ASSAM ELECTRICITY GRID CORPORATION LIMITED

Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SUBMITTED BY:

P.K.DUTTA & CO.
'SAI TOWER' BLOCK-A 1ST FLOOR,
NAIHATI, WEST BWNGAL-743165

A TABLE OF CONTENTS

PAGE NO

A) BY WASH BORING METHOD

A.1.0 INTRODUCTION 1
A.2.0 FIELD INVESTIGATION 1
A.2.1 GENERAL 1
A.2.2 BORING/SAMPLING 3
A.2.3 STANDARD PENETRATION TEST 3-6
A.2.4 MEASUREMENT OF WATER LEVEL 6
A.2.5 ROTARY CORE DRILLING 7
A.3.0 LABORATORY TESTING 7
A.4.0 SUB-SOIL PROFILE 8
A.4.1 PROPERTIES OF STRATUM 8-18
A.5.0 CHOICE OF FOUNDATION 19
A.5.1 SAMPLE CALCULATION OF SHALLOW FOUNDATION 19-117
A.6.0 PILE FOUNDATION 118
A.6.0.1 SAMPLE CALCULATION OF PILE FOUNDATION 118-192
A.6.0.2 LATERAL LOAD CARRYING CAPACITY 193-197

B) BY PLATE LOAD TEST 198-202

C) STANDARD PROCTOR COMPACTION TEST 203

D) CHEMICAL TEST
D.1 CHEMICAL TEST ON SOIL SAMPLE 204-205

E) CONCLUSION & RECOMANDATION 205

ANNEXURE

FIELD BORELOG DATA SHEET 206 - 217
SUB-SOIL PROFILE 218 - 221
PLOT OF SPT VALUE 222 - 233
LABORATORY TEST RESULTS 234 - 236
GRAIN SIZE DISTRIBUTION CURVE 237 - 248
SHEAR TEST CURVE 249 - 259
EARTH REGISTIVITY TEST REPORT 260 - 264
SIGN FIELD DATA SHEET 265 - 278
FIELD PHOTOGRAPH 279 - 282

A) BY BORING METHOD

A.1.0 INTRODUCTION:

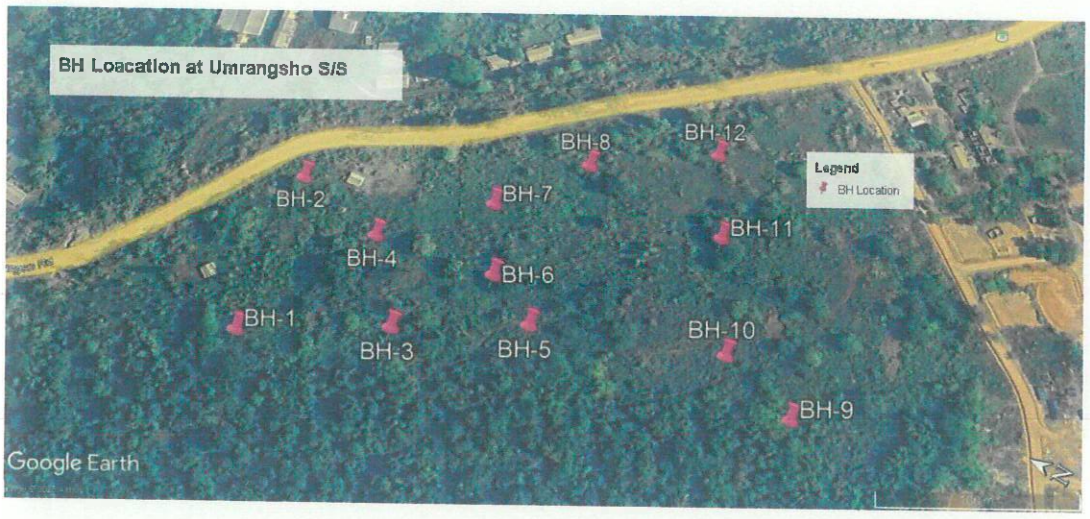
The Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam. has been awarded to P K Dutta& Co. Naihati, WB by Assam Electricity Grid Corporation Limited. Field Soil Exploration of bore holes, conducting of Plate Load Tests and Proctor density test have been completed during 25.09.2026 to 11.10.2026.

The objective of this soil investigation consisting of borings including, execution of Plate Load Tests ,California Bearing Ratio and Proctor Density test, collection of undisturbed & disturbed soil samples, conducting relevant laboratory tests, to study the soil stratifications, characteristics and engineering properties and suggesting safe approach to design and construction of foundation of proposed structure.

A.2.0 FIELD INVESTIGATION:

A.2.1 GENERAL:

For the design of the foundation for the proposed structure to be constructed at the site, this geotechnical investigation was done. In field work, the type of sub-soil profile and their characterization have been revealed. Laboratory testing and Plate Load Tests actually helps in determining relevant geotechnical properties of the sub-surface deposits leading to finalization of foundation depths and type of the structures and the bearing capacity with particular reference to the sub-surface types and their strength parameters and settlement potentials at the site.



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Schedule of boreholes is tabulated form is given below:

Bore Hole No.	Terminating Depth (m)	GPS		Date of Commencement	Date of Completion
		LONGITUDE	LATITUDE		
BH-1	15.00	92°46'04.90"	25°31'31.95"	10.10.2026	11.10.2026
BH-2	15.00	92°46'07.99"	25°31'32.62"	09.10.2026	10.10.2026
BH-3	15.00	92°46'06.27"	25°31'29.82"	06.10.2026	07.10.2026
BH-4	15.00	92°46'07.63"	25°31'30.92"	07.10.2026	08.10.2026
BH-5	15.00	92°46'07.49"	25°31'27.98"	30-09-2026	01-10-2026
BH-6	15.00	92°46'08.00"	25°31'28.90"	02-10-2026	03-10-2026
BH-7	15.00	92°46'09.28"	25°31'29.57"	05.10.2026	06.10.2026
BH-8	15.00	92°46'10.87"	25°31'28.56"	04.10.2026	05.10.2026
BH-9	15.00	92°46'08.25"	25°31'23.82"	28.09.2026	29.09.2026
BH-10	15.00	92°46'08.71"	25°31'25.12"	29.09.2026	30.09.2026
BH-11	15.00	92°46'10.69"	25°31'26.03"	27.09.2026	28.09.2026
BH-12	15.00	92°46'12.25"	25°31'26.74"	25.09.2026	26.09.2026

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A.2.2 BORING/SAMPLING:

Of the different types of explorations, borings are the most practical and relatively correct method of obtaining sub-surface information. 12 (twelve) nos. bore holes of 150 mm diameter were sunk as per specifications and IS: 1892 and were extended up to specified depth 15.00m each for visualizing the stratification of soil. Casings as required were used to retain the borehole. Boring was carried out by Shell and Augur followed by Wash boring method in soil.

The details of these bore holes including field tests of Standard Penetration tests and also collection of disturbed and undisturbed soil samples are given in Bore Logs enclosed. Disturbed & SPT representative samples of sub-surface deposits were collected from bore holes, labeled depth wise and placed in polythene bags. Reference Numbers and depth of these samples are shown in Bore Log Data Sheets.

For proper evaluation of engineering properties of in-situ soils, including shear parameters and consolidation characteristics , representative undisturbed soil samples were collected at intervals along the boreholes, whenever clayey silt/silty clay or silty fine sand with clay binders were encountered.

Disturbed representative soil samples were collected during progress of boring, from shell and also from split-spoon sampler of Standard Penetration Tests conducted at different depth in boreholes. Such soil sample contains all the constituent materials of the respective stratum. Depth and details of the sample are shown in the borehole logs (Annexure).

A.2.3 STANDARD PENETRATION TEST (SPT):

The standard penetration tests were conducted as per IS 2131-1981. The split spoon sampler, connected with a string of drill rods, was lowered into the bottom of the bore hole. The sampler was driven into the soil stratum up to a maximum depth of 450mm. by making use of 63.5 kg. Weight falling freely from a height of 750mm on to an anvil fixed on the top of drill rod. The number of blows required to penetrate each of the successive 150mm. depths was counted to produce a total penetration of 450mm. To avoid seating errors, the blows required for the first 150mm. of penetration was not taken into account. Those required to increase the penetration from 150mm. to 450mm. constituted the N-number. On completion of the test, the sampler was lifted to the ground, opened, and the specimen of the soil sample was stored in polythene bags with the proper identification mark. N-value is noted in borehole log data sheets against the corresponding depth.

Followings are the corrections on SPT values in cohesion-less soil:

1. Due to overburden: N value for cohesion-less soil shall be corrected for overburden as per Fig. 1 of IS: 2131 (N').
2. Due to Dilatancy: The values corrected for overburden shall be corrected for dilatancy if the stratum consists of fine sand and silt below water table for values of N' greater than 15, as under (N"): N" = 15+0.5*(N'-15)

Typical calculation for N value correction:

BH No.-1: 5.00m to 5.45m. Field N = 42. Water table: NIL
Effective OVP at the average depth: = 1.00 Kg/cm^2.
From Fig 1. of IS: 2131, correction factor = 1.00
So corrected SPT value for overburden, N' = 1.00x42= 42.00
Dilatancy(N")=15+0.5(42.00-15) = 28.50
Corrected SPT value=29
Same calculation will be valid for other N values in sandy layer. All the correction in detail is presented in a tabular form below.

AVG. BULK DENSITY (gm/cc)		1.91	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-1	2.00	2.45	2.23	9	0.42	0.53	0.42	1.25	11.25	-	11
	3.00	3.45	3.23	17	0.62	0.62	0.62	1.11	18.87	16.94	17
	5.00	5.45	5.23	42	1.00	0.71	1.00	1.00	42.00	28.50	29
	7.00	7.25	7.13	100	1.36	0.80	1.36	0.89	89.00	52.00	52

AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-2	2.00	2.45	2.23	10	0.43	0.46	0.43	1.24	12.40	-	12
	3.00	3.45	3.23	19	0.62	0.55	0.62	1.11	21.09	18.05	18
	4.50	4.77	4.64	100	0.89	0.72	0.89	1.02	102.00	58.50	59
	6.00	6.25	6.13	100	1.18	0.89	1.18	0.94	94.00	54.50	55

AVG. BULK DENSITY (gm/cc)		1.90	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-3	2.00	2.45	2.23	13	0.42	0.48	0.42	1.25	16.25	15.63	16
	3.00	3.25	3.13	100	0.59	0.56	0.59	1.13	113.00	64.00	64
	4.50	4.70	4.60	100	0.87	0.68	0.87	1.03	103.00	59.00	59

AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-4	2.00	2.45	2.23	14	0.43	0.57	0.43	1.24	17.36	16.18	16
	3.00	3.45	3.23	32	0.62	0.66	0.62	1.11	35.52	25.26	25
	5.00	5.45	5.23	46	1.00	0.83	1.00	1.00	46.00	30.50	31
	7.00	7.37	7.19	100	1.38	1.01	1.38	0.88	88.00	51.50	52

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AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-5	2.00	2.45	2.23	13	0.43	0.46	0.43	1.24	16.12	15.56	16
	3.00	3.45	3.23	19	0.62	0.55	0.62	1.11	21.09	18.05	18
	5.00	5.45	5.23	22	1.00	0.72	1.00	1.00	22.00	18.50	19
	7.00	7.35	7.18	100	1.38	0.89	1.38	0.88	88.00	51.50	52

AVG. BULK DENSITY (gm/cc)		1.91	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-6	2.00	2.45	2.23	10	0.42	0.51	0.42	1.25	12.50	-	13
	3.00	3.45	3.23	28	0.62	0.60	0.62	1.11	31.08	23.04	23
	5.00	5.35	5.18	100	0.99	0.77	0.99	1.00	100.00	57.50	58

AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-7	2.00	2.45	2.23	11	0.43	0.54	0.43	1.24	13.64	-	14
	3.00	3.45	3.23	25	0.62	0.62	0.62	1.11	27.75	21.38	21
	4.50	4.75	4.63	100	0.89	0.75	0.89	1.02	102.00	58.50	59

AVG. BULK DENSITY (gm/cc)		1.93	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-8	2.00	2.45	2.23	12	0.43	0.56	0.43	1.24	14.88	-	15
	3.00	3.45	3.23	26	0.62	0.64	0.62	1.11	28.86	21.93	22
	5.00	5.22	5.11	100	0.99	0.80	0.99	1.00	100.00	57.50	58

AVG. BULK DENSITY (gm/cc)		1.93	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-9	2.00	2.45	2.23	11	0.43	0.53	0.43	1.24	13.64	-	14
	3.00	3.45	3.23	25	0.62	0.62	0.62	1.11	27.75	21.38	21
	4.50	4.63	4.57	100	0.88	0.79	0.88	1.02	102.00	58.50	59

AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-10	2.00	2.45	2.23	12	0.43	0.55	0.43	1.24	14.88	-	15
	3.00	3.45	3.23	26	0.62	0.64	0.62	1.11	28.86	21.93	22
	4.50	4.70	4.60	100	0.88	0.76	0.88	1.02	102.00	58.50	59
	6.00	6.45	6.23	78	1.20	0.90	1.20	0.94	73.32	44.16	44
	7.50	7.75	7.63	100	1.46	1.02	1.46	0.86	86.00	50.50	51

AVG. BULK DENSITY (gm/cc)		1.91	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-11	2.00	2.45	2.23	10	0.42	0.54	0.42	1.25	12.50	-	13
	3.00	3.45	3.23	27	0.62	0.63	0.62	1.11	29.97	22.49	22
	5.00	5.45	5.23	40	1.00	0.80	1.00	1.00	40.00	27.50	28
	7.50	7.70	7.60	100	1.45	1.01	1.45	0.86	86.00	50.50	51
	9.00	9.17	9.09	100	1.74	1.14	1.74	0.81	81.00	48.00	48

AVG. BULK DENSITY (gm/cc)		1.92	WATER TABLE (M)				NIL				
BH NO.	START DEPTH (m)	END DEPTH (m)	AVG. DEPTH (m)	FIELD N VALUE	EFFECTIVE OVP (kg/cm2)		EFFECTIVE OVP (kg/cm2)	OVP CORR. FACTOR	CORRECTION		CORRECTED N
					ABOVE WT	BELOW WT			OVERBURDEN	DILATANCY	
BH-12	2.00	2.45	2.23	11	0.43	0.55	0.43	1.24	13.64	-	14
	3.00	3.45	3.23	30	0.62	0.64	0.62	1.11	33.30	24.15	24
	5.00	5.45	5.23	44	1.00	0.81	1.00	1.00	44.00	29.50	30
	7.00	7.25	7.13	100	1.37	0.97	1.37	1.00	100.00	57.50	58
	8.50	8.62	8.56	100	1.64	1.10	1.64	0.82	82.00	48.50	49

A.2.4 MEASUREMENT OF WATER TABLE:

Depth of level of water was noted when struck in. This is termed as depth of observed water table below existing ground level (EGL). Depth of ground water table (GWT) below EGL after 24 hours of removal of casing was also noted and shown in the profile. Ground water table was not encountered at any Borehole or Trail Pit. However ground water table is considered at ground level for design purpose.

BH No.	Depth (m)	Depth of GWT below EGL (m)	Commenced on	Completed on
BH-1	15.00	NIL	10.10.2026	11.10.2026
BH-2	15.00	NIL	09.10.2026	10.10.2026
BH-3	15.00	NIL	06.10.2026	07.10.2026
BH-4	15.00	NIL	07.10.2026	08.10.2026
BH-5	15.00	NIL	30.09.2026	01.10.2026
BH-6	15.00	NIL	02.10.2026	03.10.2026
BH-7	15.00	NIL	05.10.2026	06.10.2026
BH-8	15.00	NIL	04.10.2026	05.10.2026
BH-9	15.00	NIL	28.09.2026	29.09.2026
BH-10	15.00	NIL	29.09.2026	30.09.2026
BH-11	15.00	NIL	27.09.2026	28.09.2026
BH-12	15.00	NIL	25.09.2026	26.09.2026

Note: GWT=Ground Water Table, EGL=Existing Ground Level

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A.2.5 ROTARY CORE DRILLING:

Conventional diamond core drilling equipment was used for drilling vertical holes up to specified depth at each location. Rotary core drilling in rock was carried out according to IS 1892-1979. This drilling technique was regarded as the most satisfactory method of assessing the character of rock formations, which lie at depth below the ground surface. Specimens of rock in the form of cylindrical cores were recovered from the drill hole by means of a core barrel. Double barrel technique was adopted according to field condition. The core barrel was provided at its lower end with a detachable shoe or core bit, which is of diamond. All rotary core bits were of NX (75mm) size.

A.3.0 LABORATORY TESTING:

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

For Soil Samples:

1. Grain size analysis (Sieve as well as Hydrometer).
2. Liquid Limit & Plastic Limit.
3. Natural Moisture Content.
4. Specific Gravity.
5. Bulk & Dry Density.
6. Triaxial Shear Test (UU)
7. Unconfined Compressive Test (UC)
8. Direct Shear Test (DS)
9. Consolidation Test (**Oedometer test or a One-dimensional compression test.**)
10. Proctor Density
11. CBR
12. Free Swell Index
13. Relative Density
14. Chemical Analysis

For Water Samples:

1. Chemical Analysis

The above mentioned laboratory tests were done following the testing procedure given in the relevant parts of IS: 2720 and other relevant IS codes. Results of all tests are furnished in Annexure of this report.

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A.4.0 SUBSOIL PROFILE & ENGINEERING PROPERTIES:

4.1. BH-1:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very consistency brownish to reddish grey silty clay with kankars." Depth of this layer is 7.00m. Average Field "N" value of this layer is 23. This layer is laying after EGL and continues up to 7.00m.

Physical properties		
Gravel	%	4
Sand	%	4
Silt	%	36
Clay	%	56
Liquid limit	%	44.56
Plastic limit	%	23.25

PI		21.31
Bulk density	g/cc	1.91
Dry density	g/cc	1.44
NMC	%	32.30
Sp. Gr.		2.68
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.54
Ø	°	0
Consolidation		
M_v	m^2/t	0.0039
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured, weathered shale." Depth of this layer is 8.00m. Field "N" value of this layer is more than 100. This layer is laying after 7.00 and continues up to its termination depth (15.00m).

Range of TCR (%)	13% to 23%
Range of RQD (%)	NIL to 10%

4.2. BH-2:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff consistency, brownish to reddish yellow, silty clay with kankars." Depth of this layer is 4.50m. Average Field "N" value of this layer is 15. This layer is laying after EGL and continues up to 4.50m.

Physical properties		
Gravel	%	5
Sand	%	4
Silt	%	35
Clay	%	56
Liquid limit	%	45.06
Plastic limit	%	23.35

PI		21.71
Bulk density	g/cc	1.92
Dry density	g/cc	1.44
NMC	%	32.95
Sp. Gr.		2.69
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.55
Ø	°	0
Consolidation		
M_v	m^2/t	0.0040
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured, weathered shale." Depth of this layer is 10.50m. Average field "N" value of this layer is more than 100. This layer is laying after 4.50 and continues up to its termination depth (15.00m).

Range of TCR (%) 10% to 18%
Range of RQD (%) NIL

4.3. BH-3:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff consistency, brownish grey silty clay with kankars." Depth of this layer is 3.50m. Average Field "N" value of this layer is more than 100. This layer is laying after EGL and continues up to 3.50m.

Physical properties		
Gravel	%	2
Sand	%	5
Silt	%	39
Clay	%	54
Liquid limit	%	42.23
Plastic limit	%	22.00

PI		20.23
Bulk density	g/cc	1.90
Dry density	g/cc	1.45
NMC	%	31.11
Sp. Gr.		2.70
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.53
Ø	°	0
Consolidation		
M_v	m^2/t	0.0038
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured, weathered shale." Depth of this layer is 11.50m. Field "N" value of this layer is more than 100. This layer is laying after 3.50m and continues up to its termination depth (15.00m).

Range of TCR (%)	09% to 19%
Range of RQD (%)	NIL

4.4. BH-4:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff consistency, brownish grey silty clay with kankars." Depth of this layer is 3.00m. Average Field "N" value of this layer is 14. This layer is laying after EGL and continues up to 3.00m.

Physical properties		
Gravel	%	2
Sand	%	4
Silt	%	37
Clay	%	57
Liquid limit	%	45.50
Plastic limit	%	23.65

PI		21.85
Bulk density	g/cc	1.91
Dry density	g/cc	1.45
NMC	%	31.50
Sp. Gr.		2.69
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.53
Ø	°	0
Consolidation		
M_v	m^2/t	0.0040
Classification		
IS Classification		CI

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Very stiff, to hard brownish grey silty clay with kankars." Depth of this layer is 4.00m. Average Field "N" value of this layer is 39. This layer is laying after 3.00m and continues up to 7.00m.

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Physical properties		
Gravel	%	3
Sand	%	3
Silt	%	35
Clay	%	59
Liquid limit	%	48.00
Plastic limit	%	25.00

PI		23.00
Bulk density	g/cc	1.93
Dry density	g/cc	1.43
NMC	%	34.50
Sp. Gr.		2.72
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.64
Ø	°	0
Consolidation		
M_v	m^2/t	0.0043
Classification		
IS Classification		Cl

STRATUM-III:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured,weathered shale." Depth of this layer is 8.00m. Field "N" value of this layer is more than 100. This layer is laying after 7.00m and continues up to its termination depth (15.00m).

Range of TCR (%) 09% to 18%
Range of RQD (%) NIL

4.5. BH-5:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff, brownish grey silty clay with kankars." Depth of this layer is 7.00m. Average Field "N" value of this layer is 18. This layer is laying after EGL and continues up to 7.00m.

Physical properties		
Gravel	%	2
Sand	%	5
Silt	%	38
Clay	%	55
Liquid limit	%	43.37
Plastic limit	%	23.00

PI		20.37
Bulk density	g/cc	1.92
Dry density	g/cc	1.44
NMC	%	33.29
Sp. Gr.		2.70
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.57
Ø	°	0
Consolidation		
M_v	m^2/t	0.0042
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured, weathered shale." Depth of this layer is 8.00m. Field "N" value of this layer is more than 100. This layer is laying after 7.00m and continues up to its termination depth 15.00m.

Range of TCR (%) 10% to 25%
Range of RQD (%) NIL to 13%

4.6. BH-6:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff, consistency brownish grey silty clay with kankars." Depth of this layer is 5.00m. Average Field "N" value of this layer is 19. This layer is laying after EGL and continues up to 5.00m.

Physical properties		
Gravel	%	2
Sand	%	4
Silt	%	38
Clay	%	56
Liquid limit	%	45.00
Plastic limit	%	22.25

PI		22.75
Bulk density	g/cc	1.91
Dry density	g/cc	1.44
NMC	%	33.26
Sp. Gr.		2.68
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.56
Ø	°	0
Consolidation		
M_v	m^2/t	0.0040
Classification		
IS Classification		CI

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured, weathered shale." Depth of this layer is 10.00m. Field "N" value of this layer is more than 100. This layer is laying after 5.00m and continues up to its termination depth 15.00m.

Range of TCR (%) 14% to 27%
Range of RQD (%) NIL to 15%

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4.7. BH-7:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff, brownish grey silty clay with kankars." Depth of this layer is 4.50m. Average Field "N" value of this layer is 18. This layer is laying after EGL and continues up to 4.50m.

Physical properties		
Gravel	%	3
Sand	%	3
Silt	%	37
Clay	%	57
Liquid limit	%	45.50
Plastic limit	%	23.25

PI		22.25
Bulk density	g/cc	1.92
Dry density	g/cc	1.45
NMC	%	31.29
Sp. Gr.		2.70
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.58
Ø	°	0
Consolidation		
M_v	m^2/t	0.0040
Classification		
IS Classification		CI

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured,weathered shale." Depth of this layer is 10.50m. Average Field "N" value of this layer is more than 100. This layer is laying after 4.50m and continues up to its termination depth (15.00m).

Range of TCR (%) 12% to 22%
Range of RQD (%) NIL to 10%

4.8. BH-8:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff consistency, brownish grey silty clay with kankars." Depth of this layer is 5.00m. Average Field "N" value of this layer is 19. This layer is laying after EGL and continues up to 5.00m.

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Physical properties		
Gravel	%	2
Sand	%	4
Silt	%	37
Clay	%	57
Liquid limit	%	45.09
Plastic limit	%	23.50

PI		21.59
Bulk density	g/cc	1.93
Dry density	g/cc	1.47
NMC	%	30.24
Sp. Gr.		2.69
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.58
Ø	°	0
Consolidation		
M_v	m^2/t	0.0041
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, brownish to dark grey coloured, weathered shale." Depth of this layer is 10.00m. Average Field "N" value of this layer is more than 100. This layer is laying after 5.00m and continues up to its termination depth (15.00m).

Range of TCR (%) 14% to 19%
Range of RQD (%) NIL

4.9. BH-9:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock fragments." Depth of this layer is 4.50m. Average Field "N" value of this layer is 18. This layer is laying after EGL and continues up to 4.50m.

Physical properties		
Gravel	%	4
Sand	%	4
Silt	%	38
Clay	%	54
Liquid limit	%	46.50
Plastic limit	%	24.75

PI		21.75
Bulk density	g/cc	1.93
Dry density	g/cc	1.46
NMC	%	32.50
Sp. Gr.		2.70
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.57
Ø	°	0
Consolidation		
M_v	m^2/t	0.0041
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured, weathered shale." Depth of this layer is 10.50m. Field "N" value of this layer is more than 100. This layer is laying after 4.50m and continues up to its termination depth (15.00m).

Range of TCR (%) 12% to 23%
Range of RQD (%) NIL

4.10. BH-10:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock fragments." Depth of this layer is 4.50m. Average Field "N" value of this layer is 19. This layer is laying after EGL and continues up to 4.50m.

Physical properties		
Gravel	%	5
Sand	%	4
Silt	%	36
Clay	%	55
Liquid limit	%	44.26
Plastic limit	%	23.50

PI		20.76
Bulk density	g/cc	1.92
Dry density	g/cc	1.46
NMC	%	31.99
Sp. Gr.		2.69
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.58
Ø	°	0
Consolidation		
M_v	m^2/t	0.0042
Classification		
IS Classification		CI

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured,weathered shale." Depth of this layer is 1.50m. Average Field "N" value of this layer is more than 100. This layer is laying after 4.50m and continues up to 6.00m.

Range of TCR (%) 10%
Range of RQD (%) NIL

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STRATUM-III:-

The properties of the layer are as follows:

Description:
This layer consists of "Hard consistency,dark grey,clay." Depth of this layer is 1.50m. Average Field "N" value of this layer is 78. This layer is laying after 6.00m and continues up to 7.50m.

Range of TCR (%) 7%
Range of RQD (%) NIL

STRATUM-IV:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured, weathered shale." Depth of this layer is 9.00m. Average Field "N" value of this layer is more than 100. This layer is laying after 7.50m and continues up to its termination depth (15.00m).

Range of TCR (%) 13% to 22%
Range of RQD (%) NIL to 12%

4.11. BH-11:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff consistency, brownish to reddish grey silty clay with kankars." Depth of this layer is 3.00m. Field "N" value of this layer is 10. This layer is laying after EGL and continues up to 3.00m.

Physical properties		
Gravel	%	3
Sand	%	4
Silt	%	40
Clay	%	53
Liquid limit	%	43.33
Plastic limit	%	22.69

PI		20.64
Bulk density	g/cc	1.90
Dry density	g/cc	1.44
NMC	%	31.64
Sp. Gr.		2.68
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.50
Ø	°	0
Consolidation		
M_v	m^2/t	0.0039
Classification		
IS Classification		Cl

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "very stiff to hard, brownish to reddish grey silty clay." Depth of this layer is 4.50m. Average Field "N" value of this layer is 34. This layer is laying after 3.00m and continues up to 7.50m.

Physical properties		
Gravel	%	2
Sand	%	3
Silt	%	38
Clay	%	57
Liquid limit	%	45.00
Plastic limit	%	23.50

PI		21.50
Bulk density	g/cc	1.92
Dry density	g/cc	1.43
NMC	%	34.11
Sp. Gr.		2.68
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.62
Ø	°	0
Consolidation		
M_v	m^2/t	0.0043
Classification		
IS Classification		CI

STRATUM-III:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to highly, weathered, dark grey coloured, weathered shale." Depth of this layer is 7.50m. Average Field "N" value of this layer is more than 100. This layer is laying after 7.50m and continues up to its termination depth (15.00m).

Range of TCR (%) 9% to 19%
Range of RQD (%) NIL to 10%

4.12. BH-12:

STRATUM-I:-

The properties of the layer are as follows:

Description:
This layer consists of "Stiff consistency, brownish to reddish grey silty clay with kankars." Depth of this layer is 3.00m. Field "N" value of this layer is 11. This layer is laying after EGL and continues up to 3.00m.

Physical properties		
Gravel	%	4
Sand	%	5
Silt	%	36
Clay	%	55
Liquid limit	%	46
Plastic limit	%	24.50

PI		21.50
Bulk density	g/cc	1.91
Dry density	g/cc	1.45
NMC	%	32.00
Sp. Gr.		2.68
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.52
Ø	°	0
Consolidation		
M_v	m^2/t	0.0041
Classification		
IS Classification		CI

STRATUM-II:-

The properties of the layer are as follows:

Description:
This layer consists of "Very stiff, brownish grey silty clay with kankars." Depth of this layer is 4.00m. Field "N" value of this layer is 37. This layer is laying after 3.00m and continues up to 7.00m.

Physical properties		
Gravel	%	3
Sand	%	4
Silt	%	34
Clay	%	59
Liquid limit	%	47.50
Plastic limit	%	25.00

PI		22.50
Bulk density	g/cc	1.93
Dry density	g/cc	1.43
NMC	%	34.67
Sp. Gr.		2.69
Free swell Index	%	----

Shear strength		
C	kg/cm^2	0.63
Ø	°	0
Consolidation		
M_v	m^2/t	0.0045
Classification		
IS Classification		CI

STRATUM-III:-

The properties of the layer are as follows:

Description:
This layer consists of "Completely to high, weathered, dark grey coloured, weathered shale" Depth of this layer is 8.00m. Average Field "N" value of this layer is more than 100. This layer is laying after 7.00m and continues up to its termination depth (15.00m).

Range of TCR (%) 12% to 34%
Range of RQD (%) 10% to 19%

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5.0 CHOICE OF FOUNDATION:

In views of the above sub-soil conditions in mind and the type of structure both the aspects regarding allowable bearing capacity for shallow foundation and deep foundation have been discussed in the following paragraphs. Designer can choose the requirement depending upon the loading & geometry of the structure envisaged.

5.0.1 SHALLOW FOUNDATION:

5.1. SAMPLE CALCULATION

5.1.1BH-1:-

Stratum-I:

Assumed foundation size = 3.00 m x 3.00 m
Depth of foundation = 3.00 m.
The founding depth is falling in Stratum-I.

DETERMINATION OF BEARING CAPACITY:

As per Indian Standard IS 6403: 1981
(For Sqaure Footing)(Width 3.0mX3.0m)

Bearing Capacity as per IS 6403:1981 considering 3.00m depth of foundation

$q_d = 1/F[C.N_c.s_c.d_c.i_c + \gamma'D.(Nq-1).s_q.d_q.i_q + 0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W']$

Where:

q_d= Allowable Bearing Capacity

C= Cohision= 5.4 t/sqm

γ'= Submerged density = $(\gamma-1)$ = 1.91-1 = 0.91 t/m^3

For, Ø= 0º, Bearing Capacity factors, Nc=5.14, Nq= 1.00, Nγ= 0.00,

s_q & s_γ= Shape correction. s_q = 1.20 and s_γ = 0.80

s_c=1.30

d_q & d_γ= Depth correction. Here, d_q = 1.00 and d_γ= 1.00

d_c=1.20

i_q & i_γ = Inclination Factor.= (1- α/90) =(1-0/90)=1 (α = inclination of the load to the vertical, in degree); α = 0, [refer : IS 6403-1981, Cls- 5.1.2.3, and B.C Punmia Pg-660]

W'= Water table correction =0.5 (Considering fully submerged condition for design purpose)

F= Factor of safety, considering 3

D= 3.00 metre

B= 3.00 metre

Hence:

$q_d = 1/F[C.Nc.d_c.s_c.i_c + \gamma'D.(Nq-1).s_q.d_q.i_q + 0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W']$

= 1/(3)[5.4*5.14*1.20*1.30*1.00+0.91*3*(1.00-1)*1.20*1.00*1.00+ 0.5*1.91*3*0.00*0.8*1.00*1.00*0.5]

= 14.43 T/Sqm

Settlement Analysis of Shallow Foundation

Settlement, S = H x mv x Δp.

Here,

S= Anticipated Settlement

H= Height of strata= 1.5 B= 1.5X3.0= 4.50 m

mv= Co-efficient of Volume Change = 0.0039 sqm/t

Note – For Δp, As per IS:8009 (Part-I) – 1976, we take 2:1 Stress Distribution method,

Δp = Increment of stress = (3*3*14.43)/{(3+2.25)^2} = 4.71 t/ Sqm

Therefore,

S= 4.5X 0.0039X 4.71 X 1000 = 82.66 mm

The permissible settlement is 40 mm

Hence the allowable bearing capacity of Shallow foundation is 6.98 t/sqm

Stratum-II:

Assumed foundation size = 3.00 m x 3.00 m

Depth of foundation = 7.00 m.

The founding depth is falling in Stratum-II.

DETERMINATION OF BEARING CAPACITY:

As per Indian Standard IS 6403: 1981

(For Sqaure Footing)(Width 3.0mX3.0m)

Bearing Capacity as per IS 6403:1981 considering 7.00m depth of foundation

$q_d = 1/F[C.N_c.s_c.d_c.i_c + \gamma' D.(Nq-1).s_q.d_q.i_q + 0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W']$

Where:

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]

q_d= Allowable Bearing Capacity

C= Cohision= 0 t/sqm

γ'= Submerged density = (γ-1) = 1.80-1 = 0.80 t/m³

For, Ø= 35°, Bearing Capacity factors, Nc=46.12, Nq= 33.30, Nγ= 48.03

s_q & s_γ= Shape correction. s_q = 1.20 and s_γ = 0.80

s_c=1.30

d_q & d_γ= Depth correction. Here, d_q = 1.45 and d_γ= 1.45

d_c=1.90

i_q & i_γ = Inclination Factor.= (1- α/90) =(1-0/90)=1 (α = inclination of the load to the vertical, in degree); α = 0, [refer : IS 6403-1981, Cls- 5.1.2.3, and B.C Punmia Pg-660]

W'= Water table correction =0.5 (Considering fully submerged condition for design purpose)

F= Factor of safety, considering 3

D= 7.00 metre
B= 3.00 metre
Hence:
q_d= 1/F[C.Nc.d_c.s_c.i_c+ γ'D.(Nq-1).s_q.d_q.i_q+0.5. γ.B.Nγ.s_γ.d_γ.i_γ W']
= 1/(3)[0*46.12*1.90*1.30*1.00+0.80*7*(33.30-1)*1.20*1.45*1.00+ 0.5*1.80* 3*48.03*0.8*1.45*1.00*0.5]
= 129.98 T/Sqm

Bearing Capacity as per IS 6403:1981 (BH-1) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	43.3	39.69	38.61	37.89
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	43.3	39.69	38.61	37.89
SBC	14.43	13.23	12.87	12.63
Recommended SBC for sattlement of 40mm	14.43	10.47091	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	27.56	50.54	73.75	96.5
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.71	4.32	4.20	4.12
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-1) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.2	1.1	1.07	1.05
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	50.52	43.3	40.77	39.69
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	50.52	43.3	40.77	39.69
SBC	16.84	14.43	13.59	13.23
Recommended SBC for sattlement of 40mm	16.84	10.4698	6.98	5.23
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	32.17	55.13	77.88	101.09
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.50	4.71	4.44	4.32
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-1) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	57.73	46.91	43.3	41.5
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	57.73	46.91	43.3	41.5
SBC	19.24	15.64	14.43	13.83
Recommended SBC for sattlement of 40mm	19.24	10.47	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	36.75	59.75	82.69	105.67
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.28	5.11	4.71	4.52
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-1) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	64.95	50.52	45.83	43.3
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	64.95	50.52	45.83	43.3
SBC	21.65	16.84	15.28	14.43
Recommended SBC for sattlement of 40mm	20.93810445	10.47	6.98	5.23
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	41.36	64.34	87.56	110.26
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.07	5.50	4.99	4.71
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-1) (Depth =5m)			
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2	1.5	1.33	1.25
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.5	1.25	1.17	1.13
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	72.17	54.12	47.99	45.1
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	72.17	54.12	47.99	45.1
SBC	24.06	18.04	16	15.03
Recommended SBC for sattlement of 40mm	20.94	10.47	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	45.96	68.92	91.69	114.84
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.86	5.89	5.22	4.91
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981	(BH-1) (Depth =6m)			
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.91	1.91	1.91	1.91
C	5.4	5.4	5.4	5.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.2	1.6	1.4	1.3
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.6	1.3	1.2	1.15
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	79.38	57.73	50.52	46.91
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	79.38	57.73	50.52	46.91
SBC	26.46	19.24	16.84	15.64
Recommended SBC for sattlement of 40mm	20.94	10.47	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	50.54	73.5	96.5	119.5
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	8.64	6.28	5.50	5.11
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-1) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.34	1.67	1.45	1.34
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-01								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	43.3	50.52	57.73	64.95	72.17	79.38	548.37
SBC	1 x 1	14.43	16.84	19.24	21.65	24.06	26.46	182.79
BC for sattlement of 40mm	1 x 1	14.43	16.84	19.24	20.9381	20.94	20.94	-
Settlement (S)	1 x 1	27.56	32.17	36.75	41.36	45.96	50.54	-
NBC	2 x 2	39.69	43.3	46.91	50.52	54.12	57.73	420.23
SBC	2 x 2	13.23	14.43	15.64	16.84	18.04	19.24	140.08
BC for sattlement of 40mm	2 x 2	10.47091	10.4698	10.47	10.47	10.47	10.47	-
Settlement (S)	2 x 2	50.54	55.13	59.75	64.34	68.92	73.5	-
NBC	3 x 3	38.61	40.77	43.3	45.83	47.99	50.52	389.94
SBC	3 x 3	12.87	13.59	14.43	15.28	16	16.84	129.98
BC for sattlement of 40mm	3 x 3	6.98	6.98	6.98	6.98	6.98	6.98	-
Settlement (S)	3 x 3	73.75	77.88	82.69	87.56	91.69	96.5	-
NBC	4 x 4	37.89	39.69	41.5	43.3	45.1	46.91	383.54
SBC	4 x 4	12.63	13.23	13.83	14.43	15.03	15.64	127.85
BC for sattlement of 40mm	4 x 4	5.24	5.23	5.24	5.23	5.24	5.24	-
Settlement (S)	4 x 4	96.5	101.09	105.67	110.26	114.84	119.5	-



Bearing Capacity as per IS 6403:1981 (BH-2) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.5	5.5	5.5	5.5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	44.1	40.43	39.32	38.59
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	44.1	40.43	39.32	38.59
SBC	14.7	13.48	13.11	12.86
Recommended SBC for sattlement of 40mm	14.7	10.20825	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	28.8	52.82	77.05	100.78
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.80	4.40	4.28	4.20
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-2) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.5	5.5	5.5	5.5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	51.45	44.1	41.53	40.43
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	51.45	44.1	41.53	40.43
SBC	17.15	14.7	13.84	13.48
Recommended SBC for sattlement of 40mm	17.15	10.20833	6.81	5.10
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	33.6	57.6	81.35	105.64
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.60	4.80	4.52	4.40
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981	(BH-2) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.5	5.5	5.5	5.5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	58.8	47.78	44.1	42.26
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	58.8	47.78	44.1	42.26
SBC	19.6	15.93	14.7	14.09
Recommended SBC for sattlement of 40mm	19.6	10.20827	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	38.4	62.42	86.4	110.42
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.40	5.20	4.80	4.60
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-2) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.5	5.5	5.5	5.5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	66.15	51.45	46.67	44.1
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	66.15	51.45	46.67	44.1
SBC	22.05	17.15	15.56	14.7
Recommended SBC for sattlement of 40mm	20.41666667	10.21	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	17	17	17	17
Settlement (S)	43.2	67.2	91.45	115.2
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.20	5.60	5.08	4.80
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-2) (Depth =5m)			
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.96	1.48	1.32	1.24
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-2) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0.0022	0.0022	0.0022	0.0022
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Nγ	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.15	1.58	1.38	1.29
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981	(BH-2) (Depth =7m)			
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-02								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	44.1	51.45	58.8	66.15	337.77	437.18	548.37
SBC	1 x 1	14.7	17.15	19.6	22.05	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	14.7	17.15	19.6	20.41667	-	-	-
Settlement (S)	1 x 1	28.8	33.6	38.4	43.2	-	-	-
NBC	2 x 2	40.43	44.1	47.78	51.45	280.64	348.6	420.23
SBC	2 x 2	13.48	14.7	15.93	17.15	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	10.20825	10.20833	10.20827	10.20833	-	-	-
Settlement (S)	2 x 2	52.82	57.6	62.42	67.2	-	-	-
NBC	3 x 3	39.32	41.53	44.1	46.67	273.12	328.33	389.94
SBC	3 x 3	13.11	13.84	14.7	15.56	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.81	6.81	6.81	6.81	-	-	-
Settlement (S)	3 x 3	77.05	81.35	86.4	91.45	-	-	-
NBC	4 x 4	38.59	40.43	42.26	44.1	278.01	329.22	383.54
SBC	4 x 4	12.86	13.48	14.09	14.7	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	5.10	5.10	5.10	5.10	-	-	-
Settlement (S)	4 x 4	100.78	105.64	110.42	115.2	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-3) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.9	1.9	1.9	1.9
C	5.3	5.3	5.3	5.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0038	0.0038	0.0038	0.0038
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.9	0.9	0.9	0.9
$C.N_c.s_c.d_c.i_c$	42.5	38.96	37.89	37.19
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	42.5	38.96	37.89	37.19
SBC	14.17	12.99	12.63	12.4
Recommended SBC for sattlement of 40mm	14.17	10.74664	7.16	5.37
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	26.37	48.35	70.52	92.32
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.63	4.24	4.12	4.05
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

Bearing Capacity as per IS 6403:1981 (BH-3) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.9	1.9	1.9	1.9
C	5.3	5.3	5.3	5.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0038	0.0038	0.0038	0.0038
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.9	0.9	0.9	0.9
$C.N_c.s_c.d_c.i_c$	49.58	42.5	40.02	38.96
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	49.58	42.5	40.02	38.96
SBC	16.53	14.17	13.34	12.99
Recommended SBC for sattlement of 40mm	16.53	10.74502	7.16	5.37
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	30.77	52.75	74.49	96.71
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.40	4.63	4.36	4.24
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-3) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.9	1.9	1.9	1.9
C	5.3	5.3	5.3	5.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0038	0.0038	0.0038	0.0038
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.9	0.9	0.9	0.9
$C.N_c.s_c.d_c.i_c$	56.66	46.04	42.5	40.73
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	56.66	46.04	42.5	40.73
SBC	18.89	15.35	14.17	13.58
Recommended SBC for sattlement of 40mm	18.89	10.74554	7.16	5.37
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	35.16	57.14	79.12	101.1
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.17	5.01	4.63	4.43
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-3) (Depth =4m)				
Depth (D)	**4**	4	4	4
Width (B)	**1**	2	3	4
Bulk Dencit (y)	**1.8**	1.8	1.8	1.8
C	**0**	0	0	0
Ø	**35**	35	35	35
W'	**0.5**	0.5	0.5	0.5
FOS	**3**	3	3	3
N Value	**>100**	>100	>100	>100
m_v	**0**	0	0	0
Nc	**46.12**	46.12	46.12	46.12
Nq	**33.3**	33.3	33.3	33.3
Ny	**48.03**	48.03	48.03	48.03
Sc	**1.3**	1.3	1.3	1.3
Dc	**2.54**	**1.77**	**1.51**	**1.38**
Sq	**1.2**	1.2	1.2	1.2
Dq=Dy	**1**	**1**	**1**	**1**
Dq=Dy	**1.77**	**1.38**	**1.26**	**1.19**
Sy	**0.8**	0.8	0.8	0.8
Dq=Dy	**1.77**	**1.38**	**1.26**	**1.19**
Tan(45+Ø /2)	**1.92**	1.92	1.92	1.92
ic, iq & iγ	**1**	1	1	1
Submarged Dencit (y')	**0.8**	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	**0**	**0**	**0**	**0**
$\gamma'D.(Nq-1).s_q.d_q.i_q$	**219.54**	**171.16**	**156.28**	**147.6**
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	**30.6**	**47.72**	**65.36**	**82.3**
NBC	**250.14**	**218.88**	**221.64**	**229.9**
SBC	**83.38**	**72.96**	**73.88**	**76.63**
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	**1500**	**3000**	**4500**	**6000**
Layer Depth = (1.5 x B)/2	**0.75**	**1.5**	**2.25**	**3**

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40˚ [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35˚.]



