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APPENDICES

1. INTRODUCTION

This report on Proposed building complex at Kohalpur, Banke discusses the details of soil investigation works and foundation recommendations for its proposed site at various locations. The investigation work included literature review, Percussion drilling, SPT Test, Laboratory Tests and Analysis of various test results to predict the allowable bearing capacity of sub-soil at the proposed Foundation and recommendation of the most suitable foundation compatible to the prevailing soil conditions. The details of the investigation work as well as that of findings of the analysis carried out are presented in the following paragraphs.

2. LITERATURE REVIEW

2.1 Seismicity

It has now been well understood that the Himalaya was formed by the most recent mountain building activity (tectonic activity) in the Earth's history and therefore it is called the youngest mountain on the earth. The origin of the Himalayas began around 70 million years ago at the time when the north moving Indian plate first collided with the Asian plate. Even after the collision the Indian plate continued pushing the Asian plate to the north. In the process Indian plate's leading edge was sliced, broken, folded and uplifted to form the youngest and the highest mountain range on our planet. The Indian plate is constantly moving to the north even at present and converges on Tibet by 50 mm annually (Patriat and Achache, 1984). This convergence builds up a very large storage of energy in the Himalayan region over a period of time. The energy is stored by building up elastic strain or deformation in the rock of the Himalayas and adjoining areas. When the accumulated energy exceeds the ultimate strength of the rock, the rock breaks and suddenly releases the accumulated energy as slip on faults giving rise to earthquakes. Since, as already mentioned above, the mountain building process is still under progress, the Himalayan and surrounding region are seismically one of the most active parts of the earth. The earthquake occurrence data of the last century shows that on an average Nepal was hit by a big earthquake in every 12 years (Nakarmi, 1997).

The Characteristics of seismic ground vibration expected at any locations depends upon the magnitude of earthquake, its depth of focus, distance from the epicenter, characteristics of path through the seismic waves travel and the soil strata on which the structure stand. The random earthquake ground motions, which cause structures to vibrate, can be resolved into three mutually perpendicular directions. The predominant direction of ground vibration is usually horizontal. Nepal lies in the zone which is highly vulnerable in the event earthquake.

3. FIELD WORK

3.1 General

The fieldwork included Percussion drilling, Sampling, SPT Test and Water Table Monitoring. The details of the field works carried out at the building site are presented in **Table 1.**

Table 1: Summary of Field Works

S No	Boring Type	BH	Started On	Completed On	Depth m
1	Percussion	BH1	22-12-2021	23-12-2021	20
2	Percussion	BH2	24-12-2021	25-12-2021	20
3	Percussion	BH3	26-12-2021	27-12-2021	16
4	Percussion	BH4	28-12-2021	29-12-2021	20

3.2 Boring

The drilling work was carried out using percussion drilling. The boreholes were logged continuously in the field for the all boreholes. The borehole logs included visual classification of soil, records of SPT values at every 150 mm intervals of penetration till a total depth of penetration of 450mm and records position of water table. The field boreholes records were updated after completion of laboratory investigation works. The updated logs for the tower foundation sites are presented in **Appendix A.** The location of boreholes is shown in **Fig 1.**

3.3 Photographs

A set of color photographs was taken to show the record of ground investigation work. The photographs cover the location of borehole, sample recovery and soil samples. The photographs are presented in **Appendix B**.

3.4 Sampling

Before any disturbed samples were taken, the bore holes were washed clean to flush any loose disturbed soil particles deposited during the boring operation. The samples obtained during tests were preserved as representative disturbed samples. The disturbed samples recovered were placed in airtight doubled 0.5 mm thick transparent plastic bags, labeled properly for identification and finally sealed to avoid any loss of moisture. Only then the samples were transportation to the laboratory for further investigation.

3.5 Field Test.

Standard Penetration Test (SPT)

The field test conducted at the site consisted of Standard Penetration Test (SPT). This is most commonly used in-situ test, especially for cohesionless soil which cannot be easily sampled. This test is extremely useful for determining the bearing capacity of cohesionless soil, carrying out liquefaction susceptibility and slope stability analysis.

The test consists of driving into the soil a standard split barrel having 50.8 mm outside diameter, 35 mm inside diameter and of length around 650 mm. The sampler is connected to the end of boring rods. The sampler is driven into the soil at the bottom of a cased borehole by means of a 65 kg hammer falling freely through a height of 760 mm onto the top of the SPT rods. A guide assembly is used for the falling hammer and an anvil is used to transmit the blows of the hammer to the SPT rod. The bore hole must be cleaned up to the depth at which the test is to be conducted such that the test is conducted into the undisturbed material. The casing must not be driven below the level at which the test is to begin.

At first the sampler is driven 150 mm into the soil to seat the sampler and to bypass any disturbed material at the bottom of the borehole. The number of blows required for this depth of penetration is recorded. The sampler is further driven through 150 mm and the number of blows recorded. Likewise, the sampler is once again driven by another 150 mm and the number of blows recorded. The number of blows recorded for the first 150 mm of penetration is disregarded. The number of blows recorded for the last two 150 mm intervals are added. This added value is known as Standard Penetration Number. This is also called as SPT N-Value. If the number of blows reaches 50 before a penetration of 300 mm, no further blows are applied but the actual penetration is recorded. At the end of a test the sampler is withdrawn and the soil is taken out from the sampler. This sample is the best quality disturbed representative sample and is used to carry out tests for the classification of soil. The records of the SPT values obtained are presented in borehole logs in the **Appendix A.**

The recorded SPT values are without any correction of overburden and water table. The test was conducted without using liner. The maximum rod length used was 16.5m. The overburden correction has been carried out as per the IS: 2131 – 1981 chart. The SPT value obtained in the field are corrected for overburden pressure. The SPT was originally developed for cohesionless soils so that undisturbed samples would not have to be taken as it is difficult and costly procedure in such soils.

3.6 Ground Water Table Monitoring

The position of ground water table was measured at each borehole. The water level observed in the bore holes at the end of a 24 hours long period after completion of boring work was taken as the position of ground water table. The depth to ground water table from ground level after 24 hours of completion of boring work for all the boreholes are given in the borehole logs presented in the **Appendix A.**

4. LABORATORY TESTS AND RESULTS

The following laboratory tests were conducted:

a) Grain Size Analysis (Sieve)
b) Grain Size Analysis (Hydrometer)
c) Atterberg's Limits
d) Bulk Density
e) Unconfined Compression Test
f) Specific Gravity
g) Natural water content
h) Consolidation Test

The above laboratory tests were performed as per the specification laid down in the IS standard codes. The above tests were conducted at the Geotechnical Laboratory of MULTI Lab (P) Ltd. at Kopundole, Lalitpur. The results of laboratory tests were compiled in the form of Test Results Summary Sheet and are presented in **Table 2.** The test result sheets of individual tests are given in **Appendix C.**

MULTI Lab (P) Ltd.

Table 2. - Test Result Summary Sheet

Project : Soil Investigation of Proposed Nepalgunj Medical College **Location : Kholapur, Banke**

BH. No	Depth m	% of Gravel	% of Sand	% of Fines Silt	% of Fines Clay	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Water Content	Specific Gravity	Unit Weight Dry gm/cc	Unit Weight Bulk gm/cc	q_u kN/m²	m_v cm²/kg
1	0.30-1.50	23.00	6.00	71.00		-	-	-	31.39	-	-	-	-	-
	1.50-3.00	0.00	2.00	98.00		-	-	-	33.06	-	-	-	-	-
	3.00-5.00	0.00	76.00	24.00		-	-	-	19.74	-	-	-	-	-
	5.00-10.50	0.00	2.00	56.00	42.00	44.00	30.89	13.11	33.98	2.527	1.392	1.833	91.00	0.045
	10.50-12.50	4.00	72.00	24.00		-	-	-	20.90	-	-	-	-	-
	12.50-20.00	0.00	1.00	99.00		-	-	-	29.95	-	-	-	-	-
2	0.30-3.00	0.00	2.00	98.00		-	-	-	33.69	-	-	-	-	-
	3.00-6.50	3.00	76.00	20.00		-	-	-	18.96	-	-	-	-	-
	6.50-8.50	42.00	43.00	15.00		-	-	-	14.86	-	-	-	-	-
	8.50-12.00	2.00	10.00	52.00	36.00	36.00	29.00	7.00	31.89	2.530	1.416	1.839	96.00	0.043
	12.00-13.50	7.00	83.00	9.00		-	-	-	13.09	-	-	-	-	-
	13.50-20.00	0.00	1.00	99.00		-	-	-	33.12	-	-	-	-	-
3	0.00-1.50	1.00	16.00	83.00		-	-	-	18.04	-	-	-	-	-
	1.50-4.00	2.00	82.00	16.00		-	-	-	16.58	-	-	-	-	-
	4.00-6.00	0.00	7.00	58.00	35.00	35.00	29.63	5.37	32.49	2.536	1.398	1.824	95.00	0.047
	6.00-10.50	0.00	88.00	12.00		-	-	-	17.17	-	-	-	-	-
	10.50-16.00	3.00	4.00	93.00		-	-	-	32.90	-	-	-	-	-
4	0.00-1.00	0.00	15.00	85.00		-	-	-	32.41	-	-	-	-	-
	1.00-3.00	65.00	33.00	2.00		-	-	-	12.89	-	-	-	-	-
	3.00-5.00	31.00	2.00	67.00		-	-	-	26.46	-	-	-	-	-
	5.00-11.00	8.00	71.00	21.00		-	-	-	9.62	-	-	-	-	-
	11.00-20.00	5.00	6.00	51.00	38.00	42.00	30.49	11.51	33.16	2.531	1.404	1.839	103.00	0.043

5. SOIL DESCRIPTION

The surface as well as sub-surface geological features existing at the building site is shown in the borehole logs presented in **Appendix A**. The soil types existing at the site are as shown in **Table 3** below.

Table 3: Soil Description

S No	Borehole No	Soil Description
1	BH-1	The soil from ground level to 0.3 m comprises of top soil. Below that depth, to the depth of 1.5 m soil is brown gravelly clayey silt. Beyond that depth to a depth of 3 m, brown to gray clayey silt with medium plasticity is found. Below that depth, to the depth of 5 m soil is brown silty fine sand. From that depth, brown to gray clayey silt with medium plasticity is found on investigating to a depth of 10.5 m. Below that depth, brown medium to fine sand with traces of gravels is found upto the depth of 12.5 m. On further boring to the investigated depth of 20 m, brown clayey silt of medium plasticity is found.
2	BH-2	The soil from ground level to 0.3 m comprises of top soil. Below that depth, to the depth of 3 m soil is brown clayey silt with medium plasticity. Beyond that depth to a depth of 6.5 m, brown silty fine sand with traces of gravels is found. Below that depth, to the depth of 8.5 m soil is gray to white silty gravelly sand. From that depth, brown to gray clayey silt of low plasticity with traces of gravels is found on investigating to a depth of 12 m. Below that depth, gray to white medium to coarse sand with traces of gravels is found upto the depth of 13.5 m. On further boring to the investigated depth of 20 m, brown clayey silt with medium plasticity is found.
3	BH-3	The soil from ground level to 1.5 m comprises of filling materials including sandy clayey silt. Below that depth, to the depth of 4 m soil is brown silty sand with traces of gravels. Beyond that depth to a depth of 6 m, gray to brown clayey silt of low plasticity is found. Below that depth, to the depth of 10.5 m soil is brown silty fine sand. On further boring to the investigated depth of 16 m, brown clayey silt with medium plasticity with traces of gravels is found.
4	BH-4	The soil from ground level to 1 m comprises of brown clayey silt of low plasticity. Below that depth, to the depth of 3 m soil is gray to white sandy gravels. Beyond that depth to a depth of 5 m, brown gravelly clayey silt is found. Below that depth, to the depth of 11 m soil is gray to white silty sand with traces of gravels. On further boring to the investigated depth of 20 m, brown clayey silt of medium plasticity with traces of gravels is found.

6. FOUNDATION ANALYSIS

6.1 General

Before selecting a given type of foundation vis-à-vis the particular set of conditions prevailing at a site, the probable performance of the foundation must be judged with respect to two types of potentially unsatisfactory behavior. In the first place, the bearing capacity of the foundation soil must be sufficient enough to ensure that the induced total or differential settlement is not detrimental. Secondly, the bearing capacity should be such that excessive shear strain, which could lead to shear failure, does not occur.

6.2 Depth of Foundation

The depth of foundation is governed mainly factors such as scour depth and the nature of the subsoil strata to place the foundation, basement requirement and other environmental factors. Isolated pad foundation is the type of foundation analyzed for the proposed building. The depths taken for the analysis are1.5m, 2m and 3m for isolated foundation.

6.3 Computation of Bearing Capacity

6. 3.1 General

At the proposed site the soil is clayey to sandy at the different foundation level hence the bearing capacity analysis has been carried out using shear failure criteria as well as settlement criteria. The dimensions of foundation have been taken as 1.5m by 1.5m, 2m by 2m and 3.0m by 3.0m with respect to the presented depth above. The detail is provided in the computation table. The bearing capacity analysis is carried out based on the results of corrected SPT value based on drained shear parameter for granular and undrained parameter for clayey soil respectively. IS 6403:1981 method has been used to determine the bearing capacity from shear failure criteria as well as the settlement criteria and to check the probable allowable settlement the consolidation test data has been used. The detail is provided in the computation table. The bearing capacity analysis is carried out based on the results of SPT Value. The corrected SPT value is shown in **Table 4.** The minimum value obtained from shear failure criteria and settlement criteria has been recommended as the allowable bearing capacity. The details of the relation are presented below;

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Table 4

SPT Value Correction

BH 1

Location:Kohalpur, Banke

Υ	kN/m^3	18	Υ_{sat}	19	kN/m^3	Corrected SPT Value (N)	GWT, m	4.5
S.No	Depth, m	Measured SPT	p_o	p_o'	C_N		Remarks	
1	1.5	6	27	27.00	1.00	6		
2	3	12	54	54.00	1.18	14		
3	4.5	14	81	81.00	1.04	14		
4	6	9	109.5	94.79	1.00	9		
5	7.5	10	138	108.57	1.00	10		
6	9	14	166.5	122.36	1.00	14		
7	10.5	14	195	136.14	0.88	12		
8	12	30	223.5	149.93	0.85	25		
9	13.5	14	252	163.71	1.00	14		
10	15	16	280.5	177.50	1.00	16		
11	16.5	19	309	191.28	1.00	19		
12	18	20	337.5	205.07	1.00	20		
13	19.5	17	366	218.85	1.00	17		

BH 2

Υ	kN/m^3	18	Υ_{sat}	19	kN/m^3	Corrected SPT Value (N)	GWT, m	5
S.No	Depth, m	Measured SPT	p_o	p_o'	C_N		Remarks	
1	1.5	8	27	27.00	1.00	8		
2	3	13	54	54.00	1.18	15		
3	4.5	14	81	81.00	1.04	14		
4	6	20	109	99.19	1.00	20		
5	7.5	32	137.5	112.98	0.95	30		
6	9	10	166	126.76	1.00	10		
7	10.5	12	194.5	140.55	1.00	12		
8	12	29	223	154.33	0.84	24		
9	13.5	13	251.5	168.12	1.00	13		
10	15	11	280	181.90	1.00	11		
11	16.5	12	308.5	195.69	1.00	12		
12	18	13	337	209.47	1.00	13		
13	19.5	12	365.5	223.26	1.00	12		

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Table 4

SPT Value Correction

BH 3

Location:Kohalpur, Banke

Υ	kN/m^3	18	Υ_{sat}	19	kN/m^3	Corrected SPT Value (N)	GWT, m	5
S.No	Depth, m	Measured SPT	p_o	p_o'	C_N		Remarks	
1	1.5	15	27	27.00	1.38	20		
2	3	12	54	54.00	1.18	14		
3	4.5	11	81	81.00	1.00	11		
4	6	15	109	99.19	1.00	15		
5	7.5	14	137.5	112.98	0.95	13		
6	9	15	166	126.76	0.90	13		
7	10.5	12	194.5	140.55	1.00	12		
8	12	11	223	154.33	1.00	11		
9	13.5	12	251.5	168.12	1.00	12		
10	15	13	280	181.90	1.00	13		

BH 4

Υ	kN/m^3	18	Υ_{sat}	19	kN/m^3	Corrected SPT Value (N)	GWT, m	4
S.No	Depth, m	Measured SPT	p_o	p_o'	C_N		Remarks	
1	1.5	27	27	27.00	1.38	37		
2	3	15	54	54.00	1.00	15		
3	4.5	13	81.5	76.60	1.00	13		
4	6	32	110	90.38	1.02	32		
5	7.5	29	138.5	104.17	0.98	28		
6	9	31	167	117.95	0.93	28		
7	10.5	30	195.5	131.74	0.89	26		
8	12	12	224	145.52	1.00	12		
9	13.5	14	252.5	159.31	1.00	14		
10	15	12	281	173.09	1.00	12		
11	16.5	13	309.5	186.88	1.00	13		
12	18	14	338	200.66	1.00	14		
13	19.5	12	366.5	214.45	1.00	12		

6.3.2 Sandy/Clayey Soil (IS 6403:1981)

Shear failure Criteria – The net ultimate bearing capacity of the foundation in terms of shear failure is given by the following equation.

a) In case of general shear failure, i.e. for ϕ ≥ 36°

$$q_{nu} = cN_c s_c d_c i_c + q(N_q - 1)s_q d_q i_q + 0.5B\gamma N_\gamma s_\gamma d_\gamma i_\gamma R_w$$

b) In case of local shear failure, i.e. for ϕ ≤ 29°

$$q_{nu} = {}^2/_3\, cN'_c s_c d_c i_c + q(N'_q - 1)s_q d_q i_q + 0.5B\gamma N'_\gamma s_\gamma d_\gamma i_\gamma R_w$$

The general, local shear failure and intermediate condition are interpolated as per the and Fig:1 of IS 6403:1981.

And, the net safe bearing capacity is given by the following equation.

$$q_{ns} = \frac{q_{nu}}{F.S}$$

Where,

q_{nu} = Net ultimate bearing capacity
q_{ns} = Net safe bearing capacity
q = Effective pore pressure at the base of foundation
c = Cohesion of soil
ϕ = Angle of shearing resistance
q = Effective pressure at base of foundation ($q=\Upsilon.D_f$)
B = Width of foundation
L = Length of foundation
D_f = Depth of foundation
Υ = Unit weight of soil
N_c, N_q, N_Υ, N'_c, N'_q, N'_Υ = Bearing capacity factors
s_c, s_q, s_Υ = Shape factors
d_c, d_q, d_Υ = Depth factors
i_c, i_q, i_Υ = Ground inclination factors
Rw_1, Rw_2 = Water table correction factors
F.S = Factor of safety

The bearing capacity factors N_c, N_q, N_Υ depends on the angle of shearing resistance of the soil ϕ (in degrees) as in the table given below:

Table 5: Bearing capacity factors

Φ	Nc	Nq	Nγ
0	5.14	1	0
5	6.49	1.57	0.45
10	8.35	2.47	1.22
15	10.98	3.94	2.65
20	14.83	6.4	5.39
25	20.72	10.66	10.88
30	30.14	18.4	22.4
35	46.12	33.3	48.03
40	75.31	64.2	109.41
45	138.88	134.88	271.76
50	266.89	319.07	762.89

For obtaining values of N'_c, N'_q and N'_γ, calculate $\phi' = \tan^{-1}(2/3 \tan\phi)$ and read N_c, N_q, N_γ from the table above corresponding to the value of ϕ' instead of ϕ which are the values of N'_c, N'_q and N'_γ respectively.

The shape factors s_c, s_q, s_γ depends on the type of the base of foundation as in the table given below:

Table 4: Shape factors

S.No.	Shape Of Base	Shape Factors		
		s_c	s_q	s_γ
i)	**Continuous strip**	1.00	1.00	1.00
ii)	**Rectangle**	1 + 0.2 B/L	1 + 0.2 B/L	1 - 0.4 B/L
iii)	**Square**	1.3	1.2	0.8
iv)	**Circle**	1.3	1.2	0.6

The depth factors d_c, d_q, d_γ depends on the angle of shearing resistance of the soil ϕ, base width B and the depth of foundation D_f as given below:

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

$$d_q = d_\gamma = 1 + 0.1\, D_f/B\ \sqrt{N_\phi} \qquad \text{for } \phi < 10°$$

$$d_q = d_\gamma = 1 + 0.1\, D_f/B\ \sqrt{N_\phi} \qquad \text{for } \phi > 10°$$

Where,

$$N_\phi = \tan^2(\pi/4 + \phi/2)$$

The ground inclination factors i_c, i_q, i_γ depends on the inclination of load with vertical α and given as below:

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

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

Where,

α° = inclination of the load with vertical

The effect of water table is considered as follows:

a) If the water table is likely to remain at or below a depth of (D_f + B) beneath the ground level surrounding the footing then W' = 1.
b) If the water table is located at a depth D_f or likely to rise above the base of footing then the value of W' shall be taken as 0.5.
c) If the water table is likely to remain at depth $D_f < D_w < (D_f + B)$, then the value of W' be obtained by linear interpolation.

The bearing capacity computation has been done for the worst water table condition in line with the saturation of base of the shallow foundation during the monsoon.

Settlement Criteria (IS: 8009 (Part I) –1976)

Granular soil

To check bearing capacity of granular soil on the basis of settlement criteria for the probable allowable settlement for different sizes based on standard penetration test is carried out.

Clayey soil

To check bearing capacity on the basis of settlement criteria of clayey soil the following relation can been used. To determine probable allowable settlement for different sizes based on consolidation test the relation presented below is to be used.

$$\delta = m_v * \Delta p * D_s$$

Where,

δ	=	Expected Settlement
m_v	=	Coefficient of volume compressibility
Δp	=	Increase in Pressure
Ds	=	Significant Depth

Using the appropriate relationships suggested above the analyses was carried out for 65mm allowable settlement. The bearing capacity is computed for the worst condition. The details of the analysis are shown in **Table 7**.

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Table 7

Isolated Foundation With Different Sizes And Depths

Location:Kohalpur, Banke

COMPUTATION OF BEARING CAPACITY FROM SHEAR FAILURE CRITERIA

Description	Unit	Symbol	Data									Remarks
BH no	-	-	BH 1									
Soil Type			Cohesive			Cohesive			Granular			
Depth	m	D_f	1.5	1.5	1.5	2	2	2	3	3	3	
Width	m	B	1.5	2	3	1.5	2	3	1.5	2	3	
Length	m	L	1.5	2	3	1.5	2	3	1.5	2	3	
Unit Weight of Soil	kN/m^3	γ	18	18	18	18	18	18	18	18	18	
Saturated Unit Weight of Soil	kN/m^3	γ_{sat}	19	19	19	19	19	19	19	19	19	
Depth to water Table	m	Dw	0	0	0	0	0	0	0	0	0	
Undrained shear strength	kN/m^2	Cu	45	45	45	45	45	45	0	0	0	
Design SPT Value	-	N_{design}	10	11	10	14	14	12	14	12	11	
Shape factors	-	S_c	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	
	-	S_q	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
	-	S_γ	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Depth factors	-	d_c	1.20	1.15	1.10	1.27	1.20	1.13	1.71	1.53	1.35	
	-	d_q	1.00	1.00	1.00	1.00	1.00	1.00	1.35	1.27	1.17	
	-	d_γ	1.00	1.00	1.00	1.00	1.00	1.00	1.35	1.27	1.17	
Angle of internal friction	degrees	ϕ	0	0	0	0	0	0	31	31	30	
Bearing Capacity factors	-	N_c	5.14	5.14	5.14	5.14	5.14	5.14	21.66	21.66	18.08	
	-	N_q	1.00	1.00	1.00	1.00	1.00	1.00	11.79	11.79	8.88	
	-	N_γ	0.00	0.00	0.00	0.00	0.00	0.00	13.15	13.15	8.81	
Water Table Correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Effective overburden	kN/m^2	q'	13.79	13.79	13.79	18.38	18.38	18.38	27.57	27.57	27.57	
Net Ultimate Bearing capacity	kN/m^2	q_{nu}	360.83	345.79	330.76	380.87	360.83	340.78	579.43	571.55	417.57	
Factor of Safety	-	F	3	3	3	3	3	3	3	3	3	
Net Safe Bearing capacity	kN/m2	q_{ns}	120	115	110	127	120	114	193	191	139	

COMPUTATION OF SETTLEMENT OF UNDERLYING CLAY LAYER

Description	Unit	Symbol	Data									Remarks
Depth to Center of First Clay Layer	m	Dc	0.75	0.75	0.75	0.50	0.50	0.50	2.13	2.50	3.25	
Thickness of First Compressible Layer	m	D_s	1.50	1.50	1.50	1.00	1.00	1.00	0.25	1.00	2.50	
Equivalent Width	m	Be	2.25	2.75	3.75	2.00	2.50	3.50	3.63	4.50	6.25	
Equivalent Length	m	Le	2.25	2.75	3.75	2.00	2.50	3.50	3.63	4.50	6.25	
Increase in Pressure	kN/m^2	Dp	95.56	95.74	80.64	143.44	143.36	102.86	573.43	143.41	57.37	
Expected Settlement of First Layer	mm	δ1	65	65	54	65	65	46	65	65	65	
Depth to Center of Second Clay Layer from FL	m	Dc	-	-	4.00	-	-	3.75	-	-	-	
Thickness of Second Compressible Layer	m	D_s	-	-	1.00	-	-	1.50	-	-	-	
Equivalent Width	m	Be	-	-	7.00	-	-	6.75	-	-	-	
Equivalent Length	m	Le	-	-	7.00	-	-	6.75	-	-	-	
Increase in Pressure	kN/m^2	Dp	-	-	23.14	-	-	27.65	-	-	-	
Expected Settlement of Second Layer	mm	δ2	-	-	10	-	-	19	-	-	-	
Total Expected Settlement	mm	δ	65	65	65	65	65	65	65	65	65	
Coefficient of Volume Compressibility	m^2/kN	m_V	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	0.00045	
Net safe Bearing Capacity	kN/m^2	q_{ns}	215	181	126	255	224	140	3349	726	249	

COMPUTATION OF BEARING CAPACITY FROM SETTLEMENT CRITERIA

Description	Unit	Symbol	Data									Remarks
Allowable settlement	mm	S	-	-	-	-	-	-	50	50	50	
Water Table correction Factor	-	W'	-	-	-	-	-	-	0.50	0.50	0.50	
Net Safe Bearing capacity	kN/m^2	q_{ns}	-	-	-	-	-	-	127	93	74	

CHECK AGAINST OVERSTRESSING

Description	Unit	Symbol	Data									Remarks
Depth to top of Clay Layer from FL	m	DT	3.50	3.50	3.50	3.00	3.00	3.00	2.00	2.00	2.00	**For safety against overstressing. $q_T \leq q_S$**
Equivalent Width	m	Be	5.00	5.50	6.50	4.50	5.00	6.00	3.50	4.00	5.00	
Equivalent Length	m	Le	5.00	5.50	6.50	4.50	5.00	6.00	3.50	4.00	5.00	
Pressure on Top of Clay Layer	kN/m^2	q_T	10.82	15.24	23.49	14.11	19.24	28.40	23.40	23.13	26.72	
Undrained shear strength	KN/m2	Cu	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	
Bearing Capacity Factor	-	N_C	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	
Net safe Bearing Capacity	kN/m^2	Q_{net}	231.30	231.30	231.30	231.30	231.30	231.30	231.30	231.30	231.30	
Net Safe Bearing Capacity	kN/m^2	q_S	77.10	77.10	77.10	77.10	77.10	77.10	77.10	77.10	77.10	
Remarks	$q_t < q_S$ OK		OK	OK	OK	OK	OK	OK	OK	OK	OK	

