

Section VII-8:

B. Documents

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1.LIST OF CURVE AND GRADIENT

Gradient Details PKG-C23(55.600-61.500)

28.07.2022

S.No.	Chainage KM		Length metre	Gradient 1 in	RISE/FALL	PFL		Remarks
	From	upto				From	To	
1	55559.574	55791.975	232.401		LEVEL	235.902	235.975	Main Line
2	55791.975	56319.075	527.1	165	F	235.984	232.856	
3	56319.075	57195.574	876.499	155	F	232.863	227.185	
4	57195.574	58989.075	1793.501	1004	F	226.619	225.335	
5	58989.075	59207.31	218.235		LEVEL	225.154	225.335	
6	59207.31	59827.31	620	170	F	225.152	221.723	
7	59827.31	59966.171	138.861		LEVEL	221.708	221.708	
8	59966.171	60511.172	545.001	155	R	221.708	225.188	
9	60511.172	60691.171	179.999		LEVEL	225.224	225.224	
10	60691.171	60884.075	192.904	155	F	225.224	223.998	
11	60684.075	61181.404	497.329	165	F	223.968	223.239	
12	61181.404	61634.046	452.642	265	R	222.178	223.761	
1	0	700	700	1004	R	226.217	226.914	New Patli - Patli
2	700	1847.724	1147.724	230	F	226.914	221.927	
3	1847.724	2418.056	570.332		LEVEL	221.927	221.927	
4	2418.056	2968.371	550.315	220	R	221.927	224.428	
5	2968.371	3247.861	279.49	4692	R	224.428	224.428	
6	3247.861	3760.79	512.929	585	R	224.428	225.365	
1	0	1000	1000	1004	F	226.217	225.221	New Patli - Sultanpur
2	1000	1250	250		LEVEL	225.221	225.221	
3	1250	2310.92	1060.92	170	F	225.221	218.98	
4	2310.92	2881.479	570.559	2106	R	218.98	219.251	
5	2881.479	3840.924	959.445	200	F	219.251	214.454	
6	3840.924	4114.38	273.456	400	F	214.454	213.77	

Horizontal Curve Details

S.No.	Curve No.	SIDE	DEGREE	RADIUS	DEF.ANGLE (Delta)	CANT {SE} (mm)	TANGENT LENGTH	Circular Curve Length(CCL)	TRANSITION LENGTH	CH. TTP-1	CH. TTP-2	TOTAL LENGTH	
1	47	RHS	01° 10' 14.89"	1494.700	11°47'23"	125.000	231.700	152.100	155.000	55849.683	56311.801	462.118	Main Line UP line
2	48	RHS	00° 14' 59.31"	7005.300	1°02'52"	15.000	94.100	68.100	60.000	59280.924	59469.034	188.110	
3	49	LHS	00° 38' 53.33"	2700.000	3°07'27"	40.000	138.600	17.100	130.000	60907.606	61184.746	277.140	
4	50	LHS	02° 28' 52.36"	705.300	9°16'39"	120.000	107.000	13.700	100.000	61381.500	61595.160	213.660	
1	35	RHS	01° 10' 00.00"	1500.000	11°47'23"	140.000	246.600	128.000	180.000	56018.456	56326.415	307.959	Main Line DN line
2	38	RHS	00° 15' 00.00"	7000.000	1°02'52"	15.000	94.000	68.000	60.000	59444.976	59632.989	188.013	
3	39	LHS	00° 42' 00.00"	2500.000	3°07'27"	45.000	133.100	6.200	130.000	60929.518	61195.740	266.222	
4	40	LHS	02° 30' 00.00"	700.000	9°16'39"	120.000	111.500	2.600	110.000	61376.441	61599.049	222.608	
1	1	RHS	01° 47' 41.53"	975.000	5°05'30"	45.000	58.300	56.600	30.000	163.031	279.67	116.639	New patli to patli
2	2	RHS	01° 47' 41.53"	975.000	5°05'30"	45.000	58.300	56.800	29.900	279.675	396.188	116.513	
3	3	RHS	02° 55' 00.00"	600.000	42°05'15"	65.000	250.900	400.700	40.000	622.495	1103.186	480.691	
4	4	LHS	02° 57' 39.89"	591.000	115°38'57"	85.000	969.700	1132.700	60.000	1471.172	2723.916	1252.744	
5	5	RHS	01° 00' 00.00"	1750.000	2°21'07"	50.000	60.900	21.800	50.000	3119.295	3241.119	121.824	
6	6	RHS	01° 00' 00.00"	1750.000	1°34'27"	35.000	39.000	18.100	30.000	3364.032	3442.113	78.081	
1	1	RHS	01° 47' 41.53"	975.000	5°05'30"	45.000	58.300	56.600	30.000	163.031	279.676	116.645	New patli to Sultanpur
2	2	LHS	01° 47' 41.53"	975.000	5°05'30"	45.000	58.300	56.800	30.000	279.676	396.881	117.205	
3	3	LHS	03° 53' 19.99"	450.000	7°32'22"	55.000	44.600	29.200	30.000	786.182	875.36	89.178	
4	4	LHS	01° 56' 39.99"	900.000	18°45'31"	60.000	168.700	254.600	40.000	1058.681	1393.319	334.638	
5	5	RHS	03° 48' 15.65"	460.000	65°57'46"	55.000	313.600	499.500	30.000	2956.77	3516.32	559.55	
6	6	RHS	03° 58' 38.18"	440.000	43°00'17"	60.000	188.400	300.200	30.000	3550.337	3910.537	360.2	

Note - details are taking from L-Section received vide e-mail dated 28.07.2022.

Gradient Details PKG-C23(29.200-49.700)

S.No.

S.No.	Chainage KM		Length metre	Gradient 1 in	RISE/FALL	PFL	
	From	upto				From	To
1	28420.000	29960.000	1540.000	160	R	247.78	257.405
2	29960.000	31080.000	1120.000	152	R	257.405	264.774
3	31080.000	31940.000	860.000	175	R	264.774	269.688
4	31940.000	32200.000	260.000	LEVEL		269.688	269.739
5	32200.000	33399.509	1180.004	1200	F	269.739	268.74
6	33399.509	33699.509	280.000	3000	F	268.74	268.64
7	33699.509	33939.509	220.000	LEVEL		268.64	268.64
8	33939.509	34524.257	583.243	220	F	268.64	265.89
9	34524.257	34879.509	313.242	750	R	265.89	266.336
10	34879.509	35034.415	160.000	LEVEL		266.336	266.336
11	35034.415	35519.509	439.344	5000	R	266.336	266.428
12	35519.509	35914.509	374.344	195	F	266.428	264.403
13	35914.509	36364.509	415.758	165	F	264.403	261.675
14	36364.509	36824.509	423.637	165	R	261.675	264.463
15	36824.509	37064.510	215.758	LEVEL		264.463	264.463
16	37064.510	37744.506	645.753	165	F	264.463	260.342
17	37744.506	38384.506	607.879	200	R	260.342	263.542
18	38384.506	38524.506	120.000	LEVEL		263.542	263.542
19	38524.506	39564.506	1016.377	200	F	263.542	258.342
20	39564.506	39924.506	336.377	552	R	258.342	258.994
21	39924.506	40064.506	120.000	LEVEL		258.994	258.994
22	40064.506	40544.506	457.778	200	F	258.994	256.594
23	40544.506	41084.512	517.102	900	R	256.594	257.194
24	41084.512	41954.506	848.077	155	R	257.194	262.807
25	41954.506	43264.506	1287.527	1200	R	262.807	263.899
26	43264.506	43584.506	298.764	155	R	263.899	265.963
27	43584.506	44129.344	524.838	330	R	265.963	267.315
28	44129.344	44804.344	655.000	165	R	267.315	271.706
29	44804.344	45088.261	274.880	200	R	271.706	273.181
30	45088.261	45776.311	657.079	LEVEL		273.181	273.181
31	45776.311	45899.352	103.041	200	F	273.181	272.566
32	45899.352	46649.347	729.995	400	F	272.566	270.691
33	46649.347	46784.347	115.000	150	F	270.691	269.791
34	46784.347	48184.184	1379.837	163	F	269.791	261.202
35	48184.184	48685.184	476.000	200	F	261.202	258.697
36	48685.184	49452.301	734.213	400	R	258.697	260.614
37	49452.301	50000.000	1555.377	155	F	260.614	257.081

Horizonatal Curve Details

S.No.	Curve No.	SIDE	DEGREE	RADIUS	DEF.ANGL E (Delta)	CANT {SE} (mm)	TANGENT LENGTH	CCL	TRANSITION LENGTH	CH. TTP-1	CH. TTP-2	TOTAL LENGTH
1	14	DN	00° 26' 15.00"	4000.000	19°57'37"	30.000	743.900	1313.500	80.000	28486.954	29960.434	1473.480
2	15	DN	01° 57' 58.65"	890.000	26°31'44"	145.000	284.500	260.900	150.000	31126.993	31687.918	560.925
3	16	DN	00° 29' 57.22"	3505.400	03°03'35"	30.000	143.600	87.200	100.000	32479.484	32766.658	287.174
4	17	DN	00° 52' 30.00"	2000.000	14°15'45"	80.000	315.200	367.700	130.000	34420.023	35047.728	627.705
5	18	DN	00° 31' 49.09"	3300.000	7°52'53"	35.000	277.300	353.900	100.000	36868.221	37422.137	553.916
6	19	DN	00° 36' 35.12"	2870.000	20°14'07"	40.000	567.100	903.600	110.000	39689.383	40812.944	1123.561
7	20	DN	00° 21' 00.00"	5000.000	1°43'10"	20.000	115.000	70.000	65.000	41377.845	41607.887	230.042
8	21	DN	00° 21' 00.00"	5000.000	1°30'05"	20.000	105.500	51.000	80.000	42467.917	42678.945	211.028
9	22	DN	01° 47' 41.53"	975.000	19°35'28"	160.000	257.700	151.700	180.000	43622.056	44133.762	511.706
10	23	DN	00° 58' 20.00"	1800.000	4°48'48"	100.000	140.600	21.000	130.000	44260.050	44541.086	281.036
11	24	DN	03° 30' 00.00"	500.000	16°34'33"	150.000	132.000	22.700	120.000	44851.854	45114.616	262.762
12	25	DN	04° 00' 00.00"	437.500	20°21'27"	105.000	113.400	85.000	70.000	45243.401	45468.362	224.961
13	26	DN	04° 00' 00.00"	437.500	15°28'23"	80.000	84.400	68.000	50.000	45698.954	45866.928	167.974
14	27	DN	00° 37' 30.00"	2800.000	4°3'14"	45.000	154.100	88.100	110.000	45935.763	46243.832	308.069
15	28	DN	01° 24' 00.00"	1250.000	8°29'50"	120.000	162.700	44.900	140.000	46294.845	46619.755	324.910
16	29	DN	01° 07' 44.51"	1550.000	13°5'40"	130.000	262.700	183.700	170.000	46818.226	47341.914	523.688
17	30	DN	01° 09' 04.73"	1520.000	16°50'33"	135.000	314.800	266.100	180.000	47564.307	48190.444	626.137
18	31	DN	01° 10' 00.00"	1500.000	10°5'29"	110.000	202.300	123.900	140.000	49037.443	49441.304	403.861
19	26	UP	00° 30' 00.00"	3500.000	19°57'37"	30.000	665.900	1119.300	100.000	28468.502	29787.983	1319.481
20	27	UP	02° 00' 00.00"	875.000	26°31'44"	150.000	280.900	253.900	150.000	31260.614	31664.553	403.939
21	28	UP	00° 30' 00.00"	3500.000	3°03'35"	30.000	143.500	86.900	100.000	32460.925	32747.810	286.885
22	29	UP	00° 51' 13.17"	2050.000	14°15'45"	75.000	321.400	380.200	145.000	34394.257	35034.415	640.158
23	30	UP	00° 32' 48.75"	3200.000	7°52'53"	35.000	275.400	330.200	140.000	36850.244	37400.394	550.150
24	31	UP	00° 36' 50.52"	2850.000	20°14'07"	40.000	563.600	896.500	110.000	39674.412	40790.909	1116.497
25	32	UP	00° 26' 12.91"	4005.300	1°43'10"	30.000	100.100	40.200	80.000	41375.332	41575.520	200.188
26	33	UP	00° 26' 12.91"	4005.300	1°30'05"	30.000	92.500	25.000	80.000	42463.663	42648.620	184.957
27	34	UP	01° 49' 54.78"	955.300	19°35'28"	165.000	254.300	144.900	180.000	43609.185	44114.083	504.898
28	35	UP	00° 51' 13.17"	2050.000	4°48'48"	75.000	151.100	42.100	130.000	44233.970	44536.050	302.080
29	36	UP	03° 50' 37.03"	455.300	16°34'33"	150.000	120.600	19.900	110.000	44848.326	45088.261	239.935
30	37	UP	03° 53' 19.99"	450.000	20°21'27"	100.000	115.600	89.400	70.000	45217.729	45447.158	229.429
31	38	UP	03° 53' 19.99"	450.000	15°28'23"	80.000	86.100	71.400	50.000	45690.412	45861.772	171.360
32	39	UP	00° 41' 54.66"	2505.300	4°3'14"	45.000	138.700	77.200	100.000	45932.932	46210.151	277.219
33	40	UP	01° 15' 00.00"	1400.000	8°29'50"	125.000	178.800	57.200	150.000	46260.238	46617.404	357.166
34	41	UP	01° 09' 45.21"	1505.300	13°5'40"	135.000	262.500	163.300	180.000	46800.129	47323.459	523.330
35	42	UP	01° 10' 05.60"	1498.000	16°50'33"	140.000	311.500	259.600	180.000	47550.700	48170.350	619.650
36	43	UP	01° 07' 44.51"	1550.000	10°5'29"	105.000	201.800	142.700	130.000	49021.483	49424.232	402.749

2. LIST OF CONTROL POINT

CH 55.000 KM TO CH 70.000 KM GCP'S DETAIL'S					
GCP"S	WGS84 Latitude	WGS84 Longitude	Grid Northing (m)	Grid Easting (m)	Elevation
SCP-34	28°26'27.1660"N	76°53'03.9408"E	3147488.043	684540.453	215.911
SCP-35	28°25'30.7392"N	76°50'25.8913"E	3145684.543	680266.856	219.896
SCP-36	28°28'09.7293"N	76°52'43.6735"E	3150636.520	683939.677	213.146
SCP-37	28°27'18.7550"N	76°50'07.4498"E	3149001.770	679714.292	220.146
SCP-38	28°29'42.9174"N	76°52'07.7145"E	3153489.785	682916.938	214.025
SCP-39	28°28'50.9803"N	76°49'32.4323"E	3151826.102	678718.550	213.476
SCP-40	28°31'23.0046"N	76°51'19.5862"E	3156550.370	681560.510	215.268
SCP-41	28°30'47.1215"N	76°48'49.0457"E	3155383.233	677484.549	215.147
TCP-121	28°24'44.9666"N	76°52'05.2477"E	3144317.248	682992.383	219.192
TCP-122	28°24'43.9123"N	76°52'08.2088"E	3144286.044	683073.473	218.608
TCP-123	28°25'12.0360"N	76°51'58.2550"E	3145147.538	682789.158	216.629
TCP-124	28°25'12.2561"N	76°52'01.6202"E	3145155.733	682880.630	216.485
TCP-125	28°25'44.3761"N	76°51'51.2001"E	3146140.046	682581.747	215.537
TCP-126	28°25'44.5441"N	76°51'55.0849"E	3146146.859	682687.377	215.975
TCP-127	28°26'14.6158"N	76°51'43.6273"E	3147067.689	682361.278	217.239
TCP-128	28°26'12.3380"N	76°51'47.4057"E	3146999.166	682465.168	218.938
TCP-129	28°26'52.0371"N	76°51'34.8424"E	3148215.885	682104.440	214.765
TCP-130	28°26'53.6477"N	76°51'38.0460"E	3148266.810	682190.830	213.613
TCP-131	28°27'22.0923"N	76°51'27.8475"E	3149138.096	681899.839	213.026
TCP-132	28°27'23.6537"N	76°51'29.6618"E	3149186.920	681948.452	212.382
TCP-133	28°27'36.8392"N	76°51'38.4657"E	3149596.499	682181.669	213.633
TCP-134	28°27'37.9196"N	76°51'45.7131"E	3149632.812	682378.301	213.769
TCP-135	28°27'59.5240"N	76°51'23.4804"E	3150288.477	681763.240	212.754
TCP-136	28°27'58.2345"N	76°51'26.5012"E	3150250.052	681846.023	213.531
TCP-137	28°28'36.0083"N	76°51'16.7447"E	3151408.700	681562.683	212.211
TCP-138	28°28'35.7799"N	76°51'20.2138"E	3151403.127	681657.146	212.179
TCP-139	28°28'57.6830"N	76°51'05.8799"E	3152071.330	681256.893	212.880
TCP-140	28°28'57.1481"N	76°51'10.2363"E	3152056.693	681375.628	212.816
TCP-141	28°29'18.8721"N	76°50'53.4692"E	3152718.372	680909.323	212.975
TCP-142	28°29'19.3493"N	76°50'57.6049"E	3152734.791	681021.569	212.681
TCP-143	28°29'54.7526"N	76°50'31.4879"E	3153813.651	680294.586	214.680
TCP-144	28°29'57.1221"N	76°50'30.5123"E	3153886.183	680266.936	214.588
TCP-145	28°30'22.3772"N	76°50'20.6217"E	3154659.458	679986.076	214.211
TCP-146	28°30'22.6226"N	76°50'23.7880"E	3154668.329	680072.053	214.134
TCP-147	28°30'53.1741"N	76°50'08.1171"E	3155602.235	679631.563	213.177
TCP-148	28°30'54.2896"N	76°50'11.2711"E	3155637.887	679716.790	212.908
TCP-149	28°31'22.3387"N	76°49'56.0802"E	3156494.973	679290.586	213.433
TCP-150	28°31'25.2632"N	76°49'57.6593"E	3156585.651	679332.140	213.002
TCP-151	28°31'59.1200"N	76°49'43.5444"E	3157621.968	678932.518	212.454
TCP-152	28°31'59.1272"N	76°49'46.9756"E	3157623.614	679025.787	212.229



Pramod Rehpade
Asst. Technical Manger

Project Name:-Field verification for land boundary and supplying, fixing of boundary pillars along HORC alignment and it's connectivities to existing IR/DFC networks, picking up of finalized land boundary and centre line coordinates using DGPS (RTK Method) by establishing control points in connection with Haryana Orbital Rail Corridor (HORC) from Palwal to Sonipat

GCP's DATA OF CH: -12KM TO 18 KM

Name	WGS84 Latitude	WGS84 Longitude	Grid Northing (m)	Grid Easting (m)	Elevation
SCP'S					
SCP-009	28°12'25.3731"N	77°09'09.6978"E	3122015.079	711280.047	194.380
SCP-010	28°14'42.9312"N	77°08'00.6765"E	3126216.341	709323.220	199.402
SCP-011	28°11'39.2352"N	77°07'12.9607"E	3120538.658	708121.475	193.529
SCP-012	28°14'07.9269"N	77°06'12.5381"E	3125087.181	706394.085	199.346
SCP-013	28°10'47.0640"N	77°05'43.5348"E	3118890.253	705710.322	193.408
SCP-014	28°13'39.4318"N	77°03'49.0236"E	3124142.674	702496.512	206.820
TCP'S					
TCP-031	28°13'32.7210"N	77°08'15.0757"E	3124061.929	709753.912	196.424
TCP-032	28°13'34.4235"N	77°08'10.2582"E	3124112.021	709621.637	196.726
TCP-033	28°13'24.1071"N	77°07'33.5187"E	3123776.815	708625.507	195.883
TCP-034	28°13'26.0676"N	77°07'28.5870"E	3123834.806	708489.981	195.888
TCP-035	28°13'06.1224"N	77°07'04.0268"E	3123209.091	707831.072	196.092
TCP-036	28°13'08.4893"N	77°07'01.1748"E	3123280.594	707752.032	196.182
TCP-037	28°12'46.0137"N	77°06'30.9154"E	3122574.323	706939.003	196.105
TCP-038	28°12'48.2184"N	77°06'28.5920"E	3122641.090	706874.466	195.849
TCP-039	28°12'26.9901"N	77°06'02.1892"E	3121975.106	706165.842	195.179
TCP-040	28°12'28.5366"N	77°06'00.3063"E	3122021.822	706113.673	195.220
TCP-041	28°12'02.1341"N	77°05'38.0417"E	3121198.560	705520.574	194.986
TCP-042	28°12'05.5195"N	77°05'35.9737"E	3121301.798	705462.378	194.676
TCP-043	28°11'41.1865"N	77°05'25.8750"E	3120547.998	705199.897	196.170
TCP-044	28°11'42.7878"N	77°05'22.1513"E	3120595.539	705097.490	194.453
TCP-045	28°11'09.1126"N	77°05'11.8430"E	3119554.071	704834.200	192.723
TCP-046	28°11'10.7340"N	77°05'08.4153"E	3119602.374	704739.851	192.474

GCP's DATA OF CH: -29.200 KM TO 49.700KM

SCP'S					
SCP-016	28°14'24.9297"N	77°00'38.4942"E	3125455.819	697278.697	293.012
SCP-017	28°12'09.7271"N	76°59'49.0726"E	3121271.671	696000.073	285.465
SCP-018	28°15'19.2876"N	76°59'11.9851"E	3127090.138	694892.969	273.709
SCP-019	28°12'36.4995"N	76°58'28.9449"E	3122059.974	693801.589	267.623
SCP-020	28°16'14.8549"N	76°57'40.0201"E	3128759.717	692358.624	265.112
SCP-021	28°13'47.9549"N	76°57'05.9422"E	3124222.828	691502.865	255.562
SCP-022	28°16'55.1346"N	76°56'08.4654"E	3129959.400	689843.726	263.025
SCP-023	28°15'13.5971"N	76°54'58.7895"E	3126803.659	687994.658	251.916
SCP-024	28°18'24.4724"N	76°55'12.5797"E	3132685.086	688277.200	269.222
SCP-025	28°17'16.6389"N	76°52'57.2887"E	3130539.057	684624.084	247.585
SCP-026	28°19'55.3848"N	76°54'39.3566"E	3135469.180	687327.824	274.734
SCP-027	28°18'49.3740"N	76°52'18.0110"E	3133376.943	683509.660	248.185
SCP-028	28°21'34.0782"N	76°54'03.4730"E	3138491.703	686302.627	280.255
SCP-029	28°20'24.3860"N	76°51'42.8468"E	3136286.731	682506.665	247.017
SCP-030	28°23'07.8703"N	76°53'32.8386"E	3141365.673	685423.154	233.634
SCP-031	28°22'08.1544"N	76°51'03.7859"E	3139464.494	681393.875	237.072



TCP'S					
TCP-067	28°13'06.4061"N	77°00'21.6871"E	3123031.074	696860.575	271.034
TCP-068	28°13'10.1973"N	77°00'24.0409"E	3123148.838	696922.820	267.933
TCP-069	28°13'18.2988"N	76°59'48.3517"E	3123382.138	695945.625	266.631
TCP-070	28°13'19.9142"N	76°59'51.8013"E	3123433.416	696038.857	267.836
TCP-071	28°13'30.9119"N	76°59'07.9414"E	3123752.284	694837.477	268.041
TCP-072	28°13'34.8089"N	76°59'10.8492"E	3123873.541	694914.788	265.898
TCP-073	28°13'52.9970"N	76°58'45.2818"E	3124421.995	694208.575	268.496
TCP-074	28°13'56.2575"N	76°58'46.5997"E	3124522.949	694242.866	265.104
TCP-075	28°14'13.3161"N	76°58'21.1823"E	3125036.739	693541.378	264.634
TCP-076	28°14'16.1903"N	76°58'23.6378"E	3125126.302	693606.877	263.697
TCP-077	28°14'37.2068"N	76°57'55.7443"E	3125760.863	692835.976	265.078
TCP-078	28°14'39.8343"N	76°57'57.5805"E	3125842.554	692884.717	261.528
TCP-079	28°14'57.9545"N	76°57'26.5372"E	3126386.614	692029.490	267.744
TCP-080	28°15'01.0976"N	76°57'26.4793"E	3126483.340	692026.347	263.061
TCP-081	28°15'15.1912"N	76°56'53.7368"E	3126902.765	691126.892	262.110
TCP-082	28°15'18.2916"N	76°56'54.8506"E	3126998.690	691155.712	260.056
TCP-083	28°15'32.5066"N	76°56'21.7602"E	3127421.762	690246.788	259.226
TCP-084	28°15'34.3650"N	76°56'24.1917"E	3127480.027	690312.141	257.216
TCP-085	28°15'52.5120"N	76°55'53.0335"E	3128025.036	689454.013	259.620
TCP-086	28°15'55.2536"N	76°55'55.6864"E	3128110.581	689524.965	258.329
TCP-087	28°16'11.0478"N	76°55'26.5575"E	3128584.097	688723.376	258.667
TCP-088	28°16'13.5955"N	76°55'27.8330"E	3128663.075	688756.888	257.003
TCP-089	28°16'33.0663"N	76°54'57.7123"E	3129249.383	687926.545	256.936
TCP-090	28°16'35.3419"N	76°54'59.4766"E	3129320.192	687973.514	252.996
TCP-091	28°16'58.1919"N	76°54'38.4368"E	3130014.477	687389.057	256.735
TCP-092	28°16'59.1606"N	76°54'42.0278"E	3130045.843	687486.435	254.180
TCP-093	28°17'27.8720"N	76°54'20.4598"E	3130920.345	686884.805	255.939
TCP-094	28°17'29.7514"N	76°54'21.8008"E	3130978.772	686920.431	256.329
TCP-095	28°17'57.4427"N	76°54'00.7114"E	3131822.106	686332.417	263.020
TCP-096	28°17'59.4644"N	76°54'04.6478"E	3131886.023	686438.683	258.503
TCP-097	28°18'28.6195"N	76°53'47.4042"E	3132776.079	685954.805	253.132
TCP-098	28°18'29.6459"N	76°53'49.6679"E	3132808.641	686015.977	252.571
TCP-099	28°19'00.8854"N	76°53'42.2393"E	3133767.067	685798.517	267.264
TCP-100	28°19'01.2164"N	76°53'44.2060"E	3133778.095	685851.931	264.187
TCP-101	28°19'36.3274"N	76°53'25.5125"E	3134850.886	685325.802	258.351
TCP-102	28°19'39.8222"N	76°53'26.5136"E	3134958.888	685351.382	258.279
TCP-103	28°20'00.9454"N	76°53'07.5761"E	3135601.025	684825.425	255.750
TCP-104	28°20'01.9312"N	76°53'09.9570"E	3135632.384	684889.796	256.456
TCP-105	28°20'26.6062"N	76°52'58.9299"E	3136387.228	684577.617	254.448
TCP-106	28°20'26.6381"N	76°53'00.7694"E	3136388.992	684627.698	254.540
TCP-107	28°21'02.7798"N	76°52'53.2526"E	3137498.297	684405.637	259.513
TCP-108	28°21'05.0330"N	76°52'55.7444"E	3137568.714	684472.409	260.368
TCP-109	28°21'33.4984"N	76°52'42.2721"E	3138439.205	684091.900	250.940
TCP-110	28°21'33.7066"N	76°52'45.7096"E	3138447.074	684185.399	251.315



3. LIST OF CHARTED UTILITIES
3.1 LIST OF EHT CROSSINGS

List of EHT Crossings				
Sr. No.	Chainage	Capacity in kV	Feeder	Utility Owner
1	59180	66 KV (HVPNL)	Harsaru - farukhnagar Line	HVPNL
2	59270	220 KV (BBMB)	Dadri - Samaypur - Balabhgarh Line	BBMB
3	60216	400 KV (HVPNL)	Dhanonda - Daulatabad Line	HVPNL
4	1+860 (Patli-New Patli connecting Line)	220 KV (HVPNL)	Sec-95 - Mau Line	HVPNL

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Geotechnical Investigation Report

Old Ch. 52+518 to Old Ch. 59+270 (New CH: 55+719 to 62+546)

SR NO. : 544_21-22

**CONDUCTING GEOTECHNICAL INVESTIGATION,
PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING
OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH
CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR
(HORC) PROJECT FROM PALWAL TO HARSANA KALAN
INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN
THE STATE OF HARYANA**

CLIENT

**M/S. HARYANA RAIL INFRASTRUCTURE
DEVELOPMENT CORPORATION LTD. (HRIDCL)**

PROGRAMME

APRIL - 2022

SR. No.	Report No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/808_(48 BHs)	04	07.09.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/262_(44 BHs)	03	05.05.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/97_(44 BHs)	02	18.04.2022
544_21-22	CEGTH/HRIDCL/SR-544/2021-22/1685_(44 BHs)	01	30.03.2022
544_21-22	CEGTH/HRIDCL/SR-544/2021-22/1544_(38 BHs)	00	22.03.2022



CEG TEST HOUSE
AND RESEARCH CENTRE PVT LTD

B-11(G), Malviya Industrial Area, Jaipur-302017

Tel. : 91-141-4046599, Fax : 91-141-2751806

E-mail : info@cegtesthouse.com., www.cegtesthouse.com

CEGTH/HRIDCL/SR-544/2022-23/808

Date:- 07.09.2022

To,

Haryana Rail Infrastructure Development

Corporation Ltd. (HRIDCL)

SCO No.-17-19, 3rd & 4th Floor,

Sector - 17-A,

Chandigarh - 160017

Tele:- 0172-2715644

Email: hridc2017@gmail.com

Subject :- Geotechnical investigation work for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan in the state of Haryana.

Dear Sir,

We are pleased to submit this report of the subject work based on 48 boreholes carried out at Old Ch. 52+518 (New ch. 55+719) to Old ch. 59+270 (New ch. 62+546) for the proposed project site.

The accompanying report presents results of various field tests and laboratory tests conducted on selected soil samples and their interpretation.

Should there be any clarifications regarding the contents please contact us at your most convenient time.

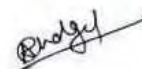
We value the opportunity to participate in this project and look forward a pleasant association on future projects.

Very truly yours,
CEG Test House & Research Centre Pvt. Ltd.

Prepared By:-



Nehal Jain
General Manager - Geotechnical
Authorized Signatory



Ankur Mudgal
Sr. Manager

SR. No.	Report Ref. No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/808_(48 BHs)	04	07-09-2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/262_(44 BHs)	03	05-05-2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/97_(44 BHs)	02	18.04.2022
544_21-22	CEGTH/HRIDCL/SR-544/2021-22/1685_(44 BHs)	01	30.03.2022
544_21-22	CEGTH/HRIDCL/SR-544/2021-22/1544_(38 BHs)	00	22.03.2022

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CHAPTER 1 GENERAL

1.0 INTRODUCTION:

The work of conducting “**Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana**” was awarded to “**CEG Test House & Research Centre Pvt. Ltd., Jaipur**” by M/S. “**Haryana Rail Infrastructure Development Corporation Ltd. (HRIDCL)**” as per work order no. HRIDC/ HORC/ GT/ CEG/ 237/ 2021/ 577-M dated 29th July 2021.

Field work including drilling of boreholes, conducting field tests such as Electrical Resistivity Test, & Plate Load Test and sample collection was carried out in the presence of representative of Client. Laboratory tests were conducted on selected soil samples to determine the design parameters, confirming to relevant IS specifications and the guidelines received from time to time from representative of Client.

This report includes the details of Methodology of Investigation, collection of samples (soil/ rock), field test results, laboratory test results, analysis of results and recommendations for proposed structure carried out at Old Ch. 52+518 (New ch. 55+719) to Old ch. 59+270 (New ch. 62+546) based on soil sample collected from the locations of 48 boreholes.

2.0 SITE LOCATION & GENERAL GEOLOGICAL HISTORY:

The details of the site & test locations for the proposed project are shown in location plan attached vide **Appendix A-1**. The site of proposed project is located from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV (Zone factor=0.24) of India.

Soil of the Haryana Sub-Region have been classified and described under the following major soil types as shown below:-

- Typic Ustochrepts : Soil of old alluvial plains
- Typic Ustipsamments : Soil of Aravali plains
- Typic Ustifluvents : Soil of recent alluvial plains and flood plains
- Typic Torripsamments : Soil of Aeofluvial plains
- Rocky Outcrops : Aravali rocky hills

The district wise details of soil characteristics are described below:-

Panipat: The soils are well drained, Sandy loam to clay loam/silty clay loam in plains and loam to clay loam/ silty/ loose clay loam in relic channels/depressions/basins.

Sonipat: The district comprises of recent flood plains, young meander plains, old meander plains and old alluvial plains. Recent flood plains occur along the Yamuna River and clearly show fluvial features. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface.

Rohtak: The district mainly comprises of old alluvial plains. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface. Old meander plains are almost flat with loamy sand to silty clay loam soils. Oldest among all the land forms are old alluvial plains, which cover major areas in the district. These soils are sand to loamy sand/sandy loam (surface) to silt loam/silty clay loam (sub-surface).

Jhajjar: The district mainly comprises of old alluvial plains and some parts of the district also have soil belonging to Aravali plains.

Rewari: The soils of the district fall under Entisols and Inceptisols orders. The surface soil texture varies from sand to fine loamy sand.

Gurgaon: The district comprises of sand dunes, sandy plains, alluvial plains, salt affected areas, low lands, lakes, hills and pediments. The soil varies from sand to loamy sand in sand dunes and sandy plain areas, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.

Mewat: The soils of the area are generally sandy loam to loam. In parts of the low-lying areas, they are clayey and saline. The upper hills are mostly barren.

Faridabad and Palwal: The district comprises of recent Yamuna flood plains, low lying plains, depressions, sand dunes and hills. The texture of the soil is sand to loamy sand in recent Yamuna flood plains, sandy loam in plains, sandy loam to clay loam in alluvial plains, sandy loam to loam (surface), clay loam/silty clay (sub-surface) in low lying plains and depressions.

3.0 SCOPE OF WORK:

The stipulated scope of work involved carrying out the following operations:-

- a) Mobilisation of necessary plant equipment, men and materials for the complete Geotechnical investigation work as per specifications, drawings and instructions of the Engineer and to complete the same within the stipulated time schedule and demobilisation after completion of field work.
- b) Shifting of Equipments from one structure location to another including Erection, installation of rigs at site and dismantling of the same after completion of field work. Shifting of setup for each borehole location and associated preparation for borehole under water
- c) Making 150 mm nominal diameter boreholes at various locations in all types of soils except hard rock and large boulders using suitable approved method of boring including chiselling, cleaning, providing casing pipe as required; performing Standard Penetration Test at every 3.0m interval and at change of strata; collection of water samples and disturbed soil samples, observation such as ground water, etc., collection of undisturbed soil samples at every 3.0 m interval and at change of strata; transportation of all the collected samples to the laboratory and back filling of boreholes on completion of the same, complete as per specification and instructions of the Engineer, for depths below natural ground level.
- d) Conducting Electrical resistivity tests at various locations all complete as per specification and directions of the Engineer.
- e) Conducting plate load test at various locations, all complete as per specification and directions of the Engineer.
- f) Drilling of Nx size boreholes (75mm dia.) in all types of hard rock, collection of core samples, maintaining continuous record of core recovery/ RQD, keeping the cores in wooden core boxes, transporting to laboratory, backfilling on completion of the same, all complete as per specification and instructions of the EIC.
- g) Conducting various laboratory tests on soil samples at an approved laboratory including preparation of soil samples to determine the following properties of soil, all complete as per specification.

On soil Samples

- Dry density test
- Bulk Density and Moisture Content.
- Sieve Analysis
- Hydrometer Analysis
- Liquid Limit and Plastic Limit
- Specific gravity
- Shrinkage Limit

- Free Swell Index
 - Direct Shear Test
 - Triaxial Shear Test
 - One Dimensional consolidation test
 - Chemical Analysis of soil samples (pH, chloride, Sulphate)
- h) Conducting laboratory tests on rock samples including preparation of the samples to determine the following properties, all complete as per specification

On Rock Samples

- Moisture content, porosity & Density
 - Specific gravity
 - Hardness
 - Unconfined compression test
 - Point load strength index
 - Modulus of Elasticity and Poission's Ratio
 - Abrasion Test
- i) Conducting chemical tests on water samples to determine the Sulphate, chloride and pH value all complete as per specification.
- j) Submitting draft report in soft copy including all field records and laboratory test results, graphs, etc., all complete as per specifications.
- k) Submitting final report in three hard copies in after the approval of the draft report including all field records and laboratory test results, graphs, etc., all complete as per specifications.

4.0 FIELD INVESTIGATION IN SOIL STRATA:

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil / rock core samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum.

For geotechnical investigation work, required equipments along with rotary drilling rigs and manpower were mobilized at site to carry out various field activities as per the scope of work. These were shifted from one test location to another location during execution of field work and were demobilized on satisfactory completion of field work.

For conducting the field investigations the following practices were followed at site:

- The locations of 48 boreholes carried out at Old Ch. 52+518 to ch. 59+270 (New ch. 55+719 to ch. 62+546) were marked at site at specified locations. These locations are shown in **Appendix A-1** attached subsequently.

The details of various boreholes along with their coordinates are provided herein below:

Table 1.1: Details of Borehole Locations

S. No.	Chainage Old	Chainage New	Structure	BH.No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+) R.L. (m)
							E	N	
1.	52+518	55+719	MJB	BH-A1	22.80	40.00	683091.771	3143671.170	213.216
				BH-A2	23.50	40.00	683092.392	3143783.105	220.511
2.	52+934	56+118	MNB	BH-CL	NE	10.00	683069.549	3144133.557	217.658
3.	53+107	56+291	MNB	BH-CL	NE	15.00	683034.675	3144302.971	218.950
4.	53+282	56+466	MNB	BH-CL	NE	10.00	682995.864	3144473.609	218.087
5.	53+572	56+756	MNB	BH-CL	NE	10.00	682931.500	3144756.380	217.532
6.	53+982	57+169	MNB	BH-CL	NE	10.00	682840.528	3145156.160	217.050
7.	54+363	57+547	MNB	BH-CL	NE	10.00	682755.991	3145527.663	216.014
8.	54+496	57+672	MNB	BH-CL	NE	15.00	682726.480	3145657.348	217.393
9.	55+020	58+204	MNB	BH-CL	10.00	13.00	682610.214	3146168.286	215.845
10.	55+044	58+228	Station	BH-PLT-04	NE	12.00	682575.147	3146175.461	215.725
11.	55+910	59+107	MJB	BH-A1	16.00	40.00	682418.856	3147009.213	218.101
				BH-A2	15.60	40.00	682407.318	3147059.917	217.474
12.	56+403	59+587	MNB	BH-CL	NE	10.00	682303.349	3147516.813	215.389
13.	56+701	59+886	MNB	BH-CL	NE	15.00	682237.228	3147807.384	215.273
14.	56+978	60+162	MNB	BH-CL	NE	10.00	682175.767	3148077.480	212.389
15.	57+400	60+603	MJB	BH-A1	10.90	30.00	682111.171	3148361.347	217.941
				BH-P2	11.85	30.00	682104.781	3148389.429	213.893
				BH-P3	11.50	31.00	682101.808	3148402.495	214.414
				BH-P4	11.80	30.00	682098.835	3148415.561	214.498
				BH-P5	12.00	30.00	682095.861	3148428.627	214.548
				BH-P6	11.40	30.00	682092.888	3148441.693	214.417
				BH-P7	11.00	30.00	682089.915	3148454.759	214.599
				BH-P9	12.00	35.00	682083.968	3148480.891	214.330
				BH-P10	11.85	30.00	682080.995	3148493.957	214.021
				BH-P11	11.80	30.00	682078.022	3148507.023	213.946
				BH-P12	12.10	30.00	682075.049	3148520.089	214.402
				BH-P13	12.30	30.00	682072.075	3148533.155	214.579
				BH-P15	11.80	30.00	682066.129	3148559.287	213.460
				BH-P16	11.20	30.00	682063.156	3148572.353	212.949
				BH-P17	10.80	30.00	682060.182	3148585.419	213.184
				BH-P18	10.50	30.00	682057.209	3148598.485	213.517
BH-P19	11.50	30.00	682054.236	3148611.551	213.504				
BH-A2	10.90	35.00	682050.819	3148626.567	213.090				
16.	57+980	61+164	MNB	BH-CL	9.28	10.00	681950.308	3149053.752	213.055
17.	58+191	61+376	MNB	BH-CL	NE	10.00	681895.083	3149257.396	212.823
18.	58+497	61+676	MJB	BH-A1	11.50	40.00	681858.380	3149467.024	213.216
				BH-P1	11.60	40.00	681844.488	3149495.176	214.371
				BH-P2	10.70	40.00	681840.419	3149522.156	213.108
				BH-P3	11.00	40.00	681840.000	3149565.000	214.145
BH-P4	11.90	40.00	681837.920	3149594.593	214.312				

S. No.	Chainage Old	Chainage New	Structure	BH.No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+ R.L. (m))
							E	N	
	58+497	61+676	MJB	BH-P5	12.00	40.00	681834.868	3149620.114	213.726
				BH-P6	11.00	40.00	681836.405	3149645.522	213.711
				BH-A2	12.00	40.00	681833.809	3149673.452	214.044
19.	58+837	62+026	MNB	BH-CL	NE	10.00	681823.952	3149897.982	213.610
20.	59+071	62+256	MNB	BH-CL	NE	10.00	681817.835	3150131.892	213.832
21.	59+206	62+400	MNB	BH-CL	12.65	15.00	681807.000	3150266.000	213.360
22.	59+270	62+546	MNB	BH-CL	NE	10.00	681801.000	3150330.000	212.593

***Not Encountered:-NE**

- In soil, boreholes of 150mm dia. were drilled as per the standard procedure laid in IS: 1892.
- Borehole was properly cleaned before taking any sample in soil.
- Casing was used as per the prevailing soil conditions, to stabilize the borehole.
- Standard Penetration Tests were conducted in bore holes at regular intervals or at every change of strata as per Technical specification.
- Undisturbed were collected wherever feasible as per the requirements and at specified depths. The same has been discussed in detail in soil characteristics sheets attached with the report.
- Water table was met at depths varying from 10.5m to 23.5m below EGL.

The detailed procedure adopted for conducting various field tests is given here in below:

(i) Standard Penetration Test:

The Standard Penetration Test was conducted in boreholes as per IS 2131. The test was carried out using the standard split spoon sampler to measure the number of blows 'N'.

Standard split spoon sampler was attached to an 'A' rod. It was driven from borehole bottom to a distance of 45 cm using a standard hammer of 63.5 kg falling freely from a height of 75 cm to the required depth. While driving, the number of blows required to penetrate every 15 cm are recorded. The total number of blows required for the last 30 cm is taken as 'N' value at that particular depth of the borehole. Wherever the total penetration was less than 45cm, the no. of blows & the depth penetrated is recorded in the respective borelog.

SPT 'N' values were correlated with relative density of non-cohesive stratum and with consistency of cohesive stratum as given below:-

Table 1.2: Soil compactness as per SPT N values (cl. 9.7, table 9.3 & 9.4, page 330_text book of V.N.S. Murthy)

Correlation for Clay / Plastic silt		Correlation for Sand / Non-Plastic silt	
Consistency	SPT "N" Value	Compactness	SPT "N" Value
Very Soft	0 - 2	Very Loose	0 - 4
Soft	2 - 4	Loose	4 - 10
Medium	4 - 8	Medium	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very Stiff	15 - 30	Very Dense	> 50
Hard	> 30		

The field SPT N values obtained were further corrected as per the guidelines given in IS: 2131 as follows:

(a) **For overburden:** - The N value for cohesionless soil is corrected with the help of fig. 1 given in IS-2131.

(b) **Due to dilatancy** :- Wherever N values observed below water table in fine sand, silty sand or silt was greater than 15, then corrected N values were corrected as under:

$$N' = 15 + \frac{1}{2} (N-15)$$

(ii) Undisturbed Sampling (Soil) in boreholes:

Undisturbed samples were collected using MS tubes of suitable diameter and length with Area ratio as per clause 4.1.1 (c) of IS: 1892 (latest) fitted to an adopter with ball and socket arrangement. Before taking any sample, sampling tube was properly greased. Immediately after taking on undisturbed sample in a tube, the adopter head was removed along with the disturbed material. The visible ends of the sample were trimmed off any wet disturbed soil. The ends were coated alternately with four layers of just molten wax. More molten wax was added to give a total thickness of min. 25 mm. The samples were carefully labeled and transported to the laboratory for testing. Undisturbed samples wherever slipped during lifting were duly marked in the field logs as well as in the soil profile.

(iii) Collection of Ground Water Samples from bore holes:

Water table was met at depths varying from 10.5m to 23.5m below EGL.

5.0 LABORATORY TESTS ON SOIL SAMPLES:

The following laboratory tests were conducted on selected soil samples:

Table 1.3: Description of Tests

Description of Test	Reference	Undisturbed (UDS) Soil Samples	Disturbed (DS/SPT) Soil Samples
Grain Size Analysis / Hydrometer	IS: 2720 (Part - 4)	√	√
Natural Moisture Content / Bulk / Dry density	IS : 2720 (Part – 2)	√	-

Description of Test	Reference	Undisturbed (UDS) Soil Samples	Disturbed (DS/SPT) Soil Samples
Atterberg Limits <ul style="list-style-type: none"> • Liquid Limit • Plastic Limit 	IS: 2720 (Part - 5) IS: 2720 (Part - 5)	√ √	√ √
Specific Gravity	IS : 2720 (Part – 3)	√	-
Direct Shear Test	IS : 2720 (Part – 13)	√	-
Triaxial compressive shear test	IS : 2720 (Part – 11 & 12)	√	-
Chemical Analysis of Soil Samples	IS : 2720 (Part – 26, 27)	√	-

Note:- The detailed procedure adopted for conducting various laboratory tests is described in the following paragraphs:

5.1.1 Dry density and Bulk density

For determination of bulk density and dry density, a sample of known volume ‘V’ was extracted from the undisturbed sampling tube and its bulk weight ‘W’ was noted down. Moisture content ‘Wn’ was determined by oven drying method.

The bulk density and dry density were determined by following equation-

$$\text{Bulk density } (\gamma_b) = W/V$$

$$\text{Dry density } (\gamma_d) = \gamma_b / (1+Wn)$$

5.1.2 Natural water content

For this test, the soil sample of known quantity (Wm) was taken in a container. The container with soil sample was placed into an oven for drying at 105-110°C temperature for 16-24 hours. After drying, the dry sample was again weighted to determine the dry weight of sample (Wd).

The natural water content was computed by the following equation-

$$Wn = (Wm-Wd)*100/Wd$$

5.1.3 Grain Size Analysis (IS: 2720- Part-4)

Wet sieve analysis:

For determination of particle sizes finer than 75 micron, wet sieve analysis test was conducted. For this test, oven dried sample of known quantity was taken in a container and soaked with dispersing agent. The soaked soil sample was washed thoroughly over 75 micron IS sieve until the water passing sieve was substantially clean.

Fraction retained on 75 micron IS sieve was carefully collected in a container without any loss in material and placed into oven for drying.

Dry sieve analysis:

For this test, the oven dried soil sample after wet sieving was sieved through the set of IS sieves 20 mm, 10 mm, 4.75 mm, 2.0 mm, 1.0 mm, 425 micron, 300 micron, 150 micron and 75 micron. The amounts of soil retained on each sieve were noted down. The % retained, cumulative % retained and % passing were computed accordingly. Wherever the soil sample % passing 75 micron sieve was significant, Hydrometer method was used to find the percentage of silt and clay fraction.

Grain size analysis for the fraction passing 75 micron IS Sieve (Hydrometer method)

Calibration of Hydrometer

Hydrometer was calibrated to determine a relationship (an equation) between the effective depth H_R and corresponding hydrometer reading R_h (obtained during test).

50 to 100 gm of soil sample passing through 75 micron IS Sieve was taken. It was mixed with 100 ml of sodium hexametaphosphate solution and the mixture was warmed for about 10 minutes. It was then transferred to the cup of the mechanical mixer and the soil suspension was stirred for 15 minutes. The soil suspension was transferred into 1000 ml measuring cylinder and distilled water was added to make 1000ml solution. This solution was mixed vigorously. The measuring cylinder was then allowed to stand and the stopwatch was started. Hydrometer was immersed in the solution and reading were taken after half, one, two and four minutes. The hydrometer was then removed slowly and kept in distilled water at the same temperature as the soil suspension. Readings were taken after the periods of 8, 15 and 30 minutes, and one, two and four hours. Hydrometer was removed, rinsed and placed in the distilled water after each reading. After 4 hours reading was taken once or twice within 24 hours. Finally a reading was taken at the end of 24 hours. The temperature of the suspension was observed and recorded.

Calculations

Diameter of the particles (D):

$$D = \sqrt{\frac{30\mu}{980(G-1)}} \times \sqrt{\frac{H_R}{t}} = M \sqrt{\frac{H_R}{t}}$$

Where,

D = diameter of particle in suspension, in mm;

μ = co-efficient of viscosity of water at the temperature of the suspension at the time of taking the hydrometer reading, in poise;

G = specific gravity of the soil fraction used in the sedimentations analysis;

H_R = effective depth corresponding to R_n , in cm.

t = time elapsed between the beginning of sedimentation and taking of hydrometer reading in minutes

$M = \sqrt{\frac{30\mu}{980(G-1)}}$ = a constant factor for given values of μ and G at the temperature of the suspension.

Percentage finer than diameter D:

The percentage by mass (w) of particles smaller than corresponding equivalent particle diameters (D) was calculated from the formula:

$$w = \frac{100G_s}{W_b(G_s - 1)} \times R_h$$

Where

w = percentage finer

G_s = specific gravity of soil particle

W_b = weight of soil

R_h = Hydrometer reading

5.1.4 Specific Gravity (IS: 2720-Part-3 Sec-1)

The specific gravity of soil sample was determined by density bottle method. For this test 5-10g oven dried and cooled soil sample was taken in 50ml capacity density bottle and its weight was noted down as W_2 . The soil was covered with distilled water and left for sufficient period for suitable soaking. The entrapped air was removed by vacuum. The bottle with soil was filled fully with water and its weight was noted down (W_3). The mass of empty bottle and bottle filled with distilled water were noted down as W_1 and W_4 respectively.

The Specific Gravity was determined by using following equation :

$$G = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}$$

5.1.5 Liquid Limit (IS: 2720- Part-5)

By Cone Penetrometer Method

The 'Cone Penetrometer Apparatus' is a variant of the fall-cone and consists of a cone with a smooth polished surface and angle of $30^\circ \pm 1/2^\circ$. The weight of the cone, together with its associated shaft is $80g \pm 0.5g$. A support assembly with an automatic cone release mechanism and cone height adjustment mechanism used to hold the cone vertically. The angle and weight of the cone were calibrated at regular intervals, and the sharpness of the cone tip was checked daily.

Distilled water was added and thoroughly mixed with the soil sample to produce a homogeneous paste. The paste was then placed in a cup with a diameter of at least 55mm and a depth of at least 40mm. The surface of the soil was smoothed off level and parallel to the base. The support assembly was used to position the tip of the cone so that it was just touching the top surface of the soil, and the automatic tripping mechanism was released. The cone was allowed to penetrate into the soil for a period of 5 (± 1) s, then the cone was locked off to stop further movement and the penetration was recorded. The cup was refilled and the test was repeated. The two recorded penetrations need to be within 0.5mm of each other, otherwise a third test is performed. when the three test vary by more than 1mm the test was repeated.

Further tests were conducted, at varying water contents, in order to produce a series of cone penetrations (usually 4) in the range 15mm to 25mm. The resulting cone penetrations were plotted verses the water content of the test specimens. The Liquid Limit (W_L) was read off the graph, being the water content at which the line of best fit through the test points crosses 20mm penetration.

5.1.6 Plastic Limit (IS: 2720-Part-5)

For this test, soil sample was prepared in the same way as for liquid limit test. A ball of soil sample weighed about 5 gm was formed. The ball was rolled between the fingers of one hand and the glass plate with pressure sufficient to reduce the mass into a thread of about 3 mm in 5 to 10 complete forward and back movements. When a diameter of 3 mm was reached, soil was again remolded into a ball. The process of rolling and remolding was repeated until the thread started just crumbling at a diameter of 3 mm. The crumbled thread was immediately transferred to an airtight container for determination of its moisture content by oven drying method.

This water content has been termed as plastic limit. (W_P)

5.1.7 Plasticity Index (IS: 2720-Part-5)

The plasticity index I_p was given by

$$I_p = W_L - W_P \text{ (in percent)}$$

5.1.8 Direct Shear Test (IS:2720-Part-13):

For this test shear box test apparatus was used. The prepared specimen from remolded/undisturbed sample was placed carefully in the box. The plain grid was kept on top of the specimen with its directions at right angles to the direction of shear. The upper porous stone was placed on the grid and loading pad on the stone. The box with specimen was gently placed in the container (water jacket). The specimen was submerged with water. The container was mounted with the shear box and the specimen inside, on the shearing machine. The upper part of the box was so adjusted that it

touched the proving ring. The jack was brought forward to bear up against the box container. The proving ring dial gauge was set to read zero.

The steel ball was placed in the recess of the loading pad. The loading yoke was set in contact with the steel ball on the loading pad. Vertical displacement dial gauge to read zero in contact with the top of the yoke. The normal load was applied and any change in thickness of specimen was recorded. Shear displacement dial gauge was also set to read zero. The locking screw was now removed and two parts of the shear box were separated by advancing the spacing screws.

The specimen was sheared at constant rate of strain. The readings of the proving ring dial gauge were noted down every 15 seconds for the first one-minute and then every 30 seconds thereafter. The reading of change in the thickness dial gauge and shear displacement dial gauge were also recorded at the same time interval. The test was continued until the specimen fails. The specimen was assumed to fail when the proving ring dial gauge started receding or at shear displacement of approximately 15% of the length took place.

The soil was removed from the box and test was repeated on the identical specimen under increased normal load.

The rate of strain for conducting Direct Shear Test is kept as 0.25 mm/min as per codal/literature provision based on strata.

5.1.9 Triaxial Shear Test_UUT (IS: 2720-Part-11)

For this test, Triaxial Shear Test apparatus was used. The plain disc was placed on the pedestal of the triaxial cell. The specimen was placed centrally on the disc. A correct size rubber membrane was fitted inside the stretcher with ends of membrane folded over those of the stretcher. Vacuum was applied to stretch the membrane to the inside surface of the stretcher which was carefully slipped around the specimen kept on the pedestal. The vacuum on the membrane was released. Its bottom part was rolled down into the pedestal. plain disc was placed on the top of the specimen and then loading pad was placed. The top part of membrane was rolled on to the loading pad. Then the stretcher was removed and ends were sealed with 'O' rings. With the properly sealed specimen placed centrally on the pedestal, the cell was assembled, keeping the loading piston initially clear of the loading pad of the specimen, the assembly was placed in the loading frame.

For unconsolidated undrained test, the bottom drainage value (BDV) and top drainage value (TDV) of cell, was closed and air release valve (ARV) was opened. The cell was filled with water through the cell water valve CWV. ARV was closed when water begins to escape through it. The cell pressure was raised to the desired value and kept constant till the end of the test.

When the cell pressure was applied, the load piston rises upward, the loading machine was operated at the anticipated rate to bring the load piston slightly above the loading pad of the specimen and the load measuring dial gauge on proving ring was set to zero.

The piston was brought just in contact with loading pad by hand operation of the machine. The

axial compression dial gauge was mounted and set to read zero.

The axial loading was started at 1.25 mm/min rate of strain. Simultaneous readings on the load and compression dial gauges were noted down. The test was continued until a recession of the axial load is observed or 20% of strain.

After failure, the specimen was unloaded by reversing the loading machine, cell pressure was reduced and cell water was drained out through BRV. The cell was dismantled and the specimen was taken out, rubber membrane was removed and weight of the failed sample and its water content was determined. The test was repeated on two more identical specimens with increasing cell pressure.

The rate of strain for conducting UUT is kept as 1.25 mm/min as per codal/literature provision based on strata.

5.1.10 Chemical Testing

Chemical Testing was generally performed in accordance with IS: 2720, but the different parts of method as described below:

a) Total Sulphate Content Of Soil

Samples were tested according to IS 2720 (Part 27). The dried soil was extracted with a 10% solution of hydrochloric acid. The extract was adjusted to slightly alkaline pH with ammonia, and then barium chloride solution was added to precipitate the sulphate. The barium sulphate precipitate was collected by filtration, and it was washed, dried and weighed. The mass of barium sulphate recovered was used to calculate the sulphate content of the original soil.

b) pH Value

Samples were tested according to IS: 2720 (Part 26). The soil sample ($30 \pm 0.1\text{g}$) was extracted with 75 ml of distilled water and the pH of the resulting suspension was measured with a calibrated (by means of Standard buffer solution) pH meter.

c) Chloride Content

For the water soluble content, soil samples were extracted with a volume of water equal to twice the mass of the soil. The extract was filtered and acidified with a small amount of nitric acid. Standardized silver nitrate solution was then added to precipitate the chloride as its silver salt. The amount of precipitated silver remaining in solution was then determined by titration.

An acid-soluble version of the test was also available, with the initial extraction being with nitric acid instead of water.

CHAPTER 2 ANALYSIS OF TEST RESULTS AND INTERPRETATION

6.0 STRATIFICATION

From the study of the 47 boreholes carried out at Old Ch. 52+518 (New Ch.55+719) to Old ch. 592+70 (New ch. 62+546), it is revealed that:-

At location of O.C. 52+518 & N.C. 55+719 :-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of Old Ch:- 52+934 New Ch:- 56+118

The sub strata of BH A2 mainly consist of Silty sand (SM)/Silty Clay of low plasticity (CL).

At location of O.C. 53+107 & N.C. 56+291:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 53+282 & N.C. :-56+466

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 53+572 & N.C. :-56+756

The sub strata mainly consist of Silty Clay of low plasticity (CL).

At location of O.C. 53+982 & N.C. :-57+169

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 54+363 & N.C. :-57+547

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Clayey sand (SM-SC).

At location of O.C. 54+496 & N.C. :-57+672

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 55+020 & N.C. :-58+204

The sub strata mainly consist of silty Clay of low plasticity (CL)/Clayey sand (SM-SC).

At location of O.C. 55+044 & N.C. :-58+228

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty Clay of low plasticity (CL).

At location of O.C. 55+910 & N.C. 59+107 :-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand (SM).

At location of O.C. 56+403 & N.C. 59+587:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand (SM).

At location of O.C. 56+701 & N.C. 59+886:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand (SM).

At location of O.C. 56+978 & N.C. :-60+162

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Clayey sand (SM-SC).

At location of O.C. 57+400 & N.C. 60+603:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand (SM).

At location of O.C. 57+980 & N.C. 61+164:-

The sub strata mainly consist of silty Clay of low plasticity (CL)/ silty Clay of Medium plasticity (CI).

At location of O.C. 58+191 & N.C. 61+376:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 58+497 & N.C. 61+676:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Clayey sand (SM-SC).

At location of O.C. 58+837 & N.C. 62+026:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand (SM).

At location of O.C. 59+071 & N.C. 62+256:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL).

At location of O.C. 59+206 & N.C. 62+400:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL).

At location of O.C. 59+270 & N.C. 62+546:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL).

6.1 GROUND WATER TABLE DEPTH

The Ground Water Table was met at depths varying from 9.28 m to 23.5m below EGL, it may rise up during heavy rains / rainy season. Therefore, for the analysis of various foundations, the water table has been considered to rise by about 3.0m at the locations of boreholes, however at the locations of 13 BHs water table was not encountered, for the analysis of foundation the water table has been considered well below the depth of influence zone.

6.2 RESULTS OF CHEMICAL ANALYSIS

Results of chemical analysis of soil samples (as per **Appendix – B2**) indicates that the soil sample falls under Class I for sulphates and chlorides concentration (As per IS 456-2000 and CIRIA Sp. Publication No. 31). The results are summarized here in below :-

Summary of chemical analysis of soil samples

Chemical Property	Findings (Min. to Max.)	Remarks (Required limits as per IS 456-2000)
pH	8.06 to 9.87	> 6.0
Sulphite as SO_3^{2-} (%)	0.0017 (%) to 0.0025 (%)	< 0.2% (Class I)
Chlorides as Cl^- (%)	0.0055 (%) to 0.0097 (%)	No limit specified in IS 456. However, a limit of 0.10% specified for class I in CIRIA Sp. Publication No. 31)

Note :- All the chemical contents are within permissible limit hence no special precautions are required.

6.3 COMPUTATION OF LIQUEFACTION POTENTIAL

Liquefaction is the sudden loss of shear strength of the sub soil strata due to earthquake-induced vibration under saturated conditions.

Assessment of liquefaction potential of foundation strata is made by simplified approach proposed as per IS: 1893 (Part-1)-2016, from the SPT data and peak ground acceleration likely to occur at the site. In this method, cyclic shear stress likely to be induced in the foundation strata by Design Basis Earthquake (DBE) is first evaluated.

Next threshold cyclic shear stress, which is good enough to cause liquefaction, is determined from SPT data and the empirical relations. Finally, comparison of these two stresses is used in the estimation of liquefaction susceptibility of the foundation strata.

Unsaturated soils are not subjected to liquefaction because vibratory forces from earthquakes do not cause any increase in pore water pressure in such soils.

The area of site from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV of India as per IS: 1893. Further as per the provisions of IS: 1893 in soil deposits consisting of submerged loose sands & soils falling under classification of SP with standard penetration N value less than 15, the shaking caused by earthquake ground motion may cause liquefaction or excessive total and differential settlements.

For the analysis of liquefaction potential, following constant parameters are considered:

EQ Zone	IV
Earthquake Magnitude (Mw)	7.0
Peak Horizontal Ground Acceleration (amax /g)	0.24

The ground water table was encountered at depths varying from 9.28 m to 23.50m below EGL at 33 boreholes locations and not encountered at 14 borehole locations. For the analysis of liquefaction potential, the water table has been considered to rise by about 3.0m at the location of all boreholes. Since, water table is either very deep or not encountered, the boreholes are not likely to liquefy, as tabulated below below:-

Table 2.1: Liquefaction Analysis

S. No.	Chainage Old	Chainage New	Structure	BH.No.	Depth of Water Table below EGL (m)	Water Table Depth considered for analysis below EGL (m)	Liquefiable Depth (m)
1.	52+518	55+719	MJB	BH-A1	22.80	19.80	Non-Liquefiable
				BH-A2	23.50	20.50	Non-Liquefiable
2.	52+934	56+118	MNB	BH-CL	NE	-	Non-Liquefiable
3.	53+107	56+291	MNB	BH-CL	NE	-	Non-Liquefiable
4.	53+282	56+466	MNB	BH-CL	NE	-	Non-Liquefiable
5.	53+572	56+756	MNB	BH-CL	NE	-	Non-Liquefiable
6.	53+982	57+169	MNB	BH-CL	NE	-	Non-Liquefiable
7.	54+363	57+547	MNB	BH-CL	NE	-	Non-Liquefiable
8.	54+496	57+672	MNB	BH-CL	NE	-	Non-Liquefiable
9.	55+020	58+204	MNB	BH-CL	10.00	-	Non-Liquefiable
10.	55+044	58+228	Station	BH-PLT-04	NE	-	Non-Liquefiable
11.	55+910	59+107	MJB	BH-A1	16.00	13.00	Non-Liquefiable
				BH-A2	15.60	12.60	Non-Liquefiable
12.	56+403	59+587	MNB	BH-CL	NE	-	Non-Liquefiable
13.	56+701	59+886	MNB	BH-CL	NE	-	Non-Liquefiable
14.	56+978	60+162	MNB	BH-CL	NE	-	Non-Liquefiable
15.	57+400	60+603	MJB	BH-A1	10.90	7.90	Non-Liquefiable
				BH-P2	11.85	8.85	Non-Liquefiable
				BH-P3	11.50	8.50	Non-Liquefiable
				BH-P4	11.80	8.80	Non-Liquefiable
				BH-P5	12.00	9.00	Non-Liquefiable
				BH-P6	11.40	8.40	Non-Liquefiable
				BH-P7	11.00	8.00	Non-Liquefiable
				BH-P9	12.00	9.00	Non-Liquefiable
				BH-P10	11.85	8.85	Non-Liquefiable
				BH-P11	11.80	8.80	Non-Liquefiable
				BH-P12	12.10	9.10	Non-Liquefiable
				BH-P13	12.30	9.30	Non-Liquefiable
				BH-P15	11.80	8.80	Non-Liquefiable
				BH-P16	11.20	8.20	Non-Liquefiable
				BH-P17	10.80	7.80	Non-Liquefiable
BH-P18	10.50	7.50	Non-Liquefiable				
BH-P19	11.50	8.50	Non-Liquefiable				
				BH-A2	10.90	7.90	Non-Liquefiable

S. No.	Chainage Old	Chainage New	Structure	BH.No.	Depth of Water Table below EGL (m)	Water Table Depth considered for analysis below EGL (m)	Liquefiable Depth (m)
16.	57+980	61+164	MNB	BH-CL	9.28	-	Non-Liquefiable
17.	58+191	61+376	MNB	BH-CL	NE	-	Non-Liquefiable
18.	58+497	61+676	MJB	BH-A1	11.50	8.60	Non-Liquefiable
				BH-P1	11.60	8.60	Non-Liquefiable
				BH-P2	10.70	7.70	Non-Liquefiable
				BH-P3	11.00	8.00	Non-Liquefiable
				BH-P4	11.90	8.90	Non-Liquefiable
				BH-P5	12.00	9.00	Non-Liquefiable
				BH-P6	11.00	8.00	Non-Liquefiable
				BH-A2	12.00	9.00	Non-Liquefiable
19.	58+837	62+026	MNB	BH-CL	NE	-	Non-Liquefiable
20.	59+071	62+256	MNB	BH-CL	NE	-	Non-Liquefiable
21.	59+206	62+400	MNB	BH-CL	12.65	9.65	Non-Liquefiable
22.	59+270	62+546	MNB	BH-CL	NE	-	Non-Liquefiable

***Not Encountered:-NE**

Note: To identify the Soil sheet, Shear curves and Log profiles, old chainages of respective bore holes are mentioned.

6.4 INTERPRETATION OF LAB TEST RESULTS

Grain Size Analysis

- **Clay content:** It generally varies from 4 to 14%.
- **Silt content:** It generally varies from 15 to 59%.
- **Sand content:** It generally varies from 23 to 85%.
- **Gravel content:** It generally varies from 1 to 12%.

Atterberg's Limit

- **Liquid limit:** The test results of liquid limit of the soil samples reveal that it generally varies from 26 to 28% in ML-CL type of soil, 30 to 34% in CL type of soil.
- **Plastic Limit:** The plastic limit of the soil sample varies from 19 to 21% in ML-CL type of soil, 20 to 23% in CL type of soil. However ML-CL type of soil is considered as non-plastic.
- **Plasticity index:** The plasticity index of the soil samples generally varies from 6 to 7% in ML-CL type of soil, 10 to 11% in CL type of soil whereas ML-CL and SM/ SM-SC/ SC type of soil are non-plastic.

Natural moisture content & Bulk density

The bulk density of soil samples generally varies from 1.63gm/cc to 1.97gm/cc whereas natural moisture content varies from 10.21% to 18.26%.

Direct shear tests:

Direct shear test under drained condition have been conducted in sandy silty (ML-CL) / sandy stratum (SM/ SM-SC/ SC) type of soil.

For Sandy strata (SM/ SM-SC/ SC), the value of angle of internal friction varies from 25° to 32°, whereas cohesion varies from 0.00 kg/cm² to 0.11 kg/cm².

For Silty strata (ML-CL), the value of angle of internal friction varies from 22° to 27°, whereas cohesion varies from 0.19 kg/cm² to 0.22 kg/cm².

Triaxial shear tests:

Triaxial shear test under undrained condition have been conducted in silty clay (CL) type of soil.

For silty clay (CL) strata, the value of angle of internal friction varies from 4° to 5°, whereas cohesion varies from 1.42kg/cm² to 2.24kg/cm².

CHAPTER 3 TYPE AND DEPTH OF FOUNDATION WITH ANALYSIS

7.0 TYPE & DEPTH OF FOUNDATION:

Based on the nature & strength characteristics of the substrata and requirement of the project, the following type of foundation have been analyzed as given below:

Table 3.1 : Shallow Foundation

Type of foundation	Depth of Foundation below E.G.L. (m)	Size of Foundation (m x m)
Shallow Foundation	1.0,1.5,2.0	6.2 X 6.2 3.7 X 3.7 4.9 X 4.9 4.7 X 4.7 11.35 X 11.35 2.7 X 2.7 3.7 X 3.7 4.7 X 4.7 2.7 X 2.7
	2.0, 3.0, 4.0	7.2 X 7.2

Table 3.2 : Pile Foundation

Type of foundation	Length of Pile below E.G.L. (m)	Dia. of Pile (m)
Normal Bored Cast in-situ RCC Pile	16.0, 18.0, 20.0, 22.0, 24.0, 26.0, 28.0	1.0 & 1.2

The details of foundation analysis are given in the subsequent paragraph.

7.1 Analysis of SHALLOW foundation

7.1.1 From Shear Failure Criteria

Net Safe Bearing capacity from Shear Failure consideration has been computed in accordance with IS: 6403-1981, which is based on, modified Terzaghi's classical approach. The weighted average of shear strength parameters for various strata upto depth equal to $0.5 \cdot B \cdot \tan(45 + \frac{\phi}{2})$ (where B = Width of the Foundation, ϕ = Angle of internal friction) is used in the analysis. A factor of safety of 2.5 to estimate the net safe bearing capacity from ultimate net bearing capacity.

For soils, containing both coarse grained (gravels & sands) and fine grained (clays), c and ϕ are used to determine the soil strength. In case of predominantly fine grained soils, c and ϕ are determined by the Triaxial Compression test as per IS: 2720 pt XI. For predominantly coarse grained soils, c and ϕ are determined by Direct Shear test as per IS: 2720 pt XIII. These c and ϕ values were used for determining the SBC of soil as per shear failure criteria.

The ultimate net bearing capacity in case of general shear failure is given by following expression,

$$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$$

The ultimate net bearing capacity in case of local shear failure is given by following expression,

$$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$$

Where,

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

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

$$d_q = d_\gamma = 1 + 0.1 (D_f/B) \sqrt{N_\phi} \text{ for } \phi > 10^\circ$$

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

$$\phi' \text{ for local shear failure} = \tan^{-1} (0.67 \tan \phi)$$

7.1.2 From Settlement Failure Criteria

Allowable Bearing Pressure from Settlement Failure consideration has been computed in accordance with IS: 8009 (Part-I). The magnitude of settlement, when foundation loads are applied, depends upon the compressibility of the underlying strata and rigidity of the substructure.

The total permissible settlement in cohesion-less soil is estimated using SPT value as per IS: 8009 (Part-I). While using this approach, the N value was corrected, wherever applicable, below the footing base to at least 1.5B below the base to account for the effects of energy ratio, adopted bearing pressure, dilation for submerged silty fine sands / fine sands as well as that due to the overburden pressure.

Further for settlement Calculation in cohesive soil the following equation has been used.

$$S_t = \Delta P M_v H$$

Where,

M_v = Coefficient of volume compressibility, cm^2/kg

ΔP = Pressure increment, kg/cm^2

H = Thickness of layers

Note: - Value of Coefficient of volume compressibility (M_v) has been calculated by using the following co-relation [Ref. Stroud and Butler, 1975] :-

Coefficient of Volume Compressibility derived from SPT N-Value (after Stroud and Butler, 1975)

Plasticity Index (%)	Conversion Factor (f_2)	$m_v (10^{-3} \text{ kPa}^{-1})$ based on N-Value: $m_v = 1/(f_2 N)$				
		N=10	N=20	N=30	N=40	N=50
10	800	0.12	0.06	0.04	0.03	0.02
20	525	0.19	0.09	0.06	0.05	0.04
30	475	0.21	0.10	0.07	0.05	0.04
40	450	0.22	0.11	0.07	0.06	0.04

$$M_v = 1/(f_2 N_{\text{corr}})$$

Where f_2 = factor based on N_{corr} . Value & plasticity index of soil

N_{corr} . = corrected SPT 'N' value

For analysis of shallow foundation the total permissible settlement has been considered as 25mm, & 50mm as per IS 1904.

Zone of influence below foundation has been considered up to 1.5 times the width of the foundation.

For the determination of the SBC from settlement criteria, the corrected SPT N values within the influence zone are given in the table below.

NOTE:-

- Lower of the two values obtained from settlement and shear criteria is used in arriving at allowable bearing capacity of the soil.
- Structural foundations are designed based on the minimum of Safe Bearing Capacity obtained from Shear Failure Criteria and Allowable Bearing Pressure corresponding to the permissible settlement. The permissible Settlement that can be allowed for the foundation depends on the strata at the location and type of foundation (whether Isolated or Raft).

Settlement occurs with the application of loads on foundations. It has two components, Immediate Settlement and Long Term Settlement. The immediate settlement takes place immediately as the loading is imposed on the structure and long term settlement arises due to the consolidation of the sub-soil with time under the load. Hence, the total settlement allowed for a foundation is the sum of the immediate and consolidation settlement that is expected to occur. The cohesionless strata (predominantly sandy) is primarily subjected to immediate settlement and cohesive strata (clayey) undergoes settlement in long time with the compression of the strata due to consolidation. Settlement of the foundation is determined from the relation provided in Indian standards (IS: 8009 (part-1) &/or various literatures (Bowles, BM Das, etc.).

From the Geotechnical investigation conducted on our site along with subsequent laboratory tests on soil samples, it is observed that predominantly the strata is silty with sand (SM/SC/SM-SC/ML-CL i.e. predominantly cohesionless) with the presence of small patches of silty clay of low plasticity (CL). Since the Settlement that takes place in cohesionless strata is mostly immediate, it takes place immediately after the imposing of load, initially during construction with the application of Dead Load and further during Live Load. The live load usually is many times lesser than the dead load, and correspondingly the post construction settlement is very less for live loads. As an example, if dead load is three times that of live load, then the settlement corresponding to

live load (i.e. the post construction settlement) will be one-third of the settlement due to dead load which is comparatively lesser than 25mm for permissible settlement of 50mm.

According to the IS 1904, the permissible settlement for concrete structure having raft foundation is allowed upto 75mm, and the permissible settlement is 25mm post construction as per IRS code (Code of Practice for The Design of Sub-Structures and Foundations of Bridges). As discussed above, the settlement post construction is directly proportional to the allowable settlement. Therefore, given the importance of structure to be constructed and considering mostly cohesionless strata encountered at site, it is recommended that the maximum permissible settlement shall be restricted to 50mm for the design purpose on conservative side so that the post construction settlement can be constraint to lesser than 25mm.

As per IS- 8009 part 1 clause 9.2.2.1, If the clay layer is sandwiched between cohesionless soil layers, the immediate settlement is zero. Hence, even though the immediate settlement has been calculated during analysis, however it is ignored in the calculation of total settlement.

The sample calculations for computation of allowable bearing capacity of sub-strata for shallow foundation vide **Appendix – C-1**.

7.2 Analysis of PILE foundation

(A) Deep foundation

The safe Load Carrying Capacity of normal bored cast in-situ RCC pile is determined in compression, uplift and lateral as per IS: 2911 (Part-1/sec-2) – 2010. The axial capacity of a pile depends upon the soil skin friction along the shaft and end bearing at it's tip.

Thus Axial load = Skin Friction + End-bearing

a) For piles in granular soils (using the static formula)

$$Q_u = (0.5 \cdot D \cdot \gamma \cdot N_\gamma + P_D \cdot N_q) \cdot A_p + (\sum K_i \cdot P_{Di} \cdot \tan \delta_i) \cdot A_{si}$$

Where,

Q_u = Ultimate load capacity of pile in KN

D = dia. of pile shaft in m

γ = effective unit weight of the soil at pile tip in kN/m^3

N_γ & N_q = bearing capacity factors depending upon the angle of internal friction Φ at pile tip (N_γ from IS 6403 for general shear failure case & N_q from Fig. 1, IS 2911)

P_D = effective overburden pressure at pile tip in kN/m^2 limited to 15-17 times diameter of pile (as per the Phi value at end bearing)

Σ = Summation for layers (1 to n) in which pile is installed and which contribute to (+ve) skin friction

K_i = coefficient of earth pressure applicable for the i^{th} layer

P_{Di} = effective overburden pressure for the i^{th} layer in kN/m^2 limited to 15-17 times diameter of pile (as per the Phi value at end bearing)

δ_i = angle of wall friction between pile and soil for i^{th} layer, and

A_{si} = surface area of pile shaft in the i^{th} layer in m^2

b) For piles in cohesive soils (using the static formula)

$$Q_u = c_p * N_c * A_p + \sum \alpha_i * c_i * A_{si}$$

Where,

Q_u = Ultimate load capacity of pile in KN

A_p = cross-sectional area of pile tip in m^2

N_c = bearing capacity factor (= 9)

Σ = Summation for layers (1 to n) in which pile is installed and which contribute to (+ve) skin friction

α_i = adhesion factor for the i^{th} layer depending on the consistency of soil

c_i = average cohesion for i^{th} layer in kN/m^2

A_{si} = surface area for pile shaft in the i^{th} layer in m^2

c) For computation of safe load carrying capacity of pile in lateral, the following equation has been used:

i. Fixed Head Condition

$$Q = (12 * E * I * Y) / (L_1 + L_f)^3$$

ii. Free Head Condition

$$Q = (3 * E * I * Y) / (L_1 + L_f)^3$$

Where,

Q = Lateral Load (in kg)

Y = Permissible lateral deflection taken as 5mm

E = Modulus of Elasticity of concrete

I = Moment of Inertia of the pile cross-section

L_1 = Length of pile above cut-off level

L_f = Length of fixity

The effective length of the pile has been considered below the cut-off level taken as 2.0m below the EGL. Normal Bored cast in-situ RCC piles having stem diameter equal to 100cm & 120cm and of effective length varying from 16.0m to 28.0m were selected.

For the analysis of the pile foundations the soil parameters used for computation of safe load carrying capacity of pile is tabulated below:-

Table 3.3 : Design Soil Parameter

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
52+518	55+719	BH-A1	0.00	4.00	4.00	Sandy Silt	12	15	1.70	0.20	29
			4.00	7.00	3.00	Sandy Silt	22	22	1.76	0.21	29
			7.00	11.50	4.50	Silty Clay	36	36	1.85	1.22	4
			11.50	16.00	4.50	Sandy Silt	44	32	1.86	0.21	30
			16.00	40.00	24.00	Sandy Silt	83	34	1.92	0.15	30
		BH-A2	0.00	5.50	5.50	Sandy Silt	13	17	1.72	0.19	29
			5.50	13.00	7.50	Silty Clay	24	24	1.78	0.74	5
			13.00	16.00	3.00	Silty Clay	39	39	1.85	1.12	4
			16.00	25.00	9.00	Sandy Silt	59	34	1.87	0.21	30
			25.00	34.00	9.00	Sandy Silt	43	18	1.84	0.23	29
52+934	56+118	BH-CL	0.00	5.25	5.25	Silty Sand	19	23	1.77	0.09	28
			5.25	8.25	3.00	Silty Clay	21	21	1.92	0.81	6
			8.25	10.00	1.75	Silty Clay	-	-	1.94	0.98	7
53+282	56+466	BH-CL	0.00	5.25	5.25	Sandy Silt	14	19	1.74	0.20	28
			5.25	8.25	3.00	Silty Clay	32	32	1.89	1.02	5
			8.25	10.00	1.75	Silty Clay	25	25	1.90	1.02	5
53+572	56+756	BH-CL	0.00	3.00	3.00	Silty Clay	9	9	1.68	0.26	5
			3.00	8.25	5.25	Silty Clay	32	32	1.91	1.09	4
			8.25	10.00	1.75	Silty Clay	47	47	1.97	1.65	4
53+982	57+169	BH-CL	0.00	2.25	2.25	Silty Clay	8	8	-	-	-
			2.25	5.25	3.00	Silty Clay	22	22	1.89	0.39	5
			5.25	7.50	2.25	Silty Clay	24	24	1.97	0.85	4
			7.50	10.00	2.50	Sandy Silt	32	25	1.90	0.20	28
54+363	57+547	BH-CL	0.00	5.25	5.25	Silty Sand	21	27	1.82	0.11	30
			5.25	8.25	3.00	Silty Clay	33	33	1.99	1.09	4
			8.25	10.00	1.75	Sandy Silt	38	28	1.90	0.20	30
54+496	57+672	BH-CL	0.00	5.25	5.25	Sandy Silt	15	19	1.79	0.21	28
			5.25	8.25	3.00	Silty Clay	32	32	1.98	1.09	5
			8.25	11.25	3.00	Silty Clay	37	37	1.99	1.26	4
			11.25	15.00	3.75	Silty Clay	44	44	2.00	1.42	4
55+020	58+204	BH-CL	0.00	5.25	5.25	Silty Sand	14	17	1.75	0.09	30
			5.25	7.50	2.25	Silty Sand	20	20	1.76	0.00	31
			7.50	13.00	5.50	Silty Clay	23	22	1.95	0.85	8
55+044	58+228	BH-PLT-04	0.00	2.25	2.25	Silty Sand	7	10	1.63	0.00	29
			2.25	4.50	2.25	Sandy Silt	16	20	1.75	0.18	27
			4.50	7.50	3.00	Sandy Silt	28	28	1.75	0.18	27
			7.50	9.00	1.50	Sandy Silt	-	-	1.78	0.18	27

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
			9.00	12.00	3.00	Silty Clay	24	21	1.82	0.82	5
55+910	59+107	BH-A1	0.00	7.00	7.00	Silty Sand	13	14	1.68	0.00	30
			7.00	13.00	6.00	Silty Clay	28	28	1.81	0.85	4
			13.00	19.00	6.00	Sandy Silt	43	25	1.83	0.20	30
			19.00	25.00	6.00	Sandy Silt	53	24	1.85	0.18	30
55+910	59+107	BH-A1	25.00	31.00	6.00	Sandy Silt	67	27	1.87	0.20	30
			31.00	40.00	9.00	Sandy Silt	85	30	1.89	0.18	30
		BH-A2	0.00	5.50	5.50	Silty Sand	19	24	1.75	0.00	32
			5.50	8.50	3.00	Silty Sand	26	24	1.76	0.00	32
			8.50	16.00	7.50	Silty Sand	36	27	1.77	0.00	32
			16.00	20.50	4.50	Silty Clay	39	39	1.99	1.34	4
			20.50	26.50	6.00	Sandy Silt	56	25	1.86	0.20	30
26.50	40.00	13.50	Sandy Silt	73	28	1.95	0.16	30			
56+978	60+162	BH-CL	0.00	2.25	2.25	Sandy Silt	14	20	-	-	-
			2.25	3.00	0.75	Sandy Silt	-	-	1.86	0.22	28
			3.00	10.00	7.00	Silty Clay	27	27	1.95	0.85	5
57+400	60+603	BH-A1	0.00	8.50	8.50	Silty Sand	17	19	1.73	0.10	31
			8.50	13.00	4.50	Silty Clay	32	32	1.86	1.06	5
			13.00	17.50	4.50	Silty Sand	57	29	1.86	0.00	32
			17.50	30.00	12.50	Silty Clay	74	43	2.01	1.66	4
		BH-P2	0.00	5.50	5.50	Sandy Silt	20	26	1.78	0.21	30
			5.50	8.50	3.00	Silty Clay	32	32	1.83	1.10	4
			8.50	14.50	6.00	Sandy Silt	40	27	1.84	0.20	30
			14.50	20.50	6.00	Silty Clay	67	67	2.01	2.22	4
			20.50	26.50	6.00	Sandy Silt	90	35	1.90	0.21	30
			26.50	30.00	3.50	Sandy Silt	-	-	1.94	0.20	32
		BH-P3	0.00	4.00	4.00	Sandy Silt	12	15	1.71	0.16	29
			4.00	10.00	6.00	Sandy Silt	31	28	1.81	0.18	30
			10.00	19.00	9.00	Silty Sand	40	25	1.82	0.00	32
			19.00	25.00	6.00	Sandy Silt	53	25	1.88	0.21	30
			25.00	31.00	6.00	Sandy Silt	61	26	1.90	0.20	30
		BH-P4	0.00	7.00	7.00	Silty Sand	16	20	1.73	0.00	31
			7.00	11.50	4.50	Sandy Silt	51	43	1.84	0.25	32
			11.50	17.50	6.00	Sandy Silt	59	29	1.90	0.21	30
			17.50	23.50	6.00	Sandy Silt	73	32	1.93	0.22	30
			23.50	30.00	6.50	Sandy Silt	80	32	1.94	0.19	30
		BH-P5	0.00	4.00	4.00	Silty Sand	11	14	1.69	0.00	31
			4.00	10.00	6.00	Silty Sand	26	24	1.75	0.00	32

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
			10.00	16.00	6.00	Sandy Silt	49	31	1.85	0.23	30
			16.00	22.00	6.00	Sandy Silt	65	30	1.88	0.22	30
			22.00	30.00	8.00	Sandy Silt	85	33	1.91	0.18	30
		BH-P6	0.00	5.50	5.50	Silty Sand	13	17	1.71	0.00	31
57+400	60+603	BH-P6	5.50	8.50	3.00	Silty Sand	20	18	1.73	0.00	31
			8.50	11.50	3.00	Silty Clay	26	26	1.84	0.90	4
			11.50	14.50	3.00	Silty Clay	32	32	1.96	1.03	5
			14.50	20.50	6.00	Sandy Silt	52	26	1.90	0.19	30
			20.50	26.50	6.00	Sandy Silt	62	27	1.90	0.22	30
			26.50	30.00	3.50	Sandy Silt	73	30	1.92	0.24	30
		BH-P7	0.00	4.00	4.00	Silty Sand	14	18	1.71	0.00	31
			4.00	10.00	6.00	Silty Sand	26	24	1.74	0.00	32
			10.00	16.00	6.00	Silty Clay	38	38	1.99	1.15	4
			16.00	22.00	6.00	Sandy Silt	51	25	1.88	0.22	30
			22.00	25.00	3.00	Sandy Silt	63	28	1.91	0.20	30
			25.00	30.00	5.00	Sandy Silt	80	32	1.94	0.23	30
		BH-P9	0.00	5.50	5.50	Sandy Silt	16	20	1.74	0.22	29
			5.50	8.50	3.00	Sandy Silt	19	18	1.75	0.22	29
			8.50	11.50	3.00	Silty Clay	33	33	1.86	1.02	4
			11.50	14.50	3.00	Silty Clay	30	30	1.89	1.02	4
			14.50	17.50	3.00	Sandy Silt	66	31	1.88	0.20	30
			17.50	23.50	6.00	Silty Clay	45	45	1.98	1.42	4
			23.50	31.00	7.50	Sandy Silt	77	31	1.92	0.17	30
			31.00	35.00	4.00	Sandy Silt	97	35	1.95	0.16	30
		BH-P10	0.00	7.00	7.00	Silty Sand	26	30	1.78	0.00	32
			7.00	10.00	3.00	Silty Clay	27	27	1.83	0.92	5
			10.00	16.00	6.00	Sandy Silt	34	22	1.84	0.21	29
			16.00	22.00	6.00	Sandy Silt	46	23	1.88	0.18	29
			22.00	30.00	8.00	Sandy Silt	68	28	1.91	0.21	30
		BH-P11	0.00	5.50	5.50	Sandy Silt	14	17	1.72	0.16	29
			5.50	11.50	6.00	Sandy Silt	25	22	1.78	0.21	29
			11.50	23.50	12.00	Sandy Silt	27	17	1.83	0.21	28
			23.50	25.00	1.50	Silty Clay	45	45	1.97	1.47	4
			25.00	30.00	3.00	Sandy Silt	85	33	1.94	0.19	30
		BH-P12	0.00	7.00	7.00	Silty Sand	26	29	1.77	0.11	32
			7.00	13.00	6.00	Sandy Silt	31	25	1.81	0.22	30
			13.00	23.50	10.50	Sandy Silt	36	20	1.83	0.21	29
			23.50	30.00	6.50	Sandy Silt	53	24	1.87	0.22	29

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)		
			From	To			Observed	Corrected					
57+400	60+603	BH-P13	0.00	4.00	4.00	Silty Sand	9	14	1.68	0.00	30		
			4.00	11.50	7.50	Sandy Silt	38	36	1.82	0.21	31		
			11.50	17.50	6.00	Sandy Silt	42	23	1.85	0.23	29		
			17.50	20.50	3.00	Silty Clay	51	51	2.00	1.67	4		
		BH-P13	20.50	30.00	9.50	Sandy Silt	64	27	1.93	0.22	30		
		BH-P15	0.00	10.00	10.00	Silty Sand	19	22	1.76	0.09	31		
			10.00	17.50	7.50	Sandy Silt	56	34	1.86	0.19	31		
			17.50	25.00	7.50	Sandy Silt	63	29	1.87	0.22	30		
			25.00	30.00	5.00	Sandy Silt	83	33	1.92	0.23	30		
		BH-P16	0.00	4.00	4.00	Sandy Silt	16	20	1.75	0.21	29		
			4.00	10.00	6.00	Sandy Silt	20	19	1.76	0.19	29		
			10.00	16.00	6.00	Silty Sand	28	18	1.78	0.00	30		
			16.00	19.00	3.00	Silty Sand	39	21	1.81	0.00	31		
			19.00	26.50	7.50	Sandy Silt	77	34	1.94	0.17	30		
			26.50	30.00	3.50	Silty Sand	-	-	1.94	0.17	33		
		BH-P17	0.00	4.00	4.00	Silty Clay	5	5	1.66	0.20	4		
			4.00	14.50	10.50	Sandy Silt	24	19	1.75	0.23	27		
			14.50	17.50	3.00	Sandy Silt	36	21	1.83	0.20	28		
		BH-P18	17.50	29.50	12.50	Sandy Silt	-	-	1.94	0.18	29		
			0.00	4.00	4.00	Sandy Silt	15	19	1.74	0.21	29		
			4.00	7.00	3.00	Sandy Silt	20	20	1.77	0.21	29		
			7.00	10.00	3.00	Sandy Silt	26	22	1.80	0.19	29		
			10.00	17.50	7.50	Silty Clay	32	32	1.93	1.07	30		
		BH-P19	17.50	30.00	12.50	Sandy Silt	-	-	1.95	0.21	33		
			0.00	8.50	8.50	Sandy Silt	15	17	1.72	0.22	29		
			8.50	16.00	7.50	Sandy Silt	28	21	1.77	0.19	29		
			16.00	20.50	4.50	Silty Clay	33	33	1.94	1.02	5		
			20.50	30.00	9.50	Silty Sand	100	36	1.94	0.00	34		
		BH-A2	0.00	4.00	4.00	Sandy Silt	14	18	1.72	0.16	29		
			4.00	7.00	3.00	Silty Clay	26	26	1.80	0.88	4		
			7.00	10.00	3.00	Silty Clay	27	27	1.82	0.88	4		
			10.00	13.00	3.00	Sandy Silt	30	19	1.80	0.20	29		
			13.00	22.00	9.00	Sandy Silt	34	20	1.82	0.20	29		
			22.00	35.00	13.00	Sandy Silt	88	31	1.95	0.19	29		
		57+980	61+164	BH-CL	0.00	3.00	3.00	Silty Clay	11	11	1.80	0.61	5
					3.00	8.25	5.25	Silty Clay	23	23	1.93	1.17	7
8.25	10.50				2.25	Silty Clay	-	-	1.89	0.68	7		

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
58+497	61+676	BH-A1	0.00	5.50	5.50	Sandy Silt	21	27	1.76	0.19	29
			5.50	8.50	3.00	Sandy Silt	32	30	1.80	0.22	29
			8.50	20.50	12.00	Silty Clay	48	48	1.86	1.52	5
			20.50	28.00	7.50	Sandy Silt	72	37	1.86	0.21	30
			28.00	40.00	12.00	Sandy Silt	78	36	1.89	0.17	30
58+497	61+676	BH-P1	0.00	4.00	4.00	Sandy Silt	17	22	1.75	0.23	29
			4.00	7.00	3.00	Sandy Silt	30	30	1.81	0.19	29
			7.00	10.00	3.00	Silty Clay	40	40	1.86	1.34	5
			10.00	13.00	3.00	Silty Clay	45	45	1.91	1.48	4
			13.00	16.00	3.00	Silty Clay	49	49	1.97	1.65	5
			16.00	19.00	3.00	Silty Clay	54	54	2.02	1.80	4
			19.00	28.00	9.00	Sandy Silt	70	29	1.88	0.20	30
			28.00	40.00	12.00	Sandy Silt	82	30	1.91	0.16	30
		BH-P2	0.00	4.00	4.00	Silty Sand	19	30	1.74	0.09	30
			4.00	11.50	7.50	Silty Clay	28	28	1.81	0.93	4
			11.50	20.50	9.00	Sandy Silt	49	25	1.83	0.20	30
			20.50	26.50	6.00	Sandy Silt	61	28	1.88	0.21	30
			26.50	40.00	13.50	Sandy Silt	100	36	1.95	0.17	33
		BH-P3	0.00	7.00	7.00	Silty Sand	15	17	1.69	0.00	31
			7.00	13.00	6.00	Sandy Silt	36	26	1.80	0.21	30
			13.00	19.00	6.00	Sandy Silt	47	25	1.85	0.19	30
			19.00	28.00	9.00	Sandy Silt	88	36	1.89	0.22	30
			28.00	40.00	12.00	Sandy Silt	105	36	1.94	0.18	33
		BH-P4	0.00	5.50	5.50	Sandy Silt	22	29	1.77	0.18	30
			5.50	13.00	7.50	Sandy Silt	42	34	1.82	0.20	31
			13.00	26.50	13.50	Sandy Silt	62	28	1.84	0.19	30
			26.50	31.00	4.50	Sandy Silt	78	30	1.87	0.19	30
			31.00	40.00	9.00	Sandy Silt	82	30	1.91	0.22	30
		BH-P5	0.00	4.00	4.00	Silty Sand	8	13	1.66	0.00	31
			4.00	8.50	4.50	Silty Sand	28	29	1.76	0.00	32
			8.50	17.50	9.00	Silty Clay	37	37	1.92	1.26	4
			17.50	23.50	6.00	Sandy Silt	54	25	1.86	0.20	30
			23.50	28.00	4.50	Sandy Silt	67	28	1.89	0.22	30
			28.00	40.00	12.00	Sandy Silt	96	33	1.96	0.17	31
		BH-P6	0.00	4.00	4.00	Sandy Silt	16	20	1.74	0.24	29
			4.00	7.00	3.00	Sandy Silt	27	27	1.79	0.19	30
			7.00	10.00	3.00	Silty Clay	36	36	1.87	1.22	5

Chainage Old & New	Chainage New	BH Ref.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
			10.00	13.00	3.00	Silty Clay	43	43	1.90	1.36	5
			13.00	16.00	3.00	Silty Clay	51	51	1.99	1.65	4
			16.00	19.00	3.00	Silty Clay	54	54	2.02	1.79	4
			19.00	28.00	9.00	Sandy Silt	73	30	1.87	0.18	30
58+497	61+676	BH-P6	28.00	40.00	12.00	Sandy Silt	100	36	1.95	0.20	32
		BH-A2	0.00	4.00	4.00	Sandy Silt	13	21	1.74	0.22	29
			4.00	11.50	7.50	Sandy Silt	29	28	1.80	0.20	30
			11.50	20.50	9.00	Sandy Silt	34	19	1.81	0.18	29
			20.50	32.50	12.00	Sandy Silt	57	25	1.87	0.19	30
			32.50	40.00	7.50	Sandy Silt	99	34	1.91	0.17	30

Design parameter have been obtained from the laboratory test results however various depth where the shear parameter seems on the lower side with respect to SPT 'N' values those shear parameter have been judicially improved based on the SPT 'N' for the analysis purpose.

The sample calculation for computation of safe load carrying capacity of normal bored cast-in-situ RCC pile in compression & uplift are attached vide **Appendix C-2**.

The sample calculation for computation of safe load carrying capacity of normal bored cast-in-situ RCC pile in lateral are attached vide **Appendix C-3**.

CHAPTER 4 FOUNDATION RECOMMENDATIONS

8.0 FOUNDATION RECOMMENDATIONS

- Based on the nature & strength characteristics of the substrata and requirement of the project, shallow foundation and normal bored cast in-situ RCC pile foundation have been analyzed.
- Based on the method of analysis & design parameters given under Para 7.1 above, the recommended net allowable bearing capacity values are given in Table 4.1 to 4.4.

Table 4.1: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
1.	52+518	55+719	BH-A1	2.0	7.2 X 7.2	32.9	20.1	20.1
				3.0		38.8	23.5	23.5
				4.0		44.9	28.1	28.1
			BH-A2	2.0	7.2 X 7.2	36.1	14.1	14.1
				3.0		42.6	15.4	15.4
				4.0		49.4	16.8	16.8
2.	52+934	56+118	BH-CL	1.0	6.2 X 6.2	28.0	8.3	8.3
				1.5		31.8	8.6	8.6
				2.0		35.7	9.0	9.0
3.	53+107	56+291	BH-CL	1.0	6.2 X 6.2	23.9	18.4	18.4
				1.5		26.3	19.6	19.6
				2.0		28.8	21.1	21.1
4.	53+282	56+466	BH-CL	1.0	3.7 X 3.7	25.3	17.0	17.0
				1.5		28.8	18.5	18.5
				2.0		32.5	20.5	20.5
5.	53+572	56+756	BH-CL	1.0	3.7 X 3.7	6.3	7.5	6.3
				1.5		6.6	8.7	6.6
				2.0		6.9	10.4	6.9
6.	53+982	57+169	BH-CL	1.0	4.9 X 4.9	9.2	5.1	5.1
				1.5		9.5	5.7	5.7
				2.0		9.9	6.6	6.6
7.	54+363	57+547	BH-CL	1.0	4.7 X 4.7	34.0	23.2	23.2
				1.5		39.1	24.6	24.6
				2.0		44.4	26.5	26.5

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
8.	54+496	57+672	BH-CL	1.0	11.35 X 11.35	39.5	13.4	13.4
				1.5		42.6	13.5	13.5
				2.0		45.7	13.7	13.7
9.	55+044	58+228	BH-PLT04	1.0	2.0x2.0	21.9	22.3	21.9
				1.5		26.0	24.3	24.3
				2.0		30.3	25.7	25.7
10.	55+020	58+204	BH-CL	1.0	8.1 X 8.1	35.2	14.3	14.3
				1.5		39.2	14.6	14.6
				2.0		43.2	14.9	14.9
11.	55+910	59+107	BH-A1	2.0	7.2 X 7.2	27.1	11.1	11.1
				3.0		33.8	12.5	12.5
				4.0		40.8	14.4	14.4
			BH-A2	2.0	7.2 X 7.2	63.4	23.4	23.4
				3.0		77.7	24.7	24.7
				4.0		92.6	26.1	26.1
12.	56+403	59+587	BH-CL	1.0	2.7 X 2.7	18.7	12.7	12.7
				1.5		22.2	16.6	16.6
				2.0		25.8	22.5	22.5
13.	56+701	59+886	BH-CL	1.0	11.35 X 11.35	18.1	9.4	9.4
				1.5		19.4	9.8	9.8
				2.0		20.9	10.2	10.2
14.	56+978	60+162	BH-CL	1.0	4.9 X 4.9	31.8	18.4	18.4
				1.5		35.7	20.1	20.1
				2.0		39.6	22.1	22.1
15.	57+400	60+603	BH-A1	2.0	7.2 X 7.2	43.6	15.8	15.8
				3.0		51.1	17.6	17.6
				4.0		58.8	19.7	19.7
			BH-P2	2.0	7.2 X 7.2	60.4	18.2	18.2
				3.0		69.3	18.4	18.4
				4.0		78.4	18.4	18.4
			BH-P3	2.0	7.2 X 7.2	30.4	23.5	23.5
				3.0		35.4	25.7	25.7
				4.0		40.6	28.3	28.3
			BH-P4	2.0	7.2 X 7.2	44.7	28.1	28.1
				3.0		53.3	29.6	29.6

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
				4.0		62.3	31.2	31.2
			BH-P5	2.0	7.2 X 7.2	33.6	25.7	25.7
				3.0		40.4	27.0	27.0
				4.0		47.4	28.6	28.6
			BH-P6	2.0	7.2 X 7.2	35.5	14.1	14.1
				3.0		42.6	15.0	15.0
				4.0		49.9	16.2	16.2
			BH-P7	2.0	7.2 X 7.2	37.4	18.2	18.2
				3.0		44.8	19.4	19.4
				4.0		52.5	21.0	21.0
			BH-P9	2.0	7.2 X 7.2	43.6	15.7	15.7
				3.0		50.1	16.7	16.7
				4.0		56.7	18.1	18.1
			BH-P10	2.0	7.2 X 7.2	61.4	23.6	23.6
				3.0		72.8	24.8	24.8
				4.0		84.7	25.5	25.5
			BH-P11	2.0	7.2 X 7.2	30.6	15.0	15.0
				3.0		35.6	15.9	15.9
				4.0		40.8	16.8	16.8
			BH-P12	2.0	7.2 X 7.2	69.4	27.8	27.8
				3.0		80.6	28.4	28.4
				4.0		92.1	27.8	27.8
			BH-P13	2.0	7.2 X 7.2	27.0	18.4	18.4
				3.0		32.6	22.6	22.6
				4.0		38.4	28.4	28.4
			BH-P15	2.0	7.2 X 7.2	39.5	21.2	21.2
				3.0		46.3	23.6	23.6
				4.0		53.3	26.5	26.5
			BH-P16	2.0	7.2 X 7.2	45.1	21.2	21.2
				3.0		37.7	19.4	19.4
				4.0		58.7	26.5	26.5
			BH-P17	2.0	7.2 X 7.2	19.8	5.4	5.4
				3.0		22.9	7.9	7.9
				4.0		26.0	17.7	17.7
			BH-P18	2.0	7.2 X 7.2	39.2	15.7	15.7
				3.0		45.1	16.5	16.5

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)	
	57+400	60+603	BH-P19	4.0	7.2 X 7.2	51.2	17.5	17.5	
				2.0		22.1	15.9	15.9	
				3.0		25.2	16.8	16.8	
				4.0		28.5	17.7	17.7	
			BH-A2	2.0	7.2 X 7.2	34.1	16.7	16.7	
				3.0		39.6	18.1	18.1	
	4.0	45.3		19.0		19.0			
	16.	57+980	61+164	BH-CL	1.0	3.7 X 3.7	14.0	10.6	10.6
					1.5		14.6	11.1	11.1
					2.0		15.1	11.7	11.7
	17.	58+191	61+376	BH-CL	1.0	3.7 X 3.7	21.2	11.2	11.2
					1.5		24.1	12.1	12.1
2.0					27.1		13.4	13.4	
18.	58+497	61+676	BH-A1	2.0	7.2 X 7.2	52.4	23.8	23.8	
				3.0		60.3	25.3	25.3	
				4.0		68.4	27.2	27.2	
			BH-P1	2.0	7.2 X 7.2	43.6	24.0	24.0	
				3.0		50.0	26.0	26.0	
				4.0		56.7	28.4	28.4	
	58+497	61+676	BH-P2	2.0	7.2 X 7.2	45.5	18.4	18.4	
				3.0		53.2	18.7	18.7	
				4.0		61.2	18.5	18.5	
			BH-P3	2.0	7.2 X 7.2	37.1	17.4	17.4	
				3.0		44.4	20.0	20.0	
				4.0		52.0	23.2	23.2	
			BH-P4	2.0	7.2 X 7.2	63.7	32.7	32.7	
				3.0		73.2	36.1	36.1	
				4.0		83.0	39.0	39.0	
			BH-P5	2.0	7.2 X 7.2	26.3	19.1	19.1	
				3.0		31.8	20.4	20.4	
				4.0		37.6	21.9	21.9	
			BH-P6	2.0	7.2 X 7.2	47.2	21.5	21.5	
				3.0		54.0	23.4	23.4	
				4.0		61.0	25.6	25.6	
			BH-A2	2.0	7.2 X 7.2	43.6	22.1	22.1	
				3.0		50.0	23.3	23.3	
				4.0		56.7	24.6	24.6	

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)	
19.	58+837	62+026	BH-CL	1.0	4.9 X 4.9	39.1	9.3	9.3	
				1.5		44.1			10.7
				2.0		49.3			12.6
20.	59+071	62+256	BH-A1	1.0	2.7 X 2.7	26.0	27.8	26.0	
				1.5		30.1			29.9
				2.0		34.3			31.9
21.	59+206	62+400	BH-CL	1.0	11.5 X 11.5	32.2	19.8	19.8	
				1.5		34.5			20.2
				2.0		36.7			20.5
22.	59+270	62+546	BH-CL	1.0	2.7 X 2.7	27.7	34.4	27.7	
				1.5		31.9			37.0
				2.0		36.3			39.5

* The maximum value of recommended net allowable bearing capacity shall be restricted to 30 t/m².

Table 4.2: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)	
1.	52+518	55+719	BH-A1	2.0	7.2 X 7.2	32.9	40.2	32.9	
				3.0		38.8			47.0
				4.0		44.9			56.2
			BH-A2	2.0	7.2 X 7.2	36.1	28.2	28.2	
				3.0		42.6			30.7
				4.0		49.4			33.7
2.	52+934	56+118	BH-CL	1.0	6.2 X 6.2	28.0	16.7	16.7	
				1.5		31.8			17.3
				2.0		35.7			18.0

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
3.	53+107	56+291	BH-CL	1.0	6.2 X 6.2	23.9	36.8	23.9
				1.5		26.3	39.1	26.3
				2.0		28.8	42.2	28.8
4.	53+282	56+466	BH-CL	1.0	3.7 X 3.7	25.3	34.0	25.3
				1.5		28.8	37.1	28.8
				2.0		32.5	41.1	32.5
5.	53+572	56+756	BH-CL	1.0	3.7 X 3.7	6.3	15.0	6.3
				1.5		6.6	29.6	6.6
				2.0		6.9	37.3	6.9
6.	53+982	57+169	BH-CL	1.0	4.9 X 4.9	9.2	10.2	9.2
				1.5		9.5	11.4	9.5
				2.0		9.9	13.2	9.9
7.	54+363	57+547	BH-CL	1.0	4.7 X 4.7	34.0	46.5	34.0
				1.5		39.1	49.3	39.1
				2.0		44.4	53.0	44.4
8.	54+496	57+672	BH-CL	1.0	11.35 X 11.35	39.5	26.7	26.7
				1.5		42.6	27.0	27.0
				2.0		45.7	27.4	27.4
9.	55+020	58+204	BH-CL	1.0	8.1 X 8.1	35.2	28.6	28.6
				1.5		39.2	29.1	29.1
				2.0		43.2	29.8	29.8
10.	55+044	58+228	BH-PLT-04	1.0	2.0 x2.0	21.9	44.6	21.9
				1.5		26.0	48.6	26.0
				2.0		30.3	51.3	30.3
11.	55+910	59+107	BH-A1	2.0	7.2 X 7.2	27.1	22.3	22.3
				3.0		33.8	25.0	25.0
				4.0		40.8	28.7	28.7
			BH-A2	2.0	7.2 X 7.2	63.4	46.9	46.9
				3.0		77.7	49.4	49.4
				4.0		92.6	52.2	52.2
12.	56+403	59+587	BH-CL	1.0	2.7 X 2.7	18.7	25.5	18.7
				1.5		22.2	33.1	22.2
				2.0		25.8	45.0	25.8
13.	56+701	59+886	BH-CL	1.0	11.35 X 11.35	18.1	18.8	18.1
				1.5		19.4	19.6	19.4
				2.0		20.9	20.4	20.4
14.	56+978	60+162	BH-CL	1.0	4.9 X 4.9	31.8	36.7	31.8
				1.5		35.7	40.2	35.7
				2.0		39.6	44.2	39.6

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
15.	57+400	60+603	BH-A1	2.0	7.2 X 7.2	43.6	31.7	31.7
				3.0		51.1	35.2	35.2
				4.0		58.8	39.4	39.4
			BH-P2	2.0	7.2 X 7.2	60.4	36.5	36.5
				3.0		69.3	36.7	36.7
				4.0		78.4	36.8	36.8
			BH-P3	2.0	7.2 X 7.2	30.4	47.0	30.4
				3.0		35.4	51.5	35.4
				4.0		40.6	56.5	40.6
			BH-P4	2.0	7.2 X 7.2	44.7	56.1	44.7
				3.0		53.3	59.2	53.3
				4.0		62.3	62.5	62.3
			BH-P5	2.0	7.2 X 7.2	33.6	51.3	33.6
				3.0		40.4	54.1	40.4
				4.0		47.4	57.1	47.4
			BH-P6	2.0	7.2 X 7.2	35.5	28.1	28.1
				3.0		42.6	30.0	30.0
				4.0		49.9	32.5	32.5
			BH-P7	2.0	7.2 X 7.2	37.4	36.4	36.4
				3.0		44.8	38.8	38.8
				4.0		52.5	42.1	42.1
			BH-P9	2.0	7.2 X 7.2	43.6	31.4	31.4
				3.0		50.1	33.4	33.4
				4.0		56.7	36.2	36.2
			BH-P10	2.0	7.2 X 7.2	61.4	47.2	47.2
				3.0		72.8	49.6	49.6
				4.0		84.7	51.0	51.0
			BH-P11	2.0	7.2 X 7.2	30.6	30.1	30.1
				3.0		35.6	31.7	31.7
				4.0		40.8	33.5	33.5
			BH-P12	2.0	7.2 X 7.2	69.4	55.7	55.7
				3.0		80.6	56.7	56.7
				4.0		92.1	55.5	55.5
			BH-P13	2.0	7.2 X 7.2	27.0	36.8	27.0
				3.0		32.6	45.3	32.6
				4.0		38.4	56.7	38.4
			BH-P15	2.0	7.2 X 7.2	39.5	42.5	39.5
				3.0		46.3	47.2	46.3
				4.0		53.3	53.0	53.0

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
			BH-P16	2.0	7.2 X 7.2	45.1	42.5	42.5
				3.0		37.7	38.9	37.7
				4.0		58.7	53.0	53.0
			BH-P17	2.0	7.2 X 7.2	19.8	10.8	10.8
				3.0		22.9	15.9	15.9
				4.0		26.0	35.5	26.0
			BH-P18	2.0	7.2 X 7.2	39.2	31.5	31.5
				3.0		45.1	33.0	33.0
				4.0		51.2	35.1	35.1
			BH-P19	2.0	7.2 X 7.2	22.1	31.9	22.1
				3.0		25.2	33.6	25.2
				4.0		28.5	35.5	28.5
BH-A2	2.0	7.2 X 7.2	34.1	33.4	33.4			
	3.0		39.6	36.1	36.1			
	4.0		45.3	38.0	38.0			
16.	57+980	61+164	BH-CL	1.0	3.7 X 3.7	14.0	21.1	14.0
				1.5		14.6	22.2	14.6
				2.0		15.1	23.5	15.1
17.	58+191	61+376	BH-CL	1.0	3.7 X 3.7	21.2	22.5	21.2
				1.5		24.1	24.3	24.1
				2.0		27.1	26.8	26.8
18.	58+497	61+676	BH-A1	2.0	7.2 X 7.2	52.4	47.7	47.7
				3.0		60.3	50.7	50.7
				4.0		68.4	54.3	54.3
			BH-P1	2.0	7.2 X 7.2	43.6	47.9	43.6
				3.0		50.0	52.1	50.0
				4.0		56.7	56.9	56.7
			BH-P2	2.0	7.2 X 7.2	45.5	36.9	36.9
				3.0		53.2	37.5	37.5
				4.0		61.2	37.1	37.1
			BH-P3	2.0	7.2 X 7.2	37.1	34.9	34.9
				3.0		44.4	40.0	40.0
				4.0		52.0	46.4	46.4
			BH-P4	2.0	7.2 X 7.2	63.7	65.3	63.7
				3.0		73.2	72.2	72.2
				4.0		83.0	78.0	78.0
			BH-P5	2.0	7.2 X 7.2	26.3	38.3	26.3
				3.0		31.8	40.8	31.8
				4.0		37.6	43.8	37.6

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
			BH-P6	2.0	7.2 X 7.2	47.2	43.1	43.1
				3.0		54.0	46.7	46.7
				4.0		61.0	51.1	51.1
			BH-A2	2.0	7.2 X 7.2	43.6	44.2	43.6
				3.0		50.0	46.6	46.6
				4.0		56.7	49.2	49.2
19.	58+837	62+026	BH-CL	1.0	4.9 X 4.9	39.1	18.6	18.6
				1.5		44.1	21.4	21.4
				2.0		49.3	25.2	25.2
20.	59+071	62+256	BH-A1	1.0	2.7 X 2.7	26.0	55.7	26.0
				1.5		30.1	59.9	30.1
				2.0		34.3	63.8	34.3
21.	59+206	62+400	BH-CL	1.0	11.5 X 11.5	32.2	39.6	32.2
				1.5		34.5	40.3	34.5
				2.0		36.7	41.1	36.7
22.	59+270	62+546	BH-CL	1.0	2.7 X 2.7	27.7	68.9	27.7
				1.5		31.9	74.1	31.9
				2.0		36.3	79.0	36.3

* The maximum value of recommended net allowable bearing capacity shall be restricted to 30 t/m².

Based on the method of analysis given under Para 7.2 above, The values of Safe Load Carrying Capacity of piles in compression, uplift and lateral under static conditions have been tabulated below:-

Table 4.3: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm (Replaced or Compacted Soil)

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from 25mm settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
1.	53+982	57+169	BH-CL	1.0	4.9 X 4.9	26.3	21.6	21.6
				1.5		27.3	22.8	22.8
				2.0		28.4	24.2	24.2
2.	52+934	56+118	BH-CL	1.0	6.2 X 6.2	32.5	20.0	20.0
				1.5		36.4	19.5	19.5
				2.0		40.4	19.0	19.0
3.	57+980	61+164	BH-CL	1.0	3.7 X 3.7	43.0	17.8	17.8
				1.5		48.7	18.5	18.5
				2.0		54.0	19.2	19.2

Table 4.4: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm (Replaced or Compacted Soil)

Sr. No.	Old Chainage	New Chainage	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from 50 mm settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
1.	53+982	57+169	BH-CL	1.0	4.9 X 4.9	26.3	43.2	26.3
				1.5		27.3	45.6	27.3
				2.0		28.4	48.3	28.4
2.	52+934	56+118	BH-CL	1.0	6.2 X 6.2	32.5	40.0	32.5
				1.5		36.4	38.9	36.4
				2.0		40.4	38.0	38.0
3.	57+980	61+164	BH-CL	1.0	3.7 X 3.7	43.0	35.6	35.6
				1.5		48.7	36.9	36.9
				2.0		54.0	39.3	39.3

Note:- Table 4.1 & 4.2 Show that the SBC at the location of Ch (Old) 53+982, Ch (Old) 52+934 and Ch (Old) 57+980 are poor. Therefore before laying the open foundation at 1.0, 1.5 m & 2.0m depth it is recommended to replace & compact the soil up to 1.5m depth below the foundation level.

As per the Morth guidelines the gradation of fill soil shall be as per following limits. The effective angle of friction not less than 30°. The gradation of fill soil shall be as per following limits.

Sieve Size	Percentage Passing
75 mm	100%
425 micron	0-60%
75 micron	less than 15 %
PI	≤6

- 1. The density of backfill soil should be more than 95% of proctor density. The replaced /compacted soil should be lay down layer wise for each 300mm.*
- 2. The design parameters considered for replaced/compacted Soil for calculating the SBC from shear criteria are as follows;*

C=0, Phi = 32 degree, Sp. Gravity= 2.63 Moisture content= 8%, bulk density= 1.84 g/cc, N = 25.

Table 4.5: Safe Load Carrying Capacity of normal bored cast in-situ RCC Pile in Soil

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
1.	O.C._52+518 N.C._55+719	BH-A1	1.0	22.0	2.0	437.0	275.0	26.22
				24.0		480.0	315.0	
				26.0		523.0	355.0	
				28.0		565.0	394.0	
		1.2	22.0	2.0	644.0	370.0	35.10	
			24.0		706.0	427.0		
			26.0		766.0	483.0		
			28.0		827.0	540.0		
2.	O.C._52+518 N.C._55+719	BH-A2	1.0	22.0	2.0	437.0	275.0	26.22
				24.0		480.0	315.0	
				26.0		523.0	355.0	
				28.0		565.0	394.0	
		1.2	22.0	2.0	644.0	370.0	35.10	
			24.0		706.0	427.0		
			26.0		766.0	483.0		
			28.0		827.0	540.0		
3.	O.C._55+910 N.C._59+107	BH-A1	1.0	22.0	2.0	426.0	270.0	24.91
				24.0		463.0	305.0	
				26.0		501.0	340.0	
				28.0		538.0	375.0	
		1.2	22.0	2.0	589.0	349.0	33.35	
			24.0		638.0	395.0		
			26.0		688.0	442.0		
			28.0		736.0	488.0		
4.	O.C._55+910 N.C._59+107	BH-A2	1.0	22.0	2.0	419.0	263.0	28.10
				24.0		455.0	298.0	
				26.0		492.0	333.0	
				28.0		529.0	367.0	
		1.2	22.0	2.0	576.0	334.0	37.62	
			24.0		625.0	382.0		
			26.0		674.0	428.0		
			28.0		723.0	474.0		
BH-A1	1.0	2.0	16.0	214.0	163.0	23.56		
			18.0	228.0	179.0			
			20.0	243.0	195.0			
			22.0	258.0	205.0			

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
5.	O.C._57+400 N.C._60+603	BH-A1	1.2	16.0	2.0	274.0	226.0	31.54
				18.0		293.0	247.0	
				20.0		311.0	268.0	
				22.0		329.0	205.0	
		BH-P2	1.0	16.0	2.0	240.0	171.0	29.31
				18.0		258.0	190.0	
				20.0		288.0	219.0	
				22.0		393.0	252.0	
			1.2	16.0	2.0	307.0	213.0	39.23
				18.0		330.0	238.0	
				20.0		371.0	277.0	
				22.0		545.0	322.0	
6.	O.C._57+400 N.C._60+603	BH-P3	1.0	16.0	2.0	331.0	192.0	28.71
				18.0		363.0	223.0	
				20.0		397.0	255.0	
				22.0		431.0	287.0	
		1.2	16.0	2.0	458.0	241.0	38.43	
			18.0		501.0	283.0		
			20.0		546.0	326.0		
			22.0		591.0	369.0		
7.	O.C._57+400 N.C._60+603	BH-P4	1.0	16.0	2.0	343.0	201.0	25.57
				18.0		378.0	234.0	
				20.0		412.0	267.0	
				22.0		447.0	299.0	
		1.2	16.0	2.0	476.0	252.0	34.23	
			18.0		523.0	296.0		
			20.0		568.0	340.0		
			22.0		614.0	384.0		
8.	O.C._57+400 N.C._60+603	BH-P5	1.0	16.0	2.0	327.0	190.0	24.91
				18.0		359.0	222.0	
				20.0		393.0	254.0	
				22.0		426.0	285.0	
		1.2	16.0	2.0	453.0	238.0	33.35	
			18.0		497.0	282.0		
			20.0		542.0	325.0		
			22.0		586.0	367.0		
9.	O.C._57+400 N.C._60+603	BH-P6	1.0	16.0	2.0	284.0	153.0	23.56
				18.0		318.0	185.0	
				20.0		352.0	217.0	
				22.0		387.0	250.0	

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
10.	O.C._57+400 N.C._60+603	BH-P6	1.2	16.0	2.0	404.0	194.0	31.54
				18.0		449.0	237.0	
				20.0		495.0	281.0	
				22.0		542.0	325.0	
		BH-P7	1.0	16.0	2.0	282.0	148.0	25.57
				18.0		316.0	181.0	
				20.0		351.0	214.0	
				22.0		385.0	247.0	
			1.2	16.0	2.0	234.0	189.0	34.23
				18.0		448.0	233.0	
				20.0		495.0	278.0	
				22.0		541.0	322.0	
11.	O.C._57+400 N.C._60+603	BH-P9	1.0	20.0	2.0	235.0	194.0	24.91
				22.0		255.0	215.0	
				24.0		378.0	246.0	
				26.0		411.0	278.0	
		1.2	20.0	2.0	300.0	246.0	33.35	
			22.0		325.0	272.0		
			24.0		523.0	315.0		
			26.0		568.0	358.0		
12.	O.C._57+400 N.C._60+603	BH-P10	1.0	16.0	2.0	299.0	179.0	28.10
				18.0		331.0	210.0	
				20.0		364.0	241.0	
				22.0		417.0	274.0	
		1.2	16.0	2.0	413.0	225.0	37.62	
			18.0		456.0	267.0		
			20.0		499.0	309.0		
			22.0		545.0	353.0		
13.	O.C._57+400 N.C._60+603	BH-P11	1.0	16.0	2.0	298.0	193.0	24.91
				18.0		329.0	223.0	
				20.0		360.0	254.0	
				22.0		392.0	284.0	
		1.2	16.0	2.0	403.0	242.0	33.35	
			18.0		445.0	283.0		
			20.0		487.0	323.0		
			22.0		529.0	364.0		
14.	O.C._57+400 N.C._60+603	BH-P12	1.0	16.0	2.0	325.0	201.0	28.10
				18.0		358.0	233.0	
				20.0		391.0	264.0	
				22.0		424.0	296.0	

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
15.	O.C._57+400 N.C._60+603	BH-P12	1.2	16.0	2.0	443.0	252.0	37.62
				18.0		487.0	294.0	
				20.0		530.0	336.0	
				22.0		574.0	379.0	
		BH-P13	1.0	16.0	2.0	256.0	198.0	31.06
				18.0		271.0	214.0	
				20.0		300.0	242.0	
				22.0		418.0	275.0	
			1.2	16.0	2.0	325.0	247.0	41.58
				18.0		343.0	268.0	
				20.0		382.0	306.0	
				22.0		571.0	350.0	
16.	O.C._57+400 N.C._60+603	BH-P15	1.0	16.0	2.0	341.0	200.0	24.91
				18.0		376.0	232.0	
				20.0		410.0	265.0	
				22.0		445.0	298.0	
		1.2	16.0	2.0	472.0	250.0	33.35	
			18.0		518.0	294.0		
			20.0		563.0	338.0		
			22.0		609.0	382.0		
17.	O.C._57+400 N.C._60+603	BH-P16	1.0	16.0	2.0	318.0	184.0	24.24
				18.0		349.0	214.0	
				20.0		381.0	245.0	
				22.0		414.0	276.0	
		1.2	16.0	2.0	433.0	231.0	32.45	
			18.0		482.0	271.0		
			20.0		525.0	313.0		
			22.0		569.0	355.0		
18.	O.C._57+400 N.C._60+603	BH-P17	1.0	16.0	2.0	308.0	192.0	22.86
				18.0		448.0	225.0	
				20.0		483.0	259.0	
				22.0		519.0	292.0	
		1.2	16.0	2.0	421.0	241.0	30.61	
			18.0		640.0	286.0		
			20.0		688.0	331.0		
			22.0		735.0	377.0		
19.	O.C._57+400 N.C._60+603	BH-P18	1.0	16.0	2.0	397.0	223.0	24.91
				18.0		505.0	259.0	
				20.0		543.0	295.0	
				22.0		582.0	331.0	

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)					
						In compression	In uplift	Fixed Head					
20.	O.C._57+400 N.C._60+603	BH-P18	1.2	16.0	2.0	547.0	279.0	33.35					
				18.0		718.0	328.0						
				20.0		770.0	376.0						
				22.0		821.0	425.0						
		BH-P19	1.0	16.0	2.0	219.0	182.0	24.24					
				18.0		234.0	198.0						
				20.0		262.0	226.0						
				22.0		515.0	257.0						
			1.2	16.0	2.0	274.0	226.0	32.45					
				18.0		294.0	248.0						
				20.0		332.0	285.0						
				22.0		743.0	328.0						
21.	O.C._58+497 N.C._61+676	BH-A2	1.0	22.0	2.0	392.0	270.0	23.56					
				24.0		424.0	300.0						
				26.0		456.0	331.0						
				28.0		489.0	362.0						
		1.2	22.0	2.0	535.0	347.0	31.54						
			24.0		578.0	388.0							
			26.0		621.0	430.0							
			28.0		664.0	471.0							
			22.		O.C._58+497 N.C._61+676	BH-A1		1.0	22.0	2.0	353.0	220.0	29.31
									24.0		386.0	253.0	
26.0	421.0	285.0											
28.0	454.0	317.0											
1.2	22.0	2.0		492.0		282.0	39.23						
	24.0			536.0		326.0							
	26.0			582.0		370.0							
	28.0			627.0		413.0							
23.	O.C._58+497 N.C._61+676	BH-P1	1.0	22.0	2.0	362.0	225.0	26.22					
				24.0		396.0	259.0						
				26.0		432.0	292.0						
				28.0		466.0	324.0						
		1.2	22.0	2.0	513.0	292.0	35.10						
			24.0		558.0	338.0							
			26.0		606.0	383.0							
			28.0		652.0	427.0							
24.	O.C._58+497 N.C._61+676	BH-P2	1.0	22.0	2.0	408.0	267	28.71					
				24.0		442.0	300						
				26.0		479.0	334						
				28.0		607.0	368						

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
25.	O.C._58+497 N.C._61+676	BH-P2	1.2	22.0	2.0	564.0	345	38.43
				24.0		609.0	388	
				26.0		658.0	434	
				28.0		855.0	481	
		BH-P3	1.0	22.0	2.0	428.0	286	26.22
				24.0		461.0	318	
				26.0		495.0	350	
				28.0		620.0	384	
			1.2	22.0	2.0	587.0	368	35.10
				24.0		632.0	411	
				26.0		677.0	454	
				28.0		725.0	500	
26.	O.C._58+497 N.C._61+676	BH-P4	1.0	22.0	2.0	452.0	304	29.31
				24.0		486.0	336	
				26.0		520.0	368	
				28.0		554.0	400	
		1.2	22.0	2.0	617.0	389	39.23	
			24.0		662.0	432		
			26.0		707.0	475		
			28.0		753.0	518		
27.	O.C._58+497 N.C._61+676	BH-P5	1.0	22.0	2.0	361.0	227	29.90
				24.0		396.0	260	
				26.0		431.0	293	
				28.0		490.0	326	
		1.2	22.0	2.0	508.0	296	40.03	
			24.0		556.0	341		
			26.0		602.0	385		
			28.0		648.0	429		
28.	O.C._58+497 N.C._61+676	BH-P6	1.0	22.0	2.0	360.0	224	27.48
				24.0		395.0	257	
				26.0		429.0	290	
				28.0		525.0	325	
		1.2	22.0	2.0	510.0	291	36.79	
			24.0		557.0	336		
			26.0		603.0	380		
			28.0		654.0	428		
29.	O.C._58+497 N.C._61+676	BH-A2	1.0	22.0	2.0	439.0	294	28.10
				24.0		472.0	326	
				26.0		506.0	358	
				28.0		539.0	390	

Sr. no.	Old & New Chainage	BH No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		In Lateral (T)
						In compression	In uplift	Fixed Head
		BH-A2	1.2	22.0	2.0	599.0	376	37.62
				24.0		643.0	419	
				26.0		688.0	462	
				28.0		732.0	504	

Notes :-

1. Permissible lateral deflection has been taken as 5mm.
2. The self weight of the pile has been taken into account while computing the Safe Load Carrying Capacity of Pile in uplift only and not considered for vertical load capacity in compression.
3. The safe load carrying capacity of piles have been worked out on the basis of IS: 2911 (Part-1/sec-2) – 2010 as per provisions / assumptions provided therein & are only an assessment based on characteristics of the sub-strata obtained at the locations of the above BHs. The safe load carrying capacities as tabulated above will further depend substantially on the piling technique adopted and equipment used for making the piles in the field. However, for the final designs & constructions, the safe/allowable load carrying capacities of these piles should be taken by conducting actual initial load tests on these piles by casting them in the respective areas.
4. While erecting normal bored cast in-situ pile, utmost care should be taken while flushing/cleaning the bottom of pile particularly prior to start of pouring of concrete so as to rest the pile in virgin soil only for obtaining full point bearing as while computing safe load carrying capacity of pile no bottom softening during erection of pile has been considered.
5. Further the pile should have necessary structural strength to transmit / sustain the design load.

Notes: -

All The above recommendations are based on the field and laboratory tests conducted on selected soil/ rock core samples and our experience in this regard. If the actual substrata conditions during excavation for the foundation differ from the observations reported here, the design experts/consultants should be referred for suggestion, further investigations.

REFERENCES

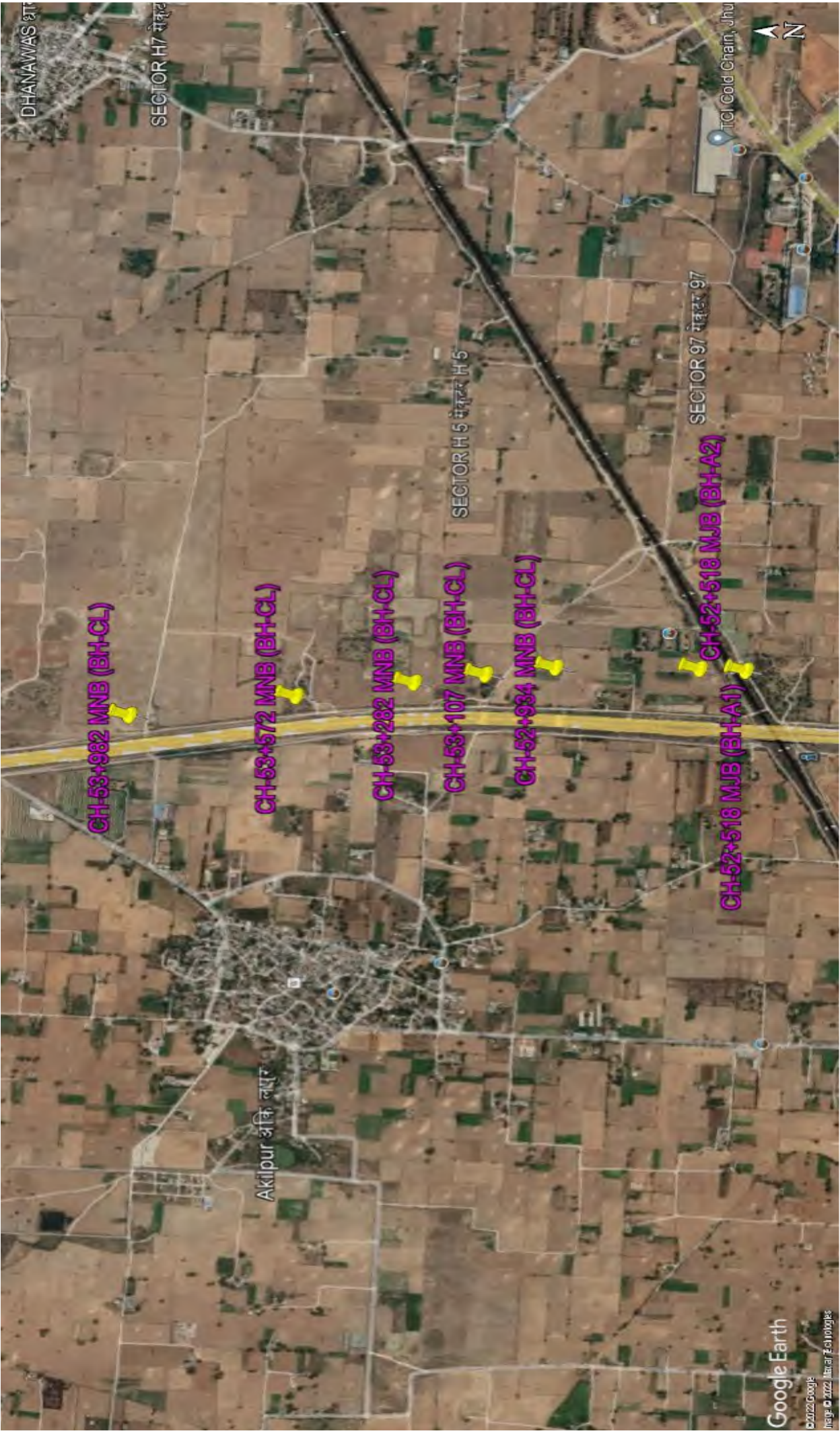
1. IS 2911: Part 1 : Sec 2 : 2010 (Reaffirmed Year : 2020) Design And construction Of pile foundations - Code Of Practice Part 1 Concrete Piles Section 2 Bored Cast In-situ Concrete Piles.
2. IS 2911 : Part 4 : 2013 (Reaffirmed Year : 2018) Design and construction of pile foundations - Code of practice : Part 4 Load test on piles .
3. IS 6403 : 1981 (Reaffirmed Year : 2016), Amd. 2 : 2018 Code of practice for determination of bearing capacity of shallow foundations.
4. IS 8009 : Part 1 : 1976 (Reaffirmed Year : 2018) Code of practice for calculation of settlements of foundations: Part 1 Shallow foundations subjected to symmetrical static vertical loads.
5. IS 8009 : Part 2 : 1980 (Reaffirmed Year : 2020) Code of practice for calculation of settlement of foundations: Part 2 Deep foundations subjected to symmetrical static vertical loading.
6. IS 1893 : Part 1 : 2016 (Reaffirmed Year : 2021) Criteria for Earthquake Resistant Design of Structures - Part 1 : General Provisions and Buildings.
7. IS 1904 : 2021 Draft Indian Standard for General requirements for design and construction of foundations in soils Code of practice third revision of IS 1904.
8. IS 456 : 2000 (Reaffirmed Year : 2021) Plain and Reinforced Concrete - Code of Practice (Including Amendment 1, 2, 3,& 4).
9. BS – 118 : 2015 Final Seismic Design of Bridges.
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12. IS 1892 : 1979 (Reaffirmed Year : 2016) Code of practice for subsurface investigation for foundations.
13. Bowles, J.E., 1982. Foundation design and analysis.
14. IS. 2720 (Part 3)-1980. Determination of Specific Gravity of Soil.
15. IS. 2720 (Part 4). 1985. Methods of Test for Soils: Grain Size Analysis.
16. IS. IS 2131, 1981. Method for standard penetration test for soils.
17. IS: 2720 (Part 11)–(1993). Determination of the shear strength parameters of a specimen tested in unconsolidated undrained triaxial compression without the measurement of pore water pressure.
18. IS: 2720 (Part 13) 1986 Method of test for soils, direct shear test. New Delhi, India.
19. IS: 2720 (Part 3/See 1)–(1980) Methods of test for soils, determination of specific gravity of soil. New Delhi, India.
20. IS: 2720 (Part 5) 1985 Methods of test for soils, determination of liquid and plastic limit of soils. New Delhi, India.

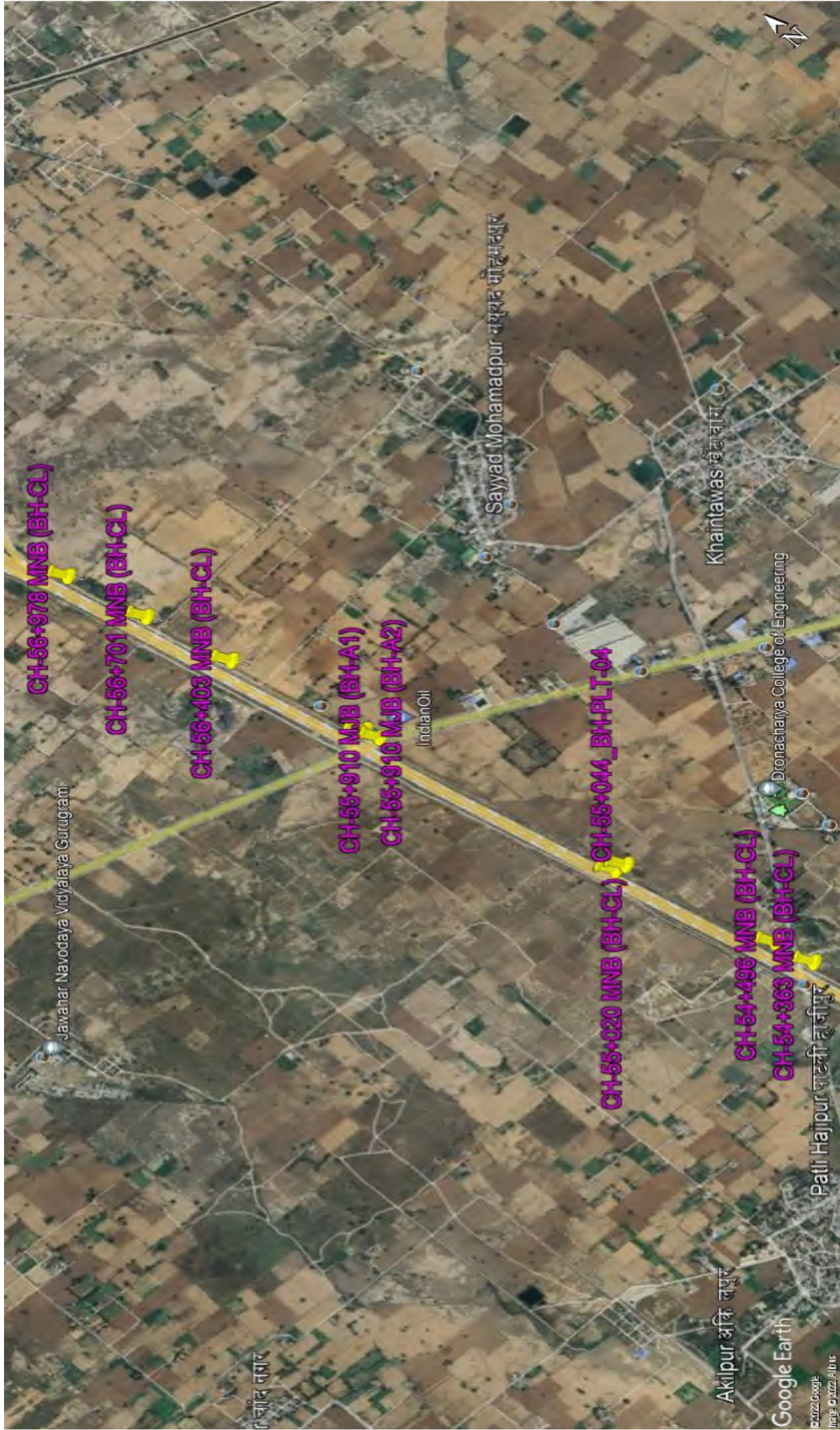
Abbreviations

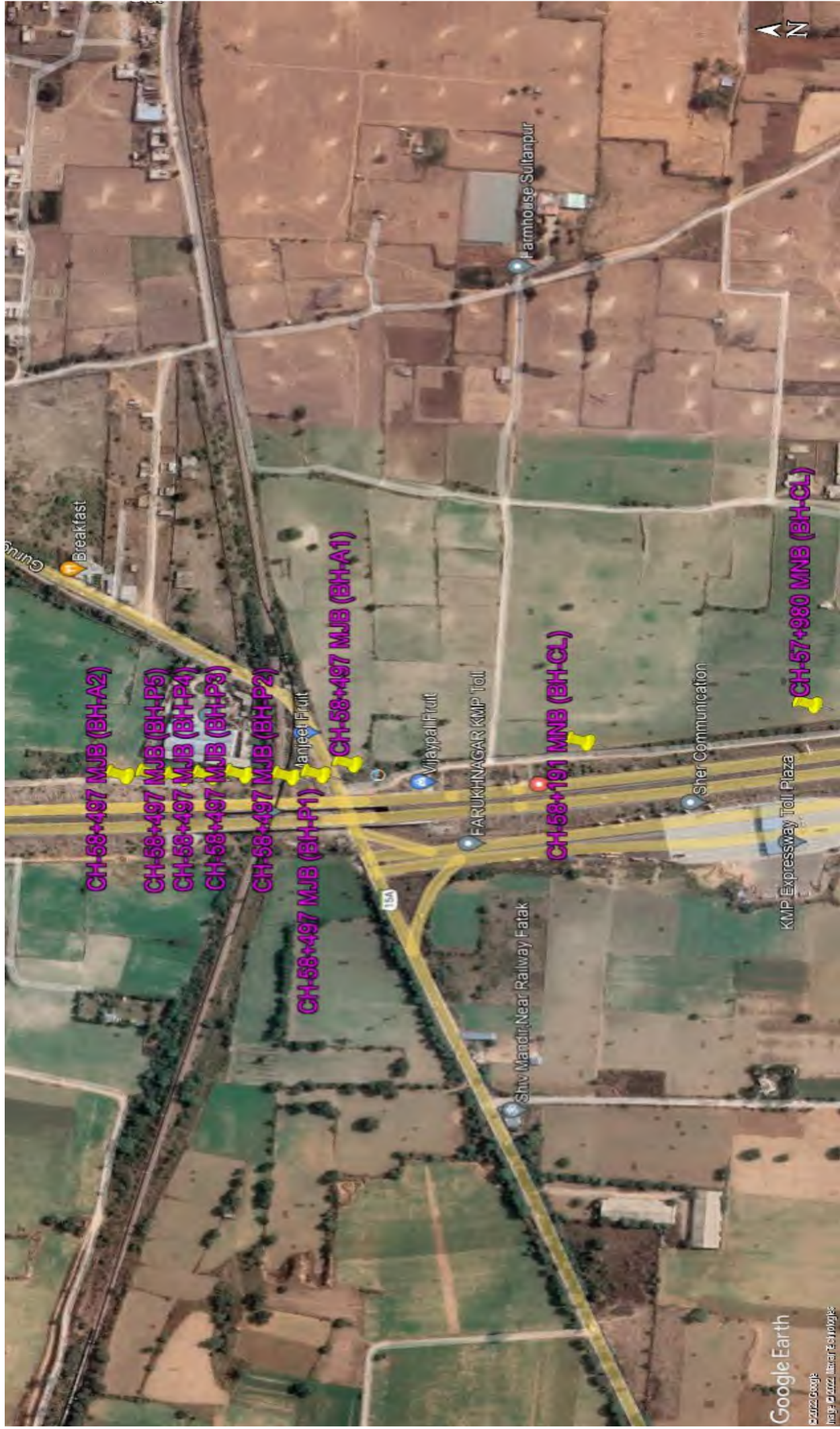
BH	Borehole
ERT	Electrical Resistivity Test
EGL	Existing Ground Level
GWT	Ground Water Table
IS	Indian Standards
SPT	Standard Penetration Test
DS	Disturbed Soil
R.L.	Reduced Level
m	Metre
sp. gr.	Specific Gravity
%	Percentage
mg /l	Milligram per litre
mg /kg	Milligram per kilogram

APPENDIX – A (FIELD DATA RESULTS)

Appendix No.	ITEMS
A-1	LOCATION PLAN
A-2	FIELD BORE HOLE LOGS
A-3	SUB SOIL PROFILE DIAGRAM



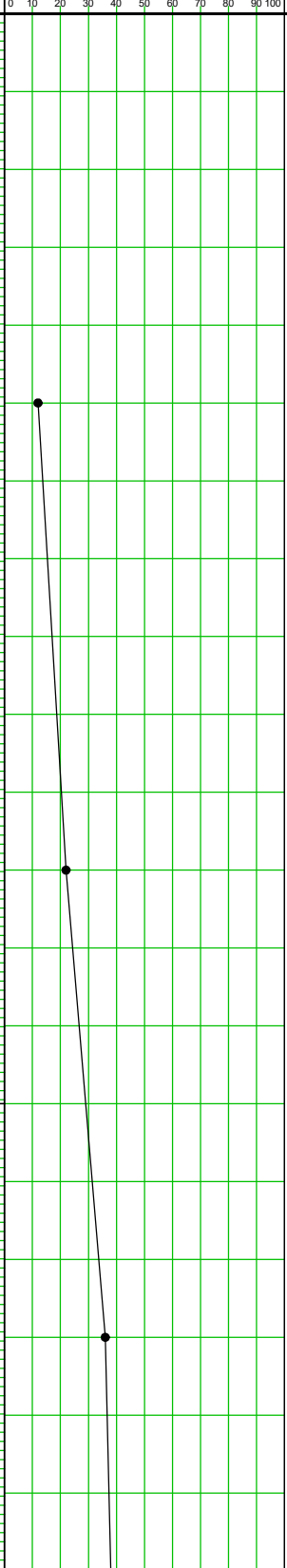






FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+518 km	Northing : 3143671.17 m	Easting : 683091.771 m
Reduced Level (m): (+)213.216	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 22.80	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 20-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	3	5	7	12	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	5	9	13	22					
6.0											
6.5											
7.0	7	UDS*									
7.5											
8.0											
8.5	8.5	SPT-3	7	15	21	36	Brown, Hard, Silty clay of low plasticity	CL			
9.0											
9.5											
10.0	10	UDS-3									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :52+518 km	Northing :3143671.17 m	Easting :683091.771 m
Reduced Level (m):(+)213.216	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):22.80	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :20-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations				
			N1	N2	N3										
10.0															
10.5						Brown, Hard, Silty clay of low plasticity	CL		0 10 20 30 40 50 60 70 80 90 100						
11.0															
11.5	11.5	SPT-4	9	16	24	40			40						
12.0						Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL		0 10 20 30 40 50 60 70 80 90 100						
12.5															
13.0	13	UDS-4													
13.5															
14.0															
14.5	14.5	SPT-5	10	20	28						48			48	
15.0															
15.5															
16.0	16	UDS-5													
16.5															
17.0															
17.5	17.5	SPT-6	13	29	50	79			79						
18.0															
18.5															
19.0	19	SPT-7	15	32	60	92			92						
19.5															
20.0															

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+518 km	Northing : 3143671.17 m	Easting : 683091.771 m
Reduced Level (m): (+)213.216	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 22.80	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 20-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	30	60	40 (8cm)	>100					
21.0											
21.5											
22.0	22	SPT-9	26	57	43 (7cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-10	24	49	51 (5cm)	>100					
24.0											
24.5											
25.0	25	SPT-11	27	62	38 (3cm)	>100	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-12	28	48	52 (12cm)	>100					
27.0											
27.5											
28.0	28	SPT-13	25	43	56	99					
28.5											
29.0											
29.5	29.5	SPT-14	20	40	60 (13cm)	>100					
30.0											

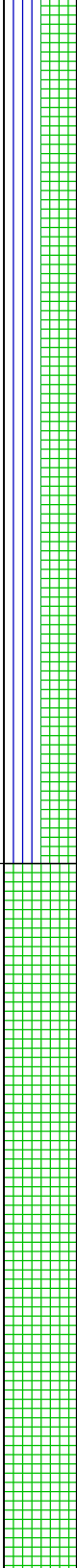
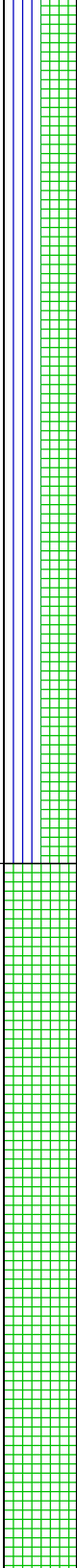
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+518 km	Northing : 3143671.17 m	Easting : 683091.771 m
Reduced Level (m): (+)213.216	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 22.80	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 20-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-15	26	44	56 (9cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-16	17	29	41	70					
33.0											
33.5											
34.0	34	SPT-17	21	36	45	81					
34.5											
35.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-18	19	30	47	77					
36.0											
36.5											
37.0	37	SPT-19	20	38	44	82					
37.5											
38.0											
38.5	38.5	SPT-20	27	62	38 (9cm)	>100					
39.0											
39.5											
40.0	40	SPT-21	29	69	31 (8cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+518 km	Northing : 3143783.105 m	Easting : 683092.392 m
Reduced Level (m): (+)220.511	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 23.50	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	6	7	13	Brown, Medium dense, Sandy silt of low plasticity ML-CL				
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	7	9	13	22	Brown, Very stiff to hard, Silty clay of low plasticity CL				
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	6	8	14	22					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :52+518 km	Northing :3143783.105 m	Easting :683092.392 m
Reduced Level (m):(+)220.511	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):23.50	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	12	21	33	54					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	13	29	37	66		▼ 23.50m			
24.0											
24.5											
25.0	25	UDS-9					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-9	9	17	26	43					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	11	19	33	52					
30.0											

FIELD BOREHOLE LOG

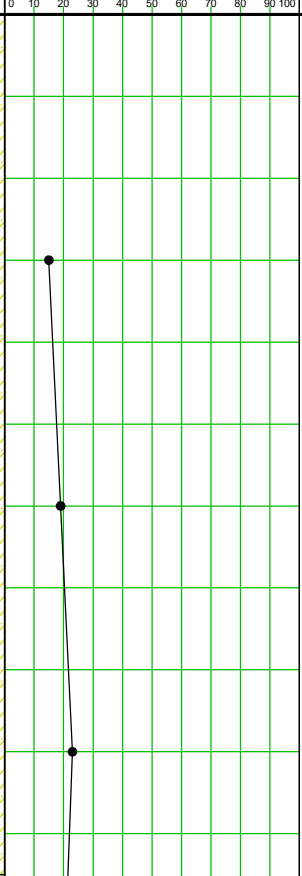
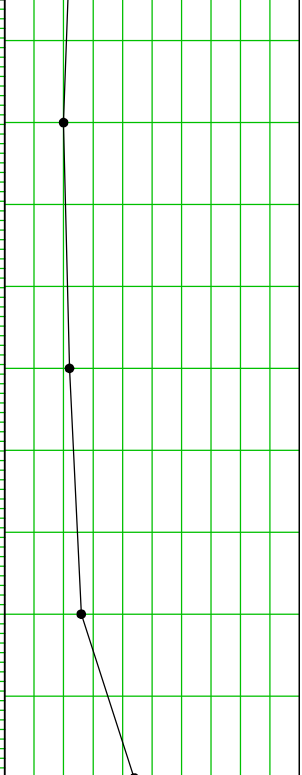
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+518 km	Northing : 3143783.105 m	Easting : 683092.392 m
Reduced Level (m): (+)220.511	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 23.50	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	9	13	21	34					
33.0											
33.5											
34.0	34	UDS-12									
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-12	19	30	39	69					
36.0											
36.5											
37.0	37	SPT-13	24	38	43	81					
37.5											
38.0											
38.5	38.5	SPT-14	29	35	43	78					
39.0											
39.5											
40.0	40	SPT-15	27	40	53	93					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

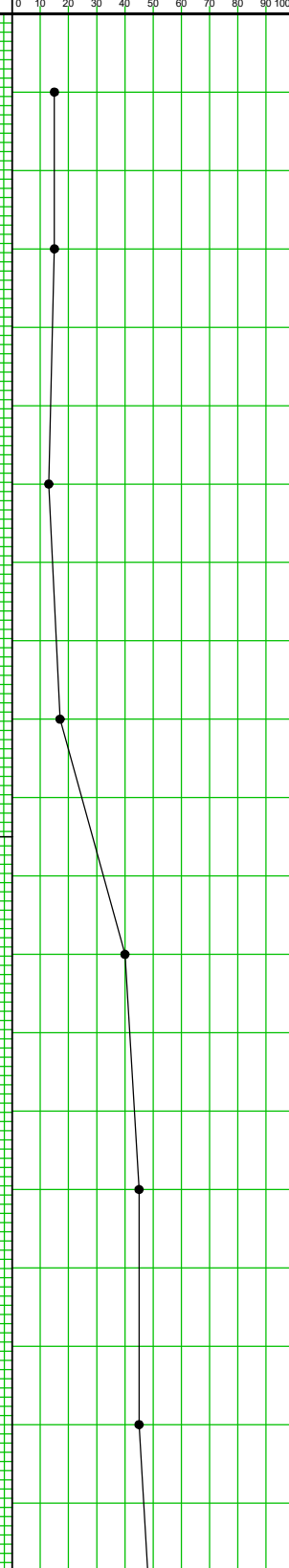
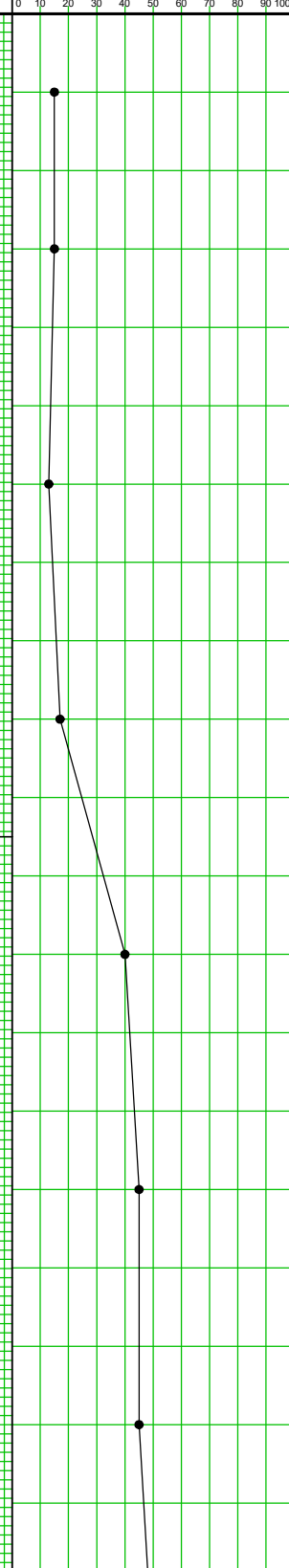
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 52+934 km	Northing : 3144133.557 m	Easting : 683069.549 m
Reduced Level (m):(+)217.658	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 154 mm	Depth of Casing (m) : Not Used
Date of Start : 04-07-2022		Date of Completion : 04-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	5	7	8	15	Brown, Very loose to Very dense, Silty Sand with Clay	SM-SC			
2.0											
2.25	2.25	UDS-1									
2.5											
3.0	3	SPT-2	6	9	10	19					
3.5											
4.0											
4.5	4.5	SPT-3	9	11	12	23					
5.0											
5.25	5.25	UDS-2									
5.5											
6.0	6	SPT-4	6	9	11	20	Brown, Very Stiff, Silty Clay of Low Plasticity	CL			
6.5											
7.0											
7.5	7.5	SPT-5	7	10	12	22					
8.0											
8.25	8.25	UDS-3									
8.5											
9.0	9	SPT-6	9	12	14	26					
9.5											
10.0	10	SPT-7	11	19	25	44					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

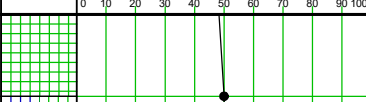
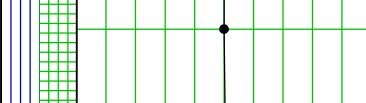
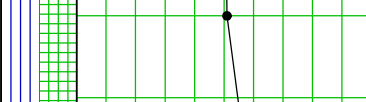
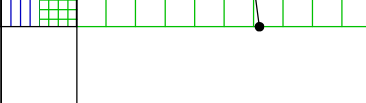
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :53+107 km	Northing :3144302.971 m	Easting :683034.675 m
Reduced Level (m):(+)218.950	BH. No. :BH-CL	BH Termination Depth (m):15
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :15-01-2022		Date of Completion :15-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1				15	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
1.0											
1.5	1.5	SPT-2				15					
2.0											
2.5	2.25	UDS*									
3.0	3	SPT-3				13					
3.5											
4.0											
4.5	4.5	SPT-4				17					
5.0											
5.5	5.25	UDS-1					Brown, Hard, Silty clay of low plasticity	CL			
6.0	6	SPT-5				40					
6.5											
7.0											
7.5	7.5	SPT-6				45					
8.0											
8.5	8.25	UDS-2									
9.0	9	SPT-7				45					
9.5											
10.0											

UDS*-UDS not recovered

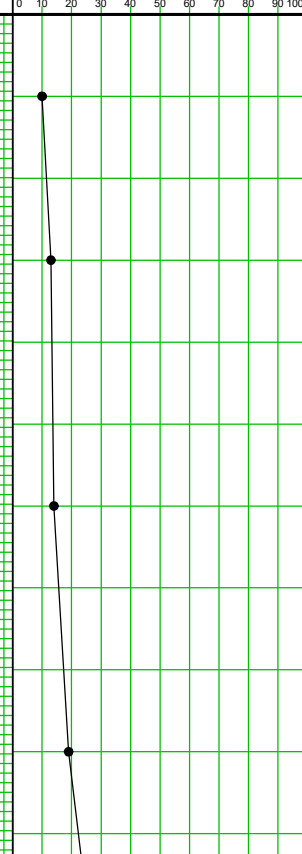
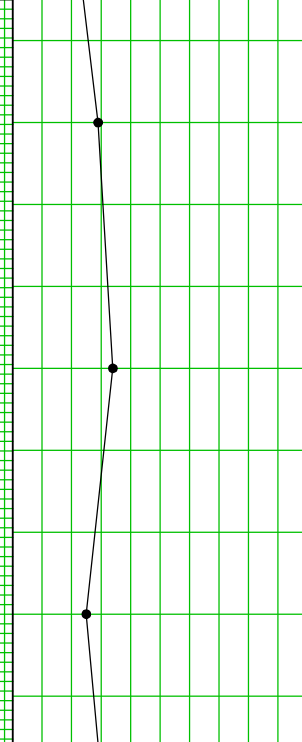
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 53+107 km	Northing : 3144302.971 m	Easting : 683034.675 m
Reduced Level (m): (+)218.950	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 15-01-2022		Date of Completion : 15-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8				50	Brown, Hard, Silty clay of low plasticity	CL			
11.0	11.25	UDS-3									
11.5											
12.0	12	SPT-9				50	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
12.5											
13.0											
13.5	13.5	SPT-10				51					
14.0	14.25	UDS-4									
14.5											
15.0	15	SPT-11				62					

FIELD BOREHOLE LOG

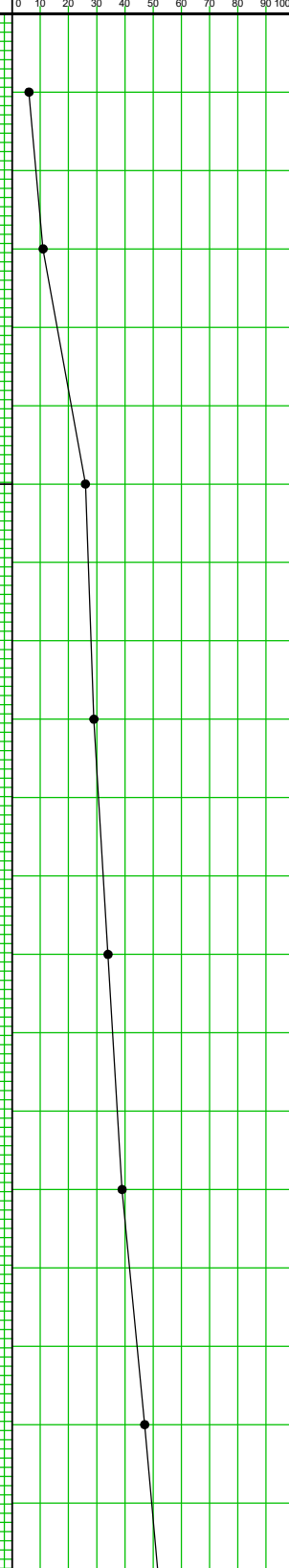
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :53+282 km	Northing :3144473.609 m	Easting :682995.864 m
Reduced Level (m):(+)218.087	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-01-2022		Date of Completion :14-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	4	5	5	10	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	5	6	7	13					
2.25	2.25	UDS*									
3.0	3	SPT-3	6	6	8	14					
4.5	4.5	SPT-4	7	8	11	19					
5.25	5.25	UDS-1					Brown, Very stiff to hard, Silty clay of low plasticity	CL			
6.0	6	SPT-5	11	13	16	29					
7.5	7.5	SPT-6	14	15	19	34					
8.25	8.25	UDS-2									
9.0	9	SPT-7	10	11	14	25					
10.0	10	SPT-8	12	13	17	30					

UDS*-UDS not recovered

FIELD BOREHOLE LOG


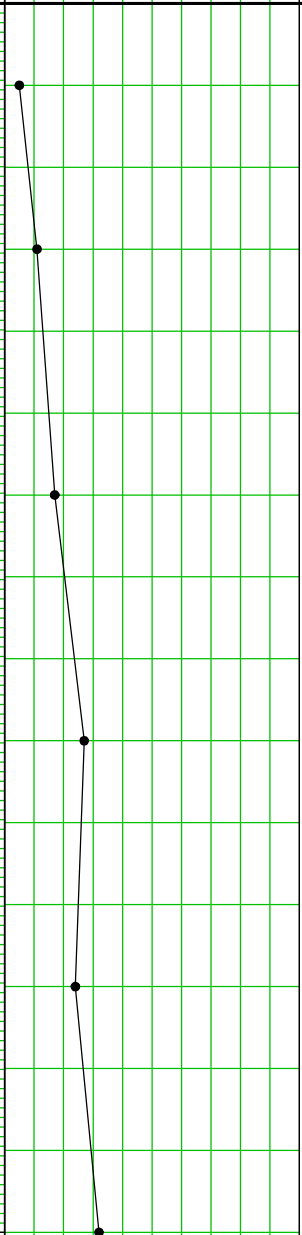
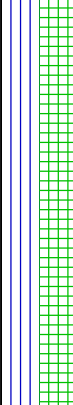
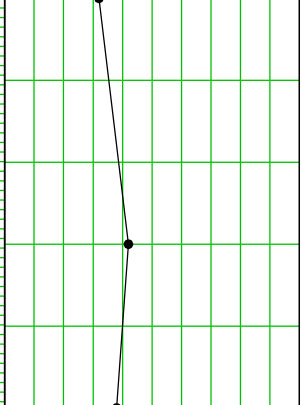
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :53+572 km	Northing :3144756.38 m	Easting :682931.5 m
Reduced Level (m):(+)217.532	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-01-2022		Date of Completion :14-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	3	6	Brown, Medium stiff to stiff, Silty clay of low plasticity	CL			
1.0											
1.5	1.5	SPT-2	3	4	7	11					
2.0											
2.25	2.25	UDS*									
2.5											
3.0	3	SPT-3	8	11	15	26	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
3.5											
4.0											
4.5	4.5	SPT-4	11	13	16	29					
5.0											
5.25	5.25	UDS-1									
5.5											
6.0	6	SPT-5	13	15	19	34					
6.5											
7.0											
7.5	7.5	SPT-6	15	18	21	39					
8.0											
8.25	8.25	UDS-2									
8.5											
9.0	9	SPT-7	17	20	27	47					
9.5											
10.0	10	SPT-8	19	22	30	52					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

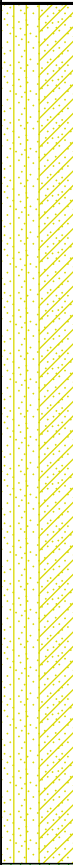
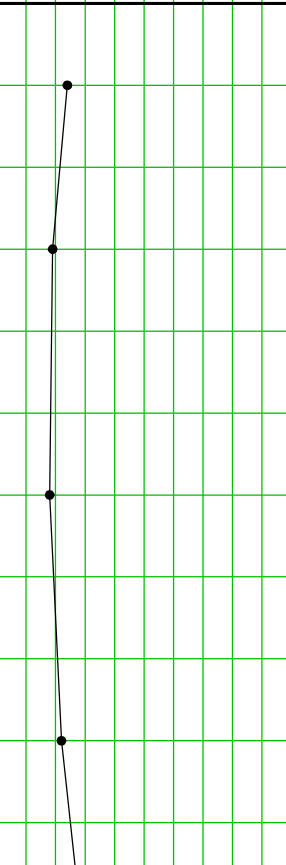

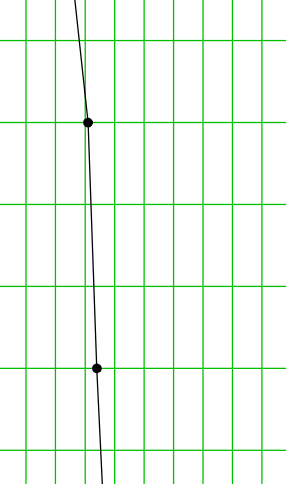
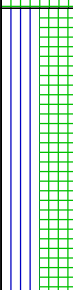
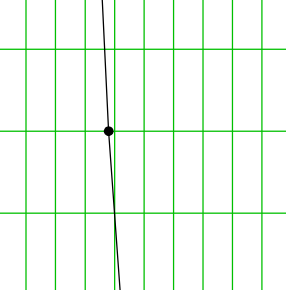
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :53+982 km	Northing :3145156.16 m	Easting :682840.528 m
Reduced Level (m):(+)217.050	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :12-01-2022		Date of Completion :12-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Medium stiff to very stiff, Silty clay of low plasticity CL				
1.5	1.5	SPT-2	5	5	6	11					
2.25	2.25	UDS-1									
3.0	3	SPT-3	7	8	9	17					
4.5	4.5	SPT-4	12	12	15	27					
5.25	5.25	UDS-2									
6.0	6	SPT-5	10	11	13	24					
7.5	7.5	SPT-6	13	15	17	32					
8.0	8.25	UDS-3					Brown, Medium dense to dense, Sandy silt of low plasticity ML-CL				
9.0	9	SPT-7	15	18	24	42					
10.0	10	SPT-8	15	17	21	38					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

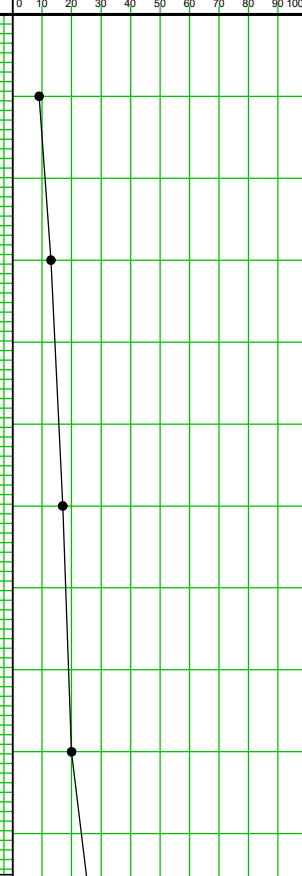
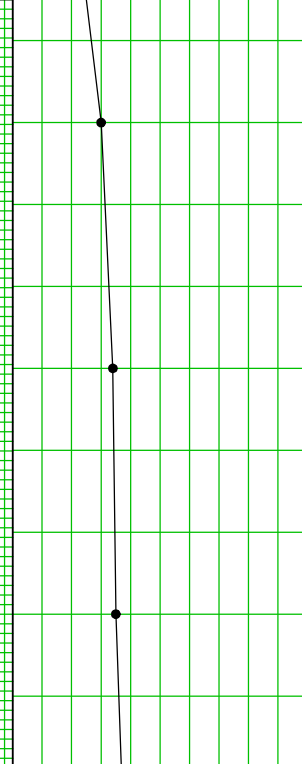
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :54+363 km	Northing :3145527.663 m	Easting :682755.991 m
Reduced Level (m):(+)216.014	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-01-2022		Date of Completion :11-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	9	11	13	24	Brown, Medium dense, Silty sand with clay	SM-SC			
1.5	1.5	SPT-2	8	9	10	19					
2.25	2.25	UDS*									
3.0	3	SPT-3	7	9	9	18					
4.5	4.5	SPT-4	8	10	12	22					
5.25	5.25	UDS-1					Brown, Hard, Silty clay of low plasticity	CL			
6.0	6	SPT-5	11	14	17	31					
7.5	7.5	SPT-6	13	15	19	34					
8.25	8.25	UDS-2									
9.0	9	SPT-7	11	17	21	38	Brown, Dense, Sandy silt of low plasticity	ML-CL			
10.0	10	SPT-8	12	19	23	42					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 54+496 km	Northing : 3145657.348 m	Easting : 682726.48 m
Reduced Level (m):(+)217.393	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-01-2022		Date of Completion : 12-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	4	5	9	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
1.0											
1.5	1.5	SPT-2	5	6	7	13					
2.0											
2.5	2.25	UDS*									
3.0	3	SPT-3	6	8	9	17					
3.5											
4.0											
4.5	4.5	SPT-4	7	9	11	20					
5.0											
5.5	5.25	UDS-1									
6.0	6	SPT-5	12	14	16	30	Brown, Hard, Silty clay of low plasticity with gravel	CL			
6.5											
7.0											
7.5	7.5	SPT-6	13	15	19	34					
8.0											
8.5	8.25	UDS-2									
9.0	9	SPT-7	12	16	19	35					
9.5											
10.0											

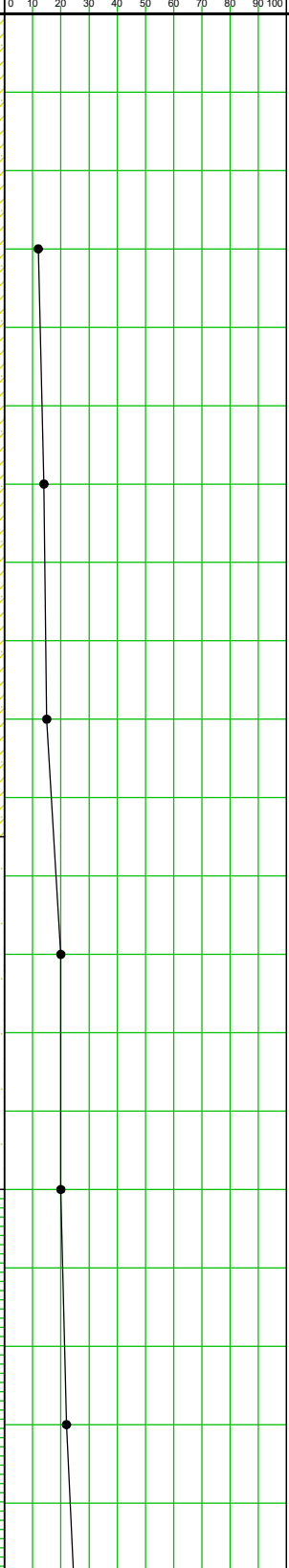
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 54+496 km	Northing : 3145657.348 m	Easting : 682726.48 m
Reduced Level (m): (+)217.393	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-01-2022		Date of Completion : 12-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	15	17	21	38					
11.0											
11.5	11.25	UDS-3									
12.0	12	SPT-9	13	19	22	41					
12.5											
13.0											
13.5	13.5	SPT-10	15	21	25	46					
14.0											
14.5	14.25	UDS-4									
15.0	15	SPT-11	18	20	26	46					

FIELD BOREHOLE LOG

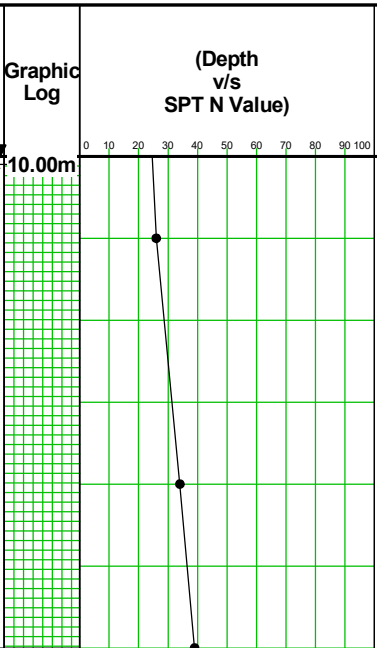
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+020 km	Northing : 3146168.286 m	Easting : 682610.214 m
Reduced Level (m): (+)215.845	BH. No. : BH-CL	BH Termination Depth (m): 13
Proposed / Existing Structure : Minor Bridge	Water Table (m): 10.00	Inclination : Vertical
Boring type : Shell	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 02-07-2022		Date of Completion : 03-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	4	6	6	12	Medium dense, Brownish, Silty Sand	SM-SC			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-2	4	6	8	14					
3.5											
4.0											
4.5	4.5	SPT-3	4	7	8	15					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-4	8	10	10	20	Medium dense, Brownish, Silty Sand	SM			
6.5											
7.0											
7.5	7.5	SPT-5	7	9	11	20					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-6	6	10	12	22	Very Stiff to Hard, Brown, Silty Clay of Low Plasticity	CL			
9.5											
10.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :55+020 km	Northing :3146168.286 m	Easting :682610.214 m
Reduced Level (m):(+)215.845	BH. No. :BH-CL	BH Termination Depth (m):13
Proposed / Existing Structure :Minor Bridge	Water Table (m):10.00	Inclination : Vertical
Boring type :Shell	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :02-07-2022		Date of Completion :03-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-7	8	11	15	26	Very Stiff to Hard, Brown, Silty Clay of LowPlasticity	CL			
11.0											
11.5	11.25	UDS-4									
12.0	12	SPT-8	9	15	19	34					
12.5											
13.0	13	SPT-9	11	16	23	39					



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+044	Northing : 3146175.461 m	Easting : 682575.147 m
Reduced Level (m): (+)215.725	BH. No. : BH-PLT-04	BH Termination Depth (m): 12
Proposed / Existing Structure :-	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-10-2021	Date of Completion : 23-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.75	UDS-1					Brown, Loose, Silty sand	SM			
1.0											
1.5	1.5	SPT-1	2	3	4	7					
2.0											
2.5	2.25	SPT-2	3	5	7	12					
3.0											
3.5	3	SPT-3	5	7	9	16	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
4.0											
4.5	3.75	SPT-4	7	10	11	21					
5.0											
5.5	4.5	UDS-2									
6.0											
6.5											
7.0											
7.5	7.5	UDS-3									
8.0											
8.5											
9.0	9	SPT-6	9	11	13	24	Brown, Very stiff, Silty clay of low plasticity	CL			
9.5											
10.0											

UDS*-UDS not recovered



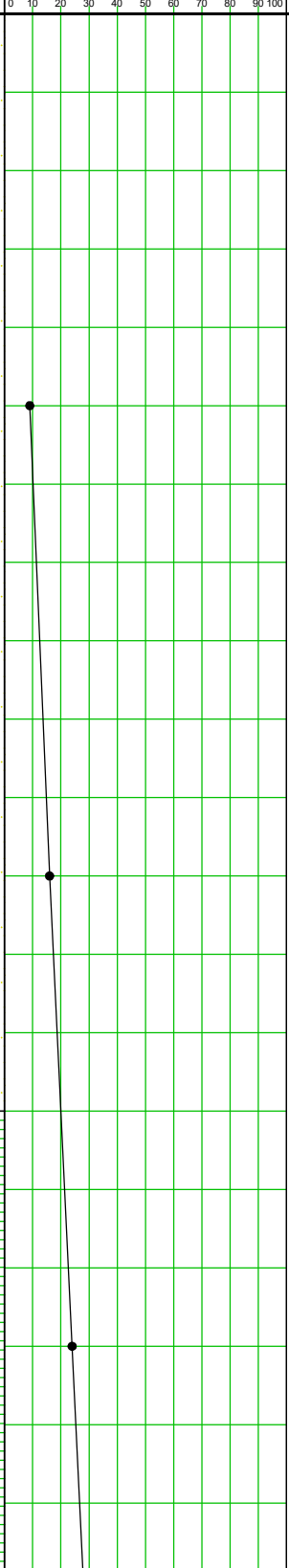
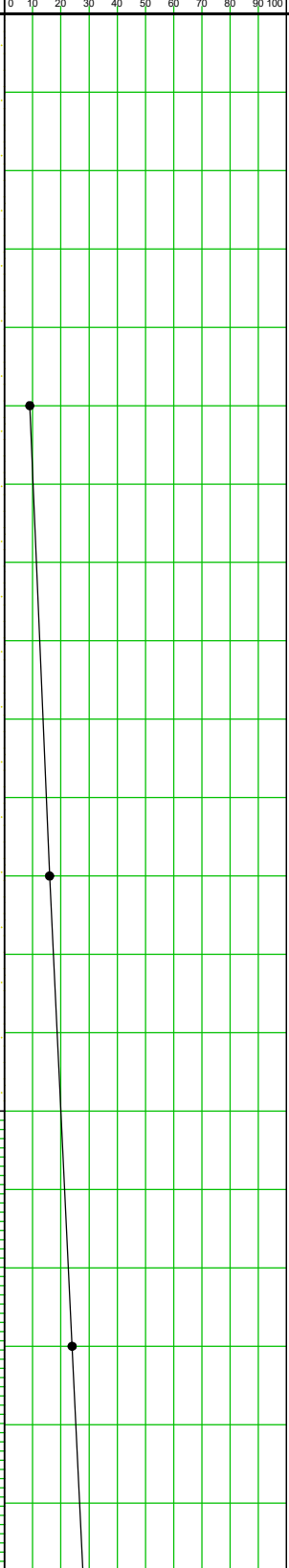
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+044	Northing : 3146175.461 m	Easting : 682575.147 m
Reduced Level (m): (+)215.725	BH. No. : BH-PLT-04	BH Termination Depth (m): 12
Proposed / Existing Structure :-	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-10-2021	Date of Completion : 23-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	UDS-4					Brown, Very stiff, Silty clay of low plasticity	CL			
11.0											
11.5											
12.0	12	SPT-7	11	14	16	30					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+910 km	Northing : 3147009.213 m	Easting : 682418.856 m
Reduced Level (m): (+)218.101	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 16.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	2	4	5	9	Brown, loose to medium dense, Silty sand	SM			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	4	7	9	16					
6.0											
6.5											
7.0	7	UDS-3					Brown, Very stiff to Hard, Silty clay of low plasticity	CL			
7.5											
8.0											
8.5	8.5	SPT-3	7	10	14	24					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :55+910 km	Northing :3147009.213 m	Easting :682418.856 m
Reduced Level (m):(+)218.101	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):16.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	12	15	17	32	Brown, Very stiff to Hard, Silty clay of low plasticity	CL			
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	15	18	21	39					
15.0											
15.5											
16.0	16	UDS-6									
16.5							Brown, Dense to Very dense, Sandy silt of low plasticity with gravel	ML-CL			
17.0											
17.5	17.5	SPT-6	17	22	24	46					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :55+910 km	Northing :3147009.213 m	Easting :682418.856 m
Reduced Level (m):(+)218.101	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):16.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	18	24	27	51					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	19	25	29	54					
24.0											
24.5											
25.0	25	UDS-9					Brown, Dense to Very dense, Sandy silt of low plasticity with gravel	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-9	21	28	37	65					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	24	30	39	69					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+910 km	Northing : 3147009.213 m	Easting : 682418.856 m
Reduced Level (m): (+)218.101	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 16.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	27	38	47	85					
33.0											
33.5											
34.0	34	UDS-12									
34.5											
35.0							Brown, Dense to Very dense, Sandy silt of low plasticity with gravel	ML-CL			
35.5	35.5	SPT-12	37	48	54 (4cm)	>100					
36.0											
36.5											
37.0	37	SPT-13	39	50	50 (10cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-14	65	85	15 (12cm)	>100					
39.0											
39.5											
40.0	40	SPT-15	67	59	41 (7cm)	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+910 km	Northing : 3147059.917 m	Easting : 682407.318 m
Reduced Level (m): (+)217.474	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 15.60	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 21-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	5	7	8	15					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	7	10	12	22					
4.5											
5.0							Brown, Medium dense to dense, Silty sand	SM			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	10	12	14	26					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	11	15	17	32					

UDS*-UDS not recovered

FIELD BOREHOLE LOG





Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :55+910 km	Northing :3147059.917 m	Easting :682407.318 m
Reduced Level (m):(+)217.474	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):15.60	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-08-2021		Date of Completion :21-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	14	18	21	39	Brown, Medium dense to dense, Silty sand	SM			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	12	16	19	35			15.60m		
16.5											
17.0											
17.5	17.5	UDS-6									
18.0							Brown, Hard, Silty clay of low plasticity	CL			
18.5											
19.0	19	SPT-7	15	20	23	43					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :55+910 km	Northing :3147059.917 m	Easting :682407.318 m
Reduced Level (m):(+)217.474	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):15.60	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-08-2021		Date of Completion :21-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	20	24	29	53					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	21	27	31	58	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	24	32	41	73					
28.5											
29.0											
29.5	29.5	UDS*									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 55+910 km	Northing : 3147059.917 m	Easting : 682407.318 m
Reduced Level (m): (+)217.474	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 15.60	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 21-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	40	54	46 (4cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-12	44	62	38 (3cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	38	58	42 (5cm)	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
35.5	35.5	SPT-14	33	65	35 (6cm)	>100					
36.0											
36.5											
37.0	37	SPT-15	39	73	27 (3cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-16	42	69	31 (4cm)	>100					
39.0											
39.5											
40.0	40	SPT-17	48	70	30 (5cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 56+403 km	Northing : 3147516.813 m	Easting : 682303.349 m
Reduced Level (m): (+)215.389	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 25-09-2021	Date of Completion : 25-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS							0 10 20 30 40 50 60 70 80 90 100		
0.5											
1.0	1	SPT-1	2	3	4	7	Brown, Loose, Silty sand	SM			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	7	10	12	22	Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	8	11	14	25					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	11	15	27	42					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 56+701 km	Northing : 3147807.384 m	Easting : 682237.228 m
Reduced Level (m): (+)215.273	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): 1.40	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 10-01-2022		Date of Completion : 10-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	4	4	8	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL				
1.0											
1.5	1.5	SPT-2	5	7	9	16					
2.0											
2.25	2.25	UDS-1									
2.5											
3.0	3	SPT-3	4	6	8	14					
3.5											
4.0											
4.5	4.5	SPT-4	7	9	10	19					
5.0											
5.25	5.25	UDS-2									
5.5						Brown, Medium dense to dense, Silty sand SP-SM					
6.0	6	SPT-5	10	13	16					29	
6.5											
7.0											
7.5	7.5	SPT-6	11	14	19					33	
8.0											
8.25	8.25	UDS-3									
8.5											
9.0	9	SPT-7	12	15	20					35	
9.5											
10.0	10	SPT-8	10	13	16	29					

UDS*-UDS not recovered

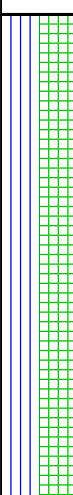
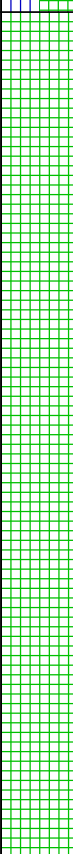
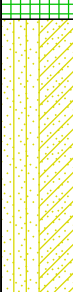
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 56+701 km	Northing : 3147807.384 m	Easting : 682237.228 m
Reduced Level (m):(+)215.273	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): 1.40	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 10-01-2022		Date of Completion : 10-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0	11.25	UDS*					Brown, Medium dense to dense, Silty sand	SP-SM			
11.5											
12.0	12	SPT-9	11	15	21	36					
12.5											
13.0											
13.5	13.5	SPT-10	14	19	22	41	Brown, Hard, Silty clay of low plasticity	CL			
14.0											
14.5	14.25	UDS*									
15.0	15	SPT-11	16	21	25	46					

FIELD BOREHOLE LOG

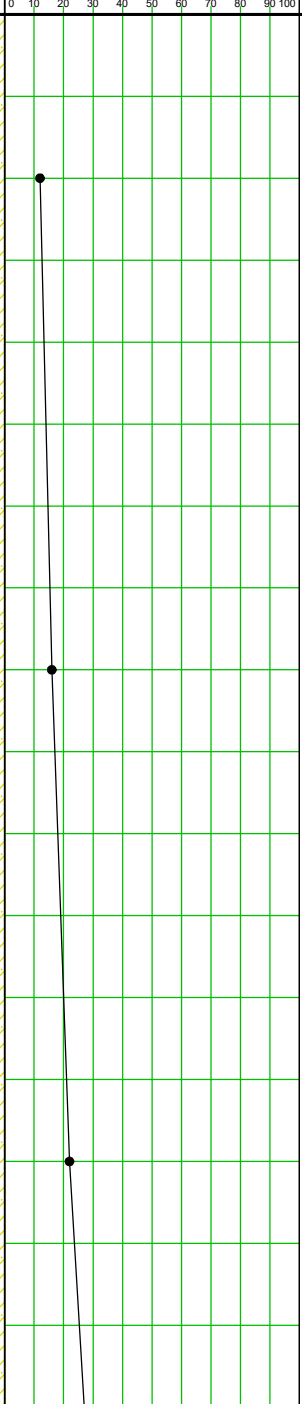
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :56+978 km	Northing :3148077.48 m	Easting :682175.767 m
Reduced Level (m):(+)212.389	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :10-01-2022		Date of Completion :10-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	5	6	11	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	7	8	8	16					
2.25	2.25	UDS-1									
3.0	3	SPT-3	7	9	11	20	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
4.5	4.5	SPT-4	8	10	12	22					
5.25	5.25	UDS-2									
6.0	6	SPT-5	9	12	14	26					
7.5	7.5	SPT-6	11	13	16	29					
8.25	8.25	UDS*									
9.0	9	SPT-7	9	11	19	30	Brown, Medium dense, Silty sand with clay	SM-SC			
9.5											
10.0	10	SPT-8	13	15	22	37					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148361.347 m	Easting : 682111.171 m
Reduced Level (m):(+)217.941	BH. No. : BH-A1	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):10.90	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-08-2021		Date of Completion : 27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	5	7	12	Brown, Medium dense, Silty sand with clay	SM-SC			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	5	7	9	16					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	7	10	12	22					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0							Brown, Hard, Silty clay of low plasticity	CL			
9.5											
10.0	10	SPT-4	12	15	17	32					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

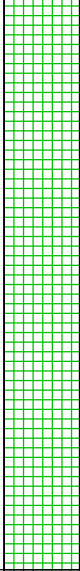
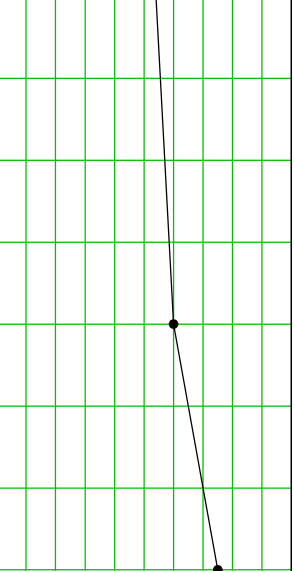
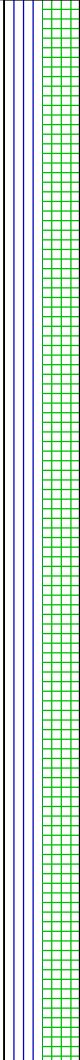
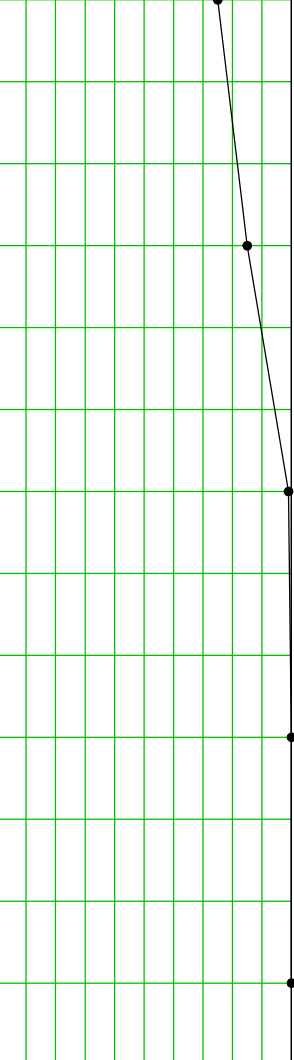
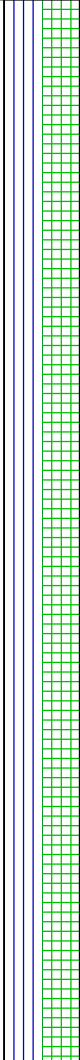
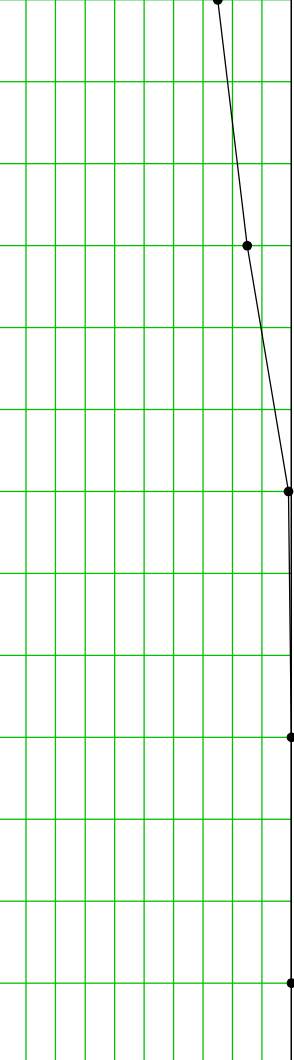
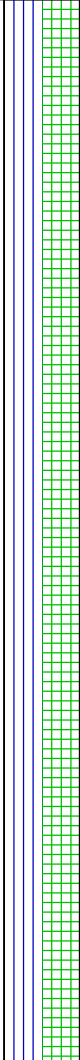
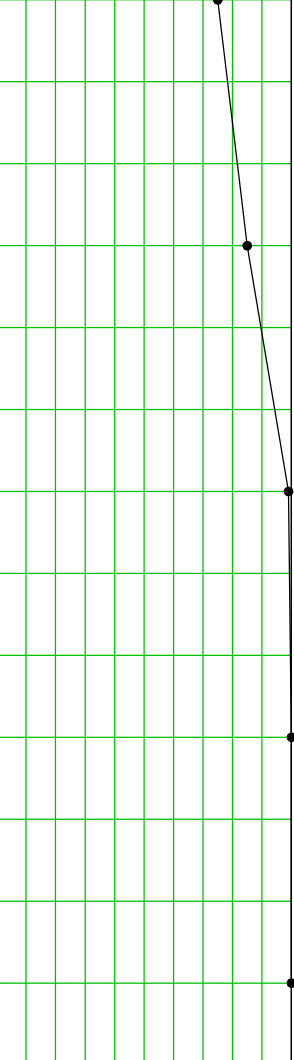
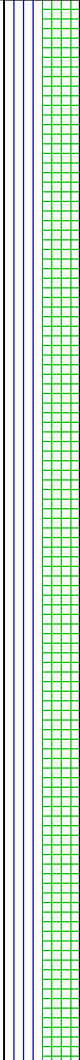
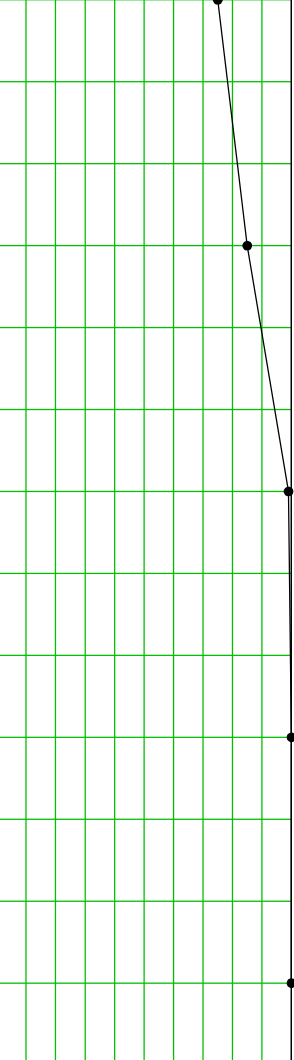
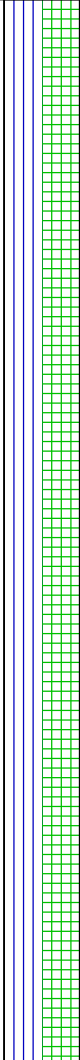
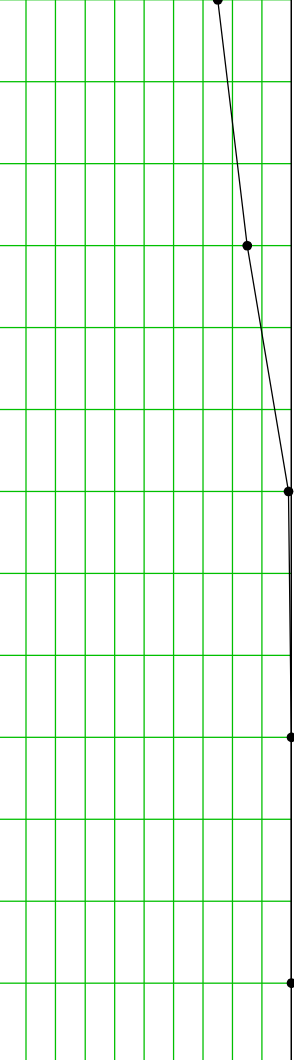
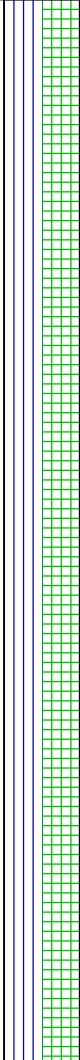
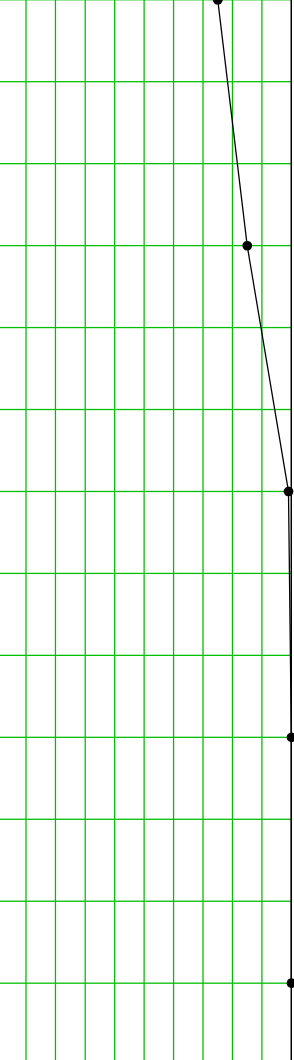
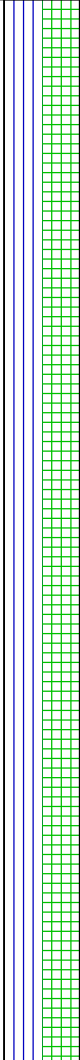
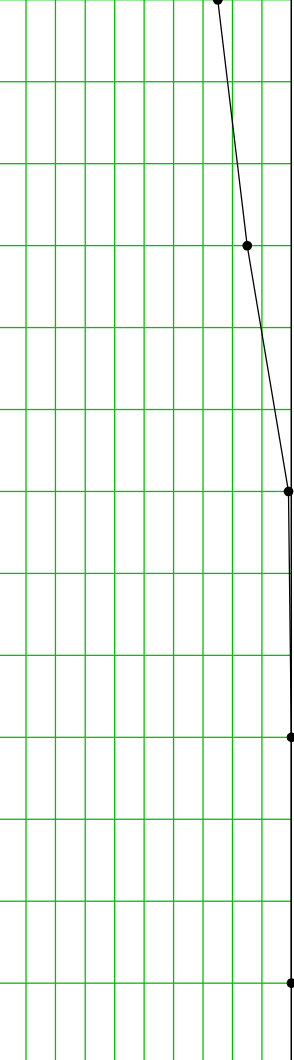
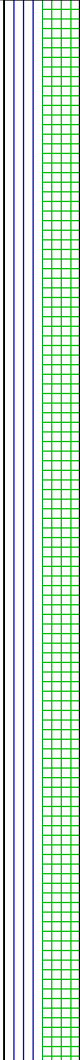
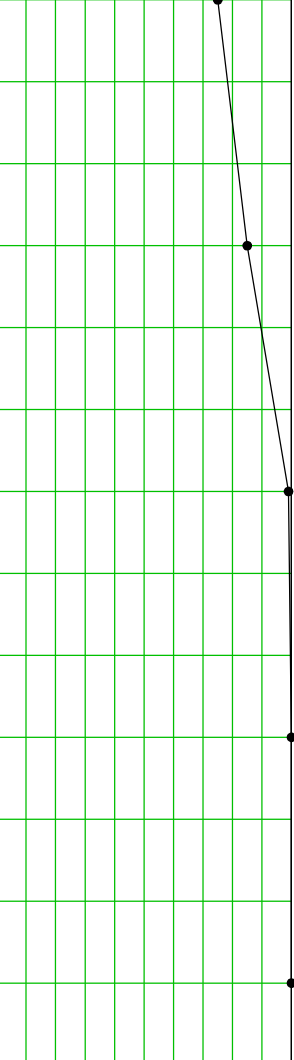
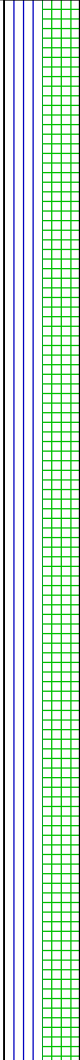
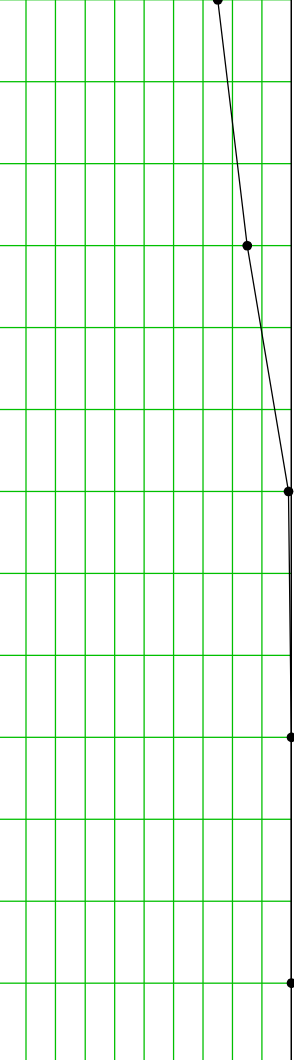
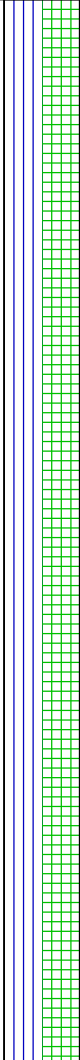
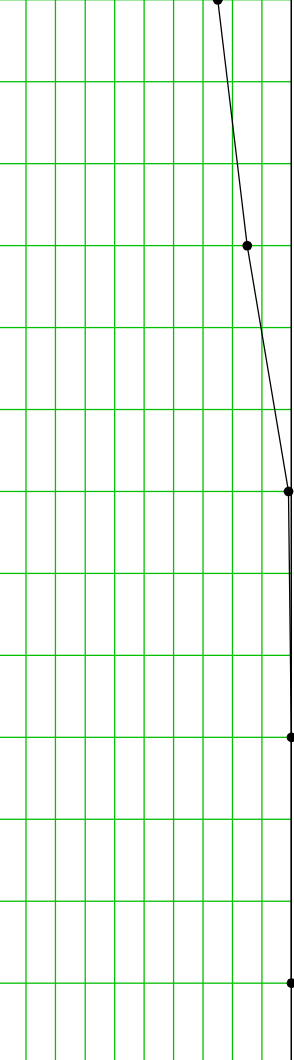
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148361.347 m	Easting :682111.171 m
Reduced Level (m):(+)217.941	BH. No. :BH-A1	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.90	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4					Brown, Hard, Silty clay of low plasticity	CL			
12.0											
12.5											
13.0	13	SPT-5	18	23	29	52					
13.5											
14.0											
14.5	14.5	UDS-5					Brown, Very dense, Silty sand	SM			
15.0											
15.5											
16.0	16	SPT-6	23	28	34	62					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	16	24	27	51	Brown, Hard, Silty clay of low plasticity	CL			
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148361.347 m	Easting :682111.171 m
Reduced Level (m):(+)217.941	BH. No. :BH-A1	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.90	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	21	28	32	60					
22.5							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
23.0											
23.5	23.5	SPT-9	27	34	41	75					
24.0											
24.5											
25.0	25	SPT-10	29	36	49	85					
25.5											
26.0											
26.5	26.5	SPT-11	34	48	51	99					
27.0											
27.5											
28.0	28	SPT-12	40	55	45 (4cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-13	46	66	34 (13cm)	>100					
30.0	30	-									

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148389.429 m	Easting : 682104.781 m
Reduced Level (m): (+)213.893	BH. No. : BH-P2	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.85	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	6	7	8	15					
2.5	2.5	UDS-1					Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
4.0	4	SPT-2	8	10	14	24					
5.5	5.5	UDS-2									
7.0	7	SPT-3	10	14	18	32	Brown, Hard, Silty clay of low plasticity	CL			
8.5	8.5	UDS-3									
9.5							Brown, Dense, Sandy silt of low plasticity	ML-CL			
10.0	10	SPT-4	12	16	21	37					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148389.429 m	Easting :682104.781 m
Reduced Level (m):(+)213.893	BH. No. :BH-P2	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.85	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	19	23	42	Brown, Dense, Sandy silt of low plasticity	ML-CL			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	18	26	38	64					
16.5											
17.0											
17.5	17.5	UDS-6					Brown, Hard, Silty clay of low plasticity	CL			
18.0											
18.5											
19.0	19	SPT-7	24	29	41	70					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148389.429 m	Easting :682104.781 m
Reduced Level (m):(+)213.893	BH. No. :BH-P2	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.85	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	27	36	48	84					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.0	25	SPT-9	26	38	58	96					
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	32	58	42 (6cm)	>100					
28.5											
29.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
29.5	29.5	SPT-11	42	62	38 (7cm)	>100					
30.0	30										

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148402.495 m	Easting : 682101.808 m
Reduced Level (m): (+)214.414	BH. No. : BH-P3	BH Termination Depth (m): 31
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.50	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	2	5	7	12					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	7	11	15	26					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	13	16	19	35					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

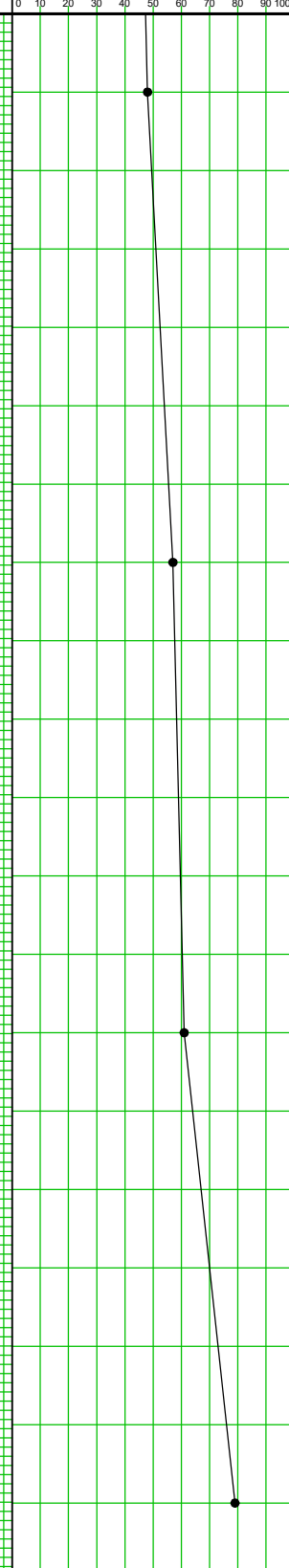
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148402.495 m	Easting :682101.808 m
Reduced Level (m):(+)214.414	BH. No. :BH-P3	BH Termination Depth (m):31
Proposed / Existing Structure :Major Bridge	Water Table (m):11.50	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	15	17	20	37		▼ 11.50m	●		
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	16	18	21	39	Brown, Dense, Silty sand	SM	●		
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	17	20	24	44			●		
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

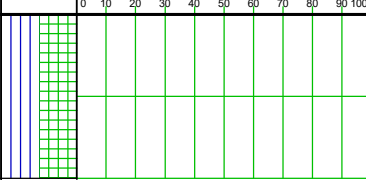
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148402.495 m	Easting : 682101.808 m
Reduced Level (m): (+)214.414	BH. No. : BH-P3	BH Termination Depth (m): 31
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.50	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	19	23	25	48	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	22	27	30	57					
24.0											
24.5											
25.0	25	UDS-9									
25.5											
26.0											
26.5	26.5	SPT-9	24	29	32	61					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	31	37	42	79					
30.0											

UDS*-UDS not recovered

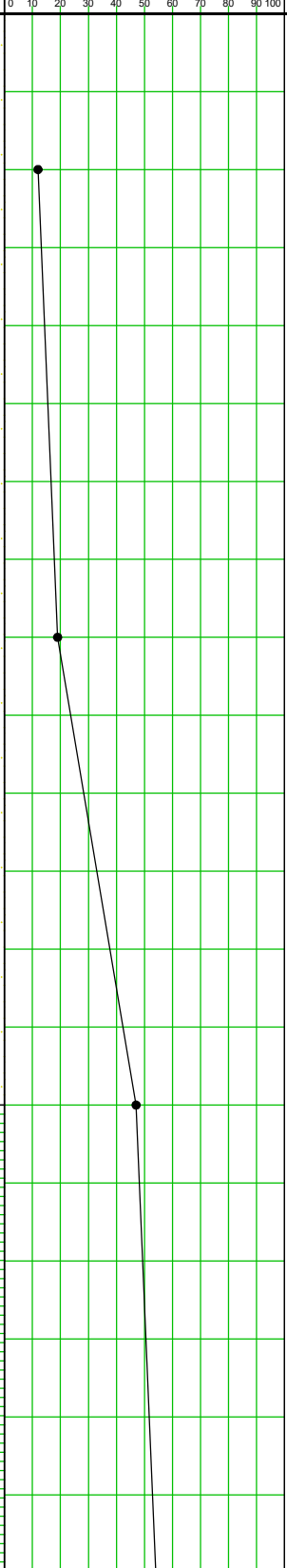
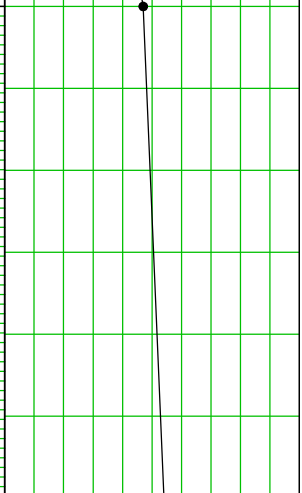
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148402.495 m	Easting :682101.808 m
Reduced Level (m):(+)214.414	BH. No. :BH-P3	BH Termination Depth (m):31
Proposed / Existing Structure :Major Bridge	Water Table (m):11.50	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
31.0	31	UDS-11									

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148415.561 m	Easting : 682098.835 m
Reduced Level (m): (+)214.498	BH. No. : BH-P4	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.80	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-08-2021	Date of Completion : 25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	5	7	12	Brown, Medium dense, Silty sand	SM			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	5	8	11						
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	10	15	32	47	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	11	17	37	54					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148415.561 m	Easting :682098.835 m
Reduced Level (m):(+)214.498	BH. No. :BH-P4	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :24-08-2021		Date of Completion :25-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	19	39	58					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-6	13	21	38	59					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	15	35	40	75					
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148415.561 m	Easting : 682098.835 m
Reduced Level (m): (+)214.498	BH. No. : BH-P4	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.80	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-08-2021	Date of Completion : 25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	17	29	42	71					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	20	31	45	76	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS*									
27.0											
27.5											
28.0	28	SPT-10	28	36	48	84					
28.5											
29.0											
29.5	29.5	UDS-9									
30.0	30										

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148428.627 m	Easting : 682095.861 m
Reduced Level (m): (+)214.548	BH. No. : BH-P5	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-08-2021	Date of Completion : 25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	3	5	6	11					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense to dense, Silty sand	SM			
5.5	5.5	SPT-2	7	9	11	20					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	12	14	17	31					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

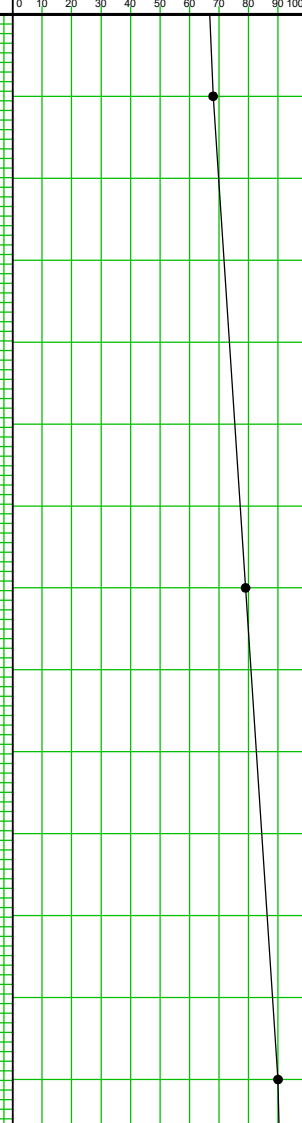
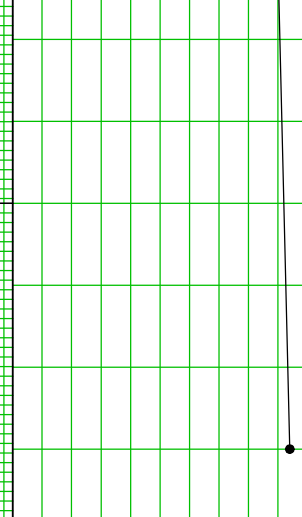
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148428.627 m	Easting :682095.861 m
Reduced Level (m):(+)214.548	BH. No. :BH-P5	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :24-08-2021	Date of Completion :25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	15	20	25	45					
12.0								▼ 12.00m			
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	18	24	29	53					
15.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	22	28	33	61					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148428.627 m	Easting : 682095.861 m
Reduced Level (m): (+)214.548	BH. No. : BH-P5	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-08-2021	Date of Completion : 25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	19	31	37	68	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	27	36	43	79					
24.0											
24.5											
25.0	25	UDS*									
25.5											
26.0											
26.5	26.5	SPT-9	28	43	47	90					
27.0											
27.5											
28.0	28	UDS-9				Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL				
28.5											
29.0											
29.5	29.5	SPT-10	26	45	59					94	
30.0	30										

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148441.693 m	Easting : 682092.888 m
Reduced Level (m):(+)214.417	BH. No. : BH-P6	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):11.40	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	2	4	6	10					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	4	7	9	16	Brown, Medium dense, Silty sand	SM			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	4	8	12	20					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0							Brown, Very stiff to hard, Silty clay of low plasticity	CL			
9.5											
10.0	10	SPT-4	6	10	16	26					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148441.693 m	Easting :682092.888 m
Reduced Level (m):(+)214.417	BH. No. :BH-P6	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.40	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021	Date of Completion :24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4						▼ 11.40m			
12.0						Brown, Very stiff to hard, Silty clay of low plasticity	CL				
12.5											
13.0	13	SPT-5	9	13	19	32					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	15	21	29	50					
16.5											
17.0											
17.5	17.5	UDS-6					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
18.0											
18.5											
19.0	19	SPT-7	14	22	31	53					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148441.693 m	Easting : 682092.888 m
Reduced Level (m): (+)214.417	BH. No. : BH-P6	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.40	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	16	25	35	60					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	17	26	37	63	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	19	31	42	73					
28.5											
29.0											
29.5	29.5	UDS*									
30.0	30										

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148454.759 m	Easting : 682089.915 m
Reduced Level (m): (+)214.599	BH. No. : BH-P7	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	6	8	14					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Silty sand	SM			
5.5	5.5	SPT-2	7	10	11	21					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	9	14	16	30					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148454.759 m	Easting :682089.915 m
Reduced Level (m):(+)214.599	BH. No. :BH-P7	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0								▼ 11.00m			
11.5	11.5	SPT-4	13	19	23	42			●		
12.0											
12.5											
13.0	13	UDS-5					Brown, hard, Silty clay of low plasticity	CL			
13.5											
14.0											
14.5	14.5	SPT-5	12	15	18	33			●		
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	14	20	23	43			●		
18.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148454.759 m	Easting : 682089.915 m
Reduced Level (m): (+)214.599	BH. No. : BH-P7	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	25	27	32	59					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	24	29	34	63					
24.0											
24.5											
25.0	25	UDS-9					Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-9	27	35	45	80					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	31	42	51	93					
30.0	30										

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148480.891 m	Easting : 682083.968 m
Reduced Level (m): (+)214.330	BH. No. : BH-P9	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 28.00
Date of Start : 20-08-2021	Date of Completion : 22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	3	6	7	13	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
2.5	2.5	UDS-1									
4.0	4	SPT-2	4	8	10	18					
5.5	5.5	UDS-2									
7.0	7	SPT-3	6	9	10	19	Brown, Hard, Silty clay of low plasticity	CL			
8.5	8.5	UDS-3									
9.0											
10.0	10	SPT-4	9	14	19	33					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148480.891 m	Easting :682083.968 m
Reduced Level (m):(+)214.330	BH. No. :BH-P9	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :28.00
Date of Start :20-08-2021	Date of Completion :22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0								▼ 12.00m			
12.5											
13.0	13	SPT-5	8	13	17	30					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	16	30	36	66	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	12	17	25	42	Brown, Hard, Silty clay of low plasticity	CL			
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148480.891 m	Easting :682083.968 m
Reduced Level (m):(+)214.330	BH. No. :BH-P9	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :28.00
Date of Start :20-08-2021	Date of Completion :22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	13	20	28	48	Brown, Hard, Silty clay of low plasticity	CL			
22.5											
23.0											
23.5	23.5	SPT-9	18	24	36	60					
24.0											
24.5											
25.0	25	SPT-10	29	32	39	71					
25.5											
26.0											
26.5	26.5	SPT-11	30	36	41	77	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
27.0											
27.5											
28.0	28	SPT-12	35	40	48	88					
28.5											
29.0											
29.5	29.5	SPT-13	37	41	50	91					
30.0											

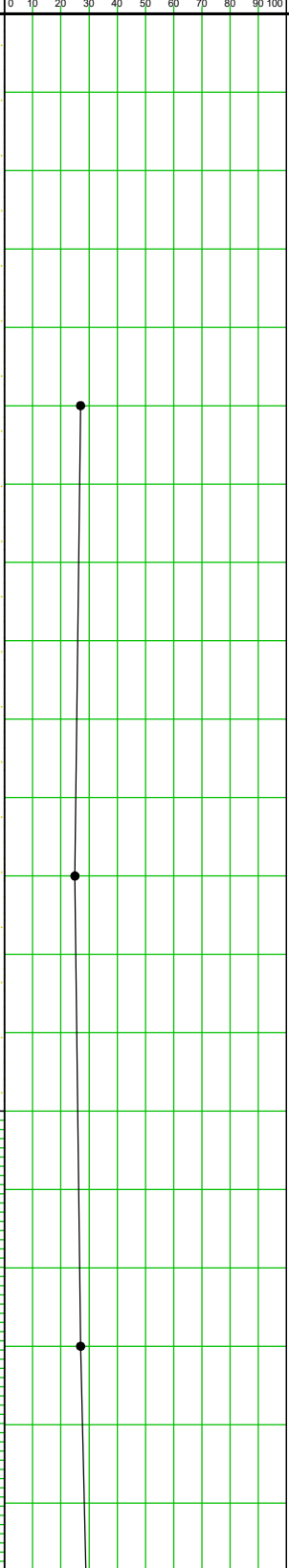
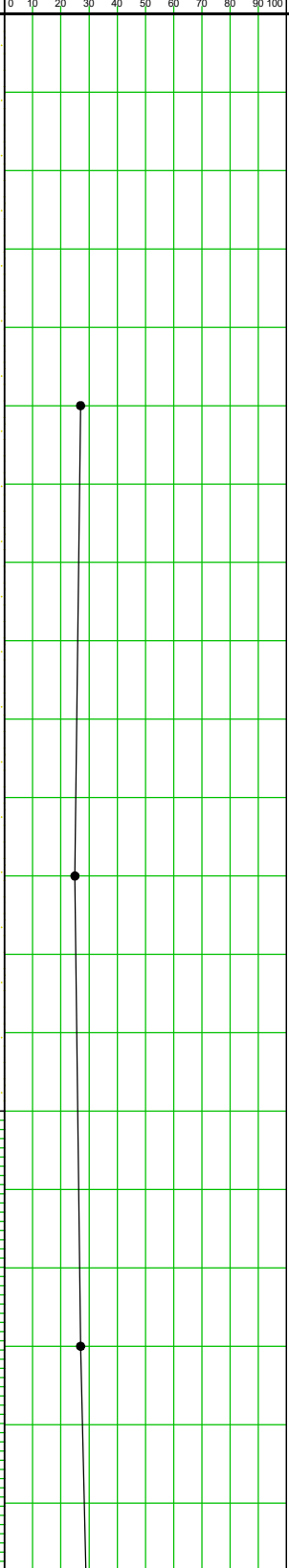
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148480.891 m	Easting : 682083.968 m
Reduced Level (m): (+)214.330	BH. No. : BH-P9	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 28.00
Date of Start : 20-08-2021	Date of Completion : 22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-14	32	45	52	97					
31.5											
32.0											
32.5	32.5	SPT-15	29	52	48 (10cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
33.0											
33.5											
34.0	34	SPT-16	31	58	42 (8cm)	>100					
34.5											
35.0	35	SPT-17	33	67	33 (5cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148493.957 m	Easting : 682080.995 m
Reduced Level (m):(+)214.021	BH. No. : BH-P10	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):11.85	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) :27.00
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	9	12	15	27	Brown, Medium dense, Silty sand	SM			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	6	11	14	25					
6.0											
6.5											
7.0	7	UDS-3					Brown, Very stiff, Silty clay of low plasticity	CL			
7.5											
8.0											
8.5	8.5	SPT-3	8	11	16	27					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148493.957 m	Easting :682080.995 m
Reduced Level (m):(+)214.021	BH. No. :BH-P10	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.85	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :27.00
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	9	13	18	31					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	10	15	22	37					
15.0							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	13	18	25	43					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

▼ 11.85m

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148493.957 m	Easting : 682080.995 m
Reduced Level (m): (+)214.021	BH. No. : BH-P10	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.85	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 27.00
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	14	20	28	48					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	15	24	31	55					
24.0											
24.5											
25.0	25	SPT-9	16	28	32	60	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-10	14	23	33	56					
27.0											
27.5											
28.0	28	SPT-11	16	42	58	>100					
28.5											
29.0											
29.5	29.5	SPT-12	52	64	36 (4cm)	>100					
30.0	30										



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148507.023 m	Easting : 682078.022 m
Reduced Level (m): (+)213.946	BH. No. : BH-P11	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.80	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 27.50
Date of Start : 24-08-2021	Date of Completion : 25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	2	4	5	9					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	5	8	10	18					
4.5											
5.0							Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	6	10	12	22					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	8	12	15	27					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148507.023 m	Easting :682078.022 m
Reduced Level (m):(+)213.946	BH. No. :BH-P11	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :27.50
Date of Start :24-08-2021		Date of Completion :25-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	14	16	30					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-6	7	9	13	22					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	8	10	15	25					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

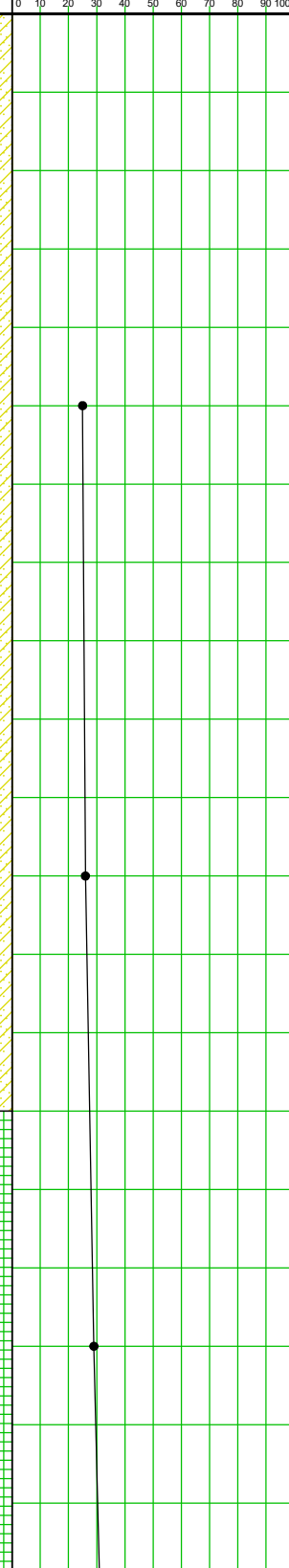
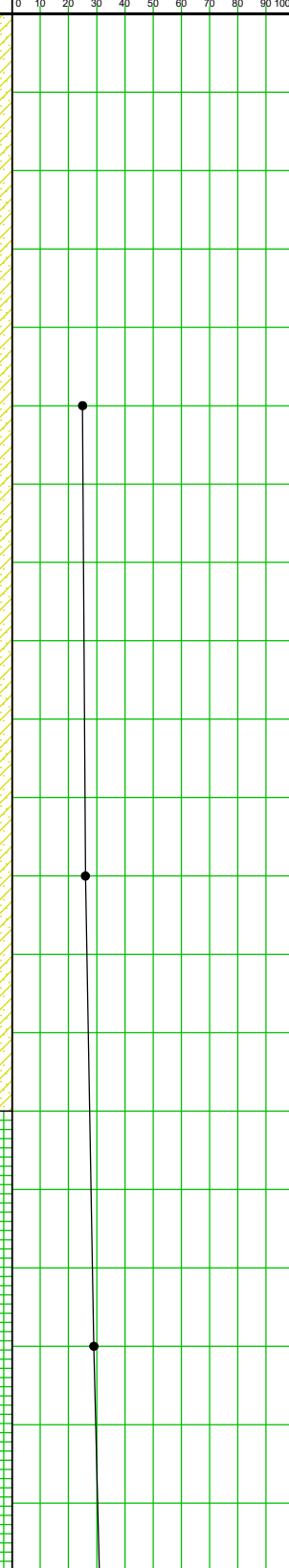
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148507.023 m	Easting :682078.022 m
Reduced Level (m):(+)213.946	BH. No. :BH-P11	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :27.50
Date of Start :24-08-2021	Date of Completion :25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	9	13	17	30	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
22.5											
23.0											
23.5	23.5	SPT-9	11	25	20	45					
24.0											
24.5											
25.0	25	SPT-10	12	20	24	44	Brown, Hard, Silty clay of low plasticity	CL			
25.5											
26.0											
26.5	26.5	SPT-11	20	35	50	85					
27.0											
27.5											
28.0	28	SPT-12	21	50	50 (10cm)	>100	Brown, Very dense, Sandy silt of low plastic	ML-CL			
28.5											
29.0											
29.5	29.5	SPT-13	40	80	20 (3cm)	>100					
30.0	30										

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148520.089 m	Easting : 682075.049 m
Reduced Level (m):(+)214.402	BH. No. : BH-P12	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):12.10	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 26-08-2021		Date of Completion : 27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	8	11	14	25	Brown, Medium dense, Silty sand	SM-SC			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	10	12	14	26					
6.0											
6.5											
7.0	7	UDS-3					Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
7.5											
8.0											
8.5	8.5	SPT-3	12	13	16	29					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148520.089 m	Easting :682075.049 m
Reduced Level (m):(+)214.402	BH. No. :BH-P12	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):12.10	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :26-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	13	15	18	33					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	14	17	20	37					
15.0							Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	12	16	19	35					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered


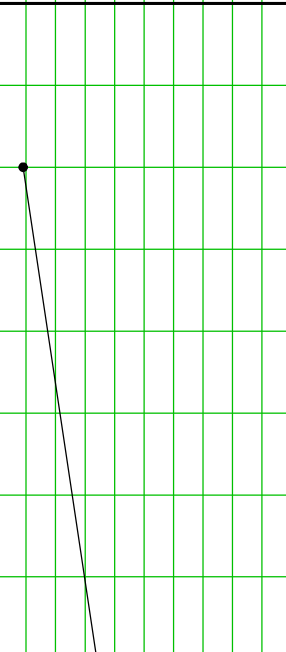
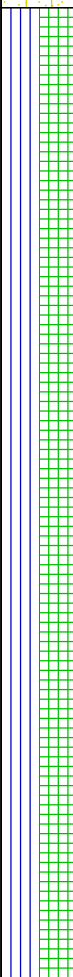
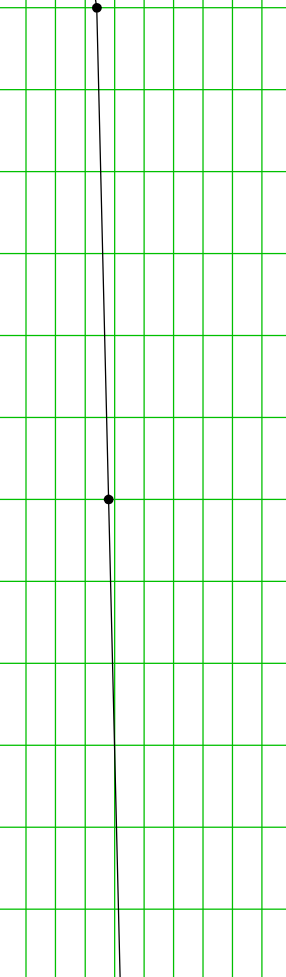
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148520.089 m	Easting :682075.049 m
Reduced Level (m):(+)214.402	BH. No. :BH-P12	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):12.10	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :26-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	11	13	19	32					
21.0											
21.5											
22.0	22	SPT-8	13	16	22	38					
22.5											
23.0											
23.5	23.5	SPT-9	15	20	31	51					
24.0											
24.5											
25.0	25	SPT-10	16	26	34	60	Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-11	17	22	27	49					
27.0											
27.5											
28.0	28	SPT-12	20	25	33	58					
28.5											
29.0											
29.5	29.5	SPT-13	38	70	30 (4cm)	>100					
30.0	30										

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148533.155 m	Easting : 682072.075 m
Reduced Level (m):(+)214.579	BH. No. : BH-P13	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):12.30	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-08-2021	Date of Completion : 28-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	5	9	Brown, Loose, Silty sand	SM			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	10	15	19	34	Brown, Dense, Sandy silt of low plasticity	ML-CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	11	17	21	38					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	12	19	23	42					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148533.155 m	Easting :682072.075 m
Reduced Level (m):(+)214.579	BH. No. :BH-P13	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):12.30	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-08-2021		Date of Completion :28-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5								▼ 12.30m			
13.0	13	SPT-5	14	21	25	46	Brown, Dense, Sandy silt of low plasticity ML-CL		●		
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	10	16	22	38			●		
16.5											
17.0											
17.5	17.5	UDS-6									
18.0							Brown, Hard, Silty clay of low plasticity CL				
18.5											
19.0	19	SPT-7	12	18	33	51				●	
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148533.155 m	Easting : 682072.075 m
Reduced Level (m): (+)214.579	BH. No. : BH-P13	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.30	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-08-2021		Date of Completion : 28-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	15	33	40	73					
22.5											
23.0											
23.5	23.5	SPT-9	14	25	35	60					
24.0											
24.5											
25.0	25	SPT-10	15	27	40	67	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-11	14	25	35	60					
27.0											
27.5											
28.0	28	SPT-12	15	24	35	59					
28.5											
29.0											
29.5	29.5	SPT-13	19	28	34	62					
30.0	30										

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148559.287 m	Easting : 682066.129 m
Reduced Level (m):(+)213.460	BH. No. : BH-P15	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 25-08-2021	Date of Completion : 26-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	7	8	15					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	6	8	10	18					
4.5											
5.0							Brown, Medium dense, Silty sand	SM-SC			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	8	11	14	25					
7.5											
8.0											
8.5	8.5	UDS*									
9.0											
9.5											
10.0	10	SPT-4	18	25	31	56					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

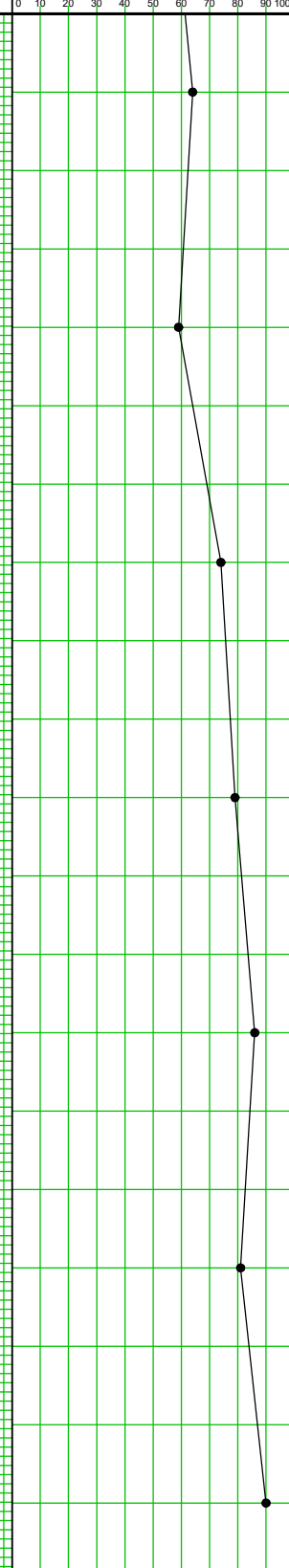
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148559.287 m	Easting :682066.129 m
Reduced Level (m):(+)213.460	BH. No. :BH-P15	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :25-08-2021		Date of Completion :26-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-3									
12.0											
12.5											
13.0	13	SPT-5	20	28	33	61					
13.5											
14.0											
14.5	14.5	UDS-4									
15.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-6	18	23	28	51					
16.5											
17.0											
17.5	17.5	UDS-5									
18.0											
18.5											
19.0	19	SPT-7	21	26	30	56					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148559.287 m	Easting :682066.129 m
Reduced Level (m):(+)213.460	BH. No. :BH-P15	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.80	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :25-08-2021	Date of Completion :26-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	24	29	35	64	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	SPT-9	22	27	32	59					
22.5											
23.0											
23.5	23.5	SPT-10	28	35	39	74					
24.0											
24.5											
25.0	25	SPT-11	26	37	42	79					
25.5											
26.0											
26.5	26.5	SPT-12	29	40	46	86					
27.0											
27.5											
28.0	28	SPT-13	32	38	43	81					
28.5											
29.0											
29.5	29.5	SPT-14	35	41	49	90					
30.0	30										



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148572.353 m	Easting : 682063.156 m
Reduced Level (m): (+)212.949	BH. No. : BH-P16	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.20	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-08-2021	Date of Completion : 28-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	5	7	9	16					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	6	8	11	19					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	7	9	12	21					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

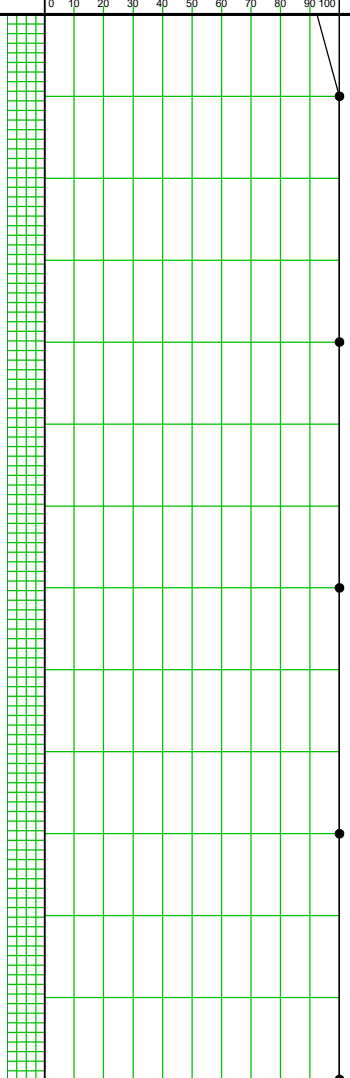
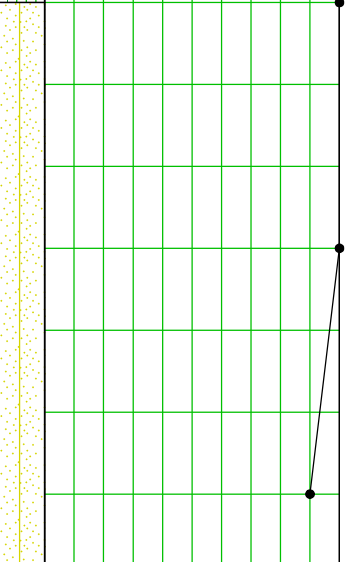
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148572.353 m	Easting :682063.156 m
Reduced Level (m):(+)212.949	BH. No. :BH-P16	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.20	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-08-2021	Date of Completion :28-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	7	10	14	24		▼ 11.20m	●		
12.0											
12.5											
13.0	13	UDS*									
13.5											
14.0											
14.5	14.5	SPT-5	9	13	18	31	Brown, Medium dense to dense, Silty sand	SM	●		
15.0											
15.5											
16.0	16	UDS-5									
16.5											
17.0											
17.5	17.5	SPT-6	12	16	23	39			●		
18.0											
18.5											
19.0	19	SPT-7	22	34	43	77			●		
19.5							Brown, Very dense, Sandy silt of low plasticity	ML-CL	●		
20.0											

UDS*-UDS not recovered

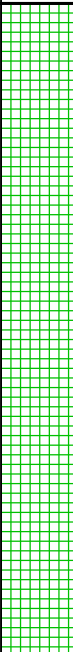
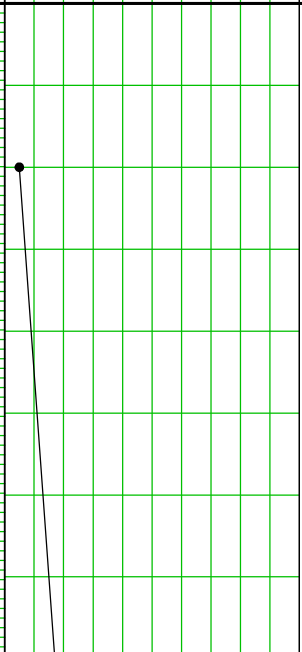
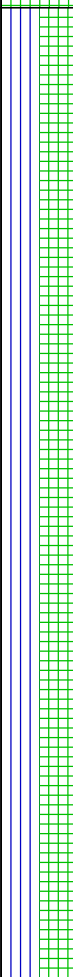
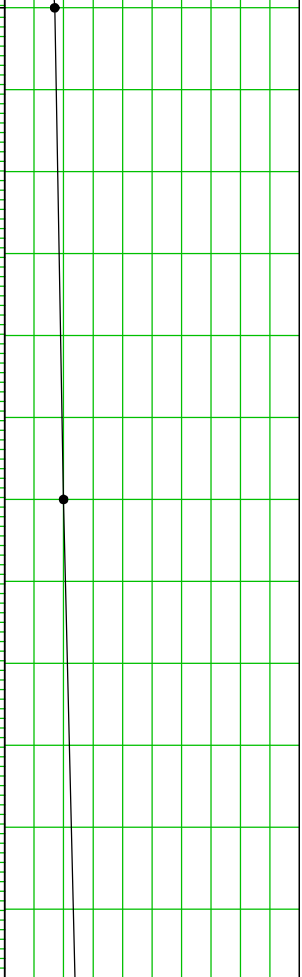
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148572.353 m	Easting :682063.156 m
Reduced Level (m):(+)212.949	BH. No. :BH-P16	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.20	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-08-2021		Date of Completion :28-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	29	63	37 (9cm)	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	SPT-9	31	65	35 (8cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-10	30	67	33 (11cm)	>100					
24.0											
24.5											
25.0	25	SPT-11	27	55	45 (8cm)	>100					
25.5											
26.0											
26.5	26.5	SPT-12	38	62	38 (11cm)	>100	Brown, Very dense, Silty sand	SM			
27.0											
27.5											
28.0	28	SPT-13	33	60	40 (9cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-14	33	46	44	90					
30.0	30										

FIELD BOREHOLE LOG

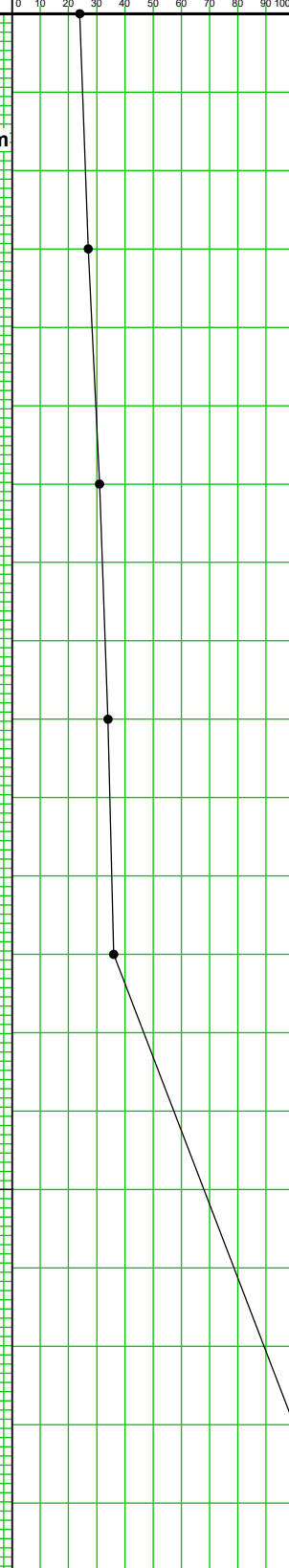
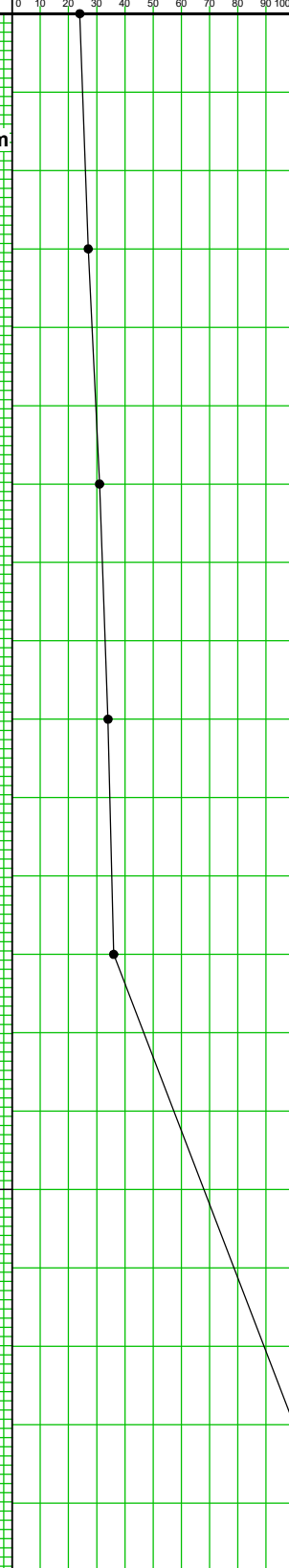
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148585.419 m	Easting : 682060.182 m
Reduced Level (m): (+)213.184	BH. No. : BH-P17	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 10.80	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 26-08-2021	Date of Completion : 27-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	3	2	5	Brown, Medium stiff, Silty clay of low plasticity CL				
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	4	7	10	17	Brown, Medium dense to dense, Sandy silt of low plasticity ML-CL				
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	6	8	12	20					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	8	10	14	24					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148585.419 m	Easting :682060.182 m
Reduced Level (m):(+)213.184	BH. No. :BH-P17	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.80	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :26-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-5	9	11	16	27	Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
12.0											
12.5											
13.0	13	SPT-6	9	13	18	31					
13.5											
14.0											
14.5	14.5	SPT-7	11	14	20	34					
15.0											
15.5											
16.0	16	SPT-8	12	15	21	36					
16.5											
17.0											
17.5	17.5	UDS-4					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
18.0											
18.5											
19.0	19	SPT-9	43	68	32 (3cm)	>100					
19.5											
20.0											

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148585.419 m	Easting :682060.182 m
Reduced Level (m):(+)213.184	BH. No. :BH-P17	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.80	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :26-08-2021		Date of Completion :27-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-10	35	55	45 (10cm)	>100					
21.0											
21.5											
22.0	22	SPT-11	33	53	47 (9cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-12	36	62	38 (5cm)	>100					
24.0											
24.5											
25.0	25	SPT-13	38	65	35 (9cm)	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-14	34	67	33 (9cm)	>100					
27.0											
27.5											
28.0	28	SPT-15	30	75	25 (5cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-16	39	68	32 (3cm)	>100					
30.0	30										

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148598.485 m	Easting : 682057.209 m
Reduced Level (m):(+)213.517	BH. No. : BH-P18	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):10.50	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) :27.50
Date of Start :24-08-2021	Date of Completion :25-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	5	6	9	15					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	7	9	11	20					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	8	12	14	26					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148598.485 m	Easting :682057.209 m
Reduced Level (m):(+)213.517	BH. No. :BH-P18	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.50	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :27.50
Date of Start :24-08-2021		Date of Completion :25-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0									0 10 20 30 40 50 60 70 80 90 100		
10.5								▼ 10.50m			
11.5	11.5	SPT-4	10	14	16	30	Brown, Hard, Silty clay of low plasticity CL				
13.0	13	SPT-5	8	13	17	30					
14.5	14.5	SPT-6	11	15	19	34					
16.0	16	SPT-7	9	14	20	34					
17.5	17.5	SPT-8	37	67	33 (5cm)	>100	Brown, Very dense, Sandy silt of low plasticity ML-CL				
19.0	19	SPT-9	35	65	35 (7cm)	>100					
18.0											
18.5											
19.5											
20.0											



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148598.485 m	Easting :682057.209 m
Reduced Level (m):(+)213.517	BH. No. :BH-P18	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):10.50	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :27.50
Date of Start :24-08-2021		Date of Completion :25-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0									0 10 20 30 40 50 60 70 80 90 100		
20.5	20.5	SPT-10	36	65	35 (3cm)	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	SPT-11	36	66	34 (10cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-12	38	68	32 (6cm)	>100					
24.0											
24.5											
25.0	25	SPT-13	31	59	41 (9cm)	>100					
25.5											
26.0											
26.5	26.5	SPT-14	39	59	44 (11cm)	>100					
27.0											
27.5											
28.0	28	SPT-15	32	58	42 (8cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-16	48	69	31 (12cm)	>100					
30.0	30										

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148611.551 m	Easting : 682054.236 m
Reduced Level (m): (+)213.504	BH. No. : BH-P19	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.50	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 26.00
Date of Start : 23-08-2021		Date of Completion : 24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	4	5	6	11					
2.5	2.5	UDS-1									
4.0	4	SPT-2	7	7	7	14					
5.5	5.5	UDS-2									
7.0	7	SPT-3	6	9	10	19					
8.5	8.5	UDS-3									
10.0	10	SPT-4	7	10	13	23					

Brown, Medium dense, Sandy silt of low plasticity

ML-CL



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148611.551 m	Easting :682054.236 m
Reduced Level (m):(+)213.504	BH. No. :BH-P19	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):11.50	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :26.00
Date of Start :23-08-2021		Date of Completion :24-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-5	8	11	20	31		▼ 11.50m			
12.0											
12.5											
13.0	13	SPT-6	9	13	18	31	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
13.5											
14.0											
14.5	14.5	SPT-7	7	11	16	27					
15.0											
15.5											
16.0	16	SPT-8	8	12	19	31					
16.5											
17.0											
17.5	17.5	UDS-4									
18.0							Brown, Hard, Silty clay of medium plasticity	CL			
18.5											
19.0	19	SPT-9	11	14	21	35					
19.5											
20.0											

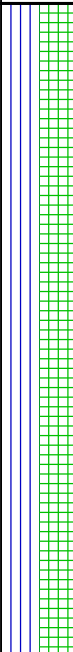
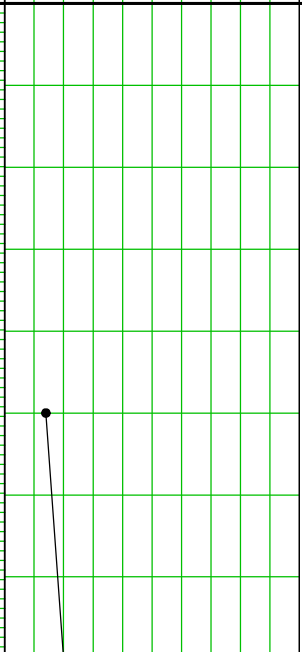

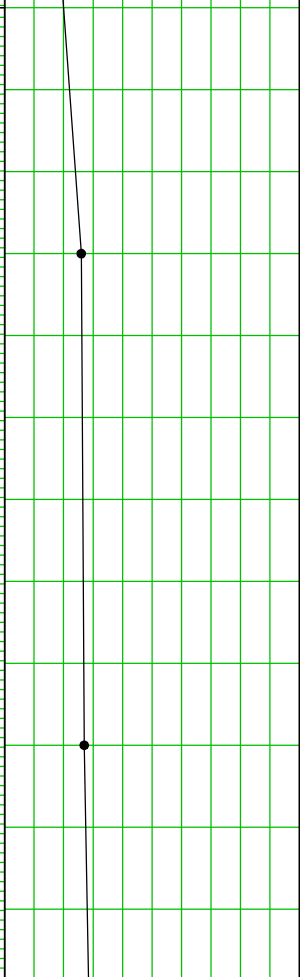
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148611.551 m	Easting : 682054.236 m
Reduced Level (m):(+)213.504	BH. No. : BH-P19	BH Termination Depth (m):30
Proposed / Existing Structure : Major Bridge	Water Table (m):11.50	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) :26.00
Date of Start :23-08-2021	Date of Completion :24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations	
			N1	N2	N3							
20.0												
20.5	20.5	SPT-10	64	36 (9cm)	-	>100	Brown, Hard, Silty clay of medium plasticity	CL				
21.0												
21.5												
22.0	22	SPT-11	56	44 (8cm)	-	>100	Brown, Very dense, Silty sand	SM				
22.5												
23.0												
23.5	23.5	SPT-12	59	41 (7cm)	-	>100						
24.0												
24.5												
25.0	25	SPT-13	54	46 (5cm)	-	>100						
25.5												
26.0												
26.5	26.5	SPT-14	22	56 (3cm)		>100						
27.0												
27.5												
28.0	28	SPT-15	24	51 (10cm)		>100						
28.5												
29.0												
29.5	29.5	SPT-16	33	64 (10cm)	-	>100						
30.0	30											

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148626.567 m	Easting : 682050.819 m
Reduced Level (m): (+)213.090	BH. No. : BH-A2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): 10.90	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 26.00
Date of Start : 20-08-2021	Date of Completion : 22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1					Brown, Medium dense, Sandy silt of low plasticity ML-CL				
1.5											
2.0											
2.5	2.5	SPT-1	4	6	8	14					
3.0											
3.5											
4.0	4	UDS-2					Brown, Very stiff, Silty clay of low plasticity CL				
4.5											
5.0											
5.5	5.5	SPT-2	8	11	15	26					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	7	10	17	27					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

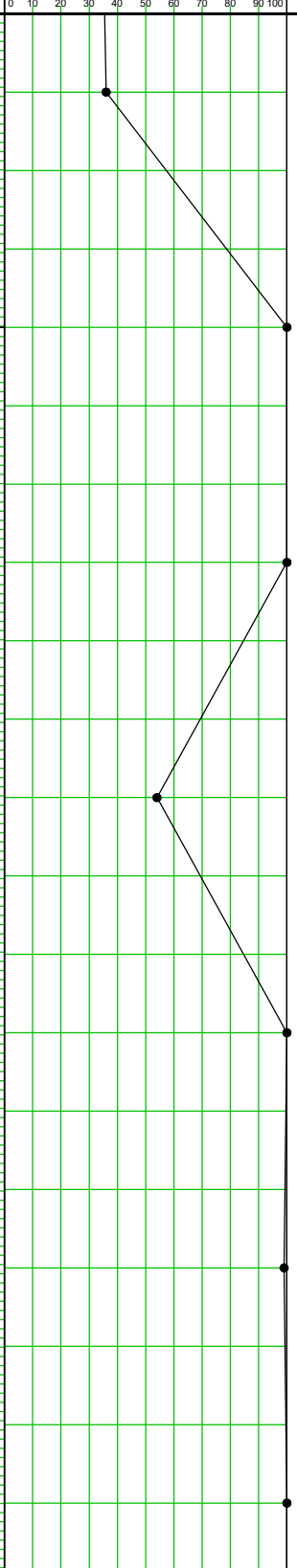
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148626.567 m	Easting :682050.819 m
Reduced Level (m):(+)213.090	BH. No. :BH-A2	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):10.90	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :26.00
Date of Start :20-08-2021		Date of Completion :22-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	8	11	19	30					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	9	13	21	34					
15.0							Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	11	14	19	33					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+400 km	Northing :3148626.567 m	Easting :682050.819 m
Reduced Level (m):(+)213.090	BH. No. :BH-A2	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):10.90	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :26.00
Date of Start :20-08-2021		Date of Completion :22-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	12	15	21	36	Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL			
21.0											
21.5											
22.0	22	SPT-8	70	30 (9cm)	-	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
22.5											
23.0											
23.5	23.5	SPT-9	66	34 (7cm)	-	>100					
24.0											
24.5											
25.0	25	SPT-10	19	25	29	54					
25.5											
26.0											
26.5	26.5	SPT-11	24	45	55 (13cm)	>100					
27.0											
27.5											
28.0	28	SPT-12	29	49	50	99					
28.5											
29.0											
29.5	29.5	SPT-13	25	79	21 (3cm)	>100					
30.0											

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 57+400 km	Northing : 3148626.567 m	Easting : 682050.819 m
Reduced Level (m): (+)213.090	BH. No. : BH-A2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): 10.90	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : 26.00
Date of Start : 20-08-2021	Date of Completion : 22-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-14	26	76	34 (5cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-15	28	71	29 (4cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
33.0											
33.5											
34.0	34	SPT-16	31	69	31 (7cm)	>100					
34.5											
35.0	35	SPT-17	37	76	34 (8cm)	>100					



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :57+980 km	Northing :3149053.752 m	Easting :681950.308 m
Reduced Level (m):(+)213.055	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):9.28	Inclination : Vertical
Boring type :Shell	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-07-2022		Date of Completion :03-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	3	5	6	11	Brown, Silty Clay of medium Plasticity	CI			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-2	4	7	7	14	Stiff to Hard, Brown, Silty Clay of Low Plasticity	CL			
3.5											
4.0											
4.5	4.5	SPT-3	6	8	9	17					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-4	9	13	16	29					
6.5											
7.0											
7.5	7.5	SPT-5	10	15	18	33					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-6	5	7	7	14					
9.5											
10.0	10	SPT-7	6	9	12	21					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

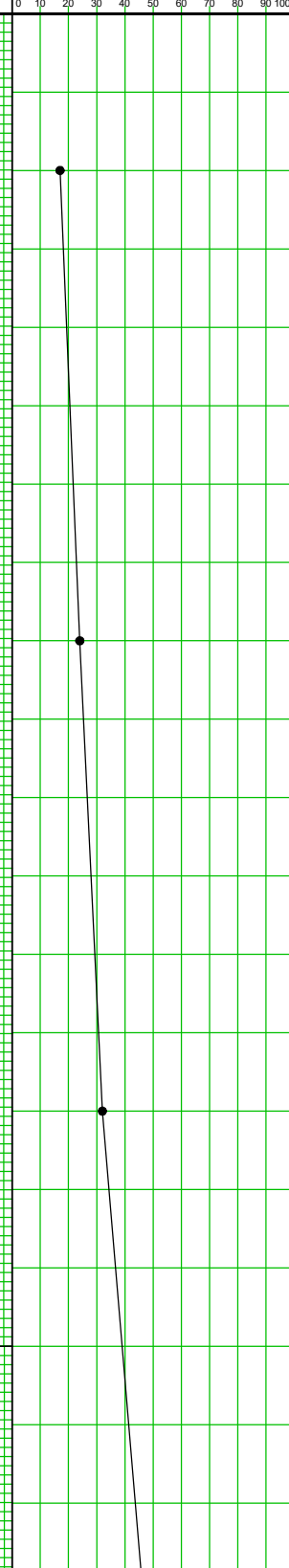
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+191 km	Northing : 3149257.396 m	Easting : 681895.083 m
Reduced Level (m): (+)212.823	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-09-2021	Date of Completion : 24-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations	
			N1	N2	N3							
0.0		DS										
0.5												
1.0	1	SPT-1	2	3	3	6	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL	ML-CL				
1.5												
2.0												
2.5	2.5	UDS-1										
3.0												
3.5												
4.0	4	SPT-2	5	7	9	16						
4.5												
5.0												
5.5	5.5	UDS-2					Brown, Hard, Silty clay of low plasticity with gravel CL	CL				
6.0												
6.5												
7.0	7	SPT-3	11	14	17	31						
7.5												
8.0												
8.5	8.5	UDS-3										
9.0												
9.5												
10.0	10	SPT-4	13	20	26	46						

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149467.024 m	Easting : 681858.38 m
Reduced Level (m): (+)213.216	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 100 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	4	7	10	17	Brown, Medium dense TO DENSE, Sandy silt of low plasticity	ML-CL			
2.5	2.5	UDS-1									
4.0	4	SPT-2	8	11	13	24					
5.5	5.5	UDS-2									
7.0	7	SPT-3	10	14	18	32	Brown, Hard, Silty clay of low plasticity	CL			
8.5	8.5	UDS-3									
10.0	10	SPT-4	18	21	25	46					

UDS*-UDS not recovered

FIELD BOREHOLE LOG


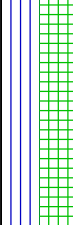
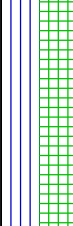
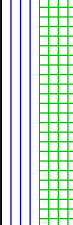
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149467.024 m	Easting :681858.38 m
Reduced Level (m):(+)213.216	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :100 mm	Depth of Casing (m) :Not Used
Date of Start :14-08-2021	Date of Completion :16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS*									
12.0											
12.5											
13.0	13	SPT-5	17	22	26	48					
13.5											
14.0											
14.5	14.5	UDS-4									
15.0							Brown, Hard, Silty clay of low plasticity	CL			
15.5											
16.0	16	SPT-6	20	24	28	52					
16.5											
17.0											
17.5	17.5	UDS-5									
18.0											
18.5											
19.0	19	SPT-7	18	21	24	45					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149467.024 m	Easting :681858.38 m
Reduced Level (m):(+)213.216	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :100 mm	Depth of Casing (m) :Not Used
Date of Start :14-08-2021	Date of Completion :16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-6					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	25	34	41	75					
22.5											
23.0											
23.5	23.5	UDS-7									
24.0											
24.5											
25.0	25	SPT-9	23	31	38	69	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-8									
27.0											
27.5											
28.0	28	SPT-10	21	34	41	75					
28.5											
29.0											
29.5	29.5	UDS-9									
30.0											

FIELD BOREHOLE LOG

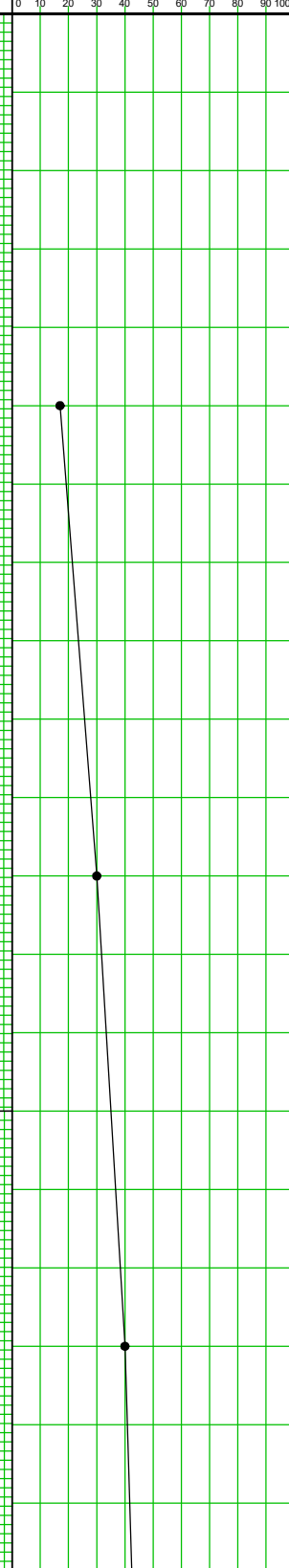
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149467.024 m	Easting : 681858.38 m
Reduced Level (m): (+)213.216	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 100 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	24	35	45	80					
31.5											
32.0											
32.5	32.5	UDS-10									
33.0											
33.5											
34.0	34	SPT-12	34	55	45 (5cm)	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-13	30	64	36 (8cm)	>100					
36.0											
36.5											
37.0	37	SPT-14	38	70	30 (11cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-15	22	29	38	67					
39.0											
39.5											
40.0	40	UDS-11									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149495.176 m	Easting : 681844.488 m
Reduced Level (m):(+)214.371	BH. No. : BH-P1	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):11.60	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 16-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	5	8	9	17	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	10	14	16	30					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	15	18	22	40	Brown, Hard, Silty clay of low plasticity	CL			
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149495.176 m	Easting :681844.488 m
Reduced Level (m):(+)214.371	BH. No. :BH-P1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.60	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-08-2021	Date of Completion :18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	17	21	24	45		▼ 11.60m	●		
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	19	23	26	49	Brown, Hard, Silty clay of low plasticity	CL	●		
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	18	25	29	54			●		
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149495.176 m	Easting :681844.488 m
Reduced Level (m):(+)214.371	BH. No. :BH-P1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.60	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-08-2021	Date of Completion :18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	15	28	33	61					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	20	30	38	68					
24.0											
24.5											
25.0	25	UDS*	28	39	42	81	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-10	23	32	37	69					
27.0											
27.5											
28.0	28	UDS-9									
28.5											
29.0											
29.5	29.5	SPT-11	27	36	41	77					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

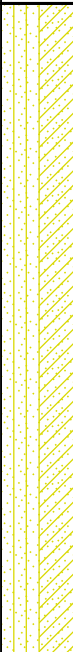
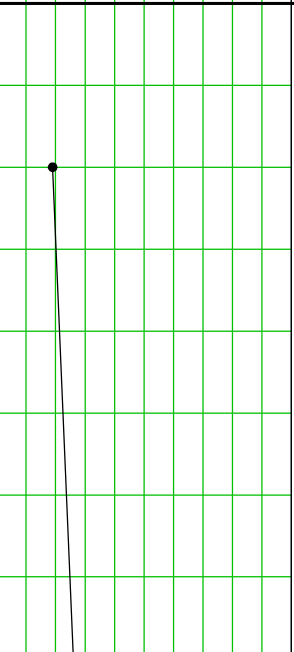
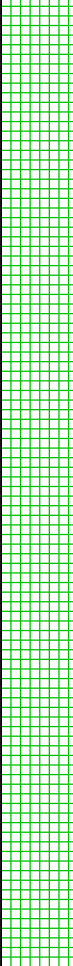
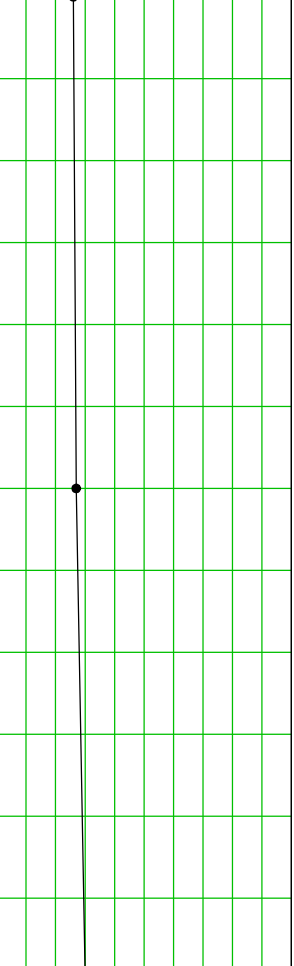
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149495.176 m	Easting : 681844.488 m
Reduced Level (m): (+)214.371	BH. No. : BH-P1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.60	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 16-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS*	24	39	47	86					
31.5											
32.0											
32.5	32.5	SPT-13	34	51	49 (2cm)	>100					
33.0											
33.5											
34.0	34	UDS*	40	65	35 (10cm)	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	UDS*	31	72	28 (11cm)	>100					
36.0											
36.5											
37.0	37	UDS*	36	67	33 (10cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-14	23	32	41	73					
39.0											
39.5											
40.0	40	UDS-10									

UDS*-UDS not recovered

FIELD BOREHOLE LOG


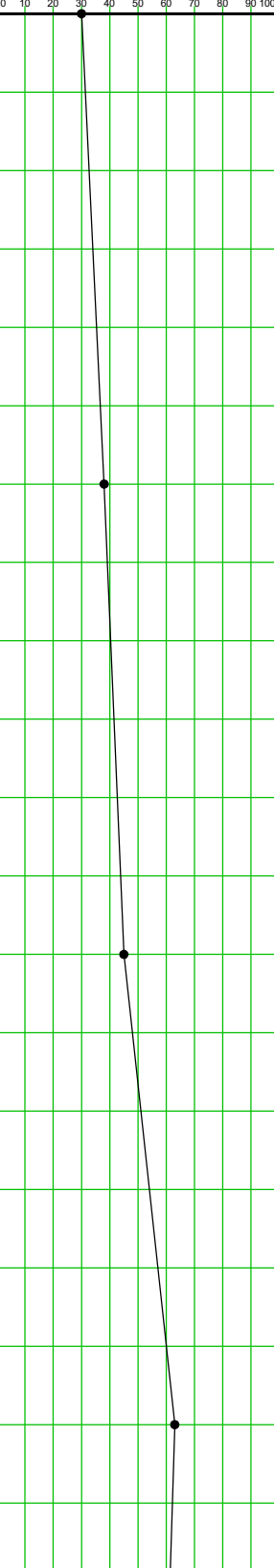
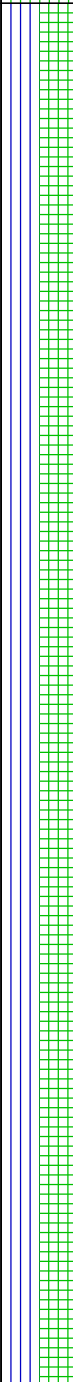
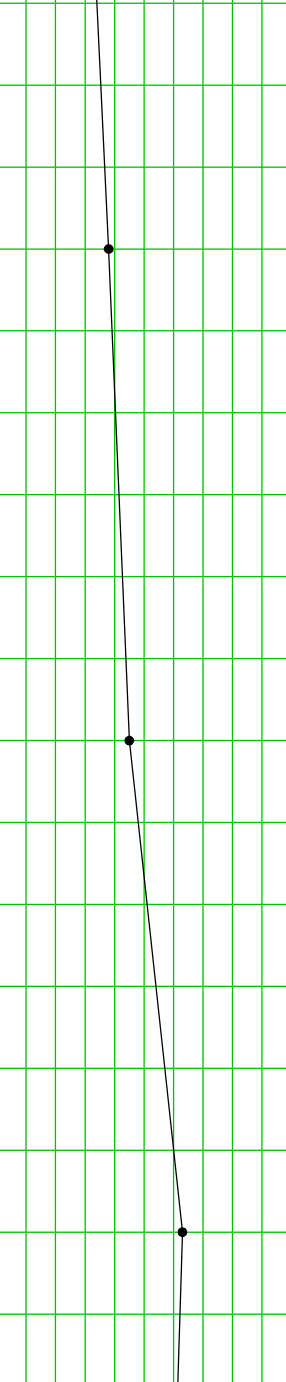
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149522.156 m	Easting : 681840.419 m
Reduced Level (m):(+)213.108	BH. No. : BH-P2	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):10.70	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	5	8	11	19	Brown, Medium dense, Silty sand with clay	SM-SC			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	6	10	16	26	Brown, Very stiff, Silty clay of low plasticity	CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	8	12	15	27					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	7	13	17	30					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149522.156 m	Easting :681840.419 m
Reduced Level (m):(+)213.108	BH. No. :BH-P2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):10.70	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-08-2021		Date of Completion :20-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5						Brown, Very stiff, Silty clay of low plasticity	CL	 10.70m			
11.0											
11.5	11.5	UDS-4									
12.0						Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL				
12.5											
13.0	13	SPT-5	8	16	22						38
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	12	19	26	45					
16.5											
17.0											
17.5	17.5	UDS*									
18.0											
18.5											
19.0	19	SPT-7	20	27	36	63					
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149522.156 m	Easting : 681840.419 m
Reduced Level (m): (+)213.108	BH. No. : BH-P2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 10.70	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-6									
21.0											
21.5											
22.0	22	SPT-8	18	26	32	58					
22.5											
23.0											
23.5	23.5	UDS-7									
24.0											
24.5											
25.0	25	SPT-9	21	27	37	64	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-8									
27.0											
27.5											
28.0	28	SPT-10	80	20 (12cm)	-	>100					
28.5											
29.0											
29.5	29.5	SPT-11	42	62	38 (5cm)	>100					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149522.156 m	Easting : 681840.419 m
Reduced Level (m):(+)213.108	BH. No. : BH-P2	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):10.70	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	70	30 (8cm)	-	>100					
31.5											
32.0											
32.5	32.5	SPT-13	48	72 (10cm)	28 (10cm)	>100					
33.0											
33.5											
34.0	34	SPT-14	36	52 (10cm)	48 (10cm)	>100					
34.5											
35.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-15	77	23 (9cm)	-	>100					
36.0											
36.5											
37.0	37	SPT-16	59	41 (12cm)	-	>100					
37.5											
38.0											
38.5	38.5	SPT-17	60	40 (8cm)	-	>100					
39.0											
39.5											
40.0	40	SPT-18	73	27 (6cm)	-	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149565 m	Easting : 681840 m
Reduced Level (m): (+)214.145	BH. No. : BH-P3	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	6	8	14	Brown, Medium dense, Silty sand	SM			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	6	7	9	16					
6.0											
6.5											
7.0	7	UDS-3					Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
7.5											
8.0											
8.5	8.5	SPT-3	10	15	18	33					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149565 m	Easting : 681840 m
Reduced Level (m): (+)214.145	BH. No. : BH-P3	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	12	18	20	38					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	13	19	21	40					
15.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	18	24	29	53					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149565 m	Easting : 681840 m
Reduced Level (m): (+)214.145	BH. No. : BH-P3	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	26	38	42	80					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	24	36	48	84					
24.0											
24.5											
25.0	25	UDS-9					Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-9	28	42	58	100					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	36	68	32 (10cm)	>100					
30.0											

UDS*-UDS not recovered

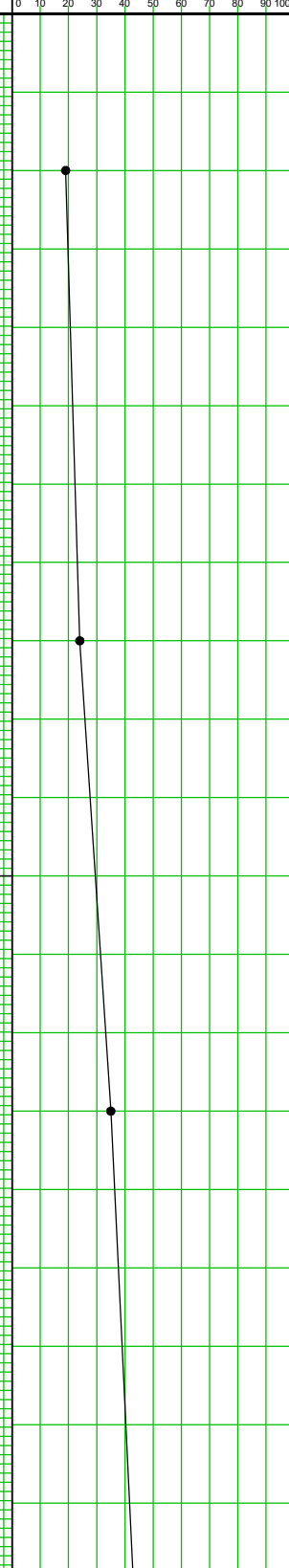
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149565 m	Easting : 681840 m
Reduced Level (m): (+)214.145	BH. No. : BH-P3	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-08-2021	Date of Completion : 24-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	58	58	42 (8cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-12	62	58	42 (10cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	68	48	52 (5cm)	>100					
34.5											
35.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-14	43	63	42	105					
36.0											
36.5											
37.0	37	SPT-15	39	72	35 (4cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-16	42	80	20 (8cm)	>100					
39.0											
39.5											
40.0	40	SPT-17	65	76	24 (10cm)	>100					

FIELD BOREHOLE LOG

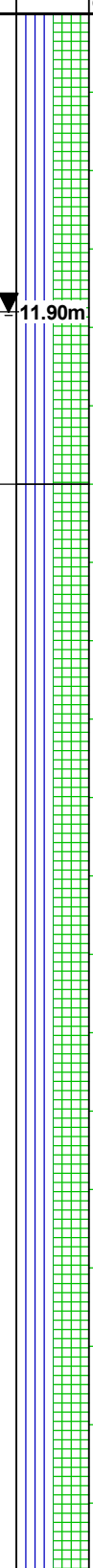
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149594.593 m	Easting : 681837.92 m
Reduced Level (m):(+)214.312	BH. No. : BH-P4	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):11.90	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 18-08-2021	Date of Completion : 19-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	6	8	11	19	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
2.5	2.5	UDS-1									
4.0	4	SPT-2	8	10	14	24					
5.5	5.5	UDS-2									
7.0	7	SPT-3	11	16	19	35	Brown, Dense, Sandy silt of low plasticity	ML-CL			
8.5	8.5	UDS-3									
10.0	10	SPT-4	17	20	23	43					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149594.593 m	Easting :681837.92 m
Reduced Level (m):(+)214.312	BH. No. :BH-P4	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.90	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :18-08-2021		Date of Completion :19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-5	19	22	26	48	Brown, Dense, Sandy silt of low plasticity	ML-CL			
12.0											
12.5											
13.0	13	SPT-6	18	25	29	54					
13.5											
14.0											
14.5	14.5	UDS-4									
15.0											
15.5											
16.0	16	SPT-7	21	27	31	58	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
16.5											
17.0											
17.5	17.5	UDS-5									
18.0											
18.5											
19.0	19	SPT-8	14	24	29	53					
19.5											
20.0											



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149594.593 m	Easting :681837.92 m
Reduced Level (m):(+)214.312	BH. No. :BH-P4	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.90	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :18-08-2021	Date of Completion :19-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-6									
21.0											
21.5											
22.0	22	SPT-9	26	30	36	66					
22.5											
23.0											
23.5	23.5	UDS*									
24.0											
24.5											
25.0	25	SPT-10	22	35	43	78	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-7									
27.0											
27.5											
28.0	28	SPT-11	24	38	40	78					
28.5											
29.0											
29.5	29.5	UDS-8									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

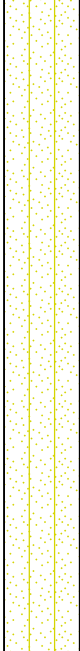
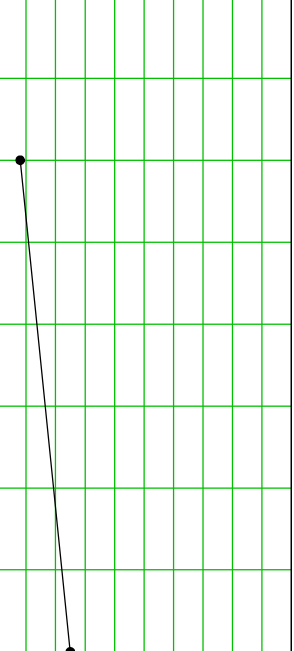
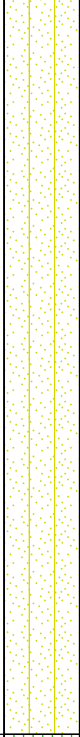
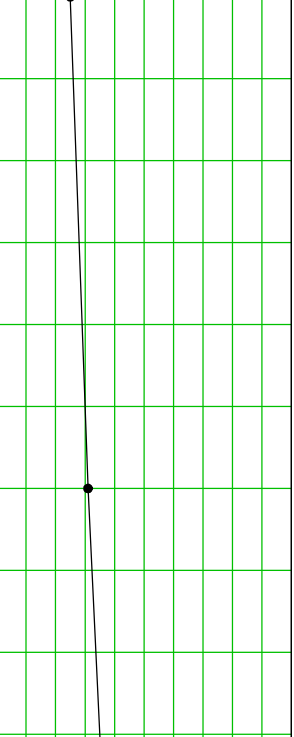
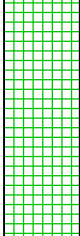
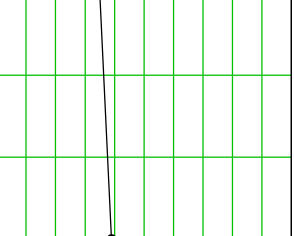
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149594.593 m	Easting :681837.92 m
Reduced Level (m):(+)214.312	BH. No. :BH-P4	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.90	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :18-08-2021		Date of Completion :19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	26	34	48	82					
31.5											
32.0											
32.5	32.5	UDS-9									
33.0											
33.5											
34.0	34	SPT-13	38	55	45 (9cm)	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-14	43	70	30 (4cm)	>100					
36.0											
36.5											
37.0	37	SPT-15	32	53	47 (11cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-16	30	58	42 (8cm)	>100					
39.0											
39.5											
40.0	40	SPT-17	26	41	48	89					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149620.114 m	Easting : 681834.868 m
Reduced Level (m):(+)213.726	BH. No. : BH-P5	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	2	3	5	8	Brown, Loose, Silty sand SM				
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	4	10	15	25	Brown, Medium dense, Silty sand SM				
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	9	13	18	31	Brown, Hard, Silty clay of low plasticity CL				
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	12	18	21	39					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149620.114 m	Easting :681834.868 m
Reduced Level (m):(+)213.726	BH. No. :BH-P5	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-08-2021	Date of Completion :20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0								▼ 12.00m			
12.5											
13.0	13	SPT-5	14	17	20	37	Brown, Hard, Silty clay of low plasticity CL				
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	11	15	19	34					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0							Brown, Very dense, Sandy silt of low plasticity ML-CL				
18.5											
19.0	19	SPT-7	17	24	27	51					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149620.114 m	Easting : 681834.868 m
Reduced Level (m):(+)213.726	BH. No. : BH-P5	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021	Date of Completion : 20-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	20	26	30	56					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	28	31	36	67	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	34	40	49	89					
28.5											
29.0											
29.5	29.5	UDS-10									
30.0											

UDS*-UDS not recovered

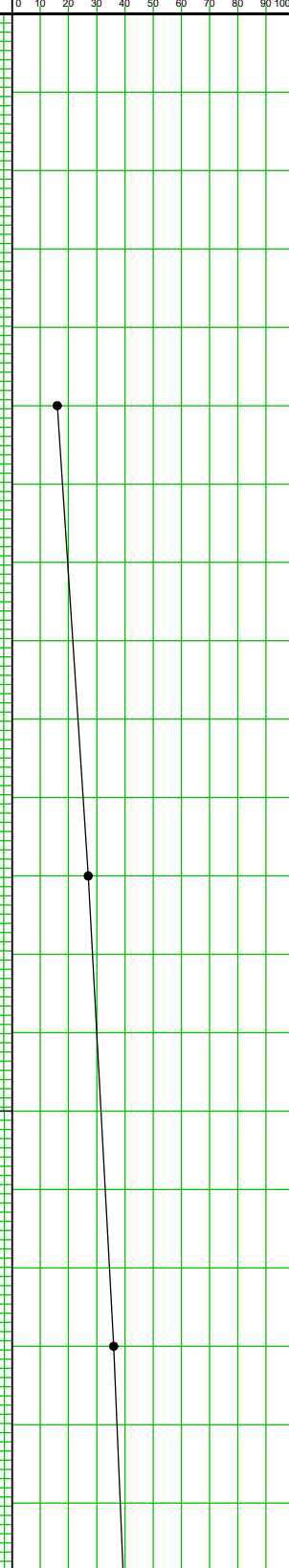
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149620.114 m	Easting : 681834.868 m
Reduced Level (m): (+)213.726	BH. No. : BH-P5	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-08-2021		Date of Completion : 20-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	42	52	48 (10cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-12	40	54	46 (10cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	36	47	53	100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-14	40	49	51	100					
36.0											
36.5											
37.0	37	SPT-15	42	45	55 (11cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-16	37	47	53 (9cm)	>100					
39.0											
39.5											
40.0	40	SPT-17	52	48 (10cm)	-	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149645.522 m	Easting : 681836.405 m
Reduced Level (m):(+)213.711	BH. No. : BH-P6	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	9	7	9	16	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	9	11	16	27					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	14	17	19	36	Brown, Hard, Silty clay of low plasticity	CL			
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149645.522 m	Easting :681836.405 m
Reduced Level (m):(+)213.711	BH. No. :BH-P6	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0								▼ 11.00m			
11.5	11.5	SPT-4	16	19	24	43			●		
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	19	24	27	51	Brown, Hard, Silty clay of low plasticity	CL		●	
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	21	25	29	54				●	
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149645.522 m	Easting :681836.405 m
Reduced Level (m):(+)213.711	BH. No. :BH-P6	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):11.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	25	30	37	67	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	29	38	39	72					
24.0											
24.5											
25.0	25	UDS-9									
25.5											
26.0											
26.5	26.5	SPT-9	30	35	45	80					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	54	46 (10cm)	-	>100					
30.0											

UDS*-UDS not recovered

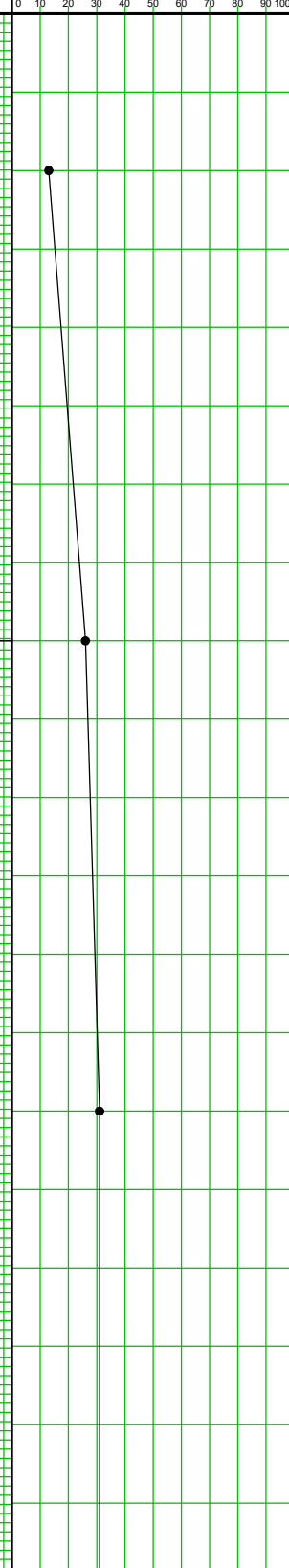
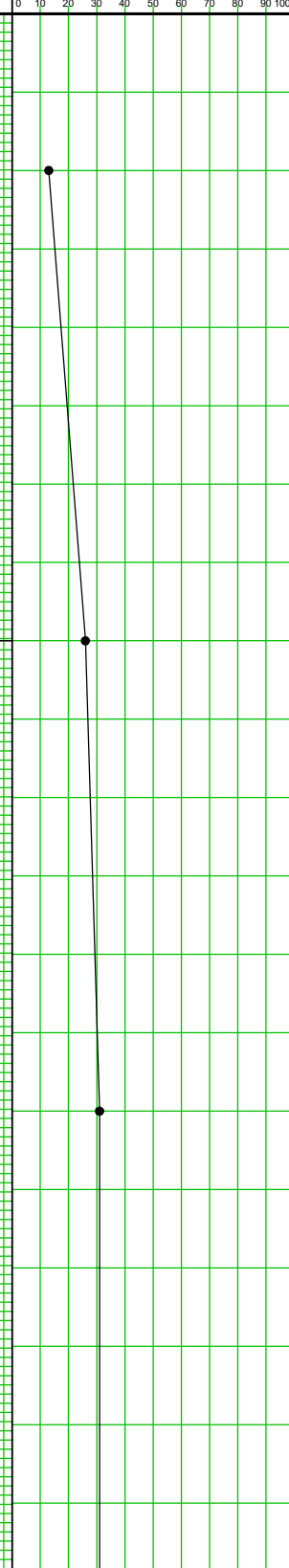
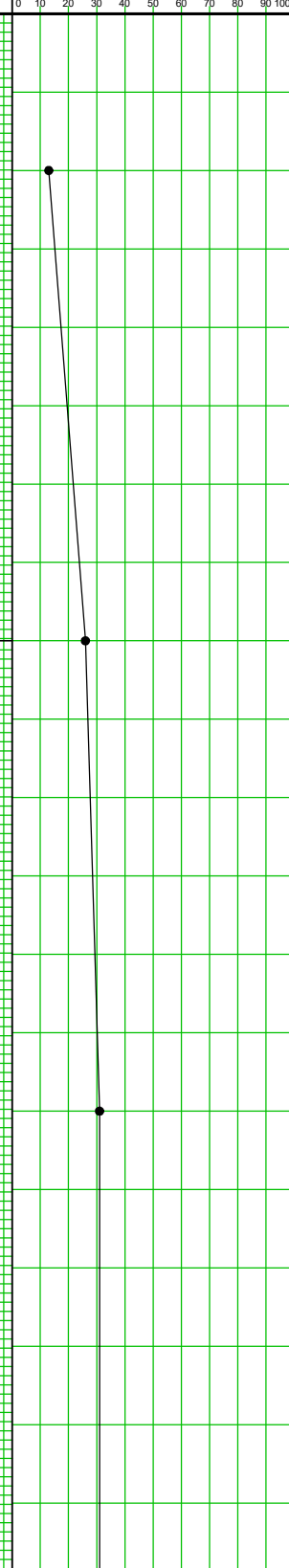
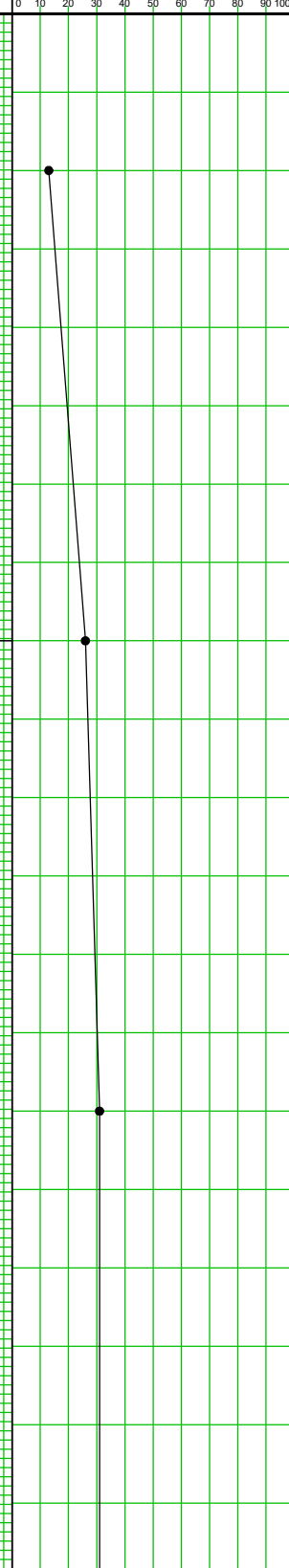
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149645.522 m	Easting : 681836.405 m
Reduced Level (m):(+)213.711	BH. No. : BH-P6	BH Termination Depth (m):40
Proposed / Existing Structure : Major Bridge	Water Table (m):11.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	58	42 (8cm)	-	>100					
31.5											
32.0											
32.5	32.5	SPT-12	50	50 (9cm)	-	>100					
33.0											
33.5											
34.0	34	SPT-13	54	46 (8cm)	-	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-14	41	53 (10cm)		>100					
36.0											
36.5											
37.0	37	SPT-15	45	57 (7cm)		>100					
37.5											
38.0											
38.5	38.5	SPT-16	55	45 (10cm)	-	>100					
39.0											
39.5											
40.0	40	SPT-17	57	43 (9cm)	-	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149673.452 m	Easting : 681833.809 m
Reduced Level (m): (+)214.044	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	5	6	7	13	Brown, Medium dense, Sandy silt of low plasticity ML-CL				
2.5	2.5	UDS-1									
4.0	4	SPT-2	8	12	14	26	Brown, Medium dense to dense, Sandy silt of low plasticity ML-CL				
5.5	5.5	UDS-2									
7.0	7	SPT-3	9	13	18	31	Brown, Medium dense to dense, Sandy silt of low plasticity ML-CL				
8.5	8.5	UDS-3									
10.0	10	SPT-4	8	12	19	31					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149673.452 m	Easting :681833.809 m
Reduced Level (m):(+)214.044	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021	Date of Completion :18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0								▼ 12.00m			
12.5											
13.0	13	SPT-5	7	14	18	32					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-6	9	11	17	28					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	12	18	23	41					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :58+497 km	Northing :3149673.452 m	Easting :681833.809 m
Reduced Level (m):(+)214.044	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):12.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	SPT-8	17	21	29	50					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	20	24	31	55	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	21	24	34	58					
28.5											
29.0											
29.5	29.5	UDS-10									
30.0											

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+497 km	Northing : 3149673.452 m	Easting : 681833.809 m
Reduced Level (m): (+)214.044	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 12.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	22	27	38	65					
31.5											
32.0											
32.5	32.5	UDS-11									
33.0											
33.5											
34.0	34	SPT-12	27	48	51	99					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-13	38	54	46 (6cm)	>100					
36.0											
36.5											
37.0	37	SPT-14	48	60	40 (8cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-15	53	47 (11cm)	-	>100					
39.0											
39.5											
40.0	40	SPT-16	30 (3cm)	-	-	>100					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 58+837 km	Northing : 3149897.982 m	Easting : 681823.952 m
Reduced Level (m): (+)213.610	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-09-2021	Date of Completion : 24-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	2	2	4	6	Brown, Loose, Silty sand	SM			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	4	8	14	22	Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	ML-CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	8	12	20						
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	11	19	28	47					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 59+071 km	Northing : 3150131.892 m	Easting : 681817.835 m
Reduced Level (m): (+)213.832	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-09-2021	Date of Completion : 24-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	7	11	18					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	ML-CL			
5.5	5.5	SPT-2	6	12	17	29					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	9	13	19	32					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 59+206 km	Northing : 3150266 m	Easting : 681807 m
Reduced Level (m): (+)213.360	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): 12.65	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-09-2021	Date of Completion : 24-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	5	8	12	20					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	7	12	14	26					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	8	10	14	24					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 59+206 km	Northing : 3150266 m	Easting : 681807 m
Reduced Level (m): (+)213.360	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): 12.65	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-09-2021		Date of Completion : 24-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	12	15	18	33					
12.0											
12.5							Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL ▼ 12.65m			
13.0	13	UDS*									
13.5	13.5	SPT-5	12	14	16	30					
14.0											
14.5											
15.0	15	SPT-6	17	22	27	49					



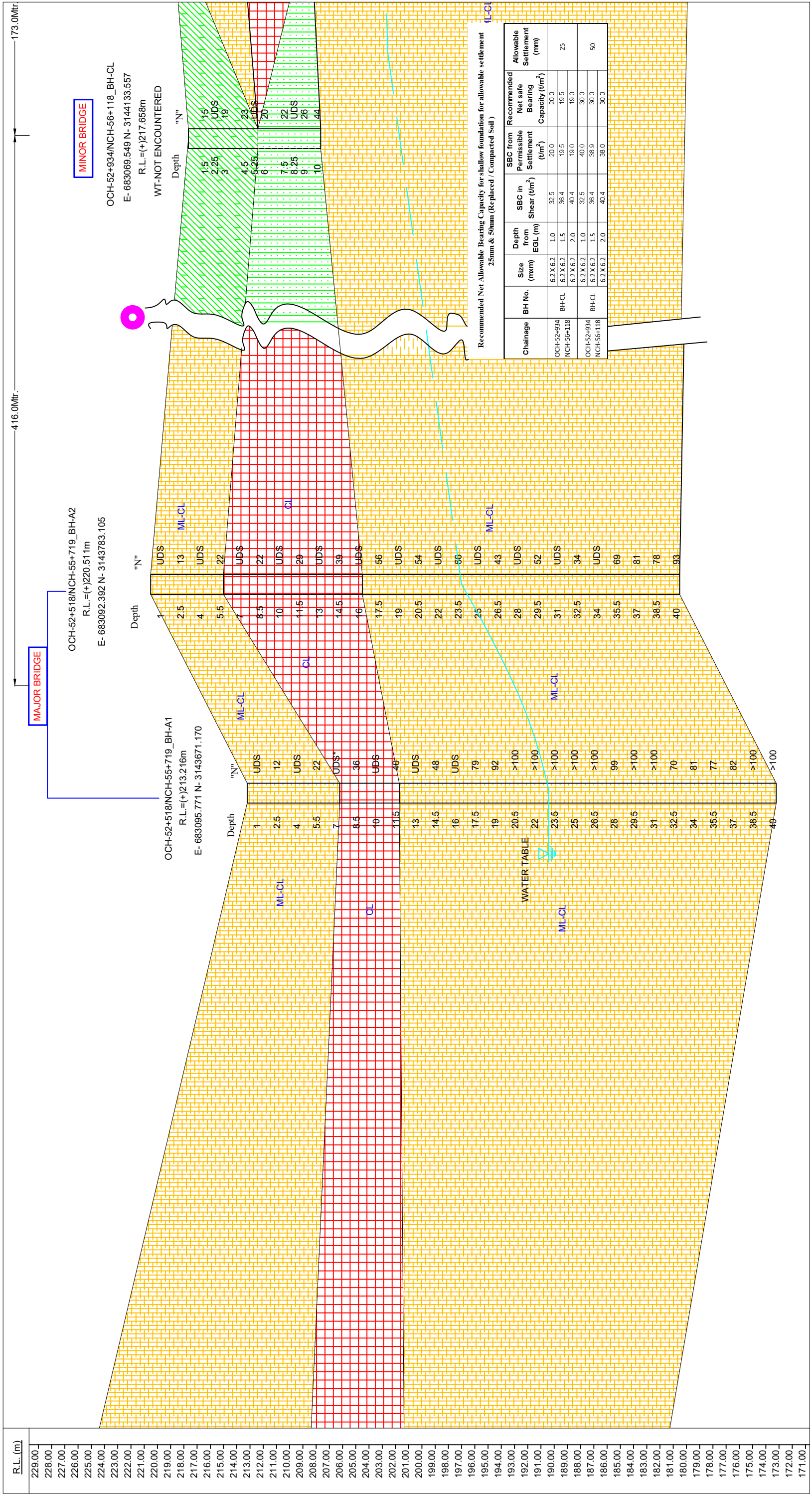
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 59+270 km	Northing : 3150330 m	Easting : 681801 m
Reduced Level (m): (+)212.593	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-09-2021	Date of Completion : 23-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	7	9	11	20					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	8	12	14	26					
4.5											
5.0							Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	ML-CL			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	15	19	20	39					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	19	20	22	42					

UDS*-UDS not recovered

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

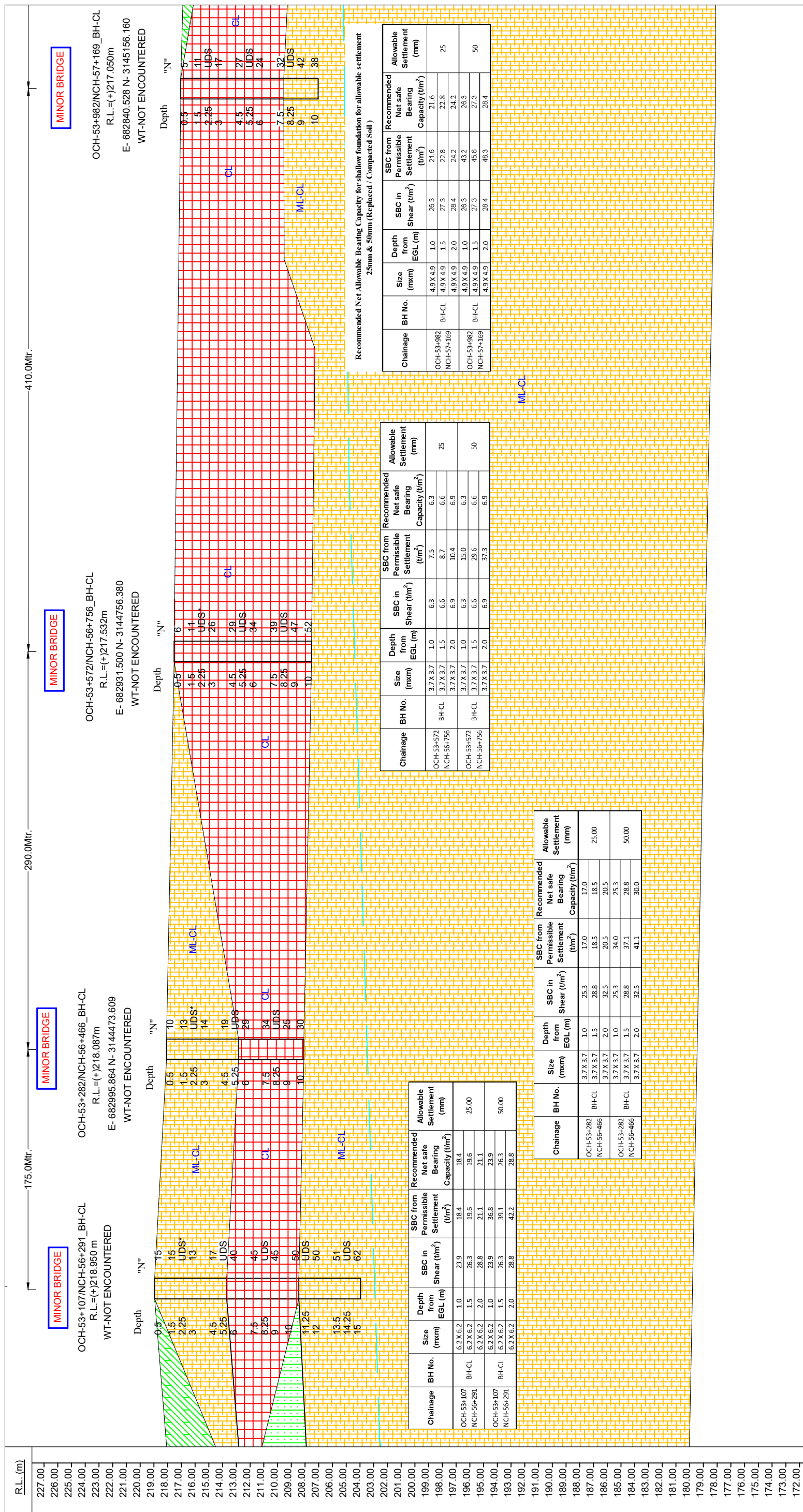


Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m^2)	SBC from Permissible Settlement (t/m^2)	Recommended Net safe Bearing Capacity (t/m^2)	Allowable Settlement (mm)
OCH-52+518	BH-A1	7.2 X 7.2	2.0	32.9	20.1	20.1	25.00
NCH-55+719	BH-A1	7.2 X 7.2	3.0	38.8	23.5	23.5	25.00
OCH-52+518	BH-A1	7.2 X 7.2	2.0	32.9	40.2	30.0	50.00
NCH-55+719	BH-A1	7.2 X 7.2	3.0	38.8	47.0	30.0	50.00
OCH-52+518	BH-A2	7.2 X 7.2	0.7	25.5	50.1	25.5	25.00
NCH-55+719	BH-A2	7.2 X 7.2	1.0	27.2	51.6	27.2	25.00
OCH-52+518	BH-A2	7.2 X 7.2	0.7	25.5	47.6	25.5	50.00
NCH-55+719	BH-A2	7.2 X 7.2	1.0	27.2	48.2	27.2	50.00

SYMBOL	DESCRIPTION
[Green diagonal lines]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green horizontal lines]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow diagonal lines]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red diagonal lines]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Red horizontal lines]	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED
[Blue arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wi-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mxm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-53+572	BH-CL	3.7X3.7	1.0	6.3	7.5	6.3	25
NCH-56+756	BH-CL	3.7X3.7	1.5	6.6	8.7	6.6	25
OCH-53+572	BH-CL	3.7X3.7	2.0	6.9	10.4	6.9	50
NCH-56+756	BH-CL	3.7X3.7	1.0	6.3	15.0	6.3	50
OCH-53+572	BH-CL	3.7X3.7	1.5	6.6	29.6	6.6	50
NCH-56+756	BH-CL	3.7X3.7	2.0	6.9	37.3	6.9	50

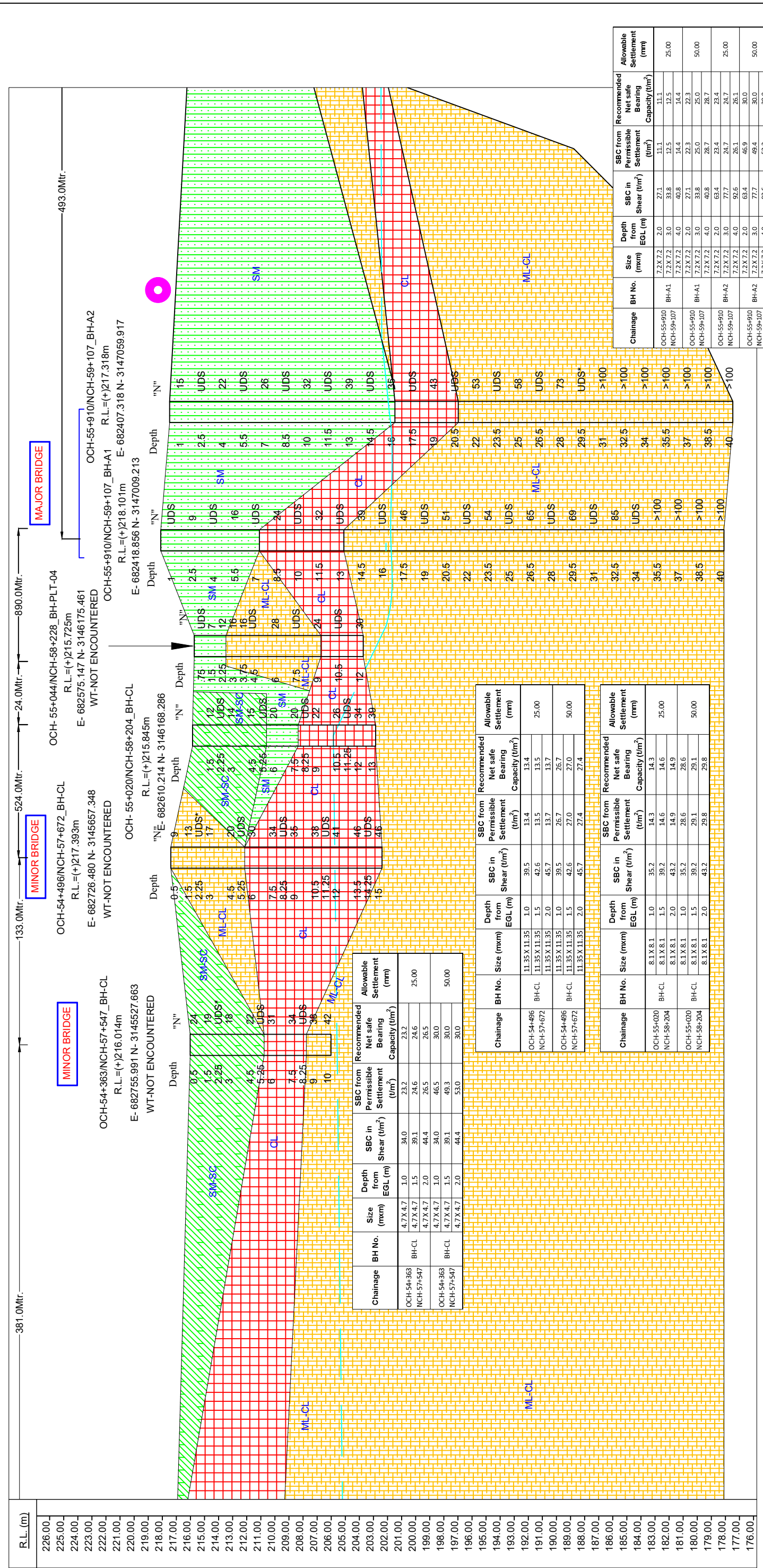
Chainage	BH No.	Size (mxm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-53+107	BH-CL	6.2X6.2	1.0	23.9	18.4	18.4	25.00
NCH-56+291	BH-CL	6.2X6.2	1.5	26.3	19.6	19.6	25.00
OCH-53+107	BH-CL	6.2X6.2	2.0	28.8	21.1	21.1	50.00
NCH-56+291	BH-CL	6.2X6.2	1.0	23.9	36.8	23.9	50.00
OCH-53+107	BH-CL	6.2X6.2	1.5	26.3	39.1	26.3	50.00
NCH-56+291	BH-CL	6.2X6.2	2.0	28.8	47.2	28.8	50.00

Chainage	BH No.	Size (mxm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-53+282	BH-CL	3.7X3.7	1.0	25.3	17.0	17.0	25.00
NCH-56+466	BH-CL	3.7X3.7	1.5	28.8	18.5	18.5	25.00
OCH-53+282	BH-CL	3.7X3.7	2.0	32.5	20.5	20.5	50.00
NCH-56+466	BH-CL	3.7X3.7	1.0	25.3	34.0	25.3	50.00
OCH-53+282	BH-CL	3.7X3.7	1.5	28.8	37.1	28.8	50.00
NCH-56+466	BH-CL	3.7X3.7	2.0	32.5	41.1	30.0	50.00

SYMBOL	DESCRIPTION
[Green hatched]	SM-Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Red hatched]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow hatched]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Blue hatched]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Red hatched]	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
[Blue circle]	BOREHOLE REQUIRED
[Blue arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wi-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

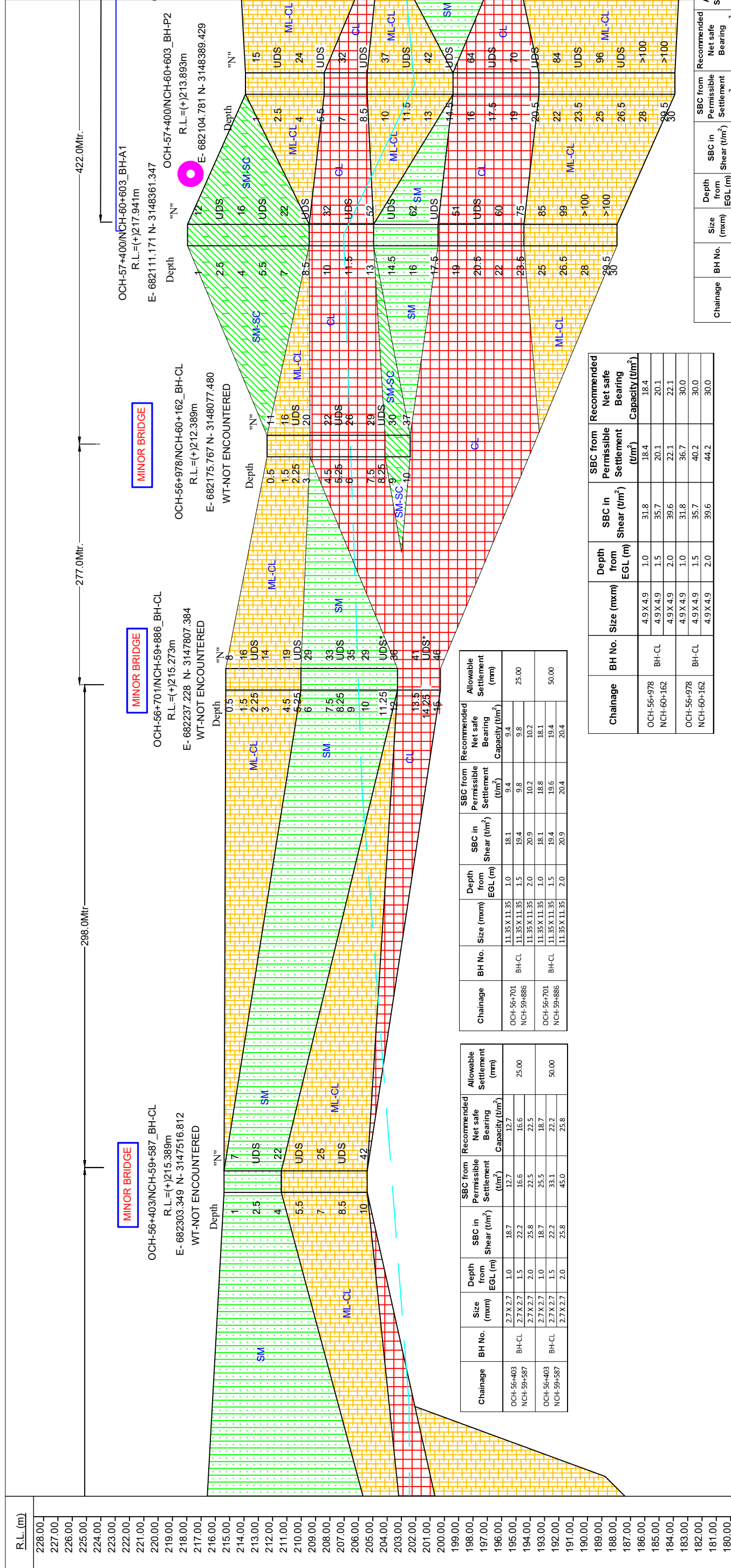


SYMBOL	DESCRIPTION
[Green hatched pattern]	SM-Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green and yellow hatched pattern]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow hatched pattern]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red hatched pattern]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Red and yellow hatched pattern]	Cl- Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED
[Blue arrow]	WATER TABLE

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m²)	SBC from Permissible Settlement (t/m²)	Recommended Net safe Bearing Capacity (t/m²)	Allowable Settlement (mm)
OCH-55+044	BH-PLT-04	2 X 2	1.0	21.9	22.3	21.9	25.00
NCH-58+228	04	2 X 2	1.5	26.0	24.3	24.3	25.00
OCH-55+044	BH-PLT-04	2 X 2	1.0	21.9	22.3	21.9	50.00
NCH-58+228	04	2 X 2	1.5	26.0	24.3	24.3	50.00

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-56+701	BH-CL	11.35 X 11.35	1.0	18.1	9.4	9.4	25.00
			1.5	19.4	9.8	9.8	25.00
NCH-59+886	BH-CL	11.35 X 11.35	2.0	20.9	10.2	10.2	50.00
			1.0	18.1	18.8	18.1	50.00
OCH-56+701	BH-CL	11.35 X 11.35	1.5	19.4	19.6	19.4	50.00
			2.0	20.9	20.4	20.4	50.00

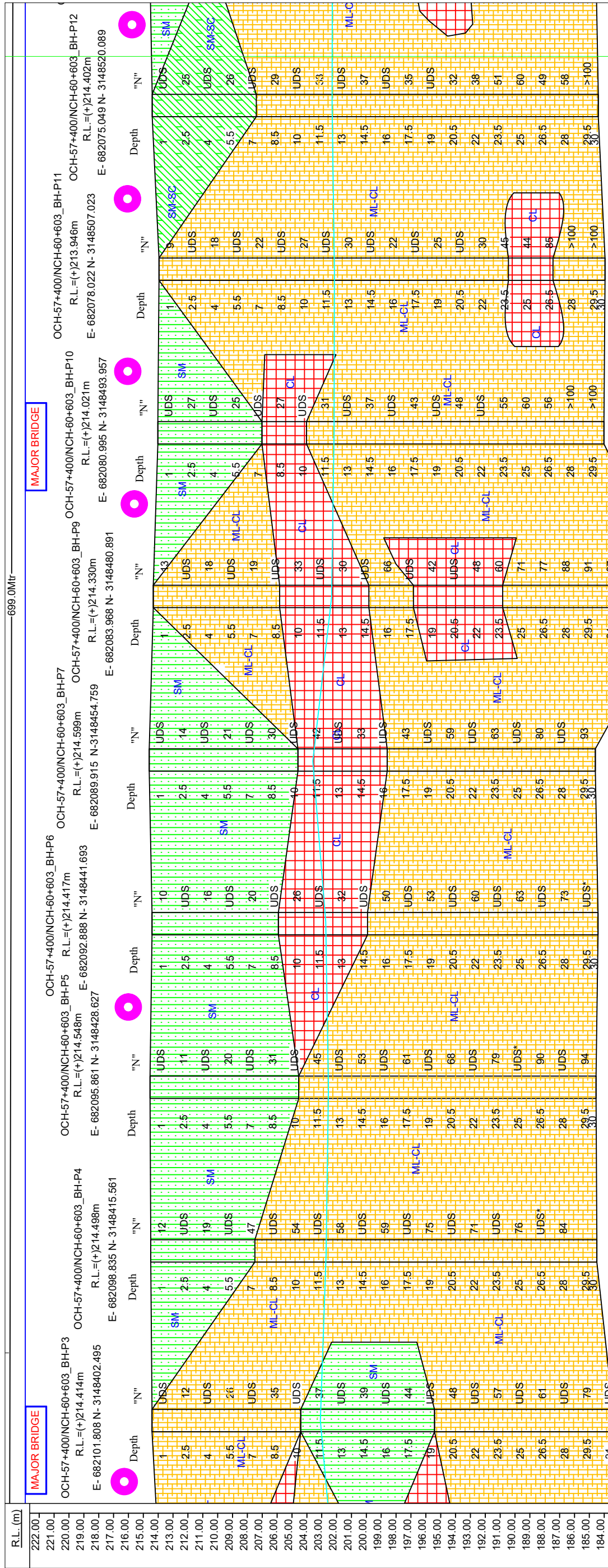
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)
OCH-56+978	BH-CL	4.9 X 4.9	1.0	31.8	18.4	18.4
			1.5	35.7	20.1	20.1
NCH-60+162	BH-CL	4.9 X 4.9	2.0	39.6	22.1	22.1
			1.0	31.8	36.7	30.0
OCH-56+978	BH-CL	4.9 X 4.9	1.5	35.7	40.2	30.0
			2.0	39.6	44.2	30.0

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+400	A1	7.2 X 7.2	2.0	43.6	15.8	15.8	25.00
			3.0	51.1	17.6	17.6	25.00
NCH-60+603	A1	7.2 X 7.2	4.0	58.8	19.7	19.7	50.00
			2.0	43.6	31.7	30.0	50.00
OCH-57+400	P2	7.2 X 7.2	4.0	58.8	39.4	30.0	25.00
			2.0	60.4	18.2	18.2	25.00
NCH-60+603	P2	7.2 X 7.2	4.0	69.3	18.4	18.4	50.00
			2.0	60.4	36.5	30.0	50.00

SYMBOL	DESCRIPTION
[Green Dotted Pattern]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green Diagonal Lines]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow Diagonal Lines]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red Diagonal Lines]	CL- Silty Clay of low plasticity (Above A-line, LL<35)
[Red Diagonal Lines]	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
[Purple Circle]	BOREHOLE REQUIRED
[Blue Arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line=73(wi-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+400 NCH-60+603	P-10	7.2x7.2	2.0	61.4	23.6	23.6	25.00
		7.2x7.2	3.0	72.8	24.8	24.8	25.00
		7.2x7.2	4.0	84.7	25.5	25.5	25.00
OCH-57+400 NCH-60+603	P-11	7.2x7.2	2.0	61.4	47.2	30.0	50.00
		7.2x7.2	3.0	72.8	49.6	30.0	50.00
		7.2x7.2	4.0	84.7	51.0	30.0	50.00
OCH-57+400 NCH-60+603	P-12	7.2x7.2	2.0	61.4	30.1	15.0	25.00
		7.2x7.2	3.0	72.8	31.7	15.9	25.00
		7.2x7.2	4.0	84.7	33.5	16.8	25.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+400 NCH-60+603	P-7	7.2x7.2	2.0	37.4	18.2	18.2	25.00
		7.2x7.2	3.0	44.8	19.4	19.4	25.00
		7.2x7.2	4.0	52.5	21.0	21.0	25.00
OCH-57+400 NCH-60+603	P-9	7.2x7.2	2.0	43.6	15.7	15.7	50.00
		7.2x7.2	3.0	50.1	16.7	16.7	50.00
		7.2x7.2	4.0	56.7	18.1	18.1	50.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+400 NCH-60+603	P-5	7.2x7.2	2.0	33.6	25.7	25.7	25.00
		7.2x7.2	3.0	40.4	27.0	27.0	25.00
		7.2x7.2	4.0	47.4	28.6	28.6	25.00
OCH-57+400 NCH-60+603	P-6	7.2x7.2	2.0	35.5	14.1	14.1	50.00
		7.2x7.2	3.0	42.6	15.0	15.0	50.00
		7.2x7.2	4.0	49.9	16.2	16.2	50.00

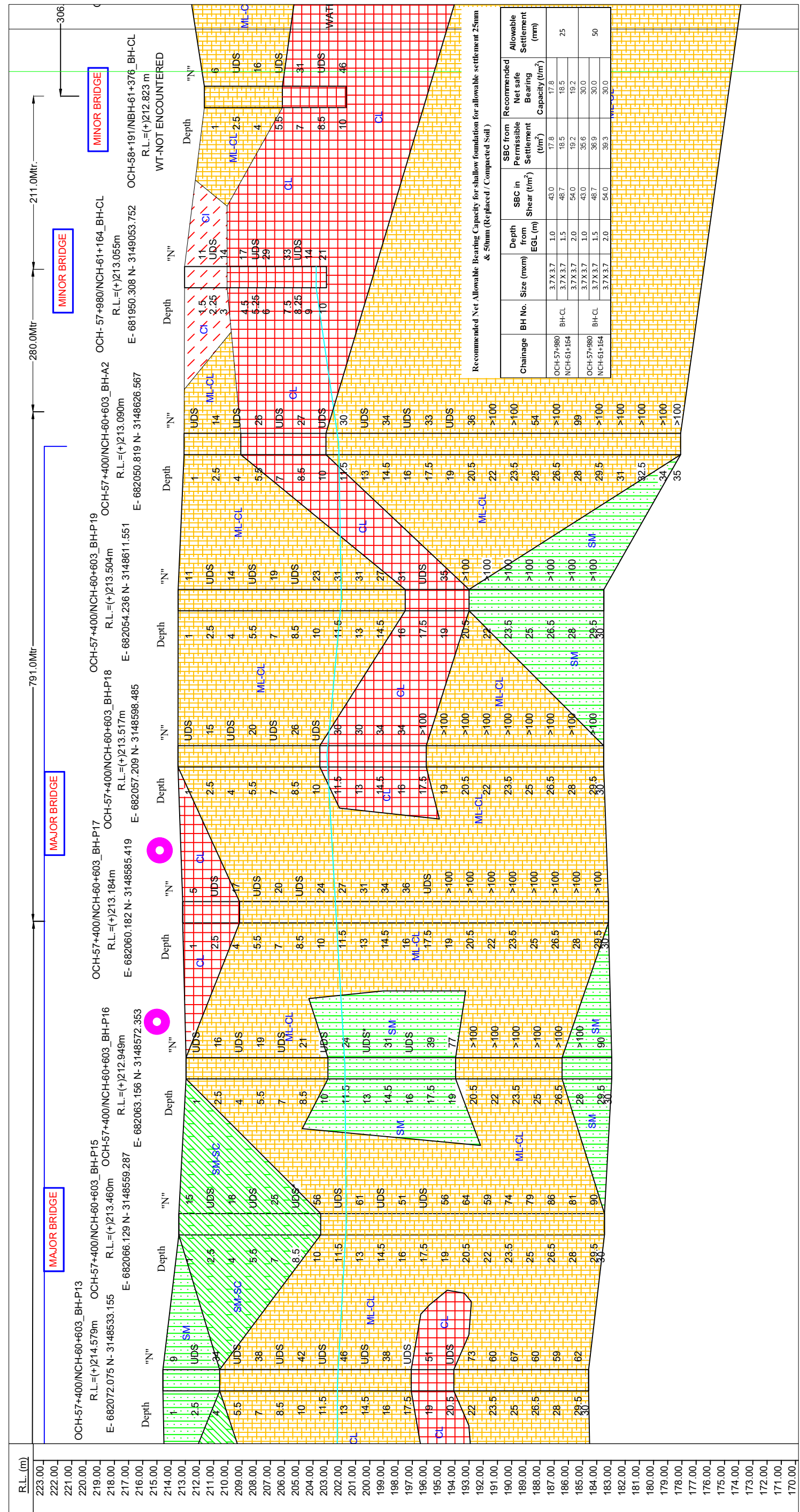
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+400 NCH-60+603	P3	7.2x7.2	2.0	30.4	23.5	23.5	25.00
		7.2x7.2	3.0	35.4	25.7	25.7	25.00
		7.2x7.2	4.0	40.6	28.3	28.3	25.00
OCH-57+400 NCH-60+603	P4	7.2x7.2	2.0	44.7	28.1	28.1	50.00
		7.2x7.2	3.0	53.3	29.6	29.6	50.00
		7.2x7.2	4.0	62.3	31.2	31.2	50.00

SYMBOL	DESCRIPTION
	SM-Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC-Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PI<7))
	ML-CL-Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4-PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI-Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED

SYMBOL	DESCRIPTION
	SM-Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC-Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PI<7))
	ML-CL-Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4-PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI-Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED

Note:- Fines= Percentage of Silty + Clay A-line=73(wi-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm & 50mm (Replaced / Compacted Soil)

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-57+980	BH-CL	3.7X3.7	1.0	43.0	17.8	17.8	25
NCH-61+164		3.7X3.7	1.5	48.7	18.5	18.5	25
		3.7X3.7	2.0	54.0	19.2	19.2	25
OCH-58+191	BH-CL	3.7X3.7	1.0	43.0	35.6	30.0	50
NCH-61+376		3.7X3.7	1.5	48.7	36.9	30.0	50
		3.7X3.7	2.0	54.0	39.3	30.0	50

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-58+191	BH-CL	3.7X3.7	1.0	21.2	11.2	11.2	25.00
NCH-61+376		3.7X3.7	1.5	24.1	12.1	12.1	25.00
		3.7X3.7	2.0	27.1	13.4	13.4	25.00
OCH-58+191	BH-CL	3.7X3.7	1.0	21.2	22.5	21.2	50.00
NCH-61+376		3.7X3.7	1.5	24.1	24.3	24.1	50.00
		3.7X3.7	2.0	27.1	26.8	26.8	50.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
P-18		7.2X7.2	2.0	39.2	15.7	15.7	25.00
		7.2X7.2	3.0	45.1	16.5	16.5	25.00
		7.2X7.2	4.0	51.2	17.5	17.5	25.00
P-18		7.2X7.2	2.0	39.2	31.5	30.0	50.00
		7.2X7.2	3.0	45.1	33.0	30.0	50.00
		7.2X7.2	4.0	51.2	35.1	30.0	50.00
P-19		7.2X7.2	2.0	22.1	15.9	15.9	25.00
		7.2X7.2	3.0	25.2	16.8	16.8	25.00
		7.2X7.2	4.0	28.5	17.7	17.7	25.00
P-19		7.2X7.2	2.0	22.1	31.9	22.1	50.00
		7.2X7.2	3.0	25.2	33.6	25.2	50.00
		7.2X7.2	4.0	28.5	35.5	25.2	50.00
A2		7.2X7.2	2.0	34.1	16.7	16.7	25.00
		7.2X7.2	3.0	39.6	18.1	18.1	25.00
		7.2X7.2	4.0	45.3	19.0	19.0	25.00
A2		7.2X7.2	2.0	34.1	33.4	30.0	50.00
		7.2X7.2	3.0	39.6	36.1	30.0	50.00
		7.2X7.2	4.0	45.3	38.0	30.0	50.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
P-16		7.2X7.2	2.0	45.1	21.2	21.2	25.00
		7.2X7.2	1.0	37.7	19.4	19.4	25.00
		7.2X7.2	4.0	58.7	26.5	26.5	25.00
P-16		7.2X7.2	2.0	45.1	42.5	30.0	50.00
		7.2X7.2	1.0	37.7	38.9	30.0	50.00
		7.2X7.2	4.0	58.7	53.0	30.0	50.00
P-17		7.2X7.2	2.0	19.8	5.4	5.4	25.00
		7.2X7.2	3.0	22.9	7.9	7.9	25.00
		7.2X7.2	4.0	26.0	10.8	10.8	25.00
P-17		7.2X7.2	2.0	19.8	15.9	15.9	50.00
		7.2X7.2	3.0	22.9	15.9	15.9	50.00
		7.2X7.2	4.0	26.0	35.5	26.0	50.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
P-13		7.2X7.2	2.0	27.0	18.4	18.4	25.00
		7.2X7.2	3.0	32.6	22.6	22.6	25.00
		7.2X7.2	4.0	38.4	28.4	28.4	25.00
P-13		7.2X7.2	2.0	27.0	36.8	27.0	50.00
		7.2X7.2	3.0	32.6	45.3	30.0	50.00
		7.2X7.2	4.0	38.4	56.7	30.0	50.00
P-15		7.2X7.2	2.0	21.2	21.2	21.2	25.00
		7.2X7.2	3.0	46.3	23.6	23.6	25.00
		7.2X7.2	4.0	53.3	26.5	26.5	25.00
P-15		7.2X7.2	2.0	21.2	39.5	30.0	50.00
		7.2X7.2	3.0	46.3	47.2	30.0	50.00
		7.2X7.2	4.0	53.3	53.0	30.0	50.00

SYMBOL

	SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	ML-CL - Silty Clay (Having fines Less Than 50% and in the hatched zone (4-PI<7))
	CL - Silty Clay of low plasticity (Above A-line, LL<35)
	CL - Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED WATER TABLE

DESCRIPTION

SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)

ML-CL - Silty Clay (Having fines Less Than 50% and in the hatched zone (4-PI<7))

CL - Silty Clay of low plasticity (Above A-line, LL<35)

CL - Clay of medium plasticity (Above A-line, 35<LL<50)

BOREHOLE REQUIRED WATER TABLE

SYMBOL

	SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	ML-CL - Silty Clay (Having fines Less Than 50% and in the hatched zone (4-PI<7))
	CL - Silty Clay of low plasticity (Above A-line, LL<35)
	CL - Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED WATER TABLE

DESCRIPTION

SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)

