



HOWE Engineers Projects (India) Pvt. Ltd.

REPORT ON
GEOTECHNICAL INVESTIGATION WORK AT HALDIA
TERMINAL FOR INLAND WATERWAYS AUTHORITY OF
INDIA



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TABLE OF CONTENTS

CHAPTER – I	
<i>INTRODUCTION</i>	1
CHAPTER – II	
<i>PROJECT DETAILS</i>	2
CHAPTER – III	
<i>LABORATORY TESTING</i>	6
CHAPTER – IV	
<i>DISCUSSION AND RECOMMENDATION</i>	7
CHAPTER – V	
<i>ANALYSIS AND RECOMMENDATIONS</i>	21
CHAPTER – VI	
<i>LOCATION PLAN</i>	A-1
<i>BORE LOGS</i>	B-1 TO B-50
<i>GRAPHICAL REPRESENTATION OF N-VALUE WITH R.L</i>	B-51 TO B-58
<i>LABORATORY TEST RESULTS</i>	C-1 TO C-41
<i>SOIL PROFILES</i>	D-1 TO D-4
<i>GRAIN SIZE DISTRIBUTION CURVES</i>	E-1 TO E-65
<i>MOHR’S DIAGRAMS</i>	F-1 TO F-49
<i>E-LOGP CURVES</i>	G-1 TO G-32
<i>BEARING AND PILE CAPACITY CALCULATIONS</i>	H-1 TO H-12
<i>SITE PHOTOGRPAHS</i>	I-1 TO I-6

CHAPTER - I

1.0 INTRODUCTION

- 1.1 Geotechnical Investigation work at Haldia Terminal in connection with Detailed Feasibility Study for Capacity Augmentation of National Waterway-1 & Detailed Engineering for its Ancillary Works and processes between Haldia to Allahabad (Jal Marg Vikas Project) was entrusted to Xplorer Consultancy Services Pvt. Ltd., Gurgaon by HOWE Engineering Projects (India) Pvt. Ltd. Nehru Place, New Delhi.
- 1.2 The scope of the soil investigation work consisted of sinking eight (8) land bore holes and four (4) river bore holes each upto a depth of 60.0m below the existing ground level at specified locations. In addition to this collection of undisturbed soil samples from cohesive soil, conducting Standard Penetration Test and conducting necessary laboratory tests on selected soil samples were also included in the scope of work.
- 1.3 The formation at the site is to be reported for various layers present at their respective depths along with their thickness. As ground water table location influences the method of construction of foundation at a site its location also needs to be found out.
- 1.4 During sinking of bore holes soil samples both in disturbed and undisturbed conditions are to be collected for laboratory tests. The disturbed samples would be subjected to tests to obtain soil index properties. The undisturbed soil samples, however, would be used mainly for conducting tests to obtain shear strength parameters as well as consolidation characteristics of the soil representing the strata.
- 1.5 Since the investigation could not cover the regional sub-soil features, due weightage for the variations of sub-surface layers in its horizontal and vertical extent is to be given in selecting design basis.

CHAPTER - II

2.0 PROJECT DETAILS

2.1 The site for the investigation work is situated in the area of Patikhali-Panghat between Tata Chemicals and Hindustan Petroleum in Haldia.

2.2 The field work consisted of sinking twelve (12) bore holes – eight (8) land bore holes and four (4) river bore holes upto a maximum depth of 60.68m below the existing ground / bed level. The details of field work like, location (Co-ordinate), bore hole no., RL at bore hole top, termination depth, water level and the dates of commencement and completion are furnished below.

Bore Hole No.	Location (Co-ordinate)		RL. at Bore Hole Top (m)	Termination Depth (m)	Water Level b.g.l (m)	Start Date	End Date
	North	East					
BH-1	2440210.6	617591.0	+98.0	60.09	1.20	04.12.15	06.12.15
BH-2	2440109.0	617689.2	+97.4	60.18	0.55	30.11.15	03.12.15
BH-3	2440029.4	617768.8	+98.0	60.40	1.10	26.11.15	29.11.15
BH-4	2440052.3	617918.0	+98.6	60.25	1.80	22.11.15	25.11.15
BH-5	2439854.7	617655.0	+97.0	60.03	0.70	13.11.15	16.11.15
BH-6	2439930.6	618021.0	+97.0	60.39	1.00	18.11.15	21.11.15
BH-7	2439699.2	617755.6	+96.5	60.68	1.10	08.12.15	10.12.15
BH-8	2439827.0	618029.0	+97.7	60.00	2.17	11.12.15	14.12.15
BH-9	2439536.0	617783.0	+93.2	60.52	*Under Water	23.12.15	27.12.15
BH-10	2439684.0	618099.0	+93.1	60.15		19.12.15	22.12.15
BH-11	2439495.0	617903.0	+90.8	60.10		14.12.15	18.12.15
BH-12	2439566.0	618042.0	+91.0	60.30		08.12.15	12.12.15

Note: b.g.l.= below ground level, * = The variation of water levels are shown in respective bore logs

2.3 The bore holes of 200 / 150 mm diameter were explored with the help of auger (in land bore holes) and cable operated shell using engine driven mechanical winch as per IS 1892-1979. Here the auger is turned in the bottom of the hole through auger pipes. Due to this the soil cuttings are held in the auger and are drawn to the surface by pulling the auger out of the hole each time the auger is filled. In continuation to auger boring shell is used which is a 127mm diameter steel cylinder with a cutting edge at the bottom and is fitted with a hinged one-way flap valve at the bottom. The bore hole is advanced by raising the shell upto a height and allowing it to fall and this is repeated several times till sufficient amount of soil enters the shell. When the shell gets nearly filled with soil, it is lifted out of the bore hole and emptied. This method of boring is followed upto a suitable depth below the existing ground / bed level.

For further advancement of bore hole mud rotary boring method was adopted. In this method the boring is advanced by a cutter fixed to drill pipes, which are rotated by means of pipe wrenches. Bentonite solution is pushed simultaneously by a mechanical pump. The slurry flowing out of cutter bottom mixes up with the cut soil and flows up to the ground surface, and slurry tank after passing through settling pits and back to the slurry tank. The process is continuous and the same slurry can be used several times. The cutting tool is lowered slowly with the help of a double pulley system fixed on a tripod. This method of boring was followed upto the explored depth of the bore hole.

2.4 Seamless flush jointed steel casings of 200mm / 150mm sizes were used to prevent any caving of bore hole and was inserted simultaneously with the advancement of boring operation.

2.5 The undisturbed samples were collected from the bore holes at 2.0m intervals wherever possible, with the help of a thin walled sampler, as per the IS: 2132-1986 "Code of practice for thin walled tube sampling of soils". The area ratio of the sampler is of the order of twelve percent and the inside clearance is around two percent. The

sample tube about 500mm long and 100mm inner diameter, is coupled with the sampler with a drive head, vent holes and ball check valve to complete the sampling assembly. While sampling below the water table inside the bore hole, the entrapped water has the opportunity to escape through this valve at the top. The sampling assembly is then lowered inside the bore holes by connecting a string of 'A' / 'AW' size drill rods to it. The assembly is driven to a predetermined depth with the help of jarring link. On completion of sampling operation, the sampler is first rotated (so that the soil would shear off on a horizontal plane at the cutting shoe edge) and then raised to the surface. The undisturbed sample is waxed at both ends with proper identification mark on the tube sampler.

2.6 Standard Penetration Tests were conducted inside the bore holes at 2.0m intervals as per IS 2131-1981 "Method of standard penetration tests for soils". The split spoon sampler used is of standard design and dimension. The spoon is advanced by driving with a drop hammer weighing 63.5 kg falling freely through a height of 75 cm. A record of the number of blows required to penetrate every 15 cm. to a depth of 45cm is kept. The number of blows required for the last 30 cm penetration of the split spoon sampler is recorded as 'N'-value. On completion of the test, the sampler is lifted to the ground, opened and the specimen of the soil sample is stored in double polythene bags with the proper identification mark. The penetration number, 'N' has been shown against the corresponding depths in field bore logs.

2.7 Representative disturbed samples were collected regularly and wherever the stratum changed. These samples are taken from the cutting edge of undisturbed samples and the split spoon samplers after standard penetration tests. These samples are labelled depth wise and used in the preparation of bore hole log and for general identification and classification purposes.

2.8 The field investigation work commenced on 13.11.2015 and was completed on 27.12.2015. The depth of water level in land bore hole was measured 24 hours after the completion of bore hole. No artesian condition was encountered in any bore hole.

CHAPTER - III

3.0 LABORATORY TESTING

3.1 The following laboratory tests are carried out on undisturbed and disturbed soil samples for identification and classification purposes and to obtain other relevant properties of the sub-surface formation.

- (a) Natural Moisture Content
- (b) Particle Size Distribution
 - i) Sieve analysis
 - ii) Hydrometer analysis
- (c) Liquid Limit and Plastic Limit
- (d) Bulk and Dry Density
- (e) Unconfined Compression Test
- (f) Triaxial Shear Test (Unconsolidated Un-drained)
- (g) Specific Gravity
- (h) Consolidation Test

3.2 All these tests are conducted as per relevant IS Code where such exists and the test results are tabulated in Tables attached herewith.

CHAPTER - IV

4.0 DISCUSSION AND RECOMMENDATION

4.1 The sub-soil formation for this report has been investigated by sinking twelve (12) bore holes eight (8) land bore holes and four (4) river bore holes upto a maximum depth of 60.68m below the existing ground / bed level at specified locations. The field investigation data and the results of laboratory testing conducted on samples collected from the bore holes indicate the presence of different layers besides a filled up layer at the surface of BH-3 & BH-4 only. The details of layers like layer no., description of layer and the thickness of each layer as encountered in the bore holes are furnished below.

Layer No.	Description	Layer Thickness (m)					
		BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
—	Fill consisting of silty clay with sand, kankars, brick pieces etc.	—	—	1.50	2.00	—	—
I	Very soft / soft / firm / stiff silty clay with occasional laminations of silt / fine sand	*22.00	*23.00	22.00	14.50	20.00	*15.00
II	Medium dense silty fine sand	—	—	—	**6.50	2.00	**6.00
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	12.00	12.00	11.50	13.00	11.00	15.00
IV	Stiff / very stiff sandy silty clay	5.00	3.00	4.00	4.00	4.00	3.70
V	Medium dense / dense silty sand	9.00	6.60	6.50	4.50	6.50	4.30
VI	Stiff / very stiff silty clay with yellow / brown spots	7.50	4.40	7.50	11.50	2.50	10.00
VII	Medium dense / dense silty fine sand	4.59	11.18	7.40	4.25	14.03	6.39
<p>*3.0 ± 0.5m thick bands of medium dense silty sand are found to be present within this layer in BH-1, BH-2 & BH-6 as shown in sub-soil profile. **1.4m & 1.0m thick bands of silty clay are found to be present within this layer in BH-4 & BH-6 respectively as shown in sub-soil profile.</p>							

Layer No.	Description	Layer Thickness (m)					
		BH-7	BH-8	BH-9	BH-10	BH-11	BH-12
—	Fill consisting of silty clay with sand, kankars, brick pieces etc.	—	—	—	—	—	—
I	Very soft / soft / firm / stiff silty clay with occasional laminations of silt / fine sand	19.50	*20.50	*17.00	*17.00	*15.00	*15.00
II	Medium dense silty fine sand	1.50	1.50	—	—	—	—
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	13.00	14.00	14.00	14.00	14.00	15.00
IV	Stiff / very stiff sandy silty clay	4.00	3.00	2.00	4.00	4.00	2.00
V	Medium dense / dense silty sand	6.00	4.70	5.70	4.00	5.70	5.00
VI	Stiff / very stiff silty clay with yellow / brown spots	4.50	10.30	16.80	16.00	14.00	14.70
VII	Medium dense / dense silty fine sand	12.18	6.00	5.02	5.15	7.40	8.60
*4.0 ± 2.0m thick bands of medium dense silty sand are found to be present within this layer in the areas of BH-8 to BH-12 as shown in sub-soil profile.							

Note: The descriptions of layers are very much generalized. For detail description refer respective bore hole logs.

4.2 The water level during the period of field work is shown in the respective bore logs. The results of laboratory test conducted on soil samples are tabulated in table nos. C/1-1 to C/12-3. The bore hole location plan is shown in fig. no.A/1. The graphical representation of field and corrected N-Values with R.L are shown in fig nos.B/1 to B/8. The sub soil formation as revealed by the bore holes are shown in fig no. D/1 to D/4. The grain size distribution curves are shown in fig. nos. E/1 to E/65. Mohr's Diagrams from Triaxial Shear Test are shown in fig. nos. F/1 to F/49. The e-logp curves from Consolidation Test are shown in fig nos.G/1 to G/32.