Bearing Capacity as per IS 6403:1981	(BH-3) (Depth =5m)			
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0	0	0	0
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.96	1.48	1.32	1.24
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-3) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.15	1.58	1.38	1.29
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-3) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.34	1.67	1.45	1.34
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-03								
Depth (D)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Footing Size								
NBC	**1 x 1**	42.5	49.58	56.66	250.14	337.77	437.18	548.37
SBC	**1 x 1**	14.17	16.53	18.89	83.38	112.59	145.73	182.79
BC for sattlement of 40mm	**1 x 1**	14.17	16.53	18.89	-	-	-	-
Settlement (S)	**1 x 1**	26.37	30.77	35.16	-	-	-	-
NBC	**2 x 2**	38.96	42.5	46.04	218.88	280.64	348.6	420.23
SBC	**2 x 2**	12.99	14.17	15.35	72.96	93.55	116.2	140.08
BC for sattlement of 40mm	**2 x 2**	10.74664	10.74502	10.74554	-	-	-	-
Settlement (S)	**2 x 2**	48.35	52.75	57.14	-	-	-	-
NBC	**3 x 3**	37.89	40.02	42.5	221.64	273.12	328.33	389.94
SBC	**3 x 3**	12.63	13.34	14.17	73.88	91.04	109.44	129.98
BC for sattlement of 40mm	**3 x 3**	7.16	7.16	7.16	-	-	-	-
Settlement (S)	**3 x 3**	70.52	74.49	79.12	-	-	-	-
NBC	**4 x 4**	37.19	38.96	40.73	229.9	278.01	329.22	383.54
SBC	**4 x 4**	12.4	12.99	13.58	76.63	92.67	109.74	127.85
BC for sattlement of 40mm	**4 x 4**	5.37	5.37	5.37	-	-	-	-
Settlement (S)	**4 x 4**	92.32	96.71	101.1	-	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.3	5.3	5.3	5.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	42.5	38.96	37.89	37.19
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	42.5	38.96	37.89	37.19
SBC	14.17	12.99	12.63	12.4
Recommended SBC for sattlement of 40mm	14.17	10.20825	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	27.76	50.9	74.23	97.18
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.63	4.24	4.12	4.05
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-4) (Depth =2m)			
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.3	5.3	5.3	5.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	49.58	42.5	40.02	38.96
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	49.58	42.5	40.02	38.96
SBC	16.53	14.17	13.34	12.99
Recommended SBC for sattlement of 40mm	16.53	10.20893	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	32.39	55.52	78.41	101.8
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.40	4.63	4.36	4.24
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	6.4	6.4	6.4	6.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	68.42	55.59	51.32	49.18
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\ \gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	68.42	55.59	51.32	49.18
SBC	22.81	18.53	17.11	16.39
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	48.04	78.05	108.11	138.08
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.45	6.05	5.59	5.35
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-4) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.93	1.93	1.93	1.93
C	6.4	6.4	6.4	6.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	76.98	59.87	54.31	51.32
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	76.98	59.87	54.31	51.32
SBC	25.66	19.96	18.1	17.11
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	54.04	84.08	114.36	144.14
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	8.38	6.52	5.91	5.59
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	6.4	6.4	6.4	6.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2	1.5	1.33	1.25
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.5	1.25	1.17	1.13
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	85.53	64.15	56.88	53.46
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	85.53	64.15	56.88	53.46
SBC	28.51	21.38	18.96	17.82
Recommended SBC for sattlement of 40mm	18.99	9.50	6.330551	4.748201
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	60.05	90.06	119.8	150.12
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	9.31	6.98	6.19	5.82
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	6.4	6.4	6.4	6.4
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.2	1.6	1.4	1.3
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.6	1.3	1.2	1.15
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	94.08	68.42	59.87	55.59
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	94.08	68.42	59.87	55.59
SBC	31.36	22.81	19.96	18.53
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	66.05	96.08	126.11	156.11
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	10.24	7.45	6.52	6.05
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.34	1.67	1.45	1.34
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-04								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	42.5	49.58	68.42	76.98	85.53	94.08	548.37
SBC	1 x 1	14.17	16.53	22.81	25.66	28.51	31.36	182.79
BC for sattlement of 40mm	1 x 1	14.17	16.53	18.99251	18.99334	18.99	18.99	-
Settlement (S)	1 x 1	27.76	32.39	48.04	54.04	60.05	66.05	-
NBC	2 x 2	38.96	42.5	55.59	59.87	64.15	68.42	420.23
SBC	2 x 2	12.99	14.17	18.53	19.96	21.38	22.81	140.08
BC for sattlement of 40mm	2 x 2	10.21	10.20893	9.496477	9.495718	9.50	9.50	-
Settlement (S)	2 x 2	50.9	55.52	78.05	84.08	90.06	96.08	-
NBC	3 x 3	37.89	40.02	51.32	54.31	56.88	59.87	389.94
SBC	3 x 3	12.63	13.34	17.11	18.1	18.96	19.96	129.98
BC for sattlement of 40mm	3 x 3	6.81	6.81	6.33	6.33	6.33	6.33	-
Settlement (S)	3 x 3	74.23	78.41	108.11	114.36	119.8	126.11	-
NBC	4 x 4	37.19	38.96	49.18	51.32	53.46	55.59	383.54
SBC	4 x 4	12.4	12.99	16.39	17.11	17.82	18.53	127.85
BC for sattlement of 40mm	4 x 4	5.10	5.10	4.75	4.75	4.75	4.75	-
Settlement (S)	4 x 4	97.18	101.8	138.08	144.14	150.12	156.11	-

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Bearing Capacity as per IS 6403:1981 (BH-5) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	45.7	41.9	40.75	39.99
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	45.7	41.9	40.75	39.99
SBC	15.23	13.97	13.58	13.33
Recommended SBC for sattlement of 40mm	15.23	9.721642	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	31.33	57.48	83.81	109.69
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.97	4.56	4.43	4.35
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981	(BH-5) (Depth =2m)			
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	53.32	45.7	43.04	41.9
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	53.32	45.7	43.04	41.9
SBC	17.77	15.23	14.35	13.97
Recommended SBC for sattlement of 40mm	17.77	9.722311	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	36.56	62.66	88.56	114.95
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.80	4.97	4.69	4.56
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-5) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	60.94	49.51	45.7	43.8
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	60.94	49.51	45.7	43.8
SBC	20.31	16.5	15.23	14.6
Recommended SBC for sattlement of 40mm	19.44471039	9.721608	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	41.78	67.89	93.99	120.14
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.63	5.39	4.97	4.77
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-5) (Depth =4m)				
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	68.56	53.32	48.37	45.7
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	68.56	53.32	48.37	45.7
SBC	22.85	17.77	16.12	15.23
Recommended SBC for sattlement of 40mm	19.44267177	9.72	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	47.01	73.11	99.48	125.32
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.46	5.80	5.26	4.97
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-5) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2	1.5	1.33	1.25
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.5	1.25	1.17	1.13
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	76.17	57.13	50.66	47.61
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	76.17	57.13	50.66	47.61
SBC	25.39	19.04	16.89	15.87
Recommended SBC for sattlement of 40mm	19.44	9.72	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	52.23	78.34	104.24	130.59
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	8.29	6.22	5.52	5.18
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (B -5) (Depth =6m)				
Depth (D)	IS 6	BH	D 6	6
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.2	1.6	1.4	1.3
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.6	1.3	1.2	1.15
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	83.79	60.94	53.32	49.51
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	83.79	60.94	53.32	49.51
SBC	27.93	20.31	17.77	16.5
Recommended SBC for sattlement of 40mm	19.44	9.72	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	57.46	83.56	109.67	135.77
ΔP = (SBC x Footing Size)/(width of Foundatio +Layer Depth)^2 =	9.12	6.63	5.80	5.39
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-5) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.34	1.67	1.45	1.34
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-05								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	45.7	53.32	60.94	68.56	76.17	83.79	548.37
SBC	1 x 1	15.23	17.77	20.31	22.85	25.39	27.93	182.79
BC for sattlement of 40mm	1 x 1	15.23	17.77	19.44471	19.44267	19.44	19.44	-
Settlement (S)	1 x 1	31.33	36.56	41.78	47.01	52.23	57.46	-
NBC	2 x 2	41.9	45.7	49.51	53.32	57.13	60.94	420.23
SBC	2 x 2	13.97	15.23	16.5	17.77	19.04	20.31	140.08
BC for sattlement of 40mm	2 x 2	9.72	9.72	9.72	9.72	9.72	9.72	-
Settlement (S)	2 x 2	57.48	62.66	67.89	73.11	78.34	83.56	-
NBC	3 x 3	40.75	43.04	45.7	48.37	50.66	53.32	389.94
SBC	3 x 3	13.58	14.35	15.23	16.12	16.89	17.77	129.98
BC for sattlement of 40mm	3 x 3	6.48	6.48	6.48	6.48	6.48	6.48	-
Settlement (S)	3 x 3	83.81	88.56	93.99	99.48	104.24	109.67	-
NBC	4 x 4	39.99	41.9	43.8	45.7	47.61	49.51	383.54
SBC	4 x 4	13.33	13.97	14.6	15.23	15.87	16.5	127.85
BC for sattlement of 40mm	4 x 4	4.86	4.86	4.86	4.86	4.86	4.86	-
Settlement (S)	4 x 4	109.69	114.95	120.14	125.32	130.59	135.77	-



Bearing Capacity as per IS 6403:1981	(BH-6) (Depth =1m)			
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.91	1.91	1.91	1.91
C	5.6	5.6	5.6	5.6
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	44.9	41.16	40.04	39.29
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	44.9	41.16	40.04	39.29
SBC	14.97	13.72	13.35	13.1
Recommended SBC for sattlement of 40mm	14.97	10.20833	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	29.33	53.76	78.47	102.66
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.89	4.48	4.36	4.28
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-6) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.6	5.6	5.6	5.6
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	52.39	44.9	42.28	41.16
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	52.39	44.9	42.28	41.16
SBC	17.46	14.97	14.09	13.72
Recommended SBC for sattlement of 40mm	17.46	10.20798	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	34.21	58.66	82.81	107.52
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.70	4.89	4.60	4.48
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981	(BH-6) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.6	5.6	5.6	5.6
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	59.87	48.64	44.9	43.03
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	59.87	48.64	44.9	43.03
SBC	19.96	16.21	14.97	14.34
Recommended SBC for sattlement of 40mm	19.96	10.20781	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	39.11	63.52	87.99	112.38
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.52	5.29	4.89	4.68
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-6) (Depth =4m)				
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.91	1.91	1.91	1.91
C	5.6	5.6	5.6	5.6
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.4	1.2	1.13	1.1
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	67.35	52.39	47.52	44.9
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	67.35	52.39	47.52	44.9
SBC	22.45	17.46	15.84	14.97
Recommended SBC for sattlement of 40mm	20.41837199	10.21	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	43.98	68.41	93.1	117.32
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.33	5.70	5.17	4.89
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-6) (Depth =5m)			
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.96	1.48	1.32	1.24
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-6) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.15	1.58	1.38	1.29
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma.W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-6) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-06								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	44.9	52.39	59.87	67.35	337.77	437.18	548.37
SBC	1 x 1	14.97	17.46	19.96	22.45	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	14.97	17.46	19.96	20.41837	-	-	-
Settlement (S)	1 x 1	29.33	34.21	39.11	43.98	-	-	-
NBC	2 x 2	41.16	44.9	48.64	52.39	280.64	348.6	420.23
SBC	2 x 2	13.72	14.97	16.21	17.46	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	10.21	10.20798	10.20781	10.20903	-	-	-
Settlement (S)	2 x 2	53.76	58.66	63.52	68.41	-	-	-
NBC	3 x 3	40.04	42.28	44.9	47.52	273.12	328.33	389.94
SBC	3 x 3	13.35	14.09	14.97	15.84	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.81	6.81	6.81	6.81	-	-	-
Settlement (S)	3 x 3	78.47	82.81	87.99	93.1	-	-	-
NBC	4 x 4	39.29	41.16	43.03	44.9	278.01	329.22	383.54
SBC	4 x 4	13.1	13.72	14.34	14.97	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	5.10	5.10	5.10	5.10	-	-	-
Settlement (S)	4 x 4	102.66	107.52	112.38	117.32	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-7) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	46.51	42.63	41.47	40.69
$\gamma' D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	46.51	42.63	41.47	40.69
SBC	15.5	14.21	13.82	13.56
Recommended SBC for sattlement of 40mm	15.5	10.20833	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	30.37	55.68	81.23	106.27
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.06	4.64	4.51	4.43
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-7) (Depth =2m)			
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	54.26	46.51	43.79	42.63
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	54.26	46.51	43.79	42.63
SBC	18.09	15.5	14.6	14.21
Recommended SBC for sattlement of 40mm	18.09	10.20912	6.81	5.10
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	35.44	60.73	85.81	111.36
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.91	5.06	4.77	4.64
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-7) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	62.01	50.38	46.51	44.57
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	62.01	50.38	46.51	44.57
SBC	20.67	16.79	15.5	14.86
Recommended SBC for sattlement of 40mm	20.41	10.21	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	40.5	65.79	91.1	116.45
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.75	5.48	5.06	4.85
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-7) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.004	0.004	0.004	0.004
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	69.76	54.26	49.22	46.51
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	69.76	54.26	49.22	46.51
SBC	23.25	18.09	16.41	15.5
Recommended SBC for sattlement of 40mm	20.42	10.21	6.81	5.10
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	17	17	17	17
Settlement (S)	45.55	70.88	96.45	121.47
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.59	5.91	5.36	5.06
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-7) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.96	1.48	1.32	1.24
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-7) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0.0022	0.0022	0.0022	0.0022
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.15	1.58	1.38	1.29
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.15	1.58	1.38	1.29
Tan(45+Ø/2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981	(BH-7) (Depth =7m)			
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.34	1.67	1.45	1.34
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-07								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	46.51	54.26	62.01	69.76	337.77	437.18	548.37
SBC	1 x 1	15.5	18.09	20.67	23.25	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	15.5	18.09	20.41481	20.41712	-	-	-
Settlement (S)	1 x 1	30.37	35.44	40.5	45.55	-	-	-
NBC	2 x 2	42.63	46.51	50.38	54.26	280.64	348.6	420.23
SBC	2 x 2	14.21	15.5	16.79	18.09	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	10.20833	10.20912	10.20824	10.2088	-	-	-
Settlement (S)	2 x 2	55.68	60.73	65.79	70.88	-	-	-
NBC	3 x 3	41.47	43.79	46.51	49.22	273.12	328.33	389.94
SBC	3 x 3	13.82	14.6	15.5	16.41	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.81	6.81	6.81	6.81	-	-	-
Settlement (S)	3 x 3	81.23	85.81	91.1	96.45	-	-	-
NBC	4 x 4	40.69	42.63	44.57	46.51	278.01	329.22	383.54
SBC	4 x 4	13.56	14.21	14.86	15.5	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	5.10	5.10	5.10	5.10	-	-	-
Settlement (S)	4 x 4	106.27	111.36	116.45	121.47	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-8) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	46.51	42.63	41.47	40.69
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	46.51	42.63	41.47	40.69
SBC	15.5	14.21	13.82	13.56
Recommended SBC for sattlement of 40mm	15.5	9.959699	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	31.13	57.07	83.26	108.92
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.06	4.64	4.51	4.43
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-8) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	54.26	46.51	43.79	42.63
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	54.26	46.51	43.79	42.63
SBC	18.09	15.5	14.6	14.21
Recommended SBC for sattlement of 40mm	18.09	9.959839	6.64	4.98
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	36.33	62.25	87.96	114.14
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.91	5.06	4.77	4.64
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-8) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	62.01	50.38	46.51	44.57
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	62.01	50.38	46.51	44.57
SBC	20.67	16.79	15.5	14.86
Recommended SBC for sattlement of 40mm	19.92	9.96	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	41.51	67.43	93.38	119.37
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.75	5.48	5.06	4.85
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-8) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	69.76	54.26	49.22	46.51
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	69.76	54.26	49.22	46.51
SBC	23.25	18.09	16.41	15.5
Recommended SBC for sattlement of 40mm	19.91861212	9.96	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	17	17	17	17
Settlement (S)	46.69	72.66	98.86	124.51
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.59	5.91	5.36	5.06
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-8) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.96	1.48	1.32	1.24
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-8) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0.0022	0.0022	0.0022	0.0022
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.15	1.58	1.38	1.29
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-8) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-08								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	46.51	54.26	62.01	69.76	337.77	437.18	548.37
SBC	1 x 1	15.5	18.09	20.67	23.25	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	15.5	18.09	19.91809	19.91861	-	-	-
Settlement (S)	1 x 1	31.13	36.33	41.51	46.69	-	-	-
NBC	2 x 2	42.63	46.51	50.38	54.26	280.64	348.6	420.23
SBC	2 x 2	14.21	15.5	16.79	18.09	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	9.959699	9.959839	9.959958	9.958712	-	-	-
Settlement (S)	2 x 2	57.07	62.25	67.43	72.66	-	-	-
NBC	3 x 3	41.47	43.79	46.51	49.22	273.12	328.33	389.94
SBC	3 x 3	13.82	14.6	15.5	16.41	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.64	6.64	6.64	6.64	-	-	-
Settlement (S)	3 x 3	83.26	87.96	93.38	98.86	-	-	-
NBC	4 x 4	40.69	42.63	44.57	46.51	278.01	329.22	383.54
SBC	4 x 4	13.56	14.21	14.86	15.5	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	4.98	4.98	4.98	4.98	-	-	-
Settlement (S)	4 x 4	108.92	114.14	119.37	124.51	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	45.7	41.9	40.75	39.99
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	45.7	41.9	40.75	39.99
SBC	15.23	13.97	13.58	13.33
Recommended SBC for sattlement of 40mm	15.23	9.959009	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	30.58	56.11	81.81	107.08
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.97	4.56	4.43	4.35
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	53.32	45.7	43.04	41.9
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	53.32	45.7	43.04	41.9
SBC	17.77	15.23	14.35	13.97
Recommended SBC for sattlement of 40mm	17.77	9.95913	6.64	4.98
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	35.69	61.17	86.45	112.22
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.80	4.97	4.69	4.56
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	60.94	49.51	45.7	43.8
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	60.94	49.51	45.7	43.8
SBC	20.31	16.5	15.23	14.6
Recommended SBC for sattlement of 40mm	19.92	9.96	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	40.79	66.27	91.75	117.28
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.63	5.39	4.97	4.77
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =4m)				
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.93	1.93	1.93	1.93
C	5.7	5.7	5.7	5.7
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	68.56	53.32	48.37	45.7
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	68.56	53.32	48.37	45.7
SBC	22.85	17.77	16.12	15.23
Recommended SBC for sattlement of 40mm	19.91719329	9.96	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	17	17	17	17
Settlement (S)	45.89	71.37	97.11	122.34
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.46	5.80	5.26	4.97
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.96	1.48	1.32	1.24
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0.0022	0.0022	0.0022	0.0022
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.15	1.58	1.38	1.29
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-9) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Subma ed Dencit (γ')	0.8	0.8	0.8	0.8
C.Nc.sc.dc.ic	0	0	0	0
γ'D.(Nq-1).sq.dq.iq	507.91	362.48	314.73	290.86
0.5. γ.B.Nγ.sγ.dγ.iγ W'	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, ` = 0.00 t/m2 & Φ = .]

C 35°



SBC & Settlement Summary of BH-09								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	45.7	53.32	60.94	68.56	337.77	437.18	548.37
SBC	1 x 1	15.23	17.77	20.31	22.85	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	15.23	17.77	19.91665	19.91719	-	-	-
Settlement (S)	1 x 1	30.58	35.69	40.79	45.89	-	-	-
NBC	2 x 2	41.9	45.7	49.51	53.32	280.64	348.6	420.23
SBC	2 x 2	13.97	15.23	16.5	17.77	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	9.959009	9.95913	9.959258	9.959367	-	-	-
Settlement (S)	2 x 2	56.11	61.17	66.27	71.37	-	-	-
NBC	3 x 3	40.75	43.04	45.7	48.37	273.12	328.33	389.94
SBC	3 x 3	13.58	14.35	15.23	16.12	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.64	6.64	6.64	6.64	-	-	-
Settlement (S)	3 x 3	81.81	86.45	91.75	97.11	-	-	-
NBC	4 x 4	39.99	41.9	43.8	45.7	278.01	329.22	383.54
SBC	4 x 4	13.33	13.97	14.6	15.23	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	4.98	4.98	4.98	4.98	-	-	-
Settlement (S)	4 x 4	107.08	112.22	117.28	122.34	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-10) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	46.51	42.63	41.47	40.69
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	46.51	42.63	41.47	40.69
SBC	15.5	14.21	13.82	13.56
Recommended SBC for sattlement of 40mm	15.5	9.722887	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	31.89	58.46	85.29	111.58
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.06	4.64	4.51	4.43
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-10) (Depth =2m)			
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	54.26	46.51	43.79	42.63
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	54.26	46.51	43.79	42.63
SBC	18.09	15.5	14.6	14.21
Recommended SBC for sattlement of 40mm	18.09	9.72244	6.48	4.86
For Settlement				
of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	37.21	63.77	90.1	116.93
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.91	5.06	4.77	4.64
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-10) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	62.01	50.38	46.51	44.57
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	62.01	50.38	46.51	44.57
SBC	20.67	16.79	15.5	14.86
Recommended SBC for sattlement of 40mm	19.44	9.72	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	42.52	69.08	95.66	122.28
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	6.75	5.48	5.06	4.85
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-10) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	5.8	5.8	5.8	5.8
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0042	0.0042	0.0042	0.0042
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	69.76	54.26	49.22	46.51
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	69.76	54.26	49.22	46.51
SBC	23.25	18.09	16.41	15.5
Recommended SBC for sattlement of 40mm	19.44386368	9.72	6.48	4.86
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	17	17	17	17
Settlement (S)	47.83	74.43	101.27	127.54
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.59	5.91	5.36	5.06
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-10) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	2.92	1.96	1.64	1.48
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.96	1.48	1.32	1.24
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1.96	1.48	1.32	1.24
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	303.88	229.46	204.65	192.25
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	33.89	51.18	68.47	85.76
NBC	337.77	280.64	273.12	278.01
SBC	112.59	93.55	91.04	92.67
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981 (BH-10) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
m_v	0.0022	0.0022	0.0022	0.0022
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Nγ	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.3	2.15	1.77	1.58
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	2.15	1.58	1.38	1.29
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	2.15	1.58	1.38	1.29
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	400	293.96	256.75	240
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	37.18	54.64	71.58	89.22
NBC	437.18	348.6	328.33	329.22
SBC	145.73	116.2	109.44	109.74
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



Bearing Capacity as per IS 6403:1981	(BH-10) (Depth =7m)			
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (y)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-10								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	46.51	54.26	62.01	69.76	337.77	437.18	548.37
SBC	1 x 1	15.5	18.09	20.67	23.25	112.59	145.73	182.79
BC for sattlement of 40mm	1 x 1	15.5	18.09	19.44497	19.44386	-	-	-
Settlement (S)	1 x 1	31.89	37.21	42.52	47.83	-	-	-
NBC	2 x 2	42.63	46.51	50.38	54.26	280.64	348.6	420.23
SBC	2 x 2	14.21	15.5	16.79	18.09	93.55	116.2	140.08
BC for sattlement of 40mm	2 x 2	9.722887	9.72244	9.722061	9.721886	-	-	-
Settlement (S)	2 x 2	58.46	63.77	69.08	74.43	-	-	-
NBC	3 x 3	41.47	43.79	46.51	49.22	273.12	328.33	389.94
SBC	3 x 3	13.82	14.6	15.5	16.41	91.04	109.44	129.98
BC for sattlement of 40mm	3 x 3	6.48	6.48	6.48	6.48	-	-	-
Settlement (S)	3 x 3	85.29	90.1	95.66	101.27	-	-	-
NBC	4 x 4	40.69	42.63	44.57	46.51	278.01	329.22	383.54
SBC	4 x 4	13.56	14.21	14.86	15.5	92.67	109.74	127.85
BC for sattlement of 40mm	4 x 4	4.86	4.86	4.86	4.86	-	-	-
Settlement (S)	4 x 4	111.58	116.93	122.28	127.54	-	-	-



Bearing Capacity as per IS 6403:1981 (BH-11) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (y)	1.9	1.9	1.9	1.9
C	5	5	5	5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.1	1.05	1.03	1.03
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.9	0.9	0.9	0.9
$C.N_c.s_c.d_c.i_c$	40.09	36.75	35.75	35.08
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	40.09	36.75	35.75	35.08
SBC	13.36	12.25	11.92	11.69
Recommended SBC for sattlement of 40mm	13.36	10.47009	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	25.52	46.8	68.31	89.32
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.36	4.00	3.89	3.82
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-11) (Depth =2m)			
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.9	1.9	1.9	1.9
C	5	5	5	5
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0039	0.0039	0.0039	0.0039
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.9	0.9	0.9	0.9
$C.N_c.s_c.d_c.i_c$	46.77	40.09	37.75	36.75
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	46.77	40.09	37.75	36.75
SBC	15.59	13.36	12.58	12.25
Recommended SBC for sattlement of 40mm	15.59	10.47022	6.98	5.24
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	29.78	51.04	72.09	93.6
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.09	4.36	4.11	4.00
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981	(BH-11) (Depth =3m)			
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	6.2	6.2	6.2	6.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	66.29	53.86	49.71	47.64
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	66.29	53.86	49.71	47.64
SBC	22.1	17.95	16.57	15.88
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	46.55	75.61	104.7	133.78
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.22	5.86	5.41	5.19
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-11) (Depth =4m)				
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	6.2	6.2	6.2	6.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	74.57	58	52.61	49.71
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	74.57	58	52.61	49.71
SBC	24.86	19.33	17.54	16.57
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	52.36	81.42	110.82	139.59
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	8.12	6.31	5.73	5.41
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-4) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	6.2	6.2	6.2	6.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2	1.5	1.33	1.25
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.5	1.25	1.17	1.13
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	82.86	62.14	55.1	51.79
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	82.86	62.14	55.1	51.79
SBC	27.62	20.71	18.37	17.26
Recommended SBC for sattlement of 40mm	18.99	9.50	6.330663	4.747954
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	58.17	87.24	116.07	145.41
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	9.02	6.76	6.00	5.64
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-11) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	6.2	6.2	6.2	6.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.2	1.6	1.4	1.3
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.6	1.3	1.2	1.15
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	91.14	66.29	58	53.86
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	91.14	66.29	58	53.86
SBC	30.38	22.1	19.33	17.95
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	63.98	93.09	122.13	151.22
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	9.92	7.22	6.31	5.86
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-11) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (y)	1.92	1.92	1.92	1.92
C	6.2	6.2	6.2	6.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0043	0.0043	0.0043	0.0043
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.4	1.7	1.47	1.35
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.7	1.35	1.23	1.18
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iy	1	1	1	1
Submarged Dencit (y')	0.92	0.92	0.92	0.92
$C.N_c.s_c.d_c.i_c$	99.43	70.43	60.9	55.93
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	99.43	70.43	60.9	55.93
SBC	33.14	23.48	20.3	18.64
Recommended SBC for sattlement of 40mm	18.99	9.50	6.33	4.75
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	69.8	98.9	128.26	157.03
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	10.82	7.67	6.63	6.09
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



SBC & Settlement Summary of BH-11								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	40.09	46.77	66.29	74.57	82.86	91.14	99.43
SBC	1 x 1	13.36	15.59	22.1	24.86	27.62	30.38	33.14
BC for sattlement of 40mm	1 x 1	13.36	15.59	18.99033	18.9916	18.99	18.99	18.99
Settlement (S)	1 x 1	25.52	29.78	46.55	52.36	58.17	63.98	69.8
NBC	2 x 2	36.75	40.09	53.86	58	62.14	66.29	70.43
SBC	2 x 2	12.25	13.36	17.95	19.33	20.71	22.1	23.48
BC for sattlement of 40mm	2 x 2	10.47	10.47022	9.496098	9.496438	9.50	9.50	9.50
Settlement (S)	2 x 2	46.8	51.04	75.61	81.42	87.24	93.09	98.9
NBC	3 x 3	35.75	37.75	49.71	52.61	55.1	58	60.9
SBC	3 x 3	11.92	12.58	16.57	17.54	18.37	19.33	20.3
BC for sattlement of 40mm	3 x 3	6.98	6.98	6.33	6.33	6.33	6.33	6.33
Settlement (S)	3 x 3	68.31	72.09	104.7	110.82	116.07	122.13	128.26
NBC	4 x 4	35.08	36.75	47.64	49.71	51.79	53.86	55.93
SBC	4 x 4	11.69	12.25	15.88	16.57	17.26	17.95	18.64
BC for sattlement of 40mm	4 x 4	5.24	5.24	4.75	4.75	4.75	4.75	4.75
Settlement (S)	4 x 4	89.32	93.6	133.78	139.59	145.41	151.22	157.03



Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =1m)				
Depth (D)	1	1	1	1
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.91	1.91	1.91	1.91
C	5.2	5.2	5.2	5.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.2	1.1	1.07	1.05
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.1	1.05	1.03	1.03
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	41.7	38.22	37.18	36.48
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	41.7	38.22	37.18	36.48
SBC	13.9	12.74	12.39	12.16
Recommended SBC for sattlement of 40mm	13.9	9.95896	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	27.91	51.17	74.64	97.68
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	4.54	4.16	4.05	3.97
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =2m)				
Depth (D)	2	2	2	2
Width (B)	1	2	3	4
Bulk Dencit (y)	1.91	1.91	1.91	1.91
C	5.2	5.2	5.2	5.2
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0041	0.0041	0.0041	0.0041
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.4	1.2	1.13	1.1
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.2	1.1	1.07	1.05
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.91	0.91	0.91	0.91
$C.N_c.s_c.d_c.i_c$	48.64	41.7	39.26	38.22
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	48.64	41.7	39.26	38.22
SBC	16.21	13.9	13.09	12.74
Recommended SBC for sattlement of 40mm	16.21	9.958804	6.64	4.98
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976		0	0	0
Settlement (S)	32.55	55.83	78.86	102.34
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	5.29	4.54	4.27	4.16
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =3m)				
Depth (D)	3	3	3	3
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	6.3	6.3	6.3	6.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0045	0.0045	0.0045	0.0045
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.6	1.3	1.2	1.15
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.3	1.15	1.1	1.08
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	67.35	54.73	50.52	48.41
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	67.35	54.73	50.52	48.41
SBC	22.45	18.24	16.84	16.14
Recommended SBC for sattlement of 40mm	18.15	9.07	6.05	4.54
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	49.48	80.4	111.35	142.3
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	7.33	5.96	5.50	5.27
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

Bearing Capacity as per IS 6403:1981	(BH 12 (1 - 2) (Depth =4m)			
Depth (D)	4	4	4	4
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.93	1.93	1.93	1.93
C	6.3	6.3	6.3	6.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	0	0	0	0
m_v	0.0045	0.0045	0.0045	0.0045
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	1.8	1.4	1.27	1.2
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.4	1.2	1.13	1.1
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	75.77	58.94	53.46	50.52
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	75.77	58.94	53.46	50.52
SBC	25.26	19.65	17.82	16.84
Recommended SBC for sattlement of 40mm	18.15	9.07	6.05	4.54
For Settlement				
Sattlement Factor (As per Fig 9 of IS 800: 1979 (Part-I) 1976	0	0	0	0
Settlement (S)	55.68	86.62	117.83	148.47
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 = B)	8.25	6.42	5.82	5.50
H (1.5 x	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

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Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =5m)				
Depth (D)	5	5	5	5
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.93	1.93	1.93	1.93
C	6.3	6.3	6.3	6.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0045	0.0045	0.0045	0.0045
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2	1.5	1.33	1.25
Sq	1.2	1.2	1.2	1.2
Dq=Dγ	1	1	1	1
Dq=Dγ	1.5	1.25	1.17	1.13
Sγ	0.8	0.8	0.8	0.8
Dq=Dγ	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	84.19	63.14	55.99	52.62
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	84.19	63.14	55.99	52.62
SBC	28.06	21.05	18.66	17.54
Recommended SBC for sattlement of 40mm	18.15	9.07	6.049603	4.536989
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	0	0	0	0
Settlement (S)	61.85	92.79	123.38	154.64
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	9.16	6.87	6.09	5.73
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =6m)				
Depth (D)	6	6	6	6
Width (B)	1	2	3	4
Bulk Dencit (y)	1.93	1.93	1.93	1.93
C	6.3	6.3	6.3	6.3
Ø	0	0	0	0
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
m_v	0.0045	0.0045	0.0045	0.0045
Nc	5.14	5.14	5.14	5.14
Nq	1	1	1	1
Ny	0	0	0	0
Sc	1.3	1.3	1.3	1.3
Dc	2.2	1.6	1.4	1.3
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	1.6	1.3	1.2	1.15
Sy	0.8	0.8	0.8	0.8
Dq=Dy	1	1	1	1
Tan(45+Ø /2)	1	1	1	1
ic, iq & iγ	1	1	1	1
Submarged Dencit (y')	0.93	0.93	0.93	0.93
$C.N_c.s_c.d_c.i_c$	92.61	67.35	58.94	54.73
$\gamma'D.(Nq-1).s_q.d_q.i_q$	0	0	0	0
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	0	0	0	0
NBC	92.61	67.35	58.94	54.73
SBC	30.87	22.45	19.65	18.24
Recommended SBC for sattlement of 40mm	18.15	9.07	6.05	4.54
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	68.04	98.96	129.93	160.81
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	10.08	7.33	6.42	5.96
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3



Bearing Capacity as per IS 6403:1981 (BH-12) (Depth =7m)				
Depth (D)	7	7	7	7
Width (B)	1	2	3	4
Bulk Dencit (γ)	1.8	1.8	1.8	1.8
C	0	0	0	0
Ø	35	35	35	35
W'	0.5	0.5	0.5	0.5
FOS	3	3	3	3
N Value	>100	>100	>100	>100
Nc	46.12	46.12	46.12	46.12
Nq	33.3	33.3	33.3	33.3
Ny	48.03	48.03	48.03	48.03
Sc	1.3	1.3	1.3	1.3
Dc	3.69	2.34	1.9	1.67
Sq	1.2	1.2	1.2	1.2
Dq=Dy	1	1	1	1
Dq=Dy	2.34	1.67	1.45	1.34
Sy	0.8	0.8	0.8	0.8
Dq=Dy	2.34	1.67	1.45	1.34
Tan(45+Ø /2)	1.92	1.92	1.92	1.92
ic, iq & iγ	1	1	1	1
Submarged Dencit (γ')	0.8	0.8	0.8	0.8
$C.N_c.s_c.d_c.i_c$	0	0	0	0
$\gamma'D.(Nq-1).s_q.d_q.i_q$	507.91	362.48	314.73	290.86
$0.5.\gamma.B.N\gamma.s_\gamma.d_\gamma.i_\gamma W'$	40.46	57.75	75.21	92.68
NBC	548.37	420.23	389.94	383.54
SBC	182.79	140.08	129.98	127.85
Recommended SBC for sattlement of 40mm	-	-	-	-
For Settlement				
Sattlement Factor (As per Fig 9 of IS 8009 (Part-I) 1976	-	-	-	-
Settlement (S)	-	-	-	-
ΔP = (SBC x Footing Size)/(width of Foundation +Layer Depth)^2 =	-	-	-	-
H (1.5 x B)	1500	3000	4500	6000
Layer Depth = (1.5 x B)/2	0.75	1.5	2.25	3

[Note: - The weathered rock or shale may be treated as soil [Refer IS 12070, Clause 7.1]. From literature we know that C and Φ value of rock specimen ranges from C = 3.5 to 17.5 MPa and Φ seldom less than 40° [Refer Bowles, J.E., Foundation Analysis and Design, 5th Edition, pp-278] as the rock in the present case is weathered, cohesion will not be there. So, considering rock quality and to be on the safer side, use, C = 0.00 t/m2 & Φ = 35°.]



SBC & Settlement Summary of BH-12								
Depth (D)		1	2	3	4	5	6	7
Footing Size								
NBC	1 x 1	41.7	48.64	67.35	75.77	84.19	92.61	548.37
SBC	1 x 1	13.9	16.21	22.45	25.26	28.06	30.87	182.79
BC for sattlement of 40mm	1 x 1	13.9	16.21	18.14875	18.14655	18.15	18.15	-
Settlement (S)	1 x 1	27.91	32.55	49.48	55.68	61.85	68.04	-
NBC	2 x 2	38.22	41.7	54.73	58.94	63.14	67.35	420.23
SBC	2 x 2	12.74	13.9	18.24	19.65	21.05	22.45	140.08
BC for sattlement of 40mm	2 x 2	9.96	9.958804	9.074627	9.074117	9.07	9.07	-
Settlement (S)	2 x 2	51.17	55.83	80.4	86.62	92.79	98.96	-
NBC	3 x 3	37.18	39.26	50.52	53.46	55.99	58.94	389.94
SBC	3 x 3	12.39	13.09	16.84	17.82	18.66	19.65	129.98
BC for sattlement of 40mm	3 x 3	6.64	6.64	6.05	6.05	6.05	6.05	-
Settlement (S)	3 x 3	74.64	78.86	111.35	117.83	123.38	129.93	-
NBC	4 x 4	36.48	38.22	48.41	50.52	52.62	54.73	383.54
SBC	4 x 4	12.16	12.74	16.14	16.84	17.54	18.24	127.85
BC for sattlement of 40mm	4 x 4	4.98	4.98	4.54	4.54	4.54	4.54	-
Settlement (S)	4 x 4	97.68	102.34	142.3	148.47	154.64	160.81	-



A.6.0 USE OF PILE FOUNDATION:

Bored cast in-situ piles are preferred due to typical geological formation, availability of construction agencies; ease of construction and less sound pollution.
While calculating the pile capacity, let us assume that,

a) Cut off level is at 2.0 m
b) Pile capacities shall be ascertained by approved method (IS 2911 (Part 1/Sec 2):2010).
c) Assumed Grade of Concrete = M25
d) Diameter of pile used = 600mm.

Sample Calculation of Safe Vertical Pile Capacity around BH-1 [As per IS 2911 (Part 1/Sec 2) : 2010]

Pile embedment depth = 10 m.

Diameter of pile = 600 mm.

Socket Length Considered in Calcualtion = 3m, [**Note:**Socket length can be provided shorter than the recommended value, depending on the design requirement for Pile capacity]

Sample vertical pile capacity has been estimated considering average layer stratification as per Sub- Soil Profile Clause 4.1 in the Report

Design Strength Parameters:

STRATUM-I

Considering the lab result and subsoil condition,

Use design c = 5.4 t/m^2 and $\Phi = 0^o$.