PROPOSED NEPAL MEDICAL COLLEGE

Table 7

Isolated Foundation With Different Sizes And Depths

Location:Kohalpur, Banke

COMPUTATION OF BEARING CAPACITY FROM SHEAR FAILURE CRITERIA

Description	Unit	Symbol	Data									Remarks
BH no	-	-	BH 2									
Soil Type			Cohesive			Cohesive			Granular			
Depth	m	D_f	1.5	1.5	1.5	2	2	2	3	3	3	
Width	m	B	1.5	2	3	1.5	2	3	1.5	2	3	
Length	m	L	1.5	2	3	1.5	2	3	1.5	2	3	
Unit Weight of Soil	kN/m^3	γ	18	18	18	18	18	18	18	18	18	
Saturated Unit Weight of Soil	kN/m^3	γ_{sat}	19	19	19	19	19	19	19	19	19	
Depth to water Table	m	Dw	0	0	0	0	0	0	0	0	0	
Undrained shear strength	kN/m^2	Cu	48	48	48	48	48	48	0	0	0	
Design SPT Value	-	N_{design}	11	12	14	15	14	16	14	16	19	
Shape factors	-	S_c	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	
	-	S_q	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
	-	S_γ	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Depth factors	-	d_c	1.20	1.15	1.10	1.27	1.20	1.13	1.71	1.54	1.37	
	-	d_q	1.00	1.00	1.00	1.00	1.00	1.00	1.35	1.27	1.18	
	-	d_γ	1.00	1.00	1.00	1.00	1.00	1.00	1.35	1.27	1.18	
Angle of internal friction	degrees	ϕ	0	0	0	0	0	0	31	32	33	
Bearing Capacity factors	-	N_c	5.14	5.14	5.14	5.14	5.14	5.14	21.66	25.89	30.78	
	-	N_q	1.00	1.00	1.00	1.00	1.00	1.00	11.79	15.37	19.61	
	-	N_γ	0.00	0.00	0.00	0.00	0.00	0.00	13.15	18.71	25.50	
Water Table Correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Effective overburden	kN/m^2	q'	13.79	13.79	13.79	18.38	18.38	18.38	27.57	27.57	27.57	
Net Ultimate Bearing capacity	kN/m^2	q_{nu}	384.88	368.85	352.81	406.27	384.88	363.50	579.43	775.30	1055.26	
Factor of Safety	-	F	3	3	3	3	3	3	3	3	3	
Net Safe Bearing capacity	kN/m2	q_{ns}	128	123	118	135	128	121	193	258	352	

COMPUTATION OF SETTLEMENT OF UNDERLYING CLAY LAYER

Description	Unit	Symbol	Data									Remarks
Depth to Center of First Clay Layer	m	Dc	0.75	0.75	0.75	0.50	0.50	0.50	-	-	-	
Thickness of First Compressible Layer	m	D_s	1.50	1.50	1.50	1.00	1.00	1.00	-	-	-	
Equivalent Width	m	Be	2.25	2.75	3.75	2.00	2.50	3.50	-	-	-	
Equivalent Length	m	Le	2.25	2.75	3.75	2.00	2.50	3.50	-	-	-	
Increase in Pressure	kN/m^2	Dp	100.00	100.50	100.48	150.19	150.40	150.61	-	-	-	
Total Expected Settlement	mm	δ	65	65	65	65	65	65	-	-	-	
Coefficient of Volume Compressibility	m^2/kN	m_V	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	-	-	-	
Net safe Bearing Capacity	kN/m^2	q_{ns}	225	190	157	267	235	205	-	-	-	

COMPUTATION OF BEARING CAPACITY FROM SETTLEMENT CRITERIA

Description	Unit	Symbol	Data									Remarks
Allowable settlement	mm	S	-	-	-	-	-	-	50	50	50	
Water Table correction Factor	-	W'	-	-	-	-	-	-	0.50	0.50	0.50	
Net Safe Bearing capacity	kN/m^2	q_{ns}	-	-	-	-	-	-	127	140	152	

CHECK AGAINST OVERSTRESSING

Description	Unit	Symbol	Data									Remarks
Depth to top of Clay Layer from FL	m	DT	7.00	7.00	7.00	6.50	6.50	6.50	5.50	5.50	5.50	
Equivalent Width	m	Be	8.50	9.00	10.00	8.00	8.50	9.50	7.00	7.50	8.50	
Equivalent Length	m	Le	8.50	9.00	10.00	8.00	8.50	9.50	7.00	7.50	8.50	
Pressure on Top of Clay Layer	kN/m^2	q_T	4.00	6.07	10.58	4.76	7.10	12.08	5.85	9.95	18.99	**For safety against overstressing. $q_T \leq q_S$**
Undrained shear strength	KN/m2	Cu	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	
Bearing Capacity Factor	-	N_C	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	
Net safe Bearing Capacity	kN/m^2	Q_{net}	246.72	246.72	246.72	246.72	246.72	246.72	246.72	246.72	246.72	
Net Safe Bearing Capacity	kN/m^2	q_S	82.24	82.24	82.24	82.24	82.24	82.24	82.24	82.24	82.24	
Remarks	$q_t<q_S$ OK		OK	OK	OK	OK	OK	OK	OK	OK	OK	

PROPOSED NEPAL MEDICAL COLLEGE

Table 7

Isolated Foundation With Different Sizes And Depths

Location:Kohalpur, Banke

COMPUTATION OF BEARING CAPACITY FROM SHEAR FAILURE CRITERIA

Description	Unit	Symbol	Data									Remarks
BH no	-	-	BH 3									
Soil Type			Granular			Granular			Granular			
Depth	m	D_f	1.5	1.5	1.5	2	2	2	3	3	3	
Width	m	B	1.5	2	3	1.5	2	3	1.5	2	3	
Length	m	L	1.5	2	3	1.5	2	3	1.5	2	3	
Unit Weight of Soil	kN/m^3	γ	18	18	18	18	18	18	18	18	18	
Saturated Unit Weight of Soil	kN/m^3	γ_{sat}	19	19	19	19	19	19	19	19	19	
Depth to water Table	m	Dw	0	0	0	0	0	0	0	0	0	
Undrained shear strength	kN/m^2	Cu	0	0	0	0	0	0	0	0	0	
Design SPT Value	-	N_{design}	17	15	15	14	12	13	12	13	13	
Shape factors	-	S_c	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	
	-	S_q	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
	-	S_γ	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Depth factors	-	d_c	1.36	1.27	1.18	1.47	1.35	1.24	1.71	1.53	1.35	
	-	d_q	1.18	1.14	1.09	1.24	1.18	1.12	1.35	1.27	1.18	
	-	d_γ	1.18	1.14	1.09	1.24	1.18	1.12	1.35	1.27	1.18	
Angle of internal friction	degrees	ϕ	32	32	32	31	31	31	31	31	31	
Bearing Capacity factors	-	N_c	25.89	25.89	25.89	21.66	21.66	21.66	21.66	21.66	21.66	
	-	N_q	15.37	15.37	15.37	11.79	11.79	11.79	11.79	11.79	11.79	
	-	N_γ	18.71	18.71	18.71	13.15	13.15	13.15	13.15	13.15	13.15	
Water Table Correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Effective overburden	kN/m^2	q'	13.79	13.79	13.79	18.38	18.38	18.38	27.57	27.57	27.57	
Net Ultimate Bearing capacity	kN/m^2	q_{nu}	399.90	422.86	479.51	381.91	391.55	424.86	579.43	571.55	587.33	
Factor of Safety	-	F	3	3	3	3	3	3	3	3	3	
Net Safe Bearing capacity	kN/m2	q_{ns}	133	141	160	127	131	142	193	191	196	

COMPUTATION OF SETTLEMENT OF UNDERLYING CLAY LAYER

Description	Unit	Symbol	Data									Remarks
Depth to Center of First Clay Layer	m	Dc	-	2.75	3.50	2.13	2.50	3.00	1.63	2.00	2.00	
Thickness of First Compressible Layer	m	D_s	-	0.50	2.00	0.25	1.00	2.00	1.25	2.00	2.00	
Equivalent Width	m	Be	-	4.75	6.50	3.63	4.50	6.00	3.13	4.00	5.00	
Equivalent Length	m	Le	-	4.75	6.50	3.63	4.50	6.00	3.13	4.00	5.00	
Increase in Pressure	kN/m^2	Dp	-	274.61	68.80	548.95	137.28	68.75	109.90	68.75	68.76	
Total Expected Settlement	mm	δ	-	65	65	65	65	65	65	65	65	
Coefficient of Volume Compressibility	m^2/kN	m_V	-	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	0.00047	
Net safe Bearing Capacity	kN/m^2	q_{ns}	-	1549	323	3206	695	275	477	275	191	

COMPUTATION OF BEARING CAPACITY FROM SETTLEMENT CRITERIA

Description	Unit	Symbol	Data									Remarks
Allowable settlement	mm	S	50	50	50	50	50	50	50	50	50	
Water Table correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Net Safe Bearing capacity	kN/m^2	q_{ns}	163	133	120	127	93	92	102	103	92	

CHECK AGAINST OVERSTRESSING

Description	Unit	Symbol	Data									Remarks
Depth to top of Clay Layer from FL	m	DT	2.50	2.50	2.50	2.00	2.00	2.00	1.00	1.00	1.00	**For safety against overstressing. $q_T \leq q_S$**
Equivalent Width	m	Be	4.00	4.50	5.50	3.50	4.00	5.00	2.50	3.00	4.00	
Equivalent Length	m	Le	4.00	4.50	5.50	3.50	4.00	5.00	2.50	3.00	4.00	
Pressure on Top of Clay Layer	kN/m^2	q_T	18.75	26.27	35.76	23.38	23.13	33.04	36.79	45.76	51.62	
Undrained shear strength	KN/m2	Cu	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00	
Bearing Capacity Factor	-	N_C	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	
Net safe Bearing Capacity	kN/m^2	Q_{net}	241.58	241.58	241.58	241.58	241.58	241.58	241.58	241.58	241.58	
Net Safe Bearing Capacity	kN/m^2	q_S	80.53	80.53	80.53	80.53	80.53	80.53	80.53	80.53	80.53	
Remarks	$q_t < q_S$ OK		OK	OK	OK	OK	OK	OK	OK	OK	OK	

PROPOSED NEPAL MEDICAL COLLEGE

Table 7

Spread Foundation With Different Sizes And Depths

Location:Kohalpur, Banke

COMPUTATION OF BEARING CAPACITY FROM SHEAR FAILURE CRITERIA

Description	Unit	Symbol	Data									Remarks
BH no	-	-	BH 4									
Soil Type			Granular			Granular			Cohesive			
Depth	m	D_f	1.5	1.5	1.5	2	2	2	3	3	3	
Width	m	B	1.5	2	3	1.5	2	3	1.5	2	3	
Length	m	L	1.5	2	3	1.5	2	3	1.5	2	3	
Unit Weight of Soil	kN/m^3	γ	18	18	18	18	18	18	18	18	18	
Saturated Unit Weight of Soil	kN/m^3	γ_{sat}	19	19	19	19	19	19	19	19	19	
Depth to water Table	m	Dw	0	0	0	0	0	0	0	0	0	
Undrained shear strength	kN/m^2	Cu	0	0	0	0	0	0	51	51	51	
Design SPT Value	-	N_{design}	21	21	21	15	14	14	14	20	22	
Shape factors	-	S_c	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	
	-	S_q	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
	-	S_γ	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Depth factors	-	d_c	1.37	1.28	1.18	1.48	1.35	1.24	1.40	1.30	1.20	
	-	d_q	1.18	1.14	1.09	1.24	1.18	1.12	1.00	1.00	1.00	
	-	d_γ	1.18	1.14	1.09	1.24	1.18	1.12	1.00	1.00	1.00	
Angle of internal friction	degrees	ϕ	33	33	33	32	31	31	0	0	0	
Bearing Capacity factors	-	N_c	30.78	30.78	30.78	25.89	21.66	21.66	5.14	5.14	5.14	
	-	N_q	19.61	19.61	19.61	15.37	11.79	11.79	1.00	1.00	1.00	
	-	N_γ	25.50	25.50	25.50	18.71	13.15	13.15	0.00	0.00	0.00	
Water Table Correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Effective overburden	kN/m^2	q'	13.79	13.79	13.79	18.38	18.38	18.38	27.57	27.57	27.57	
Net Ultimate Bearing capacity	kN/m^2	q_{nu}	527.63	559.36	636.99	518.57	391.55	424.86	477.09	443.02	408.94	
Factor of Safety	-	F	3	3	3	3	3	3	3	3	3	
Net Safe Bearing capacity	kN/m2	q_{ns}	176	186	212	173	131	142	159	148	136	

COMPUTATION OF SETTLEMENT OF UNDERLYING CLAY LAYER

Description	Unit	Symbol	Data									Remarks
Depth to Center of First Clay Layer	m	Dc	1.88	2.25	2.50	1.63	2.00	2.00	1.00	1.00	1.00	
Thickness of First Compressible Layer	m	D_s	0.75	1.50	2.00	1.25	2.00	2.00	2.00	2.00	2.00	
Equivalent Width	m	Be	3.38	4.25	5.50	3.13	4.00	5.00	2.50	3.00	4.00	
Equivalent Length	m	Le	3.38	4.25	5.50	3.13	4.00	5.00	2.50	3.00	4.00	
Increase in Pressure	kN/m^2	Dp	200.10	100.10	75.27	120.04	75.00	75.24	75.24	75.11	75.38	
Total Expected Settlement	mm	δ	65	65	65	65	65	65	65	65	65	
Coefficient of Volume Compressibility	m^2/kN	m_V	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	
Net safe Bearing Capacity	kN/m^2	q_{ns}	1013	452	253	521	300	209	209	169	134	

COMPUTATION OF BEARING CAPACITY FROM SETTLEMENT CRITERIA

Description	Unit	Symbol	Data									Remarks
Allowable settlement	mm	S	50	50	50	50	50	50	-	-	-	
Water Table correction Factor	-	W'	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	
Net Safe Bearing capacity	kN/m^2	q_{ns}	211	189	173	145	116	104	-	-	-	

CHECK AGAINST OVERSTRESSING

Description	Unit	Symbol	Data									Remarks
Depth to top of Clay Layer from FL	m	DT	1.50	1.50	1.50	1.00	1.00	1.00	8.00	8.00	8.00	**For safety against overstressing. $q_T \leq q_S$**
Equivalent Width	m	Be	3.00	3.50	4.50	2.50	3.00	4.00	9.50	10.00	11.00	
Equivalent Length	m	Le	3.00	3.50	4.50	2.50	3.00	4.00	9.50	10.00	11.00	
Pressure on Top of Clay Layer	kN/m^2	q_T	43.97	60.88	76.84	52.33	51.58	58.54	3.96	5.91	9.97	
Undrained shear strength	KN/m2	Cu	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	
Bearing Capacity Factor	-	N_C	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	
Net safe Bearing Capacity	kN/m^2	Q_{net}	262.14	262.14	262.14	262.14	262.14	262.14	262.14	262.14	262.14	
Net Safe Bearing Capacity	kN/m^2	q_S	87.38	87.38	87.38	87.38	87.38	87.38	87.38	87.38	87.38	
Remarks	$q_t<q_S$ OK		OK	OK	OK	OK	OK	OK	OK	OK	OK	

6.3.3 Coefficient of sub-grade reaction(K)

For the design of foundation the sub-grade modulus can be used which is defined as the unit pressure required to produce a unit settlement. This can be determined through plate load test directly which is both costly and time consuming hence indirectly through empirical relation proposed by Bowles or standard charts proposed by different designers it can be easily determined. The detail of the calculation based on the relation presented below and the computed values are presented in table 8 below.

i) Bowle's equation as:

i) $K = 25*(SF)*q_{all}$

Where,

K	=	Modulus of subgrade rxn KN/m^3
qall	=	allowable bearing capacity KN/m^2
FS	=	Factor of safety

ii) Design chart:

Table 8: Coefficient of Sub-grade Reaction

Soil	Type	Ks(MN/m^3)
Sand(dry or moist)	Loose	8-25
	Medium	25-125
	Dense	125-375
Sand Submerged	Loose	10-15
	Medium	35-40
	Dense	130-150
Clay	Stiff(qu=100-200KN/m^2)	12-15
	Very Stiff(qu=200-400KN/m^2)	25-50
	Hard(qu>400KN/m^2)	>50

A Summary of bearing capacity is given in **Table 9** below.

Table-9

BH 1

Summary Of Bearing Capacity of Isolated Foundation With Different Sizes And Depths

Bore Hole	Soil Type	Depth(m)	Foundation Size(B×L)	Unit Wt(ϒ) (kN/m^2)	Angle of internal Friction(Ø)	Cohesion C	Net Safe Bearing Capacity		Allowable Bearing Capacity (kN/m^2)	Modulus of subgrade reaction (MN/m^3)
							Shear (kN/m^2)	Settlement (kN/m^2)		
BH 1	Cohesive	1.5	1.5 × 1.5	18	0	45	120	215	120	8
			2.0 × 2.0	18	0	45	115	181	115	7
			3.0 × 3.0	18	0	45	110	126	110	7
	Cohesive	2	1.5 × 1.5	18	0	45	127	255	125	8
			2.0 × 2.0	18	0	45	120	224	120	8
			3.0 × 3.0	18	0	45	114	140	110	7
	Granular	3	1.5 × 1.5	18	31	0	193	127	125	8
			2.0 × 2.0	18	31	0	191	93	90	6
			3.0 × 3.0	18	30	0	139	74	70	4

Table-9

BH 2

Summary Of Bearing Capacity of Isolated Foundation With Different Sizes And Depths

Bore Hole	Soil Type	Depth(m)	Foundation Size(B×L)	Unit Wt(ϒ) (kN/m^2)	Angle of internal Friction(Ø)	Cohesion C	Net Safe Bearing Capacity		Allowable Bearing Capacity (kN/m^2)	Modulus of subgrade reaction (MN/m^3)
							Shear (kN/m^2)	Settlement (kN/m^2)		
BH 2	Cohesive	1.5	1.5 × 1.5	18	0	48	128	225	125	8
			2.0 × 2.0	18	0	48	123	190	120	8
			3.0 × 3.0	18	0	48	118	157	115	7
	Cohesive	2	1.5 × 1.5	18	0	48	135	267	135	8
			2.0 × 2.0	18	0	48	128	235	125	8
			3.0 × 3.0	18	0	48	121	205	120	8
	Granular	3	1.5 × 1.5	18	31	0	193	127	125	8
			2.0 × 2.0	18	32	0	258	140	135	8
			3.0 × 3.0	18	33	0	352	152	150	9

Table-9

BH 3

Summary Of Bearing Capacity of Isolated Foundation With Different Sizes And Depths

Bore Hole	Soil Type	Depth(m)	Foundation Size(B×L)	Unit Wt(ϒ) (kN/m^2)	Angle of internal Friction(Ø)	Cohesion C	Net Safe Bearing Capacity		Allowable Bearing Capacity (kN/m^2)	Modulus of subgrade reaction (MN/m^3)
							Shear (kN/m^2)	Settlement (kN/m^2)		
BH 3	Granular	1.5	1.5 × 1.5	18	32	0	133	163	130	8
			2.0 × 2.0	18	32	0	141	133	130	8
			3.0 × 3.0	18	32	0	160	120	120	8
	Granular	2	1.5 × 1.5	18	31	0	127	127	125	8
			2.0 × 2.0	18	31	0	131	93	90	6
			3.0 × 3.0	18	31	0	142	92	90	6
	Granular	3	1.5 × 1.5	18	31	0	193	102	100	6
			2.0 × 2.0	18	31	0	191	103	100	6
			3.0 × 3.0	18	31	0	196	92	90	6

Table-9

BH 4

Summary Of Bearing Capacity of Spread Foundation With Different Sizes And Depths

Bore Hole	Soil Type	Depth(m)	Foundation Size(B×L)	Unit Wt(ϒ) (kN/m^2)	Angle of internal Friction(Ø)	Cohesion C	Net Safe Bearing Capacity		Allowable Bearing Capacity (kN/m^2)	Modulus of subgrade reaction (MN/m^3)
							Shear (kN/m^2)	Settlement (kN/m^2)		
BH 4	Granular	1.5	1.5 × 1.5	18	33	0	176	211	175	11
			2.0 × 2.0	18	33	0	186	189	185	12
			3.0 × 3.0	18	33	0	212	173	170	11
	Granular	2	1.5 × 1.5	18	32	0	173	145	145	9
			2.0 × 2.0	18	31	0	131	116	115	7
			3.0 × 3.0	18	31	0	142	104	100	6
	Cohesive	3	1.5 × 1.5	18	0	51	159	209	155	10
			2.0 × 2.0	18	0	51	148	169	145	9
			3.0 × 3.0	18	0	51	136	134	130	8

7. Evaluation of Peak Ground Acceleration and Probable EQ Magnitude

A strong (7.8), 2015 April 25 earthquake hit Nepal in the area near Barpak, a mountain village between capital Kathmandu and tourist town Pokhara. The earthquake was followed by many powerful aftershocks and a new earthquake (6.7) hit Nepal on Sunday April 26. The earthquakes caused extensive damage to buildings and thousands of deaths and injuries and were even felt in Pakistan, India and Bangladesh. Many (historic) buildings collapsed, temples have been ruined, roads destroyed. Nearly 8000 deaths in Nepal and tens of deaths in India & Tibet. The quake was followed by more than 200 aftershocks and another huge earthquake (7.3) on May 12.

.The Seismic Hazard Map of Nepal as suggested by **(NBC 105:2019)**) shows that the Peak Ground Acceleration of study area is around 400 gal (0.40g). The Map is shown in **Figure 2.**

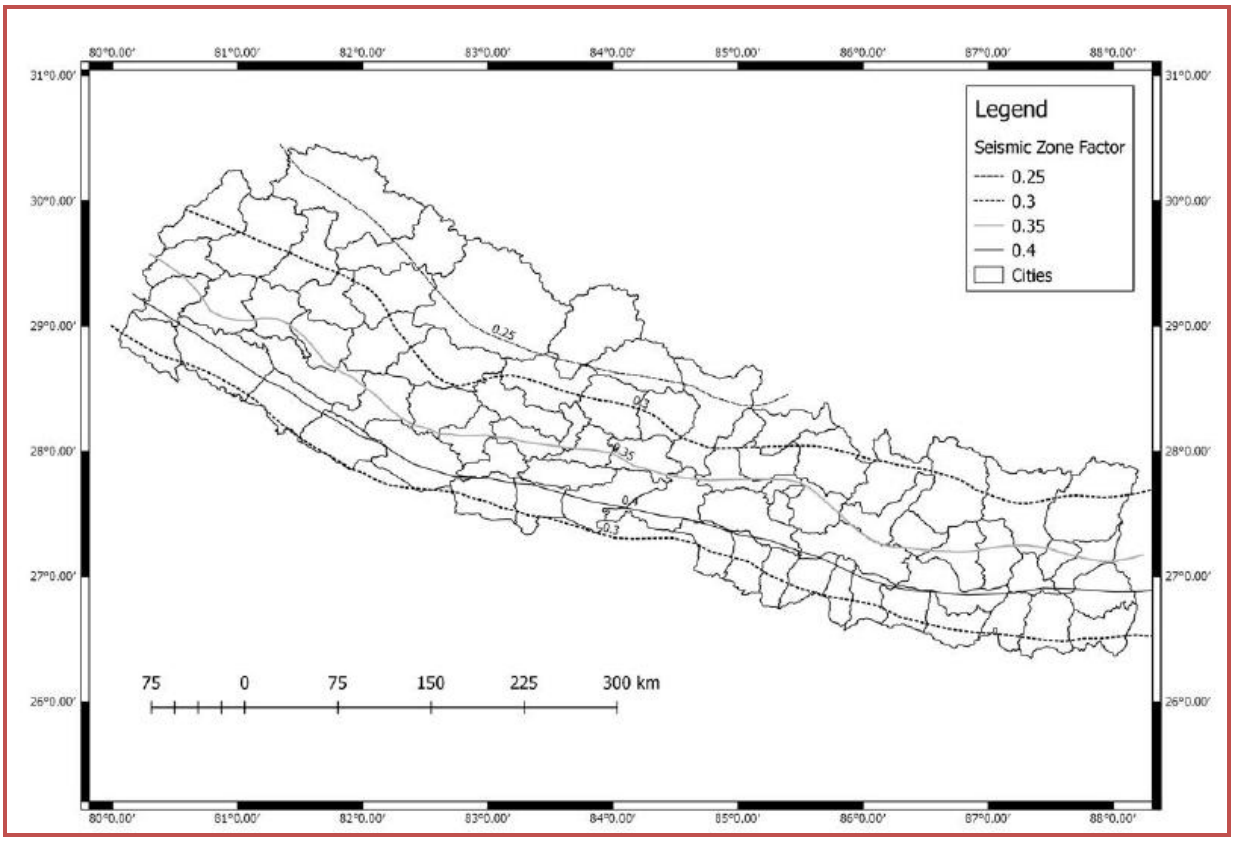

Figure 2: Seismic Zoning Map of Nepal
Source: (NBC 105:2019) National Building Code of Nepal

The Seismic Zoning Map of Nepal as presented in fig 2 and table 10 as suggested by Nepal National building code **(NBC 105:2019)** shows that the Peak Ground Acceleration of area is 400 gal (0.40 g). The table is shown in **Table 10.**

Table10: Seismic Zoning factors for selected cities and municipalities (**NBC 105:2019**)

Cities/Municipalities	PGA	Cities/Municipalities	PGA
Baglung	0.3	Janakpur	0.3
Beni	0.3	Jomsom	0.25
Besishar	0.3	Jumla	0.3
Bharatpur	0.4	Kalaiya	0.3
Bhimdatta	0.3	Kamalamai	0.4
Bhimeshwar	0.3	Kapilbastu	0.3
Bhojpur	0.35	Kathmandu	0.35
Bidur	0.3	Khalanga	0.3
Biratnagar	0.3	Khandbari	0.3
Birendranagar	0.35	Kusma	0.3
Birgunj	0.3	Lahan	0.3
Butwal	0.3	Libang	0.35
Chainpur	0.3	Malangwa	0.3

Where,

PHA = Peak Horizontal Acceleration in cm/sec^2

Using M = 7.6 (assumed for the site), we get,PHA = 400 cm/sec^2 = 0.40g

As per the above references the PHA value is 0.40g hence, due to the site specific importance 0.40g is used in the analysis.

8. LIQUEFACTION/DENSIFICATION SUCEPTABILITY

8.1 General

The liquefaction phenomena occur in saturated cohesionless soil. The generation of excess pore pressure below water table under undrained condition is a hall mark of liquefaction phenomena. Under earthquake a rapid dynamic loading takes place. As a result there is tendency of saturated sandy soil for densification but it cannot. This trend increases excess pore water pressure in saturated sand to rise and the effective stress to decrease. If the effective stress of soil becomes zero, the soil behaves as a liquid and any weight lying above it sinks in a level ground or soil flows like water in sloppy areas.

In Nepal Laboratory Testing facility for liquefaction analysis is not available. As liquefaction occurs in sands and non-plastic silty sands, simulation of field condition in the laboratory is very much difficult. Thus results of field test is much preferred and widely used.

Over the years a number of approaches to evaluation for potential for initiation of liquefaction haven developed. Out of these, the most common is the **cyclic stress approach** developed H B Seed between 1960s and 1970s at the University of California, Berkley. Liquefaction occurs when cyclic shear stress induced by a certain earthquake exceeds the shear strength of soil.

The cyclic stress approach is conceptually is quite simple. In this approach the earthquake induced loading is expressed in terms of cyclic shear stresses. It is then compared with the liquefaction resistance of the soil which is also expressed in terms of cyclic shear stresses. If the loading exceeds the soil resistance liquefaction is expected to occur.