4.3 On close scrutiny of field and laboratory test results and based on experience and judgement, necessary soil parameters (bore hole wise) for the purpose of design of foundation are tabulated in the following table.

BH-1

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick-ness (m)			
		From	To				
I	Soft / firm silty clay with occasional lamination of silt; medium dense silty fine sand observed from 15.0m to 18.0m depth	+98.0 (G.L.)	+83.0	15.0	2 to 4	1.820	$c=1.9t/m^2$
		+83.0	+80.0	3.0	*19	1.895	$\phi=32.5^\circ$
		+80.0	+76.0	4.0	4	1.837	$c=2.4t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.0	+64.0	12.0	5 to 7	1.755	$c=2.7t/m^2$
IV	Very stiff sandy silty clay with occasional traces of kankars	+64.0	+59.0	5.0	17 to 23	1.991	$\phi_c=10.0t/m^2$
V	Dense silty sand	+59.0	+50.0	9.0	ϕ^*30	$\phi^2.020$	$\phi=35.5^\circ$
VI	Stiff to very stiff / hard silty clay with yellow spots	+50.0	+48.0	2.0	12	1.913	$c=6.0t/m^2$
		+48.0	+45.0	3.0	24	1.970	$\phi_c=12.0t/m^2$
		+45.0	+42.5	2.5	34	$\phi^2.040$	$\phi_c=17.0t/m^2$
VII	Medium dense silty fine sand	+42.5	+37.9 (T.L.)	4.6	*25	$\phi^1.995$	$\phi=34^\circ$

G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, ϕ = Suggested Value

BH-2

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick- ness (m)			
		From	To				
I	Very soft / soft to firm silty clay with occasional laminations of silt / fine sand; medium dense silty fine sand observed from 15.0m to 17.5m depth	+97.4 (G.L.)	+82.4	15.0	1 to 4	1.803	$c=1.6t/m^2$
		+82.4	+79.9	2.5	*10	§1.760	§ $\phi=30^\circ$
		+79.9	+74.4	5.5	5 & 6	1.843	$c=2.9t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+74.4	+62.4	12.0	6 to 9	1.784	$c=3.2t/m^2$
IV	Very stiff sandy silty clay with kankars	+62.4	+59.4	3.0	24 & 27	2.008	§ $c=13.0t/m^2$
V	Medium dense / dense silty sand	+59.4	+52.8	6.6	§*30	§2.020	§ $\phi=35.5^\circ$
VI	Stiff silty clay with brown spots	+52.8	+48.4	4.4	10	1.896	$c=5.0t/m^2$
VII	Medium dense silty fine sand	+48.4	+37.2 (T.L)	11.2	*24	§1.980	§ $\phi=34^\circ$
G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-3

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick- ness (m)			
		From	To				
—	Fill consisting of silty clay with traces of sand, brick pieces etc.	+98.0 (G.L.)	+96.5	1.5	—	1.828	—
I	Soft / firm silty clay with occasional laminations of silt / fine sand	+96.5	+77.0	19.5	2 to 4	1.823	$c=1.9t/m^2$
		+77.0	+74.5	2.5	8	1.851	$c=3.7t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+74.5	+63.0	11.5	5 to 9	1.759	$c=3.0t/m^2$
IV	Very stiff sandy silty clay	+63.0	+59.0	4.0	22 & 28	2.007	$\xi c=12.5t/m^2$
V	Medium dense / dense silty sand	+59.0	+52.5	6.5	*27	$\xi 2.000$	$\xi \phi=34.5^\circ$
VI	Stiff / very stiff silty clay with brown spots	+52.5	+45.0	7.5	15 to 22	1.946	$\xi c=9.0t/m^2$
VII	Medium dense to dense silty fine sand	+45.0	+40.0	5.0	*26	$\xi 2.000$	$\xi \phi=34.5^\circ$
		+40.0	+37.6 (T.L.)	2.4	$\xi *30$	$\xi 2.020$	$\xi \phi=35.5^\circ$
G.L= Ground Level, T.L.= Termination Level, * = Corrected N value, ξ = Suggested Value							

BH-4

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick-ness (m)			
		From	To				
—	Fill consisting of silty clay with sand, kankar, brick pieces etc.	+98.6 (G.L.)	+96.6	2.0	—	§1.800	—
I	Soft / firm silty clay with occasional laminations of silt / fine sand	+96.6	+87.6	9.0	2	1.815	$c=1.6t/m^2$
		+87.6	+82.1	5.5	4 & 6	1.833	$c=2.4t/m^2$
II	Medium dense silty fine sand with a thin band of firm silty clay from 18.6m to 20.0m depth	+82.1	+80.0	2.1	*19	§1.900	§ $\phi=32.5^\circ$
		+80.0	+78.6	1.4	7	§1.850	§ $c=3.5t/m^2$
		+78.6	+75.6	3.0	*11	§1.780	§ $\phi=30^\circ$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.6	+62.6	13.0	6 to 9	1.754	$c=3.5t/m^2$
IV	Stiff to very stiff silty sandy clay	+62.6	+58.6	4.0	18 & 20	1.988	§ $c=9.5t/m^2$
V	Dense to very dense silty sand	+58.6	+54.1	4.5	§*30	§2.020	§ $\phi=35.5^\circ$
VI	Stiff / very stiff silty clay with brown spots	+54.1	+48.6	5.5	22 to 24	1.965	§ $c=11.5t/m^2$
		+48.6	+42.6	6.0	13 to 16	1.929	§ $c=7.0t/m^2$
VII	Medium dense / dense silty fine sand	+42.6	+38.4 (T.L.)	4.2	§*30	§2.020	§ $\phi=35.5^\circ$

G.L= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value

BH-5

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick- ness (m)			
		From	To				
I	Soft / firm silty clay with occasional laminations of silt / fine sand	+97.0 (G.L.)	+81.0	16.0	2 to 4	1.821	$c=1.8t/m^2$
		+81.0	+77.0	4.0	9	1.867	$c=4.0t/m^2$
II	Medium dense silty fine sand	+77.0	+75.0	2.0	*18	§1.885	§ $\phi=32^\circ$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.0	+64.0	11.0	4 to 7	1.755	$c=2.9t/m^2$
IV	Stiff to very stiff silty sandy clay	+64.0	+60.0	4.0	18 & 19	1.994	§ $c=9.5t/m^2$
V	Medium dense silty sand	+60.0	+53.5	6.5	*25	§1.995	§ $\phi=34^\circ$
VI	Very stiff silty clay with yellow spots	+53.5	+51.0	2.5	20	1.956	§ $c=10.0t/m^2$
VII	Medium dense silty fine sand	+51.0	+37.0 (T.L)	14.0	*24	§1.980	§ $\phi=34^\circ$
G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-6

LAYER DETAILS							
No.	Brief Description	RL (m)		Thick-ness (m)	Field N-Value	Bulk Density (t/m ³)	Shear Strength parameter
		From	To				
I	Soft / firm silty clay with occasional laminations of silt; medium dense silty sand with clay as binder observed from 10.0m to 13.5m depth	+97.0 (G.L.)	+87.0	10.0	3	1.827	c=2.0t/m ²
		+87.0	+83.5	3.5	*15	1.840	§φ=31.5°
		+83.5	+82.0	1.5	7	§1.850	§c=3.5t/m ²
II	Medium dense silty fine sand with thin band of firm silty clay from 18.0m to 19.0m depth	+82.0	+79.0	3.0	*24	1.930	§φ=34°
		+79.0	+78.0	1.0	4	§1.830	§c=2.4t/m ²
		+78.0	+76.0	2.0	*11	§1.780	§φ=30°
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.0	+61.0	15.0	4 to 9	1.755	c=3.1t/m ²
IV	Stiff to very stiff sandy silty clay with traces of kankars	+61.0	+60.0	1.0	15	§1.940	§c=7.5t/m ²
		+60.0	+57.3	2.7	26	2.013	§c=13.0t/m ²
V	Medium dense / dense silty sand	+57.3	+53.0	4.3	30	§2.020	§φ=35.5°
VI	Stiff / very stiff silty clay with brown spots	+53.0	+43.0	10.0	13 to 18	1.933	§c=7.5t/m ²
VII	Dense silty fine sand with kankars	+43.0	+36.6 (T.L)	6.4	§*30	§2.020	§φ=35.5°
G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-7

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick- ness (m)			
		From	To				
I	Very soft / soft to firm silty clay with occasional laminations of silt	+96.5 (G.L.)	+78.5	18.0	1 to 3	1.822	$c=1.7t/m^2$
		+78.5	+77.0	1.5	5	1.846	$c=2.6t/m^2$
II	Medium dense silty fine sand	+77.0	+75.5	1.5	*11	§1.780	§ $\phi=30^\circ$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.5	+62.5	13.0	4 to 8	1.766	$c=3.1t/m^2$
IV	Stiff to very stiff sandy silty clay with occasional traces of kankars	+62.5	+58.5	4.0	14 & 17	1.962	§ $c=8.0t/m^2$
V	Medium dense silty sand	+58.5	+52.5	6.0	*25	§1.995	§ $\phi=34^\circ$
VI	Very stiff silty clay with yellow spots	+52.5	+49.5	3.0	16	1.942	$c=8.1t/m^2$
		+49.5	+48.0	1.5	31	2.000	§ $c=15.5t/m^2$
VII	Medium dense / dense silty fine sand	+48.0	+35.8 (T.L.)	12.2	*26	§2.000	§ $\phi=34.5^\circ$

G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value

BH-8

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick-ness (m)			
		From	To				
I	Soft / firm to stiff silty clay with occasional laminations of silt / fine sand; medium dense silty sand with clay as binder observed from 12.0m to 14.5m depth	+97.7 (G.L.)	+87.7	10.0	3	1.822	$c=2.0t/m^2$
		+87.7	+85.7	2.0	5	1.832	$c=2.5t/m^2$
		+85.7	+83.2	2.5	*13	§1.805	§ $\phi=30.5^\circ$
		+83.2	+77.2	6.0	§7	1.855	$c=3.4t/m^2$
II	Silty fine sand	+77.2	+75.7	1.5	–	1.825	§ $\phi=31^\circ$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.7	+61.7	14.0	5 to 9	1.764	$c=3.1t/m^2$
IV	Stiff to very stiff sandy silty clay with kankars	+61.7	+58.7	3.0	13 & 19	1.964	§ $c=8.0t/m^2$
V	Medium dense to dense silty sand	+58.7	+54.0	4.7	§*30	§2.020	§ $\phi=35.5^\circ$
VI	Stiff / very stiff silty clay with yellow / brown spots	+54.0	+43.7	10.3	13 to 19	1.933	§ $c=7.5t/m^2$
VII	Medium dense / dense silty fine sand	+43.7	+37.7 (T.L)	6.0	*24	§1.980	§ $\phi=34^\circ$
G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-9

LAYER DETAILS							
No.	Brief Description	RL (m)		Thick-ness (m)	Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
		From	To				
I	Soft / firm to stiff silty clay with occasional laminations of silt / fine sand; medium dense silty fine sand observed from 9.0m to 11.0m depth	+93.2 (B.L.)	+84.2	9.0	2 to 3	1.736	$c=1.6t/m^2$
		+84.2	+82.2	2.0	*26	§2.000	§ $\phi=34.5^\circ$
		+82.2	+76.2	6.0	12	1.917	$c=5.5t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.2	+62.2	14.0	7 to 9	1.784	$c=3.1t/m^2$
IV	Very stiff sandy silty clay with kankars	+62.2	+60.2	2.0	26	2.002	§ $c=13.0t/m^2$
V	Medium dense to dense silty sand	+60.2	+54.5	5.7	§*30	§2.020	§ $\phi=35.5^\circ$
VI	Very stiff / hard silty clay with yellow spots	+54.5	+48.2	6.3	35 & 36	2.031	§ $c=18.0t/m^2$
		+48.2	+37.7	10.5	21 to 25	1.975	§ $c=11.5t/m^2$
VII	Medium dense silty fine sand	+37.7	+32.7 (T.L.)	5.0	*25	§1.995	§ $\phi=34^\circ$
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-10

