-	-		
	1.50																
	2.00					Dark Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 1.60 to 2.90m	2.00	2.00	2.50	SPT	3	3	5	8	-	-	
	2.50																
	3.00																
	3.50																
	4.00				Reddish brown to reddish yellow, fine to medium grained, clayey sand with little to much gravels (SC) 2.90 to 5.70m	4.00	4.00	4.50	SPT	9	9	12	21	-	-		
	4.50																
	5.00																
	5.50																
	6.00				Yellowish brown, fine to very fine grained, clays of intermediate plasticity with occasional gravels (CI) 5.70 to 7.40m	6.00	6.00	6.50	SPT	10	14	17	31	-	-		
	6.50																
	7.00																
	7.50																
	8.00		Dark greyish brown, fine to very fine grained, cemented, silty clays of intermediate plasticity - Mud stone 7.40 to 10.30m	8.00	8.00	8.50	SPT	7	11	15	26	-	-				
	8.50																
	9.00																
	9.50																
	10.00	Not used		Highly weathered, very weak, dark brownish grey, fine to very fine grained, very thinly laminated rock 10.30 to 16.50m	10.00	10.00	10.50	Core	-	-	-	-	20.00	-			
	10.50																
	11.00																
	11.50																
	12.00																
	12.50																
	13.00																
	13.50																
	14.00																
	14.50																
	15.00																
	15.50																
16.00																	
16.50																	
17.00																	
17.50																	
18.00		Moderately weathered, moderately weak, dark black, fine to medium grained, rock with moderately close spacing of discontinuities 16.50 to 18.00m	18.00	16.50	18.00	Core	-	-	-	-	52.66	23.33					
18.50																	
19.00																	
19.50																	
20.00		Moderately weathered, weak, dark black, fine to medium grained, rock with wide spacing of discontinuities 18.00 to 19.50m	20.00	18.00	19.50	Core	-	-	-	-	44.00	38.00					
20.50																	
21.00																	
21.50																	
22.00		Moderately weathered, weak, dark black, fine to medium grained, massive rock 19.50 to 24.00m	22.00	19.50	21.00	Core	-	-	-	-	56.00	50.00					
22.50																	
23.00																	
23.50																	
24.00		Moderately weathered, moderately weak, dark black, very fine grained, rock with close spacing of discontinuities 24.00 to 24.50m	24.00	22.50	24.00	Core	-	-	-	-	52.00	18.66					
24.50																	
25.00																	
25.00																	

24.50 to 25.00m

Page no. 567 of 618

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 32

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1670, N 3419

Depth of Water Table : Encountered at 4.00m depth during investigation

Date of Start: 17-08-2024

Date of Completion: 19-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 208.90 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Used		Dark reddish , fine to coarse grained, clayey sand with some to much gravels (SC)	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00															
	1.50			0.00 to 2.10m												
	2.00				Reddish yellow, fine to coarse grained, silty and clayey sand with much gravels (SM-SC)	2.00	2.00	2.50	SPT	7	15	27	42	-	-	
	2.50					2.50	3.00	UDS	-	-	-	-	-	-	-	
	3.00				Reddish brown and brownish, fine to medium grained, silty sand with some to much gravels (SM)	3.00	3.00	3.50	SPT	23	23	20	43	-	-	
	3.50					3.50	4.00	UDS	-	-	-	-	-	-	-	
	4.00				Yellowish brown, fine to medium grained, clayey sand with little gravels (SC)	4.00	4.00	4.50	SPT	50/14cm	-	-	>100	-	-	
	4.50					4.50	5.00	SPT	6	17	30	47	-	-		
	5.00					5.00	5.50	SPT	27	50/10cm	-	>100	-	-		
	5.50					5.50	6.00	SPT	15	50/4cm	-	>100	-	-		
	6.00					6.00	6.50	SPT	24	50/12cm	-	>100	-	-		
	6.50					6.50	7.00	SPT	50/13cm	-	-	>100	-	-		
	7.00					7.00	7.50	SPT	50/10cm	-	-	>100	-	-		
	7.50					7.50	8.00	SPT	50/5cm	-	-	>100	-	-		
	8.00					8.00	8.50	SPT	50/8cm	-	-	>100	-	-		
	8.50					8.50	9.00	SPT	50/5cm	-	-	>100	-	-		
	9.00			4.20 to 9.50m												
	9.50				Mixture of brownish, fine to medium grained, clayey sadn with highly weathered, completely fractured and disintegrated, very weak and fractured rock fragments	9.50	9.50	10.00	SPT	50/7cm	-	-	>100	-	-	
	10.00					10.00	11.00	SPT	50/6cm	-	-	>100	-	-		
	10.50															
	11.00	Not used		Highly weathered,very weak, yellowish brown, fine to medium grained, friable rock												
	11.50															
	12.00			Highly weathered, completely fractured and disintegrated, dark brownish, fine to medium grained, very weak and fracture rock	12.00	11.56	12.50	Core	-	-	-	-	7.00	-		
	12.50				12.50	12.52	SPT	50/2cm	-	-	>100	-	-			
	13.00		11.70 to 14.00m													
	13.50				14.00	12.52	14.00	Core	-	-	-	-	5.00	-		
	14.00				14.00	14.02	SPT	50/2cm	-	-	>100	-	-			
	14.50				15.00	14.02	15.50	SPT	50/4cm	-	-	>100	-	-		
	15.00				15.50	16.00	SPT	50/5cm	-	-	>100	-	-			
	15.50				16.00	15.50	16.00									
16.00																
16.50				17.00	16.00	17.00	Core	-	-	-	-	12.00	-			
17.00				17.00	17.02	SPT	50/2cm	-	-	>100	-	-				
17.50				18.00	17.02	18.50	Core	-	-	-	-	10.00	-			
18.00				18.50	18.52	SPT	50/2cm	-	-	>100	-	-				
18.50			19.00	18.50	18.52											
19.00																
19.50			20.00	18.52	20.00	Core	-	-	-	-	9.00	-				
20.00			20.00	20.02	SPT	50/2cm	-	-	>100	-	-					
17.50 to 20.00m																

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 33

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1172, N 3393

Depth of Water Table : Encountered at 4.10m depth during investigation

Date of Start: 09-07-2024

Date of Completion: 14-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 199.62 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Used		Brownish, fine to medium grained, clayey sand (SC) 0.00 to 1.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50				1.00	1.00	2.00	SPT	3	4	4	8	-	-		
	1.00															
	1.50			Dark reddish brown, fine to medium grained, sandy clays of intermediate plasticity with much gravels (CI) 1.50 to 5.30m												2.00
	2.50				2.50	3.00	UDS	-	-	-	-	-	-			
	3.00				3.00	3.50	SPT	4	4	6	10	-	-			
	3.50				3.50	4.00	UDS	-	-	-	-	-	-			
	4.00				4.00	4.50	SPT	5	6	6	12	-	-			
	4.50				4.50	5.00	UDS	-	-	-	-	-	-			
	5.00				5.00	5.50	SPT	7	9	12	21	-	-			
	5.50			5.50	6.00	SPT	7	7	10	17	-	-				
	6.00			6.00	6.50	SPT	7	8	10	18	-	-				
	6.50			Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 5.30 to 8.30m	6.50	6.50	7.00	UDS	-	-	-	-	-	-		
	7.00				7.00	7.50	SPT	8	10	14	24	-	-			
	7.50				7.50	8.00	SPT	7	11	14	25	-	-			
	8.00				8.00	8.50	SPT	7	12	15	27	-	-			
	8.50				Yellowish brown, fine to very fine grained, clayey sand (SC) 8.30 to 10.50m	8.50	8.50	9.00	SPT	8	10	12	22	-		-
	9.00					9.00	9.50	SPT	7	9	12	21	-	-		
	9.50					9.50	10.00	SPT	9	13	15	28	-	-		
	10.00			10.00		11.00	SPT	7	11	13	24	-	-			
	10.50			Yellowish brown, fine to medium grained, silty sand with little gravels (SM) 10.50 to 14.30m	11.00	11.00	11.50	SPT	6	6	8	14	-	-		
	11.50				11.50	12.50	SPT	7	7	8	15	-	-			
	12.00				12.50	12.50	13.00	SPT	8	11	12	23	-	-		
	12.50				13.00	13.00	14.00	SPT	7	12	17	24	-	-		
	13.00			Dark greyish brown, fine to medium grained, sandy clays of intermediate plasticity with some gravels (CI) 14.30 to 16.00m	14.00	14.00	14.50	SPT	9	15	19	34	-	-		
	14.50				14.50	16.00	SPT	25	50/10cm	-	>100	-	-			
	15.00				Dark greyish brown, fine to medium grained, sandy clays of intermediate plasticity with some gravels (CI) 14.30 to 16.00m	16.00	16.00	16.15	SPT	39	50/5cm	-	>100	-		-
	16.50					Highly weathered, completely fractured and disintegrated, dark brownish grey, very fine grained, rock 16.00 to 22.00m	17.50	16.15	17.50	Core	-	-	-	-		6.00
	17.00			20.50			19.00	20.50	Core	-	-	-	-	18.00		-
	17.50															
	18.00															
	18.50															
19.00																
19.50																
20.00																
20.50	Moderately weathered, very weak, dark grey, very fine grained, moderately thickly bedded rock	22.00	20.50	22.00	Core	-	-	-	-	57.33	55.00					
21.00		23.50	22.00	23.50	Core	-	-	-	-	72.66	40.00					
21.50																
22.00																
22.50																
23.00																
23.50																
24.00																
24.50	25.00	23.50	25.00	Core	-	-	-	-	70.66	60.00						
25.00																
22.00 to 25.00m																

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 34

Location : Talabira

Depth of Termination : 20.5 M

Co-ordinates: E 1457, N 3001

Depth of Water Table : Encountered at 4.00m depth during investigation

Date of Start: 18-08-2024












Date of Completion: 22-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.77 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00			Yellowish brown to ligh reddish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 0.30 to 2.80m	1.00	1.00	2.00	SPT	1	3	3	6	-	-			
	1.50																
	2.00							SPT	2	2	3	5	-	-			
	2.50							UDS	-	-	-	-	-	-			
	3.00							SPT	3	5	6	11	-	-			
	3.50			Brownish yellow, fine to medium grained, clayey sand with little gravels (SC) 2.80 to 4.70m	3.50	3.50	4.00	UDS	-	-	-	-	-	-			
	4.00							SPT	5	7	5	12	-	-			
	4.50							UDS	-	-	-	-	-	-			
	5.00							SPT	6	8	12	20	-	-			
	5.50							UDS	-	-	-	-	-	-			
	6.00			Light greyish yellow, very fine grained, clays of high plasticity (CH) 4.70 to 6.30m	6.00	6.00	6.50	SPT	20	23	31	54	-	-			
	6.50							UDS	-	-	-	-	-	-			
	7.00					Brownish, very fine grained, clays of intermediate plasticity (CI) 6.30 to 8.20m	7.00	7.00	7.50	SPT	21	26	34.00	60	-	-	
	7.50									SPT	24	27	39	66	-	-	
	8.00									SPT	27	50/5cm	-	>100	-	-	
	8.50			Blackish brown, very fine grained, clays of intermediate plasticity (CI) 8.20 to 10.00m			8.50	8.15	8.50	Core	-	-	-	-	16.66	-	
	9.00									SPT	55/6cm	-	-	>100	-	-	
	9.50																
	10.00					Highly weathered, completely fractured and disintegrated, dark brownish grey and brownish yellow, very fine grained, very weak and friable fractured rock 10.00 to 11.50m	10.00	8.56	10.00	Core	-	-	-	-	6.66	-	
	10.50									SPT	-	-	-	>100	-	-	
	11.00			Highly weathered, completely fractured and disintegrated, dark brownish grey, fine to very fine grained, gravel, pebble and cobble size fragments of fractured rock with infilled dark brownish grey, fine to very fine grained, clayey sand 11.50 to 16.00m			11.50	10.00	11.50	Core	-	-	-	-	16.66	-	
	12.00																
	12.50																
	+ 13.00						Core	-	-	-	-	16.66	-				
	13.50																
	14.00																
	14.50						Core	-	-	-	-	57.33	6.66				
	15.00																
	15.50																
	16.00		Highly weathered, very weak, dark brownish grey, fine to very fine grained, fractured rock 16.00 to 17.50m	16.00	14.50	16.00	Core	-	-	-	-	56.66	6.66				
	16.50																
17.00				Moderately weathered, weak, dark brownish grey, very fine grained, rock with close spacing of discontinuities	17.50	16.00	17.50	Core	-	-	-	-	73.33	40.66			
17.50																	
18.00																	
18.50																	
19.00						19.00	17.50	19.00	Core	-	-	-	-	72.66	16.66		
19.50																	
20.00																	
20.50				20.50	19.00	20.50	Core	-	-	-	-	91.33	48.00				
23.50 to 25.00m																	

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 35

Location : Talabira

Depth of Termination : 15.00 m

Co-ordinates: E 1010, N 3360

Depth of Water Table : Encountered at 2.00m depth during investigation

Date of Start: 25-12-2025

Date of Completion: 25-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 196.340 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Yellowish brown, fine to very fine grained, sandy clays of low plasticity with occasional gravels (CL) 0.00 to 0.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00			Light yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with little gravels (CI) 0.50 to 1.70m	1.00	1.00	2.00	SPT	2	3	5	8	-	-	
	1.50														
	2.00			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 1.70 to 2.90m	2.00	2.00	2.50	SPT	3	4	6	10	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	6	8	11	19	-	-	
	3.50			Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity with occasional gravels (CI) 2.90 to 4.90m	3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	7	9	11	20	-	-	
	4.50				4.50	4.50	4.70	UDS	-	-	-	-	-	-	
	5.00			Yellowish brown, fine to very fine grained, silty clays of low plasticity (CL) 4.90 to 5.95m	5.00	5.00	5.50	SPT	12	17	23	40	-	-	
	5.50				5.50	5.50	6.00	SPT	28	50/10 cm	-	>100	-	-	
	6.00			Light greyish brown, fine to very fine grained, cemented silty clays of intermediate plasticity (CI) (Mud Stone) 5.95 to 6.95m	6.00	6.00	6.50	SPT	15	23	29	52	-	-	
	6.50				6.50	5.02	6.50	SPT	20	34	50/12 cm	>100	-	-	
	7.00			Yellowish brown, fine to very fine grained, cemented silty clays of intermediate plasticity (CI) (Mud Stone) 6.95 to 7.20m	7.00	7.00	7.20	SPT	30/12 cm	-	-	>100	-	-	
	7.50				7.50	7.20	7.50	Core	-	-	-	-	43.00	-	
	8.00			Highly weathered, weak, yellowish brown, fine to very fine grained, fractured rock 7.20 to 9.00m											
	8.50														
	9.00				9.00	7.50	9.00	Core					21.00	8.00	
	9.50														
	10.00			Highly weathered, moderately weak, yellowish brown, fine to medium grained, rock with very close spacing of discontinuities 9.00 to 12.10m	10.50	9.00	10.50	Core					21.00	6.00	
	10.50														
	11.00														
	11.50														
	12.00				12.00	10.50	12.00	Core					52.00	6	
	12.50														
	13.00			Slightly weathered, weak, dark blackish grey, fine to medium grained, rock with wide spacing of discontinuities 12.10 to 14.00m	13.50	12.00	13.50	Core					64.00	37	
	13.50														
	14.00														
	14.50			Slightly weathered, weak, dark blackish grey, fine to medium grained, massive rock											
	15.00				15.00	13.50	15.00	Core					80.00	46	
14.00 to 15.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 37

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 955, N 3368

Depth of Water Table : Encountered at 1.90m depth during investigation

Date of Start: 12-07-2024

Date of Completion: 14-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 195.75

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Brownish, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown, fine to medium grained, clayey sand with much gravels (SC) 0.30 to 1.50m											
	1.00				1.00	1.00	2.00	SPT	8	4	4	8	-	-	
	1.50														
	2.00			Yellowish brown, fine to very fine grained, sandy clays of low plasticity (CL) 1.50 to 3.95m	2.00	2.00	2.50	SPT	8	9	9	18	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	3	4	6	10	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	9	12	13	25	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			Brownish, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 3.95 to 7.10m	5.00	5.00	5.50	SPT	11	14	21	35	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	24	27	39	66	-	-	
	6.50				6.50	6.50	7.00	SPT	50/14cm	-	-	>100	-	-	
	7.00			Moderately weathered, very weak, brownish yellow, fine to very fine grained, very thinly bedded rock	7.00	7.00	7.13	SPT	50/13cm	-	-	>100	-	-	
	7.50														
	8.00				8.00	7.13	8.00	Core	-	-	-	-	59.28	7.14	
	8.50			7.10 to 9.00m											
	9.00														
	9.50			Highly weathered, very weak, dark brownish grey, very fine grained, fractured and disintegrated rock 9.00 to 10.90m	9.50	8.00	9.50	Core	-	-	-	-	11.33	-	
	10.00				9.50	9.50	9.53	SPT	50/3cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	9.53	11.00	Core	-	-	-	-	20.66	-	
	11.50														
	12.00			Highly weathered, very weak, dark greyish black, very fine grained, very thinly laminated rock	12.50	11.00	12.50	Core	-	-	-	-	29.33	-	
	12.50														
	13.00														
	13.50														
	14.00				14.00	12.50	14.00	Core	-	-	-	-	26.66	-	
	14.50			10.90 to 15.00m											
	15.00				15.50	14.00	15.50	Core	-	-	-	-	32.00	19.33	
	15.50														
	16.00			Highly weathered, weak, dark brownish black, fine grained, very thinly bedded rock	17.00	15.50	17.00	Core	-	-	-	-	30.66	-	
	16.50														
	17.00														
	17.50			15.00 to 18.60m											
	18.00				18.50	17.00	18.50	Core	-	-	-	-	38.66	8.66	
	18.50														
	19.00			Highly weathered, moderately weak, dark greyish black, fine to very fine grained, fractured rock	20.00	18.50	20.00	Core	-	-	-	-	24.00	-	
	19.50														
	20.00														
18.60 to 20.00m															

Project : BHEL

Bore Hole No. : 38

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1411, N 3308

Depth of Water Table : Encountered at 3.60m depth during investigation

Date of Start: 31-08-2024

Date of Completion: 01-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used Soil Surface Bit and NX Size

Reduced Level: 204.30 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Not Used		Dark Yellowish brown, fine to medium grained, silty clayey sand (SM-SC) 0.00 to 0.80m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00														
	1.50														
	2.00														
	2.50														
	3.00			Dark Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional to little gravels (CI) 0.80 to 5.80m	2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.50	SPT	6	8	9	17	-	-		
	3.50				3.50	4.00	UDS	-	-	-	-	-	-		
	4.00				4.00	4.50	SPT	5	8	10	18	-	-		
	4.50				4.50	5.00	UDS	-	-	-	-	-	-		
	5.00				5.00	5.50	SPT	6	9	10	19	-	-		
	5.50				5.50	6.00	UDS	-	-	-	-	-	-		
	6.00				Yellowish brown, fine to very fine grained, clayey sand (SC) 5.80 to 10.20m	6.00	6.00	6.50	SPT	10	11	13	24	-	-
	6.50			6.50		7.00	UDS	-	-	-	-	-	-		
	7.00			7.00		7.50	SPT	9	12	23	35	-	-		
	7.50			7.50		8.00	UDS	-	-	-	-	-	-		
	8.00			8.00		8.50	SPT	10	13	20	33	-	-		
	8.50			8.50		9.00	UDS	-	-	-	-	-	-		
	9.00			9.00		9.50	SPT	35	46	50/6cm	>100	-	-		
	9.50			9.50		10.00	SPT	37	50/13cm	-	>100	-	-		
	10.00			Light Yellowish brown, fine to medium fine grained, weakly cemented clayey sand with little to occasional gravels (SC) 10.20 to 14.40m	10.00	10.00	11.00	SPT	56/12cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	18	22	45.00	67	-	-	
	11.50				11.50	11.50	12.50	SPT	25	35	48.00	83	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	32.00	50/10cm	-	>100	-	-	
	+ 13.00				13.00	13.00	14.00	SPT	38.00	50/8cm	-	>100	-	-	
	13.50														
	14.00			Yellowish brown, fine to medium grained, weakly cemented clayey sand with little (SC) 14.40 to 17.30m	14.00	14.00	14.50	SPT	50/10cm	-	-	>100	-	-	
	14.50				14.50	14.50	15.50	SPT	50/13cm	-	-	>100	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/9cm	-	-	>100	-	-	
16.00	16.00	16.00	17.00		SPT	50/8cm	-	-	>100	-	-				
16.50															
17.00	17.00	17.00	17.50		SPT	50/7cm	-	-	>100	-	-				
17.50	Yellowish brown, fine to medium grained, weakly cemented silty sand (SM) 17.30 to 17.80m	17.50	17.50		18.50	SPT	56/9cm	-	-	>100	-	-			
18.00															
18.50	Yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC)	18.50	18.50	19.00	SPT	50/12cm	-	-	>100	-	-				
19.00		19.00	19.00	19.06	SPT	50/6cm	-	-	>100	-	-				
19.50															
20.00		20.00	19.06	20.00	SPT	50/7cm	-	-	>100	-	-				
17.80 to 20.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 39