Submerged Density=0.91

Also use, $\alpha = 0.85$ (As C= 5.4 t/m^2) (IS 2911 (Part 1 / Sec 2) : 2010, P-11, Fig. 2

Variation of α with C_u) Length of shaft= 5 m(As Cut off length = 2.0m)

STRATUM-II:

Note:*Since the RQD for this layer is nil, the rock samples Recovered are fractured and unsuitable for testing. Therefore, the compressive strength and shear capacity of this layer are estimated based on rock test results from samples collected from subsequent layers. This estimation is further supported by visual identification of the mineralogical structure and physical examinations, such as breakability, strength,*

and penetration (Ref. to Fig. 3 of IS 2911-1-2, Annex-B), performed on the fractured rock obtained from this layer.
Compressive strength of the Rock is assumed as, q_u = 140 tonne/m2,
Note:- According to Mohr-Coulomb failure theory, in an unconfined compression test - $q_u=2c_u$
Hence, c = 70 tonne/m^2
Nc= 9 (Recommended value)
α =0.9 (Recommended)

The ultimate vertical pile capacity of bored cast in situ RCC pile in soil may be estimated using the formula as given below:

$$Q_u = [K_i \times P_{Di} \times \tan\delta_i \times A_{si}]/F_s + C_{ul} x N_c X \pi x B^2/4F_s + \alpha x C_{u2} x \pi x B x L/F_s$$

$C_{ul}xN_cX\pi xB^2/4F_s$ is end bearing of Stratum-III (Ref. Cl 6.3.1.1 , and 6.3.2 Annex-B-8 page 13 of IS 2911 (Part-1/sec-2): 2010 (Pile in soft/ weathered rock)

$\alpha xC_{u2}x\pi xBxL/F_s$ is end bearing of Stratum-III (Ref. Cl 6.3.1.1 , and 6.3.2 Annex-B-8 page 13 of IS 2911 (Part-1/sec-2): 2010 (Pile in soft/ weathered rock)

where, Q_u = Ultimate vertical load carrying capacity of RCC bored pile,
K_i = Co-efficient of earth pressure in i^{th} layer.
P_{Di} = Mean effective overburden pressure of i^{th} layer.
δ_i = Angle of wall friction between pile and soil for the i^{th} layer.
A_{si} = Surface area of pile shaft in i^{th} layer = π x D x L
C_{ul} = Shear strength of rock below the base of pile
N_c = Bearing capacity factor taken as 9
D = Dia of pile in meter
F_s = Factor safety taken 3
α = 0.9 (recommended value)
C_{u2} = Average shear strength of rock in the socketed length pile
L = Length of pile in respective stratum,

Calculation of Safe Skin Frictional Resistance:

Stratum-I: (Layer 2 m depth to - 7.00 m depth)
As Cut off length = 2.0m
αi= 0.85
Effective thickness = 5 m.
Cus= 5.4t/m^2. (Avg. value has been taken for calculation)
A_s = πx0.6x5= 9.42 m^2.
Where, D = 0.6 m. and Shaft length = 5m.
Ultimate Skin Frictional Resistance = (0.85x5.4x9.42) = 43.24 t
Permissible skin friction resistance = 43.24/3= 14.41 t

Stratum-II: (Layer – 7.00 m depth to - 10.00 m depth)
Adhesion factor, α=0.9 (Recommended by IS-2911-1-2)
Note:- According to Mohr-Coulomb failure theory, in an unconfined compression test - $q_u=2c_u$

Shear Strength Capacity along the socket length, c = 70 tonne/m^2 (*Ref. to Fig. 3 of IS 2911-1-2, Annex-B)*

$(\alpha x C_{u2} x \pi x B x L)/F_s$

Dia. of the pile shaft, d= 0.6m
Length of the Socket, L = 3.0 m
Factor of Safety, F_s= 3
As = (3.14x0.6x3.0) = 5.65 m^2
Ultimate Skin Frictional Resistance along the Socket Length = (0.9x70x5.65) tonne = 356 t
Factor of Safety, F_s= 3
Safe Frictional Resistance =356/3 = 119 t

Calculation of Safe End Bearing Resistance:

A_p = 3.14 x $(0.6)^2/4$ = 0.2826 m^2.
D = Dia of pile 0.6 meter
F_s = Factor safety taken 3
Cu=Shear strength at the base of the foundation = 70 t/m^2
Nc= 9 [Taken from fig.1 of ANNEX-B of IS 2911-1-1(2010)]

$(C_{ul} x N_c x \pi x B^2/4)/F_s$

Ultimate End Bearing Pressure = (70x9X0.2826) = 178 t/m^2 (Restricted to 500 t/m^2)
Factor of Safety, F_s= 3
Hence, Safe End Bearing Resistance of the Pile = 178/3 = 59 t/m^2
Safe vertical capacity of Pile = (14.41+119+59) t = 192.41 t
Recommended vertical capacity of the Pile = 184 t

Calculation of Uplift capacity of pile:
So, as per IS 2911(Part 1 /Sec 2):2010, Clause 6.3.2

Self weight of the pile (W_p) = $A_p x L x \Upsilon$
= 0.2826x10x25 = 70.65KN/9.81 (including cut off 2 m,
Υ=**25kN/m^3 as per IS 456)**
= 7.20 t
Safe uplift capacity of pile = Safe skin friction+ W_p /2
= (119+14.41)/2+7.20 = 73.91 t =74 t

Recommended uplift capacity of pile = 65 t

BH-1					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.4	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.91	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.275	4.55	4.55	4.55	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	18.02	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	6.01	0.00	0.00	0.00	
Uplift capacity of Pile	3.00				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	140	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	70	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	148	[α*cu2*πBL/Fs]
Safe Frictional Resistance	49	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	31	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	10	
Safe Vertical Capacity of pile (t)	**66**	
Self Weight of Pile	1.25	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**29**	



BH-1					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.4	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	1	1	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.91	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.275	4.55	4.55	4.55	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.62	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.21	0.00	0.00	0.00	
Uplift capacity of Pile	3.60				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	140	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	70	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	178	[α*cu2*πBL/Fs]
Safe Frictional Resistance	59	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	45	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	15	
Safe Vertical Capacity of pile (t)	**81**	
Self Weight of Pile	1.80	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**35**	



BH-1					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.4	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	1	1	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.91	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.275	4.55	4.55	4.55	
As (π x dia x tickness)	6.28	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	28.83	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	9.61	0.00	0.00	0.00	
Uplift capacity of Pile	4.80				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$

α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	140	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	70	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	237	[α*cu2*πBL/Fs]
Safe Frictional Resistance	79	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	79	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	26	
Safe Vertical Capacity of pile (t)	**115**	
Self Weight of Pile	3.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**48**	



BH-1					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.4	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	1	1	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.91	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.275	4.55	4.55	4.55	
As (π x dia x tickness)	7.85	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	36.03	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	12.01	0.00	0.00	0.00	
Uplift capacity of Pile	6.01				

The allowable load on the pile $(Q_a) = c_{u1}{}^{*}Nc^{*}\pi B^2/4F_s + \alpha^{*}c_{u2}{}^{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	140	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	70	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	297	[α*cu2*πBL/Fs]
Safe Frictional Resistance	99	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	124	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	41	
Safe Vertical Capacity of pile (t)	**152**	
Self Weight of Pile	5.00	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**60**	



BH-1					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.4	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.91	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.275	4.55	4.55	4.55	
As (π x dia x tickness)	9.42	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	43.24	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	14.41	0.00	0.00	0.00	
Uplift capacity of Pile	7.21				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	140	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	70	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	356	[α*cu2*πBL/Fs]
Safe Frictional Resistance	119	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	178	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	59	
Safe Vertical Capacity of pile (t)	**192**	
Self Weight of Pile	7.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**74**	



BH-1					
Depth of Pile (10 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	66	81	115	152	192
Safe Uplift capacity of Pile	29	35	48	60	74



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.5	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.92	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	1.9625	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	9.17	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.06	0.00	0.00	0.00	
Uplift capacity of Pile	1.53				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	163	[α*cu2*πBL/Fs]
Safe Frictional Resistance	54	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	34	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	11	
Safe Vertical Capacity of pile (t)	**69**	
Self Weight of Pile	1.25	(Wp) = ApxLxYc/9.81 (including cut off 2 m, Y=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**30**	



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.5	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.92	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	11.01	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.67	0.00	0.00	0.00	
Uplift capacity of Pile	1.83				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	196	[α*cu2*πBL/Fs]
Safe Frictional Resistance	65	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	49	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	16	
Safe Vertical Capacity of pile (t)	**85**	
Self Weight of Pile	1.80	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**36**	



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.5	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.92	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.14	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	14.68	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.89	0.00	0.00	0.00	
Uplift capacity of Pile	2.45				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	261	[α*cu2*πBL/Fs]
Safe Frictional Resistance	87	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	87	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	29	
Safe Vertical Capacity of pile (t)	**121**	
Self Weight of Pile	3.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**49**	



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.5	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.92	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	18.35	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	6.12	0.00	0.00	0.00	
Uplift capacity of Pile	3.06				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	326	[α*cu2*πBL/Fs]
Safe Frictional Resistance	109	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	136	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	45	
Safe Vertical Capacity of pile (t)	**160**	
Self Weight of Pile	5.00	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**62**	



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.5	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.92	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	22.02	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.34	0.00	0.00	0.00	
Uplift capacity of Pile	3.67				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	392	[α*cu2*πBL/Fs]
Safe Frictional Resistance	131	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	196	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	65	
Safe Vertical Capacity of pile (t)	**203**	
Self Weight of Pile	7.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**76**	



BH-2					
Depth of Pile (10 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	69	85	121	160	203
Safe Uplift capacity of Pile	30	36	49	62	76



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3.5	3.5	3.5	
	3.5	3.5	3.5	3.5	
	1.5	**0**	**0**	**0**	
C Value	5.3	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.9	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.675	1.35	1.35	1.35	
As (π x dia x tickness)	1.1775	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	5.30	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.77	0.00	0.00	0.00	
Uplift capacity of Pile	0.88				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	163	[α*cu2*πBL/Fs]
Safe Frictional Resistance	54	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	34	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	11	
Safe Vertical Capacity of pile (t)	**68**	
Self Weight of Pile	1.25	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**29**	



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3.5	3.5	3.5	
	3.5	3.5	3.5	3.5	
	1.5	**0**	**0**	**0**	
C Value	5.3	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.9	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.675	1.35	1.35	1.35	
As (π x dia x tickness)	1.413	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	6.37	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.12	0.00	0.00	0.00	
Uplift capacity of Pile	1.06				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	196	[α*cu2*πBL/Fs]
Safe Frictional Resistance	65	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	49	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	16	
Safe Vertical Capacity of pile (t)	**84**	
Self Weight of Pile	1.80	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**36**	



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3.5	3.5	3.5	
	3.5	3.5	3.5	3.5	
	1.5	**0**	**0**	**0**	
C Value	5.3	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.9	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.675	1.35	1.35	1.35	
As (π x dia x tickness)	1.884	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	8.49	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.83	0.00	0.00	0.00	
Uplift capacity of Pile	1.41				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	261	[α*cu2*πBL/Fs]
Safe Frictional Resistance	87	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	87	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	29	
Safe Vertical Capacity of pile (t)	**119**	
Self Weight of Pile	3.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**48**	



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3.5	3.5	3.5	
	3.5	3.5	3.5	3.5	
	1.5	**0**	**0**	**0**	
C Value	5.3	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.9	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.675	1.35	1.35	1.35	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.61	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.54	0.00	0.00	0.00	
Uplift capacity of Pile	1.77				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	326	[α*cu2*πBL/Fs]
Safe Frictional Resistance	109	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	136	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	45	
Safe Vertical Capacity of pile (t)	**158**	
Self Weight of Pile	5.00	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**61**	



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3.5	3.5	3.5	
	3.5	3.5	3.5	3.5	
	1.5	**0**	**0**	**0**	
C Value	5.3	0	0	0	
Φ Value	0	0	0	0	
α	0.85	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.9	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.675	1.35	1.35	1.35	
As (π x dia x tickness)	2.826	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	12.73	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.24	0.00	0.00	0.00	
Uplift capacity of Pile	2.12				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	154	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	77	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	392	[α*cu2*πBL/Fs]
Safe Frictional Resistance	131	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	196	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	65	
Safe Vertical Capacity of pile (t)	**200**	
Self Weight of Pile	7.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**75**	



BH-3					
Depth of Pile (10 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	68	84	119	158	200
Safe Uplift capacity of Pile	29	36	48	61	75



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.3	6.4	0	0	
Φ Value	0	0	0	0	
α	0.85	0.75	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	0.785	3.14	0	0	
Ultimate Skin Frictional Resistance (For C Value)	3.54	15.07	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.18	5.02	0.00	0.00	
Uplift capacity of Pile	3.10				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$

α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	170	[α*cu2*πBL/Fs]
Safe Frictional Resistance	57	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	35	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**74**	
Self Weight of Pile	1.25	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**33**	



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.3	6.4	0	0	
Φ Value	0	0	0	0	
α	0.85	0.75	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	0.942	3.768	0	0	
Ultimate Skin Frictional Resistance (For C Value)	4.24	18.0864	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.41	6.03	0.00	0.00	
Uplift capacity of Pile	3.72				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	203	[α*cu2*πBL/Fs]
Safe Frictional Resistance	68	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	51	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	17	
Safe Vertical Capacity of pile (t)	**92**	
Self Weight of Pile	1.80	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**39**	



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.3	6.4	0	0	
Φ Value	0	0	0	0	
α	0.85	0.75	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.256	5.024	0	0	
Ultimate Skin Frictional Resistance (For C Value)	5.66	24.1152	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.89	8.04	0.00	0.00	
Uplift capacity of Pile	4.96				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	271	[α*cu2*πBL/Fs]
Safe Frictional Resistance	90	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	90	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	30	
Safe Vertical Capacity of pile (t)	**131**	
Self Weight of Pile	3.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**53**	



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.3	6.4	0	0	
Φ Value	0	0	0	0	
α	0.85	0.75	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.57	6.28	0	0	
Ultimate Skin Frictional Resistance (For C Value)	7.07	30.144	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.36	10.05	0.00	0.00	
Uplift capacity of Pile	6.20				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	339	[α*cu2*πBL/Fs]
Safe Frictional Resistance	113	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	141	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	47	
Safe Vertical Capacity of pile (t)	**173**	
Self Weight of Pile	5.00	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**68**	



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.3	6.4	0	0	
Φ Value	0	0	0	0	
α	0.85	0.75	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.884	7.536	0	0	
Ultimate Skin Frictional Resistance (For C Value)	8.49	36.1728	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.83	12.06	0.00	0.00	
Uplift capacity of Pile	7.44				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	407	[α*cu2*πBL/Fs]
Safe Frictional Resistance	136	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	203	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	68	
Safe Vertical Capacity of pile (t)	**218**	
Self Weight of Pile	7.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**82**	



BH-4					
Depth of Pile (10 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	74	92	131	173	218
Safe Uplift capacity of Pile	33	39	53	68	82



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.3	4.6	4.6	4.6	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	17.90	0.00	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	5.97	0.00	0.00	0.00	
Uplift capacity of Pile	2.98				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$

α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	170	[α*cu2*πBL/Fs]
Safe Frictional Resistance	57	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	35	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**74**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**32**	



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.3	4.6	4.6	4.6	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.48	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.16	0.00	0.00	0.00	
Uplift capacity of Pile	3.58				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	203	[α*cu2*πBL/Fs]
Safe Frictional Resistance	68	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	51	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	17	
Safe Vertical Capacity of pile (t)	**92**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**39**	



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.3	4.6	4.6	4.6	
As (π x dia x tickness)	6.28	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	28.64	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	9.55	0.00	0.00	0.00	
Uplift capacity of Pile	4.77				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	271	[α*cu2*πBL/Fs]
Safe Frictional Resistance	90	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	90	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	30	
Safe Vertical Capacity of pile (t)	**130**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**53**	



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.3	4.6	4.6	4.6	
As (π x dia x tickness)	7.85	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	35.80	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	11.93	0.00	0.00	0.00	
Uplift capacity of Pile	5.97				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	339	[α*cu2*πBL/Fs]
Safe Frictional Resistance	113	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	141	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	47	
Safe Vertical Capacity of pile (t)	**172**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**67**	



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	7	7	7	
	7	7	7	7	
	5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	2.3	4.6	4.6	4.6	
As (π x dia x tickness)	9.42	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	42.96	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	14.32	0.00	0.00	0.00	
Uplift capacity of Pile	7.16				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	160	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	80	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	407	[α*cu2*πBL/Fs]
Safe Frictional Resistance	136	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	203	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	68	
Safe Vertical Capacity of pile (t)	**218**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**81**	



BH-5					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	74	92	130	172	218
Safe Uplift capacity of Pile	32	39	53	67	81



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.6	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.365	2.73	2.73	2.73	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.55	0.00	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.52	0.00	0.00	0.00	
Uplift capacity of Pile	1.76				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	174	[α*cu2*πBL/Fs]
Safe Frictional Resistance	58	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	36	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**74**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**32**	



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.6	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.365	2.73	2.73	2.73	
As (π x dia x tickness)	2.826	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	12.66	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.22	0.00	0.00	0.00	
Uplift capacity of Pile	2.11				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	209	[α*cu2*πBL/Fs]
Safe Frictional Resistance	70	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	52	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	17	
Safe Vertical Capacity of pile (t)	**91**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**38**	



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.6	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.365	2.73	2.73	2.73	
As (π x dia x tickness)	3.768	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	16.88	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	5.63	0.00	0.00	0.00	
Uplift capacity of Pile	2.81				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	278	[α*cu2*πBL/Fs]
Safe Frictional Resistance	93	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	93	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	31	
Safe Vertical Capacity of pile (t)	**129**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**52**	



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.6	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.365	2.73	2.73	2.73	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.10	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.03	0.00	0.00	0.00	
Uplift capacity of Pile	3.52				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	348	[α*cu2*πBL/Fs]
Safe Frictional Resistance	116	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	145	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	48	
Safe Vertical Capacity of pile (t)	**171**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**66**	



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.6	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.365	2.73	2.73	2.73	
As (π x dia x tickness)	5.652	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	25.32	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	8.44	0.00	0.00	0.00	
Uplift capacity of Pile	4.22				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	417	[α*cu2*πBL/Fs]
Safe Frictional Resistance	139	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	209	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	70	
Safe Vertical Capacity of pile (t)	**217**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**80**	



BH-6					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	74	91	129	171	217
Safe Uplift capacity of Pile	32	38	52	66	80



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	1.9625	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	9.11	0.00	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.04	0.00	0.00	0.00	
Uplift capacity of Pile	1.52				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	172	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	86	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	182	[α*cu2*πBL/Fs]
Safe Frictional Resistance	61	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	38	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	13	
Safe Vertical Capacity of pile (t)	**76**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**33**	



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.93	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.64	0.00	0.00	0.00	
Uplift capacity of Pile	1.82				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	172	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	86	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	219	[α*cu2*πBL/Fs]
Safe Frictional Resistance	73	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	55	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	18	
Safe Vertical Capacity of pile (t)	**95**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**40**	



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.14	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	14.57	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.86	0.00	0.00	0.00	
Uplift capacity of Pile	2.43				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	172	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	86	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	292	[α*cu2*πBL/Fs]
Safe Frictional Resistance	97	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	97	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	32	
Safe Vertical Capacity of pile (t)	**134**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**54**	



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	18.21	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	6.07	0.00	0.00	0.00	
Uplift capacity of Pile	3.04				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	172	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	86	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	365	[α*cu2*πBL/Fs]
Safe Frictional Resistance	122	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	152	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	51	
Safe Vertical Capacity of pile (t)	**178**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**68**	



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.85	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.28	0.00	0.00	0.00	
Uplift capacity of Pile	3.64				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	172	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	86	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	437	[α*cu2*πBL/Fs]
Safe Frictional Resistance	146	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	219	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	73	
Safe Vertical Capacity of pile (t)	**226**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**83**	



BH-7					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	76	95	134	178	226
Safe Uplift capacity of Pile	33	40	54	68	83



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.93	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.395	2.79	2.79	2.79	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.93	0.00	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.64	0.00	0.00	0.00	
Uplift capacity of Pile	1.82				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	174	[α*cu2*πBL/Fs]
Safe Frictional Resistance	58	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	36	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**74**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**32**	



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.93	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.395	2.79	2.79	2.79	
As (π x dia x tickness)	2.826	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	13.11	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.37	0.00	0.00	0.00	
Uplift capacity of Pile	2.19				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	209	[α*cu2*πBL/Fs]
Safe Frictional Resistance	70	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	52	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	17	
Safe Vertical Capacity of pile (t)	**91**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**39**	



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.93	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.395	2.79	2.79	2.79	
As (π x dia x tickness)	3.768	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	17.48	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	5.83	0.00	0.00	0.00	
Uplift capacity of Pile	2.91				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	278	[α*cu2*πBL/Fs]
Safe Frictional Resistance	93	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	93	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	31	
Safe Vertical Capacity of pile (t)	**129**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**52**	



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.93	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.395	2.79	2.79	2.79	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.85	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.28	0.00	0.00	0.00	
Uplift capacity of Pile	3.64				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	348	[α*cu2*πBL/Fs]
Safe Frictional Resistance	116	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	145	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	48	
Safe Vertical Capacity of pile (t)	**171**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**66**	



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	5	5	5	
	5	5	5	5	
	3	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.93	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.395	2.79	2.79	2.79	
As (π x dia x tickness)	5.652	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	26.23	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	8.74	0.00	0.00	0.00	
Uplift capacity of Pile	4.37				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	417	[α*cu2*πBL/Fs]
Safe Frictional Resistance	139	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	209	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	70	
Safe Vertical Capacity of pile (t)	**217**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**80**	



BH-8					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	74	91	129	171	217
Safe Uplift capacity of Pile	32	39	52	66	80



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.93	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.1625	2.325	2.325	2.325	
As (π x dia x tickness)	1.9625	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	8.95	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.98	0.00	0.00	0.00	
Uplift capacity of Pile	1.49				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	174	[α*cu2*πBL/Fs]
Safe Frictional Resistance	58	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	36	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**73**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**32**	



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.93	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.1625	2.325	2.325	2.325	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.74	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.58	0.00	0.00	0.00	
Uplift capacity of Pile	1.79				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	209	[α*cu2*πBL/Fs]
Safe Frictional Resistance	70	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	52	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	17	
Safe Vertical Capacity of pile (t)	**90**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**38**	



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.93	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.1625	2.325	2.325	2.325	
As (π x dia x tickness)	3.14	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	14.32	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.77	0.00	0.00	0.00	
Uplift capacity of Pile	2.39				

The allowable load on the pile $(Q_a) = c_{u1}{*}Nc{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	278	[α*cu2*πBL/Fs]
Safe Frictional Resistance	93	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	93	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	31	
Safe Vertical Capacity of pile (t)	**128**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**52**	



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.93	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.1625	2.325	2.325	2.325	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	17.90	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	5.97	0.00	0.00	0.00	
Uplift capacity of Pile	2.98				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	348	[α*cu2*πBL/Fs]
Safe Frictional Resistance	116	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	145	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	48	
Safe Vertical Capacity of pile (t)	**170**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**65**	



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.7	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.93	0.00	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.1625	2.325	2.325	2.325	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.48	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.16	0.00	0.00	0.00	
Uplift capacity of Pile	3.58				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	164	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	82	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	417	[α*cu2*πBL/Fs]
Safe Frictional Resistance	139	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	209	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	70	
Safe Vertical Capacity of pile (t)	**216**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**80**	



BH-9					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	73	90	128	170	216
Safe Uplift capacity of Pile	32	38	52	65	80



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	1.9625	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	9.11	0.00	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.04	0.00	0.00	0.00	
Uplift capacity of Pile	1.52				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$

α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	167	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	83.5	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	177	[α*cu2*πBL/Fs]
Safe Frictional Resistance	59	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	37	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**74**	
Self Weight of Pile	1.25	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**32**	



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	2.355	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	10.93	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	3.64	0.00	0.00	0.00	
Uplift capacity of Pile	1.82				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	167	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	83.5	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	212	[α*cu2*πBL/Fs]
Safe Frictional Resistance	71	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	53	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	18	
Safe Vertical Capacity of pile (t)	**92**	
Self Weight of Pile	1.80	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**39**	



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.14	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	14.57	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	4.86	0.00	0.00	0.00	
Uplift capacity of Pile	2.43				

The allowable load on the pile (Q_a) = c_{u1}*$Nc^*\pi B^2/4F_s + \alpha^* c_{u2}^* \pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	167	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	83.5	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	283	[α*cu2*πBL/Fs]
Safe Frictional Resistance	94	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	94	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	31	
Safe Vertical Capacity of pile (t)	**131**	
Self Weight of Pile	3.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**53**	



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	3.925	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	18.21	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	6.07	0.00	0.00	0.00	
Uplift capacity of Pile	3.04				

The allowable load on the pile $(Q_a) = c_{u1}{*}N_c{*}\pi B^2/4F_s + \alpha{*}c_{u2}{*}\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	167	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	83.5	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	354	[α*cu2*πBL/Fs]
Safe Frictional Resistance	118	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	147	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	49	
Safe Vertical Capacity of pile (t)	**173**	
Self Weight of Pile	5.00	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**67**	



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	4.5	4.5	4.5	
	4.5	4.5	4.5	4.5	
	2.5	**0**	**0**	**0**	
C Value	5.8	0	0	0	
Φ Value	0	0	0	0	
α	0.8	0	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.92	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	1.15	2.3	2.3	2.3	
As (π x dia x tickness)	4.71	0	0	0	
Ultimate Skin Frictional Resistance (For C Value)	21.85	0	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	7.28	0.00	0.00	0.00	
Uplift capacity of Pile	3.64				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	167	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	83.5	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	425	[α*cu2*πBL/Fs]
Safe Frictional Resistance	142	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	212	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	71	
Safe Vertical Capacity of pile (t)	**220**	
Self Weight of Pile	7.20	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**82**	



BH-10					
Depth of Pile (10 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	74	92	131	173	220
Safe Uplift capacity of Pile	32	39	53	67	82



BH-11					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7.5	7.5	
	3	7.5	7.5	7.5	
	1	**4.5**	**0**	**0**	
C Value	5	6.2	0	0	
Φ Value	0	0	0	0	
α	0.9	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.9	0.92	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.45	2.97	5.04	5.04	
As (π x dia x tickness)	0.785	3.5325	0	0	
Ultimate Skin Frictional Resistance (For C Value)	3.53	16.86	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.18	5.62	0.00	0.00	
Uplift capacity of Pile	3.40				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	170	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	85	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	180	[α*cu2*πBL/Fs]
Safe Frictional Resistance	60	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	38	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	13	
Safe Vertical Capacity of pile (t)	**79**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**35**	



BH-11					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7.5	7.5	
	3	7.5	7.5	7.5	
	1	**4.5**	**0**	**0**	
C Value	5	6.2	0	0	
Φ Value	0	0	0	0	
α	0.9	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.9	0.92	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.45	2.97	5.04	5.04	
As (π x dia x tickness)	0.942	4.239	0	0	
Ultimate Skin Frictional Resistance (For C Value)	4.24	20.236986	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.41	6.75	0.00	0.00	
Uplift capacity of Pile	4.08				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	170	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	85	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	216	[α*cu2*πBL/Fs]
Safe Frictional Resistance	72	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	54	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	18	
Safe Vertical Capacity of pile (t)	**98**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**42**	



BH-11					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7.5	7.5	
	3	7.5	7.5	7.5	
	1	**4.5**	**0**	**0**	
C Value	5	6.2	0	0	
Φ Value	0	0	0	0	
α	0.9	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.9	0.92	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.45	2.97	5.04	5.04	
As (π x dia x tickness)	1.256	5.652	0	0	
Ultimate Skin Frictional Resistance (For C Value)	5.65	26.982648	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.88	8.99	0.00	0.00	
Uplift capacity of Pile	5.44				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	170	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	85	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	288	[α*cu2*πBL/Fs]
Safe Frictional Resistance	96	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	96	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	32	
Safe Vertical Capacity of pile (t)	**139**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**56**	

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BH-11					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7.5	7.5	
	3	7.5	7.5	7.5	
	1	**4.5**	**0**	**0**	
C Value	5	6.2	0	0	
Φ Value	0	0	0	0	
α	0.9	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.9	0.92	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.45	2.97	5.04	5.04	
As (π x dia x tickness)	1.57	7.065	0	0	
Ultimate Skin Frictional Resistance (For C Value)	7.07	33.72831	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.36	11.24	0.00	0.00	
Uplift capacity of Pile	6.80				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	170	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	85	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	360	[α*cu2*πBL/Fs]
Safe Frictional Resistance	120	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	150	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	50	
Safe Vertical Capacity of pile (t)	**184**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**71**	



BH-11					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7.5	7.5	
	3	7.5	7.5	7.5	
	1	**4.5**	**0**	**0**	
C Value	5	6.2	0	0	
Φ Value	0	0	0	0	
α	0.9	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.9	0.92	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.45	2.97	5.04	5.04	
As (π x dia x tickness)	1.884	8.478	0	0	
Ultimate Skin Frictional Resistance (For C Value)	8.48	40.473972	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.83	13.49	0.00	0.00	
Uplift capacity of Pile	8.16				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	170	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	85	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	432	[α*cu2*πBL/Fs]
Safe Frictional Resistance	144	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	216	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	72	
Safe Vertical Capacity of pile (t)	**233**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**87**	



BH-11					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	79	98	139	184	233
Safe Uplift capacity of Pile	35	42	56	71	87



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.2	6.3	0	0	
Φ Value	0	0	0	0	
α	0.88	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.25**	**0.25**	**0.25**	**0.25**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	0.785	3.14	0	0	
Ultimate Skin Frictional Resistance (For C Value)	3.59	15.23	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0.00	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.20	5.08	0.00	0.00	
Uplift capacity of Pile	3.14				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	168	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	84	
B	0.25	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.36	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	178	[α*cu2*πBL/Fs]
Safe Frictional Resistance	59	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.049	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	37	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	12	
Safe Vertical Capacity of pile (t)	**78**	
Self Weight of Pile	1.13	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**34**	



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.2	6.3	0	0	
Φ Value	0	0	0	0	
α	0.88	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.3**	**0.3**	**0.3**	**0.3**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	0.942	3.768	0	0	
Ultimate Skin Frictional Resistance (For C Value)	4.31	18.278568	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.44	6.09	0.00	0.00	
Uplift capacity of Pile	3.76				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	168	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	84	
B	0.3	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	2.83	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	214	[α*cu2*πBL/Fs]
Safe Frictional Resistance	71	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.071	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	53	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	18	
Safe Vertical Capacity of pile (t)	**97**	
Self Weight of Pile	1.62	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**41**	



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.2	6.3	0	0	
Φ Value	0	0	0	0	
α	0.88	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.4**	**0.4**	**0.4**	**0.4**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.256	5.024	0	0	
Ultimate Skin Frictional Resistance (For C Value)	5.75	24.371424	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	1.92	8.12	0.00	0.00	
Uplift capacity of Pile	5.02				

The allowable load on the pile $(Q_a) = c_{u1}*N_c*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	168	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	84	
B	0.4	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	3.77	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	285	[α*cu2*πBL/Fs]
Safe Frictional Resistance	95	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.126	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	95	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	32	
Safe Vertical Capacity of pile (t)	**137**	
Self Weight of Pile	2.88	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**55**	



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.2	6.3	0	0	
Φ Value	0	0	0	0	
α	0.88	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.5**	**0.5**	**0.5**	**0.5**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.57	6.28	0	0	
Ultimate Skin Frictional Resistance (For C Value)	7.18	30.46428	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.39	10.15	0.00	0.00	
Uplift capacity of Pile	6.27				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	168	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	84	
B	0.5	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	4.71	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	356	[α*cu2*πBL/Fs]
Safe Frictional Resistance	119	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.196	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	148	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	49	
Safe Vertical Capacity of pile (t)	**181**	
Self Weight of Pile	4.50	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**70**	



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)					
	STRATUM-I	**STRATUM-II**	**STRATUM-III**	**STRATUM-IV**	
Shaft Length	2	3	7	7	
	3	7	7	7	
	1	**4**	**0**	**0**	
C Value	5.2	6.3	0	0	
Φ Value	0	0	0	0	
α	0.88	0.77	0	0	
Ki	0	0	0	0	
Dia of Pile	**0.6**	**0.6**	**0.6**	**0.6**	
Bulk Dencity (Submarged)	0.91	0.93	0	0	
Tan Value (TAN Φ)	0.000	0.000	0.000	0.000	
Pdmean	0.455	2.77	4.63	4.63	
As (π x dia x tickness)	1.884	7.536	0	0	
Ultimate Skin Frictional Resistance (For C Value)	8.62	36.557136	0	0	
Ultimate Skin Frictional Resistance (For Φ Value)	0	0.00	0.00	0.00	
Permissable skin friction Resistance (t)	2.87	12.19	0.00	0.00	
Uplift capacity of Pile	7.53				

The allowable load on the pile $(Q_a) = c_{u1}*Nc*\pi B^2/4F_s + \alpha*c_{u2}*\pi BL/F_s$		
α = Adhesion factor	0.9	As per IS - 2911-1-2 : 2010, P-13,
Compressive strength of the Rock (qu) [T/m²]	168	IS - 2911-1-2 : 2010, P-13, FIG - 3
C (T/m²)	84	
B	0.6	
Length of Socket (m) = (L)	3	Minimum shocket length of pile 2-3 diameter of pile
A_{si} (Surface Area) = π*B*L (m²)	5.65	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate Skin Frictional Resistance	427	[α*cu2*πBL/Fs]
Safe Frictional Resistance	142	
N_c	9	As per IS - 2911-1-2:2010, P-13,
Ap = πB²/4	0.283	
Factor of Safety (Fs)	3	As per IS - 2911-1-2 : 2010, Factor of Safety =3
Ultimate End Bearing resistance (t/m²)	214	[cu1*Nc*πB²/4]/Fs
Safe End Bearing Ressistance (t)	71	
Safe Vertical Capacity of pile (t)	**229**	
Self Weight of Pile	6.48	(Wp) = ApxLxϒc/9.81 (including cut off 2 m, ϒ=25kN/m3 as per IS 456)
Safe Uplift capacity of Pile	**85**	



BH-12					
Depth of Pile (9 m including 2 m Cut offf length)	Dia 250mm	Dia 300mm	Dia 400mm	Dia 500mm	Dia 600mm
Safe vertical capacity of Pile	78	97	137	181	229
Safe Uplift capacity of Pile	34	41	55	70	85



6.0.2. ***Calculation of Lateral-Load Carrying Capacity and Moment-Resisting Capacity: Umrangsho, BH-1***

Diameter of Pile= 600 mm

Refer to IS 2911 (Part-1/Section-2): 2010 Annex-c (Clause 6.5.2 page-14)

Stiffness Factor R= $(EI/KB)^{1/4}$m (For piles in Preloaded clays)

Here E= 5000√25 (f_{ck} = 25) = 2.5X 10^7 kN/ Sqm

$I = \pi \times 0.6^4/64 = 0.0064m^4$

k_1 = 9500 kN/m^3 (from Table-4 of IS 2911 (Part-1/Section-2)

Therefore, R= $((2.5x10^7x0.0064)/(9500/1.5x0.3/0.6)x0.6)^{1/4}$ = 3.0293 m

Taking, k_1 = 9500 kN/m3 (from Table-4 of IS2911 (Part-1/Section-2) for Field N-value = 42 in fixity zone.

Therefore, R = 3.0293 m [Note: As, L<= 2R i.e. Short Pile]

Here e= 0 m (Considering pile will be firmly embedded in Stratum-I) and

e/R= 0

For Fixed Head Pile

Refer to figure-4 of IS: 2911(Part-1/Section-2) (Fixed head pile in Preloaded clay)

Z_f/R = 2.0

Therefore, Z_f = 2.0 X 3.0293= 6.059 m and hence, $e+Z_f$ = 0+6.059= 6.059 m

Permissible deflection of 600mm dia. Pile = 6 mm (considering 1% of Pile dia)

Refer to Clause c- 4.2 of IS 2911 y= H $(e+Zf)^3/12$ EI x 10^3

Here, y= 6 mm or 0.006m

or H= 51.8 kN = 5.179 ton

Moment MF = (Refer to Clause C-4.3 of IS 2911) = H (e+Zf)/2

MF = 5.179 x (6.059/2) = 15.69 t-M

Reduction Factor, m=0.68 [Ref. to Is 2911-part1-sec2, cl.C-4.3, 5B]

Hence, Actual Maximum moment, MA=10.669 ton-m

For Free Head Pile

Refer to figure-4 of IS: 2911(Part-1/Section-2) (Fixed head pile in Preloaded clay)

Z_f/R = 1.6

Therefore, Z_f = 1.6 X 3.0293= 4.847 m and hence, $e+Z_f$ = 0+4.847= 4.847 m

Permissible deflection of 600mm dia. Pile = 6 mm (considering 1% of Pile dia)

Refer to Clause c- 4.2 of IS 2911 y= H $(e+Zf)^3/3$ EI x 10^3

Here, y= 6 mm or 0.006m

or H= 25.29 kN= 2.529 ton

Moment MF = (Refer to Clause C-4.3 of IS 2911) = Hx(e+Zf)

MF = 2.529 X 4.847 = 12.26 t-M

Reduction Factor, m=0.3 [Ref. to Is 2911-part1-sec2, cl.C-4.3, 5A]

Hence, Actual Maximum moment, MA=3.678 t-M

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-1	250	0.908	0.443	0.789	0.27
	300	1.295	0.633	1.333	0.459
	400	2.319	1.132	3.21	1.104
	500	3.602	1.759	6.188	2.133
	600	5.179	2.529	10.669	3.678

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-2	250	0.928	0.454	0.796	0.276
	300	1.325	0.647	1.353	0.468
	400	2.373	1.158	3.257	1.122
	500	3.687	1.800	6.29	2.166
	600	5.301	2.590	10.832	3.738

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-3	250	0.871	0.425	0.762	0.264
	300	1.243	0.608	1.299	0.447
	400	2.226	1.087	3.121	1.074
	500	3.458	1.688	6.025	2.076
	600	4.974	2.429	10.384	3.579

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-4	250	1.081	0.528	0.884	0.303
	300	1.544	0.753	1.503	0.516
	400	2.762	1.349	3.604	1.242
	500	4.290	2.095	6.956	2.397
	600	6.172	3.014	11.995	4.134

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-5	250	0.979	0.477	0.83	0.285
	300	1.397	0.681	1.401	0.483
	400	2.499	1.221	3.373	1.161
	500	3.883	1.895	6.508	2.241
	600	5.584	2.727	11.22	3.867

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-6	250	0.943	0.460	0.809	0.279
	300	1.345	0.657	1.367	0.471
	400	2.408	1.177	3.291	1.134
	500	3.742	1.827	6.351	2.187
	600	5.384	2.629	10.948	3.774

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-7	250	1.013	0.494	0.843	0.291
	300	1.446	0.706	1.435	0.495
	400	2.588	1.263	3.448	1.188
	500	4.021	1.963	6.664	2.295
	600	5.781	2.824	11.478	3.957

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-8	250	1.034	0.505	0.857	0.297
	300	1.475	0.720	1.455	0.501
	400	2.640	1.289	3.495	1.206
	500	4.101	2.003	6.746	2.328
	600	5.901	2.881	11.642	4.011

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-9	250	0.922	0.450	0.796	0.273
	300	1.315	0.642	1.346	0.465
	400	2.355	1.150	3.237	1.116
	500	3.658	1.787	6.256	2.157
	600	5.262	2.569	10.785	3.717

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-10	250	0.992	0.485	0.836	0.288
	300	1.415	0.692	1.414	0.489
	400	2.535	1.237	3.4	1.173
	500	3.938	1.923	6.569	2.265
	600	5.664	2.765	11.322	3.903

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-11	250	1.040	0.508	0.864	0.297
	300	1.485	0.725	1.462	0.504
	400	2.658	1.298	3.509	1.212
	500	4.129	2.017	6.78	2.337
	600	5.938	2.900	11.689	4.029

BH NO	Pile Diameter (mm)	Recommended Lateral Load Carrying Capacity (t)		Recommended Moment Resisting Capacity (t-m)	
		Fixed-head Pile	Free-head Pile	Fixed-head Pile	Free-head Pile
BH-12	250	1.068	0.522	0.877	0.303
	300	1.524	0.744	1.489	0.513
	400	2.727	1.332	3.57	1.233
	500	4.236	2.069	6.895	2.376
	600	6.095	2.976	11.893	4.098



B) PLATE LOAD TEST

B.1.0 INTRODUCTION:

Assam Electricity Grid Corporation Limited, has entrusted us to carry out 1 (one) Nos. Plate Load Test for proposed Sub-Station Complex at Assam .The main objective of this investigation is to estimate the Ultimate Bearing Capacity of the soil. This report consists of details of field tests performed and the result of the tests.

B.2.0 METHOD :

A test plate having size 300 mm X 300 mm was used as a model of prototype foundation. The plate was placed at proposed foundation level and subject to incremental loading. Settlement of each increment of load was measured and Load Vs Settlement Curve plotted. The Bearing Capacity and Settlement of proposed shallow foundation were determined with the help of Load Vs. Settlement Curve for the test plate. The test conducted as per IS 1888:1982.

Procedure:

1. Rough Mild Steel plate 300mmX 300 mm square in shape was used in this test. The proposed foundation area was excavated upto 1500 mm depth. The test plate was seated at the centre over a fine sand layer of about 5 mm.
2. The Kentledge was constructed by preparing loading platform with ISMB and wooden platform. Sack of gravel, sand and clay were placed over that platform to obtain a a total load of about 4.5 tons.
3. Load was applied on the plate by hydraulic jack of 50 ton capacity by reaction obtained from Kentledge. Pressure on the jack was recorded from a calibrated pressure gauge placed between the jack and hydraulic pump.
4. A seating load of 70 g/sqm was first applied and released after sometimes. Loads were applied on the test plate in increment of $1/5^{th}$. of total estimated safe load.
5. At each load increment settlement recordings were recorded at a time interval of 1 minute,2 minutes, 4 minutes, 6 minutes, 9 minutes, 16 minutes, 25 minutes, 36 minutes and 1 hour by means of displacement with dial gauge having least count of 0.01 mm. The settlements were recorded with reference to the datum bar.
6. After noting settlement recordings of 1 hour and when the settlement dropped to a value less than 0.02mm/ minute the next increment of load was applied

The load Vs settlement curve for the test plate were plotted from obtained test data

B.3.0 CALCULATIONS

B.3.1 Bearing Capacity

From Load Intensity vs Settlement Curve:-
Ultimate Bearing capacity = 2.95 Kg/cm²
Size of plate = 0.3 m X 0.3 m
Ultimate Bearing capacity = 2.95 Kg/cm² = 32.78 Mt/Sqm
Safe Bearing Capacity = 32.78/3 =10.93 Mt/Sqm

Therefore, Safe Bearing Capacity of **10.93 Mt/Sqm is recommended at a depth of 1.5 M depth with Factor of Safety = 3.0**

B.3.2 Settlement Analysis

Refer to IS 8009 (Part-I) 1976 (Reaffirmed 1993 and 1998) in Amendment No-1, May 1981 in clause no. 9.1.3.

