

PROJECT	SUBJECT	DOCUMENT NO.	REV.	SECTION
NLC India Limited NLC Talabira Thermal Power Project- 3x800 MW Jharsuguda, Odisha	Geotechnical Investigation Report Part-3	PE-DC-511-602-C001B	3	
				<b>SHEET NO.</b>
				1



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

**GEOTECHNICAL INVESTIGATION REPORT  
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)

BHEL DOCUMENT NO. PE-DC-511-602-C001B

(REVISION R3)




**BHARAT HEAVY ELECTRICALS LIMITED  
NEW DELHI**






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




<b>S. No.</b>	<b>Description</b>	<b>Area covered</b>
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).
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-3

			3 X 800 MW NLC Talabira Thermal Power Project EPC Package				
COMMENT RESOLUTION SHEET							
DOC TITLE		Geotechnical Investigation Report Part - 3					
BHEL DOC NO.		PE-DC-511-602-C001B					
BHEL UNIT		PEM- NOIDA					
Geotechnical Investigation Report Part - 3 R2							
Sl. No	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00) Date: 28.02.2025 Approval Category : - 3	BHEL Reply dated 01.04.2025	NLCIL/DCPL Reply dated 03.06.2025	BHEL reply dated 07.07.2025	NLCIL/DCPL Reply dated 12.08.2025	BHEL reply dated 02.09.2025
		Section-B Comments					
1	General	CBR Tests results available from page 54/65 to 56/65 shall be removed from this report and shall be including in Geotechnical Investigation report Part-5.	The CBR test results have been removed from the Part 3 report and will be incorporated into the Part 6 report.	-	Point closed.	-	Point closed.
		Section-A Comments					
2	General	It is noted that BH 107 pertaining to Thermal project office, BH 143/146 pertaining to storm water pump house and storm water collection pond on western side are not covered in this report. Hence, it is suggested to rename this report as Part 3A and accordingly areas covered under pg 2 of the report shall be modified suitably.	BH-107 and BH-143 have been included in the revised report. However, since the drilling of BH-146 is still pending due to unacquired land, it has not been included in this revised report. The same shall be included later.	It is noted that BH 146 pertaining to storm water collection pond on western side is not covered in this report. After completion of borehole 146, Geotechnical Investigation Report Part - 3A & 3B shall be submitted for approval.	BH-146 related to storm water pump house on western side is included in revised report.	In page 101 of 120, cross section profile of sub-soil for BH-146 is not included. The same shall be checked and added.	Incorporated in the revised report.
3	General	It is noted that no separate boreholes are mentioned for security building, watch towers and gates on northern and western side. M/s BHEL to confirm boreholes applicable for these buildings.	Watch towers, security building (northern & western side) and gates (northern & western side) are located along the plant compound wall. Hence Net SBC recommendations for these structures shall be updated in Part-2 report based on nearest bore hole of plant compound wall.	Watch tower shall be removed from the cover page 1 of 65 and in page 2 of 65 as the same does not pertain to Geotech report part 3. As mentioned in BHEL reply to SI No 3, Watch tower shall be based on nearest borehole in Plant compound wall.	Noted and incorporated in the revised report.	-	Point closed.
4	General	All CBR test results/reports and recommendations pertaining to CBR(pg 9) shall be removed from the Part 3 of the soil investigation report as roads are not covered in the description of report and shall be included under relevant parts of the soil investigation report.	The CBR test results have been removed from the Part 3 report and will be incorporated into the Part 6 report.	-	Point closed.	-	Point closed.
5	Page- 4 Contents	The following test results/figures shall also be included in the report –“Result of Chemical analysis ,Cross section profile and Field photographs”	The results of the chemical analysis, cross-section profile, and field photographs have been included in the revised report.	-	Point closed.	-	Point closed.
6	Page-6	Check RL of the boreholes with respect to survey drawings.	Checked and found in order.	-	Point closed.	-	Point closed.
7	Page-6 & 12	For BH 122 under structure wherever security office is mentioned shall be corrected as security and Time office. Also, watch tower is to be removed from the description.	It has been incorporated in revised report.	-	Point closed.	-	Point closed.
8	Page-6 & 12	For BH 144 and 145 under structure wherever rainwater is mentioned shall be corrected as storm water.	It has been incorporated in revised report.	-	Point closed.	-	Point closed.
9	Page-6	Depth planned for investigation shall be included in separate column.	It has been incorporated in revised report.	-	Point closed.	-	Point closed.
10	Page-8 Clause 7	The proposed FGL mentioned as 202.5 shall be corrected as 201/202.5	It has been incorporated in revised report.	-	Point closed.	-	Point closed.
11	Page-8 Clause 7	It is mentioned that “The filling will vary in depth from 5.40 meters to 5.75 meters”. However, vide Pg 6- filling depth is in the range of 3.9-4.25m. To be reviewed and corrected.	It was a typographical error and has been corrected in the revised report.	-	Point closed.	-	Point closed.
12	Page-9 Clause 8.6	“For foundation resting on controlled compacted filled up soil, net safe bearing pressure of 5t/m2 shall be considered.” has been mentioned without basis/calculations. It is suggested to place shallow footings only below NGL. Hence, this recommendation may be reviewed and removed.	The same clause has been elaborated in the revised report.	As already noted in S.No.12 earlier compliance sheet, presumptive SBC of 5 T/sqm mentioned in Cl.8.5 of report shall be reviewed and removed as type of soil for filled up earth is unknown.	The recommendation provided in Clause 8.5 has been reviewed and found to be appropriate. Since the filling soil shall be layer wise compacted as per specification, we have adopted the minimum presumptive bearing capacity among all possible soil types given in table as a conservative approach.	As already noted in S.No.12 in earlier compliance sheet in both R0 & R1, presumptive SBC of 5 T/sqm mentioned in page 4, para 7, S.no.6 of this report shall be reviewed and removed as type of soil for filled up earth is unknown. Remark not attended by M/s BHEL in last two revisions.	SBC of 5 T/sqm shall be used for design of very lightly loaded structures viz. drains, sumps, culverts, staircases etc. which shall be rested on controlled compacted filled up soil. Hence the same has been recommended in the report.
13	Page-10	Design parameters-for BH 144-The filling height of the soil is mentioned as 5.75m.However, under pg 6,the filling height for BH 144 is mentioned as 4.25m.To be reviewed.	It was a typographical error and has been corrected in the revised report.	-	Point closed.	-	Point closed.
14	Page-10 & 64	For BH 144-from depth of 6.7m-10m from NGL, the soil classification is mentioned as SM. However, Pg 68-for BH 144, for the same depth range the soil classification is mentioned as SC. To be reviewed and corrected.	It was a typographical error and has been corrected in the revised report.	-	Point closed.	-	Point closed.
15	Page-11	For BH 145-under soil classification the depth range is mentioned as 3.4 to 7.3m for all layers. However, the depth from NGL is Varying from 3.4 to 4, 4-6.5, 6.5-7.3m. To be reviewed and corrected in soil classification.	Out of BH-144 & 145, BH-144 is governing. Hence design parameter of BH-144 is considered in the revised report.	-	Point closed.	-	Point closed.
16	Page-12	For BH 144-Width of foundation mentioned as 3-6m shall be checked and corrected as 4m-6m.	BH-144 & 145 belongs to storm water pump house area. Approx. width of foundation shall be approx. 10 to 11 m. Hence, width of foundation is modified in the revised report.	-	Point closed.	-	Point closed.
17	Page-12	Allowable bearing pressure shall be arrived for 25mm Settlement only instead of 40mm and 75mm and accordingly the report and recommendations shall be revised accordingly. Also, the unit (T/M2)of recommended SBC shall be mentioned.	Please refer specification Vol. II-G1/Section-II/closure no. 5.03.00, permissible settlement of 40 mm is allowed for Security & time office, Gate complex and parking sheds. Accordingly, Net SBC recommendations are updated in revised report as per specification.	-	Point closed.	-	Point closed.
18	Page-12	Recommended SBC shall match exactly with the values furnished under tables in annexure 1 to 3.( For Ex: For BH 122 at 1.5m depth for 6.5m-7m width of footing the allowable bearing pressure for 40mm settlement is mentioned as 14T/m2.However, the same is 13T/m2 as per the tables furnished under annexure pg 21)	Suitably incorporated in the revised report as per specification.	-	Point closed.	-	Point closed.

				3 X 800 MW NLC Talabira Thermal Power Project EPC Package			
COMMENT RESOLUTION SHEET							
DOC TITLE		Geotechnical Investigation Report Part - 3					
BHEL DOC NO.		PE-DC-511-602-C001B					
BHEL UNIT		PEM- NOIDA					
Geotechnical Investigation Report Part - 3 R2							
Sl. No	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00) Date: 28.02.2025 Approval Category : - 3	BHEL Reply dated 01.04.2025	NLCIL/DCPL Reply dated 03.06.2025	BHEL reply dated 07.07.2025	NLCIL/DCPL Reply dated 12.08.2025	BHEL reply dated 02.09.2025
19	General	BH 122- C and Phi is assumed as 0.1kg/cm2 and phi as 28 degrees for the calculation of SBC based on shear from 1m to 3.5m depth. However, the same may be checked and corrected inline with design parameters (I.e for 1.55-3.05m depth from FGL, C=0.06kg/cm2 and phi=25 and for 3.05m-3.75m depth from FGL, C=0.04kg/cm2 and phi=27).	If the width of the foundation is considered to be 1.0m, the influence zone extends up to 1.5m from the foundation depth. In this case, no shear parameters are available up to the influence zone. Therefore, correlated parameters have been considered, and the average of all parameters within the influence zone has been taken. Soil properties, such as cohesion and the angle of internal friction, are inferred from the SPT N-value as per correlations given in Appendix-12.	-	Point closed.	-	Point closed.
20	General	BH 144- C and Phi and density of soil assumed at 4m depth (I.e C=0.4kg/cm2 and phi=7 and density=1.82g/cc) for the calculation of SBC based on shear shall be checked and corrected inline with design parameters (I.e C=0.33kg/cm2 and phi=6 and density=1.76g/cc).	The calculations have been revised.	In Appendix 2.1 (pg 20 of 60), for BH 144 & 145, while calculating SBC, cohesion value is substituted directly in kg/cm² instead of T/m². The same shall be checked and corrected	The provided data has been reviewed and appears to be accurate. While cohesion values were originally presented in units consistent with our laboratory test results, these values were appropriately converted to T/m² during the calculation of the Safe Bearing Capacity (SBC).	-	Point closed.
21	General	BH 122,144,145- For settlement calculations cd shall be considered as 1.12 at all locations as per table 2 of IS 8009 Part 1.	The calculations have been revised, considering Cd as 1.12, in accordance with IS 8009 Part 1.	-	Point closed.	-	Point closed.
22	General	BH 144,145-For immediate settlement calculations use width of the footing as B instead of B/2.	Calculations have been revised considering B instead of B/2 in settlement calculation.	-	Point closed.	-	Point closed.
23	Page- 37, 38 & 39	Pg 37,38 and 39,For BH 144-under settlement calculations the Value of E considered as 160kg/cm2 shall be corrected to 52kg/cm2 since lower N Value is noted in BH 144 inline with E value considered for foundation width from 1-6m.	Value of E has been corrected in the revised report.	In page 30 of 60, In Appendix 3.2, E value 319 Kg/cm² for BH-107 adopted shall be checked and corrected. For foundation depth between 1 to 2m, N value is 13 to 15 for which E value works out to be 92.8 Kg/cm²	The foundation depths are 1.0 m, 1.5 m, and 2.0 m below the Finished Ground Level (FGL), corresponding to 3.0 m, 3.5 m, and 4.0 m below the Natural Ground Level (NGL). At 3.0 m depth, the Standard Penetration Test (SPT) N-value is 57. Therefore, the modulus of elasticity (E-value) used in the analysis is appropriate and consistent with the observed N-value.	For BH-107 (pg 104 of 120), N value is 57 at 3 to 4m depth with Clayey sand soil. For SC, E = 320*(N+15) which works out to be 230.40 Kg/cm2 instead of 319 Kg/cm2 indicated in the report. The same shall be checked and corrected.  Similarly, for BH-144 (pg 107 of 120), N value ranges from 12 to 100 between 5m to 7m depth for which E value works out to be 86.4 to 368 Kg/cm2 for SC soil. However, E value is indicated as 413 Kg/cm2 in report.  Similarly, for BH-146 (pg 109 of 120), N value ranges from 4 to 11 between 1m to 3m depth for which E value works out to be 60.8 to 83.2 Kg/cm2 for SC soil. However, E value is indicated as 228 Kg/cm2 in report.  Further, calculation for E value adopted for clay soil with low/intermediate plasticity with reference document shall also be furnished to check the E value indicated for boreholes 143 to 145.	Sample calculation of the allowable bearing pressure has been included for all boreholes in the revised report. The equation for determining the modulus of elasticity is provided within the sample calculation for the representative borehole.



 		3 X 800 MW NLC Talabira Thermal Power Project EPC Package					
COMMENT RESOLUTION SHEET							
DOC TITLE		Geotechnical Investigation Report Part - 3					
BHEL DOC NO.		PE-DC-511-602-C001B					
BHEL UNIT		PEM- NOIDA					
Geotechnical Investigation Report Part - 3 R2							
Sl. No	Dwg Ref	NLCIL/DCPL Comments: (Rev No. 00) Date: 28.02.2025 Approval Category : - 3	BHEL Reply dated 01.04.2025	NLCIL/DCPL Reply dated 03.06.2025	BHEL reply dated 07.07.2025	NLCIL/DCPL Reply dated 12.08.2025	BHEL reply dated 02.09.2025
24				In calculation of SBC based on shear criteria, the Nc, Nq & Ny factor arrived shall be checked for each borehole. As such, the same is not matching for mixed shear failure. Void ratio adopted shall be brought out in Design parameter table for each borehole.	The bearing capacity factors have been interpolated based on the void ratio rather than the internal friction angle ( $\phi$ ), as the mixed shear failure mechanism is defined in terms of void ratio.	In calculation of SBC based on shear criteria, in order to check the Nc, Nq & Ny factor arrived for mixed shear failure, void ratio adopted shall be brought out in Design parameter table for each borehole. Earlier remark not attended.  Actual calculation along with reference shall be provided for arriving at C, internal friction angle ( $\phi$ ) based on SPT N Value, void ratio for shear and Modulus of Elasticity E, Coefficient of volume compressibility mv, factor related to pore pressure parameter $\lambda$ , Depth factor, correction factor $\{ (D+0.5H)^2/D^2 \}$ for settlement.  Further, when depth of foundation is varying from 1m to 8m, SPT N value will also change with depth. However, single N value is considered in SBC calculation for each borehole and all the above parameters are assumed to be constant throughout.  It is suggested to submit excel file (.xls) for SBC calculations to understand the way various parameters are calculated based on correlations.	Sample calculations of allowable bearing pressure for all boreholes have been provided, wherein the bearing capacity factors Nc, Nq & Ny are calculated for mixed shear failure based on void ratio value reported in lab test data. The shear strength parameters are considered from laboratory tests conducted on remoulded samples and are not obtained through empirical correlations. The coefficient of volume compressibility value as applicable is derived from the results of consolidation tests performed on UDS samples and is mentioned in the laboratory test data. A detailed calculation of the modulus of elasticity, along with relevant references, is presented in the sample calculation for the representative borehole. Value of $\lambda = 0.7$ has been adopted in accordance with Table 1 of IS-8009 (Part 1).
25				In pg 28 pf 60, in pile capacity calculations for BH 144 & 145 furnished in Appendix 2.3, BH - 13 is wrongly considered which is not near to BH 144 & 145. Pile test results corresponding to BH 144 & 145 shall be checked and added as depth of foundation is more than 10m from FGL. The summary of pile capacity calculations for BH 144 & 145 shall be brought out under recommendation in page 6 of 60	Storm water collection pond and storm water pump house on eastern and western side shall be constructed below NGL. Hence Net SBC recommendations are provided from NGL in the revised report. Pile foundation is not required for these structures.	Pile foundation indicated for storm water collection pond and pump house in R1 are removed in R2 revision on their own. However, depth of isolated footing is indicated upto 8m in SBC recommendations in page 7 of 120 for BH 143 & 144. Provision of isolated footing upto 8m depth is not practical. Hence, M/s BHEL shall review and furnish recommendations of pile foundation for BH 143 & BH 144.	Storm water collection pond on eastern and western side shall be constructed at lowest contour level to collect storm water drainage discharge from the area in between boundary wall and Bhedan River. Hence storm water collection pond and storm water pump house on eastern and western side shall be constructed below NGL. Hence Net SBC recommendations are provided from NGL in the revised report. Pile foundation is not required for these structures.
26				Pile capacity recommendation shall be added for BH 144 & BH 155 in addition to SBC value since depth of foundation is in the range of 10m to 12m below FGL (6m & 8m below NGL)	Storm water collection pond and storm water pump house on eastern and western side shall be constructed below NGL. Hence Net SBC recommendations are provided from NGL in the revised report. Pile foundation is not required for these structures.	In Appendix-2 (page 16 to 22), for BH-144, SBC is indicated at depths from 1m to 7m only. However, in page 7, recommended SBC for BH 144 is indicated at depths from 1m to 5m, 7m & 8m. The same shall be checked and corrected in page 7 of 120.	Corrected in the revised report.
27				For BH - 107, SBC is recommended in page 6 of 60 at depths 1m, 1.5m & 2m from FGL (i.e., 3m, 3.5m & 4.0m from NGL). As such in design parameters (page 8 of 60) and lab test result (page 49 of 60), lab test result such as c, $\phi$ , $\gamma$ , e, etc., are missing. However value such as $c = 0.06 \text{ Kg/cm}^2$ , $\phi = 31$ degree & $\gamma = 2 \text{ g/cc}$ are assumed to calculate SBC. Lab tests shall be conducted & actual lab test results shall be taken for calculation of SBC instead of assumed / correlated value, Thermal Project Office being a major structure.	Since the proposed foundation depths extend beyond 2.5 m below the Natural Ground Level (NGL) and undisturbed soil samples could not be collected at these depths. Shear strength parameters derived from remoulded samples have been employed in the calculation of the allowable bearing pressure.	Shear strength parameters derived from remoulded samples will vary from that of parameters obtained from Undisturbed soil sample. As already intimated in previous revision, Thermal Project Office being a major structure, M/s BHEL shall ensure to collect Undisturbed soil sample from Borehole at Thermal Project Office location. Lab tests shall be conducted & actual lab test results shall be taken for calculation of SBC instead of assumed / correlated value. Earlier remark not attended.  Reasons on why undisturbed soil samples not collected at an important building location shall also be clearly explained.	For BH-107, proposed foundation depths extend beyond 2.5 m below the Natural Ground Level (NGL) and undisturbed soil samples could not be collected at these depths due to dense soil strata. Refer clause no. 7.2 of IS 1892, SPT test were performed at these depths. Shear strength parameters derived from remoulded samples have been considered in the calculation of the allowable bearing pressure.  Similarly for BH-122,144,145,143, where soft clay is encountered, UDS sample could not be collected and Shear strength parameters derived from remoulded samples have been considered in the calculation of the allowable bearing pressure.
28						Further, it is noted that UTM coordinates of BH 107 and BH 122 are changed in R2 with respect to earlier revision without any change in soil parameters. However, the reason for the change in coordinates are not indicated in the compliance sheet.	Due to local site constraints, the locations of BH-107 & 122 were shifted during field investigation. The revised borehole locations have been mentioned in the report.
29						In page 8 to 12 of 120, for BH 143,144,145,146, filled up soil of height 5.32m, 4.25m, 3.90m & 9.07m are indicated respectively. However, in page 2, corresponding FGL and cutting/filling data indicated in R1 revision are deleted in R2. The same shall be checked and corrected in page 2 for BH 143 to 146.	Corrected in the revised report.

# **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 3**

**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<sup>®</sup> 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

**January - 2025**

## Table of Contents

SR No.	Contents	Page No.
1	Introduction	1
2	Field Investigation	1
3	Laboratory investigation	3
4	General Geology of site	3
5	Subsurface Soil Conditions	4
6	Computation of safe bearing capacity	4
7	Conclusions	4
8	Limitation	5
9	Recommended Safe Bearing Pressure	6
10	Design parameters	8
11	Appendix- 1 to 6 Calculation of allowable bearing pressure	13
12	Appendix- 7 Sample calculation for ABP	; 3
13	Appendix- : /34" T g h t g p e g u ' h q t ' e q t t g r v k p u	338
14	Ej go k e c n ' c p c n ' u k u ' t g u w m u "	343
15	E t q u u ' U g e v k p ' R t q h k g	344
16	Notations	345
17	References	346
18	Results of laboratory tests	347
19	Investigation Layout Plan	353
20	Bore log data sheets	354
21	Site Photographs	35:

# **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 compound 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 6 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:

Sr No.	Bore hole No	Structure	R.L. of borehole	FGL	Cutting/ Filling (m)	Co-Ordinate	Depth Investigated from ground level	Depth Planned for investigation
1	BH 122	Gate Complex, Security and time office, packing shed	202.75	202.5	0.25 Cutting	E 1908 N 2892	20.00	20.00
2	BH 144	Strom water pump house eastern side	196.75	''''''/	/	E 2408 N 2784	20.00	20.00
3	BH 145	Strom water collection pond eastern side	197.10	''''''/	/	E 2350 N 2777	20.00	20.00
4	BH 107	Thermal Project office building	204.50	202.50	2.00 Cutting	E1835 N2997	25.00	25.00
5	BH 143	Strom water pump house on western side	195.68	''''''/	/	E312 N2784	25.00	25.00
6	BH 146	Strom water collection pond western side	191.93	''''''/	/	E388 N2776	20.00	20.00

## 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 that 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**

The proposed Finished Ground Level (FGL) is set as 201.0/202.5 meters R.L. Given these FGL requirements, soil cutting and filling will be necessary in various areas on-site. The filling will vary in depth from 4.25 meters to 5.32 meters, while soil cutting will range from 0.25 to 2.00meters. The Safe Bearing Capacity (SBC) values for the open foundation are provided in Appendix Nos. 1 to 4.

## **7.0 Conclusions**

- 1) General stratifications are as described in section 5.0 and as shown in respective borelogs. An open foundation is recommended for the areas below depth 1.0m from NGL.
- 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 ( $\text{SO}_3$ ) 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  $5 \text{ t/m}^2$  as suggested in presumptive safe bearing capacity of soil in various credible documents. For the ready reference the document suggesting  $5 \text{ t/m}^2$  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 Appendix-13 for your ready reference. From that table, we have considered the minimum presumptive safe bearing capacity among all types of soil, which is  $5 \text{ t/m}^2$ .

**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.



## Recommended SBC

Sr No.	Structure	BH	NGL (m)	FGL (m)	Foundation depth from FGL (m)	Width of foundation (m)	Allowable Bearing Pressure suggested For 25mm Settlement (t/m <sup>2</sup> )	Allowable Bearing Pressure suggested For 40mm Settlement (t/m <sup>2</sup> )
1	Gate Complex, Security and time office, parking shed	122	202.75	202.5	1.00	1 to 3	13	13
						4	11	15
						6.5 to 7	6	10
					1.50	1 to 3	15	16
						4	11	17
						6.5 to 7	6	10
					2.00	1 to 3	15	19
						4	11	18
						6.5 to 7	6	10
					2.50	1 to 3	15	21
						4	11	18
						6.5 to 7	6	10
					3.00	1 to 3	15	24
						4	11	18
						6.5 to 7	6	10
2	Thermal Project office building	107	204.5	202.5	1.00	1 to 3	15	-
						4	21	-
						6 to 9	11	-
					1.50	1 to 3	20	-
						4	24	-
						6 to 9	11	-
					2.00	1 to 3	25	-
						4	25	-
						6 to 9	11	-

Sr No.	Structure	BH	NGL (m)	Foundation depth from NGL (m)	Width of foundation (m)	Allowable Bearing Pressure suggested For 25mm Settlement (t/m <sup>2</sup> )	Allowable Bearing Pressure suggested For 40mm Settlement (t/m <sup>2</sup> )
3	Strom water pump house eastern side	144	196.75	1.00	1.5-3.0	4	-
					3.5-6.0	3	-
					7.0-10.0	2	-
				2.00	1.5-3.0	4	-
					3.5-6.0	4	-
					7.0-10.0	3	-
				3.00	1.5-3.0	4	-
					3.5-6.0	4	-
					7.0-10.0	3	-
				4.00	1.5-3.0	7	-
					3.5-6.0	5	-
					7.0-10.0	3	-
4	Strom water pump house on western side	143	195.68	1.00	1.5-3.0	8	-
					3.5-6.0	8	-
					7.0-10.0	7	-
				2.00	1.5-3.0	9	-
					3.5-6.0	8	-
					7.0-10.0	7	-
				3.00	1.5-3.0	9	-
					3.5-6.0	9	-
					7.0-10.0	7	-
				4.00	1.5-3.0	10	-
					3.5-6.0	9	-
					7.0-10.0	8	-
				5.00	1.5-3.0	14	-
					3.5-6.0	13	-
					7.0-10.0	8	-
				6.00	1.5-3.0	21	-
					3.5-6.0	13	-
					7.0-10.0	8	-
5	Strom water collection pond eastern side	145	197.1	1.00	1.5-3.0	6	-
					3.5-6.0	6	-
					7.0-10.0	4	-
				2.00	1.5-3.0	6	-
					3.5-6.0	6	-
					7.0-10.0	4	-
6	Strom water collection pond western side	146	191.93	1.00	1.5-3.0	6	-
					3.5-6.0	7	-
					7.0-10.0	7	-
				2.00	1.5-3.0	9	-
					3.5-6.0	9	-
					7.0-10.0	7	-
3	Strom water pump house eastern side	144	196.75	4.00	1.5-3.0	7	-
					3.5-6.0	5	-
					7.0-10.0	3	-
4	Strom water pump house on western side	143	195.68	5.00	1.5-3.0	22	-
					3.5-6.0	22	-
					7.0-10.0	13	-
7	Strom water pump house eastern side	144	196.75	7.00	1.5-3.0	27	-
					3.5-6.0	22	-
					7.0-10.0	13	-

## Design Parameter

BH-122							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m <sup>2</sup>
0.0 – 0.25	Reddish yellow, fine to medium grained, clayey sand (SC) 0.00 to 0.70m	Up to 0.25m depth from FGL soil in cutting	-	-	-	-	NA
0.25-0.70	Reddish yellow, fine to medium grained, clayey sand (SC)	FGL-0.45	-	-	-	-	
0.70-1.80	Reddish brown, fine to coarse grained, clayey sand (SC)	0.45-1.55	-	-	-	-	
1.80-3.30	Brownish, fine to medium grained, clayey sand with some gravels (SC)	1.55-3.05	0.06	25	1.81	24	
3.30-4.00	Mixture of dark brownish, fine to coarse grained, weakly cemented, clayey sand	3.05-3.75	0.04	27	2.02	29	
4.00-10.30	Mixture of dark brownish, fine to coarse grained, weakly cemented, clayey sand	3.75-10.05	-	-	-	>100	
10.3-20.00	Highly weathered, moderately weak to moderately strong, reddish brown, fine to coarse grained, fractured rock	10.05-19.75	-	-	-	-	80.20

