



NORTH EASTERN RAILWAY

**FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE
PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY
FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD &
4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY
(TOTAL 1022.00 KM)**

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
22208.775	39	ROAD	RUB	BH-01	207413	2991347	107.83

SUBMITTED BY:

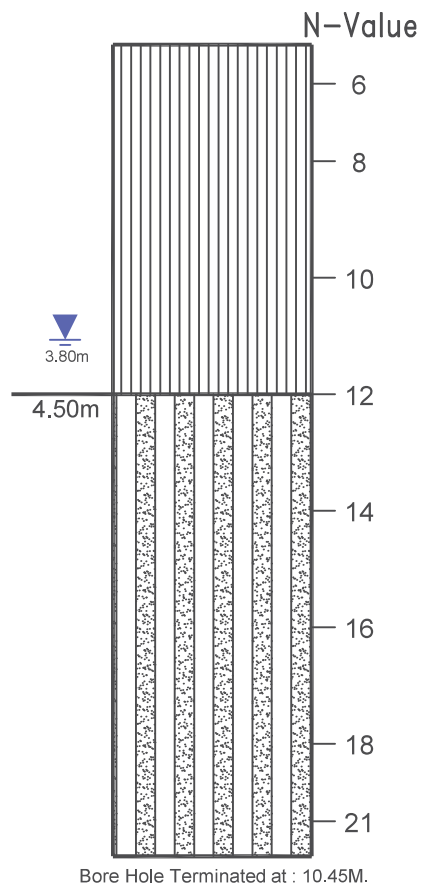


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

IR BRIDGE NO.- BR-39

BOREHOLE NO.: BH- 01



LEGENDS



Sandy Silt (ML)





Silty Sand (SM)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

BRIDGE NO.39 BOREHOLE NO. BH- 01					GWT: 3.80 m		DATE STARTED : 30/01/2025																													
										CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																										
FIELD TEST RESULTS										LABORATORY TEST RESULTS																										
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE /LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result							
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion, C _v (kg/cm ²)	Angle of friction (Degrees)		Compression Index(C _c)	SOIL SAMPLE			WATER SAMPLE			
-0.50	0.5	DS	1	<div>3.80 m</div> <div>11</div>	0,00	0,50	DS	-	-	-		MEDIUM DENSE, LITE GREY, SANDY SILT (ML)	-	0	44	51	5	NON-PLASTIC			-	-	-	-	-	-	-	-	-	-	7,65	0,03	NIL	-	-	-
	1.0	SPT	1		0,50	0,95	6	30	6	11			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,68	0,04	NIL	-	-	-
	2.0	SPT	2		1,50	1,95	8	30	8	12			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,75	0,03	NIL	-	-	-
-3,00	3,0	UD	1		2,50	2,80	-						-	0	37	59	4	NON-PLASTIC			1,74	-	-	-	2,52	-	0	27°	-	-	-	-	-	-	-	
	4,0	SPT	3		3,00	3,45	10	30	10	12			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5,0	SPT	4		4,50	4,95	12	30	12	16			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-6,00	6,0	DS	2		5,50	5,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	7,0	SPT	5		6,00	6,45	14	30	14	17			-	0	72	27	1	NON-PLASTIC			-	-	-	2,55	-	-	-	-	-	-	-	-	-	-	-	
	8,0	SPT	6		7,50	7,95	16	30	16	17			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-9,00	9,0	DS	3		8,50	8,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10,0	SPT	7		9,00	9,45	18	30	18	17			-	0	68	30	2	NON-PLASTIC			-	-	-	2,56	-	-	-	-	-	-	-	-	-	-	-	
	11,0	SPT	8		10,00	10,45	21	30	21	18			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST										Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																				SECTION: CHITAUNI-MADHUBANI						

CALCULATIONS FOR CORRECTED SPT (N) VALUES

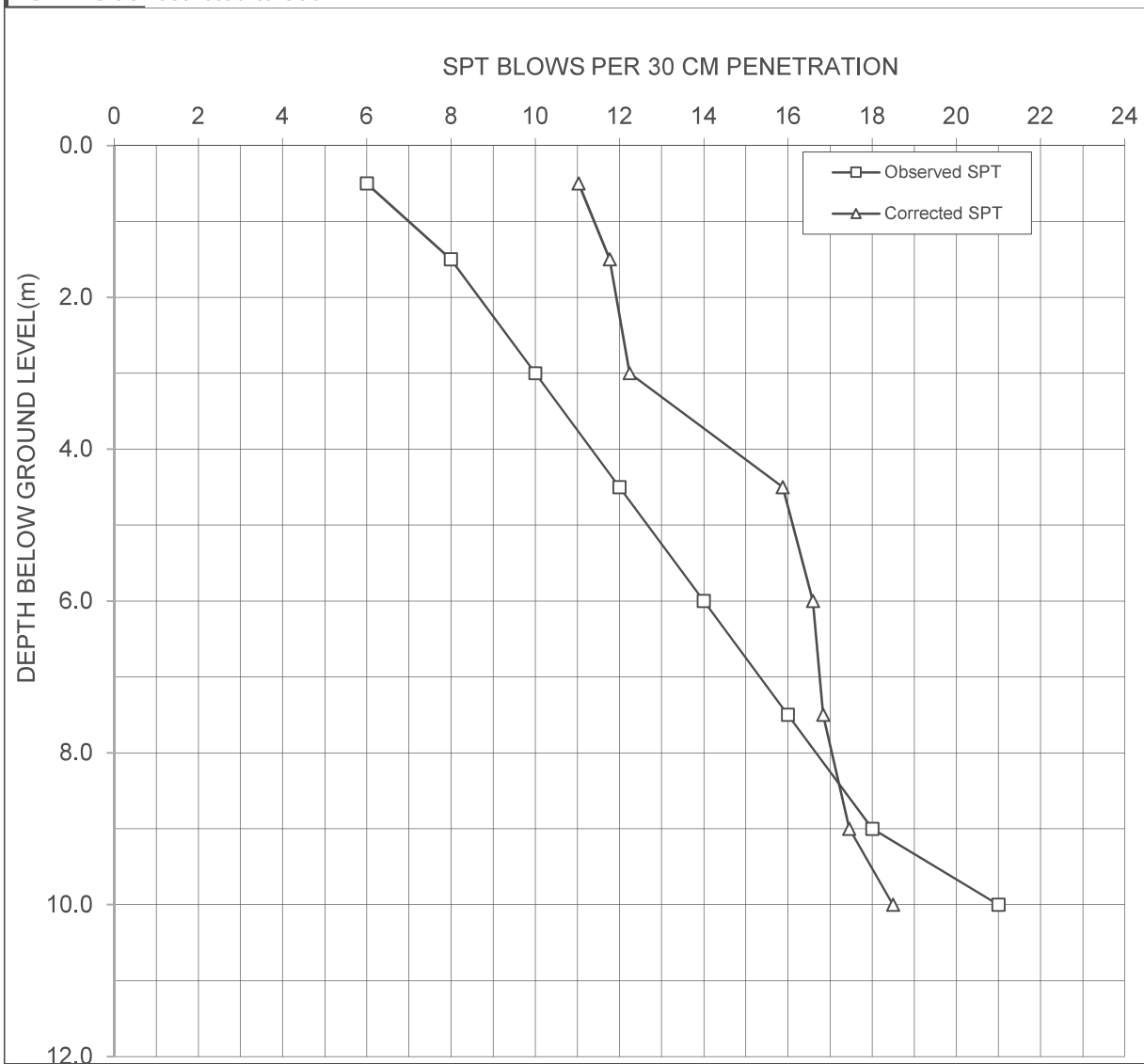
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE:-3.80m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	6	11	11
1.50	Non Plastic	8	12	12
3.00	Non Plastic	10	12	12
4.50	Non Plastic	12	17	16
6.00	Non Plastic	14	18	17
7.50	Non Plastic	16	19	17
9.00	Non Plastic	18	20	17
10.00	Non Plastic	21	22	18

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 39

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_σ	K_u	MSF	CRR	FOS	Conclusion
0.50	ML	6	1.29	0.29	56	IV	0.24	7.00	1.00	0.65	0.15	0.69	1.70	1.33	1.000	1.05	0.75	1.00	10.68	5.00	1.20	17.82	0.19	NA	NA	1.00	1.00	1.19	0.23	>1.0	Non Liquefiable
1.50	ML	8	1.59	0.59	56	IV	0.24	7.00	0.99	1.94	0.44	0.69	1.70	1.33	1.000	1.05	0.75	1.00	14.24	5.00	1.20	22.09	0.24	NA	NA	1.00	1.00	1.19	0.29	>1.0	Non Liquefiable
3.00	ML	10	1.74	0.74	63	IV	0.24	7.00	0.98	4.32	1.32	0.50	1.70	1.33	1.000	1.05	0.85	1.00	20.18	5.00	1.20	29.22	0.42	NA	NA	1.00	1.00	1.19	0.50	>1.0	Non Liquefiable
4.50	SM	12	1.74	0.74	63	IV	0.24	7.00	0.97	6.93	2.43	0.43	1.70	1.33	1.000	1.05	0.95	1.00	27.06	5.00	1.20	37.48	NA	58.39	0.71	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	14	2.04	1.04	28	IV	0.24	7.00	0.95	9.54	3.54	0.40	1.68	1.33	1.000	1.05	0.95	1.00	31.22	4.56	1.14	40.09	NA	66.22	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	16	2.04	1.04	28	IV	0.24	7.00	0.94	12.60	5.10	0.36	1.40	1.33	1.000	1.05	0.95	1.00	29.72	4.56	1.14	38.39	NA	64.38	0.68	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	18	2.02	1.02	32	IV	0.24	7.00	0.93	15.66	6.66	0.34	1.23	1.33	1.000	1.05	1	1.00	30.80	4.83	1.17	40.90	NA	65.80	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SM	21	2.02	1.02	32	IV	0.24	7.00	0.91	17.68	7.68	0.33	1.14	1.33	1.000	1.05	1	1.00	33.46	4.83	1.17	44.02	NA	68.46	0.66	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_u Correction for static shear stress is required only for sloping ground

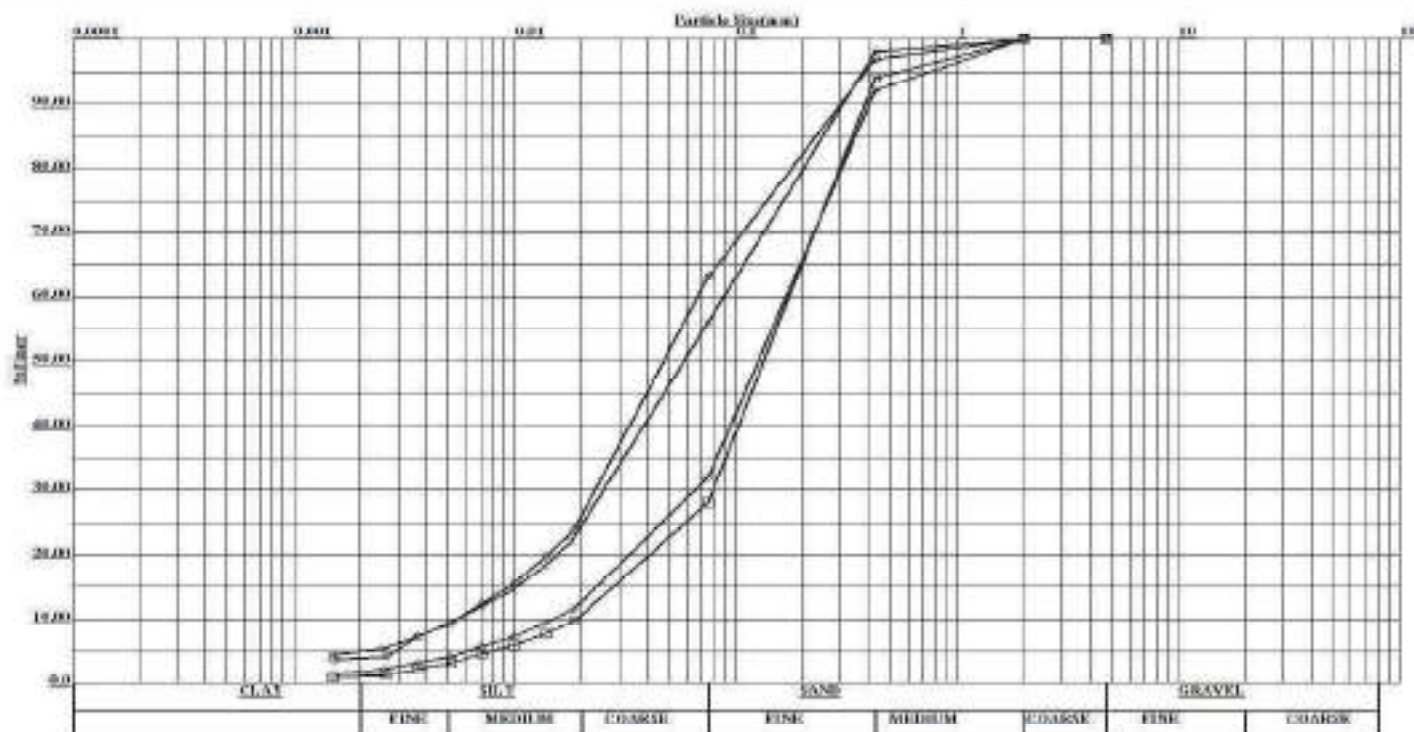
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 39 (RUB)