$S_t = Sp* [\{B*(Bp+0.3)\}/\{Bp*(B+0.3)\}]^2$

Where:

S_t = Settlement of footing in mm

Sp = Settlement of plate in mm = 8.2 mm for load intensity 2.95 Kg/cm² (from graph)

B = Width of footing in metre = 3.0 m

Bp = Width of plate in metre = 0.30 m

(Considering size of footing 3.0m X 3.0 m)

Hence:

$S_t = 2.65 * [\{3.0*(0.30+0.3)\}/\{0.30*(3.0+0.3)\}]^2$

= 8.2 * 3.305 mm

= 27.10 mm **hence within Permissible limit**



P.K.Dutta & Co											Plate Load Test: 1	
Project	400/132 KV Grid Sub-station at Umrangso			Dial Guage	0.01-25	mm				Date	03.10.2026	
Jack Arm Area	103.82	cm^2										
Time	Pressure Gauge reading	Time Elasped (Min)	Dial Gauge Reading				Least count (mm)	Settlement				Average Settlement (mm)	Total Settlement (mm)
			DG-1	DG-2	DG-3	DG-4		DG-1	DG-2	DG-3	DG-4		
10:15AM		0 min	0.00	0.00	0.00	0.00							
10:16AM		1 min	0.00	0.00	0.00	0.00	0.01	0	0	0	0	0.00	
10:17AM		2 min	15.00	18.00	20.00	15.00	0.01	0.15	0.18	0.2	0.15	0.16	
10:19AM		4 min	20.00	22.00	22.00	20.00	0.01	0.05	0.04	0.02	0.05	0.05	
10:21AM		6 min	22.00	25.00	25.00	22.00	0.01	0.02	0.03	0.03	0.02	0.02	
10:24AM	10Kg/cm^2	9 min	26.00	27.00	28.00	22.00	0.01	0.04	0.02	0.03	0	0.02	
10:31AM		16 min	30.00	29.00	30.00	24.00	0.01	0.04	0.02	0.02	0.02	0.03	
10:40AM		25 min	32.00	31.00	32.00	25.00	0.01	0.02	0.02	0.02	0.01	0.02	
10:51AM		36 min	35.00	31.00	33.00	27.00	0.01	0.03	0	0.01	0.02	0.02	
11:15AM		60 min	35.00	33.00	35.00	27.00	0.01	0	0.02	0.02	0	0.01	
												0.32	**0.32**
11:16AM		1 min	90.00	110.00	80.00	63.00	0.01	0.55	0.77	0.45	0.36	0.56	
11:17AM		2 min	195.00	203.00	170.00	173.00	0.01	1.05	0.93	0.9	1.1	1.03	
11:19AM		4 min	202.00	210.00	178.00	180.00	0.01	0.07	0.07	0.08	0.07	0.07	
11:21AM		6 min	208.00	212.00	182.00	183.00	0.01	0.06	0.02	0.04	0.03	0.04	
11:24AM	20 Kg/cm^2	9 min	210.00	215.00	183.00	187.00	0.01	0.02	0.03	0.01	0.04	0.03	
11:31AM		16 min	215.00	218.00	189.00	190.00	0.01	0.05	0.03	0.06	0.03	0.04	
11:40AM		25 min	217.00	220.00	191.00	192.00	0.01	0.02	0.02	0.02	0.02	0.02	
11:51AM		36 min	220.00	222.00	195.00	197.00	0.01	0.03	0.02	0.04	0.05	0.03	
12:16PM		60 min	226.00	229.00	205.00	203.00	0.01	0.06	0.07	0.1	0.06	0.06	
												1.88	**2.19**
12:17PM		1 min	226.00	229.00	205.00	203.00	0.01	0	0	0	0	0.00	
12:18PM		2 min	1230.00	1227.00	1209.00	1213.00	0.01	10.04	9.98	10.04	10.1	10.04	
12:20PM		4 min	1270.00	1250.00	1280.00	1295.00	0.01	0.4	0.23	0.71	0.82	0.48	
12:22PM		6 min	1280.00	1258.00	1287.00	1303.00	0.01	0.1	0.08	0.07	0.08	0.09	
12:25PM		9 min	1288.00	1267.00	1302.00	1310.00	0.01	0.08	0.09	0.15	0.07	0.08	
12:32PM	40 Kg/cm^2	16 min	1292.00	1278.00	1310.00	1320.00	0.01	0.04	0.11	0.08	0.1	0.08	
12:41PM		25 min	1305.00	1282.00	1317.00	1326.00	0.01	0.13	0.04	0.07	0.06	0.08	
12:52PM		36 min	1308.00	1285.00	1320.00	1330.00	0.01	0.03	0.03	0.03	0.04	0.03	
01:17PM		60 min	1312.00	1295.00	1325.00	1337.00	0.01	0.04	0.1	0.05	0.07	0.07	
												10.95	**13.15**
01:18PM		1 min	1312.00	1295.00	1325.00	1337.00	0.01	0	0	0	0	0.00	
01:19PM		2 min	2690.00	2710.00	2685.00	2692.00	0.01	13.78	14.15	13.6	13.55	13.83	
01:21PM		4 min	2689.00	2709.00	2670.00	2690.00	0.01	-0.01	-0.01	-0.15	-0.02	-0.01	
01:23PM		6 min	2688.00	2709.00	2669.00	2690.00	0.01	-0.01	0	-0.01	0	0.00	
01:26PM		9 min	2687.00	2708.00	2669.00	2689.00	0.01	-0.01	-0.01	0	-0.01	-0.01	
01:33PM	60 Kg/cm^2	16 min	2687.00	2708.00	2668.00	2688.00	0.01	0	0	-0.01	-0.01	0.00	
01:42PM		25 min	2687.00	2708.00	2668.00	2688.00	0.01	0	0	0	0	0.00	
01:53PM		36 min	2687.00	2708.00	2668.00	2688.00	0.01	0	0	0	0	0.00	
02:18PM		60 min	2686.00	2708.00	2668.00	2687.00	0.01	-0.01	0	0	-0.01	-0.01	
												13.79	**26.94**



Rebound

P.K.Dutta & Co

Plate Load Test: 1

Project	400/132 KV Grid Sub-station at Umrangso		Dial Guage	0.01-25	mm	Date	03.10.2026
Jack Arm Area	103.82	cm^2					

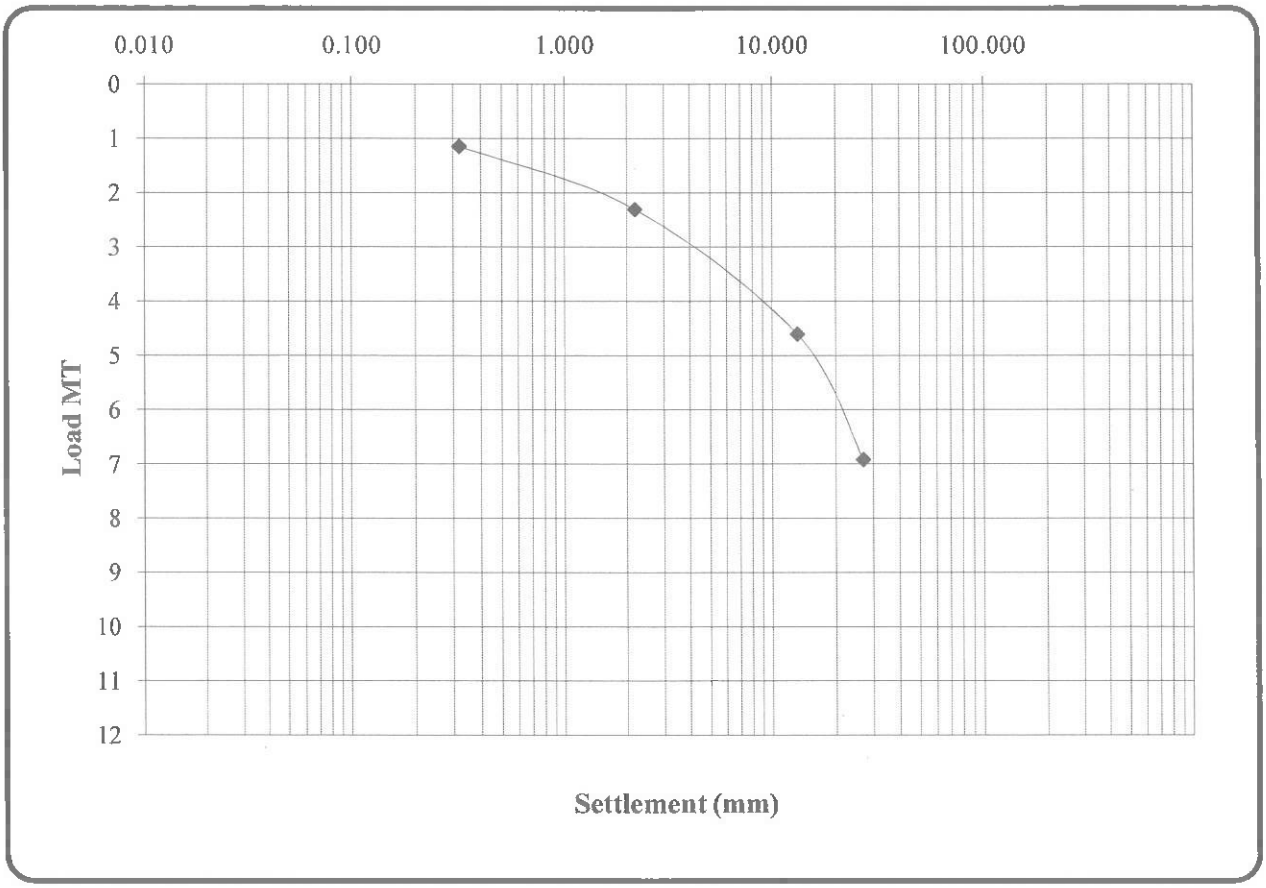
Time	Pressure Gauge reading	Time Elasped (Min)	Dial Gauge Reading				Least count(mm)	Settlement				Average Settlement (mm)	Total Settlement (mm)
			DG-1	DG-2	DG-3	DG-4		DG-1	DG-2	DG-3	DG-4		
02:20PM	40 Kg/cm^2	1 min	2686.00	2708.00	2668.00	2687.00	0.01	13.74	14.13	13.43	13.5	13.79	
02:21PM		2 min	2686.00	2708.00	2668.00	2687.00	0.01	0	0	0	0	0.00	
02:23PM		4 min	2686.00	2708.00	2668.00	2687.00	0.01	0	0	0	0	0.00	
02:25PM		6 min	2686.00	2708.00	2668.00	2687.00	0.01	0	0	0	0	0.00	
02:28PM		9 min	2686.00	2708.00	2668.00	2687.00	0.01	0	0	0	0	0.00	
02:34PM		16 min	2686.00	2708.00	2668.00	2687.00	0.01	0	0	0	0	0.00	
02:43PM		25 min	2686.00	2708.00	2668.00	2686.00	0.01	0	0	0	-0.01	0.00	
02:54PM		36 min	2685.00	2708.00	2668.00	2686.00	0.01	-0.01	0	0	0	0.00	
03:20PM		60 min	2685.00	2707.00	2668.00	2686.00	0.01	0	-0.01	0	0	0.00	
												13.78	**26.93**
03:21PM	20 Kg/cm^2	1 min	2685.00	2707.00	2668.00	2686.00	0.01	0	0	0	0	0.00	
02:22PM		2 min	2684.00	2707.00	2667.00	2686.00	0.01	-0.01	0	-0.01	0	0.00	
02:24PM		4 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
02:26PM		6 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
02:29PM		9 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
02:35PM		16 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
02:45PM		25 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
02:56PM		36 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
03:21PM		60 min	2684.00	2707.00	2667.00	2686.00	0.01	0	0	0	0	0.00	
												0.00	**26.92**



M/s. P.K.Dutta & Co.	Load Vs Settlement Curve

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

PLATE LOAD TEST **Depth- 1.50**



P. DUTTA & CO. NAIHATI

C) STANDARD PROCTOR COMPACTION TEST

The Proctor density test is standard IS: 2720(Part-8)-1983 lays down the determination of relation between the water content and the dry density of soils.

The soil is compacted into the mould to a certain amount of equal layers, each receiving a number of blows from 2.6 Kg weighted hammer at a 31 cm height. The process is then repeated for various moisture contents and dry densities are determined for each. The graphical relationship is then plotted to establish the compaction curve.

a) Optimum Moisture Content = 28.30 %
b) Maximum Dry Density = 1.60 grm/cc

D) CHEMICAL TESTS

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

D.1 Chemical Test on Soil Sample

Bore Hole No- BH-1
At depth –1.00-1.45m

SL NO	Test Parameters	Test Method	Unit	Result
1	pH value	IS:2720(Part-26):1987	.....	2.58
2	Organic Matter(OM)	IS:2720(Part-22):1972	%	0.27
3	Calcium carbonate ($caco_3$)	IS:2720(Part-23):1976	%	17.65
4	Sulphate(SO_3)	IS:2720(Part-27):1977	mg/kg	5.59
5	Sulphate(SO_4)	IS:2720(Part-27):1977	mg/kg	8.64
6	Chloride	IS:3025(Part-32):1988	%	0.021
7	Salinity as Conductivity	IS:14767-2000	ms	1.56
8	Nitrate	SOP No: RVB/SOP/05/25 As per ICAR 2011 (Department of Agriculture & cooperation , Ministry of Agriculture, Govt. of India)	mg/kg	0.66

Bore Hole No- BH-6
At depth –3.00-3.45m

SL NO	Test Parameters	Test Method	Unit	Result
1	pH value	IS:2720(Part-26):1987	.....	2.70
2	Organic Matter(OM)	IS:2720(Part-22):1972	%	0.33
3	Calcium carbonate ($caco_3$)	IS:2720(Part-23):1976	%	19.18
4	Sulphate(SO_3)	IS:2720(Part-27):1977	mg/kg	5.86
5	Sulphate(SO_4)	IS:2720(Part-27):1977	mg/kg	8.70
6	Chloride	IS:3025(Part-32):1988	%	0.023
7	Salinity as Conductivity	IS:14767-2000	ms	1.65
8	Nitrate	SOP No: RVB/SOP/05/25 As per ICAR 2011 (Department of Agriculture & cooperation , Ministry of Agriculture, Govt. of India)	mg/kg	0.55

Chemical test was carried out on a soil samples to determine the pH value, Sulphate and Chloride. It is seen that the values are within permissible limits (as per IS: 456-2000) and so no special cement will be required for foundation concrete. **Either Ordinary Portland cement or Portland slag cement or Portland Pozzolana cement can be used for concreting.**

E) CONCLUSION & RECOMANDATION

From engineering properties of the deposit following recommendations for foundation are suggested:

a) Based on the field tests and the foregoing discussion the following are summarized:
b) The subsoil is characterized by silty clay with kankars in first layer, second layer characterized weathered shale continues up to terminating depth of maximum boreholes.
c) The present report deals with the geotechnical investigation findings at the location and the discussion on the aspects regarding allowable bearing capacity of open foundations. However, the Foundation Designer may modulate the type of foundations and other values regarding foundation geometry and soil design parameter to meet any specific design criteria.
d) Water level observations were made during the progress of boring. The depths at which ground water was encountered, was recorded in the respective borelog sheet as standing water level. Standing water level was measured after 24 hours of removal of casing. It was noticed that the ground water level was found NIL for all boreholes.
e) Precaution in all respect should be taken for nearby existing structures, if any. The final decision regarding the foundation will depend on the judgment of the engineer concerned.
f) Any unsuitable expansive/decomposed if encountered should be replaced.
g) The foundation spacing should be chosen in such a way that there should not be any overlap of pressure bulb of 2 adjacent footings.
h) Concentration of chlorides, sulphates & pH value are under limit as per IS Code specification. So no special cement will be required for foundation concrete.
i) Pile Capacity shall be considered for Foundation design as per nearest bore hole data

Prepared By | **Checked & approved by**

Signature
Soil Investigator
Corporation Ltd

P.K. Dutta & Co.
Pranaya Dutta
PRANAYA DUTTA
B. Tech (Civil)
Sr. Geotechnical Engineer

P.K. DUTTA & CO. W.B. NAIHATI

Signature
Assam Electricity Grid

ANNEXURE

FIELD BORE LOG DATA

M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED**. **Project:-** Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-1	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'31.95"				
Commenced on:-	10.10.2026	Easting :-	92°46'04.90"	SPT	4	Undisturbed (U)	2
Completed on:-	11.10.2026	Termination Depth (m):-15.00 M		Cone		Distubed (D)	3
Water Level :- NIL				Vane	-	Core (C)	6

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00								D	1	0.5	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	3	4	5	9	Stiff to very consistency,to brownish to reddish grey silty clay with kankars.			S	1	2.00	2.45			
	4	7	10	17				S	2	3.00	3.45			
								U	2	4.00	4.45			
								D	3	4.50	----			
7.00	10	16	26	42			7.00	S	3	5.00	5.45			
7.00	38	56 blows for 10cm>100						S	4	7.00	7.25			Rebounded
								C	1	7.00	8.50	13%	NIL	
					Completely to highly, weathered, brownish to dark grey coloured,weathered shale.			C	2	8.50	10.00	14%	NIL	
								C	3	10.00	11.50	13%	NIL	
								C	4	11.50	13.00	15%	NIL	
								C	5	13.00	14.00	18%	NIL	
15.00							8.00	C	6	14.00	15.00	23%	10%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-** Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-2	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'32.62"				
Commenced on:-	09.10.2026	Easting :-	92°46'07.99"	SPT	4	Undisturbed (U)	1
Completed on:-	10.10.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :- NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	`Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to verry stiff consistency, brownish to reddish yellow silty clay with kankars.			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	3	4	6	10				S	1	2.00	2.45			
	5	8	11	19				S	2	3.00	3.45			
4.50							4.50	U	2	4.00	4.20			Rebounded
4.50	30	52 blows for 12cm>100			Completely to highly, weathered, brownish to dark grey coloured, weathered shale.			S	3	4.50	4.77			Rebounded
								C	1	4.50	6.00	10%	NIL	
	42	55 blows for 10cm>100						S	4	6.00	6.25			Rebounded
								C	2	6.00	7.50	13%	NIL	
								C	3	7.50	9.00	12%	NIL	
								C	4	9.00	10.50	14%	NIL	
								C	5	10.50	12.00	14%	NIL	
								C	6	12.00	13.50	17%	NIL	
15.00							10.50	C	7	13.50	15.00	18%	NIL	

" S " - ' SPT '	" C " - 'CORE'	" U " - ' UNDISTURBED SAMPLE '	" D " - ' DISTURBED SAMPLE '	" W " - ' WATER SAMPLE '	" BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-** Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-3	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'29.82"				
Commenced on:-	06.10.2026	Easting :-	92°46'06.27"	SPT	3	Undisturbed (U)	1
Completed on:-	07.10.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :-NIL				Vane	-	Core (C)	8

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff consistency, brownish grey silty clay with kankars.			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	4	6	7	13				S	1	2.00	2.45			
3.50	21	55 blows for 10cm>100					3.50	S	2	3.00	3.25			Rebounded
3.50					Completely to highly, weathered, brownish to dark grey coloured, weathered shale			C	1	3.00	4.50	13%	NIL	
	46	56 blows for 5cm>100						S	3	4.50	4.70			Rebounded
								C	2	4.50	6.00	16%	NIL	
								C	3	6.00	7.50	9%	NIL	
								C	4	7.50	9.00	11%	NIL	
								C	5	9.00	10.50	14%	NIL	
								C	6	10.50	12.00	17%	NIL	
								C	7	12.00	13.50	16%	NIL	
15.00							11.50	C	8	13.50	15.00	19%	NIL	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client:** ASSAM ELECTRICITY GRID CORPORATION LIMITED. **Project:-** Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	BORE LOG DATA SHEET

Bore Hole No. :-	BH-4	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'30.92"				
Commenced on:-	07.10.2026	Easting :-	92°46'07.63"	SPT	4	Undisturbed (U)	2
Completed on:-	08.10.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	3
Water Level :- NIL				Vane	-	Core (C)	6

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)`	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff consistency, brownish grey silty clay with kankars			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
3.00	4	6	8	14			3.00	S	1	2.00	2.45			
3.00	8	14	18	32				S	2	3.00	3.45			
					Very stiff, to hard brownish grey silty clay with kankars			U	2	4.00	4.45			
								D	3	4.50	----			
7.00	13	20	26	46			4.00	S	3	5.00	5.45			
7.00	38	45	56 blows for 7cm>100					S	4	7.00	7.37			Rebounded
								C	1	7.00	8.50	9%	NIL	
					Completely to highly, weathered, brownish dark grey coloured,weathered shale			C	2	8.50	10	11%	NIL	
								C	3	10.50	11.5	12%	NIL	
								C	4	11.50	13	14%	NIL	
								C	5	13.00	14.00	15%	NIL	
15.00							8.00	C	6	14.00	15.00	18%	NIL	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-5	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'27.98"				
Commenced on:-	30-09-2026	Easting :-	92°46'07.49"	SPT	4	Undisturbed (U)	2
Completed on:-	01-10-2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	3
Water Level :- NIL				Vane	-	Core (C)	6

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00								D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	4	6	7	13	Stiff to very stiff, brownish grey silty clay with kankars			S	1	2.00	2.45			
	6	8	11	19				S	2	3.00	3.45			
								U	2	4.00	4.45			
								D	3	4.50	----			
7.00	7	10	12	22			7.00	S	3	5.00	5.45			
7.00	32	55	30 for 5cm>100					S	4	7.00	7.35			Rebounded
								C	1	7.00	8.00	10%	NIL	
								C	2	8.00	9.50	14%	10%	
					Completely to highly, weathered, dark grey coloured, weathered shale			C	3	9.50	11.00	15%	10%	
								C	4	11.50	12.50	19%	12%	
								C	5	12.50	14.00	21%	10%	
15.00							8.00	C	6	14.00	15.00	25%	13%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-6	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'28.90"				
Commenced on:-	02-10-2026	Easting :-	92°46'08.00"	SPT	3	Undisturbed (U)	1
Completed on:-	03-10-2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :- NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff,consistency ,brownish grey silty clay with kankars			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	3	4	6	10				S	1	2.00	2.45			
	7	12	16	28				S	2	3.00	3.45			
5.00							5.00	U	2	4.00	4.20			Rebounded
5.00	33	56	45 blows>100		Completely to highly, weathered, dark grey coloured, weathered shale			S	3	5.00	5.35			Rebounded
								C	1	5.00	6.50	14%	NIL	
								C	2	6.50	8.00	22%	12%	
								C	3	8.00	9.50	20%	13%	
								C	4	9.50	11.00	18%	NIL	
								C	5	11.00	12.50	21%	12%	
								C	6	12.50	14.00	24%	13%	
15.00							10.00	C	7	14.00	15.00	27%	15%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client:** ASSAM ELECTRICITY GRID CORPORATION LIMITED. **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	BORE LOG DATA SHEET

Bore Hole No. :-	BH-7	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'29.57"				
Commenced on:-	05.10.2026	Easting :-	92°46'09.28"	SPT	3	Undisturbed (U)	1
Completed on:-	06.10.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :- NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff,brownish grey silty clay with kankars.			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	4	5	6	11				S	1	2.00	2.45			
4.50	6	9	16	25			4.50	S	2	3.00	3.45			
4.50	49	53 for 10cm>100			Completely to highly, weathered, brownish to dark grey coloured,weathered shale			S	3	4.50	4.75			
								C	1	4.50	6.00	12%	NIL	
								C	2	6.00	7.50	13%	NIL	
								C	3	7.50	9.00	15%	NIL	
								C	4	9.00	10.50	18%	NIL	
								C	5	10.50	12.00	17%	NIL	
								C	6	12.00	13.50	20%	NIL	
15.00							10.50	C	7	13.50	15.00	22%	10%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client:** ASSAM ELECTRICITY GRID CORPORATION LIMITED. **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-8	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'28.56"				
Commenced on:-	04.10.2026	Easting :-	92°46'10.87"	SPT	3	Undisturbed (U)	1
Completed on:-	05.10.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :-NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff consistency brownish grey silty clay with kankars.			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	3	5	7	12				S	1	2.00	2.45			
5.00	7	10	16	26			5.00	S	2	3.00	3.45			
5.00	55	50 blows for 7cm>100			Completely to highly, weathered, brownish to dark grey coloured,weathered shale			S	3	5.00	5.22			Rebounded
								C	1	5.00	6.50	15%	NIL	
								C	2	6.50	8.00	16%	NIL	
								C	3	8.00	9.50	14%	NIL	
								C	4	9.50	11.00	17%	NIL	
								C	5	11.00	12.50	19%	NIL	
								C	6	12.50	14.00	18%	NIL	
15.00							10.00	C	7	14.00	15.00	17%	NIL	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-9	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'23.82"				
Commenced on:-	28.09.2026	Easting :-	92°46'08.25"	SPT	3	Undisturbed (U)	1
Completed on:-	29.09.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :- NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock fragments			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	3	5	6	11				S	1	2.00	2.45			
	7	11	14	25				S	2	3.00	3.45			
4.50							4.50	U	2	4.00	4.10			Rebounded
4.50	68 blows for 13cm>100				Completely to highly, weathered, dark grey coloured,weathered shale			S	3	4.50	4.63			Rebounded
								C	1	4.50	6.00	13%	NIL	
								C	2	6.00	7.50	12%	NIL	
								C	3	7.50	9.00	14%	NIL	
								C	4	9.00	10.50	16%	NIL	
								C	5	10.50	12.00	15%	NIL	
								C	6	12.00	13.50	18%	NIL	
15.00							10.50	C	7	13.50	15.00	23%	NIL	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client:** ASSAM ELECTRICITY GRID CORPORATION LIMITED. **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-10	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'25.12"				
Commenced on:-	29.09.2026	Easting :-	92°46'08.71"	SPT	5	Undisturbed (U)	1
Completed on:-	30.09.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	2
Water Level :- NIL				Vane	-	Core (C)	7

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock fragments			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
	4	5	7	12				S	1	2.00	2.45			
	7	12	14	26				S	2	3.00	3.45			
4.50							4.50	U	2	4.00	4.15			Rebounded
4.50	53	50 blows>100			Completely to highly, weathered, dark grey coloured,weathered shale			S	3	4.50	4.70			Rebounded
6.00							1.50	C	1	4.50	6.00	10%	NIL	
6.00	24	35	43	78	Hard consistency,dark grey,clay			S	4	6.00	6.45			
7.50							1.50	C	2	6.00	7.50	7%	NIL	
7.50	40	62 blows >100			Completely to highly, weathered, dark grey coloured,weathered shale			S	5	7.50	7.75			Rebounded
								C	3	7.50	9.00	13%	NIL	
								C	4	9.00	10.50	14%	NIL	
								C	5	10.50	12.00	16%	NIL	
								C	6	12.00	13.50	20%	12%	
15.00							9.00	C	7	13.50	15.00	22%	10%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client: ASSAM ELECTRICITY GRID CORPORATION LIMITED.** **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	**BORE LOG DATA SHEET**

Bore Hole No. :-	BH-11	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'26.03"				
Commenced on:-	27.09.2026	Easting :-	92°46'10.69"	SPT	5	Undisturbed (U)	2
Completed on:-	28.09.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	3
Water Level :- NIL				Vane	-	Core (C)	5

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff consistency, brownish to reddish grey silty clay with kankars			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
3.00	3	4	6	10			3.00	S	1	2.00	2.45			
3.00	7	11	16	27	very stiff to hard, brownish to reddish grey silty clay			S	2	3.00	3.45			
								U	2	4.00	4.45			
								D	3	4.50	----			
7.50	11	15	25	40			4.50	S	3	5.00	5.45			
7.50	49	56 blows for 5cm>100			Completely to high, weathered, dark grey coloured, weathered shale			S	4	7.50	7.70			Rebounded
								C	1	7.50	9.00	9%	NIL	
	44	60 blows >100						S	5	9.00	9.17			Rebounded
								C	2	9.00	10.50	12%	NIL	
								C	3	10.50	12.00	13%	NIL	
								C	4	12.00	13.50	16%	NIL	
15.00							7.50	C	5	13.50	15.00	19%	10%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '



M/s P.K.Dutta & Co.	**Client:** ASSAM ELECTRICITY GRID CORPORATION LIMITED. **Project:-**Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.	BORE LOG DATA SHEET

Bore Hole No. :-	BH-12	Borehole Diameter :- 150 mm Drill Hole:- NX.		Field Tests	Nos	Samples	Nos
Land Type :-	S/S Land	Northing :-	25°31'26.74"				
Commenced on:-	25.09.2026	Easting :-	92°46'12.25"	SPT	5	Undisturbed (U)	2
Completed on:-	26.09.2026	Termination Depth (m):-15.00 M		Cone	-	Distubed (D)	3
Water Level :- NIL				Vane	-	Core (C)	6

DEPTH (m.)	Penetration 15 cm	15 cm	15 cm	N value	STRATA DESCRIPTION	Symbol	Thickness (m)	SAMPLES Type	No.	Depth (m.)		Core Recovery (%)	R.Q.D. (%)	Remarks
0.00					Stiff consistency, brownish to reddish grey silty clay with kankars			D	1	0.50	----			
								D	2	1.00	----			
								U	1	1.00	1.45			
3.00	3	5	6	11			3.00	S	1	2.00	2.45			
3.00	7	14	16	30	Very stiff, brownish grey silty clay with kankars			S	2	3.00	3.45			
								U	2	4.00	4.45			
								D	3	4.50	----			
7.00	11	16	28	44			4.00	S	3	5.00	5.45			
7.00	37	65 blows for 10cm>100			Completely to high, weathered, dark grey coloured, weathered shale			S	4	7.00	7.25			Rebounded
								C	1	7.00	8.50	12%	12%	
	60 blows for 12cm>100							S	5	8.50	8.62			Rebounded
								C	2	8.50	10.00	17%	10%	
								C	3	10.00	11.50	23%	14%	
								C	4	11.50	13.00	27%	15%	
								C	5	13.00	14.00	32%	19%	
15.00							8.00	C	6	14.00	15.00	34%	18%	

" S " - ' SPT ' | " C " - 'CORE' | " U " - ' UNDISTURBED SAMPLE ' | " D " - ' DISTURBED SAMPLE ' | " W " - ' WATER SAMPLE ' | " BGL " - 'BELOW GROUND LEVEL '

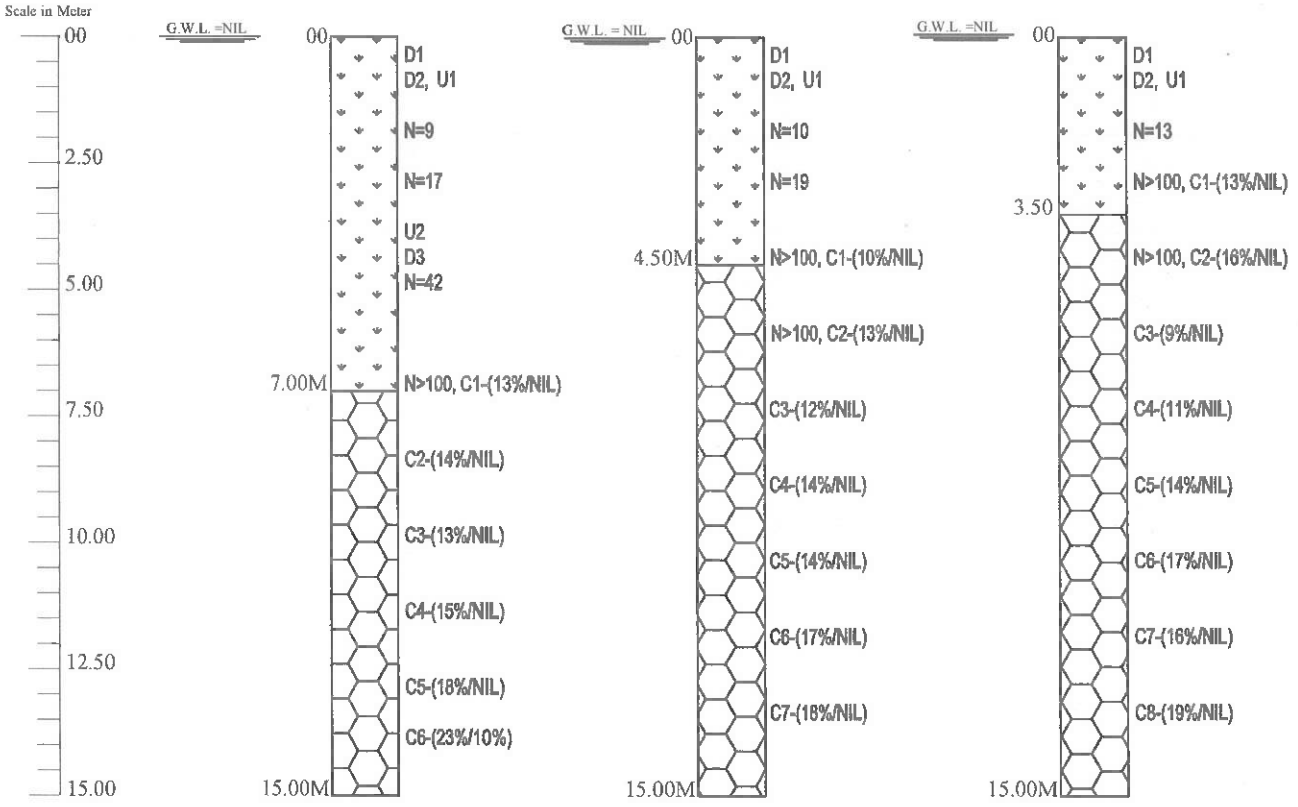
SUBSOIL PROFILE

M/s P.K.DUTTA & CO.	Generalised Subsoil Profile

CLIENT:-ASSAM ELECTRICITY GRID CORPORATION LIMITED.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Generalised Subsoil Profile



BH-1
Depth = 15.00 m.

BH-2
Depth = 15.00 m.

BH-3
Depth = 15.00 m.

= Silty clay with kankars.

=Weathered, dark grey coloured, weathered shale

P.K. DUTTA & CO. NAIHATI

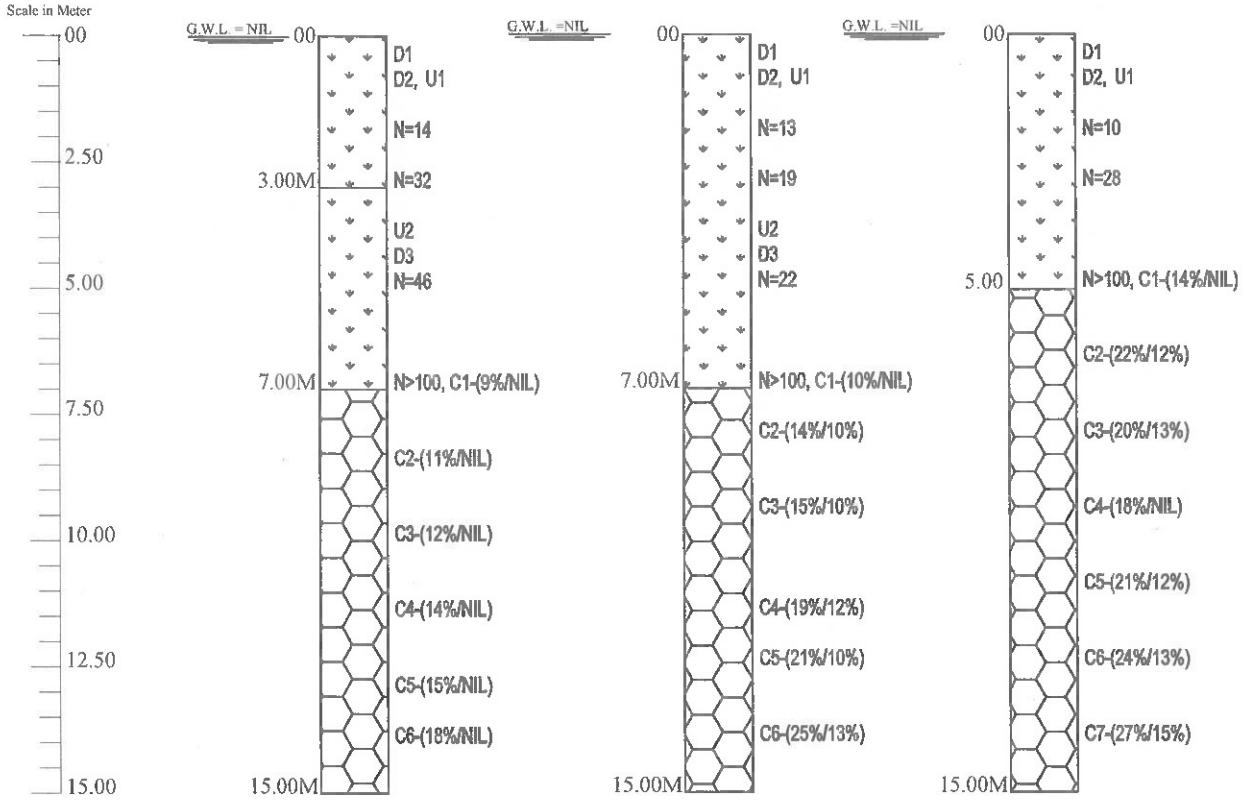
NOTE:
1) "N" means Standard Penetration Test value.
2) "U" means Undisturbed Soil Sample.
3) C <No.> (TCR/RQD).
4) "C" means Core.
5) "TCR" means Total Core Recovery.
6) "RQD" means Rock Quality Desigantion.
7) "SWL" means Standing water Level.
8) Thickness of each startum is shown in left side of each borehole.

M/s P.K.DUTTA & CO.	Generalised Subsoil Profile

CLIENT:-ASSAM ELECTRICITY GRID CORPORATION LIMITED.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Generalised Subsoil Profile



BH-4
Depth = 15.00 m.

BH-5
Depth = 15.00 m.

BH-6
Depth = 15.00 m.

- Silty clay with kankars.
- Weathered, dark grey coloured, weathered shale

P.K. DUTTA & CO. NAIHATI

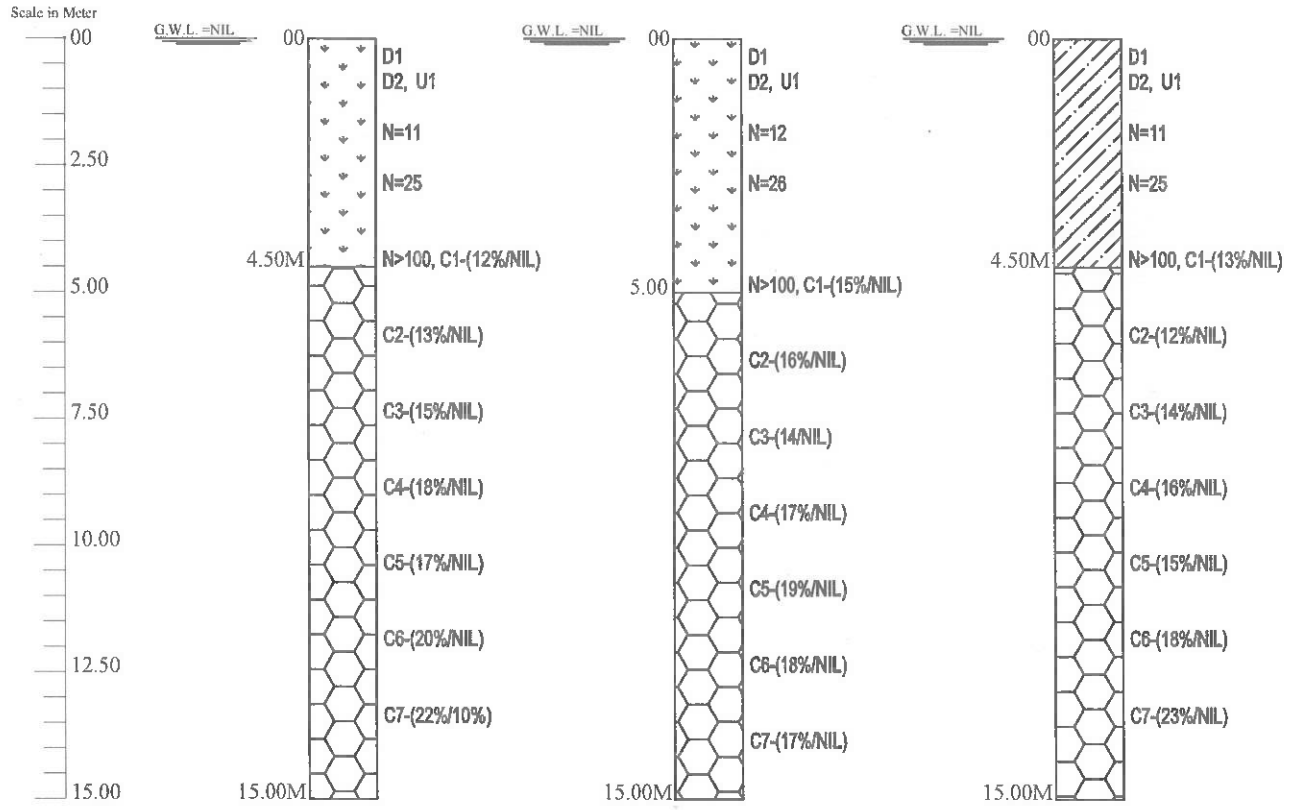
NOTE:
1) "N" means Standard Penetration Test value.
2) "U" means Undisturbed Soil Sample.
3) C <No.> (TCR/RQD).
4) "C" means Core.
5) "TCR" means Total Core Recovery.
6) "RQD" means Rock Quality Desigantion.
7) "SWL" means Standing water Level.
8) Thickness of each startum is shown in left side of each borehole.

