

REPORT
ON
SUB-SOIL INVESTIGATIONS
FOR
CONSTRUCTION OF PROPOSED
CENTRE OF EXCELLENCE OF FIRE TRAINING
AND RESEARCH LABORATORY
AT IIT, PATNA (BIHAR)

Submitted to

The Executive Engineer
Building Construction Divn no-3.
Building Construction Department Patna (Bihar)

Aug, 2025



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1. **INTRODUCTION**

The present report is based on results of field tests through 3 bore holes of 12.0 m depth at representative locations and laboratory tests on soil samples obtained during field testing.

2. **FIELD WORK**

2.1 Boring

Holes of 100 mm diameter were sunk manually as per IS: 1892, using wash boring equipment.

2.2 Sampling

Disturbed/undisturbed soil samples were collected at 1.5 m depth interval or at change of soil stratum. The tubes were then properly sealed with wax and labeled. They were transported to the laboratory for various tests on the samples.

2.3 Standard Penetration Test (SPT)

Standard Penetration Tests (SPT) were done as per IS : 2131 at depth intervals of 1.5 m. Collection of undisturbed soil samples and SPT were done as per requirements.

2.4 Ground Water:

The level of ground water in each bore hole was recorded 24 hours after the completion of boring. The water table was found at 4.50 to 4.60 m depth below G.L in Aug,2025.

3. **LABORATORY TESTS**

The necessary tests were conducted in the laboratory [as per the relevant parts of IS:2720] on selected representative soil samples out of those brought from the field. The names of the tests are given below:

- (a) Natural moisture content
- (b) Bulk density
- (c) Grain size analysis (using sieves and/or hydrometer)
- (d) Specific gravity of solid solids
- (e) Atterberg's limit tests (on plastic soils)



- (f) Shear Tests:
- [I] Triaxial compression test (unconsolidated – undrained), generally for fine-grained soils.
 - [II] Unconfined compression tests, only on cohesive soils.
 - [III] Direct shear tests, generally for coarse-grained soils
- (g) Consolidation test (for fine-grained soils)

4. DISCUSSION OF FIELD AND LABORATORY TESTS RESULTS

Laboratory test results on sandy (purely non-cohesive) soil samples get affected by loss of moisture and disturbance during sampling, transportation and time gap between sampling and testing. Therefore, field results are likely to be more dependable than laboratory test results in case of non-cohesive soils.

Laboratory test results are likely to be more dependable than the field results in case of soft to stiff consistency cohesive soils. In case of stiff to hard clays, collection of truly undisturbed samples are not practically possible. Undrained cohesion and coefficient of volume compressibility of the stiff / hard consistency cohesive soils may be determined by internationally accepted empirical correlations as below:

$$C_u = (0.45 \text{ to } 0.6) N \quad (T/m^2)$$

$$m_v = 1 / ((0.45 \text{ to } 0.6) \times N \times 100) \quad (m^2/T)$$

Reference: **FOUNDATION DESIGN AND CONSTRUCTION “ M.J.TOMLINSON ”**

Relative density D_r and angle of shearing resistance Φ may be obtained based on Standard penetration (SPT) test data for non-cohesive soils. Natural densities may also be taken as per table 3 – 4 , page no. 163,(Foundation Analysis and design by J.E.Bowles.

5. PRESENTATION OF TEST RESULTS

The results of the tests conducted on soil in the field and in the laboratory are reported herein through tables and graphs given in the Appendix.



FOUNDATION ANALYSIS

6.

The soil formation consists of reddish sandy silty clay /silty sand of type CL/SM/SM-ML up to about 2.0 m depth followed by reddish silty sand of type SP-SM/SP up to the depth investigated.

The details of soil strata is tabulated in tabular form under field & lab test values.

Keeping in view the soil formation shallow foundation (Isolated ,raft) and plane piles may be provided.

The soil strata in BH-2 in the range of 2.0 to 3.5 m depth is loose, the minimum depth of shallow foundation has been taken as 3.5 m below G.L.

7. FORMULA USED FOR CALCULATION OF BEARING CAPACITY

7.1 Shear Failure Criterion

7.1.1 Soil with Cohesion and Angle of Internal Friction

The **net ultimate bearing capacity** q_{uf} (t/m^2) of a shallow foundation of breadth B (m) and depth D (m) is given as per IS : 6403 – 1981 (Sec. 5.1.2) by the following equation :

$$q_d = c N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 \gamma B N_\gamma S_\gamma d_\gamma i_\gamma w'$$

where the N 's are functions of ϕ and are obtained from relevant tables for general shear failure; they are replaced by reduced N' values for local shear failure by taking a reduced value $\phi' = \tan^{-1} (0.67 \tan \phi)$. In this case c is replaced by $c' = 2c/3$,

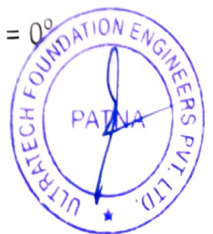
$s_c = s_q = s_\gamma = 1$ for strip footing ; consult table for other shapes.

$$d_c = 1 + 0.2 (D/B) \tan (45^\circ + \phi/2), = 1 + 0.2 D/B \text{ when } \phi = 0^\circ$$

$$i_c = i_q = i_\gamma = 1 \text{ for vertical loading.}$$

$$d_q = d_\gamma = 1 + 0.1 (D/B) \tan (45^\circ + \phi/2) \text{ for } \phi > 10^\circ$$

$$d_q = d_\gamma = 1 \text{ for } \phi < 10^\circ$$



and $q = \gamma' D = (\gamma - \gamma_w) D$.

7.2 Settlement criterion

The allowable bearing pressures corresponding to the permissible settlement was calculated as per Teng's formula.

7.3 FORMULA FOR CALCULATION OF CAPACITY OF PLANE PILE IN GRANULAR SOIL

The ultimate load bearing capacity of pile as per IS:2911 (Part I / Sec 2)-1979 Appendix B, clause 5.3.1.1. is given by the formula:

$$Q_u = A_p \left(\frac{1}{2} \cdot D \cdot \gamma \cdot N_\gamma + P_D \cdot N_q \right) + \sum_{i=1}^D K \cdot P_{Di} \cdot \tan \delta \cdot A_{si}$$

Where,

A_p = Crossectional area of pile toe in m^2

D = stem diameter in m

γ = effective unit weight of soil at pile toe in t/m^3

P_D = effective overburden pressure at pile toe in t/m^2

N_γ and N_q = bearing capacity factors depending upon the angle of internal friction Φ at toe.

$\sum_{i=1}^n$ = summation for n layer in which pile is installed.

K = Coefficient of earth pressure.