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thick-ness (m)			
		From	To				
I	Soft / firm to stiff silty clay with occasional laminations of silt; medium dense silty fine sand observed from 5.5m to 11.5m depth	+93.1 (B.L.)	+87.6	5.5	2 & 4	1.815	$c=1.5t/m^2$
		+87.6	+81.6	6.0	*15	1.834	$\phi=31.5^\circ$
		+81.6	+79.1	2.5	5	1.842	$c=2.8t/m^2$
		+79.1	+76.1	3.0	10 & 12	1.897	$c=4.8t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.1	+62.1	14.0	7 to 9	1.768	$c=3.0t/m^2$
IV	Very stiff / hard sandy silty clay with kankars	+62.1	+58.1	4.0	30 & 37	2.035	$\phi_c=17.0t/m^2$
V	Dense silty sand	+58.1	+54.1	4.0	ϕ^*30	$\phi 2.020$	$\phi=35.5^\circ$
VI	Very stiff silty clay with brown spots	+54.1	+38.1	16.0	17 to 20	1.949	$\phi_c=9.0t/m^2$
VII	Dense silty fine sand	+38.1	+33.0 (T.L.)	5.1	ϕ^*30	$\phi 2.020$	$\phi=35.5^\circ$
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, ϕ = Suggested Value							

BH-11

LAYER DETAILS							
No.	Brief Description	RL (m)		Thick-ness (m)	Field N-Value	Bulk Density (t/m ³)	Shear Strength parameter
		From	To				
I	Firm to stiff silty clay with occasional laminations of silt; medium dense silty fine sand observed from 8.0m to 10.0m depth	+90.8 (B.L.)	+82.8	8.0	5 to 8	1.840	c=3.0t/m ²
		+82.8	+80.8	2.0	*17	§1.870	§φ=32°
		+80.8	+78.8	2.0	7	1.864	c=3.5t/m ²
		+78.8	+75.8	3.0	11 & 13	1.910	c=5.3t/m ²
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.8	+61.8	14.0	8 to 9	1.778	c=3.2t/m ²
IV	Very stiff sandy silty clay	+61.8	+57.8	4.0	30 & 32	2.032	§c=15.5t/m ²
V	Medium dense silty sand with traces of kankars	+57.8	+52.1	5.7	*22	§1.950	§φ=33°
VI	Very stiff silty clay with yellow spots	+52.1	+48.8	3.3	32 & 34	2.022	§c=16.5t/m ²
		+48.8	+38.1	10.7	19 to 24	1.970	§c=10.5t/m ²
VII	Dense / very dense silty fine sand	+38.1	+30.7 (T.L.)	7.4	§*30	§2.020	§φ=35.5°
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

BH-12

LAYER DETAILS							
No.	Brief Description	RL (m)		Thick-ness (m)	Field N-Value	Bulk Density (t/m ³)	Shear Strength parameter
		From	To				
I	Very soft / soft to firm silty clay with occasional laminations of silt / fine sand; medium dense silty fine sand with clay as binder observed from 12.0m to 14.0m depth	+91.0 (B.L.)	+85.0	6.0	1	§1.700	–
		+85.0	+79.0	6.0	5 & 8	1.837	c=3.0t/m ²
		+79.0	+77.0	2.0	*17	§1.870	§φ=32°
		+77.0	+76.0	1.0	–	1.919	c=5.6t/m ²
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.0	+61.0	15.0	6 to 9	1.775	c=3.1t/m ²
IV	Very stiff sandy silty clay with kankars	+61.0	+59.0	2.0	18	1.974	§c=9.0t/m ²
V	Dense / very dense silty sand	+59.0	+54.0	5.0	§*30	§2.020	§φ=35.5°
VI	Very stiff silty clay with yellow spots	+54.0	+51.0	3.0	28	1.994	§c=14.0t/m ²
		+51.0	+44.0	7.0	15 to 19	1.948	§c=8.5t/m ²
		+44.0	+39.3	4.7	21 to 28	1.986	§c=12.5t/m ²
VII	Medium dense to dense / very dense silty fine sand	+39.3	+36.0	3.3	*28	§2.010	§φ=35°
		+36.0	+30.7 (T.L)	5.3	§*30	§2.020	§φ=35.5°
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, § = Suggested Value							

4.4 In view of the sub-soil formation encountered in this area suitable foundation system for the proposed structures envisages in chapter V.

CHAPTER - V

5.0 ANALYSIS AND RECOMMENDATION

5.1 For the design of foundation, a generalised soil profile has been prepared considering individual borehole profile and design parameters for land area as well as for boreholes in water. The generalised soil profile is categorised into two zones, Ist for Land zone and IInd for water zone. The generalised soil profile considered for the design for foundation along with the design parameters are presented in Table 5.1 and Table 5.2

Table 5.1: Soil Profile for Boreholes on Land

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Dry Density (t/m^3)	Shear Strength parameter
No.	Description	RL (m)		Thick- ness (m)				
		From	To					
I	Soft Silty CLAY	97.5	82.5	15.0	3	1.81	1.39	$c=2.3t/m^2$
II	Firm Silty CLAY	82.5	76.0	6.5	6	1.84	1.41	$c=3.1t/m^2$
III	Firm Silty CLAY	76.0	61.0	15.0	7	1.76	1.35	$c=3.2t/m^2$
IV	Very Stiff Silty CLAY	61.0	57.5	3.5	20	1.97	1.51	$\xi c=9.0t/m^2$
V	Medium Dense Silty SAND	57.5	53.0	4.5	*28	2.00	1.54	$\xi\phi=35^\circ$
VI	Very Stiff Silty CLAY	53.0	42.5	10.5	17	1.94	1.49	$\xi c=8.0t/m^2$
VII	Medium Dense Silty SAND	42.5	37.5	5.0	*26	2.00	1.54	$\xi\phi=35^\circ$

G.L= Ground Level, T.L.= Termination Level, * = Corrected N value, ξ = Suggested Value

Table 5.2: Soil Profile for Boreholes in Water

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Dry Density (t/m^3)	Shear Strength parameter
No.	Description	RL (m)		Thick- ness (m)				
		From	To					
I	Soft Silty CLAY	91.0	79.0	12.0	4	1.81	1.39	$c=2.0t/m^2$
II	Stiff Silty CLAY	79.0	76.0	3.0	10	1.90	1.46	$c=5.3t/m^2$
III	Firm Silty CLAY	76.0	62.0	14.0	8	1.77	1.36	$c=3.1t/m^2$
IV	Very Stiff Silty CLAY	62.0	59.0	3.0	27	2.00	1.54	$\xi c=13.6t/m^2$
V	Medium Dense Silty SAND	59.0	54.0	5.0	*28	1.98	1.52	$\xi\phi=35^\circ$
VI	Very Stiff Silty CLAY	54.0	38.0	16.0	22	1.96	1.51	$c=12.8t/m^2$
VII	Medium Dense Silty SAND	38.0	31.0	7.0	*28	2.00	1.54	$\xi\phi=35^\circ$
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, ξ = Suggested Value								

5.2 Scour Depth

For the proposed jetty, the scour depth as provided by the design consultant is (-) 25.0m CD, which has been considered for the pile capacity calculations.

5.3 Recommendations Regarding Type of Foundation

Following types of foundations are envisaged for the proposed structures:

Shallow Foundation

Pile Foundation

5.3.1 Shallow / Open Foundation

A properly designed foundation has to satisfy two allowable values of shear strength and settlement.

For soils, based on shear strength properties, the net Safe Bearing Capacities are calculated using Hansen's General Bearing Capacity Equation as recommended by Indian Standards with a Factor of Safety equal to 2.5 which takes care of L/B ratio, depth of foundation etc. along with other parameters. The calculations have been performed as per IS: 6403 using following equation:

$$Q \text{ (Safe, Net)} = \frac{((C.N_c.S_c.d_c.i_c) + ((\gamma * D)(N_q - 1)S_q.d_q.i_q) + (0.5.B.\gamma.N_\gamma.S_\gamma.d_\gamma.i_\gamma))}{FS}$$

Where, C = Cohesion in kPa

$N_c, N_q \& N_\gamma$ = Bearing Capacity Factors taken from IS: 6403-1981

$S_c, S_q \& S_\gamma$ = Shape Factors taken from IS: 6403-1981

$d_c, d_q \& d_\gamma$ = Depth Factors taken from IS: 6403-1981

$i_c, i_q \& i_\gamma$ = Inclination Factors taken from IS: 6403-1981

γ = Unit Weight in kN/m^3

D = Depth of foundation in m

B = Width of foundation in m

FS = Factor of Safety (2.5)

The foundation settlements are estimated using compressibility characteristics of the sub-soils. Computations are performed using isotropic stress distribution. The settlement for each layer is obtained and total settlement is arrived by adding components of each layer. This is corrected for depth factor as recommended by Fox and rigidity factor. Settlement analyses have been performed as per IS: 8009 (Part I) - 1976 using following equations:

For Clayey (Plastic) Soils

Settlement (Δ in mm) = $m_v * H * \Delta P * \mu_g * d_f * \text{Rigidity Factor}$

Where, m_v = Coefficient of volume compressibility

H = Thickness of layer in m

ΔP = Pressure Increment = $P * I$

P = Design Bearing Capacity in kPa

I = Influence Factor for Immediate Settlement taken from Fig.18 of IS: 8009 (Part-I)

μ_g = A Factor Related to Pore Pressure Parameter A and the Dimensions of Loaded Area (From Table 1 of IS: 8009 (Part-1) -1976)

d_f = Depth Factor taken from Fig.12 of IS:8009 (Part-I) -1976

Rigidity Factor = 0.8 taken from IS: 8009 (Part-I) -1976

For Non-Plastic Soils (Sand/Silt)

Settlement (Δ in mm) = $2.303 * \frac{H}{C} * \text{Log}_{10} ((P_o + \Delta P) / P_o) * d_f * \text{Rigidity Factor}$

Where, H = Thickness of layer in m

ΔP = Pressure Increment = $P \cdot I$

P = Design Bearing Capacity in kPa

I = Influence Factor for Immediate Settlement taken from Fig.18 of

IS: 8009 (Part-I) -1976

d_f = Depth Factor from Fig.12 of IS: 8009 (Part-I) -1976

Rigidity Factor = 0.8 from IS: 8009 (Part-I) -1976

P_o = Overburden Pressure in kN/m^2

$C = 1.5 \times (C_{kd} / P_o)$

C_{kd}/N – from available correlations as per IS 2911 (Part1, Sec-2)-2010.

Table 5.3 Recommended Bearing Capacities

Depth of Foundation Below EGL (m)	Founding Strata	Size of Foundation (m)	Shape of Footing	Net Safe Bearing capacity from Shear (kPa)	Allowable Bearing capacity for 25mm Settlement (kPa)
1.2	Soil	1.5	Strip	55	55
2.0				60	60
2.5				60	60
3.0				65	65
1.2	Soil	2.0	Strip	50	50
2.0				55	55
2.5				55	55
3.0				60	60
1.5	Soil	1.5X1.5	Square	70	70
2.0				75	75
2.5				80	80
3.0				85	85
1.5	Soil	2.0X2.0	Square	70	70
2.0				70	70
2.5				75	75
3.0				80	80

Depth of Foundation Below EGL (m)	Founding Strata	Size of Foundation (m)	Shape of Footing	Net Safe Bearing capacity from Shear (kPa)	Allowable Bearing capacity for 25mm Settlement (kPa)
1.5	Soil	4.0X4.0	Square	65	65
2.0				65	65
2.5				65	65
3.0				70	70
1.5	Soil	6.0X6.0	Square	60	50
2.0				65	40
2.5				65	45
3.0				65	45

5.3.2 Pile Foundations

As per the subsoil condition, large diameter bored cast-in-situ pile foundation is found to be suitable at this site.

The computation of pile capacities has been carried out as per IS: 2911 (Part I/ Sec 2) – 2010 using following equation:

Ultimate Pile Capacity = Sum of skin friction for various layers + end bearing

$$= \sum f_u A_s + q_u A_p$$

For Non-Plastic (SAND/SILT) Soils,

Skin Friction, f_u (in kN) = $K \cdot P_o \cdot \tan \delta$

Where, K = Coefficient of Earth Pressure (Taken as 1 from IS 2911 (Part1, Sec1))

P_o = Overburden Pressure in kN/m^2 at the centre of the layer (Limited to 15 times pile diameter)

$$\delta = \phi$$

End Bearing, q_u (in kN) = $P_o \cdot N_q$

Where, P_o = Overburden Pressure in kN/m^2 at the pile tip (Limited to 15 times pile diameter)

N_q = Taken From Fig.1 of Amendment No.1 of IS: 2911 (Part1, Sec-2)

For Plastic (CLAY) Soils,

Skin Friction, f_u (in kN) = $\alpha \cdot C$

Where, C = Cohesion in kPa (taken from laboratory test results / available correlations with SPT.)