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	MEDIUM DENSE, LITE GREY,SANDY SILT (ML)	0.00	44.00	51.00	5.00	15.76	1.30
O	2.5		0.00	37.00	59.00	4.00	12.20	1.43
□	6.0	MEDIUM DENSE, LITE GREY,SILTY SAND (SM)	0.00	72.00	27.00	1.00	9.10	1.88
◇	9.0		0.00	68.00	30.00	2.00	11.26	1.70



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. BR-39

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0									Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))
1	BH-1	0.00	0.50	SANDY SILT	ML	0.0	0.0	0.0	2.0	28.0	14.0	56.0	0.00	0.00	0.00	1.43	8.47	1.79	2.100	0.138	0.653	-	-	-	-	
2		2.50	2.80	SANDY SILT	ML	0.0	0.0	0.0	3.0	25.0	9.0	63.0	0.00	0.00	0.00	2.14	7.56	1.15	2.363	0.132	0.640	-	-	-	-	
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	38.0	28.0	28.0	0.00	0.00	0.00	4.28	11.50	3.57	1.050	0.204	0.795	-	-	-	-	

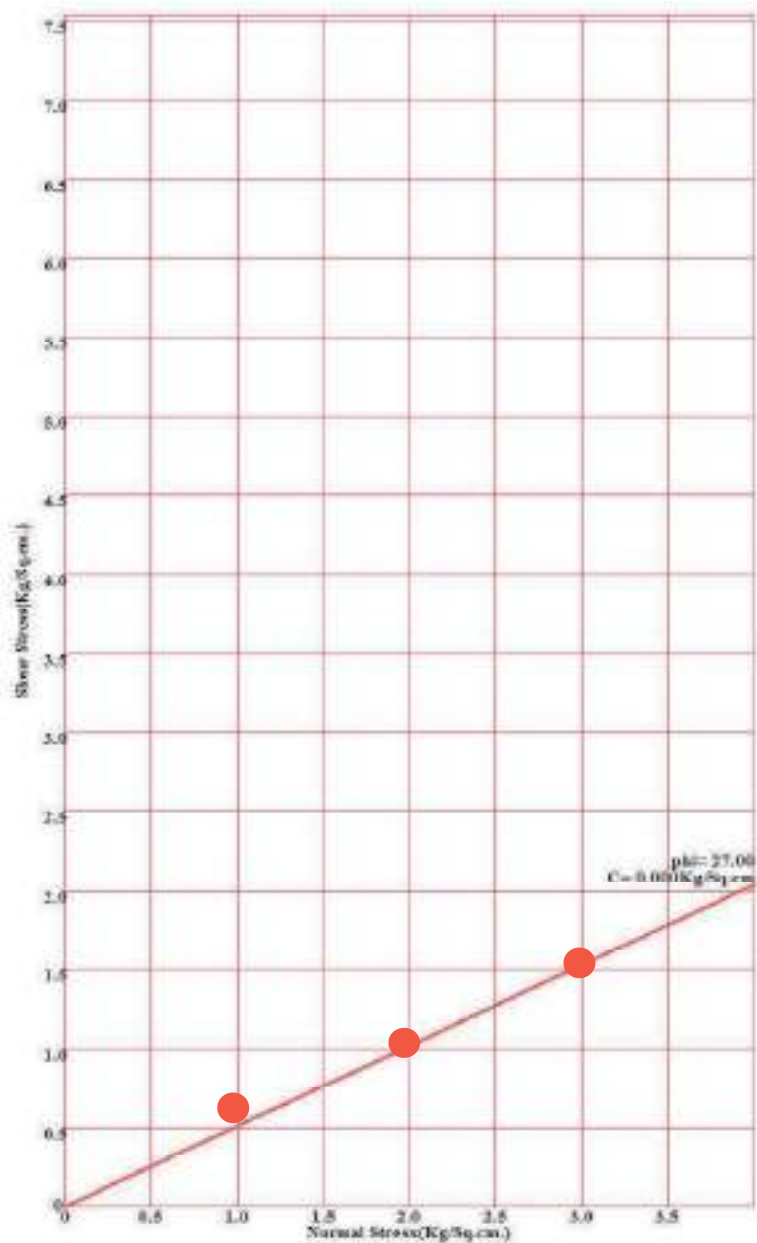
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. -39 (RUB)

BOREHOLE NO. -1

SECTION:CHITAUNI TO MADHUBANI

DIRECT SHEAR GRAPH



Bore Hole No.= 1
 Sample No.= A.1/UD1
 Depth= 2.50000M
 Type of Test= C.D.



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
22709.254	40	ROAD	RUB	BH-01	207505	2990855	106.75

SUBMITTED BY:

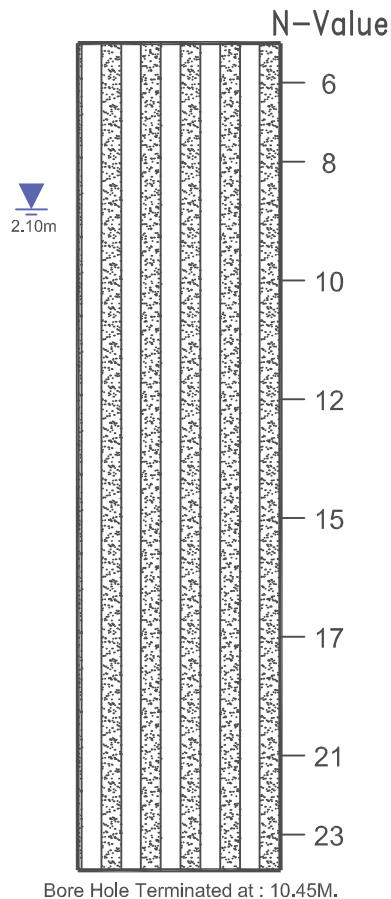


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

BRIDGE NO.-40

BOREHOLE NO.: BH- 01



LEGENDS






Silty Sand (SM)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

BRIDGE NO.40 BOREHOLE NO. BH- 01				GWT: 2.10 m		DATE STARTED : 31/01/2025																																	
														CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																									
FIELD TEST RESULTS										LABORATORY TEST RESULTS																													
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE /LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result										
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion, C _v (kg/cm ²)	Angle of friction (Degrees)		Compression Index(C _c)	SOIL SAMPLE			WATER SAMPLE						
-0.50	0.5	DS	1		0,00	0,50	DS	-	-	-		MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	-	0	71	28	1	NON-PLASTIC				-	-	-	-	-	-	-	-	-	7,41	0,02	NIL	-	-	-			
	1.0	SPT	1		0,50	0,95	6	30	6	11			-	0	68	31	1	NON-PLASTIC				-	-	-	2,55	-	-	-	-	-	7,42	0,02	NIL	-	-	-			
	2.0	SPT	2		1,50	1,95	8	30	8	12			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,46	0,03	NIL	-	-	-				
-3.00	3.0	DS	1		2,50	2,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	4.0	SPT	3		3,00	3,45	10	30	10	15			-	0	66	32	2	NON-PLASTIC				-	-	-	2,54	-	-	-	-	-	-	-	-	-	-				
	5.0	SPT	4		4,50	4,95	12	30	12	16			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
-6.00	6.0	DS	2		5,50	5,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	7.0	SPT	5		6,00	6,45	15	30	15	17			-	0	64	35	1	NON-PLASTIC				-	-	-	2,56	-	-	-	-	-	-	-	-	-	-	-			
	8.0	SPT	6		7,50	7,95	17	30	17	17			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
-9.00	9.0	DS	3		8,50	8,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	10.0	SPT	7		9,00	9,45	21	30	21	19			-	0	62	36	2	NON-PLASTIC				-	-	-	2,55	-	-	-	-	-	-	-	-	-	-	-			
	11.0	SPT	8		10,00	10,45	23	30	23	20			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST													Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																										
												SECTION: CHITAUNI-MADHUBANI																											

CALCULATIONS FOR CORRECTED SPT (N) VALUES

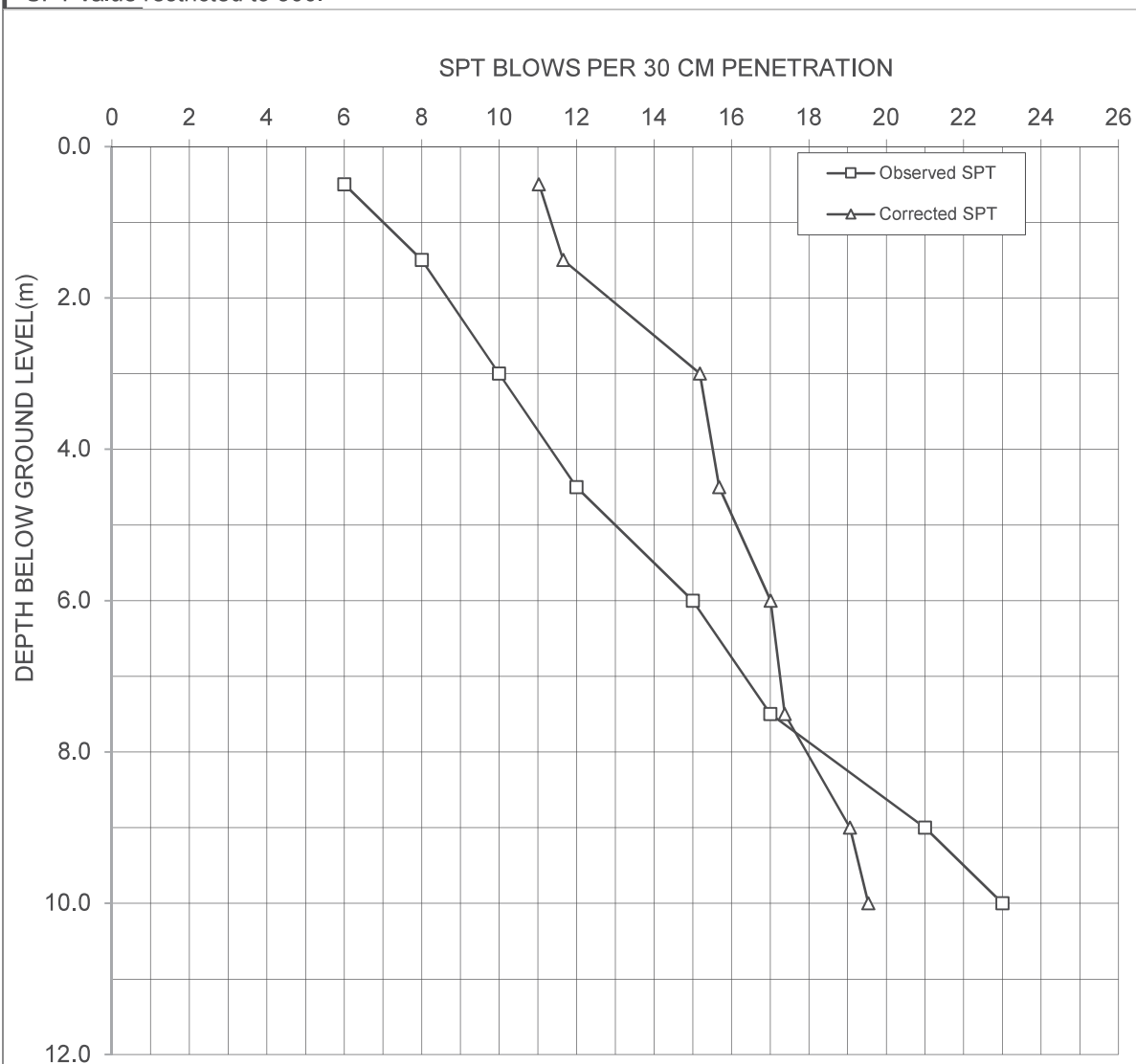
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE:-2.10 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	6	11	11
1.50	Non Plastic	8	12	12
3.00	Non Plastic	10	15	15
4.50	Non Plastic	12	16	16
6.00	Non Plastic	15	19	17
7.50	Non Plastic	17	20	17
9.00	Non Plastic	21	23	19
10.00	Non Plastic	23	24	20

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 40

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_σ	K_u	MSF	CRR	FOS	Conclusion
0.50	SM	6	1.72	0.72	32	IV	0.24	7.00	1.00	0.86	0.36	0.37	1.70	1.33	1.000	1.05	0.75	1.00	10.68	4.83	1.17	17.34	0.18	21.54	0.89	1.00	1.00	1.19	0.22	0.59	Liquefiable
1.50	SM	8	1.72	0.72	32	IV	0.24	7.00	0.99	2.58	1.08	0.37	1.70	1.33	1.000	1.05	0.75	1.00	14.24	4.83	1.17	21.51	0.24	29.55	0.85	1.00	1.00	1.19	0.28	0.76	Liquefiable
3.00	SM	10	1.88	0.88	34	IV	0.24	7.00	0.98	5.16	2.16	0.36	1.70	1.33	1.000	1.05	0.85	1.00	20.18	4.93	1.19	28.91	0.41	42.90	0.79	1.00	1.00	1.19	0.48	1.33	Non Liquefiable
4.50	SM	12	1.88	0.88	34	IV	0.24	7.00	0.97	7.98	3.48	0.35	1.70	1.33	1.000	1.05	0.95	1.00	26.99	4.93	1.19	37.00	NA	58.22	0.71	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	15	2.02	1.02	36	IV	0.24	7.00	0.95	10.80	4.80	0.33	1.44	1.33	1.000	1.05	0.95	1.00	28.72	5.00	1.20	39.47	NA	62.13	0.69	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	17	2.02	1.02	36	IV	0.24	7.00	0.94	13.83	6.33	0.32	1.26	1.33	1.000	1.05	0.95	1.00	28.35	5.00	1.20	39.02	NA	61.28	0.69	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	21	2.04	1.04	38	IV	0.24	7.00	0.93	16.86	7.86	0.31	1.13	1.33	1.000	1.05	1	1.00	33.08	5.00	1.20	44.69	NA	68.08	0.66	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SM	23	2.04	1.04	38	IV	0.24	7.00	0.91	18.90	8.90	0.30	1.06	1.33	1.000	1.05	1	1.00	34.05	5.00	1.20	45.86	NA	69.05	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