Seed and Idriss (1971) has given a simplified procedure to obtain uniform cyclic shear stress for level ground or gently sloping sites using SPT test. Since, then a lot of advancement in the liquefaction study has taken place. Accordingly in this report, simplified procedure for evaluation of liquefaction potential suggested by IS 1893 (Part 1) : 2016 has been used.

8.2 Load Characterization

Seed and Idriss (1971) has given a simplified procedure to obtain uniform cyclic shear stress for level ground or gently sloping sites. The suggested relation is:

$$\tau_{max} = \frac{a_{max}}{g} \times \frac{\sigma_v}{\sigma_v'} \times r_d$$

$$\tau_{cyc} = 0.65 \times \frac{a_{max}}{g} \times \frac{\sigma_v}{\sigma_v'} \times r_d$$

Where,

τ_{max} = Maximum shear stress
a_g = Peak ground surface acceleration
g = Acceleration due to gravity
σ_v = Total vertical stress
σ_v' = Effective vertical stress
r_d = Stress reduction factor at the depth of interest

The stress reduction factor is evaluated as:

$r_d = 1 - 0.00765 \times z$ for $0 < z \leq 9.15\ m$
$r_d = 1.174 - 0.0267 \times z$ for $9.15 < z \leq 23.0\ m$

8.3 Resistance Characterization

The cyclic resistance ratio CRR is obtained by correcting standard cyclic resistance ratio $CRR_{7.5}$ for earthquake magnitude, high overburden stress level and high initial static shear stress using:

$$CRR = CRR_{7.5}(MSF)K_\sigma K_\alpha$$

Where,

$CRR_{7.5}$ = standard cyclic resistance ratio for a 7.5 magnitude earthquake
MSF = magnitude scaling factor given by following equation:

$$MSF = 10^{2.24}/M_w^{2.56}$$

K_σ = correction for high overburden stress (required for depth > 15m)
K_α = correction for static shear stresses (only required for sloping ground)

In most of the countries the Standard Penetration test (SPT) has been the most commonly used in-situ test for characterization of liquefaction resistance. The SPT blow count N_{60} for a hammer efficiency of 60 percent is evaluated and normalized to an effective overburden pressure using:

$$(N_1)_{60} = C_N N_{60}$$

Where,

$(N_1)_{60}$ = Corrected SPT value
C_N = Overburden Correction Factor given by:

$$C_N = \sqrt{\frac{P_a}{\sigma_v'}} \leq 1.7$$

P_a = Atmospheric pressure

σ_v' = Effective vertical stress

N_{60} = Standard penetration test blow count for a hammer efficiency of 60 percent given as:

$$N_{60} = NC_{60}$$

C_{60} = Correction for hammer efficiency given by:

$$C_{60} = \frac{E_m}{0.6 \times E_{ff}}$$

E_m = Actual hammer efficiency

E_{ff} = Theoritical free fall hammer efficiency

N = Measured SPT blow count

The effect of fines content FC (in percent) can be rationally accounted by correcting $(N_1)_{60}$ and finding $(N_1)_{60cs}$ as follows:

$$(N_1)_{60cs} = \alpha + \beta (N_1)_{60}$$

Where,

$\alpha = 0$	$\beta = 1$	for $FC \leq 5$ percent
$\alpha = e^{\left(1.76 - \frac{190}{FC^2}\right)}$	$\beta = 0.99 + \frac{FC^{1.5}}{1000}$	for $5 < FC < 35$ percent
$\alpha = 0.5$	$\beta = 1.2$	for $FC \geq 35$ percent

Hence, Standard Cyclic Resistance Ratio $CRR_{7.5}$ is given by:

$$CRR_{7.5} = \frac{1}{34 - (N_1)_{60cs}} + \frac{(N_1)_{60cs}}{135} + \frac{50}{[10 \times (N_1)_{60cs} + 45]^2} - \frac{1}{200}$$

This equation is valid for $(N_1)_{60} < 30$. For $(N_1)_{60} \geq 30$, clean granular soils are too dense to liquefy and are classed as non-liquefiable

8.4 Factor of Safety

The factor of safety is given by:

$$F = \frac{Cyclic\ \ shear\ stress\ required\ \ for\ \ liquefacti\ on}{Equivalent\ \ cyclic\ \ shear\ stress\ \ induced\ \ by\ earthquake}$$

Using the above mentioned relationships the analysis is to be carried out.

PROPOSED NEPAL MEDICAL COLLEGE **Table 11**

Liquefaction Trigerring Analysis

BH 1 **Location:Kohalpur, Banke**

Input Parameters	Symbol	Unit	Data
Pear Ground Acceleration	a_{max}	-	0.40
Earthquake Magnitude , Ritcher	M	-	7.60
Water Table Depth (m)	D_w	m	4.50
Unit Weight above Water Table	γ	kN/m^3	18.00
Unit Weight below Water Table	γ_{sat}	kN/m^3	19.00
Borehole Diameter	d	mm	150.00
Required Correction for Sampler liners	C_s	-	NO
Required Correction for High Overburden Stress	K_σ	-	NO
Required Correction for Sloping ground	K_α	-	NO

SPT Sample Number	Depth (m)	Measured N	Fines %	Energy Ratio E_R	C_E	C_R	C_S	C_B	N_{60}	σ_{vo}	σ'_{vo}	C_N	$(N_1)_{60}$	For Fines Content		$(N_1)_{60-CS}$	Stress Reduction Coefficient r_d	CSR	MSF	K_σ	K_α	CRR for M = 7.5 & σ'_v = 1 atm	CRR	FOS	REMARKS
														α	β										
1	1.50	6	98	60	1.00	0.75	1.00	1.05	4.73	27.00	27.00	1.70	8.03	0.50	1.20	10.14	0.99	0.26	0.97	1.00	1.00	0.11	0.11	0.43	**NLIQ**
1	3.00	12	24	60	1.00	0.80	1.00	1.05	10.08	54.00	54.00	1.37	13.79	4.18	1.11	19.45	0.98	0.25	0.97	1.00	1.00	0.21	0.20	0.79	**LIQ**
2	4.50	14	24	60	1.00	0.85	1.00	1.05	12.50	81.00	81.00	1.12	13.95	4.18	1.11	19.63	0.97	0.25	0.97	1.00	1.00	0.21	0.20	0.81	**LIQ**
3	6.00	9	98	60	1.00	0.95	1.00	1.05	8.98	109.50	94.79	1.03	9.27	0.50	1.20	11.62	0.95	0.29	0.97	1.00	1.00	0.13	0.12	NA	**NLIQ**
4	7.50	10	98	60	1.00	0.95	1.00	1.05	9.98	138.00	108.57	0.96	9.62	0.50	1.20	12.05	0.94	0.31	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
5	9.00	14	98	60	1.00	0.95	1.00	1.05	13.97	166.50	122.36	0.91	12.69	0.50	1.20	15.73	0.93	0.33	0.97	1.00	1.00	0.17	0.16	NA	**NLIQ**
6	10.50	14	98	60	1.00	1.00	1.00	1.05	14.70	195.00	136.14	0.86	12.66	0.50	1.20	15.69	0.89	0.33	0.97	1.00	1.00	0.17	0.16	NA	**NLIQ**
7	12.00	30	24	60	1.00	1.00	1.00	1.05	31.50	223.50	149.93	0.82	25.85	4.18	1.11	32.81	0.85	0.33	0.97	1.00	1.00	1.08	1.05	NA	**NLIQ**
8	13.50	14	99	60	1.00	1.00	1.00	1.05	14.70	252.00	163.71	0.79	11.55	0.50	1.20	14.36	0.81	0.33	0.97	1.00	1.00	0.15	0.15	NA	**NLIQ**
9	15.00	16	99	60	1.00	1.00	1.00	1.05	16.80	280.50	177.50	0.75	12.67	0.50	1.20	15.71	0.77	0.32	0.97	1.00	1.00	0.17	0.16	NA	**NLIQ**
10	16.50	19	99	60	1.00	1.00	1.00	1.05	19.95	309.00	191.28	0.73	14.50	0.50	1.20	17.90	0.73	0.31	0.97	1.00	1.00	0.19	0.18	NA	**NLIQ**
11	18.00	20	99	60	1.00	1.00	1.00	1.05	21.00	337.50	205.07	0.70	14.74	0.50	1.20	18.19	0.69	0.30	0.97	1.00	1.00	0.19	0.19	NA	**NLIQ**
12	19.50	17	99	60	1.00	1.00	1.00	1.05	17.85	366.00	218.85	0.68	12.13	0.50	1.20	15.05	0.65	0.28	0.97	1.00	1.00	0.16	0.16	NA	**NLIQ**

PROPOSED NEPAL MEDICAL COLLEGE **Table 11**

Liquefaction Trigerring Analysis

BH 2 **Location:Kohalpur, Banke**

Input Parameters	Symbol	Unit	Data
Pear Ground Acceleration	a_{max}	-	0.40
Earthquake Magnitude , Ritcher	M	-	7.60
Water Table Depth (m)	D_w	m	5.00
Unit Weight above Water Table	γ	kN/m^3	18.00
Unit Weight below Water Table	γ_{sat}	kN/m^3	19.00
Borehole Diameter	d	mm	150.00
Required Correction for Sampler liners	C_s	-	NO
Required Correction for High Overburden Stress	K_σ	-	NO
Required Correction for Sloping ground	K_α	-	NO

SPT Sample Number	Depth (m)	Measured N	Fines %	Energy Ratio E_R	C_E	C_R	C_S	C_B	N_{60}	σ_{vo}	σ'_{vo}	C_N	$(N_1)_{60}$	For Fines Content		$(N_1)_{60-CS}$	Stress Reduction Coefficient r_d	CSR	MSF	K_σ	K_α	CRR for M = 7.5 & σ'_v = 1 atm	CRR	FOS	REMARKS
														α	β										
1	1.50	8	98	60	1.00	0.75	1.00	1.05	6.30	27.00	27.00	1.70	10.71	0.50	1.20	13.35	0.99	0.26	0.97	1.00	1.00	0.14	0.14	0.54	**NLIQ**
1	3.00	13	20	60	1.00	0.80	1.00	1.05	10.92	54.00	54.00	1.37	14.93	3.61	1.08	19.74	0.98	0.25	0.97	1.00	1.00	0.21	0.20	0.81	**LIQ**
2	4.50	14	20	60	1.00	0.85	1.00	1.05	12.50	81.00	81.00	1.12	13.95	3.61	1.08	18.68	0.97	0.25	0.97	1.00	1.00	0.20	0.19	0.77	**LIQ**
3	6.00	20	20	60	1.00	0.95	1.00	1.05	19.95	109.50	94.79	1.03	20.59	3.61	1.08	25.84	0.95	0.29	0.97	1.00	1.00	0.31	0.30	1.04	**NLIQ**
4	7.50	32	15	60	1.00	0.95	1.00	1.05	31.92	138.00	108.57	0.96	30.79	2.50	1.05	34.77	0.94	0.31	0.97	1.00	1.00	-1.05	-1.02	NA	**NLIQ**
5	9.00	10	88	60	1.00	0.95	1.00	1.05	9.98	166.50	122.36	0.91	9.06	0.50	1.20	11.38	0.93	0.33	0.97	1.00	1.00	0.13	0.12	NA	**NLIQ**
6	10.50	12	88	60	1.00	1.00	1.00	1.05	12.60	195.00	136.14	0.86	10.85	0.50	1.20	13.52	0.89	0.33	0.97	1.00	1.00	0.15	0.14	NA	**NLIQ**
7	12.00	29	9	60	1.00	1.00	1.00	1.05	30.45	223.50	149.93	0.82	24.99	0.56	1.02	25.97	0.85	0.33	0.97	1.00	1.00	0.31	0.30	0.91	**LIQ**
8	13.50	13	99	60	1.00	1.00	1.00	1.05	13.65	252.00	163.71	0.79	10.72	0.50	1.20	13.37	0.81	0.33	0.97	1.00	1.00	0.14	0.14	NA	**NLIQ**
9	15.00	11	99	60	1.00	1.00	1.00	1.05	11.55	280.50	177.50	0.75	8.71	0.50	1.20	10.96	0.77	0.32	0.97	1.00	1.00	0.12	0.12	NA	**NLIQ**
10	16.50	12	99	60	1.00	1.00	1.00	1.05	12.60	309.00	191.28	0.73	9.16	0.50	1.20	11.49	0.73	0.31	0.97	1.00	1.00	0.13	0.12	NA	**NLIQ**
11	18.00	13	99	60	1.00	1.00	1.00	1.05	13.65	337.50	205.07	0.70	9.58	0.50	1.20	12.00	0.69	0.30	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
12	19.50	12	99	60	1.00	1.00	1.00	1.05	12.60	366.00	218.85	0.68	8.56	0.50	1.20	10.77	0.65	0.28	0.97	1.00	1.00	0.12	0.12	NA	**NLIQ**

PROPOSED NEPAL MEDICAL COLLEGE **Table 11**

Liquefaction Trigerring Analysis

BH 3 **Location:Kohalpur, Banke**

Input Parameters	Symbol	Unit	Data
Pear Ground Acceleration	a_{max}	-	0.40
Earthquake Magnitude , Ritcher	M	-	7.60
Water Table Depth (m)	D_w	m	5.00
Unit Weight above Water Table	γ	kN/m^3	18.00
Unit Weight below Water Table	γ_{sat}	kN/m^3	19.00
Borehole Diameter	d	mm	150.00
Required Correction for Sampler liners	C_s	-	NO
Required Correction for High Overburden Stress	K_σ	-	NO
Required Correction for Sloping ground	K_α	-	NO

SPT Sample Number	Depth (m)	Measured N	Fines %	Energy Ratio E_R	C_E	C_R	C_S	C_B	N_{60}	σ_{vo}	σ'_{vo}	C_N	$(N_1)_{60}$	For Fines Content		$(N_1)_{60-CS}$	Stress Reduction Coefficient r_d	CSR	MSF	K_σ	K_α	CRR for M = 7.5 & σ'_v = 1 atm	CRR	FOS	REMARKS
														α	β										
1	1.50	15	16	60	1.00	0.75	1.00	1.05	11.81	27.00	27.00	1.70	20.08	2.77	1.05	23.93	0.99	0.26	0.97	1.00	1.00	0.27	0.26	1.02	**NLIQ**
1	3.00	12	16	60	1.00	0.80	1.00	1.05	10.08	54.00	54.00	1.37	13.79	2.77	1.05	17.30	0.98	0.25	0.97	1.00	1.00	0.18	0.18	0.70	**LIQ**
2	4.50	11	93	60	1.00	0.85	1.00	1.05	9.82	81.00	81.00	1.12	10.96	0.50	1.20	13.66	0.97	0.25	0.97	1.00	1.00	0.15	0.14	NA	**NLIQ**
3	6.00	15	12	60	1.00	0.95	1.00	1.05	14.96	109.50	94.79	1.03	15.45	1.55	1.03	17.49	0.95	0.29	0.97	1.00	1.00	0.19	0.18	0.63	**LIQ**
4	7.50	14	12	60	1.00	0.95	1.00	1.05	13.97	138.00	108.57	0.96	13.47	1.55	1.03	15.45	0.94	0.31	0.97	1.00	1.00	0.16	0.16	0.51	**LIQ**
5	9.00	15	12	60	1.00	0.95	1.00	1.05	14.96	166.50	122.36	0.91	13.59	1.55	1.03	15.58	0.93	0.33	0.97	1.00	1.00	0.17	0.16	0.49	**LIQ**
6	10.50	12	93	60	1.00	1.00	1.00	1.05	12.60	195.00	136.14	0.86	10.85	0.50	1.20	13.52	0.89	0.33	0.97	1.00	1.00	0.15	0.14	NA	**NLIQ**
7	12.00	11	93	60	1.00	1.00	1.00	1.05	11.55	223.50	149.93	0.82	9.48	0.50	1.20	11.88	0.85	0.33	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
8	13.50	12	93	60	1.00	1.00	1.00	1.05	12.60	252.00	163.71	0.79	9.90	0.50	1.20	12.38	0.81	0.33	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
9	15.00	13	93	60	1.00	1.00	1.00	1.05	13.65	280.50	177.50	0.75	10.30	0.50	1.20	12.86	0.77	0.32	0.97	1.00	1.00	0.14	0.13	NA	**NLIQ**

PROPOSED NEPAL MEDICAL COLLEGE **Table 11**

Liquefaction Trigerring Analysis

BH 4 **Location:Kohalpur, Banke**

Input Parameters	Symbol	Unit	Data
Pear Ground Acceleration	a_{max}	-	0.40
Earthquake Magnitude , Ritcher	M	-	7.60
Water Table Depth (m)	D_w	m	4.00
Unit Weight above Water Table	γ	kN/m^3	18.00
Unit Weight below Water Table	γ_{sat}	kN/m^3	19.00
Borehole Diameter	d	mm	150.00
Required Correction for Sampler liners	C_s	-	NO
Required Correction for High Overburden Stress	K_σ	-	NO
Required Correction for Sloping ground	K_α	-	NO

SPT Sample Number	Depth (m)	Measured N	Fines %	Energy Ratio E_R	C_E	C_R	C_S	C_B	N_{60}	σ_{vo}	σ'_{vo}	C_N	$(N_1)_{60}$	For Fines Content		$(N_1)_{60-CS}$	Stress Reduction Coefficient r_d	CSR	MSF	K_σ	K_α	CRR for M = 7.5 & σ'_v = 1 atm	CRR	FOS	REMARKS
														α	β										
1	1.50	27	2	60	1.00	0.75	1.00	1.05	21.26	27.00	27.00	1.70	36.15	0.00	1.00	36.15	0.99	0.26	0.97	1.00	1.00	-0.20	-0.20	-0.76	**NLIQ**
1	3.00	15	67	60	1.00	0.80	1.00	1.05	12.60	54.00	54.00	1.37	17.23	0.50	1.20	21.18	0.98	0.25	0.97	1.00	1.00	0.23	0.22	NA	**NLIQ**
2	4.50	13	67	60	1.00	0.85	1.00	1.05	11.60	81.00	81.00	1.12	12.96	0.50	1.20	16.05	0.97	0.25	0.97	1.00	1.00	0.17	0.17	NA	**NLIQ**
3	6.00	32	21	60	1.00	0.95	1.00	1.05	31.92	109.50	94.79	1.03	32.95	3.78	1.09	39.57	0.95	0.29	0.97	1.00	1.00	0.11	0.11	NA	**NLIQ**
4	7.50	29	21	60	1.00	0.95	1.00	1.05	28.93	138.00	108.57	0.96	27.90	3.78	1.09	34.08	0.94	0.31	0.97	1.00	1.00	-11.56	-11.17	NA	**NLIQ**
5	9.00	31	21	60	1.00	0.95	1.00	1.05	30.92	166.50	122.36	0.91	28.09	3.78	1.09	34.30	0.93	0.33	0.97	1.00	1.00	-3.14	-3.03	NA	**NLIQ**
6	10.50	30	21	60	1.00	1.00	1.00	1.05	31.50	195.00	136.14	0.86	27.13	3.78	1.09	33.25	0.89	0.33	0.97	1.00	1.00	1.57	1.52	NA	**NLIQ**
7	12.00	12	89	60	1.00	1.00	1.00	1.05	12.60	223.50	149.93	0.82	10.34	0.50	1.20	12.91	0.85	0.33	0.97	1.00	1.00	0.14	0.13	NA	**NLIQ**
8	13.50	14	89	60	1.00	1.00	1.00	1.05	14.70	252.00	163.71	0.79	11.55	0.50	1.20	14.36	0.81	0.33	0.97	1.00	1.00	0.15	0.15	NA	**NLIQ**
9	15.00	12	89	60	1.00	1.00	1.00	1.05	12.60	280.50	177.50	0.75	9.50	0.50	1.20	11.91	0.77	0.32	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
10	16.50	13	89	60	1.00	1.00	1.00	1.05	13.65	309.00	191.28	0.73	9.92	0.50	1.20	12.40	0.73	0.31	0.97	1.00	1.00	0.13	0.13	NA	**NLIQ**
11	18.00	14	89	60	1.00	1.00	1.00	1.05	14.70	337.50	205.07	0.70	10.32	0.50	1.20	12.88	0.69	0.30	0.97	1.00	1.00	0.14	0.13	NA	**NLIQ**
12	19.50	12	89	60	1.00	1.00	1.00	1.05	12.60	366.00	218.85	0.68	8.56	0.50	1.20	10.77	0.65	0.28	0.97	1.00	1.00	0.12	0.12	NA	**NLIQ**

9. DISCUSSIONS

In the project site the soil types encountered during boring are described in detail in **Table 3, Section 6**. At the proposed site the soil is clayey to sandy at the different foundation level hence the bearing capacity analysis has been carried out using shear failure criteria as well as settlement criteria for the soil based on the results of corrected averaged corrected SPT value and unconfined strength. For the granular soil IS 6403:1981 method has been used to determine the bearing capacity from shear failure whereas IS: 8009 (Part I) –1976 has been used to determination bearing capacity from the settlement criteria and from the two methods least value has been recommended as the allowable bearing capacity of the soil. The dimensions of foundation have been taken according to the different sizes with respect to their sub-structural requirement.

10. RECOMMENDATIONS

On the basis of foundation analysis the following recommendations have been made.

- A detailed description of soil types existing at the site is provided in **Table 3** in **Section 5**.
- The foundation analyzed is an isolated foundation .
- The depths adopted are1.5m, 2.0m to 3m with 0.5m of increment.
- The recommended bearing capacities with the foundation classification are given in **Table 9 above.**
- The bearing capacity is computed for the expected allowable settlement of as 65mm as per IS: 8009 (Part I).
- The soil at the site is susceptible to liquefaction at the time of major earthquake.
- For the antiliquefaction measures gravel pile of dia 400mm with 12m length is proposed at the C/C spacing of 2m in a triangular pattern.
- MULTI Lab will provide its every assistance in this regard as and when requested at the cost of the employer.
- The foundation designer need not follow strictly the depth and dimensions adopted in the analysis presented in this report. He is free to select any other dimensions for depth and width depending upon the actual loads and moments to be transmitted to the foundation soil. At this juncture it is worth mentioning that the allowable bearing capacity depends on many variables such as allowable settlement, type of foundation, size and depth of foundation, importance of structure, cost of project etc. Therefore, on the basis of soil index properties data and engineering properties data provided in this report **(i.e. data furnished in test result summary sheet Table 2 and bore hole logs presented in Appendix A**), the foundation designer is free to refine the calculations wherever he feels necessary.

11. REFERENCES

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d. Peck, R. B., Hanson W. E. and Thornburn T. H (1974), "Foundation Engineering", Wiley Eastern Limited, New Delhi.
e. Geotechnical Engineering Investigation Handbook, "Earthquakes" pp-915
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g. IS: 1892: " Code of practice for subsurface investigation of foundation".
h. IS: 1498: " Classification and identification of soil for general engineering purpose".
i. IS: 2131: " Method for standard penetration test for soil".
j. IS: 2132: "Method for collecting undisturbed soil samples".
k. IS: 8763 - "Method for Undisturbed sampling in cohesion less soil".
l. IS: 6935 - "Method for determining the ground water table in bore hole".
m. IS: 6403- 1981, "Code of Practice for Determination of Bearing Capacity of Shallow Foundation" .
n. IS: 8009 (Part I) –1976, code of practice for calculation of settlements of Foundations"

Appendix-A

Borehole Logs

MULTI Lab (P) Ltd.

BORE HOLE LOG

Project	:	Nepalgunj Medical College
Location	:	Kohalpur, Banke
Client	:	
Bore Hole No	:	**1**
Diameter of BH, mm	:	150
RL of GWT	:	4.50 m
Date	:	22nd Dec, 2021 to 23rd Dec, 2021
Logged By	:	Sunit Kumar Jha
Prepared By	:	Manoj Subedi
Checked By	:	Sandeep Kr. Jha
Certified By	:	Madhusudan K.C

Scale 1=50cm Each	Depth m	Thickness m	Sampiling Depth m	Sampiling Type	Soil Classification	Group Symbol	Soil Symbol	SPT (Field Record) 15 cm	30 cm	45 cm	Value N
	0-0.30	0.30			Top soil	FM					
	1.50	1.20	1.50	SPT	Brown gravelly clayey silt	ML		3	3	3	**6**
	3.00	1.50	3.00	SPT	Brown to gray clayey silt with medium plasticity	ML		3	4	8	**12**
	5.00	2.00	4.50	SPT	Brown silty fine sand	SM		4	8	6	**14**
			6.00	SPT				4	4	5	**9**
			6.50	UDS							
			7.50	SPT				4	6	4	**10**
		5.50			Brown to gray clayey silt with medium plasticity	MI					
			9.00	SPT				6	6	8	**14**
	10.50		10.50	SPT				6	7	7	**14**
	12.50	2.00	12.00	SPT	Brown medium to fine sand with traces of gravels	SM		10	14	16	**30**
			13.50	SPT				6	7	7	**14**
			15.00	SPT				8	8	8	**16**
		7.50	16.50	SPT	Brown clayey silt of medium plasticity	MI		8	9	10	**19**
			18.00	SPT				8	10	10	**20**
			19.50	SPT				8	8	9	**17**
	20.00										

MULTI Lab (P) Ltd.

BORE HOLE LOG

Project	:	Nepalgunj Medical College
Location	:	Kohalpur, Banke
Client	:	
Bore Hole No	:	**2**
Diameter of BH, mm	:	150
RL of GWT	:	5.0 m
Date	:	24th Dec, 2022 to 25th Dec, 2022
Logged By	:	Sunit Kumar Jha
Prepared By	:	Manoj Subedi
Checked By	:	Sandeep Kr. Jha
Certified By	:	Madhusudan K.C

Scale 1=50cm Each	Depth m	Thickness m	Sampiling Depth m	Sampiling Type	Soil Classification	Group Symbol	Soil Symbol	SPT (Field Record) 15 cm	30 cm	45 cm	Value N
	0-0.30	0.30			Top soil	FM					
		2.70	1.50	SPT	Brown clayey silt with medium plasticity	MI		3	4	4	**8**
	3.00		3.00	SPT				3	5	8	**13**
		3.50	4.50	SPT	Brown silty fine sand with traces of gravels	SM		4	8	6	**14**
	6.50		6.00	SPT				4	8	12	**20**
		2.00	7.50	SPT	Gray to white silty gravelly sand	SM		10	17	15	**32**
	8.50		9.00	SPT				4	5	5	**10**
		3.50	9.50	UDS	Brown to gray clayey silt of low plasticity with traces of gravels	ML					
			10.50	SPT				3	6	6	**12**
	12.00		12.00	SPT				8	15	14	**29**
	13.50	1.50	13.50	SPT	Gray to white medium to coarse sand with traces of gravels	SP-SM		6	6	7	**13**
			15.00	SPT				5	5	6	**11**
			16.50	SPT				4	6	6	**12**
		6.50			Brown clayey silt of medium plasticity	MI					
			18.00	SPT				5	6	7	**13**
			19.50	SPT				6	6	6	**12**
	20.00										

MULTI Lab (P) Ltd.