P_{Di} = effective overburden pressure in t/m^2 for the i^{th} layer where i varies from 1 to n

δ = angle of wall friction between pile and soil, in degrees
(may be taken equal to Φ); and

A_{si} = surface area of pile stem in m^2 in the i_{th} layer where i varies from 1 to n



FORMULA USED FOR CALCULATION OF CAPACITY OF PLANE PILE IN COHESIVE SOIL

7.4

For clayey soils the ultimate load carrying capacity of an under-reamed pile may be worked out from the following expressions:

$$Q_u = A_p \cdot N_c \cdot C_p + \alpha \cdot C_a \cdot A_s$$

- Where, Q_u (t) = Ultimate bearing capacity of pile
 A_p (m²) = crosssectional area of pile stem at toe level.
 N_c = Bearing capacity factor, usually taken as 9
 C_p (t/m²) = Cohesion of the soil around toe.
 α = reduction factor
 C_a (t/m²) = average cohesion of the soil along the pile stem
 A_s (m²) = surface area of stem; and



8. RECOMMENDATIONS :

The present report is based on the results of field tests through 3 bore-holes of 12.0.0 m depth at specified locations and laboratory tests on soil samples obtained from field tests.

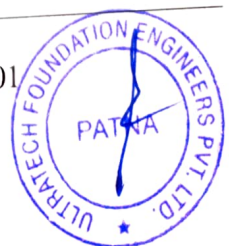
Considering the soil formation the placement of shallow foundation (isolated or raft)and plane pile foundation may be provided.

It is, therefore, recommended that the proposed structure be provided with shallow foundations or plane pile foundation of different depth and sizes depending on structural requirement and economic considerations .

During piling bore – hole may collapse due to presence of pockets of sand which may be prevented by providing casing or using bentonite slurry of adequate consistency. Casting of piles must be done using trimie pipes.

The safe capacities of a foundations of any type and size may be calculated using the reported soil data and basing the calculations on the relevant IS codes to fulfill both the shear failure and settlement criteria.

The safe capacities of shallow foundations and plane pile foundation at certain depth and sizes have been calculated using the relevant IS codes with factor of safety 3.0 and 2.5 respectively and tabulated below.



A. PLANE PILE FOUNDATION :

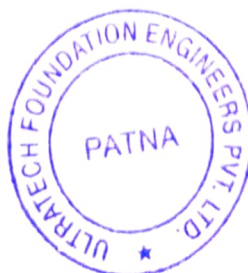
Pile length below G.L (m)	Stem dia. (m)	Safe capacity of plane pile (tonnes)
10.0	0.45	40.0
	0.50	49.5
12.0	0.45	51.0
	0.50	62.0

B SHALLOW FOUNDATIONS

Depth (m)	Size (m)	Net allowable bearing pressure (t/m ²)	Max .expected settlement (mm)
3.5	2.0x1.5	23.6	25
	3.0x2.5	20.5	25
	15.0x10.0	11.7	25

Limitation :

If a sub soil condition is met different from those reported here during foundation trenching or piling ,suitable steps should be taken. A few piles must be load tested.

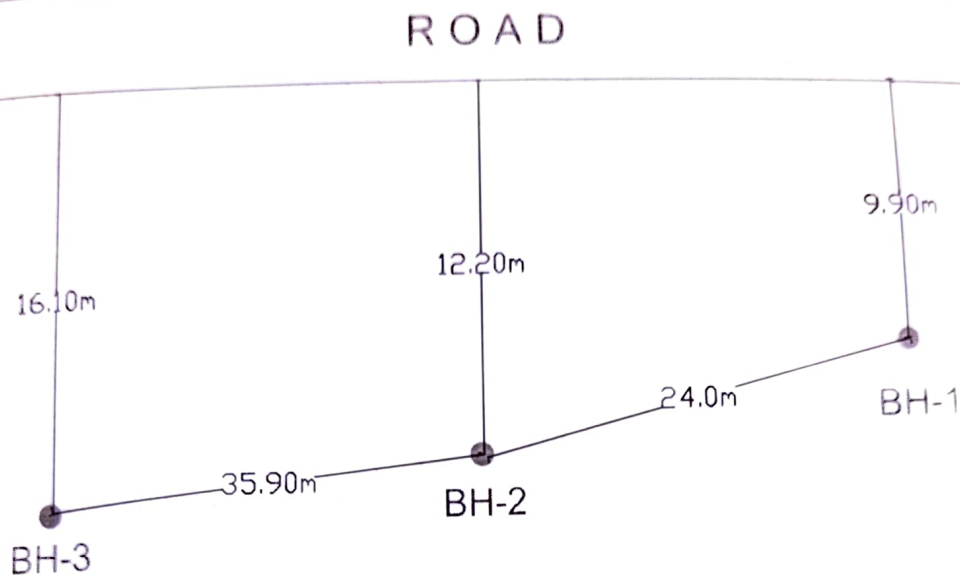


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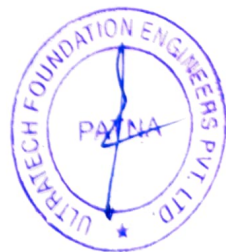
(Er. S.Prasad)
M.Sc Engg (Structure) ,MIE
Director

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Fire Testing Training and Research Laboratory at IIT, Patna (Bihar)