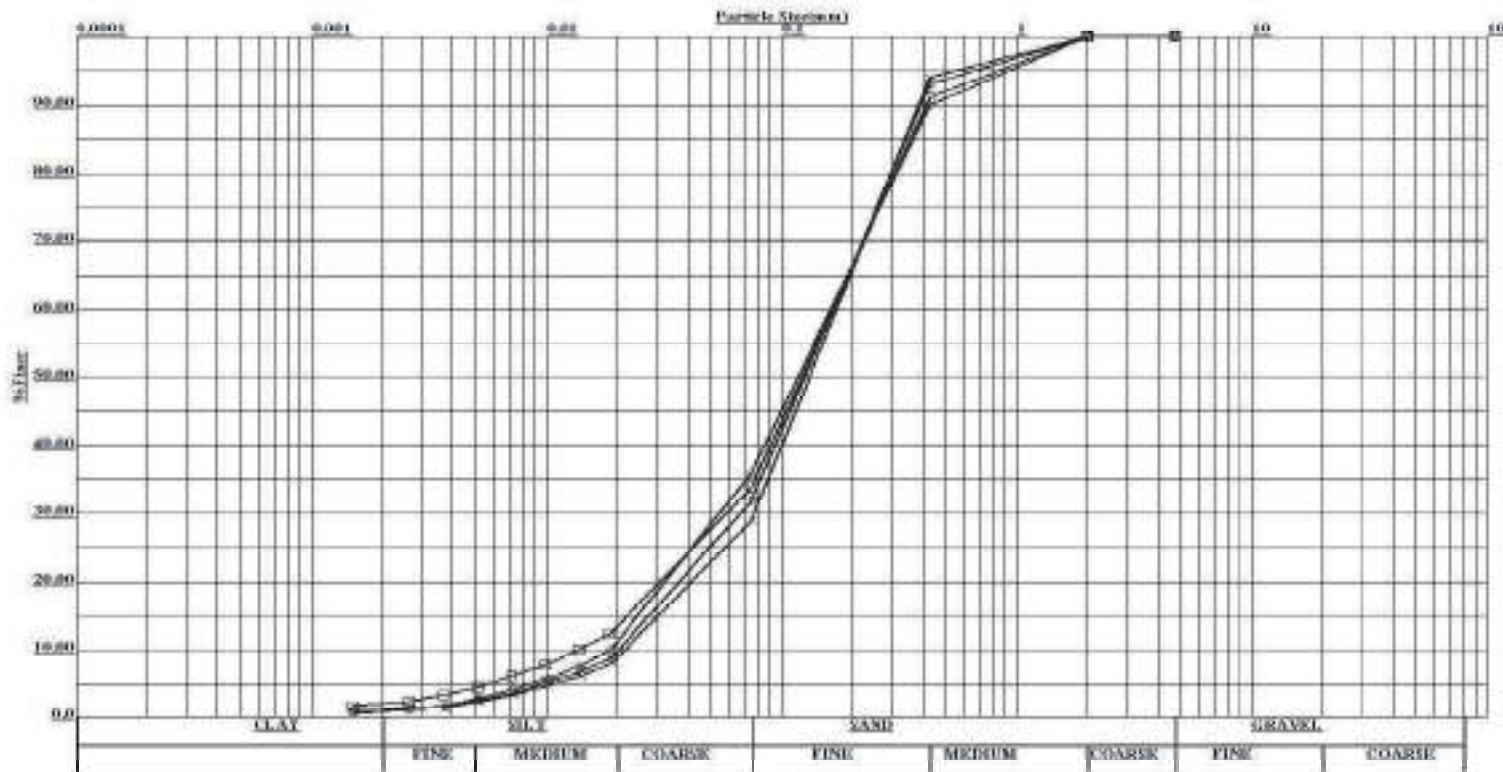
K_u Correction for static shear stress is required only for sloping ground

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 40
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	0.00	71.00	28.00	1.00	7.95	1.60
O	0.5		0.00	68.00	31.00	1.00	8.20	1.31
□	3.0		0.00	66.00	32.00	2.00	12.00	1.47
◇	6.0		0.00	64.00	35.00	1.00	8.55	0.97



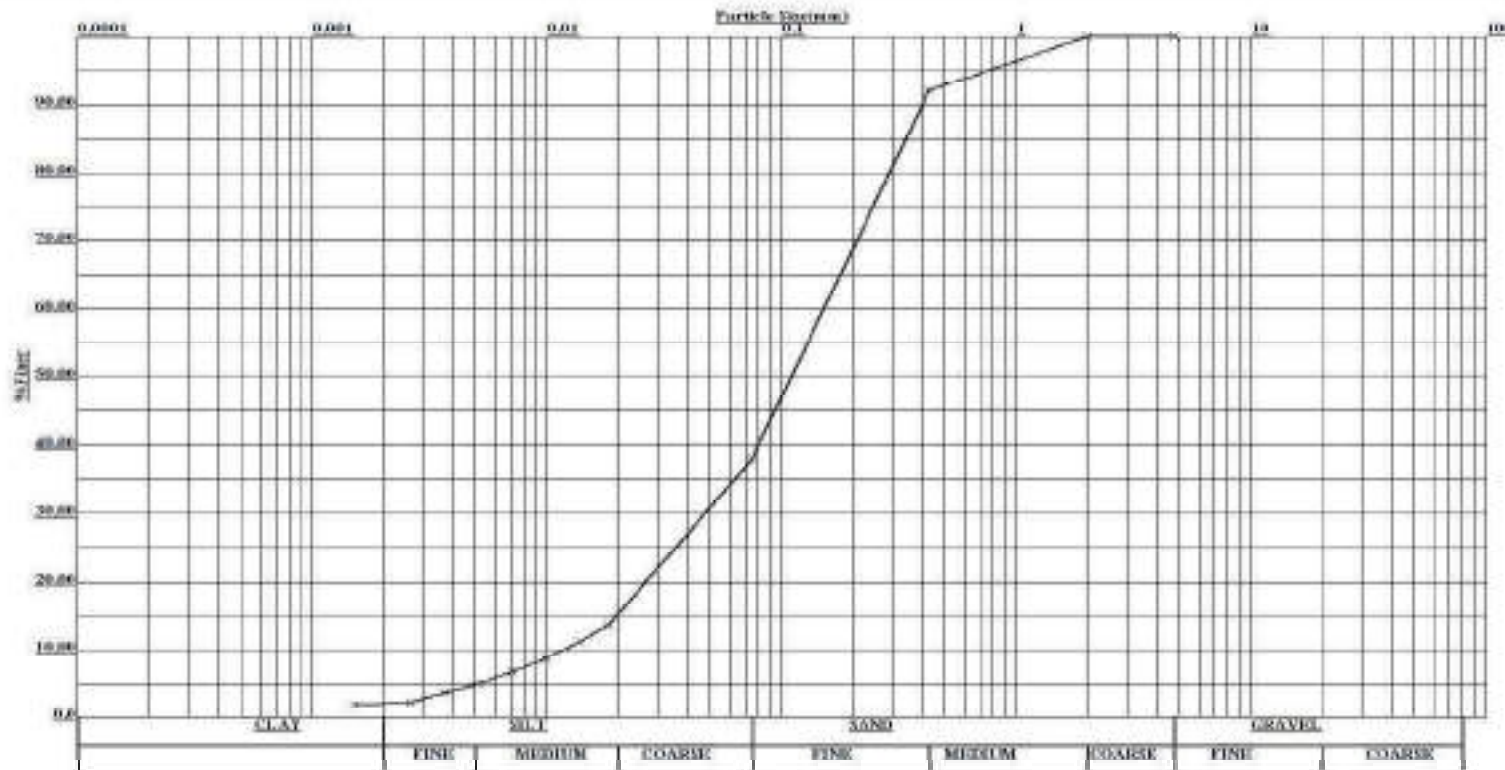
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 40
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
x	9.0	MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	0.00	62.00	36.00	2.00	12.87	1.25



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.-40

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained						Mean Particle Size (mm)						Sandy Strata		Clayey Soil					
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))
1	BH-1	0.00	0.95	SILTY SAND	SM	0.0	0.0	0.0	7.0	35.0	26.0	32.0	0.00	0.00	0.00	4.99	10.59	3.32	1.200	0.201	0.789	-	-	-	-
2		3.00	3.45			0.0	0.0	0.0	9.0	41.0	16.0	34.0	0.00	0.00	0.00	6.41	12.40	2.04	1.275	0.221	0.828	-	-	-	-
3		6.00	6.45			0.0	0.0	0.0	10.0	39.0	15.0	36.0	0.00	0.00	0.00	7.13	11.80	1.91	1.350	0.222	0.829	-	-	-	-



NORTH EASTERN RAILWAY

**FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE
PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY
FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD &
4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY
(TOTAL 1022.00 KM)**

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
23804.738	42	ROAD	RUB	BH-01	207708	2989778	107.33

SUBMITTED BY:

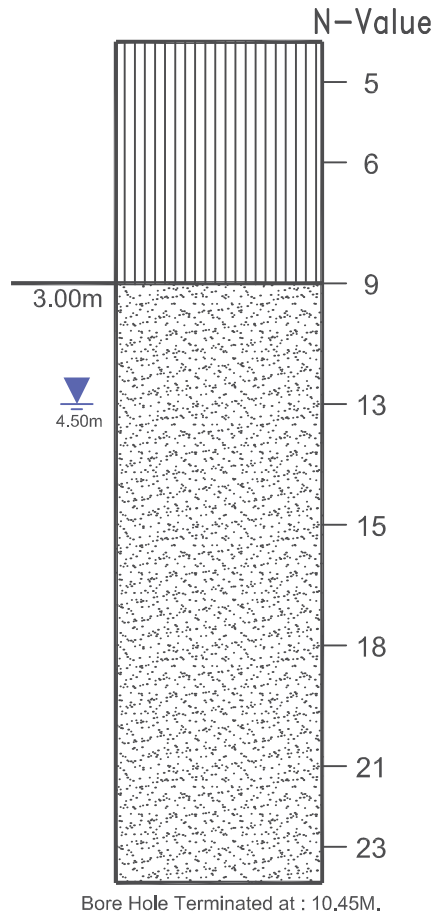


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

IR BRIDGE NO.- BR-42

BOREHOLE NO.: BH- 01



LEGENDS



Sandy Silt (ML)





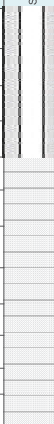
Poorly Graded Sand (SP)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

BRIDGE NO.42										DATE STARTED : 02-01-2025																											
BOREHOLE NO. BH- 01										DATE COMPLETED : 02-01-2025																											
GWT: 4.50 m										CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																											
FIELD TEST RESULTS										LABORATORY TEST RESULTS																											
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE /LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result								
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion, C _v (kg/cm ²)	Angle of friction (Degrees)		Compression Index(C _c)	SOIL SAMPLE			WATER SAMPLE				
-0.50	0.5	DS	1	<div>4.50 m</div> <div></div> <div>-11</div>	0,00	0,50	DS	-	-	-		MEDIUM DENSE, LITE GREY, SANDY SILT (ML)	-	0	42	53	5	NON-PLASTIC			-	-	-	-	-	-	-	-	-	-	-	7,44	0,02	NIL	-	-	-
	1.0	SPT	1		0,50	0,95	5	30	5	9			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,36	0,01	NIL	-	-	-	
	2.0	SPT	2		1,50	1,95	6	30	6	9			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,48	0,02	NIL	-	-	-	
-3,00	3,0	UD	1		2,50	2,80	-						-	0	38	58	4	NON-PLASTIC			1,74	-	-	-	2,53	-	0	26°	-	-	-	-	-	-	-		
	4,0	SPT	3		3,00	3,45	9	30	9	11		MEDIUM DENSE, LITE GREY, POORLY GRADED SAND (SP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	5,0	SPT	4		4,50	4,95	13	30	13	18			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
-6,00	6,0	DS	2		5,50	5,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	7,0	SPT	5		6,00	6,45	15	30	15	17			-	0	96	4	0	NON-PLASTIC			-	-	-	2,60	-	-	-	-	-	-	-	-	-	-	-		
	8,0	SPT	6		7,50	7,95	18	30	18	18			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-9,00	9,0	DS	3		8,50	8,80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	10,0	SPT	7		9,00	9,45	21	30	21	19			-	0	97	3	0	NON-PLASTIC			-	-	-	2,56	-	-	-	-	-	-	-	-	-	-	-		
	11,0	SPT	8		10,00	10,45	23	30	23	20			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST													Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																								
												SECTION: CHITAUNI-MADHUBANI																									