BORE HOLE LOG

Project	:	Nepalgunj Medical College
Location	:	Kohalpur, Banke
Client	:	
Consultants	:	**3**
Diameter of BH, mm	:	150
RL of GWT	:	5.00 m
Date	:	26th Dec, 2021 to 27th Dec, 2021
Logged By	:	Sunit Kumar Jha
Prepared By	:	Manoj Subedi
Checked By	:	Sandeep Kr. Jha
Certified By	:	Madhusudan K.C

Scale 1=50cm Each	Depth m	Thickness m	Sampiling Depth m	Sampiling Type	Soil Classification	Group Symbol	Soil Symbol	SPT (Field Record) 15 cm	30 cm	45 cm	Value N
	0.00										
		1.50			Filling materials including sandy clayey silt	FM					
	1.50		1.50	SPT				6	7	8	**15**
		2.50	3.00	SPT	Brown silty sand with traces of gravels	SM		3	6	6	**12**
	4.00										
			4.50	SPT				3	5	6	**11**
		2.00	5.00	UDS	Gray to brown clayey silt of low plasticity	ML					
	6.00		6.00	SPT				6	7	8	**15**
			7.50	SPT				7	7	7	**14**
		4.50			Brown silty fine sand	SM					
			9.00	SPT				7	7	8	**15**
	10.50		10.50	SPT				6	6	6	**12**
			12.00	SPT				5	5	6	**11**
		5.50	13.50	SPT	Brown clayey silt with medium plasticity with traecs of gravels	MI		6	6	6	**12**
			15.00	SPT				5	6	7	**13**
	16.00										

MULTI Lab (P) Ltd.

BORE HOLE LOG

Project	:	Nepalgunj Medical College
Location	:	Kohalpur, Banke
Client	:	
Bore Hole No	:	**4**
Diameter of BH, mm	:	150
RL of GWT	:	4.00 m
Date	:	28th Dec, 2021 to 29th Dec, 2021
Logged By	:	Sunit Kumar Jha
Prepared By	:	Manoj Subedi
Checked By	:	Sandeep Kr. Jha
Certified By	:	Madhusudan K.C

Scale 1=50cm Each	Depth m	Thickness m	Sampling Depth m	Sampling Type	Soil Classification	Group Symbol	Soil Symbol	SPT (Field Record) 15 cm	30 cm	45 cm	Value N
	0.00	1.00			Brown clayey silt of low plasticity	ML					
	1.00		1.50	SPT				13	13	14	**27**
		2.00			Gray to white sandy gravels	GW					
	3.00		3.00	SPT				6	8	7	**15**
		2.00	4.50	SPT	Brown gravelly clayey silt	MG		6	6	7	**13**
	5.00										
			6.00	SPT				12	14	18	**32**
			7.50	SPT				10	12	17	**29**
		6.00			Gray to white silty sand with traces of gravels	SM					
			9.00	SPT				12	15	16	**31**
			10.50	SPT				10	14	16	**30**
	11.00										
			12.00	SPT				6	6	6	**12**
			12.50	UDS							
			13.50	SPT				5	7	7	**14**
			15.00	SPT				5	6	6	**12**
		9.00			Brown clayey silt of medium plasticity with traces of gravels	MI					
			16.50	SPT				6	6	7	**13**
			18.00	SPT				5	7	7	**14**
			19.50	SPT				5	5	7	**12**
	20.00										

Appendix-B

Photographs

Appendix-C

Test Result Sheets

MULTI Lab (P) Ltd.

ATTERBERG LIMITS

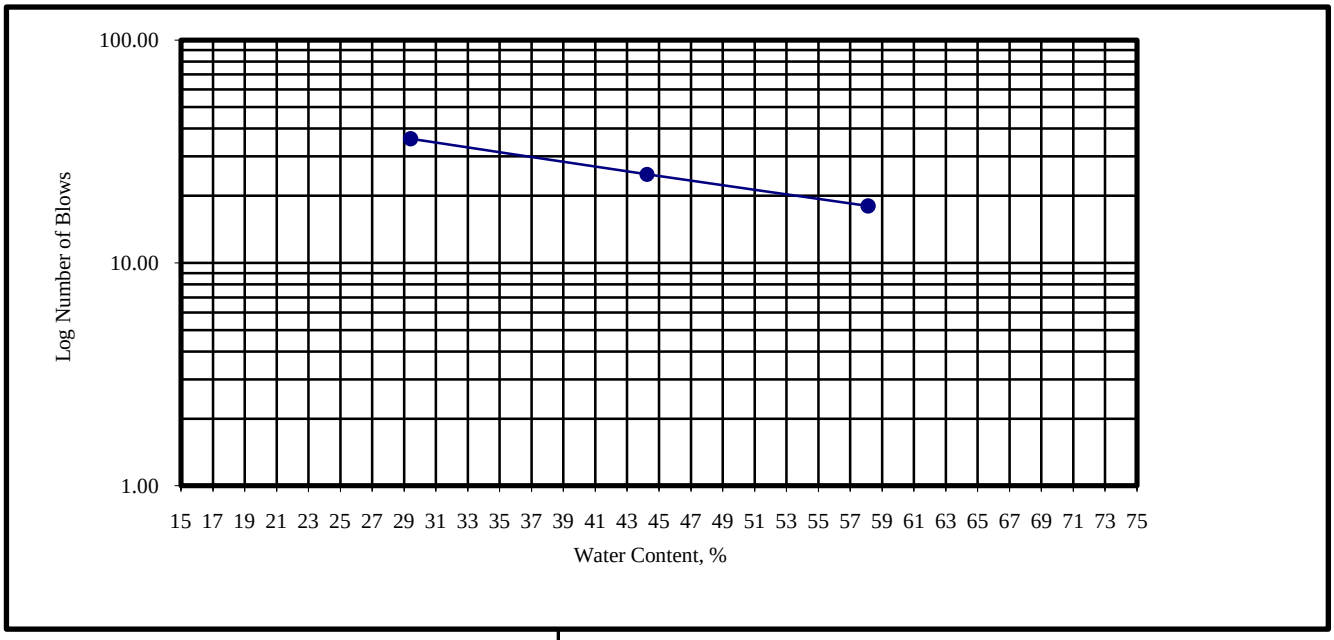
Project	:	Proposed Building Site	**BH No.**	:	BH-1
Location	:	Nepalgunj, Banke	**Date**	:	10th Jan, 2022
Depth (m)	:	5.00-10.50	**Checked by**	:	S.K. Jha
Tested by	:	Manoj Subedi	**Certified by**	:	Madhu Sudan KC

PLASTIC LIMIT

Determination No.		1		2		3	
Continer No		1	2				
Weight of Container + wet soil	gms	34.10	33.50				
Weight of container + Dry soil	gms	28.20	28.00				
Weight of water	gms	5.90	5.50				
Weight of container	gms	9.20	10.10				
Weight of dry soil	gms	19.00	17.90				
Water content	%	31.05	30.73				
Plastic limit	%	30.89					

LIQUID LIMIT

Determination No.		1	2	3	4	5	6
Container No		3	4	5			
Weight of container + Wet soil	gms	43.20	40.80	42.10			
Weight of container +Dry soil	gms	31.40	31.60	35.60			
Weight of water	gms	11.80	9.20	6.50			
Weight of container	gms	11.10	10.80	13.50			
Weight of dry soil	gms	20.30	20.80	22.10			
Water content	%	58.13	44.23	29.41			
Number of blows		18.00	25.00	36.00			



Liquid Limit, W_L	**44.00**
Plastic Limit, W_p	**30.89**
Plascicity Index, PI	**13.11**

Remarks:

MULTI Lab (P) Ltd.

ATTERBERG LIMITS

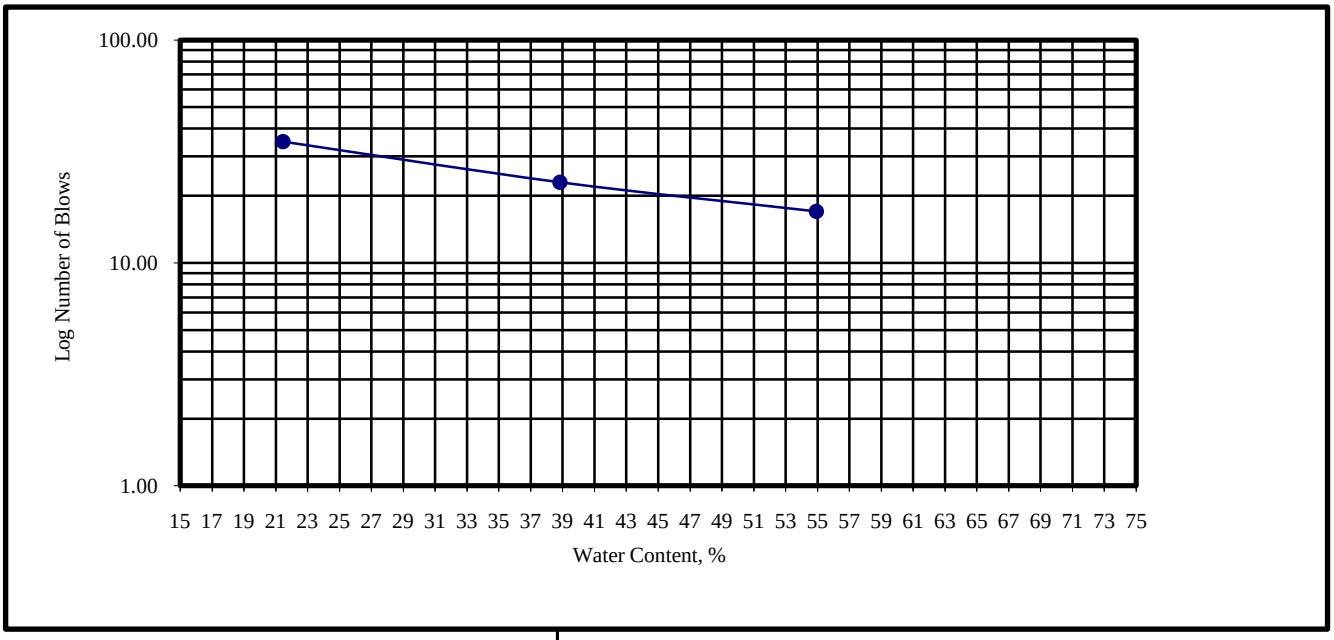
Project	:	Proposed Building Site	**BH No.**	:	BH-2
Location	:	Nepalgunj, Banke	**Date**	:	10th Jan, 2022
Depth (m)	:	8.50-12.00	**Checked by**	:	S.K. Jha
Tested by	:	Manoj Subedi	**Certified by**	:	Madhu Sudan KC

PLASTIC LIMIT

Determination No.		1		2		3	
Continer No		1	2				
Weight of Container + wet soil	gms	33.90	34.20				
Weight of container + Dry soil	gms	28.50	28.70				
Weight of water	gms	5.40	5.50				
Weight of container	gms	10.10	9.50				
Weight of dry soil	gms	18.40	19.20				
Water content	%	29.35	28.65				
Plastic limit	%	29.00					

LIQUID LIMIT

Determination No.		1	2	3	4	5	6
Container No		3	4	5			
Weight of container + Wet soil	gms	45.00	42.20	40.80			
Weight of container +Dry soil	gms	33.30	33.50	35.50			
Weight of water	gms	11.70	8.70	5.30			
Weight of container	gms	12.00	11.10	10.80			
Weight of dry soil	gms	21.30	22.40	24.70			
Water content	%	54.93	38.84	21.46			
Number of blows		17.00	23.00	35.00			



Liquid Limit, W_L	**36.00**
Plastic Limit, W_p	**29.00**
Plascicity Index, PI	**7.00**

Remarks:

MULTI Lab (P) Ltd.

ATTERBERG LIMITS

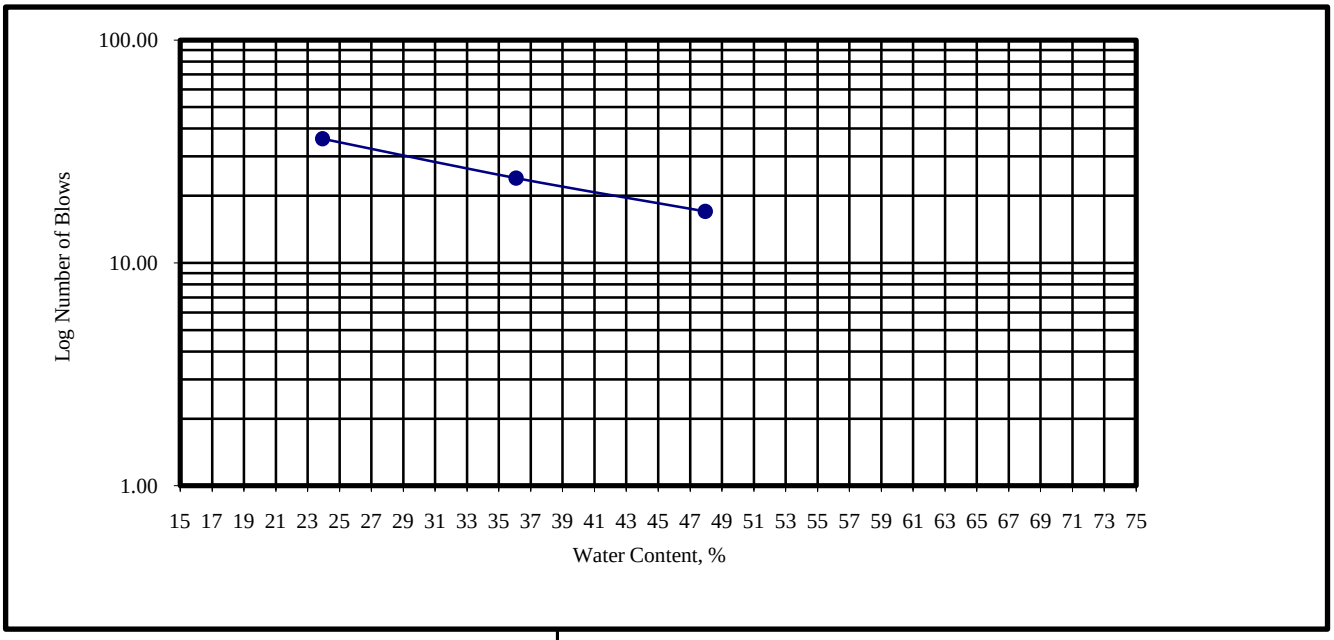
Project	:	Proposed Building Site	**BH No.**	:	BH-3
Location	:	Nepalgunj, Banke	**Date**	:	10th Jan, 2022
Depth (m)	:	4.00-6.00	**Checked by**	:	S.K. Jha
Tested by	:	Manoj Subedi	**Certified by**	:	Madhu Sudan KC

PLASTIC LIMIT

Determination No.		1		2		3	
Continer No		1	2				
Weight of Container + wet soil	gms	33.80	34.10				
Weight of container + Dry soil	gms	28.20	28.20				
Weight of water	gms	5.60	5.90				
Weight of container	gms	9.10	8.50				
Weight of dry soil	gms	19.10	19.70				
Water content	%	29.32	29.95				
Plastic limit	%	29.63					

LIQUID LIMIT

Determination No.		1	2	3	4	5	6
Container No		3	4	5			
Weight of container + Wet soil	gms	42.20	41.80	43.60			
Weight of container +Dry soil	gms	31.60	33.50	37.50			
Weight of water	gms	10.60	8.30	6.10			
Weight of container	gms	9.50	10.50	12.00			
Weight of dry soil	gms	22.10	23.00	25.50			
Water content	%	47.96	36.09	23.92			
Number of blows		17.00	24.00	36.00			



Liquid Limit, W_L	**35.00**
Plastic Limit, W_p	**29.63**
Plascicity Index, PI	**5.37**

Remarks:

MULTI Lab (P) Ltd.

ATTERBERG LIMITS

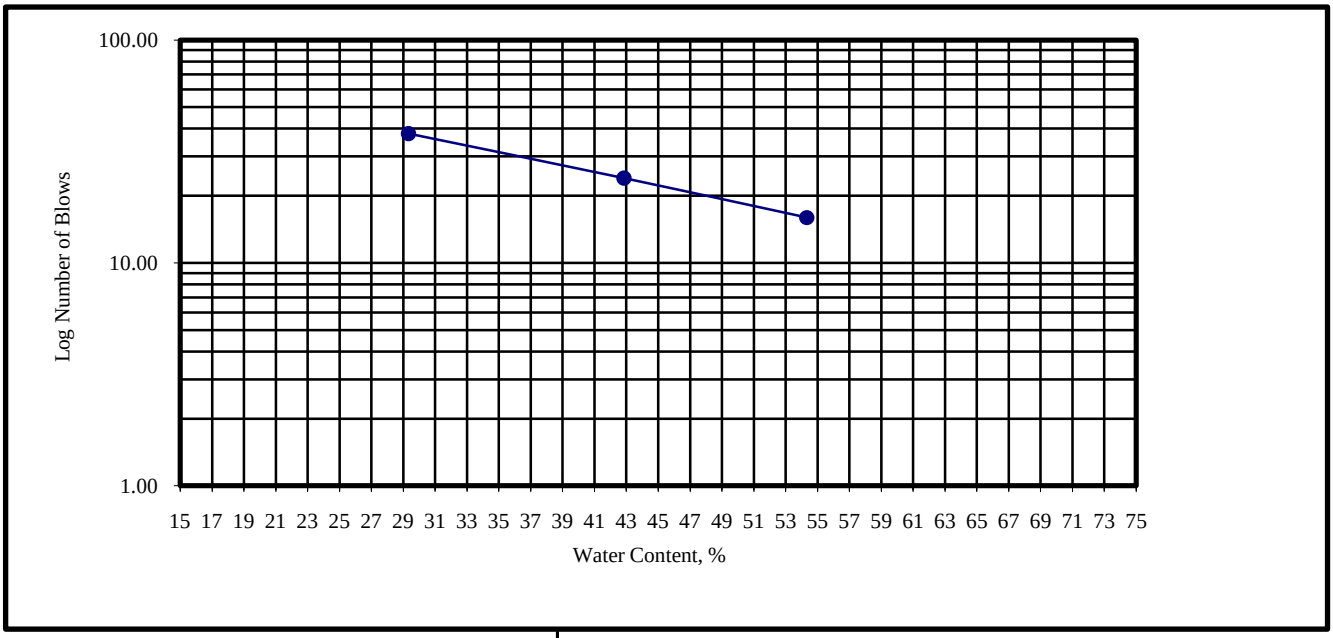
Project	:	Proposed Building Site	**BH No.**	:	BH-4
Location	:	Nepalgunj, Banke	**Date**	:	10th Jan, 2022
Depth (m)	:	11.00-20.00	**Checked by**	:	S.K. Jha
Tested by	:	Manoj Subedi	**Certified by**	:	Madhu Sudan KC

PLASTIC LIMIT

Determination No.		1		2		3	
Continer No		1	2				
Weight of Container + wet soil	gms	34.20	33.90				
Weight of container + Dry soil	gms	28.50	28.20				
Weight of water	gms	5.70	5.70				
Weight of container	gms	10.10	9.20				
Weight of dry soil	gms	18.40	19.00				
Water content	%	30.98	30.00				
Plastic limit	%	30.49					

LIQUID LIMIT

Determination No.		1	2	3	4	5	6
Container No		3	4	5			
Weight of container + Wet soil	gms	43.60	42.00	42.10			
Weight of container +Dry soil	gms	32.30	33.00	35.00			
Weight of water	gms	11.30	9.00	7.10			
Weight of container	gms	11.50	12.00	10.80			
Weight of dry soil	gms	20.80	21.00	24.20			
Water content	%	54.33	42.86	29.34			
Number of blows		16.00	24.00	38.00			



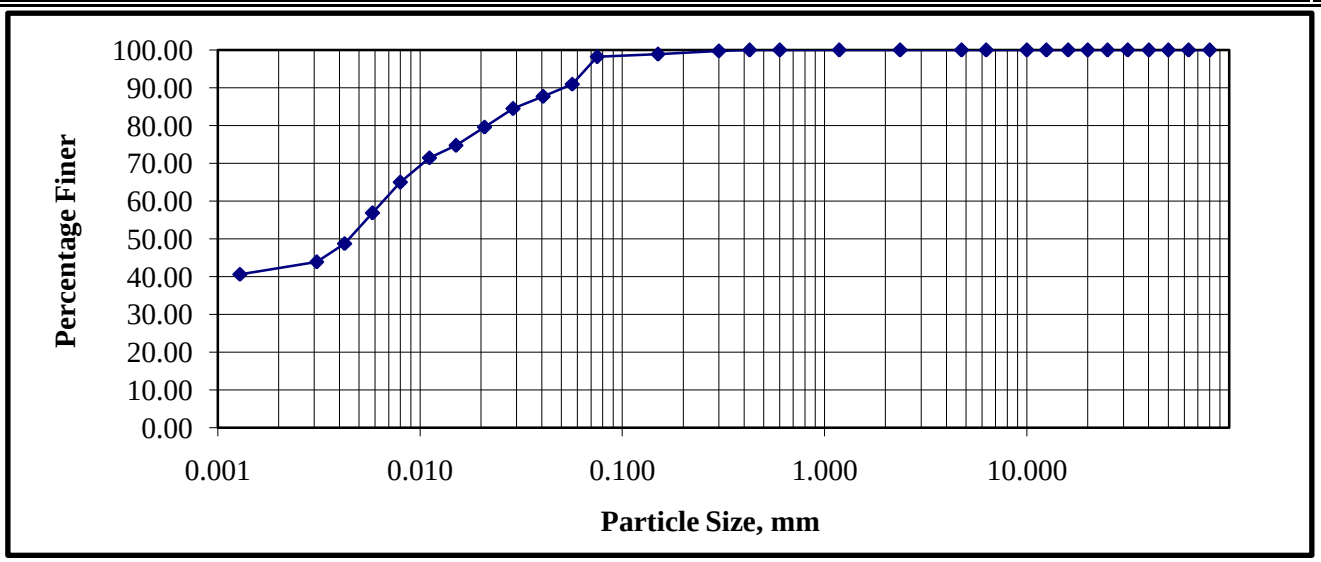
Liquid Limit, W_L	**42.00**
Plastic Limit, W_p	**30.49**
Plascicity Index, PI	**11.51**

Remarks:

MULTI Lab (P) Ltd
SIEVE ANALYSIS

Project:	Proposed Building Site		
Location :	Nepalgunj, Banke	**BH No.:**	1
Wt. of Sample (gms):	450.00	**Tested by :**	Manoj Subedi
Date :	10th Jan, 2022	**Checked by:**	Sandeep Kr. Jha
Depth (m):	5.00-10.50	**Certified by:**	Madhu Sudan KC

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.00	0.00	0.00	100.00
0.300	1.00	1.00	0.22	99.78
0.150	4.00	5.00	1.11	98.89
0.075	3.00	8.00	1.78	98.22
0.057	**Data From Hydrometer Analysis**			90.96
0.041				87.71
0.029				84.46
0.021				79.59
0.015				74.71
0.011				71.46
0.008				64.97
0.006				56.85
0.004				48.73
0.003				43.85
0.001				40.60



MULTI Lab (P) Ltd.

HYDROMETER ANALYSIS

Project	:	Proposed Building Site			
BH No	:	**1**			
Volume of Hydrometer (cucm)	:	50.00	**Location**	:	Nepalgunj, Banke
Qty of Dispersing Agent (gms)	:	4.00	**Depth (m)**	:	5.00-10.50
Specific Gravity	:	2.530	**Date:**	:	10th Jan, 2022
Minus 75 micron Seive	:	50.00	**Hydrometer No**	:	1
Meniscus Correction (C_m):	:	0.50	**Unit Wt water (gm/cc)**	:	1.00
Dispersing Agent:	:	$(NaPo_3)_6$	**Area of Jar (sqcm)**	:	38.46
Tested by	:	Manoj Subedi	**h_o**	:	7.50
Certified by:	:	Madhu Sudan KC	**Checked by**	:	S.K. Jha

Time	Elapses Time	Hyd. Reading	Temp.	Comp. Cor.	Cor. Read $R_{h1} = R_h + C_m$	Eff. Depth H_e	$R_{h2} = R_h + C$	η	M	$(H_e/t)^{0.5}$	Particle Size D	%age Finer N
	min	R_h	° C	C		cm					mm	%
10.31	0.50	31.00	22.00	-1	31.5	8.495	30	0.00961	0.01373	4.122	0.0566	99.22
10.32	1.00	30.00	22.00	-1	30.5	8.765	29	0.00961	0.01373	2.961	0.0406	95.91
10.34	2.00	29.00	23.00	-1	29.5	9.035	28	0.00938	0.01356	2.125	0.0288	92.60
10.38	4.00	27.50	23.00	-1	28	9.44	26.5	0.00938	0.01356	1.536	0.0208	87.64
10.46	8.00	26.00	23.00	-1	26.5	9.845	25	0.00938	0.01356	1.109	0.015	82.68
11.01	15.00	25.00	23.00	-1	25.5	10.12	24	0.00938	0.01356	0.821	0.0111	79.37
11.33	30.00	23.00	24.00	-1	23.5	10.66	22	0.00916	0.0134	0.596	0.008	72.76
12.33	60.00	20.50	24.00	-1	21	11.33	19.5	0.00916	0.0134	0.435	0.0058	64.49
2.33	120.00	18.00	24.00	-1	18.5	12.01	17	0.00916	0.0134	0.316	0.0042	56.22
6.33	240.00	16.50	23.00	-1	17	12.41	15.5	0.00938	0.01356	0.227	0.0031	51.26
10.31	1440.00	15.50	22.00	-1	16	12.68	14.5	0.00961	0.01373	0.094	0.0013	47.95

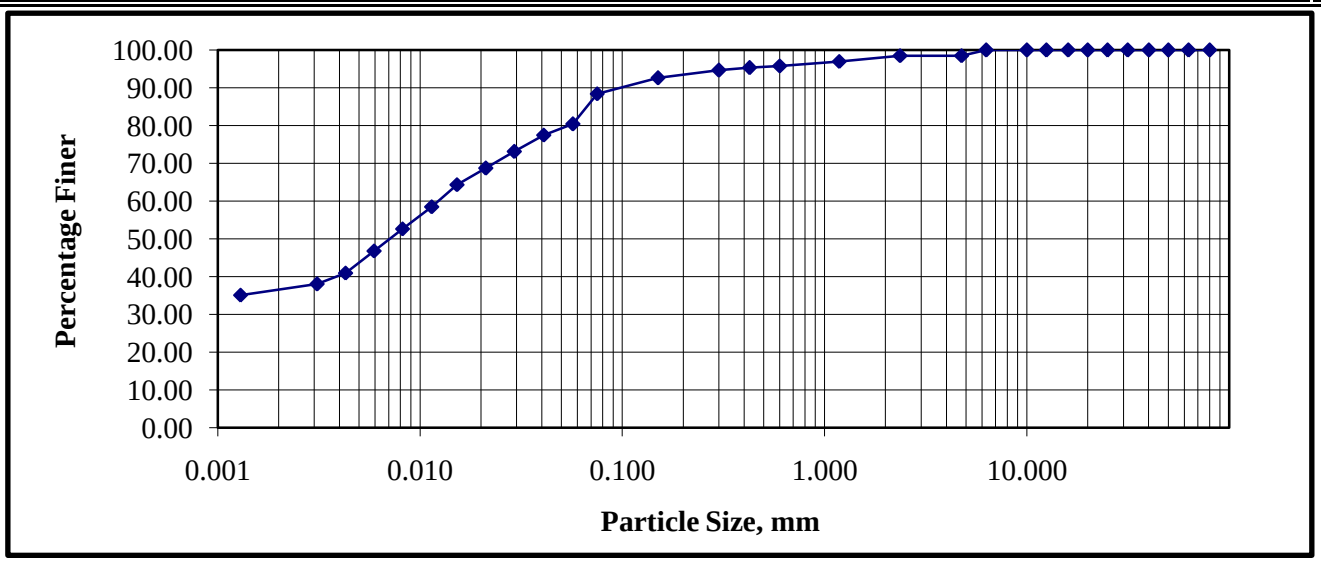
$M = [0.03h/(G-1)]^{0.5}$ $D = M (H_e/t)^{0.5}$

$N = (G/G-1)(R_{h2}/W) \times 100$

MULTI Lab (P) Ltd
SIEVE ANALYSIS

Project:	Proposed Building Site		
Location :	Nepalgunj, Banke	**BH No.:**	2
Wt. of Sample (gms):	595.00	**Tested by :**	Manoj Subedi
Date :	10th Jan, 2022	**Checked by:**	Sandeep Kr. Jha
Depth (m):	8.50-12.00	**Certified by:**	Madhu Sudan KC

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	9.00	9.00	1.51	98.49
2.360	0.00	9.00	1.51	98.49
1.180	9.00	18.00	3.03	96.97
0.600	7.00	25.00	4.20	95.80
0.425	3.00	28.00	4.71	95.29
0.300	4.00	32.00	5.38	94.62
0.150	12.00	44.00	7.39	92.61
0.075	25.00	69.00	11.60	88.40
0.057				80.40
0.041				77.48
0.029				73.09
0.021				68.71
0.015				64.32
0.011	**Data From Hydrometer Analysis**			58.47
0.008				52.63
0.006				46.78
0.004				40.93
0.003				38.01
0.001				35.08



MULTI Lab (P) Ltd.