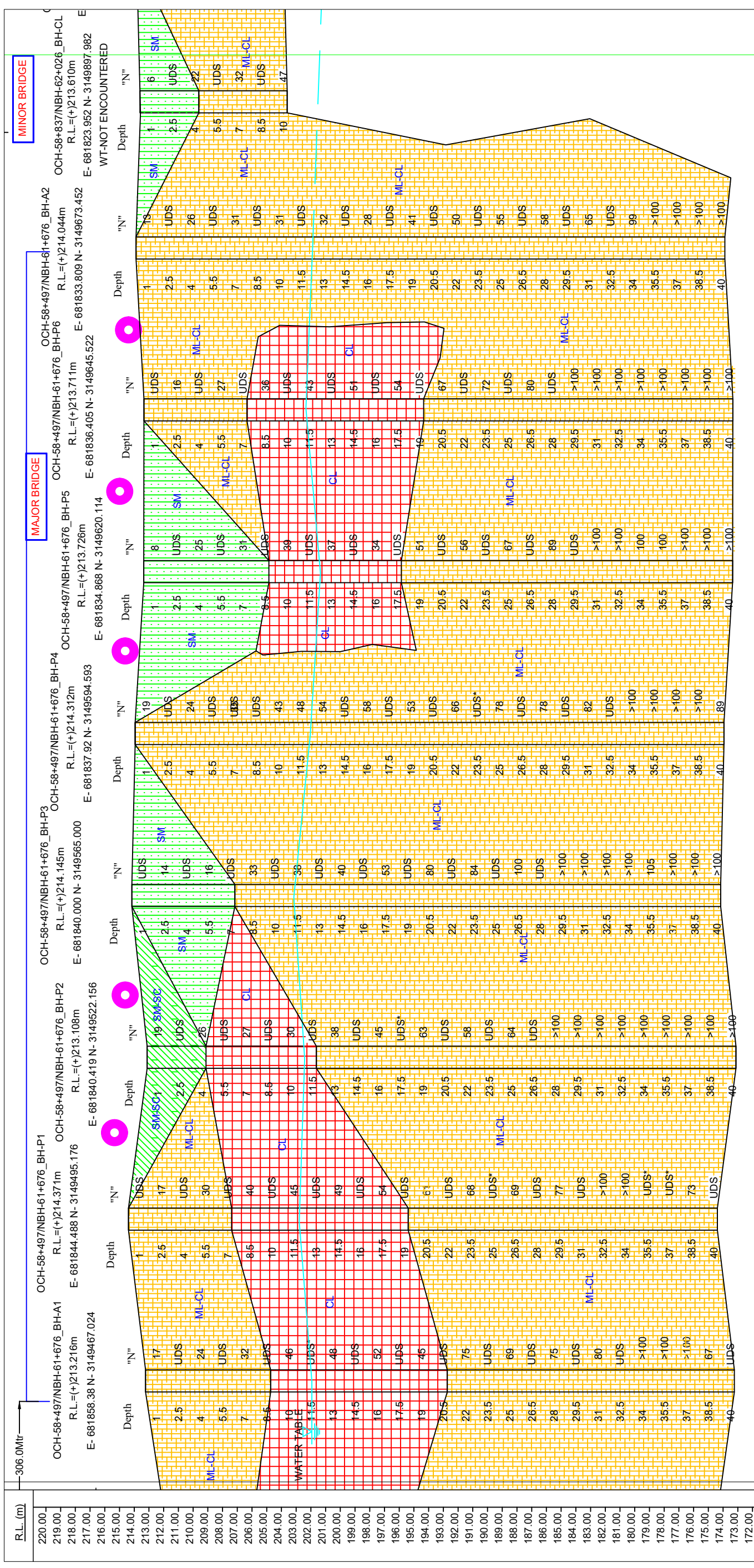
ML-CL - Silty Clay (Having fines Less Than 50% and in the hatched zone (4-PI<7))

CL - Silty Clay of low plasticity (Above A-line, LL<35)

CL - Clay of medium plasticity (Above A-line, 35<LL<50)

BOREHOLE REQUIRED WATER TABLE

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

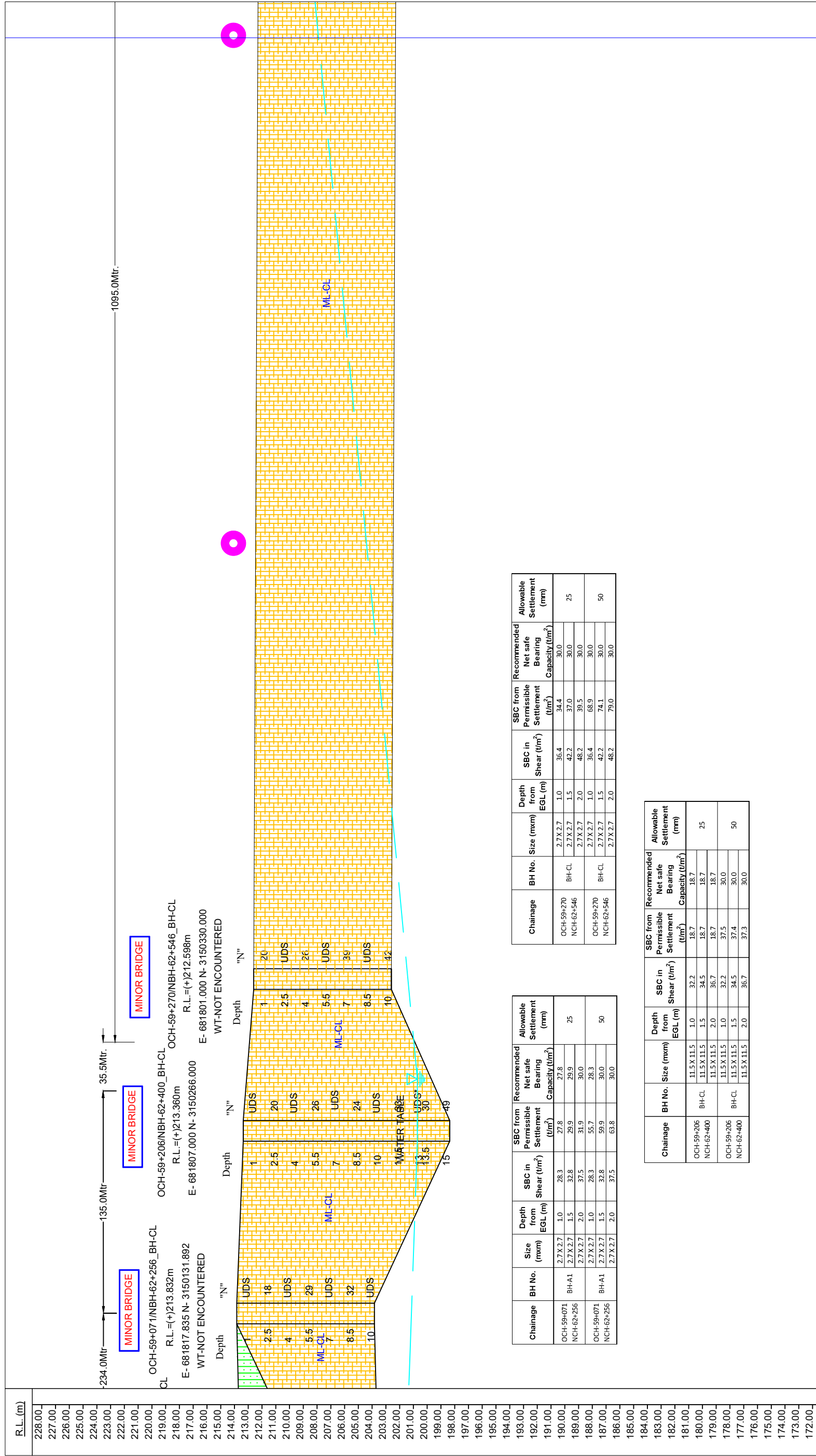


Chaignage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-58497	BH-P1	72X72	2.0	52.4	23.8	23.8	25
NCH-61476	BH-P1	72X72	3.0	60.3	25.3	25.3	25
OCH-58497	BH-P2	72X72	3.0	68.4	27.2	27.2	25
NCH-61476	BH-P2	72X72	4.0	52.4	27.2	27.2	25
OCH-58497	BH-P3	72X72	3.0	60.3	30.0	30.0	50
NCH-61476	BH-P3	72X72	4.0	68.4	30.0	30.0	50
OCH-58497	BH-P4	72X72	2.0	52.4	23.8	23.8	25
NCH-61476	BH-P4	72X72	3.0	60.3	25.3	25.3	25
OCH-58497	BH-P5	72X72	3.0	68.4	27.2	27.2	25
NCH-61476	BH-P5	72X72	4.0	52.4	27.2	27.2	25
OCH-58497	BH-P6	72X72	2.0	52.4	23.8	23.8	25
NCH-61476	BH-P6	72X72	3.0	60.3	25.3	25.3	25

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PI<7)
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4-PI<7)
	CL -Silty Clay of low plasticity (Above A-line, LL<35)
	CI - Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wt-20) SCALE:- HOR:- 1:2850 SCALE:- VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-59+270	BH-CL	2.7X2.7	1.0	36.4	34.4	30.0	25
		2.7X2.7	1.5	42.2	37.0	30.0	
NCH-62+546	BH-CL	2.7X2.7	2.0	48.2	39.5	30.0	50
		2.7X2.7	1.0	36.4	68.9	30.0	
OCH-59+270	BH-CL	2.7X2.7	1.5	42.2	74.1	30.0	50
		2.7X2.7	2.0	48.2	79.0	30.0	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-59+071	BH-A1	2.7X2.7	1.0	28.3	27.8	27.8	25
		2.7X2.7	1.5	32.8	29.9	29.9	
NCH-62+256	BH-A1	2.7X2.7	2.0	37.5	31.9	30.0	50
		2.7X2.7	1.0	28.3	55.7	28.3	
OCH-59+071	BH-A1	2.7X2.7	1.5	32.8	59.9	30.0	50
		2.7X2.7	2.0	37.5	63.8	30.0	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-59+206	BH-CL	11.5X11.5	1.0	32.2	18.7	18.7	25
		11.5X11.5	1.5	34.5	18.7	18.7	
NCH-62+400	BH-CL	11.5X11.5	2.0	36.7	18.7	18.7	50
		11.5X11.5	1.0	32.2	37.5	30.0	
OCH-59+206	BH-CL	11.5X11.5	1.5	34.5	37.4	30.0	50
		11.5X11.5	2.0	36.7	37.4	30.0	

SYMBOL	DESCRIPTION
	SM-Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wt-20) SCALE:- HOR:- 1:2850 VER:- 1:285

APPENDIX – B (LAB TEST RESULTS)

Appendix No.	ITEMS
B-1	SOIL CHARACTERISTICS SHEETS
B-2	RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES
B-3	RESULT OF CHEMICAL ANALYSIS OF WATER SAMPLES
B-4	GSD CURVES
B-5	SAMPLE SHEAR CURVE
B-6	CONSOLIDATION CURVE

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	Date of Boring			Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																														
		23-08-2021 to 24-08-2021		55+910			16.00 m	40.00 m		682418.856 m		3147009.213 m				(+2)18.101 m		SR-544_21-22																											
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Depth of Water Table			Dry Density (g/cm ³)		Specific Gravity		Type of Test			Shear Strength			Free Swell Index (%)		Swelling Pressure (kg/cm ²)		Permeability (cm/sec)		Void Ratio (e ₀)		Pressure (kg/cm ²)		C _v x 10 ⁻⁴ (cm ² /Sec)		M _v x 10 ⁻² (cm ² /Kg)		Compression Index (C _p)		
							Clay	Silt	Fine	Medium	Coarse	Fine	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)				Type of Test	Cohesion C ₀ (kg/cm ²)	Angle of Friction (φ)	Friction (φ)																			
UDS-10	28.00	-	-	ML-CL	ML-CL	ML-CL	6	53	30	3	4	4	0	27	21	6	-	-	-	16.00 m	40.00 m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-10	29.50	69	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-11	31.00	-	-	ML-CL	ML-CL	ML-CL	7	50	26	5	2	9	1	27	20	7	-	1.89	18.06	16.00 m	2.67	DST	0.18	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	32.50	85	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-12	34.00	-	-	ML-CL	ML-CL	ML-CL	8	57	22	3	4	6	0	28	21	7	-	-	-	16.00 m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	35.50 (19cm)	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	37.00 (25cm)	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	38.50 (27cm)	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	40.00 (22cm)	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring					Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code														
	19-08-2021 to 21-08-2021		55+910		15.60 m			40.00 m	682407.318 m		3147059.917 m		(+2)17.474 m				SR-544_21-22													
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters													
							Sand		Gravel		Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)		
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit																			Plasticity Index	Shrinkage Limit
SPT-10	28.00	73	28	Brown, Very dense, Sandy silt of low plasticity with gravel	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	29.50	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-11	31.00	100 (19cm)	-		ML-CL	ML-CL		8	44	26	3	2	9	8	28	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	32.50	100 (18cm)	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	34.00	100 (20cm)	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.50	100 (21cm)	-		ML-CL	ML-CL		6	46	34	3	2	9	0	27	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	37.00	100 (18cm)	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	38.50	100 (19cm)	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	40.00	100 (20cm)	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code								
	IS Classification	IS Symbol	Not encountered	10.00 m				682303.349 m	3147516.813 m		Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)			Compression Index (C _p)							
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Grain Size Distribution % wt retained			Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)				
				Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit											Plastic Limit	Plasticity Index	Shrinkage Limit	
DS	0.00	-	-	Brown, Loose, Silty sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	1.00	7	11		0	41	56	2	1	0	0	0	NP	-	-	-	-	-	-	-	-	-		
UDS-1	2.50	-	-	0	40	58	1	1	0	0	0	NP	1.65	10.64	1.49	2.62	DST	0.00	27	-	-	-	-	
SPT-2	4.00	22	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-2	5.50	-	-	6	54	33	4	1	2	0	27	20	1.78	12.88	1.58	2.66	DST	0.21	24	-	-	-	-	-
SPT-3	7.00	25	24	Brown, Medium dense to dense, Sandy silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-		7	54	31	4	1	3	0	28	21	1.83	13.46	1.61	2.66	DST	0.19	26	-	-	-	-
SPT-4	10.00	42	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table	Termination Depth		Coordinates (E,N)			R.L.		Ref. Code																																		
	10-01-2022	to				10-01-2022	56+978	1.36 m	10.00 m	682175.767 m	3148077.480 m	(+)212.389 m		SR-544_21-22																																	
															Grain Size Distribution % wt retained			Atterberg Limits %			Soil Strength			Consolidation Parameters																							
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _p)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Sand	Coarse	Fine	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)													
DS	0.00	-	-																																												
SPT-1	0.50	11	20	Brown, Medium dense, Silty silt of low plasticity	ML-CL		7	46	38	5	2	2	0	0		27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
SPT-2	1.50	16	20																																												
UDS-1	2.25	-	-		ML-CL		8	44	35	7	4	2	0	0		28	21	7	-	1.86	19.74	1.55	2.66	DST	0.22	24	-	-	-	-	-	-	-	-	-	-	-	-	-								
SPT-3	3.00	20	20		CL		11	49	28	6	3	3	0	0		31	20	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
SPT-4	4.50	22	22																																												
UDS-2	5.25	-	-	Brown, Very stiff to hard, Silty clay of low plasticity	CL		12	52	25	5	2	4	0	0		32	21	11	-	1.95	23.70	1.58	2.68	UUT	0.85	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-5	6.00	26	26																																												
SPT-6	7.50	29	29																																												
UDS*	8.25	-	-																																												
SPT-7	9.00	30	23	Brown, Medium dense, Silty sand with clay	SM-SC		6	36	45	3	5	5	0	0		26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-8	10.00	37	26																																												

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring			Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																										
	27-08-2021	to	27-08-2021			10.90 m	30.00 m		682111.171 m	3148361.347 m	(+2)17.941 m	SR-544_21-22																												
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																							
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)							
SPT-12	28.00	100 (19cm)	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL		8	53	24	1	3	11	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-13	29.50	100 (27cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	30.00		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.			IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Depth from G.L. (m)	Sample Type	Date of Boring	Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																												
														11.85 m	30.00 m		682104.781 m	3148389.429 m	(+2)13.893 m	SR-544_21-22																														
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	IS Classification	IS Symbol	Soil Description	Grain Size Distribution % wt retained						Atterberg Limits %			Shear Strength				Consolidation Parameters																														
							Sand			Gravel			Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																			
							Fine	Medium	Coarse	Fine	Coarse	Fine	Coarse																																					
							Clay	Silt																																										
SPT-10	28.00	100 (21cm)	-	-	-	Brown, Very dense, Sandy silt of low plasticity	-	-	-	-	3	10	0	-	-	-	-	-	-	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										
SPT-11	29.50 (22cm)	100 (22cm)	-	ML-CL	-		-	-	7	52	27	1	3	27	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-12	30.00	<100	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Grain Size Distribution % wt retained	Atterberg Limits %	Depth of Water Table	Termination Depth	Coordinates (E,N)		R.L.	Ref. Code							
													Chainage (km./Location)				B.H. No.	11.50 m	3.100 m	682101.808 m	3148402.495 m	(+2)14.414 m	SR-544_21-22
													Date of Boring										
Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %		Depth of Water Table		Termination Depth		Coordinates (E,N)		R.L.		Ref. Code									
Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %		Depth of Water Table		Termination Depth		Coordinates (E,N)		R.L.		Ref. Code									
Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %		Depth of Water Table		Termination Depth		Coordinates (E,N)		R.L.		Ref. Code									
Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %		Depth of Water Table		Termination Depth		Coordinates (E,N)		R.L.		Ref. Code									
Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %		Depth of Water Table		Termination Depth		Coordinates (E,N)		R.L.		Ref. Code									
UDS-10	28.00	-	-	ML-CL																			
SPT-10	29.50	79	31	-	Brown, Dense to very dense, Sandy silt of low plasticity																		
UDS-11	31.00	-	-	ML-CL																			

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Grain Size Distribution % wt retained						Atterberg Limits %			Depth of Water Table		Termination Depth	Coordinates (E,N)						R.L.	Ref. Code																	
	Clay	Silt	Fine	Medium	Coarse	Sand								Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test		Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)													
SPT-10	28.00	84	32	Brown, Very dense, Sandy silt of low plasticity										-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
UDS-9	29.50	-	-											-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	30.00	-	-											-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Termination Depth	B.H. No.	Depth of Water Table		Chainage (km./Location)	B.H. No.	Atterberg Limits %			Termination Depth	Coordinates (E,N)				R.L.	Ref. Code	
	Date of Boring	Date of Boring	Grain Size Distribution % wt retained	Liquid Limit	Plastic Limit	Plasticity Index										Shrinkage Limit	Bulk Density (g/cm ³)			Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)
	24-08-2021	to	25-08-2021	57+400 Major Bridge	BH-P5	12.00 m	30.00 m	682095.861 m	3148428.627 m	(+2)14.548 m	SR-544_21-22																			
	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)			
UDS-9	6	48	32	4	2	5	3	-	27	21	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DS-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				IS Classification		IS Symbol		Soil Description		Observed SPT Value (N)		Corrected SPT Value (N)		Sample Type											
											Depth from G.L. (m)		Observed SPT Value (N)			Corrected SPT Value (N)										
											29.50	30.00	93	35		93	35									
SPT-10	Brown, Dense to very dense, Sandy silt of low plasticity																									
																Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index
23-08-2021	to	24-08-2021	57+400 Major Bridge	BH-P7	11.00 m	30.00 m	682089.915 m	3148454.759 m	(+)214.599 m	SR-544_21-22																

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring								Chainage (km./Location)	B.H. No.	Depth of Water Table				Termination Depth			Coordinates (E,N)					R.L.	Ref. Code																		
							Grain Size Distribution % wt retained					Atterberg Limits %					Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)			C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)															
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse																				Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit										
SPT-13	29.50	91	33	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
SPT-14	31.00	97	34					7	48	32	1	3	9	0	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
SPT-15	32.50	100	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-16	34.00	107	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-17	35.00	100	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring				Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.	Ref. Code																			
	23-08-2021	to	24-08-2021	57+400 Major Bridge			BH-P10	11.85 m	30.00 m	682080.995 m	3148493.957 m	(+2)14.021 m	SR-544_21-22																							
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)								
							Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit																Plastic Limit	Plasticity Index	Shrinkage Limit					
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-1	1.00	-	-		SM		0	20	78	1	0	0	0	0	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-1	2.50	27	#####	Brown, Medium dense, Silty sand	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-2	4.00	-	-		SM		0	30	67	1	1	0	0	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	5.50	25	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-3	7.00	-	-	Brown, Very stiff, Silty clay of low plasticity	CL		9	57	16	6	4	8	0	20	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	8.50	27	27		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-		ML-CL		6	61	25	4	1	3	0	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	31	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	13.00	-	-		ML-CL		7	58	26	3	2	4	0	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	37	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	16.00	-	-		ML-CL		7	55	30	1	2	5	0	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	43	#####	Brown, Very dense, Sandy silt of low plasticity with gravel	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-7	19.00	-	-		ML-CL		6	57	29	3	1	4	0	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	20.50	48	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-8	22.00	-	-		ML-CL		8	54	26	4	2	6	0	28	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	23.50	55	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	25.00	60	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	26.50	56	#####		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.					IS Classification	IS Symbol	Soil Description	Corrected SPT Value (N)	Observed SPT Value (N)	Depth from G.L. (m)	Sample Type	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																														
	Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table	Termination Depth										Coordinates (E,N)	Coordinates (E,N)		Coordinates (E,N)	Coordinates (E,N)	Coordinates (E,N)																																	
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained	Atterberg Limits %	Depth of Water Table			Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																																			
							Sand	Gravel			Atterberg Limits %			Natural Moisture																																							
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																					
SPT-11	28.00	100	###	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL		7	53	25		4	6	0	27	20	7																																					
SPT-12	29.50	100																																																			
SPT-13	30.00	<100																																																			

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km./Location)				B.H. No.			Depth of Water Table			Termination Depth		Coordinates (E,N)						R.L.		Ref. Code							
								Clay	Silt	Fine	Medium	Coarse	Grain Size Distribution % wt retained		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)								
													Clay	Silt																				Fine	Medium	Coarse	Sand	Gravel			
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.								24-08-2021	to	25-08-2021	57+400	Major Bridge	BH-P11	11.80 m	30.00 m	682078.022 m	3148507.023 m	(+)213.946 m	SR-544_21-22																						
DS	DS	0.00	-	-																																					
SPT-1	SPT-1	1.00	9	14																																					
UDS-1	UDS-1	2.50	-	-	ML-CL	ML-CL																																			
SPT-2	SPT-2	4.00	18	20																																					
UDS-2	UDS-2	5.50	-	-	ML-CL	ML-CL																																			
SPT-3	SPT-3	7.00	22	21																																					
UDS-3	UDS-3	8.50	-	-	ML-CL	ML-CL																																			
SPT-4	SPT-4	10.00	27	22																																					
UDS-4	UDS-4	11.50	-	-	ML-CL	ML-CL																																			
SPT-5	SPT-5	13.00	30	19																																					
UDS-5	UDS-5	14.50	-	-	ML-CL	ML-CL																																			
SPT-6	SPT-6	16.00	22	15																																					
UDS-6	UDS-6	17.50	-	-	ML-CL	ML-CL																																			
SPT-7	SPT-7	19.00	25	16																																					
UDS-7	UDS-7	20.50	-	-	ML-CL	ML-CL																																			
SPT-8	SPT-8	22.00	30	17																																					
SPT-9	SPT-9	23.50	45	45		CL	CL																																		
SPT-10	SPT-10	25.00	44	44																																					

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring			Chainage (km./Location)		B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																							
	24-08-2021	to	25-08-2021	57+400	Major Bridge		BH-P11	11.80 m		30.00 m	682078.022 m		3148507.023 m			SR-544_21-22																						
						Clay		Silt	Fine		Medium	Coarse	Gravel	Liquid Limit	Plastic Limit		Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)					
SPT-11	26.50	85	33	0	79	7	2	7	0	26	20	6				-																		-	-	-	-	-
SPT-12	28.00	100 (25cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	29.50	100 (18cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																						
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine				Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)			Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)								
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
UDS-1	1.00	-	-	-	63	1	0	0	0	0	0	0	0	0	25	5	5	-	1.77	11.86	1.58	2.65	DST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-1	2.50	25	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-2	4.00	-	-	-	65	1	0	0	0	0	0	0	0	25	19	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	5.50	26	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	-	-	-	44	1	0	0	0	0	0	0	0	27	20	7	-	1.81	14.63	1.58	2.67	DST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	8.50	29	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.00	-	-	-	34	3	1	2	0	0	0	0	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	33	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	13.00	-	-	-	38	4	1	2	0	0	0	0	0	27	20	7	-	1.83	17.25	1.56	2.66	DST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	14.50	37	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	16.00	-	-	-	46	1	1	1	0	0	0	0	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	35	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-7	19.00	-	-	-	31	2	0	1	0	0	0	0	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	20.50	32	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	22.00	38	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	23.50	51	24	-	29	2	1	6	0	0	0	0	0	26	20	6	-	1.87	18.50	1.58	2.67	DST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	25.00	60	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	26.50	49	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
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SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Depth from G.L. (m)	Sample Type	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code					
	Date of Boring	Grain Size Distribution % wt retained		Atterberg Limits %												Shear Strength			Free Swell Index		Permeability				Void Ratio (e ₀)		Consolidation Parameters		
	26-08-2021	to	27-08-2021	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)			
				5	46	36	3	2	8	0	25	19	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	28.00	58	25	Brown, Medium dense to very dense, Sandy silt of low plasticity			ML-CL																						
SPT-13	29.50 (19cm)	100	-																										
-	30.00	-	-																										

Abbreviations:-
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SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Symbol	IS Classification	Soil Description	Corrected SPT Value (N)	Observed SPT Value (N)	Depth from G.L. (m)	Sample Type	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code						
	Date of Boring		Atterberg Limits %		Grain Size Distribution % wt retained	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)										Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)			Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)
	Fine	Medium	Coarse	Fine																															
SPT-13	27-08-2021	28-08-2021	28	2	1	7	0	28	21	7	-	-	-	8	54	28	-	-	-	-	-	-	-	-	-	-	-	62	25	29.50	30.00	682072.075 m	3148533.155 m	(+2)14.579 m	SR-544_21-22
-	57+400	Major Bridge	BH-P13	12.30 m	30.00 m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)		R.L.	Ref. Code																										
	25-08-2021	to			26-08-2021	57+400 Major Bridge		BH-P15	11.80 m			30.00 m	682066.129 m	3148559.287 m	(+2)13.460 m	SR-544_21-22																					
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Shear Strength				Consolidation Parameters																
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)					
SPT-13	28.00	81	31	Brown, Very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-14	29.50	90	33				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	30.00	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																							
	Date of Boring		Grain Size Distribution % wt retained				Atterberg Limits %			Shear Strength		Consolidation Parameters																										
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)							
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	1.00	-	-	ML-CL	ML-CL		7	59	31	2	1	0	0	26	6	6	-	1.75	12.63	1.55	2.66	DST	0.21	24	-	-	-	-	-	-	-	-	-	-				
SPT-1	2.50	16	20	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-2	4.00	-	-	Brown, Medium dense, Sandy silt of low plasticity	ML-CL		6	56	33	1	3	1	0	26	19	7	-	1.76	13.41	1.55	2.67	DST	0.19	25	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	5.50	19	19	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	-	-	ML-CL	ML-CL		8	56	32	1	2	1	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	8.50	21	18	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-	SM	SM		0	18	78	2	1	1	0	-	Nil	NP	-	1.78	14.78	1.55	2.63	DST	0.00	29	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	24	17	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS*	13.00	-	-	Brown, Medium dense to dense, Silty sand	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	31	19	SM	SM		0	14	80	3	2	1	0	-	Nil	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-5	16.00	-	-	SM	SM		0	19	74	2	2	3	0	-	Nil	NP	-	1.81	16.34	1.56	2.62	DST	0.00	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	39	21	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	19.00	77	34	ML-CL	ML-CL		7	55	26	3	2	7	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-8	20.50 (24cm)	100	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-9	22.00 (23cm)	100	-	Brown, Very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	23.50 (26cm)	100	-	ML-CL	ML-CL		8	51	31	5	1	4	0	28	21	7	-	1.94	18.00	1.64	2.66	DST	0.17	28	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	25.00 (23cm)	100	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Project Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.												Date of Boring	Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code						
							Grain Size Distribution % wt retained						Atterberg Limits %			Natural Moisture Content (%)		Dry Density (g/cm ³)				Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)			Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)	
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit				Bulk Density (g/cm ³)	Natural Moisture Content (%)														Dry Density (g/cm ³)
SPT-12	26.50	100 (26cm)	-	Brown, Very dense, Silty sand	SM		0	20	76	1	1	0	-	Nil	NP	-	-	11.20 m	30.00 m	682063.156 m	3148572.353 m	(+2)12.949 m	SR-544_21-22														
SPT-13	28.00	100 (24cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
SPT-14	29.50	90	34		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
-	30.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)		Corrected SPT Value (N _c)	Soil Description		
			Observed SPT Value	(N)				
			100 (18cm)					
	29.50							
		30.00						
Grain Size Distribution % wt retained								
Clay								
Silt								
Fine								
Medium								
Coarse								
Sand								
Fine								
Coarse								
Gravel								
Liquid Limit								
Plastic Limit								
Plasticity Index								
Shrinkage Limit								
Bulk Density (g/cm ³)								
Natural Moisture Content (%)								
Dry Density (g/cm ³)								
Specific Gravity								
Type of Test								
Cohesion C (kg/cm ²)								
Angle of Friction (φ)								
Free Swell Index (%)								
Swelling Pressure (kg/cm ²)								
Permeability (cm/sec)								
Void Ratio (e ₀)								
Pressure (kg/cm ²)								
C _v x 10 ⁻⁴ (cm ² /Sec)								
M _v x 10 ⁻² (cm ² /Kg)								
Compression Index (C _c)								
Termination Depth								
30.00 m								
Depth of Water Table								
10.80 m								
Chainage (km./Location)								
57+400 Major Bridge								
B.H. No.								
BH-P17								
Date of Boring								
26-08-2021 to 27-08-2021								
Coordinates (E,N)								
682060.182 m								
3148585.419 m								
R.L.								
(+)213.184 m								
Ref. Code								
SR-544_21-22								

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																			
	Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %				Shear Strength			Consolidation Parameters																								
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	1.00	-	-		ML-CL		8	48	42	1	0	0	27	20	7	-	1.74	13.10	1.54	2.67	DST	0.21	24	-	-	-	-	-	-	-	-	-	-			
SPT-1	2.50	15	19		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-2	4.00	-	-	Brown, Medium dense, Sandy silt of low plasticity	ML-CL		8	57	28	3	2	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	5.50	20	20		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	-	-		ML-CL		7	51	33	4	2	1	27	20	7	-	1.80	15.26	1.56	2.66	DST	0.19	25	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	8.50	26	23		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-		CL		12	61	18	4	2	3	34	22	12	-	1.93	20.65	1.60	2.68	UUT	1.07	4	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	30	30		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	13.00	30	30	Brown, Hard, Silty clay of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	14.50	34	34		CL		11	65	12	6	2	4	33	22	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	16.00	34	34		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	17.50	100 (20cm)	-		ML-CL		7	52	27	5	2	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	19.00	100 (22cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	20.50	100 (18cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-11	22.00	100 (25cm)	-	Brown, Very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	23.50	100 (21cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	25.00	100 (24cm)	-		ML-CL		6	54	24	2	3	11	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	26.50	103 (26cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.																									
							Date of Boring			Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code												
		24-08-2021		to	25-08-2021	57+400 Major Bridge	BH-P18	10.50 m	30.00 m	682057.209 m		3148598.485 m		(+2)13.517 m	SR-544_21-22																	
		Grain Size Distribution % wt retained				Atterberg Limits %					Consolidation Parameters																					
		Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)			
SPT-15	28.00	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-16	29.50	100	-	-	-	-	8	51	30	2	1	8	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	30.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DSJ+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																						
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)				Soil Description	IS Classification		IS Symbol	Clay	Silt	Fine			Medium	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)	
DS	0.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-1	1.00	11	17		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	2.50	-	-		ML-CL	-	-	7	46	45	2	0	0	26	20	6	-	1.72	12.64	1.53	2.67	DST	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	4.00	14	16		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-2	5.50	-	-		ML-CL	-	-	8	49	41	2	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	7.00	19	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	8.50	-	-		ML-CL	-	-	6	52	37	4	0	26	20	6	-	1.77	14.26	1.55	2.66	DST	-	0.19	24	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-4	10.00	23	19		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	11.50	31	25		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	13.00	31	20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	14.50	27	18		ML-CL	-	-	7	47	44	1	1	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	16.00	31	31		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	17.50	-	-		CL	-	-	12	68	16	2	1	30	20	10	-	1.94	21.34	1.60	2.68	UUT	1.02	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	19.00	35	35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	20.50	>100	-		SM	-	-	0	20	48	20	2	10	Nil	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	22.00	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	23.50	>100	-		SM	-	-	0	19	42	32	1	6	Nil	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	25.00	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Project	Date of Boring				Chainage (km./Location)	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)				R.L.	Ref. Code		
								23-08-2021		to				24-08-2021		57+400		11.50 m	30.00 m	682054,236 m	3148611,551 m	(+)213.504 m	SR-544_21-22				
								Grain Size Distribution % wt retained						Atterberg Limits %			Type of Test									Cohesion C (kg/cm ²)	Angle of Friction (φ)
Clay	Silt	Fine	Medium	Coarse	Sand	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity												
SPT-14	26.50	100 (18cm)	-	Brown, Very dense, Silty sand	-	-	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-15	28.00	100 (25cm)	-		SM	-		-	-	0	22	77	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-
SPT-16	29.50	>100	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	30.00	>100	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.								IS Symbol	IS Classification	Soil Description	Corrected SPT Value (N)	Observed SPT Value (N)	Depth from G.L. (m)	Sample Type	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code						
	Date of Boring	Grain Size Distribution % wt retained		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)										Natural Moisture Content (%)	Dry Density (g/cm ³)		Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)			Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)
20-08-2021	Fine	Medium	Coarse						Sand	Clay	Silt	Fine	Coarse	Sand	Medium	Coarse	Sand			Fine					Gravel	682050.819 m						
SPT-12	28.00	99	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	29.50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	31.00	110	-	-	6	48	36	2	1	7	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	32.50	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	34.00	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	35.00	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring				Chainage (km./Location)		B.H. No.	Depth of Water Table			Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																
					3-7-2022		to		3-7-2022			57+980		CL	9.28 m			10.00 m		681950.308 m			3149053.752 m		(+2)13.055 m	SR-544_21-22												
					Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification		IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Shear Strength			Consolidation Parameters															
Clay	Silt	Fine	Medium	Coarse							Fine		Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)						
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-1	1.50	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-1	2.25	-	-	19	68	7	5	1	0	0	42	24	18	-	1.80	18.60	1.52	2.71	0.61	5	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-2	3.00	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-3	4.50	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-2	5.25	-	-	11	44	34	7	1	3	0	32	21	11	-	1.93	19.70	1.61	2.66	1.17	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-4	6.00	29	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	7.50	33	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	8.25	-	-	12	51	28	5	1	3	0	31	22	9	-	1.89	19.88	1.58	2.68	0.68	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	9.00	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	10.00	21	21	-	-	43	13	2	0	0	27	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained							Atterberg Limits %				Natural Moisture Content (%)	Bulk Density (g/cm ³)	Termination Depth	Depth of Water Table	B.H. No.	Chainage (km./Location)	B.H. No.	Coordinates (E,N)				R.L.	Ref. Code																						
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit								Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _r x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)															
DS	0.00	-	-	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL	ML-CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																				
SPT-1	1.00	6	10					7	50	37	4	2	0	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-											
UDS-1	2.50	-	-					6	48	35	6	3	2	26	20	6	-	-	1.69	12.60	1.50	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
SPT-2	4.00	16	18					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
UDS-2	5.50	-	-	Brown, Hard, Silty clay of low plasticity with gravel	CL	CL	-	11	49	28	5	2	31	20	11	1.84	15.24	1.60	2.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-3	7.00	31	31					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	8.50	-	-					10	53	24	4	3	6	30	20	10	-	-	1.90	16.49	1.63	2.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	10.00	46	46					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Date of Boring							Chainage (km./Location)	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)						R.L.	Ref. Code																								
							Grain Size Distribution % wt retained									Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																	
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse			Gravel	Liquid Limit	Plastic Limit	Plasticity Index																		Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)	
SPT-10	28.00	75	27	Brown, Very dense, Sandy silt of low plasticity	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
UDS-9	29.50	-	-		ML-CL	ML-CL	-	Clay	6	46	36	2	2	0	27	7	-	2.66	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-											
SPT-11	31.00	80	26		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
UDS-10	32.50	-	-		ML-CL	ML-CL	-	Clay	6	49	37	3	1	0	26	6	20	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-12	34.00	100 (20cm)	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-13	35.50	100 (23cm)	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-14	37.00	100 (26cm)	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-15	38.50	67	23		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-11	40.00	-	-		-	ML-CL	-	Clay	7	47	32	3	2	0	26	7	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST*+ - Direct Shear Test on Remoulded Sample, UUT*+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.					Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																					
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description				IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel			Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _u)		
SPT-10	28.00	>100	-	Brown, Dense to very dense, Sandy silt of low plasticity	-																																		
SPT-11	29.50	100 (20cm)	-		-																																		
SPT-12	31.00	>100	-		ML-CL																																		
SPT-13	32.50	100 (25cm)	-		-																																		
SPT-14	34.00	100 (25cm)	-		-																																		
SPT-15	35.50	>100	-		ML-CL																																		
SPT-16	37.00	>100	-		-																																		
SPT-17	38.50	>100	-		-																																		
SPT-18	40.00	>100	-	-																																			

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Grain Size Distribution % wt retained										Atterberg Limits %			Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code
	Date of Boring				Chainage (km./Location)		B.H. No.		Depth of Water Table									Termination Depth		Coordinates (E,N)		R.L.		Ref. Code																
	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit								Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)								
DS	23-08-2021	24-08-2021	58+497	BH-P3	11.00 m	40.00 m	681840.000 m	3149565.000 m	(+2)14.145 m	SR-544_21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
UDS-1	0	22	77	1	0	0	0	0	0	0	10.63	1.53	2.62	DST	0.00	29	-	-	-	-	-	-	-	-	-	-														
SPT-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-2	0	22	72	3	2	1	0	0	0	0	-	-	-	-	Nil	NP	-	-	-	-	-	-	-	-	-	-														
SPT-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-3	5	59	30	3	2	1	0	25	20	5	14.22	1.58	2.66	DST	0.21	25	-	-	-	-	-	-	-	-	-															
SPT-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-4	6	56	34	1	1	2	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
SPT-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-5	7	56	29	3	2	3	0	27	20	7	16.87	1.58	2.66	DST	0.19	26	-	-	-	-	-	-	-	-	-															
SPT-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-6	8	45	33	4	4	6	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
SPT-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-7	6	57	21	1	2	8	5	26	20	6	17.64	1.61	2.67	DST	0.22	27	-	-	-	-	-	-	-	-	-															
SPT-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-8	9	51	19	1	1	9	10	29	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
SPT-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-9	6	46	40	1	1	6	0	27	21	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
SPT-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																						
	23-08-2021	to			24-08-2021	58+497	BH-P3	11.00 m	40.00 m	681840.000 m	3149565.000 m	(+2)14.145 m			SR-544_21-22																					
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																			
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)			
UDS-10	28.00	-	-	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL		7	51	35	1	1	5	0	26	19	7	-	1.94	18.10	1.64	2.66	DST	0.18	28	-	-	-	-	-	-	-	-	-			
SPT-10	29.50 (25cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-11	31.00 (23cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	32.50 (25cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	34.00 (20cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.50	105	36		-	ML-CL		8	55	25	3	1	8	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	37.00 (19cm)	107	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	38.50 (23cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	40.00 (25cm)	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.		Ref. Code							
									Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)		Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)		
																					Grain Size Distribution % wt retained	
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity		
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-1	1.00	19	30	Brown, Medium dense, Sandy silt of low plasticity	ML-CL	ML-CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-1	2.50	-	-				5	63	30	2	0	0	0	0	0	26	20	6	11.23	1.77	11.23	1.59
SPT-2	4.00	24	27		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	5.50	-	-	Brown, Dense, Sandy silt of low plasticity	ML-CL	ML-CL	6	60	29	3	1	1	0	26	19	7	11.84	1.80	11.84	1.61	-	-
SPT-3	7.00	35	32				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-		-		7	53	32	4	1	3	0	27	20	7	2.67	2.67	2.67	2.67	2.67	
SPT-4	10.00	43	33		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	11.50	48	34		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	13.00	54	26		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-4	14.50	-	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL	ML-CL	7	51	35	2	3	2	0	27	21	6	2.66	2.66	2.66	2.66	2.66	2.66
SPT-7	16.00	58	25				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	17.50	-	-		-		8	51	29	6	2	4	0	28	21	7	-	-	-	-	-	-
SPT-8	19.00	53	22		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	20.50	-	-		-		7	55	26	4	3	5	0	27	20	7	1.87	16.75	1.60	-	-	-
SPT-9	22.00	66	25		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS*	23.50	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	25.00	78	28		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-7	26.50	-	-		-		9	59	23	3	4	2	0	29	22	7	2.66	2.66	2.66	2.66	2.66	2.66

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol						
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Grain Size Distribution % wt retained							Atterberg Limits %					
						Clay	Silt	Fine	Medium	Coarse				Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index
Date of Boring		Chainage (km./Location)		B.H. No.		Depth of Water Table		Termination Depth		Coordinates (E,N)			R.L.		Ref. Code			
	18-08-2021	to	19-08-2021	58+497	BH-P4	11.90 m	40.00 m	681837.920 m	3149594.593 m	(+2)14.312 m	SR-544_21-22							
SPT-11	28.00	78	26		Brown, Very dense, Sandy silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-8	29.50	-	-	ML-CL		7	61	27	3	2	0	0	27	-	-	-	-	-
SPT-12	31.00	82	26	-		-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-9	32.50	-	-	ML-CL		8	65	24	2	1	0	0	28	21	7	0.22	27	-
SPT-13	34.00	100 (24cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.50	100 (19cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	37.00	100 (26cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	38.50	100 (23cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	40.00	89	28	-		-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol														
	Date of Boring		Chainage (km./Location)		B.H. No.		Depth of Water Table		Termination Depth				Coordinates (E,N)				R.L.	Ref. Code								
	17-08-2021	to	18-08-2021	58+497	BH-P6	11.00 m	40.00 m	681836.405 m	3149645.522 m	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)										
Grain Size Distribution % wt retained						Atterberg Limits %			Shear Strength		Free Swell Index						Swelling Pressure		Permeability							
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)		
DS	0.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-1	1.00	-	-	ML-CL	7	58	27	4	3	1	0	20	7	-	1.74	12.19	1.55	2.66	DST	0.24	23	-	-	-	-	
SPT-1	2.50	16	20	Brown, Medium dense, Sandy silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	4.00	-	-	ML-CL	9	58	24	5	2	0	28	21	7	-	1.79	13.26	1.58	2.67	DST	0.19	24	-	-	-	-	
SPT-2	5.50	27	27		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	7.00	-	-	CL	13	71	11	3	1	1	33	22	11	-	1.87	16.34	1.61	2.68	UUT	1.22	5	-	-	-	-	
SPT-3	8.50	36	36		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.00	-	-	CL	12	66	15	3	2	2	32	21	11	-	1.90	17.48	1.62	2.68	UUT	1.36	5	-	-	0.655	8.61 1.71 1.0-2.0 6.38 1.23 2.0-4.0 5.24 0.81 4.0-8.0 4.03 0.52	0.1100
SPT-4	11.50	43	43	Brown, Hard, Silty clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	13.00	-	-	CL	12	61	18	4	1	4	31	20	11	-	1.99	21.63	1.64	2.67	UUT	1.65	4	-	-	-	-	-
SPT-5	14.50	51	51		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	16.00	-	-	CL	13	57	16	5	3	5	33	22	11	-	2.02	22.20	1.65	2.68	UUT	1.79	4	-	-	-	-	-
SPT-6	17.50	54	54		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-7	19.00	-	-	ML-CL	8	58	28	2	1	3	28	21	7	-	1.87	17.10	1.60	2.66	DST	0.18	26	-	-	-	-	-
SPT-7	20.50	67	29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-8	22.00	-	-	ML-CL	6	52	32	3	1	6	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	23.50	72	30		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-9	25.00	-	-	ML-CL	7	62	21	4	1	5	26	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	26.50	80	31		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																				
	17-08-2021	to			18-08-2021	58+497	BH-P6	11.00 m	40.00 m	681836.405 m	3149645.522 m	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _u)																
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)												
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit							Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity					
UDS-10	28.00	-	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL		8	63	22	1	0	0	0	28	21	7	-	1.95	18.19	1.65	2.67	DST	0.20	28	-	-	-	-	-	-	-	-	-	
SPT-10	29.50	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	31.00	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	32.50	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	34.00	>100	-				7	59	26	7	1	0	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.50	100 (25cm)	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	37.00	100 (22cm)	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	38.50	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	40.00	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Date of Boring						Chainage (km./Location)	B.H. No.	Depth of Water Table			Termination Depth		Coordinates (E,N)						R.L.	Ref. Code					
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Clay			Silt	Fine	Medium	Coarse	Gravel	Liquid Limit			Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)
SPT-10	28.00	58	25	Brown, Very dense, Sandy silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-10	29.50	-	-		ML-CL	7	67	26	0	0	0	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-11	31.00	65	26		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-11	32.50	-	-		ML-CL	5	51	36	4	1	3	0	26	19	7	-	2.66	2.66	2.66	2.66	DST	0.17	27	-	-	-	-	-	-	-	-	-		
SPT-12	34.00	99	33		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-13	35.50	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	37.00	100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	38.50	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	40.00	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.	Ref. Code														
							24-09-2021		to		24-09-2021				58+837		Minor Bridge		BH-CL		Not Encountered		10.00 m			681823.952 m		3149897.982 m		(+2)13.610 m		SR-544_21-22							
							Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)											
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit																												
DS	0.00	-	-		-																																		
SPT-1	1.00	6	10	Brown, Loose, Silty sand	-																																		
UDS-1	2.50	-	-		SM																																		
SPT-2	4.00	22	25		-																																		
UDS-2	5.50	-	-		ML-CL																																		
SPT-3	7.00	32	30	Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	-																																		
UDS-3	8.50	-	-		ML-CL																																		
SPT-4	10.00	47	38		-																																		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)		R.L.	Ref. Code																																					
	24-09-2021	to	24-09-2021	59+071 Minor Bridge				BH-CL	Not Encountered		10.00 m	681817.835 m			3150131.892 m	(+)213.832 m	SR-544_21-22																																		
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																				
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit																Plastic Limit	Plasticity Index	Shrinkage Limit																	
DS	0.00	-	-	Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
UDS-1	1.00	-	-		ML-CL	-	-	7	51	33	5	1	3	0	27	20	7	14.60	1.79	1.56	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										
SPT-1	2.50	18	23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
UDS-2	4.00	-	-		ML-CL	-	-	6	54	30	4	2	4	0	26	20	6	15.41	1.85	1.60	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	5.50	29	29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-3	7.00	-	-		ML-CL	-	-	8	51	28	6	1	6	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-3	8.50	32	27		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																															
									681801.000 m	3150330.000 m	Void Ratio (e ₀)	Pressure (kg/cm ²)			C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																												
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)															
Clay		Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)																Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)						
		Clay	Silt	Fine	Medium											Coarse																													
DS	0.00	-	-		-																																								
SPT-1	1.00	20	31		-																																								
UDS-1	2.50	-	-		ML-CL																																								
SPT-2	4.00	26	29	Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	-																																								
UDS-2	5.50	-	-		ML-CL																																								
SPT-3	7.00	39	36		-																																								
UDS-3	8.50	-	-		ML-CL																																								
SPT-4	10.00	42	33	-																																									

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES

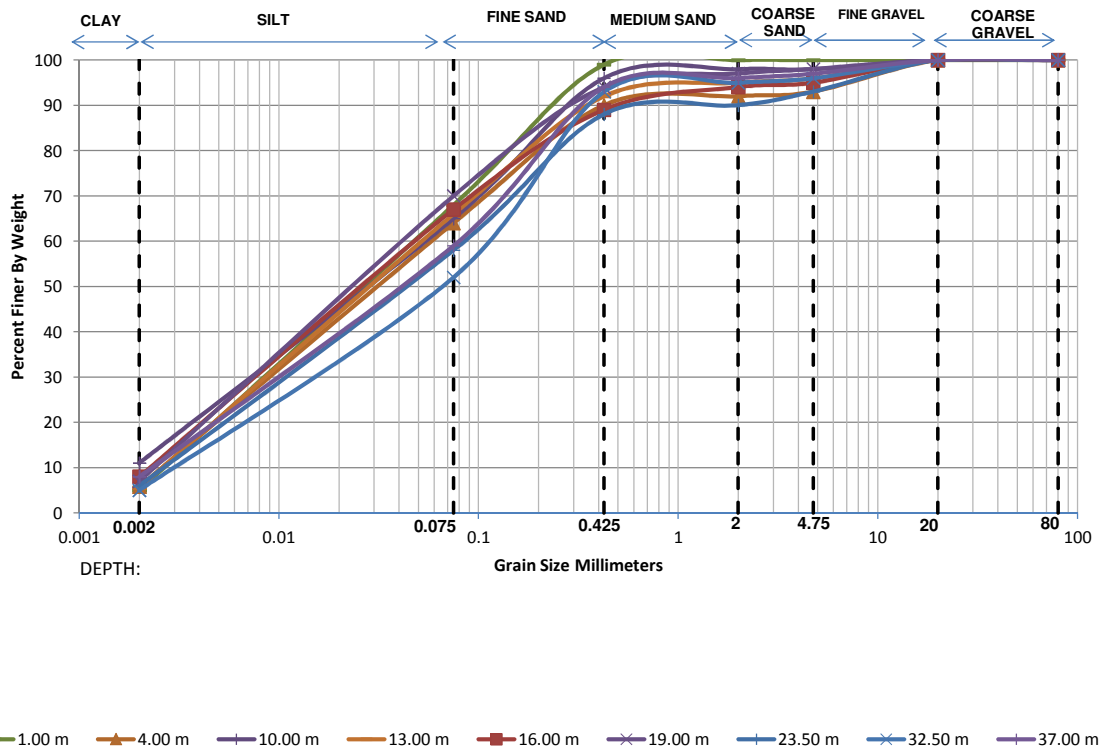
Sr. No	Chainage Old	Chainage New	BH No.	Depth of collected sample (m)	pH	Chlorides (Cl ⁻)		Sulphate (SO ₄ ²⁻)	
						(mg/kg)	(%)	(mg/kg)	(%)
1.	52+518	55+719	BH-A1	1.0	8.79	76.23	0.0076	18.14	0.0018
			BH-A2	16.0	7.88	85.68	0.0086	29.30	0.0029
2.	55+910	59+107	BH-A1	13.0	7.14	56.12	0.0056	19.35	0.0019
			BH-A2	2.5	9.34	65.67	0.0066	24.26	0.0024
3.	57+400	60+603	BH-P3	13.0	8.74	74.54	0.0074	23.10	0.0023
			BH-P19	5.5	9.70	61.71	0.0062	29.20	0.0029
4.	58+497	61+676	BH-A1	2.5	8.90	80.43	0.0080	17.04	0.0017
			BH-A2	11.5	8.75	79.71	0.0080	22.40	0.0022

RESULT OF CHEMICAL ANALYSIS OF WATER SAMPLE

Sr. No	Chainage Old	Chainage New	BH No.	pH	Chlorides (Cl ⁻) (mg/l)		Sulphate (SO ₄ ²⁻) (mg/l)	
1.	52+518	55+719	BH-A1	9.23	55.34		20.64	
2.	55+910	59+107	BH-A1	9.06	70.33		24.19	
3.	57+400	60+603	BH-A1	10.12	57.73		25.43	
4.	58+497	61+676	BH-A1	9.43	57.65		23.28	

GRAIN SIZE DISTRIBUTION CURVES

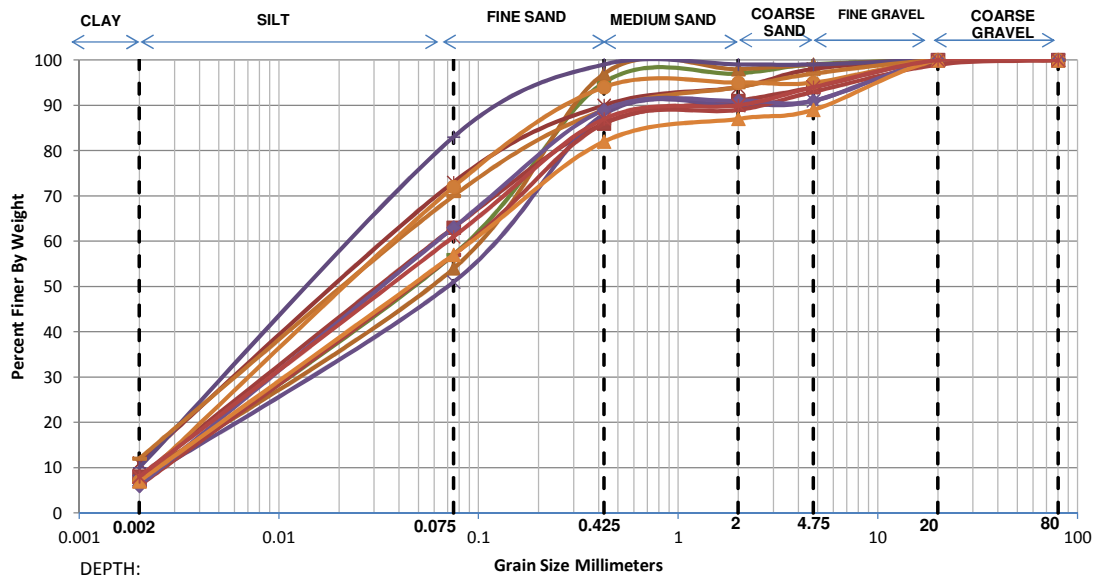
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	52+518 (Old Ch) & 55+719 (New Ch) Major Bridge
B.H. No.	BH-A1



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	63.00	31.00	1.00	0.00	0.00	0.00	0.0051	0.0202	0.0595	11.76	1.36
4.00 m	5.80	58.20	26.00	2.00	1.00	7.00	0.00	0.0044	0.0203	0.0662	15.06	1.42
10.00 m	11.00	54.00	31.00	2.00	0.00	2.00	0.00	-	0.0148	0.0634	-	-
13.00 m	5.60	60.40	26.00	3.00	1.00	4.00	0.00	0.0045	0.0199	0.0625	13.79	1.39
16.00 m	8.00	59.00	22.00	5.00	1.00	5.00	0.00	0.0029	0.0167	0.0600	20.88	1.61
19.00 m	7.00	63.00	24.00	3.00	1.00	2.00	0.00	0.0034	0.0169	0.0555	16.15	1.50
23.50 m	6.00	52.00	30.00	2.00	3.00	7.00	0.00	0.0044	0.0231	0.0810	18.60	1.51
32.50 m	5.00	47.00	41.00	2.00	1.00	4.00	0.00	0.0056	0.0291	0.1022	18.27	1.48
37.00 m	8.00	51.00	35.00	2.00	1.00	3.00	0.00	0.0029	0.0205	0.0777	26.55	1.86

GRAIN SIZE DISTRIBUTION CURVES

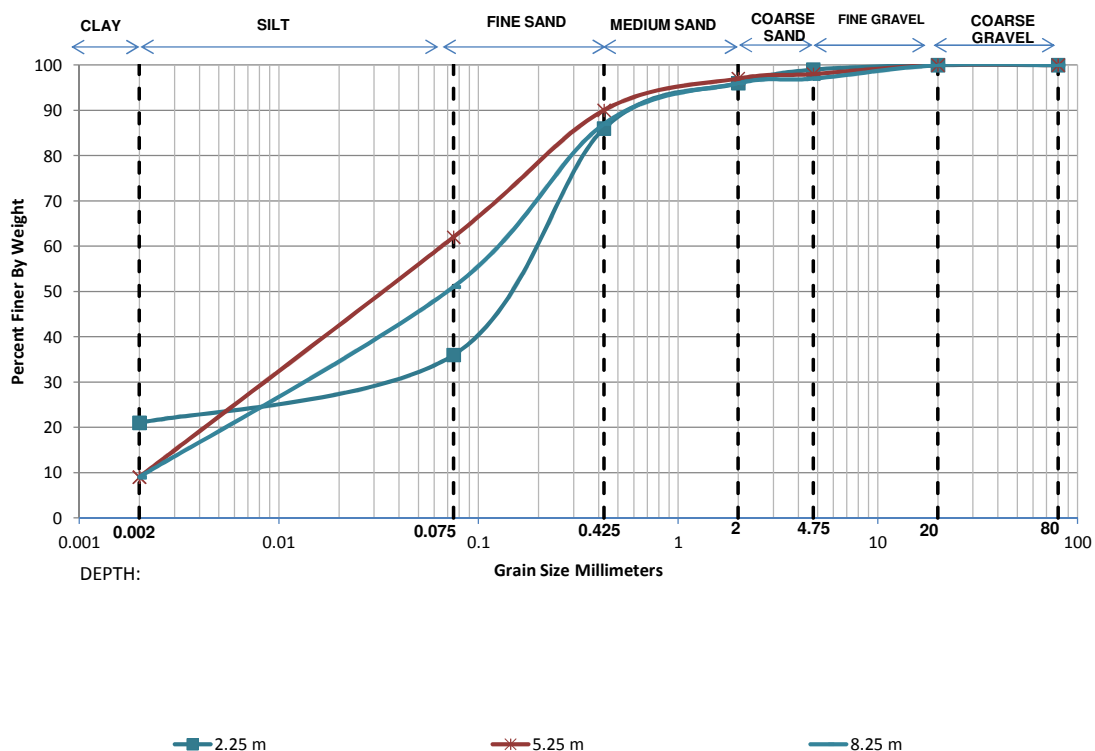
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	52+518 (Old Ch) & 55+719 (New Ch) Major Bridge
B.H. No.	BH-A2



- | | | | | | |
|---------|---------|---------|---------|---------|---------|
| 1.00 m | 4.00 m | 7.00 m | 10.00 m | 13.00 m | 16.00 m |
| 19.00 m | 22.00 m | 25.00 m | 28.00 m | 31.00 m | 34.00 m |

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	50.00	38.00	2.00	2.00	1.00	0.00	0.0036	0.0229	0.0836	23.25	1.75
4.00 m	8.00	46.00	43.00	1.00	1.00	1.00	0.00	0.0030	0.0241	0.0937	31.52	2.09
7.00 m	11.00	62.00	17.00	4.00	4.00	2.00	0.00	-	0.0122	0.0493	-	-
10.00 m	10.00	73.00	16.00	0.00	0.00	1.00	0.00	0.0020	0.0113	0.0388	19.42	1.66
13.00 m	12.00	58.00	19.00	5.00	3.00	3.00	0.00	-	0.0122	0.0535	-	-
16.00 m	8.00	55.00	23.00	5.00	3.00	6.00	0.00	0.0029	0.0181	0.0679	23.47	1.67
19.00 m	7.00	44.00	37.00	2.00	1.00	9.00	0.00	0.0037	0.0273	0.1106	29.87	1.82
22.00 m	7.00	65.00	22.00	1.00	0.00	5.00	0.00	0.0034	0.0163	0.0525	15.37	1.48
25.00 m	6.00	51.00	29.00	3.00	4.00	6.00	1.00	0.0044	0.0236	0.0851	19.45	1.50
28.00 m	6.00	57.00	26.00	2.00	0.00	9.00	0.00	0.0042	0.0205	0.0682	16.06	1.45
31.00 m	7.00	50.00	25.00	5.00	2.00	11.00	0.00	0.0036	0.0222	0.0866	24.20	1.60
34.00 m	8.00	53.00	26.00	3.00	4.00	6.00	0.00	0.0029	0.0191	0.0725	24.96	1.74

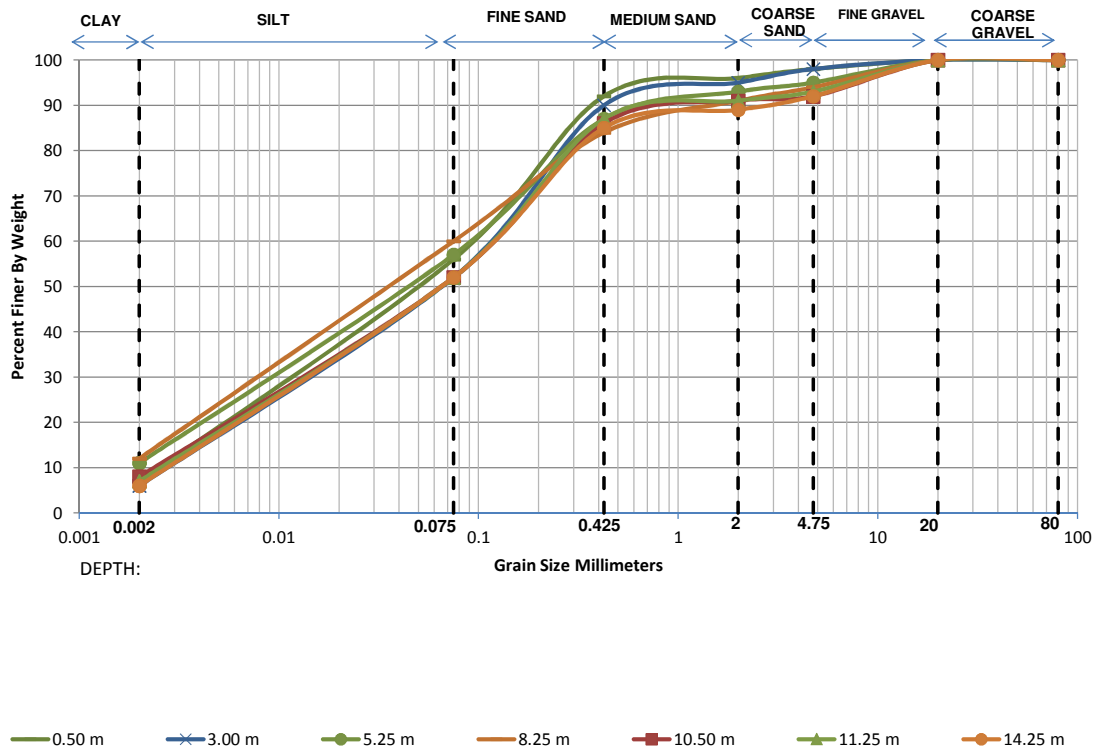
GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	52+934 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	21.00	15.00	50.00	10.00	3.00	1.00	0.00	-	0.0372	0.1965	-	-
5.25 m	9.00	53.00	28.00	7.00	1.00	2.00	0.00	0.0024	0.0178	0.0701	29.23	1.88
8.25 m	9.00	42.00	36.00	9.00	1.00	3.00	0.00	0.0024	0.0251	0.1135	46.74	2.28

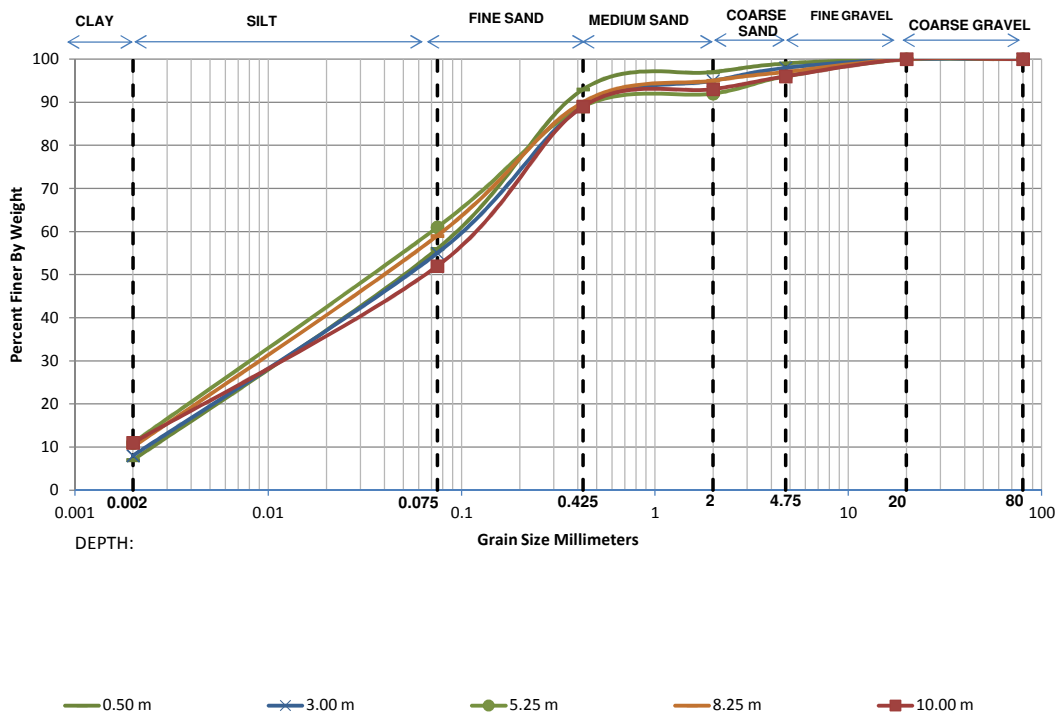
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	53+107
B.H. No.	BH-CL

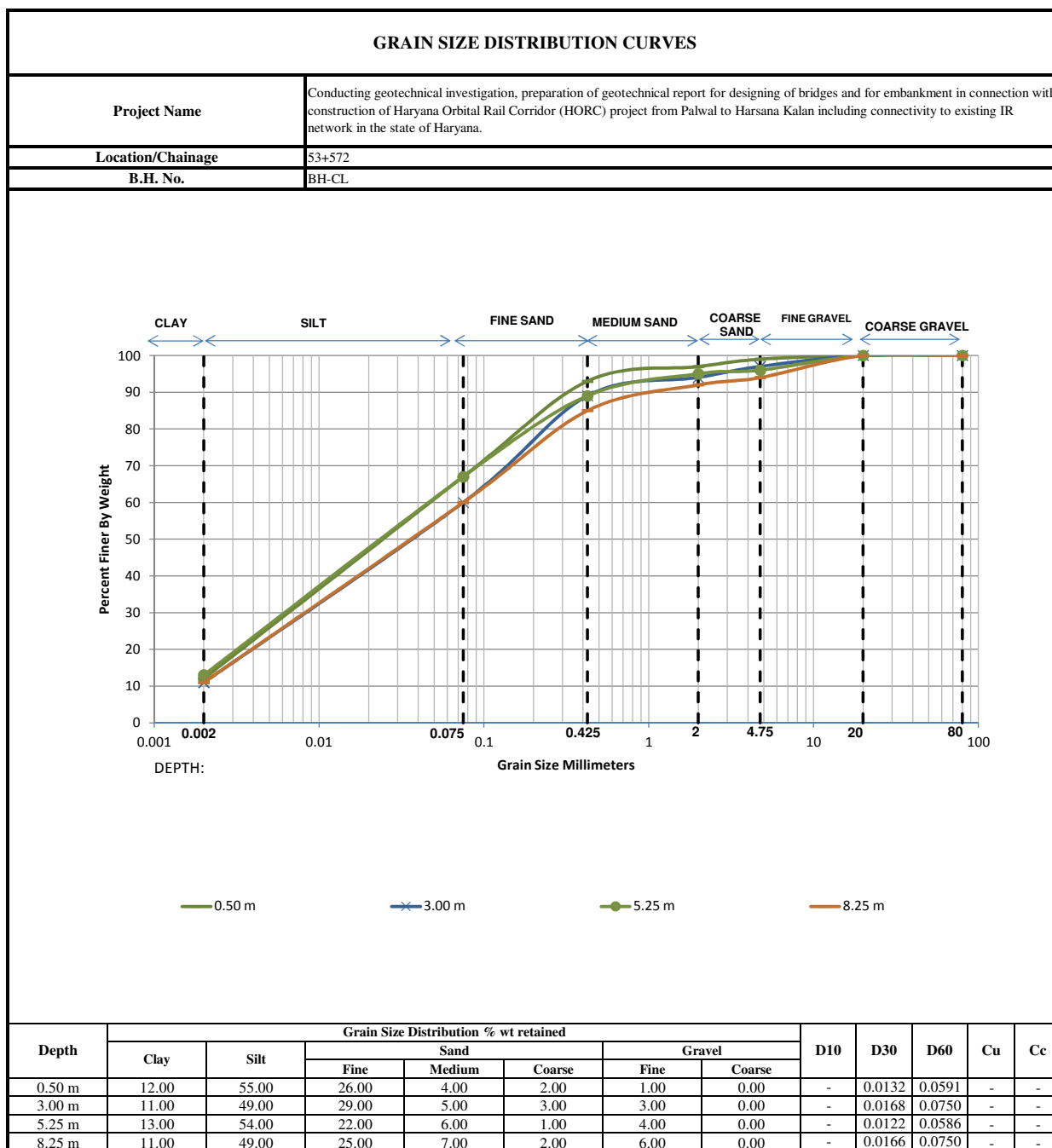


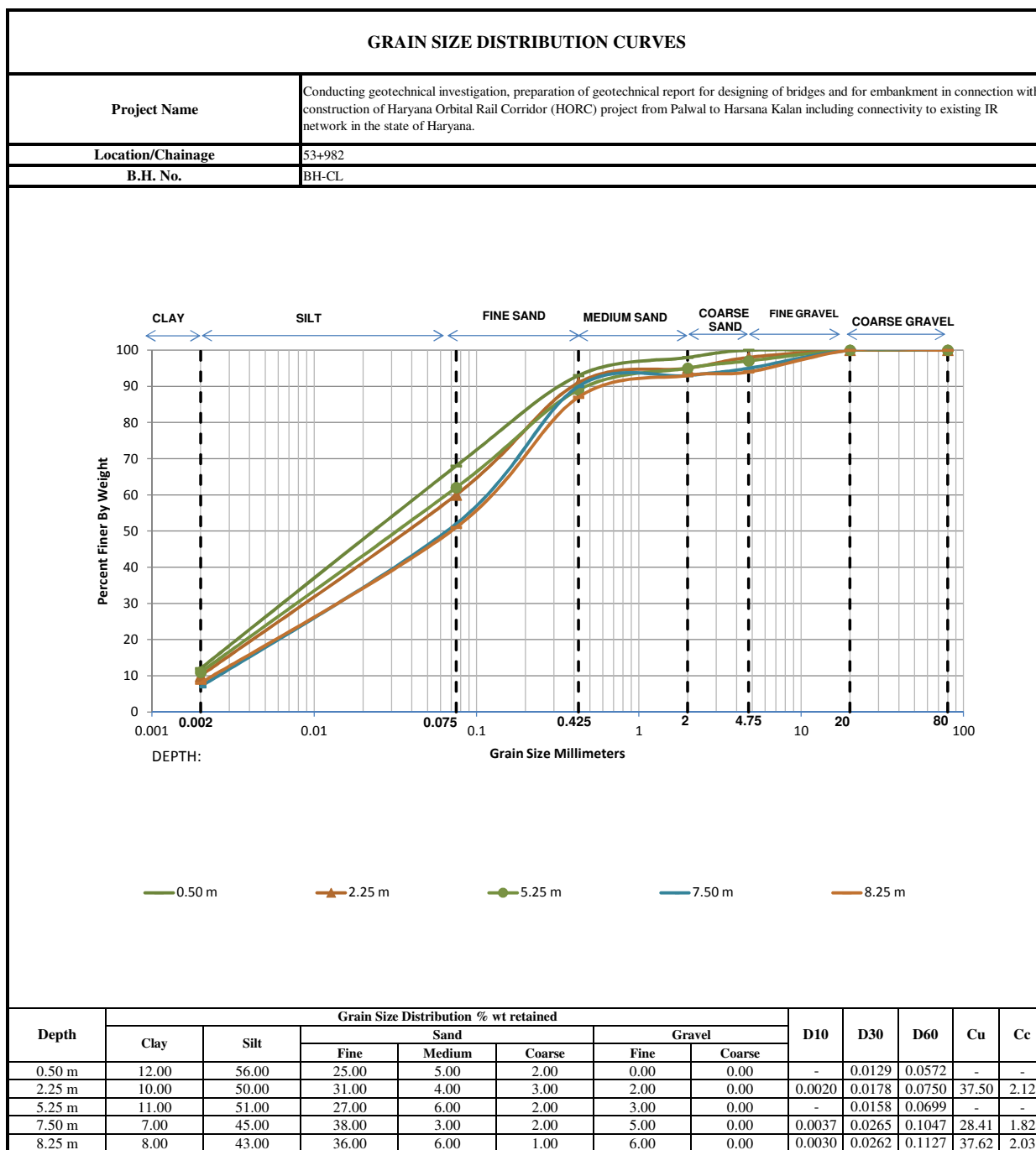
Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	49.00	36.00	4.00	2.00	2.00	0.00	0.0036	0.0235	0.0877	24.29	1.74
3.00 m	6.00	46.00	38.00	5.00	3.00	2.00	0.00	0.0045	0.0277	0.1047	23.08	1.61
5.25 m	11.00	46.00	30.00	6.00	2.00	5.00	0.00	-	0.0183	0.0856	-	-
8.25 m	12.00	48.00	24.00	7.00	3.00	6.00	0.00	-	0.0156	0.0750	-	-
10.50 m	8.00	44.00	34.00	5.00	1.00	8.00	0.00	0.0030	0.0252	0.1087	36.44	1.95
11.25 m	7.00	45.00	35.00	4.00	2.00	7.00	0.00	0.0037	0.0263	0.1073	29.16	1.76
14.25 m	6.00	46.00	33.00	4.00	3.00	8.00	0.00	0.0045	0.0274	0.1091	24.13	1.52

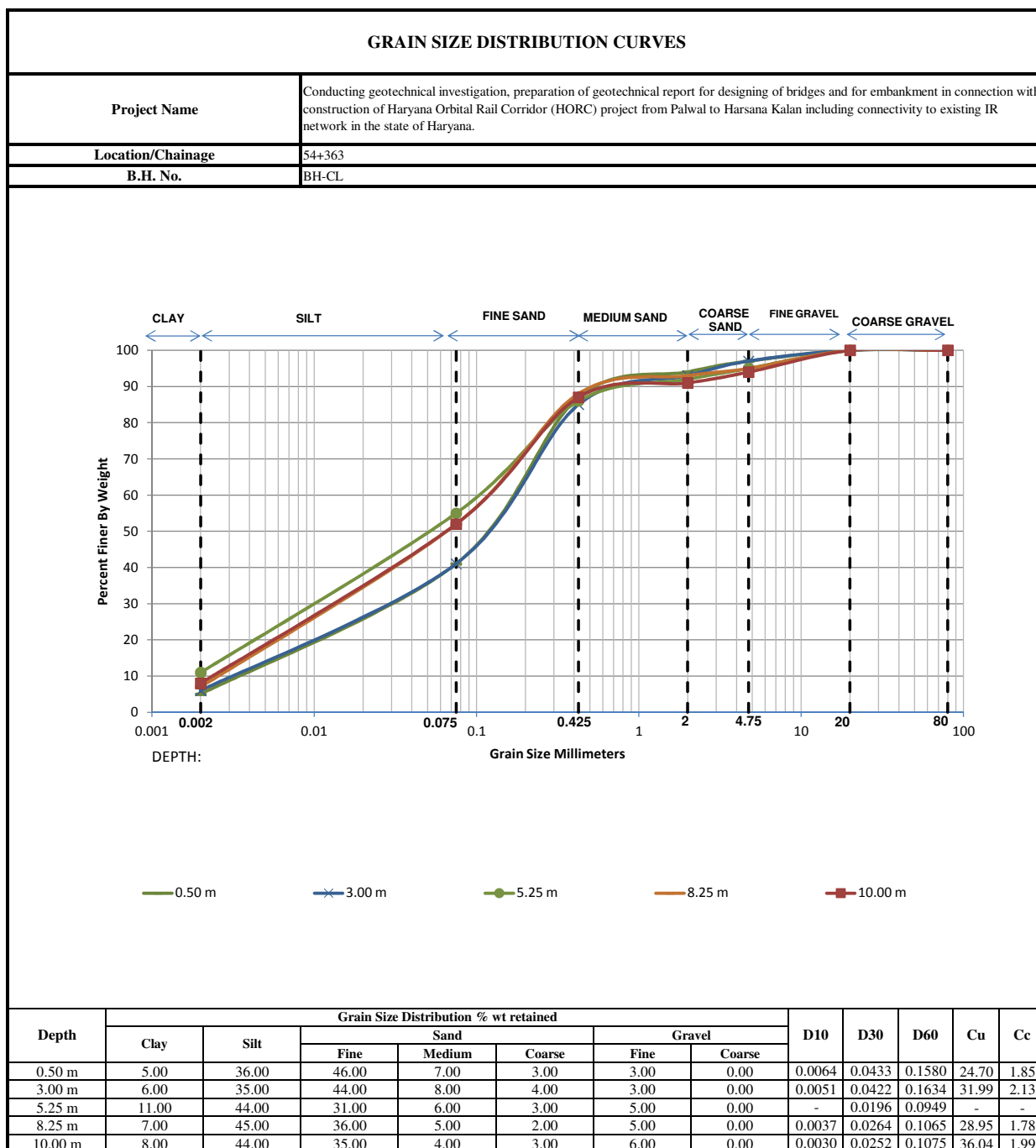
GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	53+282
B.H. No.	BH-CL

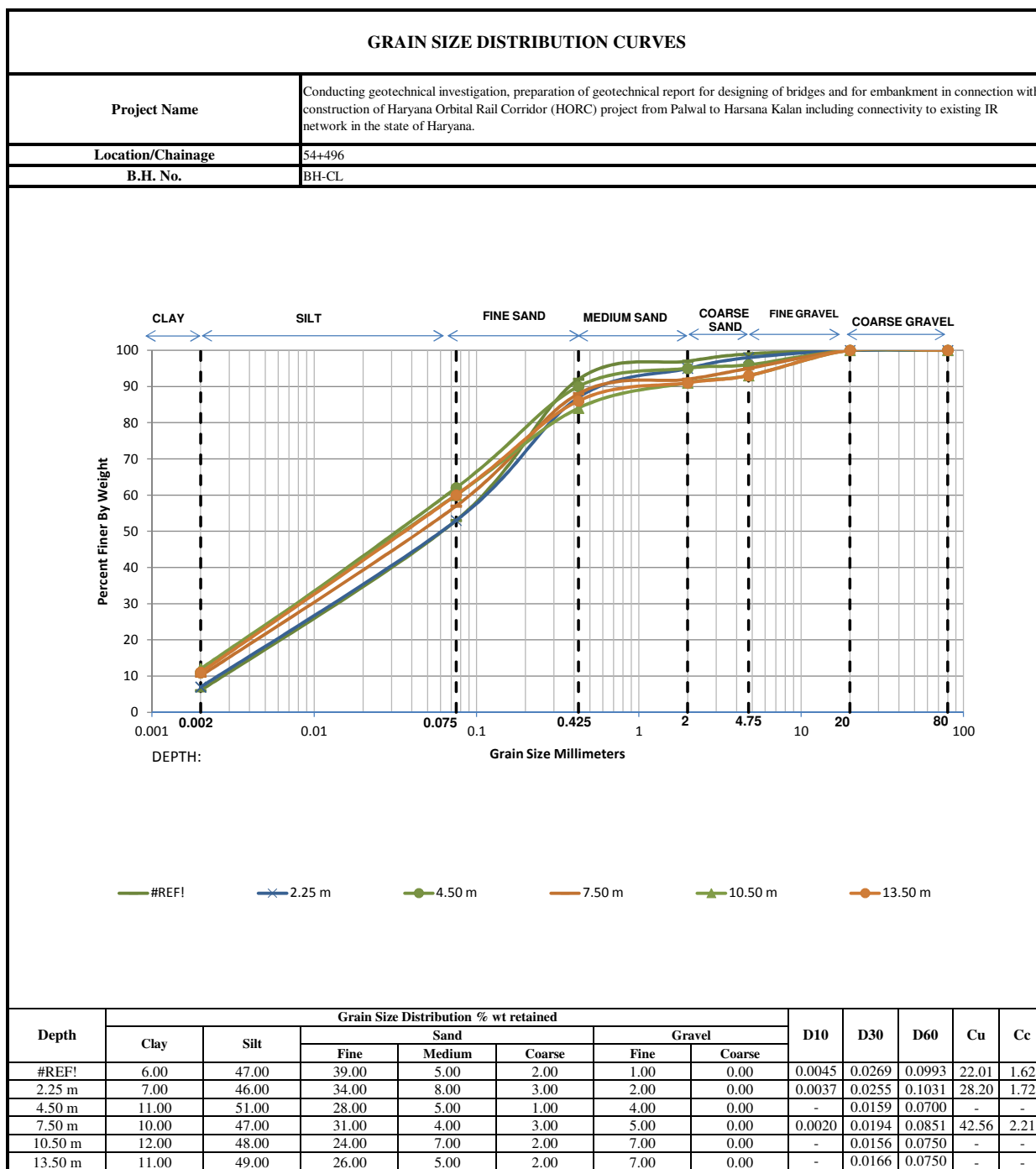


Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	49.00	37.00	4.00	2.00	1.00	0.00	0.0036	0.0235	0.0875	24.22	1.75
3.00 m	8.00	47.00	34.00	6.00	3.00	2.00	0.00	0.0030	0.0229	0.0929	31.43	1.91
5.25 m	11.00	50.00	28.00	3.00	4.00	4.00	0.00	-	0.0163	0.0724	-	-
8.25 m	10.00	49.00	31.00	5.00	2.00	3.00	0.00	0.0020	0.0183	0.0779	38.93	2.15
10.00 m	11.00	41.00	37.00	4.00	3.00	4.00	0.00	-	0.0221	0.1067	-	-



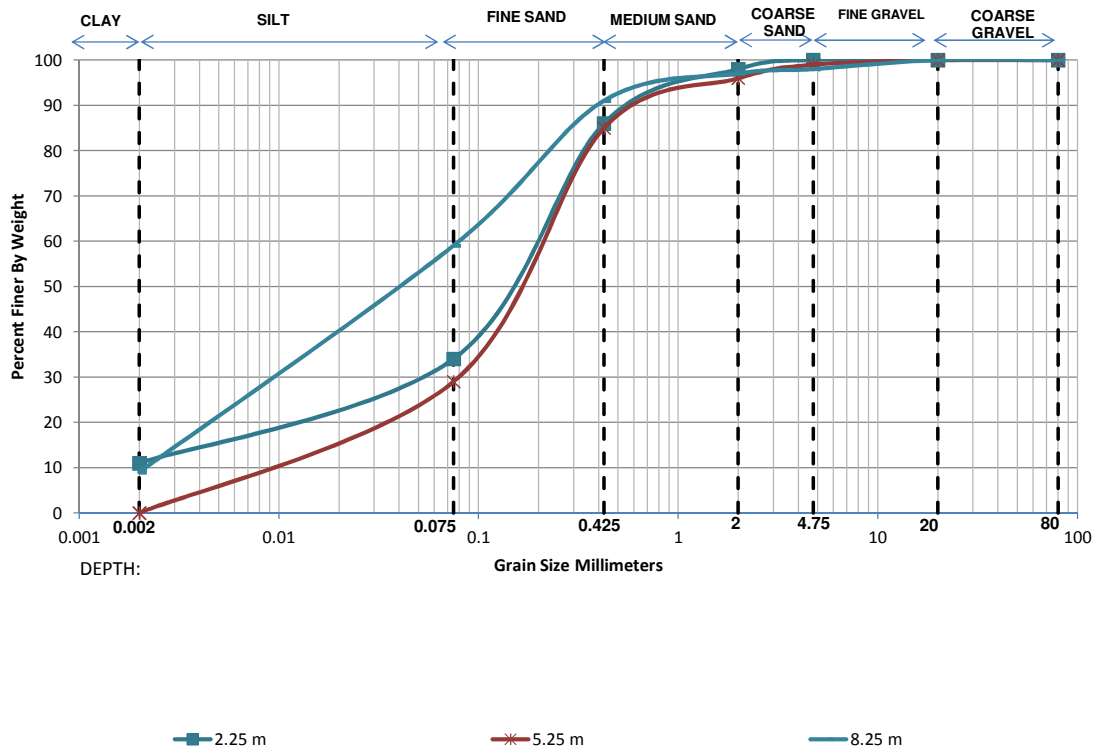






GRAIN SIZE DISTRIBUTION CURVES

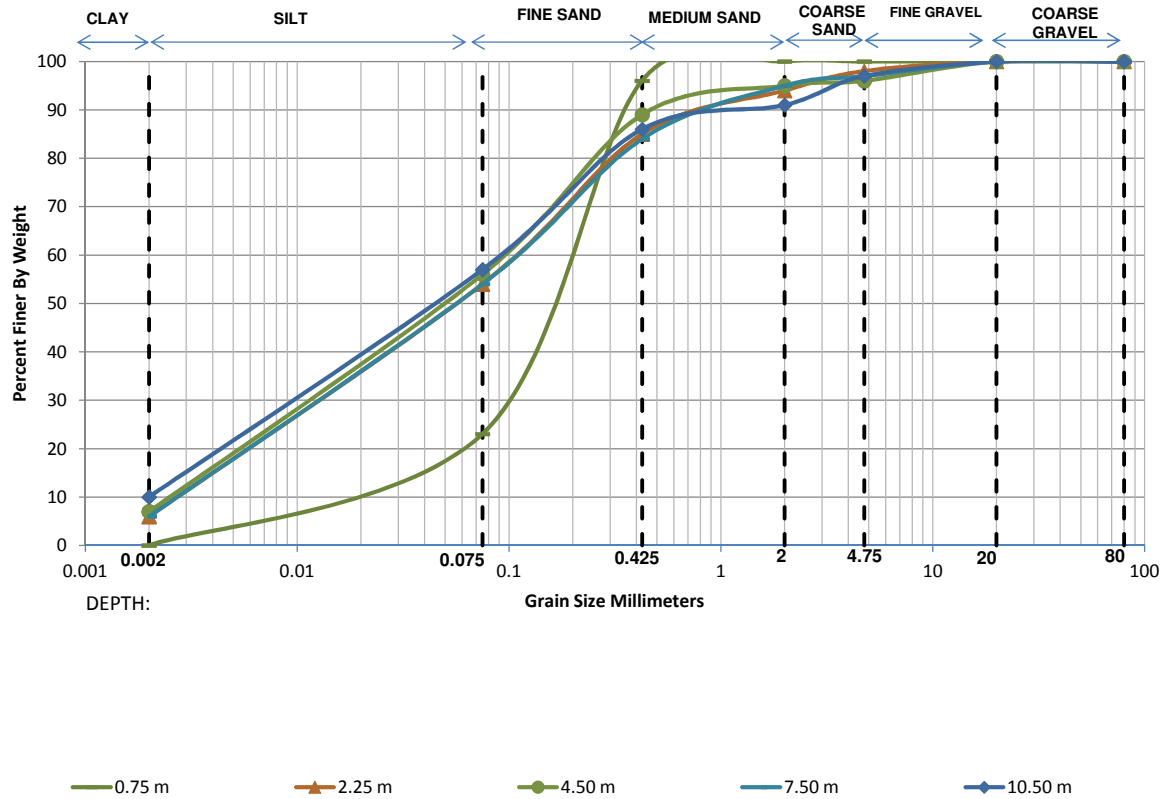
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	55+020
B.H. No.	CL



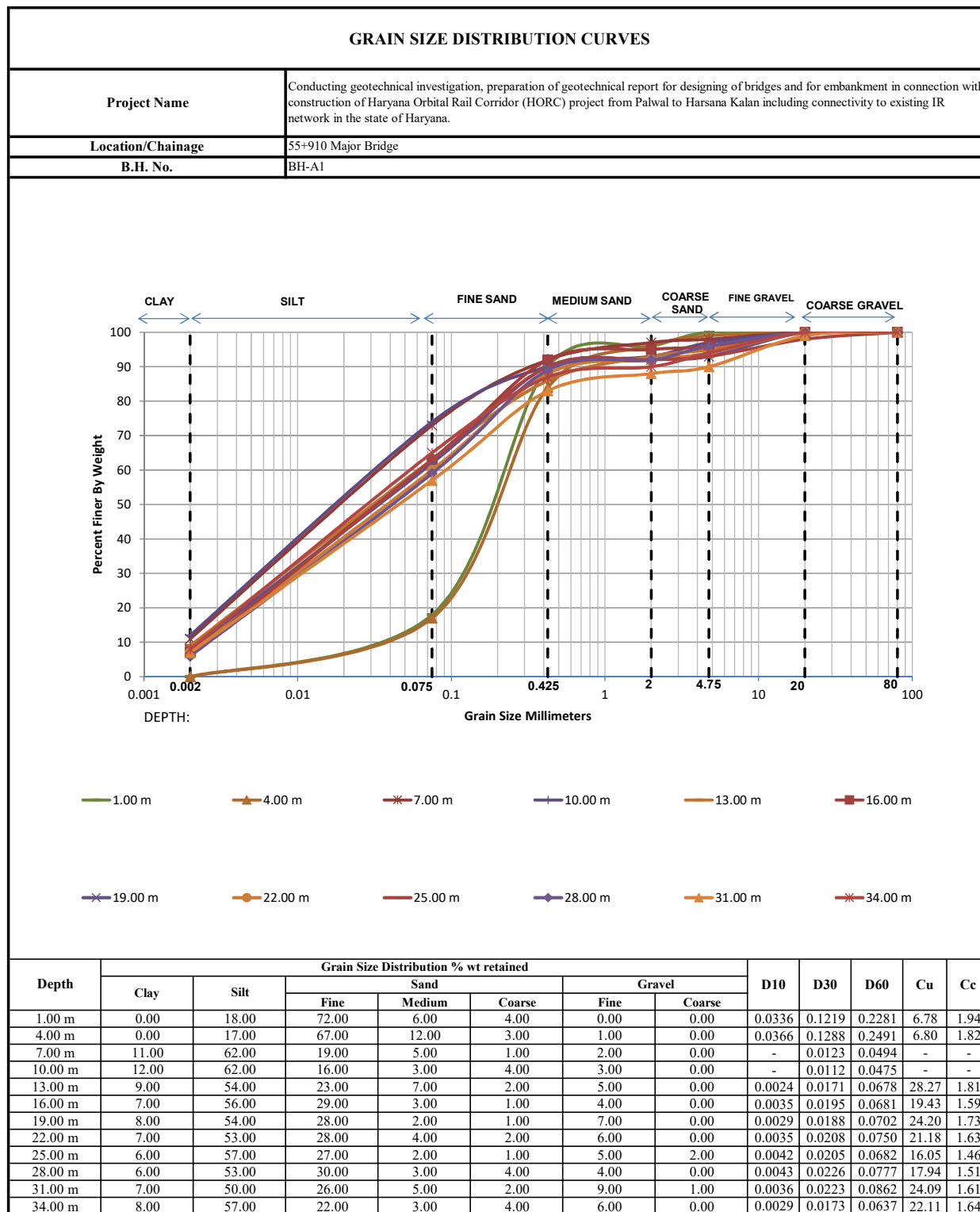
Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	11.00	23.00	52.00	12.00	2.00	0.00	0.00	-	0.0576	0.1948	-	-
5.25 m	0.00	29.00	56.00	11.00	3.00	1.00	0.00	0.0139	0.0786	0.2084	14.95	2.12
8.25 m	9.00	50.00	32.00	6.00	1.00	2.00	0.00	0.0024	0.0194	0.0778	32.32	2.00

GRAIN SIZE DISTRIBUTION CURVES

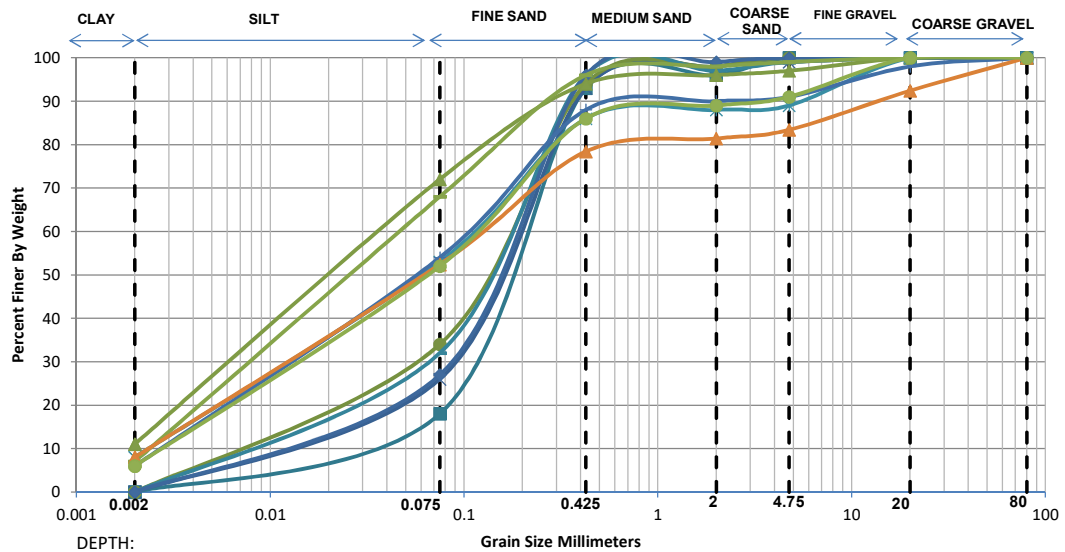
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	55+044
B.H. No.	BH-PLT-04



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.75 m	0.00	23.00	73.00	4.00	0.00	0.00	0.00	0.0220	0.1001	0.2003	9.10	2.27
2.25 m	6.00	48.00	31.00	9.00	4.00	2.00	0.00	0.0045	0.0257	0.0999	22.41	1.48
4.50 m	7.00	49.00	33.00	6.00	1.00	4.00	0.00	0.0036	0.0233	0.0886	24.57	1.70
7.50 m	6.00	48.00	30.00	11.00	2.00	3.00	0.00	0.0045	0.0256	0.1010	22.69	1.46
10.50 m	10.00	47.00	29.00	5.00	6.00	3.00	0.00	0.0020	0.0193	0.0856	42.82	2.17



GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	55+910 Major Bridge
B.H. No.	BH-A2

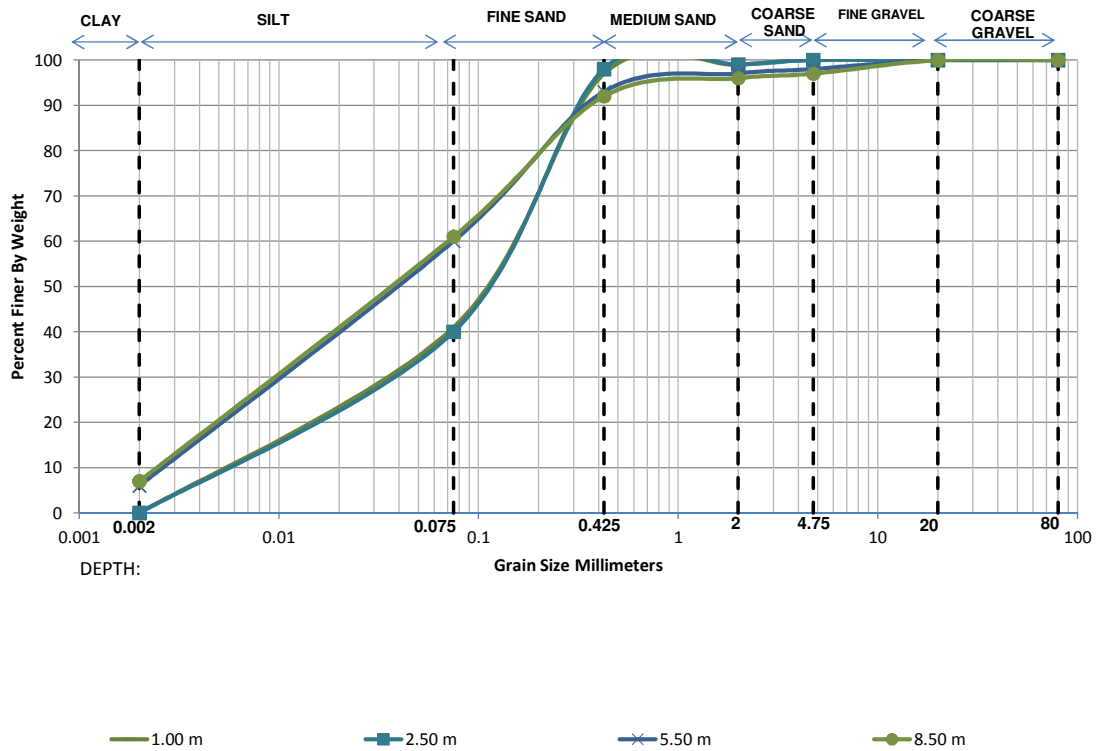


—■— 2.50 m —×— 5.50 m —●— 8.50 m —◆— 11.50 m —◇— 14.50 m —▲— 17.50 m —*— 20.50 m —+— 23.50 m —■— 26.50 m —▲— 31.00 m —●— 35.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	0.00	18.00	75.00	3.00	4.00	0.00	0.00	0.0338	0.1208	0.2209	6.53	1.95
5.50 m	0.00	26.00	67.00	5.00	1.00	1.00	0.00	0.0174	0.0892	0.1967	11.28	2.32
8.50 m	0.00	34.00	60.00	4.00	2.00	0.00	0.00	0.0107	0.0624	0.1680	15.68	2.17
11.50 m	0.00	32.00	64.00	1.00	2.00	1.00	0.00	0.0120	0.0685	0.1708	14.21	2.29
14.50 m	0.00	27.00	69.00	3.00	1.00	0.00	0.00	0.0164	0.0854	0.1875	11.44	2.37
17.50 m	11.00	61.00	22.00	2.00	1.00	3.00	0.00	-	0.0126	0.0510	-	-
20.50 m	8.00	45.00	33.00	2.00	1.00	11.00	0.00	0.0030	0.0243	0.1033	34.76	1.92
23.50 m	6.00	48.00	34.00	2.00	1.00	7.00	2.00	0.0045	0.0259	0.0969	21.71	1.55
26.50 m	7.00	61.00	28.00	2.00	1.00	1.00	0.00	0.0035	0.0176	0.0588	17.01	1.53
31.00 m	8.00	44.40	26.00	3.00	2.00	9.00	7.60	0.0030	0.0243	0.1171	39.43	1.70
35.50 m	6.00	46.00	34.00	3.00	2.00	9.00	0.00	0.0045	0.0274	0.1078	23.83	1.54

GRAIN SIZE DISTRIBUTION CURVES

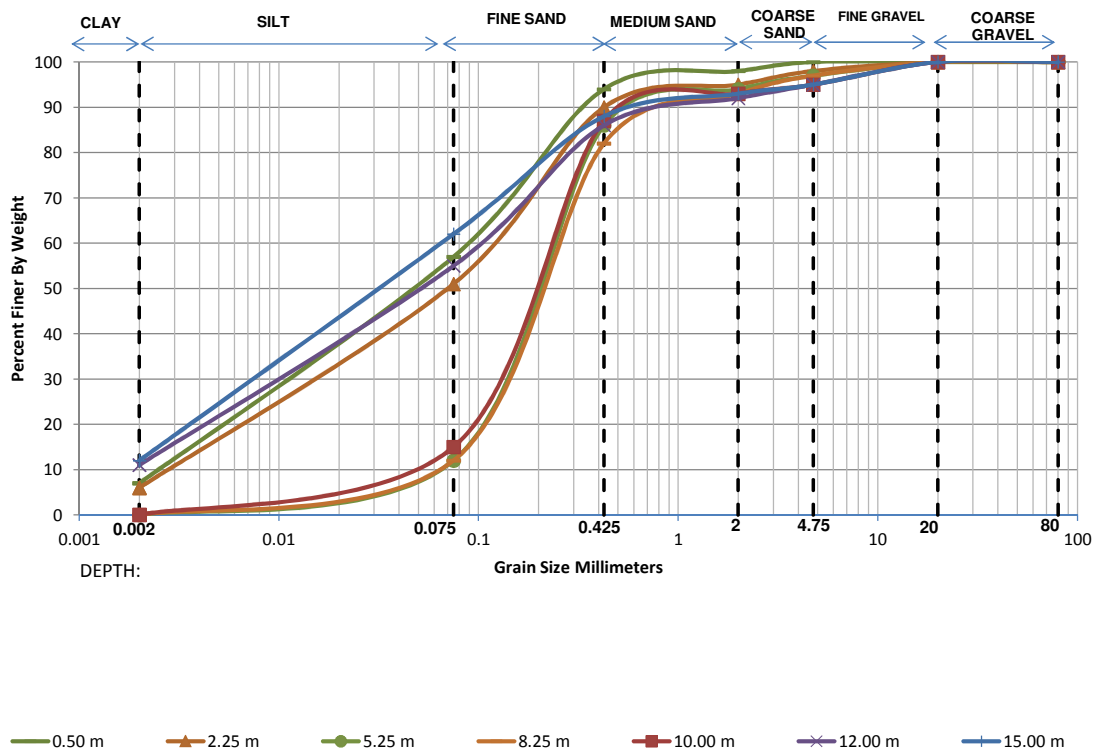
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	56+403 km
B.H. No.	BH-C/L



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	41.00	56.00	2.00	1.00	0.00	0.00	0.0078	0.0457	0.1387	17.78	1.93
2.50 m	0.00	40.00	58.00	1.00	1.00	0.00	0.00	0.0082	0.0478	0.1409	17.28	1.99
5.50 m	6.00	54.00	33.00	4.00	1.00	2.00	0.00	0.0043	0.0222	0.0750	17.37	1.52
8.50 m	7.00	54.00	31.00	4.00	1.00	3.00	0.00	0.0035	0.0204	0.0726	20.55	1.63

GRAIN SIZE DISTRIBUTION CURVES

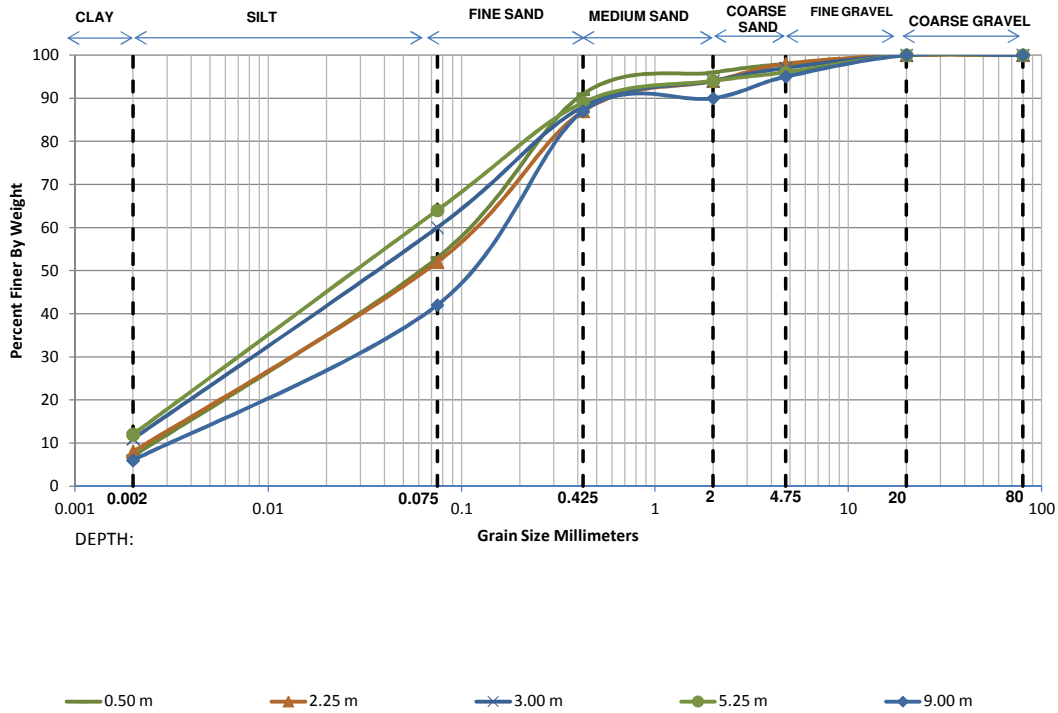
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	56+701 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	50.00	37.00	4.00	2.00	0.00	0.00	0.0036	0.0229	0.0838	23.31	1.74
2.25 m	6.00	45.00	39.00	5.00	3.00	2.00	0.00	0.0046	0.0286	0.1091	23.84	1.64
5.25 m	0.00	12.00	74.00	8.00	3.00	3.00	0.00	0.0622	0.1513	0.2562	4.12	1.44
8.25 m	0.00	12.00	70.00	11.00	4.00	3.00	0.00	0.0620	0.1538	0.2691	4.34	1.42
10.00 m	0.00	15.00	72.00	6.00	2.00	5.00	0.00	0.0453	0.1364	0.2444	5.40	1.68
12.00 m	11.00	44.00	31.00	6.00	3.00	5.00	0.00	-	0.0196	0.0949	-	-
15.00 m	12.00	50.00	26.00	5.00	2.00	5.00	0.00	-	0.0149	0.0698	-	-

GRAIN SIZE DISTRIBUTION CURVES

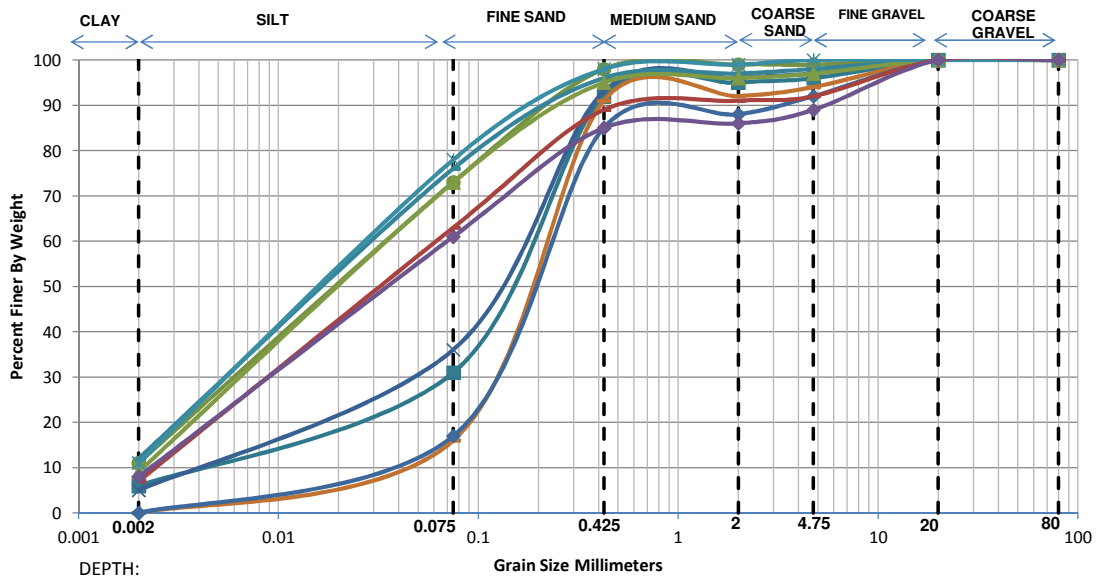
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	56+978
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	46.00	38.00	5.00	2.00	2.00	0.00	0.0037	0.0257	0.1000	27.29	1.80
2.25 m	8.00	44.00	35.00	7.00	4.00	2.00	0.00	0.0030	0.0252	0.1080	36.21	1.98
3.00 m	11.00	49.00	28.00	6.00	3.00	3.00	0.00	-	0.0167	0.0750	-	-
5.25 m	12.00	52.00	25.00	5.00	2.00	4.00	0.00	-	0.0141	0.0652	-	-
9.00 m	6.00	36.00	45.00	3.00	5.00	5.00	0.00	0.0050	0.0404	0.1528	30.31	2.12

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-A1

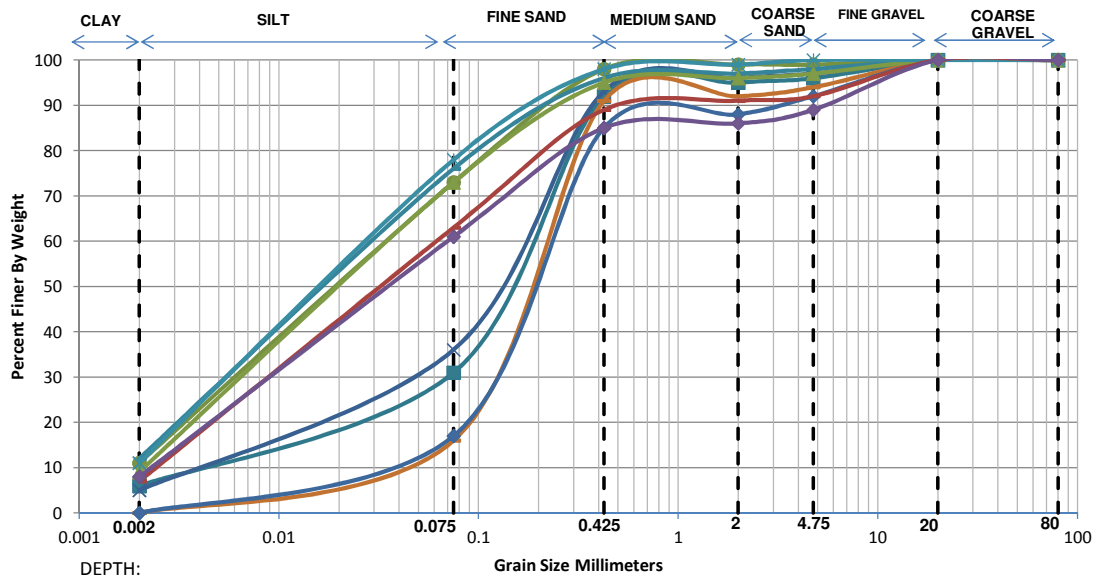


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 — 13.00 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 — 25.00 m
 ◆ 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	25.00	61.00	3.00	1.00	4.00	0.00	0.0066	0.0711	0.1859	28.09	4.11
5.50 m	5.00	31.00	57.00	3.00	1.00	3.00	0.00	0.0072	0.0552	0.1653	22.99	2.57
8.50 m	11.00	62.00	25.00	1.00	0.00	1.00	0.00	-	0.0125	0.0498	-	-
11.50 m	12.00	64.00	20.00	1.00	1.00	2.00	0.00	-	0.0110	0.0452	-	-
13.00 m	0.00	16.00	75.00	1.00	2.00	6.00	0.00	0.0411	0.1300	0.2304	5.61	1.78
14.50 m	0.00	17.00	68.00	3.00	4.00	8.00	0.00	0.0367	0.1278	0.2432	6.62	1.83
17.50 m	9.00	64.00	22.00	1.00	1.00	3.00	0.00	0.0024	0.0141	0.0504	21.17	1.66
20.50 m	11.00	67.00	20.00	1.00	1.00	0.00	0.00	-	0.0114	0.0434	-	-
25.00 m	7.00	56.00	26.00	2.00	1.00	8.00	0.00	0.0035	0.0193	0.0681	19.43	1.57
28.00 m	8.00	53.00	24.00	1.00	3.00	11.00	0.00	0.0029	0.0190	0.0725	24.96	1.72

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P2

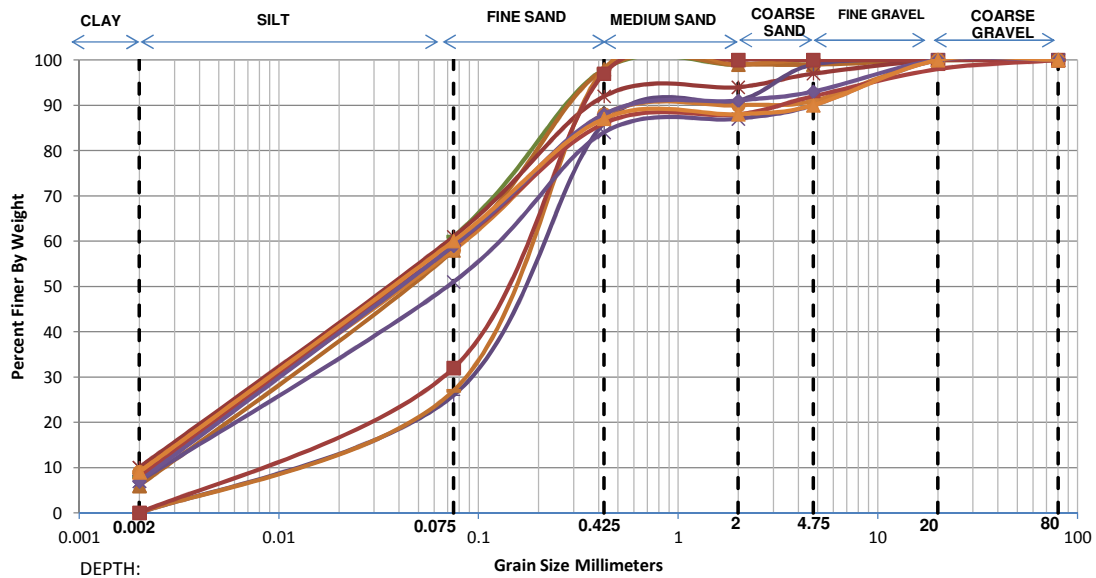


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 — 13.00 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 — 25.00 m
 ◆ 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	7.00	51.00	36.00	2.00	3.00	1.00	0.00	0.0036	0.0222	0.0806	22.51	1.72
5.50 m	9.00	67.00	11.00	4.00	3.00	6.00	0.00	0.0024	0.0132	0.0460	19.38	1.58
8.50 m	7.00	52.00	33.00	2.00	3.00	3.00	0.00	0.0036	0.0215	0.0777	21.81	1.68
11.50 m	8.00	56.00	30.00	1.00	1.00	4.00	0.00	0.0029	0.0180	0.0660	22.81	1.71
14.50 m	11.00	50.00	32.00	4.00	2.00	1.00	0.00	-	0.0164	0.0724	-	-
17.50 m	10.00	60.00	26.00	1.00	1.00	2.00	0.00	0.0020	0.0141	0.0546	27.29	1.81
20.50 m	6.00	56.00	33.00	1.00	2.00	2.00	0.00	0.0043	0.0212	0.0704	16.46	1.50
23.50 m	7.00	56.00	29.00	5.00	1.00	2.00	0.00	0.0035	0.0195	0.0681	19.43	1.59
26.50 m	9.00	62.00	25.00	2.00	0.00	2.00	0.00	0.0024	0.0147	0.0534	22.38	1.69
29.50 m	7.00	52.00	27.00	1.00	3.00	10.00	0.00	0.0036	0.0212	0.0778	21.91	1.63

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P3

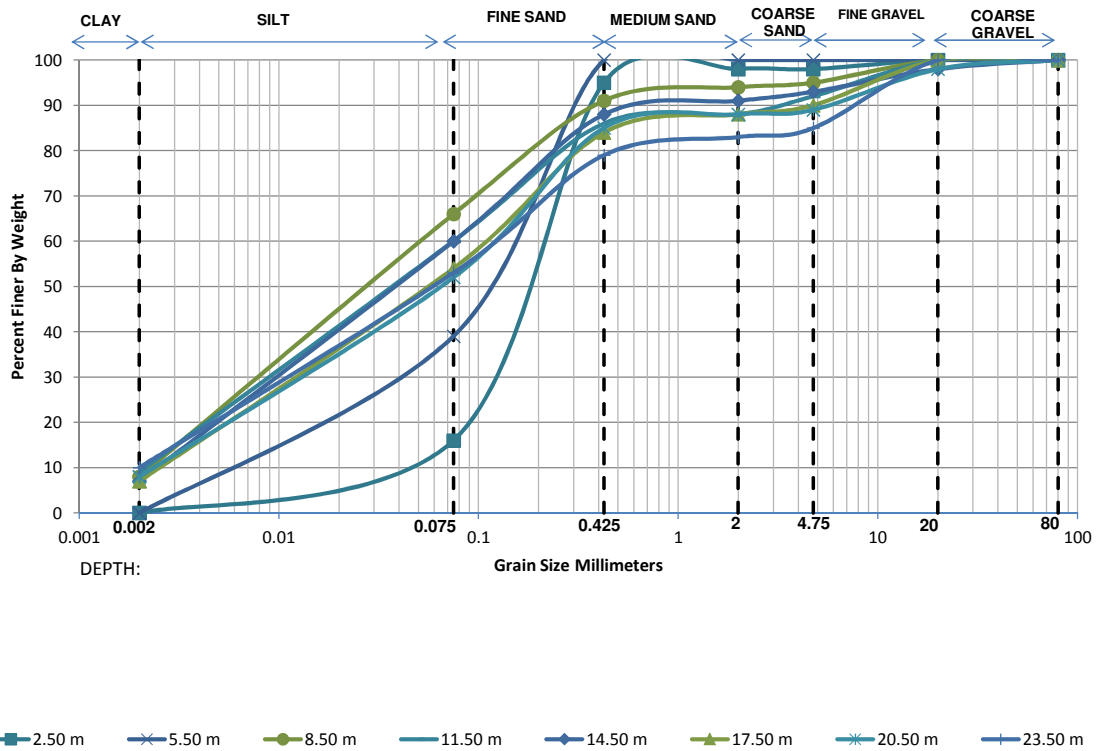


— 1.00 m
 —▲ 4.00 m
 —✕ 7.00 m
 — 10.00 m
 — 13.00 m
 —■ 16.00 m
 —✕ 19.00 m
 —● 22.00 m
 — 25.00 m
 —◆ 28.00 m
 —▲ 31.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	8.00	53.00	37.00	1.00	1.00	0.00	0.00	0.0029	0.0196	0.0726	24.93	1.82
4.00 m	6.00	52.00	40.00	1.00	0.00	1.00	0.00	0.0044	0.0236	0.0803	18.33	1.59
7.00 m	10.00	51.00	31.00	2.00	3.00	3.00	0.00	0.0020	0.0174	0.0725	36.24	2.08
10.00 m	0.00	26.00	60.00	5.00	8.00	1.00	0.00	0.0171	0.0898	0.2134	12.46	2.21
13.00 m	0.00	27.00	71.00	1.00	1.00	0.00	0.00	0.0165	0.0852	0.1839	11.16	2.40
16.00 m	0.00	32.00	65.00	3.00	0.00	0.00	0.00	0.0120	0.0685	0.1698	14.09	2.30
19.00 m	7.00	44.00	33.00	3.00	3.00	10.00	0.00	0.0037	0.0271	0.1154	31.25	1.72
22.00 m	9.00	49.00	30.00	2.00	1.00	9.00	0.00	0.0024	0.0198	0.0812	33.72	2.00
25.00 m	8.00	51.00	27.00	2.00	4.00	6.00	2.00	0.0029	0.0201	0.0779	26.68	1.79
28.00 m	7.00	52.00	29.00	3.00	2.00	7.00	0.00	0.0036	0.0213	0.0778	21.88	1.65
31.00 m	9.00	51.00	27.00	1.00	2.00	10.00	0.00	0.0024	0.0186	0.0750	31.21	1.92

GRAIN SIZE DISTRIBUTION CURVES

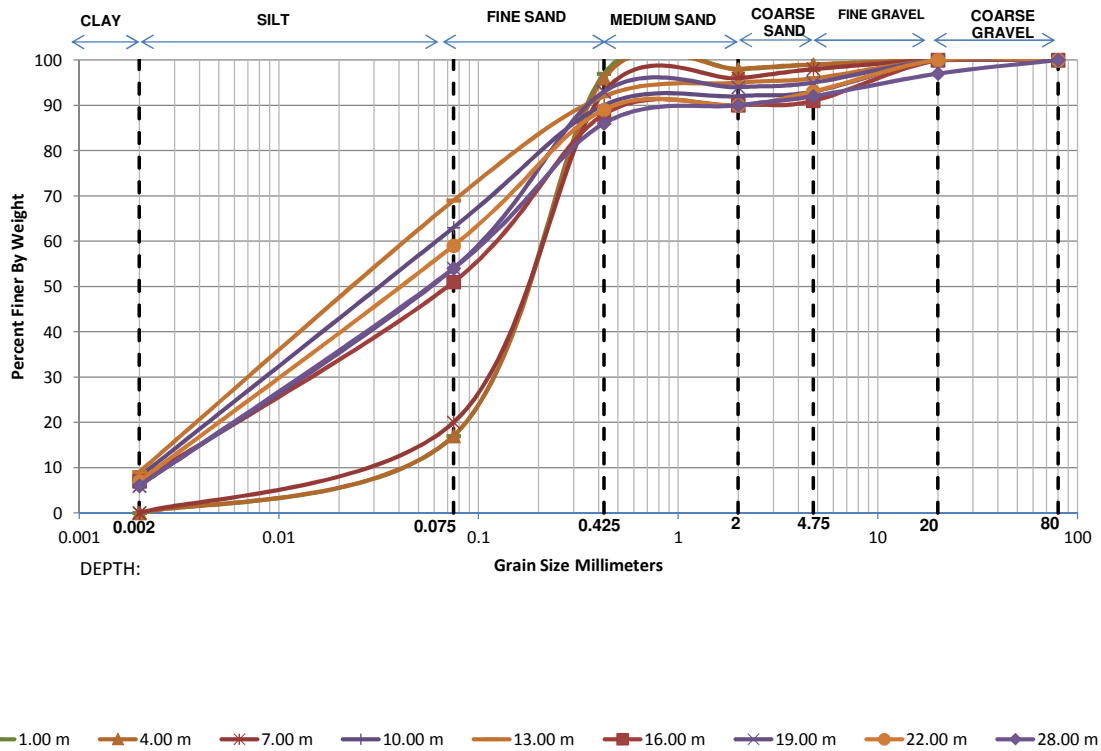
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P4



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	0.00	16.00	79.00	3.00	0.00	2.00	0.00	0.0414	0.1287	0.2232	5.40	1.80
5.50 m	0.00	39.00	61.00	0.00	0.00	0.00	0.00	0.0086	0.0501	0.1964	22.95	1.49
8.50 m	8.00	58.00	25.00	3.00	1.00	5.00	0.00	0.0029	0.0171	0.0619	21.51	1.64
11.50 m	9.00	51.00	26.00	2.00	4.00	8.00	0.00	0.0024	0.0186	0.0750	31.21	1.91
14.50 m	7.00	53.00	28.00	3.00	2.00	5.00	2.00	0.0035	0.0208	0.0750	21.18	1.63
17.50 m	7.00	47.00	30.00	4.00	2.00	10.00	0.00	0.0036	0.0245	0.1002	27.58	1.65
20.50 m	8.00	44.00	33.00	3.00	1.00	9.00	2.00	0.0030	0.0251	0.1094	36.68	1.93
23.50 m	10.00	43.00	26.00	4.00	2.00	15.00	0.00	0.0020	0.0217	0.1129	56.43	2.09

GRAIN SIZE DISTRIBUTION CURVES

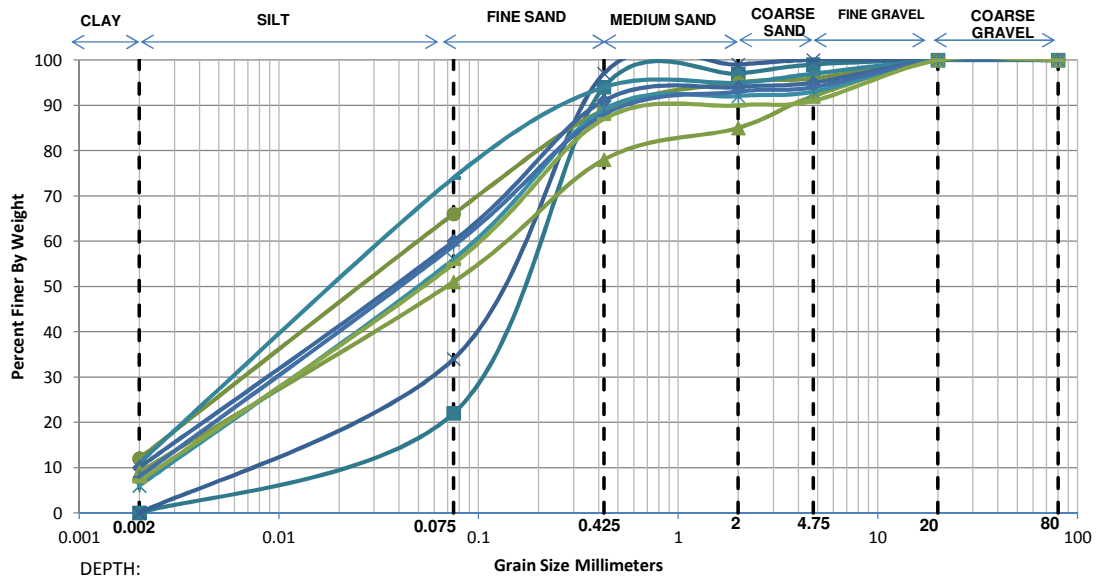
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P5



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	17.00	80.00	1.00	1.00	1.00	0.00	0.0376	0.1238	0.2162	5.76	1.89
4.00 m	0.00	17.00	79.00	2.00	1.00	1.00	0.00	0.0375	0.1241	0.2182	5.82	1.88
7.00 m	0.00	20.00	73.00	3.00	2.00	2.00	0.00	0.0281	0.1125	0.2148	7.63	2.10
10.00 m	8.00	55.00	27.00	2.00	1.00	7.00	0.00	0.0029	0.0183	0.0680	23.48	1.70
13.00 m	9.00	60.00	23.00	3.00	1.00	4.00	0.00	0.0024	0.0151	0.0563	23.61	1.70
16.00 m	7.00	44.00	37.00	2.00	1.00	9.00	0.00	0.0037	0.0273	0.1106	29.87	1.82
19.00 m	6.00	48.00	39.00	1.00	1.00	5.00	0.00	0.0045	0.0262	0.0945	21.10	1.62
22.00 m	7.00	52.00	30.00	1.00	3.00	7.00	0.00	0.0036	0.0214	0.0777	21.85	1.65
28.00 m	6.00	48.00	32.00	4.00	2.00	5.00	3.00	0.0045	0.0258	0.0984	22.08	1.51

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P6

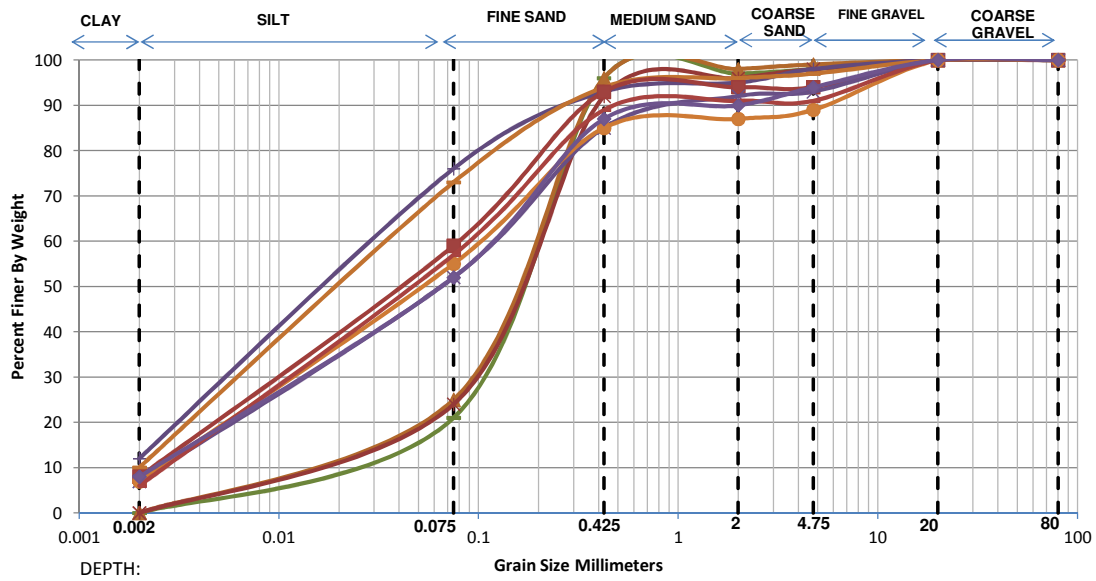


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Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	22.00	72.00	3.00	2.00	1.00	0.00	0.0238	0.1043	0.2068	8.70	2.22
4.00 m	0.00	34.00	63.00	2.00	1.00	0.00	0.00	0.0108	0.0626	0.1629	15.08	2.23
7.00 m	12.00	54.00	23.00	6.00	1.00	4.00	0.00	-	0.0134	0.0609	-	-
10.00 m	11.00	63.00	20.00	1.00	2.00	3.00	0.00	-	0.0121	0.0481	-	-
13.00 m	10.00	50.00	31.00	3.00	1.00	5.00	0.00	0.0020	0.0178	0.0750	37.50	2.12
16.00 m	9.00	42.00	27.00	7.00	7.00	8.00	0.00	0.0024	0.0245	0.1290	53.15	1.91
19.00 m	6.00	50.00	33.00	3.00	1.00	7.00	0.00	0.0044	0.0245	0.0882	20.02	1.54
22.00 m	8.00	51.00	29.00	5.00	1.00	6.00	0.00	0.0029	0.0202	0.0778	26.65	1.80
25.00 m	7.00	48.00	32.00	3.00	1.00	9.00	0.00	0.0036	0.0239	0.0933	25.79	1.69

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P7

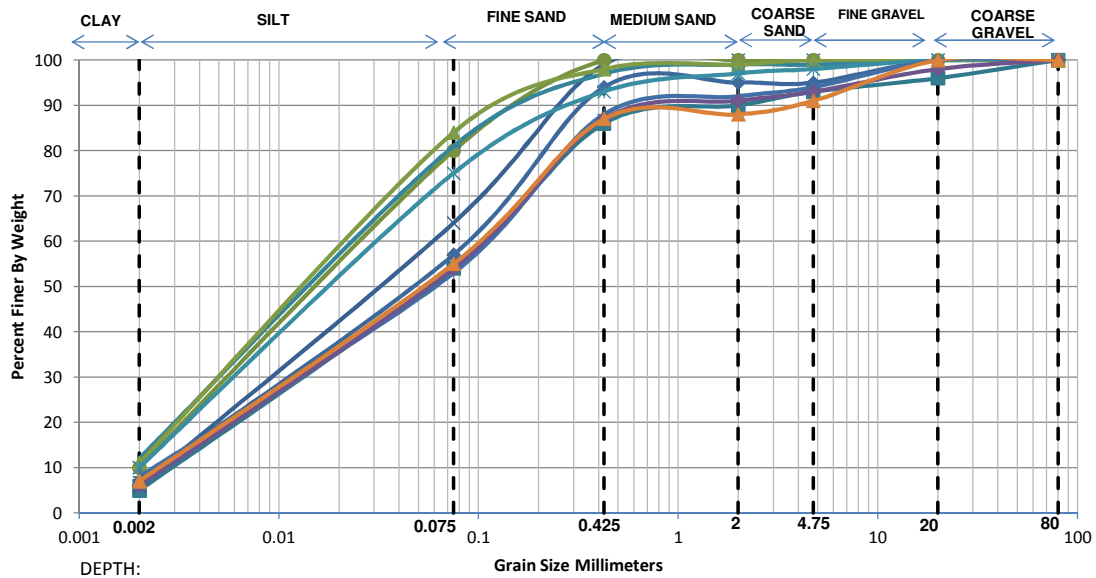


— 1.00 m
 —▲— 4.00 m
 —✱— 7.00 m
 —✕— 10.00 m
 —■— 13.00 m
 —■— 16.00 m
 —✕— 19.00 m
 —●— 22.00 m
 —■— 25.00 m
 —●— 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	21.00	75.00	1.00	1.00	2.00	0.00	0.0260	0.1078	0.2057	7.93	2.18
4.00 m	0.00	25.00	71.00	2.00	1.00	1.00	0.00	0.0189	0.0926	0.1936	10.25	2.34
7.00 m	0.00	24.00	68.00	4.00	2.00	2.00	0.00	0.0202	0.0969	0.2048	10.15	2.27
10.00 m	12.00	64.00	17.00	2.00	3.00	2.00	0.00	-	0.0109	0.0450	-	-
13.00 m	10.00	63.00	21.00	2.00	1.00	3.00	0.00	0.0020	0.0132	0.0499	24.97	1.74
16.00 m	8.00	51.00	34.00	1.00	0.00	6.00	0.00	0.0029	0.0205	0.0777	26.56	1.85
19.00 m	7.00	45.00	33.00	7.00	1.00	7.00	0.00	0.0037	0.0262	0.1099	29.91	1.70
22.00 m	7.00	48.00	30.00	2.00	2.00	11.00	0.00	0.0036	0.0238	0.0943	26.08	1.66
25.00 m	6.00	51.00	32.00	2.00	0.00	9.00	0.00	0.0044	0.0238	0.0844	19.26	1.53
28.00 m	8.00	44.00	35.00	3.00	4.00	6.00	0.00	0.0030	0.0252	0.1074	35.98	1.99

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P9

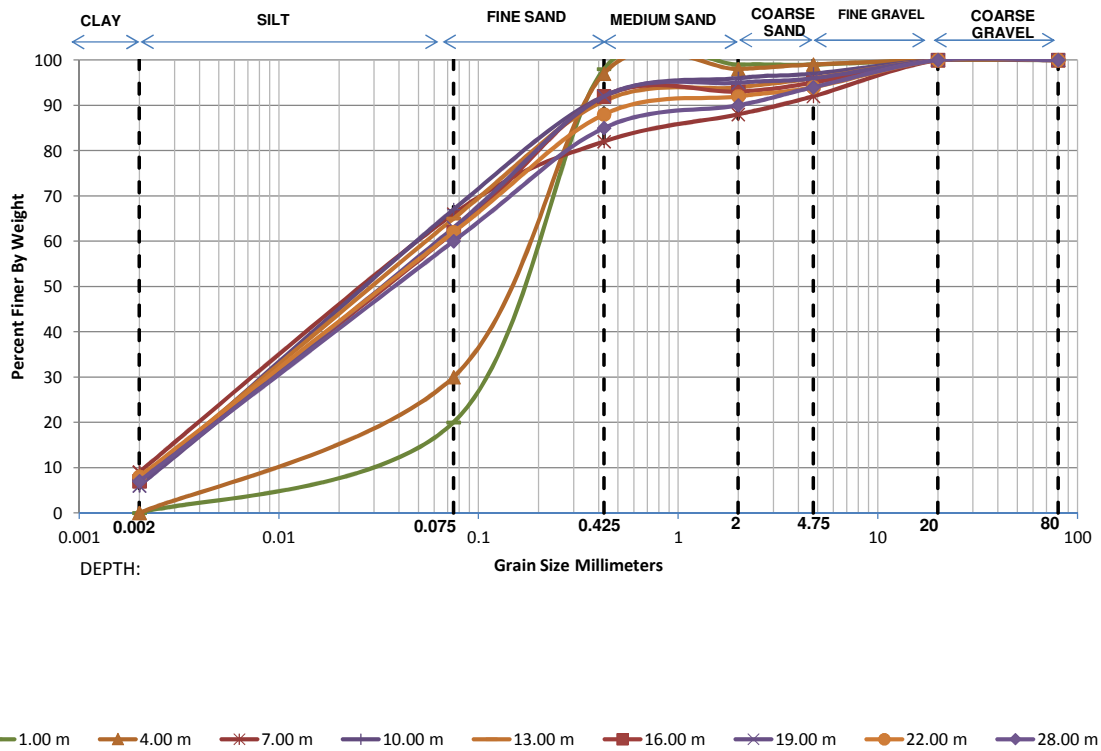


■ 2.50 m
 × 5.50 m
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 ▲ 17.50 m
 ✱ 20.50 m
 + 23.50 m
 ◆ 28.00 m
 ▲ 31.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	49.00	32.00	4.00	3.00	3.00	4.00	0.0055	0.0270	0.0982	17.97	1.36
5.50 m	6.00	58.00	35.00	1.00	0.00	0.00	0.00	0.0042	0.0205	0.0664	15.63	1.49
8.50 m	10.00	70.00	20.00	0.00	0.00	0.00	0.00	0.0020	0.0119	0.0418	20.91	1.68
11.50 m	12.00	69.00	16.00	2.00	0.00	1.00	0.00	-	0.0101	0.0396	-	-
14.50 m	7.00	50.00	37.00	1.00	0.00	5.00	0.00	0.0036	0.0229	0.0837	23.29	1.74
17.50 m	11.00	73.00	14.00	1.00	1.00	0.00	0.00	-	0.0104	0.0374	-	-
20.50 m	10.00	65.00	18.00	4.00	1.00	2.00	0.00	0.0020	0.0127	0.0472	23.59	1.71
23.50 m	8.00	45.00	35.00	4.00	2.00	6.00	0.00	0.0030	0.0244	0.1021	34.32	1.97
28.00 m	6.00	48.00	33.00	4.00	2.00	5.00	2.00	0.0045	0.0258	0.0978	21.91	1.53
31.00 m	7.00	48.00	32.00	1.00	3.00	9.00	0.00	0.0036	0.0239	0.0931	25.74	1.69

GRAIN SIZE DISTRIBUTION CURVES

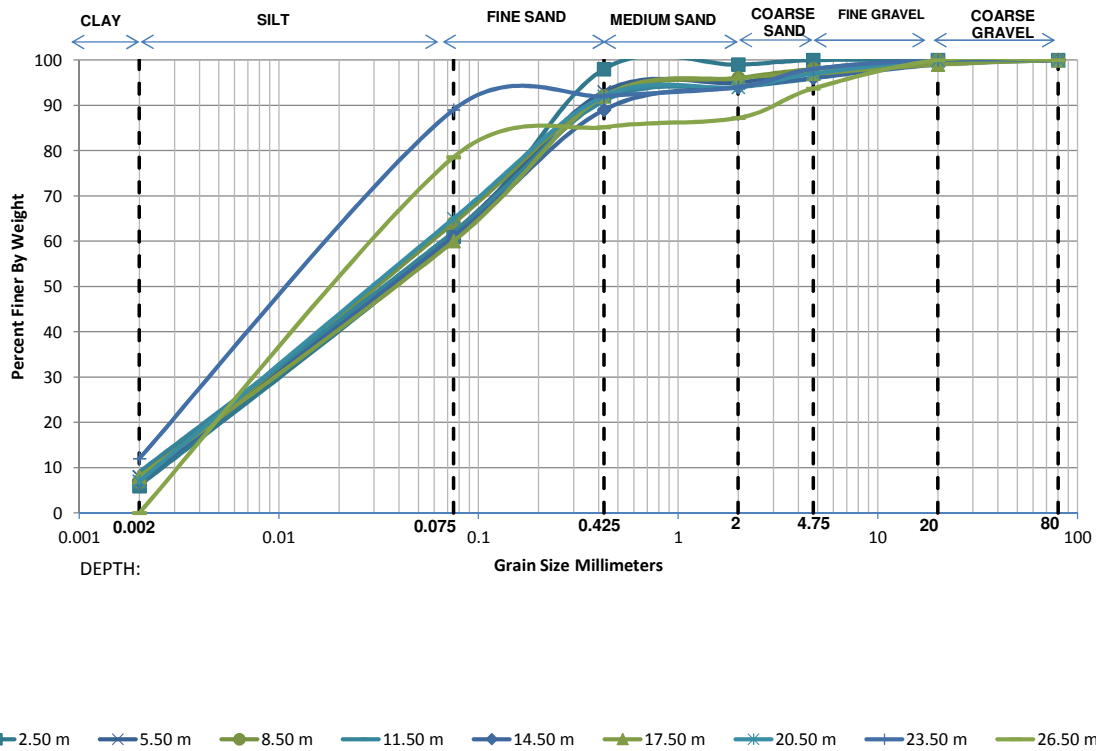
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P10



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	20.00	78.00	1.00	0.00	1.00	0.00	0.0284	0.1114	0.2055	7.23	2.12
4.00 m	0.00	30.00	67.00	1.00	1.00	1.00	0.00	0.0135	0.0750	0.1758	12.98	2.36
7.00 m	9.00	57.00	16.00	6.00	4.00	8.00	0.00	0.0024	0.0158	0.0613	25.66	1.70
10.00 m	6.00	61.00	25.00	4.00	1.00	3.00	0.00	0.0042	0.0190	0.0606	14.50	1.42
13.00 m	7.00	58.00	26.00	3.00	2.00	4.00	0.00	0.0035	0.0186	0.0640	18.38	1.55
16.00 m	7.00	55.00	30.00	1.00	2.00	5.00	0.00	0.0035	0.0199	0.0703	19.98	1.61
19.00 m	6.00	57.00	29.00	3.00	1.00	4.00	0.00	0.0043	0.0206	0.0683	16.05	1.47
22.00 m	8.00	54.00	26.00	4.00	2.00	6.00	0.00	0.0029	0.0187	0.0702	24.20	1.72
28.00 m	7.00	53.00	25.00	5.00	4.00	6.00	0.00	0.0035	0.0206	0.0750	21.20	1.60

GRAIN SIZE DISTRIBUTION CURVES

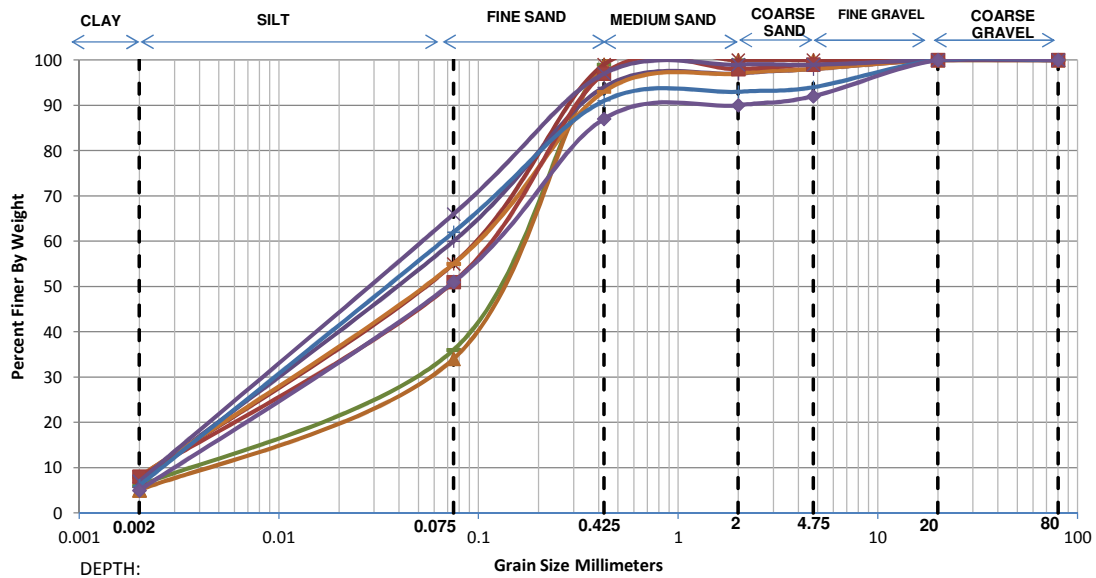
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P11



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	55.00	37.00	1.00	1.00	0.00	0.00	0.0043	0.0219	0.0727	16.88	1.53
5.50 m	8.00	54.00	31.00	2.00	3.00	2.00	0.00	0.0029	0.0189	0.0703	24.20	1.75
8.50 m	7.00	57.00	28.00	4.00	2.00	2.00	0.00	0.0035	0.0190	0.0661	18.90	1.57
11.50 m	9.00	53.00	29.00	3.00	2.00	4.00	0.00	0.0024	0.0178	0.0701	29.23	1.88
14.50 m	7.00	54.00	28.00	5.00	2.00	3.00	1.00	0.0035	0.0203	0.0726	20.57	1.61
17.50 m	8.00	52.00	32.00	4.00	1.00	2.00	1.00	0.0029	0.0199	0.0750	25.72	1.81
20.50 m	7.00	58.00	27.00	2.00	3.00	3.00	0.00	0.0035	0.0186	0.0641	18.39	1.55
23.50 m	12.00	77.00	3.00	2.00	4.00	2.00	0.00	-	0.0090	0.0325	-	-
26.50 m	0.00	78.55	6.60	2.05	6.50	6.30	0.00	0.0032	0.0129	0.0449	13.96	1.15

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P12

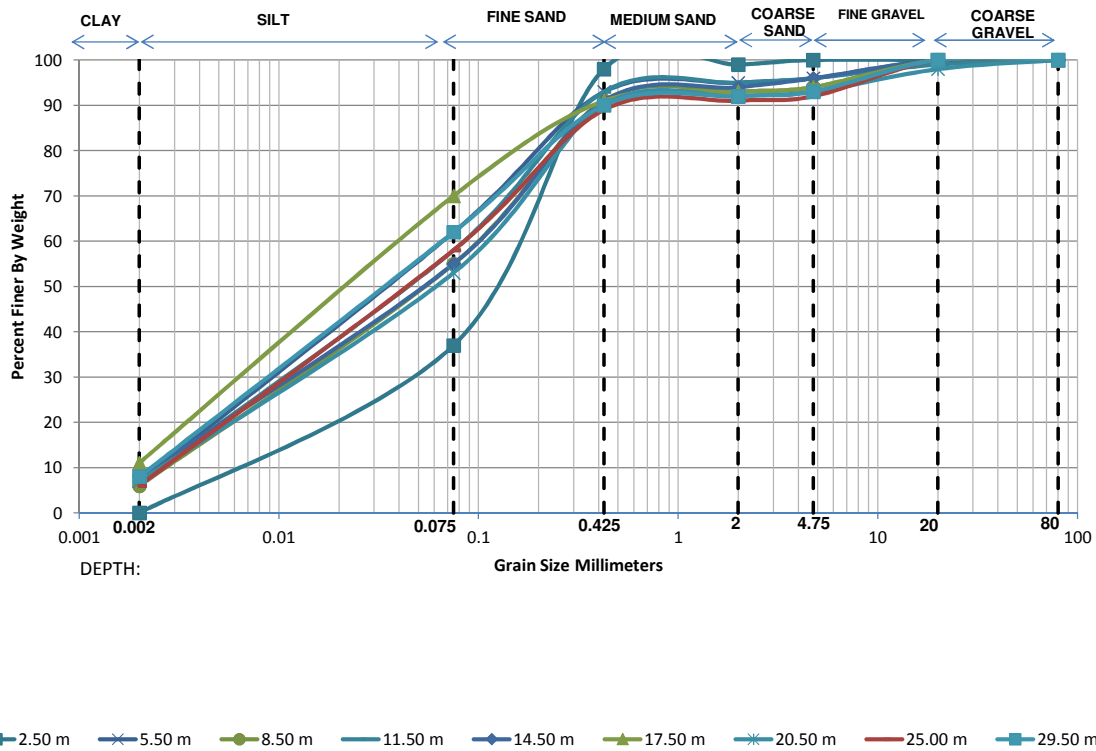


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 — 10.00 m
 — 13.00 m
 — 16.00 m
 — 19.00 m
 — 23.50 m
 — 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	30.00	63.00	1.00	0.00	0.00	0.00	0.0057	0.0550	0.1571	27.35	3.35
4.00 m	5.00	29.00	65.00	1.00	0.00	0.00	0.00	0.0077	0.0613	0.1633	21.27	3.00
7.00 m	8.00	47.00	44.00	1.00	0.00	0.00	0.00	0.0030	0.0235	0.0898	30.30	2.07
10.00 m	7.00	53.00	34.00	3.00	1.00	2.00	0.00	0.0035	0.0211	0.0750	21.13	1.67
13.00 m	8.00	47.00	38.00	4.00	1.00	2.00	0.00	0.0030	0.0231	0.0913	30.87	1.98
16.00 m	8.00	43.00	46.00	1.00	1.00	1.00	0.00	0.0030	0.0268	0.1047	34.83	2.28
19.00 m	7.00	59.00	31.00	2.00	0.00	1.00	0.00	0.0035	0.0184	0.0623	17.92	1.56
23.50 m	6.00	56.00	29.00	2.00	1.00	6.00	0.00	0.0043	0.0211	0.0704	16.48	1.48
28.00 m	5.00	46.00	36.00	3.00	2.00	8.00	0.00	0.0056	0.0297	0.1113	19.81	1.41

GRAIN SIZE DISTRIBUTION CURVES

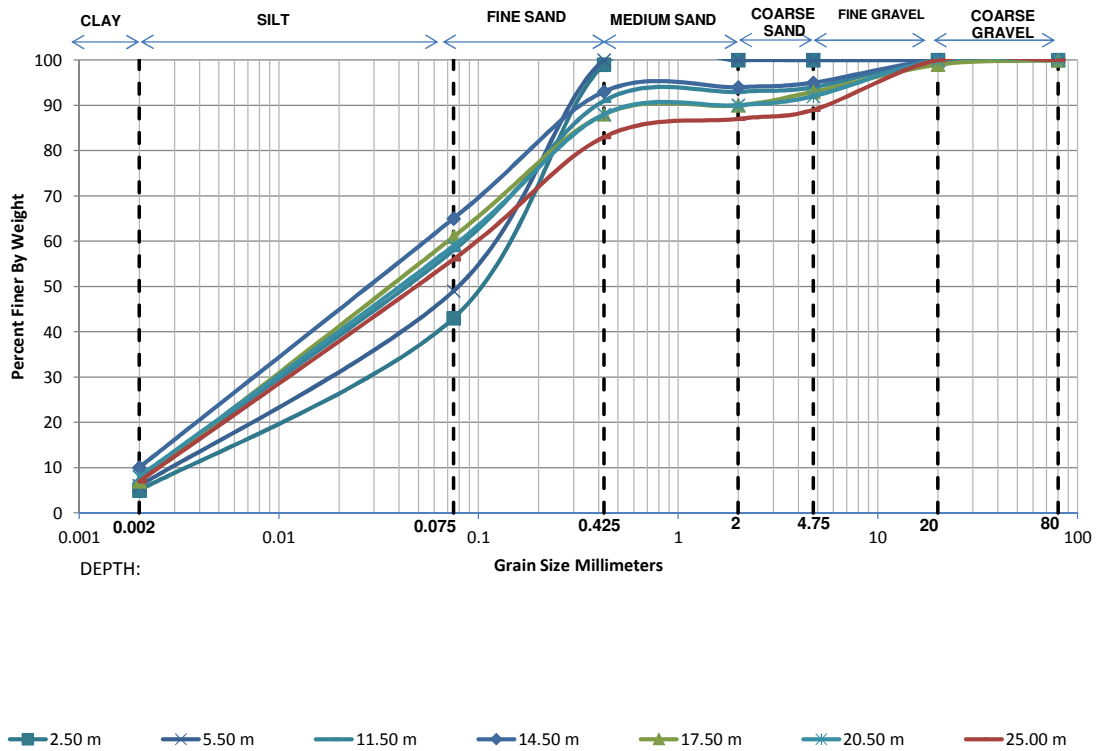
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P13



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	0.00	37.00	61.00	1.00	1.00	0.00	0.00	0.0093	0.0546	0.1512	16.22	2.12
5.50 m	7.00	55.00	31.00	2.00	1.00	4.00	0.00	0.0035	0.0200	0.0703	19.98	1.61
8.50 m	6.00	49.00	36.00	2.00	1.00	6.00	0.00	0.0044	0.0253	0.0915	20.59	1.57
11.50 m	7.00	51.00	35.00	2.00	1.00	3.00	1.00	0.0036	0.0222	0.0806	22.53	1.71
14.50 m	8.00	47.00	36.00	3.00	2.00	4.00	0.00	0.0030	0.0230	0.0919	31.08	1.95
17.50 m	11.00	59.00	21.00	2.00	1.00	6.00	0.00	-	0.0130	0.0540	-	-
20.50 m	7.00	46.00	37.00	2.00	1.00	5.00	2.00	0.0037	0.0257	0.1003	27.37	1.79
25.00 m	6.00	52.00	31.00	2.00	1.00	8.00	0.00	0.0044	0.0232	0.0809	18.56	1.52
29.50 m	8.00	54.00	28.00	2.00	1.00	7.00	0.00	0.0029	0.0188	0.0702	24.20	1.73

GRAIN SIZE DISTRIBUTION CURVES

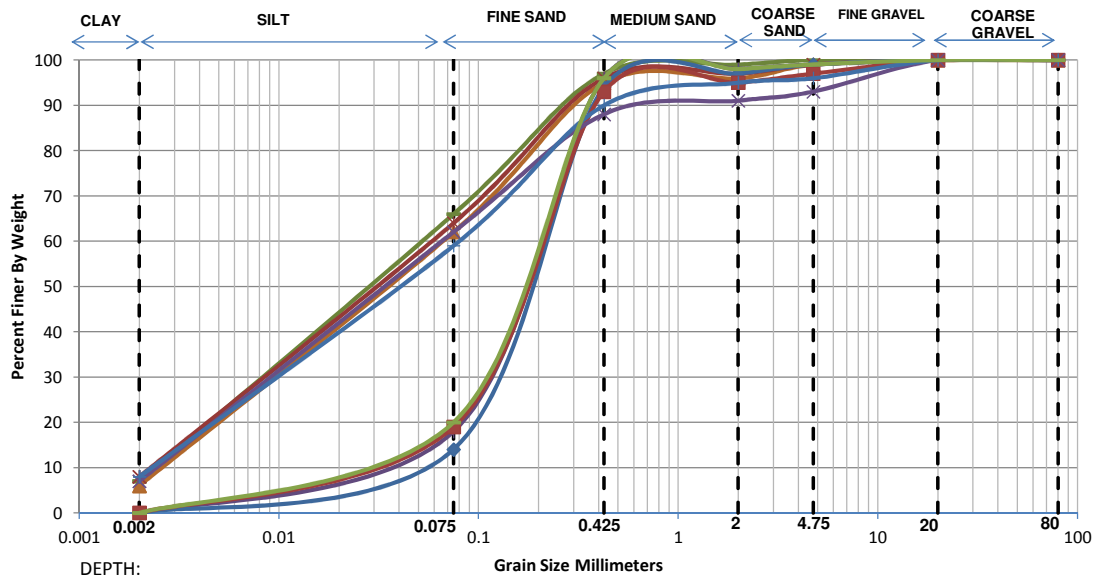
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P15



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	38.00	56.00	1.00	0.00	0.00	0.00	0.0063	0.0406	0.1317	20.98	2.00
5.50 m	6.00	43.00	51.00	0.00	0.00	0.00	0.00	0.0047	0.0313	0.1352	28.82	1.55
11.50 m	8.00	50.00	33.00	2.00	1.00	6.00	0.00	0.0029	0.0210	0.0808	27.59	1.86
14.50 m	10.00	55.00	28.00	1.00	1.00	5.00	0.00	0.0020	0.0156	0.0635	31.76	1.93
17.50 m	7.00	54.00	27.00	2.00	3.00	6.00	1.00	0.0035	0.0203	0.0726	20.57	1.60
20.50 m	8.00	51.00	29.00	2.00	2.00	8.00	0.00	0.0029	0.0202	0.0778	26.64	1.80
25.00 m	7.00	49.00	27.00	4.00	2.00	11.00	0.00	0.0036	0.0229	0.0909	25.28	1.61

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P16

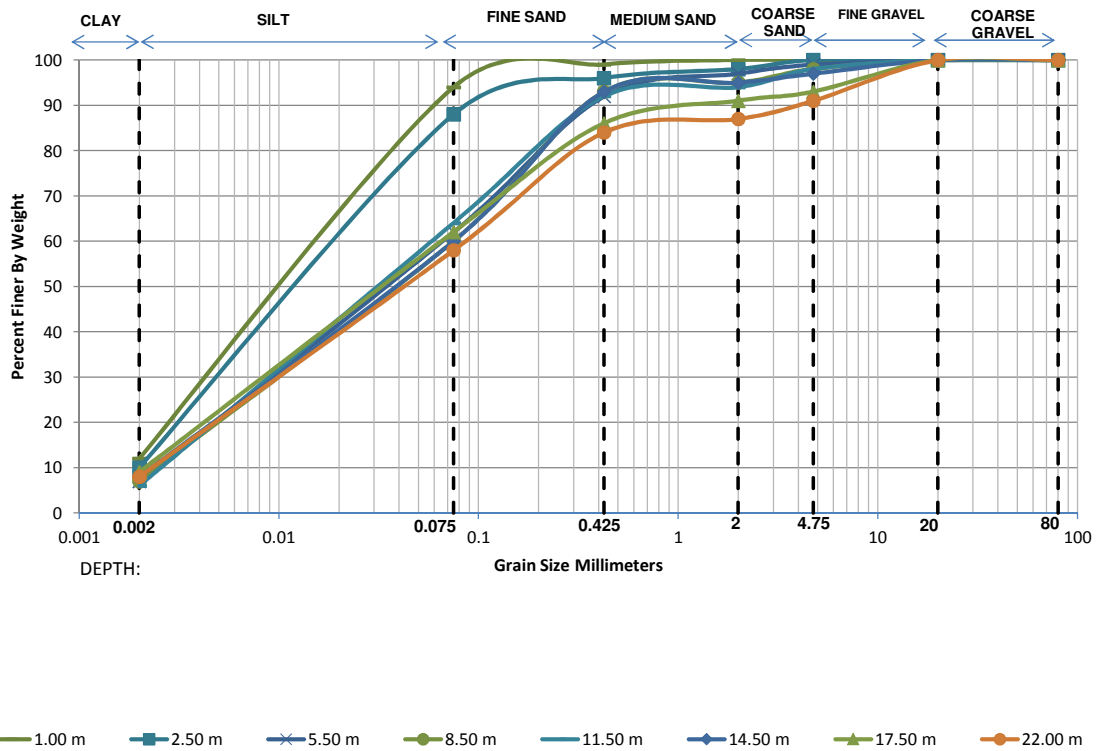


— 1.00 m
 — 4.00 m
 — 7.00 m
 — 10.00 m
 — 14.50 m
 — 16.00 m
 — 19.00 m
 — 23.50 m
 — 26.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	59.00	31.00	2.00	1.00	0.00	0.00	0.0035	0.0184	0.0623	17.92	1.56
4.00 m	6.00	56.00	33.00	1.00	3.00	1.00	0.00	0.0043	0.0212	0.0704	16.46	1.50
7.00 m	8.00	56.00	32.00	1.00	2.00	1.00	0.00	0.0029	0.0181	0.0660	22.82	1.72
10.00 m	0.00	18.00	78.00	2.00	1.00	1.00	0.00	0.0340	0.1200	0.2151	6.32	1.97
14.50 m	0.00	14.00	80.00	3.00	2.00	1.00	0.00	0.0508	0.1379	0.2311	4.55	1.62
16.00 m	0.00	19.00	74.00	2.00	2.00	3.00	0.00	0.0308	0.1166	0.2176	7.06	2.03
19.00 m	7.00	55.00	26.00	3.00	2.00	7.00	0.00	0.0035	0.0198	0.0703	19.99	1.58
23.50 m	8.00	51.00	31.00	5.00	1.00	4.00	0.00	0.0029	0.0204	0.0778	26.61	1.82
26.50 m	0.00	20.00	76.00	2.00	1.00	1.00	0.00	0.0283	0.1118	0.2090	7.38	2.11

GRAIN SIZE DISTRIBUTION CURVES

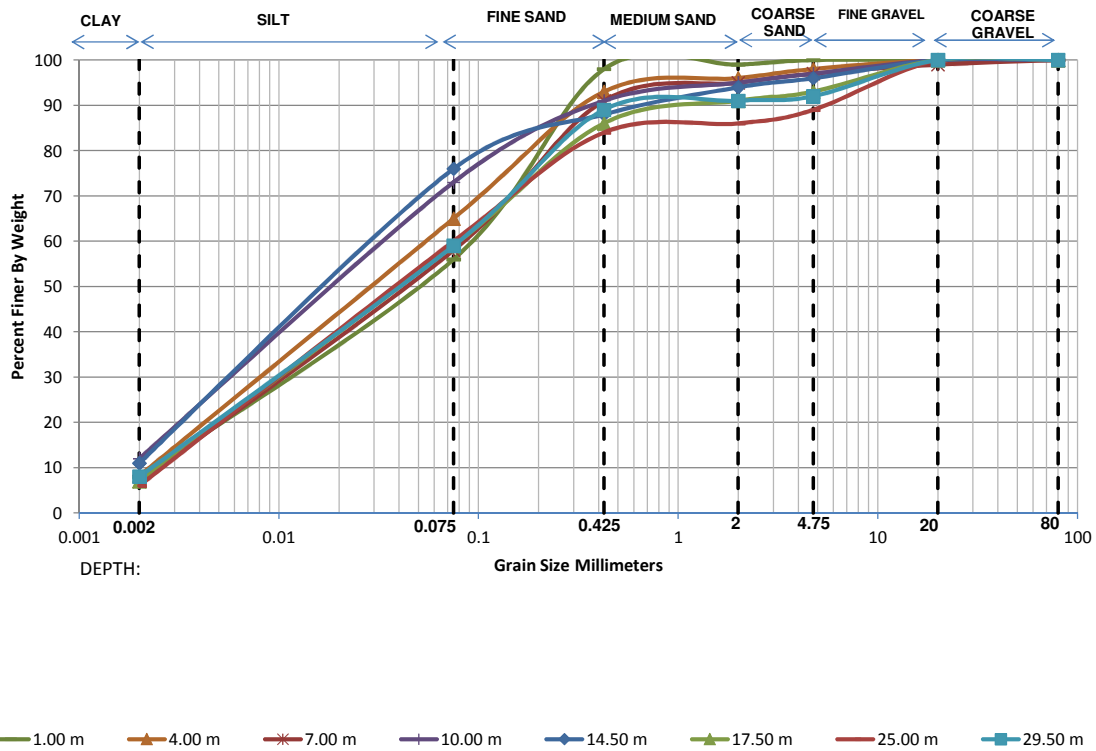
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P17



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	12.00	82.00	5.00	1.00	0.00	0.00	0.00	-	0.0087	0.0296	-	-
2.50 m	10.00	78.00	8.00	2.00	2.00	0.00	0.00	0.0020	0.0106	0.0346	17.29	1.62
5.50 m	7.00	55.00	30.00	5.00	2.00	1.00	0.00	0.0035	0.0199	0.0703	19.98	1.61
8.50 m	7.00	53.00	33.00	2.00	3.00	2.00	0.00	0.0035	0.0210	0.0750	21.14	1.66
11.50 m	6.00	58.00	28.00	2.00	4.00	2.00	0.00	0.0042	0.0202	0.0662	15.64	1.45
14.50 m	8.00	52.00	33.00	2.00	2.00	3.00	0.00	0.0029	0.0199	0.0750	25.71	1.82
17.50 m	9.00	53.00	24.00	5.00	2.00	7.00	0.00	0.0024	0.0176	0.0701	29.21	1.84
22.00 m	8.00	50.00	26.00	3.00	4.00	9.00	0.00	0.0029	0.0206	0.0817	27.91	1.78

GRAIN SIZE DISTRIBUTION CURVES

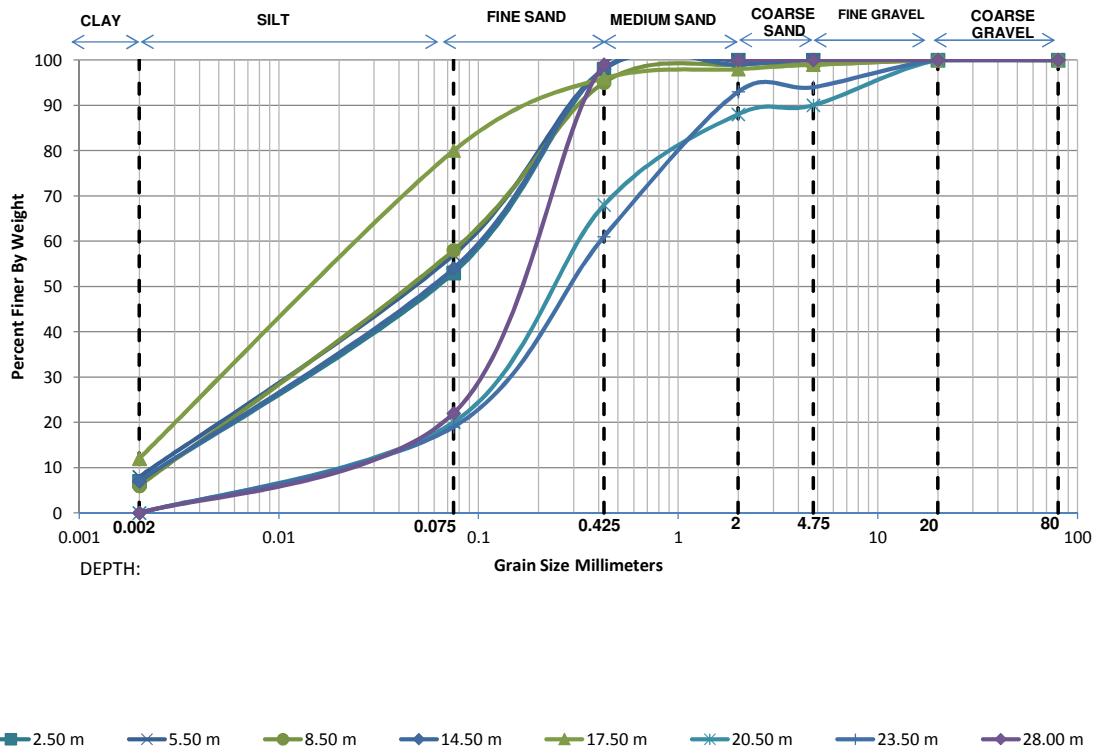
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P18



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	8.00	48.00	42.00	1.00	1.00	0.00	0.00	0.0030	0.0227	0.0866	29.34	2.01
4.00 m	8.20	56.80	28.00	3.00	2.00	2.00	0.00	0.0028	0.0174	0.0639	22.99	1.70
7.00 m	7.00	51.00	33.00	4.00	2.00	2.00	1.00	0.0036	0.0221	0.0808	22.60	1.69
10.00 m	12.00	61.00	18.00	4.00	2.00	3.00	0.00	-	0.0115	0.0490	-	-
14.50 m	11.00	65.00	12.00	6.00	2.00	4.00	0.00	-	0.0115	0.0452	-	-
17.50 m	7.00	52.00	27.00	5.00	2.00	7.00	0.00	0.0036	0.0212	0.0779	21.92	1.63
25.00 m	6.00	54.00	24.00	2.00	3.00	11.00	0.00	0.0043	0.0217	0.0750	17.45	1.47
29.50 m	8.00	51.00	30.00	2.00	1.00	8.00	0.00	0.0029	0.0203	0.0778	26.62	1.81

GRAIN SIZE DISTRIBUTION CURVES

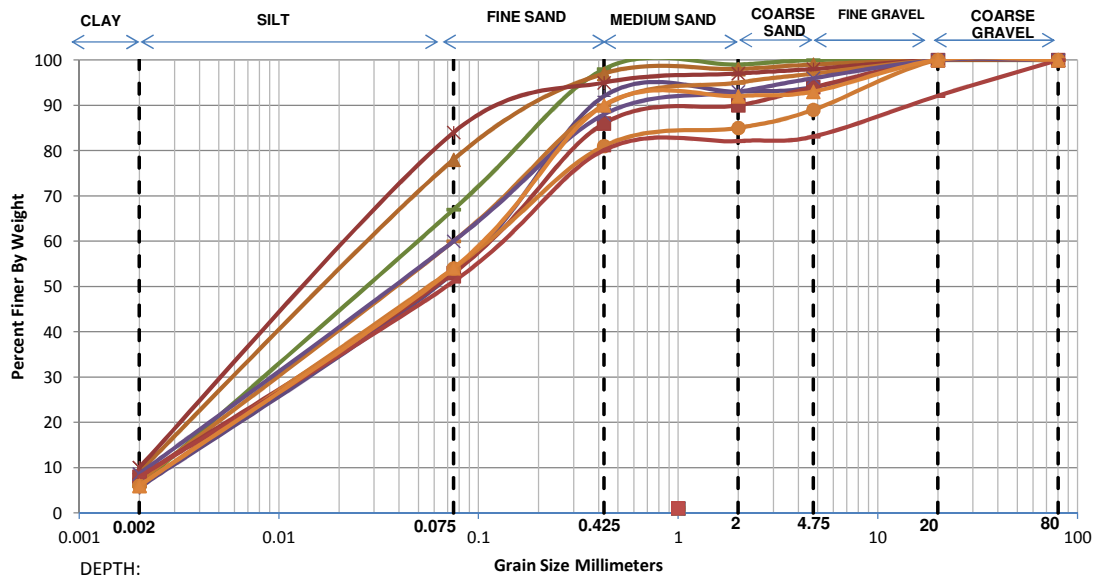
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-P19



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	7.00	46.00	45.00	2.00	0.00	0.00	0.00	0.0037	0.0261	0.0968	26.31	1.92
5.50 m	8.00	49.00	41.00	2.00	0.00	0.00	0.00	0.0029	0.0220	0.0834	28.34	1.97
8.50 m	6.00	52.00	37.00	4.00	0.00	0.00	1.00	0.0044	0.0235	0.0804	18.40	1.57
14.50 m	7.00	47.00	44.00	1.00	1.00	0.00	0.00	0.0037	0.0253	0.0932	25.48	1.88
17.50 m	12.00	68.00	16.00	2.00	1.00	1.00	0.00	-	0.0103	0.0406	-	-
20.50 m	0.00	20.00	48.00	20.00	2.00	10.00	0.00	0.0263	0.1227	0.3303	12.54	1.73
23.50 m	0.00	19.00	42.00	32.00	1.00	6.00	0.00	0.0283	0.1357	0.4110	14.54	1.58
28.00 m	0.00	22.00	77.00	1.00	0.00	0.00	0.00	0.0240	0.1034	0.1979	8.24	2.25

GRAIN SIZE DISTRIBUTION CURVES

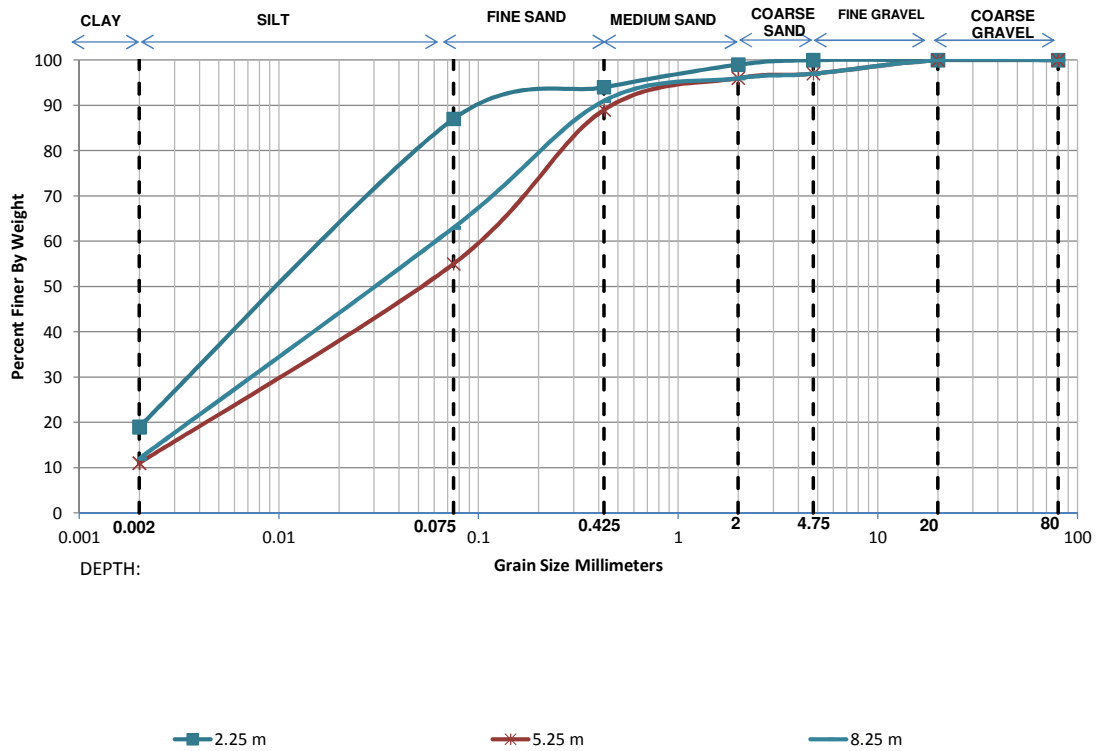
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+400 Major Bridge
B.H. No.	BH-A2



— 1.00 m
 —▲ 4.00 m
 —✕ 7.00 m
 —+ 10.00 m
 — 13.00 m
 —■ 16.00 m
 —× 19.00 m
 —● 22.00 m
 — 25.00 m
 —▲ 31.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	61.00	31.00	1.00	1.00	0.00	0.00	0.0042	0.0192	0.0608	14.52	1.45
4.00 m	9.00	69.00	19.00	1.00	1.00	1.00	0.00	0.0024	0.0130	0.0443	18.66	1.61
7.00 m	10.00	74.00	11.00	2.00	1.00	2.00	0.00	0.0020	0.0111	0.0377	18.86	1.64
10.00 m	5.60	47.40	39.00	1.00	1.00	6.00	0.00	0.0049	0.0274	0.0988	20.17	1.56
13.00 m	7.00	53.00	30.00	5.00	2.00	3.00	0.00	0.0035	0.0209	0.0750	21.16	1.64
16.00 m	8.00	45.00	33.00	4.00	4.00	6.00	0.00	0.0030	0.0243	0.1036	34.87	1.92
19.00 m	8.60	51.40	28.00	5.00	3.00	4.00	0.00	0.0026	0.0191	0.0750	28.91	1.87
22.00 m	6.00	48.00	27.00	4.00	4.00	11.00	0.00	0.0044	0.0254	0.1030	23.19	1.41
25.00 m	8.00	43.10	29.00	2.00	1.00	9.00	7.90	0.0030	0.0256	0.1214	40.64	1.81
31.00 m	6.00	48.00	36.00	2.00	1.00	7.00	0.00	0.0045	0.0260	0.0959	21.45	1.58

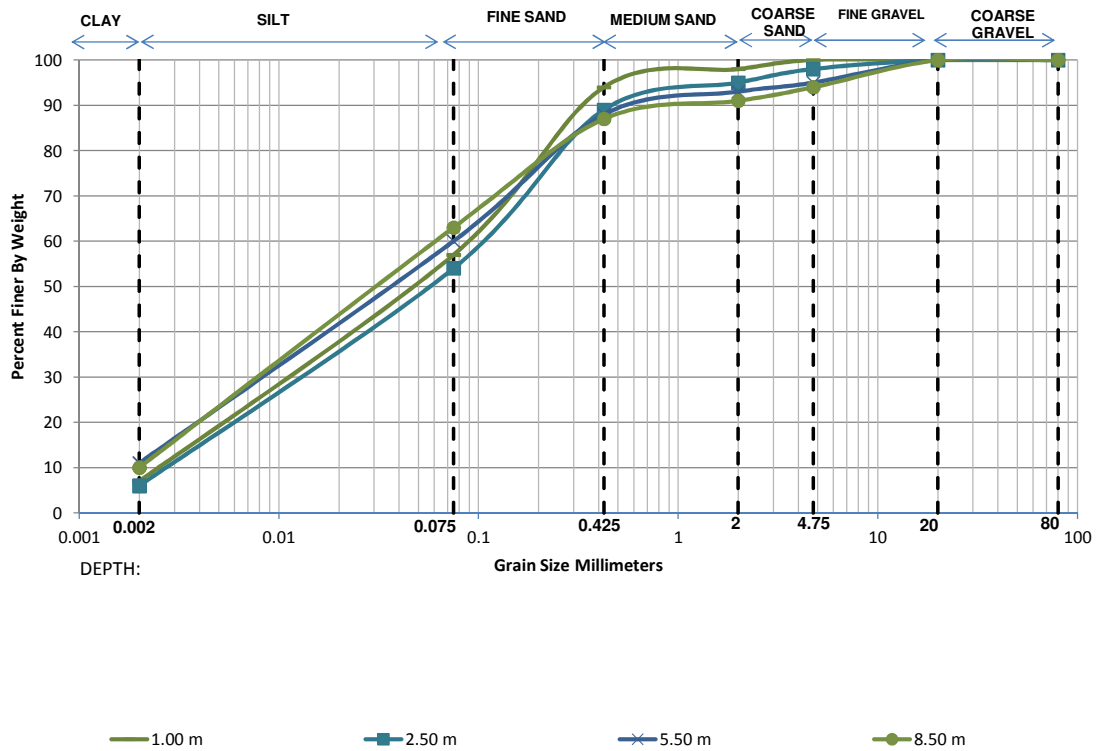
GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	57+980
B.H. No.	CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	19.00	68.00	7.00	5.00	1.00	0.00	0.00	-	0.0055	0.0302	-	-
5.25 m	11.00	44.00	34.00	7.00	1.00	3.00	0.00	-	0.0198	0.0935	-	-
8.25 m	12.00	51.00	28.00	5.00	1.00	3.00	0.00	-	0.0146	0.0675	-	-

GRAIN SIZE DISTRIBUTION CURVES

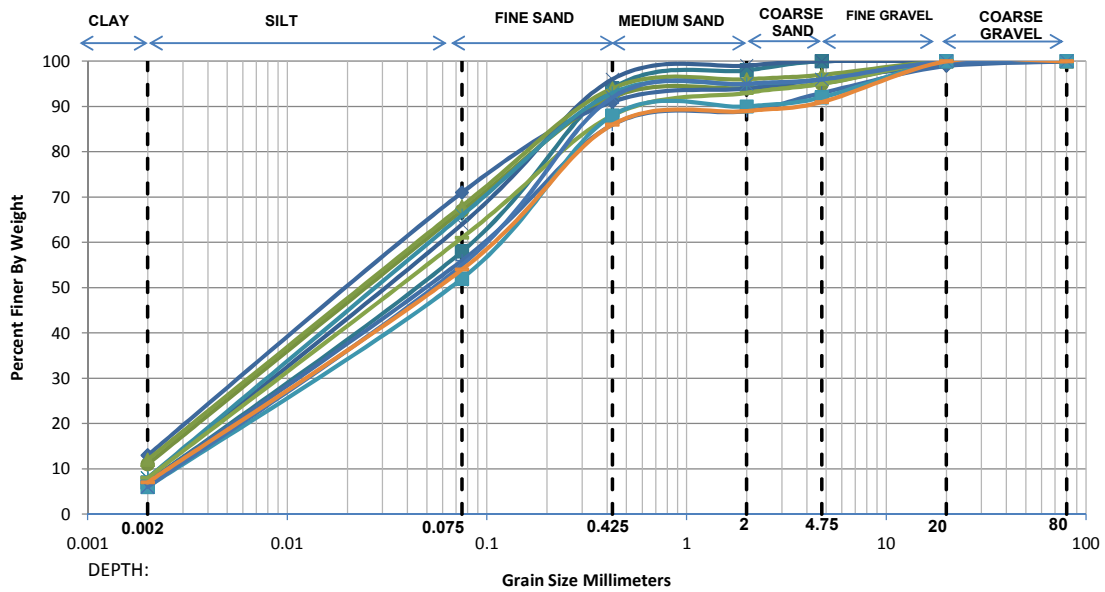
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+191
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	50.00	37.00	4.00	2.00	0.00	0.00	0.0036	0.0229	0.0838	23.31	1.74
2.50 m	6.00	48.00	35.00	6.00	3.00	2.00	0.00	0.0045	0.0259	0.0968	21.66	1.56
5.50 m	11.00	49.00	28.00	5.00	2.00	5.00	0.00	-	0.0167	0.0750	-	-
8.50 m	10.00	53.00	24.00	4.00	3.00	6.00	0.00	0.0020	0.0162	0.0677	33.83	1.94

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-A1

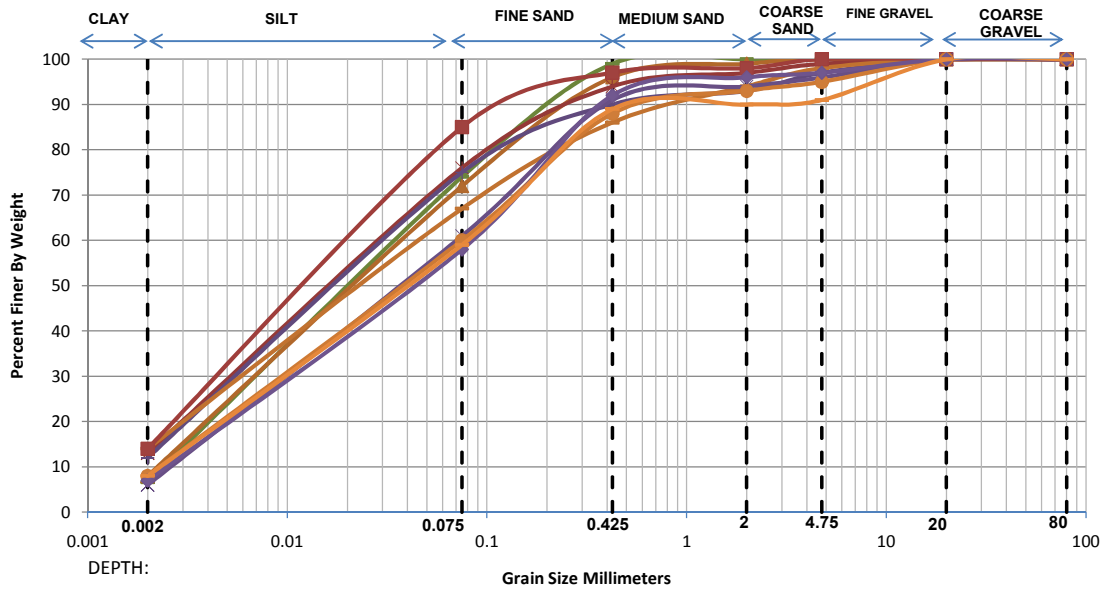


Legend for depths: 2.50 m (blue square), 5.50 m (blue cross), 8.50 m (green circle), 14.50 m (blue diamond), 17.50 m (green triangle), 20.50 m (blue asterisk), 23.50 m (blue plus), 26.50 m (green dash), 29.50 m (blue square), 32.50 m (blue cross), 40.00 m (orange line).

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	7.00	51.00	36.00	4.00	2.00	0.00	0.00	0.0036	0.0222	0.0806	22.51	1.72
5.50 m	8.00	56.00	32.00	3.00	1.00	0.00	0.00	0.0029	0.0181	0.0660	22.82	1.72
8.50 m	11.00	56.00	25.00	2.00	1.00	5.00	0.00	-	0.0140	0.0593	-	-
14.50 m	13.00	58.00	20.00	3.00	2.00	3.00	1.00	-	0.0112	0.0516	-	-
17.50 m	12.00	56.00	26.00	2.00	1.00	3.00	0.00	-	0.0129	0.0573	-	-
20.50 m	8.00	58.00	27.00	2.00	1.00	4.00	0.00	0.0029	0.0172	0.0620	21.53	1.66
23.50 m	7.00	49.00	30.00	3.00	4.00	6.00	1.00	0.0036	0.0231	0.0894	24.84	1.66
26.50 m	8.00	53.00	27.00	5.00	2.00	5.00	0.00	0.0029	0.0192	0.0725	24.95	1.74
29.50 m	6.00	46.00	36.00	2.00	2.00	8.00	0.00	0.0045	0.0276	0.1058	23.36	1.58
32.50 m	6.00	49.00	37.00	3.00	1.00	4.00	0.00	0.0044	0.0253	0.0912	20.52	1.58
40.00 m	7.00	47.00	32.00	3.00	2.00	9.00	0.00	0.0036	0.0246	0.0985	27.09	1.69

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P1

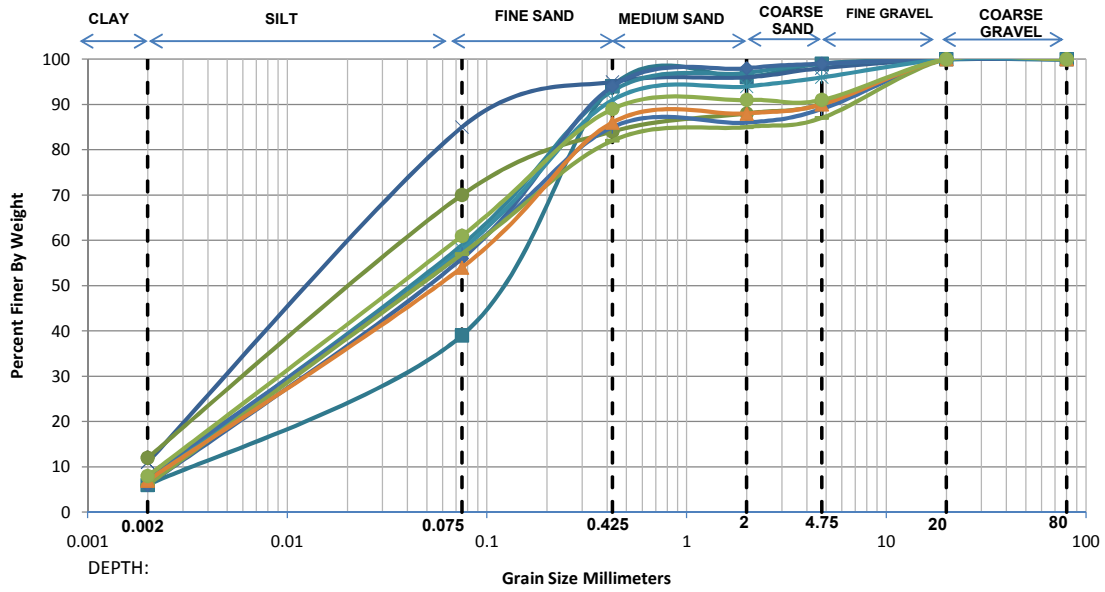


— 1.00 m
 —▲— 4.00 m
 —*— 7.00 m
 —+— 10.00 m
 —■— 13.00 m
 —■— 16.00 m
 —x— 19.00 m
 —●— 22.00 m
 —◆— 28.00 m
 —■— 40.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.60	67.40	25.00	1.00	0.00	0.00	0.00	0.0037	0.0163	0.0503	13.73	1.45
4.00 m	8.00	64.00	24.00	3.00	1.00	0.00	0.00	0.0029	0.0153	0.0523	18.33	1.58
7.00 m	13.00	63.00	18.00	3.00	2.00	1.00	0.00	-	0.0102	0.0446	-	-
10.00 m	12.00	63.00	15.00	3.00	4.00	3.00	0.00	-	0.0110	0.0461	-	-
13.00 m	14.00	53.00	19.00	8.00	4.00	2.00	0.00	-	0.0113	0.0582	-	-
16.00 m	14.00	71.00	12.00	1.00	2.00	0.00	0.00	-	0.0083	0.0348	-	-
19.00 m	6.00	55.00	30.00	3.00	2.00	4.00	0.00	0.0043	0.0216	0.0726	16.93	1.49
22.00 m	8.00	52.00	28.00	5.00	2.00	5.00	0.00	0.0029	0.0197	0.0750	25.74	1.78
28.00 m	7.00	51.00	34.00	4.00	1.00	3.00	0.00	0.0036	0.0221	0.0807	22.57	1.70
40.00 m	8.00	51.00	30.00	1.00	1.00	9.00	0.00	0.0029	0.0203	0.0778	26.62	1.81

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P2

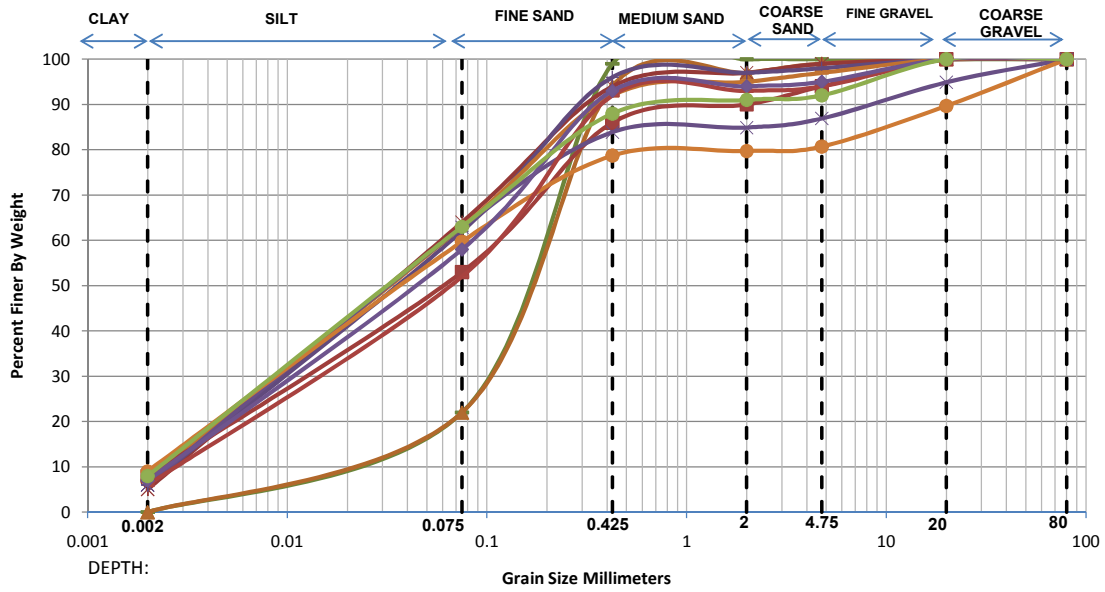


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ✱ 20.50 m
 — 23.50 m
 — 26.50 m
 ▲ 31.00 m
 ● 35.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	33.00	55.00	2.00	3.00	1.00	0.00	0.0053	0.0471	0.1529	28.58	2.71
5.50 m	11.00	74.00	10.00	1.00	2.00	2.00	0.00	-	0.0102	0.0363	-	-
8.50 m	12.00	58.00	14.00	4.00	2.00	10.00	0.00	-	0.0120	0.0532	-	-
11.50 m	7.00	52.00	34.00	4.00	2.00	1.00	0.00	0.0036	0.0216	0.0776	21.79	1.68
14.50 m	6.00	50.00	38.00	4.00	1.00	1.00	0.00	0.0044	0.0247	0.0871	19.70	1.59
20.50 m	7.00	51.00	33.00	3.00	2.00	4.00	0.00	0.0036	0.0221	0.0808	22.60	1.69
23.50 m	8.00	49.00	28.00	1.00	3.00	11.00	0.00	0.0029	0.0213	0.0854	29.12	1.81
26.50 m	6.00	51.00	25.00	3.00	2.00	13.00	0.00	0.0044	0.0234	0.0863	19.78	1.45
31.00 m	7.00	47.00	32.00	2.00	2.00	10.00	0.00	0.0036	0.0246	0.0984	27.05	1.69
35.50 m	8.00	53.00	28.00	2.00	0.00	9.00	0.00	0.0029	0.0192	0.0725	24.95	1.75

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P3

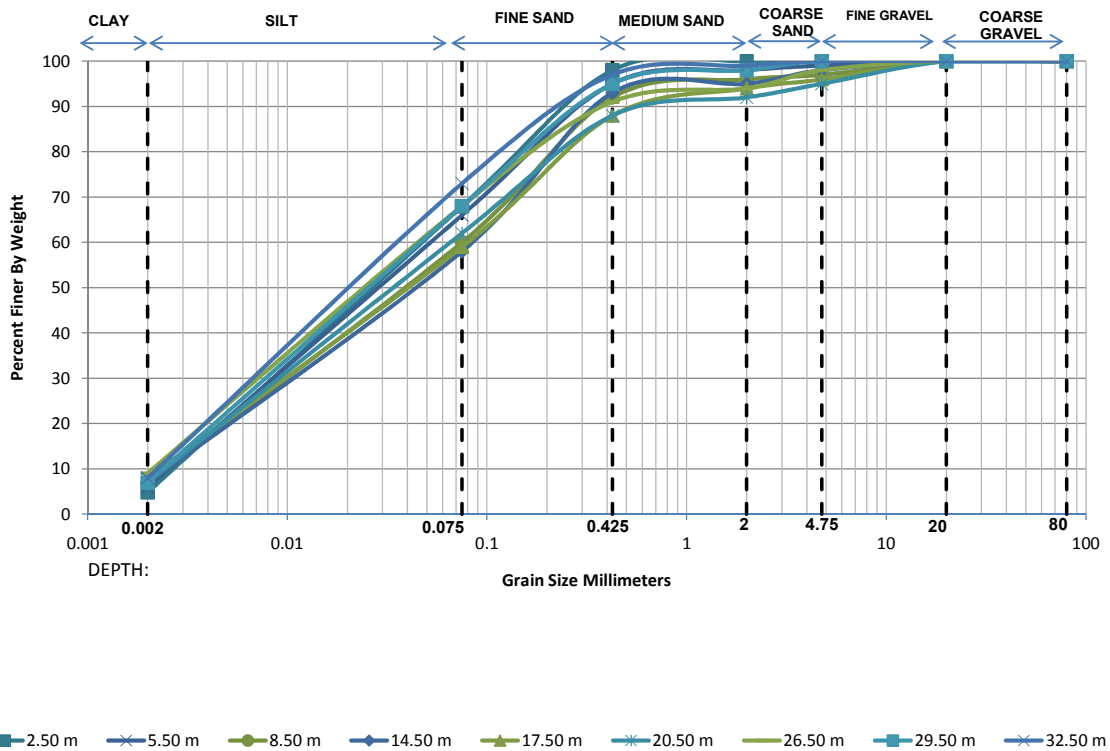


— 1.00 m
 —▲— 4.00 m
 —✱— 7.00 m
 —◆— 10.00 m
 — 13.00 m
 —■— 16.00 m
 —✕— 19.00 m
 —●— 22.00 m
 — 25.00 m
 —◆— 28.00 m
 —●— 35.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	22.00	77.00	1.00	0.00	0.00	0.0240	0.1034	0.1979	8.24	2.25	
4.00 m	0.00	22.00	72.00	3.00	2.00	1.00	0.0238	0.1043	0.2068	8.70	2.22	
7.00 m	5.00	59.00	30.00	3.00	2.00	1.00	0.0051	0.0216	0.0664	12.90	1.36	
10.00 m	6.00	56.00	34.00	1.00	1.00	2.00	0.0043	0.0213	0.0705	16.46	1.50	
13.00 m	7.00	56.00	29.00	3.00	2.00	3.00	0.0035	0.0195	0.0681	19.43	1.59	
16.00 m	8.00	45.00	33.00	4.00	4.00	6.00	0.0030	0.0243	0.1036	34.87	1.92	
19.00 m	6.00	56.90	21.00	1.00	2.00	8.00	0.0042	0.0203	0.0683	16.12	1.42	
22.00 m	9.00	50.70	19.00	1.00	1.00	9.00	0.0024	0.0184	0.0759	31.58	1.85	
25.00 m	6.00	46.00	40.00	1.00	1.00	6.00	0.0045	0.0278	0.1029	22.64	1.65	
28.00 m	7.00	51.00	35.00	1.00	1.00	5.00	0.0036	0.0222	0.0806	22.53	1.71	
35.50 m	8.00	55.00	25.00	3.00	1.00	8.00	0.0029	0.0182	0.0679	23.47	1.69	

GRAIN SIZE DISTRIBUTION CURVES

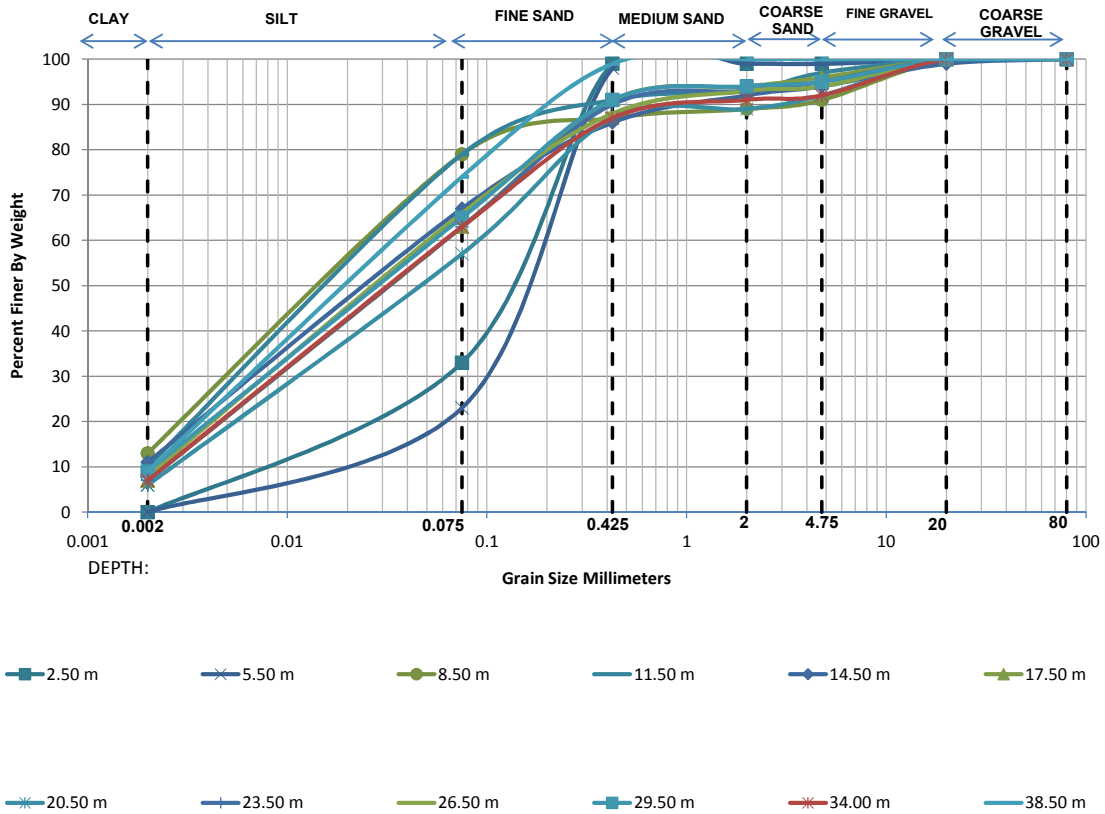
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P4



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	4.80	63.20	30.00	2.00	0.00	0.00	0.00	0.0053	0.0204	0.0595	11.32	1.34
5.50 m	6.00	60.00	29.00	3.00	1.00	1.00	0.00	0.0042	0.0195	0.0625	14.87	1.45
8.50 m	7.00	53.00	32.00	4.00	1.00	3.00	0.00	0.0035	0.0210	0.0750	21.15	1.65
14.50 m	7.00	51.00	35.00	2.00	3.00	2.00	0.00	0.0036	0.0222	0.0806	22.53	1.71
17.50 m	8.00	51.00	29.00	6.00	2.00	4.00	0.00	0.0029	0.0202	0.0778	26.65	1.80
20.50 m	7.00	55.00	26.00	4.00	3.00	5.00	0.00	0.0035	0.0198	0.0703	19.99	1.58
26.50 m	9.00	59.00	23.00	3.00	4.00	2.00	0.00	0.0024	0.0154	0.0580	24.29	1.72
29.50 m	7.00	61.00	27.00	3.00	2.00	0.00	0.00	0.0035	0.0176	0.0588	17.00	1.52
32.50 m	8.00	65.00	24.00	2.00	1.00	0.00	0.00	0.0028	0.0151	0.0509	17.88	1.57

GRAIN SIZE DISTRIBUTION CURVES

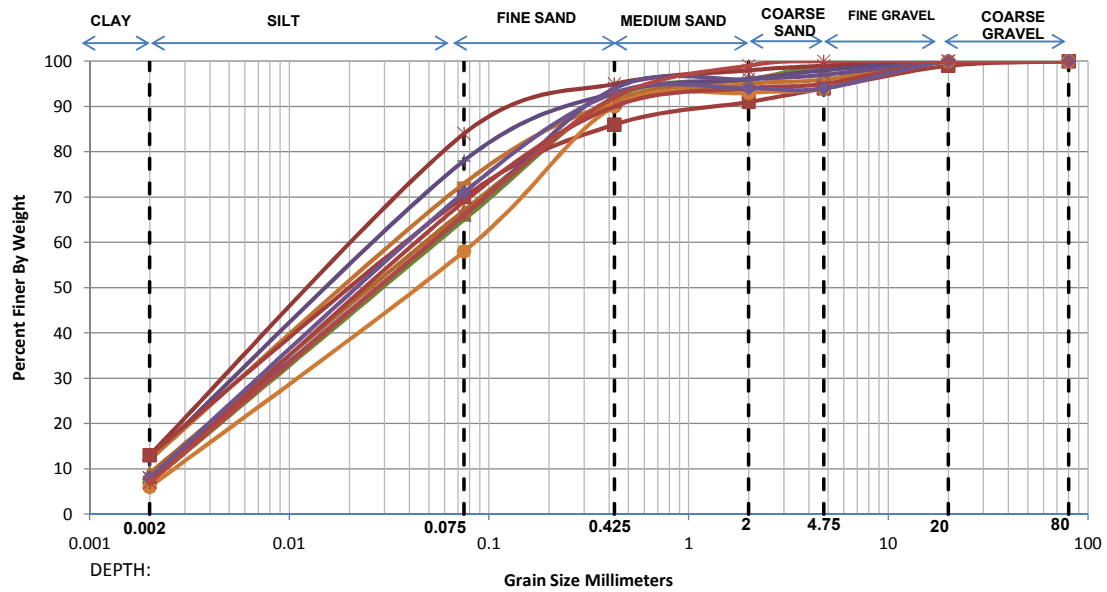
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P5



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	0.00	33.00	66.00	0.00	0.00	1.00	0.00	0.0115	0.0656	0.2322	20.28	1.62
5.50 m	0.00	23.00	75.00	1.00	0.00	1.00	0.00	0.0221	0.0998	0.1963	8.88	2.29
8.50 m	13.00	66.00	8.00	2.00	2.00	9.00	0.00	-	0.0096	0.0406	-	-
11.50 m	10.00	69.00	12.00	2.00	4.00	3.00	0.00	0.0020	0.0118	0.0423	21.17	1.65
14.50 m	11.00	56.00	19.00	6.00	2.00	5.00	1.00	-	0.0138	0.0591	-	-
17.50 m	7.00	56.00	28.00	3.00	2.00	4.00	0.00	0.0035	0.0194	0.0681	19.43	1.58
20.50 m	6.00	51.00	30.00	2.00	3.00	8.00	0.00	0.0044	0.0237	0.0848	19.37	1.51
23.50 m	7.00	56.00	27.00	3.00	2.00	5.00	0.00	0.0035	0.0194	0.0681	19.43	1.57
26.50 m	8.00	58.00	22.00	5.00	1.00	6.00	0.00	0.0029	0.0170	0.0618	21.48	1.62
29.50 m	9.00	56.00	26.00	3.00	1.00	5.00	0.00	0.0024	0.0165	0.0637	26.59	1.79
34.00 m	7.00	56.00	24.00	4.00	1.00	8.00	0.00	0.0035	0.0192	0.0680	19.43	1.56
38.50 m	9.00	65.00	25.00	1.00	0.00	0.00	0.00	0.0024	0.0140	0.0493	20.70	1.66

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-P6

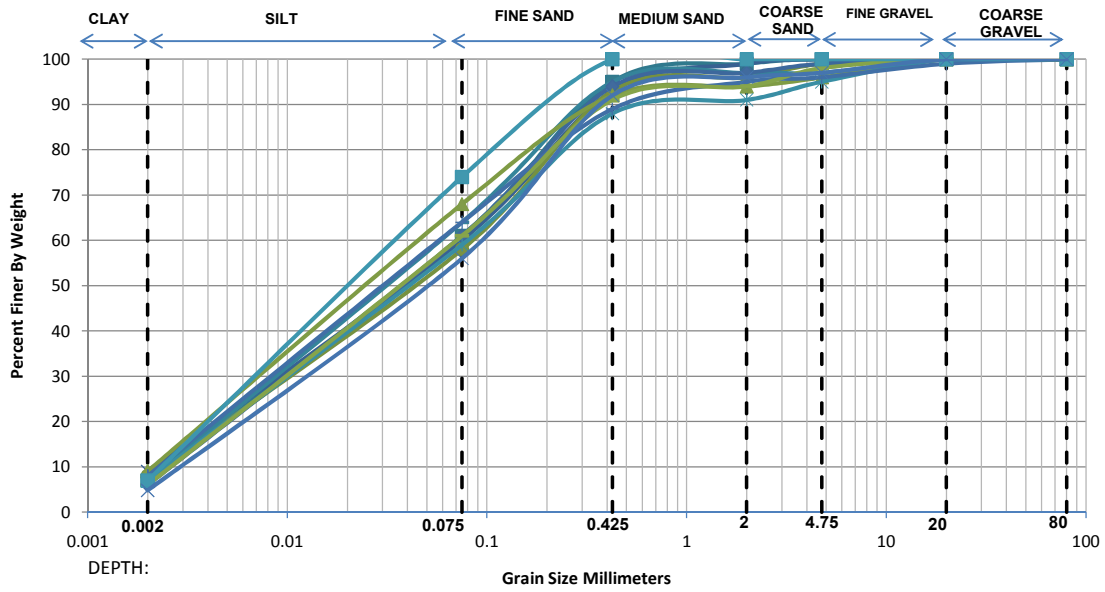


— 1.00 m
 —▲— 4.00 m
 —✱— 7.00 m
 —◆— 10.00 m
 — 13.00 m
 —■— 16.00 m
 —✕— 19.00 m
 —●— 22.00 m
 — 25.00 m
 —◆— 28.00 m
 —✱— 34.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	58.00	27.00	4.00	3.00	1.00	0.00	0.0035	0.0186	0.0641	18.39	1.55
4.00 m	9.00	58.00	24.00	5.00	2.00	2.00	0.00	0.0024	0.0158	0.0598	25.02	1.74
7.00 m	13.00	71.00	11.00	3.00	1.00	1.00	0.00	-	0.0090	0.0361	-	-
10.00 m	12.00	66.00	15.00	3.00	2.00	2.00	0.00	-	0.0105	0.0426	-	-
13.00 m	12.00	61.00	18.00	4.00	1.00	4.00	0.00	-	0.0115	0.0490	-	-
16.00 m	13.00	57.00	16.00	5.00	3.00	5.00	1.00	-	0.0113	0.0530	-	-
19.00 m	8.00	58.00	28.00	2.00	1.00	3.00	0.00	0.0029	0.0172	0.0620	21.54	1.66
22.00 m	6.00	52.00	32.00	3.00	1.00	6.00	0.00	0.0044	0.0232	0.0808	18.54	1.53
25.00 m	7.00	62.00	21.00	4.00	1.00	5.00	0.00	0.0034	0.0171	0.0569	16.53	1.49
28.00 m	8.00	63.00	22.00	1.00	0.00	6.00	0.00	0.0029	0.0155	0.0536	18.77	1.58
34.00 m	7.00	59.00	26.00	7.00	1.00	0.00	0.00	0.0035	0.0182	0.0622	17.90	1.54

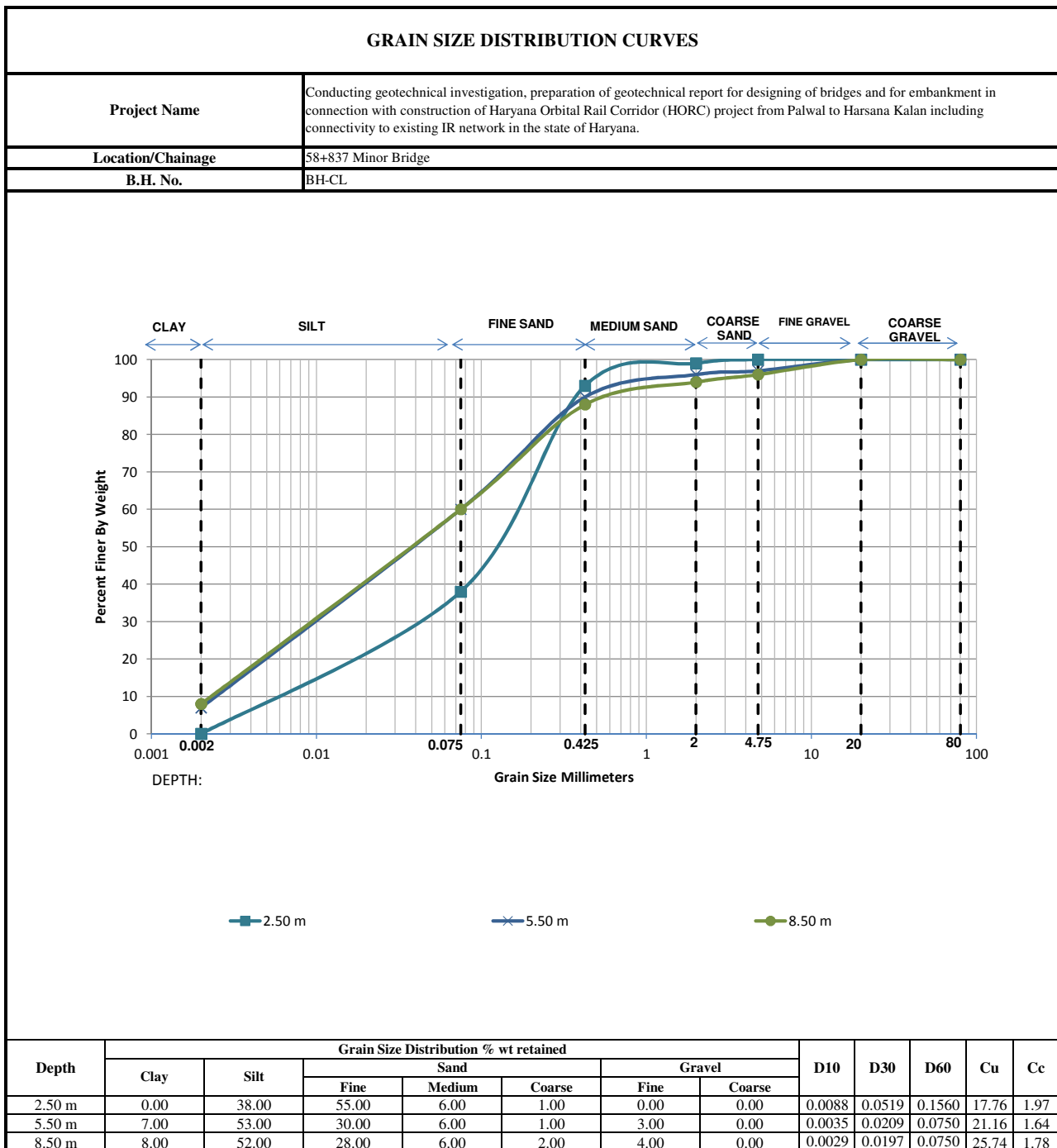
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	58+497 Major Bridge
B.H. No.	BH-A2



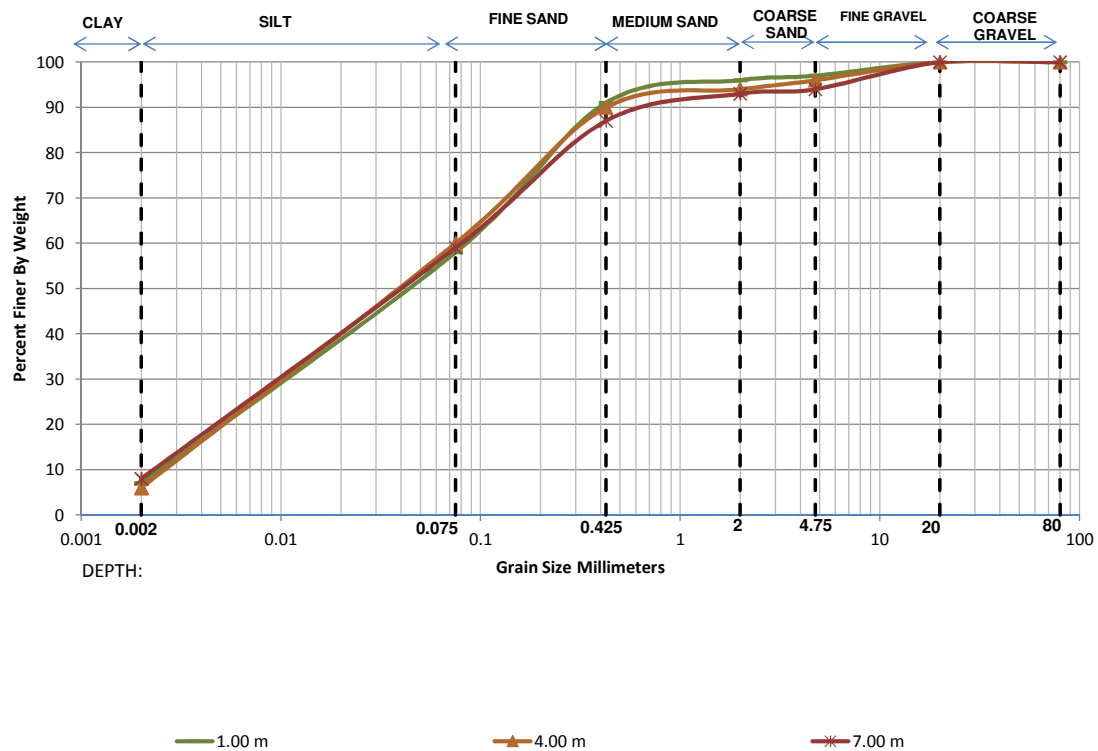
■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 + 23.50 m
 — 26.50 m
 ■ 29.50 m
 × 32.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	7.00	54.00	34.00	4.00	1.00	0.00	0.00	0.0035	0.0206	0.0726	20.53	1.65
5.50 m	9.00	51.00	33.00	6.00	1.00	0.00	0.00	0.0024	0.0189	0.0750	31.19	1.98
8.50 m	8.00	50.00	35.00	3.00	3.00	1.00	0.00	0.0029	0.0211	0.0807	27.53	1.88
11.50 m	7.00	57.00	31.00	2.00	0.00	3.00	0.00	0.0035	0.0192	0.0661	18.90	1.59
14.50 m	6.00	55.00	33.00	3.00	2.00	1.00	0.00	0.0043	0.0217	0.0727	16.90	1.51
17.50 m	9.00	59.00	24.00	2.00	2.00	4.00	0.00	0.0024	0.0155	0.0581	24.31	1.72
20.50 m	7.00	52.00	29.00	3.00	4.00	5.00	0.00	0.0036	0.0213	0.0778	21.88	1.65
23.50 m	8.00	56.00	25.00	6.00	1.00	3.00	1.00	0.0029	0.0178	0.0658	22.79	1.67
26.50 m	6.00	55.00	30.00	3.00	4.00	2.00	0.00	0.0043	0.0216	0.0726	16.93	1.49
29.50 m	7.00	67.00	26.00	0.00	0.00	0.00	0.00	0.0034	0.0159	0.0502	14.72	1.49
32.50 m	4.80	51.20	36.00	4.00	1.00	3.00	0.00	0.0056	0.0262	0.0874	15.51	1.39

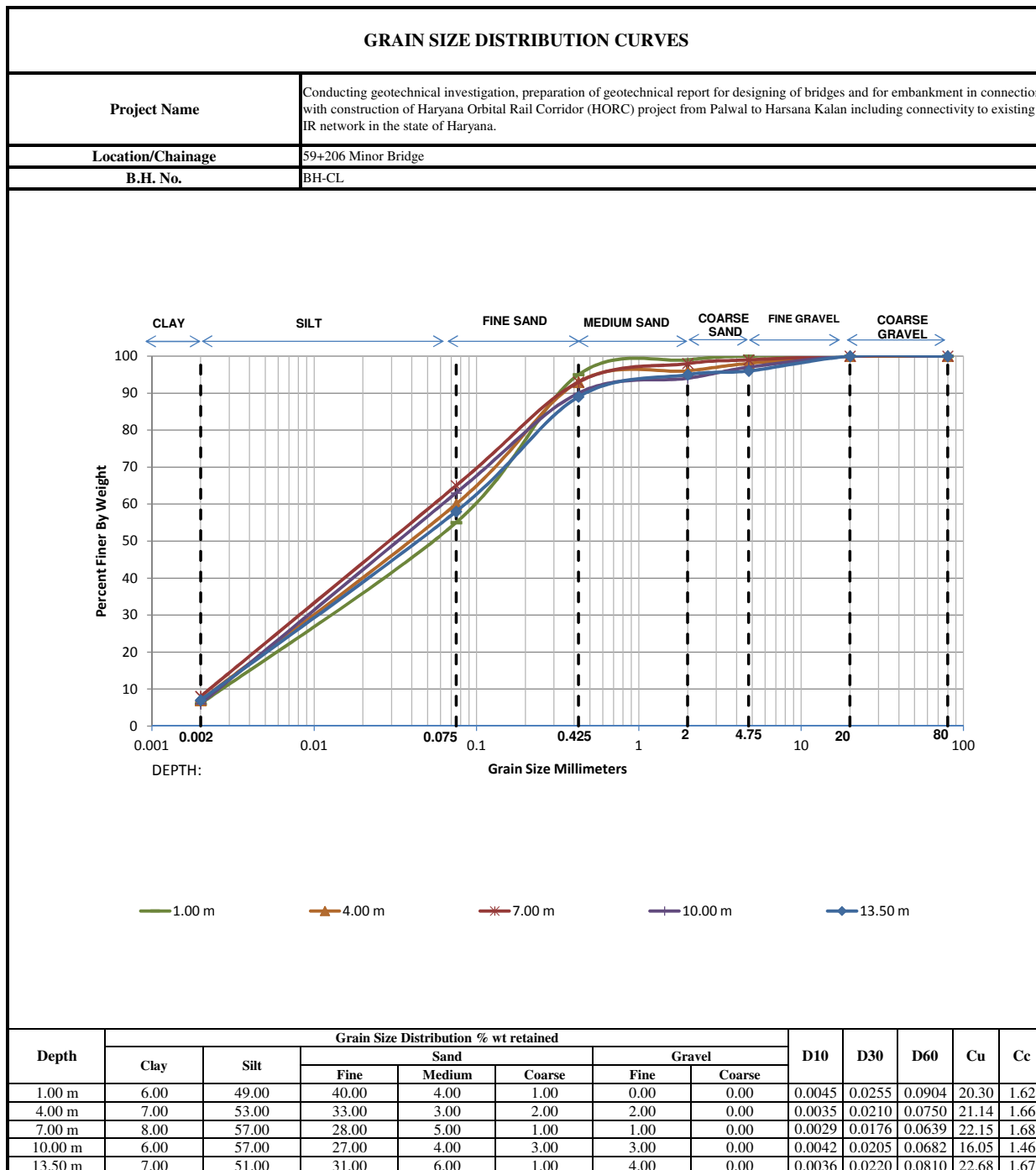


GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	59+071 Minor Bridge
B.H. No.	BH-CL

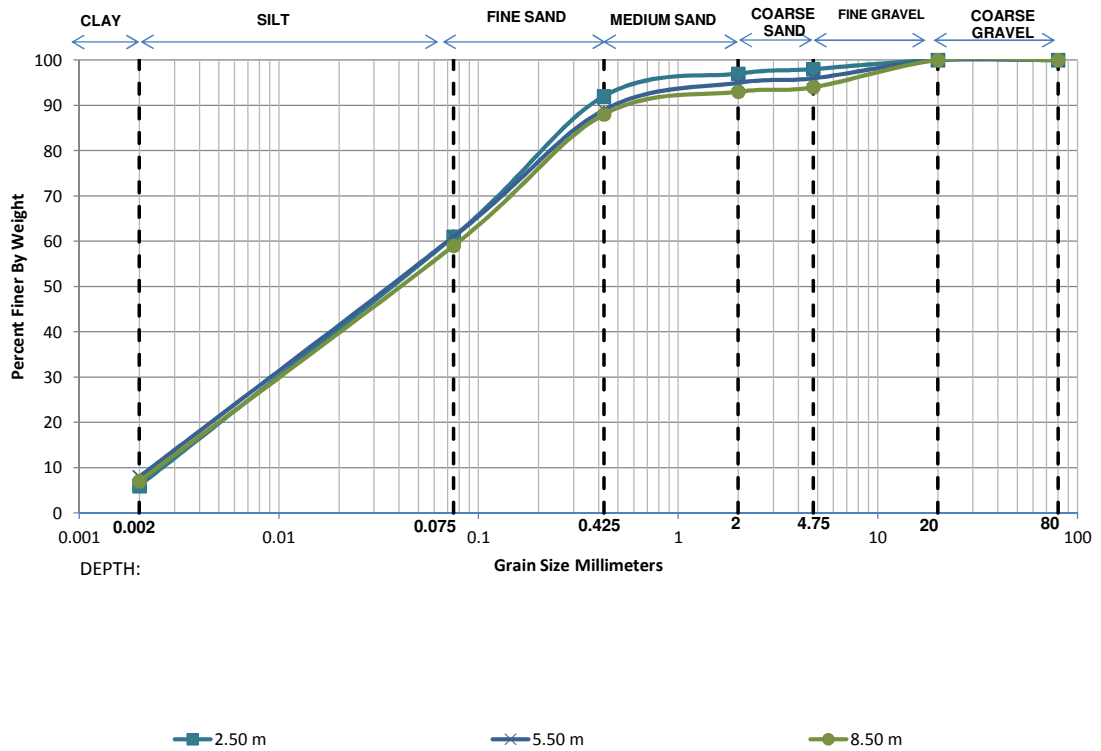


Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	51.00	33.00	5.00	1.00	3.00	0.00	0.0036	0.0221	0.0808	22.61	1.69
4.00 m	6.00	54.00	30.00	4.00	2.00	4.00	0.00	0.0043	0.0220	0.0750	17.39	1.50
7.00 m	8.00	51.00	28.00	6.00	1.00	6.00	0.00	0.0029	0.0202	0.0779	26.67	1.79



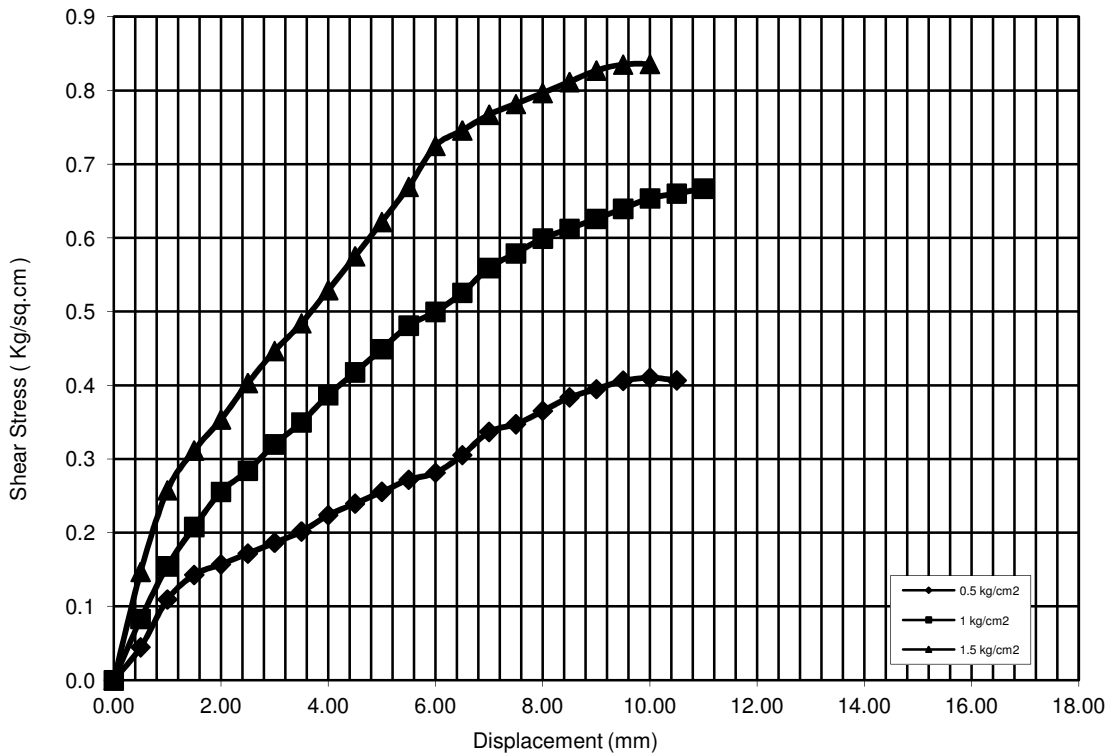
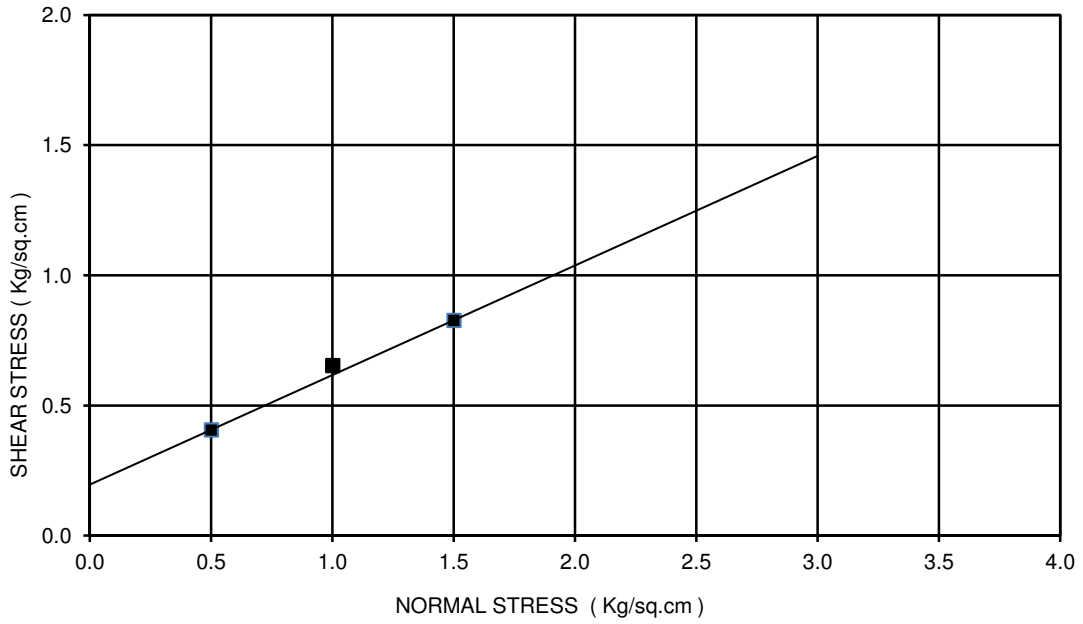
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	59+270 Minor Bridge
B.H. No.	BH-CL

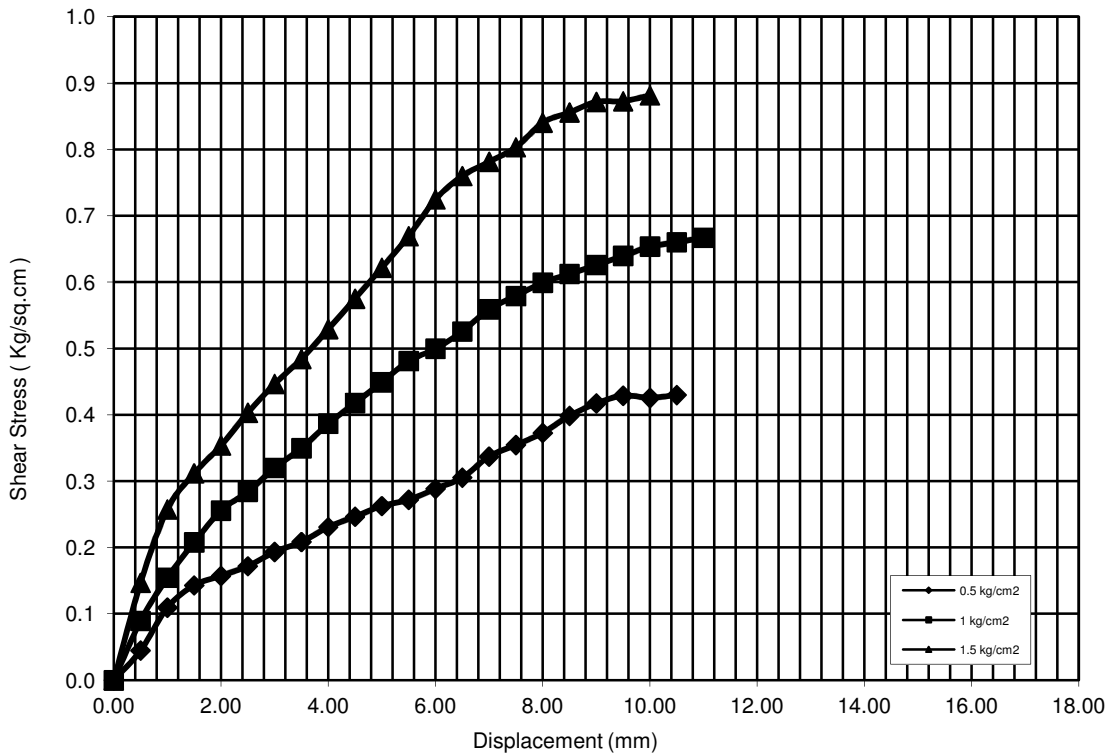
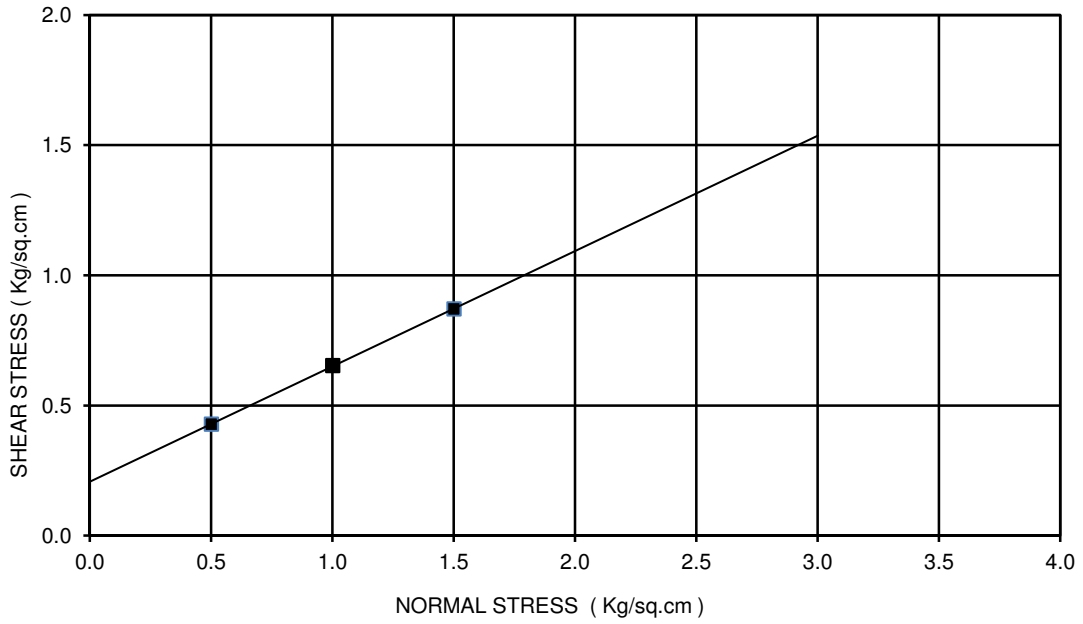


Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	55.00	31.00	5.00	1.00	2.00	0.00	0.0043	0.0216	0.0726	16.92	1.50
5.50 m	8.00	53.00	28.00	6.00	1.00	4.00	0.00	0.0029	0.0192	0.0725	24.95	1.75
8.50 m	7.00	52.00	29.00	5.00	1.00	6.00	0.00	0.0036	0.0213	0.0778	21.88	1.65

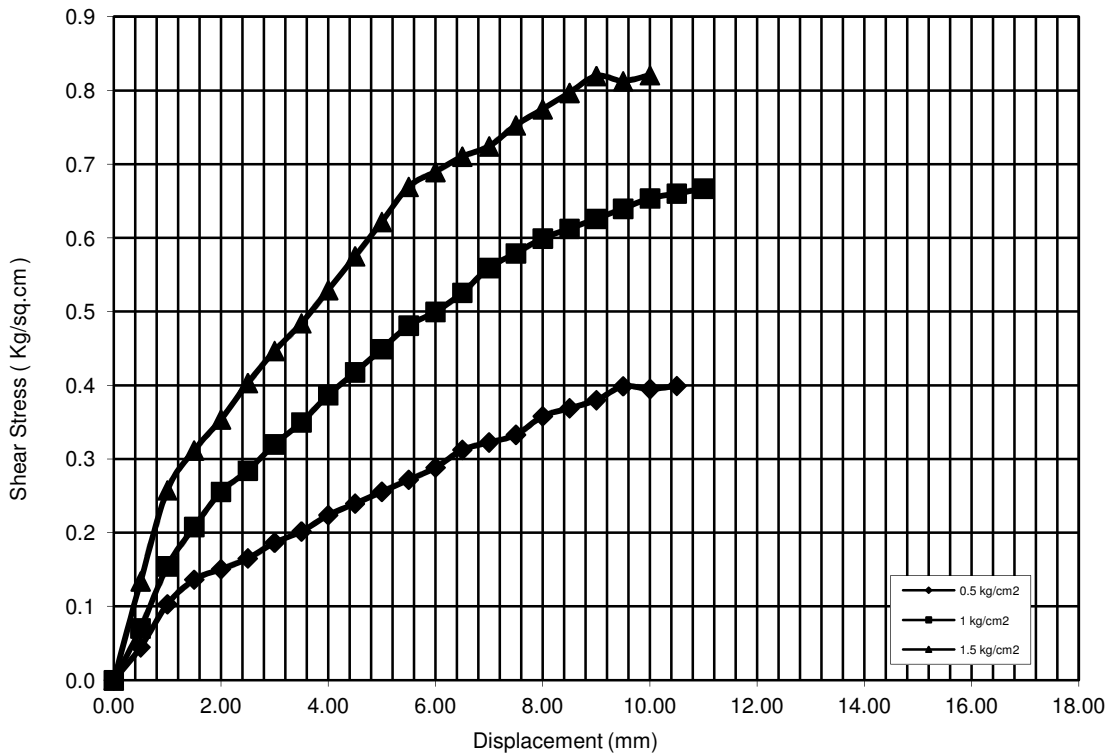
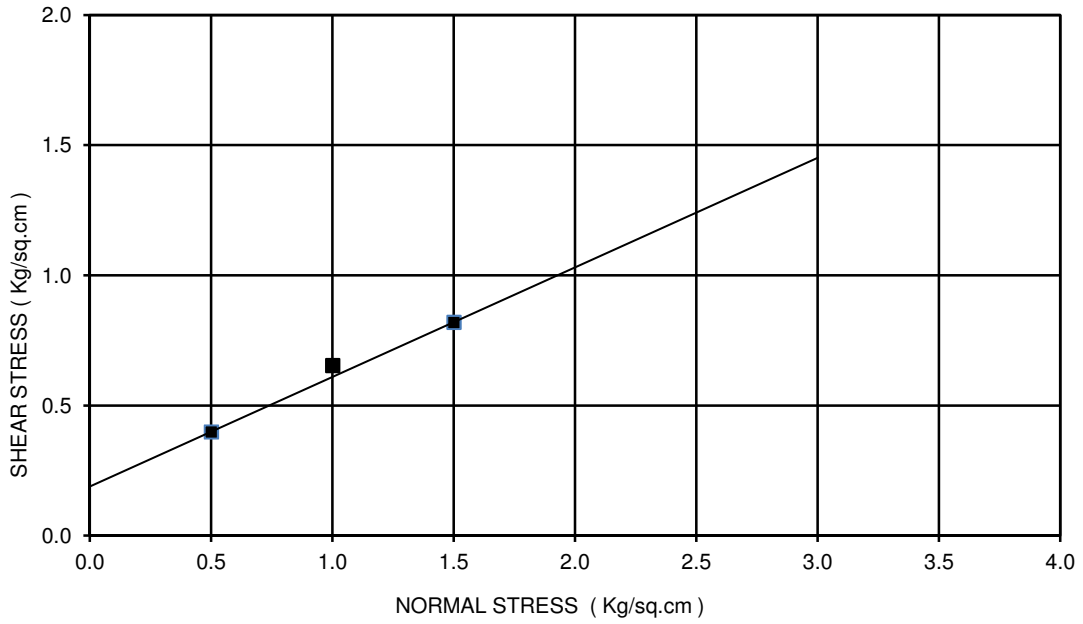
Ch. 52+518
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



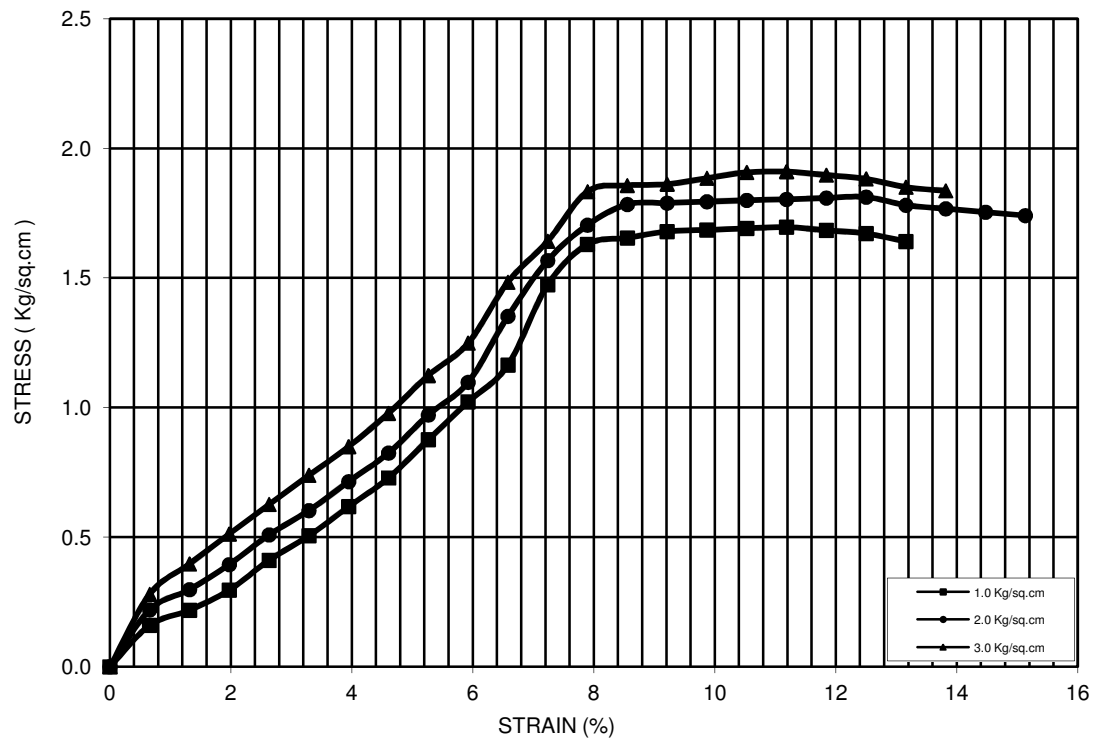
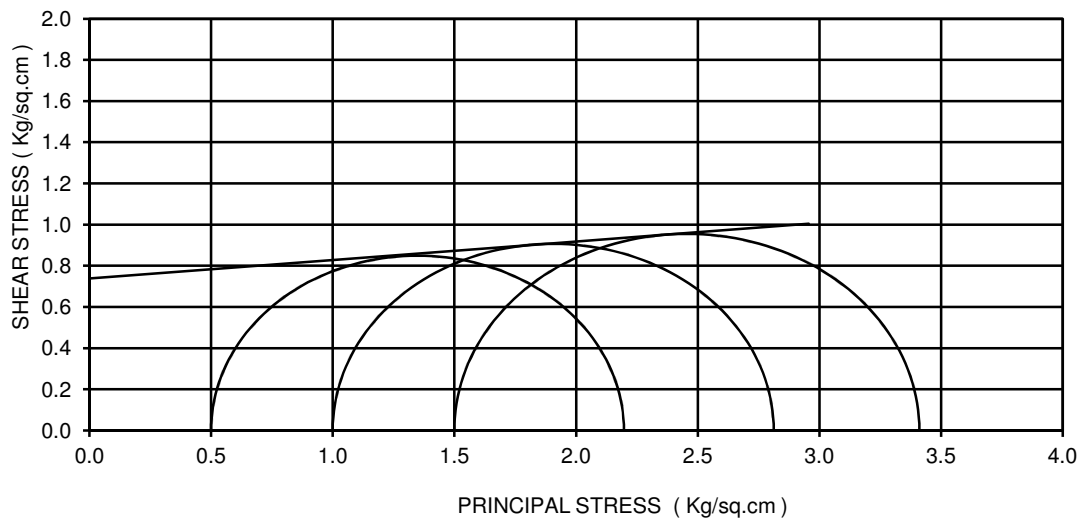
Ch. 52+518
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



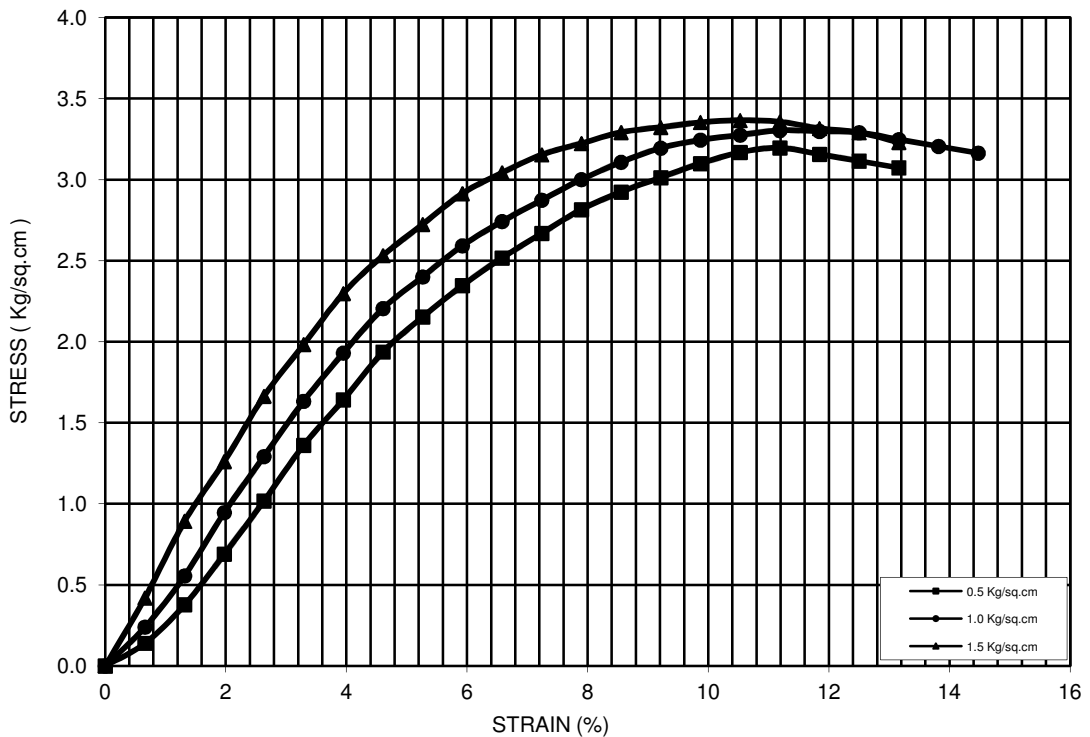
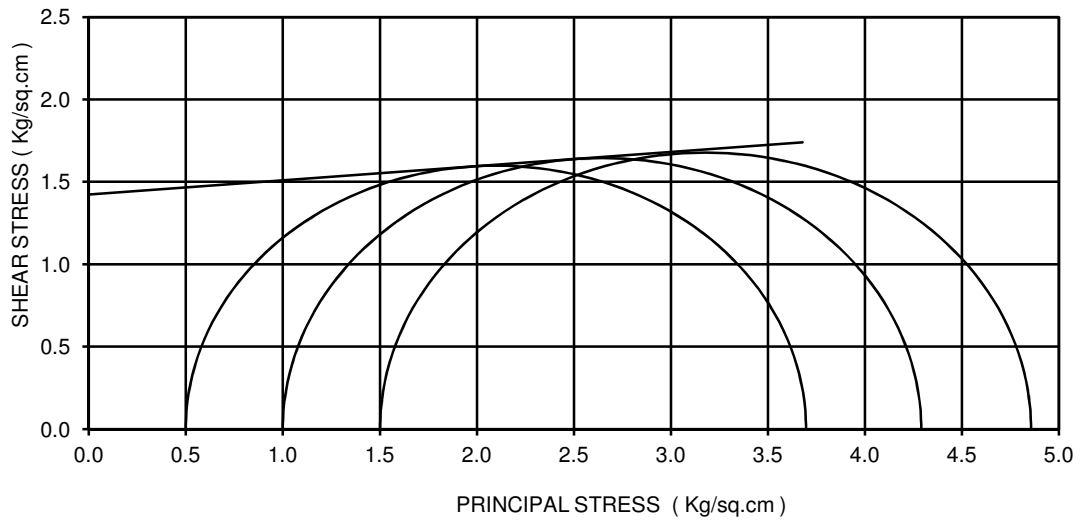
Ch. 52+518
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



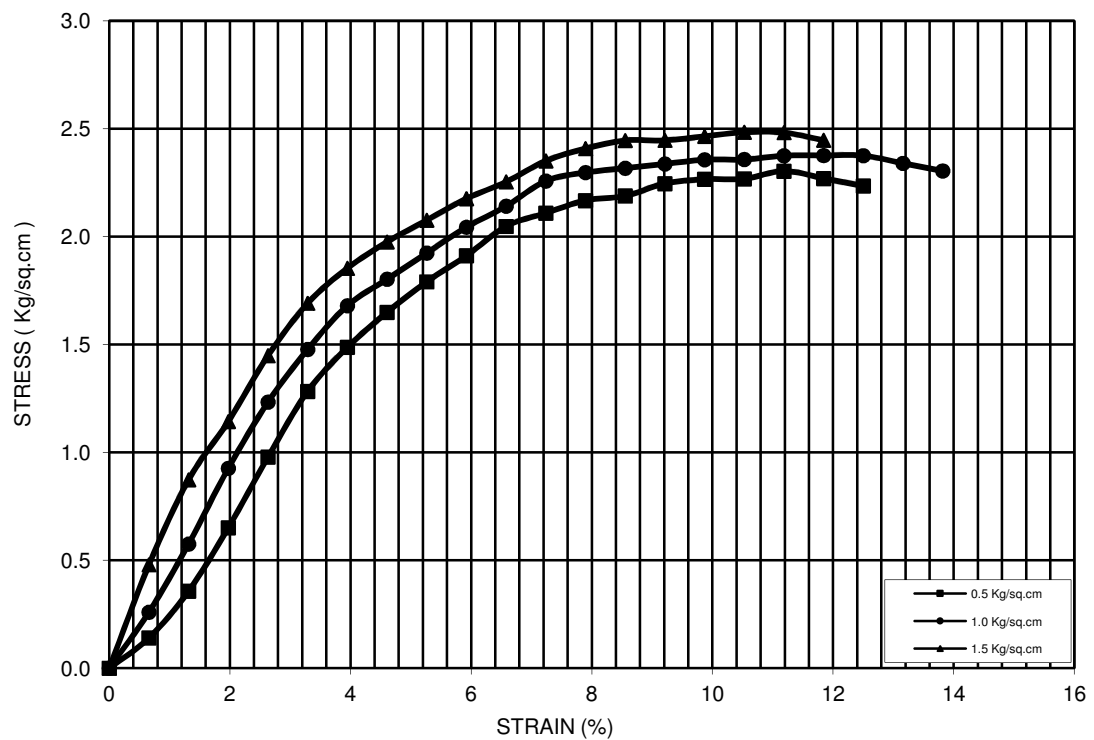
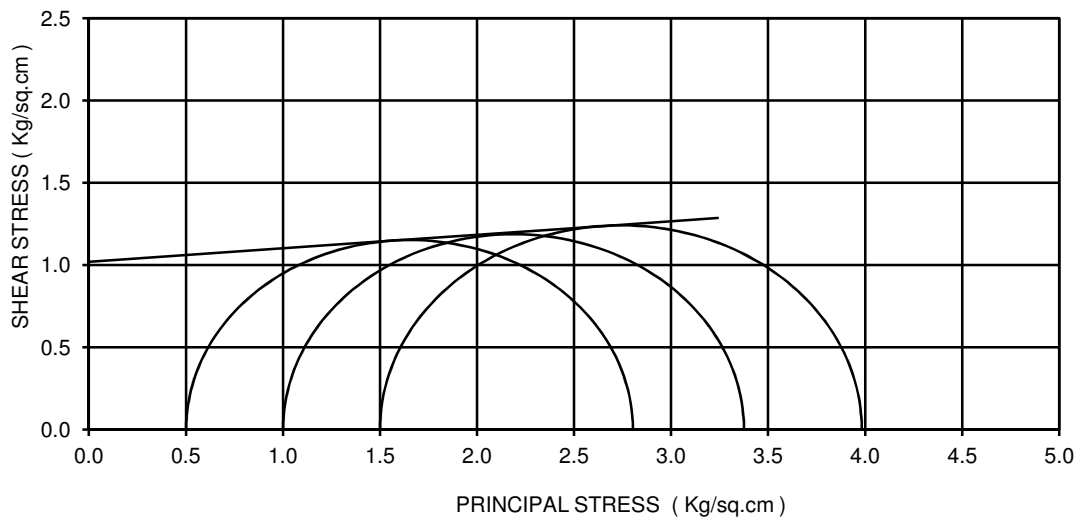
Ch. 52+518
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-5
 DEPTH: 16.00 m
 COHESION(C)= 0.62 kg/sq.cm
 ANGLE OF FRICTION(Phi): 11 deg
 TYPE OF THE TEST: UUT



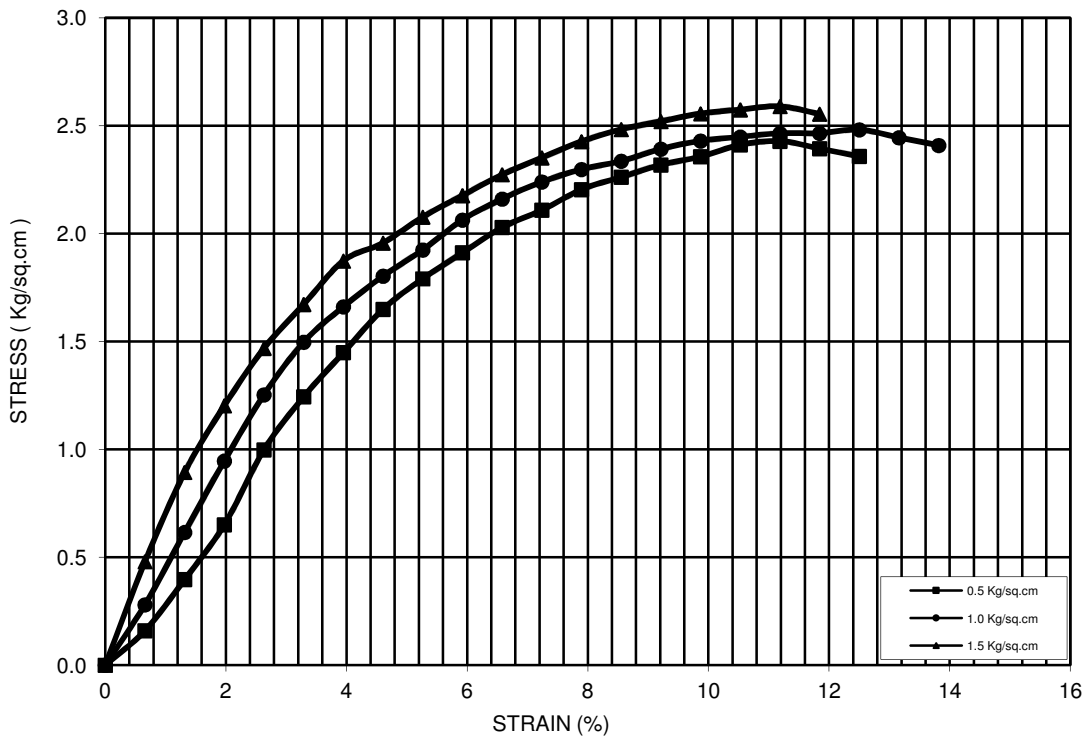
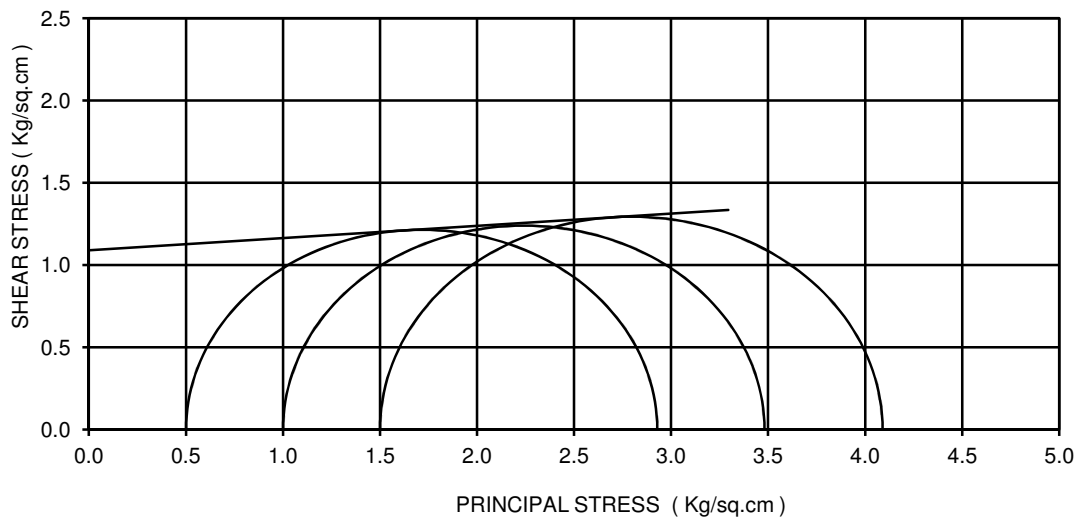
Ch. 53+107
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.42 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



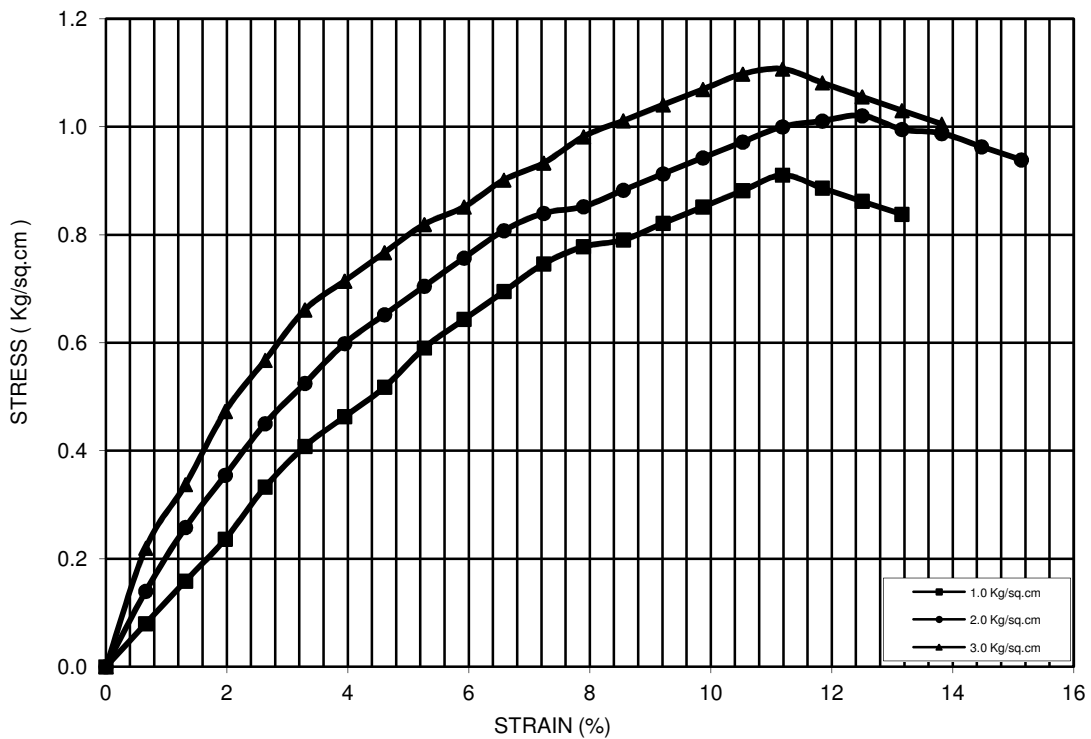
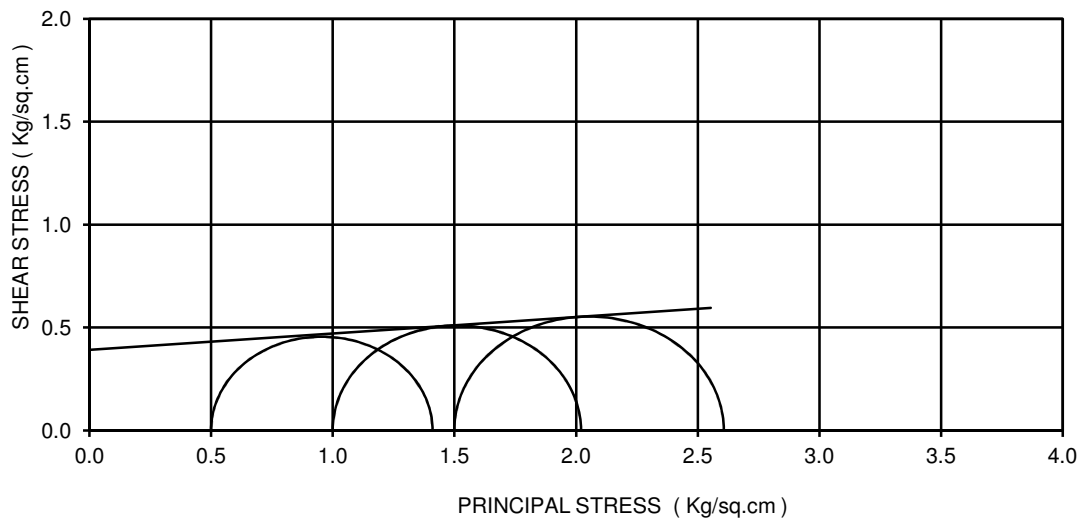
Ch. 53+282
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.02 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



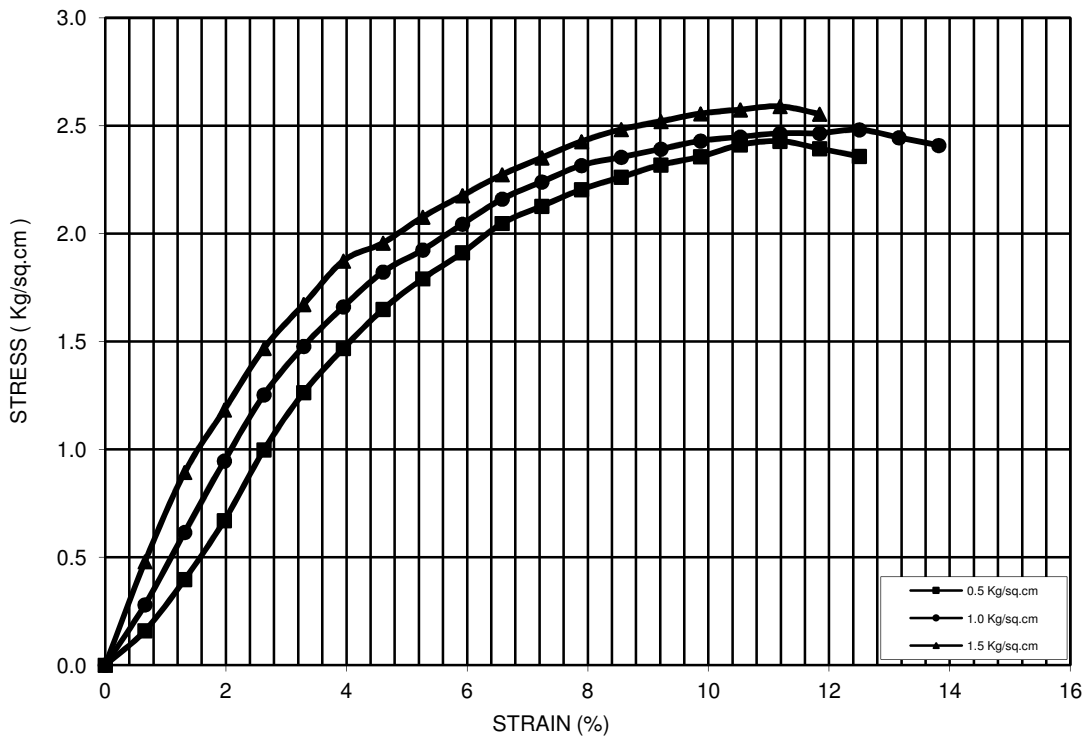
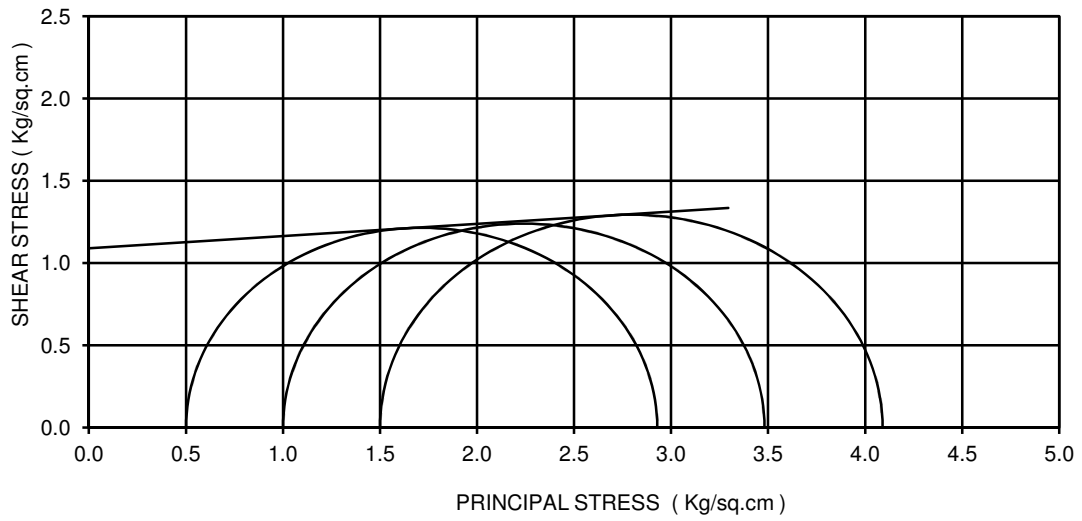
Ch. 53+572
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



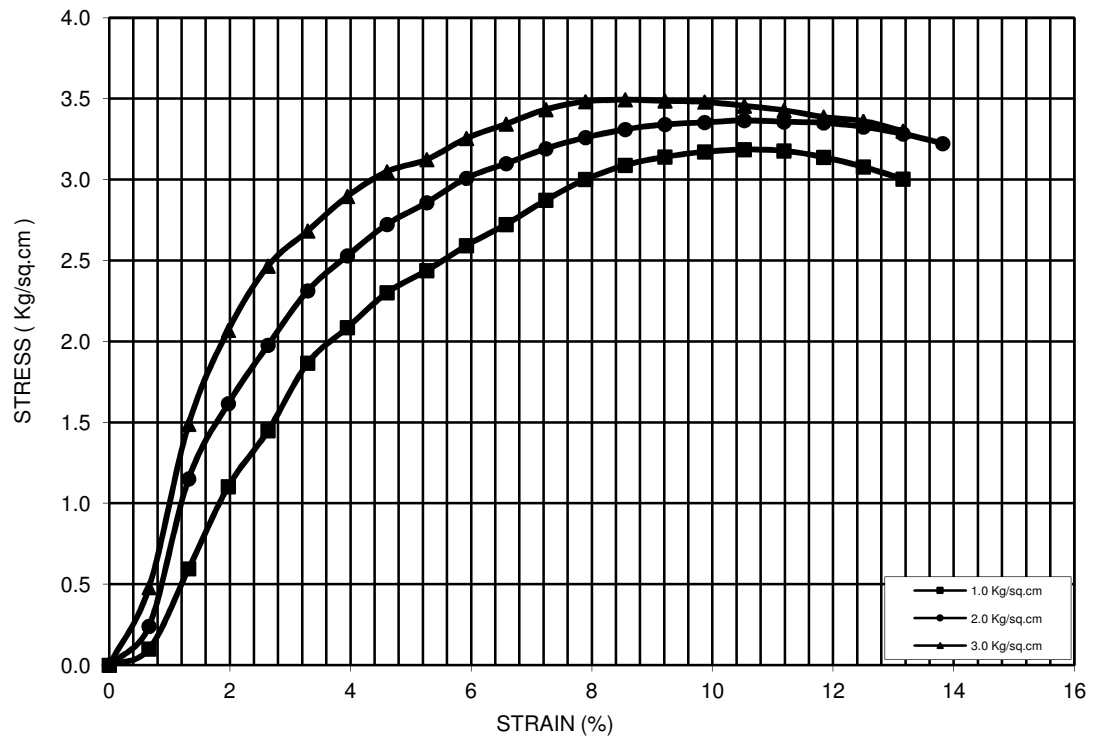
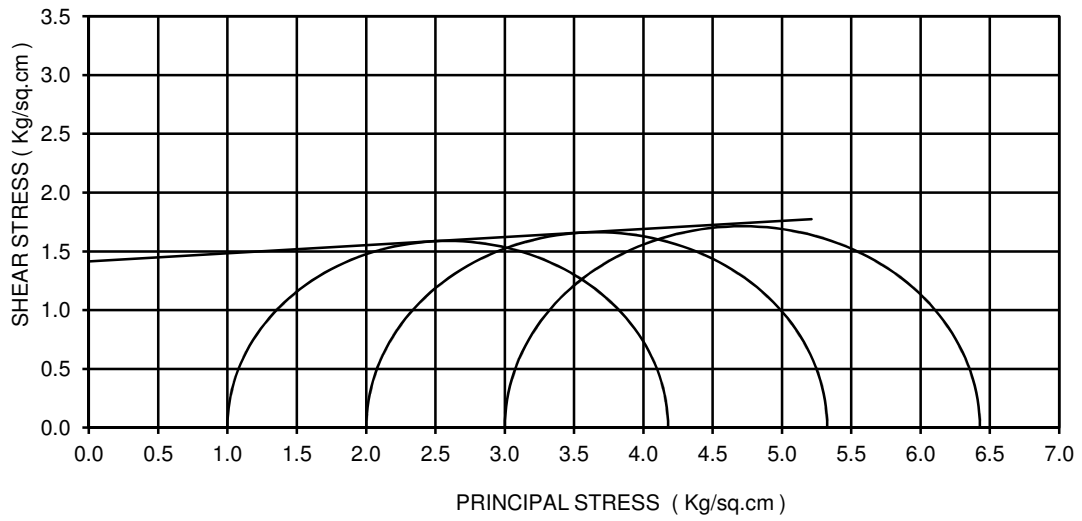
Ch. 53+982
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.39 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



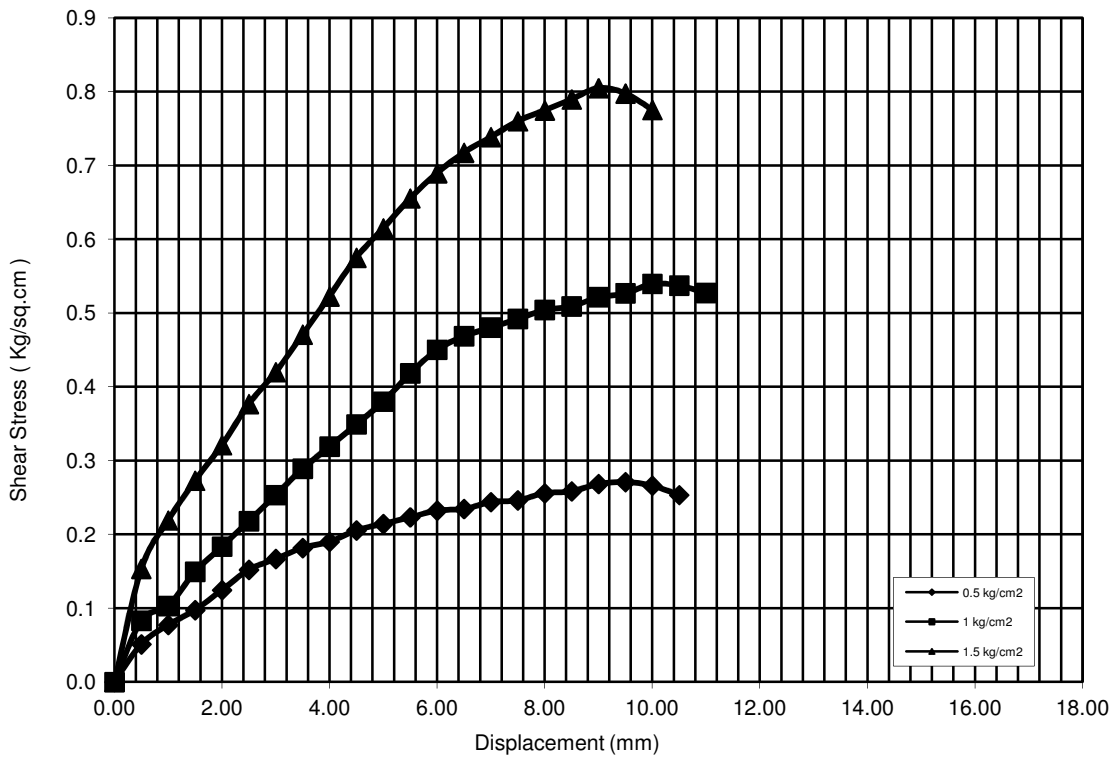
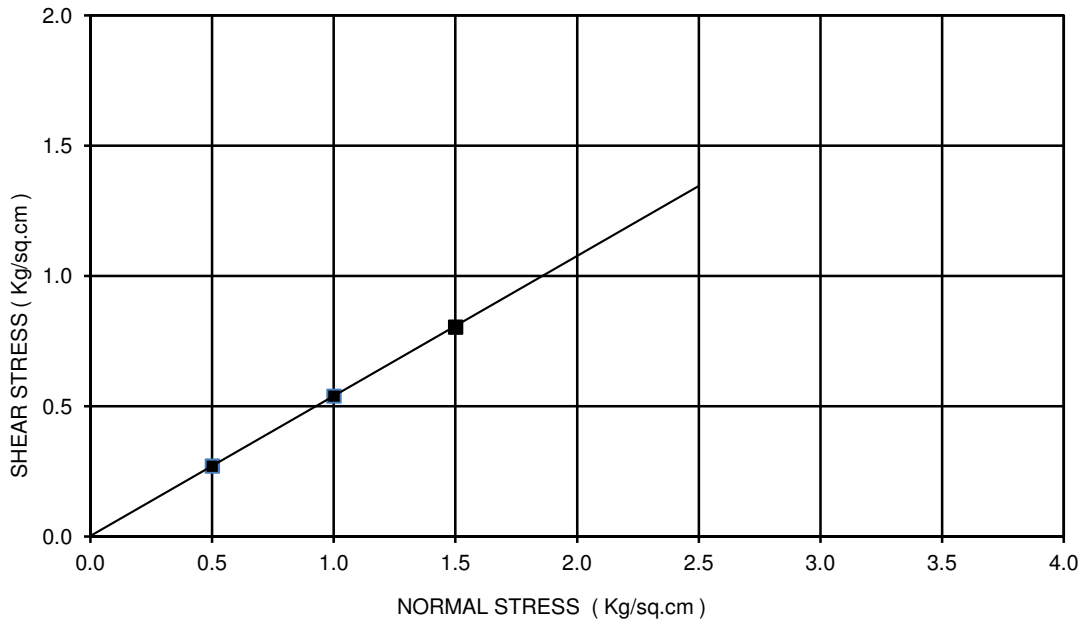
Ch. 54+363
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



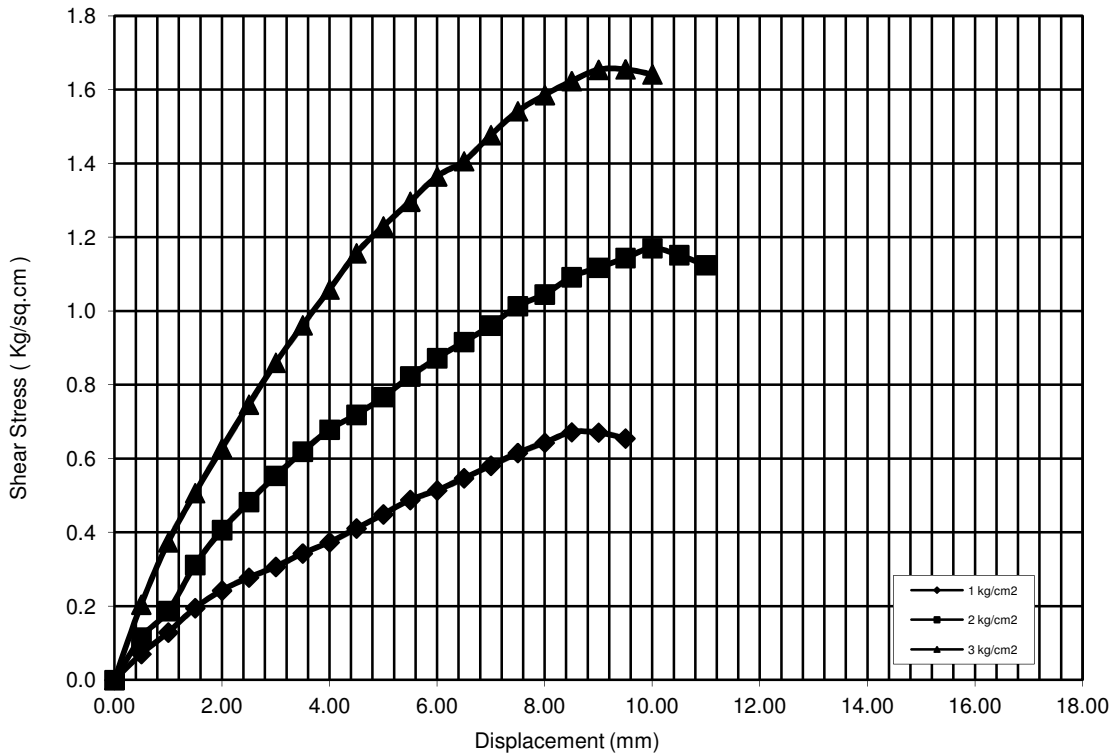
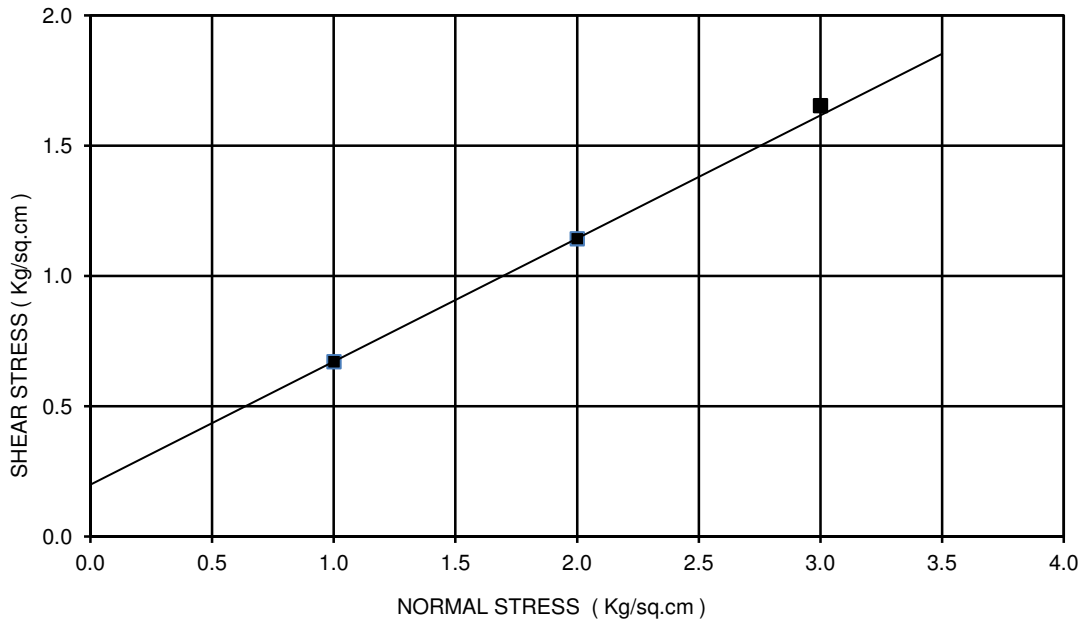
Ch. 54+496
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-3
 DEPTH: 11.25 m
 COHESION(C)= 1.42 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



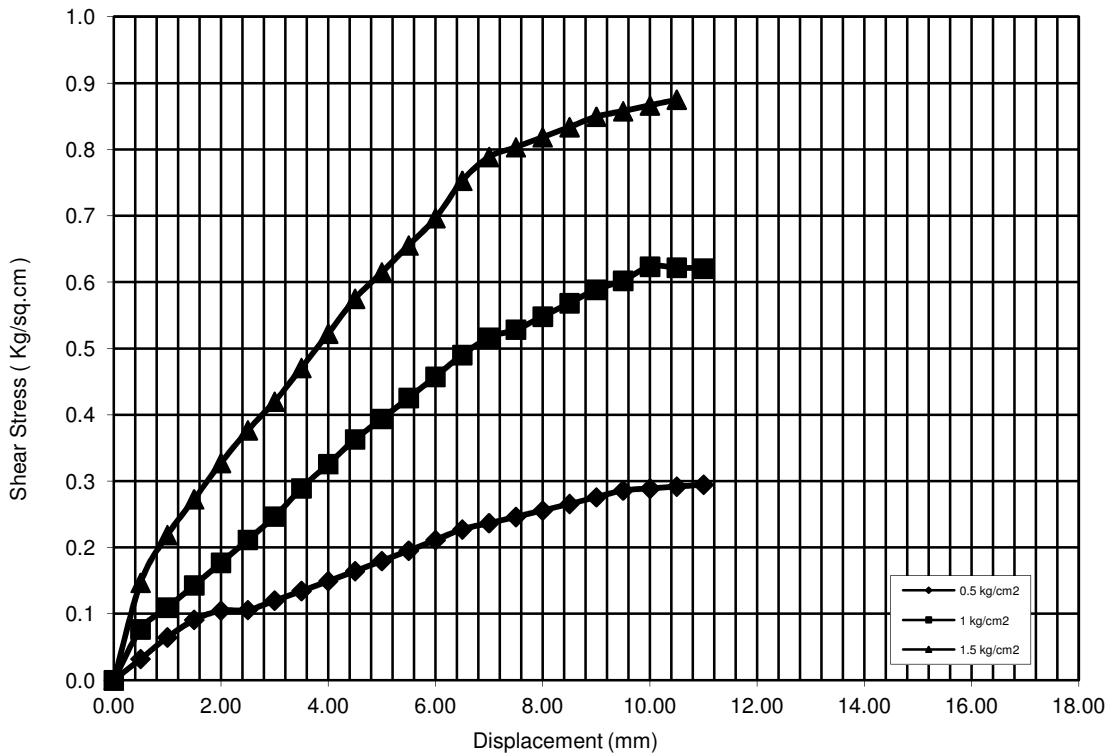
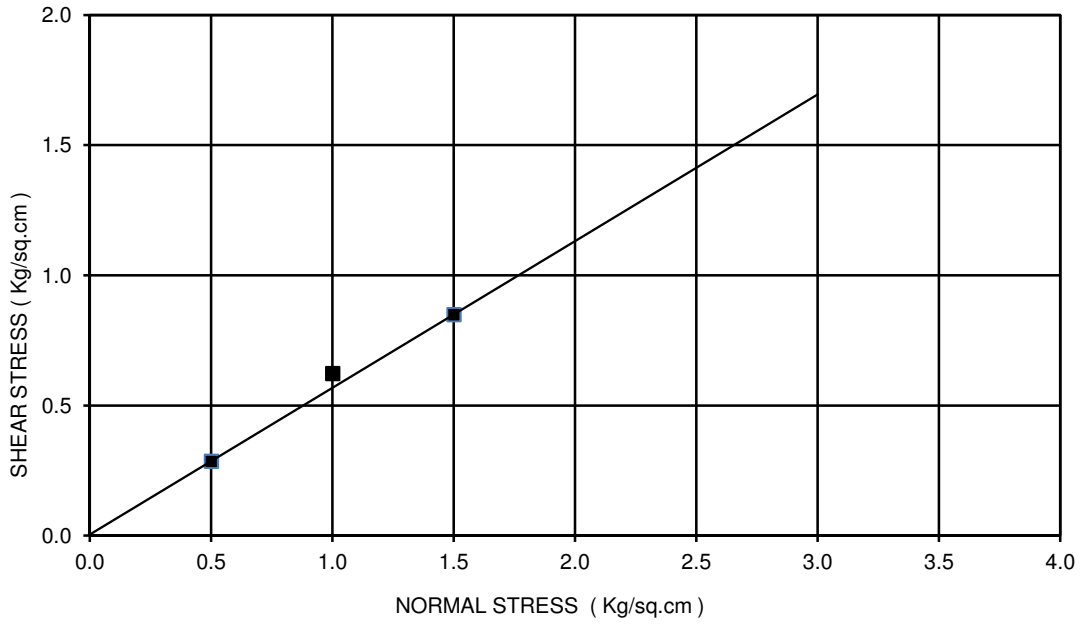
Ch. 55+910
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-1
 DEPTH: 2.5 m
 COHESION(C)= 0.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



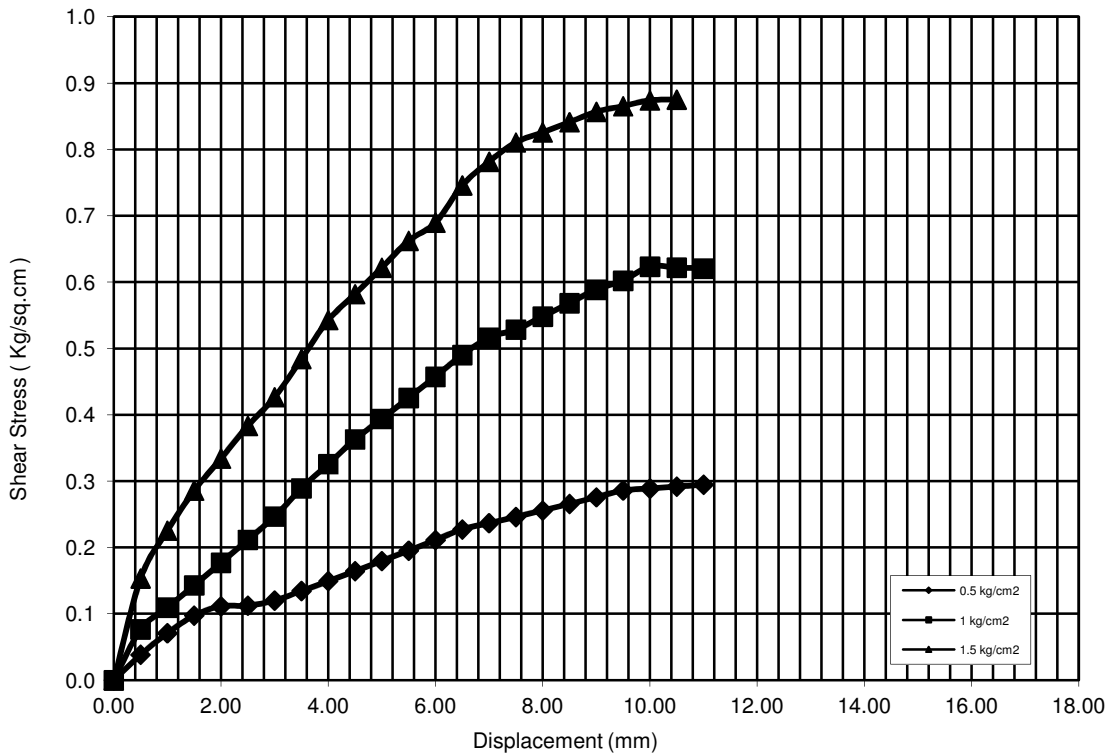
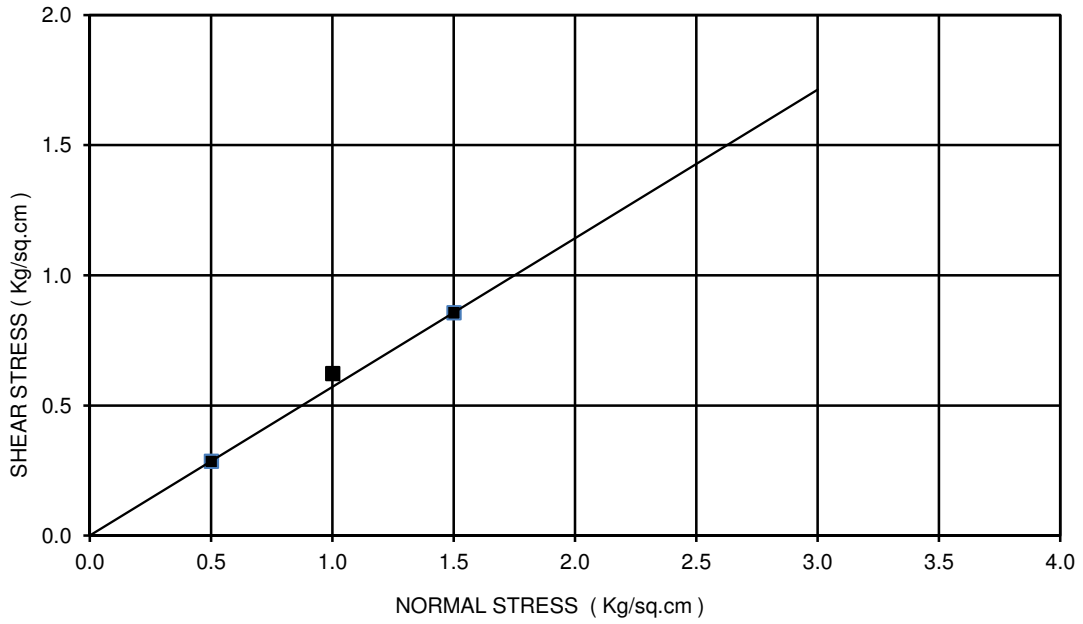
Ch. 55+910
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



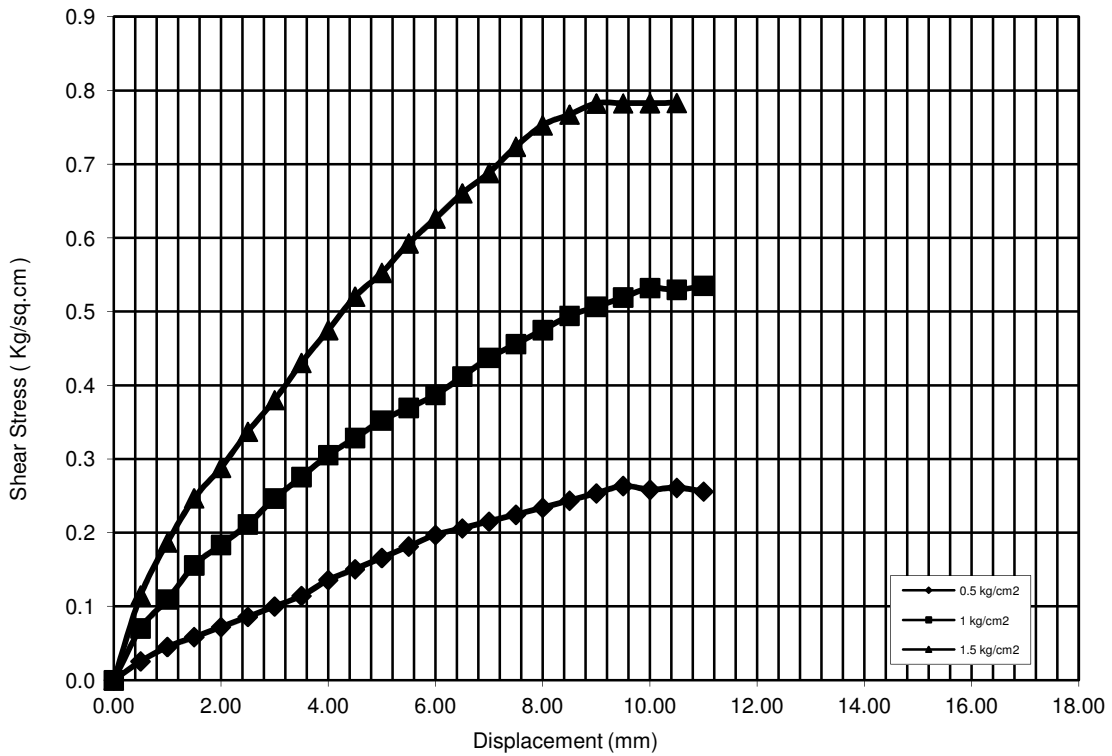
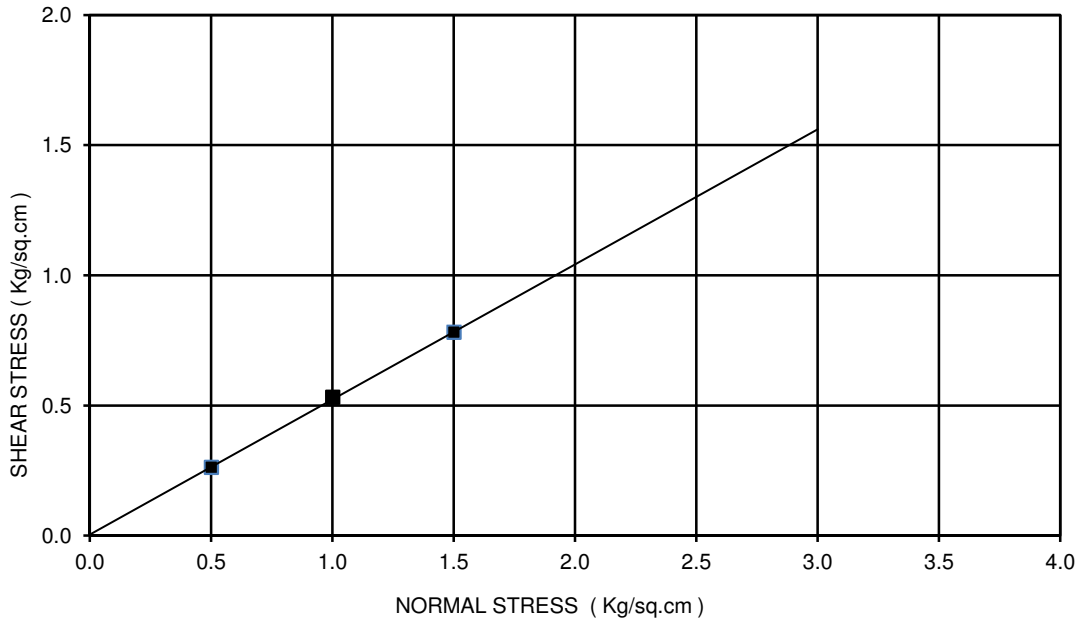
Ch. 55+910
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



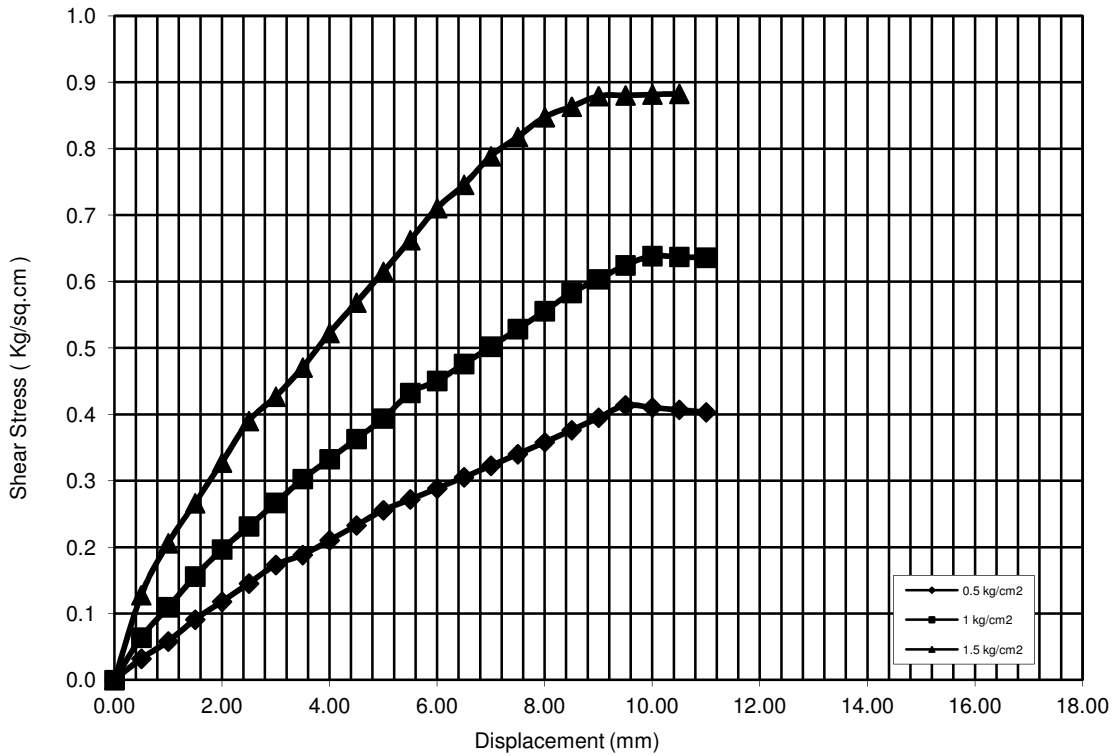
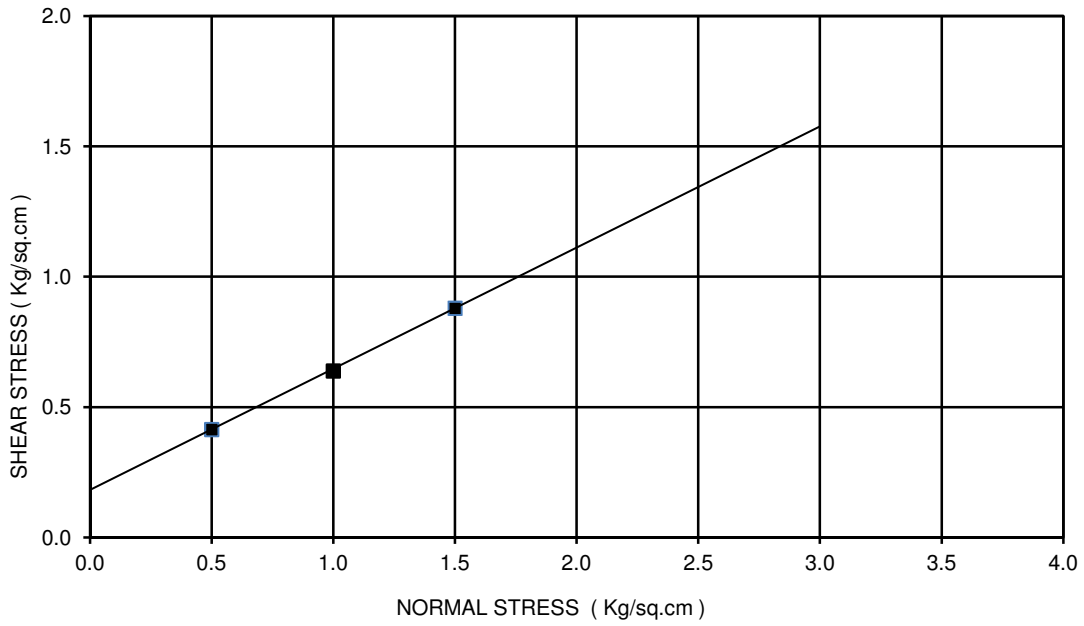
Ch. 55+910
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



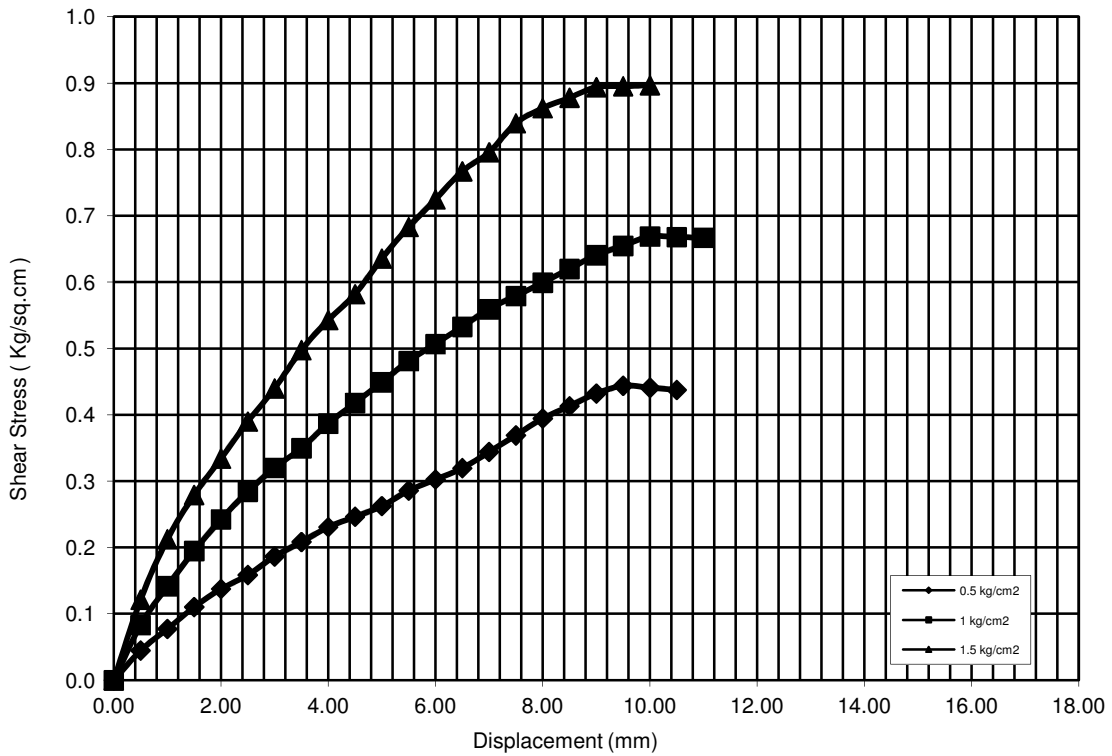
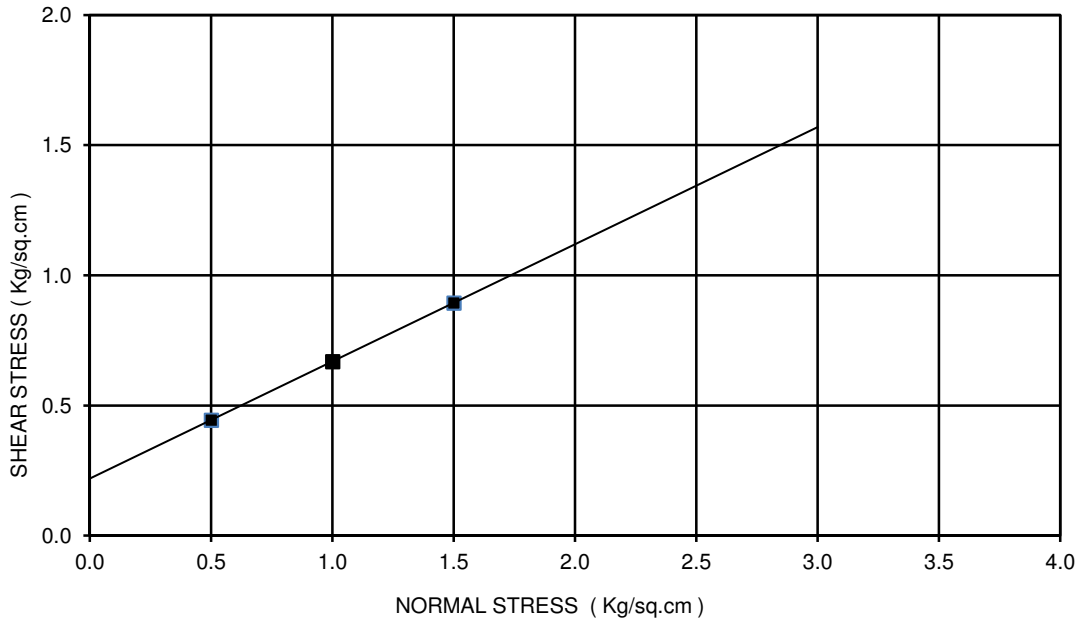
Ch. 56+403
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



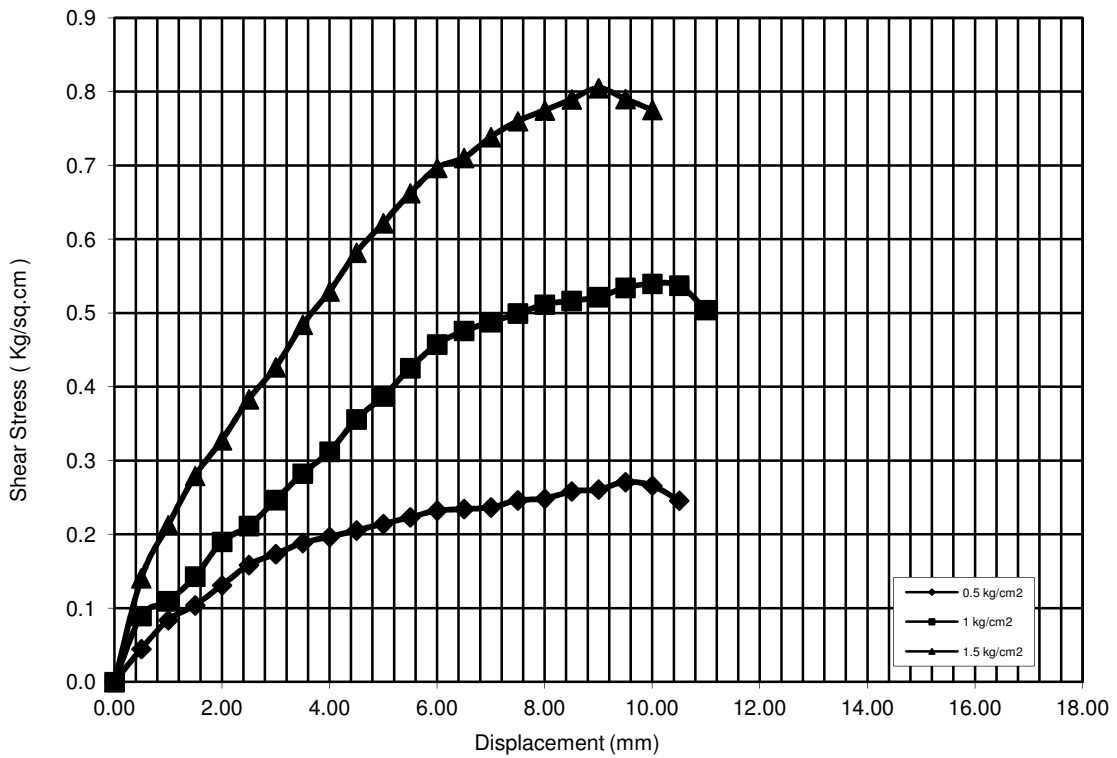
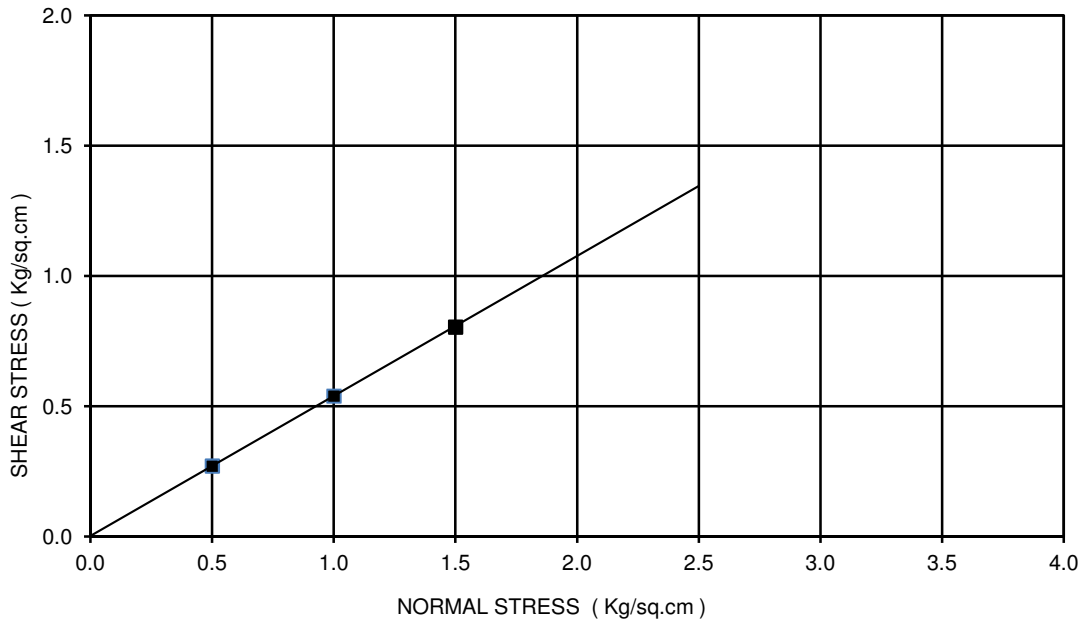
Ch. 56+701
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.18 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



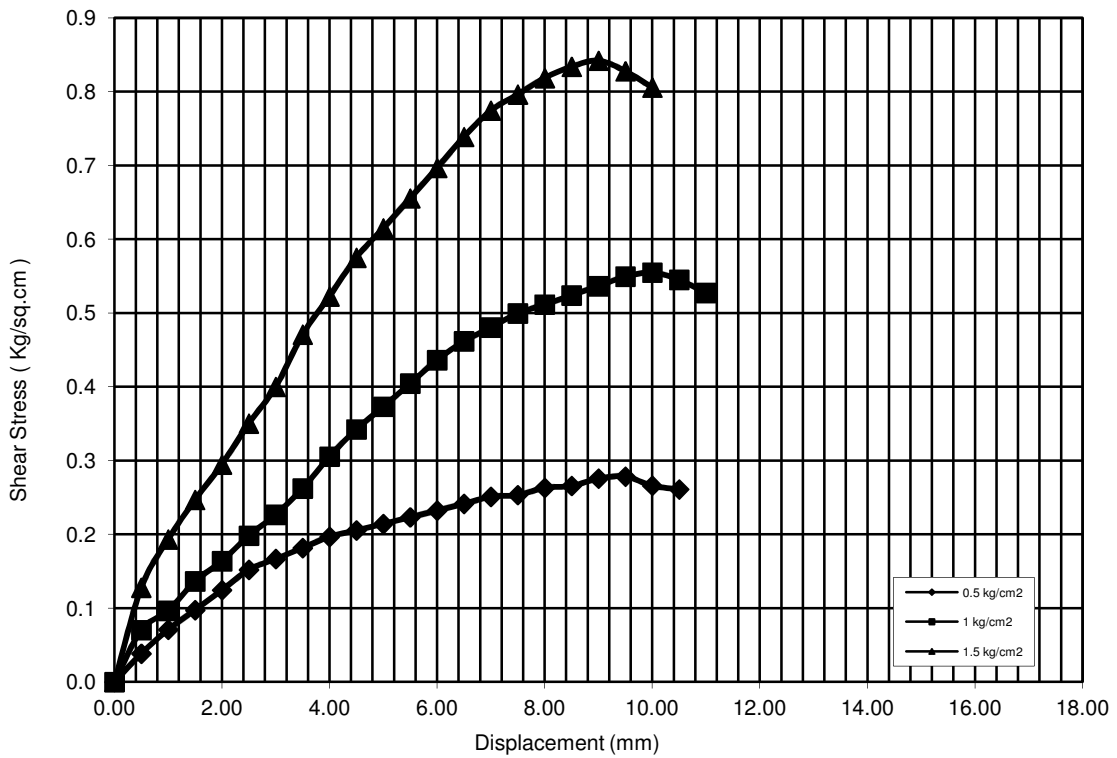
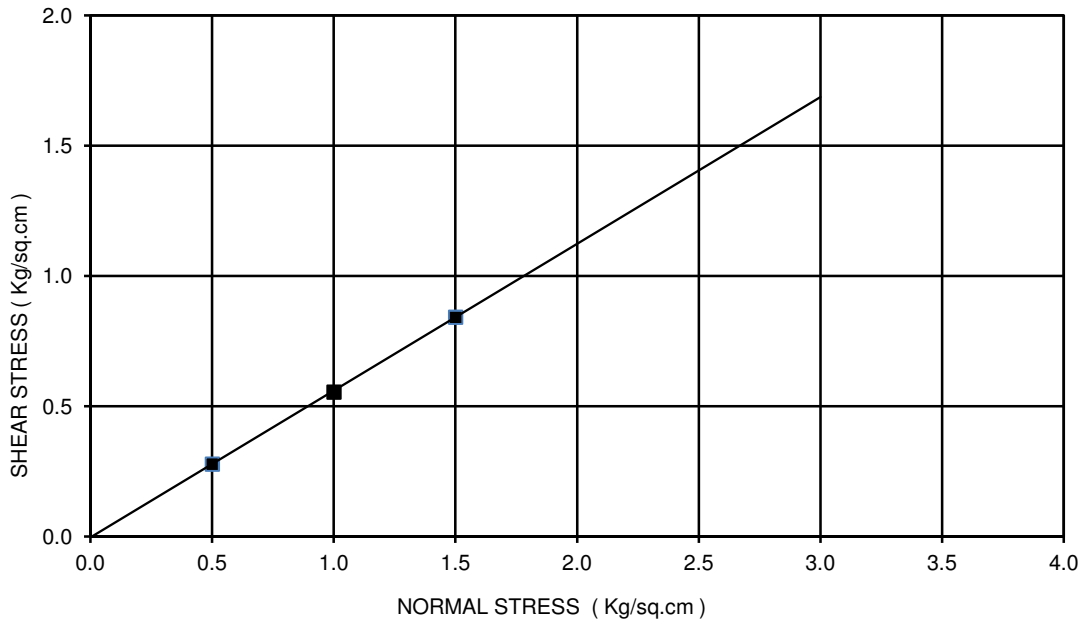
Ch. 56+978
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.22 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



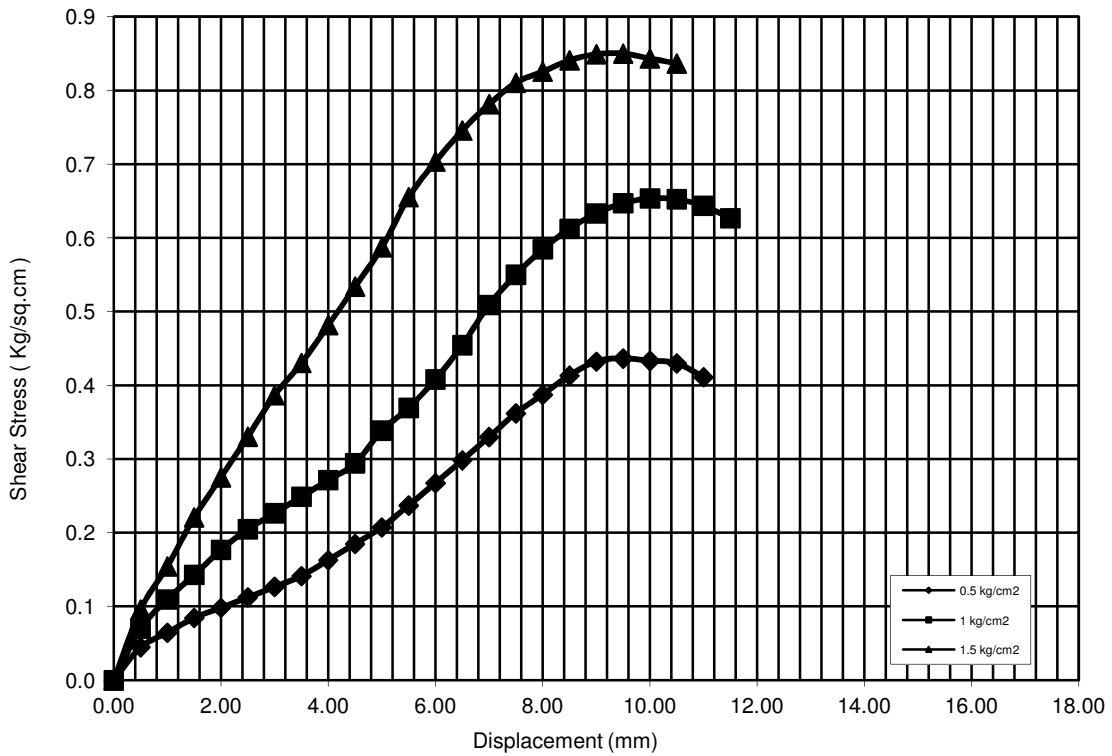
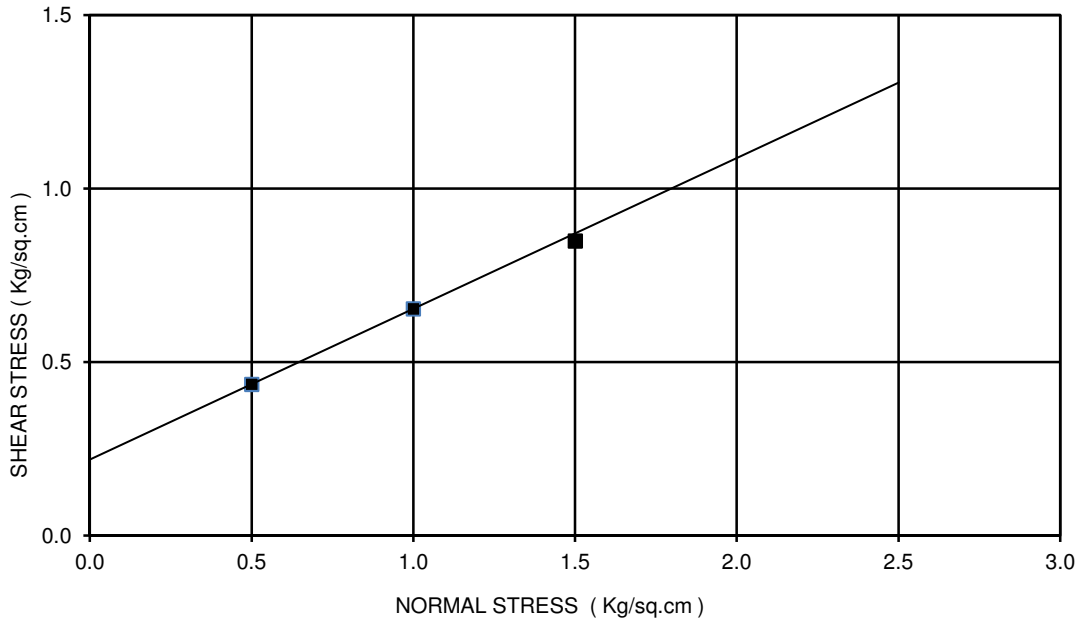
Ch. 57+400
 BORE HOLE NO: P5
 SAMPLE NO.: UDS-1
 DEPTH: 2.5 m
 COHESION(C)= 0.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



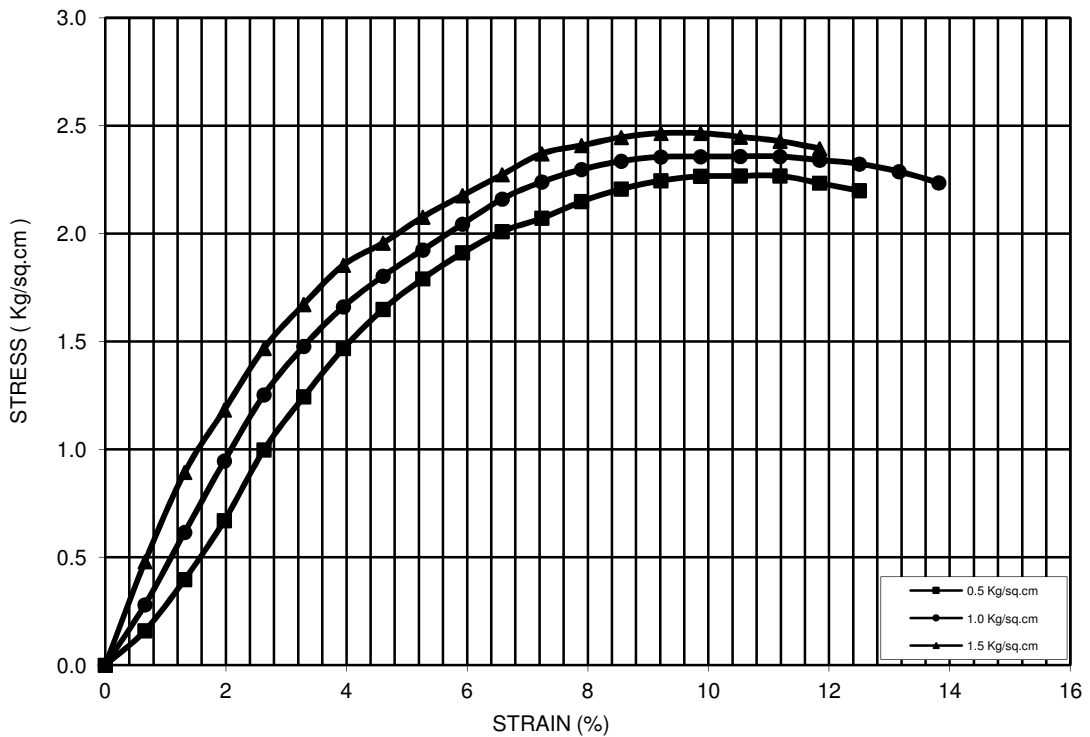
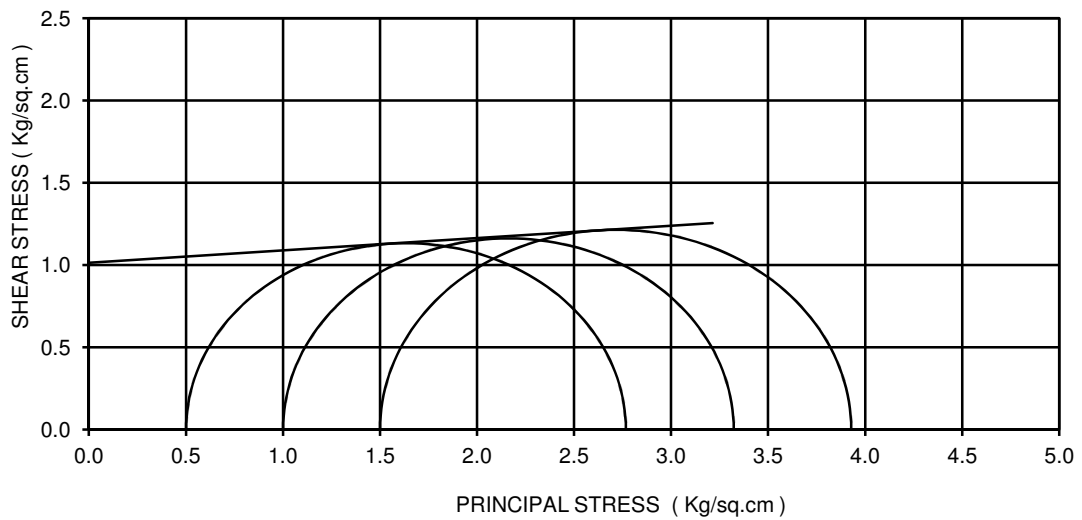
Ch. 57+400
 BORE HOLE NO: BH-P5
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



