REPORT ON

GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED PILE FOUNDATION AT LOC-15 & 16 OF 220 KV SONAPUR LILO

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REPORT SUBMITTED TO

ASSAM ELECTRICITY GRID CORPORATION LIMITED

REPORT PREPARED BY:

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1. INTRODUCTION: The prime object of this investigation work is to find out subsoil profile, important engineering properties, recommendation of type of foundation, capacities of subsoil for different types of foundation. Bore hole is made at the site for conducting field test and collection of samples.

1.1 The field and laboratory investigations is carried out by us to access the nature of sub-strata and to evaluate the soil parameters required for design of foundations proposed to be constructed for proposed construction.

1.2 Client's help is gratefully acknowledged in providing bore hole locations, close supervision and checking during boring, sampling, various testing operations and cooperation and guidance during finalization of report.

1.3 This report is based upon the results of field, laboratory tests conducted on selected soil samples collected from borehole locations.

2. SCOPE OF WORK:

The scope of work provided to us for this project is limited to the following: -

2.1 Mobilizing necessary plant, equipments and personnel to the project site, setting up the equipment, carrying out the field investigations and demobilization on completion of work.

2.2 Making bore holes at the site in all types of soil/ boulder / rock by using suitable approved method of boring to be given at site by the Engineer-in-Charge.

2.3 Collection of soil/ rock cores from boulder and rock.

2.4 Recording the depth of ground water table in all the bore holes

2.5 Conducting the laboratory tests on selected samples.

2.6. Analysis**,** Preparation and submission of report.

3. FIELD INVESTIGATIONS:

The investigation is done by making boreholes by using Core drilling machine.

The drilling method involves a powered rotary cutting head on the end of a shaft, driven into the ground as it rotates. The system requires lubrication (air, water or drilling mud) to keep the cutting head cool.

There are two types of rotary boring, open-hole and core drilling. Material recovered from open-hole drilling is mixed with the drilling lubricant. It is unsuitable for effective sampling, and it is often difficult to observe and record the strata. Open-hole boring is only suitable for rapid drilling to enable core recovery at a greater depth or for the installation of monitoring wells.

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Core drilling is carried out using wire-line, double or triple-tube core barrels with diamond or tungsten-tipped core bits. Wire-line core barrels are rotated from the surface by rods normally of the same diameter as the outer core barrel. The core is brought to the surface within the inner barrel using a wire rope or attached line to a recovery tool. This system is particularly suitable for superficial or weak deposits, as any vibration from the drilling action is minimized due to close-fitting rods used within the hole.

The conventional double-tube core consists of two barrels; the outer barrel is rotated by the drill rods and carries the coring bit. The inner barrel does not rotate, and the core passes up into this inner barrel, enabling the sample to be recovered and brought to the surface. With triple-core barrels, the non-rotating inner barrel contains a removable tube or liner. At the end of each core run, this liner with the core it contains is extracted and stored in a core box. This method does not increase core recovery but is more likely to preserve the core in original condition.

Standard penetration tests were conducted in the above bore hole at every 1.50 m interval & at change of strata as per specifications / instructions of Engineer-in-Charge. The bore was cleaned up to the desired depths. Standard split spoon sampler attached to lower end of 'A' drill rods was driven in the bore holes by means of standard hammer of 63.5 Kg. falling freely from a height of 75 cm. The sampler was driven 45 cm as per specifications & the numbers of blows required for each 15 cm penetration were recorded. The numbers of blows for the first 15 cm penetration were not taken into account. This was considered as seating drive. The numbers of blows for next 30 cm penetration were designated as SPT 'N' value. N value more than 100 is termed as refusal.

4. SUMMERY OF BOREHOLES:

BH NO	Location	Co-ordinates		Depth of borehole (m)	Depth of water table(M)
		Longitude	Latitude		
BH01	SONAPUR	91.990519	26.198198	40.0	1.00M From EGL
BH02		91.990519	26.198198	40.0	1.70M From EGL

5. LABORATORY INVESTIGATIONS:

5.1 The following laboratory tests are conducted on selected soil samples recovered from bore hole / test location as relevant.

(1) Specific gravity. As per IS: 2720, part-III
(2) Water absorption
(3) Unconfined compression test. of rock sample

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(4)Direct shear test. As per IS: 2720; part-XIII
All the above laboratory tests ae carried out as per relevant Indian Standards.

6. FINDING OF GEOTECHNICAL INVESTIGATION:

The study of bore logs/results of laboratory and other field tests are tabulated through different tables as annexed.

7. CALCULATION OF PILE LOAD CAPACITY :

7.1 Pile load capacity in compression

Ultimate bearing capacity in compression in sand, Q_U from IS: 2911(Part-I)-2010

$Qu = Q_P + Qf$

= End bearing resistance + Frictional resistance of pile in sand and clay.

$Qu = Ap\ (1/2\ D\ \gamma\ N\gamma + P_D\ Nq) + \Sigma\ K\ P_{Di}\ \tan\delta\ A_{Si} + \alpha\ Ca\ As + Ap\ Nc\ Cp$

$Q_{Ps} = Ap\ (1/2\ D\ \gamma\ N\gamma + P_D\ Nq)$

$Q_{fs} = \Sigma\ K\ P_{Di} \tan\delta\ A_{Si}$

$Q_{fc} = \alpha\ Ca\ As$

$Q_{pc} = Ap\ Nc\ Cp$

$Qsafe = Q_U/FOS = Q_U/2.5$

Where

Ap = Cross sectional area of pile toe in cm^2.

Nγ, Nq = bearing capacity factors depending upon the angle of internal friction

K = earth pressure coefficient taken as 1.2 (1-1.5) for sandy soils

δ = Angle of wall friction between pile and soil.

As = Circumferential area of pile stem = Πx l x d

l = Length of embedment.

d = Diameter of the pile.

7.2 Pile load capacity in uplift

Ultimate uplift capacity Q_{Uf} = Skin friction in soil
= Q_{fs}

Safe uplift capacity Q_{Uf} = Skin friction in soil/FOS
= $Q_{fs}/3.5$

8.0 Recommendation of foundation: After obtaining the laboratory test results of the samples collected from the field and analyzing the subsoil parameters in a very careful manner. The subsurface investigation indicates that the upper 10.0 m consists of soft soil with insufficient bearing capacity for open foundations. Therefore, open foundations are not recommended. The proposed structure should be supported on pile foundations terminating in a competent bearing stratum. The safe pile load capacities of pile foundation at different depths are calculated and shown in table1.

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RCC PILE FOUNDATION:

The load carrying capacities of bored cast in situ uniform diameter piles of 6.0M & 7.0M length with pile diameters 45cm ,50cm ,60cm & 75cm respectively are calculated and shown in Table 1.

Table 1: Safe Load carrying capacity of bored cast in situ uniform diameter pile

Location	Pile Stem Dia. (cm)	Length of Pile from E.G.L. (m)	Pile Cutoff Length (m)	Recommended Safe Load Carrying Capacity (tone)		Safe load on pile in lateral (Metric ton)
				Compression	Uplift	
BH-1,2	45	18.0	1	17.94	5.44	9.36
	50		1	24.11	6.54	10.91
	60		1	40.53	9.05	15.13
	75		1	77.34	13.56	22.78
	45	20.0	1	21.39	8.37	9.36
	50		1	27.93	9.86	10.91
	60		1	45.11	13.18	15.13
	75		1	83.07	18.99	22.78
	45	22.00	1	26.55	12.54	9.36
	50		1	33.67	14.55	10.91
	60		1	52.00	18.94	15.13
	75		1	91.68	26.46	22.78
	45	24.0	1	33.43	17.93	9.36
	50		1	41.32	20.60	10.91
	60		1	61.18	26.34	15.13
	75		1	103.15	35.98	22.78

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9.0 CONCLUSION:

- Safe pile load capacities are shown in above tables.
- For calculation of pile load capacities anfle of internal friction=34^{o}
- Liquefaction analysis is carried out as per IS 1893 (Part-I)-2016 and found to be liquifiable upto a depth of 15.0m. So for calculation of pile load capacity ,contribution of top 15.0 m of soil is ignored.