BORE - HOLE LOCATION MAP

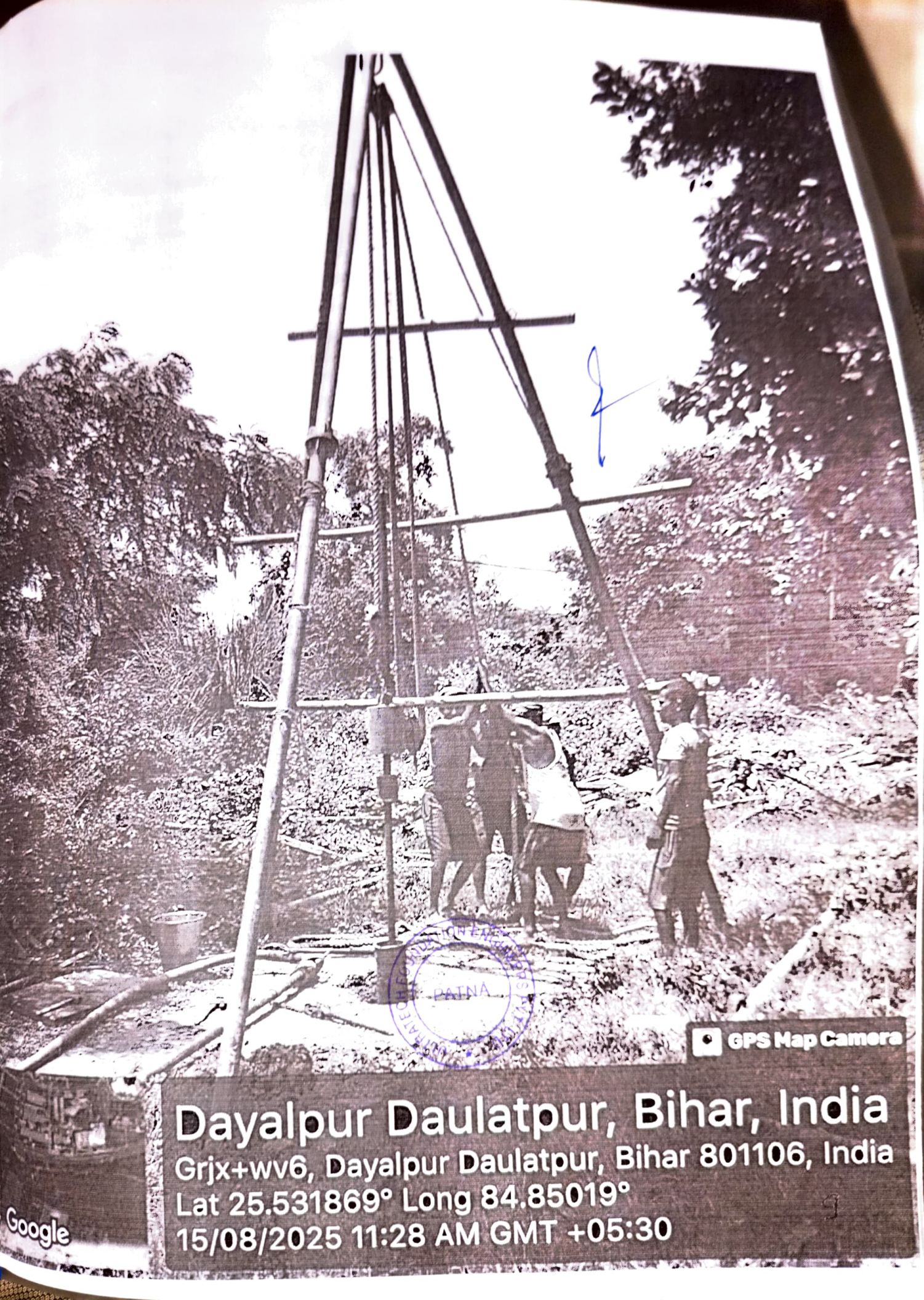


Tree & Grass Zone



Not to scale

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GPS Map Camera

Dayalpur Daulatpur, Bihar, India

Grixx+vv6, Dayalpur Daulatpur, Bihar 801106, India

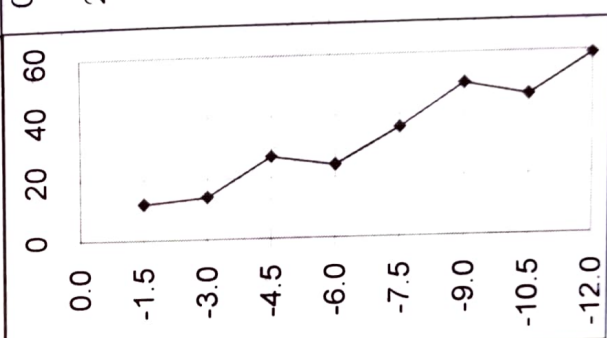
Lat 25.531869° Long 84.85019°

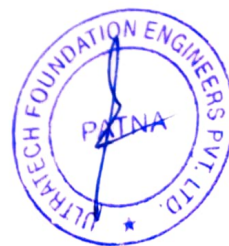
15/08/2025 11:28 AM GMT +05:30

Google

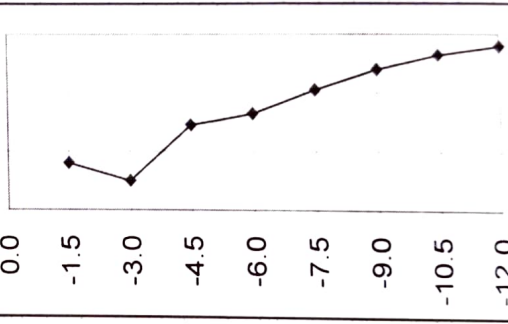
Name of Project :- Proposed Centre of Excellence of Fire Testing Training and Research Laboratory
 Bore Hole No :- 1
 Location :- IIT, Patna (Bihar)
 Method of Boring :- Rotary
 Borehole dia. :- 150 mm
 Depth of Water Table(m) 4.60
 Commenced on :- 14.08.2025
 Completed on :- 15.08.2025
 Termination Depth :- 12.0m

4.60

Depth (m)	Description of soil	Plot of observed N Vs. Depth (m)	From To (m)	Sample no & type			No. of blows			SPT 'N' Values observed	Corr. N values
				U	D	S	15cm	15cm	15cm		
0.0	Reddish sandy silty clay.		0.0	1	1	1	3	5	7	12	12.0
1.0											
1.5											
2.5											
3.0											
4.0											
4.5											
5.5											
6.0	Reddish silty sand.			2	2	4	5	9	14	15.8	
7.0											
7.5											
8.5											
9.0											
10.0											
10.5											
11.5											
12.0											



Name of Project :- Proposed Centre of Excellence of Fire Testing Training and Research Laboratory
Bore Hole No :- 2
Location :- IIT, Patna (Bihar)
Method of Boring :- Rotary
Borehole dia. :- 150 mm
Depth of Water Table(m) 4.50
Commenced on :- 15.08.2025
Completed on :- 15.08.2025
Termination Depth :- 12.0m

Depth (m)	Description of soil	Plot of observed N Vs. Depth (m)	From To (m)	Sample no & type			No. of blows			SPT 'N' Values observed	Corr. N values
				U	D	S	15cm	15cm	15cm		
0.0	Reddish silty sand.		0.0								
1.0			2.0	1	1	6	8	8	16	18.9	
1.5											
2.5					2	2	4	5	5	10	12.0
3.0											
4.0					3	3	9	12	17	29	22.9
4.5											
5.5					4	4	10	14	19	33	24.2
6.0	Reddish silty sand to clean sand.										
7.0			5	5	11	17	24	41	27.4		
7.5											
8.5			6	6	13	22	26	48	29.8		
9.0											
10.0			7	7	18	22	31	53	31.2		
10.5											
11.5			8	8	17	23	33	56	31.6		
12.0											



Name of Project :- Proposed Centre of Excellence of Fire Testing Training and Research Laboratory

Bore Hole No :-3

Location :- IIT, Patna (Bihar)