α = Reduction Factor Taken From IS:2911 (Part-1, Sec-2):2010

End Bearing, q_u (in kN) = $9 \cdot C$

A factor of safety of 2.5 has been adopted for both skin friction and end bearing to arrive at allowable pile capacity. For estimating uplift capacity a FOS of 3 has been applied on the skin friction component.

Pile head deflection has been estimated for both fixed and free head conditions as per Annexure-D (Addendum No.3) of IS 2911 Part1 Sec2. Lateral capacity has been estimated corresponding to a deflection of 1% of pile diameter (i.e., 10 mm for 1000mm dia. Piles, 12 mm for 1200mm dia. Piles and 14 mm for 1400mm dia. Piles) at Pile head or scour level whichever is applicable. For boundary wall, pile diameter is considered as 450mm and lateral load estimate corresponding to deflection of 5mm. For working piles, as the rotation at the pile head is restrained, capacity corresponding to fixed head has to be considered. Grade of concrete considered is M30. The Pile Capacities are presented in Table 5.4 below

Table 5.4 Recommended Pile Capacities

Zone	Pile Dia (m)	Pile Length below Cutoff Level (m)	Comp. (T)	Pull out (T)	Lateral Capacity(T)	
					Fixed Head	Free Head
Land Zone	0.45	40.0	90	50	3	2
		50.0	100	70		
		58.0	130	90		
	0.60	40.0	140	70	5	3
		50.0	140	100		
		58.0	200	130		

Zone	Pile Dia (m)	Pile Length below Cutoff Level (m)	Comp. (T)	Pull out (T)	Lateral Capacity(T)	
					Fixed Head	Free Head
Land Zone	1.0	45.0	240	170	7	3
		50.0	270	200		
		58.0	560	270		
	1.2	45.0	300	220	10	4
		50.0	340	250		
		58.0	800	350		
	1.4	45.0	380	280	14	6
		50.0	420	300		
		58.0	1000	400		
Water Zone	1.0	45.0	170	100	2	1
		50.0	200	130		
		58.0	500	200		
	1.2	45.0	210	130	5	1
		50.0	250	160		
		58.0	780	280		
	1.4	45.0	250	150	8	2
		50.0	300	180		
		58.0	1000	350		

5.4 Recommendation on Chemical Analysis of Subsoil

A summary of chemical analysis results of soil is presented in Table 5.5.

Table 5.5 Chemical Test Results

Bore Hole No.	Depth (m)	Chloride (%)	Sulphate (%)
BH-4	10.0	0.243	0.076
	28.0	0.243	0.638
	50.0	0.067	0.122
BH-5	11.0	0.253	0.059
	27.0	0.221	0.199
BH-10	11.0	0.364	0.083
	25.0	0.243	0.475
	47.0	0.074	0.123
BH-11	7.0	0.257	0.031
	21.0	0.324	0.531
	44.0	0.051	0.098

As per Table 3, IS: 456-2000, the exposure conditions for foundation works is low. As seen from the chemical analysis results in Table 5.5 the SO₃ content of soil falls in Class 3 (Table 4, IS: 456-2000). Super sulphated or Sulphate resisting Portland cement shall be used with minimum cement content of 330kg/m³ and maximum face water cement ratio of 0.5

There is no specific recommendation in IS: 456 as regard to allowable limits of chloride in ground water or soil. Warnings on chlorides in concrete are given in terms of chlorides coming from mix constituents like use of chloride based admixtures or contaminated aggregates rather than penetration of chlorides into concrete from environment.

5.5 Ground Improvement

As seen from the soil profile, the top soil upto 15m is soft clay. The bearing capacity of these soil strata is low i.e 50-80 kPa. In case these bearing capacities are not adequate for some structures, either pile foundations or ground improvement techniques may be adopted. The ground improvement technique will improve the bearing capacity and reduce the settlement, however, it may be time consuming as it may require preloading. If it is decided to go for ground improvement, depending on type of structure and loading conditions and available time, stone columns or PVD may be adopted, for which a detailed design need to be carried out. Preliminary recommendations for PVD and stone column are given below:

a. PVD with Preloading: This will enhance the shear strength and compressible properties of soils. Spacing of PVD would be of the range of 1m to 1.5m and depth 15 to 20m. Preload height and duration shall depend on the required bearing capacity and allowable settlement for the structure. With proper design the bearing capacity can be increased to 100 to 150 kPa.

b. Stone Column: stone columns are a ground improvement technique to reinforce the soils. It improves the load bearing capacity and reduces the settlement of the soil. Preloading is generally not required for stone columns. Diameter of the stone column will be around 600-800mm and the spacing around 2-3D. Bearing capacity can be improved upto 150 to 200 kPa. A detailed design need to be carried out depending type of structure, it's loading conditions and allowable settlements.

5.6 Conclusions

- The findings presented in this report are based the subsoil conditions as found at the borehole locations. In case of any variation in subsoil conditions at the actual foundation location the matter shall be referred to the designer.
- As per the sub soil and loading conditions open/shallow foundations are possible only for lightly loaded structures not sensitive to total and differential settlements. For moderately loaded structures either pile foundations or ground improvements with PVD or stone columns may be adopted. For heavily loaded structures pile foundations to be adopted. For the proposed jetty large diameter bored pile foundation is considered suitable for this site. The recommended bearing capacities and pile capacities are presented in Table 5.3 and Table 5.4 respectively.
- The pile capacities in compression and uplift can be increased under wind/seismic loading conditions as per provisions in relevant IS and/or IRC codes. The pile

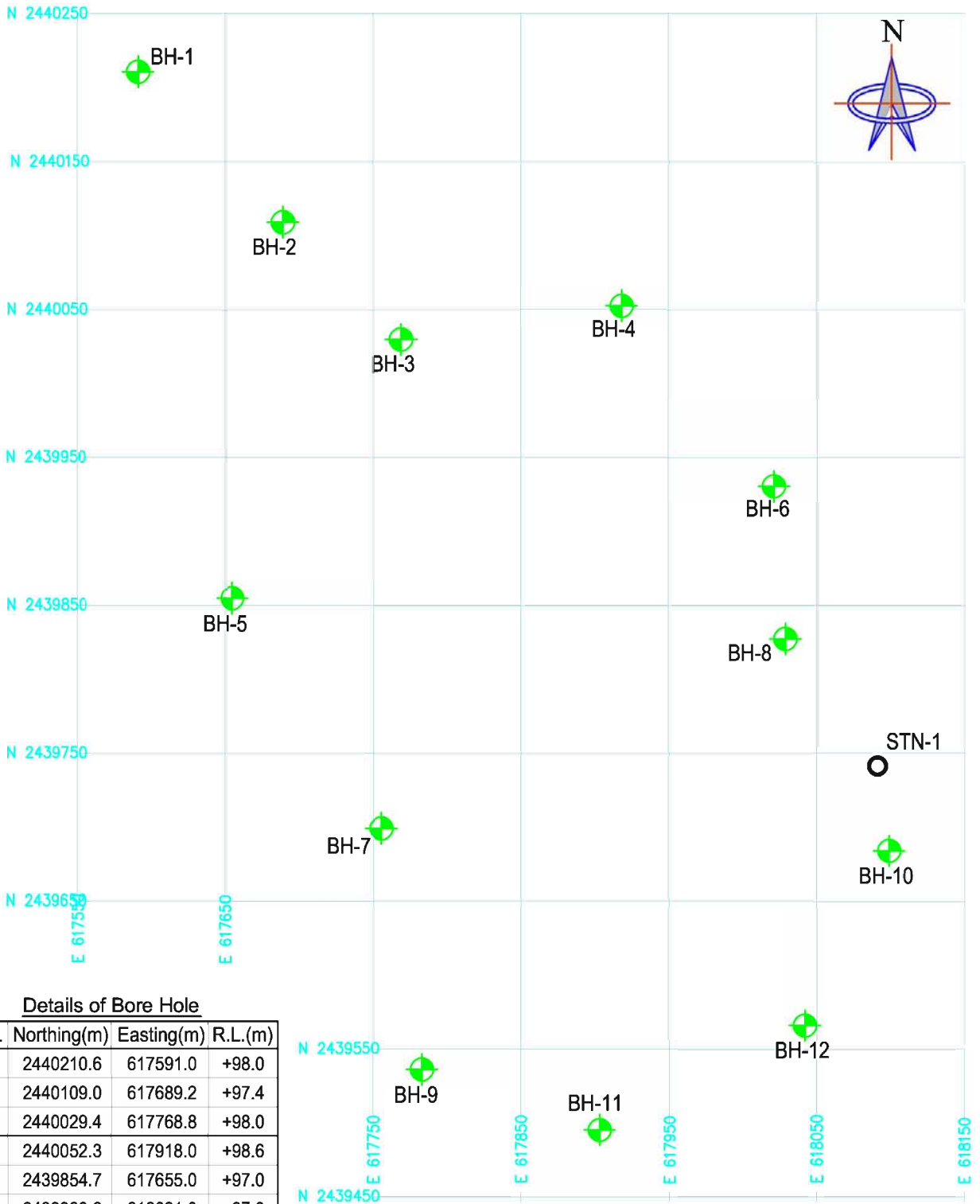
- capacities need to be ascertained at site by conducting initial load tests
- Pile holes shall be cleaned properly before pouring concrete in order not to have any loose material at borehole bottom, to achieve mobilization of end bearing. The time between drilling and the concreting should be kept minimum in order to reduce the gradual softening of the borehole walls.

for **XPLORER Consultancy Services Pvt. Ltd.**

Dated April 13, 2016

P. K. Kundu
Managing Director

CHAPTER-VI



Details of Bore Hole

BH No.	Northing(m)	Easting(m)	R.L.(m)
BH-1	2440210.6	617591.0	+98.0
BH-2	2440109.0	617689.2	+97.4
BH-3	2440029.4	617768.8	+98.0
BH-4	2440052.3	617918.0	+98.6
BH-5	2439854.7	617655.0	+97.0
BH-6	2439930.6	618021.0	+97.0
BH-7	2439699.2	617755.6	+96.5
BH-8	2439827.0	618029.0	+97.7
BH-9	2439536.0	617783.0	+93.2
BH-10	2439684.0	618099.0	+93.1
BH-11	2439495.0	617903.0	+90.8
BH-12	2439566.0	618042.0	+91.0

Notes :-

1. All dimensions are in metre, unless otherwise mentioned.
2. Location (Co-ordinate) of Bore Holes were supplied by the Client.
3. Reduced level of Bore Holes are based on Reference point STN-1 whose co-ordinates are N=2439741.000, E=618091.000 and assumed value is +100.0m (+8.688CD).