Location : Talabira

Depth of Termination : 25 M

Co-ordinates: E 1615, N 3343

Depth of Water Table : Encountered at 3.50m depth during investigation

Date of Start: 13-08-2024

Date of Completion: 16-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 207.95 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Brownish red, fine to medium grained, clayey sand (SC) 0.00 to 1.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00				1.00	2.00	SPT	1	1	1	2	-	-				
	1.50																
	2.00			Reddish brown, fine to medium grained, clayey gravels (GC) 1.50 to 2.70m	2.00	2.00	2.50	SPT	5	10	21	31	-	-			
	2.50				2.50	3.00	UDS	-	-	-	-	-	-				
	3.00				3.00	3.50	SPT	4	11	11	22	-	-				
	3.50				3.50	4.00	UDS	-	-	-	-	-	-				
	4.00			Reddish yellow, fine to medium grained, clayey sand with much to some gravels (SC) 2.70 to 6.30m	4.00	4.00	4.50	SPT	14	29	36	65	-	-			
	4.50				4.50	5.00	SPT	25.00	50/11cm	-	>100	-	-				
	5.00				5.00	5.50	SPT	50/13cm	-	-	>100	-	-				
	5.50				5.50	6.00	SPT	7.00	12	24.00	36	-	-				
	6.00				6.00	6.50	SPT	7	14	34	48	-	-				
	6.50				6.50	7.00	SPT	50/10cm	-	-	>100	-	-				
	7.00				7.00	7.07	SPT	50/7cm	-	-	>100	-	-				
	7.50				7.50	7.50	Core	-	-	-	-	10.00	-				
	8.00			Mixture of highly weathered, completely fractured and disintegrated, yellowish brown, fine to medium grained, gravel, pebble size fragments of fractured rock and yellowish brown, fine to medium grained, clayey sand 7.80 to 8.70m	8.00	7.50	8.00	SPT	50/2cm	-	-	>100	-	-			
	8.50				8.50	8.02	8.50	SPT	50/4cm	-	-	>100	-	-			
	9.00				9.00	8.50	9.00	SPT	50/3cm	-	-	>100	-	-			
	9.50				9.50	9.00	9.50	SPT	50/5cm	-	-	>100	-	-			
	10.00				10.00	9.50	10.00	SPT	50/4cm	-	-	>100	-	-			
	11.00				11.00	10.00	11.00	SPT	50/3cm	-	-	>100	-	-			
	11.50				11.50	11.00	11.50	SPT	50/5cm	-	-	>100	-	-			
	12.00																
	12.50					Dark brownish, fine to medium grained, weakly cemented clayey sand 8.70 to 16.30m	12.50	11.50	12.50	SPT	50/5cm	-	-	>100		-	-
	13.00						13.00	12.50	13.00	SPT	50/5cm	-	-	>100		-	-
	13.50																
	14.00		14.00	13.00			14.00	SPT	35	50/3cm	-	>100	-	-			
	14.50		14.50	14.00	14.50	SPT	50/14cm	-	-	>100	-	-					
	15.00																
	15.50		15.50	14.50	15.50	SPT	50/13cm	-	-	>100	-	-					
	16.00		16.00	15.50	15.63	SPT	50/13cm	-	-	>100	-	-					
	16.50			Highly weathered, very weak, dark brownish, fine to medium grained, fractured and friable fractured rock 16.30 to 20.00m	17.00	15.63	17.00	Core	-	-	-	-	17.00	-			
	17.50																
18.00																	
18.50	18.50	17.00			17.05	SPT	50/5cm	-	-	>100	-	-					
19.00																	
19.50																	
20.00	20.00	17.05			20.00	Core	-	-	-	-	6.00	-					
20.50	20.00	20.00			20.00	SPT	-	-	-	-	-	-					
21.00																	
21.50	21.50	20.00	21.50	Core	-	-	-	-	7.00	-							
22.00																	
22.50																	
23.00	23.00	21.50	23.00	Core	-	-	-	-	39.00	8.00							
23.50																	
24.00																	
24.50																	
25.00																	
	25.00	23.00	25.00	Core	-	-	-	-	35.00	10.00							
24.00 to 25.00m					Page no. 574 of 618												

Project : BHEL

Bore Hole No. : 40

Location : Hirma, Talabira

Depth of Termination : 20

Co-ordinates: E 898, N 3343

Depth of Water Table : Encountered at 0.70 m depth during investigation

Date of Start: 03-01-2025

Date of Completion: 05-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 194.96 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Not used		Brownish, fine to medium grained, clayey sand with little gravels (SC) 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50				Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 0.60 to 1.80m	1.00	1.00	2.00	SPT	2	3	3	6	-	-	
	1.00				Brownish yellow, fine to very fine grained, clayey sand (SC) 1.80 to 3.10m	2.00	2.00	2.50	SPT	5	7	7	14	-	-	
	1.50				Highly weathered, very weak, yellowish brown, fine to medium grained, thinly laminated rock 3.10 to 6.50m	2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00		3.00			3.00	3.10	SPT	50/10 cm	-	-	-	>100	-	-	
	2.50		3.50	3.10	3.50	Core	-	-	-	-	-	30.00	-			
	3.00			Highly weathered, weak, yellowish brown, fine to medium grained, thinly laminated rock 6.50m to 8.00m	5.00	3.50	5.00	Core	-	-	-	-	-	29.33	-	
	3.50				6.50	5.00	6.50	Core	-	-	-	-	-	35.33	-	
	4.00				8.00	6.50	8.00	Core	-	-	-	-	-	60.00	40.66	
	4.50				9.50	8.00	9.50	Core	-	-	-	-	-	57.33	44.66	
	5.00				11.00	9.50	11.00	Core	-	-	-	-	-	70.66	44.00	
	5.50				12.50	11.00	12.50	Core	-	-	-	-	-	63.33	26.66	
	6.00				14.00	12.50	14.00	Core	-	-	-	-	-	53.33	31.33	
	6.50				15.50	14.00	15.50	Core	-	-	-	-	-	54.66	14.66	
	7.00				17.00	15.50	17.00	Core	-	-	-	-	-	48.00	35.33	
	7.50				18.50	17.00	18.50	Core	-	-	-	-	-	54.66	52.00	
	8.00			Moderately weathered, weak, dark greyish black, fine to medium grained, massive rock	20.00	18.50	20.00	Core	-	-	-	-	-	50.00	-	
	8.50															
	9.00															
	9.50															
	10.00															
	10.50															
	11.00															
	11.50															
	12.00															
	12.50															
	13.00															
	13.50															
	14.00															
	14.50															
15.00																
15.50																
16.00																
16.50																
17.00																
17.50																
18.00																
18.50																
19.00																
19.50																
20.00																
18.50 to 20.00m																

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 41

Location : Talabira

Depth of Termination : 20 M

Co-ordinates: E 1270, N 3322

Depth of Water Table : Encountered at 3.80m depth during investigation

Date of Start: 17-07-2024


Date of Completion: 19-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.20 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Brownish, fine to very fine grained, clayey sand (SC) 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Reddish yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI) 0.40 to 1.50m	1.00	1.00	2.00	SPT	3	5	7	12	-	-	
	1.00														
	1.50														
	2.00														
	2.50														
	3.00														
	3.50														
	4.00														
	4.50			Yellowish brown, fine to medium grained, silty sand with occasional gravels (SM) 4.30 to 5.00m	4.50	4.50	5.00	SPT	5	6	9	15	-	-	
	5.00														
	5.50														
	6.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little to some gravels (CI) 5.00 to 10.20m	6.00	6.00	6.50	SPT	5	7	9	16	-	-	
	6.50														
	7.00														
	7.50														
	8.00														
	8.50														
	9.00														
	9.50														
	10.00														
	10.50														
	11.00														
	11.50														
	12.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 10.20 to 11.70m	12.50	12.50	13.00	UDS	-	-	-	-	-	-	
	12.50														
	13.00														
	13.50														
	14.00														
	14.50														
15.00	Highly weathered, weak, reddish yellow and yellowish brown, fine to coarse grained, fractured and friable rock	17.00	15.50	17.00	Core	-	-	-	-	23.33	6.66				
15.50															
16.00															
16.50															
17.00															
17.50															
18.00															
18.50															
19.00															
19.50															
20.00															
14.70 to 20.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 43

Location : Talabira

Depth of Termination : 20 M

Co-ordinates: E 1416, N 3364

Depth of Water Table : Encountered at 3.20m depth during investigation

Date of Start: 11-08-2024

Date of Completion: 13-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 200.88 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Brownish, fine to very fine grained, clayey sand (SC) 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50			Reddish yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI) 0.40 to 1.50m	1.00	1.00	2.00	SPT					-	-			
	1.00																
	1.50																
	2.00						2.00	2.00	2.50	SPT	4	6	7	13	-	-	
	2.50				Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC) 1.50 to 4.30m	2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00					3.00	3.50	SPT	4	7	8	15	-	-			
	3.50					3.50	4.00	UDS	-	-	-	-	-	-	-		
	4.00					4.00	4.50	SPT	6	8	10	18	-	-			
	4.50					Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 4.30 to 5.50m	4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00						5.00	5.00	5.50	SPT	7	9	11	20	-	-	
	5.50				Yellowish brown, fine to medium grained, silty clayey sand with occasional gravels (SM-SC) 5.50 to 6.30m	5.50	5.50	6.00	UDS	-	-	-	-	-	-	-	
	6.00					6.00	6.50	SPT	10	13	16	29	-	-			
	6.50					6.50	7.00	SPT	10.00	13	17.00	30	-	-			
	7.00					7.00	7.50	SPT	11.00	15	19.00	34	-	-			
	7.50					Yellowish brown, fine to medium grained, clayey sand with little to some gravels (SC) 6.30 to 8.10m	7.50	7.50	8.00	SPT	10.00	15	18.00	33	-	-	
	8.00				Yellowish brown, fine to medium grained, silty clayey sand with occasional gravels (SM-SC) 8.10 to 9.20m	8.00	8.00	8.50	SPT	11.00	15	19.00	34	-	-		
	8.50					8.50	9.00	SPT	12.00	16	20.00	36	-	-			
	9.00					9.00	9.50	SPT	18	32.00	39	71	-	-			
	9.50					9.50	10.00	SPT	20	28.00	38	66	-	-			
	10.00						10.00	10.00	11.00	SPT	23	34.00	45	79	-	-	
	10.50				Yellowish brown, fine to medium grained, clayey sand with occasional to much gravels (SC) 9.20 to 13.50m												
	11.00					11.00	11.50	SPT	25.00	58/9cm	-	>100	-	-			
	11.50					11.50	12.50	SPT	50/14cm	-	-	>100	-	-			
	12.00																
	12.50						12.50	12.50	13.00	SPT	50/13cm	-	-	>100	-	-	
	13.00						13.00	13.00	14.00	SPT	50/10cm	-	-	>100	-	-	
	13.50				Yellowish brown, fine to medium grained, poorly graded sand (SP) 13.50 to 17.40m												
	14.00					14.00	14.50	SPT	50/11cm	-	-	>100	-	-			
	14.50					14.50	15.50	SPT	50/6cm	-	-	>100	-	-			
15.00																	
15.50				15.50	15.50	16.00	SPT	50/10cm	-	-	>100	-	-				
16.00				16.00	16.00	17.00	SPT	50/4cm	-	-	>100	-	-				
16.50																	
17.00																	
17.50			17.00	17.08	SPT	50/8cm	-	-	>100	-	-						
18.00			17.50	17.50	Core	-	-	-	-	30.00	-						
18.50		Highly weathered, weak, reddish yellow and yellowish brown, fine to coarse grained, fractured and friable rock															
19.00																	
19.50																	
20.00																	
17.40 to 20.00m																	

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 44

Location : Talabira

Depth of Termination : 18.5 M

Co-ordinates: E 772, N 3336

Depth of Water Table : Encountered at 2.10m depth during investigation

Date of Start: 20-08-2024

Date of Completion: 23-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 197.52 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity (CI) 0.00 to 1.00m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00			Light brownish and yellowish brown, very fine grained, clays of intermediate plasticity with occasional gravels (CI)	1.00	1.00	2.00	SPT	2	3	5	8	-	-			
	1.50																
	2.00				2.00	2.50	SPT	3	4	5	9	-	-				
	2.50				2.50	3.00	UDS	-	-	-	-	-	-				
	3.00				3.00	3.50	SPT	7	8	8	16	-	-				
	3.50				3.50	4.00	UDS	-	-	-	-	-	-				
	4.00				1.00 to 4.50m	4.00	4.00	4.50	SPT	6	7	8	15	-	-		
	4.50			4.50		5.00	UDS	-	-	-	-	-	-				
	5.00			Brownish, fine to very fine grained, clayey sand (SC)	5.00	5.00	5.50	SPT	5	6	8	14	-	-			
	5.50				5.50	6.00	UDS	-	-	-	-	-	-				
	6.00				6.00	6.50	SPT	4	7	9	16	-	-				
	6.50				6.50	7.00	SPT	6.00	9	10.00	19	-	-				
	7.00				4.50 to 7.60m	7.00	7.00	7.50	SPT	4.00	6	9.00	15	-	-		
	7.50					7.50	8.00	UDS	-	-	-	-	-	-			
	8.00			Brownish, fine to very fine grained, silty and clayey sand (SM-SC) 7.60 to 9.00m	8.00	8.00	8.50	SPT	14.00	16	52/9cm	>100	-	-			
	8.50				8.50	9.00	SPT	28.00	52/10cm	-	>100	-	-				
	9.00				9.00	9.50	SPT	52/7cm	-	-	>100	-	-				
	9.50			Brownish yellow, fine to very fine grained, clayey sand with occasional gravels (SC) 9.00 to 10.00m	9.50	9.50	10.00	SPT	55/10cm	-	-	>100	-	-			
	10.00	Not used			Highly weathered, completely fractured and disintegrated, yellowish brown, fine to very fine grained, very thick and friable, fractured rock 10.00 to 11.00m	10.00	10.00	10.11	SPT	51/11cm	-	-	>100	-	-		
	10.50																
	11.00			Highly weathered, weak, dark yellowish brown, fine to very fine grained, rock with closely spaced discontinuities 11.00 to 12.50m	11.00	10.11	11.00	Core	-	-	-	-	47.00	10.00			
	11.50																
	12.00			Highly weathered, moderately weak, dark greyish, fine to medium grained, fractured rock 12.50 to 14.00m	12.50	11.00	12.50	Core	-	-	-	-	36.00	-			
	12.50																
	13.00																
	13.50																
	14.00			Moderately weathered, moderately weak, dark greyish brown, fine to medium grained, rock with moderately wide spaced discontinuities	14.00	12.50	14.00	Core	-	-	-	-	54.66	36.00			
	14.50																
	15.00																
	15.50				15.50	14.00	15.50	Core	-	-	-	-	50.00	6.66			
	16.00			14.00 to 17.00m													
	16.50																
	17.00				Slightly weathered, moderately weak, dark greyish, fine to medium grained, rock with moderately widely spaced discontinuities	17.00	15.50	17.00	Core	-	-	-	-	52.00	38.66		
	17.50																
	18.00																
	18.50							18.50	17.00	18.50	Core	-	-	-	-	80.00	53.33
17.00 to 18.50m																	

Project : BHEL

Bore Hole No. : 46

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1316, N 3323

Depth of Water Table : Encountered at 2.50m depth during investigation

Date of Start: 30-08-2024

Date of Completion: 02-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.50 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, filled up sandy clays of low plasticity 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown, fine to very fine grained, clayey sand with little gravels (SC) 0.40 to 1.50m	1.00	1.00	2.00	SPT	2	2	3	5	-	-	
	1.00			Dark Yellowish brown, fine to very fine grained, sandy clays of low plasticity with little to some gravels (CL) 1.50 to 2.90m	2.00	2.00	2.50	SPT	3	3	5	8	-	-	
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00				3.00	3.00	3.50	SPT	3	4	6	10	-	-	
	2.50				3.50	3.50	4.00	SPT	4.00	6	7.00	13	-	-	
	3.00				4.00	4.00	4.50	SPT	3	5	7	12	-	-	
	3.50				4.50	4.50	5.00	SPT	4.00	3	4.00	7	-	-	
	4.00				5.00	5.00	5.50	SPT	5	6	9	15	-	-	
	4.50				5.50	5.50	6.00	SPT	6.00	7	10.00	17	-	-	
	5.00				6.00	6.00	6.50	SPT	4	6	9	15	-	-	
	5.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	6.00				7.00	7.00	7.50	SPT	4	4	10	14	-	-	
	6.50				7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	7.00				8.00	8.00	8.50	SPT	7	10	13	23	-	-	
	7.50				8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	8.00				9.00	9.00	9.50	SPT	9	50/12cm	-	>100	-	-	
	8.50				9.50	9.50	10.00	SPT	12	50/12cm	-	>100	-	-	
	9.00				10.00	10.00	11.50	SPT	55/12cm	-	-	>100	-	-	
	9.50				11.50	11.50	12.50	SPT	55/10cm	-	-	>100	-	-	
	10.00				12.50	12.50	13.00	SPT	55/10cm	-	-	>100	-	-	
	10.50				13.00	13.00	14.00	SPT	55/12cm	-	-	>100	-	-	
	11.00				14.00	14.00	14.50	SPT	55/10cm	-	-	>100	-	-	
	11.50				14.50	14.50	15.50	SPT	50/9cm	-	-	>100	-	-	
	12.00				15.50	15.50	16.00	SPT	50/10cm	-	-	>100	-	-	
	12.50				16.00	16.00	16.09	SPT	50/9cm	-	-	>100	-	-	
	13.00	Not Used			17.50	17.50	17.62	SPT	50/12cm	-	-	>100	-	-	
	13.50				19.00	19.00	19.03	SPT	50/3cm	-	-	>100	-	-	
	14.00				20.50	19.03	20.50	Core	-	-	-	-	14.66	-	
	14.50				22.00	20.50	22.00	Core	-	-	-	-	10.00	-	
	15.00				23.50	22.00	23.50	Core	-	-	-	-	9.33	-	
	15.50				25.00	23.50	25.00	Core	-	-	-	-	28.00	-	
	16.00														
	16.50														
	17.00														
	17.50														
	18.00														
	18.50														
	19.00														
	19.50														
	20.00														
	20.50														
	21.00														
	21.50														
	22.00														
	22.50														
	23.00														
	23.50														
	24.00														
	24.50														
	25.00														

23.00 to 25.00m

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 47

Location : Talabira

Depth of Termination : 18.0 M

Co-ordinates: E 757, N 3288

Depth of Water Table : Encountered at 2.10m depth during investigation

Date of Start: 19-08-2024

Date of Completion: 26-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 197.73 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	Used		Light brownish, fine to very fine grained, silty clays of intermediate plasticity (CI) 0.00 to 0.80m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00				Yellowish brown and light brownish, very fine grained, silty clays of high plasticity (CH) 0.80 to 3.80m	1.00	1.00	2.00	SPT	1	2	2	4	-	-		
	1.50																
	2.00																
	2.50																
	3.00																
	3.50																
	4.00				Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity with occasional gravels (CI) 3.80 to 5.20m	4.00	4.00	4.50	SPT	3	5	5	10	-	-		
	4.50																
	5.00																
	5.50																
	6.00				Reddish yellow, very fine grained, indurated silty clays of low plasticity (CL) 5.20 to 5.90m	6.00	6.00	6.50	SPT	41	50/7cm	-	>100	-	-		
	6.50																
	7.00																
	7.50																
	8.00				Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity (CI) 5.90 to 7.40m	8.00	8.00	8.07	SPT	56/7cm	-	-	>100	-	-		
	8.50																
	9.00																
	9.50																
	10.00			Not used		Dark greyish, very fine grained, indurated silty clays of low plasticity (CL) 7.40 to 8.20m	10.00	8.07	9.00	Core	-	-	-	-	35.00	-	
	10.50																
	11.00																
	11.50																
	12.00					Slightly weathered, weak, light brownish yellow, fine to medium grained, rock with widely spaced discontinuities	12.00	10.50	12.00	Core	-	-	-	-	73.33	54.00	
	12.50																
	13.00																
13.50																	
14.00																	
14.50																	
15.00	Slightly weathered, moderately weak, light brownish grey, fine to medium grained, massive rock 12.00 to 16.00m	15.00	13.50				15.00	Core	-	-	-	-	64.66	22.66			
15.50																	
16.00																	
16.50																	
17.00	Slightly weathered, moderately weak, light brownish grey, fine to medium grained, rock with closely spaced discontinuities		Slightly weathered, moderately weak, light brownish grey, fine to medium grained, rock with closely spaced discontinuities	17.00	15.00	16.50	Core	-	-	-	-	74.66	66.66				
17.50																	
18.00																	
17.00 to 18.00m																	