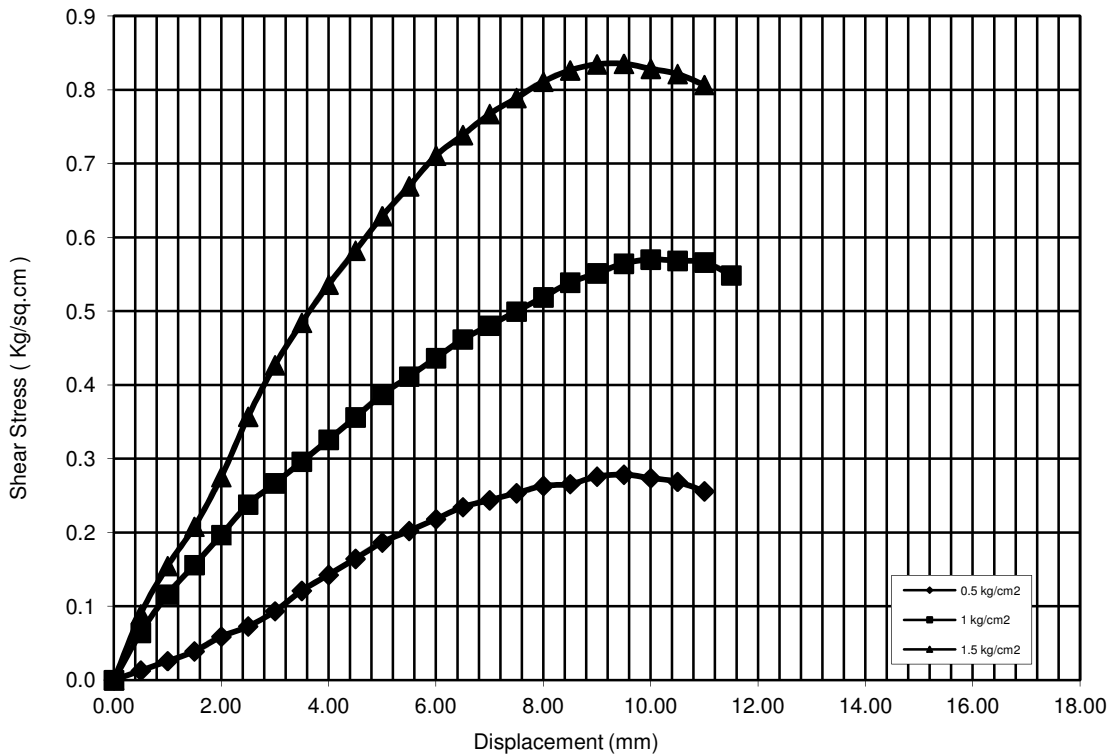
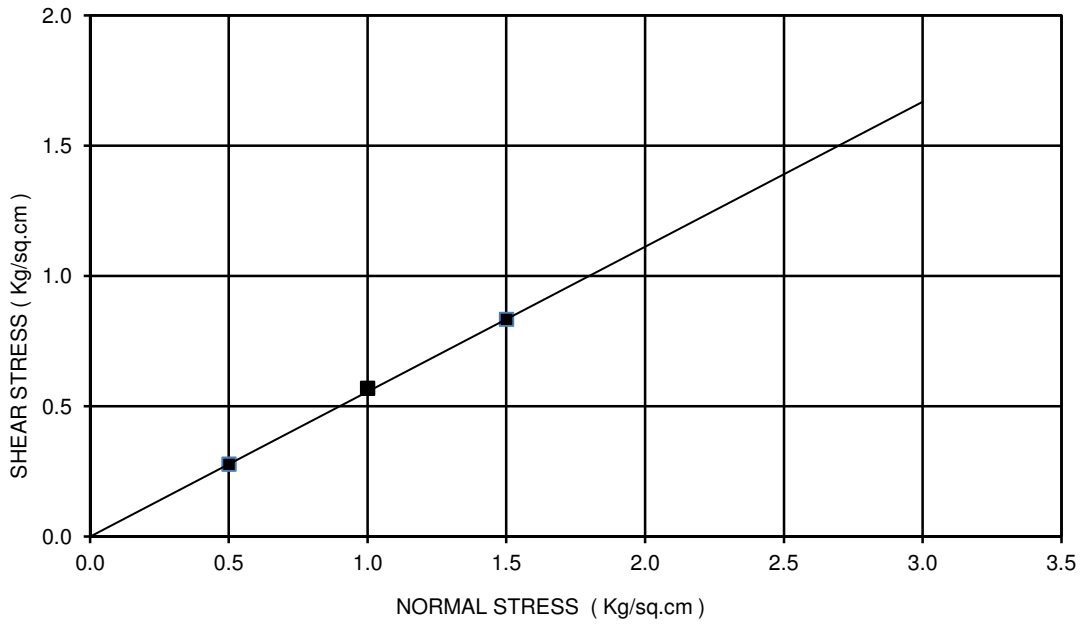
Ch. 57+400
 BORE HOLE NO: BH-P9
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.06 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



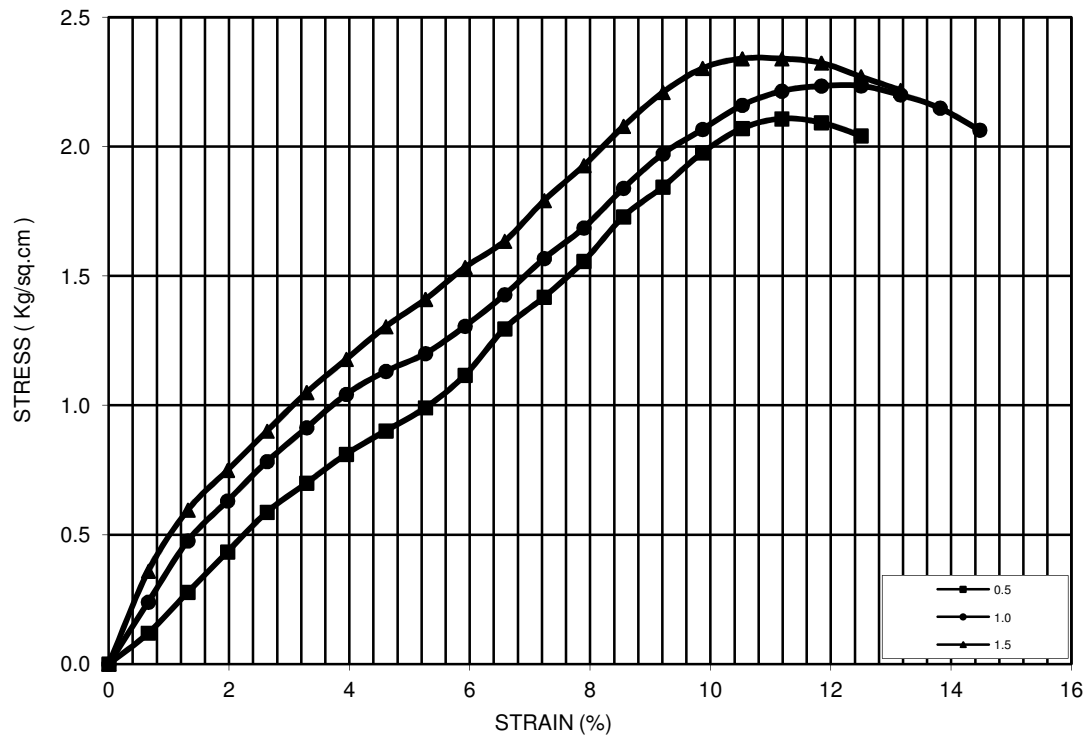
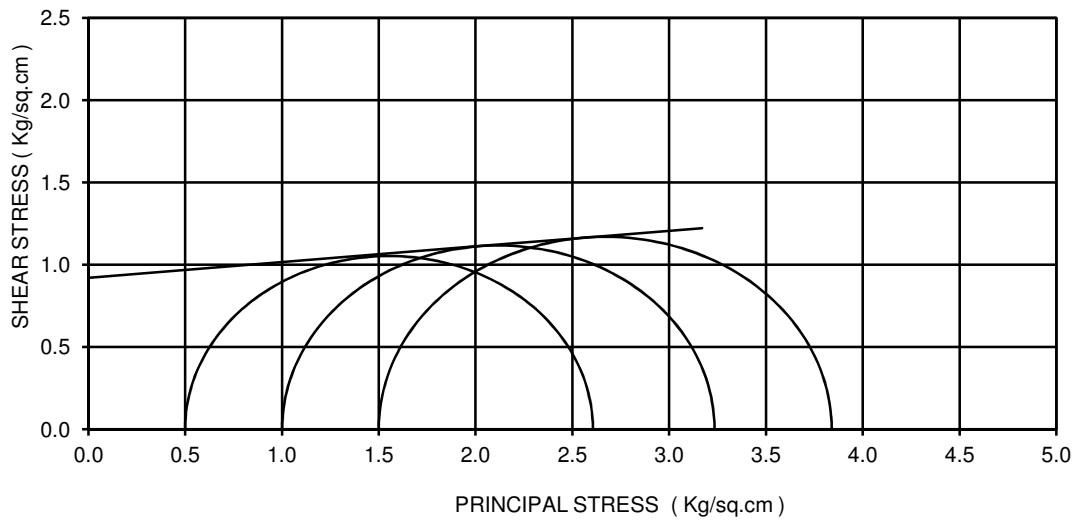
Ch. 57+400
 BORE HOLE NO: BH-P9
 SAMPLE NO.: UDS-3
 DEPTH: 10.00 m
 COHESION(C)= 1.39 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



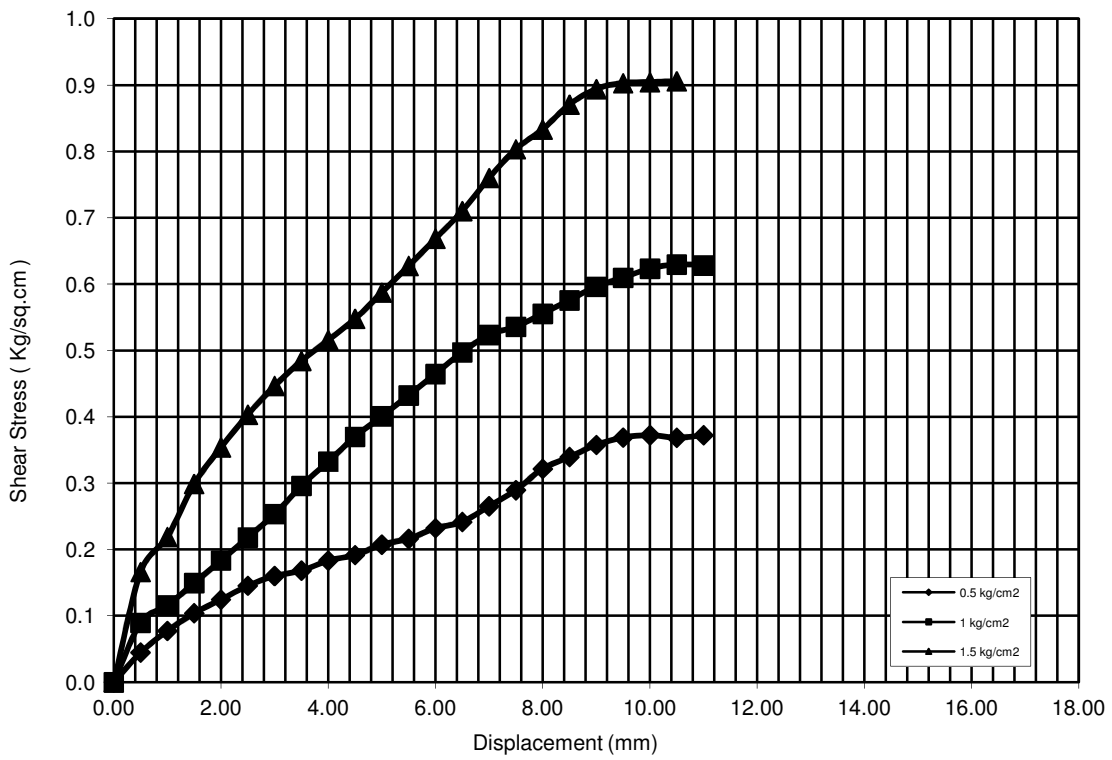
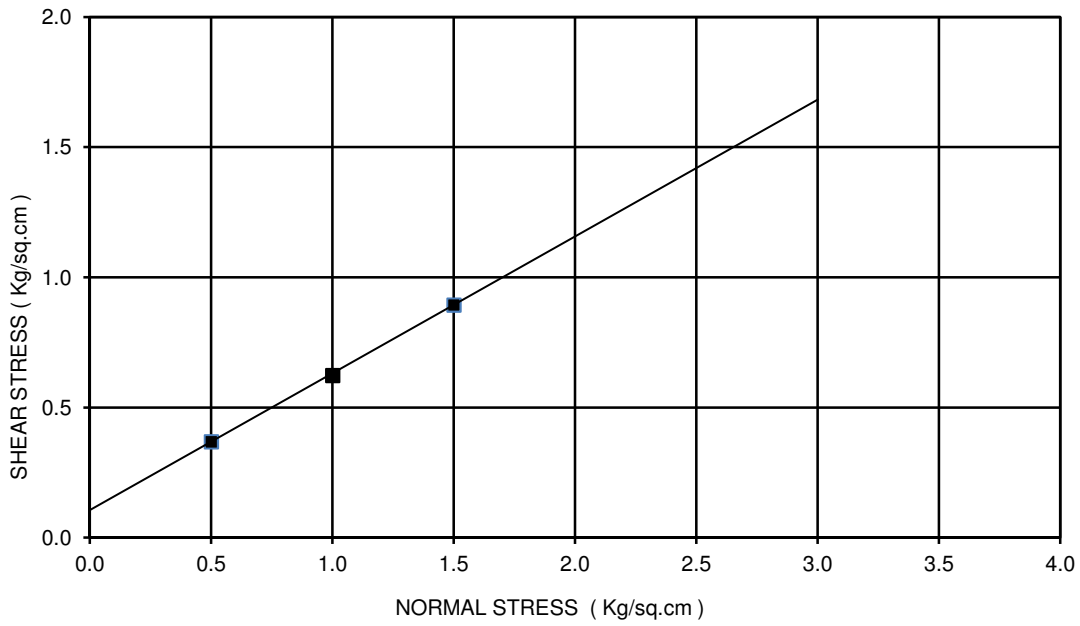
Ch. 57+400
 BORE HOLE NO: BH-P10
 SAMPLE NO.: UDS-5
 DEPTH: 16.00 m
 COHESION(C)= 0 kg/sq.cm
 ANGLE OF FRICTION(Phi): 30 deg
 TYPE OF THE TEST: DST



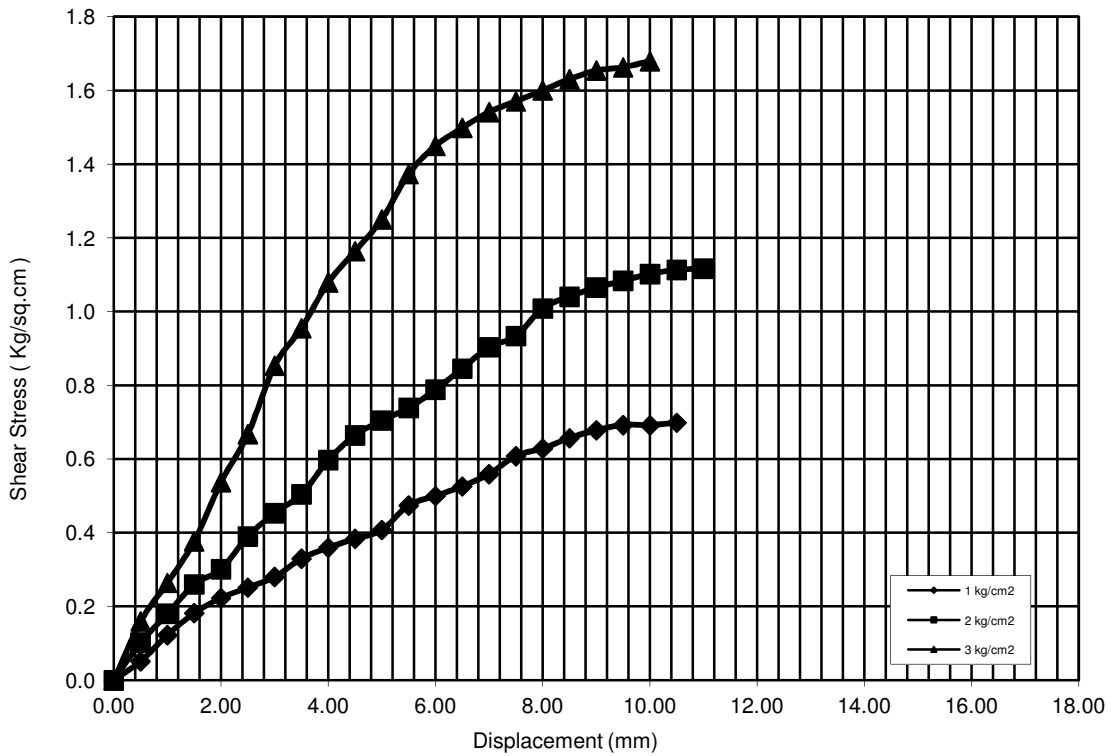
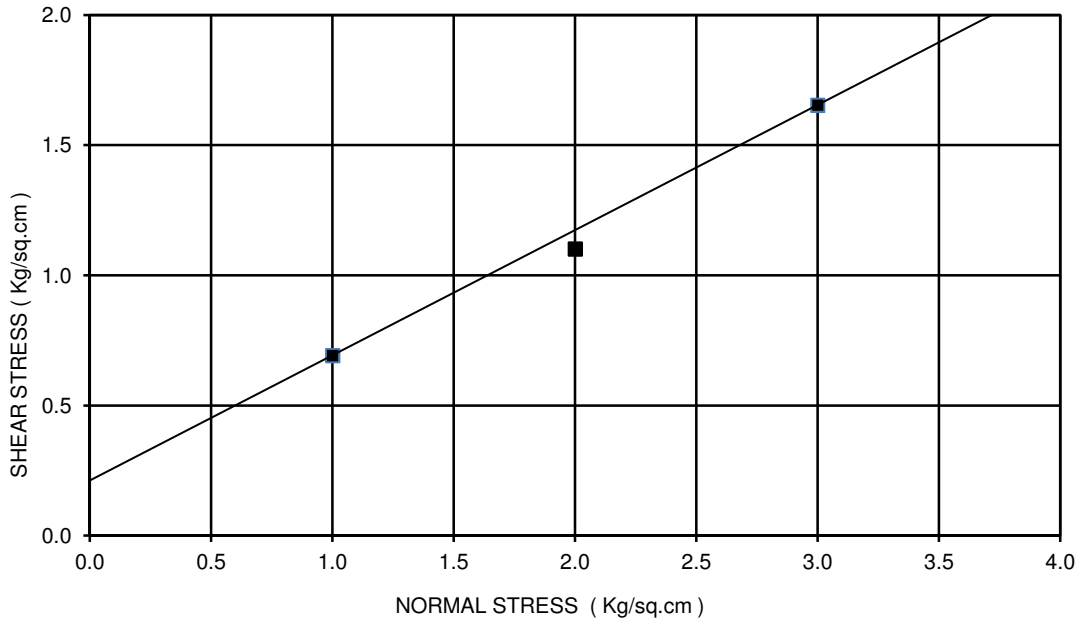
Ch. 57+400
 BORE HOLE NO: BH-P10
 SAMPLE NO.: UDS-2
 DEPTH: 7.00 m
 COHESION(C)= 0.78 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



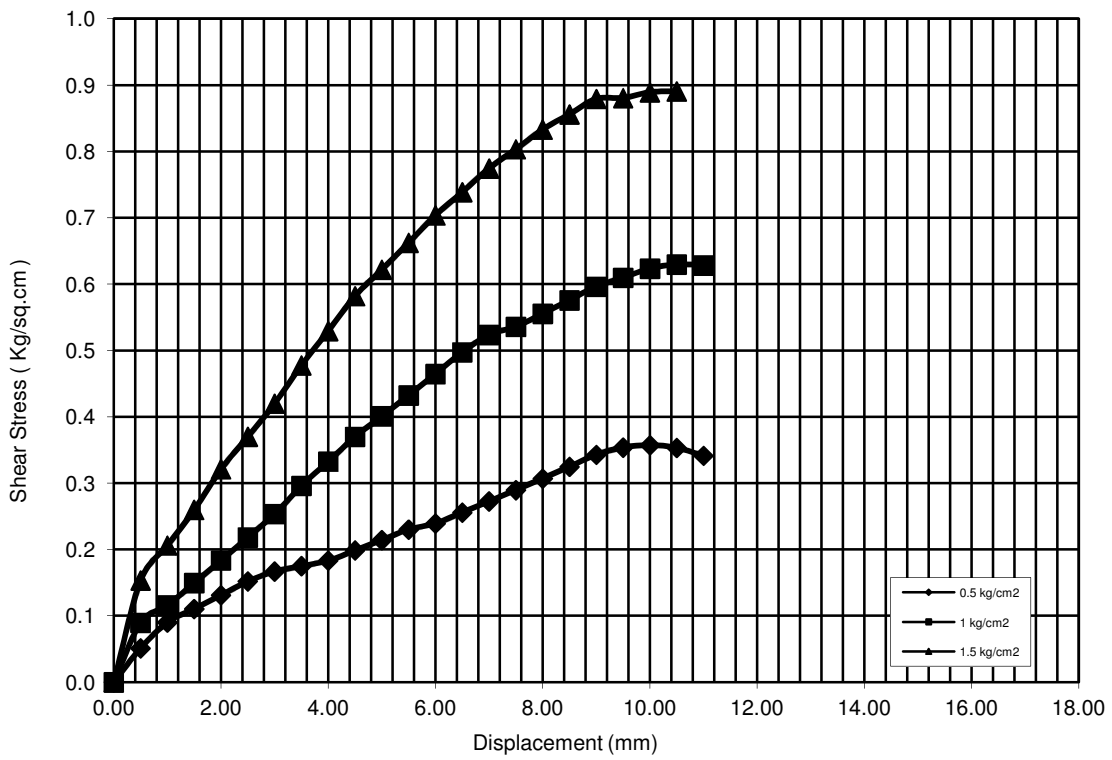
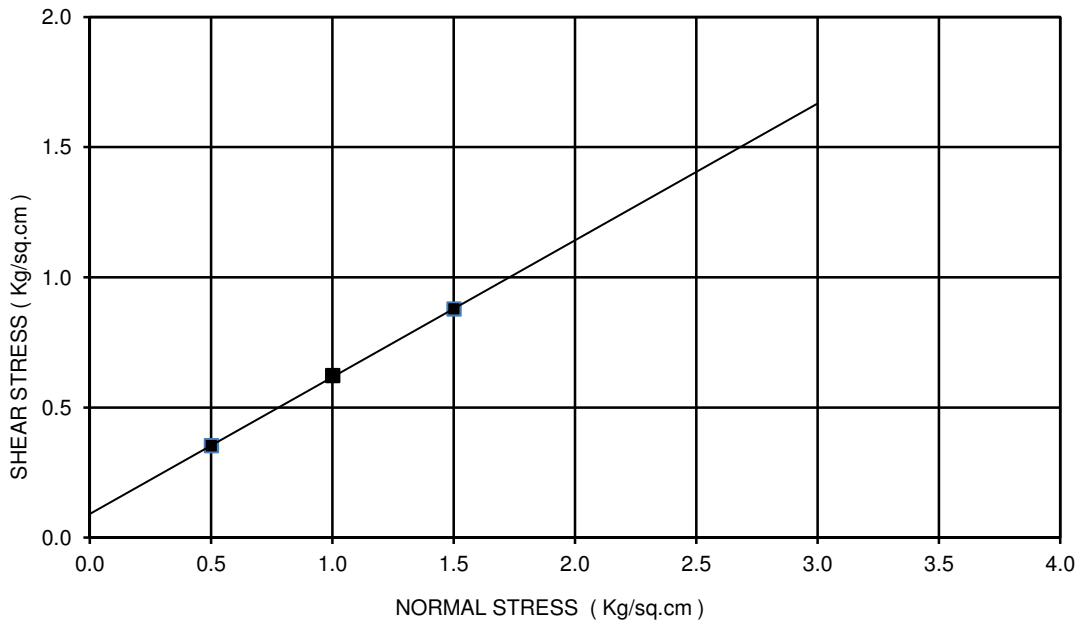
Ch. 57+400
 BORE HOLE NO: BH-P12
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



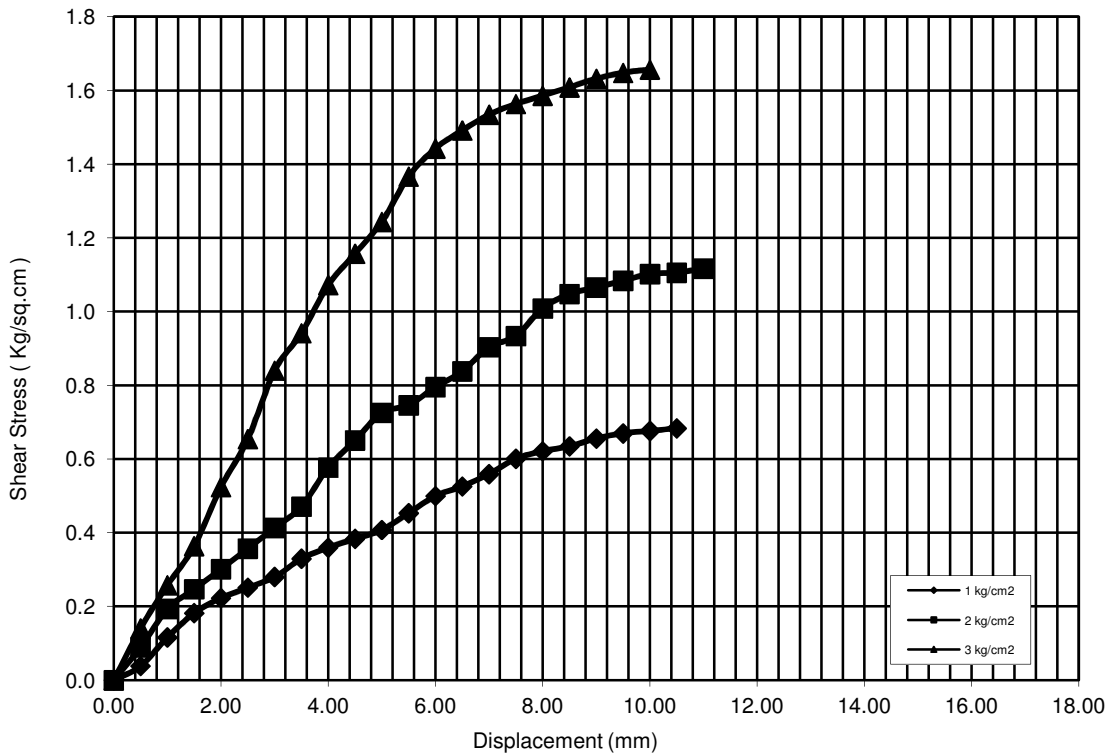
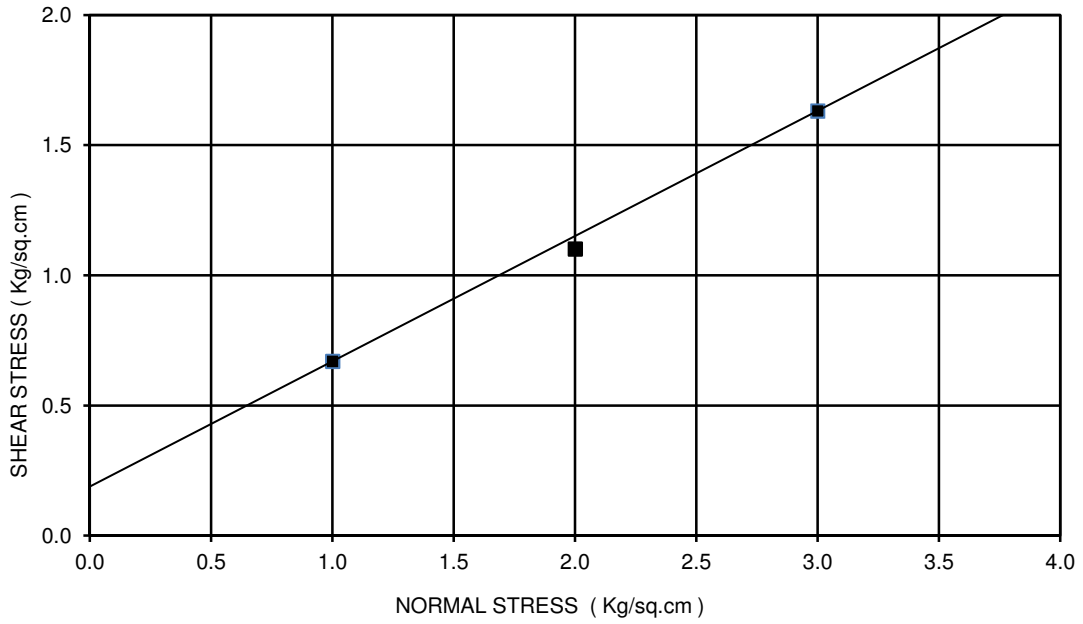
Ch. 57+400
 BORE HOLE NO: BH-P12
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



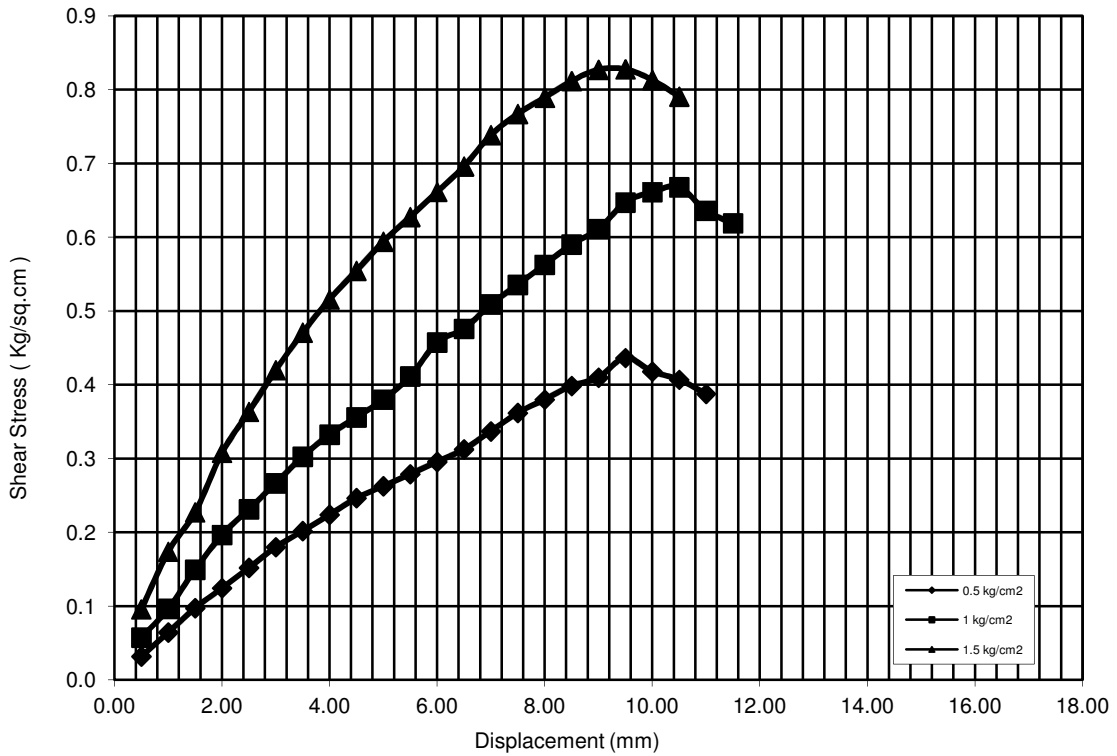
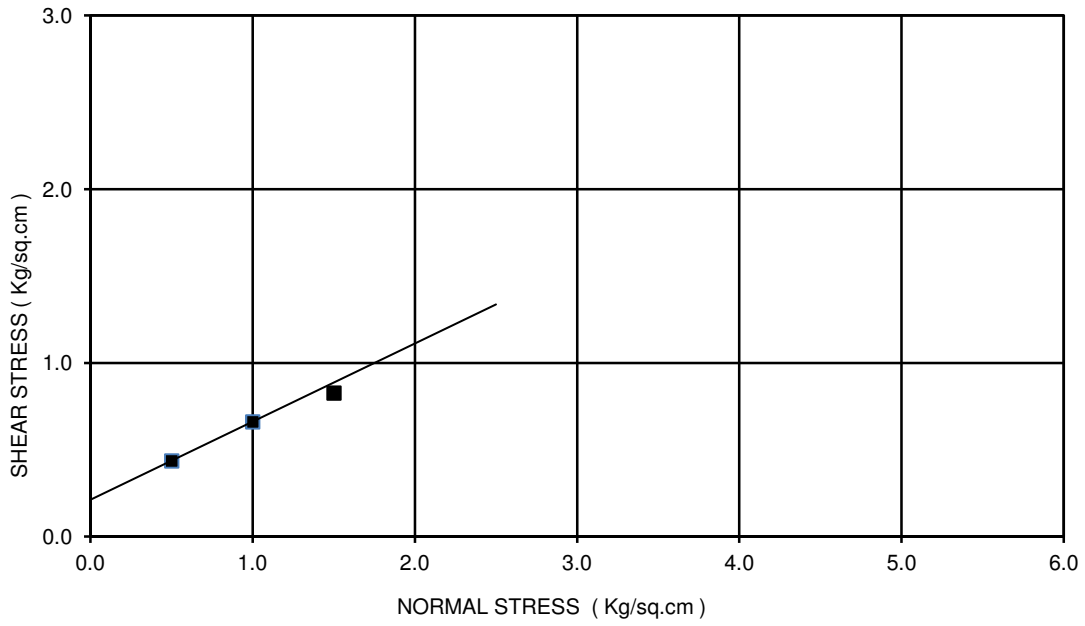
Ch. 57+400
 BORE HOLE NO: BH-P15
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



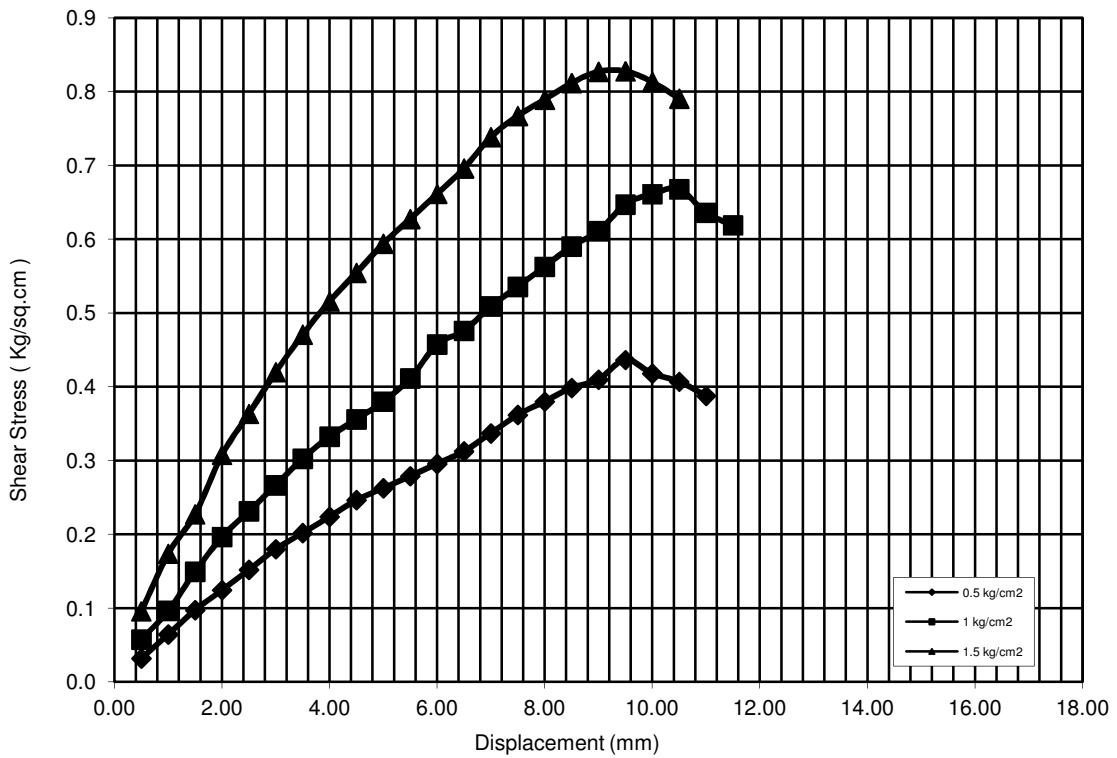
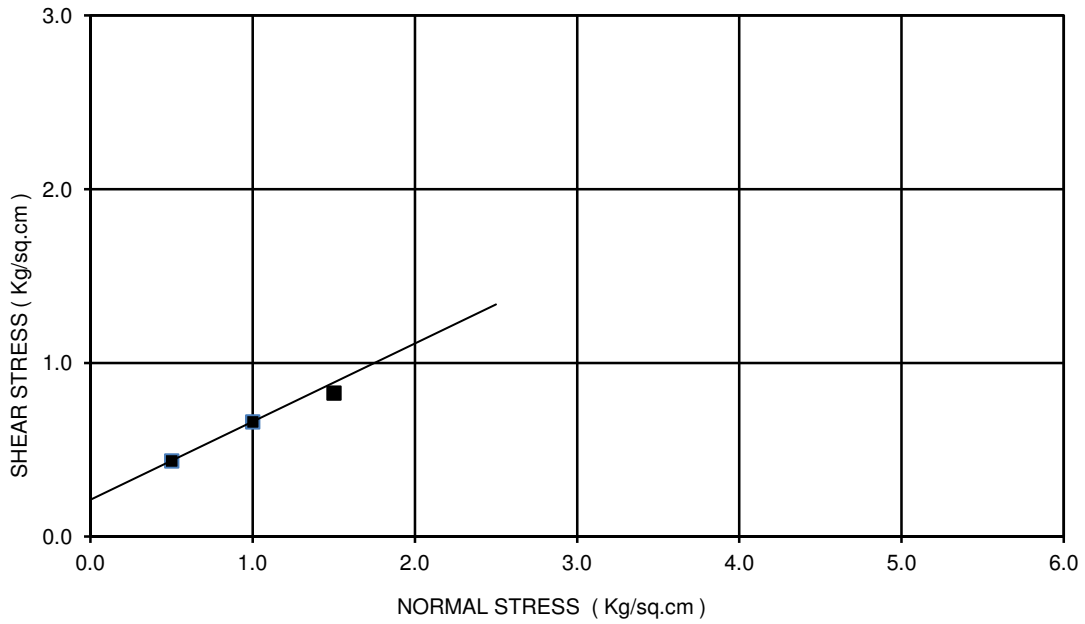
Ch. 57+400
 BORE HOLE NO: BH-P15
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



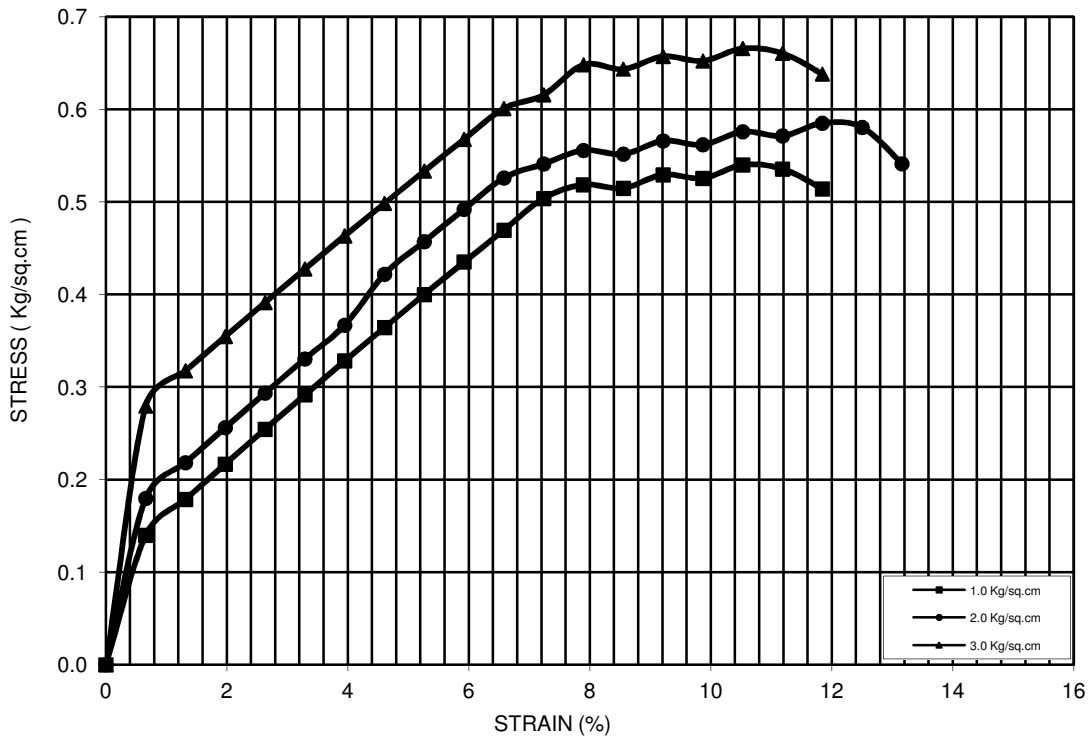
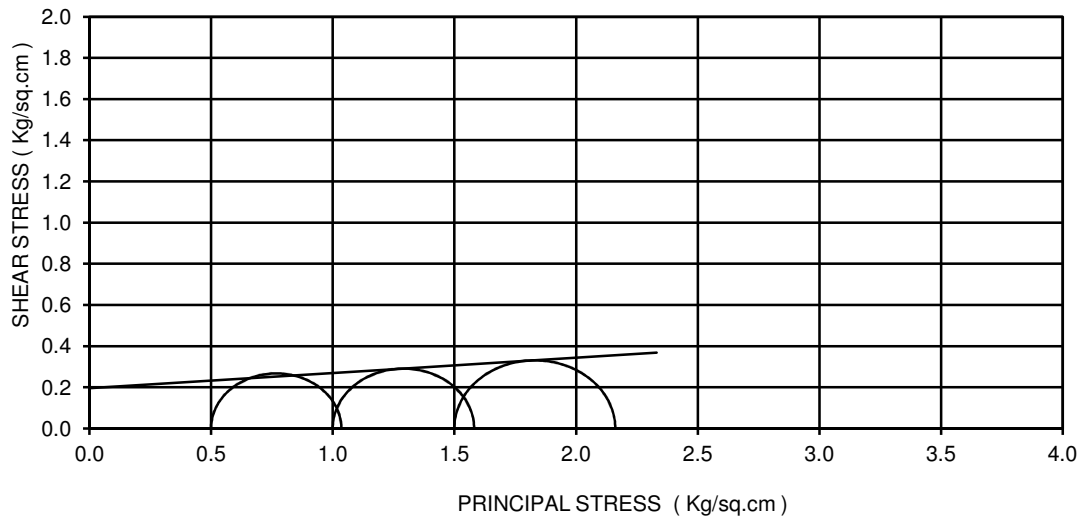
Ch. 57+400
 BORE HOLE NO: BH-P16
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



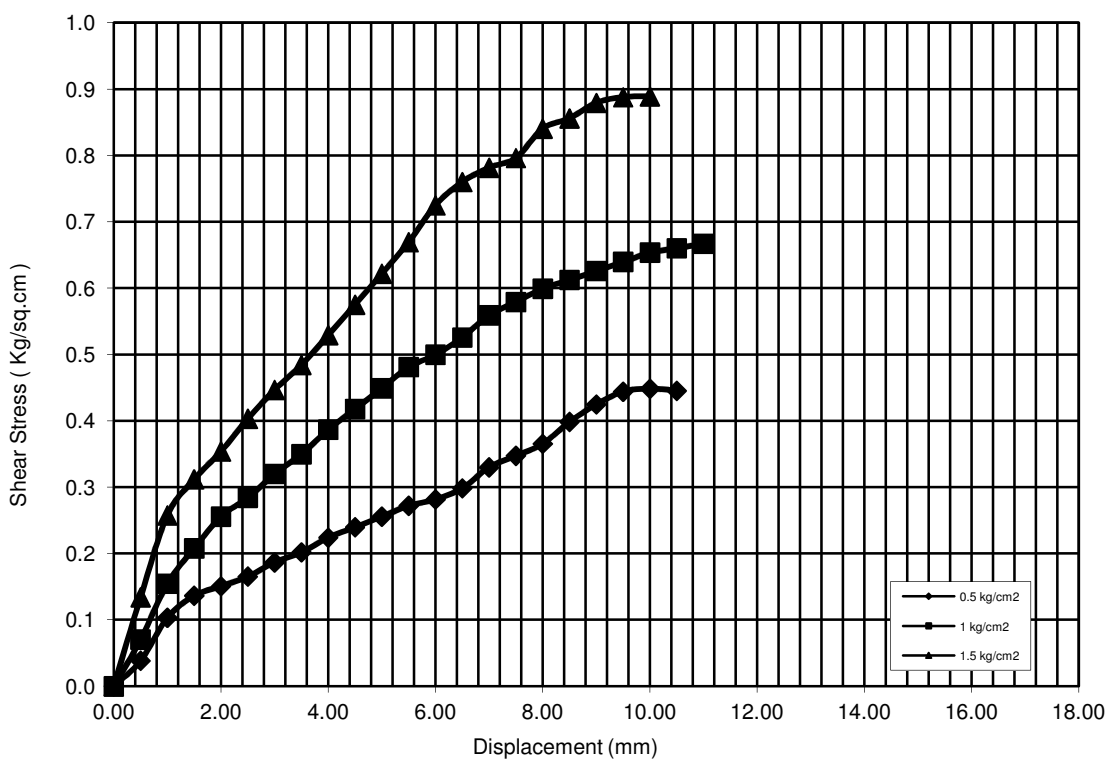
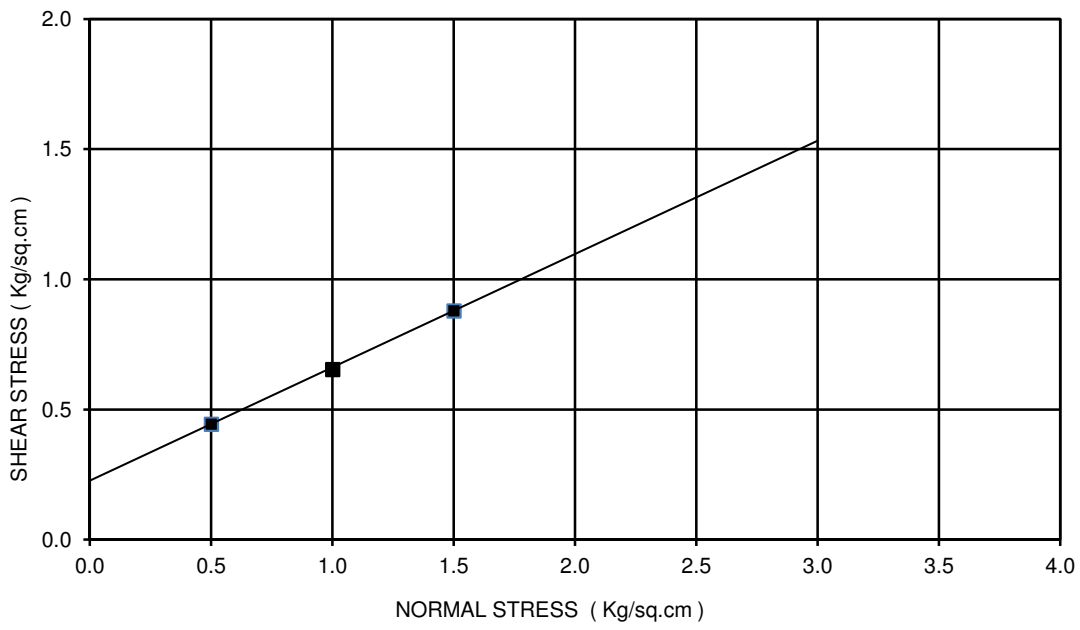
Ch. 57+400
 BORE HOLE NO: BH-P16
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



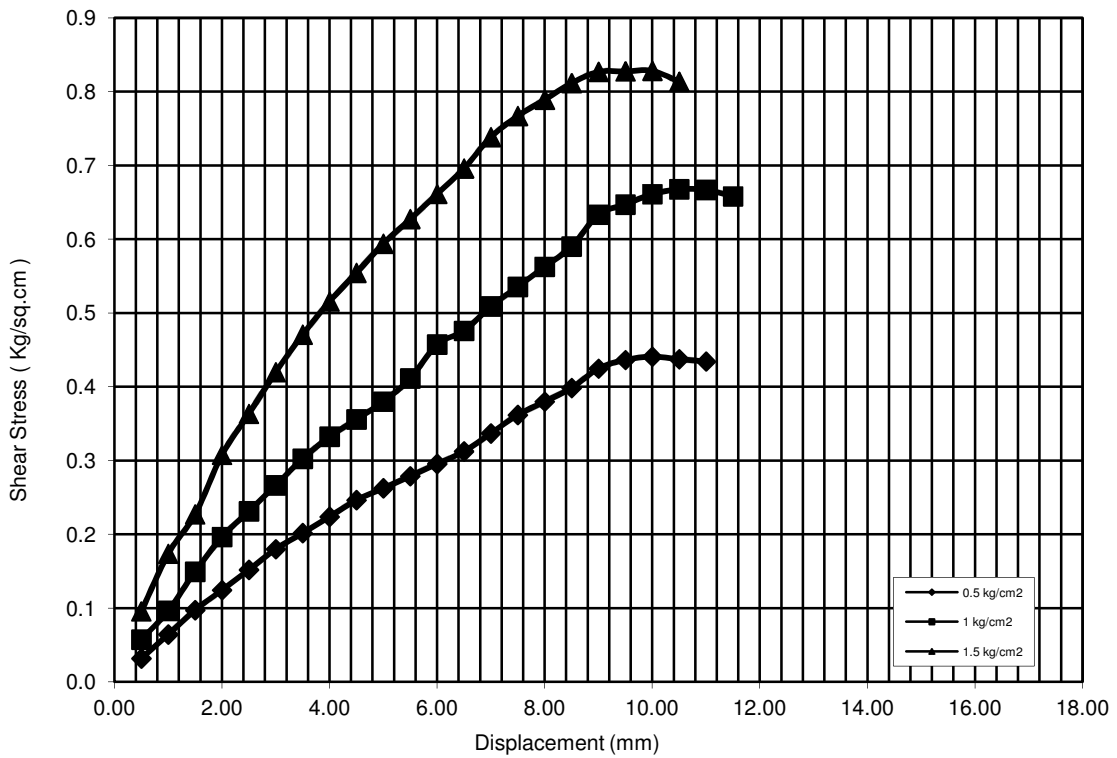
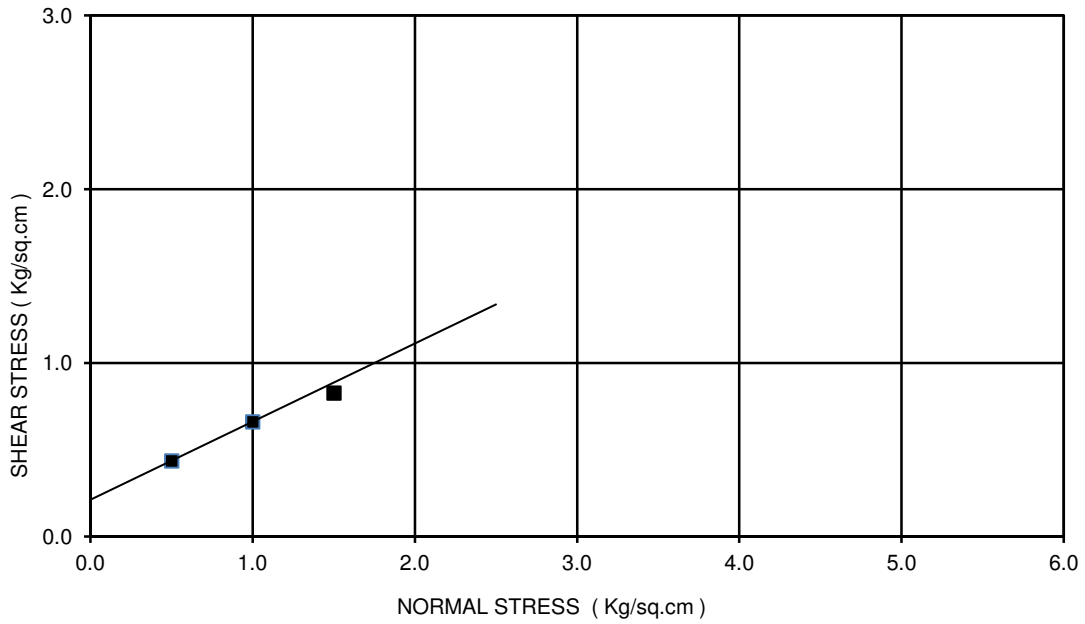
Ch. 57+400
 BORE HOLE NO: BH-P17
 SAMPLE NO.: UDS-5
 DEPTH: 16.00 m
 COHESION(C)= 0.62 kg/sq.cm
 ANGLE OF FRICTION(Phi): 11 deg
 TYPE OF THE TEST: UUT



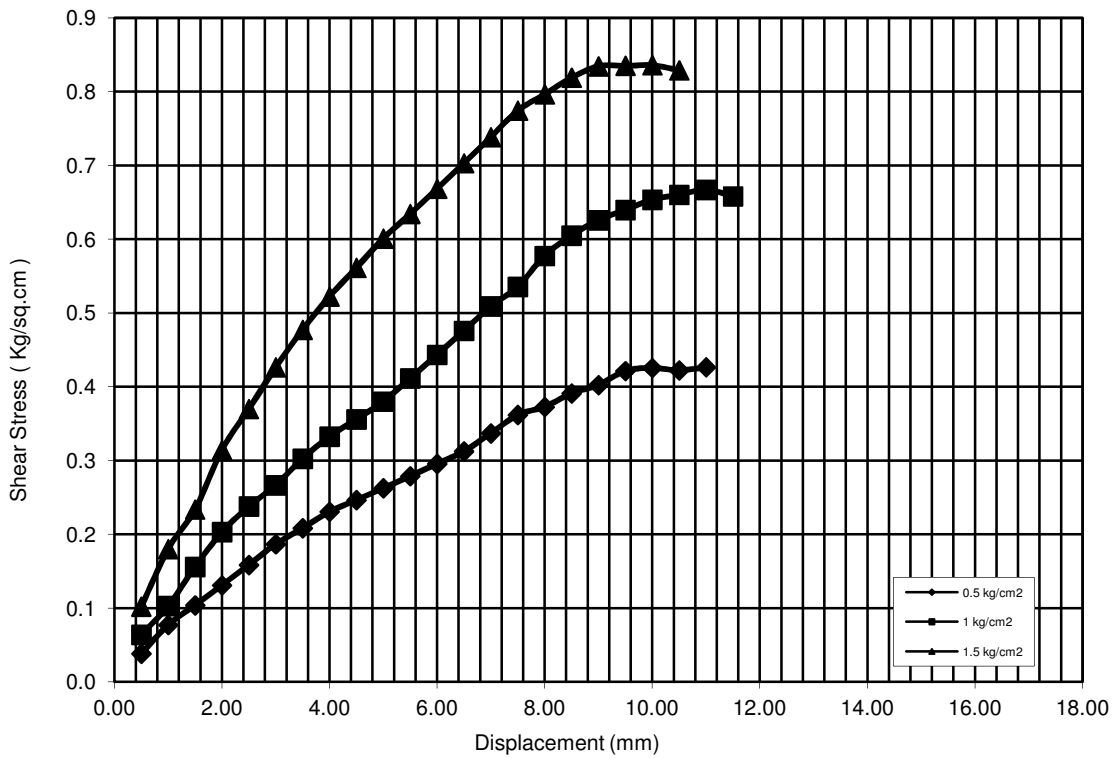
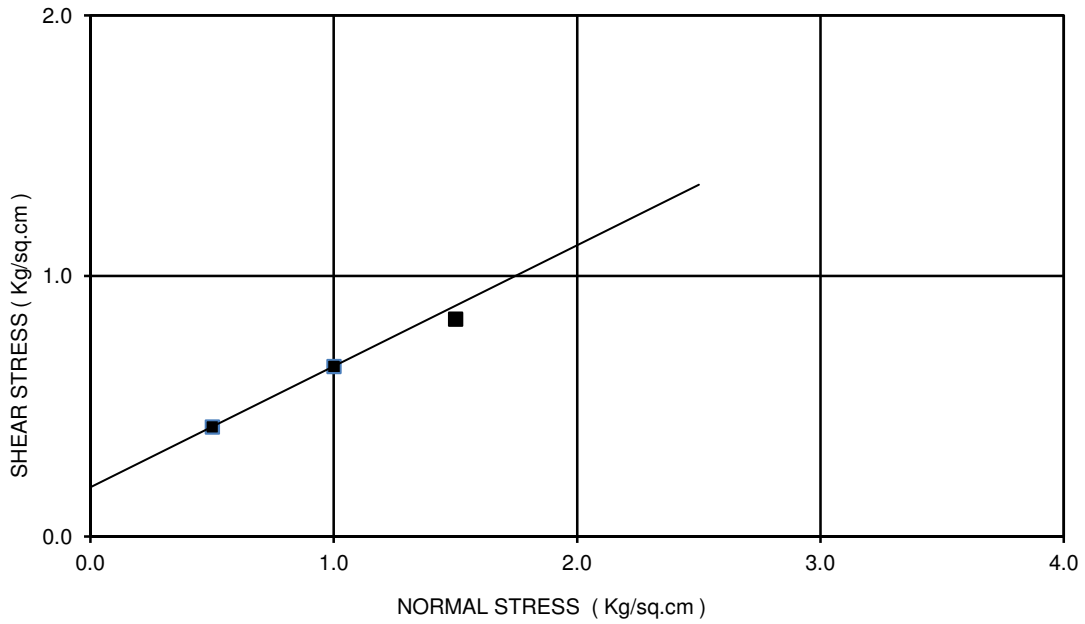
Ch. 57+400
 BORE HOLE NO: BH-P17
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



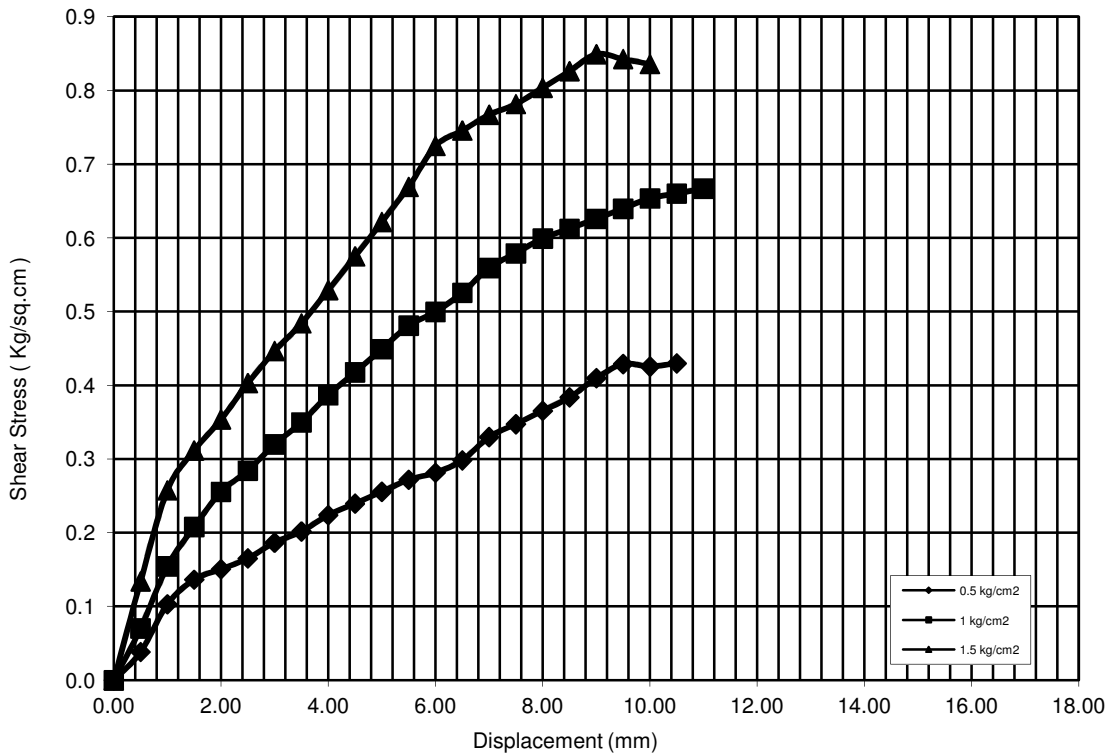
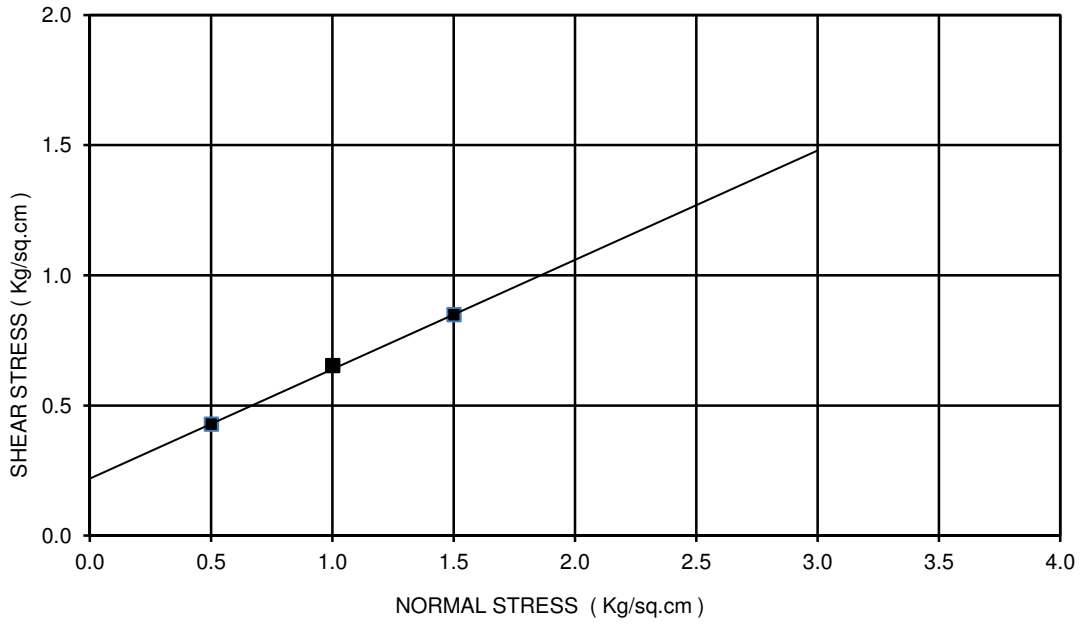
Ch. 57+400
 BORE HOLE NO: BH-P18
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



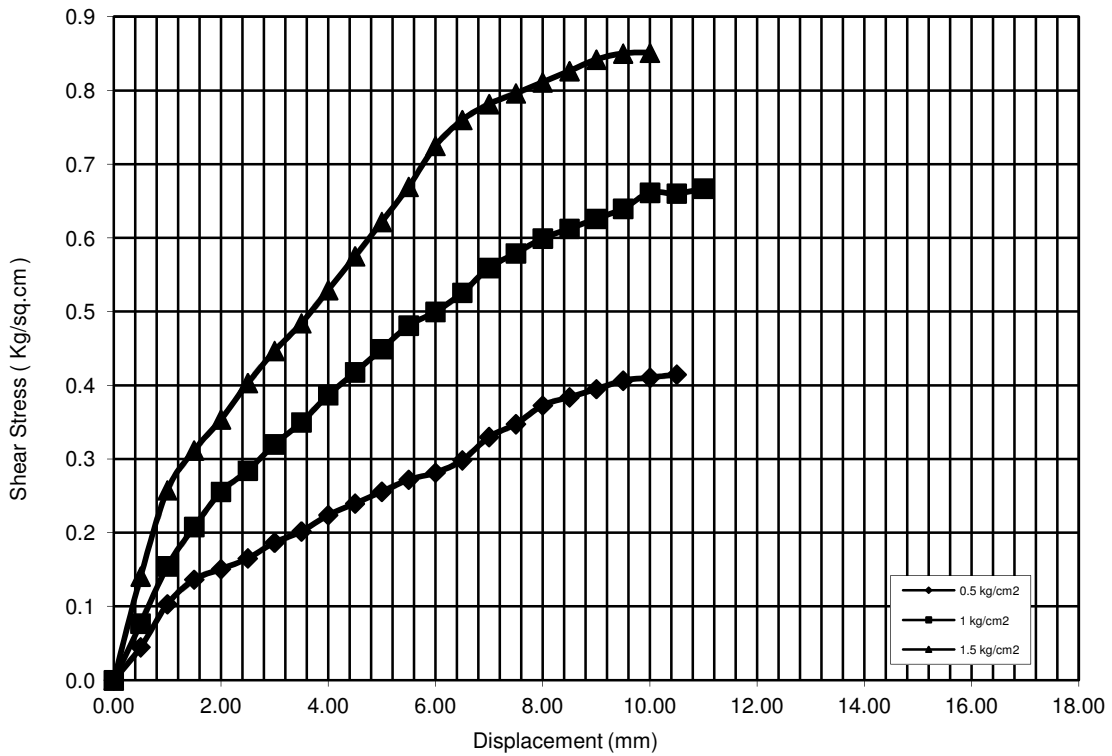
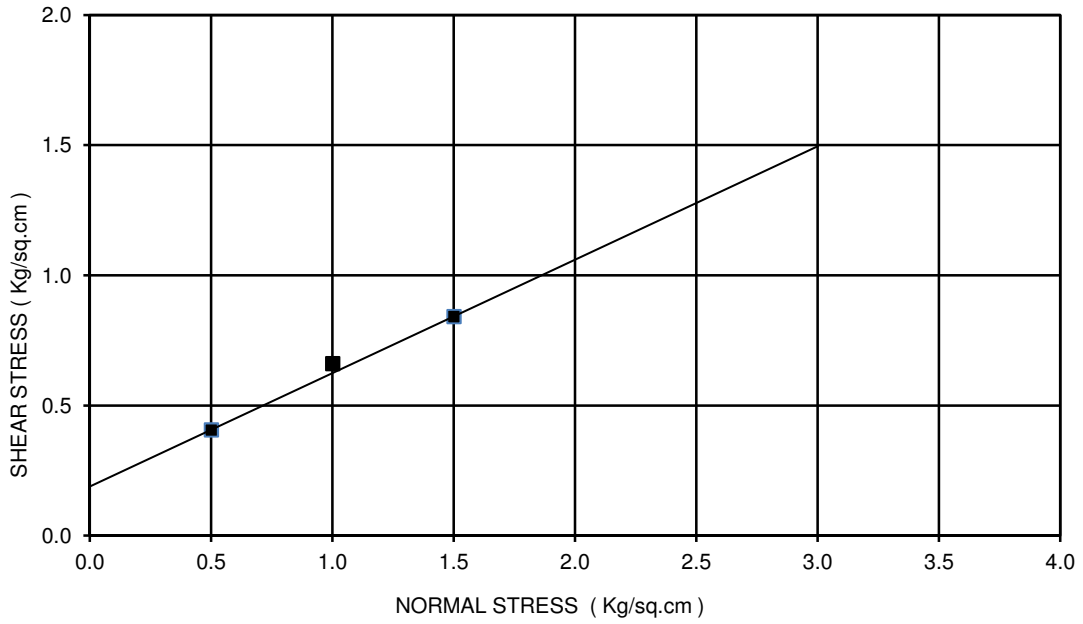
Ch. 57+400
 BORE HOLE NO: BH-P18
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



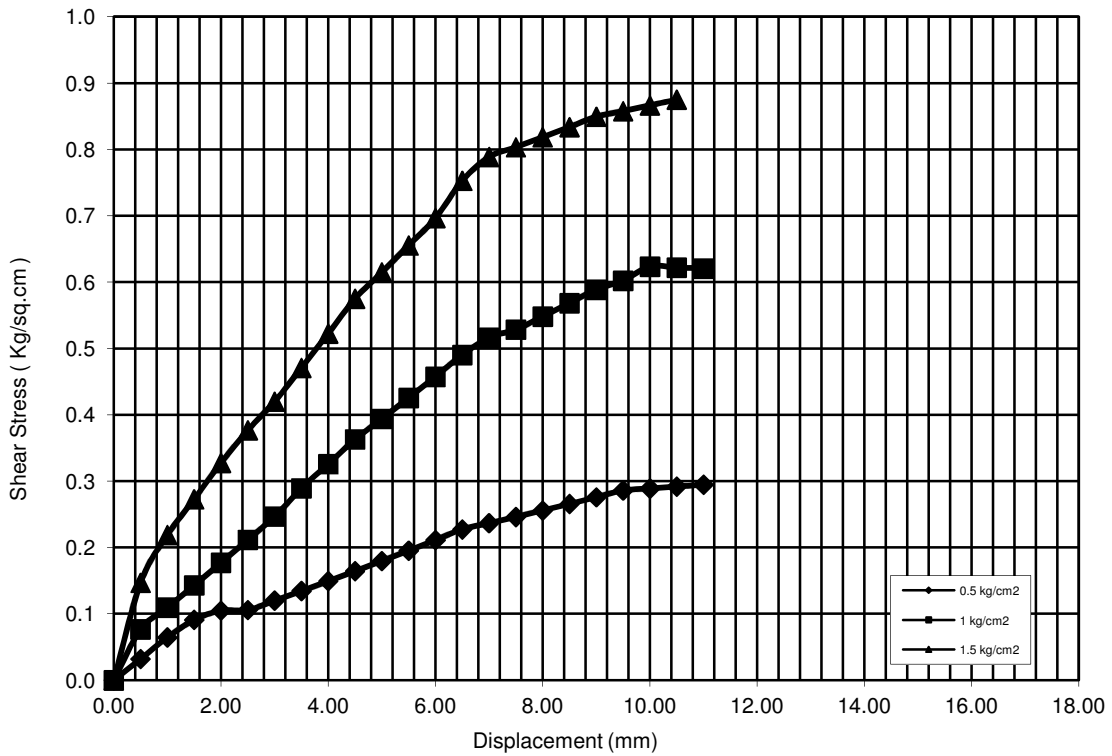
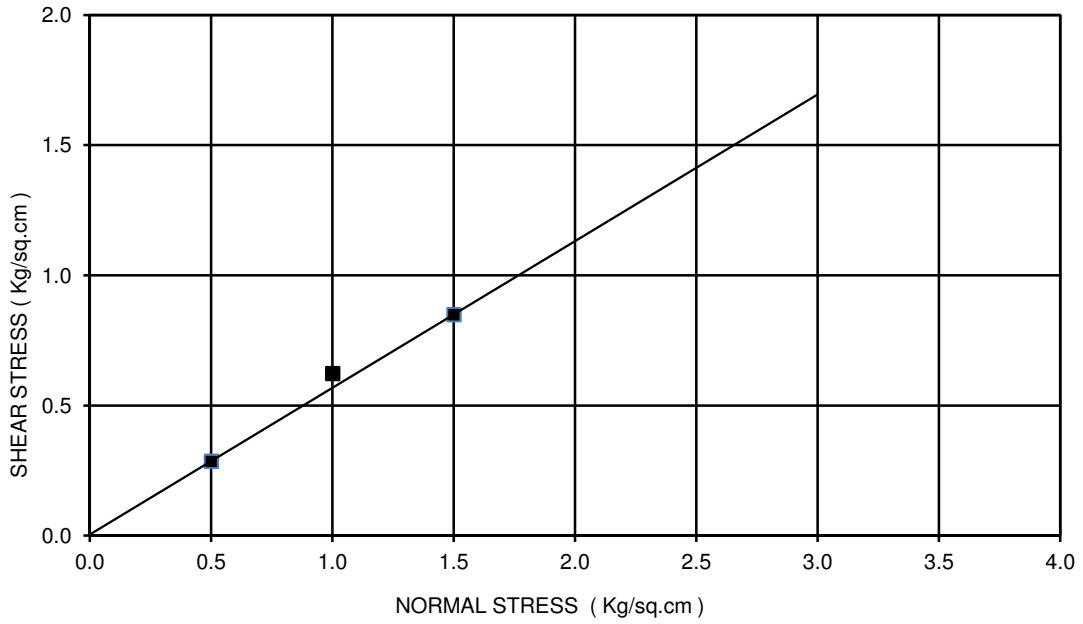
Ch. 57+400
 BORE HOLE NO: BH-P19
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



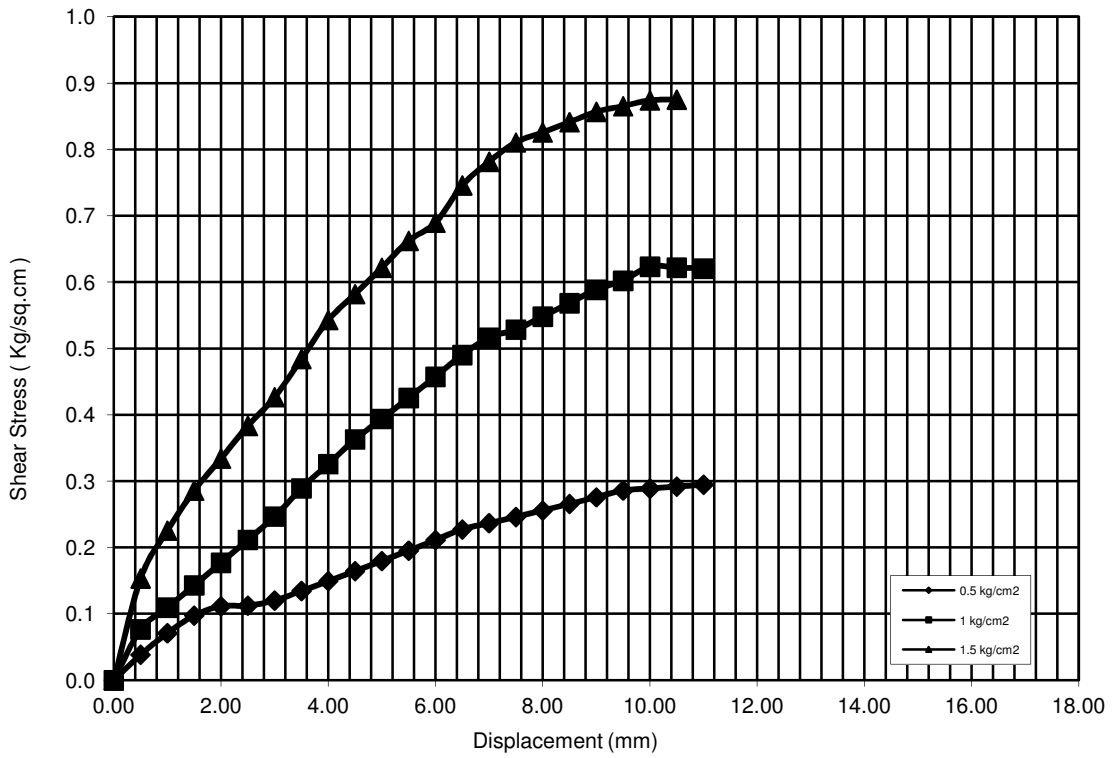
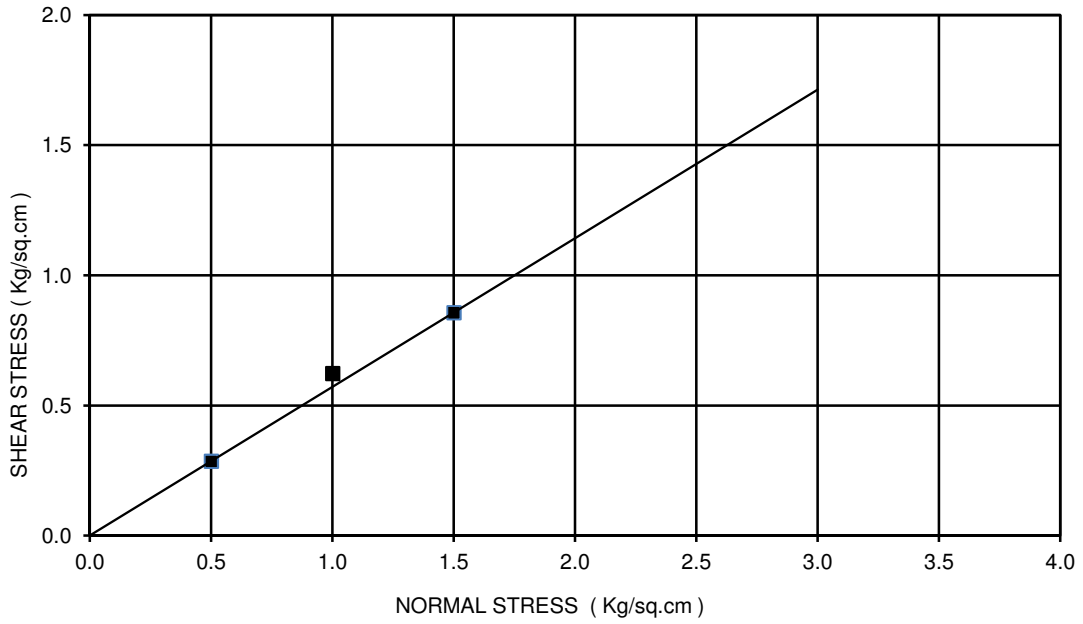
Ch. 57+400
 BORE HOLE NO: BH-P19
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



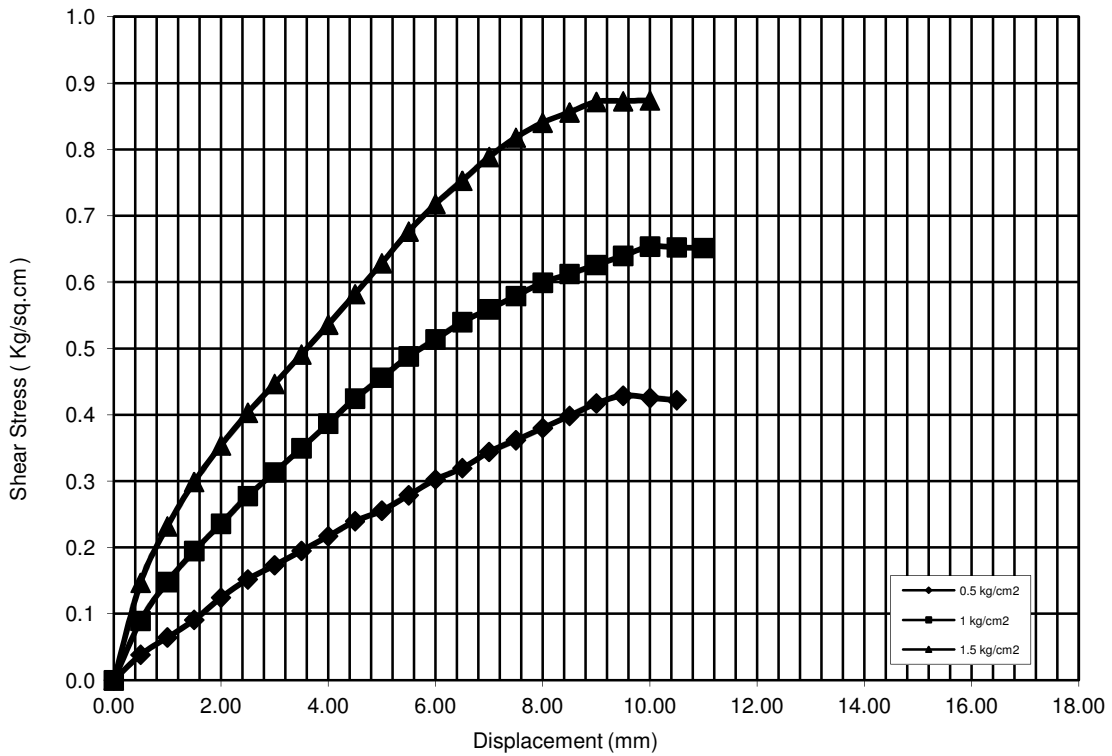
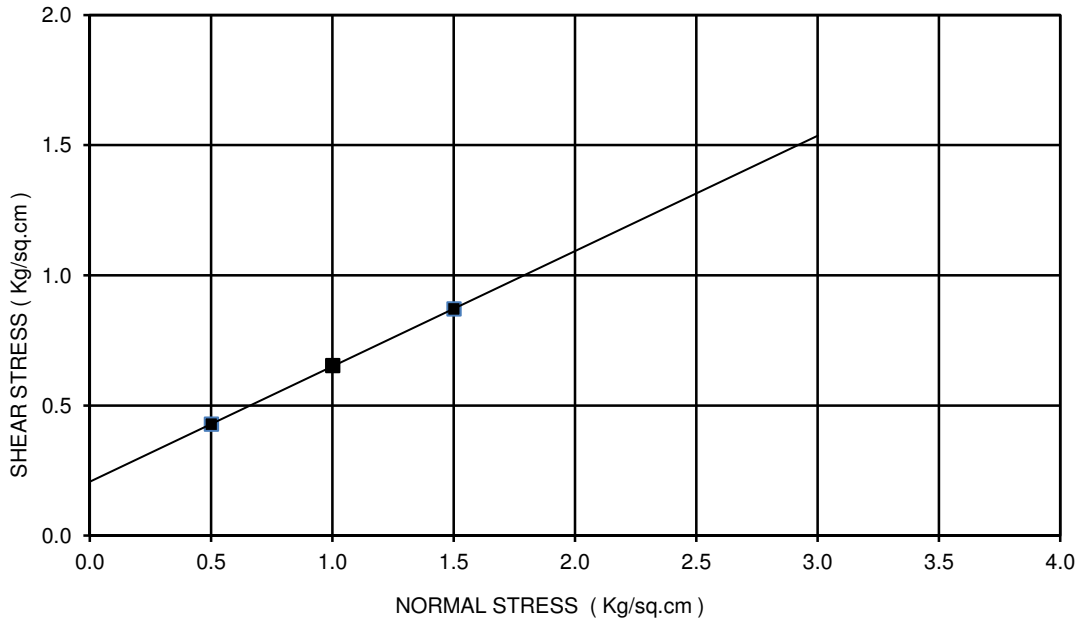
Ch. 57+400
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



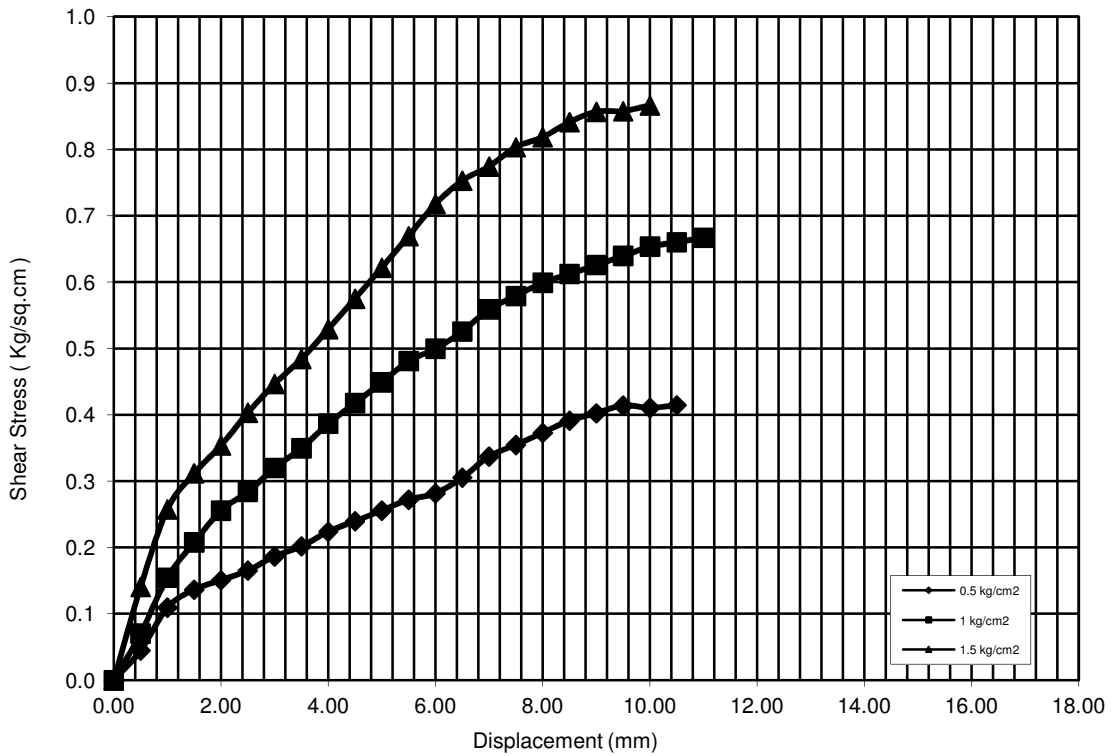
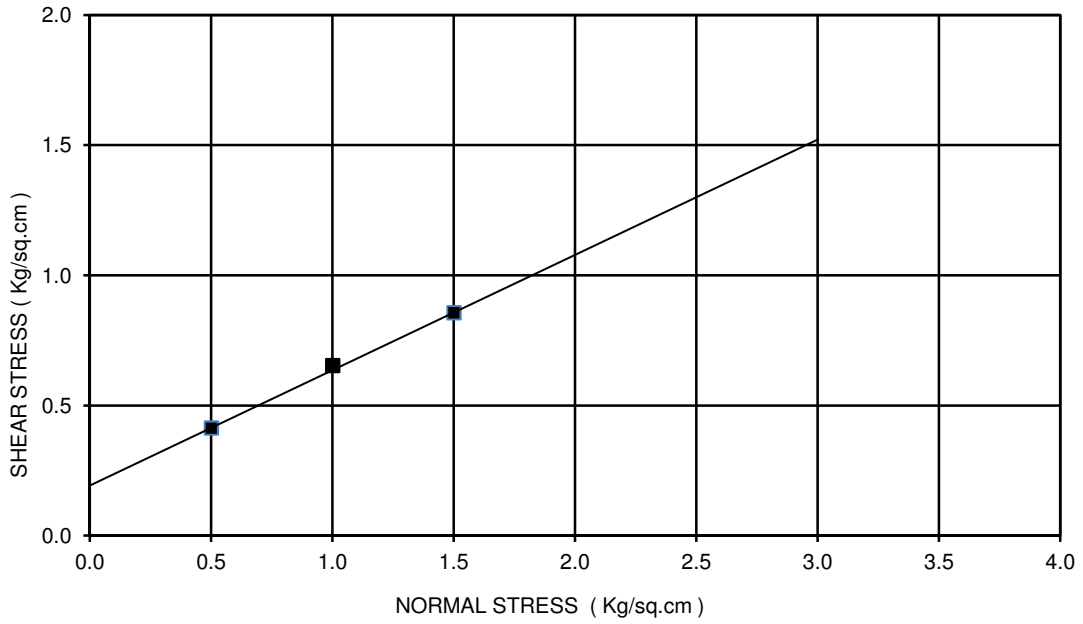
Ch. 57+400
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



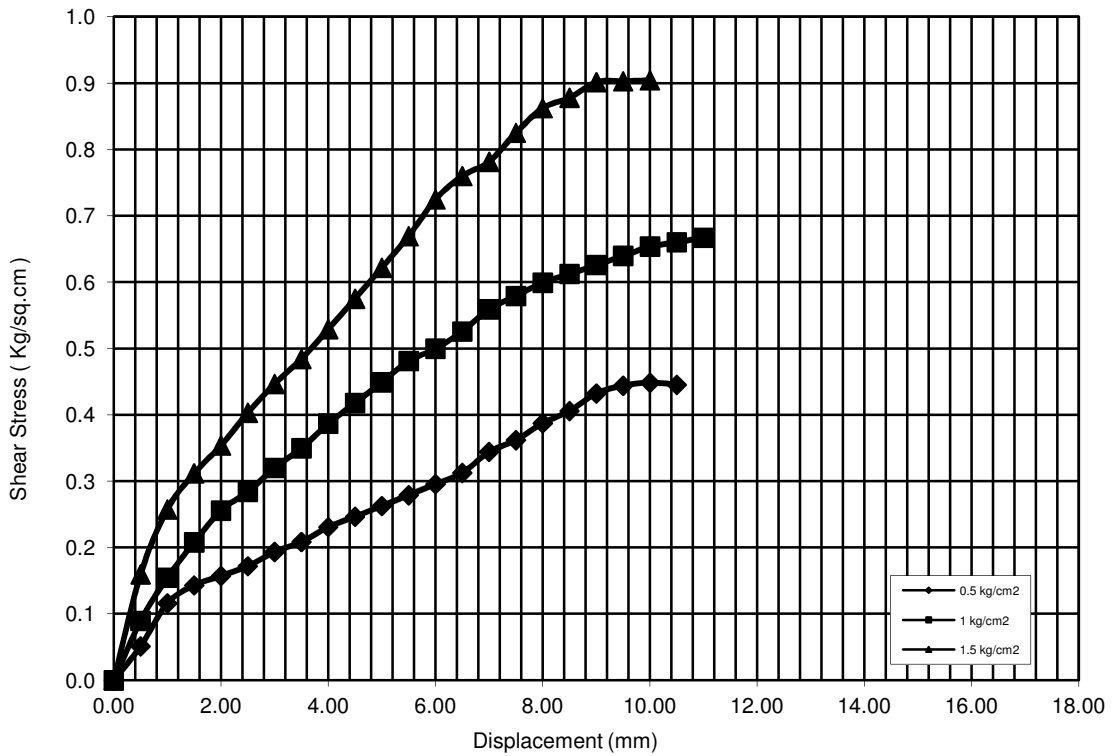
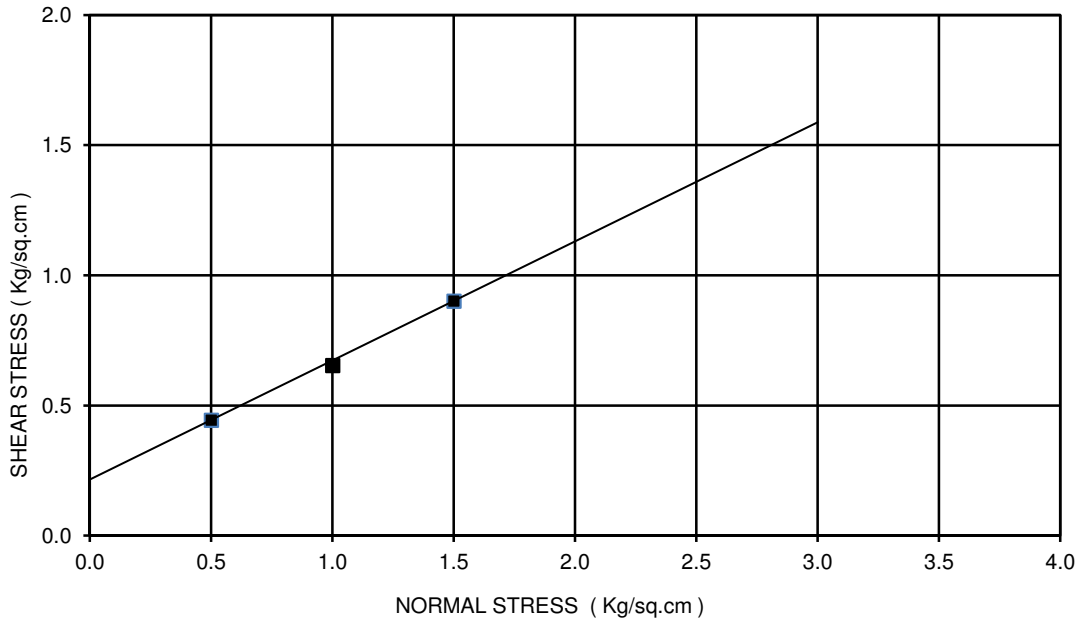
Ch. 58+191
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



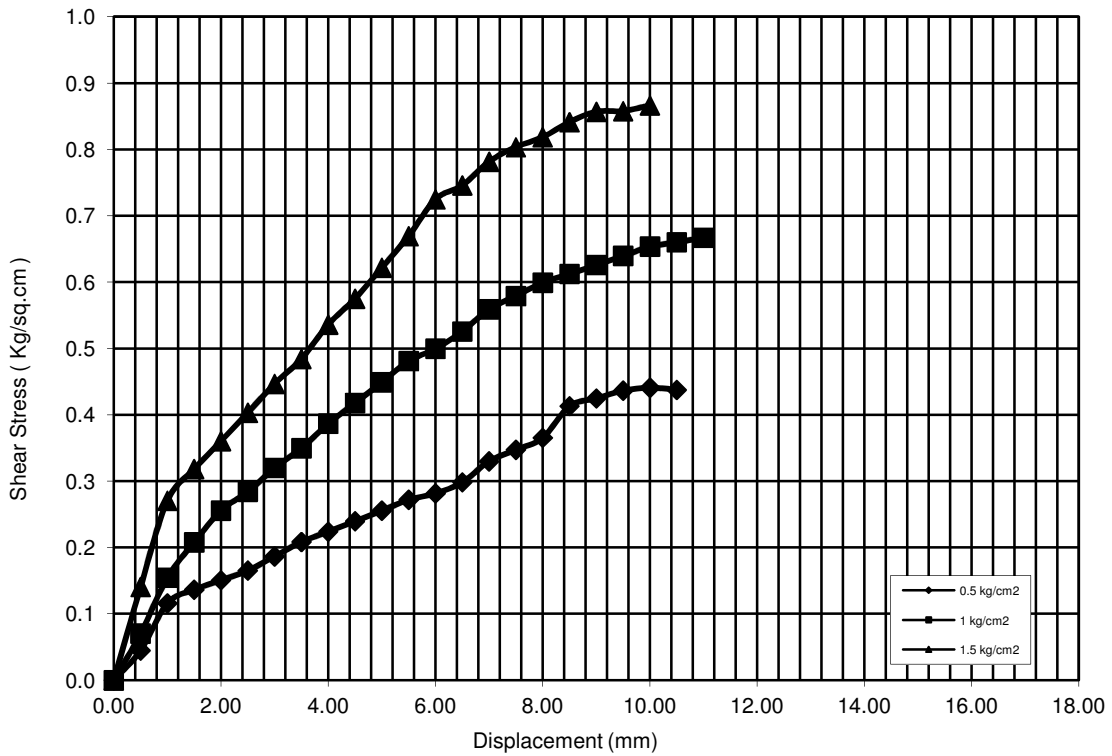
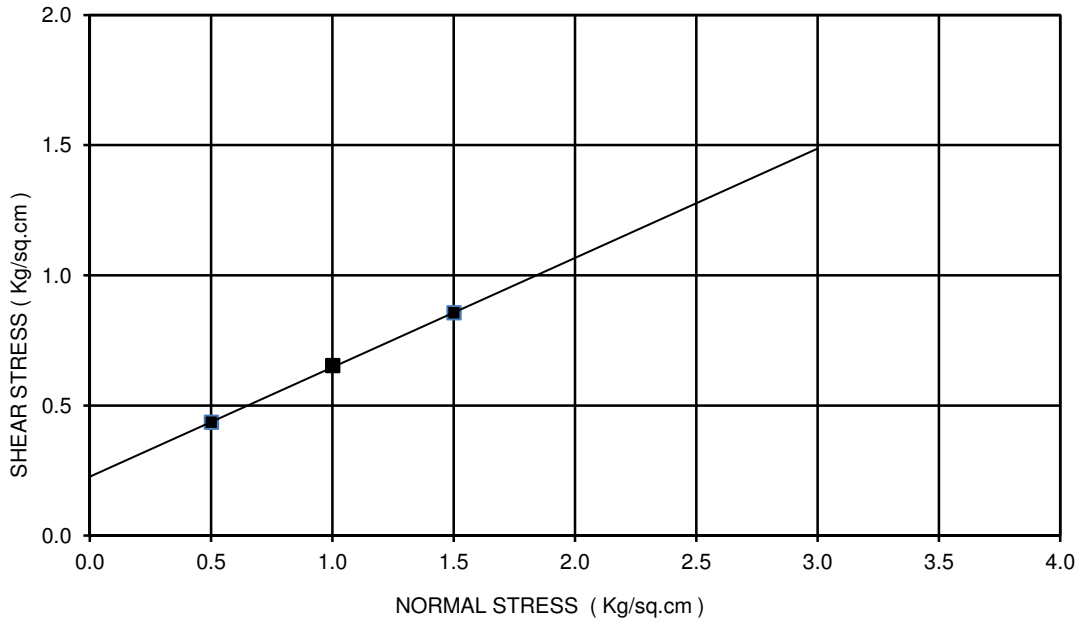
Ch. 58+497
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



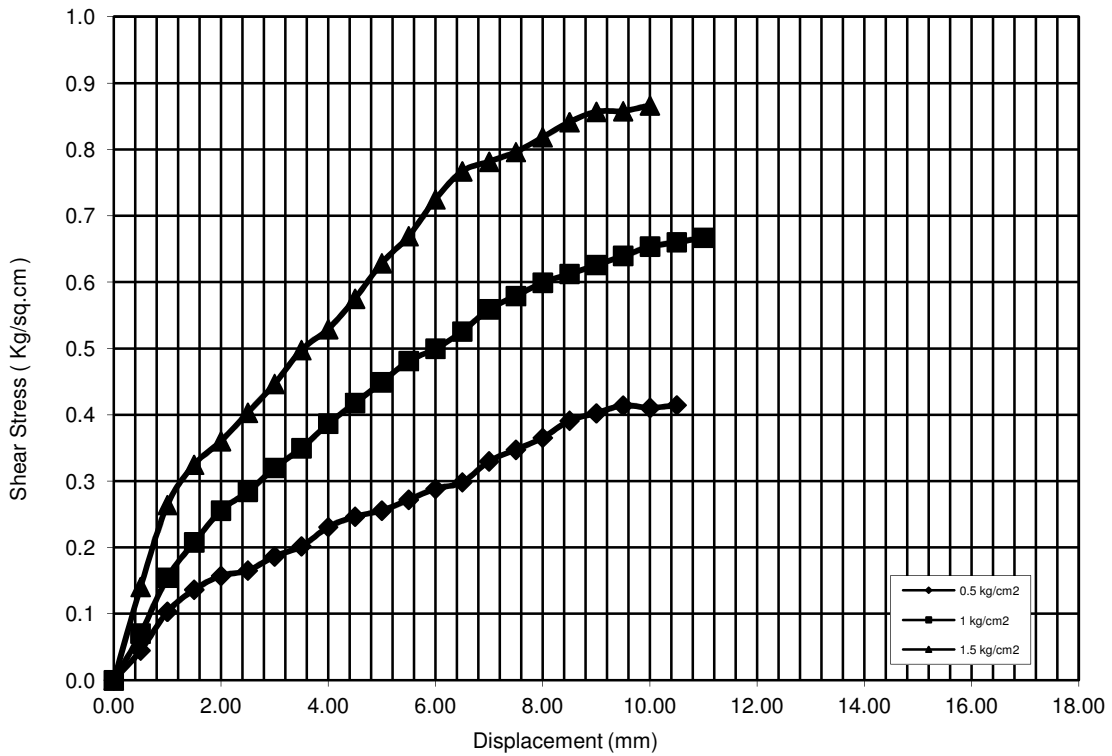
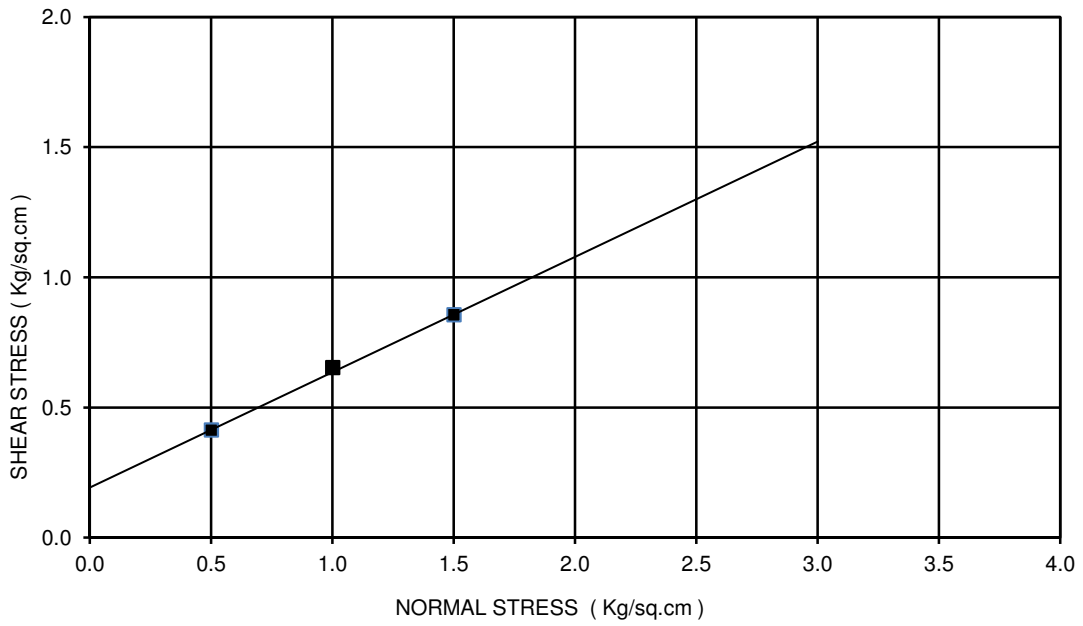
Ch. 58+497
 BORE HOLE NO: BH-A1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



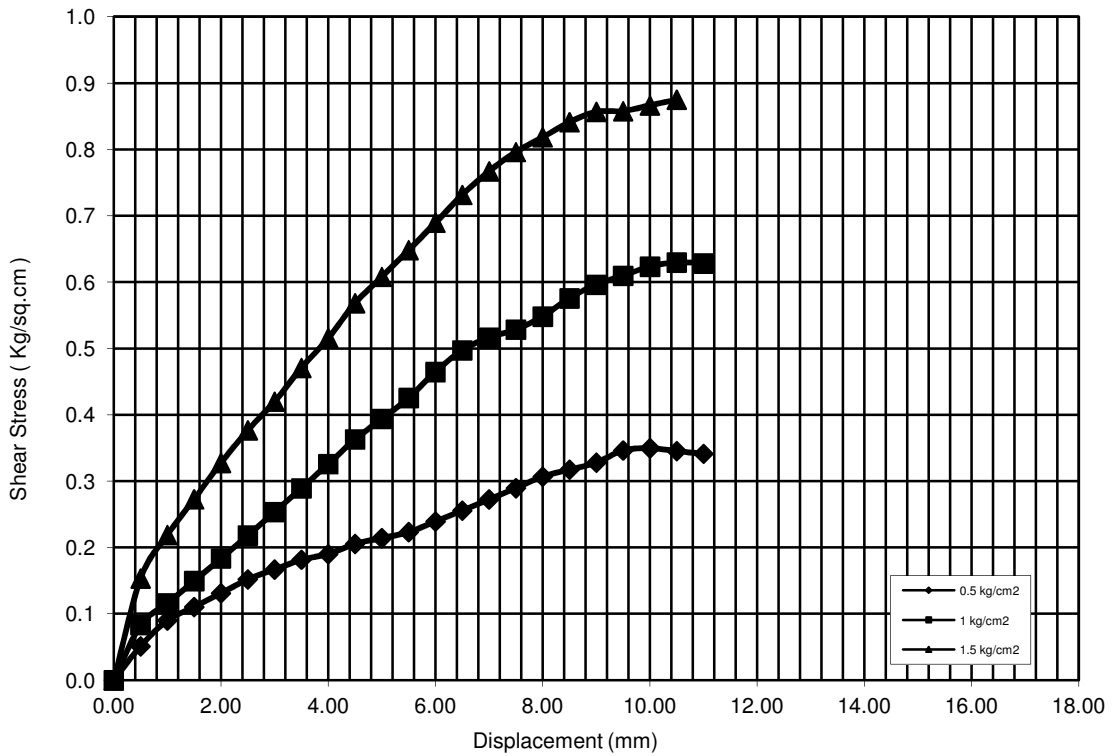
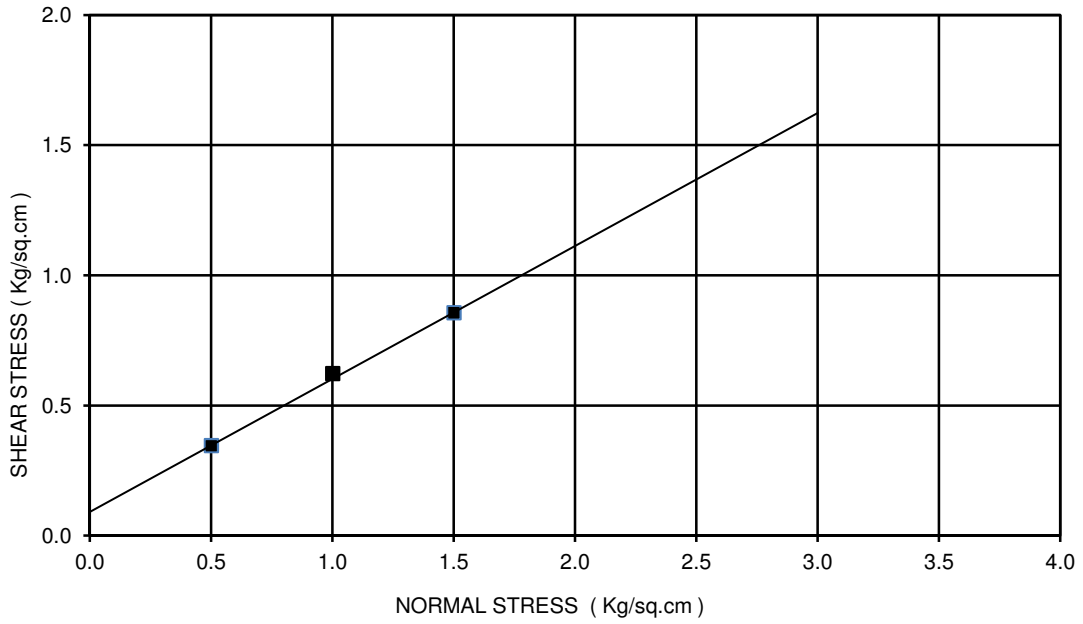
Ch. 58+497
 BORE HOLE NO: BH-P1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



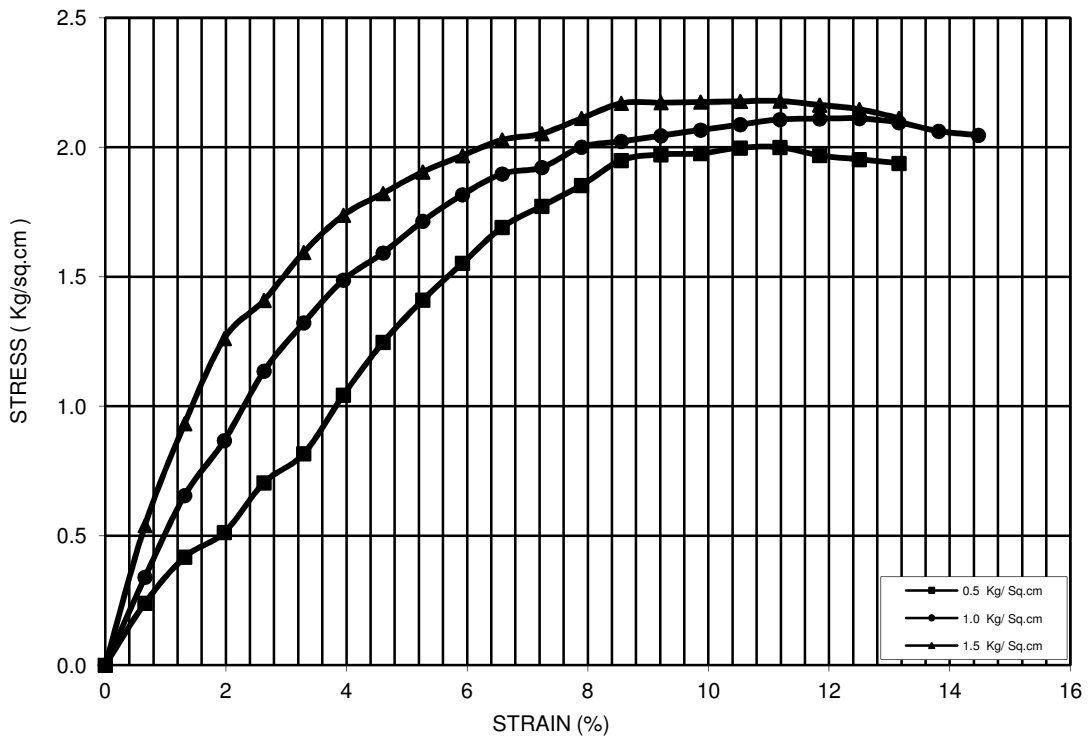
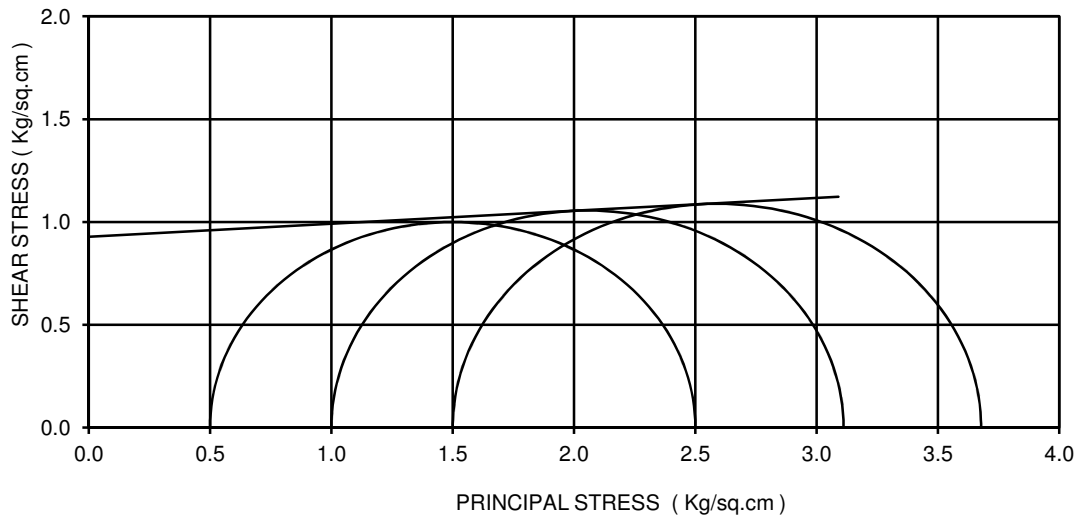
Ch. 58+497
 BORE HOLE NO: BH-P1
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



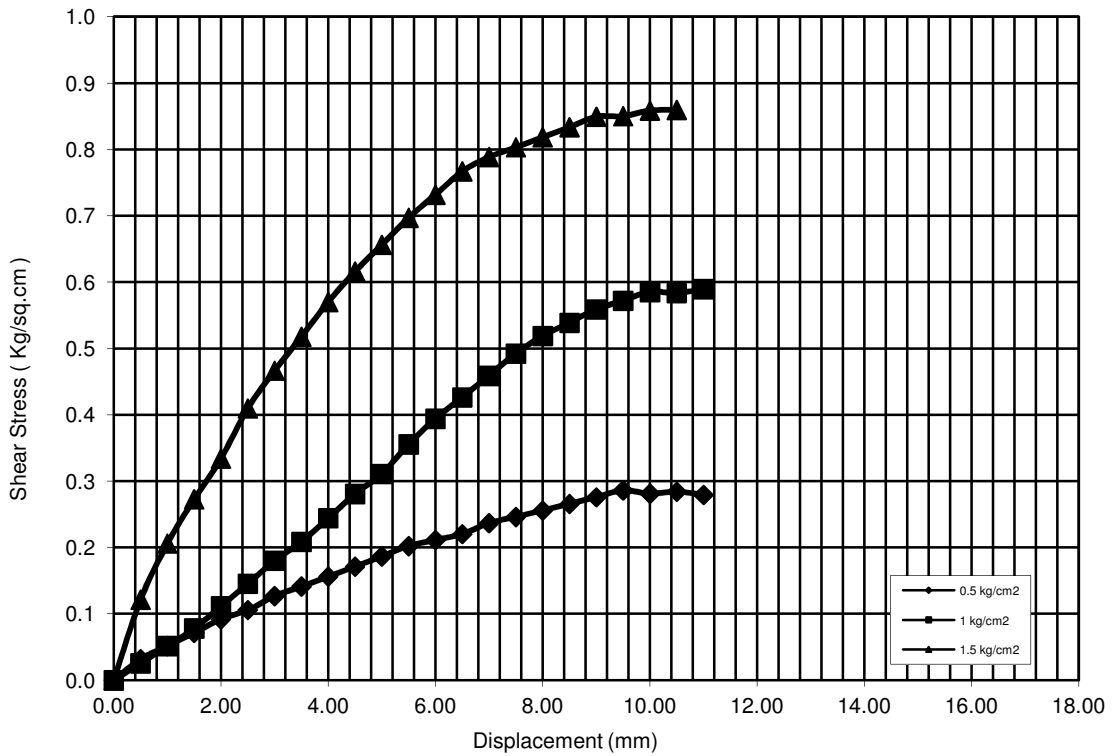
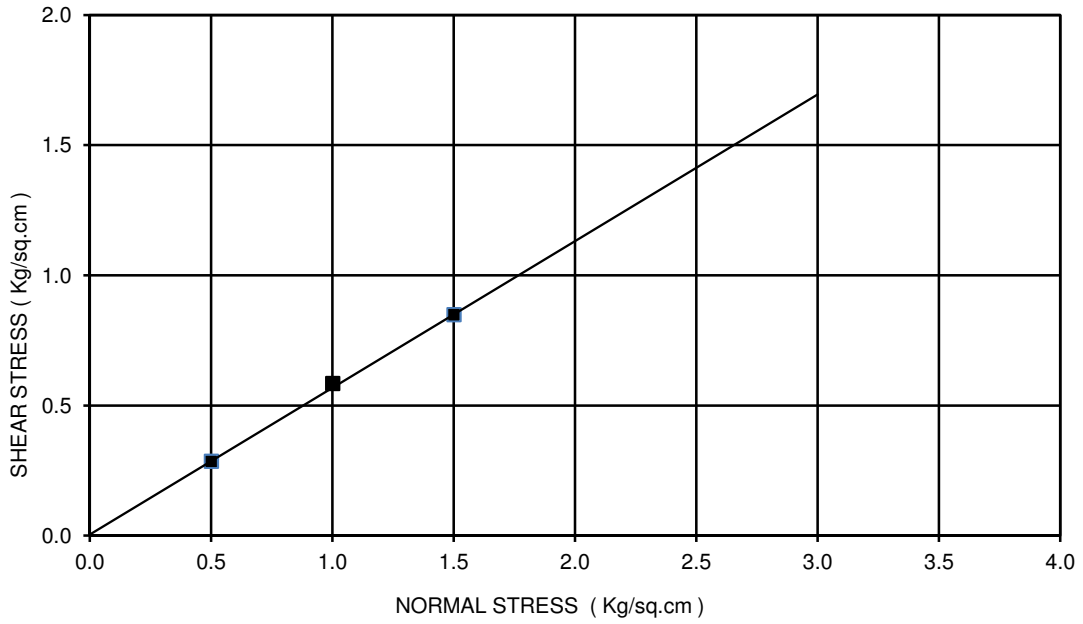
Ch. 58+497
 BORE HOLE NO: BH-P2
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



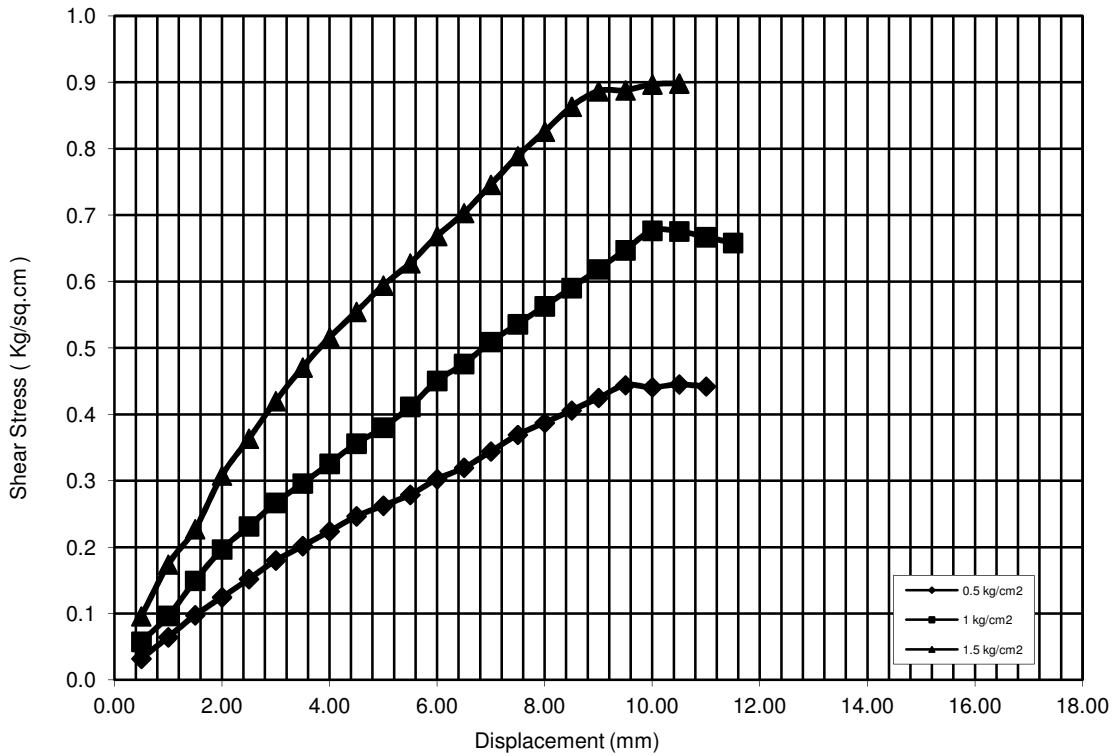
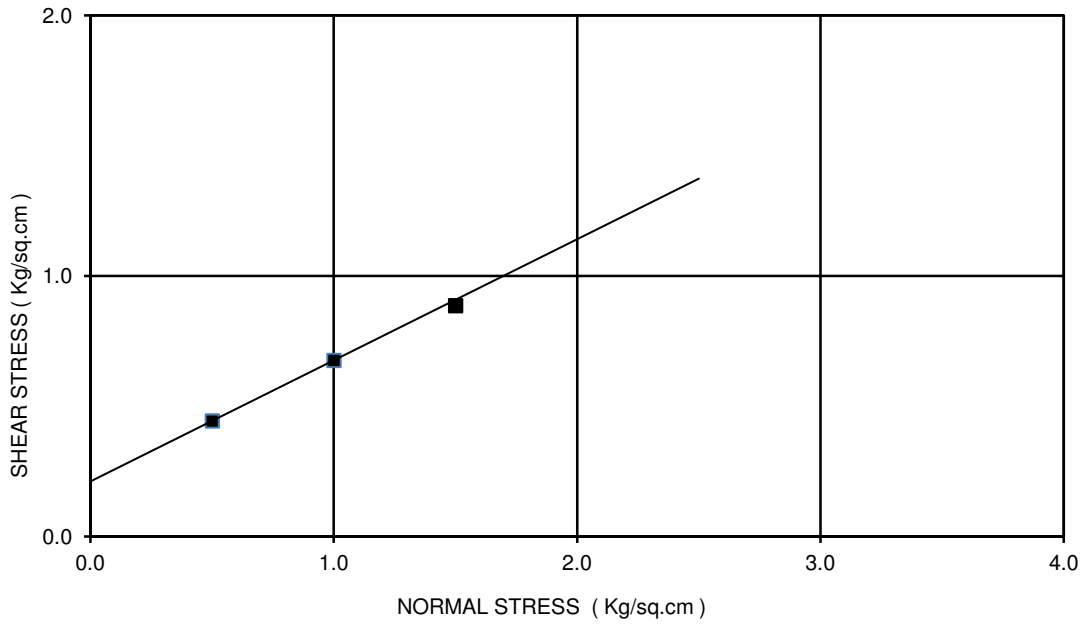
Ch. 58+497
 BORE HOLE NO: BH-P2
 SAMPLE NO.: UDS-8
 DEPTH: 28.00 m
 COHESION(C)= 2.65 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



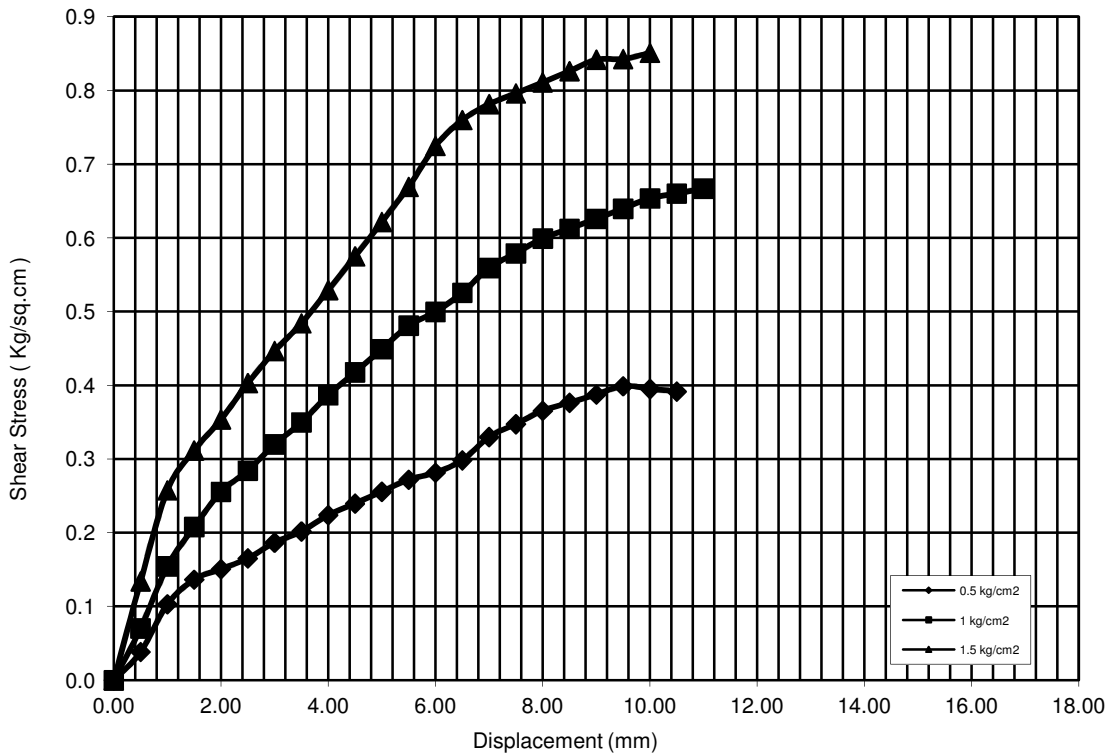
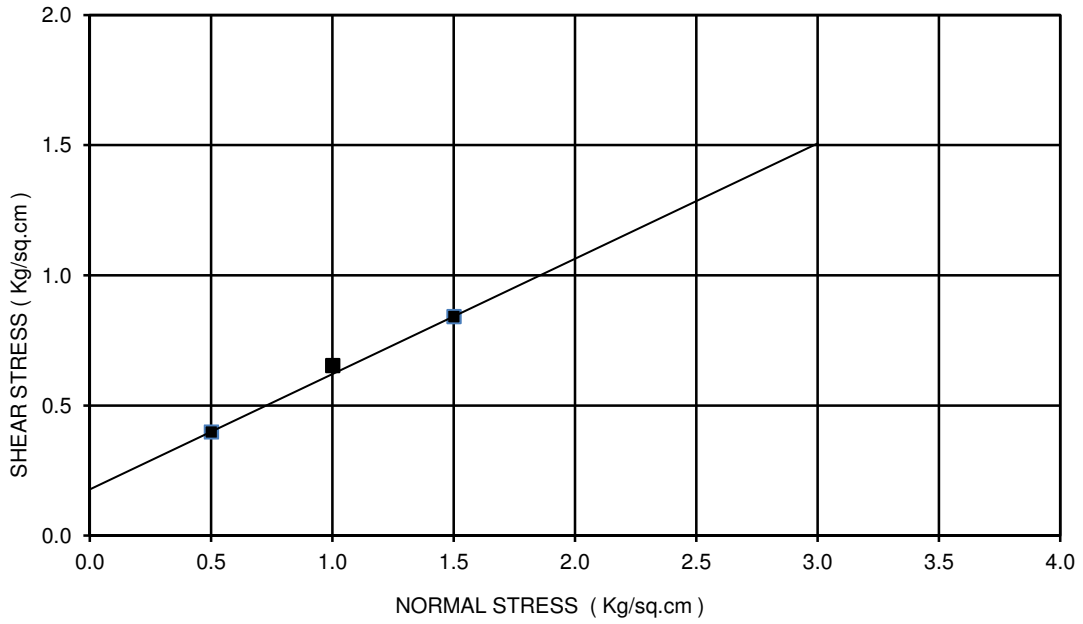
Ch. 58+497
 BORE HOLE NO: BH-P3
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



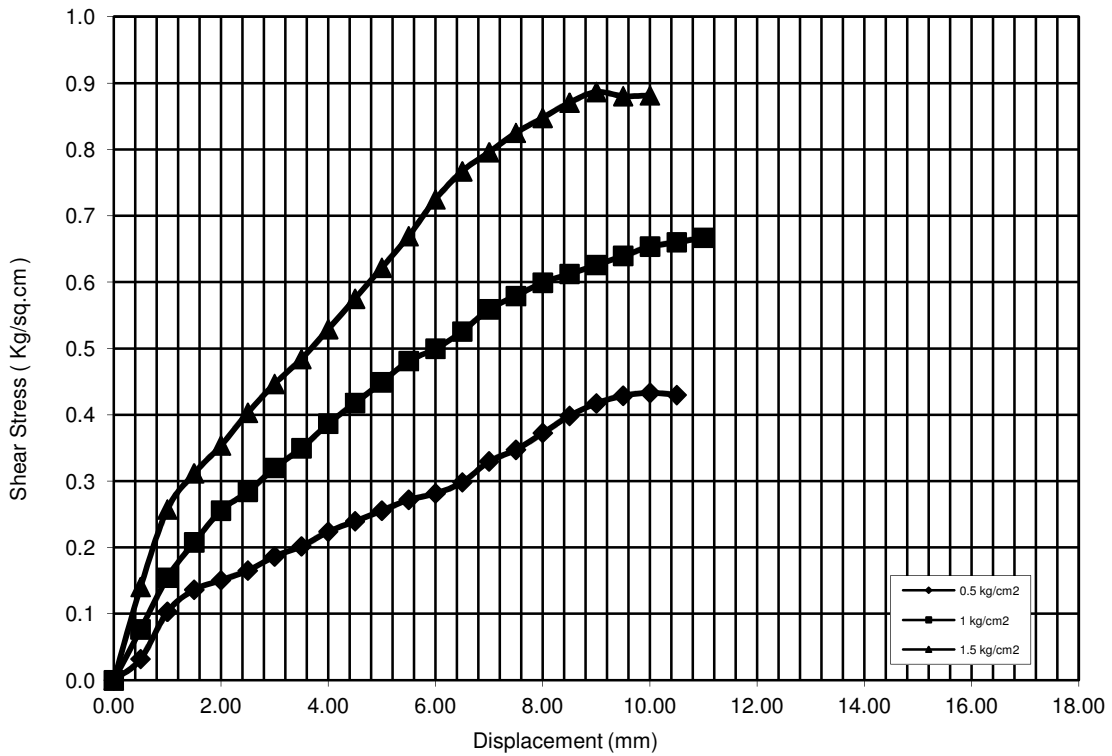
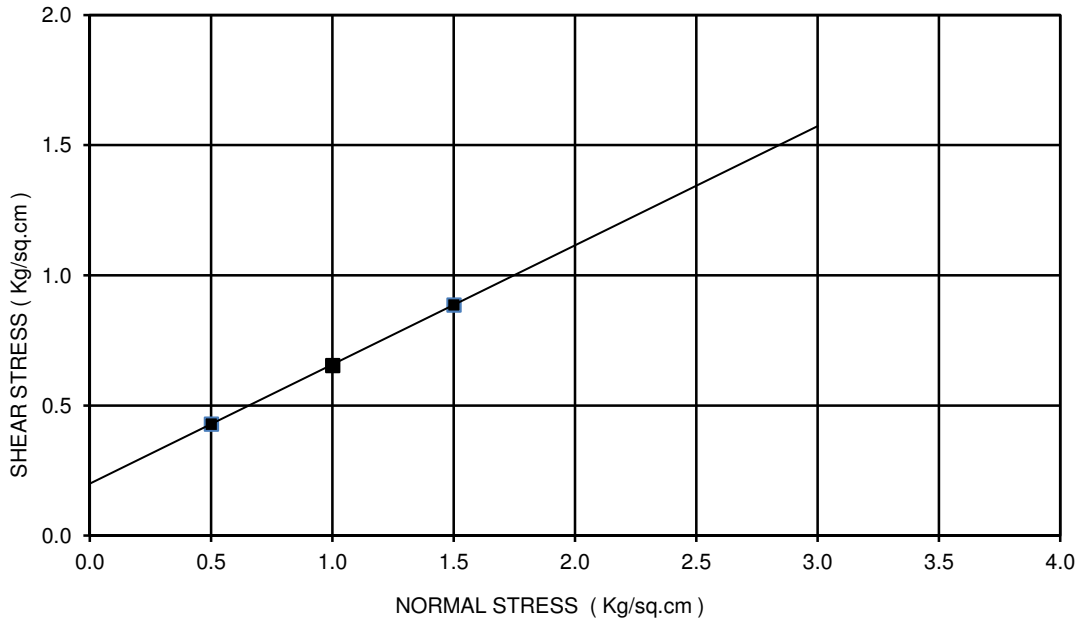
Ch. 58+497
 BORE HOLE NO: BH-P3
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



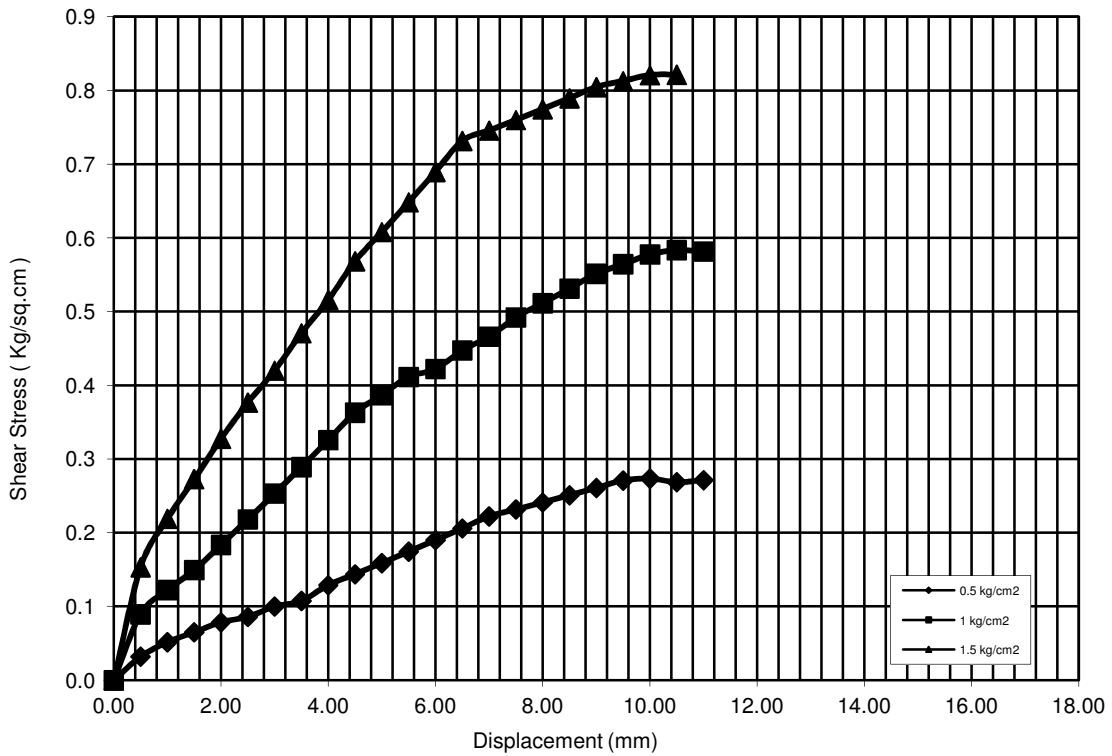
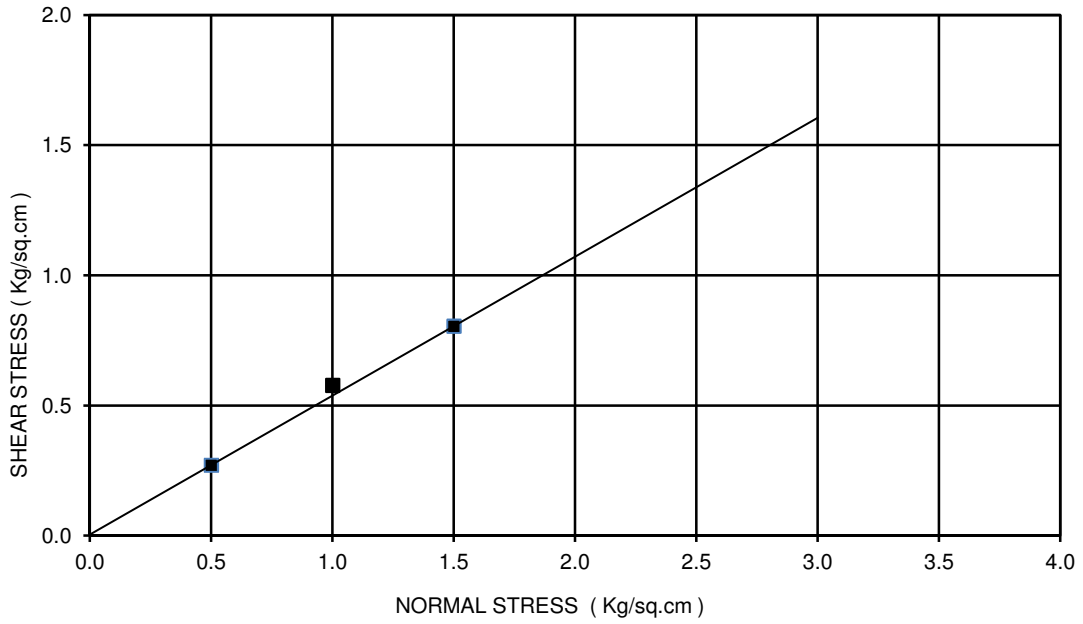
Ch. 58+497
 BORE HOLE NO: BH-P4
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



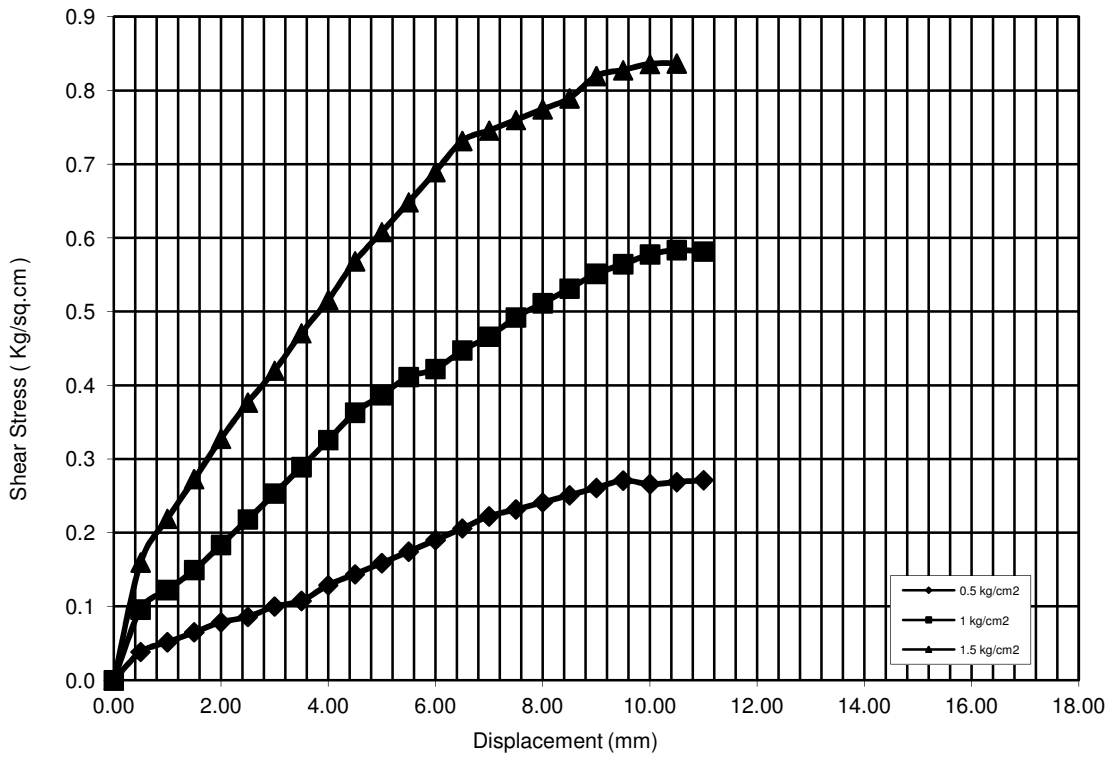
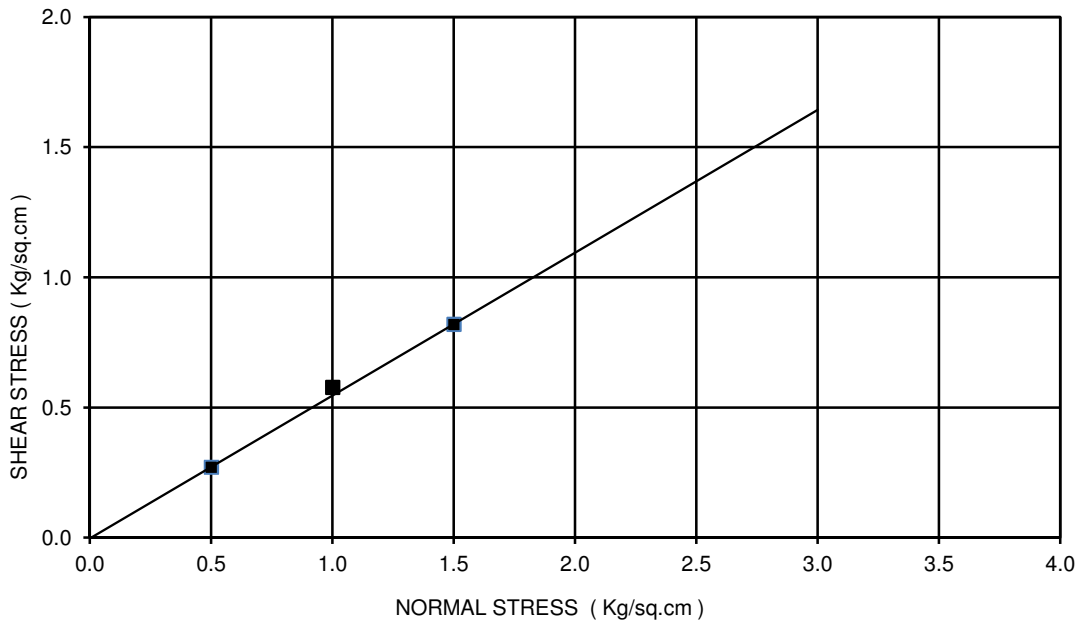
Ch.58+497
 BORE HOLE NO: BH-P4
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



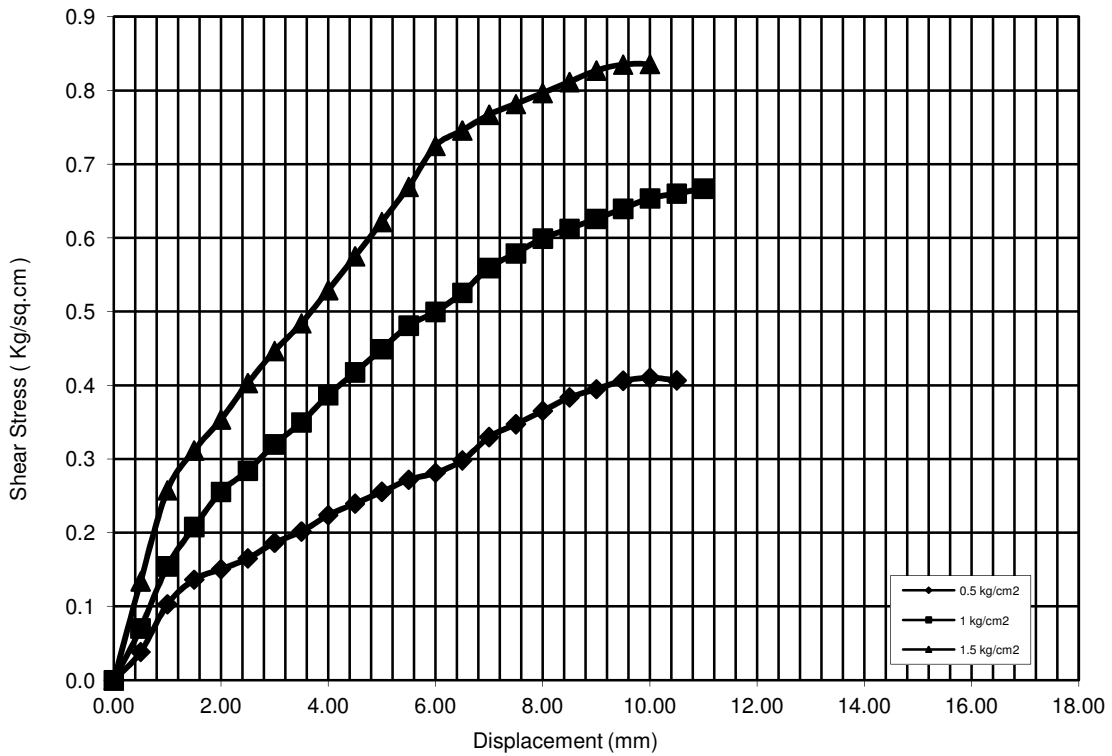
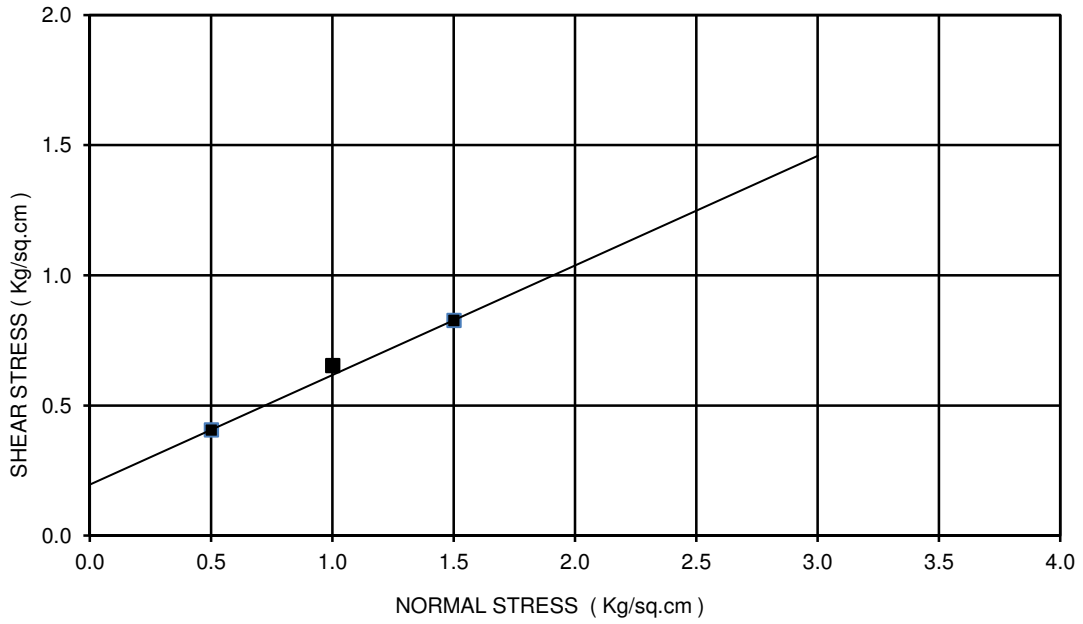
Ch. 58+497
 BORE HOLE NO: BH-P5
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



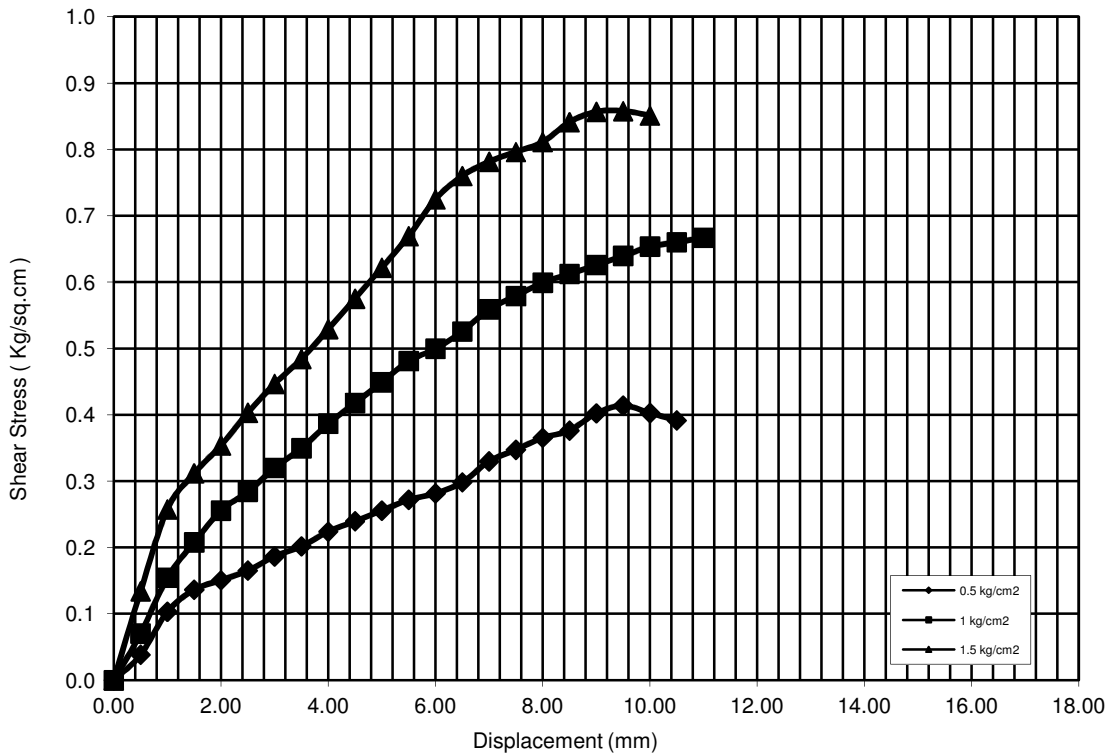
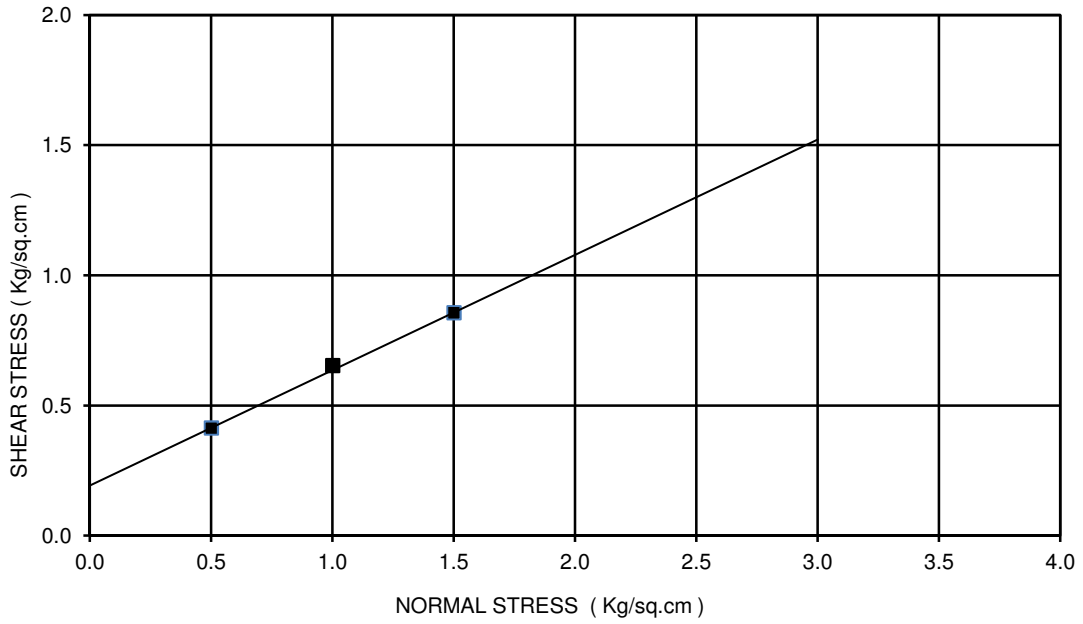
Ch. 58+497
 BORE HOLE NO: BH-P5
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



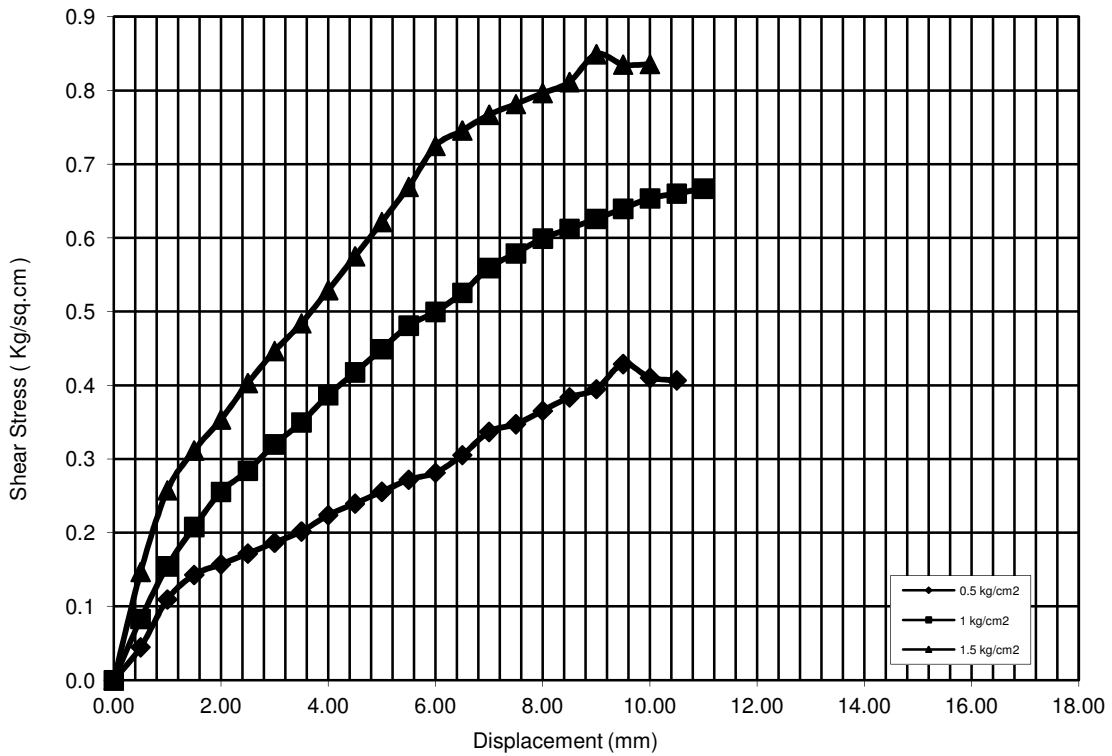
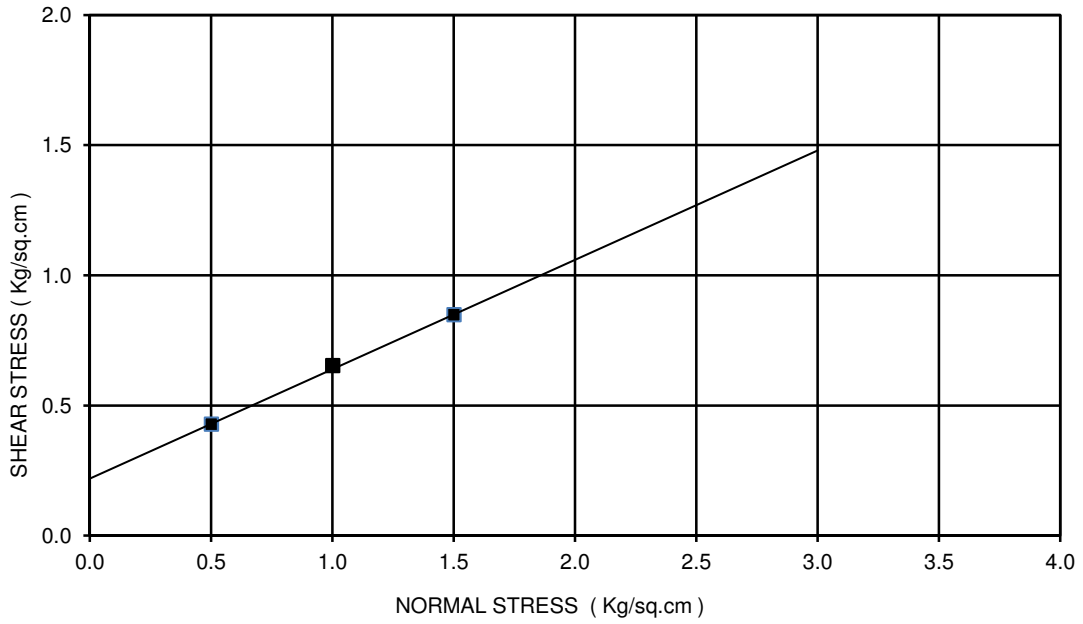
Ch. 58+497
 BORE HOLE NO: BH-P6
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



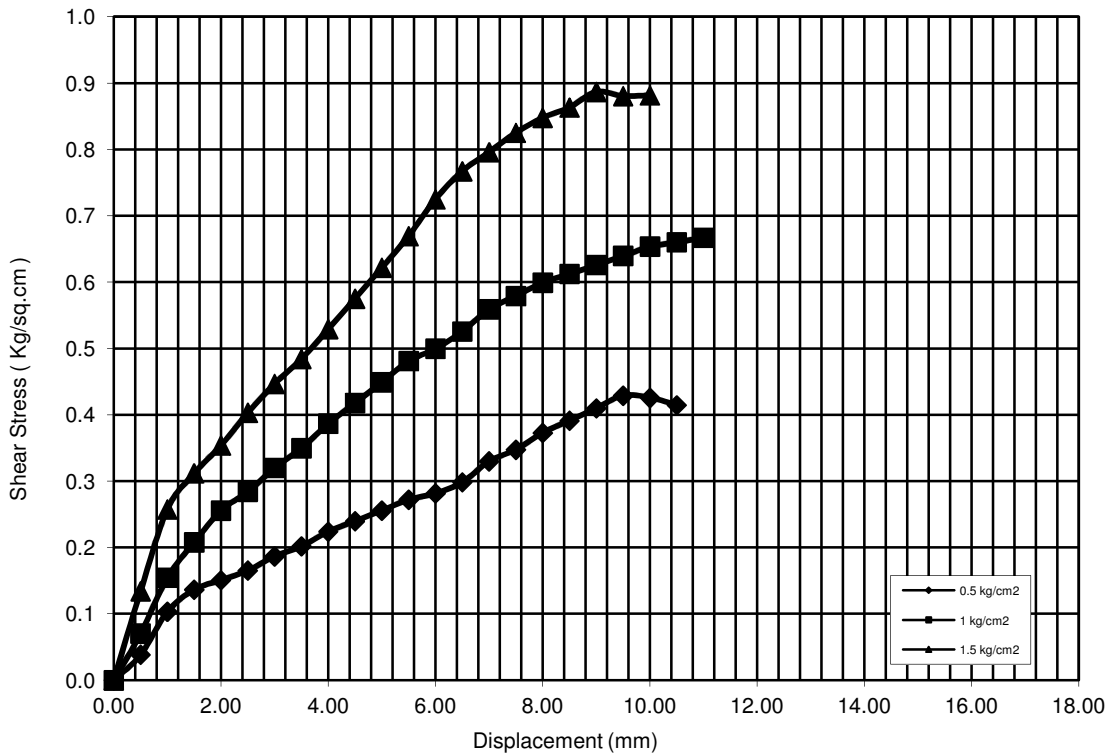
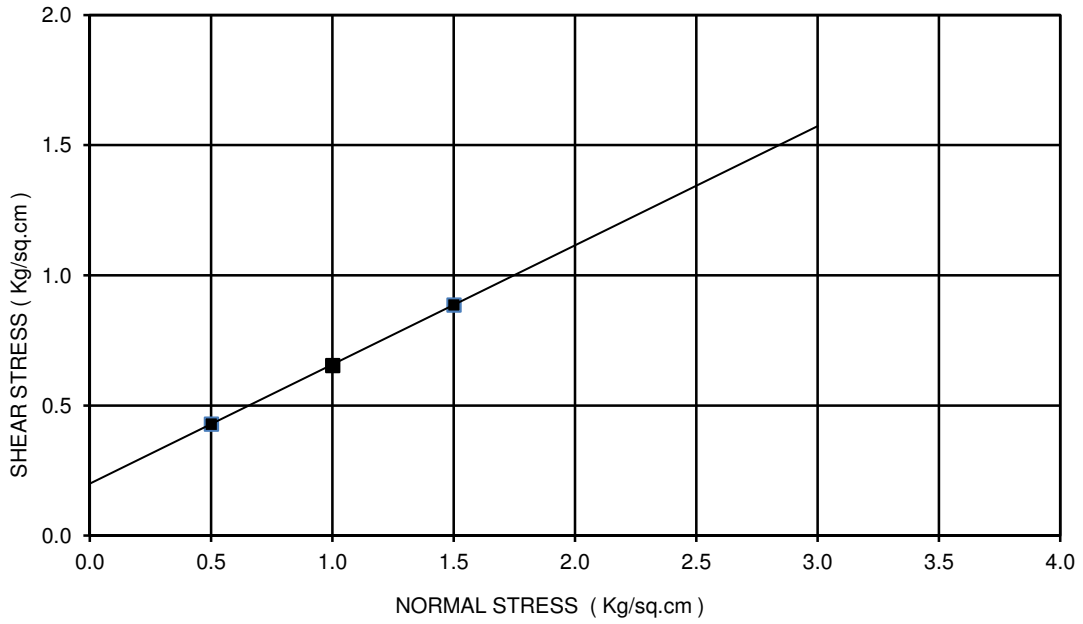
Ch. 58+497
 BORE HOLE NO: BH-P6
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



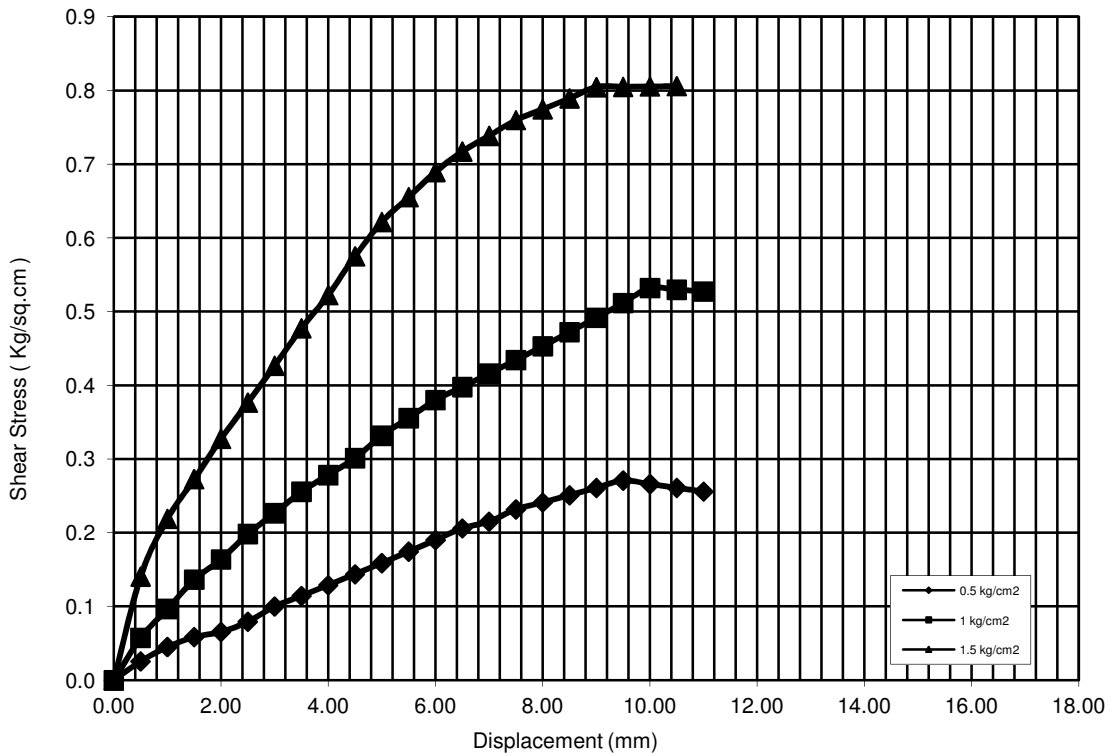
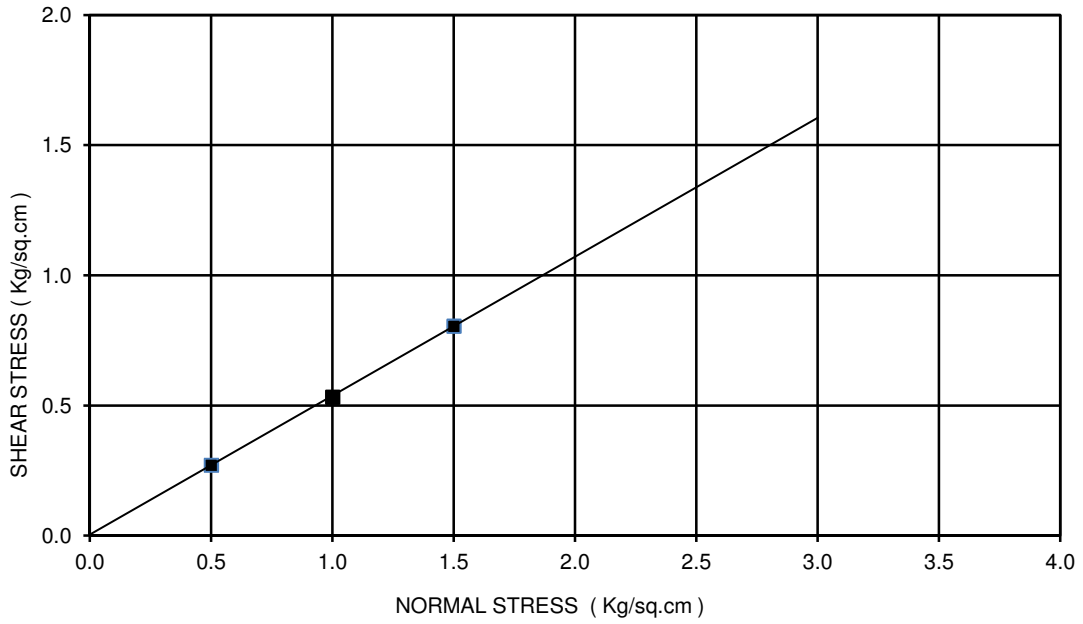
Ch. 58+497
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



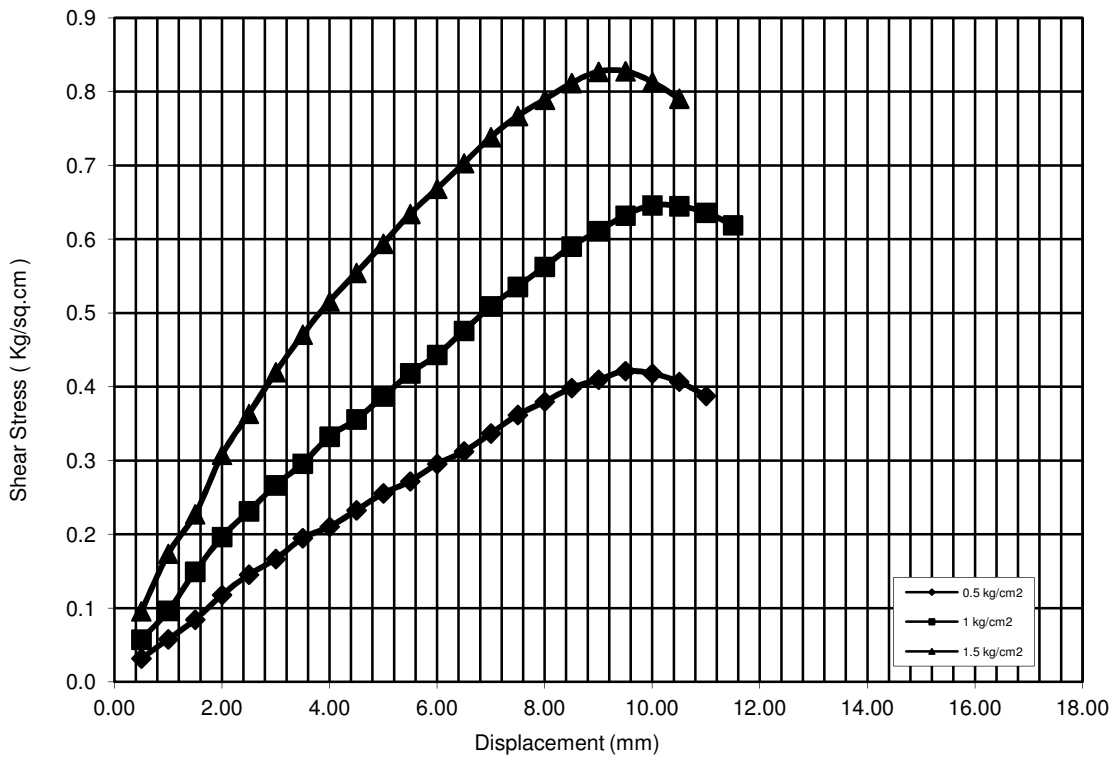
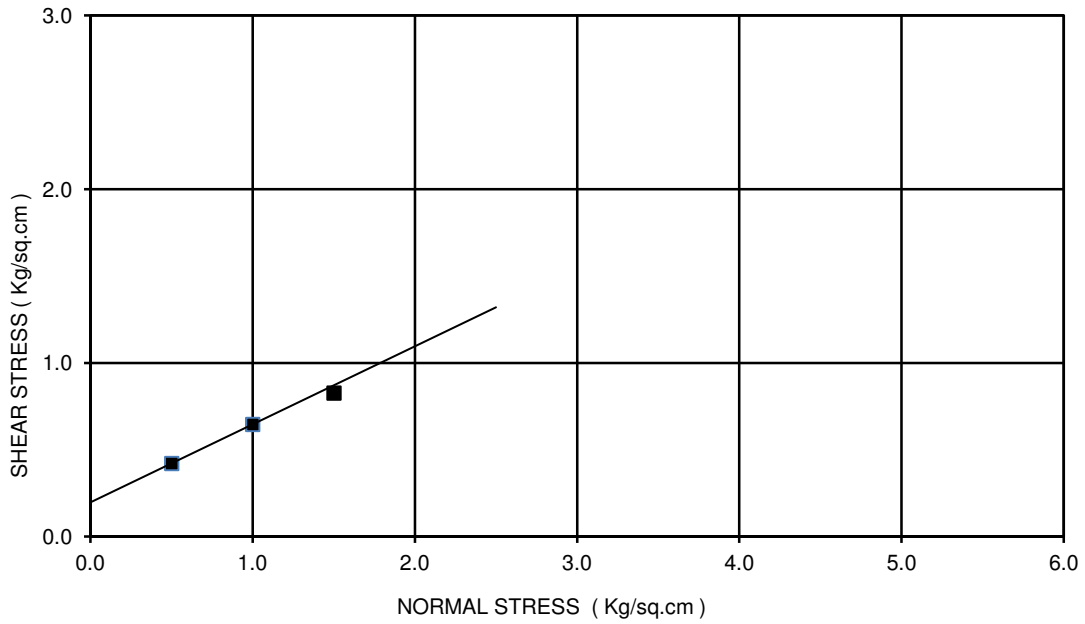
Ch. 58+497
 BORE HOLE NO: BH-A2
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



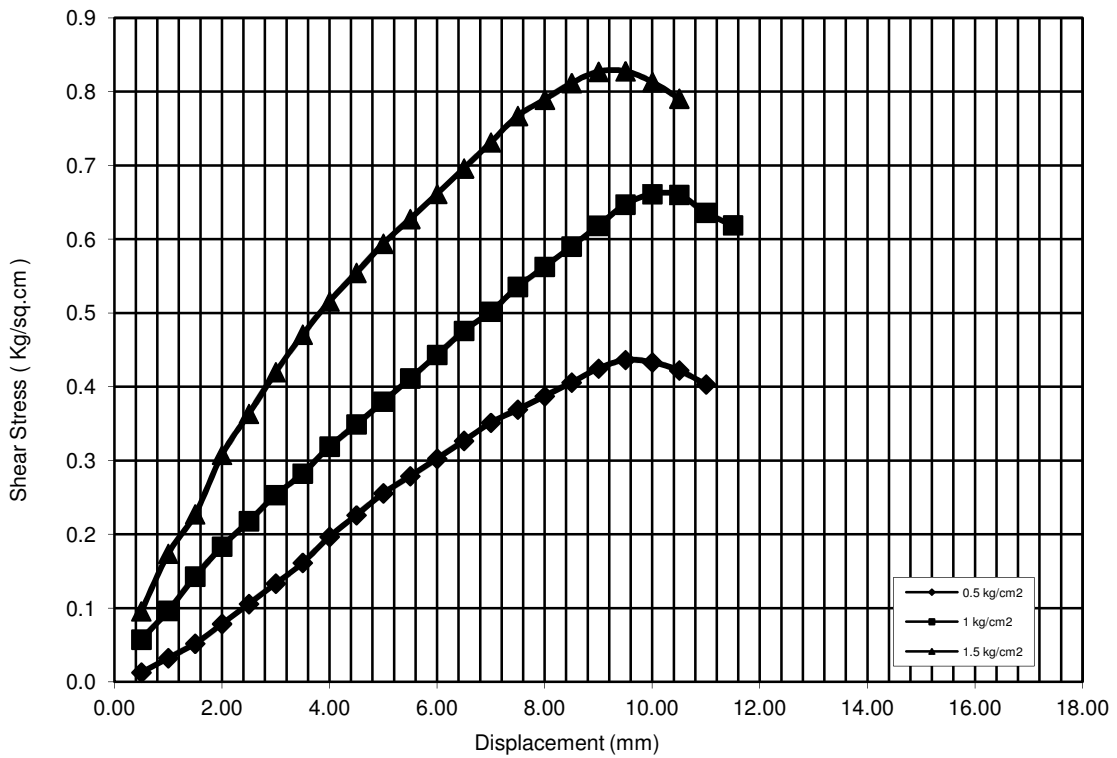
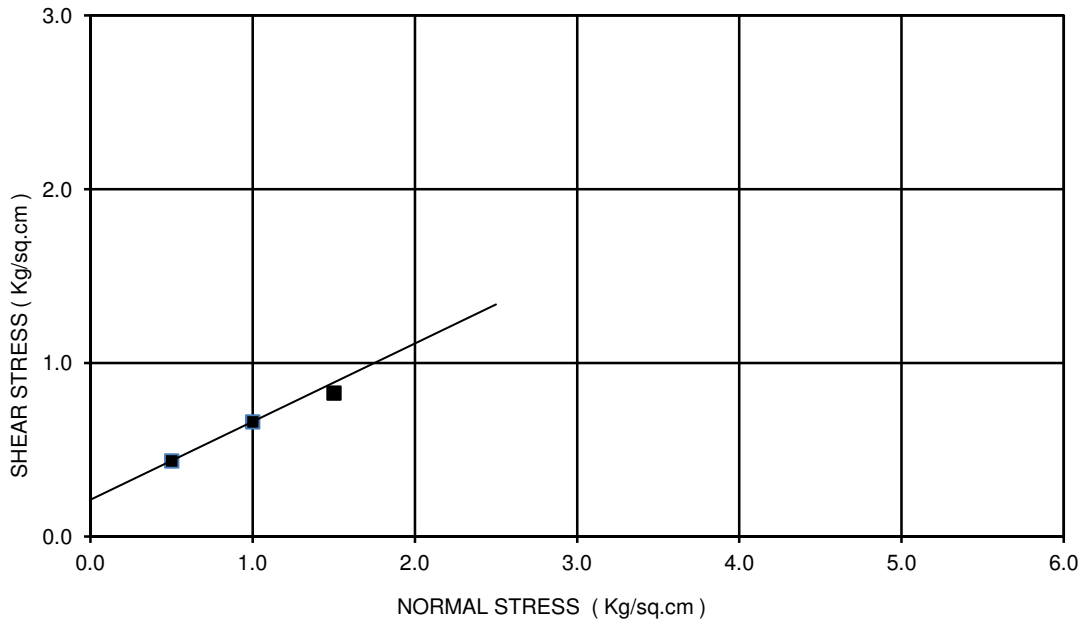
Ch. 58+837
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 28 deg
 TYPE OF THE TEST: DST



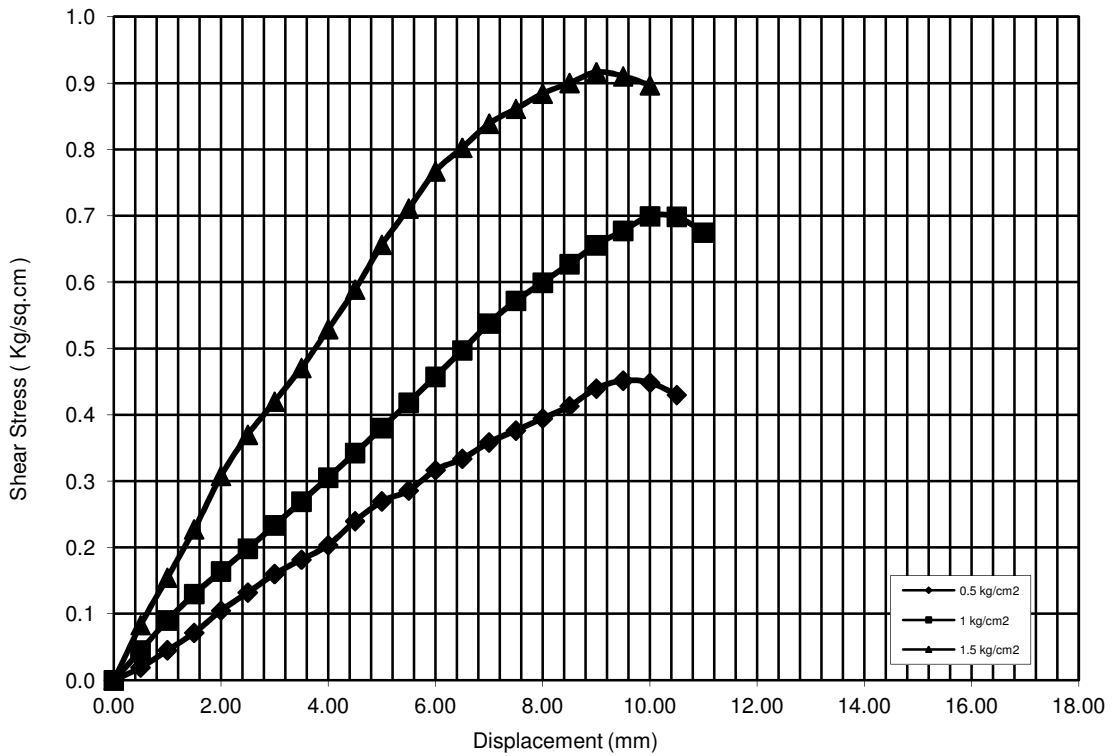
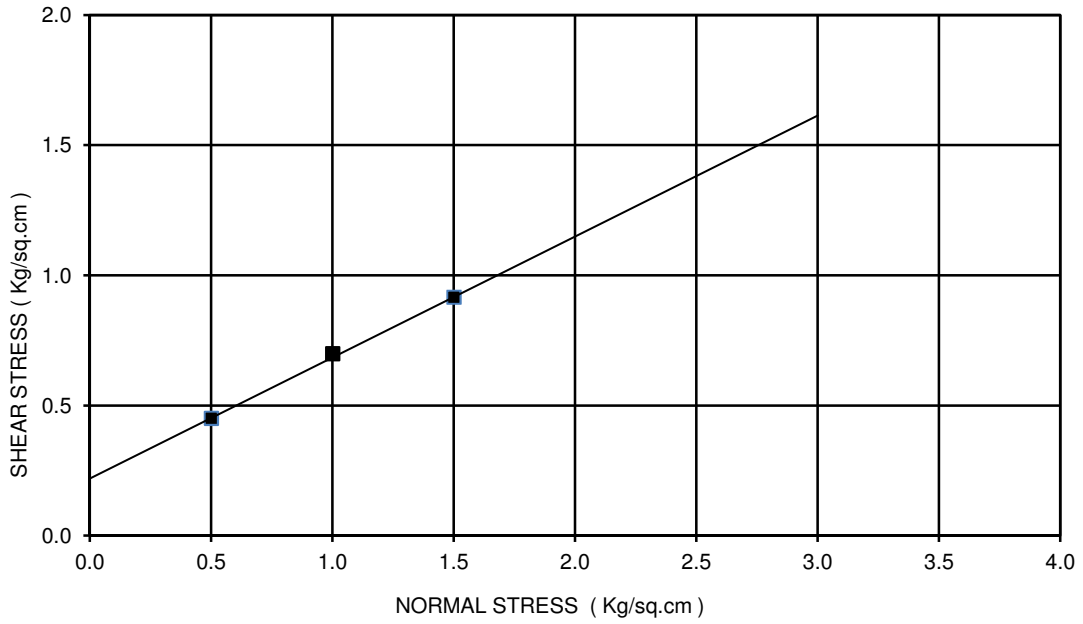
Ch. 59+071
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



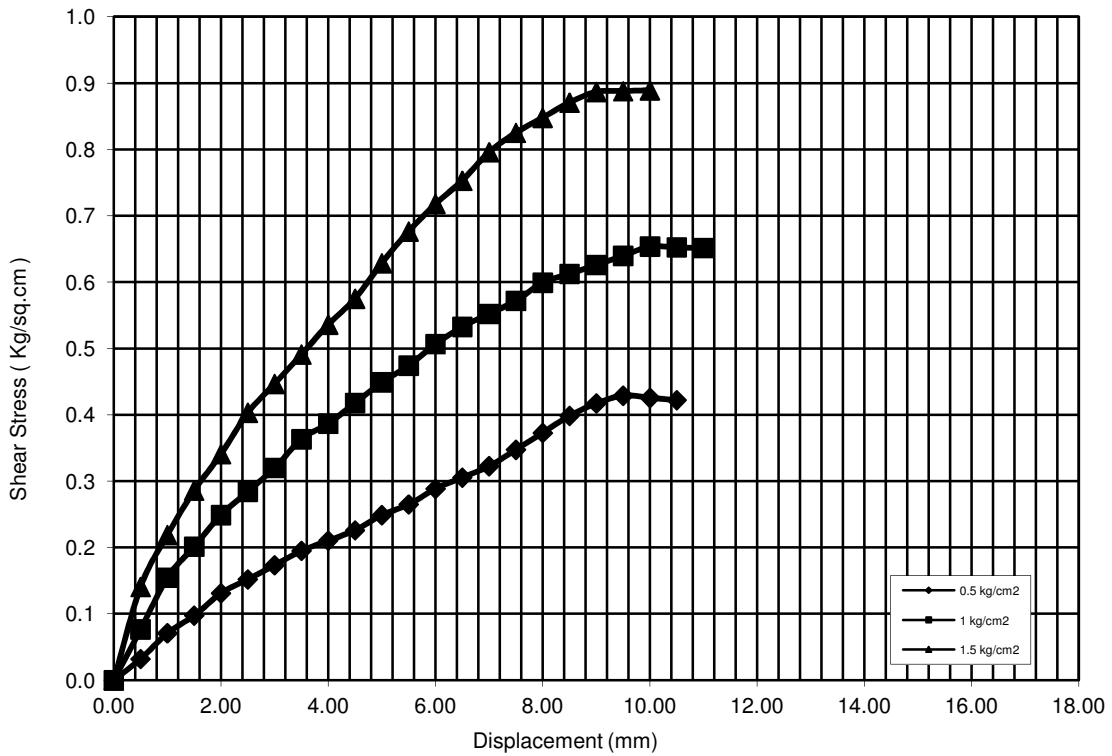
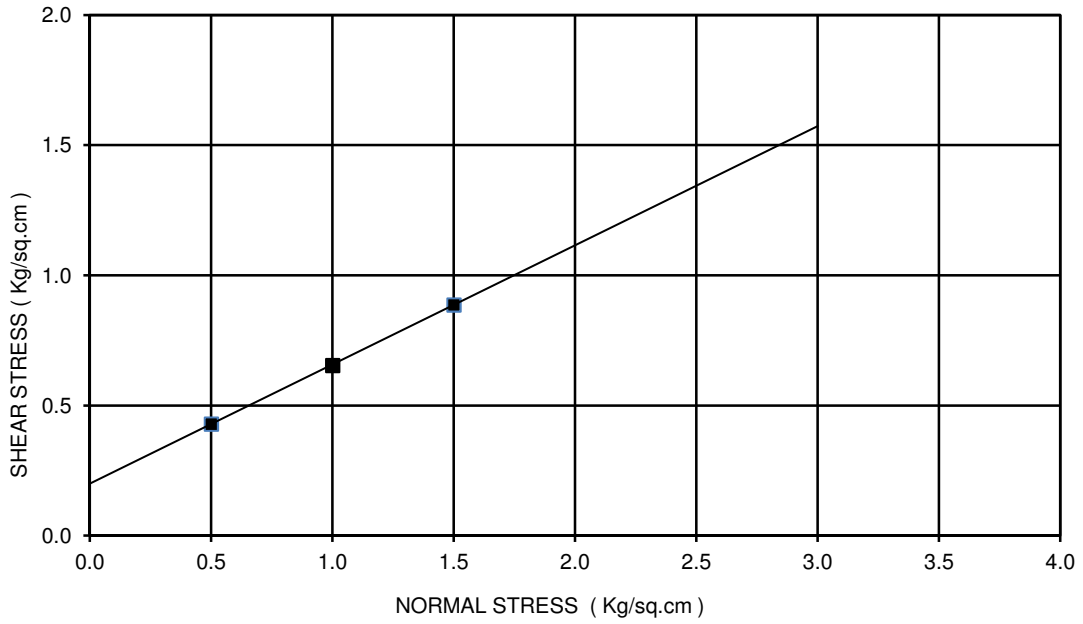
Ch. 59+206
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



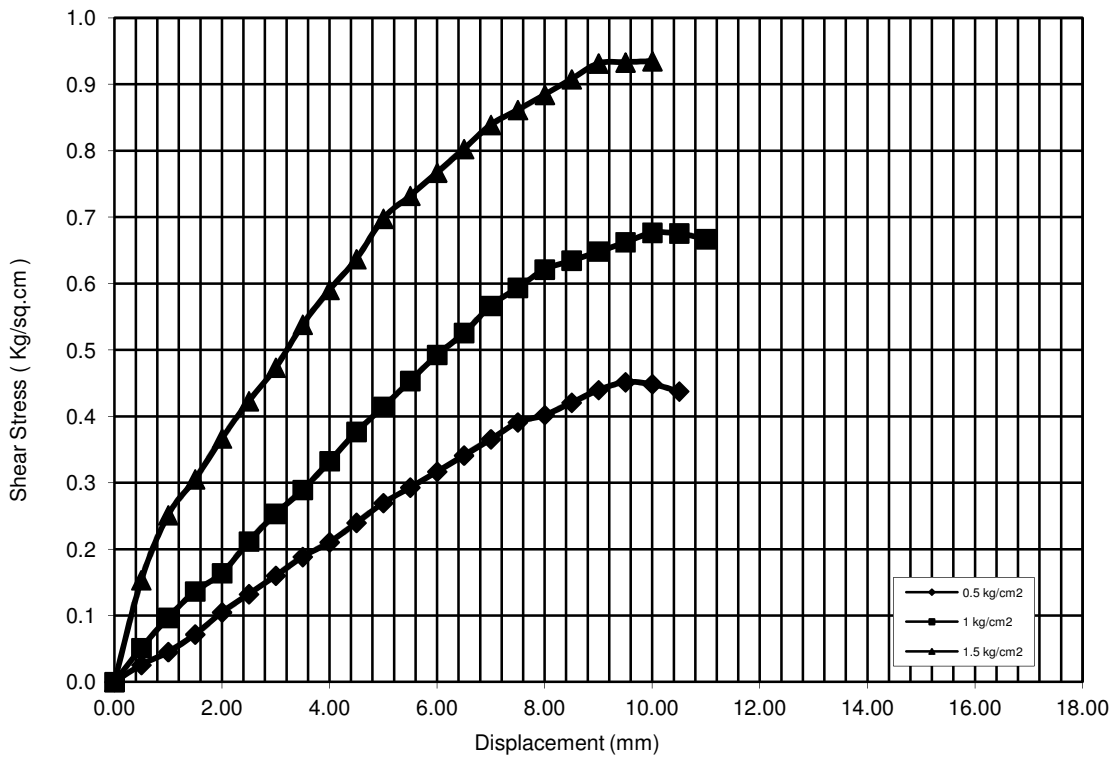
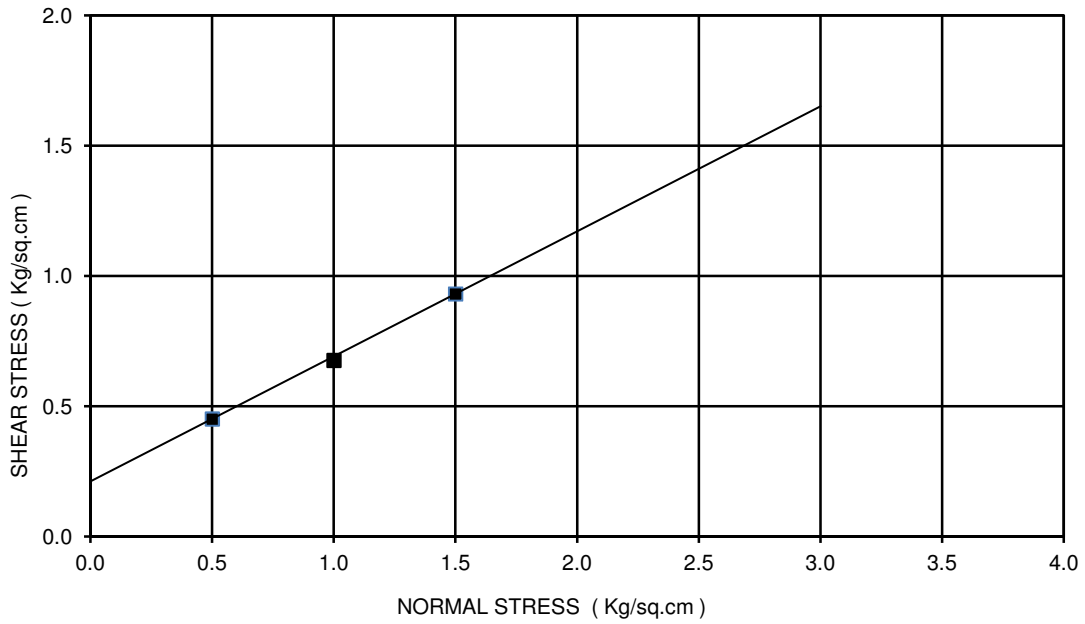
Ch. 59+206
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST

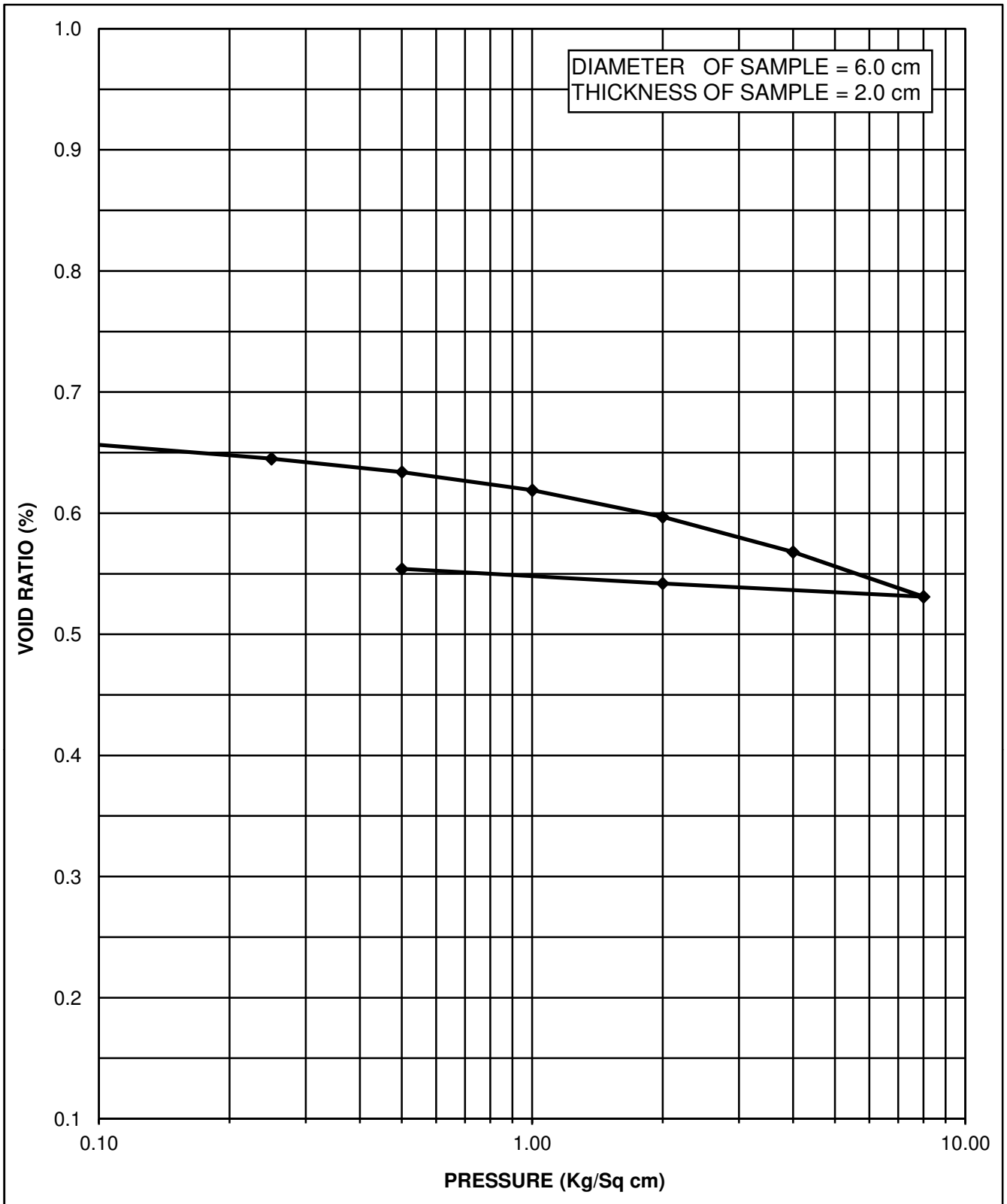


Ch. 59+270
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



Ch. 59+270
 BORE HOLE NO: BH-CL
 SAMPLE NO.: UDS-2
 DEPTH: 5.50 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST





CHAINAGE:-58+497

INITIAL WATER CONTENT = 15.10 %

BORE HOLE NO. = BH-P1

DRY DENSITY = 1.62 gm/cm³

SAMPLE NO. = UDS-3

VOID RATIO (e_0) = 0.655

DEPTH = 7.00 M

COMPRESSION INDEX (C_c) = 0.123

TYPE OF SOIL = CL

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 58+497
 BORE HOLE NO. = BH-P1
 SAMPLE NO. = UDS-3
 DEPTH = 7.00 M

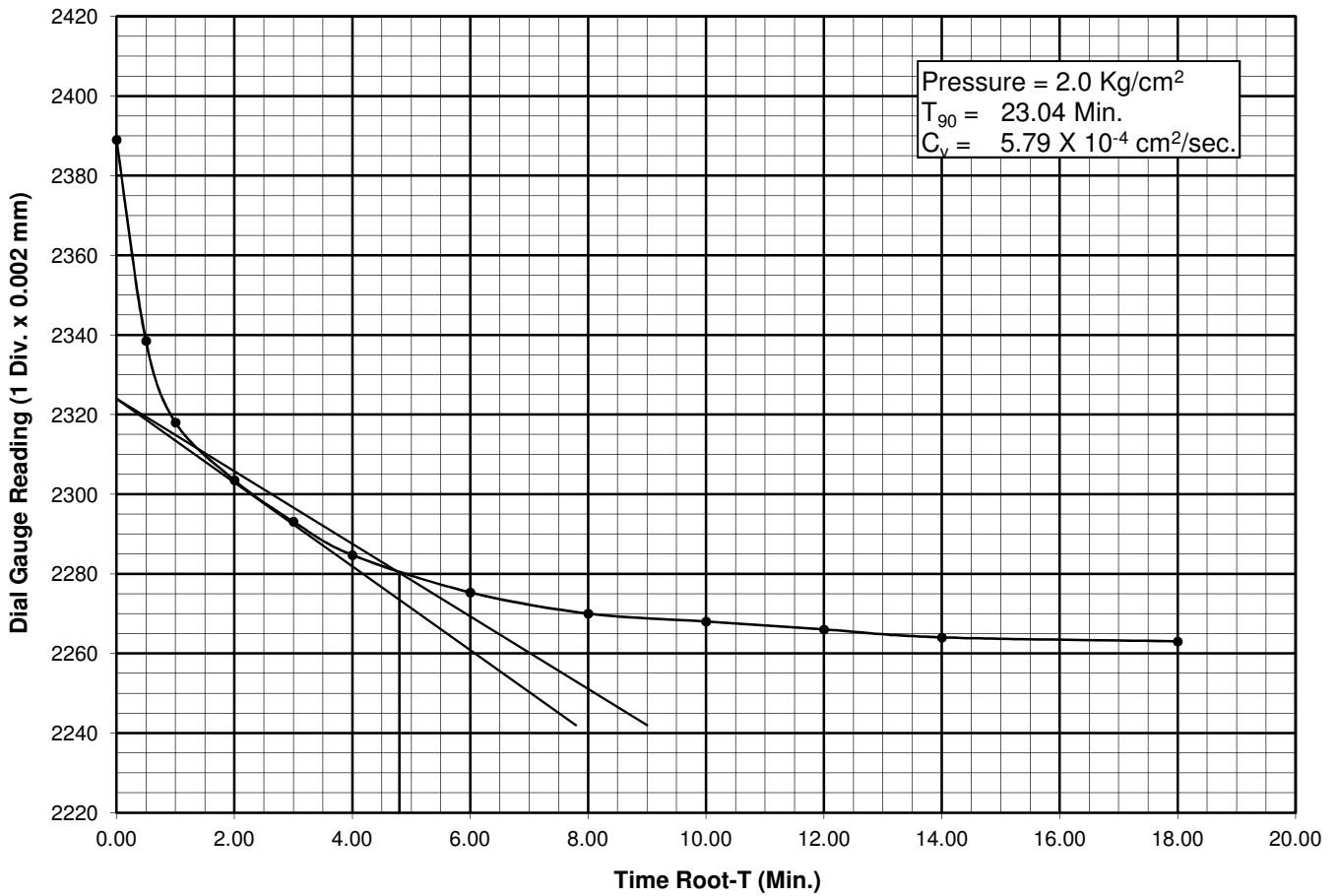
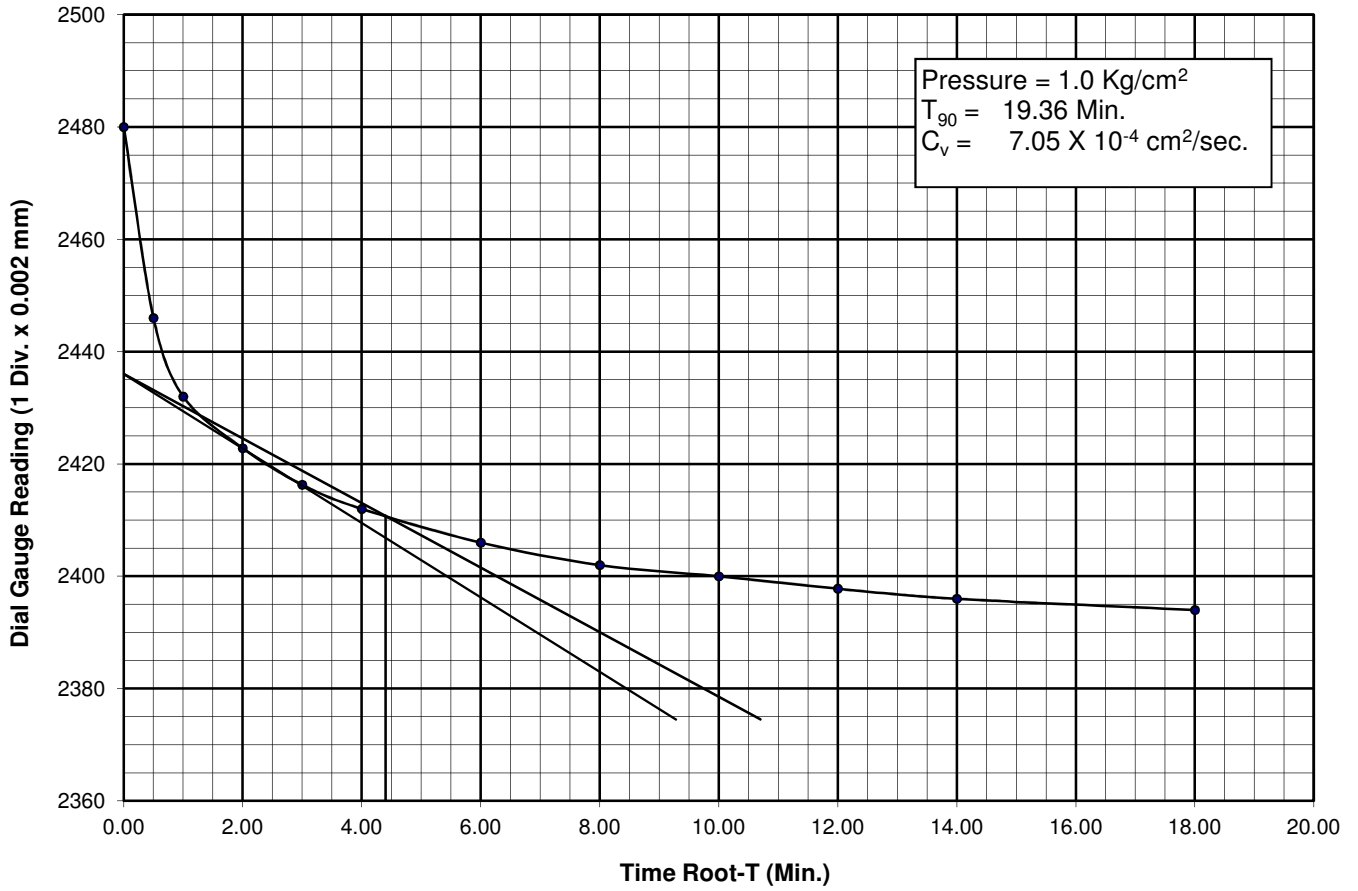


Figure No. -

CHAINAGE = 58+497
 BORE HOLE NO. = BH-P1
 SAMPLE NO. = UDS-3
 DEPTH = 7.00 M

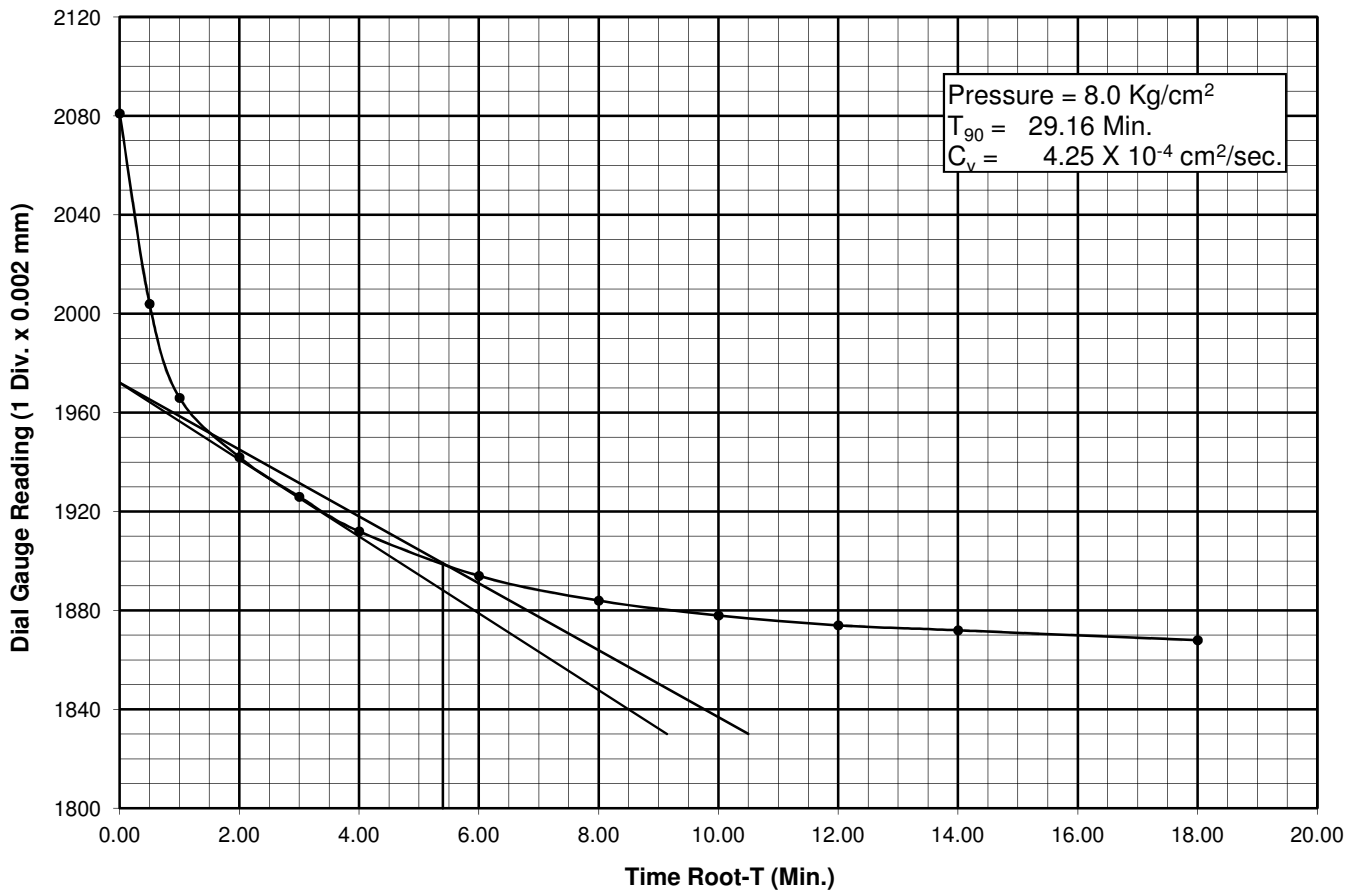
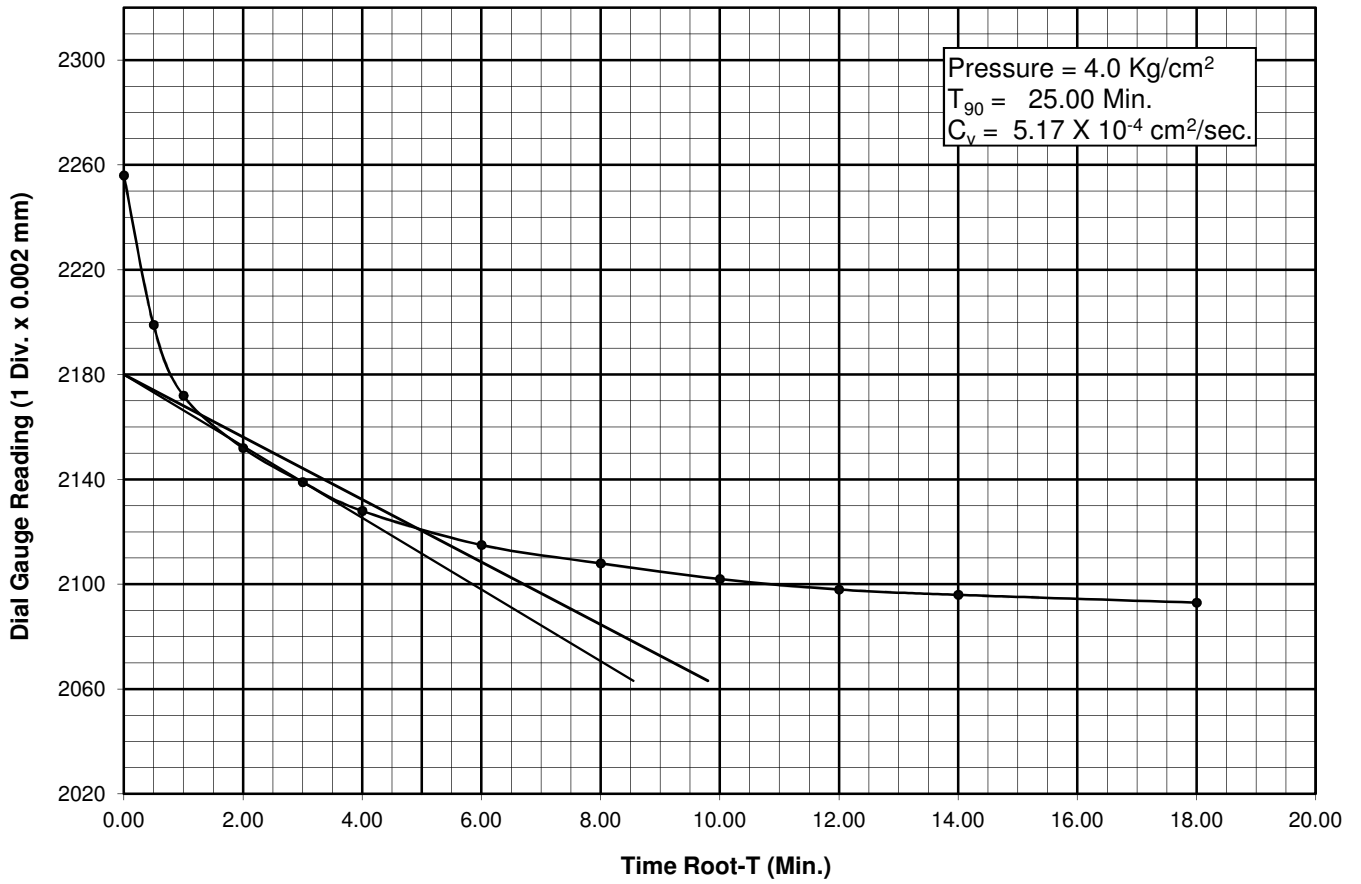
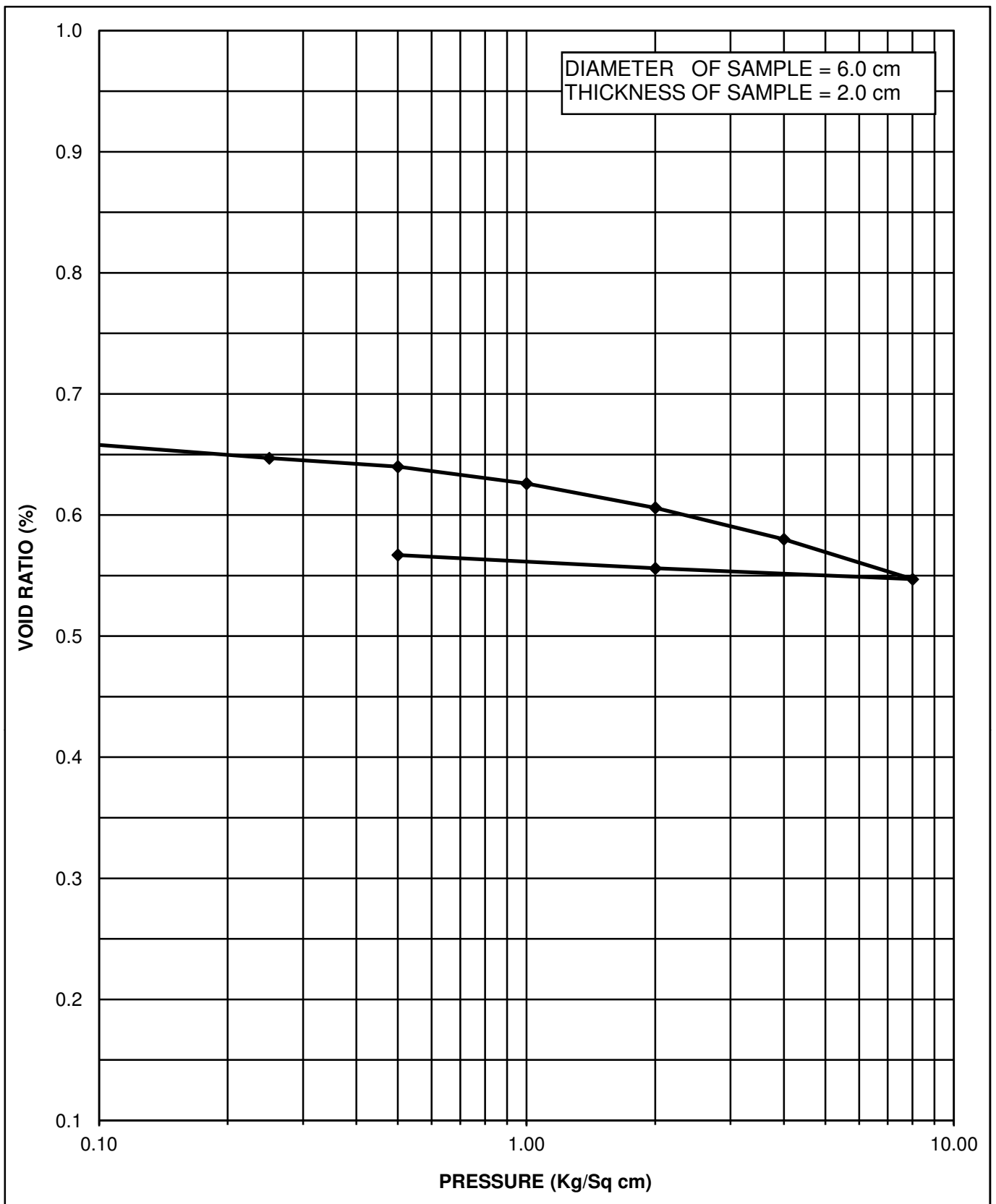


Figure No. -



CHAINAGE = 58+497

INITIAL WATER CONTENT = 17.48 %

BORE HOLE NO. = BH-P6

DRY DENSITY = 1.62 gm/cm³

SAMPLE NO. = UDS-4

VOID RATIO (e_0) = 0.655

DEPTH = 10.00 M

COMPRESSION INDEX (C_c) = 0.110

TYPE OF SOIL = CL

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 58+497
 BORE HOLE NO. = BH-P6
 SAMPLE NO. = UDS-4
 DEPTH = 10.00 M

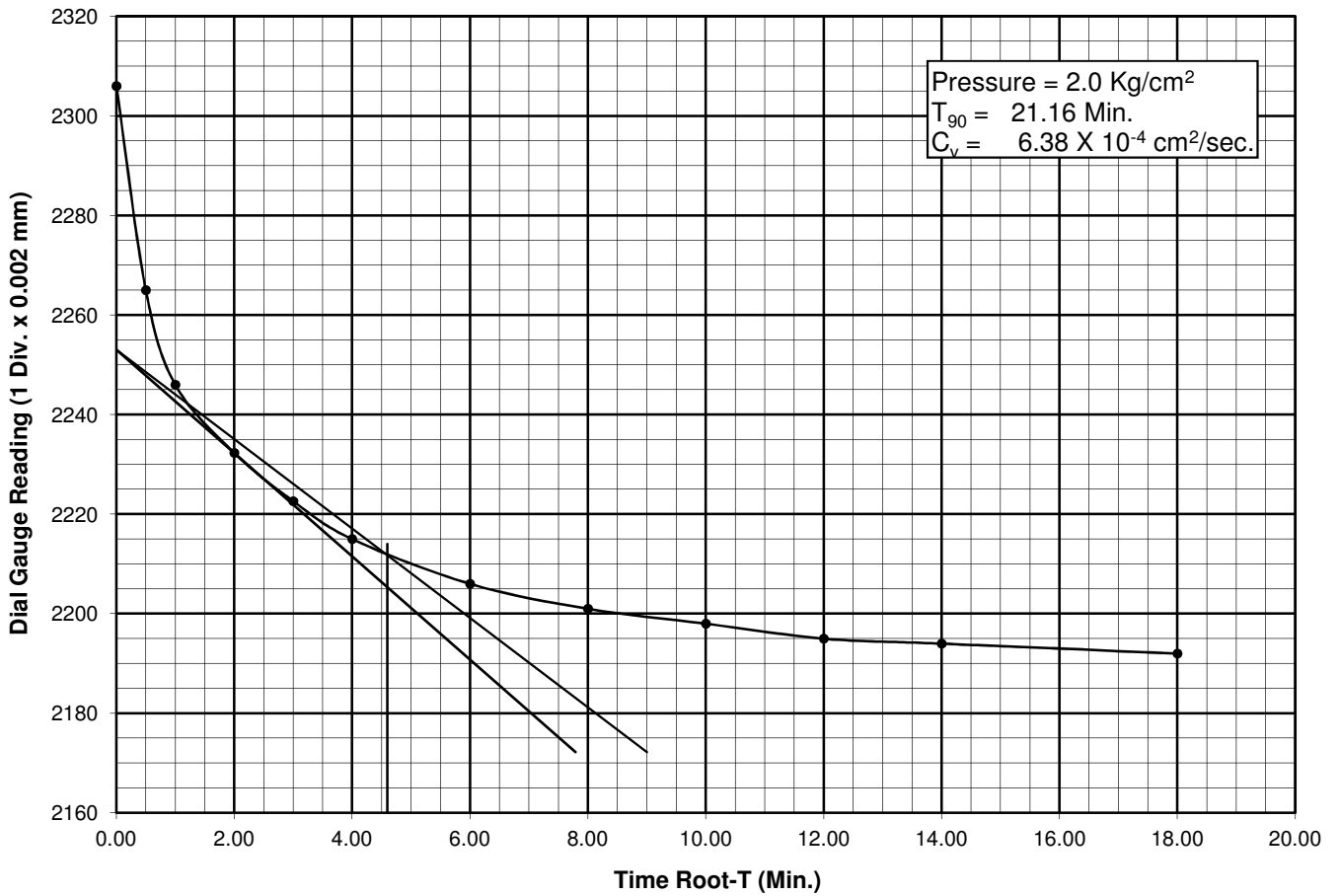
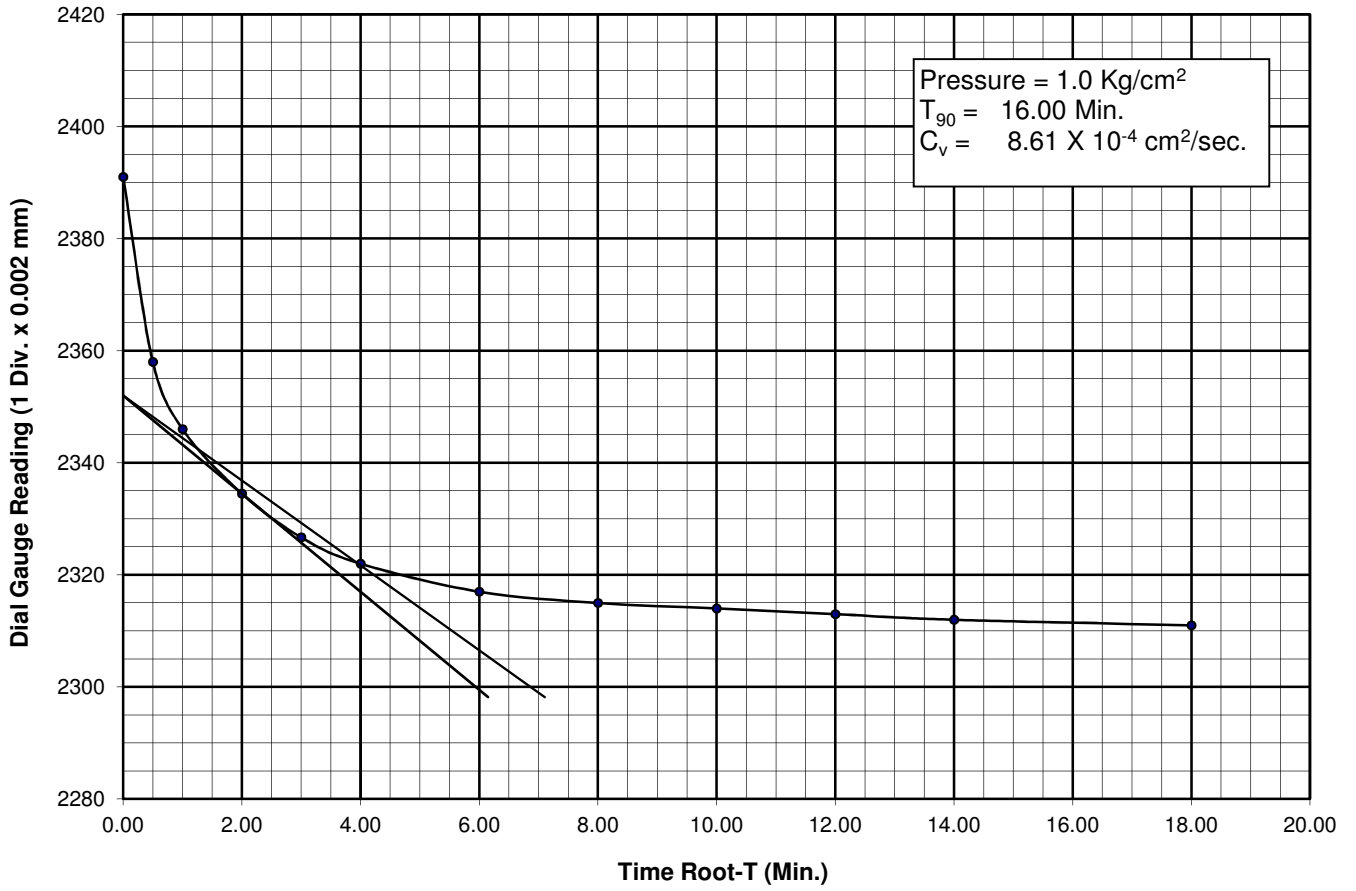


Figure No. -

CHAINAGE = 58+497
 BORE HOLE NO. = BH-P6
 SAMPLE NO. = UDS-4
 DEPTH = 10.00 M

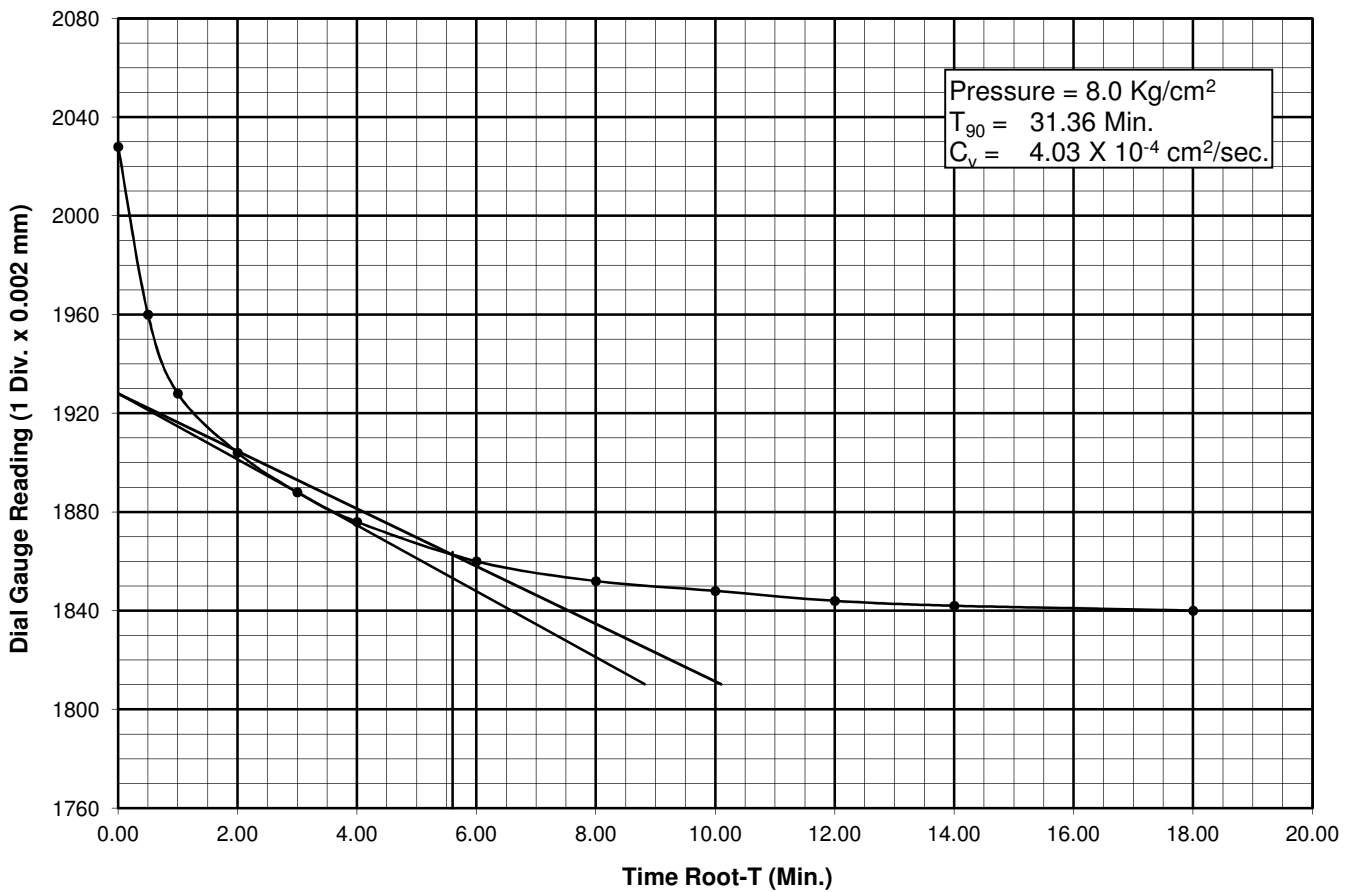
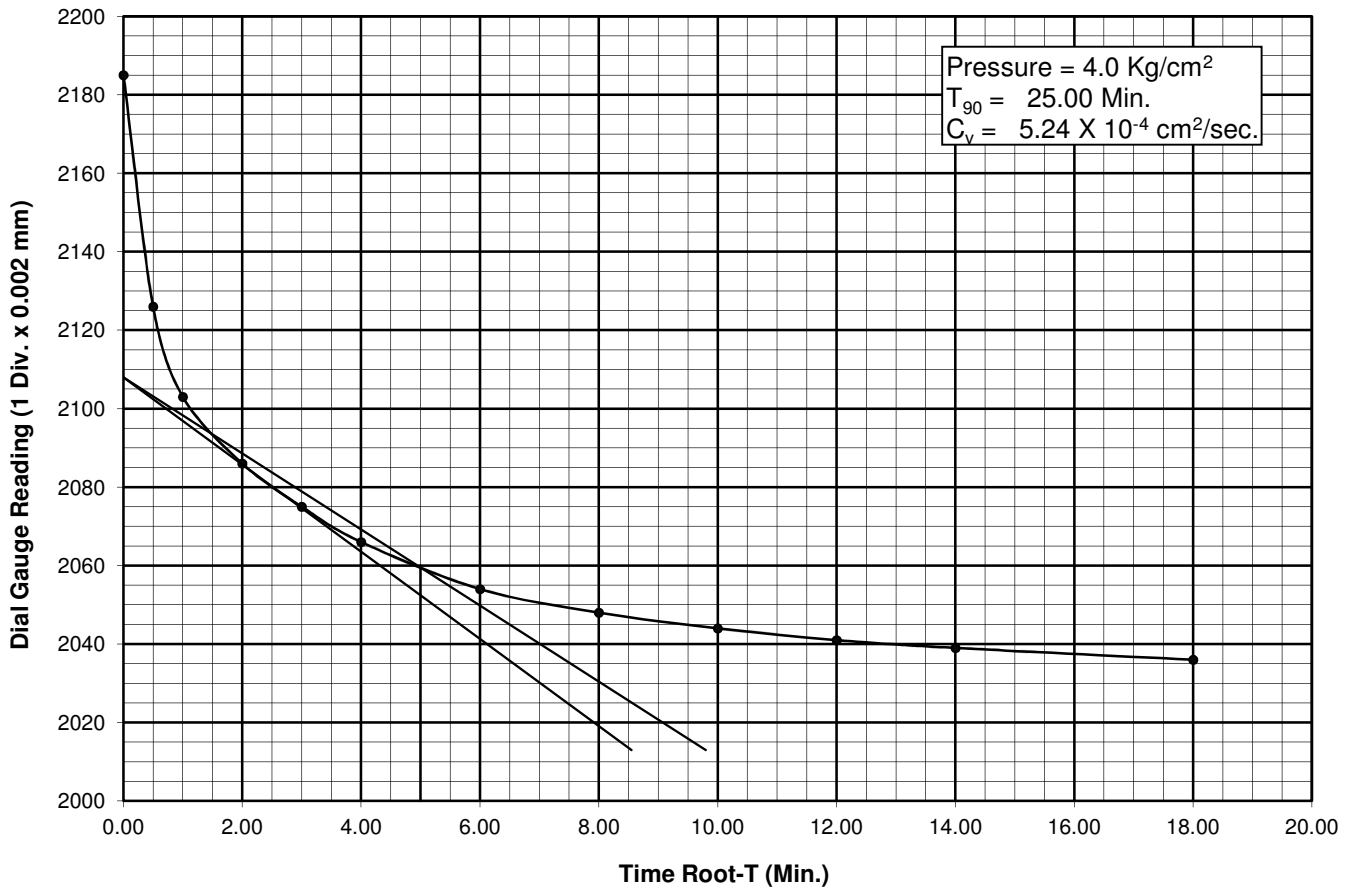


Figure No. -

APPENDIX – C (ANALYSIS & RECOMENDATION)

Appendix No.	ITEMS
C-1	SAMPLE CALCULATIONS FOR COMPUTATION OF ALLOWABLE BEARING CAPACITY OF SUB-STRATA FOR SHALLOW FOUNDATION
C-2	SAMPLE CALCULATION FOR COMPUTATION OF SAFE LOAD CARRYING CAPACITY OF NORMAL BORED CAST-IN-SITU RCC PILE IN COMPRESSION & UPLIFT
C-3	SAMPLE CALCULATION FOR COMPUTATION OF SAFE LOAD CARRYING CAPACITY OF NORMAL BORED CAST-IN-SITU RCC PILE IN LATERAL

Calculation of SBC for shallow foundations as per IS : 6403 - 1981			
INPUT DATA		CH. (KM) :- 53+107	
		BH NO. :- BH-CL	
Type of footing		Square	3
1	Continuous Strip		
2	Rectangular		
3	Square		
4	Circular		
Angle of internal friction (ϕ°)		24.00	
Cohesion (c in t/m^2)		2.10	
Void ratio (e), $e = (G \cdot \gamma_w / \gamma_d) - 1$		0.71	
Direction of load with vertical ($^\circ$)		0.00	
Density of foundation soil (t/m^3) γ_{bulk}		1.74	
Depth of water table (m)		15.00	
Factor of safety		2.50	
S.no.	Depth (m) of footing (D_f) below EGL	Width (m)	
1	1.00	6.20	
2	1.50	6.20	
3	2.00	6.20	
SHEAR FAILURE CRITERIA			
Assumptions and formula used in calculation as per IS:6403-1981 are given below -			
NOTE: The type of failure used for bearing capacity analysis depends upon the value of void ratio (see IS 6403 : 1981, Page No. 9, Table No. 3).			
The ultimate net bearing capacity in case of general shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$			
The ultimate net bearing capacity in case of local shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q'_d = (2/3) c N'_c s'_c d'_c i'_c + q (N'_q - 1) s'_q d'_q i'_q + (1/2) B \gamma N'_\gamma s'_\gamma d'_\gamma i'_\gamma W'$			
Where,			
$d_c = 1 + 0.2 (D_f/B) \cdot \text{SQRT}(N_\phi)$		(from IS 6403 : 1981, page No. 9)	
$d_q = d_\gamma = 1$ for $\phi < 10^\circ$			
$d_q = d_\gamma = 1 + 0.1 (D_f/B) \cdot \text{SQRT}(N_\phi)$ for $\phi > 10^\circ$			
$N_\phi = \tan^2(\pi/4 + \phi/2)$			
ϕ' is friction angle for local shear failure = $\tan^{-1} (0.67 \tan \phi)$			
OUTPUT			
The computer aided results for shear failure criteria are tabulated below. The results are interpolated values of bearing capacity obtained from general and local shear failure criteria.			

Bearing capacity factors : (from IS 6403 : 1981, page No. 8, Table No. 1)					
ϕ	24.00		ϕ'	16.61	
N_c	19.32		N'_c	12.06	
N_q	9.60		N'_q	4.60	
N_γ	9.44		N'_γ	3.34	
Shape factors : (from IS 6403 : 1981, page No. 8, Table No. 2)					
S.no.	Width(m)		S_c	S_q	S_γ
1	6.20		1.30	1.20	0.80
2	6.20		1.30	1.20	0.80
3	6.20		1.30	1.20	0.80
			1.30	1.20	0.80
			1.30	1.20	0.80
Depth factors : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	d_c	d_q	d_γ
1	1.00	6.20	1.05	1.02	1.02
2	1.50	6.20	1.07	1.04	1.04
3	2.00	6.20	1.10	1.05	1.05
			#VALUE!	#VALUE!	#VALUE!
			#VALUE!	#VALUE!	#VALUE!
			#VALUE!	#VALUE!	#VALUE!
Inclination factors : (from IS 6403 : 1981, page No. 9)					
	$i_c = (1 - \alpha / 90)^2$		$i_q = (1 - \alpha / 90)^2$		$i_\gamma = (1 - \alpha / \phi)^2$
	1.00		1.00		1.00
Water table factor : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	Z_w/B		W'
1	1.00	6.20	2.26		1.00
2	1.50	6.20	2.18		1.00
3	2.00	6.20	2.10		1.00
			#VALUE!		#VALUE!
			#VALUE!		#VALUE!
			#VALUE!		#VALUE!
Safe Bearing Capacity					
S.no.	Depth(m)	Width(m)	SBC in (t/m ²)		
			General shear	Local shear	Recommended
1	1.00	6.20	46.27	18.22	23.87
2	1.50	6.20	50.82	20.10	26.30
3	2.00	6.20	55.46	22.03	28.77
					#VALUE!
					#VALUE!
					#VALUE!

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976														53+107				BH NO. :- BH-CL			
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress Increment at top for cohesionless layer & for mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Water Table Correction Factor	Settlement (mm) for 10 t/m ² (from IS:8009 (Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil S _i (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	5.25	4.25	4.25	1.84	6.20	6.20	4.25	6.20	6.200	1.840	21	1.00	14.90	19.33	19.33	0.97	1.00	25.00		
Layer 2	5.25	10.30	5.05	5.05				12.975	0.420	43	1.00										6.58
Layer 1	1.50	5.25	3.75	3.75	1.96	6.20	6.20	3.75	6.20	6.200	1.957	21	1.00	14.90	18.78	18.78	0.94	1.00	25.00		
Layer 2	5.25	10.50	5.25	5.25				12.575	0.476	43	1.00										7.75
Layer 3	10.50	10.80	0.30	0.30				15.200	0.326	38											0.06
Layer 1	2.00	5.25	3.25	3.25	2.11	6.20	6.20	3.25	6.20	6.200	2.110	21	1.00	14.90	18.13	18.13	0.91	1.00	25.00		
Layer 2	5.25	10.50	5.25	5.25				12.075	0.556	43	1.00										9.06
Layer 3	10.50	11.30	0.80	0.80				14.700	0.375	38	1.00										0.20

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 22.00 m												Bore Hole No = BH-A1			Ch. (KM) 52+518			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 18.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap cm ²	qs	Qp								
		from (m)	to (m)	c	Ø	deg	k	α	γ _{eff} gm/cc	ΔL	cm								pd (s.f) kg/cm ²	γ _{eff} gm/cc	c	Ø	deg			
1.00	2.00	0.00	2.00	0.19	29	1.72	200	0.17																		
1.00	5.50	2.00	5.50	0.74	5	1.72	350	0.64	1.00	1.00	1.72	200	0.17				60.14	314.29								
1.00	13.00	5.50	13.00	0.74	5	1.78	750	1.61	1.00	0.62	1.78	750	1.61				140.90	314.29								
1.00	15.00	13.00	15.00	1.12	4	1.85	200	2.46	1.00	0.40	1.85	200	2.46				38.68	314.29								
1.00	16.00	15.00	16.00	1.12	4	1.85	100	2.65	1.00	0.40	1.85	100	2.65				19.75	314.29								
1.00	18.00	16.00	18.00	0.21	30	1.87	200	2.65	1.00	1.00	1.87	200	2.65				109.40	314.29								
1.00	18.00	18.00	24.00	0.21	30	0.87	600	2.65	1.00	1.00	0.87	600	2.65	0.84	0.23	29	9	17.93	7857.14	314.29	395.97					

Qu,comp. =	qs + Qp	Qu,uplift =	Safe Frictional Resistance + Weight of Pile
Qa,comp. =	(697.07 + 395.97) / 2.5	Qa,uplift =	697.07 / 3 + 43.2
Qa,comp. =	437.22 T	Qa,uplift =	275.55 T
Qa,comp. =	437.00 T	Qa,uplift =	275.00 T

Say

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 24.00 m												Bore Hole No = BH-A1			Ch. (KM) 52+518			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 18.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap	qs	Qp								
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)								y _{eff}	c	Ø					
1.00	2.00	0.00	2.00																							
1.00	5.50	2.00	5.50	0.19	29	1.00	1.00	1.72	200	0.17								60.14								
1.00	13.00	5.50	13.00	0.74	5	1.00	0.62	1.78	750	0.64								140.90								
1.00	15.00	13.00	15.00	1.12	4	1.00	0.40	1.85	200	1.61								38.68								
1.00	16.00	15.00	16.00	1.12	4	1.00	0.40	1.85	100	2.46								19.75								
1.00	18.00	16.00	18.00	0.21	30	1.00	1.00	1.87	200	2.65								109.40								
1.00	25.00	18.00	25.00	0.21	30	1.00	1.00	0.87	700	2.65								382.90								
1.00	26.00	25.00	26.00	0.23	29	1.00	1.00	0.84	100	2.65	0.84	0.23	29	17.93	19.34	7857.14		53.41	395.97							

Q _{u,comp.} =	qs + Qp	Q _{u,uplift} =	Safe Frictional Resistance + Weight of Pile
Q _{a,comp.} =	(805.18 + 395.97) / 2.5	Q _{a,uplift} =	805.18 / 3 + 47.12
Q _{a,comp.} =	480.46 T	Q _{a,uplift} =	315.52 T
Say		Q_{a,uplift} = 315.00 T	

*FOS for Vertical Capacity of pile in compression = 2.5
**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 26.00 m												Bore Hole No = BH-A1			Ch. (KM) 52+5.18			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 18.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap cm ²	qs	t	Qp	t						
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)										y _{eff}	c	Ø			
1.00	2.00	0.00	2.00																							
1.00		2.00	5.50	0.19	29	1.00	1.00	1.72	200	0.17											60.14					
1.00		5.50	13.00	0.74	5	1.00	0.62	1.78	750	0.64											140.90					
1.00		13.00	15.00	1.12	4	1.00	0.40	1.85	200	1.61											38.68					
1.00		15.00	16.00	1.12	4	1.00	0.40	1.85	100	2.46											19.75					
1.00		16.00	18.00	0.21	30	1.00	1.00	1.87	200	2.65											109.40					
1.00		18.00	25.00	0.21	30	1.00	1.00	0.87	700	2.65											382.90					
1.00		25.00	28.00	0.23	29	1.00	1.00	0.84	300	2.65	0.84	0.23	29	17.93	19.34	7857.14					160.23					
																					912.00			395.97		
												Q _{u,comp.} = qs + Q _p			Q _{u,uplift} =			Safe Frictional Resistance + Weight of Pile								
												(912 + 395.97) / 2.5			Q _{a,uplift} =			912 / 3 + 51.05								
												523.19 T			Q _{a,uplift} =			355.05 T								
												Say			Q _{a,uplift} =			355.00 T								

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 28.00 m												Bore Hole No = BH-A1			Ch. (KM) 52+5.18			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 18.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap cm ²	qs	Qp								
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)								y _{eff}	c	Ø					
1.00	2.00	0.00	2.00																							
1.00	5.50	2.00	5.50	0.19	29	1.00	1.00	1.72	200	0.17								60.14								
1.00	13.00	5.50	13.00	0.74	5	1.00	0.62	1.78	750	0.64								140.90								
1.00	15.00	13.00	15.00	1.12	4	1.00	0.40	1.85	200	1.61								38.68								
1.00	16.00	15.00	16.00	1.12	4	1.00	0.40	1.85	100	2.46								19.75								
1.00	18.00	16.00	18.00	0.21	30	1.00	1.00	1.87	200	2.65								109.40								
1.00	18.00	18.00	25.00	0.21	30	1.00	1.00	0.87	700	2.65								382.90								
1.00	25.00	25.00	30.00	0.23	29	1.00	1.00	0.84	500	2.65	0.84	0.23	29	17.93	19.34	7857.14		267.05		395.97						
																					1018.82			395.97		
												Q _{u,comp.} = qs + Q _p			Q _{u,uplift} =			Safe Frictional Resistance + Weight of Pile								
												(1018.82 + 395.97) / 2.5			Q _{a,uplift} =			1018.82 / 3 + 54.98								
												565.92 T			Q _{a,uplift} =			394.58 T								
												Say			Q _{a,uplift} =			394.00 T								

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap cm ²	qs t	Qp t		
		from (m)	to (m)	Ø deg	k	α	y _{eff} gm/cc	ΔL cm	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²	y _{eff} gm/cc								c kg/cm ²	Ø deg
		Water Table depth considered for analysis =			Bore Hole No = BH-A1 Ch. (KM) 52+518			Scour Depth = Non-scourable			Dia of pile = 1.20 m								Cut-off Level = 2.00 m below EGL	
1.20	2.00	0.00	2.00			1.72	200	0.17												
1.20		2.00	5.50	29	1.00	1.72	350	0.64									72.17			
1.20		5.50	13.00	5	1.00	1.78	750	1.61									169.09			
1.20		13.00	16.00	4	1.00	1.85	300	2.56									70.35			
1.20		16.00	18.00	30	1.00	1.87	200	3.02									147.49			
1.20		18.00	24.00	30	1.00	0.87	600	3.21	0.84	3.21	0.23	29	9	17.93	11314.29	466.90	685.44			
															925.99	685.44				

Qu,comp.=	qs + Qp	Qu,uplift =	Safe Frictional Resistance + Weight of Pile
Qa,comp.=	(925.99 + 685.44) / 2.5	Qa,uplift =	925.99 / 3 + 62.2
Qa,comp.=	644.57 T	Qa,uplift =	370.87 T
Qa,comp.=	644.00 T	Qa,uplift =	370.00 T

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 24.00 m															Bore Hole No = BH-A1			Ch. (KM) 52+5.18			Dia of pile = 1.20 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D															Water Table depth considered for analysis = 18.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction					For End Bearing				Nc	Nq	Ny	As/cm ²	Ap cm ²	qs	Qp										
		from (m)	to (m)	c	Ø	k	α	y _{eff} gm/cc	ΔL	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²	y _{eff} gm/cc								c	Ø								
1.20	2.00	0.00	2.00																										
1.20	5.50	2.00	5.50	0.19	29	1.00	1.00	1.72	200	0.17							377.14		72.17										
1.20	13.00	5.50	13.00	0.74	5	1.00	0.62	1.78	750	0.64							377.14		169.09										
1.20	16.00	13.00	16.00	1.12	4	1.00	0.40	1.85	300	1.61							377.14		70.35										
1.20	18.00	16.00	18.00	0.21	30	1.00	1.00	1.87	200	2.56							377.14		147.49										
1.20	25.00	18.00	25.00	0.21	30	1.00	1.00	0.87	700	3.02							377.14		544.71										
1.20	26.00	25.00	26.00	0.23	29	1.00	1.00	0.84	100	3.21							377.14	11314.29	75.78	685.44									
															9	17.93	19.34				1079.59	685.44							
															Qu,comp.= qs + Qp			Qu,uplift =			Safe Frictional Resistance + Weight of Pile								
															(1079.59 + 685.44) / 2.5			Qa,uplift =			1079.59 / 3 + 67.86								
															706.01 T			Qa,uplift =			427.72 T								
															706.00 T			Qa,uplift =			427.00 T								
															Say														

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 26.00 m		Bore Hole No = BH-A1		Ch. (KM) 52+5.18		Dia of pile = 1.20 m		Cut-off Level = 2.00 m		below EGL									
Restricting PD to 15D		Water Table depth considered for analysis = 18.00 m		Scour Depth = Non-scourable		Liquefaction Depth = Non-Liquefiable													
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Ny	As/cm ²	Ap cm ²	qs	Qp		
		from (m)	to (m)	c	Ø	α	γ _{eff}	ΔL	pd (s.f)	Pd (e-b)	γ _{eff}							c	Ø
1.20	2.00	0.00	2.00			1.72	200		0.17										
1.20	5.50	2.00	5.50	0.19	29	1.72	350	1.00	0.64							377.14		72.17	
1.20	13.00	5.50	13.00	0.74	5	1.78	750	0.62	1.61							377.14		169.09	
1.20	16.00	13.00	16.00	1.12	4	1.85	300	0.40	2.56							377.14		70.35	
1.20	18.00	16.00	18.00	0.21	30	1.87	200	1.00	3.02							377.14		147.49	
1.20	25.00	18.00	25.00	0.21	30	0.87	700	1.00	3.21							377.14		544.71	
1.20	28.00	25.00	28.00	0.23	29	0.84	300	1.00	3.21	3.21	0.84	0.23	29	17.93	19.34	11314.29		227.34	685.44
<p> Qu,comp.= qs + Qp Qa,comp.= (1231.15 + 685.44) / 2.5 Qa,comp.= 766.64 T Qa,comp.= 766.00 T Qa,uplift = Safe Frictional Resistance + Weight of Pile Qa,uplift = 1231.15 / 3 + 73.51 Qa,uplift = 483.90 T Qa,uplift = 483.00 T </p>																			

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 28.00 m		Bore Hole No = BH-A1		Ch. (KM) 52+5.18		Dia of pile = 1.20 m		Cut-off Level = 2.00 m		below EGL									
Restricting PD to 15D		Water Table depth considered for analysis = 18.00 m		Scour Depth = Non-scourable		Liquefaction Depth = Non-Liquefiable													
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Ny	As/cm ²	Ap cm ²	qs	Qp		
		from (m)	to (m)	c kg/cm ²	Ø deg	k	α	y _{eff} gm/cc	ΔL cm	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²							y _{eff} gm/cc	c kg/cm ²
1.20	2.00	0.00	2.00			1.72	200	0.17											
1.20	5.50	2.00	5.50	1.00	1.00	1.72	350	0.64										72.17	
1.20	13.00	5.50	13.00	1.00	0.62	1.78	750	1.61										169.09	
1.20	16.00	13.00	16.00	1.00	0.40	1.85	300	2.56										70.35	
1.20	18.00	16.00	18.00	1.00	1.00	1.87	200	3.02										147.49	
1.20	25.00	18.00	25.00	1.00	1.00	0.87	700	3.21										544.71	
1.20	30.00	25.00	30.00	1.00	1.00	0.84	500	3.21	3.21	0.84	0.23	29	17.93	19.34	11314.29			378.90	685.44
<p> Qu,comp.= qs + Qp Qa,comp.= (1382.71 + 685.44) / 2.5 Qa,comp.= 827.26 T Say Qa,comp.= 827.00 T </p> <p> Qu,uplift = Safe Frictional Resistance + Weight of Pile Qa,uplift = 1382.71 / 3 + 79.17 Qa,uplift = 540.07 T Qa,uplift = 540.00 T </p>																			

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

Lateral Load capacity of Pile			
BH-A1			
52+518			
Type of Strata =	Sandy		
Le = Embedded Length of Pile in Meter	=	24.000 m	Fck = 35.0 N/mm² D = 100 cm
Bed level		0.0 m	
Pile cap bottom level		-2.0 m	
Max. of Liquefaction & Scour Depth		-2.0 m	
E = Young's Modulus of Pile (Kg/cm ²)	=	$5000 \sqrt{F_{ck}}$ N/mm ²	= 295803.99 Kg/cm ²
I = Moment of Inertia (cm ²)	=	$\pi \times D^4 / 64$	= 4908738.5 cm ⁴
K ₁ = Constant for Sandy / Normally Consolidated Clay		(Kg/cm ³)	= 0.490
T, Relative stiffness factor in Sand		$\sqrt[5]{\frac{EI}{K_1}}$	= 312.1 cm
For Long Pile If L_e > 4T			
L ₁ =			= 0.000 cm
$\frac{L_1}{T}$			= 0.00
For Fixed Head Pile			
$\frac{L_f}{T}$			= 2.219 From Fig. 4
L _f			= 692.65 cm
Equivalent length of cantilever L = L ₁ + L _F	0.00 +	692.64846	= 692.65 cm
Y = Pile Head Deflection (Cm)	=	$\frac{Q(L_1 + L_F)^3}{12 EI}$ (for fixed Head pile)	
		Q = Lateral Load in Kg	
Lateral Load For Pile Head Deflection .5 cm		Q	= 26217.22 Kg
			= 26.22 T

Lateral Load capacity of Pile			
BH-A1			
52+518			
Type of Strata =	Sandy		
Le = Embedded Length of Pile in Meter	=	24.000 m	Fck = 35.0 N/mm² D = 120 cm
Bed level	0.0 m		
Pile cap bottom level	-2.0 m		
Max. of Liquefaction & Scour Depth	-2.0 m		
E = Young's Modulus of Pile (Kg/cm ²)	=	$5000 \sqrt{F_{ck}}$ N/mm ²	= 295803.99 Kg/cm ²
I = Moment of Inertia (cm ²)	=	$\pi \times D^4 / 64$	= 10178760.2 cm ⁴
K ₁ = Constant for Sandy / Normally Consolidated Clay		(Kg/cm ³)	= 0.490
T, Relative stiffness factor in Sand		$\sqrt[5]{\frac{EI}{K_1}}$	= 361.2 cm
For Long Pile If L_e > 4T			
L ₁ =			= 0.000 cm
$\frac{L_1}{T}$			= 0.00
For Fixed Head Pile			
$\frac{L_f}{T}$			= 2.219 From Fig. 4
L _f			= 801.42 cm
Equivalent length of cantilever L = L ₁ + L _F	0.00 +	801.41574	= 801.42 cm
Y = Pile Head Deflection (Cm)	=	$\frac{Q(L_1 + L_F)^3}{12 EI}$ (for fixed Head pile)	
		Q = Lateral Load in Kg	
Lateral Load For Pile Head Deflection .5 cm		Q	= 35097.53 Kg
			= 35.10 T

Geotechnical Investigation Report

Old Ch. 29+487 to Old Ch. 46+400 (New CH: 30+155 to 49+584)

SR NO. : 544_21-22

**CONDUCTING GEOTECHNICAL INVESTIGATION,
PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING
OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH
CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR
(HORC) PROJECT FROM PALWAL TO HARSANA KALAN
INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN
THE STATE OF HARYANA**

CLIENT

**M/S. HARYANA RAIL INFRASTRUCTURE
DEVELOPMENT CORPORATION LTD. (HRIDCL)**

PROGRAMME

MAY - 2022

SR. No.	Report No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/952_(72 BHs)	03	04.10.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/796_(65 BHs)	02	02.09.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/511_(59 BHs)	01	20.06.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/291_(57 BHs)	00	16.05.2022



CEG TEST HOUSE
AND RESEARCH CENTRE PVT LTD

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CEGTH/HRIDCL/SR-544/2022-23/952

Date:- 04.10.2022

To,

Haryana Rail Infrastructure Development

Corporation Ltd. (HRIDCL)

SCO No.-17-19, 3rd & 4th Floor,

Sector - 17-A,

Chandigarh - 160017

Tele:- 0172-2715644

Email: hride2017@gmail.com

Subject :- Geotechnical investigation work for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan in the state of Haryana.

Dear Sir,

We are pleased to submit this report of the subject work based on 72 boreholes carried out at Old Ch. 29+487 to Old ch. 46+400 (New CH: 30+155 to 49+584) for the proposed project site.

The accompanying report presents results of various field tests and laboratory tests conducted on selected soil samples and their interpretation.

Should there be any clarifications regarding the contents please contact us at your most convenient time.

We value the opportunity to participate in this project and look forward a pleasant association on future projects.

Very truly yours,
CEG Test House & Research Centre Pvt. Ltd.

Prepared By:-



Nehal Jain
General Manager - Geotechnical
Authorized Signatory



Ankur Mudgal
Sr. Manager

SR. No.	Report Ref. No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/952_(72 BHs)	03	04.10.2022
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544_21-22	CEGTH/HRIDCL/SR-544/2022-23/291_(57 BHs)	00	16.05.2022

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CHAPTER 1 GENERAL

1.0 INTRODUCTION:

The work of conducting “**Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana**” was awarded to “**CEG Test House & Research Centre Pvt. Ltd., Jaipur**” by M/S. “**Haryana Rail Infrastructure Development Corporation Ltd. (HRIDCL)**” as per work order no. HRIDC/ HORC/ GT/ CEG/ 237/ 2021/ 577-M dated 29th July 2021.

Field work including drilling of boreholes, conducting field tests such as Electrical Resistivity Test, & Plate Load Test and sample collection was carried out in the presence of representative of Client. Laboratory tests were conducted on selected soil samples to determine the design parameters, confirming to relevant IS specifications and the guidelines received from time to time from representative of Client.

This report includes the details of Methodology of Investigation, collection of samples of soil, field test results, laboratory test results, analysis of results and recommendations for proposed structure carried out at Old Ch. 29+487 to Old ch. 46+400 (New CH: 30+155 to 49+584) based on soil sample collected from the locations of 72 boreholes.

2.0 SITE LOCATION & GENERAL GEOLOGICAL HISTORY:

The details of the site & test locations for the proposed project are shown in location plan attached vide **Appendix A-1**. The site of proposed project is located from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV (Zone factor=0.24) of India.

Soil of the Haryana Sub-Region have been classified and described under the following major soil types as shown below:-

- Typic Ustochrepts : Soil of old alluvial plains
- Typic Ustipsamments : Soil of Aravali plains
- Typic Ustifluvents : Soil of recent alluvial plains and flood plains
- Typic Torripsamments : Soil of Aeofluvial plains
- Rocky Outcrops : Aravali rocky hills

The district wise details of soil characteristics are described below:-

Panipat: The soils are well drained, Sandy loam to clay loam/silty clay loam in plains and loam to clay loam/ silty/ loose clay loam in relic channels/depressions/basins.

Sonipat: The district comprises of recent flood plains, young meander plains, old meander plains and old alluvial plains. Recent flood plains occur along the Yamuna River and clearly show fluvial features. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface.

Rohtak: The district mainly comprises of old alluvial plains. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface. Old meander plains are almost flat with loamy sand to silty clay loam soils. Oldest among all the land forms are old alluvial plains, which cover major areas in the district. These soils are sand to loamy sand/sandy loam (surface) to silt loam/silty clay loam (sub-surface).

Jhajjar: The district mainly comprises of old alluvial plains and some parts of the district also have soil belonging to Aravali plains.

Rewari: The soils of the district fall under Entisols and Inceptisols orders. The surface soil texture varies from sand to fine loamy sand.

Gurgaon: The district comprises of sand dunes, sandy plains, alluvial plains, salt affected areas, low lands, lakes, hills and pediments. The soil varies from sand to loamy sand in sand dunes and sandy plain areas, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.

Mewat: The soils of the area are generally sandy loam to loam. In parts of the low-lying areas, they are clayey and saline. The upper hills are mostly barren.

Faridabad and Palwal: The district comprises of recent Yamuna flood plains, low lying plains, depressions, sand dunes and hills. The texture of the soil is sand to loamy sand in recent Yamuna flood plains, sandy loam in plains, sandy loam to clay loam in alluvial plains, sandy loam to loam (surface), clay loam/silty clay (sub-surface) in low lying plains and depressions.

3.0 SCOPE OF WORK:

The stipulated scope of work involved carrying out the following operations:-

- a) Mobilisation of necessary plant equipment, men and materials for the complete Geotechnical investigation work as per specifications, drawings and instructions of the Engineer and to complete the same within the stipulated time schedule and demobilisation after completion of field work.
- b) Shifting of Equipments from one structure location to another including Erection, installation of rigs at site and dismantling of the same after completion of field work. Shifting of setup for each borehole location and associated preparation for borehole under water
- c) Making 150 mm nominal diameter boreholes at various locations in all types of soils except hard rock and large boulders using suitable approved method of boring including chiselling, cleaning, providing casing pipe as required; performing Standard Penetration Test at every 3.0m interval and at change of strata; collection of water samples and disturbed soil samples, observation such as ground water, etc., collection of undisturbed soil samples at every 3.0 m interval and at change of strata; transportation of all the collected samples to the laboratory and back filling of boreholes on completion of the same, complete as per specification and instructions of the Engineer, for depths below natural ground level.
- d) Conducting Electrical resistivity tests at various locations all complete as per specification and directions of the Engineer.
- e) Conducting plate load test at various locations, all complete as per specification and directions of the Engineer.
- f) Drilling of Nx size boreholes (75mm dia.) in all types of hard rock, collection of core samples, maintaining continuous record of core recovery/ RQD, keeping the cores in wooden core boxes, transporting to laboratory, backfilling on completion of the same, all complete as per specification and instructions of the EIC.
- g) Conducting various laboratory tests on soil samples at an approved laboratory including preparation of soil samples to determine the following properties of soil, all complete as per specification.

On soil Samples

- Dry density test
- Bulk Density and Moisture Content.
- Sieve Analysis
- Hydrometer Analysis
- Liquid Limit and Plastic Limit
- Specific gravity
- Shrinkage Limit

- Free Swell Index
 - Direct Shear Test
 - Triaxial Shear Test
 - One Dimensional consolidation test
 - Chemical Analysis of soil samples (pH, chloride, Sulphate)
- h) Conducting laboratory tests on rock samples including preparation of the samples to determine the following properties, all complete as per specification

On Rock Samples

- Moisture content, porosity & Density
 - Specific gravity
 - Hardness
 - Unconfined compression test
 - Point load strength index
 - Modulus of Elasticity and Poission's Ratio
 - Abrasion Test
- i) Conducting chemical tests on water samples to determine the Sulphate, chloride and pH value all complete as per specification.
- j) Submitting draft report in soft copy including all field records and laboratory test results, graphs, etc., all complete as per specifications.
- k) Submitting final report in three hard copies in after the approval of the draft report including all field records and laboratory test results, graphs, etc., all complete as per specifications.

4.0 CONDUCTING PLATE LOAD TESTS

The reaction Load is applied on the test plate by reaction truss with a weight of several tonnes. The Plate Bearing Test is normally carried out at foundation level, either on the surface or in a shallow pit. The Size of Plate is 45 cm x 45 cm size (30mm thickness) and 60 cm x 60 cm size (30mm thickness) by the hydraulic jack. The test plate was placed over a horizontal sand layer of thickness 5 mm and leveled in a manner such that the center of the plate coincides with the center of application of load. The load was applied with hydraulic jack along with a pressure gauge. Settlement of the plate was measured by using two dial gauges, fixed to reference datum bars placed on firm ground, on either side of the plate. Desired seating pressure was applied on firmly seated test plate. Settlement was recorded for each increment of load. Loading was continued till a settlement of 25 mm occurred or up to desired loading intensity as per directions.

PLATE LOAD TEST LIMITATIONS

Plate load test, though useful in obtaining the necessary information about the soil with particular reference to design of foundation has some limitations:-

- (a) The tests results reflect only the character of the soil located within a depth of less than twice the width of the bearing plate. Since the foundations are generally larger than the test plates, the settlement and shear resistance will depend on the properties of much thicker stratum. Moreover this method does not give the ultimate settlements particularly in case of cohesive soils. Thus the results of the test are likely to be misleading, if the character of the soil changes at shallow depths, which is not uncommon. A satisfactory load test should, therefore, include adequate soil exploration (see IS: 1892-1979) with due attention being paid to any weaker stratum below the level of the footing.
- (b) Another limitation is the concerning of the effect of size of foundation. For clayey soils the bearing capacity (from shear consideration) for a larger foundation is almost the same as that for the smaller test plate. But in dense sandy soils the bearing capacity increases with the size of the foundation. Thus tests with smaller size plate tend to give conservative values in dense sandy soils. It may, therefore, be necessary to test with plates of at least three sizes and the bearing capacity results extrapolated for the size of the actual foundation (minimum dimensions in the case of rectangular footings).
- (c) It has limited depth of influence. It could only give the bearing capacity of soils with depth up to two times the diameter of plate.
- (d) It may not provide information on the potential for long term consolidation of foundation soils.
- (e) There is scale effect as the size of test plate is smaller than actual foundation.
- (f) To gain access to test position, excavation is carried out which causes significant ground disturbance. The change in ground stress leads to the change of soil properties which the test is planned to investigate.

Hence the interpretation of the test results & recommendation has been made in view of the above limitations.

The field record of applied load and respective average settlement obtained for plate load tests is being tabulated herein below :

Plate Load Test Data PLT-01(Ch. 39+149)

Applied Load (T)	Applied Pressure (T/m ²)	Cumulative Settlement (mm)
0.000	0.00	0.00
1.020	5.04	0.49
2.039	10.07	1.09
3.059	15.11	1.70
4.078	20.14	3.53
5.098	25.18	6.80
6.118	30.21	10.54
7.137	35.25	16.03
8.157	40.28	20.75
9.176	45.32	26.01

Plate Load Test Data PLT-02(Ch. 43+100)

Applied Load (T)	Applied Pressure (T/m ²)	Cumulative Settlement (mm)
0.00	0.00	0.00
1.90	5.28	2.21
3.80	10.56	3.41
5.70	15.83	4.39
7.60	21.11	5.16
9.50	26.39	5.73
11.40	31.67	6.40
13.30	36.94	7.09

Plate Load Test Data PLT-03(Ch. 29+000)

Applied Load (T)	Applied Pressure (T/m ²)	Cumulative Settlement (mm)
0.000	0.00	0.00
1.020	5.04	0.41
2.039	10.07	0.76
3.059	15.11	1.16
4.078	20.14	1.47
5.098	25.18	1.89
6.118	30.21	2.25
7.137	35.25	2.77
8.157	40.28	3.71
9.176	45.32	4.01
10.196	50.35	4.81
11.215	55.39	5.13
12.235	60.42	5.70
13.255	65.46	6.44

FIELD INVESTIGATION IN SOIL STRATA:

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil / rock core samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum.

For geotechnical investigation work, required equipments along with rotary drilling rigs and manpower were mobilized at site to carry out various field activities as per the scope of work. These were shifted from one test location to another location during execution of field work and were demobilized on satisfactory completion of field work.

For conducting the field investigations the following practices were followed at site:

- The locations of 72 borehole carried out at Old Ch. 29+487 to Old ch. 46+400 (New CH: 30+155 to 49+584) were marked at site at specified locations. These locations are shown in **Appendix A-1** attached subsequently.

The details of various boreholes along with their coordinates are provided herein below:

Table 1.1: Details of Borehole Locations

S. No.	Chainage Old (km)	Chainage New (km)	Structure	BH.No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+) R.L. (m)
							E	N	
1.	29+000	-	-	BH-PLT-06	8.00	12.45	693884.000	3124860.000	265.960
2.	29+487	30+155	MJB	BH-A1	27.53	53.00	696007.240	3123405.825	263.946
3.				BH-A2	27.39	53.00	695931.872	3123393.836	266.542
4.	29+860	30+528	MNB	BH-CL	NE	10.00	695623.682	3123534.155	263.108
5.	30+176	30+829	MNB	BH-CL	NE	20.00	695330.324	3123643.872	263.553
6.	30+478	31+145	MNB	BH-CL	NE	12.00	695041.409	3123752.008	264.728
7.	30+697	31+365	MNB	BH-CL	NE	12.00	694847.555	3123845.139	264.094
8.	31+354	32+022	MNB	BH-CL	NE	15.00	694378.453	3124304.952	264.674
9.	32+160	32+767	MNB	BH-CL	NE	10.00	693822.662	3124884.260	263.186
10.	32+487	33+155	MNB	BH-CL	NE	12.00	693587.448	3125111.207	261.988
11.	30+083	33+269	MNB	BH-CL	NE	10.00	693503.406	3125192.295	263.667
12.	30+488	33+673	MJB	BH-A1	27.84	30.00	693220.478	3125465.069	262.988
13.				BH-A2	26.98	30.00	693206.085	3125478.956	262.292
14.	31+095	34+280	MNB	BH-CL	NE	10.00	692778.166	3125892.043	261.355
15.	31+714	34+899	MJB	BH-A1	36.55	40.00	692316.719	3126281.196	260.608
16.				BH-A2	36.33	40.00	692289.084	3126299.382	261.768
17.	32+191	35+371	MNB	BH-CL	NE	10.00	691893.138	3126530.493	262.443
18.	32+738	35+916	MNB	BH-CL	NE	10.00	691418.519	3126801.350	260.749

S. No.	Chainage Old (km)	Chainage New (km)	Structure	BH.No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+) R.L. (m)
							E	N	
19.	33+713	36+984	MJB	BH-A1	28.98	30.00	690578.397	3127280.622	257.231
20.				BH-A2	29.52	30.00	690560.289	3127290.956	257.830
21.	34+019	37+318	MNB	BH-CL	NE	10.00	690307.695	312744.537	256.788
22.	34+619	37+804	MNB	BH-CL	NE	10.00	689829.431	3127806.228	256.661
23.	35+273	38+457	MJB	BH-A1	24.92	30.00	689320.433	3128197.938	257.980
24.				BH-A2	24.36	30.00	689304.586	3128210.139	215.188
25.	36+367	39+553	MNB	BH-CL	NE	10.00	688442.635	3128873.981	255.925
26.	36+816	40+003	MJB	BH-A1	23.89	30.00	688102.237	3129148.530	253.133
27.				BH-A2	23.16	30.00	688087.580	3129162.136	253.255
28.	37+174	40+358	MNB	BH-CL	NE	6.00	687850.788	3129414.081	252.485
29.	37+487	40+671	MNB	BH-CL	NE	10.00	687664.026	3129665.052	253.510
30.	38+127	41+312	MNB	BH-CL	NE	10.00	687322.404	3130206.236	254.370
31.	38+482	41+667	MNB	BH-CL	NE	6.00	687138.270	3130509.717	254.888
32.	38+701	41+926	MNB	BH-CL	NE	10.00	687027.281	3130698.508	254.062
33.	38+778	41+963	MNB	BH-CL	NE	15.00	686988.257	3130764.000	254.956
34.	39+060	42+239	MNB	BH-CL	NE	10.00	686845.338	3131007.988	256.112
35.	39+149	-	-	BH-PLT-03	NE	12.00	686653.951	3131306.518	255.863
36.	39+400	42+579	MNB	BH-CL	NE	10.00	686673.940	3131301.616	256.079
37.	40+325	43+507	MNB	BH-CL	NE	15.00	686221.079	3132119.630	257.953
38.	40+573	43+758	MNB	BH-CL	NE	10.00	686107.704	3132328.870	252.612
39.	41+056	44+246	MJB	BH-A1	NE	30.00	685995.127	3132785.751	253.199
40.				BH-A2	NE	40.00	685993.223	3132810.479	252.668
41.	41+100	44+282	MNB	BH-CL	NE	10.00	685985.307	3132839.175	252.428
42.	41+217	44+402	MNB	BH-CL	NE	10.00	685963.297	3132954.077	255.462
43.	41+235	44+421	MNB	BH-CL	NE	10.00	685959.452	3132971.662	254.441
44.	41+390	44+571	MJB	BH-A1	NE	35.00	685929.941	3133111.995	258.326
45.				BH-A2	NE	35.00	685920.014	3133135.325	258.616
46.	42+256	45+497	MJB	BH-A1	NE	35.00	685833.304	3133665.625	262.272
47.				BH-P2	NE	35.00	685843.959	3133711.521	263.721
48.				BH-P3	NE	35.00	685846.067	3133732.830	262.764
49.				BH-P4	NE	34.00	685829.930	3133756.860	262.555
50.				BH-P5	NE	40.00	685839.438	3133785.448	264.797
51.				BH-P6	NE	40.00	685841.105	3133808.838	263.810
52.				BH-P13	NE	40.00	685807.139	3133991.627	264.859
53.				BH-P14	NE	40.00	685782.242	3134066.732	263.998
54.				BH-P15	NE	40.00	685773.857	3134091.912	263.446
55.				BH-P16	NE	40.00	685765.737	3134166.127	263.316
56.				BH-A2	NE	40.00	685746.693	3134176.656	263.529
57.	43+100	46+280	MNB	BH-PLT-02	NE	12.00	685434.986	3134725.214	-

S. No.	Chainage Old (km)	Chainage New (km)	Structure	BH.No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+ R.L. (m))
							E	N	
58.	43+452	46+636	MNB	BH-CL	NE	15.00	685239.663	3135017.235	258.485
59.	43+585	46+769	MNB	BH-CL	NE	15.00	685158.018	3135122.226	258.478
60.	43+732	46+916	MNB	BH-CL	NE	15.00	685068.353	3135238.709	257.686
61.	44+050	47+234	MNB	BH-CL	NE	15.00	684905.712	3135511.319	256.063
62.	44+116	47+301	MNB	BH-CL	NE	15.00	684877.774	3135571.113	256.889
63.	44+317	47+501	MNB	BH-CL	NE	10.00	684793.328	3135753.513	254.620
64.	44+641	47+825	MNB	BH-CL	NE	10.00	684668.530	3136052.232	256.869
65.	44+910	48+094	MNB	BH-CL	NE	10.00	684609.724	3136314.389	254.293
66.	45+048	48+232	MNB	BH-CL	NE	10.00	684590.519	3136451.182	253.929
67.	45+411	48+595	MNB	BH-CL	NE	10.00	684540.434	3136810.574	253.338
68.	45+480	48+664	MJB	BH-A1	16.00	30.00	684534.196	3136867.243	254.056
69.				BH-A2	15.75	30.00	684529.247	3136889.146	255.775
70.	45+612	48+795	MNB	BH-CL	NE	10.00	684512.699	3137009.651	254.161
71.	45+984	49+168	MNB	BH-CL	NE	15.00	684458.641	3137377.674	257.656
72.	46+400	49+584	MNB	BH-CL	NE	10.00	684341.186	3137776.436	257.489

***Not Encountered:-NE**

- In soil, boreholes of 150mm dia. were drilled as per the standard procedure laid in IS: 1892.
- Borehole was properly cleaned before taking any sample in soil.
- Casing was used as per the prevailing soil conditions, to stabilize the borehole.
- Standard Penetration Tests were conducted in bore holes at regular intervals or at every change of strata as per Technical specification.
- Undisturbed were collected wherever feasible as per the requirements and at specified depths. The same has been discussed in detail in soil characteristics sheets attached with the report.
- The Ground Water Table was met at depths of from 15.75m to 36.55m below EGL in 12 boreholes and not encountered in the remaining boreholes. The detailed procedure adopted for conducting various field tests is given here in below:

(i) Standard Penetration Test:

The Standard Penetration Test was conducted in boreholes as per IS 2131. The test was carried out using the standard split spoon sampler to measure the number of blows ‘N’.

Standard split spoon sampler was attached to an ‘A’ rod. It was driven from borehole bottom to a distance of 45 cm using a standard hammer of 63.5 kg falling freely from a height of 75 cm to the required depth. While driving, the number of blows required to penetrate every 15 cm are recorded. The total number of blows required for the last 30 cm is taken as ‘N’ value at that particular depth of the borehole. Wherever the total penetration was less than 45cm, the no. of blows & the depth penetrated is recorded in the respective borelog.

SPT ‘N’ values were correlated with relative density of non-cohesive stratum and with consistency of cohesive stratum as given below:-

Table 1.2: Soil compactness as per SPT N values (cl. 9.7, table 9.3 & 9.4, page 330_text book of V.N.S. Murthy)

Correlation for Clay / Plastic silt		Correlation for Sand / Non-Plastic silt	
Consistency	SPT "N" Value	Compactness	SPT "N" Value
Very Soft	0 - 2	Very Loose	0 - 4
Soft	2 - 4	Loose	4 - 10
Medium	4 - 8	Medium	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very Stiff	15 - 30	Very Dense	> 50
Hard	> 30		

The field SPT N values obtained were further corrected as per the guidelines given in IS: 2131 as follows:

(a) For overburden: - The N value for cohesionless soil is corrected with the help of fig. 1 given in IS-2131.

(b) Due to dilatancy :- Wherever N values observed below water table in fine sand, silty sand or silt was greater than 15, then corrected N values were corrected as under:

$$N' = 15 + \frac{1}{2} (N-15)$$

(ii) Undisturbed Sampling (Soil) in boreholes:

Undisturbed samples were collected using MS tubes of suitable diameter and length with Area ratio as per clause 4.1.1 (c) of IS: 1892 (latest) fitted to an adopter with ball and socket arrangement. Before taking any sample, sampling tube was properly greased. Immediately after taking on undisturbed sample in a tube, the adopter head was removed along with the disturbed material. The visible ends of the sample were trimmed off any wet disturbed soil. The ends were coated alternately with four layers of just molten wax. More molten wax was added to give a total thickness of min. 25 mm. The samples were carefully labeled and transported to the laboratory for testing. Undisturbed samples wherever slipped during lifting were duly marked in the field logs as well as in the soil profile.

5.0 LABORATORY TESTS ON SOIL SAMPLES:

The following laboratory tests were conducted on selected soil samples:

Table 1.3: Description of Tests

Description of Test	Reference	Undisturbed (UDS) Soil Samples	Disturbed (DS/SPT) Soil Samples
Grain Size Analysis / Hydrometer	IS: 2720 (Part - 4)	√	-
Natural Moisture Content / Bulk / Dry density	IS : 2720 (Part – 2)	√	-
Atterberg Limits <ul style="list-style-type: none"> • Liquid Limit • Plastic Limit 	IS: 2720 (Part - 5) IS: 2720 (Part - 5)	√ √	√ √
Specific Gravity	IS : 2720 (Part – 3)	√	-
Direct Shear Test	IS : 2720 (Part – 13)	√	-
Triaxial compressive shear test	IS : 2720 (Part – 11 & 12)	√	-
Chemical Analysis of Soil Samples	IS : 2720 (Part – 26, 27)	√	-

Note:- The detailed procedure adopted for conducting various laboratory tests is described in the following paragraphs:

5.1.1 Dry density and Bulk density

For determination of bulk density and dry density, a sample of known volume ‘V’ was extracted from the undisturbed sampling tube and its bulk weight ‘W’ was noted down. Moisture content ‘Wn’ was determined by oven drying method.

The bulk density and dry density were determined by following equation-

$$\text{Bulk density } (\gamma_b) = W/V$$

$$\text{Dry density } (\gamma_d) = \gamma_b / (1+Wn)$$

5.1.2 Natural water content

For this test, the soil sample of known quantity (Wm) was taken in a container. The container with soil sample was placed into an oven for drying at 105-110°C temperature for 16-24 hours. After drying, the dry sample was again weighted to determine the dry weight of sample (Wd).

The natural water content was computed by the following equation-

$$Wn = (Wm - Wd) * 100 / Wd$$

5.1.3 Grain Size Analysis (IS: 2720- Part-4)

Wet sieve analysis:

For determination of particle sizes finer than 75 micron, wet sieve analysis test was conducted. For this test, oven dried sample of known quantity was taken in a container and soaked with dispersing

agent. The soaked soil sample was washed thoroughly over 75 micron IS sieve until the water passing sieve was substantially clean.

Fraction retained on 75 micron IS sieve was carefully collected in a container without any loss in material and placed into oven for drying.

Dry sieve analysis:

For this test, the oven dried soil sample after wet sieving was sieved through the set of IS sieves 20 mm, 10 mm, 4.75 mm, 2.0 mm, 1.0 mm, 425 micron, 300 micron, 150 micron and 75 micron. The amounts of soil retained on each sieve were noted down. The % retained, cumulative % retained and % passing were computed accordingly. Wherever the soil sample % passing 75 micron sieve was significant, Hydrometer method was used to find the percentage of silt and clay fraction.

Grain size analysis for the fraction passing 75 micron IS Sieve (Hydrometer method)

Calibration of Hydrometer

Hydrometer was calibrated to determine a relationship (an equation) between the effective depth H_R and corresponding hydrometer reading R_h (obtained during test).

50 to 100 gm of soil sample passing through 75 micron IS Sieve was taken. It was mixed with 100 ml of sodium hexametaphosphate solution and the mixture was warmed for about 10 minutes. It was then transferred to the cup of the mechanical mixer and the soil suspension was stirred for 15 minutes. The soil suspension was transferred into 1000 ml measuring cylinder and distilled water was added to make 1000ml solution. This solution was mixed vigorously. The measuring cylinder was then allowed to stand and the stopwatch was started. Hydrometer was immersed in the solution and reading were taken after half, one, two and four minutes. The hydrometer was then removed slowly and kept in distilled water at the same temperature as the soil suspension. Readings were taken after the periods of 8, 15 and 30 minutes, and one, two and four hours. Hydrometer was removed, rinsed and placed in the distilled water after each reading. After 4 hours reading was taken once or twice within 24 hours. Finally a reading was taken at the end of 24 hours. The temperature of the suspension was observed and recorded.

Calculations

Diameter of the particles (D):

$$D = \sqrt{\frac{30\mu}{980(G-1)}} \times \sqrt{\frac{H_R}{t}} = M \sqrt{\frac{H_R}{t}}$$

Where,

D = diameter of particle in suspension, in mm;

- μ = co-efficient of viscosity of water at the temperature of the suspension at the time of taking the hydrometer reading, in poise;
- G = specific gravity of the soil fraction used in the sedimentations analysis;
- H_R = effective depth corresponding to R_h , in cm.
- t = time elapsed between the beginning of sedimentation and taking of hydrometer reading in minutes

$M = \sqrt{\frac{30\mu}{980(G-1)}}$ = a constant factor for given values of μ and G at the temperature of the suspension.

Percentage finer than diameter D:

The percentage by mass (w) of particles smaller than corresponding equivalent particle diameters (D) was calculated from the formula:

$$w = \frac{100G_s}{W_b(G_s - 1)} \times R_h$$

Where

- w = percentage finer
- G_s = specific gravity of soil particle
- W_b = weight of soil
- R_h = Hydrometer reading

5.1.4 Specific Gravity (IS: 2720-Part-3 Sec-1)

The specific gravity of soil sample was determined by density bottle method. For this test 5-10g oven dried and cooled soil sample was taken in 50ml capacity density bottle and its weight was noted down as W_2 . The soil was covered with distilled water and left for sufficient period for suitable soaking. The entrapped air was removed by vacuum. The bottle with soil was filled fully with water and its weight was noted down (W_3). The mass of empty bottle and bottle filled with distilled water were noted down as W_1 and W_4 respectively.

The Specific Gravity was determined by using following equation :

$$G = \frac{W_2 - W_1}{[(W_2 - W_1) - (W_3 - W_4)]}$$

5.1.5 Liquid Limit (IS: 2720- Part-5)

By Cone Penetrometer Method

The 'Cone Penetrometer Apparatus' is a variant of the fall-cone and consists of a cone with a smooth polished surface and angle of $30^\circ \pm 1/2^\circ$. The weight of the cone, together with its

associated shaft is $80\text{g} \pm 0.5\text{g}$. A support assembly with an automatic cone release mechanism and cone height adjustment mechanism used to hold the cone vertically. The angle and weight of the cone were calibrated at regular intervals, and the sharpness of the cone tip was checked daily.

Distilled water was added and thoroughly mixed with the soil sample to produce a homogeneous paste. The paste was then placed in a cup with a diameter of at least 55mm and a depth of at least 40mm. The surface of the soil was smoothed off level and parallel to the base. The support assembly was used to position the tip of the cone so that it was just touching the top surface of the soil, and the automatic tripping mechanism was released. The cone was allowed to penetrate into the soil for a period of $5 (\pm 1)$ s, then the cone was locked off to stop further movement and the penetration was recorded. The cup was refilled and the test was repeated. The two recorded penetrations need to be within 0.5mm of each other, otherwise a third test is performed. when the three test vary by more than 1mm the test was repeated.

Further tests were conducted, at varying water contents, in order to produce a series of cone penetrations (usually 4) in the range 15mm to 25mm. The resulting cone penetrations were plotted verses the water content of the test specimens. The Liquid Limit (W_L) was read off the graph, being the water content at which the line of best fit through the test points crosses 20mm penetration.

5.1.6 Plastic Limit (IS: 2720-Part-5)

For this test, soil sample was prepared in the same way as for liquid limit test. A ball of soil sample weighed about 5 gm was formed. The ball was rolled between the fingers of one hand and the glass plate with pressure sufficient to reduce the mass into a thread of about 3 mm in 5 to 10 complete forward and back movements. When a diameter of 3 mm was reached, soil was again remolded into a ball. The process of rolling and remolding was repeated until the thread started just crumbling at a diameter of 3 mm. The crumbled thread was immediately transferred to an airtight container for determination of its moisture content by oven drying method.

This water content has been termed as plastic limit. (W_P)

5.1.7 Plasticity Index (IS: 2720-Part-5)

The plasticity index I_p was given by

$$I_p = W_L - W_P \text{ (in percent)}$$

5.1.8 Direct Shear Test (IS:2720-Part-13):

For this test shear box test apparatus was used. The prepared specimen from remolded/undisturbed sample was placed carefully in the box. The plain grid was kept on top of the specimen with its directions at right angles to the direction of shear. The upper porous stone was placed on the grid and loading pad on the stone. The box with specimen was gently placed in the container (water

jacket). The specimen was submerged with water. The container was mounted with the shear box and the specimen inside, on the shearing machine. The upper part of the box was so adjusted that it touched the proving ring. The jack was brought forward to bear up against the box container. The proving ring dial gauge was set to read zero.

The steel ball was placed in the recess of the loading pad. The loading yoke was set in contact with the steel ball on the loading pad. Vertical displacement dial gauge to read zero in contact with the top of the yoke. The normal load was applied and any change in thickness of specimen was recorded. Shear displacement dial gauge was also set to read zero. The locking screw was now removed and two parts of the shear box were separated by advancing the spacing screws.

The specimen was sheared at constant rate of strain. The readings of the proving ring dial gauge were noted down every 15 seconds for the first one-minute and then every 30 seconds thereafter. The reading of change in the thickness dial gauge and shear displacement dial gauge were also recorded at the same time interval. The test was continued until the specimen fails. The specimen was assumed to fail when the proving ring dial gauge started receding or at shear displacement of approximately 15% of the length took place.

The soil was removed from the box and test was repeated on the identical specimen under increased normal load.

The rate of strain for conducting Direct Shear Test is kept as 0.25 mm/min as per codal/literature provision based on strata.

5.1.9 Triaxial Shear Test_UUT (IS: 2720-Part-11)

For this test, Triaxial Shear Test apparatus was used. The plain disc was placed on the pedestal of the triaxial cell. The specimen was placed centrally on the disc. A correct size rubber membrane was fitted inside the stretcher with ends of membrane folded over those of the stretcher. Vacuum was applied to stretch the membrane to the inside surface of the stretcher which was carefully slipped around the specimen kept on the pedestal. The vacuum on the membrane was released. Its bottom part was rolled down into the pedestal. plain disc was placed on the top of the specimen and then loading pad was placed. The top part of membrane was rolled on to the loading pad. Then the stretcher was removed and ends were sealed with 'O' rings. With the properly sealed specimen placed centrally on the pedestal, the cell was assembled, keeping the loading piston initially clear of the loading pad of the specimen, the assembly was placed in the loading frame.

For unconsolidated undrained test, the bottom drainage valve (BDV) and top drainage value (TDV) of cell, was closed and air release valve (ARV) was opened. The cell was filled with water through the cell water value CWV. ARV was closed when water begins to escape through it. The cell pressure was raised to the desired value and kept constant till the end of the test.

When the cell pressure was applied, the load piston rises upward, the loading machine was operated at the anticipated rate to bring the load piston slightly above the loading pad of the specimen and the load measuring dial gauge on proving ring was set to zero.

The piston was brought just in contact with loading pad by hand operation of the machine. The axial compression dial gauge was mounted and set to read zero.

The axial loading was started at 1.25 mm/min rate of strain. Simultaneous readings on the load and compression dial gauges were noted down. The test was continued until a recession of the axial load is observed or 20% of strain.

After failure, the specimen was unloaded by reversing the loading machine, cell pressure was reduced and cell water was drained out through BRV. The cell was dismantled and the specimen was taken out, rubber membrane was removed and weight of the failed sample and its water content was determined. The test was repeated on two more identical specimens with increasing cell pressure.

The rate of strain for conducting UUT is kept as 1.25 mm/min as per codal/literature provision based on strata.

5.1.10 Chemical Testing

Chemical Testing was generally performed in accordance with IS: 2720, but the different parts of method as described below:

a) Total Sulphate Content Of Soil

Samples were tested according to IS 2720 (Part 27). The dried soil was extracted with a 10% solution of hydrochloric acid. The extract was adjusted to slightly alkaline pH with ammonia, and then barium chloride solution was added to precipitate the sulphate. The barium sulphate precipitate was collected by filtration, and it was washed, dried and weighed. The mass of barium sulphate recovered was used to calculate the sulphate content of the original soil.

b) pH Value

Samples were tested according to IS: 2720 (Part 26). The soil sample (30 ± 0.1 g) was extracted with 75 ml of distilled water and the pH of the resulting suspension was measured with a calibrated (by means of Standard buffer solution) pH meter.

c) Chloride Content

For the water soluble content, soil samples were extracted with a volume of water equal to twice the mass of the soil. The extract was filtered and acidified with a small amount of nitric acid. Standardized silver nitrate solution was then added to precipitate the chloride as its silver salt. The amount of precipitated silver remaining in solution was then determined by titration.

An acid-soluble version of the test was also available, with the initial extraction being with nitric acid instead of water.

CHAPTER 2 ANALYSIS OF TEST RESULTS AND INTERPRETATION

6.0 STRATIFICATION

From the study of the borehole carried out at Old Ch. 29+487 to Old ch. 46+400 (New CH: 30+155 to 49+584), it is revealed that:-

At location of O.C. 29+487 (N.C. 30+155):-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 29+860 (N.C. 30+528):-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 30+176 (N.C. 30+829):-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 30+478 (N.C. 31+145):-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 30+697 (N.C. 31+365):-

The sub strata mainly consist of silty Sand (SM).

At location of O.C. 31+354 (N.C. 32+022):-

The sub strata mainly consist of silty Clay of low plasticity (CL).

At location of O.C. 32+160 (N.C. 32+767):-

The sub strata mainly consist of Silty Clay of low plasticity (CL).

At location of O.C. 32+487 (N.C. 33+155):-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 30+083 (N.C. 33+269):-

The sub strata mainly consist of silty Clay of low plasticity (CL)/sandy silt of low plasticity (ML-CL).

At location of O.C. 30+488 (N.C. 33+673)

The sub strata of BHA1 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

The sub strata of BH A2 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 31+095 (N.C. 34+280)

The sub strata mainly consist of Silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 31+714 (N.C. 34+899)

The sub strata mainly consist of Silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 32+191 (N.C. 35+371)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand (SM).

At location of O.C. 32+738 (N.C. 35+916)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand (SM)/ Silty Clay of low plasticity (CL).

At location of O.C. 33+713 (N.C. 36+984)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand (SM)/ Silty Clay of low plasticity (CL).

At location of O.C. 34+019 (N.C. 37+318)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 34+619 (N.C. 37+804)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand with clay (SM-SC).

At location of O.C. 35+272 (N.C. 38+457)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 36+367 (N.C. 39+553)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 36+816 (N.C. 40+003)

The sub strata of BH A1 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

The sub strata of BH A2 mainly consist of Silty sand (SM)/sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 37+174 (N.C. 40+358)

The sub strata of BH A2 mainly consist of Silty sand (SM)/sandy silt of low plasticity (ML-CL)

At location of O.C. 37+487 (N.C. 40+671)

The sub strata of BH A2 mainly consist of Silty sand (SM)/sandy silt of low plasticity (ML-CL)

At location of O.C. 38+127 (N.C. 41+312)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 38+482 (N.C. 41+667)

The sub strata mainly consist of Silty Clay of low plasticity (CL).

At location of O.C. 38+701 (N.C. 41+926)

The sub strata mainly consist of Silty Clay of low plasticity (CL).

At location of O.C. 38+778 (N.C. 41+963)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 39+060 (N.C. 42+239)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 39+400 (N.C. 42+579)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand (SM).

At location of O.C. 40+325 (N.C. 43+507)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 40+573 (N.C. 43+758)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL).

At location of O.C. 41+056 (N.C. 44+246)

The sub strata of BH-A1 mainly consist of sandy silt of low plasticity (ML-CL).

The sub strata of BH-A2 mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand with clay (SM-SC).

At location of O.C. 41+100 (N.C. 44+282)

The sub strata mainly consist of Silty Clay of low plasticity (CL)/ Silty sand with clay (SM-SC).

At location of O.C. 41+217 (N.C. 44+402)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL) and Silty sand (SM).

At location of O.C. 41+235 (N.C. 44+421)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 41+390 (N.C. 44+571)

The sub strata of BH-A1 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

The sub strata of BH-A2 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 42+256 (N.C. 45+497)

The sub strata of BH-A1 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

The sub strata of BH-A2 mainly consist of sandy silt of low plasticity (ML-CL).

The sub strata of BH-P2 mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand with clay (SM-SC).

The sub strata of BH-P3 mainly consist of sandy silt of low plasticity (ML-CL).

The sub strata of BH-P13 mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand with clay (SM-SC).

The sub strata of BH-P4 mainly consist of sandy silt of low plasticity (ML-CL)/ Silty sand with clay (SM-SC).

The sub strata of BH-P5 mainly consist of sandy silt of low plasticity (ML-CL).

The sub strata of BH-P6 mainly consist of sandy silt of low plasticity (ML-CL).

The sub strata of BH-P13 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/ silty Clay of low plasticity (CL).

The sub strata of BH-P14 mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 43+100 (N.C. 46+280)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/Silty sand (SM).

At location of O.C. 43+452 (N.C. 46+636)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL).

At location of O.C. 43+585 (N.C. 46+769)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 43+732 (N.C. 46+916)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 44+050 (N.C. 47+234)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 44+116 (N.C.47+301)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 44+641 (N.C. 47+825)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of O.C. 44+910 (N.C. 48+094)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL)/Silty sand with clay (SM-SC).

At location of O.C. 45+048 (N.C. 48+664)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of Old Ch:- 45+984 New Ch:- 49+168:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty sand (SM).

At location of CH:- 46+400 New Ch:- 49+584

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty sand (SM).

At location of O.C. 45+612 (N.C. 48+795)

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty Clay of low plasticity (CL).

At location of Old Ch:- 45+984 New Ch:- 49+168:-

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty sand (SM).

At location of Old Ch:- 46+400 New Ch:- 49+584

The sub strata mainly consist of sandy silt of low plasticity (ML-CL)/ silty sand (SM).

6.1 GROUND WATER TABLE DEPTH

The Ground Water Table was met at depths of from 15.75m to 36.55m below EGL in 12 boreholes and not encountered in the remaining boreholes as given in Table 2.1, it may rise up during heavy rains / rainy season. Therefore, for the analysis of various foundations, the water table has been considered to rise by about 2 to 3.0m at the locations of boreholes.

6.2 RESULTS OF CHEMICAL ANALYSIS

Results of chemical analysis of soil samples (as per **Appendix – B2**) indicates that the soil sample falls under Class I for sulphates and chlorides concentration (As per IS 456-2000 and CIRIA Sp. Publication No. 31). The results are summarized here in below :-

Summary of chemical analysis of soil samples

Chemical Property	Findings (Min. to Max.)	Remarks (Required limits as per IS 456-2000)
pH	7.11 to 9.70	> 6.0
Sulphite as SO ₃ ²⁻ (%)	0.0016 (%) to 0.0032 (%)	< 0.2% (Class I)
Chlorides as Cl ⁻ (%)	0.0050 (%) to 0.0080 (%)	No limit specified in IS 456. However, a limit of 0.10% specified for class I in CIRIA Sp. Publication No. 31)

Note :- All the chemical contents are within permissible limit hence no special precautions are required.

6.3 COMPUTATION OF LIQUEFACTION POTENTIAL

Liquefaction is the sudden loss of shear strength of the sub soil strata due to earthquake-induced vibration under saturated conditions.

Assessment of liquefaction potential of foundation strata is made by simplified approach proposed as per IS: 1893 (Part-1)-2016, from the SPT data and peak ground acceleration likely to occur at the site. In this method, cyclic shear stress likely to be induced in the foundation strata by Design Basis Earthquake (DBE) is first evaluated.

Next threshold cyclic shear stress, which is good enough to cause liquefaction, is determined from SPT data and the empirical relations. Finally, comparison of these two stresses is used in the estimation of liquefaction susceptibility of the foundation strata.

Unsaturated soils are not subjected to liquefaction because vibratory forces from earthquakes do not cause any increase in pore water pressure in such soils.

The area of site from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV of India as per IS: 1893. Further as per the provisions of IS: 1893 in soil deposits consisting of submerged loose sands & soils falling under classification of SP with standard penetration N value less than 15, the shaking caused by earthquake ground motion may cause liquefaction or excessive total and differential settlements.

For the analysis of liquefaction potential, following constant parameters are considered:

EQ Zone	IV
Earthquake Magnitude (Mw)	7.0
Peak Horizontal Ground Acceleration (amax /g)	0.24

The Ground Water Table was met at depths of from 15.75m to 36.55m below EGL in 12 boreholes and not encountered in the remaining boreholes. For the analysis of liquefaction potential, the water table is generally considered to rise by about 3.0m at the location of all

boreholes. Since, water table is either very deep or not encountered, the boreholes are not likely to liquefy and hence no analysis has been performed. However, a sample analysis sheet is provided for reference.

The strata in the boreholes are not likely to liquefy as mentioned above and the same is tabulated below:-

Table 2.1: Liquefaction Analysis

S. No.	Chainage Old (km)	Chainage New (km)	Structure	BH.No.	Depth of Water Table below EGI (m)	Liquefiable Depth (m)
1.	29+487	30+155	MJB	BH-A1	27.53	Non-Liquefiable
2.				BH-A2	27.39	Non-Liquefiable
3.	29+860	30+528	MNB	BH-CL	NE	Non-Liquefiable
4.	30+176	30+829	MNB	BH-CL	NE	Non-Liquefiable
5.	30+478	31+145	MNB	BH-CL	NE	Non-Liquefiable
6.	30+697	31+365	MNB	BH-CL	NE	Non-Liquefiable
7.	31+354	32+022	MNB	BH-CL	NE	Non-Liquefiable
8.	32+160	32+767	MNB	BH-CL	NE	Non-Liquefiable
9.	32+487	33+155	MNB	BH-CL	NE	Non-Liquefiable
10.	30+083	33+269	MNB	BH-CL	NE	Non-Liquefiable
11.	30+488	33+673	MJB	BH-A1	27.84	Non-Liquefiable
12.				BH-A2	26.98	Non-Liquefiable
13.	31+095	34+280	MNB	BH-CL	NE	Non-Liquefiable
14.	31+714	34+899	MJB	BH-A1	36.55	Non-Liquefiable
15.				BH-A2	36.33	Non-Liquefiable
16.	32+191	35+371	MNB	BH-CL	NE	Non-Liquefiable
17.	32+738	35+916	MNB	BH-CL	NE	Non-Liquefiable
18.	33+713	36+984	MJB	BH-A1	28.98	Non-Liquefiable
19.				BH-A2	29.52	Non-Liquefiable
20.	34+019	37+318	MNB	BH-CL	NE	Non-Liquefiable
21.	34+619	37+804	MNB	BH-CL	NE	Non-Liquefiable
22.	35+273	38+457	MJB	BH-A1	24.92	Non-Liquefiable
23.				BH-A2	24.36	Non-Liquefiable
24.	36+367	39+553	MNB	BH-CL	NE	Non-Liquefiable
25.	36+816	40+003	MJB	BH-A1	23.89	Non-Liquefiable
26.				BH-A2	23.16	Non-Liquefiable
27.	37+174	40+358	MNB	BH-CL	NE	Non-Liquefiable
28.	37+487	40+671	MNB	BH-CL	NE	Non-Liquefiable
29.	38+127	41+312	MNB	BH-CL	NE	Non-Liquefiable
30.	38+482	41+667	MNB	BH-CL	NE	Non-Liquefiable
31.	38+701	41+926	MNB	BH-CL	NE	Non-Liquefiable
32.	38+778	41+963	MNB	BH-CL	NE	Non-Liquefiable
33.	39+060	42+239	MNB	BH-CL	NE	Non-Liquefiable

S. No.	Chainage Old (km)	Chainage New (km)	Structure	BH.No.	Depth of Water Table below EG (m)	Liquefiable Depth (m)
34.	39+400	42+579	MNB	BH-CL	NE	Non-Liquefiable
35.	40+325	43+507	MNB	BH-CL	NE	Non-Liquefiable
36.	40+573	43+758	MNB	BH-CL	NE	Non-Liquefiable
37.	41+056	44+246	MJB	BH-A1	NE	Non-Liquefiable
38.				BH-A2	NE	Non-Liquefiable
39.	41+100	44+282	MNB	BH-CL	NE	Non-Liquefiable
40.	41+217	44+402	MNB	BH-CL	NE	Non-Liquefiable
41.	41+235	44+421	MNB	BH-CL	NE	Non-Liquefiable
42.	41+390	44+571	MJB	BH-A1	NE	Non-Liquefiable
43.				BH-A2	NE	Non-Liquefiable
44.	42+256	45+497	MJB	BH-A1	NE	Non-Liquefiable
45.				BH-P2	NE	Non-Liquefiable
46.				BH-P3	NE	Non-Liquefiable
47.				BH-P4	NE	Non-Liquefiable
48.				BH-P5	NE	Non-Liquefiable
49.				BH-P6	NE	Non-Liquefiable
50.				BH-P13	NE	Non-Liquefiable
51.				BH-P14	NE	Non-Liquefiable
52.				BH-P15	NE	Non-Liquefiable
53.				BH-P16	NE	Non-Liquefiable
54.				BH-A2	NE	Non-Liquefiable
55.	43+100	46+280	MNB	BH-PLT-02	NE	Non-Liquefiable
56.	43+452	46+636	MNB	BH-CL	NE	Non-Liquefiable
57.	43+585	46+769	MNB	BH-CL	NE	Non-Liquefiable
58.	43+732	46+916	MNB	BH-CL	NE	Non-Liquefiable
59.	44+050	47+234	MNB	BH-CL	NE	Non-Liquefiable
60.	44+116	47+301	MNB	BH-CL	NE	Non-Liquefiable
61.	44+317	47+501	MNB	BH-CL	NE	Non-Liquefiable
62.	44+641	47+825	MNB	BH-CL	NE	Non-Liquefiable
63.	44+910	48+094	MNB	BH-CL	NE	Non-Liquefiable
64.	45+048	48+232	MNB	BH-CL	NE	Non-Liquefiable
65.	45+411	48+595	MNB	BH-CL	NE	Non-Liquefiable
66.	45+480	48+664	MJB	BH-A1	16.00	Non-Liquefiable
67.				BH-A2	15.75	Non-Liquefiable
68.	45+612	48+795	MNB	BH-CL	NE	Non-Liquefiable
69.	45+984	49+168	MNB	BH-CL	NE	Non-Liquefiable
70.	46+400	49+584	MNB	BH-CL	NE	Non-Liquefiable

6.4 INTERPRETATION OF LAB TEST RESULTS

Grain Size Analysis

- **Clay content:** It generally varies from 4 to 13%.
- **Silt content:** It generally varies from 21 to 65%.
- **Sand content:** It generally varies from 22 to 85%.
- **Gravel content:** It generally varies from 1 to 12%.

Atterberg's Limit

- **Liquid limit:** The test results of liquid limit of the soil samples reveal that it generally varies from 26 to 28% in ML-CL type of soil, 31 to 34% in CL type of soil.
- **Plastic Limit:** The plastic limit of the soil sample varies from 20 to 21% in ML-CL type of soil, 20 to 23% in CL type of soil. However ML-CL type of soil is considered as non-plastic.
- **Plasticity index:** The plasticity index of the soil samples generally varies from 6 to 7% in ML-CL type of soil, 09 to 11% in CL type of soil whereas ML-CL and SM/ SM-SC/ SC type of soil are non-plastic.

Natural moisture content & Bulk density

The bulk density of soil samples generally varies from 1.63gm/cc to 1.97gm/cc whereas natural moisture content varies from 10.21% to 18.26%.

Direct shear tests:

Direct shear test under drained condition have been conducted in sandy silty (ML-CL) / sandy stratum (SM/ SM-SC/ SC) type of soil.

For Sandy strata (SM/ SM-SC/ SC), the value of angle of internal friction varies from 25° to 32°, whereas cohesion varies from 0.00 kg/cm² to 0.11 kg/cm².

For Silty strata (ML-CL), the value of angle of internal friction varies from 22° to 27°, whereas cohesion varies from 0.19 kg/cm² to 0.22 kg/cm².

Triaxial shear tests:

Triaxial shear test under undrained condition have been conducted in silty clay (CL) type of soil.

For silty clay (CL) strata, the value of angle of internal friction varies from 4° to 5°, whereas cohesion varies from 1.42kg/cm² to 2.24kg/cm².

FROM THE STUDY OF PRESSURE-SETTLEMENT CURVE (ON ARITHMETIC SCALE) OF 03 PLATE LOAD TESTS AS PROVIDED VIDE APPENDIX A-4, IT IS REVEALED THAT

For PLT-39+149:-

- Ultimate bearing capacity and Safe bearing capacity of the sandy soil with respect to plate is found to be 21.98 t/m² and 8.79 t/m², respectively.

- Safe bearing capacity of soil for 2 m foundation width is found to be 31.46 t/m² at 25 mm settlement. As per shear failure criteria (Bowles, J.E., 1982. Foundation design and analysis), it is found to be 26.37 t/m².

For PLT-43+100:-

- Ultimate bearing capacity and Safe bearing capacity of the sandy soil with respect to plate is found to be 36.94 t/m² and 14.78 t/m², respectively.
- Safe bearing capacity of soil for 2 m foundation width is found to be 76.60 t/m² at 25 mm settlement. As per shear failure criteria (Bowles, J.E., 1982. Foundation design and analysis), it is found to be 44.34 t/m².

For PLT-29+000:-

- Ultimate bearing capacity and Safe bearing capacity of the sandy soil with respect to plate is found to be 65.46 t/m² and 26.18 t/m², respectively.
- Safe bearing capacity of sandy soil for 2 m foundation width is found to be 120.93 t/m² at 25 mm settlement. As per shear failure criteria (Bowles, J.E., 1982. Foundation design and analysis), it is found to be 78.54 t/m².

Note:

- The Safe bearing capacity of sandy soil as per shear failure criteria is computed by the following given relation (Bowles, J.E., 1982. Foundation design and analysis),

$$q_{safe} = q_{safe(Plate)} X \left(\frac{B_{Foundation}}{B_{Plate}} \right)$$

- J.E., 1982 recommended that the above equation is valid when the ratio lies between 3 to 6. However for better understanding the ratio is conservatively restricted to 3. The use of this equation is not recommended unless the ratio is not much more than about 3. When the ratio is more than 6 to 15 or more the extrapolation from a plate load test is little more than a guess that could be obtained at least as reliably using an SPT or CPT corection.

CHAPTER 3 TYPE AND DEPTH OF FOUNDATION WITH ANALYSIS

7.0 TYPE & DEPTH OF FOUNDATION:

Based on the nature & strength characteristics of the substrata and requirement of the project, the following type of foundation have been analyzed as given below:

Table 3.1 : Shallow Foundation

Type of foundation	Depth of Foundation below E.G.L. (m)	Size of Foundation (m x m)
Shallow Foundation	1.0, 1.5, 2.0	1.6 x 1.6
	1.0, 1.5, 2.0, 2.5	2.0 x 2.0 3.0 x 3.0
	1.0, 1.5, 2.0	2.2 x 2.2
	1.0, 1.5, 2.0	2.5 x 2.5
	1.0, 1.5, 2.0	2.7 x 2.7
	1.0, 1.5, 2.0	4.8 x 4.8 4.9 x 4.9
	1.0, 1.5, 2.0	6.2 x 6.2
	1.0, 1.5, 2.0	7.2 x 7.2
	2.0, 3.0, 4.0	7.3 x 7.3
	1.0, 1.5, 2.0	11.5 x 11.5
	1.0, 1.5, 2.0	11.35 x 11.35

Table 3.2 : Pile Foundation

Type of foundation	Length of Pile below E.G.L. (m)	Dia. of Pile (m)
Normal Bored Cast in-situ RCC Pile	16.0, 18.0, 20.0, 22.0	1.0 & 1.2

The details of foundation analysis are given in the subsequent paragraph.

7.1 ANALYSIS OF SHALLOW FOUNDATION

7.1.1 From Shear Failure Criteria

Net Safe Bearing capacity from Shear Failure consideration has been computed in accordance with IS: 6403-1981, which is based on, modified Terzaghi's classical approach. The weighted average of shear strength parameters for various strata upto depth equal to $0.5 \cdot B \cdot \tan(45 + \frac{\phi}{2})$ (where B = Width of the Foundation, ϕ = Angle of internal friction) is used in the analysis. A factor of safety of 2.5 to estimate the net safe bearing capacity from ultimate net bearing capacity.

For soils, containing both coarse grained (gravels & sands) and fine grained (clays), c and ϕ are used to determine the soil strength. In case of predominantly fine grained soils, c and ϕ are

determined by the Triaxial Compression test as per IS: 2720 pt XI. For predominantly coarse grained soils, c and Φ are determined by Direct Shear test as per IS: 2720 pt XIII. These c and Φ values were used for determining the SBC of soil as per shear failure criteria.

The ultimate net bearing capacity in case of general shear failure is given by following expression,

$$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$$

The ultimate net bearing capacity in case of local shear failure is given by following expression,

$$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$$

Where,

$$d_c = 1 + 0.2 (D_f/B) * \text{SQRT}(N_\phi)$$

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

$$d_q = d_\gamma = 1 + 0.1 (D_f/B) * \text{SQRT}(N_\phi) \text{ for } \phi > 10^\circ$$

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

$$\phi' \text{ for local shear failure} = \tan^{-1} (0.67 \tan \phi)$$

7.1.2 From Settlement Failure Criteria

Allowable Bearing Pressure from Settlement Failure consideration has been computed in accordance with IS: 8009 (Part-I). The magnitude of settlement, when foundation loads are applied, depends upon the compressibility of the underlying strata and rigidity of the substructure.

The total permissible settlement in cohesion-less soil is estimated using SPT value as per IS: 8009 (Part-I). While using this approach, the N value was corrected, wherever applicable, below the footing base to at least 1.5B below the base to account for the effects of energy ratio, adopted bearing pressure, dilation for submerged silty fine sands / fine sands as well as that due to the overburden pressure.

Further for settlement Calculation in cohesive soil the following equation has been used.

$$S_t = \Delta P M_v H$$

Where,

$$M_v = \text{Coefficient of volume compressibility, cm}^2/\text{kg}$$

$$\Delta P = \text{Pressure increment, kg/cm}^2$$

$$H = \text{Thickness of layers}$$

Note: - Value of Coefficient of volume compressibility (M_v) has been calculated by using the following co-relation [Ref. Stroud and Butler, 1975] :-

**Coefficient of Volume Compressibility derived from SPT N-Value
(after Stroud and Butler, 1975)**

Plasticity Index (%)	Conversion Factor (f ₂)	m _v (10 ⁻³ kPa ⁻¹) based on N-Value: m _v = 1/(f ₂ N)				
		N=10	N=20	N=30	N=40	N=50
10	800	0.12	0.06	0.04	0.03	0.02
20	525	0.19	0.09	0.06	0.05	0.04
30	475	0.21	0.10	0.07	0.05	0.04
40	450	0.22	0.11	0.07	0.06	0.04

$$M_v = 1/(f_2 N_{corr.})$$

Where f₂ = factor based on N_{corr.} Value & plasticity index of soil

N_{corr.} = corrected SPT 'N' value

For analysis of shallow foundation the total permissible settlement has been considered as 25mm, & 50mm as per IS 1904.

Zone of influence below foundation has been considered up to 1.5 times the width of the foundation.

For the determination of the SBC from settlement criteria, the corrected SPT N values within the influence zone are given in the table below.

NOTE:-

- Lower of the two values obtained from settlement and shear criteria is used in arriving at allowable bearing capacity of the soil.
- Structural foundations are designed based on the minimum of Safe Bearing Capacity obtained from Shear Failure Criteria and Allowable Bearing Pressure corresponding to the permissible settlement. The permissible Settlement that can be allowed for the foundation depends on the strata at the location and type of foundation (whether Isolated or Raft).

Settlement occurs with the application of loads on foundations. It has two components, Immediate Settlement and Long Term Settlement. The immediate settlement takes place immediately as the loading is imposed on the structure and long term settlement arises due to the consolidation of the sub-soil with time under the load. Hence, the total settlement allowed for a foundation is the sum of the immediate and consolidation settlement that is expected to occur. The cohesionless strata (predominantly sandy) is primarily subjected to immediate settlement and cohesive strata (clayey) undergoes settlement in long time with the compression of the strata due to consolidation. Settlement of the foundation is determined from the relation provided in Indian standards (IS: 8009 (part-1) &/or various literatures (Bowles, BM Das, etc.).

From the Geotechnical investigation conducted on our site along with subsequent laboratory tests on soil samples, it is observed that predominantly the strata is silty with sand (SM/SC/SM-SC/ML-CL i.e. predominantly cohesionless) with the presence of small patches of silty clay of low plasticity (CL). Since the Settlement that takes place in cohesionless strata is mostly immediate, it takes place immediately after the imposing of load, initially during construction with the application of Dead Load and further during Live Load. The live load usually is many times lesser than the dead load, and correspondingly the post construction settlement is very less for live loads. As an example, if dead load is three times that of live load, then the settlement corresponding to live load (i.e. the post construction settlement) will be one-third of the settlement due to dead load which is comparatively lesser than 25mm for permissible settlement of 50mm.

According to the IS 1904, the permissible settlement for concrete structure having raft foundation is allowed upto 75mm, and the permissible settlement is 25mm post construction as per IRS code (Code of Practice for The Design of Sub-Structures and Foundations of Bridges). As discussed above, the settlement post construction is directly proportional to the allowable settlement. Therefore, given the importance of structure to be constructed and considering mostly cohesionless strata encountered at site, it is recommended that the maximum permissible settlement shall be restricted to 50mm for the design purpose on conservative side so that the post construction settlement can be constraint to lesser than 25mm.

As per IS- 8009 part 1 clause 9.2.2.1, If the clay layer is sandwiched between cohesionless soil layers, the immediate settlement is zero. Hence, even though the immediate settlement has been calculated during analysis, however it is ignored in the calculation of total settlement.

The sample calculations for computation of allowable bearing capacity of sub-strata for shallow foundation vide **Appendix – C-1**.

7.2 ANALYSIS OF PILE FOUNDATION

(A) DEEP FOUNDATION

The safe Load Carrying Capacity of normal bored cast in-situ RCC pile is determined in compression, uplift and lateral as per IS: 2911 (Part-1/sec-2) – 2010. The axial capacity of a pile depends upon the soil skin friction along the shaft and end bearing at it's tip.

Thus Axial load = Skin Friction + End-bearing

a) For piles in granular soils (using the static formula)

$$Q_u = (0.5 * D * \gamma * N_\gamma + P_D * N_q) * A_p + (\sum K_i * P_{Di} * \tan \delta_i) * A_{si}$$

Where,

Q_u = Ultimate load capacity of pile in KN

D = dia. of pile shaft in m

γ = effective unit weight of the soil at pile tip in kN/m^3

N_γ & N_q = bearing capacity factors depending upon the angle of internal friction Φ at pile tip (N_γ from IS 6403 for general shear failure case & N_q from Fig. 1, IS 2911)

P_D = effective overburden pressure at pile tip in kN/m^2 limited to 15-17 times diameter of pile (as per the Φ value at end bearing)

Σ = Summation for layers (1 to n) in which pile is installed and which contribute to (+ve) skin friction

K_i = coefficient of earth pressure applicable for the i^{th} layer

P_{Di} = effective overburden pressure for the i^{th} layer in kN/m^2 limited to 15-17 times diameter of pile (as per the Φ value at end bearing)

δ_i = angle of wall friction between pile and soil for i^{th} layer, and

A_{si} = surface area of pile shaft in the i^{th} layer in m^2

b) For piles in cohesive soils (using the static formula)

$$Q_u = c_p * N_c * A_p + \Sigma \alpha_i * c_i * A_{si}$$

Where,

Q_u = Ultimate load capacity of pile in KN

A_p = cross-sectional area of pile tip in m^2

N_c = bearing capacity factor (= 9)

Σ = Summation for layers (1 to n) in which pile is installed and which contribute to (+ve) skin friction

α_i = adhesion factor for the i^{th} layer depending on the consistency of soil

c_i = average cohesion for i^{th} layer in kN/m^2

A_{si} = surface area for pile shaft in the i^{th} layer in m^2

c) For computation of safe load carrying capacity of pile in lateral, the following equation has been used:

i. Fixed Head Condition

$$Q = (12 * E * I * Y) / (L_1 + L_f)^3$$

ii. Free Head Condition

$$Q = (3 * E * I * Y) / (L_1 + L_f)^3$$

Where,

Q = Lateral Load (in kg)

Y = Permissible lateral deflection taken as 5mm

E = Modulus of Elasticity of concrete

I = Moment of Inertia of the pile cross-section

L_1 = Length of pile above cut-off level

L_f = Length of fixity

The effective length of the pile has been considered below the cut-off level taken as 2.0m below the EGL. Normal Bored cast in-situ RCC piles having stem diameter equal to 100cm & 120cm and of effective length varying from 16.0m to 28.0m were selected.