BH-144						
Depth in m from NGL	Soil Classification	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m2
0.00-2.60	Brownish, fine to very sandy clays of low plasticity (CL)	0.26	7	1.71	2	NA
2.60-4.60	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	0.33	6	1.76	5	
4.60-6.70	Brownish, fine to medium grained, clayey sand with some gravels (SC)	0.05	26	2.00	11	
6.70-10.00	Dark brownish, fine to coarse grained, weakly silty sand (SM)	-	-	-	>100	
10.00-14.10	Dark brownish, fine to coarse grained, weakly clayey sand (SC)	-	-	-	>100	
14.10-20.00	Highly weathered, moderately weak, reddish brown, fine to coarse grained, fractured rock	-	-	-	-	136.00

BH-145						
Depth in m from NGL	Soil Classification	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT Value	shear strength h qc kN/m <sup>2</sup>
0.00-0.70	Yellowish brown, fine to very fine grained, sandy clays of low plasticity (CL)	-	-	-	-	NA
0.70-1.40	Brownish, fine to very fine grained, sandy clays of low plasticity (CL)	-	-	-	-	
1.40-3.40	Dark yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI)	0.50	9	1.96	3	
3.40-4.00	Yellowish brown, fine to medium grained, clayey sand (SC)	0.03	24	1.97	8-9	
4.00-6.50	Yellowish brown, fine to medium grained, clayey sand (SC)	-	-	-	46->100	
6.50-7.30	Yellowish brown, fine to medium grained, clayey sand (SC)	-	-	-	>100	
7.30-7.70	Yellowish brown, fine to medium grained, weakly cemented silty sand with occasional gravels (SM)	-	-	-	>100	
7.70-8.70	Yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC)	-	-	-	>100	
8.70-13.10	Yellowish brown, fine to medium grained, weakly cemented silty sand with occasional gravels (SM)	-	-	-	>100	
13.10-20.00	Highly weathered, moderately weak, whitish yellow, fine to coarse grained, fractured rock	-	-	-	-	125.4

BH-107							
Depth in m from NGL	Soil Classification	Depth in m from FGL	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT N Value	shear strength qc kN/m <sup>2</sup>
0.0 – 2.00	Dark greyish, fine to coarse grained, silty clayey sand with little gravels (SM-SC)	Up to 2.00m depth from NGL soil in cutting	-	-	-	13	NA
2.00-2.90	Dark greyish, fine to coarse grained, silty clayey sand with little gravels (SM-SC)	FGL-0.90	0.02	28	2.00	15	
2.90-19.60	Dark reddish brown, fine to medium grained, cemented, clayey sand with little gravels	0.90-17.60	-	-	-	49- >100	
19.60-22.20	Mixture of highly weathered, completely fractured and disintegrated, light yellowish white, fine to coarse grained, gravel, pebble size fractured rock fragments with cemented yellowish white, fine to coarse grained, sand	17.60-20.20	-	-	-	>100	
22.20-24.00	Highly weathered, moderately weak, dark brownish, fine to coarse grained, fractured rock	20.20-22.00	-	-	-	-	121.10
24.00-25.00	Highly weathered, moderately strong, dark brownish, fine to coarse grained, fractured rock	22.00-23.00	-	-	-	-	225.60

BH-143						
Depth in m from NGL	Soil Classification	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT Value	shear strength qc kN/m <sup>2</sup>
-	Filled up soil	-	-	-	-	NA
0.00-5.90	Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with some gravels (CI)	-	-	-	7-15	
5.90-7.40	Reddish brown, very fine grained, silty clays of intermediate plasticity (CI)	0.73	3	1.94	14	
7.40-9.40	Yellowish brown, fine to very fine grained, sandy clays of low plasticity with little gravels (CL)	0.70	7	1.98	14-15	
9.40-11.30	Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (SC)	-	-	-	21-26	
11.30-14.70	Yellowish brown, fine to coarse grained, silty sand with much gravels and pebble size fractured rock fragments	-	-	-	33->100	
14.70-19.50	Boulders formation of highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, angular interlocking fragments of fractured rock mixed with yellowish brown, fine to coarse grained, clayey sand	0.11	29	2.21	>100	
19.50-20.50	Light greyish and yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC)	-	-	-	73	
20.50-22.50	Yellowish grey, fine to very fine grained, indurated, sandy clays of low plasticity (CL)- mud rock	-	-	-	>100	
22.50-25.00	Dark greyish, fine to very fine grained, cemented clayey sand (SC)	-	-	-	>100	

BH-146						
Depth in m from NGL	Soil Classification	Cohesion in kg/cm <sup>2</sup>	Angle of Internal Friction	Bulk density in gm/cc	SPT Value	shear strength qc kN/m <sup>2</sup>
0.00-2.10	Brownish yellow, fine to medium grained, clayey sand (SC) 0.00 to 2.10m	-	-	-	4-9	NA
2.10-3.30	Yellowish brown, fine to medium grained, clayey sand (SC) 2.10 to 3.30m	0.05	24	1.97	11	
3.30-4.70	Brownish yellow, fine to medium grained, silty sand with little plastic fines and much gravels (SM) 3.30 to 4.70m	-	-	-	22-30	
4.70-7.30	Brownish yellow, fine to medium grained, poorly graded sand and silty sand with little to much gravels (SP-SM) 4.70 to 7.30m	0.00	32	2.10	30-42	
7.30-9.40	Yellowish brown, fine to coarse grained, poorly graded sand and silty sand with much gravels (SP-SM) 7.30 to 9.40m	-	-	-	44-61	
9.40-13.50	Light greyish, fine to very fine grained, clayey sand (SC) 9.40 to 13.50m	-	-	-	34-69	
13.50-18.50	Greyish brown, fine fine to very fine grained, cemented clayey sand (SC) 13.50 to 18.50m	-	-	-	53->100	
18.50-20.00	Light brownish, fine to very fine grained, cemented clayey sand (SC)	-	-	-	>100	

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 1 (For BH-122)

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

Depth of Foundation from RL-202.5m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria	Safe Bearing Pressures calculated based on Settlement Criteria		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	201.50	1.00	1.00	13	45	71	13	13
1.00	201.50	2.00	2.00	13	22	36	13	13
1.00	201.50	3.00	3.00	14	15	24	14	14
1.00	201.50	4.00	4.00	15	11	18	11	15
1.00	201.50	6.50	6.50	18	7	11	7	11
1.00	201.50	7.00	7.00	19	6	10	6	10
1.50	201.00	1.00	1.00	17	45	71	17	17
1.50	201.00	2.00	2.00	16	22	36	16	16
1.50	201.00	3.00	3.00	17	15	24	15	17
1.50	201.00	4.00	4.00	17	11	18	11	17
1.50	201.00	6.50	6.50	20	7	11	7	11
1.50	201.00	7.00	7.00	21	6	10	6	10

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.



KCT Consultancy Services LLP, Ahmedabad

(For BH-122)

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

Depth of Foundation from RL-202.5m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria	Safe Bearing Pressures calculated based on Settlement Criteria		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
2.00	200.50	1.00	1.00	20	45	71	20	20
2.00	200.50	2.00	2.00	19	22	36	19	19
2.00	200.50	3.00	3.00	19	15	24	15	19
2.00	200.50	4.00	4.00	20	11	18	11	18
2.00	200.50	6.50	6.50	22	7	11	7	11
2.00	200.50	7.00	7.00	23	6	10	6	10
2.50	200.00	1.00	1.00	24	45	71	24	24
2.50	200.00	2.00	2.00	21	22	36	21	21
2.50	200.00	3.00	3.00	21	15	24	15	21
2.50	200.00	4.00	4.00	22	11	18	11	18
2.50	200.00	6.50	6.50	24	7	11	7	11
2.50	200.00	7.00	7.00	25	6	10	6	10

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-122)

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

Depth of Foundation from RL-202.5m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria	Safe Bearing Pressures calculated based on Settlement Criteria		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
3.00	199.50	1.00	1.00	28	45	71	28	28
3.00	199.50	2.00	2.00	24	22	36	22	24
3.00	199.50	3.00	3.00	24	15	24	15	24
3.00	199.50	4.00	4.00	24	11	18	11	18
3.00	199.50	6.50	6.50	26	7	11	7	11
3.00	199.50	7.00	7.00	27	6	10	6	10
3.50	199.00	1.00	1.00	32	45	71	32	32
3.50	199.00	2.00	2.00	27	22	36	22	27
3.50	199.00	3.00	3.00	26	15	24	15	24
3.50	199.00	4.00	4.00	27	11	18	11	18
3.50	199.00	6.50	6.50	29	7	11	7	11
3.50	199.00	7.00	7.00	29	6	10	6	10

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 2 (For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	195.75	1.50	1.50	4	14	23	4	4
1.00	195.75	2.00	2.00	4	10	17	4	4
1.00	195.75	2.50	2.50	4	8	13	4	4
1.00	195.75	3.00	3.00	4	7	11	4	4
2.00	194.75	1.50	1.50	5	15	24	5	5
2.00	194.75	2.00	2.00	4	11	18	4	4
2.00	194.75	2.50	2.50	4	9	14	4	4
2.00	194.75	3.00	3.00	4	7	12	4	4
3.00	193.75	1.50	1.50	5	15	24	5	5
3.00	193.75	2.00	2.00	5	11	18	5	5
3.00	193.75	2.50	2.50	4	9	14	4	4
3.00	193.75	3.00	3.00	4	8	12	4	4

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

..... (For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	195.75	3.50	3.50	4	6	9	4	4
1.00	195.75	4.00	4.00	4	5	8	4	4
1.00	195.75	5.00	5.00	4	4	7	4	4
1.00	195.75	6.00	6.00	4	3	6	3	4
2.00	194.75	3.50	3.50	4	6	10	4	4
2.00	194.75	4.00	4.00	4	5	9	4	4
2.00	194.75	5.00	5.00	4	4	7	4	4
2.00	194.75	6.00	6.00	4	4	6	4	4
3.00	193.75	3.50	3.50	4	7	11	4	4
3.00	193.75	4.00	4.00	4	6	9	4	4
3.00	193.75	5.00	5.00	4	5	7	4	4
3.00	193.75	6.00	6.00	4	4	6	4	4

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	195.75	7.00	7.00	4	3	5	3	4
1.00	195.75	8.00	8.00	4	3	4	3	4
1.00	195.75	9.00	9.00	4	2	4	2	4
1.00	195.75	10.00	10.00	4	2	4	2	4
2.00	194.75	7.00	7.00	4	3	5	3	4
2.00	194.75	8.00	8.00	4	3	5	3	4
2.00	194.75	9.00	9.00	4	3	4	3	4
2.00	194.75	10.00	10.00	4	2	4	2	4
3.00	193.75	7.00	7.00	4	3	6	3	4
3.00	193.75	8.00	8.00	4	3	5	3	4
3.00	193.75	9.00	9.00	4	3	5	3	4
3.00	193.75	10.00	10.00	4	3	4	3	4

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Á ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Á		Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion) Á	
					For 25 mm Settlement	For 40 mm Settlement	For 25 mm Settlement	For 40 mm Settlement
( m )	( m )	( m )	( m )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
5.00	191.75	1.50	1.50	25	87	140	25	25
5.00	191.75	2.00	2.00	23	66	105	23	23
5.00	191.75	2.50	2.50	23	52	84	23	23
5.00	191.75	3.00	3.00	22	44	70	22	22
6.00	190.75	1.50	1.50	31	87	140	31	31
6.00	190.75	2.00	2.00	28	66	105	28	28
6.00	190.75	2.50	2.50	27	52	84	27	27
6.00	190.75	3.00	3.00	27	44	70	27	27
7.00	189.75	1.50	1.50	37	87	140	37	37
7.00	189.75	2.00	2.00	34	66	105	34	34
7.00	189.75	2.50	2.50	32	52	84	32	32
7.00	189.75	3.00	3.00	31	44	70	31	31

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

ffor BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
5.00	191.75	3.50	3.50	22	37	60	22	22
5.00	191.75	4.00	4.00	22	33	52	22	22
5.00	191.75	5.00	5.00	23	26	42	23	23
5.00	191.75	6.00	6.00	23	22	35	22	23
6.00	190.75	3.50	3.50	26	37	60	26	26
6.00	190.75	4.00	4.00	26	33	52	26	26
6.00	190.75	5.00	5.00	26	26	42	26	26
6.00	190.75	6.00	6.00	27	22	35	22	27
7.00	189.75	3.50	3.50	31	37	60	31	31
7.00	189.75	4.00	4.00	30	33	52	30	30
7.00	189.75	5.00	5.00	30	26	42	26	30
7.00	189.75	6.00	6.00	30	22	35	22	30

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\hat{A}$  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\hat{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
5.00	191.75	7.00	7.00	24	19	30	19	24
5.00	191.75	8.00	8.00	24	16	26	16	24
5.00	191.75	9.00	9.00	25	15	23	15	23
5.00	191.75	10.00	10.00	26	13	21	13	21
6.00	190.75	7.00	7.00	27	19	30	19	27
6.00	190.75	8.00	8.00	28	16	26	16	26
6.00	190.75	9.00	9.00	28	15	23	15	23
6.00	190.75	10.00	10.00	29	13	21	13	21
7.00	189.75	7.00	7.00	31	19	30	19	30
7.00	189.75	8.00	8.00	31	16	26	16	26
7.00	189.75	9.00	9.00	32	15	23	15	23
7.00	189.75	10.00	10.00	32	13	21	13	21

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 196.75m
- 3) Calculations are considering the effect of water table at FGL.



KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Depth of Foundation from RL-196.75m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
4.00	192.75	1.50	1.50	9	14	23	9	9
4.00	192.75	2.00	2.00	8	11	17	8	8
4.00	192.75	2.50	2.50	8	9	14	8	8
4.00	192.75	3.00	3.00	7	8	12	7	7
4.00	192.75	3.50	3.50	7	7	11	7	7
4.00	192.75	4.00	4.00	7	6	10	6	7
4.00	192.75	5.00	5.00	7	5	8	5	7
4.00	192.75	6.00	6.00	7	5	7	5	7
4.00	192.75	7.00	7.00	7	4	6	4	6
4.00	192.75	8.00	8.00	7	4	6	4	6
4.00	192.75	9.00	9.00	7	3	5	3	5
4.00	192.75	10.00	10.00	7	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 196.75m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - I (For BH-107)

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

Depth of Foundation From RL-202.5m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria	Safe Bearing Pressures calculated based on Settlement Criteria	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
( m )	( m )	( m )	( m )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	201.50	1.00	1.00	15	101	15
1.00	201.50	2.00	2.00	17	51	17
1.00	201.50	3.00	3.00	19	34	19
1.00	201.50	4.00	4.00	21	25	21
1.50	201.00	1.00	1.00	20	101	20
1.50	201.00	2.00	2.00	21	51	21
1.50	201.00	3.00	3.00	22	34	22
1.50	201.00	4.00	4.00	24	25	24
2.00	200.50	1.00	1.00	25	101	25
2.00	200.50	2.00	2.00	25	51	25
2.00	200.50	3.00	3.00	26	34	26
2.00	200.50	4.00	4.00	28	25	25

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-107)

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

Depth of Foundation From RL-202.5m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria	Safe Bearing Pressures calculated based on Settlement Criteria	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement	For 25 mm Settlement
( m )	( m )	( m )	( m )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	201.50	6.00	6.00	25	17	17
1.00	201.50	7.00	7.00	28	14	14
1.00	201.50	8.00	8.00	30	13	13
1.00	201.50	9.00	9.00	32	11	11
1.50	201.00	6.00	6.00	29	17	17
1.50	201.00	7.00	7.00	31	14	14
1.50	201.00	8.00	8.00	33	13	13
1.50	201.00	9.00	9.00	35	11	11
2.00	200.50	6.00	6.00	32	17	17
2.00	200.50	7.00	7.00	34	14	14
2.00	200.50	8.00	8.00	36	13	13
2.00	200.50	9.00	9.00	39	11	11

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 4 (For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	194.68	1.50	1.50	9	49	78	9	9
1.00	194.68	2.00	2.00	9	35	56	9	9
1.00	194.68	2.50	2.50	9	27	44	9	9
1.00	194.68	3.00	3.00	8	22	36	8	8
2.00	193.68	1.50	1.50	10	51	82	10	10
2.00	193.68	2.00	2.00	9	39	62	9	9
2.00	193.68	2.50	2.50	9	30	48	9	9
2.00	193.68	3.00	3.00	9	24	39	9	9
3.00	192.68	1.50	1.50	11	51	82	11	11
3.00	192.68	2.00	2.00	10	39	62	10	10
3.00	192.68	2.50	2.50	10	31	49	10	10
3.00	192.68	3.00	3.00	9	26	41	9	9

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	194.68	3.50	3.50	8	19	30	8	8
1.00	194.68	4.00	4.00	8	16	26	8	8
1.00	194.68	5.00	5.00	8	13	21	8	8
1.00	194.68	6.00	6.00	8	11	17	8	8
2.00	193.68	3.50	3.50	9	20	33	9	9
2.00	193.68	4.00	4.00	9	17	28	9	9
2.00	193.68	5.00	5.00	9	14	22	9	9
2.00	193.68	6.00	6.00	8	11	18	8	8
3.00	192.68	3.50	3.50	9	22	35	9	9
3.00	192.68	4.00	4.00	9	19	30	9	9
3.00	192.68	5.00	5.00	9	14	23	9	9
3.00	192.68	6.00	6.00	9	12	19	9	9

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
1.00	194.68	7.00	7.00	8	9	15	8	8
1.00	194.68	8.00	8.00	8	8	13	8	8
1.00	194.68	9.00	9.00	8	7	12	7	8
1.00	194.68	10.00	10.00	8	7	11	7	8
2.00	193.68	7.00	7.00	8	10	15	8	8
2.00	193.68	8.00	8.00	8	8	13	8	8
2.00	193.68	9.00	9.00	8	8	12	8	8
2.00	193.68	10.00	10.00	8	7	11	7	8
3.00	192.68	7.00	7.00	9	10	16	9	9
3.00	192.68	8.00	8.00	8	9	14	8	8
3.00	192.68	9.00	9.00	8	8	13	8	8
3.00	192.68	10.00	10.00	8	7	12	7	8

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\hat{A}$	Safe Bearing Pressures calculated based on Settlement Criteria		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
6.00	189.68	1.50	1.50	27	52	84	27	27
6.00	189.68	2.00	2.00	24	39	62	24	24
6.00	189.68	2.50	2.50	22	31	49	22	22
6.00	189.68	3.00	3.00	21	26	41	21	21
7.00	188.68	1.50	1.50	29	53	85	29	29
7.00	188.68	2.00	2.00	26	39	62	26	26
7.00	188.68	2.50	2.50	24	31	49	24	24
7.00	188.68	3.00	3.00	22	26	41	22	22
8.00	187.68	1.50	1.50	31	54	86	31	31
8.00	187.68	2.00	2.00	27	39	62	27	27
8.00	187.68	2.50	2.50	25	31	49	25	25
8.00	187.68	3.00	3.00	23	26	41	23	23

**Notes :**

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from the RL 195.68m

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

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$ ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
6.00	189.68	3.50	3.50	20	22	35	20	20
6.00	189.68	4.00	4.00	20	19	31	19	20
6.00	189.68	5.00	5.00	19	16	25	16	19
6.00	189.68	6.00	6.00	18	13	22	13	18
7.00	188.68	3.50	3.50	21	22	35	21	21
7.00	188.68	4.00	4.00	21	20	31	20	21
7.00	188.68	5.00	5.00	19	16	26	16	19
7.00	188.68	6.00	6.00	19	14	22	14	19
8.00	187.68	3.50	3.50	22	22	36	22	22
8.00	187.68	4.00	4.00	21	20	32	20	21
8.00	187.68	5.00	5.00	20	17	27	17	20
8.00	187.68	6.00	6.00	19	14	23	14	19

**Notes :**

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from the RL 195.68m

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



KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{A}$  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{A}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
6.00	189.68	7.00	7.00	18	12	19	12	18
6.00	189.68	8.00	8.00	18	10	17	10	17
6.00	189.68	9.00	9.00	17	9	15	9	15
6.00	189.68	10.00	10.00	17	8	14	8	14
7.00	188.68	7.00	7.00	18	12	20	12	18
7.00	188.68	8.00	8.00	18	11	18	11	18
7.00	188.68	9.00	9.00	18	10	16	10	16
7.00	188.68	10.00	10.00	18	9	14	9	14
8.00	187.68	7.00	7.00	19	13	21	13	19
8.00	187.68	8.00	8.00	18	12	19	12	18
8.00	187.68	9.00	9.00	18	11	17	11	17
8.00	187.68	10.00	10.00	18	10	16	10	16

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria $\bar{q}$ ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria $\bar{s}$		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
4.00	191.68	1.50	1.50	12	51	82	12	12
4.00	191.68	2.00	2.00	11	39	62	11	11
4.00	191.68	2.50	2.50	10	31	49	10	10
4.00	191.68	3.00	3.00	10	26	41	10	10
4.00	191.68	3.50	3.50	10	22	35	10	10
4.00	191.68	4.00	4.00	9	19	31	9	9
4.00	191.68	5.00	5.00	9	15	24	9	9
4.00	191.68	6.00	6.00	9	12	20	9	9
4.00	191.68	7.00	7.00	9	11	17	9	9
4.00	191.68	8.00	8.00	9	9	15	9	9
4.00	191.68	9.00	9.00	9	8	13	8	9
4.00	191.68	10.00	10.00	9	8	12	8	9

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

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

Depth of Foundation from RL-195.68m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å		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 <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )	( t / m <sup>2</sup> )
5.00	190.68	1.50	1.50	18	51	82	18	18
5.00	190.68	2.00	2.00	16	39	62	16	16
5.00	190.68	2.50	2.50	15	31	49	15	15
5.00	190.68	3.00	3.00	14	26	41	14	14
5.00	190.68	3.50	3.50	14	22	35	14	14
5.00	190.68	4.00	4.00	13	19	31	13	13
5.00	190.68	5.00	5.00	13	16	25	13	13
5.00	190.68	6.00	6.00	13	13	21	13	13
5.00	190.68	7.00	7.00	12	11	18	11	12
5.00	190.68	8.00	8.00	12	10	16	10	12
5.00	190.68	9.00	9.00	12	9	14	9	12
5.00	190.68	10.00	10.00	12	8	13	8	12

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

**5DD9B8-L !)** (For BH-145)**SUMMARY OF ALLOWABLE BEARING PRESSURE BASED ON SHEAR AND SETTLEMENT CRITERION****Project :** Proposed structure in Phase 1 of 3 x 800 MW NLC Talabira, Thermal Power Project (NTTPP) at village- Hirma, Talabira, Odisha

Depth of Foundation from RL-197.10m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	196.10	1.50	1.50	6	24	6
1.00	196.10	2.00	2.00	6	17	6
1.00	196.10	2.50	2.50	6	14	6
1.00	196.10	3.00	3.00	6	11	6
2.00	195.10	1.50	1.50	7	25	7
2.00	195.10	2.00	2.00	7	19	7
2.00	195.10	2.50	2.50	6	15	6
2.00	195.10	3.00	3.00	6	12	6
3.00	194.10	1.50	1.50	8	25	8
3.00	194.10	2.00	2.00	7	19	7
3.00	194.10	2.50	2.50	7	15	7
3.00	194.10	3.00	3.00	7	13	7

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-145)

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

Depth of Foundation from RL-197.10m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	196.10	3.50	3.50	6	10	6
1.00	196.10	4.00	4.00	6	8	6
1.00	196.10	5.00	5.00	6	7	6
1.00	196.10	6.00	6.00	6	6	6
2.00	195.10	3.50	3.50	6	10	6
2.00	195.10	4.00	4.00	6	9	6
2.00	195.10	5.00	5.00	6	7	6
2.00	195.10	6.00	6.00	6	6	6
3.00	194.10	3.50	3.50	7	11	7
3.00	194.10	4.00	4.00	6	10	6
3.00	194.10	5.00	5.00	6	8	6
3.00	194.10	6.00	6.00	6	7	6

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-145)

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

Depth of Foundation from RL-197.10m	R.L. of Foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	196.10	7.00	7.00	6	5	5
1.00	196.10	8.00	8.00	6	5	5
1.00	196.10	9.00	9.00	6	4	4
1.00	196.10	10.00	10.00	6	4	4
2.00	195.10	7.00	7.00	6	6	6
2.00	195.10	8.00	8.00	6	5	5
2.00	195.10	9.00	9.00	6	5	5
2.00	195.10	10.00	10.00	6	4	4
3.00	194.10	7.00	7.00	6	6	6
3.00	194.10	8.00	8.00	6	6	6
3.00	194.10	9.00	9.00	6	5	5
3.00	194.10	10.00	10.00	6	5	5

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 6 (For BH-146)

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

Depth of Foundation from RL-191.93m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	190.93	1.50	1.50	6	48	6
1.00	190.93	2.00	2.00	6	36	6
1.00	190.93	2.50	2.50	6	29	6
1.00	190.93	3.00	3.00	7	24	7
2.00	189.93	1.50	1.50	9	48	9
2.00	189.93	2.00	2.00	9	36	9
2.00	189.93	2.50	2.50	9	29	9
2.00	189.93	3.00	3.00	9	24	9
3.00	188.93	1.50	1.50	12	48	12
3.00	188.93	2.00	2.00	12	36	12
3.00	188.93	2.50	2.50	12	29	12
3.00	188.93	3.00	3.00	12	24	12

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 191.93m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-146)

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

Depth of Foundation from RL-191.93m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	190.93	3.50	3.50	7	21	7
1.00	190.93	4.00	4.00	7	18	7
1.00	190.93	5.00	5.00	8	14	8
1.00	190.93	6.00	6.00	8	12	8
2.00	189.93	3.50	3.50	9	21	9
2.00	189.93	4.00	4.00	10	18	10
2.00	189.93	5.00	5.00	10	14	10
2.00	189.93	6.00	6.00	11	12	11
3.00	188.93	3.50	3.50	12	21	12
3.00	188.93	4.00	4.00	12	18	12
3.00	188.93	5.00	5.00	13	14	13
3.00	188.93	6.00	6.00	13	12	12

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 191.93m
- 3) Calculations are considering the effect of water table at FGL.