Project : BHEL

Bore Hole No. : 54

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1680, N 3246

Depth of Water Table : Encountered at 2.50 m depth during investigation

Date of Start: 22-08-2024

Date of Completion: 25-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 204.10 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From	To		N ₁	N ₂	N ₃	N			
						m	m								
Rotary drilling method	0.00			Dark yellowish brown, fine to very fine grained, clayey sand (SC) 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00			Dark yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with some to much gravels (CI) 0.60 to 2.40m	1.00	1.00	2.00	SPT	1	2	3	5			
	1.50												-	-	
	2.00				2.00	2.00	2.50	SPT	2	3	6	9			
	2.50				2.50	2.50	3.00	UDS	-	-	-	-			
	3.00				3.00	3.00	3.50	SPT	6	13	15	28	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-			
	4.00				4.00	4.00	4.50	SPT	11	16	15	31			
	4.50			Yellowish brown, fine to medium grained, clayey sand with little to much gravels (SC) 2.40 to 7.30m	4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	13	30	34	64			
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	15	24	27	51	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	24	50/7 cm	-	>100			
	7.50				7.50	7.50	8.00	DS	-	-	-	-	-	-	
	8.00				8.00	8.00	8.50	SPT	25	50/6 cm	-	>100			
	8.50			Light Yellowish brown, fine to medium cemented clayey sand (SC) 7.30 to 9.40m	8.50	8.50	9.00	SPT	23	50/7 cm	-	>100	-		
	9.00				9.00	9.00	9.50	SPT	27	50/5 cm	-	>100			
	9.50			Light yellowish brown, fine to medium grained, cemented silty sand (SM) 9.40 to 10.00m	9.50	9.50	10.00	SPT	24	50/7 cm	-	>100	-	-	
	10.00				10.00	10.00	11.00	SPT	22	50/8 cm	-	>100			
	10.50														
	11.00				11.00	11.00	11.50	SPT	26	50/8 cm	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	25	50/9 cn	-	>100			
	12.00														
	12.50				12.50	12.50	13.50	SPT	50/5 cm	-	-	>100		-	
	13.00														
	13.50				13.50	13.50	14.00	SPT	55/6 cm	-	-	>100			
	14.00			Yellowish brown, fine to medium grained, cemented clayey sand with little to occasional gravels (SC) 10.00 to 18.00m	14.00	14.00	14.50	SPT	50/6 cm	-	-	>100			
	14.50				14.50	14.50	15.50	SPT	50/6 cn	-	-	>100			
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/5 cm	-	-	>100			
	16.00				16.00	16.00	17.00	SPT	50/7 cn	-	-	>100			
	16.50														
	17.00				17.00	17.00	18.50	SPT	55/5 cm	-	-	>100			
	17.50														
18.00															
18.50				18.50	18.50	19.00	SPT	55/5 cm	-	-	>100	-	-		
19.00			Yellowish brown, fine to medium grained, cemented silty sand with occasional to some gravels (SM)	19.00	19.00	20.00	SPT	55/5 cm	-	-	>100	-	-		
19.50															
20.00					20.00	20.00	20.05	SPT	55/5 cm	-	-	>100	-	-	
18.00 to 20.00m															

Project : BHEL

Bore Hole No. : 55

Location : Hirma, Talabira

Depth of Termination : 21.5 m

Co-ordinates: E 1314, N 3230

Depth of Water Table : Encountered at 2.10 m depth during investigation

Date of Start: 21-09-2024
















Date of Completion: 24-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 201.80 M

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov- ery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Not used		Brownish, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50				Reddish yellow, fien to very fine grained, sandy clays of intermediate plasticity with some gravels (CI) 0.30 to 1.50m											
	1.00				1.00	2.00	SPT	2	2	2	4					
	1.50					Yellowish brown, fine to coarse grained, clayey sand with much gravels (SC) 1.50 to 2.50m	2.00	2.00	2.50	SPT	5	4	7	11	-	-
	2.00			2.50		2.50	3.00	UDS	-	-	-	-				
	2.50			3.00		3.00	3.50	SPT	6	6	7	13	-	-		
	3.00				Yellowish brown, fine to coarse grained, sandy clays of intermediate plasticity with some to little gravels (CI)	3.50	3.50	4.00	UDS	-	-	-	-			
	3.50					4.00	4.00	4.50	SPT	7	9	13	21			
	4.00					4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.50				2.50 to 6.00m	5.00	5.00	5.50	SPT	10	12	14	26			
	5.00					5.50	5.50	6.00	SPT	8	9	11	20	-		
	5.50					6.00	6.00	6.50	SPT	6	3	10	13	-	-	
	6.00				Yellowish brown, fine to coarse grained, clayey sand with little gravels (SC) 6.00 to 7.00m	6.50	6.50	7.00	SPT	6	8	11	19	-	-	
	6.50					7.00	7.00	7.50	SPT	5	9	11	20	-	-	
	7.00					7.50	7.50	8.00	SPT	6	8	10	18	-	-	
	7.50				Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI)	8.00	8.00	8.50	SPT	8	10	11	21	-	-	
	8.00					8.50	8.50	9.00	SPT	8	7	8	15	-	-	
	8.50					9.00	9.00	9.50	SPT	10	15	18	33	-	-	
	9.00				7.00 to 10.80m	9.50	9.50	10.00	SPT	9	14	19	33	-	-	
	9.50					10.00	10.00	11.00	SPT	7	10	13	23	-	-	
	10.00					11.00	11.00	11.50	SPT	20	23	27	50	-	-	
	10.50				Light greyish brown, fine to very fine grained, indurated silty clays of intermediate plasticity (CI) (Silty stone)	11.00	11.00	11.50	SPT	27	39	44	83	-	-	
	11.00					11.50	11.50	12.50	SPT	29	38	43	81	-	-	
	11.50					12.50	13.00	14.00	SPT	27	36	41	77	-	-	
	12.00				10.80 to 15.30m	13.00	13.00	14.00	SPT	21	28	39	67	-	-	
	12.50					14.00	14.00	14.50	SPT	23	25	29	54	-	-	
	13.00					14.50	14.50	15.30	SPT	50/13 cm	-	-	>100	-	-	
	13.50				Dark greyish brown, fine to very fine grained, indurated silty clays of intermediate plasticity with some gravels (CI)	15.00	15.00	16.00	SPT	50/13 cm	-	-	>100	-	-	
	14.00					16.00	16.00	17.00	SPT	50/10 CM	-	-	>100			
	14.50					17.00	17.00	17.20	SPT	-	-	-	-	42.66		
	15.00				15.30 to 17.20m	15.50	15.50	16.00	SPT	-	-	-	-	65.33	8.66	
	15.50					16.00	16.00	17.00	SPT	-	-	-	-	90.00	52.66	
	16.00					17.00	17.00	17.20	SPT	-	-	-	-			
16.50		Slightly weathered, very weak, dark greyish brown, fine to very fine grained, very thinly laminated rock	17.00	17.00	17.20	SPT	-	-	-	-						
17.00			17.20	17.20	18.50	Core	-	-	-	-						
17.50			18.50	18.50	20.00	Core	-	-	-	-						
18.00		17.20 to 19.00m	18.50	18.50	19.00	Core	-	-	-	-						
18.50			19.00	19.00	20.00	Core	-	-	-	-						
19.00			20.00	20.00	21.50	Core	-	-	-	-						
19.50		Moderately weathered, very weak, dark greyish brown, fine to very fine grained, thinly bedded rock	19.50	19.50	20.00	Core	-	-	-	-						
20.00			20.00	20.00	21.50	Core	-	-	-	-						
20.50			21.50	21.50	21.50	Core	-	-	-	-						
21.00	19.00 to 21.50m															
21.50																

Project : BHEL

Bore Hole No. : 62

Location : Talabira

Depth of Termination : 30.0 M

Co-ordinates: E 1414, N 3223

Depth of Water Table : Encountered at 2.10 m depth during investigation

Date of Start: 31-08-2024

Date of Completion: 04-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 203.70

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
					From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50													
	1.00			1.00	1.00	2.00	SPT	1	1	2	3	-	-	
	1.50													
	2.00			2.00	2.00	2.50	SPT	2	2	4	6	-	-	
	2.50			2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00			3.00	3.00	3.50	SPT	2	3	5	8	-	-	
	3.50													
	4.00			3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.50			4.00	4.00	4.50	SPT	8	10	11	21	-	-	
	5.00			4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.50			5.00	5.00	5.50	SPT	9	11	13	24	-	-	
	6.00			5.50	5.50	6.00	SPT	4.00	7	10.00	17	-	-	
	6.50			6.00	6.00	6.50	SPT	7	9	13	22	-	-	
	7.00			6.50	6.50	7.00	SPT	6.00	8	14.00	22	-	-	
	7.50			7.00	7.00	7.50	SPT	8	10	16	26	-	-	
	8.00			7.50	7.50	8.00	SPT	5	9	12	21	-	-	
	8.50			8.00	8.00	8.50	SPT	7	9	14	23	-	-	
	9.00			8.50	8.50	9.00	SPT	8	10	13	23	-	-	
	9.50			9.00	9.00	9.50	SPT	7	10	15.00	25	-	-	
	10.00			9.50	9.50	10.00	SPT	6	8	10.00	18	-	-	
	10.50			10.00	10.00	11.00	SPT	7	14	24.00	38	-	-	
	11.00			11.00	11.00	11.50	SPT	13	17	19.00	36	-	-	
	11.50			11.50	11.50	12.50	SPT	15	18	28.00	46	-	-	
	12.00													
	12.50			12.50	12.50	13.00	SPT	28	40	53.00	93	-	-	
	13.00			13.00	13.00	14.00	SPT	24	29	39.00	68	-	-	
	13.50													
	14.00			14.00	14.00	14.50	SPT	35.00	42.00	58/13cm	>100	-	-	
	14.50			14.50	14.50	15.50	SPT	38.00	45.00	55/12cm	>100	-	-	
	15.00													
	15.50			15.50	15.50	16.00	SPT	33	39.00	61/13cm	>100	-	-	
	16.00			16.00	16.00	17.00	SPT	38	62/14cm	-	>100	-	-	
	16.50													
	17.00			17.00	17.00	17.50	SPT	41	59/13cm	-	>100	-	-	
	17.50			17.50	17.50	18.50	SPT	46	50/7cm	-	>100	-	-	
	18.00													
	18.50			18.50	18.50	19.00	SPT	50/12cm	-	-	>100	-	-	
	19.00			19.00	19.00	19.09	SPT	50/9cm	-	-	>100	-	-	
	19.50													
	20.00			20.00	19.09	20.00	Core	-	-	-	-	21.42	-	
	20.50													
	21.00													
	21.50			21.50	20.00	21.50	Core	-	-	-	-	22.00	-	
	22.00													
	22.50													
	23.00			23.00	21.50	23.00	Core	-	-	-	-	15.33	-	
	23.50			23.00	23.00	23.03	SPT	50/3cm	-	-	>100	-	-	
	24.00													
	24.50			24.50	23.03	24.50	Core	-	-	-	-	12.33	-	
	25.00			24.50	24.50	24.53	SPT	50/3cm	-	-	>100	-	-	
	25.50													
	26.00			26.00	24.53	26.00	Core	-	-	-	-	32.00	22.00	
	26.50													
	27.00													
	27.50			27.50	26.00	27.50	Core	-	-	-	-	14.00	-	
	28.00			27.50	27.50	27.53	SPT	50/3cm	-	-	>100	-	-	
	28.50													
	29.00			29.00	27.53	29.00	Core	-	-	-	-	25.33	-	
	29.50													
	30.00			30.00	29.00	30.00	Core	-	-	-	-	37.00	-	

27.50 to 30.00m

Project : BHEL

Bore Hole No. : 72

Location : Hirma, Talabira

Depth of Termination : 30.0 m

Co-ordinates: E 1598, N 3160

Depth of Water Table : Encountered at 2.40 m depth during investigation

Date of Start: 08-08-2024

Date of Completion: 16-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 206.10m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method	0.00	Not used		Reddish yellow, fine to coarse grained, clayey sand with much gravels (SC) 0.00 to 1.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-				
	0.50																	
	1.00				1.00	2.00	SPT	2	2	3	5							
	1.50																	
	2.00																	
	2.50																	
	3.00																	
	3.50																	
	4.00																	
	4.50																	
	5.00																	
	5.50																	
	6.00																	
	6.50																	
	7.00																	
	7.50																	
	8.00																	
	8.50																	
	9.00																	
	9.50																	
	10.00																	
	10.50																	
	11.00																	
	11.50																	
	12.00				used		Mixture of dark brownish, fine to medium grained, clayey sand and highly weathered, completely fractured and disintegrated, very weak and friable fractured rock 11.30 to 13.40m	11.50	11.50	12.50	SPT	26	55/14cm	-	>100	-	-	
	12.50																	
	13.00																	
	13.50																	
	14.00																	
	14.50																	
	15.00																	
	15.50																	
	16.00																	
	16.50																	
	17.00																	
	17.50																	
18.00																		
18.50																		
19.00																		
19.50																		
20.00																		
20.50																		
21.00																		
21.50																		
22.00																		
22.50																		
23.00																		
23.50																		
24.00																		
24.50																		
25.00																		
25.50																		
26.00																		
26.50																		
27.00																		
27.50																		
28.00																		
28.50																		
29.00																		
29.50																		
30.00																		
28.50 to 30.00m					30.00	28.50	30.00	Core	-	-	-	-	25.33	-				

Project : BHEL

Bore Hole No. : 74

Location : Talabira

Depth of Termination : 27.00 m

Co-ordinates: E 1705, N 3142

Depth of Water Table : Encountered at 2.80m depth during investigation

Date of Start: 26-04-2025


Date of Completion: 04-05-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level:207.27

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov-ery (%)	RQD (%)	Remarks																									
						From	To		N ₁	N ₂	N ₃	N																												
						m	m																																	
Rotary drilling method	0.00	Not Used		Dark brownish, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-																										
	0.50			Yellowish brown, fine to medium grained, clayey sand with little to much gravels (SC) 0.30 to 6.60m	0.00	1.00	2.00	SPT	6	9	22	31	-	-																										
	1.00																																							
	1.50																																							
	2.00																																							
	2.50																																							
	3.00																																							
	3.50																																							
	4.00																																							
	4.50																																							
	5.00																																							
	5.50																																							
	6.00																																							
	6.50																																							
	7.00																																							
	7.50			Light brownish, fine to medium grained, cemented clayey sand with some gravels (SC) 6.60 to 9.30m	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	11.00	11.50	12.50	13.00	13.00	14.00	14.50	15.50	16.00	17.00	17.50	18.50	19.00	20.00	20.50	21.00	21.50	22.00	22.50	23.00	23.50	24.00	24.50	25.00	25.50	26.00	26.50	27.00
	2.00																																							
	2.50																																							
	3.00																																							
	3.50																																							
	4.00																																							
	4.50																																							
	5.00																																							
	5.50																																							
	6.00																																							
	6.50																																							
	7.00																																							
	7.50																																							
	8.00																																							
	8.50																																							
	9.00																																							
	9.50																																							
	10.00																																							
	10.50																																							
	11.00																																							
11.50																																								
12.00																																								
12.50																																								
13.00																																								
13.50																																								
14.00																																								
14.50																																								
15.00																																								
15.50																																								
16.00																																								
16.50																																								
17.00																																								
17.50																																								
18.00																																								
18.50																																								
19.00																																								
19.50																																								
20.00																																								
20.50																																								
21.00																																								
21.50																																								
22.00																																								
22.50																																								
23.00																																								
23.50																																								
24.00																																								
24.50																																								
25.00																																								
25.50																																								
26.00																																								
26.50																																								
27.00																																								
26.00 to 27.00m																																								

26.00 to 27.00m

Project : BHEL

Bore Hole No. : 81

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates : E 1430, N 3109

Depth of Water Table : Encountered at 3.80 m depth during investigation

Date of Start: 22-07-2024

Date of Completion: 24-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 203.28

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov- ery (%)	RQD (%)	Remarks					
						From m	To m		N ₁	N ₂	N ₃	N								
Rotary drilling method	0.00	Not used		Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-						
	0.50		Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 0.60 to 4.40m	2.00	1.00	1.00	2.00	SPT	2	3	5	7	-	-						
	1.00				2.00	1.00	2.00	2.50	SPT	3	5	7	12	-	-					
	1.50					2.50	2.50	3.00	UDS	-	-	-	-	-	-					
	2.00						3.00	3.00	3.50	SPT	5	8	10	18	-	-				
	2.50							3.50	3.50	4.00	UDS	-	-	-	-	-	-			
	3.00								4.00	4.00	4.50	SPT	6	9	12	21	-	-		
	3.50									4.50	4.50	5.00	SPT	5	8	10	18	-	-	
	4.00										5.00	5.00	5.50	SPT	6	9	11	20	-	-
	4.50		5.50	5.50								6.00	UDS	-	-	-	-	-	-	
	5.00			6.00	6.00							6.50	SPT	6	10	14	24	-	-	
	5.50				6.50	6.50						7.00	UDS	-	-	-	-	-	-	
	6.00					7.00	7.00					7.50	SPT	8	13	17	30	-	-	
	6.50						7.50	7.50				8.00	SPT	13	17	21	38	-	-	
	7.00							8.00	8.00			8.50	SPT	12	17	22	39	-	-	
	7.50								8.50	8.50		9.00	SPT	13	19	24	43	-	-	
	8.00									9.00	9.00	9.50	SPT	12	18	23	41	-	-	
	8.50		9.50								9.50	10.00	UDS	-	-	-	-	-	-	
	9.00			10.00							10.00	11.00	SPT	18	26	32	58	-	-	
	9.50				11.00						11.00	11.50	SPT	16	21	27	48	-	-	
	10.00					11.50					11.50	12.50	SPT	18	24	30	54	-	-	
	10.50						12.50				12.50	13.00	SPT	19	26	32	58	-	-	
	11.00							13.00			13.00	14.00	SPT	21	35	43	78	-	-	
	11.50								14.00		14.00	14.50	SPT	24	35	43	78	-	-	
	12.00									14.50	14.50	15.50	SPT	60/13cm	-	-	>100	-	-	
	12.50		15.50								15.50	17.00	SPT	60/11cm	-	-	>100	-	-	
	13.00			17.00							17.00	17.08	SPT	65/8cm	-	-	>100	-	-	
	13.50				17.50						17.50	17.50	Core	-	-	-	-	56.66	-	
	14.00					18.50					18.50	18.50	Core	-	-	-	-	52.00	30.66	
	14.50						20.00				20.00	20.00	Core	-	-	-	-	63.00	51.00	
	15.00							19.00 to 20.00m			19.00	20.00	Core	-	-	-	-	63.00	51.00	
	15.50								19.00 to 20.00m		19.00	20.00	Core	-	-	-	-	63.00	51.00	
16.00	19.00 to 20.00m	19.00								20.00	Core	-	-	-	-	63.00	51.00			
16.50		19.00 to 20.00m	19.00							20.00	Core	-	-	-	-	63.00	51.00			
17.00			19.00 to 20.00m	19.00						20.00	Core	-	-	-	-	63.00	51.00			
17.50				19.00 to 20.00m	19.00					20.00	Core	-	-	-	-	63.00	51.00			
18.00					19.00 to 20.00m	19.00				20.00	Core	-	-	-	-	63.00	51.00			
18.50						19.00 to 20.00m	19.00			20.00	Core	-	-	-	-	63.00	51.00			
19.00							19.00 to 20.00m	19.00		20.00	Core	-	-	-	-	63.00	51.00			
19.50								19.00 to 20.00m	19.00	20.00	Core	-	-	-	-	63.00	51.00			
20.00	19.00 to 20.00m								19.00	20.00	Core	-	-	-	-	63.00	51.00			

Project : BHEL

Bore Hole No. : 83

Location : Hirma, Talabira

Depth of Termination : 22.0 M

Co-ordinates: E 1306, N 3093

Depth of Water Table : Encountered at 0.80 m depth during investigation

Date of Start: 25-12-2024

Date of Completion: 27-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 200.90