For the analysis of the pile foundations the soil parameters used for computation of safe load carrying capacity of pile is tabulated below:-

Table 3.3 : Design Soil Parameter

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)		
			From	To			Observed	Corrected					
29+487	30+155	BH-A1	0.00	5.50	5.50	Sandy Silt	17	21	1.79	0.19	30		
			5.50	8.50	3.00	Sandy Silt	49	45	1.85	0.20	30		
			8.50	11.50	3.00	Sandy Silt	57	46	1.86	0.20	30		
			11.50	14.50	3.00	Sandy Silt	63	45	1.87	0.19	31		
			14.50	17.50	3.00	Sandy Silt	82	53	1.89	0.23	30		
			17.50	52.30	34.80	Sandy Silt	100	-	-	-	-		
				BH-A2	0.00	4.00	4.00	Silty Sand	13	17	1.70	0.10	30
					4.00	7.00	3.00	Sandy Silt	52	52	1.84	0.22	29
					7.00	10.00	3.00	Sandy Silt	52	45	1.84	0.18	29
					10.00	13.00	3.00	Sandy Silt	56	42	1.85	0.18	29
			13.00	52.26	39.26	Silty Sand	100	-	-	-	-		
29+860	30+528	BH-CL	0.00	4.50	4.50	Sandy Silt	12	17	1.73	0.20	28		
			4.50	7.50	3.00	Silty Clay	30	31	1.86	1.02	5		
			7.50	10.00	2.50	Sandy Silt	43	39	1.90	0.20	28		
30+176	30+829	BH-CL	0.00	5.25	5.25	Sandy Silt	16	21	1.74	0.22	28		
			5.25	8.25	3.00	Silty Clay	41	41	1.87	1.36	5		
			8.25	11.25	3.00	Silty Clay	58	58	1.93	1.91	4		
			11.25	14.25	3.00	Silty Clay	72	72	1.98	2.30	4		
			14.25	17.25	3.00	Silty Clay	-	-	2.03	3.18	4		
			17.25	19.50	2.25	Silty Clay	-	-	2.04	3.18	4		
30+478	31+145	BH-CL	0.00	4.00	4.00	Silty Clay	21	21	1.76	0.72	5		
			4.00	7.00	3.00	Sandy Silt	28	28	1.79	0.18	28		
			7.00	10.00	3.00	Sandy Silt	23	20	1.78	0.18	28		
			10.00	11.95	1.95	Sandy Silt	-	-	1.78	0.18	28		
30+697	31+365	BH-CL	0.00	4.50	4.50	Sandy Silt	12	17	1.73	0.20	28		
			4.50	7.50	3.00	Silty Clay	30	31	1.86	1.02	5		
			7.50	10.00	2.50	Sandy Silt	43	39	1.90	0.20	28		

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
31+354	32+022	BH-CL	0.00	5.50	5.50	Silty Clay	16	16	1.70	0.56	4
			5.50	8.50	3.00	Silty Clay	36	36	1.82	1.23	5
			8.50	11.50	3.00	Silty Clay	42	42	1.83	1.40	4
			11.50	15.00	3.50	Silty Clay	51	51	1.89	1.69	5
32+160	32+767	BH-CL	0.00	4.00	4.00	Silty Clay	16	16	1.70	0.56	5
			4.00	7.00	3.00	Silty Clay	22	22	1.77	0.75	4
			7.00	10.00	3.00	Silty Clay	27	27	1.81	0.92	5
32+487	33+155	BH-CL	0.00	4.50	4.50	Sandy Silt	19	27	1.80	0.23	28
			4.50	8.25	3.75	Silty Clay	43	43	1.88	1.46	4
			8.25	12.00	3.75	Silty Sand	56	45	1.88	0.11	30
30+083	33+269.72	BH-CL	0.00	1.50	1.50	Silty Clay	14	14	1.71	0.49	5
			1.50	4.50	3.00	Sandy Silt	19	25	1.78	0.18	28
			4.50	8.25	3.75	Silty Clay	26	26	1.82	0.85	6
			8.25	10.00	1.75	Silty Clay	35	35	1.87	1.16	5
30+488	33+673	BH-A1	0.00	4.00	4.00	Silty Sand	9	14	1.68	0.11	30
			4.00	8.50	4.50	Silty Clay	28	28	1.81	0.90	5
			8.50	11.50	3.00	Silty Clay	37	37	1.85	1.24	4
			11.50	16.00	4.50	Silty Clay	40	40	1.87	1.36	4
			16.00	20.50	4.50	Silty Sand	100	64	1.88	0.00	32
			20.50	26.50	6.00	Sandy Silt	83	44	1.89	0.22	27
			26.50	30.00	3.50	Silty Clay	100	100	2.03	3.11	4
	BH-A2	0.00	4.00	4.00	Silty Sand	16	21	1.72	0.09	29	
		4.00	7.00	3.00	Silty Clay	24	24	1.80	0.80	5	
		7.00	10.00	3.00	Silty Clay	31	31	1.84	1.06	4	
		10.00	13.00	3.00	Sandy Silt	40	30	1.84	0.17	29	
		13.00	16.00	3.00	Sandy Silt	54	37	1.86	0.19	30	
		16.00	19.00	3.00	Silty Sand	76	47	1.84	0.00	32	
		19.00	23.50	4.50	Silty Sand	100	59	1.88	0.00	33	
23.50	28.50	5.00	Silty Clay	59	59	1.95	1.98	4			
28.50	30.00	1.50	Silty Clay	100	100	2.02	3.11	4			
31+095	34+280	BH-CL	0.00	3.00	3.00	Silty Clay	10	10	1.69	0.37	5
			3.00	7.50	4.50	Silty Sand	21	23	1.81	0.10	30
			7.50	10.00	2.50	Silty Clay	29	29	1.87	1.09	6
31+714	34+899	BH-A1	0.00	7.00	7.00	Sandy Silt	14	15	1.70	0.20	28
			7.00	19.00	12.00	Sandy Silt	25	18	1.73	0.21	29
			19.00	25.00	6.00	Sandy Silt	70	39	1.88	0.19	30
			25.00	37.00	12.00	Sandy Silt	91	38	1.94	0.18	30
			37.00	40.00	3.00	Sandy Silt	85	27	1.92	0.20	27

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
31+714	34+899	BH-A2	0.00	5.50	5.50	Sandy Silt	12	16	1.71	0.22	28
			5.50	11.50	6.00	Sandy Silt	23	20	1.76	0.19	28
			11.50	17.50	6.00	Sandy Silt	55	36	1.84	0.18	29
			17.50	23.50	6.00	Sandy Silt	80	47	1.89	0.22	29
			23.50	40.00	16.50	Sandy Silt	84	30	1.93	0.20	30
32+191	35+371	BH-CL	0.00	4.00	4.00	Silty Sand	20	26	1.76	0.00	29
			4.00	7.00	3.00	Sandy Silt	33	33	1.80	0.22	26
			7.00	10.00	3.00	Sandy Silt	53	45	1.85	0.20	27
32+738	35+916	BH-CL	0.00	5.50	5.50	Sandy Silt	15	20	1.71	0.19	27
			5.50	7.00	1.50	Sandy Silt	-	-	1.76	0.21	28
			7.00	10.00	3.00	Silty Clay	33	33	1.86	1.16	5
33+713	36+984	BH-A1	0.00	5.50	5.50	Sandy Silt	24	32	1.80	0.21	28
			5.50	8.50	3.00	Silty Clay	82	82	1.93	2.54	4
			8.50	11.50	3.00	Sandy Silt	36	29	1.82	0.20	29
			11.50	14.50	3.00	Sandy Silt	87	61	1.90	0.21	29
			14.50	20.50	6.00	Sandy Silt	100	59	1.94	0.19	29
		BH-A2	20.50	30.00	9.50	Silty Clay	100	100	2.01	3.15	4
			0.00	7.00	7.00	Sandy Silt	24	27	1.77	0.20	28
			7.00	10.00	3.00	Silty Clay	98	98	1.94	3.04	4
			10.00	13.00	3.00	Silty Clay	58	58	1.91	1.89	5
			13.00	20.50	7.50	Sandy Silt	100	63	1.93	0.20	30
34+019	37+318	BH-CL	0.00	4.00	4.00	Silty Sand	11	17	1.72	0.11	30
			4.00	10.00	6.00	Silty Clay	34	34	1.86	1.14	5
34+619	37+804	BH-CL	0.00	4.00	4.00	Sandy Silt	10	16	1.71	0.23	27
			4.00	10.00	6.00	Silty Sand	33	34	1.86	0.20	30
35+273	38+457	BH-A1	0.00	7.00	7.00	Silty Sand	10	13	1.68	0.09	28
			7.00	11.50	4.50	Silty Clay	25	25	1.81	0.85	5
			11.50	14.50	3.00	Silty Clay	27	27	1.83	0.85	5
			14.50	17.50	3.00	Silty Clay	57	57	1.92	1.84	4
			17.50	20.50	3.00	Silty Clay	65	65	1.96	2.09	4
			20.50	30.00	9.50	Silty Clay	80	80	2.01	2.57	4
		BH-A2	0.00	4.00	4.00	Sandy Silt	10	13	1.70	0.21	27
			4.00	7.00	3.00	Sandy Silt	19	19	1.76	0.20	29
			7.00	10.00	3.00	Sandy Silt	23	20	1.77	0.20	29
			10.00	16.00	6.00	Silty Clay	48	48	1.91	1.65	5
			16.00	19.00	3.00	Silty Clay	53	53	1.92	1.65	5
			19.00	30.00	11.00	Silty Clay	86	86	2.02	2.72	4

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm2)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
36+367	39+553	BH-CL	0.00	4.50	4.50	Sandy Silt	15	22	1.76	0.21	28
			4.50	8.25	3.75	Silty Clay	25	25	1.81	0.85	5
			8.25	10.00	1.75	Silty Clay	24	24	1.82	0.85	5
36+816	40+003	BH-A1	0.00	5.50	5.50	Sandy Silt	8	11	1.66	0.21	27
			5.50	11.50	6.00	Silty Clay	41	41	1.85	1.35	4
			11.50	17.50	6.00	Silty Clay	34	34	1.86	1.16	4
			17.50	23.50	6.00	Sandy Silt	89	51	1.90	0.22	30
			23.50	26.50	3.00	Silty Clay	72	72	2.01	2.24	4
			26.50	30.00	3.50	Silty Clay	36	36	2.00	1.30	5
		BH-A2	0.00	4.00	4.00	Silty Sand	12	15	1.70	0.10	27
			4.00	7.00	3.00	Silty Sand	25	25	1.78	0.12	30
			7.00	10.00	3.00	Sandy Silt	44	38	1.84	0.23	29
			10.00	13.00	3.00	Silty Clay	51	51	1.89	1.68	5
			13.00	16.00	3.00	Silty Clay	56	56	1.91	1.68	5
			16.00	19.50	3.50	Sandy Silt	64	39	1.86	0.21	30
			19.50	23.50	4.00	Sandy Silt	100	56	1.91	0.20	30
23.50	30.00	6.50	Silty Clay	58	58	2.01	1.88	4			
37+174	40+358	BH-CL	0.00	6.00	6.00	Silty Sand	13	16	1.86	0.15	20
37+487	40+671	BH-CL	0.00	3.00	3.00	Sandy Silt	10	14	1.70	0.15	24
			3.00	6.00	3.00	Silty Sand	15	16	1.76	0.00	31
			6.00	10.00	4.00	Sandy Silt	29	27	1.94	0.17	21
38+127	41+312	BH-CL	0.00	3.00	3.00	Sandy Silt	8	12	1.81	0.10	24
			3.00	8.25	5.25	Silty Clay	20	20	1.92	0.98	5
			8.25	10.00	1.75	Silty Clay	-	-	1.92	0.91	6
38+482	41+667	BH-CL	0.00	6.00	6.00	Silty Clay	13	13	1.89	1.14	6
38+701	41+926	BH-CL	0.00	4.50	4.50	Silty Clay	10	10	1.69	0.36	5
			4.50	8.25	3.75	Silty Clay	28	28	1.84	0.95	4
			8.25	10.00	1.75	Silty Clay	42	42	1.91	1.38	5
38+778	41+963	BH-CL	0.00	3.00	3.00	Sandy Silt	7	11	1.67	0.20	27
			3.00	8.25	5.25	Silty Clay	26	26	1.80	0.75	5
			8.25	11.25	3.00	Silty Clay	43	43	1.89	1.35	4
			11.25	15.00	3.75	Silty Clay	51	51	1.94	1.78	4
39+060	42+239	BH-CL	0.00	3.00	3.00	Sandy Silt	7	11	1.67	0.20	27
			3.00	5.25	2.25	Silty Sand	22	25	1.79	0.11	29
			5.25	8.25	3.00	Silty Clay	36	36	1.86	1.22	4
			8.25	10.00	1.75	Silty Clay	45	45	1.90	1.48	5
39+400	42+579	BH-CL	0.00	4.50	4.50	Silty Sand	9	13	1.67	0.00	29
			4.50	8.25	3.75	Sandy Silt	34	34	1.84	0.19	29
			8.25	10.00	1.75	Sandy Silt	43	36	1.85	0.19	29

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm2)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
40+325	43+507	BH-CL	0.00	5.25	5.25	Sandy Silt	15	18	1.75	0.23	28
			5.25	8.25	3.00	Silty Clay	52	52	1.90	1.72	5
			8.25	11.25	3.00	Silty Clay	73	73	1.96	2.36	4
			11.25	15.00	3.75	Silty Clay	71	71	1.97	2.36	4
40+573	43+758	BH-CL	0.00	5.25	5.25	Sandy Silt	22	29	1.85	0.20	30
			5.25	8.25	3.00	Sandy Silt	41	39	1.85	0.20	30
			8.25	10.00	1.75	Sandy Silt	54	44	1.85	0.20	30
41+056	44+246	BH-A1	0.00	4.00	4.00	Sandy Silt	13	17	1.72	0.20	27
			4.00	7.00	3.00	Sandy Silt	20	20	1.74	0.18	28
			7.00	13.00	6.00	Sandy Silt	31	26	1.78	0.19	28
			13.00	16.00	3.00	Sandy Silt	38	26	1.79	0.17	28
			16.00	19.00	3.00	Sandy Silt	42	26	1.81	0.17	28
			19.00	22.00	3.00	Sandy Silt	56	32	1.83	0.20	28
		22.00	31.00	9.00	Sandy Silt	100	49	1.96	0.16	28	
		BH-A2	0.00	4.00	4.00	Silty Sand	11	18	1.71	0.09	30
			4.00	7.00	3.00	Silty Sand	20	23	1.73	0.09	30
			7.00	13.00	6.00	Sandy Silt	41	36	1.81	0.21	29
13.00	17.50		4.50	Sandy Silt	69	48	1.86	0.23	29		
17.50	40.00	22.50	Sandy Silt	99	57	1.96	0.17	29			
41+100	44+282	BH-CL	0.00	3.00	3.00	Silty Clay	20	20	1.90	1.58	4
			3.00	8.25	5.25	Silty Clay	36	36	1.90	1.58	4
			8.25	10.00	1.75	Silty Clay	50	50	1.90	1.58	4
41+217	44+402	BH-CL	0.00	3.00	3.00	Silty Sand	20	32	1.79	0.00	30
			3.00	8.25	5.25	Silty Sand	20	32	1.79	0.00	30
			8.25	10.00	1.75	Silty Clay	45	45	1.91	1.47	5
41+235	44+421	BH-CL	0.00	3.00	3.00	Sandy Silt	8	13	1.70	0.20	27
			3.00	8.25	5.25	Silty Clay	30	30	1.82	0.85	5
			8.25	10.00	1.75	Silty Clay	44	44	1.90	1.38	4
41+390	44+571	BH-A1	0.00	7.00	7.00	Sandy Silt	49	55	1.85	0.19	29
			7.00	10.00	3.00	Sandy Silt	71	60	1.87	0.19	29
			10.00	13.00	3.00	Sandy Silt	64	48	1.86	0.19	29
			13.00	19.00	6.00	Sandy Silt	69	44	1.86	0.21	28
			19.00	35.00	16.00	Silty Clay	100	100	1.98	3.11	5
		BH-A2	0.00	7.00	7.00	Sandy Silt	49	55	1.85	0.19	29
			7.00	10.00	3.00	Sandy Silt	71	60	1.87	0.19	29
			10.00	13.00	3.00	Sandy Silt	64	48	1.86	0.19	29
			13.00	19.00	6.00	Sandy Silt	69	44	1.86	0.21	28
19.00	35.00	16.00	Silty Clay	100	100	1.98	3.11	5			

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
42+256	45+497	BH-A1	0.00	4.00	4.00	Sandy Silt	8	13	1.68	0.24	22
			4.00	8.50	4.50	Sandy Silt	18	18	1.72	0.20	24
			8.50	11.50	3.00	Sandy Silt	22	18	1.73	0.20	24
42+256	45+497	BH-A1	11.50	14.50	3.00	Sandy Silt	25	18	1.75	0.20	24
			14.50	17.50	3.00	Sandy Silt	33	22	1.76	0.21	25
			17.50	20.50	3.00	Sandy Silt	32	19	1.78	0.21	25
			20.50	26.50	6.00	Sandy Silt	54	29	1.83	0.22	26
			26.50	32.50	6.00	Silty Clay	89	89	1.96	2.63	4
			32.50	35.00	2.50	Sandy Silt	100	46	2.00	0.19	28
		BH-P2	0.00	5.50	5.50	Silty Sand	19	25	1.75	0.08	27
			5.50	8.50	3.00	Sandy Silt	31	29	1.77	0.18	25
			8.50	11.50	3.00	Sandy Silt	36	29	1.78	0.18	25
			11.50	17.50	6.00	Sandy Silt	35	24	1.77	0.18	25
			17.50	29.50	12.00	Sandy Silt	70	36	1.84	0.20	26
			29.50	32.50	3.00	Sandy Silt	79	36	1.87	0.16	27
		BH-P3	32.50	35.00	2.50	Sandy Silt	95	35	1.88	0.16	27
			0.00	4.00	4.00	Sandy Silt	4	5	1.61	0.23	21
			4.00	7.00	3.00	Sandy Silt	30	31	1.80	0.15	26
			7.00	10.00	3.00	Sandy Silt	29	25	1.79	0.15	26
			10.00	16.00	6.00	Sandy Silt	32	24	1.80	0.15	26
			16.00	19.00	3.00	Sandy Silt	54	34	1.85	0.21	26
			19.00	25.00	6.00	Sandy Silt	58	32	1.86	0.21	26
		BH-P4	25.00	31.00	6.00	Sandy Silt	72	34	1.87	0.17	27
			31.00	35.50	4.50	Sandy Silt	100	46	1.93	0.18	28
			0.00	4.00	4.00	Silty Sand	8	13	1.67	0.08	29
			4.00	8.50	4.50	Silty Sand	14	14	1.70	0.10	29
			8.50	11.50	3.00	Silty Sand	20	16	1.73	0.12	29
			11.50	14.50	3.00	Silty Sand	23	17	1.74	0.12	29
			14.50	17.50	3.00	Silty Sand	44	29	1.81	0.09	29
			17.50	20.50	3.00	Sandy Silt	61	37	1.87	0.18	29
		BH-P5	20.50	25.00	4.50	Sandy Silt	66	36	1.88	0.18	29
			25.00	34.00	9.00	Sandy Silt	73	34	1.98	0.17	29
			0.00	4.00	4.00	Sandy Silt	12	15	1.71	0.19	24
4.00	7.00		3.00	Sandy Silt	18	18	1.73	0.19	24		
7.00	10.00		3.00	Sandy Silt	20	17	1.74	0.19	24		
10.00	13.00		3.00	Sandy Silt	26	20	1.76	0.19	24		
			13.00	19.00	6.00	Sandy Silt	32	21	1.78	0.20	25
			19.00	25.00	6.00	Sandy Silt	46	25	1.82	0.18	26

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm2)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
42+256	45+497	BH-P5	25.00	28.00	3.00	Sandy Silt	55	27	1.83	0.18	26
			28.00	34.00	6.00	Sandy Silt	81	37	1.87	0.17	27
			34.00	40.00	6.00	Sandy Silt	95	44	1.90	0.18	28
		BH-P6	0.00	8.50	8.50	Sandy Silt	33	40	1.79	0.21	26
			8.50	14.50	6.00	Sandy Silt	39	30	1.80	0.21	26
			14.50	17.50	3.00	Sandy Silt	38	25	1.81	0.21	26
			17.50	23.50	6.00	Sandy Silt	66	38	1.83	0.18	27
			23.50	26.50	3.00	Sandy Silt	70	35	1.84	0.18	27
			26.50	29.50	3.00	Sandy Silt	72	33	1.86	0.18	27
			29.50	40.00	10.50	Sandy Silt	87	40	1.88	0.16	28
		BH-P13	0.00	5.50	5.50	Silty Sand	22	28	1.76	0.10	30
			5.50	10.00	4.50	Sandy Silt	55	52	1.82	0.19	29
			10.00	13.00	3.00	Silty Sand	94	71	1.89	0.11	30
			13.00	16.00	3.00	Silty Sand	87	59	1.88	0.11	31
			16.00	19.00	3.00	Silty Sand	43	26	1.81	0.08	31
			19.00	22.00	3.00	Silty Sand	61	34	1.85	0.08	31
			22.00	25.00	3.00	Silty Sand	78	40	1.86	0.08	31
			25.00	28.00	3.00	Silty Sand	66	31	1.85	0.08	31
			28.00	31.00	3.00	Silty Sand	78	36	1.86	0.08	31
			31.00	34.00	3.00	Sandy Silt	85	39	1.88	0.16	27
			34.00	37.00	3.00	Sandy Silt	100	46	1.97	0.23	27
		37.00	40.00	3.00	Sandy Silt	100	46	1.99	0.23	27	
		BH-P14	0.00	3.00	3.00	Sandy Silt	19	30	1.80	0.15	26
			3.00	8.50	5.50	Sandy Silt	39	41	1.84	0.17	27
			8.50	11.50	3.00	Sandy Silt	55	44	1.85	0.17	27
			11.50	14.50	3.00	Sandy Silt	61	43	1.87	0.17	27
			14.50	20.50	6.00	Sandy Silt	72	44	1.87	0.19	27
			20.50	26.50	6.00	Sandy Silt	84	43	1.89	0.19	27
			26.50	29.50	3.00	Silty Clay	54	54	1.92	1.76	5
			29.50	32.50	3.00	Silty Clay	54	54	1.93	1.76	5
		BH-P15	32.50	40.00	7.50	Silty Clay	100	46	1.99	3.13	4
			0.00	5.50	5.50	Silty Sand	19	24	1.75	0.09	29
			5.50	8.50	3.00	Silty Clay	40	40	1.83	1.40	3
			8.50	13.00	4.50	Sandy Silt	73	60	1.83	0.20	30
			13.00	16.00	3.00	Sandy Silt	84	57	1.86	0.23	30
			16.00	20.50	4.50	Sandy Silt	88	53	1.87	0.23	30
			20.50	25.00	4.50	Silty Clay	78	78	1.93	2.49	5
			25.00	28.00	3.00	Silty Clay	83	83	1.94	2.49	5
		28.00	40.00	12.00	Silty Clay	94	94	1.97	3.11	5	

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
42+256	45+497	BH-P16	0.00	5.50	5.50	Silty Sand	22	28	1.76	0.10	27
			5.50	8.50	3.00	Silty Sand	38	35	1.80	0.08	28
			8.50	14.50	6.00	Silty Sand	50	38	1.81	0.08	28
			14.50	23.50	9.00	Silty Sand	59	35	1.83	0.08	28
			23.50	26.50	3.00	Silty Sand	77	38	1.82	0.08	28
			26.50	35.50	9.00	Silty Clay	67	67	1.89	2.04	5
			35.50	40.00	4.50	Silty Clay	96	96	1.95	2.80	4
		BH-A2	0.00	4.00	4.00	Sandy Silt	20	26	1.76	0.21	29
			4.00	7.00	3.00	Sandy Silt	34	34	1.80	0.18	30
			7.00	10.00	3.00	Sandy Silt	51	44	1.82	0.19	30
			10.00	16.00	6.00	Sandy Silt	51	37	1.83	0.19	30
			16.00	19.00	3.00	Sandy Silt	65	40	1.84	0.19	30
			19.00	31.00	12.00	Sandy Silt	63	32	1.84	0.16	30
		43+100	46+280	BH-PLT-02	0.00	2.25	2.25	Silty Sand	8	12	1.67
2.25	4.50				2.25	Silty Sand	26	31	1.80	0.11	32
4.50	7.50				3.00	Sandy Silt	28	29	1.83	0.18	29
7.50	12.00				4.50	Sandy Silt	33	28	1.90	1.30	5
43+452	46+636	BH-CL	0.00	5.25	5.25	Sandy Silt	9	12	1.70	0.08	29
			5.25	11.25	6.00	Sandy Silt	63	55	1.89	0.21	30
			11.25	15.00	3.75	Sandy Silt	68	49	1.94	0.19	30
43+585	46+769	BH-CL	0.00	5.25	5.25	Sandy Silt	10	13	1.70	0.20	27
			5.25	8.25	3.00	Silty Clay	39	39	1.88	1.29	4
			8.25	11.25	3.00	Sandy Silt	54	44	1.91	0.18	29
			11.25	15.00	3.75	Sandy Silt	51	36	1.92	0.18	29
43+732	46+916	BH-CL	0.00	4.50	4.50	Sandy Silt	9	13	1.69	0.18	24
			4.50	8.25	3.75	Silty Clay	26	26	1.81	0.75	5
			8.25	11.25	3.00	Silty Clay	30	30	1.87	1.05	4
			11.25	15.00	3.75	Sandy Silt	43	32	1.89	0.19	28
44+050	47+234	BH-CL	0.00	5.25	5.25	Sandy Silt	10	13	1.69	0.21	27
			5.25	8.25	3.00	Silty Clay	30	30	1.86	1.02	5
			8.25	10.50	2.25	Silty Clay	35	35	1.89	1.19	4
			10.50	15.00	4.50	Sandy Silt	53	42	1.92	0.19	29
44+116	47+301	BH-CL	0.00	3.00	3.00	Sandy Silt	9	14	1.69	0.22	27
			3.00	8.25	5.25	Silty Clay	24	24	1.85	0.82	5
			8.25	11.25	3.00	Sandy Silt	53	44	1.92	0.22	28
			11.25	15.00	3.75	Sandy Silt	62	45	1.94	0.24	28
44+317	47+501	BH-CL	0.00	3.00	3.00	Silty Sand	7	11	1.64	0.00	30
			3.00	6.00	3.00	Sandy Silt	23	27	1.82	0.18	30
			6.00	10.00	4.00	Silty Clay	27	27	1.89	1.16	5

Chainage Old (km)	Chainage New (km)	BH.No.	Layer depth below EGL (m)		Thickness of strata (m)	Strata description	SPT 'N'		Bulk Density (gm/cc)	Cohesion (C) (kg/cm ²)	Angle of internal Friction (Φ) (°)
			From	To			Observed	Corrected			
44+641	47+825	BH-CL	0.00	4.50	4.50	Sandy Silt	10	14	1.69	0.23	28
			4.50	10.00	5.50	Silty Clay	22	22	-	-	-
44+910	48+094	BH-CL	0.00	5.25	5.25	Silty Sand	10	13	1.69	0.11	30
			5.25	8.25	3.00	Silty Clay	23	23	1.82	0.75	4
			8.25	10.00	1.75	Sandy Silt	44	36	1.89	0.20	30
45+048	48+232	BH-CL	0.00	2.25	2.25	Sandy Silt	6	10	1.66	0.21	27
			2.25	4.50	2.25	Sandy Silt	12	15	1.71	0.20	24
			4.50	8.25	3.75	Silty Clay	27	27	1.83	0.86	6
			8.25	10.00	1.75	Silty Clay	32	32	1.86	1.04	6
45+411	48+595	BH-CL	0.00	3.00	3.00	Silty Sand	8	13	1.66	0.00	30
			3.00	7.50	4.50	Sandy Silt	22	24	1.81	0.20	28
			7.50	10.00	2.50	Silty Clay	28	28	1.88	1.06	4
45+480	48+664	BH-A1	0.00	4.00	4.00	Silty Sand	15	19	1.73	0.09	29
			4.00	7.00	3.00	Silty Sand	22	22	1.75	0.09	29
			7.00	10.00	3.00	Silty Sand	32	28	1.77	0.07	30
			10.00	13.00	3.00	Sandy Silt	47	36	1.84	0.19	30
			13.00	16.00	3.00	Sandy Silt	53	36	1.86	0.19	29
			16.00	19.00	3.00	Sandy Silt	62	28	1.89	0.20	29
			19.00	22.00	3.00	Sandy Silt	77	31	1.90	0.20	29
		22.00	30.00	7.50	Sandy Silt	100	36	1.98	0.16	30	
		BH-A2	0.00	5.50	5.50	Silty Sand	19	25	1.76	0.09	29
			5.50	8.50	3.00	Silty Sand	27	25	1.77	0.09	30
			8.50	11.50	3.00	Sandy Silt	45	36	1.82	0.21	28
			11.50	14.50	3.00	Sandy Silt	43	31	1.83	0.21	28
			14.50	17.50	3.00	Sandy Silt	66	29	1.86	0.21	28
			17.50	20.50	3.00	Sandy Silt	77	32	1.90	0.18	29
20.50	23.50		3.00	Sandy Silt	90	35	1.91	0.18	29		
23.50	30.00	6.00	Sandy Silt	100	35	1.96	0.15	29			
45+612	48+795	BH-CL	0.00	3.00	3.00	Sandy Silt	7	11	1.67	0.19	27
			3.00	8.25	5.25	Silty Clay	24	24	1.82	0.82	5
			8.25	10.00	1.75	Sandy Silt	38	31	1.86	0.21	29
45+984	49+168	BH-CL	0.00	3.00	3.00	Silty Sand	6	9	1.63	0.00	30
			3.00	15.00	12.00	Sandy Silt	41	35	1.84	0.20	30
46+400	49+584	BH-CL	0.00	3.00	3.00	Silty Sand	14	22	1.73	0.00	31
			3.00	15.00	12.00	Sandy Silt	38	36	1.85	0.21	29

Design parameter have been obtain from the laboratory test results however various depth where the shear parameter seems on the lower side with respect to SPT 'N' values those shear parameter have been judicially improved based on the SPT 'N' for the analysis purpose.

The sample calculation for computation of safe load carrying capacity of normal bored cast-in-situ RCC pile in compression & uplift are attached vide **Appendix C-2**.

The sample calculation for computation of safe load carrying capacity of normal bored cast-in-situ RCC pile in lateral are attached vide **Appendix C-3**.

CHAPTER 4 FOUNDATION RECOMMENDATIONS

8.0 FOUNDATION RECOMMENDATIONS

- Based on the nature & strength characteristics of the substrata and requirement of the project, shallow foundation and normal bored cast in-situ RCC pile foundation have been analyzed.
- Based on the method of analysis & design parameters given under Para 7.1 above, the recommended net allowable bearing capacity values are given in Table 4.1 to 4.4.

Table 4.1: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
29+000	-	BH-PLT-06	2.0 x 2.0	1.0	20.6	41.4	20.6
			2.0 x 2.0	1.5	24.5	45.2	24.5
			2.0 x 2.0	2.0	28.7	47.7	28.7
			2.0 x 2.0	2.5	33.0	51.3	33.0
			3.0 X 3.0	1.0	21.6	34.0	21.6
			3.0 X 3.0	1.5	25.0	36.3	25.0
			3.0 X 3.0	2.0	28.6	38.5	28.6
29+000	-	PLT-06	2.0 x 2.0	2.5	78.5	120.9	78.5
29+487	30+155	BH-A1	7.2 X 7.2	2.0	46.1	27.1	27.1
			7.2 X 7.2	3.0	54.2	32.6	32.6
			7.2 X 7.2	4.0	62.5	40.0	40.0
		BH-A2	7.2 X 7.2	2.0	32.0	28.2	28.2
			7.2 X 7.2	3.0	38.6	37.1	37.1
			7.2 X 7.2	4.0	45.4	50.9	45.4
29+860	30+528	BH-CL	7.2 X 7.2	2.0	33.8	14.1	14.1
			7.2 X 7.2	3.0	39.8	15.2	15.2
			7.2 X 7.2	4.0	46.1	16.0	16.0
30+176	30+829	BH-CL	12 X 12	1.0	36.4	6.9	6.9
			12 X 12	1.5	39.0	6.9	6.9
			12 X 12	2.0	41.7	7.0	7.0
30+478	31+145	BH-CL	7.2 X 7.2	1.0	17.7	9.9	9.9
			7.2 X 7.2	1.5	18.1	12.0	12.0
			7.2 X 7.2	2.0	18.5	14.9	14.9
30+697	31+365	BH-CL	7.2 X 7.2	2.0	31.9	22.1	22.1
			7.2 X 7.2	3.0	39.6	23.3	23.3
			7.2 X 7.2	4.0	47.7	24.6	24.6

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
31+354	32+022	BH-CL	7.2 X 7.2	1.0	12.3	7.1	7.1
			7.2 X 7.2	1.5	12.5	7.2	7.2
			7.2 X 7.2	2.0	12.8	7.4	7.4
32+160	32+767	BH-CL	7.2 X 7.2	1.0	17.8	6.5	6.5
			7.2 X 7.2	1.5	18.2	6.7	6.7
			7.2 X 7.2	2.0	18.5	6.8	6.8
32+487	33+155	BH-CL	7.2 X 7.2	1.0	47.6	25.6	25.6
			7.2 X 7.2	1.5	52.1	26.9	26.9
			7.2 X 7.2	2.0	56.7	28.3	28.3
30+083	33+269	BH-CL	2.5 X 2.5	1.0	30.0	27.0	27.0
			2.5 X 2.5	1.5	35.1	29.2	29.2
			2.5 X 2.5	2.0	40.5	31.9	31.9
30+488	33+673	BH-A1	7.2 X 7.2	2.0	29.9	14.8	14.8
			7.2 X 7.2	3.0	36.1	17.7	17.7
			7.2 X 7.2	4.0	42.5	21.7	21.7
		BH-A2	7.2 X 7.2	2.0	37.7	17.6	17.6
			7.2 X 7.2	3.0	45.5	18.9	18.9
			7.2 X 7.2	4.0	53.5	19.7	19.7
31+095	34+280	BH-CL	4.8 X 4.8	1.0	13.0	8.9	8.9
			4.8 X 4.8	1.5	14.4	11.7	11.7
			4.8 X 4.8	2.0	15.8	14.0	14.0
31+714	34+899	BH-A1	7.2 X 7.2	2.0	32.5	14.1	14.1
			7.2 X 7.2	3.0	38.4	14.9	14.9
			7.2 X 7.2	4.0	44.4	15.7	15.7
		BH-A2	7.2 X 7.2	2.0	38.4	15.1	15.1
			7.2 X 7.2	3.0	45.1	16.3	16.3
			7.2 X 7.2	4.0	52.2	17.9	17.9
32+191	35+371	BH-CL	4.8 X 4.8	1.0	24.7	31.9	24.7
			4.8 X 4.8	1.5	29.5	33.1	29.5
			4.8 X 4.8	2.0	34.4	34.5	34.4
32+738	35+916	BH-CL	4.8 X 4.8	1.0	21.5	16.1	16.1
			4.8 X 4.8	1.5	24.2	16.8	16.8
			4.8 X 4.8	2.0	27.0	17.6	17.6
33+713	36+984	BH-A1	7.2 X 7.2	2.0	84.9	36.8	36.8
			7.2 X 7.2	3.0	89.0	42.3	42.3
			7.2 X 7.2	4.0	93.2	48.6	48.6
		BH-A2	7.2 X 7.2	2.0	91.5	27.1	27.1
			7.2 X 7.2	3.0	94.7	30.4	30.4
			7.2 X 7.2	4.0	98.0	34.7	34.7

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
34+019	37+318	BH-CL	2.5 X 2.5	1.0	24.1	44.3	24.1
			2.5 X 2.5	1.5	29.2	47.9	29.2
			2.5 X 2.5	2.0	34.5	50.1	34.5
34+619	37+804	BH-CL	4.8 X 4.8	1.0	22.0	17.0	17.0
			4.8 X 4.8	1.5	24.5	19.1	19.1
			4.8 X 4.8	2.0	27.2	21.7	21.7
35+273	38+457	BH-A1	7.2 X 7.2	2.0	23.9	13.1	13.1
			7.2 X 7.2	3.0	29.0	14.0	14.0
			7.2 X 7.2	4.0	34.2	15.1	15.1
		BH-A2	7.2 X 7.2	2.0	28.3	14.0	14.0
			7.2 X 7.2	3.0	33.3	15.1	15.1
36+367	39+553	BH-CL	4.8 X 4.8	1.0	32.4	18.0	18.0
			4.8 X 4.8	1.5	36.4	19.0	19.0
			4.8 X 4.8	2.0	40.4	20.1	20.1
36+816	40+003	BH-A1	4.8 X 4.8	2.0	25.7	9.8	9.8
			4.8 X 4.8	3.0	31.0	12.6	12.6
			4.8 X 4.8	4.0	36.5	17.6	17.6
		BH-A2	4.8 X 4.8	2.0	21.2	25.8	21.2
			4.8 X 4.8	3.0	26.5	27.7	26.5
37+174	40+358	BH-CL	2.2 X 2.2	1.0	14.3	14.9	14.3
			2.2 X 2.2	1.5	18.8	16.2	16.2
			2.2 X 2.2	2.0	23.7	17.3	17.3
37+487	40+671	BH-CL	4.8 X 4.8	1.0	15.3	16.5	15.3
			4.8 X 4.8	1.5	17.3	17.2	17.2
			4.8 X 4.8	2.0	19.3	17.1	17.1
38+127	41+312	BH-CL	4.8 X 4.8	1.0	17.2	8.5	8.5
			4.8 X 4.8	1.5	19.7	8.9	8.9
			4.8 X 4.8	2.0	22.3	9.3	9.3
38+482	41+667	BH-CL	2.2 X 2.2	1.0	13.9	16.6	13.9
			2.2 X 2.2	1.5	14.7	18.0	14.7
			2.2 X 2.2	2.0	15.5	19.3	15.5
38+701	41+926	BH-CL	2.7 X 2.7	1.0	24.4	16.7	16.7
			2.7 X 2.7	1.5	25.4	18.0	18.0
			2.7 X 2.7	2.0	26.4	19.2	19.2
38+778	41+963	BH-CL	11.35 X 11.35	1.0	29.6	9.2	9.2
			11.35 X 11.35	1.5	31.9	9.4	9.4
			11.35 X 11.35	2.0	34.2	9.7	9.7

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
39+060	42+239	BH-CL	2.7 X 2.7	1.0	18.2	11.0	11.0
			2.7 X 2.7	1.5	21.1	13.8	13.8
			2.7 X 2.7	2.0	24.0	18.0	18.0
39+149	-	BH-PLT-03	2.0 x 2.0	1.0	10.9	19.6	10.9
			2.0 x 2.0	1.5	13.4	21.4	13.4
			2.0 x 2.0	2.0	16.0	22.6	16.0
			2.0 x 2.0	2.5	18.8	24.3	18.8
			3.0 X 3.0	1.0	17.2	11.7	17.2
			3.0 X 3.0	1.5	18.4	13.9	18.4
			3.0 X 3.0	2.0	19.5	16.3	19.5
39+149	-	PLT-03	3.0 X 3.0	2.5	20.5	18.7	20.5
39+149	-	PLT-03	2.0 x 2.0	2.5	26.3	31.4	26.3
39+400	42+579	BH-CL	7.3 X 7.3	1.0	16.5	14.0	14.0
			7.3 X 7.3	1.5	19.1	15.5	15.5
			7.3 X 7.3	2.0	21.8	17.3	17.3
40+325	43+507	BH-CL	11.35 X 11.35	1.0	39.7	17.4	17.4
			11.35 X 11.35	1.5	42.6	18.1	18.1
			11.35 X 11.35	2.0	45.6	18.8	18.8
40+573	43+758	BH-CL	4.8 X 4.8	1.0	43.8	28.5	28.5
			4.8 X 4.8	1.5	49.2	31.0	31.0
			4.8 X 4.8	2.0	54.7	34.1	34.1
41+056	44+246	BH-A1	7.2 X 7.2	2.0	37.2	23.4	23.4
			7.2 X 7.2	3.0	43.9	24.7	24.7
			7.2 X 7.2	4.0	50.9	26.1	26.1
		BH-A2	7.2 X 7.2	2.0	48.3	35.9	35.9
			7.2 X 7.2	3.0	57.6	37.9	37.9
			7.2 X 7.2	4.0	67.4	40.0	40.0
41+100	44+282	BH-CL	4.9 X 4.9	1.0	42.6	29.6	29.6
			4.9 X 4.9	1.5	48.8	31.6	31.6
			4.9 X 4.9	2.0	55.1	33.9	33.9
41+217	44+402	BH-CL	4.9 X 4.9	1.0	46.0	29.5	29.5
			4.9 X 4.9	1.5	54.3	31.0	31.0
			4.9 X 4.9	2.0	62.9	32.7	32.7
41+235	44+421	BH-CL	4.9 X 4.9	1.0	20.5	13.9	13.9
			4.9 X 4.9	1.5	23.0	16.3	16.3
			4.9 X 4.9	2.0	25.5	19.7	19.7
41+390	44+571	BH-A1	7.2 X 7.2	2.0	62.0	49.0	49.0
			7.2 X 7.2	3.0	72.8	51.6	51.6
			7.2 X 7.2	4.0	83.9	54.5	54.5

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)		
41+390	44+571	BH-A2	7.2 X 7.2	2.0	28.9	24.5	24.5		
			7.2 X 7.2	3.0	33.9	28.7	28.7		
			7.2 X 7.2	4.0	39.1	34.6	34.6		
42+256	45+497	BH-A1	7.2 X 7.2	2.0	20.4	16.8	16.8		
			7.2 X 7.2	3.0	23.6	17.7	17.7		
			7.2 X 7.2	4.0	26.9	18.7	18.7		
		BH-P2	7.2 X 7.2	2.0	52.0	28.1	28.1		
			7.2 X 7.2	3.0	62.6	29.6	29.6		
			7.2 X 7.2	4.0	73.6	31.2	31.2		
		BH-P3	7.2 X 7.2	2.0	32.9	4.6	4.6		
			7.2 X 7.2	3.0	39.2	8.0	8.0		
			7.2 X 7.2	4.0	45.8	30.0	30.0		
		BH-P4	7.2 X 7.2	2.0	25.5	12.2	12.2		
			7.2 X 7.2	3.0	31.0	12.9	12.9		
			7.2 X 7.2	4.0	36.7	13.6	13.6		
		BH-P5	7.2 X 7.2	2.0	37.9	15.0	15.0		
			7.2 X 7.2	3.0	44.7	15.9	15.9		
			7.2 X 7.2	4.0	51.8	17.0	17.0		
		BH-P6	7.2 X 7.2	2.0	64.4	30.6	30.6		
			7.2 X 7.2	3.0	75.4	32.3	32.3		
			7.2 X 7.2	4.0	86.8	34.1	34.1		
		BH-P13	7.2 X 7.2	2.0	56.2	37.4	37.4		
			7.2 X 7.2	3.0	67.3	44.5	44.5		
			7.2 X 7.2	4.0	78.9	53.2	53.2		
		BH-P14	7.2 X 7.2	2.0	63.2	41.0	41.0		
			7.2 X 7.2	3.0	74.9	43.7	43.7		
			7.2 X 7.2	4.0	87.1	46.1	46.1		
		BH-P15	7.2 X 7.2	2.0	49.4	32.9	32.9		
			7.2 X 7.2	3.0	59.4	39.7	39.7		
			7.2 X 7.2	4.0	69.8	48.6	48.6		
		BH-P16	7.2 X 7.2	2.0	54.1	31.7	31.7		
			7.2 X 7.2	3.0	64.8	33.4	33.4		
			7.2 X 7.2	4.0	76.0	35.3	35.3		
		BH-A2	7.2 X 7.2	2.0	70.4	19.4	19.4		
			7.2 X 7.2	3.0	82.9	20.4	20.4		
			7.2 X 7.2	4.0	95.9	21.6	21.6		
		43+100	46+280	PLT-02	2.0 X 2.0	2.5	44.3	76.6	44.3
		43+100	46+280	BH-PLT-02	2.0 X 2.0	1.0	13.7	15.5	13.7
						1.5	17.0	21.8	17.0
						2.0	20.5	34.4	20.5
						2.5	24.1	48.5	24.1

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
43+100	46+280	BH-PLT-02	3.0 X 3.0	1.0	14.9	15.9	14.9
				1.5	17.8	21.8	17.8
				2.0	20.9	32.1	20.9
				2.5	24.2	82.8	24.2
43+452	46+636	BH-CL	7.3 X 7.3	1.0	18.9	12.0	12.0
			7.3 X 7.3	1.5	21.3	13.2	13.2
			7.3 X 7.3	2.0	23.8	14.8	14.8
43+585	46+769	BH-CL	7.3 X 7.3	1.0	23.2	11.8	11.8
			7.3 X 7.3	1.5	25.5	12.7	12.7
			7.3 X 7.3	2.0	27.9	14.0	14.0
43+732	46+916	BH-CL	6.2 X 6.2	1.0	20.9	10.5	10.5
			6.2 X 6.2	1.5	23.3	11.3	11.3
			6.2 X 6.2	2.0	25.7	12.3	12.3
44+050	47+234	BH-CL	6.2 X 6.2	1.0	22.4	11.0	11.0
			6.2 X 6.2	1.5	24.8	11.9	11.9
			6.2 X 6.2	2.0	27.2	13.1	13.1
44+116	47+301	BH-CL	11.5 X 11.5	1.0	29.1	11.0	11.0
			11.5 X 11.5	1.5	31.4	11.2	11.2
			11.5 X 11.5	2.0	33.6	11.4	11.4
44+317	47+501	BH-CL	4.9 X 4.9	1.0	26.7	12.4	12.4
			4.9 X 4.9	1.5	30.0	14.6	14.6
			4.9 X 4.9	2.0	33.3	17.7	17.7
44+641	47+825	BH-CL	4.8 X 4.8	1.0	21.9	11.2	11.2
			4.8 X 4.8	1.5	24.4	12.3	12.3
			4.8 X 4.8	2.0	27.1	13.7	13.7
44+910	48+094	BH-CL	4.8 X 4.8	1.0	17.1	9.5	9.5
			4.8 X 4.8	1.5	19.6	10.4	10.4
			4.8 X 4.8	2.0	22.3	11.5	11.5
45+048	48+232	BH-CL	4.9 X 4.9	1.0	16.6	8.8	8.8
			4.9 X 4.9	1.5	18.5	9.8	9.8
			4.9 X 4.9	2.0	20.5	11.1	11.1
45+411	48+595	BH-CL	2.2 X 2.2	1.0	14.3	13.3	13.3
			2.2 X 2.2	1.5	17.3	16.3	16.3
			2.2 X 2.2	2.0	20.4	20.6	20.4
45+480	48+664	BH-A1	7.2 X 7.2	2.0	41.2	26.4	26.4
			7.2 X 7.2	3.0	49.6	27.8	27.8
			7.2 X 7.2	4.0	58.3	29.4	29.4
		BH-A2	7.2 X 7.2	2.0	53.4	26.9	26.9
			7.2 X 7.2	3.0	64.1	28.4	28.4
			7.2 X 7.2	4.0	75.3	30.0	30.0

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
45+612	48+795	BH-CL	4.9 X 4.9	1.0	19.8	10.8	10.8
			4.9 X 4.9	1.5	22.2	12.6	12.6
			4.9 X 4.9	2.0	24.7	15.0	15.0
45+984	49+168	BH-CL	11.5 x 11.5	1.0	22.6	25.4	22.6
			11.5 x 11.5	1.5	24.7	25.7	24.7
			11.5 x 11.5	2.0	26.8	26.0	26.0
46+400	49+584	BH-CL	1.6 x 1.6	1.0	12.6	25.6	12.6
			1.6 x 1.6	1.5	17.3	30.5	17.3
			1.6 x 1.6	2.0	22.4	38.7	22.4

* The maximum value of recommended net allowable bearing capacity shall be restricted to 30 t/m².

Table 4.2: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
29+000	-	BH-PLT-06	2.0 x 2.0	1.0	20.6	82.9	20.6
			2.0 x 2.0	1.5	24.5	90.3	24.5
			2.0 x 2.0	2.0	28.7	95.4	28.7
			2.0 x 2.0	2.5	33.0	102.6	33.0
			3.0 X 3.0	1.0	21.6	67.9	21.6
			3.0 X 3.0	1.5	25.0	72.6	25.0
			3.0 X 3.0	2.0	28.6	77.1	28.6
29+487	30+155	BH-A1	7.2 X 7.2	2.0	46.1	54.2	46.1
			7.2 X 7.2	3.0	54.2	65.2	54.2
			7.2 X 7.2	4.0	62.5	80.0	62.5
		BH-A2	7.2 X 7.2	2.0	32.0	56.4	32.0
			7.2 X 7.2	3.0	38.6	74.2	38.6
			7.2 X 7.2	4.0	45.4	101.7	45.4
29+860	30+528	BH-CL	7.2 X 7.2	2.0	33.8	28.3	28.3
			7.2 X 7.2	3.0	39.8	30.4	30.4
			7.2 X 7.2	4.0	46.1	31.9	31.9

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
30+176	30+829	BH-CL	12 X 12	1.0	36.4	13.7	13.7
			12 X 12	1.5	39.0	13.9	13.9
			12 X 12	2.0	41.7	14.0	14.0
30+478	31+145	BH-CL	7.2 X 7.2	1.0	17.7	19.8	17.7
			7.2 X 7.2	1.5	18.1	23.9	18.1
			7.2 X 7.2	2.0	18.5	29.8	18.5
30+697	31+365	BH-CL	7.2 X 7.2	2.0	31.9	44.2	31.9
			7.2 X 7.2	3.0	39.6	46.6	39.6
			7.2 X 7.2	4.0	47.7	49.2	47.7
31+354	32+022	BH-CL	7.2 X 7.2	1.0	12.3	14.2	12.3
			7.2 X 7.2	1.5	12.5	14.5	12.5
			7.2 X 7.2	2.0	12.8	14.9	12.8
32+160	32+767	BH-CL	7.2 X 7.2	1.0	17.8	13.1	13.1
			7.2 X 7.2	1.5	18.2	13.3	13.3
			7.2 X 7.2	2.0	18.5	13.7	13.7
32+487	33+155	BH-CL	7.2 X 7.2	1.0	47.6	51.2	47.6
			7.2 X 7.2	1.5	52.1	53.7	52.1
			7.2 X 7.2	2.0	56.7	56.6	56.6
30+083	33+269	BH-CL	2.5 X 2.5	1.0	30.0	54.0	30.0
			2.5 X 2.5	1.5	35.1	58.4	35.1
			2.5 X 2.5	2.0	40.5	63.8	40.5
30+488	33+673	BH-A1	7.2 X 7.2	2.0	29.9	29.7	29.7
			7.2 X 7.2	3.0	36.1	35.4	35.4
			7.2 X 7.2	4.0	42.5	43.4	42.5
		BH-A2	7.2 X 7.2	2.0	37.7	35.1	35.1
			7.2 X 7.2	3.0	45.5	37.7	37.7
			7.2 X 7.2	4.0	53.5	39.5	39.5
31+095	34+280	BH-CL	4.8 X 4.8	1.0	13.0	17.9	13.0
			4.8 X 4.8	1.5	14.4	23.4	14.4
			4.8 X 4.8	2.0	15.8	28.1	15.8
31+714	34+899	BH-A1	7.2 X 7.2	2.0	32.5	28.2	28.2
			7.2 X 7.2	3.0	38.4	29.7	29.7
			7.2 X 7.2	4.0	44.4	31.4	31.4
		BH-A2	7.2 X 7.2	2.0	38.4	30.3	30.3
			7.2 X 7.2	3.0	45.1	32.6	32.6
			7.2 X 7.2	4.0	52.2	35.7	35.7
32+191	35+371	BH-CL	4.8 X 4.8	1.0	24.7	63.8	24.7
			4.8 X 4.8	1.5	29.5	66.2	29.5
			4.8 X 4.8	2.0	34.4	68.9	34.4

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
32+738	35+916	BH-CL	4.8 X 4.8	1.0	21.5	32.2	21.5
			4.8 X 4.8	1.5	24.2	33.5	24.2
			4.8 X 4.8	2.0	27.0	35.2	27.0
33+713	36+984	BH-A1	7.2 X 7.2	2.0	84.9	73.5	73.5
			7.2 X 7.2	3.0	89.0	84.5	84.5
			7.2 X 7.2	4.0	93.2	97.2	93.2
		BH-A2	7.2 X 7.2	2.0	91.5	54.2	54.2
			7.2 X 7.2	3.0	94.7	60.8	60.8
			7.2 X 7.2	4.0	98.0	69.4	69.4
34+019	37+318	BH-CL	2.5 X 2.5	1.0	24.1	88.7	24.1
			2.5 X 2.5	1.5	29.2	95.8	29.2
			2.5 X 2.5	2.0	34.5	100.2	34.5
34+619	37+804	BH-CL	4.8 X 4.8	1.0	22.0	34.0	22.0
			4.8 X 4.8	1.5	24.5	38.2	24.5
			4.8 X 4.8	2.0	27.2	43.3	27.2
35+273	38+457	BH-A1	7.2 X 7.2	2.0	23.9	26.1	23.9
			7.2 X 7.2	3.0	29.0	27.9	27.9
			7.2 X 7.2	4.0	34.2	30.2	30.2
		BH-A2	7.2 X 7.2	2.0	28.3	28.0	28.0
			7.2 X 7.2	3.0	33.3	30.2	30.2
			7.2 X 7.2	4.0	38.4	33.1	33.1
36+367	39+553	BH-CL	4.8 X 4.8	1.0	32.4	36.1	32.4
			4.8 X 4.8	1.5	36.4	38.0	36.4
			4.8 X 4.8	2.0	40.4	40.2	40.2
36+816	40+003	BH-A1	4.8 X 4.8	2.0	25.7	19.7	19.7
			4.8 X 4.8	3.0	31.0	25.3	25.3
			4.8 X 4.8	4.0	36.5	35.2	35.2
		BH-A2	4.8 X 4.8	2.0	21.2	51.5	21.2
			4.8 X 4.8	3.0	26.5	55.4	26.5
			4.8 X 4.8	4.0	32.1	58.5	32.1
37+174	40+358	BH-CL	2.2 X 2.2	1.0	14.3	29.7	14.3
			2.2 X 2.2	1.5	18.8	32.4	18.8
			2.2 X 2.2	2.0	23.7	34.6	23.7
37+487	40+671	BH-CL	4.8 X 4.8	1.0	15.3	33.0	15.3
			4.8 X 4.8	1.5	17.3	34.3	17.3
			4.8 X 4.8	2.0	19.3	34.1	19.3

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
38+127	41+312	BH-CL	4.8 X 4.8	1.0	17.2	17.0	17.0
			4.8 X 4.8	1.5	19.7	17.8	17.8
			4.8 X 4.8	2.0	22.3	18.7	18.7
38+482	41+667	BH-CL	2.2 X 2.2	1.0	13.9	33.1	13.9
			2.2 X 2.2	1.5	14.7	36.0	14.7
			2.2 X 2.2	2.0	15.5	38.5	15.5
38+701	41+926	BH-CL	2.7 X 2.7	1.0	24.4	33.5	24.4
			2.7 X 2.7	1.5	25.4	36.0	25.4
			2.7 X 2.7	2.0	26.4	38.4	26.4
38+778	41+963	BH-CL	11.35 X 11.35	1.0	29.6	18.3	18.3
			11.35 X 11.35	1.5	31.9	18.9	18.9
			11.35 X 11.35	2.0	34.2	19.4	19.4
39+060	42+239	BH-CL	2.7 X 2.7	1.0	18.2	22.1	18.2
			2.7 X 2.7	1.5	21.1	27.5	21.1
			2.7 X 2.7	2.0	24.0	36.0	24.0
39+149	-	BH-PLT-03	2.0 x 2.0	1.0	10.9	39.2	10.9
			2.0 x 2.0	1.5	13.4	42.8	13.4
			2.0 x 2.0	2.0	16.0	45.2	16.0
			2.0 x 2.0	2.5	18.8	24.3	18.8
			3.0 X 3.0	1.0	11.7	34.4	11.7
			3.0 X 3.0	1.5	13.9	36.8	13.9
			3.0 X 3.0	2.0	16.3	39.0	16.3
			3.0 X 3.0	2.5	18.7	41.1	18.7
39+400	42+579	BH-CL	7.3 X 7.3	1.0	16.5	28.1	16.5
			7.3 X 7.3	1.5	19.1	30.9	19.1
			7.3 X 7.3	2.0	21.8	34.5	21.8
40+325	43+507	BH-CL	11.35 X 11.35	1.0	39.7	34.8	34.8
			11.35 X 11.35	1.5	42.6	36.1	36.1
			11.35 X 11.35	2.0	45.6	37.6	37.6
40+573	43+758	BH-CL	4.8 X 4.8	1.0	43.8	57.0	43.8
			4.8 X 4.8	1.5	49.2	62.0	49.2
			4.8 X 4.8	2.0	54.7	68.2	54.7
41+056	44+246	BH-A1	7.2 X 7.2	2.0	37.2	46.9	37.2
			7.2 X 7.2	3.0	43.9	49.4	43.9
			7.2 X 7.2	4.0	50.9	52.2	50.9
		BH-A2	7.2 X 7.2	2.0	48.3	71.8	48.3
			7.2 X 7.2	3.0	57.6	75.7	57.6
			7.2 X 7.2	4.0	67.4	80.0	67.4

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
41+100	44+282	BH-CL	4.9 X 4.9	1.0	42.6	59.1	42.6
			4.9 X 4.9	1.5	48.8	63.2	48.8
			4.9 X 4.9	2.0	55.1	67.8	55.1
41+217	44+402	BH-CL	4.9 X 4.9	1.0	46.0	59.0	46.0
			4.9 X 4.9	1.5	54.3	61.9	54.3
			4.9 X 4.9	2.0	62.9	65.5	62.9
41+235	44+421	BH-CL	4.9 X 4.9	1.0	20.5	27.7	20.5
			4.9 X 4.9	1.5	23.0	32.5	23.0
			4.9 X 4.9	1.5	25.5	39.4	25.5
41+390	44+571	BH-A1	7.2 X 7.2	2.0	62.0	98.0	62.0
			7.2 X 7.2	3.0	72.8	103.3	72.8
			7.2 X 7.2	4.0	83.9	109.1	83.9
		BH-A2	7.2 X 7.2	2.0	28.9	49.0	28.9
			7.2 X 7.2	3.0	33.9	57.4	33.9
			7.2 X 7.2	4.0	39.1	69.2	39.1
42+256	45+497	BH-A1	7.2 X 7.2	2.0	20.4	33.7	20.4
			7.2 X 7.2	3.0	23.6	35.5	23.6
			7.2 X 7.2	4.0	26.9	37.5	26.9
		BH-P2	7.2 X 7.2	2.0	52.0	56.1	52.0
			7.2 X 7.2	3.0	62.6	59.2	59.2
			7.2 X 7.2	4.0	73.6	62.5	62.5
		BH-P3	7.2 X 7.2	2.0	32.9	9.1	9.1
			7.2 X 7.2	3.0	39.2	15.9	15.9
			7.2 X 7.2	4.0	45.8	60.0	45.8
		BH-P4	7.2 X 7.2	2.0	25.5	24.5	24.5
			7.2 X 7.2	3.0	31.0	25.8	25.8
			7.2 X 7.2	4.0	36.7	27.2	27.2
		BH-P5	7.2 X 7.2	2.0	37.9	30.1	30.1
			7.2 X 7.2	3.0	44.7	31.7	31.7
			7.2 X 7.2	4.0	51.8	33.9	33.9
		BH-P6	7.2 X 7.2	2.0	64.4	61.2	61.2
			7.2 X 7.2	3.0	75.4	64.5	64.5
			7.2 X 7.2	4.0	86.8	68.2	68.2
		BH-P13	7.2 X 7.2	2.0	56.2	74.8	56.2
			7.2 X 7.2	3.0	67.3	89.0	67.3
			7.2 X 7.2	4.0	78.9	106.4	78.9

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
42+256	45+497	BH-P14	7.2 X 7.2	2.0	63.2	82.0	63.2
			7.2 X 7.2	3.0	74.9	87.4	74.9
			7.2 X 7.2	4.0	87.1	92.3	87.1
		BH-P15	7.2 X 7.2	2.0	49.4	65.8	49.4
			7.2 X 7.2	3.0	59.4	79.4	59.4
			7.2 X 7.2	4.0	69.8	97.2	69.8
		BH-P16	7.2 X 7.2	2.0	54.1	63.4	54.1
			7.2 X 7.2	3.0	64.8	66.8	64.8
			7.2 X 7.2	4.0	76.0	70.6	70.6
		BH-A2	7.2 X 7.2	2.0	70.4	38.8	38.8
			7.2 X 7.2	3.0	82.9	40.9	40.9
			7.2 X 7.2	4.0	95.9	43.2	43.2
43+100	46+280	BH-PLT-02	2.0 x 2.0	1.0	13.7	31.0	13.7
			2.0 x 2.0	1.5	17.0	43.7	17.0
			2.0 x 2.0	2.0	20.5	68.8	20.5
			2.0 x 2.0	2.5	24.1	96.9	24.1
			3.0 X 3.0	1.0	14.9	31.8	14.9
			3.0 X 3.0	1.5	17.8	43.7	17.8
			3.0 X 3.0	2.0	20.9	64.2	20.9
			3.0 X 3.0	2.5	24.2	82.8	24.2
43+452	46+636	BH-CL	7.3 X 7.3	1.0	18.9	23.9	18.9
			7.3 X 7.3	1.5	21.3	26.4	21.3
			7.3 X 7.3	2.0	23.8	29.5	23.8
43+585	46+769	BH-CL	7.3 X 7.3	1.0	23.2	23.5	23.2
			7.3 X 7.3	1.5	25.5	25.5	25.5
			7.3 X 7.3	2.0	27.9	28.0	27.9
43+732	46+916	BH-CL	6.2 X 6.2	1.0	20.9	21.0	20.9
			6.2 X 6.2	1.5	23.3	22.6	22.6
			6.2 X 6.2	2.0	25.7	24.6	24.6
44+050	47+234	BH-CL	6.2 X 6.2	1.0	22.4	22.0	22.0
			6.2 X 6.2	1.5	24.8	23.8	23.8
			6.2 X 6.2	2.0	27.2	26.2	26.2
44+116	47+301	BH-CL	11.5 X 11.5	1.0	29.1	21.9	21.9
			11.5 X 11.5	1.5	31.4	22.4	22.4
			11.5 X 11.5	2.0	33.6	22.8	22.8
44+317	47+501	BH-CL	4.9 X 4.9	1.0	26.7	24.8	24.8
			4.9 X 4.9	1.5	30.0	29.3	29.3
			4.9 X 4.9	2.0	33.3	35.4	33.3

Chainage Old (km)	Chainage New (km)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
44+641	47+825	BH-CL	4.8 X 4.8	1.0	21.9	22.4	21.9
			4.8 X 4.8	1.5	24.4	24.6	24.4
			4.8 X 4.8	2.0	27.1	27.4	27.1
44+910	48+094	BH-CL	4.8 X 4.8	1.0	17.1	19.1	17.1
			4.8 X 4.8	1.5	19.6	20.8	19.6
			4.8 X 4.8	2.0	22.3	23.0	22.3
45+048	48+232	BH-CL	4.9 X 4.9	1.0	16.6	17.7	16.6
			4.9 X 4.9	1.5	18.5	19.6	18.5
			4.9 X 4.9	2.0	20.5	22.2	20.5
45+411	48+595	BH-CL	2.2 X 2.2	1.0	14.3	26.5	14.3
			2.2 X 2.2	1.5	17.3	32.6	17.3
			2.2 X 2.2	2.0	20.4	41.1	20.4
45+480	48+664	BH-A1	7.2 X 7.2	2.0	41.2	52.8	41.2
			7.2 X 7.2	3.0	49.6	55.7	49.6
			7.2 X 7.2	4.0	58.3	58.8	58.3
		BH-A2	7.2 X 7.2	2.0	53.4	53.9	53.4
			7.2 X 7.2	3.0	64.1	56.8	56.8
			7.2 X 7.2	4.0	75.3	60.0	60.0
45+612	48+795	BH-CL	4.9 X 4.9	1.0	19.8	21.5	19.8
			4.9 X 4.9	1.5	22.2	25.1	22.2
			4.9 X 4.9	2.0	24.7	30.0	24.7
45+984	49+168	BH-CL	11.5 x 11.5	1.0	22.6	50.8	22.6
			11.5 x 11.5	1.5	24.7	51.4	24.7
			11.5 x 11.5	2.0	26.8	52.0	26.8
46+400	49+584	BH-CL	1.6 x 1.6	1.0	12.6	51.3	12.6
			1.6 x 1.6	1.5	17.3	61.1	17.3
			1.6 x 1.6	2.0	22.4	77.4	22.4

Table 4.3: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm (Replaced or Compacted Soil)

Sr. No.	Chainage Old (km)	Chainage New (km)	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from 50 mm settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
1.	30+176	30+829	BH-CL	1.0	12 X 12	44.5	19.9	19.9
				1.5		47.8	20.1	20.1
				2.0		51.2	20.6	20.6
2.	31+354	32+022	BH-CL	1.0	7.2 X 7.2	37.8	16.6	16.6
				1.5		38.7	17.0	17.0
				2.0		39.7	17.4	17.4
3.	32+160	37+767	BH-CL	1.0	7.2 X 7.2	18.0	13.1	13.1
				1.5		18.4	14.6	14.6
				2.0		18.9	15.0	15.0
4.	31+095	34+280	BH-CL	1.0	4.8 X 4.8	29.8	25.5	25.5
				1.5		30.8	26.7	26.7
				2.0		32.6	26.2	26.2
5.	37+487	40+671	BH-CL	1.0	4.8 X 4.8	33.2	22.9	22.9
				1.5		38.6	23.7	23.7
				2.0		44.0	24.4	24.4
6.	45+048	48+232	BH-CL	1.0	4.9 X 4.9	31.0	27.5	27.5
				1.5		32.8	25.9	25.9
				2.0		34.6	28.9	28.9
7.	38+482	41+667	BH-CL	1.0	2.2 X 2.2	34.2	28.8	28.8
				1.5		41.9	31.4	31.4
				2.0		50.0	33.5	33.5

Table 4.4: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm (Replaced or Compacted Soil)

Sr. No.	Chainage Old (km)	Chainage New (km)	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from 50 mm settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
1.	30+176	30+829	BH-CL	1.0	12 X 12	44.5	39.8	39.8
				1.5		47.8	40.7	40.7
				2.0		51.2	41.7	41.7

Sr. No.	Chainage Old (km)	Chainage New (km)	BH. No.	Depth of foundation below EGL (m)	Foundation Size (m x m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from 50 mm settlement failure (t/m ²)	*Recommended Net Allowable Bearing Capacity (t/m ²)
2.	31+354	32+022	BH-CL	1.0	7.2 X 7.2	37.8	33.3	33.3
				1.5		38.7	34.0	34.0
				2.0		39.7	34.8	34.8
3.	32+160	37+767	BH-CL	1.0	7.2 X 7.2	18.0	26.3	18.0
				1.5		18.4	29.2	18.4
				2.0		18.9	30.0	18.9
4.	31+095	34+280	BH-CL	1.0	4.8 X 4.8	29.8	50.9	29.8
				1.5		30.8	53.4	30.8
				2.0		32.4	54.4	32.4
5.	37+487	40+671	BH-CL	1.0	4.8 X 4.8	33.2	45.7	33.2
				1.5		38.6	47.5	38.6
				2.0		44.0	47.5	44.0
6.	45+048	48+232	BH-CL	1.0	4.9 X 4.9	31.0	55.0	31.0
				1.5		32.8	51.8	32.8
				2.0		34.6	57.9	34.6
7.	38+482	41+667	BH-CL	1.0	2.2 X 2.2	34.2	57.6	34.2
				1.5		41.9	62.7	41.9
				2.0		50.0	67.0	50.0

Note:-

From table no. 4.1, PLT and boreholes have been conducted on Chainage 39+149, 43+100 and Dhulawat section. Least value of SBC obtained from PLT and Soil exploration data has been recommended.

- The maximum value of recommended net allowable bearing capacity shall be restricted to 30 t/m².
- **Table 4.1&4.2 Show that the SBC at location Ch (Old) 30+176, Ch (Old) 31+354, Ch (Old) 32+160, Ch(Old) 31+095, Ch (Old) 37+487, Ch (Old) 45+048, & Ch (Old) 38+482 are poor. Therefore before laying the open foundation at 1.0, 1.5 m & 2.0m depth, it is recommended to replace or Compact the existing the soil up for 1.5m depth with properly compacted granular material below the foundation level.**
- As per the Morth guidelines the gradation of fill soil shall be as per following limits. The effective angle of friction not less than 30°. The gradation of fill soil shall be as per following limits.

Sieve Size	Percentage Passing
75 mm	100%
425 micron	0-60%
75 micron	less than 15 %
PI	≤ 6

1. The density of backfill soil should be more than 95% of proctor density. The replaced /compacted soil should be lay down layer wise for each 300mm.
2. The design parameters considered for replaced/compacted Soil for calculating the SBC from shear criteria are as follows;

C=0, Phi = 32 degree, Sp. Gravity= 2.63 Moisture content= 8%, Bulk density =1.84 g/cc N = 25.

- Based on the method of analysis given under Para 7.2 above, The values of Safe Load Carrying Capacity of piles in compression, uplift and lateral under static conditions have been tabulated below:-

Table 4.5: Safe Load Carrying Capacity of normal bored cast in-situ RCC Pile in Soil

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
29+487	30+155	BH-A1	1.0	20.0	2.0	532.0	322.0	74.0
				22.0		578.0	364.0	
				24.0		624.0	406.0	
				26.0		666.0	448.0	
				28.0		711.0	490.0	
				30.0		757.0	532.0	
			1.2	20.0	2.0	772.0	420.0	120.0
				22.0		832.0	478.0	
				24.0		897.0	538.0	
				26.0		955.0	598.0	
		BH-A2	1.0	2.0	28.0	1020.0	657.0	67.0
					30.0	1085.0	717.0	
					22.0	520.0	340.0	
					24.0	562.0	379.0	
					26.0	601.0	418.0	
					28.0	644.0	458.0	
			1.2	2.0	32.0	728.0	536.0	108.0
					22.0	564.0	447.0	
					24.0	804.0	503.0	
					26.0	859.0	559.0	
30+488	33+673	BH-A1	1.0	28.0	2.0	919.0	614.0	18.8
				30.0		979.0	670.0	
				20.0		347.0	225.0	
				22.0		387.0	263.0	
		1.2	2.0	16.0	389.0	191.0	22.6	
				18.0	451.0	248.0		
				20.0	509.0	302.0		
				22.0	566.0	355.0		

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
30+488	33+673	BH-A2	1.0	16.0	2.0	274.0	203.0	19.2
				18.0		317.0	243.0	
				20.0		361.0	283.0	
				22.0		399.0	319.0	
			1.2	16.0	2.0	356.0	257.0	23.1
				18.0		419.0	315.0	
				20.0		483.0	374.0	
				22.0		537.0	424.0	
31+714	34+899	BH-A1	1.0	22.0	2.0	438.0	282.0	22.9
				24.0		475.0	317.0	
				26.0		536.0	352.0	
				28.0		570.0	387.0	
			1.2	22.0	2.0	639.0	377.0	30.6
				24.0		692.0	426.0	
				26.0		787.0	477.0	
				28.0		835.0	528.0	
		BH-A2	1.0	22.0	2.0	428.0	288.0	23.6
				24.0		466.0	324.0	
				26.0		504.0	360.0	
				28.0		539.0	395.0	
			1.2	22.0	2.0	621.0	386.0	31.5
				24.0		676.0	438.0	
				26.0		732.0	490.0	
				28.0		782.0	541.0	
33+713	36+984	BH-A1	1.0	16.0	2.0	335.0	226.0	30.5
				18.0		379.0	266.0	
				20.0		409.0	295.0	
				22.0		434.0	320.0	
			1.2	16.0	2.0	438.0	285.0	40.8
				18.0		500.0	342.0	
				20.0		539.0	380.0	
				22.0		571.0	412.0	
		BH-A2	1.0	16.0	2.0	311.0	205.0	29.3
				18.0		356.0	247.0	
				20.0		387.0	276.0	
				22.0		412.0	302.0	

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
33+713	36+984	BH-A2	1.2	16.0	2.0	409.0	260.0	39.2
				18.0		474.0	320.0	
				20.0		514.0	359.0	
				22.0		545.0	391.0	
35+273	38+457	BH-A1	1.0	16.0	2.0	181.0	129.0	22.9
				18.0		207.0	148.0	
				20.0		228.0	170.0	
				22.0		262.0	191.0	
		1.2	2.0	16.0	238.0	163.0	30.6	
				18.0	271.0	188.0		
				20.0	297.0	216.0		
				22.0	344.0	244.0		
		BH-A2	1.0	2.0	16.0	203.0	151.0	22.9
					18.0	223.0	171.0	
					20.0	275.0	194.0	
					22.0	297.0	216.0	
1.2	2.0	16.0	264.0	189.0	30.6			
		18.0	289.0	216.0				
		20.0	358.0	245.0				
		22.0	387.0	274.0				
36+816	40+003	BH-A1	1.0	16.0	2.0	173.0	134.0	22.2
				18.0		218.0	175.0	
				20.0		262.0	216.0	
				22.0		300.0	252.0	
		1.2	2.0	16.0	227.0	171.0	29.7	
				18.0	290.0	229.0		
				20.0	353.0	287.0		
				22.0	406.0	337.0		
		BH-A2	1.0	2.0	16.0	233.0	171.0	22.2
					18.0	278.0	212.0	
					20.0	322.0	253.0	
					22.0	360.0	289.0	
1.2	2.0	16.0	306.0	219.0	29.7			
		18.0	370.0	277.0				
		20.0	433.0	335.0				
		22.0	485.0	385.0				
41+056	44+246	BH-A1	1.0	16.0	2.0	342.0	188.0	24.9
				18.0		379.0	223.0	
				20.0		416.0	257.0	
				22.0		479.0	293.0	

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
41+056	44+246	BH-A1	1.2	16.0	2.0	500.0	239.0	33.3
				18.0		553.0	289.0	
				20.0		607.0	339.0	
				22.0		662.0	391.0	
		BH-A2	1.0	22.0	2.0	421.0	281.0	26.9
				24.0		456.0	315.0	
				26.0		492.0	349.0	
				28.0		528.0	382.0	
			1.2	22.0	2.0	612.0	376.0	36.0
				24.0		664.0	425.0	
				26.0		716.0	474.0	
				28.0		768.0	523.0	
41+390	44+571	BH-A1	1.0	20.0	2.0	259.0	244.0	44.1
				22.0		266.0	253.0	
				24.0		272.0	262.0	
				26.0		278.0	271.0	
			1.2	20.0	2.0	333.0	314.0	59.1
				22.0		342.0	327.0	
				24.0		351.0	340.0	
				26.0		360.0	353.0	
		BH-A2	1.0	22.0	2.0	283.0	209.0	42.2
				24.0		327.0	235.0	
				26.0		353.0	261.0	
				28.0		380.0	287.0	
			1.2	22.0	2.0	368.0	265.0	56.5
				24.0		427.0	299.0	
				26.0		460.0	332.0	
				28.0		493.0	365.0	
42+256	45+497	BH-A1	1.0	20.0	2.0	262.0	248.0	23.6
				22.0		300.0	283.0	
				24.0		337.0	318.0	
				26.0		350.0	333.0	
			1.2	20.0	2.0	345.0	327.0	31.5
				22.0		399.0	378.0	
				24.0		453.0	429.0	
				26.0		472.0	450.0	
		BH-P2	1.0	20.0	2.0	413.0	255.0	28.1
				22.0		450.0	289.0	
				24.0		487.0	324.0	
				26.0		524.0	359.0	

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
42+256	45+497	BH-P2	1.2	20.0	2.0	603.0	335.0	37.6
				22.0		656.0	385.0	
				24.0		710.0	436.0	
				26.0		763.0	486.0	
		BH-P3	1.0	20.0	2.0	411.0	254.0	26.9
				22.0		447.0	288.0	
				24.0		484.0	323.0	
				26.0		520.0	357.0	
			1.2	20.0	2.0	601.0	335.0	36.0
				22.0		654.0	385.0	
				24.0		707.0	435.0	
				26.0		760.0	485.0	
		BH-P4	1.0	20.0	2.0	476.0	295.0	20.7
				22.0		513.0	330.0	
				24.0		551.0	365.0	
				26.0		588.0	400.0	
			1.2	20.0	2.0	703.0	395.0	27.7
				22.0		757.0	446.0	
				24.0		812.0	496.0	
				26.0		866.0	547.0	
		BH-P5	1.0	22.0	2.0	398.0	266.0	23.6
				24.0		433.0	298.0	
				26.0		468.0	331.0	
				28.0		503.0	364.0	
			1.2	22.0	2.0	580.0	355.0	31.5
				24.0		630.0	403.0	
				26.0		680.0	450.0	
				28.0		730.0	498.0	
		BH-P6	1.0	22.0	2.0	432.0	290.0	31.1
				24.0		468.0	323.0	
				26.0		505.0	358.0	
				28.0		564.0	394.0	
			1.2	22.0	2.0	623.0	385.0	41.6
				24.0		675.0	434.0	
				26.0		728.0	484.0	
				28.0		820.0	535.0	

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)		
						In compression	In uplift	In Lateral
								Fixed Head
42+256	45+497	BH-P13	1.0	22.0	2.0	443.0	298.0	29.9
				24.0		480.0	332.0	
				26.0		516.0	366.0	
				28.0		553.0	401.0	
			1.2	22.0	2.0	641.0	396.0	40.0
				24.0		694.0	446.0	
				26.0		746.0	496.0	
				28.0		799.0	546.0	
		BH-P14	1.0	2.0	22.0	340.0	315.0	31.1
					24.0	380.0	352.0	
					26.0	394.0	368.0	
					28.0	400.0	377.0	
			1.2	2.0	22.0	452.0	419.0	41.6
					24.0	509.0	472.0	
					26.0	530.0	496.0	
					28.0	539.0	509.0	
		BH-P15	1.0	2.0	22.0	403.0	309.0	27.5
					24.0	425.0	331.0	
					26.0	447.0	354.0	
					28.0	491.0	379.0	
			1.2	2.0	22.0	530.0	399.0	36.8
					24.0	558.0	428.0	
					26.0	586.0	458.0	
					28.0	619.0	491.0	
		BH-P16	1.0	2.0	22.0	400.0	317.0	28.1
					24.0	441.0	355.0	
					26.0	465.0	379.0	
					28.0	484.0	399.0	
			1.2	2.0	22.0	538.0	422.0	37.6
					24.0	596.0	476.0	
					26.0	629.0	509.0	
					28.0	654.0	535.0	
		BH-A2	1.0	2.0	22.0	463.0	298.0	33.3
					24.0	501.0	333.0	
					26.0	539.0	368.0	
					28.0	576.0	404.0	
			1.2	2.0	22.0	674.0	396.0	44.6
					24.0	729.0	447.0	
					26.0	783.0	498.0	
					28.0	837.0	549.0	

Chainage Old (km)	Chainage New (km)	BH. No.	Diameter of Pile (m)	Length of piles below cut-off (m)	Cut-off level below EGL (m)	Safe load carrying capacity of single pile (T)			
						In compression	In uplift	In Lateral	
								Fixed Head	
45+480	48+664	BH-A1	1.0	16.0	2.0	382.0	214.0	26.2	
				18.0		422.0	251.0		
				20.0		461.0	288.0		
				22.0		568.0	326.0		
			1.2	16.0	2.0	526.0	268.0		35.1
				18.0		579.0	316.0		
				20.0		631.0	365.0		
				22.0		685.0	416.0		
		BH-A2	1.0	2.0	16.0	390.0	220.0	27.5	
					18.0	429.0	256.0		
					20.0	468.0	293.0		
					22.0	467.0	330.0		
			1.2	2.0	16.0	535.0	274.0	36.8	
					18.0	587.0	323.0		
					20.0	638.0	371.0		
					22.0	625.0	420.0		

Notes :-

1. Permissible lateral deflection has been taken as 5mm.
2. The self weight of the pile has been taken into account while computing the Safe Load Carrying Capacity of Pile in uplift only and not considered for vertical load capacity in compression.
3. The safe load carrying capacity of piles have been worked out on the basis of IS: 2911 (Part-1/sec-2) – 2010 as per provisions / assumptions provided therein & are only an assessment based on characteristics of the sub-strata obtained at the locations of the above BHs. The safe load carrying capacities as tabulated above will further depend substantially on the piling technique adopted and equipment used for making the piles in the field. However, for the final designs & constructions, the safe/allowable load carrying capacities of these piles should be taken by conducting actual initial load tests on these piles by casting them in the respective areas.
4. While erecting normal bored cast in-situ pile, utmost care should be taken while flushing/cleaning the bottom of pile particularly prior to start of pouring of concrete so as o rest

the pile in virgin soil only for obtaining full point bearing as while computing safe load carrying capacity of pile no bottom softening during erection of pile has been considered.

5. Further the pile should have necessary structural strength to transmit / sustain the design load.

Notes: -

All The above recommendations are based on the field and laboratory tests conducted on selected soil/ rock core samples and our experience in this regard. If the actual substrata conditions during excavation for the foundation differ from the observations reported here, the design experts/consultants should be referred for suggestion, further investigations.

REFERENCES

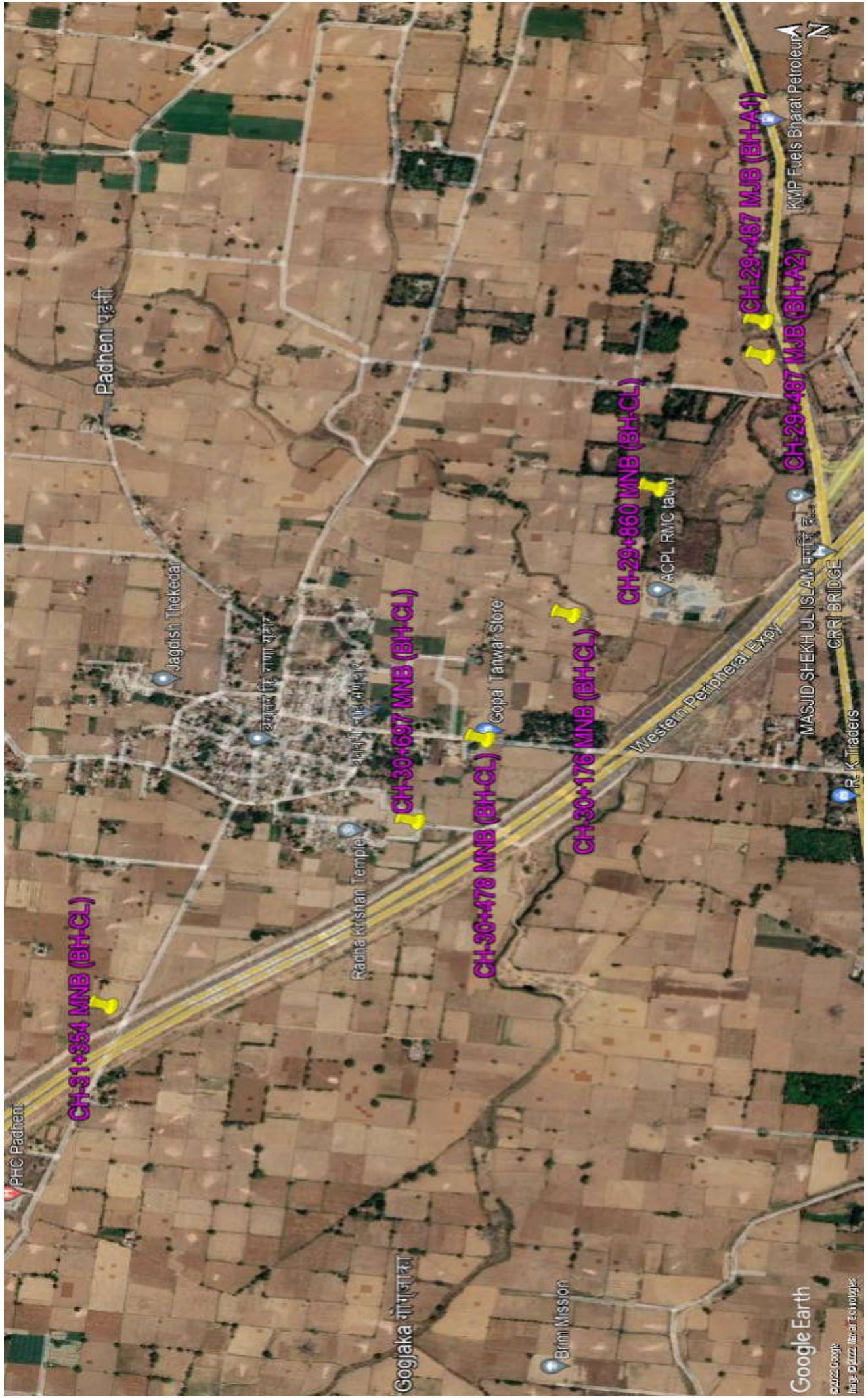
1. IS 2911: Part 1 : Sec 2 : 2010 (Reaffirmed Year : 2020) Design And construction Of pile foundations - Code Of Practice Part 1 Concrete Piles Section 2 Bored Cast In-situ Concrete Piles.
2. IS 2911 : Part 4 : 2013 (Reaffirmed Year : 2018) Design and construction of pile foundations - Code of practice : Part 4 Load test on piles .
3. IS 6403 : 1981 (Reaffirmed Year : 2016), Amd. 2 : 2018 Code of practice for determination of bearing capacity of shallow foundations.
4. IS 8009 : Part 1 : 1976 (Reaffirmed Year : 2018) Code of practice for calculation of settlements of foundations: Part 1 Shallow foundations subjected to symmetrical static vertical loads.
5. IS 8009 : Part 2 : 1980 (Reaffirmed Year : 2020) Code of practice for calculation of settlement of foundations: Part 2 Deep foundations subjected to symmetrical static vertical loading.
6. IS 1893 : Part 1 : 2016 (Reaffirmed Year : 2021) Criteria for Earthquake Resistant Design of Structures - Part 1 : General Provisions and Buildings.
7. IS 1904 : 2021 Draft Indian Standard for General requirements for design and construction of foundations in soils Code of practice third revision of IS 1904.
8. IS 456 : 2000 (Reaffirmed Year : 2021) Plain and Reinforced Concrete - Code of Practice (Including Amendment 1, 2, 3,& 4).
9. BS – 118 : 2015 Final Seismic Design of Bridges.
10. IS 2131 : 1981 (Reaffirmed Year : 2016) Method for standard penetration test for soils.
11. IS 2132 : 1986 (Reaffirmed Year : 2016) Code of practice for thin-walled tube sampling of soils.
12. IS 1892 : 1979 (Reaffirmed Year : 2016) Code of practice for subsurface investigation for foundations.
13. Bowles, J.E., 1982. Foundation design and analysis.
14. IS. 2720 (Part 3)-1980. Determination of Specific Gravity of Soil.
15. IS. 2720 (Part 4). 1985. Methods of Test for Soils: Grain Size Analysis.
16. IS. IS 2131, 1981. Method for standard penetration test for soils.
17. IS: 2720 (Part 11)–(1993). Determination of the shear strength parameters of a specimen tested in unconsolidated undrained triaxial compression without the measurement of pore water pressure.
18. IS: 2720 (Part 13) 1986 Method of test for soils, direct shear test. New Delhi, India.
19. IS: 2720 (Part 3/See 1)–(1980) Methods of test for soils, determination of specific gravity of soil. New Delhi, India.
20. IS: 2720 (Part 5) 1985 Methods of test for soils, determination of liquid and plastic limit of soils. New Delhi, India.

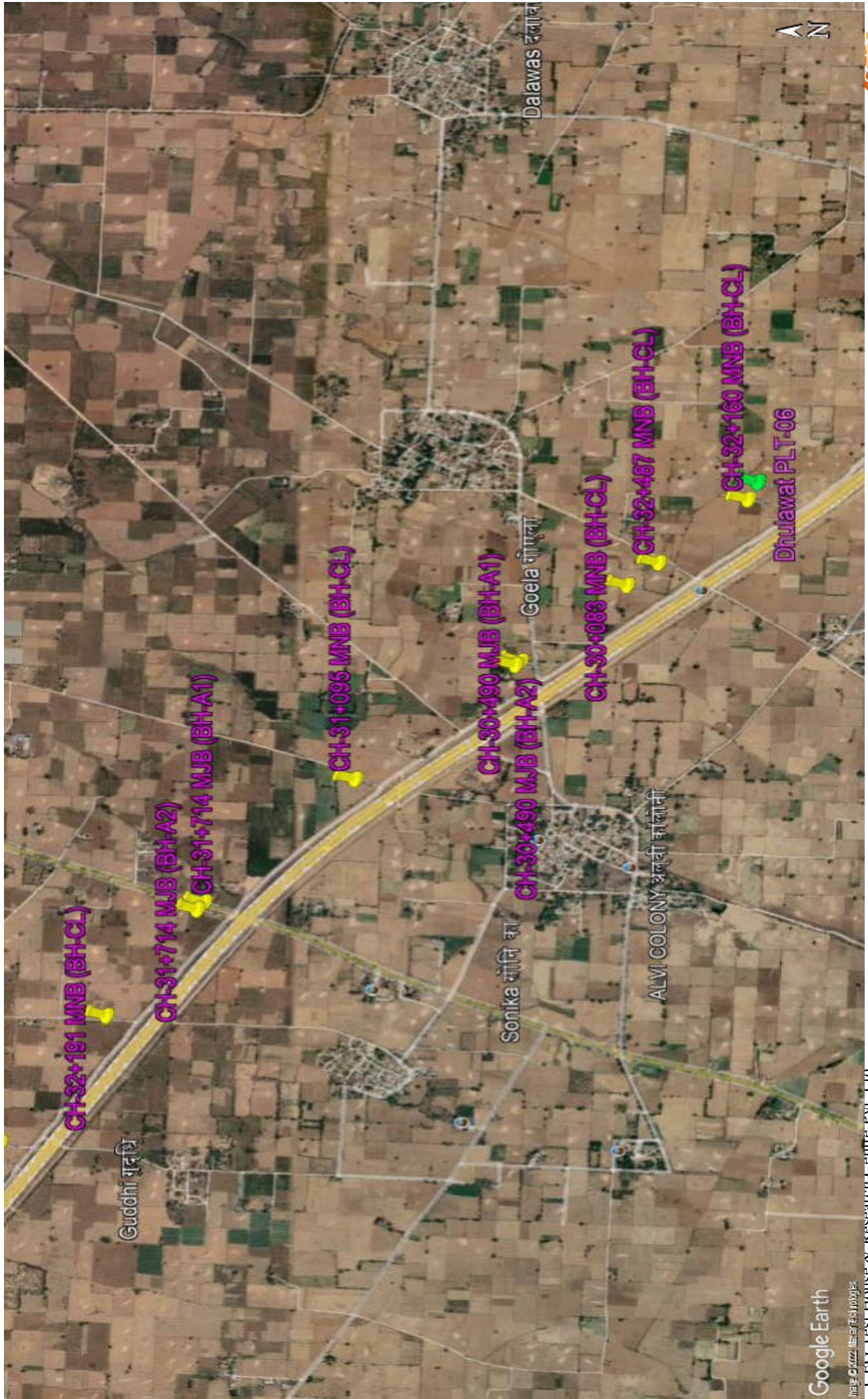
Abbreviations

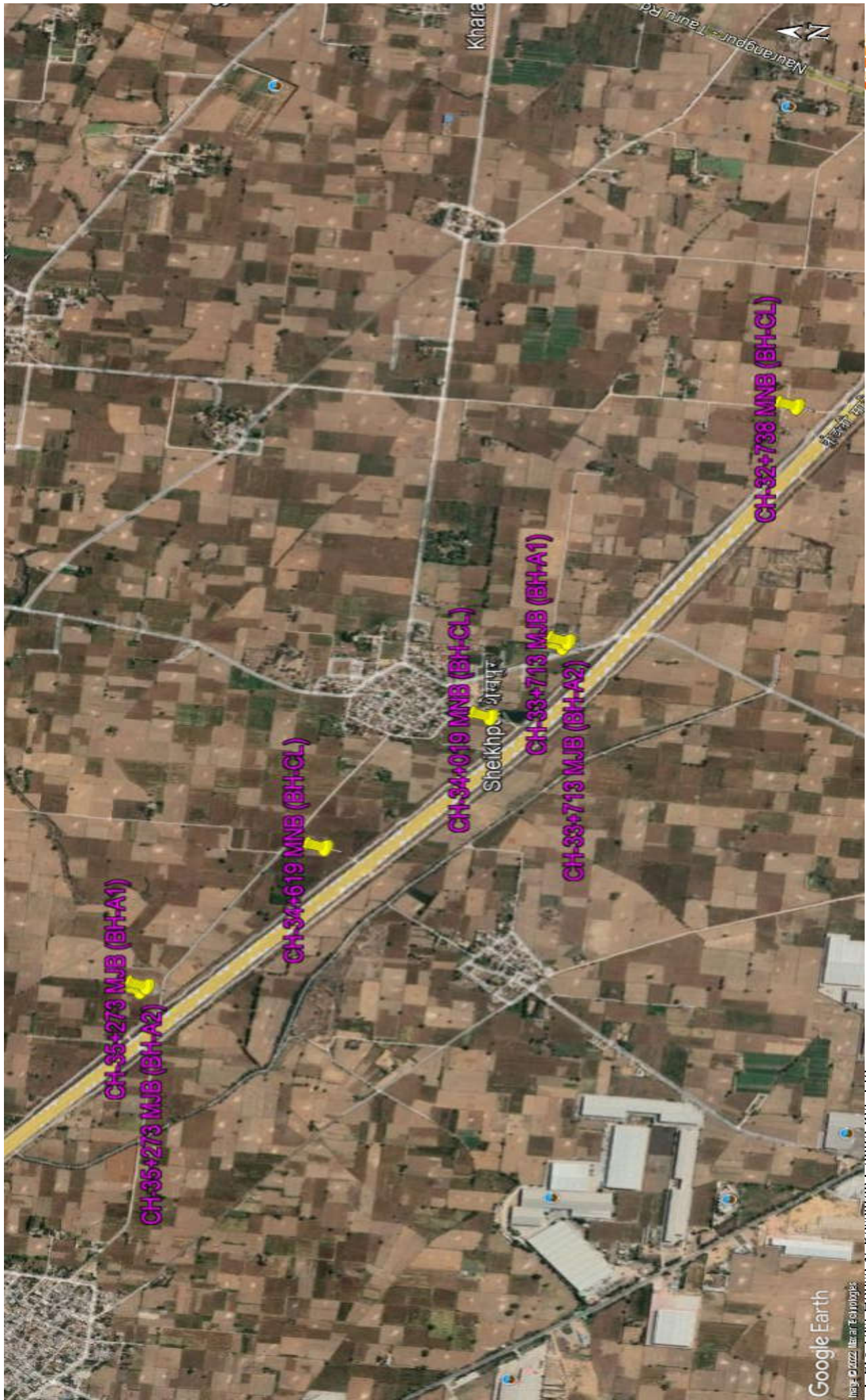
BH	Borehole
ERT	Electrical Resistivity Test
EGL	Existing Ground Level
GWT	Ground Water Table
IS	Indian Standards
SPT	Standard Penetration Test
DS	Disturbed Soil
R.L.	Reduced Level
m	Metre
sp. gr.	Specific Gravity
%	Percentage
mg /l	Milligram per litre
mg /kg	Milligram per kilogram

APPENDIX – A (FIELD DATA RESULTS)

Appendix No.	ITEMS
A-1	LOCATION PLAN
A-2	FIELD BORE HOLE LOGS
A-3	SUB SOIL PROFILE DIAGRAM



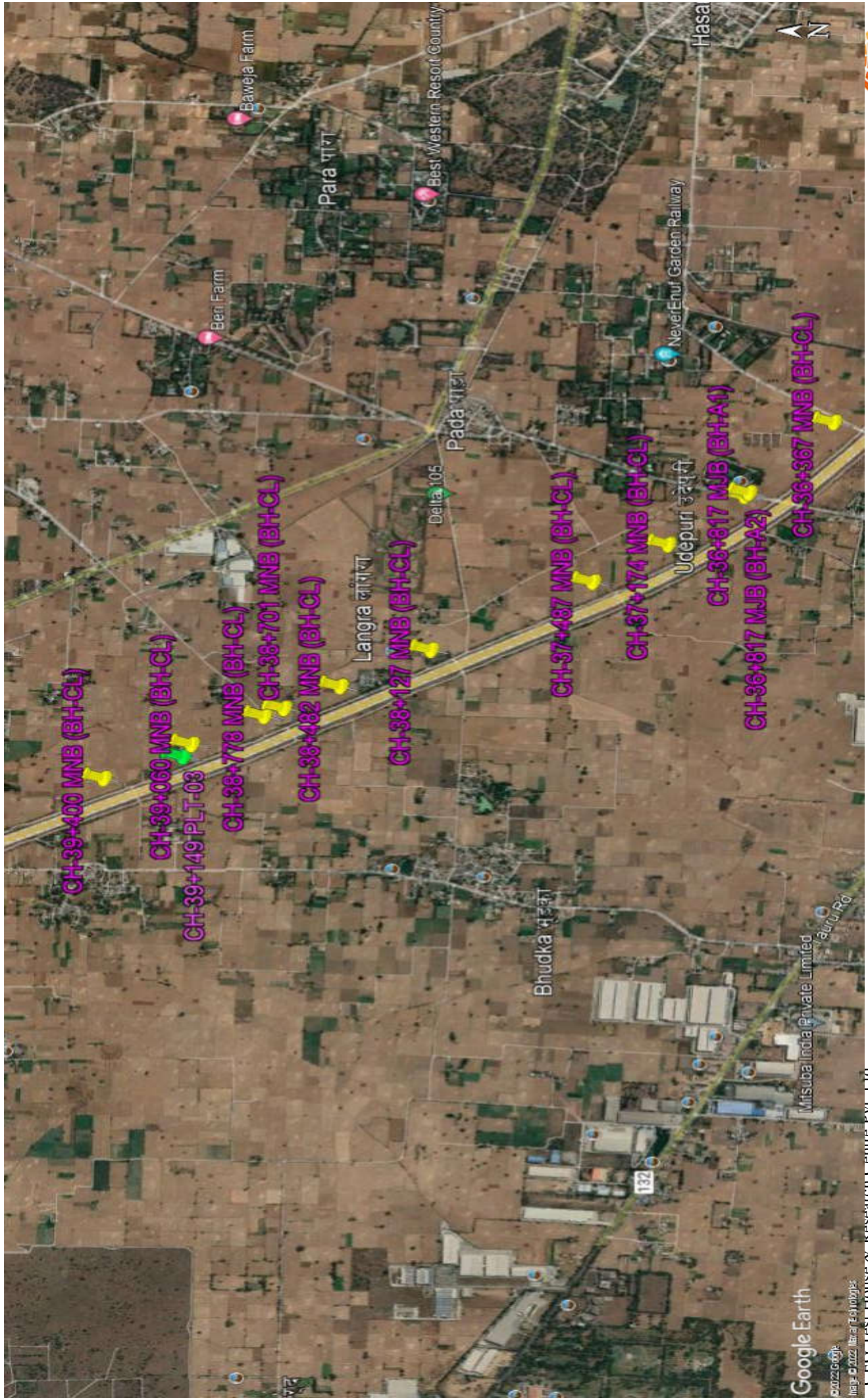


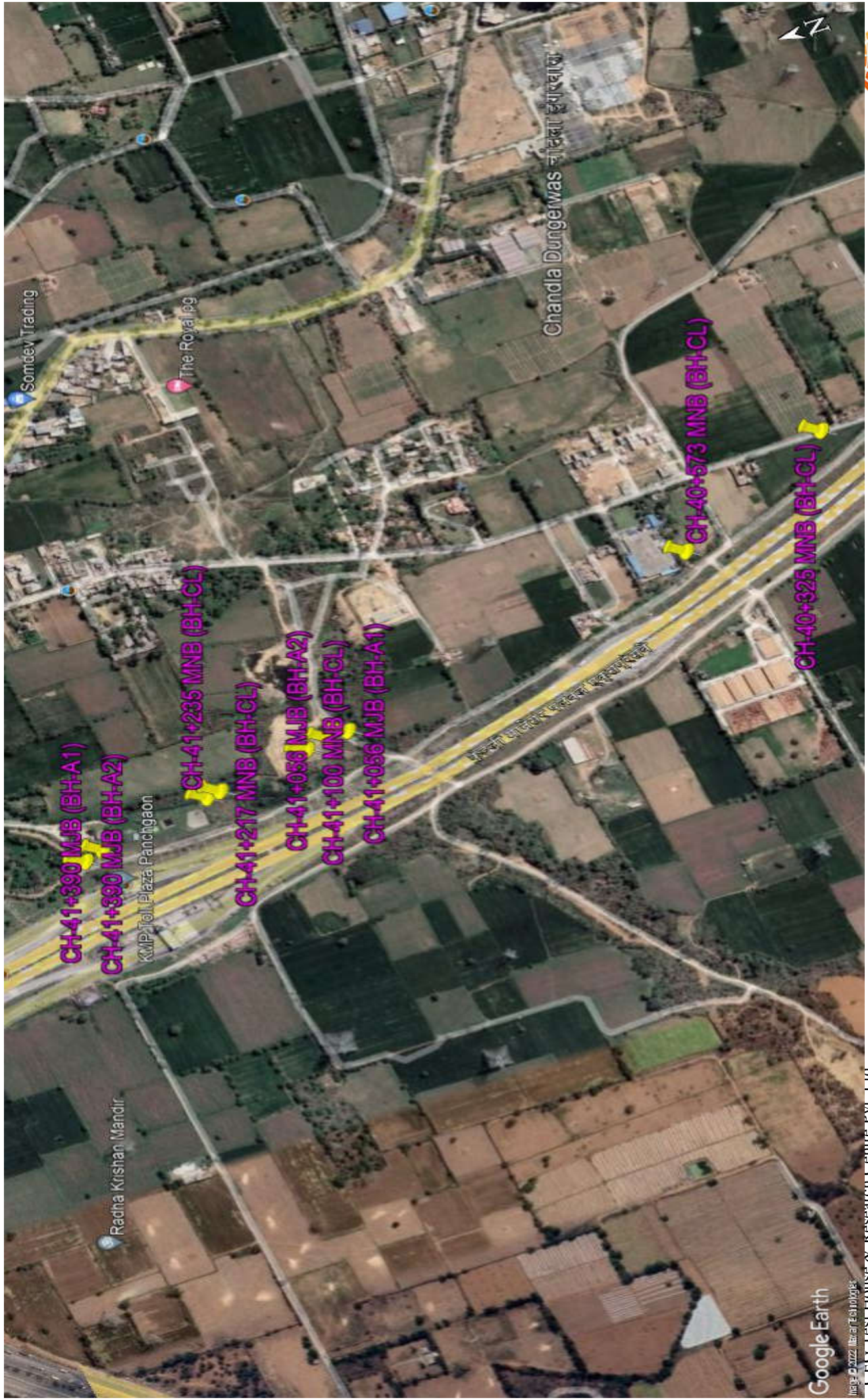


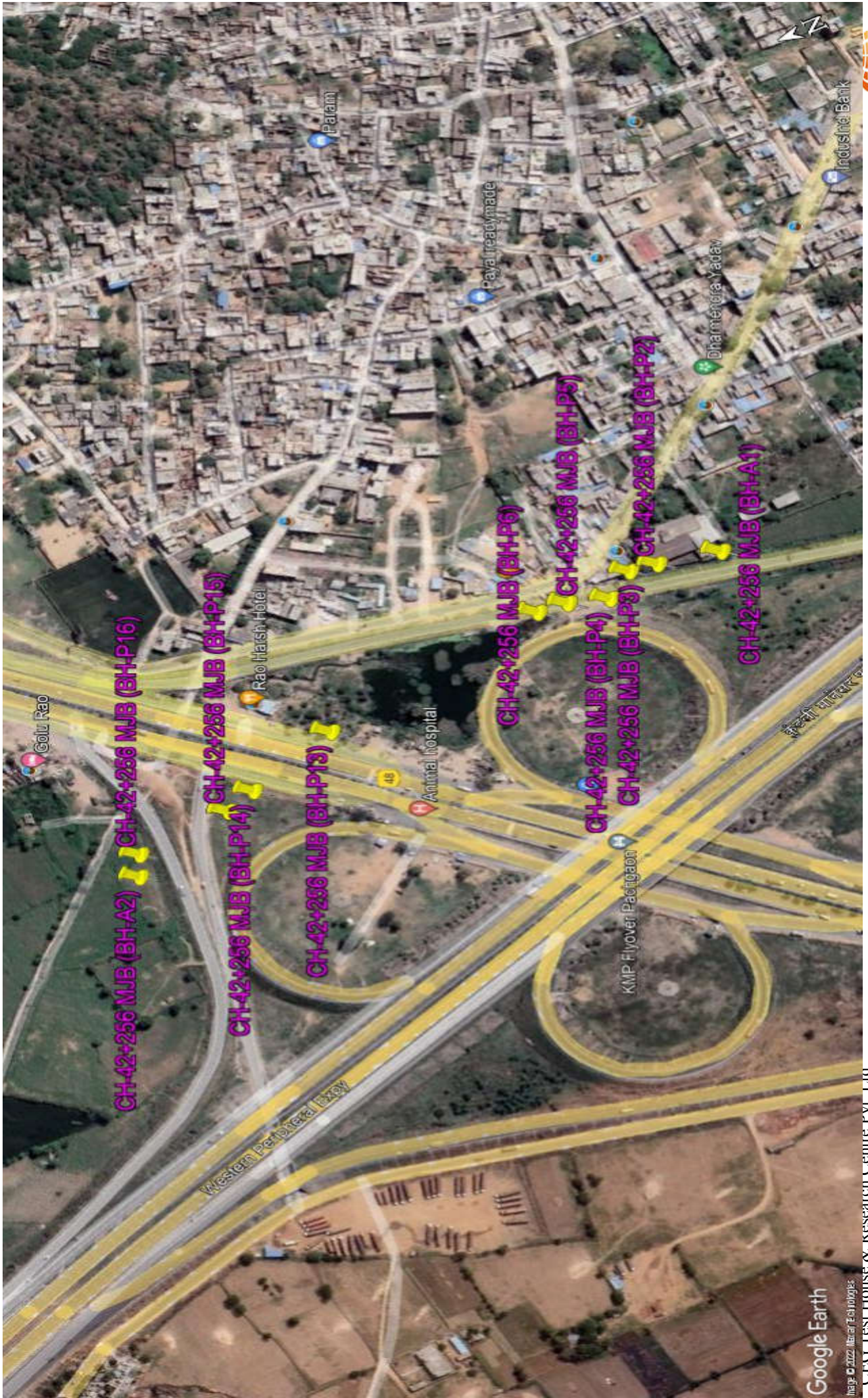
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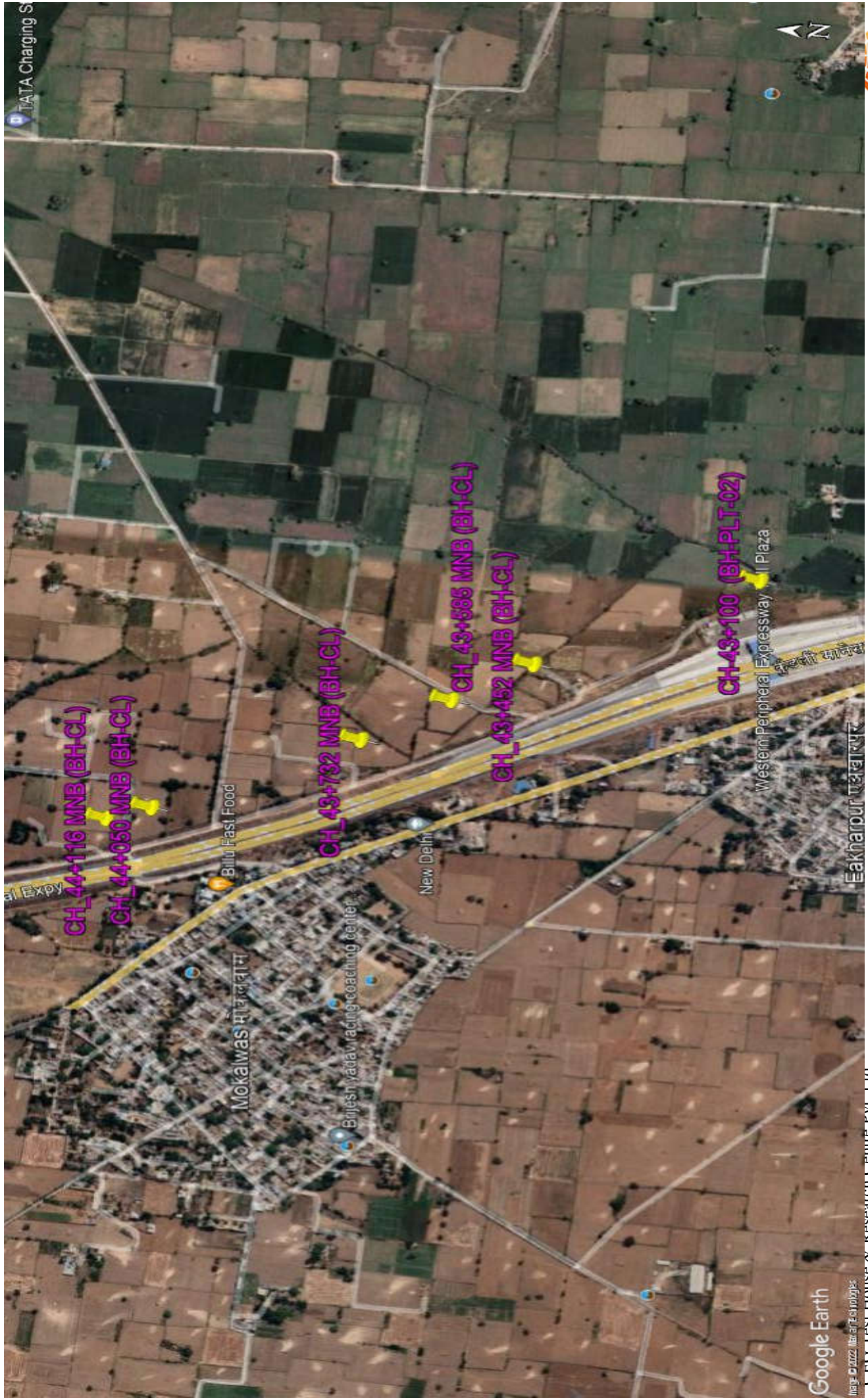
Image © 2022, Imagery © 2022

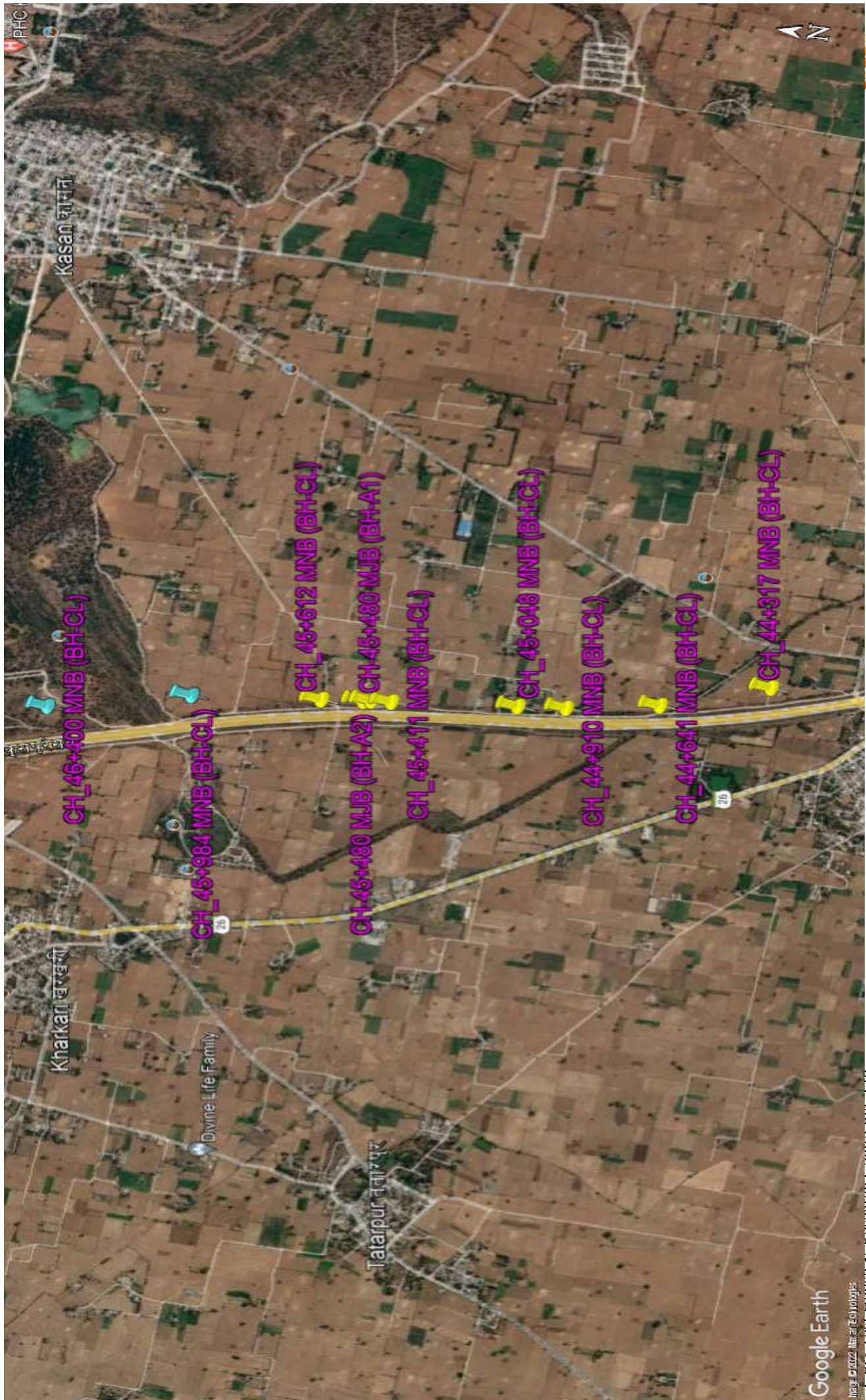
CEGTH Test House & Research Centre Pvt. Ltd.





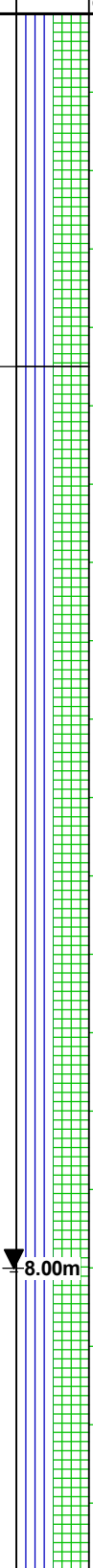
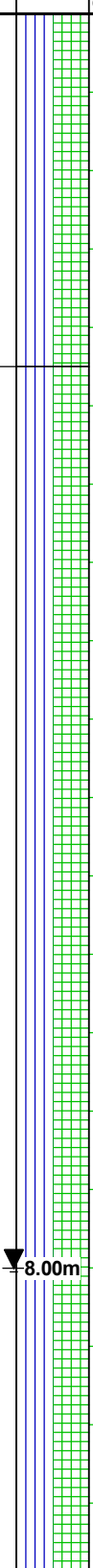






FIELD BOREHOLE LOG

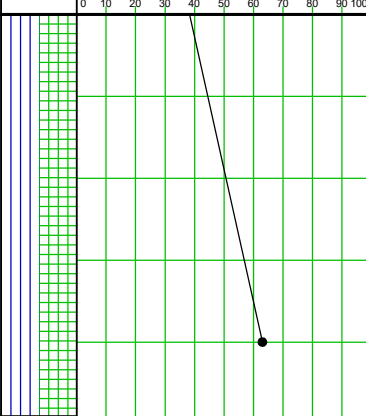
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BH Location/Chainage : Dhulawat	Northing : 3124860 m	Easting : 693884 m
Reduced Level (m): (+)265.96	BH. No. : BH-PLT-06	BH Termination Depth (m): 12.45
Proposed / Existing Structure :-	Water Table (m): 8.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-12-2021	Date of Completion : 19-12-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
0.75	0.75	UDS-1					Yellowish brown, Loose, Sandy silt ML-CL				
1.0											
1.5	1.5	SPT-1	1	2	3	5					
2.0											
2.25	2.25	SPT-2	6	9	13	22					
2.5											
3.0	3	SPT-3	9	14	16	30					
3.5											
3.75	3.75	SPT-4	14	17	20	37					
4.0											
4.5	4.5	UDS-2									
5.0											
5.5											
6.0	6	SPT-5	20	23	26	49	Yellowish brown, Medium dense to Very dense, Sandy silt ML-CL				
6.5											
7.0											
7.5	7.5	UDS-3									
8.0											
8.5											
9.0	9	SPT-6	24	26	28	26					
9.5											
10.0											

UDS*-UDS not recovered

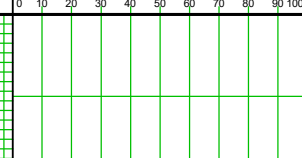
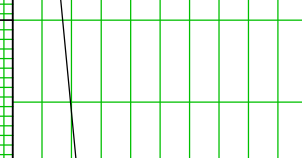
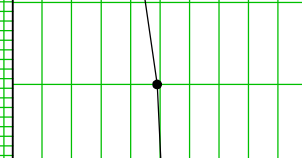
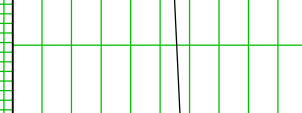
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : Dhulawat	Northing : 3124860 m	Easting : 693884 m
Reduced Level (m): (+)265.96	BH. No. : BH-PLT-06	BH Termination Depth (m): 12.45
Proposed / Existing Structure :-	Water Table (m): 8.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 19-12-2021	Date of Completion : 19-12-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	UDS-4					Yellowish brown, Medium dense to Very dense, Sandy silt	ML-CL			
11.0											
11.5											
12.0	12	SPT-7	26	30	33	63					
12.45	12.45										

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 29+487 km	Northing : 3123405.825 m	Easting : 696007.24 m
Reduced Level (m): (+)263.946	BH. No. : BH-A1	BH Termination Depth (m): 53
Proposed / Existing Structure : Major Bridge	Water Table (m): 27.53	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 03-10-2021	Date of Completion : 05-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	3	4	5	9	Brown, Loose, Sandy silt of low plasticity	ML-CL			
2.5	2.5	UDS-1									
4.0	4	SPT-2	7	12	13	25	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	UDS-2									
7.0	7	SPT-3	14	22	27	49	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
8.5	8.5	UDS-3									
10.0	10	SPT-4	18	25	32	57					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123405.825 m	Easting :696007.24 m
Reduced Level (m):(+)263.946	BH. No. :BH-A1	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.53	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021		Date of Completion :05-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	21	27	36	63					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
15.5											
16.0	16	SPT-6	22	39	43	82					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	35	75	25 (8cm)	>100					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123405.825 m	Easting :696007.24 m
Reduced Level (m):(+)263.946	BH. No. :BH-A1	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.53	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021	Date of Completion :05-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS*									
21.0											
21.5											
22.0	22	SPT-8	34	65	35 (7cm)	>100	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
22.5											
23.0											
23.5	23.5	SPT-9	45	60	40 (7cm)	>100					
24.0											
24.5											
25.0	25	SPT-10	50	100 (15cm)	-	>100					
25.5											
26.0											
26.5	26.5	UDS*									
27.0											
27.5											
28.0	28	SPT-11	37	46	54 (7cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
28.5											
29.0											
29.5	29.5	UDS*									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 29+487 km	Northing : 3123405.825 m	Easting : 696007.24 m
Reduced Level (m): (+)263.946	BH. No. : BH-A1	BH Termination Depth (m): 53
Proposed / Existing Structure : Major Bridge	Water Table (m): 27.53	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 03-10-2021	Date of Completion : 05-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0									0 10 20 30 40 50 60 70 80 90 100		
30.5											
31.0	31	SPT-12	38	51	49 (6cm)	>100					
31.5											
32.0											
32.5	32.5	UDS*									
33.0											
33.5											
34.0	34	SPT-13	100 (8cm)	-	-	>100					
34.5											
35.0							Brown, Hard, Silty clay of low plasticity with gravel	CL			
35.5	35.5	SPT-14	37	50	50 (11cm)	>100					
36.0											
36.5											
37.0	37	SPT-15	33	47	53 (6cm)	>100					
37.5											
38.0											
38.5	38.5	UDS*									
39.0											
39.5											
40.0	40	SPT-16	36	70	30 (9cm)	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123405.825 m	Easting :696007.24 m
Reduced Level (m):(+)263.946	BH. No. :BH-A1	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.53	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021		Date of Completion :05-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
40.0									0 10 20 30 40 50 60 70 80 90 100		
40.5											
41.0											
41.5	41.5	UDS*									
42.0											
42.5											
43.0	43	SPT-17	44	57	43 (5cm)	>100					
43.5	43.5	UDS*									
44.0											
44.5											
45.0							Brown, Hard, Silty clay of low plasticity with gravel	CL			
45.5											
46.0	46	SPT-18	30	47	53 (6cm)	>100					
46.5											
47.0											
47.5	47.5	UDS*									
48.0											
48.5											
49.0	49	SPT-19	31	57	43 (5cm)	>100					
49.5											
50.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123405.825 m	Easting :696007.24 m
Reduced Level (m):(+)263.946	BH. No. :BH-A1	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.53	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021	Date of Completion :05-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
50.0											
50.5	50.5	SPT-20	38	70	30 (9cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
51.0											
51.5											
52.0	52	SPT-21	47	100 (15cm)	-	>100					
52.3	52.3	-									
52.5											
53.0											



FIELD BOREHOLE LOG

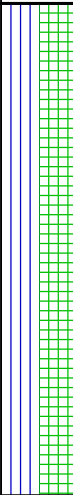
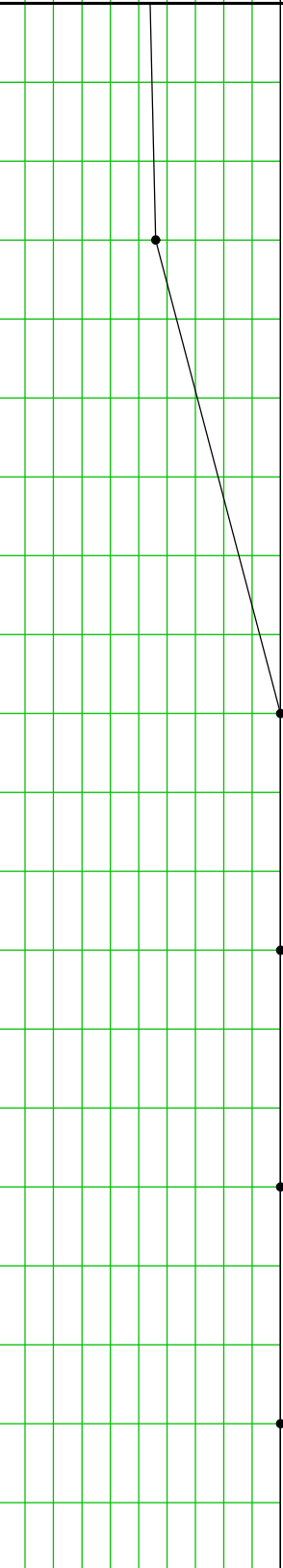

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BH Location/Chainage : 29+487 km	Northing : 3123393.836 m	Easting : 695931.872 m
Reduced Level (m): (+)266.542	BH. No. : BH-A2	BH Termination Depth (m): 53
Proposed / Existing Structure : Major Bridge	Water Table (m): 27.39	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 03-10-2021	Date of Completion : 06-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS-1									
0.5											
1.0	1	UDS-1									
1.5											
2.0						Brown, Medium dense, Silty sand with clay	SM-SC				
2.5	2.5	SPT-1	3	5	8	13					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	10	18	34	52					
6.0											
6.5											
7.0	7	UDS-3					Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
7.5											
8.0											
8.5	8.5	SPT-3	15	22	30	52					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

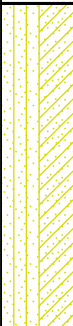
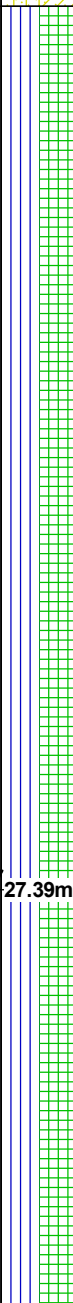
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123393.836 m	Easting :695931.872 m
Reduced Level (m):(+)266.542	BH. No. :BH-A2	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.39	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021	Date of Completion :06-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	17	25	31	56	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	20	28	72	>100					
15.0											
15.5											
16.0	16	SPT-6	40	100 (15cm)	-	>100					
16.5											
17.0											
17.5	17.5	SPT-7	32	45	55 (6cm)	>100	Brown, Very dense, Silty sand with clay & gravel	SM-SC			
18.0											
18.5											
19.0	19	SPT-8	50	100 (10cm)	-	>100					
19.5											
20.0											

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123393.836 m	Easting :695931.872 m
Reduced Level (m):(+)266.542	BH. No. :BH-A2	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.39	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021	Date of Completion :06-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0									0 10 20 30 40 50 60 70 80 90 100		
20.5	20.5	SPT-9	37	100 (15cm)	-	>100	Brown, Very dense, Silty sand with clay & gravel	SM-SC			
21.0											
21.5											
22.0	22	SPT-10	40	100 (12cm)	-	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
22.5											
23.0											
23.5	23.5	SPT-11	45	100 (10cm)	-	>100					
24.0											
24.5											
25.0	25	SPT-12	55	100 (5cm)	-	>100					
25.5											
26.0											
26.5	26.5	SPT-13	48	100 (5cm)	-	>100					
27.0											
27.5											
28.0	28	SPT-14	45	100 (7cm)	-	>100					
28.5											
29.0											
29.5	29.5	SPT-15	52	100 (11cm)	-	>100					
30.0											

▼ 27.39m

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 29+487 km	Northing : 3123393.836 m	Easting : 695931.872 m
Reduced Level (m): (+)266.542	BH. No. : BH-A2	BH Termination Depth (m): 53
Proposed / Existing Structure : Major Bridge	Water Table (m): 27.39	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 03-10-2021	Date of Completion : 06-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0									0 10 20 30 40 50 60 70 80 90 100		
30.5						Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL				
31.0	31	SPT-16	52	100 (12cm)	-						
31.5											
32.0											
32.5	32.5	SPT-17	35	55	45 (13cm)	>100					
33.0											
33.5											
34.0	34	SPT-18	40	61	39 (8cm)	>100					
34.5											
35.0											
35.5	35.5	SPT-19	45	65	35 (10cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
36.0											
36.5											
37.0	37	SPT-20	100 (10cm)	-	-	>100					
37.5											
38.0											
38.5	38.5	SPT-21	100 (12cm)	-	-	>100					
39.0											
39.5											
40.0	40	SPT-22	100 (15cm)	-	-	>100					

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123393.836 m	Easting :695931.872 m
Reduced Level (m):(+)266.542	BH. No. :BH-A2	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.39	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021		Date of Completion :06-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
40.0									0 10 20 30 40 50 60 70 80 90 100		
40.5							Brown, Hard, Silty clay of low plasticity with gravel	CL			
41.0											
41.5	41.5	SPT-23	45	100 (8cm)	-	>100					
42.0											
42.5											
43.0	43	SPT-24	52	100 (5cm)	-	>100					
43.5											
44.0											
44.5	44.5	SPT-25	39	65	35 (5cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
45.0											
45.5											
46.0	46	SPT-26	45	60	40 (9cm)	>100					
46.5											
47.0											
47.5	47.5	SPT-27	38	65	35 (7cm)	>100					
48.0	48	SPT-28	45	70	30 (9cm)	>100					
48.5											
49.0							Brown, Hard, Silty clay of low plasticity with gravel	CL			
49.5											
50.0											



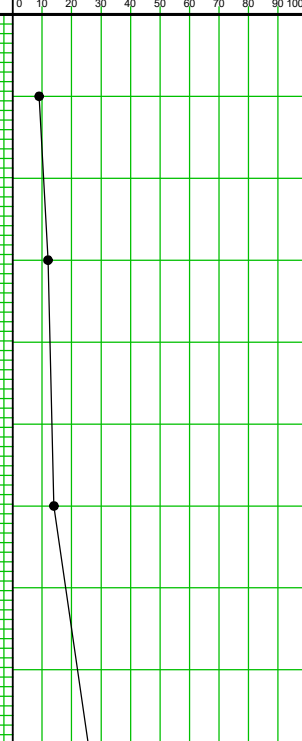
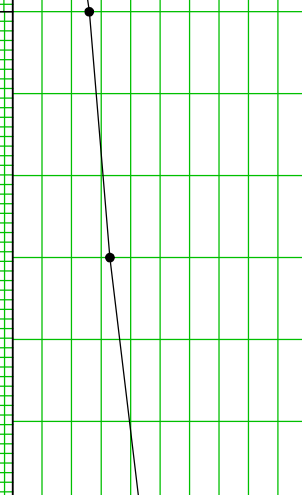
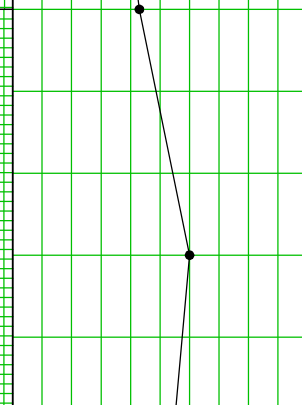
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+487 km	Northing :3123393.836 m	Easting :695931.872 m
Reduced Level (m):(+)266.542	BH. No. :BH-A2	BH Termination Depth (m):53
Proposed / Existing Structure :Major Bridge	Water Table (m):27.39	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :03-10-2021	Date of Completion :06-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
50.0											
50.5	50.5	SPT-29	44	66	34 (12cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel CL				
51.0											
51.5											
52.0	52	SPT-30	47	100 (11cm)	-	>100					
52.5	52.26	DS-2									
53.0											

FIELD BOREHOLE LOG

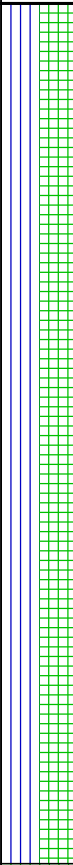
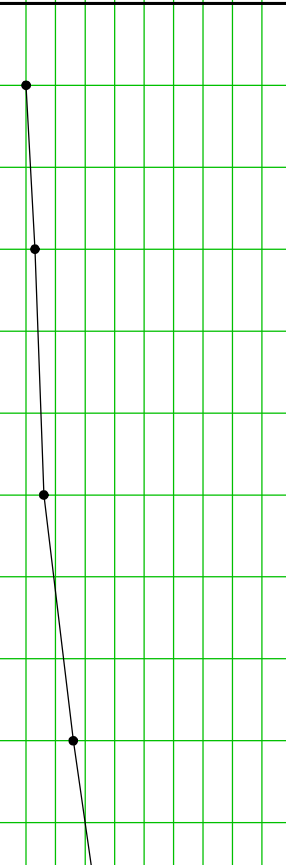

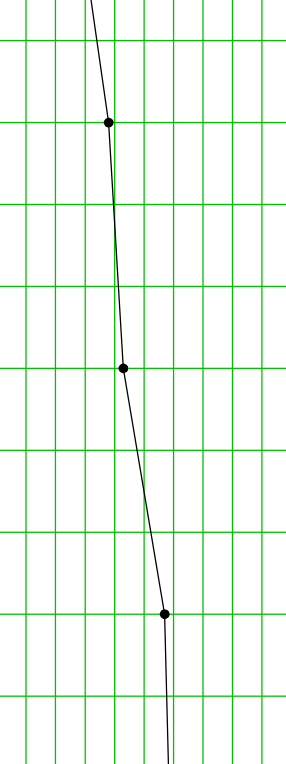
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :29+860 km	Northing :3123534.155 m	Easting :695623.682 m
Reduced Level (m):(+)263.108	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :20-11-2021		Date of Completion :20-11-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	4	5	9	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	4	5	7	12					
2.25	2.25	UDS-1									
3.0	3	SPT-3	5	6	8	14					
4.5	4.5	SPT-4	8	12	14	26	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
5.25	5.25	UDS-2									
6.0	6	SPT-5	10	16	17	33					
7.5	7.5	SPT-6	12	18	25	43	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
8.25	8.25	UDS-3									
9.0	9	SPT-7	14	22	38	60					
10.0	10	SPT-8	13	20	35	55					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+176 km	Northing :3123643.872 m	Easting :695330.324 m
Reduced Level (m):(+)263.553	BH. No. :BH-CL	BH Termination Depth (m):20
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :21-11-2021	Date of Completion :21-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	4	6	10	Brown, Medium dense, Sandy silt of low plasticity ML-CL				
1.0											
1.5	1.5	SPT-2	5	6	7	13					
2.0											
2.25	2.25	UDS-1									
2.5											
3.0	3	SPT-3	6	7	9	16					
3.5											
4.0											
4.5	4.5	SPT-4	9	11	15	26					
5.0											
5.25	5.25	UDS-2									
5.5											
6.0	6	SPT-5	11	18	20	38	Brown, Hard, Silty clay of low plasticity with gravel CL				
6.5											
7.0											
7.5	7.5	SPT-6	13	17	26	43					
8.0											
8.25	8.25	UDS-3									
8.5											
9.0	9	SPT-7	3	23	34	57					
9.5											
10.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

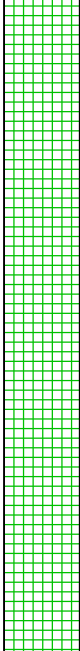
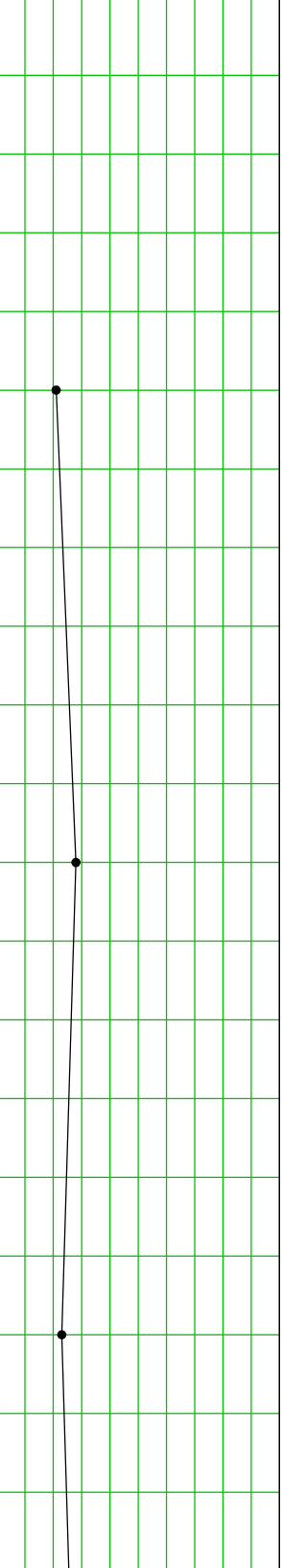
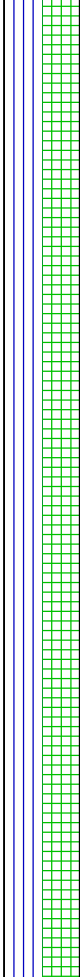
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 30+176 km	Northing : 3123643.872 m	Easting : 695330.324 m
Reduced Level (m): (+)263.553	BH. No. : BH-CL	BH Termination Depth (m): 20
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 21-11-2021	Date of Completion : 21-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	15	20	39	59					
11.0											
11.5	11.25	UDS-4									
12.0	12	SPT-9	12	25	42	67					
12.5											
13.0											
13.5	13.5	SPT-10	16	29	48	77					
14.0											
14.5	14.25	UDS-5									
15.0	15	SPT-11	27	42	58 (12cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
15.5											
16.0											
16.5	16.5	SPT-12	32	47	53 (10cm)	>100					
17.0											
17.5	17.25	UDS*									
18.0	18	SPT-13	35	45	55 (15cm)	>100					
18.5											
19.0											
19.5	19.5	SPT-14	38	52	48 (7cm)	>100					
20.0	20										

UDS*-UDS not recovered

FIELD BOREHOLE LOG

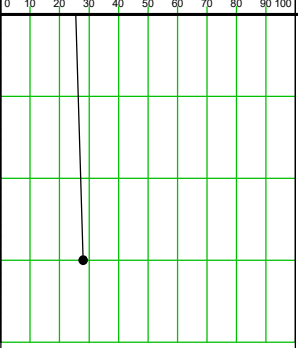
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 30+478 km	Northing : 3123752.008 m	Easting : 695041.409 m
Reduced Level (m): (+)264.728	BH. No. : BH-CL	BH Termination Depth (m): 12
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 16-10-2021	Date of Completion : 16-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1					Brown, Very stiff, Silty clay of low plasticity with gravel	CL			
1.5											
2.0											
2.5	2.5	SPT-1	7	9	12	21					
3.0											
3.5											
4.0	4	UDS-2					Brown, Medium dense, Sandy silt of low plasticity with gravel	ML-CL			
4.5											
5.0											
5.5	5.5	SPT-2	10	13	15	28					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	8	10	13	23					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 30+478 km	Northing : 3123752.008 m	Easting : 695041.409 m
Reduced Level (m): (+)264.728	BH. No. : BH-CL	BH Termination Depth (m): 12
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 16-10-2021		Date of Completion : 16-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	11	12	16	28	Brown, Medium dense, Sandy silt of low plasticity with gravel	ML-CL			
12.0	11.95 12	-									

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+697 km	Northing :3123845.139 m	Easting :694847.555 m
Reduced Level (m):(+)264.094	BH. No. :BH-CL	BH Termination Depth (m):12
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-10-2021	Date of Completion :16-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	8	3	7	10	Brown, Loose, Silty sand	SM			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	6	6	10	16	Brown, Medium dense, Silty sand	SM			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	10	13	16	29	Brown, Dense, Silty sand	SM			
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	15	19	22	41					

UDS*-UDS not recovered

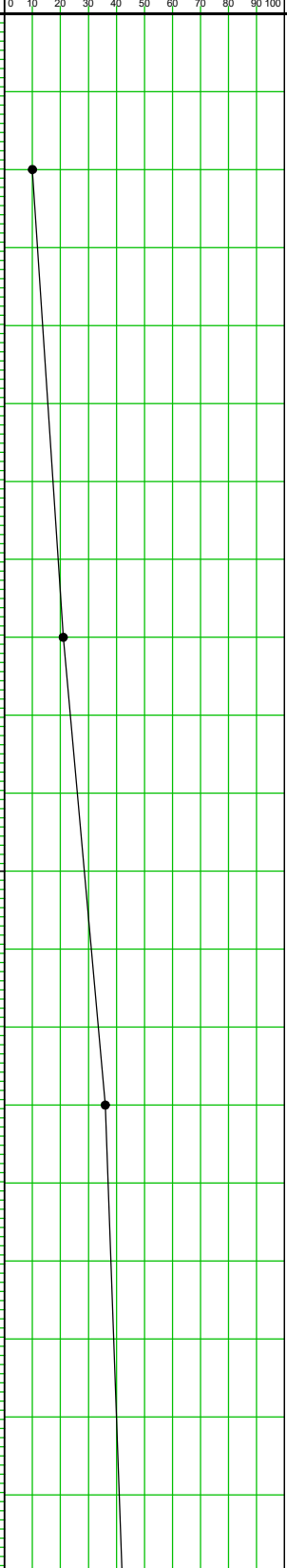
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+697 km	Northing :3123845.139 m	Easting :694847.555 m
Reduced Level (m):(+)264.094	BH. No. :BH-CL	BH Termination Depth (m):12
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-10-2021		Date of Completion :16-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0									0 10 20 30 40 50 60 70 80 90 100		
10.5											
11.0							Brown, Dense, Silty sand	SM			
11.5	11.5	UDS-4									
12.0	11.95 12	-									

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+354 km	Northing : 3124304.952 m	Easting : 694378.453 m
Reduced Level (m): (+)264.674	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-10-2021	Date of Completion : 17-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	6	10	Brown, Stiff to very stiff, Silty clay of low plasticity	CL			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	6	9	12	21	Brown, Hard, Silty clay of low plasticity with gravel	CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	12	15	21	36	Brown, Hard, Silty clay of low plasticity with gravel	CL			
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	10	18	24	42					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+354 km	Northing : 3124304.952 m	Easting : 694378.453 m
Reduced Level (m): (+)264.674	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-10-2021		Date of Completion : 17-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	17	21	30	51	Brown, Hard, Silty clay of low plasticity with gravel	CL			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0	15	-									



FIELD BOREHOLE LOG

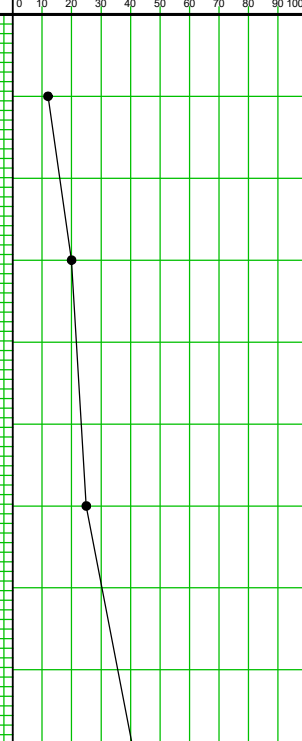
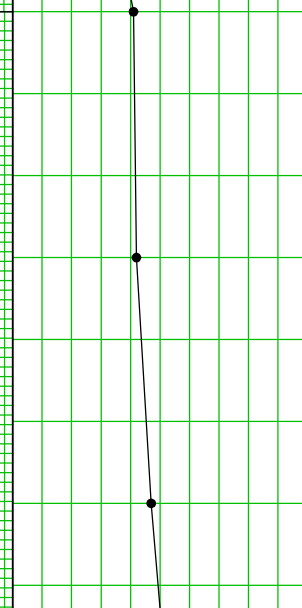
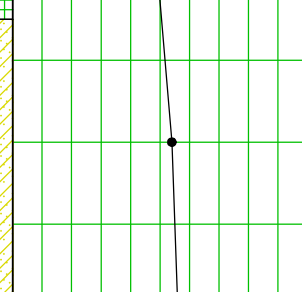
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 32+160 km	Northing : 3124884.26 m	Easting : 693822.662 m
Reduced Level (m): (+)263.186	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-10-2021	Date of Completion : 17-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	6	10	16					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Very stiff, Silty clay of low plasticity	CL			
5.5	5.5	SPT-2	7	10	12	22					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	8	12	15	27					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

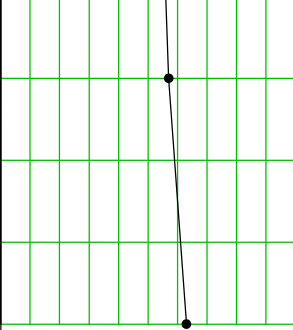
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :32+487 km	Northing :3125111.207 m	Easting :69358.448 m
Reduced Level (m):(+)261.988	BH. No. :BH-CL	BH Termination Depth (m):12
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-11-2021	Date of Completion :16-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	4	5	7	12	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	6	8	12	20					
3.0	3	SPT-3	8	10	15	25					
4.5	4.5	SPT-4	10	16	25	41					
5.0	5.25	UDS-2					Brown, Hard, Silty clay of low plasticity	CL			
6.0	6	SPT-5	13	15	27	42					
7.5	7.5	SPT-6	12	17	30	47					
8.25	8.25	UDS-3									
9.0	9	SPT-7	14	20	34	54	Brown, Very dense, Silty sand with clay	SM-SC			
10.0											

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :32+487 km	Northing :3125111.207 m	Easting :69358.448 m
Reduced Level (m):(+)261.988	BH. No. :BH-CL	BH Termination Depth (m):12
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-11-2021	Date of Completion :16-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	19	23	34	57	Brown, Very dense, Silty sand with clay	SM-SC			
11.0											
11.5	11.25	UDS-4									
12.0	12	SPT-9	20	26	37	63					

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+083 km	Northing :3125192.295 m	Easting :693503.406 m
Reduced Level (m):(+)263.667	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :16-11-2021		Date of Completion :16-11-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS							0 10 20 30 40 50 60 70 80 90 100		
0.5	0.5	SPT-1	4	6	8	14	Brown, Very stiff, Silty clay of low plasticity	CL			
1.0											
1.5	1.5	SPT-2	6	7	11	18	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-3	6	8	12	20					
3.5											
4.0											
4.5	4.5	SPT-4	7	8	14	22	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-5	8	10	18	28					
6.5											
7.0											
7.5	7.5	SPT-6	8	11	17	28					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-7	9	14	18	32					
9.5											
10.0	10	SPT-8	12	16	22	38					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 30+488 km	Northing : 3125465.069 m	Easting : 693220.478 m
Reduced Level (m): (+)262.988	BH. No. : BH-A1	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 27.84	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS							0 10 20 30 40 50 60 70 80 90 100		
0.5											
1.0	1	SPT-1	3	4	5	9	Brown, Loose, Silty sand with clay	SM-SC			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	6	9	13	22	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	9	13	20	33					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	11	15	22	37					

UDS*-UDS not recovered

FIELD BOREHOLE LOG


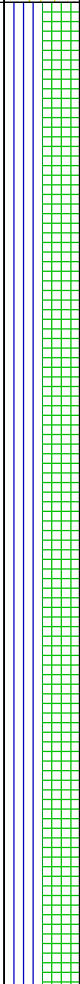
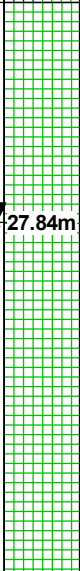
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+488 km	Northing :3125465.069 m	Easting :693220.478 m
Reduced Level (m):(+)262.988	BH. No. :BH-A1	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):27.84	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021		Date of Completion :29-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0									0 10 20 30 40 50 60 70 80 90 100		
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	16	24	40	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	26	42	58 (15cm)	>100					
16.5											
17.0											
17.5	17.5	SPT-7	28	65	35 (5cm)	>100					
18.0							Brown, Very dense, Silty sand with gravel	SM			
18.5											
19.0	19	SPT-8	50	100 (12cm)	-	>100					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+488 km	Northing :3125465.069 m	Easting :693220.478 m
Reduced Level (m):(+)262.988	BH. No. :BH-A1	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):27.84	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021		Date of Completion :29-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0									0 10 20 30 40 50 60 70 80 90 100		
20.5	20.5	SPT-9	24	38	51	89	Brown, Very dense, Silty sand with gravel	SM			
21.0											
21.5											
22.0	22	SPT-10	27	45	54	99	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
22.5											
23.0											
23.5	23.5	UDS-6									
24.0											
24.5											
25.0	25	SPT-11	22	27	33	60					
25.5											
26.0											
26.5	26.5	UDS-7									
27.0											
27.5											
28.0	28	SPT-12	40	100 (15cm)	-	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
28.5											
29.0											
29.5	29.5	SPT-13	45	100 (13cm)	-	>100					
30.0	30	DS-2									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 30+488 km	Northing : 3125478.956 m	Easting : 693206.085 m
Reduced Level (m): (+)262.292	BH. No. : BH-A2	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): 26.98	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS							0 10 20 30 40 50 60 70 80 90 100		
0.5											
1.0	1	UDS-1									
1.5											
2.0							Brown, Medium dense, Silty sand with clay	SM-SC			
2.5	2.5	SPT-1	4	7	9	16					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	9	11	13	24					
6.0											
6.5											
7.0	7	UDS-3					Brown, Very stiff to hard, Silty clay of low plasticity	CL			
7.5											
8.0											
8.5	8.5	SPT-3	11	14	17	31					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

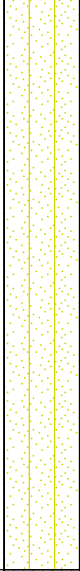
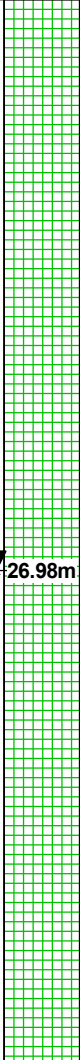
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+488 km	Northing :3125478.956 m	Easting :693206.085 m
Reduced Level (m):(+)262.292	BH. No. :BH-A2	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):26.98	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	14	18	22	40					
12.0											
12.5											
13.0	13	UDS-5					Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
13.5											
14.0											
14.5	14.5	SPT-5	17	25	29	54					
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	23	33	43	76					
18.0							Brown, Very dense, Silty sand with gravel	SM			
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

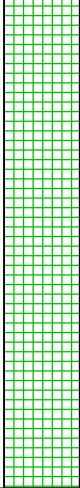
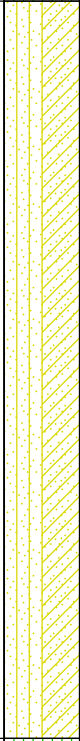
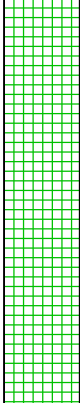
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :30+488 km	Northing :3125478.956 m	Easting :693206.085 m
Reduced Level (m):(+)262.292	BH. No. :BH-A2	BH Termination Depth (m):30
Proposed / Existing Structure :Major Bridge	Water Table (m):26.98	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0									0 10 20 30 40 50 60 70 80 90 100		
20.5	20.5	SPT-7	40	55	45 (6cm)	>100	Brown, Very dense, Silty sand with gravel	SM			
21.0											
21.5											
22.0	22	SPT-8	43	62	38 (4cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-9	17	25	31	56	Brown, Hard, Silty clay of low plasticity with gravel	CL			
24.0											
24.5											
25.0	25	UDS-8									
25.5											
26.0											
26.5	26.5	SPT-10	20	27	35	62					
27.0											
27.5											
28.0	28	UDS*									
28.5	28.5	SPT-11	70	100 (5cm)	-	>100					
29.0											
29.5	29.5	SPT-12				>100					
30.0	30	DS-2									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :31+095 km	Northing :3125892.043 m	Easting :692778.166 m
Reduced Level (m):(+)261.355	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :16-11-2021	Date of Completion :16-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS							0 10 20 30 40 50 60 70 80 90 100		
0.5	0.5	SPT-1	3	4	4	8	Brown, Stiff, Silty clay of low plasticity	CL			
1.0											
1.5	1.5	SPT-2	5	5	7	12					
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-3	6	8	10	18	Brown, Medium dense, Silty sand with clay	SM-SC			
3.5											
4.0											
4.5	4.5	SPT-4	7	8	12	20					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-5	8	10	14	24					
6.5											
7.0											
7.5	7.5	SPT-6	8	12	17	29					
8.0											
8.5	8.25	UDS-3					Brown, Very stiff to hard, Silty clay of low plasticity	CL			
9.0	9	SPT-7	9	14	19	33					
9.5											
10.0	10	SPT-8	9	15	21	36					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+714 km	Northing : 3126281.196 m	Easting : 692316.719 m
Reduced Level (m): (+)260.608	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 36.55	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	5	6	11					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	5	7	9	16					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	8	11	16	27					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

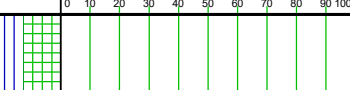
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :31+714 km	Northing :3126281.196 m	Easting :692316.719 m
Reduced Level (m):(+)260.608	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):36.55	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0									0 10 20 30 40 50 60 70 80 90 100		
10.5											
11.0											
11.5	11.5	SPT-4	6	9	12	21					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	7	10	14	24	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	8	11	15	26					
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :31+714 km	Northing :3126281.196 m	Easting :692316.719 m
Reduced Level (m):(+)260.608	BH. No. :BH-A1	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):36.55	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	15	35	45	80	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	16	22	38	60					
24.0											
24.5											
25.0	25	UDS-9									
25.5											
26.0											
26.5	26.5	SPT-9	30	53	47 (12cm)	>100					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	31	57	43 (9cm)	>100					
30.0											

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+714 km	Northing : 3126281.196 m	Easting : 692316.719 m
Reduced Level (m): (+)260.608	BH. No. : BH-A1	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 36.55	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0									0 10 20 30 40 50 60 70 80 90 100		
30.5											
31.0	31	SPT-11	33	56	44 (8cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-12	36	62	38 (5cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	34	100 (14cm)	-	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
35.5	35.5	SPT-14	32	40	42	82					
36.0											
36.5											
37.0	37	UDS-11									
37.5											
38.0											
38.5	38.5	SPT-15	24	35	46	81					
39.0											
39.5											
40.0	40	SPT-16	26	38	50	88					

▼ 36.55m

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+714 km	Northing : 3126299.382 m	Easting : 692289.084 m
Reduced Level (m): (+)261.768	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 36.33	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	4	8					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	5	7	9	16					
4.5											
5.0							Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	6	8	13	21					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	8	11	14	25					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :31+714 km	Northing :3126299.382 m	Easting :692289.084 m
Reduced Level (m):(+)261.768	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):36.33	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021		Date of Completion :29-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0									0 10 20 30 40 50 60 70 80 90 100		
10.5							Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	24	42	58 (8cm)	>100					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	12	20	35	55	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	14	30	50	80					
19.5											
20.0											



FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :31+714 km	Northing :3126299.382 m	Easting :692289.084 m
Reduced Level (m):(+)261.768	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):36.33	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	38	64	36 (6cm)	>100					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	32	53	47 (12cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	26	36	39	75					
28.5											
29.0											
29.5	29.5	UDS-10									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG


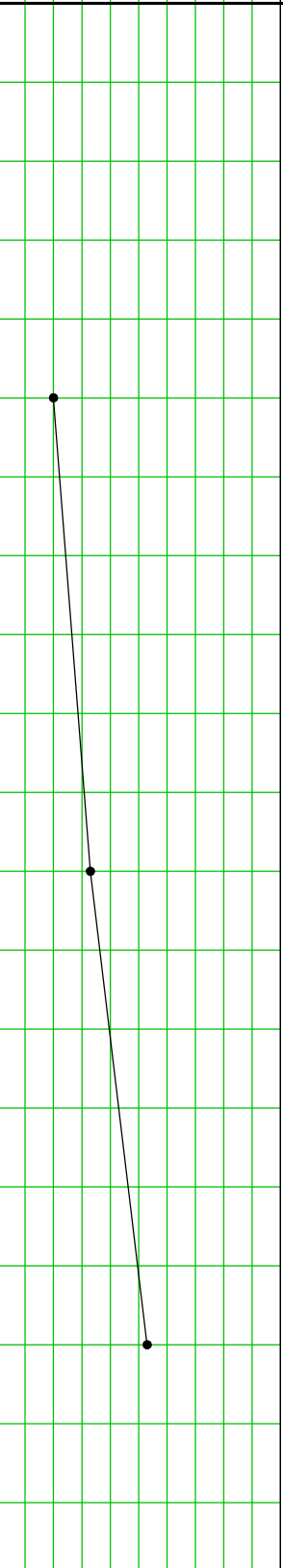
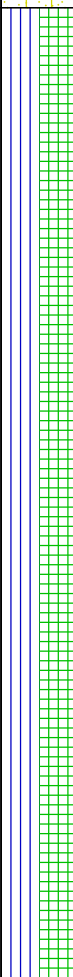
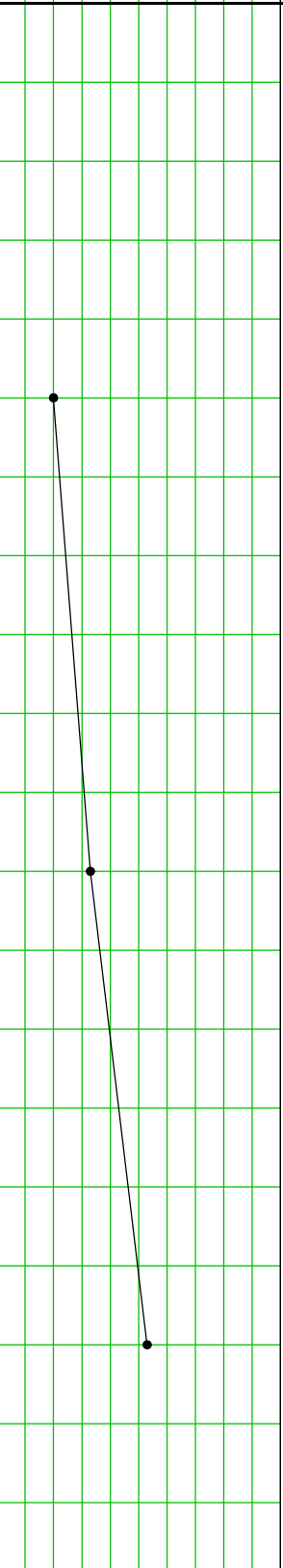
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 31+714 km	Northing : 3126299.382 m	Easting : 692289.084 m
Reduced Level (m): (+)261.768	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): 36.33	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	29	56	44 (7cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-12	30	61	39 (5cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	34	100 (12cm)	-	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
35.5	35.5	SPT-14	33	70	30 (5cm)	>100					
36.0											
36.5											
37.0	37	SPT-15	25	33	44	77					
37.5											
38.0											
38.5	38.5	UDS-11									
39.0											
39.5											
40.0	40	SPT-16	28	40	50	90					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 32+191 km	Northing : 3126530.493 m	Easting : 691893.138 m
Reduced Level (m): (+)262.443	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 30-09-2021	Date of Completion : 30-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1					Brown, Medium dense, Silty sand	SM			
1.5											
2.0											
2.5	2.5	SPT-1	7	9	11	20					
3.0											
3.5											
4.0	4	UDS-2					Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	ML-CL			
4.5											
5.0											
5.5	5.5	SPT-2	12	15	18	33					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	20	24	29	53					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 32+738 km	Northing : 3126801.35 m	Easting : 691418.519 m
Reduced Level (m): (+)260.749	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 29-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	6	10					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
4.0	4	SPT-2	6	9	11	20					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	11	15	18	33					
7.5											
8.0											
8.5	8.5	UDS-3					Brown, Hard, Silty clay of low plasticity with gravel	CL			
9.0											
9.5											
10.0	10	SPT-4	20	25	29	54					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

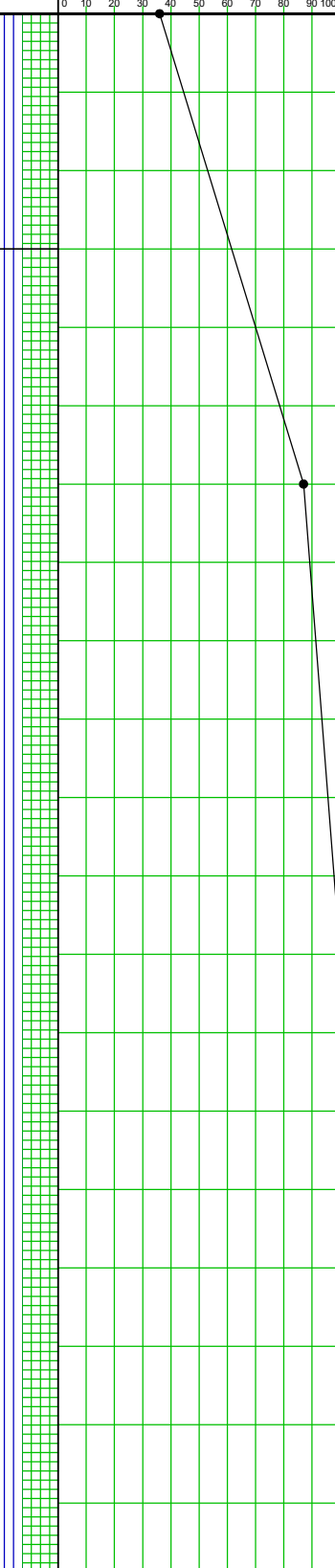
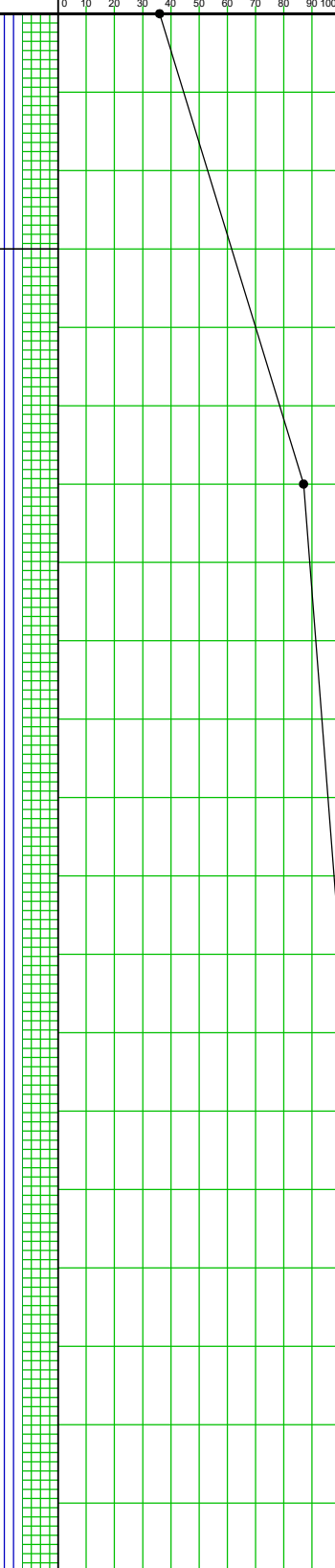
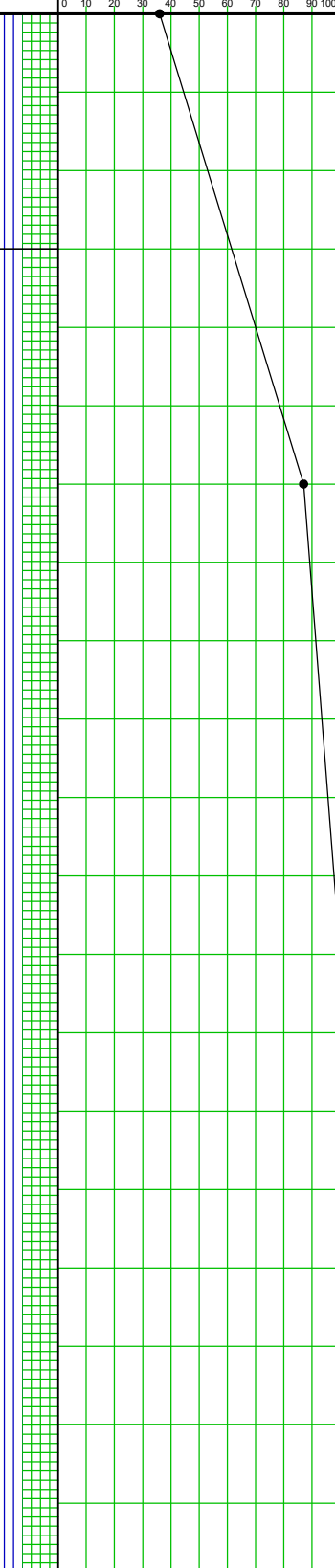
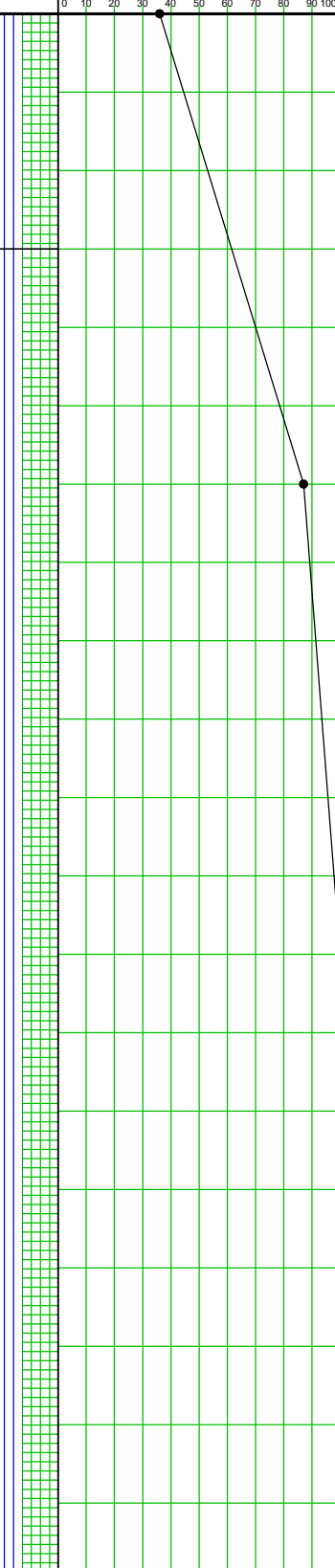
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 33+713 km	Northing : 3127280.622 m	Easting : 690578.397 m
Reduced Level (m): (+)257.231	BH. No. : 33+713_A1	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 28.98	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	7	9	13	22					
1.5											
2.0											
2.5	2.5	UDS-1					Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	SPT-2	8	11	15	26					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	14	33	49	82	Brown, Hard, Silty clay of low plasticity with gravel	CL			
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5							Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL			
10.0	10	SPT-4	11	15	21	36					

UDS*-UDS not recovered


FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :33+713 km	Northing :3127280.622 m	Easting :690578.397 m
Reduced Level (m):(+)257.231	BH. No. :33+713_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):28.98	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5						Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL				
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	18	42	45	87					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	30	79	21 (3cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
16.5											
17.0											
17.5	17.5	SPT-7	32	100 (11cm)	-	>100					
18.0											
18.5											
19.0	19	SPT-8	45	100 (11cm)	-	>100					
19.5											
20.0											

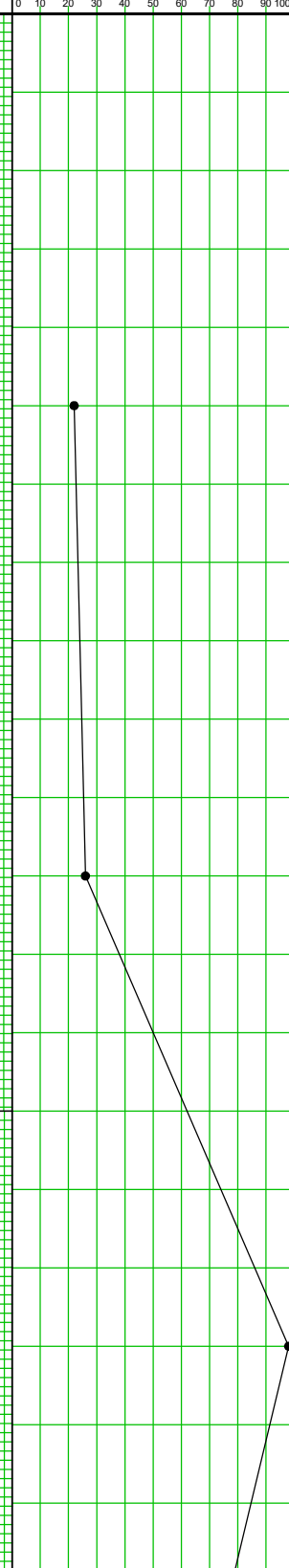
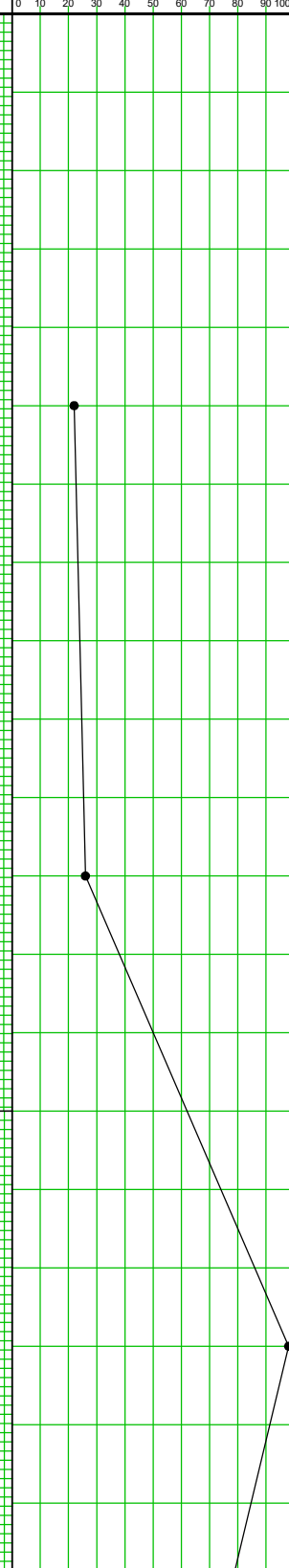
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :33+713 km	Northing :3127280.622 m	Easting :690578.397 m
Reduced Level (m):(+)257.231	BH. No. :33+713_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):28.98	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-9	40	64	36 (8cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
21.0											
21.5											
22.0	22	SPT-10	45	70	30 (7cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-11	30	40	60 (5cm)	>100					
24.0											
24.5											
25.0	25	SPT-12	47	100 (8cm)	-	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
25.5											
26.0											
26.5	26.5	SPT-13	26	43	57 (13cm)	>100					
27.0											
27.5											
28.0	28	SPT-14	30	100 (12cm)	-	>100					
28.5											
29.0											
29.5	29.5	SPT-15	30	40	50	90					
30.0	30	DS-2									

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 33+713 km	Northing : 3127290.956 m	Easting : 690560.289 m
Reduced Level (m): (+)257.830	BH. No. : 33+713_A2	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 29.52	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 28-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	7	11	11	22	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	8	12	14	26					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	20	40	58	98	Brown, Hard, Silty clay of low plasticity with gravel	CL			
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :33+713 km	Northing :3127290.956 m	Easting :690560.289 m
Reduced Level (m):(+)257.830	BH. No. :33+713_A2	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):29.52	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :28-09-2021		Date of Completion :29-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	16	25	33	58	Brown, Hard, Silty clay of low plasticity with gravel	CL			
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	29	45	55 (8cm)	>100					
15.0											
15.5											
16.0	16	SPT-6	26	48	52 (12cm)	>100					
16.5							Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
17.0											
17.5	17.5	SPT-7	38	73	27 (5cm)	>100					
18.0											
18.5											
19.0	19	SPT-8	29	100 (12cm)	-	>100					
19.5											
20.0											

UDS*-UDS not recovered



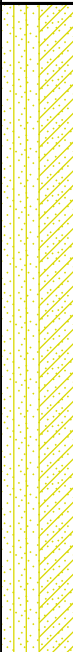
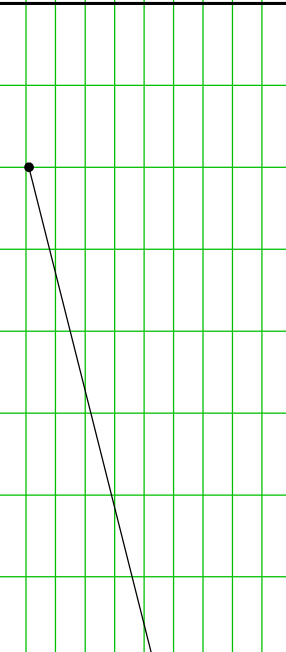
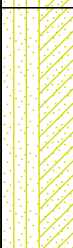
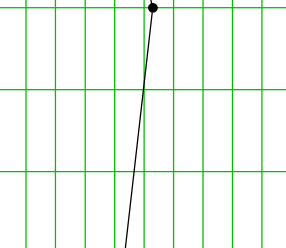

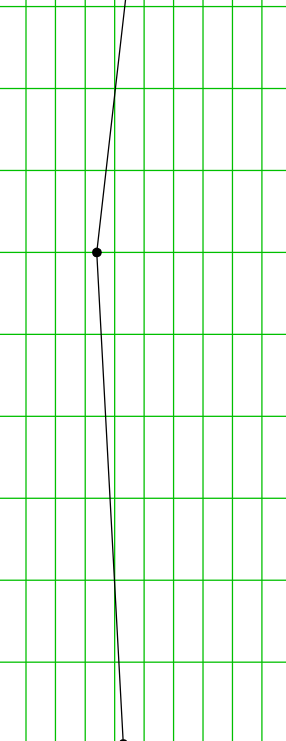
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :33+713 km	Northing :3127290.956 m	Easting :690560.289 m
Reduced Level (m):(+)257.830	BH. No. :33+713_A2	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):29.52	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :28-09-2021	Date of Completion :29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0									0 10 20 30 40 50 60 70 80 90 100		
20.5	20.5	SPT-9	45	80 (3cm)	-	>100	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
21.0											
21.5											
22.0	22	SPT-10	24	34	64	98					
22.5											
23.0											
23.5	23.5	SPT-11	26	43	57 (12cm)	>100					
24.0											
24.5											
25.0	25	SPT-12	36	44	56 (13cm)	>100	Brown, Hard, Silty clay of low plasticity with gravel	CL			
25.5											
26.0											
26.5	26.5	SPT-13	35	45	55 (9cm)	>100					
27.0											
27.5											
28.0	28	SPT-14	32	60	40 (10cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-15	34	70	30 (9cm)	>100					
30.0	30	DS-2									

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 34+019 km	Northing : 312744.537 m	Easting : 690307.695 m
Reduced Level (m): (+)256.788	BH. No. : 34+019_C-L	BH Termination Depth (m): 10
Proposed / Existing Structure :-	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 01-10-2021	Date of Completion : 01-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	5	6	11	Brown, Medium dense, Silty sand with clay SM-SC				
1.5											
2.0											
2.5	2.5	UDS-1					Brown, Very dense, Silty sand with clay SM-SC				
3.0											
3.5											
4.0	4	SPT-2	12	18	35	53					
4.5											
5.0											
5.5	5.5	UDS-2					Brown, Hard, Silty clay of low plasticity with gravel CL				
6.0											
6.5											
7.0	7	SPT-3	10	14	20	34					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	15	18	25	43					

UDS*-UDS not recovered



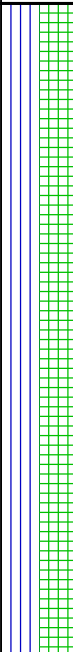
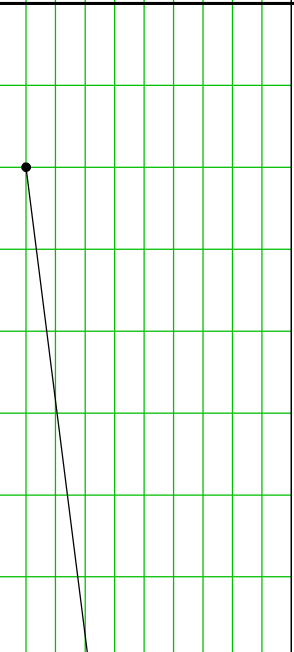

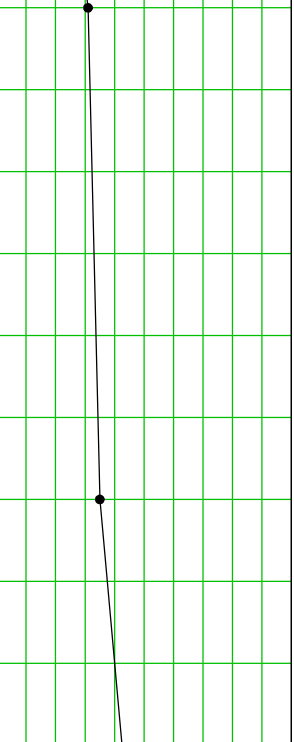
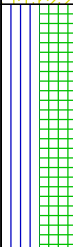
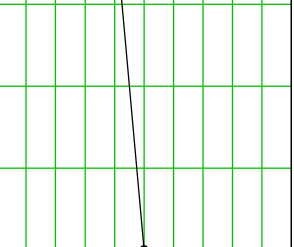
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 34+019 km	Northing : 312744.537 m	Easting : 690307.695 m
Reduced Level (m): (+)256.788	BH. No. : 34+019_C-L	BH Termination Depth (m): 10
Proposed / Existing Structure :-	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 01-10-2021	Date of Completion : 01-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
							Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL		0 10 20 30 40 50 60 70 80 90 100	

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 34+619 km	Northing : 3127806.228 m	Easting : 689829.431 m
Reduced Level (m): (+)256.661	BH. No. : 34+619_C-L	BH Termination Depth (m): 10
Proposed / Existing Structure :-	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 29-09-2021	Date of Completion : 29-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	4	6	10	Brown, Medium dense, Sandy silt of low plasticity ML-CL				
1.5											
2.0											
2.5	2.5	UDS-1					Brown, Dense, Silty sand with clay SM-SC				
3.0											
3.5											
4.0	4	SPT-2	8	14	17	31					
4.5											
5.0											
5.5	5.5	UDS-2					Brown, Very dense, Sandy silt of low plasticity ML-CL				
6.0											
6.5											
7.0	7	SPT-3	10	15	20	35					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	15	18	32	50					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 35+273 km	Northing : 3128197.938 m	Easting : 689320.433 m
Reduced Level (m): (+)257.980	BH. No. : 35+272_A1	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 24.92	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-09-2021		Date of Completion : 30-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	5	9					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5							Brown, Loose, Silty sand with clay	SM-SC			
4.0	4	SPT-2	4	5	5	10					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	7	13	16	29					
7.5											
8.0											
8.5	8.5	UDS-3					Brown, Very stiff, Silty clay of low plasticity	CL			
9.0											
9.5											
10.0	10	SPT-4	8	10	11	21					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :35+273 km	Northing :3128197.938 m	Easting :689320.433 m
Reduced Level (m):(+)257.980	BH. No. :35+272_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):24.92	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :30-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	6	9	18	27	Brown, Very stiff, Silty clay of low plasticity	CL			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0	15	SPT-6	18	24	30	54					
15.5											
16.0	16	SPT-7	15	25	34	59					
16.5											
17.0											
17.5	17.5	UDS-6					Brown, Hard, Silty clay of low plasticity with gravel	CL			
18.0											
18.5											
19.0	19	SPT-8	22	27	38	65					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :35+273 km	Northing :3128197.938 m	Easting :689320.433 m
Reduced Level (m):(+)257.980	BH. No. :35+272_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):24.92	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021		Date of Completion :30-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0	21	SPT-9	29	32	41	73					
21.5											
22.0	22	SPT-10	19	31	40	71					
22.5											
23.0											
23.5	23.5	SPT-11	25	37	45	82					
24.0											
24.5											
25.0	25	SPT-12	30	38	46	84	Brown, Hard, Silty clay of low plasticity with gravel	CL	24.92m		
25.5											
26.0											
26.5	26.5	SPT-13	35	42	46	88					
27.0											
27.5											
28.0	28	SPT-14	40	48	52 (12cm)	>100					
28.5											
29.0											
29.5											
30.0	30	SPT-15	46	53	47 (11cm)	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 35+273 km	Northing : 3128210.139 m	Easting : 689304.586 m
Reduced Level (m): (+)257.188	BH. No. : 35+272_A2	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 24.36	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-09-2021	Date of Completion : 28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	3	4	6	10					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	6	7	12	19					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	5	11	12	23					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :35+273 km	Northing :3128210.139 m	Easting :689304.586 m
Reduced Level (m):(+)257.188	BH. No. :35+272_A2	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):24.36	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	16	24	25	49					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	15	21	25	46	Brown, Hard, Silty clay of low plasticity with gravel	CL			
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	17	25	28	53					
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Hard, Silty clay of low plasticity with gravel	CL			
20.0											

UDS*-UDS not recovered

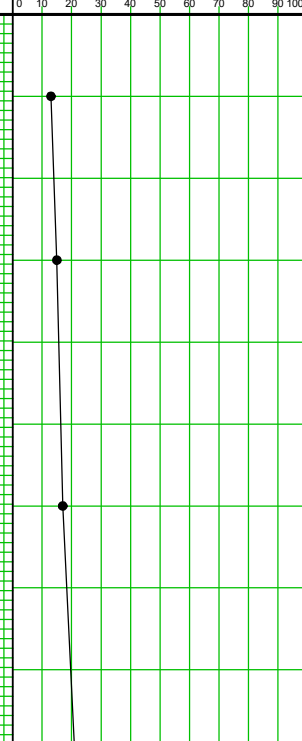
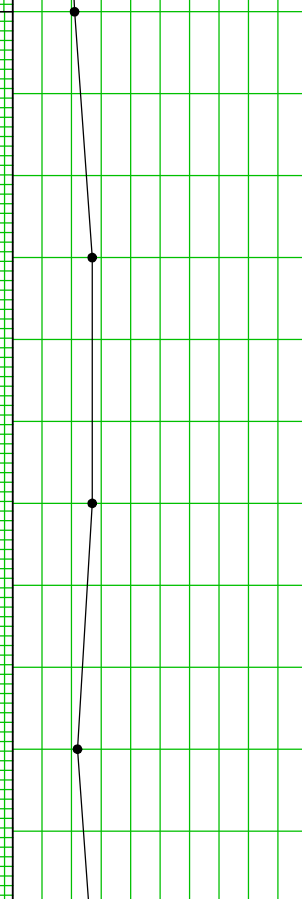
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :35+273 km	Northing :3128210.139 m	Easting :689304.586 m
Reduced Level (m):(+)257.188	BH. No. :35+272_A2	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):24.36	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	25	32	48	80					
21.0											
21.5											
22.0	22	SPT-8	24	37	47	84					
22.5											
23.0											
23.5	23.5	SPT-9	27	38	52	90					
24.0											
24.5								▼ 24.36m			
25.0	25	SPT-10	30	36	47	83	Brown, Hard, Silty clay of low plasticity with gravel	CL			
25.5											
26.0											
26.5	26.5	SPT-11	42	45	50	95					
27.0											
27.5											
28.0	28	SPT-12	46	55	45 (10cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-13	52	100 (10cm)	-	>100					
30.0	30	DS-2									

FIELD BOREHOLE LOG

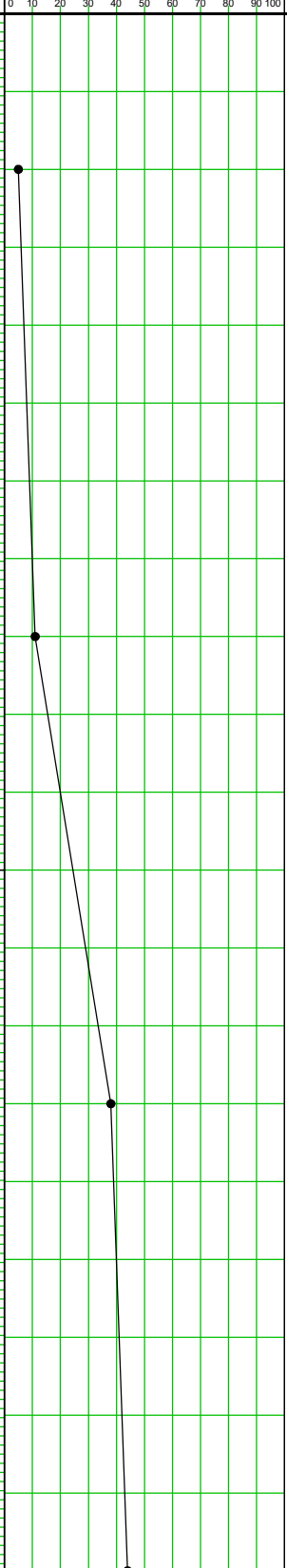
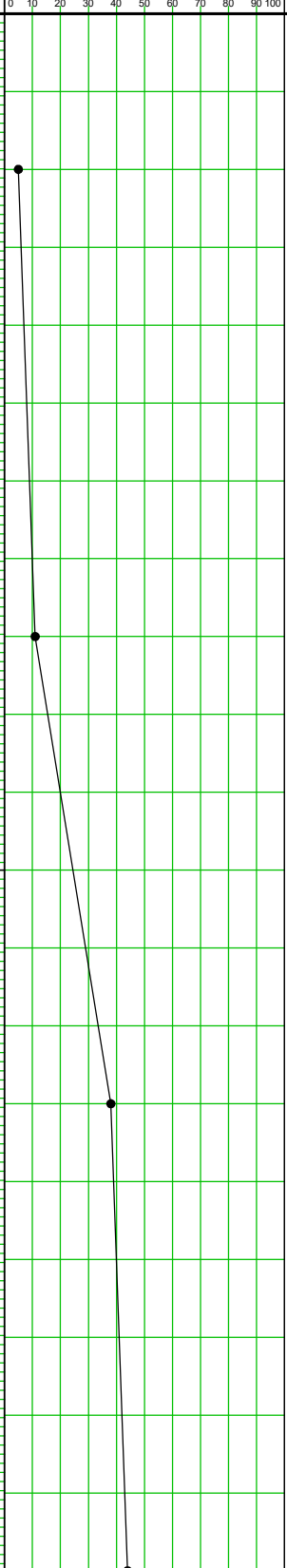
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :36+367 km	Northing :3128873.981 m	Easting :688442.635 m
Reduced Level (m):(+)255.925	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :17-11-2021	Date of Completion :17-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	4	6	7	13	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	5	6	9	15					
2.25	2.25	UDS-1									
3.0	3	SPT-3	6	7	10	17					
4.5	4.5	SPT-4	7	9	12	21	Brown, Very stiff, Silty clay of low plasticity	CL			
5.25	5.25	UDS-2									
6.0	6	SPT-5	8	12	15	27					
7.5	7.5	SPT-6	8	10	17	27					
8.25	8.25	UDS-3									
9.0	9	SPT-7	8	10	12	22					
10.0	10	SPT-8	10	11	15	26					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 36+816 km	Northing : 3129148.53 m	Easting : 688102.237 m
Reduced Level (m): (+)253.133	BH. No. : 36+817_A1	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 23.89	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-09-2021	Date of Completion : 28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	2	2	3	5	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL	ML-CL			
2.5	2.5	UDS-1									
4.0	4	SPT-2	3	3	8	11					
5.5	5.5	UDS-2									
7.0	7	SPT-3	8	16	22	38	Brown, Hard, Silty clay of low plasticity with gravel CL	CL			
8.5	8.5	UDS-3									
10.0	10	SPT-4	10	21	23	44					

UDS*-UDS not recovered

FIELD BOREHOLE LOG



Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :36+816 km	Northing :3129148.53 m	Easting :688102.237 m
Reduced Level (m):(+)253.133	BH. No. :36+817_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):23.89	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	15	17	32	Brown, Hard, Silty clay of low plasticity with gravel	CL			
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	12	14	22	36					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0							Brown, Very dense, Sandy silt of low plasticity with	ML-CL			
18.5											
19.0	19	SPT-7	20	36	44	80					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

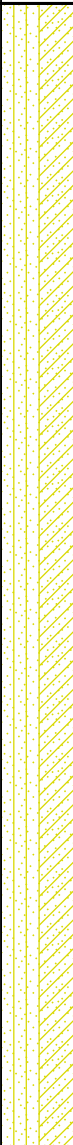
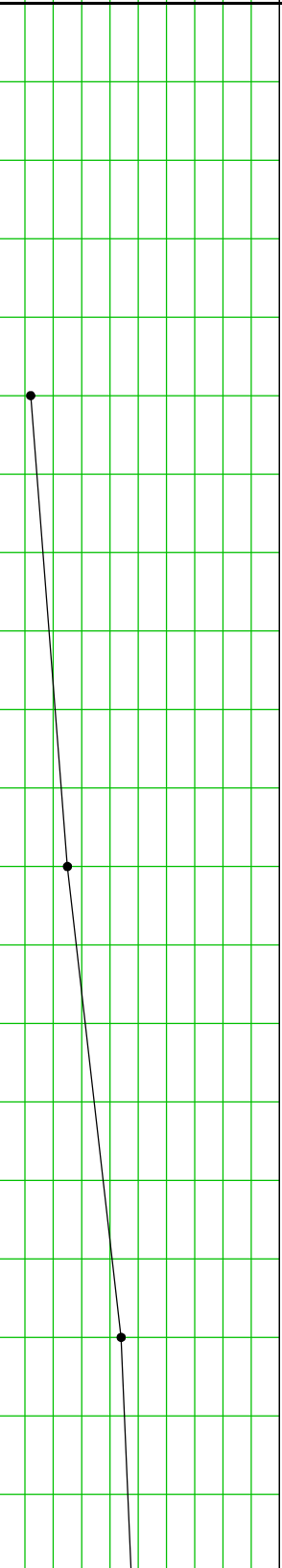
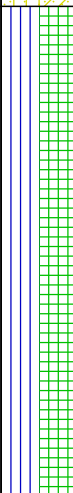
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :36+816 km	Northing :3129148.53 m	Easting :688102.237 m
Reduced Level (m):(+)253.133	BH. No. :36+817_A1	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):23.89	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS*									
21.0	21	SPT-8	25	45	53	98	Brown, Very dense, Sandy silt of low plasticity with	ML-CL			
21.5											
22.0	22	SPT-9	34	57	43 (10cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-10	18	27	42	69	Brown, Hard, Silty clay of low plasticity with gravel	CL			
24.0											
24.5											
25.0	25	SPT-11	21	29	45	74					
25.5											
26.0											
26.5	26.5	UDS-7									
27.0											
27.5											
28.0	28	SPT-12	12	15	21	36					
28.5											
29.0											
29.5	29.5	UDS*									
30.0	30	SPT-13	10	18	24	42					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

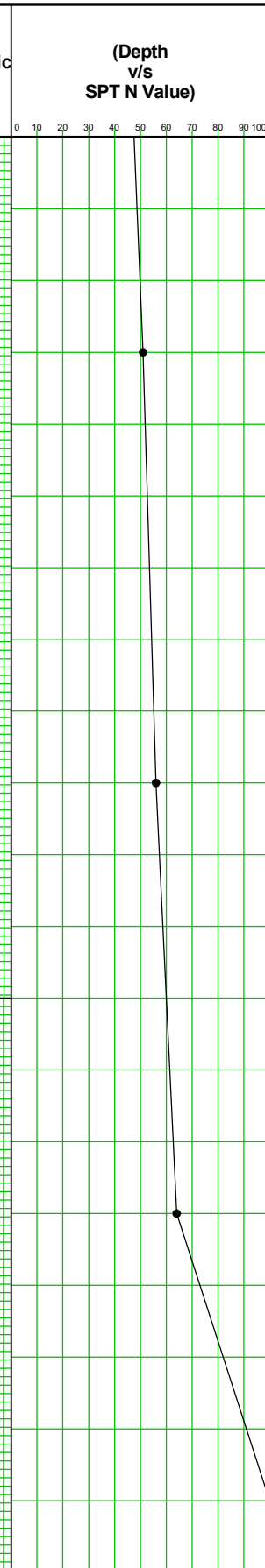
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 36+816 km	Northing : 3129162.136 m	Easting : 688087.58 m
Reduced Level (m): (+)253.255	BH. No. : 36+817_A2	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 23.16	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-09-2021	Date of Completion : 28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	3	5	7	12	Brown, Medium dense, Silty sand with clay	SM-SC			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	5	10	15	25					
6.0											
6.5											
7.0	7	UDS-3					Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL			
7.5											
8.0											
8.5	8.5	SPT-3	16	20	24	44					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG


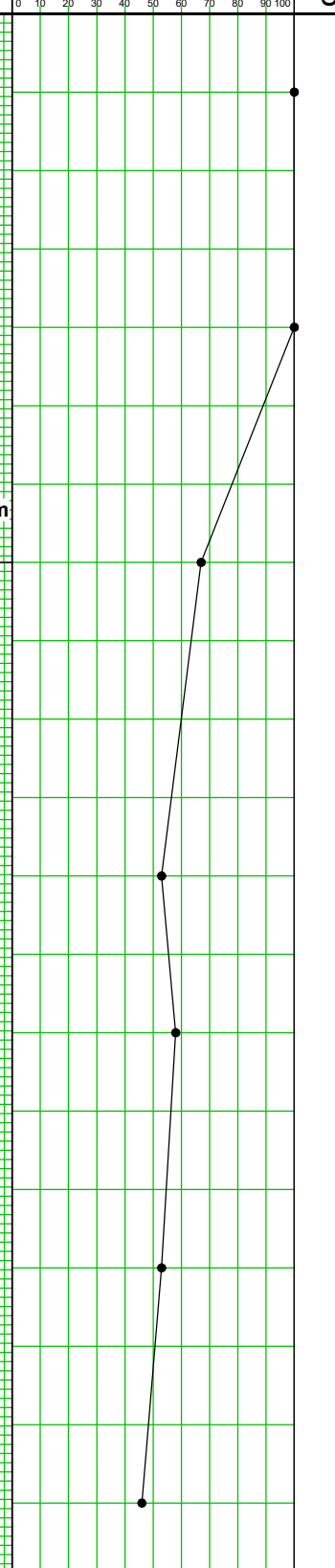

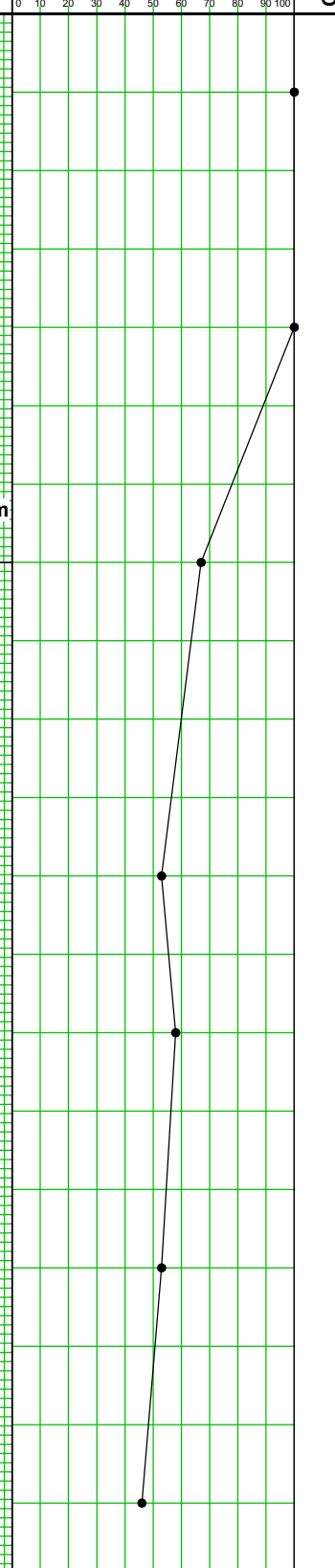
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :36+816 km	Northing :3129162.136 m	Easting :688087.58 m
Reduced Level (m):(+)253.255	BH. No. :36+817_A2	BH Termination Depth (m):30
Proposed / Existing Structure :-	Water Table (m):23.16	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :27-09-2021	Date of Completion :28-09-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	20	23	28	51	Brown, Hard, Silty clay of low plasticity with gravel	CL			
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	22	26	30	56	Brown, Very dense, Sandy silt of low plasticity with	ML-CL			
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	25	31	33	64	Brown, Very dense, Sandy silt of low plasticity with	ML-CL			
18.0											
18.5											
19.0	19	UDS*									
19.5	19.5	SPT-7	32	52	48 (6cm)	>100					
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

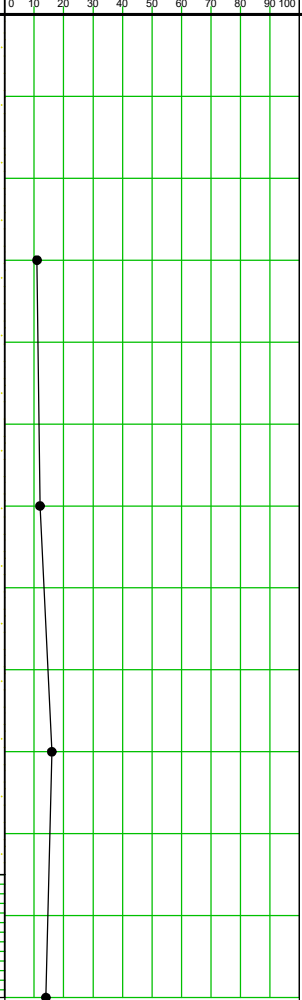
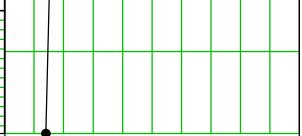
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 36+816 km	Northing : 3129162.136 m	Easting : 688087.58 m
Reduced Level (m): (+)253.255	BH. No. : 36+817_A2	BH Termination Depth (m): 30
Proposed / Existing Structure :-	Water Table (m): 23.16	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-09-2021		Date of Completion : 28-09-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	38	58	42 (10cm)	>100	Brown, Very dense, Sandy silt of low plasticity with	ML-CL			
21.0											
21.5											
22.0	22	SPT-9	44	64	36 (11cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-10	20	31	36	67	Brown, Hard, Silty clay of low plasticity with gravel	CL			
24.0											
24.5											
25.0	25	UDS*									
25.5	25.5	SPT-11	18	24	29	53					
26.0											
26.5	26.5	SPT-12	21	27	31	58					
27.0											
27.5											
28.0	28	SPT-13	19	25	28	53					
28.5											
29.0											
29.5	29.5	SPT-14	17	21	25	46					
30.0	30	DS-2									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :37+174 km	Northing :3129414.081 m	Easting :687850.788 m
Reduced Level (m):(+)252.485	BH. No. :BH-CL	BH Termination Depth (m):6
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :08-07-2022		Date of Completion :08-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	4	5	6	11	Reddish Brown, Medium dense, Silty Sand	SM			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-2	4	5	7	12					
3.5											
4.0											
4.5	4.5	SPT-3	5	7	9	16	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-4	6	6	8	14					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 37+487 km	Northing : 3129665.052 m	Easting : 687664.026 m
Reduced Level (m): (+)253.510	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 151 mm	Depth of Casing (m) : Not Used
Date of Start : 07-07-2022		Date of Completion : 07-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	3	4	6	10	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-2	5	6	6	12					
3.5											
4.0											
4.5	4.5	SPT-3	6	8	9	17	Reddish Brown, Medium dense, Silty Sand	SM			
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-4	9	13	18	31					
6.5											
7.0											
7.5	7.5	SPT-5	7	12	14	26	Brown, Dense, Sandy silt of low plasticity	ML-CL			
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-6	9	14	21	35					
9.5											
10.0	10	SPT-7	7	12	14	26	Brown, Dense, Silty Clay of low plasticity	CL			

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 38+127 km	Northing : 3130206.236 m	Easting : 687322.404 m
Reduced Level (m): (+)254.370	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 152 mm	Depth of Casing (m) : Not Used
Date of Start : 06-07-2022		Date of Completion : 07-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	2	3	5	8	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-2	4	5	6	11					
3.5											
4.0											
4.5	4.5	SPT-3	5	6	7	13					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-4	8	12	14	26	Brown, Dense, Silty Clay of low plasticity	CL			
6.5											
7.0											
7.5	7.5	SPT-5	10	14	16	30					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-6	7	11	13	24					
9.5											
10.0	10	SPT-7	9	12	14	26					

UDS*-UDS not recovered

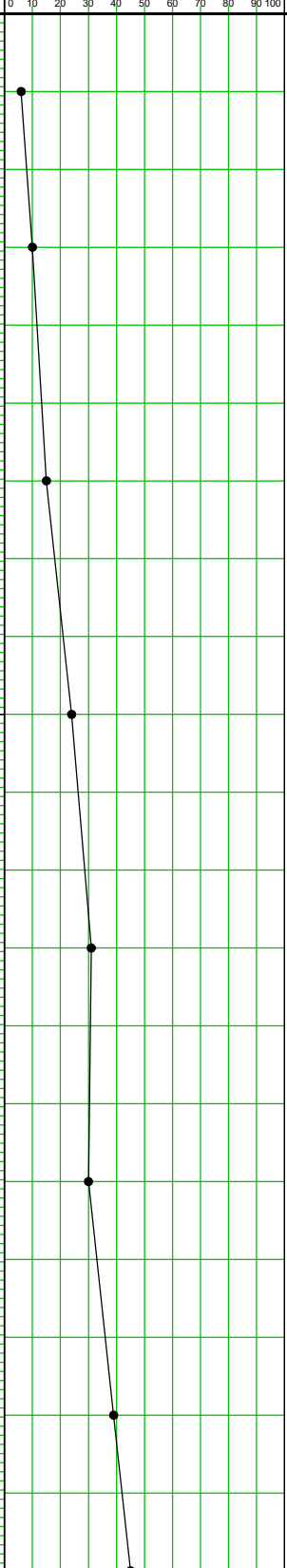
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :38+482 km	Northing :3130509.717 m	Easting :687138.27 m
Reduced Level (m):(+)254.888	BH. No. :BH-CL	BH Termination Depth (m):6
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :153 mm	Depth of Casing (m) :Not Used
Date of Start :08-07-2022		Date of Completion :08-07-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0											
1.5	1.5	SPT-1	3	4	5	9					
2.0											
2.25	2.25	UDS-1									
2.5											
3.0	3	SPT-2	4	6	7	13	Reddish Brown,Medium Dense,Silty Clay of low plasticity	CL			
3.5											
4.0											
4.5	4.5	SPT-3	6	8	8	16					
5.0											
5.25	5.25	UDS-2									
5.5											
6.0	6	SPT-4	8	13	17	30					

FIELD BOREHOLE LOG

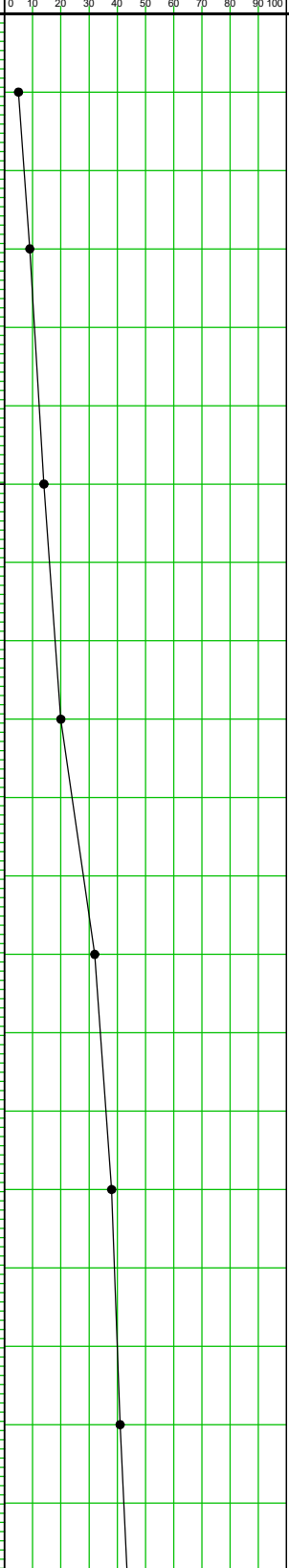
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :38+701 km	Northing :3130698.508 m	Easting :687027.281 m
Reduced Level (m):(+)254.062	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :30-01-2022		Date of Completion :30-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	4	6	Brown, Medium stiff to stiff, Silty clay of low plasticity	CL			
1.5	1.5	SPT-2	3	4	6	10					
2.25	2.25	UDS*									
3.0	3	SPT-3	7	7	8	15					
4.5	4.5	SPT-4	10	11	13	24	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
5.25	5.25	UDS-1									
6.0	6	SPT-5	9	13	18	31					
7.5	7.5	SPT-6	12	14	16	30					
8.25	8.25	UDS-2									
9.0	9	SPT-7	13	17	22	39					
10.0	10	SPT-8	15	21	24	45					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :38+778 km	Northing :3130764 m	Easting :686988.257 m
Reduced Level (m):(+)254.956	BH. No. :BH-CL	BH Termination Depth (m):15
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :30-01-2022		Date of Completion :30-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	4	4	5	9					
2.25	2.25	UDS*									
3.0	3	SPT-3	5	6	8	14	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
4.5	4.5	SPT-4	7	9	11	20					
5.25	5.25	UDS-1									
6.0	6	SPT-5	10	14	18	32					
7.5	7.5	SPT-6	13	17	21	38					
8.25	8.25	UDS-2									
9.0	9	SPT-7	15	19	22	41					
10.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

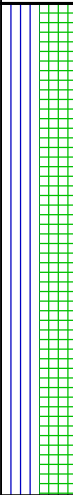
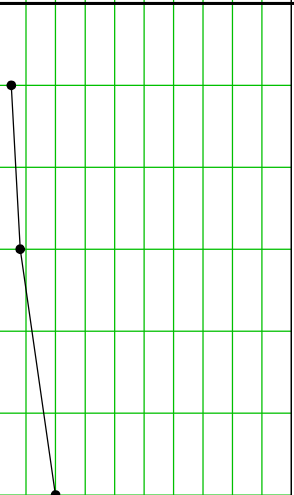
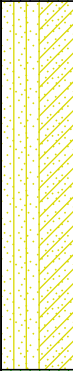
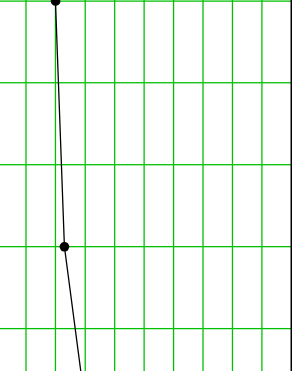
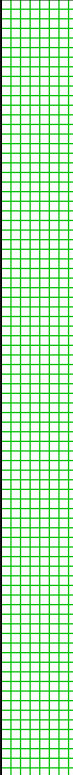
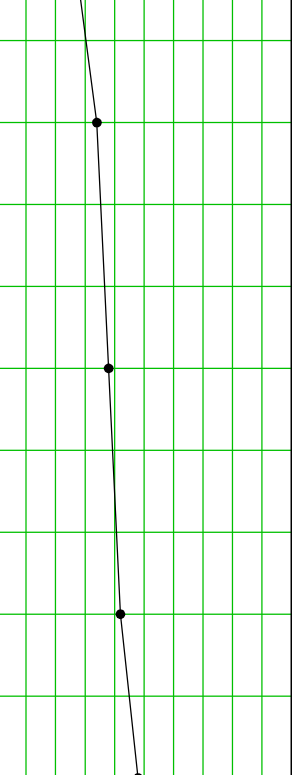
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 38+778 km	Northing : 3130764 m	Easting : 686988.257 m
Reduced Level (m): (+)254.956	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 30-01-2022		Date of Completion : 30-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	18	21	24	45	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
11.0											
11.25	11.25	UDS-3									
11.5											
12.0	12	SPT-9	17	19	29	48					
12.5											
13.0											
13.5	13.5	SPT-10	19	23	31	54					
14.0											
14.25	14.25	UDS*									
14.5											
15.0	15	SPT-11	25	22	38	60					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :39+060 km	Northing :3131007.988 m	Easting :686845.338 m
Reduced Level (m):(+)256.112	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :29-01-2022	Date of Completion :29-01-2022	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose, Sandy silt of low plasticity ML-CL				
1.5	1.5	SPT-2	3	4	4	8					
2.25	2.25	UDS*									
3.0	3	SPT-3	7	9	11	20	Brown, Medium dense, Silty sand with clay SM-SC				
4.5	4.5	SPT-4	8	10	13	23					
5.25	5.25	UDS-1									
6.0	6	SPT-5	10	15	19	34	Brown, Hard, Silty clay of low plasticity with gravel CL				
7.5	7.5	SPT-6	12	17	21	38					
8.25	8.25	UDS-2									
9.0	9	SPT-7	15	19	23	42					
9.5											
10.0	10	SPT-8	17	22	26	48					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 39+149 km	Northing : 3131306.518 m	Easting : 686653.951 m
Reduced Level (m): (+)255.863	BH. No. : BH-PLT-03	BH Termination Depth (m): 12
Proposed / Existing Structure :-	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 21-10-2021	Date of Completion : 21-10-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.75	UDS-1									
1.0											
1.5	1.5	SPT-1	2	3	3	3	Brown, Loose, Silty sand with clay	SM-SC			
2.0											
2.5	2.25	SPT-2	2	3	4	4					
3.0	3	SPT-3	5	7	9	9					
3.5											
4.0	3.75	SPT-4	5	7	9	9					
4.5	4.5	UDS-2									
5.0											
5.5											
6.0	6	SPT-5	10	12	18	18					
6.5							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
7.0											
7.5	7.5	UDS-3									
8.0											
8.5											
9.0	9	SPT-6	9	11	15	15					
9.5											
10.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 39+149 km	Northing : 3131306.518 m	Easting : 686653.951 m
Reduced Level (m): (+)255.863	BH. No. : BH-PLT-03	BH Termination Depth (m): 12
Proposed / Existing Structure :-	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 21-10-2021		Date of Completion : 21-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	UDS-4					Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
11.0											
11.5											
12.0	12	SPT-7	10	12	16	16					



FIELD BOREHOLE LOG

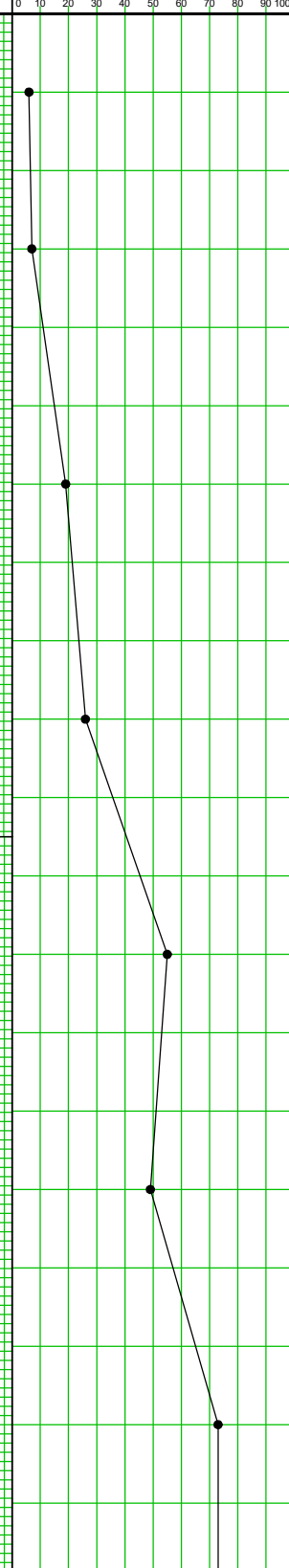
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :39+400 km	Northing :3131301.616 m	Easting :686673.94 m
Reduced Level (m):(+)256.079	BH. No. :39+400_CL	BH Termination Depth (m):10
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :20-11-2021	Date of Completion :20-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	3	6	Brown, Loose to medium dense, Silty sand	SM			
1.0											
1.5	1.5	SPT-2	2	3	4	7					
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-3	5	7	8	15					
3.5											
4.0											
4.5	4.5	SPT-4	8	14	16	30	Brown, Dense, Sandy silt of low plasticity	ML-CL			
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-5	11	15	18	33					
6.5											
7.0											
7.5	7.5	SPT-6	10	18	20	38					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-7	10	19	22	41					
9.5											
10.0	10	SPT-8	13	21	23	44					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

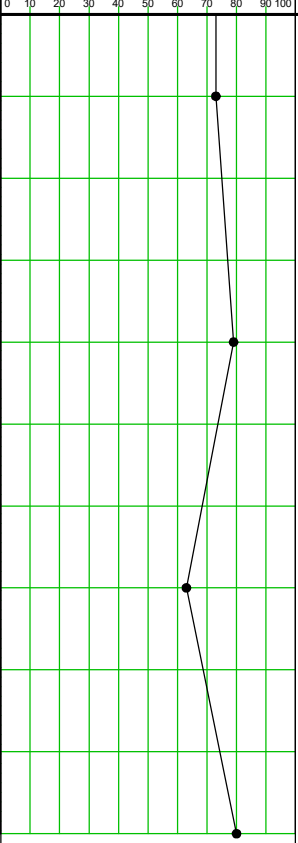
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :40+325 km	Northing :3132119.63 m	Easting :686221.079 m
Reduced Level (m):(+)257.953	BH. No. :BH-CL	BH Termination Depth (m):15
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :29-01-2022		Date of Completion :29-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1				6	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL				
1.5	1.5	SPT-2				7					
2.25	2.25	UDS*				UDS*					
3.0	3	SPT-3				19					
4.5	4.5	SPT-4				26					
5.25	5.25	UDS-1				UDS					
6.0	6	SPT-5				55					
7.5	7.5	SPT-6				49	Brown, Hard, Silty clay of low plasticity with gravel CL				
8.25	8.25	UDS-2				UDS					
9.0	9	SPT-7				73					
10.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

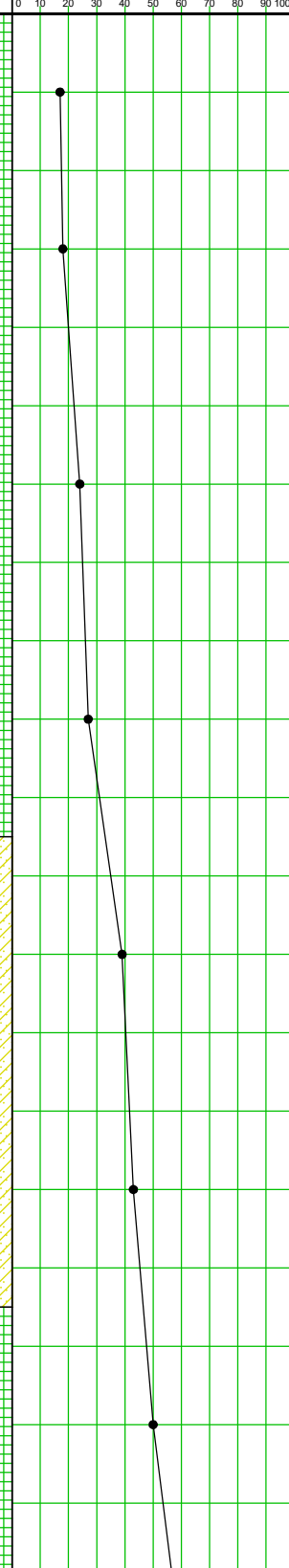
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 40+325 km	Northing : 3132119.63 m	Easting : 686221.079 m
Reduced Level (m): (+)257.953	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 29-01-2022		Date of Completion : 29-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8				73	Brown, Hard, Silty clay of low plasticity with gravel CL	CL			
11.0	11.25	UDS-3				UDS					
11.5											
12.0	12	SPT-9				79					
12.5											
13.0											
13.5	13.5	SPT-10				63					
14.0											
14.5	14.25	UDS*				UDS*					
15.0	15	SPT-11				80					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :40+573 km	Northing :3132328.87 m	Easting :686107.704 m
Reduced Level (m):(+)252.612	BH. No. :40+573_CL	BH Termination Depth (m):10
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-11-2021	Date of Completion :19-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	4	8	9	17	Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
1.0											
1.5	1.5	SPT-2	5	9	9	18					
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-3	9	11	13	24					
3.5											
4.0											
4.5	4.5	SPT-4	11	13	14	27					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-5	14	18	21	39	Brown, Medium dense to very dense, Sandy silt of low plasticity	SM-SC			
6.5											
7.0											
7.5	7.5	SPT-6	13	20	23	43					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-7	15	24	26	50	Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
9.5											
10.0	10	SPT-8	17	26	31	57					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+056 km	Northing : 3132785.751 m	Easting : 685995.127 m
Reduced Level (m): (+)253.199	BH. No. : BH-A1	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 18-08-2021	Date of Completion : 19-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	3	5	8	13	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	5	8	12	20					
6.0											
6.5											
7.0	7	UDS-3					Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
7.5											
8.0											
8.5	8.5	SPT-3	8	13	17	30					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

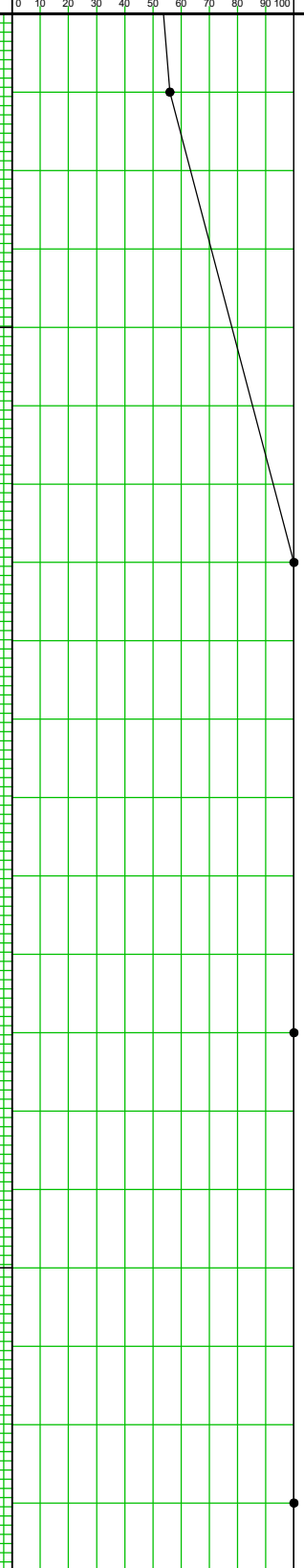
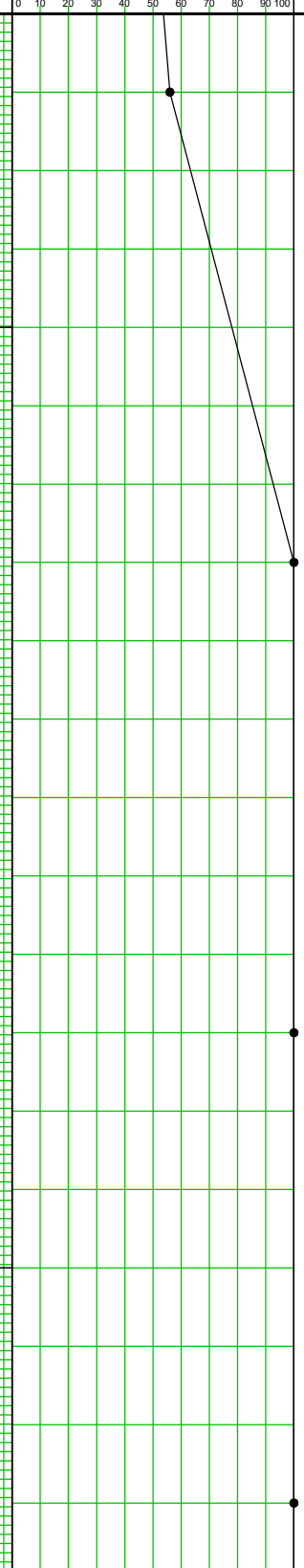
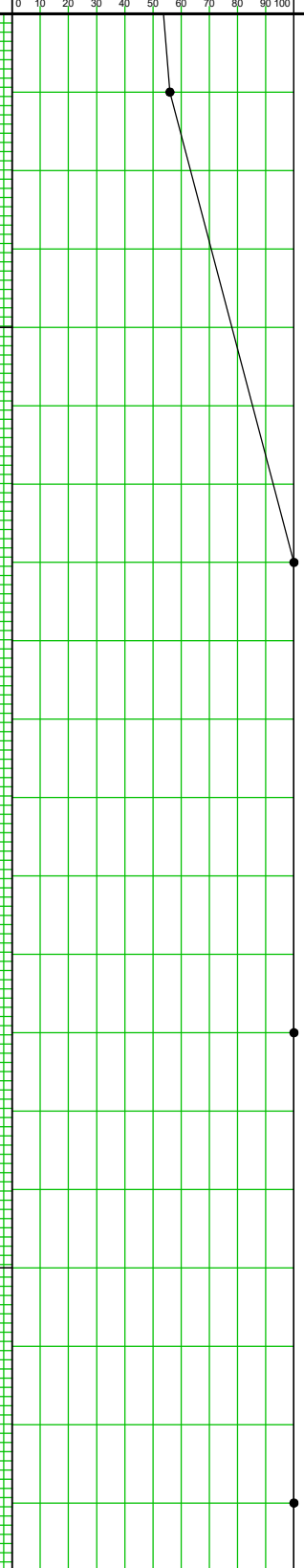
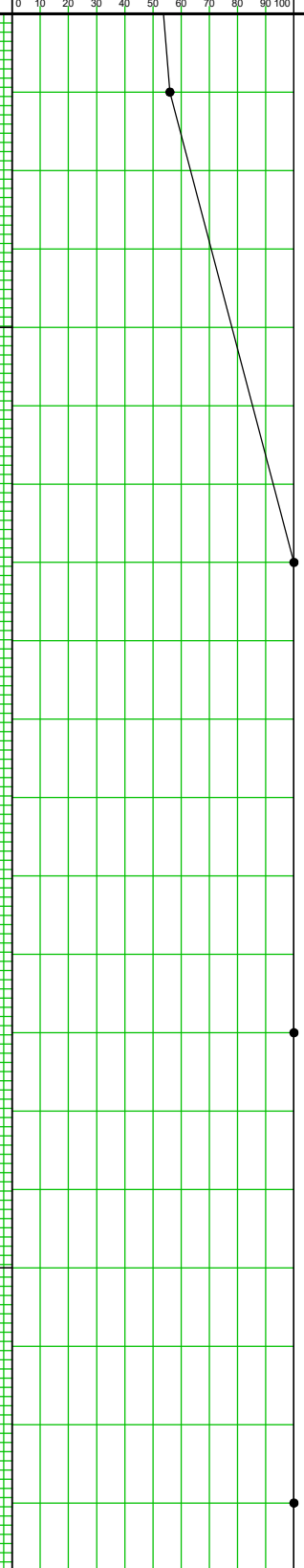
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+056 km	Northing : 3132785.751 m	Easting : 685995.127 m
Reduced Level (m): (+)253.199	BH. No. : BH-A1	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 18-08-2021		Date of Completion : 19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	7	14	18	32					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	10	16	22	38					
15.0							Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	10	18	24	42					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+056 km	Northing : 3132785.751 m	Easting : 685995.127 m
Reduced Level (m): (+)253.199	BH. No. : BH-A1	BH Termination Depth (m): 30
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 18-08-2021	Date of Completion : 19-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	14	22	34	56	Brown, Dense to very dense, Sandy silt of low plasticity with gravel ML-CL				
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	20	39	61 (3cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel ML-CL				
24.0											
24.5											
25.0	25	UDS*									
25.5											
26.0											
26.5	26.5	SPT-9	30	48	54 (7cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel ML-CL				
27.0											
27.5											
28.0	28	UDS*									
28.5											
29.0											
29.5	29.5	SPT-10	32	89	11 (7cm)	>100	Brown, Very dense, Sandy silt of low plasticity with gravel ML-CL				
30.0	30	SPT-11	42	100 (11cm)	-	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+056 km	Northing : 3132810.479 m	Easting : 685993.223 m
Reduced Level (m): (+)252.668	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-08-2021		Date of Completion : 14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	2	4	7	11					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5							Brown, Medium dense, Silty sand with clay	SM-SC			
4.0	4	SPT-2	7	9	11	20					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	12	17	21	38					
7.5											
8.0											
8.5	8.5	UDS-3					Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
9.0											
9.5											
10.0	10	SPT-4	15	19	24	43					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+056 km	Northing :3132810.479 m	Easting :685993.223 m
Reduced Level (m):(+)252.668	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :12-08-2021		Date of Completion :14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	20	30	37	67					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
15.5											
16.0	16	SPT-6	25	34	37	71					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	29	39	57	96					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+056 km	Northing :3132810.479 m	Easting :685993.223 m
Reduced Level (m):(+)252.668	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :12-08-2021		Date of Completion :14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	36	45	65 (4cm)	>100					
22.5											
23.0											
23.5	23.5	SPT-9	39	57	50 (5cm)	>100					
24.0											
24.5											
25.0	25	SPT-10	45	67	40 (4cm)	>100	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-11	53	100 (5cm)	-	>100					
27.0											
27.5											
28.0	28	SPT-12	57	100 (12cm)	-	>100					
28.5											
29.0											
29.5	29.5	SPT-13	43	59	41 (8cm)	>100					
30.0											

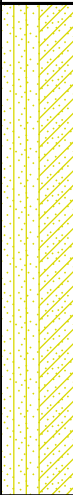
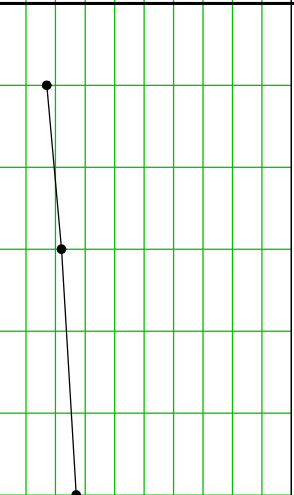
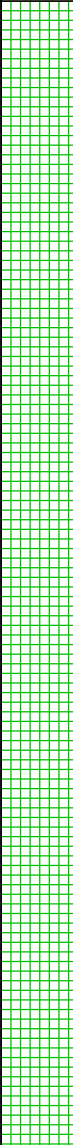
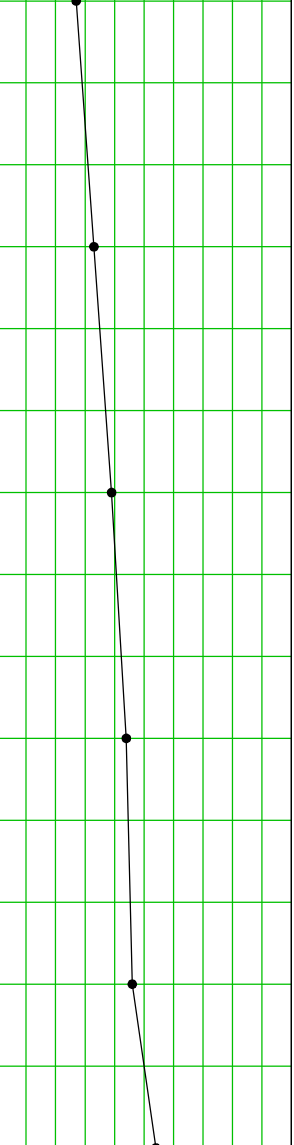
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+056 km	Northing : 3132810.479 m	Easting : 685993.223 m
Reduced Level (m): (+)252.668	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-08-2021		Date of Completion : 14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-14	51	62	38 (12cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-15	45	56	44 (7cm)	>100					
33.0											
33.5											
34.0	34	SPT-16	50	100 (3cm)	-	>100					
34.5											
35.0							Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL			
35.5	35.5	SPT-17	57	100 (4cm)	-	>100					
36.0											
36.5											
37.0	37	SPT-18	47	100 (8cm)	-	>100					
37.5											
38.0											
38.5	38.5	SPT-19	54	100 (10cm)	-	>100					
39.0											
39.5											
40.0	40	SPT-20	60	100 (10cm)	-	>100					

FIELD BOREHOLE LOG

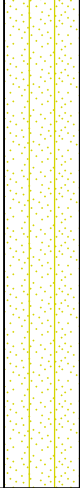
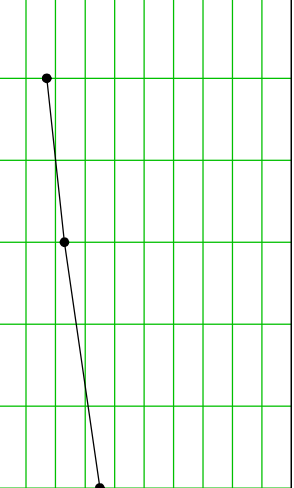
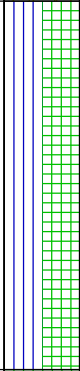
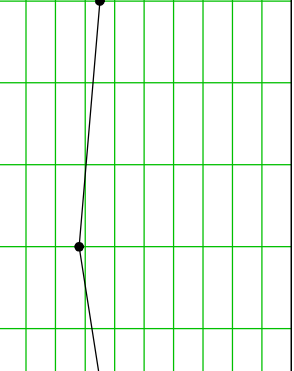
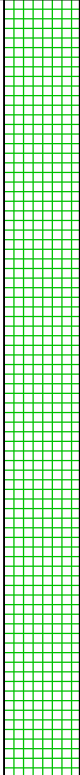
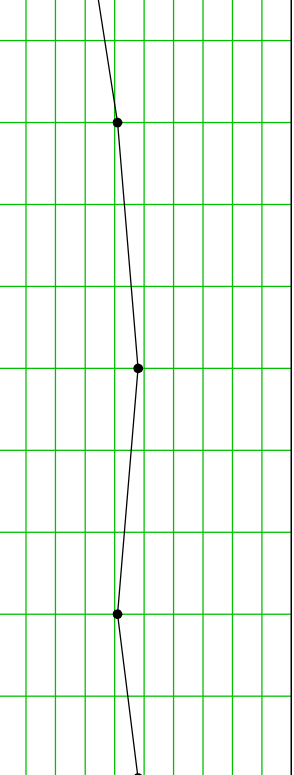
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+100 km	Northing :3132839.175 m	Easting :685985.307 m
Reduced Level (m):(+)252.428	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :18-11-2021	Date of Completion :18-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	5	6	11	17	Brown, Medium dense, Silty sand with clay	SM-SC			
1.5	1.5	SPT-2	4	9	13	22					
2.25	2.25	UDS-1									
3.0	3	SPT-3	8	12	15	27	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
4.5	4.5	SPT-4	9	14	19	33					
5.25	5.25	UDS-2									
6.0	6	SPT-5	12	17	22	39					
7.5	7.5	SPT-6	13	21	23	44					
8.25	8.25	UDS-3									
9.0	9	SPT-7	11	22	24	46					
10.0	10	SPT-8	12	26	28	54					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

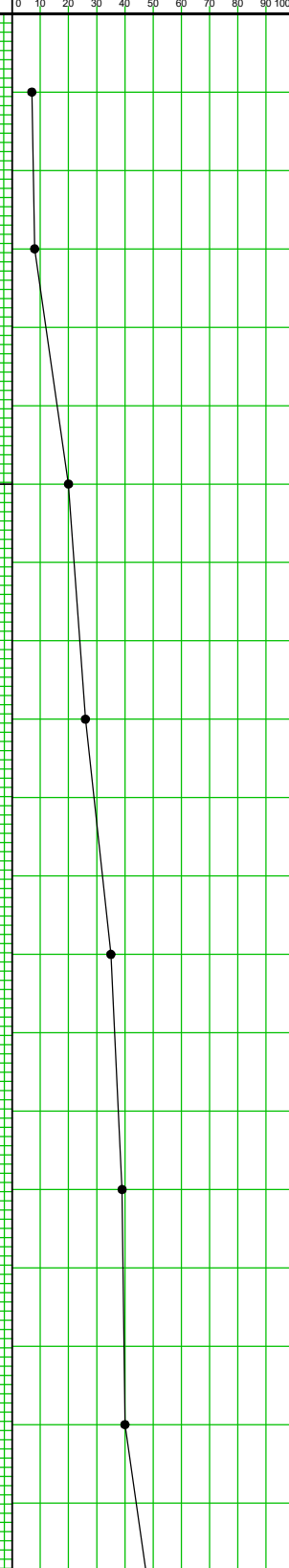
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+217 km	Northing :3132954.077 m	Easting :685963.297 m
Reduced Level (m):(+)255.462	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :18-11-2021	Date of Completion :18-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	8	9	17	Brown, Medium dense, Silty sand	SM			
1.5	1.5	SPT-2	4	8	15	23					
2.25	2.25	UDS-1									
3.0	3	SPT-3	9	16	19	35	Brown, Medium dense to dense, Sandy Silt of low plasticity	ML-CL			
4.5	4.5	SPT-4	11	17	11	28					
5.25	5.25	UDS-2									
6.0	6	SPT-5	13	20	21	41	Brown, Hard, Silty clay of low plasticity	CL			
7.5	7.5	SPT-6	15	22	26	48					
8.25	8.25	UDS-3									
9.0	9	SPT-7	13	20	21	41					
10.0	10	SPT-8	15	22	26	48					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+235 km	Northing :3132971.662 m	Easting :685959.452 m
Reduced Level (m):(+)254.441	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :28-01-2022		Date of Completion :28-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	4	7	Brown, Loose, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	3	3	5	8					
2.25	2.25	UDS*									
3.0	3	SPT-3	8	9	11	20	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
4.5	4.5	SPT-4	7	12	14	26					
5.25	5.25	UDS-1									
6.0	6	SPT-5	9	14	21	35					
7.5	7.5	SPT-6	11	16	23	39					
8.25	8.25	UDS-2									
9.0	9	SPT-7	10	19	21	40					
10.0	10	SPT-8	12	22	26	48					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+390 km	Northing : 3133111.995 m	Easting : 685929.941 m
Reduced Level (m): (+)258.326	BH. No. : BH-A1	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 13-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	14	22	26	48					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	16	21	29	50					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	22	29	42	71					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+390 km	Northing :3133111.995 m	Easting :685929.941 m
Reduced Level (m):(+)258.326	BH. No. :BH-A1	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :13-08-2021	Date of Completion :16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	24	29	35	64					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	24	29	35	64	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	27	34	39	73					
18.0											
18.5											
19.0	19	UDS-7									
19.5							Brown, Hard, Silty clay of low plasticity	CL			
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+390 km	Northing :3133111.995 m	Easting :685929.941 m
Reduced Level (m):(+)258.326	BH. No. :BH-A1	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :13-08-2021	Date of Completion :16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.2	20.2	SPT-7	31	45	57	>100	Brown, Hard, Silty clay of low plasticity	[Grid]	[Graph]	[Line]	
20.5											
21.0											
21.5											
22.0	22	SPT-8	32	42	55	97					
22.5											
23.0											
23.5	23.5	SPT-9	100 (3cm)	-	-	>100					
24.0											
24.5											
25.0	25	SPT-10	37	95	5 (12cm)	>100					
25.5											
26.0											
26.5	26.5	SPT-11	41	54	46 (3cm)	>100					
27.0											
27.5											
28.0	28	SPT-12	47	59	41 (8cm)	>100	Brown, Hard, Silty clay of low plasticity	[Grid]	[Graph]	[Line]	
28.5											
29.0											
29.5	29.5	SPT-13	51	61	39 (3cm)	>100					
30.0											

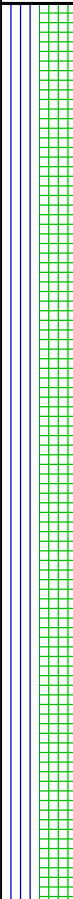
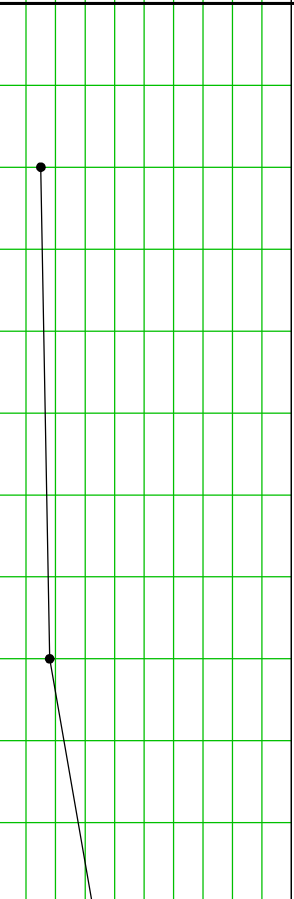
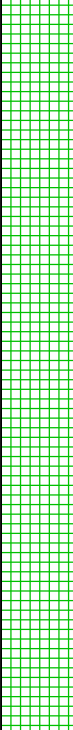
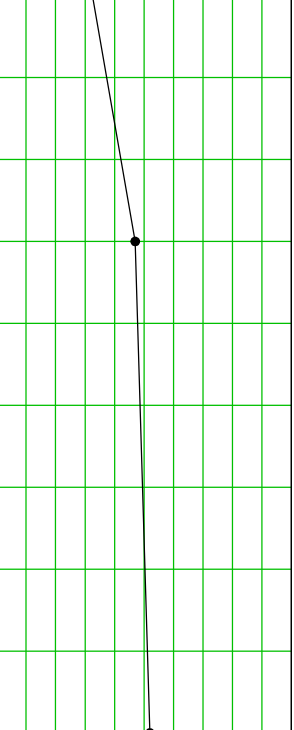
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+390 km	Northing : 3133111.995 m	Easting : 685929.941 m
Reduced Level (m): (+)258.326	BH. No. : BH-A1	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 13-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-14	54	67	33 (7cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-15	41	54	46 (7cm)	>100	Brown, Hard, Silty clay of low plasticity	CL			
33.0											
33.5											
34.0	34	SPT-16	45	57	43 (5cm)	>100					
34.5											
35.0	35	SPT-17	49	58	42 (5cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+390 km	Northing : 3133135.325 m	Easting : 685920.014 m
Reduced Level (m): (+)258.616	BH. No. : BH-A2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-08-2021	Date of Completion : 14-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations	
			N1	N2	N3							
0.0		DS										
0.5												
1.0	1	SPT-1	5	6	9	15	Brown, Medium dense, Sandy silt of low plasticity ML-CL					
1.5												
2.0												
2.5	2.5	UDS-1										
3.0												
3.5												
4.0	4	SPT-2	4	7	11	18						
4.5												
5.0												
5.5	5.5	UDS-2					Brown, Hard, Silty clay of low plasticity CL					
6.0												
6.5												
7.0	7	SPT-3	15	22	25	47						
7.5												
8.0												
8.5	8.5	UDS-3										
9.0												
9.5												
10.0	10	SPT-4	15	23	29	52						

UDS*-UDS not recovered

FIELD BOREHOLE LOG

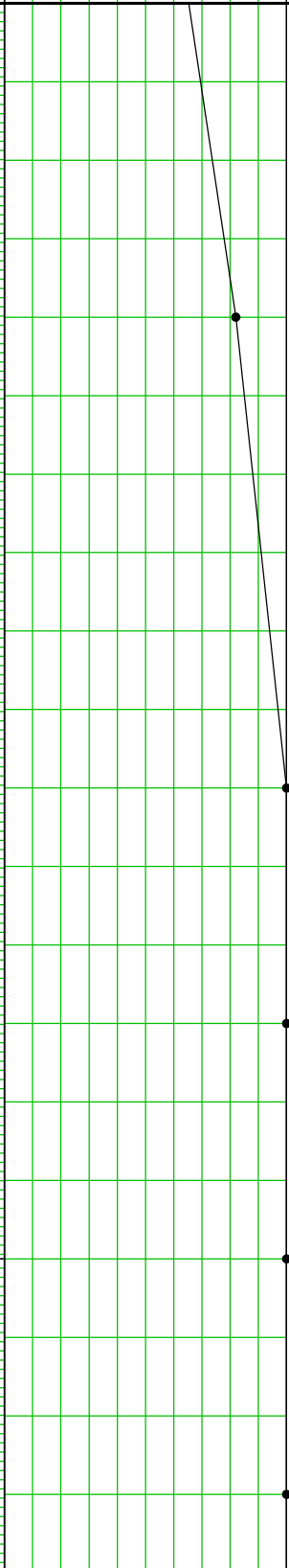
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :41+390 km	Northing :3133135.325 m	Easting :685920.014 m
Reduced Level (m):(+)258.616	BH. No. :BH-A2	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :12-08-2021		Date of Completion :14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
11.5	11.5	UDS-4									
13.0	13	SPT-5	16	32	45	77					
14.5	14.5	UDS-5									
15.0							Brown, Hard, Silty clay of low plasticity	CL			
16.0	16	SPT-6	15	35	47	82					
17.5	17.5	UDS-6									
19.0	19	SPT-7	19	25	32	57					
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+390 km	Northing : 3133135.325 m	Easting : 685920.014 m
Reduced Level (m): (+)258.616	BH. No. : BH-A2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-08-2021		Date of Completion : 14-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
21.0											
21.5											
22.0	22	SPT-8	22	35	47	82					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	26	46	68	>100					
25.5											
26.0											
26.5	26.5	SPT-10	28	49	51 (3cm)	>100					
27.0											
27.5											
28.0	28	SPT-11	31	55	45 (7cm)	>100					
28.5											
29.0											
29.5	29.5	SPT-12	36	62	38 (12cm)	>100					
30.0											
						Brown, Hard, Silty clay of low plasticity	CL				

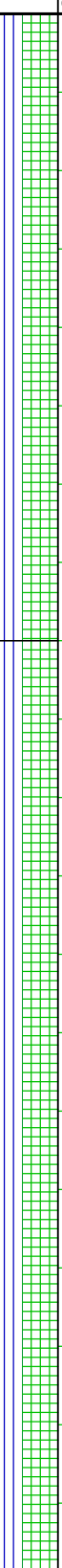
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 41+390 km	Northing : 3133135.325 m	Easting : 685920.014 m
Reduced Level (m): (+)258.616	BH. No. : BH-A2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 12-08-2021	Date of Completion : 14-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-13	25	51	49 (4cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-14	55	65	35 (13cm)	>100	Brown, Hard, Silty clay of low plasticity	CL			
33.0											
33.5											
34.0	34	SPT-15	45	70	30 (5cm)	>100					
34.5											
35.0	35	SPT-16	47	59	41 (5cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133665.625 m	Easting : 685833.304 m
Reduced Level (m): (+)262.272	BH. No. : BH-A1	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 10-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	3	5	8	Brown, Loose, Sandy silt of low plasticity ML-CL				
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	5	7	9	16	Brown, Medium dense to dense, Sandy silt of low plasticity ML-CL				
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	5	8	11	19					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	7	10	12	22					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133665.625 m	Easting :685833.304 m
Reduced Level (m):(+)262.272	BH. No. :BH-A1	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :10-08-2021		Date of Completion :12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	9	11	14	25					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-6	13	15	18	33					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	10	15	17	32					
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133665.625 m	Easting : 685833.304 m
Reduced Level (m): (+)262.272	BH. No. : BH-A1	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 10-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7					Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	SPT-8	17	24	28	52					
22.5											
23.0											
23.5	23.5	UDS-8					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
24.0											
24.5											
25.0	25	SPT-9	16	26	30	56					
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	21	39	43	82	Brown, Hard, Silty clay of low plasticity	CL			
28.5											
29.0											
29.5	29.5	SPT-11	19	41	49	90					
30.0											

UDS*-UDS not recovered

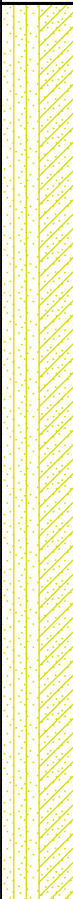
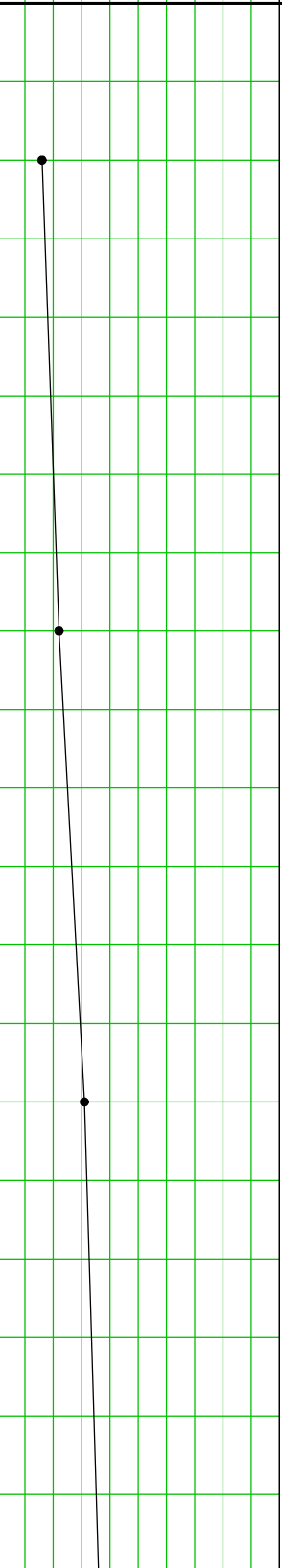
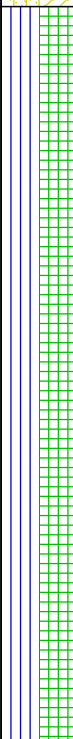
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133665.625 m	Easting : 685833.304 m
Reduced Level (m): (+)262.272	BH. No. : BH-A1	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 10-08-2021	Date of Completion : 12-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	22	45	51	96	Brown, Hard, Silty clay of low plasticity	CL			
31.5											
32.0											
32.5	32.5	SPT-13	24	49	52 (14cm)	>100					
33.0											
33.5											
34.0	34	SPT-14	28	51	49 (13cm)	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
34.5											
35.0	35	SPT-15	100 (15cm)	-	-	>100					

FIELD BOREHOLE LOG

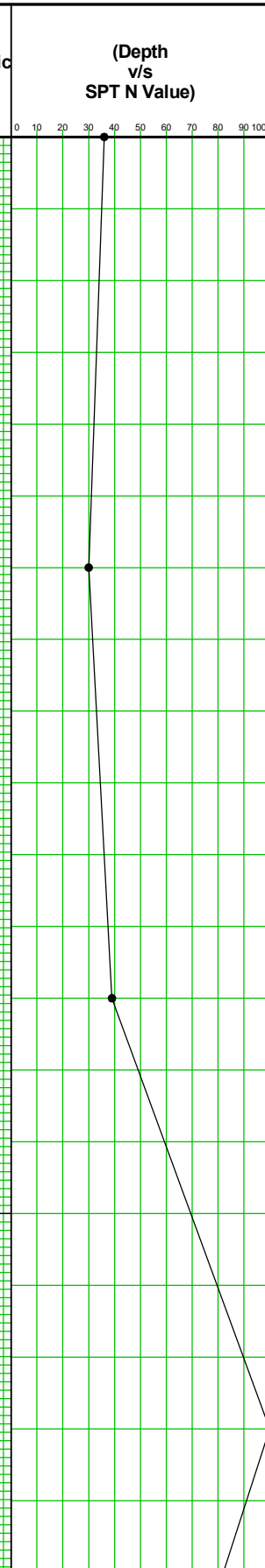
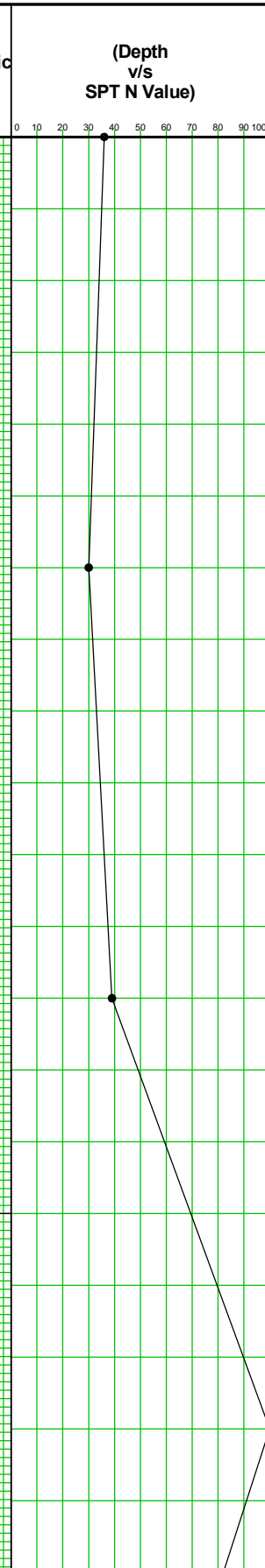
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133711.521 m	Easting : 685843.959 m
Reduced Level (m): (+)263.721	BH. No. : BH-P2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 13-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	7	9	16	Brown, Medium dense, Silty sand with clay	SM-SC			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	7	10	12	22	Brown, Dense, Sandy silt of low plasticity	ML-CL			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	8	14	17	31					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	10	16	20	36					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133711.521 m	Easting :685843.959 m
Reduced Level (m):(+)263.721	BH. No. :BH-P2	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :13-08-2021		Date of Completion :16-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	10	12	18	30	Brown, Dense, Sandy silt of low plasticity ML-CL				
13.5											
14.0											
14.5	14.5	UDS-5									
15.0											
15.5											
16.0	16	SPT-6	14	17	22	39					
16.5											
17.0											
17.5	17.5	UDS-6									
18.0											
18.5											
19.0	19	SPT-7	19	72	21 (3cm)	>100	Brown, Very dense, Sandy silt of low plasticity ML-CL				
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133711.521 m	Easting : 685843.959 m
Reduced Level (m): (+)263.721	BH. No. : BH-P2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 13-08-2021		Date of Completion : 16-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	16	34	39	73					
21.0											
21.5											
22.0	22	SPT-9	15	32	34	66					
22.5											
23.0											
23.5	23.5	UDS-7									
24.0											
24.5											
25.0	25	SPT-10	17	30	37	67	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-8									
27.0											
27.5											
28.0	28	SPT-11	15	32	40	72					
28.5											
29.0											
29.5	29.5	UDS-9									
30.0											

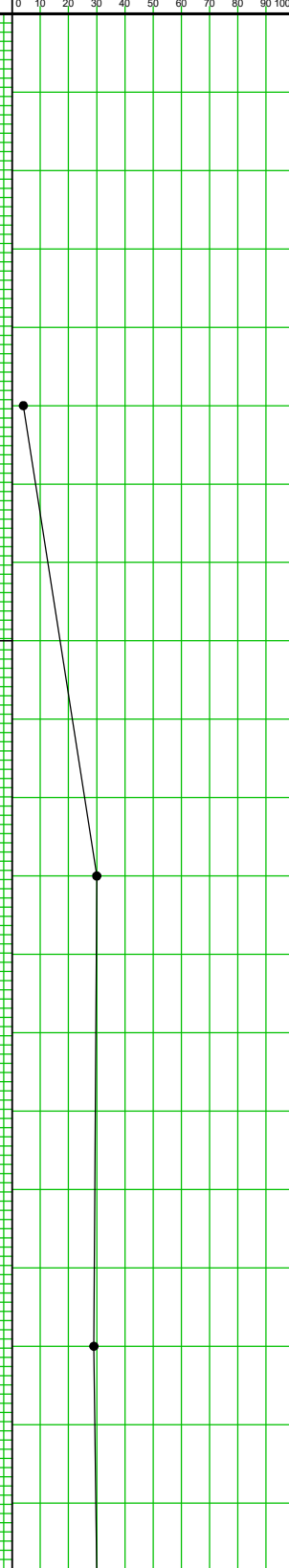
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133711.521 m	Easting : 685843.959 m
Reduced Level (m): (+)263.721	BH. No. : BH-P2	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 13-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	18	35	44	79					
31.5											
32.0											
32.5	32.5	UDS-10					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
33.0											
33.5											
34.0	34	SPT-13	21	43	47	90					
34.5											
35.0	35	SPT-14	52	100 (12cm)	-	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133732.83 m	Easting : 685846.067 m
Reduced Level (m): (+)262.764	BH. No. : BH-P3	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1					Brown, Very loose, Sandy silt of low plasticity	ML-CL			
1.5											
2.0											
2.5	2.5	SPT-1	2	2	2	4					
3.0											
3.5											
4.0	4	UDS-2					Brown, Dense, Sandy silt of low plasticity	ML-CL			
4.5											
5.0											
5.5	5.5	SPT-2	11	13	17	30					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	10	13	16	29					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

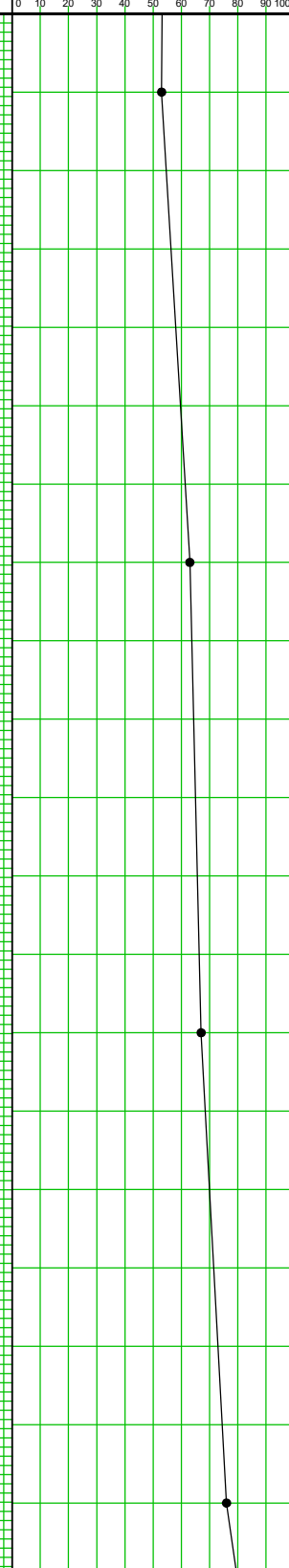
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133732.83 m	Easting : 685846.067 m
Reduced Level (m): (+)262.764	BH. No. : BH-P3	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	11	14	17	31					
12.0											
12.5											
13.0	13	UDS-5					Brown, Dense, Sandy silt of low plasticity	ML-CL			
13.5											
14.0											
14.5	14.5	SPT-5	12	15	18	33					
15.0											
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	13	25	29	54					
18.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133732.83 m	Easting :685846.067 m
Reduced Level (m):(+)262.764	BH. No. :BH-P3	BH Termination Depth (m):35
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	17	22	51	53	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	22	27	36	63					
24.0											
24.5											
25.0	25	UDS-9									
25.5											
26.0											
26.5	26.5	SPT-9	24	29	38	67					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	25	30	46	76					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133732.83 m	Easting : 685846.067 m
Reduced Level (m): (+)262.764	BH. No. : BH-P3	BH Termination Depth (m): 35
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	28	52	48 (12cm)	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
33.0											
33.5											
34.0	34	SPT-12	30	75	25 (4cm)	>100					
34.5											
35.0	35	SPT-13	45	86	14 (2cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133756.86 m	Easting : 685829.93 m
Reduced Level (m): (+)262.555	BH. No. : BH-P4	BH Termination Depth (m): 34
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 09-08-2021	Date of Completion : 12-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	3	4	4	8	Brown, Loose, Silty sand with clay	SM-SC			
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	3	5	7	12	Brown, Medium dense, Silty sand with clay	SM-SC			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	4	6	9	15					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	4	9	11	20					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133756.86 m	Easting :685829.93 m
Reduced Level (m):(+)262.555	BH. No. :BH-P4	BH Termination Depth (m):34
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :09-08-2021		Date of Completion :12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
11.5	11.5	UDS-4									
13.0	13	SPT-5	7	10	13	23	Brown, Medium dense, Silty sand with clay	SM-SC			
14.5	14.5	UDS-5									
16.0	16	SPT-6	16	21	23	44	Brown, Dense, Silty sand with clay	SM-SC			
17.5	17.5	UDS-6									
19.0	19	SPT-7	14	25	36	61	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

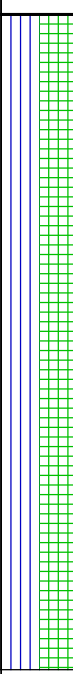
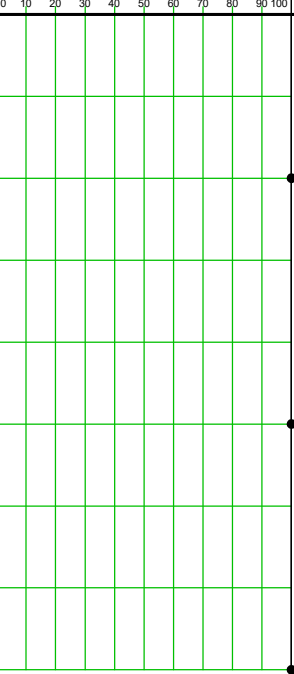
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133756.86 m	Easting : 685829.93 m
Reduced Level (m): (+)262.555	BH. No. : BH-P4	BH Termination Depth (m): 34
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 09-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	21	28	41	69					
22.5											
23.0											
23.5	23.5	SPT-9	21	26	37	63					
24.0											
24.5											
25.0	25	UDS-8					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-10	24	56	45 (9cm)	>100					
27.0											
27.5											
28.0	28	SPT-11	21	26	47	73					
28.5											
29.0											
29.5	29.5	SPT-12	36	59	42 (11cm)	>100					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133756.86 m	Easting : 685829.93 m
Reduced Level (m): (+)262.555	BH. No. : BH-P4	BH Termination Depth (m): 34
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 09-08-2021	Date of Completion : 12-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations		
			N1	N2	N3								
30.0													
30.5													
31.0	31	SPT-13	33	54	47 (13cm)	>100	Brown, Very dense, Sandy silt of low plasticity ML-CL			●			
31.5													
32.0													
32.5	32.5	SPT-14	43	68	33 (5cm)	>100							●
33.0													
33.5													
34.0	34	SPT-15	60	78	23 (4cm)	>100				●			

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133785.448 m	Easting : 685839.438 m
Reduced Level (m): (+)264.797	BH. No. : BH-P5	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021		Date of Completion : 17-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	5	5	7	12					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
5.5	5.5	SPT-2	6	8	10	18					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	7	9	11	20					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

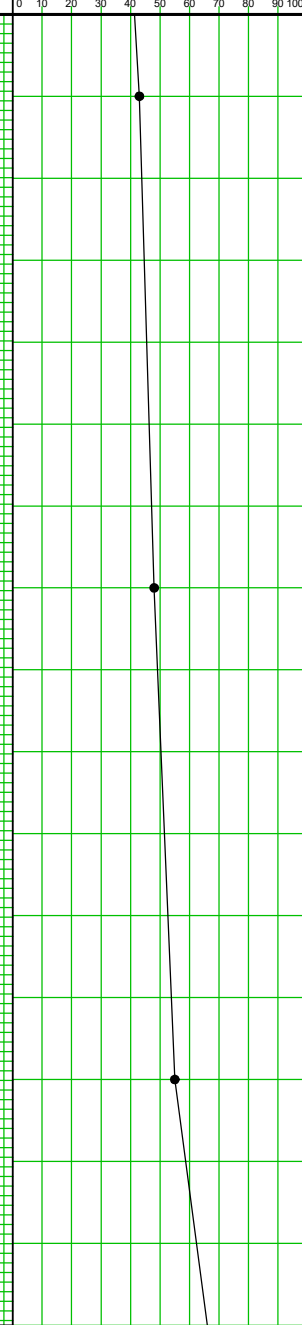
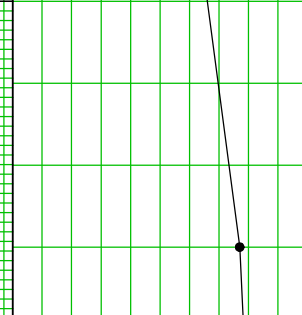
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133785.448 m	Easting :685839.438 m
Reduced Level (m):(+)264.797	BH. No. :BH-P5	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-08-2021		Date of Completion :17-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	9	11	15	26	Brown, Medium dense, Sandy silt of low plasticity	ML-CL	●		
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	10	13	17	30			●		
15.0											
15.5											
16.0	16	UDS-6									
16.5							Brown, Dense, Sandy silt of low plasticity	ML-CL			
17.0											
17.5	17.5	SPT-6	11	14	19	33			●		
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133785.448 m	Easting : 685839.438 m
Reduced Level (m): (+)264.797	BH. No. : BH-P5	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 17-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	13	17	26	43	Brown, Dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	14	19	29	48					
24.0											
24.5											
25.0	25	UDS-9									
25.5											
26.0											
26.5	26.5	SPT-9	17	24	31	55					
27.0											
27.5											
28.0	28	UDS-10					Brown, Very dense, Sandy silt of low plasticity	ML-CL			
28.5											
29.0											
29.5	29.5	SPT-10	21	33	44	77					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133785.448 m	Easting : 685839.438 m
Reduced Level (m): (+)264.797	BH. No. : BH-P5	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 17-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	22	35	50	85					
33.0											
33.5											
34.0	34	UDS-12									
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-12	24	39	56	95					
36.0											
36.5											
37.0	37	SPT-13	28	58	42 (12cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-14	34	76	25 (6cm)	>100					
39.0											
39.5											
40.0	40	SPT-15	41	100 (14cm)	-	>100					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

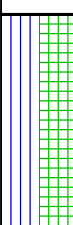
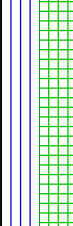
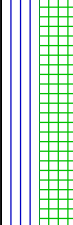
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133808.838 m	Easting : 685841.105 m
Reduced Level (m): (+)263.810	BH. No. : BH-P6	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021		Date of Completion : 19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
1.0	1	SPT-1	11	20	15	35					
2.5	2.5	UDS-1									
4.0	4	SPT-2	10	13	17	30					
5.5	5.5	UDS-2									
7.0	7	SPT-3	12	15	20	35					
8.5	8.5	UDS-3									
10.0	10	SPT-4	10	16	22	38					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133808.838 m	Easting :685841.105 m
Reduced Level (m):(+)263.810	BH. No. :BH-P6	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Shell & Auger	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations	
			N1	N2	N3							
10.0												
10.5												
11.0												
11.5	11.5	UDS-4										
12.0												
12.5												
13.0	13	SPT-5	12	18	21	39	Brown, Dense, Sandy silt of low plasticity ML-CL		40			
13.5												
14.0												
14.5	14.5	UDS-5										
15.0												
15.5												
16.0	16	SPT-6	8	16	22	38	Brown, Very dense, Sandy silt of low plasticity ML-CL		40			
16.5												
17.0												
17.5	17.5	UDS-6										
18.0												
18.5												
19.0	19	SPT-7	19	27	35	62	Brown, Very dense, Sandy silt of low plasticity ML-CL		40			
19.5												
20.0												

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133808.838 m	Easting : 685841.105 m
Reduced Level (m): (+)263.810	BH. No. : BH-P6	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 19-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	22	31	39	70					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	18	29	41	70	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	UDS-9									
27.0											
27.5											
28.0	28	SPT-10	19	28	44	72					
28.5											
29.0											
29.5	29.5	UDS-10									
30.0											

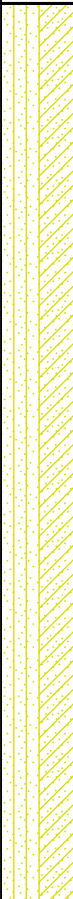
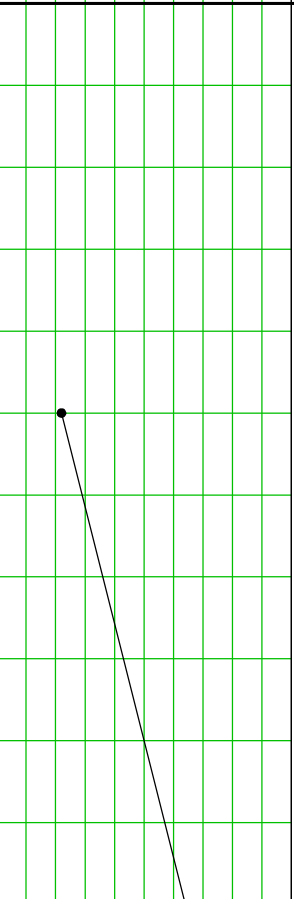
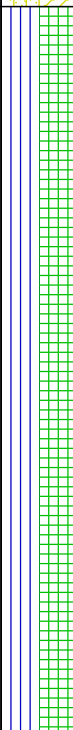
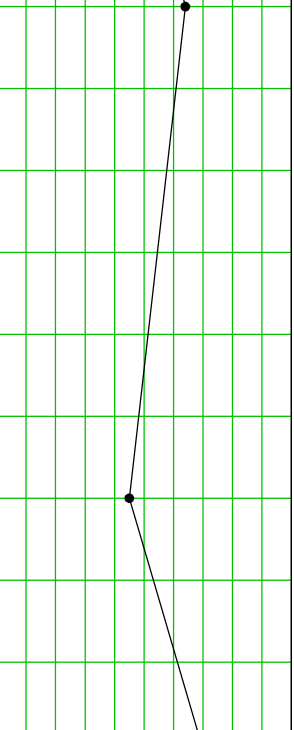
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133808.838 m	Easting : 685841.105 m
Reduced Level (m): (+)263.810	BH. No. : BH-P6	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Shell & Auger	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021		Date of Completion : 19-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	22	39	48	87					
31.5											
32.0											
32.5	32.5	SPT-12	23	40	60 (5cm)	>100					
33.0											
33.5											
34.0	34	SPT-13	25	58	42 (4cm)	>100					
34.5											
35.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-14	28	62	38 (3cm)	>100					
36.0											
36.5											
37.0	37	SPT-15	31	43	59 (11cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-16	34	60	40 (10cm)	>100					
39.0											
39.5											
40.0	40	SPT-17	55	95	5 (12cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133991.627 m	Easting : 685807.139 m
Reduced Level (m): (+)264.859	BH. No. : BH-P13	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	6	9	13	22	Brown, Medium dense, Silty sand with clay	SM-SC			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	8	22	42	64	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	17	19	26	45					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3133991.627 m	Easting :685807.139 m
Reduced Level (m):(+)264.859	BH. No. :BH-P13	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-08-2021		Date of Completion :12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	18	38	56	94					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	15	36	51	87					
15.0							Brown, Very dense, Silty sand with clay	SM-SC			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	10	16	27	43					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133991.627 m	Easting : 685807.139 m
Reduced Level (m): (+)264.859	BH. No. : BH-P13	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	12	28	33	61					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	24	36	42	78					
24.0											
24.5											
25.0	25	UDS-9					Brown, Very dense, Silty sand with clay	SM-SC			
25.5											
26.0											
26.5	26.5	SPT-9	17	29	37	66					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	22	33	45	78					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

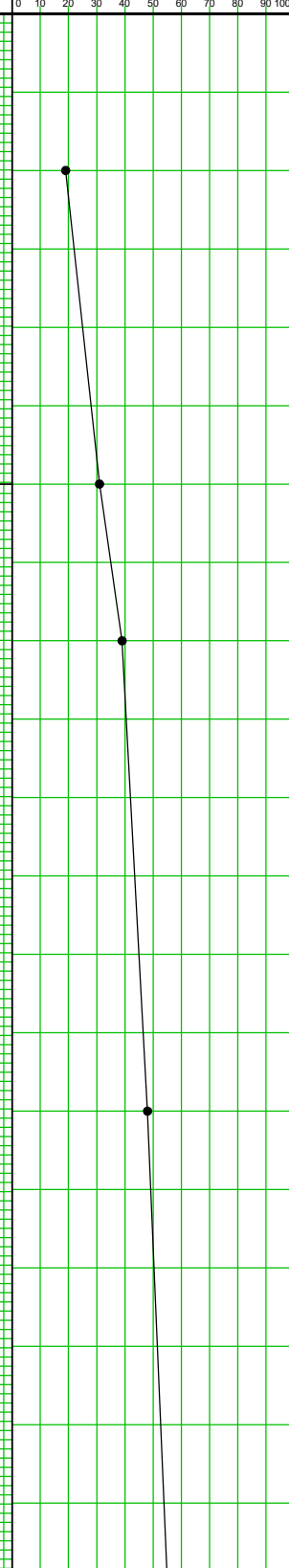
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3133991.627 m	Easting : 685807.139 m
Reduced Level (m): (+)264.859	BH. No. : BH-P13	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021		Date of Completion : 12-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5						Brown, Very dense, Silty sand with clay	SM-SC				
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	24	37	48	85					
33.0											
33.5											
34.0	34	UDS-12									
34.5											
35.0											
35.5	35.5	SPT-12	22	100 (11cm)	-	>100	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
36.0											
36.5											
37.0	37	UDS-13									
37.5											
38.0											
38.5	38.5	SPT-13	36	55	46 (7cm)	>100					
39.0											
39.5											
40.0	40	UDS*									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134066.732 m	Easting : 685782.242 m
Reduced Level (m): (+)263.998	BH. No. : BH-P14	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 07-08-2021	Date of Completion : 10-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	5	8	11	19	Brown, Medium dense, Sandy silt of low plasticity ML-CL				
1.5											
2.0											
2.5	2.5	UDS-1									
3.0	3	SPT-2	10	15	16	31	Brown, Dense to very dense, Sandy silt of low plasticity ML-CL				
3.5											
4.0	4	SPT-3	12	18	21	39					
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-4	16	22	26	48					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-5	18	24	31	55					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134066.732 m	Easting :685782.242 m
Reduced Level (m):(+)263.998	BH. No. :BH-P14	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :07-08-2021	Date of Completion :10-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-6	15	27	34	61					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	SPT-7	19	30	38	68					
16.5											
17.0											
17.5	17.5	UDS*									
18.0											
18.5											
19.0	19	SPT-8	23	34	42	76					
19.5											
20.0											

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134066.732 m	Easting : 685782.242 m
Reduced Level (m): (+)263.998	BH. No. : BH-P14	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 07-08-2021	Date of Completion : 10-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-6									
21.0											
21.5											
22.0	22	SPT-9	20	36	45	81	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
22.5											
23.0											
23.5	23.5	UDS-7									
24.0											
24.5											
25.0	25	SPT-10	24	38	48	86					
25.5											
26.0											
26.5	26.5	UDS-8									
27.0											
27.5											
28.0	28	SPT-11	21	27	27	54	Brown, Hard, Silty clay of low plasticity	CL			
28.5											
29.0											
29.5	29.5	UDS-9									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

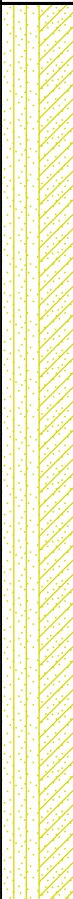
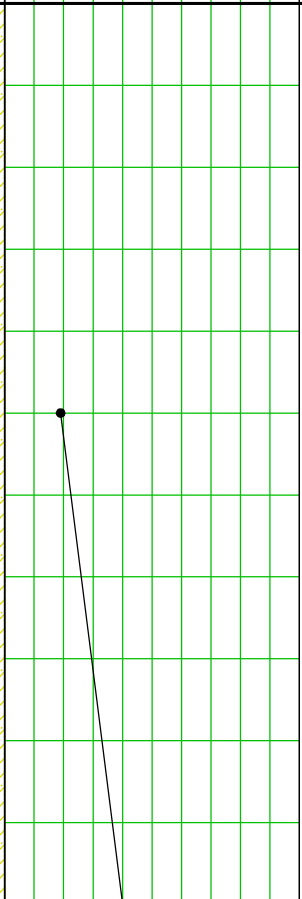

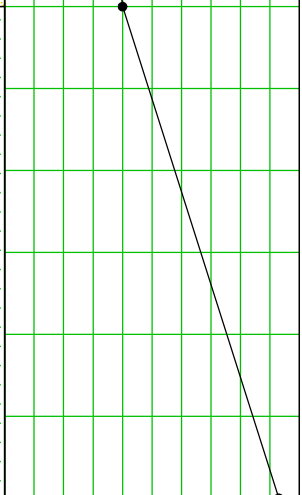
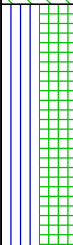
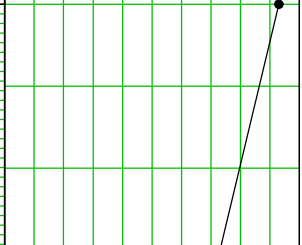
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134066.732 m	Easting :685782.242 m
Reduced Level (m):(+)263.998	BH. No. :BH-P14	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :07-08-2021	Date of Completion :10-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	19	25	29	54					
31.5											
32.0											
32.5	32.5	UDS-10									
33.0											
33.5											
34.0	34	SPT-13	53	65	35 (4cm)	>100					
34.5											
35.0							Brown, Hard, Silty clay of low plasticity	CL			
35.5	35.5	UDS*									
36.0											
36.5											
37.0	37	SPT-14	36	52	48 (4cm)	>100					
37.5											
38.0											
38.5	38.5	UDS*									
39.0											
39.5											
40.0	40	SPT-15	38	67	33 (10cm)	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134091.912 m	Easting : 685773.857 m
Reduced Level (m): (+)263.446	BH. No. : BH-P15	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021		Date of Completion : 13-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	7	8	11	19	Brown, Medium dense, Silty sand with clay	SM-SC			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	12	16	24	40					
6.0											
6.5											
7.0	7	UDS-3					Brown, Hard, Silty clay of medium plasticity	CI			
7.5											
8.0											
8.5	8.5	SPT-3	24	38	55	93					
9.0											
9.5											
10.0	10	UDS-4					Brown, Very dense, Sandy silt of low plasticity	ML-CL			

UDS*-UDS not recovered

FIELD BOREHOLE LOG









Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134091.912 m	Easting :685773.857 m
Reduced Level (m):(+)263.446	BH. No. :BH-P15	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-08-2021		Date of Completion :13-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	17	24	29	53					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	26	38	46	84					
15.0							Brown, Very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	25	35	41	76					
18.0											
18.5											
19.0	19	SPT-7	24	48	52	>100					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134091.912 m	Easting : 685773.857 m
Reduced Level (m): (+)263.446	BH. No. : BH-P15	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021	Date of Completion : 13-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-8	24	38	42	80	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
21.0											
21.5											
22.0	22	UDS-7									
22.5											
23.0											
23.5	23.5	SPT-9	22	32	43	75					
24.0											
24.5											
25.0	25	UDS-8					Brown, Hard, Silty clay of low plasticity	CL			
25.5											
26.0											
26.5	26.5	SPT-10	22	36	47	83					
27.0											
27.5											
28.0	28	UDS-9									
28.5											
29.0											
29.5	29.5	SPT-11	37	48	53 (13cm)	>100					
30.0											

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134091.912 m	Easting : 685773.857 m
Reduced Level (m): (+)263.446	BH. No. : BH-P15	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021	Date of Completion : 13-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-12	42	48	53 (12cm)	>100					
31.5											
32.0											
32.5	32.5	SPT-13	28	41	53	94					
33.0											
33.5											
34.0	34	SPT-14	30	58	43 (10cm)	>100					
34.5											
35.0							Brown, Hard, Silty clay of low plasticity	CL			
35.5	35.5	SPT-15	33	40	55	95					
36.0											
36.5											
37.0	37	SPT-16	33	39	53	92					
37.5											
38.0											
38.5	38.5	SPT-17	41	85	16 (4cm)	>100					
39.0											
39.5											
40.0	40	SPT-18	38	80	21 (6cm)	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134166.127 m	Easting : 685765.737 m
Reduced Level (m): (+)263.316	BH. No. : BH-P16	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021	Date of Completion : 13-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	7	9	16					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	9	12	15	27					
4.5											
5.0							Brown, Medium dense to very dense, Silty sand with clay	SM-SC			
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	11	17	21	38					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0											
9.5											
10.0	10	SPT-4	15	21	26	47					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

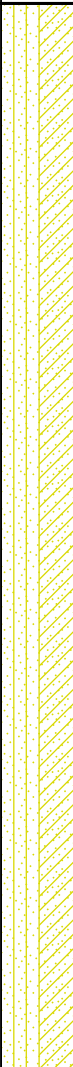
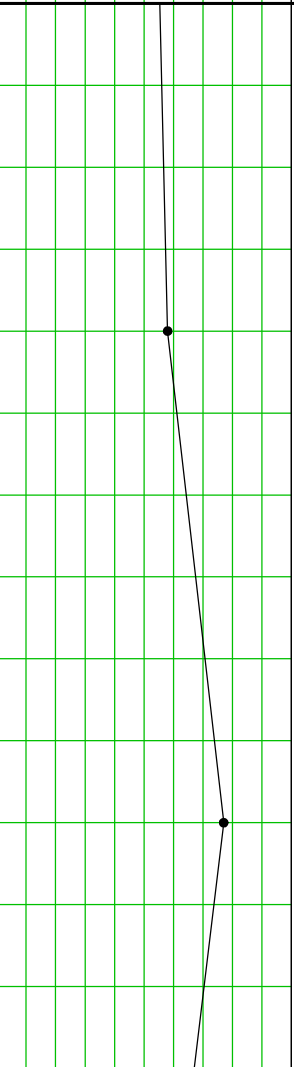

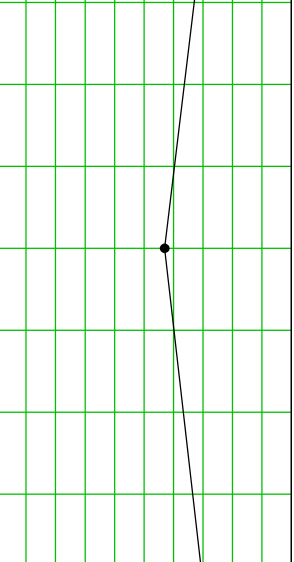
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134166.127 m	Easting :685765.737 m
Reduced Level (m):(+)263.316	BH. No. :BH-P16	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-08-2021		Date of Completion :13-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	UDS-4									
12.0											
12.5											
13.0	13	SPT-5	16	25	28	53					
13.5											
14.0											
14.5	14.5	UDS-5									
15.0							Brown, Medium dense to very dense, Silty sand with clay	SM-SC			
15.5											
16.0	16	SPT-6	20	29	37	66					
16.5											
17.0											
17.5	17.5	UDS*									
18.0											
18.5											
19.0	19	SPT-7	19	24	30	54					
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134166.127 m	Easting : 685765.737 m
Reduced Level (m): (+)263.316	BH. No. : BH-P16	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 11-08-2021	Date of Completion : 13-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS*									
21.0											
21.5											
22.0	22	SPT-8	18	27	31	58	Brown, Medium dense to very dense, Silty sand with clay	SM-SC			
22.5											
23.0											
23.5	23.5	UDS-6									
24.0											
24.5											
25.0	25	SPT-9	21	34	43	77					
25.5											
26.0											
26.5	26.5	UDS-7					Brown, Hard, Silty clay of low plasticity	CL			
27.0											
27.5											
28.0	28	SPT-10	20	26	31	57					
28.5											
29.0											
29.5	29.5	UDS*									
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

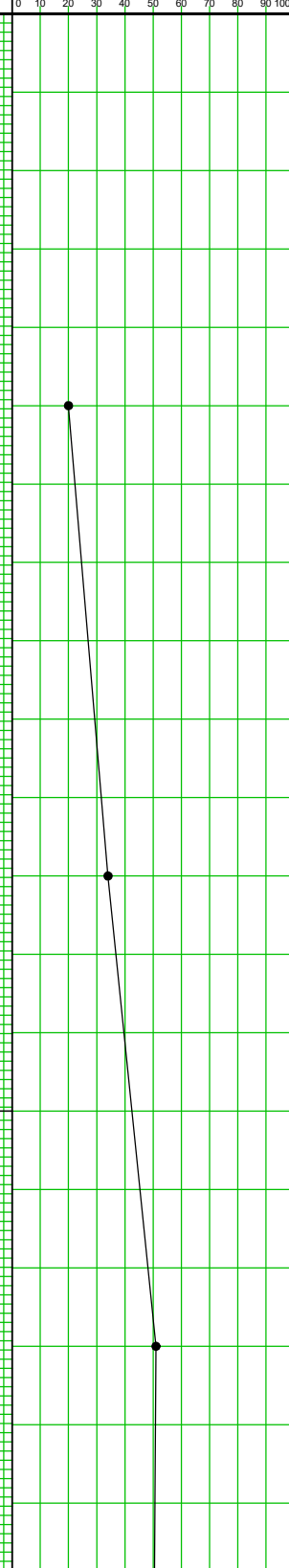
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134166.127 m	Easting :685765.737 m
Reduced Level (m):(+)263.316	BH. No. :BH-P16	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-08-2021		Date of Completion :13-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	SPT-11	25	32	44	76					
31.5											
32.0											
32.5	32.5	UDS*									
33.0											
33.5											
34.0	34	SPT-12	58	72	28 (12cm)	>100					
34.5											
35.0							Brown, Hard, Silty clay of low plasticity	CL			
35.5	35.5	SPT-13	34	42	55	97					
36.0											
36.5											
37.0	37	SPT-14	31	48	47	95					
37.5											
38.0											
38.5	38.5	SPT-15	35	41	45	86					
39.0											
39.5											
40.0	40	SPT-16	48	75	26 (12cm)	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134176.656 m	Easting : 685746.693 m
Reduced Level (m): (+)263.529	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021		Date of Completion : 16-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	6	8	12	20	Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0											
5.5	5.5	SPT-2	12	17	17	34					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	14	24	27	51	Brown, very dense, Sandy silt of low plasticity	ML-CL			
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :42+256 km	Northing :3134176.656 m	Easting :685746.693 m
Reduced Level (m):(+)263.529	BH. No. :BH-A2	BH Termination Depth (m):40
Proposed / Existing Structure :Major Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-08-2021	Date of Completion :16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	16	22	28	50					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	14	21	31	52					
15.0							Brown, very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	21	27	38	65					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134176.656 m	Easting : 685746.693 m
Reduced Level (m): (+)263.529	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	17	29	32	61					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	19	27	35	62					
24.0											
24.5											
25.0	25	UDS-9					Brown, very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-9	24	31	39	70					
27.0											
27.5											
28.0	28	UDS-10									
28.5											
29.0											
29.5	29.5	SPT-10	23	24	34	58					
30.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 42+256 km	Northing : 3134176.656 m	Easting : 685746.693 m
Reduced Level (m): (+)263.529	BH. No. : BH-A2	BH Termination Depth (m): 40
Proposed / Existing Structure : Major Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-08-2021	Date of Completion : 16-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
30.0											
30.5											
31.0	31	UDS-11									
31.5											
32.0											
32.5	32.5	SPT-11	21	32	48	80					
33.0											
33.5											
34.0	34	UDS-12									
34.5											
35.0							Brown, very dense, Sandy silt of low plasticity	ML-CL			
35.5	35.5	SPT-12	25	57	43 (7cm)	>100					
36.0											
36.5											
37.0	37	SPT-13	48	52	49 (8cm)	>100					
37.5											
38.0											
38.5	38.5	SPT-14	70	100 (10cm)	-	>100					
39.0											
39.5											
40.0	40	SPT-15	53	100 (11cm)	-	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG


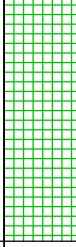

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :43+100 km	Northing :3134725.214 m	Easting :685434.986 m
Reduced Level (m):(±)-	BH. No. :BH-PLT-02	BH Termination Depth (m):12
Proposed / Existing Structure :	Water Table (m):Not encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :21-10-2021		Date of Completion :21-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.75	UDS-1									
1.0											
1.5	1.5	SPT-1	2	3	5	8	Brown, Loose, Silty sand with clay	SM-SC			
2.0											
2.5	2.25	SPT-2	5	6	10	16					
3.0											
3.5	3.0	SPT-3	10	13	20	33	Brown, Medium dense to dense, Silty sand with clay	SM-SC			
4.0											
4.5	3.75	SPT-4	9	13	16	29					
5.0											
5.5	4.5	UDS-2									
6.0											
6.5	5.0	SPT-5	9	15	17	32					
7.0											
7.5	6.0	SPT-6	8	11	13	24					
8.0											
8.5	7.5	UDS-3					Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
9.0											
9.5	9.0	SPT-7	12	15	18	33					
10.0											

UDS*-UDS not recovered

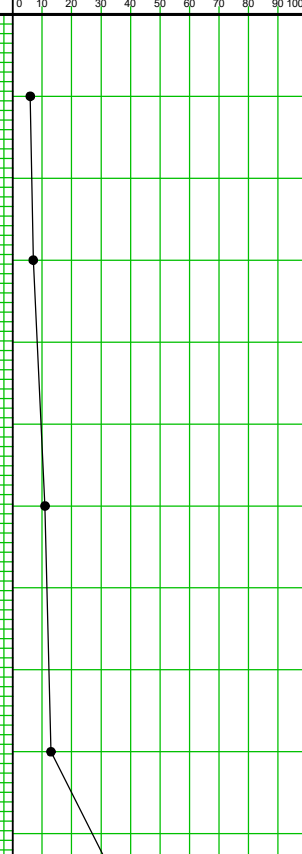
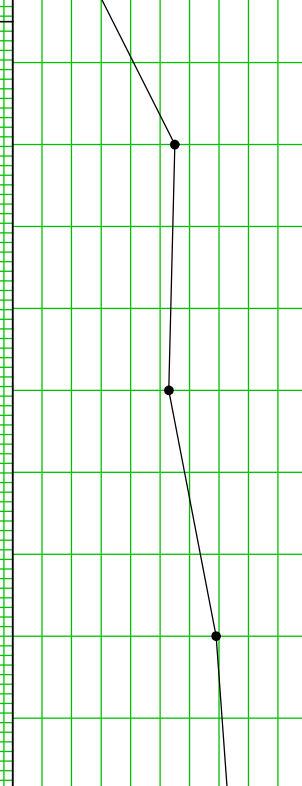
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+100 km	Northing : 3134725.214 m	Easting : 685434.986 m
Reduced Level (m):(+) -	BH. No. : BH-PLT-02	BH Termination Depth (m): 12
Proposed / Existing Structure :	Water Table (m): Not encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not-used
Date of Start : 21-10-2021		Date of Completion : 21-10-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	UDS-4					Brown, Medium dense to dense, Sandy silt of low plasticity	ML-CL			
11.0							Brown, Hard, Silty clay of low plasticity with gravel	CL			
11.5											
12.0	12	SPT-8	13	18	20	38					

FIELD BOREHOLE LOG

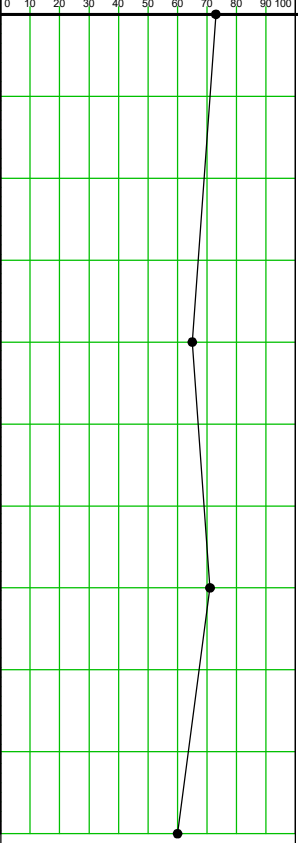
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+452 km	Northing : 3135017.235 m	Easting : 685239.663 m
Reduced Level (m): (+)258.485	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-01-2022		Date of Completion : 27-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	3	6	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	3	3	4	7					
2.25	2.25	UDS-1									
3.0	3	SPT-3	3	5	6	11					
4.5	4.5	SPT-4	4	6	7	13					
5.25	5.25	UDS-2					Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
6.0	6	SPT-5	15	26	29	55					
7.5	7.5	SPT-6	14	21	32	53					
8.25	8.25	UDS*									
9.0	9	SPT-7	21	29	40	69					
10.0	10	SPT-8	23	31	42	73					

UDS*-UDS not recovered

FIELD BOREHOLE LOG




Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+452 km	Northing : 3135017.235 m	Easting : 685239.663 m
Reduced Level (m): (+)258.485	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 27-01-2022		Date of Completion : 27-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.25	UDS-3									
12.0	12	SPT-9	19	29	36	65	Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
12.5											
13.0											
13.5	13.5	SPT-10	24	32	39	71					
14.0											
14.5	14.25	UDS*									
15.0	15	SPT-11	19	24	36	60					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

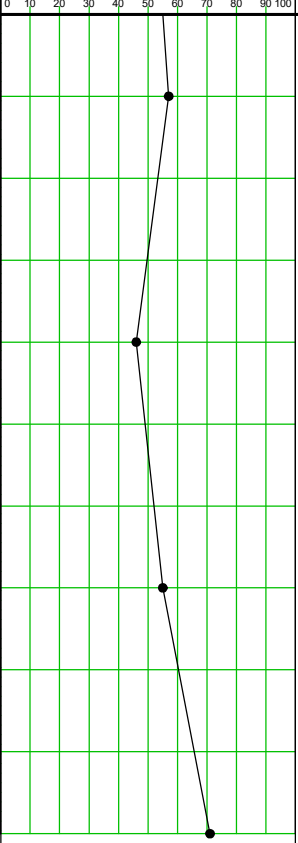
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+585 km	Northing : 3135122.226 m	Easting : 685158.018 m
Reduced Level (m): (+)258.478	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 25-01-2022		Date of Completion : 25-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL				
1.5	1.5	SPT-2	3	4	4	8					
2.25	2.25	UDS-1									
3.0	3	SPT-3	4	5	6	11					
4.5	4.5	SPT-4	5	7	8	15					
5.25	5.25	UDS-2					Brown, Very stiff to hard, Silty clay of low plasticity CL				
6.0	6	SPT-5	11	17	19	36					
7.5	7.5	SPT-6	12	19	23	42					
8.25	8.25	UDS-3									
9.0	9	SPT-7	21	24	27	51					
9.0	9	SPT-7	21	24	27	51	Brown, Dense to very dense, Sandy silt of low plasticity ML-CL				
9.5											
10.0											

UDS*-UDS not recovered

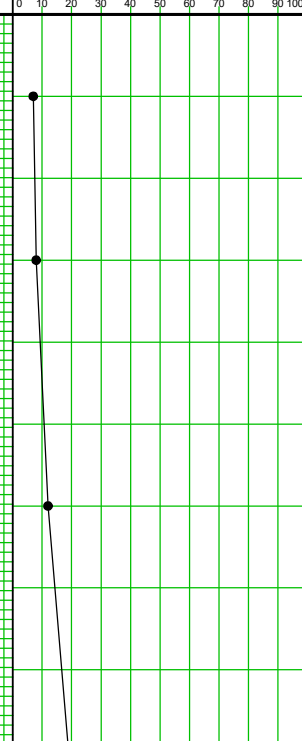
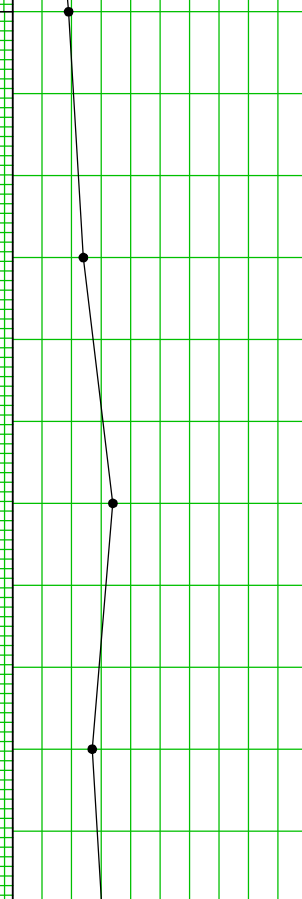
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+585 km	Northing : 3135122.226 m	Easting : 685158.018 m
Reduced Level (m): (+)258.478	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 25-01-2022		Date of Completion : 25-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	22	26	31	57	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
11.0											
11.5	11.25	UDS-4									
12.0	12	SPT-9	19	22	24	46					
13.0											
13.5	13.5	SPT-10	22	26	29	55					
14.0											
14.5	14.25	UDS*									
15.0	15	SPT-11	24	32	39	71					

FIELD BOREHOLE LOG

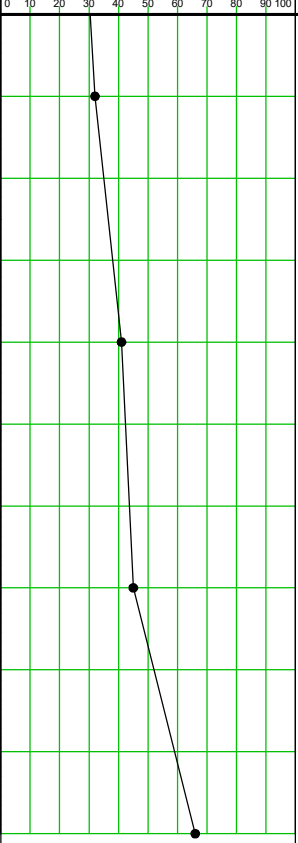
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+732 km	Northing : 3135218.709 m	Easting : 685068.353 m
Reduced Level (m): (+)257.686	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-01-2022		Date of Completion : 24-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	4	7	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	3	3	5	8					
2.25	2.25	UDS-1									
3.0	3	SPT-3	4	5	7	12					
4.5	4.5	SPT-4	6	9	10	19	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
5.25	5.25	UDS-2									
6.0	6	SPT-5	10	11	13	24					
7.5	7.5	SPT-6	12	15	19	34					
8.25	8.25	UDS-3									
9.0	9	SPT-7	8	12	15	27					
10.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

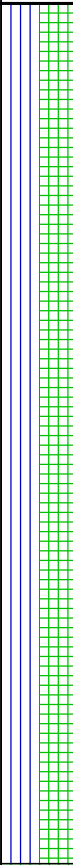
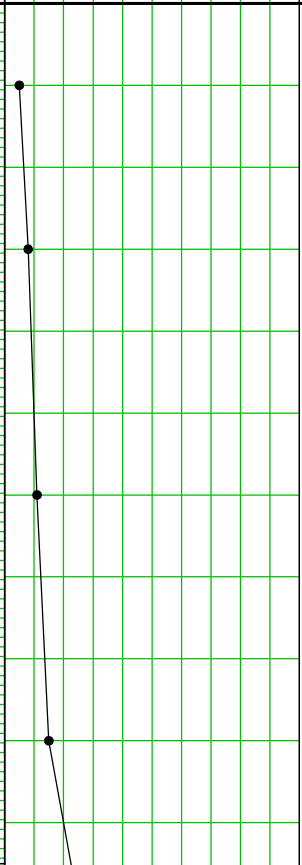

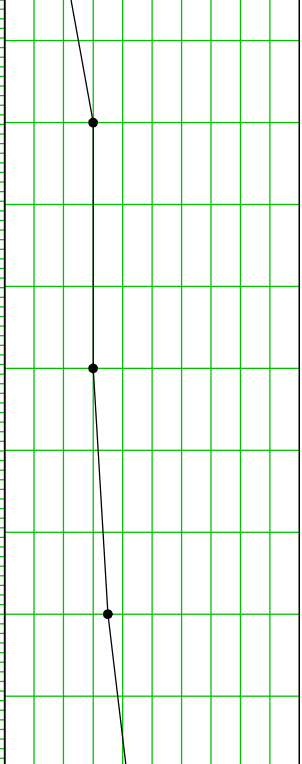
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 43+732 km	Northing : 3135218.709 m	Easting : 685068.353 m
Reduced Level (m): (+)257.686	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 24-01-2022	Date of Completion : 24-01-2022	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	11	14	18	32	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
11.0											
11.25	11.25	UDS-4									
11.5											
12.0	12	SPT-9	15	19	22	41	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
12.5											
13.0											
13.5	13.5	SPT-10	18	21	24	45					
14.0											
14.25	14.25	UDS*									
14.5											
15.0	15	SPT-11	26	30	36	66					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

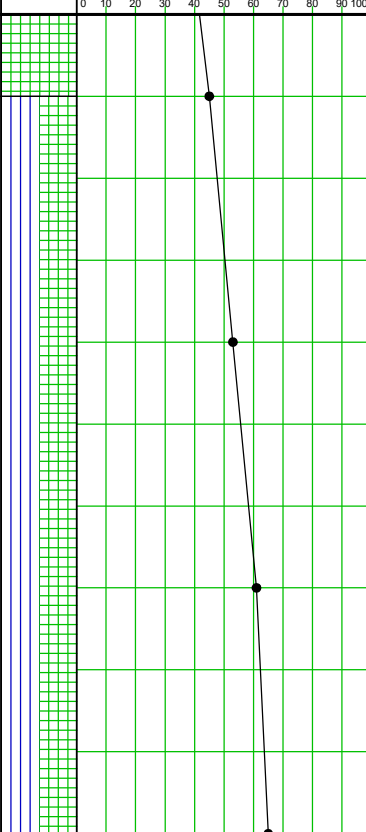
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 44+050 km	Northing : 3135511.319 m	Easting : 684905.712 m
Reduced Level (m): (+)256.063	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-01-2022		Date of Completion : 23-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL				
1.0											
1.5	1.5	SPT-2	3	3	5	8					
2.0											
2.5	2.25	UDS*									
3.0	3	SPT-3	4	5	6	11					
3.5											
4.0											
4.5	4.5	SPT-4	5	7	8	15					
5.0											
5.5	5.25	UDS-1									
6.0	6	SPT-5	9	14	16	30	Brown, Hard, Silty clay of low plasticity CL				
6.5											
7.0											
7.5	7.5	SPT-6	11	13	17	30					
8.0											
8.5	8.25	UDS-2									
9.0	9	SPT-7	14	16	19	35					
9.5											
10.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

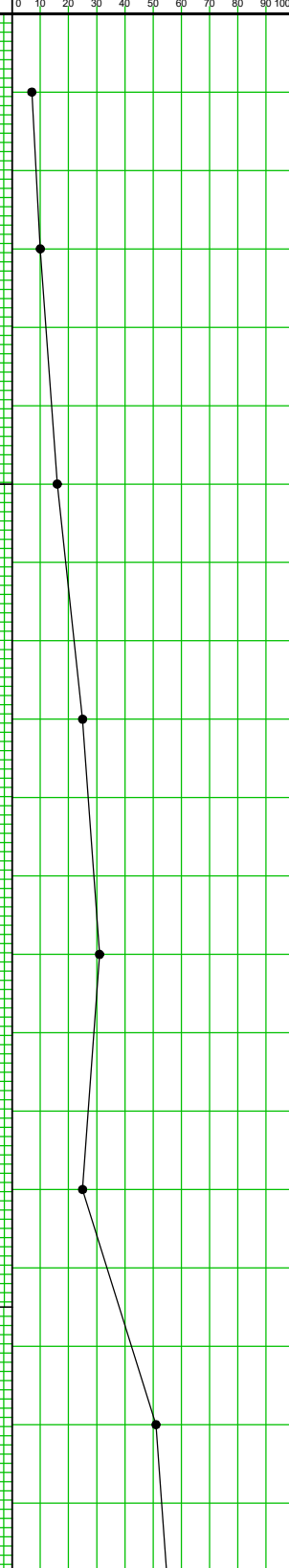
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 44+050 km	Northing : 3135511.319 m	Easting : 684905.712 m
Reduced Level (m): (+)256.063	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 23-01-2022		Date of Completion : 23-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5	10.5	SPT-8	17	20	25	45	Brown, Hard, Silty clay of low plasticity	CL			
11.0	11.25	UDS-3					Brown, Very dense, Sandy silt of low plasticity with gravel	ML-CL			
11.5											
12.0	12	SPT-9	21	26	27	53					
12.5											
13.0											
13.5	13.5	SPT-10	23	29	32	61					
14.0	14.25	UDS*									
14.5											
15.0	15	SPT-11	24	31	34	65					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

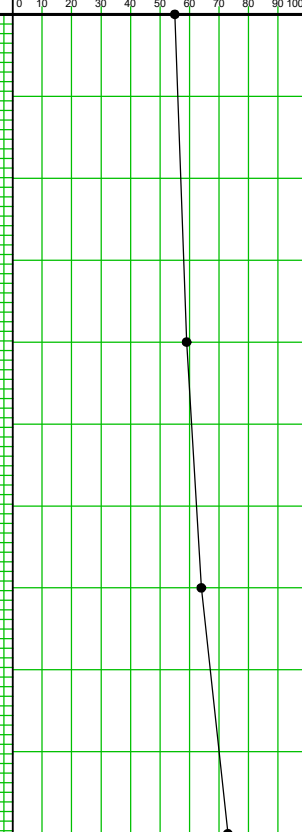
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :44+116 km	Northing :3135571.113 m	Easting :684877.774 m
Reduced Level (m):(+)256.889	BH. No. :BH-CL	BH Termination Depth (m):15
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :21-01-2022		Date of Completion :21-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	4	7	Brown, Loose, Sandy silt of low plasticity	ML-CL			
1.0											
1.5	1.5	SPT-2	2	4	6	10					
2.0											
2.25	2.25	UDS*									
2.5											
3.0	3	SPT-3	5	7	9	16	Brown, Very stiff, Silty clay of low plasticity	CL			
3.5											
4.0											
4.5	4.5	SPT-4	6	11	14	25					
5.0											
5.25	5.25	UDS-1									
5.5											
6.0	6	SPT-5	9	14	17	31					
6.5											
7.0											
7.5	7.5	SPT-6	7	11	14	25					
8.0											
8.25	8.25	UDS-2									
8.5											
9.0	9	SPT-7	19	24	27	51	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
9.5											
10.0	10	SPT-8	23	26	29	55					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

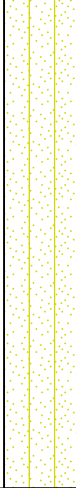
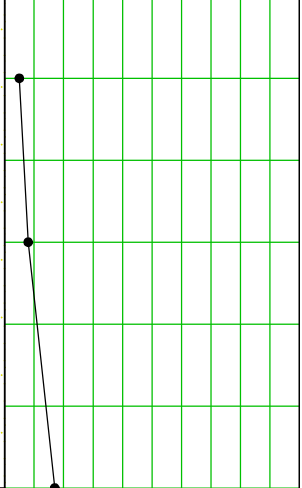
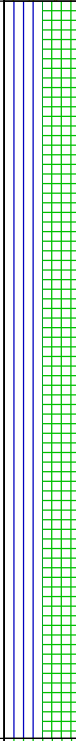
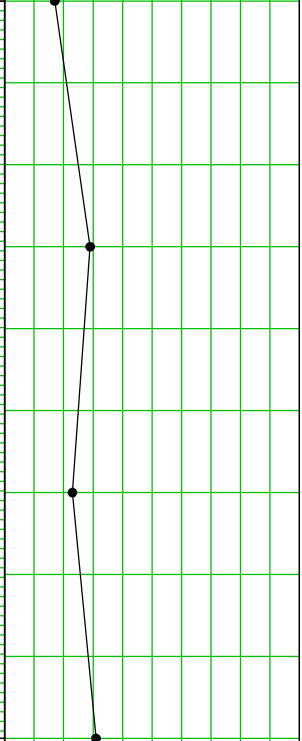
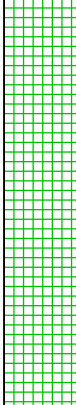
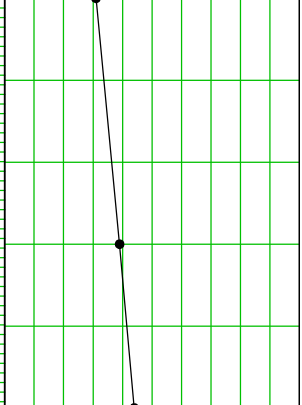
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 44+116 km	Northing : 3135571.113 m	Easting : 684877.774 m
Reduced Level (m): (+)256.889	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 21-01-2022		Date of Completion : 21-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0	11.25	UDS-3									
11.5											
12.0	12	SPT-9	22	28	31	59	Brown, Very dense, Sandy silt of low plasticity	ML-CL			
12.5											
13.0											
13.5	13.5	SPT-10	24	30	34	64					
14.0											
14.5	14.25	UDS*									
15.0	15	SPT-11	26	33	40	73					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :44+317 km	Northing :3135753.513 m	Easting :684793.328 m
Reduced Level (m):(+)254.620	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :20-01-2022	Date of Completion :20-01-2022	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose, Silty sand	SM			
1.5	1.5	SPT-2	2	3	5	8					
2.25	2.25	UDS*									
3.0	3	SPT-3	4	6	11	17	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
4.5	4.5	SPT-4	7	12	17	29					
5.25	5.25	UDS-1									
6.0	6	SPT-5	5	10	13	23					
7.5	7.5	SPT-6	7	12	19	31					
8.25	8.25	UDS-2									
9.0	9	SPT-7	9	17	22	39	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
10.0	10	SPT-8	11	15	29	44					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

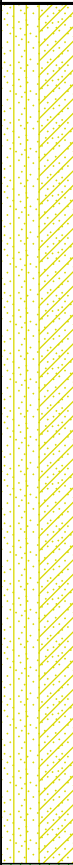
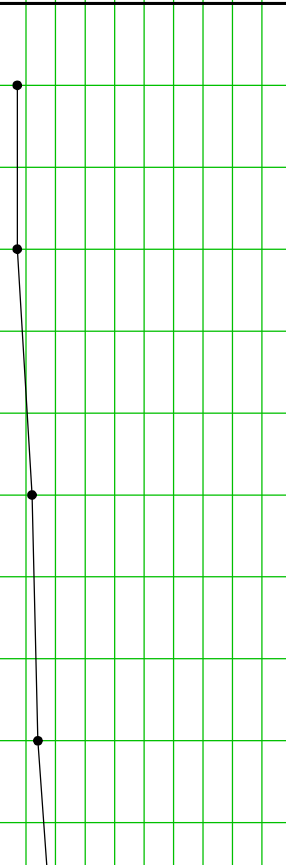

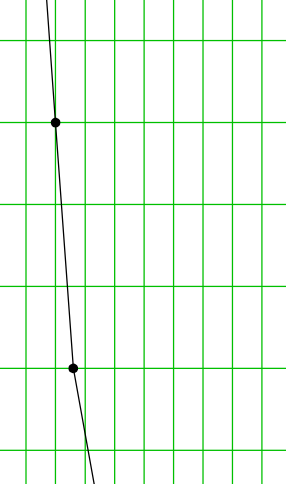
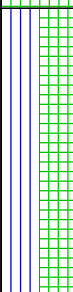
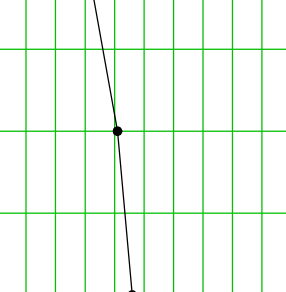
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :44+641 km	Northing :3136052.232 m	Easting :684668.53 m
Reduced Level (m):(+)256.869	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :19-01-2022		Date of Completion :19-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	4	6	Brown, Loose to medium dense, Sandy silt of low plasticity ML-CL				
1.5	1.5	SPT-2	3	4	7	11					
2.25	2.25	UDS*									
3.0	3	SPT-3	4	5	7	12					
4.5	4.5	SPT-4	6	9	11	20	Brown, Very stiff, Silty clay of low plasticity CL				
5.25	5.25	UDS-1									
6.0	6	SPT-5	7	8	12	20					
7.5	7.5	SPT-6	5	11	14	25					
8.25	8.25	UDS*					Brown, Dense to very dense, Sandy silt of low plasticity ML-CL				
9.0	9	SPT-7	17	21	24	45					
10.0	10	SPT-8	15	24	28	52					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

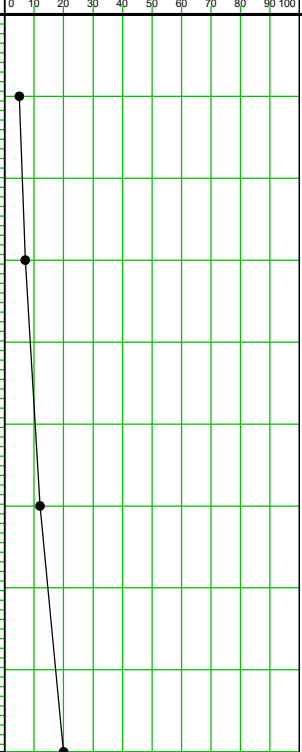
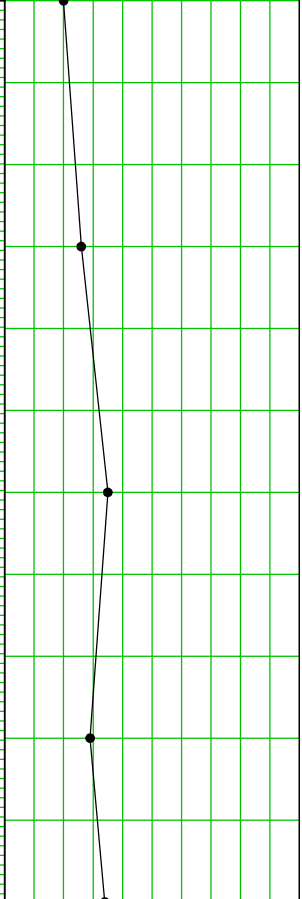
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 44+910 km	Northing : 3136314.389 m	Easting : 684609.724 m
Reduced Level (m): (+)254.293	BH. No. : BH-CL	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 18-01-2022		Date of Completion : 18-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	3	4	7	Brown, Loose to medium dense, Silty sand with clay SM-SC				
1.5	1.5	SPT-2	2	3	4	7					
2.25	2.25	UDS*									
3.0	3	SPT-3	4	5	7	12					
4.5	4.5	SPT-4	6	5	9	14					
5.25	5.25	UDS-1					Brown, Very stiff, Silty clay of low plasticity CL				
6.0	6	SPT-5	8	9	11	20					
7.5	7.5	SPT-6	10	12	14	26					
8.25	8.25	UDS-2					Brown, Dense, Sandy silt of low plasticity ML-CL				
9.0	9	SPT-7	17	19	22	41					
10.0	10	SPT-8	18	21	25	46					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

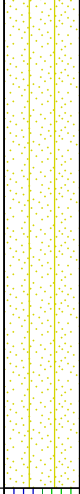
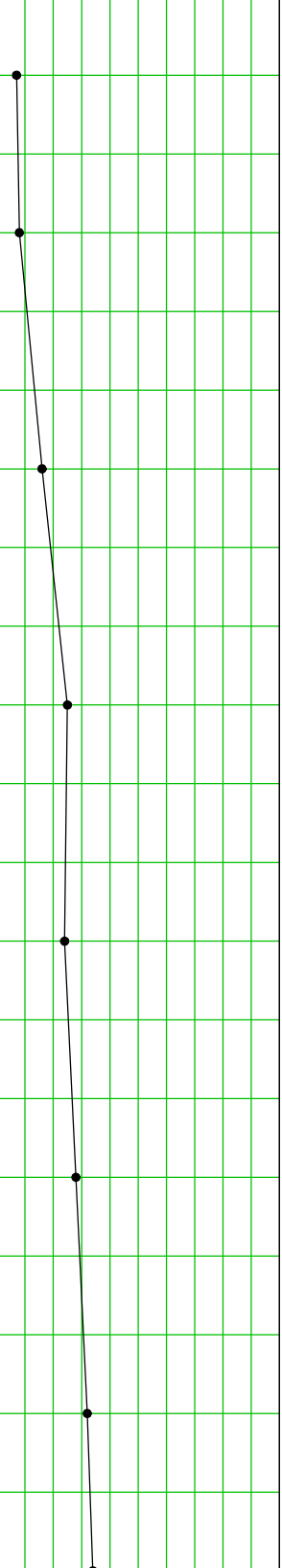
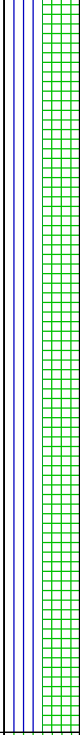
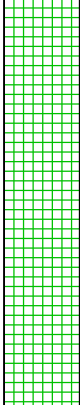
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+048 km	Northing :3136451.182 m	Easting :684590.519 m
Reduced Level (m):(+)253.929	BH. No. :45+048_CL	BH Termination Depth (m):10
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :15-11-2021	Date of Completion :15-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	1	2	3	5	Brown, Loose to medium dense, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	2	3	4	7					
2.25	2.25	UDS-1									
3.0	3	SPT-3	5	5	7	12					
4.5	4.5	SPT-4	8	9	11	20	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			
5.25	5.25	UDS-2									
6.0	6	SPT-5	7	12	14	26					
7.5	7.5	SPT-6	9	15	20	35					
8.25	8.25	UDS-3									
9.0	9	SPT-7	10	12	17	29					
10.0	10	SPT-8	12	15	19	34					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+411 km	Northing :3136810.574 m	Easting :684540.434 m
Reduced Level (m):(+)253.338	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not-used
Date of Start :17-01-2022		Date of Completion :17-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	4	7	Brown, Loose, Silty sand	SM			
1.5	1.5	SPT-2	3	4	4	8					
2.25	2.25	UDS*									
3.0	3	SPT-3	6	7	9	16	Brown, Medium dense, Sandy silt of low plasticity	ML-CL			
4.5	4.5	SPT-4	7	11	14	25					
5.25	5.25	UDS-1									
6.0	6	SPT-5	10	11	13	24					
7.5	7.5	SPT-6	9	12	16	28					
8.25	8.25	UDS-2					Brown, Very stiff to hard, Silty clay of low plasticity	CL			
9.0	9	SPT-7	11	15	17	32					
10.0	10	SPT-8	13	15	19	34					

UDS*-UDS not recovered



FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 45+480 km	Northing : 3136867.243 m	Easting : 684534.196 m
Reduced Level (m): (+)254.056	BH. No. : BH-A1	BH Termination Depth (m): 29.5
Proposed / Existing Structure : Major Bridge	Water Table (m): 16.00	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021		Date of Completion : 18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	UDS-1									
1.5											
2.0											
2.5	2.5	SPT-1	4	6	9	15					
3.0											
3.5											
4.0	4	UDS-2									
4.5											
5.0							Brown, Medium dense to dense, Silty sand with clay	SM-SC			
5.5	5.5	SPT-2	7	10	12	22					
6.0											
6.5											
7.0	7	UDS-3									
7.5											
8.0											
8.5	8.5	SPT-3	11	14	18	32					
9.0											
9.5											
10.0	10	UDS-4									

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+480 km	Northing :3136867.243 m	Easting :684534.196 m
Reduced Level (m):(+)254.056	BH. No. :BH-A1	BH Termination Depth (m):29.5
Proposed / Existing Structure :Major Bridge	Water Table (m):16.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0											
11.5	11.5	SPT-4	13	22	25	47					
12.0											
12.5											
13.0	13	UDS-5									
13.5											
14.0											
14.5	14.5	SPT-5	17	24	29	53					
15.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
15.5											
16.0	16	UDS-6									
16.5											
17.0											
17.5	17.5	SPT-6	19	27	35	62					
18.0											
18.5											
19.0	19	UDS-7									
19.5											
20.0											

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+480 km	Northing :3136867.243 m	Easting :684534.196 m
Reduced Level (m):(+)254.056	BH. No. :BH-A1	BH Termination Depth (m):29.5
Proposed / Existing Structure :Major Bridge	Water Table (m):16.00	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	SPT-7	22	35	42	77					
21.0											
21.5											
22.0	22	UDS-8									
22.5											
23.0											
23.5	23.5	SPT-8	25	45	60	>100					
24.0											
24.5											
25.0	25	SPT-9	28	47	62	>100	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-10	27	42	66	>100					
27.0											
27.5											
28.0	28	SPT-11	29	44	67	>100					
28.5											
29.0											
29.5	29.5	SPT-12	31	58	79	>100					

FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 45+480 km	Northing : 3136889.146 m	Easting : 684529.247 m
Reduced Level (m): (+)255.775	BH. No. : BH-A2	BH Termination Depth (m): 29.5
Proposed / Existing Structure : Major Bridge	Water Table (m): 15.75	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 17-08-2021	Date of Completion : 18-08-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5											
1.0	1	SPT-1	4	7	9	16					
1.5											
2.0											
2.5	2.5	UDS-1									
3.0											
3.5											
4.0	4	SPT-2	7	7	14	21	Brown, Medium dense, Silty sand with clay	SM-SC			
4.5											
5.0											
5.5	5.5	UDS-2									
6.0											
6.5											
7.0	7	SPT-3	9	11	16	27					
7.5											
8.0											
8.5	8.5	UDS-3									
9.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
9.5											
10.0	10	SPT-4	14	19	26	45					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+480 km	Northing :3136889.146 m	Easting :684529.247 m
Reduced Level (m):(+)255.775	BH. No. :BH-A2	BH Termination Depth (m):29.5
Proposed / Existing Structure :Major Bridge	Water Table (m):15.75	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
11.5	11.5	UDS-4									
13.0	13	SPT-5	10	15	28	43					
14.5	14.5	UDS-5									
15.0							Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
16.0	16	SPT-6	15	25	41	66					
17.5	17.5	UDS-6									
19.0	19	SPT-7	18	29	48	77					
20.0											

▼ 15.75m



FIELD BOREHOLE LOG

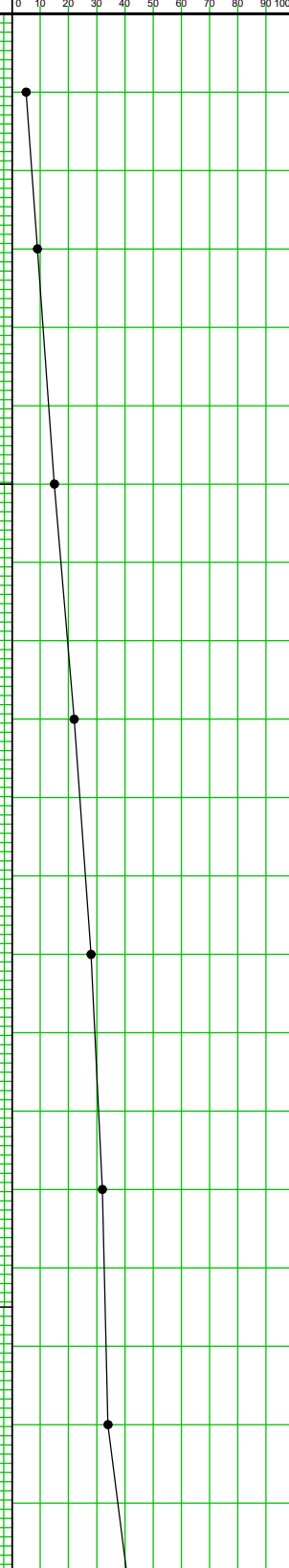
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+480 km	Northing :3136889.146 m	Easting :684529.247 m
Reduced Level (m):(+)255.775	BH. No. :BH-A2	BH Termination Depth (m):29.5
Proposed / Existing Structure :Major Bridge	Water Table (m):15.75	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :17-08-2021		Date of Completion :18-08-2021

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
20.0											
20.5	20.5	UDS-7									
21.0											
21.5											
22.0	22	SPT-8	24	38	52	90					
22.5											
23.0											
23.5	23.5	UDS-8									
24.0											
24.5											
25.0	25	SPT-9	27	49	57	>100	Brown, Dense to very dense, Sandy silt of low plasticity	ML-CL			
25.5											
26.0											
26.5	26.5	SPT-10	30	55	61	>100					
27.0											
27.5											
28.0	28	SPT-11	24	53	47	>100					
28.5											
29.0											
29.5	29.5	SPT-12	29	55	45	>100					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

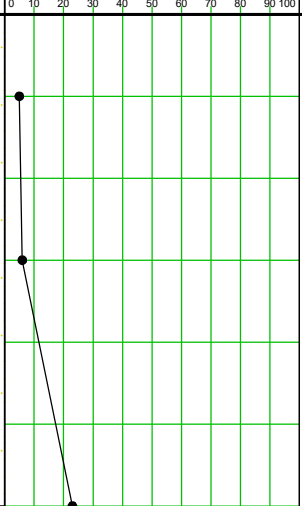
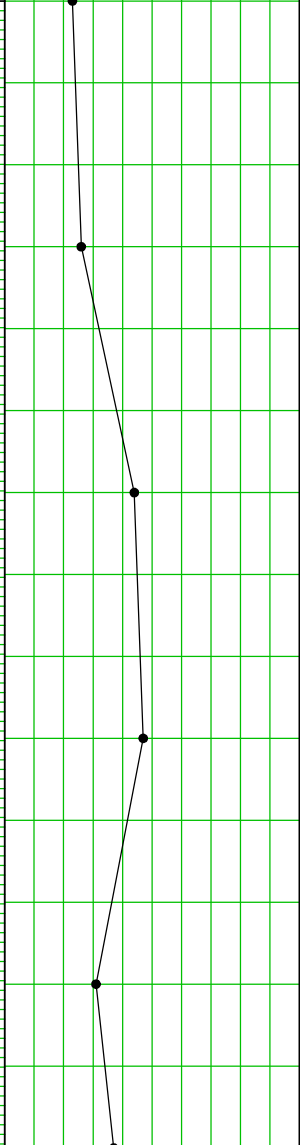
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+612 km	Northing :3137009.651 m	Easting :684512.699 m
Reduced Level (m):(+)254.161	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-11-2021	Date of Completion :15-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose, Sandy silt of low plasticity	ML-CL			
1.5	1.5	SPT-2	3	4	5	9					
2.25	2.25	UDS-1									
3.0	3	SPT-3	5	7	8	15	Brown, Very stiff to hard, Silty clay of low plasticity	CL			
4.5	4.5	SPT-4	7	10	12	22					
5.25	5.25	UDS-2									
6.0	6	SPT-5	10	13	15	28					
7.5	7.5	SPT-6	12	15	17	32					
8.25	8.25	UDS-3									
9.0	9	SPT-7	13	16	18	34	Brown, Dense, Sandy silt of low plasticity	ML-CL			
10.0	10	SPT-8	15	20	21	41					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

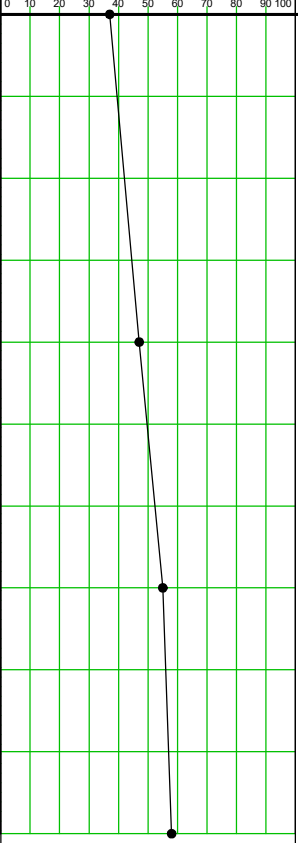
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :45+984 km	Northing :3137377.674 m	Easting :684458.641 m
Reduced Level (m):(+)257.656	BH. No. :BH-CL	BH Termination Depth (m):15
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :16-01-2022		Date of Completion :16-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	2	3	5	Brown, Loose, Silty sand	SM			
1.5	1.5	SPT-2	2	3	3	6					
2.25	2.25	UDS*									
3.0	3	SPT-3	5	10	13	23	Brown, Medium dense to very dense, Sandy silt of low plasticity	ML-CL			
4.5	4.5	SPT-4	7	11	15	26					
5.25	5.25	UDS-1									
6.0	6	SPT-5	15	20	24	44					
7.5	7.5	SPT-6	16	21	26	47					
8.25	8.25	UDS-2									
9.0	9	SPT-7	13	15	16	31					
10.0	10	SPT-8	15	17	20	37					

UDS*-UDS not recovered


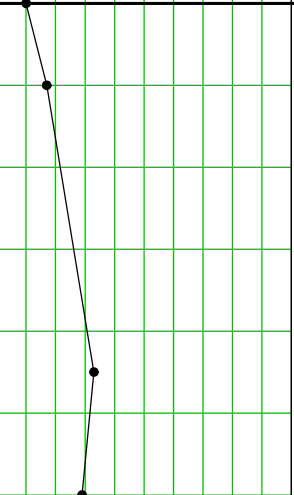
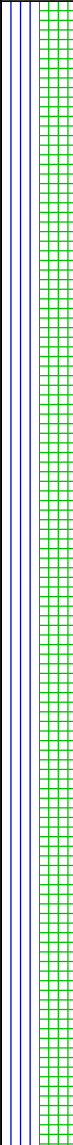
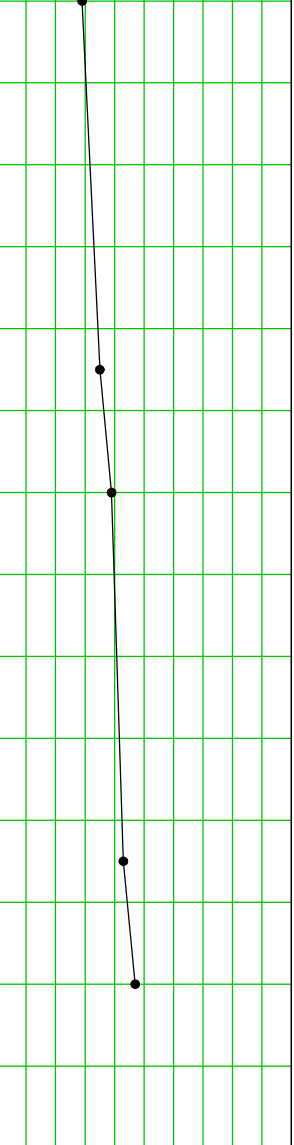
FIELD BOREHOLE LOG

Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 45+984 km	Northing : 3137377.674 m	Easting : 684458.641 m
Reduced Level (m): (+)257.656	BH. No. : BH-CL	BH Termination Depth (m): 15
Proposed / Existing Structure :-	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 16-01-2022		Date of Completion : 16-01-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
10.0											
10.5											
11.0	11.25	UDS-3									
11.5											
12.0	12	SPT-9	11	19	28	47	Brown, Medium dense to very dense, Sandy silt of low plasticity ML-CL	ML-CL			
12.5											
13.0											
13.5	13.5	SPT-10	15	26	29	55					
14.0											
14.5	14.25	UDS*									
15.0	15	SPT-11	16	23	35	58					

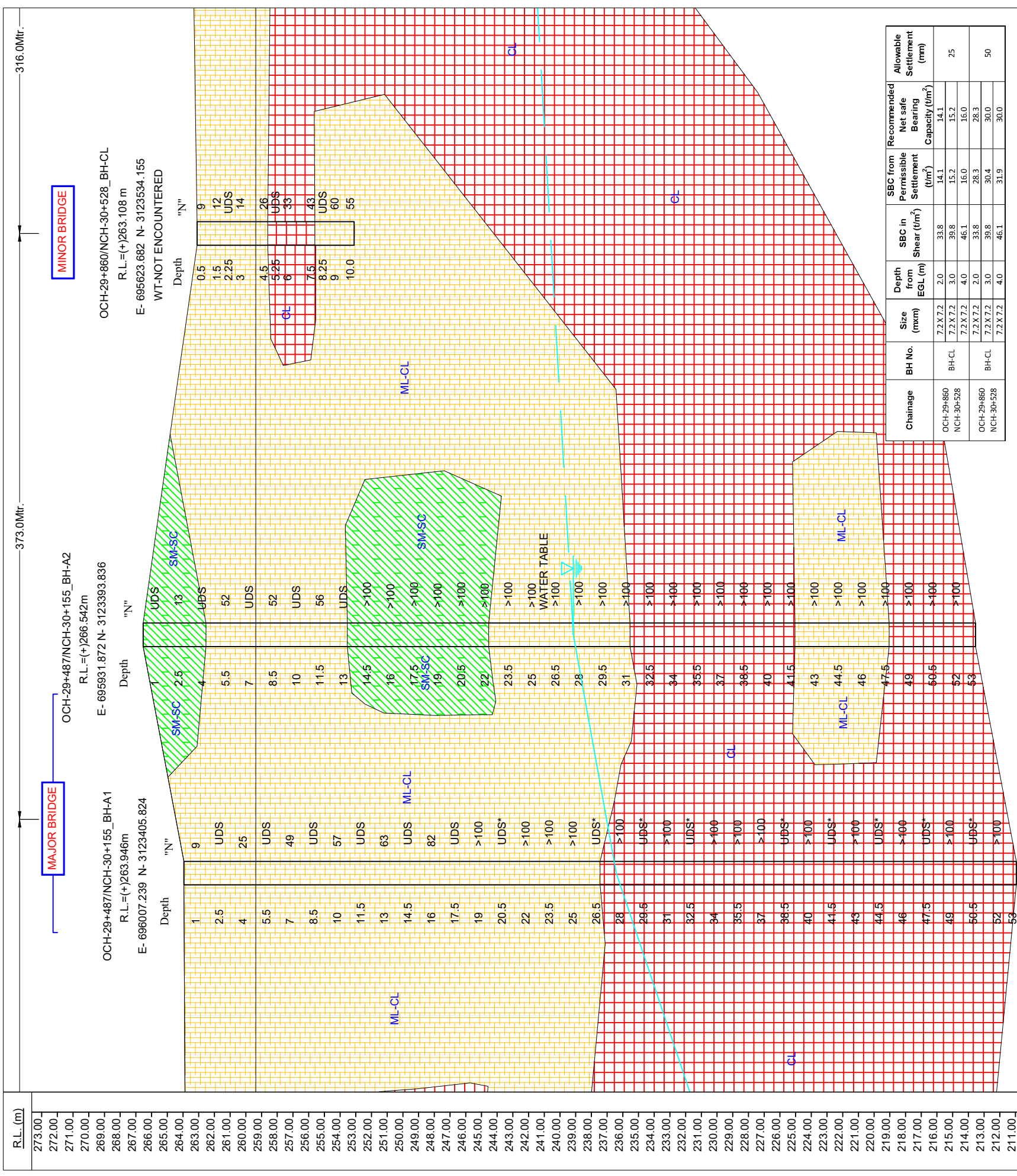
FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :46+400 km	Northing :3137776.436 m	Easting :684341.186 m
Reduced Level (m):(+)257.489	BH. No. :BH-CL	BH Termination Depth (m):10
Proposed / Existing Structure :-	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-11-2021	Date of Completion :14-11-2021	

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS	3	4	6	10					
0.5	0.5	SPT-1	5	7	11	17	Brown, Medium dense, Silty sand	SM			
1.5	1.5	SPT-2									
2.25	2.25	UDS-1	12	15	18	33					
3.0	3	SPT-3	9	13	16	29	Brown, Dense, Sandy silt of low plasticity	ML-CL			
4.5	4.5	SPT-4									
5.25	5.25	UDS-2	12	16	19	35					
6.0	6	SPT-5	13	18	21	39					
7.5	7.5	SPT-6									
8.25	8.25	UDS-3	15	19	24	43					
9.0	9	SPT-7	20	21	26	47					
10.0	10	SPT-8				47					

UDS*-UDS not recovered

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



R.L. (m)	Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
273.00								
272.00								
271.00								
270.00								
269.00								
268.00								
267.00								
266.00								
265.00								
264.00								
263.00								
262.00								
261.00								
260.00								
259.00								
258.00								
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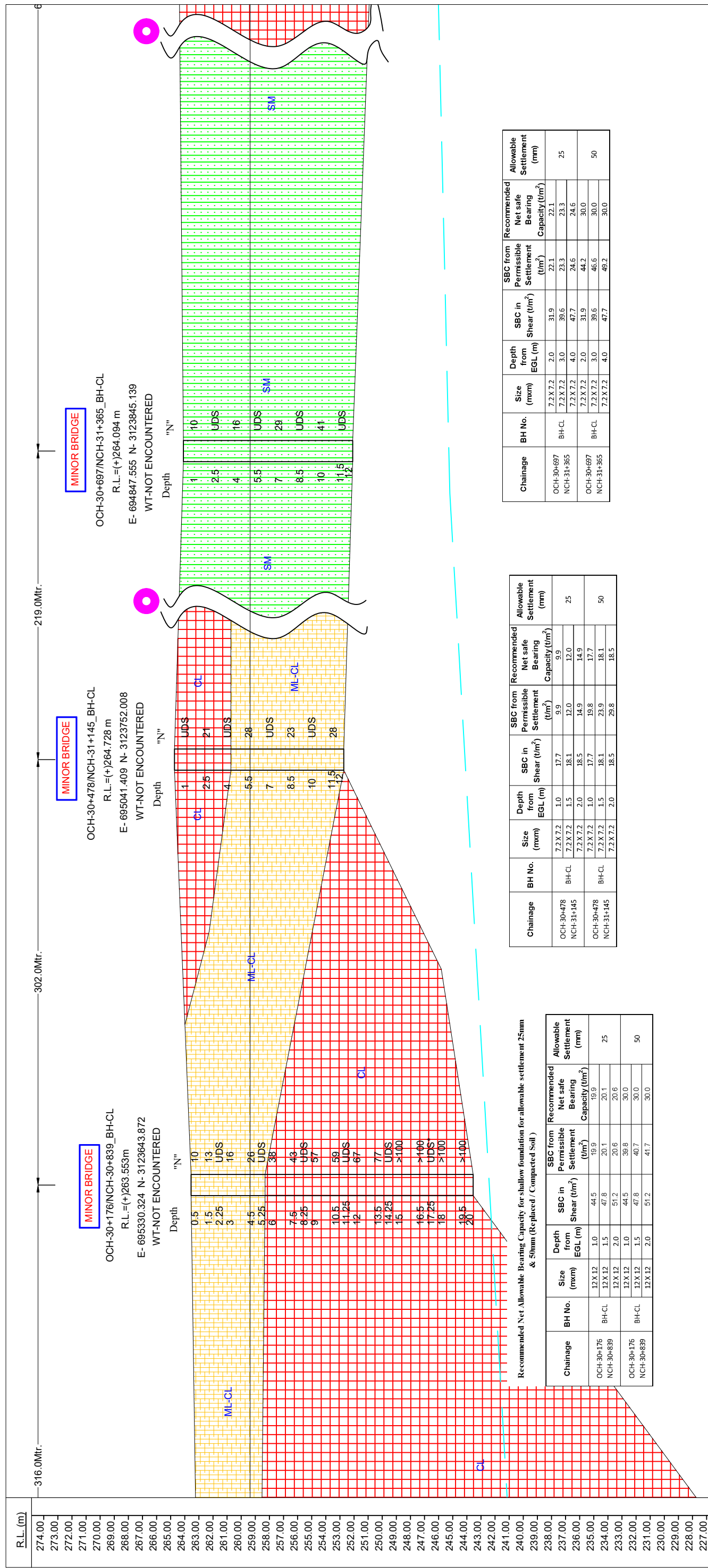
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-29+860	BH-CL	7.2 X 7.2	2.0	33.8	14.1	14.1	25
NCH-30+528	BH-CL	7.2 X 7.2	3.0	39.8	15.2	15.2	25
OCH-29+860	BH-CL	7.2 X 7.2	4.0	46.1	16.0	16.0	25
NCH-30+528	BH-CL	7.2 X 7.2	2.0	33.8	28.3	30.0	50
OCH-29+860	BH-CL	7.2 X 7.2	3.0	39.8	30.4	30.0	50
NCH-30+528	BH-CL	7.2 X 7.2	4.0	46.1	31.9	30.0	50