HYDROMETER ANALYSIS

Project	:	Proposed Building Site			
BH No	:	**2**			
Volume of Hydrometer (cucm)	:	50.00	**Location**	:	Nepalgunj, Banke
Qty of Dispersing Agent (gms)	:	4.00	**Depth (m)**	:	8.50-12.00
Specific Gravity	:	2.530	**Date:**	:	10th Jan, 2022
Minus 75 micron Seive	:	50.00	**Hydrometer No**	:	1
Meniscus Correction (C_m):	:	0.50	**Unit Wt water (gm/cc)**	:	1.00
Dispersing Agent:	:	$(NaPo_3)_6$	**Area of Jar (sqcm)**	:	38.46
Tested by	:	Manoj Subedi	**h_o**	:	7.50
Certified by:	:	Madhu Sudan KC	**Checked by**	:	S.K. Jha

Time	Elapses Time	Hyd. Reading	Temp.	Comp. Cor.	Cor. Read $R_{h1} = R_h+C_m$	Eff. Depth H_e	$R_{h2} = R_h + C$	η	M	$(H_e/t)^{0.5}$	Particle Size D	%age Finer N
	min	R_h	° C	C		cm					mm	%
10.31	0.50	30.50	22.00	-1	31	8.63	30	0.00961	0.01373	4.155	0.057	97.56
10.32	1.00	29.50	22.00	-1	30	8.9	28.5	0.00961	0.01373	2.983	0.041	94.25
10.34	2.00	28.00	23.00	-1	28.5	9.305	27	0.00938	0.01356	2.157	0.0293	89.29
10.38	4.00	26.50	23.00	-1	27	9.71	25.5	0.00938	0.01356	1.558	0.0211	84.33
10.46	8.00	25.00	23.00	-1	25.5	10.12	24	0.00938	0.01356	1.124	0.0152	79.37
11.01	15.00	23.00	23.00	-1	23.5	10.66	22	0.00938	0.01356	0.843	0.0114	72.76
11.33	30.00	21.00	24.00	-1	21.5	11.2	20	0.00916	0.0134	0.611	0.0082	66.14
12.33	60.00	19.00	24.00	-1	19.5	11.74	18	0.00916	0.0134	0.442	0.0059	59.53
2.33	120.00	17.00	24.00	-1	17.5	12.28	16	0.00916	0.0134	0.32	0.0043	52.92
6.33	240.00	16.00	23.00	-1	16.5	12.55	15	0.00938	0.01356	0.229	0.0031	49.61
10.31	1440.00	15.00	22.00	-1	15.5	12.82	14	0.00961	0.01373	0.094	0.0013	46.30

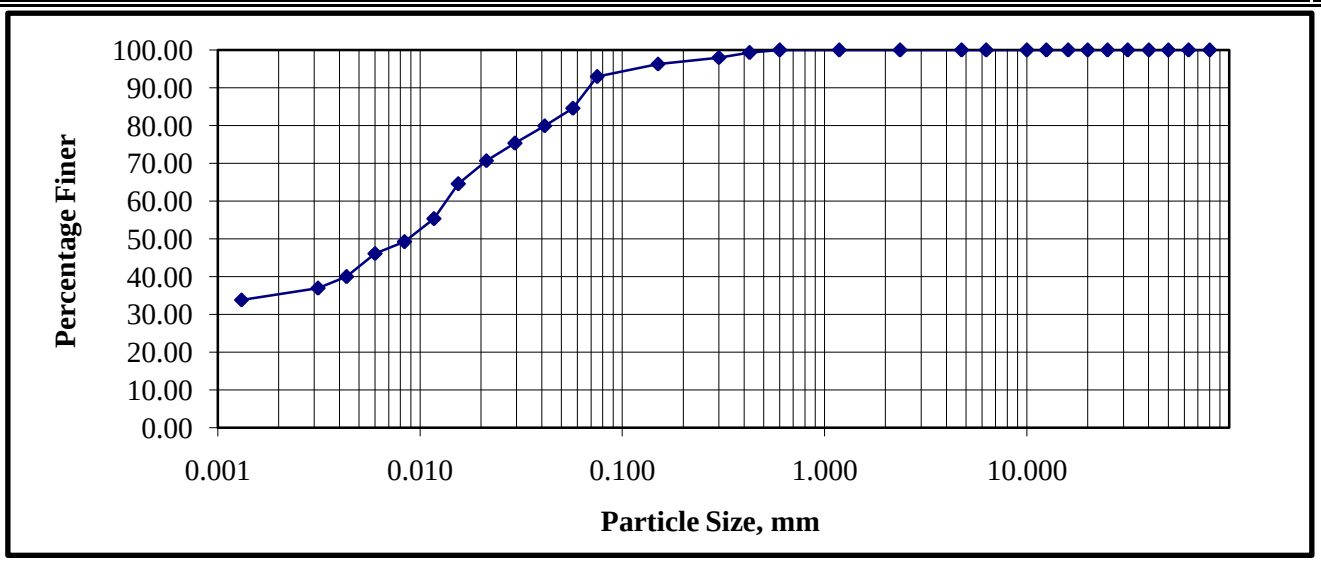
$M = [0.03h/(G-1)]^{0.5}$ $D = M (H_e/t)^{0.5}$

$N = (G/G-1)(R_{h2}/W) \times 100$

MULTI Lab (P) Ltd
SIEVE ANALYSIS

Project:	Proposed Building Site		
Location :	Nepalgunj, Banke	**BH No.:**	3
Wt. of Sample (gms):	595.00	**Tested by :**	Manoj Subedi
Date :	10th Jan, 2022	**Checked by:**	Sandeep Kr. Jha
Depth (m):	4.00-6.00	**Certified by:**	Madhu Sudan KC

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	4.00	4.00	0.67	99.33
0.300	8.00	12.00	2.02	97.98
0.150	10.00	22.00	3.70	96.30
0.075	20.00	42.00	7.06	92.94
0.057				84.53
0.041				79.92
0.029				75.31
0.021				70.70
0.015				64.55
0.012	**Data From Hydrometer Analysis**			55.33
0.008				49.18
0.006				46.11
0.004				39.96
0.003				36.88
0.001				33.81



MULTI Lab (P) Ltd.

HYDROMETER ANALYSIS

Project	:	Proposed Building Site			
BH No	:	**3**			
Volume of Hydrometer (cucm)	:	50.00	**Location**	:	Nepalgunj, Banke
Qty of Dispersing Agent (gms)	:	4.00	**Depth (m)**	:	4.00-6.00
Specific Gravity	:	2.530	**Date:**	:	10th Jan, 2022
Minus 75 micron Seive	:	50.00	**Hydrometer No**	:	1
Meniscus Correction (C_m):	:	0.50	**Unit Wt water (gm/cc)**	:	1.00
Dispersing Agent:	:	$(NaPo_3)_6$	**Area of Jar (sqcm)**	:	38.46
Tested by	:	Manoj Subedi	**h_o**	:	7.50
Certified by:	:	Madhu Sudan KC	**Checked by**	:	S.K. Jha

Time	Elapses Time	Hyd. Reading	Temp.	Comp. Cor.	Cor. Read $R_{h1} = R_h + C_m$	Eff. Depth H_e	$R_{h2} = R_h + C$	η	M	$(H_e/t)^{0.5}$	Particle Size D	%age Finer N
	min	R_h	° C	C		cm					mm	%
10.31	0.50	30.50	22.00	-1	31	8.63	30	0.00961	0.01373	4.155	0.057	97.56
10.32	1.00	29.00	22.00	-1	29.5	9.035	28	0.00961	0.01373	3.006	0.0413	92.60
10.34	2.00	27.50	23.00	-1	28	9.44	26.5	0.00938	0.01356	2.173	0.0295	87.64
10.38	4.00	26.00	23.00	-1	26.5	9.845	25	0.00938	0.01356	1.569	0.0213	82.68
10.46	8.00	24.00	23.00	-1	24.5	10.39	23	0.00938	0.01356	1.139	0.0155	76.07
11.01	15.00	21.00	23.00	-1	21.5	11.2	20	0.00938	0.01356	0.864	0.0117	66.14
11.33	30.00	19.00	24.00	-1	19.5	11.74	18	0.00916	0.0134	0.625	0.0084	59.53
12.33	60.00	18.00	24.00	-1	18.5	12.01	17	0.00916	0.0134	0.447	0.006	56.22
2.33	120.00	16.00	24.00	-1	16.5	12.55	15	0.00916	0.0134	0.323	0.0043	49.61
6.33	240.00	15.00	23.00	-1	15.5	12.82	14	0.00938	0.01356	0.231	0.0031	46.30
10.31	1440.00	14.00	22.00	-1	14.5	13.09	13	0.00961	0.01373	0.095	0.0013	42.99

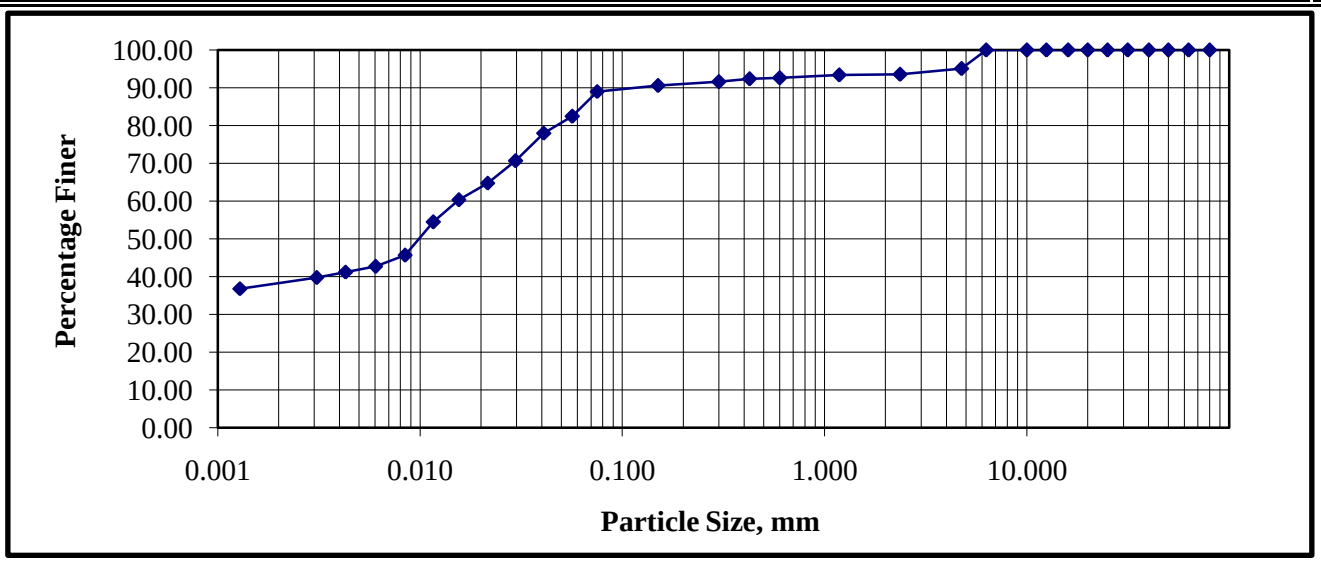
$M = [0.03h/(G-1)]^{0.5}$ $D = M (H_e/t)^{0.5}$

$N = (G/G-1)(R_{h2}/W) \times 100$

MULTI Lab (P) Ltd
SIEVE ANALYSIS

Project:	Proposed Building Site		
Location :	Nepalgunj, Banke	**BH No.:**	4
Wt. of Sample (gms):	772.00	**Tested by :**	Manoj Subedi
Date :	10th Jan, 2022	**Checked by:**	Sandeep Kr. Jha
Depth (m):	11.00-20.00	**Certified by:**	Madhu Sudan KC

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	38.00	38.00	4.92	95.08
2.360	12.00	50.00	6.48	93.52
1.180	1.00	51.00	6.61	93.39
0.600	6.00	57.00	7.38	92.62
0.425	2.00	59.00	7.64	92.36
0.300	6.00	65.00	8.42	91.58
0.150	8.00	73.00	9.46	90.54
0.075	12.00	85.00	11.01	88.99
0.057				82.41
0.041				77.99
0.030				70.63
0.022				64.75
0.016				60.33
0.012	**Data From Hydrometer Analysis**			54.45
0.008				45.62
0.006				42.67
0.004				41.20
0.003				39.73
0.001				36.79



MULTI Lab (P) Ltd.

HYDROMETER ANALYSIS

Project	:	Proposed Building Site			
BH No	:	**4**			
Volume of Hydrometer (cucm)	:	50.00	**Location**	:	Nepalgunj, Banke
Qty of Dispersing Agent (gms)	:	4.00	**Depth (m)**	:	11.00-20.00
Specific Gravity	:	2.530	**Date:**	:	10th Jan, 2022
Minus 75 micron Seive	:	50.00	**Hydrometer No**	:	1
Meniscus Correction (C_m):	:	0.50	**Unit Wt water (gm/cc)**	:	1.00
Dispersing Agent:	:	$(NaPo_3)_6$	**Area of Jar (sqcm)**	:	38.46
Tested by	:	Manoj Subedi	**h_o**	:	7.50
Certified by:	:	Madhu Sudan KC	**Checked by**	:	S.K. Jha

Time	Elapses Time	Hyd. Reading	Temp.	Comp. Cor.	Cor. Read $R_{h1} = R_h + C_m$	Eff. Depth H_e	$R_{h2} = R_h + C$	η	M	$(H_e/t)^{0.5}$	Particle Size D	%age Finer N
	min	R_h	° C	C		cm					mm	%
10.31	0.50	31.00	22.00	-1	31.5	8.495	30	0.00961	0.01373	4.122	0.0566	99.22
10.32	1.00	29.50	22.00	-1	30	8.9	28.5	0.00961	0.01373	2.983	0.041	94.25
10.34	2.00	27.00	23.00	-1	27.5	9.575	26	0.00938	0.01356	2.188	0.0297	85.99
10.38	4.00	25.00	23.00	-1	25.5	10.12	24	0.00938	0.01356	1.59	0.0216	79.37
10.46	8.00	23.50	23.00	-1	24	10.52	22.5	0.00938	0.01356	1.147	0.0156	74.41
11.01	15.00	21.50	23.00	-1	22	11.06	20.5	0.00938	0.01356	0.859	0.0116	67.80
11.33	30.00	18.50	24.00	-1	19	11.87	17.5	0.00916	0.0134	0.629	0.0084	57.88
12.33	60.00	17.50	24.00	-1	18	12.14	16.5	0.00916	0.0134	0.45	0.006	54.57
2.33	120.00	17.00	24.00	-1	17.5	12.28	16	0.00916	0.0134	0.32	0.0043	52.92
6.33	240.00	16.50	23.00	-1	17	12.41	15.5	0.00938	0.01356	0.227	0.0031	51.26
10.31	1440.00	15.50	22.00	-1	16	12.68	14.5	0.00961	0.01373	0.094	0.0013	47.95

$M = [0.03h/(G-1)]^{0.5}$ $D = M (H_e/t)^{0.5}$

$N = (G/G-1)(R_{h2}/W) \times 100$

MULTI Lab (P) Ltd
CONSOLIDATION TEST

Project:	Proposed Building Site	**Location :**	Nepalgunj, Banke
BH. No.	1	**Depth (m):**	6.50 m UDS
Analyzed by :	S.K. Jha	**Certified by:**	Madhu Sudan KC
Description of soil :		**Date :**	2nd to 8th Jan, 2022

Consolidometer Type:	Fixed Ring	Ring No :	1
Multiplication ratio of load device:	10	Height(cm) :	2
Ring Diameter (cm) :	6	Dial Constant (cm	0.001
Specific Gravity :	2.54	Volume V(cm^3) :	56.55
Area(cm^2) :	28.27		

SOIL PROPERTY DETERMINATION

Weight of can + wet soil (gms) :	300.600
Weight of can + dry soil (gms) :	276.000
Weight of can (gms) :	197.000
Weight of water (gms) :	24.600
weight of wet soil (gms) :	103.600
weight of dry soil (gms) :	79.000
Natural water content (%)	31.139
Weight of ring (gms) :	197.000
Weight of ring+ wet soil after test (gms) :	301.500
Weight of ring+dry soil after test (gms) :	276.000
Weight of wet soil after test (gms) :	104.500
Weight of dry soil (gms) :	79.000
Weight of water after test (gms) :	25.500
Final water content (%) :	32.278
Initial dial reading (div) :	1655.000
Final dial reading (div) :	1455.000
Change in height (cms) :	0.200
Final height of sample (cms)	1.800
Height of solids (cms) :	1.100
Final height of voids (cms) :	0.700
Final void ratio	0.636
Initial height of voids	0.900
Initial voids ratio	0.818
Unit weight of soil (gm/ cc) :	1.832

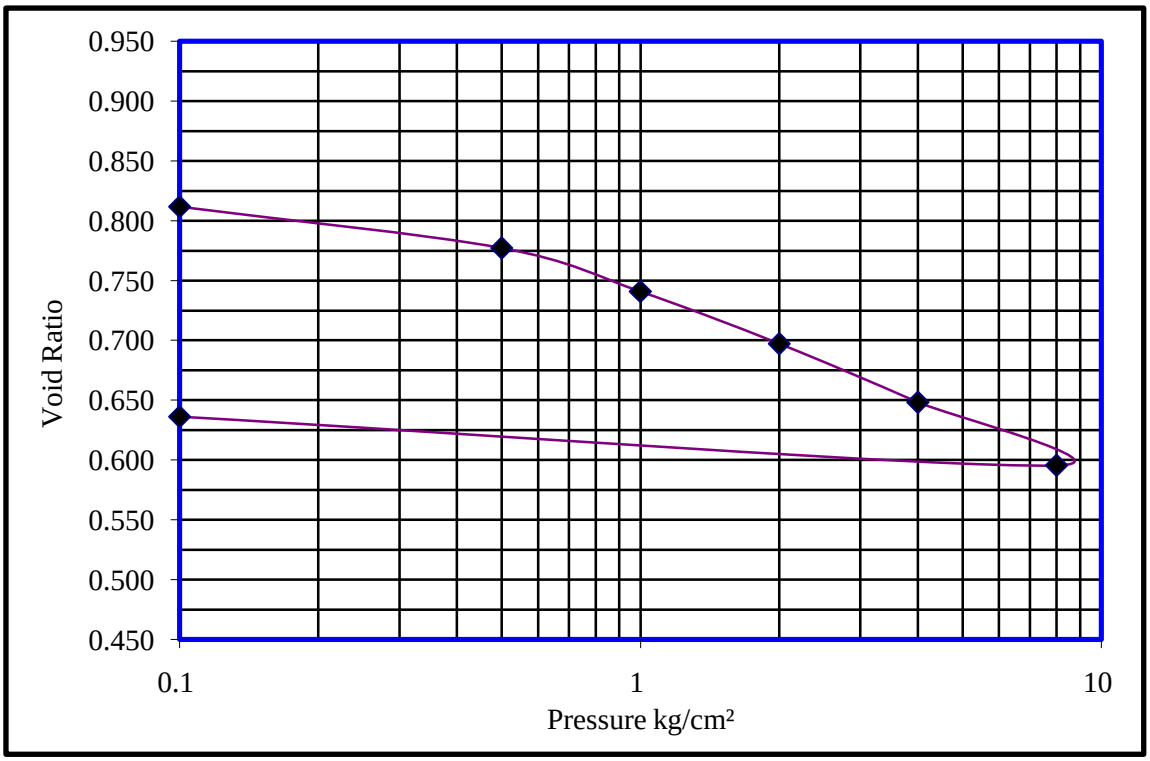
MULTI Lab (P) Ltd.

CONSOLIDATION TEST RESULT SHEET

Project :	Proposed Building Site	**Location:**	Nepalgunj, Banke
BH No :	1	**Depth (m) :**	6.50 m UDS
Date :	2nd to 8th Jan, 2022	**Analyzed by :**	S.K. Jha
Certified By:	Madhu Sudan KC		

$\Delta e = ((1+e_f) / H_f) \times \Delta H$

Applied Load	Initial Dial Reading	Final Dial Reading	Diff.	ΔH cm	Total DH cm	Sample Height cm	Δe	Total De	Void Ratio e	c_c	a_v cm²/kg	m_v cm²/kg
0.1	1655	1648	7	0.007	0.007	2.000	0.006	0.006	0.812			
0.5	1648	1610	38	0.038	0.045	1.962	0.035	0.041	0.777		0.082	0.045
1	1610	1570	40	0.040	0.085	1.922	0.036	0.077	0.741		0.077	0.043
2	1570	1522	48	0.048	0.133	1.874	0.044	0.121	0.697	0.154	0.060	0.035
4	1522	1468	54	0.054	0.187	1.820	0.049	0.170	0.648		0.042	0.025
8	1468	1410	58	0.058	0.245	1.762	0.053	0.223	0.595		0.028	0.017
0.1	1410	1455	-45	-0.045	0.200	1.800	-0.041	0.182	0.636			



MULTI Lab (P) Ltd
CONSOLIDATION TEST

Project:	Proposed Building Site	**Location :**	Nepalgunj, Banke
BH. No.	2	**Depth (m):**	9.50 m UDS
Analyzed by :	S.K. Jha	**Certified by:**	Madhu Sudan KC
Description of soil :		**Date :**	2nd to 8th Jan, 2022

Consolidometer Type:	Fixed Ring	Ring No :	1
Multiplication ratio of load device:	10	Height(cm) :	2
Ring Diameter (cm) :	6	Dial Constant (cm	0.001
Specific Gravity :	2.54	Volume V(cm^3) :	56.55
Area(cm^2) :	28.27		

SOIL PROPERTY DETERMINATION

Weight of can + wet soil (gms) :	299.000
Weight of can + dry soil (gms) :	274.900
Weight of can (gms) :	195.000
Weight of water (gms) :	24.100
weight of wet soil (gms) :	104.000
weight of dry soil (gms) :	79.900
Natural water content (%)	30.163
Weight of ring (gms) :	195.000
Weight of ring+ wet soil after test (gms) :	299.400
Weight of ring+dry soil after test (gms) :	274.900
Weight of wet soil after test (gms) :	104.400
Weight of dry soil (gms) :	79.900
Weight of water after test (gms) :	24.500
Final water content (%) :	30.663
Initial dial reading (div) :	1765.000
Final dial reading (div) :	1585.000
Change in height (cms) :	0.180
Final height of sample (cms)	1.820
Height of solids (cms) :	1.113
Final height of voids (cms) :	0.707
Final void ratio	0.636
Initial height of voids	0.887
Initial voids ratio	0.798
Unit weight of soil (gm/ cc) :	1.839

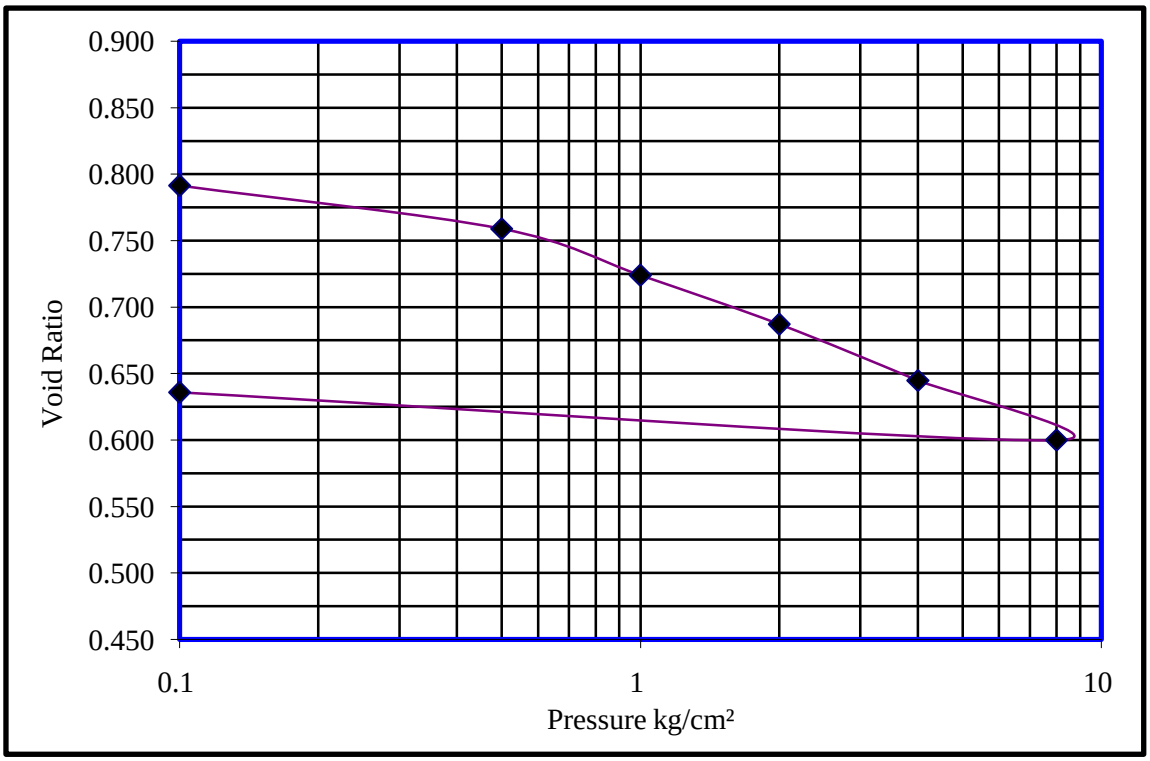
MULTI Lab (P) Ltd.