KCT Consultancy Services LLP, Ahmedabad

(For BH-146)

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

Depth of Foundation from RL-191.93m	RL of foundation	Length of Foundation	Width of Foundation	Safe Bearing Capacities calculated based on Shear Criteria Å  ( t / m <sup>2</sup> )	Safe Bearing Pressures calculated based on Settlement Criteria Å	Allowable Bearing Pressure suggested (Min. of Shear and Settlement Criterion)
					For 25 mm Settlement  ( t / m <sup>2</sup> )	For 25 mm Settlement  ( t / m <sup>2</sup> )
( m )	( m )	( m )	( m )			
1.00	190.93	7.00	7.00	9	10	9
1.00	190.93	8.00	8.00	10	9	9
1.00	190.93	9.00	9.00	10	8	8
1.00	190.93	10.00	10.00	11	7	7
2.00	189.93	7.00	7.00	11	10	10
2.00	189.93	8.00	8.00	12	9	9
2.00	189.93	9.00	9.00	13	8	8
2.00	189.93	10.00	10.00	13	7	7
3.00	188.93	7.00	7.00	14	10	10
3.00	188.93	8.00	8.00	14	9	9
3.00	188.93	9.00	9.00	15	8	8
3.00	188.93	10.00	10.00	16	7	7

**Notes :**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 191.93m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 1.1 (For BH-122)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL 202.5m m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.00	1.00	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>13</b>
2	2.00	2.00	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>13</b>
3	3.00	3.00	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.09	1.05	1.05	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>14</b>
4	4.00	4.00	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>15</b>
5	6.50	6.50	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>18</b>
6	7.00	7.00	1.00	201.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>19</b>
7	1.00	1.00	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>17</b>
8	2.00	2.00	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>16</b>
9	3.00	3.00	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>17</b>
10	4.00	4.00	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>17</b>
11	6.50	6.50	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>20</b>
12	7.00	7.00	1.50	201.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>21</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-122)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL 202.5m m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.00	1.00	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.57	1.28	1.28	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>20</b>
2	2.00	2.00	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>19</b>
3	3.00	3.00	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.19	1.09	1.09	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>19</b>
4	4.00	4.00	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>20</b>
5	6.50	6.50	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.09	1.04	1.04	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>22</b>
6	7.00	7.00	2.00	200.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>23</b>
7	1.00	1.00	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.71	1.35	1.35	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>24</b>
8	2.00	2.00	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.35	1.18	1.18	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>21</b>
9	3.00	3.00	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.24	1.12	1.12	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>21</b>
10	4.00	4.00	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.18	1.09	1.09	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>22</b>
11	6.50	6.50	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.11	1.05	1.05	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>24</b>
12	7.00	7.00	2.50	200.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>25</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from RL 202.5m.****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-122)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL 202.5m m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.00	1.00	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.85	1.42	1.42	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>28</b>
2	2.00	2.00	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.42	1.21	1.21	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>24</b>
3	3.00	3.00	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.28	1.14	1.14	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>24</b>
4	4.00	4.00	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.21	1.11	1.11	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>24</b>
5	6.50	6.50	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.13	1.07	1.07	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>26</b>
6	7.00	7.00	3.00	199.50	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.12	1.06	1.06	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>27</b>
7	1.00	1.00	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.99	1.50	1.50	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>32</b>
8	2.00	2.00	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.50	1.25	1.25	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>27</b>
9	3.00	3.00	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.33	1.17	1.17	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>26</b>
10	4.00	4.00	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.25	1.12	1.12	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>27</b>
11	6.50	6.50	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>29</b>
12	7.00	7.00	3.50	199.00	0.10	28	17.90	7.75	8.63	1.30	1.20	0.80	1.14	1.07	1.07	1.00	1.00	1.00	1.81	0.91	0.50	0.50	<b>29</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 2.1 (For BH-144 )

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
2	2.00	2.00	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
3	2.50	2.50	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
4	3.00	3.00	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
5	1.50	1.50	2.00	194.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>5</b>
6	2.00	2.00	2.00	194.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>4</b>
7	2.50	2.50	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
8	3.00	3.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
9	1.50	1.50	3.00	193.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.40	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>5</b>
10	2.00	2.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	<b>5</b>
11	2.50	2.50	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	<b>4</b>
12	3.00	3.00	3.00	193.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>4</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	4
2	4.00	4.00	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	4
3	5.00	5.00	1.00	195.75	0.20	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	1.70	0.85	0.50	0.50	4
4	6.00	6.00	1.00	195.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
5	3.50	3.50	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
6	4.00	4.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
7	5.00	5.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
8	6.00	6.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
9	3.50	3.50	3.00	193.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
10	4.00	4.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4
11	5.00	5.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4
12	6.00	6.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4

**Note :-**

1) The factor of safety of 2.5 is considered.

2) The depth of foundation is considered from the RL 196.75m

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

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	1.00	195.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
2	8.00	8.00	1.00	195.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
3	9.00	9.00	1.00	195.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
4	10.00	10.00	1.00	195.75	0.20	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	4
5	7.00	7.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
6	8.00	8.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
7	9.00	9.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
8	10.00	10.00	2.00	194.75	0.20	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	1.70	0.85	0.50	0.50	4
9	7.00	7.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4
10	8.00	8.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4
11	9.00	9.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4
12	10.00	10.00	3.00	193.75	0.20	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	1.70	0.85	0.50	0.50	4

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**

**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	5.00	191.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.91	1.45	1.45	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>25</b>
2	2.00	2.00	5.00	191.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.68	1.34	1.34	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>23</b>
3	2.50	2.50	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>23</b>
4	3.00	3.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>22</b>
5	1.50	1.50	6.00	190.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	2.09	1.54	1.54	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>31</b>
6	2.00	2.00	6.00	190.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.81	1.41	1.41	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>28</b>
7	2.50	2.50	6.00	190.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.65	1.33	1.33	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>27</b>
8	3.00	3.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>27</b>
9	1.50	1.50	7.00	189.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	2.27	1.63	1.63	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>37</b>
10	2.00	2.00	7.00	189.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.95	1.48	1.48	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>34</b>
11	2.50	2.50	7.00	189.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.76	1.38	1.38	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>32</b>
12	3.00	3.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>31</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**



**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	5.00	191.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.39	1.19	1.19	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>22</b>
2	4.00	4.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>22</b>
3	5.00	5.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>23</b>
4	6.00	6.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>23</b>
5	3.50	3.50	6.00	190.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.47	1.23	1.23	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>26</b>
6	4.00	4.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>26</b>
7	5.00	5.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>26</b>
8	6.00	6.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>27</b>
9	3.50	3.50	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>31</b>
10	4.00	4.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>30</b>
11	5.00	5.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>30</b>
12	6.00	6.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>30</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**

**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>24</b>
2	8.00	8.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>24</b>
3	9.00	9.00	5.00	191.75	0.04	25	14.83	5.51	5.69	1.30	1.20	0.80	1.15	1.08	1.08	1.00	1.00	1.00	1.98	0.99	0.50	0.50	<b>25</b>
4	10.00	10.00	5.00	191.75	0.04	25	14.83	5.51	5.69	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	<b>26</b>
5	7.00	7.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>27</b>
6	8.00	8.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>28</b>
7	9.00	9.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>28</b>
8	10.00	10.00	6.00	190.75	0.04	25	14.83	5.51	5.69	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	<b>29</b>
9	7.00	7.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>31</b>
10	8.00	8.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>31</b>
11	9.00	9.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>32</b>
12	10.00	10.00	7.00	189.75	0.04	25	14.83	5.51	5.69	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	<b>32</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.57	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>9</b>
2	2.00	2.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.42	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>8</b>
3	2.50	2.50	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.34	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>8</b>
4	3.00	3.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.28	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
5	3.50	3.50	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.24	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
6	4.00	4.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.21	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
7	5.00	5.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
8	6.00	6.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.14	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
9	7.00	7.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.12	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
10	8.00	8.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.11	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
11	9.00	9.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.09	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>
12	10.00	10.00	4.00	192.75	0.25	5	5.99	0.35	0.27	1.30	1.20	0.80	1.08	1.00	1.00	1.00	1.00	1.00	1.70	0.85	0.50	0.50	<b>7</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 196.75m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 'A'.1 (For BH-107)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL202.5m m	R.L. of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	Sc	S <sub>q</sub>	S <sub>γ</sub>	dc	dq	d <sub>γ</sub>	ic	iq	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.00	1.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.30	1.15	1.15	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>15</b>
2	2.00	2.00	1.00	201.50	0.06	31	23.09	11.87	14.58	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	<b>17</b>
3	3.00	3.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>19</b>
4	4.00	4.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>21</b>
5	1.00	1.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.44	1.22	1.22	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>20</b>
6	2.00	2.00	1.50	201.00	0.06	31	23.09	11.87	14.58	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	<b>21</b>
7	3.00	3.00	1.50	201.00	0.06	31	23.09	11.87	14.58	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	<b>22</b>
8	4.00	4.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.11	1.06	1.06	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>24</b>
9	1.00	1.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.59	1.30	1.30	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>25</b>
10	2.00	2.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.30	1.15	1.15	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>25</b>
11	3.00	3.00	2.00	200.50	0.06	31	23.09	11.87	14.58	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	<b>26</b>
12	4.00	4.00	2.00	200.50	0.06	31	23.09	11.87	14.58	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	<b>28</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-107)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL202.5m m	R.L. of Foundation m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	6.00	6.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>25</b>
2	7.00	7.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>28</b>
3	8.00	8.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.04	1.02	1.02	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>30</b>
4	9.00	9.00	1.00	201.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.03	1.02	1.02	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>32</b>
5	6.00	6.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>29</b>
6	7.00	7.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>31</b>
7	8.00	8.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.06	1.03	1.03	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>33</b>
8	9.00	9.00	1.50	201.00	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.05	1.02	1.02	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>35</b>
9	6.00	6.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.10	1.05	1.05	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>32</b>
10	7.00	7.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.08	1.04	1.04	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>34</b>
11	8.00	8.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.07	1.04	1.04	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>36</b>
12	9.00	9.00	2.00	200.50	0.06	31	23.09	11.87	14.58	1.30	1.20	0.80	1.07	1.03	1.03	1.00	1.00	1.00	2.00	1.00	0.50	0.50	<b>39</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 202.5m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 4.1 (For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
2	2.00	2.00	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
3	2.50	2.50	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
4	3.00	3.00	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
5	1.50	1.50	2.00	193.68	0.44	0	5.14	0.00	0.00	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	<b>10</b>
6	2.00	2.00	2.00	193.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>9</b>
7	2.50	2.50	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
8	3.00	3.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
9	1.50	1.50	3.00	192.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.40	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>11</b>
10	2.00	2.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>10</b>
11	2.50	2.50	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>10</b>
12	3.00	3.00	3.00	192.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>9</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	8
2	4.00	4.00	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	8
3	5.00	5.00	1.00	194.68	0.44	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	1.94	0.97	0.50	0.50	8
4	6.00	6.00	1.00	194.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	8
5	3.50	3.50	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	9
6	4.00	4.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	9
7	5.00	5.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	9
8	6.00	6.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	8
9	3.50	3.50	3.00	192.68	0.44	0	5.14	0.00	0.00	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	9
10	4.00	4.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	9
11	5.00	5.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	9
12	6.00	6.00	3.00	192.68	0.44	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	1.94	0.97	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 195.68m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	1.00	194.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>8</b>
2	8.00	8.00	1.00	194.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>8</b>
3	9.00	9.00	1.00	194.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>8</b>
4	10.00	10.00	1.00	194.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>8</b>
5	7.00	7.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
6	8.00	8.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
7	9.00	9.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
8	10.00	10.00	2.00	193.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
9	7.00	7.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
10	8.00	8.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
11	9.00	9.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>
12	10.00	10.00	3.00	192.68	0.44	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	1.94	0.97	0.50	0.50	<b>8</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 195.68m****3) Calculations are considering the effect of water table at FGL.**



KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	6.00	189.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.83	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>27</b>
2	2.00	2.00	6.00	189.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.62	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>24</b>
3	2.50	2.50	6.00	189.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.50	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>22</b>
4	3.00	3.00	6.00	189.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>21</b>
5	1.50	1.50	7.00	188.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.97	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>29</b>
6	2.00	2.00	7.00	188.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.72	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>26</b>
7	2.50	2.50	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>24</b>
8	3.00	3.00	7.00	188.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.48	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>22</b>
9	1.50	1.50	8.00	187.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	2.10	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>31</b>
10	2.00	2.00	8.00	187.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.83	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>27</b>
11	2.50	2.50	8.00	187.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.66	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>25</b>
12	3.00	3.00	8.00	187.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.55	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>23</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	6.00	189.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.36	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>20</b>
2	4.00	4.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>20</b>
3	5.00	5.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>19</b>
4	6.00	6.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
5	3.50	3.50	7.00	188.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>21</b>
6	4.00	4.00	7.00	188.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.36	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>21</b>
7	5.00	5.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>19</b>
8	6.00	6.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>19</b>
9	3.50	3.50	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>22</b>
10	4.00	4.00	8.00	187.68	0.73	3	5.68	0.22	0.17	1.30	1.20	0.80	1.41	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>21</b>
11	5.00	5.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>20</b>
12	6.00	6.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>19</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 195.68m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
2	8.00	8.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
3	9.00	9.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>17</b>
4	10.00	10.00	6.00	189.68	0.73	3	5.68	0.22	0.17	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	<b>17</b>
5	7.00	7.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
6	8.00	8.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
7	9.00	9.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
8	10.00	10.00	7.00	188.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
9	7.00	7.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>19</b>
10	8.00	8.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
11	9.00	9.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>
12	10.00	10.00	8.00	187.68	0.73	3	5.68	0.22	0.17	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	<b>18</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 195.68m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	4.00	191.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.53	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>12</b>
2	2.00	2.00	4.00	191.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.40	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>11</b>
3	2.50	2.50	4.00	191.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.32	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>10</b>
4	3.00	3.00	4.00	191.68	0.44	0	5.14	0.00	0.00	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	<b>10</b>
5	3.50	3.50	4.00	191.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.23	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>10</b>
6	4.00	4.00	4.00	191.68	0.44	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>9</b>
7	5.00	5.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
8	6.00	6.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
9	7.00	7.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
10	8.00	8.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
11	9.00	9.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>
12	10.00	10.00	4.00	191.68	0.44	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	1.94	0.97	0.50	0.50	<b>9</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 195.68m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-143)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	5.00	190.68	0.60	0	5.14	0.00	0.00	1.30	1.20	0.80	1.67	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>18</b>
2	2.00	2.00	5.00	190.68	0.60	0	5.14	0.00	0.00	1.30	1.20	0.80	1.50	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>16</b>
3	2.50	2.50	5.00	190.68	0.60	0	5.14	0.00	0.00	1.30	1.20	0.80	1.40	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>15</b>
4	3.00	3.00	5.00	190.68	0.60	0	5.14	0.00	0.00	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	<b>14</b>
5	3.50	3.50	5.00	190.68	0.60	0	5.14	0.00	0.00	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	<b>14</b>
6	4.00	4.00	5.00	190.68	0.60	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	1.94	0.97	0.50	0.50	<b>13</b>
7	5.00	5.00	5.00	190.68	0.60	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.94	0.97	0.50	0.50	<b>13</b>
8	6.00	6.00	5.00	190.68	0.60	0	5.14	0.00	0.00	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	<b>13</b>
9	7.00	7.00	5.00	190.68	0.60	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	1.94	0.97	0.50	0.50	<b>12</b>
10	8.00	8.00	5.00	190.68	0.60	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	1.94	0.97	0.50	0.50	<b>12</b>
11	9.00	9.00	5.00	190.68	0.60	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	1.94	0.97	0.50	0.50	<b>12</b>
12	10.00	10.00	5.00	190.68	0.60	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	1.94	0.97	0.50	0.50	<b>12</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from the RL 195.68m
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 5.1 (For BH-145)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL-197.10m  m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
2	2.00	2.00	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
3	2.50	2.50	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
4	3.00	3.00	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
5	1.50	1.50	2.00	195.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.27	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>7</b>
6	2.00	2.00	2.00	195.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>7</b>
7	2.50	2.50	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
8	3.00	3.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
9	1.50	1.50	3.00	194.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.40	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>8</b>
10	2.00	2.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>7</b>
11	2.50	2.50	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>7</b>
12	3.00	3.00	3.00	194.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.20	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>7</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-145)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL-197.10m  m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
2	4.00	4.00	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
3	5.00	5.00	1.00	196.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
4	6.00	6.00	1.00	196.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>6</b>
5	3.50	3.50	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
6	4.00	4.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
7	5.00	5.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
8	6.00	6.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
9	3.50	3.50	3.00	194.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.17	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>7</b>
10	4.00	4.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
11	5.00	5.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
12	6.00	6.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.

KCT Consultancy Services LLP, Ahmedabad

(For BH-145)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 RL-197.10m  m	R.L. of Foundation  m	Shear Parameter		Bearing Capacity Factors			Shape Factors			Depth Factors			Inclination Factors			Unit Weight		Water Table Correction		Safe Bearing Capacity  t / m <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	1.00	196.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>6</b>
2	8.00	8.00	1.00	196.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.03	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>6</b>
3	9.00	9.00	1.00	196.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>6</b>
4	10.00	10.00	1.00	196.10	0.31	0	5.14	0.00	0.00	1.30	1.20	0.80	1.02	1.00	1.00	1.00	1.00	1.00	1.96	0.98	0.50	0.50	<b>6</b>
5	7.00	7.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
6	8.00	8.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
7	9.00	9.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
8	10.00	10.00	2.00	195.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
9	7.00	7.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
10	8.00	8.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
11	9.00	9.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>
12	10.00	10.00	3.00	194.10	0.31	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	1.96	0.98	0.50	0.50	<b>6</b>

**Note :-**

- 1) The factor of safety of 2.5 is considered.
- 2) The depth of foundation is considered from RL 197.10m.
- 3) Calculations are considering the effect of water table at FGL.



KCT Consultancy Services LLP, Ahmedabad

APPENDIX - 6.1 (For BH-146)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	1.50	1.50	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>6</b>
2	2.00	2.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>6</b>
3	2.50	2.50	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>6</b>
4	3.00	3.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>7</b>
5	1.50	1.50	2.00	189.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.36	1.18	1.18	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>9</b>
6	2.00	2.00	2.00	189.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>9</b>
7	2.50	2.50	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>9</b>
8	3.00	3.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>9</b>
9	1.50	1.50	3.00	188.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.54	1.27	1.27	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>12</b>
10	2.00	2.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>12</b>
11	2.50	2.50	3.00	188.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.32	1.16	1.16	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>12</b>
12	3.00	3.00	3.00	188.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>12</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 191.93m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-146)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	3.50	3.50	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>7</b>
2	4.00	4.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>7</b>
3	5.00	5.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>8</b>
4	6.00	6.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>8</b>
5	3.50	3.50	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>9</b>
6	4.00	4.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>10</b>
7	5.00	5.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>10</b>
8	6.00	6.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>11</b>
9	3.50	3.50	3.00	188.93	0.05	24	13.04	4.28	4.17	1.30	1.20	0.80	1.23	1.11	1.11	1.00	1.00	1.00	1.97	0.99	0.50	0.50	<b>12</b>
10	4.00	4.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>12</b>
11	5.00	5.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>13</b>
12	6.00	6.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>13</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 191.93m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

(For BH-146)

**Calculation of Net Safe Bearing Capacity Based on Shear Parameters C -  $\phi$** 

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

**Project :** Proposed structure 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 <sup>2</sup>
	Length	Width			C	$\phi$	N <sub>c</sub>	N <sub>q</sub> - 1	N <sub>γ</sub>	S <sub>c</sub>	S <sub>q</sub>	S <sub>γ</sub>	d <sub>c</sub>	d <sub>q</sub>	d <sub>γ</sub>	i <sub>c</sub>	i <sub>q</sub>	i <sub>γ</sub>	γ	0.5 γ			
	m	m			Kg/cm <sup>2</sup>	degree													gm/cc		W <sub>q</sub>	W <sub>γ</sub>	
1	7.00	7.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>9</b>
2	8.00	8.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>10</b>
3	9.00	9.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>10</b>
4	10.00	10.00	1.00	190.93	0.05	24	13.04	4.28	4.17	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	<b>11</b>
5	7.00	7.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>11</b>
6	8.00	8.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>12</b>
7	9.00	9.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>13</b>
8	10.00	10.00	2.00	189.93	0.05	24	13.04	4.28	4.17	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	<b>13</b>
9	7.00	7.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>14</b>
10	8.00	8.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>14</b>
11	9.00	9.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>15</b>
12	10.00	10.00	3.00	188.93	0.05	24	13.04	4.28	4.17	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	<b>16</b>

**Note :-****1) The factor of safety of 2.5 is considered.****2) The depth of foundation is considered from the RL 191.93m****3) Calculations are considering the effect of water table at FGL.**

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 1.2 (For BH-122 )

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 structure 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 from RL 202.5m m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	201.50	1.00	1.12	0.35	140	0.80	45	71
2	1.00	201.50	2.00	1.12	0.35	140	0.80	22	36
3	1.00	201.50	3.00	1.12	0.35	140	0.80	15	24
4	1.00	201.50	4.00	1.12	0.35	140	0.80	11	18
5	1.00	201.50	6.50	1.12	0.35	140	0.80	7	11
6	1.00	201.50	7.00	1.12	0.35	140	0.80	6	10
7	1.50	201.00	1.00	1.12	0.35	140	0.80	45	71
8	1.50	201.00	2.00	1.12	0.35	140	0.80	22	36
9	1.50	201.00	3.00	1.12	0.35	140	0.80	15	24
10	1.50	201.00	4.00	1.12	0.35	140	0.80	11	18
11	1.50	201.00	6.50	1.12	0.35	140	0.80	7	11
12	1.50	201.00	7.00	1.12	0.35	140	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

(For BH-122 )

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 structure 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 from RL 202.5m m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	2.00	200.50	1.00	1.12	0.35	140	0.80	45	71
2	2.00	200.50	2.00	1.12	0.35	140	0.80	22	36
3	2.00	200.50	3.00	1.12	0.35	140	0.80	15	24
4	2.00	200.50	4.00	1.12	0.35	140	0.80	11	18
5	2.00	200.50	6.50	1.12	0.35	140	0.80	7	11
6	2.00	200.50	7.00	1.12	0.35	140	0.80	6	10
7	2.50	200.00	1.00	1.12	0.35	140	0.80	45	71
8	2.50	200.00	2.00	1.12	0.35	140	0.80	22	36
9	2.50	200.00	3.00	1.12	0.35	140	0.80	15	24
10	2.50	200.00	4.00	1.12	0.35	140	0.80	11	18
11	2.50	200.00	6.50	1.12	0.35	140	0.80	7	11
12	2.50	200.00	7.00	1.12	0.35	140	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

(For BH-122 )

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 structure 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 from RL 202.5m m	RL of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	3.00	199.50	1.00	1.12	0.35	140	0.80	45	71
2	3.00	199.50	2.00	1.12	0.35	140	0.80	22	36
3	3.00	199.50	3.00	1.12	0.35	140	0.80	15	24
4	3.00	199.50	4.00	1.12	0.35	140	0.80	11	18
5	3.00	199.50	6.50	1.12	0.35	140	0.80	7	11
6	3.00	199.50	7.00	1.12	0.35	140	0.80	6	10
7	3.50	199.00	1.00	1.12	0.35	140	0.80	45	71
8	3.50	199.00	2.00	1.12	0.35	140	0.80	22	36
9	3.50	199.00	3.00	1.12	0.35	140	0.80	15	24
10	3.50	199.00	4.00	1.12	0.35	140	0.80	11	18
11	3.50	199.00	6.50	1.12	0.35	140	0.80	7	11
12	3.50	199.00	7.00	1.12	0.35	140	0.80	6	10

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 2.2 (For BH-144 )

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

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

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth of foundation From RL 196.75m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>3</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	195.75	1.50	1.50	0.40	125	1.12	0.80	0.0250	3.00	0.70	0.80	0.80	14	23
2	1.00	195.75	2.00	2.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.85	0.80	10	17
3	1.00	195.75	2.50	2.50	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.88	0.80	8	13
4	1.00	195.75	3.00	3.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.91	0.80	7	11
5	2.00	194.75	1.50	1.50	0.40	125	1.12	0.80	0.0250	3.00	0.70	0.73	0.80	15	24
6	2.00	194.75	2.00	2.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.73	0.80	11	18
7	2.00	194.75	2.50	2.50	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.76	0.80	9	14
8	2.00	194.75	3.00	3.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.80	0.80	7	12
9	3.00	193.75	1.50	1.50	0.40	125	1.12	0.80	0.0250	3.00	0.70	0.73	0.80	15	24
10	3.00	193.75	2.00	2.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.73	0.80	11	18
11	3.00	193.75	2.50	2.50	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.73	0.80	9	14
12	3.00	193.75	3.00	3.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.73	0.80	8	12

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Project :- Proposed structure 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 of foundation From RL 196.75m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>3</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	195.75	3.50	3.50	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.92	0.80	6	9
2	1.00	195.75	4.00	4.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.93	0.80	5	8
3	1.00	195.75	5.00	5.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.95	0.80	4	7
4	1.00	195.75	6.00	6.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.96	0.80	3	6
5	2.00	194.75	3.50	3.50	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.83	0.80	6	10
6	2.00	194.75	4.00	4.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.85	0.80	5	9
7	2.00	194.75	5.00	5.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.88	0.80	4	7
8	2.00	194.75	6.00	6.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.91	0.80	4	6
9	3.00	193.75	3.50	3.50	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.75	0.80	7	11
10	3.00	193.75	4.00	4.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.77	0.80	6	9
11	3.00	193.75	5.00	5.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.82	0.80	5	7
12	3.00	193.75	6.00	6.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.85	0.80	4	6



KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Project :- Proposed structure 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 of foundation From RL 196.75m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>3</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	195.75	7.00	7.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.97	0.80	3	5
2	1.00	195.75	8.00	8.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.97	0.80	3	4
3	1.00	195.75	9.00	9.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.97	0.80	2	4
4	1.00	195.75	10.00	10.00	0.40	125	1.12	0.80	0.0250	6.00	0.70	0.98	0.80	2	4
5	2.00	194.75	7.00	7.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.92	0.80	3	5
6	2.00	194.75	8.00	8.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.93	0.80	3	5
7	2.00	194.75	9.00	9.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.94	0.80	3	4
8	2.00	194.75	10.00	10.00	0.40	125	1.12	0.80	0.0250	5.00	0.70	0.95	0.80	2	4
9	3.00	193.75	7.00	7.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.87	0.80	3	6
10	3.00	193.75	8.00	8.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.89	0.80	3	5
11	3.00	193.75	9.00	9.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.91	0.80	3	5
12	3.00	193.75	10.00	10.00	0.40	125	1.12	0.80	0.0250	4.00	0.70	0.92	0.80	3	4

**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****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 structure 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 $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	5.00	191.75	1.50	1.12	0.35	413	0.80	87	140
2	5.00	191.75	2.00	1.12	0.35	413	0.80	66	105
3	5.00	191.75	2.50	1.12	0.35	413	0.80	52	84
4	5.00	191.75	3.00	1.12	0.35	413	0.80	44	70
5	6.00	190.75	1.50	1.12	0.35	413	0.80	87	140
6	6.00	190.75	2.00	1.12	0.35	413	0.80	66	105
7	6.00	190.75	2.50	1.12	0.35	413	0.80	52	84
8	6.00	190.75	3.00	1.12	0.35	413	0.80	44	70
9	7.00	189.75	1.50	1.12	0.35	413	0.80	87	140
10	7.00	189.75	2.00	1.12	0.35	413	0.80	66	105
11	7.00	189.75	2.50	1.12	0.35	413	0.80	52	84
12	7.00	189.75	3.00	1.12	0.35	413	0.80	44	70