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BORE LOG CUM LABORATORY TEST RESULT

GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED PILE FOUNDATION AT LOC-15 & 16 OF 220 KV SONAPUR LILO

BH: 01	Location : SONAPUR	Date Commenced: 02-09-2026	Longitude : 91.990519	DEPTH OF WATER TABLE =1.00M From EGL
		Date completed: 04-09-2026	Latitude : 26.198198	

Depth in meters below reference	Types of Sample	SPT N-values					Visual description of soil	% Gravel > 4.75 mm	% Sand 4.75-0.075 mm	% Silt and Clay <0.075mm	Field density, gms/cm³	Dry density, gms/cm3	Specific Gravity	Void Ratio	Water Absorption	Uniaxial Compressive Strength (MPa)	Cohesion 'c' Kg/cm²	Angle of shearing resistance (Φ°)	Compression Index Cc	LL%	PL%	PI%	Casing used	Bit used	Loss of Water	Colour Return Water
		15cm	15cm	15cm	Observed N-Value	Corrected N-Value																			
1.50-3.00	P	2	1	1	2	2	Browish Silty Clay 9.0M			100	1.60	1.27	2.66	1.10	26.14		0.13	7	0.25	40.32	26.10	14.22	YES	NX	NO	
3.00-4.50	P	2	2	3	5	5			2	98	1.80	1.44	2.66	0.85	25.02		0.33	7	0.17	38.52	25.56	12.96				
4.50-6.00	P	1	1	2	3	3			3	97	1.68	1.34	2.66	0.98	25.27		0.20	7	0.21	37.11	25.13	11.98				
6.00-7.50	P	2	2	3	5	5																				
7.50-9.00	P	2	3	3	6	6			5	95	1.84		2.66				0.40	7								
9.00-10.50	P	4	4	5	9	9			5	95	1.94		2.66													
10.50-12.0	P	4	5	5	10	10	Fine To Medium Sand With Silt																			
12.0-13.5	P	5	5	7	12	12			80	25	1.79		2.67					31								
13.50-15.0	P	5	6	7	13	13																				
15.0-16.50	P	7	7	8	15	15																				
16.50-18.0	P	8	9	9	18	17			90	10	1.87		2.67					32								
18.0-19.50	P	10	11	11	22	19																				
19.50-21.0	P	10	12	14	26	21																				
21.0-22.50	P	11	13	15	28	22			95	5	1.94		2.67					33								

U: Undisturbed Sample:: D: Disturbed Sample:: P: Standard Penetration test:: EGL: Existing Ground Level :: R : Refusal N>100, NP: Non plastic ::Hydrometer Analysis done for clay and silt::

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GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED PILE FOUNDATION AT LOC-15 & 16 OF 220 KV SONAPUR LILO

BH: 01	Location : SONAPUR	Date Commenced: 02-09-2026 Date completed: 04-09-2026	DEPTH OF WATER TABLE =1.00M From EGL

Depth in meters below reference	Types of Sample	SPT N-values					Visual description of soil	% Gravel > 4.75 mm	% Sand 4.75-0.075 mm	% Silt and Clay <0.075mm	Field density, gms/cm³	Dry density, gms/cm3	Specific Gravity	Void Ratio	Water Absorption	Uniaxial Compressive Strength (Kg/cm²)	Cohesion 'c' Kg/cm²	Angle of shearing resistance (Φ°)	Compression Index Cc	LL%	PL%	PI%	Casing used	Bit used	Loss of Water	Colour Return Water
		15cm	15cm	15cm	Observed N-Value	Corrected N-Value																			
22.50-24.0	P	13	15	17	32	23	Fine To Medium Sand With Silt 30.0M																YES	BX	NO	
24.0-25.50	P	15	15	18	33	24			96	4	1.97		2.66					33								
25.50-27.0	P	17	17	19	36	25																				
27.0-28.50	P	18	19	21	40	28			100		2.03		2.66					34								
28.50-30.0	P	20	24	27	51	33																				
30.0-31.50	P	25	29	35	64	40	Coarse Sand 40.50M																			
31.50-33.0	P	33	40	44	84	50																				
33.0-34.50	P	39	45	55	100	58		2	98		2.21		2.66					35								
34.50-36.00	P	49	56	R	R	R																				
36.0-37.50	P	49	56	R	R	R																				
37.50-39.0	P	50+	50+	50+	R	R		3	97		2.23		2.66					36								
39.0-40.50	P	50+	50+	50+	R	R																				

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BORE LOG CUM LABORATORY TEST RESULT

GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED PILE FOUNDATION AT LOC-15 & 16 OF 220 KV SONAPUR LILO

BH: 02	Location : SONAPUR	Date Commenced: 05-09-2026	Longitude : 91.990519	DEPTH OF WATER TABLE =1.70M From EGL
		Date completed: 07-09-2026	Latitude : 26.198198	

Depth in meters below reference	Types of Sample	SPT N-values					Visual description of soil	% Gravel > 4.75 mm	% Sand 4.75-0.075 mm	% Silt and Clay <0.075mm	Field density, gms/cm³	Dry density, gms/cm3	Specific Gravity	Void Ratio	Water Absorption	Uniaxial Compressive Strength (MPa)	Cohesion 'c' Kg/cm²	Angle of shearing resistance (Φ°)	Compression Index Cc	LL%	PL%	PI%	Casing used	Bit used	Loss of Water	Colour Return Water
		15cm	15cm	15cm	Observed N-Value	Corrected N-Value																			
1.50-3.00	P	1	1	1	2	2	Browish Silty Clay 9.0M			100	1.61	1.27	2.66	1.09	26.58		0.11	7	0.25	39.54	25.86	13.68	YES	NX	NO	
3.00-4.50	P	1	2	1	3	3				100	1.69	1.35	2.66	0.97	25.44		0.22	7	0.21	38.52	25.56	12.96				
4.50-6.00	P	2	2	3	5	5				100	1.82	1.47	2.66	0.80	23.47		0.32	7	0.16	36.21	24.86	11.35				
6.00-7.50	P	2	3	3	6	6				100																
7.50-9.00	P	3	2	2	4	4			2	98	1.76		2.66				0.27	7								
9.00-10.50	P	3	3	4	7	7			3	97	1.88		2.66													
10.50-12.0	P	3	4	5	9	9	Fine To Medium Sand With Some Silt 18.00M																			
12.0-13.5	P	4	5	5	10	10			73	27	1.76		2.65					30								
13.50-15.0	P	5	6	6	12	12																				
15.0-16.50	P	6	5	7	12	12																				
16.50-18.0	P	6	7	8	15	16			88	12	1.84		2.65					32								
18.0-19.50	P	9	17	25	42	29	Coarse Sand		97	3	2.05		2.65					34								
19.50-21.0	P	19	24	26	50	33																				
21.0-22.50	P	21	25	27	52	34			100		2.11		2.65					34								

U: Undisturbed Sample:: D: Disturbed Sample:: P: Standard Penetration test:: EGL: Existing Ground Level :: R : Refusal N>100, NP: Non plastic ::Hydrometer Analysis done for clay and silt::

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GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED PILE FOUNDATION AT LOC-15 & 16 OF 220 KV SONAPUR LILO

BH: 02	Location : SONAPUR	Date Commenced: 05-09-2026 Date completed: 07-09-2026	DEPTH OF WATER TABLE =1.70M From EGL

Depth in meters below reference	Types of Sample	SPT N-values					Visual description of soil	% Gravel > 4.75 mm	% Sand 4.75-0.075 mm	% Silt and Clay <0.075mm	Field density, gms/cm³	Dry density, gms/cm3	Specific Gravity	Void Ratio	Water Absorption	Uniaxial Compressive Strength (Kg/cm²)	Cohesion 'c' Kg/cm²	Angle of shearing resistance (Φ°)	Compression Index Cc	LL%	PL%	PI%	Casing used	Bit used	Loss of Water	Colour Return Water
		15cm	15cm	15cm	Observed N-Value	Corrected N-Value																			
22.50-24.0	P	23	27	29	56	36	Coarse Sand 40.50M																YES	BX	NO	
24.0-25.50	P	31	39	47	86	51			100		2.23		2.65					35								
25.50-27.0	P	39	48	53	101	58																				
27.0-28.50	P	50+	50+	50+	R	R			100		2.25		2.65					36								
28.50-30.0	P	50+	50+	50+	R	R																				
30.0-31.50	P	50+	50+	50+	R	R			100		2.26		2.65					36								
31.50-33.0	P	50+	50+	50+	R	R																				
33.0-34.50	P	50+	50+	50+	R	R			100		2.26		2.65					37								
34.50-36.00	P	50+	50+	50+	R	R																				
36.0-37.50	P	50+	50+	50+	R	R																				
37.50-39.0	P	50+	50+	50+	R	R			100		2.27		2.65					37								
39.0-40.50	P	50+	50+	50+	R	R																				

U: Undisturbed Sample:: D: Disturbed Sample:: P: Standard Penetration test:: EGL: Existing Ground Level :: R : Refusal N>100, NP: Non plastic ::Hydrometer Analysis done for clay and silt::



CALCULATION OF PILE LOAD CAPACITY

Pile Length .(M)	18.000		If Liquified strata than liquified level	15.0M
Pile cutoff Length (m)	1.000			
Angle of Internal Friction at Pile Tip (Degree)		ø	34	
Cohesion at Pile tip (t/m2)		c	0	

Bearing Capacity Factor			
Nc	Nq	Ny	ø
9	37.00	42.90	34

Ultimate pile capacity , Qu = QP + Qs = { Ap Nc Cp + Ap (1/2 D γ Nγ + P_D Nq} +{ Sum (K P_{Di} tan d Asi) + alpha x Ca As }

Qp = End bearing resistnce , Qs = Frictional resistsnce

1 Pile dia (m) = 0.45

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	15.00			15.00	Ignored													
15.00	18.00		3.00	3.00			0.45	4.24	1.20	34	1.94	0.94	1.41	4.84				
15D =	6.75	17.00	3.00	6.75			0.45			0	1.97	0.97	6.55	4.84	40.02	44.86	17.94	5.44