CONSOLIDATION TEST RESULT SHEET

Project :	Proposed Building Site	**Location:**	Nepalgunj, Banke
BH No :	2	**Depth (m) :**	9.50 m UDS
Date :	2nd to 8th Jan, 2022	**Analyzed by :**	S.K. Jha
Certified By:	Madhu Sudan KC		

$\Delta e = ((1+e_f) / H_f) \times \Delta H$

Applied Load	Initial Dial Reading	Final Dial Reading	Diff.	ΔH cm	Total DH cm	Sample Height cm	Δe	Total De	Void Ratio e	c_c	a_v cm²/kg	m_v cm²/kg
0.1	1765	1758	7	0.007	0.007	2.000	0.006	0.006	0.791			
0.5	1758	1722	36	0.036	0.043	1.964	0.032	0.039	0.759		0.077	0.043
1	1722	1683	39	0.039	0.082	1.925	0.035	0.074	0.724		0.074	0.042
2	1683	1642	41	0.041	0.123	1.884	0.037	0.111	0.687	0.131	0.055	0.032
4	1642	1595	47	0.047	0.170	1.837	0.042	0.153	0.645		0.038	0.023
8	1595	1545	50	0.050	0.220	1.787	0.045	0.198	0.600		0.025	0.015
0.1	1545	1585	-40	-0.040	0.180	1.820	-0.036	0.162	0.636			



MULTI Lab (P) Ltd
CONSOLIDATION TEST

Project:	Proposed Building Site	**Location :**	Nepalgunj, Banke
BH. No.	3	**Depth (m):**	5.0 m UDS
Analyzed by :	S.K. Jha	**Certified by:**	Madhu Sudan KC
Description of soil :		**Date :**	2nd to 8th Jan, 2022

Consolidometer Type:	Fixed Ring	Ring No :	1
Multiplication ratio of load device:	10	Height(cm) :	2
Ring Diameter (cm) :	6	Dial Constant (cm	0.001
Specific Gravity :	2.54	Volume V(cm^3) :	56.55
Area(cm^2) :	28.27		

SOIL PROPERTY DETERMINATION

Weight of can + wet soil (gms) :	294.500
Weight of can + dry soil (gms) :	270.200
Weight of can (gms) :	191.000
Weight of water (gms) :	24.300
weight of wet soil (gms) :	103.500
weight of dry soil (gms) :	79.200
Natural water content (%)	30.682
Weight of ring (gms) :	191.000
Weight of ring+ wet soil after test (gms) :	295.100
Weight of ring+dry soil after test (gms) :	270.200
Weight of wet soil after test (gms) :	104.100
Weight of dry soil (gms) :	79.200
Weight of water after test (gms) :	24.900
Final water content (%) :	31.439
Initial dial reading (div) :	1585.000
Final dial reading (div) :	1365.000
Change in height (cms) :	0.220
Final height of sample (cms)	1.780
Height of solids (cms) :	1.103
Final height of voids (cms) :	0.677
Final void ratio	0.614
Initial height of voids	0.897
Initial voids ratio	0.814
Unit weight of soil (gm/ cc) :	1.830

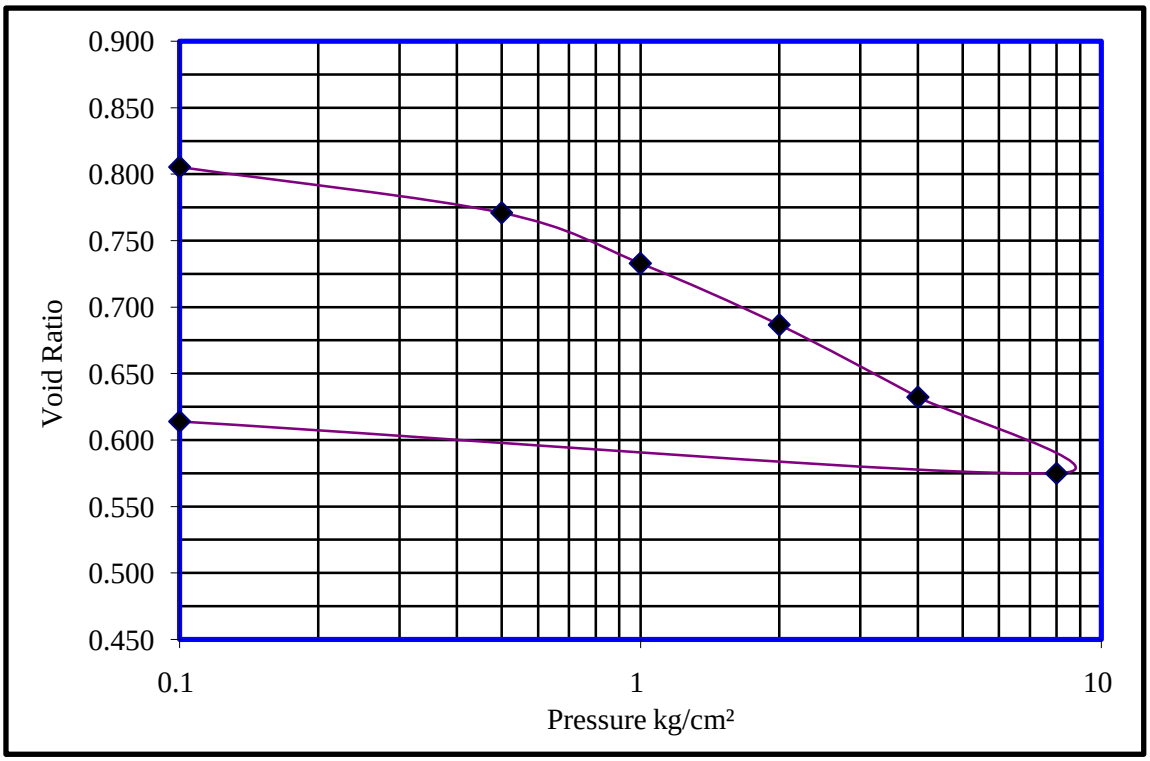
MULTI Lab (P) Ltd.

CONSOLIDATION TEST RESULT SHEET

Project :	Proposed Building Site	**Location:**	Nepalgunj, Banke
BH No :	3	**Depth (m) :**	5.0 m UDS
Date :	2nd to 8th Jan, 2022	**Analyzed by :**	S.K. Jha
Certified By:	Madhu Sudan KC		

$\Delta e = ((1+e_f) / H_f) \times \Delta H$

Applied Load	Initial Dial Reading	Final Dial Reading	Diff.	ΔH cm	Total DH cm	Sample Height cm	Δe	Total De	Void Ratio e	c_c	a_v cm²/kg	m_v cm²/kg
0.1	1585	1576	9	0.009	0.009	2.000	0.008	0.008	0.805			
0.5	1576	1538	38	0.038	0.047	1.962	0.034	0.043	0.771		0.085	0.047
1	1538	1496	42	0.042	0.089	1.920	0.038	0.081	0.733		0.081	0.046
2	1496	1445	51	0.051	0.140	1.869	0.046	0.127	0.687	0.167	0.063	0.037
4	1445	1385	60	0.060	0.200	1.809	0.054	0.181	0.632		0.045	0.027
8	1385	1322	63	0.063	0.263	1.746	0.057	0.238	0.575		0.030	0.018
0.1	1322	1365	-43	-0.043	0.220	1.780	-0.039	0.199	0.614			



MULTI Lab (P) Ltd
CONSOLIDATION TEST

Project:	Proposed Building Site	**Location :**	Nepalgunj, Banke
BH. No.	4	**Depth (m):**	12.50 m UDS
Analyzed by :	S.K. Jha	**Certified by:**	Madhu Sudan KC
Description of soil :		**Date :**	2nd to 8th Jan, 2022

Consolidometer Type:	Fixed Ring	Ring No :	1
Multiplication ratio of load device:	10	Height(cm) :	2
Ring Diameter (cm) :	6	Dial Constant (cm	0.001
Specific Gravity :	2.54	Volume V(cm^3) :	56.55
Area(cm^2) :	28.27		

SOIL PROPERTY DETERMINATION

Weight of can + wet soil (gms) :	291.900
Weight of can + dry soil (gms) :	267.200
Weight of can (gms) :	188.000
Weight of water (gms) :	24.700
weight of wet soil (gms) :	103.900
weight of dry soil (gms) :	79.200
Natural water content (%)	31.187
Weight of ring (gms) :	188.000
Weight of ring+ wet soil after test (gms) :	292.500
Weight of ring+dry soil after test (gms) :	267.200
Weight of wet soil after test (gms) :	104.500
Weight of dry soil (gms) :	79.200
Weight of water after test (gms) :	25.300
Final water content (%) :	31.944
Initial dial reading (div) :	1366.000
Final dial reading (div) :	1182.000
Change in height (cms) :	0.184
Final height of sample (cms)	1.816
Height of solids (cms) :	1.103
Final height of voids (cms) :	0.713
Final void ratio	0.647
Initial height of voids	0.897
Initial voids ratio	0.814
Unit weight of soil (gm/ cc) :	1.837

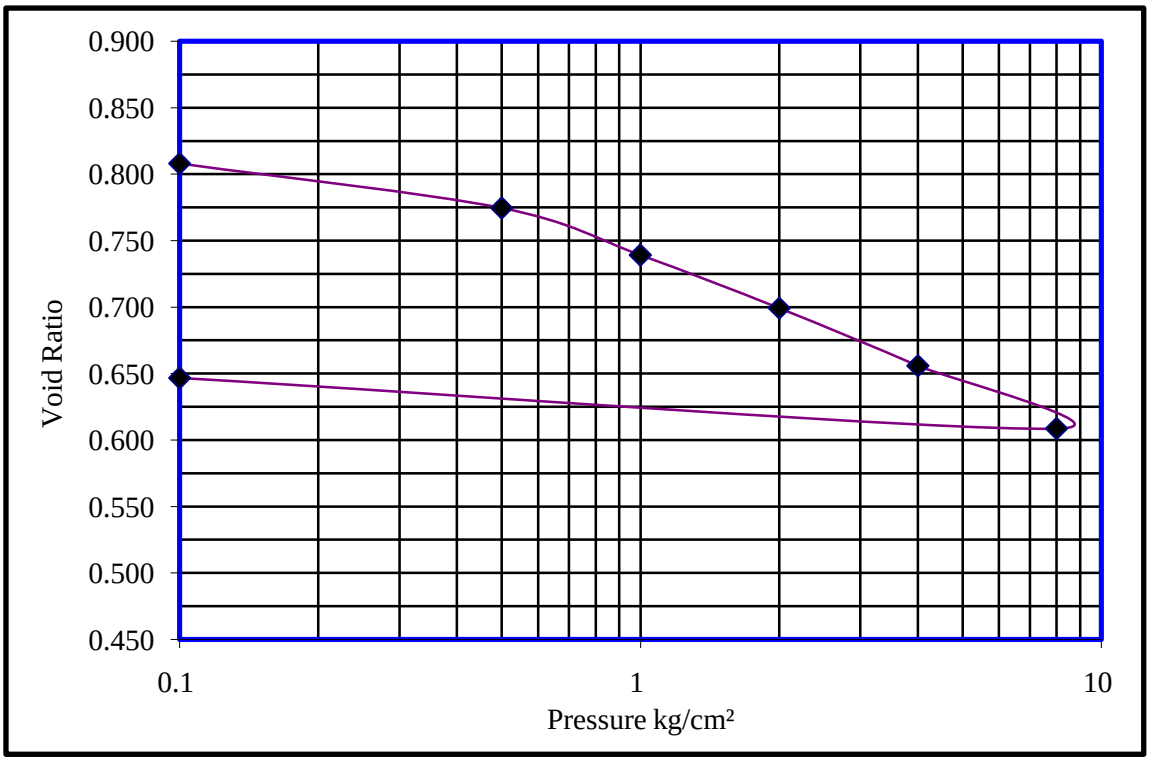
MULTI Lab (P) Ltd.

CONSOLIDATION TEST RESULT SHEET

Project :	Proposed Building Site	**Location:**	Nepalgunj, Banke
BH No :	4	**Depth (m) :**	12.50 m UDS
Date :	2nd to 8th Jan, 2022	**Analyzed by :**	S.K. Jha
Certified By:	Madhu Sudan KC		

$\Delta e = ((1+e_f) / H_f) \times \Delta H$

Applied Load	Initial Dial Reading	Final Dial Reading	Diff.	ΔH cm	Total DH cm	Sample Height cm	Δe	Total De	Void Ratio e	c_c	a_v cm²/kg	m_v cm²/kg
0.1	1366	1360	6	0.006	0.006	2.000	0.005	0.005	0.808			
0.5	1360	1323	37	0.037	0.043	1.963	0.034	0.039	0.775		0.078	0.043
1	1323	1284	39	0.039	0.082	1.924	0.035	0.074	0.739		0.074	0.042
2	1284	1240	44	0.044	0.126	1.880	0.040	0.114	0.699	0.139	0.057	0.033
4	1240	1192	48	0.048	0.174	1.832	0.044	0.158	0.656		0.039	0.023
8	1192	1140	52	0.052	0.226	1.780	0.047	0.205	0.609		0.026	0.015
0.1	1140	1182	-42	-0.042	0.184	1.816	-0.038	0.167	0.647			

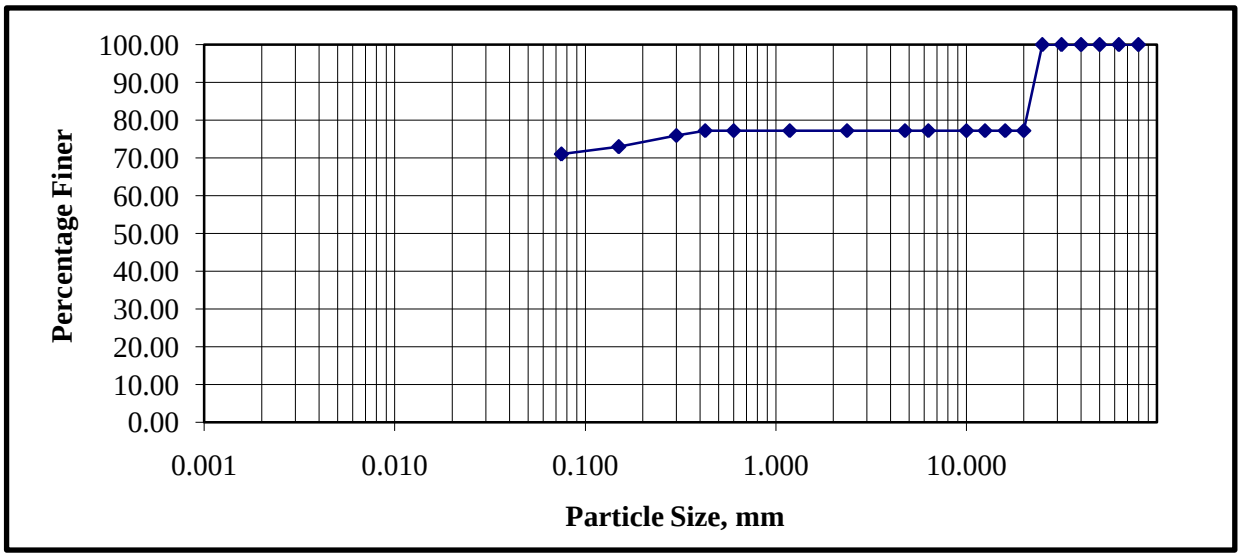


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	1
Wt. of Sample (gms):	400.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	0.30-1.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	91.00	91.00	22.75	77.25
16.000	0.00	91.00	22.75	77.25
12.500	0.00	91.00	22.75	77.25
10.000	0.00	91.00	22.75	77.25
6.300	0.00	91.00	22.75	77.25
4.750	0.00	91.00	22.75	77.25
2.360	0.00	91.00	22.75	77.25
1.180	0.00	91.00	22.75	77.25
0.600	0.00	91.00	22.75	77.25
0.425	0.00	91.00	22.75	77.25
0.300	5.00	96.00	24.00	76.00
0.150	12.00	108.00	27.00	73.00
0.075	8.00	116.00	29.00	71.00
Pan				

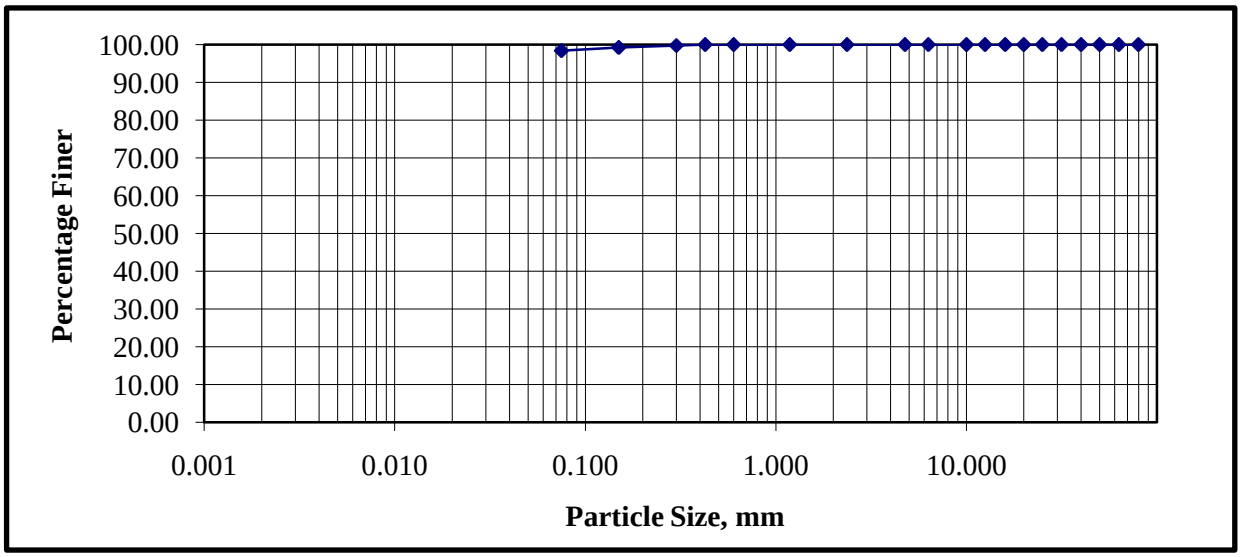


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	1
Wt. of Sample (gms):	558.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	1.50-3.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.00	0.00	0.00	100.00
0.300	1.00	1.00	0.18	99.82
0.150	3.00	4.00	0.72	99.28
0.075	5.00	9.00	1.61	98.39
Pan				

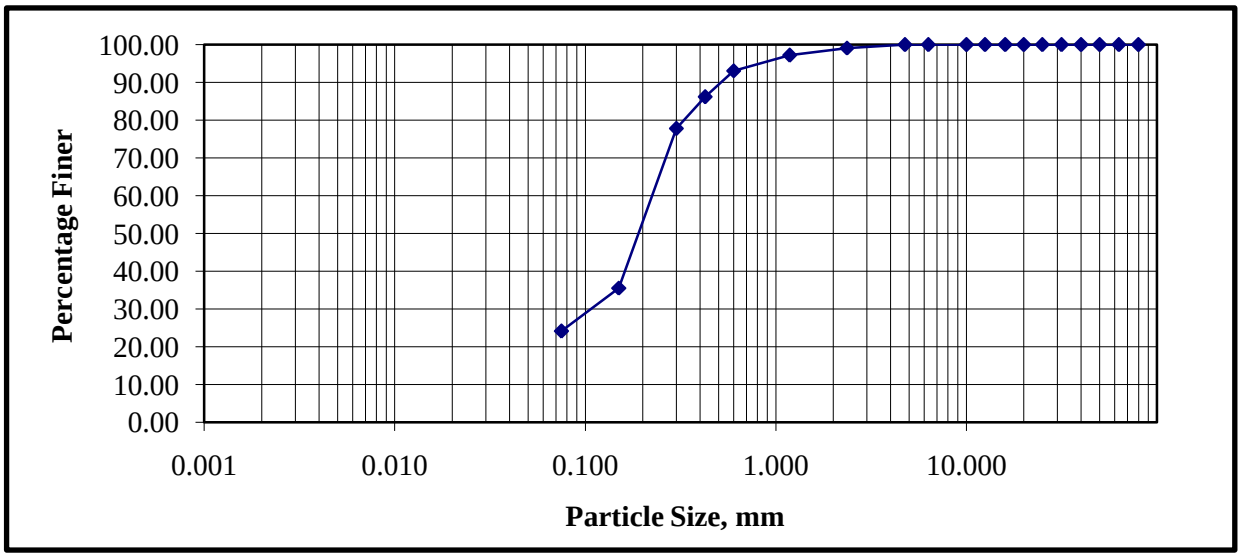


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	1
Wt. of Sample (gms):	464.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	3.00-5.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	4.00	4.00	0.86	99.14
1.180	9.00	13.00	2.80	97.20
0.600	19.00	32.00	6.90	93.10
0.425	32.00	64.00	13.79	86.21
0.300	39.00	103.00	22.20	77.80
0.150	196.00	299.00	64.44	35.56
0.075	53.00	352.00	75.86	24.14
Pan				

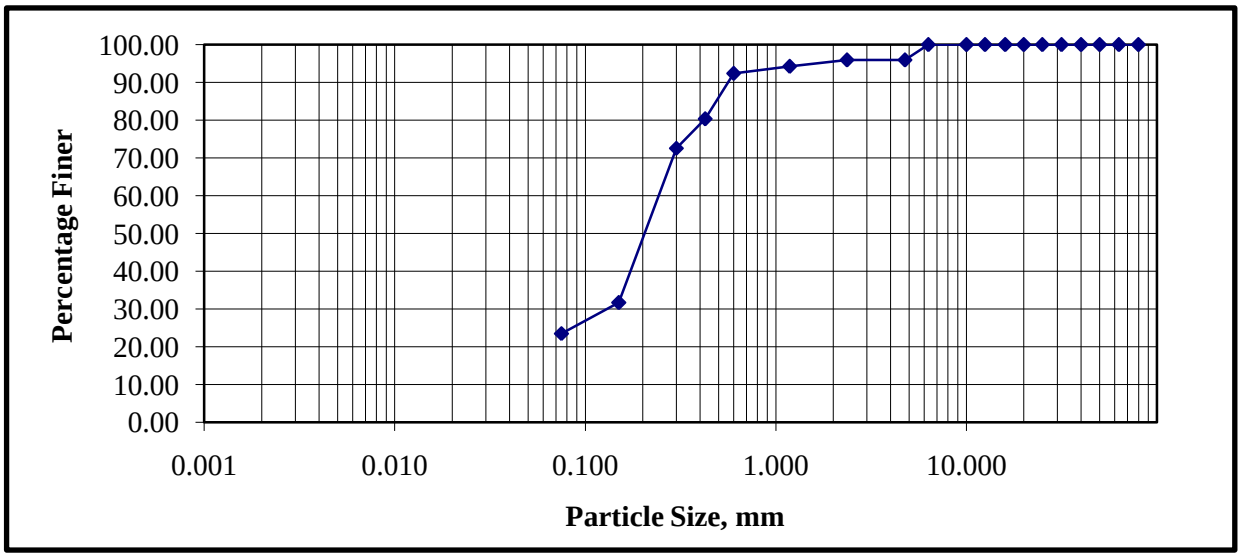


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	1
Wt. of Sample (gms):	540.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	10.50-12.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	22.00	22.00	4.07	95.93
2.360	0.00	22.00	4.07	95.93
1.180	9.00	31.00	5.74	94.26
0.600	10.00	41.00	7.59	92.41
0.425	65.00	106.00	19.63	80.37
0.300	42.00	148.00	27.41	72.59
0.150	221.00	369.00	68.33	31.67
0.075	44.00	413.00	76.48	23.52
Pan				

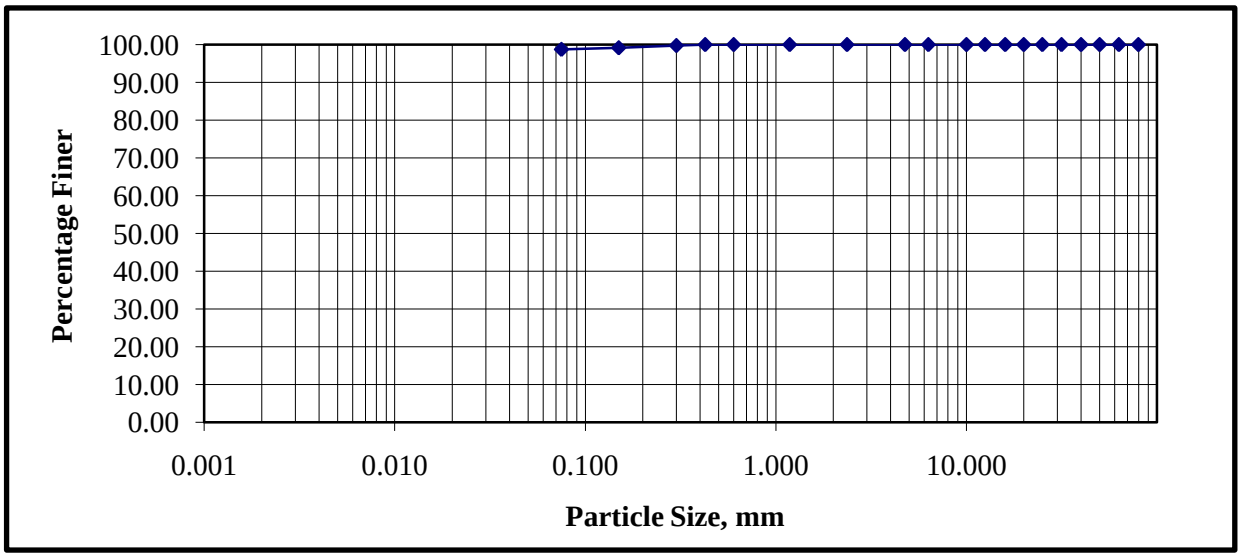


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	1
Wt. of Sample (gms):	481.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	12.50-20.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.00	0.00	0.00	100.00
0.300	1.00	1.00	0.21	99.79
0.150	3.00	4.00	0.83	99.17
0.075	2.00	6.00	1.25	98.75
Pan				

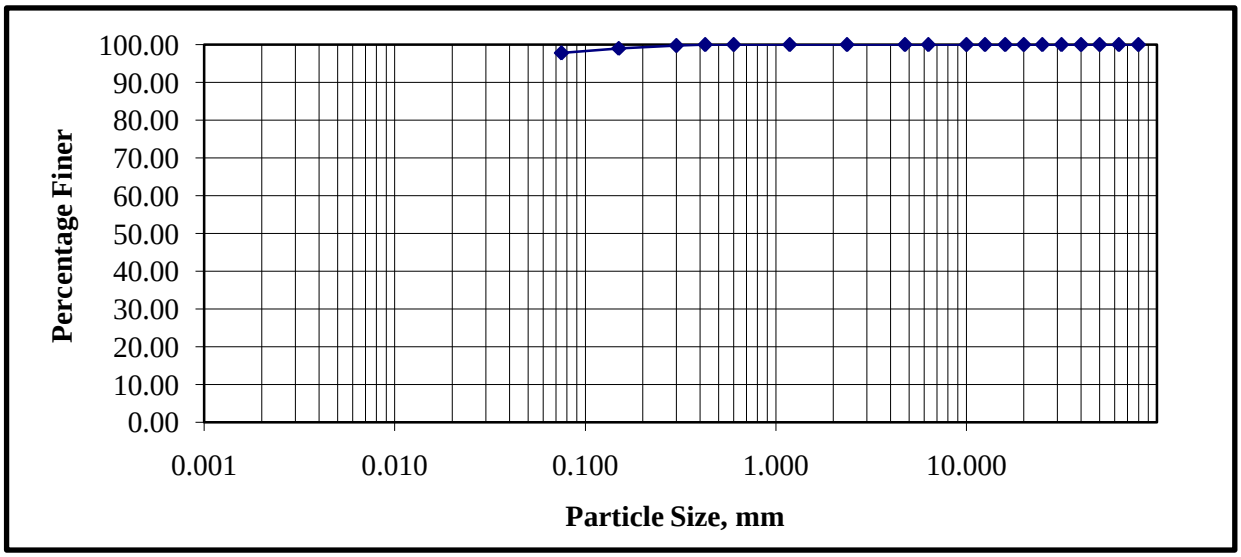


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	2
Wt. of Sample (gms):	415.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	0.30-3.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.00	0.00	0.00	100.00
0.300	1.00	1.00	0.24	99.76
0.150	3.00	4.00	0.96	99.04
0.075	5.00	9.00	2.17	97.83
Pan				