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description water table encountered at 0.80m depth	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov- ery (%)	RQD (%)	Remarks	
						From	To		N ₁	N ₂	N ₃	N				
						m	m									
Rotary drilling method	0.00	used		Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 0.00 to 0.85m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occaational gravels (CI)	1.00	1.00	2.00	SPT	2	2	2	4	-	-		
	1.50															
	2.00															
	2.50															
	3.00															
	3.50			0.85 to 3.80m	3.00	3.00	3.50	SPT	5	6	7	13	-	-		
	3.50															
	4.00				Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity with occational gravels (CI) 3.80 to 4.80m	4.00	4.00	4.50	SPT	5	7	9	16			
	4.50															
	5.00															
	5.50			Yellowish brown, fine to medium grained, clays of intermediate plasticity with occatinal gravels (CI)		5.00	5.00	5.50	SPT	5	6	9	15	-	-	
	5.50															
	6.00															
	6.50				4.80 to 7.30m	6.00	6.00	6.50	SPT	5	7	11	18	-	-	
	7.00															
	7.50	Yellowish brown, fine to very fine grained, silty clays of intermediate plasticity with occational gravels (CI) 7.30 to 7.80m	6.50	6.50		7.00	SPT	6	7	13	20	-	-			
	8.00															
	8.50															
	9.00			7.00	7.00	7.50	SPT	7	8	13	21	-	-			
	9.50															
	10.00															
	10.50			7.50	7.50	8.00	SPT	8	13	26	39	-	-			
	11.00															
	11.50			8.00	8.00	8.13	SPT	50/13 cm	-	-	>100					
	12.00															
	12.50			Highly weathered, weak, greyish brown, fine to very fine grained, very thinly laminated rock	8.50	8.13	8.50	Core	-	-	-	-	63.33	-		
	13.00															
	13.50															
	14.00		10.00		8.50	10.00	Core	-	-	-	-	22.66	-			
	14.50															
	15.00		8.20 to 12.00m													
15.50																
16.00																
16.50	Highly weathered, moderately strong, dark brownish grey, fine to very fine grained, rock with closely spaced discontinuities															
17.00																
17.50																
18.00																
18.50																
19.00																
19.50																
20.00																
20.50			Highly weathered, very weak and moderately weak, light brownish grey and greyish black, fine to very fine grained, thinly bedded rock													
21.00																
21.50																
22.00																
		12.00 to 14.00m														
	Highly weathered, very weak and moderately weak, light brownish grey and greyish black, fine to very fine grained, thinly bedded rock															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 89

Location : Hirma, Talabira

Depth of Termination : 20.50 m

Co-ordinates: E 1551, N 3047

Depth of Water Table : Encountered at 2.30 m depth during investigation

Date of Start: 04-08-2024

Date of Completion: 07-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 204.70

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.s				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method with Hydraulic feed	0.00	Used		Yellowish brown, fine to medium grained, filled up sandy clays of intermediate plasticity 0.00 to 0.70m	0.00	0.00	1.50	DS	-	-	-	-	-	-	
	0.50														
	1.00		Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 0.70 to 3.80m		1.00	1.00	2.00	SPT	2	3	4	7			
	1.50														
	2.00				2.00	2.00	2.50	SPT	3	3	4	7			
	2.50				2.50	2.50	2.00	UDS	-	-	-	-			
	3.00				3.00	3.00	3.40	SPT	9	12	15	27	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-			
	4.00				4.00	4.00	4.50	SPT	5	7	8	15			
	4.50				4.50	4.50	5.00	UDS	-	-	-	-			
	5.00				5.00	5.00	5.50	SPT	9	17	22	40			
	5.50				5.50	5.50	6.00	UDS	-	-	-	-			
	6.00				6.00	6.00	6.50	SPT	13	14	12	26	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	9	15	17	32	-	-	
	7.50				7.50	7.50	8.00	SPT	8	21	44	65	-	-	
	8.00				8.00	8.00	8.50	SPT	19	23	36	59	-	-	
	8.50			Not Used		8.50	8.50	9.00	SPT	23	39	46	85	-	-
	9.00		9.00		9.00	9.08	SPT	50/8 cm	-	-	>100	-	-		
	9.50														
	10.00		10.00		9.08	10.00	Core	-	-	-	-	16.00			
	10.50														
	11.00	Highly weathered, very weak, greyish brown, very fine grained, very thinly laminated rock 8.30 to 14.50m													
	11.50				11.50	11.50	11.57	Core	-	-	-	-	21.33		
	12.00														
	12.50														
	13.00				13.00	11.57	13.00	Core	-	-	-	-	32.00	-	
	13.50														
	14.00	Highly weathered, very weak, greyish brown, very fine grained, thinly bedded rock 14.50 to 17.60m			14.50	13.00	14.50	Core	-	-	-	-	29.33	8.66	
	15.00														
	15.50														
	16.00			16.00	14.50	16.00	Core	-	-	-	-	56.00	33.33		
16.50															
17.00															
17.50			17.50	16.00	17.50	Core	-	-	-	-	56.66	6.66			
18.00															
18.50															
19.00			19.00	17.50	19.00	Core	-	-	-	-	62.66	6.66			
19.50															
20.00															
20.50			20.50	19.00	20.50	Core	-	-	-	-	87.33	45.33			
17.60 to 20.50m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 95

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1678, N 3020

Depth of Water Table : Encountered at 2.40m depth during investigation

Date of Start: 16-08-2024

Date of Completion: 18-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 206.60 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Reddish brown, fine to coarse grained, clayey sand with some to much gravels (SC) 0.00 to 2.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	1	1	15	16	-	-	
	1.50														
	2.00			Brownish to yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 2.40 to 6.50m	2.00	2.00	2.50	SPT	9	10	11	21	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	5	7	7	14	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	6	10	12	22	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	14	17	21	38	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	25	45	55/13cm	>100	-	-	
	6.50			Yellowish brown, fine to medium grained, weakly cemented silty clayey sand with occasional gravels (SM-SC) 6.50 to 8.60m	6.50	6.50	7.00	SPT	22	40	56	96	-	-	
	7.00				7.00	7.50	SPT	26	47	53/12cm	>100	-	-		
	7.50				7.50	8.00	SPT	50/14cm	-	-	>100	-	-		
	8.00				8.00	8.50	SPT	50/12cm	-	-	>100	-	-		
	8.50			Yellowish brown, fine to medium grained, weakly cemented poorly graded sand and silty sand with much to some gravels (SP-SM) 8.60 to 9.60m	8.50	8.50	9.00	SPT	45	50/6cm	-	>100	-	-	
	9.00				9.00	9.50	SPT	50/10cm	-	-	>100	-	-		
	9.50				9.50	10.00	SPT	50/6cm	-	-	>100	-	-		
	10.00				10.00	11.00	SPT	50/7cm	-	-	>100	-	-		
	10.50	Brownish, fine to medium grained, weakly cemented silty sand with little plastic fines and much gravels (SM) 9.60 to 12.30m		11.00	11.00	11.50	SPT	50/5cm	-	-	>100	-	-		
	11.50			11.50	12.50	SPT	50/7cm	-	-	>100	-	-			
	12.00														
	12.50			Brownish, fine to medium grained, clayey sand (SC) 12.30 to 16.30m	12.50	12.50	13.00	SPT	50/6cm	-	-	>100	-	-	
	13.00				13.00	14.00	SPT	50/6cm	-	-	>100	-	-		
	14.00				14.00	14.50	SPT	50/5cm	-	-	>100	-	-		
	14.50				14.50	15.50	SPT	50/5cm	-	-	>100	-	-		
	15.00														
	15.50	15.50	15.50	16.00	SPT	50/7cm	-	-	>100	-	-				
	16.00	16.00	16.00	17.00	SPT	50/6cm	-	-	>100	-	-				
	16.50	Mixture of dark brownish, fine to medium grained, clayey sand with highly weathered, completely fractured and disintegrated, gravel, pebble size very weak and friable fractured rock fragments 16.30 to 18.10m													
17.00	17.00			17.50	SPT	50/7cm	-	-	>100	-	-				
17.50	17.50			17.54	SPT	50/4cm	-	-	>100	-	-				
18.00	Highly weathered, very weak, dark brownish, fine to medium grained, gravel, pebble cobble size angular interlocking fragments of fractured rock														
18.50			18.50	17.54	18.50	Core	-	-	-	-	32.50	-			
19.00			18.50	18.50	18.52	SPT	50/2cm	-	-	>100	-	-			
19.50															
20.00			20.00	18.52	20.00	SPT	50/2cm	-	-	>100	-	-			
18.10 to 20.00m															

K.C.T. Consultancy Services®

Project : BHEL
 Bore Hole No. : 102
 Location : Talabira
 Depth of Termination : 30.0 M
 Co-ordinates: E 1602, N 2997
 Depth of Water Table : Encountered at 3.40m depth during investigation

Date of Start: 22-08-2024
 Date of Completion: 25-08-2024
 Diameter of Bore: 150mm and Nx size
 Bit Used: Soil Surface Bit and NX Size
 Reduced Level: 205.11 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00			Dark yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50			Dark yellowish brown, fine to medium grained, sandy clays of low plasticity (CL) 0.30 to 1.60m	1.00	1.00	2.00	SPT	1	1	2	3	-	-		
	1.00															
	1.50															
	2.00			Yellowish brwn, fine to medium grained, clayey sand with little to much gravels (SC) 1.60 to 2.70m	2.00	2.00	2.50	SPT	4	6	12	18	-	-		
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00				3.00	3.00	3.50	SPT	8	10	12	22	-	-		
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-		
	4.00				4.00	4.00	4.50	SPT	6	8	10	18	-	-		
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-		
	5.00				5.00	5.00	5.50	SPT	9	11	13	24	-	-		
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-		
	6.00				6.00	6.00	6.50	SPT	13	18	28	46	-	-		
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-		
	7.00				Dark yellowish brown to dark greyish brown, very fine grained, clays of high plasticity (CH) 2.70 to 12.00m	7.00	7.00	7.50	SPT	15	17	25	42	-	-	
	7.50					7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	8.00					8.00	8.00	8.50	SPT	16	20	27	47	-	-	
	8.50					8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	9.00					9.00	9.00	9.50	SPT	18	22	26	48	-	-	
	9.50					9.50	9.50	10.00	UDS	-	-	-	-	-	-	
	10.00					10.00	10.00	11.00	SPT	18	20	24	44	-	-	
	10.50															
	11.00					11.00	11.00	11.50	UDS	-	-	-	-	-	-	
	11.50					11.50	11.50	12.50	SPT	20	26	34	60	-	-	
	12.00															
	12.50					12.50	12.50	13.00	SPT	50/14cm	-	-	>100	-	-	
	13.00					13.00	13.00	14.00	SPT	50/13cm	-	-	>100	-	-	
	13.50															
	14.00					14.00	14.00	14.50	SPT	50/14cm	-	-	>100	-	-	
	14.50					14.50	14.50	15.50	SPT	50/12cm	-	-	>100	-	-	
	15.00															
	15.50					15.50	15.50	16.00	SPT	50/9cm	-	-	>100	-	-	
	16.00					16.00	16.00	17.00	SPT	50/11cm	-	-	>100	-	-	
	16.50				Dark yellowish brown to dark greyish brown, very fine grained, indurated clays of high plasticity (CH) 12.00 to 22.00m	17.00	17.00	17.50	SPT	50/10cm	-	-	>100	-	-	
	17.00					17.50	17.50	18.50	SPT	50/10cm	-	-	>100	-	-	
	17.50															
	18.00															
	18.50					18.50	18.50	19.00	SPT	50/8cm	-	-	>100	-	-	
	19.00					19.00	19.00	20.00	SPT	50/8cm	-	-	>100	-	-	
	19.50															
20.00					20.00	20.00	20.50	SPT	50/9cm	-	-	>100	-	-		
20.50					20.50	20.50	21.50	SPT	50/8cm	-	-	>100	-	-		
21.00																
21.50					21.50	21.50	22.00	SPT	50/7cm	-	-	>100	-	-		
22.00					22.00	22.00	22.08	SPT	50/8cm	-	-	>100	-	-		
22.50				Moderately weathered, moderately strong, dark blackish grey, fine to medium grained, rock with close spacing of discontinuities 22.00 to 24.50m	23.00	22.08	23.00	Core	-	-	-	-	63.75	6.66		
23.00																
23.50																
24.00																
24.50				Slightly weathered, moderately weak, blackish grey, fine to medium grained, rock with moderately wide spacing of discontinuities 24.50 to 26.00m	24.50	23.00	24.50	Core	-	-	-	-	74.00	39.33		
25.00																
25.50																
26.00				Moderately weathered, moderately weak, light blackish grey, fine to medium grained, rock with very close spacing of discontinuities 26.00 to 27.50m	26.00	24.50	26.00	Core	-	-	-	-	58.00	7.33		
26.50																
27.00																
27.50				Moderately weathered, moerately weak, light blackish grey, fine to medium grained, fractured rock 27.50 to 29.00m	27.50	26.00	27.50	Core	-	-	-	-	52.00	-		
28.00																
28.50																
29.00				Moderately weathered, very weak, blackish grey, fine to very fine grained, rock with wide spacing of discontinuities 29.00 to 29.50m	29.00	27.50	29.00	Core	-	-	-	-	62.66	46.00		
29.50																
30.00				Moderately weathered, very weak, light blackish grey, fine to medium grained, rock with wide spacing of discontinuities	30.00	29.00	30.00	Core	-	-	-	-	60.00	11.00		

29.50 to 30.00m

Page no.590 of 618

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 110

Location : Talabira

Depth of Termination : 19.5 M

Co-ordinates: E 1422, N 2931

Depth of Water Table : Encountered at 3.70m depth during investigation

Date of Start: 23-07-2024





Date of Completion: 26-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 201.42

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov- ery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 0.00 to 1.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00					1.00	1.00	2.00	SPT	2	3	4	7	-	-	
	1.50															
	2.00			Yellowish brown, very fine grained, clys of high plasticity (CH) 1.60 to 2.60m	2.00	2.00	2.50	SPT	4	10	9	19	-	-		
	2.50				2.50	2.50	3.00	UDS	-	-	-	-				
	3.00	Not Used		Brownish, very fine grained, clays of intermediate plasticity (CI) 2.60 to 3.80m	3.00	3.00	3.50	SPT	5	11	13	24	-	-		
	3.50				3.50	3.50	4.00	SPT	7	13	15	28	-	-		
	4.00				4.00	4.00	4.50	SPT	51/3cm	-	-	>100	-	-		
	4.50				4.50	4.50	6.00	SPT	51/3cm	-	-	>100				
	5.00															
	5.50															
	6.00					6.00	6.00	7.50	SPT	51/3cm	-	-	>100	-	-	
	6.50															
	7.00															
	7.50					7.50	7.50	7.53	SPT	51/3cm	-	-	>100	-		
	8.00															
	8.50															
	9.00				Highly weathered, very weak, dark brownish grey, fine to very fine grained, very thinly laminated rock 3.80 to 15.00m	9.00	7.53	9.00	Core	-	-	-	-	6.00	-	
	9.50															
	10.00															
	10.50					10.50	9.00	10.50	Core	-	-	-	-	18.00	-	
	11.00															
	11.50															
	12.00															
	12.50					12.50	10.50	12.50	Core	-	-	-	-	44.00	6.66	
	+ 13.00															
	13.50				13.50	12.50	13.5	Core	-	-	-	-	34.00	6.66		
	14.00															
	14.50															
15.00				15.00	13.50	15.00	Core	-	-	-	-	53.33	50.67			
15.50																
16.00																
16.50				Slightly weathered, weak, dark greyish black, fine to very fine grained, thickly bedded rock 15.00 to 19.00m	16.50	15.00	16.50	Core	-	-	-	-	70.66	62.67		
17.00																
17.50																
18.00					18.00	16.50	18.00	Core	-	-	-	-	64.67	50.67		
18.50																
19.00																
19.50				Fresh, weak, dark greyish black, fine to very fine grained, massive rock	19.50	18.00	19.50	Core	-	-	-	-	88.00	-		
19.00 to 20.00m																

Project : BHEL

Bore Hole No. : 117

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1747, N 2930

Depth of Water Table : Encountered at 2.50m depth during investigation

Date of Start: 04-09-2024

Date of Completion: 05-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 206.10 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Not used		Yellowish brown, fine to medium grained, filled up silty and clayey sand with some gravels 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Dark brownish red, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI) 0.60 to 1.50m											
	1.00				1.00	1.00	2.00	SPT	5	6	7	13			
	1.50														
	2.00			Dark brownish red and light yellowish brown, fine to medium grained, clayey sand (SC)	2.00	2.00	2.50	SPT	9	12	14	26	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-			
	3.00				3.00	3.00	3.50	SPT	8	9	10	19	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-			
	4.00			1.50 to 4.50m	4.00	4.00	4.50	SPT	15	18	23	41			
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			Yellowish brown, fine to medium grained, weakly cemented clayey sand	5.00	5.00	5.50	SPT	25	27	32	59			
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	20	27	38	65	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00			4.50 to 7.40m	7.00	7.00	7.50	SPT	30	50/12 cm	-	>100	-	-	
	7.50				7.50	7.50	8.00	SPT	25	50/14 cm	-	>100	-	-	
	8.00			Light brownish and dark brownish, fine to medium grained, weakly cemented sand	8.00	8.00	8.50	SPT	40	50/8 cm	-	>100	-	-	
	8.50				8.50	8.50	9.00	SPT	30	50/9 cm	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	45	50/6 cm	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/14 cm	-	-	>100	-	-	
	10.00			7.40 to 10.00m	10.00	10.00	11.00	SPT	50/12 cm	-	-	>100	-	-	
	10.50														
	11.00			Yellowish brown, fine to medium grained, cemented clayey sand	11.00	11.00	11.50	SPT	50/10 cm	-	-	>100			
	11.50				11.50	11.50	12.50	SPT	44	50/8 cm	-	>100			
	12.00				12.50	12.50	13.00	SPT	40	50/6 cm	-	>100			
	12.50				13.00	13.00	14.00	SPT	50/8 cm	-	-	>100	-	-	
	13.00			10.00 to 14.00m	14.00	14.00	14.50	SPT	50/7 cm	-	-	>100			
	13.50				14.50	14.50	14.50	SPT	50/10 cm	-	-	>100	-	-	
	14.00			Whitish yellow, dark brownish and yellowish brown, fine to coarse grained, cemented sand	15.00										
	14.50				15.50	15.00	16.00	SPT	50/9 cm	-	-	>100			
	15.00				16.00	16.00	17.00	SPT	50/12 cm	-	-	>100			
	15.50				17.00	17.00	17.50	SPT	50/10 cm	-	-	>100			
	16.00			14.00 to 18.60m	17.50	17.50	18.50	SPT	50/9 cm	-	-	>100	-	-	
	16.50														
	17.00				18.50	18.50	19.00	SPT	50/8 cm	-	-	>100			
	17.50				19.00	19.00	20.00	SPT	50/10 cm	-	-	>100	-	-	
18.00	Dark brownish, fine to coarse grained, cemented clayey sand (SC)	20.00	20.00	20.08	SPT	50/8 cm	-	-	>100	-	-				
18.50															
19.00															
19.50															
20.00															
18.60 to 20.00m															

Project : BHEL

Bore Hole No. : 118

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1609, N 2910

Depth of Water Table : Encountered at 3.20m depth during investigation

Date of Start: 17-12-2024

Date of Completion: 19-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 204.520 M

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Yellowish brown, fine to medium grained, sandy clays of low plasticity (CL) 0.00 to 1.00m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00			Yellowish brown and brownish, fine to medium grained, sandy clays of intermediate plasticity with little gravels (CI) 1.00 to 2.80m	1.00	1.00	2.00	SPT	2	2	3	5	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	2	3	3	6	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00			Yellowish brown, very fine grained, silty clays of high plasticity with some gravels (CH) 2.80 to 4.80m	3.00	3.00	3.50	SPT	3	4	5	9	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	9	9	10	19	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			Greyish brown, very fine grained, silty clays of intermediate plasticity (CI) 4.80 to 6.40m	5.00	5.00	5.50	SPT	11	13	16	29	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	12	15	17	32	-	-	
	6.50			Yellowish brown and greyish, very fine grained, clays of high plasticity (CH) 6.40 to 7.00m	6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00			Yellowish brown and greyish brown, very fine grained, silty clays of intermediate plasticity with occasional gravels (CI) 7.00 to 8.50m	7.00	7.00	7.50	SPT	11	16	17	33	-	-	
	7.50				7.50	7.50	8.00	SPT	11	18	21	39	-	-	
	8.00				8.00	8.00	8.50	SPT	17	17	20	37	-	-	
	8.50				8.50	8.50	9.00	SPT	25	30	39	69	-	-	
	9.00				9.00	9.00	9.50	SPT	27	50/12 cm	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	25	37	41	78	-	-	
	10.00				10.00	10.00	11.00	SPT	31	50/13 cm	-	>100	-	-	
	10.50														
	11.00			Dark brownish, fine to very fine grained, indurated clays of intermediate plasticity (CI) (Mud stone)	11.00	11.00	11.50	SPT	33	50/12 cm	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	30	50/13 cm	-	>100	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	35	50/12 cm	-	>100	-	-	
	13.00				13.00	13.00	14.00	SPT	46	50/8 cm	-	>100	-	-	
	13.50														
	14.00			8.50 to 14.70m	14.00	14.00	14.50	SPT	41	50/7 cm	-	>100	-	-	
	14.50				14.50	14.50	14.70	SPT	48	50/5 cm	-	>100	-	-	
	15.00														
	15.50			Highly weathered, very weak, dark greyish and greyish brown, very fine grained, very thinly laminated rock	15.50	14.70	15.00	Core	-	-	-	-	36.25	-	
	16.00														
	16.50														
	17.00				17.00	15.00	17.00	Core	-	-	-	-	20.66	-	
	17.50														
	18.00			14.70 to 18.60m											
	18.50				18.50	17.00	18.50	Core	-	-	-	-	18.66	-	
	19.00			Highly weathered, moderately strong, greyish brown, fine to coarse grained, friable rock	18.50	18.50	18.54	SPT	50/4 cm	-	-	>100	-	-	
	19.50														
	20.00				20.00	18.50	20.08	Core	-	-	-	-	9.33	-	
18.60 to 20.00m					20.00	20.00	20.03	SPT	50/3 cm			>100			