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-29+487	BH-A1	7.2 X 7.2	2.0	46.1	27.1	27.1	25
NCH-30+155	BH-A1	7.2 X 7.2	3.0	54.2	32.6	30.0	25
OCH-29+487	BH-A1	7.2 X 7.2	4.0	62.5	40.0	30.0	25
NCH-30+155	BH-A1	7.2 X 7.2	2.0	46.1	54.2	30.0	50
OCH-29+487	BH-A2	7.2 X 7.2	3.0	54.2	65.2	30.0	25
NCH-30+155	BH-A2	7.2 X 7.2	4.0	62.5	80.0	30.0	25
OCH-29+487	BH-A2	7.2 X 7.2	2.0	32.0	28.2	28.2	25
NCH-30+155	BH-A2	7.2 X 7.2	3.0	38.6	37.1	30.0	25
OCH-29+487	BH-A2	7.2 X 7.2	4.0	45.4	50.9	30.0	25
NCH-30+155	BH-A2	7.2 X 7.2	2.0	32.0	56.4	30.0	50
OCH-29+487	BH-A2	7.2 X 7.2	3.0	38.6	74.2	30.0	25
NCH-30+155	BH-A2	7.2 X 7.2	4.0	45.4	101.7	30.0	25

SYMBOL	DESCRIPTION
	SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC - Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL - Silty Clay with clay (Having fines greater than 50% and in the hatched zone (LL<55 & 4<PI<7))
	CL - Silty Clay of low plasticity (Above A-line, LL<55)
	CH - Clay of medium plasticity (Above A-line, 55<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(w/20) SCALE:- HOR:- 1:2850 VER:- 1:285

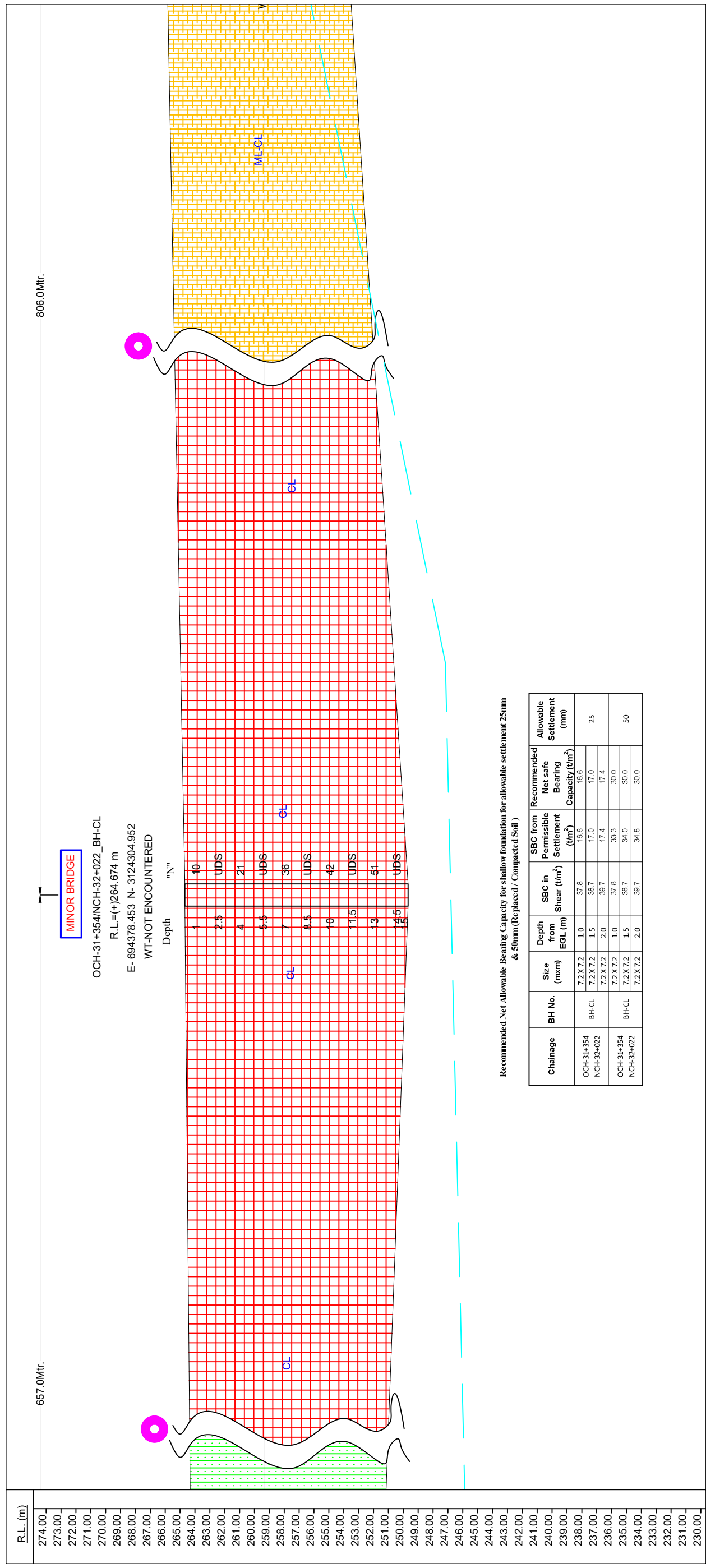
CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7)
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7)
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



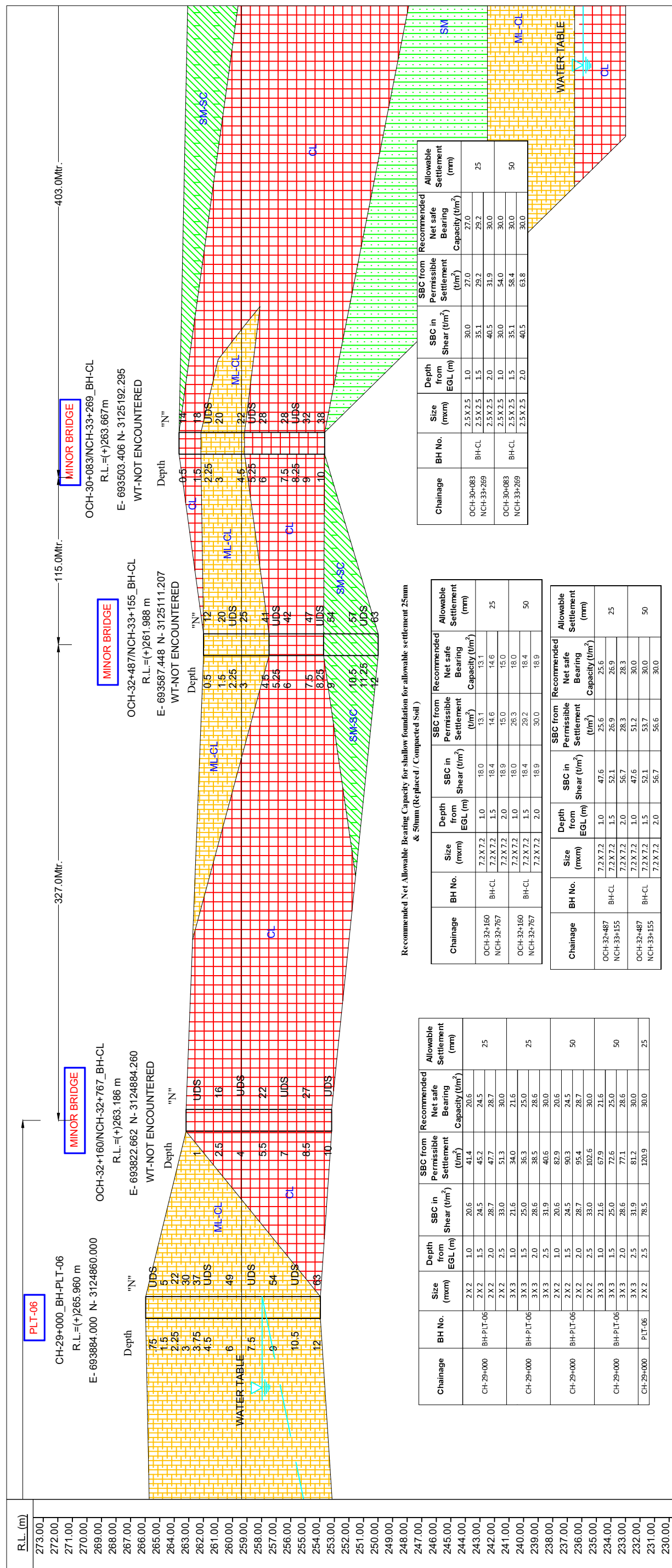
Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm & 50mm (Replaced / Compacted Soil)

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-31+354 NCH-32+022	BH-CL	7.2 X 7.2	1.0	37.8	16.6	16.6	25
			1.5	36.7	17.0	17.0	
OCH-31+354 NCH-32+022	BH-CL	7.2 X 7.2	2.0	36.7	17.4	17.4	50
			1.0	37.8	33.3	30.0	
OCH-31+354 NCH-32+022	BH-CL	7.2 X 7.2	1.5	36.7	34.0	30.0	50
			2.0	36.7	34.8	30.0	

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7)
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7)
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	Cl- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(w/20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm & 50mm (Replaced / Compacted Soil)

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
CH-29+000	BH-PLT-06	2 X 2	1.0	20.6	41.4	20.6	25
		2 X 2	1.5	24.5	45.2	24.5	
		2 X 2	2.0	28.7	47.7	28.7	
		2 X 2	2.5	33.0	51.3	30.0	
CH-29+000	BH-PLT-06	3 X 3	1.0	21.6	34.0	21.6	25
		3 X 3	1.5	25.0	36.3	25.0	
		3 X 3	2.0	28.6	38.5	28.6	
		3 X 3	2.5	31.9	40.6	30.0	
CH-29+000	BH-PLT-06	2 X 2	1.0	20.6	82.9	20.6	50
		2 X 2	1.5	24.5	90.3	24.5	
		2 X 2	2.0	28.7	95.4	28.7	
		2 X 2	2.5	33.0	102.6	30.0	
CH-29+000	BH-PLT-06	3 X 3	1.0	21.6	67.9	21.6	50
		3 X 3	1.5	25.0	72.6	25.0	
		3 X 3	2.0	28.6	77.1	28.6	
		3 X 3	2.5	31.9	81.2	30.0	
CH-29+000	PLT-06	2 X 2	2.5	78.5	120.9	30.0	25

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-32+160	BH-CL	7.2 X 7.2	1.0	18.0	13.1	13.1	25
		7.2 X 7.2	1.5	18.4	14.6	14.6	
		7.2 X 7.2	2.0	18.9	15.0	15.0	
OCH-32+160	BH-CL	7.2 X 7.2	1.0	18.0	26.3	18.0	50
		7.2 X 7.2	1.5	18.4	29.2	18.4	
		7.2 X 7.2	2.0	18.9	30.0	18.9	

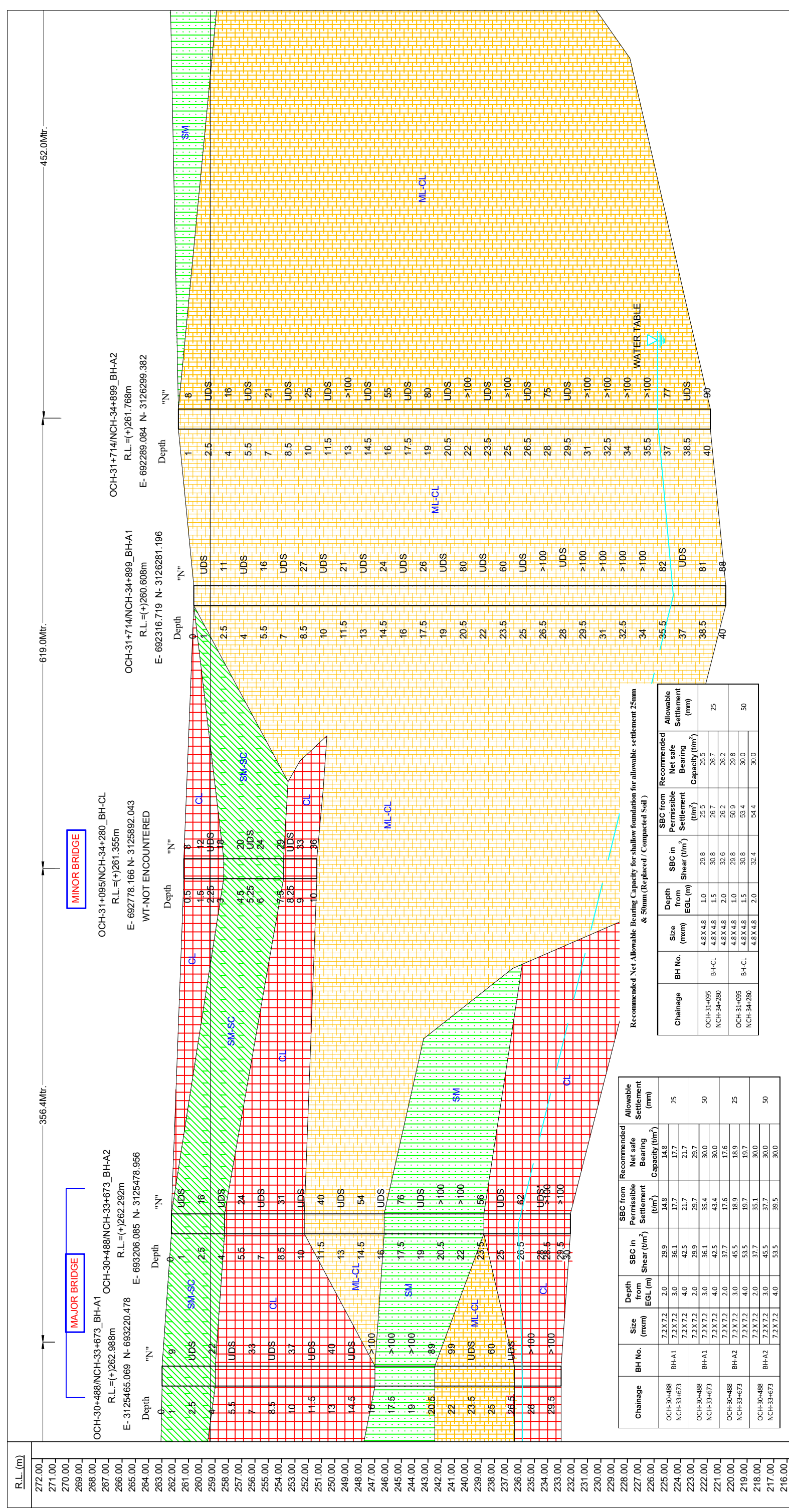
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-32+487	BH-CL	7.2 X 7.2	1.0	47.6	25.6	25.6	25
		7.2 X 7.2	1.5	52.1	26.9	26.9	
		7.2 X 7.2	2.0	56.7	28.3	28.3	
OCH-32+487	BH-CL	7.2 X 7.2	1.0	47.6	51.2	30.0	50
		7.2 X 7.2	1.5	52.1	53.7	30.0	
		7.2 X 7.2	2.0	56.7	56.6	30.0	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-30+083	BH-CL	2.5 X 2.5	1.0	30.0	27.0	27.0	25
		2.5 X 2.5	1.5	35.1	29.2	29.2	
		2.5 X 2.5	2.0	40.5	31.9	30.0	
OCH-30+083	BH-CL	2.5 X 2.5	1.0	30.0	54.0	30.0	50
		2.5 X 2.5	1.5	35.1	58.4	30.0	
		2.5 X 2.5	2.0	40.5	65.8	30.0	

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm & 50mm (Replaced / Compacted Soil)

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-31+095	BH-CL	4.8X4.8	1.0	29.8	25.5	25.5	25
		4.8X4.8	1.5	30.8	26.7	26.7	25
NCH-34+280	BH-A1	4.8X4.8	1.0	30.8	26.7	26.7	25
		4.8X4.8	1.5	32.6	26.2	26.2	25
OCH-31+095	BH-CL	4.8X4.8	1.0	29.8	53.4	30.0	50
		4.8X4.8	1.5	30.8	53.4	30.0	50
NCH-34+280	BH-A2	4.8X4.8	2.0	32.4	54.4	30.0	50
		4.8X4.8	2.0	32.4	54.4	30.0	50

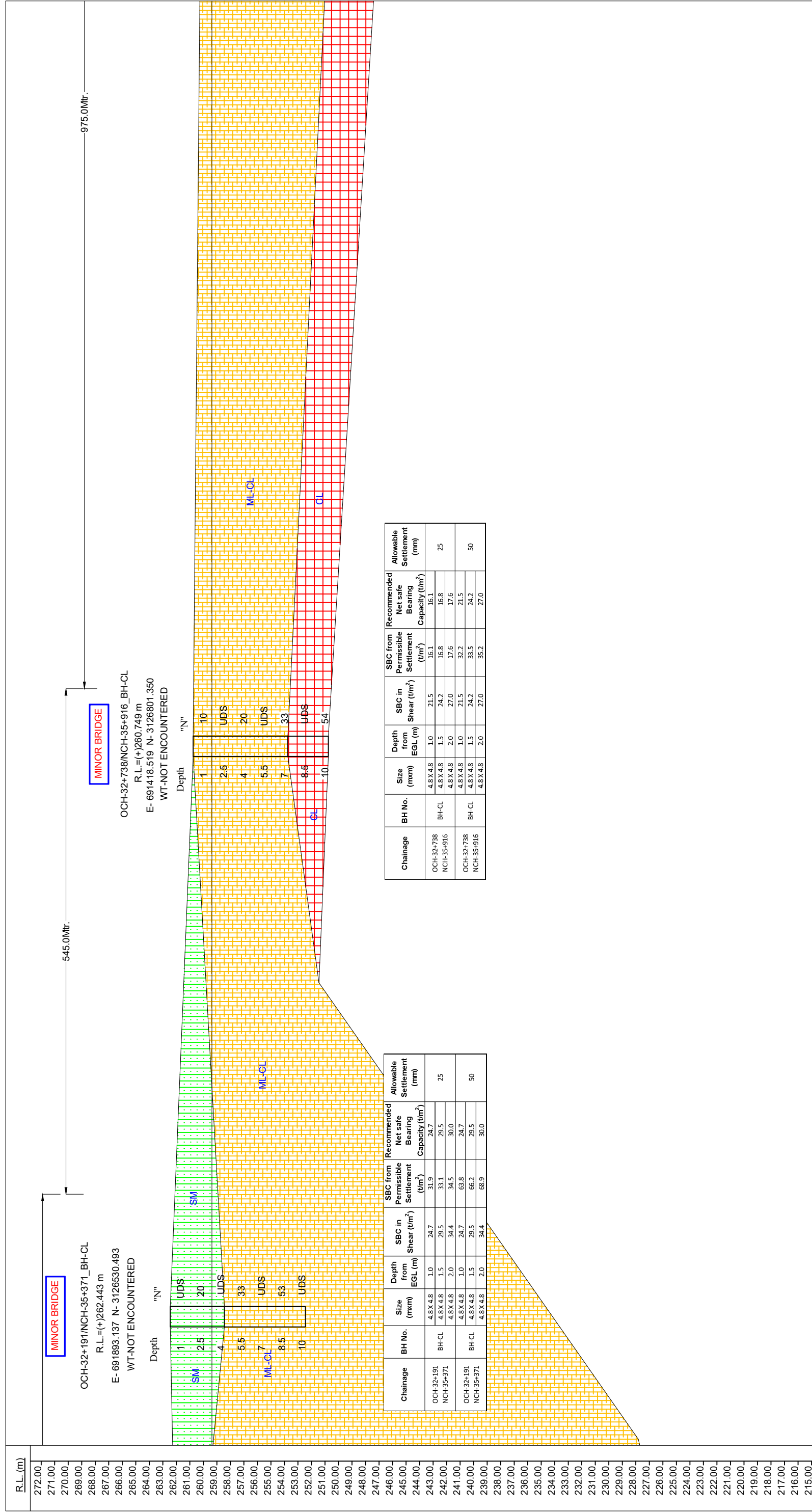
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-30+488	BH-A1	7.2X7.2	2.0	29.9	14.8	14.8	25
		7.2X7.2	3.0	36.1	17.7	17.7	25
NCH-33+673	BH-A1	7.2X7.2	2.0	29.9	21.7	21.7	25
		7.2X7.2	3.0	42.5	21.7	21.7	25
OCH-30+488	BH-A1	7.2X7.2	2.0	29.9	29.7	29.7	50
		7.2X7.2	3.0	35.1	35.4	30.0	50
OCH-30+488	BH-A2	7.2X7.2	2.0	37.7	17.6	17.6	25
		7.2X7.2	3.0	45.5	18.9	18.9	25
NCH-33+673	BH-A2	7.2X7.2	2.0	37.7	19.7	19.7	25
		7.2X7.2	3.0	45.5	35.1	30.0	25
OCH-30+488	BH-A2	7.2X7.2	2.0	37.7	37.7	30.0	50
		7.2X7.2	3.0	45.5	37.7	30.0	50
NCH-33+673	BH-A2	7.2X7.2	2.0	37.7	39.5	30.0	50
		7.2X7.2	3.0	45.5	39.5	30.0	50

SYMBOL	DESCRIPTION
[Green dotted pattern]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green diagonal lines]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow diagonal lines]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red diagonal lines]	CL- Silty Clay of low plasticity (Above A-line, LL<35)
[Red diagonal lines]	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
[Blue circle]	BOREHOLE REQUIRED

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-31+714	BH-A1	7.2X7.2	2.0	32.5	14.1	14.1	25
		7.2X7.2	3.0	38.4	14.9	14.9	25
NCH-34+899	BH-A1	7.2X7.2	2.0	32.5	15.7	15.7	25
		7.2X7.2	3.0	44.4	15.7	15.7	25
OCH-31+714	BH-A1	7.2X7.2	2.0	32.5	28.2	28.2	50
		7.2X7.2	3.0	38.4	29.7	29.7	50
NCH-34+899	BH-A2	7.2X7.2	2.0	38.4	31.4	30.0	25
		7.2X7.2	3.0	45.1	16.3	16.3	25
OCH-31+714	BH-A2	7.2X7.2	2.0	38.4	30.3	30.0	50
		7.2X7.2	3.0	45.1	32.6	30.0	50
NCH-34+899	BH-A2	7.2X7.2	2.0	38.4	35.7	30.0	50
		7.2X7.2	3.0	45.1	35.7	30.0	50

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285 WATER TABLE

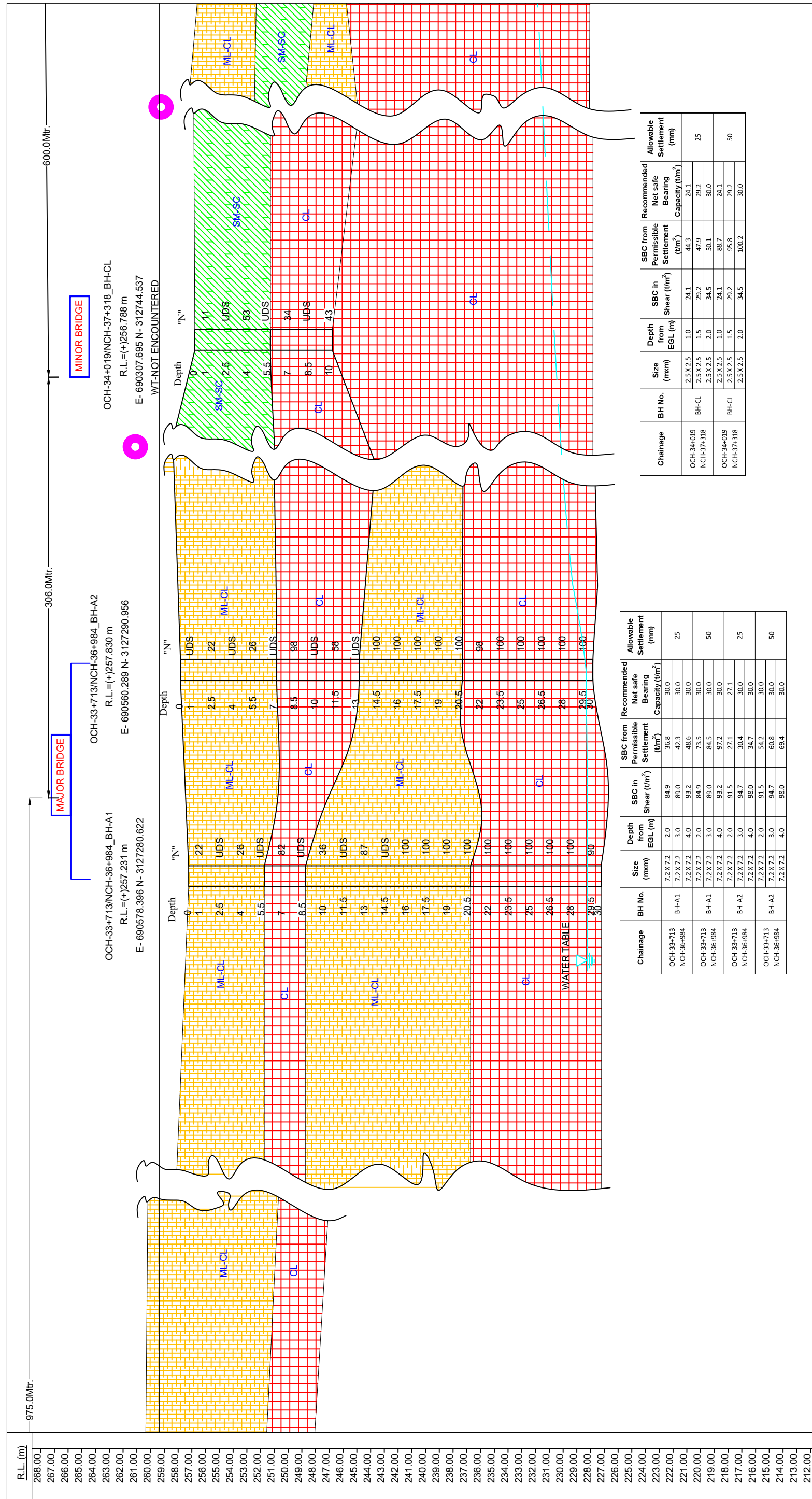
CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7)
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7)
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

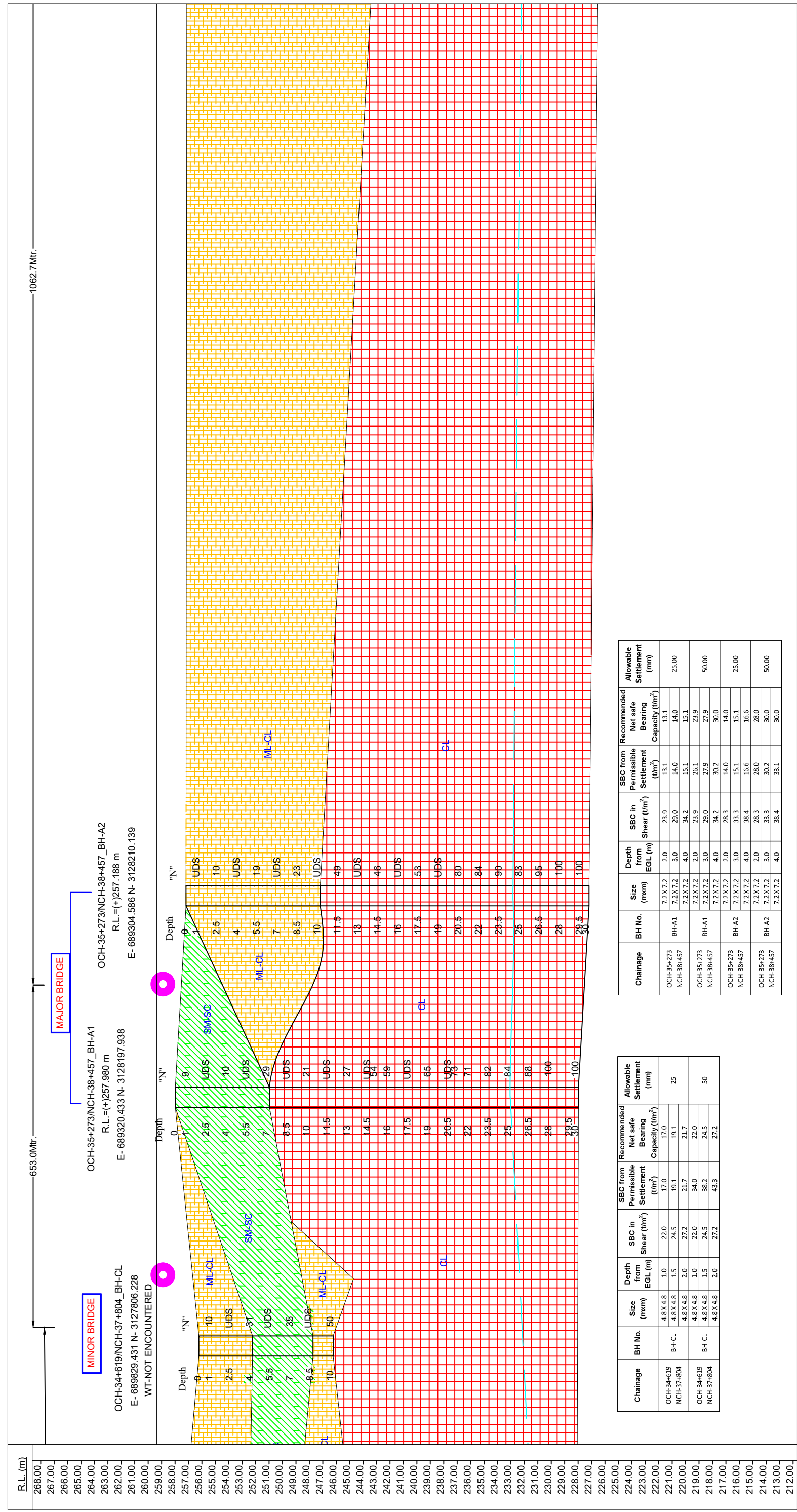
CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



SYMBOL	DESCRIPTION
[Green diagonal lines]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green diagonal lines with dots]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow diagonal lines]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red diagonal lines]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Red diagonal lines with dots]	CL- Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED
[Blue line with arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



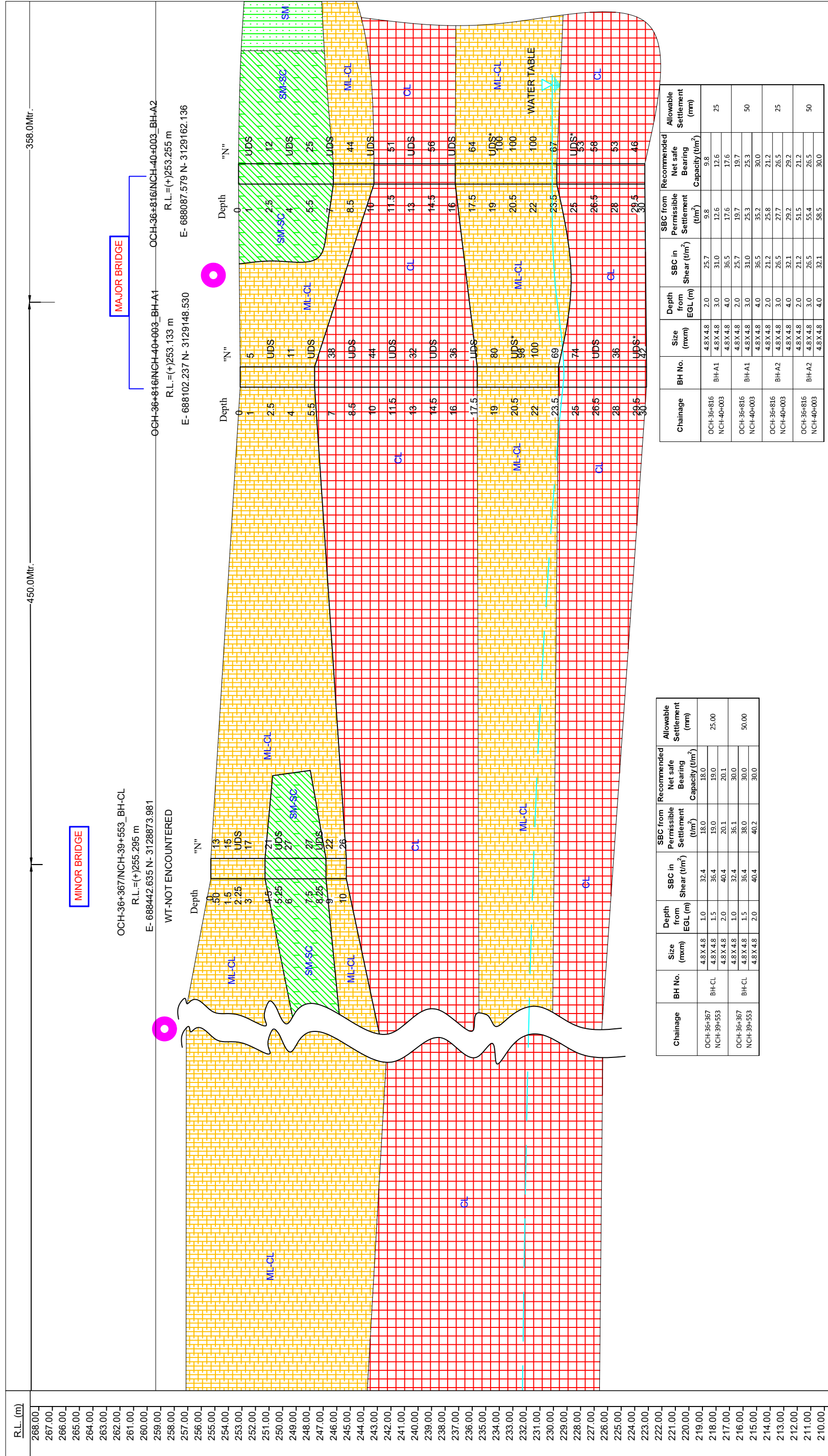
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-34+619	BH-CL	4.8 X 4.8	1.0	22.0	17.0	17.0	25
NCH-37+804		4.8 X 4.8	1.5	24.5	19.1	19.1	
		4.8 X 4.8	2.0	27.2	21.7	21.7	
OCH-34+619	BH-CL	4.8 X 4.8	1.0	22.0	34.0	22.0	50
NCH-37+804		4.8 X 4.8	1.5	24.5	38.2	24.5	
		4.8 X 4.8	2.0	27.2	43.3	27.2	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-35+273	BH-A1	7.2 X 7.2	2.0	23.9	13.1	13.1	25.00
NCH-38+457		7.2 X 7.2	3.0	29.0	14.0	14.0	
		7.2 X 7.2	4.0	34.2	15.1	15.1	
OCH-35+273	BH-A1	7.2 X 7.2	2.0	23.9	26.1	23.9	50.00
NCH-38+457		7.2 X 7.2	3.0	29.0	27.9	27.9	
		7.2 X 7.2	4.0	34.2	30.2	30.0	
OCH-35+273	BH-A2	7.2 X 7.2	2.0	26.3	14.0	14.0	25.00
NCH-38+457		7.2 X 7.2	3.0	33.3	15.1	15.1	
		7.2 X 7.2	4.0	36.4	16.6	16.6	
OCH-35+273	BH-A2	7.2 X 7.2	2.0	26.3	28.0	26.0	50.00
NCH-38+457		7.2 X 7.2	3.0	33.3	30.2	30.0	
		7.2 X 7.2	4.0	36.4	33.1	30.0	

SYMBOL	DESCRIPTION
[Green hatched pattern]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Yellow hatched pattern]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7)
[Orange hatched pattern]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7)
[Red hatched pattern]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Blue hatched pattern]	Cl- Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED
[Blue arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



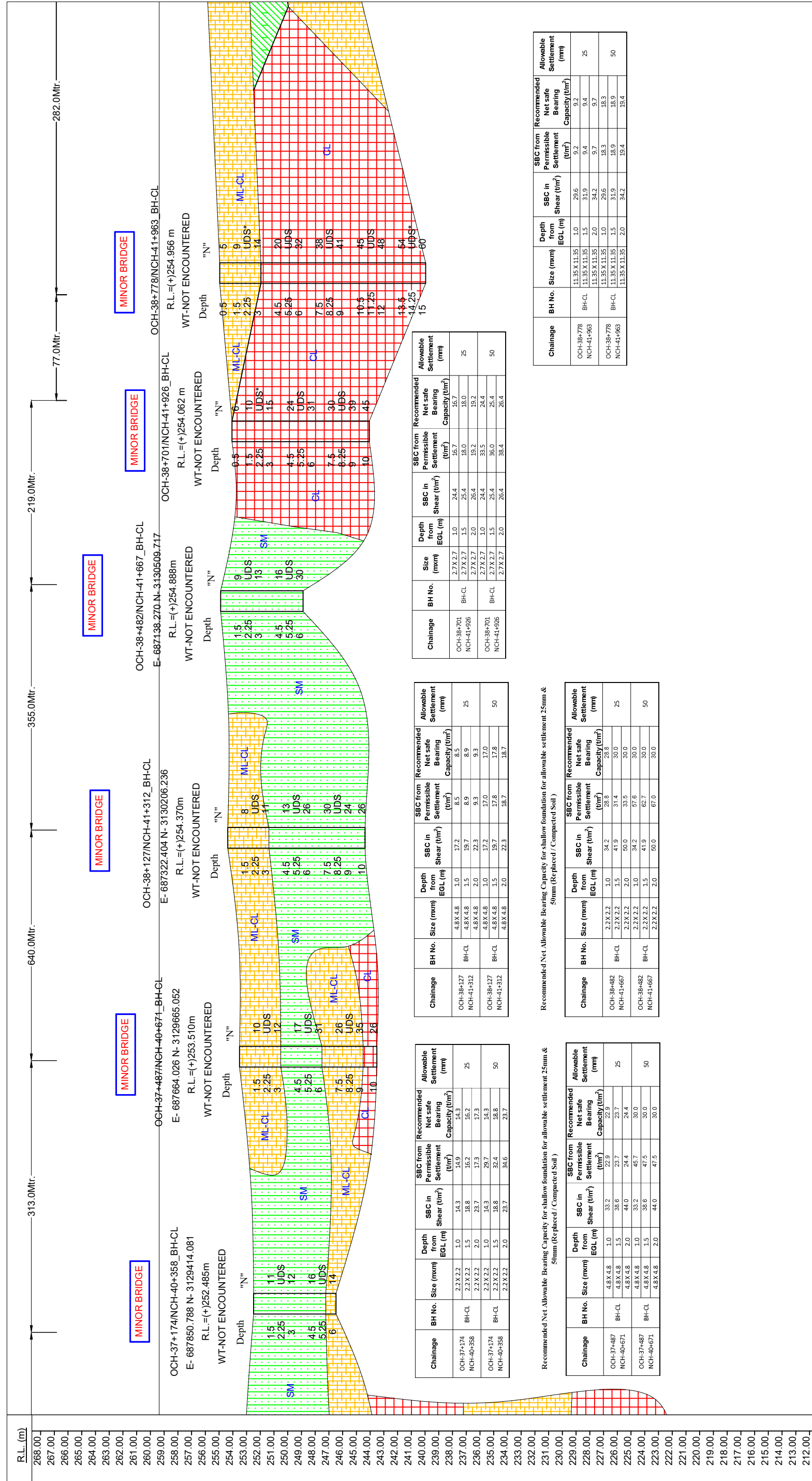
SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	Cl- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-36+367	BH-CL	4.8 X 4.8	1.0	32.4	18.0	18.0	25.00
NCH-39+553	BH-CL	4.8 X 4.8	1.5	36.4	19.0	19.0	25.00
OCH-36+367	BH-CL	4.8 X 4.8	1.0	32.4	36.1	30.0	50.00
NCH-39+553	BH-CL	4.8 X 4.8	1.5	36.4	38.0	30.0	50.00

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-36+816	BH-A1	4.8 X 4.8	2.0	25.7	9.8	9.8	25
NCH-40+003	BH-A1	4.8 X 4.8	3.0	31.0	12.6	12.6	25
OCH-36+816	BH-A1	4.8 X 4.8	2.0	25.7	17.6	17.6	50
NCH-40+003	BH-A1	4.8 X 4.8	3.0	31.0	25.3	25.3	50
OCH-36+816	BH-A2	4.8 X 4.8	4.0	36.5	30.0	30.0	25
NCH-40+003	BH-A2	4.8 X 4.8	2.0	21.2	21.2	21.2	25
OCH-36+816	BH-A2	4.8 X 4.8	3.0	26.5	27.7	26.5	25
NCH-40+003	BH-A2	4.8 X 4.8	4.0	32.1	29.2	29.2	25
OCH-36+816	BH-A2	4.8 X 4.8	2.0	21.2	51.5	21.2	50
NCH-40+003	BH-A2	4.8 X 4.8	3.0	26.5	55.4	26.5	50
OCH-36+816	BH-A2	4.8 X 4.8	4.0	32.1	58.5	30.0	50

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl>20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

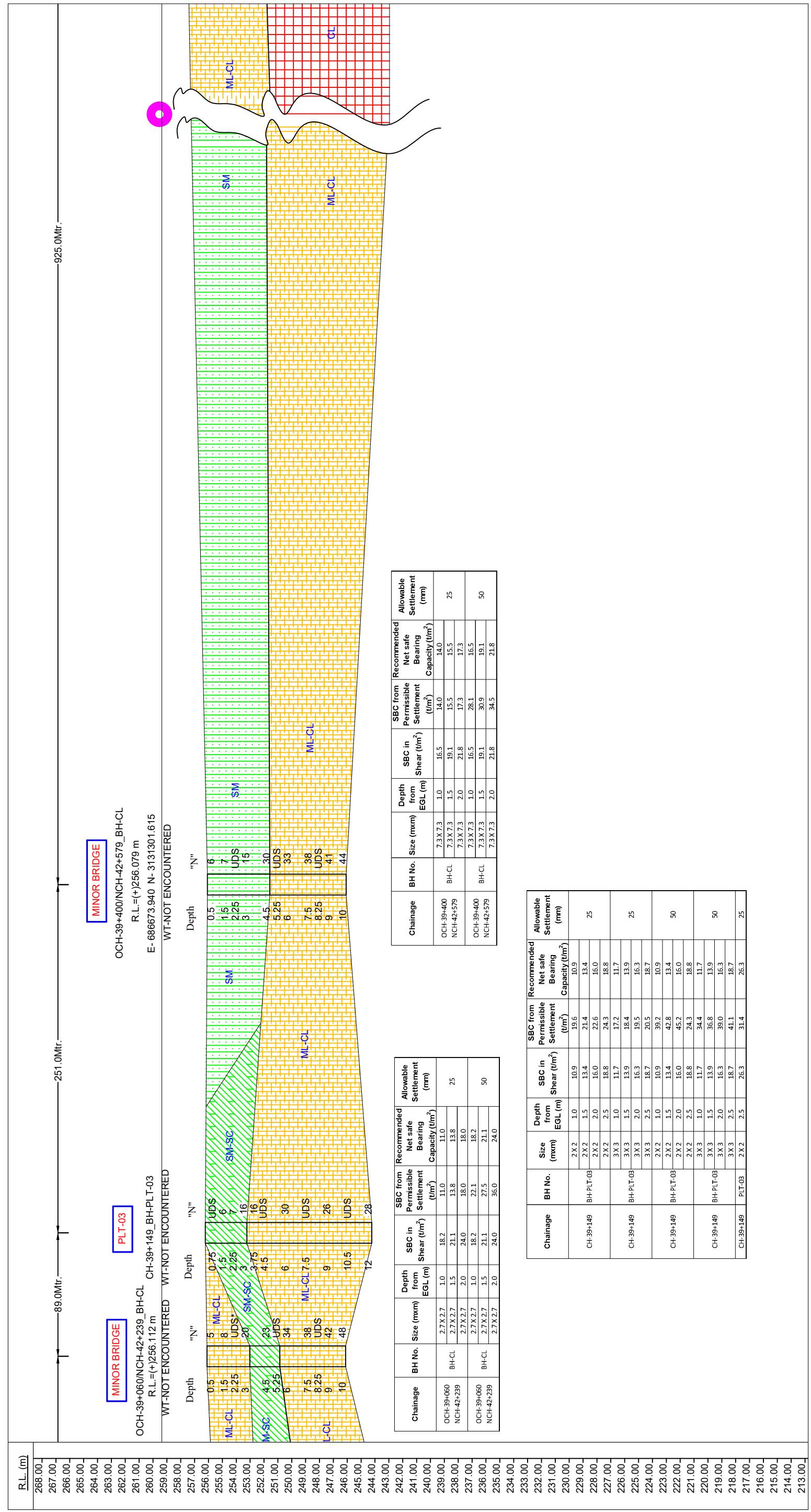


SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7) (LL<35 & 4<PI<7)
	ML-CL -Silty Clay of low plasticity (Above A-line, LL<35)
	CL- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m²)	SBC from Permissible Settlement (t/m²)	Recommended Net safe Bearing Capacity (t/m²)	Allowable Settlement (mm)
OCH-38+778	BH-CL	11.35X11.35	1.0	29.6	29.6	29.6	25
NCH-41+963	BH-CL	11.35X11.35	1.5	31.9	31.9	31.9	25
OCH-38+778	BH-CL	11.35X11.35	2.0	34.2	34.2	34.2	25
NCH-41+963	BH-CL	11.35X11.35	2.5	36.5	36.5	36.5	25
OCH-38+778	BH-CL	11.35X11.35	3.0	38.8	38.8	38.8	25
NCH-41+963	BH-CL	11.35X11.35	3.5	41.1	41.1	41.1	25
OCH-38+778	BH-CL	11.35X11.35	4.0	43.4	43.4	43.4	25
NCH-41+963	BH-CL	11.35X11.35	4.5	45.7	45.7	45.7	25
OCH-38+778	BH-CL	11.35X11.35	5.0	48.0	48.0	48.0	25
NCH-41+963	BH-CL	11.35X11.35	5.5	50.3	50.3	50.3	25

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



MINOR BRIDGE
 OCH-39+400/NCH-42+579_BH-CL
 R.L.= (+)256.079 m
 E- 686673.940 N- 3131301.615
 WT-NOT ENCOUNTERED

MINOR BRIDGE
 OCH-39+060/NCH-42+239_BH-CL
 R.L.= (+)256.112 m
 CH-39+149_BH-PLT-03
 WT-NOT ENCOUNTERED

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m^2)	SBC from Permissible Settlement (t/m^2)	Recommended Net safe Bearing Capacity (t/m^2)	Allowable Settlement (mm)
OCH-39+400	BH-CL	7.3 X 7.3	1.0	16.5	14.0	14.0	25
		7.3 X 7.3	1.5	19.1	15.5	15.5	
		7.3 X 7.3	2.0	21.8	17.3	17.3	
OCH-39+400	BH-CL	7.3 X 7.3	1.0	16.5	28.1	16.5	50
		7.3 X 7.3	1.5	19.1	30.9	19.1	
		7.3 X 7.3	2.0	21.8	34.5	21.8	

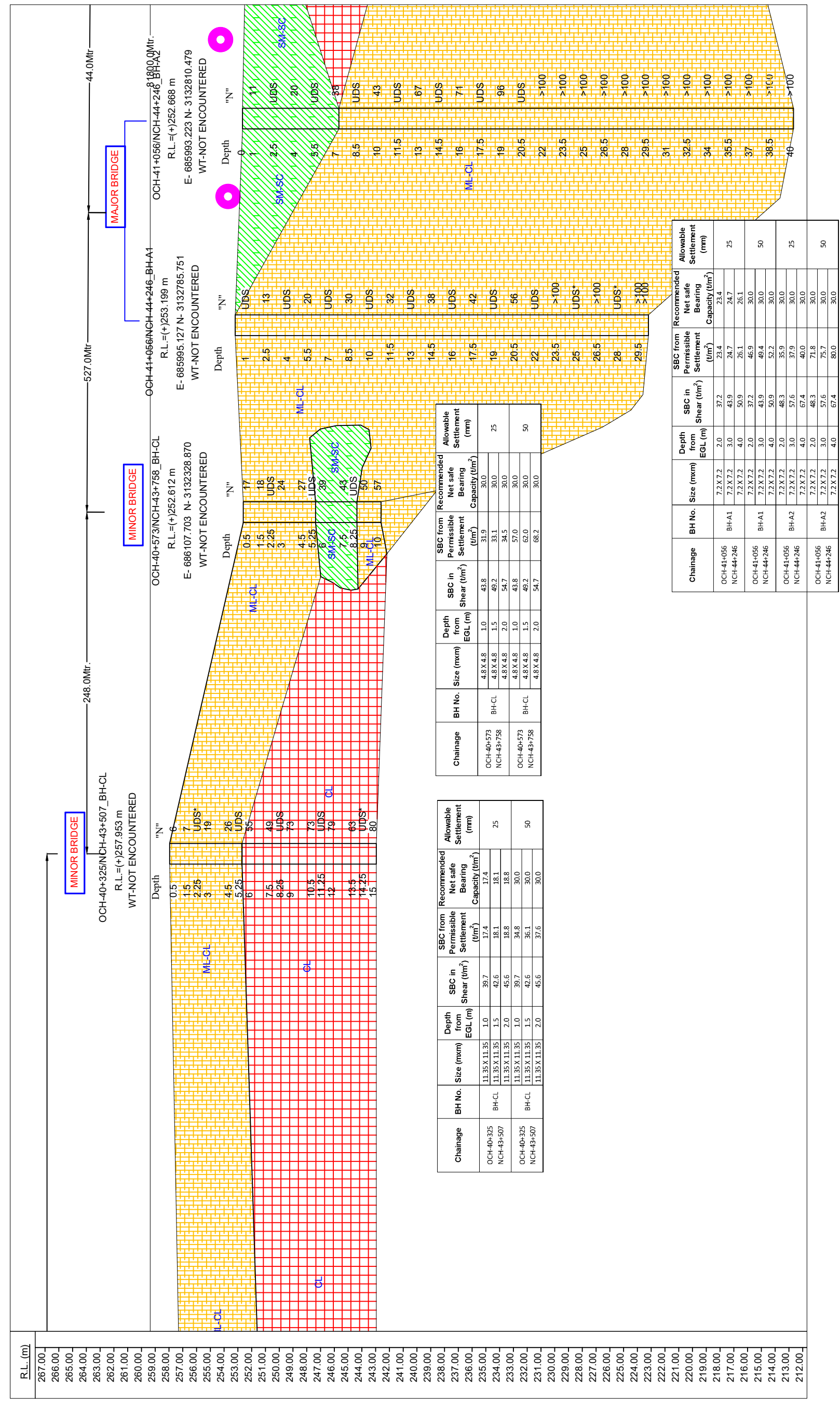
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m^2)	SBC from Permissible Settlement (t/m^2)	Recommended Net safe Bearing Capacity (t/m^2)	Allowable Settlement (mm)
OCH-39+060	BH-CL	2.7 X 2.7	1.0	18.2	11.0	11.0	25
		2.7 X 2.7	1.5	21.1	13.8	13.8	
		2.7 X 2.7	2.0	24.0	18.0	18.0	
OCH-39+060	BH-CL	2.7 X 2.7	1.0	18.2	22.1	18.2	50
		2.7 X 2.7	1.5	21.1	27.5	21.1	
		2.7 X 2.7	2.0	24.0	36.0	24.0	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m^2)	SBC from Permissible Settlement (t/m^2)	Recommended Net safe Bearing Capacity (t/m^2)	Allowable Settlement (mm)
CH-39+149	BH-PLT-03	2 X 2	1.0	10.9	15.6	10.9	25
		2 X 2	1.5	13.4	21.4	13.4	
		2 X 2	2.0	16.0	25.6	16.0	
CH-39+149	BH-PLT-03	3 X 3	1.0	11.7	17.2	11.7	25
		3 X 3	1.5	13.9	18.4	13.9	
		3 X 3	2.0	16.3	19.5	16.3	
CH-39+149	BH-PLT-03	2 X 2	1.0	10.9	39.2	10.9	50
		2 X 2	1.5	13.4	42.8	13.4	
		2 X 2	2.0	16.0	45.2	16.0	
CH-39+149	BH-PLT-03	2 X 2	1.0	11.7	24.3	11.7	50
		3 X 3	1.0	11.7	34.4	11.7	
		3 X 3	1.5	13.9	36.8	13.9	
CH-39+149	BH-PLT-03	3 X 3	2.0	16.3	39.0	16.3	50
		3 X 3	2.5	18.7	41.1	18.7	
		3 X 3	2.5	26.3	31.4	26.3	

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

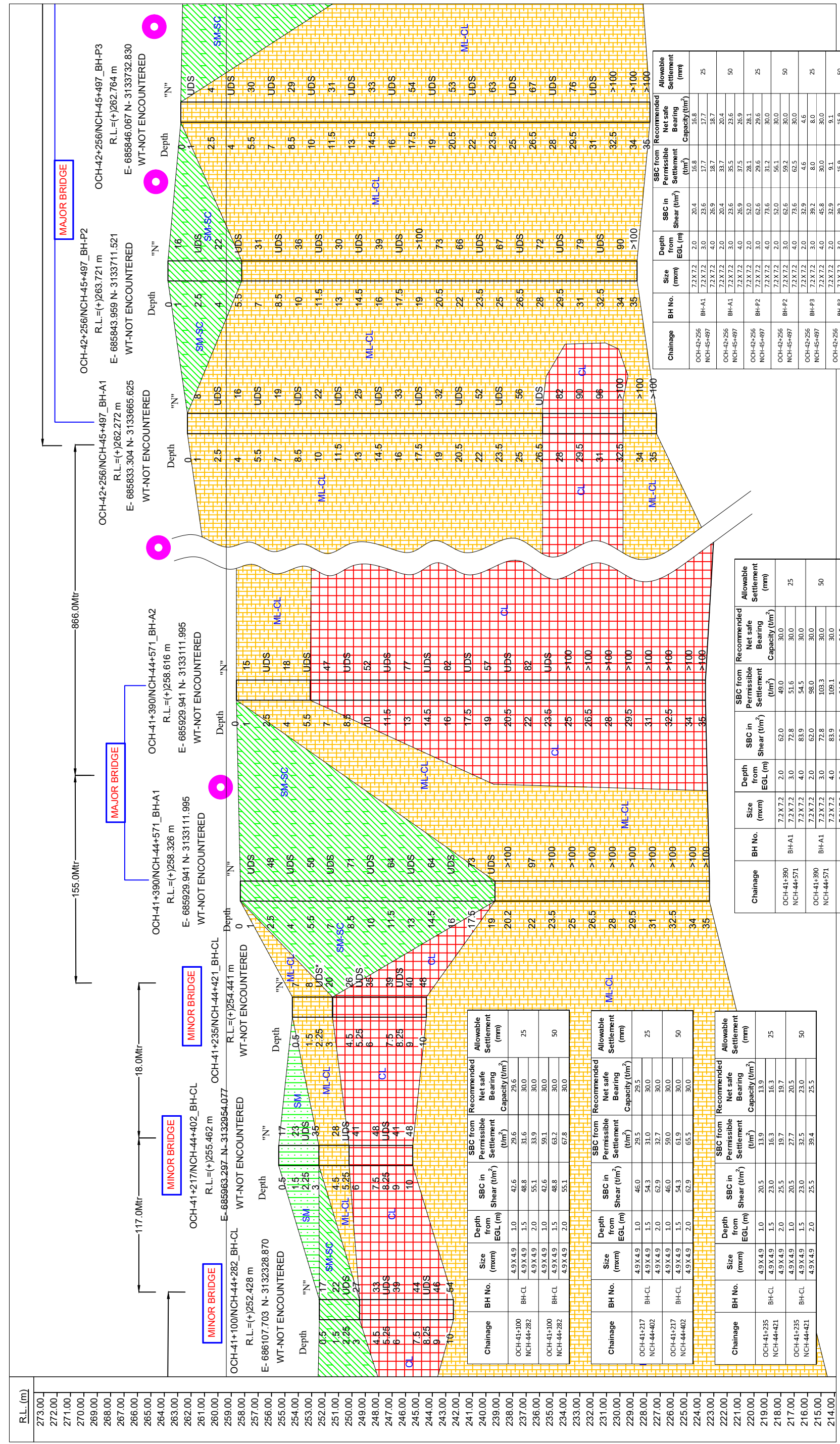
CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



SYMBOL	DESCRIPTION
[Green diagonal lines]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green diagonal lines with dots]	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
[Yellow diagonal lines]	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
[Red diagonal lines]	CL-Silty Clay of low plasticity (Above A-line, LL<35)
[Red diagonal lines with dots]	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED
[Blue arrow]	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-41+100	BH-CL	4.9 X 4.9	1.0	42.6	29.6	29.6	25
NCH-44+282	BH-CL	4.9 X 4.9	1.5	48.8	31.6	30.0	30.0
OCH-41+100	BH-CL	4.9 X 4.9	2.0	55.1	33.9	30.0	30.0
NCH-44+282	BH-CL	4.9 X 4.9	1.0	42.6	59.1	30.0	30.0
OCH-41+100	BH-CL	4.9 X 4.9	1.5	48.8	63.2	30.0	30.0
NCH-44+282	BH-CL	4.9 X 4.9	2.0	55.1	67.8	30.0	30.0

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-41+217	BH-CL	4.9 X 4.9	1.0	46.0	29.5	29.5	25
NCH-44+402	BH-CL	4.9 X 4.9	1.5	54.3	31.0	30.0	30.0
OCH-41+217	BH-CL	4.9 X 4.9	2.0	62.9	32.7	30.0	30.0
NCH-44+402	BH-CL	4.9 X 4.9	1.0	46.0	59.0	30.0	30.0
OCH-41+217	BH-CL	4.9 X 4.9	1.5	54.3	61.9	30.0	30.0
NCH-44+402	BH-CL	4.9 X 4.9	2.0	62.9	65.5	30.0	30.0

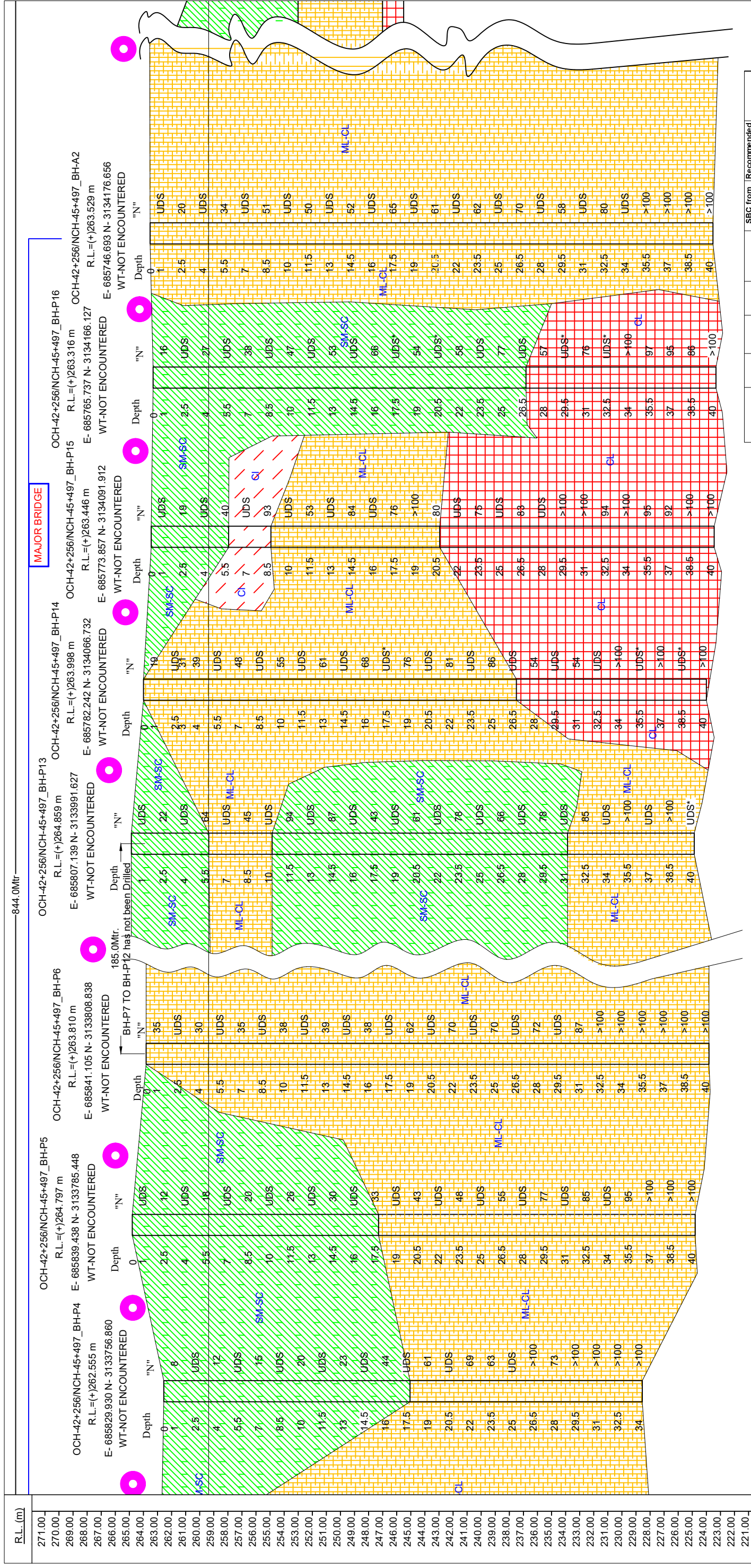
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-41+235	BH-CL	4.9 X 4.9	1.0	20.5	13.9	13.9	25
NCH-44+421	BH-CL	4.9 X 4.9	1.5	23.0	16.3	16.3	25
OCH-41+235	BH-CL	4.9 X 4.9	2.0	25.5	19.7	19.7	25
NCH-44+421	BH-CL	4.9 X 4.9	1.0	20.5	27.7	20.5	25
OCH-41+235	BH-CL	4.9 X 4.9	1.5	23.0	32.5	23.0	25
NCH-44+421	BH-CL	4.9 X 4.9	2.0	25.5	39.4	25.5	25

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-41+390	BH-A1	7.2 X 7.2	2.0	62.0	49.0	30.0	25
NCH-44+571	BH-A1	7.2 X 7.2	3.0	72.8	51.6	30.0	30.0
OCH-41+390	BH-A1	7.2 X 7.2	4.0	83.9	54.5	30.0	30.0
NCH-44+571	BH-A1	7.2 X 7.2	2.0	62.0	96.0	30.0	30.0
OCH-41+390	BH-A1	7.2 X 7.2	3.0	72.8	103.3	30.0	30.0
NCH-44+571	BH-A1	7.2 X 7.2	4.0	83.9	109.1	30.0	30.0
OCH-41+390	BH-A2	7.2 X 7.2	2.0	28.9	24.5	24.5	25
NCH-44+571	BH-A2	7.2 X 7.2	3.0	33.9	28.7	28.7	30.0
OCH-41+390	BH-A2	7.2 X 7.2	4.0	39.1	34.6	30.0	30.0
NCH-44+571	BH-A2	7.2 X 7.2	2.0	28.9	49.0	28.9	30.0
OCH-41+390	BH-A2	7.2 X 7.2	3.0	33.9	57.4	30.0	30.0
NCH-44+571	BH-A2	7.2 X 7.2	4.0	39.1	69.2	30.0	30.0

SYMBOL	DESCRIPTION
[Green diagonal lines]	SM - Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Green horizontal lines]	SM-SC - Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PI<7)
[Yellow diagonal lines]	ML-CL - Silty clay with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7)
[Red diagonal lines]	CL - Silty Clay of low plasticity (Above A-line, LL<35)
[Red horizontal lines]	CI - Clay of medium plasticity (Above A-line, 35<LL<50)
[Pink circle]	BOREHOLE REQUIRED

Note:- Fines= Percentage of Silty + Clay A-line= 73(wi-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	2.0	25.5	12.2	12.2	25
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	3.0	31.0	12.9	12.9	25
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	4.0	36.7	13.6	13.6	25
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	2.0	25.5	24.5	24.5	50
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	3.0	31.0	25.8	25.8	50
OCH-42+256 NCH-45+497	BH-P4	7.2 X 7.2	4.0	36.7	27.2	27.2	50
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	2.0	37.9	15.0	15.0	25
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	3.0	44.7	15.9	15.9	25
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	4.0	51.8	17.0	17.0	25
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	2.0	37.9	30.1	30.1	50
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	3.0	44.7	31.7	31.7	50
OCH-42+256 NCH-45+497	BH-P5	7.2 X 7.2	4.0	51.8	33.9	33.9	50
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	2.0	64.4	30.6	30.6	25
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	3.0	75.4	32.3	32.3	25
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	4.0	86.8	34.1	34.1	25
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	2.0	64.4	61.2	61.2	50
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	3.0	75.4	64.5	64.5	50
OCH-42+256 NCH-45+497	BH-P6	7.2 X 7.2	4.0	86.8	68.2	68.2	50

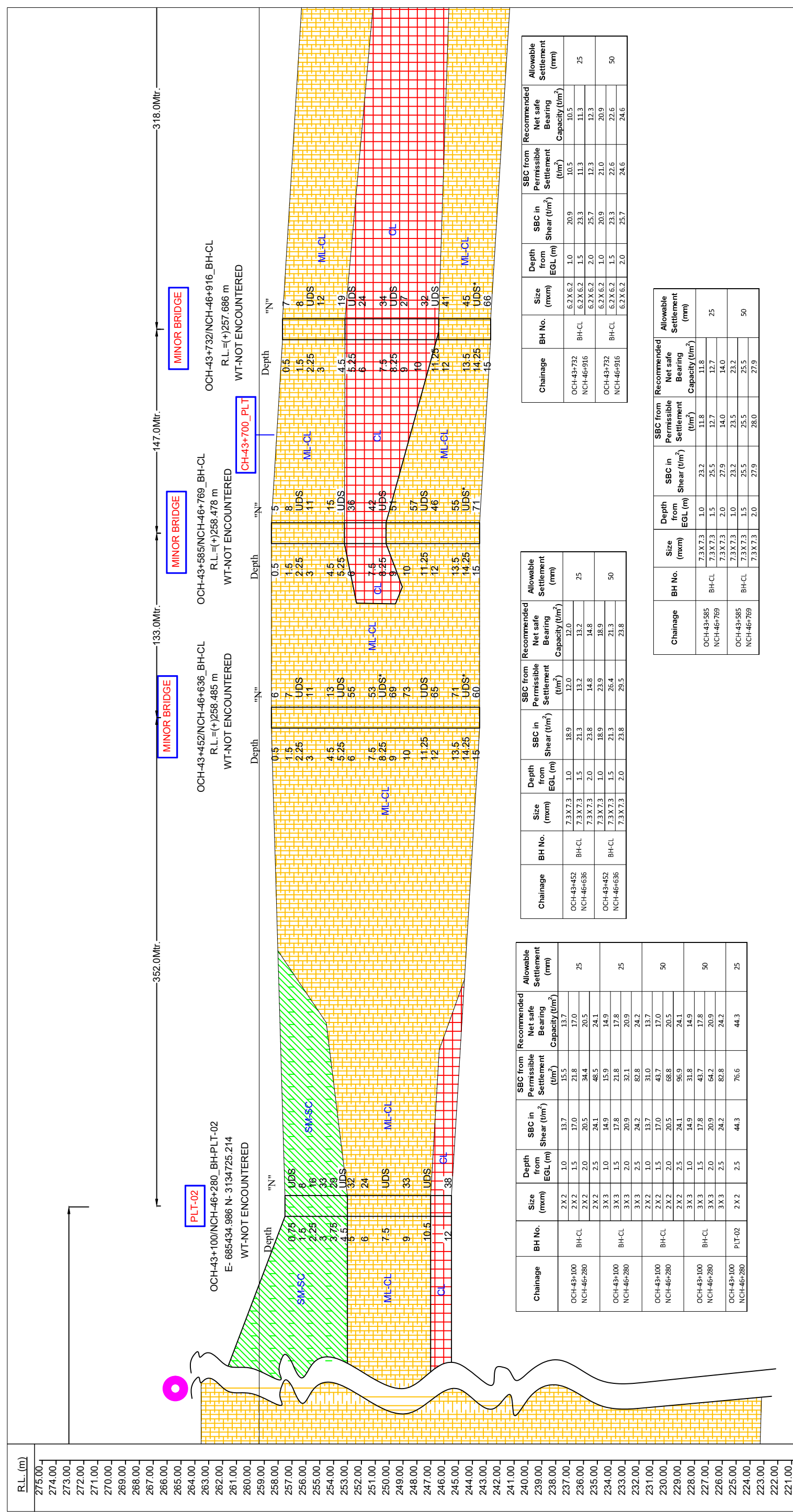
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	2.0	56.2	37.4	30.0	25
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	3.0	67.3	44.5	30.0	25
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	4.0	78.9	53.2	30.0	25
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	2.0	56.2	74.8	30.0	50
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	3.0	67.3	89.0	30.0	50
OCH-42+256 NCH-45+497	BH-P13	7.2 X 7.2	4.0	78.9	106.4	30.0	50
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	2.0	63.2	41.0	30.0	25
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	3.0	74.9	43.7	30.0	25
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	4.0	87.1	46.1	30.0	25
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	2.0	63.2	82.0	30.0	50
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	3.0	74.9	87.4	30.0	50
OCH-42+256 NCH-45+497	BH-P14	7.2 X 7.2	4.0	87.1	92.3	30.0	50
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	2.0	48.4	32.9	30.0	25
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	3.0	59.4	39.0	30.0	25
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	4.0	69.8	48.6	30.0	25
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	2.0	48.4	65.8	30.0	50
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	3.0	59.4	79.4	30.0	50
OCH-42+256 NCH-45+497	BH-P15	7.2 X 7.2	4.0	69.8	97.2	30.0	50

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	2.0	54.1	31.7	30.0	25
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	3.0	64.8	33.4	30.0	25
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	4.0	76.0	35.3	30.0	25
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	2.0	54.1	63.4	30.0	50
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	3.0	64.8	66.8	30.0	50
OCH-42+256 NCH-45+497	BH-P16	7.2 X 7.2	4.0	76.0	70.6	30.0	50
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	2.0	70.4	19.4	19.4	25
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	3.0	82.9	20.4	20.4	25
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	4.0	95.9	21.6	21.6	25
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	2.0	70.4	38.8	30.0	50
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	3.0	82.9	40.9	30.0	50
OCH-42+256 NCH-45+497	BH-A2	7.2 X 7.2	4.0	95.9	43.2	30.0	50

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC - Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PI<7))
	ML-CL - Silty with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4-PI<7))
	CL - Silty Clay of low plasticity (Above A-line, LL<35)
	CI - Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wi<20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (m x m)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-43+100 NCH-46+280	BH-CL	2 X 2	1.0	13.7	15.5	13.7	25
			1.5	17.0	21.8	17.0	
			2.0	20.5	34.4	20.5	
OCH-43+100 NCH-46+280	BH-CL	3 X 3	1.0	14.9	15.9	14.9	25
			1.5	17.8	21.8	17.8	
			2.0	20.9	32.1	20.9	
OCH-43+100 NCH-46+280	BH-CL	2 X 2	1.0	13.7	15.5	13.7	50
			1.5	17.0	21.8	17.0	
			2.0	20.5	34.4	20.5	
OCH-43+100 NCH-46+280	BH-CL	3 X 3	1.0	14.9	15.9	14.9	50
			1.5	17.8	21.8	17.8	
			2.0	20.9	32.1	20.9	
OCH-43+100 NCH-46+280	P.L.T-02	2 X 2	2.5	44.3	76.6	44.3	25

Chainage	BH No.	Size (m x m)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-43+452 NCH-46+656	BH-CL	7.3 X 7.3	1.0	18.9	12.0	12.0	25
			1.5	21.3	13.2	13.2	
			2.0	23.8	14.8	14.8	
OCH-43+452 NCH-46+656	BH-CL	7.3 X 7.3	1.0	18.9	23.9	21.3	50
			1.5	21.3	26.4	21.3	
			2.0	23.8	29.5	23.8	

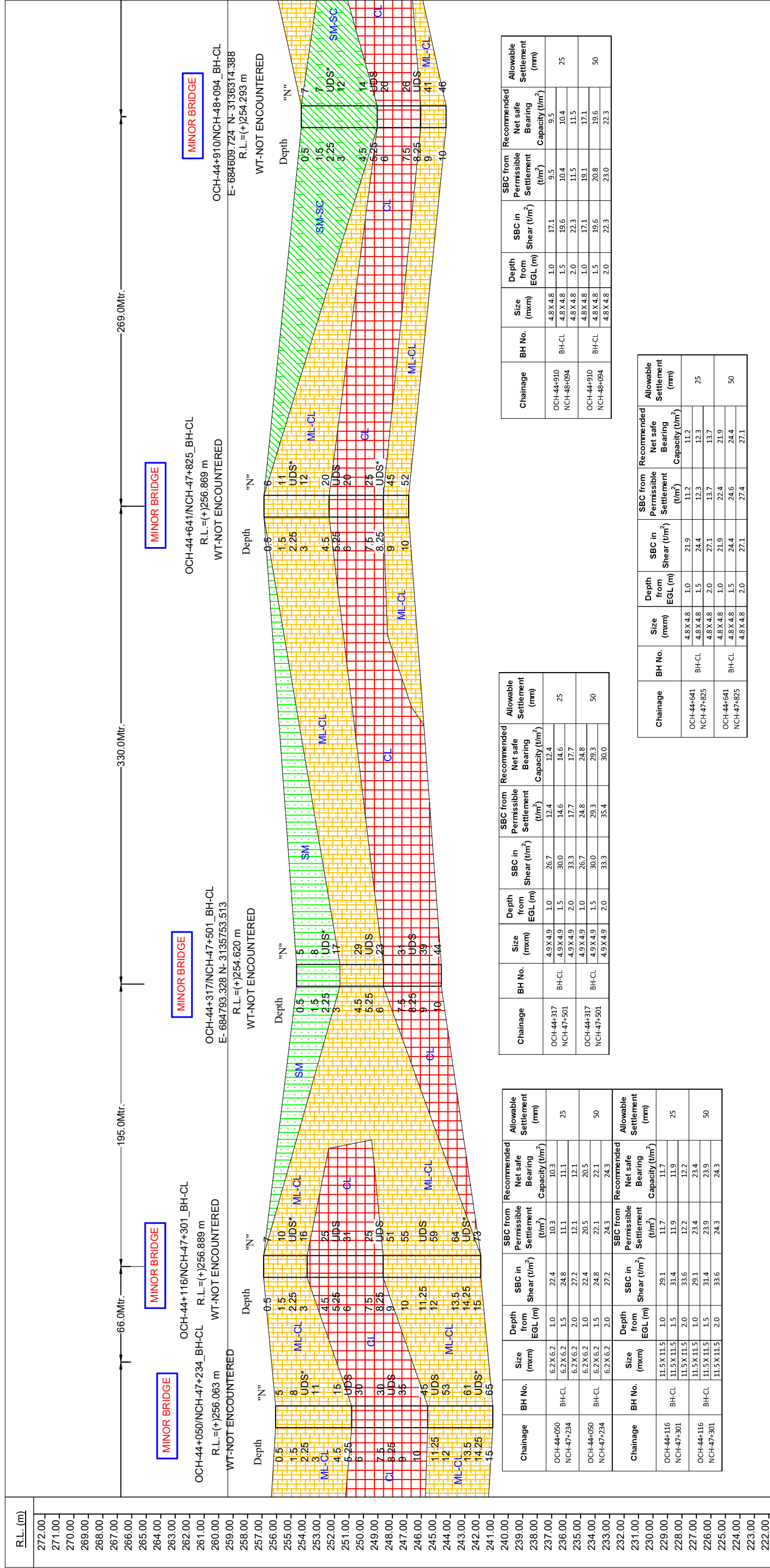
Chainage	BH No.	Size (m x m)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-43+732 NCH-46+916	BH-CL	6.2 X 6.2	1.0	20.9	10.5	10.5	25
			1.5	23.3	11.3	11.3	
			2.0	25.7	12.3	12.3	
OCH-43+732 NCH-46+916	BH-CL	6.2 X 6.2	1.0	20.9	21.0	20.9	50
			1.5	23.3	22.6	22.6	
			2.0	25.7	24.6	24.6	

Chainage	BH No.	Size (m x m)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-43+585 NCH-46+769	BH-CL	7.3 X 7.3	1.0	23.2	11.8	11.8	25
			1.5	25.5	12.7	12.7	
			2.0	27.9	14.0	14.0	
OCH-43+585 NCH-46+769	BH-CL	7.3 X 7.3	1.0	23.2	23.5	23.2	50
			1.5	25.5	25.5	25.5	
			2.0	27.9	28.0	27.9	

SYMBOL	DESCRIPTION
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-44+050	BH-CL	6.2X6.2	1.0	22.4	10.3	10.3	25
		6.2X6.2	1.5	24.8	11.1	11.1	
		6.2X6.2	2.0	27.2	12.1	12.1	
OCH-44+050	BH-CL	6.2X6.2	1.0	22.4	20.5	20.5	50
		6.2X6.2	1.5	24.8	22.1	22.1	
		6.2X6.2	2.0	27.2	24.3	24.3	
Chainage		Size (mm)	Depth from EGL (m)	SBC in Shear (t/m²)	SBC from Permissible Settlement (t/m²)	Recommended Net safe Bearing Capacity (t/m²)	Allowable Settlement (mm)
OCH-44+116	BH-CL	11.5X11.5	1.0	29.1	11.7	11.7	25
NCH-47-301	BH-CL	11.5X11.5	1.5	31.4	11.9	11.9	
OCH-44+116	BH-CL	11.5X11.5	2.0	33.6	12.2	12.2	50
NCH-47-301	BH-CL	11.5X11.5	1.5	29.1	23.4	23.4	
NCH-47-301	BH-CL	11.5X11.5	2.0	33.6	24.3	24.3	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-44+317	BH-CL	4.9X4.9	1.0	26.7	12.4	12.4	25
		4.9X4.9	1.5	30.0	14.6	14.6	
		4.9X4.9	2.0	33.3	17.7	17.7	
OCH-44+317	BH-CL	4.9X4.9	1.0	26.7	24.8	24.8	50
		4.9X4.9	1.5	30.0	29.3	29.3	
		4.9X4.9	2.0	33.3	35.4	35.4	

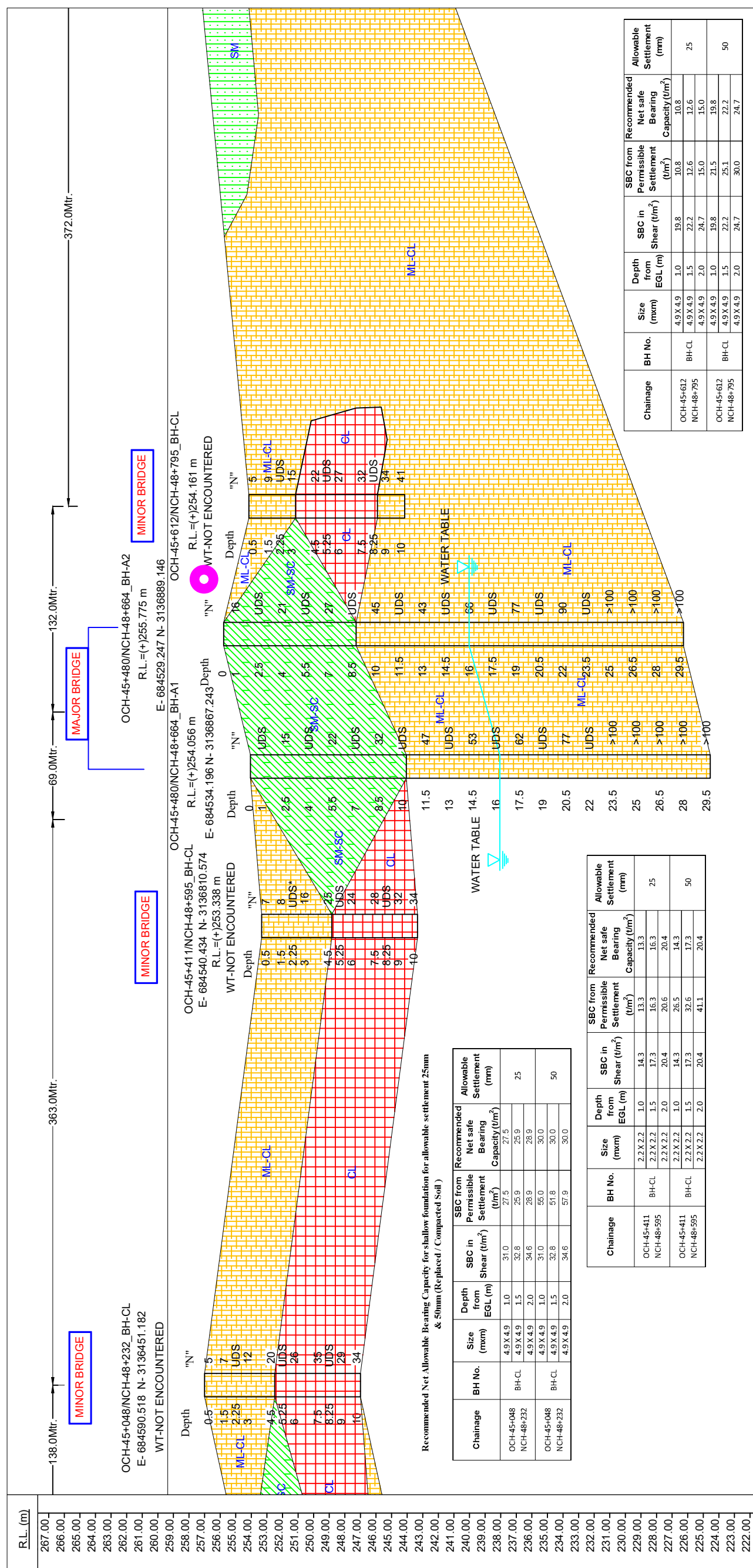
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-44+910	BH-CL	4.8X4.8	1.0	17.1	9.5	9.5	25
		4.8X4.8	1.5	19.6	10.4	10.4	
		4.8X4.8	2.0	22.3	11.5	11.5	
OCH-44+910	BH-CL	4.8X4.8	1.0	17.1	19.1	19.1	50
		4.8X4.8	1.5	19.6	20.8	20.8	
		4.8X4.8	2.0	22.3	23.0	23.0	

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-44+641	BH-CL	4.8X4.8	1.0	21.9	11.2	11.2	25
		4.8X4.8	1.5	24.4	12.3	12.3	
		4.8X4.8	2.0	27.1	13.7	13.7	
OCH-44+641	BH-CL	4.8X4.8	1.0	21.9	22.4	21.9	50
		4.8X4.8	1.5	24.4	24.6	24.6	
		4.8X4.8	2.0	27.1	27.4	27.4	

SYMBOL	DESCRIPTION
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	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CL- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm & 50mm (Replaced / Compacted Soil)

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-45+048	BH-CL	4.9X4.9	1.0	31.0	21.5	27.5	25
NCH-48+232	BH-CL	4.9X4.9	1.5	32.8	25.9	25.9	25
OCH-45+048	BH-CL	4.9X4.9	1.0	31.0	55.0	30.0	50
NCH-48+232	BH-CL	4.9X4.9	1.5	32.8	51.8	30.0	50
OCH-45+048	BH-CL	4.9X4.9	2.0	34.6	57.9	30.0	50

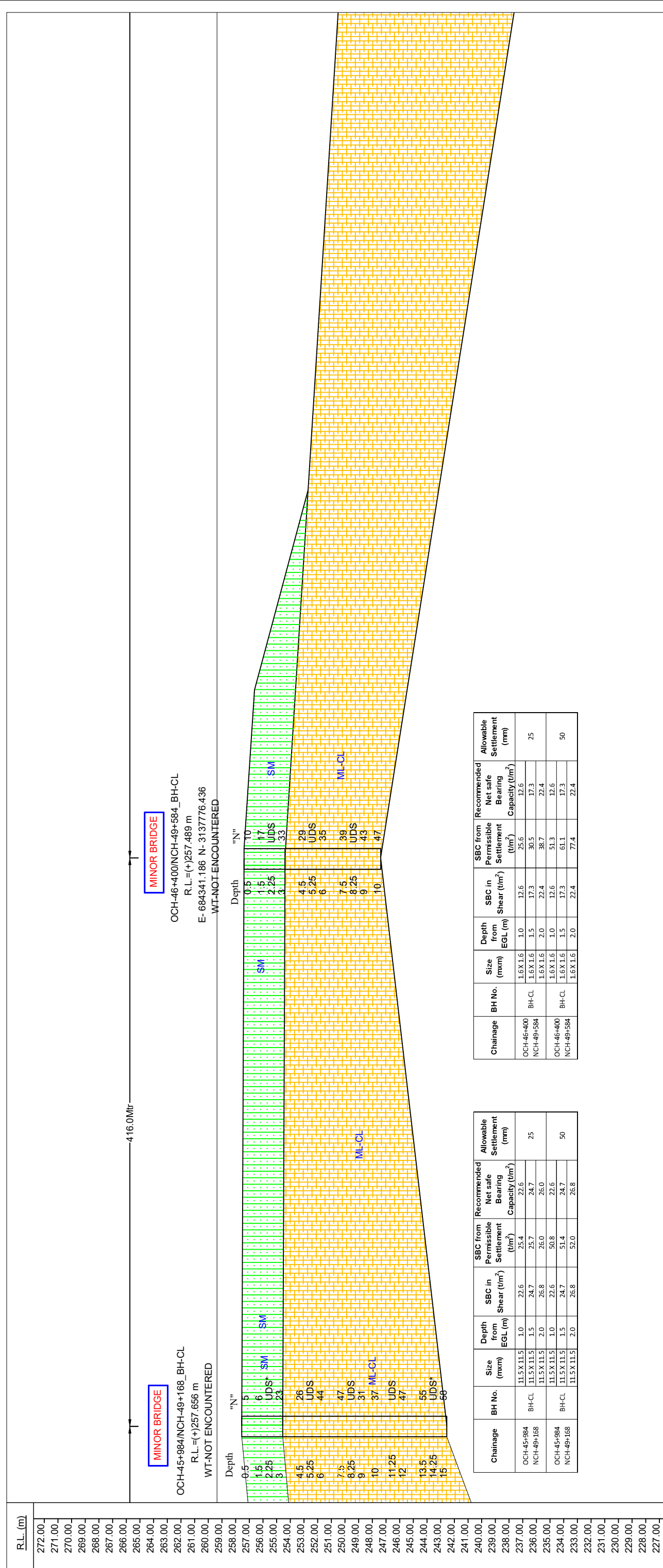
Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-45+411	BH-CL	2.2X2.2	1.0	14.3	13.3	13.3	25
NCH-48+595	BH-CL	2.2X2.2	1.5	17.3	16.3	16.3	25
OCH-45+411	BH-CL	2.2X2.2	1.0	14.3	26.5	14.3	50
NCH-48+595	BH-CL	2.2X2.2	1.5	17.3	32.6	17.3	50
OCH-45+411	BH-CL	2.2X2.2	2.0	20.4	41.1	20.4	50

Chainage	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-45+480	BH-A1	7.2X7.2	2.0	41.2	26.4	26.4	25
NCH-48+664	BH-A1	7.2X7.2	3.0	49.6	27.8	27.8	25
OCH-45+480	BH-A1	7.2X7.2	2.0	41.2	52.8	30.0	50
NCH-48+664	BH-A1	7.2X7.2	3.0	49.6	55.7	30.0	50
OCH-45+480	BH-A2	7.2X7.2	2.0	53.4	26.9	26.9	25
NCH-48+664	BH-A2	7.2X7.2	3.0	64.1	28.4	28.4	25
OCH-45+480	BH-A2	7.2X7.2	2.0	53.4	53.9	30.0	50
NCH-48+664	BH-A2	7.2X7.2	3.0	64.1	56.8	30.0	50

SYMBOL	DESCRIPTION
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	CL-Silty Clay of low plasticity (Above A-line, LL<35)
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	BOREHOLE REQUIRED

Note:- Fines= Percentage of Silty + Clay A-line= 73(wL-20) SCALE:- HOR:- 1:2850 VER:- 1:285

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.



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	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	CI- Clay of medium plasticity (Above A-line, 35<LL<50)
	BOREHOLE REQUIRED
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl-20) SCALE:- HOR:- 1:2850 VER:- 1:285

APPENDIX – B (LAB TEST RESULTS)

Appendix No.	ITEMS
B-1	SOIL CHARACTERISTICS SHEETS
B-2	RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES
B-3	RESULT OF CHEMICAL ANALYSIS OF WATER SAMPLES
B-4	GSD CURVES
B-5	SHEAR CURVE
B-6	CONSOLIDATION CURVE
B-7	PLT TEST CURVE

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.		IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.	Ref. Code														
								19-12-2021	to 19-12-2021			Dhulawat	PLT-06	8.00 m	12.45 m	693884.000 m	3124860.000 m	+	265.960 m	SR-544_21-22																
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)		Natural Moisture Content (%)		Dry Density (g/cm ³)	Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)					
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-1	0.75	-	-	Yellowish brown, Loose, Sandy silt	ML-CL	-	-	-	-	-	-	7	-	-	-	-	1.65	10.90	1.49	2.66	24	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	1.50	5	7	-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	2.25	22	29	-	ML-CL	-	Silt	31	1	2	21	26	22	28	6	1.69	11.50	1.52	2.65	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	3.00	30	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-4	3.75	37	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	4.50	-	-	-	ML-CL	-	-	34	1	1	22	26	22	26	4	1.73	12.40	1.54	2.65	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	6.00	49	49	Yellowish brown, Medium dense to Very dense, Sandy silt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	7.50	-	-	-	ML-CL	-	-	32	2	1	21	25	21	25	4	1.75	12.80	1.55	2.65	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	9.00	54	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	12.00	63	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring					Chainage (km./Location)		B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code				
	03-10-2021 to 05-10-2021		29+487 Major Bridge		27.53 m		53.00 m		696007.240 m			3123405.825 m		Void Ratio (e _v)	Pressure (kg/cm ²)			C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)	
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Type of Test			Cohesion C (kg/cm ²)	Angle of Friction (φ)				Free Swell Index (%)
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel				Liquid Limit	Plastic Limit	Plasticity Index	
DS	0.00	-	-	Brown, Loose, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-				-
SPT-1	1.00	9	14	Brown, Medium dense, Sandy silt of low plasticity	ML-CL		61	29	2	1	0	26	20	6	-	-	-	-	-	-	
UDS-1	2.50	-	-		ML-CL		59	27	3	2	0	27	20	7	-	-	-	-	-	-	-
SPT-2	4.00	25	28	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	5.50	-	-		ML-CL		52	33	3	1	4	1	26	20	6	-	-	-	-	-	-
SPT-3	7.00	49	45		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-		ML-CL		51	30	4	2	5	0	28	21	7	-	-	-	-	-	-
SPT-4	10.00	57	46		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-4	11.50	-	-		ML-CL		49	31	3	2	8	0	26	19	7	-	-	-	-	-	-
SPT-5	13.00	63	45		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	14.50	-	-		ML-CL		51	33	2	1	6	1	27	21	6	-	-	-	-	-	-
SPT-6	16.00	82	53		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	17.50	-	-		ML-CL		46	29	5	3	9	1	27	20	7	-	-	-	-	-	-
SPT-7	19.00	100 (23cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	20.50	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	22.00	100 (22cm)	-	ML-CL		50	30	3	2	6	2	26	19	7	-	-	-	-	-	-	
SPT-9	23.50	100 (22cm)	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	25.00	>100	-	ML-CL		50	27	4	3	8	0	27	20	7	-	-	-	-	-	-	

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Date of Boring	Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)						R.L.	Ref. Code
	03-10-2021	to	06-10-2021	29+487 Major Bridge	BH-A2	27.39 m											53.00 m	695931.872 m		3123393.836 m	(+266.542 m)	SR-544_21-22					
Sample Type	Clay	Silt	Fine	Medium	Coarse	Gravel	Gravel	Coarse	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)		
SPT-14	7	53	28	2	1	7	2	2	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-16	11	59	19	1	2	8	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-18	10	56	20	3	2	8	1	30	20	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-20	11	52	17	4	5	9	2	31	20	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-22	10	53	22	3	2	10	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-23	6	54	32	4	2	2	0	26	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-25	7	52	34	5	1	1	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-27	10	51	19	9	2	5	4	31	20	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-29	11	50	20	7	4	6	2	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DS-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Date of Boring								Chainage (km.)/Location			B.H. No.			Depth of Water Table				Termination Depth			Coordinates (E,N)							R.L.		Ref. Code											
								20-11-2021	to	20-11-2021	Minor Bridge	BH-CL	Not Encountered	10.00 m	Grain Size Distribution % wt retained		Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm³)	Natural Moisture Content (%)	Dry Density (g/cm³)	Specific Gravity	Type of Test	Cohesion C (kg/cm²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm²)	C _v x 10 ⁻⁴ (cm²/Sec)	M _v x 10 ⁻² (cm²/Kg)	Compression Index (C _p)															
															Clay	Silt																			Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel								
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	DS	0.00	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	SPT-1	0.50	9	16	ML-CL			7	45	6	1	1	0	26	6																																		
	SPT-2	1.50	12	17	-	Brown, Loose to medium dense, Silty sand of low plasticity			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	UDS-1	2.25	-	-	ML-CL				9	55	6	1	1	0	28	21	7	-	-	-	13.10	1.53	2.66	DST	0.20	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	SPT-3	3.00	14	17	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPT-4	4.50	26	28	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	UDS-2	5.25	-	-	CL	Brown, Very stiff to hard, Silty clay of low plasticity			11	50	5	3	6	0	32	21	11	-	-	16.23	1.60	2.67	UUT	1.02	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPT-5	6.00	33	33	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	7.50	43	39	ML-CL				6	49	4	2	4	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	8.25	-	-	ML-CL	Brown, Dense to very dense, Silty silt of low plasticity			7	45	6	1	3	0	27	20	7	-	-	16.70	1.63	2.66	DST	0.20	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	9.00	60	50	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-8	10.00	55	44	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring			Chainage (km./) Location			B.H. No.			Depth of Water Table			Termination Depth		Coordinates (E,N)							R.L.				Ref. Code					
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Sand	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v × 10 ⁻⁴ (cm ² /Sec)	M _v × 10 ⁻² (cm ² /Kg)	Compression Index (C _c)		
DS	0.00	-	-	-																															
SPT-1	0.50	10	18		ML-CL		6	45	3	2	0	26	6																						
SPT-2	1.50	13	19																																
UDS-1	2.25	-	-		ML-CL		7	46	39	5	1	2	0	27	20	7		1.74	12.40	1.55	2.66	DST	0.22	24											
SPT-3	3.00	16	20																																
SPT-4	4.50	26	28																																
UDS-2	5.25	-	-		CL		11	48	30	4	2	5	0	32	21	11		1.87	15.26	1.62	2.68	UUT	1.36	5											
SPT-5	6.00	38	38																																
SPT-6	7.50	43	43																																
UDS-3	8.25	-	-		CL		10	49	27	4	3	7	0	30	20	10		1.93	16.56	1.66	2.67	UUT	1.91	4											
SPT-7	9.00	57	57																																
SPT-8	10.50	59	59																																
UDS-4	11.25	-	-		CL		12	51	23	3	2	9	0	33	22	11		1.98	17.85	1.68	2.67	UUT	2.30	4											
SPT-9	12.00	67	67																																
SPT-10	13.50	77	77																																
UDS-5	14.25	-	-		CL		11	50	25	5	1	8	0	31	20	11		2.03	19.22	1.70	2.68	UUT	3.18	4											
SPT-11	15.00 (27cm)	100	100																																
SPT-12	16.50 (25cm)	100	100																																
UDS*	17.25	-	-		CL		12	49	22	4	3	10	0	32	21	11		2.04	20.04	1.70															
SPT-13	18.00 (30cm)	100	100																																
SPT-14	19.50 (22cm)	100	100																																

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project Sample Type	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pawai to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Date of Boring										Chainage (km.)/Location	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)					R.L.	Ref. Code						
	16-10-2021		to		16-10-2021				30+697		Minor Bridge		BH-CL		Not Encountered		12.00 m				694847.555 m		3123845.139 m		SR-544_21-22														
	Grain Size Distribution % wt retained			Atterberg Limits %					Bulk Density (g/cm ³)		Natural Moisture Content (%)		Dry Density (g/cm ³)		Specific Gravity		Type of Test				Cohesion C (kg/cm ²)		Angle of Friction (φ)		Free Swell Index (%)		Swelling Pressure (kg/cm ²)		Permeability (cm/sec)		Void Ratio (e ₀)			Pressure (kg/cm ²)		C _v x 10 ⁻⁴ (cm ² /Sec)		M _v x 10 ⁻² (cm ² /Kg)	
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-1	1.00	10	16	0	33	65	1	1	0	0	0	0	0	0	0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-1	2.50	-	-	0	26	70	2	1	1	0	0	0	0	0	NP	NP	1.69	11.06	1.52	2.63	DST	0.00	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	4.00	16	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	5.50	-	-	0	21	71	2	2	4	0	0	0	0	0	NP	NP	1.75	12.10	1.56	2.62	DST	0.00	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-3	7.00	29	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	8.50	-	-	0	21	69	3	1	6	0	0	0	0	0	NP	NP	1.81	12.97	1.60	2.62	DST	0.00	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	10.00	41	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	11.50	-	-	0	16	70	4	3	5	2	-	-	-	-	NP	NP	1.83	13.64	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-	11.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.			Depth of Water Table						Termination Depth		Coordinates (E,N)						R.L.	Ref. Code										
								17-10-2021		to		17-10-2021			3.1+354		B.H.-CL			Not Encountered		15.00 m		694378.453 m		3124304.952 m				(+)264.674 m													
								Grain Size Distribution % wt retained							Atterberg Limits %			Bulk Density (g/cm ³)		Natural Moisture Content (%)		Dry Density (g/cm ³)		Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)			Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)					
Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit																															
DS	DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-1	SPT-1	1.00	10	10	Brown, Stiff to very stiff, Silty clay of low plasticity	CL		9	58	26	3	3	1	0	29	20	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-1	UDS-1	2.50	-	-	Brown, Stiff to very stiff, Silty clay of low plasticity	CL		10	58	23	4	2	2	1	30	20	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	SPT-2	4.00	21	21		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	UDS-2	5.50	-	-		CL		12	59	21	4	1	3	0	33	22	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	SPT-3	7.00	36	36		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	UDS-3	8.50	-	-		CL		11	55	22	5	2	5	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	SPT-4	10.00	42	42		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	UDS-4	11.50	-	-	Brown, Hard, Silty clay of low plasticity with gravel	CL		10	62	20	1	1	5	1	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	SPT-5	13.00	51	51		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	UDS-5	14.50	-	-		CL		11	56	19	6	2	6	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-	15.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																
								Clay		Silt		Sand		Gravel		Liquid Limit	Plastic Limit					Plasticity Index	Shrinkage Limit	Type of Test	Cohesion C (kg/cm ²)			Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)							
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pahwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
	UDS-1	1.00	-	-		CL		10	58	24	4	2	2	0	31	21	10	12.10	1.70	1.52	2.67	UUT	0.56	5	-	-	-	-	-	-	-	1.0-2.0	7.06	2.07	1.69	0.150							
	SPT-1	2.50	16	16		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	UDS-2	4.00	-	-	Brown, Very stiff, Silty clay of low plasticity	CL		9	53	26	6	2	4	0	29	20	9	13.26	1.77	1.56	2.68	UUT	0.75	4	-	-	-	-	-	-	-	2.0-4.0	4.72	1.18	-	-	-	-					
	SPT-2	5.50	22	22		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	UDS-3	7.00	-	-		CL		12	52	19	9	2	6	0	33	22	11	14.28	1.81	1.58	2.67	UUT	0.92	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPT-3	8.50	27	27		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	UDS-4	10.00	-	-		CL		11	54	20	7	3	5	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Grain Size Distribution % wt retained	Atterberg Limits %				Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code									
	Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm³)	Natural Moisture Content (%)	Dry Density (g/cm³)									Specific Gravity	Type of Test	Cohesion C (kg/cm²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm²)	Permeability (cm/sec)	Void Ratio (e₀)	Pressure (kg/cm²)	C _v × 10 ⁴ (cm²/Sec)	M _v × 10 ² (cm²/Kg)	Compression Index (C _p)											
																											Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Shrinkage Limit
		16-11-2021	to	16-11-2021		32+487	BH-CL		Not Encountered		12.00 m	69358.448 m	3125111.207 m	(+)261.988 m	SR-544_21-22																						
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	0.50	12	22				ML-CL																														
SPT-2	1.50	20	29				Brown, Medium dense, Sandy silt of low plasticity																														
UDS-1	2.25	-	-	7	48	33	8	1	3	0	27	20	7	1.80	12.94	1.59	2.66	DST	0.23	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	3.00	25	30																																		
SPT-4	4.50	41	44																																		
UDS-2	5.25	-	-	11	58	18	6	2	5	0	33	22	11	1.88	15.20	1.63	2.68	UUT	1.46	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	6.00	42	42				Brown, Hard, Silty clay of low plasticity																														
SPT-6	7.50	47	47																																		
UDS-3	8.25	-	-	6	29	50	9	1	5	0	26	20	6	1.88	15.16	1.63	2.65	DST	0.11	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-7	9.00	54	45																																		
SPT-8	10.50	57	45				Brown, Very dense, Silty sand with clay																														
UDS-4	11.25	-	-	7	23	51	11	1	7	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-9	12.00	63	46																																		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pawai to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)					R.L.	Ref. Code						
	IS Classification	IS Symbol	Not Encountered	10.00 m				693503.406 m	3125192.295 m		Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)								
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Grain Size Distribution % wt retained			Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Consolidation Parameters		
				Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit											Plastic Limit	Shrinkage Limit	
DS	0.00	-	-	Brown, Very stiff, Silty clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-1	0.50	14	14		12	56	25	6	1	0	0	34	11	23	-	-	-	-	-	-	-	-	-
SPT-2	1.50	18	26		8	50	30	9	2	1	0	28	7	21	-	-	-	-	-	-	-	-	-
UDS-1	2.25	-	-	Brown, Medium dense, Sandy silt of low plasticity	7	51	33	4	3	2	0	27	7	20	1.78	12.46	1.58	2.66	DST	0.18	25	-	-
SPT-3	3.00	20	24		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	4.50	22	22		11	51	28	6	2	2	0	32	11	21	-	-	-	-	-	-	-	-	-
UDS-2	5.25	-	-		10	53	26	6	2	3	0	31	10	21	1.82	15.26	1.58	2.67	UUT	0.85	6	-	-
SPT-5	6.00	28	28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	7.50	28	28	Brown, Very stiff to hard, Silty clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.25	-	-		12	51	24	6	2	5	0	33	11	22	1.87	16.89	1.60	2.68	UUT	1.16	5	-	-
SPT-7	9.00	32	32		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	10.00	38	38		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pahal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Grain Size Distribution % wt retained						Atterberg Limits %			Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code
	Date of Boring		Chainage (km./Location)		B.H. No.		Depth of Water Table		Termination Depth									Coordinates (E,N)				Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)										
	28-09-2021	to	29-09-2021	30+488 km	BH-A1	27.84 m	30.00 m	693220.478 m	3125465.069 m	Type of Test								Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)						Permeability (cm/sec)									
Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)		Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Shear Strength	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)											Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
SPT-1	5	40	50	4	1	0	0	26	19	7	-	-	-	-	-	-	-	-	-	-																
UDS-1	4	35	52	4	1	0	0	27	21	6	1.68	2.65	DST	0.11	26	-	-	-	-	-																
SPT-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-2	10	59	24	3	1	3	0	30	20	10	1.81	2.67	UUT	0.90	5	26.0	-	-	-																	
SPT-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-3	12	58	23	1	2	4	0	33	22	11	1.85	2.68	UUT	1.24	4	-	0.665	10.57	1.58	0.110																
SPT-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-4	11	58	20	5	2	4	0	32	21	11	1.87	2.67	UUT	1.36	4	22.0	-	8.39	1.23																	
SPT-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-5	10	56	24	3	2	5	0	30	20	10	-	-	-	-	-	-	-	-	-	-																
SPT-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-6	8	47	33	4	2	6	0	27	20	7	1.89	2.66	DST	0.22	27	-	-	6.18	0.74																	
SPT-7	0	36	48	5	2	9	0	-	Nil	NP	-	-	-	-	-	-	-	-	4.66	0.52																
SPT-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
SPT-9	7	46	37	2	1	7	0	26	20	6	-	-	-	-	-	-	-	-	-	-																
SPT-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																
UDS-6	8	47	33	4	2	6	0	27	20	7	1.89	2.66	DST	0.22	27	-	-	-	-																	
SPT-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																											
	28-09-2021	to			29-09-2021	30+488 km		BH-A1	27.84 m	30.00 m	693220.478 m			3125465.069 m	(+)262.988 m	SR-544_21-22																								
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																							
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)						
UDS-7	26.50	-	-		CL		11	51	26	4	2	6	0	32	21	11	-	2.03	19.28	1.70	2.67	UUT	3.11	4	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-12	28.00	>100	-	Brown, Hard, Silty clay of low plasticity with gravel	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-13	29.50	>100	-		CL		12	43	31	3	2	8	1	33	22	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DS-2	30.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pawai to Harsana Kalan including connectivity to existing IR network in the state of Haryana.					Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)						R.L.	Ref. Code																
	Date of Boring	Grain Size Distribution % wt retained						Atterberg Limits %			Natural Moisture Content (%)		Dry Density (g/cm ³)		Specific Gravity				Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _r x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _r x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)		
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	1.00	-	-	Brown, Medium dense, Silty sand with clay	SM-SC	-	4	31	60	2	1	0	26	20	6	-	1.72	11.14	1.55	2.65	-	DST	0.09	27	-	-	-	-	-	-	-	-		
SPT-1	2.50	16	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	4.00	-	-	-	CL	-	13	63	14	4	3	0	34	23	11	-	1.80	14.22	1.58	2.67	UUT	0.80	5	23.0	-	-	-	-	-	-	-	-		
SPT-2	5.50	24	24	Brown, Very stiff to hard, Silty clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	-	-	-	CL	-	12	63	17	3	1	4	33	22	11	-	1.84	15.30	1.60	2.68	UUT	1.06	4	-	-	-	-	-	-	-	-	-		
SPT-3	8.50	31	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-	-	ML-CL	-	7	51	30	4	3	4	26	19	7	-	1.84	14.80	1.60	2.66	DST	0.17	26	-	-	-	-	-	-	-	-	-		
SPT-4	11.50	40	87/2x	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	13.00	-	-	-	ML-CL	-	8	50	32	3	2	5	27	20	7	-	1.86	15.24	1.61	2.66	DST	0.19	27	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	54	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	16.00	-	-	-	SM	-	0	34	54	4	2	6	0	Nil	NP	-	1.84	13.04	1.63	2.62	DST	0.00	31	-	-	-	-	-	-	-	-	-	-	
SPT-6	17.50	76	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	19.00	-	-	Brown, Very dense, Silty sand with gravel	SM	-	0	23	63	2	3	9	0	Nil	NP	-	1.88	13.80	1.65	2.63	DST	0.00	32	-	-	-	-	-	-	-	-	-	-	-
SPT-7	20.50	100	(21cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	22.00	100	(19cm)	-	SM	-	0	32	57	1	3	7	0	Nil	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pahal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.							IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Grain Size Distribution % wt retained					Atterberg Limits %			Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.	Ref. Code
	Date of Boring		Chainage (km./Location)		B.H. No.		Depth of Water Table								Termination Depth		Coordinates (E,N)					Void Ratio (e_0)	Pressure (kg/cm^2)	$C_u \times 10^{-4}$ (cm ² /Sec)	$M_v \times 10^{-2}$ (cm ² /Kg)	Compression Index (C_c)							
	16-11-2021	to	16-11-2021	31+095	BH-CL	Not Encountered	10.00 m								692778.166 m	3125892.043 m	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)						Void Ratio (e_0)	Pressure (kg/cm^2)	$C_u \times 10^{-4}$ (cm ² /Sec)	$M_v \times 10^{-2}$ (cm ² /Kg)	Compression Index (C_c)		
Sample Type	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (ϕ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e_0)	Pressure (kg/cm^2)	$C_u \times 10^{-4}$ (cm ² /Sec)	$M_v \times 10^{-2}$ (cm ² /Kg)	Compression Index (C_c)							
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-1	12	53	28	6	1	0	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-1	11	53	26	5	3	2	0	31	21	10	-	1.69	14.16	1.48	2.67	UUT	0.37	5	-	-	-	-	-	-	-	-	-	-					
SPT-3	5	37	48	7	1	2	0	25	20	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-2	6	37	45	6	3	3	0	26	20	6	-	1.81	15.10	1.57	2.65	DST	0.10	27	-	-	-	-	-	-	-	-	-	-					
SPT-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-6	10	50	25	8	2	5	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-3	12	50	27	4	3	4	0	33	22	11	-	1.87	16.22	1.61	2.68	UUT	1.09	6	-	-	-	-	-	-	-	-	-	-					
SPT-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-8	11	50	24	9	1	5	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					

SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.		Ref. Code										
								Date of Boring				Chainage (km.)/Location		B.H. No.	Bulk Density (g/cm ³)		Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)		Void Ratio (e _v)	Pressure (kg/cm ²)	C _c x 10 ⁻⁴ (cm ² /sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
								Clay	Silt	Fine	Medium	Coarse	Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e _v)	Pressure (kg/cm ²)	C _c x 10 ⁻⁴ (cm ² /sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)						
																															Grain Size Distribution % wt retained			Atterberg Limits %		Depth of Water Table
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Pahwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	DS	0.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	UDS-1	1.00	-	-		ML-CL		7	55	35	2	1	0	26	19	7	1.70	12.06	1.52	2.66	DST	0.20	23	-	-	-	-	-	-	-	-	-	-			
	SPT-1	2.50	11	14		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	UDS-2	4.00	-	-		ML-CL		6	51	30	9	3	1	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	SPT-2	5.50	16	16		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	UDS-3	7.00	-	-		ML-CL		6	54	31	5	2	2	27	20	7	1.73	13.24	1.53	2.66	DST	0.21	24	-	-	-	-	-	-	-	-	-	-	-		
	SPT-3	8.50	27	24		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	UDS-4	10.00	-	-		ML-CL		7	51	33	7	1	1	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPT-4	11.50	21	16		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	UDS-5	13.00	-	-		ML-CL		7	53	30	5	3	2	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	24	17		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-6	16.00	-	-		ML-CL		8	52	32	3	2	3	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	17.50	26	16		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-7	19.00	-	-		ML-CL		7	53	28	4	2	6	26	19	7	1.88	15.22	1.63	2.67	DST	0.19	27	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	20.50	80	46		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-8	22.00	-	-		ML-CL		6	56	26	6	6	1	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	23.50	60	32		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-9	25.00	-	-		ML-CL		7	57	24	2	3	3	27	20	7	1.94	17.34	1.65	2.66	DST	0.18	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	26.50	100 (17cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-10	28.00	-	-		ML-CL		6	53	22	6	3	2	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

SOIL CHARACTERISTICS

Project	Date of Boring				Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)					R.L.	Ref. Code																																		
											Grain Size Distribution % wt retained			Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C _c (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _c x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																			
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patawa to Harsana Kalan including connectivity to existing IR network in the state of Haryana.	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit																Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity													
	SPT-10	29.50	100 (24cm)	-	-	Brown, Very dense, Sandy silt of low plasticity with gravel			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	SPT-11	31.00	100 (23cm)	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	SPT-12	32.50	100 (20cm)	-	-		ML-CL	ML-CL	6	51	26	5	2	10	0	26	20	6				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	SPT-13	34.00	>100	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	SPT-14	35.50	82	38	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	UDS-11	37.00	-	-	-					7	59	20	4	3	7	0	28	21	7			1.92	20.11	1.60	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	SPT-15	38.50	81	26	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPT-16	40.00	88	28	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)			Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km./Location			B.H. No.			Depth of Water Table		Termination Depth		Coordinates (E,N)						R.L.	Ref. Code													
		28-09-2021	to	29-09-2021						31+714 km	BH-A2	36.33 m	40.00 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m	692289.084 m	3126299.382 m																	
										Grain Size Distribution % wt retained						Atterberg Limits %			Natural Moisture Content (%)		Dry Density (g/cm ³)		Specific Gravity		Shear Strength			Free Swell Index (%)			Swelling Pressure (kg/cm ²)		Permeability (cm/sec)		Void Ratio (e ₀)			Pressure (kg/cm ²)			C _p x 10 ⁻⁴ (cm ² /Sec)		M _v x 10 ⁻² (cm ² /Kg)		Compression Index (C _p)	
										Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C ₂ (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _p x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)										
															Clay	Silt	Fine	Medium																			Coarse	Fine	Coarse							
UDS-10	UDS-10	29.50	-	-	-	-	ML-CL			6	55	26	3	1	9	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-11	SPT-11	31.00	100 (22cm)	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-12	SPT-12	32.50	100 (20cm)	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-13	SPT-13	34.00	>100	-	-	-	ML-CL			7	50	28	3	2	8	2	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-14	SPT-14	35.50	100 (20cm)	-	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-15	SPT-15	37.00	77	25	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-11	UDS-11	38.50	-	-	-	-	ML-CL			7	49	29	5	1	9	0	26	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-16	SPT-16	40.00	90	28	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code																					
															Grain Size Distribution % wt retained		Atterberg Limits %		Shear Strength		Consolidation Parameters														
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)				
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-1	1.00	-	-	Brown, Medium dense, Silty sand	SM		0	37	58	5	0	0	0	0	Nil	NP	-	1.76	11.23	1.58	2.63	DST	0.00	29	-	-	-	-	-	-	-	-	-	-	
SPT-1	2.50	20	26		SM		0	41	56	2	1	0	0	Nil	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	4.00	-	-		ML-CL		6	56	30	3	1	4	0	20	6	6	1.80	12.70	1.60	2.66	DST	0.22	26	-	-	-	-	-	-	-	-	-	-	-	
SPT-2	5.50	33	33		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	7.00	-	-	Brown, Medium dense to dense, Sandy silt of low plasticity with gravel	ML-CL		7	52	28	5	3	5	0	19	7	7	1.85	13.46	1.63	2.66	DST	0.20	27	-	-	-	-	-	-	-	-	-	-	-	-
SPT-3	8.50	53	45		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.00	-	-		ML-CL		7	54	27	4	2	6	0	20	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.							IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	Grain Size Distribution % wt retained	Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Termination Depth		Coordinates (E,N)	R.L.	Ref. Code				
	Liquid Limit	Plasticity Index	Shrinkage Limit	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)									Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)			C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)				Compression Index (C _p)			
																												Clay	Silt	Fine
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-1	1.00	10	16	-	-	35	4	1	0	0	0	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-1	2.50	-	-	-	-	32	3	1	1	0	26	-	1.71	12.30	1.52	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-2	4.00	20	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-2	5.50	-	-	-	-	33	5	2	2	0	26	-	1.76	13.14	1.56	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-3	7.00	33	33	-	-	24	2	1	4	0	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-	-	-	22	3	2	6	0	32	-	1.86	15.26	1.61	2.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	10.00	54	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol									
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Termination Depth	Coordinates (E,N)	R.L.	Ref. Code		
						Clay	Silt	Fine	Medium	Coarse										Sand	Fine
SPT-14	28.00	>100	-		Brown, Hard, Silty clay of low plasticity with gravel																
SPT-15	29.50	90	90																		
DS-2	30.00	-	-																		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)		R.L.	Ref. Code																							
	28-09-2021	to			29-09-2021	33+713 km		BH-A2	29.52 m			30.00 m	690560.289 m	3127290.956 m	(+257.830 m)	SR-544_21-22																		
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																	
							Clay	Silt	Fine	Medium	Coarse	Fine	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)		
SPT-14	28.00	100 (25cm)	100 (25cm)	Brown, Hard, Silty clay of low plasticity with gravel	CL		12	51	21	4	2	10	0	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	29.50	100 (24cm)	100 (24cm)		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DS-2	30.00	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.	Depth of Water Table			Termination Depth		Coordinates (E,N)				R.L.	Ref. Code													
							01-10-2021		to		01-10-2021				34+019 km		BH-CL		Not encountered		10.00 m		690307.695 m			312744.537 m		SR-544_21-22										
							Clay	Silt	Fine	Medium	Coarse	Gravel			Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test			Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)			
4	44	50	1	1	0	0						25	20	5										-	1.72											12.30	1.53	2.65
5	38	41	5	3	8	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
11	58	23	2	1	5	0	32	21	11	-	1.86	15.41	1.61	2.67	UUT	1.14	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	57	28	1	0	4	0	31	20	11	-	1.87	16.02	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	53	33	2	1	5	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.	Depth of Water Table				Termination Depth			Coordinates (E,N)				R.L.	Ref. Code							
							29-09-2021		to		29-09-2021				34+619 km		BH-CL		Not encountered		10.00 m		689829.431 m		3127806.228 m			(+256.661 m)		SR-544_21-22				
							Clay	Silt	Grain Size Distribution % wt retained		Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)			
Coarse	Fine	Liquid Limit	Plasticity Index	Shrinkage Limit																														
DS	0.00	-	-		-																													
SPT-1	1.00	10	16	Brown, Medium dense, Sandy silt of low plasticity	ML-CL																													
UDS-1	2.50	-	-		ML-CL																													
SPT-2	4.00	31	35	Brown, Dense, Silty sand with clay	SM-SC																													
UDS-2	5.50	-	-		SM-SC																													
SPT-3	7.00	35	33		-																													
UDS-3	8.50	-	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL																													
SPT-4	10.00	50	40		-																													

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.												Date of Boring			Chainage (km./Location)			B.H. No.			Depth of Water Table			Termination Depth		Coordinates (E,N)				R.L.		Ref. Code				
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _p)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)						
DS	0.00	-	-																																		
UDS-1	1.00	-	-		ML-CL													1.70	13.04	1.50	2.66	DST	0.21	23	-	-	-	-	-	-							
SPT-1	2.50	10	13																																		
UDS-2	4.00	-	-	Brown, Medium dense, Sandy silt of low plasticity	ML-CL													1.76	13.71	1.55	2.66	DST	0.20	24	-	-	-	-	-	-	-						
SPT-2	5.50	19	19																																		
UDS-3	7.00	-	-		ML-CL																																
SPT-3	8.50	23	20																																		
UDS-4	10.00	-	-		CL													1.91	16.22	1.64	2.68	UUT	1.65	5	-	-	0.635	7.14	1.36	0.99	0.096						
SPT-4	11.50	49	49																																		
UDS-5	13.00	-	-	Brown, Hard, Silty clay of low plasticity with gravel	CL																																
SPT-5	14.50	46	46																																		
UDS-6	16.00	-	-		CL																																
SPT-6	17.50	53	53																																		
UDS-7	19.00	-	-		CL													2.02	18.68	1.70	2.68	UUT	2.72	4	-	-	-	-	-	-	-	-	-	-			
SPT-7	20.50	80	80																																		
SPT-8	22.00	84	84		CL																																
SPT-9	23.50	90	90																																		
SPT-10	25.00	83	83		CL																																
SPT-11	26.50	95	95																																		
SPT-12	28.00	100	100		CL																																

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																							
	27-09-2021	to			28-09-2021	36+816 km		BH-A1	23.89 m	30.00 m	688102.237 m			3129148.530 m	(+253.133 m)	SR-544_21-22																				
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																			
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)		
SPT-10	23.50	69	69	Brown, Hard, Silty clay of low plasticity with gravel	CL		12	59	17	4	2	0	33	22	11	-	2.01	20.50	1.67	2.68	UUT+	2.24	4	-	-	-	-	-	-	-	-	-	-			
SPT-11	25.00	74	74		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-7	26.50	-	-		CL			11	63	16	4	3	0	31	20	11	-	2.00	23.36	1.62	2.67	UUT	1.30	5	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	28.00	36	36		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	29.50	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	30.00	42	42		CL			11	58	20	5	2	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)					R.L.	Ref. Code								
							Grain Size Distribution % wt retained								Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)			Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)
							Clay	Silt	Fine	Medium	Coarse	Gravel			Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit																	
DS	0.00	-	-		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-1	1.00	-	-		SM-SC		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-1	2.50	12	15	Brown, Medium dense, Silty sand with clay	-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-2	4.00	-	-		SM-SC		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-2	5.50	25	25		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-3	7.00	-	-	Brown, Dense, Sandy silt of low plasticity with gravel	ML-CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-3	8.50	44	38		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-4	10.00	-	-		CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-4	11.50	51	51	Brown, Hard, Silty clay of low plasticity with gravel	-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-5	13.00	-	-		CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-5	14.50	56	56		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS-6	16.00	-	-		ML-CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-6	17.50	64	39		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
UDS*	19.00	-	-	Brown, Very dense, Sandy silt of low plasticity with	-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-7	19.50 (21cm)	100	-		ML-CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-8	20.50 (25cm)	100	-		-		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													
SPT-9	22.00 (26cm)	100	-		ML-CL		27-09-2021						36+816 km	BH-A2	23.16 m			30.00 m	688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22													

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring			Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																										
	27-09-2021	to	28-09-2021			23.16 m	30.00 m		688087.580 m	3129162.136 m	(+253.255 m)	SR-544_21-22																												
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Consolidation Parameters																							
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)								
SPT-10	23.50	67	67	Brown, Hard, Silty clay of low plasticity with gravel	CL		13	58	18	4	1	5	1	34	23	11	-	2.01	22.00	1.65	2.68	UUT+	1.88	4	-	-	-	-	-	-	-	-	-	-	-					
UDS*	25.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-11	25.50	53	53		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-12	26.50	58	58		CL			11	56	22	3	2	6	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-13	28.00	53	53		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	29.50	46	46		CL			12	58	17	4	3	5	1	32	21	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DS-2	30.00	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)				R.L.	Ref. Code
	08-07-2022	to	08-07-2022	37+174 Minor Bridge	BH-CL	Not Encountered								6.00 m	687850.788 m			3129414.081 m	(+) 252.485 m	SR-544_21-22									
Sample Type	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _x x 10 ⁻⁴ (cm ² /Sec)	M _x x 10 ⁻² (cm ² /kg)	Compression Index (C _p)				
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	0	18	74	7	1	0	-	NIL	NP	-	1.71	12.60	1.52	2.59	DST	0.00	29	-	-	-	-	-	-	-	-				
SPT-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-3	0	25	70	5	0	0	-	NIL	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-2	7	48	37	5	3	0	26	20	6	-	1.83	17.40	1.56	2.92	DST	0.15	18	-	-	-	-	-	-	-	-				
SPT-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code													
	07-07-2022	to	07-07-2022	37+487 Minor Bridge	BH-CL	Not Encountered											10.00 m	687664.026 m		3129665.052 m	(+) 253.510 m	SR-544_21-22																
													Grain Size Distribution % wt retained				Atterberg Limits %				Consolidation Parameters																	
													Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)	
																																						Clay
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-1	10	14	-	-	-	-	-	Brown, Medium dense, Silty silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	-	-	4	35	6	3	4	0	27	22	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	12	14	0	76	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	17	18	-	-	-	-	-	Reddish Brown, Medium dense, Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	-	-	0	74	5	2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	31	30	-	-	-	-	-	Brown, Dense, Silty silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	26	23	-	-	-	-	-	Brown, Dense, Silty Clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	-	-	7	36	6	1	1	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	35	29	-	-	-	-	-	Brown, Dense, Silty Clay of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	26	26	11	29	6	1	0	34	21	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code					
							to								Not Encountered			10.00 m	687322.404 m		3130206.236 m			(+)254.370 m	SR-544_21-22			
							Grain Size Distribution % wt retained						Atterberg Limits %			Consolidation Parameters												
							Silt		Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)
Clay		Clay		Coarse	Medium	Coarse	Fine	Coarse		Clay																		
DS	0.00	-	-		-																							
SPT-1	1.50	8	12	Brown, Medium dense, Sandy silt of low plasticity	-																							
UDS-1	2.25	-	-		ML-CL																							
SPT-2	3.00	11	11		CL																							
SPT-3	4.50	13	13		-																							
UDS-2	5.25	-	-		CL																							
SPT-4	6.00	26	26		-																							
SPT-5	7.50	30	30	Brown, Dense, Silty Clay of low plasticity	-																							
UDS-3	8.25	-	-		CL																							
SPT-6	9.00	24	24		-																							
SPT-7	10.00	26	26		CL																							

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Date of Boring				Chainage (km.)/Location		B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code
	08-07-2022	to	08-07-2022	38+482 Minor Bridge	BH-CL	Not Encountered								6.00 m	687138.270 m	3130509.717 m	(+254.888 m	SR-544_21-22											
Sample Type	Clay	Silt	Fine	Medium	Coarse	Gravel	Grain Size Distribution % wt retained	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /kg)	Compression Index (C _p)			
DS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	11	55	26	4	3	1	0	32	21	11	-	1.87	20.70	1.55	2.63	UUT	0.50	5	-	-	-	-	-	-	-	-	-		
SPT-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	12	52	20	2	0	14	0	32	21	11	-	1.89	20.30	1.57	2.64	UUT	1.14	6	-	-	-	-	-	-	-	-			
SPT-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring										Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth			Coordinates (E,N)					R.L.	Ref. Code		
							30-01-2022		to		30-01-2022		38+701		BH-CL				Not Encountered		10.00 m		687027.281 m		3130698.508 m		(+)254.062 m				SR-544_21-22	
							Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)			Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)			M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)
Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit																				
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-1	0.50	6	6	Brown, Medium stiff to stiff, Silty clay of low plasticity	CL		-	11	54	27	5	3	0	0	31	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-2	1.50	10	10		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS*	2.25	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-3	3.00	15	15	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL		10	51	29	7	1	4	2	0	30	1.84	16.59	1.58	-	-	-	-	-	-	-	-	-	-				
SPT-4	4.50	24	24		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	5.25	-	-		-	CL		12	50	24	6	4	4	4	33	1.91	17.68	2.67	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT			
SPT-5	6.00	31	31		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-6	7.50	30	30		CL		11	49	26	5	3	3	6	0	32	1.91	17.68	2.67	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT	UUT				
UDS-2	8.25	-	-		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-7	9.00	39	39		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-8	10.00	45	45		-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring					Chainage (km.)/Location	B.H. No.	Depth of Water Table					Termination Depth	Coordinates (E,N)				R.L.	Ref. Code								
							30-01-2022		30-01-2022		30-01-2022			Not Encountered	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity		686988.257 m		3130764.000 m				Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)			
							Clay	Silt	Grain Size Distribution % wt retained		Atterberg Limits %									Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)								Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	
									Coarse	Medium	Fine																						Coarse
Sand	Gravel	Plastic Limit																															
			DS	0.00	-	-	Brown, Loose, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-1	0.50	5	9	ML-CL				7	47	39	4	3	0	0	27	7	20	20	0	0	-	-	-	-	-	-	-	-					
SPT-2	1.50	9	13	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS*	2.25	-	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-3	3.00	14	14	CL				11	52	28	5	2	2	0	31	20	20	11	0	0	-	-	-	-	-	-	-	-					
SPT-4	4.50	20	20	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-1	5.25	-	-	CL				10	48	30	4	4	4	0	30	20	10	10	1.80	15.24	1.56	2.67	0.75	5	-	-	-	-					
SPT-5	6.00	32	32	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-6	7.50	38	38	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-2	8.25	-	-	CL				12	48	24	8	3	5	0	33	22	11	11	1.89	16.79	1.62	2.68	1.35	4	-	-	-	-					
SPT-7	9.00	41	41	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-8	10.50	45	45	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
UDS-3	11.25	-	-	CL			11	50	26	5	3	5	0	32	21	11	11	1.94	17.66	1.65	2.67	1.78	4	-	-	-	-						
SPT-9	12.00	48	48	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-10	13.50	54	54	CL			10	50	24	7	2	7	0	30	20	10	10	-	-	-	-	-	-	-	-	-	-						
UDS*	14.25	-	-	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-11	15.00	60	60	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						



Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST++ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring				Chainage (km./Location)		B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																		
	20-11-2021		to 20-11-2021		39+400			Not Encountered			10.00 m		686673.940 m				3131301.616 m																	
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Consolidation Parameters																			
DS	0.00	-	-				Clay		Sand		Gravel		Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)				
SPT-1	0.50	6	11	Brown, Loose to medium dense, Silty sand	SM		Clay		Sand		Gravel		Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	DST	0.00	29	-	-	-	-	-	-	-	-	-			
SPT-2	1.50	7	10					0	25	68	0	0	-	Nil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	2.25	-	-			SM		0	21	72	4	2	1	0	0	0	1.67	11.26	1.50	2.62	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	3.00	15	18			-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-4	4.50	30	33			-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	5.25	-	-			ML-CL		7	48	38	6	1	0	0	0	0	1.84	14.16	1.61	2.66	DST	0.19	27	-	-	-	-	-	-	-	-	-	-	
SPT-5	6.00	33	33			-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	7.50	38	35			-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.25	-	-	Brown, Dense, Sandy silt of low plasticity	ML-CL		6	45	41	6	1	1	0	0	1.85	14.80	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-7	9.00	41	35			-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	10.00	44	36			ML-CL		8	46	38	5	2	1	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code
	Not Encountered		10.00 m		686107.704 m												3132328.870 m		Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)			
	Grain Size Distribution % wt retained	Atterberg Limits %	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity											Type of Test	Cohesion C (kg/cm ²)						Angle of Friction (φ)		
Clay							Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)									Dry Density (g/cm ³)	Specific Gravity
Clay	Silt	Fine	Medium	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)							Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)		

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Classification	IS Symbol							
	Date of Boring		Chainage (km./Location)		B.H. No.		Depth of Water Table		Termination Depth				Coordinates (E,N)				R.L.		Ref. Code
	18-08-2021	to	19-08-2021	41+056 Major Bridge	BH-A1	Not Encountered	30.00 m	685995.127 m	3132785.751 m	(+253.199 m)			SR-544_21-22	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)	
Grain Size Distribution % wt retained		Atterberg Limits %		Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)						
Clay	Silt	Fine	Medium											Coarse	Gravel		Liquid Limit	Plastic Limit	Plasticity Index
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	1.00	7	61	32	0	0	0	0	0	0	0	0	0	0	0	0	0		
SPT-1	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	4.00	6	59	33	1	0	1	0	0	0	0	0	0	0	0	0	0		
SPT-2	5.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	8	61	27	1	0	3	0	0	0	0	0	0	0	0	0	0		
SPT-3	8.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	7	54	28	3	2	6	0	0	0	0	0	0	0	0	0	0		
SPT-4	11.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-5	13.00	7	58	30	1	0	4	0	0	0	0	0	0	0	0	0	0		
SPT-5	14.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-6	16.00	6	60	24	4	1	5	0	0	0	0	0	0	0	0	0	0		
SPT-6	17.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-7	19.00	7	52	29	2	1	9	0	0	0	0	0	0	0	0	0	0		
SPT-7	20.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-8	22.00	9	54	23	5	2	7	0	0	0	0	0	0	0	0	0	0		
SPT-8	23.50 (18cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS*	25.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-9	26.50 (22cm)	10	48	28	2	1	11	0	0	0	0	0	0	0	0	0	0		

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Termination Depth	Depth of Water Table	B.H. No.	Chainage (km./Location)		Date of Boring		Grain Size Distribution % wt retained				Atterberg Limits %			Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code
	18-08-2021	to	19-08-2021	Sand	Fine	Medium											Coarse	Gravel	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)		
UDS*															41+056 Major Bridge		19-08-2021		18-08-2021							Not Encountered		30.00 m		685995.127 m		3132785.751 m		(+253.199 m)	SR-544_21-22		
SPT-10																																					
SPT-11																																					

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																
	12-08-2021	to			14-08-2021	Not Encountered		40.00 m	685993,223 m		3132810,479 m			(+)252.668 m	SR-544_21-22														
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)	
	Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit																
DS	0.00	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-1	1.00	11	18				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-1	2.50	-	-	Brown, Medium dense, Silty sand with clay	SM-SC		6	39	43	7	5	0	0	0	26	20	6	-	1.71	10.35	1.55	2.64	DST	-	0.09	27	-	-	-
SPT-2	4.00	20	23				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-2	5.50	-	-		SM-SC		5	43	41	6	4	1	0	0	25	20	5	-	1.73	10.80	1.56	2.65	DST	-	0.12	27	-	-	-
SPT-3	7.00	38	36				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-		ML-CL		8	54	33	4	1	0	0	0	28	21	7	-	1.81	12.63	1.61	2.66	DST	-	0.21	27	-	-	-
SPT-4	10.00	43	35				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-4	11.50	-	-		ML-CL		9	51	35	4	1	0	0	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	13.00	67	49				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	14.50	-	-		ML-CL		7	52	30	6	3	2	0	0	26	20	6	-	1.86	13.67	1.64	2.66	DST	-	0.23	27	-	-	-
SPT-6	16.00	71	46				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	17.50	-	-	Brown, Dense to very dense, Sandy silt of low plasticity with gravel	ML-CL		8	53	32	5	1	1	0	0	27	20	7	-	1.94	14.78	1.69	2.66	DST	-	0.17	28	-	-	-
SPT-7	19.00	96	57				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-7	20.50	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	22.00	110	(19cm)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	23.50	107	(20cm)		ML-CL		9	46	28	7	3	5	2	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-10	25.00	107	(19cm)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-11	26.50	>100	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring										Chainage (km.)/Location	B.H. No.	Depth of Water Table			Termination Depth		Coordinates (E,N)				R.L.	Ref. Code													
							Clay	Silt	Grain Size Distribution % wt retained			Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)			Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)									
Clay	Silt	Fine	Medium	Coarse	Liquid Limit	Plastic Limit			Plasticity Index	Shrinkage Limit																																
SPT-12	28.00	>100	-	Brown, Dense to very dense, Sandy silt of low plasticity with gravel			-																																			
SPT-13	29.50	100 (23cm)	-		ML-CL																																					
SPT-14	31.00	100 (27cm)	-		-																																					
SPT-15	32.50	100 (22cm)	-		-																																					
SPT-16	34.00	>100	-		-																																					
SPT-17	35.50	>100	-		-																																					
SPT-18	37.00	>100	-		ML-CL																																					
SPT-19	38.50	>100	-		-																																					
SPT-20	40.00	>100	-		-																																					

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	Atterberg Limits %	Depth of Water Table			Termination Depth	Coordinates (E,N)					R.L.	Ref. Code																			
	Chainage (km./Location)	B.H. No.	Not Encountered		Natural Moisture Content (%)	Dry Density (g/cm ³)									Specific Gravity	Type of Test	Cohesion C _v (kg/cm ²)		Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)			Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)															
Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Grain Size Distribution % wt retained	Atterberg Limits %	Type of Test	Cohesion C _v (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																									
18-11-2021	to			18-11-2021	Not Encountered															10.00 m	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)													
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained			Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C _v (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																	
							Clay	Silt	Fine	Medium	Coarse	Gravel																Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C _v (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
SPT-1	0.50	17	31	Brown, Medium dense, Silty sand with clay	SM-SC			40	12	1	0	0	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-2	1.50	22	32																																									
UDS-1	2.25	-	-	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	SM-SC			43	15	7	0	0	27	-	-	1.80	12.64	1.60	2.65	DST	0.11	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-3	3.00	27	27							28	7	1	2	0	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-4	4.50	33	33					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	5.25	-	-	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			26	5	1	5	0	34	-	-	1.84	15.23	1.60	2.68	UUT	1.12	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	6.00	39	39							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	7.50	44	44					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	8.25	-	-	Brown, Very stiff to hard, Silty clay of low plasticity with gravel	CL			22	11	1	6	0	33	-	-	1.90	16.80	1.63	2.67	UUT	1.58	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	9.00	46	46							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	10.00	54	54					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Date of Boring						Chainage (km./Location)		B.H. No.			Depth of Water Table				Termination Depth		Coordinates (E,N)						R.L.				Ref. Code								
	13-08-2021 to 16-08-2021			16-08-2021 to 41+390 Major Bridge			41+390 Major Bridge		BH-A-1			Not Encountered				35.00 m		68529.941 m						3133111.995 m				(+258.326 m)				SR-544_21-22				
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained							Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
							Sand			Gravel				Liquid Limit	Plastic Limit	Plasticity Index																Shrinkage Limit				
DS	0.00	-	-				Clay																													
UDS-1	1.00	-	-		ML-CL			6	45	27	20	1	1	0	0	26	20	6	12.06	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	2.50	48	60		-																															
UDS-2	4.00	-	-		ML-CL			7	44	25	21	2	1	0	25	19	6	12.74	1.64	2.66	DST	0.19	27	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	5.50	50	50		-																															
UDS-3	7.00	-	-		ML-CL			8	49	36	2	1	4	0	27	20	7	13.24	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	8.50	71	60		-																															
UDS-4	10.00	-	-		ML-CL			9	45	37	1	1	7	0	28	21	7	13.68	1.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	11.50	64	48		-																															
UDS-5	13.00	-	-		ML-CL			7	46	35	3	4	5	0	27	20	7	14.26	1.63	2.67	DST	0.21	26	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	14.50	64	43		-																															
UDS-6	16.00	-	-		ML-CL			8	45	34	6	2	4	1	29	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	73	44		-																															
UDS-7	19.00	-	-		CL			11	71	15	1	1	1	0	31	20	11	16.33	1.70	2.68	UUT	3.11	5	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	20.20	>100	-		-																															
SPT-8	22.00	97	97		-																															
SPT-9	23.50	>100	-		CL			14	62	13	5	2	4	0	34	23	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	25.00	100 (27cm)	100 (27cm)		-																															
SPT-11	26.50	100 (18cm)	100 (18cm)		-																															

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained							Atterberg Limits %	Depth of Water Table	Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																				
							Clay	Silt	Sand			Gravel					Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
									Fine	Medium	Coarse	Fine	Coarse																									Clay	Silt	Fine	Medium	Coarse
SPT-12	28.00	100 (23cm)	100 (23cm)	Brown, Hard, Silty clay of low plasticity	-	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-13	29.50	100 (18cm)	100 (18cm)		13		64	14	3	1	5	0	33	22	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-14	31.00	100 (22cm)	100 (22cm)		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	32.50	100 (22cm)	100 (22cm)		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-16	34.00	100 (20cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-17	35.00	100 (20cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Corrected SPT Value (N)	Observed SPT Value (N)	Depth from G.L. (m)	Sample Type	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code					
	Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %											Shear Strength			Consolidation Parameters										
	12-08-2021	to	14-08-2021	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	35.00 m	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)			
SPT-11	28.00	100 (22cm)	100 (22cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	29.50	100 (19cm)	100 (19cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	31.00	100 (19cm)	100 (19cm)	11	58	15	5	6	5	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	32.50	100 (28cm)	100 (28cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	34.00	100 (20cm)	100 (20cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	35.00	100 (20cm)	100 (20cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code														
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification				IS Symbol	Clay	Silt	Fine	Medium	Coarse	Gravel	Liquid Limit			Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)
UDS-9	26.50	-	-	-	CL		14	57	16	5	4	0	-	-	19	13	-	1.96	15.10	1.70	2.69	UUT	2.63	4	-	-	0.580	0.5-1.0 1.0-2.0 2.0-4.0 4.0-8.0	8.65 7.05 5.81 4.16	1.15 0.90 0.52 0.38	0.076		
SPT-10	28.00	82	82	Brown, Hard, Silty clay of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	29.50	90	90	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	31.00	96	96	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	32.50	101 (29cm)	-	ML-CL	ML-CL		8	59	21	6	3	0	27	20	7	-	2.00	16.00	1.72	2.66	DST+	0.19	28	-	-	-	-	-	-	-	-	-	-
SPT-14	34.00	100 (28cm)	-	Brown, Very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	35.00	>100	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Termination Depth	Chainage (km.)/Location	B.H. No.	Depth of Water Table	Coordinates (E,N)						R.L.	Ref. Code		
	Date of Boring		Grain Size Distribution % wt retained		Atterberg Limits %													Shear Strength		Free Swell Index		Swelling Pressure				Permeability	
	13-08-2021	to	16-08-2021	Sand		Gravel		Liquid Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)		
UDS-9	29.50	-	-	7	47	30	6	4	6	0	26	19	7	-	1.87	15.23	1.62	2.67	DST	0.16	27	-	-	-	-	-	-
SPT-12	31.00	79	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-10	32.50	-	-	7	46	29	6	5	7	0	27	20	7	1.88	16.04	1.62	-	-	-	-	-	-	-	-	-	-	-
SPT-13	34.00	90	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.00	>100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
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SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring										Chainage (km./Location)	B.H. No.	Depth of Water Table					Termination Depth		Coordinates (E,N)					R.L.				Ref. Code					
							Grain Size Distribution % wt retained					Atterberg Limits %							Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)							
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit																		Plastic Limit		Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)
DS	0.00	-	-	Brown, Very loose, Sandy silt of low plasticity	-		17-08-2021	18-08-2021	42+256 Major Bridge	BH-P3	Not Encountered	35.00 m	685846.067 m	3133732.830 m	(+262.764 m)	SR-544_21-22																								
UDS-1	1.00	-	-		ML-CL		6	49	45	0	0	27	21	6	1.61	12.04	1.44	2.66	DST	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-1	2.50	4	5		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	4.00	-	-		ML-CL		8	45	38	7	1	0	28	21	7	1.80	12.64	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	5.50	30	31		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	7.00	-	-		ML-CL		5	50	44	1	0	0	26	20	6	1.79	13.22	1.58	2.67	DST	0.15	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	8.50	29	25		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.00	-	-		ML-CL		7	53	40	0	0	0	26	19	7	1.80	13.89	1.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	11.50	31	24		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	13.00	-	-		ML-CL		6	48	41	3	2	0	27	20	7	1.80	14.39	1.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	14.50	33	23	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	16.00	-	-	ML-CL		6	51	41	2	0	0	27	20	7	1.85	15.10	1.61	2.66	DST	0.21	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	54	34	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	19.00	-	-	ML-CL		8	51	35	3	1	2	28	21	7	1.86	15.34	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	20.50	53	30	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-8	22.00	-	-	ML-CL		7	47	33	6	4	2	27	20	7	1.86	15.77	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	23.50	63	33	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-9	25.00	-	-	ML-CL		6	58	29	1	1	5	26	19	7	1.87	16.11	1.61	2.67	DST	0.17	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	26.50	67	32	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-10	28.00	-	-	ML-CL		7	55	25	3	2	8	27	20	7	1.87	16.45	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.					Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																																											
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description				IS Classification	IS Symbol		Grain Size Distribution % wt retained						Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																																
												Clay	Silt	Fine	Medium														Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity																							
SPT-11	28.00	73	34	Brown, Very dense, Sandy silt of low plasticity	-	-																																																						
SPT-12	29.50	101 (26cm)	-																																																									
SPT-13	31.00	101 (28cm)	-																												ML-CL																													
SPT-14	32.50	101 (20cm)	-																																																									
SPT-15	34.00	101 (19cm)	-																																																									

SOIL CHARACTERISTICS

Project	Date of Boring						Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)					R.L.	Ref. Code																				
	14-08-2021		to		17-08-2021				42+256 Major Bridge			Not Encountered		40.00 m		685839.438 m			3133785.448 m			(+264.797 m)																
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Consolidation Parameters																						
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)				
UDS-10	28.00	-	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL							8	51	35	2																				1	3	0	28
SPT-10	29.50	77	35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-11	31.00	-	-		ML-CL		7	45	36	6	1	5	0	27	20	7	-	1.87	16.07	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	32.50	85	39		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-12	34.00	-	-		ML-CL		9	53	24	3	1	10	0	29	22	7	-	1.90	16.27	1.63	2.67	DST	0.18	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	35.50	95	44		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	37.00	100 (27cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	38.50	100 (21cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	40.00	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.					Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)						R.L.	Ref. Code																										
	Grain Size Distribution % wt retained		Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)				Specific Gravity	Shear Strength			Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Consolidation Parameters																													
	Clay	Silt								Fine	Medium	Coarse				Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																	
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					-								-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-1	1.00	35	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
UDS-1	2.50	-	-	5	60	28	3	2	0	26	1.79	11.84	1.60	2.66	DST	0.21	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-2	4.00	30	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-2	5.50	-	-	6	58	30	3	1	0	26	1.79	12.06	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-3	7.00	35	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-3	8.50	-	-	7	51	33	4	2	3	26	1.80	12.61	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-4	10.00	38	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	11.50	-	-	8	50	30	3	4	2	27	1.80	12.70	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-5	13.00	39	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-5	14.50	-	-	-	8	53	1	1	5	27	1.81	13.04	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-6	16.00	38	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	17.50	-	-	6	55	34	1	0	0	27	1.83	13.64	1.61	2.67	DST	0.18	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-7	19.00	62	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	20.50	-	-	5	58	31	2	1	3	26	1.83	13.88	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-8	22.00	70	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-8	23.50	-	-	7	50	34	6	2	1	27	1.84	14.12	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-9	25.00	70	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-9	26.50	-	-	6	48	36	3	1	6	26	1.86	14.63	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-10	28.00	72	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Project																				
							Date of Boring			Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)			R.L.	Ref. Code							
							Fine	Medium	Coarse			Not Encountered	40.00 m	685841.105 m	3133808.838 m	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)			M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)					
UDS-10	29.50	-	-	Brown, Very dense, Sandy silt of low plasticity	ML-CL		Clay	8	47	35	1	0	9	0	28	21	7	-	-	-	-	-	-	-	-		
SPT-11	31.00	87	40		-	-	-	Silt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	32.50	100	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	34.00	100	-		-	-	-	Silt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-14	35.50	100	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	37.00	100	-		-	-	-	Silt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	38.50	100	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-17	40.00	100	-		-	-	-	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km.)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																									
	11-08-2021	to			12-08-2021	Not Encountered		40.00 m	685807.139 m	3133991.627 m	(+264.859 m			SR-544_21-22																								
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Depth of Water Table				Termination Depth				Coordinates (E,N)				R.L.				Ref. Code					
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)				
UDS-10	28.00	-	-	Brown, Very dense, Silty sand with clay	SM-SC		7	34	46	4	6	3	0	27	20	7	-	1.86	15.80	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	29.50	78	36		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-11	31.00	-	-		ML-CL		8	50	32	5	3	2	0	27	20	7	1.88	16.23	1.62	2.67	DST	0.16	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-11	32.50	85	39		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-12	34.00	-	-		ML-CL		10	49	30	6	2	3	0	28	21	7	1.97	16.74	1.69	2.66	DST	0.23	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	35.50	>100	-	Brown, Very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-13	37.00	-	-		ML-CL		9	50	29	4	3	5	0	27	20	7	1.99	17.01	1.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-13	38.50	101 (22cm)	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	40.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.										IS Symbol	IS Classification	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N)	Sample Type	Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table			Termination Depth			Coordinates (E,N)						R.L.	Ref. Code									
	to		Not Encountered	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)										Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /kg)	Compression Index (C _c)															
	07-08-2021	10-08-2021																										Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit			Gravel	Grain Size Distribution % wt retained							
	Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index										Shrinkage Limit	Clay	Silt	Fine	Coarse																		
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	1.00	19	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	3.00	31	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	4.00	39	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	5.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	7.00	48	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-3	8.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	10.00	55	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-4	11.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	13.00	61	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-5	14.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	16.00	68	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	17.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	19.00	76	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	20.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	22.00	81	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	23.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	25.00	86	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																									
	07-08-2021	to			10-08-2021	42+256 Major Bridge		BH-P14	Not Encountered	40.00 m	685782.242 m			3134066.732 m	(+263.998 m)	SR-544_21-22																						
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Depth of Water Table				Termination Depth				Coordinates (E,N)				R.L.				Ref. Code					
							Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)				
UDS-8	26.50	-	-	Brown, Hard, Silty clay of low plasticity	CL		12	58	19	2	3	5	1	31	20	11	-	1.92	16.45	1.65	2.68	UUT	1.76	5	-	-	0.5-1.0	8.60	1.61	-	-	-	-	-	-	-		
SPT-11	28.00	54	54		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-9	29.50	-	-		CL		10	61	18	4	3	4	0	30	20	10	-	1.93	16.86	1.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-12	31.00	54	54		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-10	32.50	-	-		CL		11	54	24	6	3	2	0	30	20	10	-	1.99	17.06	1.70	2.67	UUT	3.13	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	34.00	100 (19cm)	100 (19cm)		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	35.50	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-14	37.00	100 (19cm)	100 (19cm)		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	38.50	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	40.00	100 (25cm)	100 (25cm)		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring					Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)						R.L.	Ref. Code																					
	11-08-2021 to 13-08-2021		42+256 Major Bridge		BH-P15			Not Encountered			40.00 m		685773.857 m		3134091.912 m				(+)263.446 m	SR-544_21-22																			
	Clay	Silt	Fine	Medium	Coarse			Gravel	Liquid Limit		Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test			Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)									
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	1.00	-	-	51	10	3	2	0	25	20	5	-	1.75	11.29	1.57	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-1	2.50	19	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	4.00	-	-	40	9	2	1	0	26	20	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-2	5.50	40	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	7.00	-	-	42	4	2	5	11	38	24	14	-	1.83	13.26	1.62	2.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	8.50	93	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-4	10.00	-	-	42	1	0	2	2	28	21	7	-	1.83	12.84	1.62	2.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	53	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	13.00	-	-	40	2	1	3	0	27	20	7	-	1.86	13.24	1.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	84	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	16.00	-	-	34	3	4	3	1	28	21	7	-	1.87	13.87	1.64	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	76	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	19.00	100	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	20.50	80	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	22.00	-	-	6	4	3	1	0	34	22	12	-	1.93	14.91	1.68	2.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-9	23.50	75	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-8	25.00	-	-	12	3	5	4	0	32	21	11	-	1.94	15.23	1.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	26.50	83	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-9	28.00	-	-	8	4	2	3	0	33	22	11	-	1.97	16.10	1.70	2.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.



SOIL CHARACTERISTICS

Project	Date of Boring				Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																									
	11-08-2021	to	13-08-2021				42+256 Major Bridge	BH-P16		Not Encountered	40.00 m	685765.737 m	3134166.127 m			(+263.316 m)	SR-544_21-22																							
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %				Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)									
							Clay	Silt	Fine	Medium	Coarse	Sand		Gravel		Liquid Limit																Plastic Limit	Plasticity Index	Shrinkage Limit						
DS	0.00	-	-	Brown, Medium dense to very dense, Silty sand with clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-1	1.00	16	25		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-1	2.50	-	-		SM-SC	-	-	5	41	45	6	2	1	0	26	20	6	11.20	1.76	1.58	2.65	DST	-	-	0.10	27	-	-	-	-	-	-	-	-	-	-	-			
SPT-2	4.00	27	30		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS-2	5.50	-	-		SM-SC	-	-	6	38	53	1	0	2	0	25	19	6	11.86	1.80	1.61	2.64	DST	-	-	0.08	28	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-3	7.00	38	35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-3	8.50	-	-		SM-SC	-	-	5	39	48	2	1	5	0	27	20	7	12.34	1.81	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-4	10.00	47	38		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	11.50	-	-		SM-SC	-	-	6	42	40	7	1	4	0	26	19	7	12.60	1.81	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	13.00	53	38		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	14.50	-	-		SM-SC	-	-	6	30	53	6	2	3	0	26	20	6	13.12	1.83	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	16.00	66	43		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS*	17.50	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	19.00	54	32		-	-	-	5	44	44	4	2	1	0	25	20	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS*	20.50	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-8	22.00	58	31		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-6	23.50	-	-		SM-SC	-	-	5	41	38	8	5	3	0	26	21	5	13.81	1.82	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-9	25.00	77	38		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code			
											Not Encountered	Natural Moisture Content (%)	40.00 m	Specific Gravity	685765.737 m		3134166.127 m				Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)
															Clay	Silt	Fine	Medium	Coarse	Gravel			
UDS-7	26.50	-	-	Brown, Hard, Silty clay of low plasticity	CL		11-08-2021	13-08-2021	42+256 Major Bridge	BH-P16	-	-	-	UUT	2.04	5	-	-	-	-	263.316 m	SR-544_21-22	
SPT-10	28.00	57	57		-	-						-	-	-	-	-	-	-	-	-	-	-	-
UDS*	29.50	-	-		-	-						-	-	-	-	-	-	-	-	-	-	-	-
SPT-11	31.00	76	76		CL							23	11	-	-	-	-	-	-	-	-	-	-
UDS*	32.50	-	-		-	-						-	-	-	-	-	-	-	-	-	-	-	-
SPT-12	34.00	100 (27cm)	100 (27cm)		-	-						-	-	-	-	-	-	-	-	-	-	-	-
SPT-13	35.50	97	97		CL							22	12	-	UUT+	2.80	4	-	-	-	-	-	-
SPT-14	37.00	95	95		-	-						-	-	-	-	-	-	-	-	-	-	-	-
SPT-15	38.50	86	86		-	-						-	-	-	-	-	-	-	-	-	-	-	-
SPT-16	40.00	101 (27cm)	-		-	-						-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Date of Boring						Chainage (km./Location)	B.H. No.	Depth of Water Table				Termination Depth		Coordinates (E,N)					R.L.		Ref. Code										
							14-08-2021 to 16-08-2021								42+256 Major Bridge	BH-A2	Not Encountered	40.00 m	685746.693 m	3134176.656 m	(+263.529 m		SR-544_21-22															
							Grain Size Distribution % wt retained														Bulk Density (g/cm³)	Natural Moisture Content (%)	Dry Density (g/cm³)	Specific Gravity	Type of Test	Cohesion C (kg/cm²)	Angle of Friction (φ)		Free Swell Index (%)	Swelling Pressure (kg/cm²)	Permeability (cm/sec)	Void Ratio (e₀)	Pressure (kg/cm²)	C _v x 10 ⁻⁴ (cm²/Sec)	M _v x 10 ⁻² (cm²/Kg)	Compression Index (C _c)		
							Clay	Silt	Fine	Medium	Coarse	Gravel																									Liquid Limit	Plastic Limit
Clay	Silt	Fine	Medium	Coarse	Fine	Coarse							Gravel																									
DS	0.00	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-1	1.00	-	-		ML-CL		5	55	35	2	1	2	0	26	19	7	-	1.76	11.23	1.58	2.66	DST	0.21	24	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-1	2.50	20	26	Brown, Medium dense to dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-2	4.00	-	-		ML-CL		6	55	33	2	1	3	0	26	20	6	-	1.80	11.86	1.61	2.67	DST	0.18	26	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-2	5.50	34	34		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	7.00	-	-		ML-CL		8	60	25	3	2	2	0	28	21	7	-	1.82	12.46	1.62	2.66	DST	0.19	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-3	8.50	51	44		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-4	10.00	-	-		ML-CL		6	59	29	2	2	2	0	27	20	7	-	1.83	12.91	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	11.50	50	38		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-5	13.00	-	-		ML-CL		6	52	33	4	2	3	0	26	20	6	-	1.83	13.44	1.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-5	14.50	52	35		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-6	16.00	-	-		ML-CL		5	53	37	2	1	2	0	26	19	7	-	1.84	13.88	1.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	17.50	65	40	Brown, very dense, Sandy silt of low plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-7	19.00	-	-		ML-CL		7	49	32	6	2	3	1	27	20	7	-	1.84	14.26	1.61	2.66	DST	0.16	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-7	20.50	61	34		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-8	22.00	-	-		ML-CL		7	46	35	3	4	5	0	27	21	6	-	1.84	14.79	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	23.50	62	32		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-9	25.00	-	-		ML-CL		6	66	24	2	1	1	0	26	21	5	-	1.84	15.13	1.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-9	26.50	70	33		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-10	28.00	-	-		ML-CL		8	55	26	3	2	6	0	28	22	6	-	1.84	15.88	1.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)		R.L.	Ref. Code																																					
	14-08-2021	to			16-08-2021	Not Encountered		40.00 m	685746.693 m			3134176.656 m	(+263.529 m)	SR-544_21-22																																		
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)																									
							Clay	Silt	Fine	Medium	Coarse	Sand												Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity														
SPT-10	29.50	58	27	Brown, very dense, Sandy silt of low plasticity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																			
UDS-11	31.00	-	-		ML-CL	ML-CL		7	64	22	3	1	0	28	21	7	-	1.88	16.23	1.62	2.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-									
SPT-11	32.50	80	37		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
UDS-12	34.00	-	-		ML-CL	ML-CL		6	47	29	4	2	0	27	20	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-12	35.50	100 (22cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-13	37.00	100 (23cm)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-14	38.50	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-15	40.00	>100	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (km./Location)	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code							
	Grain Size Distribution % wt retained		Bulk Density (g/cm ³)	Natural Moisture Content (%)				Dry Density (g/cm ³)	Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)
	Clay	Silt																					
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	0.50	5	9	4	2	0	0	26	6	20	27	7	20	7	20	7	20	7	20	7			
SPT-2	1.50	8	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS*	2.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-3	3.00	11	14	7	1	2	0	27	7	20	27	7	20	7	20	7	20	7	20	7			
SPT-4	4.50	15	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-1	5.25	-	-	11	49	29	5	31	11	20	31	11	20	11	20	11	20	11	20	11			
SPT-5	6.00	30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-6	7.50	30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-2	8.25	-	-	12	48	24	8	4	12	48	24	8	4	12	48	24	8	4	12	48			
SPT-7	9.00	35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-8	10.50	45	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-3	11.25	-	-	8	45	31	6	28	8	45	31	6	28	8	45	31	6	28	8	45			
SPT-9	12.00	53	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-10	13.50	61	43	7	45	34	4	27	7	45	34	4	27	7	45	34	4	27	7	45			
UDS*	14.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-11	15.00	65	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring			Chainage (km./Location)	B.H. No.	Depth of Water Table			Termination Depth			Coordinates (E,N)					R.L.	Ref. Code																													
							Grain Size Distribution % wt retained					Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ°)	Free Swell Index (%)			Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																						
							Clay	Silt	Fine			Medium	Coarse	Sand									Fine	Coarse								Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Shear Strength																
DS	0.00	-	-	Brown, Loose, Silty sand	SM		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																							
SPT-1	0.50	5	9				0	15	74	9	2	0	0	NP	1.63	11.00	1.47	2.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
SPT-2	1.50	6	9				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-											
UDS*	2.25	-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-3	3.00	23	29				6	46	39	4	2	3	0	6	20	1.84	15.26	1.60	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-4	4.50	26	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-								
UDS-1	5.25	-	-	7	45	35	5	3	5	0	7	20	1.87	16.74	1.60	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
SPT-5	6.00	44	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
SPT-6	7.50	47	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
UDS-2	8.25	-	-	7	45	36	3	5	4	0	19	20	1.91	17.60	1.62	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
SPT-7	9.00	31	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-8	10.00	37	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
UDS-3	11.25	-	-	6	46	34	6	2	6	0	6	20	1.91	17.60	1.62	2.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-9	12.00	47	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-10	13.50	55	39	8	45	35	5	2	5	0	21	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
UDS*	14.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-11	15.00	58	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOIL CHARACTERISTICS

Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring					Chainage (km.)/Location	B.H. No.	Depth of Water Table			Coordinates (E,N)					R.L.		Ref. Code																						
							Grain Size Distribution % wt retained							Atterberg Limits %			Bulk Density (g/cm ³)	Natural Moisture Content (%)	Termination Depth	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)		Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)															
Clay	Silt	Fine	Medium	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)								Void Ratio (e ₀)								Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)											
Silt	Fine	Medium	Coarse	Coarse													Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Dry Density (g/cm ³)	Specific Gravity		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)					Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)							
Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.																																													
DS	0.00	-	-		-																																									
SPT-1	0.50	10	18	Brown, Medium dense, Silty sand	SM																																									
SPT-2	1.50	17	25																																											
UDS-1	2.25	-	-		SM																																									
SPT-3	3.00	33	40		ML-CL																																									
SPT-4	4.50	29	32		-																																									
UDS-2	5.25	-	-		ML-CL																																									
SPT-5	6.00	35	34	Brown, Dense, Sandy silt of low plasticity	-																																									
SPT-6	7.50	39	35		-																																									
UDS-3	8.25	-	-		ML-CL																																									
SPT-7	9.00	43	36		-																																									
SPT-8	10.00	47	38		-																																									

RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES

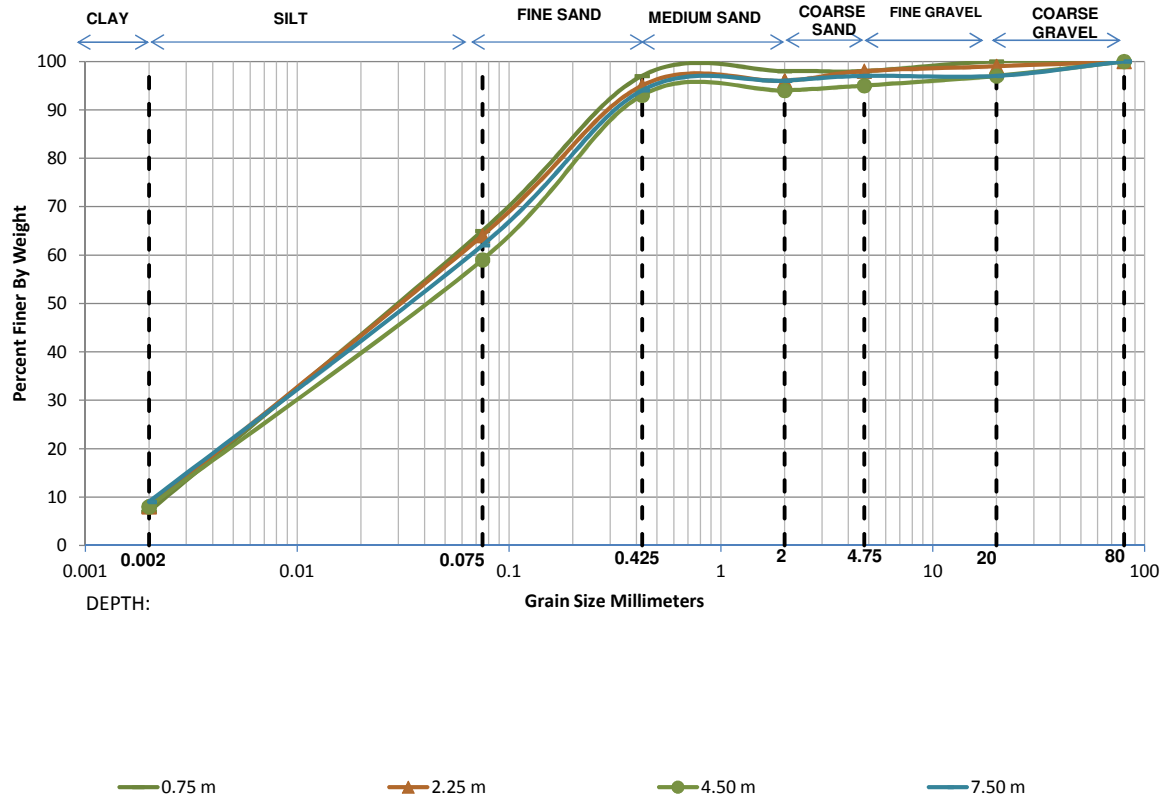
Sr. No	Chainage Old (km)	Chainage New (km)	BH No.	Depth of collected sample (m)	pH	Chlorides (Cl)		Sulphate (SO ₃ ²⁻)	
						(mg/kg)	(%)	(mg/kg)	(%)
1.	29+487	30+155	BH-A1	2.50	8.67	59.28	0.0059	23.08	0.0023
2.			BH-A2	13.00	8.52	65.17	0.0065	25.46	0.0025
3.	30+488	33+673	BH-A1	2.50	9.10	72.23	0.0072	19.14	0.0019
4.			BH-A2	16.0	8.50	80.67	0.0080	28.31	0.0028
5.	31+714	34+899	BH-A1	1.0	7.95	50.11	0.0050	23.35	0.0023
6.			BH-A2	17.50	8.65	55.68	0.0055	23.21	0.0023
7.	33+713	36+984	BH-A1	2.50	9.01	64.55	0.0064	21.11	0.0021
8.			BH-A2	17.50	9.70	61.70	0.0062	30.20	0.0030
9.	35+273	38+457	BH-A1	2.50	7.11	78.43	0.0078	16.04	0.0016
10.			BH-A2	16.00	7.56	77.71	0.0077	21.40	0.0021
11.	36+816	40+003	BH-A1	2.50	8.21	65.23	0.0065	24.56	0.0024
12.			BH-A2	16.0	8.11	68.45	0.0068	29.54	0.0029
13.	41+056	42+246	BH-A1	1.00	7.58	72.15	0.0072	31.12	0.0031
14.			BH-A2	17.50	8.01	68.95	0.0068	32.45	0.0032
15.	41+390	44+571	BH-A1	1.00	7.55	58.46	0.0058	28.45	0.0028
16.			BH-A2	17.50	8.01	60.14	0.0060	29.44	0.0029
17.	42+256	45+497	BH-P1	2.50	8.12	58.22	0.0058	18.54	0.0018
18.			BH-P2	16.00	8.55	61.41	0.0061	19.44	0.0019
19.	45+480	48+664	BH-A1	1.00	7.41	55.00	0.0055	20.12	0.0020
20.			BH-A2	14.50	7.88	58.65	0.0058	17.44	0.0017

RESULT OF CHEMICAL ANALYSIS OF WATER SAMPLE

Sr. No	Chainage Old	Chainage New	BH No.	pH	Chlorides (Cl) (mg/l)		Sulphate (SO ₃ ²⁻) (mg/l)	
1.	29+487	30+155	BH-A1	8.61	48.08		19.61	
2.	30+488	33+673	BH-A1	8.80	55.25		17.07	
3.	31+714	34+899	BH-A2	9.29	68.84		23.81	
4.	33+713	36+984	BH-A1	8.69	52.81		23.09	
5.	35+273	38+457	BH-A2	8.58	49.36		23.21	
6.	36+816	40+003	BH-A2	9.31	62.55		29.66	
7.	41+056	42+246	BH-A1	8.59	54.27		30.57	
8.	41+390	44+571	BH-A2	7.67	38.55		18.38	
9.	42+256	45+497	BH-A2	7.85	28.32		15.35	
10.	45+480	48+664	BH-A1	7.38	48.80		17.88	

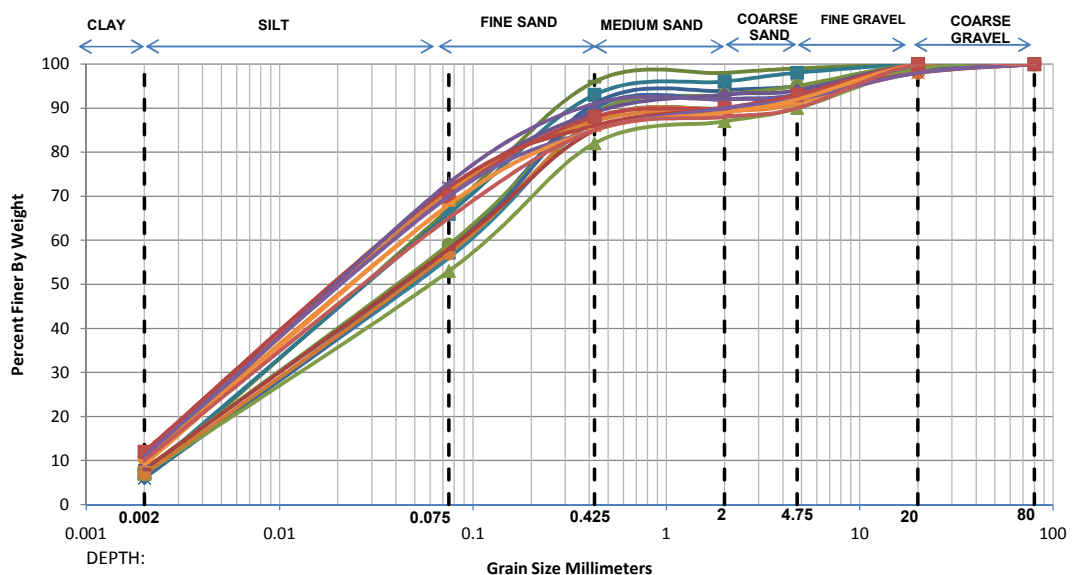
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	Dhulawat
B.H. No.	PLT-06



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.75 m	7.00	58.00	32.00	1.00	0.00	2.00	0.00	0.0035	0.0188	0.0642	18.40	1.58
2.25 m	8.00	56.00	31.00	1.00	2.00	1.00	1.00	0.0029	0.0181	0.0660	22.82	1.71
4.50 m	8.00	51.00	34.00	1.00	1.00	2.00	3.00	0.0029	0.0205	0.0777	26.56	1.85
7.50 m	9.00	53.00	32.00	2.00	1.00	0.00	3.00	0.0024	0.0179	0.0702	29.25	1.91

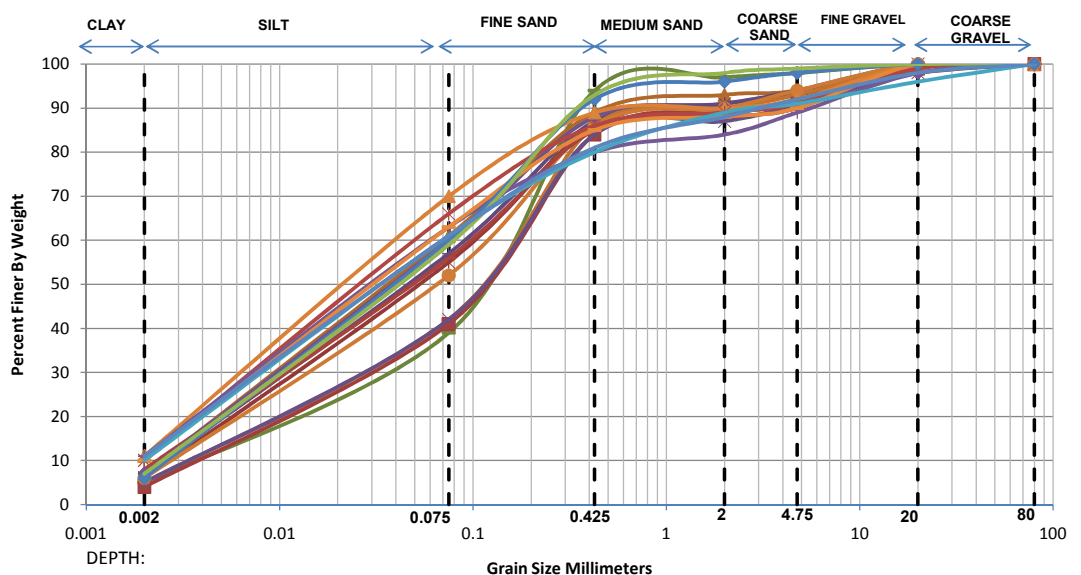
GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	29+487 Major Bridge
B.H. No.	BH-A1



- 1.00 m
- 2.50 m
- 5.50 m
- 8.50 m
- 11.50 m
- 14.50 m
- 17.50 m
- 22.00 m
- 25.00 m
- 28.00 m
- 31.00 m
- 34.00 m
- 37.00 m
- 40.00 m
- 43.00 m
- 46.00 m
- 49.00 m
- 52.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	61.00	29.00	2.00	1.00	1.00	0.00	0.0042	0.0191	0.0608	14.51	1.44
2.50 m	7.00	59.00	27.00	3.00	2.00	2.00	0.00	0.0035	0.0182	0.0622	17.90	1.54
5.50 m	6.00	52.00	33.00	3.00	1.00	4.00	1.00	0.0044	0.0233	0.0807	18.51	1.54
8.50 m	8.00	51.00	30.00	4.00	2.00	5.00	0.00	0.0029	0.0203	0.0778	26.63	1.81
11.50 m	7.00	49.00	31.00	3.00	2.00	8.00	0.00	0.0036	0.0232	0.0890	24.72	1.68
14.50 m	6.00	51.00	33.00	2.00	1.00	6.00	1.00	0.0044	0.0238	0.0842	19.21	1.54
17.50 m	7.00	46.00	29.00	5.00	3.00	9.00	1.00	0.0036	0.0252	0.1078	29.56	1.61
22.00 m	7.00	50.00	30.00	3.00	2.00	6.00	2.00	0.0036	0.0225	0.0849	23.70	1.66
25.00 m	8.00	50.00	27.00	4.00	3.00	8.00	0.00	0.0029	0.0207	0.0815	27.86	1.79
28.00 m	11.00	60.00	18.00	4.00	1.00	6.00	0.00	-	0.0127	0.0523	-	-
31.00 m	10.00	61.00	16.00	3.00	2.00	8.00	0.00	0.0020	0.0135	0.0525	26.26	1.73
34.00 m	12.00	60.00	14.00	4.00	3.00	5.00	2.00	-	0.0116	0.0502	-	-
37.00 m	9.00	64.00	18.00	1.00	1.00	7.00	0.00	0.0024	0.0140	0.0502	21.08	1.63
40.00 m	10.00	58.00	17.00	4.00	2.00	9.00	0.00	0.0020	0.0143	0.0574	28.72	1.78
43.00 m	12.00	58.00	18.00	2.00	3.00	7.00	0.00	-	0.0121	0.0535	-	-
46.00 m	11.00	59.00	15.00	5.00	2.00	6.00	2.00	-	0.0129	0.0537	-	-
49.00 m	9.00	59.00	17.00	4.00	3.00	8.00	0.00	0.0024	0.0152	0.0577	24.18	1.68
52.00 m	10.00	55.00	20.00	3.00	2.00	10.00	0.00	0.0020	0.0153	0.0632	31.62	1.86

GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	29+487 Major Bridge
B.H. No.	BH-A2

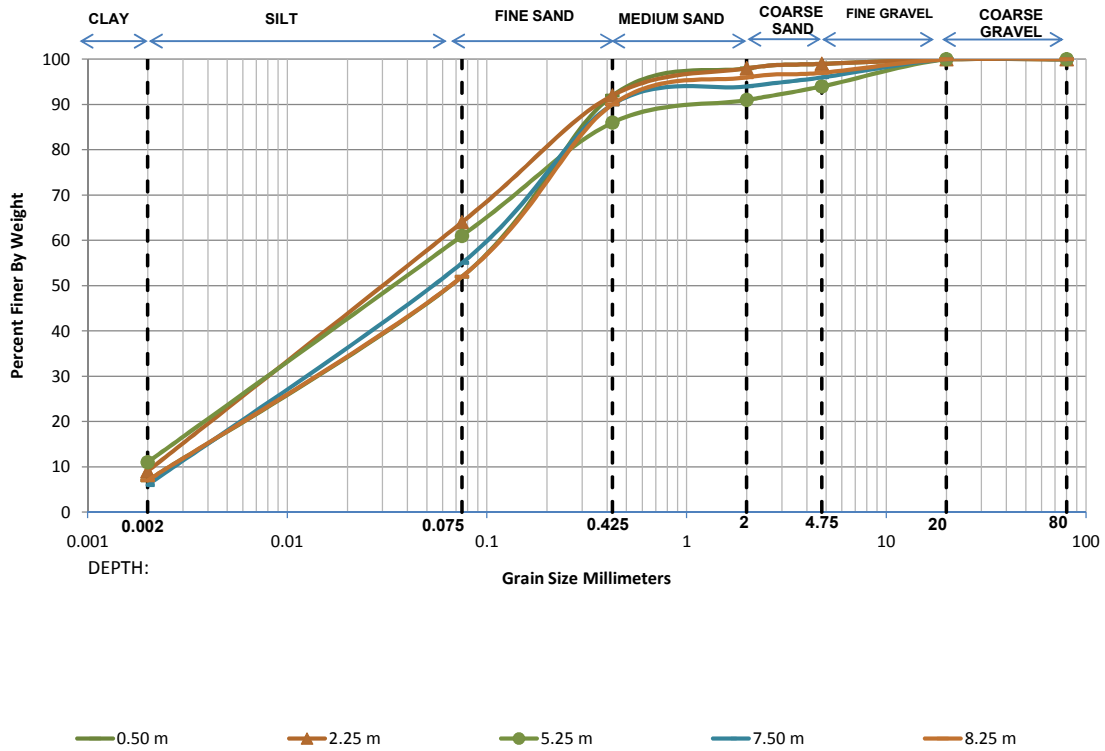


- 1.00 m
- 4.00 m
- 7.00 m
- 10.00 m
- 13.00 m
- 16.00 m
- 19.00 m
- 22.00 m
- 25.00 m
- 28.00 m
- 31.00 m
- 34.00 m
- 37.00 m
- 40.00 m
- 41.50 m
- 44.50 m
- 47.50 m
- 50.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	34.00	55.00	3.00	1.00	2.00	0.0067	0.0479	0.1525	22.73	2.24	
4.00 m	7.00	54.00	28.00	4.00	1.00	6.00	0.0035	0.0203	0.0726	20.57	1.61	
7.00 m	6.00	49.00	31.00	5.00	2.00	5.00	0.0044	0.0250	0.0939	21.20	1.50	
10.00 m	7.00	50.00	30.00	4.00	3.00	6.00	0.0036	0.0225	0.0850	23.71	1.66	
13.00 m	5.00	37.00	44.00	4.00	3.00	7.00	0.0063	0.0414	0.1548	24.66	1.76	
16.00 m	4.00	37.00	43.00	5.00	2.00	8.00	0.0079	0.0441	0.1641	20.75	1.50	
19.00 m	5.00	37.00	42.00	3.00	4.00	9.00	0.0063	0.0412	0.1592	25.42	1.70	
22.00 m	6.00	46.00	34.00	4.00	4.00	6.00	0.0045	0.0274	0.1080	23.87	1.54	
25.00 m	8.00	48.00	29.00	3.00	2.00	10.00	0.0029	0.0220	0.0899	30.57	1.82	
28.00 m	7.00	53.00	28.00	2.00	1.00	7.00	0.0035	0.0208	0.0750	21.18	1.63	
31.00 m	11.00	59.00	19.00	1.00	2.00	8.00	-	0.0130	0.0539	-	-	
34.00 m	10.00	56.00	20.00	3.00	2.00	8.00	0.0020	0.0150	0.0613	30.63	1.84	
37.00 m	11.00	52.00	17.00	4.00	5.00	9.00	-	0.0150	0.0673	-	-	
40.00 m	10.00	53.00	22.00	3.00	2.00	10.00	0.0020	0.0161	0.0676	33.81	1.93	
41.50 m	6.00	54.00	32.00	4.00	2.00	2.00	0.0043	0.0221	0.0750	17.38	1.51	
44.50 m	7.00	52.00	34.00	5.00	1.00	1.00	0.0036	0.0216	0.0776	21.79	1.68	
47.50 m	10.00	51.00	19.00	9.00	2.00	5.00	0.0020	0.0168	0.0724	36.19	1.95	
50.50 m	11.00	50.00	20.00	7.00	4.00	6.00	-	0.0159	0.0723	-	-	

GRAIN SIZE DISTRIBUTION CURVES

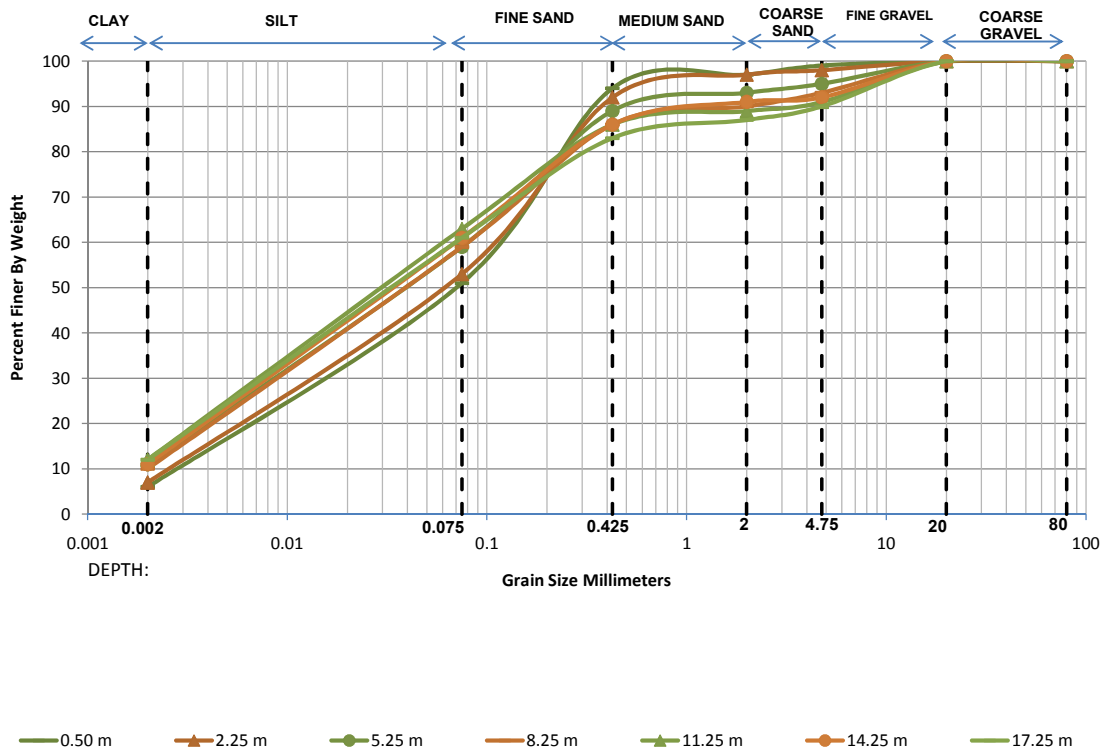
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	29+860 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	45.00	40.00	6.00	1.00	1.00	0.00	0.0037	0.0267	0.1037	28.12	1.86
2.25 m	9.00	55.00	28.00	6.00	1.00	1.00	0.00	0.0024	0.0170	0.0657	27.44	1.83
5.25 m	11.00	50.00	25.00	5.00	3.00	6.00	0.00	-	0.0161	0.0724	-	-
7.50 m	6.00	49.00	35.00	4.00	2.00	4.00	0.00	0.0044	0.0252	0.0920	20.71	1.56
8.25 m	7.00	45.00	38.00	6.00	1.00	3.00	0.00	0.0037	0.0265	0.1051	28.52	1.82

GRAIN SIZE DISTRIBUTION CURVES

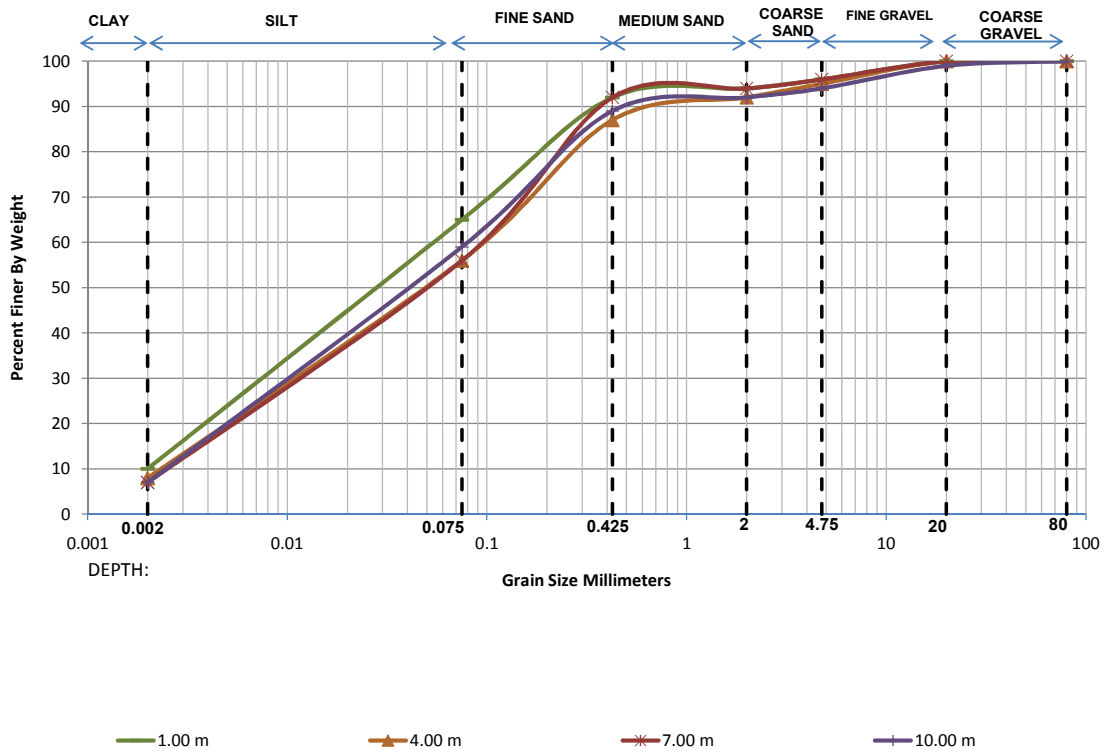
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+176 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	45.00	43.00	3.00	2.00	1.00	0.00	0.0046	0.0289	0.1059	23.09	1.72
2.25 m	7.00	46.00	39.00	5.00	1.00	2.00	0.00	0.0037	0.0258	0.0995	27.13	1.82
5.25 m	11.00	48.00	30.00	4.00	2.00	5.00	0.00	-	0.0173	0.0779	-	-
8.25 m	10.00	49.00	27.00	4.00	3.00	7.00	0.00	0.0020	0.0181	0.0780	38.99	2.10
11.25 m	12.00	51.00	23.00	3.00	2.00	9.00	0.00	-	0.0144	0.0674	-	-
14.25 m	11.00	50.00	25.00	5.00	1.00	8.00	0.00	-	0.0161	0.0724	-	-
17.25 m	12.00	49.00	22.00	4.00	3.00	10.00	0.00	-	0.0151	0.0723	-	-

GRAIN SIZE DISTRIBUTION CURVES

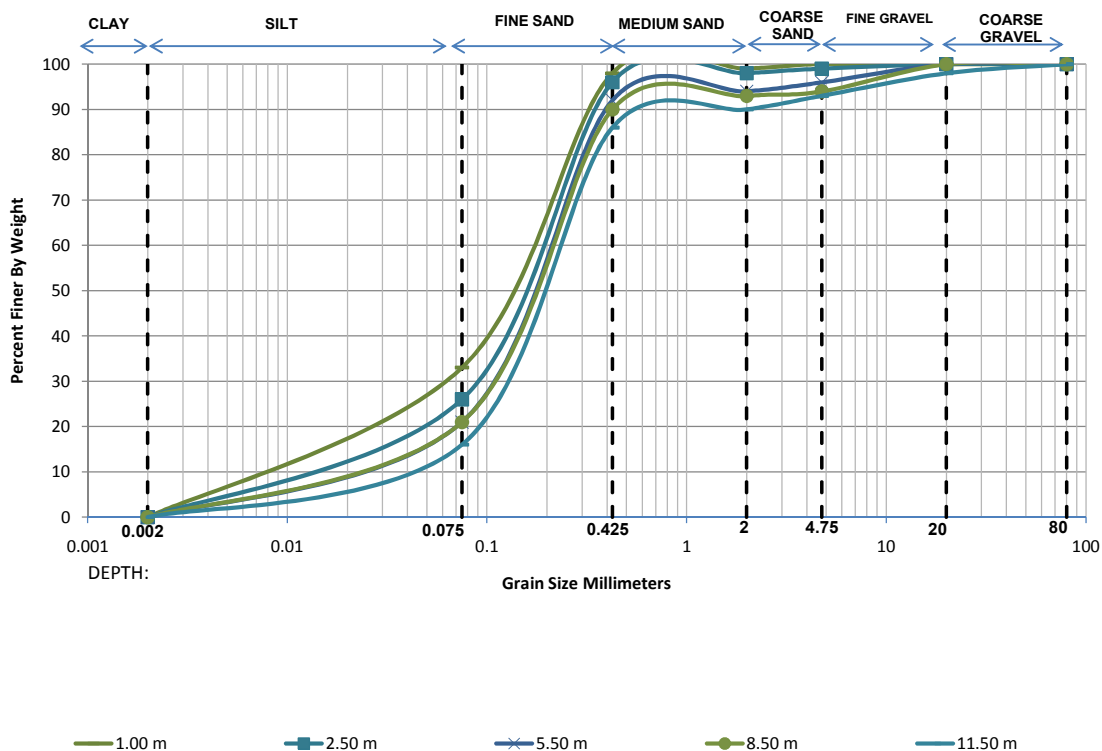
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+478 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	10.00	55.00	27.00	2.00	2.00	4.00	0.00	0.0020	0.0156	0.0635	31.75	1.92
4.00 m	8.00	48.00	31.00	5.00	3.00	5.00	0.00	0.0029	0.0221	0.0893	30.33	1.85
7.00 m	7.00	49.00	36.00	2.00	2.00	4.00	0.00	0.0036	0.0235	0.0876	24.26	1.74
10.00 m	7.00	52.00	30.00	3.00	2.00	5.00	1.00	0.0036	0.0214	0.0777	21.86	1.65

GRAIN SIZE DISTRIBUTION CURVES

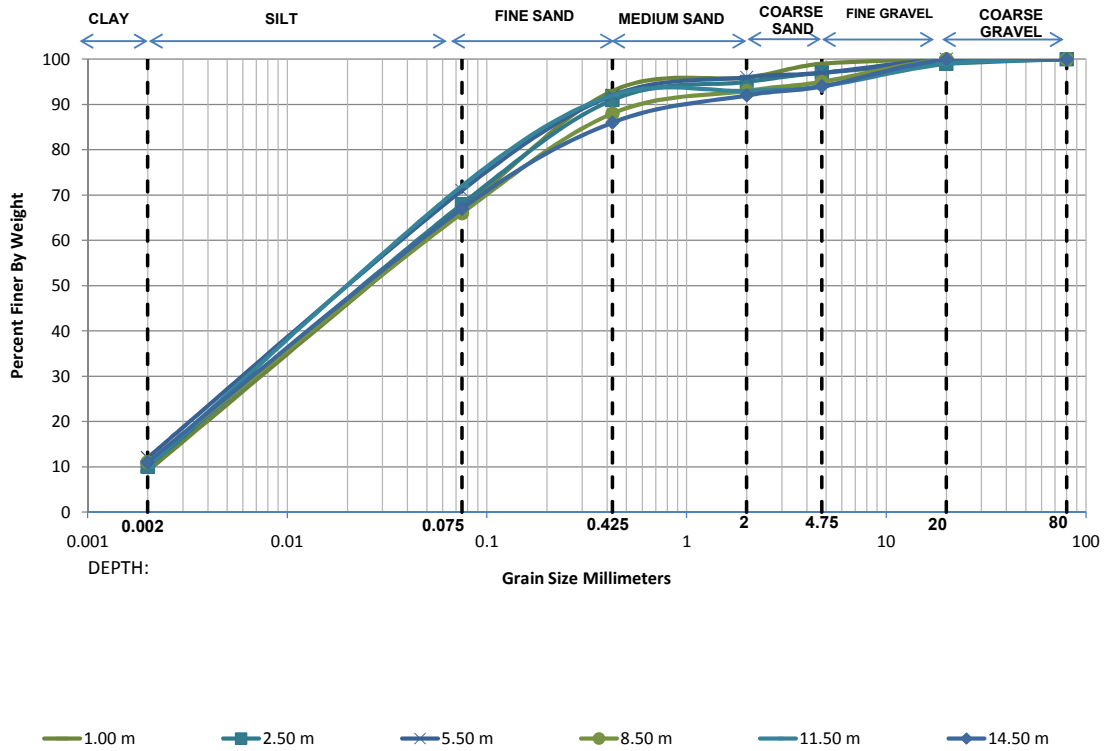
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+697 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	33.00	65.00	1.00	1.00	0.00	0.00	0.0114	0.0655	0.1646	14.41	2.28
2.50 m	0.00	26.00	70.00	2.00	1.00	1.00	0.00	0.0176	0.0889	0.1904	10.83	2.36
5.50 m	0.00	21.00	71.00	2.00	2.00	4.00	0.00	0.0257	0.1087	0.2135	8.30	2.15
8.50 m	0.00	21.00	69.00	3.00	1.00	6.00	0.00	0.0256	0.1091	0.2182	8.52	2.13
11.50 m	0.00	16.00	70.00	4.00	3.00	5.00	2.00	0.0407	0.1320	0.2435	5.98	1.76

GRAIN SIZE DISTRIBUTION CURVES

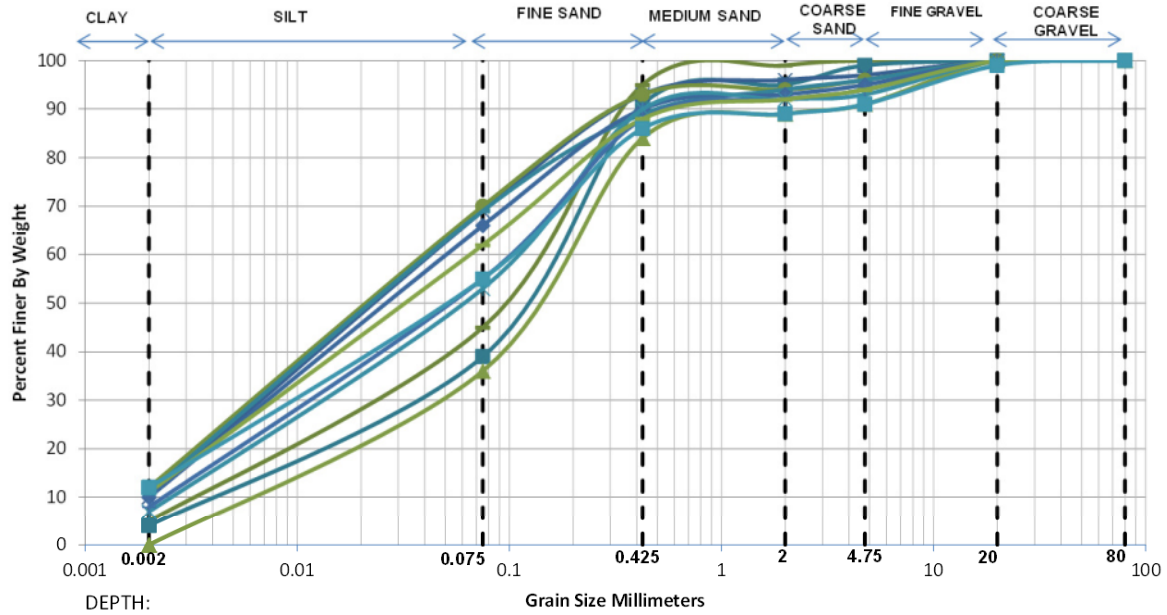
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	31+354 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	9.00	58.00	26.00	3.00	3.00	1.00	0.00	0.0024	0.0158	0.0599	25.06	1.75
2.50 m	10.00	58.00	23.00	4.00	2.00	2.00	1.00	0.0020	0.0145	0.0577	28.86	1.82
5.50 m	12.00	59.00	21.00	4.00	1.00	3.00	0.00	-	0.0120	0.0521	-	-
8.50 m	11.00	55.00	22.00	5.00	2.00	5.00	0.00	-	0.0142	0.0611	-	-
11.50 m	10.00	62.00	20.00	1.00	1.00	5.00	1.00	0.0020	0.0134	0.0513	25.64	1.75
14.50 m	11.00	56.00	19.00	6.00	2.00	6.00	0.00	-	0.0138	0.0591	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	32+487
B.H. No.	BH-CL

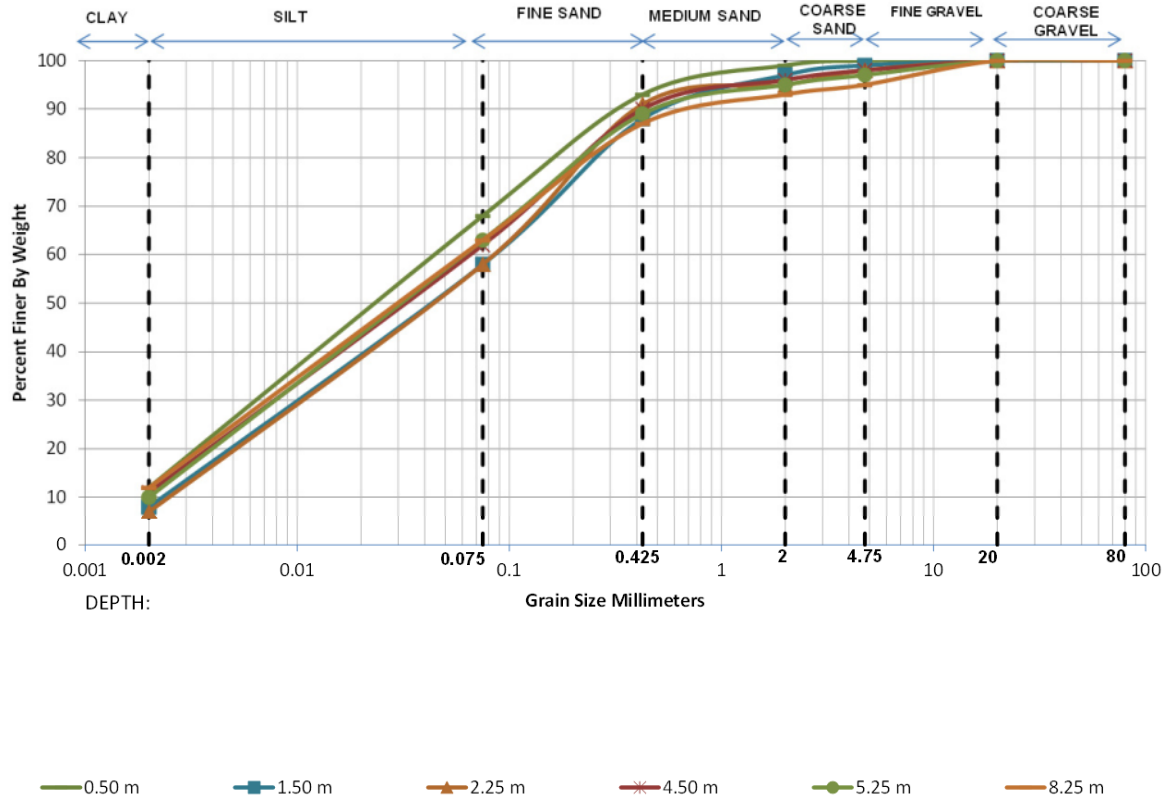


— 1.00 m
 — 2.50 m
 — 5.50 m
 — 8.50 m
 — 11.50 m
 — 14.50 m
 — 17.50 m
 — 20.50 m
 — 23.50 m
 — 26.50 m
 — 29.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	47.00	33.00	12.00	0.00	2.00	0.00	0.0045	0.0266	0.1044	23.25	1.51
2.25 m	7.00	48.00	33.00	8.00	1.00	3.00	0.00	0.0036	0.0240	0.0933	25.77	1.70
5.25 m	11.00	58.00	18.00	6.00	2.00	5.00	0.00	-	0.0132	0.0555	-	-
8.25 m	6.00	29.00	50.00	9.00	1.00	5.00	0.00	0.0058	0.0570	0.1890	32.74	2.98
11.25 m	7.00	23.00	51.00	11.00	1.00	7.00	0.00	0.0051	0.0750	0.2227	43.55	4.94

GRAIN SIZE DISTRIBUTION CURVES

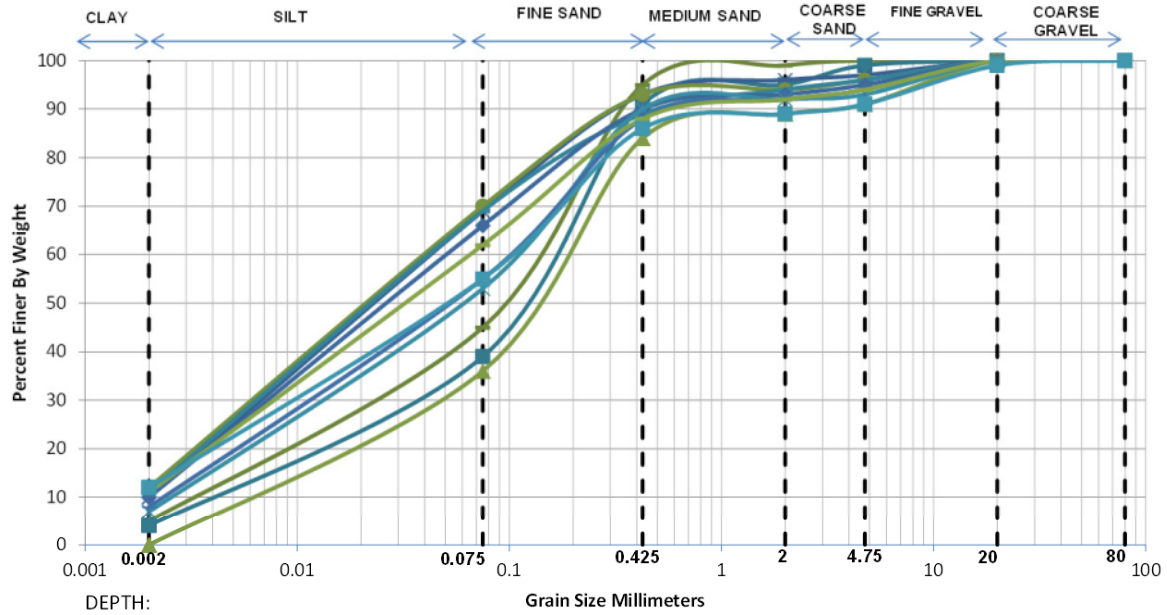
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+083
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	12.00	56.00	25.00	6.00	1.00	0.00	0.00	-	0.0129	0.0572	-	-
1.50 m	8.00	50.00	30.00	9.00	2.00	1.00	0.00	0.0029	0.0208	0.0813	27.75	1.82
2.25 m	7.00	51.00	33.00	4.00	3.00	2.00	0.00	0.0036	0.0221	0.0808	22.60	1.69
4.50 m	11.00	51.00	28.00	6.00	2.00	2.00	0.00	-	0.0159	0.0700	-	-
5.25 m	10.00	53.00	26.00	6.00	2.00	3.00	0.00	0.0020	0.0163	0.0677	33.85	1.96
8.25 m	12.00	51.00	24.00	6.00	2.00	5.00	0.00	-	0.0144	0.0674	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+488 km
B.H. No.	BH-A1

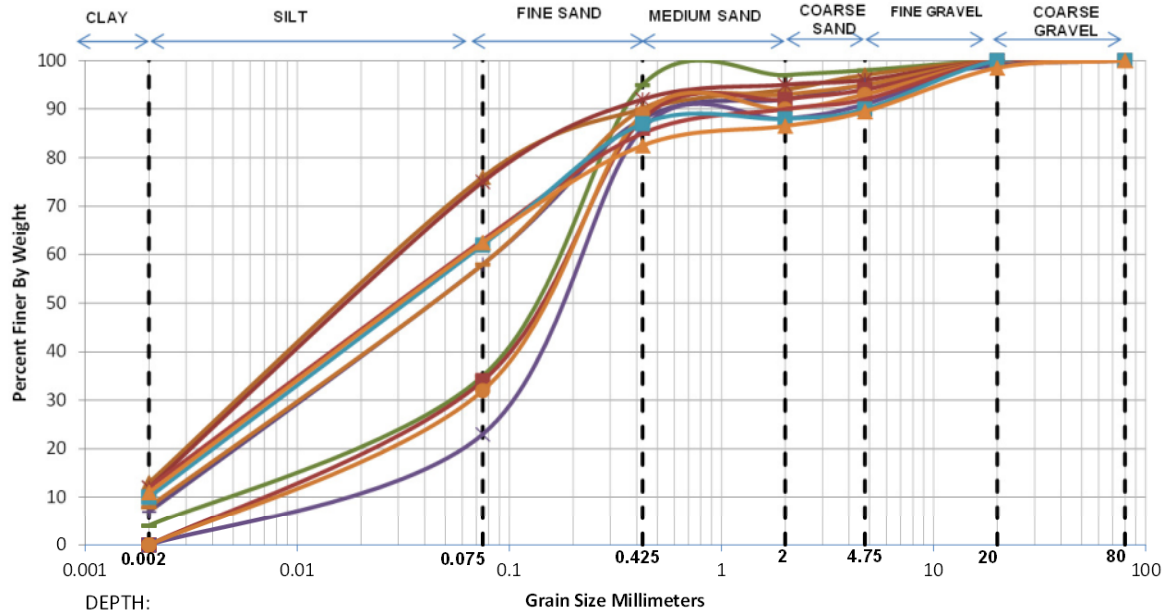


— 1.00 m — 2.50 m — 5.50 m — 8.50 m — 11.50 m — 14.50 m — 17.50 m — 20.50 m — 23.50 m — 26.50 m — 29.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	40.00	50.00	4.00	1.00	0.00	0.00	0.0061	0.0372	0.1285	21.19	1.78
2.50 m	4.00	35.00	52.00	4.00	4.00	1.00	0.00	0.0083	0.0486	0.1570	18.89	1.81
5.50 m	10.00	59.00	24.00	3.00	1.00	3.00	0.00	0.0020	0.0143	0.0561	28.04	1.81
8.50 m	12.00	58.00	23.00	1.00	2.00	4.00	0.00	-	0.0123	0.0537	-	-
11.50 m	11.00	58.00	20.00	5.00	2.00	4.00	0.00	-	0.0133	0.0556	-	-
14.50 m	10.00	56.00	24.00	3.00	2.00	5.00	0.00	0.0020	0.0152	0.0614	30.71	1.87
17.50 m	0.00	36.00	48.00	5.00	2.00	9.00	0.00	0.0094	0.0564	0.1835	19.52	1.84
20.50 m	7.00	46.00	37.00	2.00	1.00	7.00	0.00	0.0037	0.0257	0.1003	27.37	1.79
23.50 m	8.00	47.00	33.00	4.00	2.00	6.00	0.00	0.0030	0.0228	0.0931	31.53	1.90
26.50 m	11.00	51.00	26.00	4.00	2.00	6.00	0.00	-	0.0158	0.0699	-	-
29.50 m	12.00	43.00	31.00	3.00	2.00	8.00	1.00	-	0.0186	0.0948	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	30+488 km
B.H. No.	BH-A2

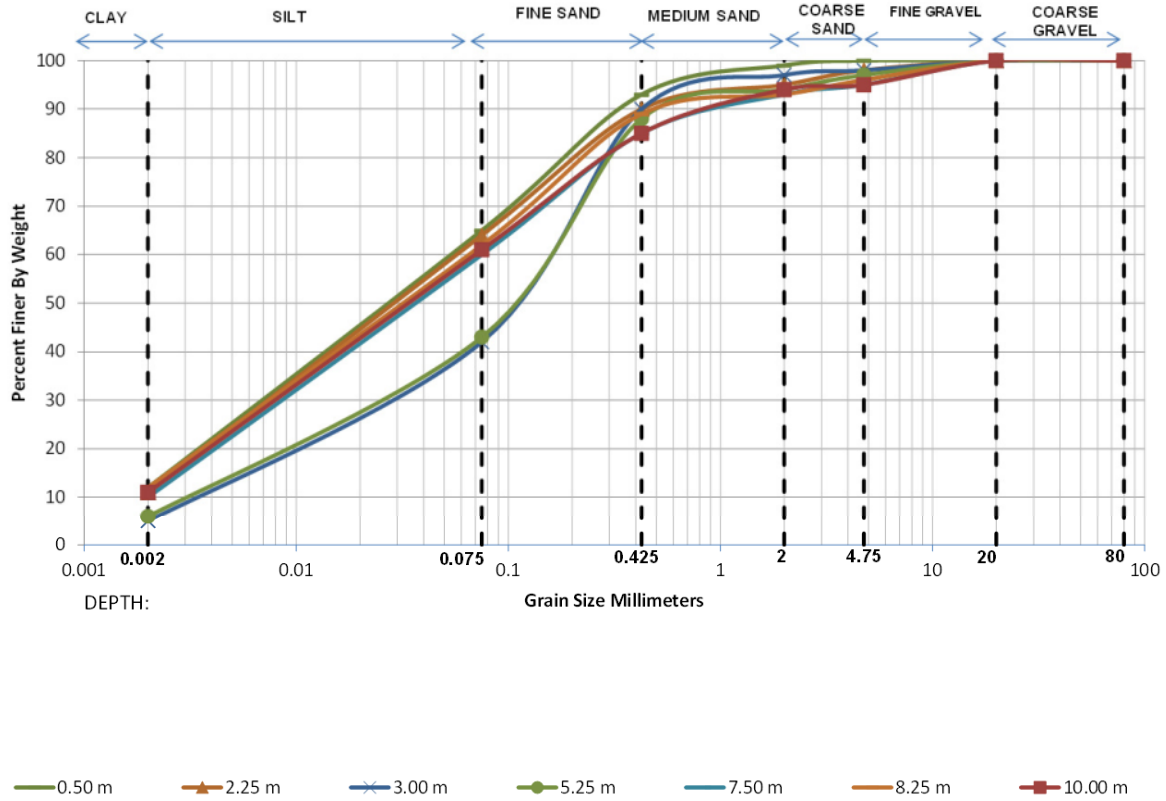


— 1.00 m — 4.00 m — 7.00 m — 10.00 m — 13.00 m — 16.00 m — 19.00 m — 22.00 m — 25.00 m — 28.50 m — 29.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	4.00	31.00	60.00	2.00	1.00	2.00	0.00	0.0092	0.0587	0.1648	17.87	2.26
4.00 m	13.00	63.00	14.00	4.00	3.00	3.00	0.00	-	0.0101	0.0444	-	-
7.00 m	12.00	63.00	17.00	3.00	1.00	4.00	0.00	-	0.0111	0.0462	-	-
10.00 m	7.00	51.00	30.00	4.00	3.00	4.00	1.00	0.0036	0.0219	0.0811	22.71	1.66
13.00 m	8.00	50.00	32.00	3.00	2.00	5.00	0.00	0.0029	0.0209	0.0809	27.63	1.85
16.00 m	0.00	34.00	54.00	4.00	2.00	6.00	0.00	0.0105	0.0622	0.1800	17.09	2.04
19.00 m	0.00	23.00	63.00	2.00	3.00	9.00	0.00	0.0215	0.1017	0.2219	10.33	2.17
22.00 m	0.00	32.00	57.00	1.00	3.00	7.00	0.00	0.0118	0.0683	0.1839	15.61	2.15
25.00 m	12.00	51.00	22.00	5.00	2.00	8.00	0.00	-	0.0143	0.0673	-	-
28.50 m	10.00	52.00	25.00	1.00	2.00	10.00	0.00	0.0020	0.0167	0.0700	35.00	1.98
29.50 m	11.00	51.50	20.00	4.00	3.00	9.00	1.50	-	0.0153	0.0686	-	-

GRAIN SIZE DISTRIBUTION CURVES

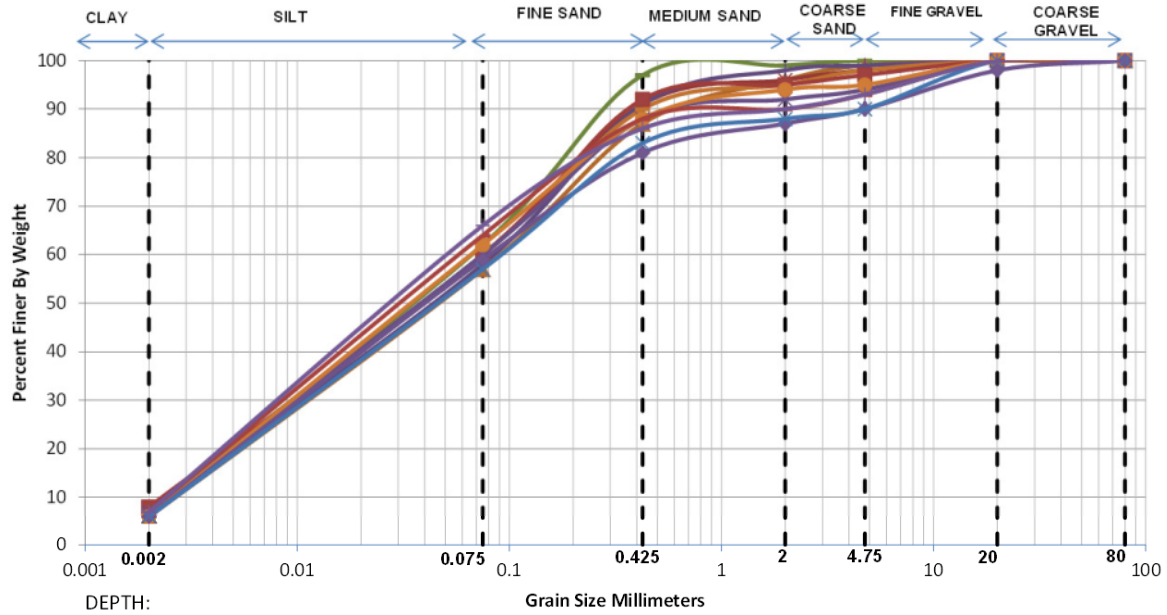
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	31+095
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	12.00	53.00	28.00	6.00	1.00	0.00	0.00	-	0.0139	0.0631	-	-
2.25 m	11.00	53.00	26.00	5.00	3.00	2.00	0.00	-	0.0150	0.0654	-	-
3.00 m	5.00	37.00	48.00	7.00	1.00	2.00	0.00	0.0063	0.0417	0.1480	23.45	1.86
5.25 m	6.00	37.00	45.00	6.00	3.00	3.00	0.00	0.0050	0.0388	0.1475	29.63	2.05
7.50 m	10.00	50.00	25.00	8.00	2.00	5.00	0.00	0.0020	0.0175	0.0750	37.50	2.05
8.25 m	12.00	50.00	27.00	4.00	3.00	4.00	0.00	-	0.0149	0.0698	-	-
10.00 m	11.00	50.00	24.00	9.00	1.00	5.00	0.00	-	0.0161	0.0724	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	31+714 km
B.H. No.	BH-A1

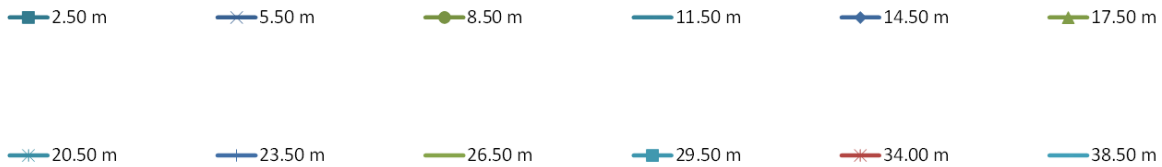
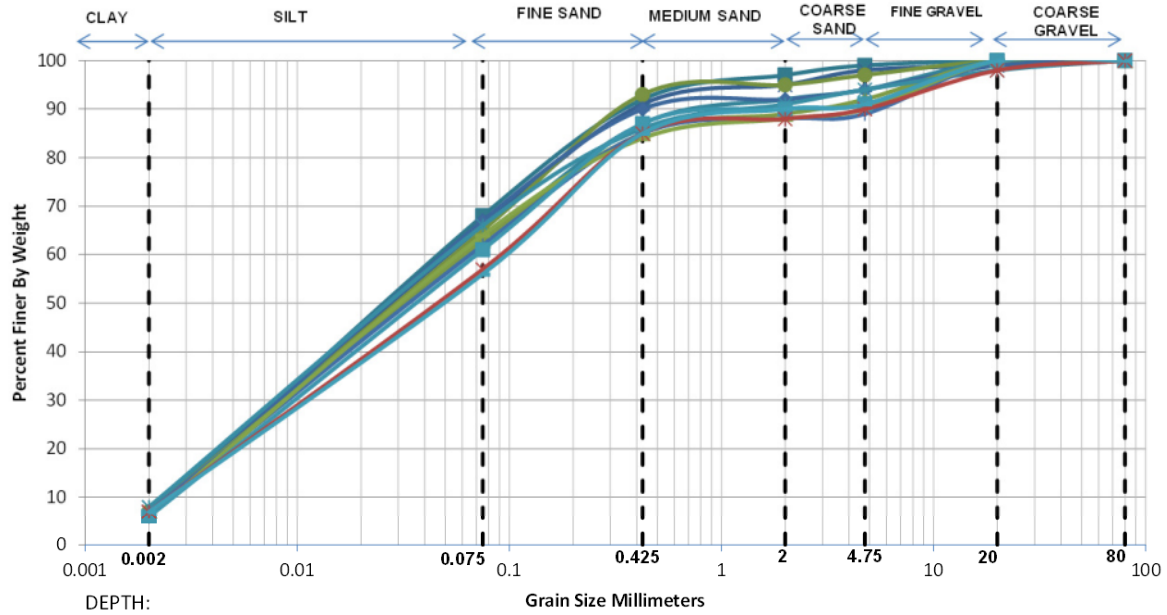


- Legend for depths:
- 1.00 m
 - ▲— 4.00 m
 - *— 7.00 m
 - ◆— 10.00 m
 - 13.00 m
 - 16.00 m
 - ×— 19.00 m
 - 22.00 m
 - ◇— 25.00 m
 - ◇— 28.00 m
 - ×— 32.50 m
 - ◇— 37.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	55.00	35.00	2.00	1.00	0.00	0.00	0.0035	0.0202	0.0704	19.96	1.64
4.00 m	6.00	51.00	30.00	9.00	3.00	1.00	0.00	0.0044	0.0237	0.0851	19.44	1.51
7.00 m	6.00	54.00	31.00	5.00	2.00	2.00	0.00	0.0043	0.0221	0.0750	17.39	1.51
10.00 m	7.00	51.00	33.00	7.00	1.00	1.00	0.00	0.0036	0.0221	0.0808	22.61	1.69
13.00 m	7.00	53.00	30.00	5.00	3.00	2.00	0.00	0.0035	0.0209	0.0750	21.16	1.64
16.00 m	8.00	52.00	32.00	3.00	2.00	3.00	0.00	0.0029	0.0199	0.0750	25.72	1.81
19.00 m	7.00	53.00	28.00	4.00	2.00	6.00	0.00	0.0035	0.0208	0.0750	21.18	1.63
22.00 m	6.00	56.00	26.00	6.00	1.00	5.00	0.00	0.0043	0.0209	0.0703	16.49	1.46
25.00 m	7.00	57.00	24.00	2.00	3.00	7.00	0.00	0.0035	0.0189	0.0660	18.89	1.54
28.00 m	6.00	53.00	22.00	6.00	3.00	8.00	2.00	0.0043	0.0221	0.0781	18.11	1.45
32.50 m	6.00	51.00	26.00	5.00	2.00	10.00	0.00	0.0044	0.0234	0.0861	19.72	1.46
37.00 m	7.00	59.00	20.00	4.00	3.00	7.00	0.00	0.0035	0.0180	0.0620	17.87	1.50

GRAIN SIZE DISTRIBUTION CURVES

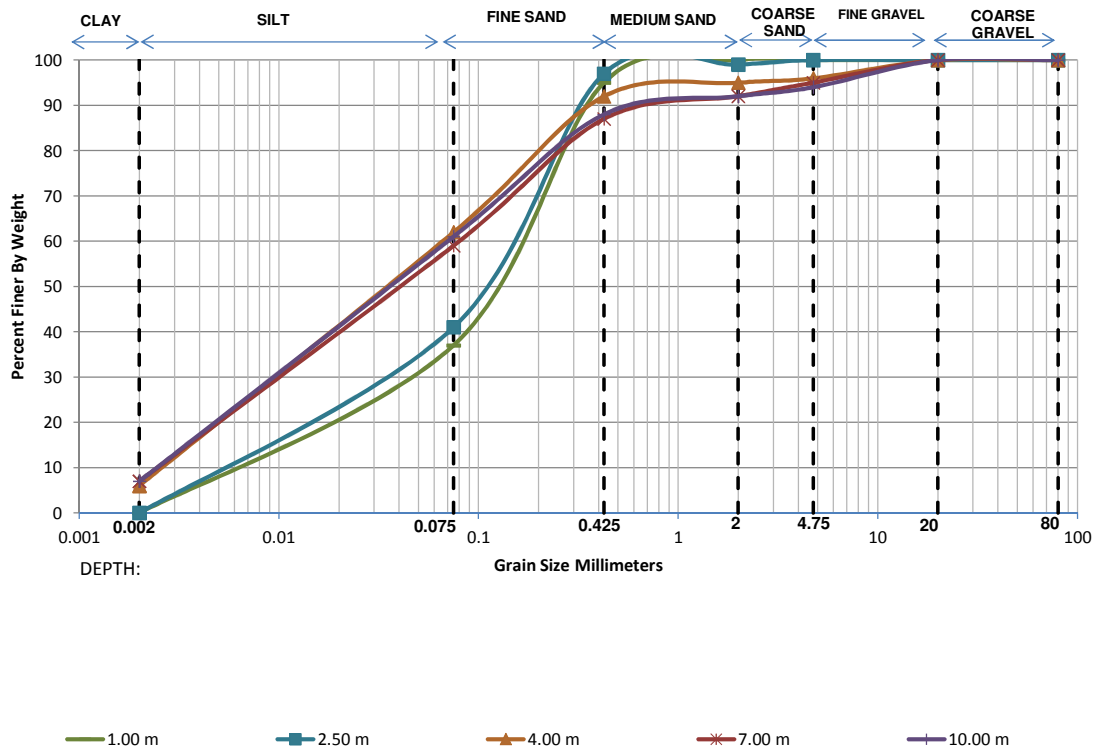
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	31+714 km
B.H. No.	BH-A2



Depth	Grain Size Distribution % wt retained								D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel							
			Fine	Medium	Coarse	Fine	Coarse						
2.50 m	6.00	62.00	24.00	5.00	2.00	1.00	0.00	0.0042	0.0186	0.0589	14.14	1.41	
5.50 m	7.00	59.00	25.00	4.00	3.00	1.00	0.00	0.0035	0.0182	0.0621	17.89	1.53	
8.50 m	7.00	58.00	28.00	2.00	2.00	3.00	0.00	0.0035	0.0186	0.0641	18.39	1.56	
11.50 m	8.00	55.00	24.00	5.00	2.00	6.00	0.00	0.0029	0.0182	0.0679	23.47	1.68	
14.50 m	6.00	61.00	23.00	2.00	2.00	5.00	1.00	0.0042	0.0189	0.0605	14.49	1.41	
17.50 m	7.00	56.00	22.00	4.00	3.00	8.00	0.00	0.0035	0.0192	0.0680	19.43	1.54	
20.50 m	8.00	58.00	20.00	5.00	3.00	4.00	2.00	0.0029	0.0169	0.0617	21.46	1.61	
23.50 m	7.00	55.00	23.00	3.00	1.00	11.00	0.00	0.0035	0.0196	0.0702	20.00	1.56	
26.50 m	6.00	58.00	20.00	4.00	2.00	10.00	0.00	0.0042	0.0198	0.0660	15.65	1.41	
29.50 m	6.00	55.00	26.00	3.00	1.00	9.00	0.00	0.0043	0.0214	0.0726	16.95	1.47	
34.00 m	7.00	50.00	28.00	3.00	2.00	8.00	2.00	0.0036	0.0224	0.0854	23.86	1.64	
38.50 m	7.00	49.00	29.00	5.00	1.00	9.00	0.00	0.0036	0.0231	0.0900	25.01	1.64	

GRAIN SIZE DISTRIBUTION CURVES

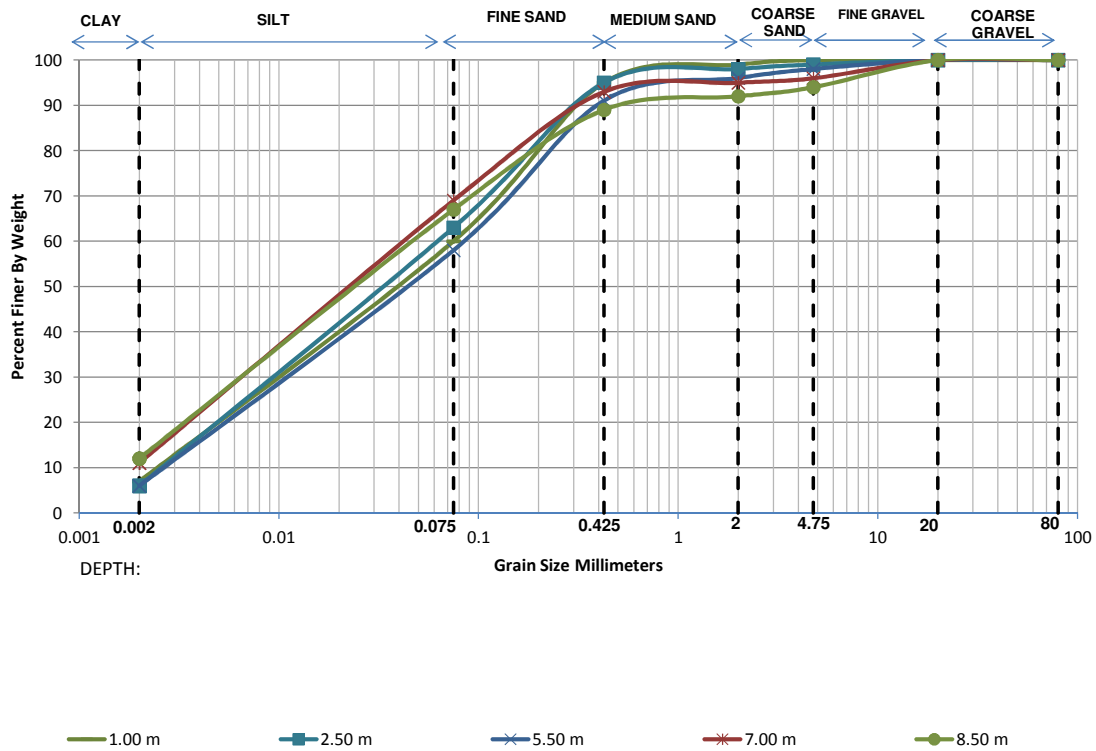
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	32+191
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	0.00	37.00	58.00	5.00	0.00	0.00	0.00	0.0092	0.0545	0.1562	16.89	2.05
2.50 m	0.00	41.00	56.00	2.00	1.00	0.00	0.00	0.0078	0.0457	0.1387	17.78	1.93
4.00 m	6.00	56.00	30.00	3.00	1.00	4.00	0.00	0.0043	0.0211	0.0704	16.48	1.48
7.00 m	7.00	52.00	28.00	5.00	3.00	5.00	0.00	0.0036	0.0213	0.0778	21.90	1.64
10.00 m	7.00	54.00	27.00	4.00	2.00	6.00	0.00	0.0035	0.0203	0.0726	20.57	1.60

GRAIN SIZE DISTRIBUTION CURVES

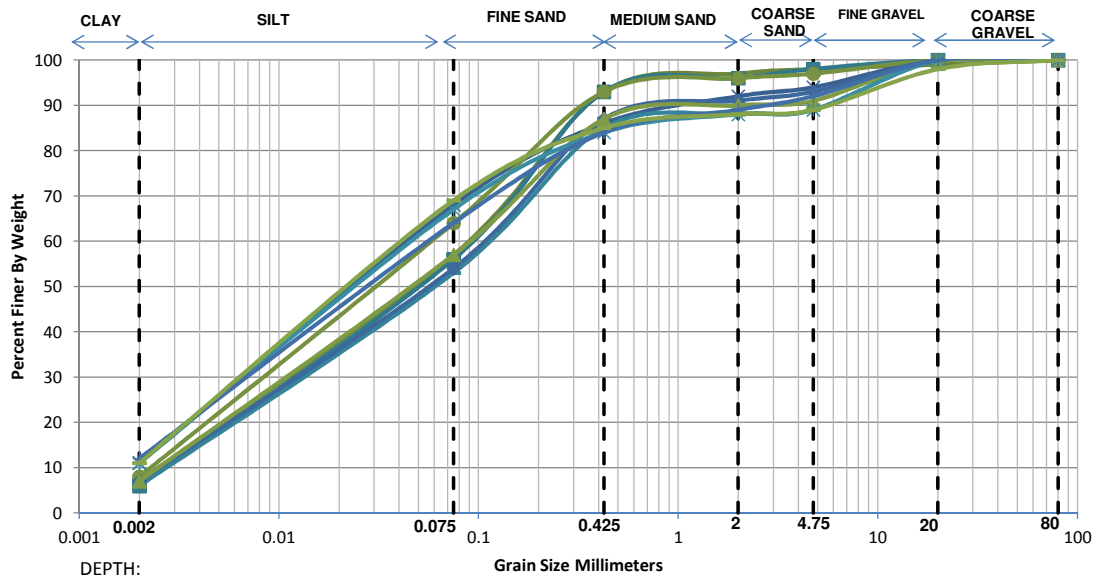
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	32+738 km
B.H. No.	BH-C/L



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	53.00	35.00	4.00	1.00	0.00	0.00	0.0036	0.0211	0.0750	21.12	1.67
2.50 m	6.00	57.00	32.00	3.00	1.00	1.00	0.00	0.0043	0.0208	0.0683	16.04	1.48
5.50 m	6.00	52.00	33.00	5.00	2.00	2.00	0.00	0.0044	0.0233	0.0807	18.51	1.54
7.00 m	11.00	58.00	24.00	2.00	1.00	4.00	0.00	-	0.0134	0.0558	-	-
8.50 m	12.00	55.00	22.00	3.00	2.00	6.00	0.00	-	0.0130	0.0589	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	33+713 km
B.H. No.	BH-A1

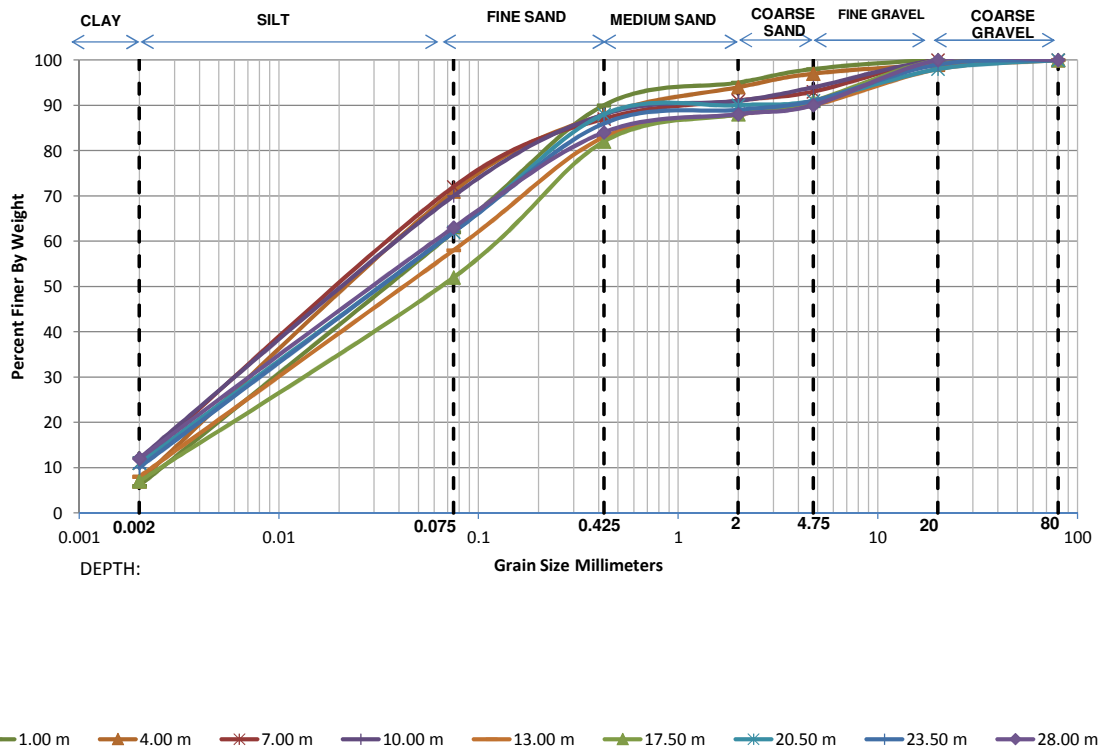


— 1.00 m
 — 2.50 m
 — 5.50 m
 — 8.50 m
 — 11.50 m
 — 14.50 m
 — 17.50 m
 — 20.50 m
 — 23.50 m
 — 26.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	50.00	36.00	4.00	1.00	1.00	1.00	0.0036	0.0228	0.0839	23.35	1.73
2.50 m	6.00	50.00	37.00	3.00	2.00	2.00	0.00	0.0044	0.0247	0.0873	19.75	1.58
5.50 m	11.00	57.00	18.00	6.00	2.00	6.00	0.00	-	0.0135	0.0572	-	-
8.50 m	8.00	56.00	29.00	3.00	1.00	3.00	0.00	0.0029	0.0180	0.0659	22.81	1.70
11.50 m	6.00	47.00	32.00	3.00	1.00	11.00	0.00	0.0045	0.0265	0.1039	23.16	1.51
14.50 m	7.00	47.00	33.00	4.00	2.00	7.00	0.00	0.0036	0.0247	0.0979	26.93	1.71
17.50 m	7.00	50.00	30.00	3.00	1.00	9.00	0.00	0.0036	0.0225	0.0849	23.70	1.66
20.50 m	11.00	56.00	17.00	4.00	1.00	11.00	0.00	-	0.0137	0.0590	-	-
23.50 m	12.00	52.00	20.00	5.00	3.00	8.00	0.00	-	0.0139	0.0650	-	-
26.50 m	11.00	58.00	16.00	3.00	1.00	9.00	2.00	-	0.0131	0.0554	-	-

GRAIN SIZE DISTRIBUTION CURVES

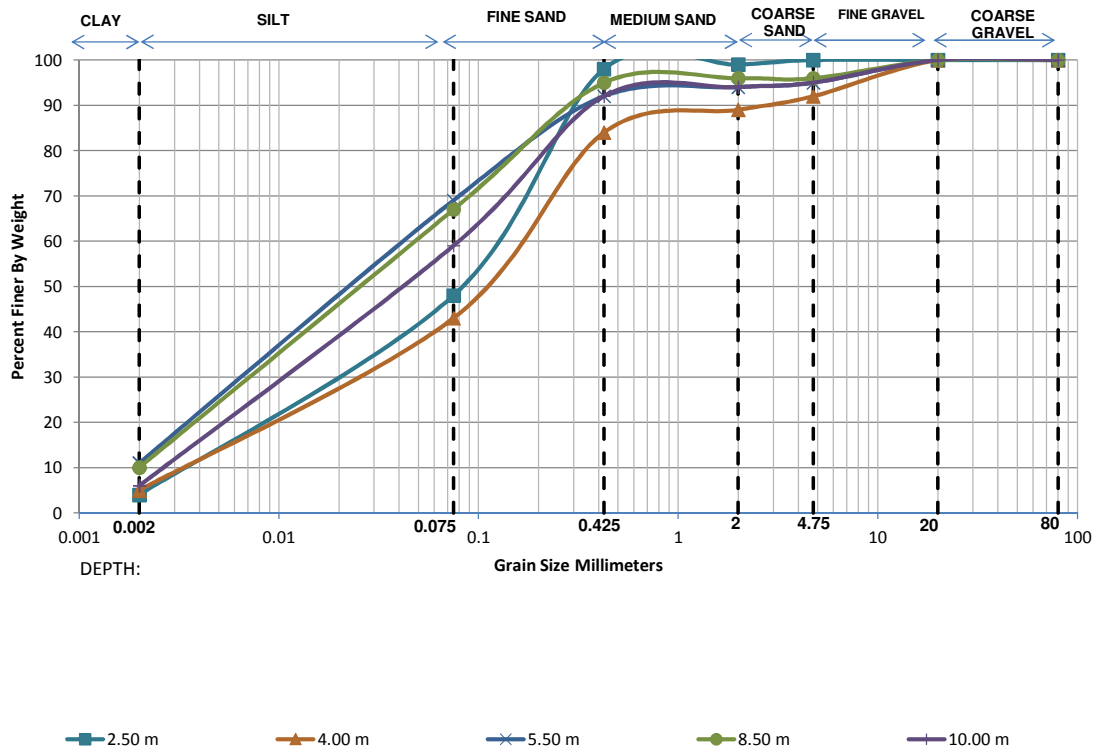
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	33+713 km
B.H. No.	BH-A2



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	56.00	28.00	5.00	3.00	2.00	0.00	0.0043	0.0210	0.0704	16.49	1.47
4.00 m	7.00	64.00	17.00	6.00	3.00	2.00	1.00	0.0034	0.0164	0.0537	15.69	1.46
7.00 m	11.00	61.00	15.00	4.00	2.00	7.00	0.00	-	0.0124	0.0506	-	-
10.00 m	12.00	58.00	18.00	3.00	3.00	6.00	0.00	-	0.0121	0.0535	-	-
13.00 m	8.00	50.00	25.00	5.00	2.00	8.00	2.00	0.0029	0.0206	0.0819	28.00	1.77
17.50 m	7.00	45.00	30.00	6.00	3.00	9.00	0.00	0.0037	0.0260	0.1137	31.00	1.62
20.50 m	11.00	51.00	26.00	2.00	1.00	7.00	2.00	-	0.0158	0.0699	-	-
23.50 m	10.00	52.00	24.00	3.00	2.00	8.00	1.00	0.0020	0.0166	0.0700	34.99	1.97
28.00 m	12.00	51.00	21.00	4.00	2.00	10.00	0.00	-	0.0143	0.0673	-	-

GRAIN SIZE DISTRIBUTION CURVES

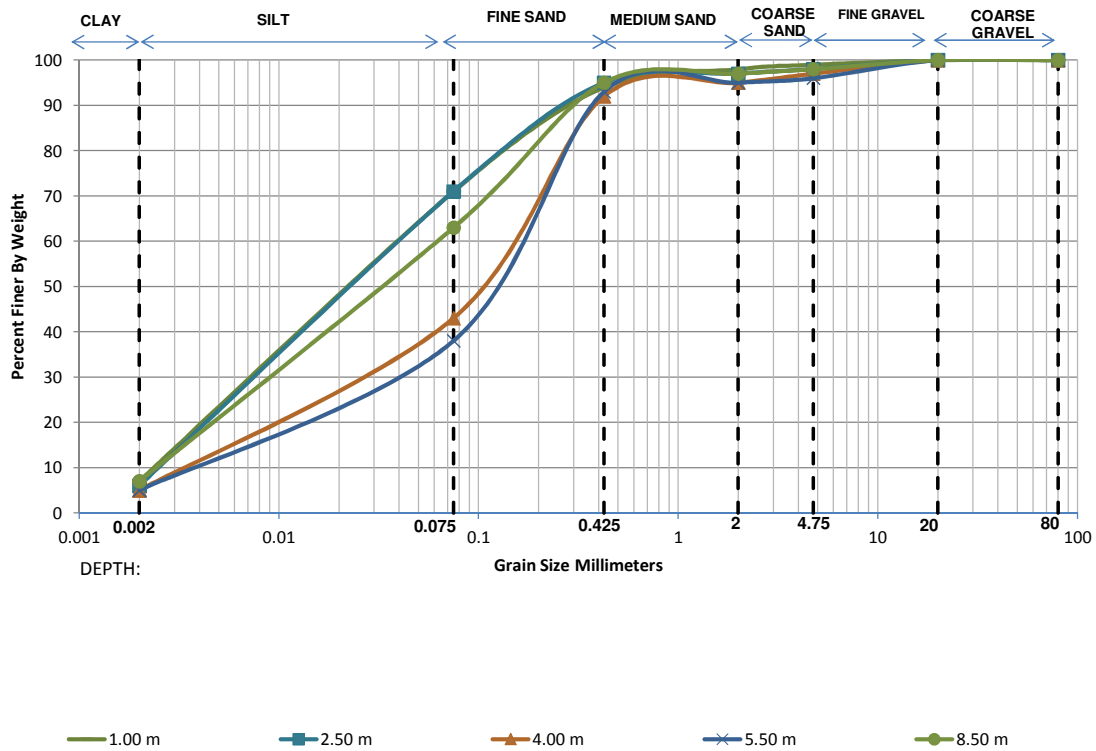
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	34+019 km
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	4.00	44.00	50.00	1.00	1.00	0.00	0.00	0.0072	0.0348	0.1139	15.72	1.47
4.00 m	5.00	38.00	41.00	5.00	3.00	8.00	0.00	0.0062	0.0395	0.1553	25.20	1.63
5.50 m	11.00	58.00	23.00	2.00	1.00	5.00	0.00	-	0.0134	0.0557	-	-
8.50 m	10.00	57.00	28.00	1.00	0.00	4.00	0.00	0.0020	0.0150	0.0597	29.86	1.88
10.00 m	6.00	53.00	33.00	2.00	1.00	5.00	0.00	0.0043	0.0227	0.0776	17.89	1.53

GRAIN SIZE DISTRIBUTION CURVES

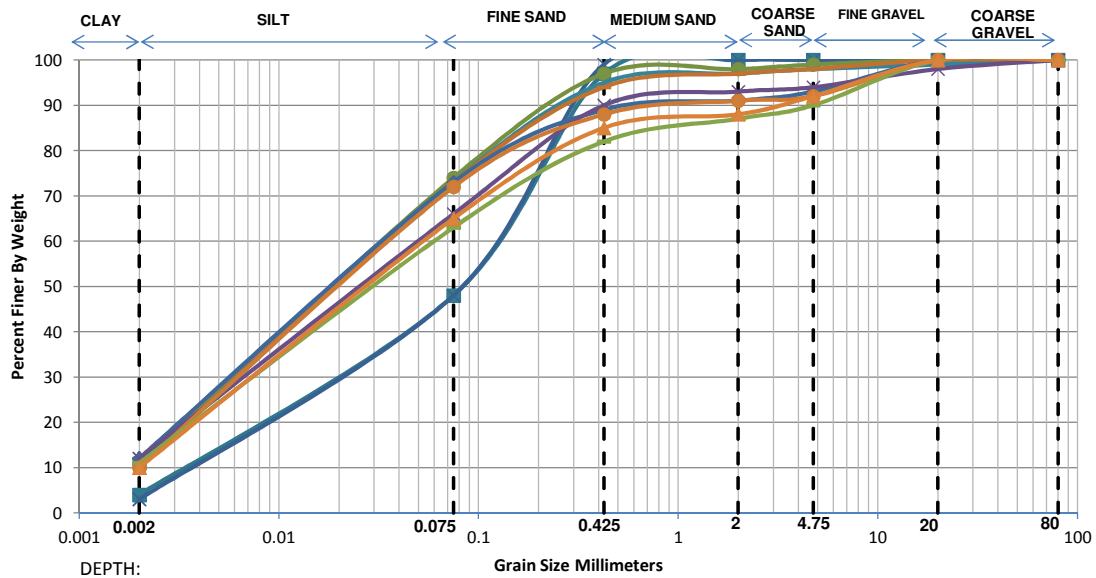
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	34+619 km
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	64.00	23.00	4.00	1.00	1.00	0.00	0.0034	0.0166	0.0540	15.75	1.49
2.50 m	6.00	65.00	24.00	2.00	1.00	2.00	0.00	0.0041	0.0178	0.0544	13.19	1.41
4.00 m	5.00	38.00	49.00	3.00	2.00	3.00	0.00	0.0062	0.0401	0.1398	22.46	1.85
5.50 m	5.00	33.00	55.00	2.00	1.00	4.00	0.00	0.0068	0.0501	0.1575	23.00	2.33
8.50 m	7.00	56.00	32.00	2.00	1.00	2.00	0.00	0.0035	0.0196	0.0682	19.43	1.60

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	35+273 km
B.H. No.	BH-A1

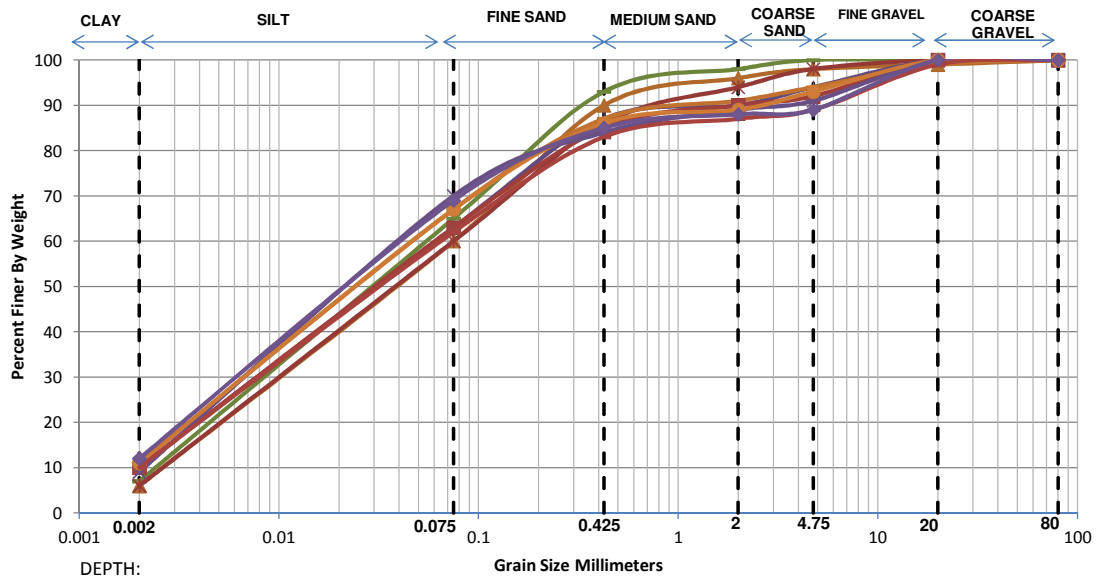


■ 1.00 m
 × 4.00 m
 ● 7.00 m
 — 10.00 m
 — 11.50 m
 ◆ 13.00 m
 × 16.00 m
 ● 19.00 m
 — 22.00 m
 ▲ 26.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	4.00	44.00	49.00	3.00	0.00	0.00	0.00	0.0072	0.0348	0.1148	15.87	1.45
4.00 m	3.00	45.00	51.00	1.00	0.00	0.00	0.00	0.0091	0.0364	0.1129	12.47	1.29
7.00 m	11.00	63.00	23.00	1.00	1.00	1.00	0.00	-	0.0122	0.0483	-	-
10.00 m	10.00	63.00	22.00	2.00	1.00	1.00	1.00	0.0020	0.0132	0.0500	25.00	1.75
11.50 m	12.00	61.00	21.00	3.00	1.00	2.00	0.00	-	0.0116	0.0491	-	-
13.00 m	12.00	61.00	16.00	2.00	2.00	7.00	0.00	-	0.0114	0.0488	-	-
16.00 m	12.00	54.00	24.00	3.00	1.00	4.00	2.00	-	0.0134	0.0609	-	-
19.00 m	10.00	62.00	16.00	3.00	1.00	8.00	0.00	0.0020	0.0133	0.0511	25.53	1.72
22.00 m	11.00	52.00	19.00	5.00	3.00	10.00	0.00	-	0.0151	0.0674	-	-
26.50 m	10.00	55.00	20.00	3.00	4.00	8.00	0.00	0.0020	0.0153	0.0632	31.62	1.86

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	35+273 km
B.H. No.	BH-A2

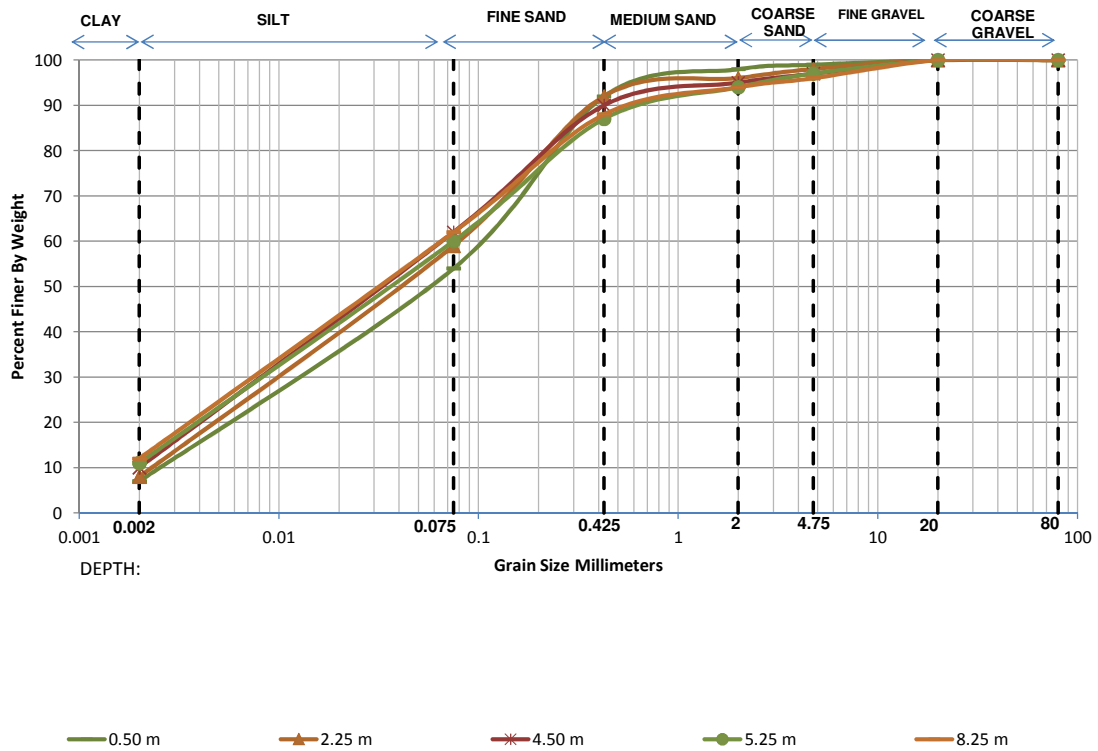


— 1.00 m
 —▲ 4.00 m
 —✱ 7.00 m
 —✕ 10.00 m
 — 13.00 m
 —■ 16.00 m
 —✕ 19.00 m
 —● 22.00 m
 — 25.00 m
 —◆ 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	58.00	28.00	5.00	2.00	0.00	0.00	0.0035	0.0186	0.0641	18.39	1.56
4.00 m	6.00	54.00	30.00	6.00	2.00	1.00	1.00	0.0043	0.0220	0.0750	17.39	1.50
7.00 m	6.00	54.00	26.00	8.00	4.00	2.00	0.00	0.0043	0.0218	0.0750	17.43	1.48
10.00 m	10.00	53.00	24.00	3.00	4.00	6.00	0.00	0.0020	0.0162	0.0677	33.83	1.94
13.00 m	11.00	56.00	20.00	4.00	3.00	5.00	1.00	-	0.0138	0.0591	-	-
16.00 m	10.00	53.00	22.00	5.00	2.00	8.00	0.00	0.0020	0.0161	0.0676	33.81	1.93
19.00 m	9.00	61.00	14.00	5.00	2.00	9.00	0.00	0.0024	0.0146	0.0543	22.78	1.64
22.00 m	11.00	56.00	19.00	3.00	4.00	7.00	0.00	-	0.0138	0.0591	-	-
25.00 m	10.00	52.00	21.00	4.00	2.00	10.00	1.00	0.0020	0.0165	0.0699	34.96	1.94
28.00 m	12.00	57.00	16.00	3.00	1.00	11.00	0.00	-	0.0123	0.0550	-	-

GRAIN SIZE DISTRIBUTION CURVES

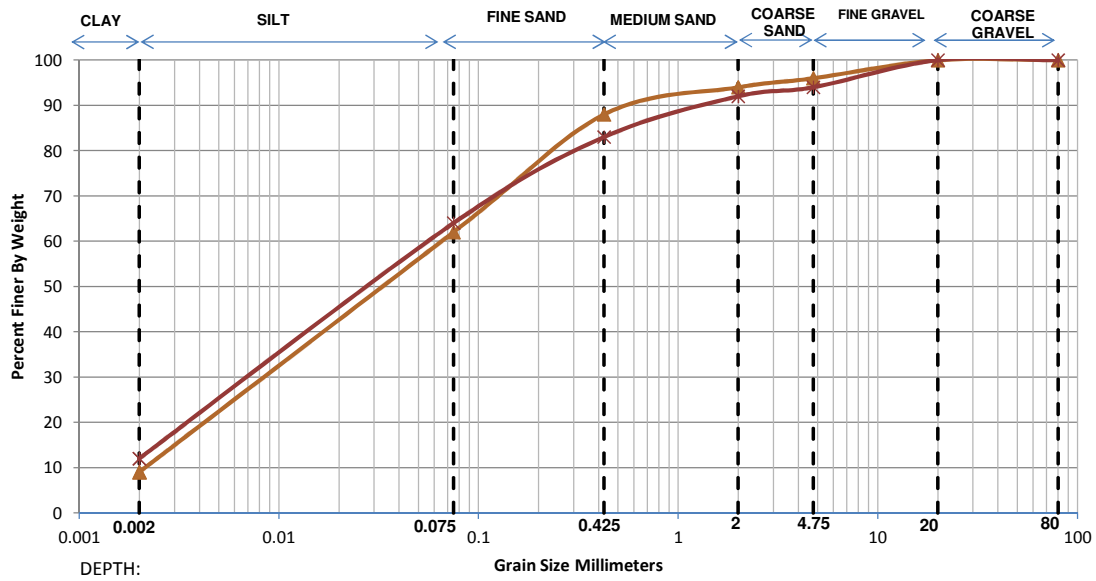
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	36+367
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	47.00	38.00	6.00	1.00	1.00	0.00	0.0036	0.0250	0.0955	26.20	1.79
2.25 m	8.00	51.00	33.00	4.00	2.00	2.00	0.00	0.0029	0.0204	0.0777	26.58	1.84
4.50 m	10.00	52.00	28.00	5.00	2.00	3.00	0.00	0.0020	0.0168	0.0700	35.02	2.01
5.25 m	11.00	49.00	27.00	7.00	3.00	3.00	0.00	-	0.0167	0.0750	-	-
8.25 m	12.00	50.00	26.00	6.00	2.00	4.00	0.00	-	0.0149	0.0698	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	36+816 km
B.H. No.	BH-A1

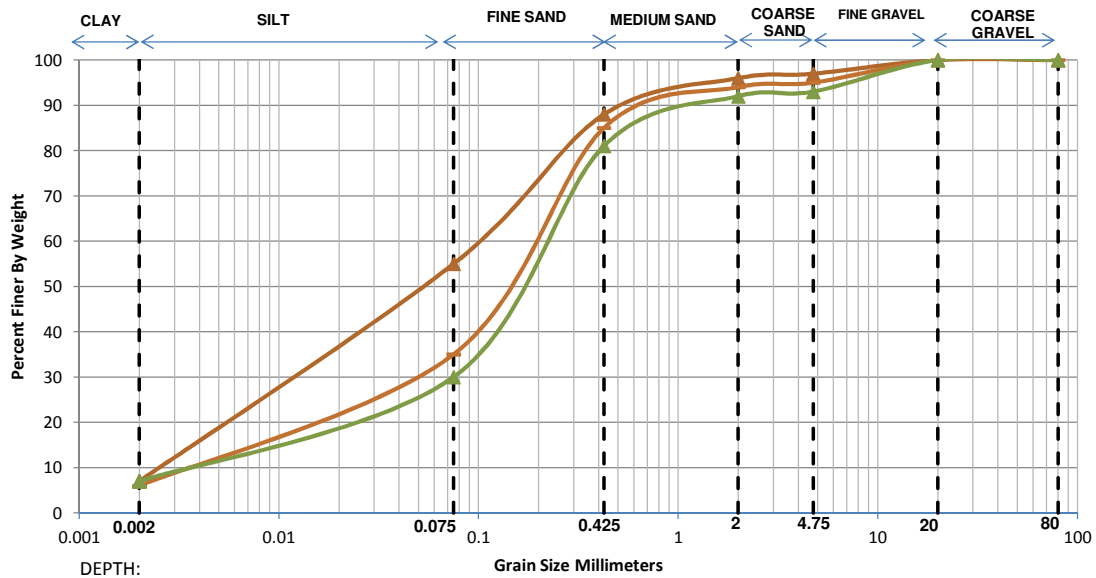


- Legend for depths: 2.50 m, 4.00 m, 7.00 m, 8.50 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m, 0.00 m.

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	59.00	29.00	2.00	3.00	1.00	0.00	0.0042	0.0198	0.0643	15.24	1.45
2.50 m	7.00	51.00	31.00	7.00	3.00	1.00	0.00	0.0036	0.0220	0.0810	22.69	1.67
5.50 m	10.00	60.00	23.00	3.00	1.00	3.00	0.00	0.0020	0.0140	0.0544	27.21	1.79
8.50 m	12.00	64.00	16.00	2.00	2.00	4.00	0.00	-	0.0109	0.0450	-	-
11.50 m	10.00	54.00	24.00	6.00	2.00	3.00	1.00	0.0020	0.0158	0.0655	32.73	1.92
14.50 m	11.00	60.00	18.00	6.00	2.00	3.00	0.00	-	0.0127	0.0523	-	-
17.50 m	7.00	49.00	31.00	4.00	3.00	6.00	0.00	0.0036	0.0232	0.0891	24.74	1.67
21.00 m	8.00	46.00	29.00	8.00	1.00	8.00	0.00	0.0030	0.0233	0.1019	34.45	1.80
23.50 m	12.00	59.00	17.00	4.00	2.00	6.00	0.00	-	0.0119	0.0518	-	-
26.50 m	11.00	63.00	16.00	4.00	3.00	3.00	0.00	-	0.0120	0.0479	-	-
30.00 m	11.00	58.00	20.00	5.00	2.00	4.00	0.00	-	0.0133	0.0556	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	36+816 km
B.H. No.	BH-A2

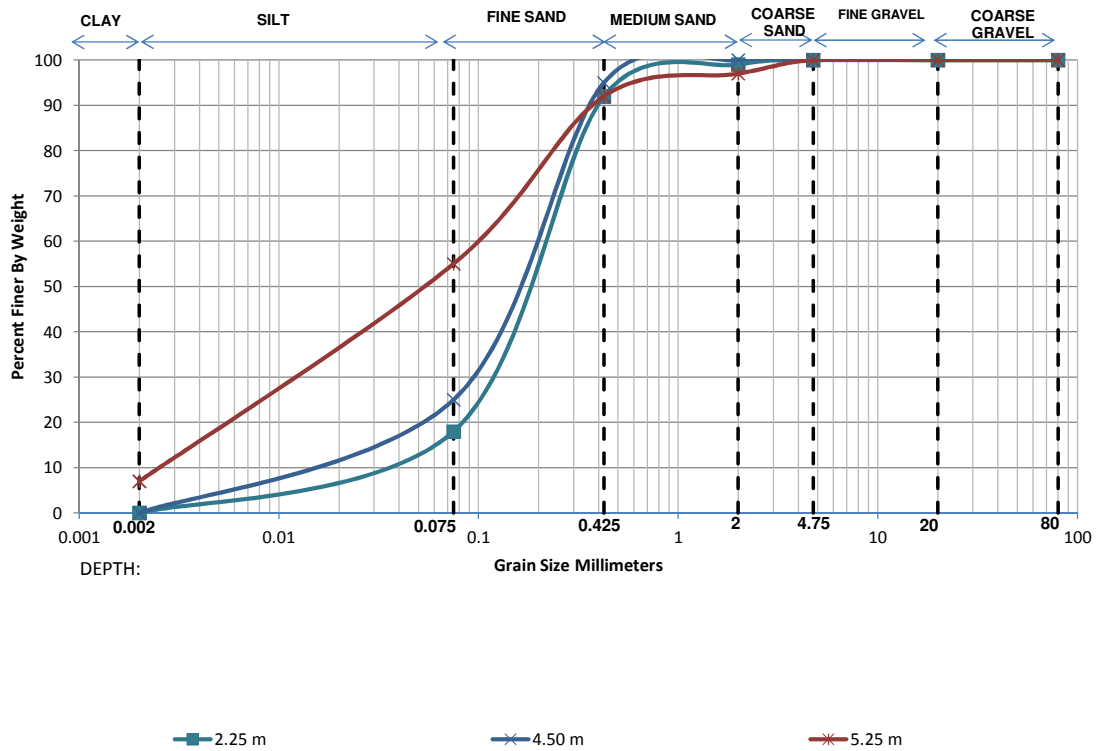


- Legend for depths (m):
- 1.50 m
 - ▲ 2.25 m
 - ✱ 4.50 m
 - 7.50 m
 - 8.25 m
 - 10.50 m
 - ▲ 11.25 m
 - ✱ 0.00 m
 - 0.00 m
 - 0.00 m
- Legend for depths (m):
- ✱ 0.00 m
 - ✱ 0.00 m
 - 0.00 m
 - 0.00 m
 - 0.00 m
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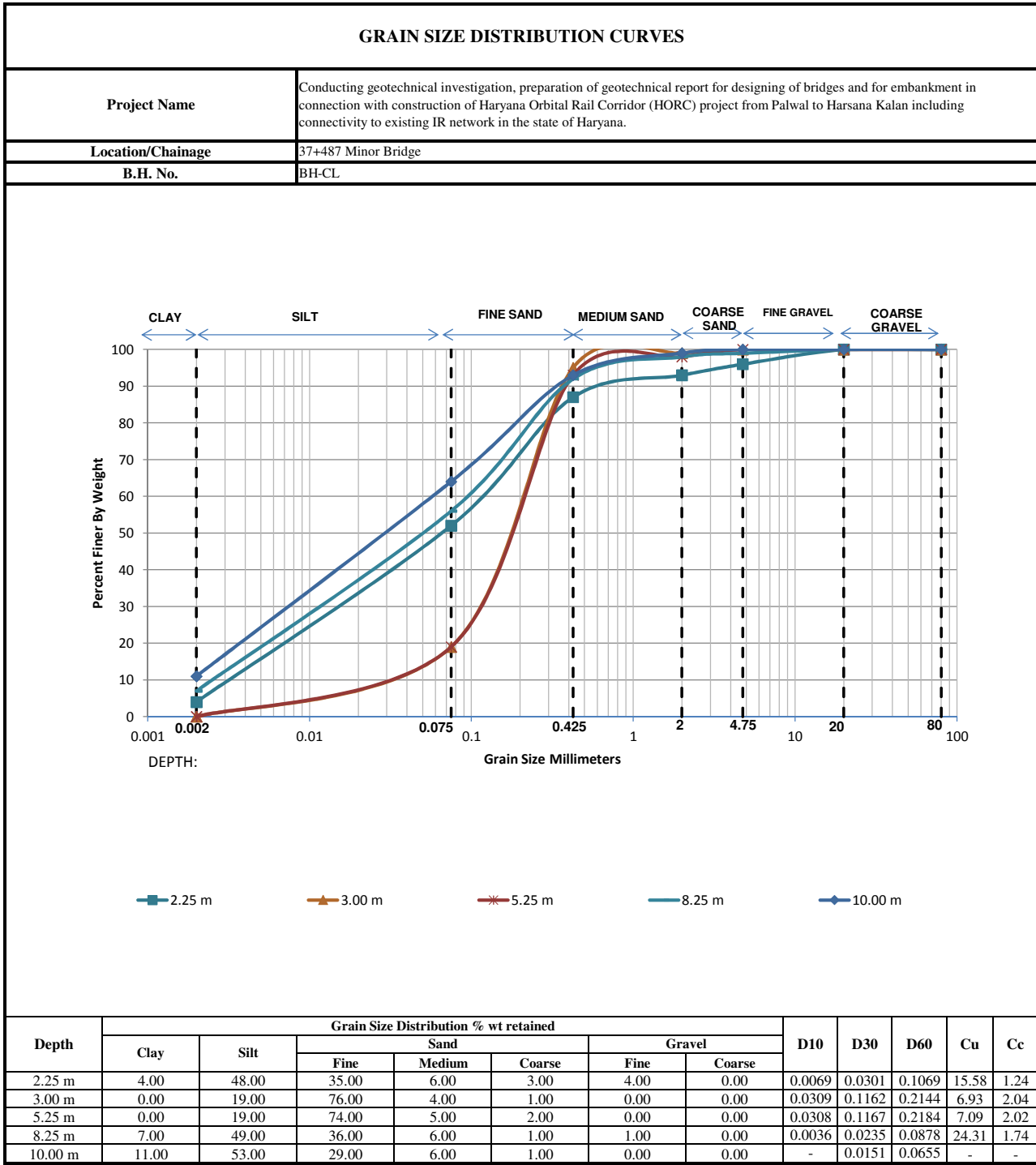
Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	44.00	44.00	4.00	2.00	1.00	0.00	0.0058	0.0321	0.1145	19.87	1.56
4.00 m	4.00	40.00	51.00	2.00	1.00	2.00	0.00	0.0076	0.0399	0.1316	17.24	1.58
7.00 m	6.00	55.00	33.00	4.00	2.00	0.00	0.00	0.0043	0.0217	0.0727	16.90	1.51
10.00 m	11.00	61.00	16.00	5.00	2.00	5.00	0.00	-	0.0124	0.0507	-	-
13.00 m	10.00	56.00	21.00	4.00	3.00	6.00	0.00	0.0020	0.0150	0.0613	30.65	1.85
16.00 m	7.00	54.00	26.00	4.00	3.00	6.00	0.00	0.0035	0.0202	0.0726	20.58	1.60
19.50 m	6.00	55.00	23.00	6.00	2.00	8.00	0.00	0.0043	0.0212	0.0726	16.97	1.45
22.00 m	8.00	49.00	27.00	5.00	4.00	6.00	1.00	0.0029	0.0212	0.0860	29.30	1.79
23.50 m	13.00	58.00	18.00	4.00	1.00	5.00	1.00	-	0.0111	0.0515	-	-
26.50 m	11.00	56.00	22.00	3.00	2.00	6.00	0.00	-	0.0139	0.0592	-	-
29.50 m	12.00	58.00	17.00	4.00	3.00	5.00	1.00	-	0.0121	0.0534	-	-

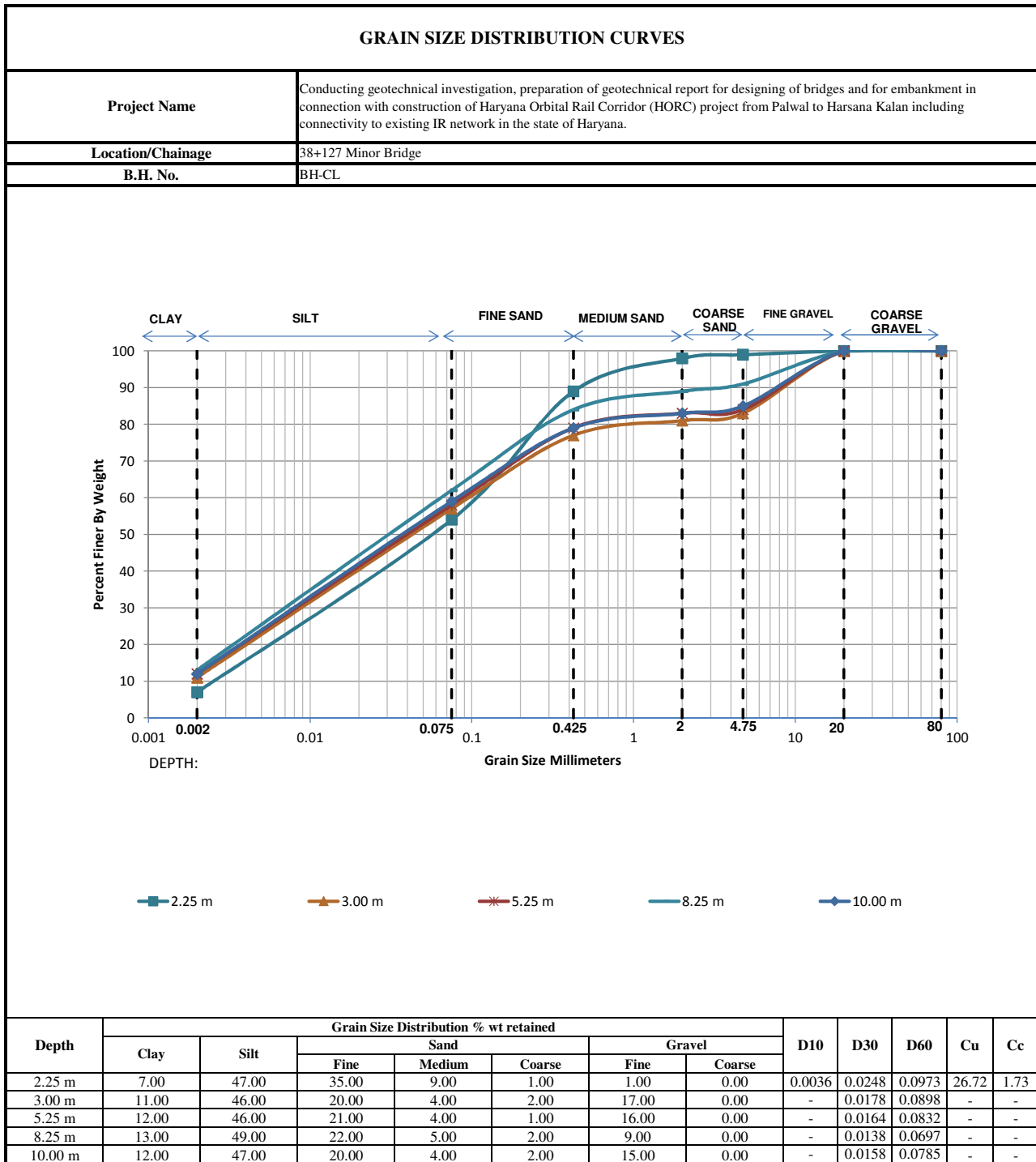
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	37+174 Minor Bridge
B.H. No.	BH-CL



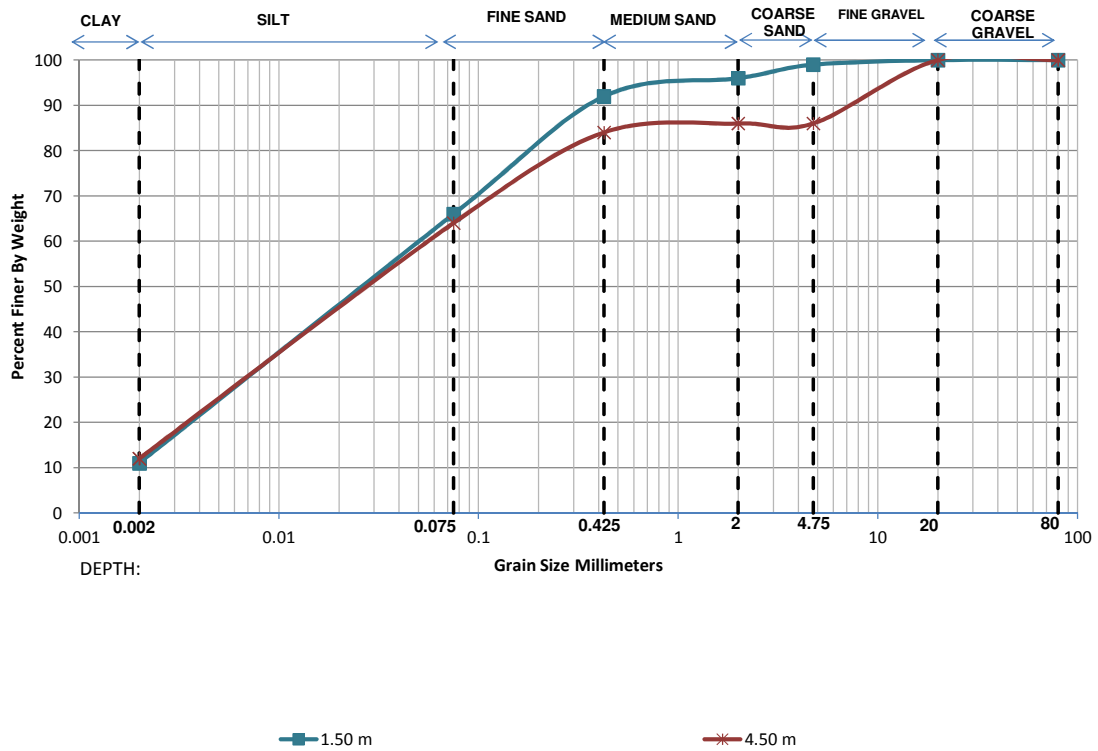
Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	0.00	18.00	74.00	7.00	1.00	0.00	0.00	0.0338	0.1213	0.2241	6.63	1.94
4.50 m	0.00	25.00	70.00	5.00	0.00	0.00	0.00	0.0188	0.0927	0.1961	10.41	2.33
5.25 m	7.00	48.00	37.00	5.00	3.00	0.00	0.00	0.0036	0.0242	0.0915	25.23	1.76





GRAIN SIZE DISTRIBUTION CURVES

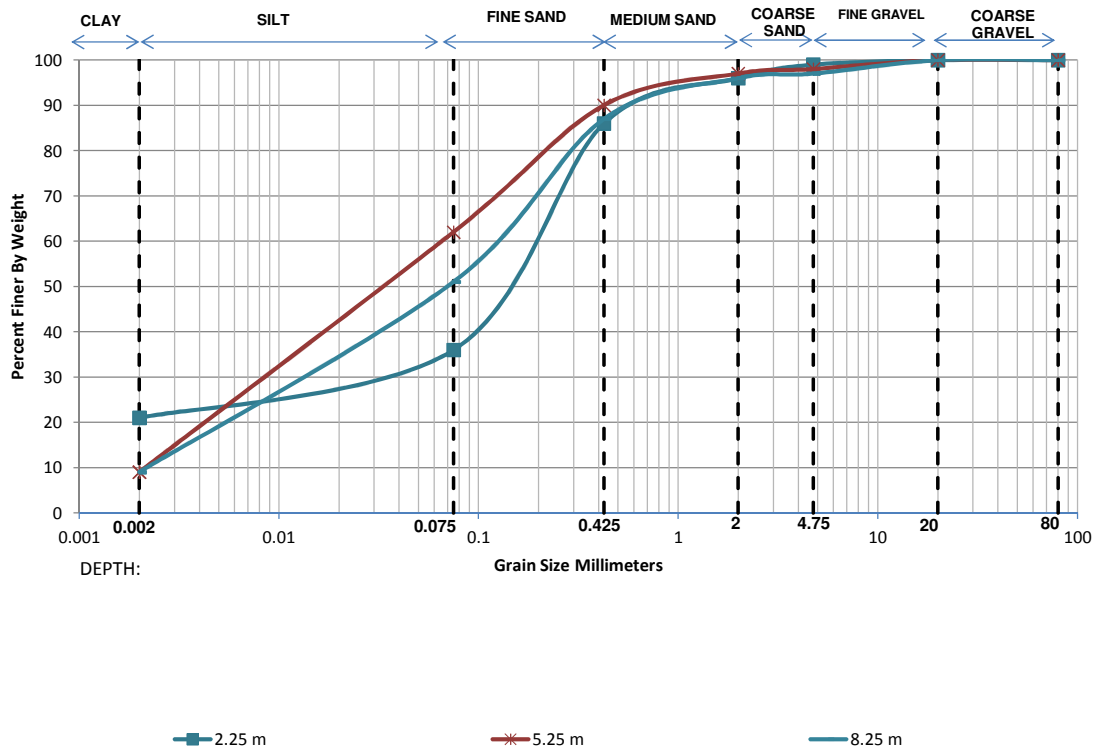
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	38+482 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.50 m	11.00	55.00	26.00	4.00	3.00	1.00	0.00	-	0.0143	0.0613	-	-
4.50 m	12.00	52.00	20.00	2.00	0.00	14.00	0.00	-	0.0139	0.0650	-	-

GRAIN SIZE DISTRIBUTION CURVES

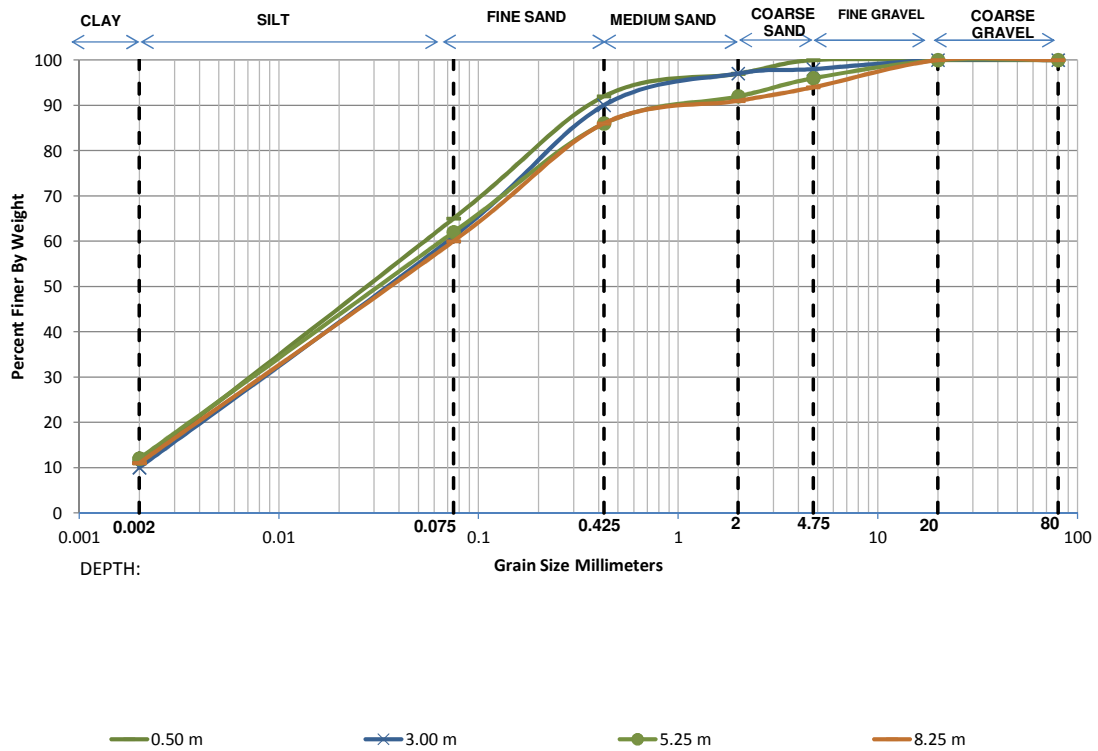
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	52+934 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	21.00	15.00	50.00	10.00	3.00	1.00	0.00	-	0.0372	0.1965	-	-
5.25 m	9.00	53.00	28.00	7.00	1.00	2.00	0.00	0.0024	0.0178	0.0701	29.23	1.88
8.25 m	9.00	42.00	36.00	9.00	1.00	3.00	0.00	0.0024	0.0251	0.1135	46.74	2.28

GRAIN SIZE DISTRIBUTION CURVES

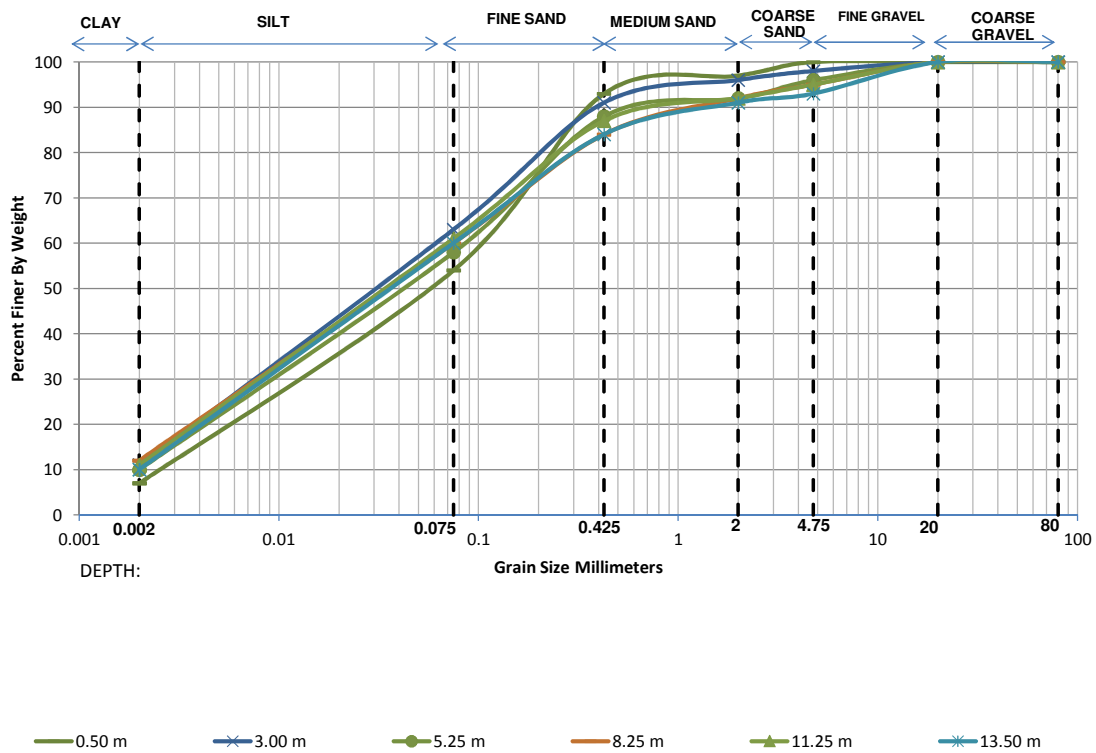
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	38+701
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	11.00	54.00	27.00	5.00	3.00	0.00	0.00	-	0.0147	0.0633	-	-
3.00 m	10.00	51.00	29.00	7.00	1.00	2.00	0.00	0.0020	0.0173	0.0725	36.23	2.06
5.25 m	12.00	50.00	24.00	6.00	4.00	4.00	0.00	-	0.0148	0.0698	-	-
8.25 m	11.00	49.00	26.00	5.00	3.00	6.00	0.00	-	0.0166	0.0750	-	-

GRAIN SIZE DISTRIBUTION CURVES

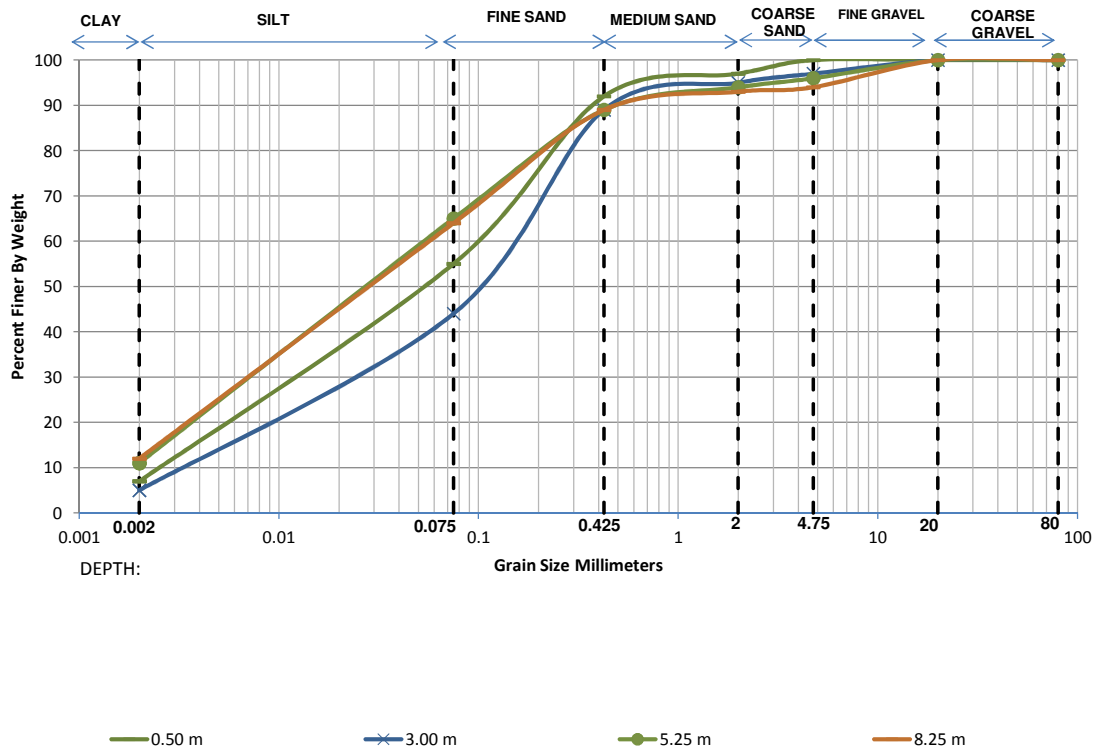
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	38+778
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	47.00	39.00	4.00	3.00	0.00	0.00	0.0036	0.0250	0.0950	26.03	1.81
3.00 m	11.00	52.00	28.00	5.00	2.00	2.00	0.00	-	0.0155	0.0676	-	-
5.25 m	10.00	48.00	30.00	4.00	4.00	4.00	0.00	0.0020	0.0188	0.0813	40.66	2.17
8.25 m	12.00	48.00	24.00	8.00	3.00	5.00	0.00	-	0.0156	0.0750	-	-
11.25 m	11.00	50.00	26.00	5.00	3.00	5.00	0.00	-	0.0162	0.0724	-	-
13.50 m	10.00	50.00	24.00	7.00	2.00	7.00	0.00	0.0020	0.0175	0.0750	37.50	2.04

GRAIN SIZE DISTRIBUTION CURVES

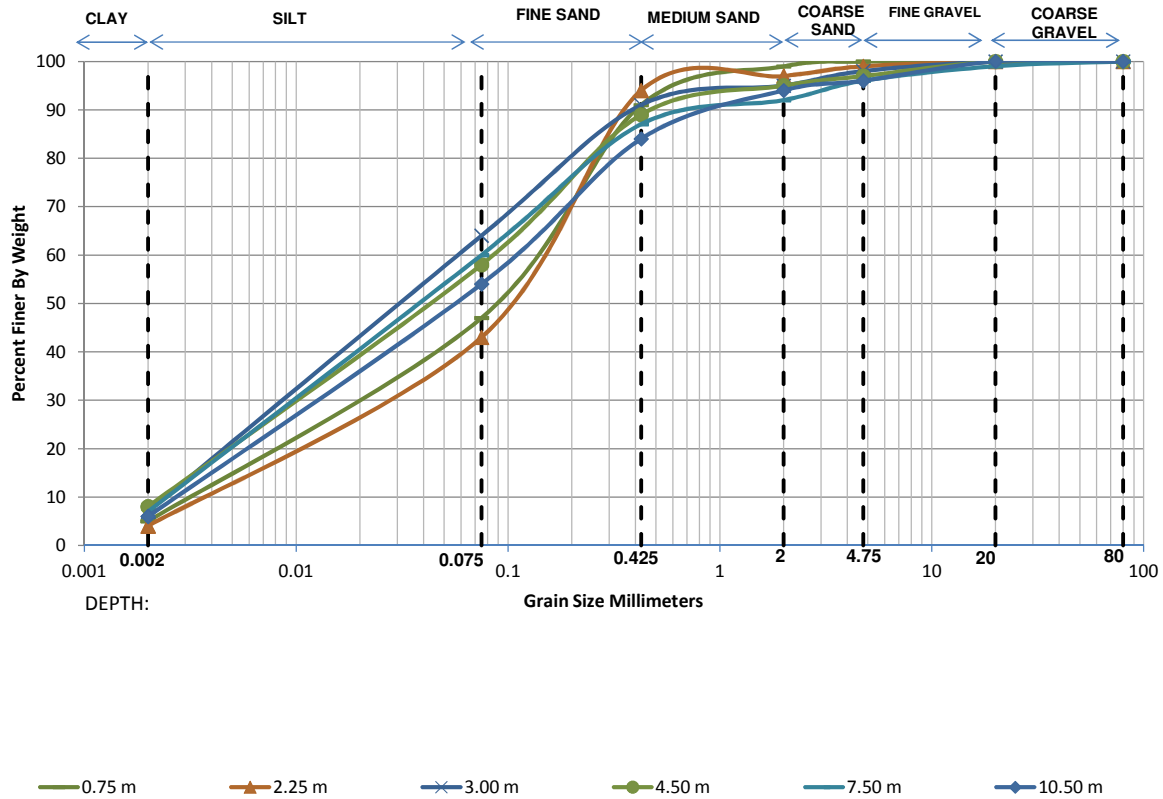
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	39+060
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	48.00	37.00	5.00	3.00	0.00	0.00	0.0036	0.0242	0.0915	25.23	1.76
3.00 m	5.00	39.00	45.00	6.00	2.00	3.00	0.00	0.0061	0.0383	0.1409	23.06	1.70
5.25 m	11.00	54.00	24.00	5.00	2.00	4.00	0.00	-	0.0146	0.0632	-	-
8.25 m	12.00	52.00	25.00	4.00	1.00	6.00	0.00	-	0.0141	0.0652	-	-

GRAIN SIZE DISTRIBUTION CURVES

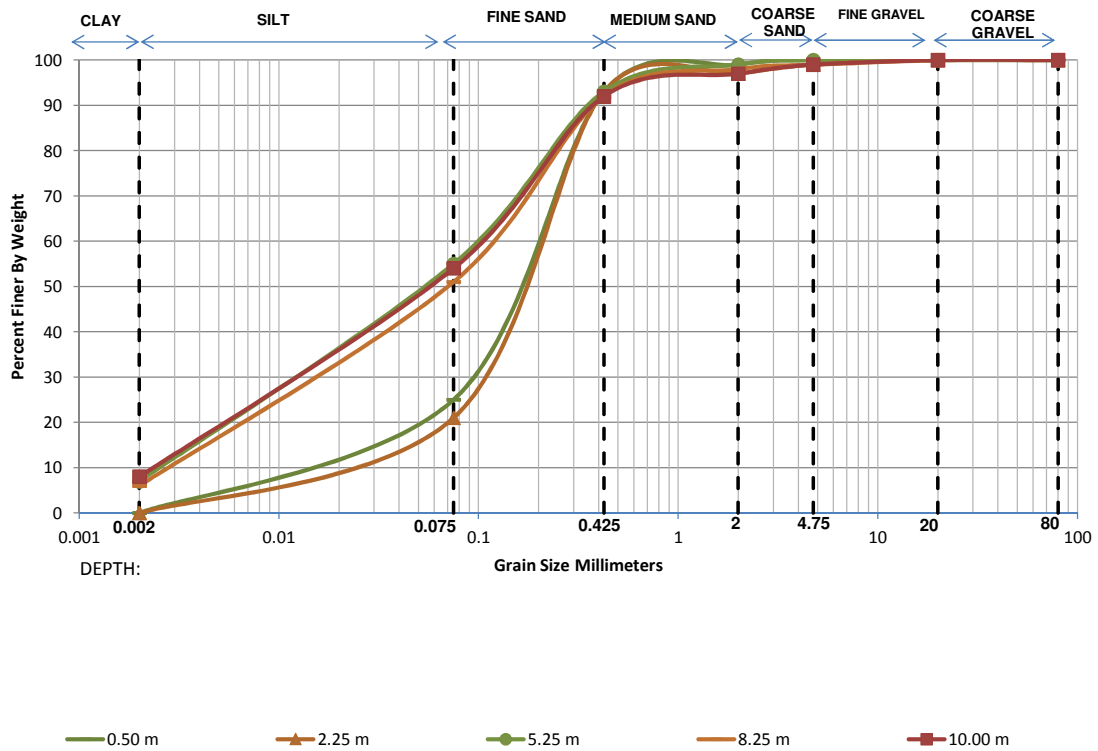
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	39+149
B.H. No.	BH-PLT-03



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.75 m	5.00	42.00	44.00	8.00	1.00	0.00	0.0059	0.0343	0.1256	21.35	1.59	
2.25 m	4.00	39.00	51.00	3.00	2.00	1.00	0.0077	0.0414	0.1368	17.66	1.61	
3.00 m	7.00	57.00	27.00	4.00	3.00	2.00	0.0035	0.0190	0.0660	18.90	1.56	
4.50 m	8.00	50.00	31.00	6.00	2.00	3.00	0.0029	0.0209	0.0811	27.68	1.84	
7.50 m	7.00	53.00	27.00	5.00	4.00	3.00	0.0035	0.0207	0.0750	21.19	1.62	
10.50 m	6.00	48.00	30.00	10.00	2.00	4.00	0.0045	0.0256	0.1009	22.66	1.46	

GRAIN SIZE DISTRIBUTION CURVES

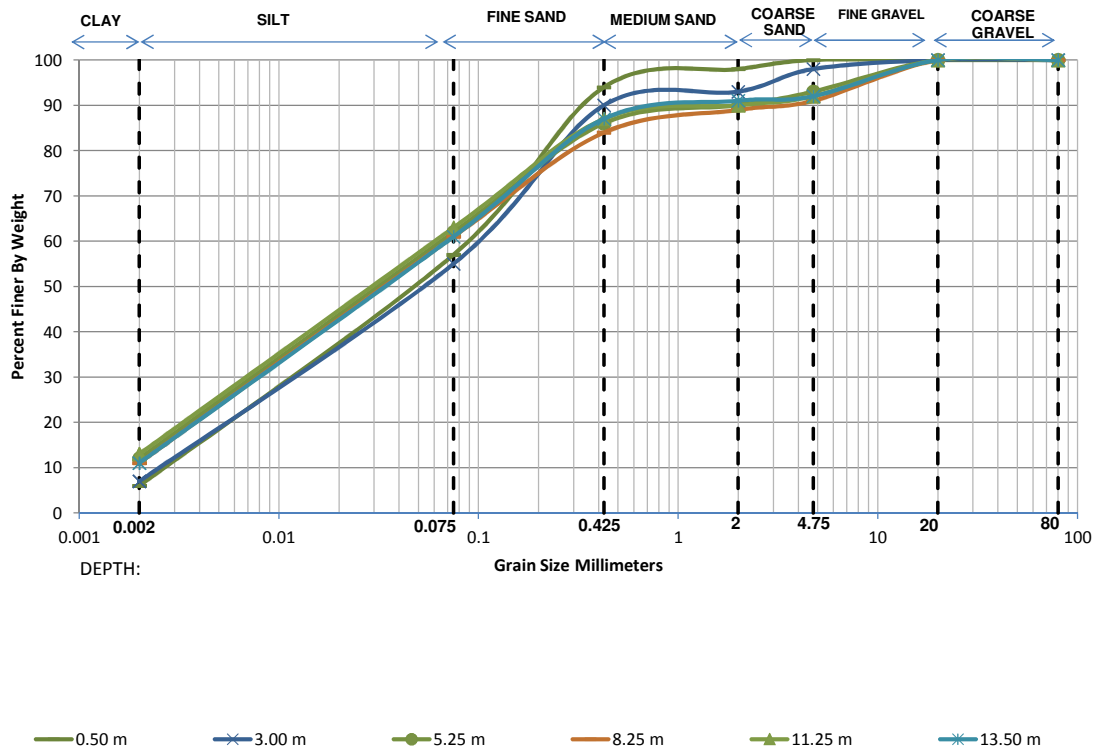
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	39+400
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	25.00	68.00	6.00	1.00	0.00	0.00	0.0188	0.0930	0.2002	10.67	2.30
2.25 m	0.00	21.00	72.00	4.00	2.00	1.00	0.00	0.0258	0.1085	0.2120	8.22	2.15
5.25 m	7.00	48.00	38.00	6.00	1.00	0.00	0.00	0.0036	0.0242	0.0913	25.15	1.77
8.25 m	6.00	45.00	41.00	6.00	1.00	1.00	0.00	0.0046	0.0287	0.1076	23.50	1.68
10.00 m	8.00	46.00	38.00	5.00	2.00	1.00	0.00	0.0030	0.0238	0.0957	32.24	2.00

GRAIN SIZE DISTRIBUTION CURVES

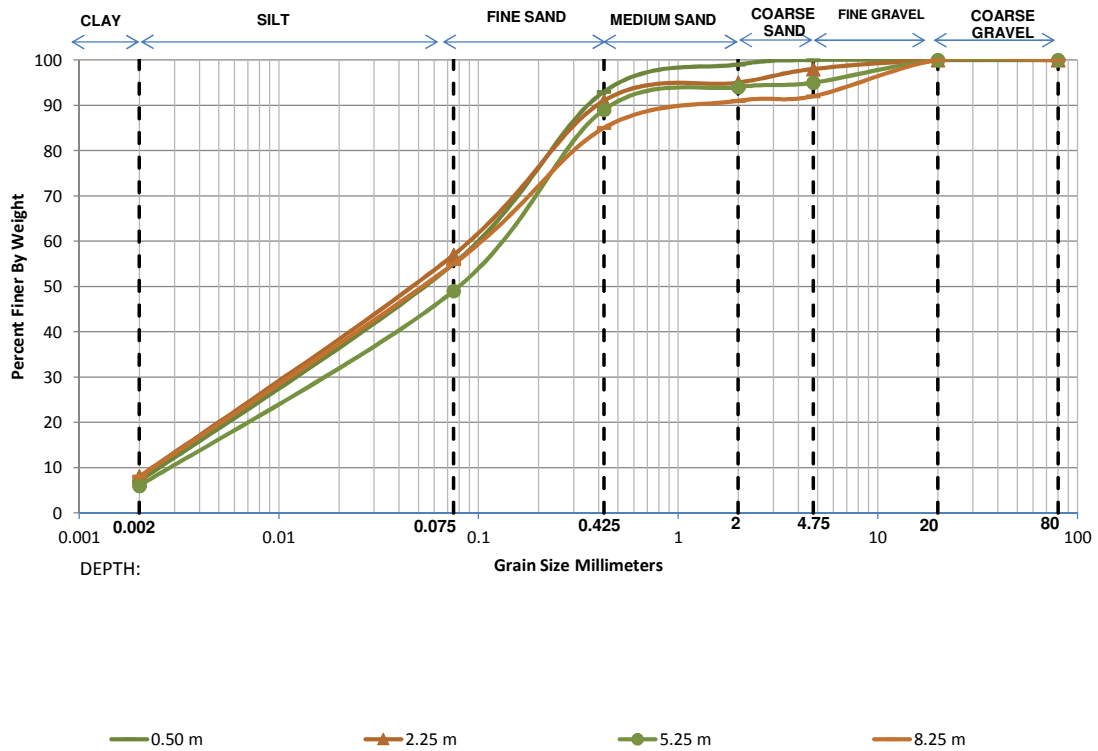
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	40+325
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	51.00	37.00	4.00	2.00	0.00	0.00	0.0044	0.0241	0.0837	19.04	1.57
3.00 m	7.00	48.00	35.00	3.00	5.00	2.00	0.00	0.0036	0.0241	0.0921	25.40	1.74
5.25 m	12.00	50.00	24.00	4.00	3.00	7.00	0.00	-	0.0148	0.0698	-	-
8.25 m	11.00	50.00	23.00	5.00	2.00	9.00	0.00	-	0.0160	0.0724	-	-
11.25 m	13.00	50.00	24.00	3.00	2.00	8.00	0.00	-	0.0135	0.0673	-	-
13.50 m	11.00	50.00	26.00	4.00	1.00	8.00	0.00	-	0.0162	0.0724	-	-

GRAIN SIZE DISTRIBUTION CURVES

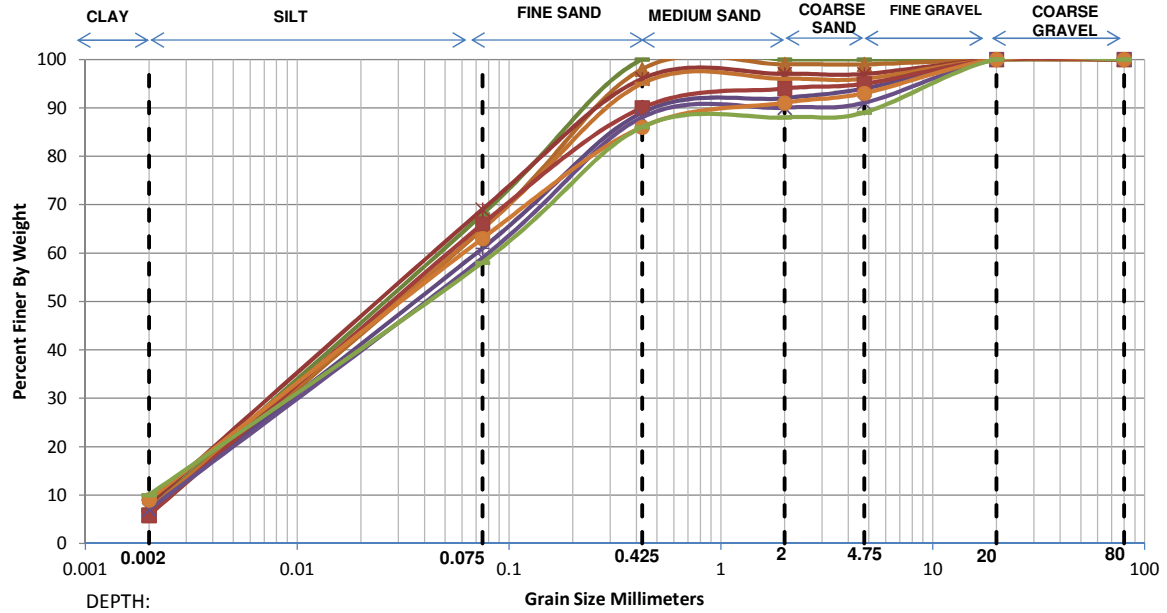
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	40+573
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	48.00	38.00	6.00	1.00	0.00	0.00	0.0036	0.0242	0.0913	25.15	1.77
2.25 m	8.00	49.00	34.00	4.00	3.00	2.00	0.00	0.0029	0.0216	0.0843	28.70	1.89
5.25 m	6.00	43.00	40.00	5.00	1.00	5.00	0.00	0.0047	0.0306	0.1189	25.57	1.69
8.25 m	8.00	47.00	30.00	6.00	1.00	8.00	0.00	0.0030	0.0227	0.0949	32.16	1.83

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+056 Major Bridge
B.H. No.	BH-A1

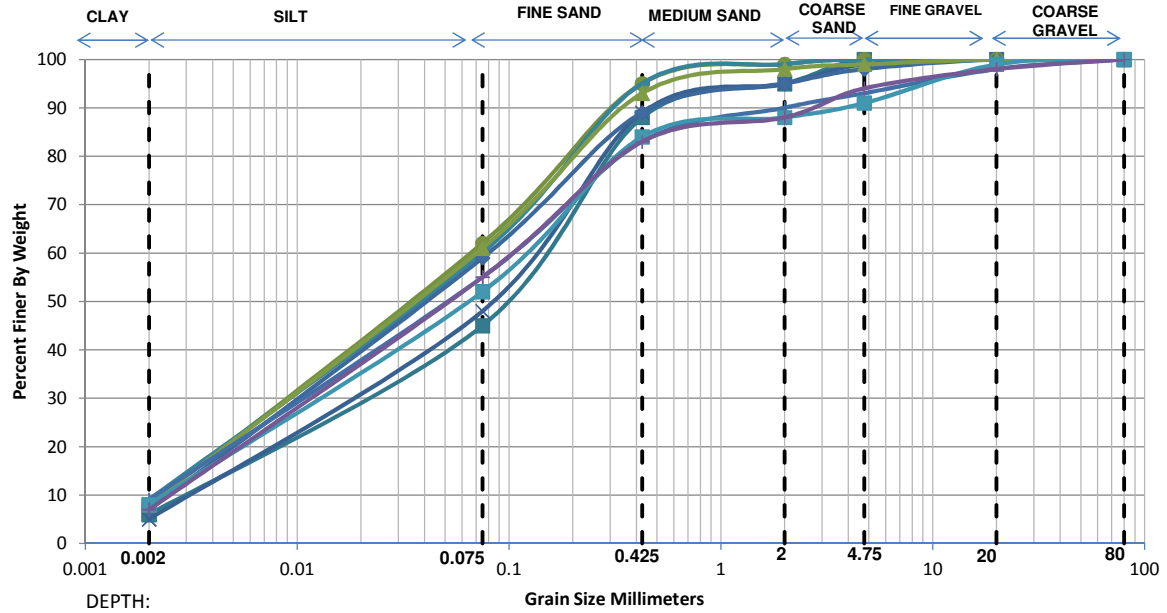


— 1.00 m
 —▲— 4.00 m
 —*— 7.00 m
 —◆— 10.00 m
 —■— 13.00 m
 —■— 16.00 m
 —◆— 19.00 m
 —●— 22.00 m
 —■— 26.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	61.00	32.00	0.00	0.00	0.00	0.00	0.0035	0.0178	0.0590	17.03	1.55
4.00 m	6.00	59.00	33.00	1.00	0.00	1.00	0.00	0.0042	0.0200	0.0644	15.25	1.47
7.00 m	8.00	61.00	27.00	1.00	0.00	3.00	0.00	0.0029	0.0162	0.0568	19.84	1.62
10.00 m	7.00	54.00	28.00	3.00	2.00	6.00	0.00	0.0035	0.0203	0.0726	20.57	1.61
13.00 m	7.00	58.00	30.00	1.00	0.00	4.00	0.00	0.0035	0.0187	0.0642	18.40	1.57
16.00 m	5.80	60.20	24.00	4.00	1.00	5.00	0.00	0.0044	0.0195	0.0624	14.31	1.40
19.00 m	7.00	52.00	29.00	2.00	1.00	9.00	0.00	0.0036	0.0213	0.0778	21.87	1.65
22.00 m	9.00	54.00	23.00	5.00	2.00	7.00	0.00	0.0024	0.0171	0.0678	28.27	1.81
26.50 m	10.00	48.00	28.00	2.00	1.00	11.00	0.00	0.0020	0.0187	0.0815	40.76	2.14

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+056 Major Bridge
B.H. No.	BH-A2

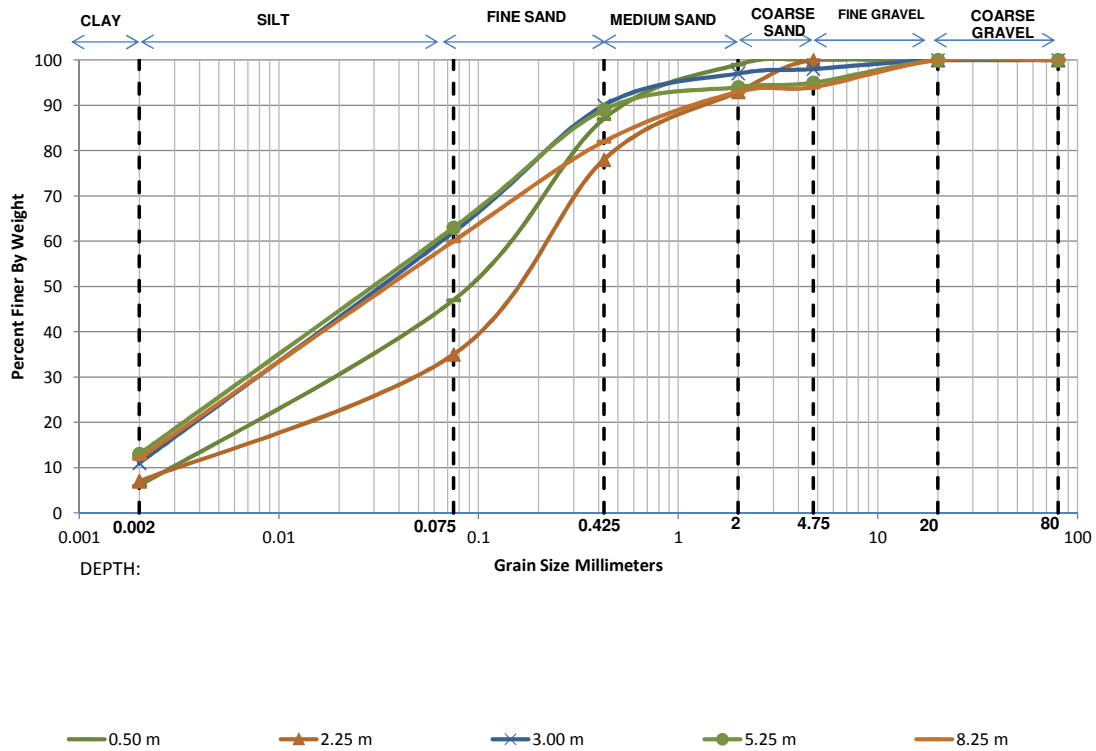


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 — 23.50 m
 ■ 29.50 m
 — 37.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	39.00	43.00	7.00	5.00	0.00	0.00	0.0048	0.0356	0.1389	28.64	1.89
5.50 m	5.00	43.00	41.00	6.00	4.00	1.00	0.00	0.0058	0.0329	0.1233	21.25	1.52
8.50 m	8.00	54.00	33.00	4.00	1.00	0.00	0.00	0.0029	0.0190	0.0703	24.20	1.77
11.50 m	9.00	51.00	35.00	4.00	1.00	0.00	0.00	0.0024	0.0190	0.0750	31.19	2.00
14.50 m	7.00	52.00	30.00	6.00	3.00	2.00	0.00	0.0036	0.0214	0.0778	21.86	1.65
17.50 m	8.00	53.00	32.00	5.00	1.00	1.00	0.00	0.0029	0.0194	0.0726	24.94	1.78
23.50 m	9.00	46.00	28.00	7.00	3.00	5.00	2.00	0.0024	0.0215	0.0966	40.01	1.98
29.50 m	8.00	44.00	32.00	4.00	3.00	8.00	1.00	0.0030	0.0250	0.1107	37.15	1.90
37.00 m	7.00	48.00	28.00	5.00	6.00	4.00	2.00	0.0036	0.0237	0.0960	26.58	1.61

GRAIN SIZE DISTRIBUTION CURVES

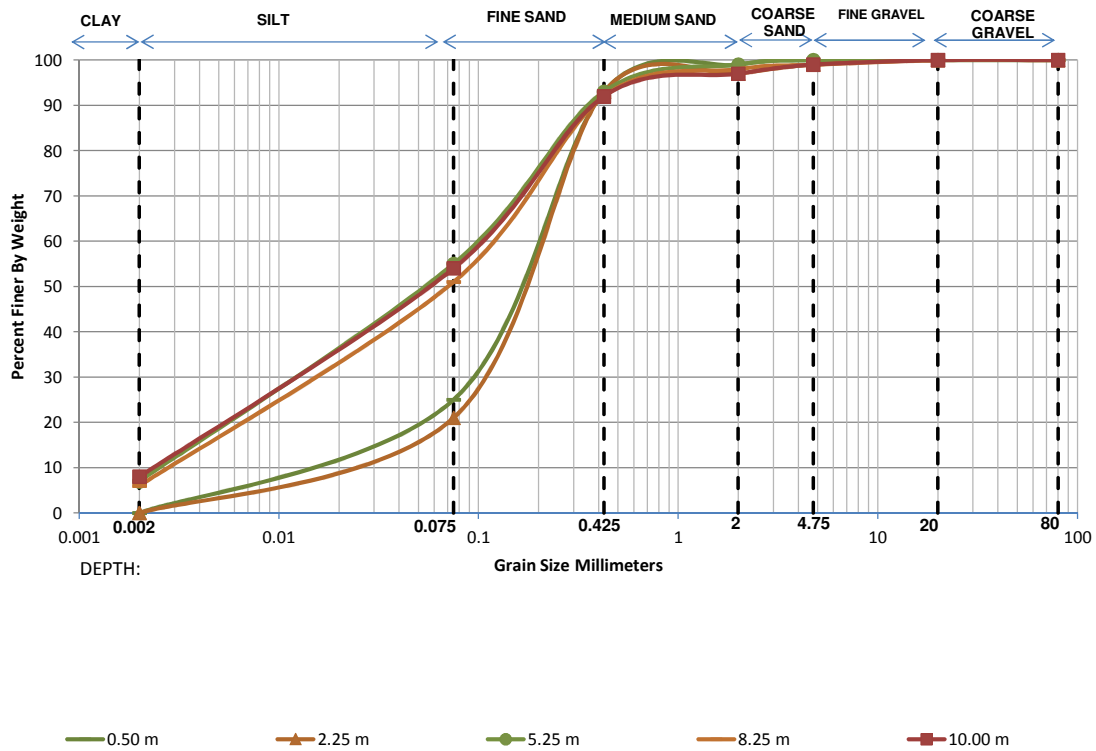
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+100 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	41.00	40.00	12.00	1.00	0.00	0.00	0.0047	0.0328	0.1326	28.00	1.72
2.25 m	7.00	28.00	43.00	15.00	7.00	0.00	0.00	0.0044	0.0559	0.2177	49.12	3.24
3.00 m	11.00	51.00	28.00	7.00	1.00	2.00	0.00	-	0.0159	0.0700	-	-
5.25 m	13.00	50.00	26.00	5.00	1.00	5.00	0.00	-	0.0136	0.0673	-	-
8.25 m	12.00	48.00	22.00	11.00	1.00	6.00	0.00	-	0.0155	0.0750	-	-

GRAIN SIZE DISTRIBUTION CURVES

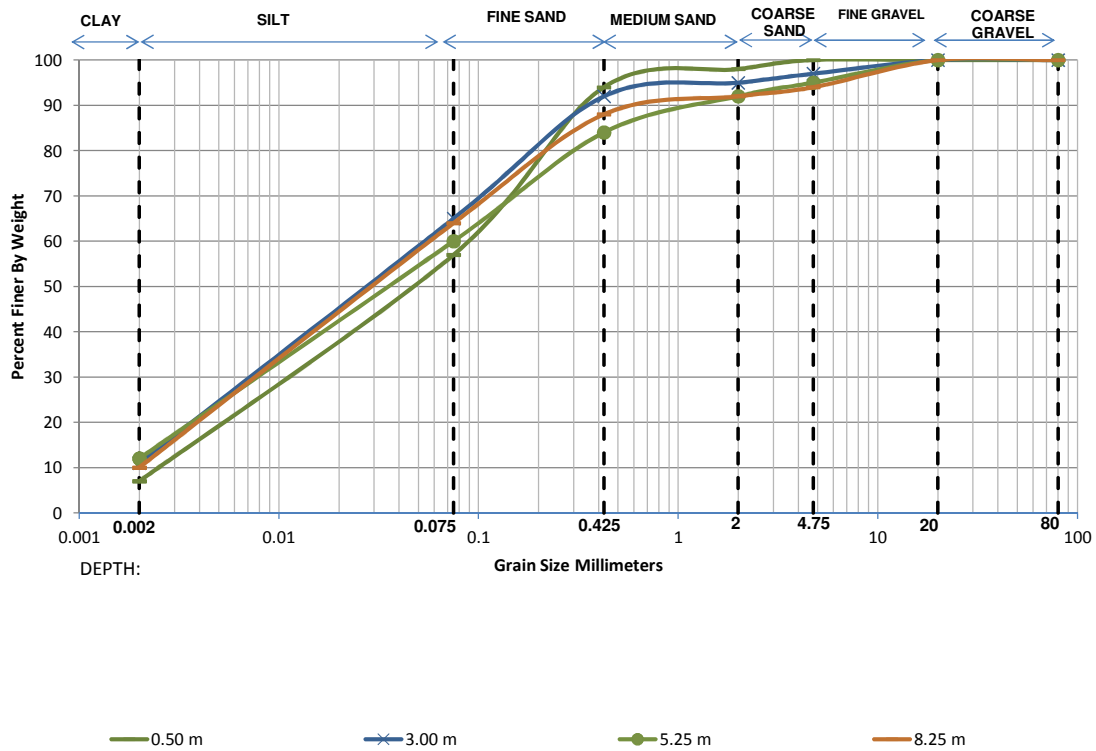
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+217
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	25.00	68.00	6.00	1.00	0.00	0.00	0.0188	0.0930	0.2002	10.67	2.30
2.25 m	0.00	19.00	72.00	4.00	3.00	2.00	0.00	0.0307	0.1172	0.2223	7.25	2.01
3.00 m	7.00	49.00	34.00	6.00	1.00	3.00	0.00	0.0036	0.0233	0.0883	24.48	1.71
5.25 m	10.00	51.00	28.00	6.00	1.00	4.00	0.00	0.0020	0.0172	0.0725	36.23	2.05
8.25 m	12.00	50.00	28.00	6.00	1.00	3.00	0.00	-	0.0149	0.0699	-	-

GRAIN SIZE DISTRIBUTION CURVES

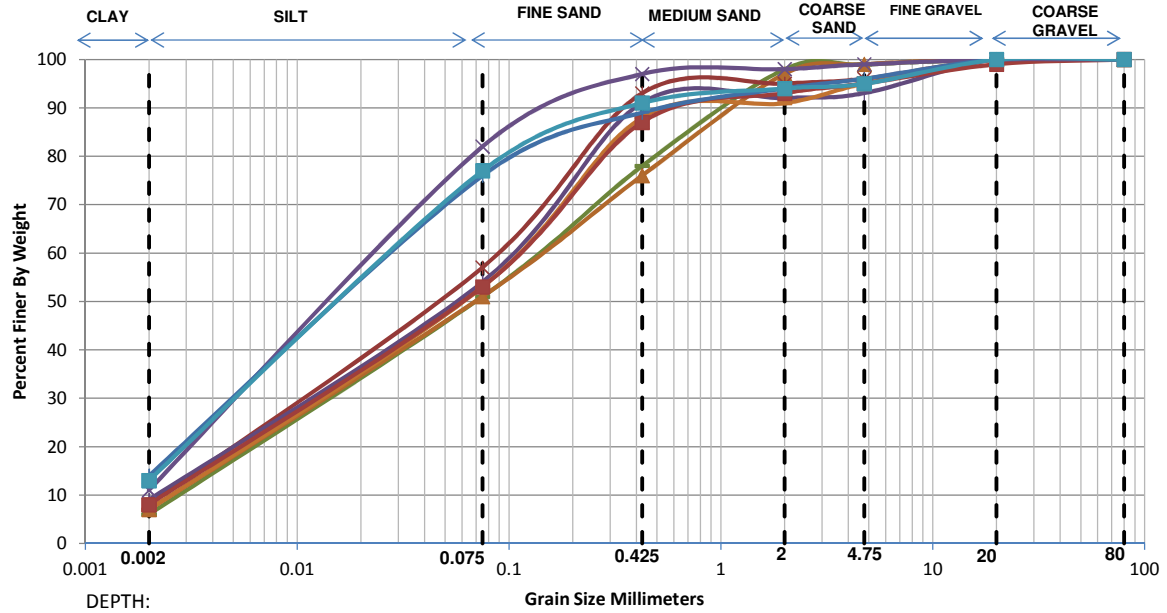
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+235
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	50.00	37.00	4.00	2.00	0.00	0.00	0.0036	0.0229	0.0838	23.31	1.74
3.00 m	11.00	54.00	27.00	3.00	2.00	3.00	0.00	-	0.0147	0.0633	-	-
5.25 m	12.00	48.00	24.00	8.00	3.00	5.00	0.00	-	0.0156	0.0750	-	-
8.25 m	10.00	54.00	24.00	4.00	2.00	6.00	0.00	0.0020	0.0158	0.0655	32.73	1.92

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+390 Major Bridge
B.H. No.	BH-A1

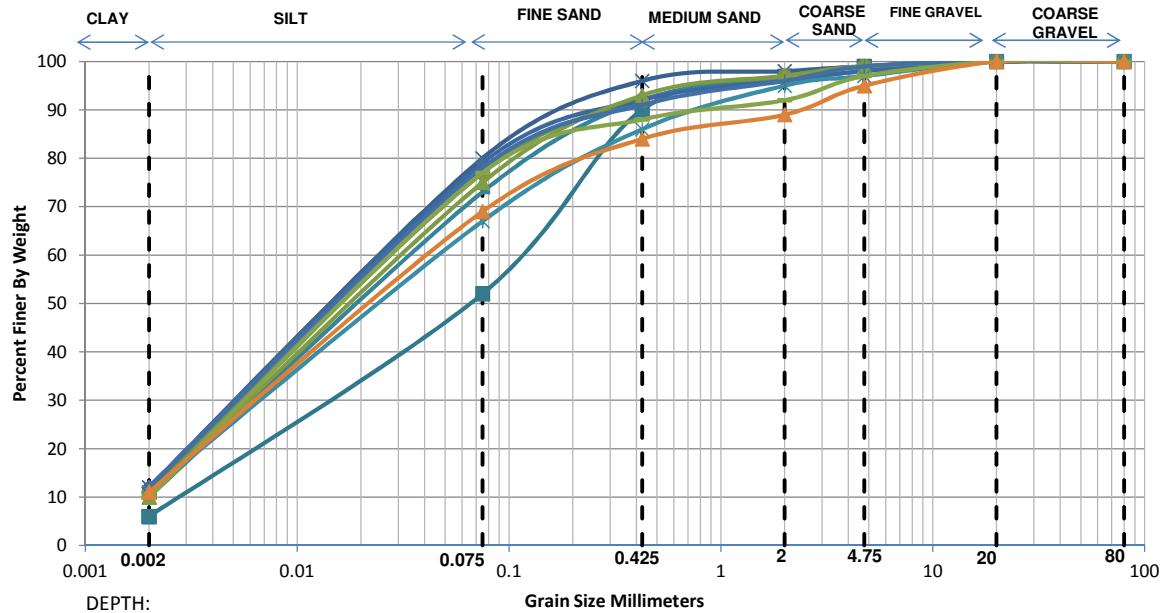


— 1.00 m
 — 4.00 m
 — 7.00 m
 — 10.00 m
 — 13.00 m
 — 16.00 m
 — 19.00 m
 — 23.50 m
 — 29.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	45.00	27.00	20.00	1.00	1.00	0.00	0.0045	0.0278	0.1328	29.30	1.29
4.00 m	7.00	44.00	25.00	21.00	2.00	1.00	0.00	0.0037	0.0265	0.1404	38.20	1.36
7.00 m	8.00	49.00	36.00	2.00	1.00	4.00	0.00	0.0029	0.0217	0.0840	28.57	1.91
10.00 m	9.00	45.00	37.00	1.00	1.00	7.00	0.00	0.0024	0.0227	0.0960	39.65	2.22
13.00 m	7.00	46.00	35.00	3.00	4.00	5.00	0.00	0.0037	0.0255	0.1017	27.79	1.75
16.00 m	8.00	45.00	34.00	6.00	2.00	4.00	1.00	0.0030	0.0244	0.1031	34.68	1.94
19.00 m	11.00	71.00	15.00	1.00	1.00	1.00	0.00	-	0.0107	0.0391	-	-
23.50 m	14.00	62.00	13.00	5.00	2.00	4.00	0.00	-	0.0094	0.0438	-	-
29.50 m	13.00	64.00	14.00	3.00	1.00	5.00	0.00	-	0.0100	0.0432	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	41+390 Major Bridge
B.H. No.	BH-A2