2 Pile dia (m) = 0.50

0.00	15.00			15.00	Ignored						0.0							
15.00	18.00		3.00	3.00			0.50	4.71	1.20	34	1.94	0.94	1.41	5.38				
15D =	7.50	17.00	3.00	7.50			0.50			0	1.97	0.97	7.28	5.38	54.90	60.27	24.11	6.54

3 Pile dia (m) = 0.60

0.00	15.00			15.00	Ignored													
15.00	18.00		3.00	3.00			0.60	5.65	1.20	34	1.94	0.94	1.41	6.45				
15D =	9.00	17.00	3.00	9.00			0.60			0	1.97	0.97	8.73	6.45	94.86	101.31	40.53	9.05

3 Pile dia (m) = 0.75

0.00	15.00			15.00	Ignored													
15.00	18.00		3.00	3.00			0.75	7.07	1.20	34	1.94	0.94	1.41	8.07				
15D =	11.25	17.00	3.00	11.25			0.75			0	1.97	0.97	10.91	8.07	185.27	193.34	77.34	13.56

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CALCULATION OF PILE LOAD CAPACITY

Pile Length .(M)	20.000		If Liquified strata than liquified level	15.0M
Pile cutoff Length (m)	1.000			
Angle of Internal Friction at Pile Tip (Degree)		ø	34	
Cohesion at Pile tip (t/m2)		c	0	

Bearing Capacity Factor			
Nc	Nq	Ny	ø
9	37.00	42.90	34

Ultimate pile capacity , Qu = QP + Qs = { Ap Nc Cp + Ap (1/2 D γ Nγ + P_D Nq} +{ Sum (K P_{Di} tan d Asi) + alpha x Ca As }

Qp = End bearing resistnce , Qs = Frictional resistsnce

1 Pile dia (m) = 0.45

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	15.00			15.00	Ignored													
15.00	20.00		5.00	5.00			0.45	7.07	1.20	34	1.94	0.94	2.35	13.45				
15D =	6.75	19.00	5.00	6.75			0.45			0	1.97	0.97	6.55	13.45	40.02	53.46	21.39	8.37

2 Pile dia (m) = 0.50

0.00	15.00			15.00	Ignored						0.0							
15.00	20.00		5.00	5.00			0.50	7.85	1.20	34	1.94	0.94	2.35	14.94				
15D =	7.50	19.00	5.00	7.50			0.50			0	1.97	0.97	7.28	14.94	54.90	69.83	27.93	9.86

3 Pile dia (m) = 0.60

0.00	15.00			15.00	Ignored													
15.00	20.00		5.00	5.00			0.60	9.42	1.20	34	1.94	0.94	2.35	17.93				
15D =	9.00	19.00	5.00	9.00			0.60			0	1.97	0.97	8.73	17.93	94.86	112.79	45.11	13.18

3 Pile dia (m) = 0.75

0.00	15.00			15.00	Ignored													
15.00	20.00		5.00	5.00			0.75	11.78	1.20	34	1.94	0.94	2.35	22.41				
15D =	11.25	19.00	5.00	11.25			0.75			0	1.97	0.97	10.91	22.41	185.27	207.68	83.07	18.99

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CALCULATION OF PILE LOAD CAPACITY

Pile Length .(M)	22.000	If Liquified strata than liquified level	15.0M
Pile cutoff Length (m)	1.000		
Angle of Internal Friction at Pile Tip (Degree)	ø	34	
Cohesion at Pile tip (t/m2)	c	0	

Bearing Capacity Factor			
Nc	Nq	Ny	ø
9	37.00	42.90	34

Ultimate pile capacity , Qu = QP + Qs = { Ap Nc Cp + Ap (1/2 D γ Nγ + P_D Nq} +{ Sum (K P_{Di} tan d Asi) + alpha x Ca As }

Qp = End bearing resistnce , Qs = Frictional resistsnce

1 Pile dia (m) = 0.45

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	15.00			15.00	Ignored													
15.00	22.00		7.00	7.00			0.45	9.90	1.20	34	1.94	0.94	3.29	26.35				
15D =	6.75	21.00	7.00	6.75			0.45			0	1.97	0.97	6.55	26.35	40.02	66.37	26.55	12.54

2 Pile dia (m) = 0.50

0.00	15.00			15.00	Ignored						0.0							
15.00	22.00		7.00	7.00			0.50	11.00	1.20	34	1.94	0.94	3.29	29.28				
15D =	7.50	21.00	7.00	7.50			0.50			0	1.97	0.97	7.28	29.28	54.90	84.18	33.67	14.55

3 Pile dia (m) = 0.60

0.00	15.00			15.00	Ignored													
15.00	22.00		7.00	7.00			0.60	13.19	1.20	34	1.94	0.94	3.29	35.14				
15D =	9.00	21.00	7.00	9.00			0.60			0	1.97	0.97	8.73	35.14	94.86	130.00	52.00	18.94

3 Pile dia (m) = 0.75

0.00	15.00			15.00	Ignored													
15.00	22.00		7.00	7.00			0.75	16.49	1.20	34	1.94	0.94	3.29	43.92				
15D =	11.25	21.00	7.00	11.25			0.75			0	1.97	0.97	10.91	43.92	185.27	229.19	91.68	26.46



CALCULATION OF LATERAL LOAD CAPACITY

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor R = $\sqrt[4]{\frac{EI}{KB}}$ for pre loaded clay soil

T= $\sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil and normaly loaded clay

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+z_f)^3}{12EI} \times 10^3$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

fck= 32 N/mm2

E= 32000000 KN/m2

1	Pile dia	B=D(m)	0.45		
2	Pile Length	L(m)	18.00		
	Pile Length				
3	(soft soil)	L1(m)	15.00		
5	k1= Modulus of subgrade reaction		15000.00	KN/m3	for Cohesive soil
6	K = k1x0.3/(1.5 xB)		6666.67		(medium stiff)
7	I= Moment of inertia		0.00201	m4	
8	E = Modulus of elasticity		32000000	KN/m2	
9	R		2.15		
10	L1/R		6.97		
11	2R		4.30		Long pile L > 2R
12	3.5R				
13	Lf/T		1.55	(From Graph)	
14	Lf		3.34		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	3.34		
17	y=(Permissible deflection mm)		4.50	{1% of dia of pile (IRC 78-2014,Cl 709.3.5.2)}	
18	**H = lateral load capacity**		**93.63**	**KN = 9.36 Ton**	

RELIANT FOUNDATIONS PVT. LTD. GHY-35

CALCULATION OF LATERAL LOAD CAPACITY

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor R = $\sqrt[4]{\frac{EI}{KB}}$ for pre loaded clay soil

T= $\sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil and normaly loaded clay

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+z_f)^3}{12EI} \times 10^3$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

fck= 32 N/mm2

E= 32000000 KN/m2

1	Pile dia	B=D(m)	0.50		
2	Pile Length	L(m)	18.00		
	Pile Length				
3	(soft soil)	L1(m)	15.00		
5	k1= Modulus of subgrade reaction		15000.00	KN/m3	for Cohesive soil
6	K = k1x0.3/(1.5 xB)		6000.00		(medium stiff)
7	I= Moment of inertia		0.00307	m4	
8	E = Modulus of elasticity		32000000	KN/m2	
9	R		2.39		
10	L1/R		6.27		
11	2R		4.78		Long pile L > 2R
12	3.5R				
13	Lf/T		1.58	(From Graph)	
14	Lf		3.78		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	3.78		
17	y=(Permissible deflection mm)		5.00	{1% of dia of pile (IRC 78-2014,Cl 709.3.5.2)}	
18	**H = lateral load capacity**		**109.14**	**KN = 10.91 Ton**	

RELIANT FOUNDATIONS PVT. LTD. GHY-35

CALCULATION OF LATERAL LOAD CAPACITY

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor R = $\sqrt[4]{\frac{EI}{KB}}$ for pre loaded clay soil

T= $\sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil and normaly loaded clay

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+z_f)^3}{12EI} \times 10^3$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

fck= 32 N/mm2

E= 32000000 KN/m2

1	Pile dia	B=D(m)	0.60		
2	Pile Length	L(m)	18.00		
	Pile Length				
3	(soft soil)	L1(m)	15.00		
5	k1= Modulus of subgrade reaction		15000.00	KN/m3	for Cohesive soil
6	K = k1x0.3/(1.5 xB)		5000.00		(medium stiff)
7	I= Moment of inertia		0.00636	m4	
8	E = Modulus of elasticity		32000000	KN/m2	
9	R		2.87		
10	L1/R		5.23		
11	2R		5.74		Long pile L > 2R
12	3.5R				
13	Lf/T		1.60	(From Graph)	
14	Lf		4.59		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	4.59		
17	y=(Permissible deflection mm)		6.00	{1% of dia of pile (IRC 78-2014,Cl 709.3.5.2)}	
18	**H = lateral load capacity**		**151.34**	**KN = 15.13 Ton**	

RELIANT FOUNDATIONS PVT. LTD. GAYA

CALCULATION OF LATERAL LOAD CAPACITY

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor R = $\sqrt[4]{\frac{EI}{KB}}$ for pre loaded clay soil

T= $\sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil and normaly loaded clay