Bore Hole Location Plan at Haldia Terminal



Job No.:
XCSPL/1372

Scale: 1:4000

Figure No.: A/1

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-1

Location :N:2440210.6 E:617591.0

Ground Elevation : +98.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.40m

Date : From 04.12.15 To 06.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
04/12	+98.0	0.00													Soft / firm grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 15.0m to 18.0m depth.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	0	1	1	-	2	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	1	1	1	-	2	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	1	2	2	-	4	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	1	2	2	-	4	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		10.00	10.45	0.45	P	1	2	2	-	4	-	-	-	-	
11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-			
12.00	12.45	0.45	P	0	1	2	-	3	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P.Dutta

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-1

Location :N:2440210.6 E:617591.0

Ground Elevation : +98.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.40m

Date : From 04.12.15 To 06.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 15.0m to 18.0m depth.	
		14.00	14.45	0.45	P	1	2	2	-	4	-	-	-	-		
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-		
		16.00	16.45	0.45	P	11	12	14	-	26	-	-	-	-		
		17.00	17.50	0.50	U	Slipped					-	-	-	-		
		18.00	18.45	0.45	P	3	4	5	-	9	-	-	-	-		
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-		
		20.00	20.45	0.45	P	1	2	2	-	4	-	-	-	-		
		21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+76.0	22.00	22.45	0.45	P	2	2	3	-	5	-	-	-	-		22.00m
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-		Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.
		24.00	24.45	0.45	P	2	3	3	-	6	-	-	-	-		
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-		
05/12		26.00	26.45	0.45	P	2	2	3	-	5	-	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P.Dutta

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-1

Location :N:2440210.6 E:617591.0

Ground Elevation : +98.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.40m

Date : From 04.12.15 To 06.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.	
		28.00	28.45	0.45	P	2	2	3	-	5	-	-	-	-		
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-		
		30.00	30.45	0.45	P	3	3	4	-	7	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	2	3	4	-	7	-	-	-	-		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+64.0	34.00	34.45	0.45	P	7	8	9	-	17	-	-	-	-		34.00m
		35.00	35.50	0.50	U	-	-	-	-	-	-	-	-	-		Very stiff bluish grey to grey sandy silty clay with occasional traces of kankars.
		36.00	36.45	0.45	P	7	7	12	-	19	-	-	-	-		
		37.00	37.50	0.50	U	-	-	-	-	-	-	-	-	-		
		38.00	38.45	0.45	P	5	8	15	-	23	-	-	-	-		
	+59.0	39.00	39.50	0.50	U	Slipped					-	-	-	-	39.00m	
		40.00	40.42	0.42	P	25	51	53	-	>100	-	-	-	-	Dense greyish yellow silty sand.	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P.Dutta

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-2

Location : N:2440109.0 E:617689.2

Ground Elevation : +97.4m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 0.55m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.00m

Date : From 30.11.15 To 03.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
30/11	+97.4	0.00													Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 15.0m to 17.5m depth.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
		1.00	1.45	0.45	P	0	1	1	-	2	-	-	-	-	
		2.00	2.50	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P	0	0	1	-	1	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		5.00	5.45	0.45	P	0	1	1	-	2	-	-	-	-	
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.00	7.45	0.45	P	1	1	1	-	2	-	-	-	-	
		8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P	1	1	2	-	3	-	-	-	-	
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	
		11.00	11.45	0.45	P	1	2	2	-	4	-	-	-	-	
12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.

BORE / DRILL LOG

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-2

Location : N:2440109.0 E:617689.2

Ground Elevation : +97.4m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 0.55m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.00m

Date : From 30.11.15 To 03.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
01/12	+74.4	13.00	13.45	0.45	P	1	2	2	-	4	-	-	-	-	Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 15.0m to 17.5m depth.	
		14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-		
		15.00	15.45	0.45	P	3	4	6	-	10	-	-	-	-		
		16.00	16.50	0.50	U	Slipped					-	-	-	-		
		17.00	17.45	0.45	P	4	5	7	-	12	-	-	-	-		
		18.00	18.50	0.50	U	-	-	-	-	-	-	-	-	-		
		19.00	19.45	0.45	P	2	2	3	-	5	-	-	-	-		
		20.00	20.50	0.50	U	-	-	-	-	-	-	-	-	-		
		21.00	21.45	0.45	P	2	3	3	-	6	-	-	-	-		
		22.00	22.50	0.50	U	-	-	-	-	-	-	-	-	-		
		23.00	23.45	0.45	P	2	3	3	-	6	-	-	-	-		23.00m
		24.00	24.50	0.50	U	-	-	-	-	-	-	-	-	-		Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.
		25.00	25.45	0.45	P	3	3	4	-	7	-	-	-	-		
		26.00	26.50	0.50	U	-	-	-	-	-	-	-	-	-		
27.00	27.45	0.45	P	2	2	4	-	6	-	-	-	-				

NOTES
 1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
 2. Level at which Artesian Condition experienced and its pressure, if any :
 3. Water Loss with depth, if any :
 4. Colour of water during drilling :

Site Engineer : A.Sarkar Driller: M.Barui Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-2

Location : N:2440109.0 E:617689.2

Ground Elevation : +97.4m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 0.55m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.00m

Date : From 30.11.15 To 03.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description		
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value							
02/12	+62.4	28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.		
		29.00	29.45	0.45	P	3	3	4	-	7	-	-	-	-			
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-			
		31.00	31.45	0.45	P	4	4	5	-	9	-	-	-	-			
		32.00	32.50	0.50	U	-	-	-	-	-	-	-	-	-			
		33.00	33.45	0.45	P	3	5	5	-	10	-	-	-	-			
		34.00	34.50	0.50	U	-	-	-	-	-	-	-	-	-			
		35.00	35.45	0.45	P	8	10	14	-	24	-	-	-	-		35.00m	
	+59.4		36.00	36.50	0.50	U	-	-	-	-	-	-	-	-	Very stiff bluish grey / grey sandy silty clay with kankars.		
			37.00	37.45	0.45	P	9	12	15	-	27	-	-	-		-	
			38.00	38.50	0.50	U	Slipped					-	-	-		-	38.00m
			39.00	39.45	0.45	P	26	38	41	-	79	-	-	-		-	Medium dense / dense greyish yellow silty sand.
			41.00	41.45	0.45	P	26	43	54	-	97	-	-	-		-	
			43.00	43.45	0.45	P	20	29	45	-	74	-	-	-		-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-2

Location : N:2440109.0 E:617689.2

Ground Elevation : +97.4m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 0.55m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.00m

Date : From 30.11.15 To 03.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
03/12	+52.8	45.00	45.45	0.45	P	8	9	10	-	19	-	-	-	-	44.60m Stiff grey silty clay with brown spots.
		46.00	46.50	0.50	U	-	-	-	-	-	-	-	-	-	
		47.00	47.45	0.45	P	3	5	5	-	10	-	-	-	-	
		48.00	48.50	0.50	U	-	-	-	-	-	-	-	-	-	
	+48.4	49.00	49.45	0.45	P	32	47	56	-	103	-	-	-	-	49.00m Medium dense yellowish grey to grey silty fine sand.
		51.00	51.45	0.45	P	27	36	43	-	79	-	-	-	-	
		53.00	53.45	0.45	P	20	32	36	-	68	-	-	-	-	
		55.00	55.45	0.45	P	18	30	40	-	70	-	-	-	-	
		57.00	57.45	0.45	P	20	28	37	-	65	-	-	-	-	
		58.50	58.95	0.45	P	18	32	34	-	66	-	-	-	-	
		60.18	60.63	0.45	P	20	30	32	-	62	-	-	-	-	
	+37.2	60.18												(Termination Depth)	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-3

Location : N:2440029.4 E:617768.8

Ground Elevation : +98.0m

Method of Boring / Drilling :Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 26.11.15 To 29.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
26/11	+98.0	0.00													Fill consisting of grey silty clay with traces of sand, brick pieces etc.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
	+96.5	1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	1.50m Soft / firm grey silty clay with occasional laminations of silt / fine sand
		2.00	2.45	0.45	P	1	1	1	-	2	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	0	1	1	-	2	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	1	1	2	-	3	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	2	3	3	-	6	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
27/11		10.00	10.45	0.45	P	3	3	3	-	6	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P	1	1	1	-	2	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: M.Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-3

Location : N:2440029.4 E:617768.8

Ground Elevation : +98.0m

Method of Boring / Drilling :Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 26.11.15 To 29.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with occasional laminations of silt / fine sand.	
		14.00	14.45	0.45	P	2	2	2	-	4	-	-	-	-		
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-		
		16.00	16.45	0.45	P	2	3	5	-	8	-	-	-	-		
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-		
		18.00	18.45	0.45	P	1	1	2	-	3	-	-	-	-		
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-		
		20.00	20.45	0.45	P	1	2	2	-	4	-	-	-	-		
		21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-		
		22.00	22.45	0.45	P	3	4	4	-	8	-	-	-	-		
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+74.5	24.00	24.45	0.45	P	2	2	3	-	5	-	-	-	-		Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-		
		26.00	26.45	0.45	P	2	3	4	-	7	-	-	-	-		

NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test				
	2. Level at which Artesian Condition experienced and its pressure, if any :				
	3. Water Loss with depth, if any :				
	4. Colour of water during drilling :				
Site Engineer :	A.Sarkar	Driller:	M.Barui	Job No.:	XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-3

Location : N:2440029.4 E:617768.8

Ground Elevation : +98.0m

Method of Boring / Drilling :Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 26.11.15 To 29.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
28/11	+63.0	27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.	
		28.00	28.45	0.45	P	3	4	4	-	8	-	-	-	-		
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-		
		30.00	30.45	0.45	P	4	5	5	-	10	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	3	4	5	-	9	-	-	-	-		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-		
		34.00	34.45	0.45	P	4	5	5	-	10	-	-	-	-		
		35.00	35.50	0.50	U	-	-	-	-	-	-	-	-	-		35.00m
		36.00	36.45	0.45	P	6	9	13	-	22	-	-	-	-		Very stiff grey sandy silty clay.
37.00	37.50	0.50	U	-	-	-	-	-	-	-	-	-				
38.00	38.45	0.45	P	11	13	15	-	28	-	-	-	-				
39.00	39.50	0.50	U		Slipped					-	-	-	-	39.00m		
40.00	40.45	0.45	P	16	26	36	-	62	-	-	-	-	-	Medium dense / dense greyish yellow silty sand.		
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :															
Site Engineer : A.Sarkar					Driller: M.Barui					Job No.: XCSPL/1372						

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-3

Location : N:2440029.4 E:617768.8

Ground Elevation : +98.0m

Method of Boring / Drilling :Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 26.11.15 To 29.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
29/11	+52.5	42.00	42.45	0.45	P	24	46	50	-	96	-	-	-	-	Medium dense / dense greyish yellow silty sand. ----- 45.50m ----- Stiff / very stiff bluish grey / grey silty clay with brown spots; hard grey silty sandy clay observed at 52.0m depth.
		44.00	44.45	0.45	P	18	28	42	-	70	-	-	-	-	
		46.00	46.45	0.45	P	8	9	13	-	22	-	-	-	-	
		47.00	47.50	0.50	U	-	-	-	-	-	-	-	-	-	
		48.00	48.45	0.45	P	6	7	8	-	15	-	-	-	-	
		49.00	49.50	0.50	U	-	-	-	-	-	-	-	-	-	
		50.00	50.45	0.45	P	7	7	9	-	16	-	-	-	-	
	+45.0	51.00	51.50	0.50	U	-	-	-	-	-	-	-	-	-	----- 53.00m ----- Medium dense to dense greyish yellow / grey silty fine sand.
		52.00	52.45	0.45	P	8	10	22	-	32	-	-	-	-	
		53.00	53.50	0.50	U	Slipped					-	-	-	-	
		54.00	54.45	0.45	P	19	36	38	-	74	-	-	-	-	
		56.00	56.45	0.45	P	22	32	48	-	80	-	-	-	-	
		58.00	58.38	0.38	P	22	50	51	-	>100	-	-	-	-	
		60.40	60.68	0.28	P	36	65	-	-	>100	-	-	-	-	
+37.6	60.40	(Termination Depth)													
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :														
Site Engineer : A.Sarkar					Driller: M.Barui					Job No.: XCSPL/1372					

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-4

Location : N:2440052.3 E:617918.0

Ground Elevation : +98.6m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.80m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx- 12.50 m.

Date : From 22.11.15 To 25.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
22/11	+98.6	0.00													Fill consisting of yellowish grey silty clay with sand, kankars, brick pieces etc.	
		0.50	-	-	D	-	-	-	-	-	-	-	-	-		
			1.00	1.45	0.45	P	2	3	5	-	8	-	-	-	-	
		+96.6	2.00	2.50	0.50	U	-	-	-	-	-	-	-	-	-	2.00m
			3.00	3.45	0.45	P	1	1	1	-	2	-	-	-	-	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt/ fine sand.
			4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
			5.00	5.45	0.45	P	0	1	1	-	2	-	-	-	-	
			6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
			7.00	7.45	0.45	P	0	1	1	-	2	-	-	-	-	
			8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-	
			9.00	9.45	0.45	P	0	1	1	-	2	-	-	-	-	
	10.00		10.50	0.50	U	-	-	-	-	-	-	-	-	-		
23/11		11.00	11.45	0.45	P	2	3	3	-	6	-	-	-	-		
		12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-		
		13.00	13.45	0.45	P	2	5	8	-	13	-	-	-	-		
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :															
Site Engineer : A. Sarkar						Driller: M. Barui						Job No.: XCSPL/1372				

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-4

Location : N:2440052.3 E:617918.0

Ground Elevation : +98.6m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.80m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx- 12.50 m.