M/s P.K.DUTTA & CO.	Generalised Subsoil Profile

CLIENT:-ASSAM ELECTRICITY GRID CORPORATION LIMITED.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Generalised Subsoil Profile



BH-7
Depth = 15.00 m.

BH-8
Depth = 15.00 m.

BH-9
Depth = 15.00 m.

= Silty clay with kankars.

=Weathered, dark grey coloured, weathered shale

= Silty clay with kankars & occasionally rock fragments.

P.K. DUTTA & CO. NAIHATI

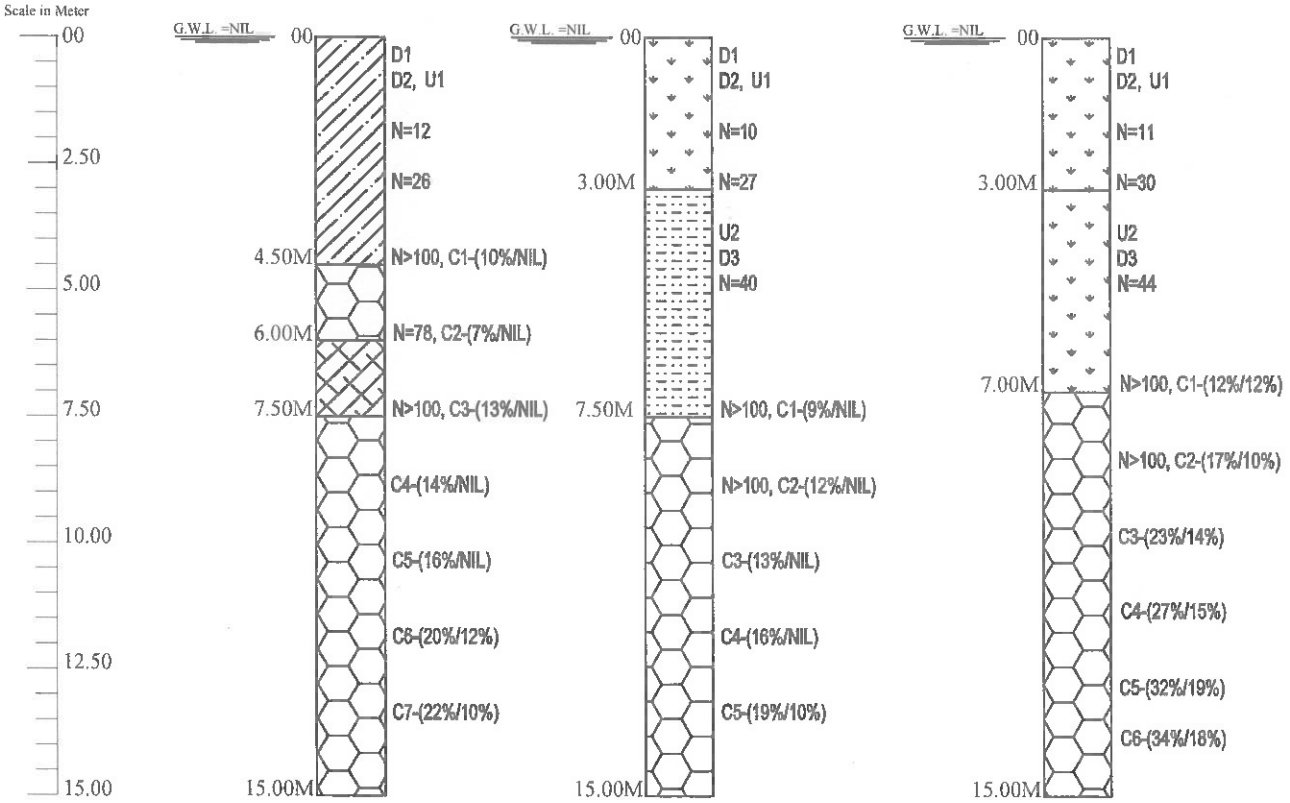
NOTE:
1) "N" means Standard Penetration Test value.
2) "U" means Undisturbed Soil Sample.
3) C <No.> (TCR/RQD).
4) "C" means Core.
5) "TCR" means Total Core Recovery.
6) "RQD" means Rock Quality Desigantion.
7) "SWL" means Standing water Level.
8) Thickness of each startum is shown in left side of each borehole.

M/s P.K.DUTTA & CO.	Generalised Subsoil Profile

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PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Generalised Subsoil Profile



BH-10
Depth = 15.00 m.

BH-11
Depth = 15.00 m.

BH-12
Depth = 15.00 m.

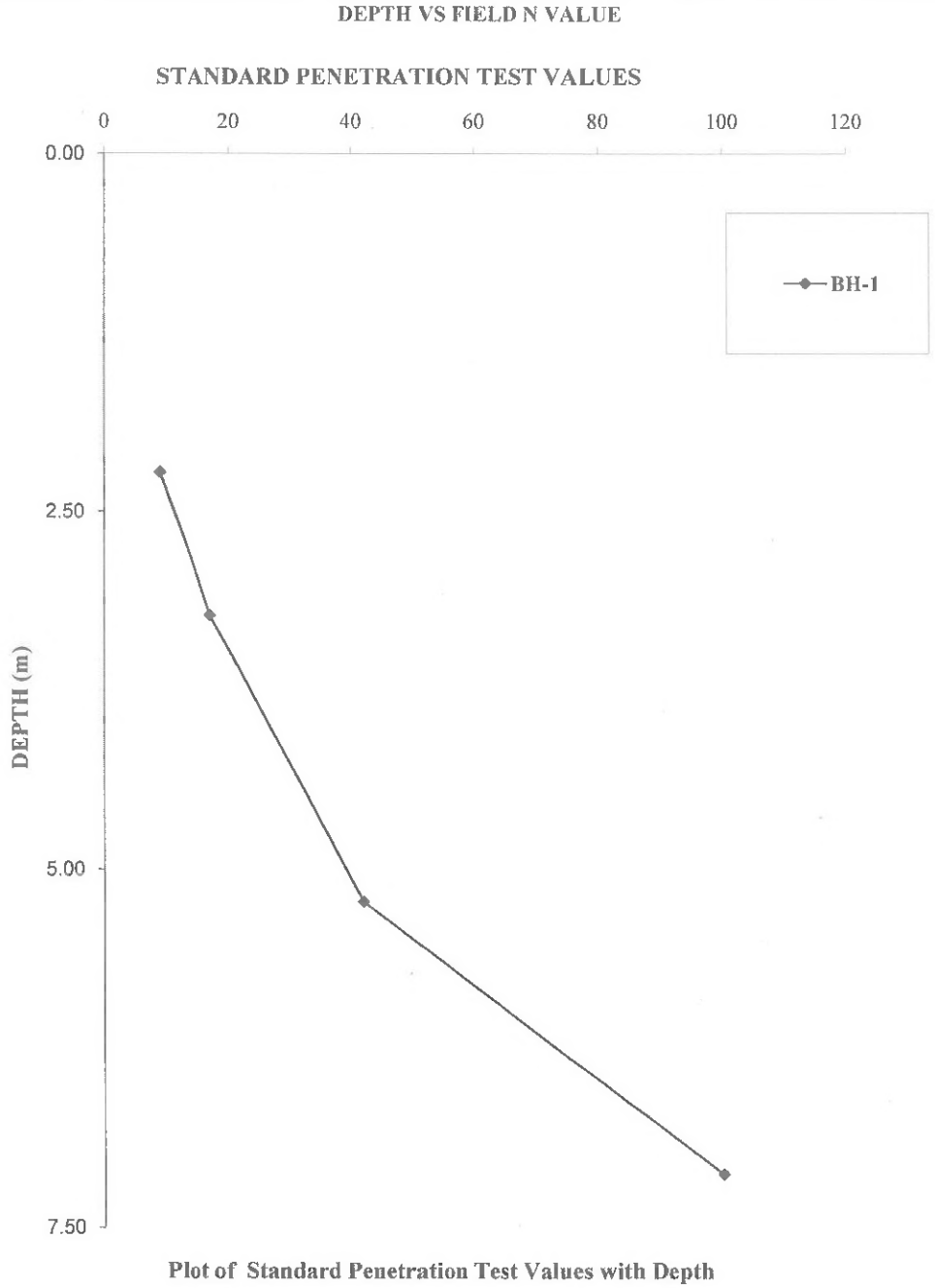
- = Silty clay with kankars & occasionally rock fragments.
- =Weathered, dark grey coloured, weathered shale
- = Hard consistency,dark grey,clay
- = Silty clay kankars.
- = Grey silty clay.

NOTE:
1) "N" means Standard Penetration Test value.
2) "U" means Undisturbed Soil Sample.
3) C <No.> (TCR/RQD).
4) "C" means Core.
5) "TCR" means Total Core Recovery.
6) "RQD" means Rock Quality Desigantion.
7) "SWL" means Standing water Level.
8) Thickness of each startum is shown in left side of each borehole.

PLOT OF SPT VALUES WITH DEPTH

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.



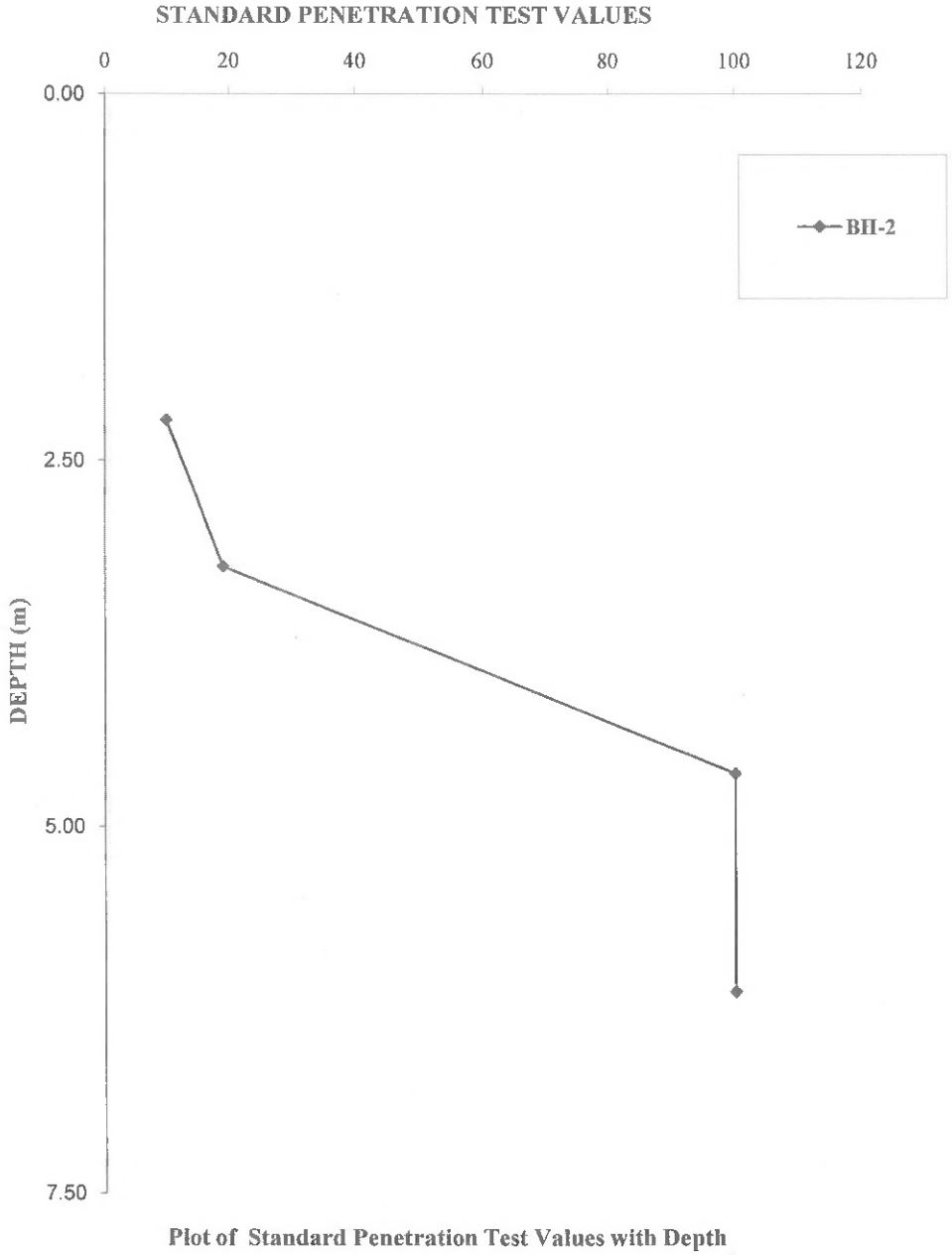
Plot of Standard Penetration Test Values with Depth

DUTTA & CO NAIHATI

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

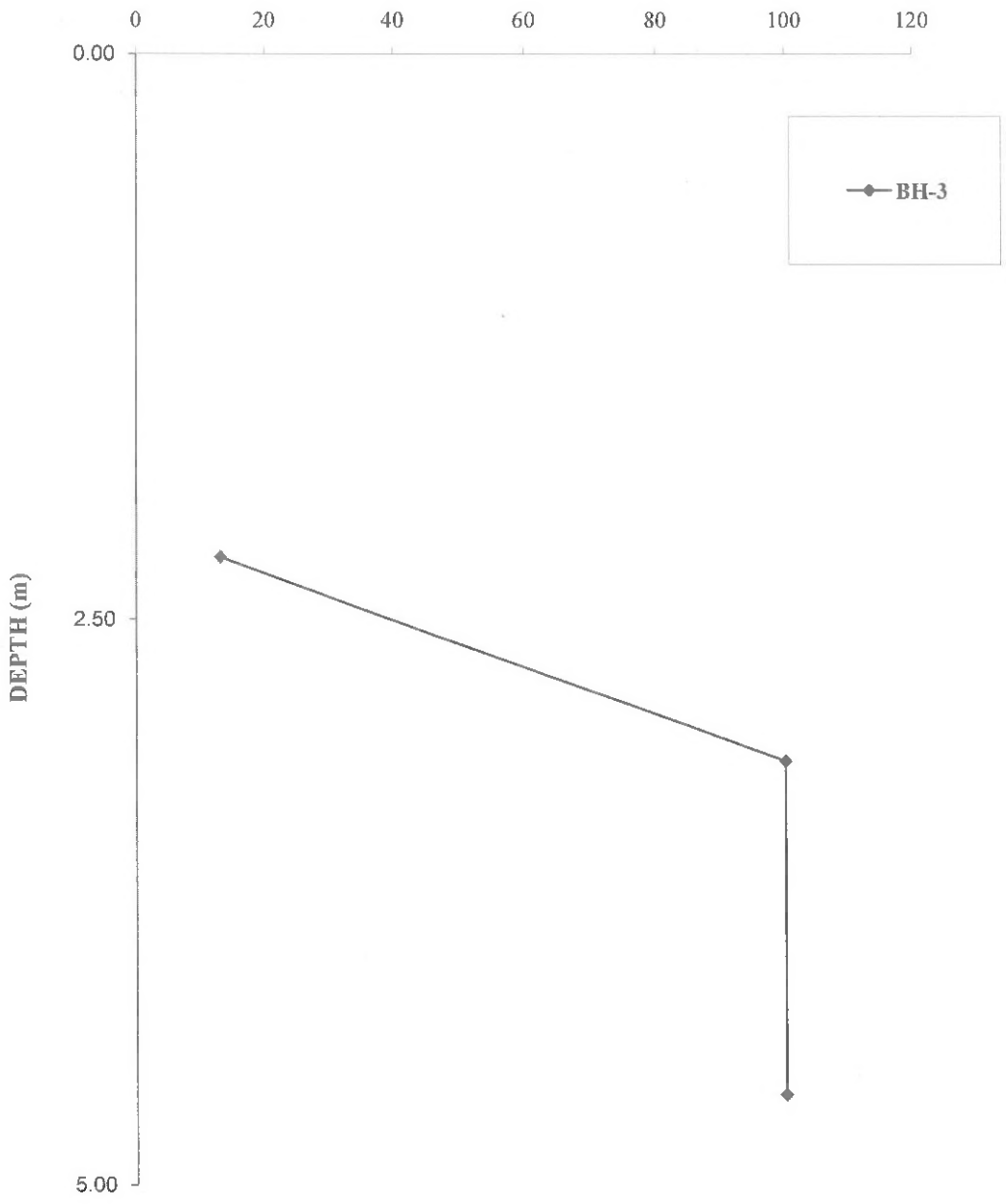


Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

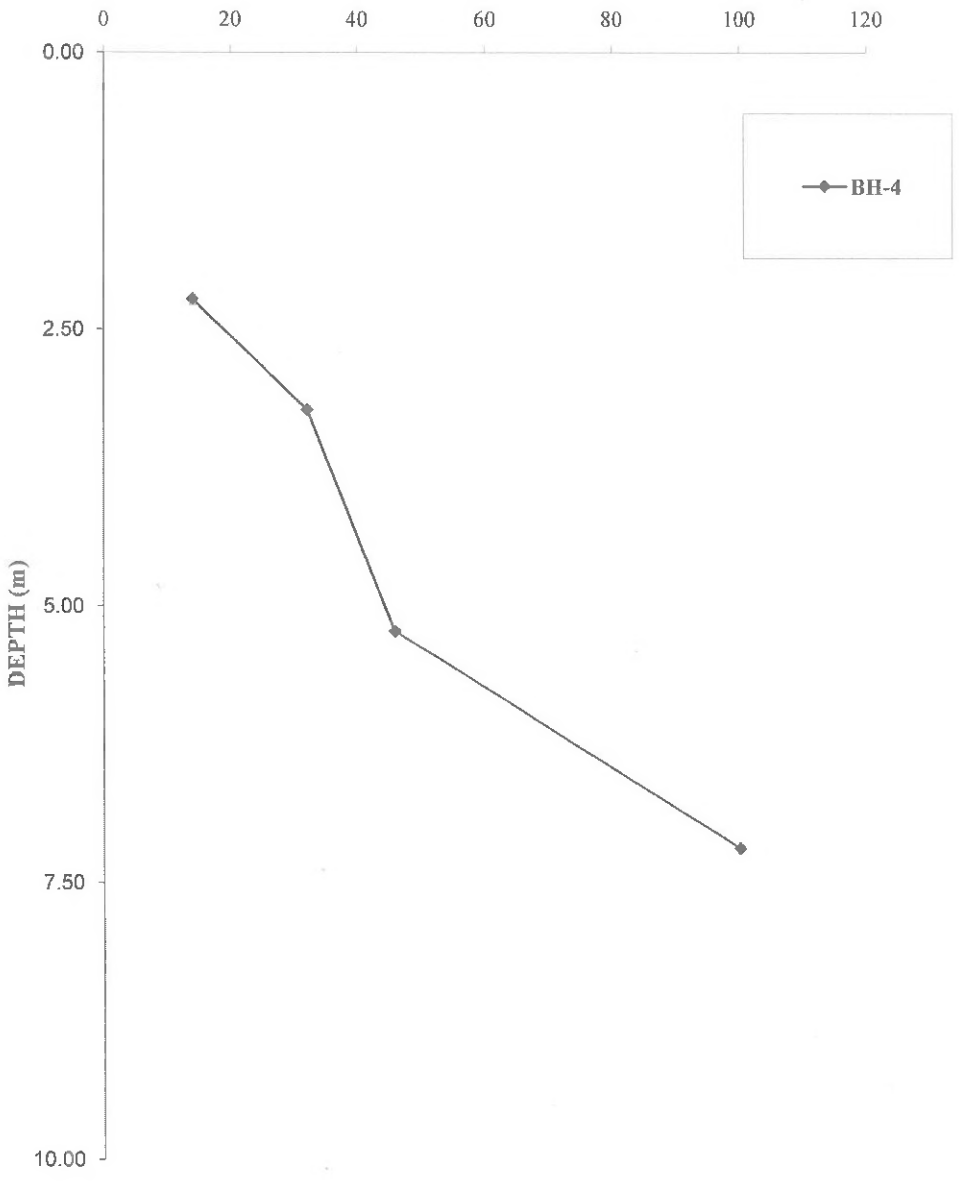


Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

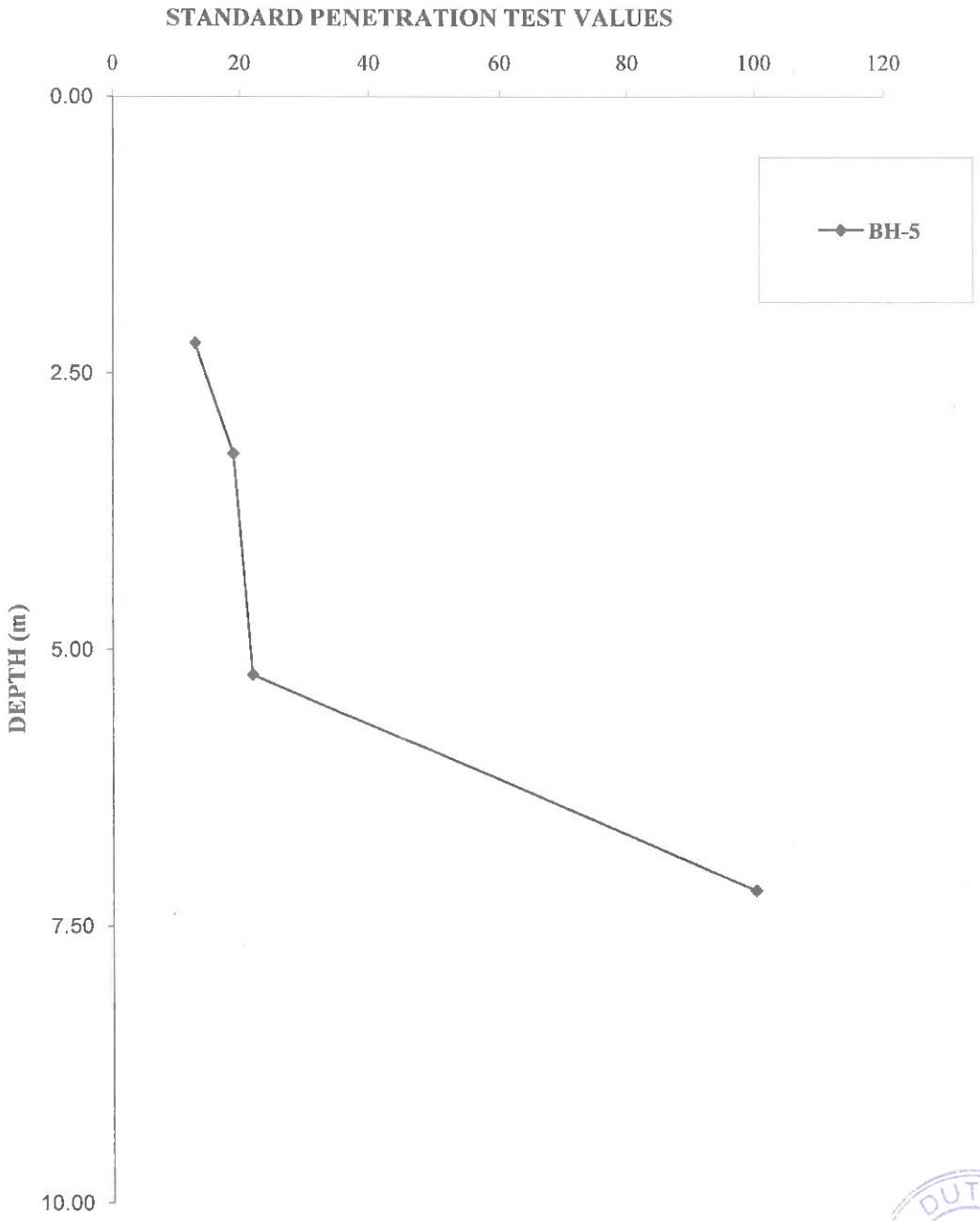


Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

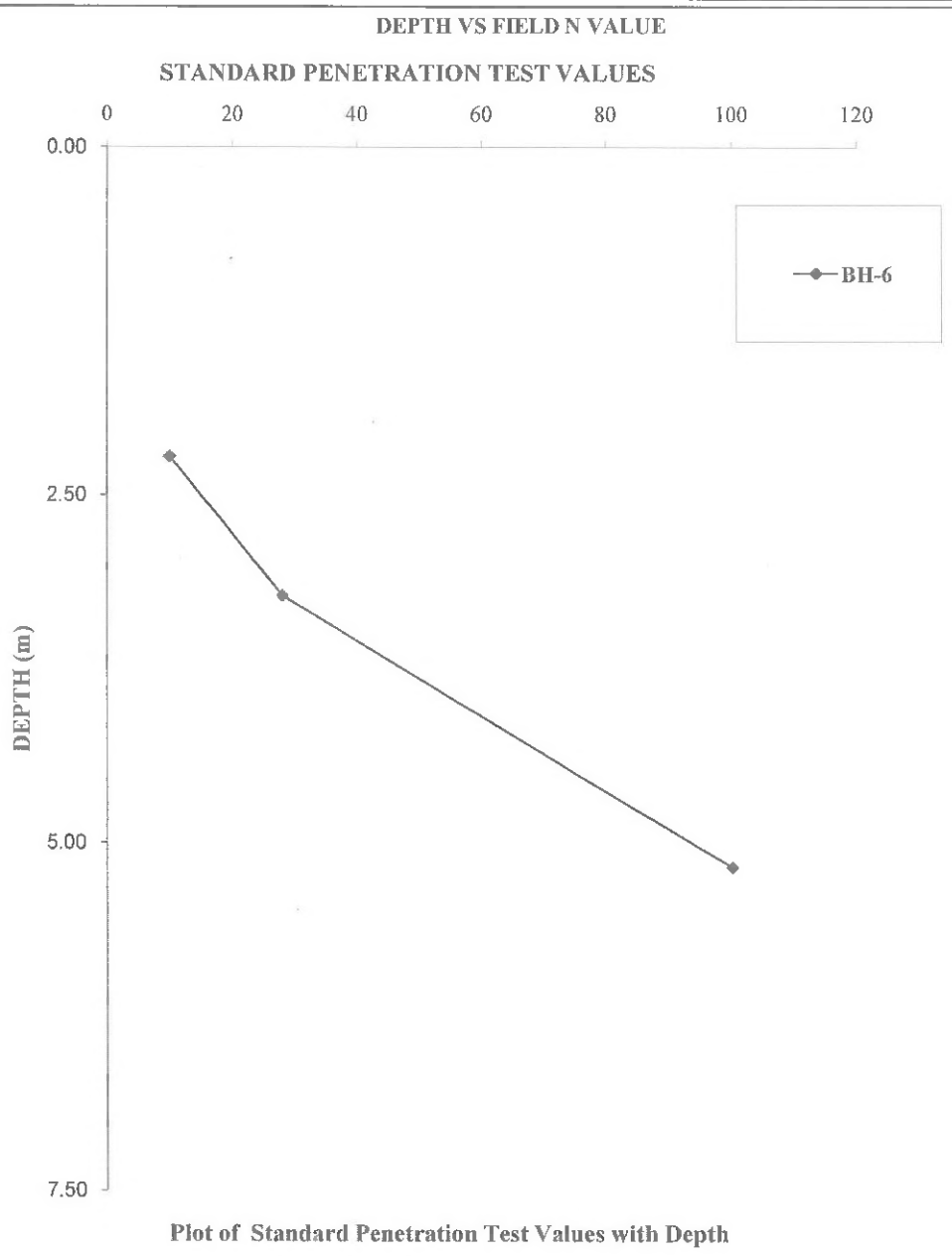


Plot of Standard Penetration Test Values with Depth

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

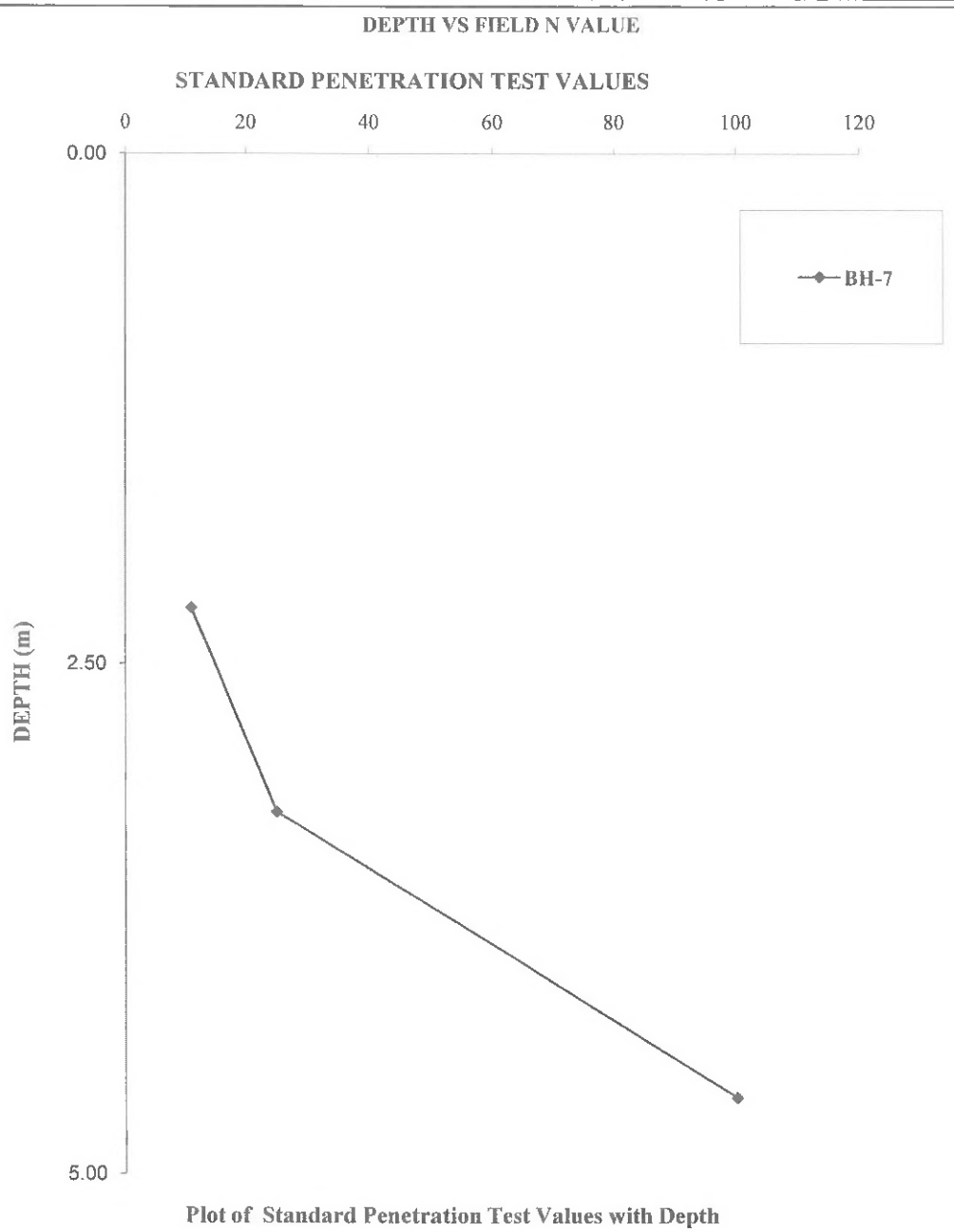
Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.



Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

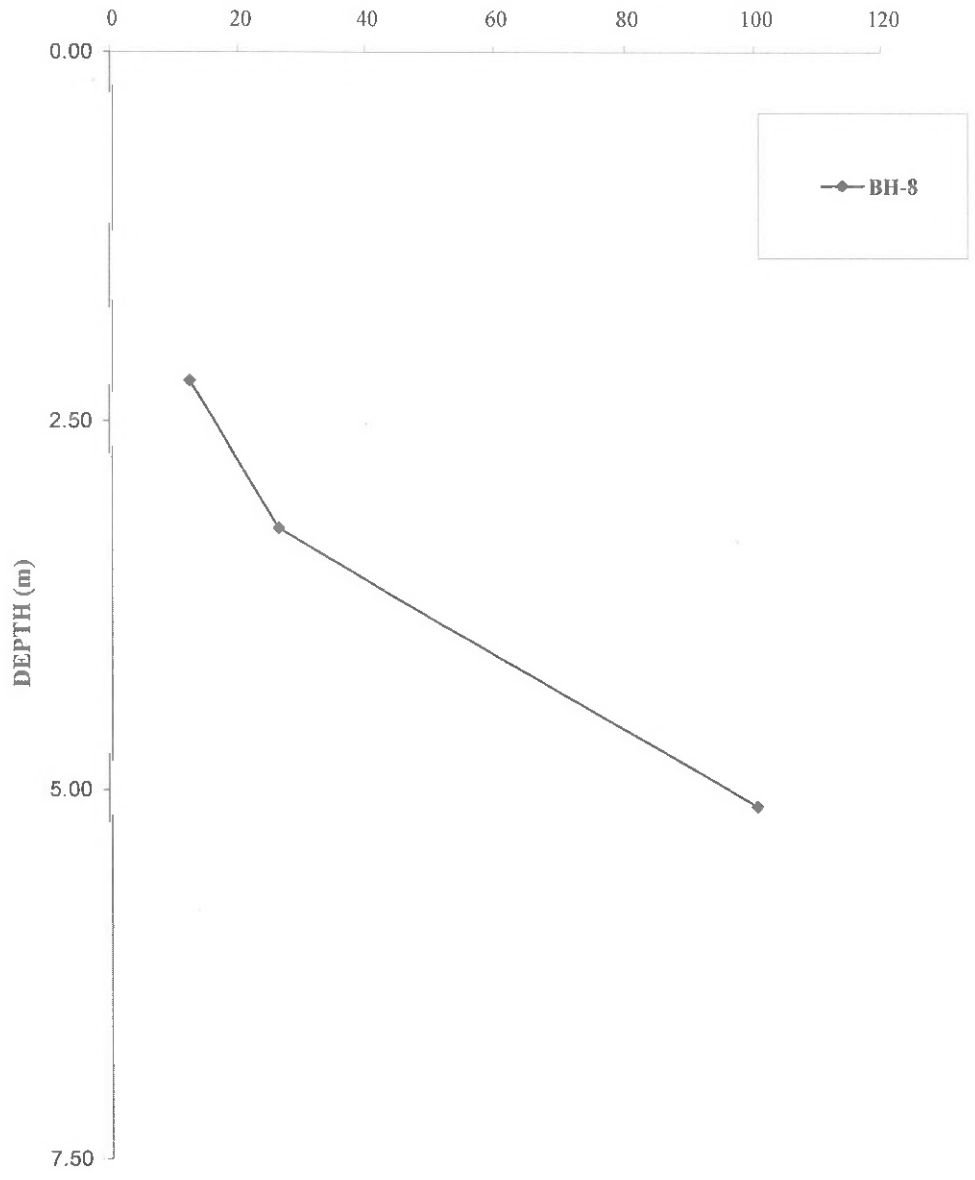


Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE



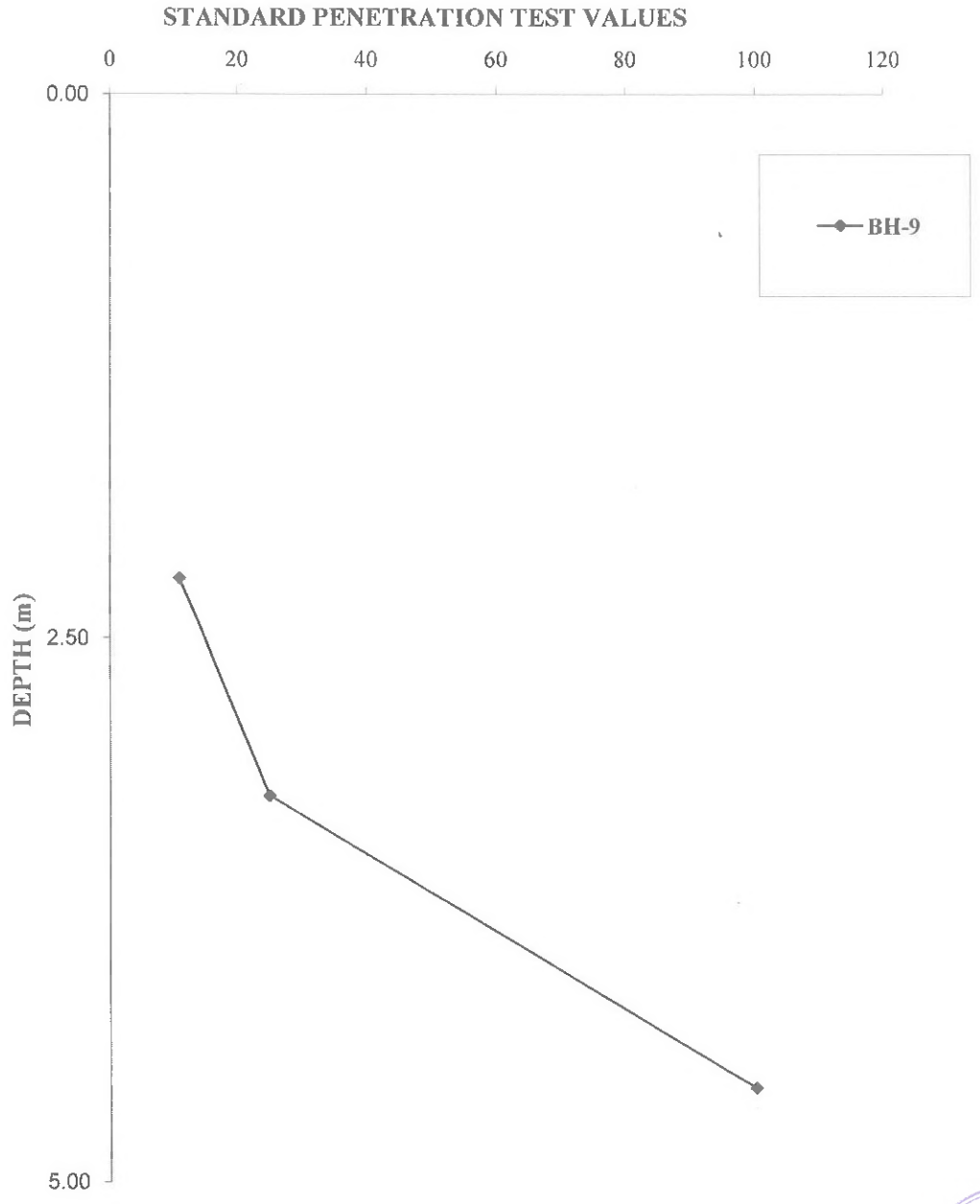
Plot of Standard Penetration Test Values with Depth

M. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE



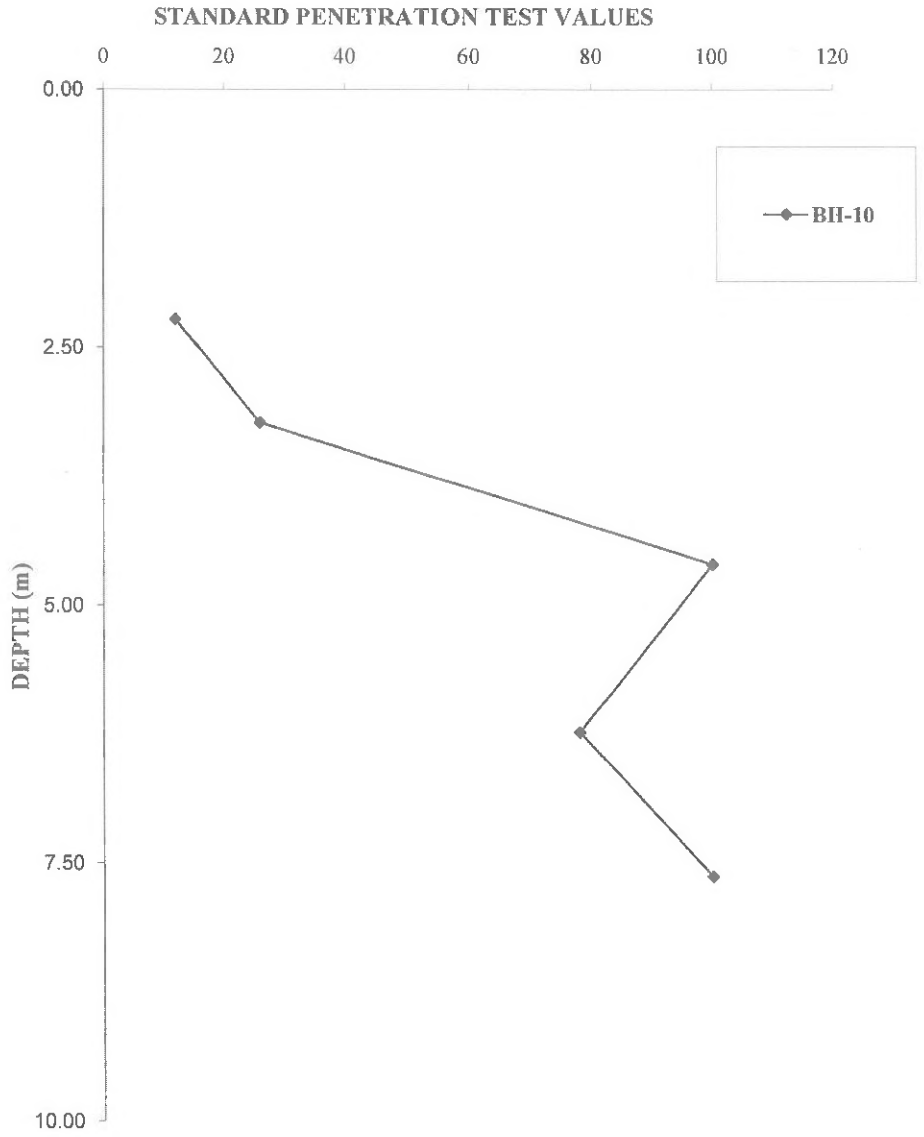
Plot of Standard Penetration Test Values with Depth