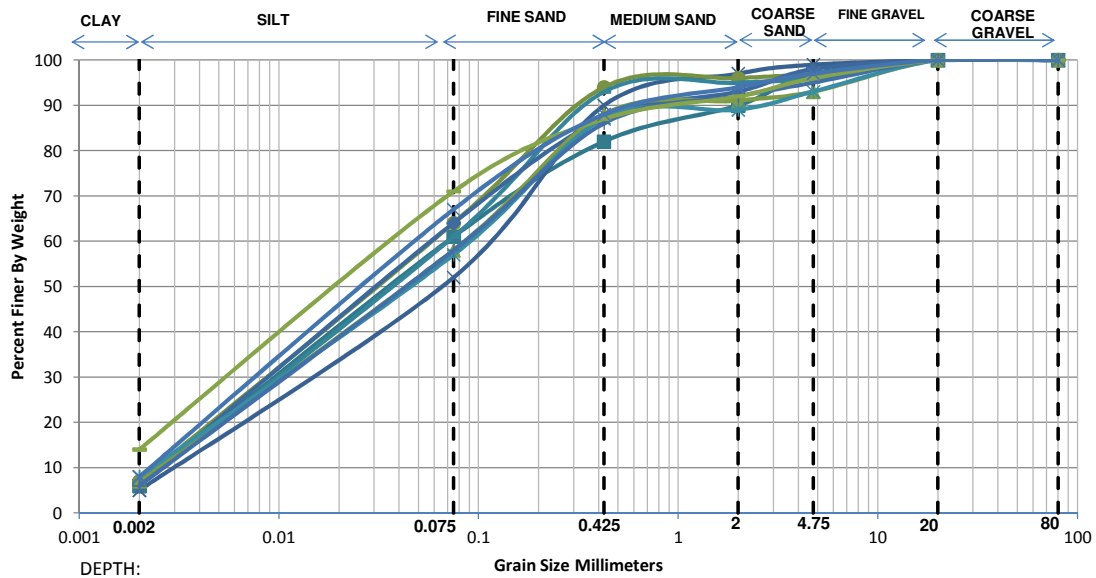


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 + 23.50 m
 — 26.50 m
 ▲ 31.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	46.00	38.00	7.00	2.00	1.00	0.00	0.0045	0.0277	0.1050	23.14	1.61
5.50 m	12.00	68.00	16.00	2.00	1.00	1.00	0.00	-	0.0103	0.0406	-	-
8.50 m	11.00	66.00	15.00	5.00	2.00	1.00	0.00	-	0.0114	0.0442	-	-
11.50 m	10.00	63.00	19.00	4.00	2.00	2.00	0.00	0.0020	0.0131	0.0498	24.92	1.73
14.50 m	12.00	67.00	13.00	4.00	2.00	2.00	0.00	-	0.0104	0.0414	-	-
17.50 m	10.00	65.00	18.00	4.00	2.00	1.00	0.00	0.0020	0.0127	0.0472	23.59	1.71
20.50 m	11.00	56.00	19.00	9.00	2.00	3.00	0.00	-	0.0138	0.0591	-	-
23.50 m	12.00	66.00	13.00	5.00	3.00	1.00	0.00	-	0.0105	0.0425	-	-
26.50 m	10.00	67.00	11.00	4.00	5.00	3.00	0.00	0.0020	0.0121	0.0444	22.21	1.66
31.00 m	11.00	58.00	15.00	5.00	6.00	5.00	0.00	-	0.0131	0.0553	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-A1

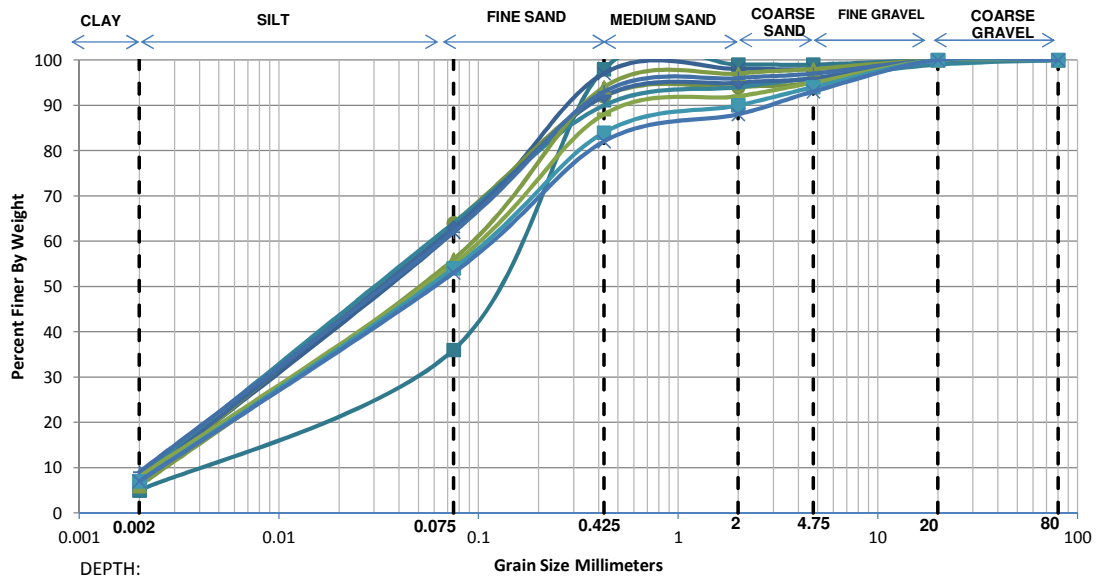


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 + 23.50 m
 — 26.50 m
 × 32.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	6.00	55.00	21.00	8.00	7.00	3.00	0.00	0.0043	0.0211	0.0726	16.99	1.44
5.50 m	5.00	47.00	38.00	7.00	2.00	1.00	0.00	0.0056	0.0289	0.1047	18.77	1.43
8.50 m	7.00	57.00	30.00	2.00	1.00	3.00	0.00	0.0035	0.0191	0.0661	18.90	1.58
11.50 m	6.00	55.00	32.00	2.00	1.00	4.00	0.00	0.0043	0.0217	0.0727	16.91	1.50
14.50 m	6.00	58.00	23.00	6.00	5.00	2.00	0.00	0.0042	0.0200	0.0661	15.64	1.43
17.50 m	7.00	51.00	30.00	3.00	2.00	7.00	0.00	0.0036	0.0219	0.0811	22.70	1.66
20.50 m	8.00	49.00	30.00	2.00	4.00	7.00	0.00	0.0029	0.0214	0.0850	28.96	1.84
23.50 m	6.00	52.00	28.00	6.00	3.00	5.00	0.00	0.0043	0.0230	0.0813	18.69	1.50
26.50 m	14.00	57.00	16.00	5.00	4.00	4.00	0.00	-	0.0103	0.0510	-	-
32.50 m	8.00	59.00	21.00	6.00	3.00	3.00	0.00	0.0029	0.0166	0.0599	20.87	1.61

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P2

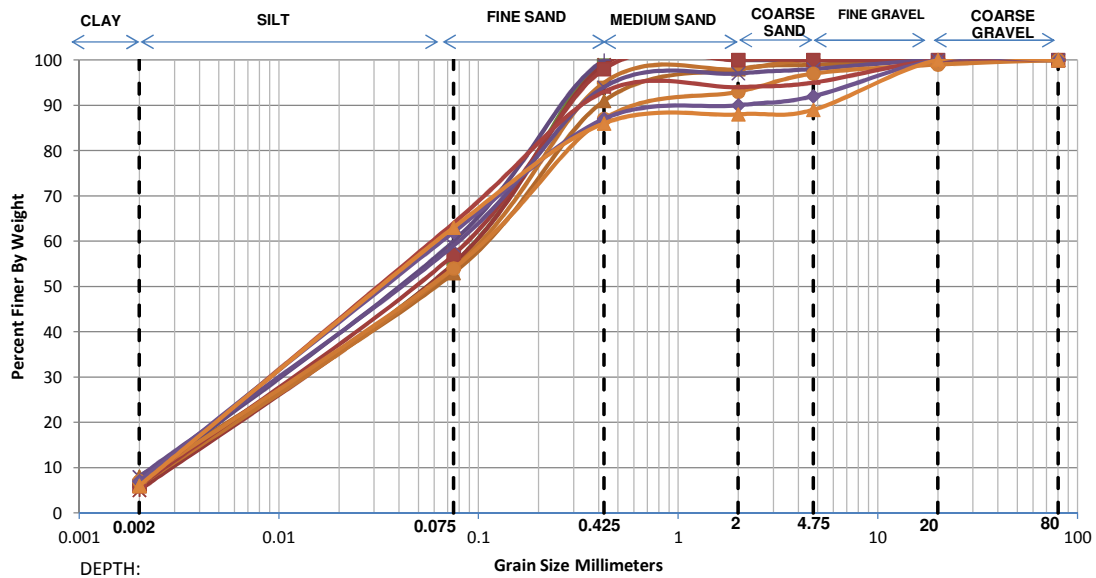


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 — 23.50 m
 — 26.50 m
 ■ 29.50 m
 × 32.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	31.00	62.00	1.00	0.00	1.00	0.00	0.0072	0.0555	0.1576	21.77	2.70
5.50 m	7.00	55.00	35.00	1.00	0.00	2.00	0.00	0.0035	0.0202	0.0704	19.96	1.64
8.50 m	6.00	58.00	28.00	2.00	1.00	5.00	0.00	0.0042	0.0202	0.0662	15.64	1.45
11.50 m	8.00	56.00	26.00	4.00	2.00	3.00	1.00	0.0029	0.0179	0.0658	22.79	1.68
14.50 m	7.00	56.00	29.00	3.00	1.00	4.00	0.00	0.0035	0.0195	0.0681	19.43	1.59
17.50 m	6.00	50.00	38.00	3.00	1.00	2.00	0.00	0.0044	0.0247	0.0871	19.69	1.59
23.50 m	9.00	53.00	31.00	3.00	1.00	3.00	0.00	0.0024	0.0179	0.0702	29.24	1.90
26.50 m	8.00	47.00	33.00	4.00	3.00	5.00	0.00	0.0030	0.0228	0.0931	31.53	1.90
29.50 m	7.00	47.00	30.00	6.00	4.00	6.00	0.00	0.0036	0.0245	0.1005	27.67	1.64
32.50 m	7.00	46.00	29.00	6.00	5.00	7.00	0.00	0.0036	0.0252	0.1081	29.62	1.61

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P3

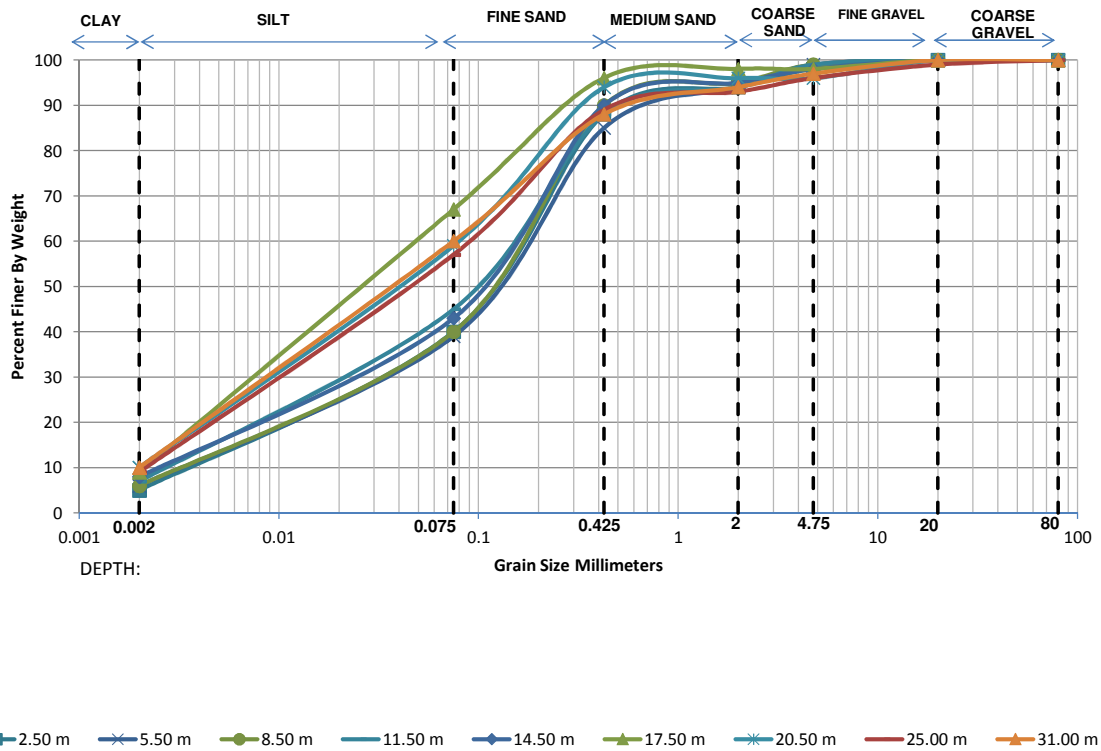


— 1.00 m
 —▲ 4.00 m
 —✕ 7.00 m
 — 10.00 m
 — 13.00 m
 —■ 16.00 m
 —✕ 19.00 m
 —● 22.00 m
 — 25.00 m
 —◆ 28.00 m
 —▲ 31.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	49.00	45.00	0.00	0.00	0.00	0.00	0.0045	0.0258	0.0969	21.68	1.54
4.00 m	8.00	45.00	38.00	7.00	1.00	1.00	0.00	0.0030	0.0246	0.1005	33.76	2.02
7.00 m	5.00	50.00	44.00	1.00	0.00	0.00	0.00	0.0055	0.0270	0.0893	16.30	1.49
10.00 m	7.00	53.00	40.00	0.00	0.00	0.00	0.00	0.0036	0.0214	0.0750	21.08	1.71
13.00 m	6.00	48.00	41.00	3.00	2.00	0.00	0.00	0.0045	0.0263	0.0940	20.95	1.64
16.00 m	6.00	51.00	41.00	2.00	0.00	0.00	0.00	0.0044	0.0243	0.0832	18.89	1.61
19.00 m	8.00	51.00	35.00	3.00	1.00	2.00	0.00	0.0029	0.0205	0.0777	26.55	1.86
22.00 m	7.00	47.00	33.00	6.00	4.00	2.00	1.00	0.0036	0.0247	0.0982	26.99	1.70
25.00 m	6.00	58.00	29.00	1.00	1.00	5.00	0.00	0.0042	0.0202	0.0662	15.64	1.46
28.00 m	7.00	55.00	25.00	3.00	2.00	8.00	0.00	0.0035	0.0197	0.0702	19.99	1.57
31.00 m	6.00	57.00	23.00	2.00	1.00	11.00	0.00	0.0042	0.0204	0.0681	16.07	1.43

GRAIN SIZE DISTRIBUTION CURVES

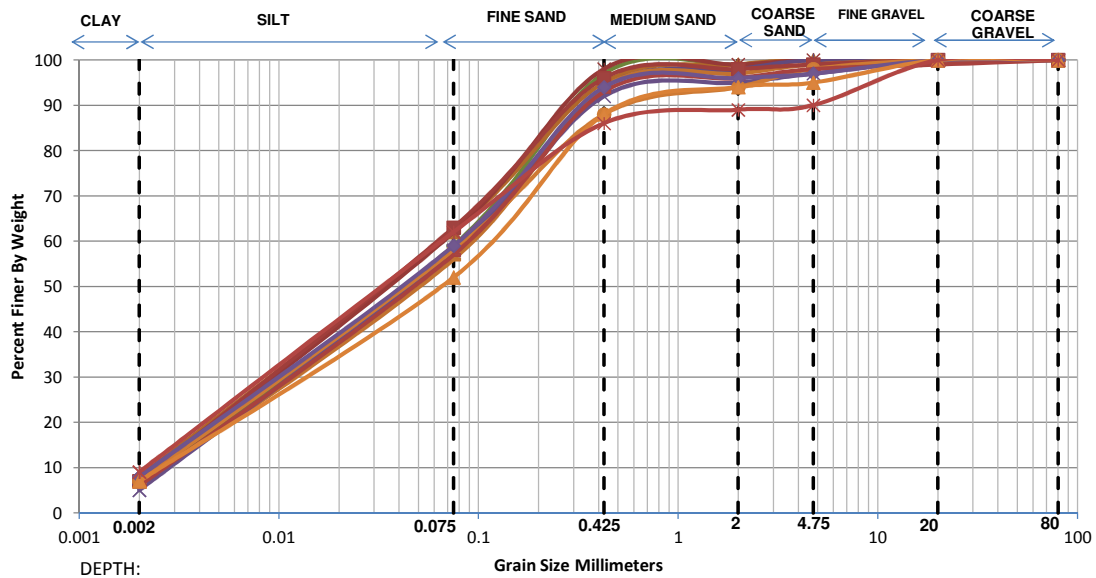
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P4



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	35.00	48.00	6.00	4.00	2.00	0.0065	0.0453	0.1598	24.49	1.97	
5.50 m	6.00	33.00	46.00	9.00	5.00	1.00	0.0053	0.0464	0.1725	32.63	2.36	
8.50 m	6.00	34.00	50.00	5.00	4.00	1.00	0.0052	0.0446	0.1561	29.87	2.44	
11.50 m	7.00	38.00	43.00	6.00	5.00	1.00	0.0039	0.0346	0.1390	35.82	2.21	
14.50 m	8.00	35.00	47.00	5.00	3.00	2.00	0.0031	0.0369	0.1447	46.23	3.00	
17.50 m	9.00	58.00	29.00	2.00	0.00	2.00	0.0024	0.0160	0.0600	25.10	1.77	
20.50 m	10.00	49.00	35.00	2.00	0.00	4.00	0.0020	0.0185	0.0777	38.87	2.20	
25.00 m	9.00	48.00	32.00	4.00	3.00	3.00	0.0024	0.0205	0.0848	35.17	2.05	
31.00 m	10.00	50.00	28.00	6.00	3.00	3.00	0.0020	0.0177	0.0750	37.50	2.08	

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P5

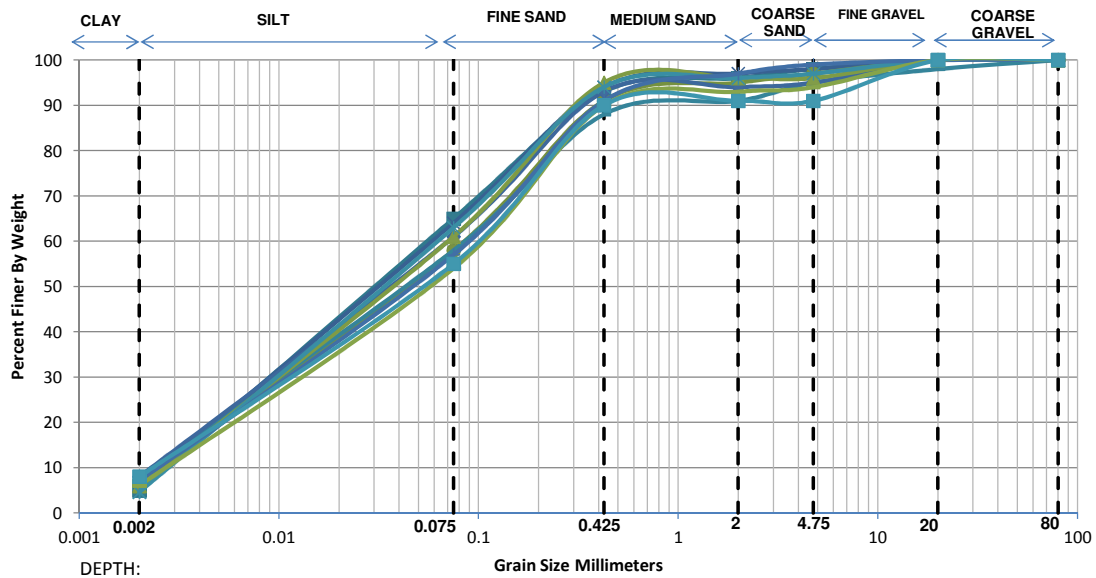


- | | | | | | |
|------------|------------|-----------|------------|------------|------------|
| — 1.00 m | —▲ 4.00 m | —* 7.00 m | —◆ 10.00 m | —■ 13.00 m | —■ 16.00 m |
| —× 19.00 m | —● 22.00 m | — 25.00 m | —◆ 28.00 m | —▲ 31.00 m | —* 34.00 m |

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	6.00	53.00	38.00	2.00	1.00	0.00	0.00	0.0044	0.0230	0.0775	17.82	1.56
4.00 m	8.00	54.00	33.00	4.00	1.00	0.00	0.00	0.0029	0.0190	0.0703	24.20	1.77
7.00 m	7.00	55.00	36.00	1.00	1.00	0.00	0.00	0.0035	0.0202	0.0704	19.96	1.64
10.00 m	8.00	50.00	36.00	4.00	2.00	0.00	0.00	0.0029	0.0211	0.0807	27.50	1.89
13.00 m	6.00	50.00	38.00	3.00	2.00	1.00	0.00	0.0044	0.0247	0.0871	19.69	1.59
16.00 m	7.00	56.00	33.00	2.00	1.00	1.00	0.00	0.0035	0.0196	0.0682	19.42	1.61
19.00 m	5.00	53.00	34.00	3.00	2.00	3.00	0.00	0.0053	0.0246	0.0806	15.11	1.41
22.00 m	7.00	51.00	30.00	6.00	4.00	2.00	0.00	0.0036	0.0219	0.0811	22.72	1.66
25.00 m	6.00	51.00	36.00	3.00	2.00	1.00	1.00	0.0044	0.0240	0.0838	19.08	1.56
28.00 m	8.00	51.00	35.00	2.00	1.00	3.00	0.00	0.0029	0.0205	0.0777	26.55	1.86
31.00 m	7.00	45.00	36.00	6.00	1.00	5.00	0.00	0.0037	0.0264	0.1067	28.99	1.78
34.00 m	9.00	53.00	24.00	3.00	1.00	10.00	0.00	0.0024	0.0176	0.0701	29.21	1.84

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P6

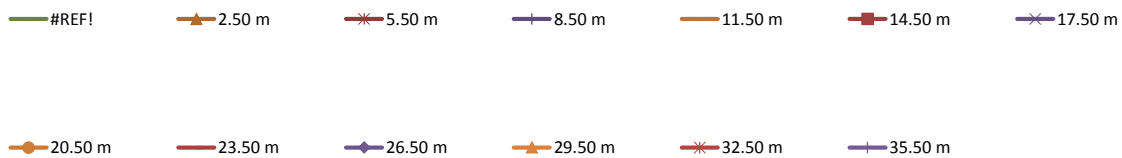
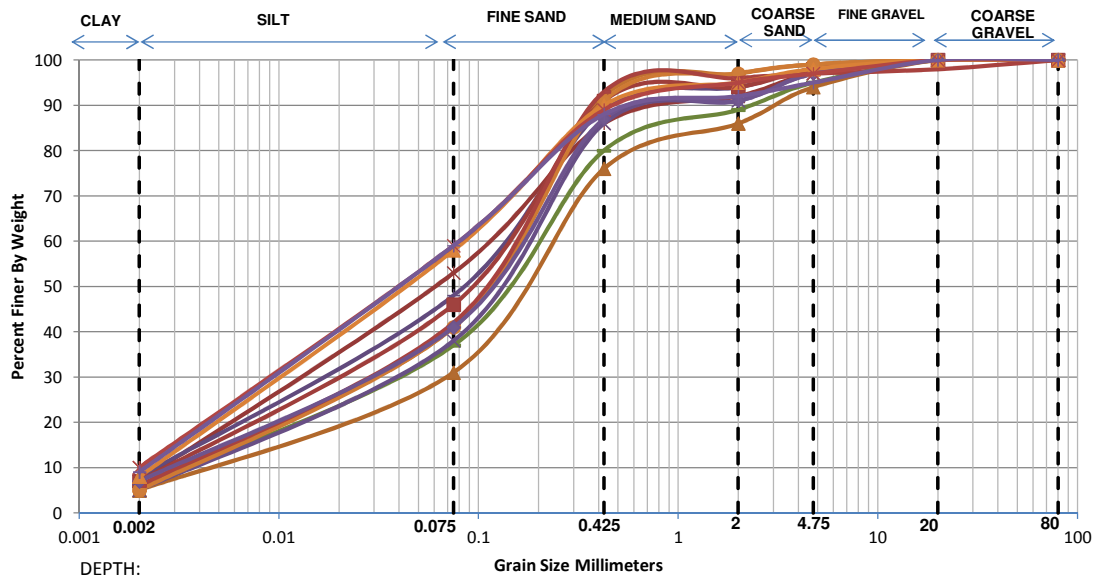


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 ▲ 17.50 m
 ✱ 20.50 m
 + 23.50 m
 — 26.50 m
 ■ 29.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	60.00	28.00	3.00	2.00	2.00	0.00	0.0051	0.0211	0.0645	12.60	1.35
5.50 m	6.00	58.00	30.00	3.00	1.00	2.00	0.00	0.0042	0.0203	0.0663	15.64	1.46
8.50 m	7.00	51.00	33.00	4.00	2.00	3.00	0.00	0.0036	0.0221	0.0808	22.60	1.69
11.50 m	8.00	50.00	30.00	3.00	4.00	3.00	2.00	0.0029	0.0208	0.0811	27.71	1.83
14.50 m	8.00	53.00	32.00	1.00	1.00	5.00	0.00	0.0029	0.0194	0.0726	24.94	1.78
17.50 m	6.00	55.00	34.00	1.00	0.00	4.00	0.00	0.0043	0.0218	0.0727	16.90	1.51
20.50 m	4.60	58.40	31.00	2.00	1.00	3.00	0.00	0.0056	0.0226	0.0685	12.21	1.33
23.50 m	7.00	50.00	34.00	6.00	2.00	1.00	0.00	0.0036	0.0227	0.0843	23.47	1.71
26.50 m	6.00	48.00	36.00	3.00	1.00	6.00	0.00	0.0045	0.0260	0.0960	21.47	1.58
29.50 m	8.00	47.00	35.00	1.00	0.00	9.00	0.00	0.0030	0.0230	0.0921	31.16	1.94

GRAIN SIZE DISTRIBUTION CURVES

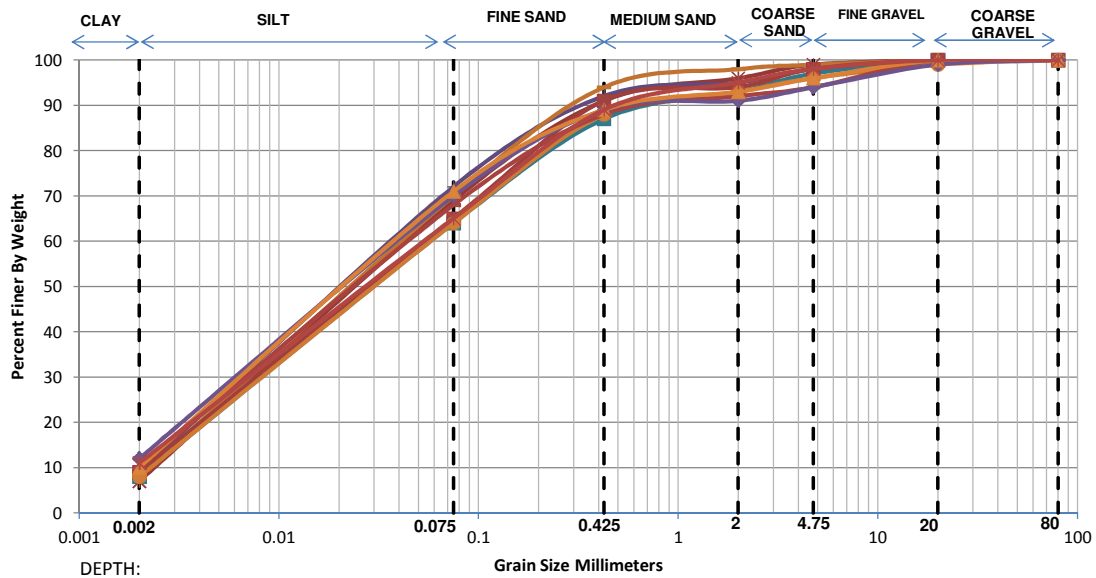
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P13



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
#REF!	6.00	31.00	43.00	9.00	6.00	5.00	0.00	0.0055	0.0509	0.1975	36.15	2.40
2.50 m	5.00	26.00	45.00	10.00	8.00	6.00	0.00	0.0081	0.0709	0.2403	29.53	2.57
5.50 m	7.00	46.00	33.00	6.00	5.00	3.00	0.00	0.0037	0.0254	0.1037	28.37	1.70
8.50 m	8.00	40.00	41.00	5.00	4.00	2.00	0.00	0.0030	0.0295	0.1242	40.88	2.31
11.50 m	6.00	35.00	51.00	5.00	2.00	1.00	0.00	0.0052	0.0427	0.1488	28.89	2.38
14.50 m	7.00	39.00	45.00	3.00	4.00	2.00	0.00	0.0039	0.0333	0.1296	33.63	2.23
17.50 m	5.00	33.00	48.00	5.00	6.00	3.00	0.00	0.0068	0.0496	0.1722	25.42	2.11
20.50 m	5.00	36.00	50.00	6.00	2.00	1.00	0.00	0.0064	0.0436	0.1501	23.35	1.97
23.50 m	6.00	36.00	51.00	3.00	1.00	1.00	2.00	0.0051	0.0409	0.1429	28.15	2.31
26.50 m	7.00	34.00	46.00	4.00	6.00	3.00	0.00	0.0041	0.0414	0.1580	38.96	2.67
29.50 m	8.00	50.00	32.00	5.00	3.00	2.00	0.00	0.0029	0.0209	0.0810	27.64	1.85
32.50 m	10.00	49.00	30.00	6.00	2.00	3.00	0.00	0.0020	0.0183	0.0779	38.94	2.14
35.50 m	9.00	50.00	29.00	4.00	3.00	5.00	0.00	0.0024	0.0192	0.0779	32.37	1.97

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P14

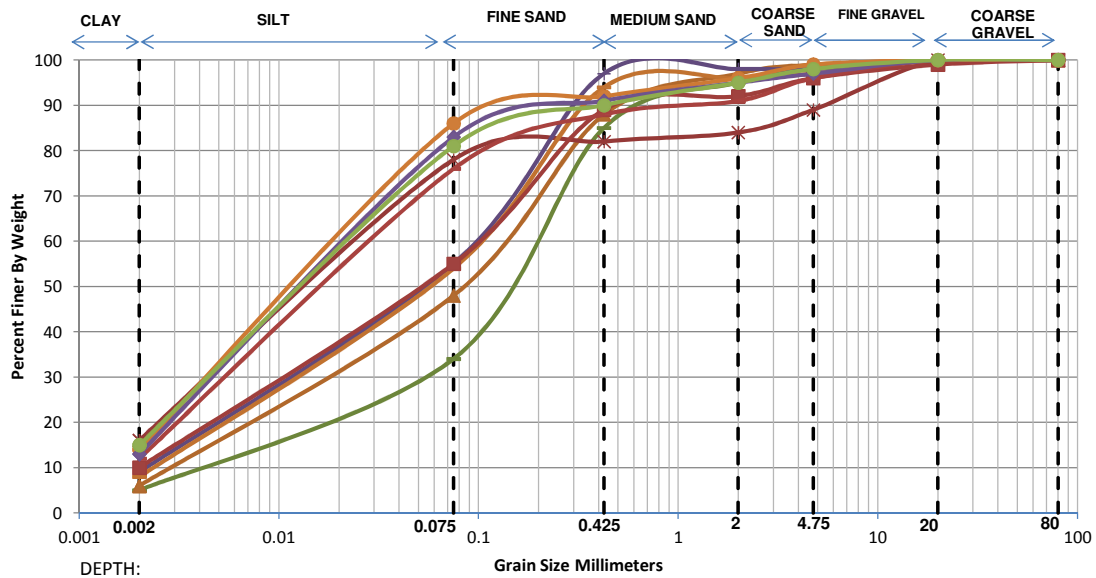


■ 2.50 m
 ✱ 5.50 m
 ■ 8.50 m
 ■ 11.50 m
 ■ 14.50 m
 ■ 20.50 m
 ■ 23.50 m
 ■ 26.50 m
 ■ 29.50 m
 ✱ 32.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	8.00	56.00	23.00	6.00	4.00	3.00	0.00	0.0029	0.0177	0.0658	22.78	1.66
5.50 m	7.00	62.00	22.00	5.00	3.00	1.00	0.00	0.0034	0.0171	0.0569	16.54	1.49
8.50 m	9.00	63.00	20.00	3.00	3.00	2.00	0.00	0.0024	0.0143	0.0517	21.69	1.65
11.50 m	8.00	62.00	24.00	4.00	1.00	1.00	0.00	0.0029	0.0159	0.0551	19.29	1.59
14.50 m	9.00	56.00	26.00	3.00	4.00	2.00	0.00	0.0024	0.0165	0.0637	26.59	1.79
20.50 m	8.00	56.00	24.00	5.00	3.00	3.00	1.00	0.0029	0.0178	0.0658	22.78	1.67
23.50 m	10.00	58.00	20.00	4.00	2.00	6.00	0.00	0.0020	0.0144	0.0576	28.79	1.80
26.50 m	12.00	58.00	19.00	2.00	3.00	5.00	1.00	-	0.0122	0.0535	-	-
29.50 m	10.00	61.00	18.00	4.00	3.00	4.00	0.00	0.0020	0.0136	0.0526	26.31	1.75
32.50 m	11.00	54.00	24.00	6.00	3.00	2.00	0.00	-	0.0146	0.0632	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P15

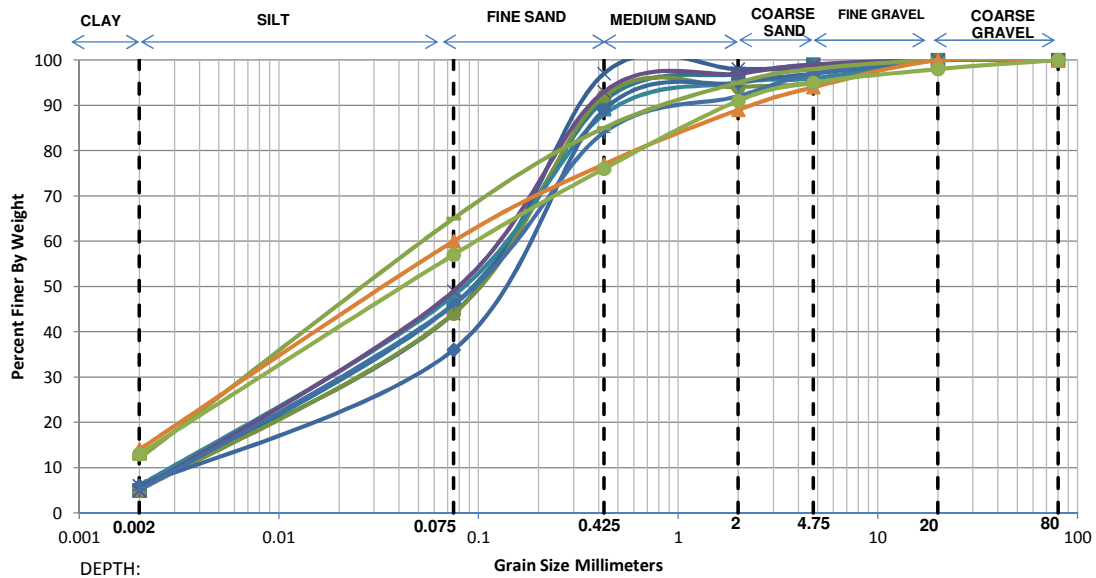


— 1.00 m
 —▲ 4.00 m
 —✱ 7.00 m
 —◆ 10.00 m
 —■ 13.00 m
 —■ 16.00 m
 —◆ 22.00 m
 —■ 25.00 m
 —◆ 28.00 m
 —◆ 35.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	29.00	51.00	10.00	3.00	2.00	0.0075	0.0606	0.1927	25.70	2.54	
4.00 m	6.00	42.00	40.00	9.00	2.00	1.00	0.0047	0.0317	0.1257	26.78	1.70	
7.00 m	16.00	62.00	4.00	2.00	5.00	11.00	-	0.0077	0.0399	-	-	
10.00 m	9.00	46.00	42.00	1.00	0.00	2.00	0.0024	0.0223	0.0904	37.36	2.27	
13.00 m	8.00	46.00	40.00	2.00	1.00	3.00	0.0030	0.0240	0.0947	31.89	2.04	
16.00 m	10.00	45.00	34.00	3.00	4.00	3.00	0.0020	0.0208	0.0930	46.51	2.33	
22.00 m	14.00	72.00	6.00	4.00	3.00	1.00	-	0.0081	0.0337	-	-	
25.00 m	12.00	64.00	12.00	3.00	5.00	4.00	-	0.0108	0.0447	-	-	
28.00 m	13.00	70.00	8.00	4.00	2.00	3.00	-	0.0091	0.0368	-	-	
35.50 m	15.00	66.00	9.00	5.00	3.00	2.00	-	0.0081	0.0376	-	-	

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-P16

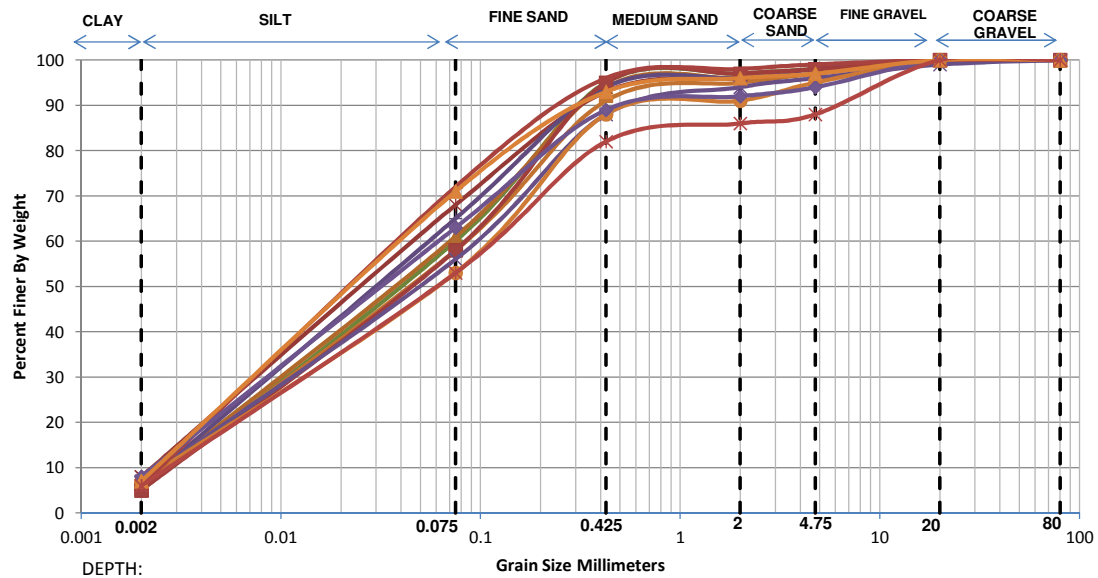


■ 2.50 m
 × 5.50 m
 ● 8.50 m
 — 11.50 m
 ◆ 14.50 m
 × 19.00 m
 — 23.50 m
 — 26.50 m
 ▲ 31.00 m
 ● 35.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	41.00	45.00	6.00	2.00	1.00	0.00	0.0060	0.0356	0.1295	21.73	1.64
5.50 m	6.00	38.00	53.00	1.00	0.00	2.00	0.00	0.0050	0.0378	0.1303	26.30	2.21
8.50 m	5.00	39.00	48.00	2.00	1.00	5.00	0.00	0.0061	0.0385	0.1355	22.10	1.79
11.50 m	6.00	42.00	40.00	7.00	1.00	4.00	0.00	0.0047	0.0317	0.1252	26.68	1.71
14.50 m	6.00	30.00	53.00	6.00	2.00	3.00	0.00	0.0057	0.0543	0.1743	30.76	2.99
19.00 m	5.00	44.00	44.00	4.00	2.00	1.00	0.00	0.0058	0.0321	0.1145	19.87	1.56
23.50 m	5.00	41.00	38.00	8.00	5.00	3.00	0.00	0.0059	0.0351	0.1419	23.99	1.47
26.50 m	12.00	53.00	20.00	10.00	3.00	2.00	0.00	-	0.0136	0.0628	-	-
31.00 m	14.00	46.00	17.00	12.00	5.00	6.00	0.00	-	0.0134	0.0750	-	-
35.50 m	13.00	44.00	19.00	15.00	4.00	3.00	2.00	-	0.0158	0.0924	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	42+256 Major Bridge
B.H. No.	BH-A2

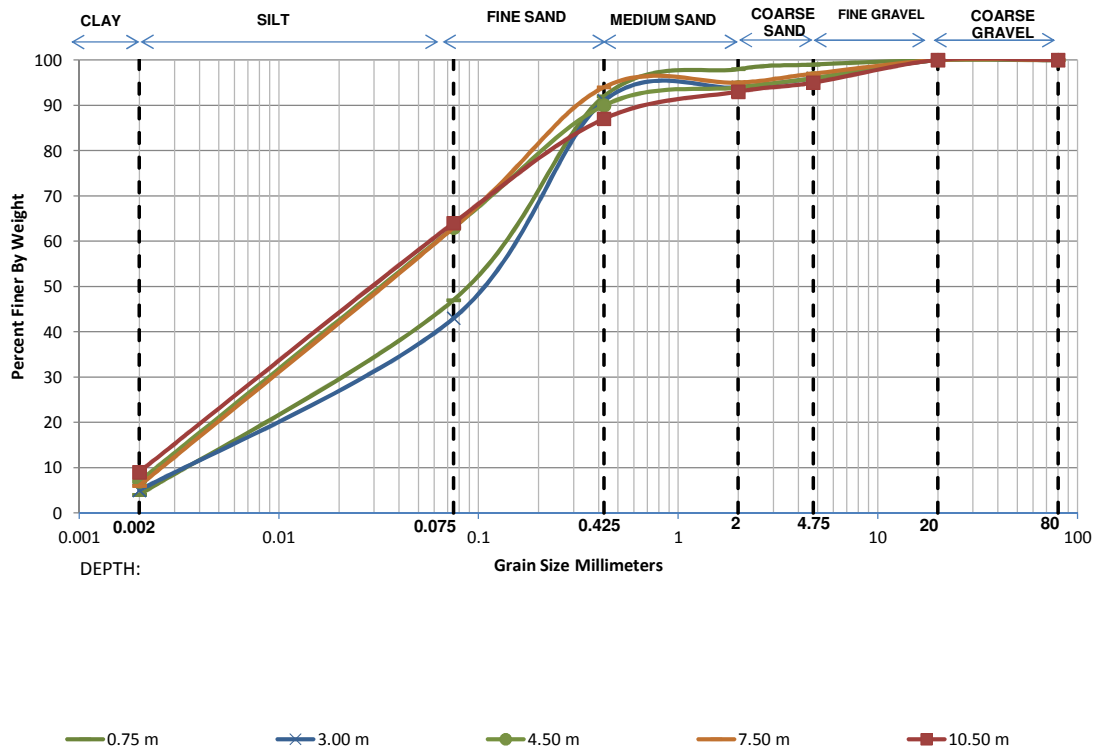


- | | | | | | |
|------------|------------|-----------|------------|------------|------------|
| — 1.00 m | —▲ 4.00 m | —* 7.00 m | —◆ 10.00 m | — 13.00 m | —■ 16.00 m |
| —× 19.00 m | —● 22.00 m | — 25.00 m | —◆ 28.00 m | —▲ 31.00 m | —* 34.00 m |

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	5.00	55.00	35.00	2.00	1.00	2.00	0.00	0.0053	0.0236	0.0750	14.23	1.41
4.00 m	6.00	55.00	33.00	2.00	1.00	3.00	0.00	0.0043	0.0217	0.0727	16.90	1.51
7.00 m	8.00	60.00	25.00	3.00	2.00	2.00	0.00	0.0029	0.0165	0.0584	20.35	1.62
10.00 m	6.00	59.00	29.00	2.00	2.00	2.00	0.00	0.0042	0.0198	0.0643	15.24	1.45
13.00 m	6.00	52.00	33.00	4.00	2.00	3.00	0.00	0.0044	0.0233	0.0807	18.51	1.54
16.00 m	5.00	53.00	37.00	2.00	1.00	2.00	0.00	0.0053	0.0247	0.0803	15.04	1.43
19.00 m	7.00	49.00	32.00	6.00	2.00	3.00	1.00	0.0036	0.0232	0.0889	24.67	1.69
22.00 m	7.00	46.00	35.00	3.00	4.00	5.00	0.00	0.0037	0.0255	0.1017	27.79	1.75
25.00 m	6.00	66.00	24.00	2.00	1.00	1.00	0.00	0.0041	0.0175	0.0530	12.90	1.40
28.00 m	8.00	55.00	26.00	3.00	2.00	6.00	0.00	0.0029	0.0183	0.0680	23.48	1.70
31.00 m	7.00	64.00	22.00	3.00	1.00	3.00	0.00	0.0034	0.0165	0.0539	15.74	1.48
34.00 m	6.00	47.00	29.00	4.00	2.00	12.00	0.00	0.0045	0.0263	0.1074	23.99	1.44

GRAIN SIZE DISTRIBUTION CURVES

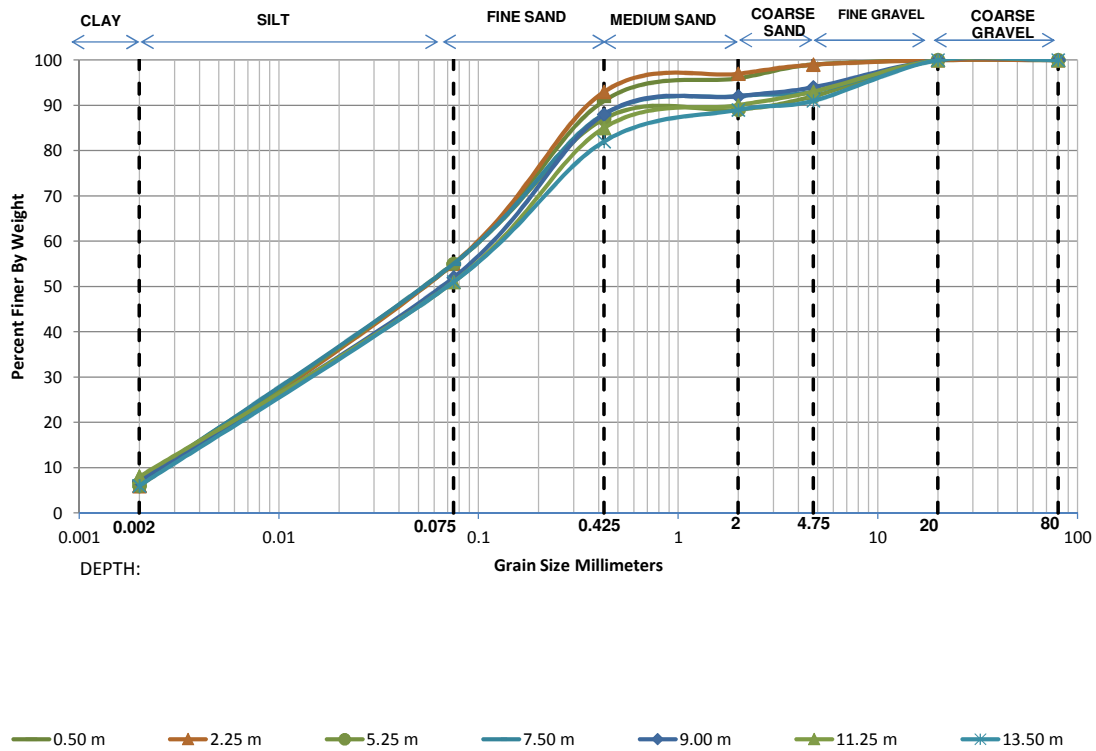
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	43+100
B.H. No.	BH-PLT-02



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.75 m	4.00	43.00	45.00	6.00	1.00	1.00	0.00	0.0073	0.0356	0.1237	16.97	1.41
3.00 m	5.00	38.00	48.00	3.00	2.00	4.00	0.00	0.0062	0.0400	0.1412	22.71	1.83
4.50 m	7.00	56.00	27.00	4.00	2.00	4.00	0.00	0.0035	0.0194	0.0681	19.43	1.57
7.50 m	6.00	57.00	31.00	1.00	2.00	3.00	0.00	0.0043	0.0207	0.0683	16.04	1.48
10.50 m	9.00	55.00	23.00	6.00	2.00	5.00	0.00	0.0024	0.0168	0.0656	27.39	1.79

GRAIN SIZE DISTRIBUTION CURVES

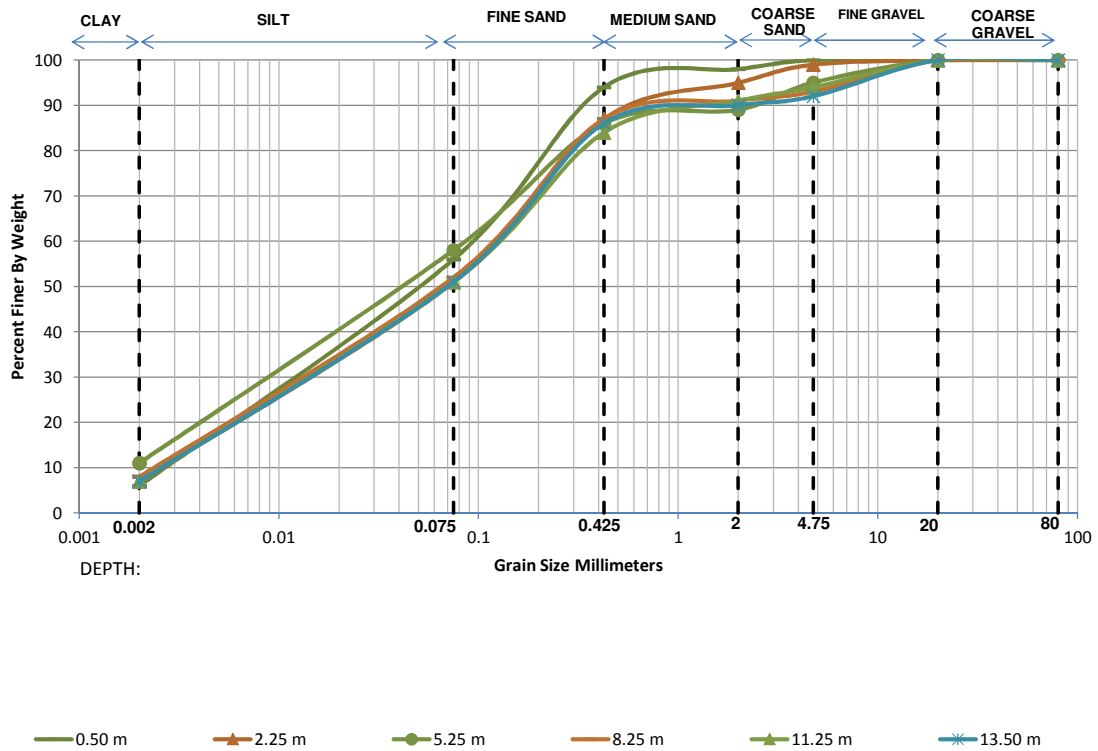
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	43+452
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	48.00	36.00	5.00	3.00	1.00	0.00	0.0036	0.0241	0.0919	25.33	1.75
2.25 m	6.00	49.00	38.00	4.00	2.00	1.00	0.00	0.0044	0.0254	0.0910	20.45	1.59
5.25 m	6.00	49.00	32.00	2.00	3.00	8.00	0.00	0.0044	0.0251	0.0931	21.00	1.52
7.50 m	7.00	48.00	33.00	4.00	1.00	7.00	0.00	0.0036	0.0240	0.0930	25.68	1.70
9.00 m	7.00	45.00	36.00	4.00	2.00	6.00	0.00	0.0037	0.0264	0.1064	28.90	1.78
11.25 m	8.00	43.00	34.00	5.00	3.00	7.00	0.00	0.0030	0.0260	0.1148	38.37	1.97
13.50 m	6.00	45.00	31.00	7.00	2.00	9.00	0.00	0.0045	0.0281	0.1194	26.26	1.45

GRAIN SIZE DISTRIBUTION CURVES

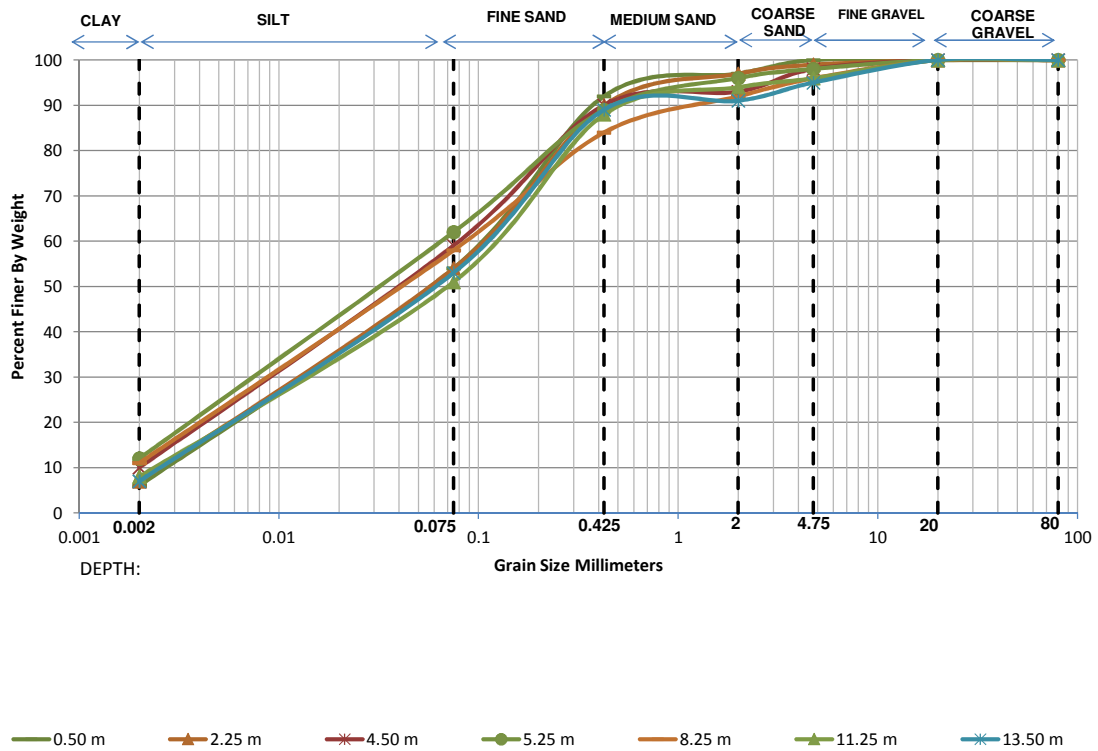
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	43+585
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	50.00	38.00	4.00	2.00	0.00	0.00	0.0044	0.0247	0.0871	19.70	1.59
2.25 m	7.00	44.00	36.00	8.00	4.00	1.00	0.00	0.0037	0.0273	0.1128	30.47	1.78
5.25 m	11.00	47.00	28.00	3.00	6.00	5.00	0.00	-	0.0177	0.0816	-	-
8.25 m	8.00	44.00	35.00	4.00	2.00	7.00	0.00	0.0030	0.0252	0.1075	36.04	1.99
11.25 m	7.00	44.00	33.00	7.00	3.00	6.00	0.00	0.0037	0.0271	0.1164	31.50	1.70
13.50 m	7.00	44.00	35.00	4.00	2.00	8.00	0.00	0.0037	0.0272	0.1131	30.58	1.77

GRAIN SIZE DISTRIBUTION CURVES

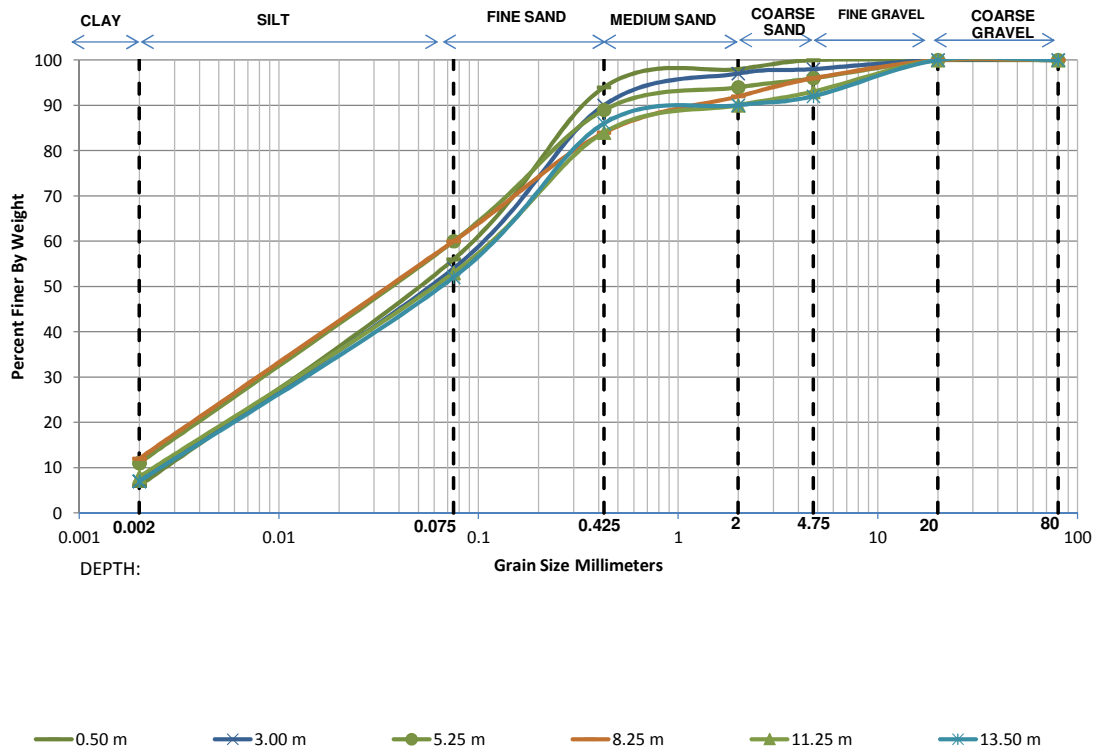
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	43+732
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	48.00	38.00	5.00	3.00	0.00	0.00	0.0045	0.0261	0.0953	21.28	1.60
2.25 m	7.00	47.00	36.00	7.00	2.00	1.00	0.00	0.0036	0.0248	0.0966	26.50	1.75
4.50 m	10.00	49.00	31.00	3.00	5.00	2.00	0.00	0.0020	0.0183	0.0778	38.92	2.15
5.25 m	12.00	50.00	27.00	7.00	2.00	2.00	0.00	-	0.0149	0.0698	-	-
8.25 m	11.00	47.00	26.00	8.00	4.00	4.00	0.00	-	0.0176	0.0821	-	-
11.25 m	8.00	43.00	37.00	6.00	2.00	4.00	0.00	0.0030	0.0262	0.1116	37.26	2.06
13.50 m	7.00	46.00	36.00	2.00	4.00	5.00	0.00	0.0037	0.0256	0.1009	27.55	1.77

GRAIN SIZE DISTRIBUTION CURVES

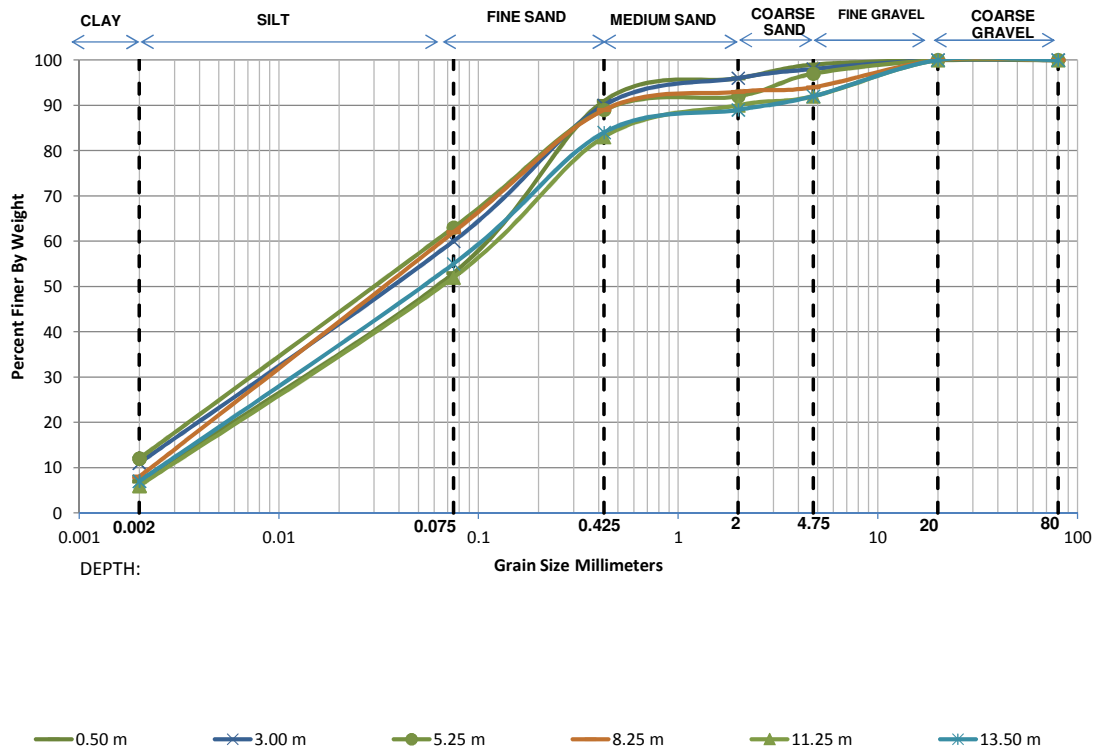
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	44+050
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	6.00	50.00	38.00	4.00	2.00	0.00	0.00	0.0044	0.0247	0.0871	19.70	1.59
3.00 m	7.00	47.00	36.00	7.00	1.00	2.00	0.00	0.0036	0.0248	0.0966	26.50	1.75
5.25 m	11.00	49.00	29.00	5.00	2.00	4.00	0.00	-	0.0168	0.0750	-	-
8.25 m	12.00	48.00	24.00	8.00	4.00	4.00	0.00	-	0.0156	0.0750	-	-
11.25 m	8.00	45.00	31.00	6.00	3.00	7.00	0.00	0.0030	0.0242	0.1059	35.65	1.86
13.50 m	7.00	45.00	34.00	4.00	2.00	8.00	0.00	0.0037	0.0263	0.1082	29.44	1.74

GRAIN SIZE DISTRIBUTION CURVES

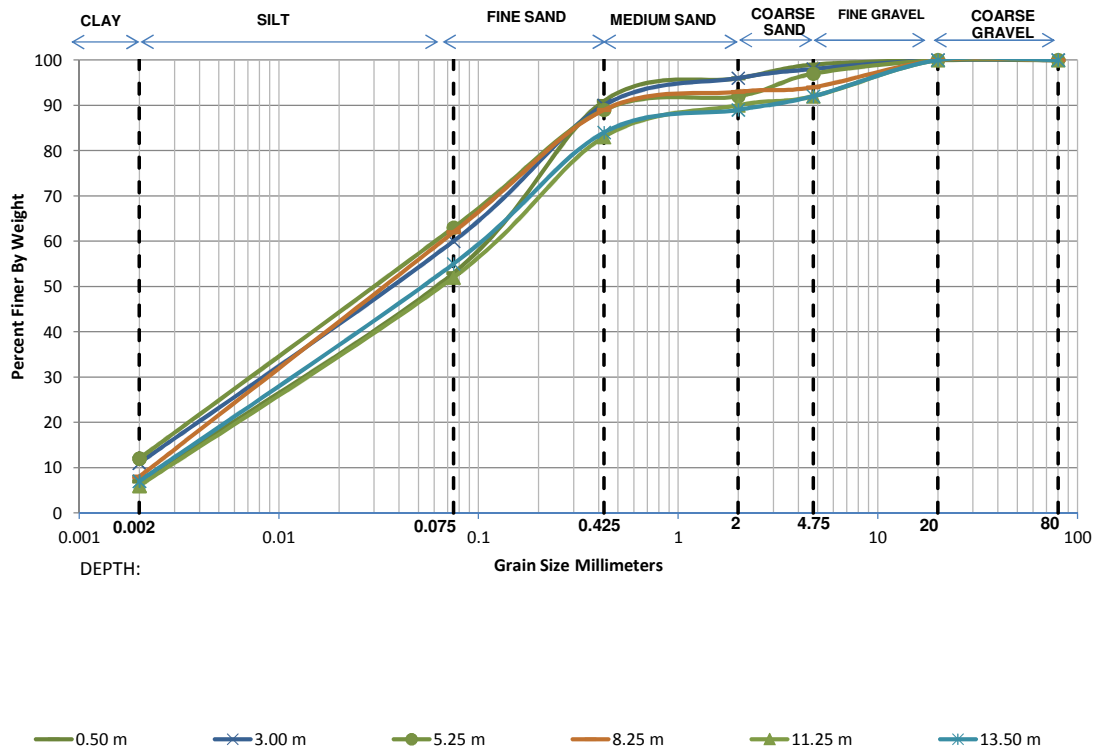
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	44+116
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	46.00	38.00	5.00	3.00	1.00	0.00	0.0037	0.0257	0.1000	27.29	1.80
3.00 m	11.00	49.00	30.00	6.00	2.00	2.00	0.00	-	0.0168	0.0750	-	-
5.25 m	12.00	51.00	26.00	3.00	5.00	3.00	0.00	-	0.0145	0.0674	-	-
8.25 m	8.00	54.00	27.00	4.00	1.00	6.00	0.00	0.0029	0.0187	0.0702	24.20	1.72
11.25 m	6.00	46.00	31.00	7.00	2.00	8.00	0.00	0.0045	0.0272	0.1122	24.86	1.46
13.50 m	7.00	48.00	29.00	5.00	3.00	8.00	0.00	0.0036	0.0237	0.0953	26.37	1.63

GRAIN SIZE DISTRIBUTION CURVES

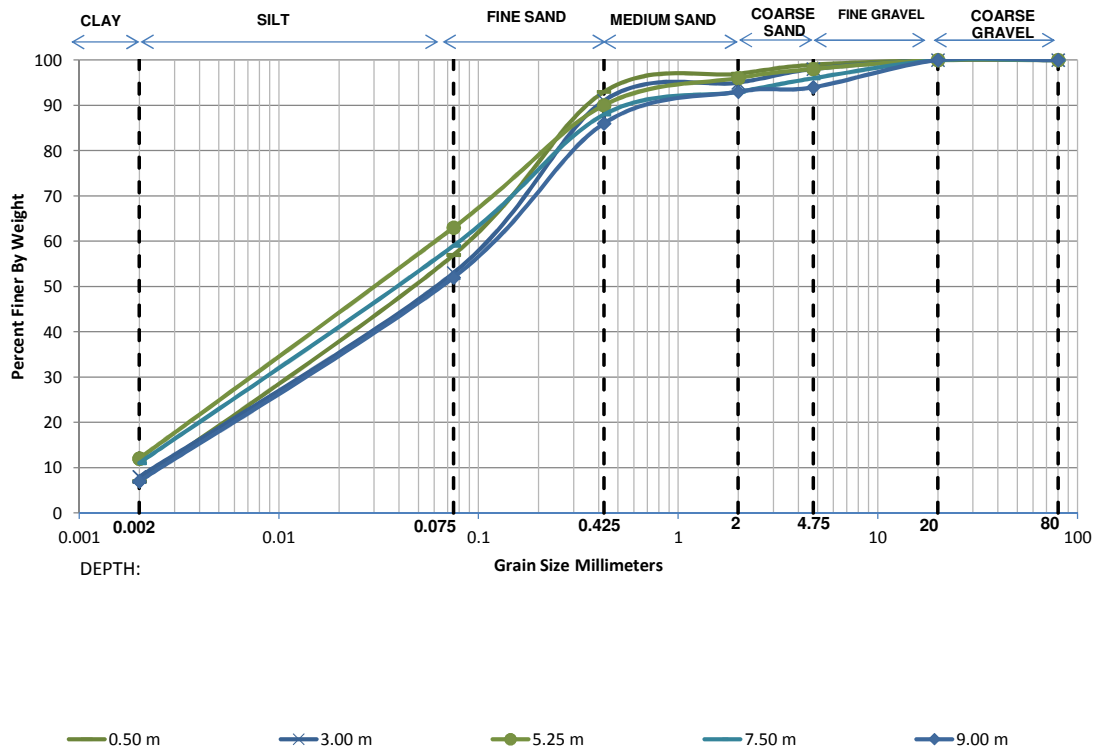
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	44+317 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	14.00	76.00	8.00	2.00	0.00	0.00	0.0505	0.1398	0.2406	4.76	1.61
3.00 m	6.00	53.00	31.00	5.00	3.00	2.00	0.00	0.0043	0.0226	0.0777	17.92	1.52
5.25 m	7.00	56.00	26.00	7.00	1.00	3.00	0.00	0.0035	0.0193	0.0681	19.43	1.57
6.00 m	11.00	49.00	31.00	4.00	2.00	3.00	0.00	-	0.0169	0.0750	-	-
8.25 m	12.00	48.00	26.00	6.00	3.00	5.00	0.00	-	0.0157	0.0750	-	-

GRAIN SIZE DISTRIBUTION CURVES

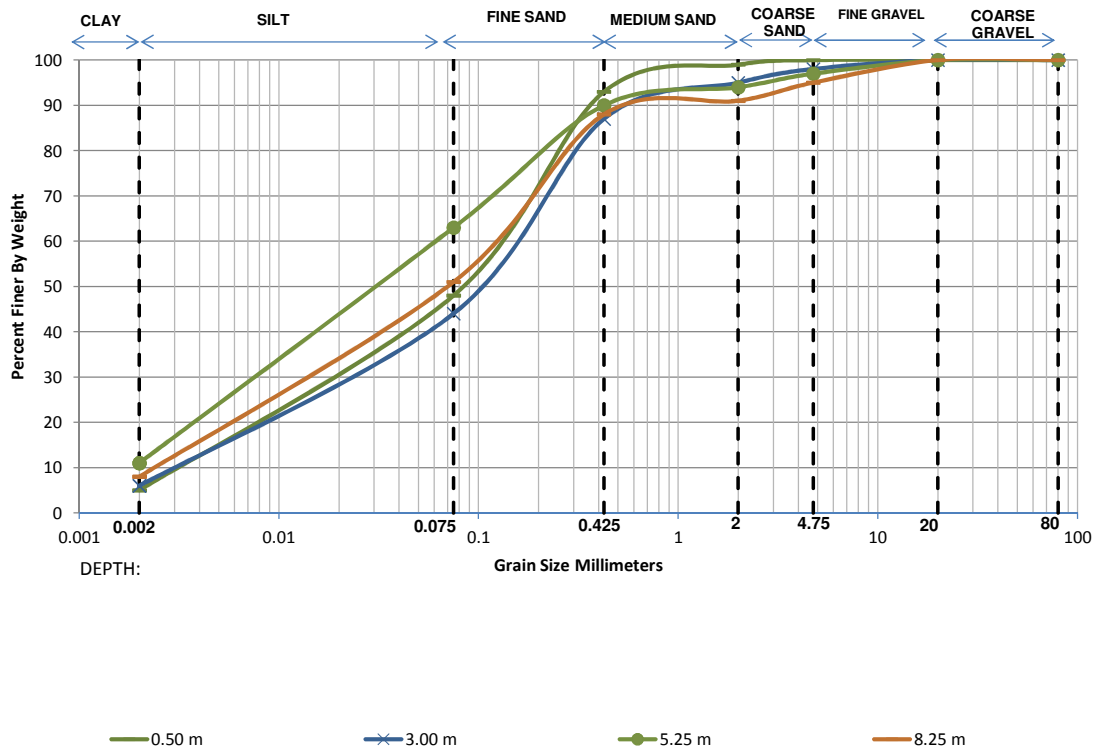
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	44+641
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	50.00	36.00	4.00	2.00	1.00	0.00	0.0036	0.0228	0.0839	23.35	1.73
3.00 m	8.00	45.00	38.00	4.00	3.00	2.00	0.00	0.0030	0.0246	0.1002	33.65	2.03
5.25 m	12.00	51.00	27.00	6.00	2.00	2.00	0.00	-	0.0145	0.0675	-	-
7.50 m	11.00	48.00	29.00	5.00	3.00	4.00	0.00	-	0.0172	0.0780	-	-
9.00 m	7.00	45.00	34.00	7.00	1.00	6.00	0.00	0.0037	0.0263	0.1088	29.59	1.73

GRAIN SIZE DISTRIBUTION CURVES

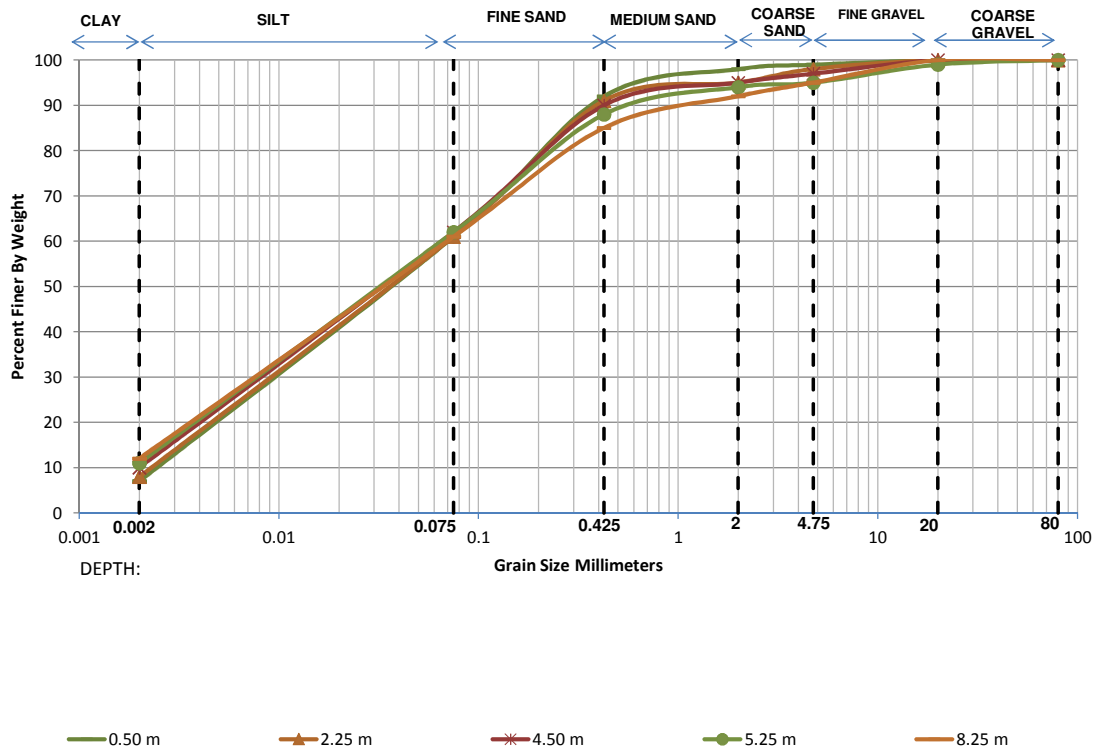
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	44+910
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	5.00	43.00	45.00	6.00	1.00	0.00	0.00	0.0058	0.0332	0.1189	20.41	1.59
3.00 m	6.00	38.00	43.00	8.00	3.00	2.00	0.00	0.0049	0.0371	0.1455	29.66	1.93
5.25 m	11.00	52.00	27.00	4.00	3.00	3.00	0.00	-	0.0154	0.0676	-	-
8.25 m	8.00	43.00	37.00	3.00	4.00	5.00	0.00	0.0030	0.0262	0.1111	37.08	2.07

GRAIN SIZE DISTRIBUTION CURVES

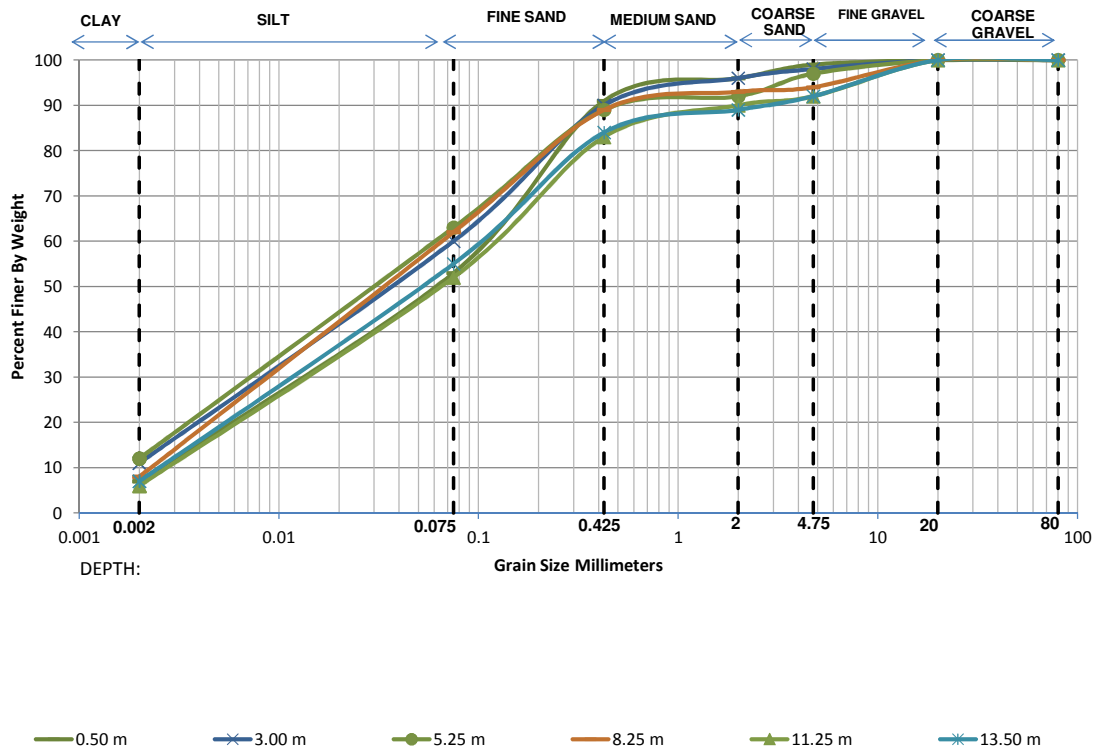
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+048
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	54.00	31.00	6.00	1.00	1.00	0.00	0.0035	0.0204	0.0726	20.55	1.63
2.25 m	8.00	53.00	30.00	4.00	3.00	2.00	0.00	0.0029	0.0193	0.0726	24.94	1.77
4.50 m	10.00	52.00	28.00	5.00	2.00	3.00	0.00	0.0020	0.0168	0.0700	35.02	2.01
5.25 m	11.00	51.00	26.00	6.00	1.00	4.00	1.00	-	0.0158	0.0699	-	-
8.25 m	12.00	49.00	24.00	7.00	3.00	5.00	0.00	-	0.0152	0.0723	-	-

GRAIN SIZE DISTRIBUTION CURVES

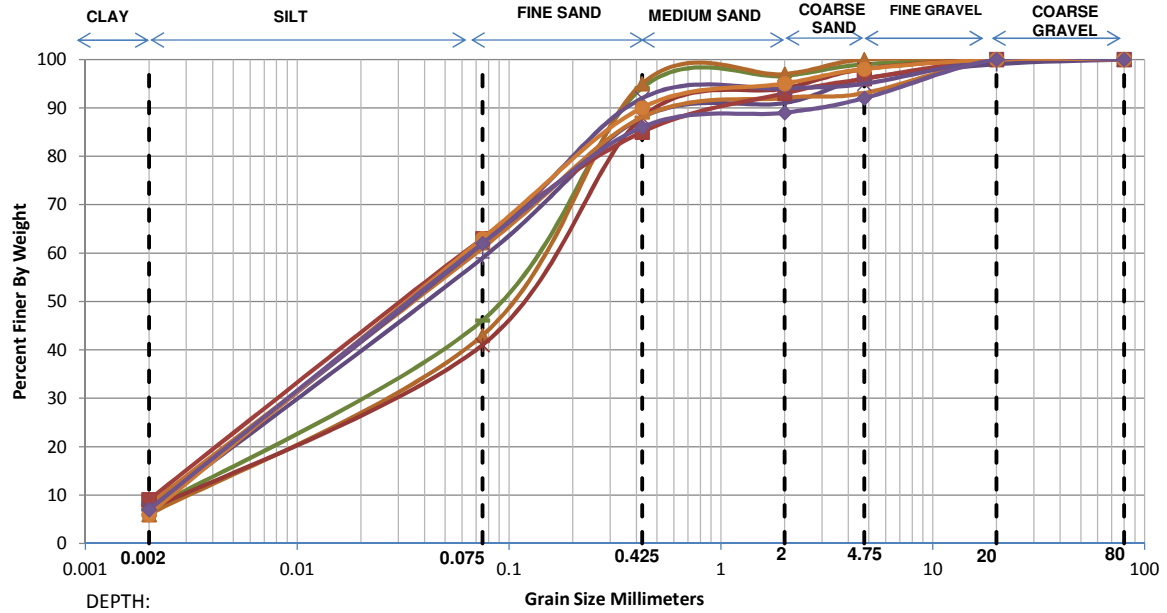
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+411 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	20.00	67.00	11.00	2.00	0.00	0.00	0.0278	0.1144	0.2312	8.33	2.04
3.00 m	7.00	46.00	38.00	4.00	3.00	2.00	0.00	0.0037	0.0257	0.0999	27.26	1.81
5.25 m	6.00	45.00	33.00	12.00	1.00	3.00	0.00	0.0046	0.0282	0.1173	25.76	1.49
7.50 m	11.00	47.00	31.00	5.00	2.00	4.00	0.00	-	0.0178	0.0813	-	-
8.25 m	12.00	50.00	26.00	4.00	3.00	5.00	0.00	-	0.0149	0.0698	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+480 Major Bridge
B.H. No.	BH-A1

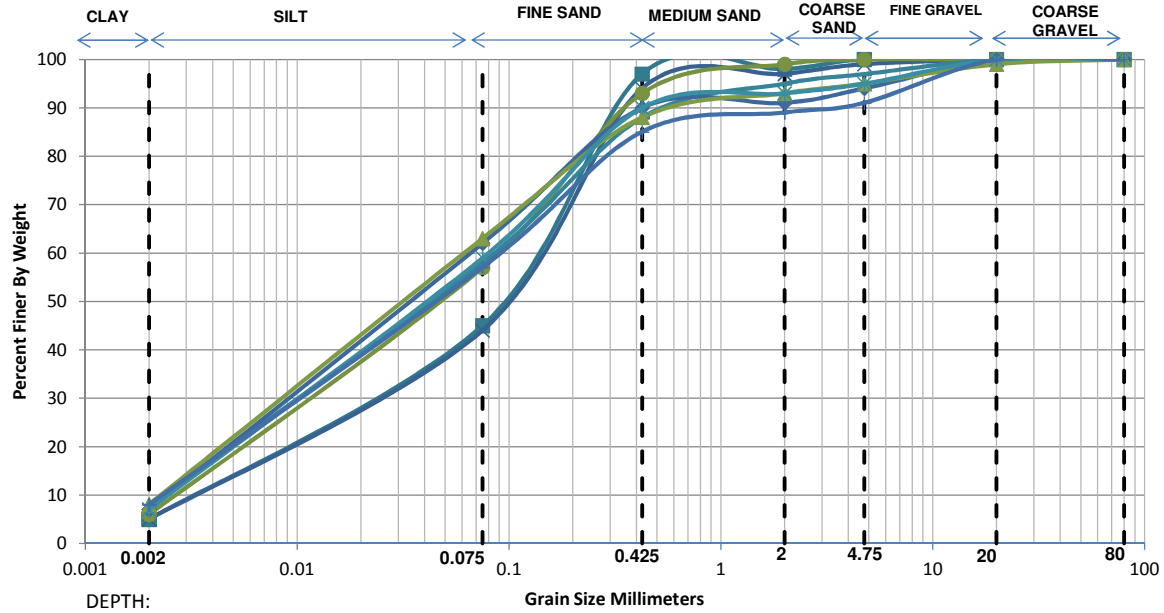


— 1.00 m
 —▲— 4.00 m
 —*— 7.00 m
 —◆— 10.00 m
 —■— 13.00 m
 —■— 16.00 m
 —◆— 19.00 m
 —◆— 22.00 m
 —◆— 28.00 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
1.00 m	7.00	39.10	48.00	2.50	2.40	1.00	0.00	0.0039	0.0334	0.1257	32.57	2.30
4.00 m	6.00	37.00	52.00	2.00	3.00	0.00	0.00	0.0050	0.0393	0.1363	27.20	2.26
7.00 m	7.00	34.00	47.00	6.00	4.00	2.00	0.00	0.0041	0.0415	0.1566	38.58	2.71
10.00 m	7.00	52.00	29.00	3.00	5.00	3.00	1.00	0.0036	0.0213	0.0778	21.88	1.65
13.00 m	8.00	53.00	27.00	4.00	1.00	7.00	0.00	0.0029	0.0192	0.0725	24.95	1.74
16.00 m	9.00	54.00	22.00	8.00	3.00	4.00	0.00	0.0024	0.0171	0.0677	28.27	1.80
19.00 m	7.00	55.00	30.00	2.00	1.00	5.00	0.00	0.0035	0.0199	0.0703	19.98	1.61
22.00 m	6.00	57.00	27.00	5.00	3.00	2.00	0.00	0.0042	0.0205	0.0682	16.05	1.46
28.00 m	7.00	55.00	24.00	3.00	3.00	8.00	0.00	0.0035	0.0197	0.0702	20.00	1.57

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+480 Major Bridge
B.H. No.	BH-A2

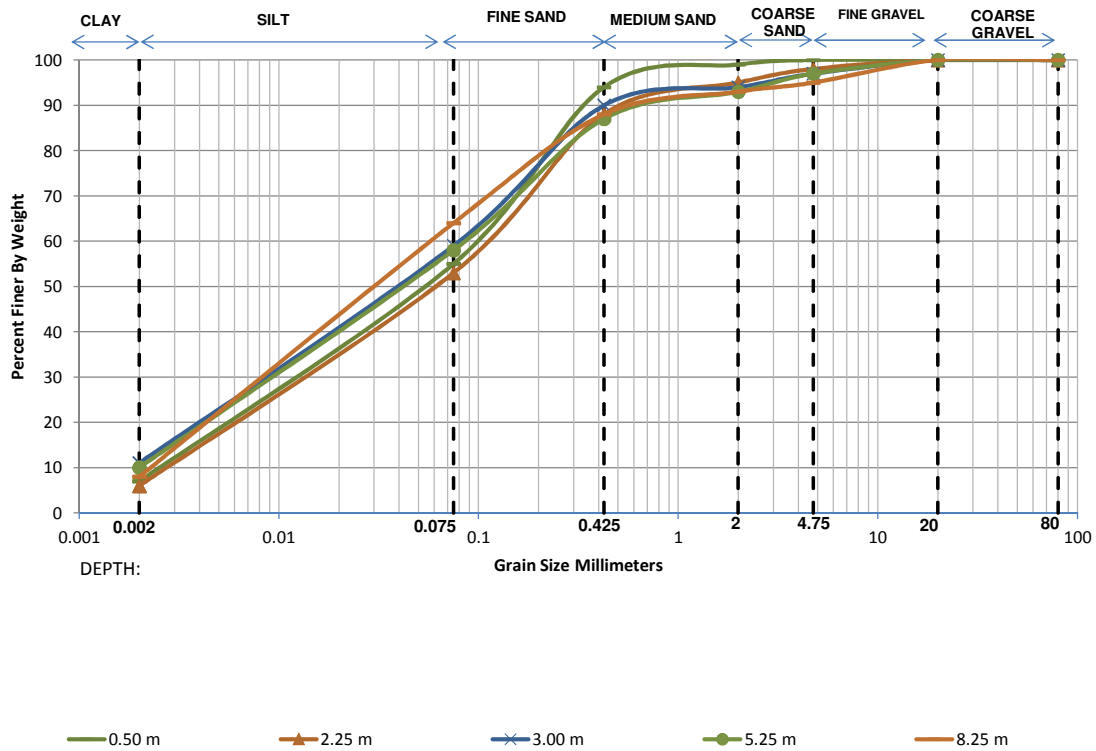


■ 2.50 m
× 5.50 m
● 8.50 m
— 11.50 m
◆ 14.50 m
▲ 17.50 m
✱ 20.50 m
+ 23.50 m

Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.50 m	5.00	40.00	52.00	1.00	2.00	0.00	0.00	0.0061	0.0374	0.1261	20.75	1.82
5.50 m	5.00	39.00	50.00	3.00	2.00	1.00	0.00	0.0061	0.0387	0.1333	21.69	1.82
8.50 m	6.00	51.00	36.00	6.00	1.00	0.00	0.00	0.0044	0.0240	0.0839	19.10	1.56
11.50 m	8.00	50.00	30.00	7.00	2.00	3.00	0.00	0.0029	0.0208	0.0812	27.73	1.83
14.50 m	7.00	55.00	28.00	1.00	3.00	6.00	0.00	0.0035	0.0199	0.0703	19.98	1.59
17.50 m	8.00	55.00	25.00	5.00	2.00	4.00	1.00	0.0029	0.0182	0.0679	23.47	1.69
20.50 m	7.00	52.00	31.00	3.00	2.00	5.00	0.00	0.0036	0.0214	0.0777	21.84	1.66
23.50 m	8.00	49.00	28.00	4.00	2.00	9.00	0.00	0.0029	0.0213	0.0856	29.17	1.81

GRAIN SIZE DISTRIBUTION CURVES

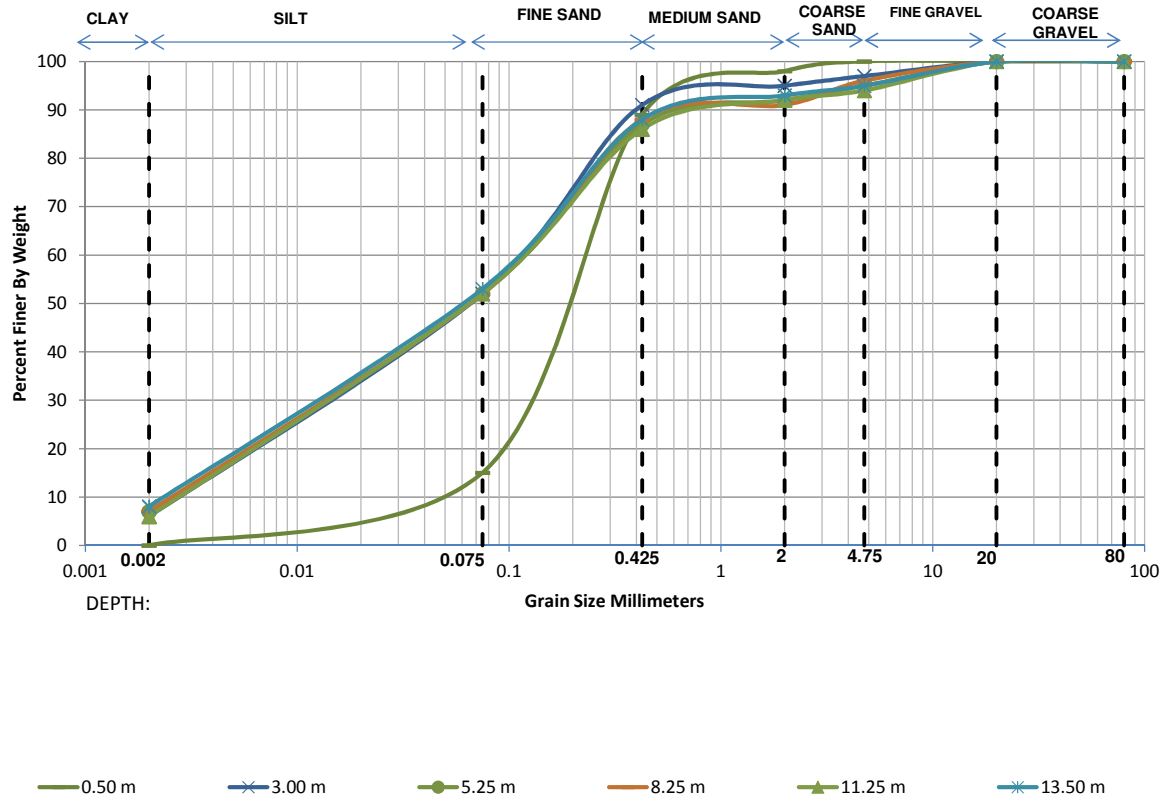
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+612 Minor Bridge
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	7.00	48.00	39.00	5.00	1.00	0.00	0.00	0.0036	0.0243	0.0909	25.04	1.79
2.25 m	6.00	47.00	35.00	7.00	3.00	2.00	0.00	0.0045	0.0267	0.1020	22.68	1.55
3.00 m	11.00	48.00	31.00	4.00	3.00	3.00	0.00	-	0.0173	0.0779	-	-
5.25 m	10.00	48.00	29.00	6.00	4.00	3.00	0.00	0.0020	0.0187	0.0815	40.74	2.15
8.25 m	8.00	56.00	24.00	5.00	2.00	5.00	0.00	0.0029	0.0178	0.0658	22.78	1.67

GRAIN SIZE DISTRIBUTION CURVES

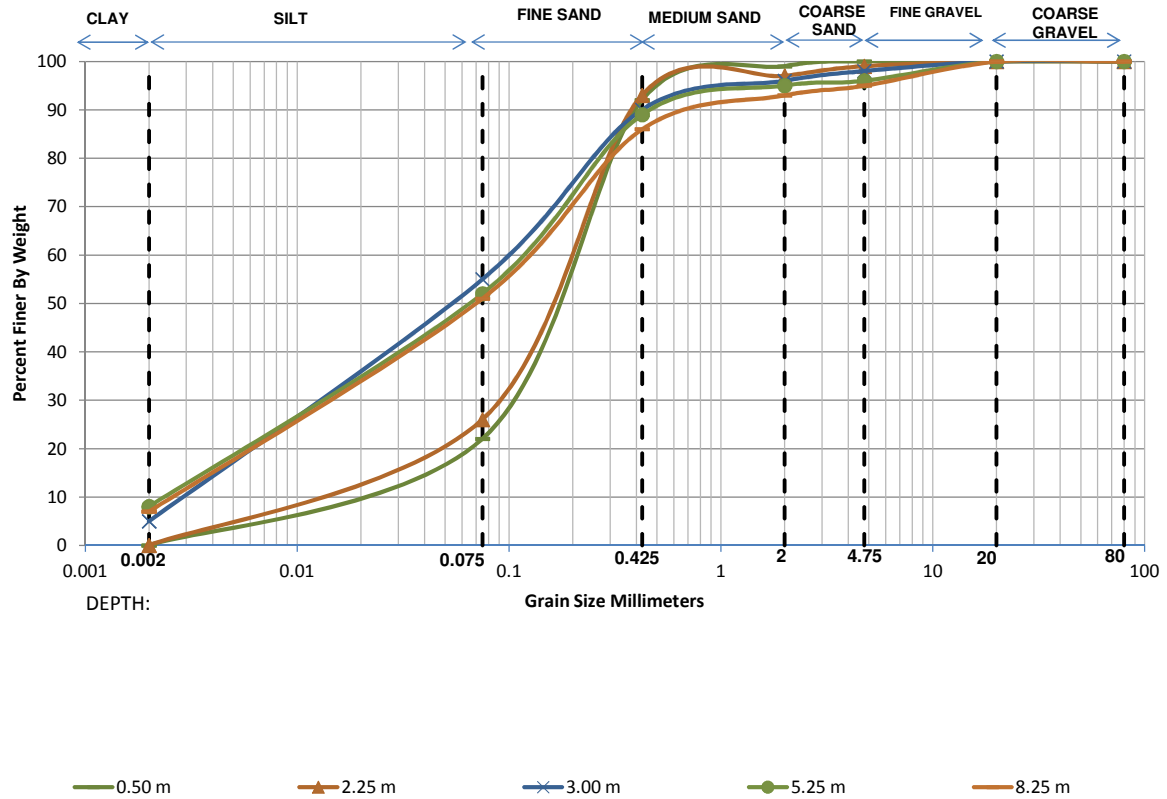
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	45+984
B.H. No.	BH-CL



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	15.00	74.00	9.00	2.00	0.00	0.0454	0.1357	0.2403	5.29	1.69	
3.00 m	6.00	46.00	39.00	4.00	2.00	3.00	0.0045	0.0278	0.1039	22.88	1.63	
5.25 m	7.00	45.00	35.00	5.00	3.00	5.00	0.0037	0.0263	0.1074	29.21	1.76	
8.25 m	7.00	45.00	36.00	3.00	5.00	4.00	0.0037	0.0264	0.1062	28.86	1.78	
11.25 m	6.00	46.00	34.00	6.00	2.00	6.00	0.0045	0.0274	0.1084	23.95	1.54	
13.50 m	8.00	45.00	35.00	5.00	2.00	5.00	0.0030	0.0244	0.1022	34.37	1.96	

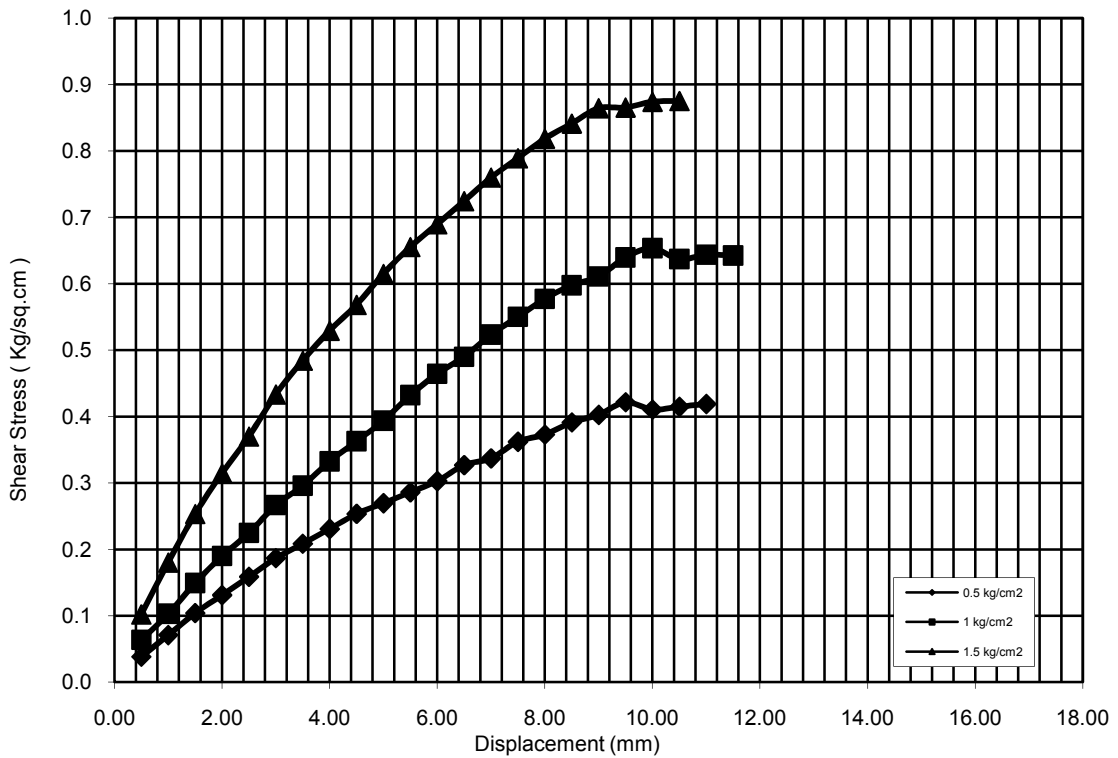
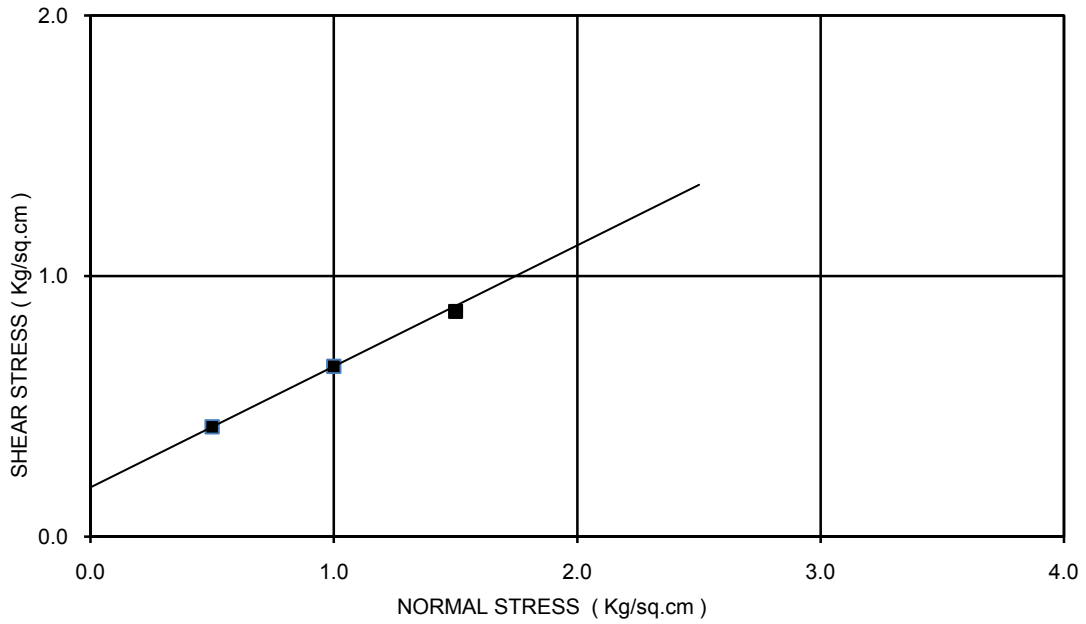
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	46+400
B.H. No.	BH-CL

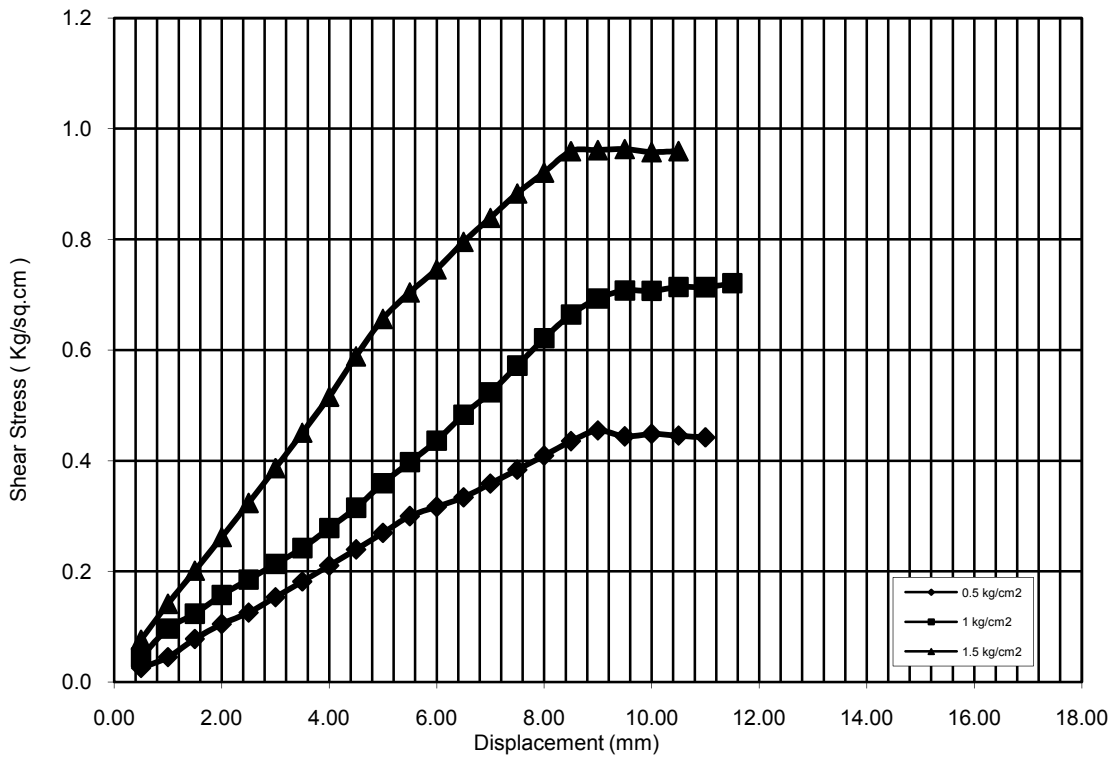
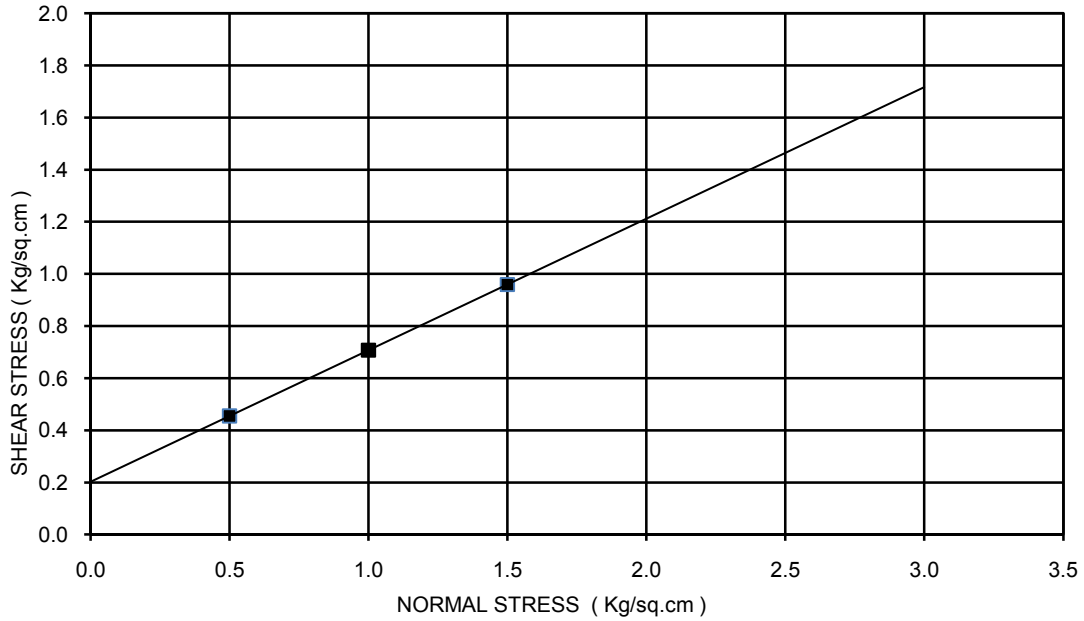


Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	22.00	70.00	7.00	1.00	0.00	0.00	0.0236	0.1048	0.2119	8.96	2.19
2.25 m	0.00	26.00	67.00	4.00	2.00	1.00	0.00	0.0174	0.0892	0.1964	11.26	2.32
3.00 m	5.00	50.00	35.00	6.00	2.00	2.00	0.00	0.0054	0.0265	0.0920	16.90	1.40
5.25 m	8.00	44.00	37.00	6.00	1.00	4.00	0.00	0.0030	0.0254	0.1061	35.55	2.03
8.25 m	7.00	44.00	35.00	7.00	2.00	5.00	0.00	0.0037	0.0272	0.1137	30.75	1.76

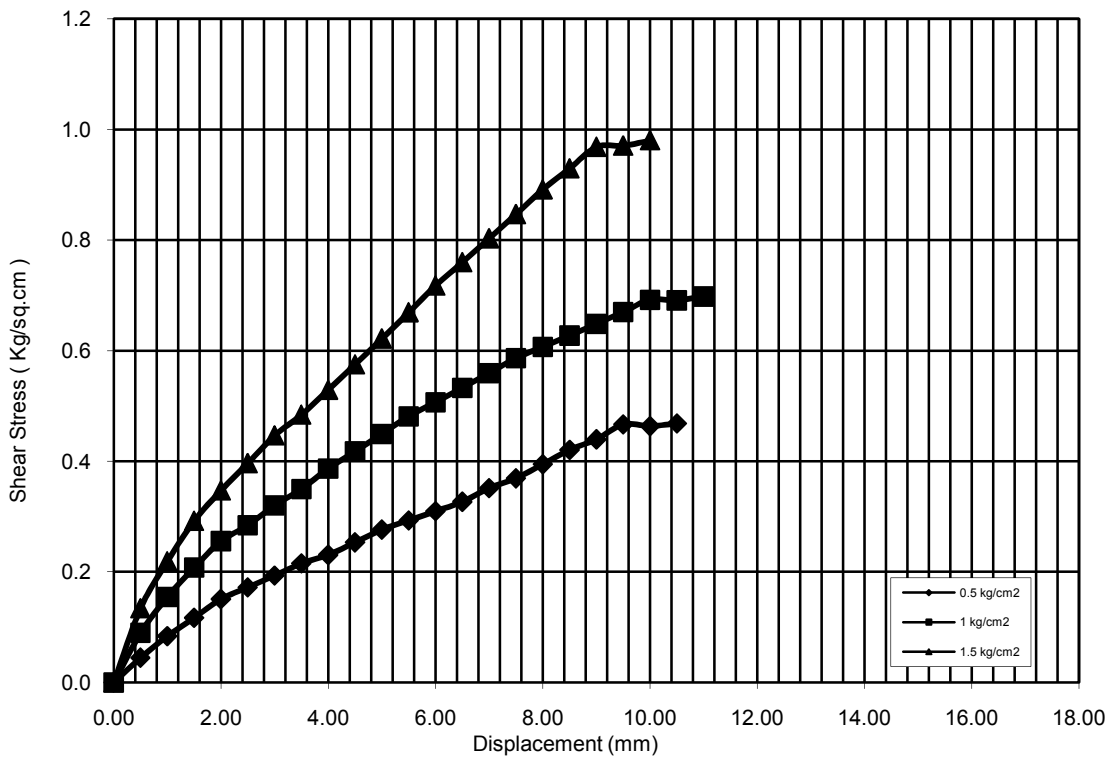
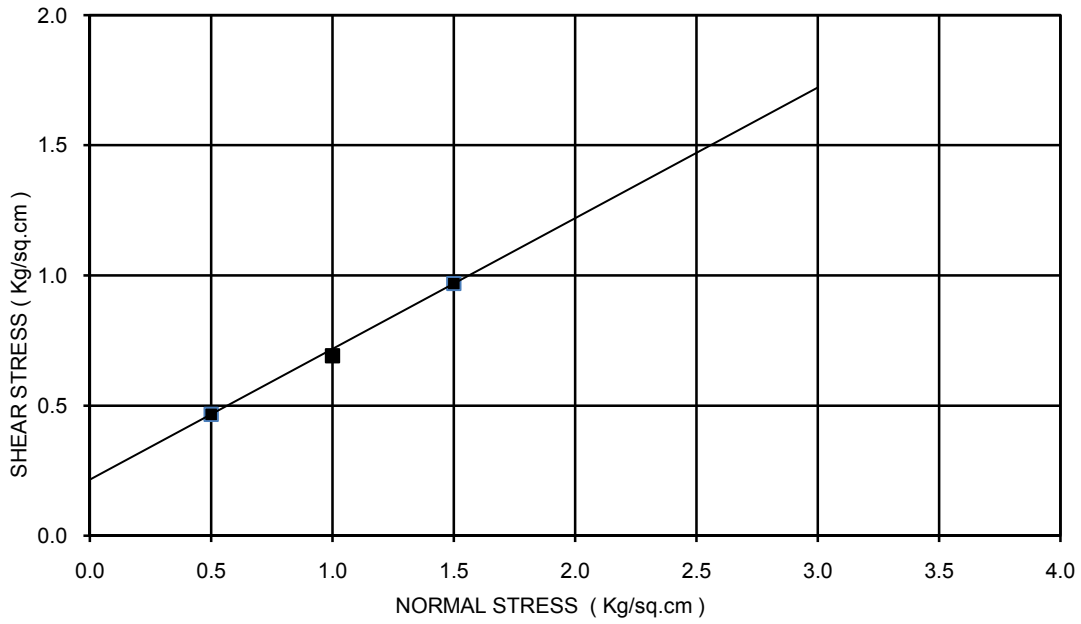
BORE HOLE NO: BH-A1
 CHAINAGE : -29+487
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.19 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



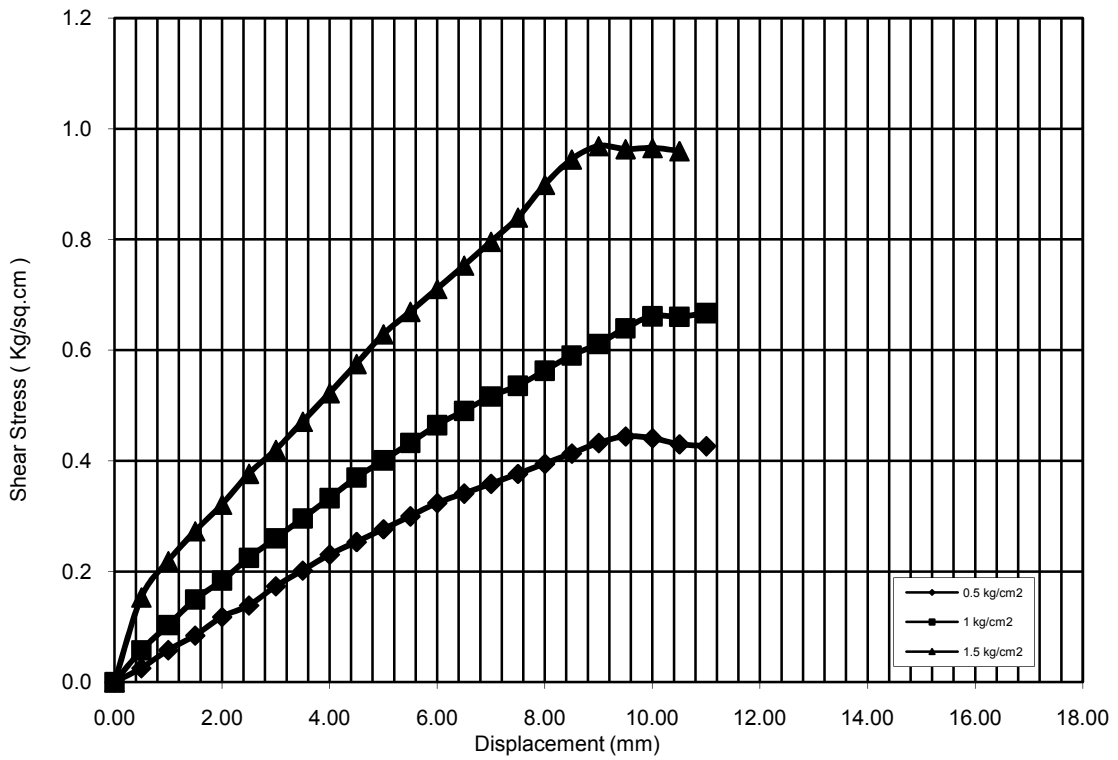
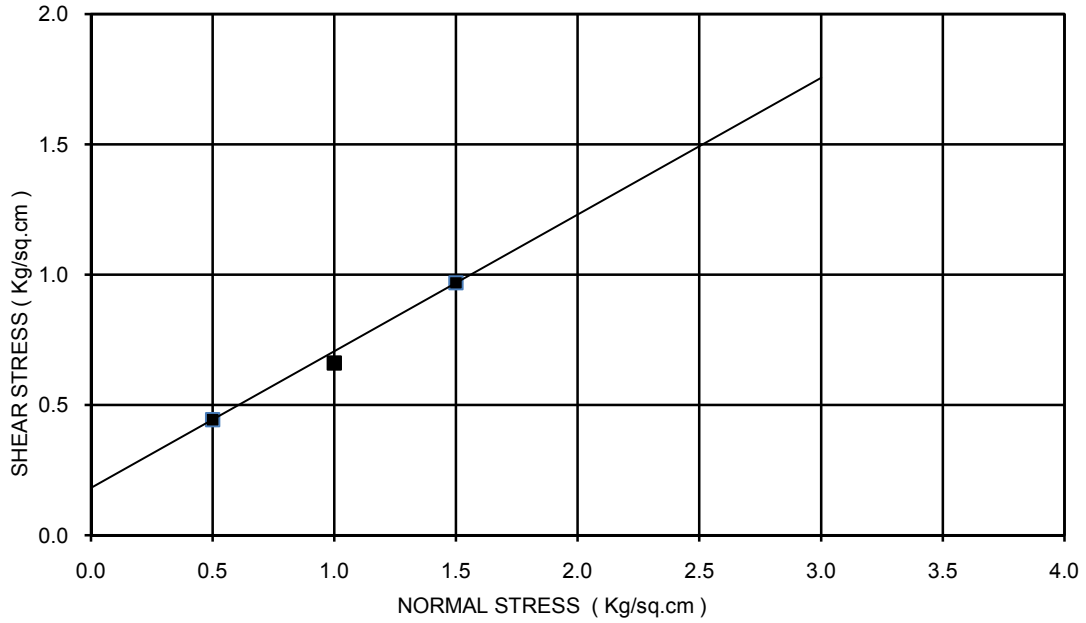
BORE HOLE NO: BH-A1
 CHAINAGE : - 29+487
 SAMPLE NO.: UDS-2
 DEPTH: 5.50 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



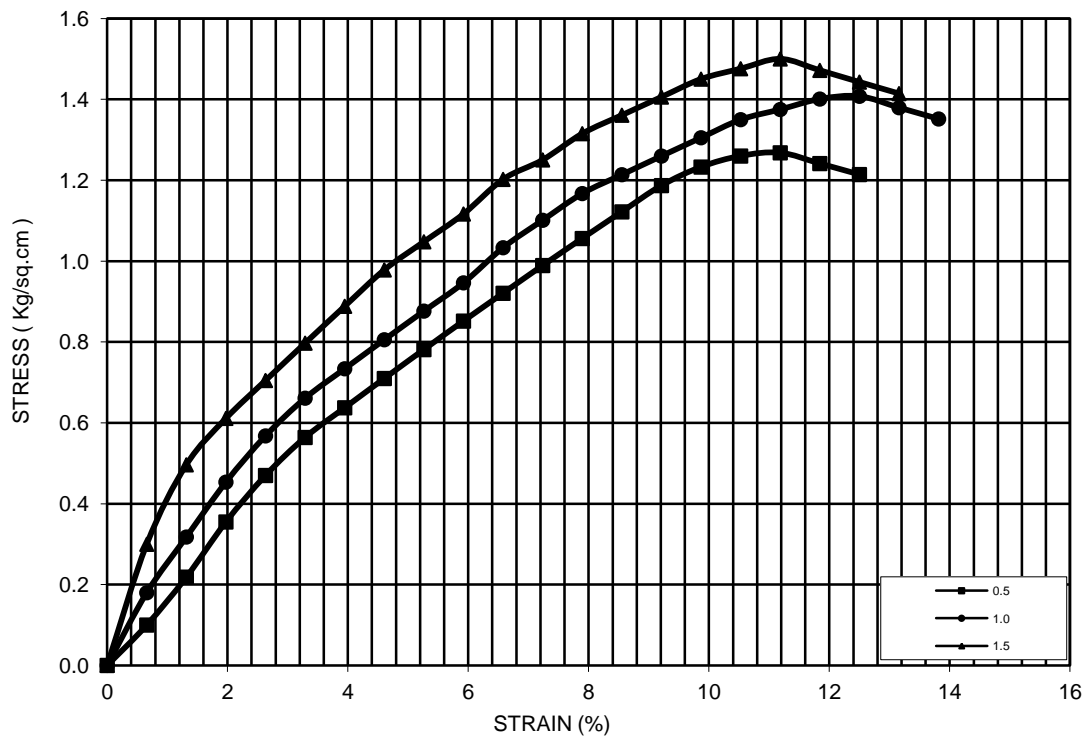
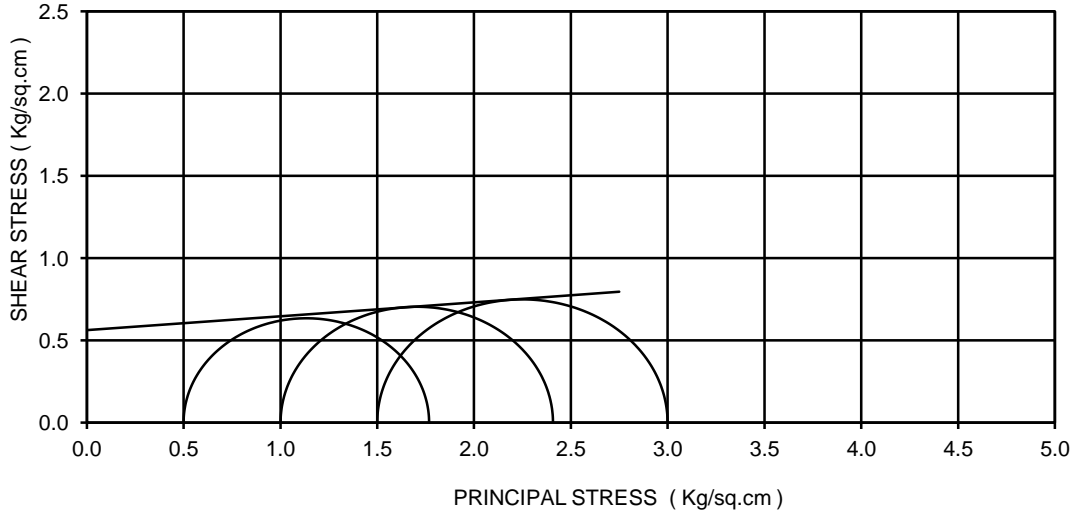
BORE HOLE NO: BH-A2
 CHAINAGE :- 29+487
 SAMPLE NO.: UDS-2
 DEPTH: 4.00 m
 COHESION(C)= 0.22 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



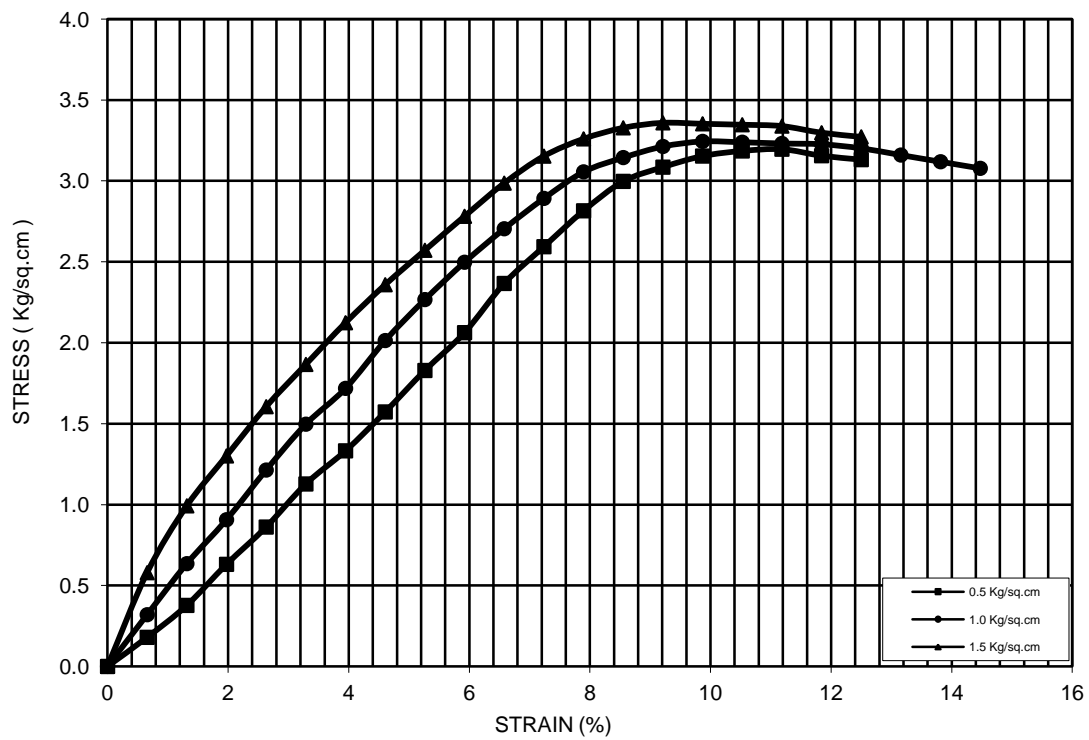
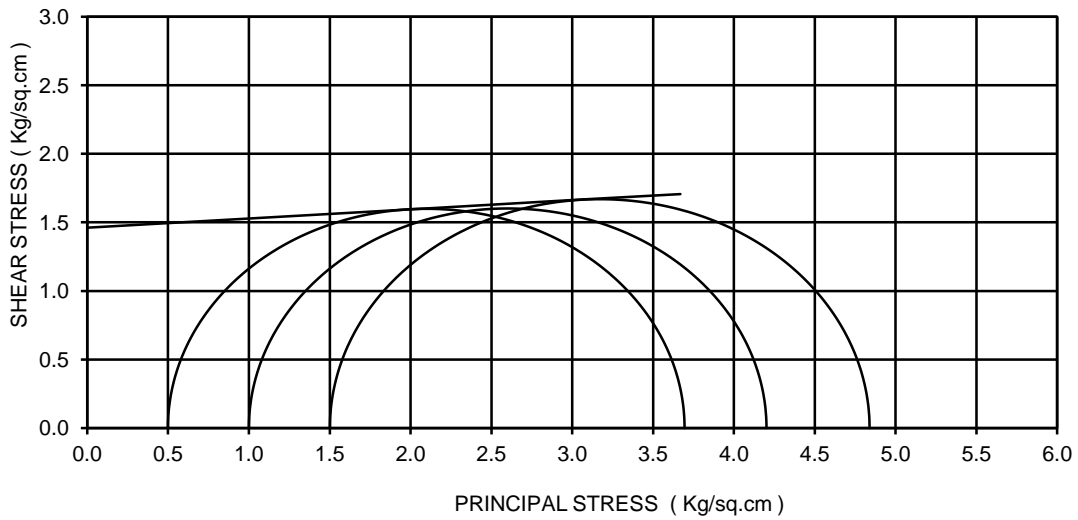
BORE HOLE NO: BH-A2
 CHAINAGE:- 29+487
 SAMPLE NO.: UDS-3
 DEPTH: 7.00 m
 COHESION(C)= 0.18 kg/sq.cm
 ANGLE OF FRICTION(Phi): 28deg
 TYPE OF THE TEST: DST



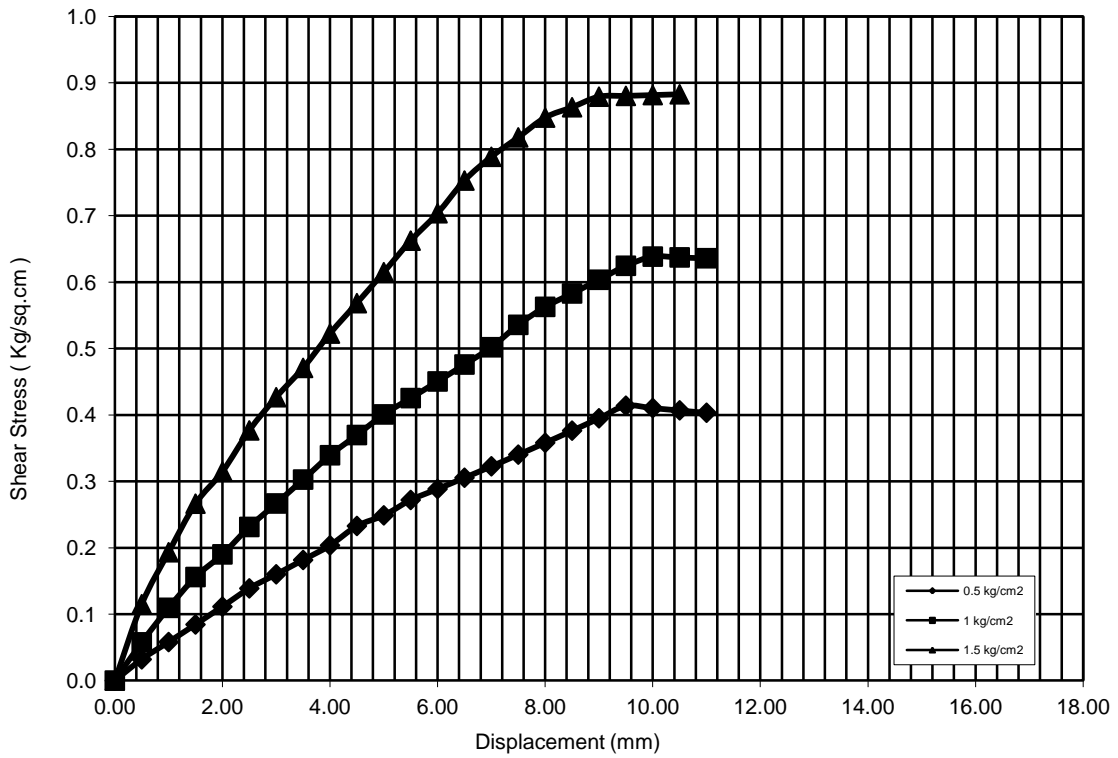
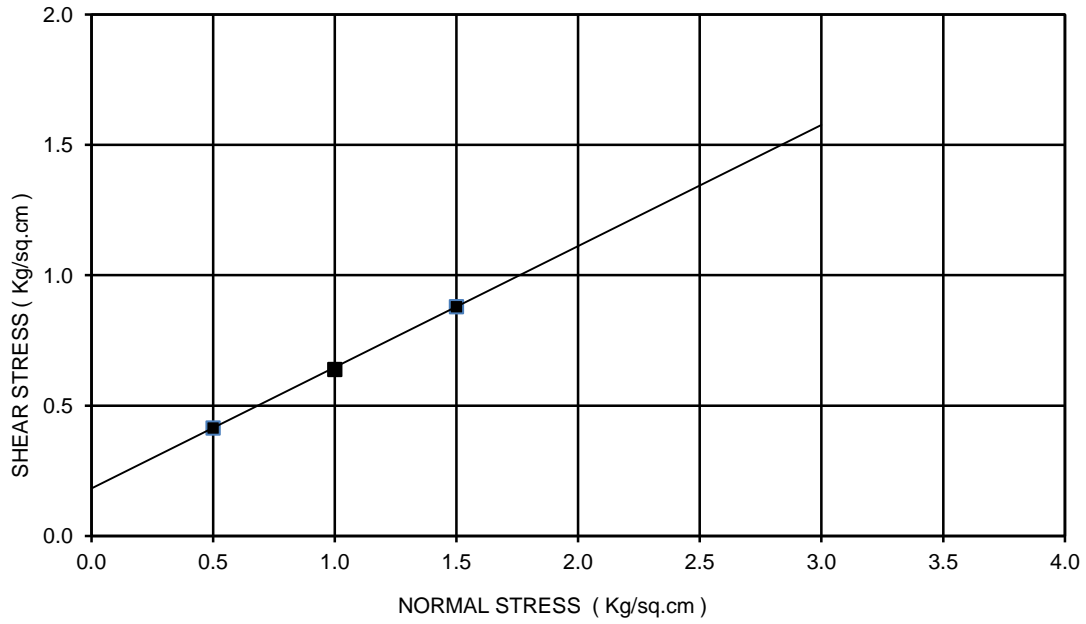
BORE HOLE NO: BH-CL
 CHAINAGE: 32+160
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.56 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



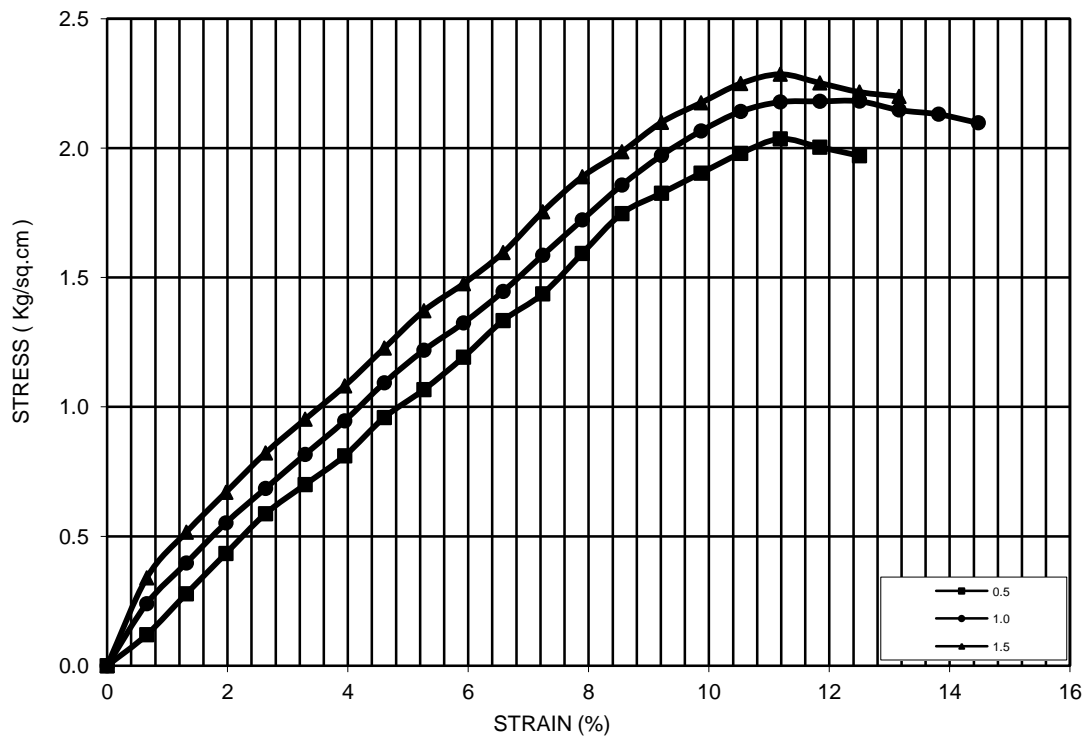
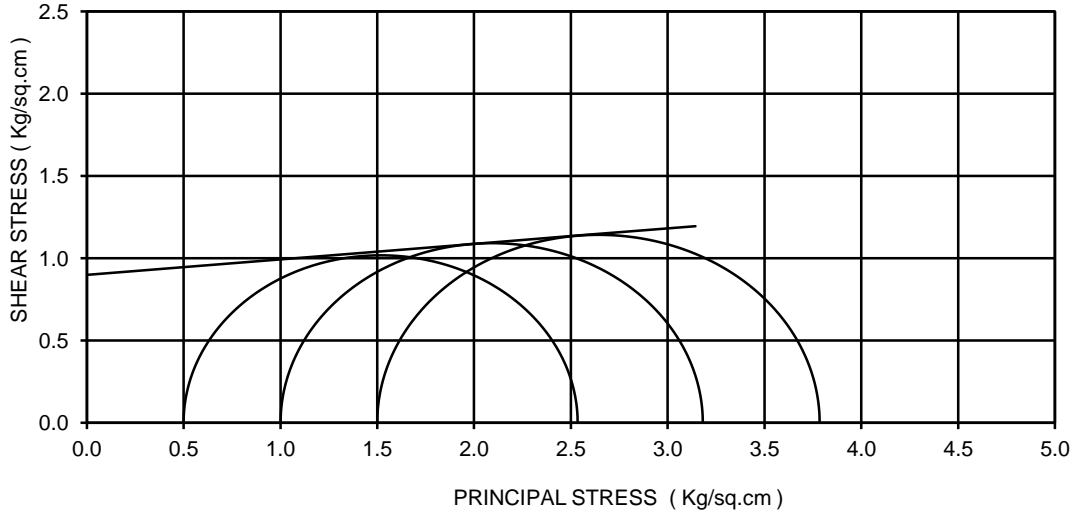
BORE HOLE NO: BH-CL
 CHAINAGE: 32+487
 SAMPLE NO.: UDS-2
 DEPTH: 5.25 m
 COHESION(C)= 1.46 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



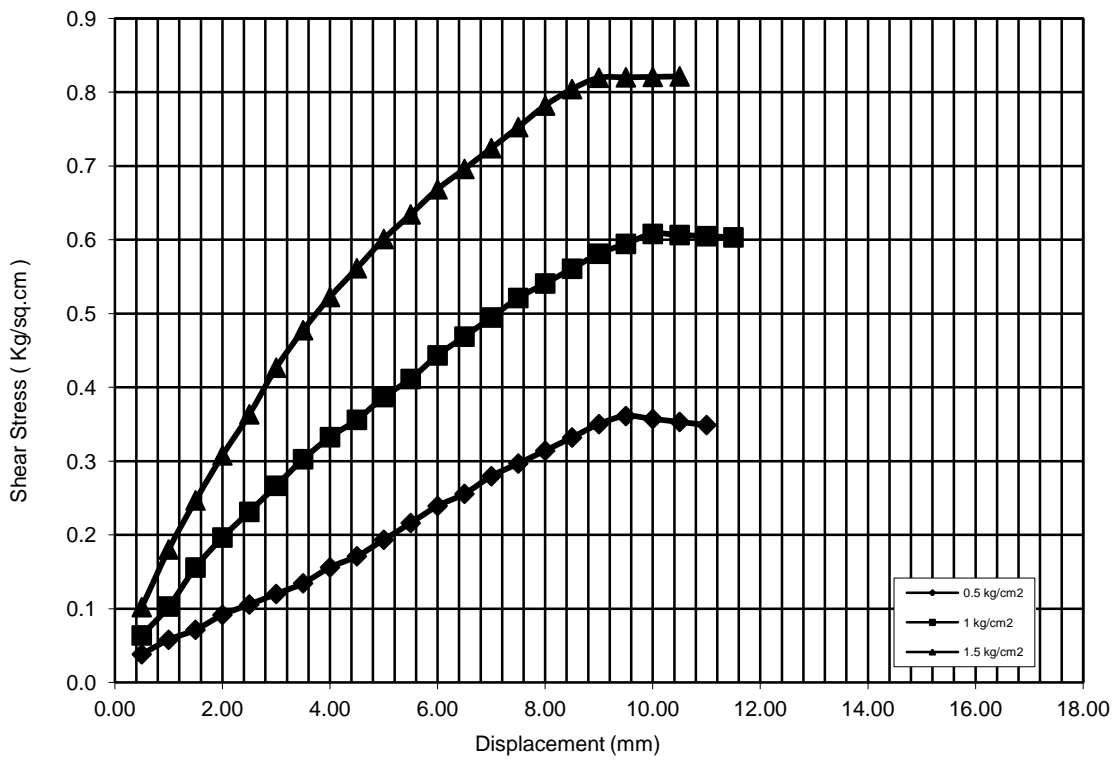
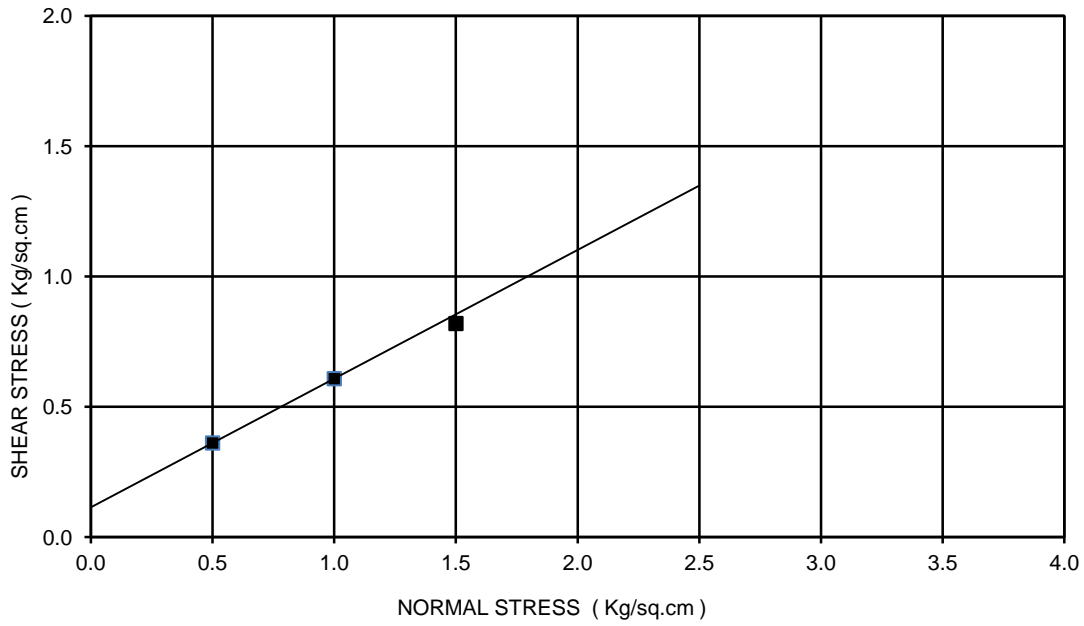
BORE HOLE NO: BH-CL
 CHAINAGE:30+083
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.18 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



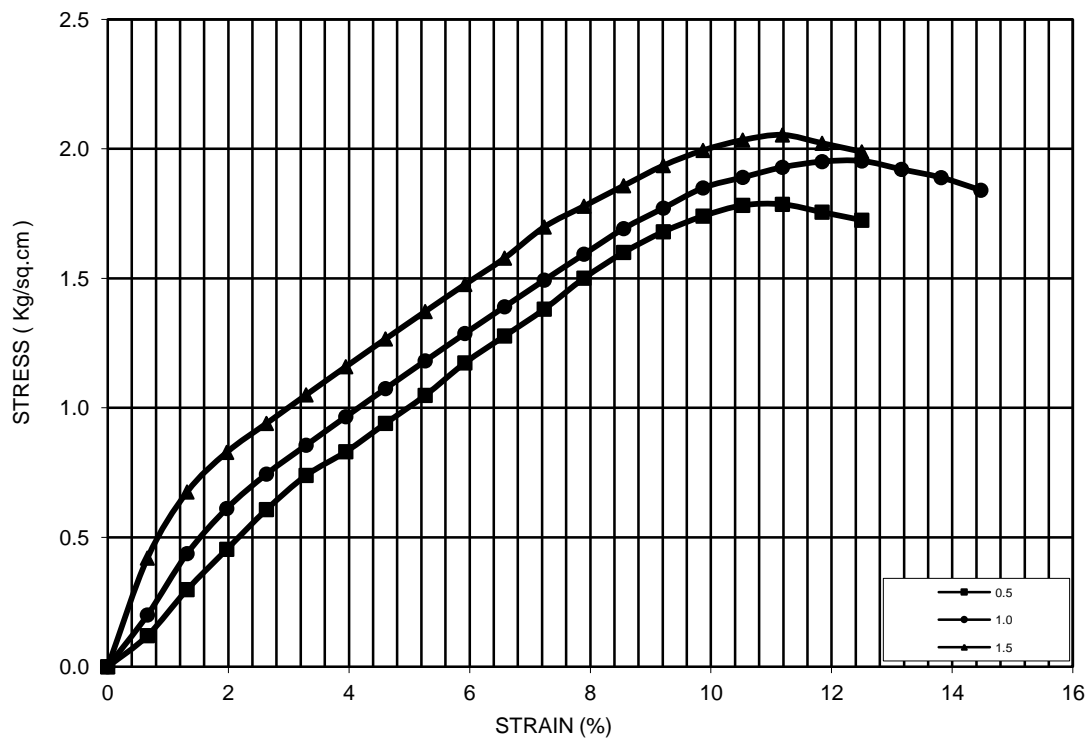
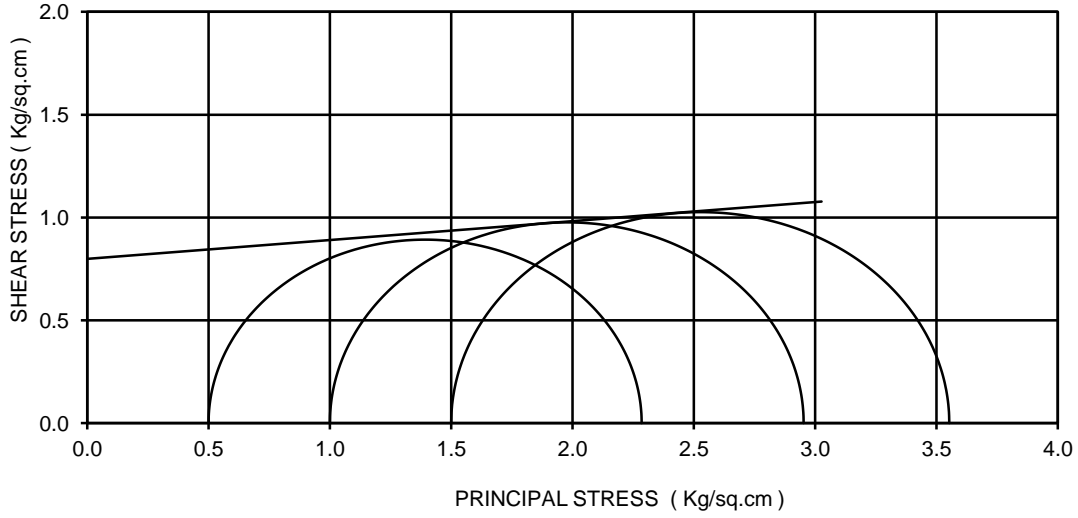
BORE HOLE NO: BH-A1
 CHAINAGE: 30+488
 SAMPLE NO.: UDS-2
 DEPTH: 5.50 m
 COHESION(C)= 0.90 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



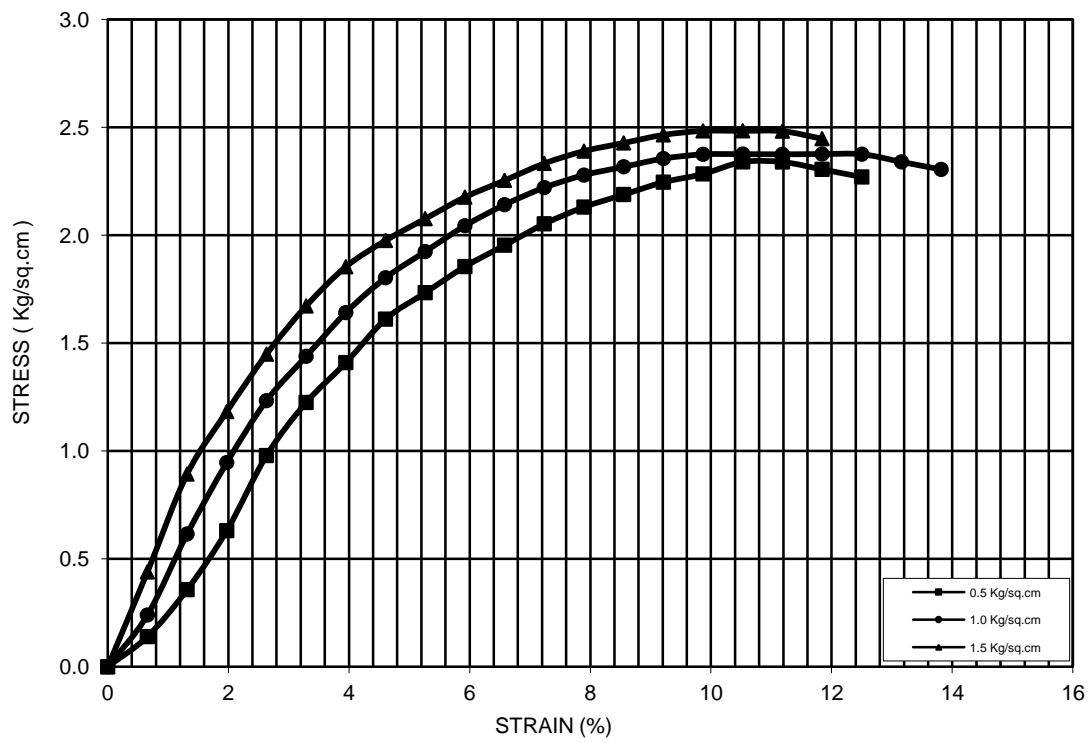
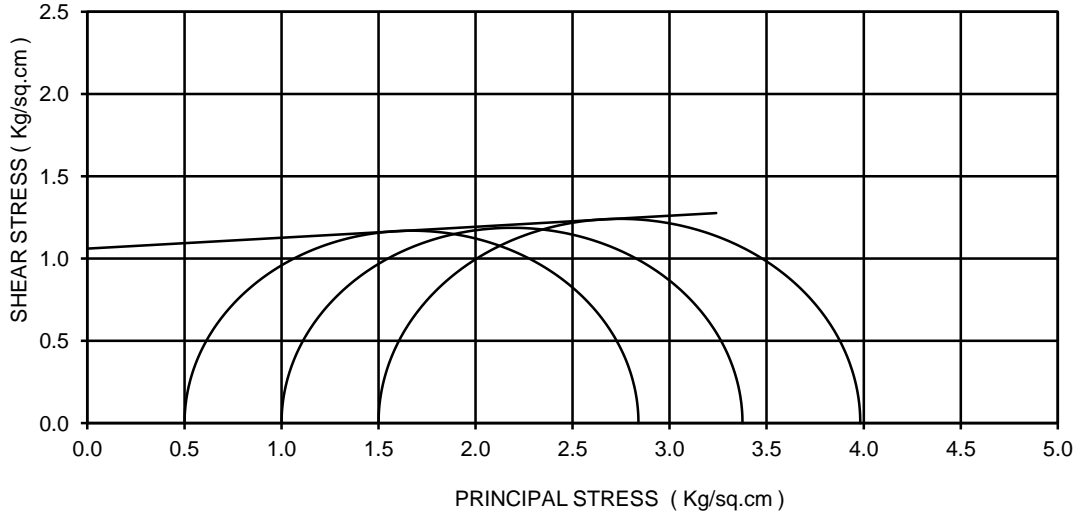
BORE HOLE NO: BH-A1
 CHAINAGE:30+488
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.11 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



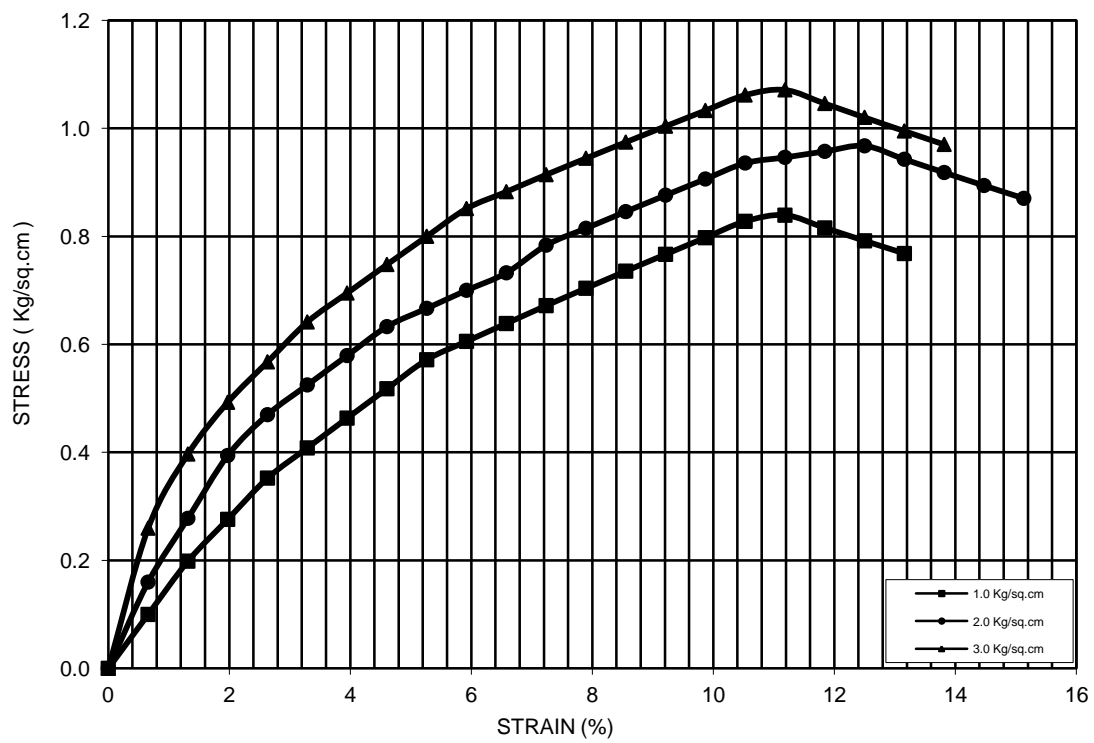
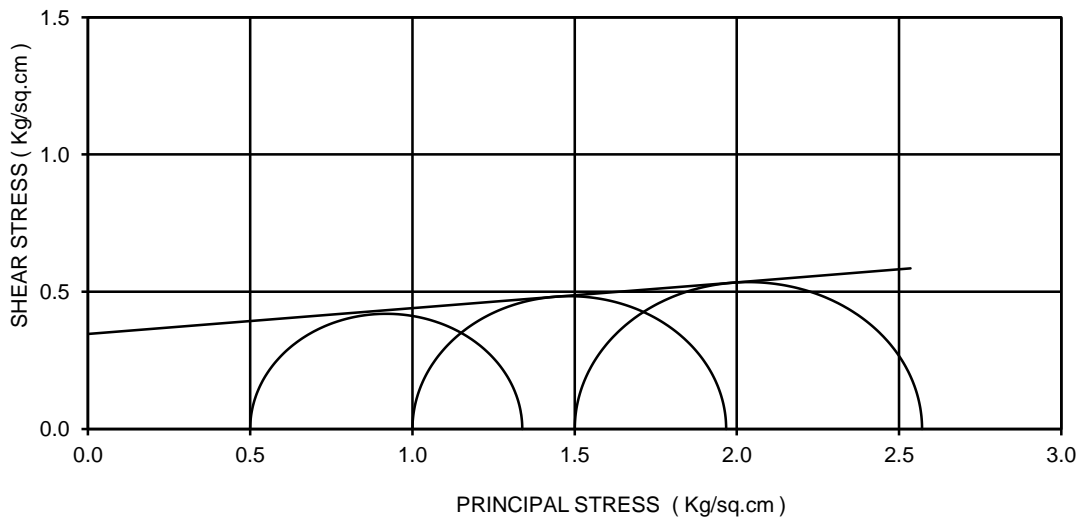
BORE HOLE NO: BH-A2
 CHAINAGE: 30+488
 SAMPLE NO.: UDS-2
 DEPTH: 4.00 m
 COHESION(C)= 0.8 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



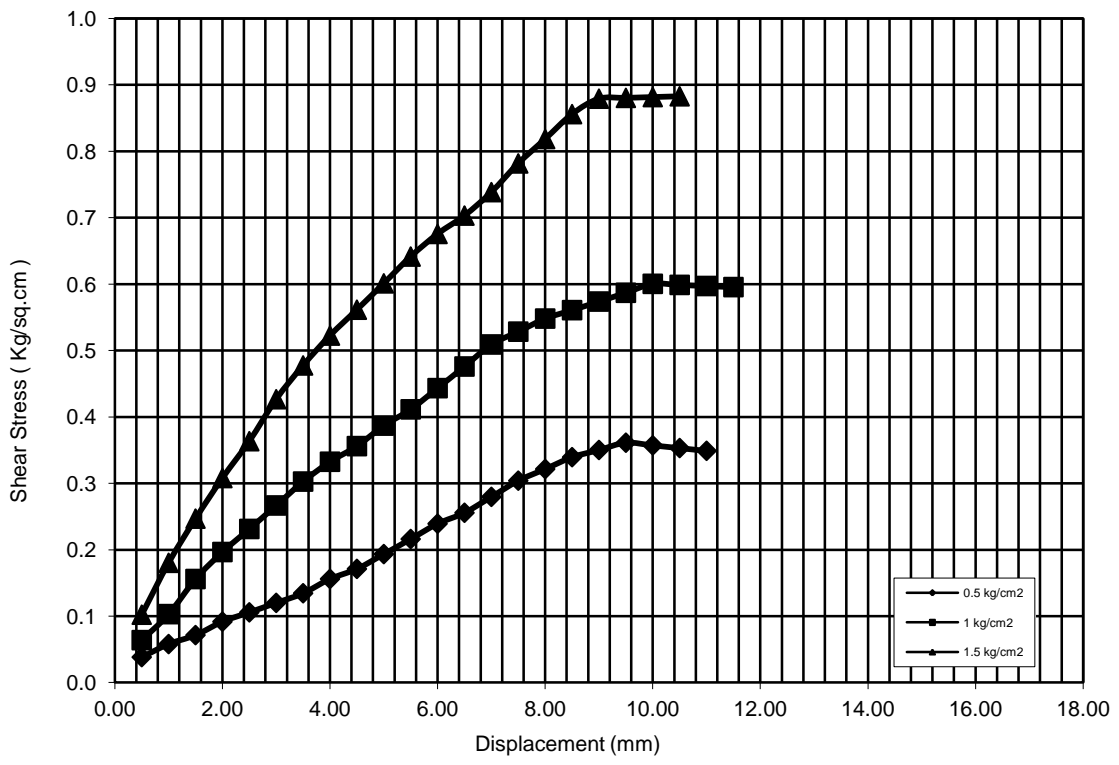
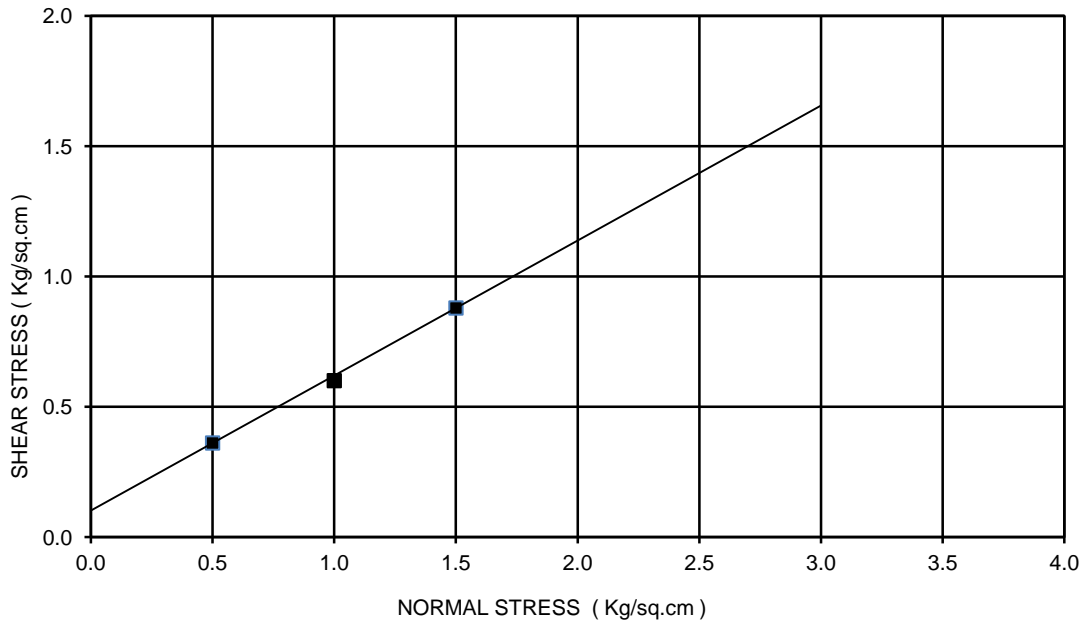
BORE HOLE NO: BH-A2
 CHAINAGE:30+488
 SAMPLE NO.: UDS-3
 DEPTH: 7.50 m
 COHESION(C)= 1.06 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



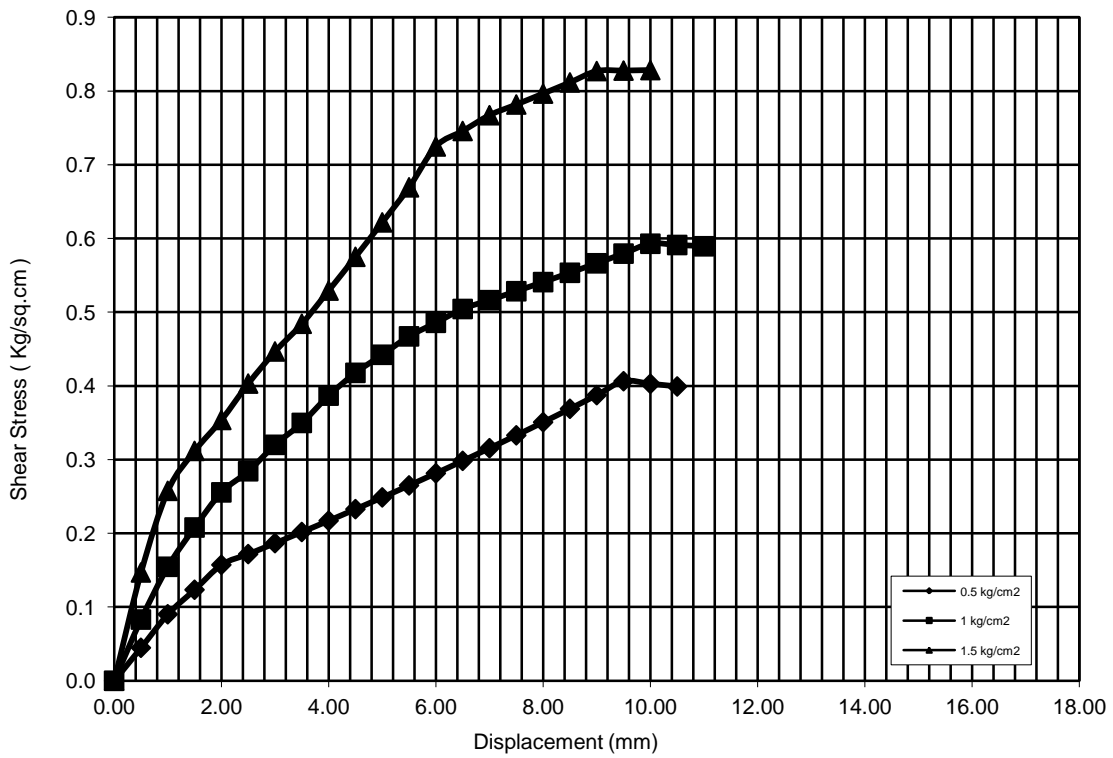
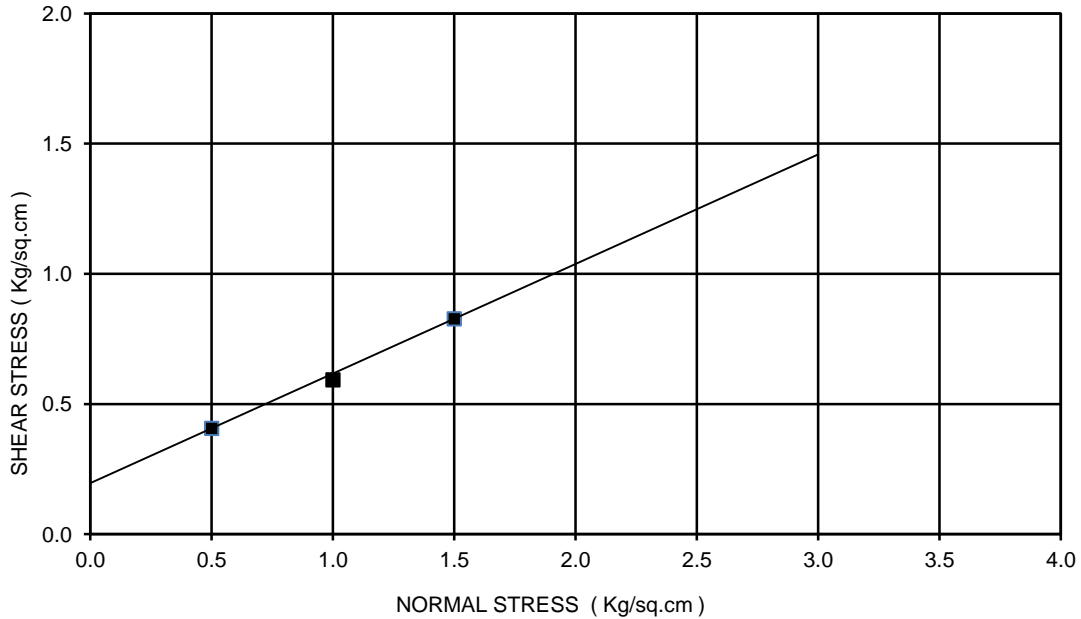
BORE HOLE NO: BH-CL
 CHAINAGE:31+095
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.35 kg/sq.cm
 ANGLE OF FRICTION(Phi):5deg
 TYPE OF THE TEST: UUT



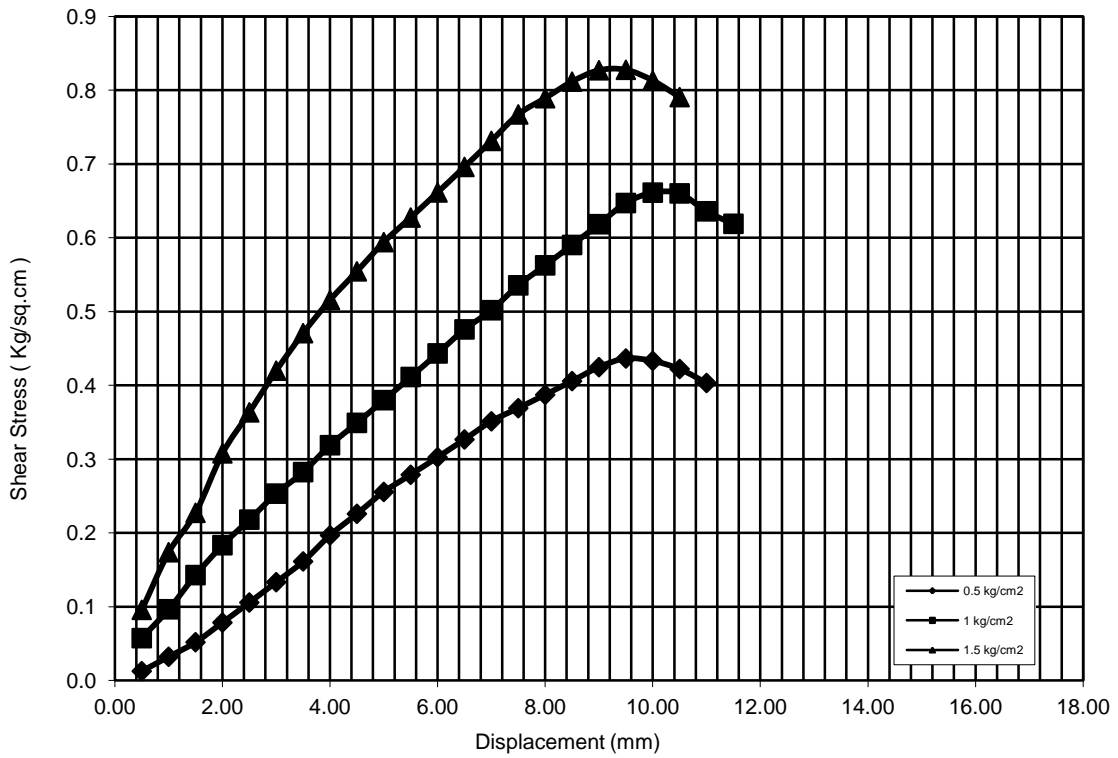
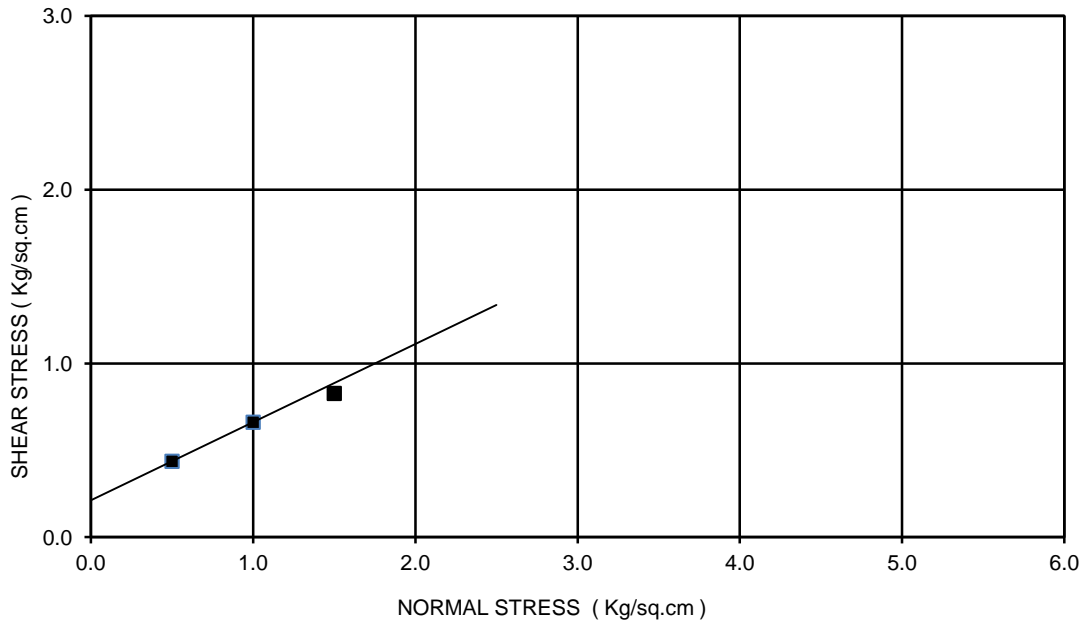
BORE HOLE NO: BH-CL
 CHAINAGE:31+095
 SAMPLE NO.: UDS-2
 DEPTH: 5.25 m
 COHESION(C)= 0.11 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



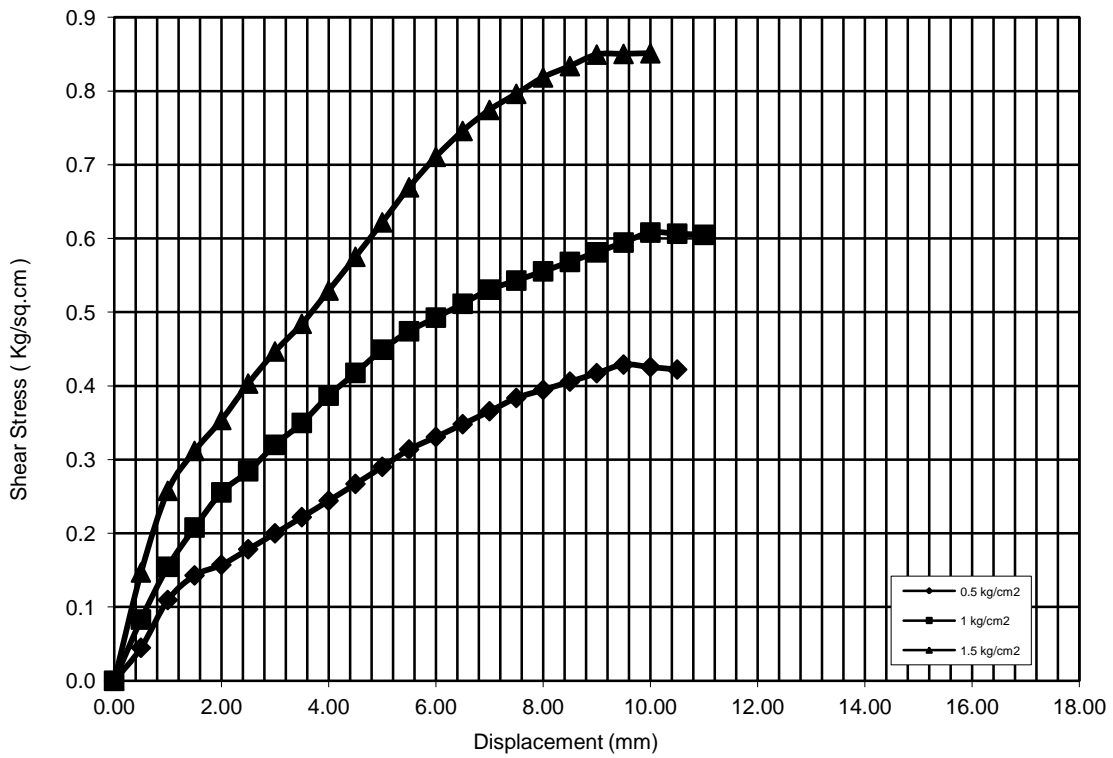
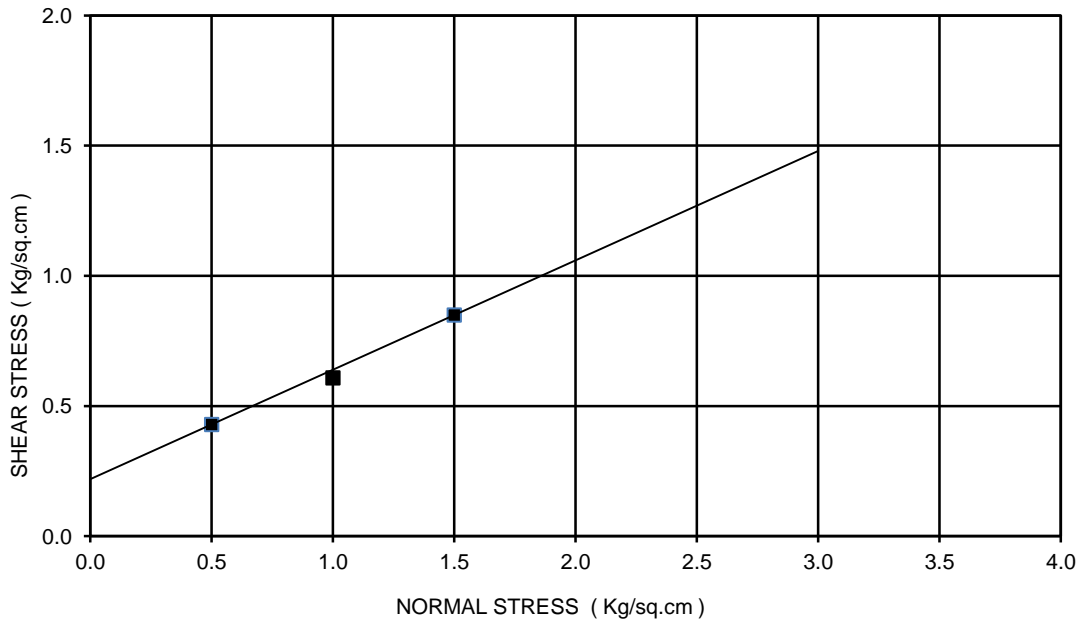
BORE HOLE NO: BH-A1
 CHAINAGE:31+714
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



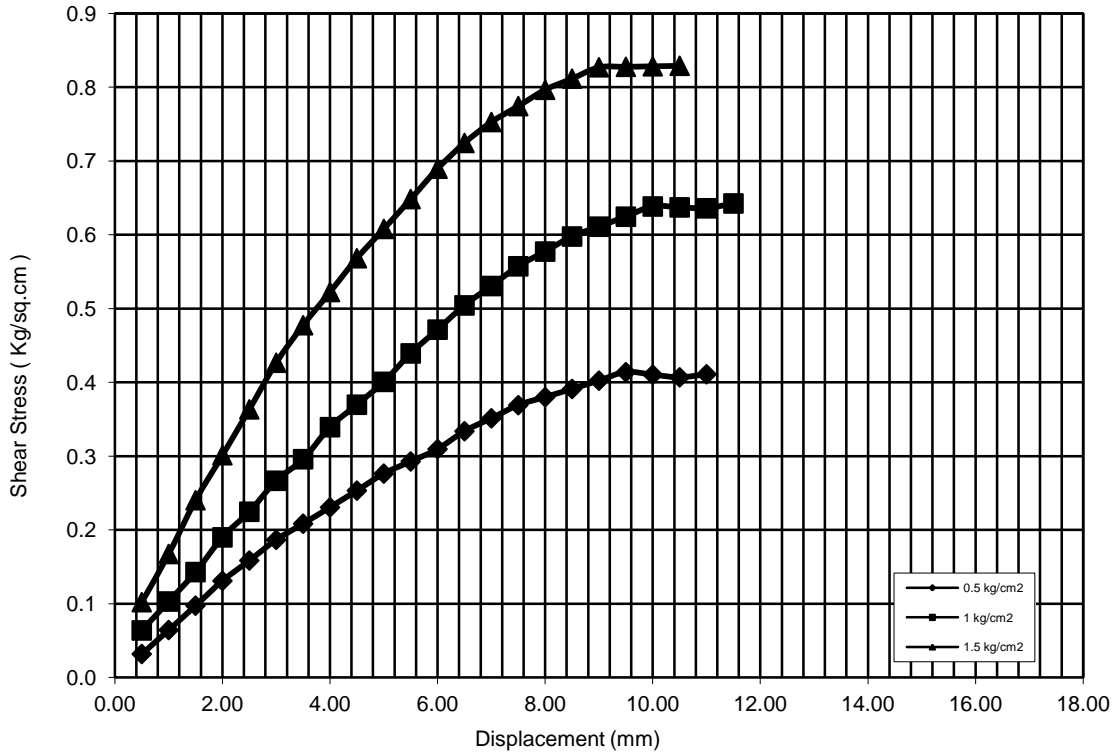
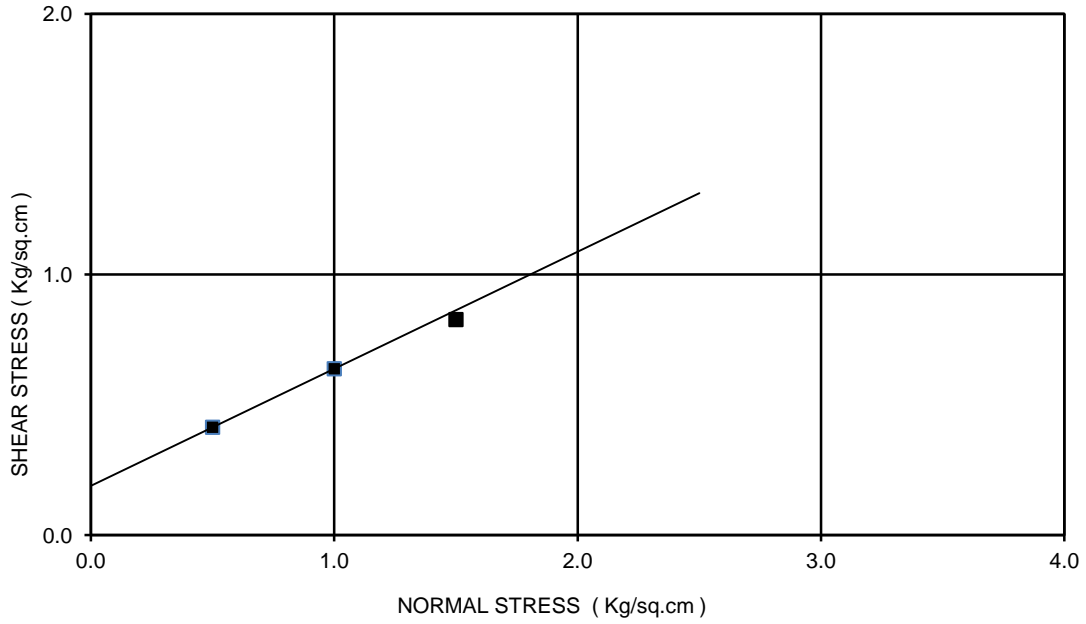
BORE HOLE NO: BH-A1
 CHAINAGE: 31+714
 SAMPLE NO.: UDS-3
 DEPTH: 7.00 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



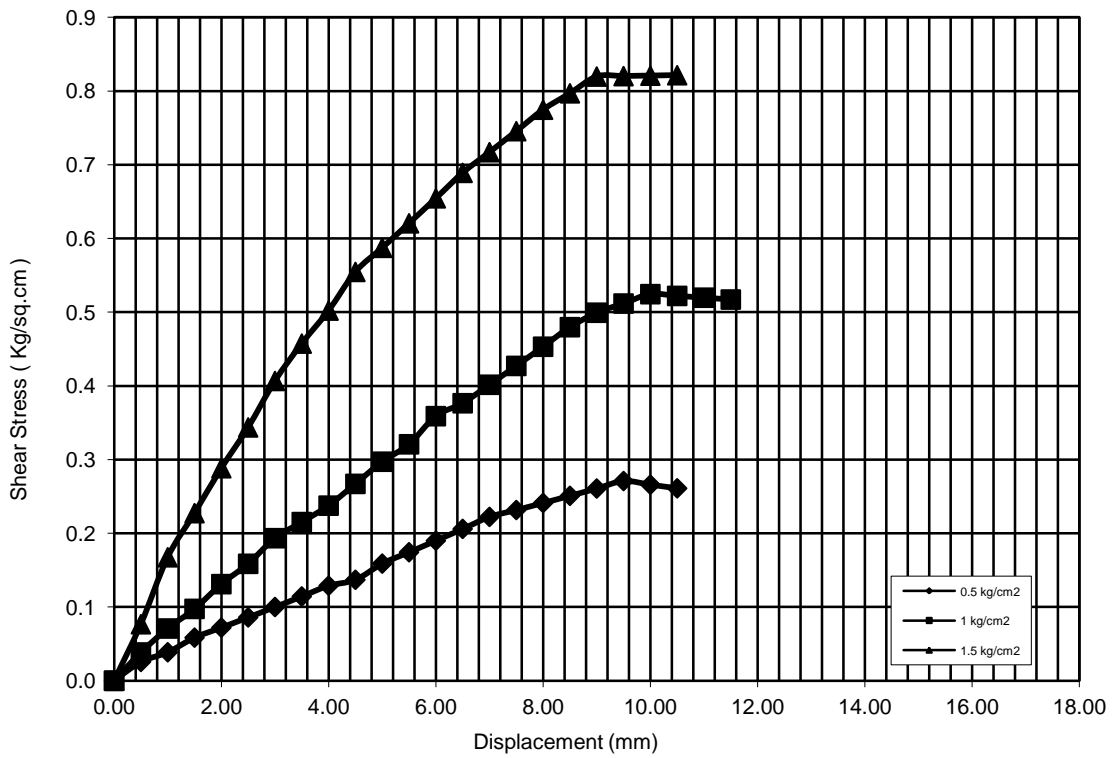
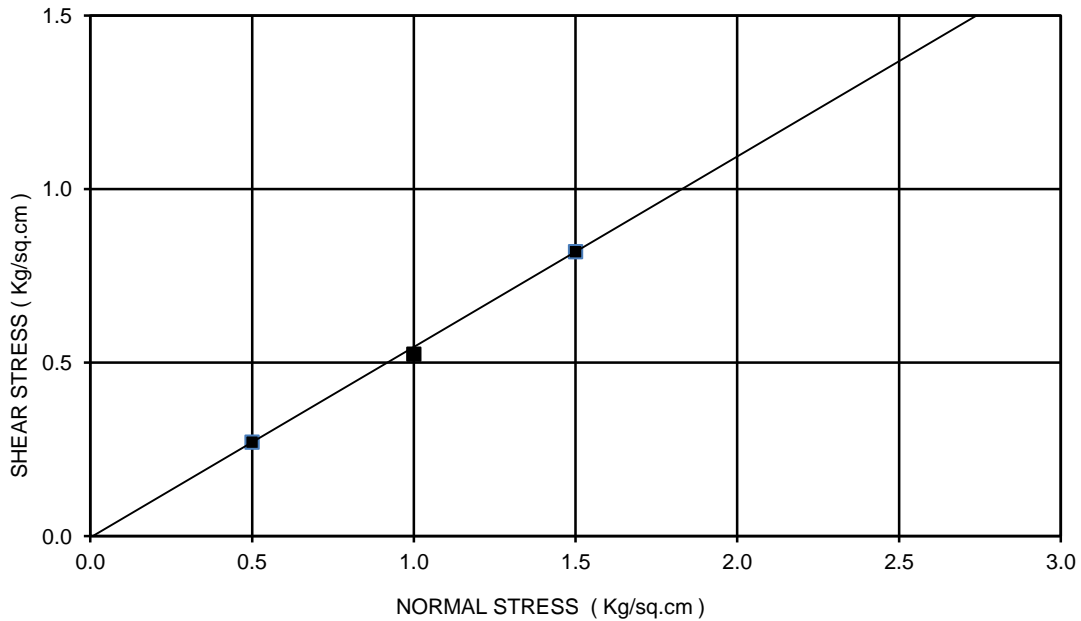
BORE HOLE NO: BH-A2
 CHAINAGE:31+714
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.22 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



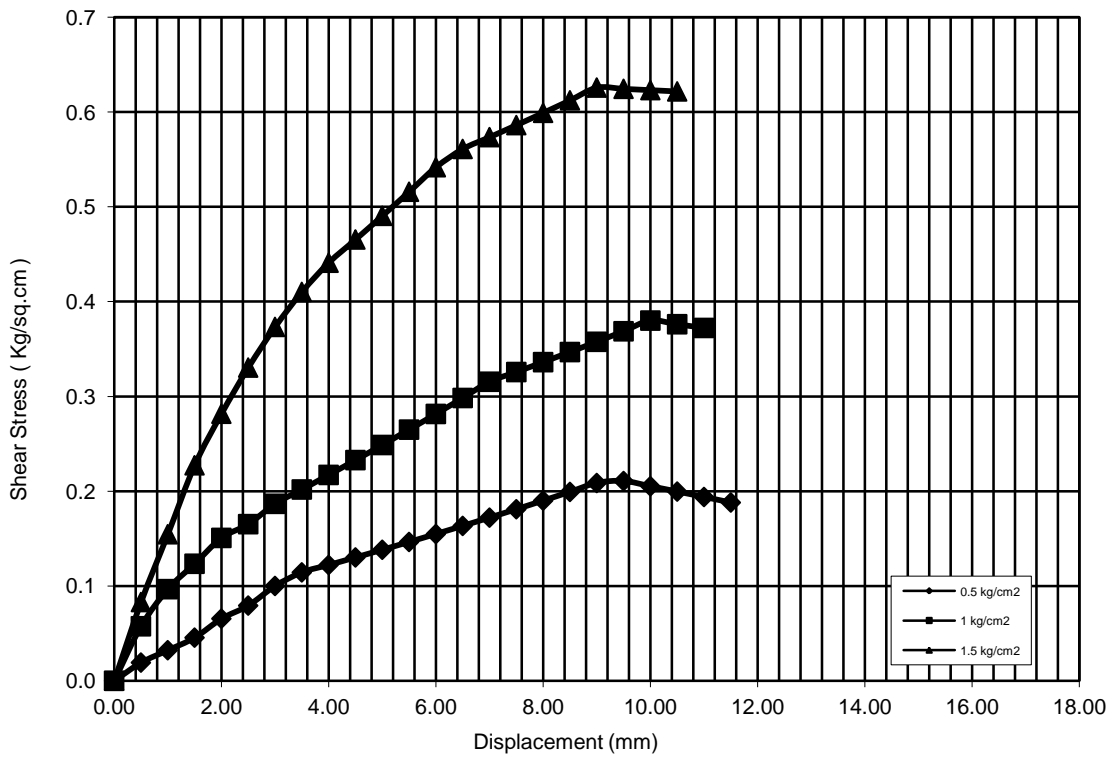
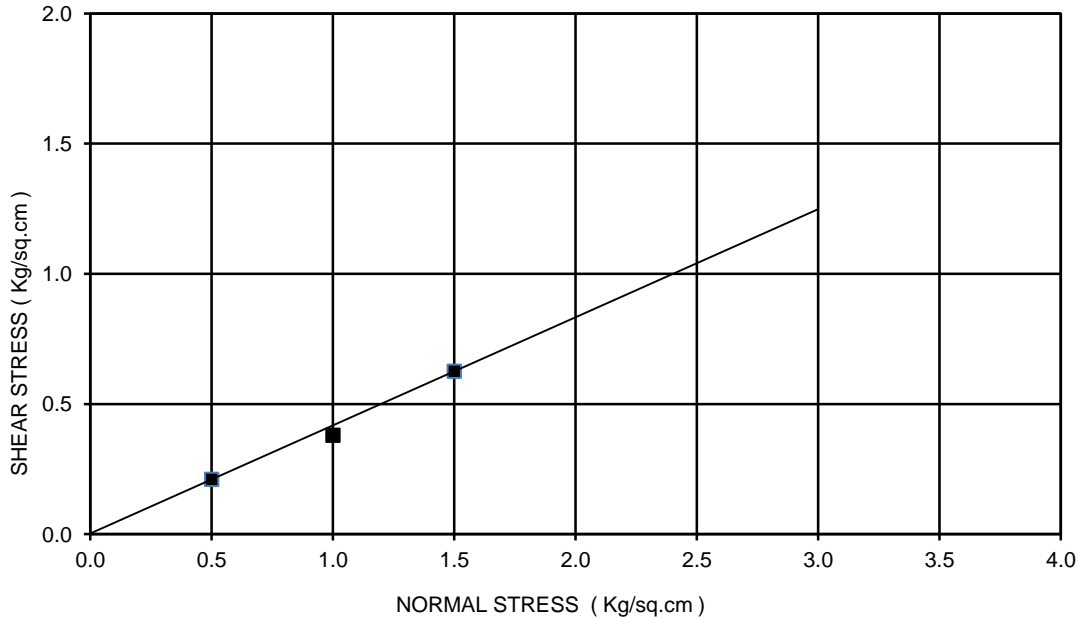
BORE HOLE NO: BH-A2
 CHAINAGE:31+714
 SAMPLE NO.: UDS-2
 DEPTH: 5.50 m
 COHESION(C)= 0.19 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



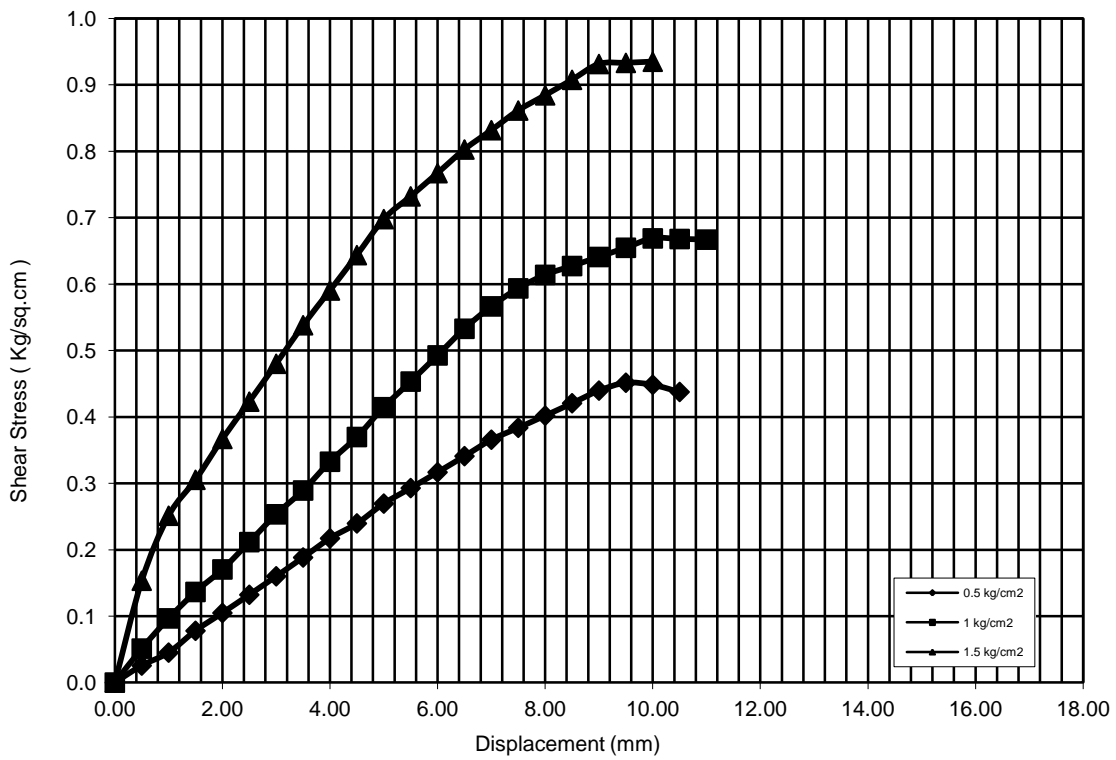
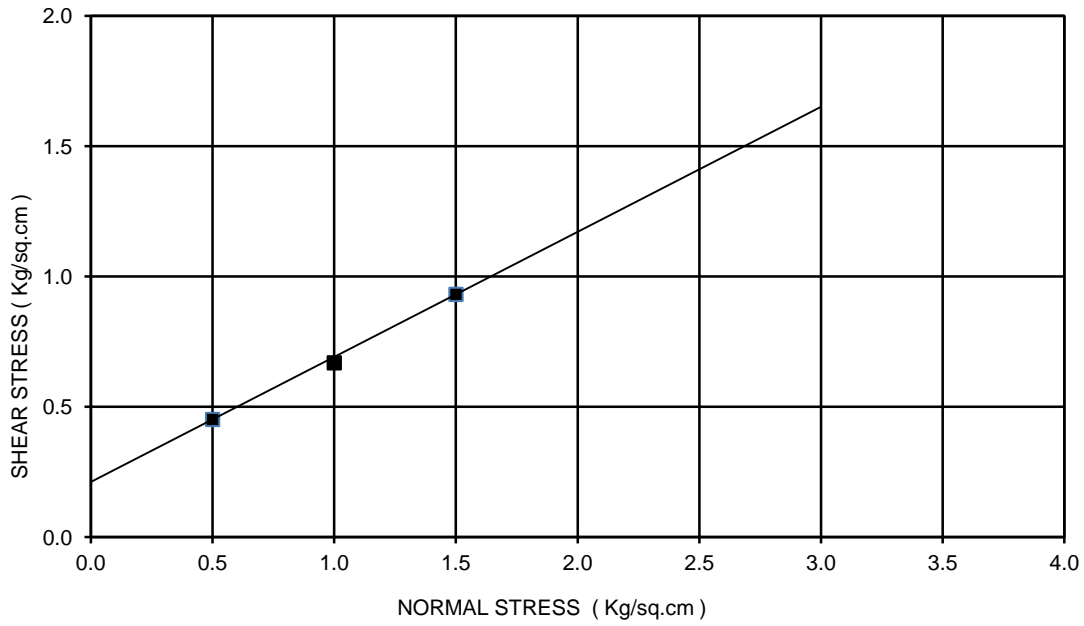
BORE HOLE NO: BH-CL
 CHAINAGE : 32+191
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 29 deg
 TYPE OF THE TEST: DST



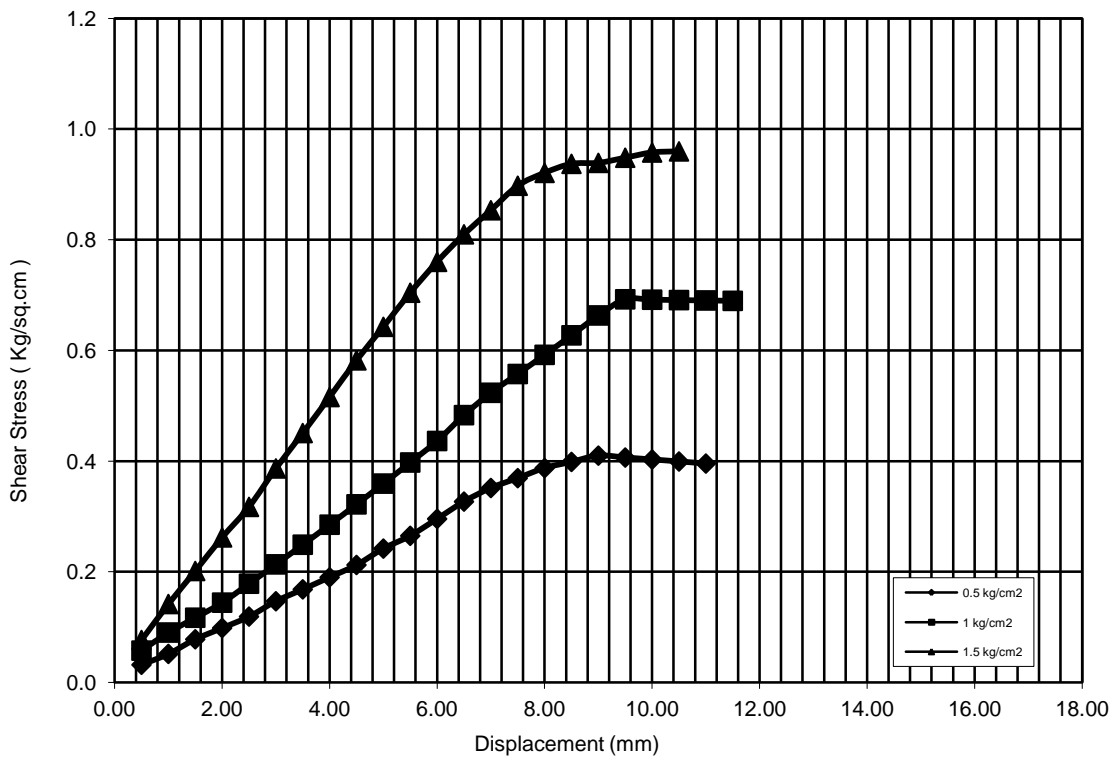
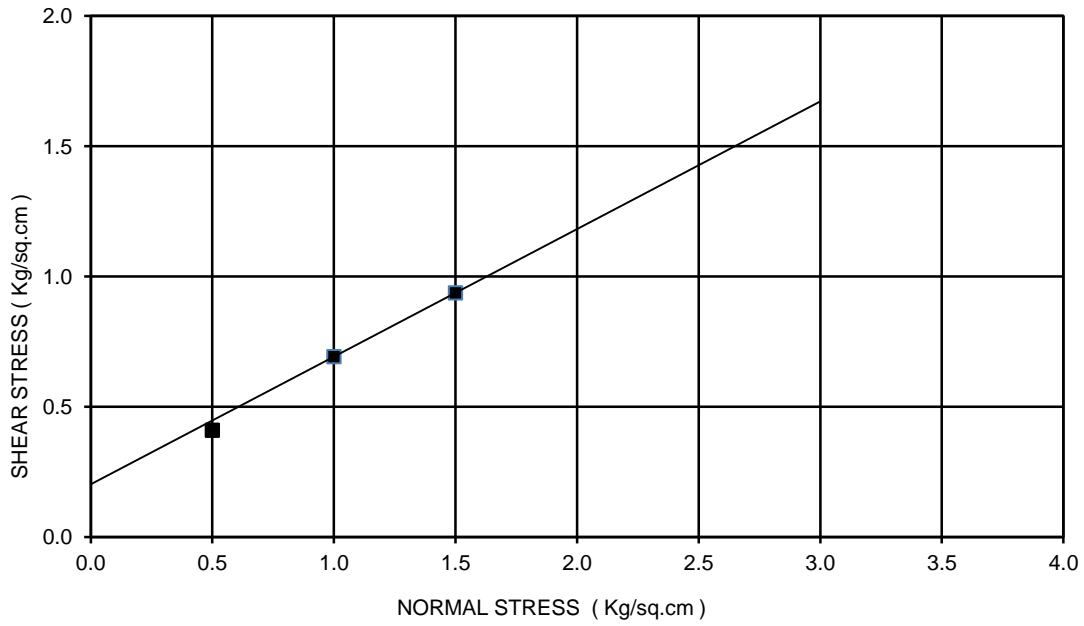
BORE HOLE NO: BH-CL
 CHAINAGE:32+738
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



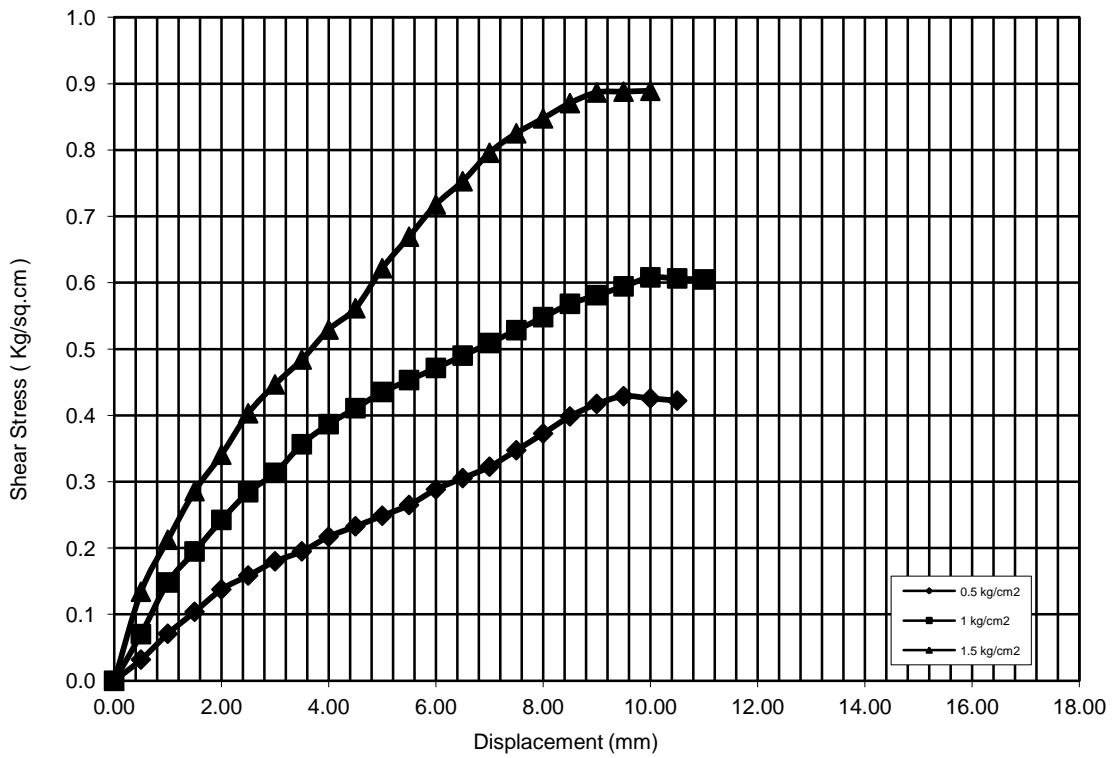
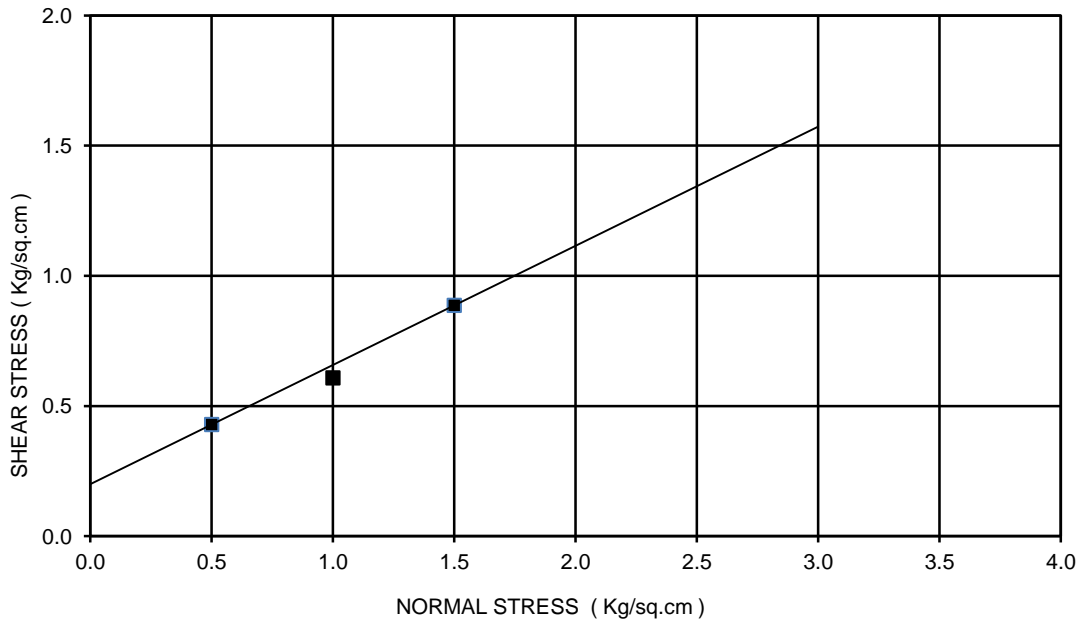
BORE HOLE NO: BH-A1
 CHAINAGE: 33+713
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



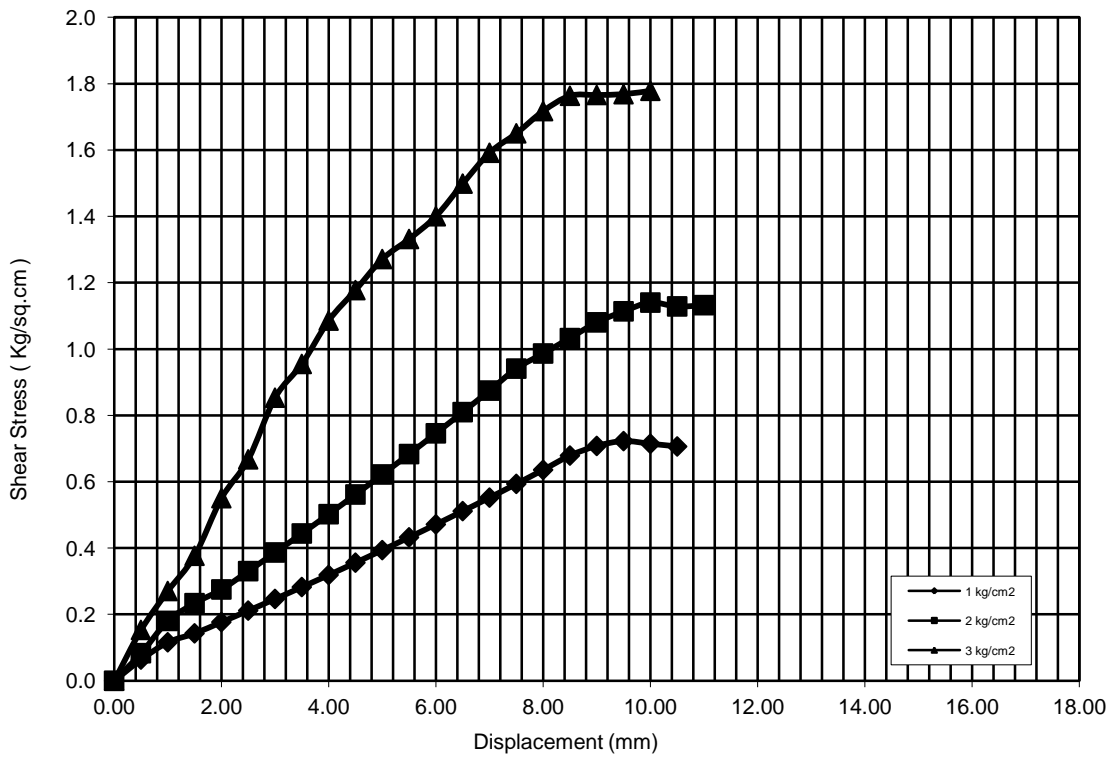
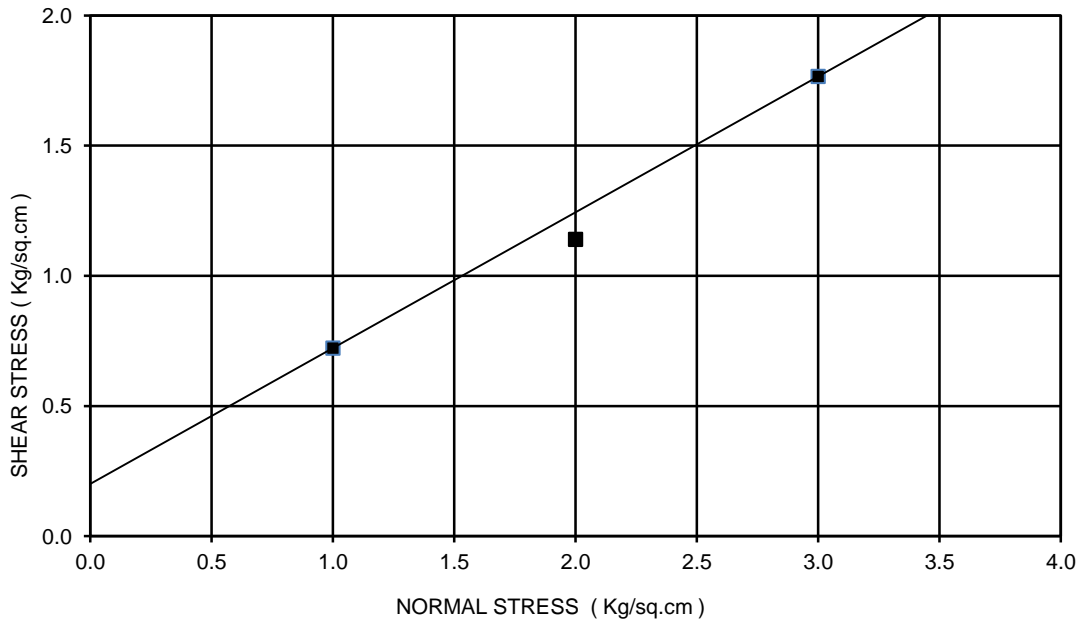
BORE HOLE NO: BH-A1
 CHAINAGE: 33+713
 SAMPLE NO.: UDS-2
 DEPTH: 8.50 m
 COHESION(C)= 0.2 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



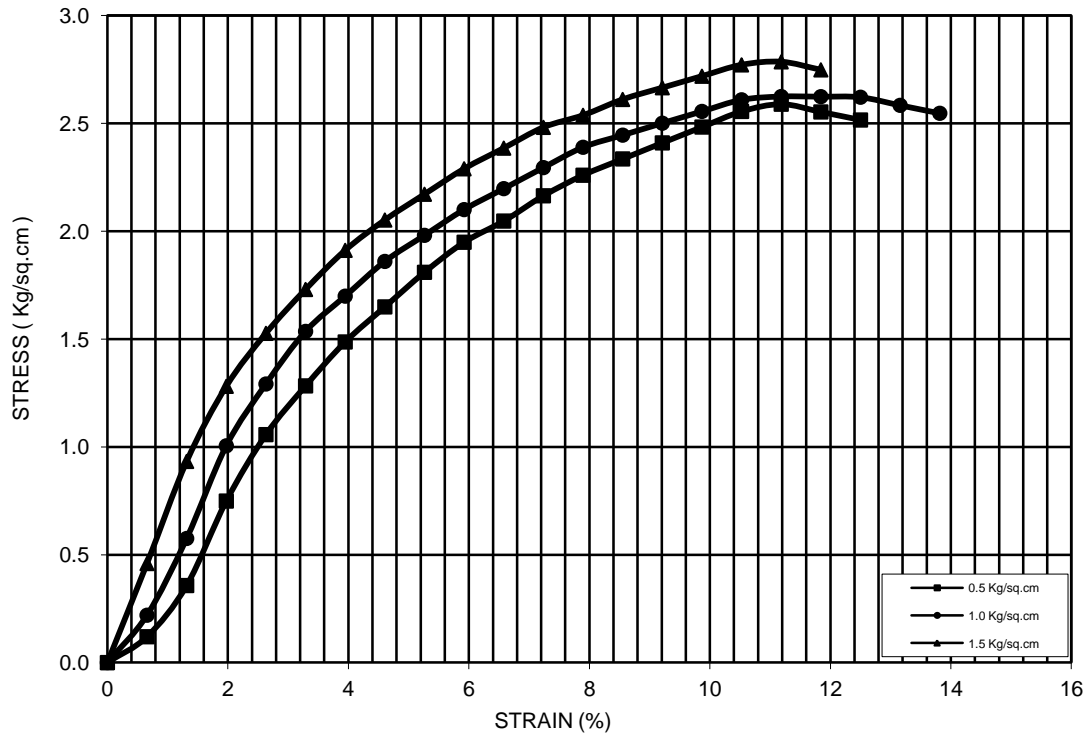
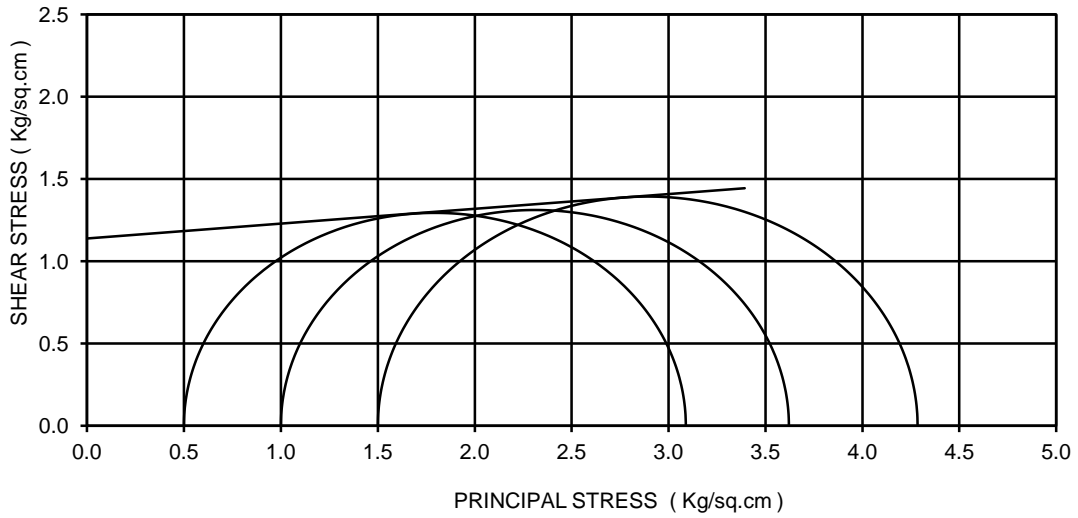
BORE HOLE NO: BH-A2
 CHAINAGE:33+713
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



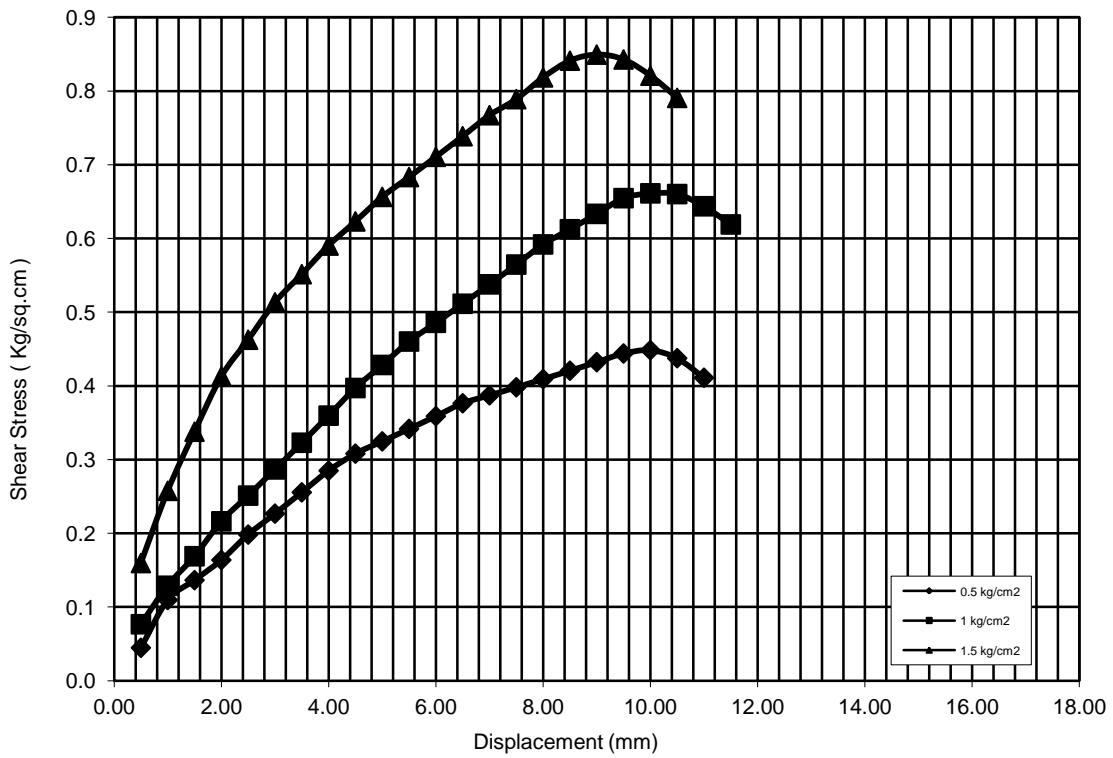
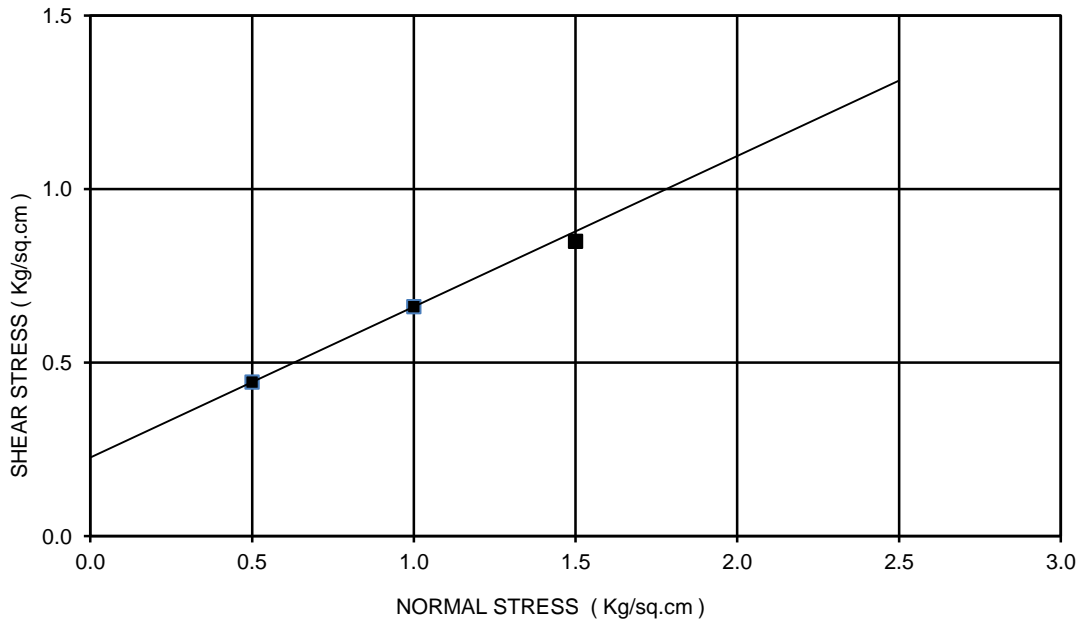
BORE HOLE NO: BH-A2
 CHAINAGE:33+713
 SAMPLE NO.: UDS-5
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



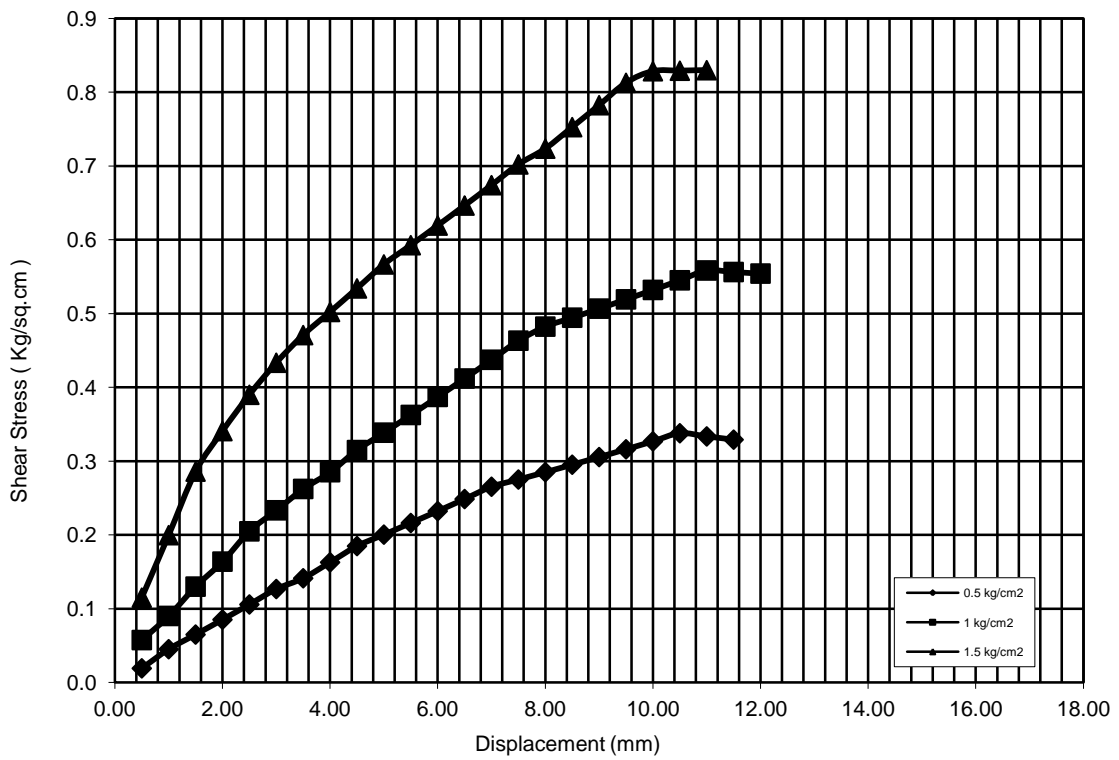
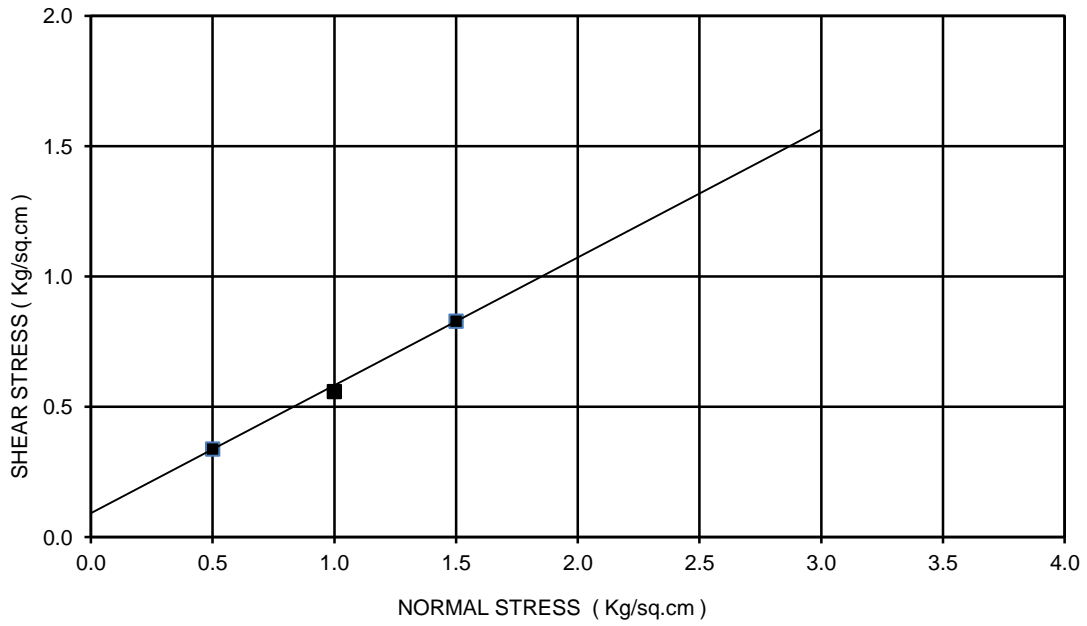
BORE HOLE NO: BH-CL
 CHAINAGE:34+019
 SAMPLE NO.: UDS-2
 DEPTH: 4.00m
 COHESION(C)= 1.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



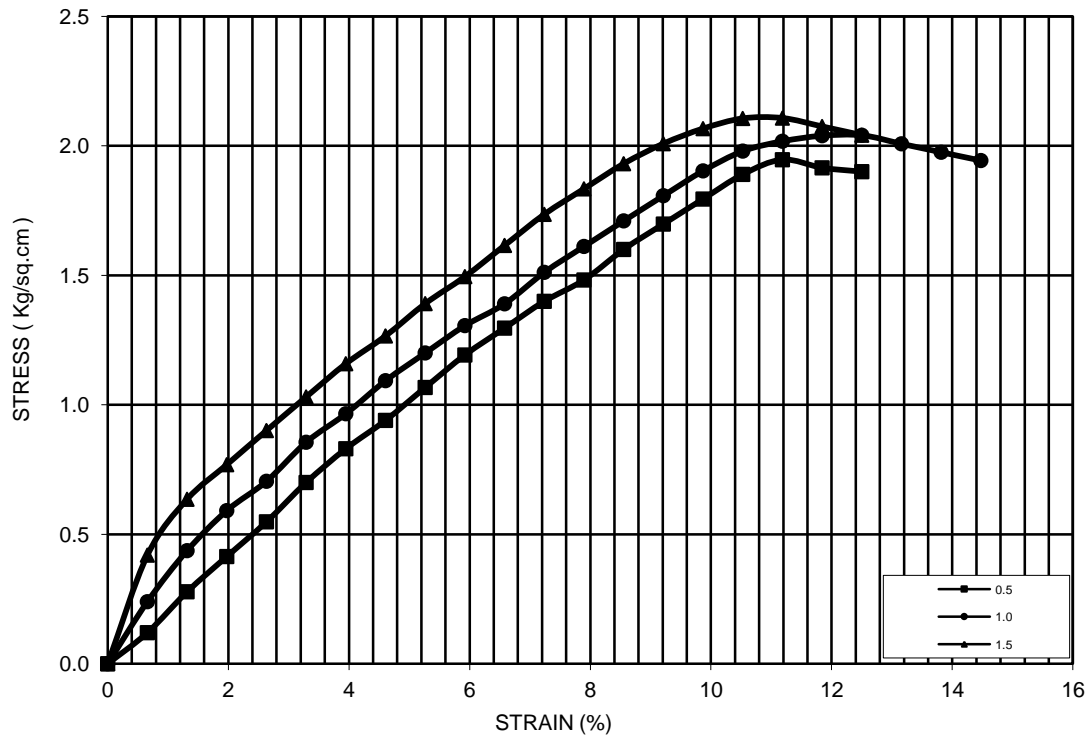
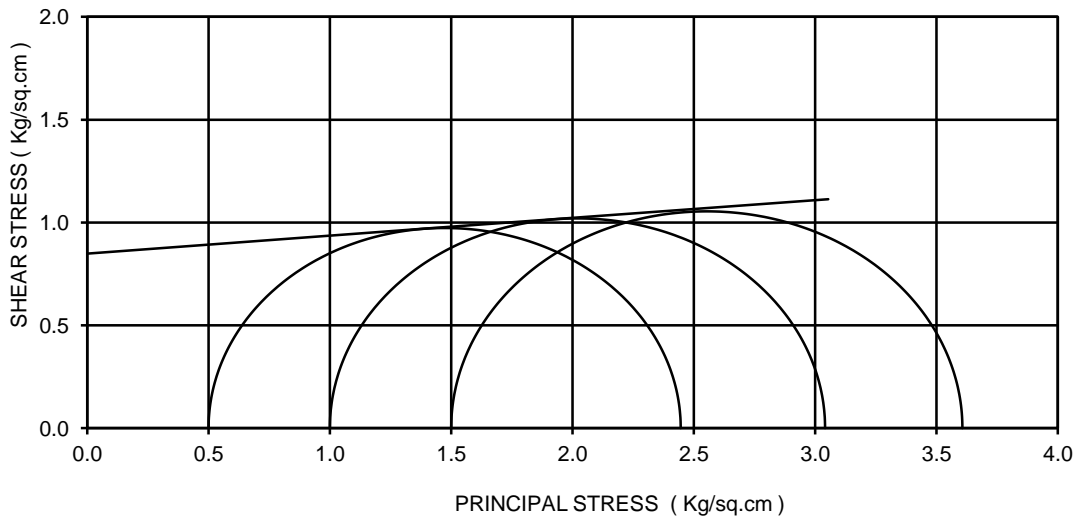
BORE HOLE NO: BH-CL
 CHAINAGE:34+619
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.23 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



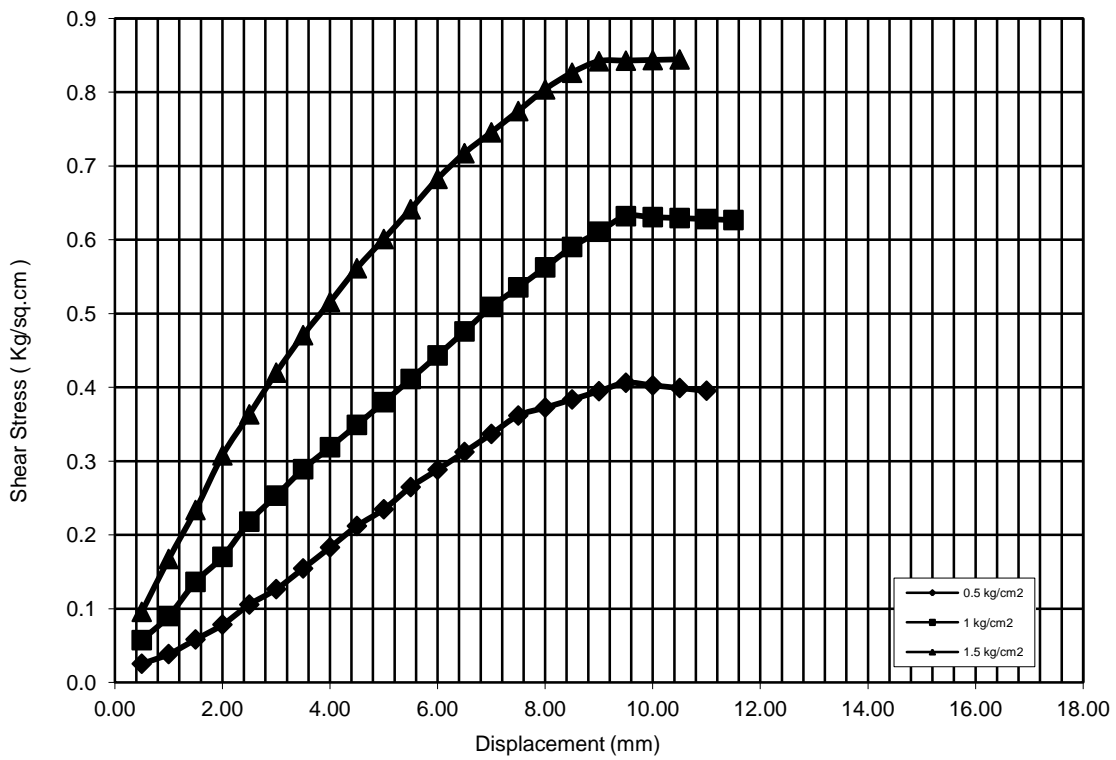
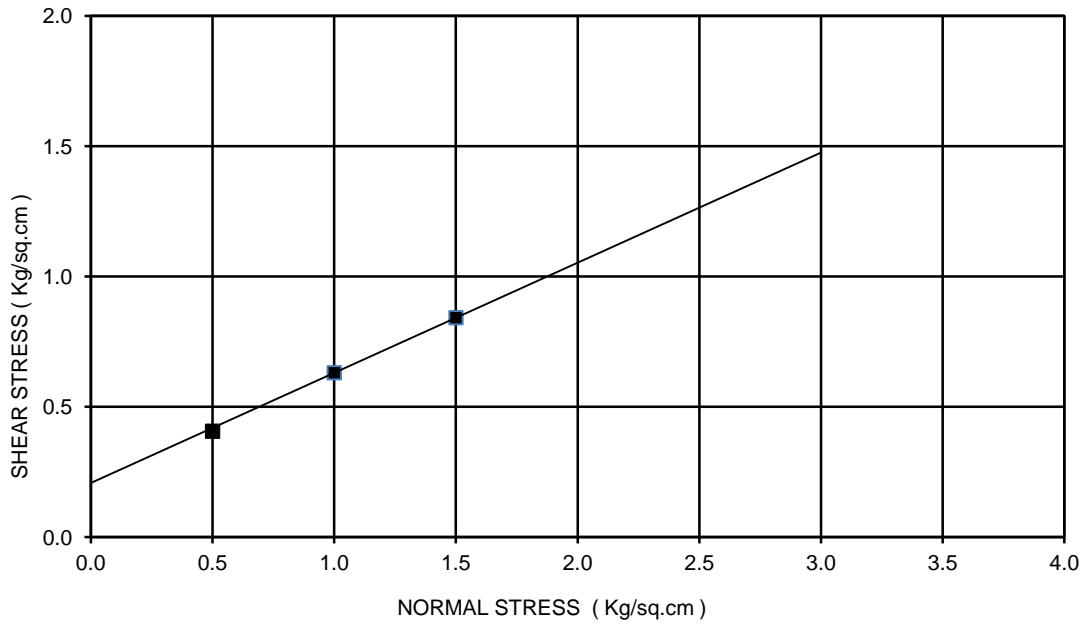
BORE HOLE NO: BH-A1
 CHAINAGE:35+273
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



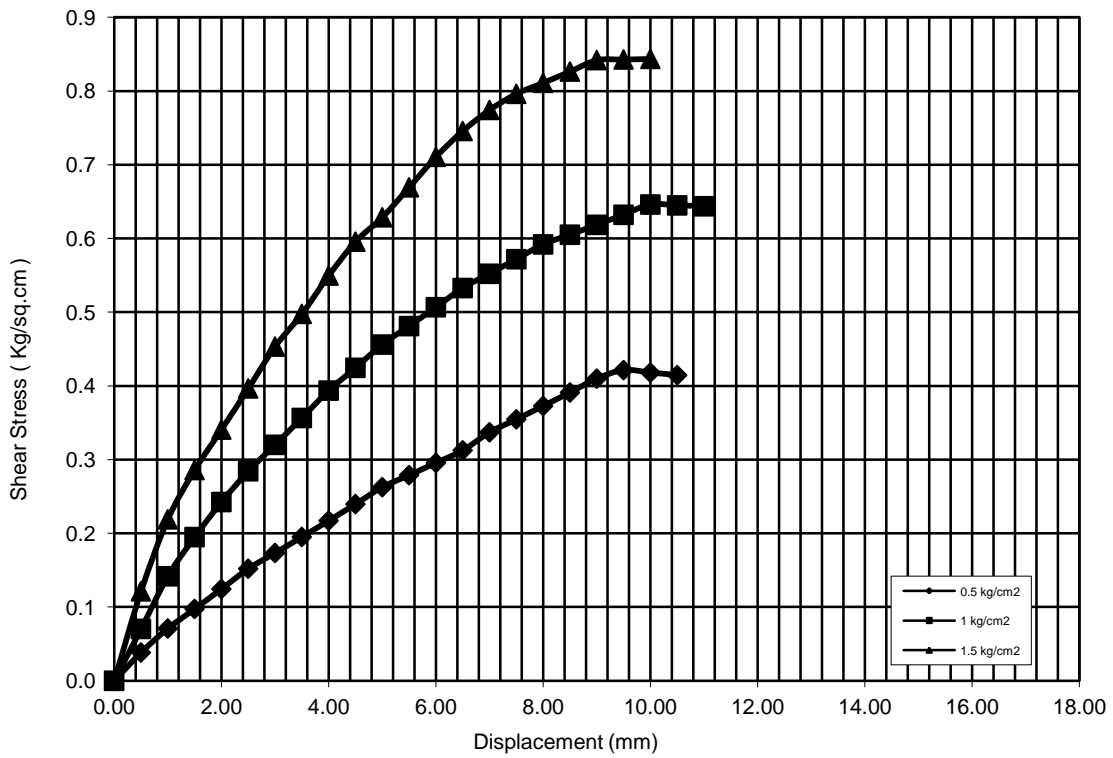
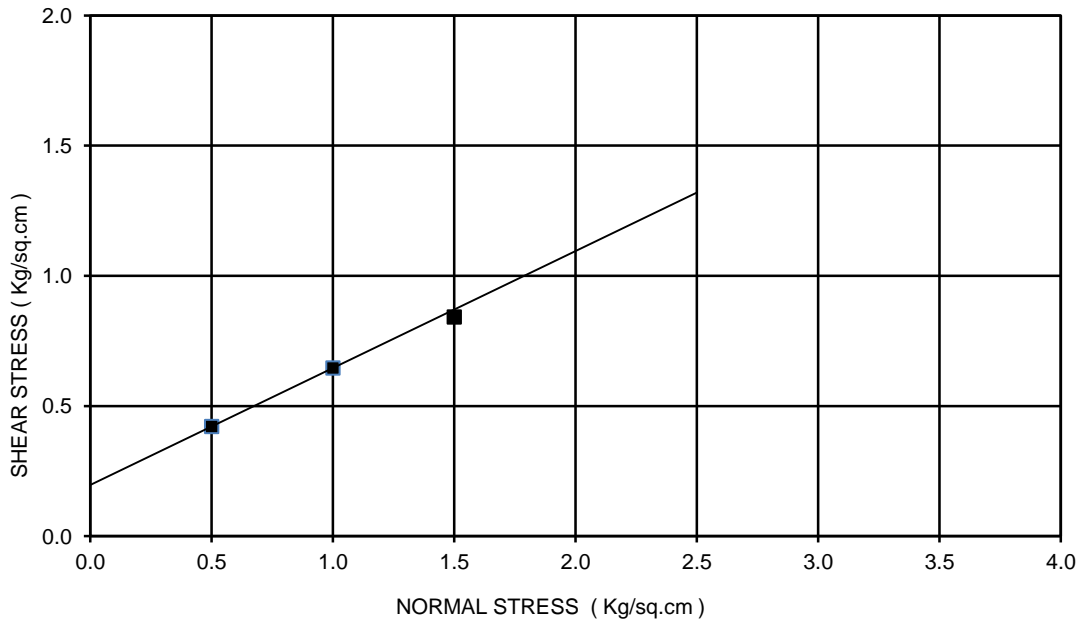
BORE HOLE NO: BH-A1
 CHAINAGE : 35+273
 SAMPLE NO.: UDS-2
 DEPTH: 8.50 m
 COHESION(C)= 0.85 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



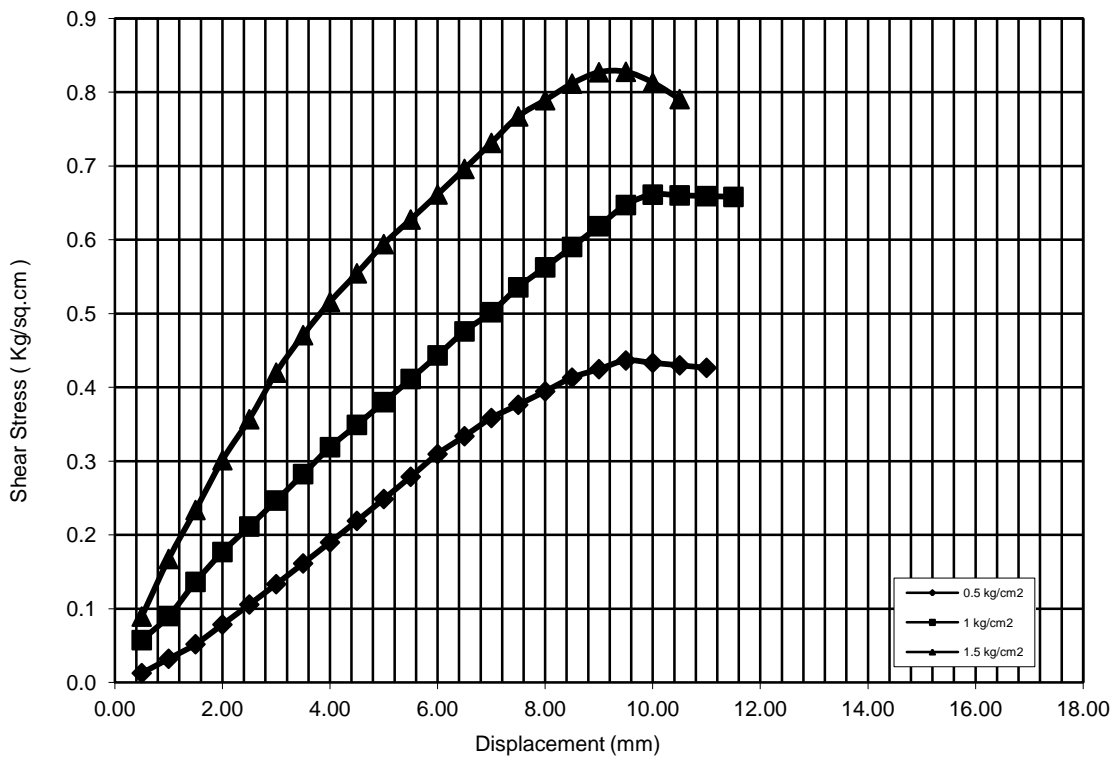
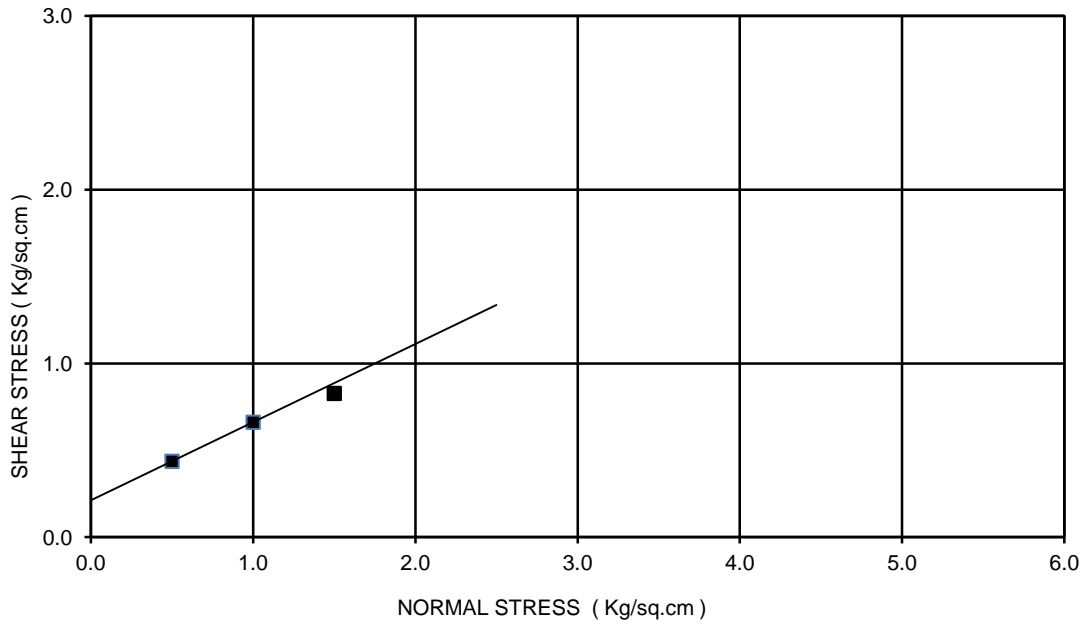
BORE HOLE NO: BH-A2
 CHAINAGE: 35+273
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



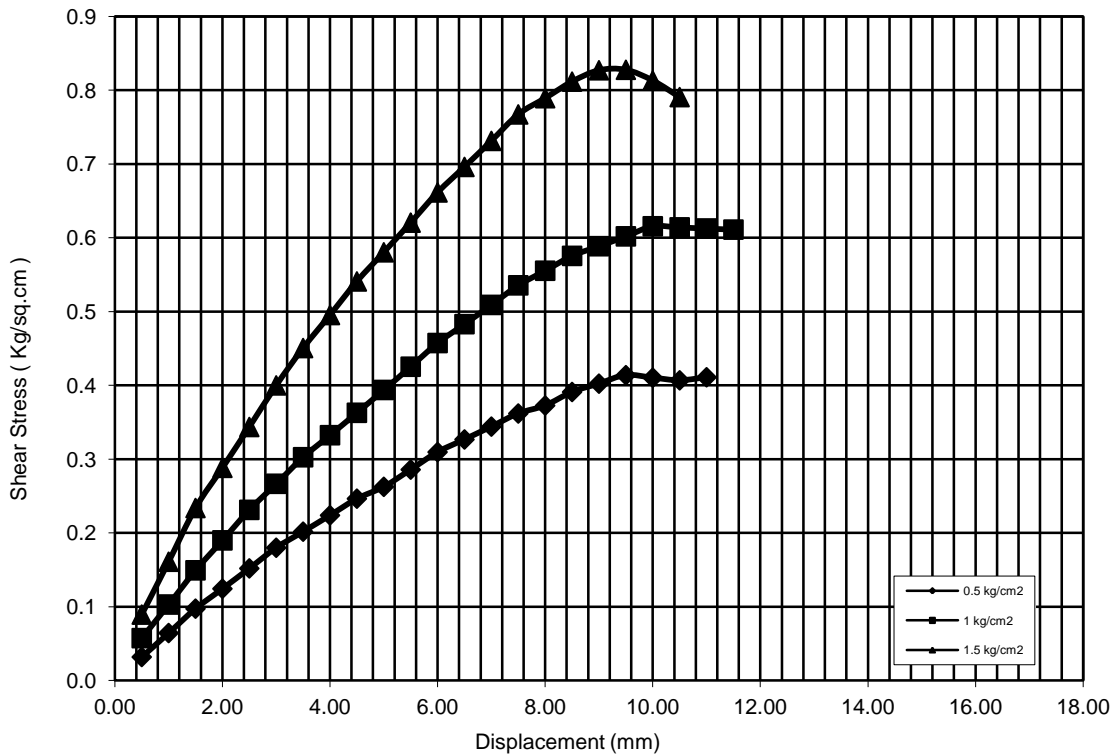
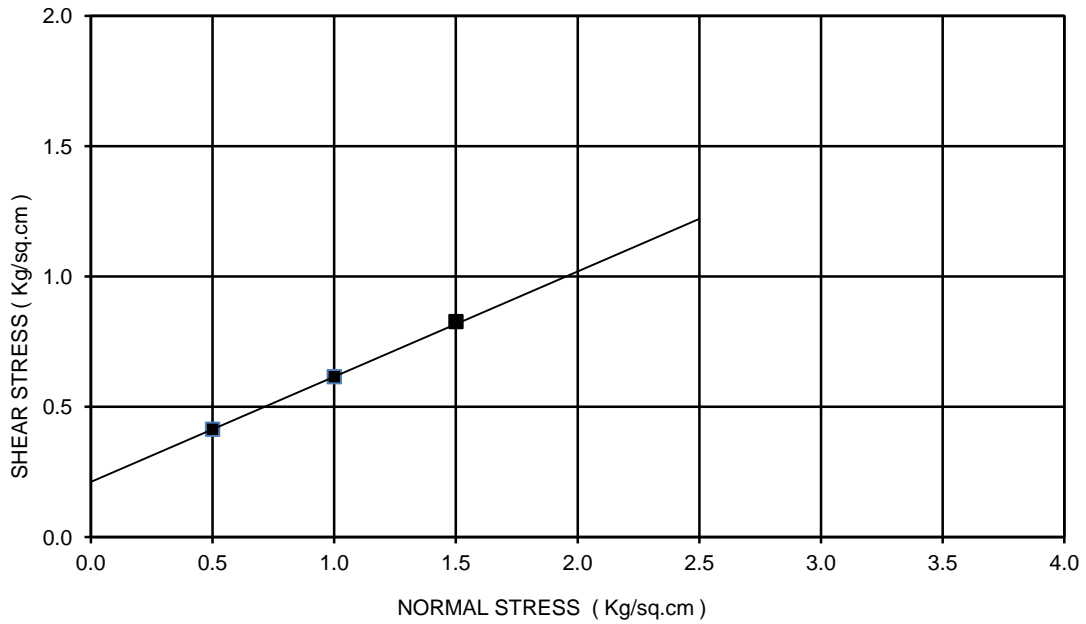
BORE HOLE NO: BH-A2
 CHAINAGE: 35+273
 SAMPLE NO.: UDS-2
 DEPTH: 4.00 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



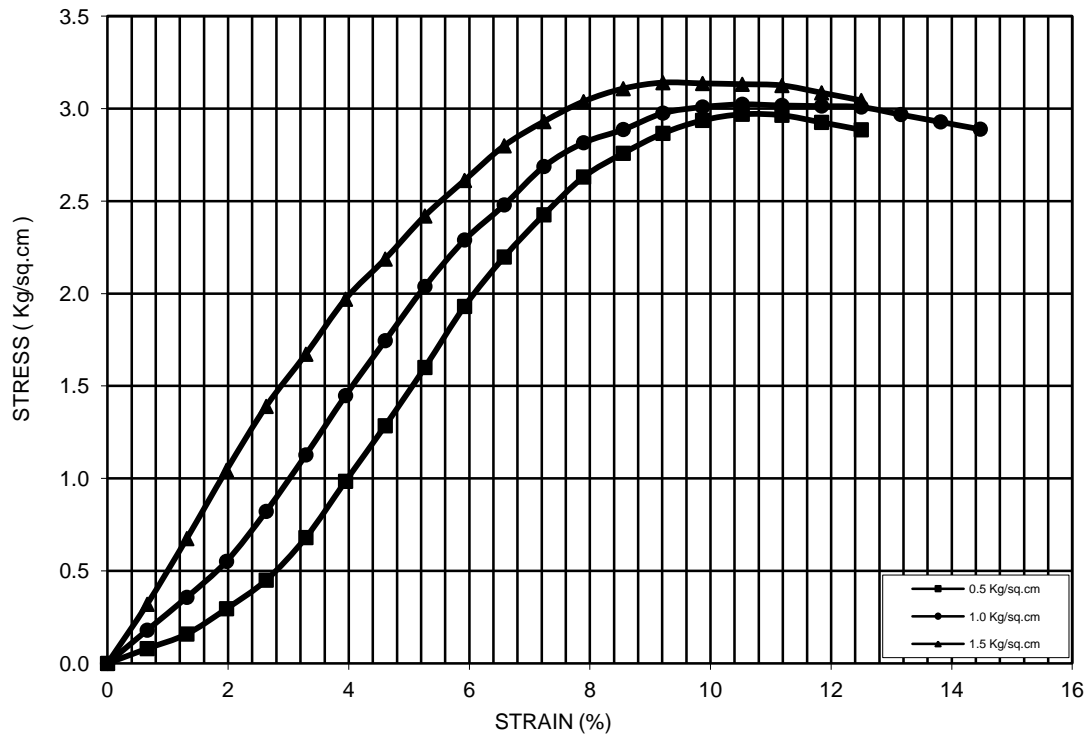
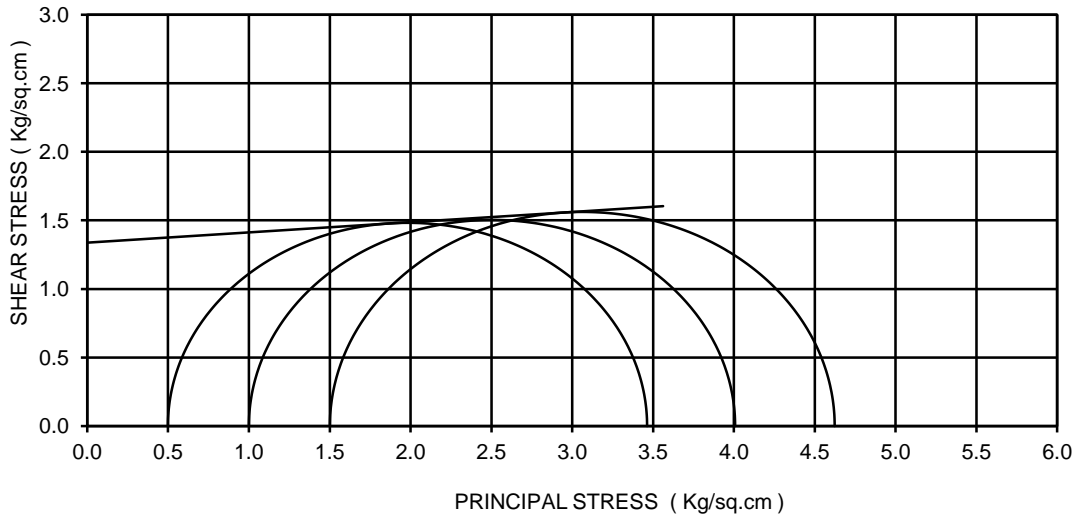
BORE HOLE NO: BH-CL
 CHAINAGE: 36+367
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



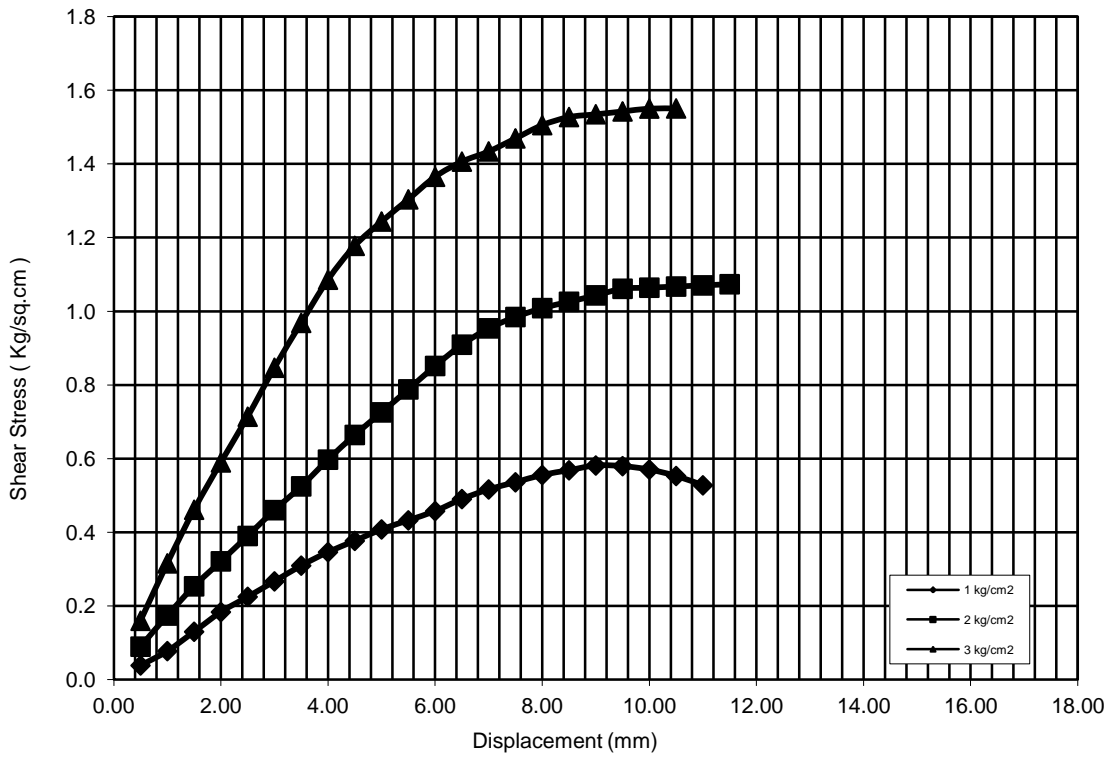
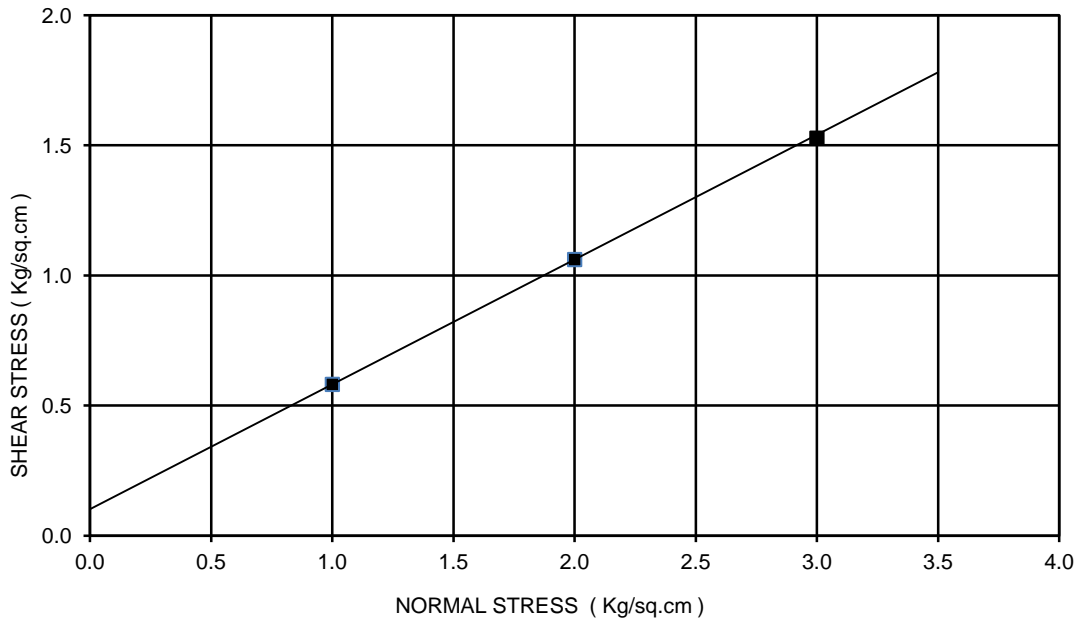
BORE HOLE NO: BH-A-1
 CHAINAGE: 36+816
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 22 deg
 TYPE OF THE TEST: DST



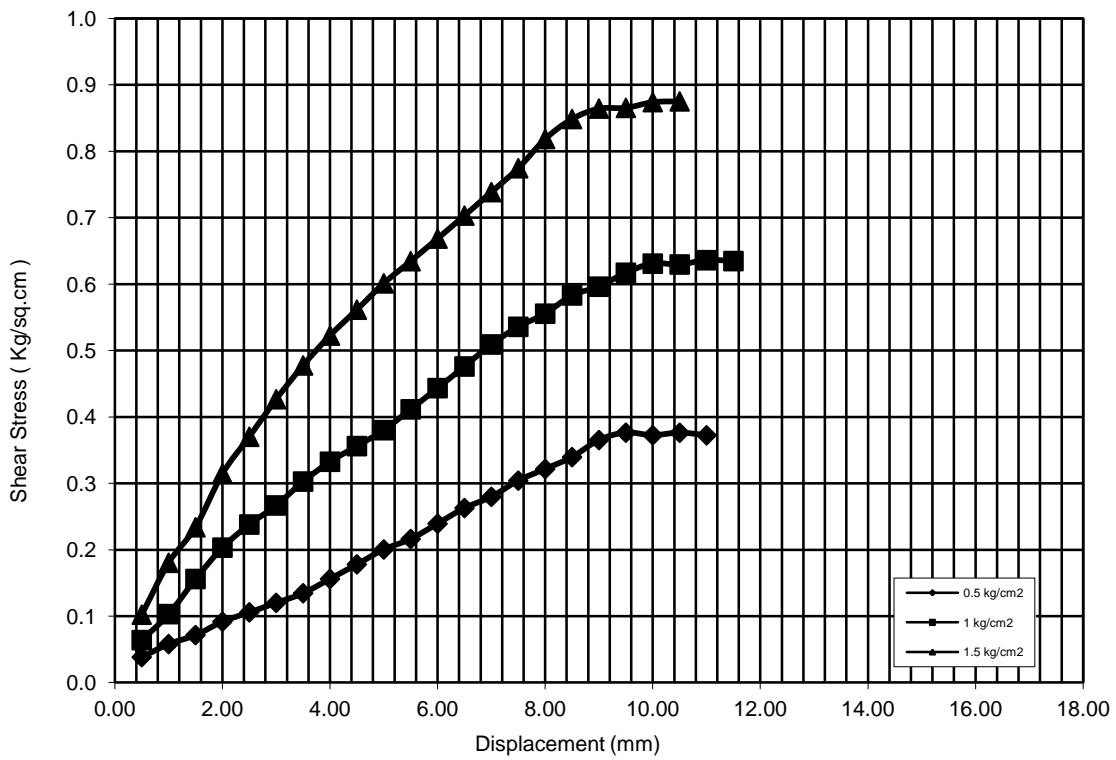
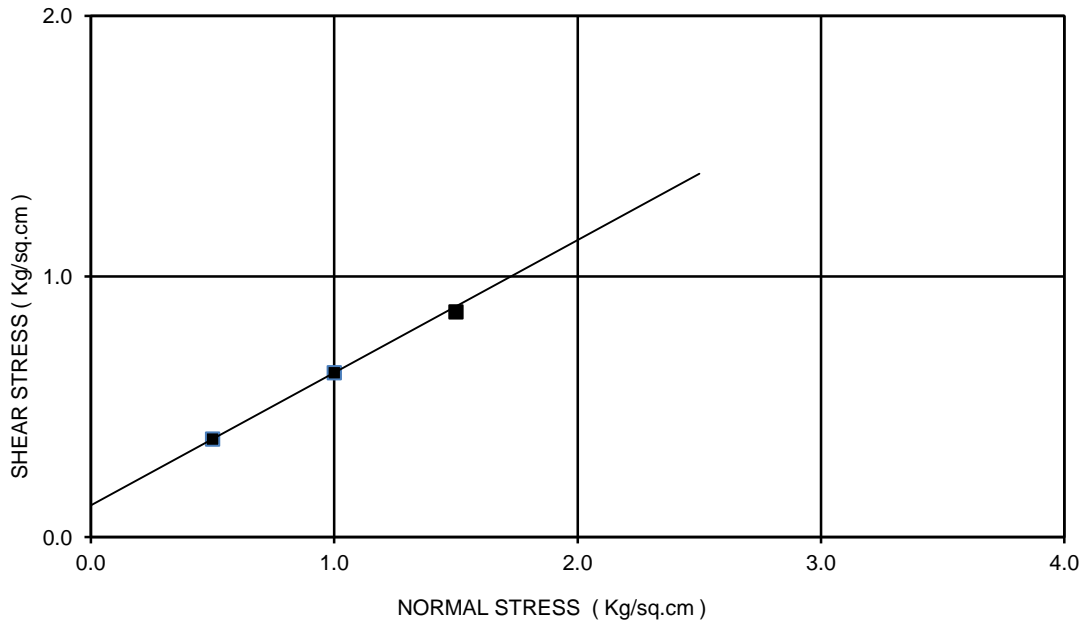
BORE HOLE NO: BH-A1
 CHAINAGE:36+816
 SAMPLE NO.: UDS-2
 DEPTH: 5.50 m
 COHESION(C)= 1.34 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



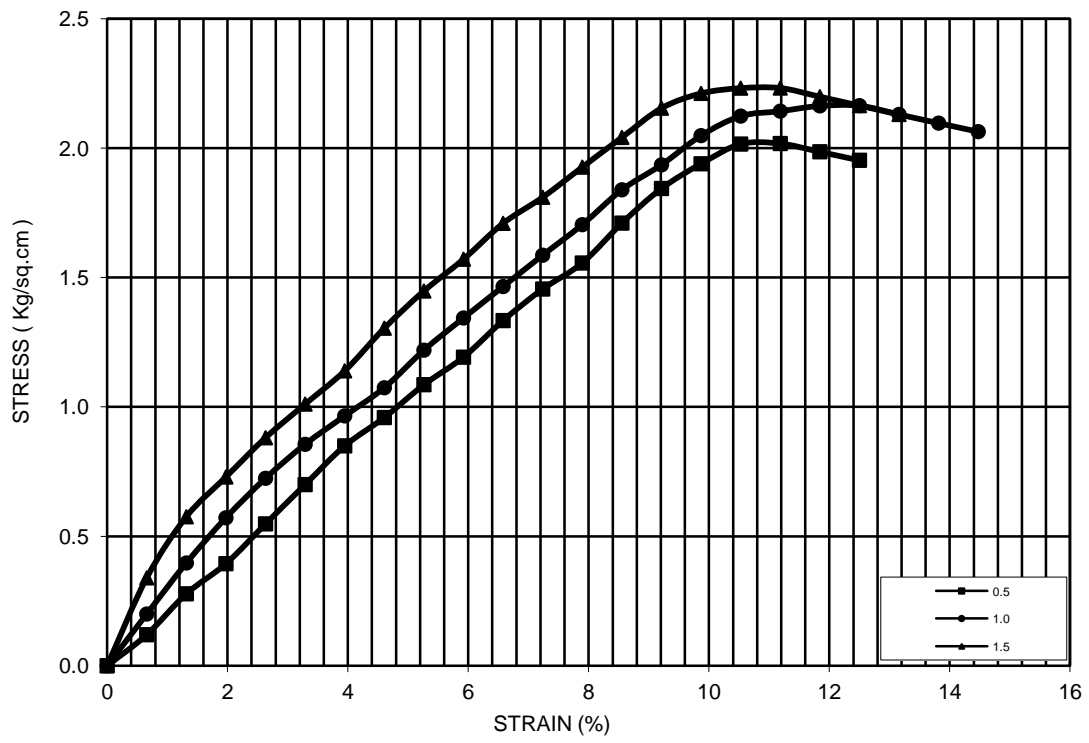
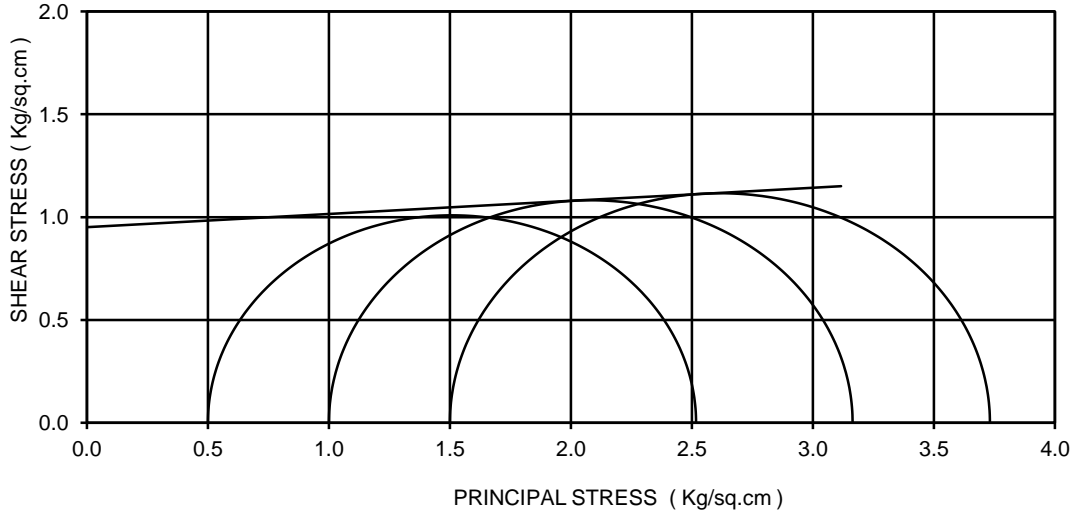
BORE HOLE NO: BH-A-2
 CHAINAGE:36+816
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.10 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



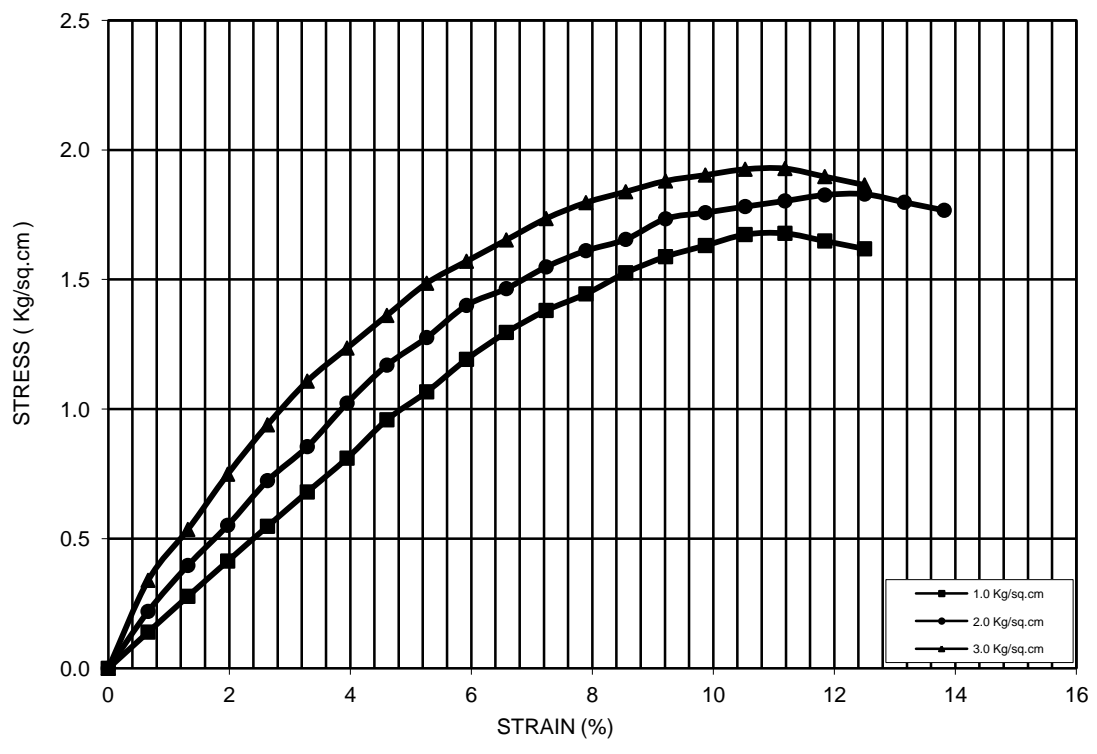
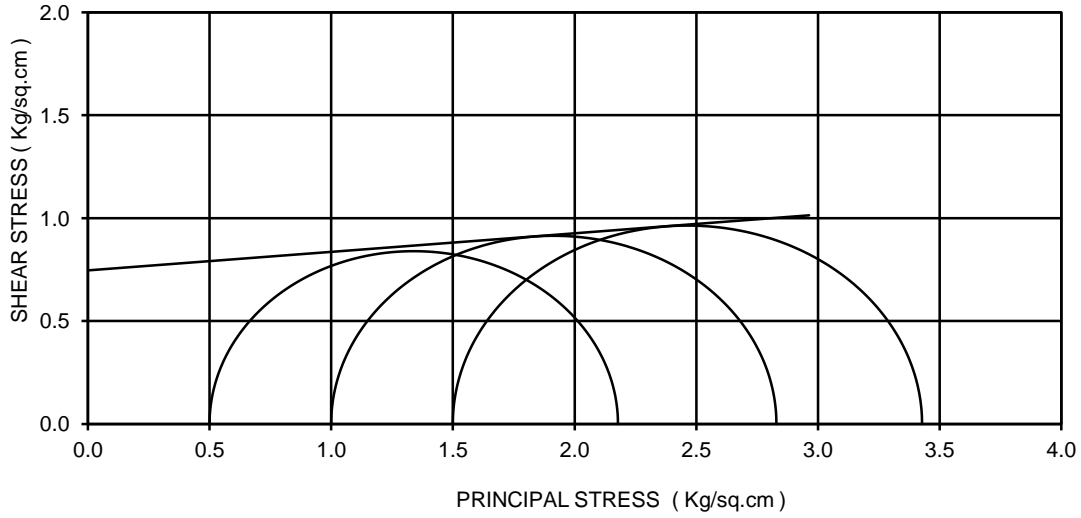
BORE HOLE NO: BH-A-2
 CHAINAGE:36+816
 SAMPLE NO.: UDS-2
 DEPTH: 4.00 m
 COHESION(C)= 0.12 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



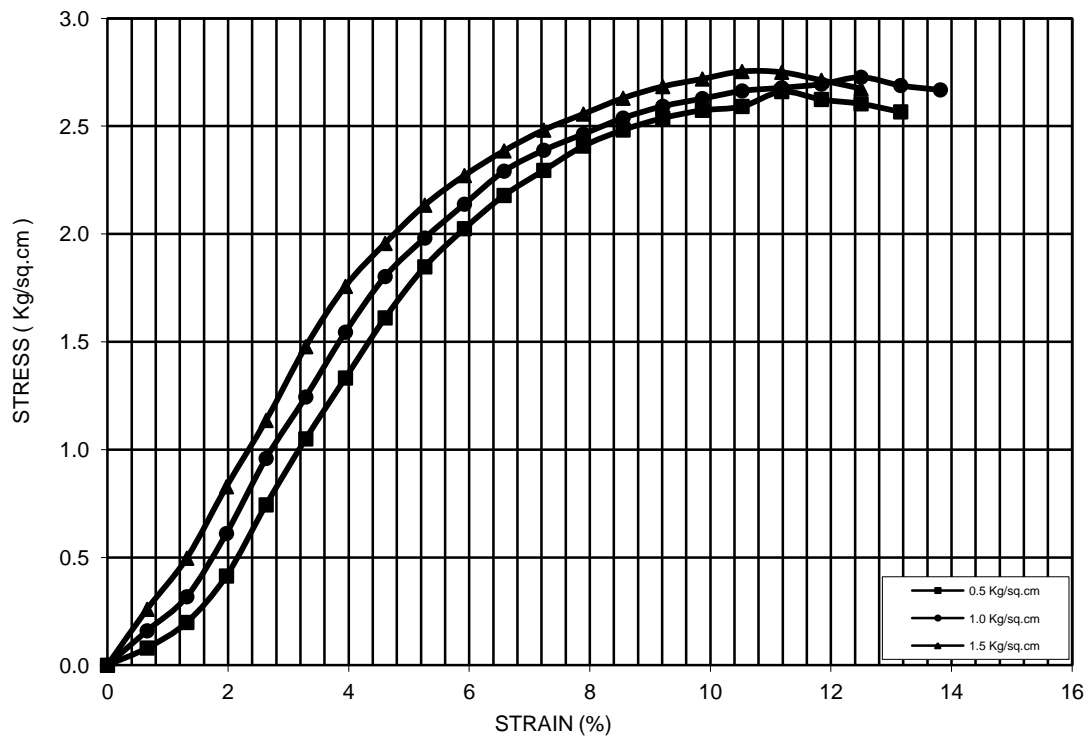
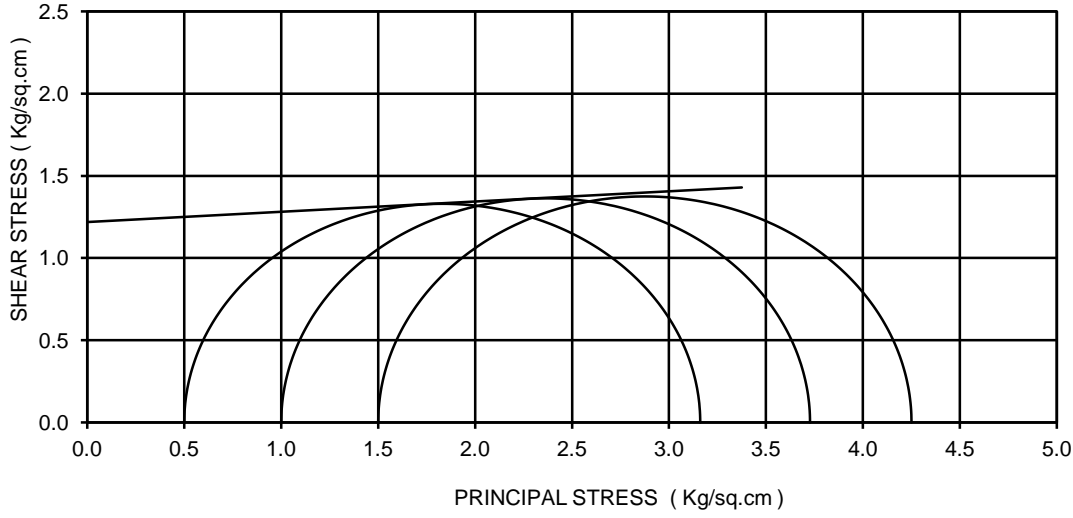
BORE HOLE NO: BH-CL
 CHAINAGE: 38+701
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.95 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



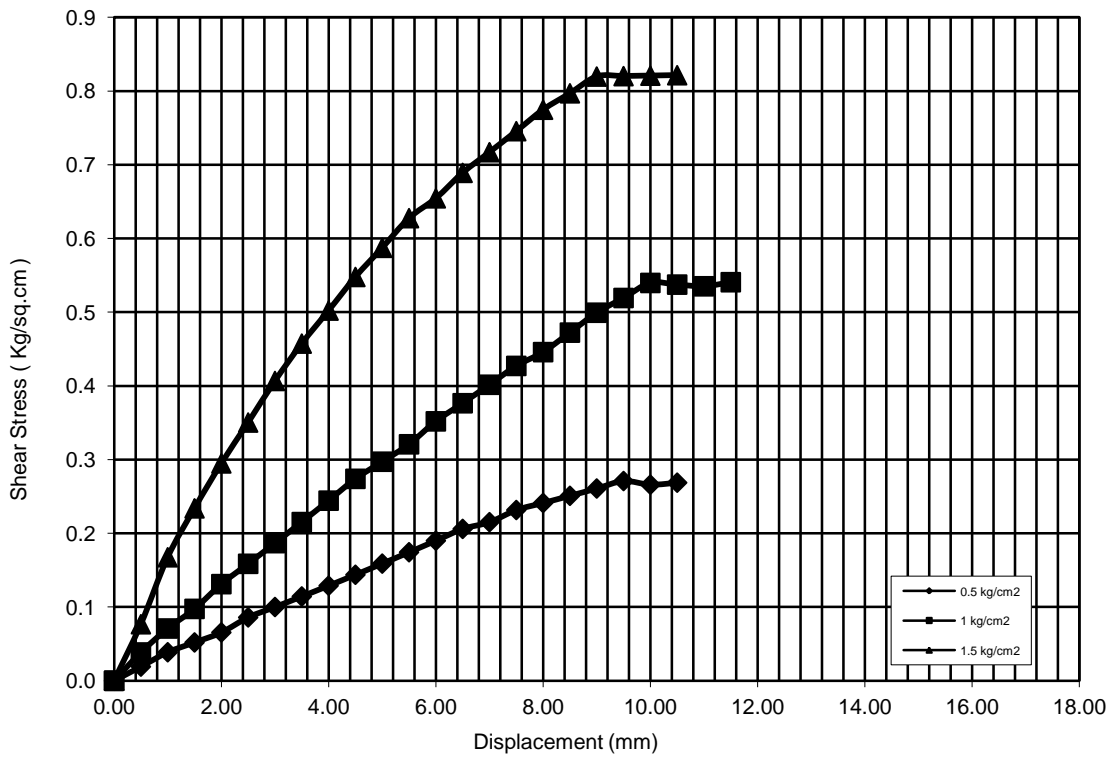
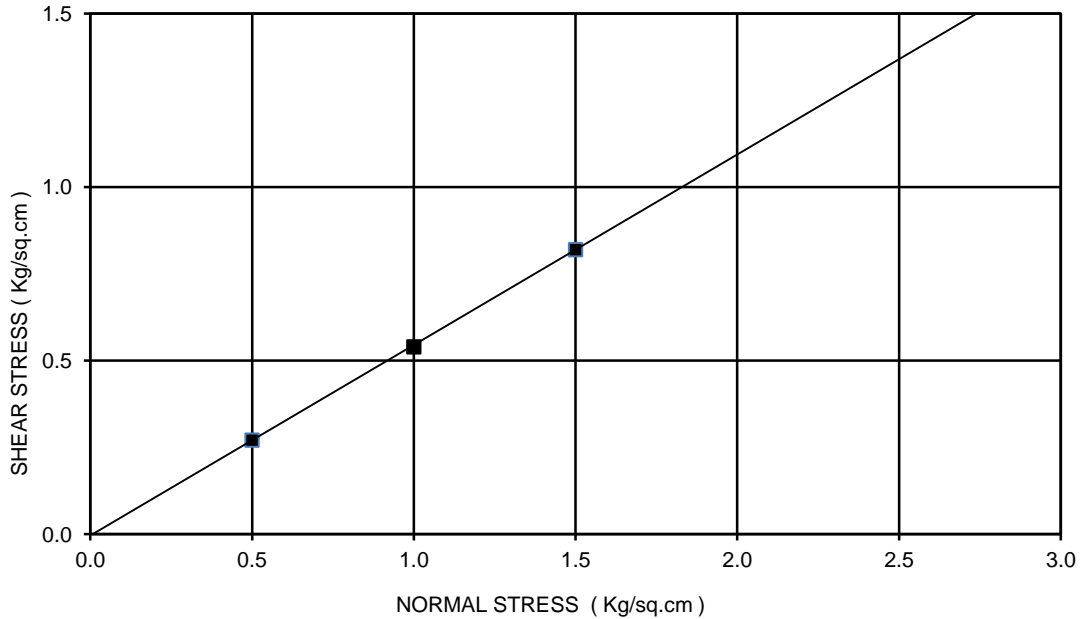
BORE HOLE NO: BH-CL
 CHAINAGE:38+778
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.75 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



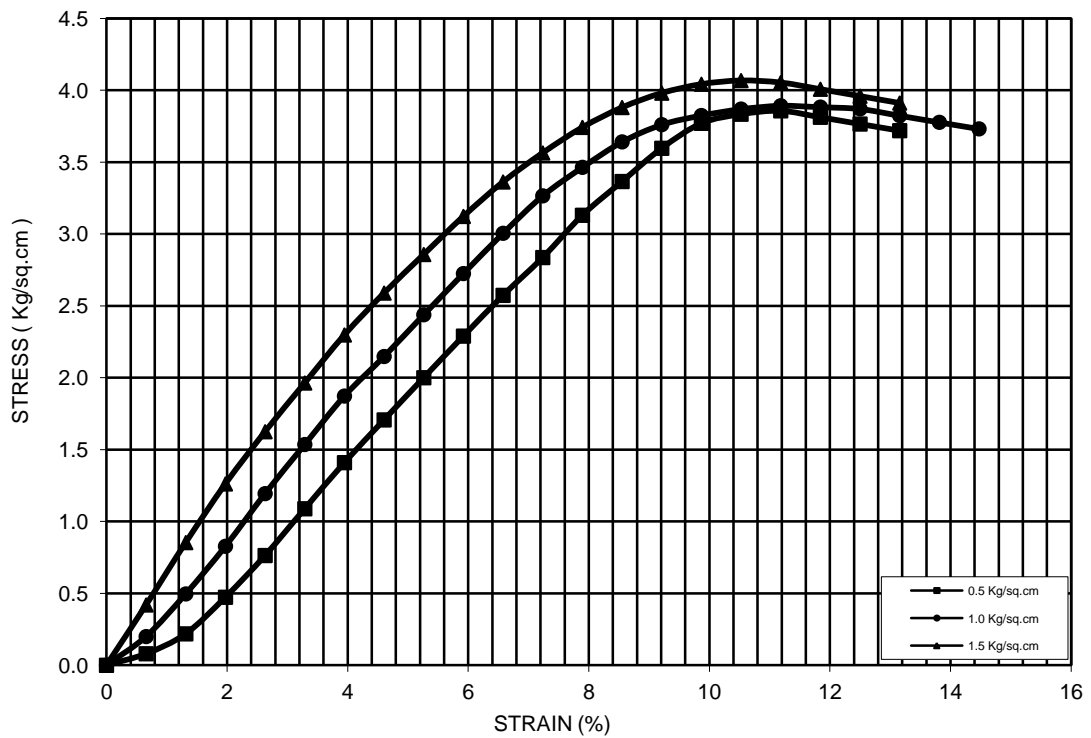
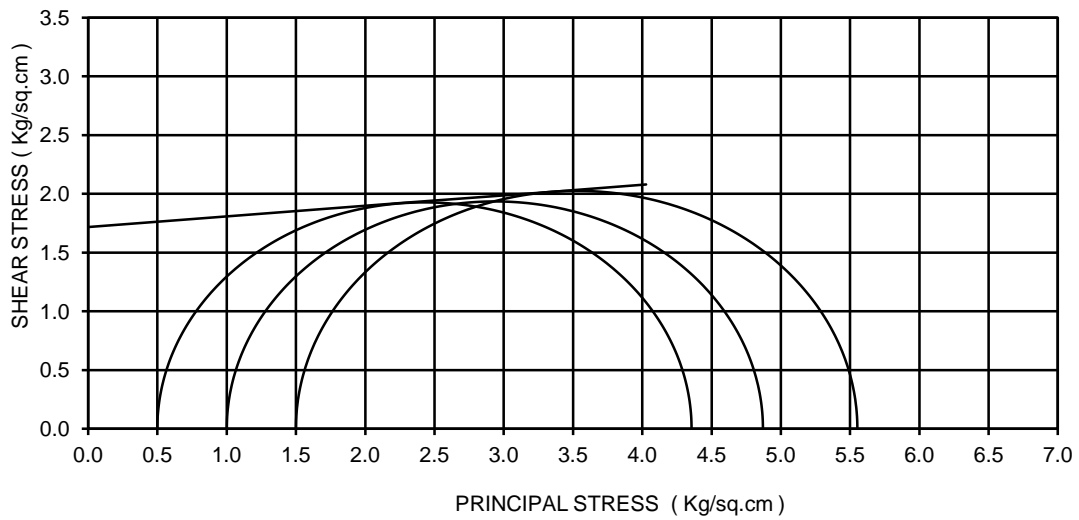
BORE HOLE NO: BH-CL
 CHAINAGE: 39+060
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.22 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



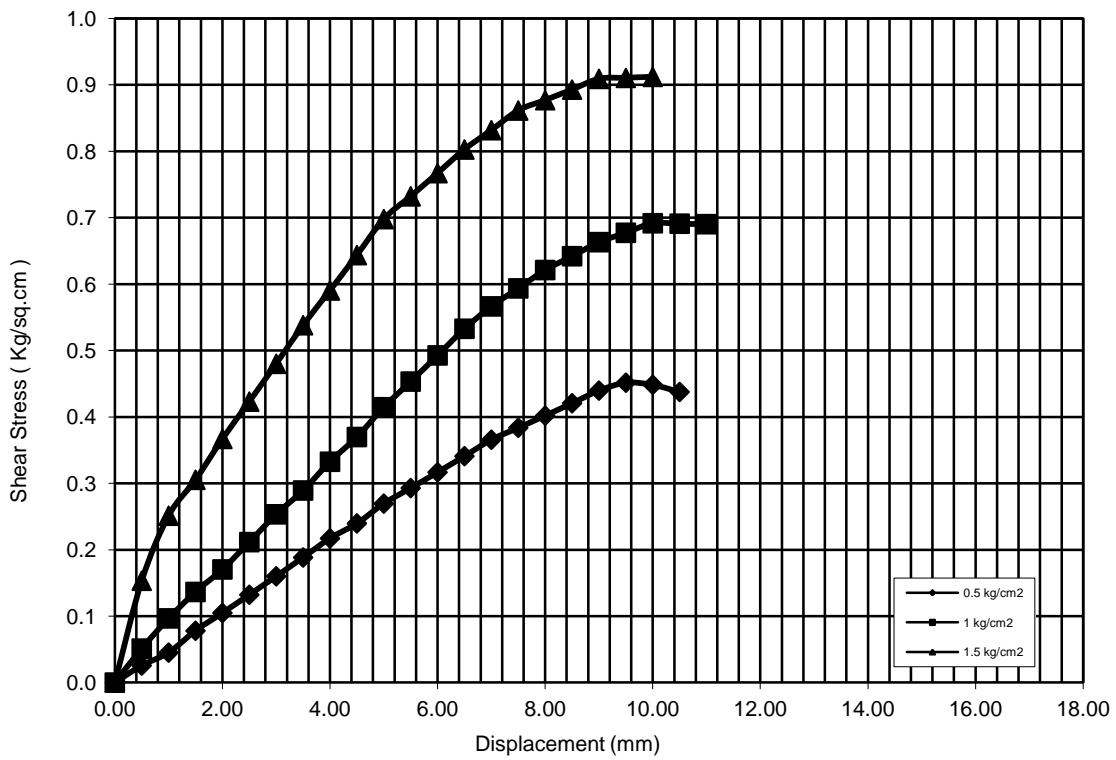
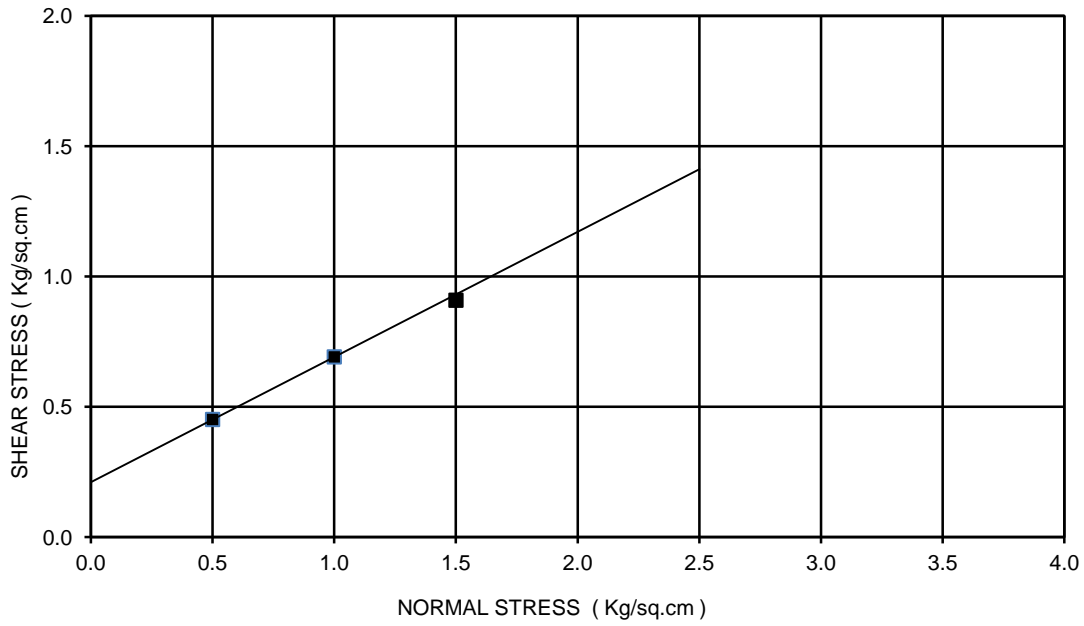
BORE HOLE NO: BH-CL
 CHAINAGE:39+400
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 29 deg
 TYPE OF THE TEST: DST



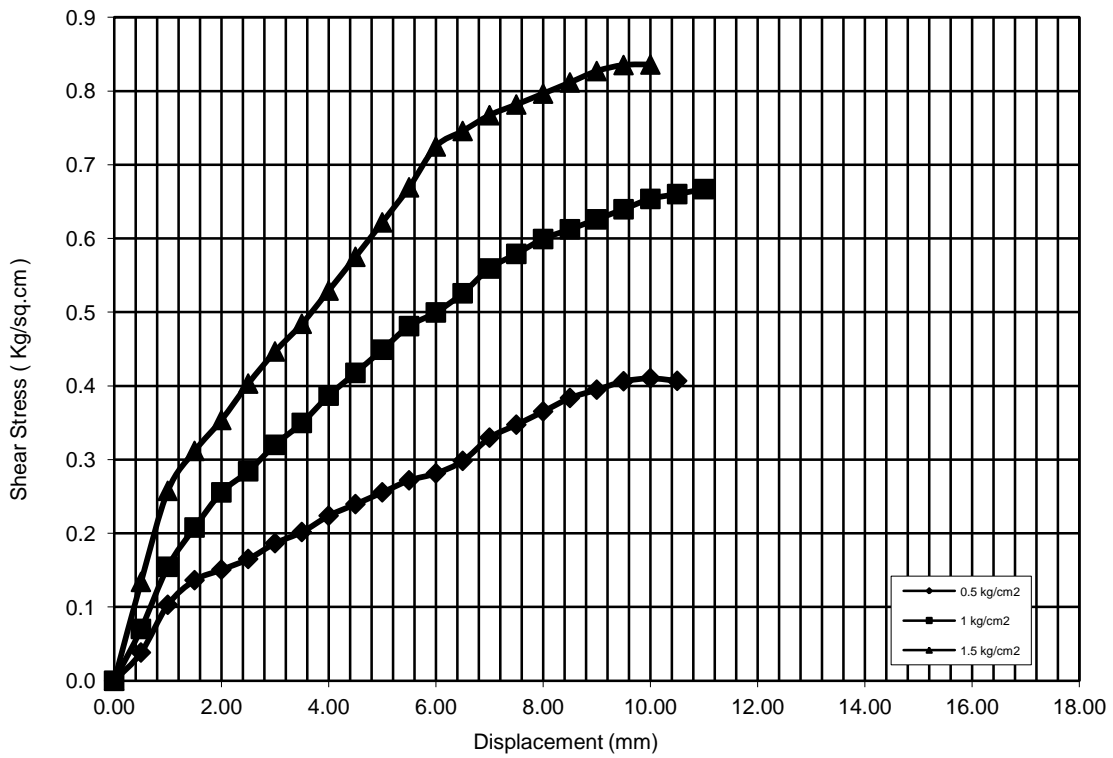
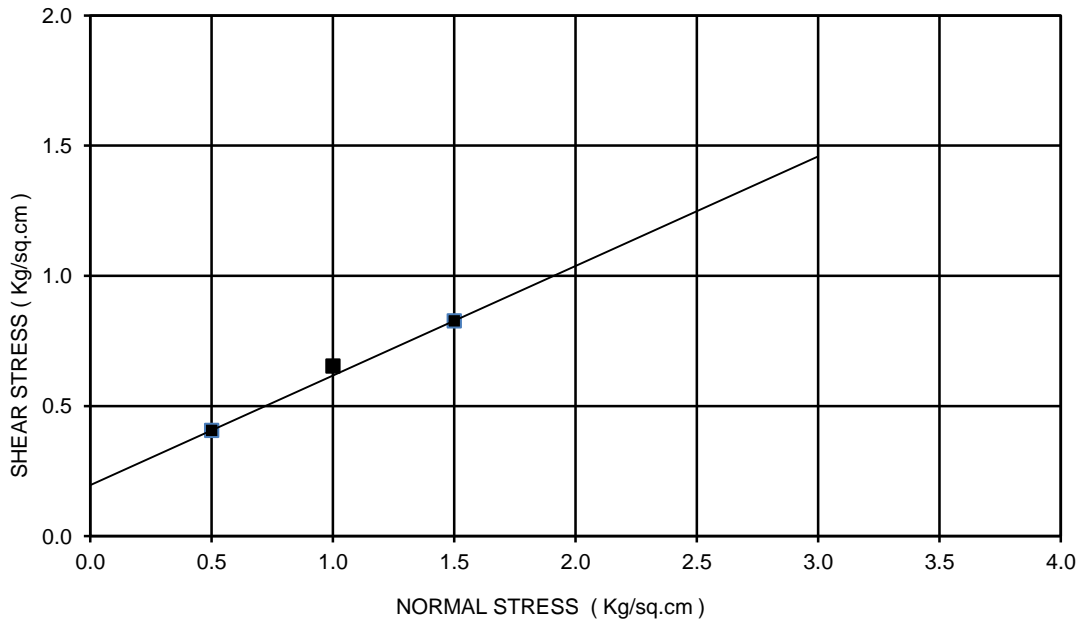
BORE HOLE NO: BH-CL
 CHAINAGE:40+325
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.75 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



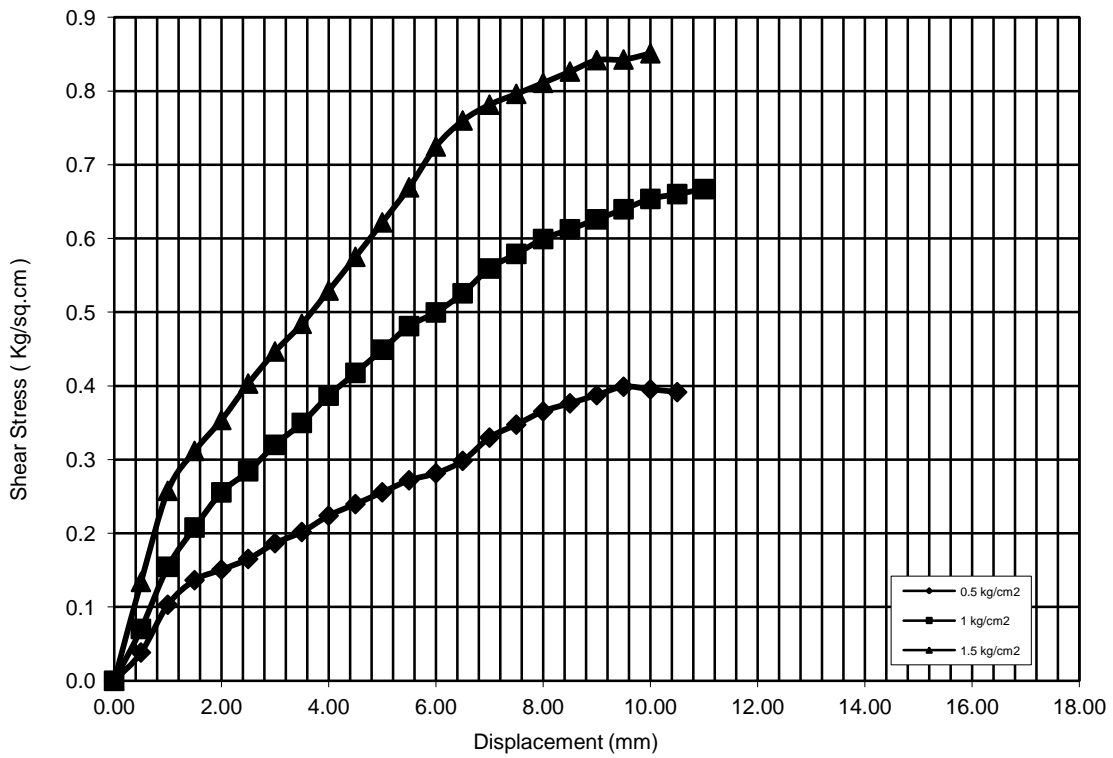
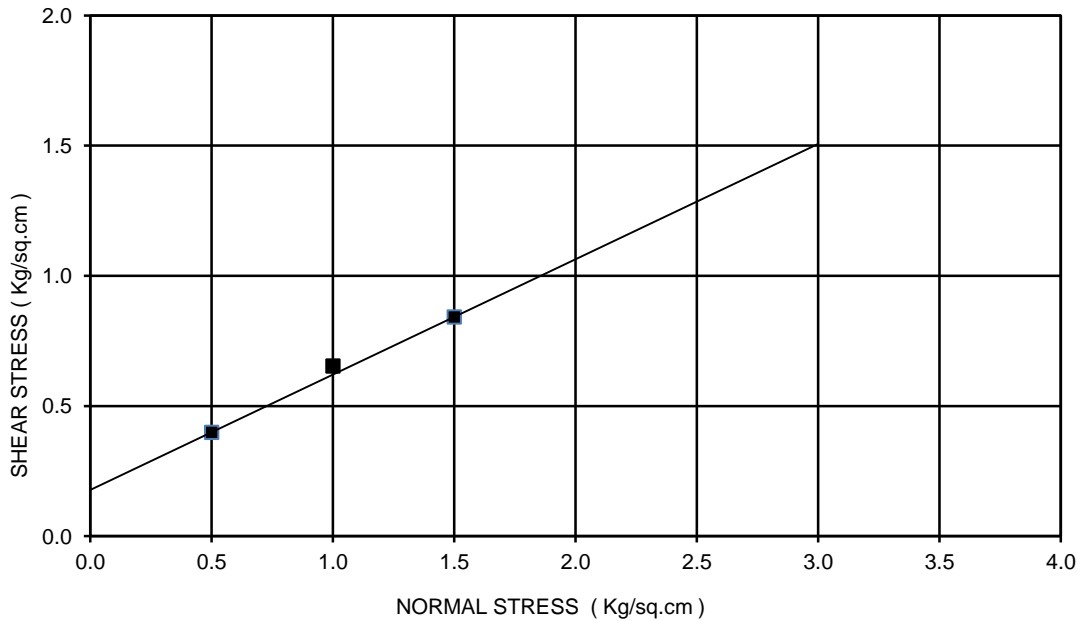
BORE HOLE NO: BH-CL
 CHAINAGE: 40+573
 SAMPLE NO.: UDS-2
 DEPTH: 5.25 m
 COHESION(C)= 0.21 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



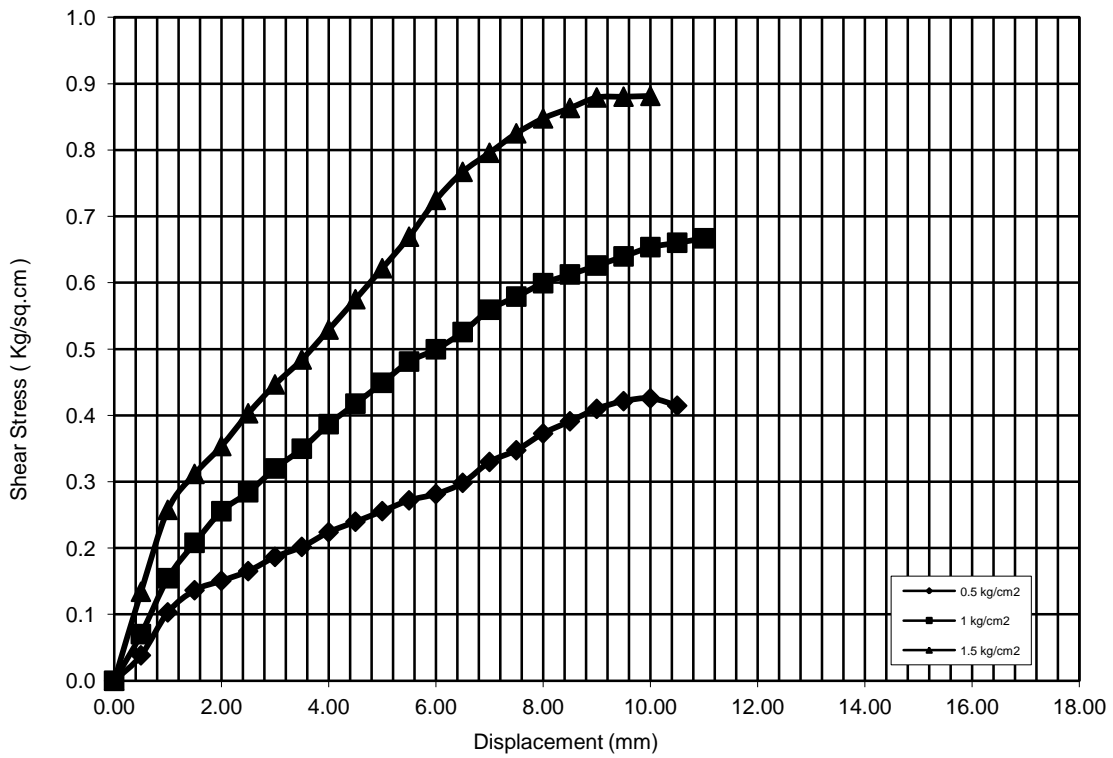
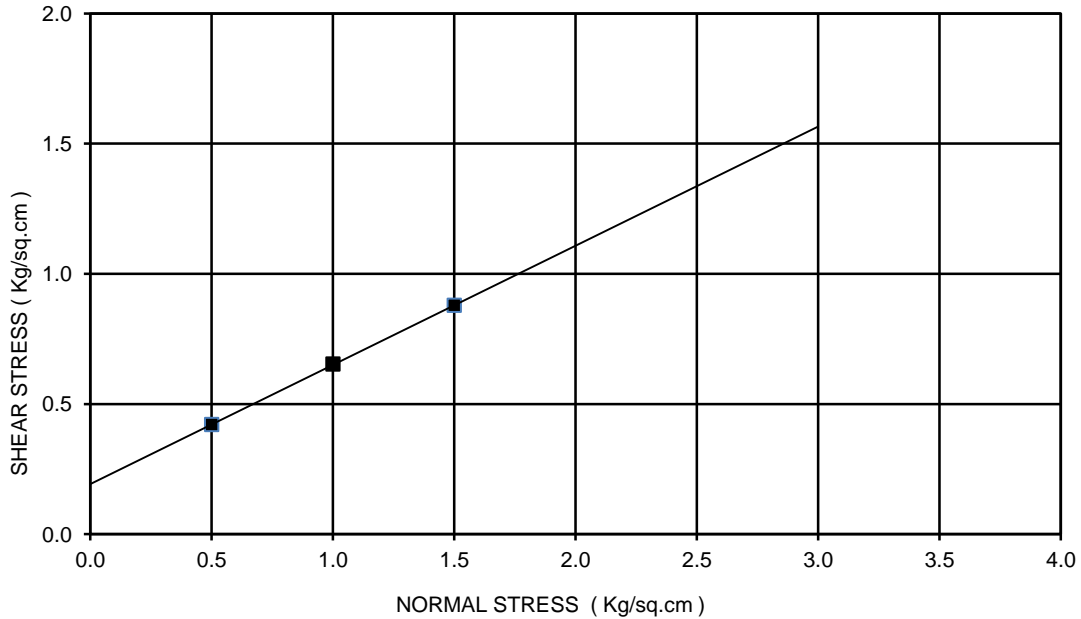
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



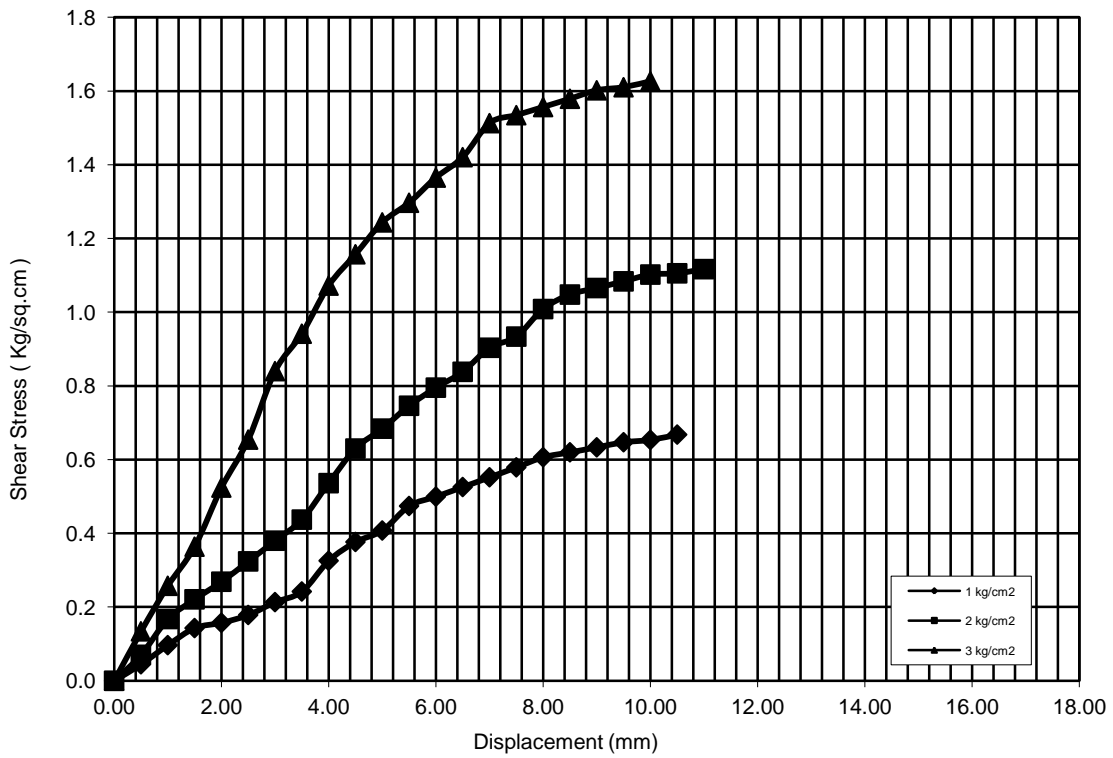
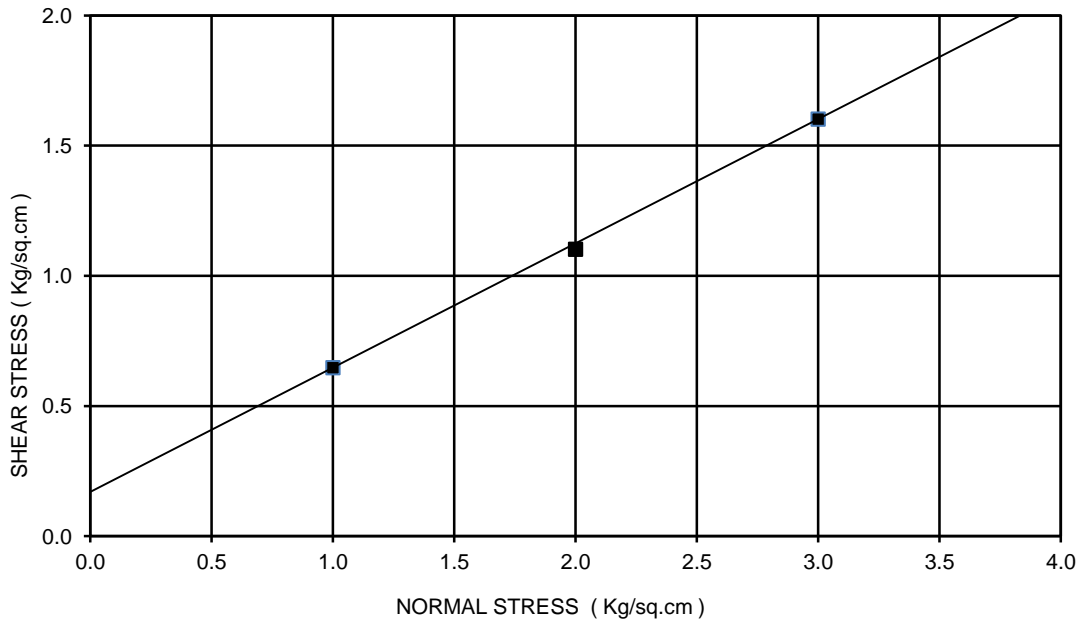
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



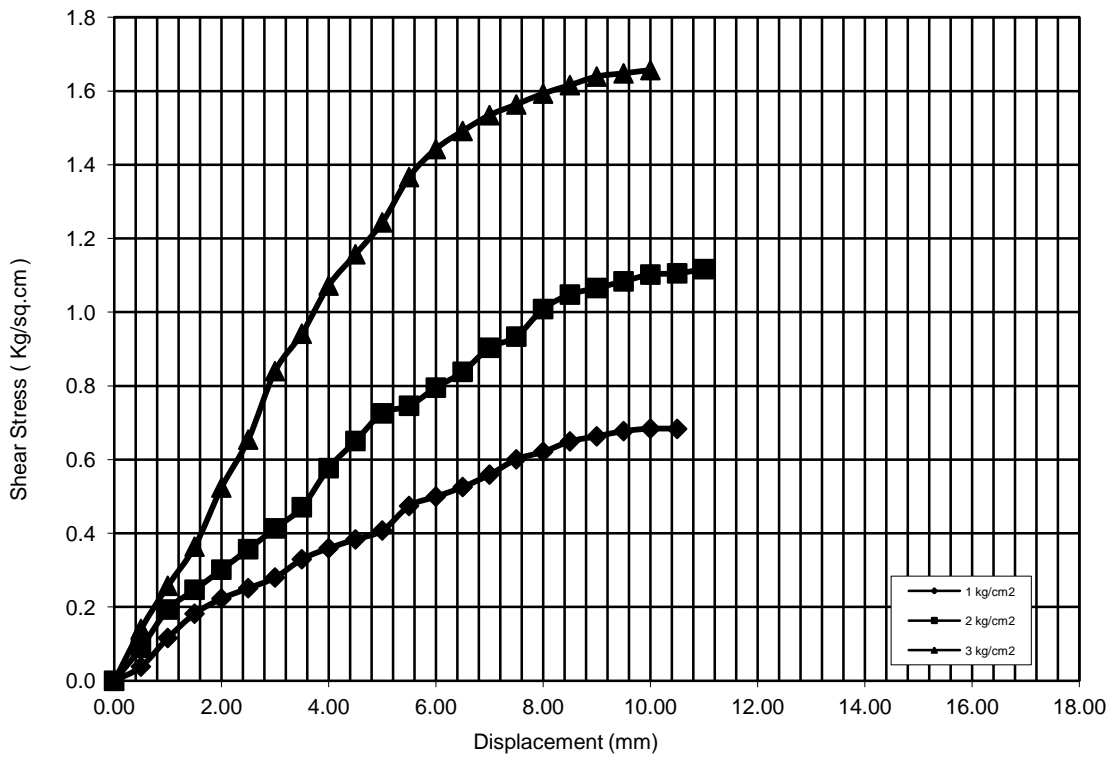
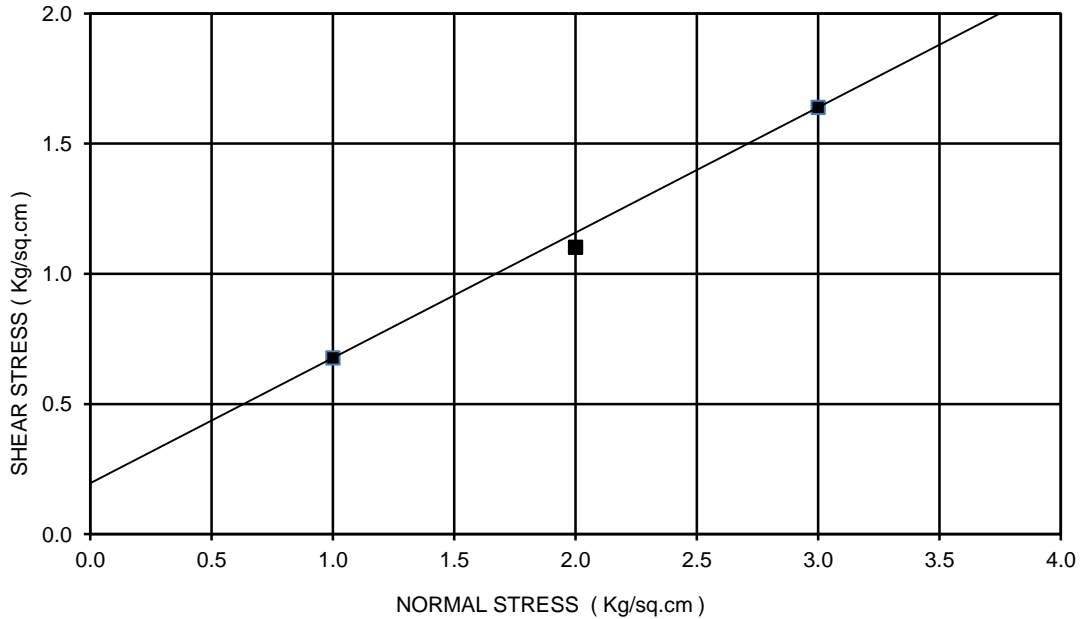
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



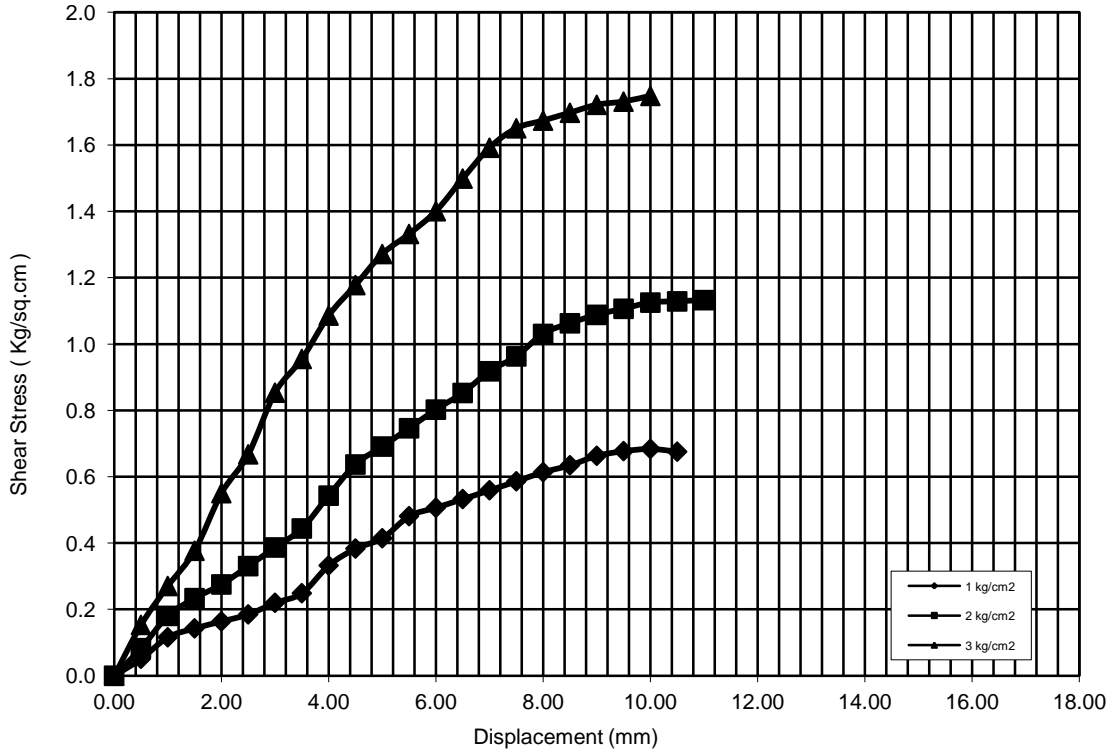
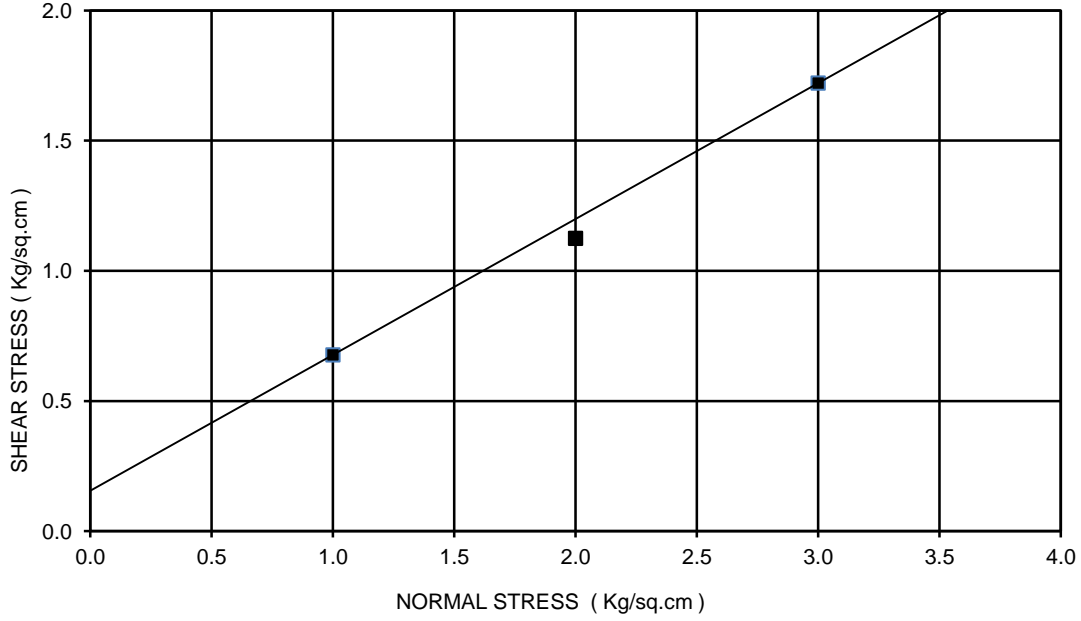
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