CALCULATIONS FOR CORRECTED SPT (N) VALUES

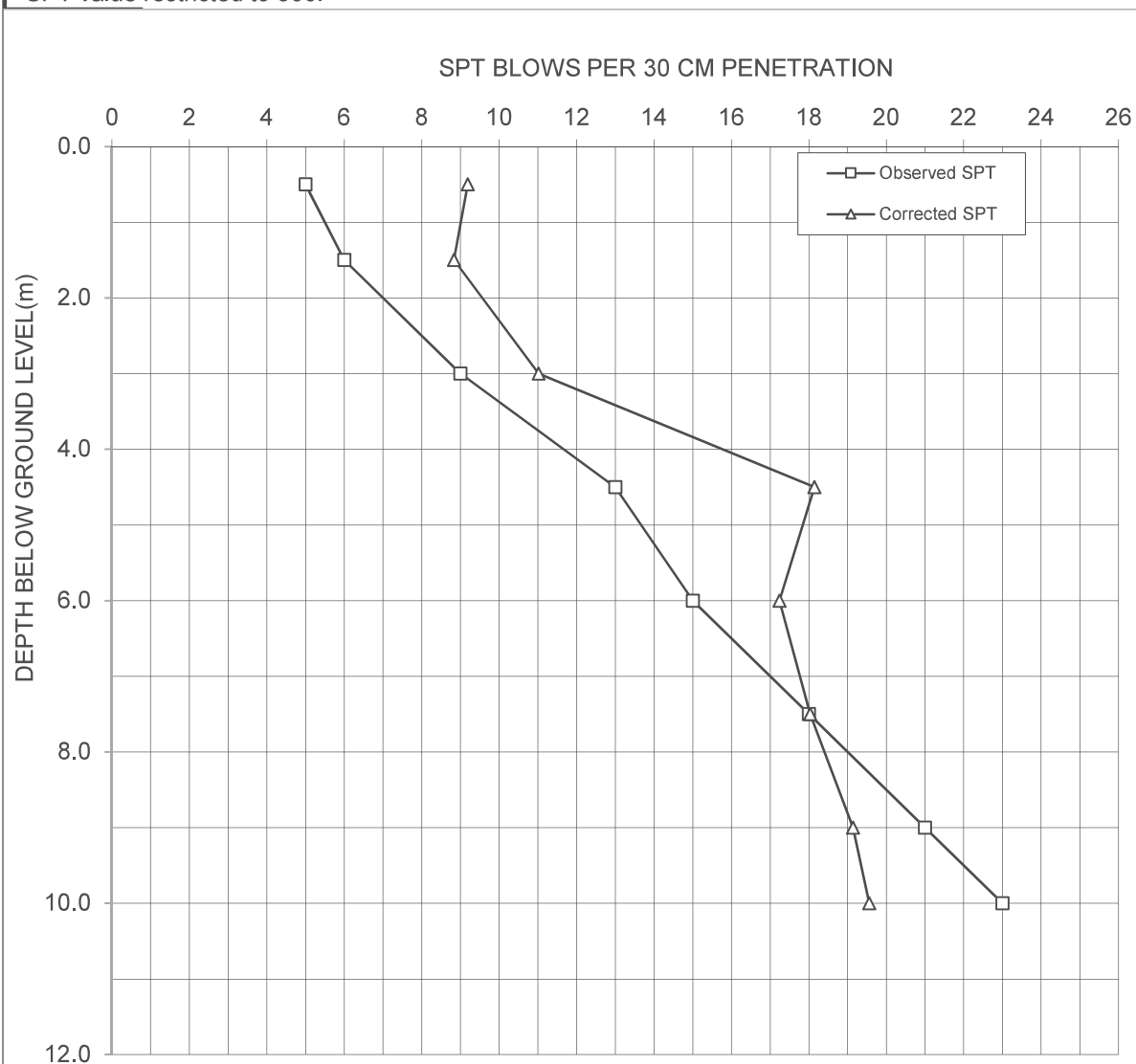
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE :-4.50 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	5	9	9
1.50	Non Plastic	6	9	9
3.00	Non Plastic	9	11	11
4.50	Non Plastic	13	18	18
6.00	Non Plastic	15	19	17
7.50	Non Plastic	18	21	18
9.00	Non Plastic	21	23	19
10.00	Non Plastic	23	24	20

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 42

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_σ	K_u	MSF	CRR	FOS	Conclusion
0.50	ML	5	1.59	0.59	58	IV	0.24	7.00	1.00	0.80	0.30	0.42	1.70	1.33	1.000	1.05	0.75	1.00	8.90	5.00	1.20	15.68	0.17	NA	NA	1.00	1.00	1.19	0.20	>1.0	Non Liquefiable
1.50	ML	6	1.59	0.59	58	IV	0.24	7.00	0.99	2.39	0.89	0.42	1.70	1.33	1.000	1.05	0.75	1.00	10.68	5.00	1.20	17.82	0.19	NA	NA	1.00	1.00	1.19	0.23	>1.0	Non Liquefiable
3.00	SP	9	1.74	0.74	4	IV	0.24	7.00	0.98	4.77	1.77	0.41	1.70	1.33	1.000	1.05	0.85	1.00	18.16	0.00	1.00	18.16	0.19	38.36	0.81	1.00	1.00	1.19	0.23	0.56	Liquefiable
4.50	SP	13	1.74	0.74	4	IV	0.24	7.00	0.97	7.38	2.88	0.39	1.70	1.33	1.000	1.05	0.95	1.00	29.32	0.00	1.00	29.32	0.43	63.47	0.68	1.00	1.00	1.19	0.51	1.32	Non Liquefiable
6.00	SP	15	2.02	1.02	4	IV	0.24	7.00	0.95	9.99	3.99	0.37	1.58	1.33	1.000	1.05	0.95	1.00	31.50	0.00	1.00	31.50	NA	66.50	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SP	18	2.02	1.02	4	IV	0.24	7.00	0.94	13.02	5.52	0.35	1.35	1.33	1.000	1.05	0.95	1.00	32.14	0.00	1.00	32.14	NA	67.14	0.66	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SP	21	2.03	1.03	3	IV	0.24	7.00	0.93	16.05	7.05	0.33	1.19	1.33	1.000	1.05	1	1.00	34.93	0.00	1.00	34.93	NA	69.93	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SP	23	2.03	1.03	3	IV	0.24	7.00	0.91	18.08	8.08	0.32	1.11	1.33	1.000	1.05	1	1.00	35.73	0.00	1.00	35.73	NA	70.73	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_u Correction for static shear stress is required only for sloping ground



aarvee associates
architects engineers & consultants pvt. ltd.

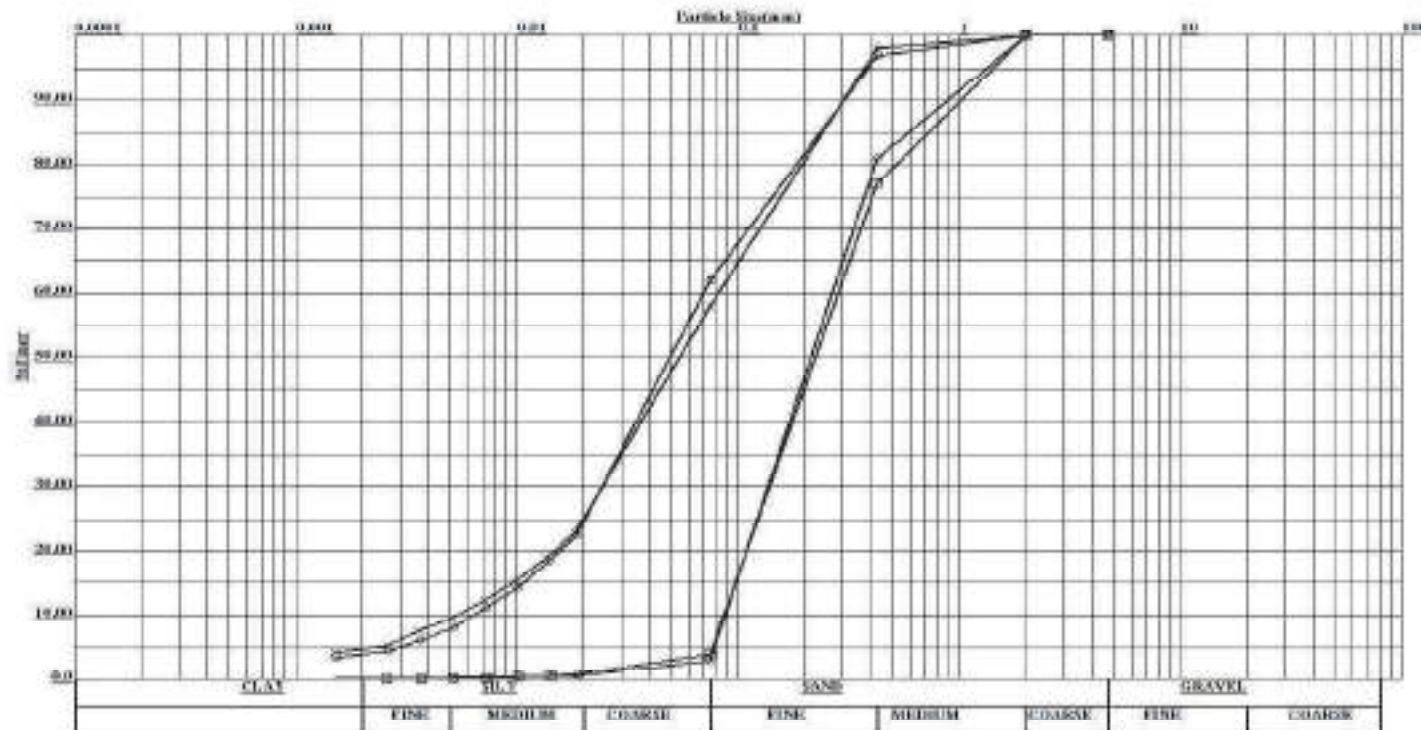
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 42 (RUB)

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	MEDIUM DENSE, LITE GREY,SANDY SILT (ML)	0.00	42.00	53.00	5.00	15.18	1.35
O	2.5		0.00	38.00	58.00	4.00	11.08	1.34
□	6.0	MEDIUM DENSE, LITE GREY,POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.28	0.79
◇	9.0		0.00	97.00	3.00	0.00	3.04	0.80



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. BR-42

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))	
																									Silt Factor	
1	BH-1	0.00	0.50	SILTY SAND	SM	0.0	0.0	0.0	6.0	42.0	24.0	28.0	0.00	0.00	0.00	4.28	12.71	3.06	1.050	0.211	0.808	-	-	-	-	
2		2.50	2.80	SILTY SAND	SM	0.0	0.0	0.0	7.0	38.0	20.0	35.0	0.00	0.00	0.00	4.99	11.50	2.55	1.313	0.203	0.794	-	-	-	-	
3		6.00	6.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	18.0	48.0	31.0	3.0	0.00	0.00	0.00	12.83	14.52	3.95	0.113	0.314	0.986	-	-	-	-	



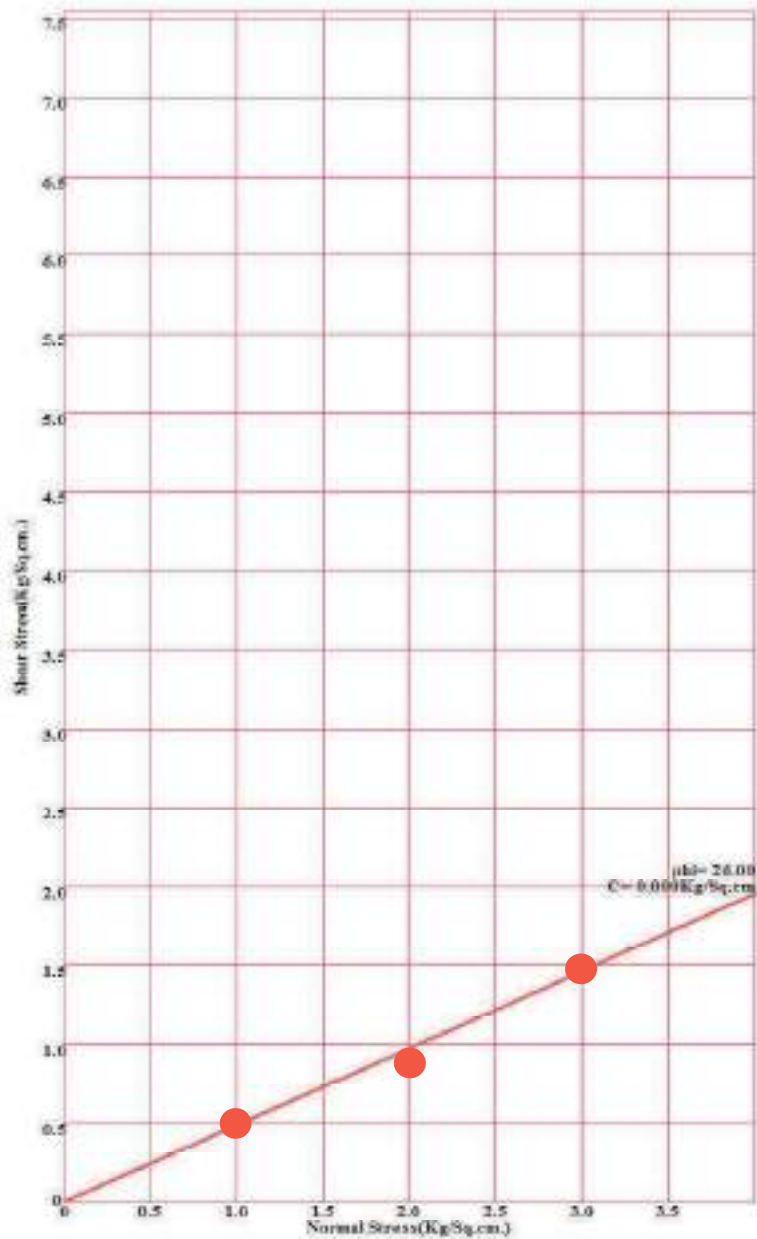
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. -42 (RUB)

BOREHOLE NO. -1

SECTION:CHITAUNI TO MADHUBANI

DIRECT SHEAR GRAPH



Bore Hole No.- 1
Sample No.- A-1/UD1
Depth- 2.50000M
Type of Test- C.D.