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+z_f)^3}{12EI} \times 10^3$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

fck= 32 N/mm2

E= 32000000 KN/m2

1	Pile dia	B=D(m)	0.75		
2	Pile Length	L(m)	18.00		
	Pile Length				
3	(soft soil)	L1(m)	15.00		
5	k1= Modulus of subgrade reaction		15000.00	KN/m3	for Cohesive soil
6	K = k1x0.3/(1.5 xB)		4000.00		(medium stiff)
7	I= Moment of inertia		0.01552	m4	
8	E = Modulus of elasticity		32000000	KN/m2	
9	R		3.59		
10	L1/R		4.18		
11	2R		7.17		Long pile L > 2R
12	3.5R				
13	Lf/T		1.62	(From Graph)	
14	Lf		5.81		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	5.81		
17	y=(Permissible deflection mm)		7.50	{1% of dia of pile (IRC 78-2014,Cl 709.3.5.2)}	
18	**H = lateral load capacity**		**227.81**	**KN = 22.78 Ton**	

RELIANT FOUNDATIONS PVT. LTD. GHY-35

Analysis of liquefaction Potential as per IS 1893 (Part1) - 2016, Seed & Idriss, Idriss & Boulanger approach

B.H. No.	Depth	Observed N value	N_{60}	$(N_1)_{60}$	$(N_1)_{60cs}$	C.S.R. (M=7.5)	**C.R.R. (M=7.5)**	F.O.S. (M=7.5)	σ_V (kPa)	σ'_V (kPa)	C_{HT}	C_{HW}	C_{ss}	C_{RL}	C_{BD}	C_N	**FC (%)**	r_d	**Bulk density ton/m3**	Bulk density KN/m3	Submerged densty	**Liquid Limit (LL) in%**	**Remark**
1	1.5	2	1.28	2.17	3.61	0.62	-	-	23.52	8.82	0.75	0.98	1.1	0.75	1.05	1.70	100	0.99	1.60	*15.68*	*5.88*	40.32	**NL**
	3.0	5	3.20	5.435	7.52	0.56	-	-	49.98	20.58	0.75	0.98	1.1	0.75	1.05	1.70	100	0.98	1.80	*17.64*	*7.84*	38.52	**NL**
	4.5	3	2.17	3.932	5.72	0.55	-	-	74.68	30.58	0.75	0.98	1.1	0.85	1.05	1.81	100	0.97	1.68	*16.464*	*6.66*	37.11	**NL**
	6.0	5	3.62	5.569	7.68	0.53	-	-	101.14	42.34	0.75	0.98	1.1	0.85	1.05	1.54	100	0.95	1.80	*17.64*	*7.84*	35.66	**NL**
	7.5	6	4.86	6.572	8.89	0.52	-	-	128.18	54.68	0.75	0.98	1.1	0.95	1.05	1.35	100	0.94	1.84	*18.032*	*8.23*	36.41	**NL**
	9.0	9	7.29	8.81	11.57	0.50	-	-	156.70	68.50	0.75	0.98	1.1	0.95	1.05	1.21	100	0.93	1.94	*19.012*	*9.21*	35.71	**NL**
	10.5	10	8.53	9.552	16.04	0.32	0.28	0.88	182.57	79.67	0.75	0.98	1.1	1	1.05	1.12	25	0.89	1.76	*17.248*	*7.45*	NP	**LL**
	12.0	12	10.23	10.71	17.33	0.46	0.30	0.66	208.89	91.29	0.75	0.98	1.1	1	1.05	1.05	25	0.85	1.79	*17.54*	*7.74*	NP	**LL**
	13.5	13	11.08	10.91	17.26	0.43	0.29	0.67	235.49	103.19	0.75	0.98	1.1	1	1.05	0.98	22	0.81	1.81	*17.738*	*7.94*	NP	**LL**
	15.0	15	12.79	11.9	18.13	0.41	0.41	1.00	262.54	115.54	0.75	0.98	1.1	1	1.05	0.93	20	0.77	1.84	*18.032*	*8.23*	NP	**NL**
	16.5	18	35.81	31.57	37.06	0.39	0.60	1.55	290.33	128.63	1.75	0.98	1.1	1	1.05	0.88	10	0.73	1.89	*18.522*	*8.72*	NP	**NL**
	18.0	22	68.78	57.63	57.63	0.36	0.60	1.65	318.84	142.44	2.75	0.98	1.1	1	1.05	0.84	5	0.69	1.94	*19.012*	*9.21*	NP	**NL**
	19.5	26	110.84	88.42	88.42	0.34	0.60	1.77	348.24	157.14	3.75	0.98	1.1	1	1.05	0.80	5	0.65	2.00	*19.6*	*9.80*	NP	**NL**

C_{BD} : Borehole diameter =150mm

C_{Hw} : Weight of hammer =63.5Kg, Height of fall =750mm

LL : Liquifiable
NL : Non Liquifiable

RELIANT FOUNDATIONS PVT. LTD. GHY-35

Analysis of liquefaction Potential as per IS 1893 (Part1) - 2016, Seed & Idriss, Idriss & Boulanger approach

B.H. No.	Depth	Observed N value	N_{60}	$(N_1)_{60}$	$(N_1)_{60cs}$	C.S.R. (M=7.5)	**C.R.R. (M=7.5)**	F.O.S. (M=7.5)	σ_V (kPa)	σ'_V (kPa)	C_{HT}	C_{HW}	C_{ss}	C_{RL}	C_{BD}	C_N	**FC (%)**	r_d	**Bulk density ton/m3**	Bulk density KN/m3	Submerged densty	**Liquid Limit (LL) in%**	**Remark**
2	1.5	2	1.28	2.17	3.61	0.61	-	-	23.67	8.97	0.75	0.98	1.1	0.75	1.05	1.70	100	0.99	1.61	*15.778*	*5.98*	39.54	**NL**
	3.0	3	1.92	3.261	4.91	0.58	-	-	48.51	19.11	0.75	0.98	1.1	0.75	1.05	1.70	100	0.98	1.69	*16.562*	*6.76*	38.52	**NL**
	4.5	5	3.62	6.491	8.79	0.55	-	-	75.26	31.16	0.75	0.98	1.1	0.85	1.05	1.79	100	0.97	1.82	*17.836*	*8.04*	36.21	**NL**
	6.0	6	4.35	6.592	8.91	0.52	-	-	102.31	43.51	0.75	0.98	1.1	0.85	1.05	1.52	100	0.95	1.84	*18.032*	*8.23*	35.74	**NL**
	7.5	4	3.24	4.381	6.26	0.52	-	-	128.18	54.68	0.75	0.98	1.1	0.95	1.05	1.35	98	0.94	1.76	*17.248*	*7.45*	35.44	**NL**
	9.0	7	5.67	6.89	9.27	0.50	-	-	155.82	67.62	0.75	0.98	1.1	0.95	1.05	1.22	97	0.93	1.88	*18.424*	*8.62*	35.21	**NL**
	10.5	9	7.67	8.685	15.32	0.32	0.26	0.81	180.96	78.06	0.75	0.98	1.1	1	1.05	1.13	28	0.89	1.71	*16.758*	*6.96*	NP	**LL**
	12.0	10	8.53	9.026	15.62	0.46	0.27	0.58	206.83	89.23	0.75	0.98	1.1	1	1.05	1.06	27	0.85	1.76	*17.25*	*7.45*	NP	**LL**
	13.5	12	10.23	10.19	16.56	0.44	0.29	0.66	233.14	100.84	0.75	0.98	1.1	1	1.05	1.00	23	0.81	1.79	*17.542*	*7.74*	NP	**LL**
	15.0	12	10.23	9.636	15.78	0.42	0.28	0.67	259.75	112.75	0.75	0.98	1.1	1	1.05	0.94	21	0.77	1.81	*17.738*	*7.94*	NP	**LL**
	16.5	15	29.84	26.68	32.48	0.39	0.60	1.52	286.80	125.10	1.75	0.98	1.1	1	1.05	0.89	12	0.73	1.84	*18.032*	*8.23*	NP	**NL**
	18.0	42	131.30	110	110.01	0.36	0.60	1.65	318.84	142.44	2.75	0.98	1.1	1	1.05	0.84	3	0.69	2.18	*21.364*	*11.56*	NP	**NL**
	19.5	50	213.15	168.3	168.31	0.34	0.60	1.79	351.48	160.38	3.75	0.98	1.1	1	1.05	0.79	3	0.65	2.22	*21.756*	*11.96*	NP	**NL**

C_{BD} : Borehole diameter =150mm

C_{Hw} : Weight of hammer =63.5Kg, Height of fall =750mm

LL : Liquifiable
NL : Non Liquifiable

RELIANT FOUNDATIONS PVT. LTD. GHY-35

BH-01-SONAPUR Depth :1.50m

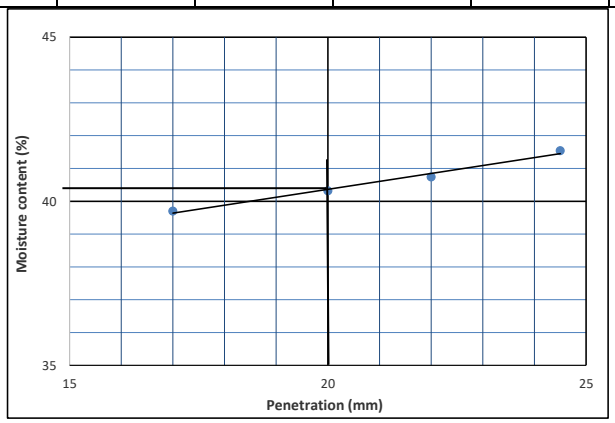
LIQUID AND PLASTIC LIMIT TEST (IS : 2720 (Part 5)-1985, Reaffirmed 2020)