**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****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 structure 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 $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	5.00	191.75	3.50	1.12	0.35	413	0.80	37	60
2	5.00	191.75	4.00	1.12	0.35	413	0.80	33	52
3	5.00	191.75	5.00	1.12	0.35	413	0.80	26	42
4	5.00	191.75	6.00	1.12	0.35	413	0.80	22	35
5	6.00	190.75	3.50	1.12	0.35	413	0.80	37	60
6	6.00	190.75	4.00	1.12	0.35	413	0.80	33	52
7	6.00	190.75	5.00	1.12	0.35	413	0.80	26	42
8	6.00	190.75	6.00	1.12	0.35	413	0.80	22	35
9	7.00	189.75	3.50	1.12	0.35	413	0.80	37	60
10	7.00	189.75	4.00	1.12	0.35	413	0.80	33	52
11	7.00	189.75	5.00	1.12	0.35	413	0.80	26	42
12	7.00	189.75	6.00	1.12	0.35	413	0.80	22	35

**KCT Consultancy Services LLP, Ahmedabad****(For BH-144 )****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 structure 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 $\mu$	Modulus of Elasticity of Soil E  Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure	
								For 25 mm Settlement  T / m <sup>2</sup>	For 40 mm Settlement  T / m <sup>2</sup>
1	5.00	191.75	7.00	1.12	0.35	413	0.80	19	30
2	5.00	191.75	8.00	1.12	0.35	413	0.80	16	26
3	5.00	191.75	9.00	1.12	0.35	413	0.80	15	23
4	5.00	191.75	10.00	1.12	0.35	413	0.80	13	21
5	6.00	190.75	7.00	1.12	0.35	413	0.80	19	30
6	6.00	190.75	8.00	1.12	0.35	413	0.80	16	26
7	6.00	190.75	9.00	1.12	0.35	413	0.80	15	23
8	6.00	190.75	10.00	1.12	0.35	413	0.80	13	21
9	7.00	189.75	7.00	1.12	0.35	413	0.80	19	30
10	7.00	189.75	8.00	1.12	0.35	413	0.80	16	26
11	7.00	189.75	9.00	1.12	0.35	413	0.80	15	23
12	7.00	189.75	10.00	1.12	0.35	413	0.80	13	21

KCT Consultancy Services LLP, Ahmedabad

(For BH-144 )

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

Project :- Proposed structure 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 of foundation From RL 196.75m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>3</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	4.00	192.75	1.50	1.50	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	14	23
2	4.00	192.75	2.00	2.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	11	17
3	4.00	192.75	2.50	2.50	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	9	14
4	4.00	192.75	3.00	3.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	8	12
5	4.00	192.75	3.50	3.50	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	7	11
6	4.00	192.75	4.00	4.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.73	0.80	6	10
7	4.00	192.75	5.00	5.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.76	0.80	5	8
8	4.00	192.75	6.00	6.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.80	0.80	5	7
9	4.00	192.75	7.00	7.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.83	0.80	4	6
10	4.00	192.75	8.00	8.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.85	0.80	4	6
11	4.00	192.75	9.00	9.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.87	0.80	3	5
12	4.00	192.75	10.00	10.00	0.40	200	1.12	0.80	0.0385	3.00	0.70	0.88	0.80	3	5

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 'A' (For BH-107 )

Calculation of Safe Bearing Pressure for Settlement of 25 and mm

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

**Project:- Proposed structure 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 From RL- 202.5m m	R.L. of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m <sup>2</sup>
1	1.00	201.50	6.00	1.12	0.35	319	0.80	17
2	1.00	201.50	7.00	1.12	0.35	319	0.80	14
3	1.00	201.50	8.00	1.12	0.35	319	0.80	13
4	1.00	201.50	9.00	1.12	0.35	319	0.80	11
5	1.50	201.00	6.00	1.12	0.35	319	0.80	17
6	1.50	201.00	7.00	1.12	0.35	319	0.80	14
7	1.50	201.00	8.00	1.12	0.35	319	0.80	13
8	1.50	201.00	9.00	1.12	0.35	319	0.80	11
9	2.00	200.50	6.00	1.12	0.35	319	0.80	17
10	2.00	200.50	7.00	1.12	0.35	319	0.80	14
11	2.00	200.50	8.00	1.12	0.35	319	0.80	13
12	2.00	200.50	9.00	1.12	0.35	319	0.80	11

KCT Consultancy Services LLP, Ahmedabad

.....(For BH-107 )

Calculation of Safe Bearing Pressure for Settlement of 25a a

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

**Project:- Proposed structure 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 From RL- 202.5m m	R.L. of Foundation m	Width of Foundation B m	Shape & Rigid factor Cd	Poisson's Ratio $\mu$	Modulus of Elasticity of Soil E Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement T / m <sup>2</sup>
1	1.00	201.50	1.00	1.12	0.35	319	0.80	101
2	1.00	201.50	2.00	1.12	0.35	319	0.80	51
3	1.00	201.50	3.00	1.12	0.35	319	0.80	34
4	1.00	201.50	4.00	1.12	0.35	319	0.80	25
5	1.50	201.00	1.00	1.12	0.35	319	0.80	101
6	1.50	201.00	2.00	1.12	0.35	319	0.80	51
7	1.50	201.00	3.00	1.12	0.35	319	0.80	34
8	1.50	201.00	4.00	1.12	0.35	319	0.80	25
9	2.00	200.50	1.00	1.12	0.35	319	0.80	101
10	2.00	200.50	2.00	1.12	0.35	319	0.80	51
11	2.00	200.50	3.00	1.12	0.35	319	0.80	34
12	2.00	200.50	4.00	1.12	0.35	319	0.80	25

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 4.2 (For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	194.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.80	0.80	49	78
2	1.00	194.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.85	0.80	35	56
3	1.00	194.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.88	0.80	27	44
4	1.00	194.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.91	0.80	22	36
5	2.00	193.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.73	0.80	51	82
6	2.00	193.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
7	2.00	193.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.76	0.80	30	48
8	2.00	193.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.80	0.80	24	39
9	3.00	192.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.73	0.80	51	82
10	3.00	192.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
11	3.00	192.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
12	3.00	192.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	26	41



KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	194.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.92	0.80	19	30
2	1.00	194.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.93	0.80	16	26
3	1.00	194.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.95	0.80	13	21
4	1.00	194.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	12.00	0.70	0.96	0.80	11	17
5	2.00	193.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.83	0.80	20	33
6	2.00	193.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.85	0.80	17	28
7	2.00	193.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.88	0.80	14	22
8	2.00	193.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	11.00	0.70	0.91	0.80	11	18
9	3.00	192.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.75	0.80	22	35
10	3.00	192.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.77	0.80	19	30
11	3.00	192.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.82	0.80	14	23
12	3.00	192.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.85	0.80	12	19

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	1.00	194.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	12.00	0.70	0.97	0.80	9	15
2	1.00	194.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	12.00	0.70	0.97	0.80	8	13
3	1.00	194.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	12.00	0.70	0.97	0.80	7	12
4	1.00	194.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	12.00	0.70	0.98	0.80	7	11
5	2.00	193.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	11.00	0.70	0.92	0.80	10	15
6	2.00	193.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	11.00	0.70	0.93	0.80	8	13
7	2.00	193.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	11.00	0.70	0.94	0.80	8	12
8	2.00	193.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	11.00	0.70	0.95	0.80	7	11
9	3.00	192.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.87	0.80	10	16
10	3.00	192.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.89	0.80	9	14
11	3.00	192.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.91	0.80	8	13
12	3.00	192.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	10.00	0.70	0.92	0.80	7	12

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	6.00	189.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.71	0.80	52	84
2	6.00	189.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
3	6.00	189.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
4	6.00	189.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	26	41
5	7.00	188.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.69	0.80	53	85
6	7.00	188.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
7	7.00	188.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
8	7.00	188.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	26	41
9	8.00	187.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.68	0.80	54	86
10	8.00	187.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
11	8.00	187.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
12	8.00	187.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	26	41

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	6.00	189.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	22	35
2	6.00	189.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	19	31
3	6.00	189.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	16	25
4	6.00	189.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	13	22
5	7.00	188.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	22	35
6	7.00	188.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	20	31
7	7.00	188.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	16	26
8	7.00	188.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	14	22
9	8.00	187.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	22	36
10	8.00	187.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	20	32
11	8.00	187.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	17	27
12	8.00	187.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	14	23

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

Project :- Proposed structure 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 of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	6.00	189.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.75	0.80	12	19
2	6.00	189.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.77	0.80	10	17
3	6.00	189.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.80	0.80	9	15
4	6.00	189.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.82	0.80	8	14
5	7.00	188.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	12	20
6	7.00	188.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.75	0.80	11	18
7	7.00	188.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.77	0.80	10	16
8	7.00	188.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.79	0.80	9	14
9	8.00	187.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	13	21
10	8.00	187.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	12	19
11	8.00	187.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.74	0.80	11	17
12	8.00	187.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.76	0.80	10	16

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

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

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	4.00	191.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.73	0.80	51	82
2	4.00	191.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
3	4.00	191.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
4	4.00	191.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	26	41
5	4.00	191.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	22	35
6	4.00	191.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.73	0.80	19	31
7	4.00	191.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.76	0.80	15	24
8	4.00	191.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.80	0.80	12	20
9	4.00	191.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.83	0.80	11	17
10	4.00	191.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.85	0.80	9	15
11	4.00	191.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.87	0.80	8	13
12	4.00	191.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	9.00	0.70	0.88	0.80	8	12

KCT Consultancy Services LLP, Ahmedabad

(For BH-143 )

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

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

Sr. No.	Foundation Details				Immediate Settlement				Consolidation Settlement					Safe Bearing Pressure	
	Depth of foundation From RL 195.68m m	RL of foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement T / m <sup>2</sup>	For 40 mm Settlement T / m <sup>2</sup>
1	5.00	190.68	1.50	1.50	0.40	630	1.12	0.80	0.0100	3.00	0.70	0.73	0.80	51	82
2	5.00	190.68	2.00	2.00	0.40	630	1.12	0.80	0.0100	4.00	0.70	0.73	0.80	39	62
3	5.00	190.68	2.50	2.50	0.40	630	1.12	0.80	0.0100	5.00	0.70	0.73	0.80	31	49
4	5.00	190.68	3.00	3.00	0.40	630	1.12	0.80	0.0100	6.00	0.70	0.73	0.80	26	41
5	5.00	190.68	3.50	3.50	0.40	630	1.12	0.80	0.0100	7.00	0.70	0.73	0.80	22	35
6	5.00	190.68	4.00	4.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.73	0.80	19	31
7	5.00	190.68	5.00	5.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.73	0.80	16	25
8	5.00	190.68	6.00	6.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.75	0.80	13	21
9	5.00	190.68	7.00	7.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.78	0.80	11	18
10	5.00	190.68	8.00	8.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.81	0.80	10	16
11	5.00	190.68	9.00	9.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.83	0.80	9	14
12	5.00	190.68	10.00	10.00	0.40	630	1.12	0.80	0.0100	8.00	0.70	0.85	0.80	8	13

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 5.2 (For BH-145 )

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

Project :- Proposed structure 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 of Foundation from RL-197.10m m	R.L. of Foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement  T / m <sup>3</sup>
1	1.00	196.10	1.50	1.50	0.35	250	1.12	0.80	0.0171	3.00	0.70	0.80	0.80	24
2	1.00	196.10	2.00	2.00	0.35	250	1.12	0.80	0.0171	4.00	0.70	0.85	0.80	17
3	1.00	196.10	2.50	2.50	0.35	250	1.12	0.80	0.0171	5.00	0.70	0.88	0.80	14
4	1.00	196.10	3.00	3.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.91	0.80	11
5	2.00	195.10	1.50	1.50	0.35	250	1.12	0.80	0.0171	3.00	0.70	0.73	0.80	25
6	2.00	195.10	2.00	2.00	0.35	250	1.12	0.80	0.0171	4.00	0.70	0.73	0.80	19
7	2.00	195.10	2.50	2.50	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.76	0.80	15
8	2.00	195.10	3.00	3.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.80	0.80	12
9	3.00	194.10	1.50	1.50	0.35	250	1.12	0.80	0.0171	3.00	0.70	0.73	0.80	25
10	3.00	194.10	2.00	2.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.73	0.80	19
11	3.00	194.10	2.50	2.50	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.73	0.80	15
12	3.00	194.10	3.00	3.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.73	0.80	13



KCT Consultancy Services LLP, Ahmedabad

(For BH-145 )

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

Project :- Proposed structure 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 of Foundation from RL-197.10m m	R.L. of Foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement  T / m <sup>3</sup>
1	1.00	196.10	3.50	3.50	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.92	0.80	10
2	1.00	196.10	4.00	4.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.93	0.80	8
3	1.00	196.10	5.00	5.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.95	0.80	7
4	1.00	196.10	6.00	6.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.96	0.80	6
5	2.00	195.10	3.50	3.50	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.83	0.80	10
6	2.00	195.10	4.00	4.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.85	0.80	9
7	2.00	195.10	5.00	5.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.88	0.80	7
8	2.00	195.10	6.00	6.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.91	0.80	6
9	3.00	194.10	3.50	3.50	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.75	0.80	11
10	3.00	194.10	4.00	4.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.77	0.80	10
11	3.00	194.10	5.00	5.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.82	0.80	8
12	3.00	194.10	6.00	6.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.85	0.80	7

KCT Consultancy Services LLP, Ahmedabad

(For BH-145 )

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

Project :- Proposed structure 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 of Foundation from RL-197.10m m	R.L. of Foundation m	Width B m	Length L m	Poissons ratio $\mu$	Modulus of Elasticity E kg/cm <sup>2</sup>	Factor Cd	Rigidity Factor	Coefficient of Volume Compressibility cm <sup>2</sup> /kg	Depth of Compressible Stratum H m	$\lambda$ factor related to pore pressure parameter	Depth Factor df	Rigidity Factor	For 25 mm Settlement  T / m <sup>3</sup>
1	1.00	196.10	7.00	7.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.97	0.80	5
2	1.00	196.10	8.00	8.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.97	0.80	5
3	1.00	196.10	9.00	9.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.97	0.80	4
4	1.00	196.10	10.00	10.00	0.35	250	1.12	0.80	0.0171	5.50	0.70	0.98	0.80	4
5	2.00	195.10	7.00	7.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.92	0.80	6
6	2.00	195.10	8.00	8.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.93	0.80	5
7	2.00	195.10	9.00	9.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.94	0.80	5
8	2.00	195.10	10.00	10.00	0.35	250	1.12	0.80	0.0171	4.50	0.70	0.95	0.80	4
9	3.00	194.10	7.00	7.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.87	0.80	6
10	3.00	194.10	8.00	8.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.89	0.80	6
11	3.00	194.10	9.00	9.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.91	0.80	5
12	3.00	194.10	10.00	10.00	0.35	250	1.12	0.80	0.0171	3.50	0.70	0.92	0.80	5

KCT Consultancy Services LLP, Ahmedabad

## APPENDIX - 6.2 (For BH-146 )

Calculation of Safe Bearing Pressure for Settlement of 25 and mm

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

**Project:- Proposed structure 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 $\mu$	Modulus of Elasticity of Soil E  Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement  T / m <sup>2</sup>
1	1.00	190.93	1.50	1.12	0.35	228	0.80	48
2	1.00	190.93	2.00	1.12	0.35	228	0.80	36
3	1.00	190.93	2.50	1.12	0.35	228	0.80	29
4	1.00	190.93	3.00	1.12	0.35	228	0.80	24
5	2.00	189.93	1.50	1.12	0.35	228	0.80	48
6	2.00	189.93	2.00	1.12	0.35	228	0.80	36
7	2.00	189.93	2.50	1.12	0.35	228	0.80	29
8	2.00	189.93	3.00	1.12	0.35	228	0.80	24
9	3.00	188.93	1.50	1.12	0.35	228	0.80	48
10	3.00	188.93	2.00	1.12	0.35	228	0.80	36
11	3.00	188.93	2.50	1.12	0.35	228	0.80	29
12	3.00	188.93	3.00	1.12	0.35	228	0.80	24

KCT Consultancy Services LLP, Ahmedabad

(For BH-146 )

Calculation of Safe Bearing Pressure for Settlement of 25 and mm

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

**Project:- Proposed structure 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 $\mu$	Modulus of Elasticity of Soil E  Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement  T / m <sup>2</sup>
1	1.00	190.93	3.50	1.12	0.35	228	0.80	21
2	1.00	190.93	4.00	1.12	0.35	228	0.80	18
3	1.00	190.93	5.00	1.12	0.35	228	0.80	14
4	1.00	190.93	6.00	1.12	0.35	228	0.80	12
5	2.00	189.93	3.50	1.12	0.35	228	0.80	21
6	2.00	189.93	4.00	1.12	0.35	228	0.80	18
7	2.00	189.93	5.00	1.12	0.35	228	0.80	14
8	2.00	189.93	6.00	1.12	0.35	228	0.80	12
9	3.00	188.93	3.50	1.12	0.35	228	0.80	21
10	3.00	188.93	4.00	1.12	0.35	228	0.80	18
11	3.00	188.93	5.00	1.12	0.35	228	0.80	14
12	3.00	188.93	6.00	1.12	0.35	228	0.80	12

KCT Consultancy Services LLP, Ahmedabad

(For BH-146 )

Calculation of Safe Bearing Pressure for Settlement of 25 and mm

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

**Project:- Proposed structure 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 $\mu$	Modulus of Elasticity of Soil E  Kg / cm <sup>2</sup>	Rigidity Factor	Safe Bearing Pressure
								For 25 mm Settlement  T / m <sup>2</sup>
1	1.00	190.93	7.00	1.12	0.35	228	0.80	10
2	1.00	190.93	8.00	1.12	0.35	228	0.80	9
3	1.00	190.93	9.00	1.12	0.35	228	0.80	8
4	1.00	190.93	10.00	1.12	0.35	228	0.80	7
5	2.00	189.93	7.00	1.12	0.35	228	0.80	10
6	2.00	189.93	8.00	1.12	0.35	228	0.80	9
7	2.00	189.93	9.00	1.12	0.35	228	0.80	8
8	2.00	189.93	10.00	1.12	0.35	228	0.80	7
9	3.00	188.93	7.00	1.12	0.35	228	0.80	10
10	3.00	188.93	8.00	1.12	0.35	228	0.80	9
11	3.00	188.93	9.00	1.12	0.35	228	0.80	8
12	3.00	188.93	10.00	1.12	0.35	228	0.80	7

## Appendix-9

### 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-122**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from FGL,  $D_f = 1.00$  m (201.50 R.L.)

Width of foundation considered,  $B_f = 1.00$  m

Length of foundation considered,  $L_f = 1.00$  m

Bulk Density  $\gamma_b = 1.81$  gm/cm<sup>3</sup>

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/ : )

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

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

**Shear Parameters**,  $c = 0.10$  kg/cm<sup>2</sup>,  $\phi = 28^\circ$ ,  $e = 0.74$

**Bearing Capacity Factors:**

$N_c = 17.90$ ,  $N_q = 8.75$ , i.e.  $N_q - 1 = 7.75$ ,  $N_\gamma = 8.63$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.28$ ,  $d_q = d_\gamma = 1.14$

(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)

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

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

$\alpha$  = 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 ultimate bearing capacity from shear criteria,

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

$$\begin{aligned}
 q_u &= \left[ \left( \frac{2}{3} \right) * (0.10 * 10) * 17.90 * 1.28 * 1.30 * 1.00 + 1.81 * (1.00)(8.75 - 1.00) \right. \\
 &\quad * 1.20 * 1.14 * 1.00 * 0.50 + 0.5 * 1.81 * 1.00 * 8.63 * 0.80 * 1.14 \\
 &\quad \left. * 1.00 * 0.50 \right] \\
 &= \mathbf{33.01 \text{ T / m}^2}
 \end{aligned}$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 13.20 \text{ T / m}^2$$

$$q_{\text{net safe}} = \mathbf{13.00 \text{ T / m}^2} = \mathbf{130.00 \text{ kN/m}^2}$$

## **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-122**

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

**Where,**

**S = Settlement of 40mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor C<sub>d</sub>**

**E = Modulus of Elasticity (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/; )**

**μ = Poisson's Ratio (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/32)**

**B, L = Width & Length of Foundation respectively**

**R<sub>f</sub> = Rigidity Factor**

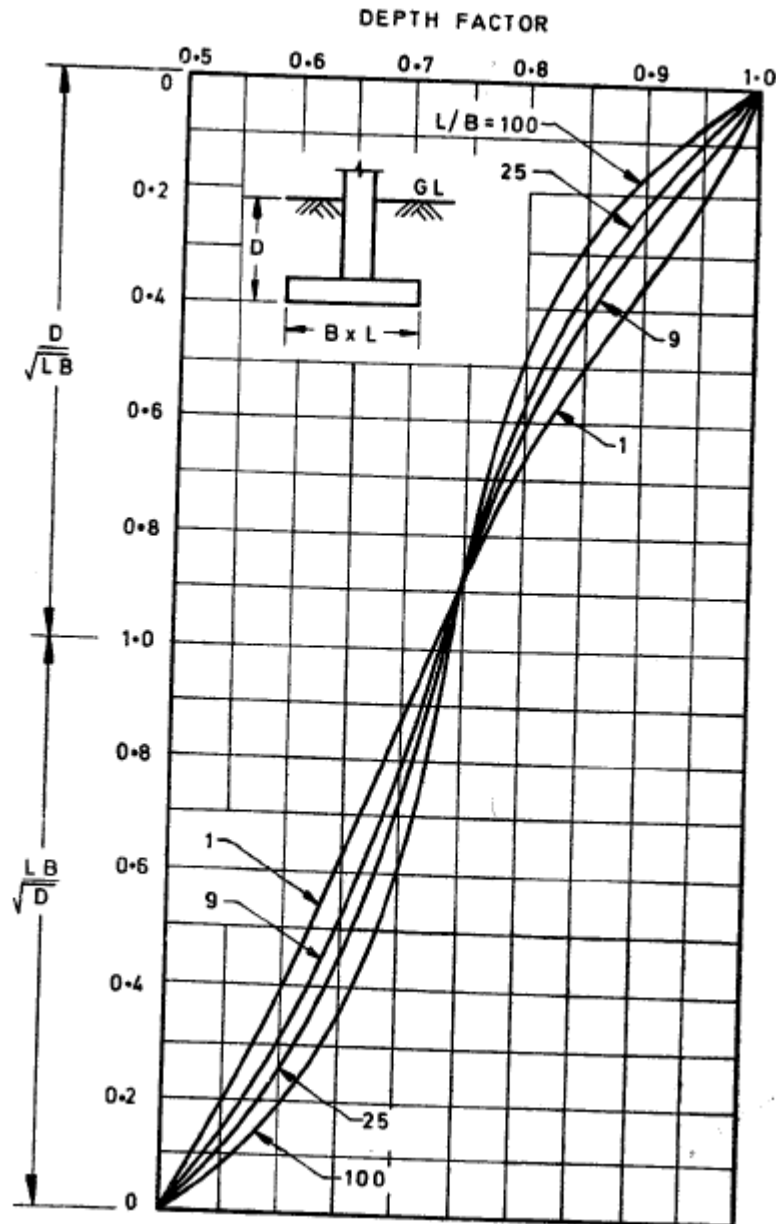
**D<sub>f</sub> = Depth factor**

**Code of Reference – IS 8009 P-1**

**For Isolated Foundations:**

- Safe Bearing Pressure for 40mm Settlement.
- Depth of foundation considered from FGL, D<sub>f</sub> = 1.00 m (201.50 R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.00 m
- Length of foundation, considered, L<sub>f</sub> = 1.00 m
- Poisson's ratio, μ = 0.35 (Ref : Foundation Analysis and Design by JE Bowles)
- Modulus of Elasticity, E = 140 kg/cm<sup>2</sup>  
For, SC soils, E = 320(N+15) = 320(29+15) = 14080 kPa
- Rigidity Factor = 0.80  
**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,

$$\text{Net S.B.P} = 25 / (((100 * 1.12 * 1.00 * (1 - 0.35^2) * 0.80) / 140.0))$$

$$= 44.52 \text{ T/m}^2$$

$$= 45.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate Settlement is  $45.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 13.00 \text{ T/m}^2 \text{ \& } 45.00 \text{ T/m}^2$$

$$= 13.00 \text{ T/m}^2 = 130.00 \text{ kN/m}^2.$$

## 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-144**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from EGL,  $D_f = 1.00$  m (195.75 R.L.)