Date : From 22.11.15 To 25.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
	+82.1	14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt/ fine sand. ----- 16.50m ----- Medium dense grey silty fine sand with a thin band of firm grey silty clay from 18.60m to 20.00m depth. ----- 23.00m ----- Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
		15.00	15.45	0.45	P	1	2	2	-	4	-	-	-	-	
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-	
		17.00	17.45	0.45	P	6	12	14	-	26	-	-	-	-	
		18.00	18.50	0.50	U	Slipped					-	-	-	-	
		19.00	19.45	0.45	P	2	3	4	-	7	-	-	-	-	
		20.00	20.50	0.50	U	-	-	-	-	-	-	-	-	-	
		21.00	21.45	0.45	P	6	7	7	-	14	-	-	-	-	
		22.00	22.50	0.50	U	Slipped					-	-	-	-	
		+75.6	23.00	23.45	0.45	P	3	4	5	-	9	-	-	-	
		24.00	24.50	0.50	U	-	-	-	-	-	-	-	-		
		25.00	25.45	0.45	P	2	3	4	-	7	-	-	-		
		26.00	26.50	0.50	U	-	-	-	-	-	-	-	-		
		27.00	27.45	0.45	P	2	3	3	-	6	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-4

Location : N:2440052.3 E:617918.0

Ground Elevation : +98.6m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.80m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx- 12.50 m.

Date : From 22.11.15 To 25.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
25/11	+54.1	43.00	43.26	0.26	P	36	66	-	-	>100	-	-	-	-	Dense to very dense grey silty sand. ----- 44.50m ----- Stiff / very stiff greyish yellow to grey silty clay with brown spots.
		45.00	45.45	0.45	P	5	8	14	-	22	-	-	-	-	
		46.00	46.50	0.50	U	-	-	-	-	-	-	-	-	-	
		47.00	47.45	0.45	P	6	12	12	-	24	-	-	-	-	
		48.00	48.50	0.50	U	-	-	-	-	-	-	-	-	-	
		49.00	49.45	0.45	P	7	10	12	-	22	-	-	-	-	
		50.00	50.50	0.50	U	-	-	-	-	-	-	-	-	-	
		51.00	51.45	0.45	P	5	6	8	-	14	-	-	-	-	
		52.00	52.50	0.50	U	-	-	-	-	-	-	-	-	-	
		53.00	53.45	0.45	P	4	5	8	-	13	-	-	-	-	
		54.00	54.50	0.50	U	-	-	-	-	-	-	-	-	-	
	55.00	55.45	0.45	P	6	8	8	-	16	-	-	-	-		
		+42.6	56.00	56.50	0.50	U	Slipped			-	-	-	-	-	----- 56.00m -----
		57.00	57.19	0.19	P	66	36	-	-	>100	-	-	-	Medium dense / dense grey silty fine sand.	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-4

Location : N:2440052.3 E:617918.0

Ground Elevation : +98.6m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.80m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx- 12.50 m.

Date : From 22.11.15 To 25.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		58.50	58.75	0.25	P	42	60 (10cm)	-	-	>100	-	-	-	-	Medium dense / dense grey silty fine sand.
		60.25	60.70	0.45	P	21	36	54	-	90	-	-	-	-	
	+38.4	60.25				(Termination Depth)									

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-5

Location : N 2439854.7, E 617655.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) :0.70m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02 m

Date : From 13.11.15 To 16.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
13/11	+97.0	0.00													Soft / firm yellowish grey to grey silty clay with occasional laminations of silt/ fine sand.	
		0.50	-	-	D	-	-	-	-	-	-	-	-			
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-		
		1.50	1.95	0.45	P	1	2	2	-	4	-	-	-	-		
		2.00	2.45	0.45	P	1	2	2	-	4	-	-	-	-		
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-		
14/11		4.00	4.45	0.45	P	1	1	1	-	2	-	-	-	-		
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-		
		6.00	6.45	0.45	P	1	1	1	-	2	-	-	-	-		
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-		
		8.00	8.45	0.45	P	1	1	2	-	3	-	-	-	-		
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-		
		10.00	10.45	0.45	P	1	2	2	-	4	-	-	-	-		
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-		
	12.00	12.45	0.45	P	1	1	1	-	2	-	-	-	-			
	13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-5

Location : N 2439854.7, E 617655.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) :0.70m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02 m

Date : From 13.11.15 To 16.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
15/11	+77.0	14.00	14.45	0.45	P	1	1	2	-	3	-	-	-	-	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt/ fine sand.	
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-		
		16.00	16.45	0.45	P	2	6	8	-	14	-	-	-	-		
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-		
		18.00	18.45	0.45	P	3	4	5	-	9	-	-	-	-		
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-		
		20.00	20.45	0.45	P	8	12	13	-	25	-	-	-	-		20.00m
		22.00	22.45	0.45	P	1	2	2	-	4	-	-	-	-		22.00m
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-		Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood
		24.00	24.45	0.45	P	1	2	2	-	4	-	-	-	-		
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-		
		26.00	26.45	0.45	P	3	3	4	-	7	-	-	-	-		
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-		
28.00	28.45	0.45	P	2	3	4	-	7	-	-	-	-				

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-5

Location : N 2439854.7, E 617655.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) :0.70m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02 m

Date : From 13.11.15 To 16.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
16/11	+64.0	29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	
		30.00	30.45	0.45	P	3	3	3	-	6	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	2	3	3	-	6	-	-	-	-		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-		33.00m
		34.00	34.45	0.45	P	8	8	10	-	18	-	-	-	-		Stiff to very stiff grey silty sandy clay
	+60.0	35.00	35.50	0.50	U	-	-	-	-	-	-	-	-	-	Medium dense yellowish grey silty sand	
		36.00	36.45	0.45	P	6	9	10	-	19	-	-	-	-		
		37.00	37.50	0.50	U	Slipped					-	-	-	-		37.00m
		38.00	38.45	0.45	P	16	22	28	-	50	-	-	-	-		
		40.00	40.45	0.45	P	22	28	30	-	58	-	-	-	-		
	+53.5	42.00	42.45	0.45	P	24	34	36	-	70	-	-	-	-	43.50m	
		44.00	44.45	0.45	P	6	8	12	-	20	-	-	-	-	Very stiff grey to bluish grey silty clay with yellow spots.	
45.00		45.50	0.50	U	-	-	-	-	-	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-5

Location : N 2439854.7, E 617655.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) :0.70m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02 m

Date : From 13.11.15 To 16.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
	+51.0	46.00	46.45	0.45	P	24	36	38	-	74	-	-	-	-	46.00m Medium dense yellowish grey silty fine sand.
		48.00	48.45	0.45	P	18	24	28	-	52	-	-	-	-	
		50.00	50.45	0.45	P	18	28	38	-	66	-	-	-	-	
		52.00	52.45	0.45	P	12	20	30	-	50	-	-	-	-	
		54.00	54.45	0.45	P	12	36	37	-	73	-	-	-	-	
		56.00	56.45	0.45	P	12	25	30	-	55	-	-	-	-	
		58.00	58.45	0.45	P	36	40	44	-	84	-	-	-	-	
		60.03	60.44	0.41	P	24	44	60	-	>100	-	-	-	-	
	+37.0	60.03													(Termination Depth)

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-6

Location : N 2439930.6, E 618021.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.00 m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50 m.

Date : From 18.11.15 To 21.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
18/11	+97.0	0.00													Soft / firm yellowish grey to grey silty clay with occasional laminations of silt; medium dense grey silty sand with clay as binder observed from 10.0m to 13.5m depth
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	1	1	2	-	3	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	1	1	2	-	3	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	1	1	2	-	3	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	1	2	1	-	3	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		10.00	10.45	0.45	P	2	2	10	-	12	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P	5	7	12	-	19	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-6

Location : N 2439930.6, E 618021.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.00 m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50 m.

Date : From 18.11.15 To 21.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
19/11	+82.0	14.00	14.45	0.45	P	2	3	4	-	7	-	-	-	-	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt; medium dense grey silty sand with clay as binder observed from 10.0 m to 13.5m depth.
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-	15.00m
		16.00	16.45	0.45	P	9	15	21	-	36	-	-	-	-	Medium dense grey silty fine sand with a thin band of firm grey silty clay from 18.0m to 19.0m depth.
		18.00	18.45	0.45	P	1	2	2	-	4	-	-	-	-	
			19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	
			20.00	20.45	0.45	P	5	5	8	-	13	-	-	-	
		+76.0	21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	21.00m
			22.00	22.45	0.45	P	1	2	2	-	4	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
			23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	
			24.00	24.45	0.45	P	1	2	2	-	4	-	-	-	
			25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	
			26.00	26.45	0.45	P	2	3	3	-	6	-	-	-	
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-		
		28.00	28.45	0.45	P	3	4	4	-	8	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-6

Location : N 2439930.6, E 618021.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.00 m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50 m.

Date : From 18.11.15 To 21.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
20/11	+61.0	29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood. 36.00m Stiff to very stiff grey sandy silty clay with traces of kankars. 39.70m Medium dense / dense yellowish grey silty sand.
		30.00	30.45	0.45	P	2	4	4	-	8	-	-	-	-	
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-	
		32.00	32.45	0.45	P	3	4	5	-	9	-	-	-	-	
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-	
		34.00	34.45	0.45	P	4	5	6	-	11	-	-	-	-	
	+57.3	35.00	35.50	0.50	U	-	-	-	-	-	-	-	-	-	
		36.00	36.45	0.45	P	4	7	8	-	15	-	-	-	-	
		37.00	37.50	0.50	U	-	-	-	-	-	-	-	-	-	
		38.00	38.45	0.45	P	10	12	14	-	26	-	-	-	-	
		39.00	39.50	0.50	U	-	-	-	-	-	-	-	-	-	
		40.00	40.45	0.45	P	36	38	46	-	84	-	-	-	-	
	42.00	42.45	0.45	P	20	24	38	-	62	-	-	-	-		
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :														
Site Engineer : A. Sarkar					Driller: M. Barui					Job No.: XCSPL/1372					

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-6

Location : N 2439930.6, E 618021.0

Ground Elevation : +97.0m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.00 m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.50 m.

Date : From 18.11.15 To 21.11.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
21/11	+53.0	44.00	44.45	0.45	P	5	8	10	-	18	-	-	-	-	44.00m Stiff / very stiff yellowish grey to grey silty clay with brown spots.
		45.00	45.50	0.50	U	-	-	-	-	-	-	-	-	-	
		46.00	46.45	0.45	P	6	7	8	-	15	-	-	-	-	
		47.00	47.50	0.50	U	-	-	-	-	-	-	-	-	-	
		48.00	48.45	0.45	P	5	6	7	-	13	-	-	-	-	
		49.00	49.50	0.50	U	-	-	-	-	-	-	-	-	-	
		50.00	50.45	0.45	P	6	6	8	-	14	-	-	-	-	
		51.00	51.50	0.50	U	-	-	-	-	-	-	-	-	-	
		52.00	52.45	0.45	P	7	7	8	-	15	-	-	-	-	
		53.00	53.50	0.50	U	-	-	-	-	-	-	-	-	-	
	+43.0	54.00	54.27	0.27	P	33	70	-	-	>100	-	-	-	-	54.00m Dense grey silty fine sand with kankars; stiff grey silty clay with laminations of sand observed at 60.39m depth.
		56.00	56.45	0.45	P	30	44	55	-	99	-	-	-	-	
		58.00	58.25	0.25	P	40	61	-	-	>100	-	-	-	-	
		60.39	60.84	0.45	P	6	8	10	-	18	-	-	-	-	
	+36.6	60.39				(Termination Depth)									

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A. Sarkar

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-7

Location : N:2439699.2 E:617755.6

Ground Elevation : +96.5m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02m

Date : From 08.12.15 To 10.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
08/12	+96.5	0.00													Very soft / soft to firm grey silty clay with occasional laminations of silt.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	0	1	2	-	3	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	0	0	1	-	1	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	1	1	2	-	3	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	1	1	2	-	3	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		10.00	10.45	0.45	P	1	1	2	-	3	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
12.00	12.45	0.45	P	1	1	1	-	2	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P. Dutta

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-7

Location : N:2439699.2 E:617755.6

Ground Elevation : +96.5m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02m

Date : From 08.12.15 To 10.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
09/12	+77.0	13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	Very soft / soft to firm grey silty clay with occasional laminations of silt.	
		14.00	14.45	0.45	P	1	1	1	-	2	-	-	-	-		
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-		
		16.00	16.45	0.45	P	1	1	2	-	3	-	-	-	-		
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-		
		18.00	18.45	0.45	P	2	2	3	-	5	-	-	-	-		
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-		
		20.00	20.45	0.45	P	3	5	8	-	13	-	-	-	-		19.50m
		21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-		21.00m
		22.00	22.45	0.45	P	2	2	3	-	5	-	-	-	-		Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-		
		24.00	24.45	0.45	P	2	2	2	-	4	-	-	-	-		
25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-				
26.00	26.45	0.45	P	3	3	4	-	7	-	-	-	-				