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

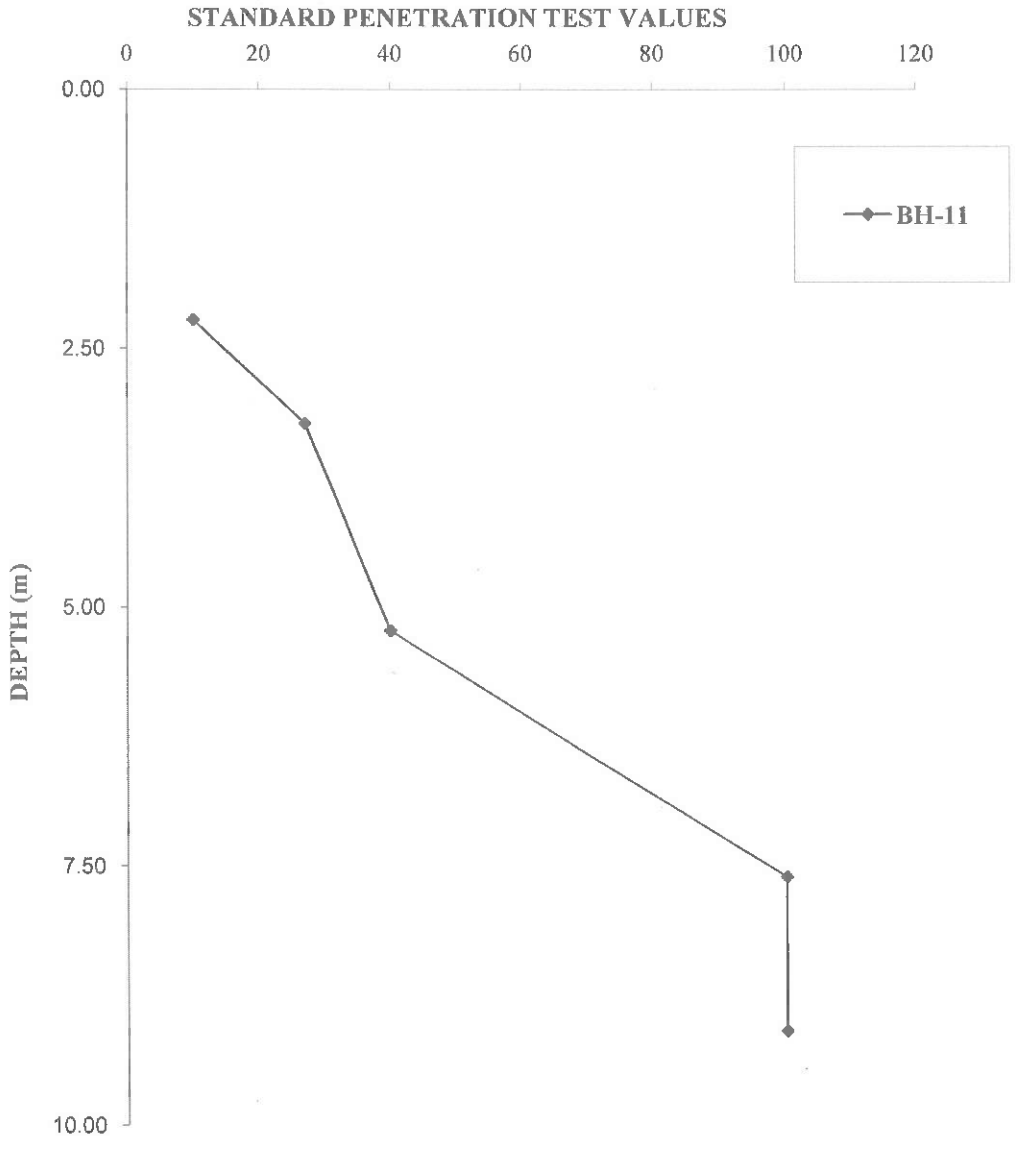


Plot of Standard Penetration Test Values with Depth

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE



Plot of Standard Penetration Test Values with Depth

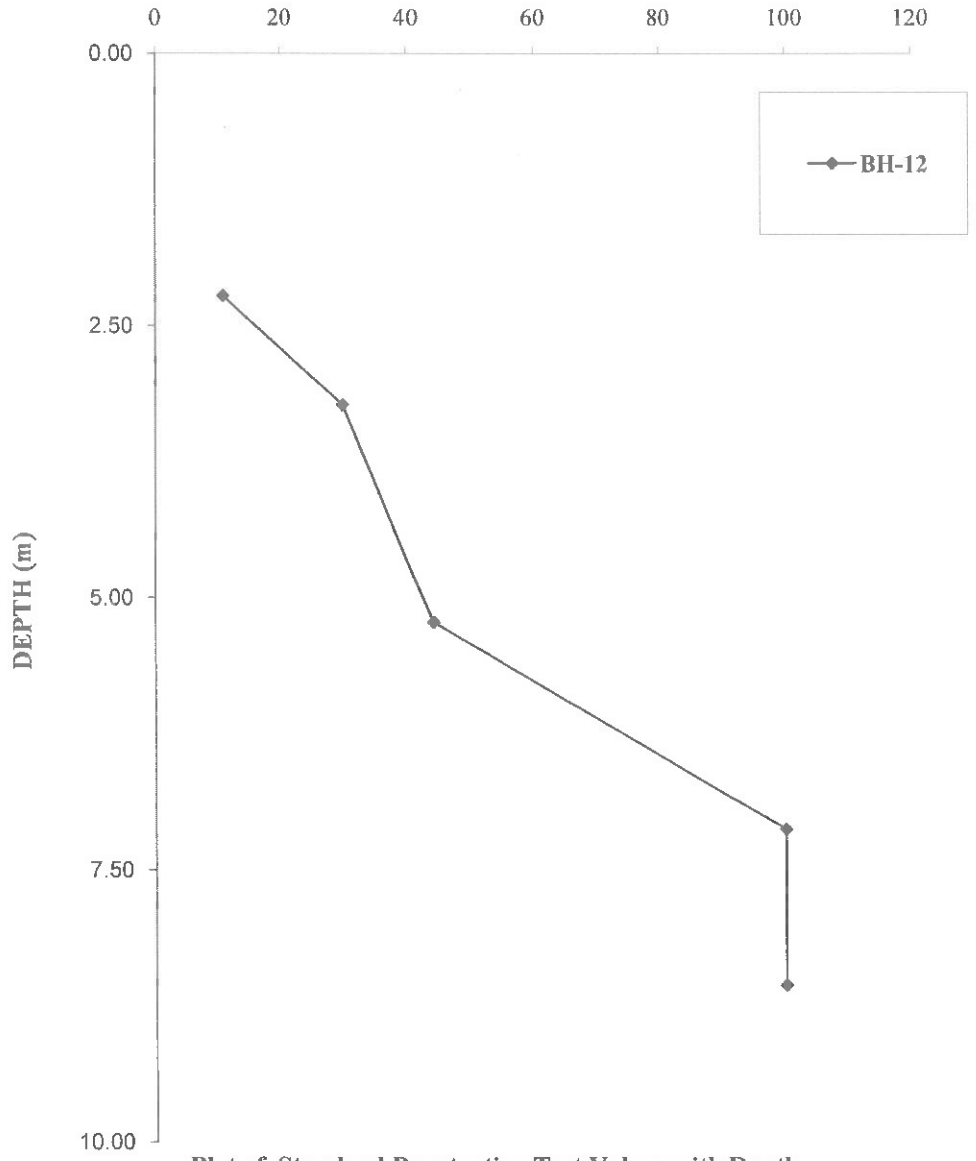
P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co	STANDARD PENETRATION TEST CURVE

Client :-	**ASSAM ELECTRICITY GRID CORPORATION LIMITED.**
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

DEPTH VS FIELD N VALUE

STANDARD PENETRATION TEST VALUES



Plot of Standard Penetration Test Values with Depth

P. K. DUTTA & CO. NAIHATI

LABORATORY TEST RESULTS OF SOIL

Client: Assam Electricity Grid Corporation Limited.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No	Sample Number	Depth (m)	Sample Description	Bulk Density	Dry Density	Sp. Gravity	Nat. Moisture	Mv	Shear Strength (kg/cm^2)		Type of Test	Atter. Limits			IS Classification	Grain Size				Test Method
									Cohesion	Friction		LL	PL	PI		Gravel	Sand	Silt	Clay	
				gms/cc	gms/cc		%	t/sqm	kg/sqcm	Deg.		%	%	%		%	%	%	%	
BH-1	U1	1.00	Stiff to very stiff consistency, brownish to reddish grey silty clay with kankars.	1.90	1.44	2.67	31.60	0.0037	0.49	0.00	UC	43.60	23.00	20.60	CI	4.00	3.00	38.00	55.00	*See the Note
	U2	4.00		1.91	1.44	2.69	33.00	0.0040	0.59	0.00	UC	45.52	23.50	22.02	CI	5.00	4.00	34.00	57.00	*See the Note
BH-2	U1	1.00	Stiff to very stiff consistency,brownish to reddish yellow silty clay with kankars.	1.91	1.45	2.68	31.89	0.0038	0.50	0.00	UC	44.11	22.69	21.42	CI	4.00	4.00	37.00	55.00	*See the Note
	U2	4.00		1.92	1.43	2.69	34.00	0.0041	0.60	0.00	UC	46.00	24.00	22.00	CI	5.00	5.00	33.00	57.00	*See the Note
BH-3	U1	1.00	Stiff consistency,brownish grey silty clay with kankars	1.90	1.45	2.70	31.11	0.0038	0.53	0.00	UC	42.23	22.00	20.23	CI	2.00	5.00	39.00	54.00	*See the Note
BH-4	U1	1.00	Stiff to very stiff consistency, brownish grey silty clay with kankars.	1.91	1.45	2.69	31.50	0.0040	0.53	0.00	UC	45.50	23.65	21.85	CI	2.00	4.00	37.00	57.00	*See the Note
	U2	4.00	Very stiff to hard, brownish grey silty clay with kankars.	1.93	1.43	2.72	34.50	0.0043	0.64	0.00	UC	48.00	25.00	23.00	CI	3.00	3.00	35.00	59.00	*See the Note

Unconfined Compressive Strength :IS 2720 (Part 10) **Plastic Limit:IS 2720 (Part 5)** **ConsolidationTest:IS 2720 (Part 15)** **Liquid limit:IS 2720 (Part 5)**

Specific Gravity: IS 2720 (Part 3) **Grain Size Analysis:IS 2720 (Part 4)** **Direct Shear Test (DS) : IS 2720 (Part 13)** **Triaxial Test (UU): IS 2720 (Part 11)** **Natural Moisture Content: IS 2720 (Part 2)** ***-Remould Sample**

DUTTA & CO. NAIHATI

Client: Assam Electricity Grid Corporation Limited.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No	Sample Number	Depth (m)	Sample Description	Bulk Density	Dry Density	Sp. Gravity	Nat. Moisture	Mv	Shear Strength (kg/cm^2)		Type of Test	Atter. Limits			IS Classification	Grain Size				Test Method
									Cohesion	Friction		LL	PL	PI		Gravel	Sand	Silt	Clay	
				gms/cc	gms/cc		%	t/sqm	kg/sqcm	Deg.		%	%	%		%	%	%	%	
BH-5	U1	1.00	Stiff to very stiff, brownish grey silty clay with kankars.	1.91	1.45	2.69	32.00	0.0041	0.52	0.00	UC	40.50	21.00	19.50	CI	2.00	4.00	40.00	54.00	*See the Note
	U2	4.00		1.93	1.43	2.71	34.58	0.0043	0.61	0.00	UC	46.23	25.00	21.23	CI	3.00	5.00	35.00	57.00	*See the Note
BH-6	U1	1.00	Stiff to very stiff, consistency,brownish grey silty clay with kankars.	1.90	1.43	2.67	32.88	0.0038	0.50	0.00	UC	43.75	22.50	21.25	CI	1.00	3.00	41.00	55.00	*See the Note
	U2	4.00		1.92	1.44	2.69	33.63	0.0042	0.62	0.00	UC	46.25	22.00	24.25	CI	3.00	4.00	35.00	58.00	*See the Note
BH-7	U1	1.00	Stiff to very stiff, brownish grey silty clay with kankars.	1.90	1.45	2.69	31.29	0.0040	0.51	0.00	UC	44.00	22.00	22.00	CI	3.00	2.00	39.00	56.00	*See the Note
	*S2	3.00		1.94	-	2.71	-	-	0.64	0.00	UC	47.00	24.50	22.50	CI	4.00	3.00	35.00	58.00	*See the Note
BH-8	U1	1.00	Stiff to very stiff consistency, brownish grey silty clay with kankars.	1.92	1.47	2.68	30.24	0.0041	0.52	0.00	UC	43.65	23.00	20.65	CI	2.00	3.00	40.00	55.00	*See the Note
	*S2	3.00		1.94	-	2.70	-	-	0.63	0.00	UC	46.52	24.00	22.52	CI	3.00	5.00	34.00	58.00	*See the Note

Unconfined Compressive Strength :IS 2720 (Part 10) Plastic Limit:IS 2720 (Part 5) ConsolidationTest:IS 2720 (Part 15) Liquid limit:IS 2720 (Part 5)

Specific Gravity: IS 2720 (Part 3) Grain Size Analysis:IS 2720 (Part 4) Direct Shear Test (DS) : IS 2720 (Part 13) Triaxial Test (UU): IS 2720 (Part 11) Natural Moisture Content: IS 2720 (Part 2) *-Remould Sample

A. DUTTA & CO. NAIHATI

Client: Assam Electricity Grid Corporation Limited.

PROJECT: Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No	Sample Number	Depth (m)	Sample Description	Bulk Density	Dry Density	Sp. Gravity	Nat. Moisture	Mv	Shear Strength (kg/cm^2)		Type of Test	Atter. Limits			IS Classification	Grain Size				Test Method
									Cohesion	Friction		LL	PL	PI		Gravel	Sand	Silt	Clay	
				gms/cc	gms/cc		%	t/sqm	kg/sqcm	Deg.		%	%	%		%	%	%	%	
BH-9	U1	1.00	Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock pragments.	1.91	1.45	2.68	32.00	0.0039	0.51	0.00	UC	46.00	24.50	21.50	CI	4.00	3.00	40.00	53.00	*See the Note
	U2	4.00		1.94	1.46	2.71	33.00	0.0042	0.63	0.00	UC	47.00	25.00	22.00	CI	5.00	4.00	36.00	55.00	*See the Note
BH-10	U1	1.00	Stiff to very stiff, brownish to reddish grey silty clay with kankars & occasionally rock pragments.	1.91	1.45	2.68	31.43	0.0040	0.52	0.00	UC	43.52	23.00	20.52	CI	5.00	4.00	38.00	53.00	*See the Note
	U2	4.00		1.93	1.46	2.70	32.54	0.0044	0.64	0.00	UC	45.00	24.00	21.00	CI	6.00	3.00	35.00	56.00	*See the Note
BH-11	U1	1.00	Stiff consistency, brownish to reddish grey silty clay with kankars.	1.90	1.44	2.68	31.64	0.0039	0.50	0.00	UC	43.33	22.69	20.64	CI	3.00	4.00	40.00	53.00	*See the Note
	U2	4.00	Very stiff to hard, brownish to reddish grey silty clay	1.92	1.43	2.68	34.11	0.0043	0.62	0.00	UC	45.00	23.50	21.50	CI	2.00	3.00	38.00	57.00	*See the Note
BH-12	U1	1.00	Stiff consistency, brownish to reddish grey silty clay with kankars.	1.91	1.45	2.68	32.00	0.0041	0.52	0.00	UC	46.00	24.50	21.50	CI	4.00	5.00	36.00	55.00	*See the Note
	U2	4.00	Very stiff brownish grey silty clay with kankars.	1.93	1.43	2.69	34.67	0.0045	0.63	0.00	UC	47.50	25.00	22.50	CI	3.00	4.00	34.00	59.00	*See the Note

Unconfined Compressive Strength :IS 2720 (Part 10) **Plastic Limit:IS 2720 (Part 5)** **ConsolidationTest:IS 2720 (Part 15)** **Liquid limit:IS 2720 (Part 5)**

Specific Gravity: IS 2720 (Part 3) **Grain Size Analysis:IS 2720 (Part 4)** **Direct Shear Test (DS) : IS 2720 (Part 13)** **Triaxial Test (UU): IS 2720 (Part 11)** **Natural Moisture Content: IS 2720 (Part 2)** ***-Remould Sample**

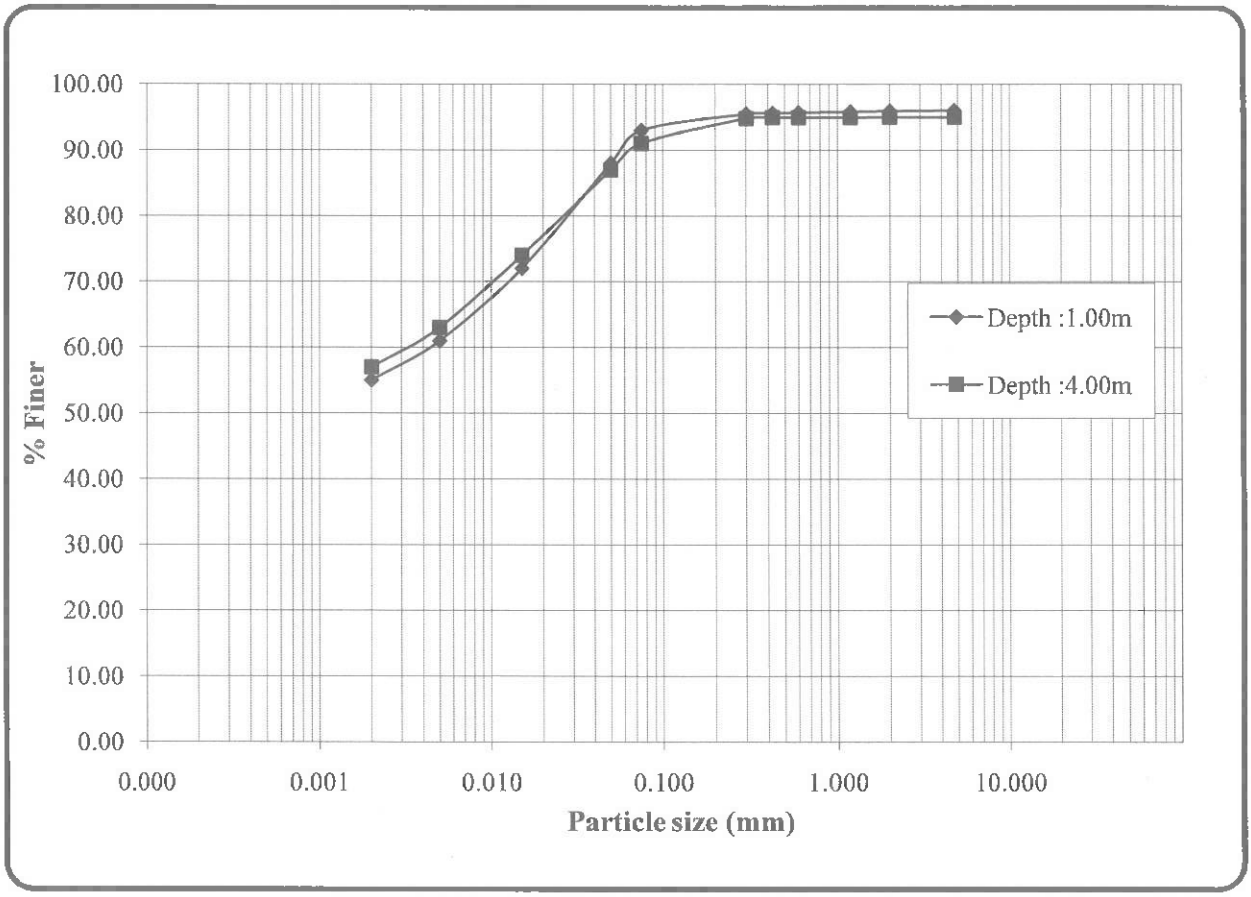
DUTTA & CO. NAIHATI

GRAIN SIZE DISTRIBUTION CURVES

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-1



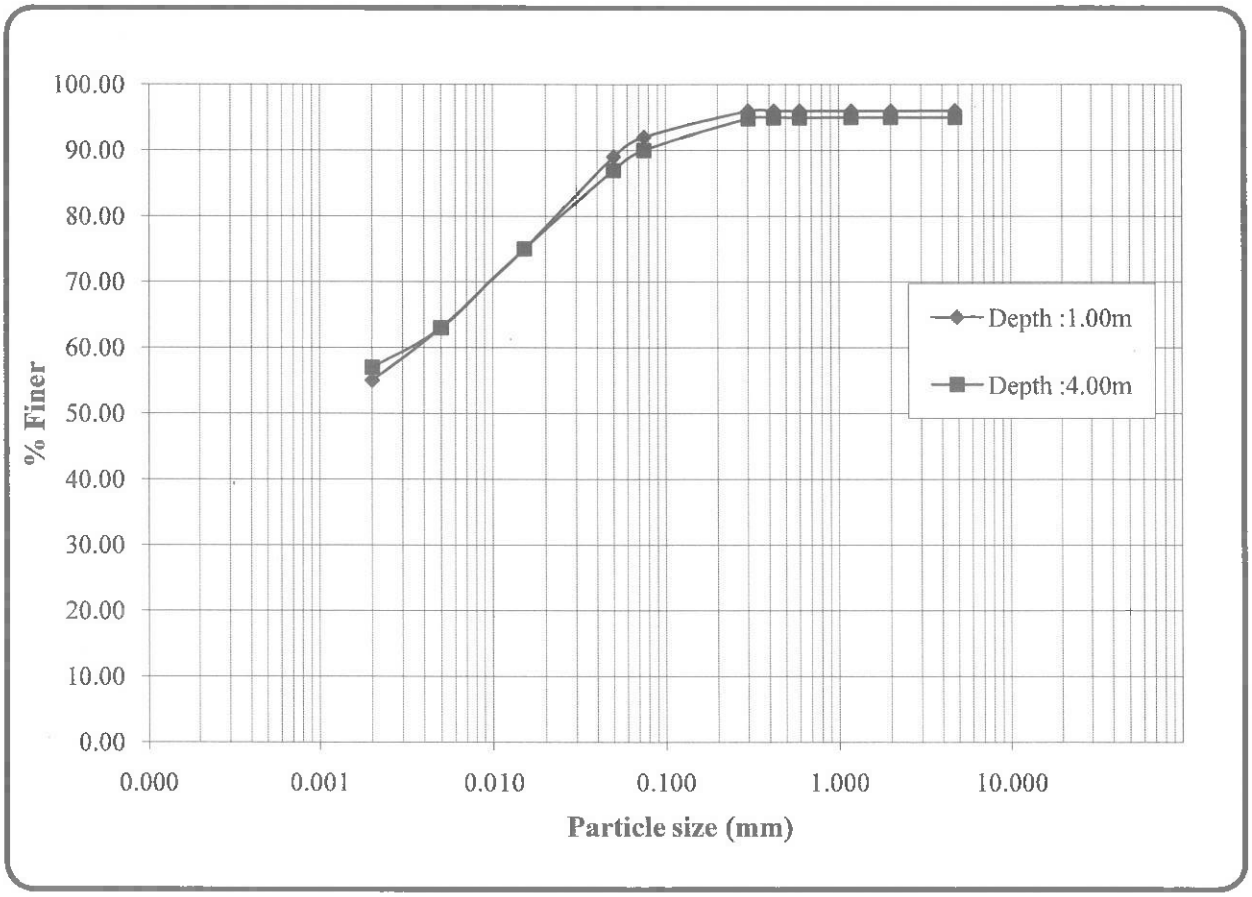
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-1, U-1, 1.00m	55.00	38.00	3.00	4.00
BH-1, U-2, 4.00m	57.00	34.00	4.00	5.00

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-2



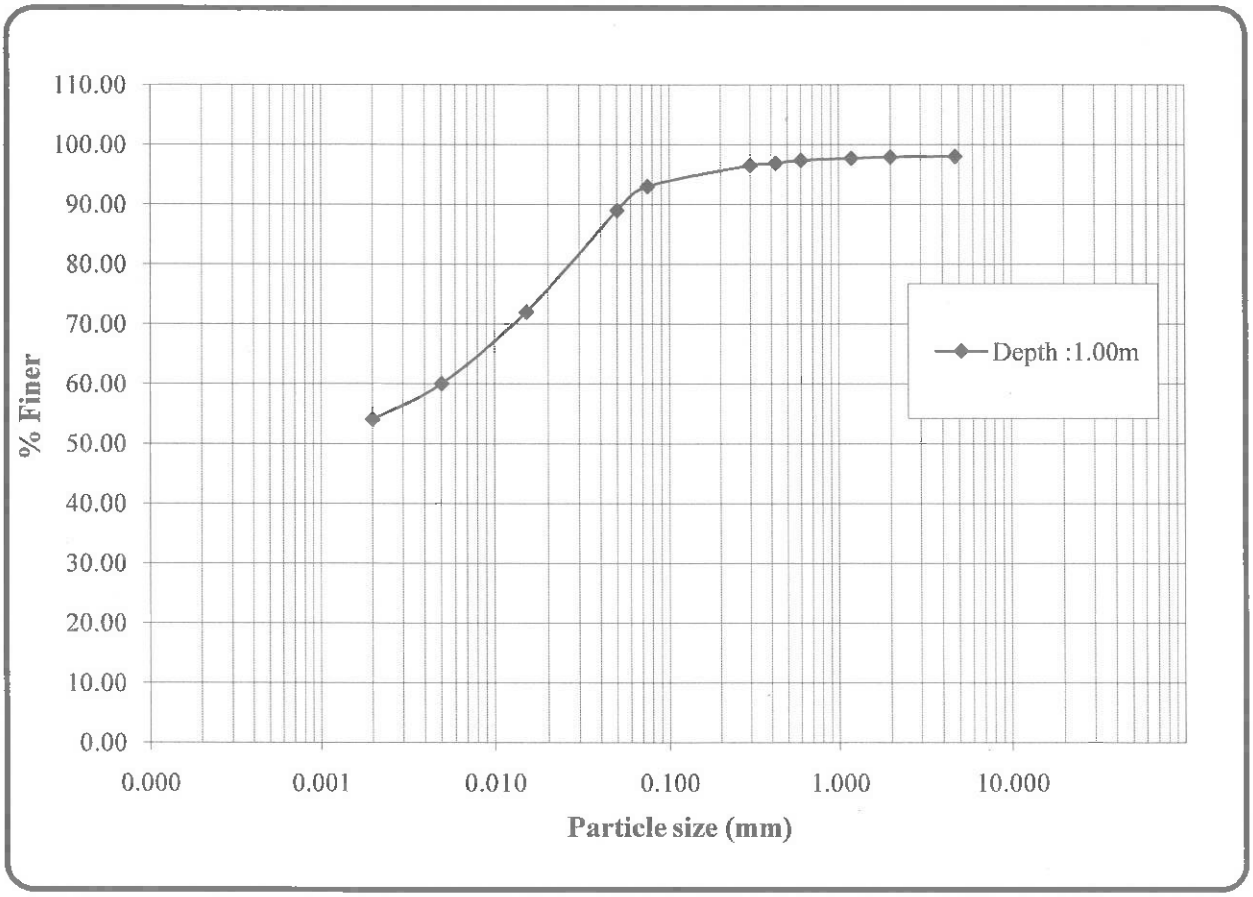
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-2, U-1, 1.00m	55.00	37.00	4.00	4.00
BH-2, U-2, 4.00m	57.00	33.00	5.00	5.00

P. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-3



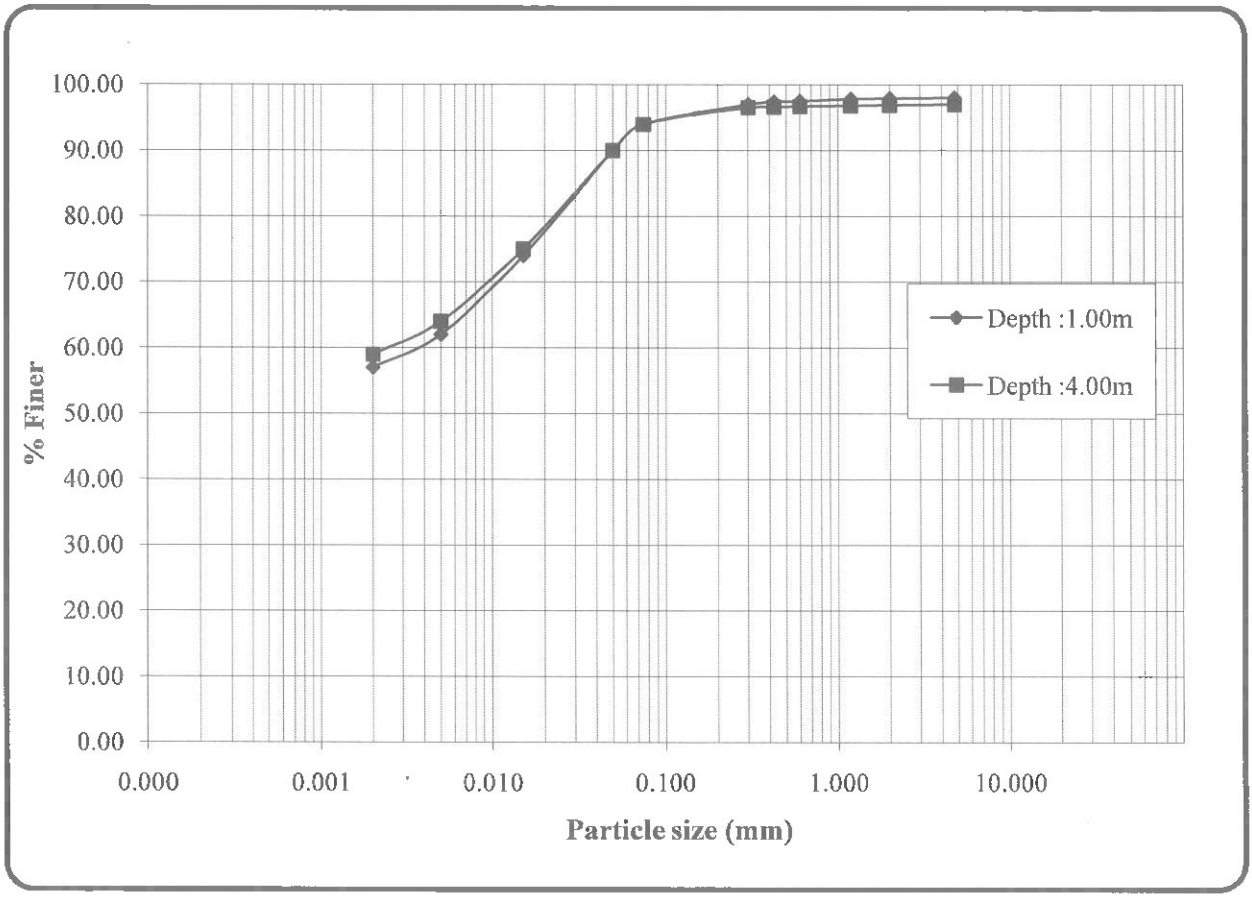
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-3, U1, 1.00m	54.00	39.00	5.00	2.00

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-4



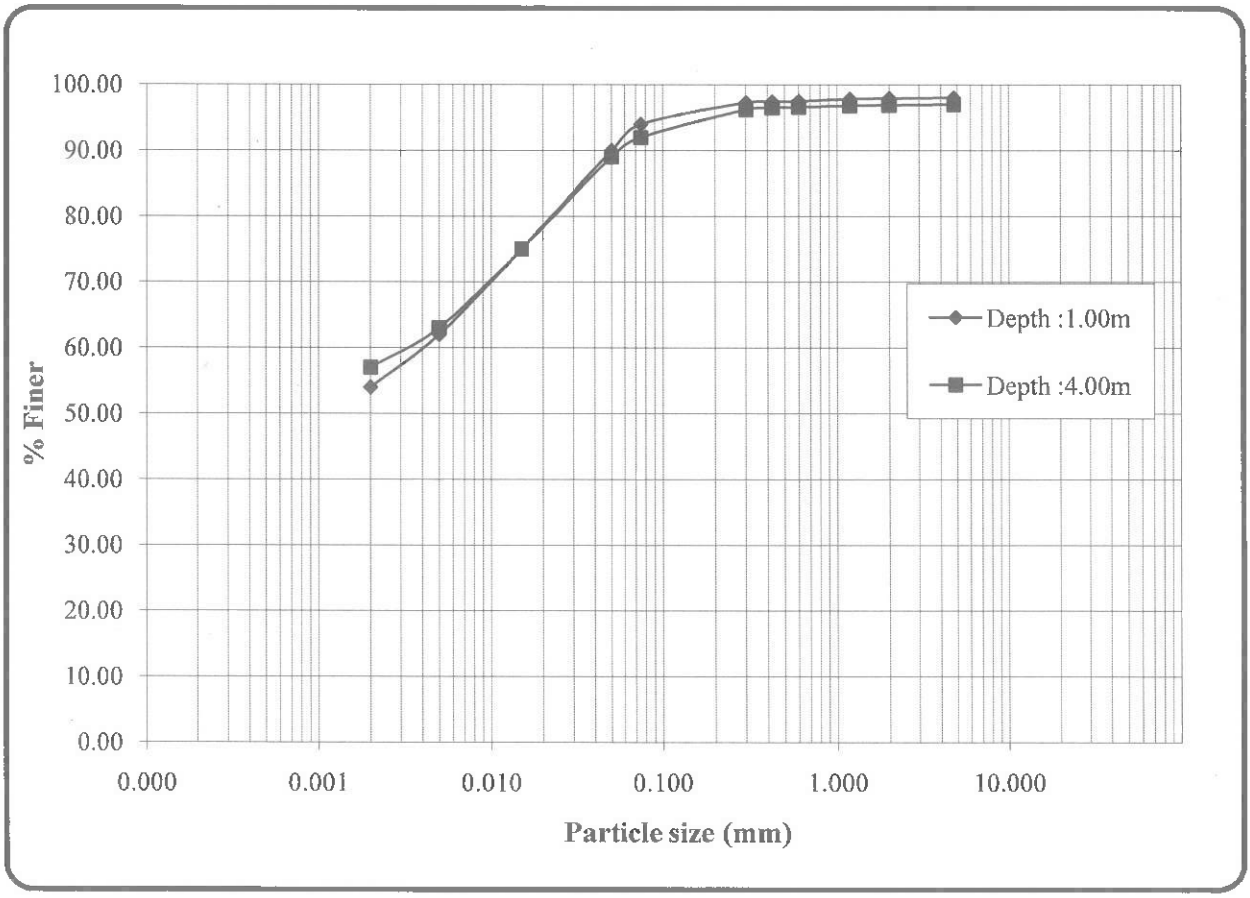
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-4, U-1, 1.00m	57.00	37.00	4.00	2.00
BH-4, U-2, 4.00m	59.00	35.00	3.00	3.00

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-5

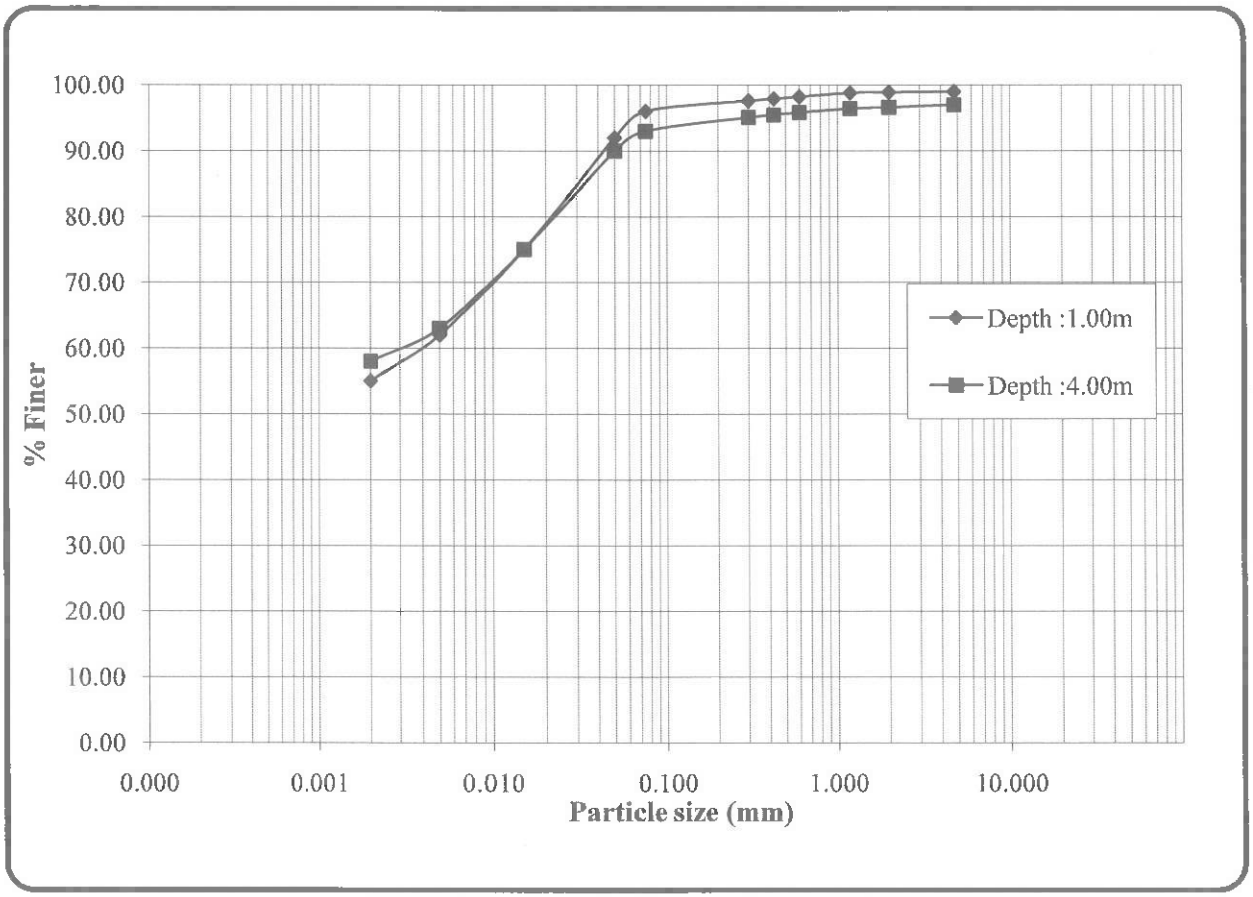


Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-5, U-1, 1.00m	54.00	40.00	4.00	2.00
BH-5, U-2, 4.00m	57.00	35.00	5.00	3.00

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-6



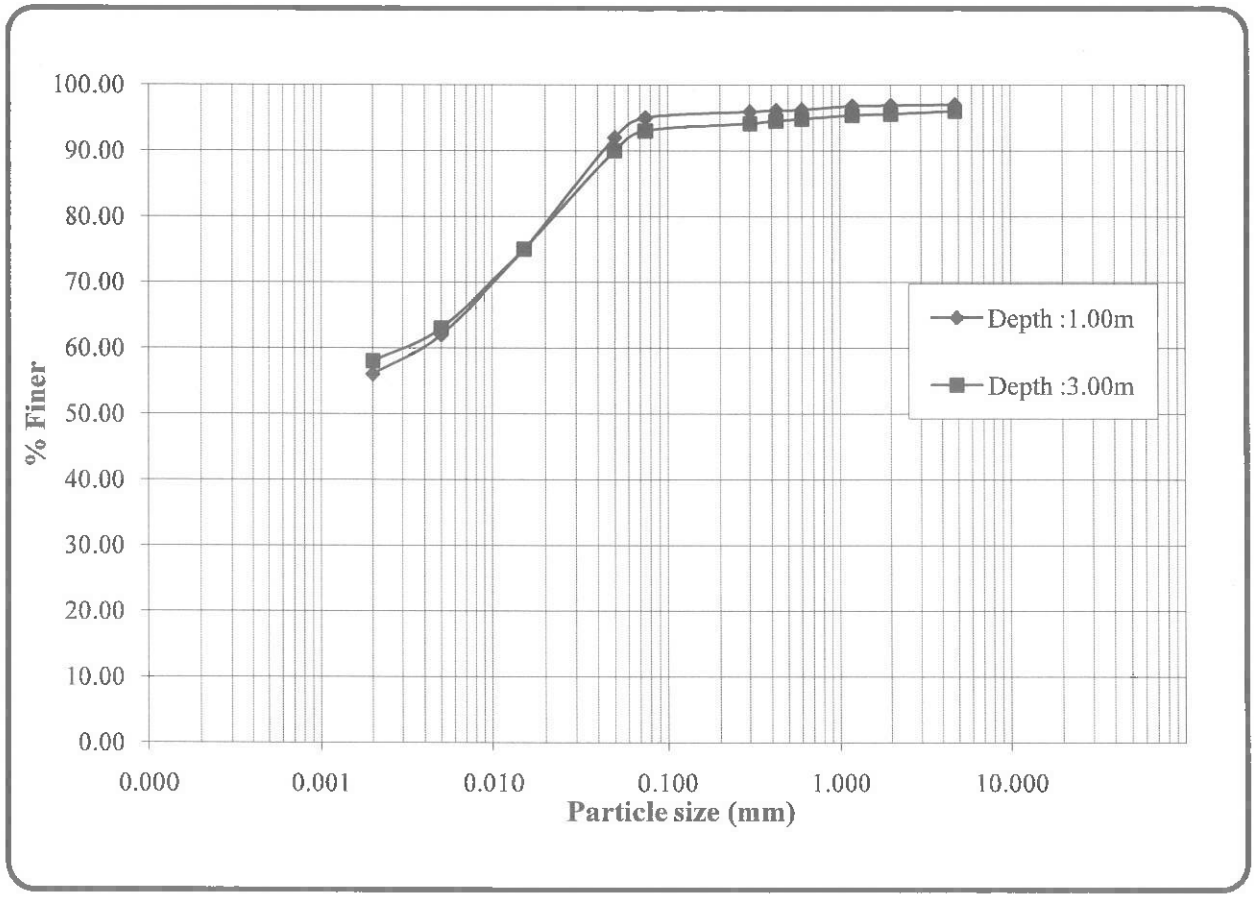
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-6, U-1, 1.00m	55.00	41.00	3.00	1.00
BH-6, U-2, 4.00m	58.00	35.00	4.00	3.00