Width of foundation considered,  $B_f = 1.50$  m

Length of foundation considered,  $L_f = 1.50$  m

Bulk Density  $\gamma_b = 1.70$  gm/cm<sup>3</sup>

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

Factor of Safety = 2.50

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

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

**Shear Parameters**,  $c = 0.20$  kg/cm<sup>2</sup>,  $\phi = 0^\circ$ ,  $e = 0.80$

**Bearing Capacity Factors:**

$N_c = 5.14$ ,  $N_q = 0.00$ , i.e.  $N_q - 1 = 0.00$ ,  $N_\gamma = 0.00$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.13$ ,  $d_q = d_\gamma = 1.00$

(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)

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

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

$\alpha$  = inclination of load to vertical in degrees = 0

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

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

(IS 6403, CL-5.1.2.4)

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

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

$$q_u = \left[ \left( \frac{2}{3} \right) * (0.20 * 10) * 5.14 * 1.30 * 1.13 * 1.00 \right]$$

$$= 10.07 \text{ T / m}^2$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 4.03 \text{ T / m}^2$$

$$q_{\text{net safe}} = 4.00 \text{ T / m}^2 = 40.00 \text{ kN/m}^2$$

## **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-144**

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

**Where,**

**S = Settlement of 40mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor C<sub>d</sub>**

**E = Modulus of Elasticity**

**m<sub>v</sub> = Co-efficient of Volume Compressibility**

**μ = Poisson's Ratio**

**B, L = Width & Length of Foundation respectively**

**R<sub>f</sub> = Rigidity Factor**

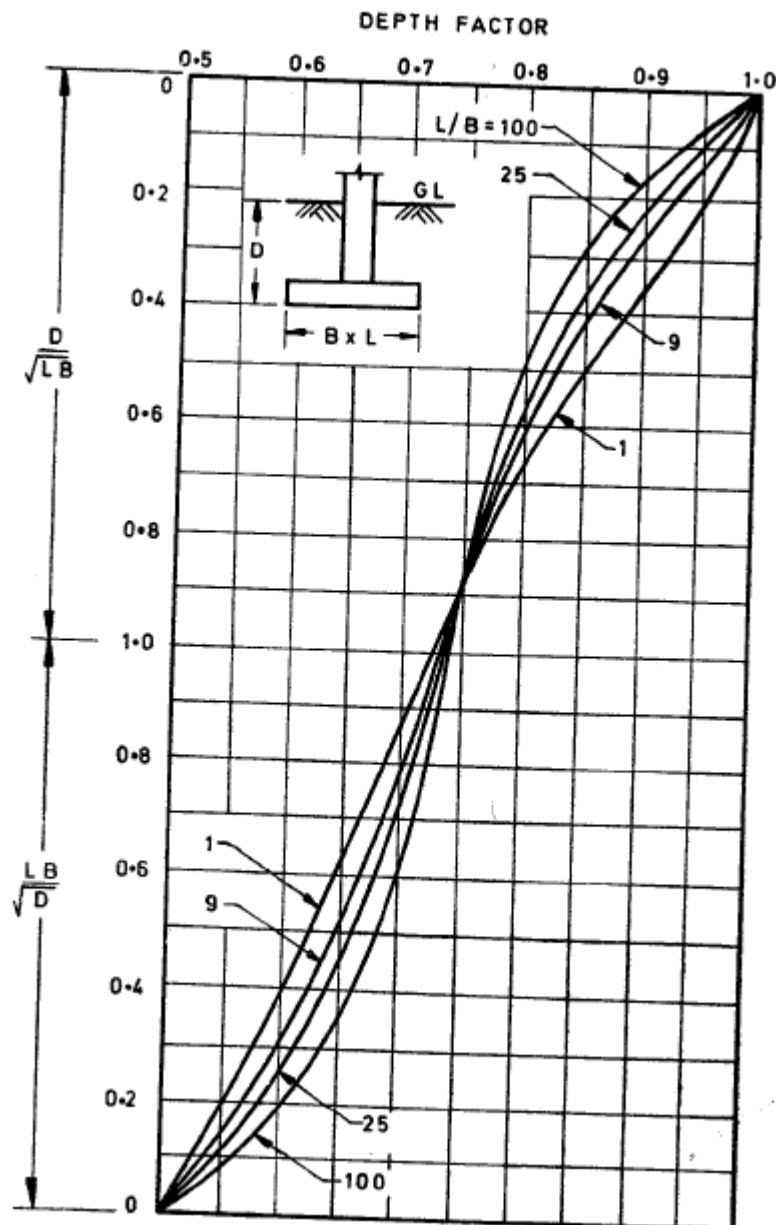
**D<sub>f</sub> = Depth factor**

**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<sub>f</sub> = 1.00 m (195.75m R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.50 m
- Length of foundation, considered, L<sub>f</sub> = 1.50 m
- Poisson's ratio, μ = 0.40 (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/33)
- Co-efficient of Volume Compressibility = 0.0250 cm<sup>2</sup>/kg,
- Modulus of Elasticity, E = 500\*Cu = 500\*0.25 = 125kg/cm<sup>2</sup>  
(Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/; )
- Depth of Compressible Stratum, H = 3.0 m
- Rigidity Factor = 0.80
- Dispersion 1:2 – Factor = ((H/2)+B)<sup>2</sup>/ B<sup>2</sup> = ((3.00/2)+1.50)<sup>2</sup>/1.50<sup>2</sup> = 4.0, (Utilized in calculations)
- Factor Related to Pore Pressure, λ = 0.7      **Ref: - Table – 1, IS 8009, P-1**
- Depth Correction Factor = 0.80      **Ref: - From Fig-12, IS 8009, P-1**  
**L/B = 1.00, D/(sqrt (L\*B)) = (1.00/sqrt(1.50\*1.50)) = 0.67**



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

$$\text{Net S.B.P} = 40 / (((100 * 1.12 * 1.50 * (1 - 0.40^2) * 0.80) / 125.0) + (100 * 0.025 * 3.00 * 0.7 * 0.80 * 0.80 / 4.0))$$

$$= 22.95 \text{ T/m}^2$$

$$= 23.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate and Consolidation Settlement is  $23.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 23.00 \text{ T/m}^2 \text{ \& } 4.00 \text{ T/m}^2$$

$$= 4.00 \text{ T/m}^2 = 40.00 \text{ kN/m}^2.$$

## 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-144 (Depth: 5.00 to 7.00m)**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from EGL,  $D_f = 5.00$  m (191.75 R.L.)

Width of foundation considered,  $B_f = 1.50$  m

Length of foundation considered,  $L_f = 1.50$  m

Bulk Density  $\gamma_b = 1.98$  gm/cm<sup>3</sup>

Water Table at depth = Considered at E.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)

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

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

**Shear Parameters**,  $c = 0.04$  kg/cm<sup>2</sup>,  $\phi = 25^\circ$ ,  $e = 0.69$

**Bearing Capacity Factors:**

$N_c = 14.83$ ,  $N_q = 6.51$ , i.e.  $N_q - 1 = 5.51$ ,  $N_\gamma = 5.69$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.91$ ,  $d_q = d_\gamma = 1.45$

(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)

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

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

$\alpha$  = inclination of load to vertical in degrees = 0

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

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

(IS 6403, CL-5.1.2.4)

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

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

$$\begin{aligned} q_u &= \left[ \left( \frac{2}{3} \right) * (0.04 * 10) * 14.83 * 1.30 * 1.91 * 1.00 + 1.98 * (5.00)(6.51 - 1.00) \right. \\ &\quad * 1.20 * 1.45 * 1.00 * 0.50 + 0.5 * 1.98 * 1.50 * 5.69 * 0.80 * 1.45 \\ &\quad \left. * 1.00 * 0.50 \right] \\ &= 62.18 \text{ T / m}^2 \end{aligned}$$

$$\mathbf{q_{net\ safe} = q_u / FS \text{ (i.e.2.5)} = 24.87 \text{ T /m}^2}$$
$$\mathbf{q_{net\ safe} = 25.00 \text{ T /m}^2 = 250.00 \text{ kN/m}^2}$$

## **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-144 Depth: 5.0 to 7.0m**

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

**Where,**

**S = Settlement of 40mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor Cd**

**E = Modulus of Elasticity (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-; )**

**μ = Poisson's Ratio (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-32)**

**B, L = Width & Length of Foundation respectively**

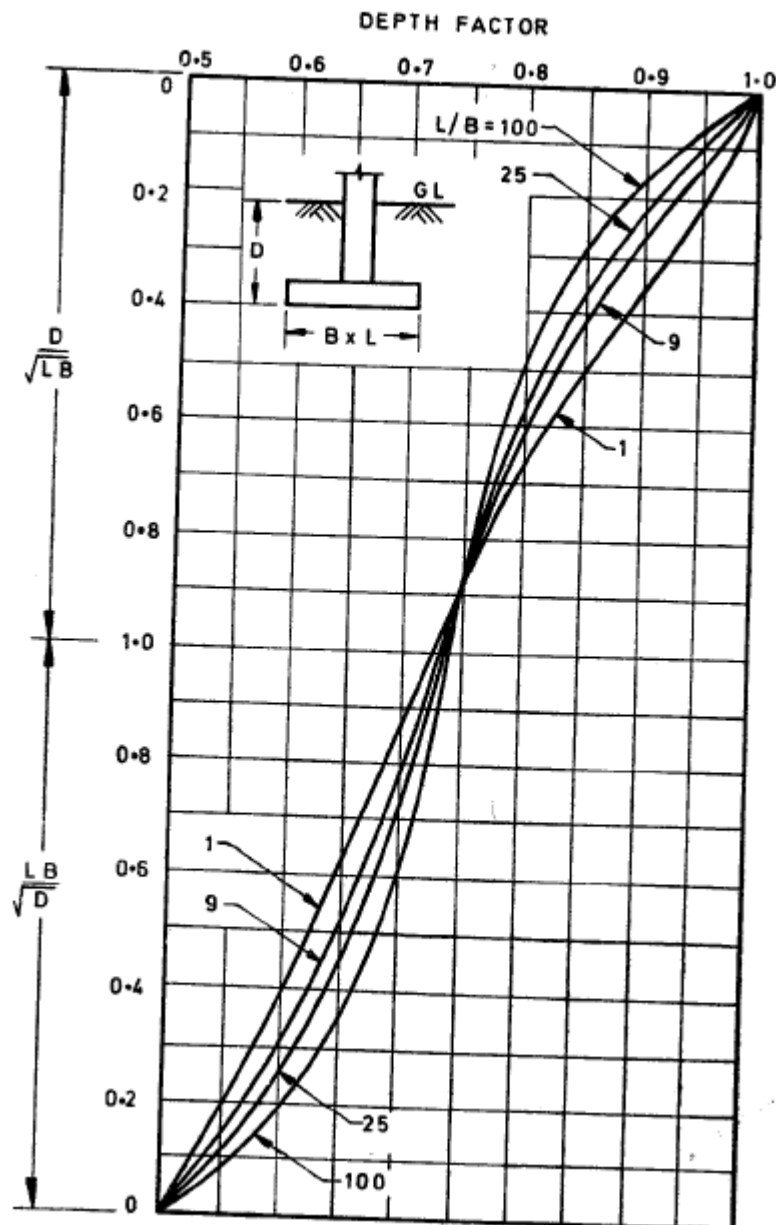
**R<sub>f</sub> = Rigidity Factor**

**D<sub>f</sub> = Depth factor**

**Code of Reference – IS 8009 P-1**

**For Isolated Foundations:**

- Safe Bearing Pressure for 40mm Settlement.
- Depth of foundation considered from FGL, D<sub>f</sub> = 5.00 m (191.75 R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.50 m
- Length of foundation, considered, L<sub>f</sub> = 1.50 m
- Poisson's ratio, μ = 0.35 (Ref : Foundation Analysis and Design by JE Bowles)
- Modulus of Elasticity, E = 413 kg/cm<sup>2</sup>  
For, Over consolidated sandy soils, E = 18000 + (N\*750)  
N = (12 + (100/2))/2 = 31  
i.e. E = 18000 + (750\*31) = 41250 kPa = 413 kg/cm<sup>2</sup>
- Rigidity Factor = 0.80  
L/B = 1.00, D/(sqrt(L\*B)) = (5.00/sqrt(1.50\*1.50)) = 3.33



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

$$\text{Net S.B.P} = 40 / (((100 * 1.12 * 1.50 * (1 - 0.35^2) * 0.80) / 413.0))$$

$$= 140.08 \text{ T/m}^2$$

$$= 140.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate Settlement is  $140.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 25.00 \text{ T/m}^2 \text{ \& } 140.00 \text{ T/m}^2$$

$$= 25.00 \text{ T/m}^2 = 250.00 \text{ kN/m}^2.$$



## **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-107**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from FGL,  $D_f = 1.00$  m (201.50 R.L.)

Width of foundation considered,  $B_f = 1.00$  m

Length of foundation considered,  $L_f = 1.00$  m

Bulk Density  $\gamma_b = 2.00$  gm/cm<sup>3</sup>

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)

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

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

**Shear Parameters**,  $c = 0.06$  kg/cm<sup>2</sup>,  $\phi = 31^\circ$ ,  $e = 0.67$

**Bearing Capacity Factors:**

For general shear failure & for  $\phi = 31^\circ$

$N_c = 32.67$ ,  $N_q = 20.63$ ,  $N_\gamma = 25.99$

For Local shear failure & for  $\phi' = 21.83^\circ$

$N_c = 16.69$ ,  $N_q = 7.69$ ,  $N_\gamma = 6.96$

For void ratio = 0.67 and considering Mixed shear failure following are the bearing capacity factors by interpolation between general and local shear failure,

$N_c = 23.09$ ,  $N_q = 12.87$ ,  $N_\gamma = 14.58$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.30$ ,  $d_q = d_\gamma = 1.15$

(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)

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

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

$\alpha$  = 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 ultimate bearing capacity from shear criteria,

$$\begin{aligned}
 q_u &= \left[ \left( \frac{2}{3} \right) * c N_c d_c S_c i_c + \gamma d (N_q - 1) S_q d_q i_q W_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma W_\gamma \right] \\
 q_u &= \left[ \left( \frac{2}{3} \right) * (0.06 * 10) * 23.09 * 1.30 * 1.30 * 1.00 + 2.00 * (1.00)(12.87 - 1.00) \right. \\
 &\quad * 1.20 * 1.15 * 1.00 * 0.50 + 0.5 * 2.00 * 1.00 * 14.58 * 0.80 * 1.15 \\
 &\quad \left. * 1.00 * 0.50 \right] \\
 &= \mathbf{38.70 \text{ T / m}^2}
 \end{aligned}$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e.2.5)} = 15.48 \text{ T / m}^2$$

$$q_{\text{net safe}} = \mathbf{15.00 \text{ T / m}^2} = \mathbf{150.00 \text{ kN/m}^2}$$

## **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-107**

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

**Where,**

**S = Settlement of 25mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor Cd**

**E = Modulus of Elasticity (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-; )**

**μ = Poisson's Ratio (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-32)**

**B, L = Width & Length of Foundation respectively**

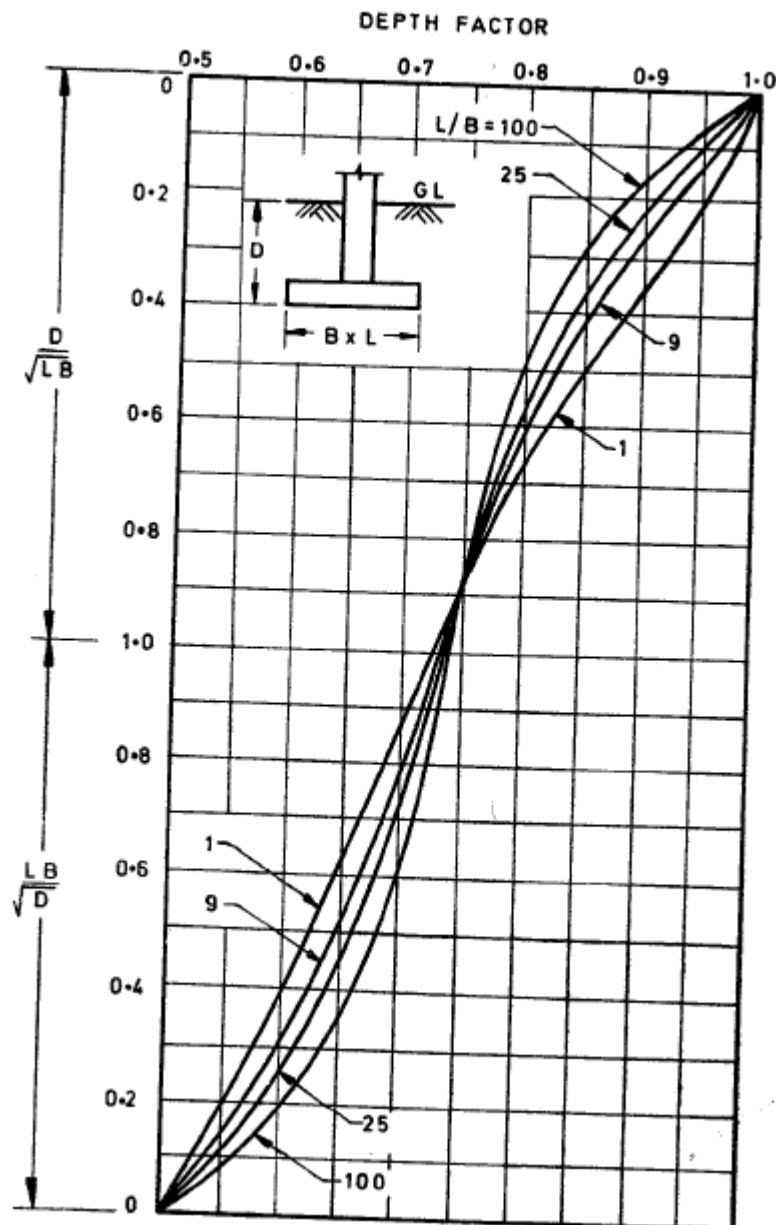
**R<sub>f</sub> = Rigidity Factor**

**D<sub>f</sub> = Depth factor**

**Code of Reference – IS 8009 P-1**

**For Isolated Foundations:**

- Safe Bearing Pressure for 40mm Settlement.
- Depth of foundation considered from FGL, D<sub>f</sub> = 1.00 m (201.50 R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.00 m
- Length of foundation, considered, L<sub>f</sub> = 1.00 m
- Poisson's ratio, μ = 0.35 (Ref : Foundation Analysis and Design by JE Bowles)
- Modulus of Elasticity, E = 319 kg/cm<sup>2</sup>  
 For, SC soils, E = 320(N+15) = 320(13+15) = 8960 kPa  
 For, Over consolidated sandy soils, E = 18000 + (N\*750) = 18000 + (750\*49) = 54750 kPa  
 Average = (54750 + 8960) / 2 = 31855 kPa = 318.55 kg/cm<sup>2</sup>
- Rigidity Factor = 0.80  
**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,

$$\text{Net S.B.P} = 25 / (((100 * 1.12 * 1.00 * (1 - 0.35^2) * 0.80) / 319.0))$$

$$= 101.43 \text{ T/m}^2$$

$$= 101.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate Settlement is  $101.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 15.00 \text{ T/m}^2 \text{ \& } 101.00 \text{ T/m}^2$$

$$= 15.00 \text{ T/m}^2 = 150.00 \text{ kN/m}^2.$$

## 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-143**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from EGL,  $D_f = 1.00$  m (194.68 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/cm<sup>3</sup>

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

Factor of Safety = 2.50

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

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

**Shear Parameters**,  $c = 0.44$  kg/cm<sup>2</sup>,  $\phi = 0^\circ$ ,  $e = 0.71$

**Bearing Capacity Factors:**

$N_c = 5.14$ ,  $N_q = 0.00$ , i.e.  $N_q - 1 = 0.00$ ,  $N_\gamma = 0.00$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.13$ ,  $d_q = d_\gamma = 1.00$

(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)

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

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

$\alpha$  = inclination of load to vertical in degrees = 0

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

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

(IS 6403, CL-5.1.2.4)

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

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

$$q_u = \left[ \left( \frac{2}{3} \right) * (0.44 * 10) * 5.14 * 1.30 * 1.13 * 1.00 \right]$$

$$= 22.15 \text{ T / m}^2$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 8.86 \text{ T / m}^2$$

$$q_{\text{net safe}} = 9.00 \text{ T / m}^2 = 90.00 \text{ kN/m}^2$$

## **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-143**

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

**Where,**

**S = Settlement of 40mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor C<sub>d</sub>**

**E = Modulus of Elasticity**

**m<sub>v</sub> = Co-efficient of Volume Compressibility**

**μ = Poisson's Ratio**

**B, L = Width & Length of Foundation respectively**

**R<sub>f</sub> = Rigidity Factor**

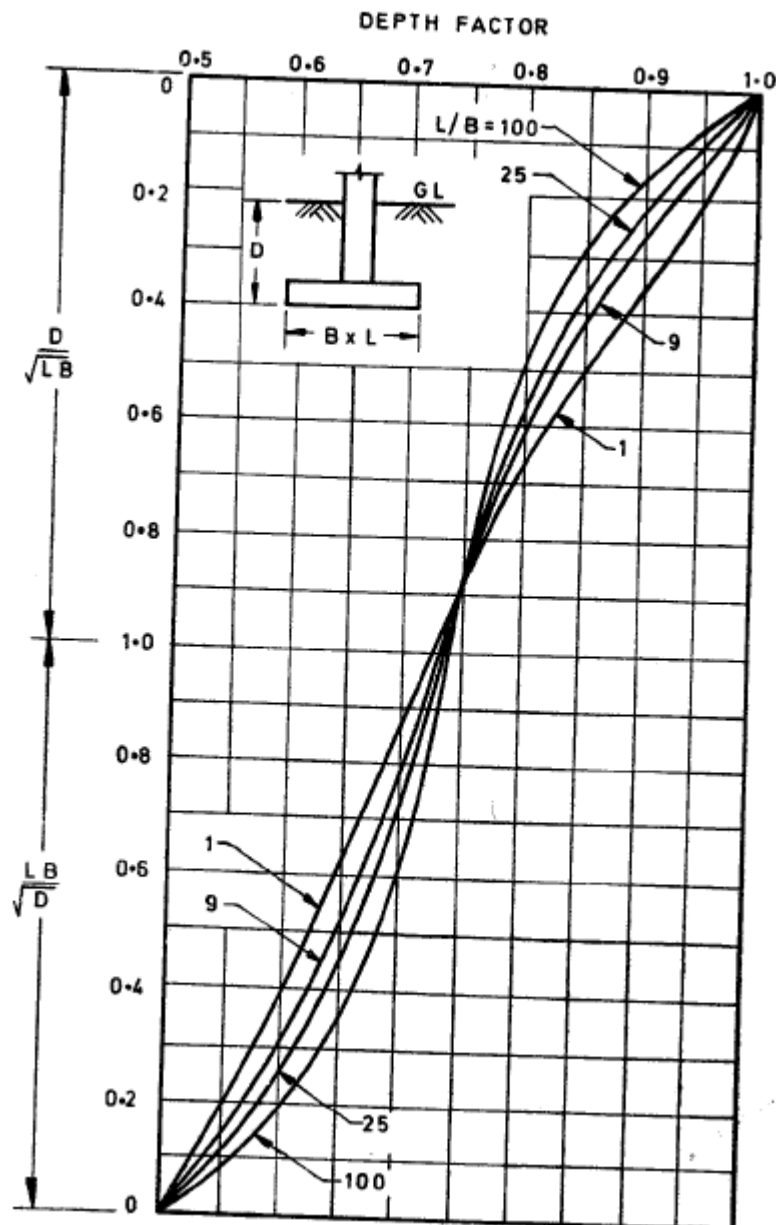
**D<sub>f</sub> = Depth factor**

**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<sub>f</sub> = 1.00 m (194.68m R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.50 m
- Length of foundation, considered, L<sub>f</sub> = 1.50 m
- Poisson's ratio, μ = 0.40 (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/32)
- Co-efficient of Volume Compressibility = 0.0100 cm<sup>2</sup>/kg,
- Modulus of Elasticity,  
For clayey soils, E = 750\*Cu = 750\*0.44 = 330kg/cm<sup>2</sup>  
For Over consolidated sandy soils, E=18000(750\*N)=18000(750\*100)= 930kg/cm<sup>2</sup>  
Average = (330+930)/2= 630 kg/cm<sup>2</sup>  
(Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/;) )
- Depth of Compressible Stratum, H = 3.0 m
- Rigidity Factor = 0.80
- Dispersion 1:2 – Factor = ((H/2)+B)<sup>2</sup>/ B<sup>2</sup>= ((3.00/2)+1.50)<sup>2</sup>/1.50<sup>2</sup>= 4.0, (Utilized in calculations)
- Factor Related to Pore Pressure, λ = 0.7      **Ref: - Table – 1, IS 8009, P-1**
- Depth Correction Factor = 0.80      **Ref: - From Fig-12, IS 8009, P-1**  
**L/B = 1.00, D/(sqrt (L\*B)) = (1.00/sqrt(1.50\*1.50)) = 0.67**



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

$$\text{Net S.B.P} = 40 / (((100 * 1.12 * 1.50 * (1 - 0.40^2) * 0.80) / 630.0) + (100 * 0.0100 * 3.00 * 0.7 * 0.80 * 0.80 / 4.0))$$

$$= 77.64 \text{ T/m}^2$$

$$= 78.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate and Consolidation Settlement is  $78.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 9.00 \text{ T/m}^2 \text{ \& } 78.00 \text{ T/m}^2$$

$$= 9.00 \text{ T/m}^2 = 90.00 \text{ kN/m}^2.$$

## 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-145**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from EGL,  $D_f = 1.00$  m (196.10 R.L.)

Width of foundation considered,  $B_f = 1.50$  m

Length of foundation considered,  $L_f = 1.50$  m

Bulk Density  $\gamma_b = 1.96$  gm/cm<sup>3</sup>

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

Factor of Safety = 2.50

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

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

**Shear Parameters**,  $c = 0.31$  kg/cm<sup>2</sup>,  $\phi = 0^\circ$ ,  $e = 0.72$

**Bearing Capacity Factors:**

$N_c = 5.14$ ,  $N_q = 0.00$ , i.e.  $N_q - 1 = 0.00$ ,  $N_\gamma = 0.00$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.13$ ,  $d_q = d_\gamma = 1.00$

(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)

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

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

$\alpha$  = inclination of load to vertical in degrees = 0

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

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

(IS 6403, CL-5.1.2.4)

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

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

$$q_u = \left[ \left( \frac{2}{3} \right) * (0.31 * 10) * 5.14 * 1.30 * 1.13 * 1.00 \right]$$

$$= 15.60 \text{ T / m}^2$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 6.24 \text{ T / m}^2$$

$$q_{\text{net safe}} = 6.00 \text{ T / m}^2 = 60.00 \text{ kN/m}^2$$



## **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-145**

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

**Where,**

**S = Settlement of 25mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor C<sub>d</sub>**

**E = Modulus of Elasticity**

**m<sub>v</sub> = Co-efficient of Volume Compressibility**

**μ = Poisson's Ratio**

**B, L = Width & Length of Foundation respectively**

**R<sub>f</sub> = Rigidity Factor**

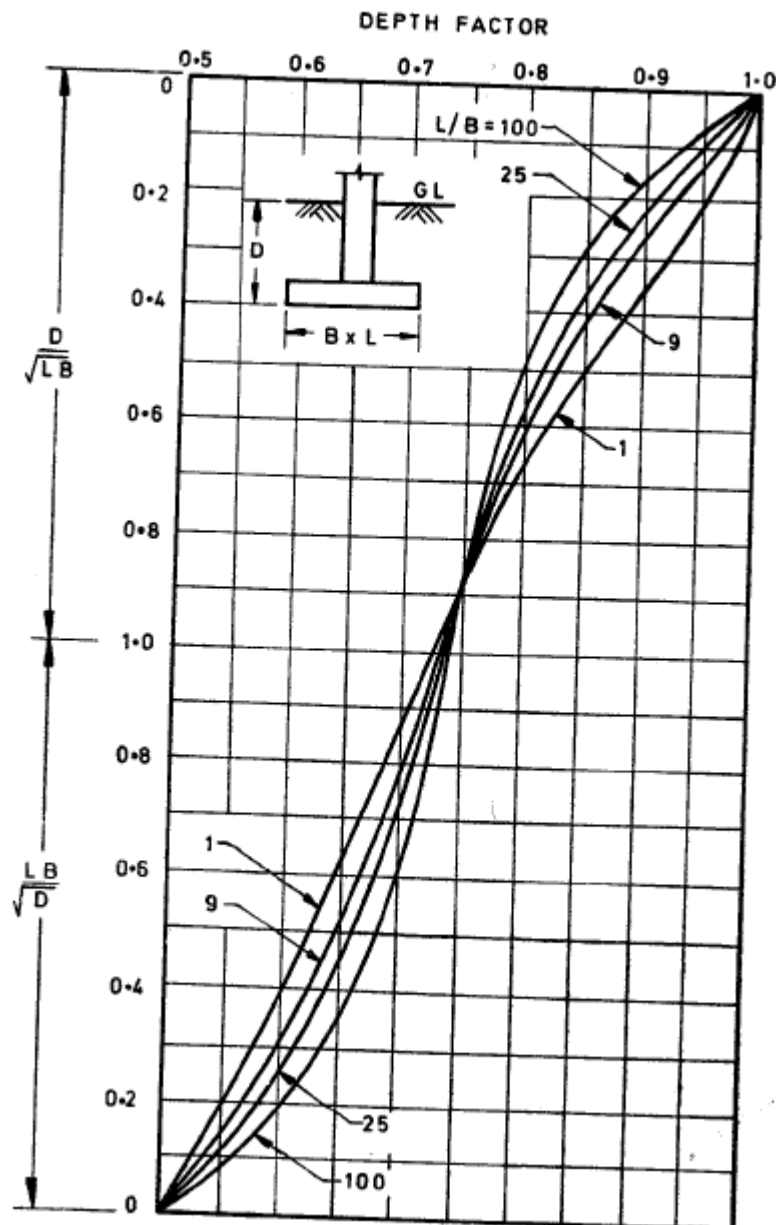
**D<sub>f</sub> = Depth factor**

**λ = Factor Related to Pore Pressure**

**Code of Reference – IS 8009 P-1**

**For Isolated Foundations:**

- Safe Bearing Pressure for 25mm Settlement.
- Depth of foundation considered from EGL, D<sub>f</sub> = 1.00 m (196.10m R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.50 m
- Length of foundation, considered, L<sub>f</sub> = 1.50 m
- Poisson's ratio, μ = 0.35 (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/32)
- Co-efficient of Volume Compressibility = 0.0171 cm<sup>2</sup>/kg,
- Modulus of Elasticity, E = 500\*Cu = 500\*0.50 = 250 kg/cm<sup>2</sup>  
(Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix/; )
- Depth of Compressible Stratum, H = 3.0 m
- Rigidity Factor = 0.80
- Dispersion 1:2 – Factor = ((H/2)+B)<sup>2</sup>/ B<sup>2</sup> = ((3.00/2)+1.50)<sup>2</sup>/1.50<sup>2</sup> = 4.0, (Utilized in calculations)
- Factor Related to Pore Pressure, λ = 0.7      **Ref: - Table – 1, IS 8009, P-1**
- Depth Correction Factor = 0.80      **Ref: - From Fig-12, IS 8009, P-1**  
**L/B = 1.00, D/(sqrt (L\*B)) = (1.00/sqrt(1.50\*1.50)) = 0.67**



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

$$\text{Net S.B.P} = 25 / (((100 * 1.12 * 1.50 * (1 - 0.35^2) * 0.80) / 250.00) + (100 * 0.0171 * 3.00 * 0.7 * 0.80 * 0.80 / 4.0))$$

$$= 23.89 \text{ T/m}^2$$

$$= 24.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate and Consolidation Settlement is  $24.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 6.00 \text{ T/m}^2 \text{ \& } 24.00 \text{ T/m}^2$$

$$= 6.00 \text{ T/m}^2 = 60.00 \text{ kN/m}^2.$$

## **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-146**

➤ **For Square Isolated Foundations:**

Depth of foundation considered from EGL,  $D_f = 1.00$  m (190.93 R.L.)