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P. Dutta

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-7

Location : N:2439699.2 E:617755.6

Ground Elevation : +96.5m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02m

Date : From 08.12.15 To 10.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.	
		28.00	28.45	0.45	P	2	3	4	-	7	-	-	-	-		
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-		
		30.00	30.45	0.45	P	3	4	4	-	8	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	2	3	4	-	7	-	-	-	-		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+62.5	34.00	34.45	0.45	P	5	6	8	-	14	-	-	-	-		34.00m
		35.00	35.50	0.50	U	-	-	-	-	-	-	-	-	-		Stiff to very stiff grey sandy silty clay with occasional traces of kankars.
		36.00	36.45	0.45	P	5	8	9	-	17	-	-	-	-		
		37.00	37.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+58.5	38.00	38.45	0.45	P	18	21	31	-	52	-	-	-	-	38.00m	
		40.00	40.45	0.45	P	31	38	48	-	86	-	-	-	-	Medium dense yellowish grey / greyish yellow silty sand.	
		42.00	42.45	0.45	P	21	26	37	-	63	-	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P. Dutta

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-7

Location : N:2439699.2 E:617755.6

Ground Elevation : +96.5m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 1.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-17.02m

Date : From 08.12.15 To 10.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
10/12	+52.5	44.00	44.45	0.45	P	10	17	24	-	41	-	-	-	-	44.00m	Very stiff bluish grey silty clay with yellow spots.
		45.00	45.50	0.50	U	-	-	-	-	-	-	-	-	-		
		46.00	46.45	0.45	P	5	7	9	-	16	-	-	-	-		
		47.00	47.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+48.0	48.00	48.45	0.45	P	9	13	18	-	31	-	-	-	-	48.50m	Medium dense /dense yellowish grey / grey silty fine sand.
		50.00	50.30	0.30	P	29	100	-	-	>100	-	-	-	-		
		52.00	52.45	0.45	P	16	22	28	-	50	-	-	-	-		
		54.00	54.45	0.45	P	21	38	49	-	87	-	-	-	-		
		56.00	56.38	0.38	P	27	49	58	-	>100	-	-	-	-		
		58.00	58.45	0.45	P	31	39	51	-	90	-	-	-	-		
+35.8	60.68	61.13	0.45	P	23	32	51	-	83	-	-	-	-			
	60.68	(Termination Depth)														

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : P. Dutta

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-8

Location : N:2439827.0 E:618029.0

Ground Elevation : +97.7m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 2.17m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.55m.

Date : From 11.12.15 To 14.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
11/12	+97.7	0.00													Soft / firm to stiff yellowish grey to grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty sand with clay as binder observed from 12.0m to 14.5m depth.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
12/12		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	1	1	2	-	3	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	1	1	2	-	3	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	2	2	4	-	6	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	0	1	2	-	3	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		10.00	10.45	0.45	P	1	2	3	-	5	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P	4	7	12	-	19	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M.Mukherjee

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-8

Location : N:2439827.0 E:618029.0

Ground Elevation : +97.7m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 2.17m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.55m.

Date : From 11.12.15 To 14.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm to stiff yellowish grey to grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty sand with clay as binder observed from 12.0m to 14.5m depth.
		14.00	14.45	0.45	P	4	5	5	-	10	-	-	-	-	
		16.00	16.45	0.45	P	2	3	4	-	7	-	-	-	-	
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-	
		18.00	18.45	0.45	P	2	3	8	-	11	-	-	-	-	
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-	
		20.00	20.45	0.45	P	3	3	7	-	10	-	-	-	-	
	+77.2	21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-	
		22.00	22.45	0.45	P	2	3	3	-	6	-	-	-	-	
	+75.7	23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-	
		24.00	24.45	0.45	P	2	3	4	-	7	-	-	-	-	
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-	
		26.00	26.45	0.45	P	2	2	3	-	5	-	-	-	-	
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M.Mukherjee

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-8

Location : N:2439827.0 E:618029.0

Ground Elevation : +97.7m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 2.17m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.55m.

Date : From 11.12.15 To 14.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
13/12		28.00	28.45	0.45	P	2	3	5	-	8	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi decomposed wood.	
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-		
		30.00	30.45	0.45	P	2	3	3	-	6	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	3	3	4	-	7	-	-	-	-		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-		
		34.00	34.45	0.45	P	3	4	5	-	9	-	-	-	-		
		+61.7	36.00	36.45	0.45	P	4	5	8	-	13	-	-	-	36.00m	
			37.00	37.50	0.50	U	-	-	-	-	-	-	-	-	Stiff to very stiff grey / bluish grey sandy silty clay with kankars.	
			38.00	38.45	0.45	P	5	9	10	-	19	-	-	-	-	
		+58.7	39.00	39.50	0.50	U	Slipped					-	-	-	-	39.00m
			40.00	40.45	0.45	P	30	34	42	-	76	-	-	-	-	Medium dense to dense grey silty sand.
		42.00	42.37	0.37	P	34	53	47	-	>100	-	-	-	-	(7cm)	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M.Mukherjee

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-8

Location : N:2439827.0 E:618029.0

Ground Elevation : +97.7m

Method of Boring / Drilling : Auger / Shell / Rotary

Water Level (Static) : 2.17m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-5)

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-12.55m.

Date : From 11.12.15 To 14.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
14/12	+54.0														43.70m
		44.00	44.45	0.45	P	6	8	11	-	19	-	-	-	-	Stiff / very stiff grey silty clay with yellow / brown spots.
		45.00	45.50	0.50	U	-	-	-	-	-	-	-	-	-	
		46.00	46.45	0.45	P	6	8	8	-	16	-	-	-	-	
		47.00	47.50	0.50	U	-	-	-	-	-	-	-	-	-	
		48.00	48.45	0.45	P	5	6	7	-	13	-	-	-	-	
		49.00	49.50	0.50	U	-	-	-	-	-	-	-	-	-	
		50.00	50.45	0.45	P	5	6	8	-	14	-	-	-	-	
		51.00	51.50	0.50	U	-	-	-	-	-	-	-	-	-	
		52.00	52.45	0.45	P	6	7	8	-	15	-	-	-	-	
	53.00	53.50	0.50	U	-	-	-	-	-	-	-	-	-		
	+43.7	54.00	54.39	0.39	P	28	59	41	-	>100	-	-	-	-	54.00m
								(9cm)							Medium dense / dense grey silty fine sand; stiff grey silty clay with laminations of sand observed at 56.0m depth.
		56.00	56.45	0.45	P	5	6	9	-	15	-	-	-	-	
		58.00	58.45	0.45	P	14	29	45	-	74	-	-	-	-	
		60.00	60.34	0.34	P	23	63	38	-	>100	-	-	-	-	
								(4cm)							
	+37.7	60.00	(Termination Depth)												

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M.Mukherjee

Driller: M. Barui

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-9

Location : N:2439536.0 E:617783.0

Ground Elevation : +93.2m

Method of Boring / Drilling : Shell / Rotary

Water Level: 0.65m a.b.l (min) at 18:20 hrs on 25/12

4.10m a.b.l (max) at 10:30 hrs on 24/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.60m

Date : From 23.12.15 To 27.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
23/12	+93.2	0.00													Soft / firm to stiff grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 9.0m to 11.0m depth.
		0.00	0.50	0.50	U	-	-	-	-	-	-	-	-	-	
		1.00	-	-	D	-	-	-	-	-	-	-	-	-	
		2.00	2.50	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P	1	1	1	-	2	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
24/12		5.00	5.45	0.45	P	1	1	2	-	3	-	-	-	-	
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.00	7.45	0.45	P	1	1	1	-	2	-	-	-	-	
		8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P	6	10	22	-	32	-	-	-	-	
		11.00	11.45	0.45	P	4	5	7	-	12	-	-	-	-	
		12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-	
		13.00	13.45	0.45	P	10	12	20	-	32	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-9

Location : N:2439536.0 E:617783.0

Ground Elevation : +93.2m

Method of Boring / Drilling : Shell / Rotary

Water Level: 0.65m a.b.l (min) at 18:20 hrs on 25/12

4.10m a.b.l (max) at 10:30 hrs on 24/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.60m

Date : From 23.12.15 To 27.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
25/12	+76.2	14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm to stiff grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 9.0m to 11.0m depth.	
		15.00	15.45	0.45	P	12	14	16	-	30	-	-	-	-		
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-		
				17.00	17.45	0.45	P	2	3	4	-	7	-	-	-	_____ 17.00m _____
				18.00	18.50	0.50	U	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
				19.00	19.45	0.45	P	3	4	5	-	9	-	-	-	
				20.00	20.50	0.50	U	-	-	-	-	-	-	-	-	
				21.00	21.45	0.45	P	2	4	4	-	8	-	-	-	
				22.00	22.50	0.50	U	-	-	-	-	-	-	-	-	
				23.00	23.45	0.45	P	3	4	5	-	9	-	-	-	
				24.00	24.50	0.50	U	-	-	-	-	-	-	-	-	
				25.00	25.45	0.45	P	3	4	5	-	9	-	-	-	
				26.00	26.50	0.50	U	-	-	-	-	-	-	-	-	
		27.00	27.45	0.45	P	4	5	5	-	10	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-9

Location : N:2439536.0 E:617783.0

Ground Elevation : +93.2m

Method of Boring / Drilling : Shell / Rotary

Water Level: 0.65m a.b.l (min) at 18:20 hrs on 25/12

4.10m a.b.l (max) at 10:30 hrs on 24/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.60m

Date : From 23.12.15 To 27.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
26/12	+62.2	28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
		29.00	29.45	0.45	P	4	4	5	-	9	-	-	-	-	
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-	
		31.00	31.45	0.45	P	8	12	14	-	26	-	-	-	-	31.00m
		32.00	32.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff bluish grey / grey sandy silty clay with kankars.
		33.00	33.45	0.45	P	14	24	38	-	62	-	-	-	-	33.00m
		35.00	35.45	0.45	P	22	36	40	-	76	-	-	-	-	Medium dense to dense grey to greyish yellow silty sand.
		37.00	37.45	0.45	P	26	42	50	-	92	-	-	-	-	38.70m
		39.00	39.45	0.45	P	10	14	21	-	35	-	-	-	-	Very stiff / hard bluish grey silty clay with yellow spots; grey sandy silty clay observed at 54.0m depth.
		40.00	40.50	0.50	U	-	-	-	-	-	-	-	-	-	
		41.00	41.45	0.45	P	10	16	20	-	36	-	-	-	-	
		42.00	42.50	0.50	U	-	-	-	-	-	-	-	-	-	
		43.00	43.45	0.45	P	12	18	24	-	42	-	-	-	-	
		44.00	44.50	0.50	U					Slipped					

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-9

Location : N:2439536.0 E:617783.0

Ground Elevation : +93.2m

Method of Boring / Drilling : Shell / Rotary

Water Level: 0.65m a.b.l (min) at 18:20 hrs on 25/12

4.10m a.b.l (max) at 10:30 hrs on 24/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.60m

Date : From 23.12.15 To 27.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
27/12		45.00	45.45	0.45	P	8	9	13	-	22	-	-	-	-	Very stiff / hard bluish grey silty clay with yellow spots; grey sandy silty clay observed at 54.0m depth.
		46.00	46.50	0.50	U	-	-	-	-	-	-	-	-	-	
		47.00	47.45	0.45	P	8	9	12	-	21	-	-	-	-	
		48.00	48.50	0.50	U	-	-	-	-	-	-	-	-	-	
		49.00	49.45	0.45	P	9	11	12	-	23	-	-	-	-	
		50.00	50.50	0.50	U	-	-	-	-	-	-	-	-	-	
		51.00	51.45	0.45	P	8	12	12	-	24	-	-	-	-	
		52.00	52.50	0.50	U	-	-	-	-	-	-	-	-	-	
		53.00	53.45	0.45	P	9	11	14	-	25	-	-	-	-	
		54.00	54.50	0.50	U	-	-	-	-	-	-	-	-	-	
		55.00	55.45	0.45	P	10	10	24	-	34	-	-	-	-	
		+37.7	57.00	57.45	0.45	P	11	31	45	-	76	-	-	-	Medium dense grey silty fine sand.
		+32.7	60.52	60.81	0.29	P	32	70	-	-	>100	-	-	-	
		60.52	(Termination Depth)												