Project : BHEL

Bore Hole No. : 119

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 1668, N 2908

Depth of Water Table : Encountered at 2.50m depth during investigation

Date of Start: 26-08-2024

Date of Completion: 28-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 205.46

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 0.00 to 1.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	1	1	3	4	-	-	
	1.50														
	2.00			Yellowish brown, fine to coarse grained, clayey sand (SC) 1.60 to 2.80m	2.00	2.00	2.50	SPT	10	15	18	33	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	11	14	13	27	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00			Reddish yellow, fine to very fine grained, clayey sand (SC) 2.80 to 5.30m	4.00	4.00	4.50	SPT	6	9	10	19	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	7	7	9	16	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	7	10	12	22	-	-	
	6.50			Yellowish brown, fine to medium grained, clayey sand with little to occasional gravels (SC) 5.30 to 8.60m	6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	8	10	14	24	-	-	
	7.50				7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	8.00				8.00	8.00	8.50	SPT	9	12	14	26	-	-	
	8.50				8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	9.00				9.00	9.00	9.50	SPT	35	50/10cm	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/13cm	-	-	>100	-	-	
	10.00				10.00	10.00	11.00	SPT	50/13cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	50/12cm	-	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	50/12cm	-	-	>100	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	50/11cm	-	-	>100	-	-	
	13.00			Brownish red to whitish yellow, fine to medium grained, weakly cemented sand rock 8.60 to 18.70m	13.00	13.00	14.00	SPT	50/11cm	-	-	>100	-	-	
	13.50														
	14.00				14.00	14.00	14.50	SPT	50/12cm	-	-	>100	-	-	
	14.50				14.50	14.50	15.50	SPT	50/10cm	-	-	>100	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/11cm	-	-	>100	-	-	
	16.00				16.00	16.00	17.00	SPT	50/13cm	-	-	>100	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	50/12cm	-	-	>100	-	-	
	17.50				17.50	17.50	18.50	SPT	50/10cm	-	-	>100	-	-	
	18.00														
	18.50				18.50	18.50	19.00	SPT	50/12cm	-	-	>100	-	-	
	19.00				19.00	19.00	20.00	SPT	50/11cm	-	-	>100	-	-	
	19.50														
	20.00				20.00	20.00	20.50	SPT	50/10cm	-	-	>100	-	-	
	20.50				20.50	20.50	21.50	SPT	50/9cm	-	-	>100	-	-	
	21.00			Light whitish yellow and light brownish, fine to coarse grained, weakly cemented sand 18.70 to 23.90m											
	21.50				21.50	21.50	22.00	SPT	50/10cm	-	-	>100	-	-	
	22.00														
	22.50				22.00	22.00	23.00	SPT	50/12cm	-	-	>100	-	-	
	23.00				23.00	23.00	23.50	SPT	50/10cm	-	-	>100	-	-	
	23.50				23.50	23.50	23.62	SPT	50/12cm	-	-	>100	-	-	
	24.00			Highly weathered, weak, light yellowish brown, fine to coarse grained, fractured rock											
	24.50														
	25.00				25.00	23.62	25.00	Core	-	-	-	-	16.36	-	
23.90 to 25.00m															

Project : BHEL

Bore Hole No. : 125

Location : Hirma, Talabira

Depth of Termination : 20.00 m

Co-ordinates: E 1557, N 2902

Depth of Water Table : Encountered at 3.0 m depth during investigation

Date of Start: 26-08-2024

Date of Completion: 29-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 204.63 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	used		Yellowish brown, fine to medium grained, filled up sandy clays of intermediate plasticity with of occational gravels 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Reddish brown, fine to coarse grained, clayey sand with much gravels (SC) 0.40 to 2.80m	1.00	1.00	2.00	SPT	2	3	5	8	-	-	
	1.00				2.00	2.00	2.50	SPT	4	6	8	15	-	-	
	1.50				2.50	2.50	3.00	SPT	6	10	15	25	-	-	
	2.00				3.00	3.00	3.50	SPT	7	8	15	23	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00			Yellowish brown, very fine grained, silty clays of high plasticity with much gravels (CH) 2.80 to 4.90m	4.00	4.00	4.50	SPT	9	13	16	29	-	-	
	3.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.00				5.00	5.00	5.50	SPT	12	15	17	32	-	-	
	4.50				5.50	5.50	6.00	SPT	55/9cm	-	-	>100	-	-	
	5.00				6.00	6.00	6.50	SPT	55/10cm	-	-	>100	-	-	
	5.50			Light greyish brown, very fine grained, silty clays of intermediate plasticity (CI) (silty stone) 4.90 to 8.00m	6.50	6.50	7.00	SPT	55/12cm	-	-	>100	-	-	
	6.00				7.00	7.00	8.00	SPT	55/10cm	-	-	>100	-	-	
	6.50				8.00	8.00	8.08	SPT	55/8cm	-	-	>100	-	-	
	7.00				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	7.50				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	8.00			Mixture of highly weathered, very weak, light greyish brown, fine to medium grained, pebbles, size rock fragments with widely spaced discontinuities 8.00 to 8.40m	8.00	8.00	8.08	SPT	55/8cm	-	-	>100	-	-	
	8.50				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	9.00				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	9.50				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	10.00				8.08	8.08	8.08	SPT	55/8cm	-	-	>100	-	-	
	10.50	Not used		Boulderous formation of hgily weathered, dark brownish and whitish yellow, fine to coarse grained, pebbles, cobbles and boulders size fragments of rock with dark brownish clayey sand 8.40 to 9.90m	9.00	8.08	9.00	Core	-	-	-	-	36.66	-	
	11.00				10.00	9.00	10.00	DS	-	-	-	-	-	-	
	11.50				10.00	10.00	10.07	SPT	50/7cm	-	-	>100	-	-	
	12.00				11.00	10.07	11.00	SPT	55/10cm	-	-	>100	-	-	
	12.50				11.50	11.00	11.50	SPT	55/12cm	-	-	>100	-	-	
	13.00			Yellowish grey, very fine grained, indurated clays of high plasticity (silty stone) 9.90 to 13.40m	12.50	11.50	12.50	SPT	55/10cm	-	-	>100	-	-	
	13.50				13.00	12.50	13.00	SPT	55/13cm	-	-	>100	-	-	
	14.00				14.50	13.00	14.50	Core	-	-	-	-	18.18	-	
	14.50				14.50	13.00	14.50	Core	-	-	-	-	18.18	-	
	15.00				14.50	13.00	14.50	Core	-	-	-	-	18.18	-	
	15.50			Highly weathered, very weak, dark brownish, fine to coarse grained, fractured micaceous rock 13.40 to 16.00m	16.00	14.50	16.00	Core	-	-	-	-	5.33	-	
	16.00				16.00	16.00	16.07	SPT	55/7cm	-	-	>100	-	-	
	16.50				16.00	16.00	16.07	SPT	55/7cm	-	-	>100	-	-	
	17.00				17.50	16.07	17.50	Core	-	-	-	-	5.33	-	
	17.50				17.50	17.50	17.59	SPT	55/9cm	-	-	>100	-	-	
	18.00			Highly weatherred, dark brownish, fine to coarse grained, fractured rock 16.00 to 18.50m	19.00	17.59	19.00	Core	-	-	-	-	8.66	-	
	18.50				19.00	19.00	19.08	SPT	55/8cm	-	-	>100	-	-	
	19.00				19.00	19.00	19.08	SPT	55/8cm	-	-	>100	-	-	
	19.50				20.00	19.08	20.00	Core	-	-	-	-	6.00	-	
	20.00				20.00	20.00	20.06	SPT	50/6cm	-	-	>100	-	-	
					20.00	20.00	20.06	SPT	50/6cm	-	-	>100	-	-	

18.50 to 20.00m

Project : BHEL

Bore Hole No. : 133

Location : Hirma, Talabira

Depth of Termination : 18.5 m

Co-ordinates: E 825, N 2840

Depth of Water Table : Encountered at 2.80 m depth during investigation

Date of Start: 25-07-2024



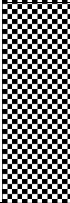
Date of Completion: 26-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 197.690 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks		
						From m	To m		N ₁	N ₂	N ₃	N					
Rotary drilling method	0.00	used		Yellowish brown, fine to very fine grained, clays of high plasticity (CH) 0.00 to 3.10m	0.00	0.00	1.00	DS	-	-	-	-	-	-			
	0.50																
	1.00				1.00	1.00	2.00	SPT	1	1	2	3					
	1.50												-	-			
	2.00			Yellowish brown, fine to medium grained, clayey sand with much to some gravels (SC) 3.10 to 6.00m	2.00	2.00	2.50	SPT	1	2	2	4					
	2.50				2.50	2.50	3.00	UDS	-	-	-	-					
	3.00				3.00	3.00	3.50	SPT	3	4	7	11	-	-			
	3.50				3.50	3.50	4.00	UDS	-	-	-	-					
	4.00			Dark Yellowish brown, fine to medium grained, clayey sand with occasional to some gravels (SC) 6.00 to 9.70m	4.00	4.00	4.50	SPT	4	6	7	13					
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-			
	5.00				5.00	5.00	5.50	SPT	4	5	5	10					
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-			
	6.00			Yellowish brown, fine to medium grained, silty clayey sand with little to some gravels (SM-SC) 9.70 to 11.30m	6.00	6.00	6.50	SPT	6	9	13	22	-	-			
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-			
	7.00				7.00	7.00	7.50	SPT	5	5	8	13					
	7.50				7.50	7.50	8.00	SPT	2	2	3	5					
	8.00			Highly weathered, weak, light brownish grey, fine to medium grained, rock with close spacing of discontinuities 14.20 to 15.50m	8.00	8.00	8.50	SPT	3	4	4	8					
	8.50				8.50	8.50	9.00	SPT	4	6	9	15					
	9.00				9.00	9.00	9.50	SPT	5	8	10	18					
	9.50				9.50	9.50	10.00	SPT	5	7	10	17					
	10.00			Yellowish brown, fine to medium grained, silty sand (SM) 11.30 to 14.20m	10.00	10.00	11.00	SPT	5	9	14	23					
	10.50																
	11.00				11.00	11.00	11.50	SPT	6	11	16	27					
	11.50				11.50	11.50	12.50	SPT	9	11	15	26					
	12.00			Slightly weathered, moderately weak, fine to medium grained, yellowish brown, rock with very wide spacing of discontinuities													
	12.50				12.50	12.50	13.00	SPT	8	13	17	30					
	13.00				13.00	13.00	14.00	SPT	10	15	21	36					
	13.50																
	14.00			Not Used			14.00	14.00	14.30	SPT	9	14	23	37			
	14.50																
15.00																	
15.50	15.50	14.30	15.50				Core	-	-	-	-	69.00	46.00				
16.00	Not Used																
16.50																	
17.00				17.00	15.50	17.00	Core	-	-	-	-	64.00	55.00				
17.50																	
18.00																	
18.50				18.50	17.00	18.50	Core	-	-	-	-	94.00	94.00				
15.50 to 20.00m																	

Project : BHEL

Bore Hole No. : 138

Location : Hirma, Talabira

Depth of Termination : 19.5 m

Co-ordinates : E 787, N 2840

Depth of Water Table : Encountered at 2.80 m depth during investigation

Date of Start: 25-07-2024

Date of Completion: 26-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 197.73

BORE LOG DATA SHEET

Method of Boring	Depth of Boring m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	used		Yellowish brown, very fine grained, clays of high plasticity (CH)	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	1	1	2	3			
	1.50												-	-	
	2.00				2.00	2.00	2.50	SPT	2	2	3	5			
	2.50			0.00 to 3.60m	2.50	2.50	3.00	UDS	-	-	-	-			
	3.00				3.00	3.00	3.50	SPT	2	3	4	7	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-			
	4.00				4.00	4.00	4.50	SPT	3	4	5	9			
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			Yellowish brown, fine to medium grained, clayey sand (SC)	5.00	5.00	5.50	SPT	4	5	7	12			
	5.50				5.50	5.50	6.00	SPT	4	7	9	16	-	-	
	6.00				6.00	6.00	6.50	SPT	3	5	6	11	-	-	
	6.50				6.50	6.50	7.00	SPT	6	7	8	15	-	-	
	7.00				7.00	7.00	7.50	SPT	6	9	11	20			
	7.50				7.50	7.50	8.00	SPT	5	7	8	15			
	8.00				8.00	8.00	8.50	SPT	5	6	8	14			
	8.50				8.50	8.50	9.00	SPT	5	7	8	15			
	9.00				9.00	9.00	9.50	SPT	7	9	11	20			
	9.50				9.50	9.50	10.00	SPT	10	11	17	28			
	10.00				10.00	10.00	11.00	SPT	6	6	8	14			
	10.50				11.00	11.00	11.50	SPT	9	11	15	26			
	11.00				11.50	11.50	12.50	SPT	9	14	14	28			
	12.00				12.50	12.50	13.00	SPT	10	15	17	32			
	12.50				13.00	13.00	14.00	SPT	14	22	34	56			
	13.00				14.00	14.00	14.50	SPT	42	50/5cm	-	>100			
	13.50				14.50	14.50	15.00	SPT	50/2cm	-	-	>100			
	14.00				15.00	15.00	15.02	SPT	50/2cm	-	-	>100			
	14.50				16.00	16.00	16.50	Core	-	-	-	-	40.00	24.00	
	15.00				16.50	15.02	16.50	Core	-	-	-	-	40.00	24.00	
	15.50				17.00	16.50	17.50	Core	-	-	-	-	60.00	36.00	
	16.00				17.50	16.50	18.00	Core	-	-	-	-	60.00	36.00	
	16.50				18.00	16.50	18.50	Core	-	-	-	-	60.00	36.00	
	17.00				18.50	16.50	19.00	Core	-	-	-	-	60.00	36.00	
	17.50				19.00	16.50	19.50	Core	-	-	-	-	60.00	36.00	
	18.00				19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
	18.50				19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
	19.00				19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
	19.50				19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	
					19.50	18.00	19.50	Core	-	-	-	-	78.00	60.00	

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 141

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1420, N 2778

Depth of Water Table : Encountered at 1.70m depth during investigation

Date of Start: 11-09-2024

Date of Completion: 12-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 203.95 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov-ery (%)	RQD (%)	Remarks
						From	To		N ₁	N ₂	N ₃	N			
						m	m								
Rotary drilling method	0.00			Yellowish brown, fine to medium grained, filled up silty sand 0.00 to 0.40m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown, fine to medium grained, clayey sand with occasional gravels (SC) 0.40 to 1.50m	1.00	1.00	2.00	SPT	1	2	2	4	-	-	
	1.00														
	1.50														
	2.00			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with little to some gravels (CI) 1.50 to 3.90m	2.00	2.00	2.50	SPT	3	4	6	10	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	8	10	12	22	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00			Dark yellowish brown, very fine grained, clays of high plasticity (CH) 3.90 to 6.20m	4.00	4.00	4.50	SPT	4	5	6	11	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	7	8	12	20	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00			Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (SC) 6.20 to 7.10m	6.00	6.00	6.50	SPT	8	10	13	23	-	-	
	6.50				6.50	6.50	7.00	SPT	10	12	15	27	-	-	
	7.00			Yellowish brown to dark brownish, very fine grained, clays of high plasticity (CH) 7.10 to 17.20m	7.00	7.00	7.50	SPT	8	9	10	19	-	-	
	7.50				7.50	7.50	8.00	SPT	7	8	11	19	-	-	
	8.00				8.00	8.00	8.50	SPT	25	37	40	77	-	-	
	8.50				8.50	8.50	9.00	SPT	30	47	49	96	-	-	
	9.00				9.00	9.00	9.50	SPT	29	33	38	71	-	-	
	9.50				9.50	9.50	10.00	SPT	31	35	41	76	-	-	
	10.00				10.00	10.00	11.00	SPT	55/10 cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	55/12 cm	-	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	55/12 cm	-	-	>100	-	-	
	12.00				12.50	12.50	13.00	SPT	55/10 cm	-	-	>100	-	-	
	12.50				13.00	13.00	14.00	SPT	55/10 cm	-	-	>101	-	-	
	13.00				14.00	14.00	14.50	SPT	55/9 cm	-	-	>100	-	-	
	13.50				14.50	14.50	15.50	SPT	55/10 cm	-	-	>100	-	-	
	14.00				15.50	15.50	16.00	SPT	55/10 cm	-	-	>100	-	-	
	14.50				16.00	16.00	17.50	SPT	55/12 cm	-	-	>100	-	-	
	15.00														
	15.50														
16.00															
16.50															
17.00															
17.50					17.50	17.50	17.55	SPT	55/5 cm	-	-	>100	-	-	
18.00															
18.50				Highly weathered, very weak, dark brownish grey, fine to very fine grained, fractured rock	18.50	18.50	18.53	SPT	58/3 cm			>100	-	-	
19.00															
19.50															
20.00					20.00	19.00	20.00	SPT	55/3 cm	-	-	>100	-	-	
17.20 to 20.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 147

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1712, N 2709

Depth of Water Table : Encountered at 3.40m depth during investigation

Date of Start: 14-11-2024

Date of Completion: 16-11-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 203.64 M

BORE LOG DATA SHEET


Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Not Used		Reddish yellow, fine to medium grained, clayey sand with little to much gravels (SC) 0.00 to 3.20m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00															
	1.50															
	2.00															
	2.50															
	3.00			Yellowish brown, fine to medium grained, clayey sand (SC) 3.20 to 4.40m	3.00	3.00	3.50	SPT	7	9	12	21	-	-		
	3.50															
	4.00															
	4.50															
	5.00															
	5.50				Yellowish brwn to reddish brown, fine to medium grained, weakly cemented clayey sand 4.40 to 8.60m	5.50	5.50	6.00	SPT	16	50/13 cm	-	>100	-		-
	6.00															
	6.50															
	7.00															
	7.50															
	8.00															
	8.50															
	9.00			Yellowish brown, fine to medium grained, weakly cemented calyey sand 8.60 to 10.00m		9.00	8.50	9.00	DS	-	-	-	-	-		-
	9.50															
	10.00															
	10.50															
	11.00			Brownish to reddish yellow, fine to medium grained, weakly cemented clayey sand 10.00 to 17.60m	11.00	11.00	11.50	SPT	50/12 cm	-	-	>100	-	-		
	11.50															
	12.00															
	12.50															
	13.00															
	13.50															
	14.00															
	14.50															
	15.00															
	15.50															
	16.00			Highly weathered, completely fractured and disintegrated, reddish brown, fine to coarse grained, fragments of fractured rock with infilled reddish brown, fine to coarse grained, clayey sand 17.60 to 20.00m	16.00	16.00	17.00	SPT	50/15 cm	-	-	>100	-	-		
	16.50															
	17.00															
	17.50															
18.00																
18.50																
19.00																
19.50																
20.00	Highly weathered, completely fractured and disintegrated, light pinkish brown and light greyish, fine to coarse grained, weak and friable fractured rock	20.00	18.50		20.00	Core	-	-	-	-	13.33	-				
20.50																
21.00																
21.50																
22.00																
22.50																
23.00																
23.50																
24.00																
24.50																
25.00																
20.00 to 25.00m					25.00	20.00	25.00	Core	-	-	-	-	26.50	5.50		

K.C.T. Consultancy Services®

Project : BHEL
Bore Hole No. : 148
Location : Talabira
Depth of Termination : 25.0 m
Co-ordinates: E 1610, N 2681
Depth of Water Table : Encountered at 5.40m depth during investigation