Width of foundation considered,  $B_f = 1.50$  m

Length of foundation considered,  $L_f = 1.50$  m

Bulk Density  $\gamma_b = 1.97$  gm/cm<sup>3</sup>

Water Table at depth = Considered at E.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)

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

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

**Shear Parameters**,  $c = 0.05$  kg/cm<sup>2</sup>,  $\phi = 24^\circ$ ,  $e = 0.72$

**Bearing Capacity Factors:**

$N_c = 13.04$ ,  $N_q = 5.28$ , i.e.  $N_q - 1 = 4.28$ ,  $N_\gamma = 4.17$

**Shape Factors: (for square footings)**

(IS 6403, Table 2)

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

**Depth Factors:**

$d_c = 1.18$ ,  $d_q = d_\gamma = 1.09$

(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)

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

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

$\alpha$  = inclination of load to vertical in degrees = 0

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

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

(IS 6403, CL-5.1.2.4)

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

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

$$\begin{aligned}
 q_u &= \left[ \left( \frac{2}{3} \right) * (0.05 * 10) * 13.04 * 1.30 * 1.18 * 1.00 + 1.00 * (1.97)(5.28 - 1.00) \right. \\
 &\quad * 1.20 * 1.09 * 1.00 * 0.50 + 0.5 * 1.97 * 1.50 * 4.17 * 0.80 * 1.09 \\
 &\quad \left. * 1.00 * 0.50 \right] \\
 &= \mathbf{14.87 \text{ T / m}^2}
 \end{aligned}$$

$$q_{\text{net safe}} = q_u / \text{FS (i.e. 2.5)} = 5.95 \text{ T / m}^2$$

$$q_{\text{net safe}} = \mathbf{6.00 \text{ T / m}^2} = \mathbf{60.00 \text{ kN/m}^2}$$

## **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-146**

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

**Where,**

**S = Settlement of 25mm Considered**

**Q<sub>net</sub> = Safe Bearing pressure**

**Factor C<sub>d</sub>**

**E = Modulus of Elasticity (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-; )**

**μ = Poisson's Ratio (Ref: "Foundation analysis and design" by Joseoh E. Bowles given in Appendix-32)**

**B, L = Width & Length of Foundation respectively**

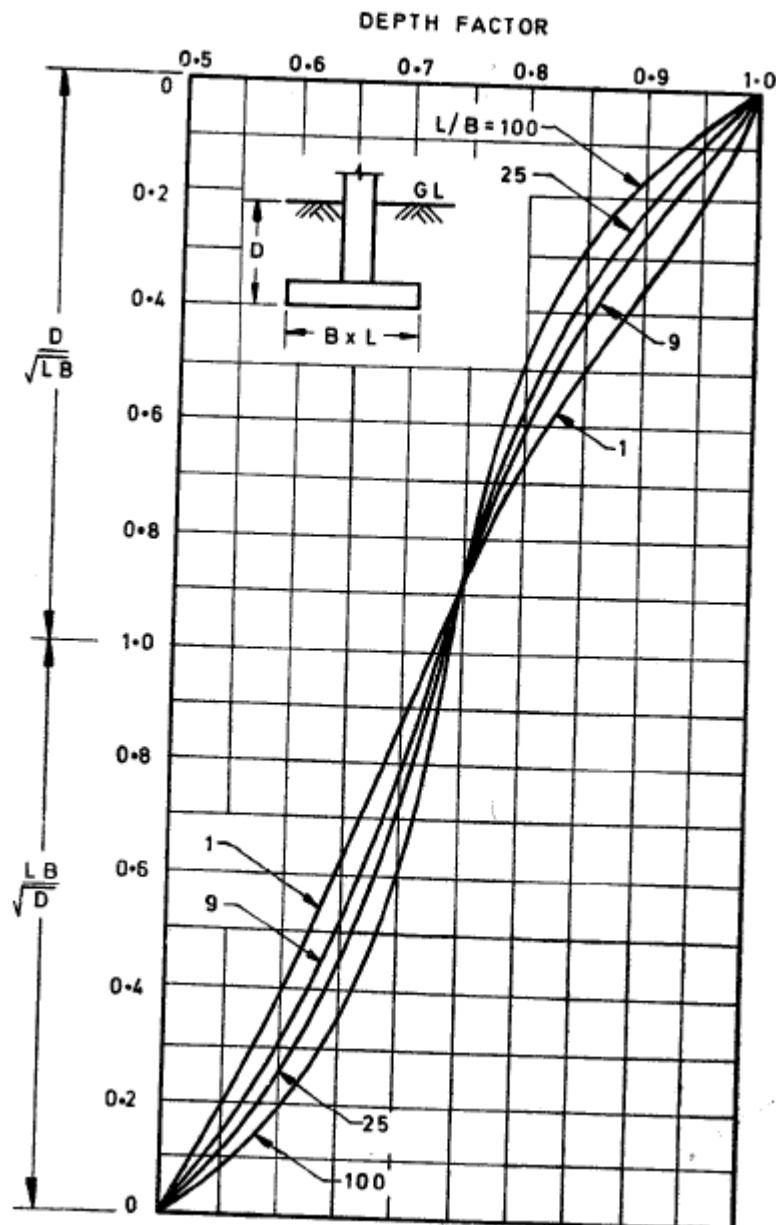
**R<sub>f</sub> = Rigidity Factor**

**D<sub>f</sub> = Depth factor**

**Code of Reference – IS 8009 P-1**

**For Isolated Foundations:**

- Safe Bearing Pressure for 25mm Settlement.
- Depth of foundation considered from FGL, D<sub>f</sub> = 1.00 m (201.50 R.L.)
- Width of foundation, considered, B<sub>f</sub> = 1.50 m
- Length of foundation, considered, L<sub>f</sub> = 1.50 m
- Poisson's ratio, μ = 0.35 (Ref : Foundation Analysis and Design by JE Bowles)
- Modulus of Elasticity, E = 228 kg/cm<sup>2</sup>  
 For, Normally consolidated sandy soils, E = 500(N+15) = 500(9+15) = 12000 kPa  
 For, Gravelly sandy soils, E = 1200(N+6) = 1200(22+6) = 33600 kPa  
 Average = (12000 + 33600) / 2 = 22800 kPa = 228 kg/cm<sup>2</sup>
- Rigidity Factor = 0.80  
 L/B = 1.00, D/(sqrt(L\*B)) = (1.00/sqrt(1.50\*1.50)) = 0.67



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

$$\text{Net S.B.P} = 25 / (((100 * 1.12 * 1.50 * (1 - 0.35^2) * 0.80) / 228.0))$$

$$= 48.33 \text{ T/m}^2$$

$$= 48.00 \text{ T/m}^2$$

So, Allowable Safe Bearing Pressure Considering Immediate Settlement is  $48.00 \text{ T/m}^2$ .

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

$$= \text{Minimum of } 6.00 \text{ T/m}^2 \text{ \& } 48.00 \text{ T/m}^2$$

$$= 6.00 \text{ T/m}^2 = 60.00 \text{ kN/m}^2.$$

## Appendix:-

Soil Mechanics And Foundation Engineering by Dr.K.R.Arora  
(For Mixed shear failure reference)

SOIL MECHANICS AND FOUNDATION ENGINEERING

600

$N_c = 57.8, N_q = 41.4 \text{ and } N_\gamma = 42.4$   
 $N'_c = 25.2, N'_q = 12.6 \text{ and } N'_\gamma = 10.1$

and  
 Difference  $(N_c)_d = 32.6, (N_q)_d = 28.8 \text{ and } (N_\gamma)_d = 32.3$ .

As the actual value of  $\phi'$  is  $35^\circ$  which is  $6^\circ$  more than the value of  $\phi'$  corresponding to local shear failure (viz.  $29^\circ$ ), the proportional difference to be added to the values of  $N'_c, N'_q$  and  $N'_\gamma$  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.  $D_f = D_w$ ),

$$q_u = c' N_c + \gamma D_f N_q + 0.5 \gamma' B N_\gamma$$

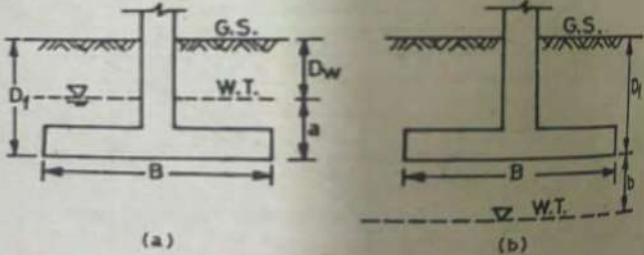


Fig. 23.11.

## Appendix-9

### “Foundation analysis and design” by Joseoh E. Bowles

266 FOUNDATION ANALYSIS AND DESIGN

TABLE 5-5 Equations for stress-strain modulus  $E_s$  by several test methods  
 $E_s$  in kPa for SPT and units of  $q_c$  for CPT; divide kPa by 50 to obtain ksi. The  $N$  values should be estimated as  $N_{60}$  and not  $N_{70}$

Soil	SPT	CPT
Sand (normally consolidated)	$E_s = 500(N + 15)$ $E_s = (15\,000 \text{ to } 22\,000) \ln N$ $E_s = (35\,000 \text{ to } 50\,000) \log N$	$E_s = 2 \text{ to } 4q_c$ $E_s = (1 + D_r^2)q_c$
Sand (saturated)	$E_s = 250(N + 15)$	
Sand (overconsolidated)	$E_s = 18\,000 + 750N$ $E_{s(OCR)} = E_{s(nc)} (OCR)^{1/2}$	$E_s = 6 \text{ to } 30q_c$
Gravelly sand and gravel	$E_s = 1200(N + 6)$ $E_s = 600(N + 6) \quad N \leq 15$ $E_s = 600(N + 6) + 2000 \quad N > 15$	
Clayey sand	$E_s = 320(N + 15)$	$E_s = 3 \text{ to } 6q_c$
Silty sand	$E_s = 300(N + 6)$	$E_s = 1 \text{ to } 2q_c$
Soft clay	—	$E_s = 3 \text{ to } 8q_c$
Clay	Using the undrained shear strength $s_u$ in units of $s_u$ $I_p > 30$ or organic $I_p < 30$ or stiff $E_{s(OCR)} = E_{s(nc)} (OCR)^{1/2}$	$E_s = 100 \text{ to } 500s_u$ $E_s = 500 \text{ to } 1500s_u$

† Vesic (1970).

‡ Author's equation from plot of D'Appolonia et al. (1970).

§ USSR (and may not be standard blow count  $N$ ).

Genet J. Sources: European Conference on Standard Penetration Testing (1974), vol. 2, pp. 150–151; CGJ, November 1983, pp. 726–737; Use of In-Situ Tests in Geotechnical Engineering, ASCE (1986), p. 1173; Mitchell and Giamberini (1977).

### Soil Mechanics And Foundation Engineering by V.N.S. Murthy (For Modulus of Elasticity reference)

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

$$E_s = Ac_u \quad (13.19)$$

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 9.



## Appendix-32

### 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  $\mu$  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  $\mu$ , 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	$\mu$
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

## Appendix-33

(For Modulus of Volume Compressibility, Angle of Internal friction and Cohesion reference)

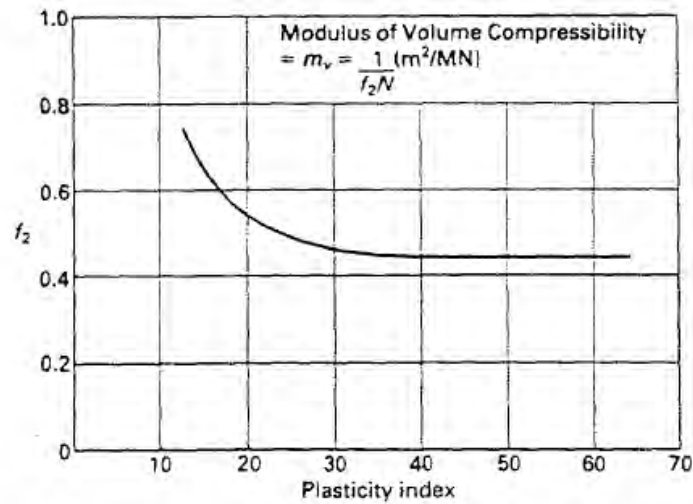


Figure 8. Relationship between Mass Shear Strength, Modulus of Volume Compressibility, Plasticity Index, and SPT-N values ( after Stroud, 1975)

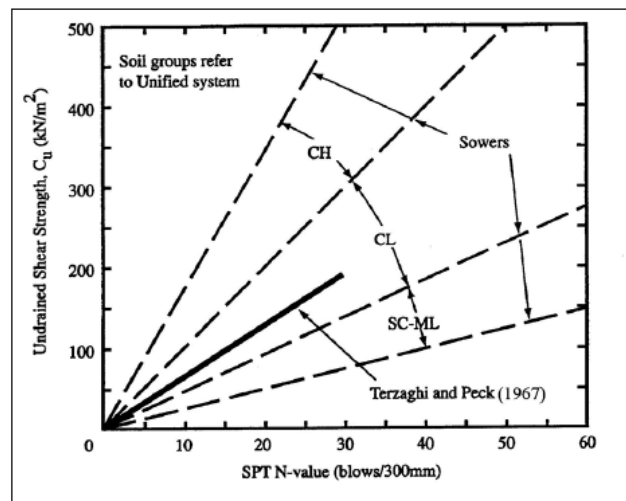


Figure 9. Approximate Correlation between Undrained Shear Strength and SPT-N values (After Sowers, 1979)

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;

$$\phi' = \sqrt{12N_{45}} + 15^\circ$$

APPENDIX-12

TABLE 6  
PRESUMPTIVE SAFE BEARING CAPACITY OF SOIL

Sr. No	Types of Rocks/Soils	Safe bearing capacity KN/m <sup>2</sup> /t/ m <sup>2</sup>	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

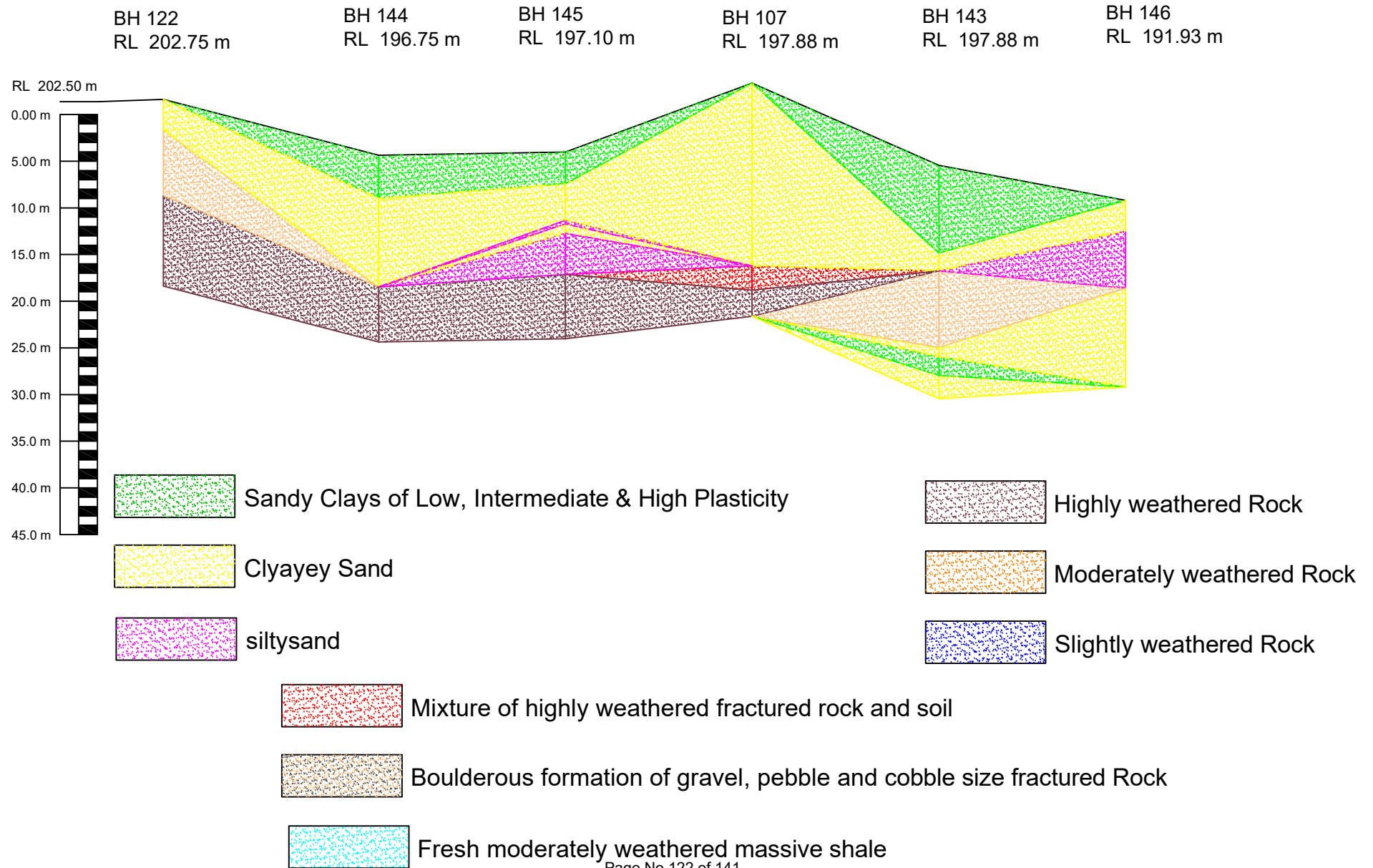
Note 4: Compactness of non-cohesive soils may be determined by driving the cone of 65 mm dia and 60 apex angle by a hammer of 65 kg falling from 75 cm. If corrected number of blows (N) for 30 cm penetration are less than 10, the soil is called loose, if N lies between 10 and 30, it is medium, if more than 30, the soils is called as dense.

**RESULTS OF CHEMICAL ANALYSIS**

Sr. No.	Borehole no.	Result			
		pH	Total Dissolved Solids	Sulphate (SO <sub>3</sub> ) (mg/l)	Chloride (mg/l)
			Inorganic		
1	BH-145	7.57	241	157	141

# Cross Section Profile of Sub Soil - Hirma, Talabira

ST/25/01/19477



**NOTATIONS**

C	Cohesion
$\phi$	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 $\gamma$	Bearing Capacity Factor
Sc, Sq, S $\gamma$	Shape Factors
$\gamma$	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

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. :- 107

Co-Ordinate :- E 1833 N 2975

Reduced Level :- 204.5m

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 <sup>2</sup>	Free Swell Index  %	Soil Classification	Shear Parameter		Unconfined Compression Test  Kg/cm <sup>2</sup>	UCS by Point Load Index in rock  Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction ϕ  Degree											
																							Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility mv  cm <sup>2</sup> /kg	Pre-consolidation Pressure  kg/cm <sup>2</sup>					
1	0.00	DS	-	-	-	-	4	71	25	25	19	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	8	66	26	24	18	6	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	13	-	-	-
3	2.00	SPT	-	-	-	-	3	67	30	27	20	7	-	-	-	-	SM-SC	-	-	-	-	-	-	-	-	-	15	-	-	-
4	2.50	UDS	2.00	1.60	25.09	2.67	7	59	34	28	21	7	-	-	-	-	SM-SC	0.02	28	-	-	DSU	-	-	-	-	-	-	0.67	40.1
5	3.00	SPT	-	-	-	-	9	58	33	32	18	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	57	-	-	-
6	3.50	SPT/ Remoulded	2.00	1.59	25.45	2.66	6	62	32	30	19	11	-	-	-	-	SC	0.06	31	-	-	DSU	-	-	-	-	-	-	0.67	40.1
7	4.00	SPT	-	-	-	-	2	69	29	28	20	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
8	4.50	SPT	-	-	-	-	0	61	39	36	21	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	51	-	-	-
9	5.00	SPT	-	-	-	-	5	66	29	31	19	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
10	5.50	SPT	-	-	-	-	6	70	24	28	18	10	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	80	-	-	-
11	6.00	SPT	-	-	-	-	2	65	33	30	16	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	9	68	23	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	9	73	18	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	5	70	25	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	7	69	24	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	71	29	30	15	15	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	67	33	34	18	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	10	63	27	29	17	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	1	73	26	28	16	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	78	22	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	20	64	16	25	17	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	10	59	31	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	9	61	30	32	18	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	6	68	26	28	19	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
25	14.50	SPT	-	-	-	-	8	73	19	26	18	8	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
26	15.50	SPT	-	-	-	-	2	72	26	29	16	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.00	SPT	-	-	-	-	0	62	38	32	18	14	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
28	17.00	SPT	-	-	-	-	10	67	23	26	15	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	7	73	20	25	16	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	6	70	24	28	15	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	8	76	16	26	17	9	-	-	-	-	SC	-	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	51	28	21	19	15	4	-	-	-	-	GM	-	-	-	-	-	-	-	-	-	>100	-	-	-
33	20.50	SPT	-	-	-	-	64	18	18	NP	NP	NP	-	-	-	-	GM	-	-	-	-	-	-	-	-	-	>100	-	-	-
34	21.50	SPT	-	-	-	-	68	16	16	NP	NP	NP	-	-	-	-	GM	-	-	-	-	-	-	-	-	-	>100	-	-	-
35	22.00	UDS	2.34	2.12	10.19	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	121.1	UCS	-	-	-	-	-	-	0.28	21.6
36	23.50	UDS	2.32	2.08	11.38	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	143.8	UCS	-	-	-	-	-	-	0.31	23.7
37	25.00	UDS	2.51	2.35	6.86	2.80	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	225.6	UCS	-	-	-	-	-	-	0.19	16.1

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. :- 122

Co-Ordinate :- E - 190 , N - 289

Reduced Level :- 202.75m

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 <sup>2</sup>	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm <sup>2</sup>	UCS by Point Load Index in rock Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction $\phi$ Degree				Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility mv cm <sup>2</sup> /kg	Pre-consolidation Pressure kg/cm <sup>2</sup>				
1	0.00	DS	-	-	-	-	0	58	42		31	16	15	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT/ Remoulded	1.81	1.57	15.02	2.66	0	56	44		33	15	18	-	-	-	SC	0.10	28	-	-	DSU	-	-	-	32	-	0.69	40.8
3	2.00	SPT	-	-	-	-	10	61	29		30	16	14	-	-	-	SC	-	-	-	-	-	-	-	-	24	-	-	-
4	2.50	UDS	1.81	1.58	14.46	2.67	14	53	33		31	15	16	-	-	-	SC	0.06	25	-	-	DSU	-	-	-	-	-	0.69	40.8
5	3.00	SPT	-	-	-	-	9	62	29		32	15	17	-	-	-	SC	-	-	-	-	-	-	-	-	29	-	-	-
6	3.50	UDS	2.02	1.63	24.14	2.68	16	57	27		29	17	12	-	-	-	SC	0.04	27	-	-	DSU	-	-	-	-	-	0.65	39.3
7	4.00	SPT	-	-	-	-	0	75	25		27	18	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
8	4.50	SPT	-	-	-	-	0	83	17		23	15	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
9	5.00	SPT	-	-	-	-	0	69	31		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
10	5.50	SPT	-	-	-	-	0	70	30		25	17	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
11	6.00	SPT	-	-	-	-	0	63	37		28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
12	6.50	SPT	-	-	-	-	0	77	23		24	14	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	0	76	24		26	15	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	72	28		27	14	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	80	20		26	16	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	84	16		25	17	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	86	14		25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	81	19		28	17	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	84	16		26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	UDS	2.61	2.53	3.16	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	326.9	UCS	-	-	-	-	-	0.09	8.0
21	12.50	UDS	2.65	2.58	2.63	2.77	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	338.1	UCS	-	-	-	-	-	0.07	6.8
22	12.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
23	14.00	UDS	2.39	2.21	8.02	2.69	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	85.3	UCS	-	-	-	-	-	0.22	17.8
24	14.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
25	15.50	UDS	2.41	2.23	8.31	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	141.4	UCS	-	-	-	-	-	0.23	18.5
26	15.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.00	UDS	2.26	2.01	12.44	2.68	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	82.9	UCS	-	-	-	-	-	0.33	25.0
28	17.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.50	UDS	2.27	2.02	12.54	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	80.2	UCS	-	-	-	-	-	0.34	25.3
30	18.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.00	UDS	2.31	2.07	11.51	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	87.0	UCS	-	-	-	-	-	0.31	23.8
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

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 (NTTTP) at village Hirma, Talabira, Odisha