Observations

Sl. No.	Description	Liquid Limit (%)				Plastic Limit (%)		
	Trail No.	1	2	3	4	1	2	Average
1	Container No.	C-23	C-24	C-25	C-26	C-17	C-18	
2	Penetration (mm)	17.0	20.0	22.0	24.5	-	-	
3	Weight of Container, W1 g	12.45	12.62	12.45	13.45	13.66	13.48	
4	Weight of Container + Wet Soil, W2 g	44.65	63.51	62.89	65.65	35.4	37.05	**26.10**
5	Weight of Container + Oven dried Soil, W3 g	35.5	48.63	48.29	50.33	30.92	32.15	
6	Water content,w =[(W2-W3)/(W3-W1)]x100 %	39.70	41.32	40.74	41.54	25.96	26.25	

Penetration (mm)	Moisture Content (%)
17	**39.70**
20.0	**40.32**
22.0	**40.74**
24.5	**41.54**

LIQUID LIMIT (%) - BY GRAPH	**40.32**
PLASTIC LIMIT (%)	**26.10**
PLASTICITY INDEX (%)	**14.22**



RELIANT FOUNDATIONS PVT. LTD. GHY-35

BH-01-SONAPUR Depth :3.00m

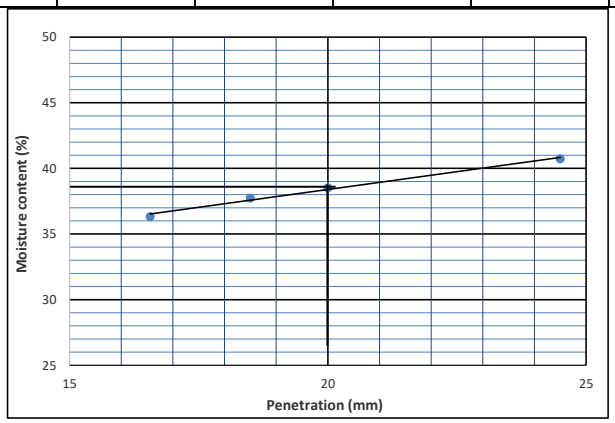
LIQUID AND PLASTIC LIMIT TEST (IS : 2720 (Part 5)-1985, Reaffirmed 2020)

Observations

Sl. No.	Description	Liquid Limit (%)				Plastic Limit (%)		
	Trail No.	1	2	3	4	1	2	Average
1	Container No.	C-27	C-28	C-29	C-30	C-100	C-25	
2	Penetration (mm)	16.56	18.5	20.0	24.5	-	-	
3	Weight of Container, W1 g	12.45	14.9	13.35	13.25	13.1	13.46	**25.56**
4	Weight of Container + Wet Soil, W2 g	44.65	71.65	64.95	66.1	35.52	37.05	
5	Weight of Container + Oven dried Soil, W3 g	36.07	56.1	50.6	55.25	31.05	32.15	
6	Water content,w =[(W2-W3)/(W3-W1)]x100 %	36.33	37.74	38.52	25.83	24.90	26.22	

Penetration (mm)	Moisture Content (%)
16.56	36.33
18.5	37.74
20.0	38.52
24.5	40.74

LIQUID LIMIT (%) - BY GRAPH	38.52
PLASTIC LIMIT (%)	25.56
PLASTICITY INDEX (%)	12.96



RELIANT FOUNDATIONS PVT. LTD. GHY-35

BH-02-SONAPUR Depth :1.50m

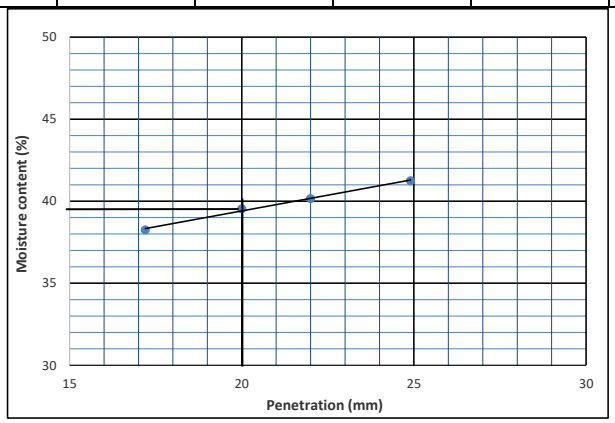
LIQUID AND PLASTIC LIMIT TEST (IS : 2720 (Part 5)-1985, Reaffirmed 2020)

Observations

Sl. No.	Description	Liquid Limit (%)				Plastic Limit (%)		
	Trail No.	1	2	3	4	1	2	Average
1	Container No.	C-19	C-20	C-21	C-22	C-30	C-101	
2	Penetration (mm)	17.2	20.0	22.0	24.9	-	-	
3	Weight of Container, W1 g	12.4	13.5	13.24	13.45	13.43	13.96	**25.86**
4	Weight of Container + Wet Soil, W2 g	37.56	59.45	63.45	58.61	35.4	37.05	
5	Weight of Container + Oven dried Soil, W3 g	30.6	46.43	49.04	45.42	30.93	32.26	
6	Water content,w =[(W2-W3)/(W3-W1)]x100 %	38.24	39.54	40.25	41.26	25.54	26.17	

Penetration (mm)	Moisture Content (%)
17.2	**38.25**
20.0	**39.54**
22.0	**40.16**
24.9	**41.25**

LIQUID LIMIT (%) - BY GRAPH	**39.54**
PLASTIC LIMIT (%)	**25.86**
PLASTICITY INDEX (%)	**13.68**



RELIANT FOUNDATIONS PVT. LTD. GHY-35

BH-02-SONAPUR Depth :4.50m

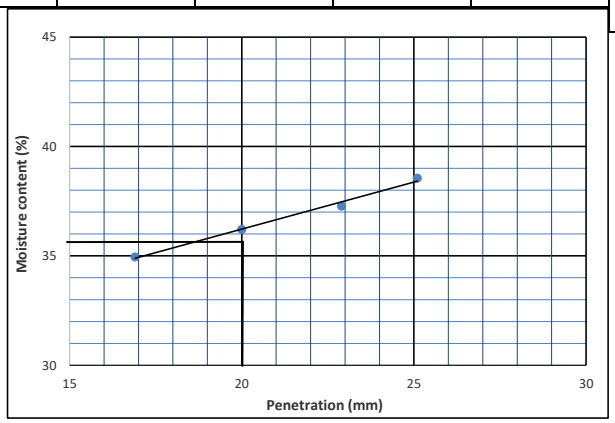
LIQUID AND PLASTIC LIMIT TEST (IS : 2720 (Part 5)-1985, Reaffirmed 2020)

Observations

Sl. No.	Description	Liquid Limit (%)				Plastic Limit (%)		
	Trail No.	1	2	3	4	1	2	Average
1	Container No.	C-19	C-20	C-21	C-22	C-30	C-101	Average
2	Penetration (mm)	16.9	20.0	22.9	25.1	-	-	
3	Weight of Container, W1 g	12.39	19.49	12.55	13.44	13.45	14.05	
4	Weight of Container + Wet Soil, W2 g	36.25	73.54	45.1	56.2	35.4	37.05	24.86
5	Weight of Container + Oven dried Soil, W3 g	30.07	59.17	36.26	44.3	31.05	32.45	
6	Water content,w =[(W2-W3)/(W3-W1)]x100 %	34.95	36.21	37.28	38.56	24.72	25.00	

Penetration (mm)	Moisture Content (%)
16.9	34.95
20.0	36.21
22.9	37.28
25.1	38.56

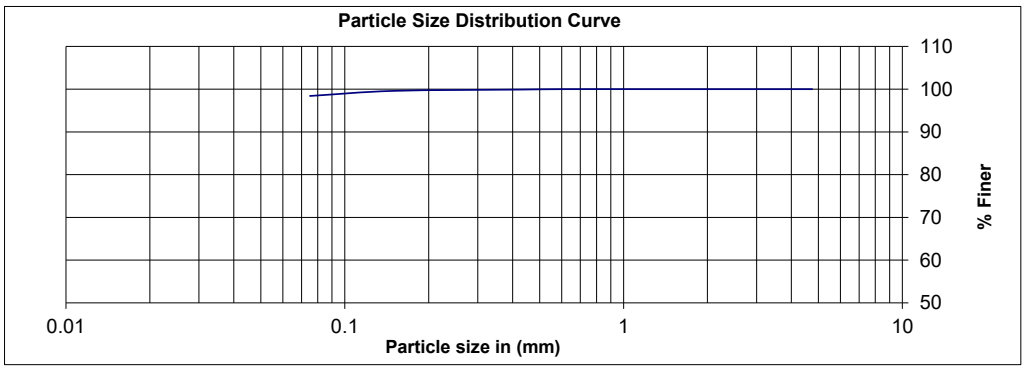
LIQUID LIMIT (%) - BY GRAPH	36.21
PLASTIC LIMIT (%)	24.86
PLASTICITY INDEX (%)	11.35