Commenced on :- 15.08.2025

Method of Boring :- Rotary

Completed on :- 15.08.2025

Borehole dia. :- 150 mm

Termination Depth :- 12.0m

Depth of Water

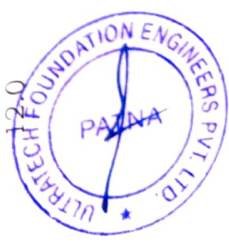
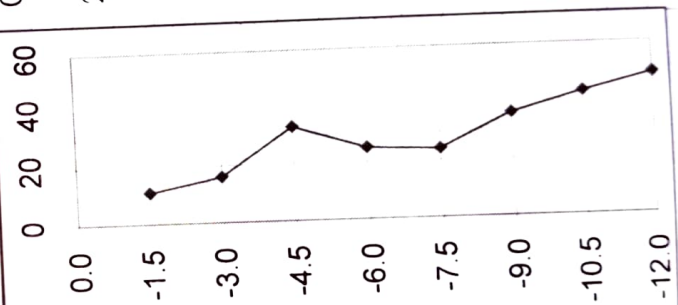
4.50

Table(m)

Depth (m)	Description of soil	Plot of observed N Vs. Depth (m)	From To (m)	Sample no & type			No. of blows			SPT 'N' Values observed	Corr. N values
				U	D	S	15cm	15cm	15cm		
0.0			0.0								
1.0			2.0								
1.5											
2.5											
3.0											
4.0											
4.5											
5.5											
6.0											
7.0											
7.5											
8.5											
9.0											
10.0											
10.5											
11.5											
12.0											

Reddish silty sand.

Reddish silty sand to
clean sand.



LABORATORY TEST RESULTS													
Bore Hole No.	Type	Depth (m)	Standard Penetration Resistance 'N' value	Corr. N Values	Natural Moisture Content (%)	Bulk Density (gm/cc)	Dry Density (gm/c.c.)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	IS Classification	Type of test	Comp. Index, Co
BH - 1	U1	0.0									CL	UU	
		1.0			22.4	2.03	1.66						
	S	1.5	12	12.0				32.7	21.2	11.5			
		2.5											
	S	3.0	14	15.8		1.85*						DS	
		4.0											
	S	4.5	27	21.7		1.88*							
		5.5											
	S	6.0	24	19.5		1.87*						DS	
		7.0											
	S	7.5	36	24.8		1.89*							
		8.5											
	S	9.0	50	30.5		1.92*						DS	
		10.0											
	S	10.5	46	27.9		1.91*							
		11.5											
		12.0	59	32.7		1.95*						DS	

S- SPT Sample, U- Undisturbed Sample



LABORATORY TEST RESULTS												
Bore Hole No.	Type	Depth (m)	Standard Penetration Resistance 'N' value	Corr. N Values	Natural Moisture Content (%)	Bulk Density (gm/cc)	Dry Density (gm/c.c.)	Liquid Limet (%)	Plastic Limit (%)	Plasticity Index (%)	IS Classification	Type of test
BH - 2		0.0									SM	
		1.0										
	S	1.5	16	18.9		1.86*						
		2.5										
	S	3.0	10	12.0		1.84*						DS
		4.0										
	S	4.5	29	22.9		1.88*						
		5.5										
	S	6.0	33	24.2		1.88*						DS
		7.0										
	S	7.5	41	27.4		1.90*						
		8.5										
	S	9.0	48	29.8		1.92*						DS
		10.0										
	S	10.5	53	31.2		1.94*						
		11.5										
		12.0	56	31.6		1.94*						DS
Non- Plastic												
SP-SM/SP												
Type of test												
Co-hesion (kg/cm2)												
Angle of friction (degree)												
Sp. Gravity												
Comp. Index, Cc												

S- SPT Sample, U- Undisturbed Sample



LABORATORY TEST RESULTS													
Bore Hole No.	Type	Depth (m)	Standard Penetration Resistance 'N' value	Corr. N Values	Natural Moisture Content (%)	Bulk Density (gm/cc)	Dry Density (gm/c.c.)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	IS Classification	Type of test	Co-hesion (kg/cm2)
BH - 3		0.0											
		1.0											
	S	1.5	11	15.3		1.92*					SM/SM-ML		
	U1	2.5											
	S	3.0	16	17.0		1.94*		26.2	23.0	3.2		DS	0.0
		4.0											
	S	4.5	33	24.8		1.89*							
		5.5											
	S	6.0	25	20.1		1.87*						DS	0.0
		7.0											
	S	7.5	24	19.1		1.87*					SP-SM/SP		
		8.5											
	S	9.0	36	24.1		1.90*						DS	0.0
		10.0											
	S	10.5	43	26.6		1.91*							
		11.5										DS	0.0
		12.0	49	28.5		1.92*							35.5
S- SPT Sample, U- Undisturbed Sample													



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Fire Testing Training and Research Laboratory at IIT, Patna (Bihar)**

GRAIN SIZE ANALYSIS

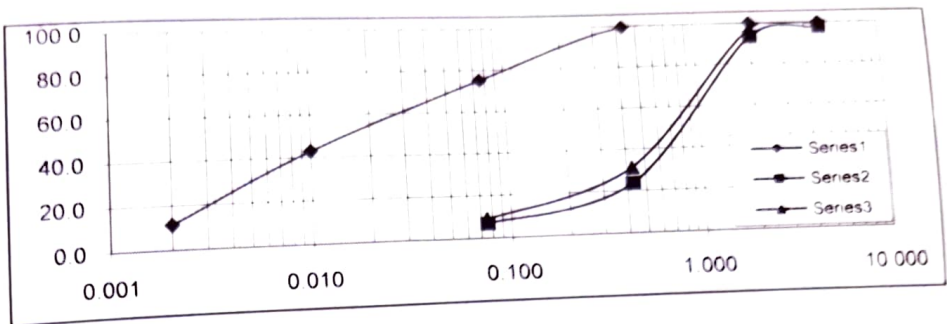
RESULTS OF LAB TESTS

[for bore hole No /Depth (m) shown

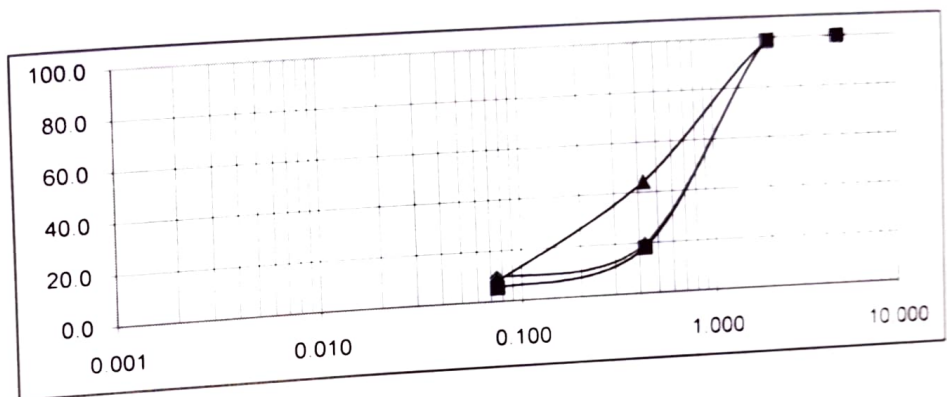
thus 1/1.5]

d = Grain size in mm, **p** = % finer by weight, **plotted** respectively on X (log scale) & Y-axis in Fig. 2 below