NORTH EASTERN RAILWAY

**FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE
PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR
CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE
(252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00
KM)**

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
25030.933	44	ROAD	RUB	BH-01	208295	2988774	107.46

SUBMITTED BY:

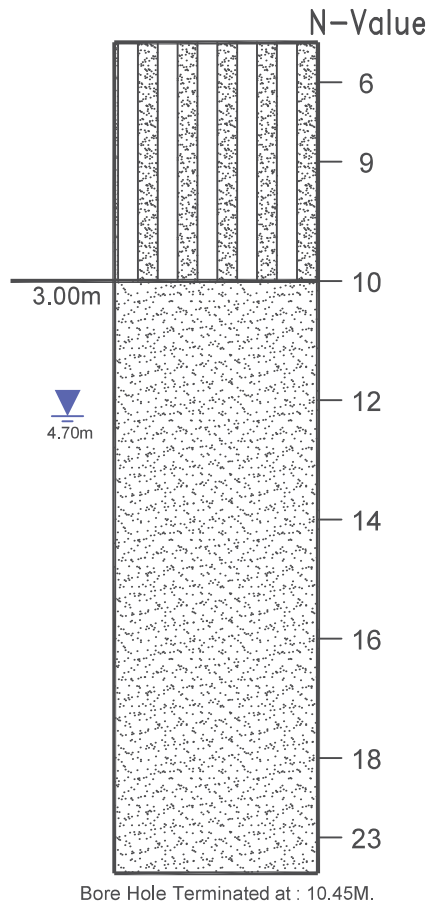


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

IR BRIDGE NO.- BR-44

BOREHOLE NO.: BH- 01



LEGENDS



Silty Sand (SM)





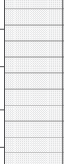
Poorly Graded Sand (SP)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

BRIDGE NO.44 BOREHOLE NO. BH-01										GWT: 4.70 m		DATE STARTED : 01-02-2025 DATE COMPLETED : 01-02-2025																								
FIELD TEST RESULTS												LABORATORY TEST RESULTS																								
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result							
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion C. (kg/cm ²)	Angle of friction (Degrees)		Compression Index(Cc)	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l	Sulphate, mg/l	
-0.50	0.5	DS	1	4.70 m -1.1	0,00	0,50	DS	-	-		MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	-	0	72	27	1	NON-PLASTIC			-	-	-	-	-	-	-	-	-	-	-	7.33	0.02	NIL	-	-	-
	1.0	SPT	1		0.50	0.95	6	30	6			11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.41	0.03	NIL	-	-	-
	2.0	SPT	2		1.50	1.95	9	30	9			13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.46	0.02	NIL	-	-	-
-3.00	3.0	UDS	1		2.50	2.80	-					CD	0	65	33	2	NON-PLASTIC			1.73	-	-	-	2.56	-	0	30°	-	-	-	-	-	-	-		
	4.0	SPT	3		3.00	3.45	10	30	10	12		MEDIUM DENSE, LITE GREY, POORLY GRADED SILTY SAND (SP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.0	SPT	4		4.50	4.95	12	30	12	13			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-6.00	6.0	DS	2		5.50	5.80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.0	SPT	5		6.00	6.45	14	30	14	17			-	0	97	3	0	NON-PLASTIC			-	-	-	2.60	-	-	-	-	-	-	-	-	-	-	-	-
	8.0	SPT	6		7.50	7.95	16	30	16	17			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-9.00	9.0	DS	3		8.50	8.80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.0	SPT	7		9.00	9.45	18	30	18	17			-	0	96	4	0	NON-PLASTIC			-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-	-
	11.0	SPT	8		10,00	10,45	23	30	23	20			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST													Project: Final location survey for New B.G Railway line projects (770,00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252,00 km.) of North Eastern Railway (Total 1022,00 km)																							
												SECTION: CHITAUNI-MADHUBANI																								



CALCULATIONS FOR CORRECTED SPT (N) VALUES

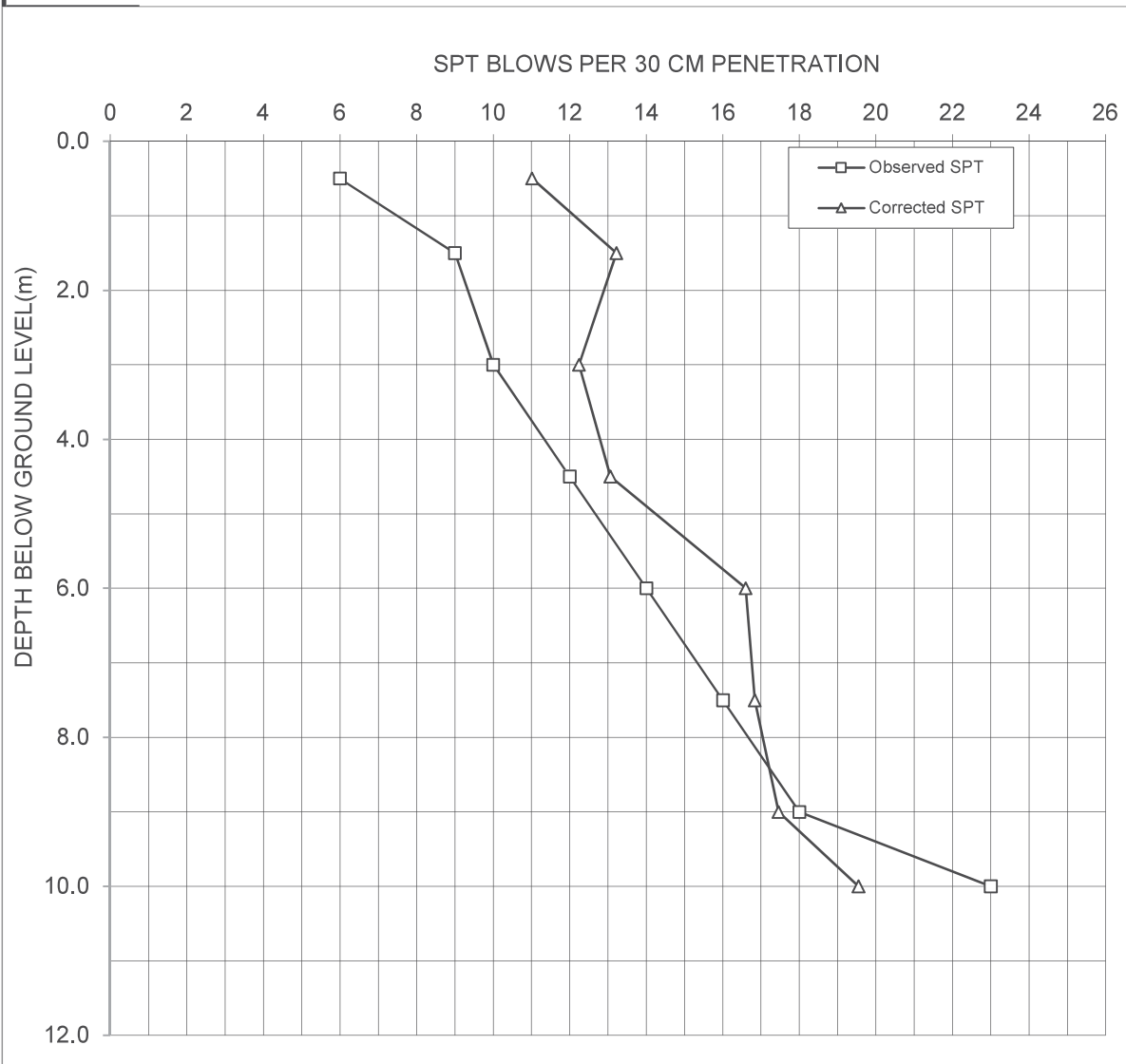
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE IN METER:- 4.70 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	6	11	11
1.50	Non Plastic	9	13	13
3.00	Non Plastic	10	12	12
4.50	Non Plastic	12	13	13
6.00	Non Plastic	14	18	17
7.50	Non Plastic	16	19	17
9.00	Non Plastic	18	20	17
10.00	Non Plastic	23	24	20

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 44

BOREHOLE NO.

BH-01

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_s) ₆₀	α	β	(N_s) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_o	K_u	MSF	CRR	FOS	Conclusion
0.50	SM	6	1.60	0.60	28	IV	0.24	7.00	1.00	0.80	0.30	0.41	1.70	1.33	1.000	1.05	0.75	1.00	10.68	4.56	1.14	16.72	0.18	21.54	0.89	1.00	1.00	1.19	0.21	0.51	Liquefiable
1.50	SM	9	1.60	0.60	28	IV	0.24	7.00	0.99	2.40	0.90	0.41	1.70	1.33	1.000	1.05	0.75	1.00	16.02	4.56	1.14	22.80	0.25	33.56	0.83	1.00	1.00	1.19	0.30	0.74	Liquefiable
3.00	SP	10	1.73	0.73	35	IV	0.24	7.00	0.98	4.80	1.80	0.41	1.70	1.33	1.000	1.05	0.85	1.00	20.18	5.00	1.20	29.22	0.42	42.90	0.79	1.00	1.00	1.19	0.50	1.23	Non Liquefiable
4.50	SP	12	1.73	0.73	35	IV	0.24	7.00	0.97	7.40	2.90	0.38	1.70	1.33	1.000	1.05	0.95	1.00	27.06	5.00	1.20	37.48	NA	58.39	0.71	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SP	14	2.04	1.04	3	IV	0.24	7.00	0.95	9.99	3.99	0.37	1.58	1.33	1.000	1.05	0.95	1.00	29.40	0.00	1.00	29.40	0.43	63.66	0.68	1.00	1.00	1.19	0.51	1.38	Non Liquefiable
7.50	SP	16	2.04	1.04	3	IV	0.24	7.00	0.94	13.05	5.55	0.35	1.34	1.33	1.000	1.05	0.95	1.00	28.49	0.00	1.00	28.49	0.39	61.61	0.69	1.00	1.00	1.19	0.46	1.34	Non Liquefiable
9.00	SP	18	2.02	1.02	4	IV	0.24	7.00	0.93	16.11	7.11	0.33	1.19	1.33	1.000	1.05	1	1.00	29.81	0.00	1.00	29.81	0.45	64.58	0.68	1.00	1.00	1.19	0.54	1.65	Non Liquefiable
10.00	SP	23	2.02	1.02	4	IV	0.24	7.00	0.91	18.13	8.13	0.32	1.11	1.33	1.000	1.05	1	1.00	35.62	0.00	1.00	35.62	NA	70.62	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_o Correction for high overburden stress (for effective oberburden pressure > 10 T/m²) ..