P. K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-7



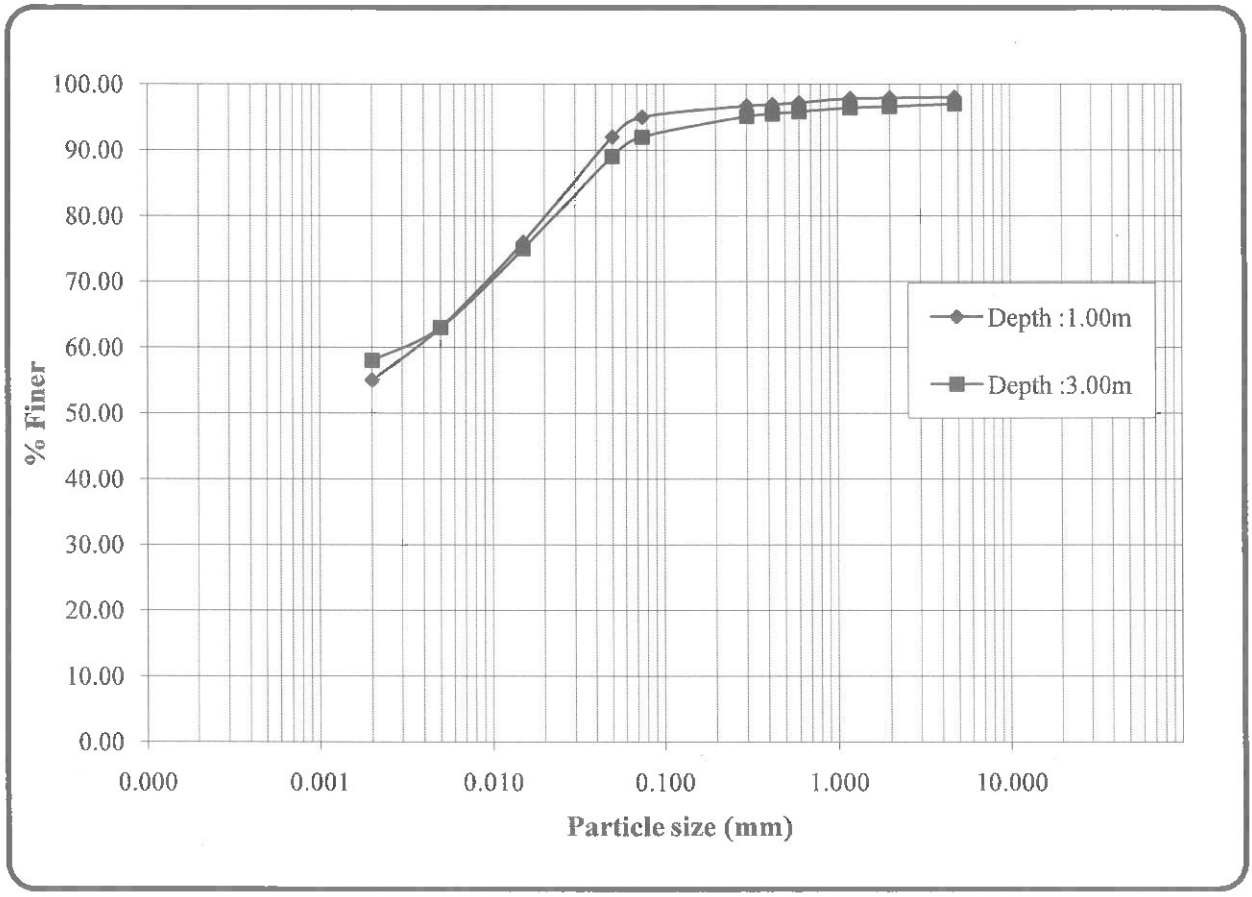
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-7, U-1, 1.00m	56.00	39.00	2.00	3.00
BH-7, S-2, 3.00m	58.00	35.00	3.00	4.00

P. K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-8



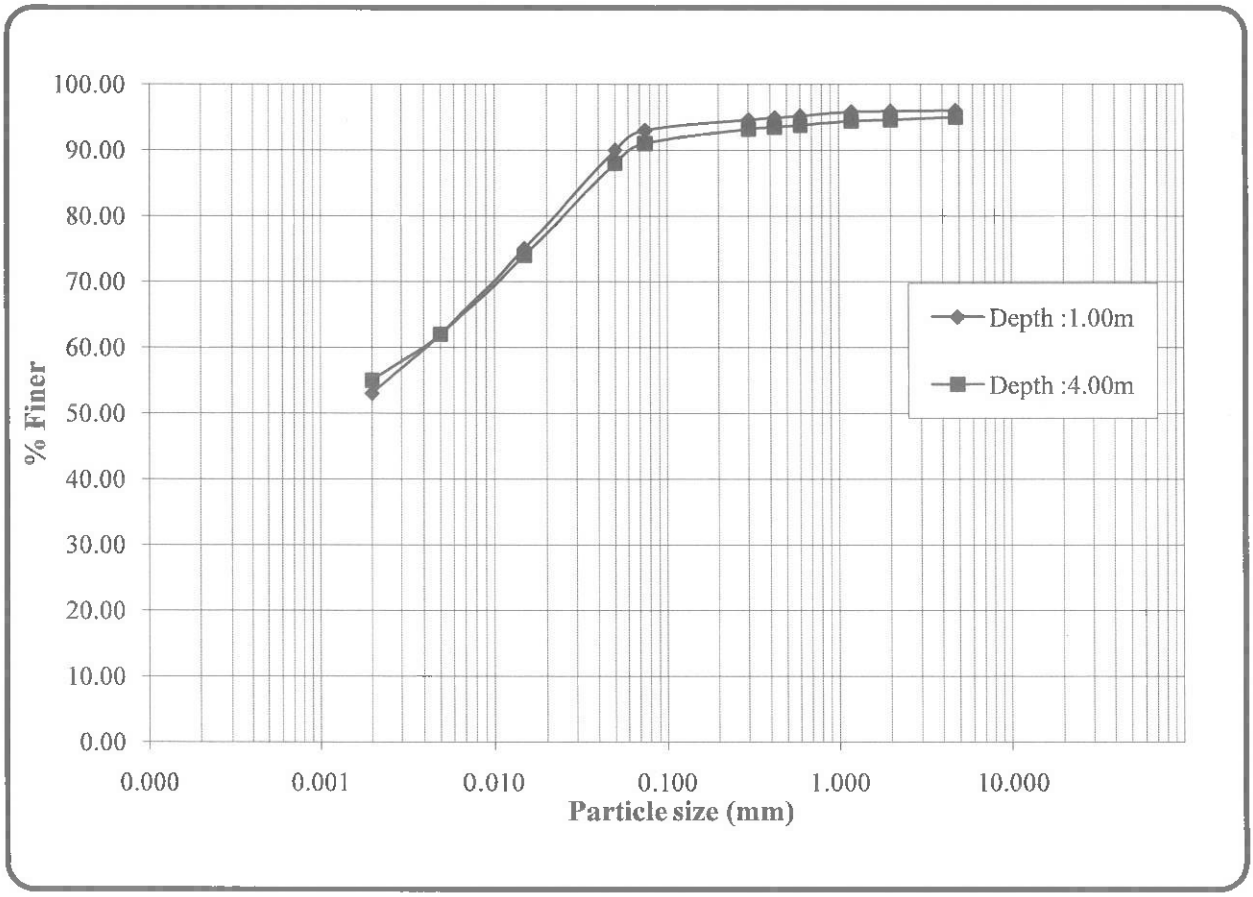
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-8, U-1, 1.00m	55.00	40.00	3.00	2.00
BH-8, S-2, 3.00m	58.00	34.00	5.00	3.00

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-9

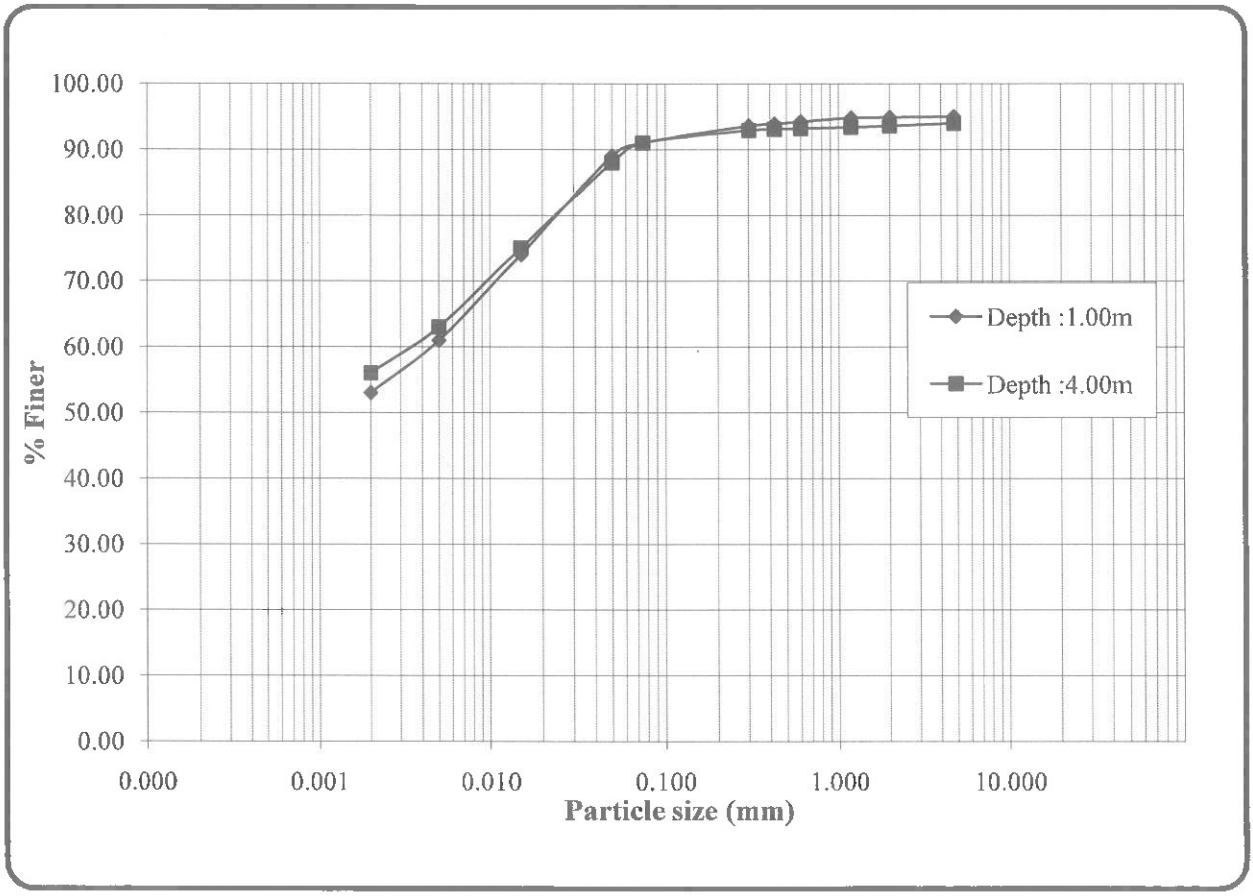


Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-9, U-1, 1.00m	53.00	40.00	3.00	4.00
BH-9, U-2, 4.00m	55.00	36.00	4.00	5.00

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-10



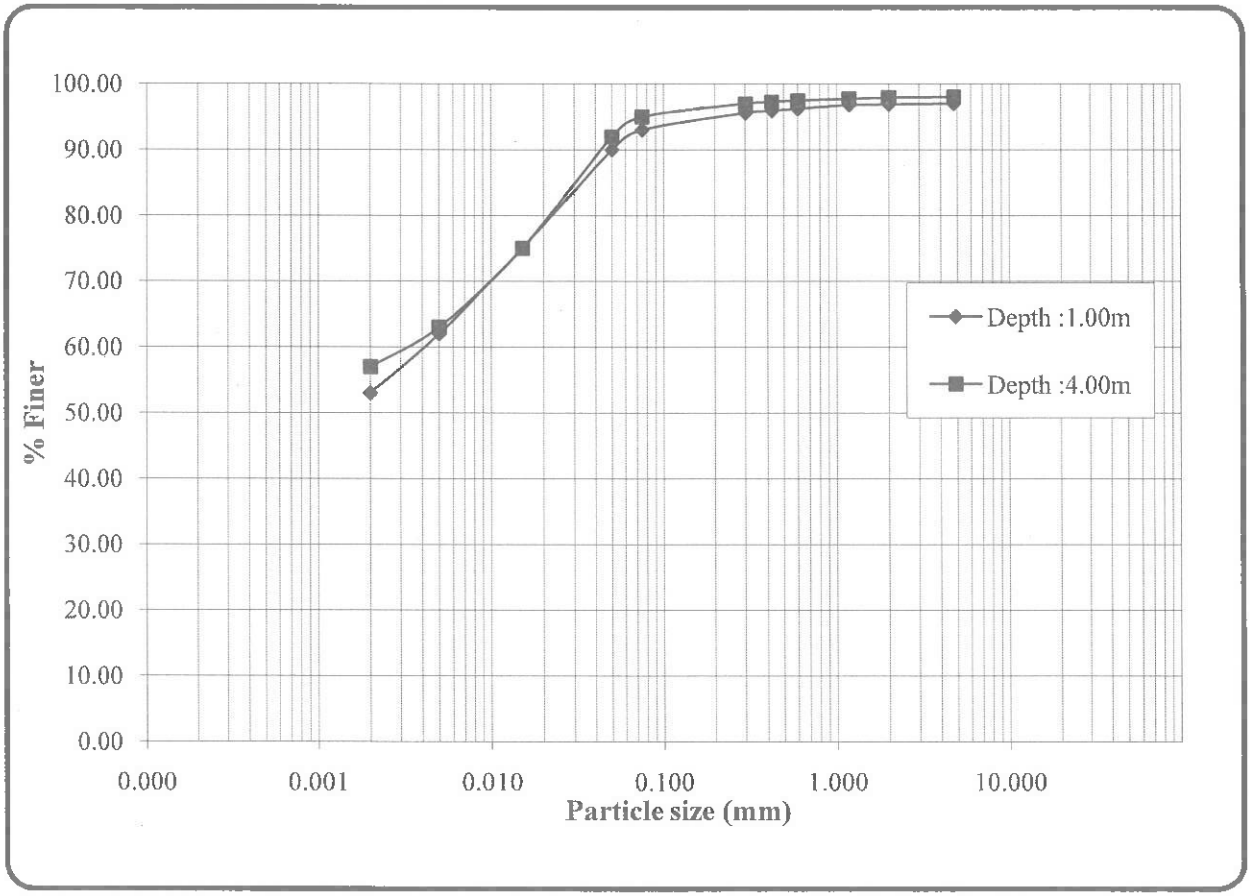
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-10, U-1, 1.00m	53.00	38.00	4.00	5.00
BH-10, U-2, 4.00m	56.00	35.00	3.00	6.00

P. K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-11



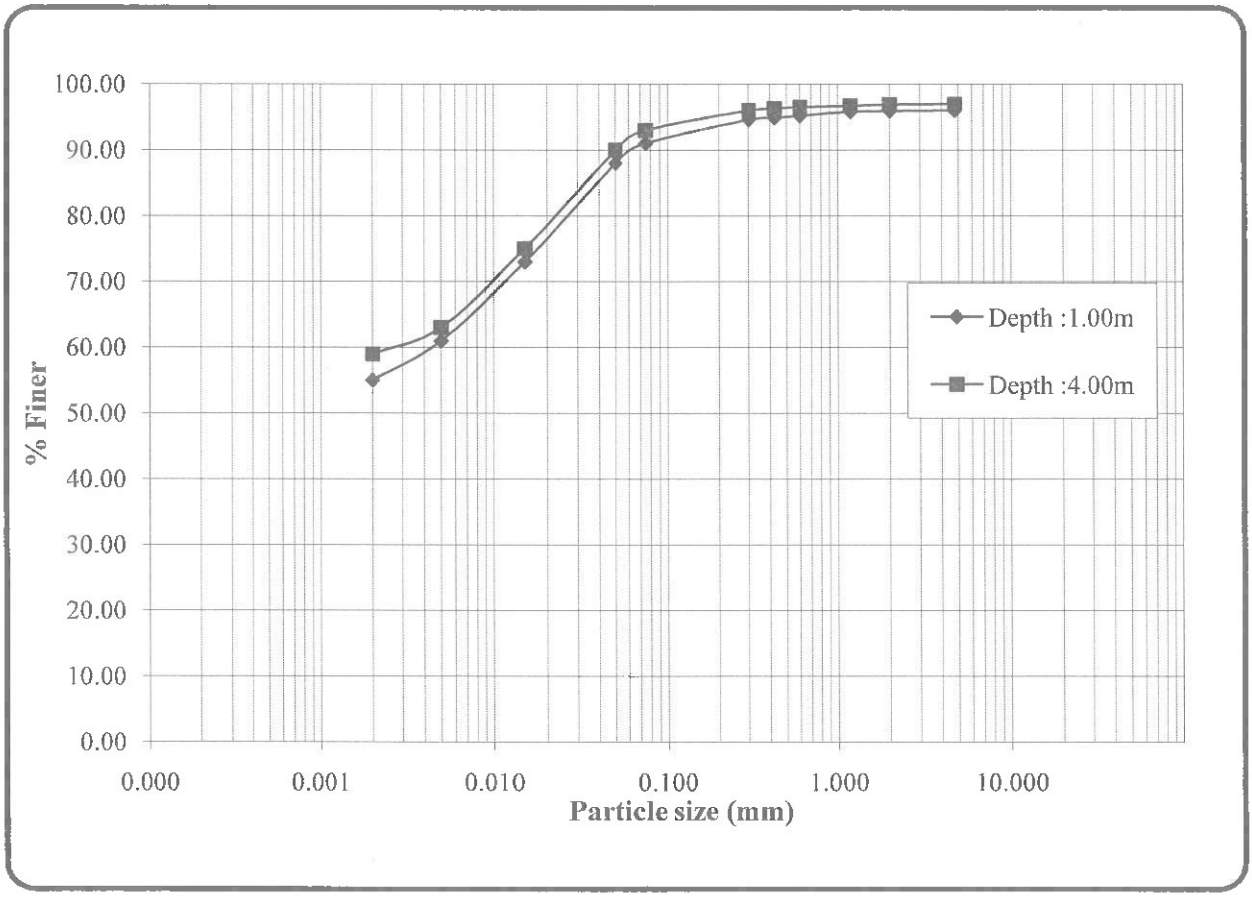
Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-11, U-1, 1.00m	53.00	40.00	4.00	3.00
BH-11, U-2, 4.00m	57.00	38.00	3.00	2.00

P.K. DUTTA & CO. NAIHATI

M/s. P.K.Dutta & Co.	GRAIN SIZE DISTRIBUTION CURVE

Client :-	Assam Electricity Grid Corporation Limited
Project :-	Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

Bore Hole No. BH-12



Grain Size (mm)	<0.002	0.002-0.075	0.075-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
BH-12, U-1, 1.00m	55.00	36.00	5.00	4.00
BH-12, U-2, 4.00m	59.00	34.00	4.00	3.00

P.K. DUTTA & CO. NAIHATI

SHEAR TEST CURVES

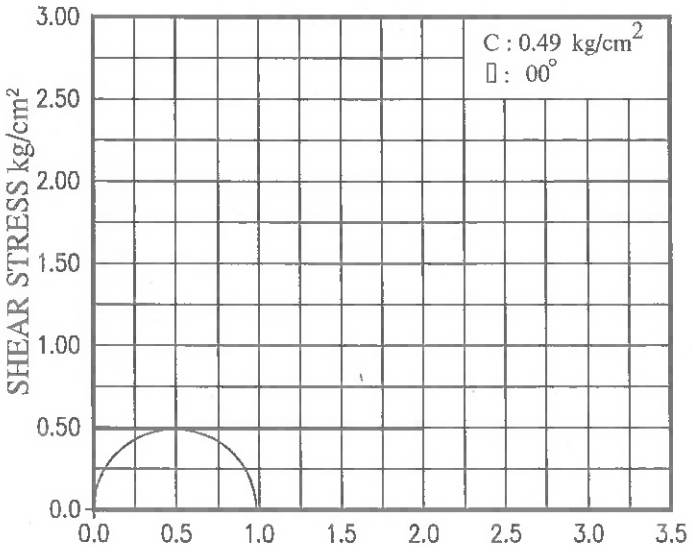
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

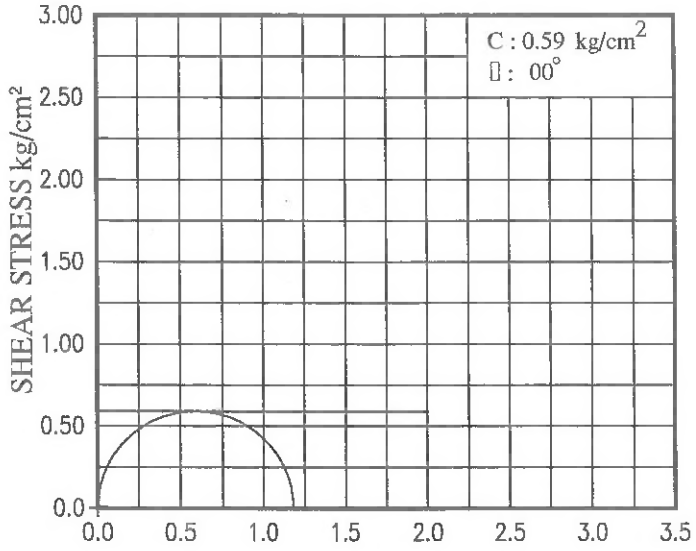
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-1
DEPTH :- 1.00m



BH-1
DEPTH :- 4.00m



P.K. DUTTA & CO. NAIHATI

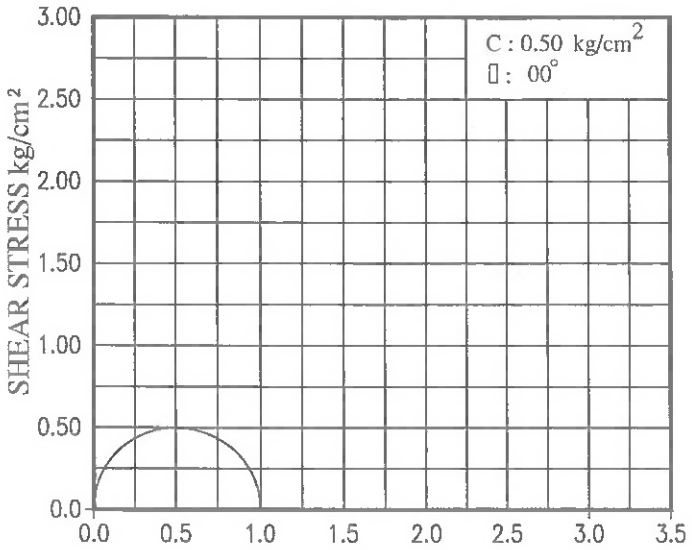
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

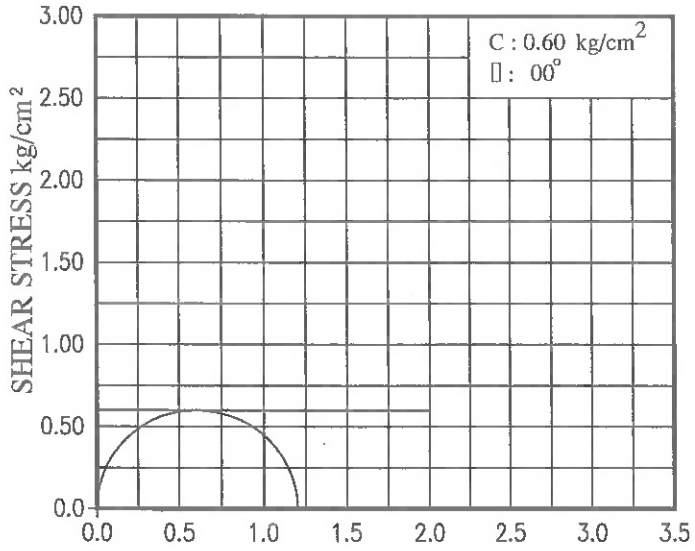
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-2
DEPTH :- 1.00m



BH-2
DEPTH :- 4.00m



P.K. DUTTA & CO. NAIHATI

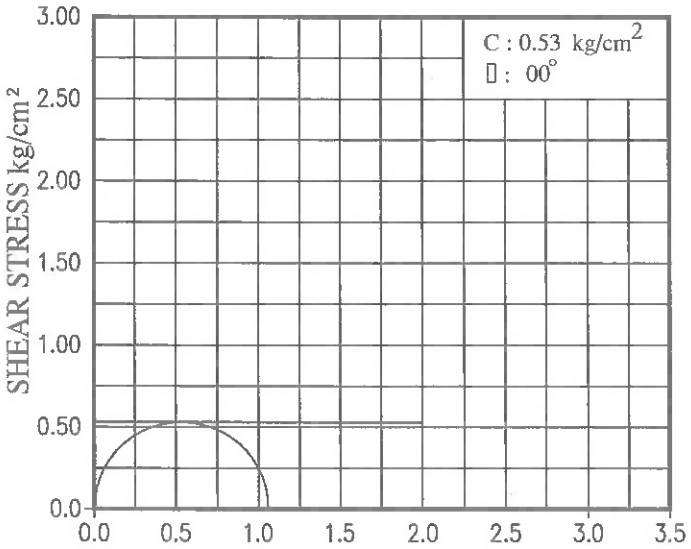
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

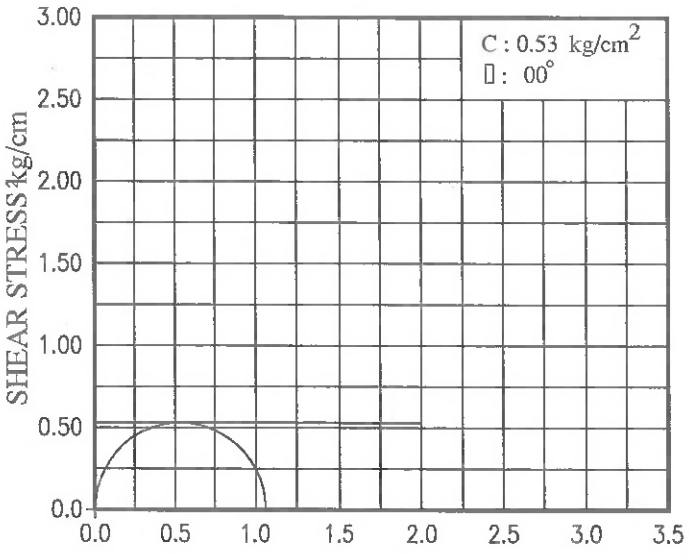
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

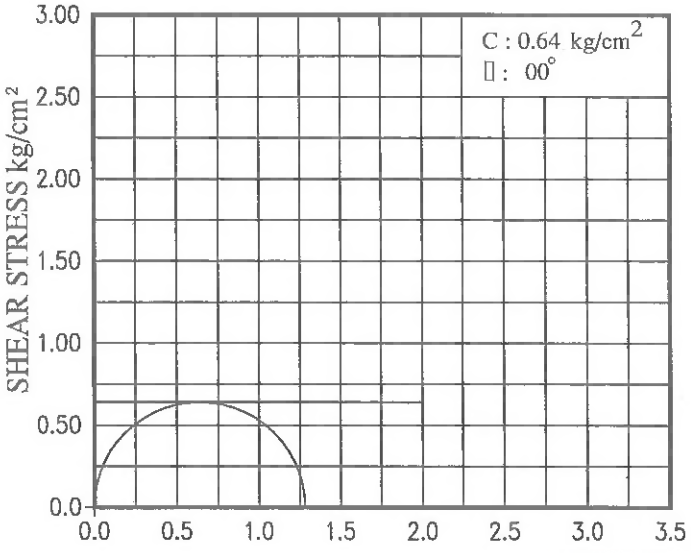
BH-3
DEPTH :- 1.00m



BH-4
DEPTH :- 1.00m



BH-4
DEPTH :- 4.00m



DUTTA & CO NAIHATI

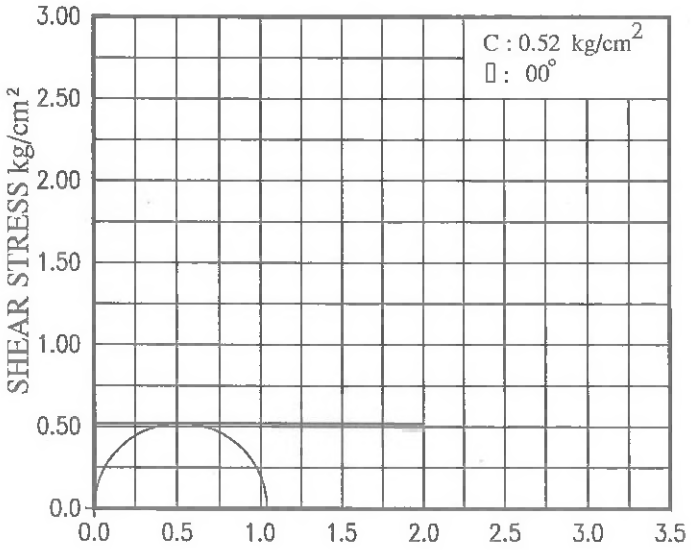
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

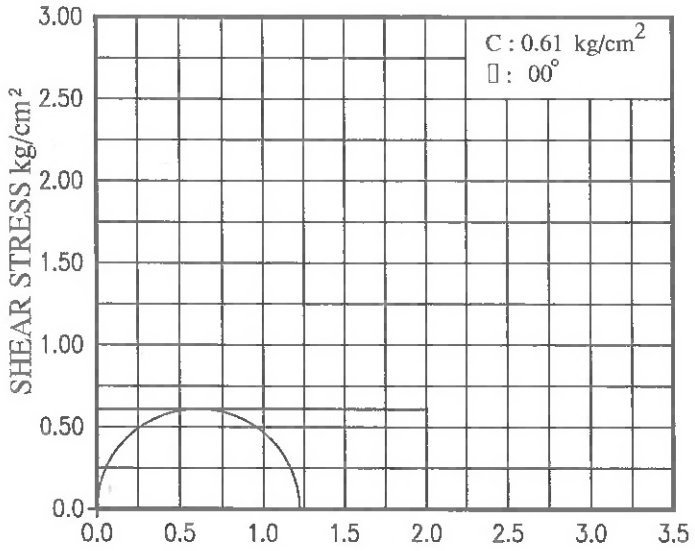
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-5
DEPTH :- 1.00m



BH-5
DEPTH :- 4.00m



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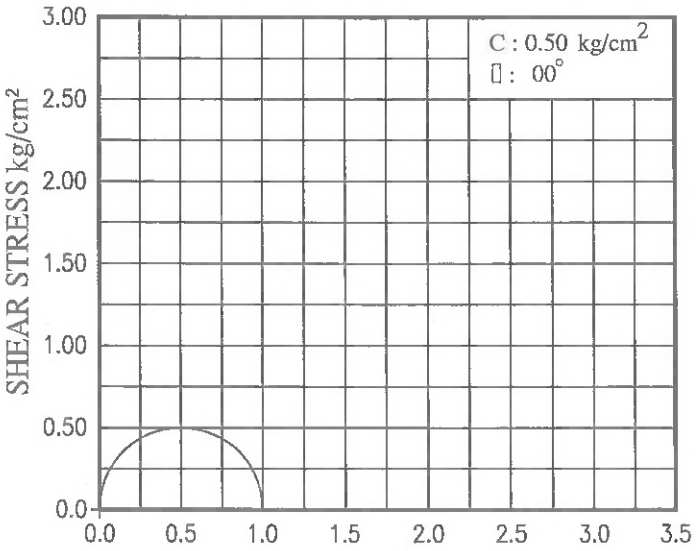
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

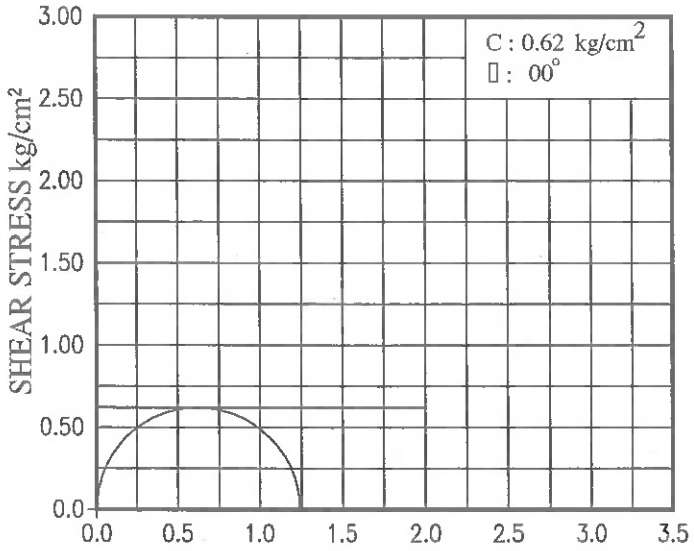
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-6
DEPTH :- 1.00m



BH-6
DEPTH :- 4.00m



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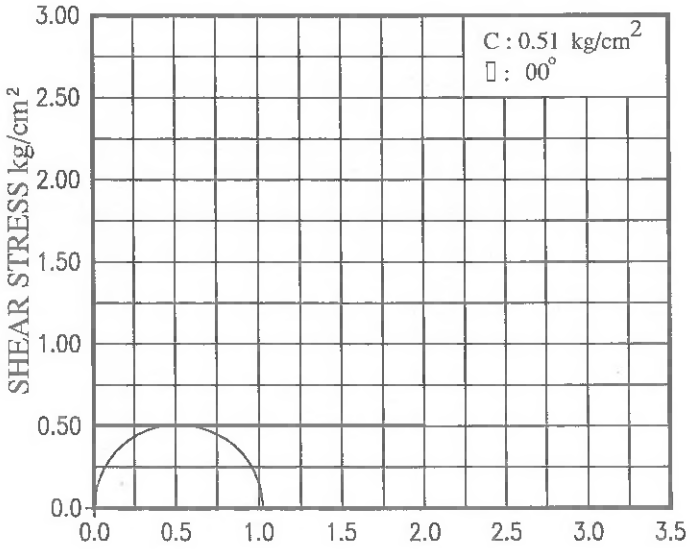
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

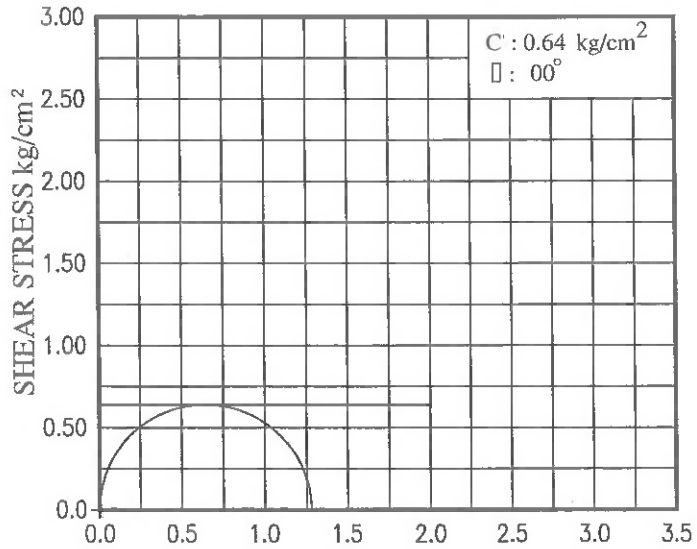
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-7
DEPTH :- 1.00m



BH-7
DEPTH :- 3.00m



P. K. DUTTA & CO. NAIHATI

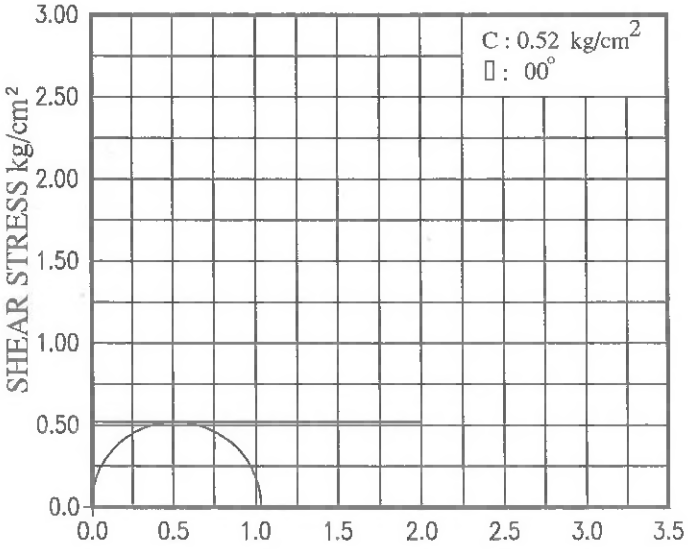
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

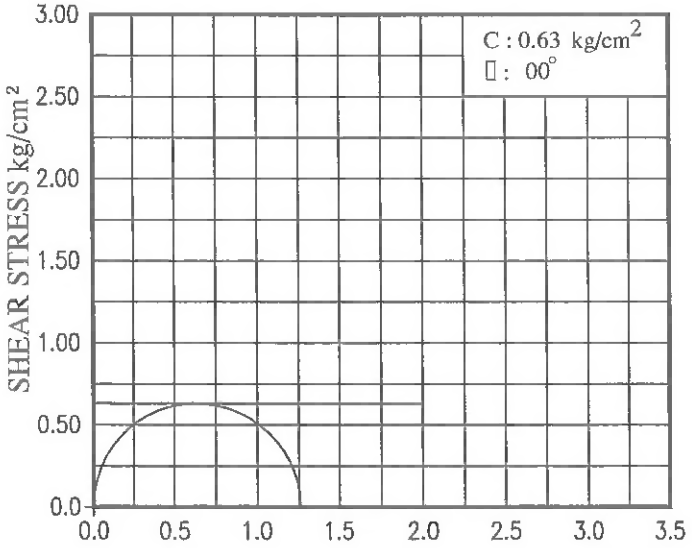
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-8
DEPTH :- 1.00m



BH-8
DEPTH :- 3.00m



P.K. DUTTA & CO. NAIHATI

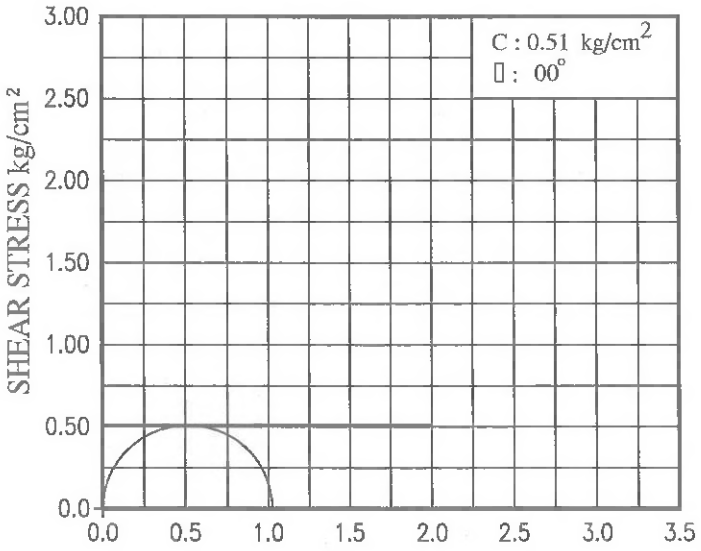
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

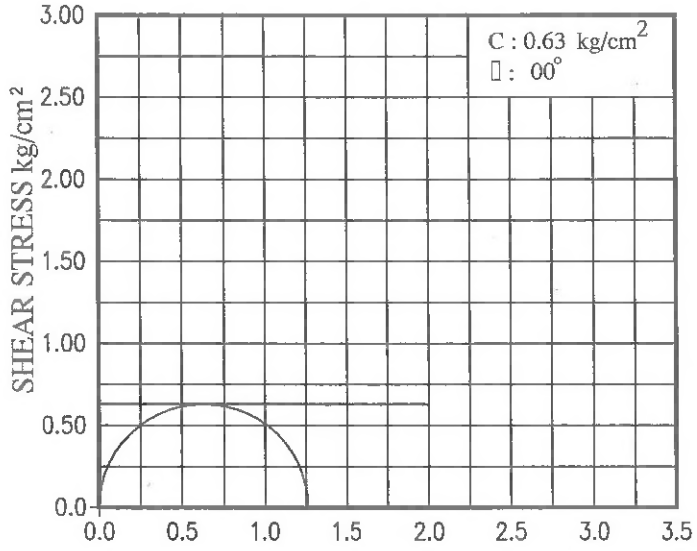
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-9
DEPTH :- 1.00m



BH-9
DEPTH :- 4.00m



P.K. DUTTA & CO. NAIHATI

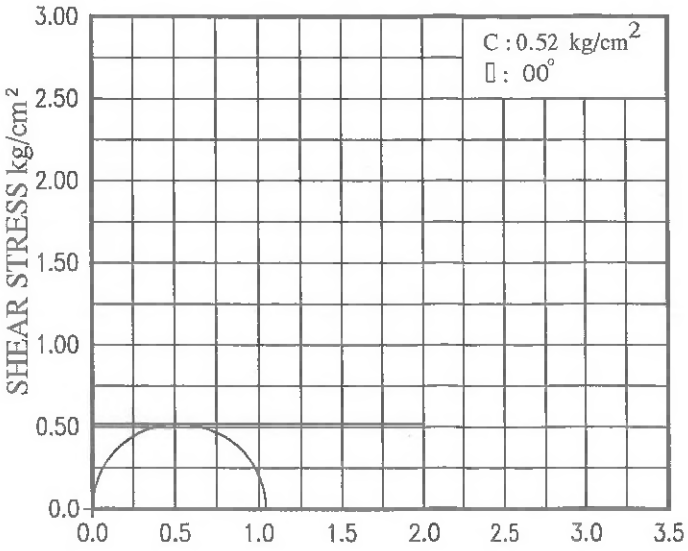
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