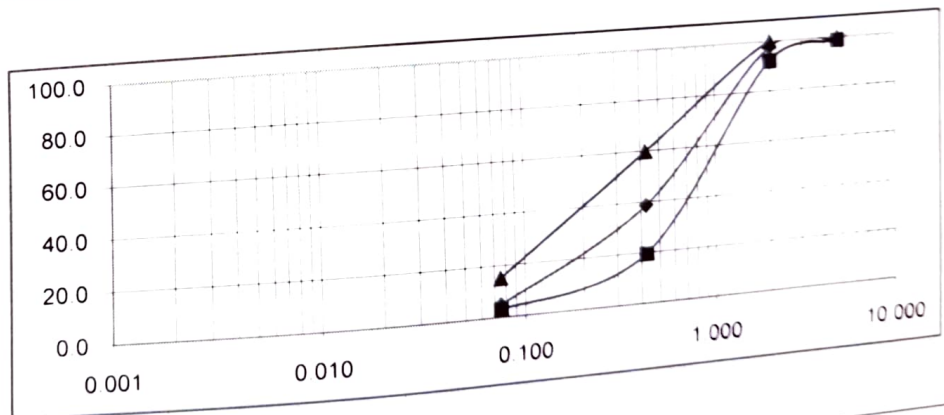
d/p for -	1/1.5	1/3.0	1/4.5
4.750	100.0	97.6	99.5
2.000	100.0	93.1	96.8
0.425	99.3	23.5	31.0
0.075	75.0	7.0	9.0
0.010	42.8		
0.002	11.2		



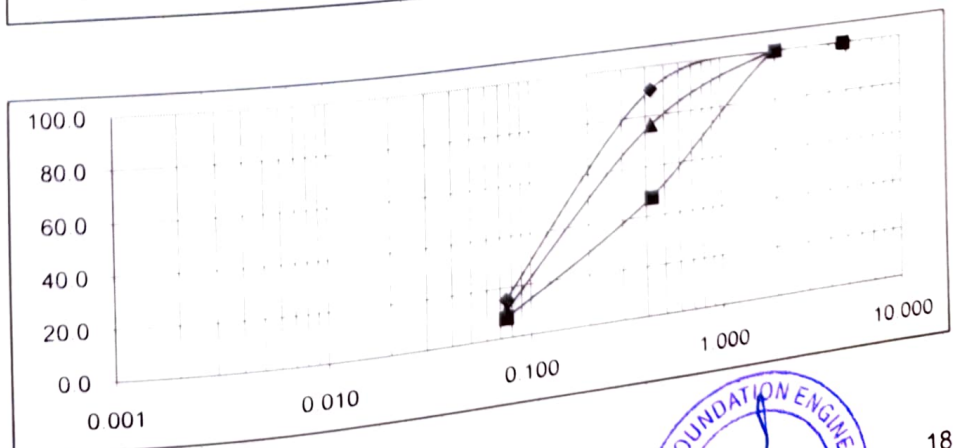
d/p for -	1/6.0	1/7.5	1/9.0
4.750	100.0	100.0	100.0
2.000	98.5	98.8	98.4
0.425	19.5	18.1	44.2
0.075	9.3	5.3	7.8
0.010			
0.002			



d/p for -	1/10.5	1/12.0	2/1.5
4.750	99.2	98.8	100.0
2.000	97.6	92.1	100.0
0.425	38.7	19.6	59.8
0.075	4.8	3.2	15.1
0.010			
0.002			



d/p for -	2/3.0	2/4.5	2/6.0
4.750	100.0	100.0	100.0
2.000	100.0	100.0	100.0
0.425	90.5	47.7	76.4
0.075	15.2	8.1	10.8
0.010			
0.002			



Sub-Soil Investigation for Proposed construction of Centre of Excellence Fire Testing Training and Research Laboratory at IIT, Patna (Bihar)

GRAIN SIZE ANALYSIS

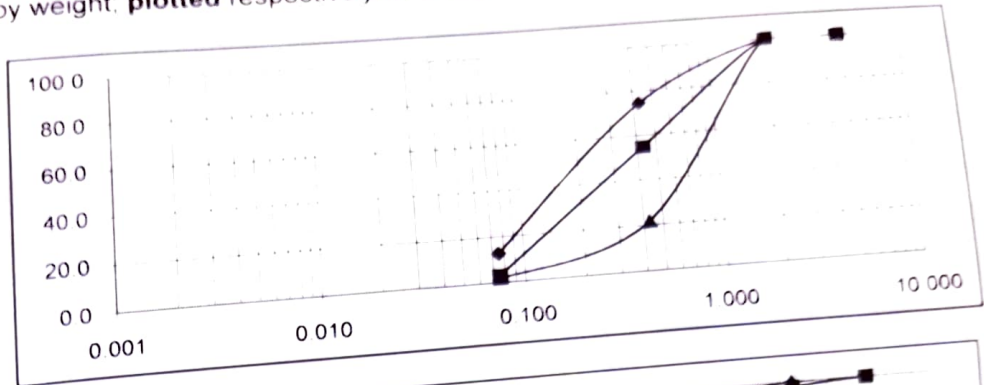
RESULTS OF LAB TESTS

[for bore hole No /Depth (m) shown

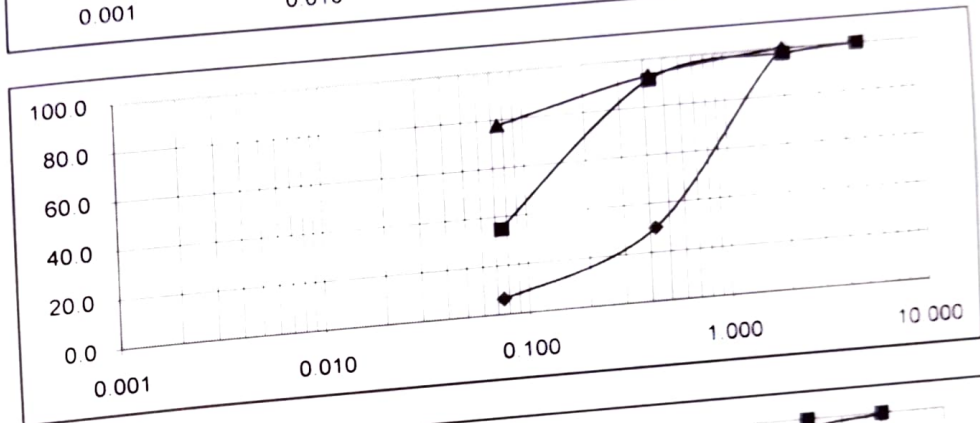
thus 1/1 5]

d = Grain size in mm, p = % finer by weight, plotted respectively on X (log scale) & Y-axis in Fig 2 below