RELIANT FOUNDATIONS PVT. LTD. GHY-35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	1
5	Depth	3.00 m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	0.00	0.00	0.00	100.00
2.00	0.00	0.00	0.00	100.00
1.18	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.10	0.10	0.10	99.90
0.150	0.30	0.30	0.40	99.60
0.075	1.19	1.19	1.59	98.41
Pan	98.41	98.41	100.00	0.00
	100.00			

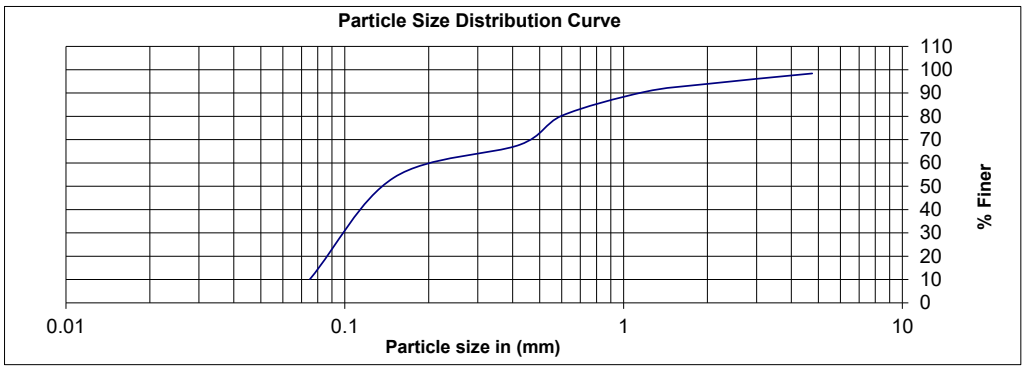


Gravel (%)	Sand (%)	Silt & Clay (%)
0.00	1.59	98.41

RELIANT FOUNDATIONS PVT. LTD. GHY-35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	1
5	Depth	16.50 m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	1.6	1.60	1.60	98.40
2.00	4.47	4.47	6.07	93.93
1.18	3.54	3.54	9.61	90.39
0.600	10.14	10.14	19.75	80.25
0.425	12.4	12.40	32.15	67.85
0.150	14.14	14.14	46.29	53.71
0.075	43.55	43.55	89.84	10.16
Pan	10.16	10.16	100.00	0.00
	100.00			

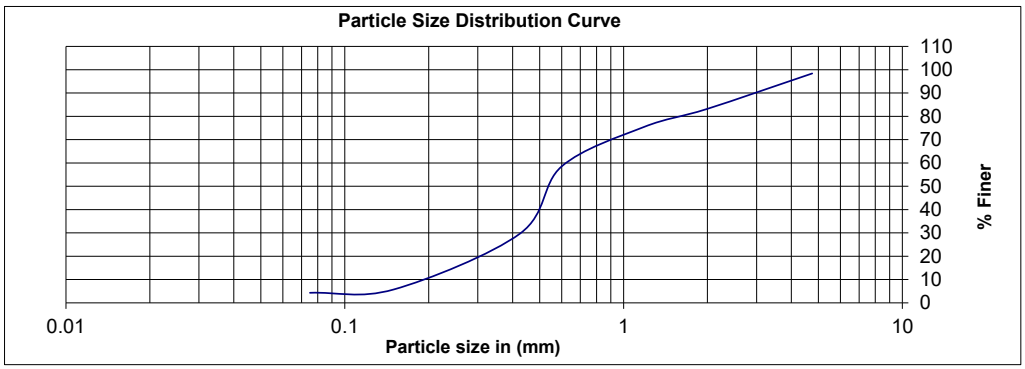


Gravel (%)	Sand (%)	Silt & Clay (%)
0.00	89.84	10.16

RELIANT FOUNDATIONS PVT. LTD. GHY-35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	1
5	Depth	24.0m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	1.6	1.60	1.60	98.40
2.00	15.17	15.17	16.77	83.23
1.18	7.84	7.84	24.61	75.39
0.600	16.84	16.84	41.45	58.55
0.425	28.86	28.86	70.31	29.69
0.150	23.94	23.94	94.25	5.75
0.075	1.44	1.44	95.69	4.31
Pan	4.31	4.31	100.00	0.00
	100.00			

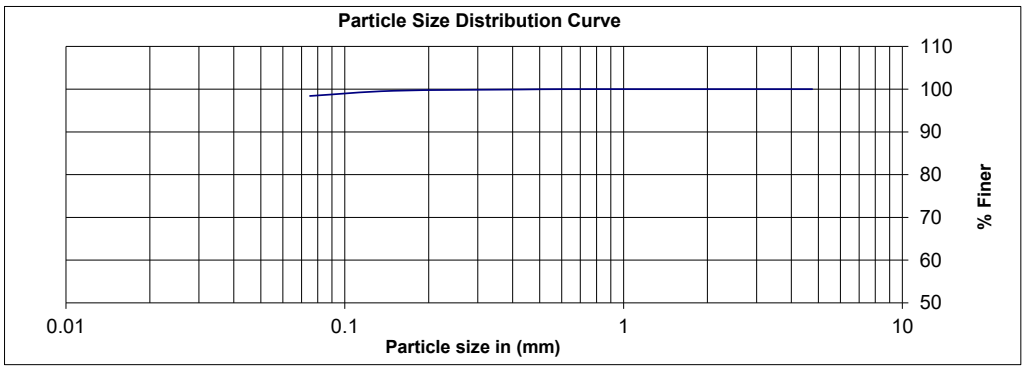


Gravel (%)	Sand (%)	Silt & Clay (%)
0.00	95.69	4.31

RELIANT FOUNDATIONS PVT. LTD. GHY-35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	2
5	Depth	7.50 m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	0.00	0.00	0.00	100.00
2.00	0.00	0.00	0.00	100.00
1.18	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.08	0.08	0.08	99.92
0.150	0.30	0.30	0.38	99.62
0.075	1.21	1.21	1.59	98.41
Pan	98.41	98.41	100.00	0.00
	100.00			

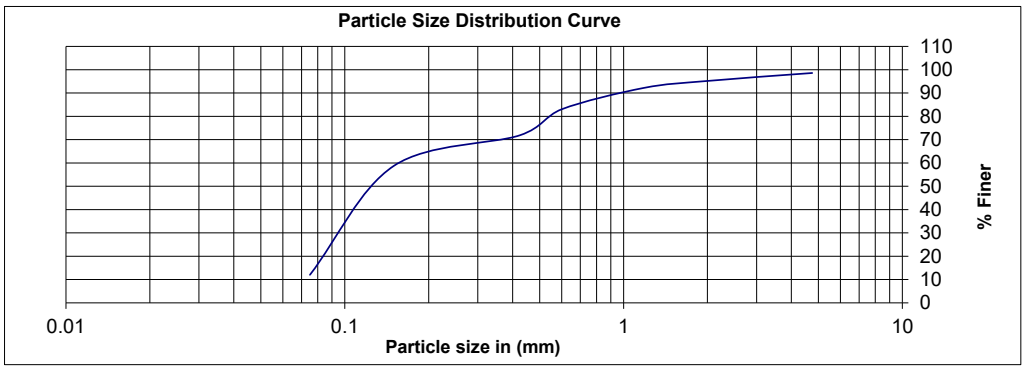


Gravel (%)	Sand (%)	Silt & Clay (%)
0.00	1.59	98.41

RELIANT FOUNDATIONS PVT. LTD. GHY:35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	2
5	Depth	16.50 m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	1.4	1.40	1.40	98.60
2.00	3.41	3.41	4.81	95.19
1.18	3.01	3.01	7.82	92.18
0.600	9.14	9.14	16.96	83.04
0.425	11.14	11.14	28.10	71.90
0.150	13.14	13.14	41.24	58.76
0.075	46.74	46.74	87.98	12.02
Pan	12.02	12.02	100.00	0.00
	100.00			

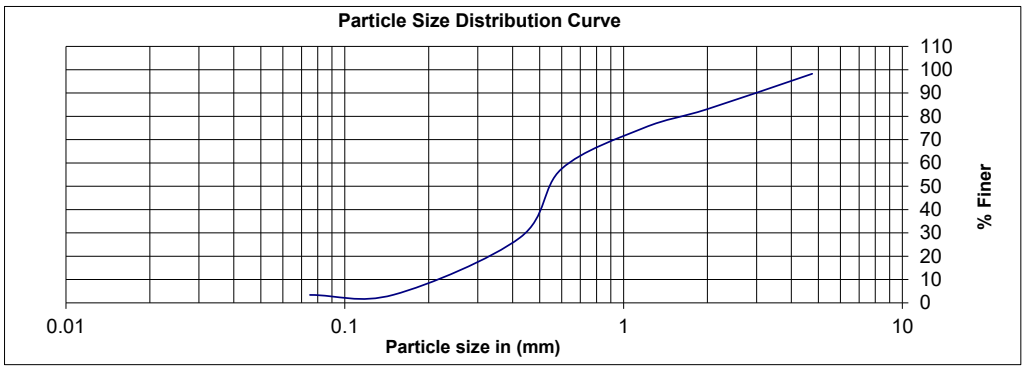


Gravel (%)	Sand (%)	Silt & Clay (%)
0.00	87.98	12.02

RELIANT FOUNDATIONS PVT. LTD. GAY-35

1	Name of test	GRAIN SIZE ANALYSIS
2	Test Method No.	IS: 2720 (Part- IV), -1985,Reaffirmed 2020
4	Bore Hole No.	2
5	Depth	18.0 m
6	Sample weight	100gm