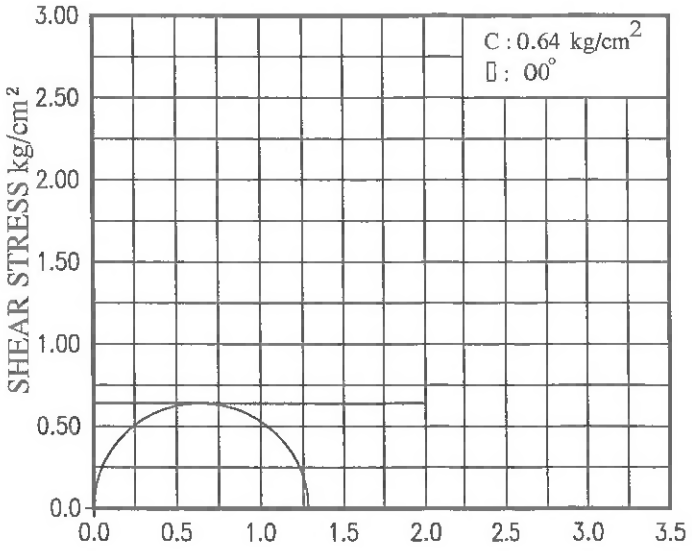
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-10
DEPTH :- 1.00m



BH-10
DEPTH :- 4.00m



P.K. DUTTA & CO. NAIHATI

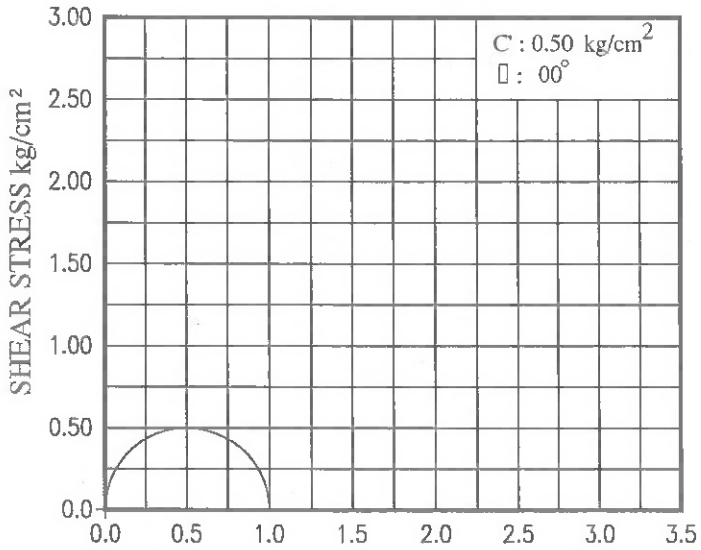
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

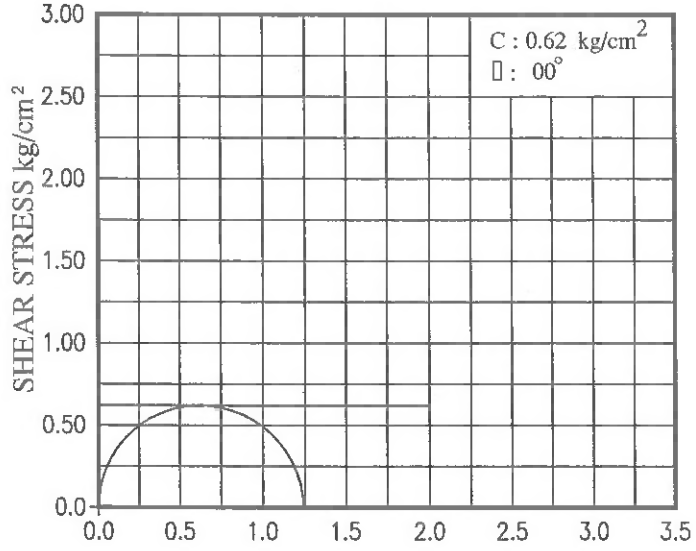
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-11
DEPTH :- 1.00m



BH-11
DEPTH :- 4.00m



P. K. DUTTA & CO. NAIHATI

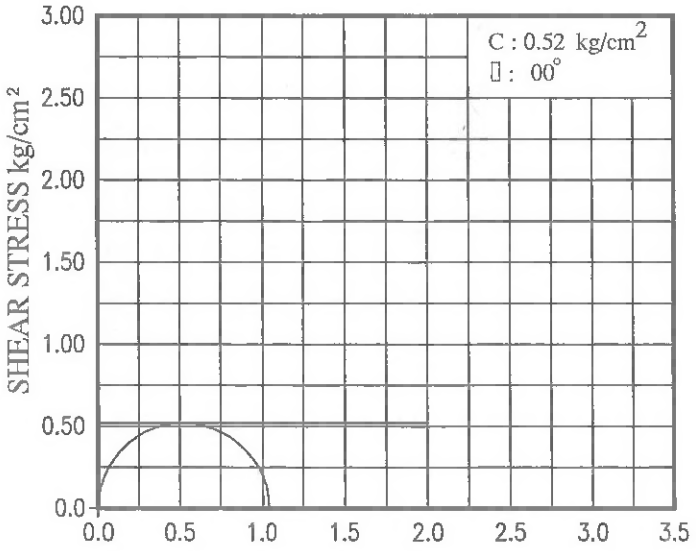
M/s P.K.Dutta & Co.	SHEAR TESTS CURVES

Client :- Assam Electricity Grid Corporation Limited

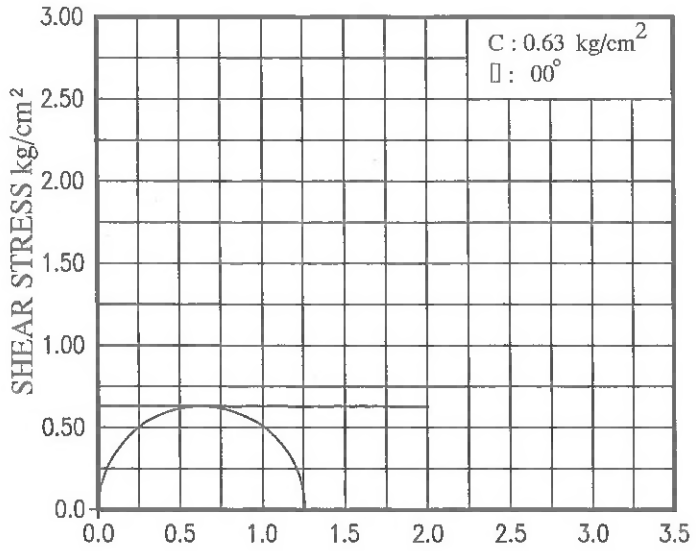
Project :- Geo Technical Investigation Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam.

SHEAR CURVE

BH-12
DEPTH :- 1.00m



BH-12
DEPTH :- 4.00m



P. K. DUTTA & CO. NAIHATI

RESISTIVITY REPORT

ERT Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam".										
ER-1 (E= 92°46'8.5" , N= 25°31'29.2")										
Soil Type : Umrangsho S/S Land, Tempareture: 27°C - 34°C										
Sl. No.	Location No.	Direction	Electrode Space (a)	Depth of Electrode(b)	Resistance (Ω)	Resistivity Value(Ω/m)	Land Type	Date	Time	Remarks
1	ER-1	N	2	0.2	1.09	13.93	Umrangsho grid Sub Station	07.10.2026	10:00AM - 10:30 AM	
		S	2	0.2	1.08	13.80				
		E	2	0.2	1.34	17.12				
		W	2	0.2	1.30	16.61				
		NE	2	0.2	0.99	12.65				
		SE	2	0.2	0.97	12.39				
		NW	2	0.2	1.06	13.54				
		SW	2	0.2	0.98	12.52				
2	ER-1	N	5	0.2	0.50	15.74		07.10.2026	10:40AM - 11:10 AM	
		S	5	0.2	0.45	14.17				
		E	5	0.2	0.41	12.91				
		W	5	0.2	0.36	11.34				
		NE	5	0.2	0.35	11.02				
		SE	5	0.2	0.42	13.22				
		NW	5	0.2	0.39	12.28				
		SW	5	0.2	0.37	11.65				
3	ER-1	N	10	0.2	0.29	18.22		07.10.2026	11:20AM - 11:50 AM	
		S	10	0.2	0.27	16.97				
		E	10	0.2	0.23	14.45				
		W	10	0.2	0.26	16.34				
		NE	10	0.2	0.19	11.94				
		SE	10	0.2	0.18	11.31				
		NW	10	0.2	0.21	13.2				
		SW	10	0.2	0.24	15.08				
4	ER-1	N	15	0.2	0.16	15.08		07.10.2026	12:00PM - 1;30 PM	
		S	15	0.2	0.15	14.13				
		E	15	0.2	0.18	16.96				
		W	15	0.2	0.16	15.08				
		NE	15	0.2	0.17	16.02				
		SE	15	0.2	0.13	12.25				
		NW	15	0.2	0.15	14.13				
		SW	15	0.2	0.16	15.08				
5	ER-1	N	25	0.2	0.09	14.13		07.10.2026	1:40PM - 1:10 PM	
		S	25	0.2	0.09	14.13				
		E	25	0.2	0.07	10.99				
		W	25	0.2	0.10	15.70				
		NE	25	0.2	0.11	17.27				
		SE	25	0.2	0.08	12.56				
		NW	25	0.2	0.09	14.13				
		SW	25	0.2	0.10	15.70				
6	ER-1	N	50	0.2	0.05	15.70		07.10.2026	1:20PM - 1:50 PM	
		S	50	0.2	0.06	18.84				
		E	50	0.2	-					
		W	50	0.2	-					
		NE	50	0.2	-					
		SE	50	0.2	-					
		NW	50	0.2	0.05	15.70				
		SW	50	0.2	0.07	21.98				
						14.50				



ERT Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam".										
ER-2 (E= 92°46'10.3" , N= 25°31'26.5")										
Soil Type : Umrangsho S/S Land, Tempareture: 27°C - 34°C										
Sl. No.	Location No.	Direction	Electrode Space (a)	Depth of Electrode(b)	Resistance (Ω)	Resistivity Value(Ω/m)	Land Type	Date	Time	Remarks
1	ER-2	N	2	0.2	1.70	21.72	Umrangsho grid Sub Station	05.10.2026	9:00AM - 9:30 AM	
		S	2	0.2	1.63	20.83				
		E	2	0.2	1.49	19.04				
		W	2	0.2	1.53	19.55				
		NE	2	0.2	1.25	15.97				
		SE	2	0.2	1.34	17.12				
		NW	2	0.2	1.27	16.23				
		SW	2	0.2	1.46	18.65				
2	ER-2	N	5	0.2	0.39	12.28		05.10.2026	9:40AM - 10:10 AM	
		S	5	0.2	0.37	11.65				
		E	5	0.2	0.36	11.34				
		W	5	0.2	0.36	11.34				
		NE	5	0.2	0.33	10.39				
		SE	5	0.2	0.34	10.71				
		NW	5	0.2	0.36	11.34				
		SW	5	0.2	0.32	10.08				
3	ER-2	N	10	0.2	0.17	10.68		05.10.2026	10:20AM - 10:50 AM	
		S	10	0.2	0.21	13.20				
		E	10	0.2	0.19	11.94				
		W	10	0.2	0.19	11.94				
		NE	10	0.2	0.16	10.06				
		SE	10	0.2	0.13	8.17				
		NW	10	0.2	0.15	9.43				
		SW	10	0.2	0.18	11.31				
4	ER-2	N	15	0.2	0.12	11.31		05.10.2026	11:00AM - 11:30 AM	
		S	15	0.2	0.11	10.37				
		E	15	0.2	0.13	12.25				
		W	15	0.2	0.10	9.42				
		NE	15	0.2	0.11	10.37				
		SE	15	0.2	0.14	13.19				
		NW	15	0.2	0.10	9.42				
		SW	15	0.2	0.09	8.48				
5	ER-2	N	25	0.2	0.08	12.56		05.10.2026	11:40AM - 12:10 PM	
		S	25	0.2	0.07	10.99				
		E	25	0.2	0.07	10.99				
		W	25	0.2	0.06	9.42				
		NE	25	0.2	0.07	10.99				
		SE	25	0.2	0.08	12.56				
		NW	25	0.2	0.06	9.42				
		SW	25	0.2	0.05	7.85				
6	ER-2	N	50	0.2	0.03	9.42		05.10.2026	12:20PM - 12:50 PM	
		S	50	0.2	0.04	12.56				
		E	50	0.2						
		W	50	0.2						
		NE	50	0.2						
		SE	50	0.2						
		NW	50	0.2						
		SW	50	0.2						
						12.30				

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ERT Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam".										
ER-3 (E= 92°46'9.3" , N= 25°31'26.0")										
Soil Type : Umrangsho S/S Land, Tempareture: 27°C - 34°C										
Sl. No.	Location No.	Direction	Electrode Space (a)	Depth of Electrode(b)	Resistance (Ω)	Resistivity Value(Ω/m)	Land Type	Date	Time	Remarks
1	ER-3	N	2	0.2	1.29	16.48	Umrangsho grid Sub Station	05.10.2026	9:00AM - 9:30 AM	
		S	2	0.2	1.32	16.86				
		E	2	0.2	1.24	15.84				
		W	2	0.2	1.18	15.08				
		NE	2	0.2	1.41	18.01				
		SE	2	0.2	1.36	17.38				
		NW	2	0.2	1.30	16.61				
		SW	2	0.2	1.44	18.40				
2	ER-3	N	5	0.2	0.42	13.22		05.10.2026	9:40AM - 10:10 AM	
		S	5	0.2	0.39	12.28				
		E	5	0.2	0.46	14.48				
		W	5	0.2	0.43	13.54				
		NE	5	0.2	0.37	11.65				
		SE	5	0.2	0.39	12.28				
		NW	5	0.2	0.41	12.91				
		SW	5	0.2	0.44	13.85				
3	ER-3	N	10	0.2	0.29	18.22		05.10.2026	10:20AM - 10:50 AM	
		S	10	0.2	0.27	16.97				
		E	10	0.2	0.27	16.97				
		W	10	0.2	0.31	19.48				
		NE	10	0.2	0.26	16.34				
		SE	10	0.2	0.22	13.83				
		NW	10	0.2	0.19	11.94				
		SW	10	0.2	0.21	13.20				
4	ER-3	N	15	0.2	0.17	16.02		05.10.2026	11:00AM - 11:30 AM	
		S	15	0.2	0.19	17.90				
		E	15	0.2	0.14	13.19				
		W	15	0.2	0.16	15.08				
		NE	15	0.2	0.15	14.13				
		SE	15	0.2	0.18	16.96				
		NW	15	0.2	0.19	17.90				
		SW	15	0.2	0.13	12.25				
5	ER-3	N	25	0.2	0.11	17.27		05.10.2026	11:40AM - 12:10 PM	
		S	25	0.2	0.12	18.84				
		E	25	0.2	0.11	17.27				
		W	25	0.2	0.09	14.13				
		NE	25	0.2	0.10	15.70				
		SE	25	0.2	0.13	20.41				
		NW	25	0.2	0.11	17.27				
		SW	25	0.2	0.08	12.56				
6	ER-3	N	50	0.2	0.06	18.84		05.10.2026	12:20PM - 12:50 PM	
		S	50	0.2	-					
		E	50	0.2	-					
		W	50	0.2	0.05	15.70				
		NE	50	0.2	-					
		SE	50	0.2	-					
		NW	50	0.2	-					
		SW	50	0.2	-					
						15.65				



ERT Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam".										
ER-4 (E= 92°46'7.6" , N= 25°31'31.8")										
Soil Type : Umrangsho S/S Land, Tempareture: 27°C - 34°C										
Sl. No.	Location No.	Direction	Electrode Space (a)	Depth of Electrode(b)	Resistance (Ω)	Resistivity Value(Ω/m)	Land Type	Date	Time	Remarks
1	ER-4	N	2	0.2	0.99	12.65	Umrangsho grid Sub Station	08.10.2026	1:00PM-1:30PM	
		S	2	0.2	0.93	11.88				
		E	2	0.2	1.10	14.05				
		W	2	0.2	0.97	12.39				
		NE	2	0.2	0.94	12.01				
		SE	2	0.2	0.98	12.52				
		NW	2	0.2	1.06	13.54				
		SW	2	0.2	1.09	13.93				
2	ER-4	N	5	0.2	0.37	11.65		08.10.2026	1:40PM-2:10PM	
		S	5	0.2	0.40	12.60				
		E	5	0.2	0.41	12.91				
		W	5	0.2	0.39	12.28				
		NE	5	0.2	0.43	13.54				
		SE	5	0.2	0.44	13.85				
		NW	5	0.2	0.47	14.80				
		SW	5	0.2	0.48	15.11				
3	ER-4	N	10	0.2	0.36	22.62		08.10.2026	2:20PM-2:50PM	
		S	10	0.2	0.36	22.62				
		E	10	0.2	0.33	20.74				
		W	10	0.2	0.34	21.37				
		NE	10	0.2	0.31	19.48				
		SE	10	0.2	0.33	20.74				
		NW	10	0.2	0.35	22.00				
		SW	10	0.2	0.29	18.22				
4	ER-4	N	15	0.2	0.20	18.85		08.10.2026	3:00PM-3:30PM	
		S	15	0.2	0.22	20.73				
		E	15	0.2	0.19	17.90				
		W	15	0.2	0.23	21.67				
		NE	15	0.2	0.20	18.85				
		SE	15	0.2	0.21	19.79				
		NW	15	0.2	0.21	19.79				
		SW	15	0.2	0.23	21.67				
5	ER-4	N	25	0.2	0.12	18.84		08.10.2026	3:40PM-4:10PM	
		S	25	0.2	0.12	18.84				
		E	25	0.2	0.14	21.98				
		W	25	0.2	0.11	17.27				
		NE	25	0.2	0.13	20.41				
		SE	25	0.2	0.10	15.70				
		NW	25	0.2	0.13	20.41				
		SW	25	0.2	0.12	18.84				
6	ER-4	N	50	0.2	-			08.10.2026	4:20PM-4:50PM	
		S	50	0.2	0.06	18.84				
		E	50	0.2	-					
		W	50	0.2	-					
		NE	50	0.2	-					
		SE	50	0.2	-					
		NW	50	0.2	0.06	18.84				
		SW	50	0.2	0.05	15.70				
						17.27				



ERT Report for Construction of a new 400/132kV Grid Sub-Station at Umrangsho along with Associated Transmission System at Dima Hasao district, Assam".										
ER-5 (E= 92°46'6.9" , N= 25°31'30.2")										
Soil Type : Umrangsho S/S Land, Tempareture: 27°C - 34°C										
Sl. No.	Location No.	Direction	Electrode Space (a)	Depth of Electrode(b)	Resistance (Ω)	Resistivity Value(Ω/m)	Land Type	Date	Time	Remarks
1	ER-5	N	2	0.2	1.10	14.05	Umrangsho grid Sub Station	06.10.2026	1:00PM-1:30PM	
		S	2	0.2	1.09	13.93				
		E	2	0.2	0.98	12.52				
		W	2	0.2	0.99	12.65				
		NE	2	0.2	1.06	13.54				
		SE	2	0.2	0.97	12.39				
		NW	2	0.2	1.03	13.16				
		SW	2	0.2	0.99	12.65				
2	ER-5	N	5	0.2	0.47	14.80		06.10.2026	1:40PM-2:10PM	
		S	5	0.2	0.46	14.48				
		E	5	0.2	0.39	12.28				
		W	5	0.2	0.37	11.65				
		NE	5	0.2	0.37	11.65				
		SE	5	0.2	0.36	11.34				
		NW	5	0.2	0.36	11.34				
		SW	5	0.2	0.37	11.65				
3	ER-5	N	10	0.2	0.33	20.74		06.10.2026	2:20PM-2:50PM	
		S	10	0.2	0.29	18.22				
		E	10	0.2	0.30	18.85				
		W	10	0.2	0.27	16.97				
		NE	10	0.2	0.29	18.22				
		SE	10	0.2	0.28	17.60				
		NW	10	0.2	0.34	21.37				
		SW	10	0.2	0.32	20.11				
4	ER-5	N	15	0.2	0.24	22.62		06.10.2026	3:00PM-3:30PM	
		S	15	0.2	0.22	20.73				
		E	15	0.2	0.21	19.79				
		W	15	0.2	0.23	21.67				
		NE	15	0.2	0.26	24.50				
		SE	15	0.2	0.19	17.90				
		NW	15	0.2	0.21	19.79				
		SW	15	0.2	0.17	16.02				
5	ER-5	N	25	0.2	0.13	20.41		06.10.2026	3:40PM-4:10PM	
		S	25	0.2	0.11	17.27				
		E	25	0.2	0.10	15.70				
		W	25	0.2	0.14	21.98				
		NE	25	0.2	0.09	14.13				
		SE	25	0.2	0.13	20.41				
		NW	25	0.2	0.08	12.56				
		SW	25	0.2	0.10	15.70				
6	ER-5	N	50	0.2	0.06	18.84		06.10.2026	4:20PM-4:50PM	
		S	50	0.2	0.08	25.12				
		E	50	0.2	0.05	15.70				
		W	50	0.2	-					
		NE	50	0.2	0.04	12.56				
		SE	50	0.2	0.06	18.84				
		NW	50	0.2	-					
		SW	50	0.2	-					
						16.63				



SIGN FIELD DATA SHEET

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangso
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-1
Commenced On:- 10-10-2026	RL:- GPS N - 25°31'31.95"
Completed On:- 11-10-2026	Ground Water:- NIL E - 92°46'04.90"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very Consistency brownish to Reddish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 4, 5 = 9		
				SPT-	3.00	3.45	4, 7, 10 = 17		
				UDS-	4.00	4.45			
				DS-	4.50				
				SPT-	5.00	5.45	10, 16, 26 = 42		
Completely to Highly, Weathered, brownish to dark grey coloured, Weathered Shale.	7.00	7.00		SPT-	7.00	7.25	38, 56 for 10 cm >		100
				RUN					
				CR-1	7.00	8.50		13%	NIL
				CR-2	8.50	10.00		14%	NIL
				CR-3	10.00	11.50		13%	NIL
				CR-4	11.50	13.00		15%	NIL
				CR-5	13.00	14.00		18%	NIL
		15.00		CR-6	14.00	15.00		23%	10%

Signature of Site In-Charge.

Dey (P.K. Dutta & Co.)

Signature of Engineer In- Charge.

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- prop. 400/132KV Grid Sub-station at Umrangkho
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-2
Commenced On:- 09-10-2026	RL:- GPS N - 25°31'32.62"
Completed On:- 10-10-2026	Ground Water:- NIL E - 92°46'07.99"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRIPTION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very stiff Consistency, brownish to Reddish yellow, Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 4, 6 = 10		
				SPT-	3.00	3.45	5, 8, 11 = 19		
				UDS-	4.00	4.20			
Completely to Highly, Weathered, brownish to dark grey Coloured Weathered Shale.	4.50	4.50		SPT-	4.50	4.77	30, 52 for 12cm	> 100	
				RUN CR-1	4.50	6.00		10%	NIL
				SPT-	6.00	6.25	42, 55 for	10 cm > 100	
				CR-2	6.00	7.50		13%	NIL
				CR-3	7.50	9.00		12%	NIL
				CR-4	9.00	10.50		14%	NIL
				CR-5	10.50	12.00		14%	NIL
				CR-6	12.00	13.50		17%	NIL
		15.00		CR-7	13.50	15.00		18%	NIL

Signature of Site In-Charge

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Proj: 400/132KV Grid Sub-Station at Umrangso
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0 (M)
	Location No :- BH-3
Commenced On:- 06-10-2026	RL:- GPS N - 25°31'29.82" E - 92°46'06.27"
Completed On:- 07-10-2026	Ground Water:- NIL

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff Consistency, brownish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	4, 6, 7 = 13		
Completely to Highly, Weathered, brownish to dark grey Coloured Weathered Shale.	3.50	3.50		SPT-	3.00	3.25	21, 55 for 10cm >		100
				RUN					
				CR-1	3.00	4.50		13%	NIL
				SPT-	4.50	4.70	46, 56 for 5cm >		100
				CR-2	4.50	6.00		16%	NIL
				CR-3	6.00	7.50		9%	NIL
				CR-4	7.50	9.00		11%	NIL
				CR-5	9.00	10.50		14%	NIL
				CR-6	10.50	12.00		17%	NIL
				CR-7	12.00	13.50		16%	NIL
		15.00		CR-8	13.50	15.00		19%	NIL

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-station at Umrangso CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0 (M) Location No :- BH-4
Commenced On:- 07-10-2026 Completed On:- 08-10-2026	RL:- GPS N - 25°31'30.92" E - 92°46'07.63" Ground Water:- NIL

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M)		Thickness(Mtr)	COLLECTION OF SOIL SAMPLES			N- Value	COLLECTION OF ROCK SAMPLES.	
	From	To		Type	Depth From	Depth To		TCR (%)	RQD (%)
Stiff to very stiff Consistency, brownish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	4, 6, 8 = 14		
Very Stiff to Hard, brownish grey Silty clay with Kankars.	3.00	3.00		SPT-	3.00	3.45	8, 14, 18 = 32		
				UDS-	4.00	4.45			
				DS-	4.50				
				SPT-	5.00	5.45	13, 20, 26 = 46		
	7.00	7.00		SPT-	7.00	7.37	38, 45, 56 for 7cm	>100	
Completely to Highly, Weathered, brownish to dark grey coloured Weathered shale.				RUN-					
				C-1	7.00	8.50		9%	NIL
				C-2	8.50	10.00		11%	NIL
				C-3	10.00	11.50		12%	NIL
				C-4	11.50	13.00		14%	NIL
				C-5	13.00	14.00		15%	NIL
		15.00		C-6	14.00	15.00		18%	NIL

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Proj. 400/132 kV Grid Sub-Station at Umrangso
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0 (M)
	Location No :- BH-5
Commenced On:- 30-09-2026	RL:- GPS N - 25°31'27.98"
Completed On:- 01-10-2026	Ground Water:- NIL E - 92°46'07.49"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M)		Thickness(Mtr)	COLLECTION OF SOIL SAMPLES			N- Value	COLLECTION OF ROCK SAMPLES.	
	From	To		Type	Depth From	Depth To		TCR (%)	RQD (%)
Stiff to very stiff, brownish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	4, 6, 7 = 13		
				SPT-	3.00	3.45	6, 8, 11 = 19		
				UDS-	4.00	4.45			
				DS-	4.50				
				SPT-	5.00	5.45	7, 10, 12 = 22		
Completely to Highly, Weathered, dark grey Coloured, Weathered Shale.	7.00	7.00		SPT-	7.00	7.35	32, 55, 30 for 5cm > 100		
				RUN					
				CR-1	7.00	8.00		10%	NIL
				CR-2	8.00	9.50		14%	10%
				CR-3	9.50	11.00		15%	10%
				CR-4	11.50	12.50		19%	12%
				CR-5	12.50	14.00		21%	10%
		15.00		CR-6	14.00	15.00		25%	13%

Signature of Site In-Charge.

(P.K.Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangsho
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-6
Commenced On:- 02-10-2026	RL:- GPS N – 25°31'28.90"
Completed On:- 03-10-2026	Ground Water:- NIL E – 92°46'08.00"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very Stiff Consistency, Greenish grey Silty Clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 4, 6 = 10		
				SPT-	3.00	3.45	7, 12, 16 = 28		
				UDS-	4.00	4.20			
Completely to Highly, Weathered, dark grey Coloured Weathered Shale.	5.00	5.00		SPT-	5.00	5.35	33, 56, 45	>100	
				RUN					
				CR-1	5.00	6.50		14%	NIL
				CR-2	6.50	8.00		22%	12%
				CR-3	8.00	9.50		20%	13%
				CR-4	9.50	11.00		18%	NIL
				CR-5	11.00	12.50		21%	12%
				CR-6	12.50	14.00		24%	13%
		15.00		CR-7	14.00	15.00		27%	15%

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
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...CL, Umrang

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132 KV Grid Sub-Station at Umrangsho
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-7
Commenced On:- 05-10-2026	RL:- GPS N - 25°31'29.57" E - 92°46'09.28"
Completed On:- 06-10-2026	Ground Water:- NIL

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very stiff, brownish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	4, 5, 6 = 11		
				SPT-	3.00	3.45	6, 9, 16 = 25		
Completely to Highly, Weathered, brownish to dark grey Coloured Weathered Shale.	4.50	4.50		SPT- RUN	4.50	4.75	49, 53 for 10cm	>100	
				CR-1	4.50	6.00		12%	NIL
				CR-2	6.00	7.50		13%	NIL
				CR-3	7.50	9.00		15%	NIL
				CR-4	9.00	10.50		18%	NIL
				CR-5	10.50	12.00		17%	NIL
				CR-6	12.00	13.50		20%	NIL
		15.00		CR-7	13.50	15.00		22%	10%

Signature of Site In-Charge

for (P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangsho
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0 (M)
	Location No :- BH-8
Commenced On:- 04-10-2026	RL:- GPS N - 25°31'28.56"
Completed On:- 05-10-2026	Ground Water:- NIL E - 92°46'10.87"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRIPTION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very stiff Consistency, brownish grey silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 5, 7 = 12		
				SPT-	3.00	3.45	7, 10, 16 = 26		
Completely to Highly, Weathered, brownish to dark grey Coloured Weathered Shale.	5.00	5.00		SPT-	5.00	5.22	55, 50 for 7cm >	100	
				RUN					
				CR-1	5.00	6.50		15%	NIL
				CR-2	6.50	8.00		16%	NIL
				CR-3	8.00	9.50		14%	NIL
				CR-4	9.50	11.00		17%	NIL
				CR-5	11.00	12.50		19%	NIL
				CR-6	12.50	14.00		18%	NIL
		15.00		CR-7	14.00	15.00		17%	NIL

Signature of Site In-Charge

(P. K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangsho
Dia Of Hole : 150mm/NX	CLIENT:- AEGCL Depth in Mtr:- 15.0(M)
Commenced On:- 28-09-2026	Location No :- BH-9 RL:- GPS
Completed On:- 29-09-2026	Ground Water:- NIL N - 25°31'23.82" E - 92°46'08.25"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very stiff, brownish to Reddish grey Silty clay with Kankars & occasionally Rock fragments.	0.00			DS -	0.50				
				DS -	1.00				
				UDS -	1.00	1.45			
				SPT -	2.00	2.45	3, 5, 6 = 11		
				SPT -	3.00	3.45	7, 11, 14 = 25		
				UDS -	4.00	4.10			
Completely to Highly, Weathered, dark grey Coloured, Weathered Shale.	4.50	4.50		SPT -	4.50	4.63	68 blows for 13cm (Rebounded)	>100	
				RUN					
				CR-1	4.50	6.00		13%	NIL
				CR-2	6.00	7.50		12%	NIL
				CR-3	7.50	9.00		14%	NIL
				CR-4	9.00	10.50		16%	NIL
				CR-5	10.50	12.00		15%	NIL
				CR-6	12.00	13.50		18%	NIL
		15.00		CR-7	13.50	15.00		23%	NIL

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangsho
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-10
Commenced On:- 29-09-2026	RL:- GPS N - 25°31'25.12"
Completed On:- 30-09-2026	Ground Water:- NIL E - 92°46'08.71"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRIPTION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff to very stiff, brownish to Reddish grey Silty clay with Kankars & occasionally Rock fragments.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	4, 5, 7 = 12		
				SPT-	3.00	3.45	7, 12, 14 = 26		
				UDS-	4.00	4.15			
		4.50		SPT-	4.50	4.70	53, 50 Rebounded	>100	
Completely to Highly, Weathered, dark grey Coloured, Weathered Shale.	4.50			RUN					
				CR-1	4.50	6.00		10%	NIL
		6.00		SPT-	6.00	6.45	24, 35, 43 = 78		
Hard Consistency, dark grey, clay.	6.00			CR-2	6.00	7.50		7%	NIL
		7.50		SPT-	7.50	7.75	40, 62 >	100	
Completely to Highly, Weathered, dark grey Coloured, Weathered Shale	7.50			CR-3	7.50	9.00		13%	NIL
				CR-4	9.00	10.50		14%	NIL
				CR-5	10.50	12.00		16%	NIL
				CR-6	12.00	13.50		20%	12%
		15.00		CR-7	13.50	15.00		22%	10%

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub-Station at Umrangsho.
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0 (M)
	Location No :- BH-11
Commenced On:- 27-09-2026	RL:- GPS N-25°31'26.03" E-92°46'10.69"
Completed On:- 28-09-2026	Ground Water:- NIL

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRITION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N- Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff Consistency, brownish to Reddish grey Silty clay with Kankars.	0.00			DS-	~~DS~~ 0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 4, 6 = 10		
very stiff to Hard, brownish to Reddish grey Silty clay.	3.00	3.00		SPT-	3.00	3.45	7, 11, 16 = 27		
				UDS-	4.00	4.45			
				DS-	4.50				
				SPT-	5.00	5.45	11, 15, 25 = 40		
Completely to Highly, Weathered, dark grey Coloured, Weathered Shale.	7.50	7.50		SPT- RUN	7.50	7.70	49, 56 for 5cm >		100
				CR-1	7.50	9.00		9%	NIL
				SPT-	9.00	9.17	44, 60 Rebound >		100
				CR-2	9.00	10.50		12%	NIL
				CR-3	10.50	12.00		13%	NIL
				CR-4	12.00	13.50		16%	NIL
		15.00		CR-5	13.50	15.00		19%	10%

Signature of Site In-Charge.

DEP (P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.DUTTA & CO.

SAI TOWER , BLOCK – A, 1st FLOOR, 6No. Bijoynagar, Naihati, 24PGS (N) W.B Pin-743165

Type of Boring:- Auger & Drilling	JOB Name:- Prop. 400/132KV Grid Sub Station at Umrangso
	CLIENT:- AEGCL
Dia Of Hole : 150mm/NX	Depth in Mtr:- 15.0(M)
	Location No :- BH-12
Commenced On:- 25-09-2026	RL:- GPS N - 25°31'26.74"
Completed On:- 26-09-2026	Ground Water:- NIL E - 92°46'12.25"

D= Disturbed Sample, U= Undisturbed Sample, P=S.P.T

DESCRIPTION	DEPTH(M) From	DEPTH(M) To	Thickness(Mtr)	COLLECTION OF SOIL SAMPLES Type	Depth From	Depth To	N-Value	COLLECTION OF ROCK SAMPLES. TCR (%)	RQD (%)
Stiff Consistency, brownish to Reddish grey Silty clay with Kankars.	0.00			DS-	0.50				
				DS-	1.00				
				UDS-	1.00	1.45			
				SPT-	2.00	2.45	3, 5, 6 = 11		
Very Stiff, brownish grey Silty clay with Kankars.	3.00	3.00		SPT-	3.00	3.45	7, 14, 16 = 30		
				UDS-	4.00	4.45			
				DS-	4.50				
				SPT-	5.00	5.45	11, 16, 28 = 44		
		7.00		SPT-	7.00	7.25	37, 65 for 10cm >	100	
Completely to Highly, Weathered, dark grey Coloured Weathered Shale.	7.00			RUN					
				CR-1	7.00	8.50		12%	12%
				SPT-	8.50	8.62	60 blows for 12 cm	>100	
				CR-2	8.50	10.00		17%	10%
				CR-3	10.00	11.50		23%	14%
				CR-4	11.50	13.00		27%	15%
				CR-5	13.00	14.00		32%	19%
		15.00		CR-6	14.00	15.00		34%	18%

Signature of Site In-Charge.

(P.K. Dutta & Co.)

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

Signature of Engineer In- Charge.

P.K.Dutta & Co. 6No. Bijoy Nagar, Naihati(W.B)

Plate Load Test: -

Project : prop. 400/132KV Grid Sub-Station at Umrangso		**Dial Guage :**	0.01-25mm
Site:			
Date:- 03-10-2026		Jack Arm Area :-	103.82 cm2

Pressure Guage reading:- 10Kg/cm²

Time	Time elasped	Dial Gauage reading				Avg. reading	Settlement	Total Settlement
		Dg-1	Dg-2	Dg-3	Dg-4			
Initial reading :-	10Kg/cm²							
		0.00	0.00	0.00	0.00			
	1 min	0.00	0.00	0.00	0.00			
10Kg/cm²	2 min	15.00	18.00	20.00	15.00			
	4 min	20.00	22.00	22.00	20.00			
	6 min	22.00	25.00	25.00	22.00			
	9 min	26.00	27.00	28.00	22.00			
	16 min	30.00	29.00	30.00	24.00			
	25 min	32.00	31.00	32.00	25.00			
	36 min	35.00	31.00	33.00	27.00			
	60 min	35.00	33.00	35.00	27.00			
						Total		
Pressure Guage reading :-		20Kg/cm²						
	1 min	90	110	80	63			
	2 min	195	203	170	173			
	4 min	202	210	178	180			
20Kg/cm²	6 min	208	212	182	183			
	9 min	210	215	183	187			
	16 min	215	218	189	190			
	25 min	217	220	191	192			
	36 min	220	222	195	197			
	60 min	226	229	205	203			
						Total		
Pressure Guage reading :-		40Kg/cm²						
	1 min	226	229	205	203			
	2 min	1230	1227	1209	1213			
	4 min	1270	1250	1280	1295			
40Kg/cm²	6 min	1280	1258	1287	1303			
	9 min	1288	1267	1302	1310			
	16 min	1292	1278	1310	1320			
	25 min	1305	1282	1317	1326			
	36 min	1308	1285	1320	1330			
	60 min	1312	1295	1325	1337			
						Total		
Pressure Guage reading :-		60Kg/cm²						
	1 min	1312	1295	1325	1337			
	2 min	2690	2710	2685	2692			
	4 min	2689	2709	2670	2690			
60Kg/cm²	6 min	2688	2709	2669	2690			
	9 min	2687	2708	2669	2689			
	16 min	2687	2708	2668	2688			
	25 min	2687	2708	2668	2688			
	36 min	2687	2708	2668	2688			
	60 min	2686	2708	2668	2687			
						Total		

Signature of Site In-Charge

for (P.K. Dutta & Co.)

Signature of Engineer In-Charge

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

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P.K.Dutta & Co. 6No. Bijoy Nagar, Naihati(W.B)

Plate Load Test: -

Project : proj- 400/132KV Grid Sub-Station at Umrangso **Dial Guage :** 0.01-25mm
Site:
Date:- 03-10-2026 Jack Arm Area :- 103.82 cm2

Pressure Guage reading:-

Time	Time elasped	Dial Gauage reading				Avg. reading	Settlement	Total Settlement
		Dg-1	Dg-2	Dg-3	Dg-4			
Initial reading :-		(Rebounded)						
	1 min	2686	2708	2668	2687			
40Kg/cm2	2 min	2686	2708	2668	2687			
	4 min	2686	2708	2668	2687			
	6 min	2686	2708	2668	2687			
	9 min	2686	2708	2668	2687			
	16 min	2686	2708	2668	2687			
	25 min	2686	2708	2668	2686			
	36 min	2685	2708	2668	2686			
	60 min	2685	2707	2668	2686			
						Total		
Pressure Guage reading :-								
	1 min	2685	2707	2668	2686			
	2 min	2684	2707	2667	2686			
	4 min	2684	2707	2667	2686			
20Kg/cm2	6 min	2684	2707	2667	2686			
	9 min	2684	2707	2667	2686			
	16 min	2684	2707	2667	2686			
	25 min	2684	2707	2667	2686			
	36 min	2684	2707	2667	2686			
	60 min	2684	2707	2667	2686			
						Total		
Pressure Guage reading :-								
	1 min							
	2 min							
	4 min							
	6 min							
	9 min							
	16 min							
	25 min							
	36 min							
	60 min							
						Total		
Pressure Guage reading :-								
	1 min							
	2 min							
	4 min							
	6 min							
	9 min							
	16 min							
	25 min							
	36 min							
	60 min							
						Total		

Signature of Site In-Charge

for (P.K.Dutta & Co.)

Signature of Engineer In-Charge

Resident Engineer
132/33 Kv Umrangso GSS
AEGCL, Umrangso

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FIELD PHOTOGRAPH



BH-1



BH-2



BH-3

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BH-4



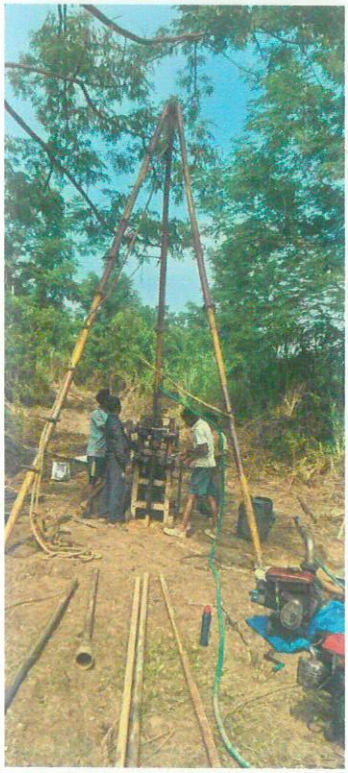
BH-5



BH-6



BH-7

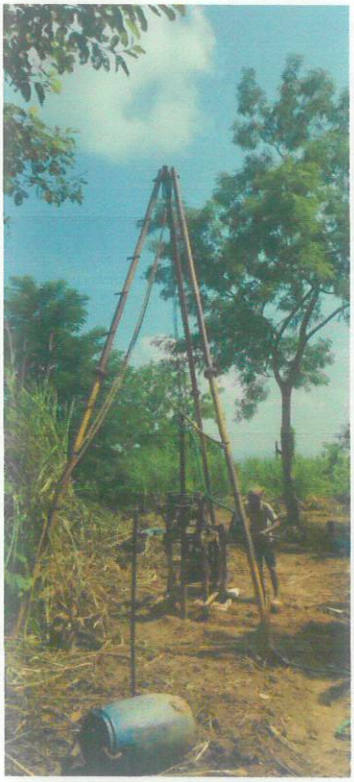


BH-8



BH-9

K. DUTTA & CO. NAIHATI



BH-10



BH-11



BH-12

S. DUTTA & CO. NAIHATI





PLT TEST

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