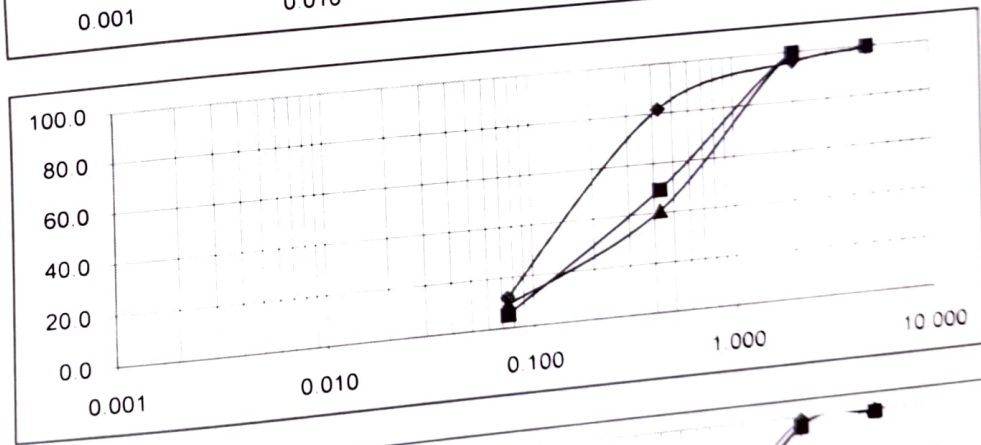
d/p for -	2/7 5	2/9 0	2/10 5
4 750	100 0	100 0	100 0
2 000	100 0	100 0	100 0
0 425	74 4	54 7	21 6
0 075	12 5	3 0	1 8
0 010			
0 002			



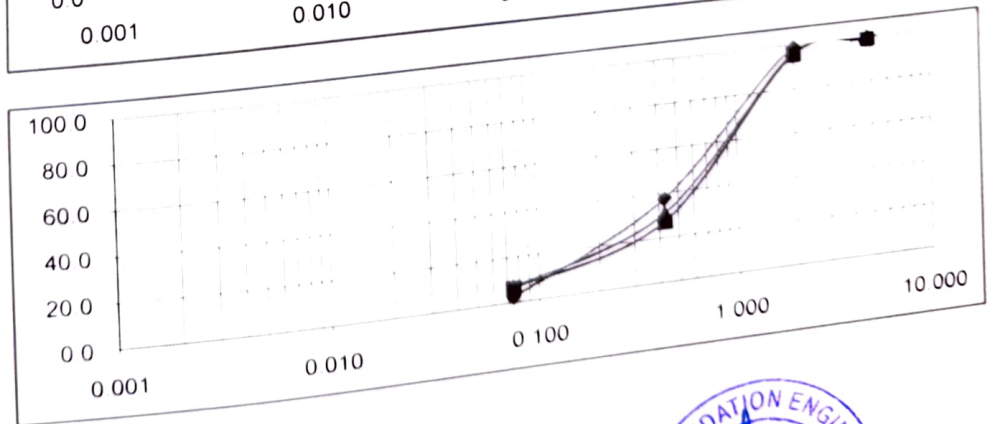
d/p for -	2/12 0	3/1 5	3/3 0
4 750	100 0	100 0	100 0
2 000	99 4	97 7	100 0
0 425	29 9	91 2	93 1
0 075	6 5	35 1	77 7
0 010			
0 002			



d/p for -	3/4 5	3/6 0	3/7 5
4 750	99 4	100 0	100 0
2 000	96 1	99 7	99 5
0 425	81 7	49 3	40 8
0 075	12 0	5 4	9 3
0 010			
0 002			

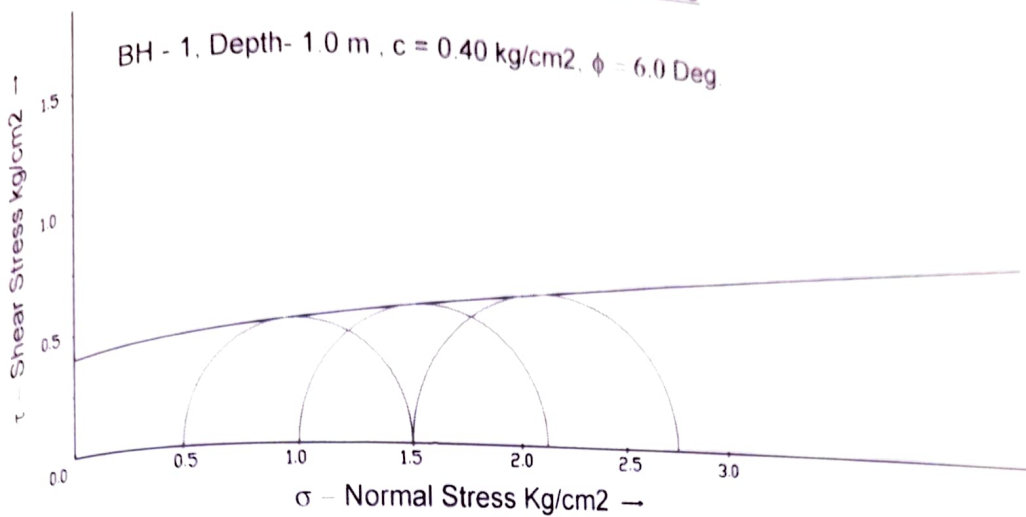


d/p for -	3/9 0	3/10 5	3/12 0
4 750	100 0	99 3	99 4
2 000	98 8	95 5	95 9
0 425	37 5	27 1	30 9
0 075	2 5	6 6	7 3
0 010			
0 002			

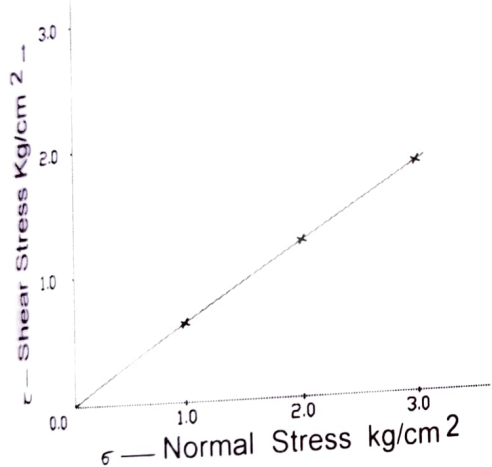


TRIAXIAL COMPRESSION TESTS MOHR'S CIRCLE PLOTS

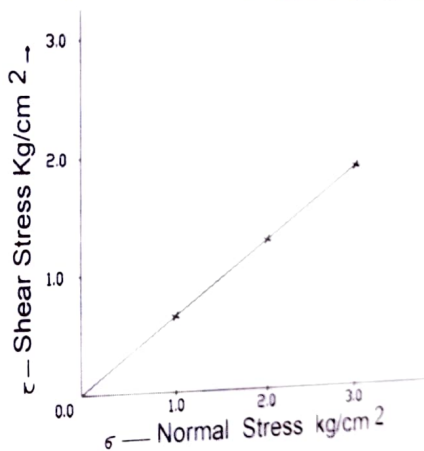
BH - 1, Depth- 1.0 m , $c = 0.40 \text{ kg/cm}^2$, $\phi = 6.0 \text{ Deg}$