K_u Correction for static shear stress is required only for sloping ground

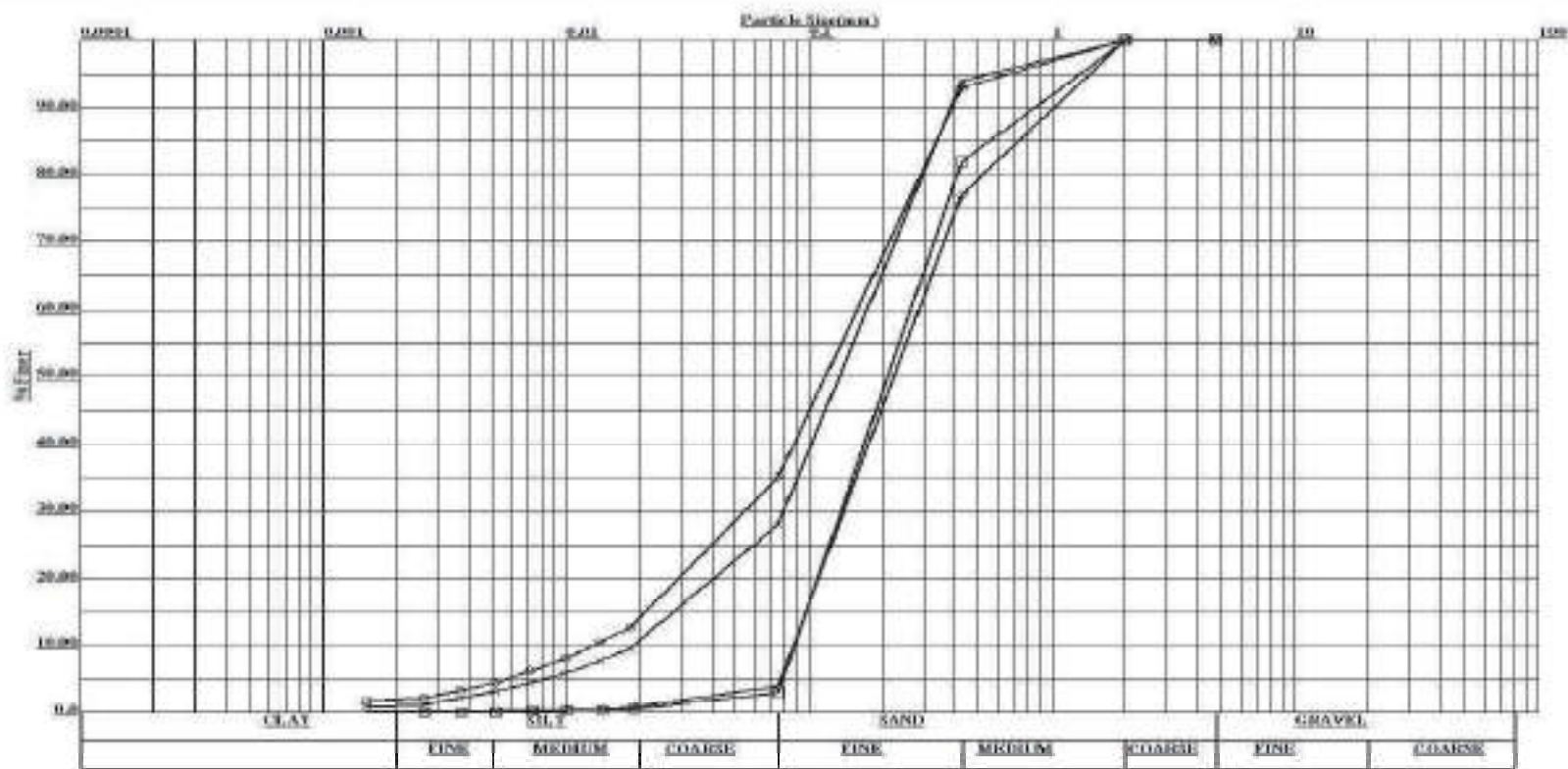
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 44(RUB)

BOREHOLE NO. -BH 01

SECTION:CHITAUNI - MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	C_u	C_c
×	0.0	MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	0.00	72.00	27.00	1.00	9.12	1.89
○	2.5		0.00	65.00	33.00	2.00	11.97	1.43
□	6.0	MEDIUM DENSE, LITE GREY, POORLY GRADED SILTY SAND (SP)	0.00	97.00	3.00	0.00	3.00	0.80
◇	9.0		0.00	96.00	4.00	0.00	3.28	0.79



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. BR-44				BOREHOLE NO- BH-01										Section : CHITAUNI - MADHUBANI												
Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F} \times (1 + \sqrt{c})$	
1	BH-01	0.00	0.50	SILTY SAND	SM	0.0	0.0	0.0	6.0	42.0	24.0	28.0	0.00	0.00	0.00	4.28	12.71	3.06	1.050	0.211	0.808	-	-	-	-	
2		2.50	2.80	SILTY SAND	SM	0.0	0.0	0.0	7.0	38.0	20.0	35.0	0.00	0.00	0.00	4.99	11.50	2.55	1.313	0.203	0.794	-	-	-	-	
3		6.00	6.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	18.0	48.0	31.0	3.0	0.00	0.00	0.00	12.83	14.52	3.95	0.113	0.314	0.986	-	-	-	-	



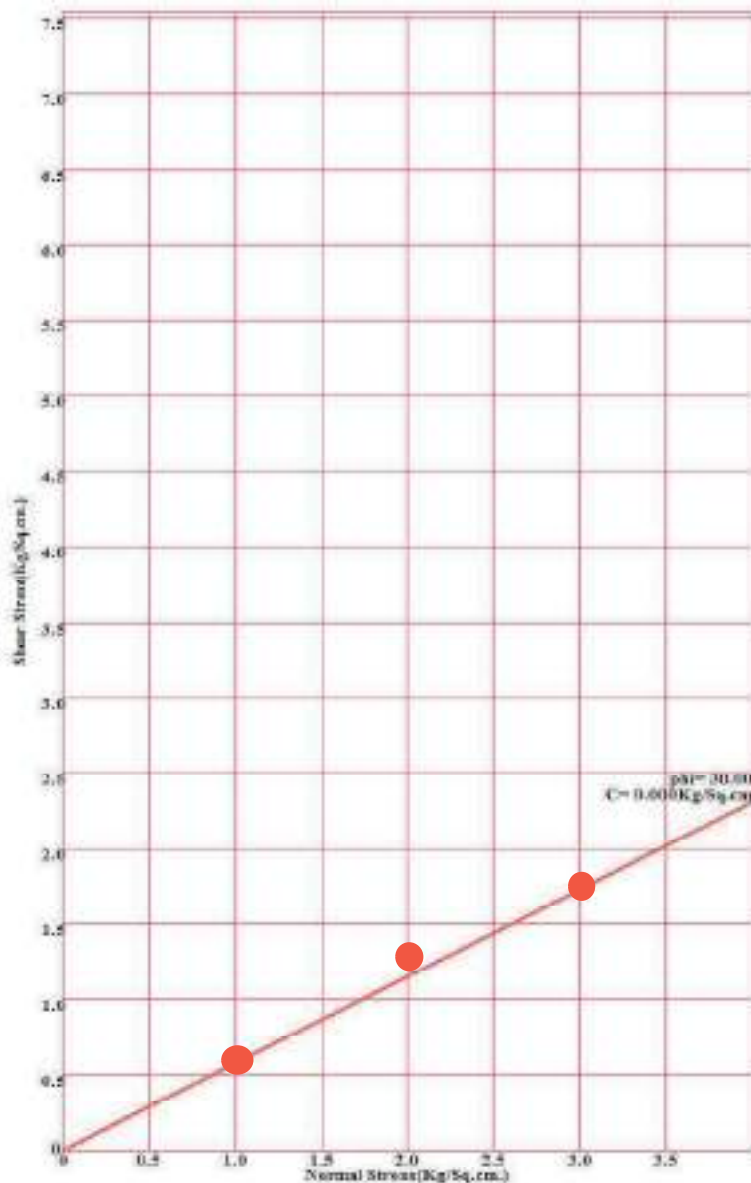
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 44 (RUB)

BOREHOLE NO. BH-01

SECTION:CHITAUNI - MADHUBANI

DIRECT SHEAR GRAPH



Bore Hole No.= 1
Sample No.= A-1/T/D1
Depth= 2.50000M
Type of Test= C.D.



NORTH EASTERN RAILWAY

**FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE
PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY
FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD &
4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY
(TOTAL 1022.00 KM)**

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
25993.856	45	ROAD	RUB	BH-01	209164	2988359	106.64

SUBMITTED BY:

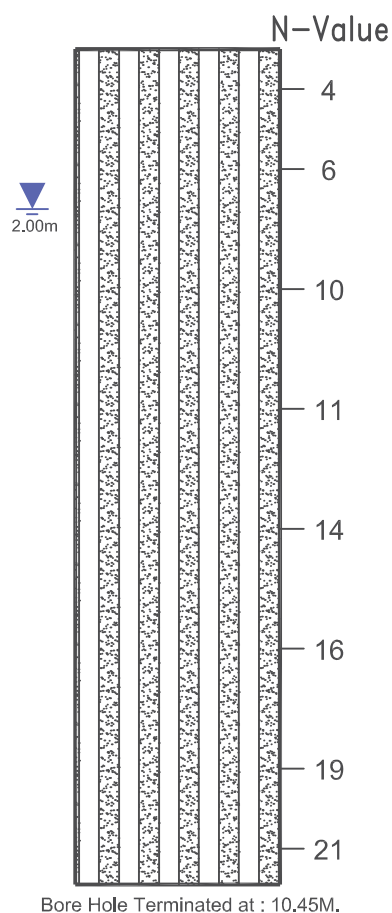


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

BRIDGE NO.-45

BOREHOLE NO.: BH- 01



LEGENDS



Silty Sand (SM)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

CALCULATIONS FOR CORRECTED SPT (N) VALUES

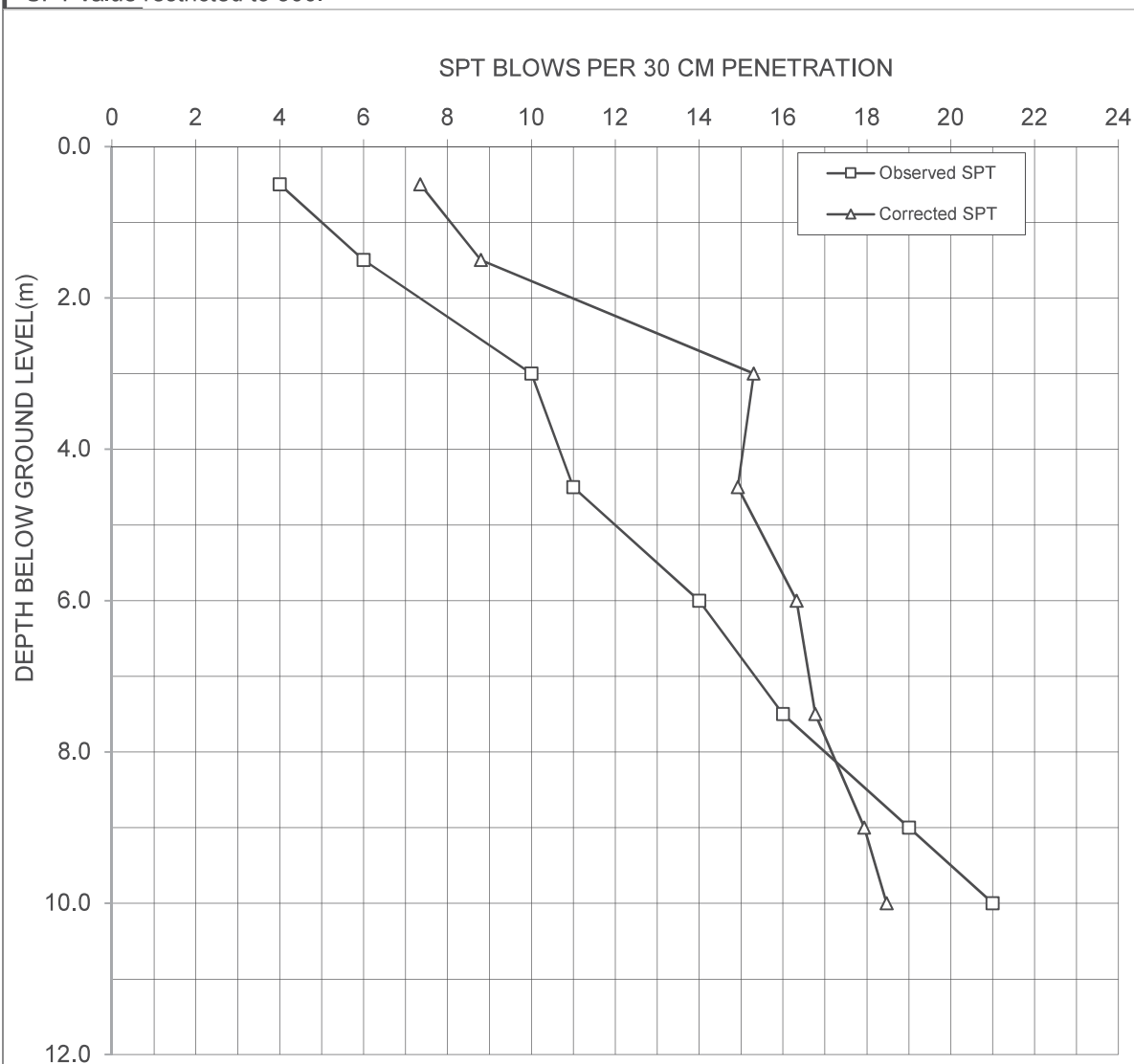
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE:-2.00m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	4	7	7
1.50	Non Plastic	6	9	9
3.00	Non Plastic	10	16	15
4.50	Non Plastic	11	15	15
6.00	Non Plastic	14	18	16
7.50	Non Plastic	16	19	17
9.00	Non Plastic	19	21	18
10.00	Non Plastic	21	22	18