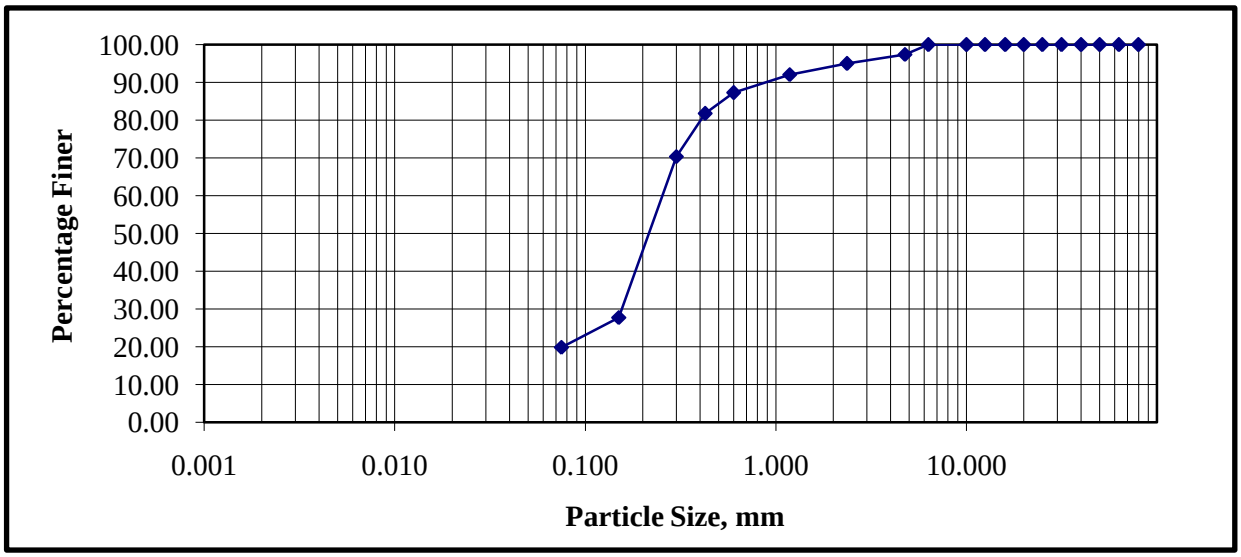


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	2
Wt. of Sample (gms):	544.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	3.00-6.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	14.00	14.00	2.57	97.43
2.360	13.00	27.00	4.96	95.04
1.180	16.00	43.00	7.90	92.10
0.600	26.00	69.00	12.68	87.32
0.425	30.00	99.00	18.20	81.80
0.300	62.00	161.00	29.60	70.40
0.150	232.00	393.00	72.24	27.76
0.075	43.00	436.00	80.15	19.85
Pan				

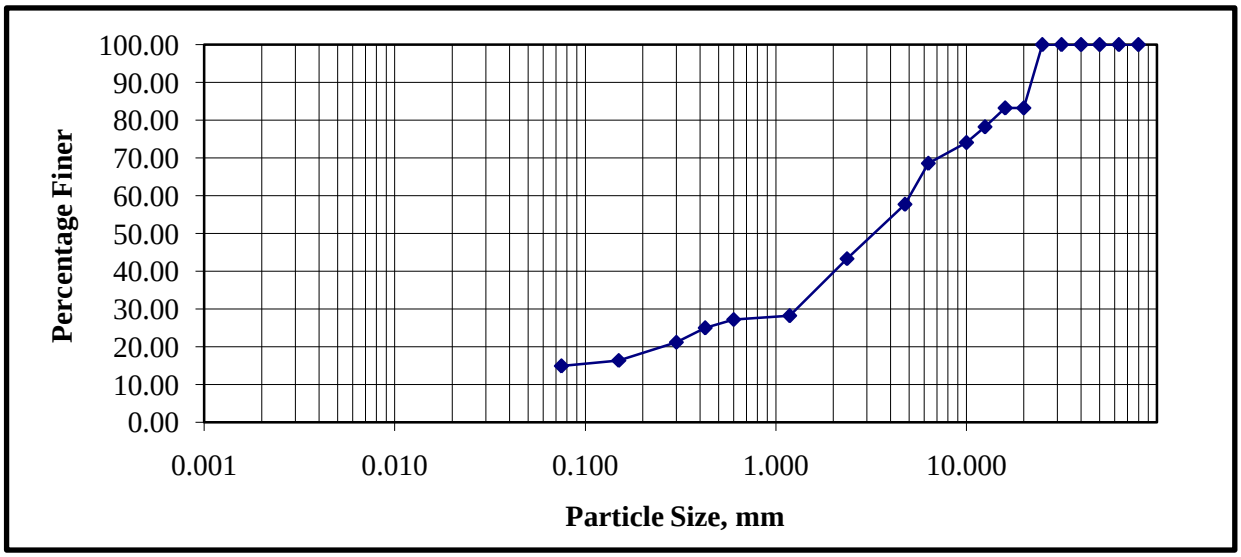


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	2
Wt. of Sample (gms):	745.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	6.50-8.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	125.00	125.00	16.78	83.22
16.000	0.00	125.00	16.78	83.22
12.500	37.00	162.00	21.74	78.26
10.000	31.00	193.00	25.91	74.09
6.300	41.00	234.00	31.41	68.59
4.750	81.00	315.00	42.28	57.72
2.360	107.00	422.00	56.64	43.36
1.180	113.00	535.00	71.81	28.19
0.600	7.00	542.00	72.75	27.25
0.425	17.00	559.00	75.03	24.97
0.300	28.00	587.00	78.79	21.21
0.150	36.00	623.00	83.62	16.38
0.075	11.00	634.00	85.10	14.90
Pan				

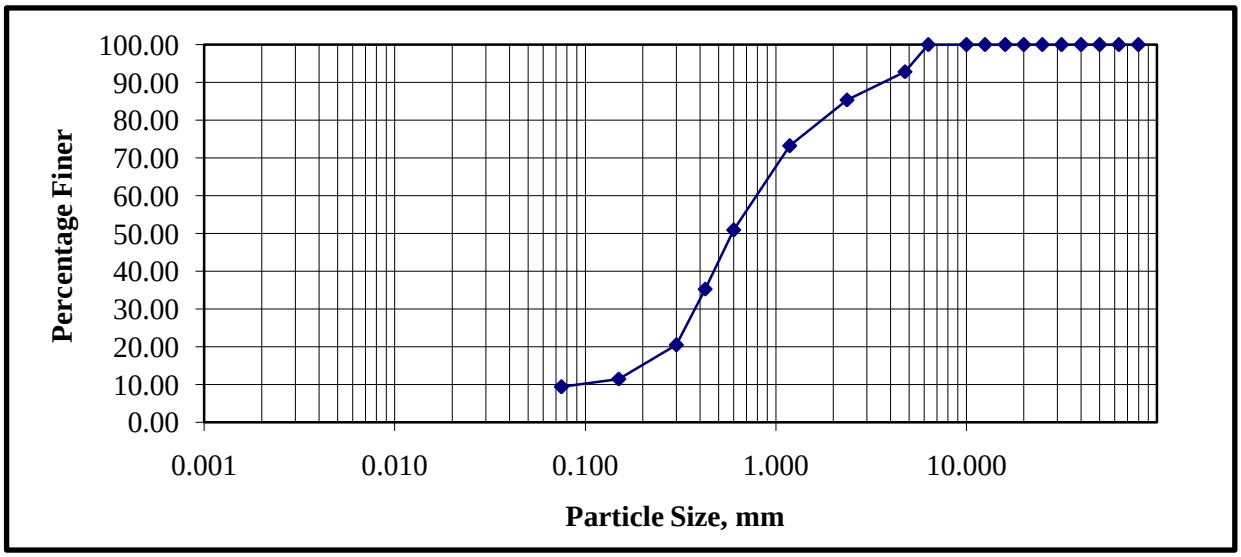


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	2
Wt. of Sample (gms):	575.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	12.00-13.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	41.00	41.00	7.13	92.87
2.360	43.00	84.00	14.61	85.39
1.180	70.00	154.00	26.78	73.22
0.600	128.00	282.00	49.04	50.96
0.425	90.00	372.00	64.70	35.30
0.300	85.00	457.00	79.48	20.52
0.150	52.00	509.00	88.52	11.48
0.075	12.00	521.00	90.61	9.39
Pan				

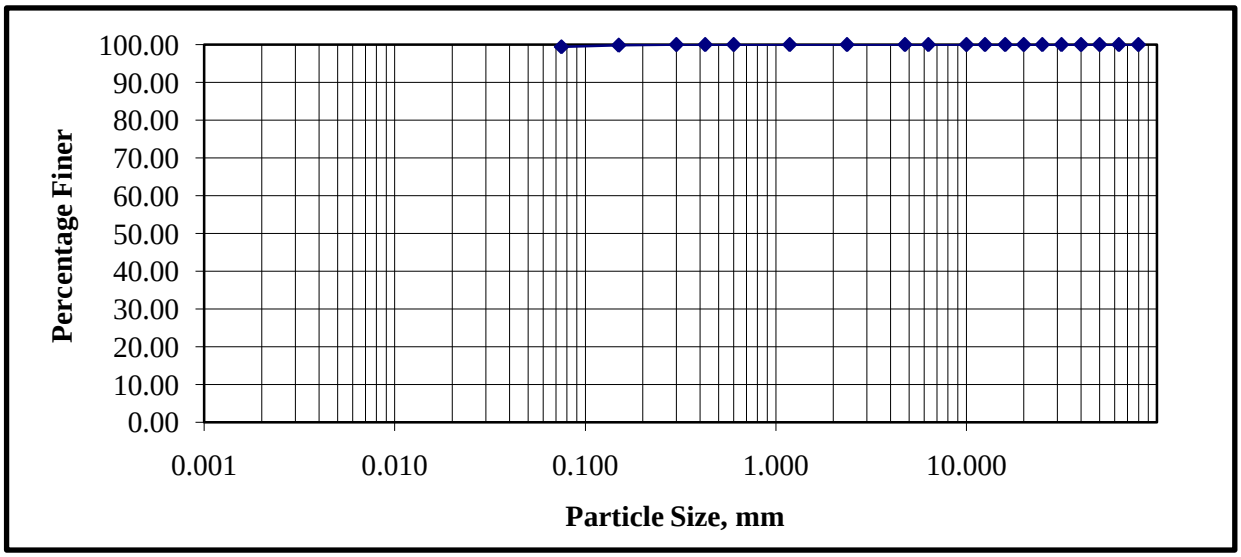


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	2
Wt. of Sample (gms):	580.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	13.50-20.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	0.00	0.00	0.00	100.00
0.300	0.00	0.00	0.00	100.00
0.150	1.00	1.00	0.17	99.83
0.075	2.00	3.00	0.52	99.48
Pan				

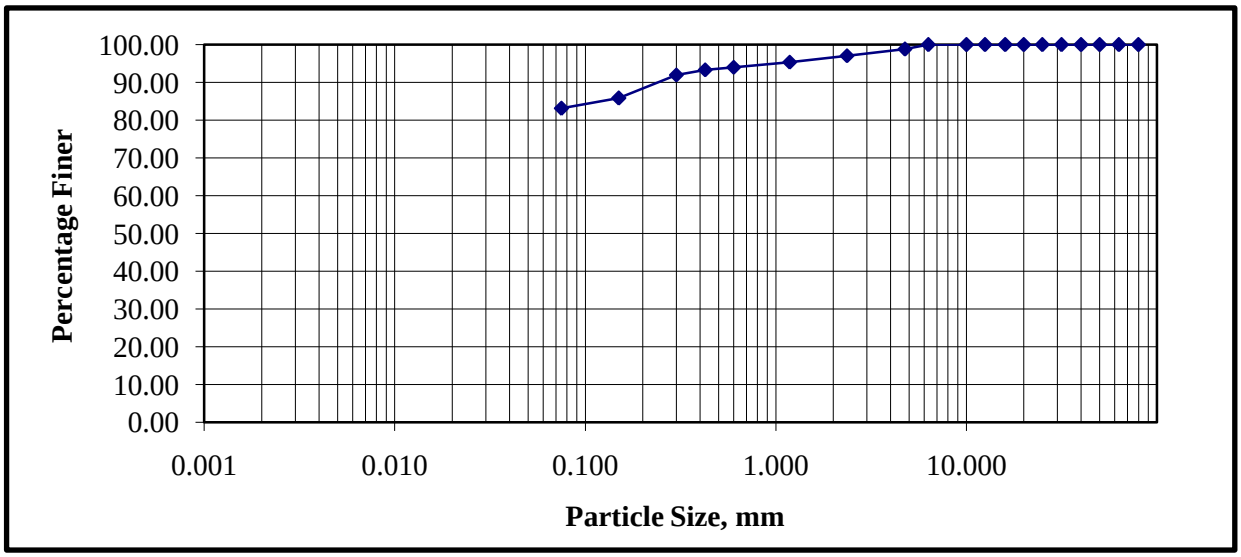


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	3
Wt. of Sample (gms):	588.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	0.00-1.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	7.00	7.00	1.19	98.81
2.360	10.00	17.00	2.89	97.11
1.180	10.00	27.00	4.59	95.41
0.600	8.00	35.00	5.95	94.05
0.425	4.00	39.00	6.63	93.37
0.300	8.00	47.00	7.99	92.01
0.150	36.00	83.00	14.12	85.88
0.075	16.00	99.00	16.84	83.16
Pan				

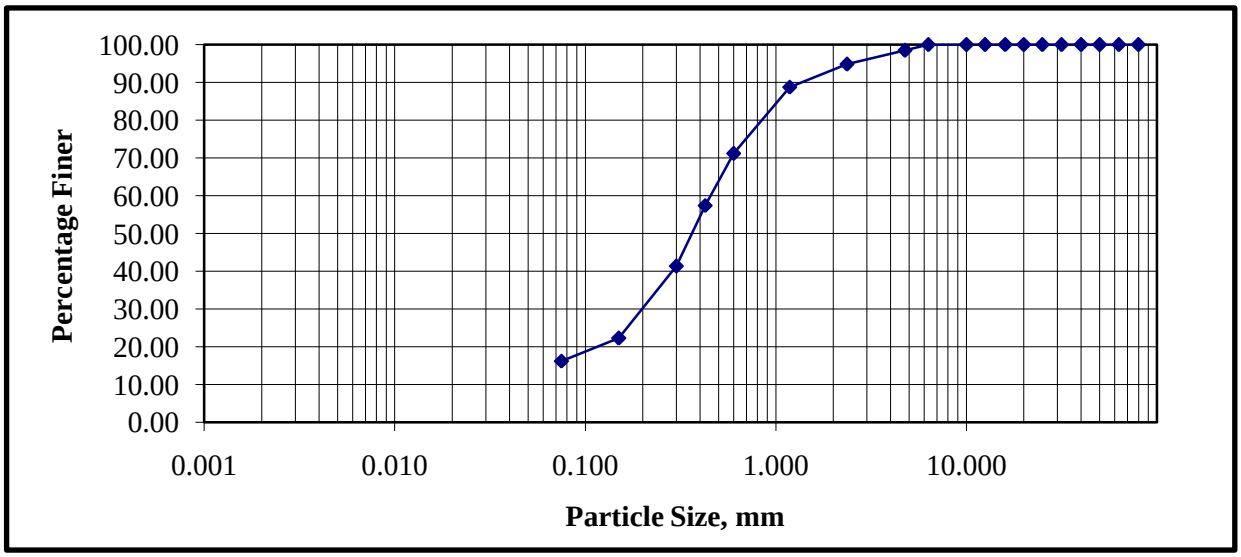


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	3
Wt. of Sample (gms):	660.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	1.50-4.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	10.00	10.00	1.52	98.48
2.360	24.00	34.00	5.15	94.85
1.180	40.00	74.00	11.21	88.79
0.600	116.00	190.00	28.79	71.21
0.425	91.00	281.00	42.58	57.42
0.300	106.00	387.00	58.64	41.36
0.150	126.00	513.00	77.73	22.27
0.075	40.00	553.00	83.79	16.21
Pan				

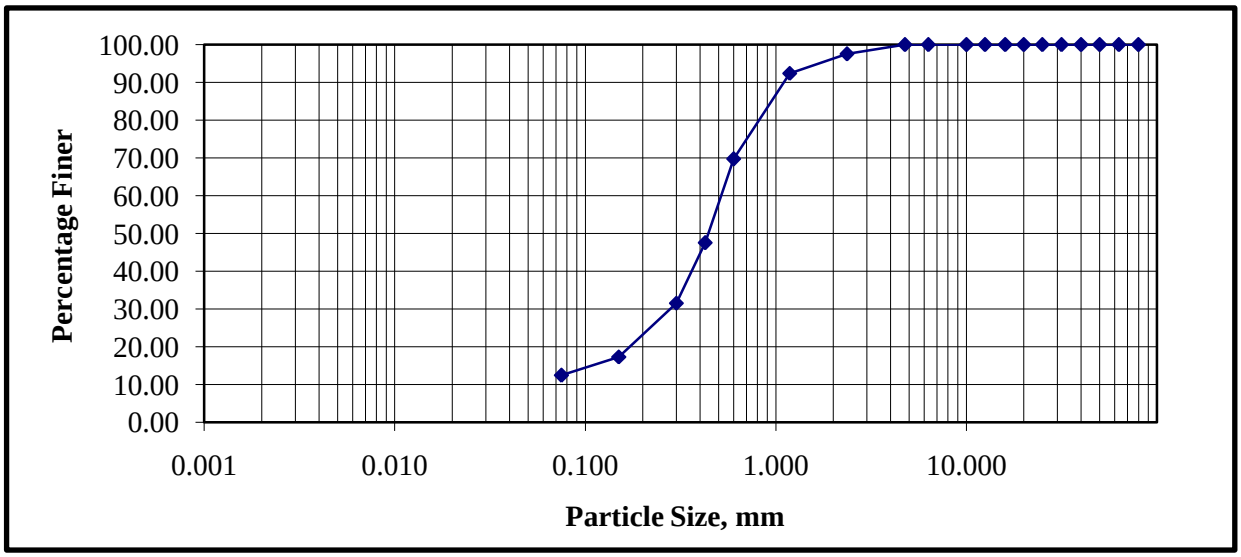


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	3
Wt. of Sample (gms):	450.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	6.00-10.50	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	11.00	11.00	2.44	97.56
1.180	23.00	34.00	7.56	92.44
0.600	102.00	136.00	30.22	69.78
0.425	100.00	236.00	52.44	47.56
0.300	72.00	308.00	68.44	31.56
0.150	64.00	372.00	82.67	17.33
0.075	22.00	394.00	87.56	12.44
Pan				

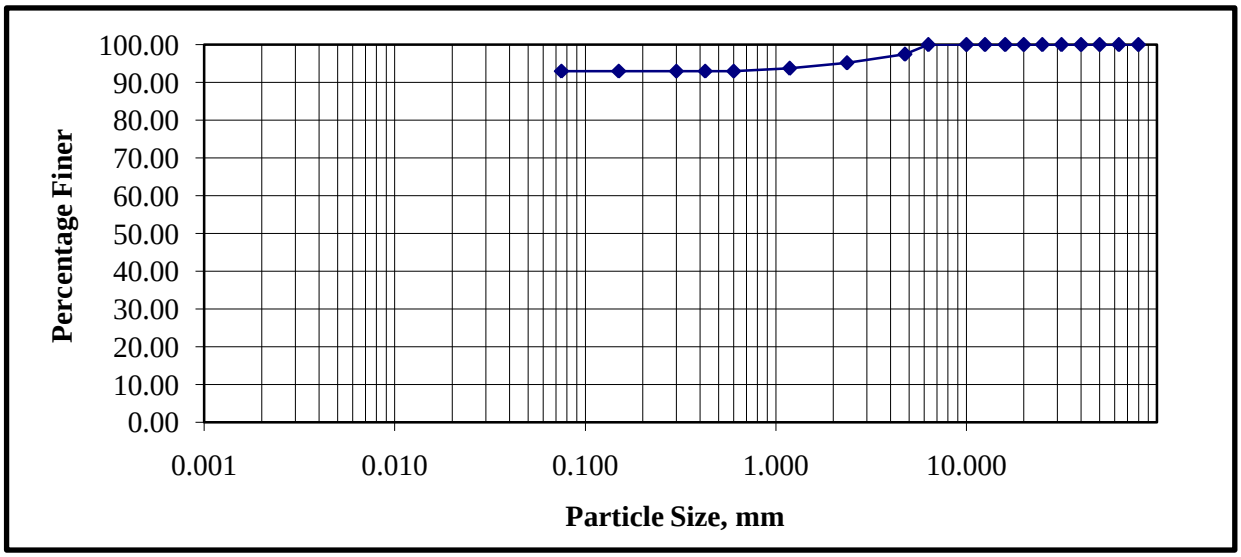


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	3
Wt. of Sample (gms):	560.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	10.00-16.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	14.00	14.00	2.50	97.50
2.360	13.00	27.00	4.82	95.18
1.180	8.00	35.00	6.25	93.75
0.600	4.00	39.00	6.96	93.04
0.425	0.00	39.00	6.96	93.04
0.300	0.00	39.00	6.96	93.04
0.150	0.00	39.00	6.96	93.04
0.075	0.00	39.00	6.96	93.04
Pan				

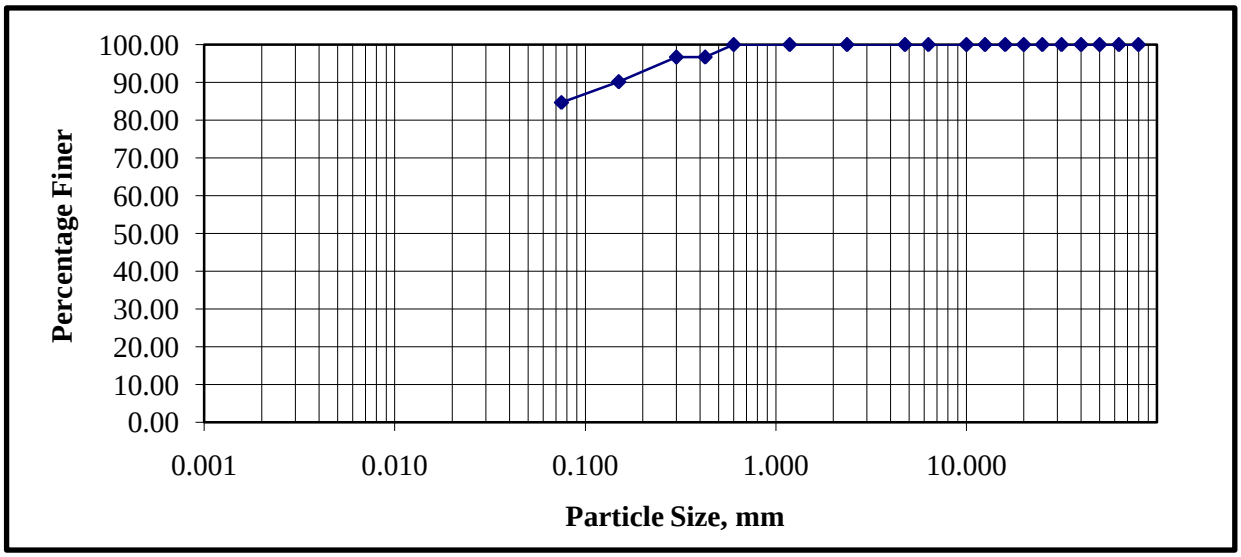


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	4
Wt. of Sample (gms):	458.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	0.00-1.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	0.00	0.00	0.00	100.00
2.360	0.00	0.00	0.00	100.00
1.180	0.00	0.00	0.00	100.00
0.600	0.00	0.00	0.00	100.00
0.425	15.00	15.00	3.28	96.72
0.300	0.00	15.00	3.28	96.72
0.150	30.00	45.00	9.83	90.17
0.075	25.00	70.00	15.28	84.72
Pan				

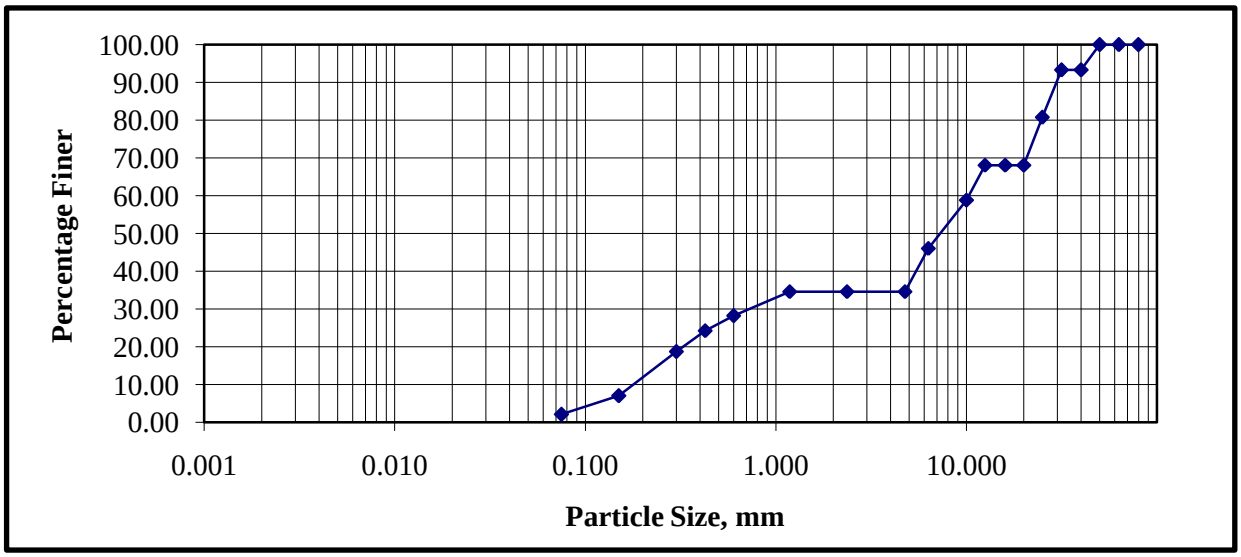


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	4
Wt. of Sample (gms):	812.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	1.00-3.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	54.00	54.00	6.65	93.35
31.500	0.00	54.00	6.65	93.35
25.000	102.00	156.00	19.21	80.79
20.000	103.00	259.00	31.90	68.10
16.000	0.00	259.00	31.90	68.10
12.500	0.00	259.00	31.90	68.10
10.000	75.00	334.00	41.13	58.87
6.300	104.00	438.00	53.94	46.06
4.750	93.00	531.00	65.39	34.61
2.360	0.00	531.00	65.39	34.61
1.180	0.00	531.00	65.39	34.61
0.600	52.00	583.00	71.80	28.20
0.425	32.00	615.00	75.74	24.26
0.300	45.00	660.00	81.28	18.72
0.150	95.00	755.00	92.98	7.02
0.075	40.00	795.00	97.91	2.09
Pan				