Date of Start: 06-01-2025
Date of Completion: 09-01-2025
Diameter of Bore: 150mm and Nx size
Bit Used: Soil Surface Bit and NX Size
Reduced Level: 205.52 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00			Dark brownish, fine to medium grained, clayey sand with occational gravels (SC) 0.00 to 0.70m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50			Dark reddish brown, fine to coarse grained, clayey sand with much gravels (SC) 0.70 to 1.90m	1.00	1.00	2.00	SPT	5	11	18	29	-	-		
	1.00															
	1.50															
	2.00			Yellowish brown, fine to coarse grained, clayey sand with some gravels (SC) 1.90 to 2.40m	2.00	2.00	2.50	SPT	5	7	9	16	-	-		
	2.50			Dark brownish, fine to medium grained, micacious clayey sand (SC) 2.40 to 2.80m	2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00															
	3.50			Dark brownish, fine to medium grained, micacious clayey sand with some gravels (SC) 2.80 to 5.00m	3.00	3.00	3.50	SPT	5	5	8	13	-	-		
	4.00															
	4.50															
	5.00															
	5.50				Yellowish brown, fine to coarse grained, clayey sand with gravels (SC) 5.00 to 6.50m	5.50	5.50	6.00	UDS	8	13	13	26	-	-	
	6.00					6.00	6.00	6.50	SPT	11	13	14	27	-	-	
	6.50					6.50	6.50	7.00	SPT	29	50/9cm	-	>100	-	-	
	7.00					7.00	7.00	7.50	SPT	23	50/10cm	-	>100	-	-	
	7.50				Yellowish brown, fine to medium grained, cemented micacious silty and clayey sand (SM-SC)	7.50	7.50	8.00	SPT	50/18cm	-	-	>100	-	-	
	8.00					8.00	8.00	8.50	SPT	20	24	38	62	-	-	
	8.50					8.50	8.50	9.00	SPT	50/2cm	-	-	>100	-	-	
	9.00					9.00		9.50	SPT	50/14cm	-	-	>100	-	-	
	9.50				6.50 to 10.40m	9.50		9.60	SPT	18	28	29	57	-	-	
	10.00					10.00		10.00	SPT	50/13cm	-	-	>100	-	-	
	10.50				Dark brownish, fine to very fine grained, cemented micacious clayey sand (SC) 10.40 to 11.00m											
	11.00					11.00		11.50	SPT	50/14cm			>100	-	-	
	11.50				Dark brownish, fie to very fine grained, cemented micacious clayey sand (SC) 11.00 to 12.50m	11.50		12.50	SPT	50/11cm	-	-	>100	-	-	
	12.00															
	12.50					12.50		13.00	SPT	50/10cm	-	-	>100	-	-	
	+ 13.00					13.00		13.13	SPT	50/13 cm	-	-	>100	-	-	
	13.50															
	14.00					14.00			SPT	50/12cm	-	-	>100	-	-	
	14.50					14.50		14.50	SPT	50/11cm	-	-	>100	-	-	
	15.00				Yellowish brown and reddish brown, fine to very fine grained, silty and clayey sand (SM-SC)	15.50		16.00	SPT	50/10cm	-	-	>100	-	-	
	15.50															
	16.00					16.00		16.00	SPT	50/9cm	-	-	>100	-	-	
	16.50															
	17.00					17.00		17.50	SPT	50/11cm	-	-	>100	-	-	
	17.50					17.50		17.50	SPT	50/12cm	-	-	>100	-	-	
18.00																
18.50			12.50 to 19.00m	18.50		19.00	SPT	50/9cm	-	-	>100	-	-			
19.00			Yellowish brown, fine to medium grained, cemented clayey sand with little gravels (SC) 19.00 to 20.00m	19.00		19.00	SPT	50/10cm	-	-	>100	-	-			
19.50																
20.00				20.00	20.00	20.50	SPT	50/9cm	-	-	>100	-	-			
20.50			Yellowish brown, fine to medium grained, cemented sand with some gravels	20.50	19.00	20.50	SPT	50/7cm	-	-	>100	-	-			
21.00																
21.50			20.00 to 22.10m	21.50	21.50	22.00	SPT	50/5cm	-	-	>100	-	-			
22.00				22.00	20.50	22.21	SPT	50/6cm	-	-	>100	-	-			
22.50																
23.00			Highly weathered, weak, dark greyish brown and yellowish brown, fine to medium grained, fracured rock	23.00	22.10	23.00	Core	-	-	-	-	10.00	-			
23.50				23.00	23.00	23.03	SPT	50/3cm	-	-	>100	-	-			
24.00				24.00	23.03	24.00	Core	-	-	-	-	6.00	-			
24.50				24.00	24.00	24.04	SPT	50/4cm	-	-	>100	-	-			
25.00							Core	-	-	-	-	6.00	-			
22.10 to 25.00m					25.00	25.00	25.05	SPT	50/5cm	-	-	>100				

Project : BHEL

Bore Hole No. : 149

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1423, N 2666

Depth of Water Table : Encountered at 3.20m depth during investigation

Date of Start: 07-01-2025

Date of Completion: 10-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 204.62 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recov-ery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00			Yellowish brown, fine to medium grained, silty and clayey sand (SM-SC) 0.00 to 0.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00				1.00	1.00	2.00	SPT	2	3	3	6	-	-		
	1.50															
	2.00				2.00	2.00	2.50	SPT	2	4	4	8	-	-		
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00			Brownish red and yellowish bown, fine to medium grained, clayey sand with little to occcational gravels (SC)	3.00	3.00	3.50	SPT	3	4	6	10	-	-		
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-		
	4.00				4.00	4.00	4.50	SPT	3	4	5	9	-	-		
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-		
	5.00				5.00	5.00	5.50	SPT	5	7	8	15	-	-		
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-		
	6.00			0.50 to 6.50m	6.00	6.00	6.50	SPT	8	10	12	22	-	-		
	6.50				6.50	6.50	7.00	SPT	30	50/14 cm	-	>100	-	-		
	7.00			Light yellowish brown, fine to medium grained, micaceous cemented silty sand with little plastic fines	7.00	7.00	7.50	SPT	12	26	55	81	-	-		
	7.50				7.50	7.50	8.00	SPT	20	31	60	91	-	-		
	8.00			6.50 to 8.50m	8.00	8.00	8.50	SPT	40	50/12 cm	-	>100	-	-		
	8.50			Light brownish, fine to very fine grained, micaceous cemented clayey sand 8.50 to 9.00m	8.50	8.50	9.00	SPT	35	50/10 cm	-	>100	-	-		
	9.00				9.00	9.00	9.50	SPT	45	50/8 cm	-	>100	-	-		
	9.50			Brownish, fine to medium grained, cemented sand 9.00 to 9.60m	9.50	9.50	9.60	SPT	60/14 cm	-	-	>100	-	-		
	10.00				10.00	9.60	10.00	Core	-	-	-	-	32.00	-		
	10.50															
	11.00		Not used													
	11.50			Highly weathered, very weak,completely fractured and disintegrated, brownish, fine to medium grained, friable fractured rock	11.50	10.00	11.50	Core	-	-	-	-	20.00	8.00		
	12.00															
	12.50															
	+ 13.00					13.00	13.00	13.05	SPT	50/5 cm	-	-	>100	-	-	
	13.50															
	14.00															
	14.50				9.60 to 15.00m	14.50	13.05	14.50	Core	-	-	-	-	22.00		
	15.00															
	15.50															
	16.00															
16.50			Moderately weathered, weak, yellowish brown, fine to medium grained, rock with closely to widely spaced discontinuities	16.00	14.54	16.00	Core	-	-	-	-	45.00	20.00			
17.00																
17.50				17.50	16.00	17.50	Core					60.00	44.00			
18.00																
18.50			15.00 to 19.00m													
19.00				19.00	17.50	19.00	Core					30.00	11.00			
19.50																
20.00			Highly weathered, moderately weak, yellowish brown, fine to coarse grained, friable rock	20.50	19.00	20.50	Core					25.00	-			
20.50																
21.00																
21.50			19.00 to 22.00m													
22.00				22.00	20.50	22.00	Core	-	-	-	-	24.00	-			
22.50																
23.00																
23.50			Highly weathered, moderately weak, brownish, fine to coarse grained, friable rock	23.50	22.00	23.50	Core	-	-	-	-	24.00	7.00			
24.00																
24.50																
25.00				25.00	23.50	25.00	Core	-	-	-	-	27.00	-			
22.00 to 25.00m																

K.C.T. Consultancy Services®

Project : BHEL
 Bore Hole No. : 153
 Location : Talabira
 Depth of Termination : 25.0 m
 Co-ordinates : E 1589, N 2547
 Depth of Water Table : Encountered at 5.30m depth during investigation

Date of Start: 18-01-2025
 Date of Completion: 20-01-2025
 Diameter of Bore: 150mm and Nx size
 Bit Used: Soil Surface Bit and NX Size
 Reduced Level: 205.30

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Reddish brown, fine to medium grained, clayey sand with occasional gravels (SC) 0.00 to 0.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Brownish red, fine to coarse grained, clayey sand with much gravels (SC) 0.50 to 1.80m											
	1.00				1.00	1.00	2.00	SPT	14	16	16	32	-	-	
	1.50														
	2.00			Reddish yellow, fine to medium grained, clayey sand with some gravels (SC) 1.80 to 3.45m	2.00	2.00	2.50	SPT	15	17	21	31	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	13	13	15	28	-	-	
	3.50			Reddish yellow, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 3.45 to 3.90m	3.50	3.50	4.00	SPT	7	10	15	25	-	-	
	4.00				4.00	4.00	4.50	SPT	17	20	31	51	-	-	
	4.50			Reddish yellow and whitish yellow, fine to medium grained, clayey sand with some to occasional gravels (SC)	4.50	4.50	5.00	SPT	15	21	33	54	-	-	
	5.00				5.00	5.00	5.50	SPT	20	24	35	59	-	-	
	5.50				5.50	5.50	6.00	SPT	17	18	37	55	-	-	
	6.00				6.00	6.00	6.50	SPT	16	28	29	57	-	-	
	6.50			3.90 to 7.00m	6.50	6.50	7.00	SPT	15	24	35	55	-	-	
	7.00				7.00	7.00	7.50	SPT	22	42	50/6 cm	>100	-	-	
	7.50				7.50	7.50	8.00	SPT	25	38	50/9 cm	>100	-	-	
	8.00				8.00	8.00	8.50	SPT	34	50/7 cm	-	>100	-	-	
	8.50			Yellowish brown and reddish yellow, fine to medium grained, cemented clayey sand with occasional to little gravels (SC)	8.50	8.50	9.00	SPT	31	50/9 cm	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	50/11 cm	-	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/13 cm	-	-	>100	-	-	
	10.00				10.00	10.00	11.00	SPT	37	50/4 cm	-	>100	-	-	
	10.50														
	11.00			7.00 to 11.70m	11.00	11.00	11.50	SPT	55/10 cm	-	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	50/13 cm	-	-	>100	-	-	
	12.00			Dark brownish, fine to medium grained, cemented clayey sand with occasional gravels	12.50	12.50	13.00	SPT	50/9 cm	-	-	>100	-	-	
	12.50				13.00	13.00	13.10	SPT	50/10 cm	-	-	>100	-	-	
	13.00			11.70 to 14.00m											
	13.50														
	14.00				14.00	13.10	14.00	Core	-	-	-	-	-	-	
	14.50														
	15.00														
	15.50			Highly weathered, moderately weak, brownish and yellowish brown, fine to coarse grained, friable rock	15.50	14.00	15.50	Core	-	-	-	-	3.33		
	16.00				15.50	15.50	15.53	SPT	50/3 cm	-	-	>100			
	16.50														
	17.00				17.00	15.52	17.00	Core	-	-	-	-	4.00		
	17.50				17.00	17.00	17.03	SPT	50/3 cm	-	-	>100			
	18.00			14.00 to 18.50m											
	18.50				18.50	17.03	18.50	Core	-	-	-	-	6.00	-	
	19.00			Highly weathered, moderately strong, brownish, fine to coarse grained, fractured rock	18.50	18.50	18.53	SPT	50/3 cm	-	-	>100			
	19.50														
	20.00				20.00	18.53	20.00	Core	-	-	-	-	30.66		
	20.50			18.50 to 21.00m											
	21.00				21.50	20.00	21.50	Core	-	-	-	-	18.66	-	
	21.50				21.50	21.50	21.53	SPT	50/3 cm	-	-	>100			
	22.00														
	22.50														
	23.00			Highly weathered, strong, brownish, fine to coarse grained, fractured rock	23.00	21.50	23.00	Core	-	-	-	-	12.00	-	
	23.50				23.00	23.00	23.04	SPT	50/4 cm	-	-	>100			
	24.00				24.00	23.04	24.00	Core	-	-	-	-	27.00	-	
	24.50														
	25.00				25.00	24.00	25.00	Core	-	-	-	-	29.00	-	
21.00 to 25.00m															

Project : BHEL

Bore Hole No. : 155

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1685, N 2538

Depth of Water Table : Encountered at 4.50m depth during investigation

Date of Start: 04-01-2025

Date of Completion: 09-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 203.90 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Yellowish brown, fine to medium grained, clayey sand (SC) 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Reddish brown, fine to coarse grained, silty and clayey sand (SM-SC) 0.30 to 2.90m	1.00	1.00	2.00	SPT	6	8	14	22	-	-	
	1.00				2.00	2.00	2.50	SPT	10	11	13	24	-	-	
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00			Light yellowish brown, fine to very fine grained, silty and clayey sand (SM-SC) 2.90 to 5.40m	3.00	3.00	3.50	SPT	9	8	12	20	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00				4.00	4.00	4.50	SPT	8	12	15	27	-	-	
	3.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.00				5.00	5.00	5.50	SPT	9	10	13	23	-	-	
	4.50				5.50	5.50	6.00	SPT	14	16	20	36	-	-	
	5.00			Yellowish brown, fine to medium grained, silty sand with little plastic fines (SM) 5.40 to 6.50m	6.00	6.00	6.50	SPT	28	30	32	62	-	-	
	5.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	6.00				7.00	7.00	7.50	SPT	30	40	60/14 cm	>100	-	-	
	6.50			Yellowish brown, fine to medium grained, cement silty sand with little plastic fines (SM) 6.50 to 8.00m	7.50	7.50	8.00	SPT	36	50/14 cm	-	>100	-	-	
	7.00				8.00	8.00	8.50	SPT	42	50/10 cm	-	>100	-	-	
	7.50				8.50	8.50	9.00	SPT	30.00	50/10 cm	-	>100	-	-	
	8.00			Yellowish brown, fine to medium grained, silty and clayey sand cemented (SM-SC) 8.00 to 9.00m	9.00	9.00	9.50	SPT	50/14 cm	-	-	>100	-	-	
	8.50				9.50	9.50	10.00	SPT	50/10 cm	-	-	>100	-	-	
	9.00				10.00	10.00	11.00	SPT	50/9 cm	-	-	>100	-	-	
	9.50			Yellowish brown, fine to medium grained, cemented micaceous silty and with little plastic fines 9.00 to 9.50m	11.00	11.00	11.50	SPT	50/11 cm	-	-	>100	-	-	
	10.00				11.50	11.50	12.50	SPT	50/10 cm	-	-	>100	-	-	
	10.50				12.50	12.50	13.00	SPT	50/9 cm	-	-	>100	-	-	
	11.00			Yellowish brown, fine to medium grained, cemented silty sand with little plastic fines (SM) 12.00 to 13.00m	13.00	13.00	14.00	SPT	50/10 cm	-	-	>100	-	-	
	11.50				14.00	14.00	14.50	SPT	50/12 cm	-	-	>100	-	-	
	12.00				14.50	14.50	15.50	SPT	50/9 cm	-	-	>101	-	-	
	12.50			Yellowish brown and brownish, fine to medium grained, cemented clayey sand with occasional gravels (SC)	15.50	15.50	16.00	SPT	50/9 cm	-	-	>101	-	-	
	13.00				16.00	16.00	17.00	SPT	50/10 cm	-	-	>100	-	-	
	13.50				17.00	15.52	17.00	SPT	50/8 cm	-	-	>100	-	-	
	14.00				17.50	17.50	18.50	SPT	50/12 cm	-	-	>100	-	-	
	14.50				18.50	18.50	19.00	SPT	50/10 cm	-	-	>100	-	-	
	15.00				19.00	19.00	20.00	SPT	50/9 cm	-	-	>100	-	-	
	15.50			Highly weathered, brownish, fine to medium grained, friable rock 13.00 to 20.60m	20.00	20.00	20.50	SPT	50/9 cm	-	-	>100	-	-	
	16.00				20.50	20.50	20.05	SPT	50/5 cm	-	-	>100	-	-	
	16.50				21.00	20.05	21.50	Core	-	-	-	-	32.00	-	
	17.00			Highly weathered, moderately weak, whitish yellow, fine to coarse grained, friable rock	21.50	21.50	23.00	Core	-	-	-	-	30.00	-	
	17.50				22.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	18.00				22.50	21.50	23.00	Core	-	-	-	-	30.00	-	
	18.50				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	19.00				23.50	21.50	23.00	Core	-	-	-	-	30.00	-	
	19.50				24.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	20.00			Highly weathered, moderately weak, whitish yellow, fine to coarse grained, friable rock	24.50	21.50	23.00	Core	-	-	-	-	30.00	-	
	20.50				25.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	21.00				25.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	21.50				25.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	22.00				25.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	22.50				25.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	23.00			Highly weathered, moderately weak, whitish yellow, fine to coarse grained, friable rock	23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	23.50				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	24.00				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	24.50				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	25.00				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	
	25.00				23.00	21.50	23.00	Core	-	-	-	-	30.00	-	

Project : BHEL

Bore Hole No. : 156

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1452, N 2512

Depth of Water Table : Encountered at 5.30m depth during investigation

Date of Start: 14-01-2025

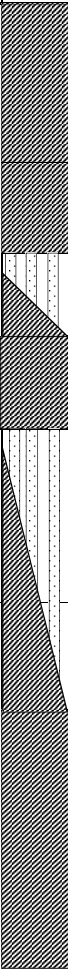
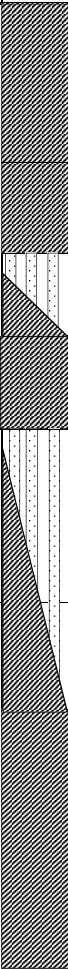









Date of Completion: 16-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 204.88 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks			
						From m	To m		N ₁	N ₂	N ₃	N						
Rotary drilling method	0.00			Brownish, fine to medium grained, clayey sand with occasional gravels (SC) 0.00 to 0.60m	0.00	0.00	1.00	DS	-	-	-	-	-	-				
	0.50			Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 0.60 to 1.70m	1.00	1.00	2.00	SPT	3	3	4	7	-	-				
	1.00																	
	1.50																	
	2.00				Reddish brown, fine to coarse grained, clayey sand with much gravels (SC) 1.70 to 2.90m	2.00	2.00	2.50	SPT	6	7	8	15	-	-			
	2.50					2.50	3.00	UDS	-	-	-	-						
	3.00				Reddish yellow, fine to coarse grained, silty and clayey sand with some gravels (SM-SC) 2.90 to 3.40m	3.00	3.00	3.50	SPT	11	12	17	29	-	-			
	3.50						Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 3.40 to 4.80m	3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00			4.00	4.50			SPT	11	14	14	28						
	4.50					Yellowish brown and slightly greyish, fine to medium grained, silty and clayey sand with little gravels (SM-SC) 4.80 to 7.30m	4.50	4.50	5.00	SPT	6	8	14	22	-	-		
	5.00						5.00	5.50	SPT	8	8	17	25					
	5.50						5.50	6.00	SPT	8	10	14	24	-	-			
	6.00						6.00	6.50	SPT	17	25	30	55	-	-			
	6.50						6.50	7.00	UDS	-	-	-	-	-	-			
	7.00						7.00	7.50	SPT	11	12	16	28	-	-			
	7.50							Yellowish brown and brownish, fine to medium grained, micaceous cemented silty and clayey sand (SM-SC) 7.30 to 8.40m	7.50	7.50	8.00	SPT	50/13 cm	-	-	>100	-	-
	8.00								8.00	8.50	SPT	50/12 cm	-	-	>100	-	-	
	8.50								8.50	9.00	SPT	50/10 cm	-	-	>100	-	-	
	9.00								9.00	9.50	SPT	50/11 cm	-	-	>100	-	-	
	9.50							Yellowish brown, fine to very fine grained, cemented micaceous clayey sand (SC) 9.30 to 11.90m	9.50	9.50	10.00	SPT	50/13 cm	-	-	>100	-	-
	10.00								10.00	11.00	SPT	50/12 cm	-	-	>100	-	-	
	10.50			11.00	11.00	11.50			SPT	50/10 cm	-	-	>100					
	11.50				11.50	12.50			SPT	50/11 cm	-	-	>100					
	12.00					Greyish brown, fine to medium grained, cemented micacious silty sand with occasional gravels (SM) 11.90 to 14.00m	12.50	12.50	13.00	SPT	50/12 cm	-	-	>100	-	-		
	13.00						13.00	13.10	SPT	50/10 cm	-	-	>100					
	13.50						14.00	Highly weathered, weak, yellowish brown and light whitish brown, fine to coarse grained, fractured rock 14.00 to 17.50m	14.00	13.10	14.00	Core	-	-	-	-	18.88	-
	14.50								15.50	14.00	15.00	Core	-	-	-	-	9.33	-
	15.00																	
	15.50																	
	16.00						17.00	Highly weathered, weak, yellowish brown, fine to medium grained, rock with closely spaced discontinuities	18.50	17.00	18.50	Core	-	-	-	-	16.66	6.66
	16.50																	
	17.00																	
17.50																		
18.00																		
18.50																		
19.00																		
19.50																		
20.00	20.00	18.50	20.08	Core	-	-	-	-	16.00	-								
17.50 to 20.00m																		