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 45

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ'_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_σ	K_u	MSF	CRR	FOS	Conclusion
0.50	SM	4	1.62	0.62	28	IV	0.24	7.00	1.00	0.81	0.31	0.41	1.70	1.33	1.000	1.05	0.75	1.00	7.12	4.56	1.14	12.67	0.14	15.20	0.92	1.00	1.00	1.19	0.16	0.40	Liquefiable
1.50	SM	6	1.62	0.62	28	IV	0.24	7.00	0.99	2.43	0.93	0.40	1.70	1.33	1.000	1.05	0.75	1.00	10.68	4.56	1.14	16.72	0.18	21.54	0.89	1.00	1.00	1.19	0.21	0.53	Liquefiable
3.00	SM	10	2.02	1.02	32	IV	0.24	7.00	0.98	4.86	1.86	0.40	1.70	1.33	1.000	1.05	0.85	1.00	20.18	4.83	1.17	28.46	0.39	42.90	0.79	1.00	1.00	1.19	0.46	1.16	Non Liquefiable
4.50	SM	11	2.02	1.02	32	IV	0.24	7.00	0.97	7.89	3.39	0.35	1.70	1.33	1.000	1.05	0.95	1.00	24.81	4.83	1.17	33.88	NA	53.32	0.73	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	14	2.00	1.00	36	IV	0.24	7.00	0.95	10.92	4.92	0.33	1.43	1.33	1.000	1.05	0.95	1.00	26.48	5.00	1.20	36.78	NA	57.08	0.71	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	16	2.00	1.00	36	IV	0.24	7.00	0.94	13.92	6.42	0.32	1.25	1.33	1.000	1.05	0.95	1.00	26.49	5.00	1.20	36.79	NA	57.11	0.71	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	19	2.03	1.03	38	IV	0.24	7.00	0.93	16.92	7.92	0.31	1.12	1.33	1.000	1.05	1	1.00	29.81	5.00	1.20	40.78	NA	64.58	0.68	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SM	21	2.03	1.03	38	IV	0.24	7.00	0.91	18.95	8.95	0.30	1.06	1.33	1.000	1.05	1	1.00	31.00	5.00	1.20	42.20	NA	66.00	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

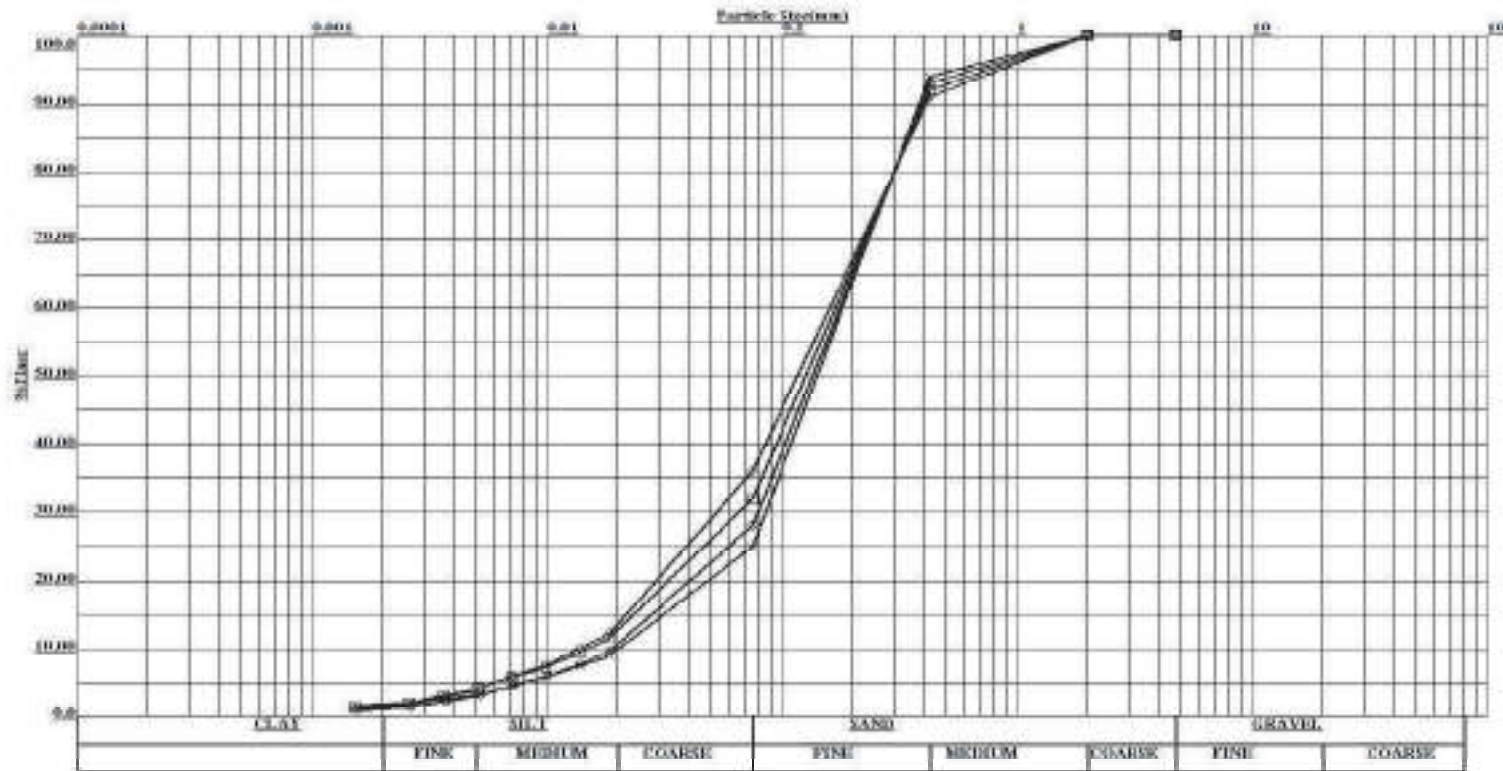
K_u Correction for static shear stress is required only for sloping ground

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - A45
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	0.0	LOOSE TO MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	0.00	75.00	23.00	2.00	8.96	1.98
O	0.5		0.00	72.00	27.00	1.00	9.21	1.86
□	3.0		0.00	68.00	30.00	2.00	11.26	1.70
◇	6.0		0.00	64.00	35.00	1.00	11.52	1.25



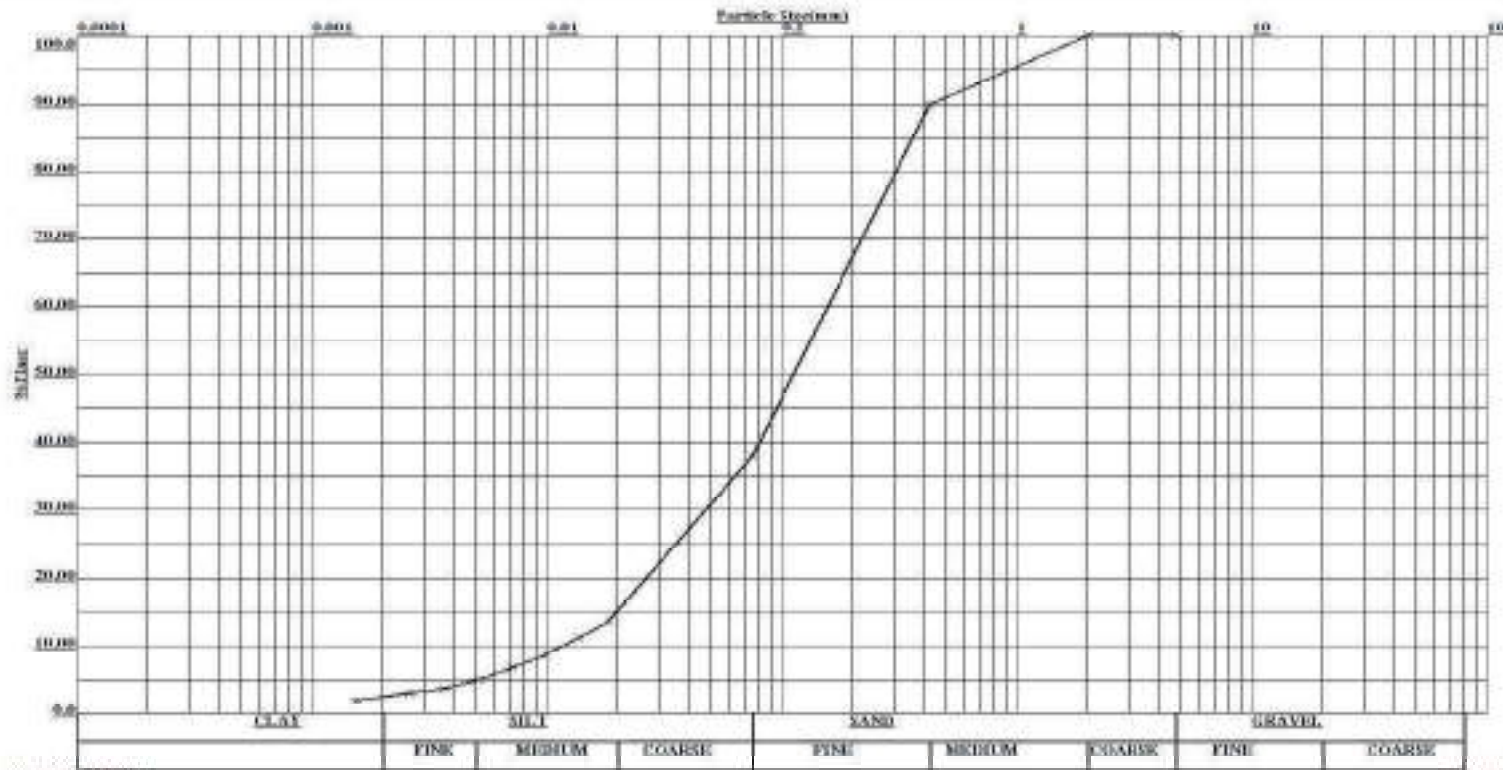
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - A45
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
x	9.0		0.00	62.00	36.00	2.00	13.22	1.21



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. -45

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained						Mean Particle Size (mm)						Sandy Strata		Clayey Soil					
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0								Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))
1	BH-1	0.00	0.50	SILTY SAND	SM	0.0	0.0	0.0	7.0	42.0	23.0	28.0	0.00	0.00	0.00	4.99	12.71	2.93	1.050	0.217	0.819	-	-	-	-
2		3.50	3.95			0.0	0.0	0.0	8.0	43.0	17.0	32.0	0.00	0.00	0.00	5.70	13.01	2.17	1.200	0.221	0.827	-	-	-	-
3		6.50	6.95			0.0	0.0	0.0	9.0	39.0	16.0	36.0	0.00	0.00	0.00	6.41	11.80	2.04	1.350	0.216	0.818	-	-	-	-



NORTH EASTERN RAILWAY

**FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE
PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY
FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD &
4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY
(TOTAL 1022.00 KM)**

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
26574.692	47	ROAD	RUB	BH-01	209688	2988109	106.68

SUBMITTED BY:

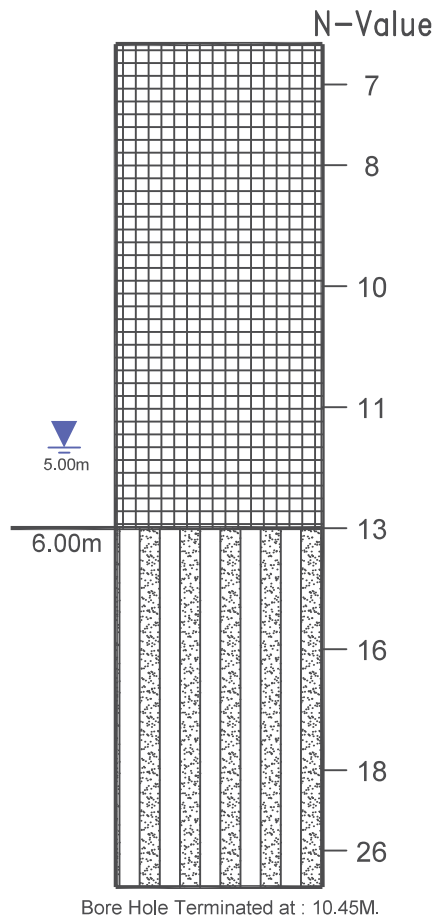


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

IR BRIDGE NO.- BR-47

BOREHOLE NO.: BH- 01



LEGENDS



Silty Clay (CL)