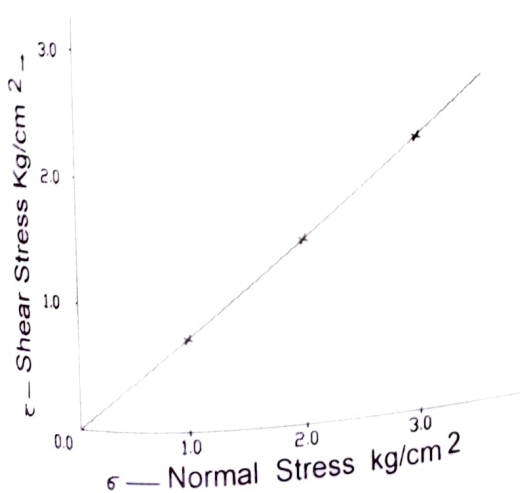
BH - 1, Depth-3.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 31.5 \text{ Deg}$



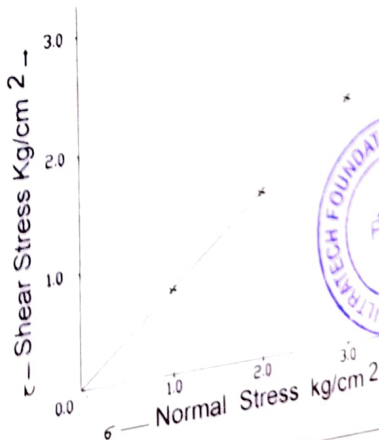
BH - 1, Depth-6.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 33.0 \text{ Deg}$



BH - 1, Depth-9.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 36.0 \text{ Deg}$

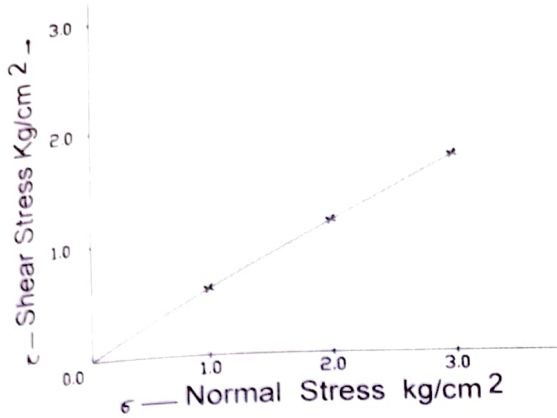


BH - 1, Depth-12.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 36.5 \text{ Deg}$

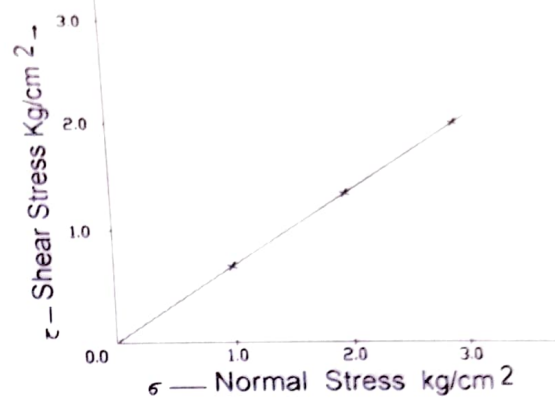


DIRECT SHEAR TEST PLOTS

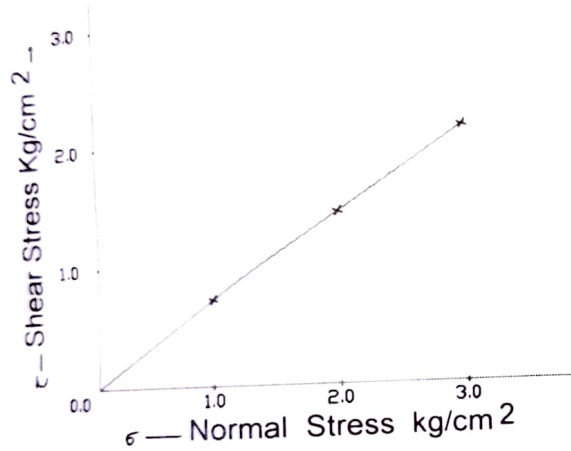
BH - 2, Depth-3.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 30.0 \text{ Deg}$



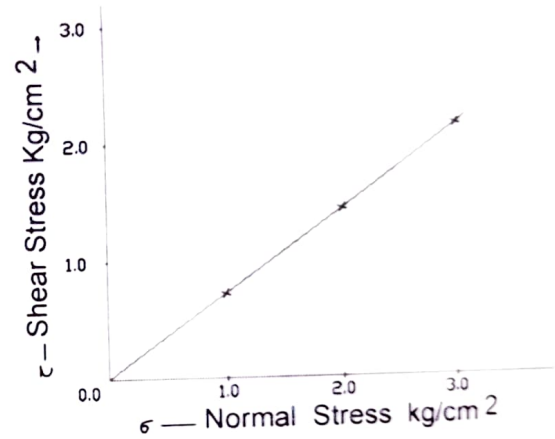
BH - 2, Depth-6.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 34.0 \text{ Deg}$



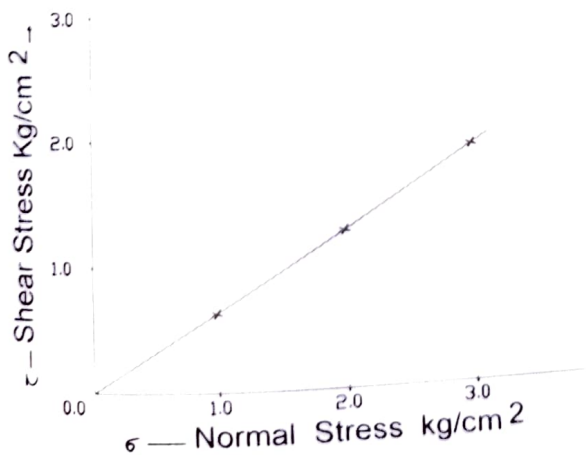
BH - 2, Depth-9.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 35.5 \text{ Deg}$