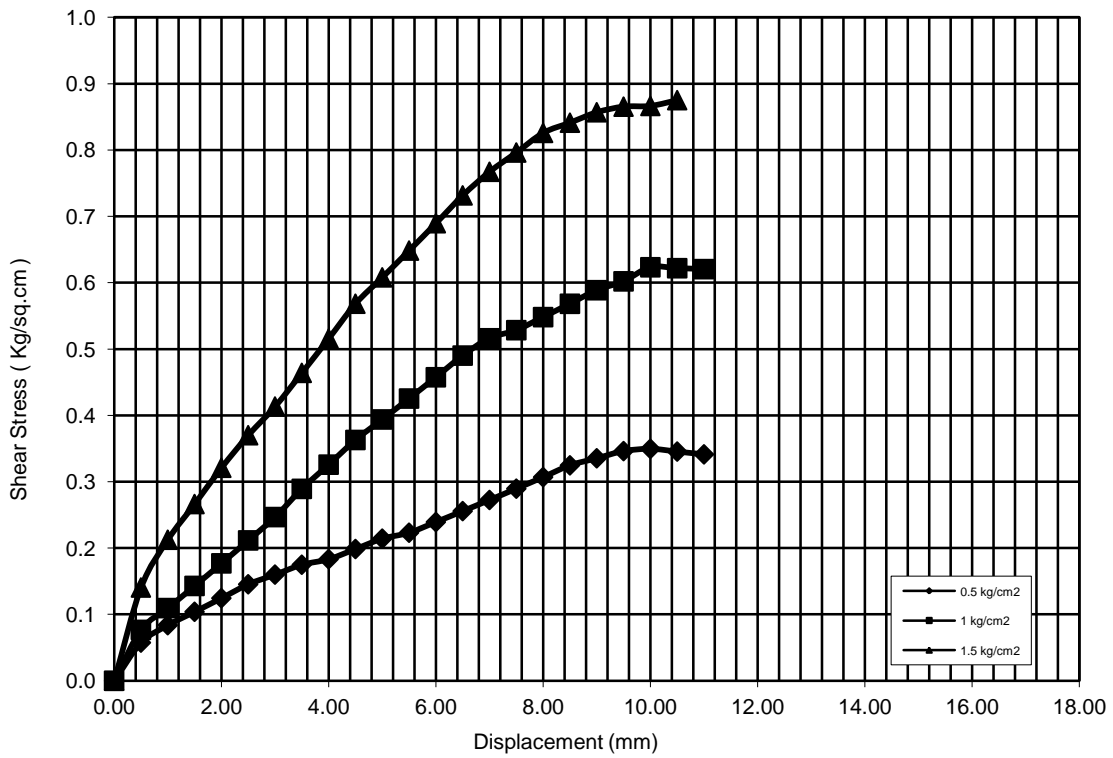
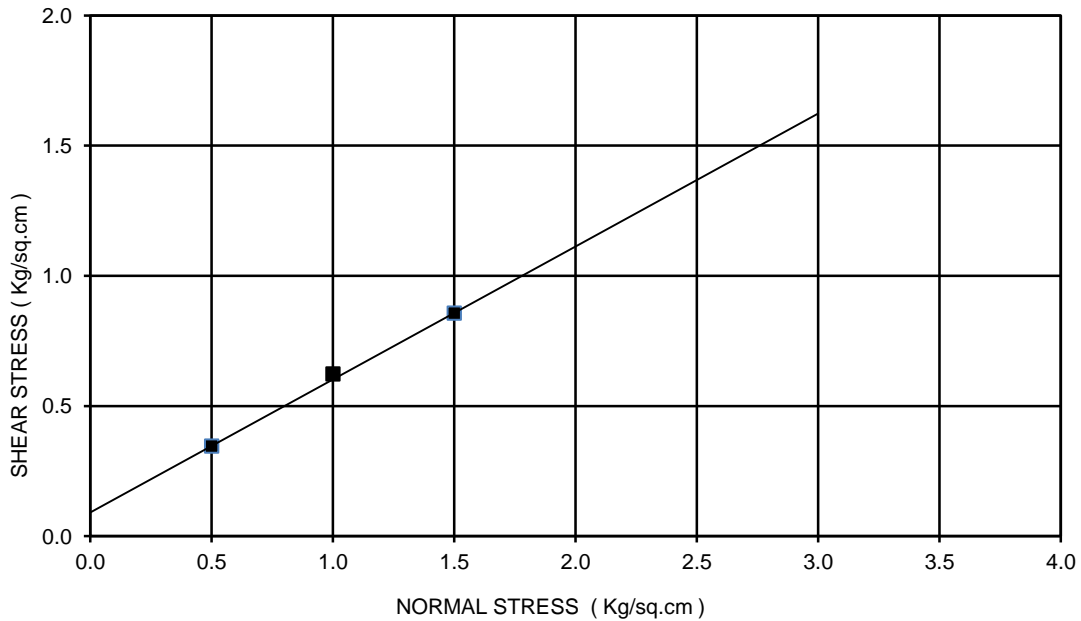
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



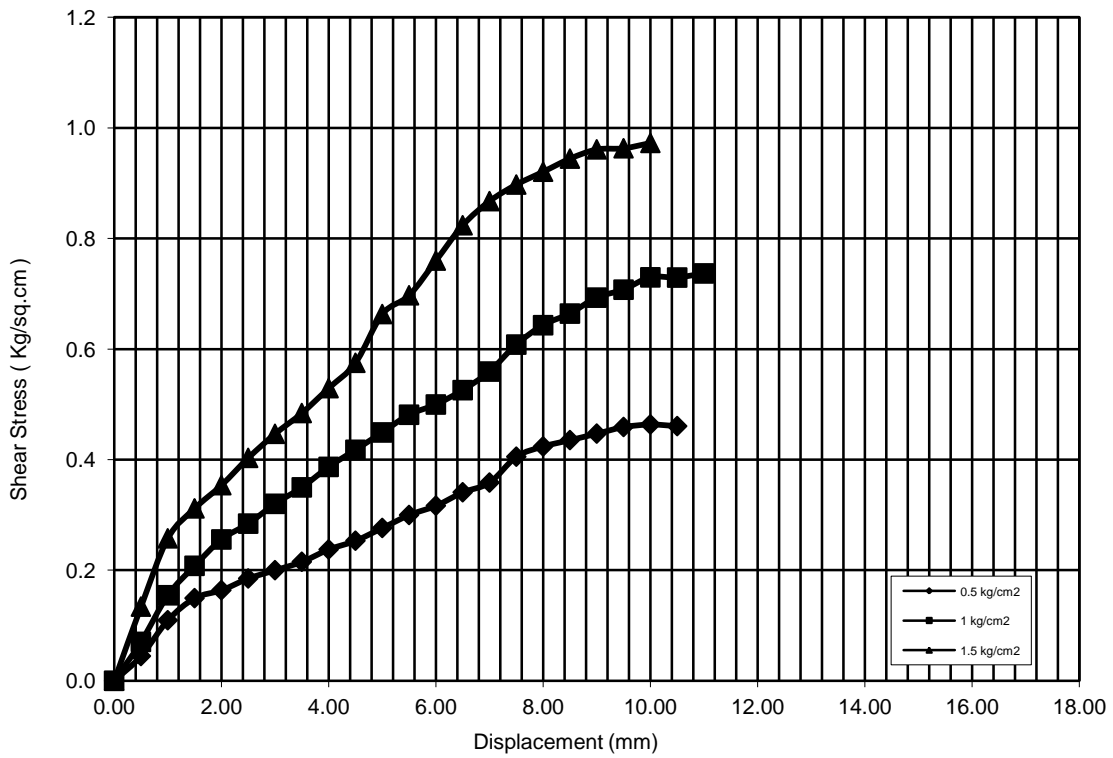
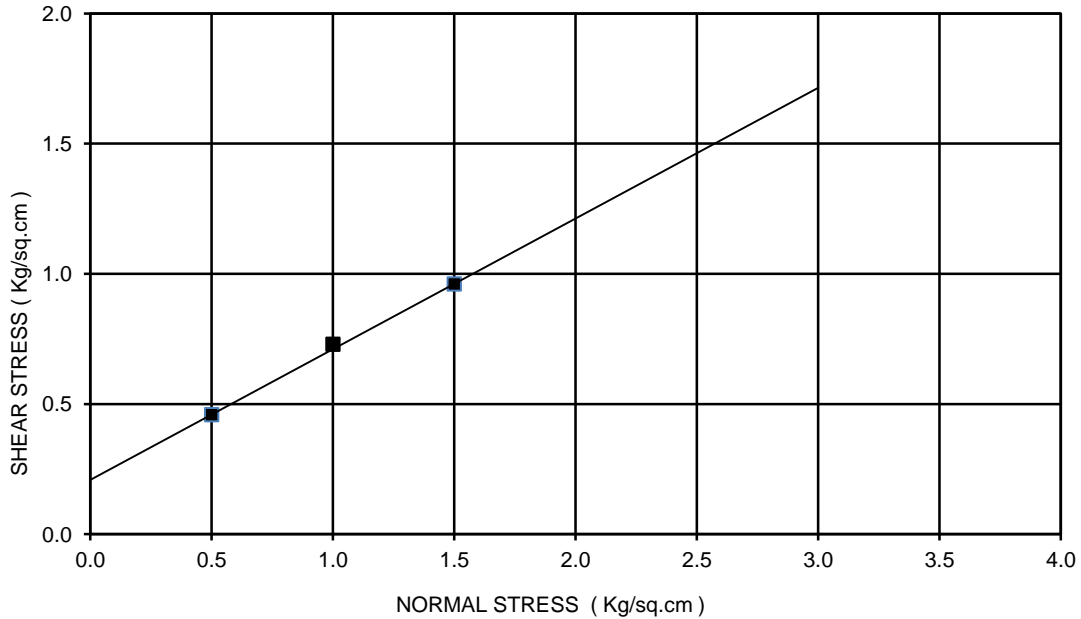
BORE HOLE NO: BH-A1
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



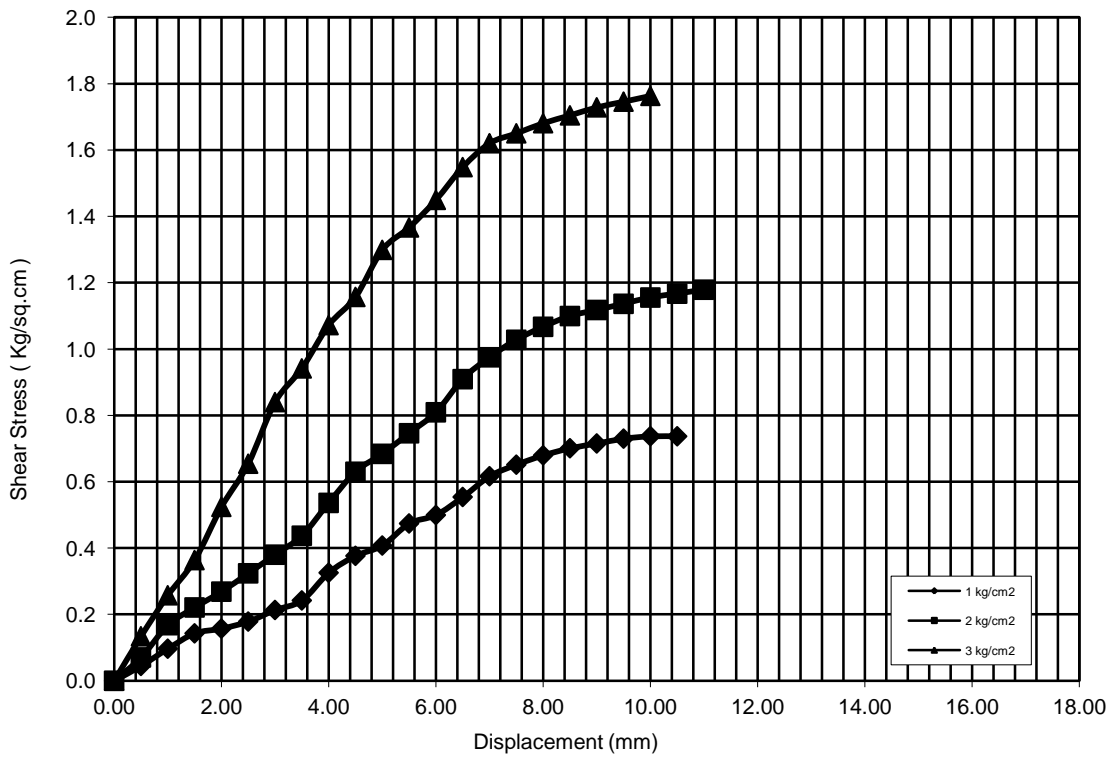
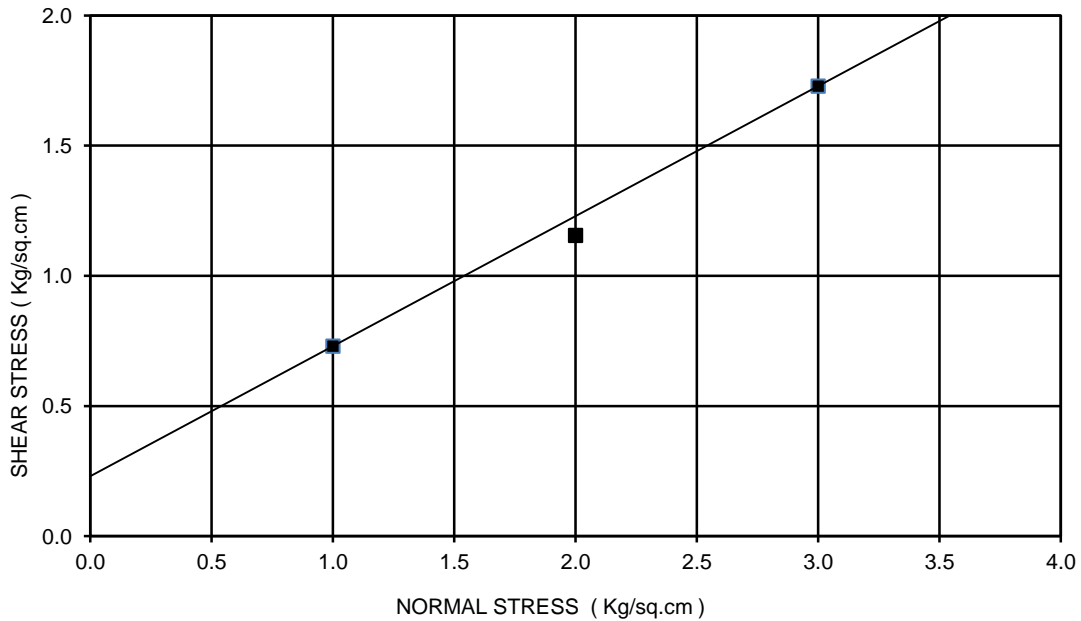
BORE HOLE NO: BH-A2
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



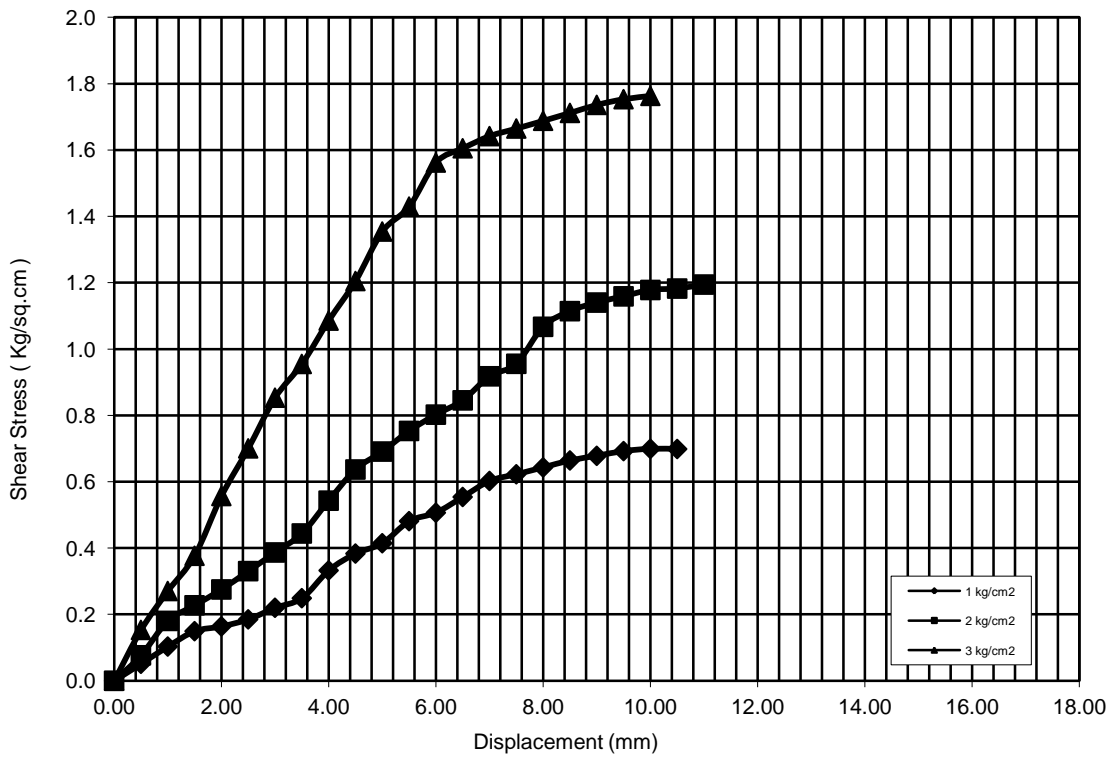
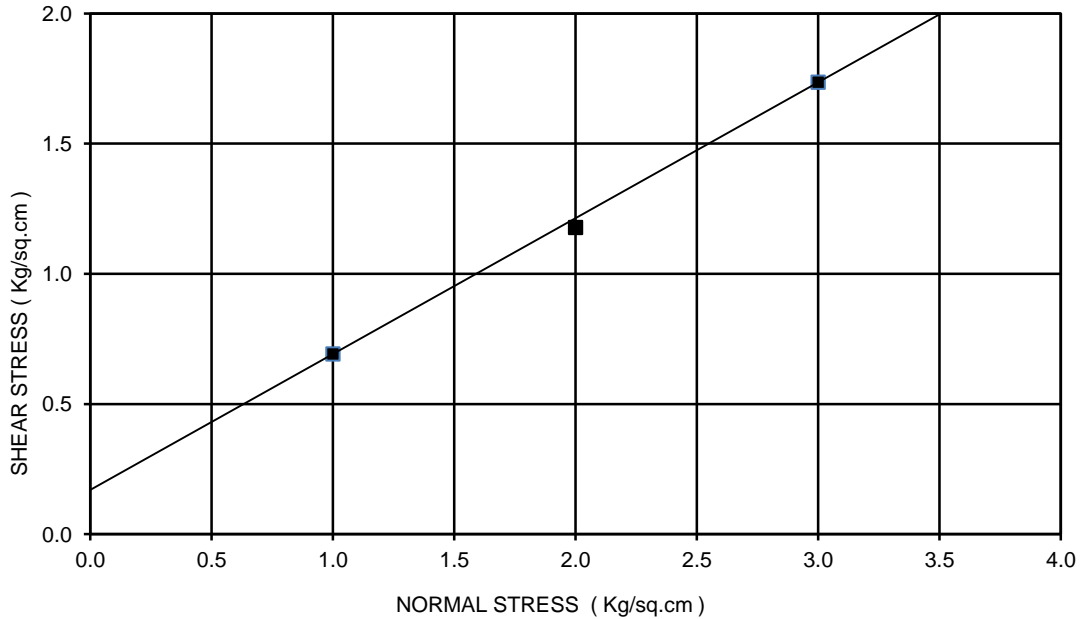
BORE HOLE NO: BH-A2
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



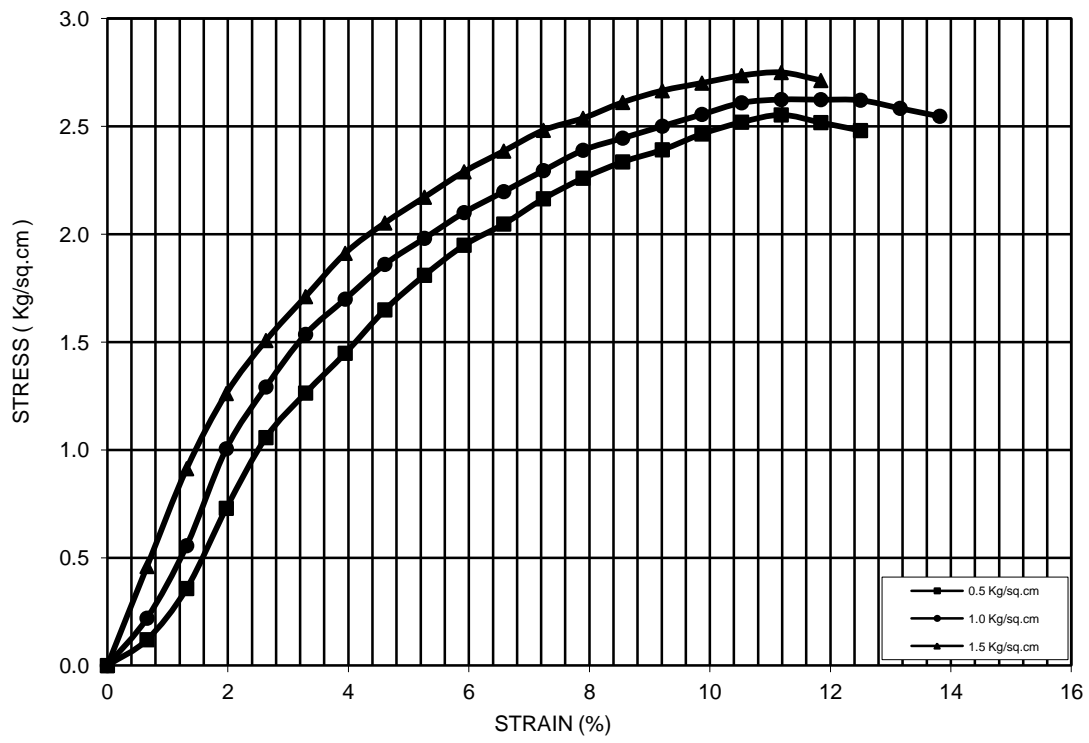
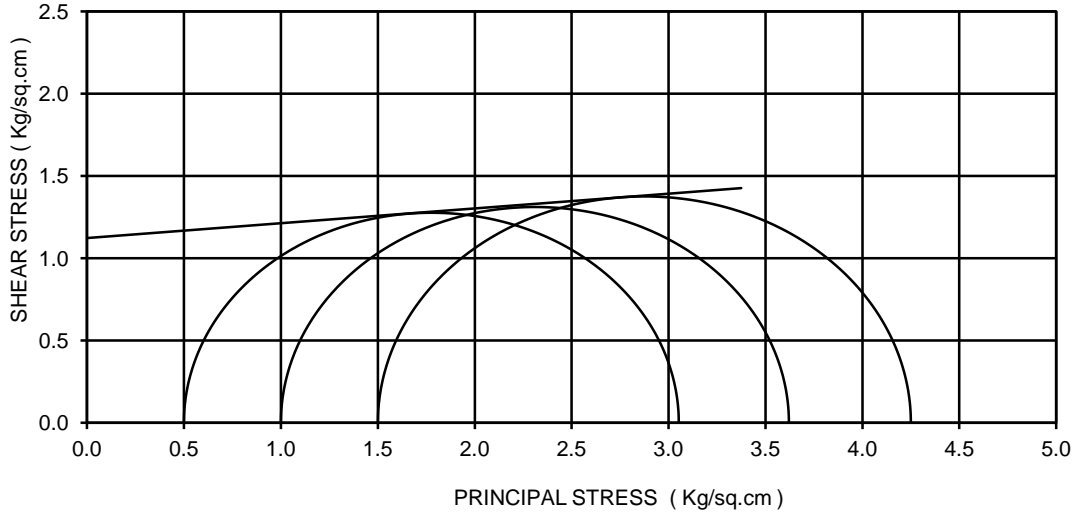
BORE HOLE NO: BH-A2
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



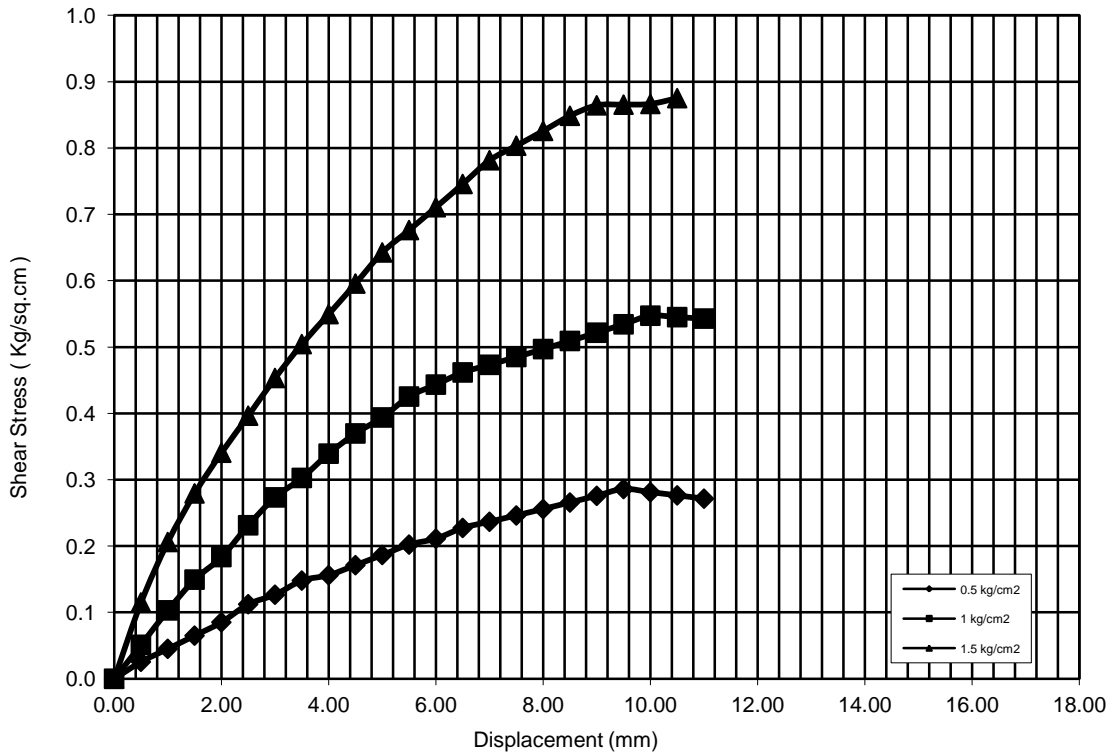
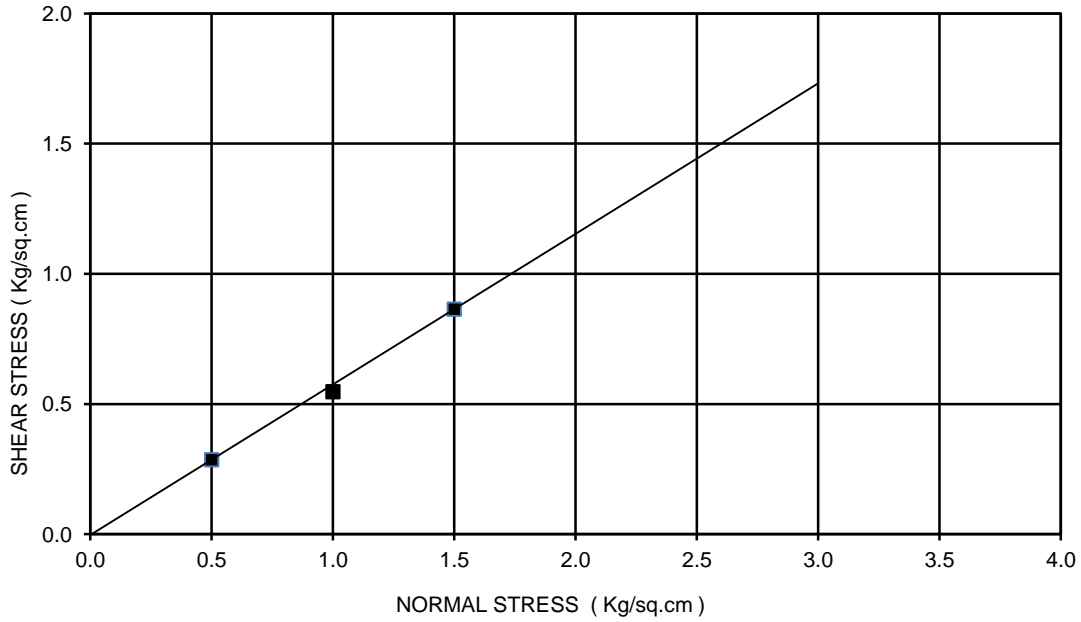
BORE HOLE NO: BH-A2
 CHAINAGE: 41+056
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



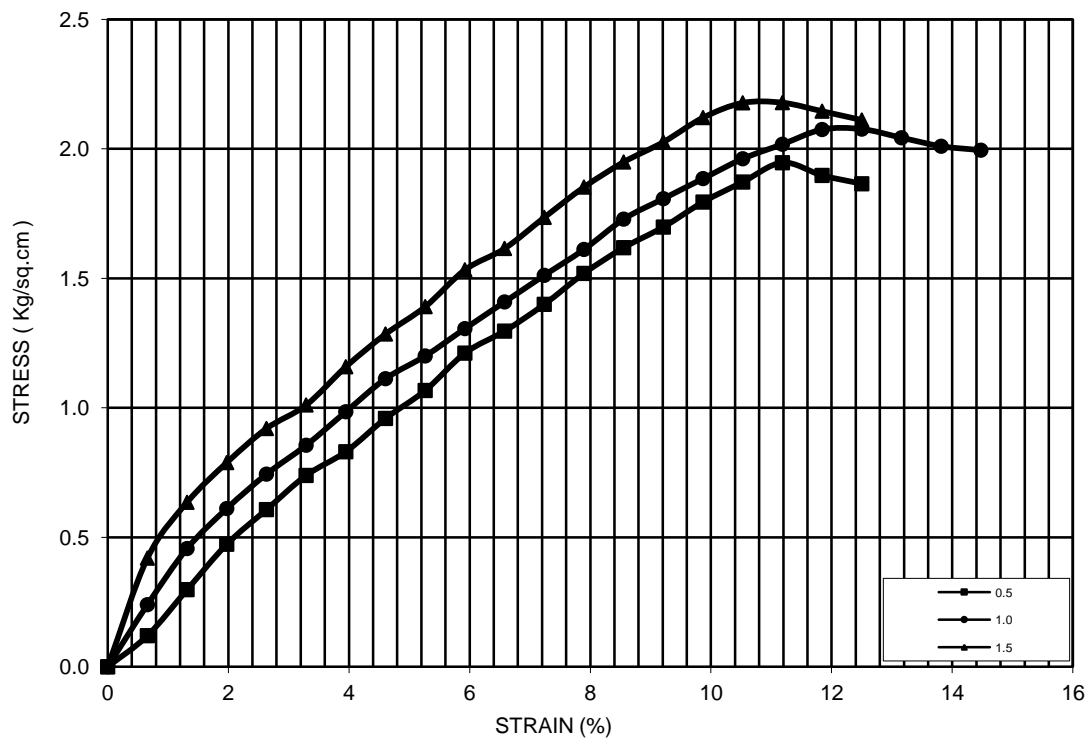
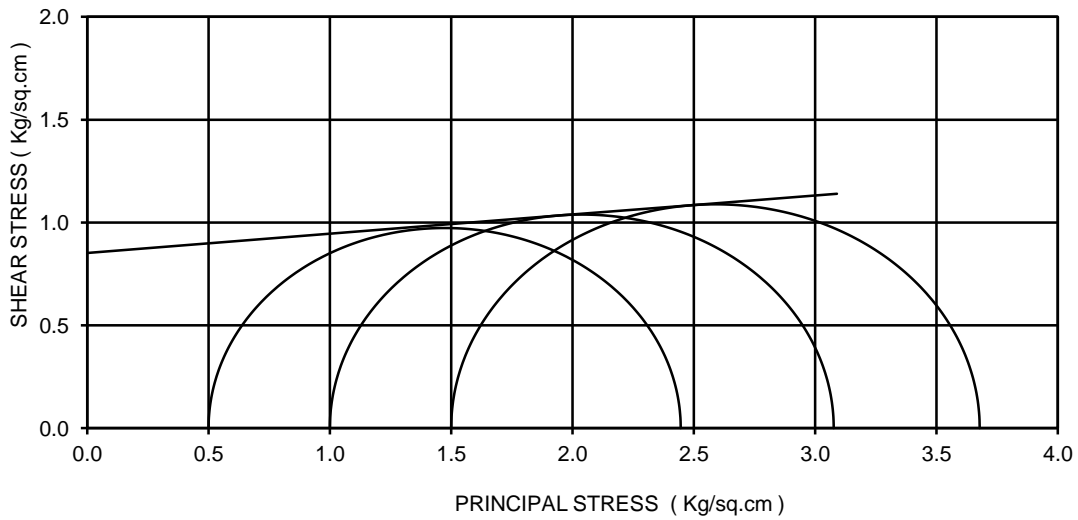
BORE HOLE NO: BH-CL
 CHAINAGE:41+100
 SAMPLE NO.: UDS-2
 DEPTH: 5.25m
 COHESION(C)= 1.12 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



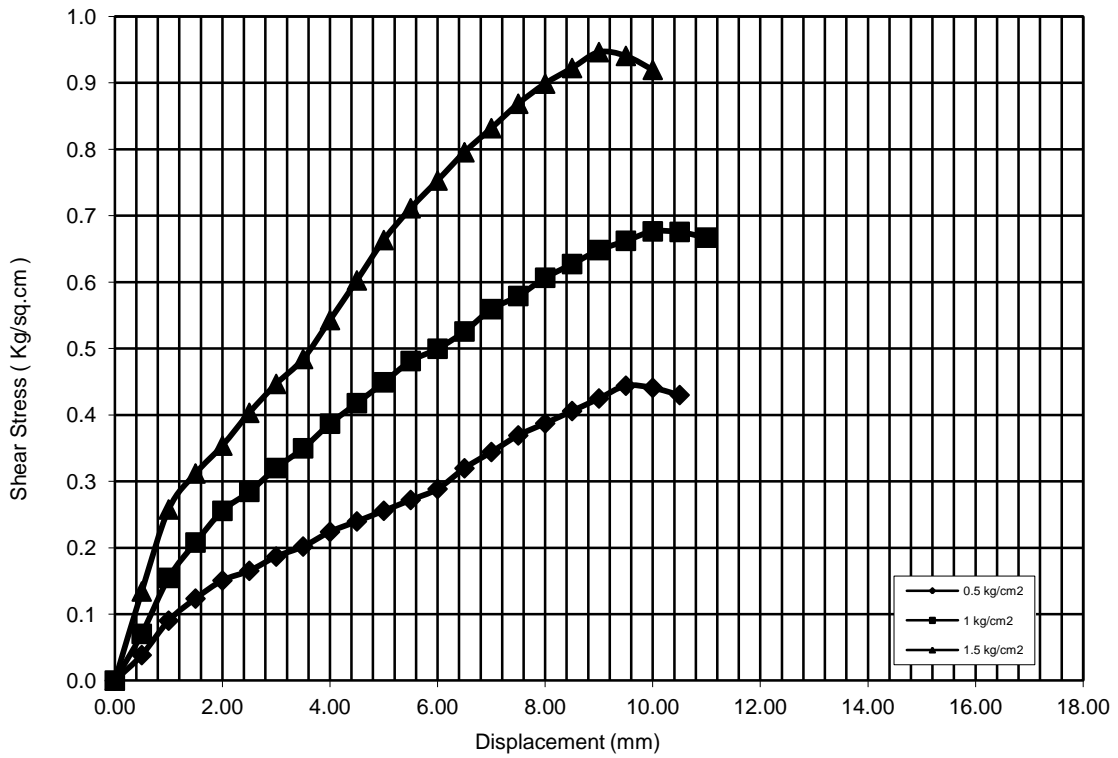
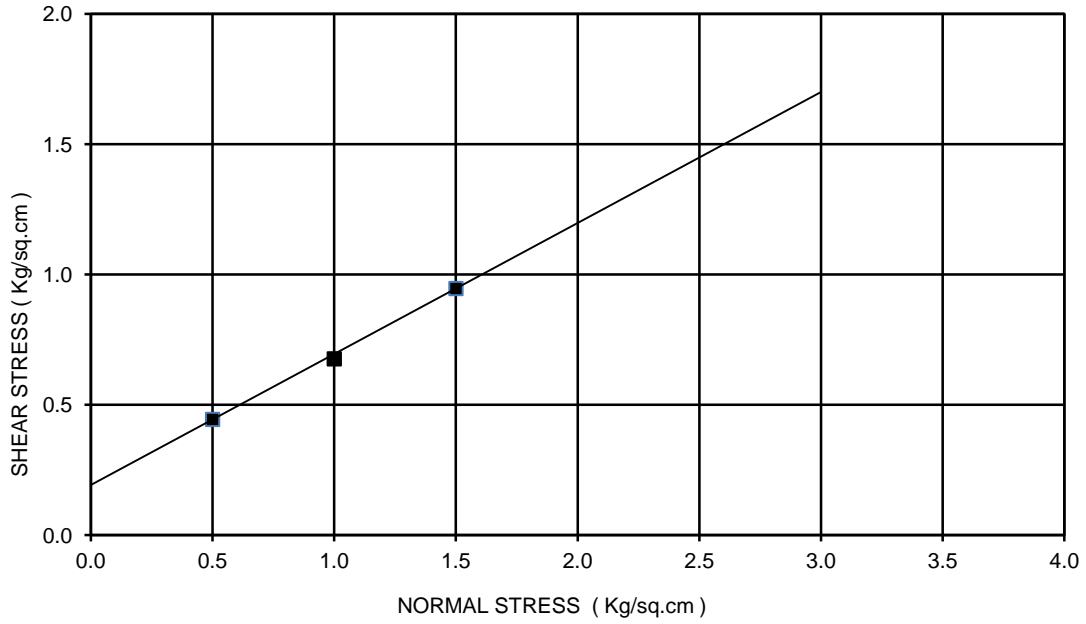
BORE HOLE NO: BH-CL
 CHAINAGE:41+217
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.00 kg/sq.cm
 ANGLE OF FRICTION(Phi): 30 deg
 TYPE OF THE TEST: DST



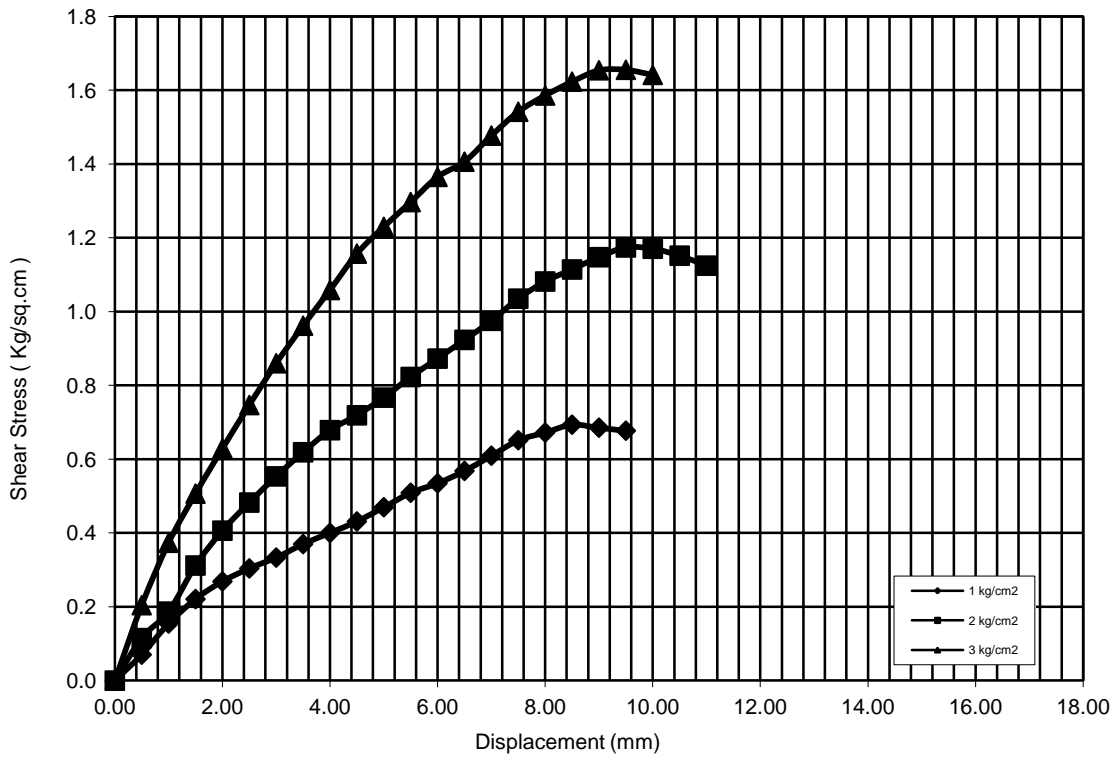
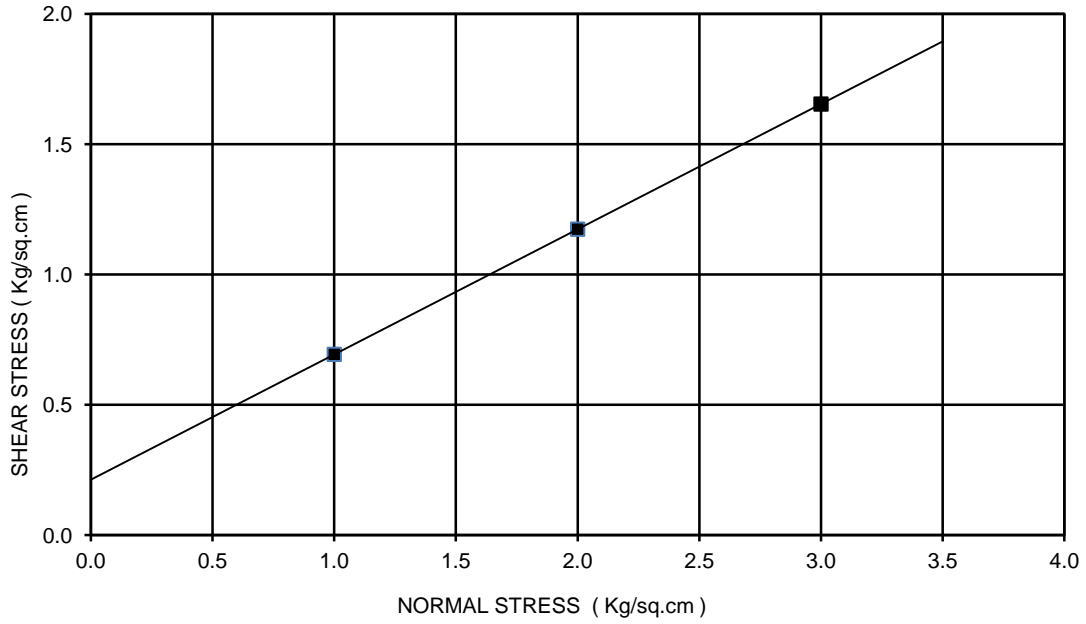
BORE HOLE NO: BH-CL
 CHAINAGE : 41+235
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.85 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



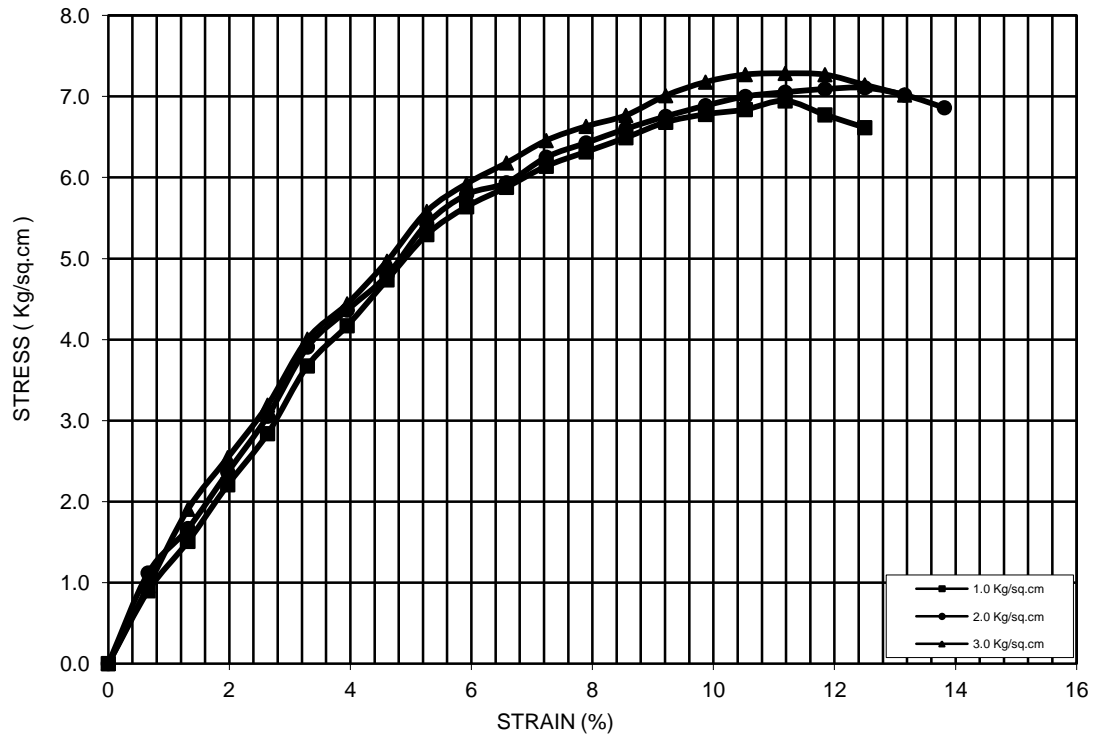
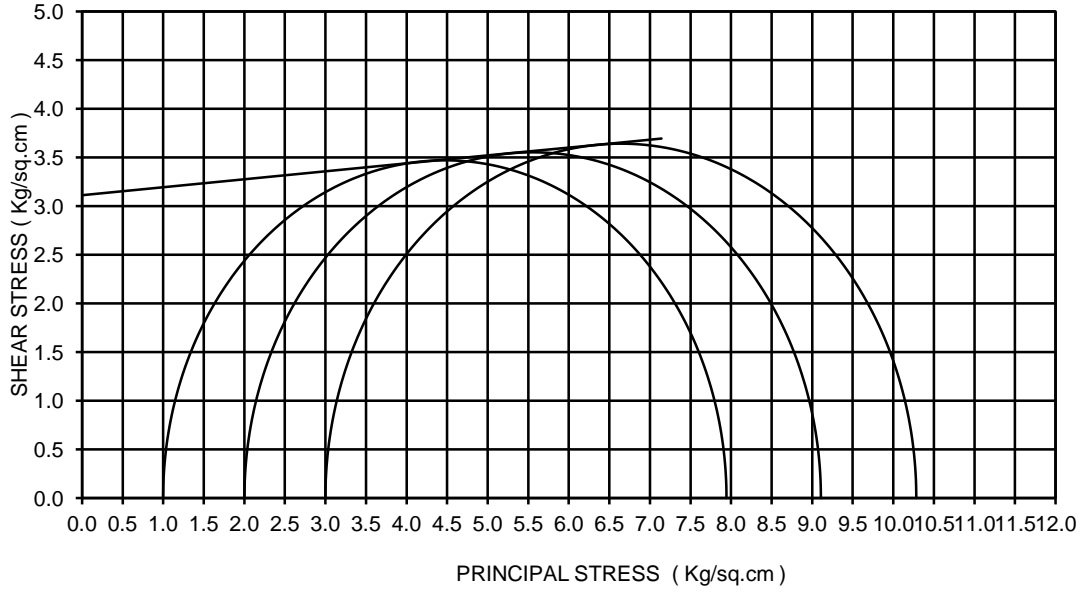
BORE HOLE NO: BH-A1
 CHAINAGE: 41+390
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



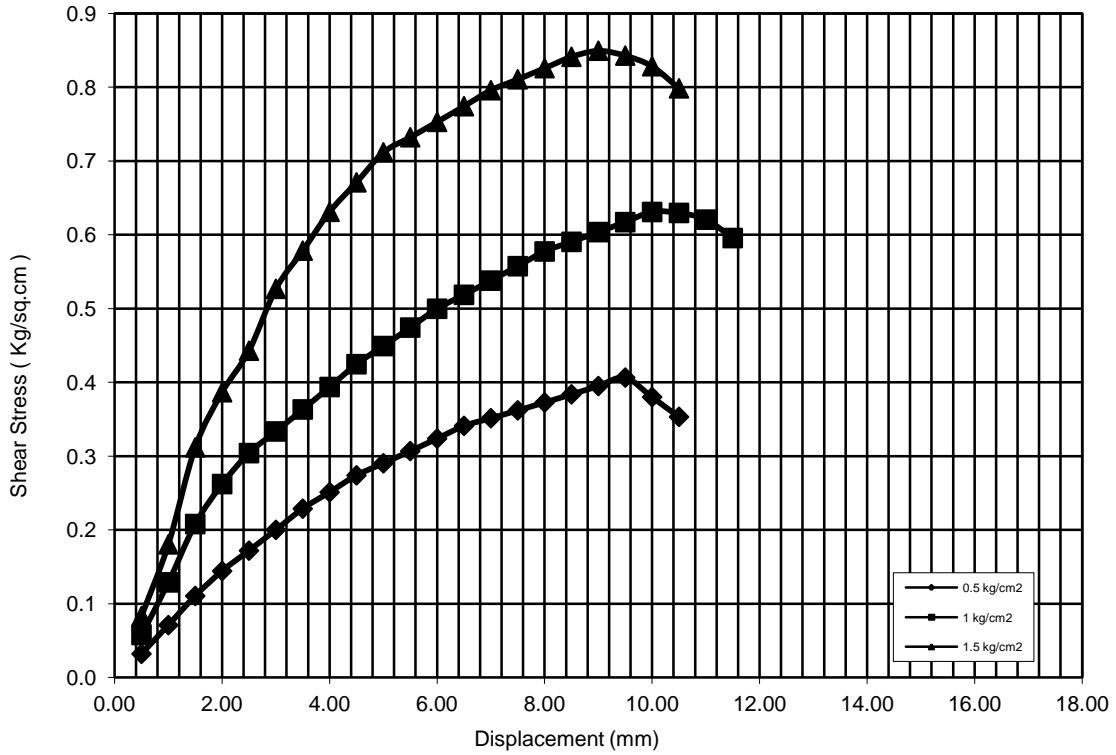
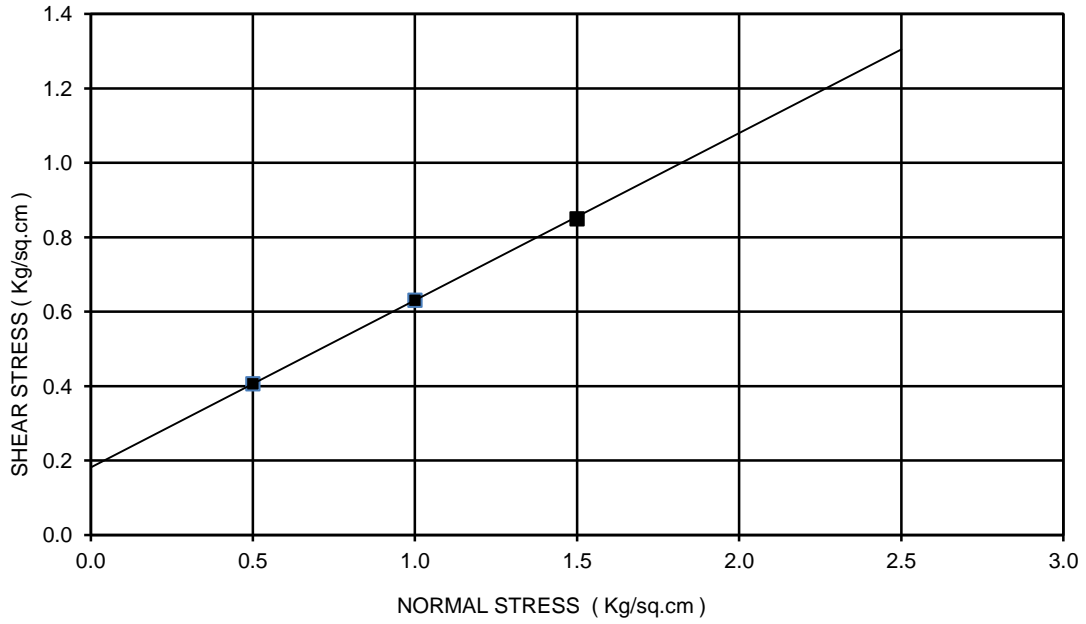
BORE HOLE NO: BH-A1
 CHAINAGE: 41+390
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



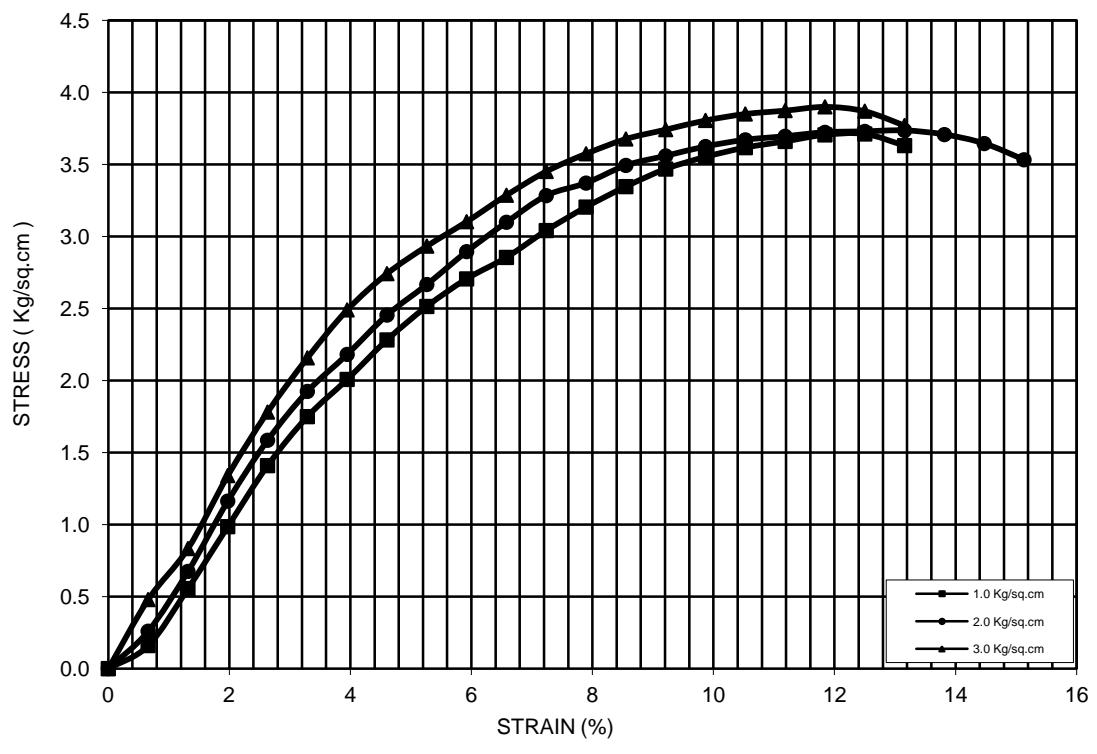
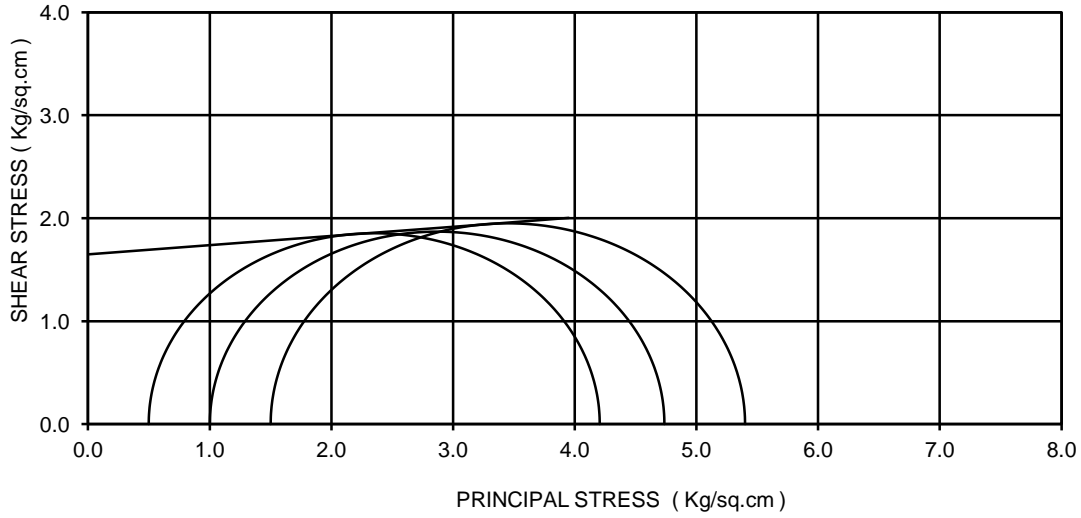
BORE HOLE NO: BH-A1
 CHAINAGE: 41+390
 SAMPLE NO.: UDS-2
 DEPTH: 7.00 m
 COHESION(C)= 1.19 kg/sq.cm
 ANGLE OF FRICTION(Phi): 6 deg
 TYPE OF THE TEST: UUT



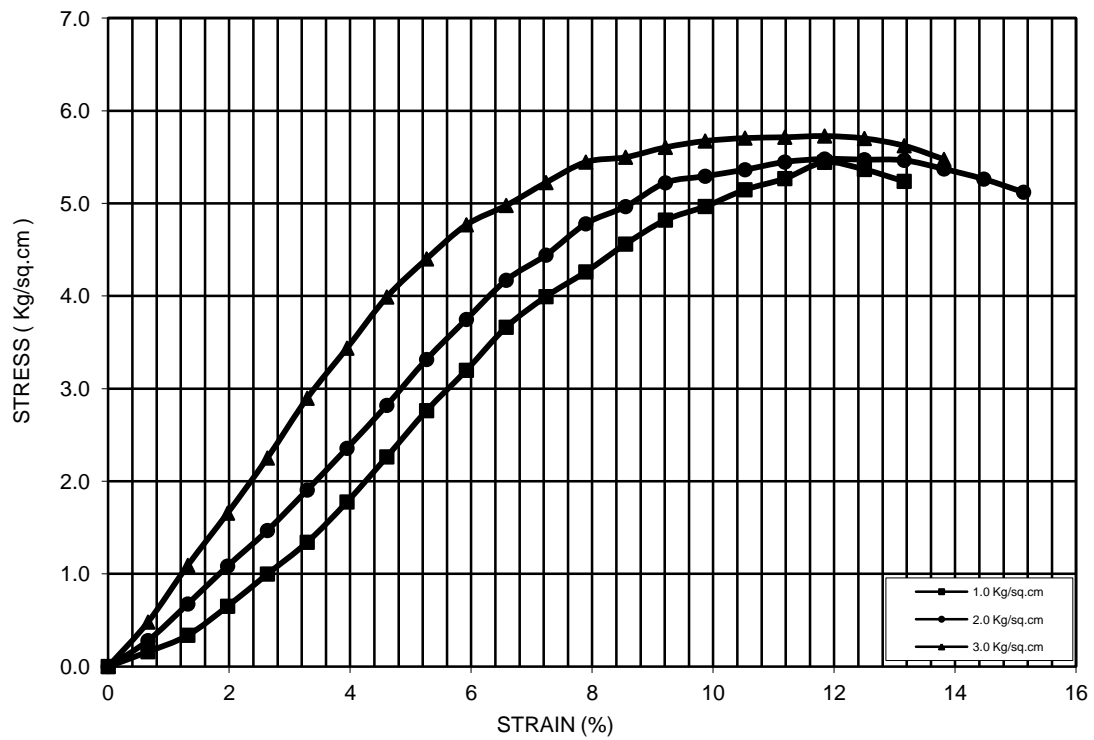
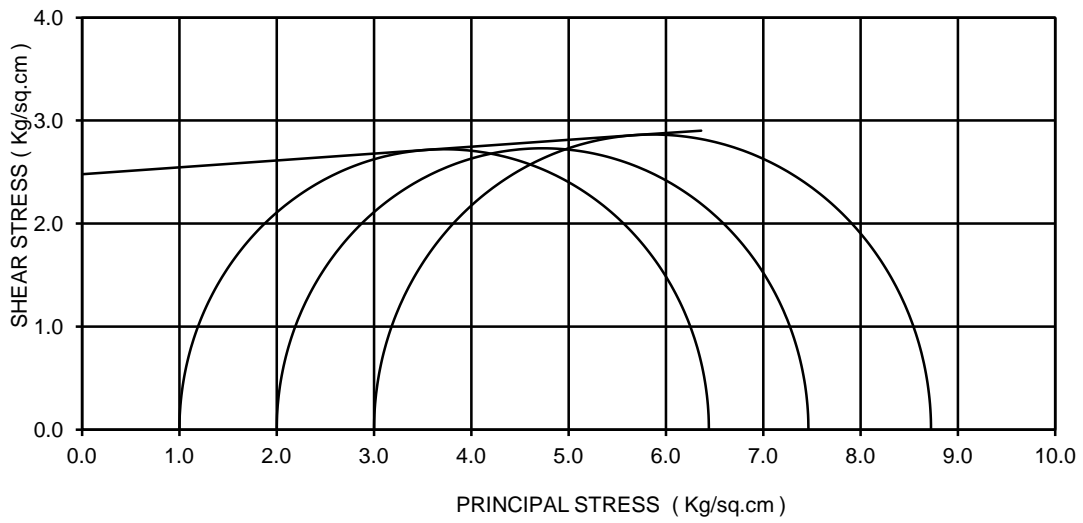
BORE HOLE NO: BH-A2
 CHAINAGE: 41+390
 SAMPLE NO.: SPT-14
 DEPTH: 22.50 m
 COHESION(C)= 0.2 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST+



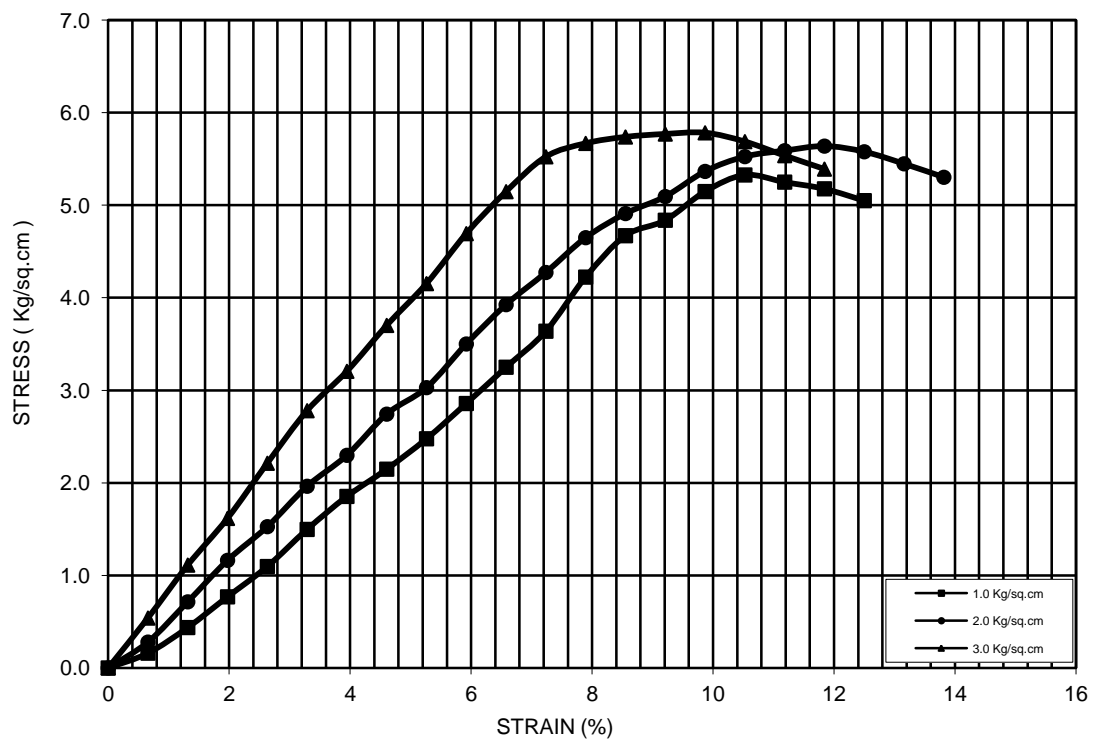
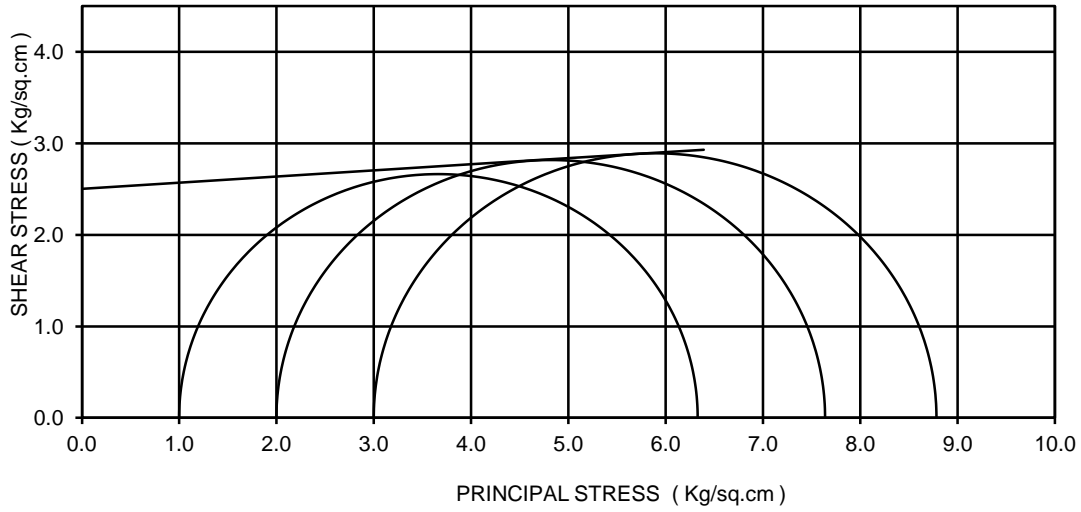
BORE HOLE NO: BH-A2
 CHAINAGE: 41+390
 SAMPLE NO.: SPT-28
 DEPTH: 43.50 m
 COHESION(C)= 1.5 kg/sq.cm
 ANGLE OF FRICTION(Phi): 13 deg
 TYPE OF THE TEST: UUT+



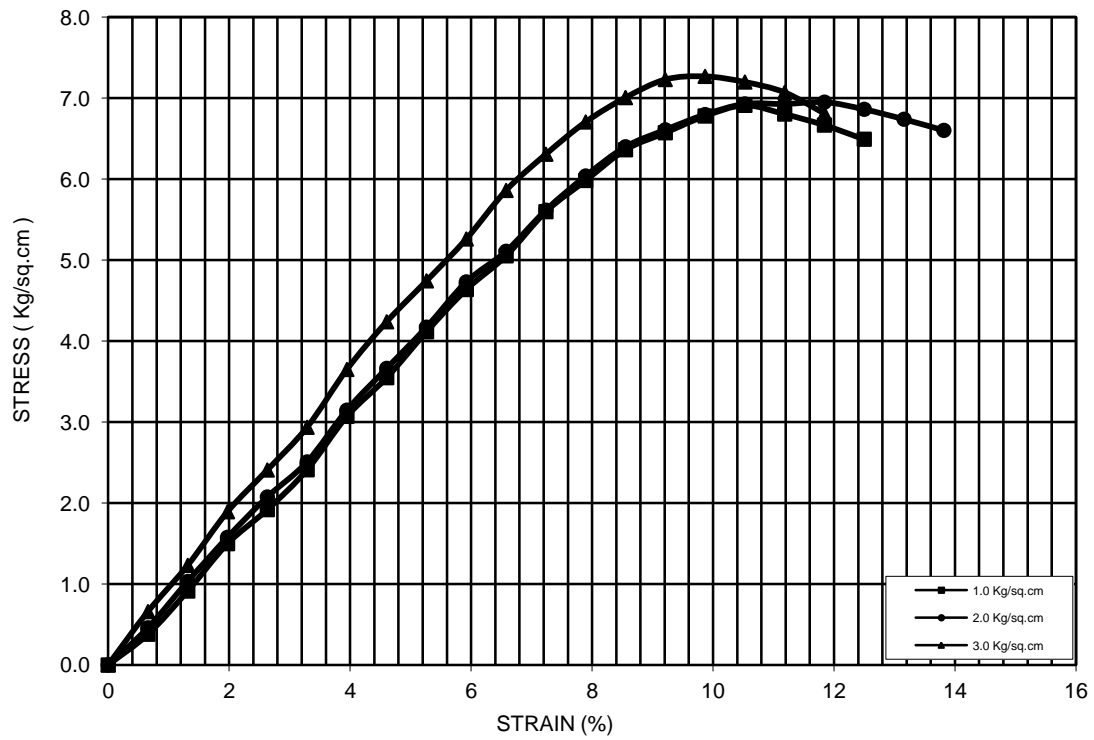
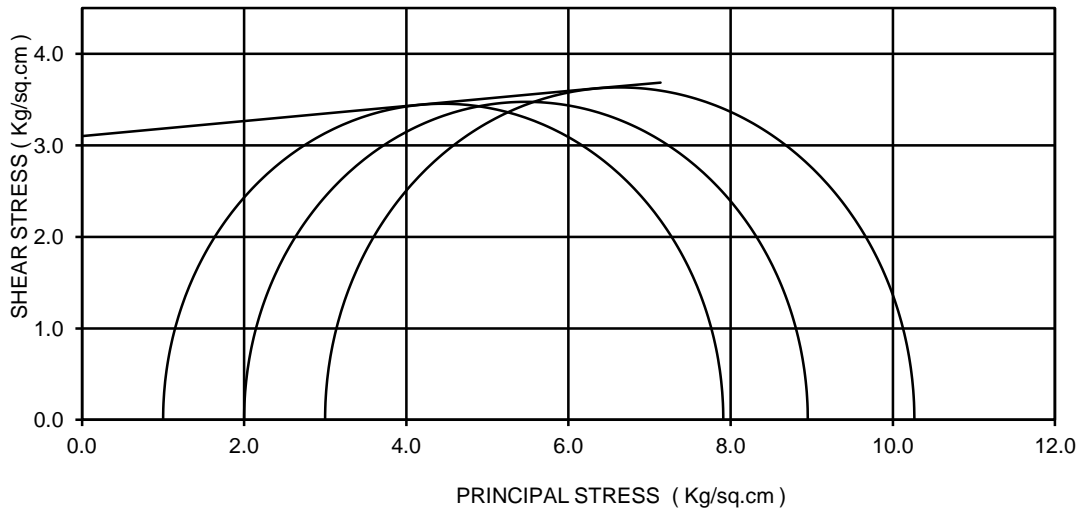
BORE HOLE NO: BH-A2
 CHAINAGE: 41+390
 SAMPLE NO.: DS-2
 DEPTH: 43.00 m
 COHESION(C)= 1.32 kg/sq.cm
 ANGLE OF FRICTION(Phi): 9 deg
 TYPE OF THE TEST: UUT+



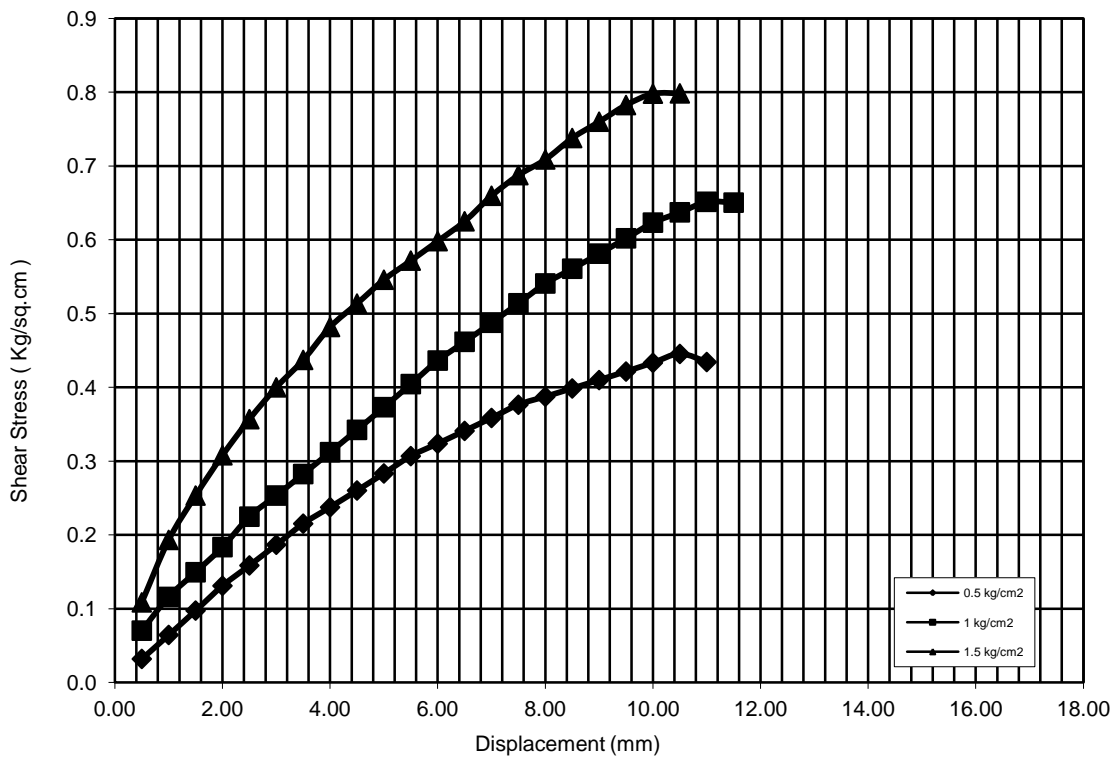
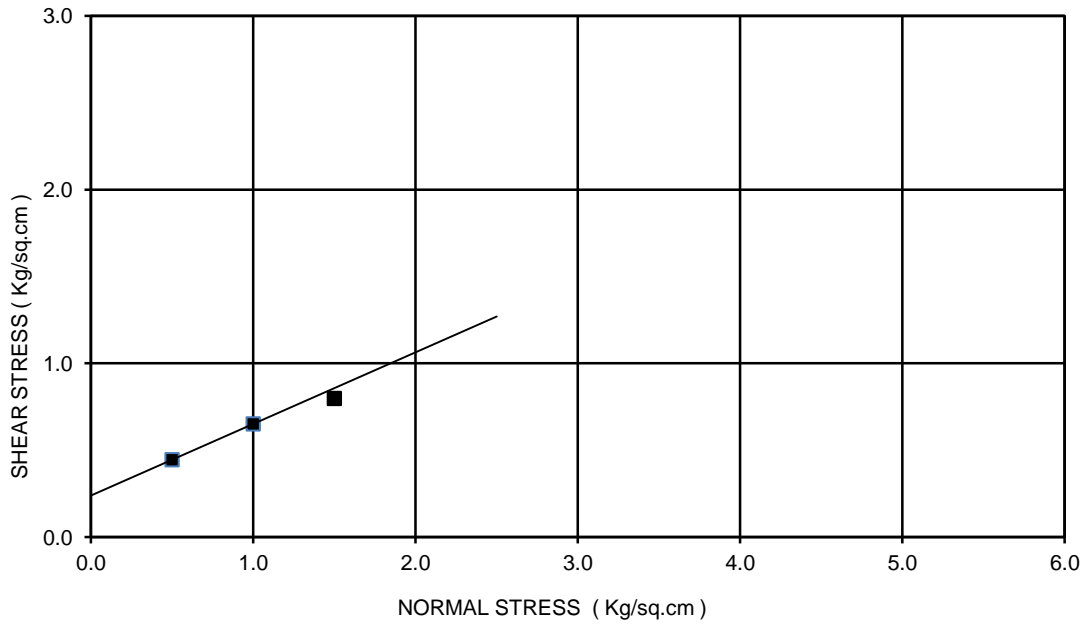
BORE HOLE NO: BH-A2
 CHAINAGE: 41+390
 SAMPLE NO.: SPT-28
 DEPTH: 43.50 m
 COHESION(C)= 1.15 kg/sq.cm
 ANGLE OF FRICTION(Phi): 9 deg
 TYPE OF THE TEST: UUT+



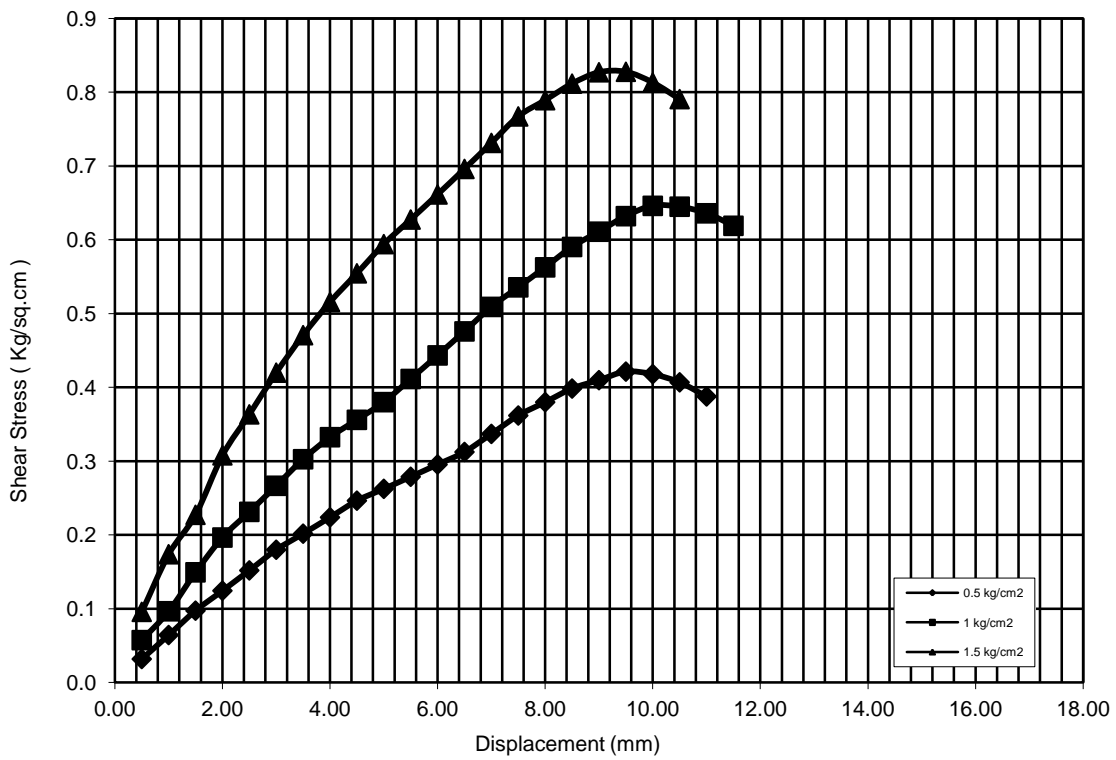
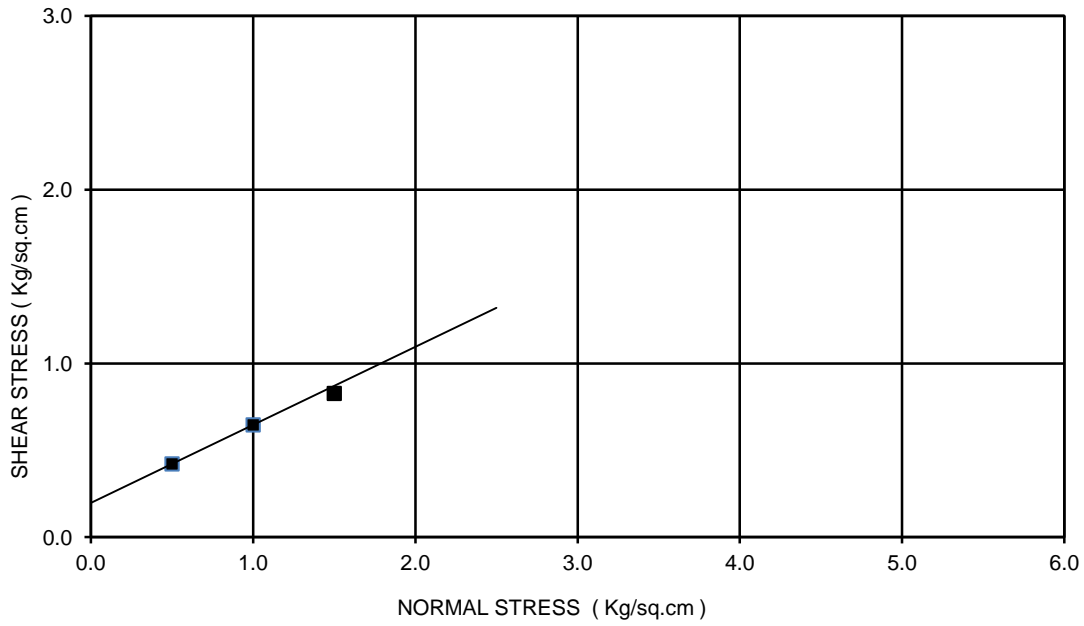
BORE HOLE NO: BH-A2
 CHAINAGE: 41+390
 SAMPLE NO.: UDS-8
 DEPTH: 23.50 m
 COHESION(C)= 1.74 kg/sq.cm
 ANGLE OF FRICTION(Phi): 9 deg
 TYPE OF THE TEST: UUT



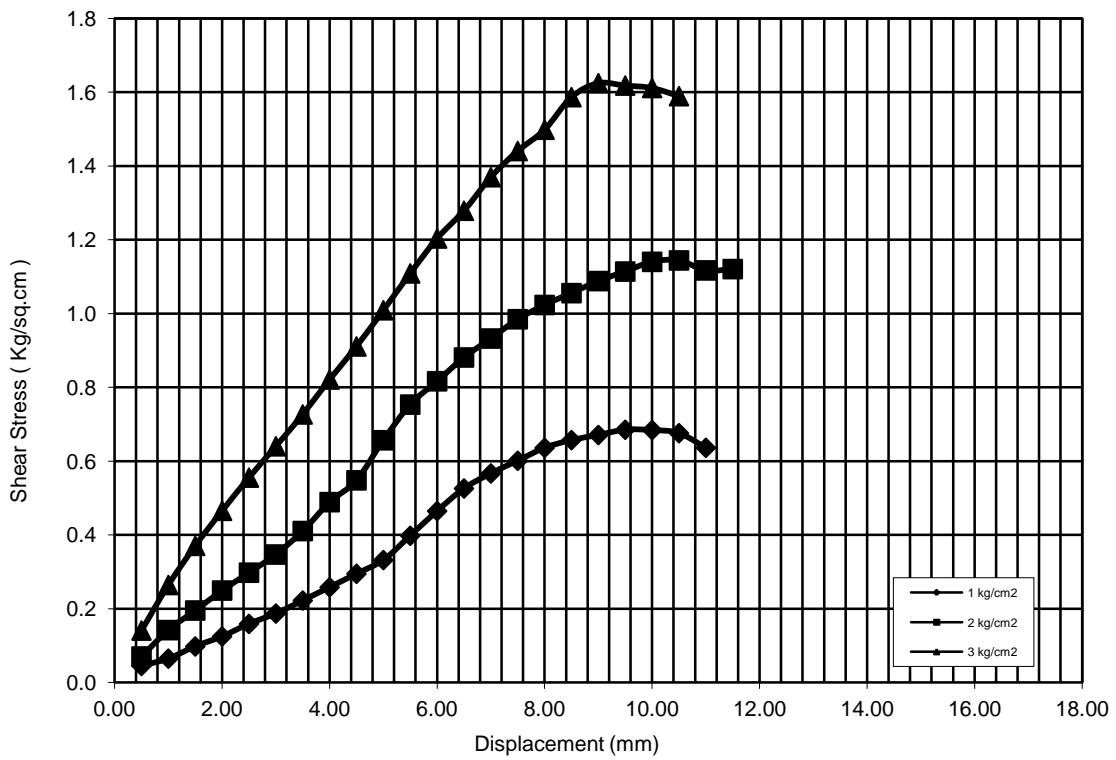
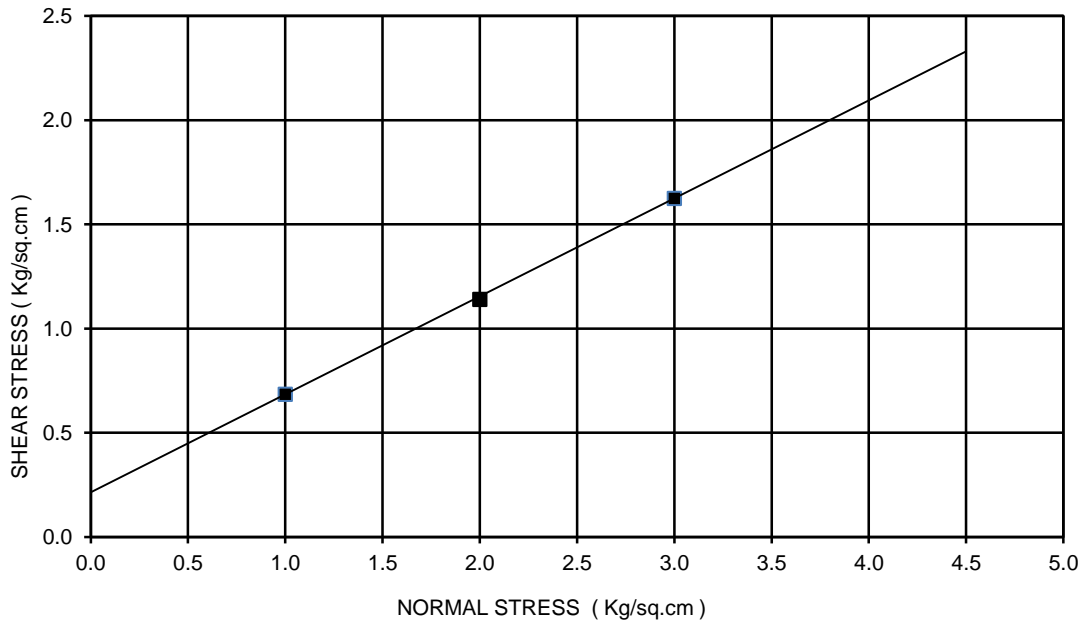
BORE HOLE NO: BH-A1
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-2
 DEPTH: 7.00 m
 COHESION(C)= 0.25 kg/sq.cm
 ANGLE OF FRICTION(Phi): 20 deg
 TYPE OF THE TEST: DST



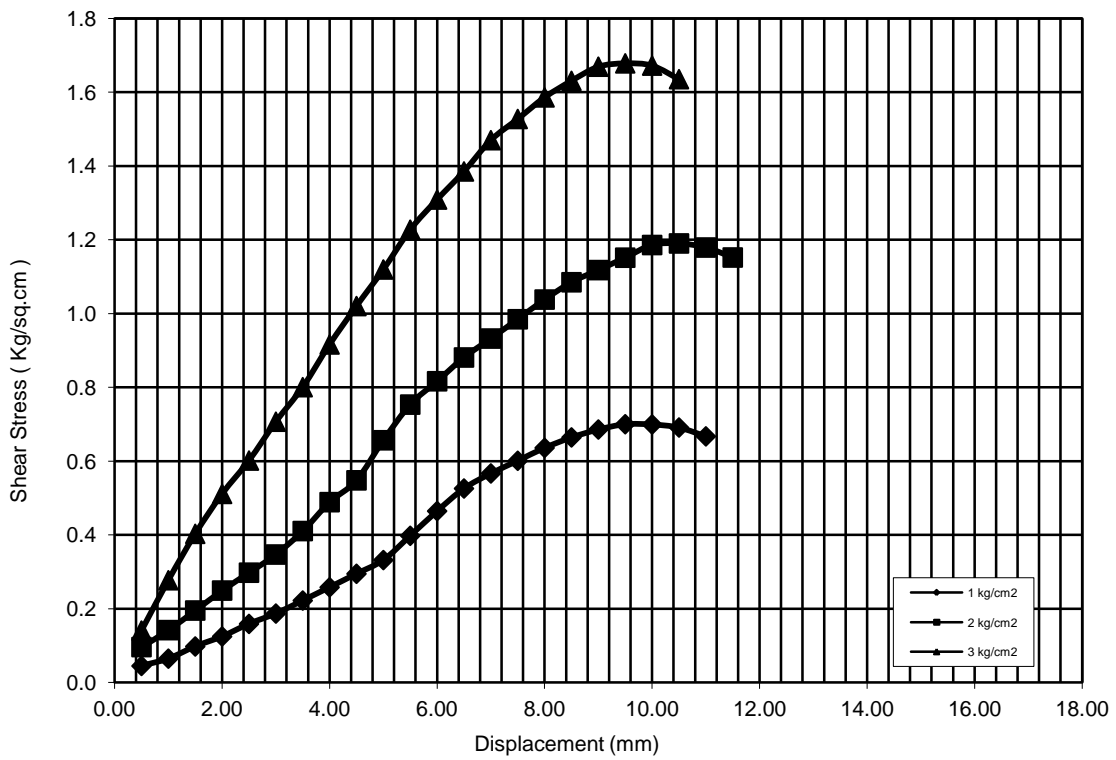
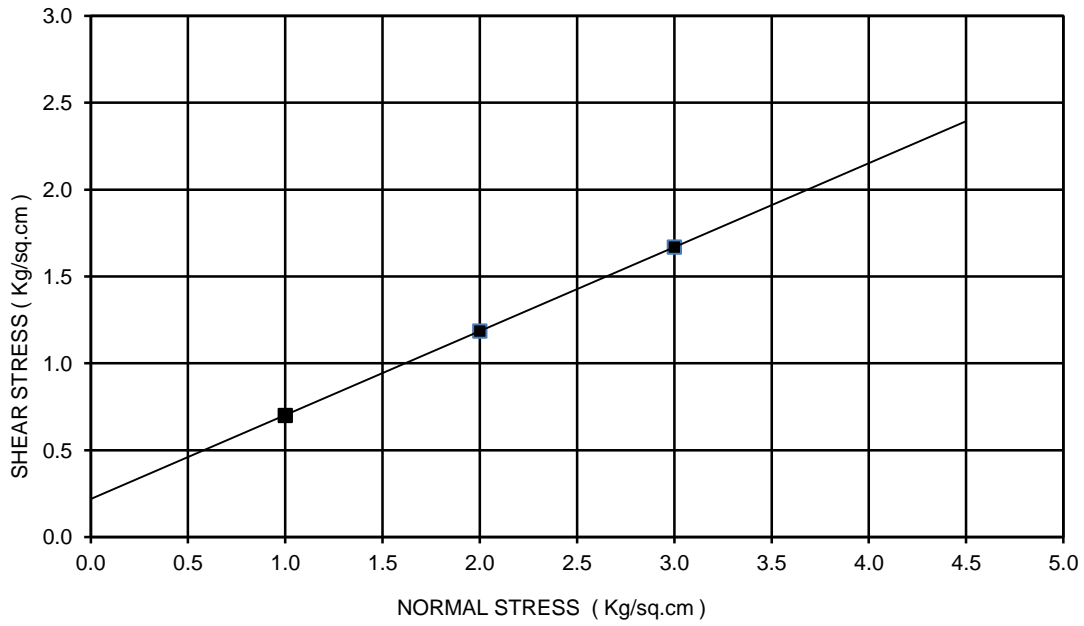
BORE HOLE NO: BH-A1
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-3
 DEPTH: 13.00 m
 COHESION(C)= 0.14 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



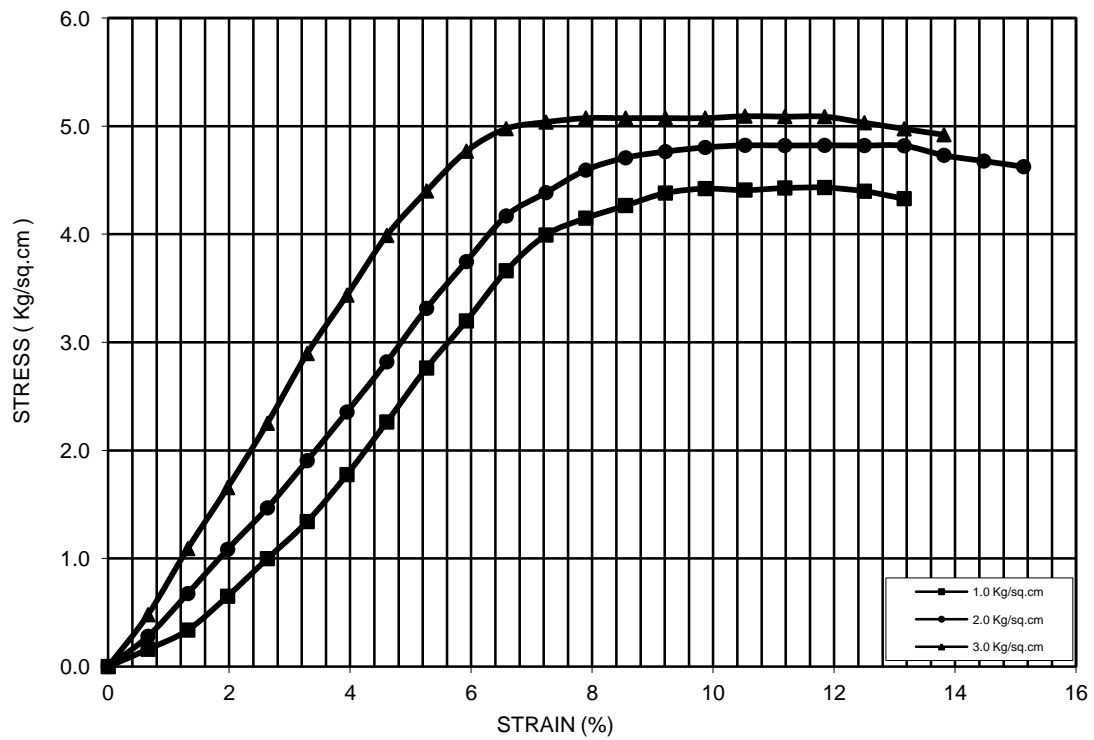
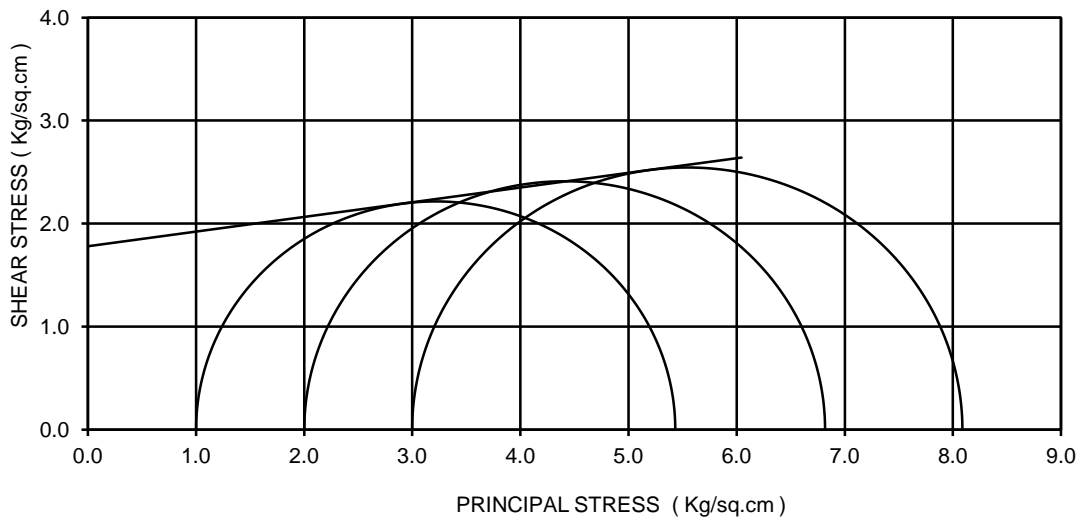
BORE HOLE NO: BH-A1
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-5
 DEPTH: 14.50 m
 COHESION(C)= 0.27 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST+



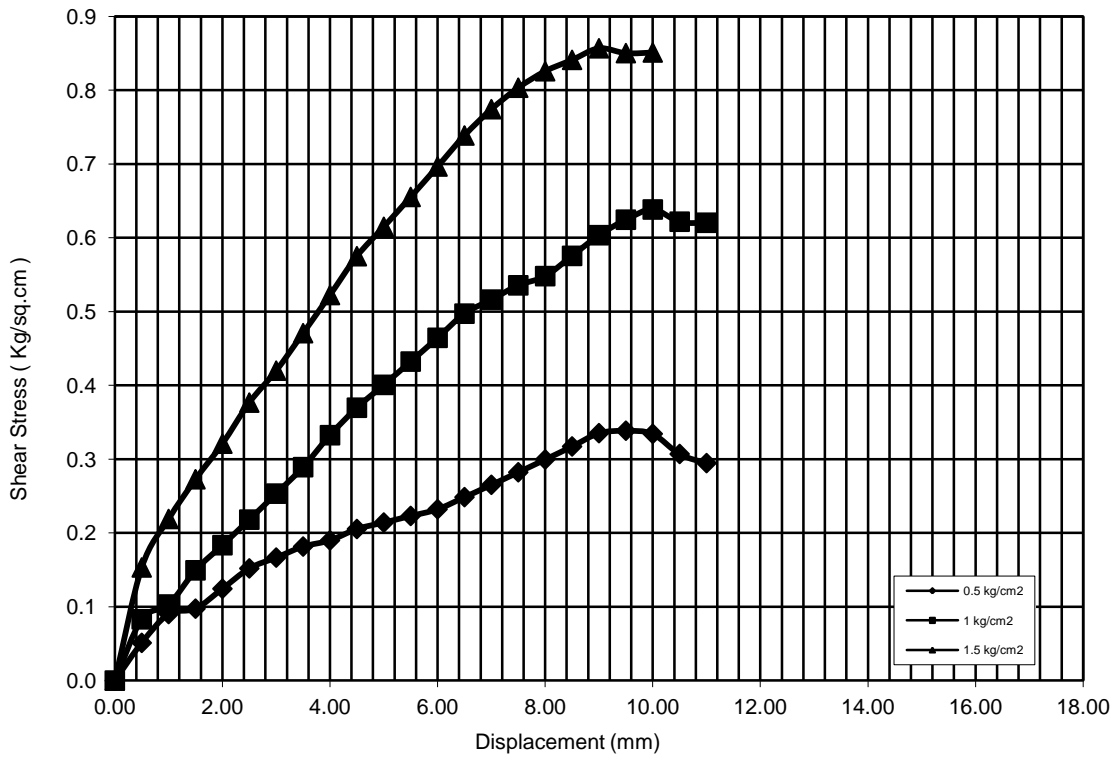
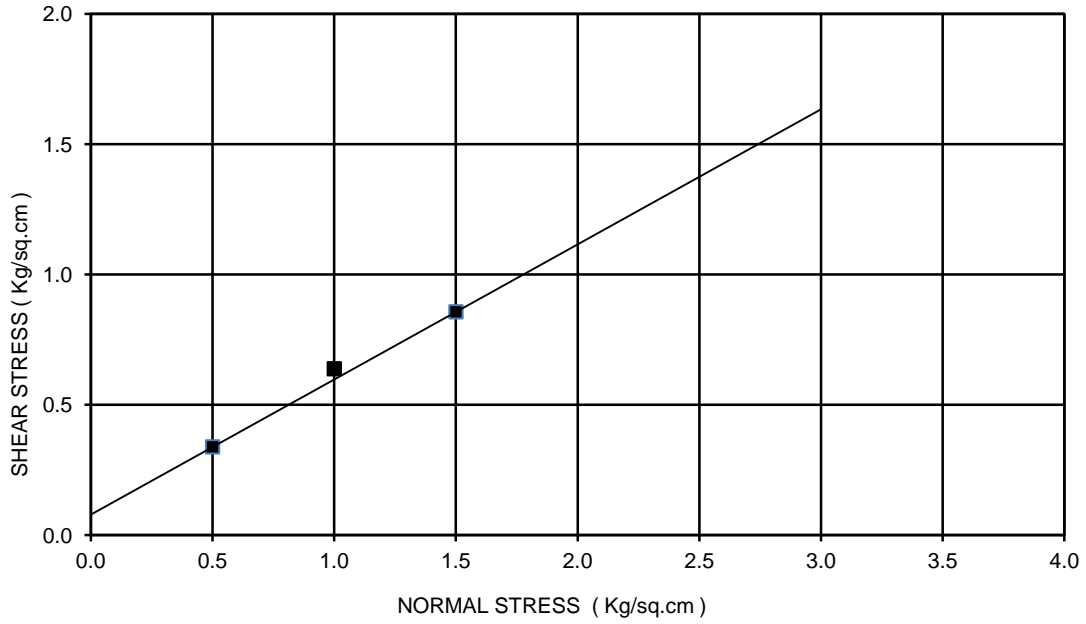
BORE HOLE NO: BH-A1
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-7
 DEPTH: 20.50 m
 COHESION(C)= 0.29 kg/sq.cm
 ANGLE OF FRICTION(Phi): 23 deg
 TYPE OF THE TEST: DST



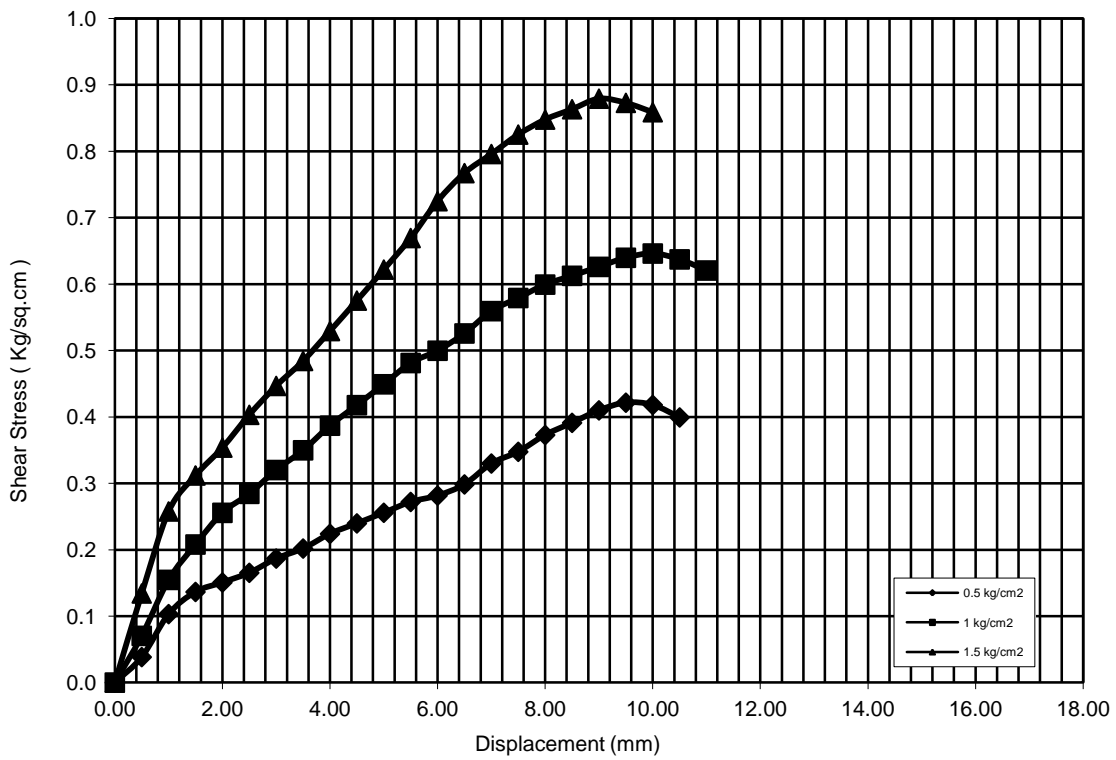
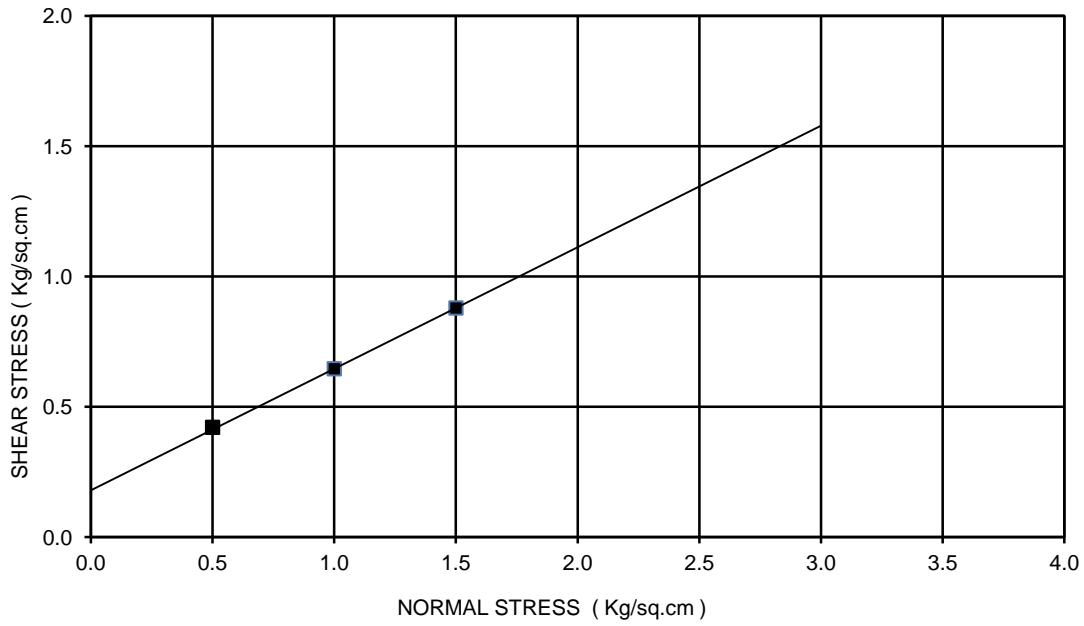
BORE HOLE NO: BH-A1
 CHAINAGE: 42+256
 SAMPLE NO.: DS-2
 DEPTH: 43.00 m
 COHESION(C)= 1.32 kg/sq.cm
 ANGLE OF FRICTION(Phi): 9 deg
 TYPE OF THE TEST: UUT+



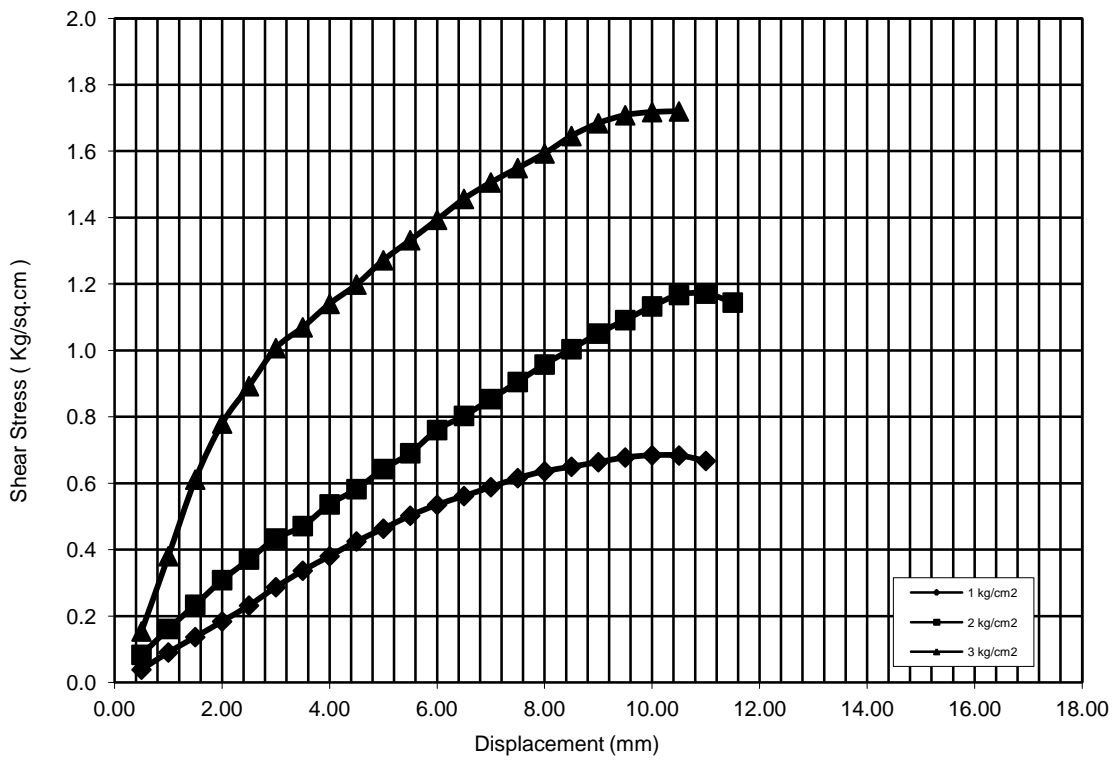
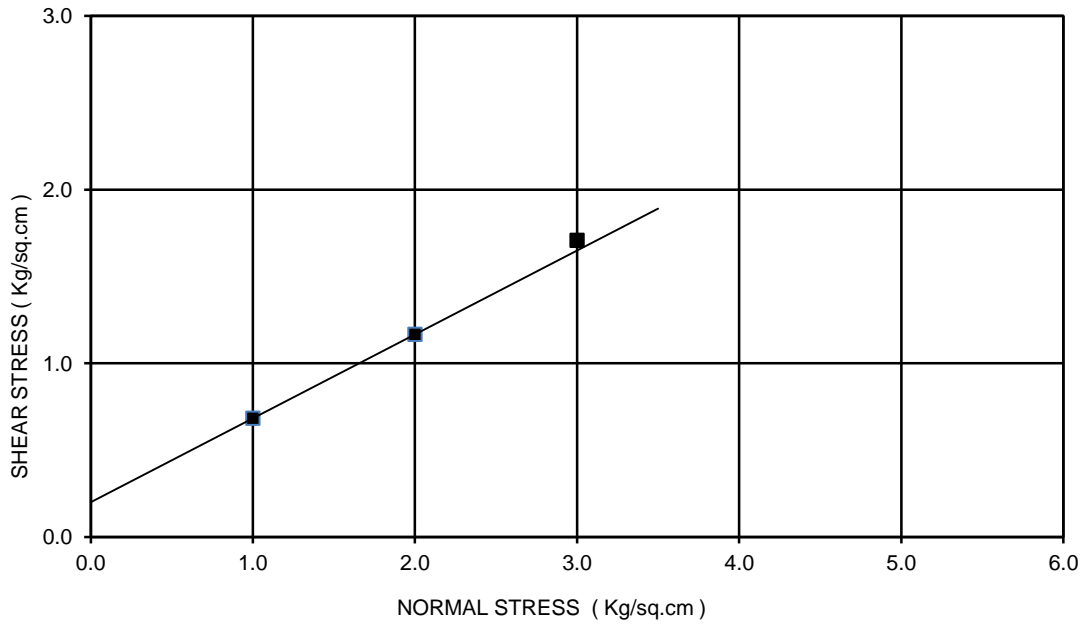
BORE HOLE NO: BH-P2
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



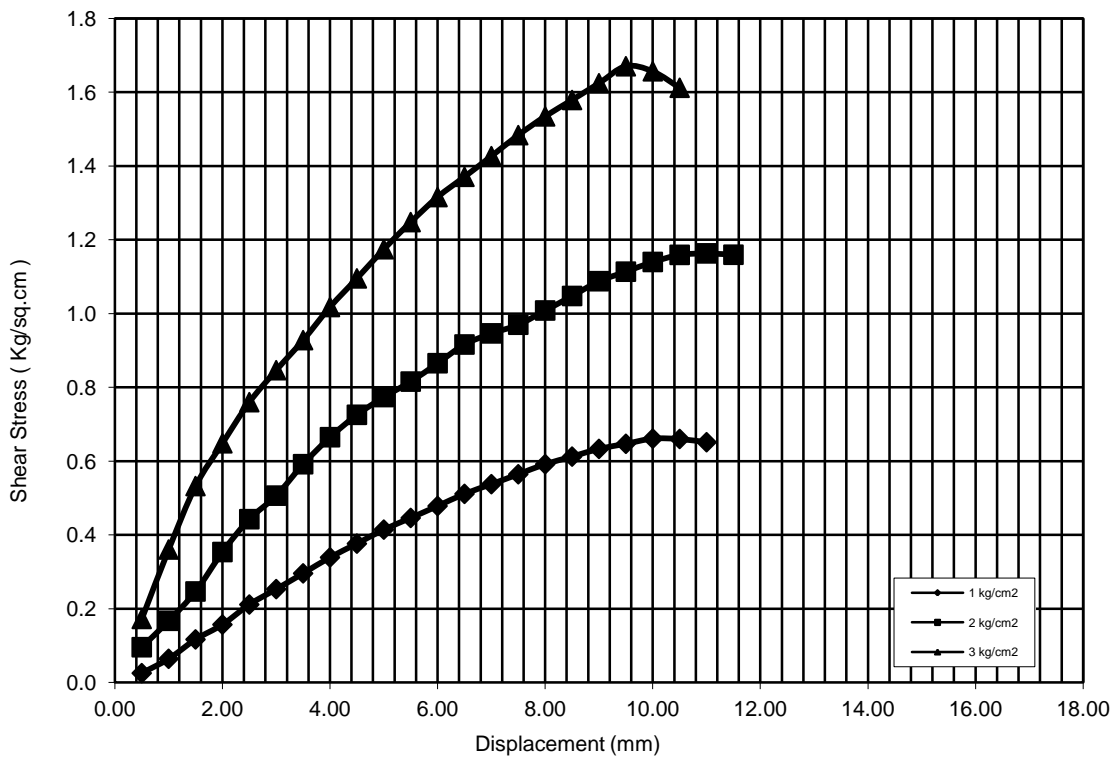
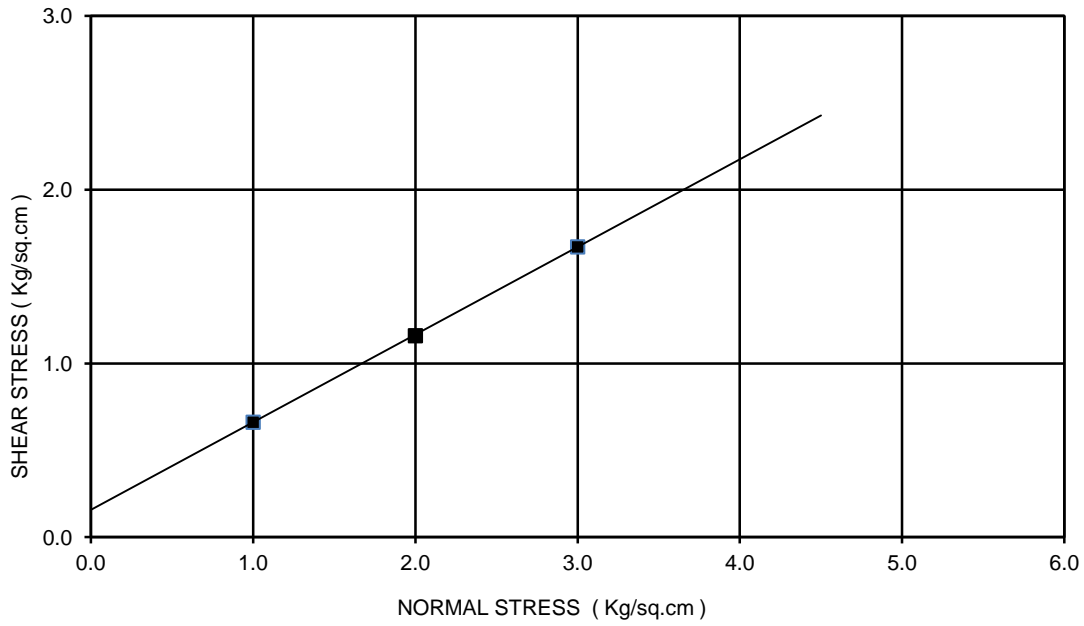
BORE HOLE NO: BH-P2
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-3
 DEPTH: 7 m
 COHESION(C)= 0.2 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



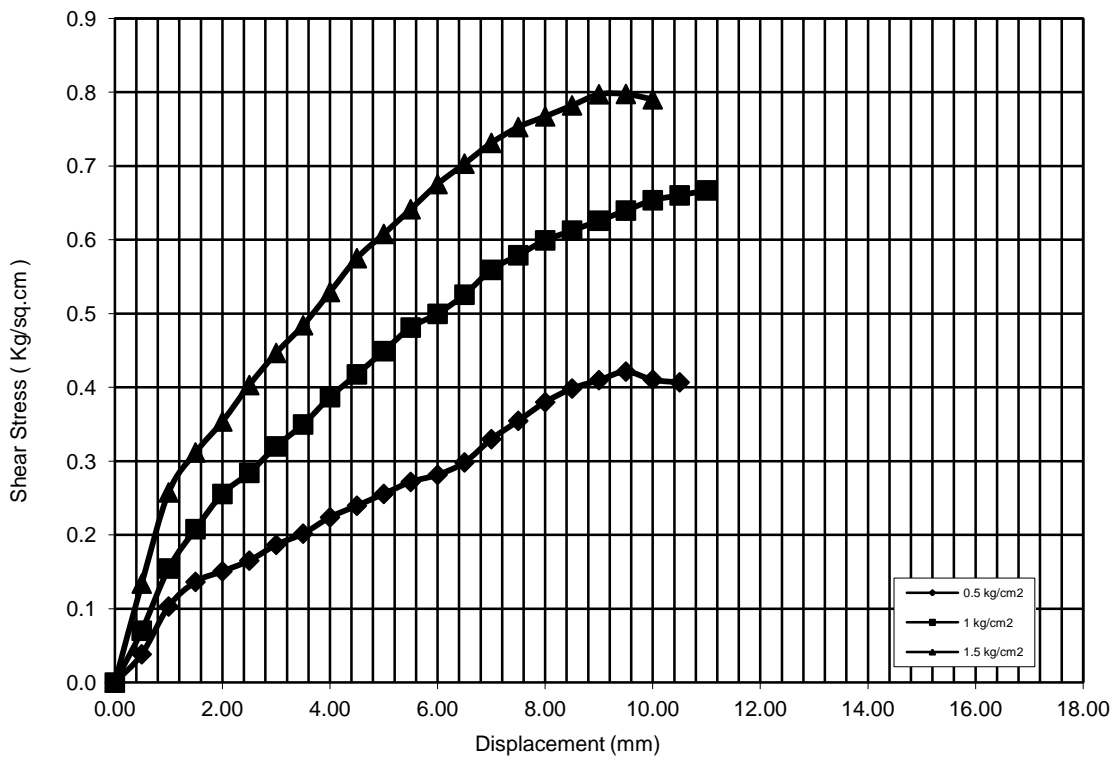
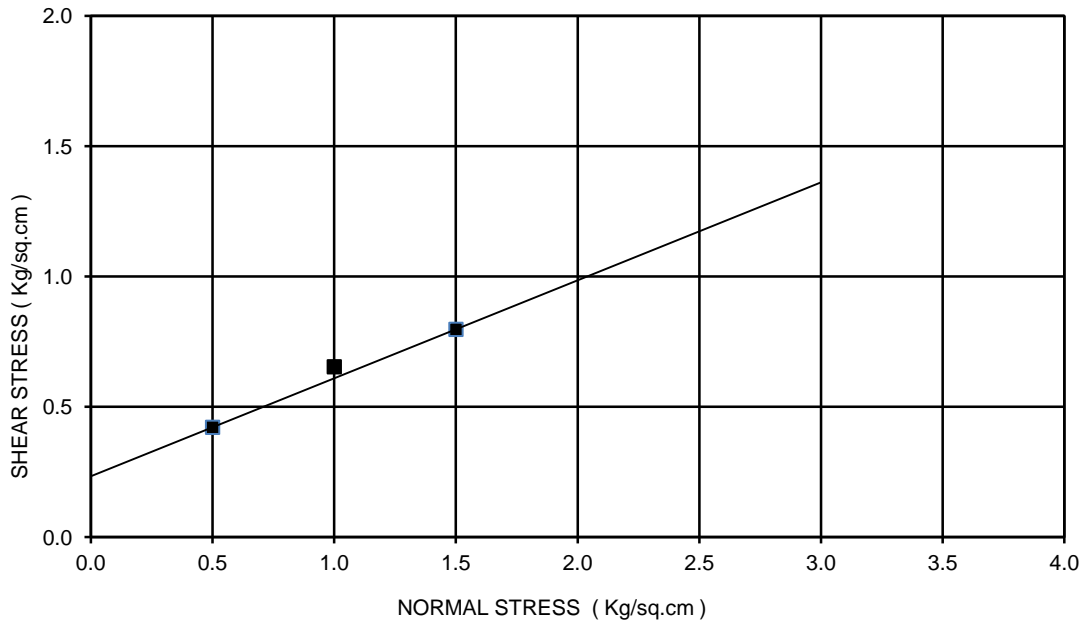
BORE HOLE NO: BH-P2
 CHAINAGE: 42+256
 SAMPLE NO.: SPT-9
 DEPTH: 15.00 m
 COHESION(C)= 0.06 kg/sq.cm
 ANGLE OF FRICTION(Phi): 29 deg
 TYPE OF THE TEST: DST



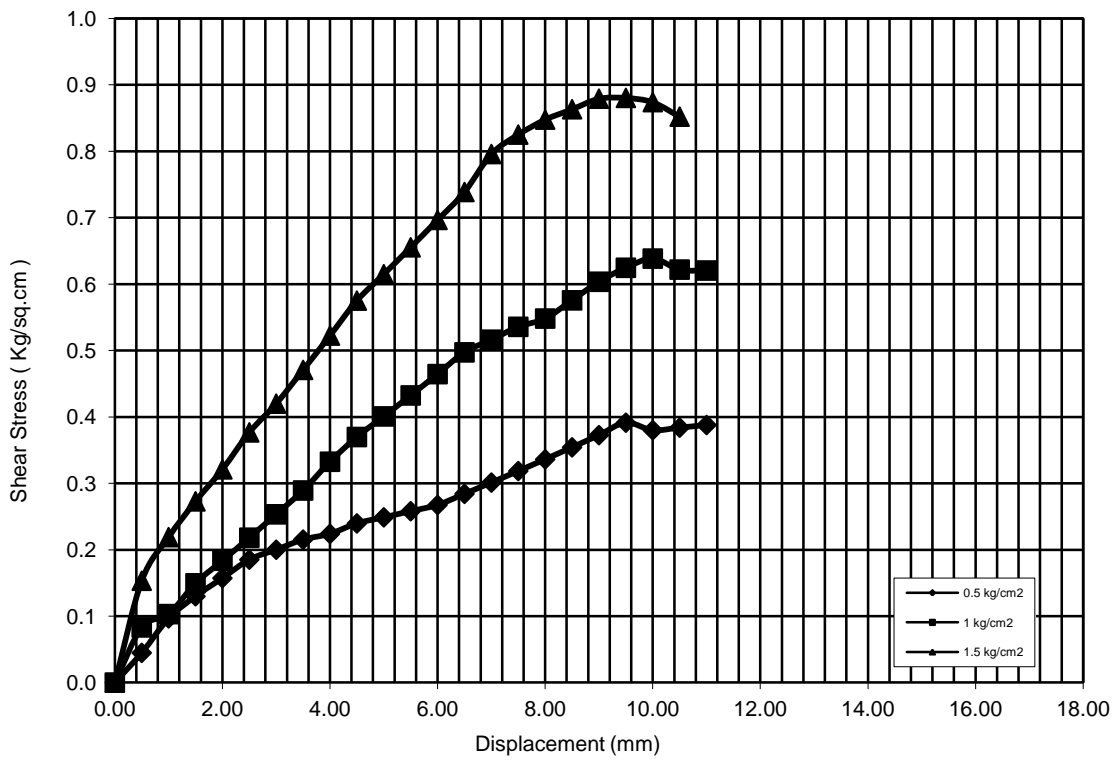
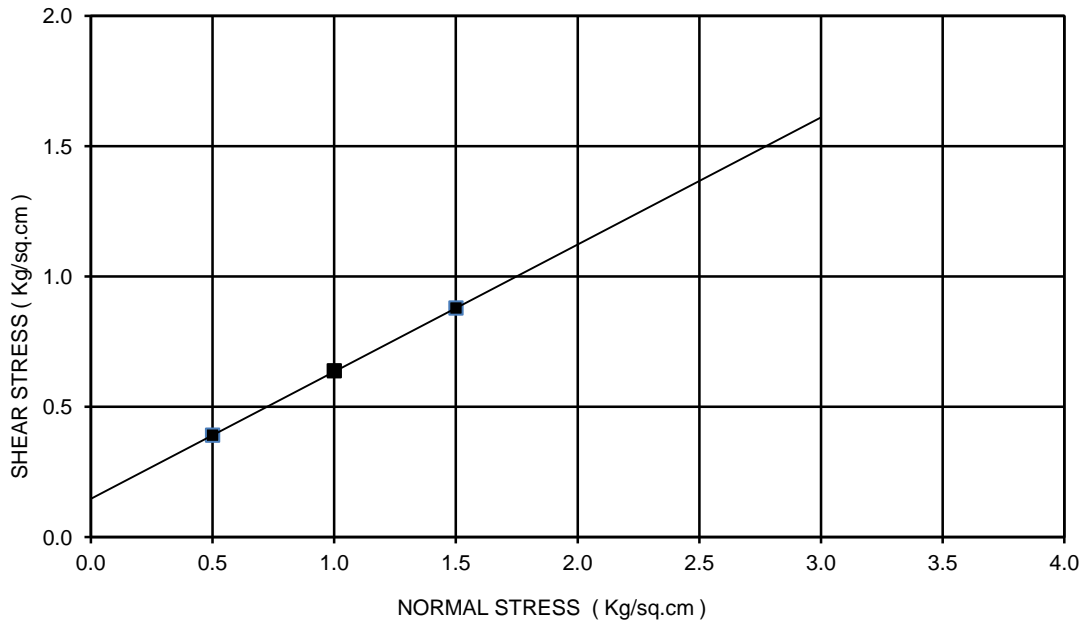
BORE HOLE NO: BH-P2
 CHAINAGE: 42+256
 SAMPLE NO.: SPT-17
 DEPTH: 27.00 m
 COHESION(C)= 0.04 kg/sq.cm
 ANGLE OF FRICTION(Phi): 30 deg
 TYPE OF THE TEST: DST+



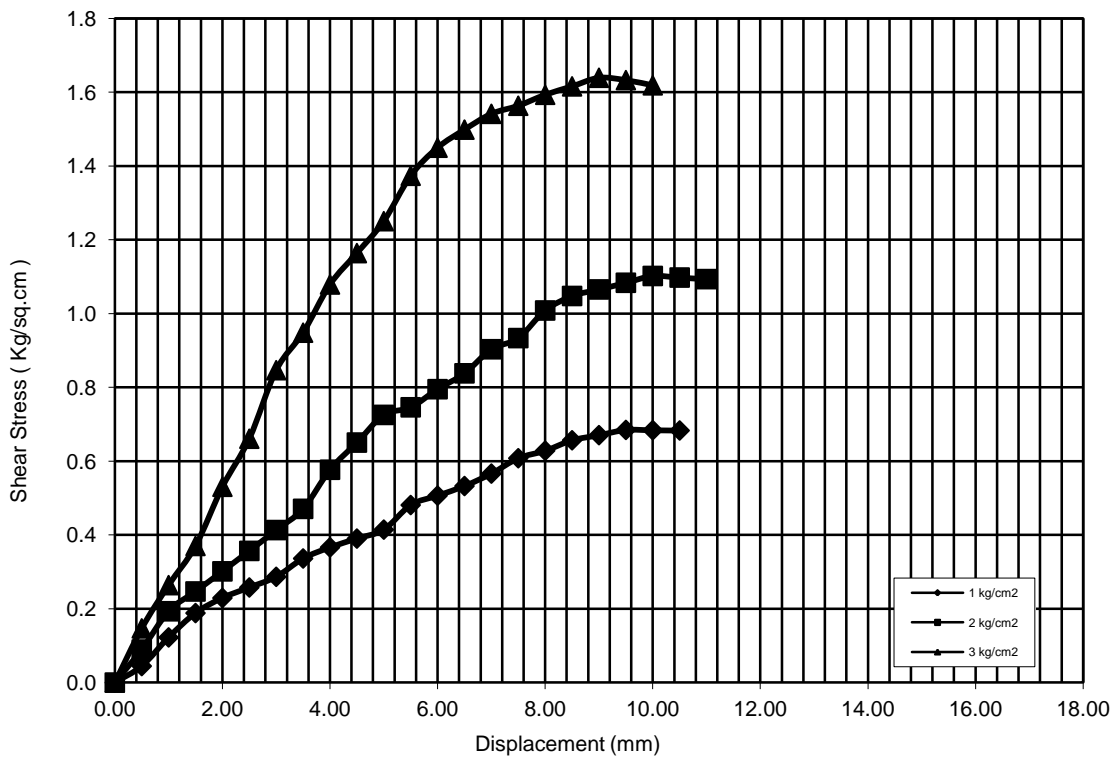
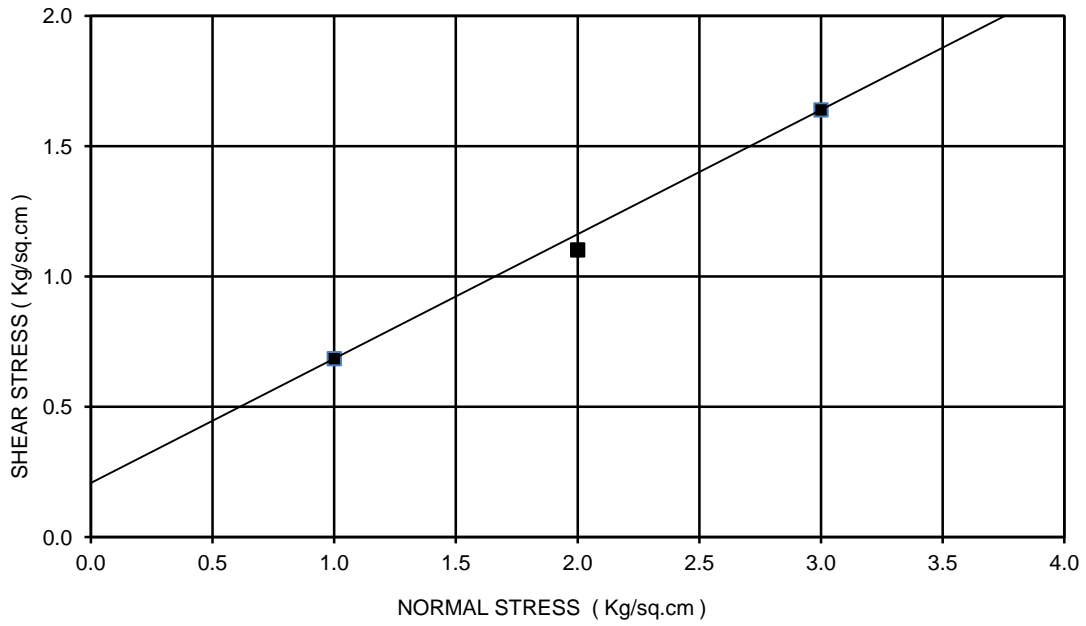
BORE HOLE NO: BH-P3
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



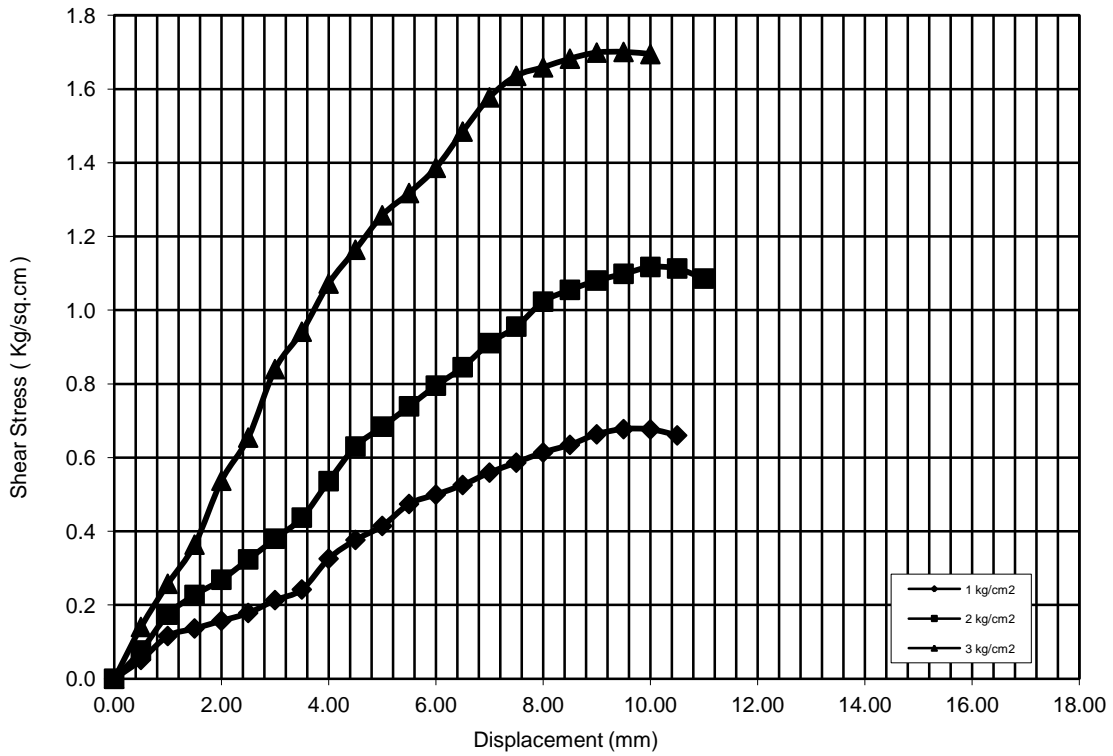
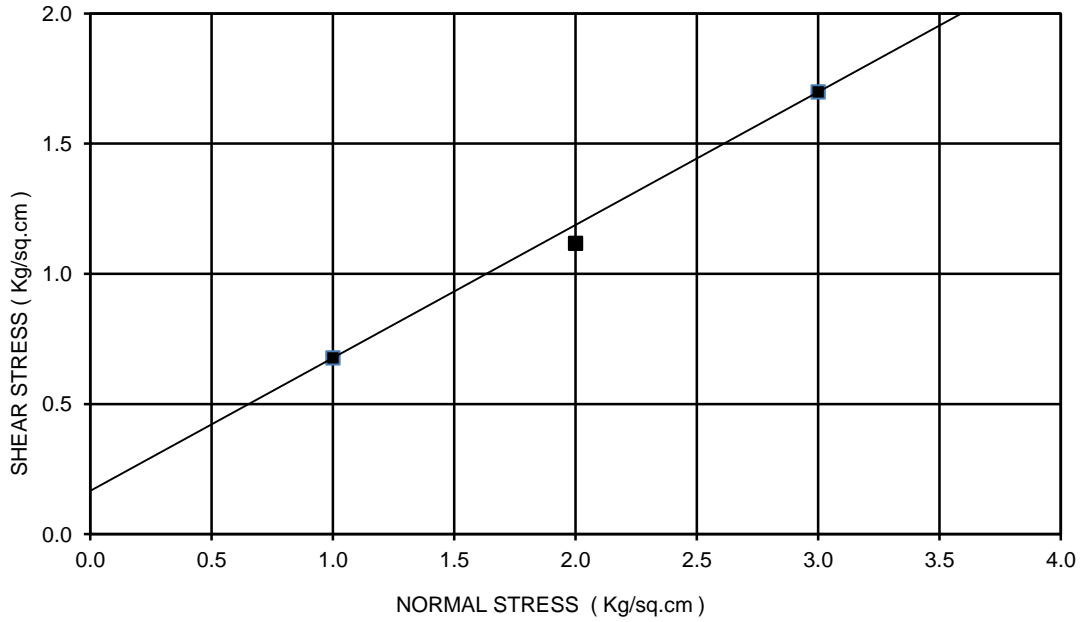
BORE HOLE NO: BH-P3
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



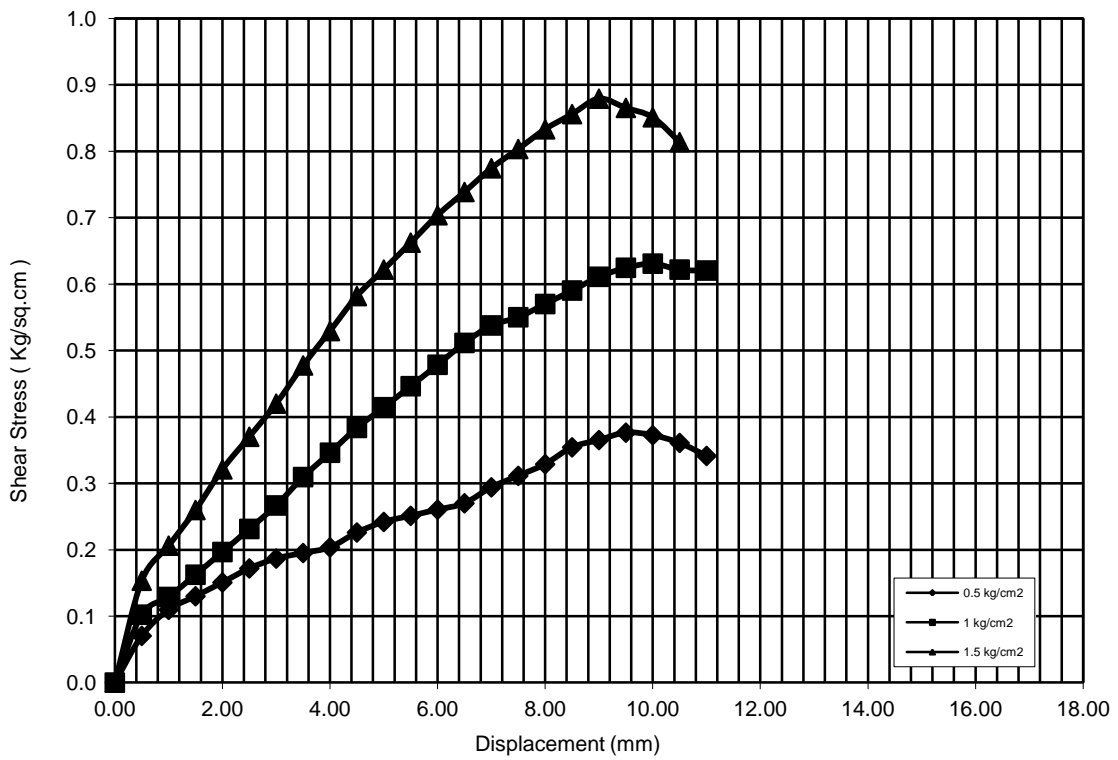
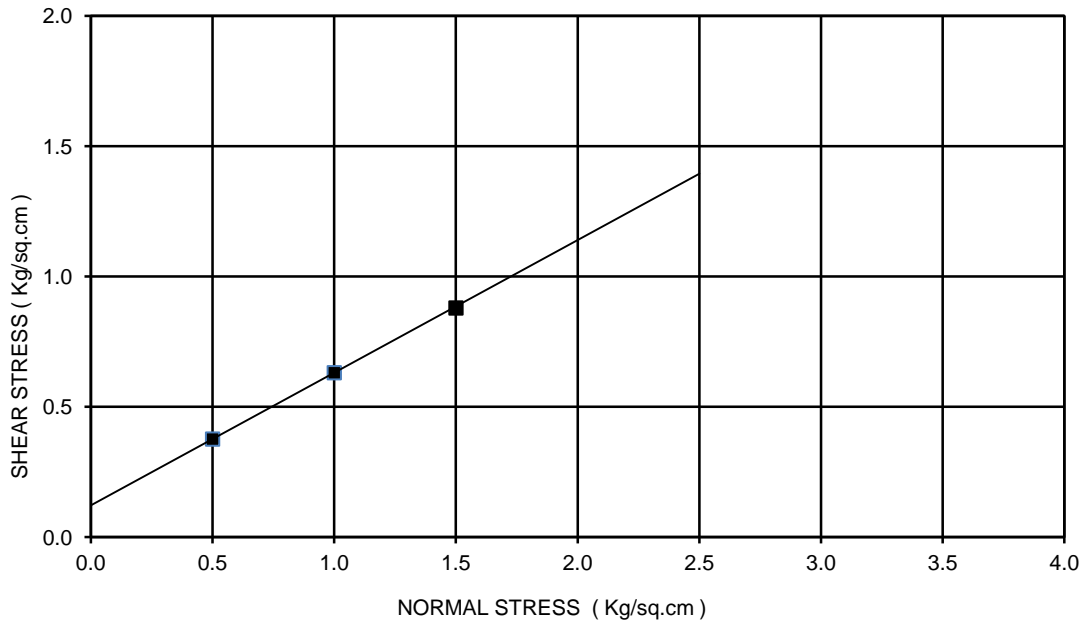
BORE HOLE NO: BH-P3
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



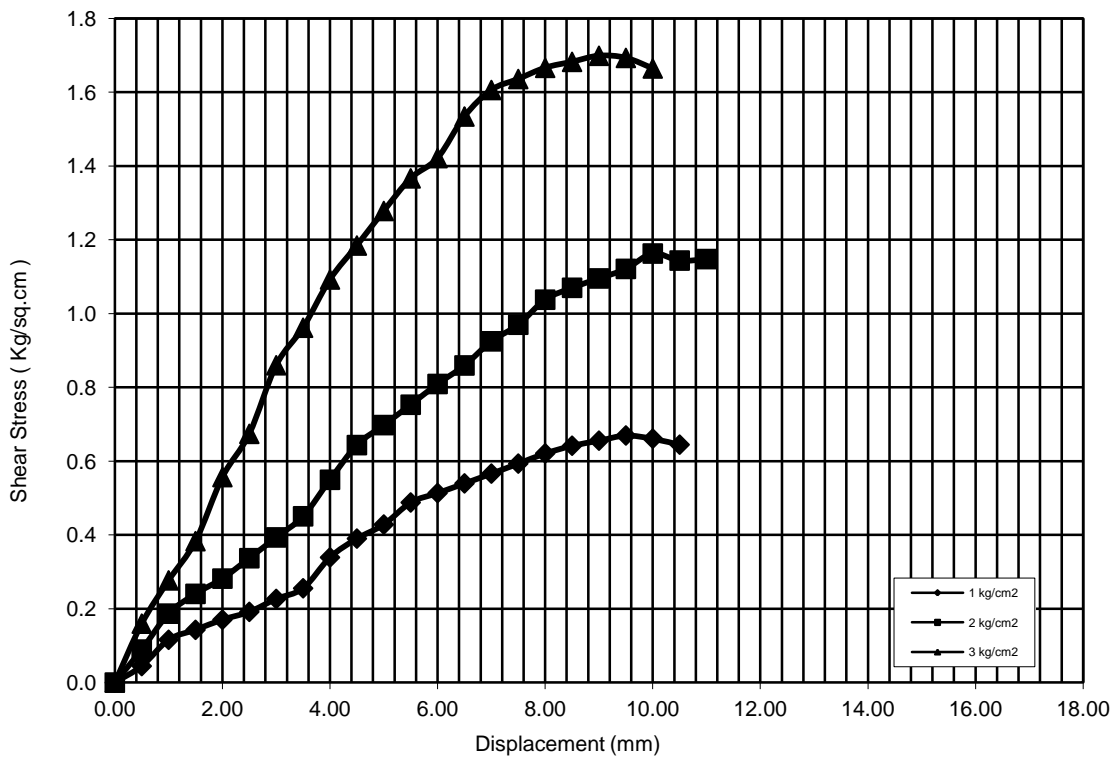
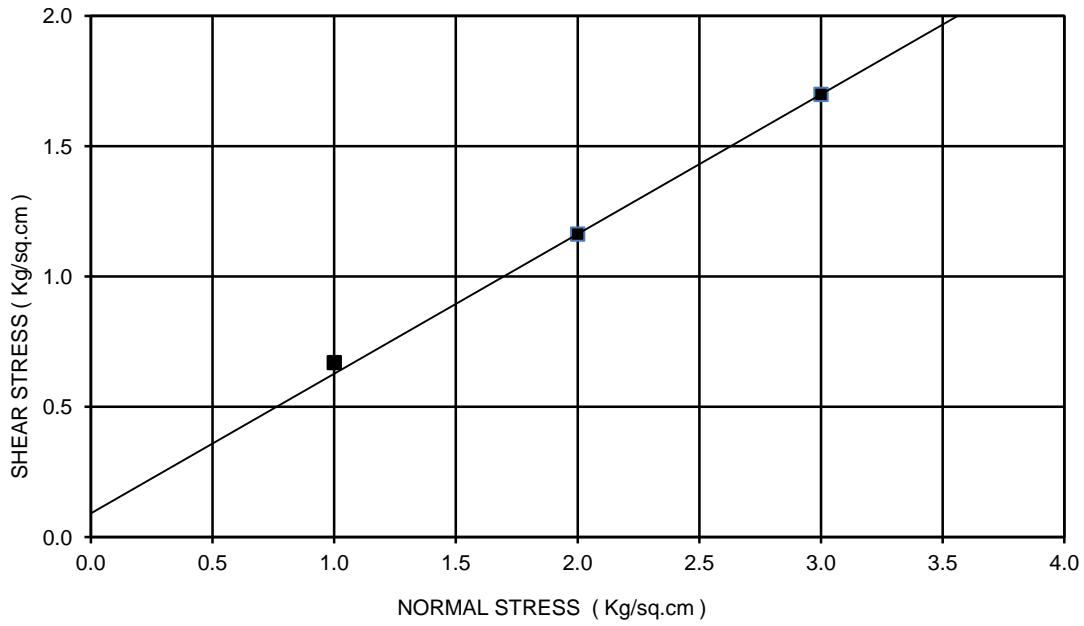
BORE HOLE NO: BH-P3
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



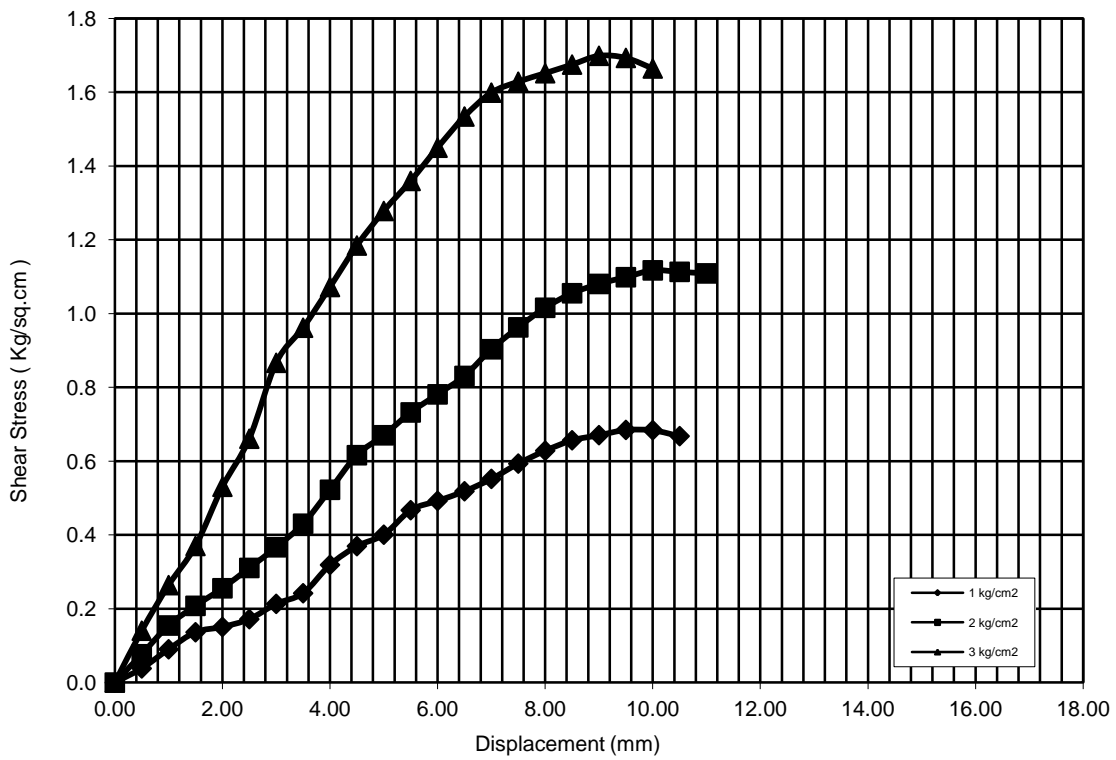
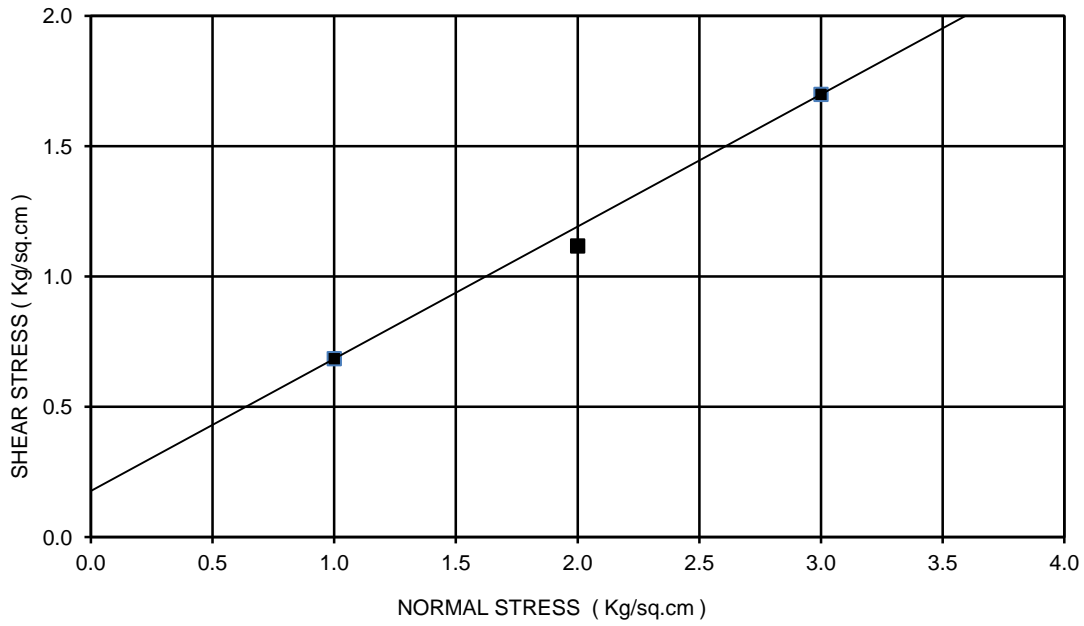
BORE HOLE NO: BH-P4
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 28 deg
 TYPE OF THE TEST: DST



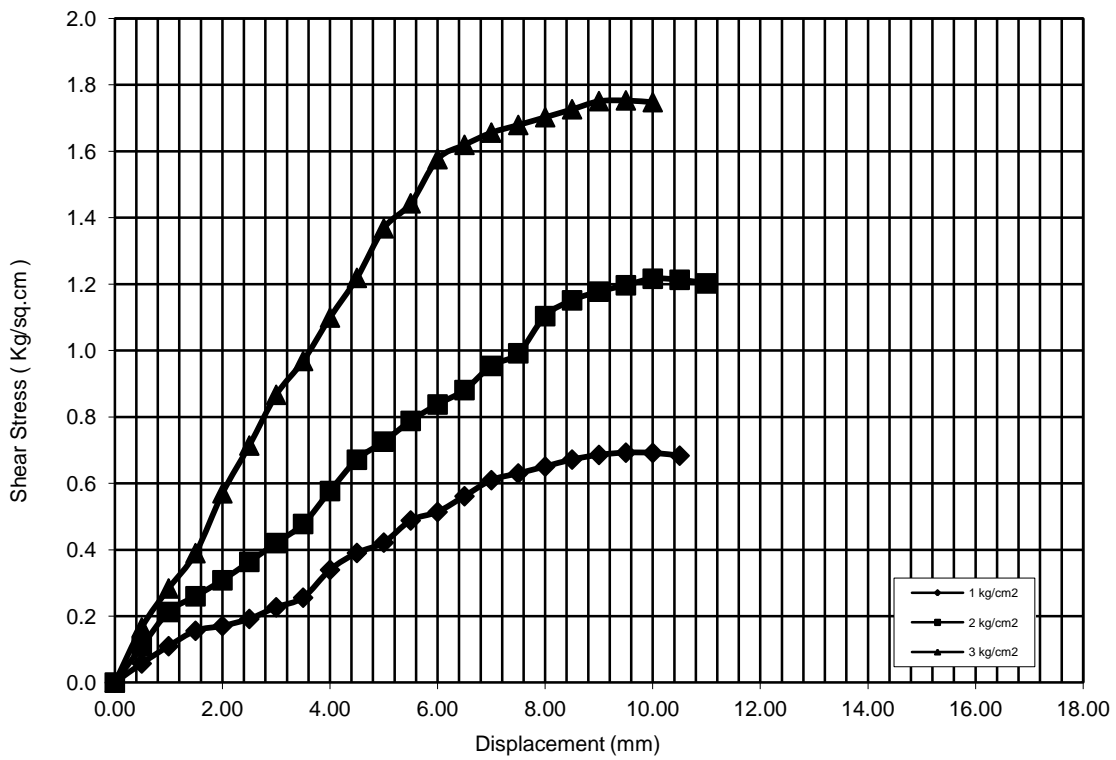
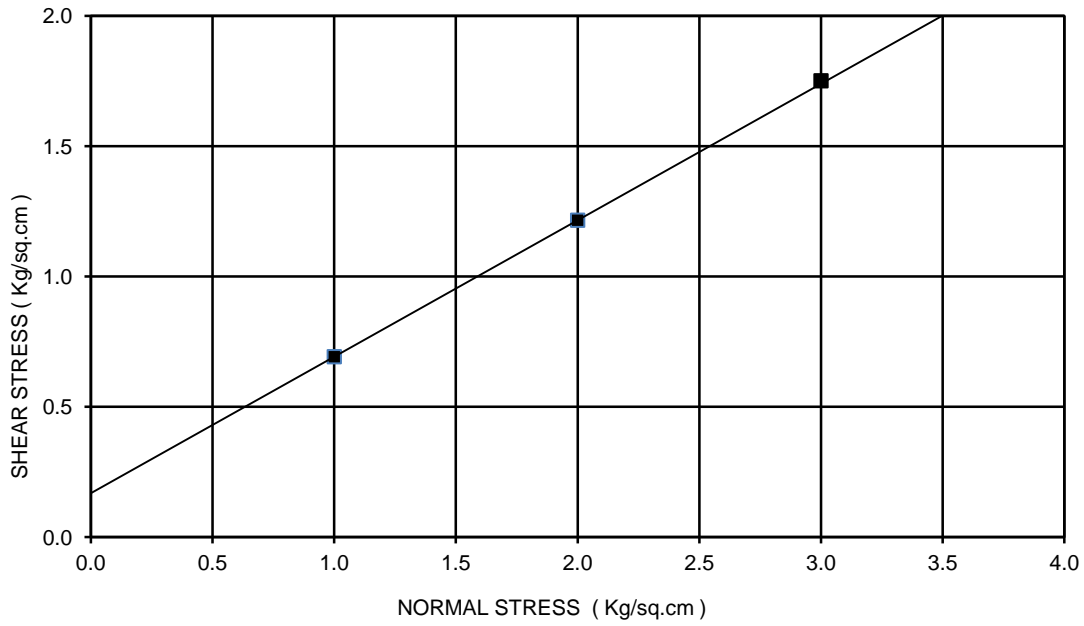
BORE HOLE NO: BH-P4
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-8
 DEPTH: 23.50 m
 COHESION(C)= -0.01 kg/sq.cm
 ANGLE OF FRICTION(Phi): 30 deg
 TYPE OF THE TEST: DST



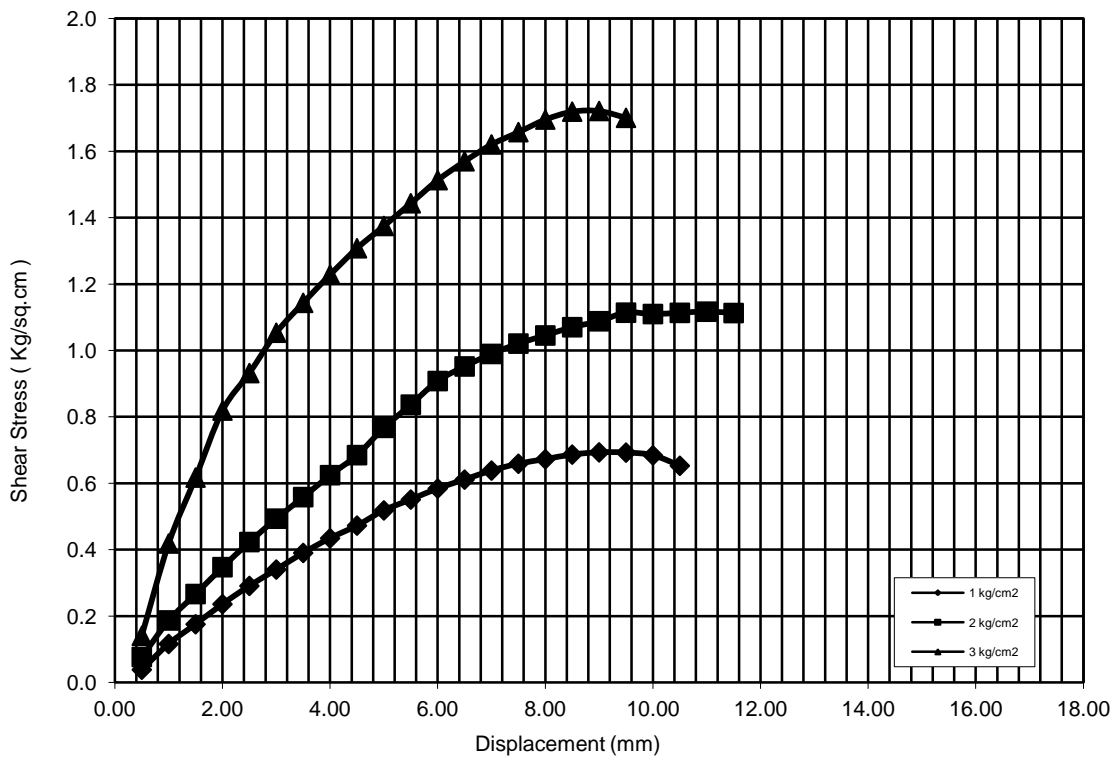
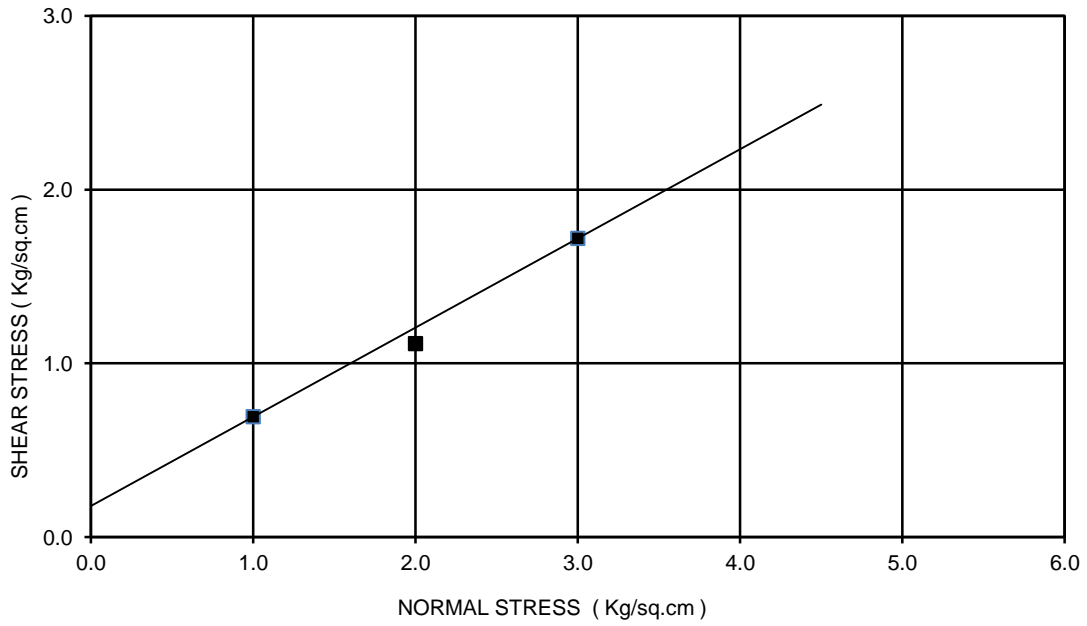
BORE HOLE NO: BH-P4
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



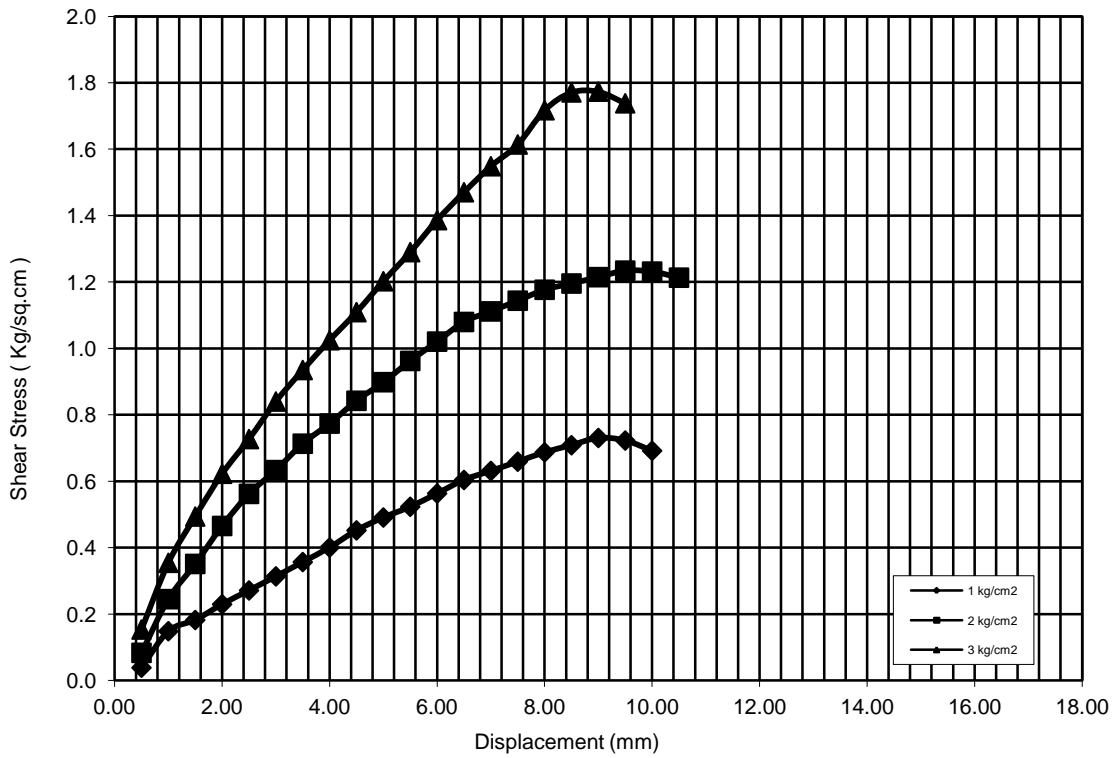
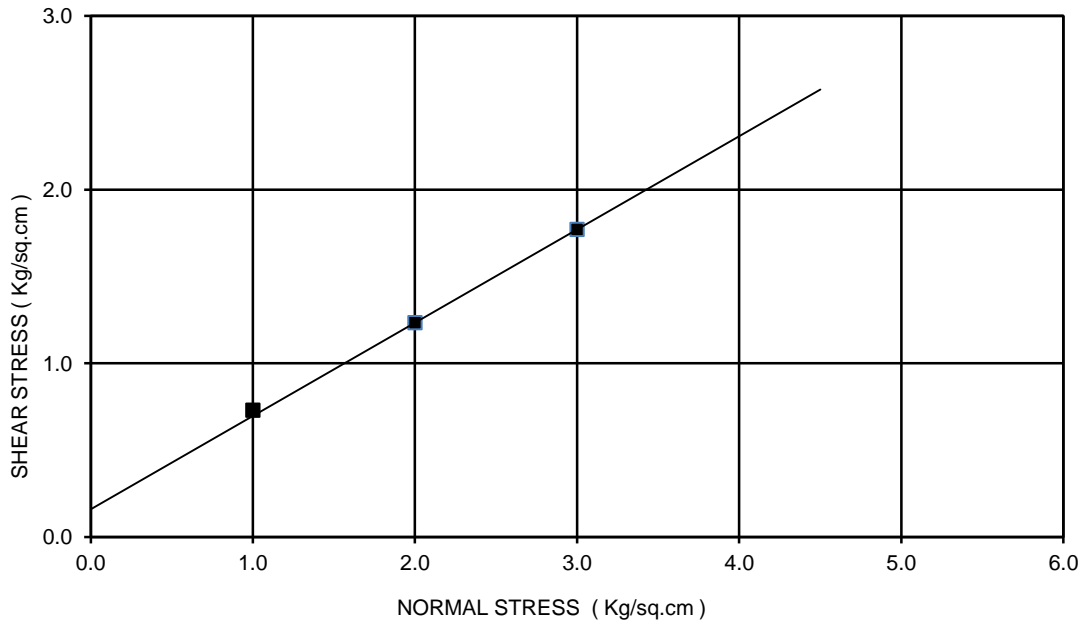
BORE HOLE NO: BH-P4
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-6
 DEPTH: 17.50 m
 COHESION(C)= 0.18 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



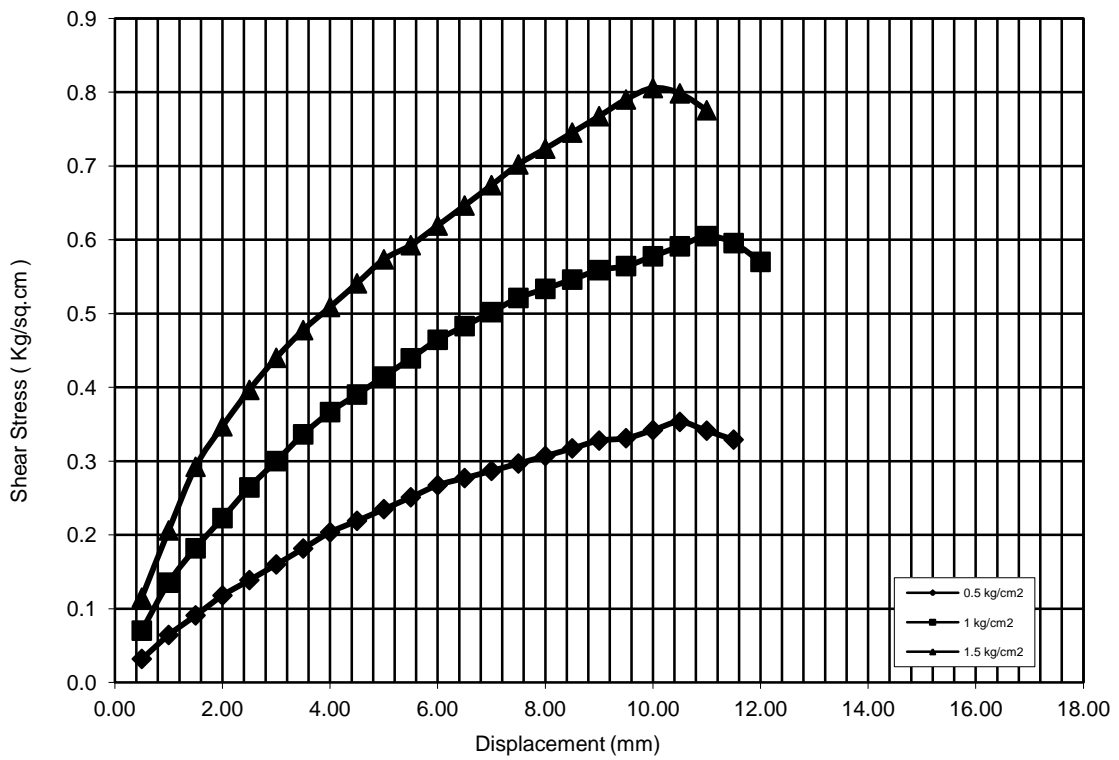
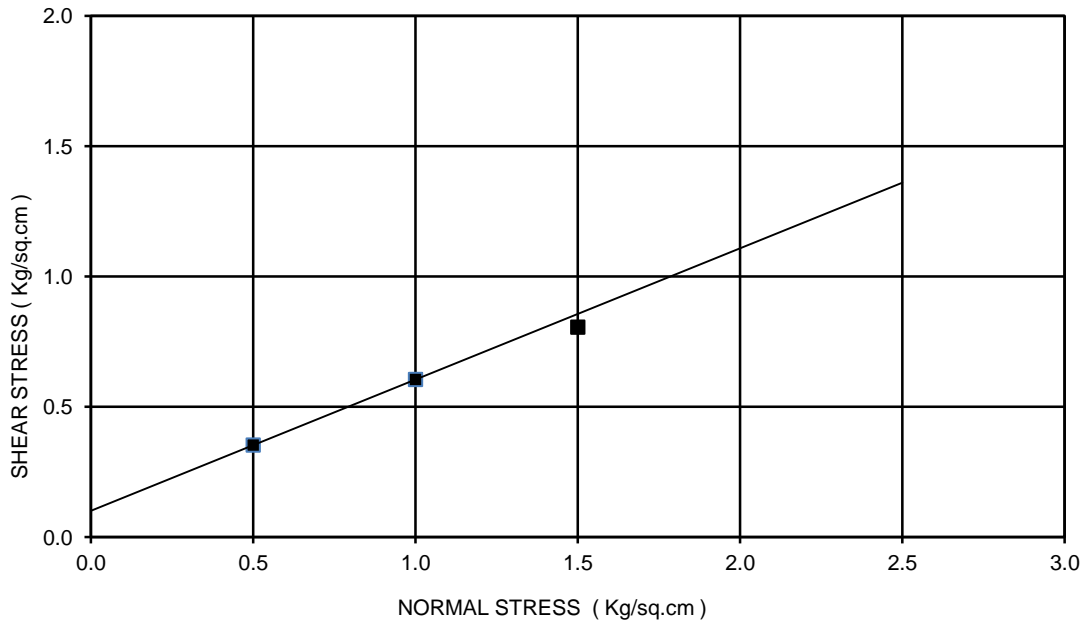
BORE HOLE NO: BH-P6
 CHAINAGE: 42+256
 SAMPLE NO.: SPT-28
 DEPTH: 43.50 m
 COHESION(C)= 0.24 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



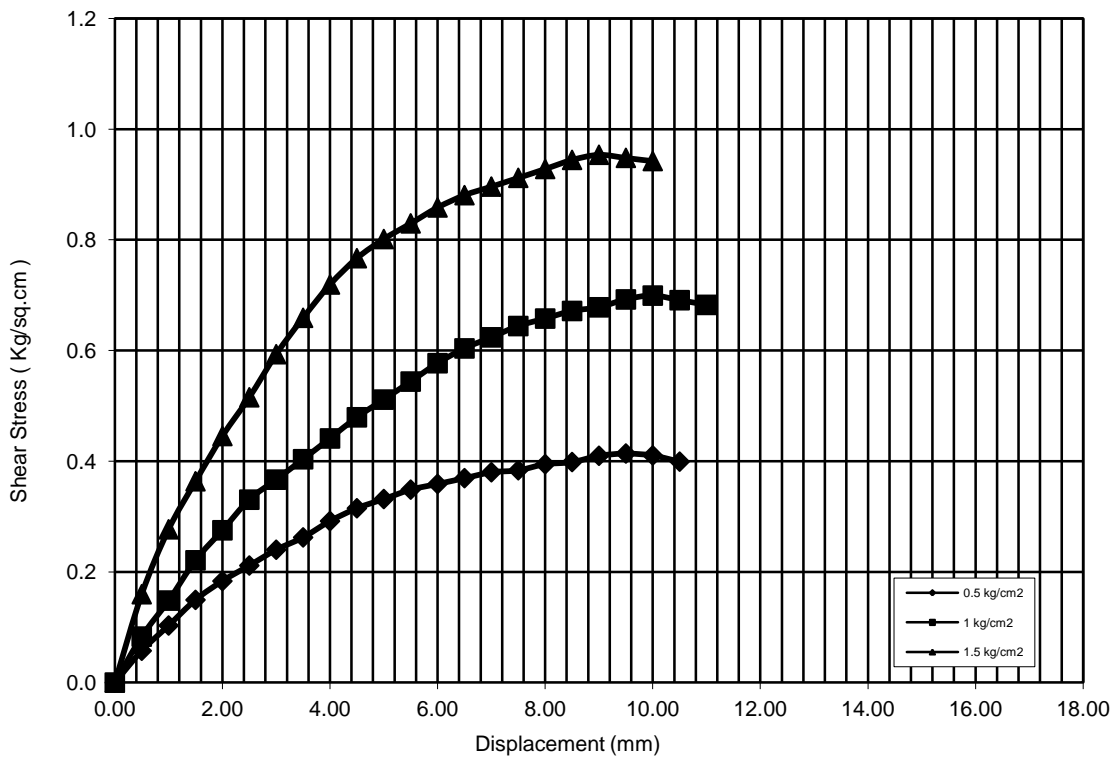
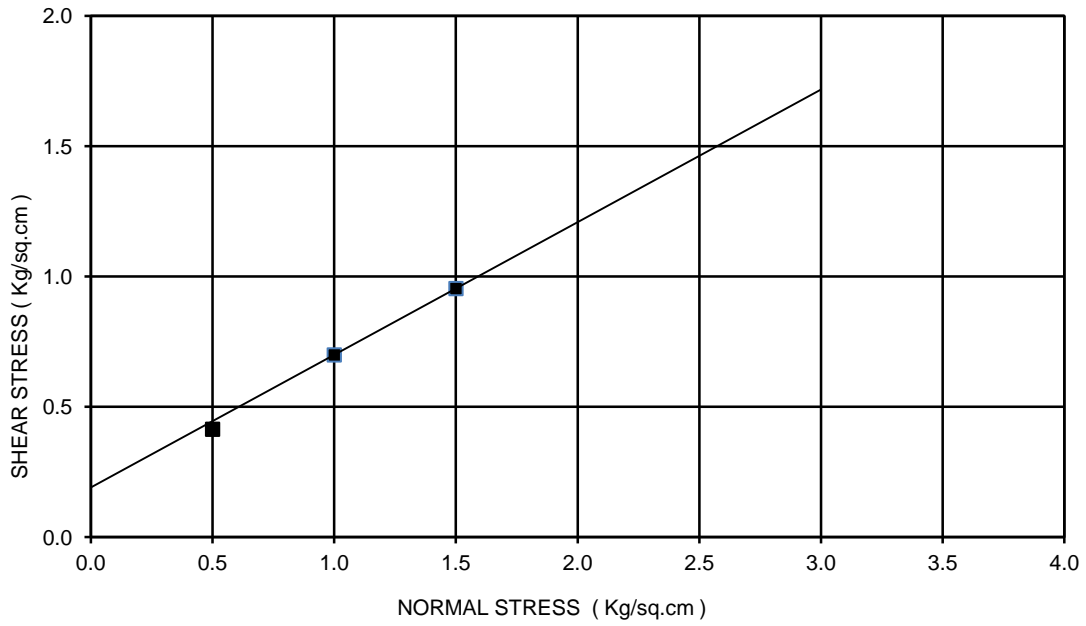
BORE HOLE NO: BH-P6
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-5
 DEPTH: 22.00 m
 COHESION(C)= 0.35 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



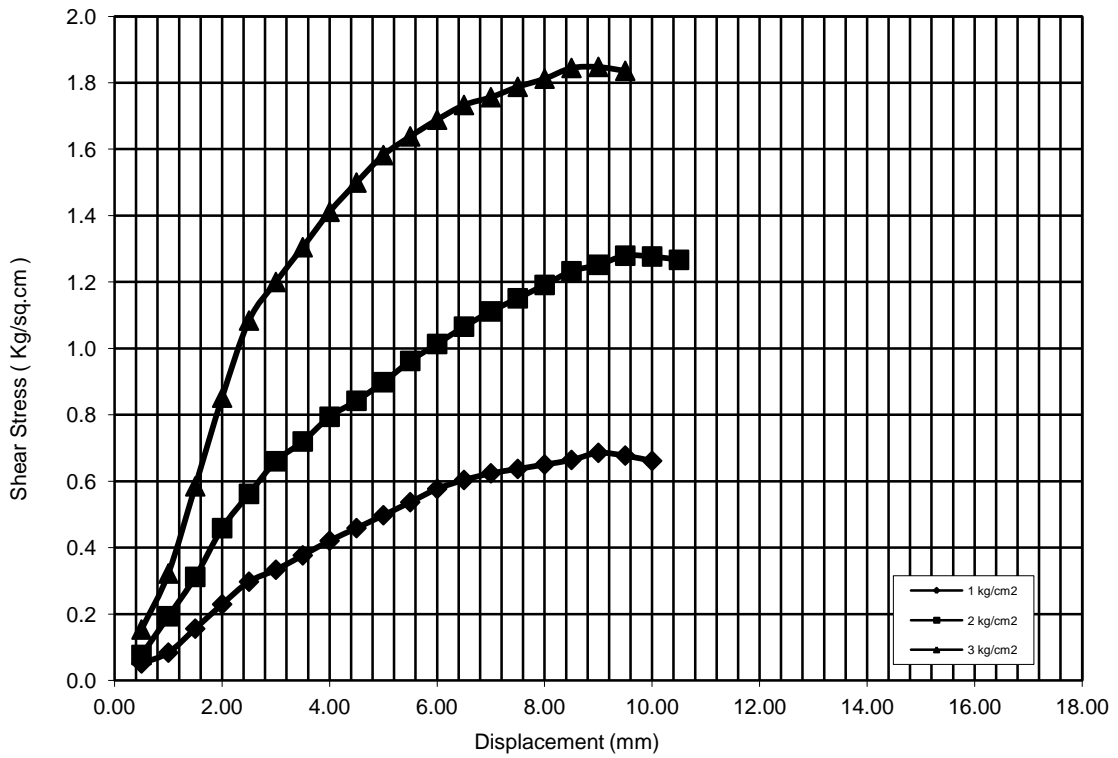
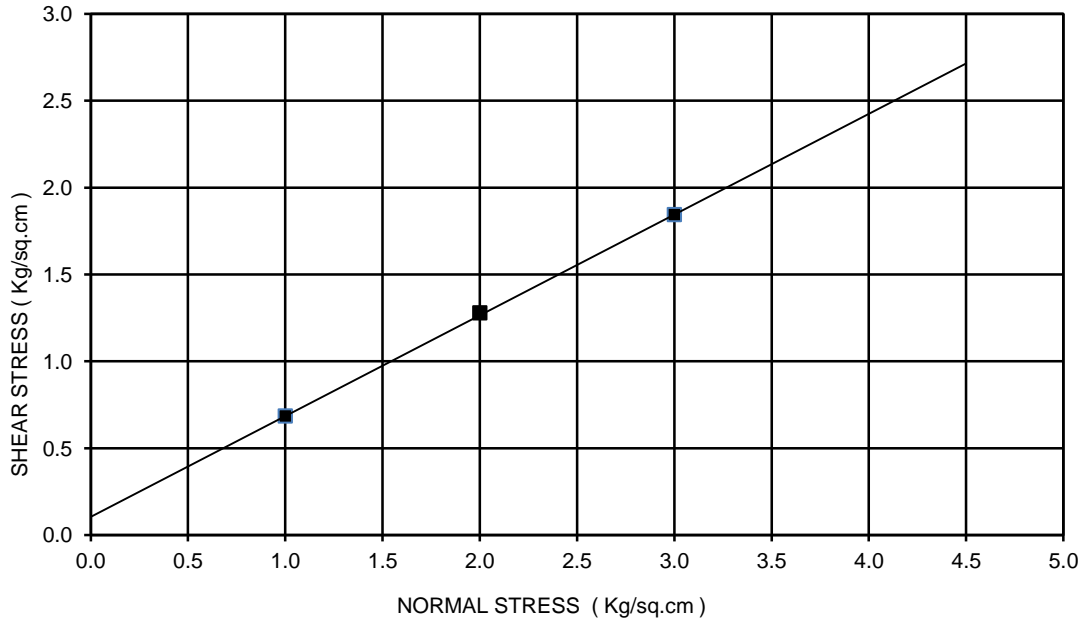
BORE HOLE NO: BH-P13
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.17 kg/sq.cm
 ANGLE OF FRICTION(Phi): 22 deg
 TYPE OF THE TEST: DST



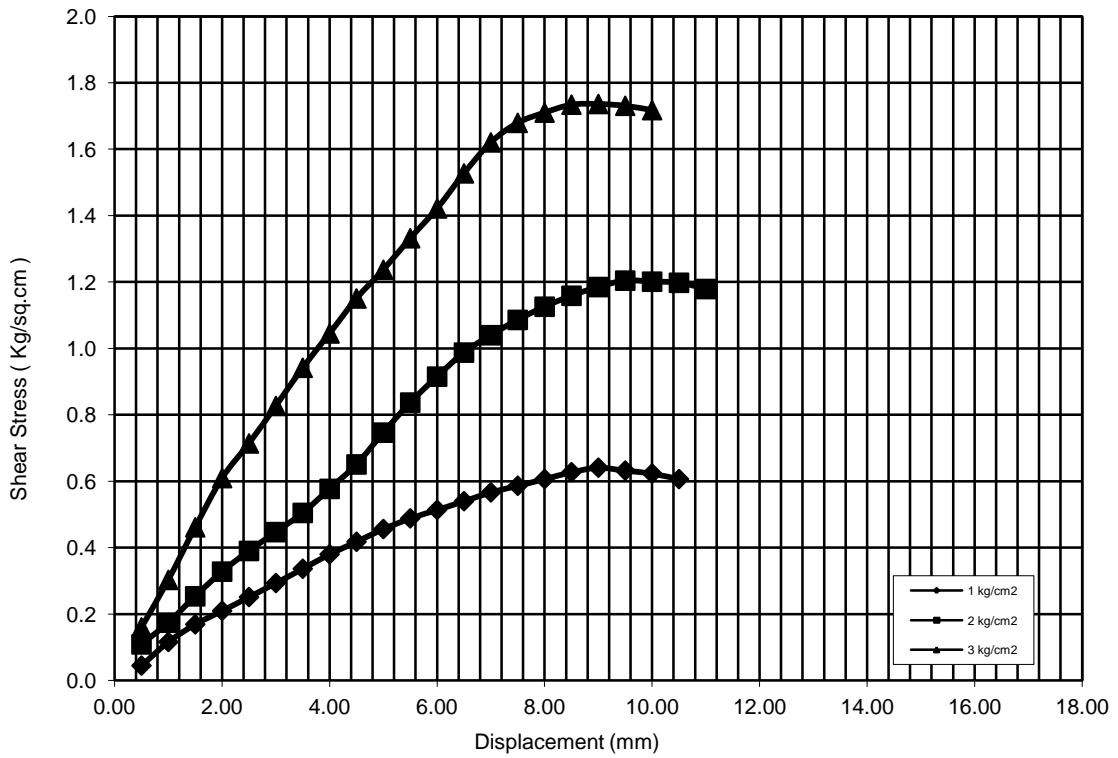
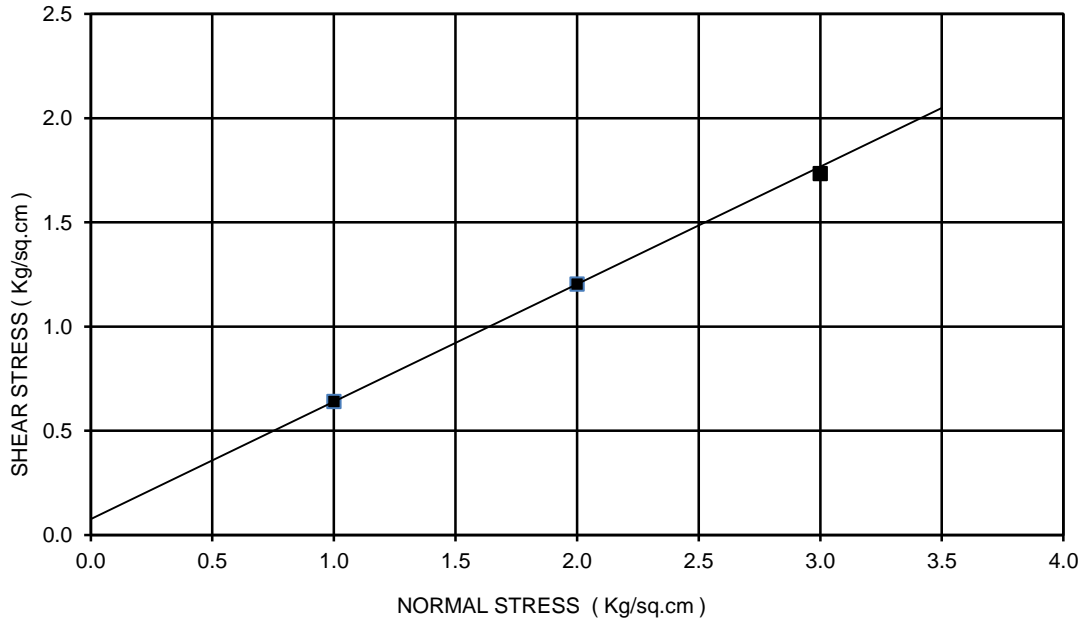
BORE HOLE NO: BH-P13
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-1
 DEPTH: 2.50 m
 COHESION(C)= 0.16 kg/sq.cm
 ANGLE OF FRICTION(Phi): 25 deg
 TYPE OF THE TEST: DST



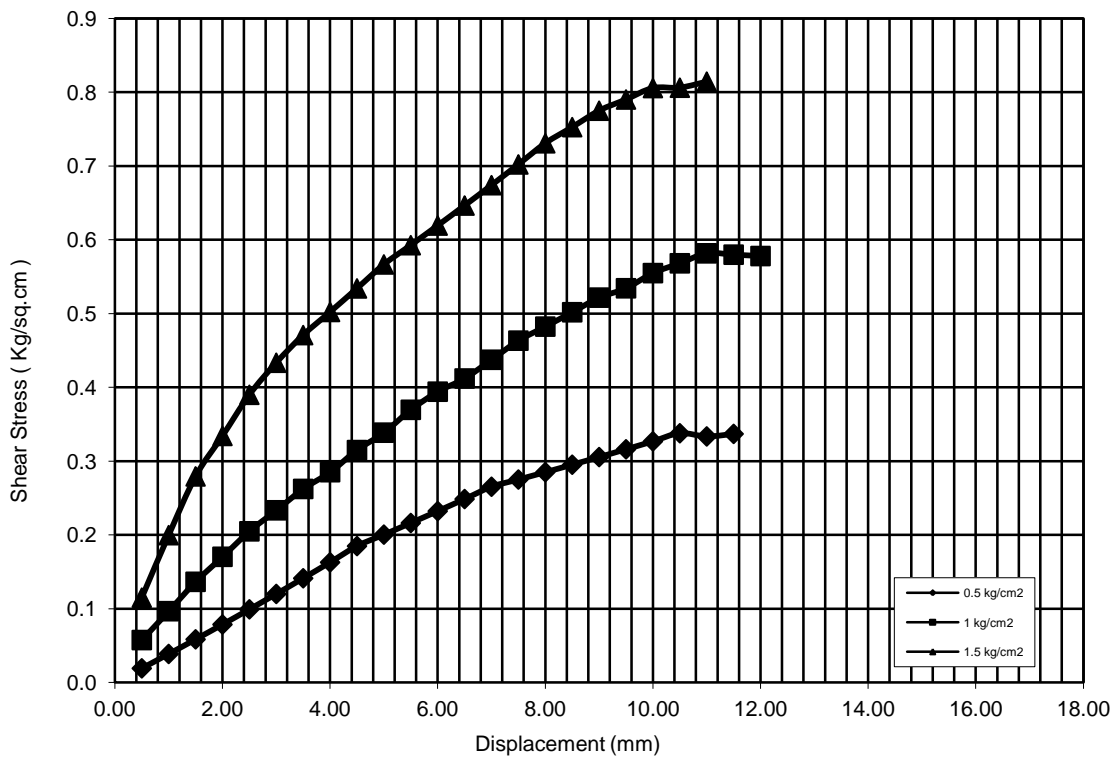
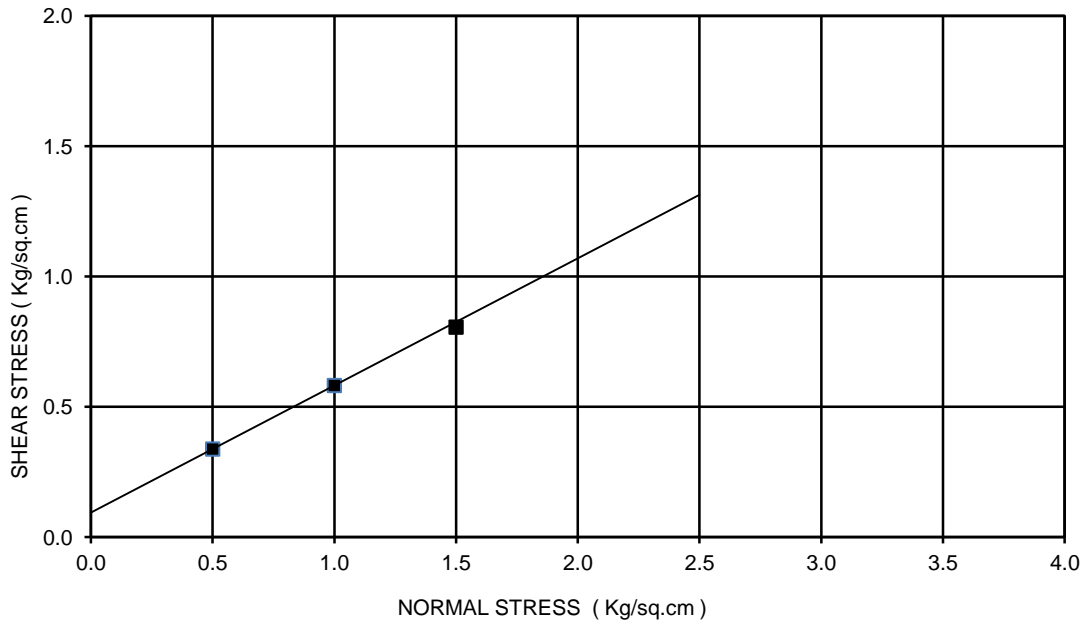
BORE HOLE NO: BH-P13
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-2
 DEPTH: 7.00 m
 COHESION(C)= 0.11 kg/sq.cm
 ANGLE OF FRICTION(Phi): 30 deg
 TYPE OF THE TEST: DST



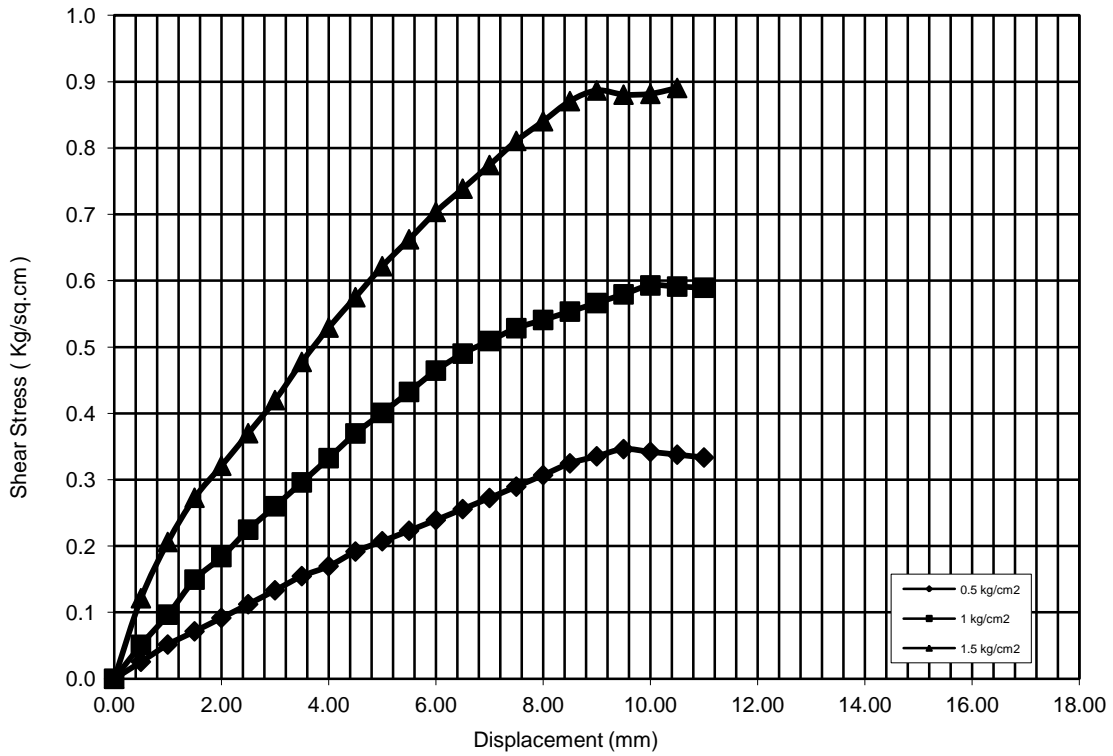
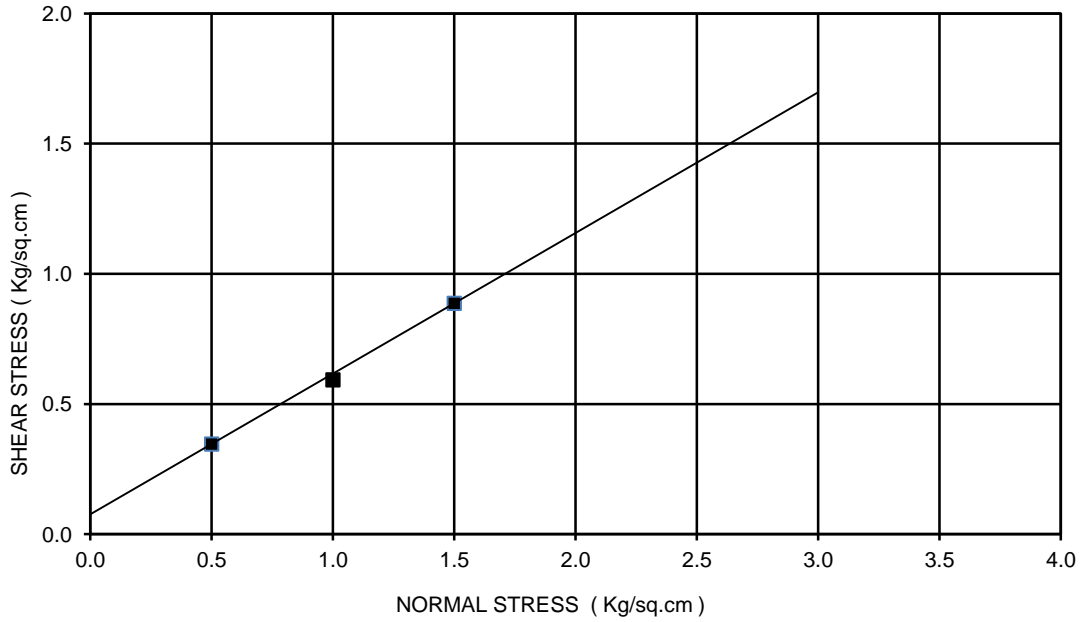
BORE HOLE NO: BH-P13
 CHAINAGE: 42+256
 SAMPLE NO.: UDS-2
 DEPTH: 7.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 29 deg
 TYPE OF THE TEST: DST



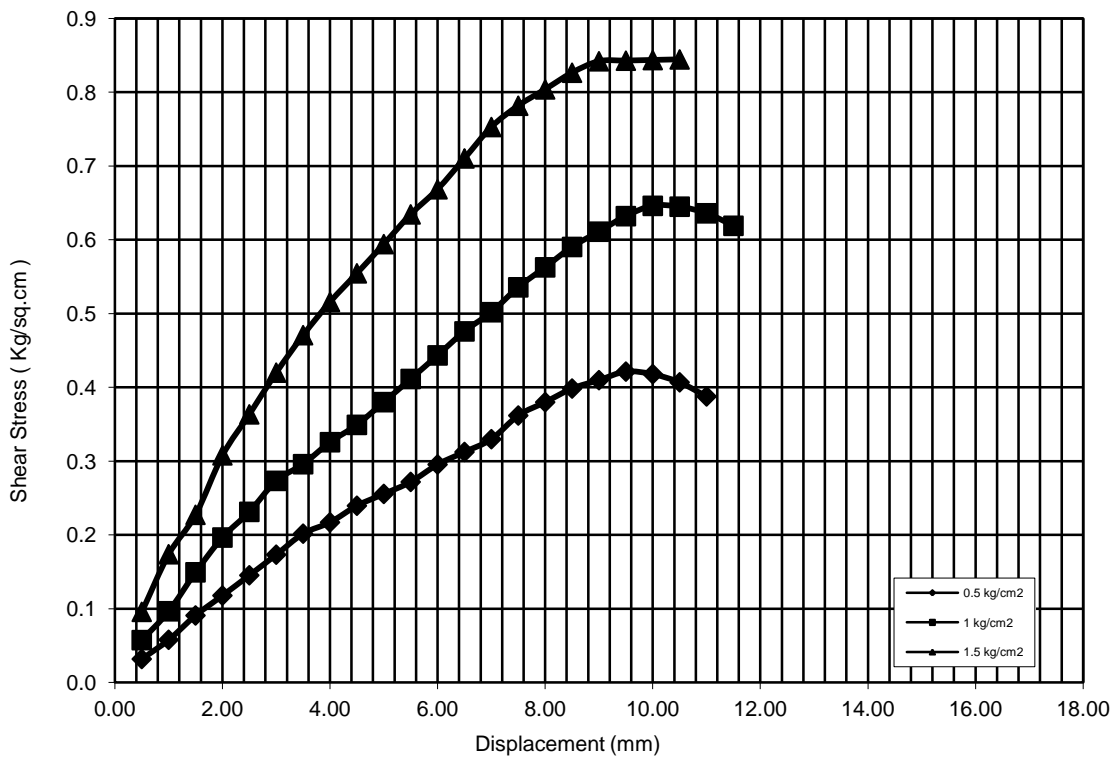
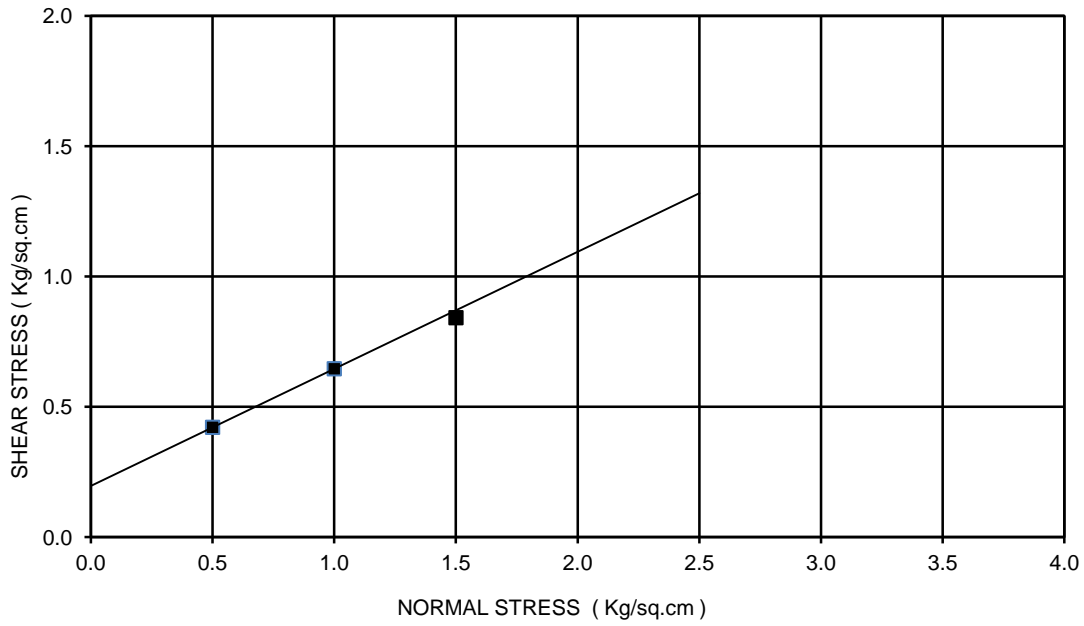
BORE HOLE NO: BH-PLT-02
 CHAINAGE:43+100
 SAMPLE NO.: UDS-1
 DEPTH: 0.75 m
 COHESION(C)= 0.09 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



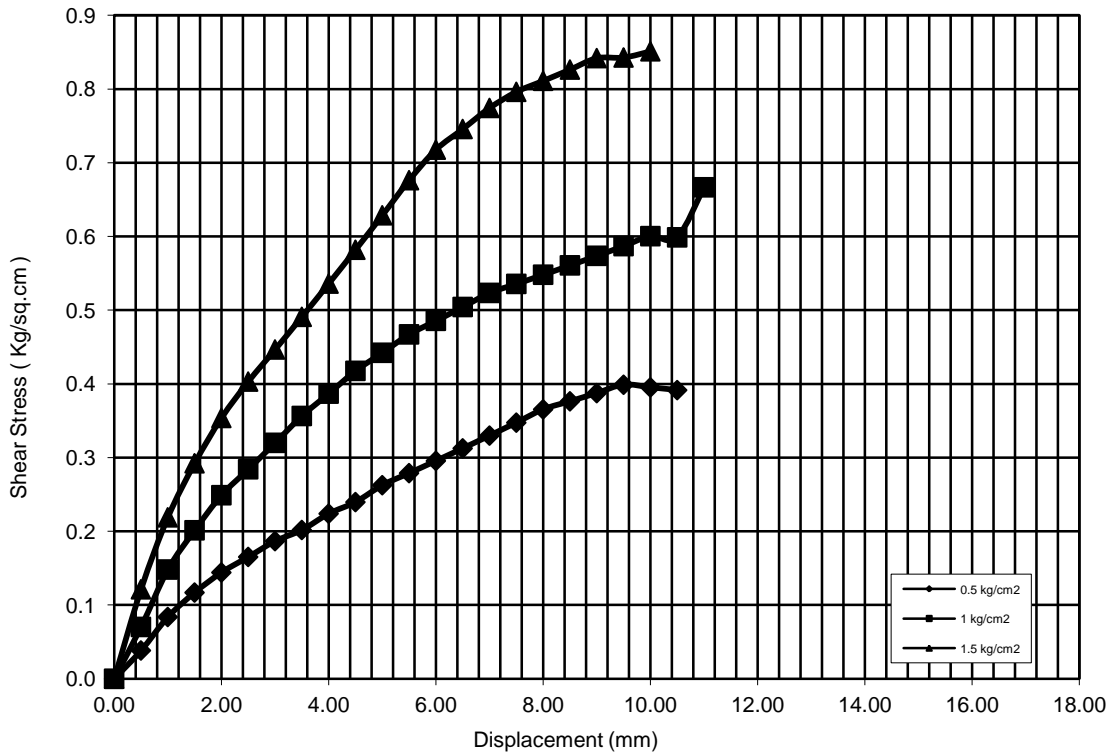
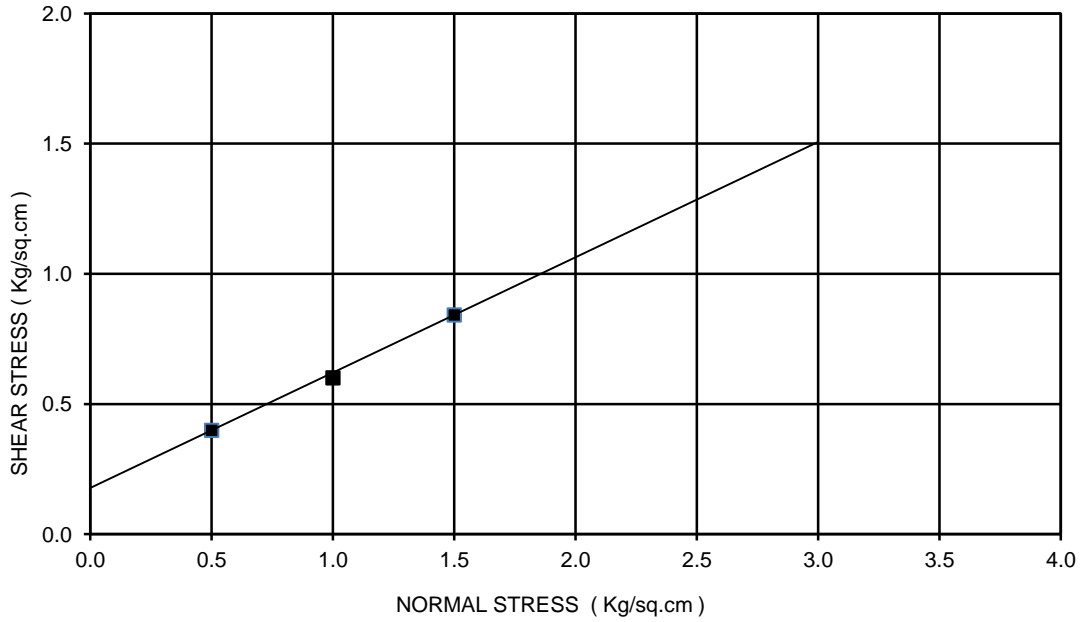
BORE HOLE NO: BH-CL
 CHAINAGE: 43+452
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 28 deg
 TYPE OF THE TEST: DST



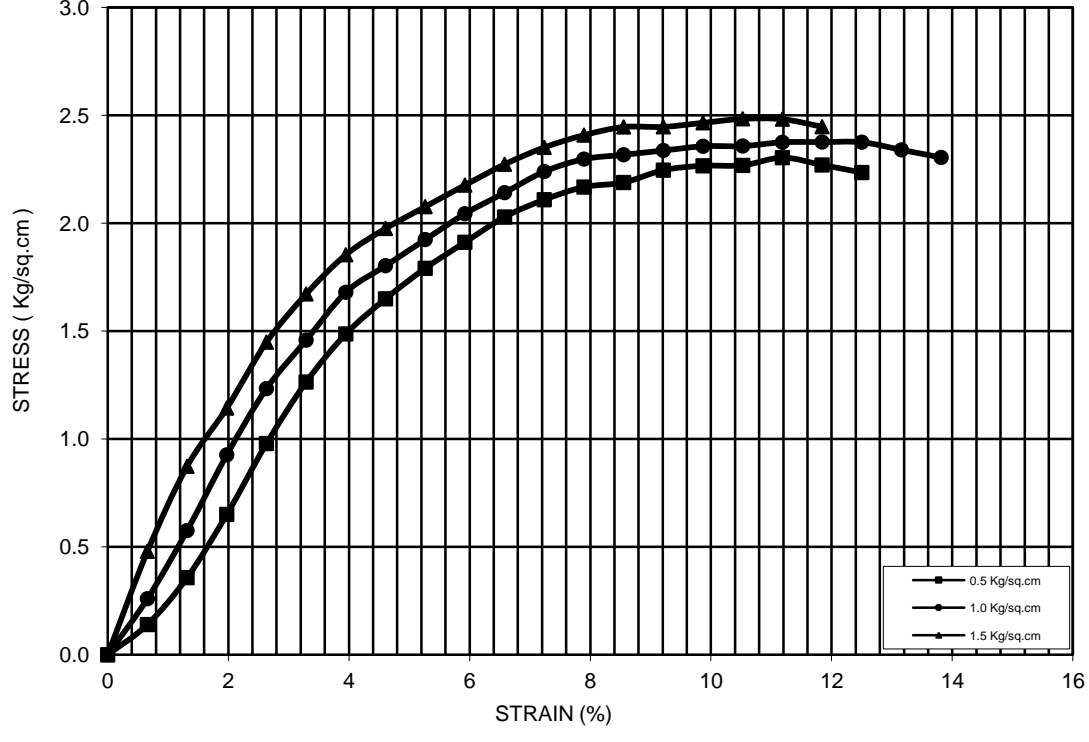
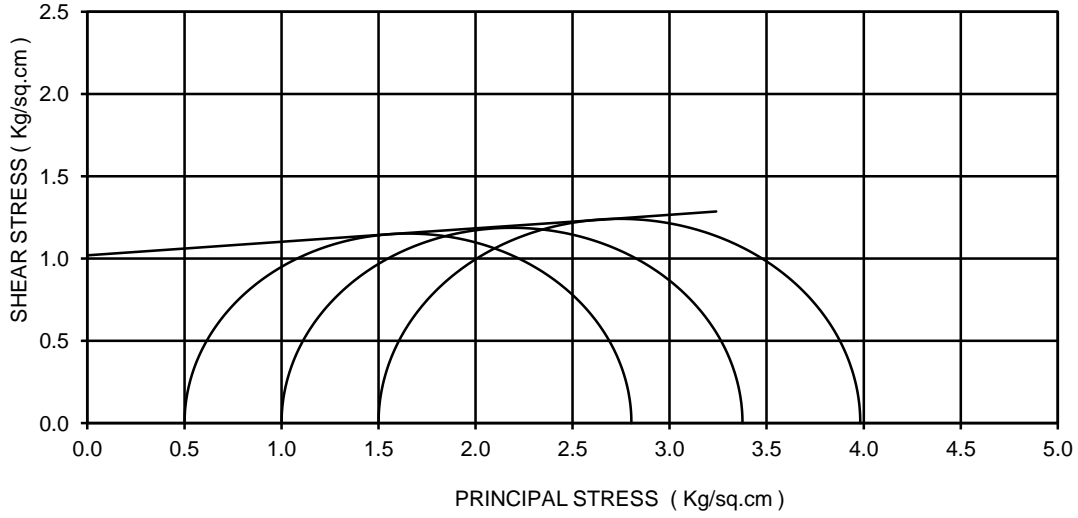
BORE HOLE NO: BH-CL
 CHAINAGE: 43+585
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.20 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



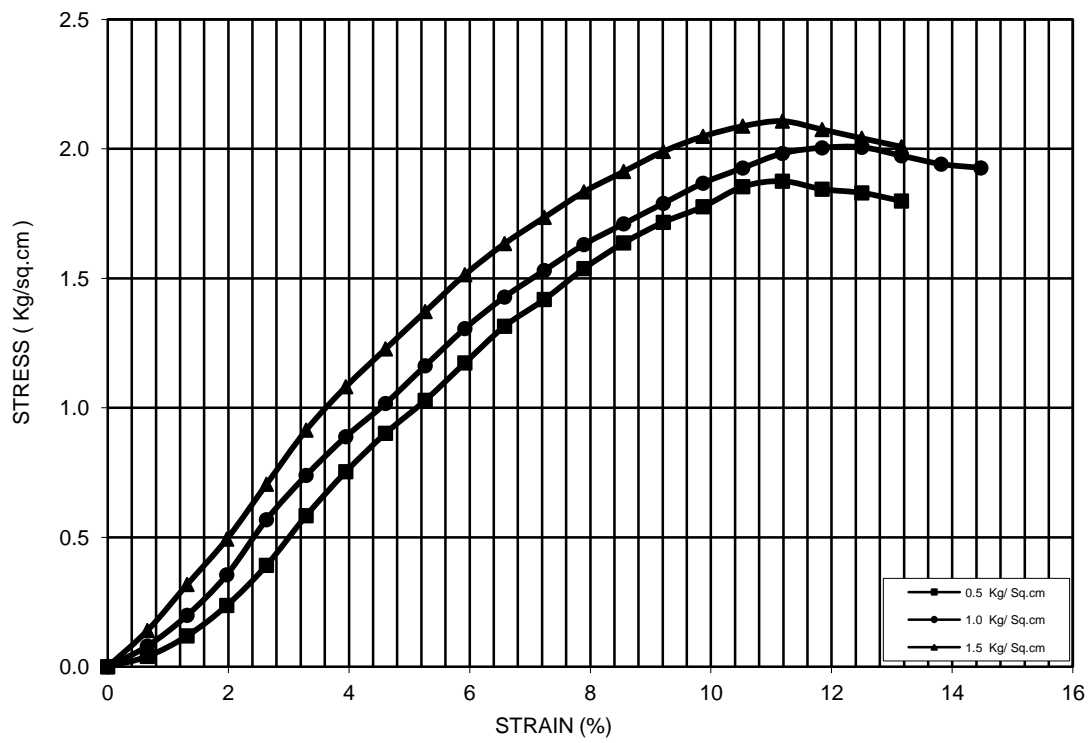
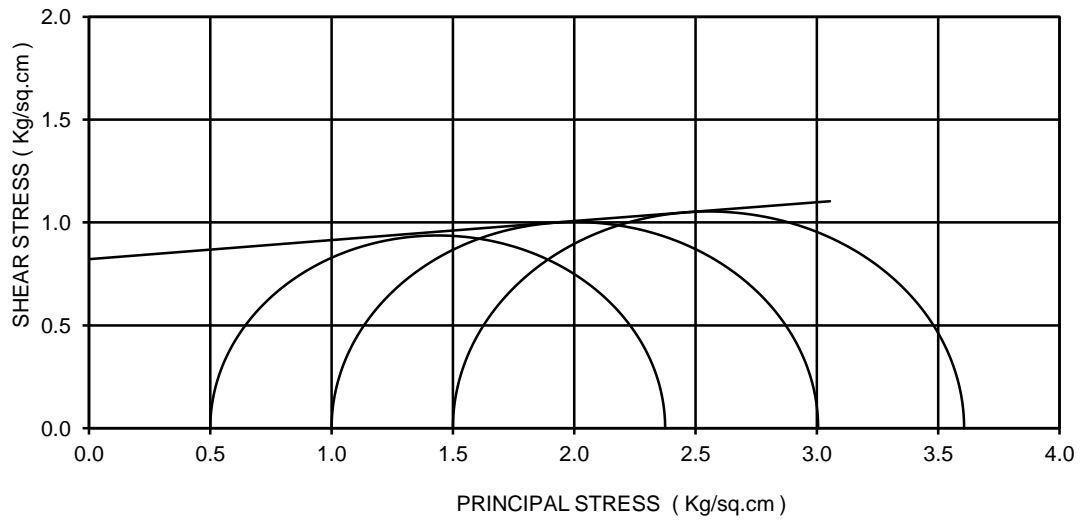
BORE HOLE NO: BH-CL
 CHAINAGE : 43+732
 SAMPLE NO.: UDS-1
 DEPTH: 1.00 m
 COHESION(C)= 0.18 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST



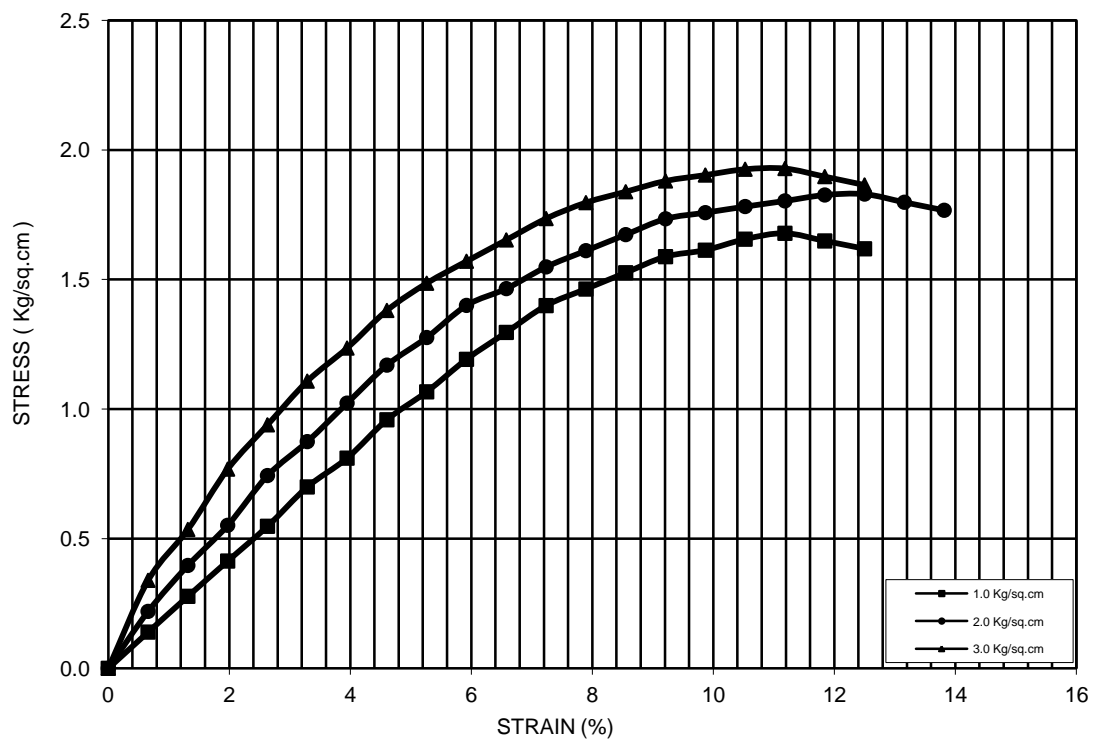
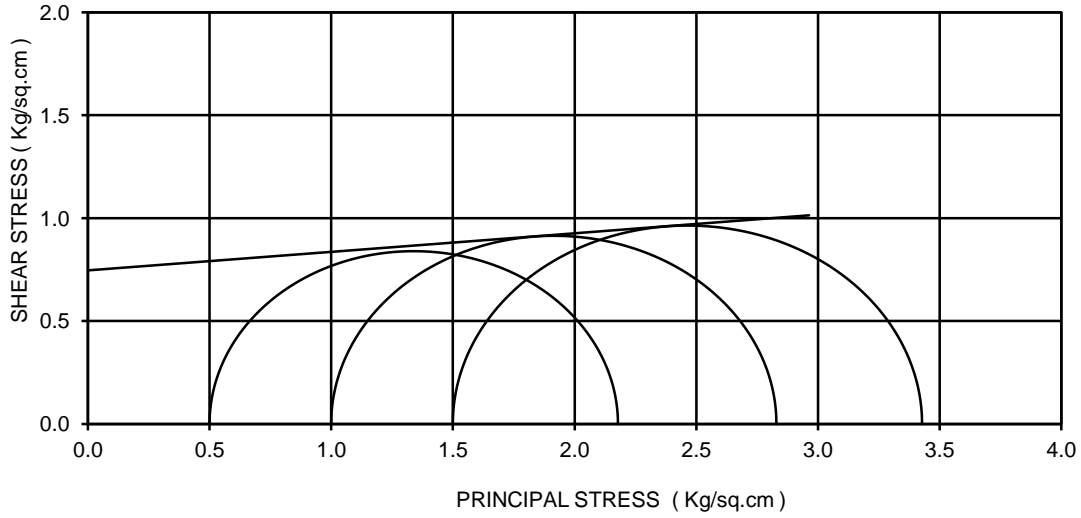
BORE HOLE NO: BH-CL
 CHAINAGE: 44+050
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 1.02 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



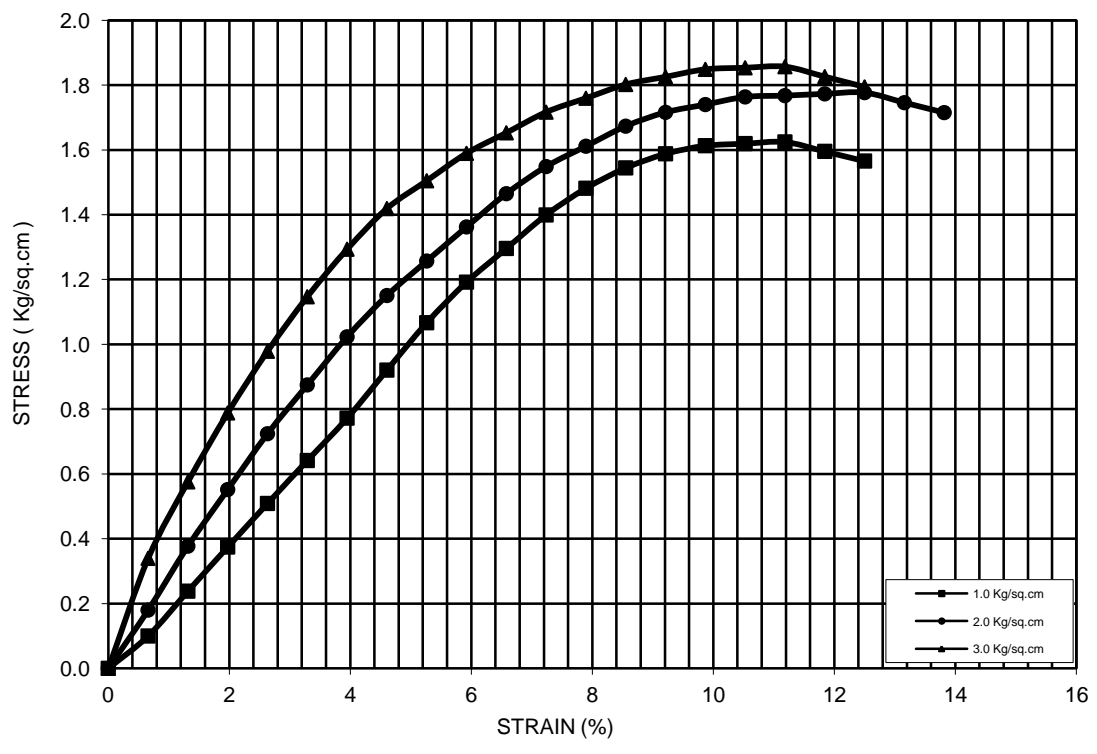
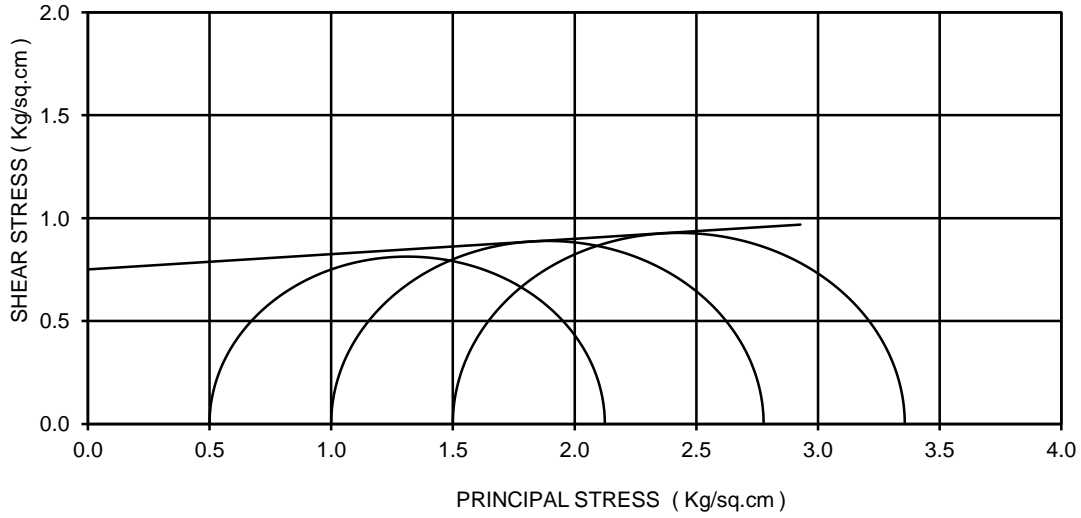
BORE HOLE NO: BH-CL
 CHAINAGE:44+116
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.82 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



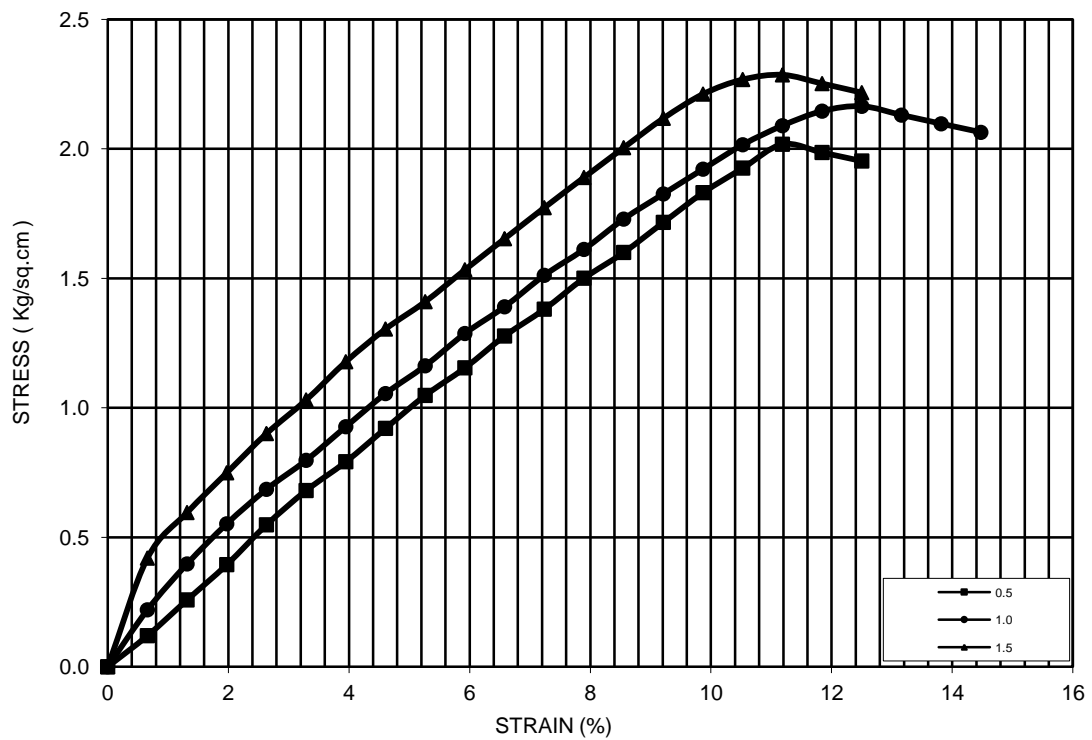
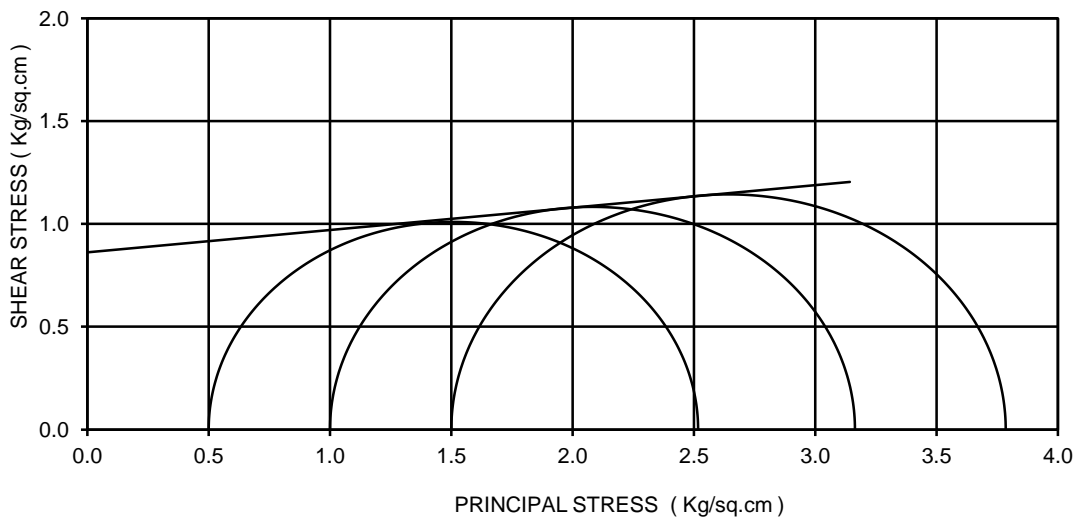
BORE HOLE NO: BH-CL
 CHAINAGE: 44+641
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.75 kg/sq.cm
 ANGLE OF FRICTION(Phi): 5 deg
 TYPE OF THE TEST: UUT



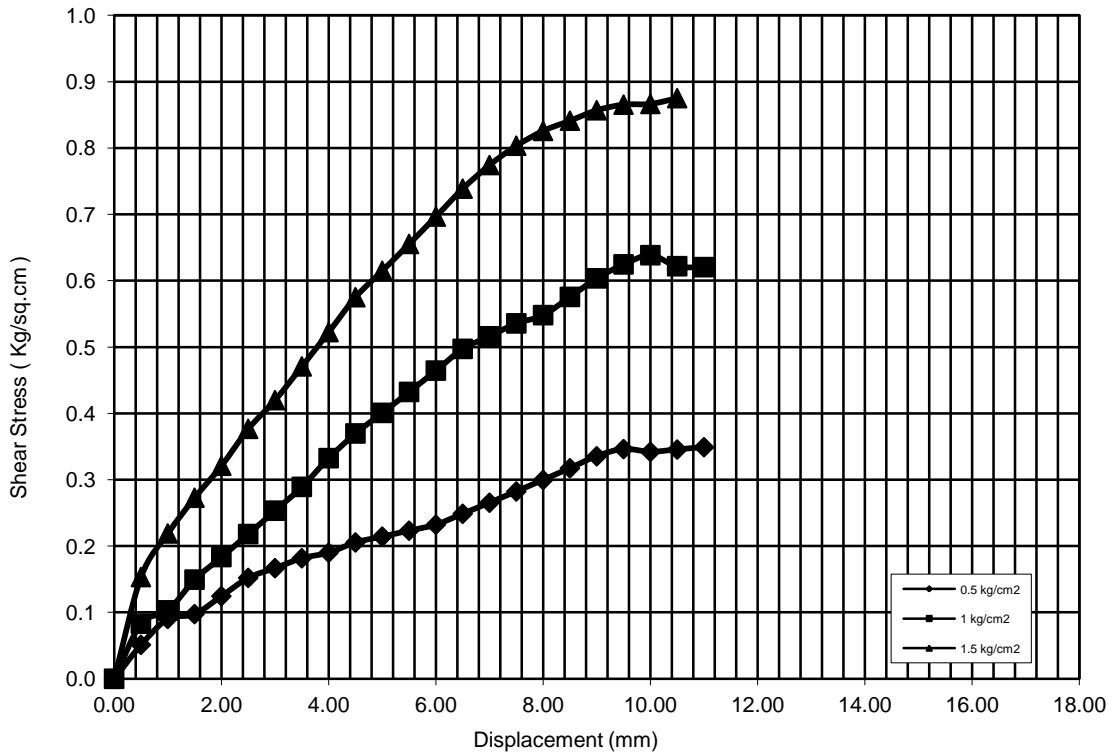
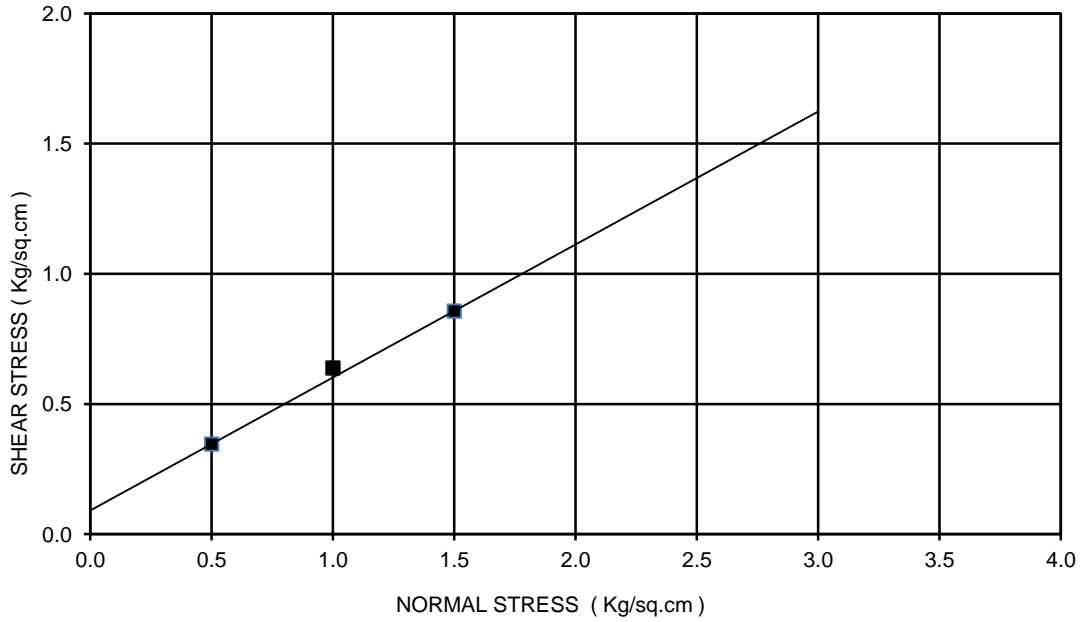
BORE HOLE NO: BH-CL
 CHAINAGE:44+910
 SAMPLE NO.: UDS-1
 DEPTH: 5.25 m
 COHESION(C)= 0.75 kg/sq.cm
 ANGLE OF FRICTION(Phi): 4 deg
 TYPE OF THE TEST: UUT



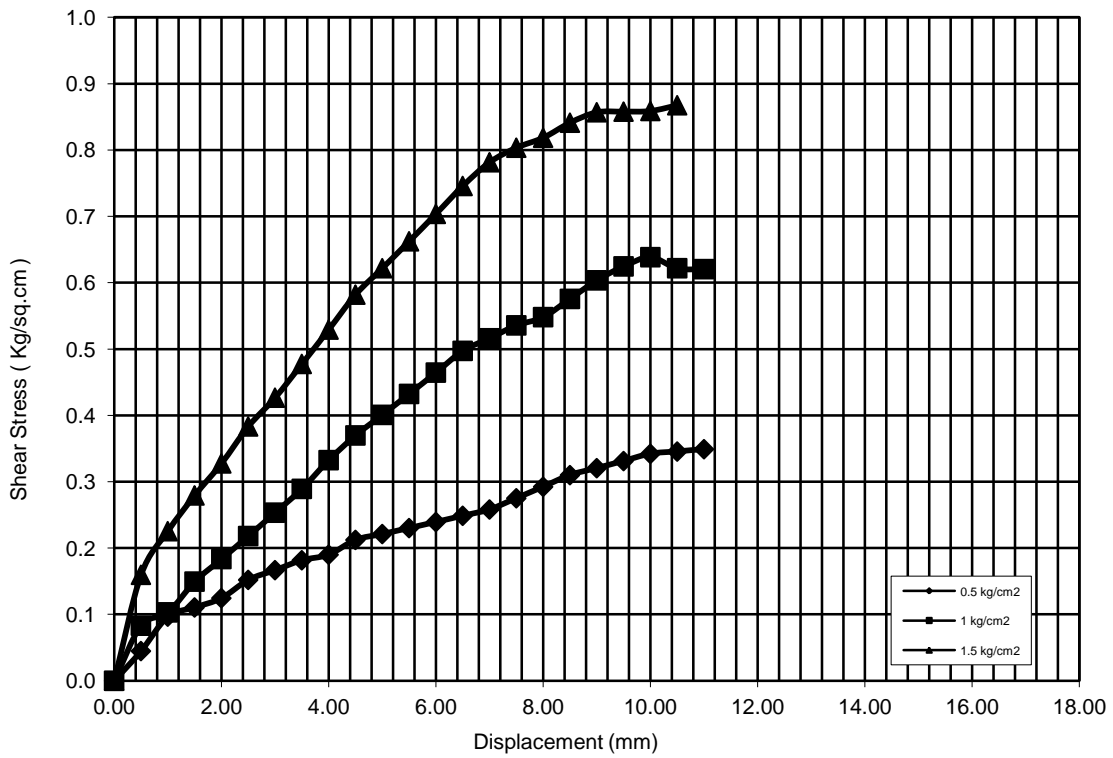
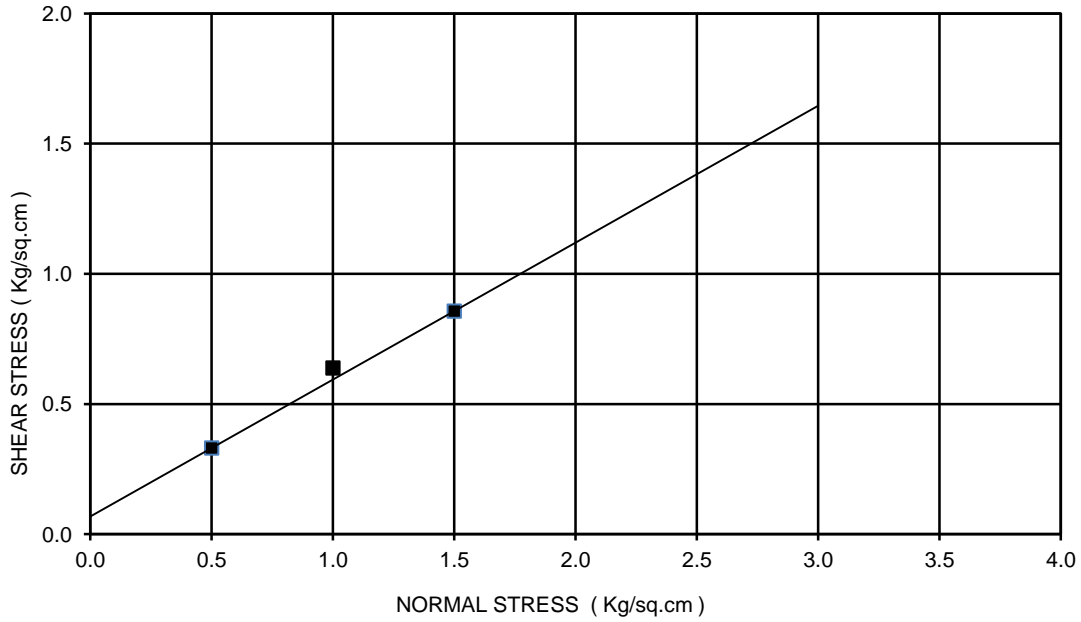
BORE HOLE NO: BH-CL
 CHAINAGE:45+048
 SAMPLE NO.: UDS-2
 DEPTH: 5.25 m
 COHESION(C)= 0.85 kg/sq.cm
 ANGLE OF FRICTION(Phi): 6 deg
 TYPE OF THE TEST: UUT



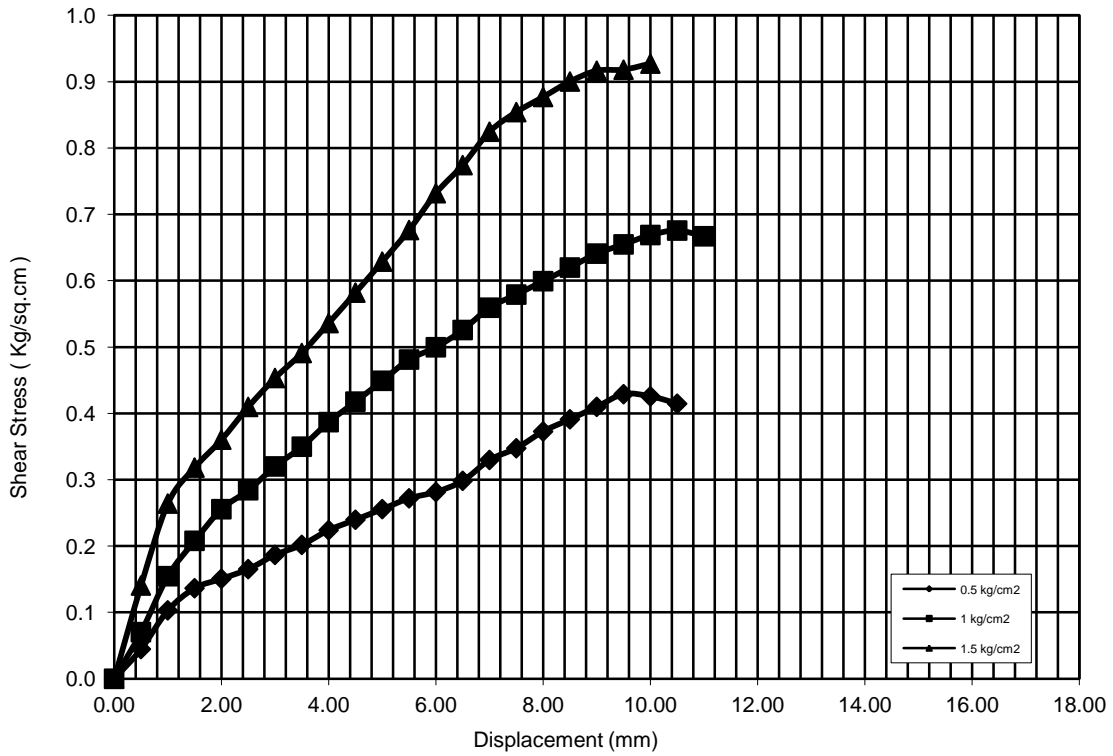
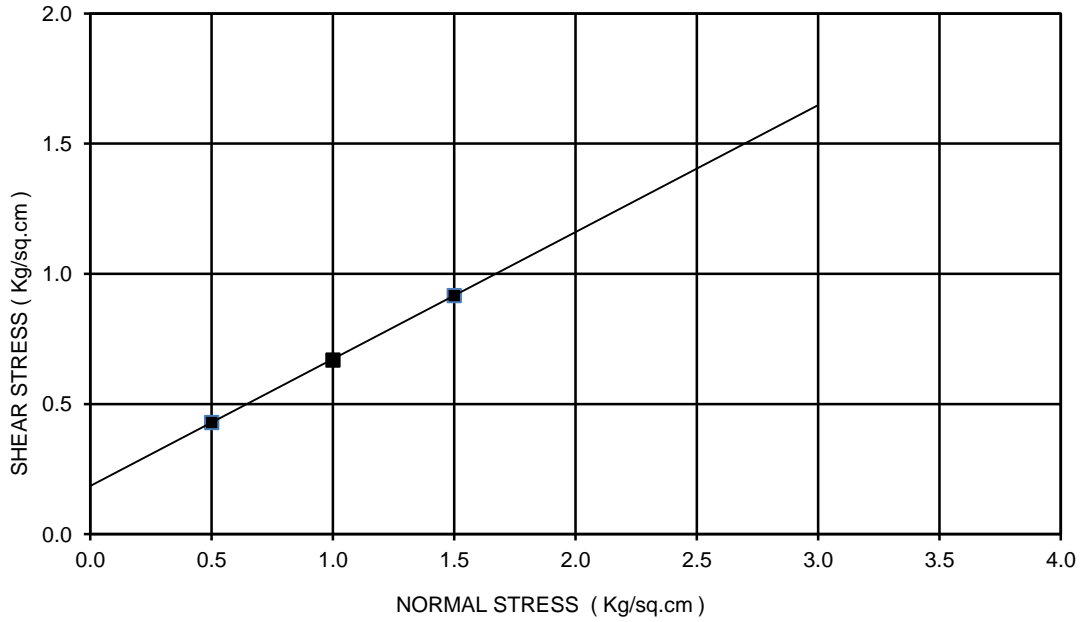
BORE HOLE NO: BH-A1
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



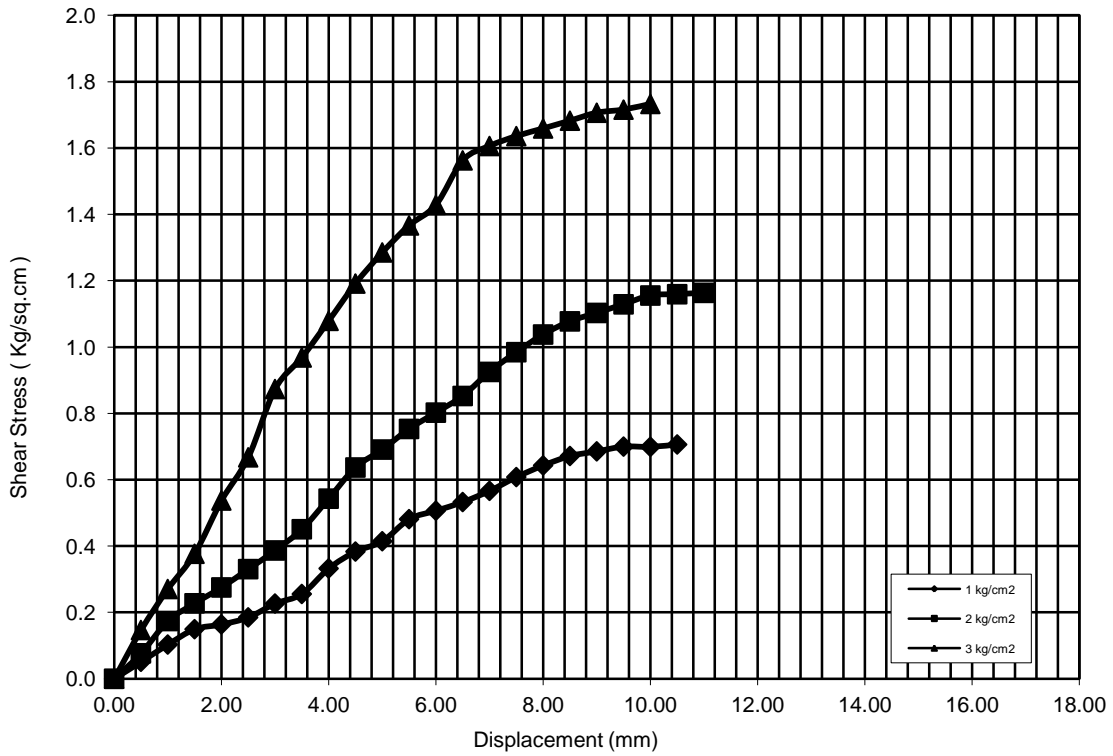
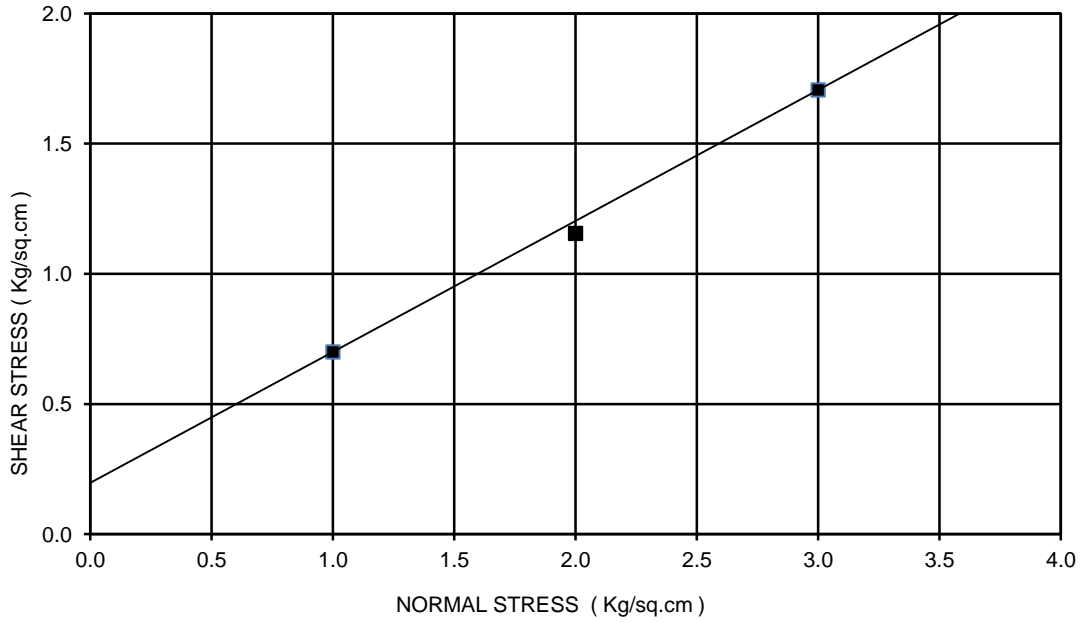
BORE HOLE NO: BH-A1
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



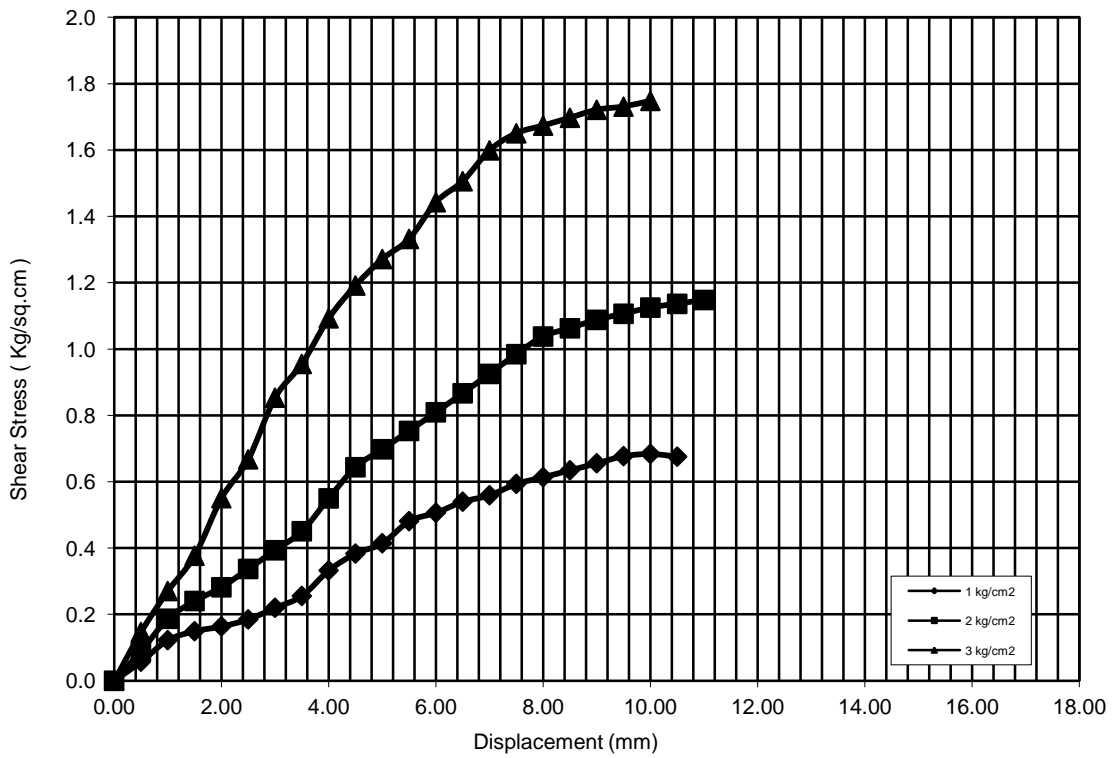
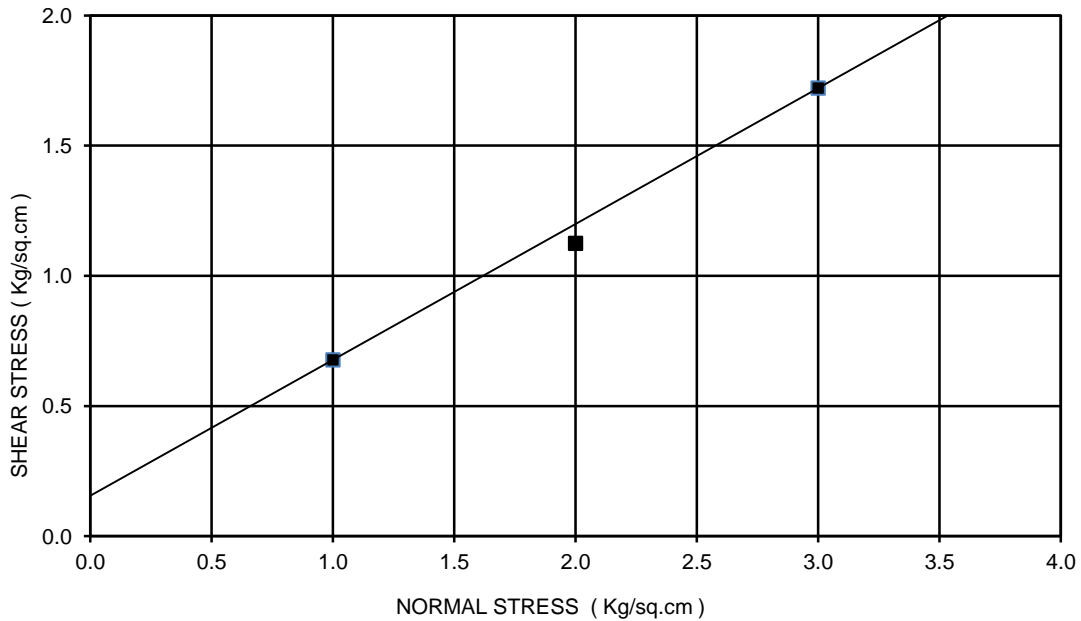
BORE HOLE NO: BH-A1
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



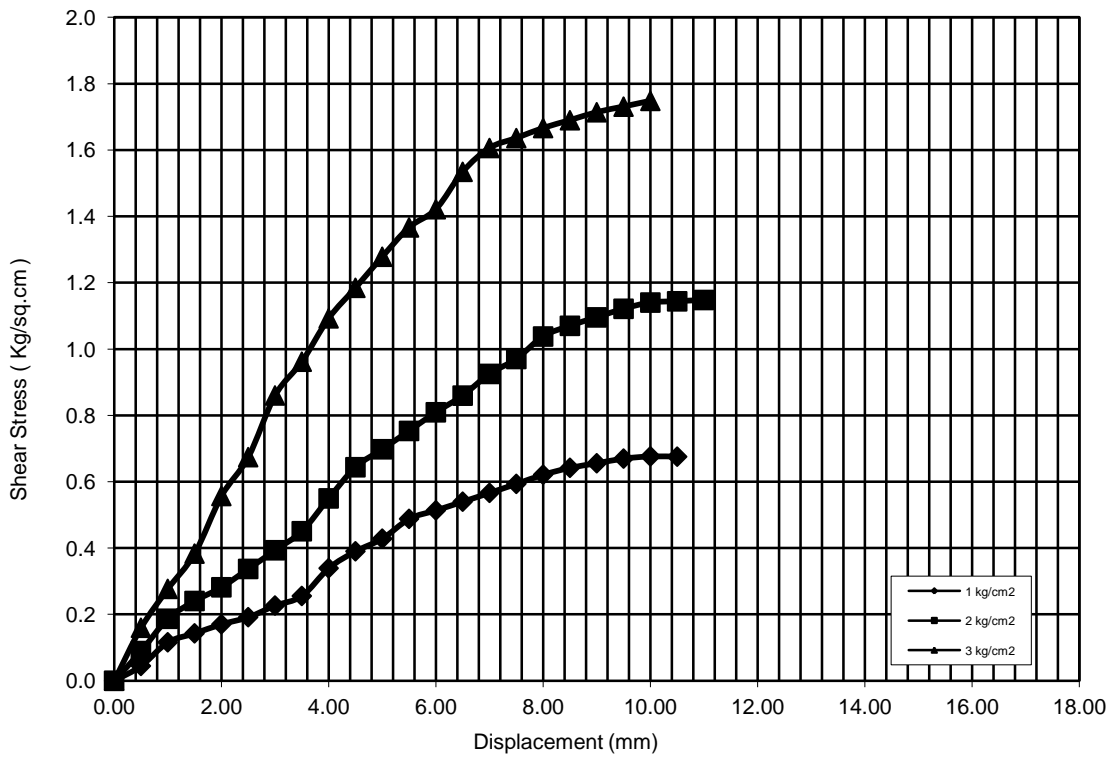
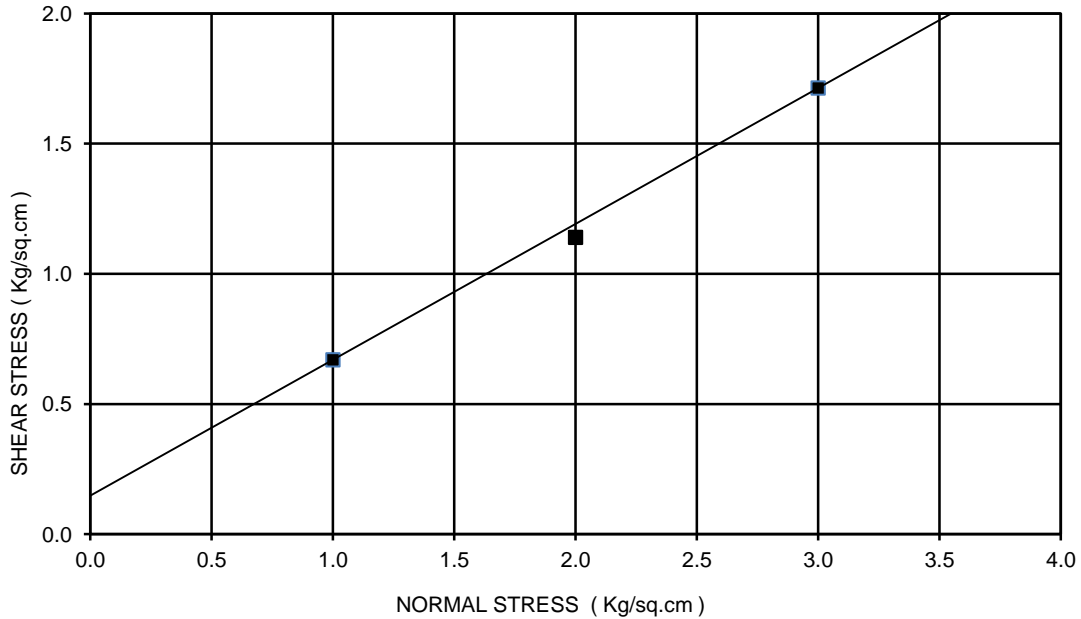
BORE HOLE NO: BH-A1
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



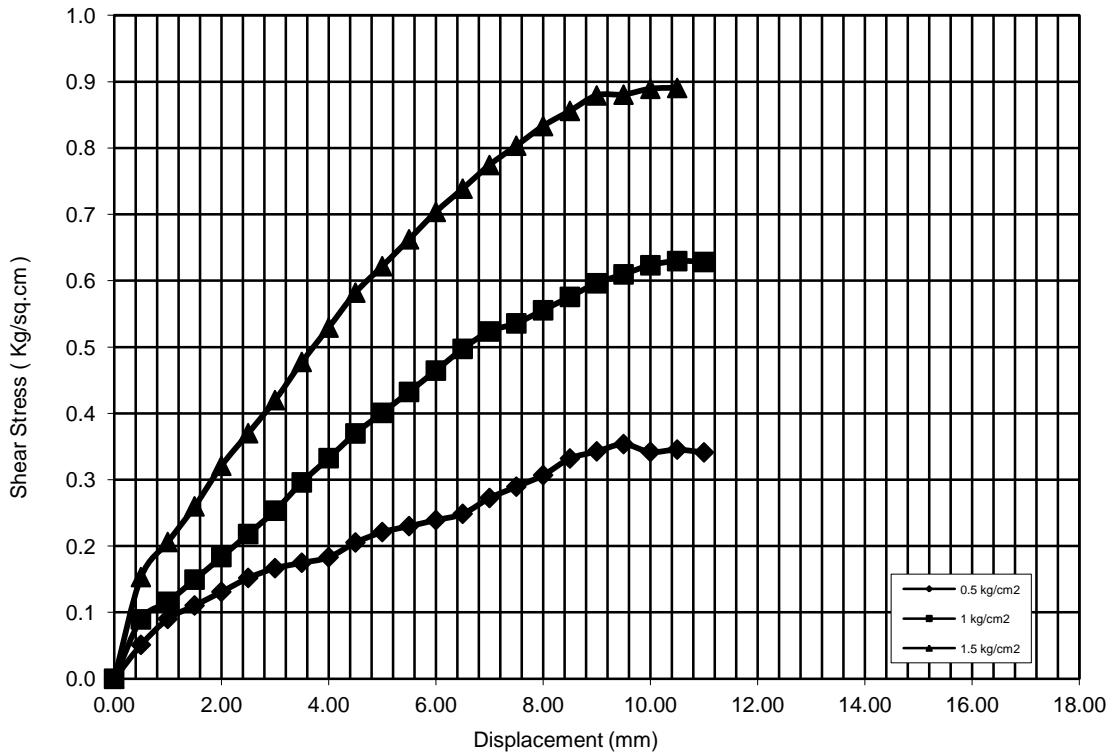
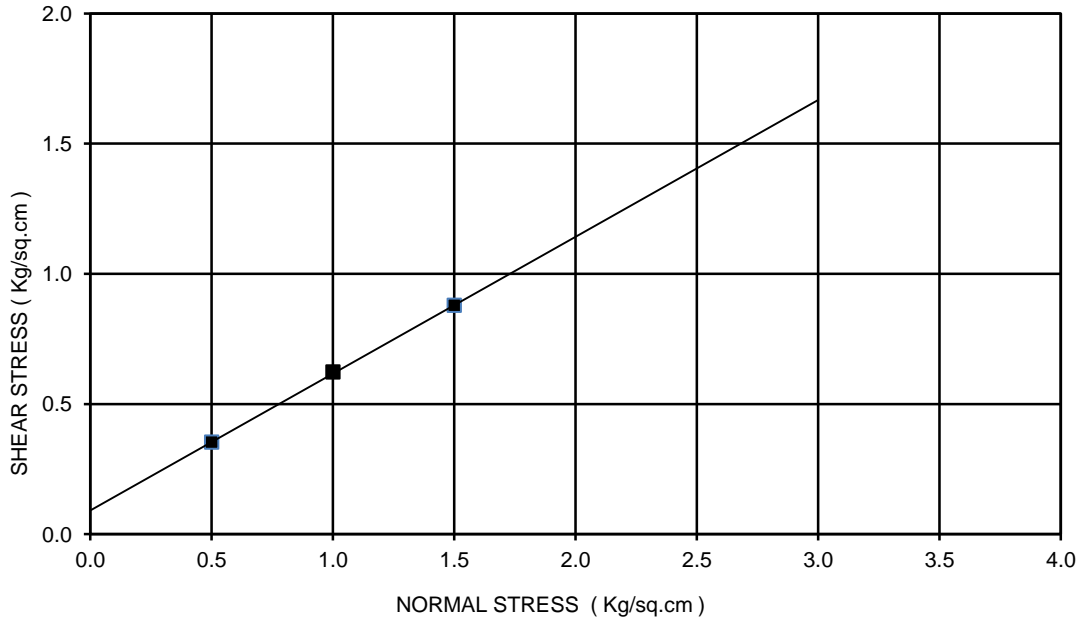
BORE HOLE NO: BH-A1
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



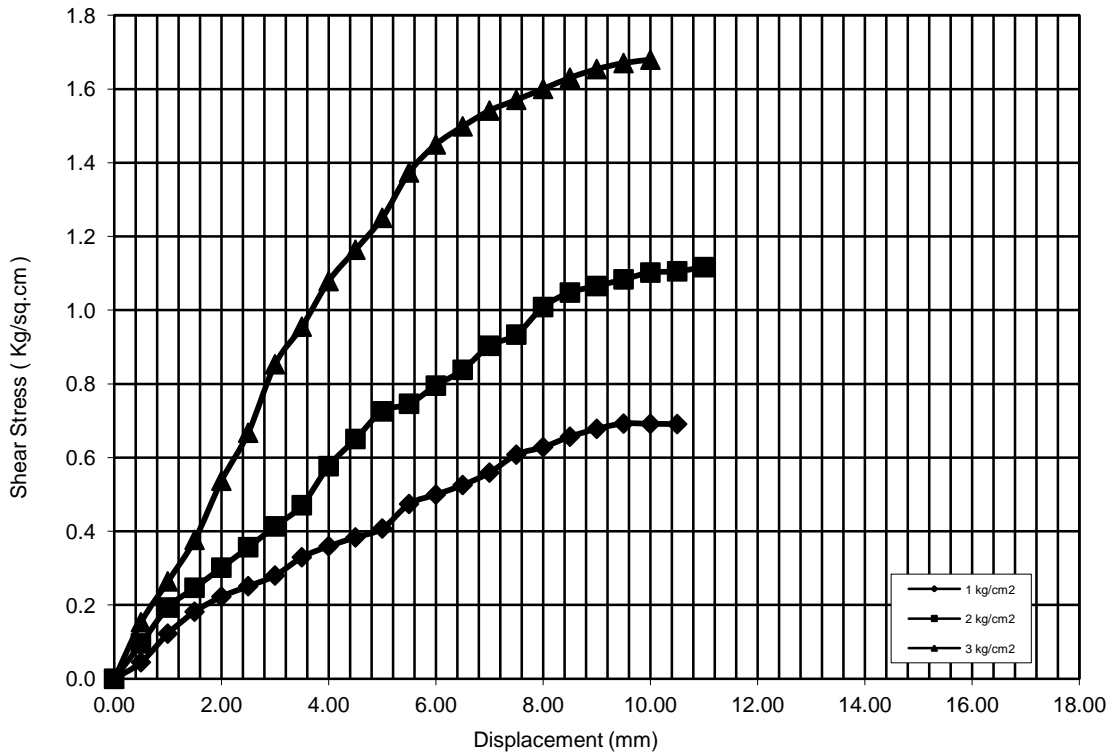
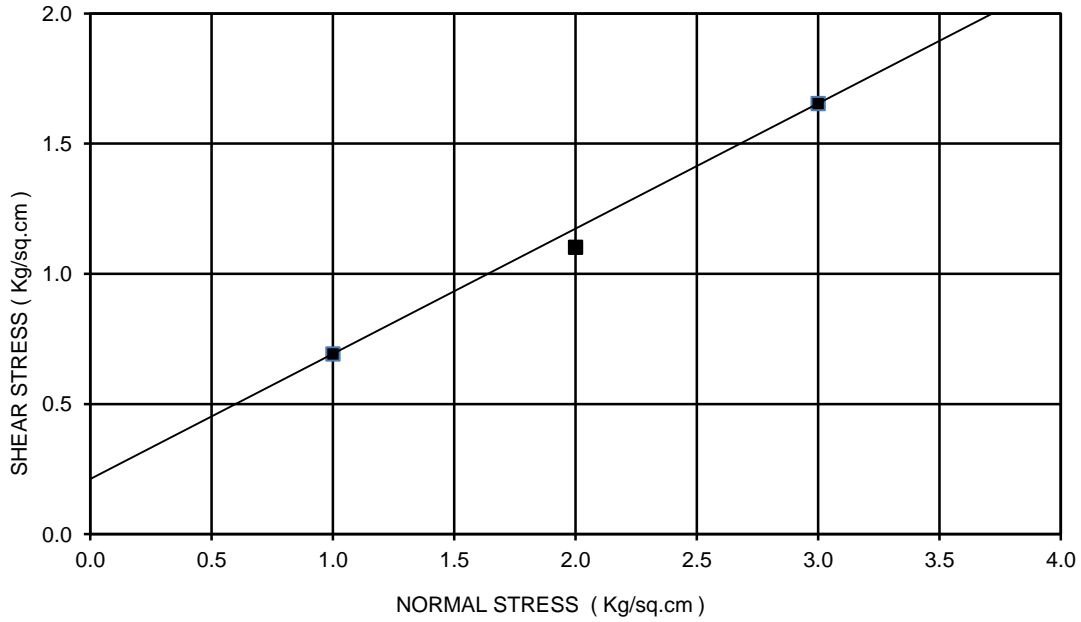
BORE HOLE NO: BH-A2
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



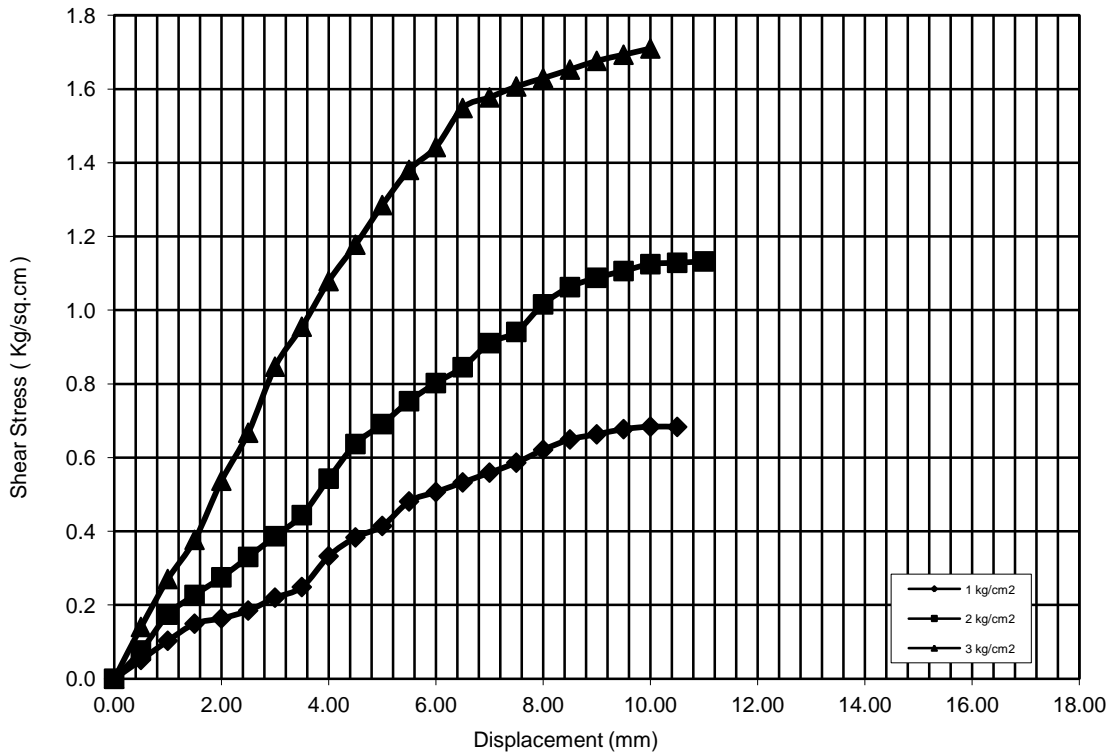
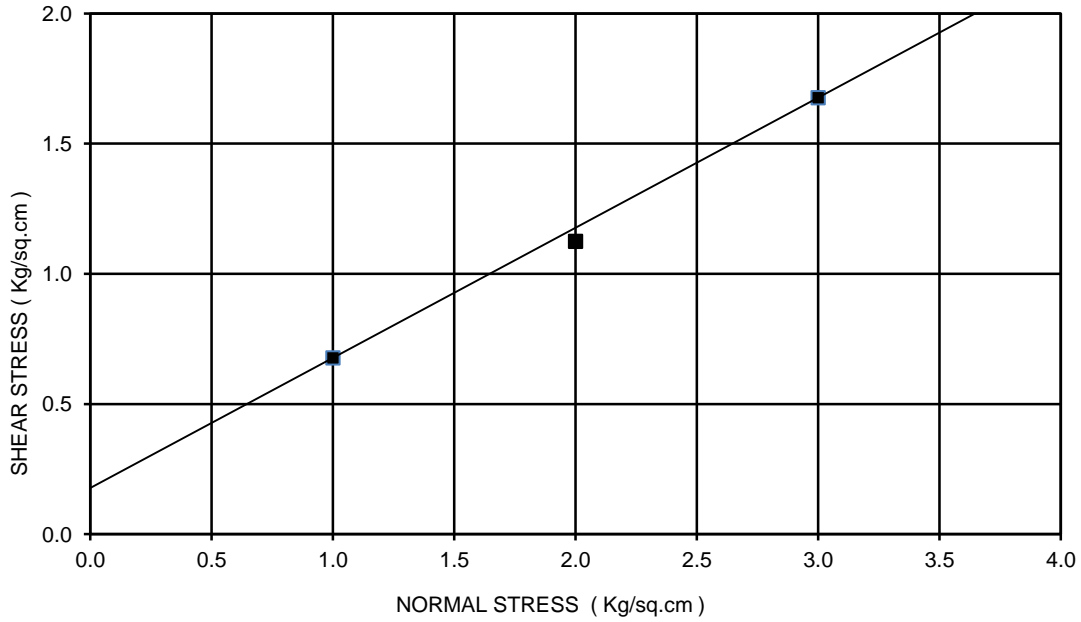
BORE HOLE NO: BH-A2
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-1
 DEPTH: 4.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 27 deg
 TYPE OF THE TEST: DST



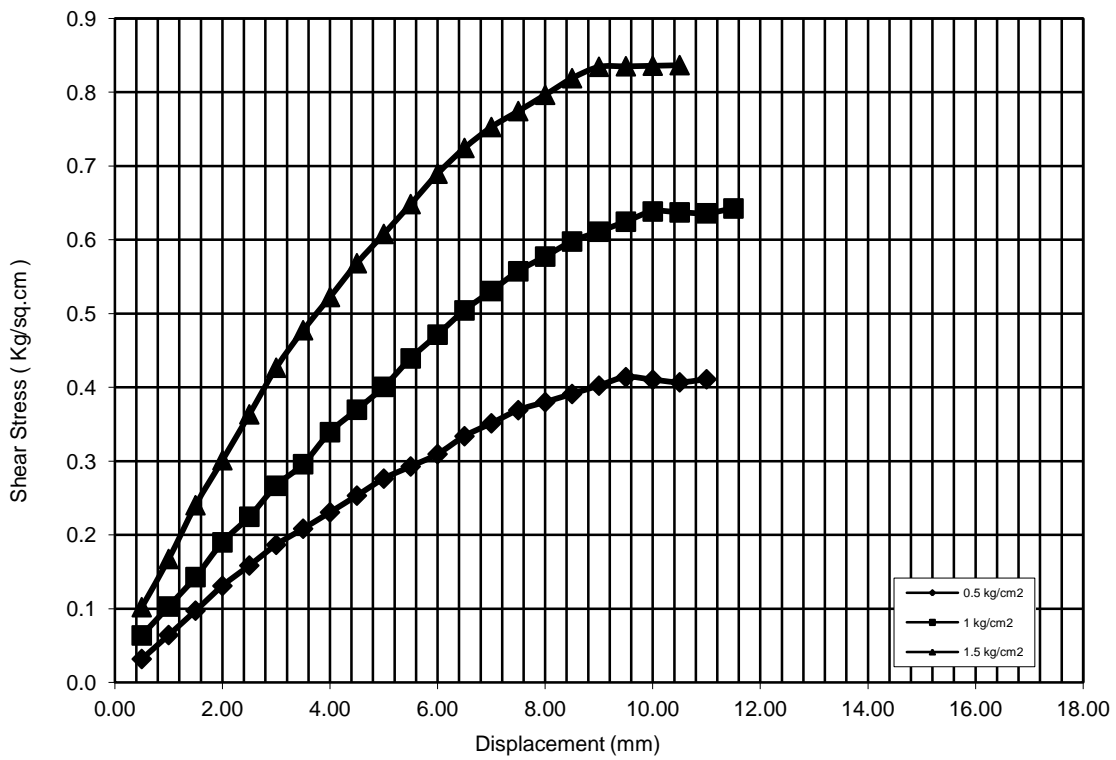
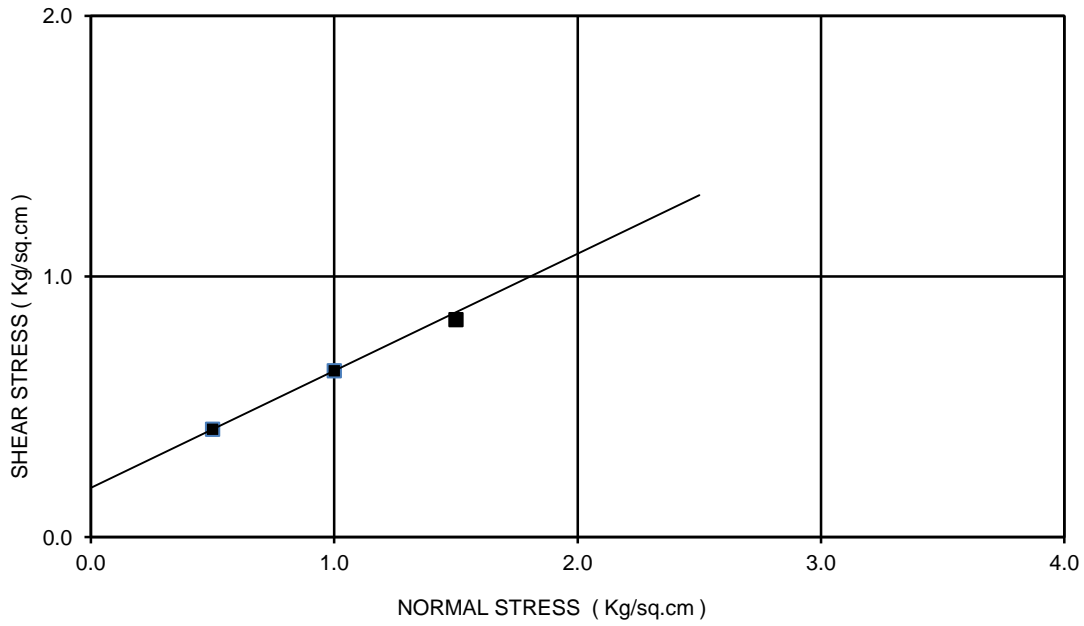
BORE HOLE NO: BH-A2
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST

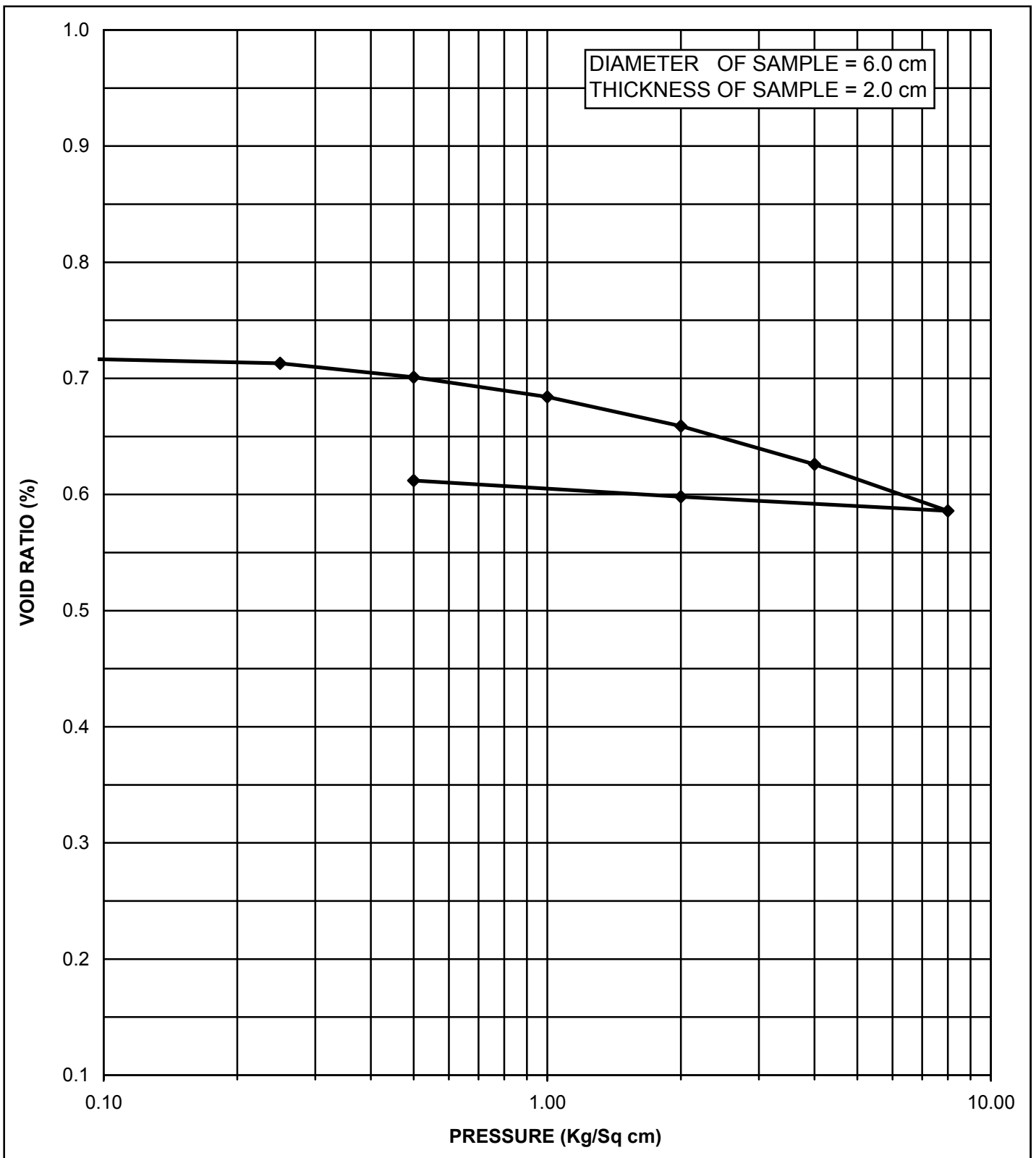


BORE HOLE NO: BH-A2
 CHAINAGE: 45+480
 SAMPLE NO.: UDS-4
 DEPTH: 13.00 m
 COHESION(C)= 0.08 kg/sq.cm
 ANGLE OF FRICTION(Phi): 26 deg
 TYPE OF THE TEST: DST



BORE HOLE NO: BH-CL
 CHAINAGE: 45+612
 SAMPLE NO.: UDS-1
 DEPTH: 2.25 m
 COHESION(C)= 0.19 kg/sq.cm
 ANGLE OF FRICTION(Phi): 24 deg
 TYPE OF THE TEST: DST





CHAINAGE :- 30+478
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-1

DEPTH = 1.00 M

TYPE OF SOIL = CL

INITIAL WATER CONTENT = 13.24 %

DRY DENSITY = 1.55 gm/cm³

VOID RATIO (e_0) = 0.725

COMPRESSION INDEX (C_c) = 0.133

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

BORE HOLE NO. = BH-CL
SAMPLE NO. = UDS-1
DEPTH = 1.00 M

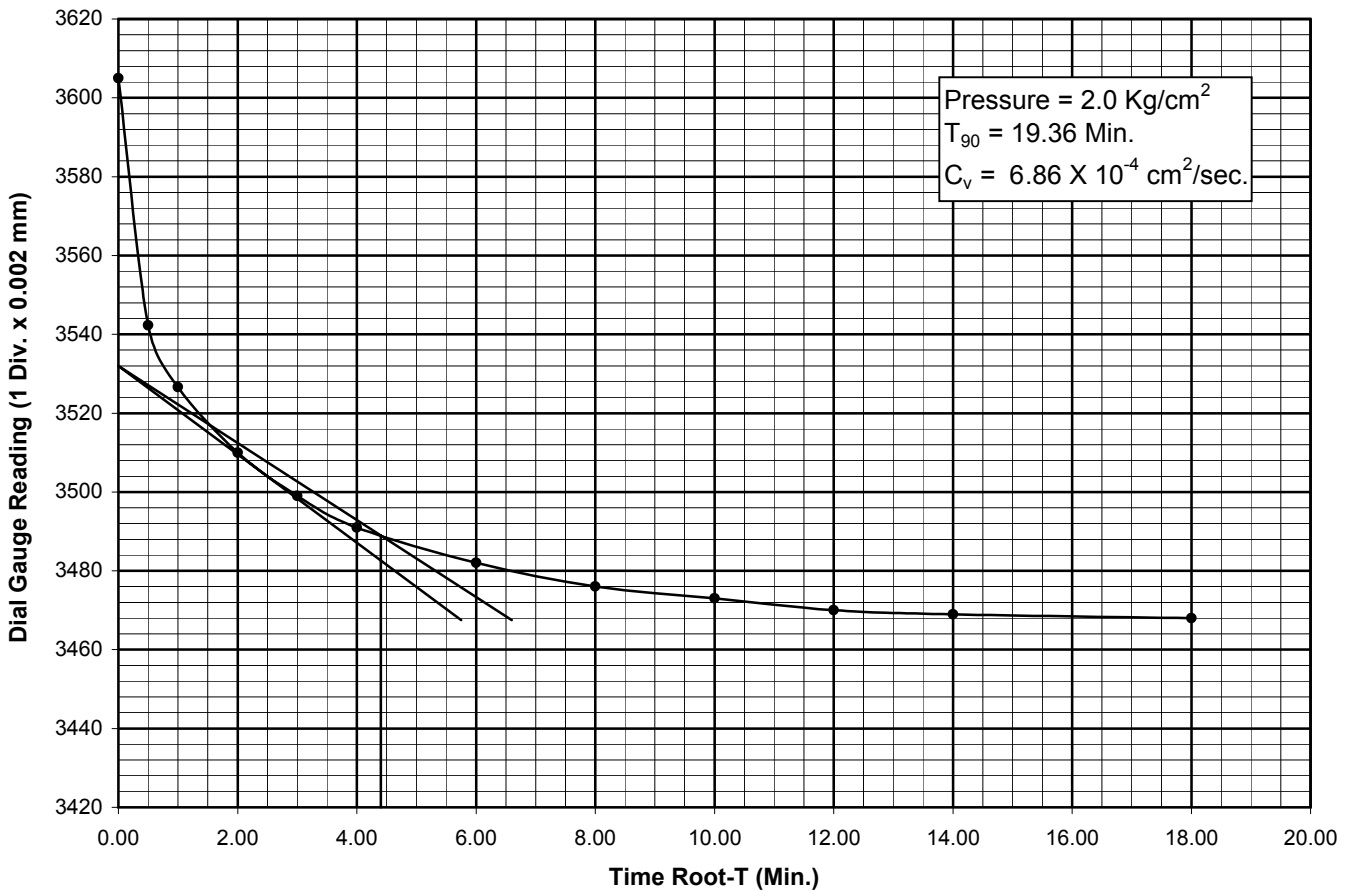
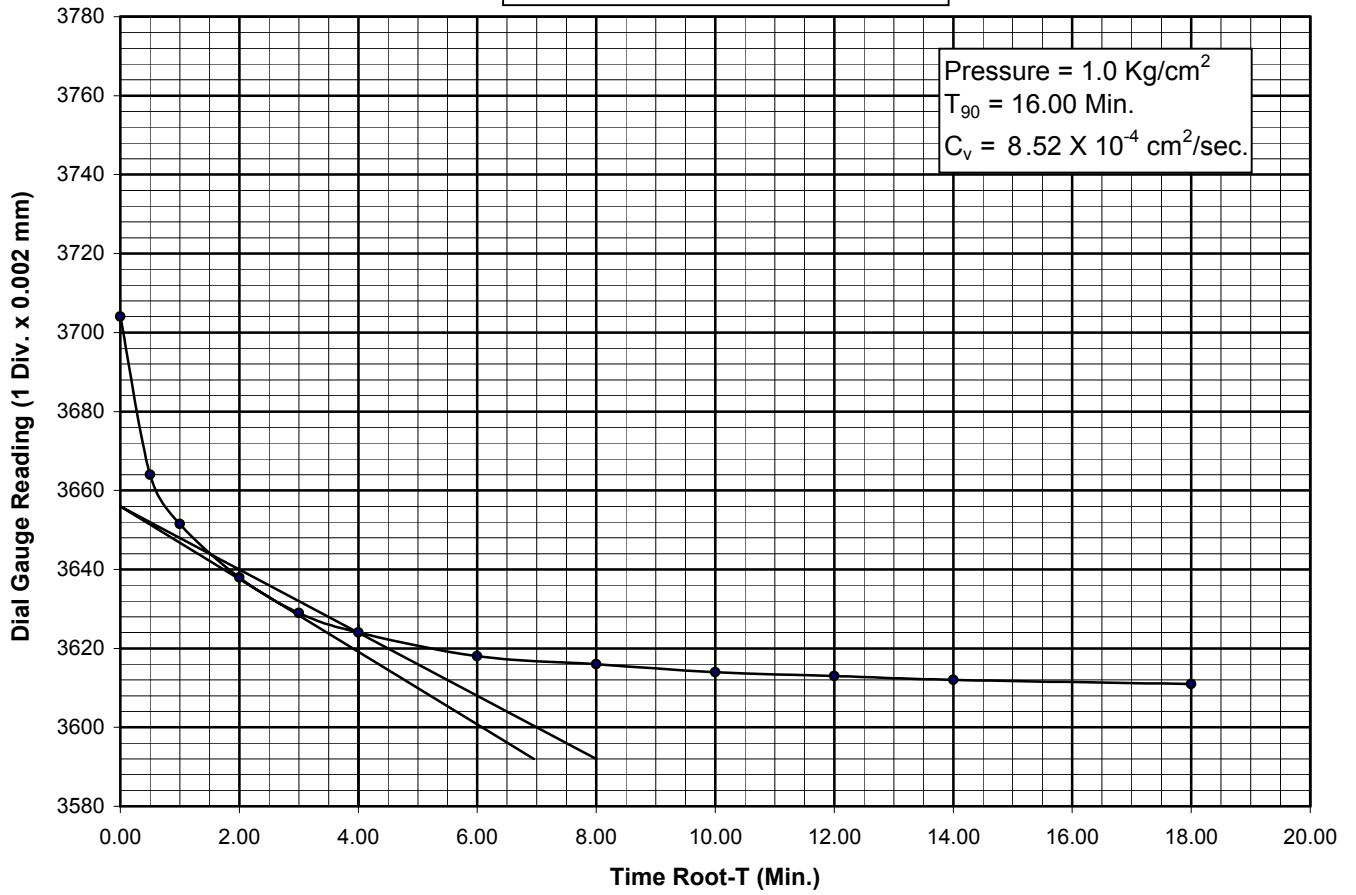


Figure No. -

BORE HOLE NO. = BH-CL
SAMPLE NO. = UDS-1
DEPTH = 1.00 M

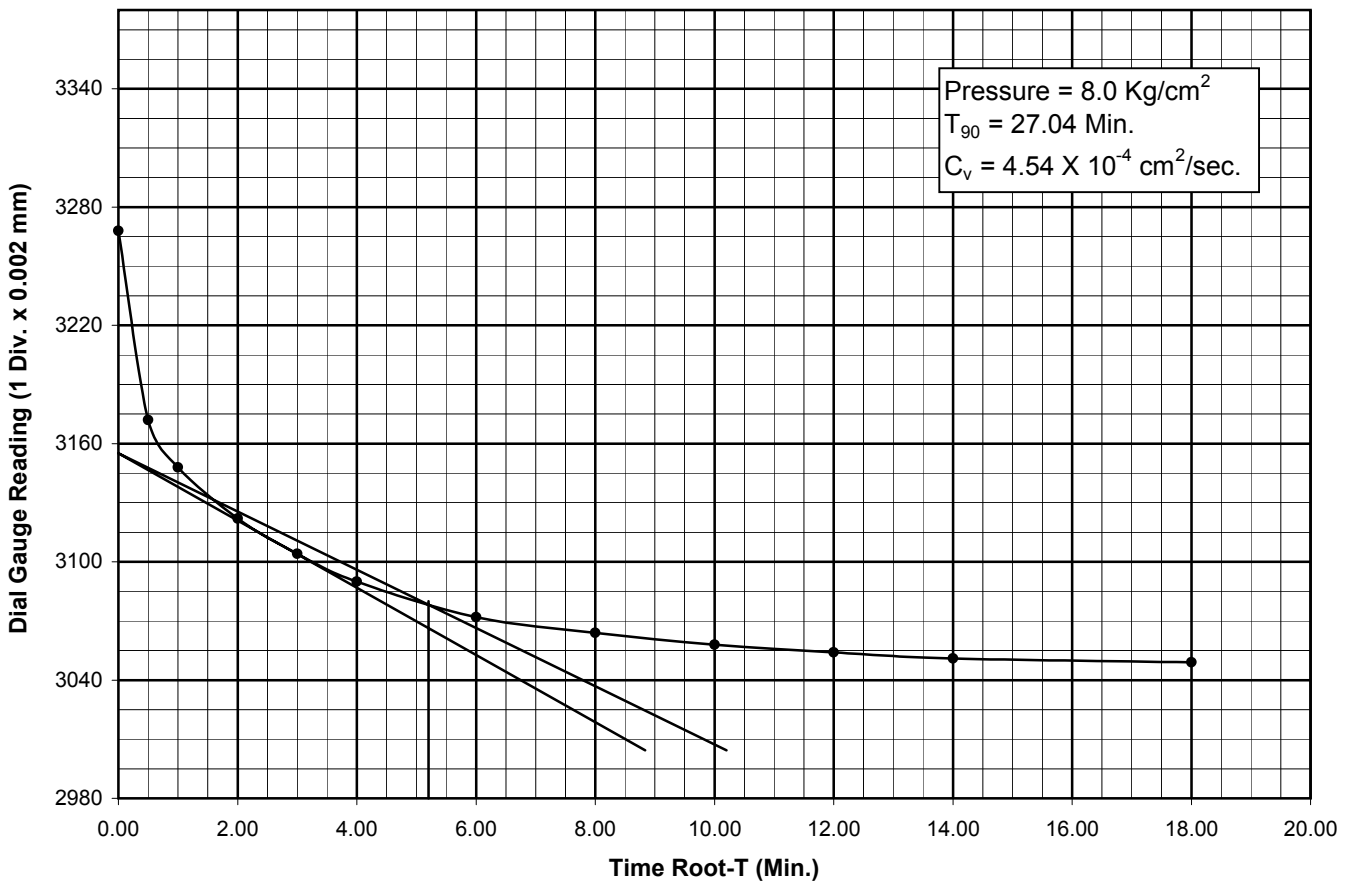
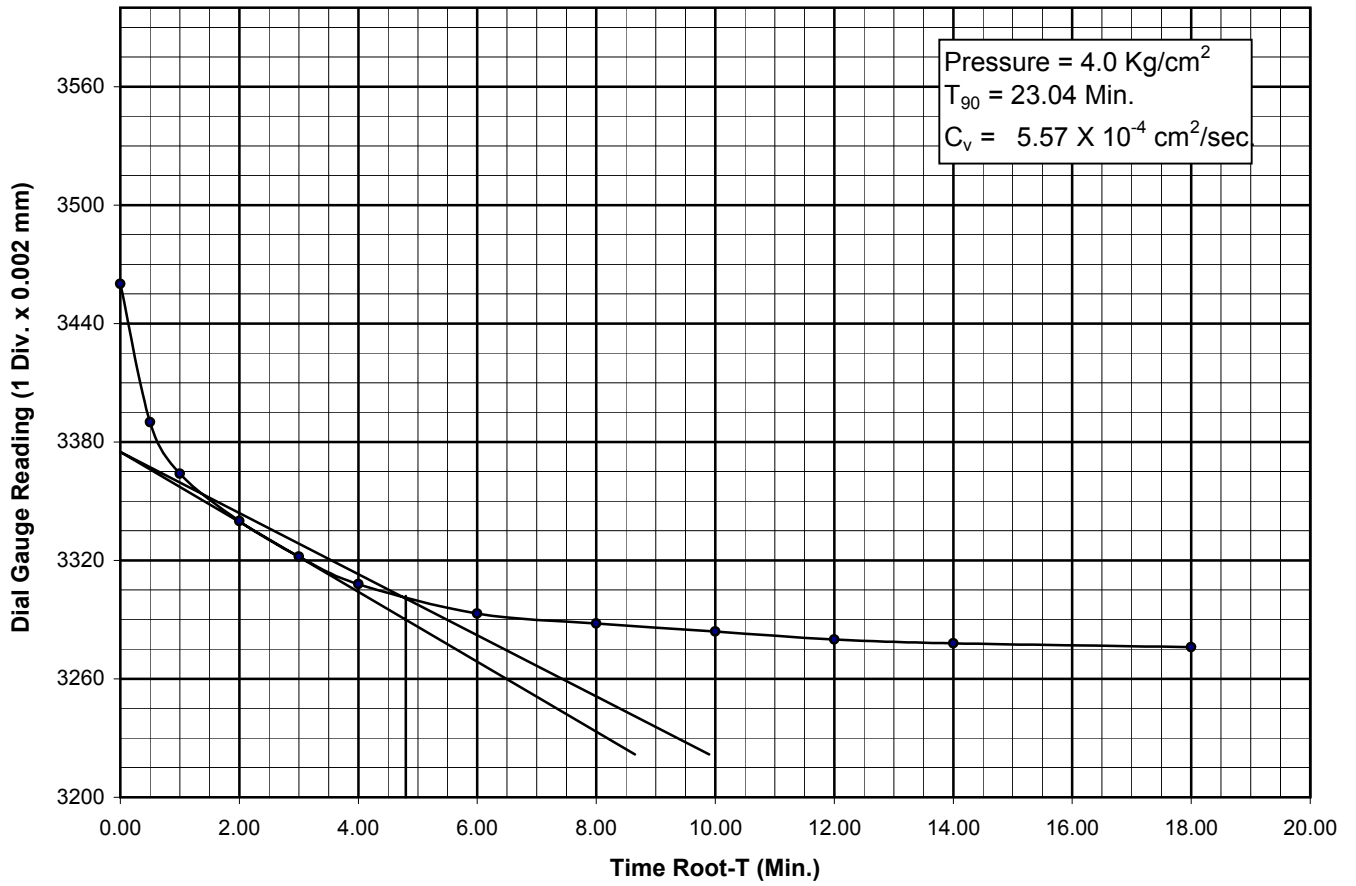
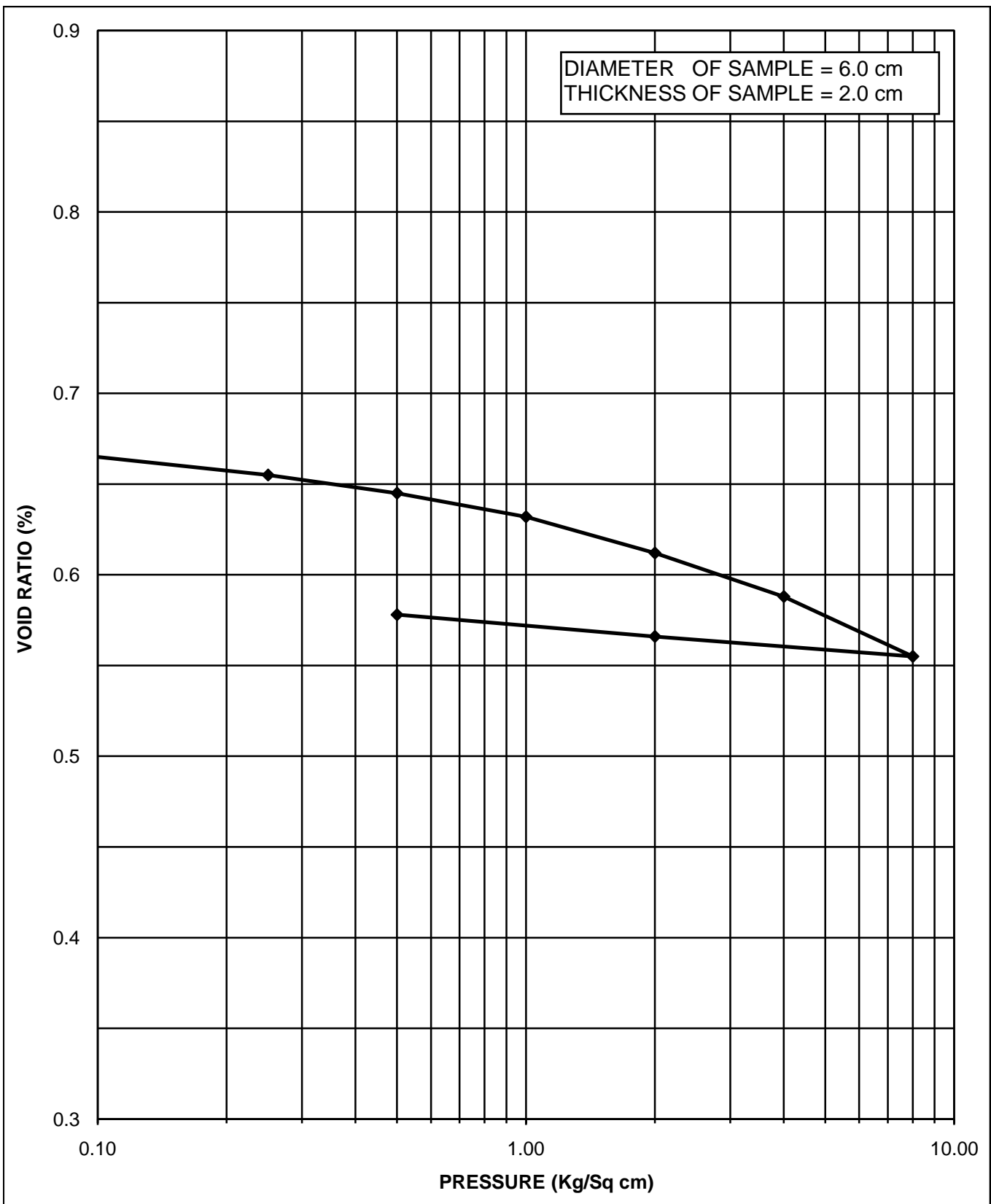


Figure No. -



CHAINAGE: 30+488

INITIAL WATER CONTENT = 15.04 %

BORE HOLE NO. = BH-A1

DRY DENSITY = 1.61 gm/cm³

SAMPLE NO. = UDS-3

VOID RATIO (e_0) = 0.665

DEPTH = 8.50 M

COMPRESSION INDEX (C_c) = 0.110

TYPE OF SOIL = CI

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e -log p)

CHAINAGE: 30+488
 BORE HOLE NO. = BH-A1
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

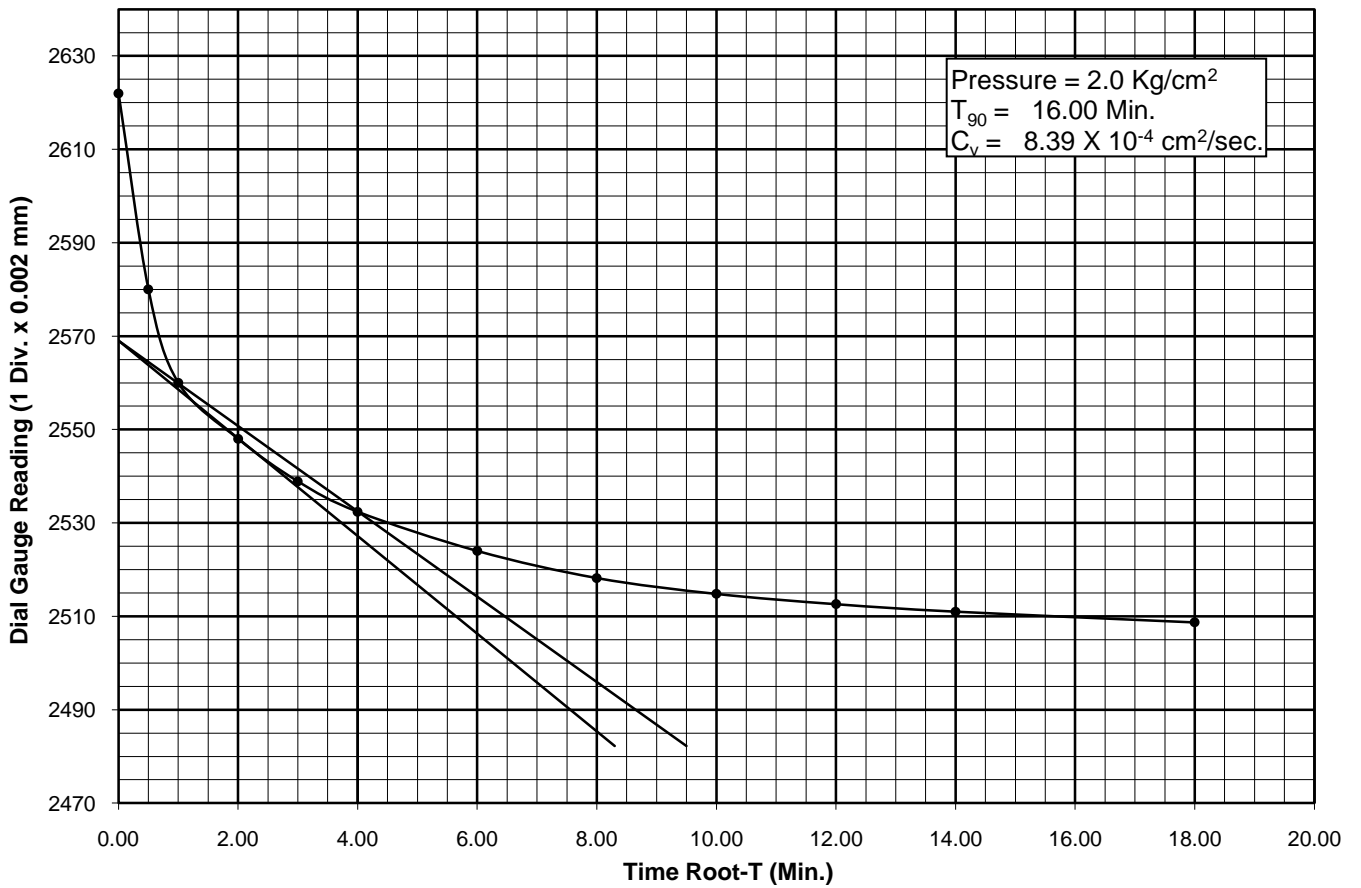
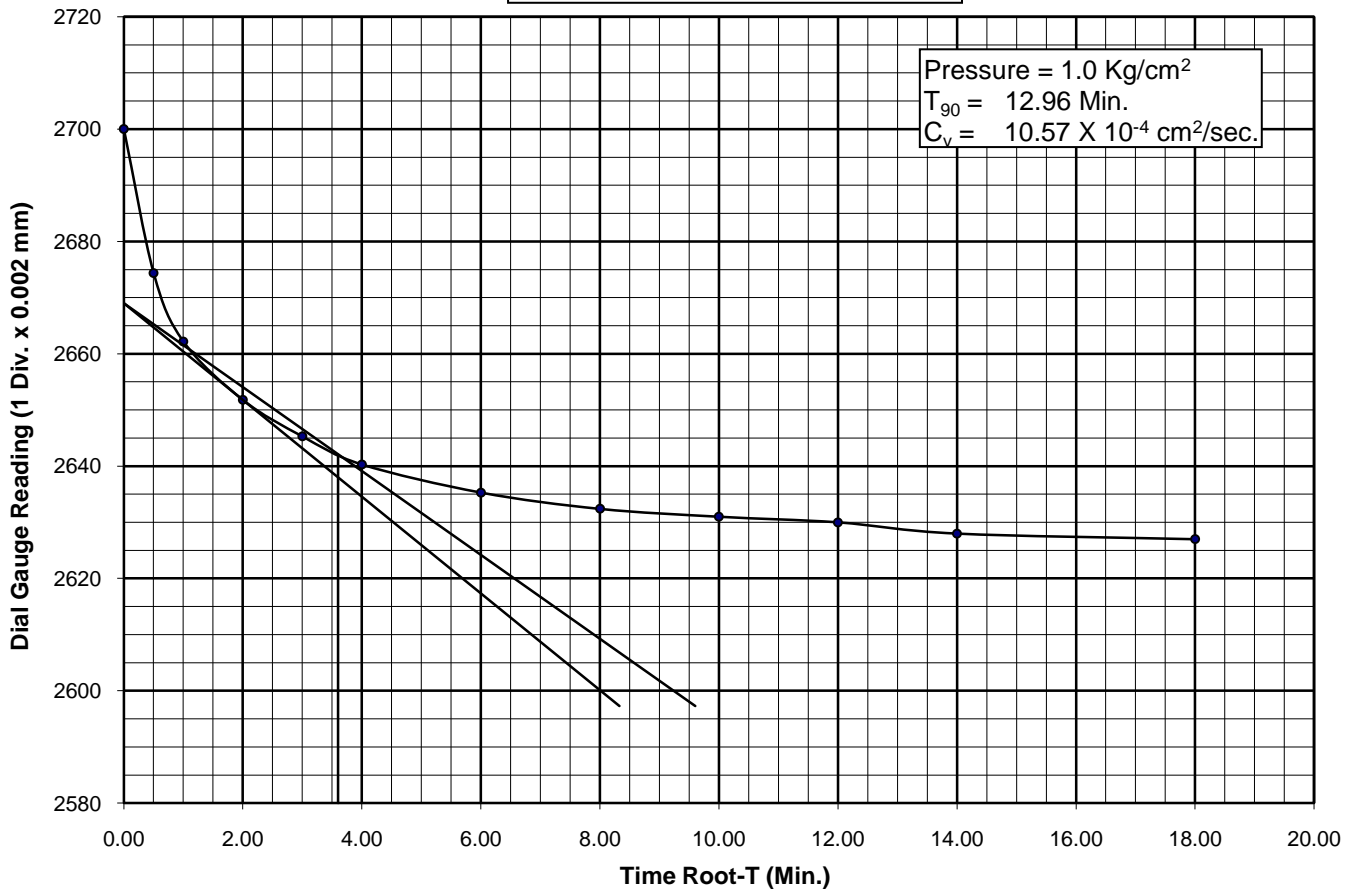


Figure No. -

CHAINAGE = 30+488
 BORE HOLE NO. = BH-A1
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

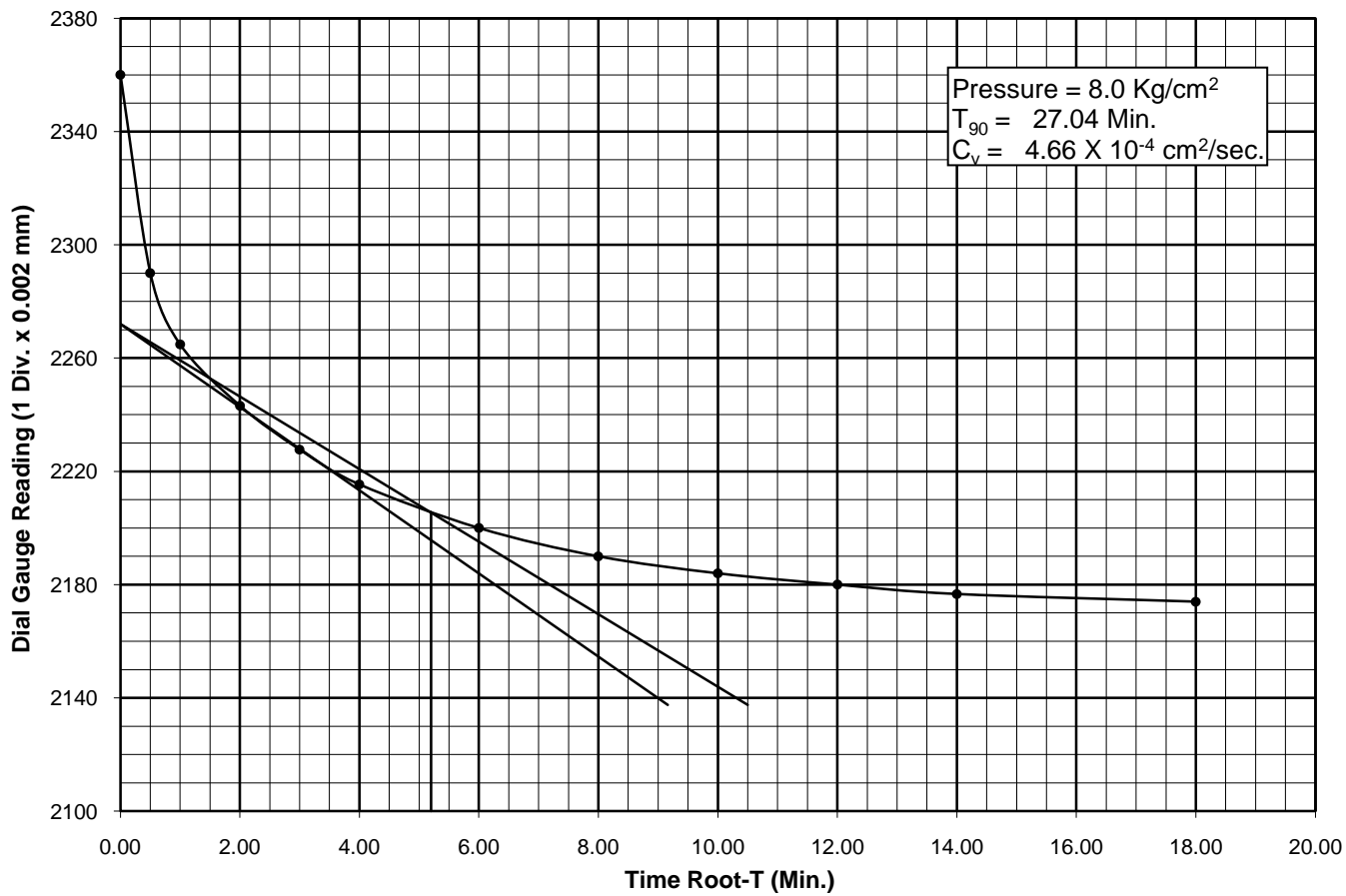
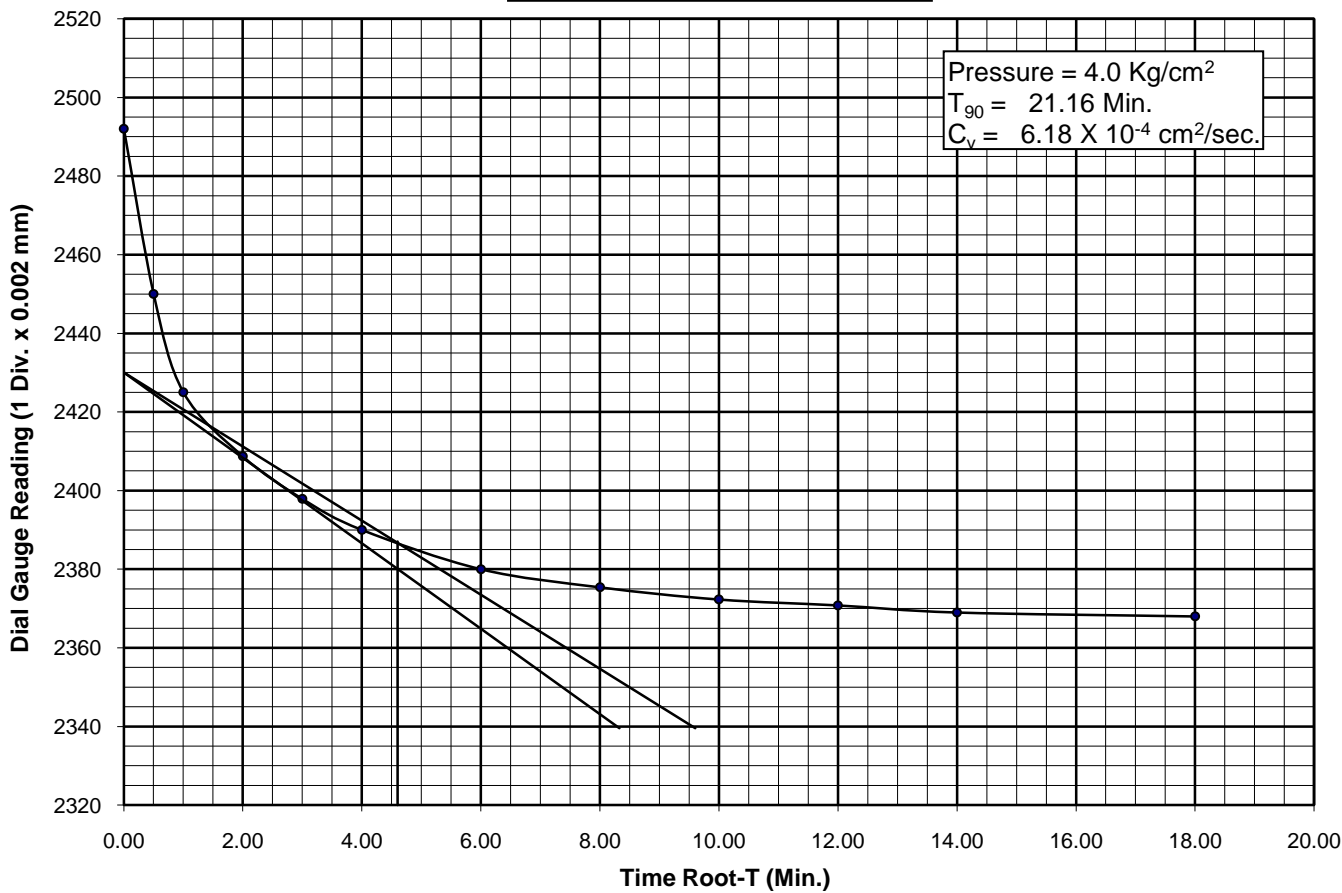
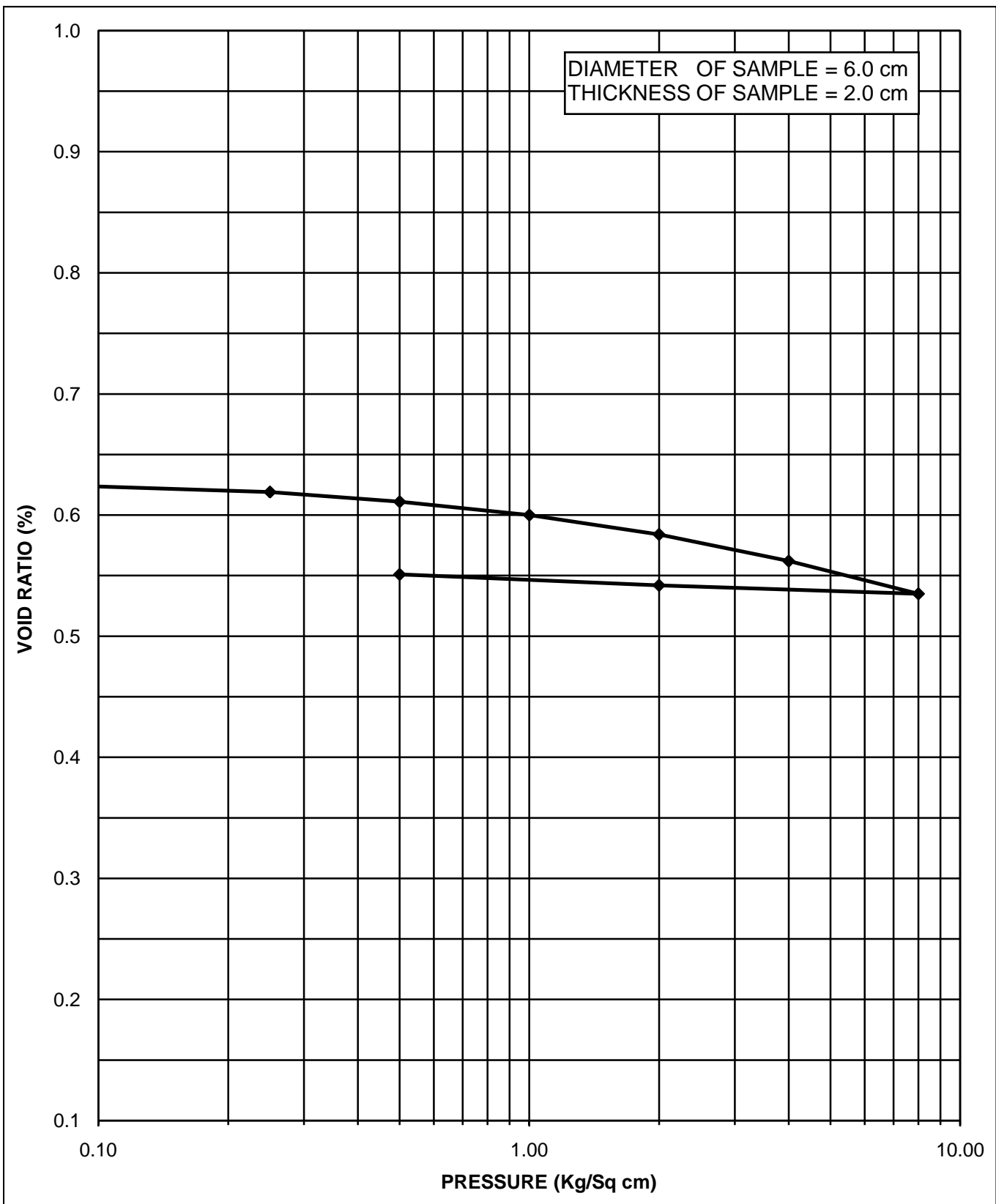


Figure No. -



CHAINAGE: 30+488

INITIAL WATER CONTENT = 18.10 %

BORE HOLE NO. = BH-A2

DRY DENSITY = 1.65 gm/cm³

SAMPLE NO. = UDS-8

VOID RATIO (e_0) = 0.625

DEPTH = 25.00 M

COMPRESSION INDEX (C_c) = 0.090

TYPE OF SOIL = CI

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 30+488
 BORE HOLE NO. = BH-A2
 SAMPLE NO. = UDS-8
 DEPTH = 25.00 M