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 157

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1500, N 2488

Depth of Water Table : Encountered at 5.35m depth during investigation

Date of Start: 19-01-2025

Date of Completion: 22-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 205.40 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Not Used		Brownish, to reddish brown, fine to medium grained, clayey sand with occasional to little gravels (SC) 0.00 to 6.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	6	7	8	15	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	14	18	20	38	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	7	8	9	17	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	9	10	14	24	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	8	12	13	25	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	7	10	15	25	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.10	SPT	50/10 cm	-	-	>100	-	-	
	7.50				7.50	7.10	7.50	Core	-	-	-	-	26.66	-	
	8.00														
	8.50														
	9.00				9.00	7.50	9.00	Core	-	-	-	-	7.33	-	
	9.50				9.00	9.00	9.04	SPT	50/4 cm	-	-	>100	-	-	
	10.00			Highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, very weak, friable fractured rock 9.00 to 12.00m	10.50	9.04	10.50	Core	-	-	-	-	10.66	-	
	10.50				10.50	10.50	10.53	SPT	50/3 cm	-	-	>100	-	-	
	11.00														
	11.50														
	12.00				12.00	10.53	12.00	Core	-	-	-	-	4.66	-	
	12.50				12.00	12.00	12.04	SPT	50/4 cm	-	-	>100	-	-	
	13.00			Highly weathered, very weak to weak, yellowish brown, fine to coarse grained, friable and fractured rock 12.00 to 15.50m	13.50	12.04	13.50	Core	-	-	-	-	10.66	-	
	13.50				13.50	13.50	13.52	SPT	50/2 cm	-	-	>100	-	-	
	14.00														
	14.50				15.00	13.52	15.00	Core	-	-	-	-	14.66	-	
	15.00				15.00	15.00	15.03	SPT	50/3 cm	-	-	>100	-	-	
	15.50			Highly weathered, weak, dark brownish, fine to coarse grained, fractured rock 15.50 to 18.00m	16.50	15.03	16.50	Core	-	-	-	-	21.33	10.00	
	16.00														
	16.50														
	17.00														
	17.50														
	18.00			Highly weathered, weak, dark brownish, fine to coarse grained, rock with close spacing of discontinuities 18.00 to 19.50m	18.00		18.00	Core	-	-	-	-	21.33	6.66	
	18.50														
	19.00														
	19.50				19.50		19.50	Core	-	-	-	-	31.33	-	
	20.00			Highly weathered, weak, dark brownish, fine to coarse grained, fractured rock 19.50 to 22.50m											
	20.50				21.00		21.00	Core	-	-	-	-	26.00	-	
	21.00														
	21.50														
	22.00			Highly weathered, weak, dark reddish brown, fine to coarse grained, rock with moderately close spacing of discontinuities	22.50		22.50	Core	-	-	-	-	32.00	26.00	
	22.50														
	23.00														
	23.50														
	24.00				24.00	23.00	24.00	Core	-	-	-	-	45.33	24.00	
	24.50														
	25.00				25.00	24.00	25.00	Core	-	-	-	-	45.00	29.00	

22.50 to 25.00m

K.C.T. Consultancy Services[®]

Project : BHEL

Bore Hole No. : 159

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 865, N 2449

Depth of Water Table : Encountered at 3.60m depth during investigation

Date of Start: 19-12-2024

Date of Completion: 19-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 198.50 M

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Brownish, fine to very fine grained, clayey sand (SC) 0.00 to 0.10m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown, very fine grained, silty clays of intermediate plasticity with occational gravels (CI)	1.00	1.00	2.00	SPT	2	2	2	4	-	-	
	1.00				2.00	2.00	2.50	SPT	3	4	6	10	-	-	
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00				3.00	3.00	3.50	SPT	6	7	10	17	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00			Reddish yellow, fine to very fine grained, clays of intermediate plasticity with occational gravels (CI)	4.00	4.00	4.50	SPT	4	6	8	14	-	-	
	3.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.00				5.00	5.00	5.50	SPT	5	7	13	20	-	-	
	4.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	5.00				6.00	6.00	6.50	SPT	7	8	11	19	-	-	
	5.50			2.60 to 6.60m	6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	6.00				7.00	7.00	7.50	SPT	3	4	6	10	-	-	
	6.50				7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	7.00				8.00	8.00	8.50	SPT	2	4	6	10	-	-	
	7.50				8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	8.00			6.60 to 9.70m	9.00	9.00	9.50	SPT	8	9	12	21	-	-	
	8.50				9.50	9.50	10.00	UDS	-	-	-	-	-	-	
	9.00				10.00	10.00	11.00	SPT	6	7	9	16	-	-	
	9.50				11.00	11.00	11.50	UDS	-	-	-	-	-	-	
	10.00				11.50	11.50	12.50	SPT	8	10	12	22	-	-	
	10.50			9.70 to 13.20m	12.50	12.50	13.00	SPT	10	13	15	28	-	-	
	11.00				13.00	13.00	14.00	SPT	14	14	16	30	-	-	
	11.50				14.00	14.00	14.50	SPT	17	25	29	54	-	-	
	12.00				14.50	14.50	15.50	SPT	34	50/10 cm	-	>100	-	-	
	12.50				15.50	15.50	16.00	SPT	14	19	35	54	-	-	
	13.00			14.60 to 16.30m	16.00	16.00	17.00	SPT	16	21	37	58	-	-	
	13.50				17.00	17.00	17.50	SPT	35	50/3 cm	-	>100	-	-	
	14.00				17.50	17.50	18.50	SPT	50/10 cm	-	-	>100	-	-	
	14.50				18.50	18.50	19.00	SPT	50/14 cm	-	-	>100	-	-	
	15.00				19.00	19.00	20.00	SPT	50/14 cm	-	-	>100	-	-	
	15.50			16.30 to 19.10m	20.00	20.00	20.50	SPT	50/12 cm	-	-	>100	-	-	
	16.00				20.50	20.50	21.50	SPT	50/13 cm	-	-	>100	-	-	
	16.50				21.50	21.50	22.00	SPT	50/12 cm	-	-	>100	-	-	
	17.00				22.00	22.00	22.04	SPT	50/14 cm	-	-	>100	-	-	
	17.50				22.04	22.04	23.50	Core	-	-	-	-	90.71	75.33	
18.00			Slightly weathered, weak, geyish brown, fine to very fine grained, massive rock	23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
18.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
19.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
19.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
20.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
20.50			22.10 to 25.00m	23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
21.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
21.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
22.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
22.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
23.00			22.10 to 25.00m	23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
23.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
24.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
24.50				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		
25.00				23.50	22.04	23.50	Core	-	-	-	-	90.71	75.33		

Project : BHEL

Bore Hole No. : 160

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates : E 948, N 2413

Depth of Water Table : Encountered at 3.00m depth during investigation

Date of Start: 20-12-2024

Date of Completion: 21-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 198.67 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00				0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	1	2	3	5	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	1	1	1	2	-	-	
	2.50			Light brownish and yellowish brown, very fine grained, clays of high plasticity (CH)	2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	1	2	2	4	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	2	2	2	4	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	2	2	3	5	-	-	
	5.50			0.00 to 6.00m	5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	5	6	7	13	-	-	
	6.50			Greyish brown, very fine grained, clays of high plasticity (CH) 6.00 to 7.60m	6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	6	7	7	14	-	-	
	7.50														
	8.00			Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 7.60 to 8.50m	7.50	7.50	8.00	SPT	5	9	11	20	-	-	
	8.50				8.00	8.00	8.50	SPT	6	7	9	16	-	-	
	9.00			Light brownish, very fine grained, clays of high plasticity (CH) 8.50 to 9.00m	8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	9.50				9.00	9.00	9.50	SPT	8	9	10	19	-	-	
	10.00			Yellowish brown and reddish yellow, fine to medium grained, clayey sand with some gravels (SC)	9.50	9.50	10.00	SPT	3	5	8.00	13	-	-	
	10.50				10.00	10.00	11.00	SPT	10	12	14	>100	-	-	
	11.00			9.00 to 11.80m	11.00	11.00	11.50	SPT	6	8	14	22	-	-	
	11.50				11.50	11.50	12.50	SPT	7	9	16	25	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	50/9 cm	-	-	>100	-	-	
	13.00			Yellowish brown, fine to coarse grained, cemented sand (Sand rock)	13.00	13.00	14.00	SPT	50/9 cm	-	-	>100	-	-	
	13.50														
	14.00				14.00	14.00	14.50	SPT	50/10 cm	-	-	>100	-	-	
	14.50				14.50	14.50	15.50	SPT	50/9 cm	-	-	>101	-	-	
	15.00			11.80 to 15.60m											
	15.50				15.50	15.50	16.00	SPT	50/3 cm	-	-	>101	-	-	
	16.00			Light brownish and light greyish, fine to very fine grained, cemented silty clays of low plasticity (Silty stone)	16.00	16.00	17.00	SPT	19	27	31	58	-	-	
	16.50														
	17.00				17.00	15.52	17.00	SPT	15	31	37	68	-	-	
	17.50				17.50	17.50	18.50	SPT	18	30	35	65	-	-	
	18.00			15.60 to 18.60m											
	18.50				18.50	18.50	18.59	SPT	50/9 cm	-	-	>100	-	-	
	19.00			Highly weathered, weak, dark greyish, fine to very fine grained, rock with very closely spaced discontinuities											
	19.50				19.50	18.59	19.50	Core	-	-	-	-	31.11	24.44	
	20.00														
	20.50			18.60 to 21.00m											
	21.00				21.00	19.50	21.00	Core	-	-	-	-	54.00	42.66	
	21.50			Moderately weathered, moderately weak, dark greyish and dark brownish, fine to very fine grained, rock with closely to moderately closely spaced discontinuities											
	22.00														
	22.50				22.50	21.00	22.50	Core	-	-	-	-	48.00	20.66	
	23.00														
	23.50			21.00 to 24.00m											
	24.00				24.00	22.50	24.00	Core	-	-	-	-	38.00	26.00	
	24.50			Highly weathered, weak, dark brown, fine to medium grained, rock with moderately closely spaced discontinuities											
	25.00				25.00	24.00	25.00	Core	-	-	-	-	35.00	11.00	
24.00 to 25.00m															

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 161

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 1576, N 2448

Depth of Water Table : Encountered at 4.40m depth during investigation

Date of Start: 19-11-2024

Date of Completion: 22-11-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 204.90 M

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00				0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	10	11	13	24	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	7	9	10	19	-	-	
	2.50			Reddish brown, fine to medium grained, clayey sand wit little gravels (SC) 0.00 to 5.60m	2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	10	25	20	45	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	13	20	23	43	-	-	
	4.50				4.50	4.50	5.00	SPT	9	15	19	34			
	5.00				5.00	5.00	5.50	SPT	5	5	10	15	-	-	
	5.50				5.50	5.50	6.00	SPT	5	7	12	19	-	-	
	6.00			Mixture of highly weathered, completely fractured and disintegrated, very weak and friable fractured rock fragments and yellowish brown, fine to coarse grained, clayey sand 5.60 to 7.50m	6.00	6.00	6.50	SPT	10	17	41	58	-	-	
	6.50				6.50	6.50	7.00	SPT	50/9 cm	-	-	>100	-	-	
	7.00				7.00	7.00	7.50	SPT	23	17	25	40	-	-	
	7.50			Yellowish brown, fine to coarse grained, clayey sand mixed with highly weathered, completely fractured and disintegrated, very weak and friable fractured rock fragments 7.50 to 8.50m	7.50	7.50	8.00	SPT	10	15	17	32	-	-	
	8.00				8.00	8.00	8.50	SPT	12	50/12 cm	-	>100	-	-	
	8.50				8.50	8.50	9.00	SPT	50/7 cm	-	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	50/8 cm	-	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/8 cm	-	-	>100	-	-	
	10.00			Yellowish brown, fine to medium grained, weakly cemented clayey sand 8.50 to 13.20m	10.00	10.00	11.00	SPT	50/9 cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	26	18	40	56	-	-	
	11.50				11.50	11.50	12.50	SPT	8	30	47	77	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	12	50/14 cm	-	>100	-	-	
	+ 13.00				13.00	13.00	14.00	SPT	50/8 cm	-	-	>100	-	-	
	13.50														
	14.00				14.00	14.00	14.50	SPT	50/7 cm	-	-	>100	-	-	
	14.50			Yellowish brown to dark brownish, fine to medium grained, weakly cemented clayey sand 13.20 to 17.20m	14.50	14.50	15.50	SPT	50/9 cm	-	-	>100	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	15	12	18	30	-	-	
	16.00				16.00	16.00	17.00	SPT	50/12cm	-	-	>100	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	50/5cm	-	-	>100	-	-	
	17.50				17.50	17.50	18.50	SPT	50/2 cm	-	-	>100	-	-	
18.00															
18.50				18.50	18.50	19.00	SPT	50/2 cm	-	-	>100	-	-		
19.00			Highly weathered, weal. Yellowish brown, fine to coarse grained, fractured rock 17.20 to 22.50m	19.00	19.00	20.00	SPT	50/8cm	-	-	>100	-	-		
19.50															
20.00				20.00	20.00	20.50	SPT	50/9cm	-	-	>100	-	-		
20.50				20.50	20.50	21.50	SPT	50/8cm	-	-	>100	-	-		
21.00															
21.50				21.50	21.50	22.00	SPT	50/7cm	-	-	>100	-	-		
22.00				22.00	22.00	22.08	SPT	50/8cm	-	-	>100	-	-		
22.50				22.50	22.08	22.50	Core	-	-	-	-	44.00	14.00		
23.00			Moderately weathered, moderately strong, yellowish brown, fine to coarse grained, fractured rock 22.50 to 24.00m												
23.50															
24.00			Highly weathered, moderately weathered, light yellowish brown, fine to coarse grained, rock with very close spacing of discontinuities	24.00	22.50	25.00	Core					27.33	-		
24.50															
25.00				25.00	24.00	25.00	Core					34.00	17.00		
24.00 to 25.00m															Page no.608 of 618

Project : BHEL

Bore Hole No. : 163

Location : Talabira

Depth of Termination : 25.0 m

Co-ordinates: E 885, N 2339

Depth of Water Table : Encountered at 4.70m depth during investigation

Date of Start: 22-10-2024

Date of Completion: 28-10-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 198.57 M

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Brownish, fine to very fine grained, silty clays of intermediate plasticity (CI) 0.00 to 0.20m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	2	2	3	5	-	-	
	1.50														
	2.00			Yellowish brown, fine to very fine grained, clays of high plasticity (CH)	2.00	2.00	2.50	SPT	2	3	3	6	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	2	4	5	9	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00			0.20 to 4.50m	4.00	4.00	4.50	SPT	3	5	8	13	-	-	
	4.50			Reddish yellow, fine to very fine grained, sandy clays of intermediate plasticity (CI) 4.50 to 5.40m	4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	5.50	SPT	4	5	6	11	-	-	
	5.50			Reddish brown, fine to medium grained, clayey sand (SC)	5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	5	6	6	12	-	-	
	6.50				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.00				7.00	7.00	7.50	SPT	4	5	7	12	-	-	
	7.50			Yellowish brown and reddish brown, fine to very fine grained, clays of high plasticity (CH) 7.50 to 9.00m	7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	8.00				8.00	8.00	8.50	SPT	6	6	9	15	-	-	
	8.50				8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	9.00				9.00	9.00	9.50	SPT	4	8	10	18	-	-	
	9.50			Reddish brown, fine ot medium grained, sandy clays of intermediate plasticity (CI) 9.00 to 10.60m	9.50	9.50	10.00	SPT	6	7	9	16	-	-	
	10.00				10.00	10.00	11.00	SPT	5	8	11	19	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	9	9	11	20	-	-	
	11.50			Yellowish brown, fine to medium grained, clayey sand (SC) 10.60 to 12.20m	11.50	11.50	12.50	SPT	12	14	15	29	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	15	17	18	35	-	-	
	13.00														
	13.50			Light whitish yellow and light yellowish grey, whitish grey, fine to medium grained, cemented clayey sand	13.00	13.00	14.00	SPT	12	13	15	28	-	-	
	14.00				14.00	14.00	14.50	SPT	15	17	21	38	-	-	
	14.50				14.50	14.50	15.50	SPT	15	17	18	35	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	25	29	33	62	-	-	
	16.00				16.00	16.00	17.00	SPT	24	29	56	85	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	28	42	58	100	-	-	
	17.50				17.50	17.50	18.50	SPT	20	45	55	>100	-	-	
	18.00										10 cm				
	18.50				18.50	18.50	19.00	SPT	33	47	53/12 cm	>100	-	-	
	19.00				19.00	19.00	20.00	SPT	31	58	42/10 cm	>100	-	-	
	19.50														
	20.00				20.00	20.00	20.50	SPT	30	35	54	89	-	-	
	20.50				20.50	20.50	21.50	SPT	26	37	60	97	-	-	
	21.00														
	21.50				21.50	21.50	22.00	SPT	60	-	-	>100	-	-	
	22.00				22.00	22.00	23.00	SPT	60	-	-	>100	-	-	
	22.50														
	23.00				23.00	23.00	23.50	SPT	20	21	27	48	-	-	
	23.50				23.50	23.50	24.50	SPT	18	20	23	43	-	-	
	24.00														
	24.50				24.50	24.50	25.00	SPT	20	23	25	48	-	-	
	25.00				25.00	23.50	25.00	SPT	30	35	40	75	-	-	

13.00 to 25.00m

Page no.609 of 618

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 164

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1047, N 2339

Depth of Water Table : Encountered at 4.85m depth during investigation

Date of Start: 16-10-2024

Date of Completion: 22-10-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 198.81 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Yellowish brown, very fine grained, silty clays of intermediate plasticity (CI) 0.00 to 0.80m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Yellowish brown and light brownish, very fine grained, silty clays of high plasticity (CH) 0.80 to 4.00m	1.00	1.00	2.00	SPT	2	2	3	5	-	-	
	1.00				2.00	2.00	2.50	SPT	2	3	3	6	-	-	
	1.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	2.00				3.00	3.00	3.50	SPT	3	4	5	9	-	-	
	2.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	3.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity (CI) 4.00 to 5.00m	4.00	4.00	4.50	SPT	6	8	10	18	-	-	
	3.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	4.00			Reddish yellow, fine to medium grained, clayey sand with some gravels (SC) 5.00 to 6.00m	5.00	5.00	5.50	SPT	4	6	9	15	-	-	
	4.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	5.00			Yellowish brown, fine to medium grained, sandy clays of intermediate plasticity with occasional gravels (CI) 6.00 to 7.00m	6.00	6.00	6.50	SPT	4	5	11	16	-	-	
	5.50				6.50	6.50	7.00	SPT	8	11	15	26	-	-	
	6.00				7.00	7.00	7.50	SPT	6	10	11	21	-	-	
	6.50				7.50	7.50	8.00	UDS	-	-	-	-	-	-	
	7.00				8.00	8.00	8.50	SPT	6	7	8	15	-	-	
	7.50			Yellowish brown and reddish yellow, fine to very fine grained, clays of high plasticity with occasional gravels (CH) 7.00 to 11.30m	8.50	8.50	9.00	UDS	-	-	-	-	-	-	
	8.00				9.00	9.00	9.50	SPT	4	7	9	16	-	-	
	8.50				9.50	9.50	10.00	UDS	-	-	-	-	-	-	
	9.00				10.00	10.00	11.00	SPT	9	10	12	22	-	-	
	9.50				11.00	11.00	11.50	UDS	-	-	-	-	-	-	
	10.00			Mixture of highly weathered, weak, completely fractured rock with fine to coarse grained, gravels, pebbles, boulders size rock with silty sand 11.30 to 13.30m	11.50	11.50	12.50	SPT	22	31	38	69	-	-	
	10.50				12.50	12.50	13.00	SPT	30	50/10 cm	-	>100	-	-	
	11.00				13.00	13.00	14.00	SPT	37	50/8 cm	-	>100	-	-	
	11.50			Yellowish brown, fine to medium grained, sand with little gravels (SM) 13.30 to 15.50m	14.00	14.00	14.50	SPT	31	50/14 cm	-	>100	-	-	
	12.00				14.50	14.50	15.50	SPT	35	50/12 cm	-	>100	-	-	
	12.50				15.50	15.50	16.00	SPT	50/14 cm	-	-	>100	-	-	
	13.00			Boulderous formation of highly weathered, weak, brownish yellow, fine to coarse grained, pebbles, cobbles and boulders size rock with whitish yellow, fine to coarse grained, sand 15.50 to 17.30m	16.00	16.00	17.00	SPT	50/10 cm	-	-	>100	-	-	
	13.50				17.00	17.00	17.08	SPT	50/8 cm	-	-	>100	-	-	
	14.00				17.50	17.50	18.50	Core	-	-	-	-	25.00	25.00	
	14.50			Highly weathered, weak, brownish black, fine to coarse grained, rock with closely spaced discontinuities 17.30 to 20.00m	18.50	18.50	20.00	Core	-	-	-	-	36.00	8.00	
	15.00				20.00	18.50	20.00	Core	-	-	-	-	36.00	8.00	
	15.50														
	16.00														
	16.50														