IS Sieve Size (mm)	Wt. Retained (gm)	Percentage Wt. retained (%)	Cumulative percent retained (%)	Percent finer (%)
4.75	1.74	1.74	1.74	98.26
2.00	15.14	15.14	16.88	83.12
1.18	8.11	8.11	24.99	75.01
0.600	17.47	17.47	42.46	57.54
0.425	29.57	29.57	72.03	27.97
0.150	24.47	24.47	96.50	3.50
0.075	0.11	0.11	96.61	3.39
Pan	3.39	3.39	100.00	0.00
	100.00			



Gravel (%)	Sand (%)	Silt & Clay (%)
1.74	94.87	3.39

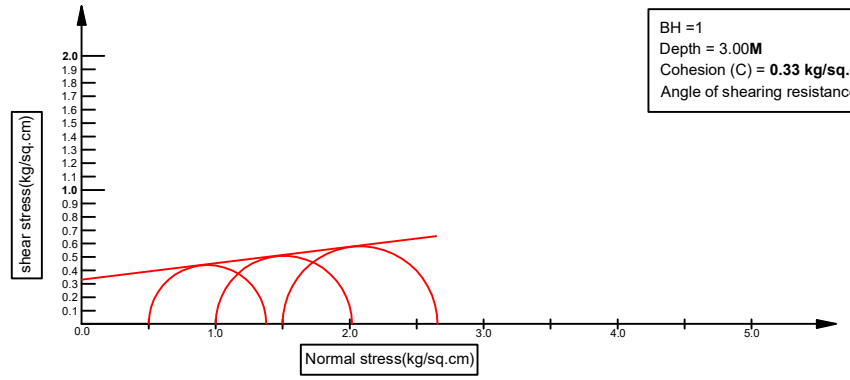
RELIANT FOUNDATIONS PVT. LTD. GHY-35

SHEAR TEST RESULT

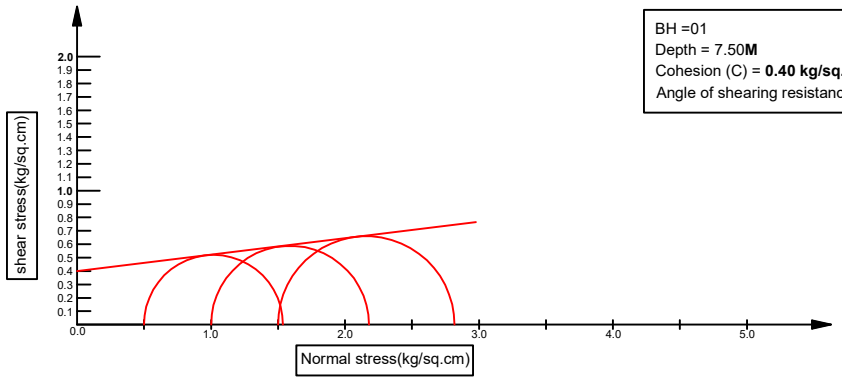
BH NO.	DEPTH(M)	COHESION 'C' kg/cm²	ANGLE OF INTERNAL FRICTION (Φ˚)	TYPE OF TEST
BH01	3.00	0.33	7	**Triaxial Shear test**
	7.50	0.40	7	
BH02	3.00	0.32	7	
	7.50	0.27	7	
BH01	16.50	0	32	**Direct Shear Test**
	21.00	0	33	
BH02	16.50	0	32	
	21.00	0	34	

RELIANT FOUNDATIONS PVT. LTD. GHY-35

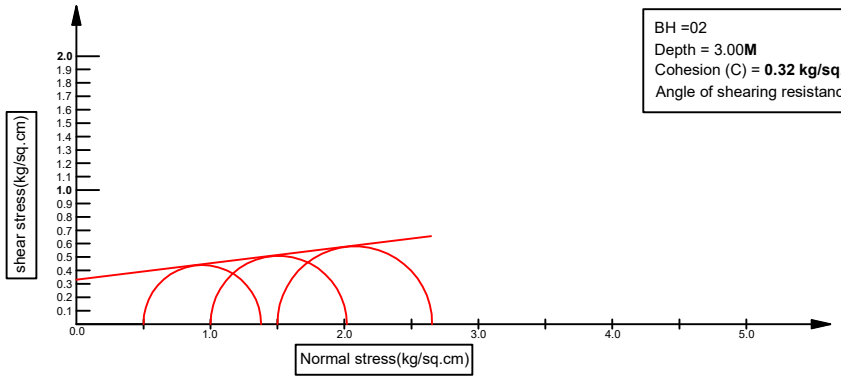
TRIAXIAL SHEAR TEST



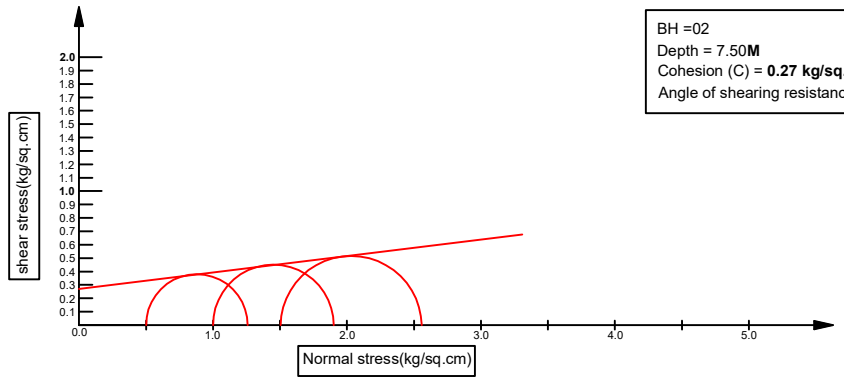
BH =1
Depth = 3.00**M**
Cohesion (C) = **0.33 kg/sq.cm**
Angle of shearing resistance (Ø)= 7°



BH =01
Depth = 7.50**M**
Cohesion (C) = **0.40 kg/sq.cm**
Angle of shearing resistance (Ø)= 7°



BH =02
Depth = 3.00**M**
Cohesion (C) = **0.32 kg/sq.cm**
Angle of shearing resistance (Ø)= 7°



BH =02
Depth = 7.50**M**
Cohesion (C) = **0.27 kg/sq.cm**
Angle of shearing resistance (Ø)= 7°

RELIANT FOUNDATIONS PVT. LTD. GAY-35

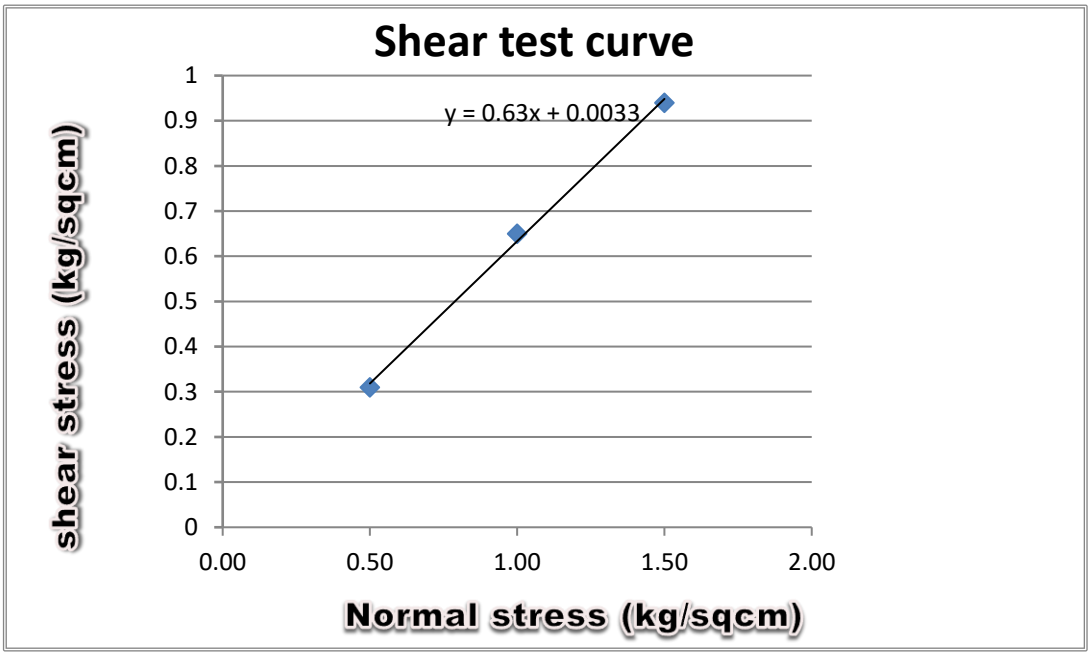
Direct Shear test result

1 Dimension : 6 cm x 6 cm
2 Thickness : 2.5 cm
3 Test condition : Drained

BH-01 Depth =16.50m

Shear Parameters determination

Sl No	Normal stress(Kg/sqcm)	Shear stress (Kg/sqcm)
1.00	0.50	0.31
2.00	1.00	0.65
3.00	1.50	0.94