BH No. :- 143

Co-Ordinate :- E - 312, N - 2784

Reduced Level :- 195.68m

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 <sup>2</sup>	Free Swell Index  %	Soil Classification	Shear Parameter		Unconfined Compression Test  Kg/cm <sup>2</sup>	UCS by Point Load Index in rock  Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction ϕ  Degree				Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility m <sub>v</sub>  cm <sup>2</sup> /kg	Pre-consolidation Pressure  kg/cm <sup>2</sup>					
1	0.00	DS	-	-	-	-	8	34	40	18	37	20	17	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	3	9	62	26	45	21	24	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-	-
3	2.00	SPT	-	-	-	-	2	13	63	22	44	24	20	-	-	-	CI	-	-	-	-	-	-	-	-	7	-	-	-	-
4	2.50	SPT/ Remoulded	1.94	1.53	26.45	2.62	6	8	54	32	47	20	27	-	-	-	CI	0.44	0	-	-	TUU	-	-	-	8	-	0.71	41.4	-
5	3.00	SPT	-	-	-	-	5	14	59	22	43	23	20	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-	-
6	3.50	SPT	-	-	-	-	2	16	66	16	33	18	15	-	-	-	CL	-	-	-	-	-	-	-	-	12	-	-	-	-
7	4.00	SPT	-	-	-	-	0	19	66	15	29	16	13	-	-	-	CL	-	-	-	-	-	-	-	-	13	-	-	-	-
8	4.50	SPT	-	-	-	-	4	18	64	14	31	18	13	-	-	-	CL	-	-	-	-	-	-	-	-	11	-	-	-	-
9	5.00	SPT	-	-	-	-	6	21	61	12	30	19	11	-	-	-	CL	-	-	-	-	-	-	-	-	14	-	-	-	-
10	5.50	SPT	-	-	-	-	2	16	65	17	31	16	15	-	-	-	CL	-	-	-	-	-	-	-	-	15	-	-	-	-
11	6.00	SPT	-	-	-	-	0	15	64	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-	-
12	6.50	UDS	1.94	1.52	27.31	2.61	0	13	62	25	42	20	22	-	-	-	CI	0.73	3	-	-	TUU	0.14	0.0137	1.20	-	-	0.71	41.6	-
13	7.00	SPT	-	-	-	-	0	16	66	18	39	23	16	-	-	-	CI	-	-	-	-	-	-	-	-	14	-	-	-	-
14	7.50	UDS	1.97	1.56	26.16	2.64	6	34	48	12	27	16	11	-	-	-	CL	0.68	7	-	-	TUU	0.12	0.0085	1.29	-	-	0.69	40.9	-
15	8.00	SPT	-	-	-	-	9	38	42	11	25	15	10	-	-	-	CL	-	-	-	-	-	-	-	-	15	-	-	-	-
16	8.50	UDS	1.98	1.57	25.80	2.65	8	36	44	12	26	15	11	-	-	-	CL	0.72	6	-	-	TUU	0.12	0.0078	1.43	-	-	0.68	40.6	-
17	9.00	SPT	-	-	-	-	6	39	46	9	25	17	8	-	-	-	CL	-	-	-	-	-	-	-	-	18	-	-	-	-
18	9.50	SPT	-	-	-	-	2	57	41	26	16	10	10	-	-	-	SC	-	-	-	-	-	-	-	-	21	-	-	-	-
19	10.00	SPT	-	-	-	-	1	66	33	24	15	9	9	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-	-
20	11.00	SPT	-	-	-	-	5	68	27	23	13	10	10	-	-	-	SC	-	-	-	-	-	-	-	-	26	-	-	-	-
21	11.50	SPT	-	-	-	-	20	64	16	NP	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	33	-	-	-	-
22	12.50	SPT	-	-	-	-	16	62	22	20	16	4	4	-	-	-	SM	-	-	-	-	-	-	-	-	80	-	-	-	-
23	13.00	SPT	-	-	-	-	23	60	17	NP	NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
24	14.00	SPT	-	-	-	-	24	58	18	19	15	4	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
25	14.50	SPT	-	-	-	-	15	63	22	21	16	5	5	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-	-
26	15.50	SPT	-	-	-	-	59	23	18	25	14	11	11	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-	-
27	16.00	SPT	-	-	-	-	63	15	22	27	15	12	12	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-	-
28	17.00	SPT	-	-	-	-	61	16	23	28	17	11	11	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-	-
29	17.50	SPT	-	-	-	-	56	20	24	27	16	11	11	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-	-
30	18.50	Remoulded	2.21	1.93	14.49	2.68	38	29	33	29	15	14	14	-	-	-	Boulders	0.11	29	-	-	DSU	-	-	-	-	-	0.39	28.0	-
31	19.00	SPT	-	-	-	-	41	35	24	26	17	9	9	-	-	-	Boulders	-	-	-	-	-	-	-	-	>100	-	-	-	-
32	20.00	SPT	-	-	-	-	0	67	33	28	16	12	12	-	-	-	SC	-	-	-	-	-	-	-	-	73	-	-	-	-
33	20.50	SPT	-	-	-	-	0	31	56	13	31	20	11	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
34	21.50	SPT	-	-	-	-	0	33	55	12	28	18	10	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
35	22.00	SPT	-	-	-	-	0	34	57	9	27	19	8	-	-	-	CL	-	-	-	-	-	-	-	-	>100	-	-	-	-
36	23.50	SPT	-	-	-	-	0	71	29	30	16	14	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-
37	25.00	SPT	-	-	-	-	0	79	21	27	15	12	12	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-	-

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. :- 144

Co-Ordinate :- E - 2408, N - 2784

Reduced Level :- 196.75 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 <sup>2</sup>	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm <sup>2</sup>	UCS by Point Load Index in rock Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction $\phi$ Degree				Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility mv cm <sup>2</sup> /kg	Pre-consolidation Pressure kg/cm <sup>2</sup>				
1	0.00	DS	-	-	-	-	0	34	50	16	30	16	14	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT/ Remoulded	1.71	1.46	17.11	2.63	0	38	51	11	28	18	10	-	-	-	CL	0.20	0	-	-	TUU	-	-	-	2	-	0.80	44.5
3	2.00	SPT	-	-	-	-	0	39	49	12	27	17	10	-	-	-	CL	-	-	-	-	-	-	-	-	5	-	-	-
4	2.50	UDS	1.71	1.47	16.34	2.64	0	35	50	15	29	16	13	-	-	-	CL	0.26	7	-	-	TUU	0.18	0.0250	0.41	-	-	0.80	44.3
5	3.00	SPT	-	-	-	-	0	31	48	21	40	21	19	-	-	-	CI	-	-	-	-	-	-	-	-	5	-	-	-
6	3.50	UDS	1.70	1.48	15.08	2.63	0	29	45	26	43	20	23	-	-	-	CI	0.25	5	-	-	TUU	0.18	0.0385	1.90	-	-	0.78	43.8
7	4.00	SPT	-	-	-	-	0	32	49	19	39	22	17	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
8	4.50	UDS	1.82	1.53	18.59	2.65	0	35	49	16	38	24	14	-	-	-	CI	0.40	7	-	-	TUU	0.16	0.0179	1.92	-	-	0.73	42.1
9	5.00	SPT	-	-	-	-	11	52	37		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
10	5.50	UDS	1.98	1.57	26.09	2.66	10	67	23		27	19	8	-	-	-	SC	0.04	25	-	-	DSU	-	-	-	-	-	0.69	41.0
11	6.00	SPT	-	-	-	-	16	59	25		28	16	12	-	-	-	SC	-	-	-	-	-	-	-	-	12	-	-	-
12	6.50	UDS	2.02	1.63	23.87	2.67	9	71	20		25	15	10	-	-	-	SC	0.05	26	-	-	DSU	-	-	-	-	-	0.64	38.9
13	7.00	SPT	-	-	-	-	0	78	22		20	16	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	0	82	18		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	80	20		19	15	4	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	86	14		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	84	16		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	85	15		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	88	12		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	75	25		27	16	11	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	74	26		29	15	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	70	30		31	18	13	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	69	31		33	16	17	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	SPT	-	-	-	-	0	76	24		26	18	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
25	15.00	UDS	2.41	2.22	8.54	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	142.8	UCS	-	-	-	-	-	0.23	19.0
26	15.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	16.50	UDS	2.39	2.21	8.26	2.70	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	138.1	UCS	-	-	-	-	-	0.22	18.2
28	16.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
29	18.00	UDS	2.44	2.28	7.15	2.72	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	147.1	UCS	-	-	-	-	-	0.19	16.3
30	18.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
31	20.00	UDS	2.42	2.25	7.54	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	136.0	UCS	-	-	-	-	-	0.20	17.0
32	20.00	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-

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. :- 145

Co-Ordinate :- E - 2350, N - 2777

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 <sup>2</sup>	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm <sup>2</sup>	UCS by Point Load Index in rock Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction $\phi$ Degree				Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility mv cm <sup>2</sup> /kg	Pre-consolidation Pressure kg/cm <sup>2</sup>				
1	0.00	DS	-	-	-	-	0	46	41	13	28	16	12	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT/ Remoulded	1.96	1.55	26.78	2.66	0	37	48	15	31	17	14	-	-	-	CL	0.31	0	-	-	TUU	-	-	-	3	-	0.72	41.9
3	2.00	SPT	-	-	-	-	0	31	45	24	38	16	22	-	-	-	CI	-	-	-	-	-	-	-	-	8	-	-	-
4	2.50	UDS	1.96	1.54	27.12	2.65	3	33	37	27	44	20	24	-	-	-	CI	0.50	9	-	-	TUU	0.13	0.0171	0.60	-	-	0.72	41.8
5	3.00	SPT	-	-	-	-	0	40	34	26	39	17	22	-	-	-	CI	-	-	-	-	-	-	-	-	9	-	-	-
6	3.50	UDS	1.97	1.55	26.74	2.66	6	59	35	36	18	18	-	-	-	-	SC	0.03	24	-	-	DSU	-	-	-	-	-	0.71	41.6
7	4.00	SPT	-	-	-	-	0	64	36	35	19	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	70	-	-	-
8	4.50	SPT	-	-	-	-	0	76	24	32	20	12	-	-	-	-	SC	-	-	-	-	-	-	-	-	46	-	-	-
9	5.00	SPT	-	-	-	-	0	61	39	37	18	19	-	-	-	-	SC	-	-	-	-	-	-	-	-	55	-	-	-
10	5.50	SPT	-	-	-	-	0	62	38	36	19	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	55	-	-	-
11	6.00	SPT	-	-	-	-	0	76	24	30	17	13	-	-	-	-	SC	-	-	-	-	-	-	-	-	54	-	-	-
12	6.50	SPT	-	-	-	-	0	68	32	33	16	17	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
13	7.00	SPT	-	-	-	-	0	66	34	29	18	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
14	7.50	SPT	-	-	-	-	2	78	20	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
15	8.00	SPT	-	-	-	-	0	69	31	27	16	11	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
16	8.50	SPT	-	-	-	-	0	62	38	31	15	16	-	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
17	9.00	SPT	-	-	-	-	0	83	17	16	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
18	9.50	SPT	-	-	-	-	0	81	19	20	16	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
19	10.00	SPT	-	-	-	-	0	88	12	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
20	11.00	SPT	-	-	-	-	0	84	16	NP	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
21	11.50	SPT	-	-	-	-	0	75	25	21	17	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
22	12.50	SPT	-	-	-	-	0	76	24	20	16	4	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
23	13.00	SPT	-	-	-	-	0	79	21	18	NP	NP	-	-	-	-	SM	-	-	-	-	-	-	-	-	>100	-	-	-
24	14.00	UDS	2.39	2.19	8.96	2.73	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	126.2	UCS	-	-	-	-	-	0.24	19.7
25	15.50	UDS	2.40	2.22	8.17	2.71	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	125.4	UCS	-	-	-	-	-	0.22	18.1
26	15.50	SPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	-	-	-	-	-	>100	-	-	-
27	17.00	UDS	2.37	2.16	9.86	2.74	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	-	139.0	UCS	-	-	-	-	-	0.27	21.3
28	18.50	UDS	2.54	2.42	4.96	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	362.4	-	UCS	-	-	-	-	8.00	0.14	12.0
29	20.00	UDS	2.57	2.47	4.17	2.75	-	-	-	-	-	-	-	-	-	-	W.ROCK	-	-	380.7	-	UCS	-	-	-	-	20.66	0.11	10.3

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

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. :- 146

Co-Ordinate :- E 388, N 2776

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 <sup>2</sup>	Free Swell Index %	Soil Classification	Shear Parameter		Unconfined Compression Test Kg/cm <sup>2</sup>	UCS by Point Load Index in rock Kg/cm <sup>2</sup>	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 <sup>2</sup>	Angle of Internal Friction $\phi$ Degree				Compression Index C <sub>c</sub>	Coefficient of Volume Compressibility m <sub>v</sub> cm <sup>2</sup> /kg	Pre-consolidation Pressure kg/cm <sup>2</sup>				
1	0.00	DS	-	-	-	-	0	51	49		34	16	18	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-
2	1.00	SPT	-	-	-	-	0	58	42		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	4	-	-	-
3	2.00	SPT	-	-	-	-	0	59	41		29	16	13	-	-	-	SC	-	-	-	-	-	-	-	-	9	-	-	-
4	2.50	UDS	1.97	1.55	27.03	2.67	0	76	24		26	15	11	-	-	-	SC	0.05	24	-	-	DSU	-	-	-	-	-	0.72	41.9
5	3.00	SPT	-	-	-	-	0	79	21		25	16	9	-	-	-	SC	-	-	-	-	-	-	-	-	11	-	-	-
6	3.50	SPT	-	-	-	-	4	80	16		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	24	-	-	-
7	4.00	SPT	-	-	-	-	24	63	13		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	22	-	-	-
8	4.50	SPT	-	-	-	-	13	73	14		NP	NP	NP	-	-	-	SM	-	-	-	-	-	-	-	-	30	-	-	-
9	5.00	SPT	-	-	-	-	6	83	11		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	37	-	-	-
10	5.50	Remoulded	2.10	1.75	20.20	2.70	29	65	6		NP	NP	NP	-	-	-	SP-SM	0.00	32	-	-	DSU	-	-	-	-	-	0.55	35.3
11	6.00	SPT	-	-	-	-	3	86	11		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	39	-	-	-
12	6.50	SPT	-	-	-	-	9	85	6		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	36	-	-	-
13	7.00	SPT	-	-	-	-	3	86	11		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	42	-	-	-
14	7.50	SPT	-	-	-	-	37	55	8		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	50	-	-	-
15	8.00	SPT	-	-	-	-	38	55	7		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	44	-	-	-
16	8.50	SPT	-	-	-	-	14	76	10		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	52	-	-	-
17	9.00	SPT	-	-	-	-	41	50	9		NP	NP	NP	-	-	-	SP-SM	-	-	-	-	-	-	-	-	56	-	-	-
18	9.50	SPT	-	-	-	-	0	70	30		31	16	15	-	-	-	SC	-	-	-	-	-	-	-	-	61	-	-	-
19	10.00	SPT	-	-	-	-	0	83	17		28	15	13	-	-	-	SC	-	-	-	-	-	-	-	-	69	-	-	-
20	11.00	SPT	-	-	-	-	0	70	30		35	19	16	-	-	-	SC	-	-	-	-	-	-	-	-	54	-	-	-
21	11.50	SPT	-	-	-	-	0	66	34		36	16	20	-	-	-	SC	-	-	-	-	-	-	-	-	59	-	-	-
22	12.50	SPT	-	-	-	-	0	62	38		33	15	18	-	-	-	SC	-	-	-	-	-	-	-	-	34	-	-	-
23	13.00	SPT	-	-	-	-	0	61	39		31	18	13	-	-	-	SC	-	-	-	-	-	-	-	-	45	-	-	-
24	14.00	SPT	-	-	-	-	0	60	40		36	16	20	-	-	-	SC	-	-	-	-	-	-	-	-	48	-	-	-
25	14.50	SPT	-	-	-	-	0	67	33		29	18	11	-	-	-	SC	-	-	-	-	-	-	-	-	53	-	-	-
26	15.50	SPT	-	-	-	-	0	66	34		30	17	13	-	-	-	SC	-	-	-	-	-	-	-	-	58	-	-	-
27	16.00	SPT	-	-	-	-	0	65	35		33	15	18	-	-	-	SC	-	-	-	-	-	-	-	-	64	-	-	-
28	17.00	SPT	-	-	-	-	0	64	36		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
29	17.50	SPT	-	-	-	-	0	66	34		28	18	10	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
30	18.50	SPT	-	-	-	-	0	75	25		24	16	8	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
31	19.00	SPT	-	-	-	-	0	78	22		23	14	9	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-
32	20.00	SPT	-	-	-	-	0	62	38		31	17	14	-	-	-	SC	-	-	-	-	-	-	-	-	>100	-	-	-



DRAWING NO. PE-DG-511-602-C001

DEVELOPMENT CONSULTANTS  
PVT. LIMITED.

Revised only for general reference with contract details and specifications. Contract is the responsibility of the client.  
1. Approved  
2. Issued and sealed  
3. For information only  
4. For information only  
LETTER REF. NO. DATE

MARKING	CO-ORDINATES	DEPTH (M)
CPLT-1	E 1182 N 3215	2
CPLT-2	E 1196 N 3219	3
CPLT-3	E 957 N 3090	2
CPLT-4	E 1197 N 3064	3
CPLT-5	E 802 N 3361	2

## FIELD CBR TEST (CBR)

MARKING	CO-ORDINATES	DEPTH (M)
CBR-1	E 1834 N 3578	0.5
CBR-2	E 1991 N 2973	0.5
CBR-3	E 1493 N 2167	0.5

## NOTES:-

- ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
- BORE HOLE SHALL BE DRILLED UP TO THE DEPTH INDICATED AGAINST EACH BORE HOLE OR UP TO THE DEPTH WHERE MORE THAN 75% CORE RECOVERY IS ENCOUNTERED, WHICHEVER IS EARLIER.
- BACKFILLING OF BORE HOLES AND PITS SHALL BE AS PER SPECIFICATION AND AS DIRECTED BY THE ENGINEER-IN-CHARGE.
- STARTING DEPTH OF STANDARD PENETRATION TEST (SPT) SHALL BE 1M BELOW GROUND LEVEL AND THE TEST SHALL BE CONDUCTED AT EVERY 1M INTERVAL ALTERNATE TO COLLECTION OF UNDISTURBED SAMPLE (UDS) UP TO 10M DEPTH BELOW GROUND LEVEL AND AT EVERY 1.5M INTERVAL ALTERNATE TO COLLECTION OF UDS BEYOND 10M DEPTH, AT CHANGE OF STRATA & AT DEPTHS WHEREVER UDS COULD NOT BE COLLECTED.
- STARTING DEPTH OF COLLECTION OF UDS SHALL BE 2M BELOW GROUND LEVEL AND UDS SHALL BE COLLECTED AT 1M INTERVAL ALTERNATE TO CONDUCTING SPT UP TO 10M DEPTH BELOW GROUND LEVEL & AT EVERY 1.5M INTERVAL ALTERNATE TO CONDUCTING SPT BEYOND 10M DEPTH.
- CROSS HOLE SHEAR WAVE TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M, 21M, 24M, 27M & 30M DEPTH BELOW GROUND LEVEL.
- PUMP IN TYPE FIELD PERMEABILITY TEST SHALL BE CARRIED OUT AT DEPTH 2M, 4M, 6M 8M & 10M BELOW EXISTING GROUND LEVEL IN BH-10, BH-55, BH-84, BH-106 & IBH-15.
- ELECTRICAL RESISTIVITY TEST SHALL BE CARRIED OUT BY WENNER'S METHOD.
- PRESSURE METER TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M, 21M, 24M, 27M & 30M DEPTH BELOW GROUND LEVEL.
- GROUND WATER SAMPLE SHALL BE COLLECTED FROM BH-5, BH-11, BH-27, BH-28, BH-54, BH-80, BH-120, IBH-15, IBH-30 & IBH-45.
- PERCOLATION TEST SHALL BE CARRIED OUT AT 1M DEPTH BELOW GROUND LEVEL IN PLT-2 & IPLT-4.
- IN PLT-2 & IPLT-4, EXCAVATION BELOW 1M DEPTH SHALL BE DONE AFTER CONDUCTING PERCOLATION TEST.
- FIELD VANE SHEAR TEST SHALL BE CARRIED OUT IN BORE HOLE WHERE VERY SOFT CLAY/SOFT CLAY LAYER IS ENCOUNTERED, IN CONSULTATION WITH ENGINEER IN-CHARGE.
- GEOTECHNICAL INVESTIGATION SHALL BE CARRIED OUT AS PER SPECIFICATION. 15. DO NOT SCALE THIS DRAWING.

## REF DRG:-

- PE-DG-100-511-M001, "PLOT PLAN".

## GEOTECHNICAL INVESTIGATION LEGEND:-

- BOREHOLE (BH / IBH) . . . . .
- DYNAMIC CONE PENETRATION TEST (DCPT / IDCPIT) . . . . .
- STATIC CONE PENETRATION TEST (SCPT) . . . . .
- PLATE LOAD TEST (PLT / IPLT) . . . . .
- CYCLIC PLATE LOAD TEST (CPLT / ICPLT) . . . . .
- PRESSURE METER TEST (PMT / IPMT) . . . . .
- ELECTRICAL RESISTIVITY TEST (ERT / IERT) . . . . .
- CROSSHOLE SHEAR TEST (CST / ICST) . . . . .
- BLOCK VIBRATION TEST (BVT) . . . . .
- SEISMIC REFRACTION TEST (SRT) . . . . .
- FIELD CBR TEST (CBR) . . . . .
- TRIAL PIT (TP/ITP) . . . . .

BHEL-Project Engg. Mgrt. (Civil Dept.)  
THIS DRAWING IS RELEASED  
FOR CONSTRUCTION  
ALL PREVIOUS REVISIONS ARE SUPERSEDED  
BY  
ANIL KHANDLWAL  
Date 11/07/24

## BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)

THIS DRAWING MARKED (✓) IS RELEASED FOR

COMMENTS/APPROVAL

PLANNING/INFORMATION

CONSTRUCTION

STAMP ALL PREVIOUS REVISION AS SUPERSEDED

ISSUED BY  
NAME ANIL KUMAR VERMA  
SIGNATURE -sd-  
DATE 01.07.2024

NLC INDIA LIMITED  
NEYVELI, TAMILNADUDEVELOPMENT CONSULTANTS PVT LTD.  
CONSULTING ENGINEERS  
KOLKATA MUMBAI CHENNAI NEW DELHINLC TALABIRA THERMAL POWER PROJECT (NTTP)  
(3x800 MW PHASE-I)BHARAT HEAVY ELECTRICALS LTD, POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT,NOIDACOPY RIGHT AND CONFIDENTIAL  
The information on this document is the property of  
BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or  
indirectly in any way detrimental to the interest of the company.

DEPT	CODE	NAME	SIGN	DATE
DRN	MS	KAMALJEET	-sd-	18.05.2024
DESIN	MS	AN	-sd-	18.05.2024
CHD	AKV	AN	-sd-	18.05.2024
APPD	AN	AN	-sd-	18.05.2024

## GEOTECHNICAL INVESTIGATION LAYOUT

DRAWING NO.  
PE-DG-511-602-C001

SHEET 1 OF 1 REV. 02

Jul 01, 2024 - 3:05pm SIZE-A0

BORE HOLE (BH)		DEPTH (M)
MARKING	CO-ORDINATES	(REFER NOTE-2)
BH-1	E 1430 N 3845	20.0
BH-2	E 957 N 3845	20.0
BH-3	E 2000 N 3843	20.0
BH-4	E 719 N 3759	20.0
BH-5	E 1869 N 3690	25.0
BH-6	E 1129 N 3563	25.0
BH-7	E 1963 N 3695	20.0
BH-8	E 1136 N 3661	20.0
BH-9	E 1046 N 3637	25.0
BH-10	E 914 N 3614	25.0
BH-11	E 714 N 3599	20.0
BH-12	E 1018 N 3561	25.0
BH-13	E 1058 N 3579	25.0
BH-14	E 941 N 3572	25.0
BH-15	E 1238 N 3567	25.0
BH-16	E 1151 N 3503	25.0
BH-17	E 937 N 3501	25.0
BH-18	E 1443 N 3456	20.0
BH-19	E 1049 N 3500	20.0
BH-20	E 956 N 3493	20.0
BH-21	E 1344 N 3488	25.0
BH-22	E 1264 N 3434	25.0
BH-23	E 1157 N 3471	25.0
BH-24	E 1176 N 3017	25.0
BH-25	E 1304 N 3435	25.0
BH-26	E 1350 N 3255	25.0
BH-27	E 928 N 3442	25.0
BH-28	E 1009 N 3416	20.0
BH-29	E 711 N 3417	25.0
BH-30	E 1349 N 3425	25.0
BH-31	E 1060 N 3388	25.0
BH-32	E 1670 N 3419	20.0
BH-33	E 1172 N 3393	25.0
BH-34	E 1457 N 3001	25.0
BH-35	E 1010 N 3360	20.0
BH-36	E 1819 N 3369	20.0
BH-37	E 955 N 3368	20.0
BH-38	E 1411 N 3308	20.0
BH-39	E 1819 N 3369	25.0
BH-40	E 998 N 3343	20.0
BH-41	E 1270 N 3322	20.0
BH-42	E 958 N 3319	25.0
BH-43	E 1416 N 3364	20.0
BH-44	E 772 N 3336	25.0
BH-45	E 1160 N 3318	25.0
BH-46	E 1316 N 3323	25.0
BH-47	E 757 N 3288	25.0
BH-48	E 1219 N 3291	25.0
BH-49	E 1081 N 3296	25.0
BH-50	E 1281 N 3254	25.0
BH-51	E 1007 N 3246	25.0
BH-52	E 908 N 3261	30.0
BH-53	E 1171 N 3260	30.0
BH-54	E 1680 N 3246	20.0
BH-55	E 1314 N 3230	30.0
BH-56	E 1152 N 3231	30.0
BH-57	E 1077 N 3230	30.0
BH-58	E 1217 N 3229	30.0
BH-59	E 967 N 3209	30.0
BH-60	E 909 N 3227	30.0
BH-61	E 1265 N 3214	30.0
BH-62	E 1414 N 3223	30.0
BH-63	E 1178 N 3201	30.0
BH-64	E 1128 N 3195	30.0
BH-65	E 1335 N 3190	20.0
BH-66	E 1280 N 3169	30.0
BH-67	E 900 N 3182	25.0
BH-68	E 1050 N 3179	25.0
BH-69	E 1805 N 3156	30.0
BH-70	E 1216 N 3170	30.0
BH-71	E 1175 N 3163	20.0
BH-72	E 1598 N 3160	30.0
BH-73	E 886 N 3136	20.0
BH-74	E 1705 N 3142	30.0
BH-75	E 917 N 3123	25.0
BH-76	E 1204 N 3137	25.0
BH-77	E 816 N 3128	20.0
BH-78	E 1253 N 3105	30.0
BH-79	E 1172 N 3104	30.0
BH-80	E 2085 N 3091	25.0
BH-81	E 1430 N 3109	20.0
BH-82	E 1011 N 3100	20.0
BH-83	E 1306 N 3093	30.0
BH-84	E 1152 N 3073	20.0
BH-85	E 712 N 3086	30.0
BH-86	E 1217 N 3081	30.0
BH-87	E 902 N 3074	30.0
BH-88	E 1266 N 3062	25.0
BH-89	E 1551 N 3047	30.0
BH-90	E 884 N 3039	30.0
BH-91	E 967 N 3056	30.0
BH-92	E 1348 N 3034	30.0
BH-93	E 1172 N 3048	20.0
BH-94	E 1109 N 3047	25.0
BH-95	E 1678 N 3020	20.0
BH-96	E 831 N 3034	25.0
BH-97	E 1868 N 3033	25.0
BH-98	E 912 N 3024	30.0
BH-99	E 1753 N 3010	30.0
BH-100	E 1248 N 3017	20.0
BH-101	E 1047 N 3016	25.0
BH-102	E 1602 N 2997	30.0
BH-103	E 856 N 2994	25.0
BH-104	E 1082 N 2970	25.0
BH-105	E 916 N 2986	30.0