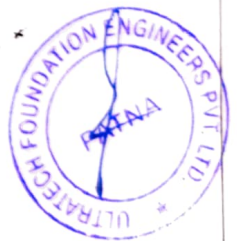
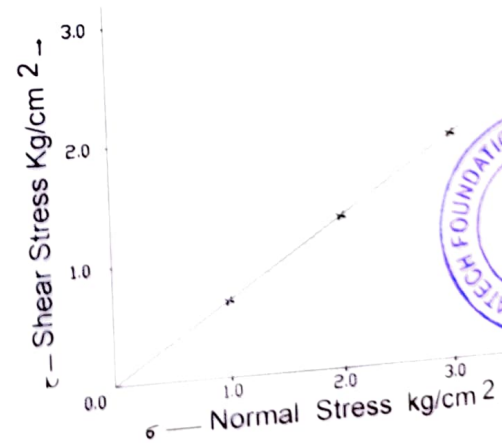
BH - 2, Depth-12.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 36.0 \text{ Deg}$



BH - 3, Depth-3.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 32.5 \text{ Deg}$

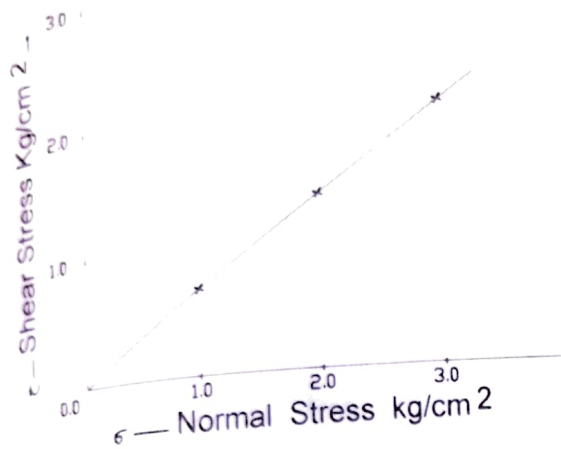


BH - 3, Depth-6.0 m , $c = 0.0 \text{ kg/cm}^2$, $\phi = 33.0 \text{ Deg}$

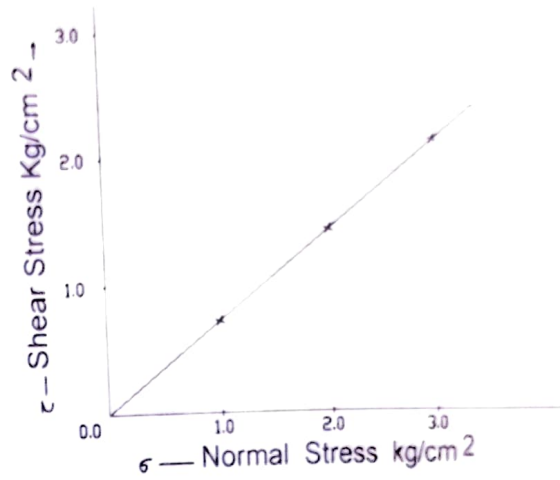


DIRECT SHEAR TEST PLOTS

BH - 3, Depth-9.0 m, $c = 0.0 \text{ kg/cm}^2$, $\phi = 34.0 \text{ Deg}$

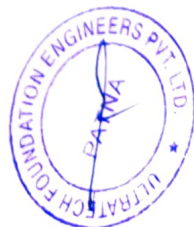


BH - 3, Depth-12.0 m, $c = 0.0 \text{ kg/cm}^2$, $\phi = 35.5 \text{ Deg}$



Calculation of bearing capacity based on Settlement Criterion

Depth (m)	Width (m)	N'-3	fd	w'	s (mm)	q_{na} (t/m ²)	s (mm)	q_{na} (t/m ²)
3.5	1.5	18.7	2.0	0.5	25	23.56	25	23.6
3.5	2.5	18.7	2.0	0.5	25	20.53	25	20.5
3.5	10.0	18.7	1.35	0.5	25	11.72	25	11.7



Calculation of Plane Pile Capacity

The load carrying capacity of the pile has been calculated using IS:2911(Part I, sec 2) 1979, appendix B, clause 5.3.1.1. These calculations are based on angle of internal friction in sand layers (taking $c=0$) and on cohesion only in fine grained soil (taking angle of internal friction = 0). This is likely to give minimum capacity of the pile.

Depth Below GL (m)	Thick ness of layer (m)	Pile Dia. (m)	Ap (m2)	Cp (t/m2)	Nc	α	Ca (t/m2)	γ	Ny	Pd	Nq	K	P _{di}	ϕ		tan δ	Asi	Pile Capacity (t)		Qu (t)	Qu/F.S (t)	Pile Length (m)
														in friction	in bearing			in friction	in bearing			
0.0																						
1.0	1.0	0.45																				
Not Considered due to cut off																						
8.0	7.0	0.45			9.0	0.0	0.0	0.88				1.5	3.1	32.5		0.64	9.90	29.2				
10.0	2.0	0.45	0.159	0.0	9.0	0.0	0.0	0.91	48.03	6.1	50.0	1.5	7.1	34.0	35.0	0.67	2.83	20.2	50.4	99.8	39.9	10.0
12.0	2.0	0.45	0.159	0.0	9.0	0.0	0.0	0.93	48.03	6.3	50.0	1.5	8.9	35.0	35.0	0.70	2.83	26.5	51.5	127.4	51.0	12.0
0.0																						
Not Considered due to cut off																						
1.0	1.0	0.50																				
8.0	7.0	0.50			9.0	0.0	0.0	0.88				1.5	3.1	32.5		0.64	11.00	32.4				
10.0	2.0	0.50	0.196	0.0	9.0	0.0	0.0	0.91	48.03	6.8	50.0	1.5	7.1	34.0	35.0	0.67	3.14	22.5	69.2	124.1	49.6	10.0
12.0	2.0	0.50	0.196	0.0	9.0	0.0	0.0	0.93	48.03	7.0	50.0	1.5	8.9	35.0	35.0	0.70	3.14	29.4	70.7	155.0	62.0	12.0

Calculation of Bearing Capacity for raft foundation
Shear Failure Criterion

Depth (m)	Length (m)	Width (m)	c (t/m ²)	N _c	S _c	d _c	q (t/m ²)	N _{q-1}	S _q	d _q	γ (t/m ³)	N _γ	S _γ	d _γ	qd (t/m ²)	qs=qd/3.0 (t/m ²)	φ (deg.)
3.5	2.0	1.5	0.00	34.16	1.15	1.48	3.08	20.94	1.15	1.24	0.88	28.13	0.70	1.24	103.36	34.5	31.50
3.5	3.0	2.5	0.00	34.16	1.17	1.43	3.08	20.94	1.17	1.21	0.88	28.13	0.67	1.21	110.19	36.7	31.50
3.5	15.0	10.0	0.00	34.16	1.13	1.54	3.08	20.94	1.13	1.27	0.88	28.13	0.73	1.27	171.19	57.1	31.50