Project : BHEL

Bore Hole No. : 168

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1425, N 2129

Depth of Water Table : Encountered at 5.10 m depth during investigation

Date of Start: 14-11-2024

Date of Completion: 17-11-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 200.99 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	used		Brownish, fine to medium grained, clayey sand (SC) 0.00 to 2.20m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00				1.00	1.00	2.00	SPT	1	2	4	6				
	1.50													-		-
	2.00				2.00	2.00	2.50	SPT	3	4	5	9				
	2.50		2.50	2.50	3.00	UDS	-	-	-	-						
	3.00		3.00	3.00	3.50	SPT	5	8	9	17	-	-				
	3.50		3.50	3.50	4.00	UDS	-	-	-	-						
	4.00		4.00	4.00	4.50	SPT	9	11	15	26						
	4.50		4.50	4.50	5.00	UDS	-	-	-	-	-	-				
	5.00		5.00	5.00	5.50	SPT	13	21	30	51						
	5.50			Reddish yellow, fine to very fine grained, sandy silts of intermediate plasticity (MI) 5.30 to 6.00m	5.50	5.50	6.00	UDS	-	-	-	-	-	-		
	6.00				6.00	6.50	SPT	31	70/7 cm	-	>100	-	-			
	6.50				6.50	7.00	SPT	51/11 cm	-	-	>100	-	-			
	7.00				7.00	7.50	SPT	55/13 cm	-	-	>100					
	7.50				7.50	8.00	SPT	56/5 cm	-	-	>100					
	8.00			Yellowish brown, fine to very fine grained, sandy clays of low plasticity with occasional gravels (CL) 6.00 to 8.30m	8.00	8.00	8.50	SPT	33	68/9 cm	-	>100				
	8.50				8.50	9.00	SPT	28	73/11 cm	-	>100					
	9.00				9.00	9.50	SPT	55/12 cm	-	-	>100					
	9.50				9.50	10.00	SPT	61/13 cm	-	-	>100					
	10.00				10.00	11.00	SPT	55/13 cm	-	-	>100					
	10.50			Dark brownish, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 10.00 to 15.60m	11.00	11.00	11.50	SPT	51/10 cm	-	-	>100				
	11.50				11.50	12.50	SPT	51/9 cm	-	-	>100					
	12.00															
	12.50				12.50	13.00	SPT	53/8 cm	-	-	>100					
	13.00				13.00	14.00	SPT	55/9 cm	-	-	>100					
	13.50															
	14.00				14.00	14.50	SPT	51/8 cm	-	-	>100					
	14.50				14.50	15.50	SPT	51/7 cm	-	-	>100					
	15.00															
	15.50				Not Used	Highly weathered, weak, dark greyish black, fine to very fine grained, fractured rock	15.50	15.50	16.00	SPT	51/7 cm	-	-	>100		-
	16.00		16.00	16.03			SPT	51/3 cm	-	-	>100					
16.50																
17.00	17.00	16.03	17.00	Core			-	-	-	-	9.00	-				
17.50	17.00	17.00	17.03	SPT			51/3 cm	-	-	>100						
18.00																
18.50	18.50	17.03	18.50	Core			-	-	-	-	14.00	-				
19.00	18.50	18.50	18.53	SPT			51/3 cm	-	-	>100						
19.50																
20.00	20.00	18.53	20.00	Core			-	-	-	-	23.33	-				
15.60 to 20.00m					20.00	20.00	20.30	SPT	51/3 cm	-	-	>100				

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 169

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1188, N 1944

Depth of Water Table : Encountered at 5.20m depth during investigation

Date of Start: 26-06-2024

Date of Completion: 03-07-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 199.13 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Not used		Dark reddish brown, fine to medium grained, clayey sand (SC) 0.00 to 1.50m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50				1.00	2.00	SPT	1	1	1	2	-	-		
	1.00														
	1.50														
	2.00			2.00	2.50	SPT	4	4	5	9	-	-			
	2.50														
	3.00														
	3.50			3.00	3.50	SPT	5	9	11	20	-	-			
	4.00														
	4.50														
	5.00			3.50	4.00	UDS	-	-	-	-	-	-			
	5.50														
	6.00														
	6.50			4.00	4.50	SPT	5	7	8	15	-	-			
	7.00														
	7.50														
	8.00			4.50	5.00	UDS	-	-	-	-	-	-			
	8.50														
	9.00														
	9.50			5.00	5.50	SPT	7	9	11	20	-	-			
	10.00														
	10.50														
	11.00			5.50	6.00	UDS	-	-	-	-	-	-			
	11.50														
	12.00														
	12.50			6.00	6.50	SPT	6	8	11	19	-	-			
	13.00														
	13.50														
	14.00			6.50	7.00	UDS	-	-	-	-	-	-			
	14.50														
	15.00														
	15.50			7.00	7.50	SPT	8	9	11	20	-	-			
	16.00														
16.50															
17.00	7.50	8.00	DS	-	UDS attempted but not recovered					-	-				
17.50															
18.00															
18.50	8.00	8.50	SPT	5	6	7	13	-	-						
19.00															
19.50															
20.00	8.50	9.00	UDS	-	-	-	-	-	-						
	9.00	9.50	SPT	7	8	11	19	-	-						
	9.50	10.00	DS	-	UDS attempted but not recovered					-	-				
	10.00	10.50	SPT	5	7	9	16	-	-						
	11.00	11.50	UDS	-	-	-	-	-	-						
	11.50	12.00	SPT	7	8	9	17	-	-						
	12.50	13.00	DS	-	UDS attempted but not recovered					-	-				
	13.00	13.50	SPT	10	11	13	23	-	-						
	14.00	14.50	DS	-	UDS attempted but not recovered					-	-				
	14.50	15.00	SPT	8	13	17	30	-	-						
	15.00	15.50	DS	-	UDS attempted but not recovered					-	-				
	15.50	16.00	SPT	15	17	19	36	-	-						
	16.00	16.50	DS	-	UDS attempted but not recovered					-	-				
	16.50	17.00	SPT	13	18	21	39	-	-						
	17.00	17.50	DS	-	UDS attempted but not recovered					-	-				
	17.50	18.00	SPT	13	18	21	39	-	-						
	18.00	18.50	DS	-	UDS attempted but not recovered					-	-				
	18.50	19.00	SPT	27	50/9cm	-	>100	-	-						
	19.00	19.50	SPT	27	50/9cm	-	>100	-	-						
	19.50	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100	-	-						
	20.00	20.00	SPT	50/13cm	-	-	>100								

Project : BHEL

Bore Hole No. : 172

Location : Hirma, Talabira

Depth of Termination : 20.0 m

Co-ordinates: E 1185, N 1777

Depth of Water Table : Encountered at 1.70m depth during investigation

Date of Start: 04-09-2024

Date of Completion: 05-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 199.40 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Not used		Dark brownish red, fine to medium grained, filled up clayey sand 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	DS	-	-	-	-	-	-	
	1.50														
	2.00			Dark brownish, fine to medium grained, clayey sand (SC) 0.30 to 3.90m	2.00	2.00	2.50	DS	-	-	-	-	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	5	7	7	14	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00			Dark brownish red, fine to medium grained, sandy clays of intermediate plasticity (CI) 3.90 to 4.30m	4.00	4.00	4.50	SPT	3	4	5	9	-	-	
	4.50				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00			Yellowish brown fine to medium grained, clayey sand with occasional to some gravels (SC) 4.30 to 6.40m	5.00	5.00	5.50	SPT	5	5	6	11	-	-	
	5.50				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.00				6.00	6.00	6.50	SPT	5	5	6	11	-	-	
	6.50				6.50	6.50	7.00	SPT	7	8	12	30	-	-	
	7.00			Yellowish brown, fine to coarse grained, silty clayey sand with little to some gravels (SM-SC) 6.10 to 9.10m	7.00	7.00	7.50	SPT	9	12	12	24	-	-	
	7.50				7.50	7.50	8.00	SPT	10	13	13	26	-	-	
	8.00				8.00	8.00	8.50	SPT	8	11	11	22	-	-	
	8.50				8.50	8.50	9.00	SPT	9	10	10	20	-	-	
	9.00				9.00	9.00	9.50	SPT	11	14	15	29	-	-	
	9.50			Reddish yellow, fine to medium grained, clayey sand with occasional to much gravels (SC) 9.10 to 10.50m	9.50	9.50	10.00	SPT	8	5	12	17	-	-	
	10.00				10.00	10.00	11.00	SPT	6	8	15	23	-	-	
	10.50														
	11.00			Reddish yellow, fine to coarse grained, silty clayey sand with little gravels (SM-SC) 10.50 to 12.60m	11.00	11.00	11.50	SPT	10	13	21	34	-	-	
	11.50				11.50	11.50	12.50	SPT	13	16	24	40	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	15	18	22	40	-	-	
	13.00			Light greyish to light whitish brown, fine to very fine grained, sandy clays of intermediate plasticity with occasional gravels (CI) 12.60 to 15.00m	13.00	13.00	14.00	SPT	10	13	24	37	-	-	
	13.50														
	14.00				14.00	14.00	14.50	SPT	13	18	26	44	-	-	
	14.50				14.50	14.50	14.50	SPT	12	19	25	44	-	-	
	15.00			Light whitish yellow, fine to very fine grained, clayey sand (SC) 15.00 to 16.10m											
	15.50				15.50	15.00	16.00	SPT	21	34	46	80	-	-	
	16.00	used			16.00	16.00	17.00	SPT	32	40	51	91	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	47	54/7 cm	-	>100	-	-	
	17.50				17.50	17.50	18.50	SPT	54/7 cm	-	-	>100	-	-	
	18.00			Light yellowish brown and whitish yellow, fine to very fine grained, weakly cemented clayey sand (SC)											
	18.50				18.50	18.50	19.00	SPT	55/10 cm	-	-	>100	-	-	
	19.00				19.00	19.00	20.00	SPT	55/12 cm	-	-	>100	-	-	
	19.50														
	20.00				20.00	20.00	20.10	SPT	60/10 cm	-	-	>100	-	-	

16.10 to 20.00m

Project : BHEL

Bore Hole No. : 173

Location : Hirma, Talabira

Depth of Termination : 20.00 m

Co-ordinates: E 1185, N 1450

Depth of Water Table : Encountered at 3.00m depth during investigation

Date of Start: 09-09-2024

Date of Completion: 10-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level:197.65m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00			Dark reddish yellow, fine to very fine grained, filled up sandy clays of low plasticity 0.00 to 0.30m	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	2	3	5	8	-	-	
	1.50														
	2.00			Dark reddish yellow, fine to very fine grained, sandy clays of intermediate plasticity (CI) 0.30 to 4.30m	2.00	2.00	2.50	SPT	4	6	6	12	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	5	6	8	14	-	-	
	3.50				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.00				4.00	4.00	4.50	SPT	8	11	14	25	-	-	
	4.50			Dark reddish yellow, fine to medium grained, clayey sand with occasional to some gravels (SC) 4.30 to 5.40m	4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.00				5.00	5.00	6.00	SPT	7	12	16	28	-	-	
	5.50			Dark reddish yellow, medium to coarse grained, clayey sand with some gravels (SC) 5.40 to 7.10m	6.00	6.00	6.50	SPT	8	8	12	20	-	-	
	6.00				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	6.50				7.00	7.00	7.50	SPT	7	12	14	26	-	-	
	7.00			Dark reddish yellow, fine to medium grained, clayey sand with little gravels (SC) 7.10 to 8.60m	7.50	7.50	8.00	SPT	9	12	19	31	-	-	
	7.50				8.00	8.00	8.50	SPT	11	14	18	32	-	-	
	8.00				8.50	8.50	9.00	SPT	10	11	14	25	-	-	
	8.50			Dark yellowish brown, fine to medium grained, silty clayey sand with little to much gravels (SM-SC) 8.60 to 10.00m	9.00	9.00	9.50	SPT	11	15	20	35	-	-	
	9.00				9.50	9.50	10.00	SPT	15	14	15	29	-	-	
	9.50				10.00	10.00	11.00	SPT	14	19	20	39	-	-	
	10.00				10.50	10.50	11.00	SPT	12	14	18	32	-	-	
	10.50			Dark yellowish brown, fine to medium grained, silty sand with little to much gravels (SM) 10.0 to 13.50m	11.00	11.00	11.50	SPT	12	15	20	35	-	-	
	11.00				11.50	11.50	12.50	SPT	13	18	22	40	-	-	
	11.50				12.00	12.00	13.00	SPT	13	21	22	43	-	-	
	12.00				12.50	12.50	13.00	SPT	13	21	22	43	-	-	
	12.50				13.00	13.00	14.00	SPT	31	35	46	81	-	-	
	13.00			Light yellowish brown, fine to medium grained, weakly cemented clayey sand with little to some gravels (SC) 13.50 to 16.80m	14.00	14.00	14.50	SPT	24	50/10cm	-	>100	-	-	
	13.50				14.50	14.50	15.50	SPT	50/6cm	-	-	>100	-	-	
	14.00				15.00	15.00	16	SPT	60/7cm	-	-	>100	-	-	
	14.50				15.50	15.50	16	SPT	50/5cm	-	-	>100	-	-	
	15.00			Dark yellowish brown, medium to coarse grained, weakly cemented silty gravels with much gravels (SM) 16.80 to 18.30m	16.00	16.00	17.00	SPT	50/6cm	-	-	>100	-	-	
	15.50				17.00	17.00	17.50	SPT	50/5cm	-	-	>100	-	-	
	16.00				17.50	17.50	18.50	SPT	50/6cm	-	-	>100	-	-	
	16.50				18.00	18.00	18.50	SPT	50/5cm	-	-	>100	-	-	
	17.00			Yellowish brown, fine to very fine grained, weakly cemented clayey sand with little to much gravels (SC)	18.50	18.50	19.00	SPT	50/9cm	-	-	>100	-	-	
	17.50				19.00	19.00	19.09	SPT	50/7cm	-	-	>100	-	-	
	18.00				19.09	19.09	20.00	SPT					-	-	
	18.50				20.00	20.00	20.00	SPT					-	-	
	19.00												-	-	
	19.50												-	-	
	20.00												-	-	
18.30 to 20.00m															

Project : BHEL

Bore Hole No. : 174

Location : Hirma, Talabira

Depth of Termination : 20.00 m

Co-ordinates: E 1185, N 1167

Depth of Water Table : Encountered at 3.50m depth during investigation

Date of Start: 09-09-2024

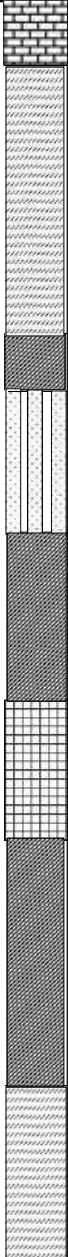
Date of Completion: 10-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced level: 196.80m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks	
						From m	To m		N ₁	N ₂	N ₃	N				
Rotary drilling method	0.00	Not used		Yellowish brown, fine to very fine grained, filled up clayey sand with little gravels 0.00 to 1.10m	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00															
	1.50						1.00	1.00	2.00	SPT	3	3	4	7		
	2.00						2.00	2.00	2.50	SPT	2	2	3	5	-	-
	2.50					Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) 1.10 to 5.40m	2.50	2.50	3.00	UDS	-	-	-	-		
	3.00						3.00	3.00	3.50	SPT	5	7	6	13	-	-
	3.50						3.50	3.50	4.00	UDS	-	-	-	-		
	4.00						4.00	4.00	4.50	SPT	5	9	13	22		
	4.50						4.50	4.50	5.00	UDS	-	-	-	-	-	-
	5.00						5.00	5.00	5.50	SPT	4	7	11	18		
	5.50					Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 5.40 to 6.30m	5.50	5.50	6.00	UDS	-	-	-	-	-	-
	6.00						6.00	6.00	6.50	SPT	7	8	14	22	-	-
	6.50						6.50	6.50	7.00	UDS	-	-	-	-	-	-
	7.00					Yellowish brown, fine to medium grained, silty sand with little to much gravels (SM) 6.30 to 8.60m	7.00	7.00	7.50	SPT	9	14	19	33		
	7.50						7.50	7.50	8.00	SPT	6	11	17	28		
	8.00						8.00	8.00	8.50	SPT	9	15	22	37		
	8.50					Yellowish brown, fine to very fine grained, clayey sand with some gravels (SC) 8.60 to 9.40m	8.50	8.50	9.00	SPT	12	14	18	32		
	9.00						9.00	9.00	9.50	SPT	9	17	25	42		
	9.50						9.50	9.50	10.00	SPT	14	19	22	41		
	10.00					Yellowish brown, fine to medium grained, clayey sand with little gravels (SC) 9.40 to 11.40m	10.00	10.00	11.00	SPT	11	21	27	48		
	10.50															
	11.00						11.00	11.00	11.50	SPT	18	24	29	53		
	11.50						11.50	11.50	12.50	SPT	13	26	33	59	-	-
	12.00					Yellowish brown, fine to very fine grained, sandy clays of low plasticity with some gravels (CL) 11.40 to 13.60m	12.50	12.50	13.00	SPT	7	10	13	23	-	-
	12.50						13.00	13.00	14.00	SPT	13	19	28	47	-	-
	13.00															
	13.50															
	14.00						14.00	14.00	14.50	SPT	20	26	37	63	-	-
	14.50						14.50	14.50	15.50	SPT	42	50/9cm	-	>100	-	-
	15.00					Brownish, fine to very fine grained, weakly cemented, clayey sand (SC) 13.60 to 17.70m	15.50	15.50	16	SPT	50/13cm	-	-	>100	-	-
	15.50						16.00	16.00	17.00	SPT	45	50/4cm	-	>100	-	-
	16.00															
16.50																
17.00				17.00	17.00	17.50	SPT	48	50/3cm	-	>100	-	-			
17.50				17.50	17.50	18.50	SPT	50/14cm	-	-	>100	-	-			
18.00																
18.50			Yellowish brown, fine to very fine grained, indurated sandy clays of intermediate plasticity (CI)	18.50	18.50	19.00	SPT	50/11cm	-	-	>100	-	-			
19.00				19.00	19.00	19.12	SPT	50/12cm	-	-	>100	-	-			
19.50																
20.00				20.00	19.12	20.00	SPT	50/9cm	-	-	>100	-	-			
17.70 to 20.00m																

K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 175

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 1654, N 3106

Depth of Water Table : Encountered at 3.20m depth during investigation

Date of Start: 12-08-2024

Date of Completion: 14-08-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 206.38 m

BORE LOG DATA SHEET

Method of Boring	Depth m	Casing	Notation	Soil Description	Depth of Sample m	Drill Run		Type of Sample	SPT N Value/Penetration of S.S.S				Core Recovery (%)	RQD (%)	Remarks
						From m	To m		N ₁	N ₂	N ₃	N			
Rotary drilling method	0.00	Used		Reddish yellow and reddish brown, fine to medium grained, clayey sand with little to much gravels (SC)	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	4	7	9	16	-	-	
	1.50														
	2.00				2.00	2.00	2.50	SPT	9	15	21	36	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00														
	3.50				3.00	3.00	3.50	SPT	11	15	18	33	-	-	
	4.00				3.50	3.50	4.00	UDS	-	-	-	-	-	-	
	4.50				4.00	4.00	4.50	SPT	9	12	7	19	-	-	
	5.00				4.50	4.50	5.00	UDS	-	-	-	-	-	-	
	5.50				5.00	5.00	5.50	SPT	7	9	10	19	-	-	
	6.00				5.50	5.50	6.00	UDS	-	-	-	-	-	-	
	6.50				6.00	6.00	6.50	SPT	18	23	25	48	-	-	
	7.00				6.50	6.50	7.00	UDS	-	-	-	-	-	-	
	7.50				7.00	7.00	7.50	SPT	18	25	36	61	-	-	
	8.00														
	8.50														
	9.00														
	9.50														
	10.00														
	10.50														
	11.00														
	11.50														
	12.00														
	12.50														
	13.00														
	13.50														
	14.00														
	14.50														
	15.00														
	15.50														
	16.00														
	16.50														
	17.00														
	17.50														
18.00															
18.50															
19.00															
19.50															
20.00															
16.00 to 20.00m															

16.00 to 20.00m