BORE HOLE (BH)		DEPTH (M)
MARKING	CO-ORDINATES	(REFER NOTE-2)
BH-106	E 888 N 2972	25.0
BH-107	E 1830 N 2953	25.0
BH-108	E 1278 N 2950	30.0
BH-109	E 1177 N 2943	30.0
BH-110	E 1422 N 2931	20.0
BH-111	E 1305 N 2930	20.0
BH-112	E 1009 N 2928	20.0
BH-113	E 908 N 2941	30.0
BH-114	E 814 N 2918	30.0
BH-115	E 1217 N 2918	25.0
BH-116	E 1154 N 2913	30.0
BH-117	E 1747 N 2930	20.0
BH-118	E 1609 N 2910	20.0
BH-119	E 1668 N 2908	25.0
BH-120	E 884 N 2920	20.0
BH-121	E 967 N 2897	30.0
BH-122	E 1905 N 2893	20.0
BH-123	E 1265 N 2898	30.0
BH-124	E 860 N 2885	25.0
BH-125	E 1557 N 2902	20.0
BH-126	E 1180 N 2881	30.0
BH-127	E 1349 N 2868	25.0
BH-128	E 1041 N 2865	30.0
BH-129	E 1128 N 2880	25.0
BH-130	E 1248 N 2855	30.0
BH-131	E 912 N 2848	25.0
BH-132	E 1877 N 2844	25.0
BH-133	E 825 N 2840	25.0
BH-134	E 1209 N 2839	30.0
BH-135	E 1150 N 2851	25.0
BH-136	E 1722 N 2829	25.0
BH-137	E 952 N 2825	25.0
BH-138	E 787 N 2840	25.0
BH-139	E 1337 N 2828	20.0
BH-140	E 1564 N 2819	25.0
BH-141	E 1421 N 2778	20.0
BH-142	E 1856 N 2771	20.0
BH-143	E 312 N 2784	25.0
BH-144	E 2408 N 2784	20.0
BH-145	E 2350 N 2777	20.0
BH-146	E 388 N 2776	20.0
BH-147	E 1766 N 2750	25.0
BH-148	E 1610 N 2681	25.0
BH-149	E 1423 N 2666	25.0
BH-150	E 771 N 2671	20.0
BH-151	E 1450 N 2584	25.0
BH-152	E 1497 N 2581	25.0
BH-153	E 1589 N 2547	25.0
BH-154	E 1501 N 2541	25.0
BH-155	E 1685 N 2538	25.0
BH-156	E 1452 N 2512	20.0
BH-157	E 1500 N 2488	25.0
BH-158	E 1684 N 2460	25.0
BH-159	E 865 N 2449	25.0
BH-160	E 948 N 2413	25.0
BH-161	E 1587 N 2429	25.0
BH-162	E 1452 N 2399	25.0
BH-163	E 885 N 2339	25.0
BH-164	E 1047 N 2339	20.0
BH-165	E 1408 N 2291	20.0
BH-166	E 1541 N 2204	25.0
BH-167	E 881 N 2212	20.0
BH-168	E 1407 N 2117	20.0
BH-169	E 1188 N 1944	20.0
BH-170	E 1393 N 1938	25.0
BH-171	E 955 N 1938	25.0
BH-172	E 1185 N 1777	20.0
BH-173	E 1185 N 1450	20.0
BH-174	E 1185 N 1167	20.0
BH-175	E 1663 N 3095	20.0

BORE HOLE FOR ISG (IBH)		DEPTH (M)
MARKING	CO-ORDINATES	(REFER NOTE-2)
IBH-1	E 1338 N 3767	25.0
IBH-2	E 1646 N 3767	25.0
IBH-3	E 1342 N 3622	25.0
IBH-4	E 1634 N 3623	25.0
IBH-5	E 1482 N 3788	25.0
IBH-6	E 1504 N 3672	25.0
IBH-7	E 1469 N 3607	25.0
IBH-8	E 1402 N 3826	25.0
IBH-9	E 1594 N 3825	25.0
IBH-10	E 1715 N 3565	25.0
IBH-11	E 1811 N 3767	25.0
IBH-12	E 1793 N 3622	25.0
IBH-13	E 843 N 3741	25.0
IBH-14	E 1122 N 3767	25.0
IBH-15	E 1221 N 3716	25.0
IBH-16	E 1218 N 3531	25.0
IBH-17	E 1219 N 3423	25.0
IBH-18	E 1218 N 3266	25.0
IBH-19	E 1218 N 2964	25.0
IBH-20	E 745 N 3722	25.0
IBH-21	E 787 N 3766	25.0
IBH-22	E 1201 N 3766	25.0
IBH-23	E 1194 N 3618	25.0
IBH-24	E 1194 N 3334	25.0
IBH-25	E 1042 N 3715	25.0
IBH-26	E 1569 N 3519	25.0
IBH-27	E 1166 N 3589	25.0
IBH-28	E 1137 N 3607	25.0
IBH-29	E 1254 N 3809	25.0
IBH-30	E 752 N 3479	25.0
IBH-31	E 830 N 3466	25.0
IBH-32	E 794 N 3534	25.0
IBH-33	E 1026 N 3326	25.0
IBH-34	E 1131 N 3266	25.0
IBH-35	E 1132 N 3102	25.0
IBH-36	E 1132 N 2951	25.0
IBH-37	E 787 N 3401	25.0
IBH-38	E 867 N 3431	25.0
IBH-39	E 814 N 3293	25.0
IBH-40	E 839 N 3591	25.0
IBH-41	E 700 N 3329	25.0
IBH-42	E 718 N 2750	25.0
IBH-43	E 798 N 2397	25.0
IBH-44	E 915 N 1955	25.0
IBH-45	E 795 N 1564	25.0
IBH-46	E 1155 N 1098	25.0
IBH-47	E 1304 N 700	25.0
IBH-48	E 1574 N 242	25.0
IBH-49	E 1899 N 351	25.0
IBH-50	E 797 N 2975	25.0
IBH-51	E 776 N 3035	25.0
IBH-52	E 775 N 3126	25.0
IBH-53	E 776 N 3228	25.0
IBH-54	E 815 N 3178	25.0
IBH-55	E 815 N 3297	25.0

DYNAMIC CONE PENETRATION TEST FOR ISG (IDCPIT)	
MARKING	CO-ORDINATES
IDCPIT-1	E 1433 N 3762
IDCPIT-2	E 1561 N 3599
IDCPIT-3	E



**K.C.T. Consultancy Services®**

Project : BHEL  
 Bore Hole No. : 107  
 Location : Talabira  
 Depth of Termination : 25.0 m  
 Co-ordinates : E183HN29ĭ ĭ  
 Depth of Water Table : Encountered at 2.70m depth during investigation

Date of Start: 29-12-2024  
 Date of Completion: 31-12-2024  
 Diameter of Bore: 150mm and Nx size  
 Bit Used: Soil Surface Bit and NX Size  
 Reduced Level: 204.50 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 <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N			
Rotary drilling method	0.00				0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	1.00	2.00	SPT	6	6	7	13	-	-	
	1.50			Dark gryish, fine to coarse grained, silty clayey sand with little gravels (SM-SC) 0.00 to 2.90m											
	2.00				2.00	2.00	2.50	SPT	5	7	8	15	-	-	
	2.50				2.50	2.50	3.00	UDS	-	-	-	-	-	-	
	3.00				3.00	3.00	3.50	SPT	17	25	32	57	-	-	
	3.50			Dark reddish brown, fine to medium grained, cemented, clayey sand with little gravels (SC) 2.90 to 4.70m	3.50	3.50	4.00	SPT	14	19	30	49	-	-	
	4.00				4.00	4.00	4.50	SPT	40	50/12 cm	-	>100	-	-	
	4.50				4.50	4.50	5.00	SPT	15	23	28	51	-	-	
	5.00				5.00	5.00	5.50	SPT	23	50/13 cm	-	>100	-	-	
	5.50				5.50	5.50	6.00	SPT	15	30	50	80	-	-	
	6.00				6.00	6.00	6.50	SPT	36	50/10 cm	-	>100	-	-	
	6.50			Dark brownish to yellowish brown, fine to very fine grained, cemented clayey sand with little gravels (SC) 4.70 to 9.60m	6.50	6.50	7.00	SPT	40	50/8 cm	-	>100	-	-	
	7.00				7.00	7.00	7.50	SPT	60/14 cm	-	-	>100	-	-	
	7.50				7.50	7.50	8.00	SPT	55/12 cm	-	-	>100	-	-	
	8.00				8.00	8.00	8.50	SPT	70	-	-	>100	-	-	
	8.50				8.50	8.50	9.00	SPT	85	-	-	>100	-	-	
	9.00				9.00	9.00	9.50	SPT	50/13 cm	-	-	>100	-	-	
	9.50				9.50	9.50	10.00	SPT	50/10 cm	-	-	>100	-	-	
	10.00				10.00	10.00	11.00	SPT	50/14 cm	-	-	>100	-	-	
	10.50														
	11.00				11.00	11.00	11.50	SPT	50/14 cm	-	-	>100	-	-	
	11.50				11.50	11.50	12.50	SPT	50/14 cm	-	-	>100	-	-	
	12.00														
	12.50				12.50	12.50	13.00	SPT	50/14 cm	-	-	>100	-	-	
	+ 13.00				13.00	13.00	14.00	SPT	50/10 cm	-	-	>100	-	-	
	13.50														
	14.00			Light whitish yellow, fine to coarse grained, cemented clayey sand with little gravels (SC) 9.60 to 19.60m	14.00	14.00	14.50	SPT	50/13 cm	-	-	>100	-	-	
	14.50				14.50	14.50	15.50	SPT	50/9 cm	-	-	>100	-	-	
	15.00														
	15.50				15.50	15.50	16.00	SPT	50/11 cm	-	-	>100	-	-	
	16.00				16.00	16.00	17.00	SPT	50/9 cm	-	-	>100	-	-	
	16.50														
	17.00				17.00	17.00	17.50	SPT	50/11 cm	-	-	>100	-	-	
	17.50				17.50	17.50	18.50	SPT	50/10 cm	-	-	>100	-	-	
	18.00														
	18.50				18.50	18.50	19.00	SPT	50/11 cm	-	-	>100	-	-	
	19.00				19.00	19.00	19.45	SPT	47	50/6 cm	-	>100	-	-	
	19.50														
	20.00			Mixture of highly weathered, completely fractured and disintegrated, light yellowish white, fine to coarse grained, gravel, pebble size fractured rock fragments with cemented yellowish white, fine to coarse grained, sand 19.60 to 22.20m	20.00	20.00	20.50	SPT	50/5 cm	-	-	>100	-	-	
	20.50				20.50	20.50	21.50	SPT	50/2 cm	-	-	>100	-	-	
	21.00														
	21.50				21.50	21.50	21.53	SPT	50/3 cm	-	-	>100	-	-	
	22.00				22.00	21.53	22.00	Core	-	-	-	-	33.33	-	
	22.50			Highly weathered, moderately weak, dark brownish, fine to coarse grained, fractured rock 22.20 to 24.00m											
	23.00														
	23.50				23.50	22.00	23.50	Core	-	-	-	-	24.00	-	
	24.00														
	24.50			Highly weathered, moderately strong, dark brownish, fine to coarse grained, fractured rock											
	25.00				25.00	23.00	25.00	Core	-	-	-	-	20.66	-	
24.00 to 25.00m															

**K.C.T. Consultancy Services®**

Project : BHEL

Bore Hole No. : 122

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 190(, N 289"

Depth of Water Table : Encountered at 3.45m depth during investigation

Date of Start: 16-12-2024




Date of Completion: 19-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 202.75

**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.S				Core Recov-ery (%)	RQD (%)	Remarks	
						From m	To m		N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N				
Rotary drilling method  ▼	0.00	Used		Reddish yellow, fine to medium grained, clayey sand (SC) <b>0.00 to 0.70m</b>	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50															
	1.00			Reddish brown, fine to coarse grained, clayey sand (SC) <b>0.70 to 1.80m</b>	1.00	1.00	2.00	SPT	12	15	17	32	-	-		
	1.50															
	2.00															
	2.50			Brownish, fine to medium grained, clayey sand with some gravels (SC) <b>1.80 to 3.30m</b>	2.50	2.50	3.00	UDS	-	-	-	-	-	-		
	3.00															
	3.50															
	4.00					4.00	4.00	4.50	SPT	27	51	50	>100	-	-	
	4.50															
	5.00															
	5.50															
	6.00	Mixture of dark brownish, fine to coarse grained, weakly cemented, clayey sand <b>3.30 to 10.30m</b>	6.00			6.00	6.50	SPT	60/9 cm	-	-	>100	-	-		
	6.50															
	7.00															
	7.50															
	8.00															
	8.50															
	9.00															
	9.50															
	10.00															
	10.50	Not Used			11.00	10.10	11.00	Core	-	-	-	-	28.57	-		
	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																
				<b>10.30 to 20.00m</b>	20.00	20.00	20.02	SPT	50/2 cm	-	-	>100				



**K.C.T. Consultancy Services®**

Project : BHEL

Bore Hole No. : 143

Location : Talabira

Depth of Termination : 25.0 M

Co-ordinates: E 312, N 2784

Depth of Water Table : Encountered at 4.60m depth during investigation

Date of Start: 10-01-2025

Date of Completion: 13-01-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 195.68m

**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 <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity with some gravels (CI) <b>0.00 to 0.80m</b>	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50														
	1.00				1.00	2.00	SPT	2	3	5	8	-	-		
	1.50														
	2.00			Yellowish brown, very fine grained, silty clays of intermediate plasticity with little gravels (CI) <b>0.80 to 3.40m</b>	2.00	2.00	2.50	SPT	3	3	4	7	-	-	
	2.50				2.50	3.00	SPT	3	3	5	8				
	3.00				3.00	3.50	SPT	4	5	5	8	-	-		
	3.50				3.50	4.00	SPT	5	5	7	12	-	-		
	4.00			Reddish brown, fine to very fine grained, silty clays of low plasticity with occasional gravels (CL) <b>3.40 to 5.90m</b>	4.00	4.00	4.50	SPT	5	6	7	13	-	-	
	4.50				4.50	5.00	SPT	5.00	5	6.00	11				
	5.00				5.00	5.50	SPT	6	7	7	14	-	-		
	5.50				5.50	6.00	SPT	6.00	7	8.00	15	-	-		
	6.00			Reddish brown, very fine grained, silty clays of intermediate plasticity (CI) <b>5.90 to 7.40m</b>	6.00	6.00	6.50	SPT	5	6	8	14	-	-	
	6.50				6.50	7.00	UDS	-	-	-	-	-	-		
	7.00				7.00	7.50	SPT	4	6	8	14	-	-		
	7.50				7.50	8.00	UDS	-	-	-	-	-	-		
	8.00			Yellowish brown, fine to very fine grained, sandy clays of low plasticity with little gravels (CL) <b>7.40 to 9.40m</b>	8.00	8.00	8.50	SPT	4	7	8	15	-	-	
	8.50				8.50	9.00	UDS	-	-	-	-	-	-		
	9.00				9.00	9.50	SPT	6	7	11	18	-	-		
	9.50				9.50	10.00	SPT	7	9	12	21	-	-		
	10.00			Yellowish brown, fine to very fine grained, clayey sand with occasional gravels (SC) <b>9.40 to 11.30m</b>	10.00	10.00	11.00	SPT	10	13	13	26	-	-	
	11.00				11.00	11.50	SPT	8	12	14	26	-	-		
	11.50				11.50	12.50	SPT	10	15	18	33	-	-		
	12.00														
	12.50			Yellowish brown, fine to coarse grained, silty sand with much gravels and pebble size fractured rock fragments <b>11.30 to 14.70m</b>	12.50	12.50	13.00	SPT	15	35	45	80	-	-	
	13.00				13.00	14.00	SPT	50/9 cm	-	-	>100	-	-		
	13.50														
	14.00				14.00	14.50	SPT	50/8 cm	-	-	>100	-	-		
	14.50				14.50	15.50	SPT	50/11 cm	-	-	>100	-	-		
	15.00			Boulderous formation of highly weathered, completely fractured and disintegrated, yellowish brown, fine to coarse grained, angular interlocking fragments of fractured rock mixed with yellowish brown, fine to coarse grained, clayey sand <b>14.70 to 19.50m</b>	15.50	15.50	16.00	SPT	50/10 cm	-	-	>100	-	-	
	16.00				16.00	17.00	SPT	50/11 cm	-	-	>100	-	-		
	16.50														
17.00	17.00	17.50	SPT		50/13 cm	-	-	>100	-	-					
17.50	17.50	18.50	SPT		50/12 cm	-	-	>100	-	-					
18.00															
18.50	18.50	19.00	UDS		50/10 cm	-	-	>100	-	-					
19.00	19.00	20.00	SPT		50/9 cm	-	-	>100	-	-					
19.50	Light greyish and yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC) <b>19.50 to 20.50m</b>														
20.00		20.00	20.50	SPT	27	34	30	73	-	-					
20.50		20.50	21.50	SPT	52/12 cm	-	-	>100	-	-					
21.00	Not used		Yellowish grey, fine to very fine grained, indurated, sandy clays of low plasticity (CL)-mud rock <b>20.50 to 22.50m</b>												
21.50			21.50	22.00	SPT	50/11 cm	-	-	>100	-	-				
22.00			22.00	23.00	SPT	50/10 cm	-	-	>100	-	-				
22.50															
23.00			23.00	23.50	SPT	50/9 cm	-	-	>100	-	-				
23.50			23.50	24.50	SPT	50/11 cm	-	-	>100	-	-				
24.00															
24.50			24.50	25.00	SPT	50/10 cm	-	-	>100	-	-				
25.00															
Page No 234 of 244															

**K.C.T. Consultancy Services®**

Project : BHEL

Bore Hole No. : 144

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 2408, N 2784

Depth of Water Table : Encountered at 5.30m depth during investigation

Date of Start: 22-12-2024

Date of Completion: 23-12-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 196.75 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 <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N			
Rotary drilling method  ▼  <															

**K.C.T. Consultancy Services®**

Project : BHEL

Bore Hole No. : 145

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 2350, N 2777

Depth of Water Table : Encountered at 1.50m depth during investigation

Date of Start: 20-09-2024

Date of Completion: 22-09-2024

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level: 197.10 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 <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N			
Rotary drilling method	0.00	Used		Yellowish brown, fine to very fine grained, sandy clays of low plasticity (CL) <b>0.00 to 0.70m</b>	0.00	0.00	1.00	DS	-	-	-	-	-	-	
	0.50			Brownish, fine to very fine grained, sandy clays of low plasticity (CL) <b>0.70 to 1.40m</b>	1.00	1.00	2.00	SPT	1	1	2	3	-	-	
	1.00			Dark yellowish brown, fine to very fine grained, sandy clays of intermediate plasticity (CI) <b>1.40 to 3.40m</b>	2.00	2.00	2.50	SPT	2	3	5	8	-	-	
	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				4.00	4.00	4.50	SPT	16	24	46	70	-	-	
	3.50				4.50	4.50	5.00	SPT	8	12	34	46	-	-	
	4.00			Yellowish brown, fine to medium grained, clayey sand (SC) <b>3.40 to 7.30m</b>	5.00	5.00	5.50	SPT	12	19	36	55	-	-	
	4.50				5.50	5.50	6.00	SPT	18	19	36	55	-	-	
	5.00				6.00	6.00	6.50	SPT	15	16	38	54	-	-	
	5.50				6.50	6.50	7.00	SPT	23	50/13 cm	-	>100	-	-	
	6.00				7.00	7.00	7.50	SPT	50/14 cm	-	-	>100	-	-	
	6.50				7.50	7.50	8.00	SPT	37	50/7 cm	-	>100	-	-	
	7.00			Yellowish brown, fine to medium grained, weakly cemented silty sand with occasional gravels (SM) <b>7.30 to 7.70m</b>	8.00	8.00	8.50	SPT	27	52/9 cm	-	>100	-	-	
	7.50				8.50	8.50	9.00	SPT	56/11 cm	-	-	>100	-	-	
	8.00	Not Used		Yellowish brown, fine to very fine grained, weakly cemented clayey sand (SC) <b>7.70 to 8.70m</b>	9.00	9.00	9.50	SPT	56/10 cm	-	-	>100	-	-	
	8.50				9.50	9.50	10.00	SPT	58/9 cm	-	-	>100	-	-	
	9.00				10.00	10.00	11.00	SPT	56/7 cm	-	-	>100	-	-	
	9.50				11.00	11.00	11.50	SPT	59/10 cm	-	-	>100	-	-	
	10.00			Yellowish brown, fine to medium grained, weakly cemented silty sand with occasional gravels (SM) <b>8.70 to 13.10m</b>	11.50	11.50	12.50	SPT	60/9 cm	-	-	>100	-	-	
	10.50				12.50	12.50	13.00	SPT	50/8 cm	-	-	>100	-	-	
	11.00				13.00	13.00	13.09	SPT	50/9 cm	-	-	>100	-	-	
	11.50				14.00	13.00	14.00	Core	-	-	-	-	33.33	-	
	12.00			Highly weathered, moderately weak, whitish yellow, fine to coarse grained, fractured rock <b>13.10 to 17.00m</b>	15.50	14.00	15.50	Core	-	-	-	-	18.66	-	
	12.50				15.50	15.50	15.53	SPT	50/3 cm	-	-	>100	-	-	
	13.00				17.00	15.53	17.00	Core	-	-	-	-	31.33	-	
	13.50				18.50	17.00	18.50	Core	-	-	-	-	32.00	8.00	
	14.00			Highly weathered, moderately strong, whitish yellow, fine to coarse grained, fractured rock <b>17.00 to 19.00m</b>											
	14.50														
	15.00														
	15.50														
	16.00														
	16.50														
	17.00														
	17.50														
	18.00														
	18.50														
	19.00														
	19.50														
	20.00														

19.00 to 20.00m

Page No 136 of 141

## K.C.T. Consultancy Services®

Project : BHEL

Bore Hole No. : 146

Location : Talabira

Depth of Termination : 20.0 M

Co-ordinates: E 388, N 2776

Depth of Water Table : Encountered at 0.80m depth during investigation

Date of Start: 05-05-2025

Date of Completion: 06-05-2025

Diameter of Bore: 150mm and Nx size

Bit Used: Soil Surface Bit and NX Size

Reduced Level:191.93m

## 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 <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N				
Rotary drilling method	0.00	Used		Brownish yellow, fine to medium grained, clayey sand (SC) <b>0.00 to 2.10m</b>	0.00	0.00	1.00	DS	-	-	-	-	-	-		
	0.50				1.00	1.00	2.00	SPT	1	2	2	4	-	-		
	1.00															
	1.50															
	2.00			Yellowish brown, fine to medium grained, clayey sand (SC) <b>2.10 to 3.30m</b>	2.00	2.00	2.50	SPT	2	4	5	9	-	-		
	2.50				2.50	3.00	UDS	-	-	-	-	-	-			
	3.00				3.00	3.50	SPT	4	5	6	11	-	-			
	3.50				3.50	4.00	SPT	7	9	15	24	-	-			
	4.00			Brownish yellow, fine to medium grained, silty sand with little plastic fines and much gravels (SM) <b>3.30 to 4.70m</b>	4.00	4.00	4.50	SPT	7	9	13	22	-	-		
	4.50				4.50	5.00	SPT	10	15	15	30	-	-			
	5.00				5.00	5.50	SPT	11	15	22	37	-	-			
	5.50				5.50	6.00	DS	-	-	-	-	-	-			
	6.00			Brownish yellow, fine to medium grained, poorly graded sand and silty sand with little to much gravels (SP-SM) <b>4.70 to 7.30m</b>	6.00	6.00	6.50	SPT	11	15	24	39	-	-		
	6.50				6.50	7.00	SPT	11	15	21	36	-	-			
	7.00				7.00	7.50	SPT	15	15	27	42	-	-			
	7.50				7.50	8.00	SPT	13	22	28	50	-	-			
	8.00			Yellowish brown, fine to coarse grained, poorly graded sand and silty sand with much gravels (SP-SM) <b>7.30 to 9.40m</b>	8.00	8.00	8.50	SPT	15	18	26	44	-	-		
	8.50				8.50	9.00	SPT	16	21	31	52	-	-			
	9.00				9.00	9.50	SPT	19	25	31	56	-	-			
	9.50				9.50	10.00	SPT	18	28	39	61	-	-			
	10.00				10.00	10.00	11.00	SPT	21	33	36	69	-	-		
	10.50				Light greyish, fine to very fine grained, clayey sand (SC) <b>9.40 to 13.50m</b>	11.00	11.00	11.50	SPT	19	22	32	54	-		-
	11.00					11.50	12.50	SPT	16	23	36	59	-	-		
	11.50					12.50	13.00	SPT	12	15	19	34	-	-		
	12.00			13.00		14.00	SPT	15	19	26	45	-	-			
	12.50				13.00	13.00	14.00	SPT	15	19	26	45	-	-		
	13.00				Greyish brown, fine fine to very fine grained, cemented clayey sand (SC) <b>13.50 to 18.50m</b>	14.00	14.00	14.50	SPT	16	20	28	48	-		-
	13.50					14.50	15.50	SPT	18	22	31	53	-	-		
	14.00					15.50	16.00	SPT	16	25	33	58	-	-		
	14.50			16.00		17.00	SPT	19	28	36	64	-	-			
	15.00				16.00	16.00	17.00	SPT	19	28	36	64	-	-		
	15.50				Light brownish, fine to very fine grained, cemented clayey sand (SC)	17.00	17.00	17.50	SPT	71/9 cm	-	-	>100	-		-
16.00	17.50	18.50	SPT			75/9 cm	-	-	>100	-	-					
16.50	18.50	19.00	SPT			78/10 cm	-	-	>100	-	-					
17.00	19.00	19.19	SPT	71/9 cm		-	-	>100	-	-						
17.50		19.00	19.00	19.19	SPT	71/9 cm	-	-	>100	-	-					
18.00		Light brownish, fine to very fine grained, cemented clayey sand (SC)	19.50	19.50	20.00	SPT	75/10 cm	-	-	>100	-	-				
18.50			20.00	20.10	SPT	75/10 cm	-	-	>100	-	-					
19.00			20.10	20.10	SPT	75/10 cm	-	-	>100	-	-					
19.50	20.10		20.10	SPT	75/10 cm	-	-	>100	-	-						
20.00		20.00	20.00	20.10	SPT	75/10 cm	-	-	>100	-	-					

18.60 to 20.00m