Silty Sand (SM)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

CALCULATIONS FOR CORRECTED SPT (N) VALUES

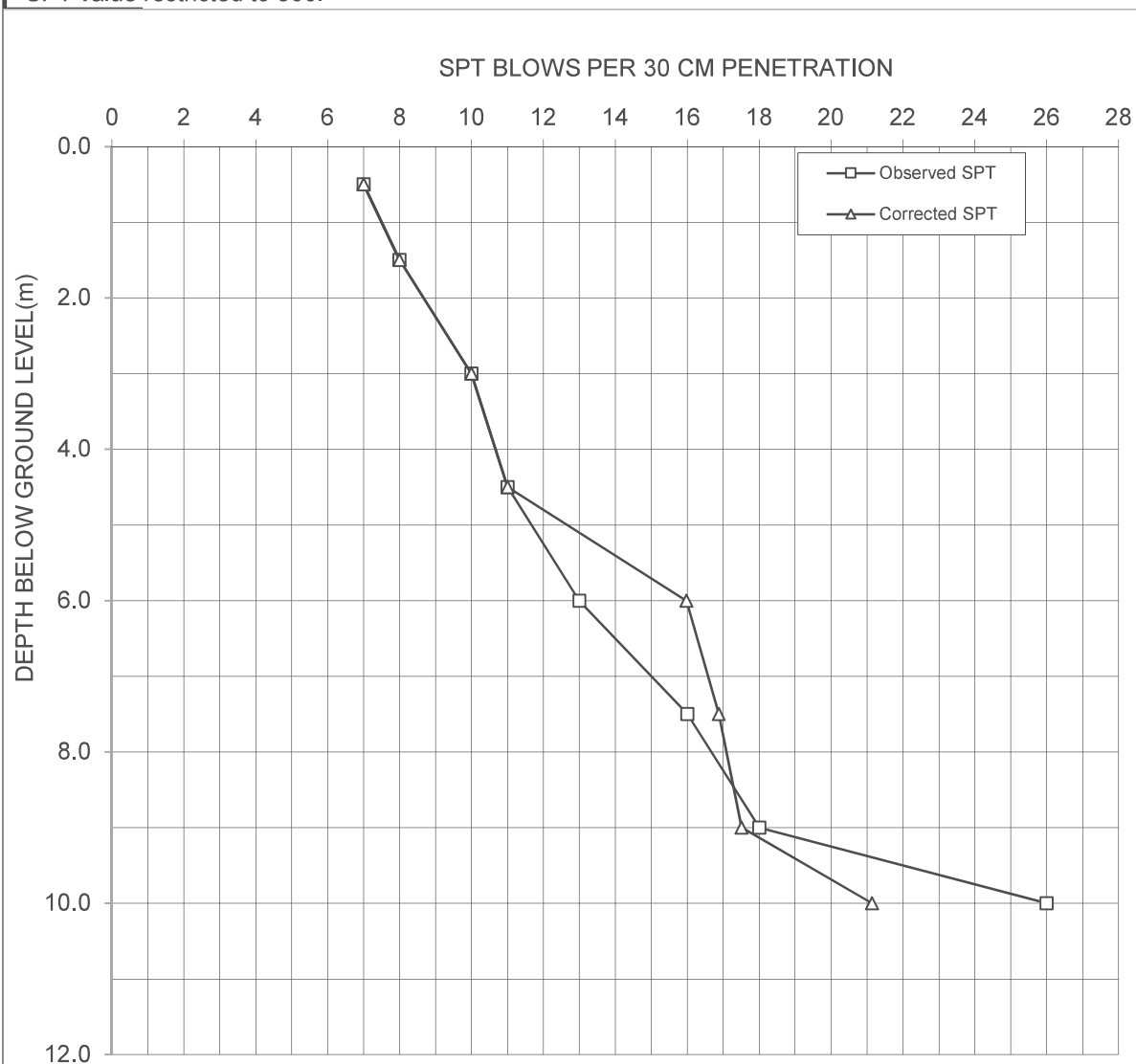
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE :-5.00 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	PLASTIC	7	7	7
1.50	PLASTIC	8	8	8
3.00	PLASTIC	10	10	10
4.50	PLASTIC	11	11	11
6.00	Non Plastic	13	17	16
7.50	Non Plastic	16	19	17
9.00	Non Plastic	18	20	18
10.00	Non Plastic	26	27	21

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 47

BOREHOLE NO.

BH-01

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_o	K_u	MSF	CRR	FOS	Conclusion
0.50	CL	7	1.58	0.58	94	IV	0.24	7.00	1.00	0.79	0.29	0.42	1.70	1.33	1.000	1.05	0.75	1.00	12.46	5.00	1.20	19.96	0.21	NA	NA	1.00	1.00	1.19	0.26	>1.0	Non Liquefiable
1.50	CL	8	1.58	0.58	94	IV	0.24	7.00	0.99	2.37	0.87	0.42	1.70	1.33	1.000	1.05	0.75	1.00	14.24	5.00	1.20	22.09	0.24	NA	NA	1.00	1.00	1.19	0.29	>1.0	Non Liquefiable
3.00	CL	10	1.73	0.73	95	IV	0.24	7.00	0.98	4.74	1.74	0.42	1.70	1.33	1.000	1.05	0.85	1.00	20.18	5.00	1.20	29.22	0.42	NA	NA	1.00	1.00	1.19	0.50	>1.0	Non Liquefiable
4.50	CL	11	1.73	0.73	95	IV	0.24	7.00	0.97	7.34	2.84	0.39	1.70	1.33	1.000	1.05	0.95	1.00	24.81	5.00	1.20	34.77	NA	NA	NA	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	13	2.02	1.02	28	IV	0.24	7.00	0.95	9.93	3.93	0.38	1.60	1.33	1.000	1.05	0.95	1.00	27.51	4.56	1.14	35.87	NA	59.40	0.70	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	16	2.02	1.02	28	IV	0.24	7.00	0.94	12.96	5.46	0.35	1.35	1.33	1.000	1.05	0.95	1.00	28.73	4.56	1.14	37.26	NA	62.14	0.69	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	18	2.04	1.04	32	IV	0.24	7.00	0.93	15.99	6.99	0.33	1.20	1.33	1.000	1.05	1	1.00	30.07	4.83	1.17	40.04	NA	65.07	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SM	26	2.04	1.04	32	IV	0.24	7.00	0.91	18.03	8.03	0.32	1.12	1.33	1.000	1.05	1	1.00	40.52	4.83	1.17	52.28	NA	75.52	0.62	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_o Correction for high overburden stress (for effective oberburden pressure > 10 T/m²) ..

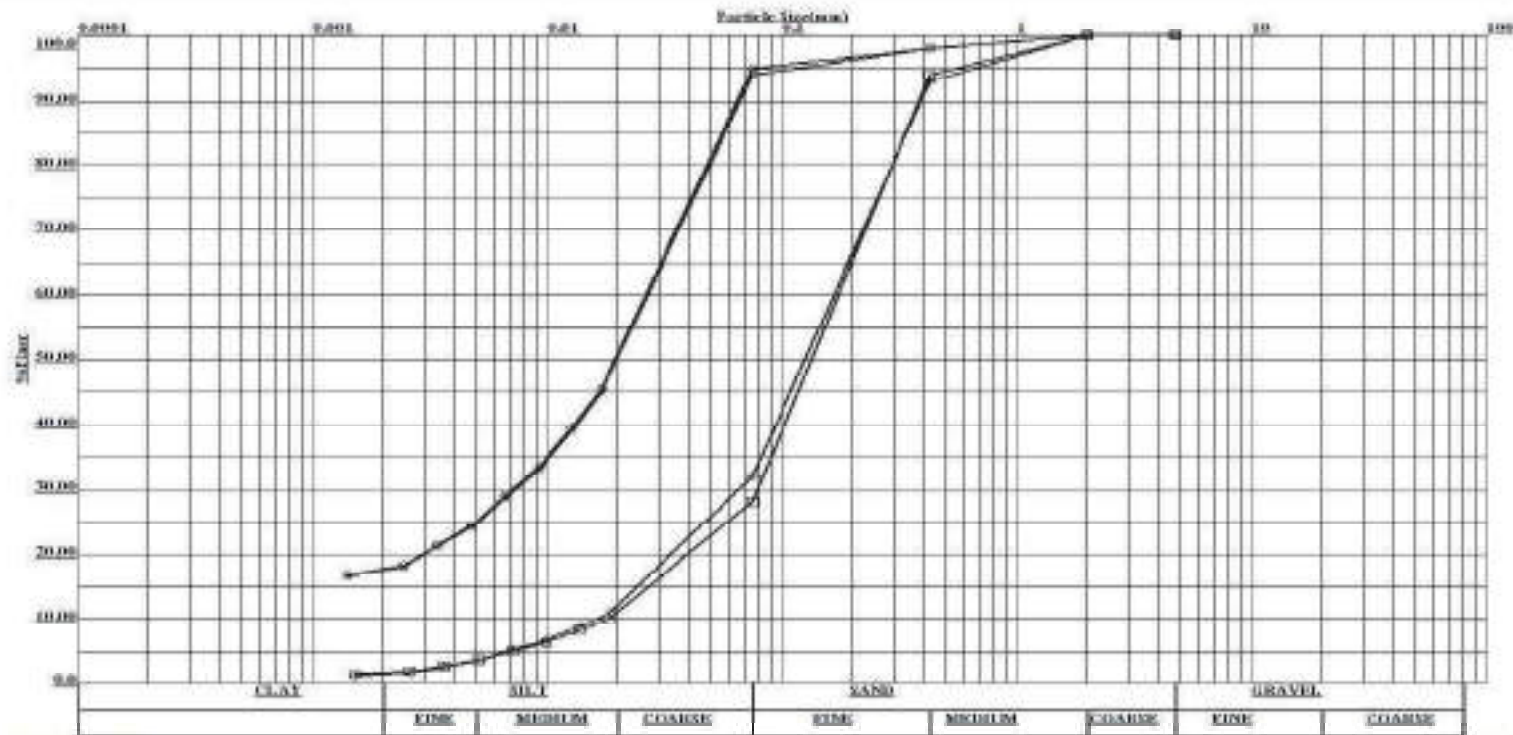
K_u Correction for static shear stress is required only for sloping ground

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 47
SECTION:CHITAUNI - MADHUBANI

BOREHOLE NO. -BH- 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	0.0	STIFF,LITE BROWN,LOW PLASTICITY CLAY (CL)	0.00	6.00	77.00	17.00	-	-
○	2.5		0.00	5.00	77.00	18.00	-	-
□	6.0	MEDIUM DENSE ,LITE GREY, SILTY SAND(SM)	0.00	72.00	26.00	2.00	9.53	1.97
◇	9.0		0.00	68.00	31.00	1.00	10.27	1.60



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. BR-47

BOREHOLE NO- BH-01

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= $1.76 \times \sqrt{d_m}$	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F \times (1 + \sqrt{c})}$	
1	BH-01	0.00	0.50	LOW PLASTICITY CLAY	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.35	9	1.75	2.79		
2		2.50	2.80	LOW PLASTICITY CLAY	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.32	10	1.5	2.35		
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	45.0	21.0	28.0	0.00	0.00	0.00	4.28	13.61	2.68	1.050	0.216	0.818	-	-	-	-	



aarvee associates
architects engineers & consultants pvt. ltd.

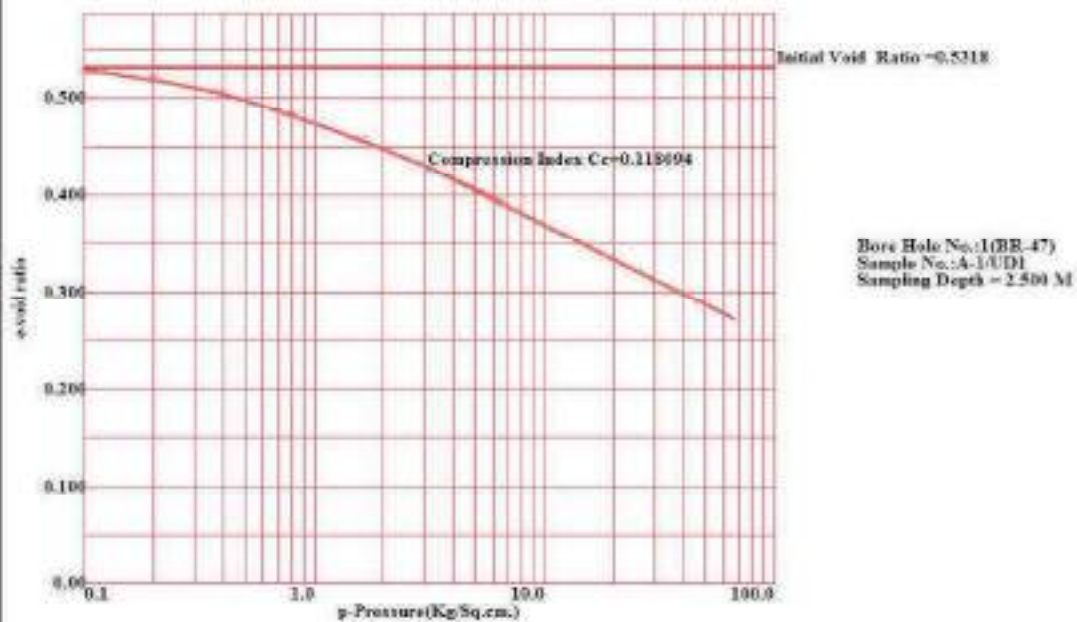
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BRIDGE NO. - BR-47

BOREHOLE NO. -BH-01

SECTION:CHITAUNI - MADHUBANI

CONSOLIDATION GRAPH





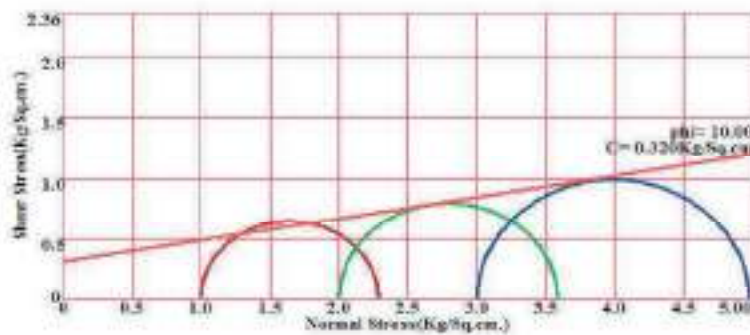
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BRIDGE NO:47

BOREHOLE NO. -BH-01

SECTION:CHITAUNI - MADHUBANI

TRIAXIAL & DIRECT SHEAR GRAPH



Bore Hole No. = 1(BH-47)
Sample No. = A-1/UD1
Depth = 2.5000031
Type of Test = C.D.