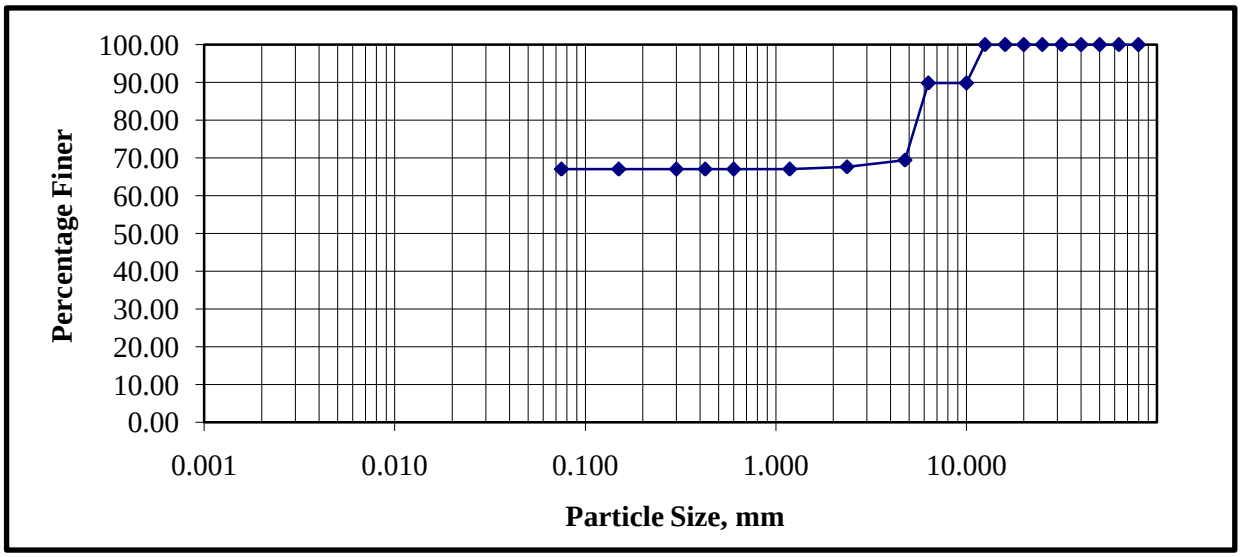


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	4
Wt. of Sample (gms):	619.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	3.00-5.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	63.00	63.00	10.18	89.82
6.300	0.00	63.00	10.18	89.82
4.750	126.00	189.00	30.53	69.47
2.360	11.00	200.00	32.31	67.69
1.180	4.00	204.00	32.96	67.04
0.600	0.00	204.00	32.96	67.04
0.425	0.00	204.00	32.96	67.04
0.300	0.00	204.00	32.96	67.04
0.150	0.00	204.00	32.96	67.04
0.075	0.00	204.00	32.96	67.04
Pan				

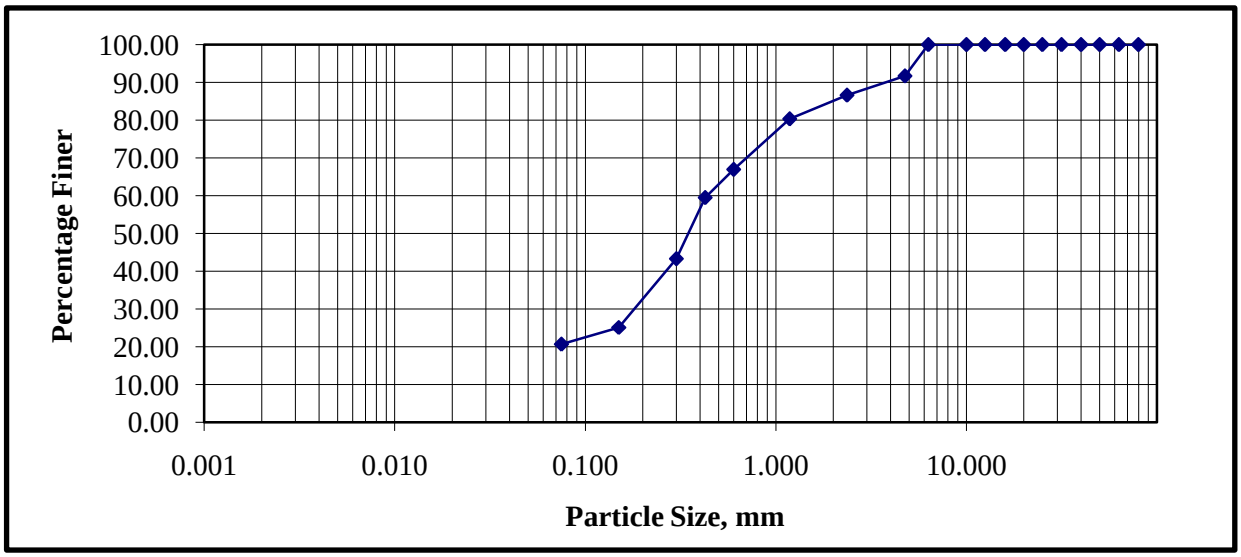


MULTI Lab (P) Ltd

SIEVE ANALYSIS

Project:	Soil Investigation of Proposed Building Complex		
Location :	Kohalpur	**BH No.:**	4
Wt. of Sample (gms):	605.00	**Tested by :**	Manoj Subedi
Date :	5th Jan, 2022	**Checked by:**	S.K.Jha
Depth (m):	5.00-11.00	**Certified by:**	Madhusudan K.C

Seive Size mm	Wt. of Soil Retained gms	Cumulative Weight Retained gms	Cumulative Percentage Retained %	Percent Passing %
80.000	0.00	0.00	0.00	100.00
63.000	0.00	0.00	0.00	100.00
50.000	0.00	0.00	0.00	100.00
40.000	0.00	0.00	0.00	100.00
31.500	0.00	0.00	0.00	100.00
25.000	0.00	0.00	0.00	100.00
20.000	0.00	0.00	0.00	100.00
16.000	0.00	0.00	0.00	100.00
12.500	0.00	0.00	0.00	100.00
10.000	0.00	0.00	0.00	100.00
6.300	0.00	0.00	0.00	100.00
4.750	50.00	50.00	8.26	91.74
2.360	31.00	81.00	13.39	86.61
1.180	38.00	119.00	19.67	80.33
0.600	81.00	200.00	33.06	66.94
0.425	45.00	245.00	40.50	59.50
0.300	98.00	343.00	56.69	43.31
0.150	110.00	453.00	74.88	25.12
0.075	27.00	480.00	79.34	20.66
Pan				



MULTI Lab (P) Ltd.

SPECIFIC GRAVITY

Project : Proposed Building Site

Location : Nepalgunj, Banke

Date : 8th Jan, 2022

Tested by : Manoj Subedi

Checked by : S.K. Jha

Certified By : Madhu Sudan KC

SPECIFIC GRAVITY

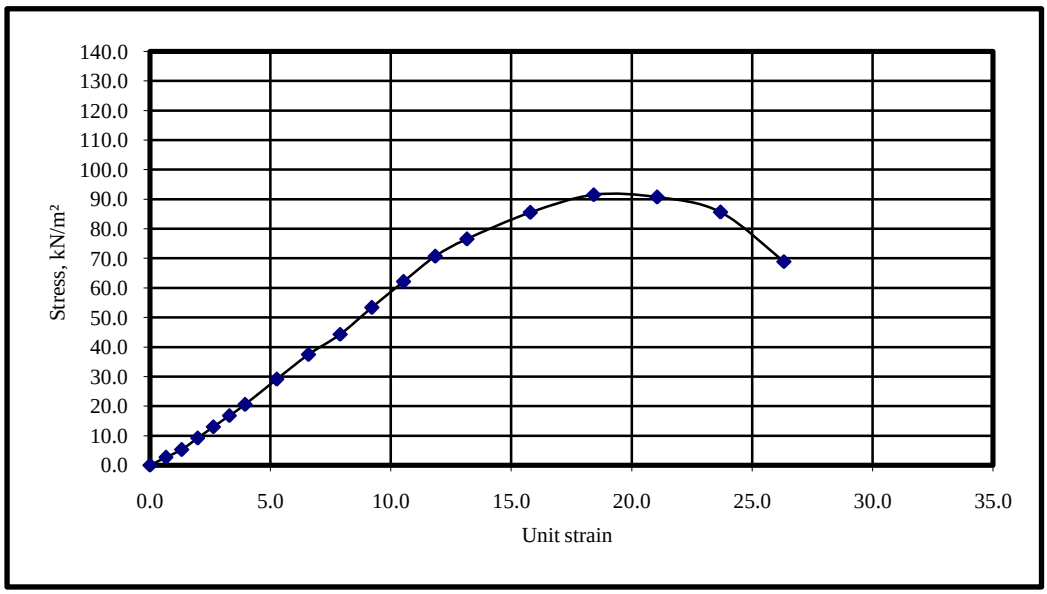
BH No		**1**	**2**	**3**	**4**
Depth (m)		5.00-10.50	8.50-12.00	4.00-6.00	11.00-20.00
Weight of Pycnometer gms		32.40	32.40	32.40	32.40
Weight of Pycnometer + soil sample	gms	84.20	86.80	82.10	84.80
Weight of Pycnometer + water + soil	gms	180.40	182.00	179.20	180.80
Weight of Pycnometer + water	gms	149.10	149.10	149.10	149.10
Weight of Sample ,	gms	51.80	54.40	49.70	52.40
Temperature of Water,	deg.	21.00	21.00	21.00	21.00
Specific Gravity of Water,		1.00	1.00	1.00	1.00
Specific Gravity of Soil Sample,		**2.527**	**2.530**	**2.536**	**2.531**

MULTI Lab (P) Ltd.

UNCONFINED COMPRESSION TEST

Project :	Proposed Building Site		**Location:**	Nepalgunj,Banke	
Borehole No.:	1		**Depth:**	6.50 m UDS	
Diameter:	3.8	cm	**Height:**	7.60	cm
Volume:	86.184	cc	**Area:**	11.34	cm²
Load Dial Const:	0.3028	Kg/Div	**Strain Dial Const**	0.001	cm
Wet Weight:	158.00	gms	**Bulk Unit wt.:**	1.833	gm/cc
Dry Weight :	120.00	gms	**Dry Unit Wt.:**	1.392	gm/cc
Date:	2nd Jan, 2022		**Prov. Ring No:**	SSTC 111	
Tested by :	Manoj Subedi		**Checked by :**	Sandeep Kr. Jha	
Certified by:	Madhu Sudan KC				

Strain Dial (div)	Load Dial (div)	Load Kg	Total Strain cm	Unit strain	1-Unit Strain	Corrected Area cm²	Stress kN/m²
0	0.00	0.00	0.00	0.00	1.00	11.34	0.00
50	1.00	0.30	0.05	0.66	0.99	11.42	2.65
100	2.00	0.61	0.10	1.32	0.99	11.49	5.27
150	3.50	1.06	0.15	1.97	0.98	11.57	9.16
200	5.00	1.51	0.20	2.63	0.97	11.65	13.00
250	6.50	1.97	0.25	3.29	0.97	11.73	16.79
300	8.00	2.42	0.30	3.95	0.96	11.81	20.52
400	11.50	3.48	0.40	5.26	0.95	11.97	29.09
500	15.00	4.54	0.50	6.58	0.93	12.14	37.42
600	18.00	5.45	0.60	7.89	0.92	12.31	44.27
700	22.00	6.66	0.70	9.21	0.91	12.49	53.33
800	26.00	7.87	0.80	10.53	0.89	12.67	62.12
900	30.00	9.08	0.90	11.84	0.88	12.86	70.62
1000	33.00	9.99	1.00	13.16	0.87	13.06	76.52
1200	38.00	11.51	1.20	15.79	0.84	13.47	85.45
1400	42.00	12.72	1.40	18.42	0.82	13.90	91.49
1600	43.00	13.02	1.60	21.05	0.79	14.36	90.65
1800	42.00	12.72	1.80	23.68	0.76	14.86	85.59
2000	35.00	10.60	2.00	26.32	0.74	15.39	68.86



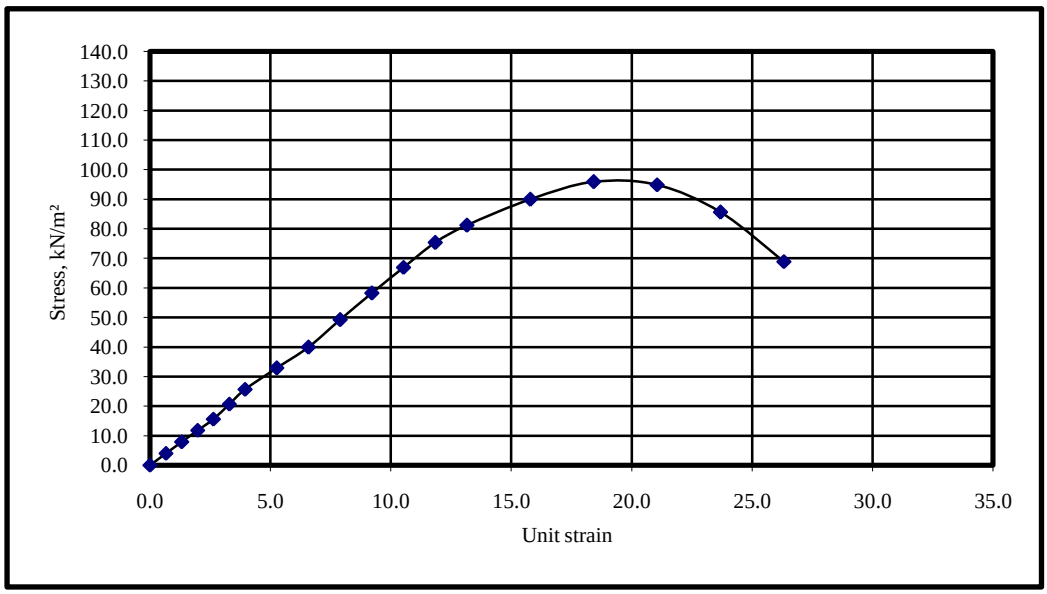
Unconfined Strength(kN/m²):	91.00	**Shear Strength (kN/m²) :**	45.50

MULTI Lab (P) Ltd.

UNCONFINED COMPRESSION TEST

Project :	Proposed Building Site		**Location:**	Nepalgunj,Banke	
Borehole No.:	2		**Depth:**	9.50 m UDS	
Diameter:	3.8	cm	**Height:**	7.60	cm
Volume:	86.184	cc	**Area:**	11.34	cm²
Load Dial Const:	0.3028	Kg/Div	**Strain Dial Const**	0.001	cm
Wet Weight:	158.50	gms	**Bulk Unit wt.:**	1.839	gm/cc
Dry Weight :	122.00	gms	**Dry Unit Wt.:**	1.416	gm/cc
Date:	2nd Jan, 2022		**Prov. Ring No:**	SSTC 111	
Tested by :	Manoj Subedi		**Checked by :**	Sandeep Kr. Jha	
Certified by:	Madhu Sudan KC				

Strain Dial (div)	Load Dial (div)	Load Kg	Total Strain cm	Unit strain	1-Unit Strain	Corrected Area cm²	Stress kN/m²
0	0.00	0.00	0.00	0.00	1.00	11.34	0.00
50	1.50	0.45	0.05	0.66	0.99	11.42	3.98
100	3.00	0.91	0.10	1.32	0.99	11.49	7.91
150	4.50	1.36	0.15	1.97	0.98	11.57	11.78
200	6.00	1.82	0.20	2.63	0.97	11.65	15.60
250	8.00	2.42	0.25	3.29	0.97	11.73	20.66
300	10.00	3.03	0.30	3.95	0.96	11.81	25.65
400	13.00	3.94	0.40	5.26	0.95	11.97	32.89
500	16.00	4.84	0.50	6.58	0.93	12.14	39.91
600	20.00	6.06	0.60	7.89	0.92	12.31	49.19
700	24.00	7.27	0.70	9.21	0.91	12.49	58.18
800	28.00	8.48	0.80	10.53	0.89	12.67	66.90
900	32.00	9.69	0.90	11.84	0.88	12.86	75.33
1000	35.00	10.60	1.00	13.16	0.87	13.06	81.16
1200	40.00	12.11	1.20	15.79	0.84	13.47	89.94
1400	44.00	13.32	1.40	18.42	0.82	13.90	95.85
1600	45.00	13.63	1.60	21.05	0.79	14.36	94.86
1800	42.00	12.72	1.80	23.68	0.76	14.86	85.59
2000	35.00	10.60	2.00	26.32	0.74	15.39	68.86



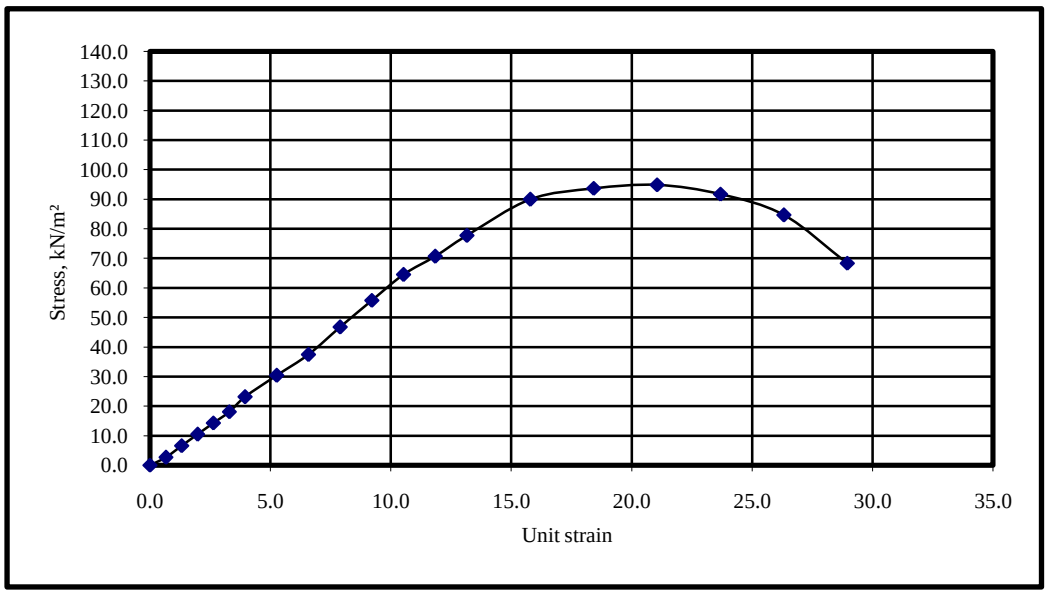
Unconfined Strength(kN/m²):	96.00	**Shear Strength (kN/m²) :**	48.00

MULTI Lab (P) Ltd.

UNCONFINED COMPRESSION TEST

Project :	Proposed Building Site		**Location:**	Nepalgunj,Banke	
Borehole No.:	3		**Depth:**	5.0 m UDS	
Diameter:	3.8	cm	**Height:**	7.60	cm
Volume:	86.184	cc	**Area:**	11.34	cm²
Load Dial Const:	0.3028	Kg/Div	**Strain Dial Const**	0.001	cm
Wet Weight:	157.20	gms	**Bulk Unit wt.:**	1.824	gm/cc
Dry Weight :	120.50	gms	**Dry Unit Wt.:**	1.398	gm/cc
Date:	2nd Jan, 2022		**Prov. Ring No:**	SSTC 111	
Tested by :	Manoj Subedi		**Checked by :**	Sandeep Kr. Jha	
Certified by:	Madhu Sudan KC				

Strain Dial (div)	Load Dial (div)	Load Kg	Total Strain cm	Unit strain	1-Unit Strain	Corrected Area cm²	Stress kN/m²
0	0.00	0.00	0.00	0.00	1.00	11.34	0.00
50	1.00	0.30	0.05	0.66	0.99	11.42	2.65
100	2.50	0.76	0.10	1.32	0.99	11.49	6.59
150	4.00	1.21	0.15	1.97	0.98	11.57	10.47
200	5.50	1.67	0.20	2.63	0.97	11.65	14.30
250	7.00	2.12	0.25	3.29	0.97	11.73	18.08
300	9.00	2.73	0.30	3.95	0.96	11.81	23.08
400	12.00	3.63	0.40	5.26	0.95	11.97	30.36
500	15.00	4.54	0.50	6.58	0.93	12.14	37.42
600	19.00	5.75	0.60	7.89	0.92	12.31	46.73
700	23.00	6.96	0.70	9.21	0.91	12.49	55.76
800	27.00	8.18	0.80	10.53	0.89	12.67	64.51
900	30.00	9.08	0.90	11.84	0.88	12.86	70.62
1000	33.50	10.14	1.00	13.16	0.87	13.06	77.68
1200	40.00	12.11	1.20	15.79	0.84	13.47	89.94
1400	43.00	13.02	1.40	18.42	0.82	13.90	93.67
1600	45.00	13.63	1.60	21.05	0.79	14.36	94.86
1800	45.00	13.63	1.80	23.68	0.76	14.86	91.70
2000	43.00	13.02	2.00	26.32	0.74	15.39	84.60
2200	36.00	10.90	2.20	28.95	0.71	15.96	68.30



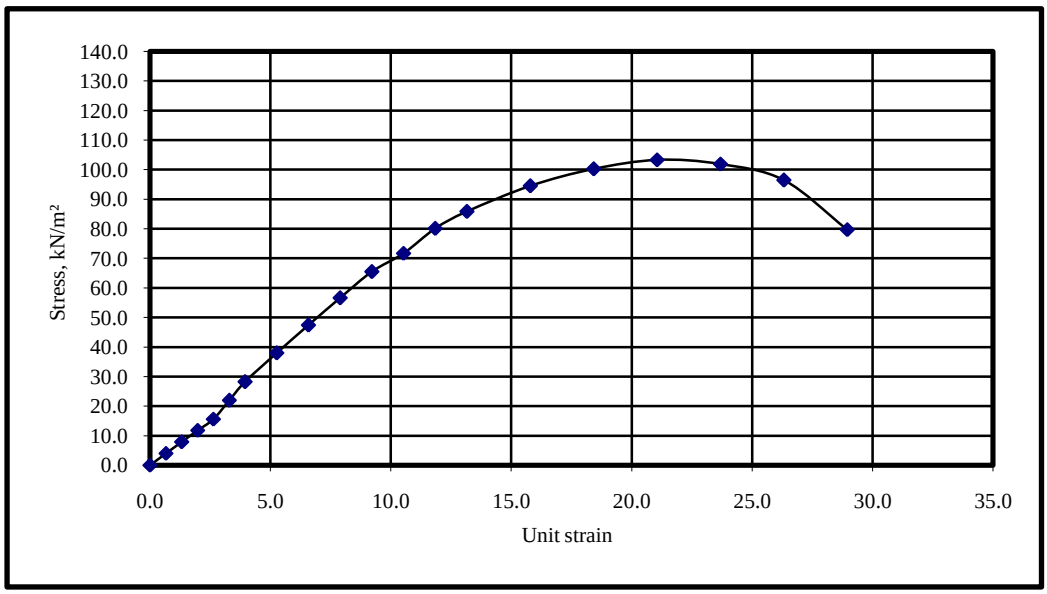
Unconfined Strength(kN/m²):	95.00	**Shear Strength (kN/m²) :**	47.50

MULTI Lab (P) Ltd.

UNCONFINED COMPRESSION TEST

Project :	Proposed Building Site		**Location:**	Nepalgunj,Banke	
Borehole No.:	4		**Depth:**	12.50 m UDS	
Diameter:	3.8	cm	**Height:**	7.60	cm
Volume:	86.184	cc	**Area:**	11.34	cm²
Load Dial Const:	0.3028	Kg/Div	**Strain Dial Const**	0.001	cm
Wet Weight:	158.50	gms	**Bulk Unit wt.:**	1.839	gm/cc
Dry Weight :	121.00	gms	**Dry Unit Wt.:**	1.404	gm/cc
Date:	2nd Jan, 2022		**Prov. Ring No:**	SSTC 111	
Tested by :	Manoj Subedi		**Checked by :**	Sandeep Kr. Jha	
Certified by:	Madhu Sudan KC				

Strain Dial (div)	Load Dial (div)	Load Kg	Total Strain cm	Unit strain	1-Unit Strain	Corrected Area cm²	Stress kN/m²
0	0.00	0.00	0.00	0.00	1.00	11.34	0.00
50	1.50	0.45	0.05	0.66	0.99	11.42	3.98
100	3.00	0.91	0.10	1.32	0.99	11.49	7.91
150	4.50	1.36	0.15	1.97	0.98	11.57	11.78
200	6.00	1.82	0.20	2.63	0.97	11.65	15.60
250	8.50	2.57	0.25	3.29	0.97	11.73	21.95
300	11.00	3.33	0.30	3.95	0.96	11.81	28.21
400	15.00	4.54	0.40	5.26	0.95	11.97	37.94
500	19.00	5.75	0.50	6.58	0.93	12.14	47.40
600	23.00	6.96	0.60	7.89	0.92	12.31	56.57
700	27.00	8.18	0.70	9.21	0.91	12.49	65.45
800	30.00	9.08	0.80	10.53	0.89	12.67	71.67
900	34.00	10.30	0.90	11.84	0.88	12.86	80.04
1000	37.00	11.20	1.00	13.16	0.87	13.06	85.80
1200	42.00	12.72	1.20	15.79	0.84	13.47	94.44
1400	46.00	13.93	1.40	18.42	0.82	13.90	100.20
1600	49.00	14.84	1.60	21.05	0.79	14.36	103.29
1800	50.00	15.14	1.80	23.68	0.76	14.86	101.89
2000	49.00	14.84	2.00	26.32	0.74	15.39	96.41
2200	42.00	12.72	2.20	28.95	0.71	15.96	79.68



Unconfined Strength(kN/m²):	103.00	**Shear Strength (kN/m²) :**	51.50

MULTI Lab (P) Ltd

WATER CONTENT DETERMENATION

Project : Soil Investigation of Proposed Building Complex

Location : Nepalgunj

Date : 2nd Jan, 2022

Tested by : Manoj Subedi

Checked by : S. K. Jha

Certified by : Madhusudan K.C

Bore Hole No.		1						2					
Depth (m)		0.30-1.50	1.50-3.00	3.00-5.00	5.00-10.50	10.50-12.50	12.50-20.00	0.30-3.00	3.00-6.50	6.50-8.50	8.50-12.00	12.00-13.50	13.50-20.00
Container No.		1	2	3	4	5	6	7	8	9	10	11	12
Wt of cont.+wet soil,	gms	812.00	910.00	810.00	652.00	795.00	810.00	966.00	1065.00	865.00	981.00	942.00	698.00
Wt of cont.+dry soil,	gms	640.00	710.00	690.00	512.00	670.00	642.00	745.00	912.00	765.00	768.00	842.00	545.00
Wt of container,	gms	92.00	105.00	82.00	100.00	72.00	81.00	89.00	105.00	92.00	100.00	78.00	83.00
Wt of water,	gms	172.00	200.00	120.00	140.00	125.00	168.00	221.00	153.00	100.00	213.00	100.00	153.00
Wt of dry sample	gms	548.00	605.00	608.00	412.00	598.00	561.00	656.00	807.00	673.00	668.00	764.00	462.00
Moisture content,	%	31.39	33.06	19.74	33.98	20.90	29.95	33.69	18.96	14.86	31.89	13.09	33.12

MULTI Lab (P) Ltd

WATER CONTENT DETERMENATION

Project : Soil Investigation of Proposed Building Complex

Location : Nepalgunj

Date : 2nd Jan, 2022

Tested by : Manoj Subedi

Checked by : S. K. Jha

Certified by : Madhusudan K.C

Bore Hole No.		3					4				
Depth (m)		0.00-1.50	1.50-4.00	4.00-6.00	6.00-10.50	10.50-16.00	0.00-1.00	1.00-3.00	3.00-5.00	5.00-11.00	11.00-20.00
Container No.		13	14	15	16	17	18	19	20	21	22
Wt of cont.+wet soil,	gms	910.00	851.00	1032.00	965.00	718.00	895.00	1302.00	981.00	720.00	595.00
Wt of cont.+dry soil,	gms	785.00	745.00	802.00	835.00	565.00	695.00	1165.00	795.00	664.00	468.00
Wt of container,	gms	92.00	105.00	94.00	78.00	100.00	78.00	102.00	92.00	82.00	85.00
Wt of water,	gms	125.00	106.00	230.00	130.00	153.00	200.00	137.00	186.00	56.00	127.00
Wt of dry sample	gms	693.00	640.00	708.00	757.00	465.00	617.00	1063.00	703.00	582.00	383.00
Moisture content,	%	18.04	16.56	32.49	17.17	32.90	32.41	12.89	26.46	9.62	33.16