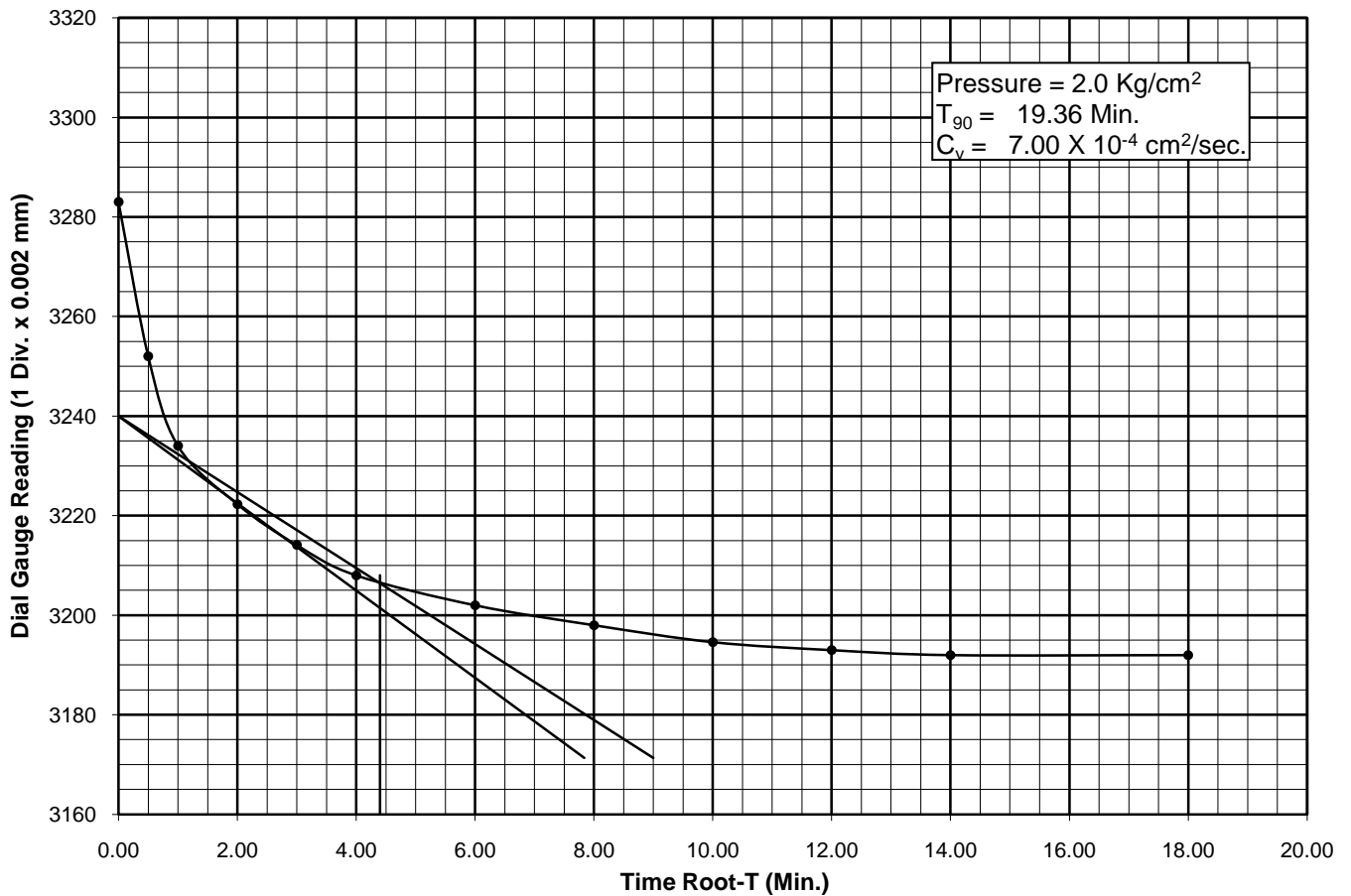
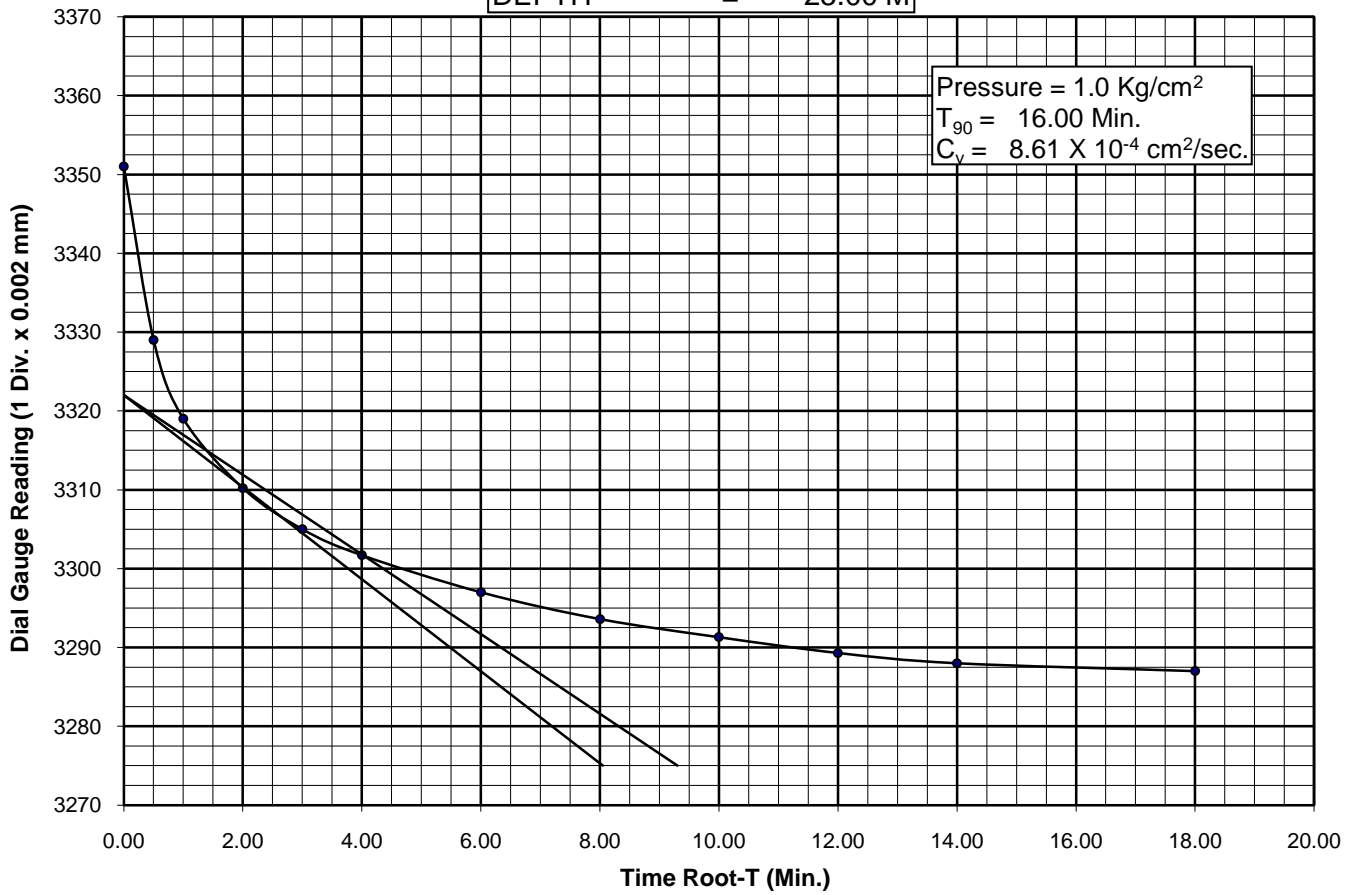


Figure No. -

CHAINAGE = 30+488
 BORE HOLE NO. = BH-A2
 SAMPLE NO. = UDS-8
 DEPTH = 25.00 M

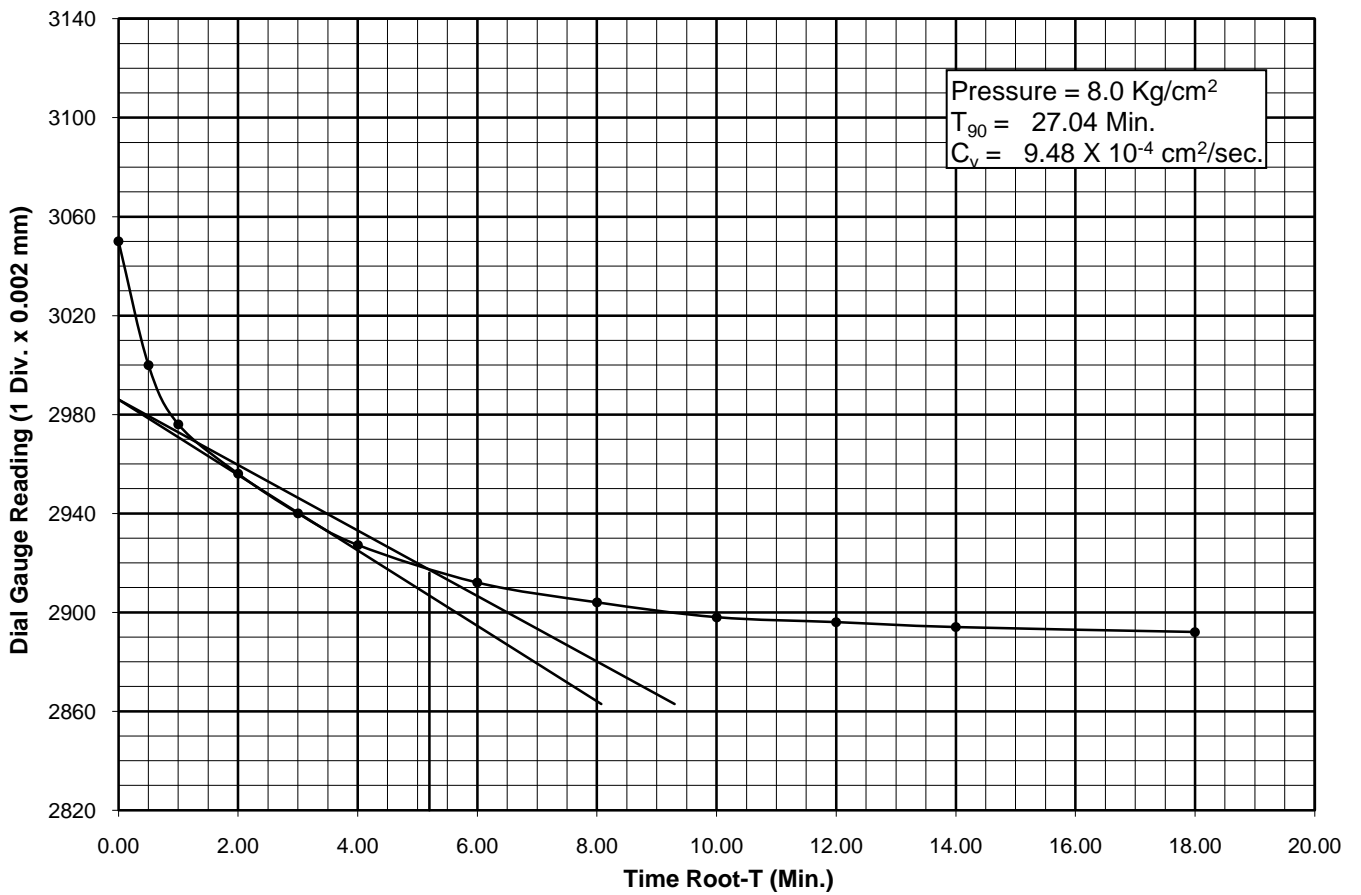
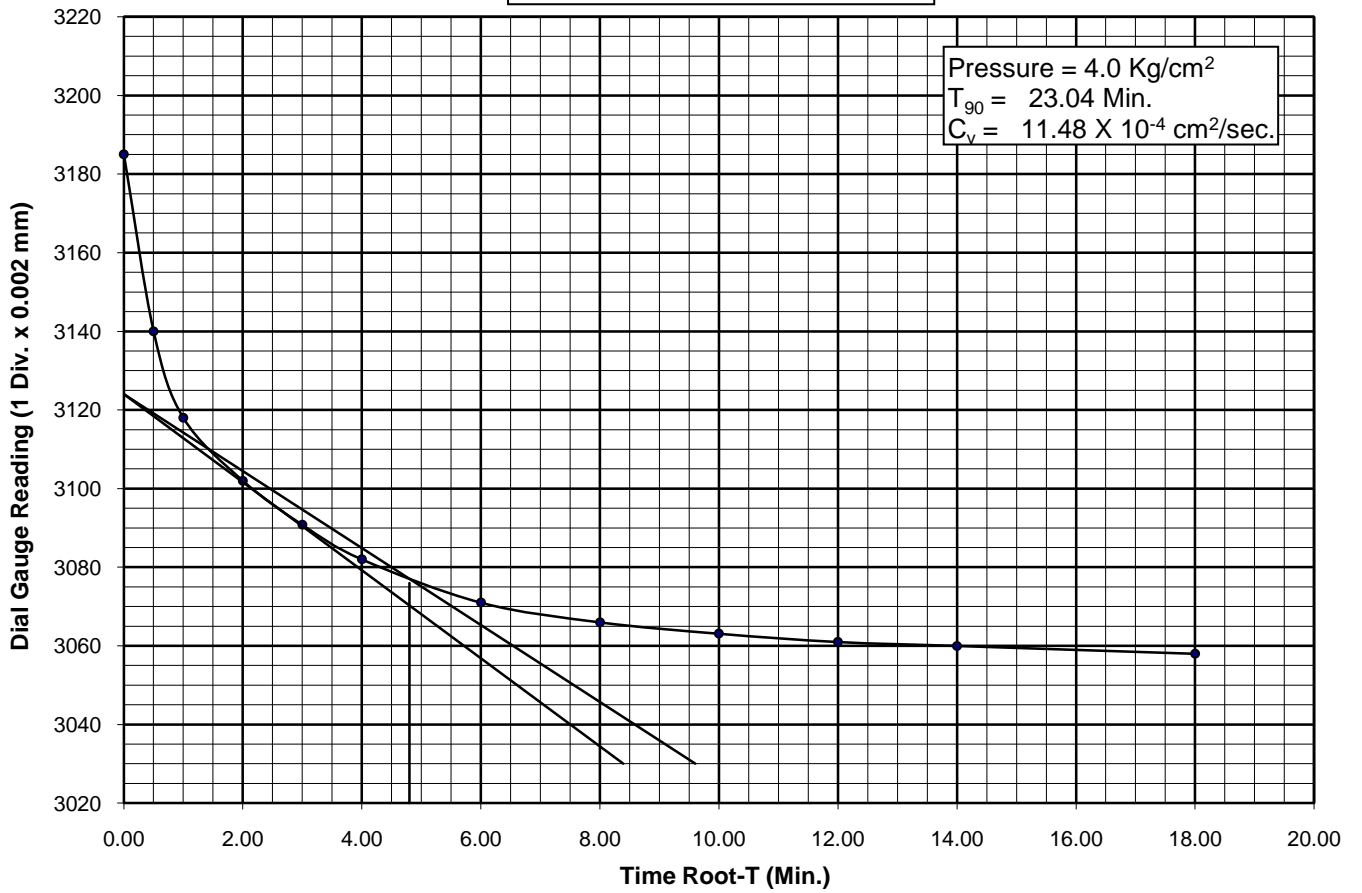
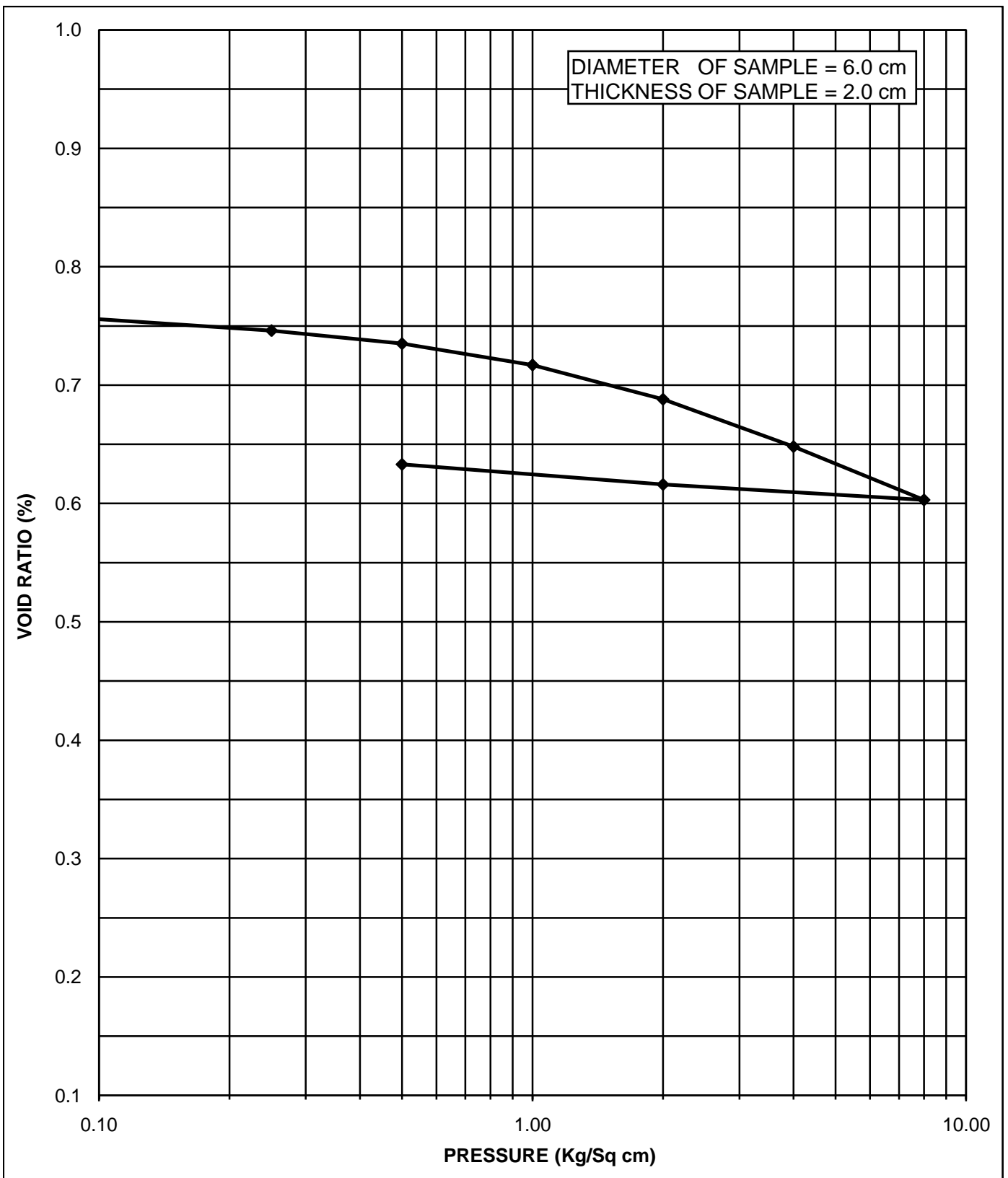


Figure No. -



CHAINAGE: 32+160

INITIAL WATER CONTENT = 12.10 %

BORE HOLE NO. = BH-CL

DRY DENSITY = 1.52 gm/cm³

SAMPLE NO. = UDS-1

VOID RATIO (e_0) = 0.755

DEPTH = 1.00 M

COMPRESSION INDEX (C_c) = 0.150

TYPE OF SOIL = CI

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 32+160
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-1
 DEPTH = 1.00 M

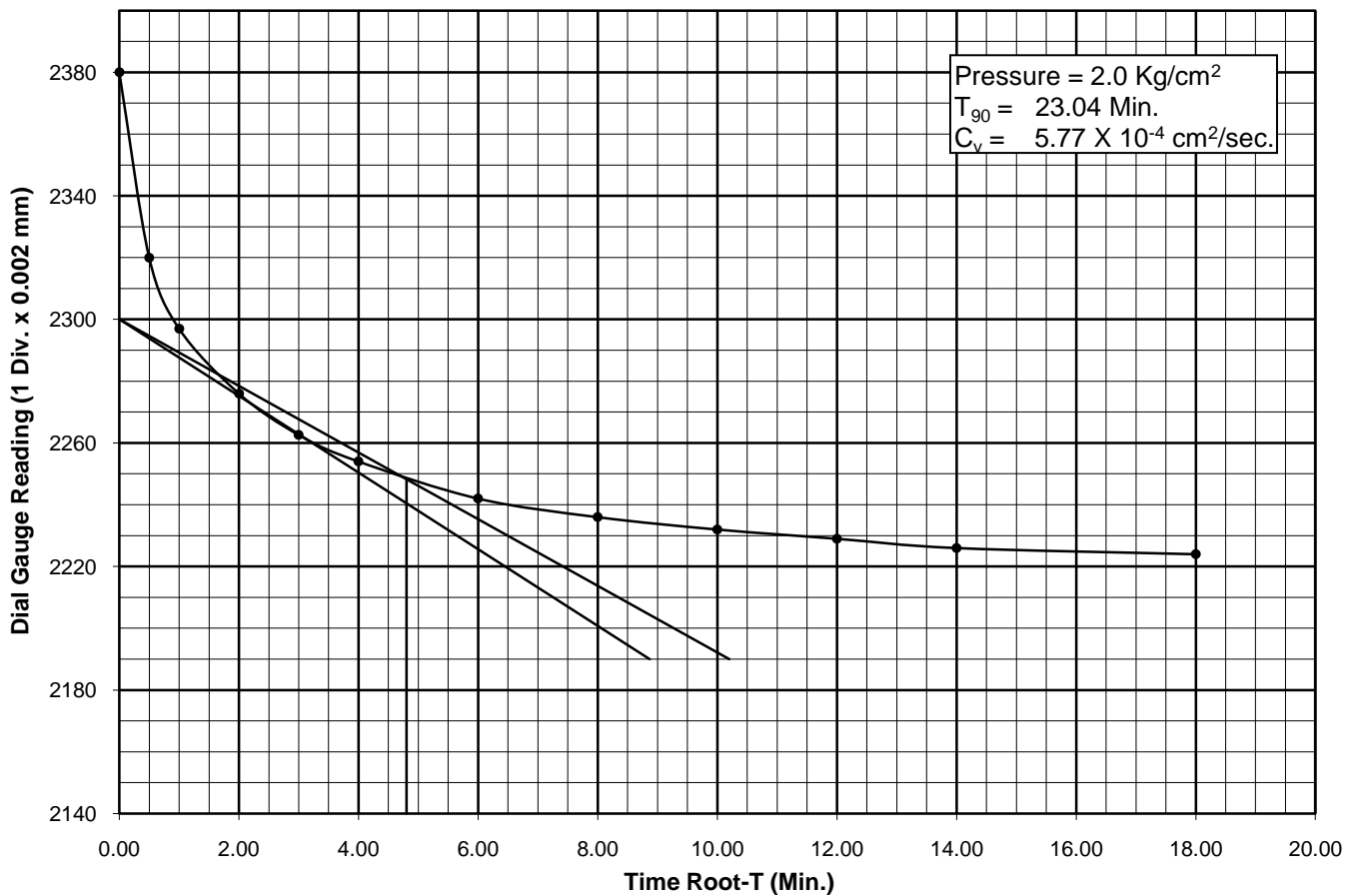
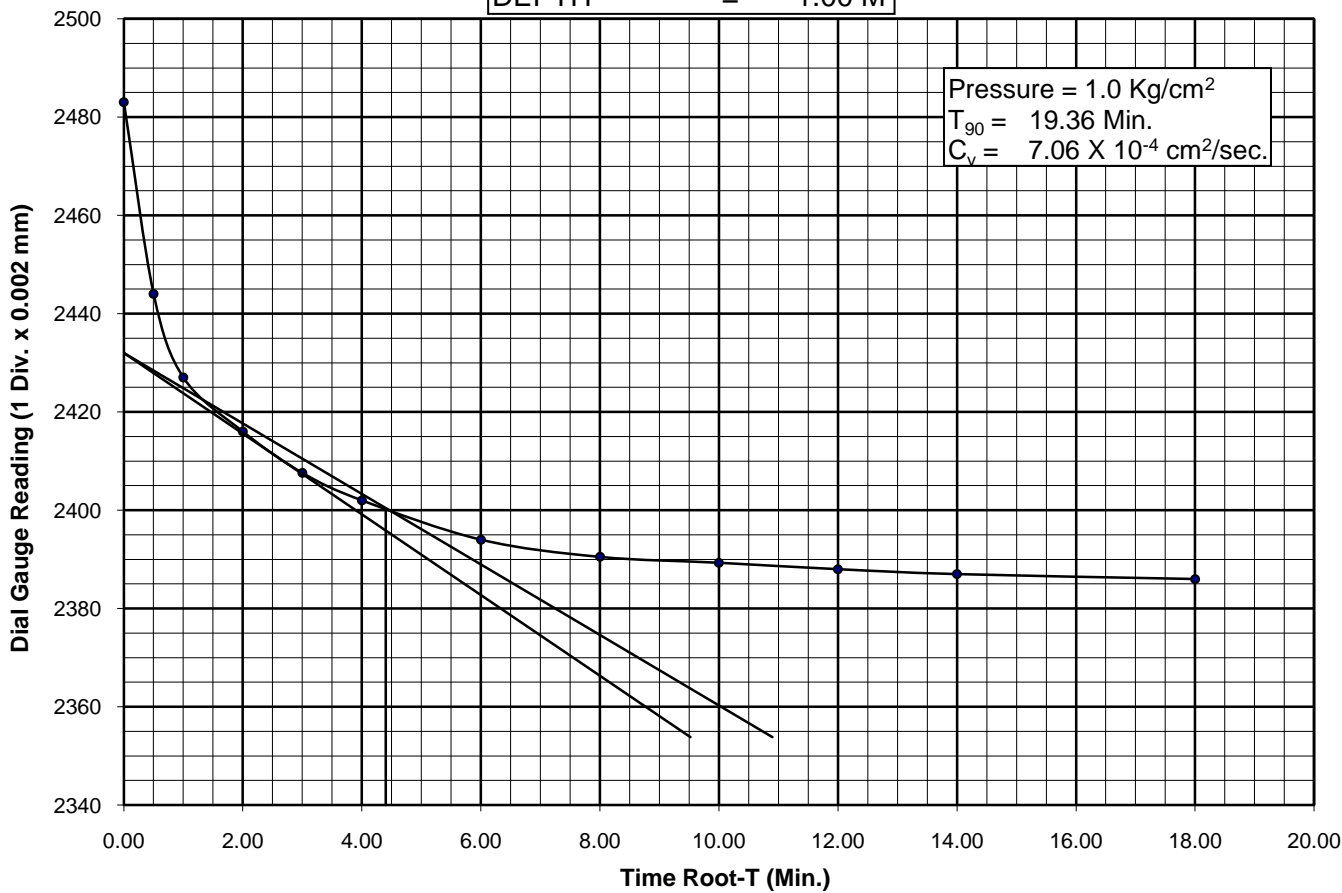


Figure No. -

CHAINAGE = 32+160
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-1
 DEPTH = 1.00 M

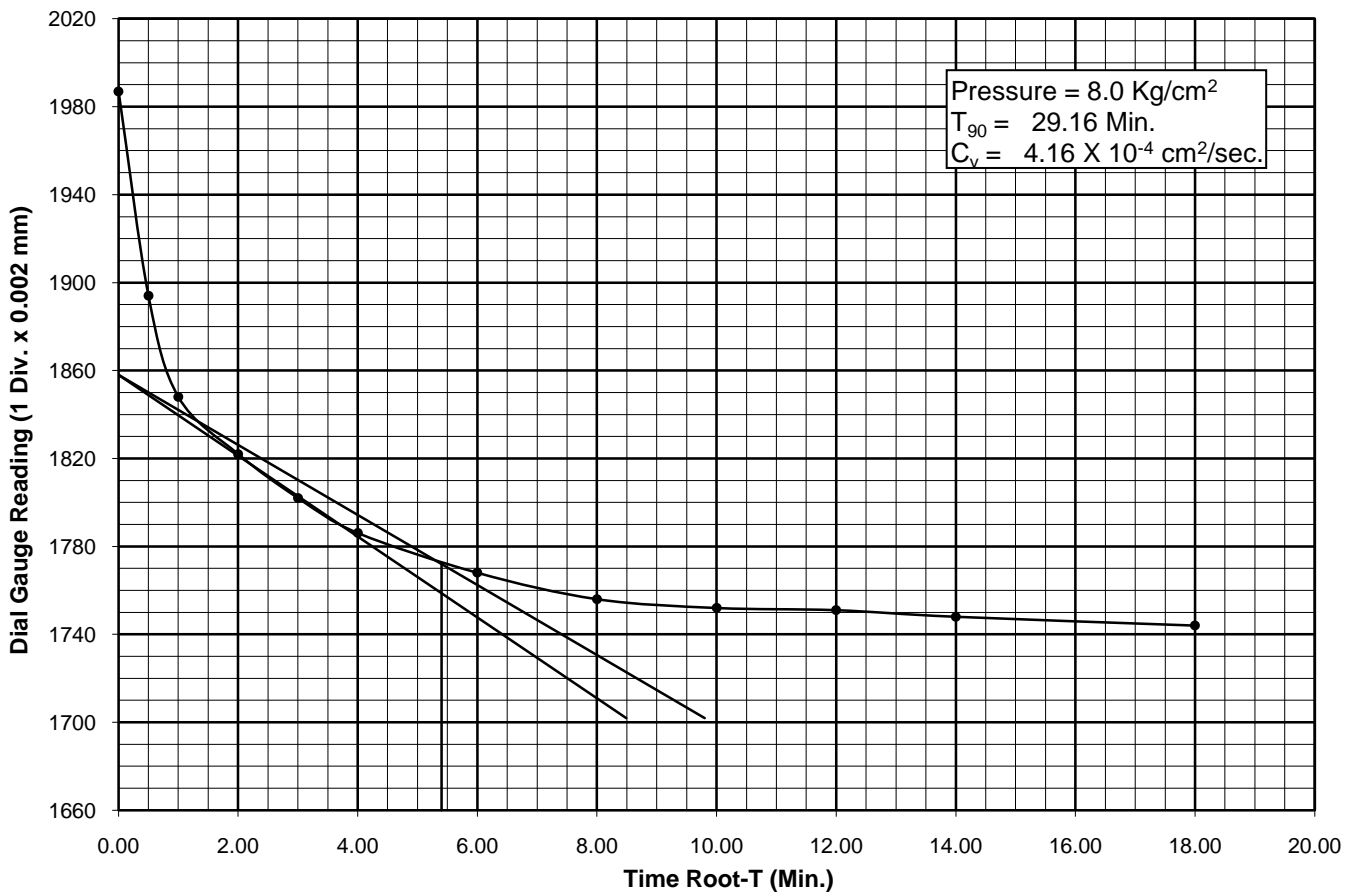
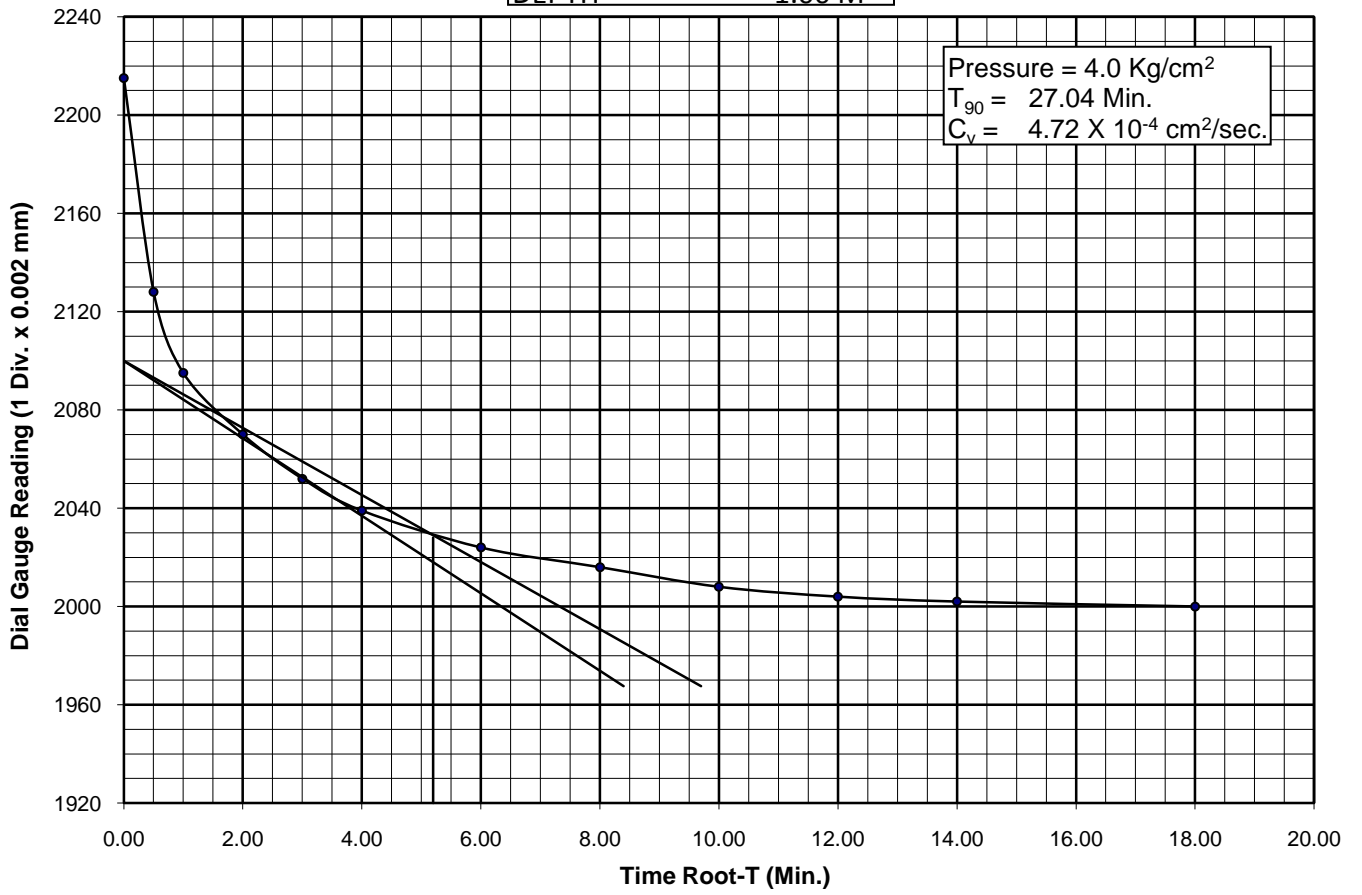
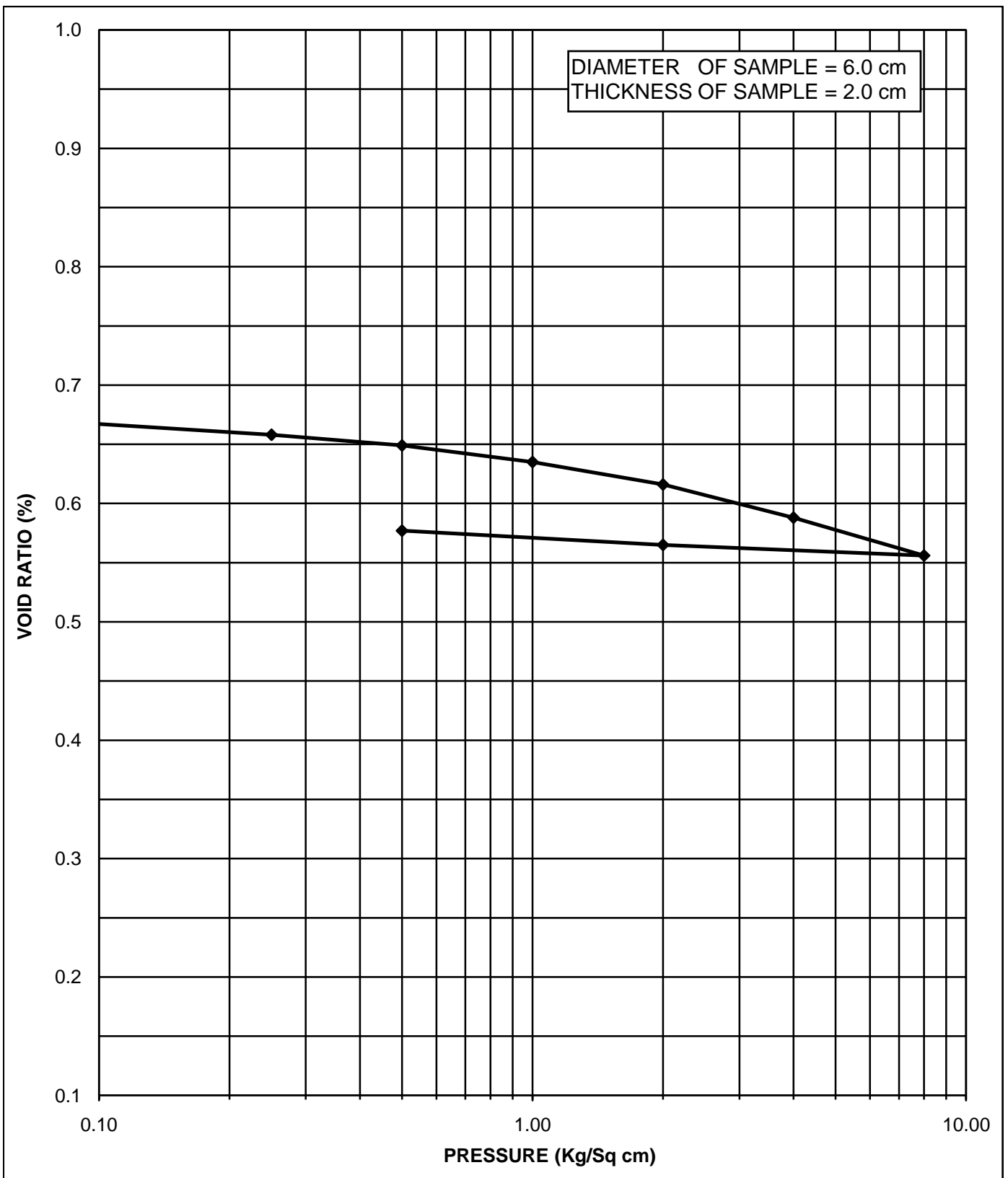


Figure No. -



CHAINAGE: 32+738

INITIAL WATER CONTENT = 15.26 %

BORE HOLE NO. = BH-CL

DRY DENSITY = 1.61 gm/cm³

SAMPLE NO. = UDS-3

VOID RATIO (e_0) = 0.665

DEPTH = 8.50 M

COMPRESSION INDEX (C_c) = 0.106

TYPE OF SOIL = CL

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 32+738
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

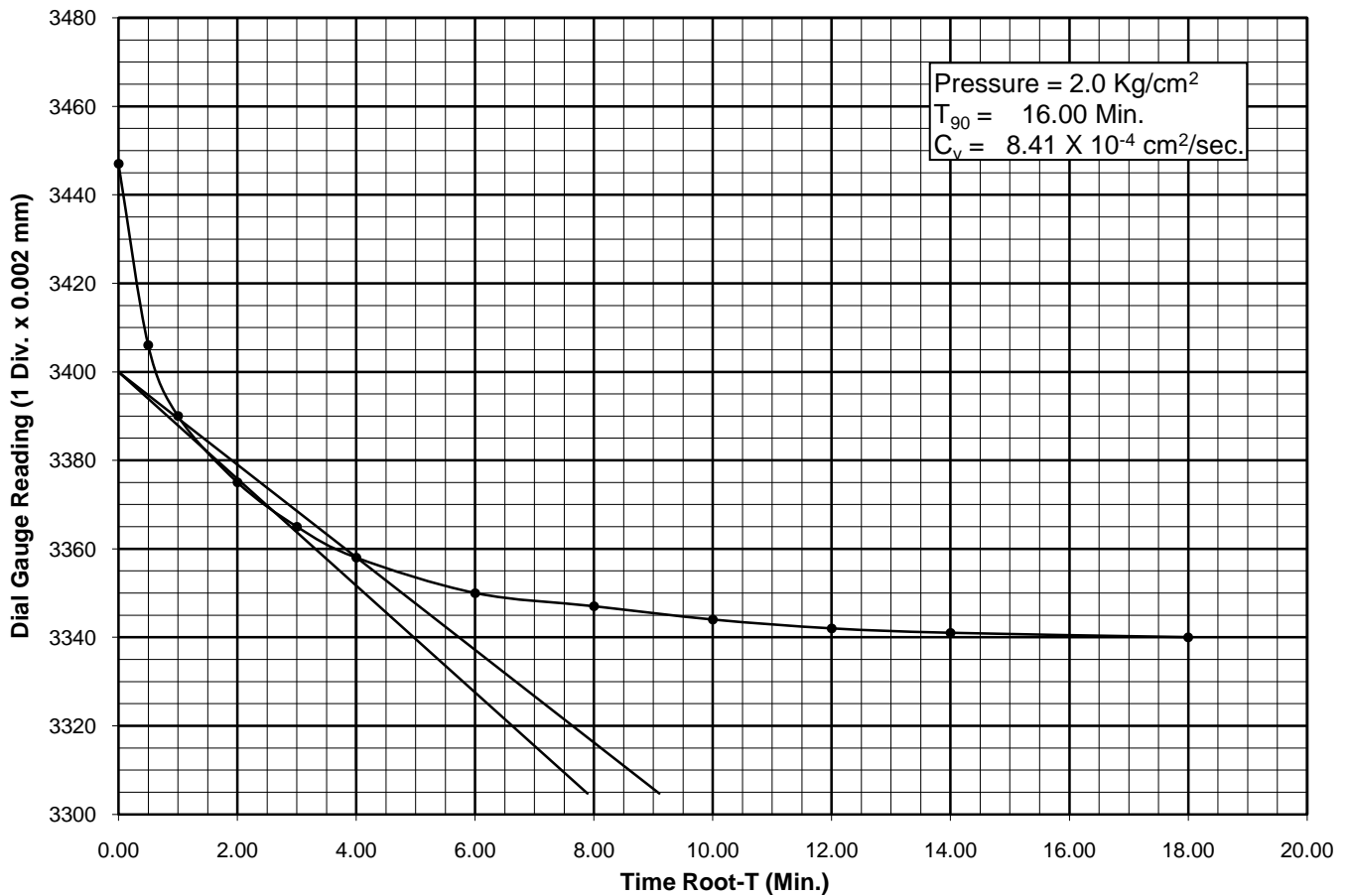
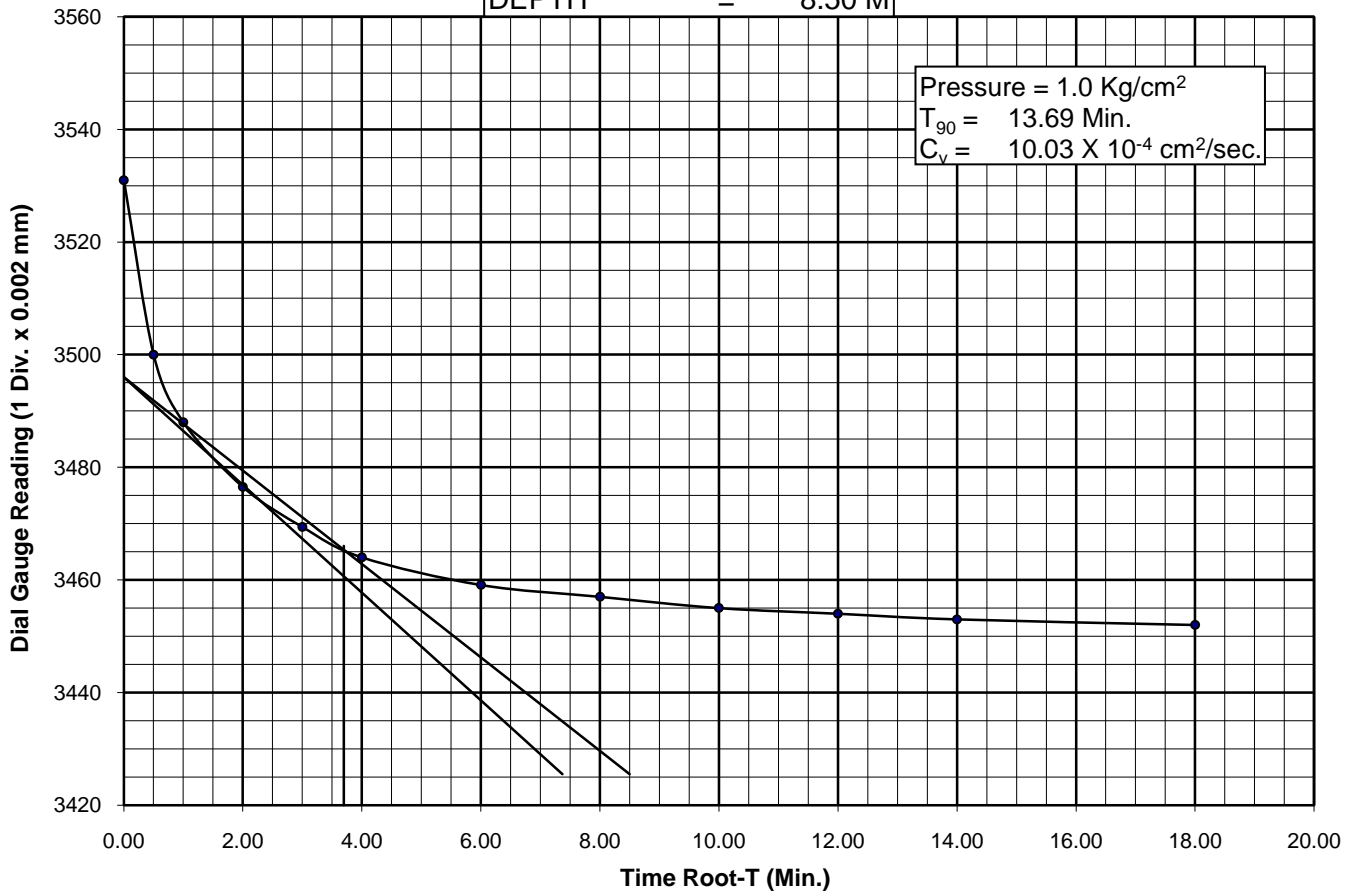


Figure No. -

CHAINAGE = 32+738
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

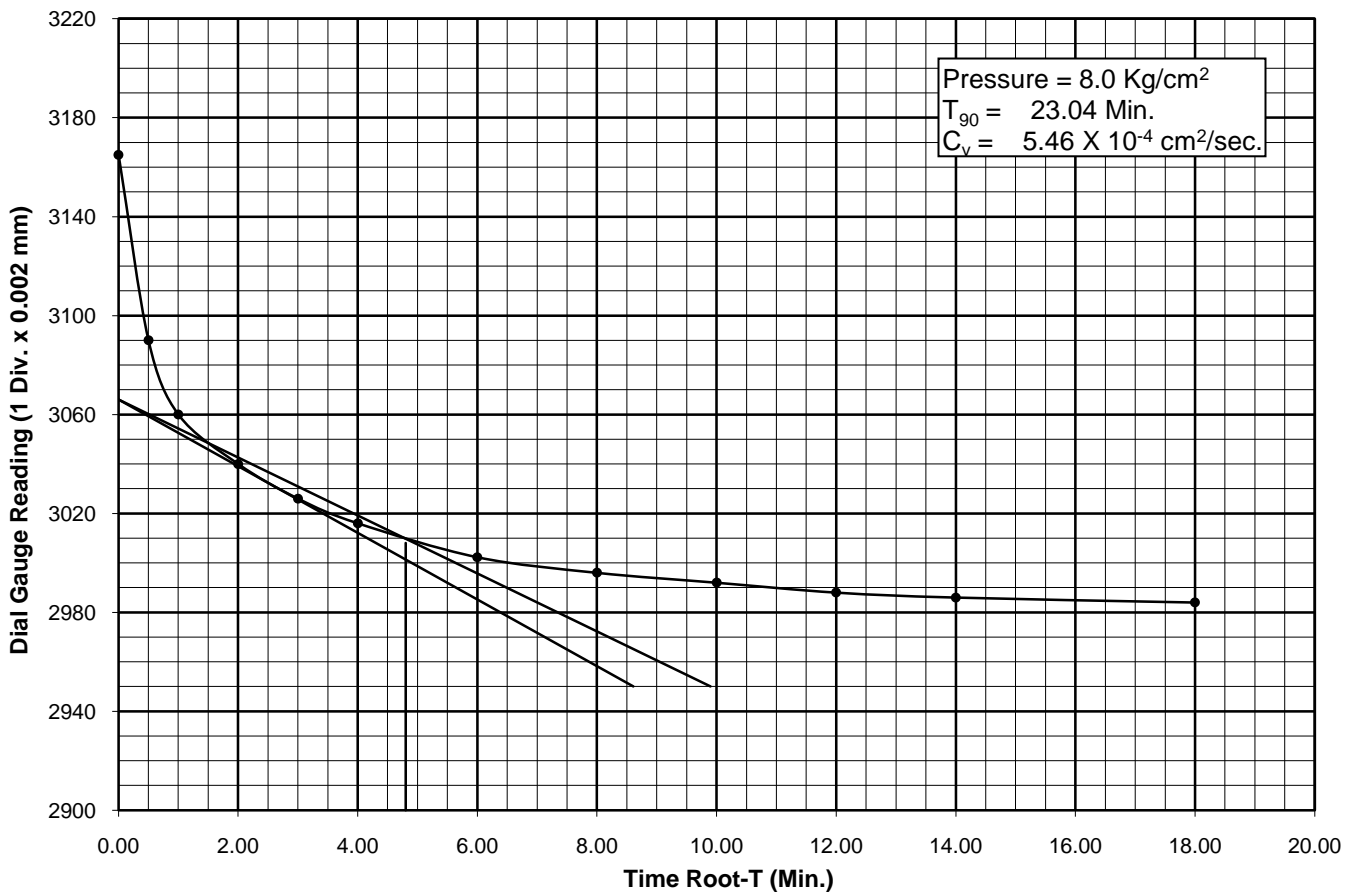
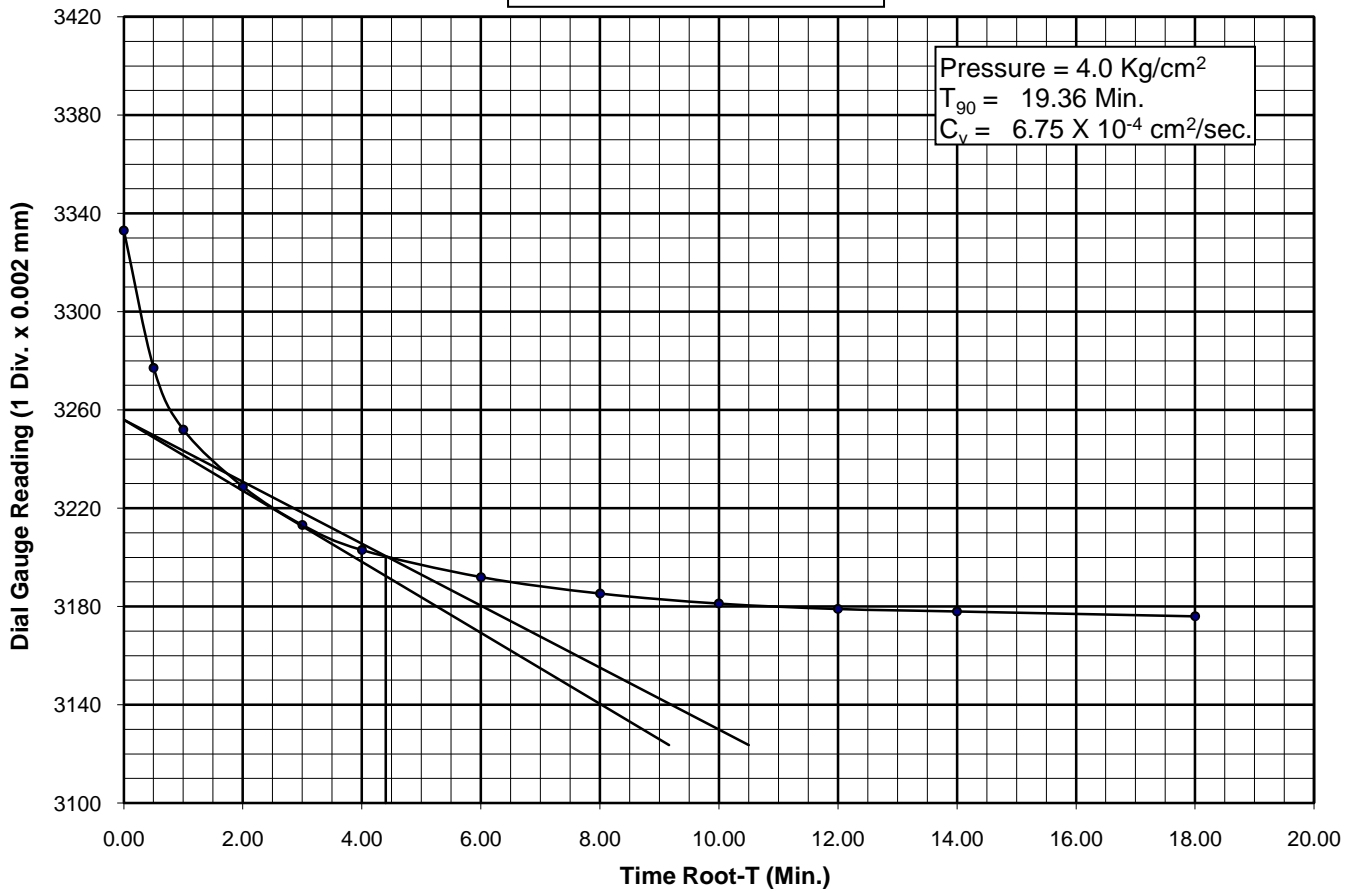
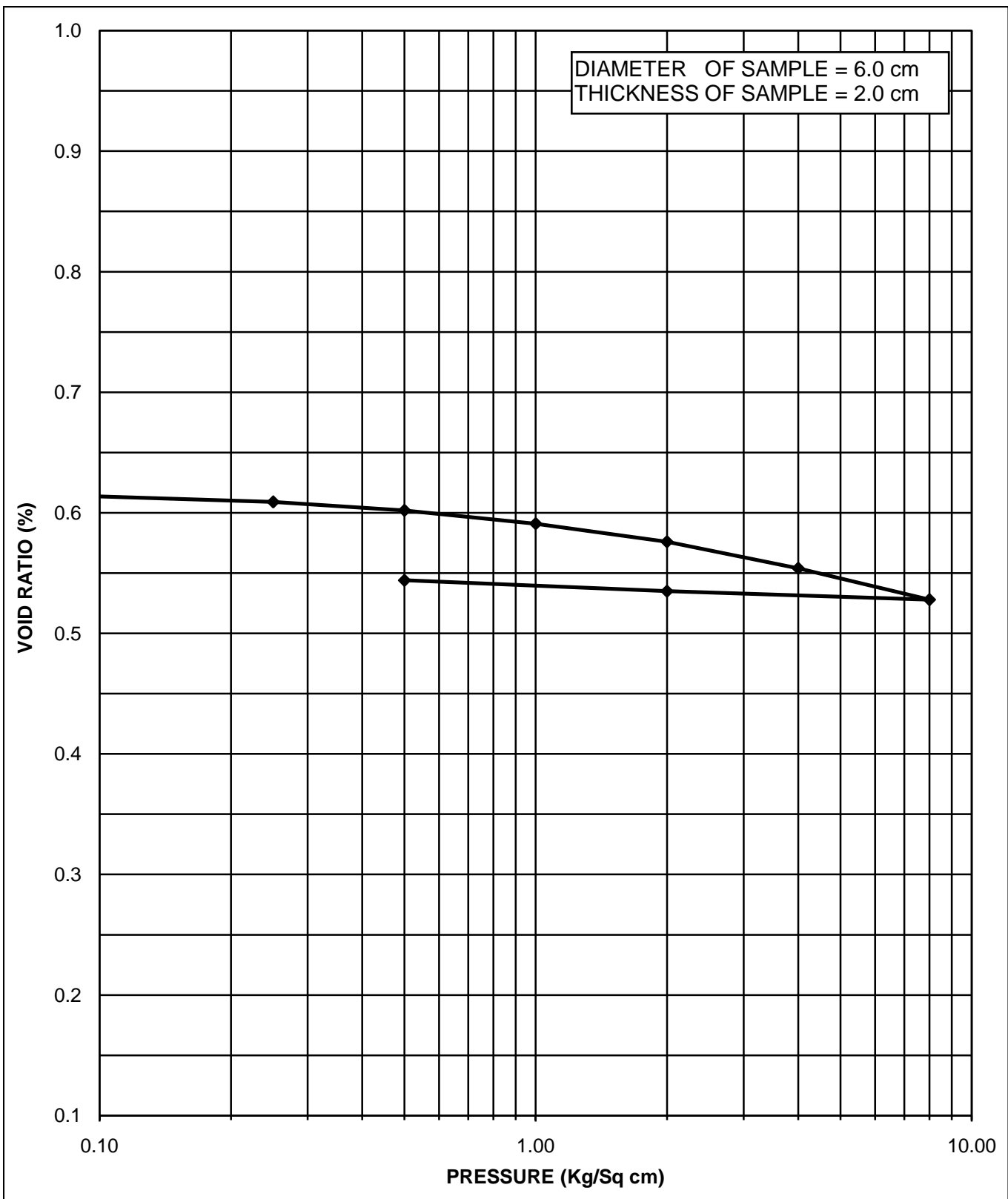


Figure No. -



CHAINAGE: 33+713

INITIAL WATER CONTENT = 15.04 %

BORE HOLE NO. = BH-A2

DRY DENSITY = 1.66 gm/cm³

SAMPLE NO. = UDS-4

VOID RATIO (e_0) = 0.615

DEPTH = 10.00 M

COMPRESSION INDEX (C_c) = 0.086

TYPE OF SOIL = CL

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 33+713
 BORE HOLE NO. = BH-A2
 SAMPLE NO. = UDS-4
 DEPTH = 10.00 M

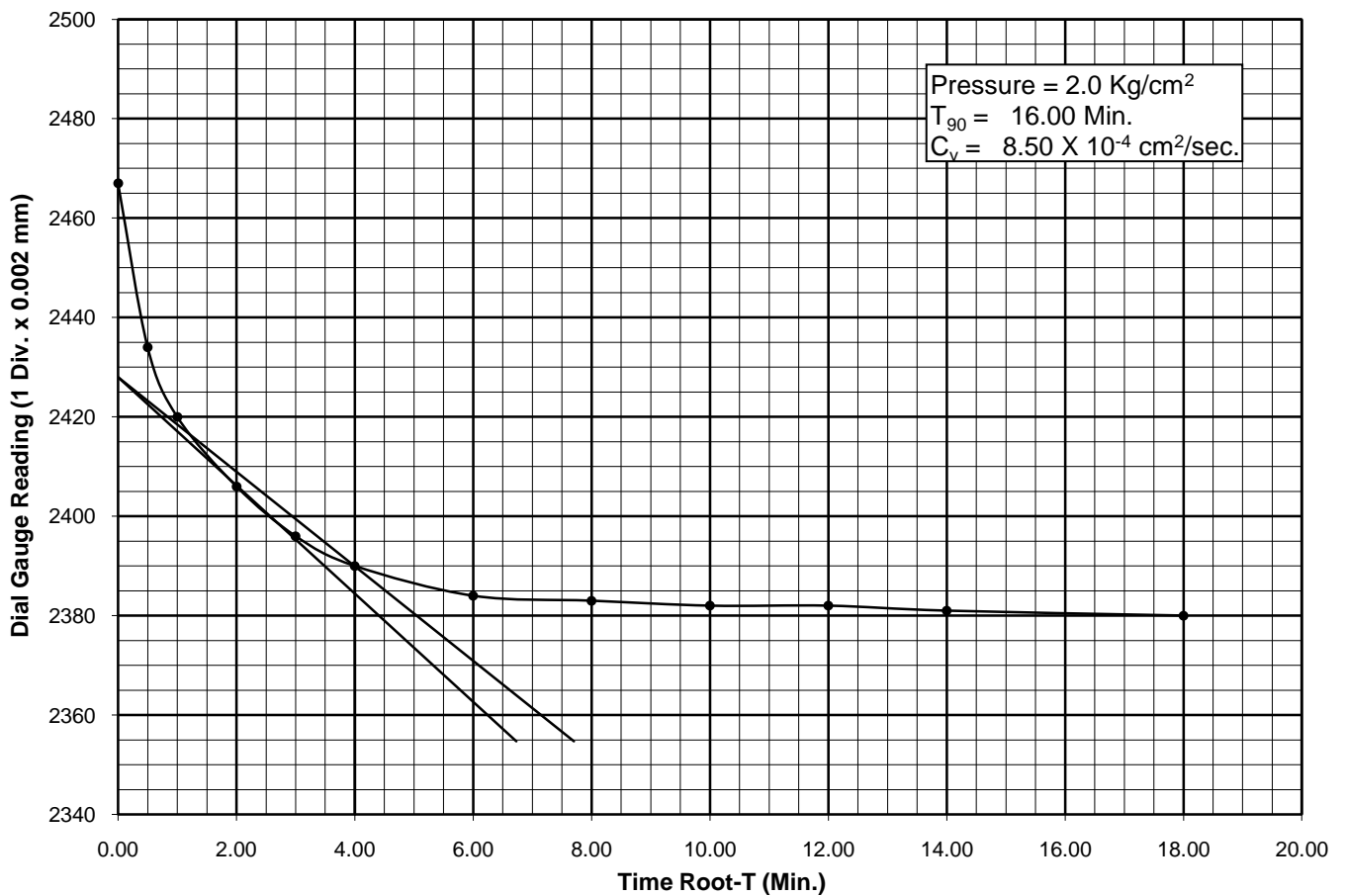
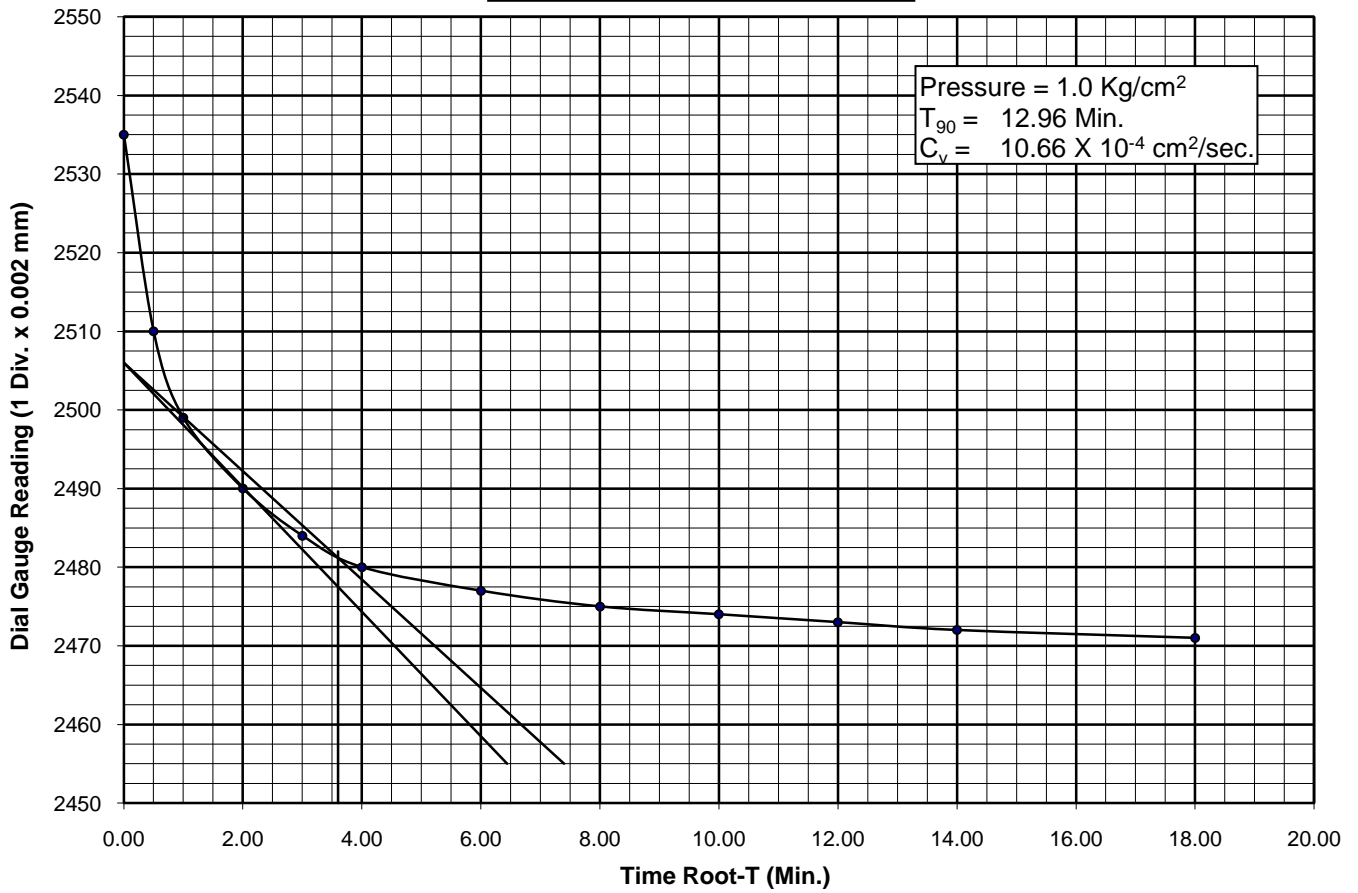


Figure No. -

CHAINAGE = 33+713
 BORE HOLE NO. = BH-A2
 SAMPLE NO. = UDS-4
 DEPTH = 10.00 M

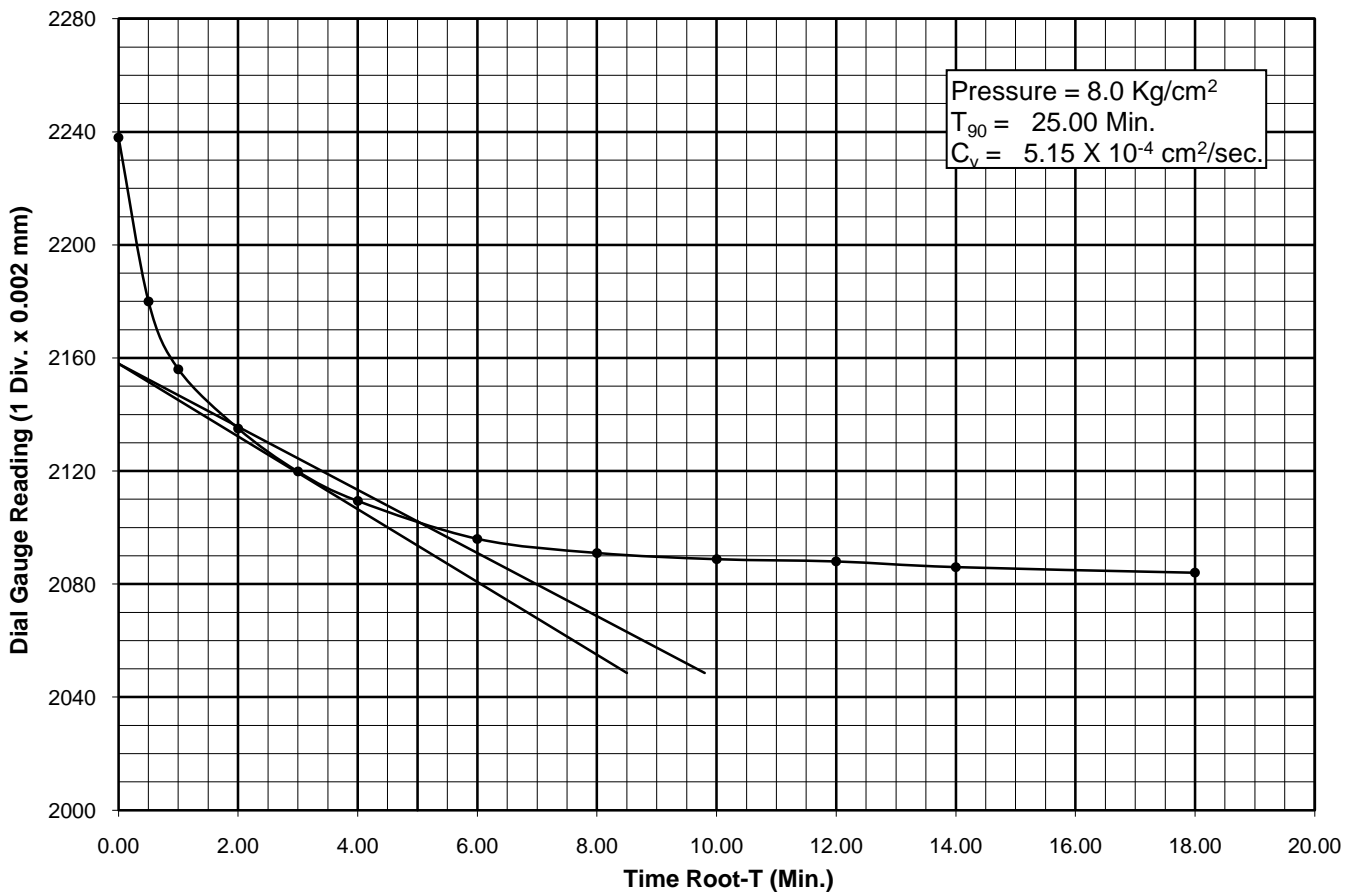
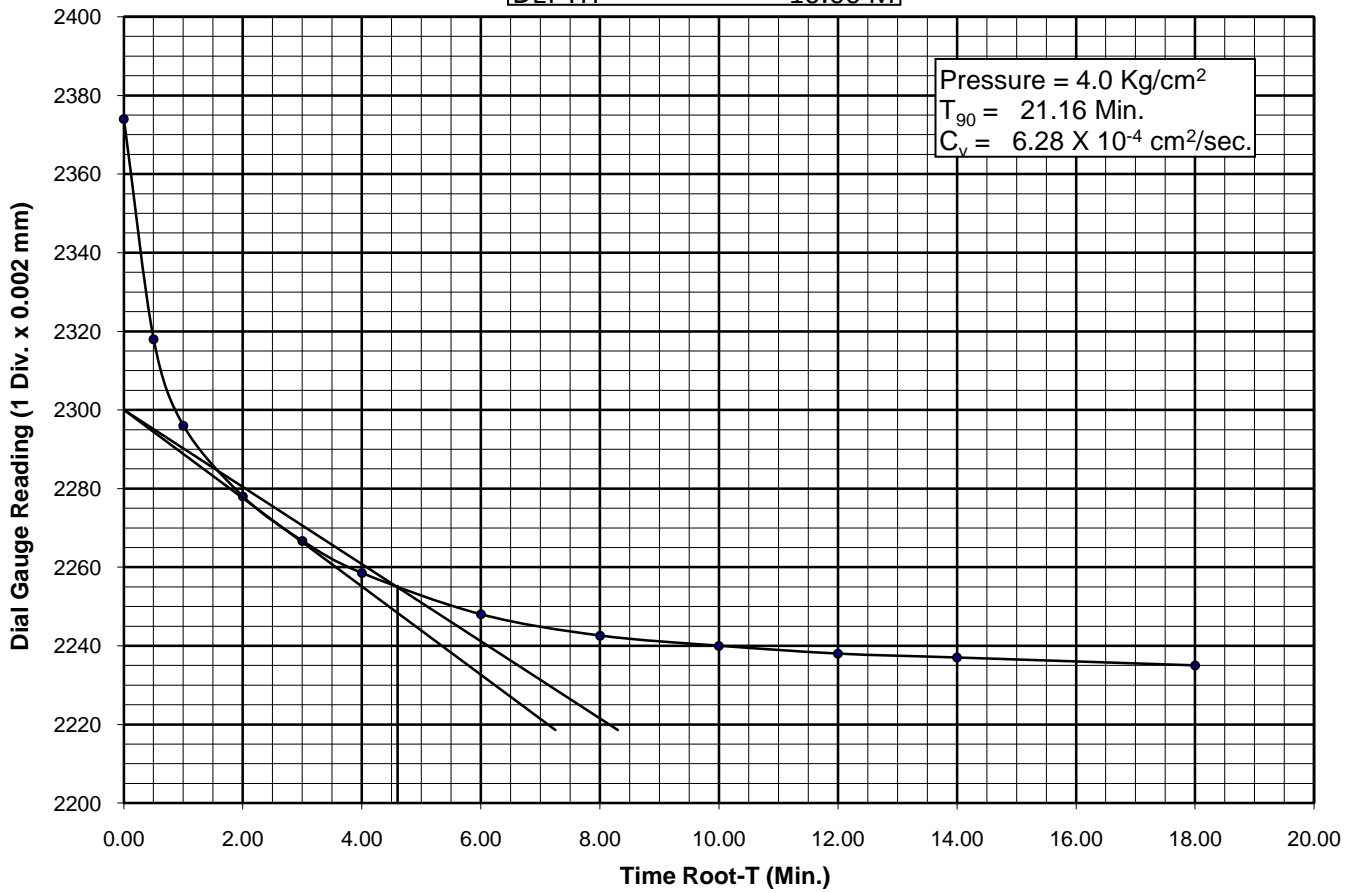
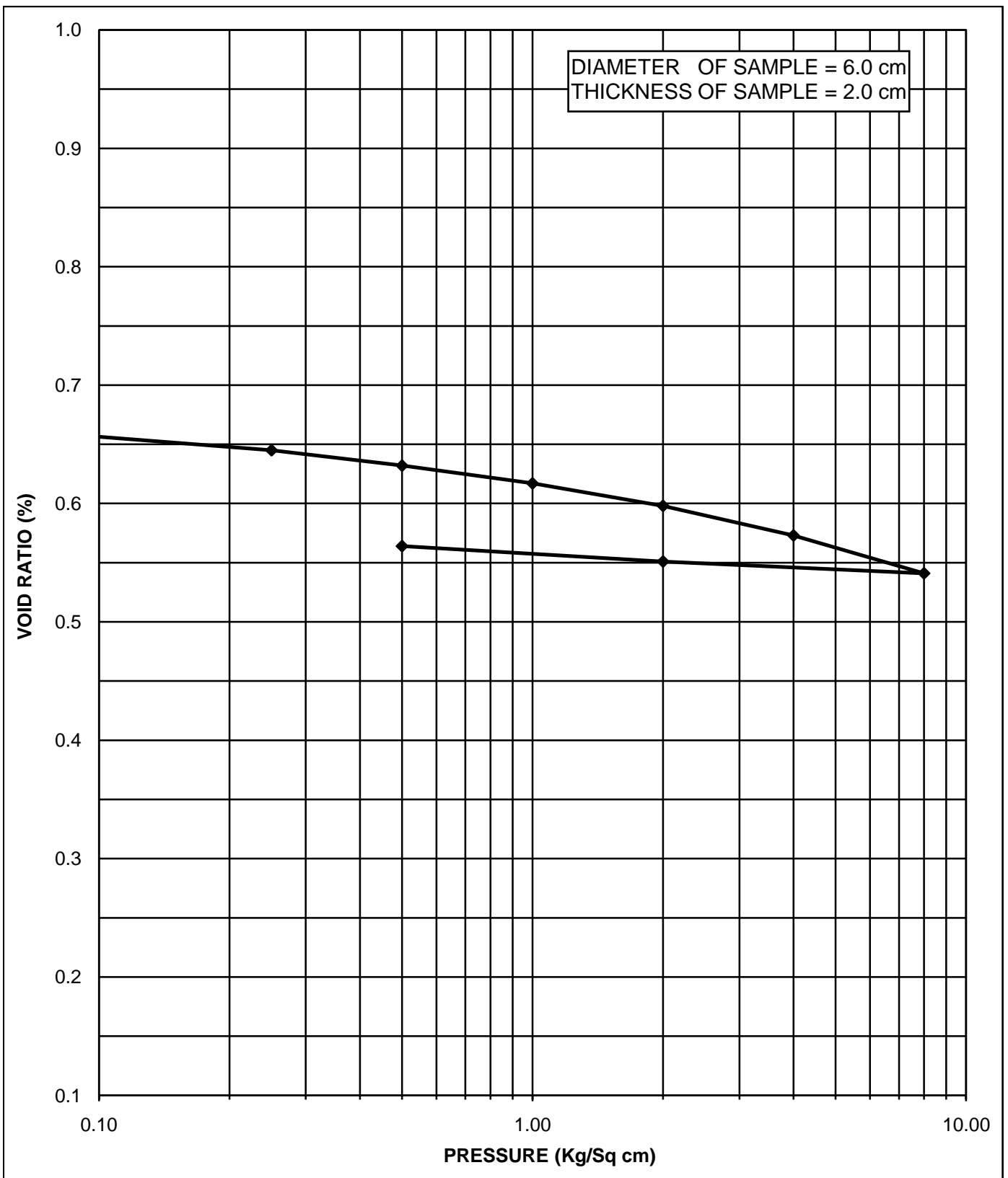


Figure No. -



CHAINAGE: 34+019

INITIAL WATER CONTENT = 15.41 %

BORE HOLE NO. = BH-CL

DRY DENSITY = 1.61 gm/cm³

SAMPLE NO. = UDS-2

VOID RATIO (e_0) = 0.655

DEPTH = 5.50 M

COMPRESSION INDEX (C_c) = 0.106

TYPE OF SOIL = CL

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE: 34+019
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-2
 DEPTH = 5.50 M

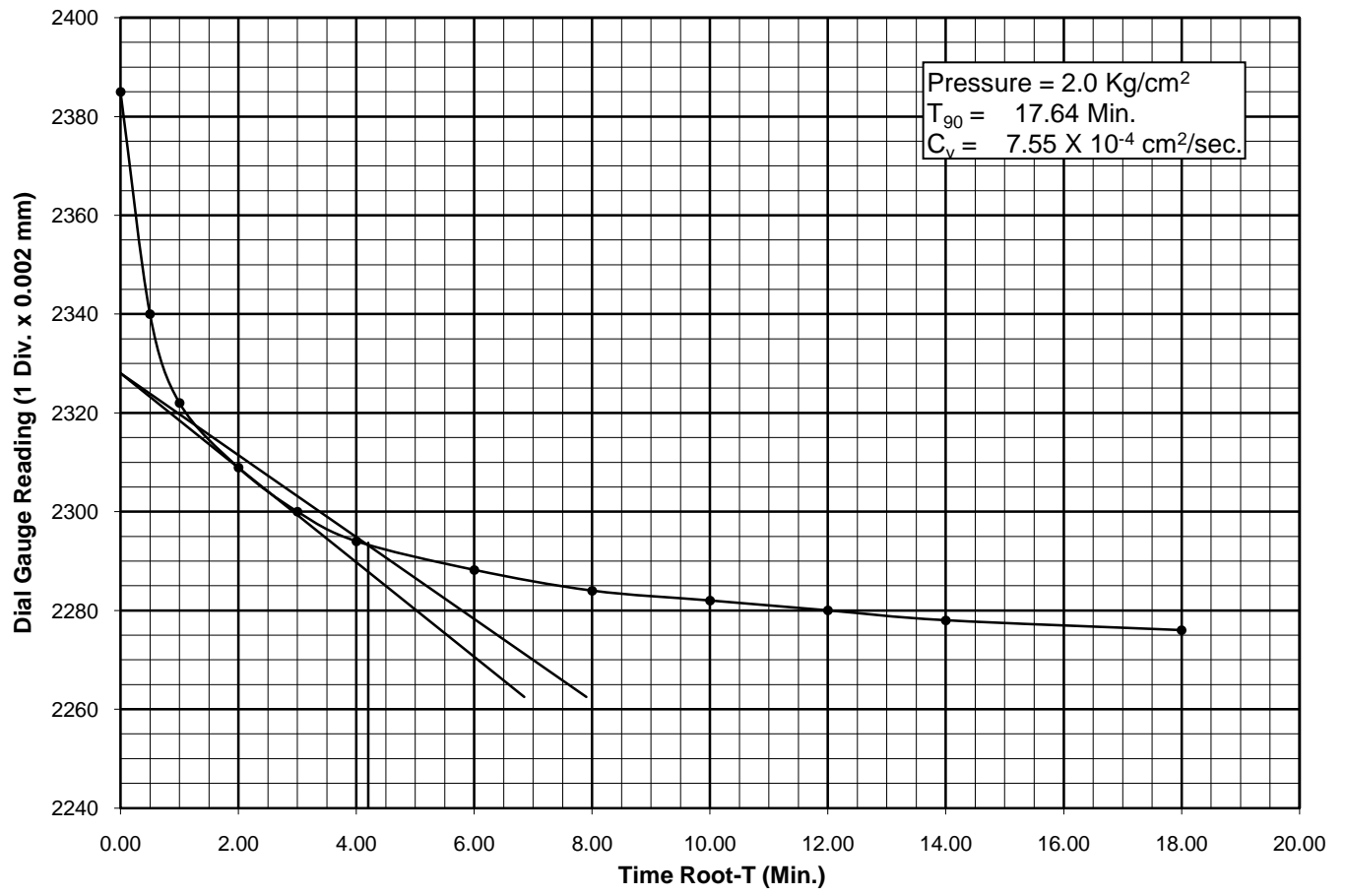
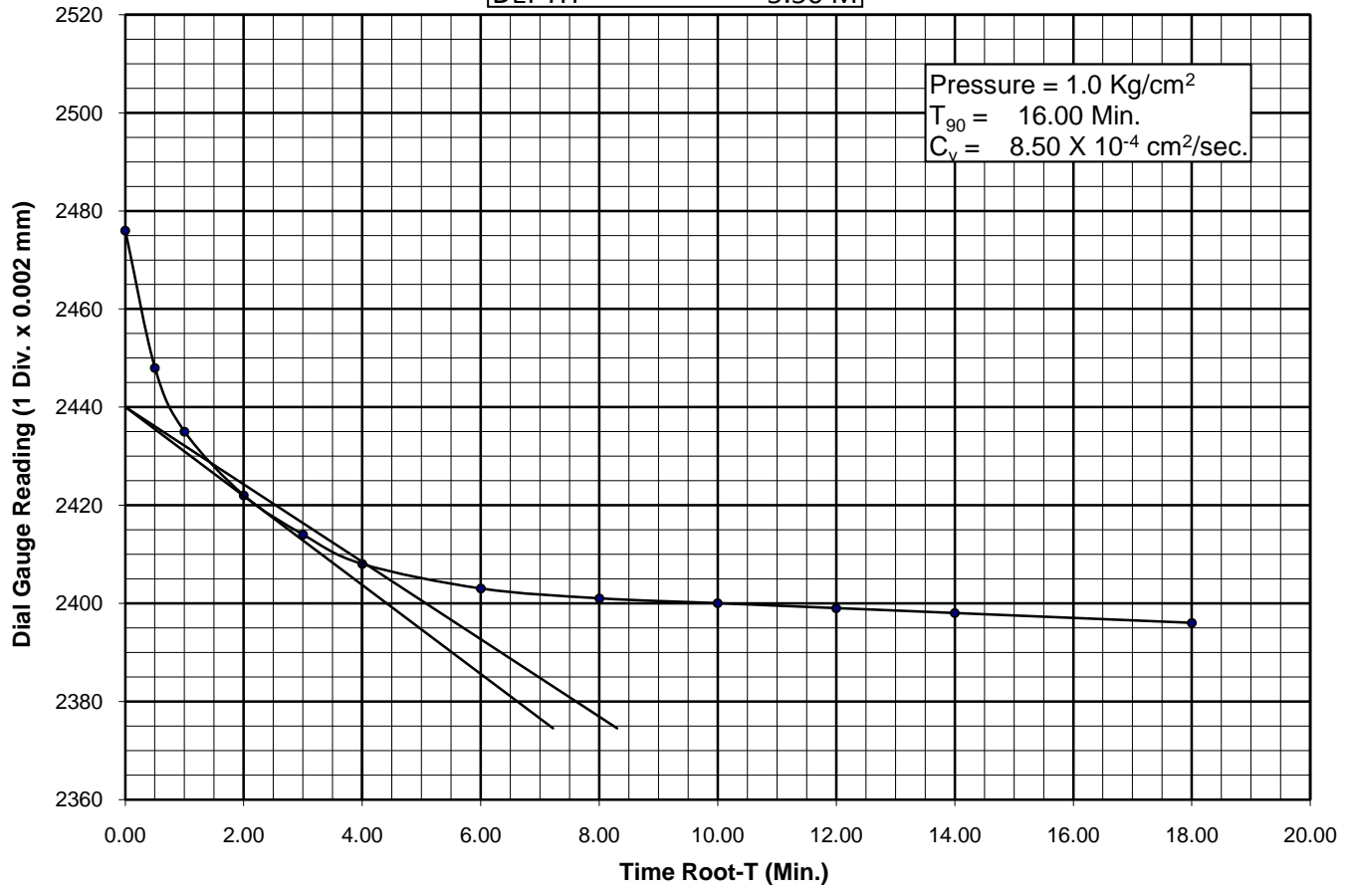


Figure No. -

CHAINAGE: 34+019
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-2
 DEPTH = 5.50 M

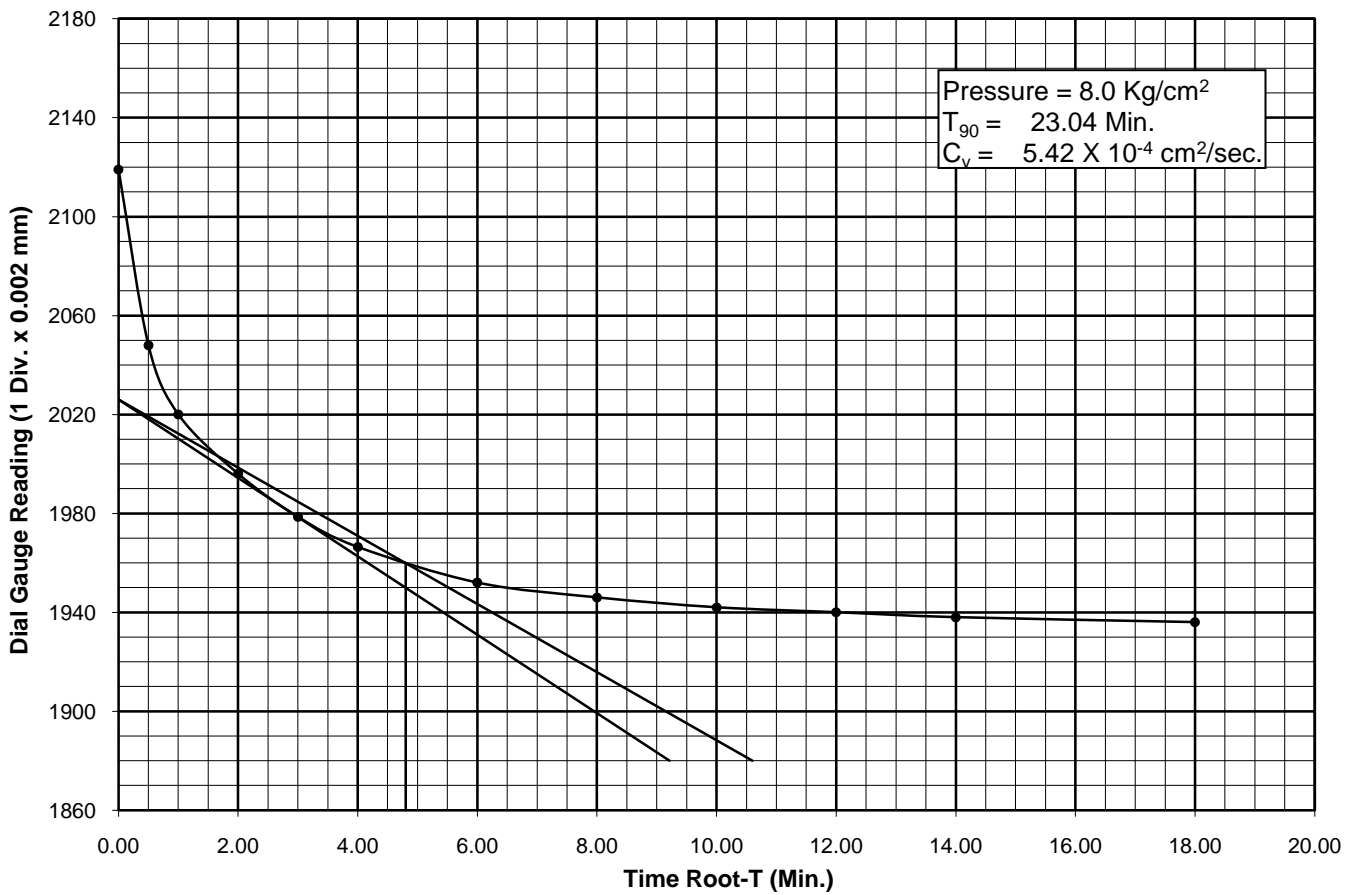
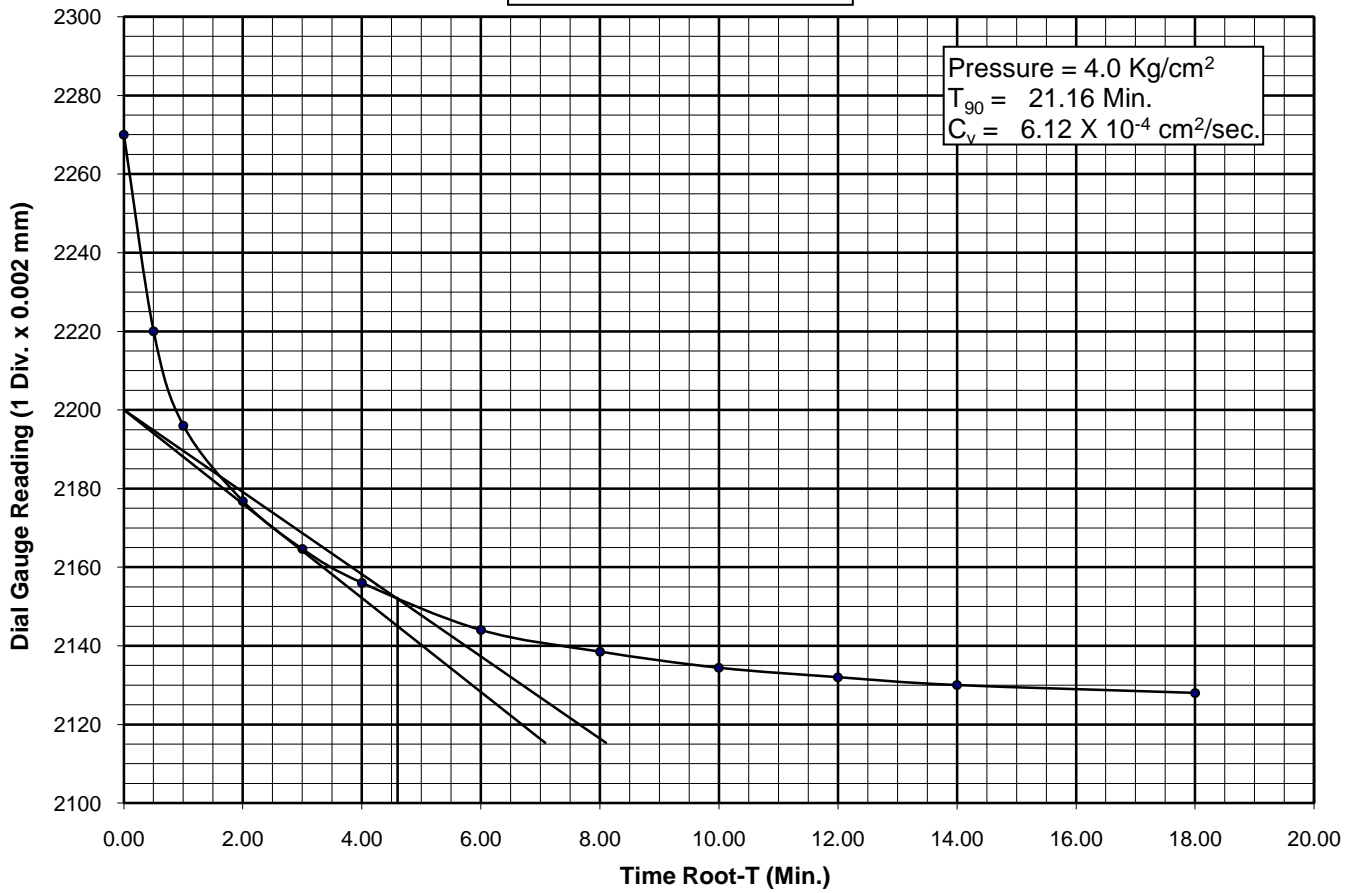
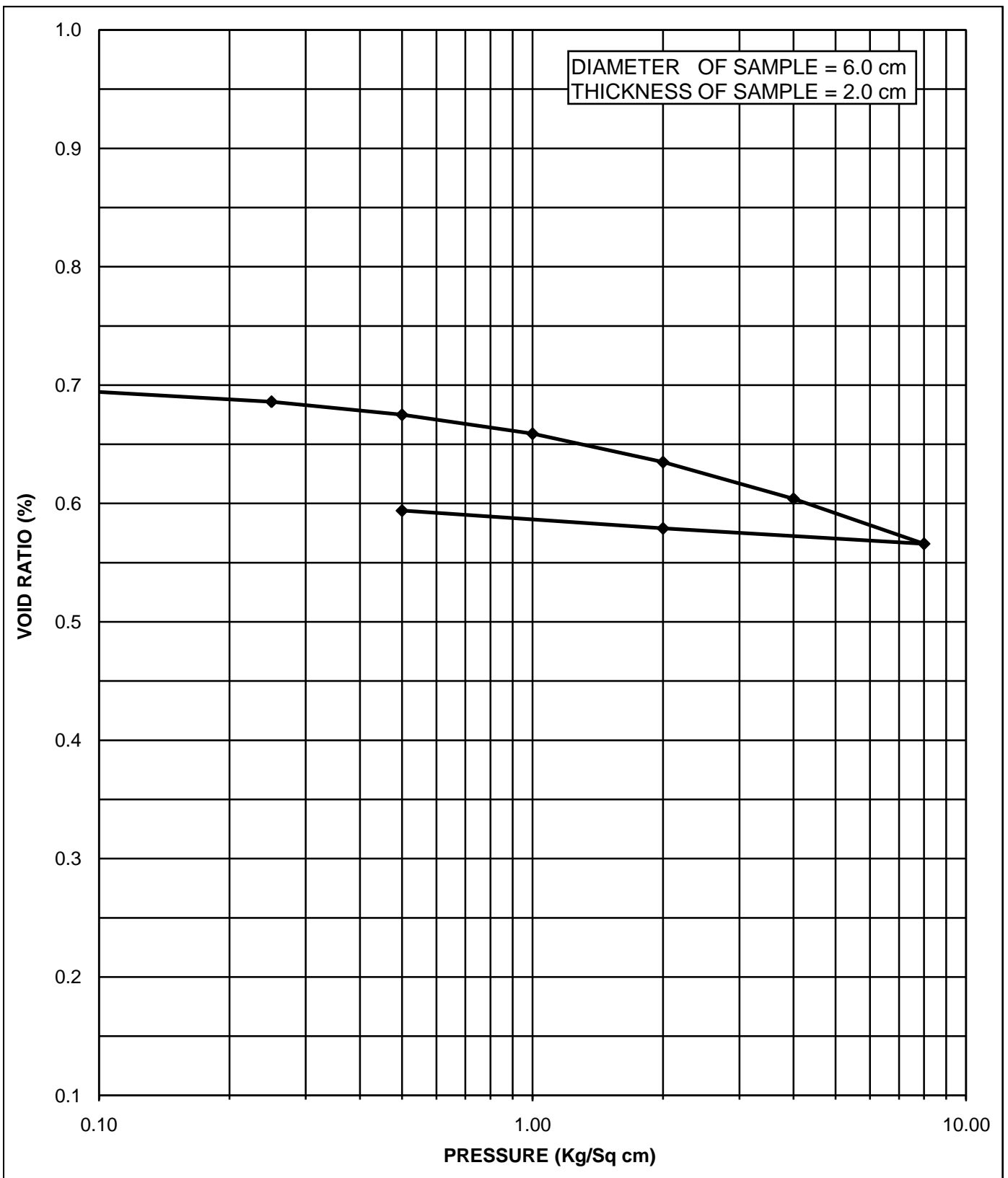


Figure No. -



CHAINAGE: 35+272

INITIAL WATER CONTENT = 14.71 %

BORE HOLE NO. = BH-CL

DRY DENSITY = 1.58 gm/cm³

SAMPLE NO. = UDS-3

VOID RATIO (e_0) = 0.695

DEPTH = 8.50 M

COMPRESSION INDEX (C_c) = 0.126

TYPE OF SOIL = CI

FIGURE NO. PRESSURE Vs VOID RATIO CURVE (e-log p)

CHAINAGE = 35+272
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

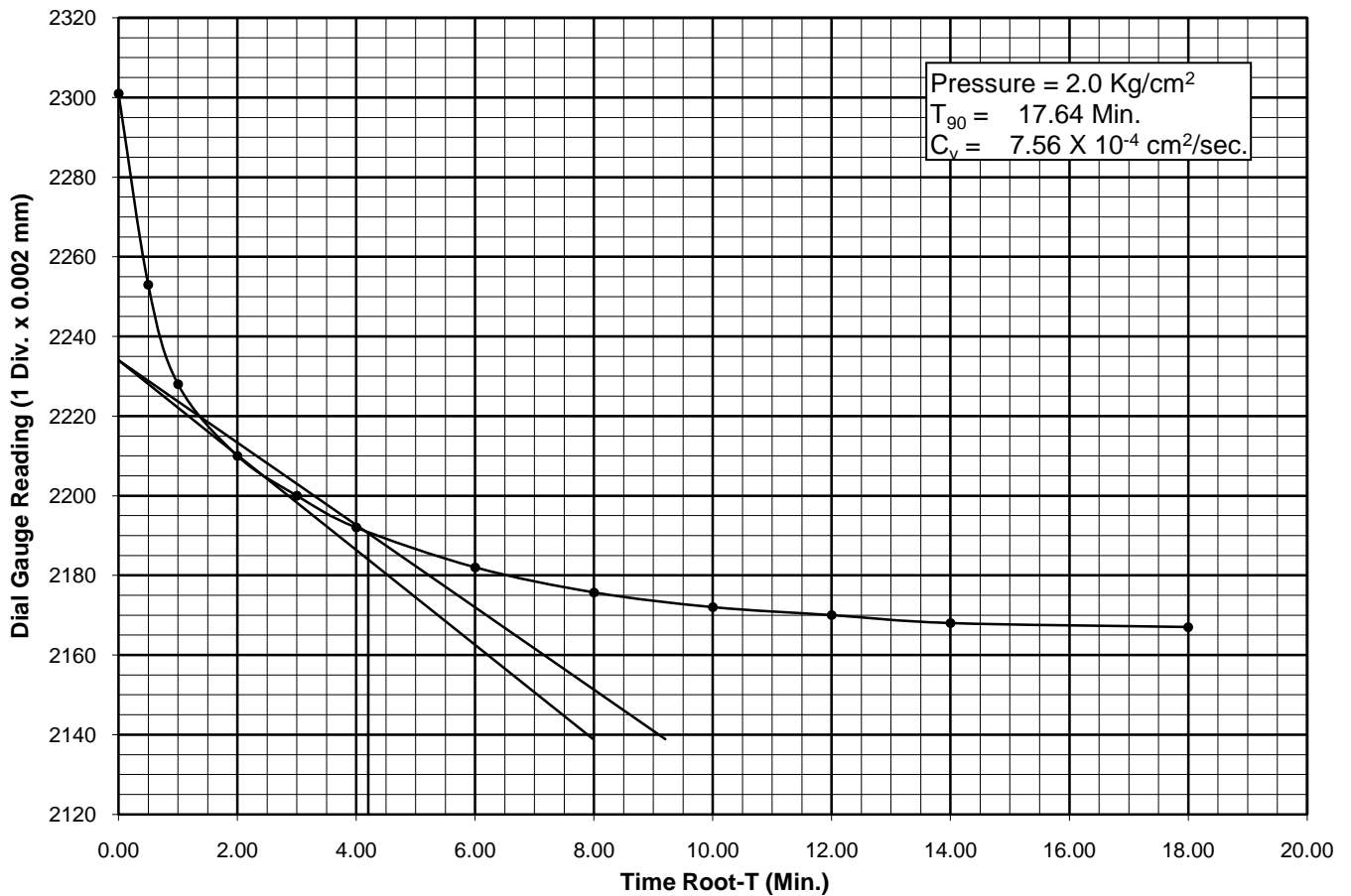
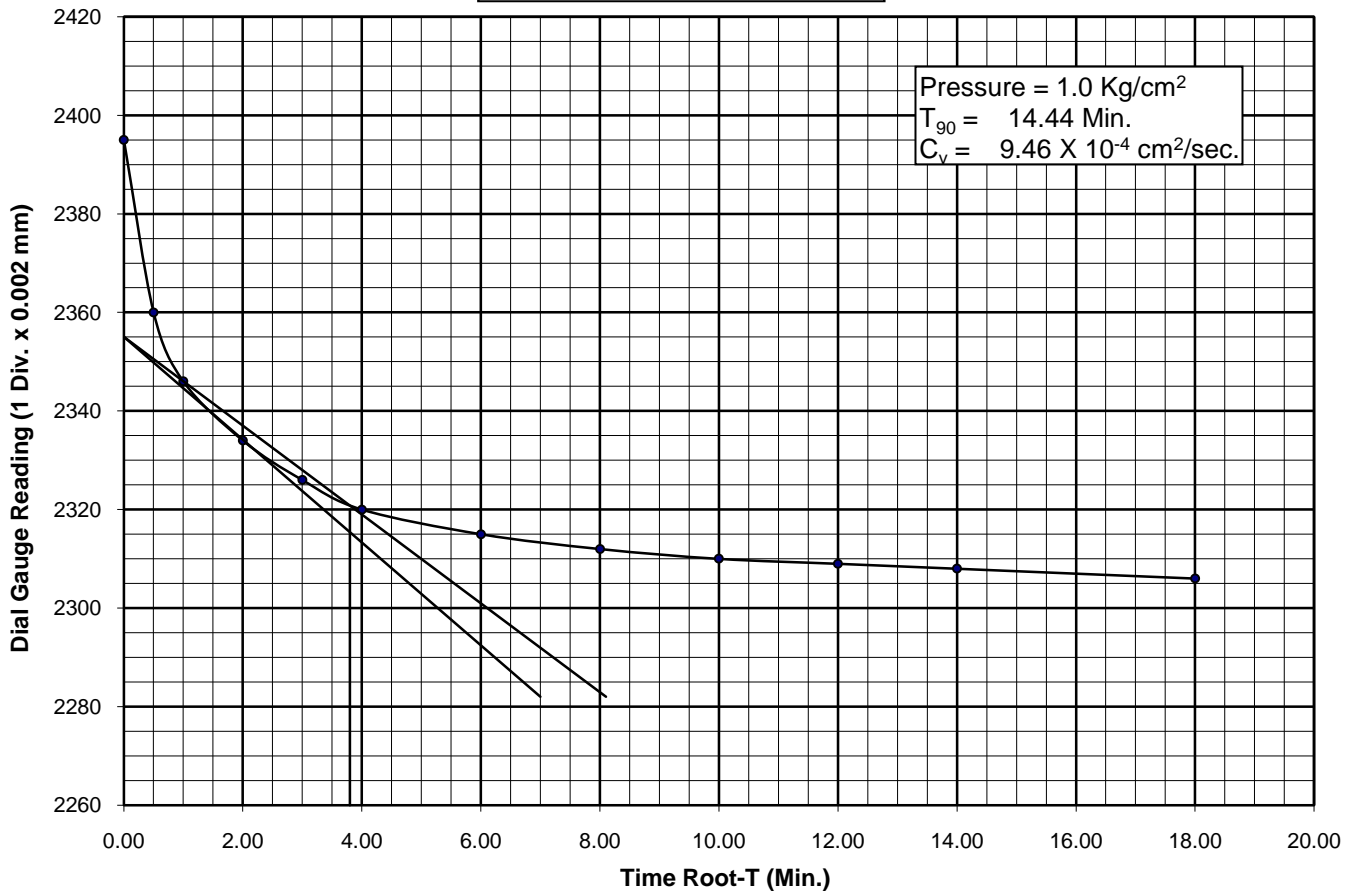


Figure No. -

CHAINAGE = 35+272
 BORE HOLE NO. = BH-CL
 SAMPLE NO. = UDS-3
 DEPTH = 8.50 M

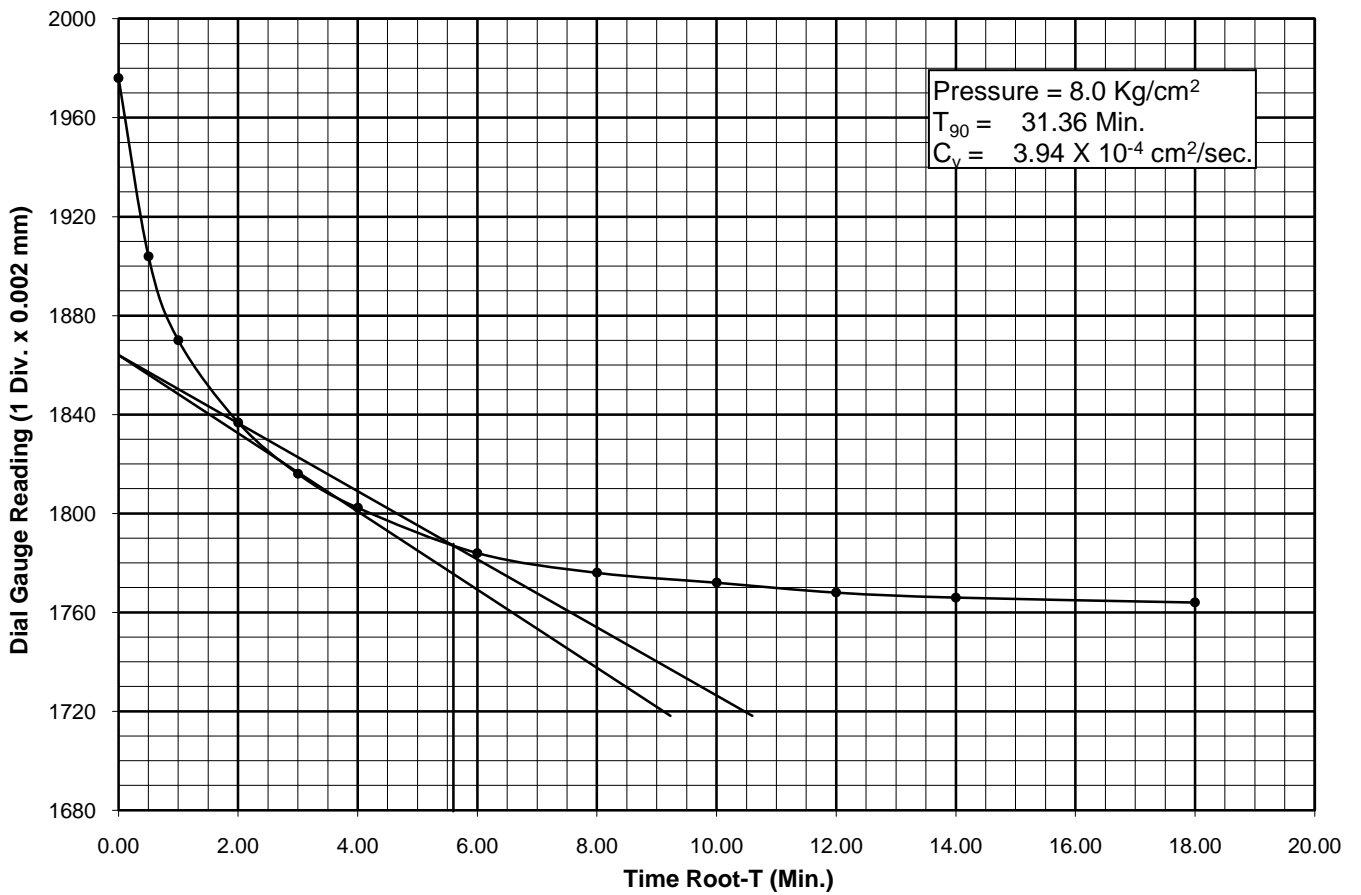
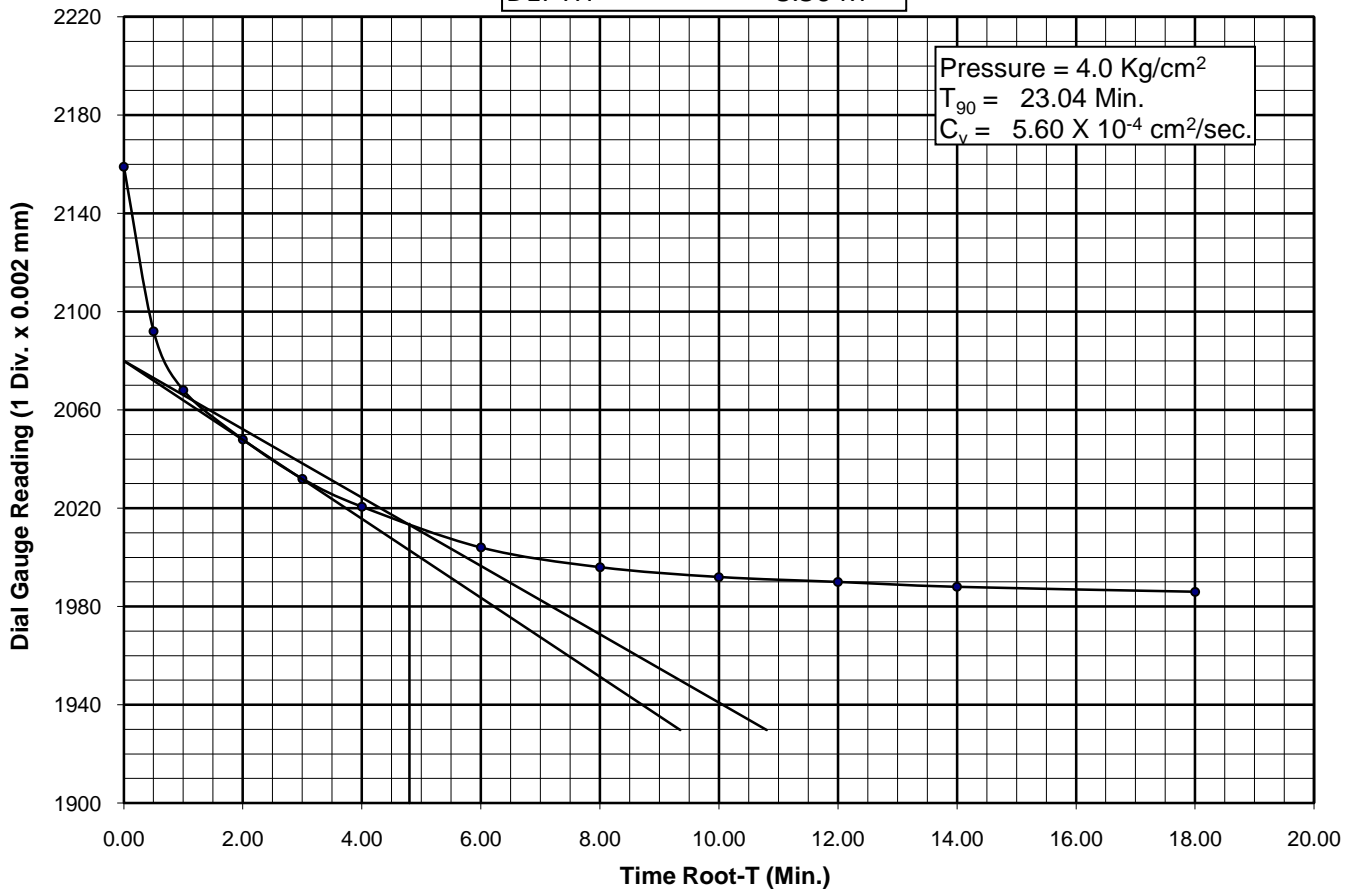
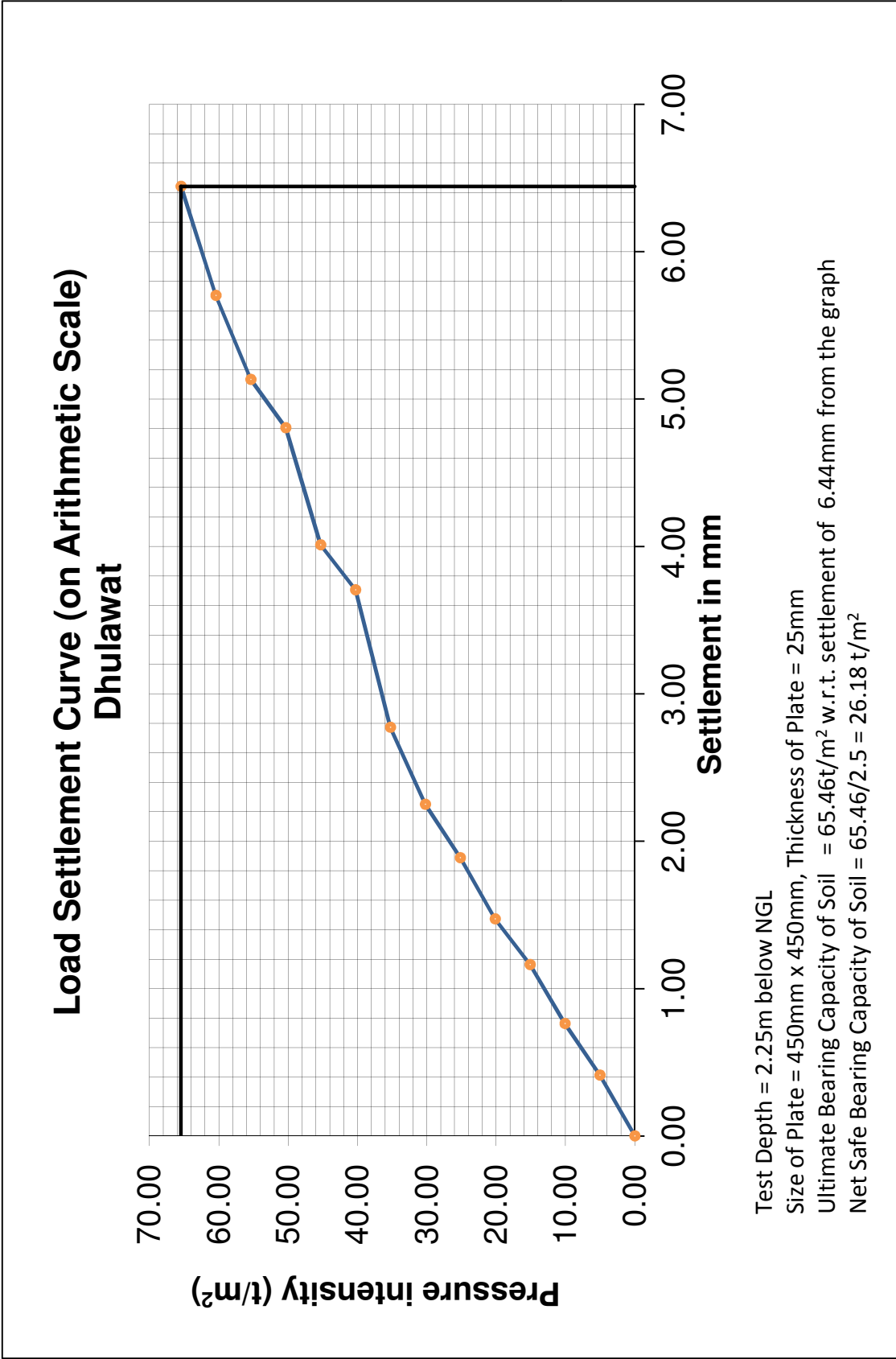
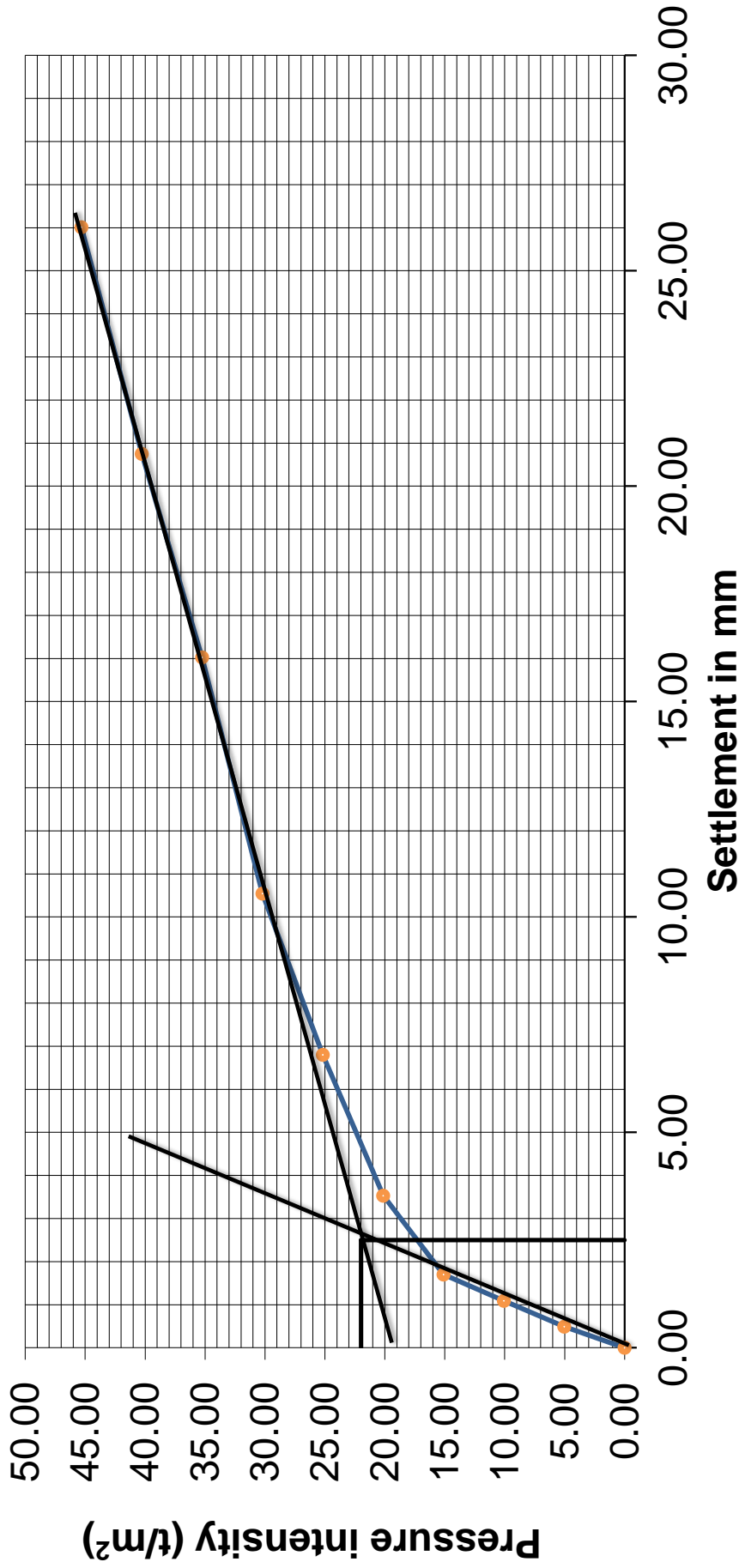


Figure No. -

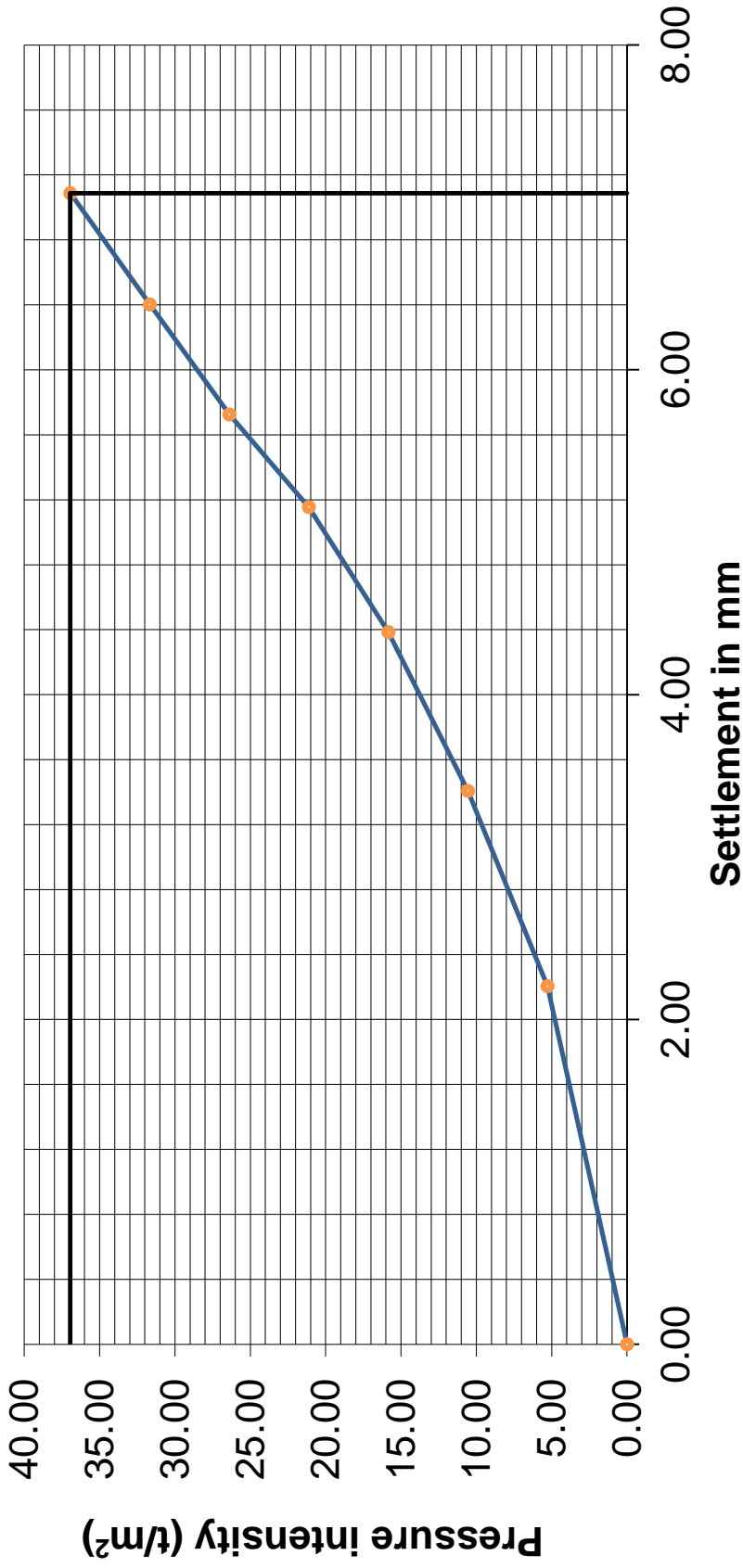


Load Settlement Curve (on Arithmetic Scale) 39+149



Test Depth = 2.25m below NGL
Size of Plate = 450mm x 450mm, Thickness of Plate = 25mm
Ultimate Bearing Capacity of Soil = 21.98t/m² w.r.t. settlement of 2.50mm from the graph
Net Safe Bearing Capacity of Soil = 21.98/2.5 = 8.7 t/m²

Load Settlement Curve (on Arithmetic Scale) 43+100



Test Depth = 2.50m below NGL

Size of Plate = 600mm x 600mm, Thickness of Plate = 25mm

Ultimate Bearing Capacity of Soil = 36.94t/m² w.r.t. settlement of 7.09mm from the graph

Net Safe Bearing Capacity of Soil = $36.94/2.5 = 14.78$ t/m²

APPENDIX – C (ANALYSIS & RECOMENDATION)

Appendix No.	ITEMS
C-1	SAMPLE CALCULATIONS FOR COMPUTATION OF ALLOWABLE BEARING CAPACITY OF SUB-STRATA FOR SHALLOW FOUNDATION
C-2	SAMPLE CALCULATION FOR COMPUTATION OF SAFE LOAD CARRYING CAPACITY OF NORMAL BORED CAST-IN-SITU RCC PILE IN COMPRESSION & UPLIFT
C-3	SAMPLE CALCULATION FOR COMPUTATION OF SAFE LOAD CARRYING CAPACITY OF NORMAL BORED CAST-IN-SITU RCC PILE IN LATERAL

Calculation of SBC for shallow foundations as per IS : 6403 - 1981			
INPUT DATA		CH. (KM) :- 32+160	
		BH NO. :- BH-CL	
<i>Type of footing</i>		Square	3
1	Continuous Strip		
2	Rectangular		
3	Square		
4	Circular		
Angle of internal friction (ϕ°)		4.00	
Cohesion (c in t/m^2)		7.50	
Void ratio (e), $e = (G \cdot \gamma_w / \gamma_d) - 1$		0.72	
Direction of load with vertical ($^\circ$)		0.00	
Density of foundation soil (t/m^3) γ_{bulk}		1.77	
Depth of water table(m)		NE	
Factor of safety		2.50	
S.no.	Depth (m) of footing (D_f) below EGL	Width (m)	
1	1.00	7.20	
2	1.50	7.20	
3	2.00	7.20	
<u>SHEAR FAILURE CRITERIA</u>			
Assumptions and formula used in calculation as per IS:6403-1981 are given below -			
NOTE: The type of failure used for bearing capacity analysis depends upon the value of void ratio (see IS 6403 : 1981, Page No. 9, Table No. 3).			
The ultimate net bearing capacity in case of general shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$			
The ultimate net bearing capacity in case of local shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$			
Where,			
$d_c = 1 + 0.2 (D_f/B) \cdot \text{SQRT}(N_\phi)$		(from IS 6403 : 1981, page No. 9)	
$d_q = d_\gamma = 1$ for $\phi < 10^\circ$			
$d_q = d_\gamma = 1 + 0.1 (D_f/B) \cdot \text{SQRT}(N_\phi)$ for $\phi > 10^\circ$			
$N_\phi = \tan^2(\pi/4 + \phi/2)$			
ϕ' is friction angle for local shear failure = $\tan^{-1} (0.67 \tan \phi)$			
<u>OUTPUT</u>			
The computer aided results for shear failure criteria are tabulated below. The results are interpolated values of bearing capacity obtained from general and local shear failure criteria.			

Bearing capacity factors : (from IS 6403 : 1981, page No. 8, Table No. 1)					
ϕ	4.00		ϕ'	2.68	
N_c	6.19		N'_c	5.81	
N_q	1.43		N'_q	1.27	
N_γ	0.34		N'_γ	0.21	
Shape factors : (from IS 6403 : 1981, page No. 8, Table No. 2)					
S.no.	Width(m)		S_c	S_q	S_γ
1	7.20		1.30	1.20	0.80
2	7.20		1.30	1.20	0.80
3	7.20		1.30	1.20	0.80
Depth factors : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	d_c	d_q	d_γ
1	1.00	7.20	1.03	1.00	1.00
2	1.50	7.20	1.04	1.00	1.00
3	2.00	7.20	1.06	1.00	1.00
Inclination factors : (from IS 6403 : 1981, page No. 9)					
	$i_c = (1 - \alpha / 90)^2$		$i_q = (1 - \alpha / 90)^2$		$i_\gamma = (1 - \alpha / \phi)^2$
	1.00		1.00		1.00
Water table factor : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	Z_w/B		W'
1	1.00	7.20	4.03		1.00
2	1.50	7.20	3.96		1.00
3	2.00	7.20	3.89		1.00
Safe Bearing Capacity					
S.no.	Depth(m)	Width(m)	SBC in (t/m^2)		
			General shear	Local shear	Recommended
1	1.00	7.20	25.90	16.23	17.78
2	1.50	7.20	26.44	16.57	18.15
3	2.00	7.20	26.98	16.91	18.52

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976													CH. (KM): 32+160							BH NO. :- BH-CL				
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress Increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	H/B	L/B	Influence Factor (i)	Poisson's Ratio	Elastic Settlement S _i (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)
Layer 1	1.00	1.00	11.80	10.80	0.65	7.20	7.20	10.80	7.20	7.20	0.654	22	0.0061	42.79	84	3.000	1.000	1.4400	0.45	32.1763	32.18	0.97	0.80	25.00
Layer 1	1.50	1.50	12.30	10.80	0.67	7.20	7.20	10.80	7.20	7.20	0.667	22	0.0091	65.50	84	3.000	1.000	1.4400	0.45	32.8358	32.84	0.95	0.80	25.00
Layer 1	2.00	2.00	12.80	10.80	0.68	7.20	7.20	10.80	7.20	7.20	0.684	22	0.0091	67.17	84	3.000	1.000	1.4400	0.45	33.6735	33.67	0.93	0.80	25.00



SETTLEMENT CALCULATION AS PER 8009 Part-1 1976														CH. (KM): 32+160							BH NO. :- BH-CL			
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress Increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	H/B	L/B	Influence Factor (i)	Poisson's Ratio	Elastic Settlement S _i (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)
Layer 1	1.00	1.00	11.80	10.80	1.31	7.20	7.20	10.80	7.20	7.20	1.308	22	0.0061	85.58	84	3.000	1.000	1.4400	0.45	64.3526	64.35	0.97	0.80	50.00
Layer 1	1.50	1.50	12.30	10.80	1.33	7.20	7.20	10.80	7.20	7.20	1.334	22	0.0061	87.34	84	3.000	1.000	1.4400	0.45	65.6716	65.67	0.95	0.80	50.00
Layer 1	2.00	2.00	12.80	10.80	1.37	7.20	7.20	10.80	7.20	7.20	1.368	22	0.0061	89.57	84	3.000	1.000	1.4400	0.45	67.3469	67.35	0.93	0.80	50.00

Calculation of SBC for shallow foundations as per IS : 6403 - 1981			
INPUT DATA		CH. (KM) :- 32+160	
		BH NO. :- BH-CL	
<i>Type of footing</i>		Square	3
1	Continuous Strip		
2	Rectangular		
3	Square		
4	Circular		
Angle of internal friction (ϕ°)		6.16	
Cohesion (c in t/m^2)		6.92	
Void ratio (e), $e = (G \cdot \gamma_w / \gamma_d) - 1$		0.72	
Direction of load with vertical ($^\circ$)		0.00	
Density of foundation soil (t/m^3) γ_{bulk}		1.75	
Depth of water table(m)		NE	
Factor of safety		2.50	
S.no.	Depth (m) of footing (D_f) below EGL	Width (m)	
1	1.00	7.20	
2	1.50	7.20	
3	2.00	7.20	
<u>SHEAR FAILURE CRITERIA</u>			
Assumptions and formula used in calculation as per IS:6403-1981 are given below -			
NOTE: The type of failure used for bearing capacity analysis depends upon the value of void ratio (see IS 6403 : 1981, Page No. 9, Table No. 3).			
The ultimate net bearing capacity in case of general shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$			
The ultimate net bearing capacity in case of local shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$			
Where,			
$d_c = 1 + 0.2 (D_f/B) \cdot \text{SQRT}(N_\phi)$		(from IS 6403 : 1981, page No. 9)	
$d_q = d_\gamma = 1$ for $\phi < 10^\circ$			
$d_q = d_\gamma = 1 + 0.1 (D_f/B) \cdot \text{SQRT}(N_\phi)$ for $\phi > 10^\circ$			
$N_\phi = \tan^2(\pi/4 + \phi/2)$			
ϕ' is friction angle for local shear failure = $\tan^{-1} (0.67 \tan \phi)$			
<u>OUTPUT</u>			
The computer aided results for shear failure criteria are tabulated below. The results are interpolated values of bearing capacity obtained from general and local shear failure criteria.			

Bearing capacity factors : (from IS 6403 : 1981, page No. 8, Table No. 1)					
ϕ	6.16		ϕ'	4.13	
N_c	6.86		N'_c	6.22	
N_q	1.74		N'_q	1.45	
N_γ	0.59		N'_γ	0.35	
Shape factors : (from IS 6403 : 1981, page No. 8, Table No. 2)					
S.no.	Width(m)		S_c	S_q	S_γ
1	7.20		1.30	1.20	0.80
2	7.20		1.30	1.20	0.80
3	7.20		1.30	1.20	0.80
Depth factors : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	d_c	d_q	d_γ
1	1.00	7.20	1.03	1.00	1.00
2	1.50	7.20	1.05	1.00	1.00
3	2.00	7.20	1.06	1.00	1.00
Inclination factors : (from IS 6403 : 1981, page No. 9)					
	$i_c = (1 - \alpha / 90)^2$		$i_q = (1 - \alpha / 90)^2$		$i_\gamma = (1 - \alpha / \phi)^2$
	1.00		1.00		1.00
Water table factor : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	Z_w/B		W'
1	1.00	7.20	4.03		1.00
2	1.50	7.20	3.96		1.00
3	2.00	7.20	3.89		1.00
Safe Bearing Capacity					
S.no.	Depth(m)	Width(m)	SBC in (t/m^2)		
			General shear	Local shear	Recommended
1	1.00	7.20	27.29	16.49	17.99
2	1.50	7.20	27.99	16.91	18.45
3	2.00	7.20	28.68	17.33	18.91

Replacement for 1.0m depth of foundation

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976														CH. (KM): 32+160							BH NO. :- BH-CL			
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Stress increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 t/m ² (from IS-8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement SI (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	1.00	2.50	1.50	2.63	7.20	7.20	1.50	2.628	25	200	43.08	84	0.9016	0.45	11.50	7.81	43.67	7.81	7.81	0.97	1.00	50.00	
Layer 2	2.50	2.50	11.80	9.30				0.764	22	0.0061														0.807
Layer 1	2.00	2.00	2.50	0.50	2.73	7.20	7.20	0.50	2.728	25	200	53.46	84	0.9771	0.45	11.50	2.84	51.04	2.84	51.04	0.93	1.00	50.00	
Layer 2	2.50	2.50	12.80	10.30				0.856	22	0.0061														0.807

Replacement for 1.5m depth of foundation

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976														CH. (KM): 32+160							BH NO. :- BH-CL			
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Stress increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 t/m ² (from IS-8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement SI (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	3.00	2.00	2.00	1.43	7.20	7.20	2.00	1.429	25			200		0.30	11.50	5.52			5.52				
Layer 2	3.00	11.80	8.80	8.80	1.43	7.20	7.20	8.80	0.400	25	0.0053	18.79	93	0.8659	0.45			20.22	20.22					
																					0.97	1.00	25.00	
Layer 1	1.50	3.00	1.50	1.50	1.46	7.20	7.20	1.50	1.461	25			200		0.30	11.50	4.34			4.34				
Layer 2	3.00	12.30	9.30	9.30	1.46	7.20	7.20	9.30	0.425	25	0.0053	21.07	93	0.9016	0.45			21.93	21.93					
																					0.95	1.00	25.00	
Layer 1	2.00	3.00	1.00	1.00	1.50	7.20	7.20	1.00	1.500	25			200		0.30	11.50	3.05			3.05				
Layer 2	3.00	12.80	9.80	9.80	1.50	7.20	7.20	9.80	0.453	25	0.0053	23.69	93	0.9386	0.45			23.89	23.89					
																					0.93	1.00	25.00	

Replacement for 2.0m depth of foundation

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976															CH. (KM): 32+160							BH NO. :- BH-CL		
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Stress increment at top for cohesionless layer & at mid depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 t/m ² (from IS:8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	1.00	3.50	2.50	1.43	7.20	7.20	2.50	1.426	25			200		0.30	11.50	6.71			6.71				
Layer 2	3.50	3.50	11.80	8.30				8.30	0.385	25			93	0.8315	0.45			19.03	19.03					
																					0.97	1.00	25.00	
	1.00																							
Layer 1	1.50	1.50	3.50	2.00				2.00	1.458	25			200		0.30	11.50	5.64			5.64				
Layer 2	3.50	3.50	12.30	8.80				8.80	0.409	25			93	0.8659	0.45			20.63	20.63					
																					0.95	1.00	25.00	
	1.50																							
Layer 1	2.00	2.00	3.50	1.50	1.50	7.20	7.20	1.50	1.498	25			200		0.30	11.50	4.45			4.45				
Layer 2	3.50	3.50	12.80	9.30				9.30	0.436	25			93	0.9016	0.45			22.49	22.49					
																					0.93	1.00	25.00	
	2.00																							

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 16.00 m															Bore Hole No = BH-A1			Ch. (KM) 30+488			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D															Water Table depth considered for analysis =			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction					For End Bearing				Nc	Nq	Ny	As/cm ²	Ap	qs	Qp										
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)	y _{eff}								c	Ø								
1.00	2.00	0.00	2.00	1.68	200	0.17	2.70	1.89	0.22	27	9	13.39	14.47	314.29	7857.14	25.21	310.05												
1.00	4.00	2.00	4.00	1.68	200	0.50	2.70	1.68	1.00	1.00	1.00	200	200	314.29	314.29	76.20													
1.00	8.50	4.00	8.50	1.81	450	1.08	2.70	1.81	0.49	1.00	1.00	450	450	314.29	314.29	54.46													
1.00	11.50	8.50	11.50	1.85	300	1.76	2.70	1.85	0.37	1.00	1.00	300	300	314.29	314.29	69.21													
1.00	15.00	11.50	15.00	1.87	350	2.37	2.70	1.87	0.34	1.00	1.00	350	350	314.29	314.29	20.49													
1.00	16.00	15.00	16.00	1.87	100	2.70	2.70	1.87	0.34	1.00	1.00	100	100	314.29	314.29	105.97													
1.00	18.00	16.00	18.00	1.88	200	2.70	2.70	1.88	1.00	1.00	1.00	200	200	314.29	314.29	351.54													

Q _{u,comp.} =	qs + Qp	Q _{u,uplift} =	Safe Frictional Resistance + Weight of Pile
Q _{a,comp.} =	(351.54 + 310.05) / 2.5	Q _{a,uplift} =	351.54 / 3 + 31.42
Q _{a,comp.} =	264.64 T	Q _{a,uplift} =	148.60 T
Q_{a,comp.} =	264.00 T	Q_{a,uplift} =	148.00 T

Say

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

***Density of Concrete for Weight of Pile = 2.5t/m³

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 18.00 m														Bore Hole No = BH-A1				Ch. (KM) 30+488				Dia of pile = 1.00 m				Cut-off Level = 2.00 m				below EGL			
Restricting PD to 15D														Water Table depth considered for analysis =				30.00 m				Scour Depth = Non-scourable				Liquefaction Depth = Non-Liquefiable							
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		c	Ø	Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap	qs	Qp													
		from (m)	to (m)			α	yeff	gm/cc	ΔL	cm	pd (s.f)	kg/cm ²	Pd (e-b)								kg/cm ²	yeff	gm/cc	c	kg/cm ²	deg							
1.00	2.00	0.00	2.00	0.11	30	1.00	1.00	1.68	200	0.17	2.70	1.89	0.22	27	9	13.39	14.47	314.29	7857.14	25.21	310.05												
1.00	4.00	2.00	4.00	0.90	5	1.00	1.00	1.81	450	0.50	2.70	1.87	0.34	32	9	13.39	14.47	314.29	7857.14	76.20	310.05												
1.00	8.50	4.00	8.50	1.24	4	1.00	1.00	1.85	300	1.08	2.70	1.87	0.34	32	9	13.39	14.47	314.29	7857.14	54.46	310.05												
1.00	11.50	8.50	11.50	1.36	4	1.00	1.00	1.87	350	2.37	2.70	1.87	0.34	32	9	13.39	14.47	314.29	7857.14	69.21	310.05												
1.00	15.00	11.50	15.00	1.36	4	1.00	1.00	1.87	100	2.70	2.70	1.87	0.34	32	9	13.39	14.47	314.29	7857.14	20.49	310.05												
1.00	16.00	15.00	16.00	0.00	32	1.00	1.00	1.88	400	2.70	2.70	1.89	0.22	27	9	13.39	14.47	314.29	7857.14	211.95	310.05												
1.00	20.00	16.00	20.00	0.00	32	1.00	1.00	1.88	400	2.70	2.70	1.89	0.22	27	9	13.39	14.47	314.29	7857.14	211.95	310.05												
														Qu,comp.= qs + Qp				Qu,uplift =				Safe Frictional Resistance + Weight of Pile											
														(457.51 + 310.05) / 2.5				457.51 / 3 + 35.34				457.51 / 3 + 35.34											
														307.03 T				187.85 T				187.85 T											
														Say				Qa,uplift =				187.00 T											
														307.00 T				187.00 T				187.00 T											

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

***Density of Concrete for Weight of Pile = 2.5t/m³



NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 20.00 m												Bore Hole No = BH-A1			Ch. (KM) 30+488			Dia of pile = 1.00 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 30.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap	qs	Qp								
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)								y _{eff}	c	Ø					
1.00	2.00	0.00	2.00																							
1.00	4.00	2.00	4.00	0.11	30	1.00	1.00	1.68	200	0.17								25.21								
1.00	8.50	4.00	8.50	0.90	5	1.00	0.49	1.68	200	0.50								76.20								
1.00	11.50	8.50	11.50	1.24	4	1.00	0.37	1.85	300	1.08								54.46								
1.00	15.00	11.50	15.00	1.36	4	1.00	0.34	1.87	350	1.76								69.21								
1.00	16.00	15.00	16.00	1.36	4	1.00	0.34	1.87	100	2.37								20.49								
1.00	20.50	16.00	20.50	0.00	32	1.00	1.00	1.88	450	2.70								238.44								
1.00	22.00	20.50	22.00	0.22	27	1.00	1.00	1.89	150	2.70	2.70	1.89	0.22	27	9	13.39	14.47	75.18	310.05							

Qu,comp.=	qs + Qp	Qu,uplift =	Safe Frictional Resistance + Weight of Pile
Qa,comp.=	(559.18 + 310.05) / 2.5	Qa,uplift =	559.18 / 3 + 39.27
Qa,comp.=	347.69 T	Qa,uplift =	225.66 T
Qa,comp.=	347.00 T	Qa,uplift =	225.00 T

Say

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

***Density of Concrete for Weight of Pile = 2.5t/m³

NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 22.00 m **Bore Hole No =** BH-A1 **Ch. (KM)** 30+488 **Dia of pile =** 1.00 m **Cut-off Level =** 2.00 m **below EGL**

Restricting PD to 15D **Water Table depth considered for analysis =** 30.00 m **Scour Depth =** Non-scourable **Liquefaction Depth =** Non-Liquefiable

Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction						For End Bearing				Nq	Ny	As/cm ²	Ap cm ²	qs	t	
		from (m)	to (m)	c kg/cm ²	Ø deg	k	α	yeff gm/cc	ΔL cm	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²	yeff gm/cc	c kg/cm ²							Ø deg
1.00	2.00	0.00	2.00	0.11	30	1.00	1.00	1.68	200	0.17										
1.00	4.00	2.00	4.00	0.90	5	1.00	0.49	1.68	200	0.50								25.21		
1.00	8.50	4.00	8.50	1.24	4	1.00	0.37	1.81	450	1.08								76.20		
1.00	11.50	8.50	11.50	1.36	4	1.00	0.34	1.85	300	1.76								54.46		
1.00	15.00	11.50	15.00	1.36	4	1.00	0.34	1.87	350	2.37								69.21		
1.00	16.00	15.00	16.00	0.00	4	1.00	1.00	1.87	100	2.70								20.49		
1.00	20.50	16.00	20.50	0.22	32	1.00	1.00	1.88	450	2.70								238.44		
1.00	24.00	20.50	24.00	0.22	27	1.00	1.00	1.89	350	2.70	0.22	2.70	1.89	27	9	13.39	14.47	7857.14	175.42	310.05

Qu,comp.=	qs + Qp	Safe Frictional Resistance + Weight of Pile
Qa,comp.=	(659.42 + 310.05) / 2.5	659.42 / 3 + 43.2
Qa,comp.=	387.79 T	263.00 T
Qa,comp.=	387.00 T	263.00 T
Say		

*FOS for Vertical Capacity of pile in compression = 2.5
 **FOS for Uplift Capacity of pile = 3.0
 ***Density of Concrete for Weight of Pile = 2.5t/m³



NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 16.00 m		Bore Hole No = BH-A1		Ch. (KM) 30+488		Dia of pile = 1.20 m		Cut-off Level = 2.00 m		below EGL									
Restricting PD to 15D		Water Table depth considered for analysis = 30.00 m		Scour Depth = Non-scourable		Liquefaction Depth = Non-Liquefiable													
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nq	Ny	As/cm ²	Ap cm ²	qs	Qp		
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)							y _{eff}	c
1.20	2.00	0.00	2.00	0.11	30	1.00	1.00	1.68	200	0.17									
1.20	4.00	2.00	4.00	0.90	5	1.00	1.00	1.68	200	0.50									30.25
1.20	8.50	4.00	8.50	1.24	4	1.00	0.49	1.81	450	1.08									91.44
1.20	11.50	8.50	11.50	1.36	4	1.00	0.37	1.85	300	1.76									65.35
1.20	16.00	11.50	16.00	0.00	4	1.00	0.34	1.87	450	2.46									107.88
1.20	18.00	16.00	18.00	0.00	32	1.00	1.00	1.88	200	3.07									144.87
																			534.99

Qu,comp.=	qs + Qp	Qu,uplift =	Safe Frictional Resistance + Weight of Pile
Qa,comp.=	(439.79 + 534.99) / 2.5	Qa,uplift =	439.79 / 3 + 45.24
Qa,comp.=	389.91 T	Qa,uplift =	191.84 T
Qa,comp.=	389.00 T	Qa,uplift =	191.00 T

Say

*FOS for Vertical Capacity of pile in compression = 2.5
 **FOS for Uplift Capacity of pile = 3.0
 ***Density of Concrete for Weight of Pile = 2.5t/m³



NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 18.00 m												Bore Hole No = BH-A1			Ch. (KM) 30+488			Dia of pile = 1.20 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 30.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		c	Ø	Properties of layers/for Skin Friction			For End Bearing			Nc	Nq	Ny	As/cm ²	Ap	qs	Qp								
		from (m)	to (m)			α	γ _{eff} gm/cc	ΔL	cm	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²								γ _{eff} gm/cc	c	Ø	deg				
1.20	2.00	0.00	2.00	1.68	200	0.17	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	4.00	2.00	4.00	1.68	200	0.50	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	8.50	4.00	8.50	1.81	450	1.08	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	11.50	8.50	11.50	1.85	300	1.76	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	16.00	11.50	16.00	1.87	450	2.46	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	18.00	16.00	18.00	1.88	200	3.07	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									
1.20	18.00	18.00	20.00	1.88	200	3.26	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	153.75	534.99									

Qu,comp.=	qs + Qp	Qu,uplift =	Safe Frictional Resistance + Weight of Pile
Qa,comp.=	(593.55 + 534.99) / 2.5	Qa,uplift =	593.55 / 3 + 50.89
Qa,comp.=	451.41 T	Qa,uplift =	248.74 T
Qa,comp.=	451.00 T	Qa,uplift =	248.00 T

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

***Density of Concrete for Weight of Pile = 2.5t/m³



NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 20.00 m **Bore Hole No =** BH-A1 **Ch. (KM)** 30+488 **Dia of pile =** 1.20 m **Cut-off Level =** 2.00 m **below EGL**

Restricting PD to 15D **Water Table depth considered for analysis =** 30.00 m **Scour Depth =** Non-scourable **Liquefaction Depth =** Non-Liquefiable

Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction						For End Bearing				Nq	Ny	As/cm ²	Ap cm ²	qs	Qp
		from (m)	to (m)	c	Ø	k	α	y _{eff} gm/cc	ΔL	pd (s.f) kg/cm ²	Pd (e-b) kg/cm ²	y _{eff} gm/cc	c						
1.20	2.00	0.00	2.00	0.11	30	1.00	1.00	1.68	200	0.17									
1.20	4.00	2.00	4.00	0.90	5	1.00	0.49	1.68	200	0.50								30.25	377.14
1.20	8.50	4.00	8.50	1.24	4	1.00	0.37	1.81	450	1.08								91.44	377.14
1.20	11.50	8.50	11.50	1.36	4	1.00	0.34	1.85	300	1.76								65.35	377.14
1.20	16.00	11.50	16.00	0.00	32	1.00	1.00	1.87	450	2.46								107.88	377.14
1.20	18.00	16.00	18.00	0.00	32	1.00	1.00	1.88	200	3.07								144.87	377.14
1.20	20.50	18.00	20.50	0.22	27	1.00	1.00	1.88	250	3.26								192.19	377.14
1.20	22.00	20.50	22.00	0.22	27	1.00	1.00	1.89	150	3.26	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29
																		738.46	534.99

Qu,comp.= qs + Qp
Qa,comp.= (738.46 + 534.99) / 2.5
Qa,comp.= 509.38 T
Qa,comp.= 509.00 T
Qa,uplift = Safe Frictional Resistance + Weight of Pile
Qa,uplift = 738.46 / 3 + 56.55
Qa,uplift = 302.70 T
Qa,uplift = 302.00 T

*FOS for Vertical Capacity of pile in compression = 2.5
 **FOS for Uplift Capacity of pile = 3.0
 ***Density of Concrete for Weight of Pile = 2.5t/m³



NAME OF PROJECT:- "GTI for designing of bridges and embankment for Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kaian including connectivity to existing IR network in the state of Haryana.

Length of Pile below cut of level = 22.00 m												Bore Hole No = BH-A1			Ch. (KM) 30+488			Dia of pile = 1.20 m			Cut-off Level = 2.00 m			below EGL		
Restricting PD to 15D												Water Table depth considered for analysis = 30.00 m			Scour Depth = Non-scourable			Liquefaction Depth = Non-Liquefiable								
Dia. of Pile (m)	Cut-off Depth (m)	Soil layers		Properties of layers/for Skin Friction				For End Bearing				Nc	Nq	Ny	As/cm ²	Ap	qs	Qp								
		from (m)	to (m)	c	Ø	k	α	y _{eff}	ΔL	pd (s.f)	Pd (e-b)								y _{eff}	c	Ø					
1.20	2.00	0.00	2.00	1.68	200	0.17	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	4.00	2.00	4.00	1.68	200	0.50	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	8.50	4.00	8.50	1.81	450	1.08	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	11.50	8.50	11.50	1.85	300	1.76	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	16.00	11.50	16.00	1.87	450	2.46	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	18.00	16.00	18.00	1.88	200	3.07	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	20.50	18.00	20.50	1.88	250	3.26	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									
1.20	24.00	20.50	24.00	1.89	350	3.26	3.26	1.89	0.22	27	9	13.39	14.47	377.14	11314.29	248.44	534.99									

Q _{u,comp.} =	qs + Qp	Q _{u,uplift} =	Safe Frictional Resistance + Weight of Pile
Q _{a,comp.} =	(880.42 + 534.99) / 2.5	Q _{a,uplift} =	880.42 / 3 + 62.2
Q _{a,comp.} =	566.16 T	Q _{a,uplift} =	355.68 T
Q_{a,comp.}=	566.00 T	Q_{a,uplift} =	355.00 T

Say

*FOS for Vertical Capacity of pile in compression = 2.5

**FOS for Uplift Capacity of pile = 3.0

***Density of Concrete for Weight of Pile = 2.5t/m³

Lateral Load capacity of Pile			
BH-A1			
Ch. (KM): 30+488			
Type of Strata = Clayey			
Le	= Embedded Length of Pile in Meter	= 20.000 m	Fck = 35.0 N/mm² D = 100 cm
	Bed level	0.0 m	
	Pile cap bottom level	-2.0 m	
	Liquefaction level	-2.0 m	
E	= Young's Modulus of Pile (Kg/cm ²)	= $5000 \sqrt{F_{ck}}$ N/mm ²	= 295803.99 Kg/cm ²
I	= Moment of Inertia (cm ²)	= $\pi x D^4 / 64$	= 4908738.5 cm ⁴
c	= weighted mean of cohesion along the length of pile from the top of scour depth to bottom of pile	=	= 0.900 Kg/cm ²
qu	= Unconfined Compression Strength	= 2 x c	= 1.800 Kg/cm ²
k₁	= Modulus of Subgrade Reaction for cohesive soil (from Table 4)	=	= 3.240 kg/cm ³
K	=	= $k_1 x 0.3 / (1.5 x B)$	= 0.648 kg/cm ³
R_i	Relative stiffness factor in Preloaded Clay	$R = \sqrt[4]{\frac{EI}{KD}}$	= 386.9 cm
For Long Pile If L_e > 3.5R			
L₁	=		= 0.000 cm
$\frac{L_1}{R}$			= 0.00
For Fixed Head Pile			
$\frac{L_1}{R}$			= 2.000 From Fig. 4
L_f			= 773.80 cm
Equivalent length of cantilever	L = L₁ + L_f	0.00 + 773.80178	= 773.80 cm
Y	= Pile Head Deflection (Cm)	= $\frac{Q(L_1 + L_f)^3}{12 EI}$ (for fixed Head pile)	
		Q = Lateral Load in Kg	
Lateral Load For Pile Head Deflection 0.5 cm		Q	= 18803.38 Kg
			= 18.8 T
Safe Lateral resistance of Pile = Lateral resistance corresponding to deflection 1.0% of Pile Diameter at scour level 1.0 cm			
			= 37.60 T
	Say	37	T

Lateral Load capacity of Pile			
BH-A1			
Ch. (KM): 30+488			
Type of Strata = Clayey			
Le	= Embedded Length of Pile in Meter	= 20.000 m	Fck = 35.0 N/mm² D = 120 cm
	Bed level	0.0 m	
	Pile cap bottom level	-2.0 m	
	Liquefaction level	-2.0 m	
E	= Young's Modulus of Pile (Kg/cm ²)	= $5000 \sqrt{F_{ck}}$ N/mm ²	= 295803.99 Kg/cm ²
I	= Moment of Inertia (cm ²)	= $\pi x D^4 / 64$	= 10178760.2 cm ⁴
c	= weighted mean of cohesion along the length of pile from the top of scour depth to bottom of pile	=	= 0.900 Kg/cm ²
qu	= Unconfined Compression Strength	= 2 x c	= 1.800 Kg/cm ²
k₁	= Modulus of Subgrade Reaction for cohesive soil (from Table 4)	=	= 3.240 kg/cm ³
K	=	= $k_1 x 0.3 / (1.5 x B)$	= 0.540 kg/cm ³
R_p	Relative stiffness factor in Preloaded Clay	$R = \sqrt[4]{\frac{EI}{KD}}$	= 464.3 cm
For Long Pile If L_e > 3.5R			
L₁	=		= 0.000 cm
$\frac{L_1}{R}$			= 0.00
For Fixed Head Pile			
$\frac{L_1}{R}$			= 2.000 From Fig. 4
L_f			= 928.56 cm
Equivalent length of cantilever	L = L₁ + L_f	0.00 + 928.56214	= 928.56 cm
Y	= Pile Head Deflection (Cm)	= $\frac{Q(L_1 + L_f)^3}{12 EI}$ (for fixed Head pile)	
		Q = Lateral Load in Kg	
Lateral Load For Pile Head Deflection 0.5 cm		Q	= 22564.06 Kg
			= 22.6 T
Safe Lateral resistance of Pile = Lateral resistance corresponding to deflection 1.0% of Pile Diameter at scour level 1.2 cm			
			= 54.15 T
	Say	54	T

Geotechnical Investigation Report

Old Ch. 898.787 New Ch. 1046.562 (Minor Bridge), Old Ch. 1153.187 New Ch. 1277.958 (Minor Bridge), Old Ch. 1859.918 New Ch. 1986.847 (Minor Bridge), Old Ch. 2391.105 New Ch. 2518.489 (Minor Bridge) m & Old Ch. 2560.493 New Ch. 2687.006 (Minor Bridge) m

PATLI TO NEW PATLI

SR NO. : 544_21-22

**CONDUCTING GEOTECHNICAL INVESTIGATION,
PREPARATION OF GEOTECHNICAL REPORT FOR
DESIGNING OF BRIDGES AND FOR EMBANKMENT
IN CONNECTION WITH CONSTRUCTION OF
HARYANA ORBITAL RAIL CORRIDOR (HORC)
PROJECT FROM PALWAL TO HARSANA KALAN
INCLUDING CONNECTIVITY TO EXISTING
IR NETWORK IN THE STATE OF HARYANA**

CLIENT

**M/S. HARYANA RAIL INFRASTRUCTURE
DEVELOPMENT CORPORATION LTD. (HRIDCL)**

PROGRAMME

JULY - 2022

SR. No.	Report No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/864_(05 BHs)	01	22.09.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/666_(05 BHs)	00	29.07.2022



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CEGTH/HRIDCL/SR-544/2022-23/864

Date:- 22.09.2022

To,

Haryana Rail Infrastructure Development

Corporation Ltd. (HRIDCL)

SCO No.-17-19, 3rd & 4th Floor,

Sector - 17-A,

Chandigarh - 160017

Tele:- 0172-2715644

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Subject :- Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.

Dear Sir,

We are pleased to submit this report of the subject work based on 05 boreholes carried out at Ch. 898.787m to Ch. 2560.493m (OLD) - Ch. 1046.562m to Ch. 2687.006m (NEW) for Minor Bridge for the proposed project site.

The accompanying report presents results of various field tests and laboratory tests conducted on selected soil samples and their interpretation.

Should there be any clarifications regarding the contents please contact us at your most convenient time.

We value the opportunity to participate in this project and look forward a pleasant association on future projects.

Very truly yours,
CEG Test House & Research Centre Pvt. Ltd.

Prepared By:-



Nehal Jain
General Manager - Geotechnical
Authorized Signatory



Dr. Ankur Mudgal
Senior Manager

SR. No.	Report Ref. No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/864_(05 BHs)	01	22.09.2022
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CHAPTER 1 GENERAL

1.0 INTRODUCTION:

The work of conducting “**Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana**” was awarded to “**CEG Test House & Research Centre Pvt. Ltd., Jaipur**” by M/S. “**Haryana Rail Infrastructure Development Corporation Ltd. (HRIDCL)**” as per work order no. HRIDC/ HORC/ GT/ CEG/ 237/ 2021/ 577-M dated 29th July 2021.

Field work including drilling of boreholes, conducting field tests such as Electrical Resistivity Test, & Plate Load Test and sample collection was carried out in the presence of representative of Client. Laboratory tests were conducted on selected soil samples to determine the design parameters, confirming to relevant IS specifications and the guidelines received from time to time from representative of Client.

This report includes the details of Methodology of Investigation, collection of samples (soil/ rock), field test results, laboratory test results, analysis of results and recommendations for results for proposed structures based on soil sample collected from the locations of boreholes.

2.0 SITE LOCATION & GENERAL GEOLOGICAL HISTORY:

The details of the site & test locations for the proposed project are shown in location plan attached vide **Appendix A-1**. The site of proposed project is located from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV (Zone factor=0.24) of India.

Soil of the Haryana Sub-Region have been classified and described under the following major soil types as shown below:-

- Typic Ustochrepts : Soil of old alluvial plains
- Typic Ustipsamments : Soil of Aravali plains
- Typic Ustifluvents : Soil of recent alluvial plains and flood plains
- Typic Torripsamments : Soil of Aeofluvial plains
- Rocky Outcrops : Aravali rocky hills

The district wise details of soil characteristics are described below:-

Panipat: The soils are well drained, Sandy loam to clay loam/silty clay loam in plains and loam to clay loam/ silty/ loose clay loam in relic channels/depressions/basins.

Sonipat: The district comprises of recent flood plains, young meander plains, old meander plains and old alluvial plains. Recent flood plains occur along the Yamuna River and clearly show fluvial features. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface.

Rohtak: The district mainly comprises of old alluvial plains. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface. Old meander plains are almost flat with loamy sand to silty clay loam soils. Oldest among all the land forms are old alluvial plains, which cover major areas in the district. These soils are sand to loamy sand/sandy loam (surface) to silt loam/silty clay loam (sub-surface).

Jhajjar: The district mainly comprises of old alluvial plains and some parts of the district also have soil belonging to Aravali plains.

Rewari: The soils of the district fall under Entisols and Inceptisols orders. The surface soil texture varies from sand to fine loamy sand.

Gurgaon: The district comprises of sand dunes, sandy plains, alluvial plains, salt affected areas, low lands, lakes, hills and pediments. The soil varies from sand to loamy sand in sand dunes and sandy plain areas, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.

Mewat: The soils of the area are generally sandy loam to loam. In parts of the low-lying areas, they are clayey and saline. The upper hills are mostly barren.

Faridabad and Palwal: The district comprises of recent Yamuna flood plains, low lying plains, depressions, sand dunes and hills. The texture of the soil is sand to loamy sand in recent Yamuna flood plains, sandy loam in plains, sandy loam to clay loam in alluvial plains, sandy loam to loam (surface), clay loam/silty clay (sub-surface) in low lying plains and depressions.

3.0 SCOPE OF WORK:

The stipulated scope of work involved carrying out the following operations:-

- a) Mobilisation of necessary plant equipment, men and materials for the complete Geotechnical investigation work as per specifications, drawings and instructions of the Engineer and to complete the same within the stipulated time schedule and demobilisation after completion of field work.
- b) Shifting of Equipments from one structure location to another including Erection, installation of rigs at site and dismantling of the same after completion of field work. Shifting of setup for each borehole location and associated preparation for borehole under water
- c) Making 150 mm nominal diameter boreholes at various locations in all types of soils except hard rock and large boulders using suitable approved method of boring including chiselling, cleaning, providing casing pipe as required; performing Standard Penetration Test at every 3.0m interval and at change of strata; collection of water samples and disturbed soil samples, observation such as ground water, etc., collection of undisturbed soil samples at every 3.0 m interval and at change of strata; transportation of all the collected samples to the laboratory and back filling of boreholes on completion of the same, complete as per specification and instructions of the Engineer, for depths below natural ground level.
- d) Conducting Electrical resistivity tests at various locations all complete as per specification and directions of the Engineer.
- e) Conducting plate load test at various locations, all complete as per specification and directions of the Engineer.
- f) Drilling of Nx size boreholes (75mm dia.) in all types of hard rock, collection of core samples, maintaining continuous record of core recovery/ RQD, keeping the cores in wooden core boxes, transporting to laboratory, backfilling on completion of the same, all complete as per specification and instructions of the EIC.
- g) Conducting various laboratory tests on soil samples at an approved laboratory including preparation of soil samples to determine the following properties of soil, all complete as per specification.

On soil Samples

- Dry density test
- Bulk Density and Moisture Content.
- Sieve Analysis
- Hydrometer Analysis
- Liquid Limit and Plastic Limit
- Specific gravity
- Shrinkage Limit

- Free Swell Index
 - Direct Shear Test
 - Triaxial Shear Test
 - One Dimensional consolidation test
 - Chemical Analysis of soil samples (pH, chloride, Sulphate)
- h) Conducting laboratory tests on rock samples including preparation of the samples to determine the following properties, all complete as per specification

On Rock Samples

- Moisture content, porosity & Density
 - Specific gravity
 - Hardness
 - Unconfined compression test
 - Point load strength index
 - Modulus of Elasticity and Poission's Ratio
 - Abrasion Test
- i) Conducting chemical tests on water samples to determine the Sulphate, chloride and pH value all complete as per specification.
- j) Submitting draft report in soft copy including all field records and laboratory test results, graphs, etc., all complete as per specifications.
- k) Submitting final report in three hard copies in after the approval of the draft report including all field records and laboratory test results, graphs, etc., all complete as per specifications.

4.0 FIELD INVESTIGATION IN SOIL STRATA:

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil / rock core samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum.

For geotechnical investigation work, required equipments along with rotary drilling rigs and manpower were mobilized at site to carry out various field activities as per the scope of work. These were shifted from one test location to another location during execution of field work and were demobilized on satisfactory completion of field work.

For conducting the field investigations the following practices were followed at site:

- The locations of 05 boreholes were marked at site at specified locations. These locations are shown in **Appendix A-1** attached subsequently.

The details of various boreholes along with their coordinates are provided herein below:

Table 1.1: Details of Borehole Locations

S. No.	Old Chainage/ Structure (m)	New Chainage/ Structure (m)	BH. No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		+R.L
						E	N	
1.	898.787	1046.562	BH-03	Not Encountered	10.00	682976.604	3145159.097	216.537
2.	1153.187	1277.958	BH-04		10.00	683182.833	3145010.076	218.023
3.	1859.918	1986.847	BH-05		10.00	683610.917	3144481.635	218.551
4.	2391.105	2518.489	BH-06		10.00	683460.537	3143989.172	220.462
5.	2560.493	2687.006	BH-07		10.00	683330.410	3143881.578	221.172

- In soil, boreholes of 150mm dia. were drilled as per the standard procedure laid in IS: 1892.
- Borehole was properly cleaned before taking any sample in soil.
- Casing was used as per the prevailing soil conditions, to stabilize the borehole.
- Standard Penetration Tests were conducted in bore holes at regular intervals or at every change of strata as per Technical specification.
- Undisturbed were collected wherever feasible as per the requirements and at specified depths. The same has been discussed in detail in soil characteristics sheets attached with the report.
- Water table was not encountered in the boreholes.
- The detailed procedure adopted for conducting various field tests is given here in below:

(i) Standard Penetration Test:

The Standard Penetration Test was conducted in boreholes as per IS 2131. The test was carried out using the standard split spoon sampler to measure the number of blows ‘N’.

Standard split spoon sampler was attached to an ‘A’ rod. It was driven from borehole bottom to a distance of 45 cm using a standard hammer of 63.5 kg falling freely from a height of 75 cm to the required depth. While driving, the number of blows required to penetrate every 15 cm are recorded. The total number of blows required for the last 30 cm is taken as ‘N’ value at that particular depth of the borehole. Wherever the total penetration was less than 45cm, the no. of blows & the depth penetrated is recorded in the respective borelog.

SPT ‘N’ values were correlated with relative density of non-cohesive stratum and with consistency of cohesive stratum as given below:-

Table 1.2: Soil compactness as per SPT N values (cl. 9.7, table 9.3 & 9.4, page 330_text book of V.N.S. Murthy)

Correlation for Clay / Plastic silt		Correlation for Sand / Non-Plastic silt	
Consistency	SPT "N" Value	Compactness	SPT "N" Value
Very Soft	0 - 2	Very Loose	0 - 4
Soft	2 - 4	Loose	4 - 10
Medium	4 - 8	Medium	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very Stiff	15 - 30	Very Dense	> 50
Hard	> 30		

The field SPT N values obtained were further corrected as per the guidelines given in IS: 2131 as follows:

(a) For overburden: - The N value for cohesionless soil is corrected with the help of fig. 1 given in IS-2131.

(b) Due to dilatancy :- Wherever N values observed below water table in fine sand, silty sand or silt was greater than 15, then corrected N values were corrected as under:

$$N' = 15 + \frac{1}{2} (N-15)$$

(ii) Undisturbed Sampling (Soil) in boreholes:

Undisturbed samples were collected using MS tubes of suitable diameter and length with Area ratio as per clause 4.1.1 (c) of IS: 1892 (latest) fitted to an adopter with ball and socket arrangement. Before taking any sample, sampling tube was properly greased. Immediately after taking on undisturbed sample in a tube, the adopter head was removed along with the disturbed material. The visible ends of the sample were trimmed off any wet disturbed soil. The ends were coated alternately with four layers of just molten wax. More molten wax was added to give a total thickness of min. 25 mm. The samples were carefully labeled and transported to the laboratory for testing. Undisturbed samples wherever slipped during lifting were duly marked in the field logs as well as in the soil profile.

(iii) Collection of Ground Water Samples from bore holes:

Water table was not encountered in the boreholes during the site investigation.

5.0 LABORATORY TESTS ON SOIL SAMPLES:

The following laboratory tests were conducted on selected soil samples:

Table 1.3: Description of Tests

Description of Test	Reference	Undisturbed (UDS) Soil Samples	Disturbed (DS/SPT) Soil Samples
Grain Size Analysis / Hydrometer	IS: 2720 (Part - 4)	√	√
Natural Moisture Content / Bulk / Dry density	IS : 2720 (Part – 2)	√	√
Atterberg Limits <ul style="list-style-type: none"> • Liquid Limit • Plastic Limit 	IS: 2720 (Part - 5) IS: 2720 (Part - 5)	√ √	√
Specific Gravity	IS : 2720 (Part – 3)	√	√
Direct Shear Test	IS : 2720 (Part – 13)	√	√
Triaxial compressive shear test	IS : 2720 (Part – 11 & 12)	√	√
Chemical Analysis of Soil Samples	IS : 2720 (Part – 26, 27)	√	-

Note:- The detailed procedure adopted for conducting various laboratory tests is described in the following paragraphs:

5.1.1 Dry density and Bulk density

For determination of bulk density and dry density, a sample of known volume ‘V’ was extracted from the undisturbed sampling tube and its bulk weight ‘W’ was noted down. Moisture content ‘Wn’ was determined by oven drying method.

The bulk density and dry density were determined by following equation-

$$\text{Bulk density } (\gamma_b) = W/V$$

$$\text{Dry density } (\gamma_d) = \gamma_b / (1+Wn)$$

5.1.2 Natural water content

For this test, the soil sample of known quantity (Wm) was taken in a container. The container with soil sample was placed into an oven for drying at 105-110°C temperature for 16-24 hours. After drying, the dry sample was again weighted to determine the dry weight of sample (Wd).

The natural water content was computed by the following equation-

$$Wn = (Wm - Wd) * 100 / Wd$$

5.1.3 Grain Size Analysis (IS: 2720- Part-4)

Wet sieve analysis:

For determination of particle sizes finer than 75 micron, wet sieve analysis test was conducted. For this test, oven dried sample of known quantity was taken in a container and soaked with dispersing

agent. The soaked soil sample was washed thoroughly over 75 micron IS sieve until the water passing sieve was substantially clean.

Fraction retained on 75 micron IS sieve was carefully collected in a container without any loss in material and placed into oven for drying.

Dry sieve analysis:

For this test, the oven dried soil sample after wet sieving was sieved through the set of IS sieves 20 mm, 10 mm, 4.75 mm, 2.0 mm, 1.0 mm, 425 micron, 300 micron, 150 micron and 75 micron. The amounts of soil retained on each sieve were noted down. The % retained, cumulative % retained and % passing were computed accordingly. Wherever the soil sample % passing 75 micron sieve was significant, Hydrometer method was used to find the percentage of silt and clay fraction.

Grain size analysis for the fraction passing 75 micron IS Sieve (Hydrometer method)

Calibration of Hydrometer

Hydrometer was calibrated to determine a relationship (an equation) between the effective depth H_R and corresponding hydrometer reading R_h (obtained during test).

50 to 100 gm of soil sample passing through 75 micron IS Sieve was taken. It was mixed with 100 ml of sodium hexametaphosphate solution and the mixture was warmed for about 10 minutes. It was then transferred to the cup of the mechanical mixer and the soil suspension was stirred for 15 minutes. The soil suspension was transferred into 1000 ml measuring cylinder and distilled water was added to make 1000ml solution. This solution was mixed vigorously. The measuring cylinder was then allowed to stand and the stopwatch was started. Hydrometer was immersed in the solution and reading were taken after half, one, two and four minutes. The hydrometer was then removed slowly and kept in distilled water at the same temperature as the soil suspension. Readings were taken after the periods of 8, 15 and 30 minutes, and one, two and four hours. Hydrometer was removed, rinsed and placed in the distilled water after each reading. After 4 hours reading was taken once or twice within 24 hours. Finally a reading was taken at the end of 24 hours. The temperature of the suspension was observed and recorded.

Calculations

Diameter of the particles (D):

$$D = \sqrt{\frac{30\mu}{980(G-1)}} \times \sqrt{\frac{H_R}{t}} = M \sqrt{\frac{H_R}{t}}$$

Where,

D = diameter of particle in suspension, in mm;

- μ = co-efficient of viscosity of water at the temperature of the suspension at the time of taking the hydrometer reading, in poise;
- G = specific gravity of the soil fraction used in the sedimentations analysis;
- H_R = effective depth corresponding to R_n , in cm.
- t = time elapsed between the beginning of sedimentation and taking of hydrometer reading in minutes

$M = \sqrt{\frac{30\mu}{980(G-1)}}$ = a constant factor for given values of μ and G at the temperature of the suspension.

Percentage finer than diameter D:

The percentage by mass (w) of particles smaller than corresponding equivalent particle diameters (D) was calculated from the formula:

$$w = \frac{100G_s}{W_b(G_s - 1)} \times R_h$$

Where

- w = percentage finer
- G_s = specific gravity of soil particle
- W_b = weight of soil
- R_h = Hydrometer reading

5.1.4 Specific Gravity (IS: 2720-Part-3 Sec-1)

The specific gravity of soil sample was determined by density bottle method. For this test 5-10g oven dried and cooled soil sample was taken in 50ml capacity density bottle and its weight was noted down as W_2 . The soil was covered with distilled water and left for sufficient period for suitable soaking. The entrapped air was removed by vacuum. The bottle with soil was filled fully with water and its weight was noted down (W_3). The mass of empty bottle and bottle filled with distilled water were noted down as W_1 and W_4 respectively.

The Specific Gravity was determined by using following equation :

$$G = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}$$

5.1.5 Liquid Limit (IS: 2720- Part-5)

By Cone Penetrometer Method

The 'Cone Penetrometer Apparatus' is a variant of the fall-cone and consists of a cone with a smooth polished surface and angle of $30^\circ \pm 1/2^\circ$. The weight of the cone, together with its

associated shaft is $80\text{g} \pm 0.5\text{g}$. A support assembly with an automatic cone release mechanism and cone height adjustment mechanism used to hold the cone vertically. The angle and weight of the cone were calibrated at regular intervals, and the sharpness of the cone tip was checked daily.

Distilled water was added and thoroughly mixed with the soil sample to produce a homogeneous paste. The paste was then placed in a cup with a diameter of at least 55mm and a depth of at least 40mm. The surface of the soil was smoothed off level and parallel to the base. The support assembly was used to position the tip of the cone so that it was just touching the top surface of the soil, and the automatic tripping mechanism was released. The cone was allowed to penetrate into the soil for a period of $5 (\pm 1)$ s, then the cone was locked off to stop further movement and the penetration was recorded. The cup was refilled and the test was repeated. The two recorded penetrations need to be within 0.5mm of each other, otherwise a third test is performed. when the three test vary by more than 1mm the test was repeated.

Further tests were conducted, at varying water contents, in order to produce a series of cone penetrations (usually 4) in the range 15mm to 25mm. The resulting cone penetrations were plotted verses the water content of the test specimens. The Liquid Limit (W_L) was read off the graph, being the water content at which the line of best fit through the test points crosses 20mm penetration.

5.1.6 Plastic Limit (IS: 2720-Part-5)

For this test, soil sample was prepared in the same way as for liquid limit test. A ball of soil sample weighed about 5 gm was formed. The ball was rolled between the fingers of one hand and the glass plate with pressure sufficient to reduce the mass into a thread of about 3 mm in 5 to 10 complete forward and back movements. When a diameter of 3 mm was reached, soil was again remolded into a ball. The process of rolling and remolding was repeated until the thread started just crumbling at a diameter of 3 mm. The crumbled thread was immediately transferred to an airtight container for determination of its moisture content by oven drying method.

This water content has been termed as plastic limit. (W_P)

5.1.7 Plasticity Index (IS: 2720-Part-5)

The plasticity index I_p was given by

$$I_p = W_L - W_P \text{ (in percent)}$$

5.1.8 Direct Shear Test (IS:2720-Part-13):

For this test shear box test apparatus was used. The prepared specimen from remolded/undisturbed sample was placed carefully in the box. The plain grid was kept on top of the specimen with its directions at right angles to the direction of shear. The upper porous stone was placed on the grid and loading pad on the stone. The box with specimen was gently placed in the container (water

jacket). The specimen was submerged with water. The container was mounted with the shear box and the specimen inside, on the shearing machine. The upper part of the box was so adjusted that it touched the proving ring. The jack was brought forward to bear up against the box container. The proving ring dial gauge was set to read zero.

The steel ball was placed in the recess of the loading pad. The loading yoke was set in contact with the steel ball on the loading pad. Vertical displacement dial gauge to read zero in contact with the top of the yoke. The normal load was applied and any change in thickness of specimen was recorded. Shear displacement dial gauge was also set to read zero. The locking screw was now removed and two parts of the shear box were separated by advancing the spacing screws.

The specimen was sheared at constant rate of strain. The readings of the proving ring dial gauge were noted down every 15 seconds for the first one-minute and then every 30 seconds thereafter. The reading of change in the thickness dial gauge and shear displacement dial gauge were also recorded at the same time interval. The test was continued until the specimen fails. The specimen was assumed to fail when the proving ring dial gauge started receding or at shear displacement of approximately 15% of the length took place.

The soil was removed from the box and test was repeated on the identical specimen under increased normal load.

5.1.9 Triaxial Shear Test_UUT (IS: 2720-Part-11)

For this test, Triaxial Shear Test apparatus was used. The plain disc was placed on the pedestal of the triaxial cell. The specimen was placed centrally on the disc. A correct size rubber membrane was fitted inside the stretcher with ends of membrane folded over those of the stretcher. Vacuum was applied to stretch the membrane to the inside surface of the stretcher which was carefully slipped around the specimen kept on the pedestal. The vacuum on the membrane was released. Its bottom part was rolled down into the pedestal. plain disc was placed on the top of the specimen and then loading pad was placed. The top part of membrane was rolled on to the loading pad. Then the stretcher was removed and ends were sealed with 'O' rings. With the properly sealed specimen placed centrally on the pedestal, the cell was assembled, keeping the loading piston initially clear of the loading pad of the specimen, the assembly was placed in the loading frame.

For unconsolidated undrained test, the bottom drainage valve (BDV) and top drainage valve (TDV) of cell, was closed and air release valve (ARV) was opened. The cell was filled with water through the cell water valve CWV. ARV was closed when water begins to escape through it. The cell pressure was raised to the desired value and kept constant till the end of the test.

When the cell pressure was applied, the load piston rises upward, the loading machine was operated at the anticipated rate to bring the load piston slightly above the loading pad of the specimen and the load measuring dial gauge on proving ring was set to zero.

The piston was brought just in contact with loading pad by hand operation of the machine. The

axial compression dial gauge was mounted and set to read zero.

The axial loading was started at 1.25 mm/min rate of strain. Simultaneous readings on the load and compression dial gauges were noted down. The test was continued until a recession of the axial load is observed or 20% of strain.

After failure, the specimen was unloaded by reversing the loading machine, cell pressure was reduced and cell water was drained out through BRV. The cell was dismantled and the specimen was taken out, rubber membrane was removed and weight of the failed sample and its water content was determined. The test was repeated on two more identical specimens with increasing cell pressure.

CHAPTER 2 ANALYSIS OF TEST RESULTS AND INTERPRETATION

6.0 STRATIFICATION

From the study of the borehole logs, it is revealed that the sub strata mainly consist of silty sand (SM), sandy silt of low plasticity (ML-CL) and silty clay of low plasticity (CL).

However,

At the location of (OLD) CH.898.787 (BH-3):-

- a) From EGL to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

At the location of (OLD) CH.1153.187 (BH-4):-

- a) From EGL to 1.50m depth consists of coarse grained strata i.e. silty sand (SM).
- b) From 1.50m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

At the location of (OLD) CH.1859.918 (BH-5):-

- a) From EGL to 3.00m depth consists of coarse grained strata i.e. sandy silt of low plasticity (ML-CL)
- b) From 3.00m to 6.00m depth consists of coarse grained strata i.e. silty sand (SM).
- c) From 6.00m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

At the location of (OLD) CH.2391.105 (BH-6):-

- a) From EGL to 4.50m depth consists of coarse grained strata i.e. silty sand (SM).
- b) From 4.50m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

At the location of (OLD) CH.2560.493 (BH-7):-

- a) From EGL to 3.00m depth consists of coarse grained strata i.e. silty sand with clay of low plasticity (SM-SC).
- b) From 3.00m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL) and silty clay of intermediate plasticity (CI).

6.1 GROUND WATER TABLE DEPTH

The Ground Water Table at all the bore hole locations was not encountered during the site investigation.

6.2 RESULTS OF CHEMICAL ANALYSIS

Results of chemical analysis of soil samples (as per **Appendix – B2**) indicates that the soil sample falls under Class I for sulphates and chlorides concentration (As per IS 456-2000 and CIRIA Sp. Publication No. 31). The results are summarized here in below :-

Summary of chemical analysis of soil samples

Chemical Property	Findings (Min. to Max.)	Remarks (Required limits as per IS 456-200)
pH	7.20 to 7.91	> 6.0
Sulphite as SO_3^{2-} (%)	0.0012 to 0.0025(%)	< 0.2% (Class I)
Chlorides as Cl^- (%)	0.0029 to 0.0065 (%)	No limit specified in IS 456. However, a limit of 0.10% specified for class I in CIRIA Sp. Publication No. 31)

Note :- All the chemical contents are within permissible limit hence no special precautions are required.

CHAPTER 3 TYPE AND DEPTH OF FOUNDATION WITH ANALYSIS

7.0 TYPE & DEPTH OF FOUNDATION:

Based on the nature & strength characteristics of the substrata and requirement of the project, the following type of foundation have been analyzed as given below:

Chainage (Old) (m)	BH No.	Type of foundation	Depth of foundation below E.G.L. (m)	Length x Width (m)	Remarks
898.787	BH-03	Shallow Foundation	1.00	5.0 x 5.0	
			1.50		
			2.00		
1153.187	BH-04		1.00	2.0 x 2.0	
			1.50		
			2.00		
1859.910	BH-05		1.00	4.0 x 4.0	
			1.50		
			2.00		
2391.105	BH-06		1.00	5.0 x 5.0	
			1.50		
			2.00		
2560.493	BH-07	1.00	2.5 x 2.5		
		1.50			
		2.00			

The details of foundation analysis are given in the subsequent paragraph.

7.1 ANALYSIS OF SHALLOW FOUNDATION

7.1.1 From Shear Failure Criteria

Net Safe Bearing capacity from Shear Failure consideration has been computed in accordance with IS: 6403-1981, which is based on, modified Terzaghi's classical approach. The weighted average of shear strength parameters for various strata upto depth equal to $0.5 \cdot B \cdot \tan(45 + \frac{\phi}{2})$ (where B = Width of the Foundation, ϕ = Angle of internal friction) is used in the analysis. A factor of safety of 2.5 to estimate the net safe bearing capacity from ultimate net bearing capacity.

For soils, containing both coarse grained (gravels & sands) and fine grained (clays), c and ϕ are used to determine the soil strength. In case of predominantly fine grained soils, c and ϕ are determined by the Triaxial Compression test as per IS: 2720 pt XI. For predominantly coarse grained soils, c and ϕ are determined by Direct Shear test as per IS: 2720 pt XIII. These c and ϕ values were used for determining the SBC of soil as per shear failure criteria.

The ultimate net bearing capacity in case of general shear failure is given by following expression,

$$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$$

The ultimate net bearing capacity in case of local shear failure is given by following expression,

$$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$$

Where,

$$d_c = 1 + 0.2 (D_f/B) * \text{SQRT}(N_\phi)$$

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

$$d_q = d_\gamma = 1 + 0.1 (D_f/B) * \text{SQRT}(N_\phi) \text{ for } \phi > 10^\circ$$

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

$$\phi' \text{ for local shear failure} = \tan^{-1} (0.67 \tan \phi)$$

7.1.2 From Settlement Failure Criteria

Allowable Bearing Pressure from Settlement Failure consideration has been computed in accordance with IS: 8009 (Part-I). The magnitude of settlement, when foundation loads are applied, depends upon the compressibility of the underlying strata and rigidity of the substructure.

The total permissible settlement in cohesion-less soil is estimated using SPT value as per IS: 8009 (Part-I). While using this approach, the N value was corrected, wherever applicable, below the footing base to at least 1.5B below the base to account for the effects of energy ratio, adopted bearing pressure, dilation for submerged silty fine sands / fine sands as well as that due to the overburden pressure.

Further for settlement Calculation in cohesive soil the following equation has been used.

$$S_t = \Delta P M_v H$$

Where,

$$M_v = \text{Coefficient of volume compressibility, cm}^2/\text{kg}$$

$$\Delta P = \text{Pressure increment, kg/cm}^2$$

$$H = \text{Thickness of layers}$$

CHAPTER 4 FOUNDATION RECOMMENDATIONS

8.0 FOUNDATION RECOMMENDATIONS

- Based on the nature & strength characteristics of the substrata and requirement of the project, shallow foundation have been analyzed.
- The recommended net allowable bearing capacity values are given in Table 4.1 to 4.2.

Table 4.1: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
898.787	1046.562	BH-03	5.0 x 5.0	1.00	37.76	13.61	13.61
				1.50	38.69	14.11	14.11
				2.00	39.62	14.66	14.66
1153.187	1277.958	BH-04	2.0 x 2.0	1.00	10.90	23.86	10.90
				1.50	19.53	33.54	19.53
				2.00	20.57	35.43	20.57
1859.918	1986.847	BH-05	4.0 x 4.0	1.00	18.53	12.91	12.91
				1.50	21.11	13.47	13.47
				2.00	23.77	14.26	14.26
2391.105	2518.489	BH-06	5.0 x 5.0	1.00	25.76	16.85	16.85
				1.50	30.60	16.96	16.96
				2.00	35.59	17.07	17.07
2560.493	2687.006	BH-07	2.5 x 2.5	1.00	23.18	11.11	11.11
				1.50	27.81	13.40	13.40
				2.00	32.67	16.54	16.54

Table 4.2: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
898.787	1046.562	BH-03	5.0 x 5.0	1.00	37.76	27.22	27.22
				1.50	38.69	28.22	28.22
				2.00	39.62	29.31	29.31
1153.187	1277.958	BH-04	2.0 x 2.0	1.00	10.90	47.72	10.90
				1.50	19.53	67.08	19.53
				2.00	20.57	70.85	20.57

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
1859.918	1986.847	BH-05	4.0 x 4.0	1.00	18.53	25.83	18.53
				1.50	21.11	26.95	21.11
				2.00	23.77	28.52	23.77
2391.105	2518.489	BH-06	5.0 x 5.0	1.00	25.76	33.71	25.76
				1.50	30.60	33.91	30.60
				2.00	35.59	34.14	34.14
2560.493	2687.006	BH-07	2.5 x 2.5	1.00	23.18	22.22	22.22
				1.50	27.81	26.81	26.81
				2.00	32.67	33.07	32.67

Notes:-

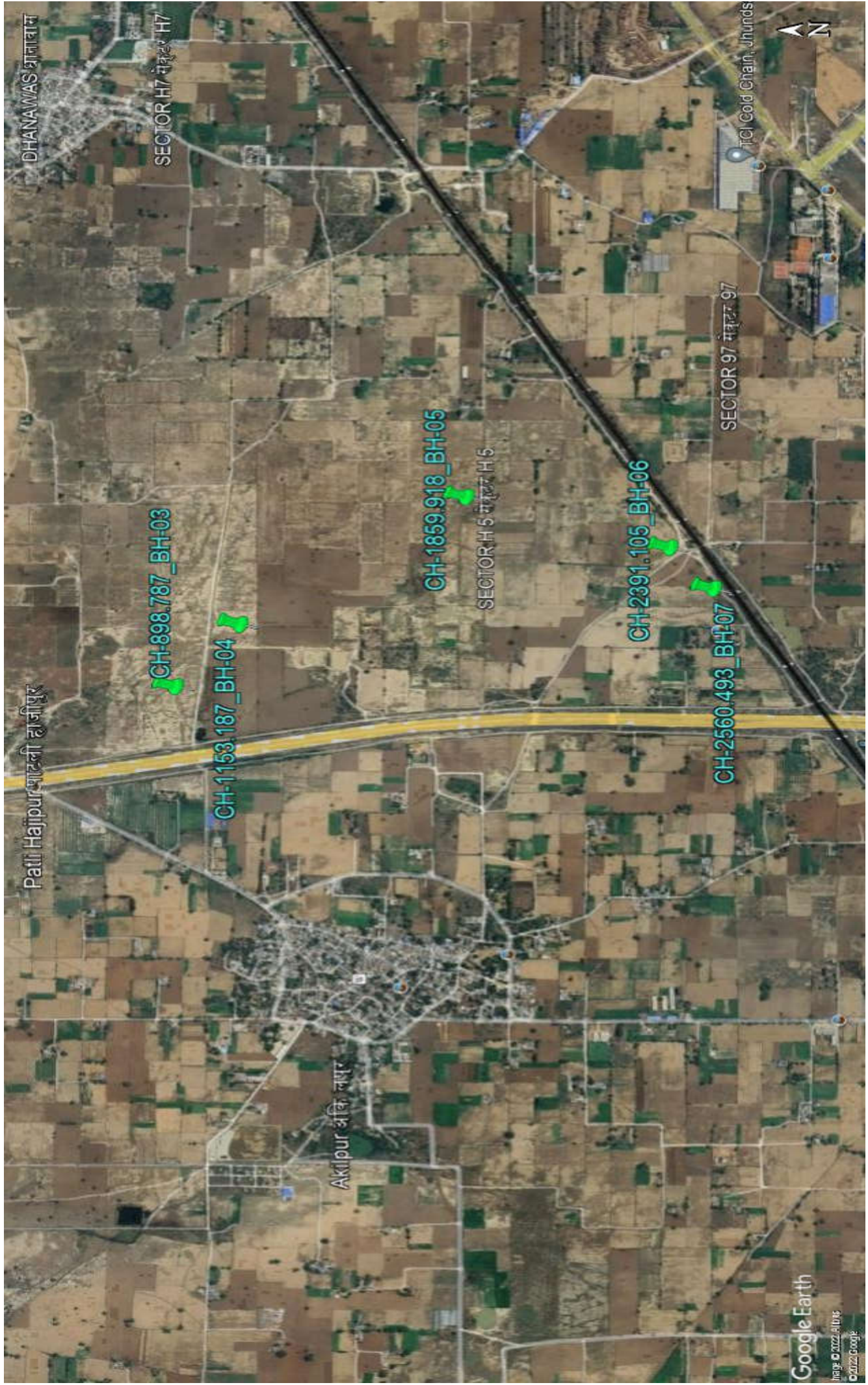
All The above recommendations are based on the field and laboratory tests conducted on selected soil/ rock core samples and our experience in this regard. If the actual substrata conditions during excavation for the foundation differ from the observations reported here, the design experts/consultants should be referred for suggestion, further investigations.

Abbreviations

BH	Borehole
ERT	Electrical Resistivity Test
EGL	Existing Ground Level
GWT	Ground Water Table
IS	Indian Standards
SPT	Standard Penetration Test
DS	Disturbed Soil
R.L.	Reduced Level
m	Metre
sp. gr.	Specific Gravity
%	Percentage
mg /l	Milligram per litre
mg /kg	Milligram per kilogram

APPENDIX – A (FIELD DATA RESULTS)

Appendix No.	ITEMS
A-1	LOCATION PLAN
A-2	FIELD BORE HOLE LOGS
A-3	SUB SOIL PROFILE DIAGRAM





FIELD BOREHOLE LOG

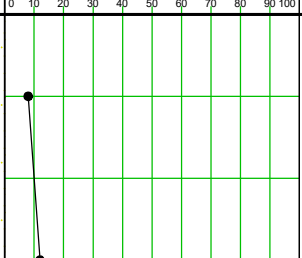
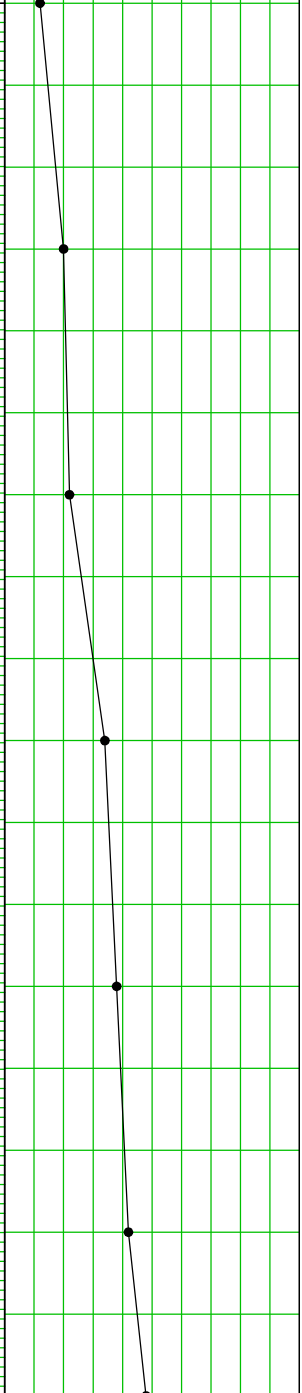
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :898.787m	Northing :3145159.097 m	Easting :682976.604 m
Reduced Level (m):(+)216.537	BH. No. :BH-03	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :08-06-2022		Date of Completion :08-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	5	6	11	Stiff to Hard, Brownish, Silty Clay of low Plasticity	CL			
1.5	1.5	SPT-2	4	7	8	15					
2.25	2.25	UDS-1									
3.0	3	SPT-3	15	19	22	41					
4.5	4.5	SPT-4	15	21	23	44					
5.25	5.25	UDS-2									
6.0	6	SPT-5	19	22	25	47					
7.5	7.5	SPT-6	17	21	24	45					
8.25	8.25	UDS-3									
9.0	9	SPT-7	21	28	38	66					
10.0	10	SPT-8	15	18	20	38					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

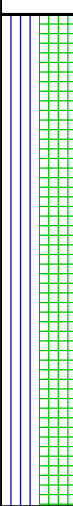


Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :1153.187m	Northing :3145010.076 m	Easting :683182.833 m
Reduced Level (m):(+)218.023	BH. No. :BH-04	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :09-06-2022		Date of Completion :09-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	5	8	Loose, Brownish, Silty Sand	SM			
1.0											
1.5	1.5	SPT-2	3	5	7	12	Stiff to Hard, Brownish, Silty Clay of Low Plasticity	CL			
2.0											
2.25	2.25	UDS-1									
2.5											
3.0	3	SPT-3	7	9	11	20					
3.5											
4.0											
4.5	4.5	SPT-4	8	10	12	22					
5.0											
5.25	5.25	UDS-2									
5.5											
6.0	6	SPT-5	11	16	18	34					
6.5											
7.0											
7.5	7.5	SPT-6	13	17	21	38					
8.0											
8.25	8.25	UDS-3									
8.5											
9.0	9	SPT-7	12	18	24	42					
9.5											
10.0	10	SPT-8	11	16	32	48					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

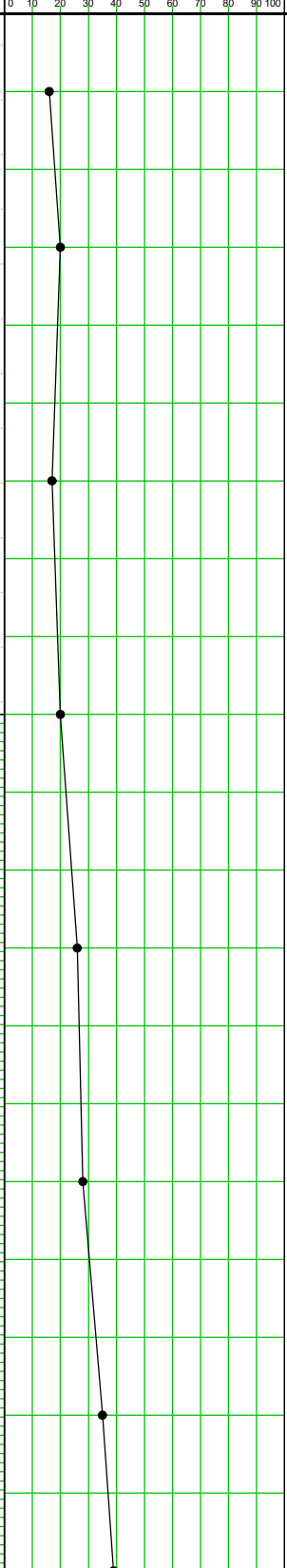
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :1859.918m	Northing :3144481.635 m	Easting :683610.917 m
Reduced Level (m):(+)218.551	BH. No. :BH-05	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :10-06-2022		Date of Completion :10-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	2	3	3	6	Medium dense, Brownish, Sandy Silt of low Plasticity	ML-CL			
1.5	1.5	SPT-2	5	6	6	12					
2.25	2.25	UDS-1									
3.0	3	SPT-3	4	6	7	13	Medium dense, Brownish, Silty Sand	SM			
4.5	4.5	SPT-4	6	8	9	17					
5.25	5.25	UDS-2									
6.0	6	SPT-5	9	13	14	27	Hard, Brownish, Silty Clay of low Plasticity	CL			
7.5	7.5	SPT-6	10	14	16	30					
8.25	8.25	UDS-3									
9.0	9	SPT-7	12	17	21	38					
9.5											
10.0	10	SPT-8	14	19	23	42					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

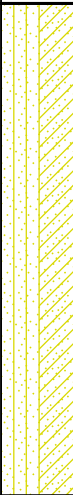
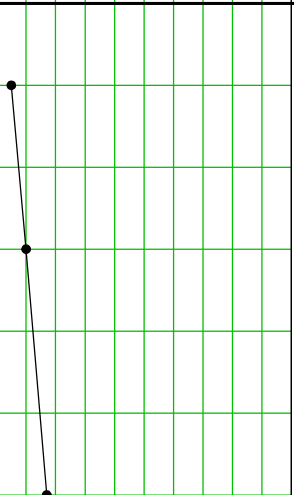
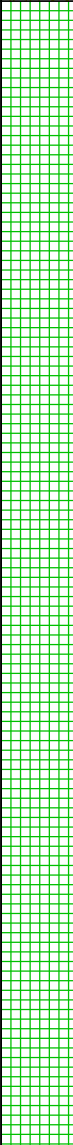
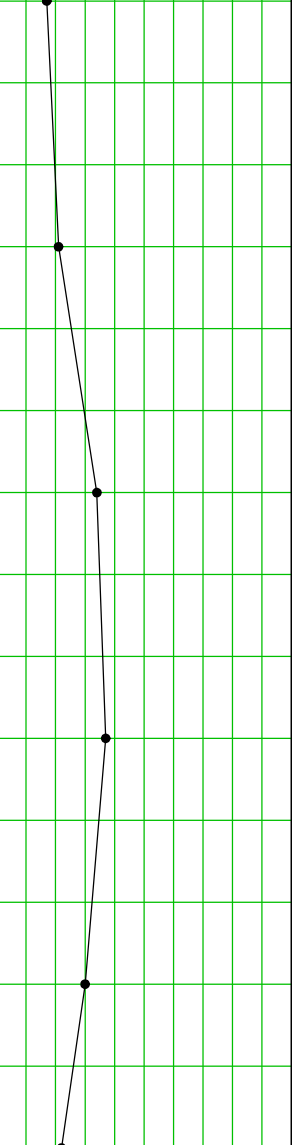
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :2391.105m	Northing :3143989.172 m	Easting :683460.538 m
Reduced Level (m):(+)220.462	BH. No. :BH-06	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :11-06-2022		Date of Completion :11-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	5	7	9	16	Medium dense, Brownish, Silty Sand	SM			
1.5	1.5	SPT-2	7	9	11	20					
2.25	2.25	UDS-1									
3.0	3	SPT-3	6	8	9	17					
4.5	4.5	SPT-4	5	9	11	20					
5.25	5.25	UDS-2									
6.0	6	SPT-5	9	12	14	26					
7.5	7.5	SPT-6	9	13	15	28					
8.25	8.25	UDS-3					Very Stiff to Hard, Brownish, Silty Clay of Low plasticity	CL			
9.0	9	SPT-7	10	15	20	35					
10.0	10	SPT-8	12	16	23	39					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :2560.493m	Northing :3143881.578 m	Easting :683330.41 m
Reduced Level (m):(+)221.172	BH. No. :BH-07	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :12-06-2022		Date of Completion :12-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	1	2	3	5	Loose, Brownish, Silty Sand with Clay	SM-SC			
1.5	1.5	SPT-2	3	4	6	10					
2.25	2.25	UDS-1									
3.0	3	SPT-3	4	8	9	17	Very Stiff to Hard, Brownish, Silty Clay of Low Plasticity	CL			
4.5	4.5	SPT-4	7	9	12	21					
5.25	5.25	UDS-2									
6.0	6	SPT-5	12	16	18	34					
7.5	7.5	SPT-6	13	17	20	37					
8.25	8.25	UDS-3									
9.0	9	SPT-7	12	14	16	30					
10.0	10	SPT-8	8	10	12	22					

UDS*-UDS not recovered

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

Pati To New Patli

R.L. (m)
225.00
224.00
223.00
222.00
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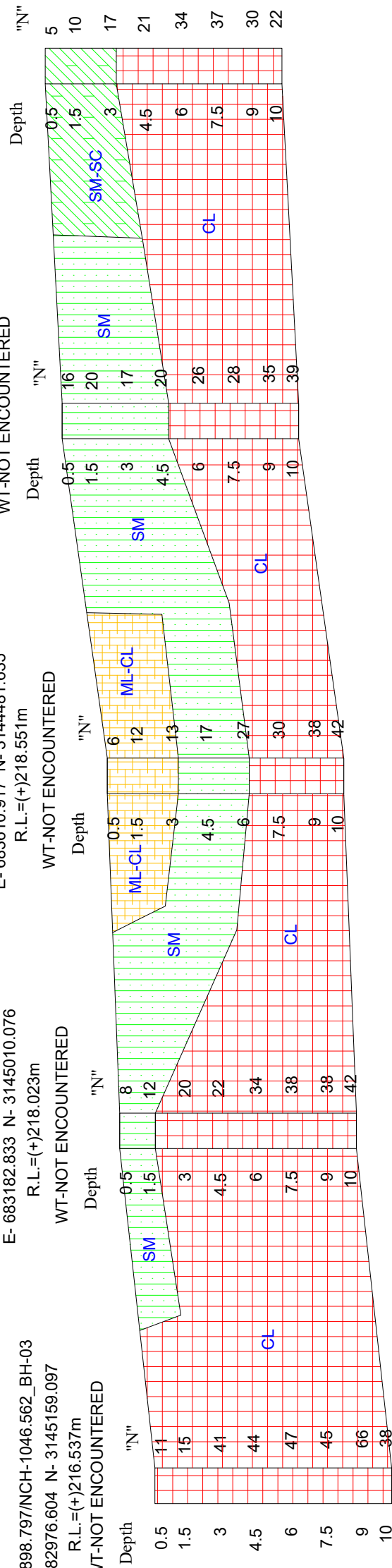
OCH-2560.493/NCH-2687.006_BH-07
E- 683330.410 N- 3143881.578
R.L.= (+)221.172m
WT-NOT ENCOUNTERED

OCH-2391.105/NCH-2518.489_BH-06
E- 683460.538 N- 3143989.172
R.L.= (+)220.462m
WT-NOT ENCOUNTERED

OCH-1859.910/NCH-1986.847_BH-05
E- 683610.917 N- 3144481.635
R.L.= (+)218.551m
WT-NOT ENCOUNTERED

OCH-1153.187/NCH-1277.958_BH-04
E- 683182.833 N- 3145010.076
R.L.= (+)218.023m
WT-NOT ENCOUNTERED

OCH-898.797/NCH-1046.562_BH-03
E- 682976.604 N- 3145159.097
R.L.= (+)216.537m
WT-NOT ENCOUNTERED



Chainage (Mtr.)	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	1.00	37.76	13.61	13.61	25
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	1.50	38.69	14.11	14.11	25
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	2.00	39.62	14.66	14.66	25
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	1.00	37.76	13.61	13.61	25
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	1.50	38.69	14.11	14.11	25
OCH-898.797/ NCH-1046.562	BH-03	5 X 5	2.00	39.62	14.66	14.66	25

Chainage (Mtr.)	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	1.00	18.53	12.91	12.91	25
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	1.50	21.11	13.47	13.47	25
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	2.00	23.77	14.26	14.26	25
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	1.00	18.53	12.91	12.91	25
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	1.50	21.11	13.47	13.47	25
OCH-1859.910/ NCH-1986.847	BH-05	4 X 4	2.00	23.77	14.26	14.26	25

Chainage (Mtr.)	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	1.00	23.18	11.11	11.11	25
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	1.50	27.81	13.40	13.40	25
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	2.00	32.67	16.54	16.54	25
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	1.00	23.18	11.11	11.11	25
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	1.50	27.81	13.40	13.40	25
OCH-2560.493/ NCH-2687.006	BH-07	2.5 X 2.5	2.00	32.67	16.54	16.54	25

Chainage (Mtr.)	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	1.00	10.90	23.86	10.90	25
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	1.50	19.53	33.94	19.53	25
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	2.00	20.57	35.43	20.57	25
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	1.00	10.90	23.86	10.90	25
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	1.50	19.53	33.94	19.53	25
OCH-1153.187/ NCH-1277.958	BH-04	2 X 2	2.00	20.57	35.43	20.57	25

Chainage (Mtr.)	BH No.	Size (mm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	1.00	25.76	16.86	16.86	25
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	1.50	30.69	19.07	19.07	25
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	2.00	35.59	21.70	21.70	25
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	1.00	25.76	16.86	16.86	25
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	1.50	30.69	19.07	19.07	25
OCH-2391.105/ NCH-2518.489	BH-06	5 X 5	2.00	35.59	21.70	21.70	25

SYMBOL	DESCRIPTION
XXXXXX	FILLED UP STRATA
[Pattern]	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
[Pattern]	SM-SC Clayey Sand (Having fines Less Than 50% and in the hatched zone (4-PC7))
[Pattern]	ML-CL - Silty with clay (Having fines greater than 50% and in the hatched zone (LL>35 & 4-PC7))
[Pattern]	CL- Silty Clay of low plasticity (Above A-line, LL>35)

Note:- Finer: Percentage of Silty + Clay A-line=73(4x20)

APPENDIX – B (LAB TEST RESULTS)

Appendix No.	ITEMS
B-1	SOIL CHARACTERISTICS SHEETS
B-2	RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES
B-3	GSD CURVES

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.				Date of Boring	Chainage (m)/Location	B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																						
	08-06-2022	to	08-06-2022	898.787				BH-03	Not Encountered		10.00 m	682976.604 m	3145159.097 m	(+2)16.537 m			SR-544_21-22																					
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained				Atterberg Limits %			Depth of Water Table			Termination Depth		Coordinates (E,N)				Consolidation Parameters															
							Clay	Silt	Fine	Medium	Coarse	Fine	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)						
DS	0.00	-	-	Stiff to Hard, Brownish, Silty Clay of low Plasticity	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SPT-1	0.50	11	11		CL			16	43	33	7	1	0	0	30	21	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-2	1.50	15	15		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-1	2.25	-	-		CL			15	46	28	9	1	0	0	33	22	11	-	1.91	17.40	1.63	2.67	UUT	1.32	4	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-3	3.00	41	41		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-4	4.50	44	44		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-2	5.25	-	-		CL			16	39	36	8	1	0	0	28	20	8	-	1.95	17.90	1.65	2.68	UUT	1.38	5	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-5	6.00	47	47		-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-6	7.50	45	45	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
UDS-3	8.25	-	-	CL			17	39	32	8	3	1	0	30	22	8	-	1.96	16.40	1.68	2.68	UUT	1.61	6	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-7	9.00	66	66	-			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SPT-8	10.00	38	38	CL			18	44	30	7	1	0	0	31	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring				Chainage (m)/Location		B.H. No.			Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.		Ref. Code																						
	09-06-2022		to 09-06-2022		1153.187		BH-04			Not Encountered		10.00 m		683182.833 m		3145010.076 m		(+2)18.023 m		SR-544_21-22																						
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)															
Clay								Silt	Fine	Medium	Coarse	Gravel	Fine	Coarse	Liquid Limit	Plastic Limit												Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity									
DS	0.00	-	-	Loose, Brownish, Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-1	0.50	8	15		SM																																					
SPT-2	1.50	12	18		-																																					
UDS-1	2.25	-	-		CL																																					
SPT-3	3.00	20	20		-																																					
SPT-4	4.50	22	22		-																																					
UDS-2	5.25	-	-	Stiff to Hard, Brownish, Silty Clay of Low Plasticity	CL																																					
SPT-5	6.00	34	34		-																																					
SPT-6	7.50	38	38		-																																					
UDS-3	8.25	-	-		CL																																					
SPT-7	9.00	42	42		-																																					
SPT-8	10.00	48	48		CI																																					

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Date of Boring		Chainage (m)/Location		B.H. No.	Depth of Water Table		Termination Depth	Coordinates (E,N)				R.L.	Ref. Code																											
	11-06-2022	to	11-06-2022	2391.105		Not Encountered			10.00 m	683460.538 m		3143989.172 m			(+220.462 m)	SR-544_21-22																									
Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained					Atterberg Limits %				Bulk Density (g/cm ³)			Natural Moisture Content (%)	Dry Density (g/cm ³)		Specific Gravity	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)								
							Clay	Silt	Fine	Medium	Coarse	Gravel		Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)		Bulk Density (g/cm ³)	Dry Density (g/cm ³)													Dry Density (g/cm ³)	Shrinkage Limit	Plastic Limit	Plasticity Index	Shrinkage Limit			
DS	0.00	-	-																																						
SPT-1	0.50	16	29																																						
SPT-2	1.50	20	29																																						
UDS-1	2.25	-	-	Medium dense, Brownish, Silty Sand	SM																																				
SPT-3	3.00	17	21																																						
SPT-4	4.50	20	22																																						
UDS-2	5.25	-	-																																						
SPT-5	6.00	26	26																																						
SPT-6	7.50	28	28	Very Stiff to Hard, Brownish, Silty Clay of Low plasticity																																					
UDS-3	8.25	-	-																																						
SPT-7	9.00	35	35																																						
SPT-8	10.00	39	39																																						

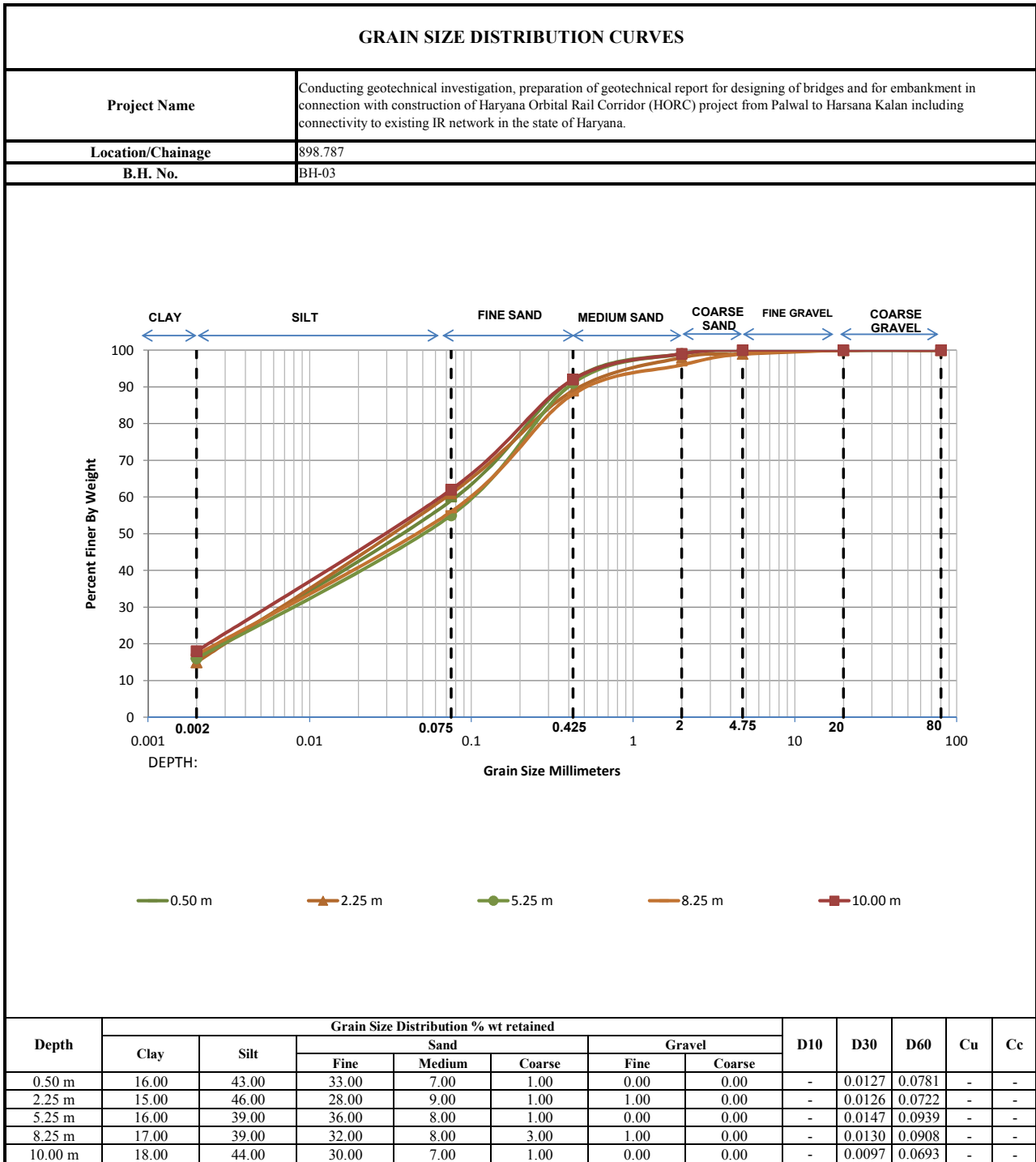
Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

SOIL CHARACTERISTICS

Project	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Date of Boring					Chainage (m)/Location			B.H. No.			Depth of Water Table				Termination Depth		Coordinates (E,N)					R.L.		Ref. Code																												
								12-06-2022	to	12-06-2022	2560.493	BH-07	Not Encountered	10.00 m	683330.410 m	3143881.578 m	3143881.578 m	(+221.172 m)	SR-544_21-22	Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)																														
																															Clay	Silt	Fine	Medium	Coarse	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity																	
								Grain Size Distribution % wt retained				Atterberg Limits %																																																

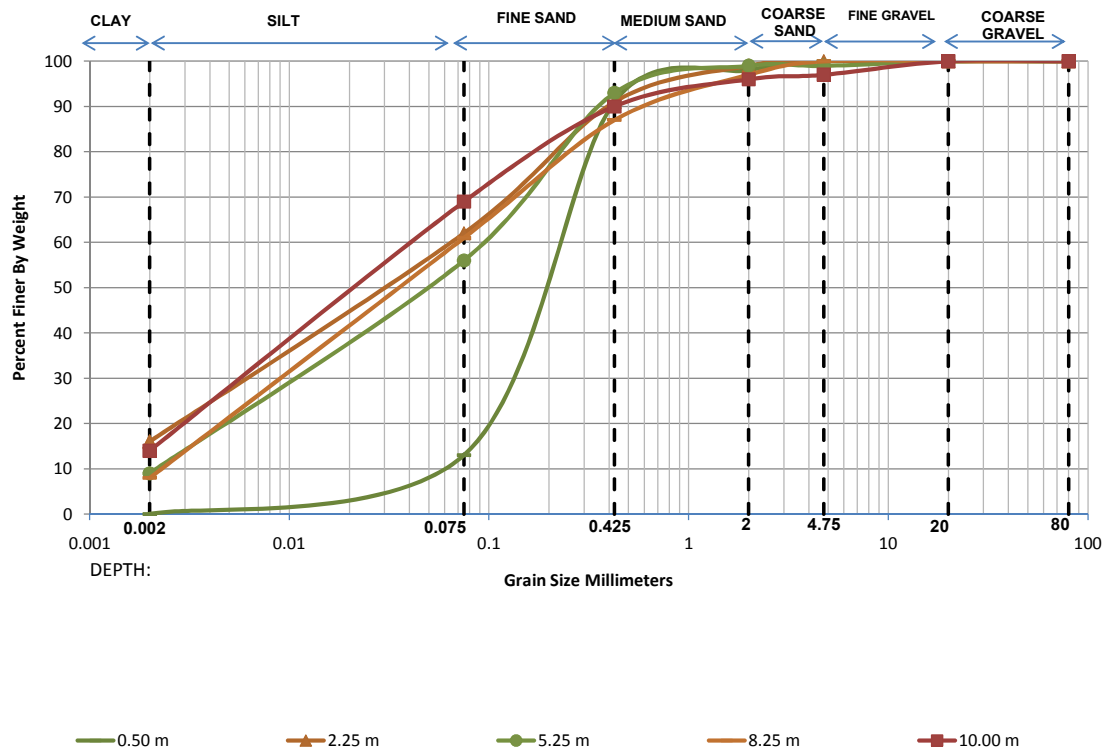
RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES

Sr. No	Chainage/ Structure (m)	BH No.	Depth (m)	pH	Chlorides (Cl ⁻)		Sulphate (SO ₃ ²⁻)	
					(mg/kg)	(%)	(mg/kg)	(%)
1.	898.787 (Minor Bridge)	BH-03	2.25	7.55	65.50	0.0065	25.32	0.0025
2.	2391.105 (Minor Bridge)	BH-06	2.25	7.80	55.55	0.0055	21.23	0.0021



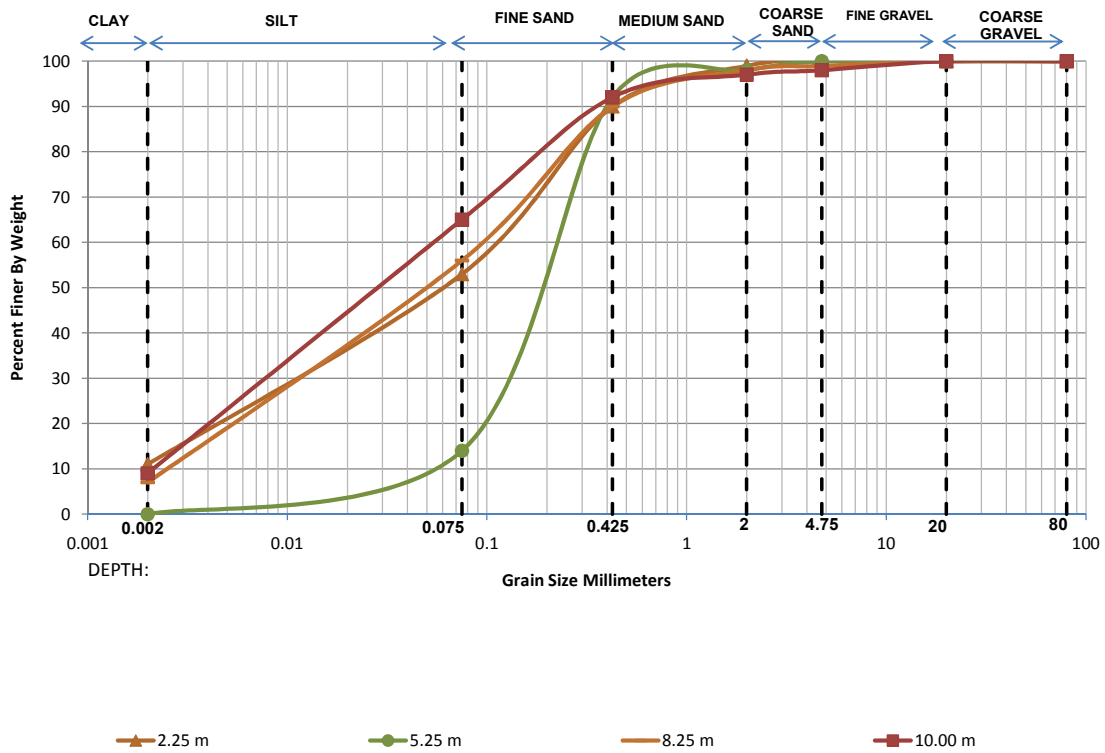
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	1153.187
B.H. No.	BH-04



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
0.50 m	0.00	13.00	78.00	7.00	2.00	0.00	0.00	0.0563	0.1440	0.2411	4.28	1.53
2.25 m	16.00	46.00	29.00	8.00	1.00	0.00	0.00	-	0.0114	0.0695	-	-
5.25 m	9.00	47.00	37.00	6.00	0.00	1.00	0.00	0.0024	0.0213	0.0878	36.38	2.15
8.25 m	8.00	53.00	26.00	10.00	3.00	0.00	0.00	0.0029	0.0191	0.0725	24.96	1.74
10.00 m	14.00	55.00	21.00	6.00	1.00	3.00	0.00	-	0.0109	0.0546	-	-

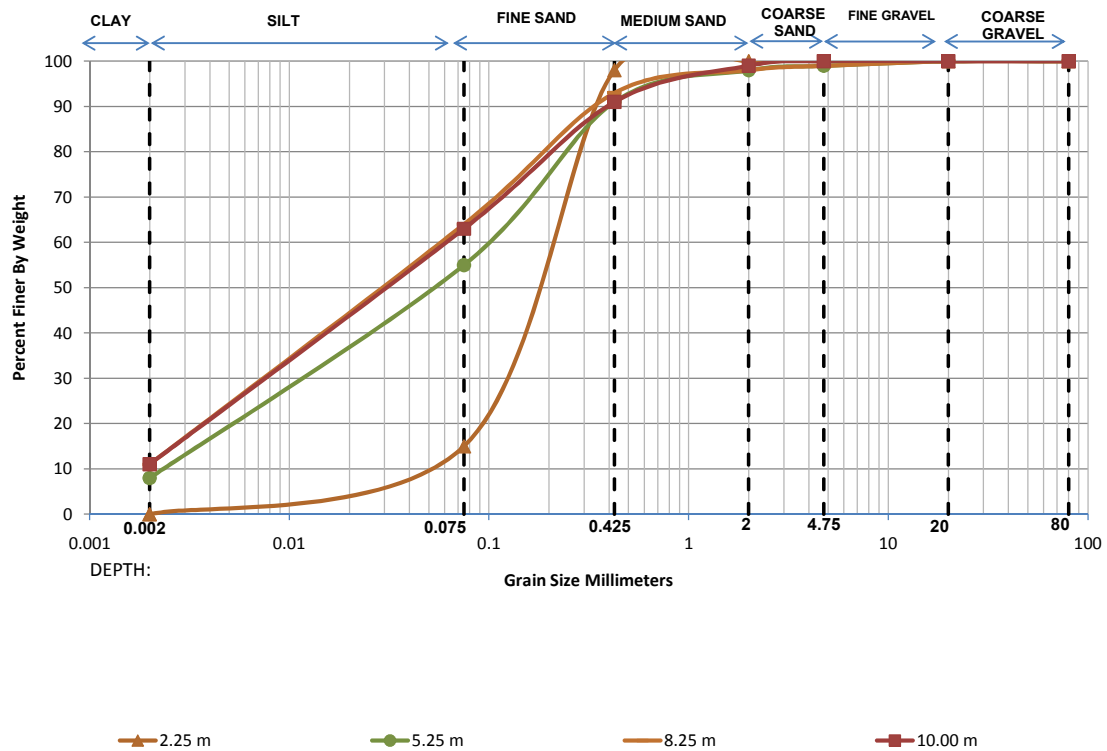
GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	1859.918
B.H. No.	BH-05



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	11.00	42.00	37.00	9.00	1.00	0.00	0.00	-	0.0214	0.1021	-	-
5.25 m	0.00	14.00	78.00	6.00	2.00	0.00	0.00	0.0507	0.1389	0.2358	4.65	1.61
8.25 m	7.00	49.00	34.00	8.00	1.00	1.00	0.00	0.0036	0.0233	0.0884	24.51	1.71
10.00 m	9.00	56.00	27.00	5.00	1.00	2.00	0.00	0.0024	0.0166	0.0637	26.61	1.80

GRAIN SIZE DISTRIBUTION CURVES

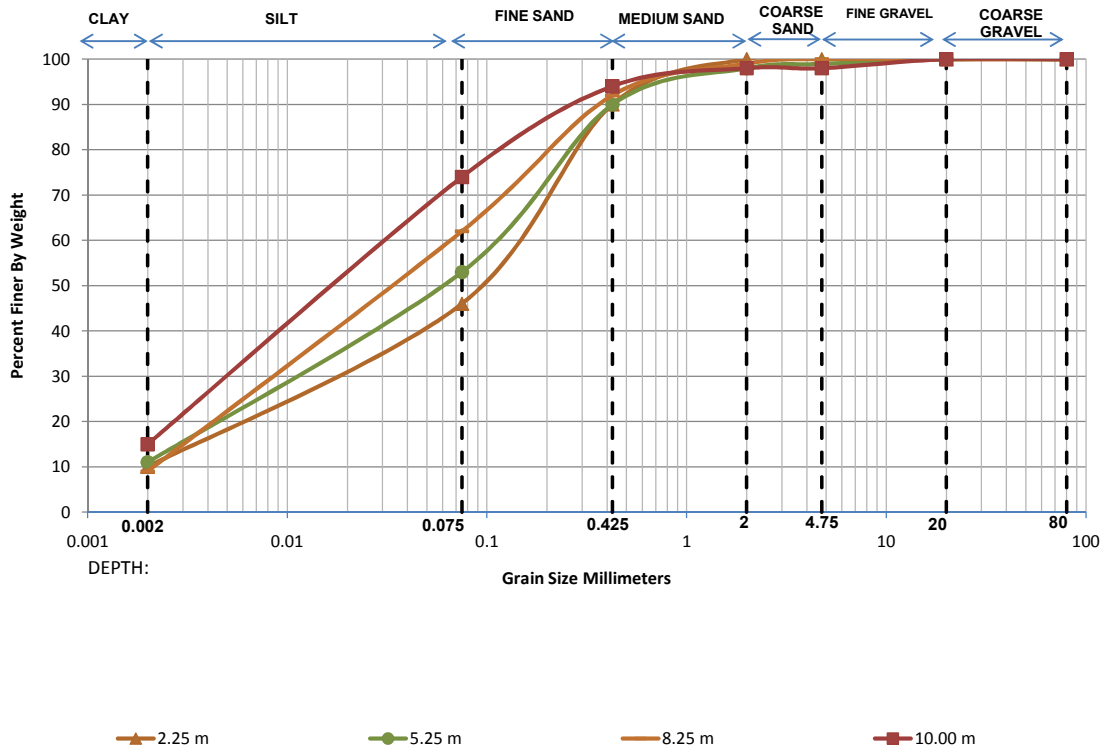
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	2391.105
B.H. No.	BH-06



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	0.00	15.00	83.00	2.00	0.00	0.00	0.00	0.0460	0.1320	0.2210	4.80	1.71
5.25 m	8.00	47.00	36.00	7.00	1.00	1.00	0.00	0.0030	0.0230	0.0922	31.17	1.94
8.25 m	11.00	53.00	29.00	5.00	1.00	1.00	0.00	-	0.0151	0.0655	-	-
10.00 m	11.00	52.00	28.00	8.00	1.00	0.00	0.00	-	0.0155	0.0676	-	-

GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	2560.493
B.H. No.	BH-07



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	10.00	36.00	44.00	10.00	0.00	0.00	0.00	0.0300	0.1338	66.89	3.37	
5.25 m	11.00	42.00	37.00	8.00	1.00	1.00	0.00	-	0.0214	0.1020	-	-
8.25 m	9.00	53.00	30.00	7.00	1.00	0.00	0.00	0.0024	0.0179	0.0702	29.24	1.89
10.00 m	15.00	59.00	20.00	4.00	0.00	2.00	0.00	-	0.0092	0.0464	-	-

APPENDIX – C **(ANALYSIS & RECOMENDATION)**

Appendix No.	ITEMS
C-1	SAMPLE CALCULATIONS FOR COMPUTATION OF ALLOWABLE BEARING CAPACITY OF SUB-STRATA FOR SHALLOW FOUNDATION

Calculation of SBC for shallow foundations as per IS : 6403 - 1981			
INPUT DATA		CH. (m) :-	898.787
		BH NO. :-	BH-03
<i>Type of footing</i>		Square	3
1	Continuous Strip		
2	Rectangular		
3	Square		
4	Circular		
Angle of internal friction (ϕ°)			4.00
Cohesion (c in t/m^2)			13.20
Void ratio (e), $e = (G \cdot \gamma_w / \gamma_d) - 1$			0.64
Direction of load with vertical ($^\circ$)			0.00
Density of foundation soil (t/m^3) γ_{bulk}			1.91
Depth of water table(m)			NE
Factor of safety			2.50
S.no.	Depth (m) of footing (D_f) below EGL	Width (m)	
1	1.00	5.00	
2	1.50	5.00	
3	2.00	5.00	
<u>SHEAR FAILURE CRITERIA</u>			
Assumptions and formula used in calculation as per IS:6403-1981 are given below -			
NOTE: The type of failure used for bearing capacity analysis depends upon the value of void ratio (see IS 6403 : 1981, Page No. 9, Table No. 3).			
The ultimate net bearing capacity in case of general shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$			
The ultimate net bearing capacity in case of local shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$			
Where,			
$d_c = 1 + 0.2 (D_f/B) \cdot \text{SQRT}(N_\phi)$		(from IS 6403 : 1981, page No. 9)	
$d_q = d_\gamma = 1$ for $\phi < 10^\circ$			
$d_q = d_\gamma = 1 + 0.1 (D_f/B) \cdot \text{SQRT}(N_\phi)$ for $\phi > 10^\circ$			
$N_\phi = \tan^2(\pi/4 + \phi/2)$			
ϕ' is friction angle for local shear failure = $\tan^{-1} (0.67 \tan \phi)$			
<u>OUTPUT</u>			
The computer aided results for shear failure criteria are tabulated below. The results are interpolated values of bearing capacity obtained from general and local shear failure criteria.			

Bearing capacity factors : (from IS 6403 : 1981, page No. 8, Table No. 1)					
ϕ	4.00		ϕ'	2.68	
N_c	6.19		N'_c	5.81	
N_q	1.43		N'_q	1.27	
N_γ	0.34		N'_γ	0.21	
Shape factors : (from IS 6403 : 1981, page No. 8, Table No. 2)					
S.no.	Width(m)		S_c	S_q	S_γ
1	5.00		1.30	1.20	0.80
2	5.00		1.30	1.20	0.80
3	5.00		1.30	1.20	0.80
Depth factors : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	d_c	d_q	d_γ
1	1.00	5.00	1.04	1.00	1.00
2	1.50	5.00	1.06	1.00	1.00
3	2.00	5.00	1.09	1.00	1.00
Inclination factors : (from IS 6403 : 1981, page No. 9)					
	$i_c = (1 - \alpha / 90)^2$		$i_q = (1 - \alpha / 90)^2$		$i_\gamma = (1 - \alpha / \phi)^2$
	1.00		1.00		1.00
Water table factor : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	Z_w/B		W'
1	1.00	5.00	5.80		1.00
2	1.50	5.00	5.70		1.00
3	2.00	5.00	5.60		1.00
Safe Bearing Capacity					
S.no.	Depth(m)	Width(m)	SBC in (t/m^2)		
			General shear	Local shear	Recommended
1	1.00	5.00	45.19	28.32	37.76
2	1.50	5.00	46.30	29.01	38.69
3	2.00	5.00	47.41	29.71	39.62

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976													CH. (m): 898.787							BH NO. :- BH-03					
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress Increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 $\gamma/2$ (from IS:8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)	
Layer 1	1.00	8.50	7.50	7.50	1.36	5.00	5.00	7.50	8.75	8.750	0.444	38	0.0035	11.69	132	0.6171	0.45				14.50	26.19	0.95	1.00	25.00
Layer 1	1.50	9.00	7.50	7.50	1.41	5.00	5.00	7.50	8.75	8.750	0.461	38	0.0035	12.13	132	0.6171	0.45				15.03	27.16	0.92	1.00	25.00
Layer 1	2.00	9.50	7.50	7.50	1.47	5.00	5.00	7.50	8.75	8.750	0.479	38	0.0035	12.59	132	0.6171	0.45				15.61	28.21	0.89	1.00	25.00

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976															CH. (m): 898.787							BH NO. :- BH-03				
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm ²)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 t/m ² (from IS:8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-cohesive Soil (mm)	Elastic Settlement (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	8.50	7.50	7.50	2.72	5.00	5.00	7.50	8.75	8.750	0.889	38	0.0035	23.39	132	0.6171	0.45			28.99	52.38					
	1.00																						0.95	1.00	50.00	
Layer 1	1.50	9.00	7.50	7.50	2.82	5.00	5.00	7.50	8.75	8.750	0.922	38	0.0035	24.25	132	0.6171	0.45			30.07	54.32					
	1.50																						0.92	1.00	50.00	
Layer 1	2.00	9.50	7.50	7.50	2.93	5.00	5.00	7.50	8.75	8.750	0.957	38	0.0035	25.19	132	0.6171	0.45			31.22	56.41					
	2.00																						0.89	1.00	50.00	



Geotechnical Investigation Report

Old Ch. 1698.053 New Ch. 1548.996 (Minor Bridge), Old Ch. 1912.700 New Ch. 1767.989 (Minor Bridge), Old Ch. 2807.817 New Ch. 2189.831 (Minor Bridge) & Old Ch. 2972.708 New Ch. 2823.679 (Minor Bridge) m

NEW PATLI TO SULTANPUR

SR NO. : 544_21-22

**CONDUCTING GEOTECHNICAL INVESTIGATION,
PREPARATION OF GEOTECHNICAL REPORT FOR
DESIGNING OF BRIDGES AND FOR EMBANKMENT
IN CONNECTION WITH CONSTRUCTION OF
HARYANA ORBITAL RAIL CORRIDOR (HORC)
PROJECT FROM PALWAL TO HARSANA KALAN
INCLUDING CONNECTIVITY TO EXISTING
IR NETWORK IN THE STATE OF HARYANA**

CLIENT

**M/S. HARYANA RAIL INFRASTRUCTURE
DEVELOPMENT CORPORATION LTD. (HRIDCL)**

PROGRAMME

JULY - 2022

SR. No.	Report No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/863_(04 BHs)	01	22.09.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/665_(04 BHs)	00	29.07.2022



CEG TEST HOUSE
AND RESEARCH CENTRE PVT LTD

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E-mail : info@cegtesthouse.com., www.cegtesthouse.com

CEGTH/HRIDCL/SR-544/2022-23/863

Date:- 22.09.2022

To,

Haryana Rail Infrastructure Development

Corporation Ltd. (HRIDCL)

SCO No.-17-19, 3rd & 4th Floor,

Sector - 17-A,

Chandigarh - 160017

Tele:- 0172-2715644

Email: hride2017@gmail.com

Subject :- Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.

Dear Sir,

We are pleased to submit this report of the subject work based on 04 boreholes carried out at Ch. 1698.053m to Ch. 2972.708m (OLD) - Ch. 1548.996m to Ch. 2823.679m (NEW) for Minor Bridge for the proposed project site.

The accompanying report presents results of various field tests and laboratory tests conducted on selected soil samples and their interpretation.

Should there be any clarifications regarding the contents please contact us at your most convenient time.

We value the opportunity to participate in this project and look forward a pleasant association on future projects.

Very truly yours,
CEG Test House & Research Centre Pvt. Ltd.

Prepared By:-



Nehal Jain
General Manager - Geotechnical
Authorized Signatory



Dr. Ankur Mudgal
Senior Manager

SR. No.	Report Ref. No.	Revision No.	Date
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/863_(04 BHs)	01	22.09.2022
544_21-22	CEGTH/HRIDCL/SR-544/2022-23/665_(04 BHs)	00	29.07.2022

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CHAPTER 1 GENERAL

1.0 INTRODUCTION:

The work of conducting “**Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana**” was awarded to “**CEG Test House & Research Centre Pvt. Ltd., Jaipur**” by M/S. “**Haryana Rail Infrastructure Development Corporation Ltd. (HRIDCL)**” as per work order no. HRIDC/ HORC/ GT/ CEG/ 237/ 2021/ 577-M dated 29th July 2021.

Field work including drilling of boreholes, conducting field tests such as Electrical Resistivity Test, & Plate Load Test and sample collection was carried out in the presence of representative of Client. Laboratory tests were conducted on selected soil samples to determine the design parameters, confirming to relevant IS specifications and the guidelines received from time to time from representative of Client.

This report includes the details of Methodology of Investigation, collection of samples (soil/ rock), field test results, laboratory test results, analysis of results and recommendations for results for proposed structures based on soil sample collected from the locations of boreholes.

2.0 SITE LOCATION & GENERAL GEOLOGICAL HISTORY:

The details of the site & test locations for the proposed project are shown in location plan attached vide **Appendix A-1**. The site of proposed project is located from Palwal to Harsana Kalan (Sonipat) in the State of Haryana falls in seismic zone – IV (Zone factor=0.24) of India.

Soil of the Haryana Sub-Region have been classified and described under the following major soil types as shown below:-

- Typic Ustochrepts : Soil of old alluvial plains
- Typic Ustipsamments : Soil of Aravali plains
- Typic Ustifluvents : Soil of recent alluvial plains and flood plains
- Typic Torripsamments : Soil of Aeofluvial plains
- Rocky Outcrops : Aravali rocky hills

The district wise details of soil characteristics are described below:-

Panipat: The soils are well drained, Sandy loam to clay loam/silty clay loam in plains and loam to clay loam/ silty/ loose clay loam in relic channels/depressions/basins.

Sonipat: The district comprises of recent flood plains, young meander plains, old meander plains and old alluvial plains. Recent flood plains occur along the Yamuna River and clearly show fluvial features. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface.

Rohtak: The district mainly comprises of old alluvial plains. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface. Old meander plains are almost flat with loamy sand to silty clay loam soils. Oldest among all the land forms are old alluvial plains, which cover major areas in the district. These soils are sand to loamy sand/sandy loam (surface) to silt loam/silty clay loam (sub-surface).

Jhajjar: The district mainly comprises of old alluvial plains and some parts of the district also have soil belonging to Aravali plains.

Rewari: The soils of the district fall under Entisols and Inceptisols orders. The surface soil texture varies from sand to fine loamy sand.

Gurgaon: The district comprises of sand dunes, sandy plains, alluvial plains, salt affected areas, low lands, lakes, hills and pediments. The soil varies from sand to loamy sand in sand dunes and sandy plain areas, sandy loam to clay loam / silty clay loam in alluvial plains, calcareous, loamy sand to loam in salt affected plains, silty loam to loam in low lands and calcareous, loamy sand to loam in hills.

Mewat: The soils of the area are generally sandy loam to loam. In parts of the low-lying areas, they are clayey and saline. The upper hills are mostly barren.

Faridabad and Palwal: The district comprises of recent Yamuna flood plains, low lying plains, depressions, sand dunes and hills. The texture of the soil is sand to loamy sand in recent Yamuna flood plains, sandy loam in plains, sandy loam to clay loam in alluvial plains, sandy loam to loam (surface), clay loam/silty clay (sub-surface) in low lying plains and depressions.

3.0 SCOPE OF WORK:

The stipulated scope of work involved carrying out the following operations:-

- a) Mobilisation of necessary plant equipment, men and materials for the complete Geotechnical investigation work as per specifications, drawings and instructions of the Engineer and to complete the same within the stipulated time schedule and demobilisation after completion of field work.
- b) Shifting of Equipments from one structure location to another including Erection, installation of rigs at site and dismantling of the same after completion of field work. Shifting of setup for each borehole location and associated preparation for borehole under water
- c) Making 150 mm nominal diameter boreholes at various locations in all types of soils except hard rock and large boulders using suitable approved method of boring including chiselling, cleaning, providing casing pipe as required; performing Standard Penetration Test at every 3.0m interval and at change of strata; collection of water samples and disturbed soil samples, observation such as ground water, etc., collection of undisturbed soil samples at every 3.0 m interval and at change of strata; transportation of all the collected samples to the laboratory and back filling of boreholes on completion of the same, complete as per specification and instructions of the Engineer, for depths below natural ground level.
- d) Conducting Electrical resistivity tests at various locations all complete as per specification and directions of the Engineer.
- e) Conducting plate load test at various locations, all complete as per specification and directions of the Engineer.
- f) Drilling of Nx size boreholes (75mm dia.) in all types of hard rock, collection of core samples, maintaining continuous record of core recovery/ RQD, keeping the cores in wooden core boxes, transporting to laboratory, backfilling on completion of the same, all complete as per specification and instructions of the EIC.
- g) Conducting various laboratory tests on soil samples at an approved laboratory including preparation of soil samples to determine the following properties of soil, all complete as per specification.

On soil Samples

- Dry density test
- Bulk Density and Moisture Content.
- Sieve Analysis
- Hydrometer Analysis
- Liquid Limit and Plastic Limit
- Specific gravity
- Shrinkage Limit

- Free Swell Index
 - Direct Shear Test
 - Triaxial Shear Test
 - One Dimensional consolidation test
 - Chemical Analysis of soil samples (pH, chloride, Sulphate)
- h) Conducting laboratory tests on rock samples including preparation of the samples to determine the following properties, all complete as per specification

On Rock Samples

- Moisture content, porosity & Density
 - Specific gravity
 - Hardness
 - Unconfined compression test
 - Point load strength index
 - Modulus of Elasticity and Poission's Ratio
 - Abrasion Test
- i) Conducting chemical tests on water samples to determine the Sulphate, chloride and pH value all complete as per specification.
- j) Submitting draft report in soft copy including all field records and laboratory test results, graphs, etc., all complete as per specifications.
- k) Submitting final report in three hard copies in after the approval of the draft report including all field records and laboratory test results, graphs, etc., all complete as per specifications.

4.0 FIELD INVESTIGATION IN SOIL STRATA:

The investigation was planned to obtain the subsurface stratification in the proposed project site and collect soil / rock core samples for laboratory testing to determine the engineering properties such as shear strength, along with basic engineering classification of the subsurface stratum.

For geotechnical investigation work, required equipments along with rotary drilling rigs and manpower were mobilized at site to carry out various field activities as per the scope of work. These were shifted from one test location to another location during execution of field work and were demobilized on satisfactory completion of field work.

For conducting the field investigations the following practices were followed at site:

- The locations of 04 boreholes were marked at site at specified locations. These locations are shown in **Appendix A-1** attached subsequently.

The details of various boreholes along with their coordinates are provided herein below:

Table 1.1: Details of Borehole Locations

S. No.	Old Chainage/ Structure (m)	New Chainage/ Structure (m)	BH. No.	Depth of Water Table below EGL (m)	Depth of Borehole below EGL (m)	Co-ordinates (m)		(+) R.L (m)
						E	N	
1.	1698.053	1548.996	BH-01	Not Encountered	10.00	682480.212	3147693.121	213.913
2.	1912.700	1767.989	BH-02		10.00	682529.013	3147832.270	214.395
3.	2807.817	2189.831	BH-03		10.00	682734.079	3148703.655	212.675
4.	2972.708	2823.679	BH-04		10.00	682770.474	3148864.480	213.976

- In soil, boreholes of 150mm dia. were drilled as per the standard procedure laid in IS: 1892.
- Borehole was properly cleaned before taking any sample in soil.
- Casing was used as per the prevailing soil conditions, to stabilize the borehole.
- Standard Penetration Tests were conducted in bore holes at regular intervals or at every change of strata as per Technical specification.
- Undisturbed were collected wherever feasible as per the requirements and at specified depths. The same has been discussed in detail in soil characteristics sheets attached with the report.
- Water table was not encountered in the boreholes.
- The detailed procedure adopted for conducting various field tests is given here in below:

(i) Standard Penetration Test:

The Standard Penetration Test was conducted in boreholes as per IS 2131. The test was carried out using the standard split spoon sampler to measure the number of blows ‘N’.

Standard split spoon sampler was attached to an ‘A’ rod. It was driven from borehole bottom to a distance of 45 cm using a standard hammer of 63.5 kg falling freely from a height of 75 cm to the required depth. While driving, the number of blows required to penetrate every 15 cm are recorded. The total number of blows required for the last 30 cm is taken as ‘N’ value at that particular depth of the borehole. Wherever the total penetration was less than 45cm, the no. of blows & the depth penetrated is recorded in the respective borelog.

SPT ‘N’ values were correlated with relative density of non-cohesive stratum and with consistency of cohesive stratum as given below:-

Table 1.2: Soil compactness as per SPT N values (cl. 9.7, table 9.3 & 9.4, page 330_text book of V.N.S. Murthy)

Correlation for Clay / Plastic silt		Correlation for Sand / Non-Plastic silt	
Consistency	SPT "N" Value	Compactness	SPT "N" Value
Very Soft	0 - 2	Very Loose	0 - 4
Soft	2 - 4	Loose	4 - 10
Medium	4 - 8	Medium	10 - 30
Stiff	8 - 15	Dense	30 - 50
Very Stiff	15 - 30	Very Dense	> 50
Hard	> 30		

The field SPT N values obtained were further corrected as per the guidelines given in IS: 2131 as follows:

(a) For overburden: - The N value for cohesionless soil is corrected with the help of fig. 1 given in IS-2131.

(b) Due to dilatancy :- Wherever N values observed below water table in fine sand, silty sand or silt was greater than 15, then corrected N values were corrected as under:

$$N' = 15 + \frac{1}{2} (N-15)$$

(ii) Undisturbed Sampling (Soil) in boreholes:

Undisturbed samples were collected using MS tubes of suitable diameter and length with Area ratio as per clause 4.1.1 (c) of IS: 1892 (latest) fitted to an adopter with ball and socket arrangement. Before taking any sample, sampling tube was properly greased. Immediately after taking on undisturbed sample in a tube, the adopter head was removed along with the disturbed material. The visible ends of the sample were trimmed off any wet disturbed soil. The ends were coated alternately with four layers of just molten wax. More molten wax was added to give a total thickness of min. 25 mm. The samples were carefully labeled and transported to the laboratory for testing. Undisturbed samples wherever slipped during lifting were duly marked in the field logs as well as in the soil profile.

(iii) Collection of Ground Water Samples from bore holes:

Water table was not encountered in the boreholes during the site investigation.

5.0 LABORATORY TESTS ON SOIL SAMPLES:

The following laboratory tests were conducted on selected soil samples:

Table 1.3: Description of Tests

Description of Test	Reference	Undisturbed (UDS) Soil Samples	Disturbed (DS/SPT) Soil Samples
Grain Size Analysis / Hydrometer	IS: 2720 (Part - 4)	√	-
Natural Moisture Content / Bulk / Dry density	IS : 2720 (Part – 2)	√	-
Atterberg Limits <ul style="list-style-type: none"> • Liquid Limit • Plastic Limit 	IS: 2720 (Part - 5) IS: 2720 (Part - 5)	√ √	-
Specific Gravity	IS : 2720 (Part – 3)	√	-
Direct Shear Test	IS : 2720 (Part – 13)	√	-
Triaxial compressive shear test	IS : 2720 (Part – 11 & 12)	√	-
Chemical Analysis of Soil Samples	IS : 2720 (Part – 26, 27)	√	-

Note:- The detailed procedure adopted for conducting various laboratory tests is described in the following paragraphs:

5.1.1 Dry density and Bulk density

For determination of bulk density and dry density, a sample of known volume ‘V’ was extracted from the undisturbed sampling tube and its bulk weight ‘W’ was noted down. Moisture content ‘Wn’ was determined by oven drying method.

The bulk density and dry density were determined by following equation-

$$\text{Bulk density } (\gamma_b) = W/V$$

$$\text{Dry density } (\gamma_d) = \gamma_b / (1+Wn)$$

5.1.2 Natural water content

For this test, the soil sample of known quantity (Wm) was taken in a container. The container with soil sample was placed into an oven for drying at 105-110°C temperature for 16-24 hours. After drying, the dry sample was again weighted to determine the dry weight of sample (Wd).

The natural water content was computed by the following equation-

$$Wn = (Wm - Wd) * 100 / Wd$$

5.1.3 Grain Size Analysis (IS: 2720- Part-4)

Wet sieve analysis:

For determination of particle sizes finer than 75 micron, wet sieve analysis test was conducted. For this test, oven dried sample of known quantity was taken in a container and soaked with dispersing agent. The soaked soil sample was washed thoroughly over 75 micron IS sieve until the water passing sieve was substantially clean.

Fraction retained on 75 micron IS sieve was carefully collected in a container without any loss in material and placed into oven for drying.

Dry sieve analysis:

For this test, the oven dried soil sample after wet sieving was sieved through the set of IS sieves 20 mm, 10 mm, 4.75 mm, 2.0 mm, 1.0 mm, 425 micron, 300 micron, 150 micron and 75 micron. The amounts of soil retained on each sieve were noted down. The % retained, cumulative % retained and % passing were computed accordingly. Wherever the soil sample % passing 75 micron sieve was significant, Hydrometer method was used to find the percentage of silt and clay fraction.

Grain size analysis for the fraction passing 75 micron IS Sieve (Hydrometer method)

Calibration of Hydrometer

Hydrometer was calibrated to determine a relationship (an equation) between the effective depth H_R and corresponding hydrometer reading R_h (obtained during test).

50 to 100 gm of soil sample passing through 75 micron IS Sieve was taken. It was mixed with 100 ml of sodium hexametaphosphate solution and the mixture was warmed for about 10 minutes. It was then transferred to the cup of the mechanical mixer and the soil suspension was stirred for 15 minutes. The soil suspension was transferred into 1000 ml measuring cylinder and distilled water was added to make 1000ml solution. This solution was mixed vigorously. The measuring cylinder was then allowed to stand and the stopwatch was started. Hydrometer was immersed in the solution and reading were taken after half, one, two and four minutes. The hydrometer was then removed slowly and kept in distilled water at the same temperature as the soil suspension. Readings were taken after the periods of 8, 15 and 30 minutes, and one, two and four hours. Hydrometer was removed, rinsed and placed in the distilled water after each reading. After 4 hours reading was taken once or twice within 24 hours. Finally a reading was taken at the end of 24 hours. The temperature of the suspension was observed and recorded.

Calculations

Diameter of the particles (D):

$$D = \sqrt{\frac{30\mu}{980(G-1)}} \times \sqrt{\frac{H_R}{t}} = M \sqrt{\frac{H_R}{t}}$$

Where,

D = diameter of particle in suspension, in mm;

μ = co-efficient of viscosity of water at the temperature of the suspension at the time of taking the hydrometer reading, in poise;

G = specific gravity of the soil fraction used in the sedimentations analysis;

H_R = effective depth corresponding to R_n , in cm.

t = time elapsed between the beginning of sedimentation and taking of hydrometer reading in minutes

$M = \sqrt{\frac{30\mu}{980(G-1)}}$ = a constant factor for given values of μ and G at the temperature of the suspension.

Percentage finer than diameter D:

The percentage by mass (w) of particles smaller than corresponding equivalent particle diameters (D) was calculated from the formula:

$$w = \frac{100G_s}{W_b(G_s - 1)} \times R_h$$

Where

w = percentage finer

G_s = specific gravity of soil particle

W_b = weight of soil

R_h = Hydrometer reading

5.1.4 Specific Gravity (IS: 2720-Part-3 Sec-1)

The specific gravity of soil sample was determined by density bottle method. For this test 5-10g oven dried and cooled soil sample was taken in 50ml capacity density bottle and its weight was noted down as W_2 . The soil was covered with distilled water and left for sufficient period for suitable soaking. The entrapped air was removed by vacuum. The bottle with soil was filled fully with water and its weight was noted down (W_3). The mass of empty bottle and bottle filled with distilled water were noted down as W_1 and W_4 respectively.

The Specific Gravity was determined by using following equation :

$$G = \frac{W_2 - W_1}{[(W_2 - W_1) - (W_3 - W_4)]}$$

5.1.5 Liquid Limit (IS: 2720- Part-5)

By Cone Penetrometer Method

The 'Cone Penetrometer Apparatus' is a variant of the fall-cone and consists of a cone with a smooth polished surface and angle of $30^\circ \pm 1/2^\circ$. The weight of the cone, together with its associated shaft is $80\text{g} \pm 0.5\text{g}$. A support assembly with an automatic cone release mechanism and cone height adjustment mechanism used to hold the cone vertically. The angle and weight of the cone were calibrated at regular intervals, and the sharpness of the cone tip was checked daily.

Distilled water was added and thoroughly mixed with the soil sample to produce a homogeneous paste. The paste was then placed in a cup with a diameter of at least 55mm and a depth of at least 40mm. The surface of the soil was smoothed off level and parallel to the base. The support assembly was used to position the tip of the cone so that it was just touching the top surface of the soil, and the automatic tripping mechanism was released. The cone was allowed to penetrate into the soil for a period of $5 (\pm 1)$ s, then the cone was locked off to stop further movement and the penetration was recorded. The cup was refilled and the test was repeated. The two recorded penetrations need to be within 0.5mm of each other, otherwise a third test is performed. when the three test vary by more than 1mm the test was repeated.

Further tests were conducted, at varying water contents, in order to produce a series of cone penetrations (usually 4) in the range 15mm to 25mm. The resulting cone penetrations were plotted verses the water content of the test specimens. The Liquid Limit (W_L) was read off the graph, being the water content at which the line of best fit through the test points crosses 20mm penetration.

5.1.6 Plastic Limit (IS: 2720-Part-5)

For this test, soil sample was prepared in the same way as for liquid limit test. A ball of soil sample weighed about 5 gm was formed. The ball was rolled between the fingers of one hand and the glass plate with pressure sufficient to reduce the mass into a thread of about 3 mm in 5 to 10 complete forward and back movements. When a diameter of 3 mm was reached, soil was again remolded into a ball. The process of rolling and remolding was repeated until the thread started just crumbling at a diameter of 3 mm. The crumbled thread was immediately transferred to an airtight container for determination of its moisture content by oven drying method.

This water content has been termed as plastic limit. (W_p)

5.1.7 Plasticity Index (IS: 2720-Part-5)

The plasticity index I_p was given by

$$I_p = W_L - W_p \text{ (in percent)}$$

5.1.8 Direct Shear Test (IS:2720-Part-13):

For this test shear box test apparatus was used. The prepared specimen from remolded/undisturbed sample was placed carefully in the box. The plain grid was kept on top of the specimen with its directions at right angles to the direction of shear. The upper porous stone was placed on the grid and loading pad on the stone. The box with specimen was gently placed in the container (water jacket). The specimen was submerged with water. The container was mounted with the shear box and the specimen inside, on the shearing machine. The upper part of the box was so adjusted that it touched the proving ring. The jack was brought forward to bear up against the box container. The proving ring dial gauge was set to read zero.

The steel ball was placed in the recess of the loading pad. The loading yoke was set in contact with the steel ball on the loading pad. Vertical displacement dial gauge to read zero in contact with the top of the yoke. The normal load was applied and any change in thickness of specimen was recorded. Shear displacement dial gauge was also set to read zero. The locking screw was now removed and two parts of the shear box were separated by advancing the spacing screws.

The specimen was sheared at constant rate of strain. The readings of the proving ring dial gauge were noted down every 15 seconds for the first one-minute and then every 30 seconds thereafter. The reading of change in the thickness dial gauge and shear displacement dial gauge were also recorded at the same time interval. The test was continued until the specimen fails. The specimen was assumed to fail when the proving ring dial gauge started receding or at shear displacement of approximately 15% of the length took place.

The soil was removed from the box and test was repeated on the identical specimen under increased normal load.

5.1.9 Triaxial Shear Test_UUT (IS: 2720-Part-11)

For this test, Triaxial Shear Test apparatus was used. The plain disc was placed on the pedestal of the triaxial cell. The specimen was placed centrally on the disc. A correct size rubber membrane was fitted inside the stretcher with ends of membrane folded over those of the stretcher. Vacuum was applied to stretch the membrane to the inside surface of the stretcher which was carefully slipped around the specimen kept on the pedestal. The vacuum on the membrane was released. Its bottom part was rolled down into the pedestal. plain disc was placed on the top of the specimen and then loading pad was placed. The top part of membrane was rolled on to the loading pad. Then the stretcher was removed and ends were sealed with 'O' rings. With the properly sealed specimen placed centrally on the pedestal, the cell was assembled, keeping the loading piston initially clear of the loading pad of the specimen, the assembly was placed in the loading frame.

For unconsolidated undrained test, the bottom drainage valve (BDV) and top drainage valve (TDV) of cell, was closed and air release valve (ARV) was opened. The cell was filled with water

through the cell water valve CWV. ARV was closed when water begins to escape through it. The cell pressure was raised to the desired value and kept constant till the end of the test.

When the cell pressure was applied, the load piston rises upward, the loading machine was operated at the anticipated rate to bring the load piston slightly above the loading pad of the specimen and the load measuring dial gauge on proving ring was set to zero.

The piston was brought just in contact with loading pad by hand operation of the machine. The axial compression dial gauge was mounted and set to read zero.

The axial loading was started at 1.25 mm/min rate of strain. Simultaneous readings on the load and compression dial gauges were noted down. The test was continued until a recession of the axial load is observed or 20% of strain.

After failure, the specimen was unloaded by reversing the loading machine, cell pressure was reduced and cell water was drained out through BRV. The cell was dismantled and the specimen was taken out, rubber membrane was removed and weight of the failed sample and its water content was determined. The test was repeated on two more identical specimens with increasing cell pressure.

CHAPTER 2 ANALYSIS OF TEST RESULTS AND INTERPRETATION

6.0 STRATIFICATION

From the study of the borehole logs, it is revealed that the sub strata mainly consist of silty sand (SM), sandy silt of low plasticity (ML-CL) and silty clay of low plasticity (CL).

However,

At the location of (OLD) CH.1698.053(BH-1):-

- a) From EGL to 7.50m depth consists of coarse grained strata i.e silty sand (SM).
- b) From 7.50m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL) and silty clay of intermediate plasticity (CI).

At the location of (OLD) CH.1912.7(BH-2):-

- a) From EGL to 8.25m depth consists of coarse grained strata i.e silty sand (SM) and silty sand with clay of low plasticity (SM-SC).
- b) From 8.25m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL) and silty clay of intermediate plasticity (CI).

At the location of (OLD) CH.2807.817(BH-3):-

- a) From EGL to 5.25m depth consists of coarse grained strata i.e silty sand (SM).
- b) From 5.25m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

At the location of (OLD) CH.2972.708(BH-4):-

- a) From EGL to 6.00m depth consists of coarse grained strata i.e silty sand (SM) and poorly graded sand (SM-SP).
- b) From 6.00m to 10.00m depth consists of fine grained strata i.e. silty clay of low plasticity (CL).

6.1 GROUND WATER TABLE DEPTH

The Ground Water Table at all the bore hole locations was not encountered during the site investigation.

6.2 RESULTS OF CHEMICAL ANALYSIS

Results of chemical analysis of soil samples (as per **Appendix – B2**) indicates that the soil sample falls under Class I for sulphates and chlorides concentration (As per IS 456-2000 and CIRIA Sp. Publication No. 31). The results are summarized here in below :-

Summary of chemical analysis of soil samples

Chemical Property	Findings (Min. to Max.)	Remarks (Required limits as per IS 456-2000)
pH	7.60 to 8.74	> 6.0
Sulphite as SO ₃ ²⁻ (%)	0.0021 to 0.0024 (%)	< 0.2% (Class I)
Chlorides as Cl ⁻ (%)	0.0055 to 0.0063 (%)	No limit specified in IS 456. However, a limit of 0.10% specified for class I in CIRIA Sp. Publication No. 31)

Note :- All the chemical contents are within permissible limit hence no special precautions are required.

CHAPTER 3 TYPE AND DEPTH OF FOUNDATION WITH ANALYSIS

7.0 TYPE & DEPTH OF FOUNDATION:

Based on the nature & strength characteristics of the substrata and requirement of the project, the following type of foundation have been analyzed as given below:

Chainage (Old) (m)	BH No.	Type of foundation	Depth of foundation below E.G.L. (m)	Length x Width (m)	Remarks
1698.053	BH-01	Shallow Foundation	1.00	2.0 x 2.0	-
			1.50		
			2.00		
1912.700	BH-02		1.00	4.0 x 4.0	
			1.50		
			2.00		
2807.817	BH-03		1.00	2.0 x 2.0	
			1.50		
			2.00		
2972.708	BH-04		1.00	5.0 x 5.0	
			1.50		
			2.00		

The details of foundation analysis are given in the subsequent paragraph.

7.1 ANALYSIS OF SHALLOW FOUNDATION

7.1.1 From Shear Failure Criteria

Net Safe Bearing capacity from Shear Failure consideration has been computed in accordance with IS: 6403-1981, which is based on, modified Terzaghi's classical approach. The weighted average of shear strength parameters for various strata upto depth equal to $0.5 \cdot B \cdot \tan(45 + \frac{\phi}{2})$ (where B = Width of the Foundation, ϕ = Angle of internal friction) is used in the analysis. A factor of safety of 2.5 to estimate the net safe bearing capacity from ultimate net bearing capacity.

For soils, containing both coarse grained (gravels & sands) and fine grained (clays), c and ϕ are used to determine the soil strength. In case of predominantly fine grained soils, c and ϕ are determined by the Triaxial Compression test as per IS: 2720 pt XI. For predominantly coarse grained soils, c and ϕ are determined by Direct Shear test as per IS: 2720 pt XIII. These c and ϕ values were used for determining the SBC of soil as per shear failure criteria.

The ultimate net bearing capacity in case of general shear failure is given by following expression,

$$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$$

The ultimate net bearing capacity in case of local shear failure is given by following expression,

$$q'_d = (2/3) c N'_c s_c d_c i_c + q (N'_q - 1) s_q d_q i_q + (1/2) B \gamma N'_\gamma s_\gamma d_\gamma i_\gamma W'$$

Where,

$$d_c = 1 + 0.2 (D_f/B) * \text{SQRT}(N_\phi)$$

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

$$d_q = d_\gamma = 1 + 0.1 (D_f/B) * \text{SQRT}(N_\phi) \text{ for } \phi > 10^\circ$$

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

$$\phi' \text{ for local shear failure} = \tan^{-1} (0.67 \tan \phi)$$

7.1.2 From Settlement Failure Criteria

Allowable Bearing Pressure from Settlement Failure consideration has been computed in accordance with IS: 8009 (Part-I). The magnitude of settlement, when foundation loads are applied, depends upon the compressibility of the underlying strata and rigidity of the substructure.

The total permissible settlement in cohesion-less soil is estimated using SPT value as per IS: 8009 (Part-I). While using this approach, the N value was corrected, wherever applicable, below the footing base to at least 1.5B below the base to account for the effects of energy ratio, adopted bearing pressure, dilation for submerged silty fine sands / fine sands as well as that due to the overburden pressure.

Further for settlement Calculation in cohesive soil the following equation has been used.

$$S_t = \Delta P M_v H$$

Where,

M_v = Coefficient of volume compressibility, cm^2/kg

ΔP = Pressure increment, kg/cm^2

H = Thickness of layers

CHAPTER 4 FOUNDATION RECOMMENDATIONS

8.0 FOUNDATION RECOMMENDATIONS

- Based on the nature & strength characteristics of the substrata and requirement of the project, shallow foundation have been analyzed.
- The recommended net allowable bearing capacity values are given in Table 4.1 to 4.2.

Table 4.1: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 25mm

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
1698.053	1548.996	BH-01	2.0 x 2.0	1.0	25.00	34.38	25.00
				1.5	33.09	37.49	33.09
				2.0	41.73	39.60	39.60
1912.700	1767.989	BH-02	4.0 x 4.0	1.0	16.72	17.20	16.72
				1.5	20.52	18.02	18.02
				2.0	24.45	18.98	18.98
2807.817	2189.831	BH-03	2.0 x 2.0	1.0	15.66	29.41	15.66
				1.5	20.85	32.07	20.85
				2.0	26.41	33.87	26.41
2972.708	2823.679	BH-04	5.0 x 5.0	1.0	33.43	10.77	10.77
				1.5	39.60	11.68	11.68
				2.0	45.96	12.67	12.67

Table 4.2: Recommended Net Allowable Bearing Capacity for shallow foundation for allowable settlement 50mm

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
1698.053	1548.996	BH-01	2.0 x 2.0	1.0	25.00	68.77	25.00
				1.5	33.09	74.98	33.09
				2.0	41.73	79.20	41.73
1912.700	1767.989	BH-02	4.0 x 4.0	1.0	16.72	34.41	16.72
				1.5	20.52	36.05	20.52
				2.0	24.45	37.95	24.45
2807.817	2189.831	BH-03	2.0 x 2.0	1.0	15.66	58.82	15.66
				1.5	20.85	64.14	20.85
				2.0	26.41	67.75	26.41

Chainage Old (m)	Chainage New (m)	BH. No.	Foundation Size (m x m)	Depth of foundation below EGL (m)	Net Safe Bearing Capacity from Shear Failure (t/m ²)	Net Allowable Bearing Pressure from settlement failure (t/m ²)	Recommended Net Allowable Bearing Capacity (t/m ²)
2972.708	2823.679	BH-04	5.0 x 5.0	1.0	33.43	21.53	21.53
				1.5	39.60	23.37	23.37
				2.0	45.96	25.35	25.35

Notes: -

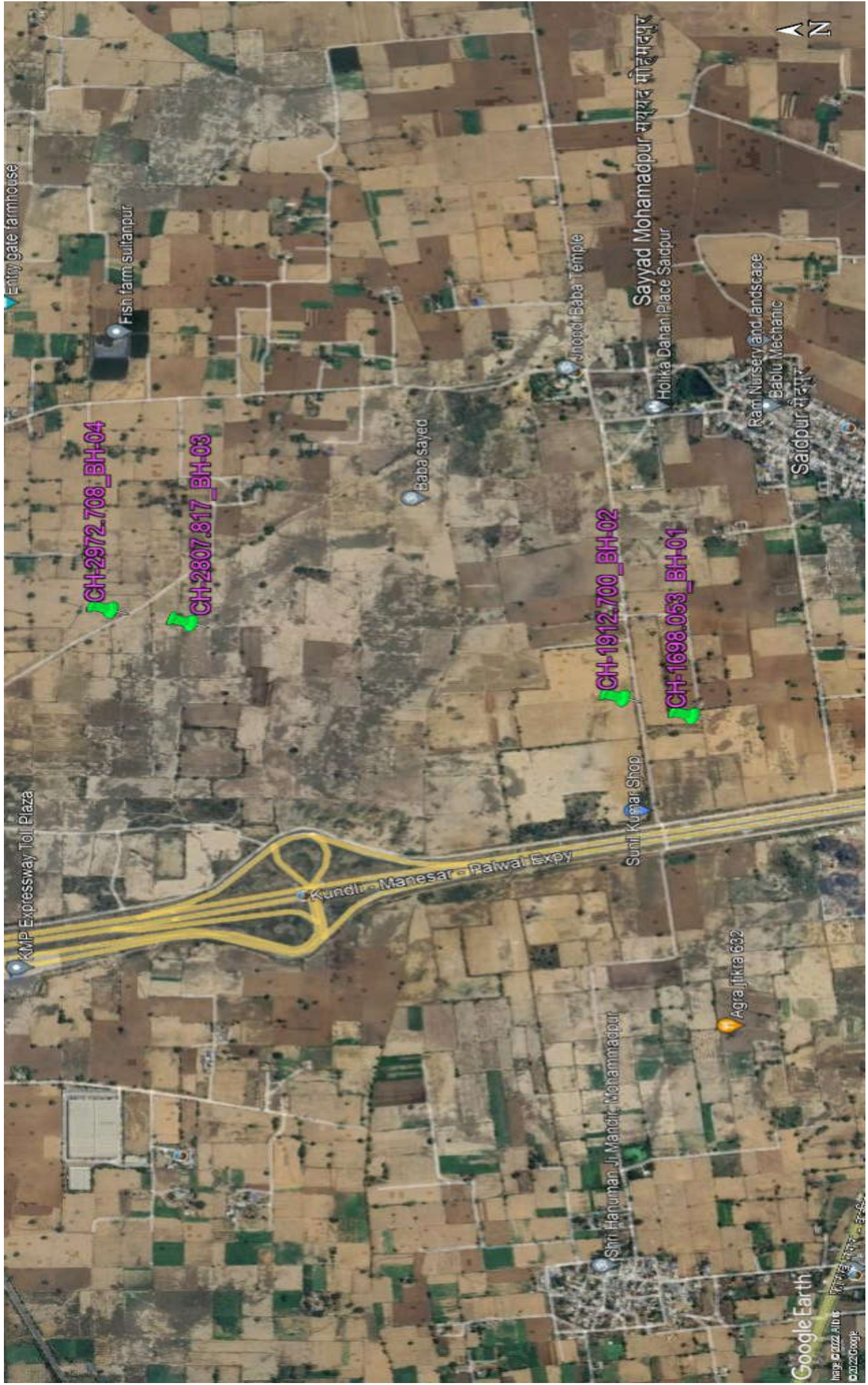
All The above recommendations are based on the field and laboratory tests conducted on selected soil/ rock core samples and our experience in this regard. If the actual substrata conditions during excavation for the foundation differ from the observations reported here, the design experts/consultants should be referred for suggestion, further investigations.

Abbreviations

BH	Borehole
ERT	Electrical Resistivity Test
EGL	Existing Ground Level
GWT	Ground Water Table
IS	Indian Standards
SPT	Standard Penetration Test
DS	Disturbed Soil
R.L.	Reduced Level
m	Metre
sp. gr.	Specific Gravity
%	Percentage
mg /l	Milligram per litre
mg /kg	Milligram per kilogram

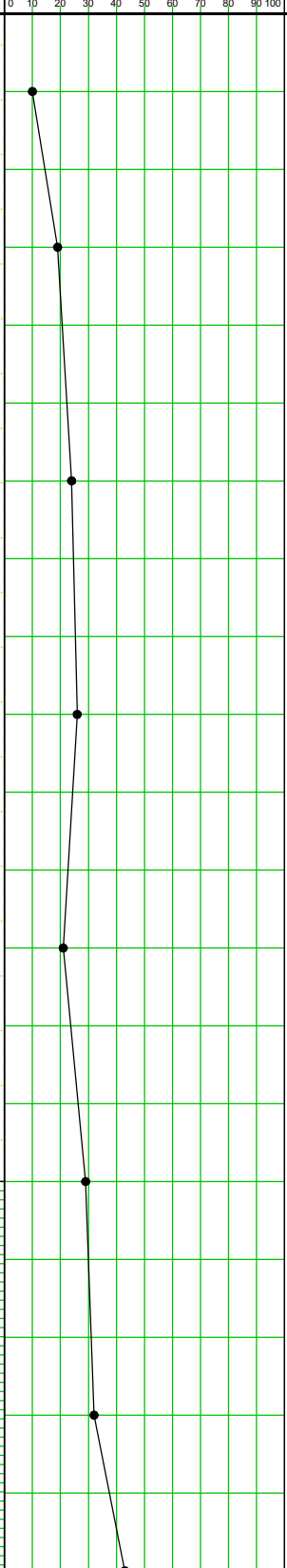
APPENDIX – A (FIELD DATA RESULTS)

Appendix No.	ITEMS
A-1	LOCATION PLAN
A-2	FIELD BORE HOLE LOGS
A-3	SUB SOIL PROFILE DIAGRAM



FIELD BOREHOLE LOG

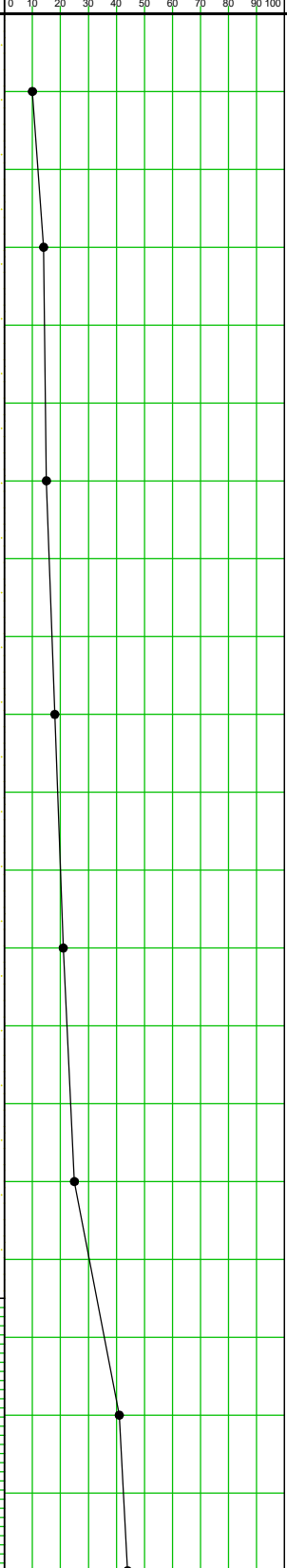
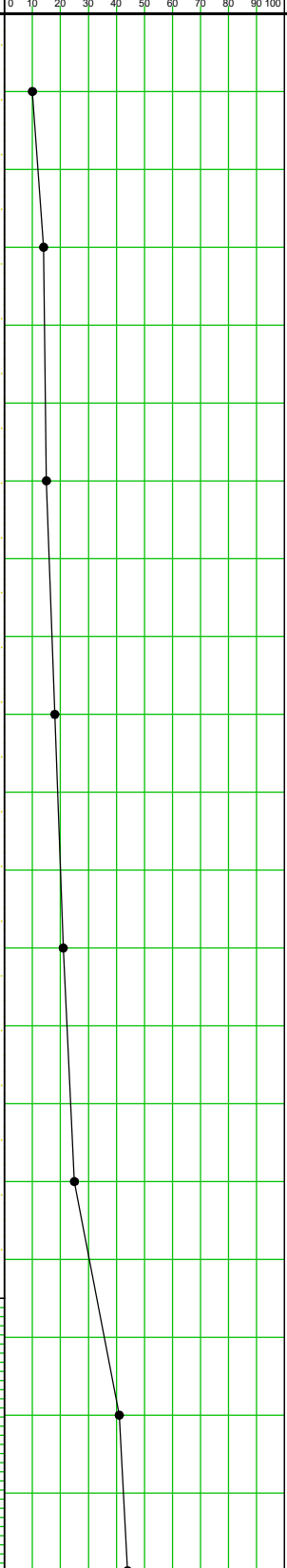
Project Name : GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client : HRIDCL
BH Location/Chainage : 1698.053m	Northing : 3147693.121 m	Easting : 682480.212 m
Reduced Level (m): (+)213.913	BH. No. : BH-01	BH Termination Depth (m): 10
Proposed / Existing Structure : Minor Bridge	Water Table (m): Not Encountered	Inclination : Vertical
Boring type : Rotary	Dia. of Boring : 150 mm	Depth of Casing (m) : Not Used
Date of Start : 14-06-2022		Date of Completion : 14-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	5	5	10	Medium dense, Brownish, Silty Sand	SM			
1.5	1.5	SPT-2	6	9	10	19					
2.25	2.25	UDS-1									
3.0	3	SPT-3	8	11	13	24					
4.5	4.5	SPT-4	10	12	14	26					
5.25	5.25	UDS-2									
6.0	6	SPT-5	9	10	11	21					
7.5	7.5	SPT-6	10	13	16	29					
8.0	8.25	UDS-3					Very Stiff to Hard, Brownish, Silty Clay of low Plasticity	CL			
9.0	9	SPT-7	12	15	17	32					
10.0	10	SPT-8	18	19	24	43					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

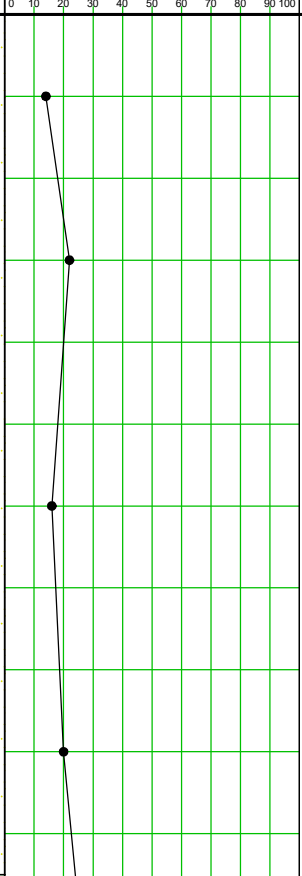
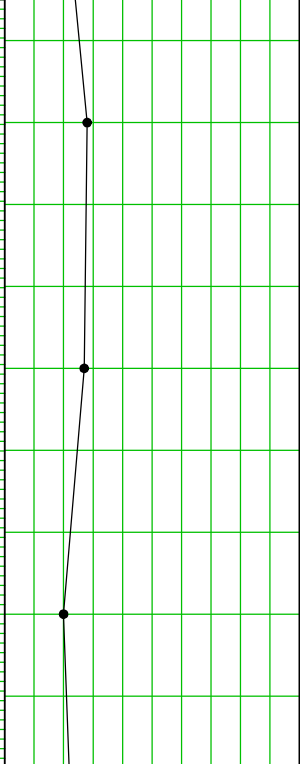
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :1912.700m	Northing :3147832.27 m	Easting :682529.013 m
Reduced Level (m):(+)214.395	BH. No. :BH-02	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :13-06-2022		Date of Completion :13-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	3	5	5	10	Medium dense, Brownish, Silty Sand	SM			
1.0											
1.5	1.5	SPT-2	4	7	7	14					
2.0											
2.5	2.25	UDS-1									
3.0	3	SPT-3	5	7	8	15					
3.5											
4.0											
4.5	4.5	SPT-4	5	8	10	18					
5.0											
5.5	5.25	UDS-2									
6.0	6	SPT-5	8	10	11	21					
6.5											
7.0											
7.5	7.5	SPT-6	8	12	13	25					
8.0											
8.5	8.25	UDS-3									
9.0	9	SPT-7	14	19	22	41	Dense, Brownish, Sandy Silt with Clay	ML-CL			
9.5											
10.0	10	SPT-8	16	20	24	44					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

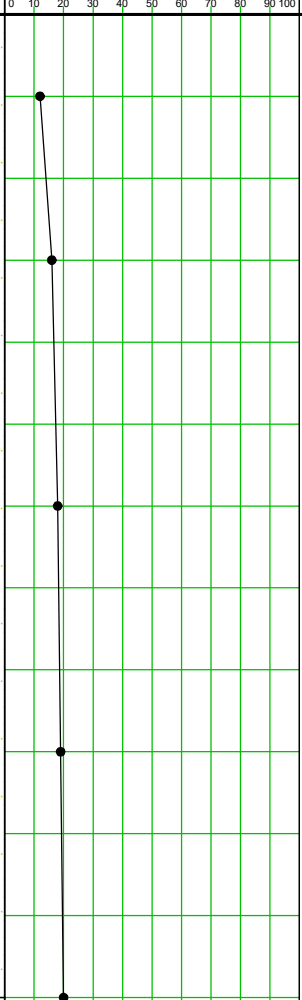
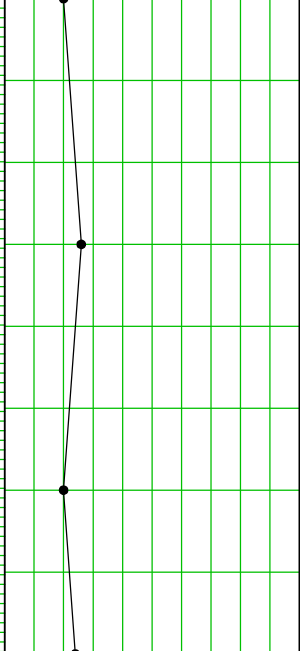
Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :2807.817m	Northing :3148703.655 m	Easting :682734.079 m
Reduced Level (m):(+)212.675	BH. No. :BH-03	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :14-06-2022		Date of Completion :14-06-2022

Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	5	7	7	14	Medium, Brownish, Silty Sand	SM			
1.5	1.5	SPT-2	8	10	12	22					
2.25	2.25	UDS-1									
3.0	3.0	SPT-3	6	7	9	16					
4.5	4.5	SPT-4	7	9	11	20					
5.25	5.25	UDS-2									
6.0	6.0	SPT-5	9	14	14	28					
7.5	7.5	SPT-6	8	13	14	27					
8.25	8.25	UDS-3					Very Stiff, Brownish, Silty Clay of Low Plasticity	CL			
9.0	9.0	SPT-7	6	9	11	20					
10.0	10.0	SPT-8	8	10	12	22					

UDS*-UDS not recovered

FIELD BOREHOLE LOG

Project Name :GTI for (HORC) project from Palwal to Harsana Kalan in the state of Haryana.		Client :HRIDCL
BH Location/Chainage :2972.708m	Northing :3148864.48 m	Easting :682770.474 m
Reduced Level (m):(+)213.976	BH. No. :BH-04	BH Termination Depth (m):10
Proposed / Existing Structure :Minor Bridge	Water Table (m):Not Encountered	Inclination : Vertical
Boring type :Rotary	Dia. of Boring :150 mm	Depth of Casing (m) :Not Used
Date of Start :15-06-2022		Date of Completion :15-06-2022

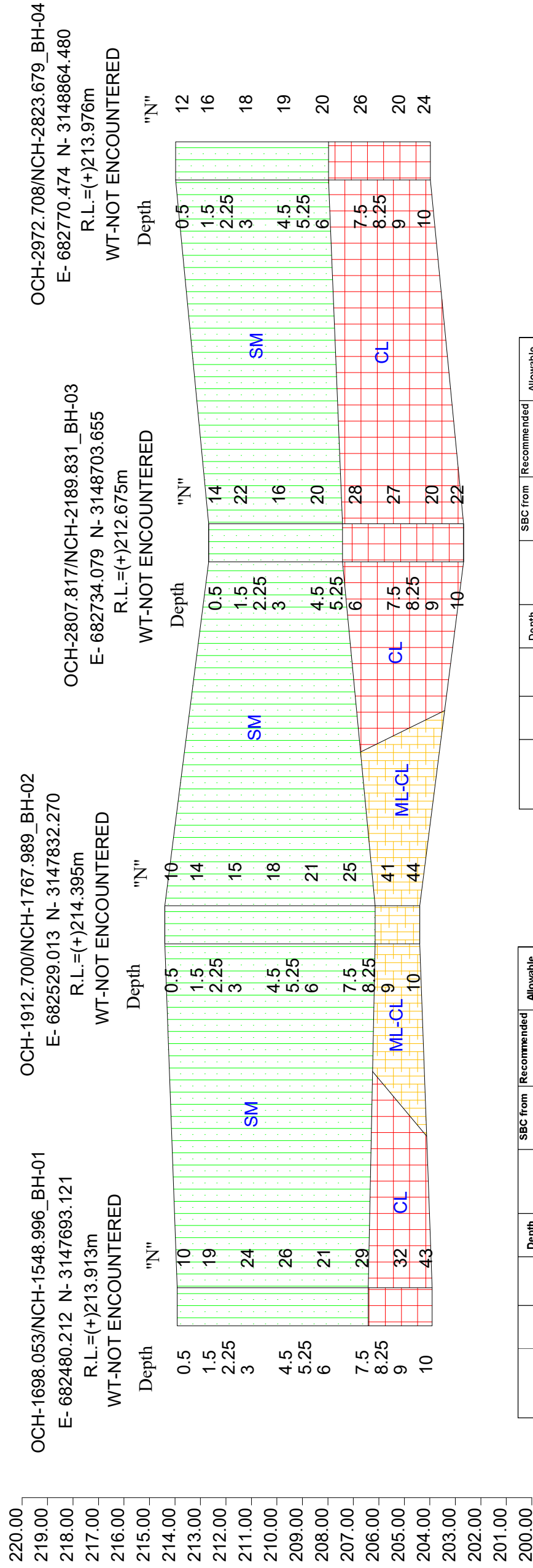
Depth (m)	In-Situ Sample Depth (m)	Sample Type	Blow counts per 15cm			SPT N Value	Strata Description	IS Classification	Graphic Log	(Depth v/s SPT N Value)	Special Observations
			N1	N2	N3						
0.0		DS									
0.5	0.5	SPT-1	4	6	6	12	Medium dense, Brownish, Silty Sand	SM			
1.5	1.5	SPT-2	5	7	9	16					
2.25	2.25	UDS-1									
3.0	3	SPT-3	7	9	9	18					
4.5	4.5	SPT-4	6	9	10	19					
5.25	5.25	UDS-2									
6.0	6	SPT-5	8	10	10	20	Very Stiff, Brownish, Silty Clay of Low Plasticity	CL			
7.5	7.5	SPT-6	7	12	14	26					
8.25	8.25	UDS-3									
9.0	9	SPT-7	6	9	11	20					
10.0	10	SPT-8	8	11	13	24					

UDS*-UDS not recovered

CONDUCTING GEOTECHNICAL INVESTIGATION, PREPARATION OF GEOTECHNICAL REPORT FOR DESIGNING OF BRIDGES AND FOR EMBANKMENT IN CONNECTION WITH CONSTRUCTION OF HARYANA ORBITAL RAIL CORRIDOR (HORC) PROJECT FROM PALWAL TO HARSANA KALAN INCLUDING CONNECTIVITY TO EXISTING IR NETWORK IN THE STATE OF HARYANA.

R.L. (m)

New Patli To Sultanpur



OCH-1698.053/NCH-1548.996_BH-01
E- 682480.212 N- 3147693.121
R.L.=(+213.913m)
WT-NOT ENCOUNTERED

OCH-1912.700/NCH-1767.989_BH-02
E- 682529.013 N- 3147832.270
R.L.=(+214.395m)
WT-NOT ENCOUNTERED

OCH-2807.817/NCH-2189.831_BH-03
E- 682734.079 N- 3148703.655
R.L.=(+212.675m)
WT-NOT ENCOUNTERED

OCH-2972.708/NCH-2823.679_BH-04
E- 682770.474 N- 3148864.480
R.L.=(+213.976m)
WT-NOT ENCOUNTERED

Chainage (Mtr.)	BH No.	Size (mxm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-1698.053/ NCH-1548.996	BH-01	2 X 2	1.00	25.00	34.38	25.00	25
			1.50	33.09	37.49	30.00	
			2.00	41.73	39.60	30.00	
OCH-1698.053/ NCH-1548.996	BH-01	2 X 2	1.00	25.00	68.77	25.00	50
			1.50	33.09	74.98	30.00	
			2.00	41.73	79.20	30.00	
OCH-1912.700/ NCH-1767.989	BH-02	4 X 4	1.00	16.72	17.20	16.72	25
			1.50	20.52	18.02	18.02	
			2.00	24.45	18.98	18.98	
OCH-1912.700/ NCH-1767.989	BH-02	4 X 4	1.00	16.72	34.41	16.72	50
			1.50	20.52	36.05	20.52	
			2.00	24.45	37.95	24.45	

Chainage (Mtr.)	BH No.	Size (mxm)	Depth from EGL (m)	SBC in Shear (t/m ²)	SBC from Permissible Settlement (t/m ²)	Recommended Net safe Bearing Capacity (t/m ²)	Allowable Settlement (mm)
OCH-2807.817/ NCH-2189.831	BH-03	2 X 2	1.00	15.66	29.41	15.66	25
			1.50	20.85	32.07	20.85	
			2.00	26.41	33.87	26.41	
OCH-2807.817/ NCH-2189.831	BH-03	2 X 2	1.00	15.66	58.82	15.66	50
			1.50	20.85	64.14	20.85	
			2.00	26.41	67.75	26.41	
OCH-2972.708/ NCH-2823.679	BH-04	5 X 5	1.00	33.43	10.77	10.77	25
			1.50	39.60	11.68	11.68	
			2.00	45.96	12.67	12.67	
OCH-2972.708/ NCH-2823.679	BH-04	5 X 5	1.00	33.43	21.53	21.53	50
			1.50	39.60	23.37	23.37	
			2.00	45.96	25.35	25.35	

SYMBOL	DESCRIPTION
	FILLED UP STRATA
	SM- Silty Sand (Having fines Less Than 50% and no plasticity or below A-line)
	SM-SC -Clayey Sand (Having fines Less Than 50% and in the hatched zone (4<PI<7))
	ML-CL -Sandy with clay (Having fines greater than 50% and in the hatched zone (LL<35 & 4<PI<7))
	CL-Silty Clay of low plasticity (Above A-line, LL<35)
	WATER TABLE

Note:- Fines= Percentage of Silty + Clay A-line= 73(wl<20)

APPENDIX – B (LAB TEST RESULTS)

Appendix No.	ITEMS
B-1	SOIL CHARACTERISTICS SHEETS
B-2	RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES
B-3	GSD CURVES

SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						IS Classification	IS Symbol	Soil Description	Observed SPT Value (N)	Corrected SPT Value (N _c)	Sample Type	Depth from G.L. (m)	Date of Boring	Chainage (m)/Location	B.H. No.	Depth of Water Table		Termination Depth		Coordinates (E,N)				R.L.	Ref. Code						
	Not Encountered		10.00 m		682529.013 m												3147832.270 m		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)			Void Ratio (e ₀)		Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _c)
	Bulk Density (g/cm ³)	Natural Moisture Content (%)	Dry Density (g/cm ³)	Specific Gravity	Clay	Silt											Fine	Medium									Coarse	Gravel				
Clay							Silt	Fine	Medium	Coarse	Fine	Coarse																				
DS	0.00	-	-	-	-	-	-	-	-	-	-	-	-	13-06-2022	to	13-06-2022	1912.700	BH-02	Not Encountered	10.00 m	682529.013 m	3147832.270 m	(+2)14.395 m	SR-544_21-22								
SPT-1	0.50	10	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-2	1.50	14	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
UDS-1	2.25	-	-	0	18	72	10	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-3	3.00	15	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-4	4.50	18	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
UDS-2	5.25	-	-	0	28	62	10	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-5	6.00	21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-6	7.50	25	23	8	38	44	8	2	0	0	0	26	6	-	-	-	-	-	-	-	-	-	-	-	-							
UDS-3	8.25	-	-	7	44	40	8	1	0	0	28	21	7	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-7	9.00	41	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
SPT-8	10.00	44	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							

Abbreviations:-
 DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+- Direct Shear Test on Remoulded Sample, UUT+- Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

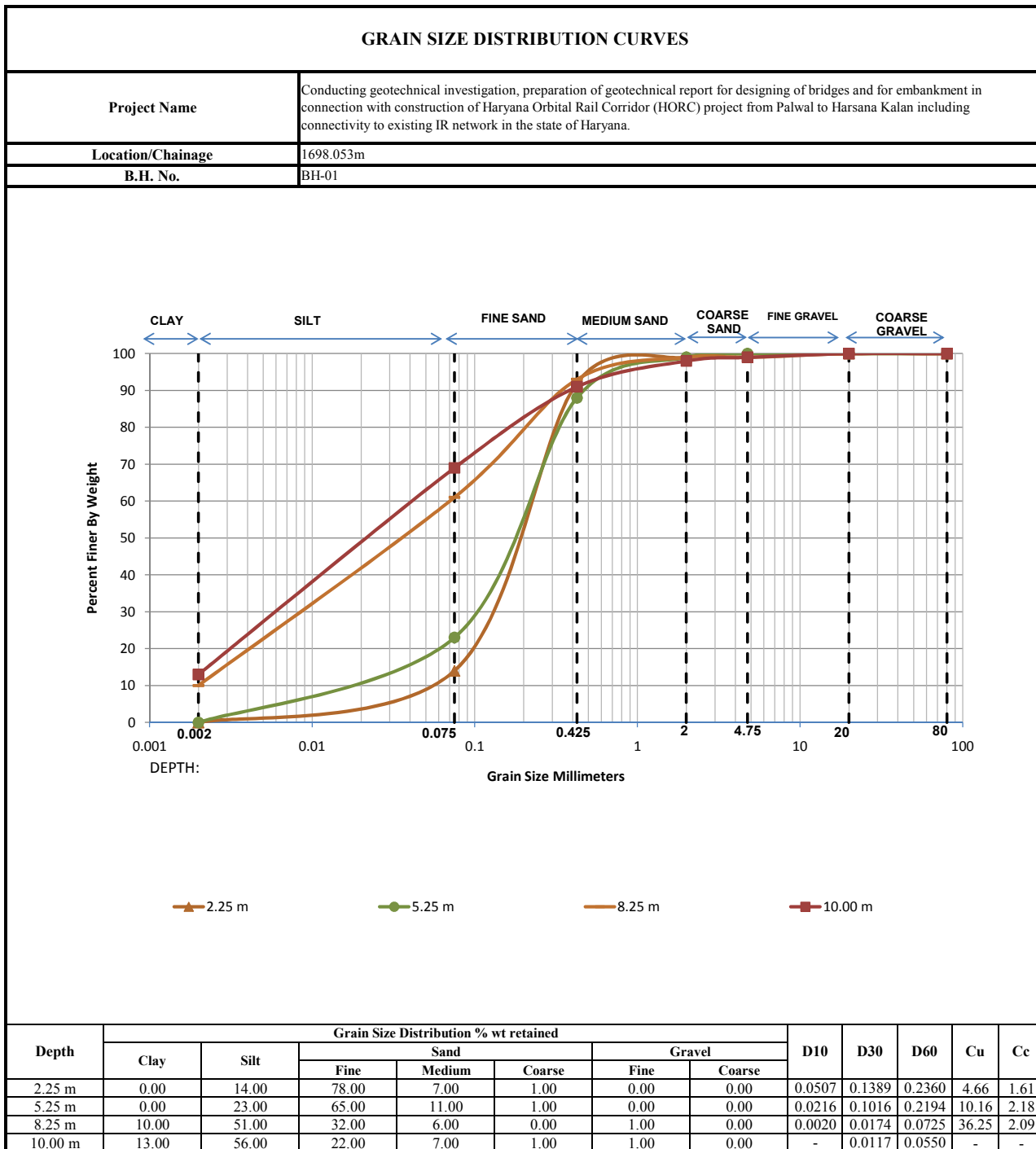
SOIL CHARACTERISTICS

Project	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Patwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.						Date of Boring			Chainage (m)/Location		B.H. No.			Depth of Water Table				Termination Depth		Coordinates (E,N)						R.L.		Ref. Code			
	Sample Type	Depth from G.L. (m)	Observed SPT Value (N)	Corrected SPT Value (N _c)	Soil Description	IS Classification	IS Symbol	Grain Size Distribution % wt retained						Atterberg Limits %			Not Encountered		10.00 m		Type of Test	Cohesion C (kg/cm ²)	Angle of Friction (φ)	Free Swell Index (%)	Swelling Pressure (kg/cm ²)	Permeability (cm/sec)	Void Ratio (e ₀)	Pressure (kg/cm ²)	C _v x 10 ⁻⁴ (cm ² /Sec)	M _v x 10 ⁻² (cm ² /Kg)	Compression Index (C _p)	
								Clay	Silt	Fine	Medium	Coarse	Sand	Fine	Coarse	Gravel	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit												Bulk Density (g/cm ³)
DS	0.00	-	-	-	Medium,Brownish,Silty Sand	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-1	0.50	14	25	SM		0	22	68	9	1	0	0	0	0	NIL	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-2	1.50	22	32	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-1	2.25	-	-	SM		0	13	77	8	1	0	1	0	0	NIL	NP	10.10	1.70	1.54	2.62	DST+	0.00	29	-	-	-	-	-	-	-	-	-
SPT-3	3.00	16	19	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-4	4.50	20	22	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UDS-2	5.25	-	-	CL		12	43	37	6	1	0	1	0	29	21	8	14.20	1.79	1.57	2.64	UUT	0.72	5	-	-	-	-	-	-	-	-	-
SPT-5	6.00	28	28	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPT-6	7.50	27	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
UDS-3	8.25	-	-	CL	13	42	37	6	1	0	1	0	29	21	8	15.10	1.80	1.56	-	UUT	0.68	4	-	-	-	-	-	-	-	-	-	
SPT-7	9.00	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SPT-8	10.00	22	22	CL	12	59	23	3	0	0	3	0	31	22	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Abbreviations:-
DS-Disturbed Sample, SPT-Standard Penetration Test, UDS-Undisturbed Sample, UDS*-UDS not recovered, DST-Direct Shear Test, UUT-Unconsolidated Undrained Triaxial Shear Test, DST+ - Direct Shear Test on Remoulded Sample, UUT+ - Unconsolidated Undrained Tri-axial Test on Remoulded Sample.

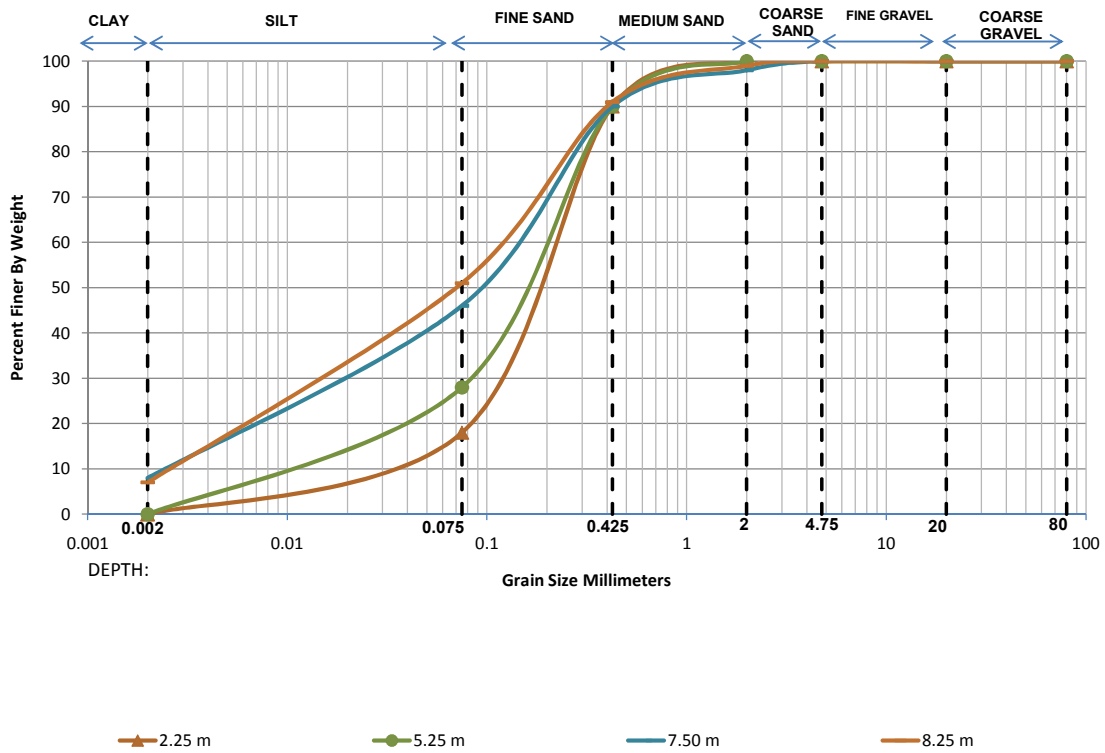
RESULT OF CHEMICAL ANALYSIS OF SOIL SAMPLES

Sr. No	Chainage/ Structure (m)	BH No.	Depth (m)	pH	Chlorides (Cl ⁻)		Sulphate (SO ₃ ²⁻)	
					(mg/kg)	(%)	(mg/kg)	(%)
1.	1698.053 (Minor Bridge)	BH-01	2.25	7.60	63.68	0.0063	24.37	0.0024
2.	2807.817 (Minor Bridge)	BH-03	5.25	8.74	55.59	0.0055	21.23	0.0021



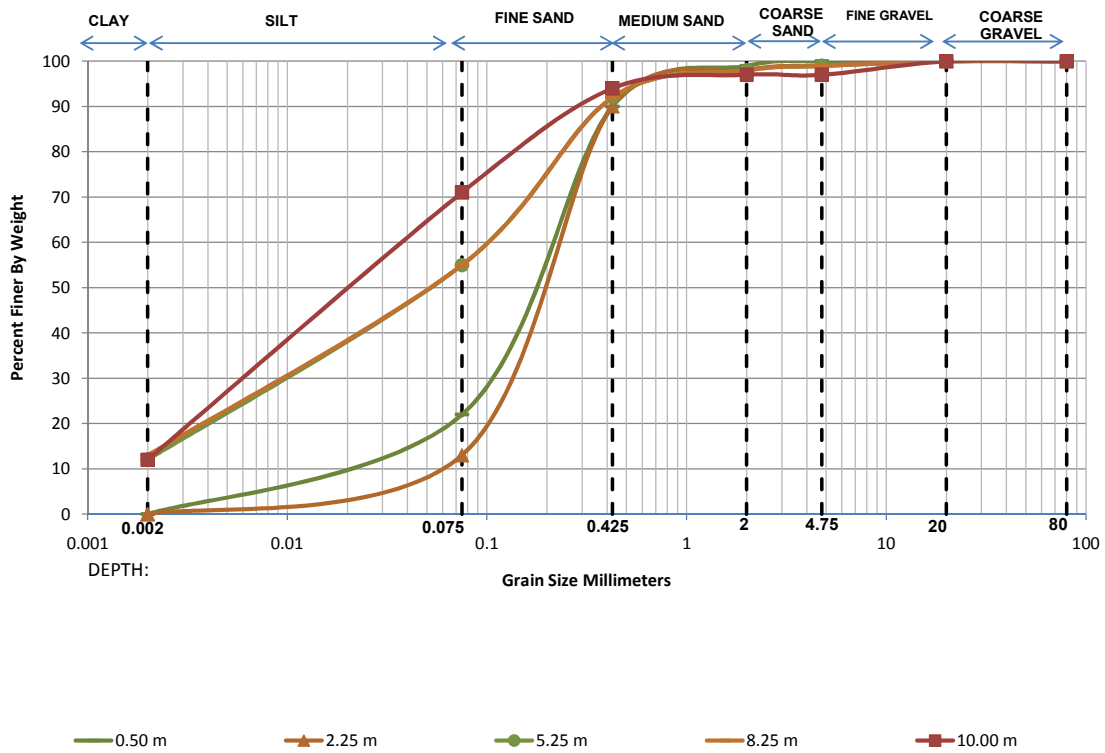
GRAIN SIZE DISTRIBUTION CURVES

Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	1912.700m
B.H. No.	BH-02



Depth	Grain Size Distribution % wt retained							D10	D30	D60	Cu	Cc
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine	Coarse					
2.25 m	0.00	18.00	72.00	10.00	0.00	0.00	0.00	0.0336	0.1221	0.2293	6.82	1.93
5.25 m	0.00	28.00	62.00	10.00	0.00	0.00	0.00	0.0151	0.0821	0.1981	13.12	2.25
7.50 m	8.00	38.00	44.00	8.00	2.00	0.00	0.00	0.0031	0.0322	0.1325	43.13	2.55
8.25 m	7.00	44.00	40.00	8.00	1.00	0.00	0.00	0.0037	0.0275	0.1090	29.37	1.88

GRAIN SIZE DISTRIBUTION CURVES	
Project Name	Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.
Location/Chainage	2807.817m
B.H. No.	BH-03



GRAIN SIZE DISTRIBUTION CURVES**Project Name**

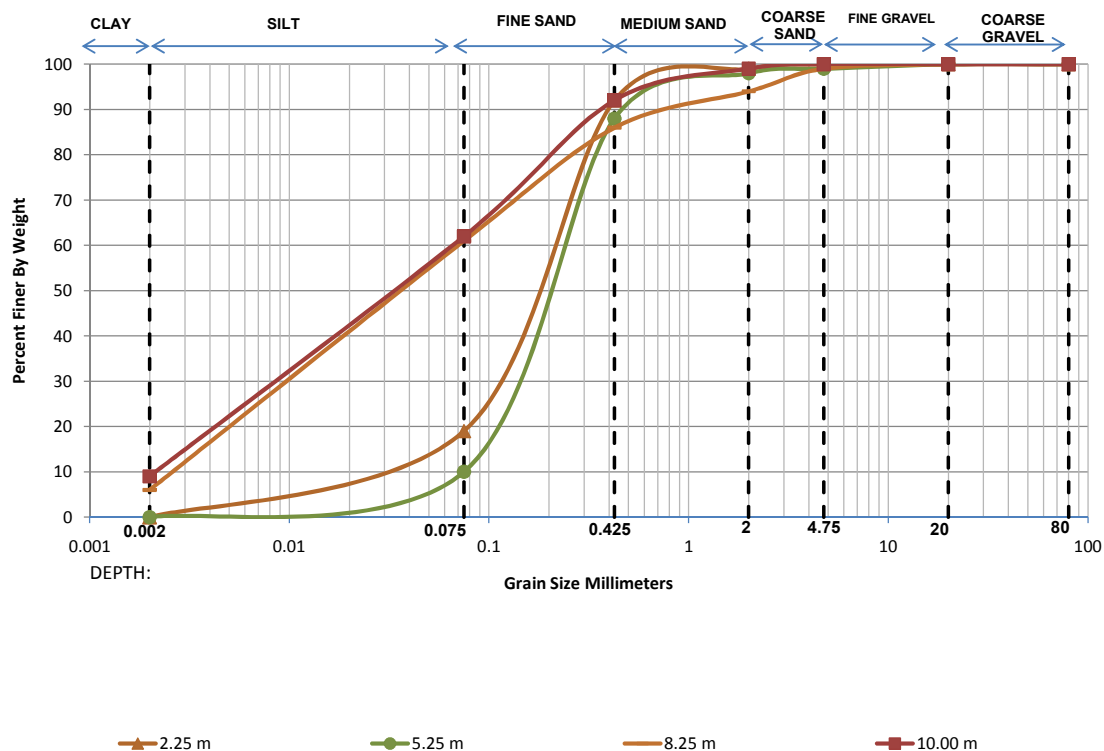
Conducting geotechnical investigation, preparation of geotechnical report for designing of bridges and for embankment in connection with construction of Haryana Orbital Rail Corridor (HORC) project from Palwal to Harsana Kalan including connectivity to existing IR network in the state of Haryana.

Location/Chainage

2972.708m

B.H. No.

BH-04



Depth	Grain Size Distribution % wt retained						D10	D30	D60	Cu	Cc	
	Clay	Silt	Sand			Gravel						
			Fine	Medium	Coarse	Fine						Coarse
2.25 m	0.00	19.00	73.00	7.00	1.00	0.00	0.00	0.0307	0.1171	0.2210	7.19	2.02
5.25 m	0.00	10.00	78.00	10.00	1.00	1.00	0.00	0.0750	0.1604	0.2575	3.43	1.33
8.25 m	6.00	55.00	25.00	8.00	5.00	1.00	0.00	0.0043	0.0213	0.0726	16.96	1.46
10.00 m	9.00	53.00	30.00	7.00	1.00	0.00	0.00	0.0024	0.0179	0.0702	29.24	1.89

APPENDIX – C (ANALYSIS & RECOMENDATION)

Appendix No.	ITEMS
C-1	SAMPLE CALCULATIONS FOR COMPUTATION OF ALLOWABLE BEARING CAPACITY OF SUB-STRATA FOR SHALLOW FOUNDATION

Calculation of SBC for shallow foundations as per IS : 6403 - 1981			
INPUT DATA		CH. (m) :-	1698.053
		BH NO. :-	BH-01
<i>Type of footing</i>		Square	3
1	Continuous Strip		
2	Rectangular		
3	Square		
4	Circular		
Angle of internal friction (ϕ°)			31.00
Cohesion (c in t/m^2)			0.00
Void ratio (e), $e = (G \cdot \gamma_w / \gamma_d) - 1$			0.64
Direction of load with vertical ($^\circ$)			0.00
Density of foundation soil (t/m^3) γ_{bulk}			1.91
Depth of water table(m)			NE
Factor of safety			2.50
S.no.	Depth (m) of footing (D_f) below EGL	Width (m)	
1	1.00	2.00	
2	1.50	2.00	
3	2.00	2.00	
<u>SHEAR FAILURE CRITERIA</u>			
Assumptions and formula used in calculation as per IS:6403-1981 are given below -			
NOTE: The type of failure used for bearing capacity analysis depends upon the value of void ratio (see IS 6403 : 1981, Page No. 9, Table No. 3).			
The ultimate net bearing capacity in case of general shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q_d = c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + (1/2) B \gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$			
The ultimate net bearing capacity in case of local shear failure is given by (from IS 6403 : 1981, page No. 8)			
$q'_d = (2/3) c N'_c s'_c d'_c i'_c + q (N'_q - 1) s'_q d'_q i'_q + (1/2) B \gamma N'_\gamma s'_\gamma d'_\gamma i'_\gamma W'$			
Where,			
$d_c = 1 + 0.2 (D_f/B) \cdot \text{SQRT}(N_\phi)$		(from IS 6403 : 1981, page No. 9)	
$d_q = d_\gamma = 1$ for $\phi < 10^\circ$			
$d_q = d_\gamma = 1 + 0.1 (D_f/B) \cdot \text{SQRT}(N_\phi)$ for $\phi > 10^\circ$			
$N_\phi = \tan^2(\pi/4 + \phi/2)$			
ϕ' is friction angle for local shear failure = $\tan^{-1} (0.67 \tan \phi)$			
<u>OUTPUT</u>			
The computer aided results for shear failure criteria are tabulated below. The results are interpolated values of bearing capacity obtained from general and local shear failure criteria.			

Bearing capacity factors : (from IS 6403 : 1981, page No. 8, Table No. 1)					
ϕ	31.00		ϕ'	21.93	
N_c	32.67		N'_c	16.80	
N_q	20.63		N'_q	7.76	
N_γ	25.99		N'_γ	7.06	
Shape factors : (from IS 6403 : 1981, page No. 8, Table No. 2)					
S.no.	Width(m)		S_c	S_q	S_γ
1	2.00		1.30	1.20	0.80
2	2.00		1.30	1.20	0.80
3	2.00		1.30	1.20	0.80
			1.30	1.20	0.80
			1.30	1.20	0.80
			1.30	1.20	0.80
Depth factors : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	d_c	d_q	d_γ
1	1.00	2.00	1.18	1.09	1.09
2	1.50	2.00	1.27	1.13	1.13
3	2.00	2.00	1.35	1.18	1.18
Inclination factors : (from IS 6403 : 1981, page No. 9)					
	$i_c = (1 - \alpha / 90)^2$		$i_q = (1 - \alpha / 90)^2$		$i_\gamma = (1 - \alpha / \phi)^2$
	1.00		1.00		1.00
Water table factor : (from IS 6403 : 1981, page No. 9)					
S.no.	Depth(m)	Width(m)	Z_w/B		W'
1	1.00	2.00	14.50		1.00
2	1.50	2.00	14.25		1.00
3	2.00	2.00	14.00		1.00
Safe Bearing Capacity					
S.no.	Depth(m)	Width(m)	SBC in (t/m^2)		
			General shear	Local shear	Recommended
1	1.00	2.00	36.95	11.47	25.00
2	1.50	2.00	48.66	15.45	33.09
3	2.00	2.00	61.17	19.71	41.73

SETTLEMENT CALCULATION AS PER 8009 Part-1 1976														CH. (m): 1698.053							BH NO. :- BH-01					
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm2)	Length (m)	Breadth (m)	Layer Thickness (m)	Dispersed Length (m)	Dispersed Breadth (m)	Stress Increment at top for cohesionless layer & at mid Depth for cohesive layer (kg/cm2)	Average N-Value	Mvc (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 V_{m2} (from IS:8009 Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	1.00	4.00	3.00	3.44	2.00	2.00	3.00	2.00	2.000	3.438	25	200	0.9400	0.30	10.00	34.38	29.41	29.41	29.41	0.85	1.00	25.00			
Layer 1	1.50	1.50	4.50	3.00	3.75	2.00	2.00	3.00	2.00	2.000	3.749	25	200	0.9400	0.30	10.00	37.49	32.07	32.07	32.07	0.78	1.00	25.00			
Layer 1	2.00	2.00	5.00	3.00	3.96	2.00	2.00	3.00	2.00	2.000	3.960	25	200	0.9400	0.30	10.00	39.60	33.87	33.87	33.87	0.74	1.00	25.00			



SETTLEMENT CALCULATION AS PER 8009 Part-1 1976												CH. (m):					1698.053				BH NO. :- BH-01			
Layer	Depth below FGL (m)	From (m)	To (m)	Layer Thickness (m)	Stress at Foundation level (kg/cm ²)	Length (m)	Breadth (m)	Layer Thickness (m)	Stress increment at top of cohesionless layer & at mid depth for cohesive layer (kg/cm ²)	Average N-Value	M _{vc} (cm ² /kg)	Consolidation Settlement (mm)	Modulus of Soil (kg/cm ²)	Influence Factor (i)	Poisson's Ratio	Settlement (mm) for 10 t/m ² (from IS:8009 (Part I), Fig. 9, Page NO. 17)	Settlement in Non-Cohesive Soil (mm)	Elastic Settlement (mm)	Total Settlement (mm)	Depth Factor	Rigidity Factor	Corrected Total Settlement (mm)		
Layer 1	1.00	1.00	4.00	3.00	6.88	2.00	2.00	2.000	6.877	25	200		200	0.9400	0.30	10.00	68.77	58.82	58.82		0.85	1.00	50.00	
Layer 1	1.50	1.50	4.50	3.00	7.50	2.00	2.00	2.000	7.498	25	200		200	0.9400	0.30	10.00	74.98	64.14	64.14		0.78	1.00	50.00	
Layer 1	2.00	2.00	5.00	3.00	7.92	2.00	2.00	2.000	7.920	25	200		200	0.9400	0.30	10.00	79.20	67.75	67.75		0.74	1.00	50.00	

5. LIST OF APPROVED VENDORS

APPROVED MANUFACTURES/SUPPLIERS LIST

All materials and products shall conform to the Outline Construction Specification (OCS), BIS codes and other relevant codes etc. and shall be of make as approved by HRIDC.

The list of approved makes for products and materials is given below. No Further approval is required to be taken for usage of these makes.

S. No.	Details of Materials/ Products		Manufacturer's Name
1.	Cement	OPC	ACC, Ultratech, Ambuja, JK Lakshmi, JSW, Orient Cement , JK Cement ,Lafrage ,Wonder
		PSC	DALMIA, JSW
2.	Reinforcement Bars		Prequalified Manufacturers as per RDSO's latest approved list with proper approval of HRIDC
3.	* Epoxy		FOSROC, SIKA QUALCRETE, BASF, CHRYSO, Vista, CICO, Pinnacle, MYK Schomburg, Thermax, Kunal Conchem, Sunanda, Fairmate, Berger, MC-Bauchemie, Fibrex, MAPEI, Ultracon, ECMAS, Durabuild
4(a).	* Expansion Joints for Viaduct		Prequalified Manufacturers as per RDSO's latest approved list with proper approval of HRIDC.
4(b).	* Expansion Joints for buildings		MYK Schomburg, Migua, CS, Sanfield, Inpro, 3R Joints & Seals, VR Engineers, Greensboro Polychem, Maruti, MC-Bauchemie, Asian Paints, ECMAS ,Z Tech
5.	* Admixtures		Buildtech, FOSROC, SIKA, MBT, MC-Bauchemie, Pidilite, CHRYSO, MYK Schomburg, BASF, MAPEI, Kunal Conchem, UNIROCK , CICO, ECMAS, CAC, Fairmate, Vista, Thermax, TP Buildtech, Sunanda, Molecules Conchem, Pinnacle, Durabuild, Ultracon, Ado additives, Asian, Greensboro Polychem, STP, Berger, Fibrex
6.	Pile Integrity Testing		CIMEC, Spectro, ADS Labstech, ATL, Avantech, Geodynamics, AIMIL, Cengers, CBRI, EMC India, Pile Dynamic, Composites Combine Technocrats, CEG test House (PLEASE NOTE THAT NABL ACCREDITATION IS MANDATORY)

7.	* Anchor Fastener	HILTI, FISCHER,BIT, TRUTEK, FOSROC, Mungo, Minova, UIP, Wuerth (Please note that ETA Certification is mandatory for using/supplying fasteners for load bearing structural members)
8.	Structural Steel	TATA, SAIL, ESSAR, Maharashtra Pipes, Jindal Steel & Power Ltd., K.L. Steel, Steel Works & Power Engineers, SKS Ispat & Power, Shamli Steel, Topworth, Goodluck India, Rimjhim
9.	* Pre- stressing Strand (LRPC)	TATA SSL Ltd, USHA Martin, DP Wires, Miki Steel, Kataria Group
10.	* Pot/Elastomeric /Spherical Bearings	Prequalified Manufactures as per RDSO's latest approved list with proper approval of HRIDC
11.	* Horizontal Tie Bars/Shear Bars	Dextra, BB Bars System, BBV Systems, Minova, Euroalloy
12.	* HDPE Sheathing	Rex, Gwalior Polypipes Ltd, Kataria Sheathing, Tirupati, Dynamic Prestress, JK Prestressing
13.	Formwork Release Agent	FOSROC, MC Bauchemie, CICO, CHRYSO, Fibrex, BASF, Sunanda, Pinnacle, Fairmate, Durabuild, CAC, Adoadditives, MYK Schomburg, Greensboro Polychem, Thermax, STP, MAPEI, Asian Labs, ECMAS ,Ultracon, Buildtech.
14.	* Prestressing System	Freyssinet, BBR, VSL, Dynamic, Kellick Nixon, Tensacciai (India Ltd.), JK Prestressing, Usha Martin, VSIL
15.	* Reinforcement Couplers (cold forged paralld threads type only)	Dextra, Halfen Moment, Sanfield, Kridhan , JB Engg
16.	Hollow Sections, Pipes	Surya Pipes, Hi-Tech Pipes, JSW, Jindal Steel and Power Ltd., Garg Ispat Udyog, Navratan, VMC Steel, APL Appolo, DADU Pipes Goodluck India, Sarvari Steel
17.	* Drainage Pipes	Tirupati Plastomatics, Duraline, REX, STIPL, Kriti, Vishal, Eonn, Giga Pipes.

18.	Acrylic Textured Coatings	Spectrum, Surfa Nova, Sunanda, Jotun, Asian Paints, Berger, Hempel, DULUX, STP, Godavari Paints, MC-Bauchemie, MAPEI
19.	* Non Shrink Grout	FOSROC, SIKA, BASF, MBT, CHRYSO, Fairmate, CICO, MYK Schomburg, Pinnacle, ECMAS, Minova, Durabuild, CAC, Asian Paints, STP, BERGER, Fibrex, Ado Additives, Thermax, CICO, Greensboro Polychem, Ultracon, Kunal Conchem, MC-Bauchemie, Asian Labs, MAPEI, Buildtech
20.	Bonding Coat	CICO, FOSROC, Sunanda, BASF, CHRYSO, MYK Schomburg, Minova, Fairmate, STP, SIKA, BERGER, Greensboro Polychem, Thermax, Ultracon, ECMAS, Asian Paints, Fibrex, Asian Labs, Ado Additives, MAPEI, MC-Bauchemie, Durabuild
21.	* Polysuphide Sealant	CICO, Pidilite, BASF, FOSROC, CHRYSO, STP, SIKA, Sunanda, Fairmate, Kunal Conchem, Durabuild, Asian Paints, MYK Schomburg, Greensboro Polychem, Ultracon, ECMAS, Fibrex, MC-Bauchemie, Buildtech
22.	* Steel Structural Fasteners	Sundram Fasteners, Pioneer Nuts & Bolts, Unbrako, Nelson, Panchsheel, LPSEJOT, UIP, Canon, Trutek, Kwaliti Forge, Atul Fasteners, Imperial Bolts, Pooja Forge (Please note that ETA Certification is mandatory for using/supplying fasteners for load bearing structural members)
23.	* Corrosion Protection Paints	Berger, Johnson Nicholson, Nerolac, Asian Paints, Akzo Nobel, Jotun, Shalimar, 3M Fosroc, Hempel, Universal Paint, Sunanda, Kunal Conchem, STP, INM Nuvent Paints, CICO, CHRYSO, Greensboro Polychem
24.	Micro Silica	Thermal Plants, Sika Elkem, FOSROC, MAPEI, Corniche, Star Silica, CICO, Rockfit, Jaycee Build Corp LLP, Vista, Kunal Conchem, CAC, BASF, Buildtech, Ashtech, Ultracon, Alccofine
25.	* Fire Resistant Paint	Akzo Nobel, PPG, Jotun, Sunanda, Berger Paints
26.	* Integral Crystalline Waterproofing Method	Penetron, XYPEX, SIKA
27.	* Water stopper/ Bar	Kanta Rubber, Greenstreak, Duron, Sunanda, Wall Grip, Asian Paints, FOSROC, Maruti, CHRYSO

28.	* Liquid Polymer membrane waterproofing	BASF, MAPEI , NINA, CICO, Kunal Conchem, MYK Schomburg, Sunanda, ECMAS, Durabuild, Asian Paints, STP, BERGER, FOSROC, Greensboro Polychem, Ado Additives, MC-Bauchemie, Thermax, Asian Labs, CHRYSO, Ultracon, Buildtech
29.	* Curing Compound	Clean Tech Concure, Vista, FOSROC, STP, Kunal Conchem, CHRYSO, CICO, Pinnacle, Durabuild, BERGER, Fibrex, Greensboro Polychem, UNICRETE, Ado Additives, UNIROCK, SIKA, Fairmate, MYK Schomburg, Ultracon, ECMAS, Asian Labs, Asian Paints, Molecules Conchem, MC-Bauchemie, MAPEI, Thermax, Buildtech, CAC
30.	* Polycarbonate Sheets	Gallina Acroplus, Coxwell, Poly U, Fabric, Lexan, (SABIC Innovative Plastics), DANPALON, GE Plastics, VMI Plastics, Power Chem Plast, Super Disco Ispat
31.	Fly Ash	Thermal Plants, Ashcrete, Ultra Pozz, Star Pozz, Ashtech, Jaycee Build Corp LLP, SUPERPOZZ P500
32.	* Pre-Coated Profiled Metal Sheethings	TATA Blue Scope, Multicolor, Kamdhenu, Essar Steel, Bhushan Steel, Ispat Profile India, Super Disco Ispat, Aditya Profiles
33.	Sodium Silicate for Grouting purposes during TBM operations	BASF, Kunal Conchem, SIKA, CHRYSO, Subham Mineral, Minova, Sunanda, Greensboro Polychem, Ado Additives, FOSROC, Ultracon, Asian Labs, Fibrex, Buildtech
34.	* Fly Ash Block/ AAC Block	Siporex, Ascolite, J.K. Laxmi, Ashtech, UNICRETE
35.	* Tunnel Segment EPDM	FIP, Datwyler, E.S. Rubber, Haida Rubber
36.	* Rock Bolts/Swellex Bolts	Geo Constech, DSI, Atlas Copco, FIREP International, Minova
37.	* Softeye GFRP	Dextra, FIREP International, Minova, Hughes Brother, Geo Constech
38.	Material Testing	ADS Labstech, Anshu Tech, Arihant, SHREE BALAJI Test House, Beauru Veritas, ShriRam, National Test House, Spectro, Indian Institute of Technology, Pioneer, Secon, Delta, CEG Test House
39.	Geotechnical Investigation	Cengers, CEG Testhouse, Delhi Test House, SHREE BALAJI Test House, Techpro, Arun Soil Labs, Indian Geotechnical, Raicon, Composite Combine Technocrats, Secon, Sai Geotech

40.	* Polymer	WALLGRIP, TRISHUL, Shubham Minerals, Goldy Minerals, GeoPolymer
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NOTE: For the categories marked as *, the enclosed undertaking performa should be duly filled and signed by authorized representatives of concerned agencies.

UNDERTAKING**Name of Contract:****Date of start of work:****Category of work:****Date of completion of work:**

This is to certify that work of (Category to be mentioned)
at

..... (Location) of the contract.....(Name of contract) has been
executed/completed in accordance with the manufacturer's/supplier's specifications
and as per the approved method statement.

The work has been jointly inspected by authorised representative of
(Manufacturer/supplier), (Executing agency) &
..... (Contractor) during its execution and all non-
conformities observed during inspection have been complied to achieve the best
industry standards.

The undersigned take full responsibility of the overall adequacy, accuracy,
effectiveness & warranty (upto design life) of the completed work as per the
provision of the contract

..... (Contract number) and Outline Construction Specifications of HRIDC.

(Stamp and Signature)**Manufacturer
Representative****(Stamp and
Signature)****Executing agency
Representative****(Stamp and
Signature)****Contractor
Representative**