c=0.0kg/sqcm
Φ = 32.2˚

RELIANT FOUNDATIONS PVT. LTD. GHY-35

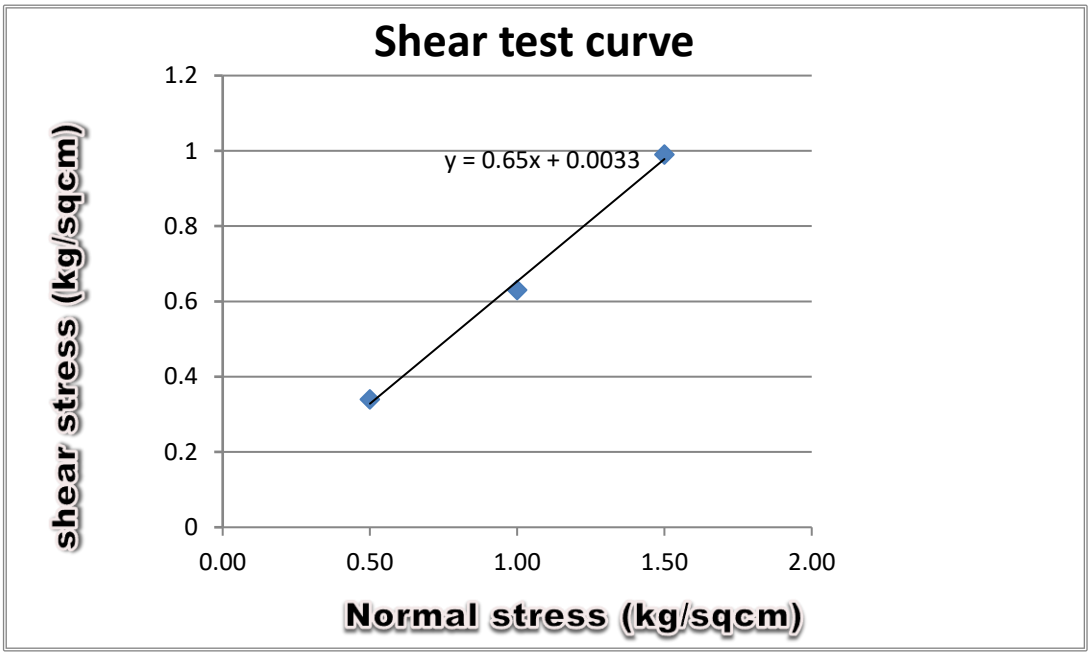
Direct Shear test result

1 Dimension : 6 cm x 6 cm
2 Thickness : 2.5 cm
3 Test condition : Drained

BH-01 Depth =21.0m

Shear Parameters determination

Sl No	Normal stress(Kg/sqcm)	Shear stress (Kg/sqcm)
1.00	0.50	0.34
2.00	1.00	0.63
3.00	1.50	0.99



c=0.0kg/sqcm
Φ = 33˚

RELIANT FOUNDATIONS PVT. LTD. GHY-35

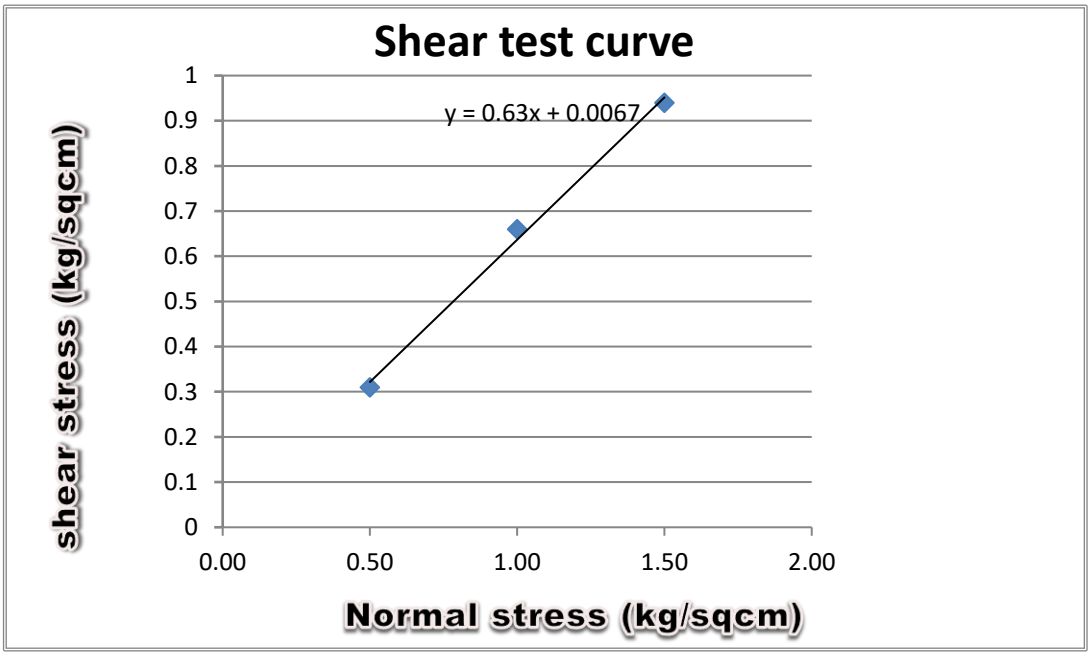
Direct Shear test result

1 Dimension : 6 cm x 6 cm
2 Thickness : 2.5 cm
3 Test condition : Drained

BH-02 Depth =16.50m

Shear Parameters determination

Sl No	Normal stress(Kg/sqcm)	Shear stress (Kg/sqcm)
1.00	0.50	0.31
2.00	1.00	0.66
3.00	1.50	0.94



c=0.0kg/sqcm
Φ = 32.2˚

RELIANT FOUNDATIONS PVT. LTD. GKV-35

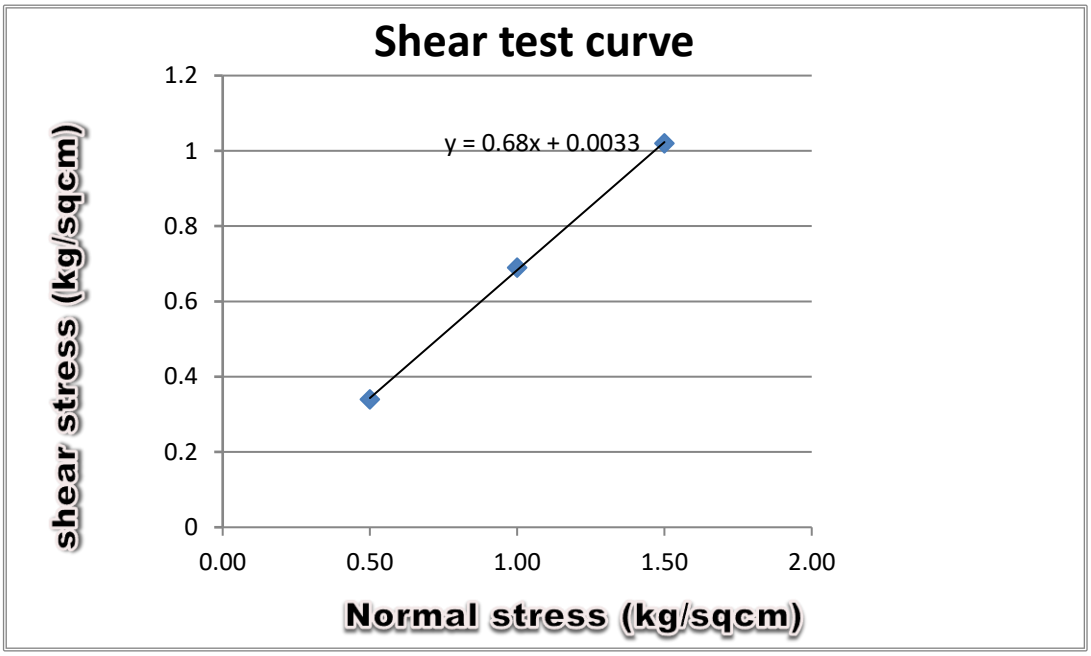
Direct Shear test result

1 Dimension : 6 cm x 6 cm
2 Thickness : 2.5 cm
3 Test condition : Drained

BH-02 Depth =21.0m

Shear Parameters determination

Sl No	Normal stress(Kg/sqcm)	Shear stress (Kg/sqcm)
1.00	0.50	0.34
2.00	1.00	0.69
3.00	1.50	1.02



c=0.0kg/sqcm
Φ = 34.2˚

RELIANT FOUNDATIONS PVT. LTD. GHY.35

SITE PHOTOS





RELIANT FOUNDATIONS PVT. LTD. GHY-35