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-10

Location : N:2439684.0 E:618099.0

Ground Elevation : +93.1m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.20m a.b.l (min) at 12:00 hrs on 19/12
3.40m a.b.l (max) at 8:30 hrs on 22/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-26.50m

Date : From 19.12.15 To 22.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
19/12	+93.1	0.00													Soft / firm to stiff grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 5.5m to 11.5m depth.
		0.00	0.50	0.50	U	-	-	-	-	-	-	-	-	-	
		1.00	-	-	D	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	1	2	2	-	4	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	1	1	1	-	2	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	7	19	24	-	43	-	-	-	-	
		8.00	8.45	0.45	P	3	4	7	-	11	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		10.00	10.45	0.45	P	6	7	9	-	16	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P	1	2	3	-	5	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-10

Location : N:2439684.0 E:618099.0

Ground Elevation : +93.1m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.20m a.b.l (min) at 12:00 hrs on 19/12
3.40m a.b.l (max) at 8:30 hrs on 22/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-26.50m

Date : From 19.12.15 To 22.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
20/12	+76.1	14.00	14.45	0.45	P	2	3	7	-	10	-	-	-	-	Soft / firm to stiff grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 5.5m to 11.5m depth. 17.00m Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
		15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-	
		16.00	16.45	0.45	P	3	4	8	-	12	-	-	-	-	
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-	
		18.00	18.45	0.45	P	3	4	4	-	8	-	-	-	-	
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-	
		20.00	20.45	0.45	P	3	3	4	-	7	-	-	-	-	
		21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-	
		22.00	22.45	0.45	P	3	5	6	-	11	-	-	-	-	
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-	
		24.00	24.45	0.45	P	3	4	5	-	9	-	-	-	-	
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-	
		26.00	26.45	0.45	P	3	4	5	-	9	-	-	-	-	
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-10

Location : N:2439684.0 E:618099.0

Ground Elevation : +93.1m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.20m a.b.l (min) at 12:00 hrs on 19/12
3.40m a.b.l (max) at 8:30 hrs on 22/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-26.50m

Date : From 19.12.15 To 22.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description		
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value							
21/12	+62.1	28.00	28.45	0.45	P	4	4	5	-	9	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.		
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-			
		30.00	30.45	0.45	P	4	5	5	-	10	-	-	-	-			
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		31.00m	
	+58.1	32.00	32.45	0.45	P	10	13	24	-	37	-	-	-	-	Very stiff / hard bluish grey sandy silty clay with kankars.		
		33.00	33.50	0.50	U	-	-	-	-	-	-	-	-	-			
		34.00	34.45	0.45	P	8	12	18	-	30	-	-	-	-			
		35.00	35.50	0.50	U	Slipped					-	-	-	-		35.00m	
		36.00	36.45	0.45	P	20	36	38	-	74	-	-	-	-		Dense yellowish grey silty sand.	
		38.00	38.25	0.25	P	48	52	-	-	>100	-	-	-	-			
		39.00	39.50	0.50	U	-	-	-	-	-	-	-	-	-			39.00m
		40.00	40.45	0.45	P	4	8	9	-	17	-	-	-	-			Very stiff yellowish grey / grey silty clay with brown spots.
	41.00	41.50	0.50	U	-	-	-	-	-	-	-	-	-				
	42.00	42.45	0.45	P	9	9	10	-	19	-	-	-	-				

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: K.Halder

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-10

Location : N:2439684.0 E:618099.0

Ground Elevation : +93.1m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.20m a.b.l (min) at 12:00 hrs on 19/12
3.40m a.b.l (max) at 8:30 hrs on 22/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-26.50m

Date : From 19.12.15 To 22.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
22/12		43.00	43.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff yellowish grey / grey silty clay with brown spots.
		44.00	44.45	0.45	P	7	8	9	-	17	-	-	-	-	
		45.00	45.50	0.50	U	-	-	-	-	-	-	-	-	-	
		46.00	46.45	0.45	P	8	9	10	-	19	-	-	-	-	
		47.00	47.50	0.50	U	-	-	-	-	-	-	-	-	-	
		48.00	48.45	0.45	P	7	8	9	-	17	-	-	-	-	
		49.00	49.50	0.50	U	-	-	-	-	-	-	-	-	-	
		50.00	50.45	0.45	P	8	9	10	-	19	-	-	-	-	
		51.00	51.50	0.50	U	-	-	-	-	-	-	-	-	-	
		52.00	52.45	0.45	P	8	9	9	-	18	-	-	-	-	
		53.00	53.50	0.50	U	-	-	-	-	-	-	-	-	-	
		54.00	54.45	0.45	P	7	9	11	-	20	-	-	-	-	
		+38.1	55.00	55.50	0.50	U	Slipped					-	-	-	
		56.00	56.29	0.29	P	40	60	-	-	>100	-	-	-	-	Dense grey silty fine sand.
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test														
	2. Level at which Artesian Condition experienced and its pressure, if any :														
	3. Water Loss with depth, if any :														
	4. Colour of water during drilling :														
Site Engineer : A.Sarkar						Driller: K.Halder						Job No.: XCSPL/1372			

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-10

Location : N:2439684.0 E:618099.0

Ground Elevation : +93.1m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.20m a.b.l (min) at 12:00 hrs on 19/12
3.40m a.b.l (max) at 8:30 hrs on 22/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-26.50m

Date : From 19.12.15 To 22.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		58.00	58.28	0.28	P	35	70 (13cm)	-	-	>100	-	-	-	-	Dense grey silty fine sand.
		60.15	60.40	0.25	P	48	54 (10cm)	-	-	>100	-	-	-	-	
	+33.0	60.15 (Termination Depth)													
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :														
Site Engineer : A.Sarkar						Driller: K.Halder						Job No.: XCSPL/1372			

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-11

Location : N:2439495.0 E:617903.0

Ground Elevation : +90.8m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.00m a.b.l (min) at 8:45 hrs on 15/12
6.00m a.b.l (max) at 13:20 hrs on 14/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.95m.

Date : From 14.12.15 To 18.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
14/12	+90.8	0.00													Firm to stiff grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 8.0m to 10.0m depth.
		1.00	-	-	D	-	-	-	-	-	-	-	-	-	
		2.00	2.45	0.45	P	1	3	5	-	8	-	-	-	-	
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P	2	2	3	-	5	-	-	-	-	
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P	2	3	4	-	7	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.00	8.45	0.45	P	3	5	11	-	16	-	-	-	-	
		10.00	10.45	0.45	P	2	3	4	-	7	-	-	-	-	
		11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P	4	6	7	-	13	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	
15/12		14.00	14.45	0.45	P	4	5	6	-	11	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: A.Majumdar

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-11

Location : N:2439495.0 E:617903.0

Ground Elevation : +90.8m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.00m a.b.l (min) at 8:45 hrs on 15/12
6.00m a.b.l (max) at 13:20 hrs on 14/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.95m.

Date : From 14.12.15 To 18.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
	+75.8	15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-	15.00m
		16.00	16.45	0.45	P	3	3	5	-	8	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-	
		18.00	18.45	0.45	P	3	4	5	-	9	-	-	-	-	
		19.00	19.50	0.50	U	-	-	-	-	-	-	-	-	-	
		20.00	20.45	0.45	P	5	6	7	-	13	-	-	-	-	
		21.00	21.50	0.50	U	-	-	-	-	-	-	-	-	-	
		22.00	22.45	0.45	P	3	4	5	-	9	-	-	-	-	
		23.00	23.50	0.50	U	-	-	-	-	-	-	-	-	-	
		24.00	24.45	0.45	P	5	5	6	-	11	-	-	-	-	
		25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-	
		26.00	26.45	0.45	P	4	6	6	-	12	-	-	-	-	
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	
		28.00	28.45	0.45	P	3	4	6	-	10	-	-	-	-	
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :														
Site Engineer : A.Sarkar					Driller: A.Majumdar					Job No.: XCSPL/1372					

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-11

Location : N:2439495.0 E:617903.0

Ground Elevation : +90.8m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.00m a.b.l (min) at 8:45 hrs on 15/12
6.00m a.b.l (max) at 13:20 hrs on 14/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.95m.

Date : From 14.12.15 To 18.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
16/12	+61.8	29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-	29.00m	Very stiff bluish grey sandy silty clay
		30.00	30.45	0.45	P	7	12	18	-	30	-	-	-	-		
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-		
		32.00	32.45	0.45	P	10	14	18	-	32	-	-	-	-		
		33.00	33.50	0.50	U	Slipped					-	-	-	-	33.00m	
	+57.8	34.00	34.45	0.45	P	6	15	18	-	33	-	-	-	-		Medium dense greyish yellow silty sand with traces of kankars.
		36.00	36.45	0.45	P	12	16	34	-	50	-	-	-	-		
		38.00	38.45	0.45	P	14	18	36	-	54	-	-	-	-		
		39.00	39.45	0.45	P	9	13	19	-	32	-	-	-	-		
		40.00	40.50	0.50	U	-	-	-	-	-	-	-	-	-		
+52.1	41.00	41.45	0.45	P	12	14	20	-	34	-	-	-	-		38.70m	Very stiff bluish grey /grey silty clay with yellow spots.
	42.00	42.50	0.50	U	-	-	-	-	-	-	-	-	-			
	43.00	43.45	0.45	P	9	11	13	-	24	-	-	-	-			
	44.00	44.50	0.50	U	-	-	-	-	-	-	-	-	-			
17/12		42.00	42.50	0.50	U	-	-	-	-	-	-	-	-			
		43.00	43.45	0.45	P	9	11	13	-	24	-	-	-	-		
		44.00	44.50	0.50	U	-	-	-	-	-	-	-	-	-		

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: A.Majumdar

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.

BORE / DRILL LOG

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-11

Location : N:2439495.0 E:617903.0

Ground Elevation : +90.8m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.00m a.b.l (min) at 8:45 hrs on 15/12
6.00m a.b.l (max) at 13:20 hrs on 14/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Sx (150mm)

Casing Lowered : Sx-21.95m.

Date : From 14.12.15 To 18.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
18/12	+38.1	45.00	45.45	0.45	P	8	10	12	-	22	-	-	-	-	Very stiff bluish grey /grey silty clay with yellow spots.	
		46.00	46.50	0.50	U	-	-	-	-	-	-	-	-	-		
		47.00	47.45	0.45	P	8	9	10	-	19	-	-	-	-		
		48.00	48.50	0.50	U	-	-	-	-	-	-	-	-	-		
		49.00	49.45	0.45	P	8	10	10	-	20	-	-	-	-		
		50.00	50.50	0.50	U	-	-	-	-	-	-	-	-	-		
		51.00	51.45	0.45	P	9	10	12	-	22	-	-	-	-		
		52.00	52.50	0.50	U	-	-	-	-	-	-	-	-	-		
		53.00	53.20	0.20	P	65	36	-	-	>100	-	-	-	-		Dense / very dense grey silty fine sand.
		55.00	55.13	0.13	P	100	-	-	-	>100	-	-	-	-		
		57.00	57.19	0.19	P	65	36	-	-	>100	-	-	-	-		
60.10	60.28	0.18	P	60	44	-	-	>100	-	-	-	-				
	+30.7	60.10	(Termination Depth)													

NOTES
 1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
 2. Level at which Artesian Condition experienced and its pressure, if any :
 3. Water Loss with depth, if any :
 4. Colour of water during drilling :

Site Engineer : A.Sarkar Driller: A.Majumdar Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-12

Location : N:2439566.0 E:618042.0

Ground Elevation : +91.0m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.70m a.b.l (min) at 7:30 hrs on 12/12
6.20m a.b.l (max) at 10:20 hrs on 11/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Zx,Sx

Casing Lowered : Zx-15.74m, Sx-31.50m

Date : From 08.12.15 To 12.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
08/12	+91.0	0.00													Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand with clay as binder observed from 12.0m to 14.0m depth	
		1.00	-	-	D	-	-	-	-	-	-	-	-	-		
		2.00	2.50	0.50	U	Slipped					-	-	-	-		
		3.00	3.45	0.45	P	0	0	1	-	1	-	-	-	-		-
		4.00	4.50	0.50	U	Slipped					-	-	-	-		
		5.00	5.45	0.45	P	0	0	1	-	1	-	-	-	-		-
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-		-
		7.00	7.45	0.45	P	2	2	3	-	5	-	-	-	-		-
		8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-		-
		9.00	9.45	0.45	P	2	3	5	-	8	-	-	-	-		-
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-		-
		11.00	11.45	0.45	P	4	5	5	-	10	-	-	-	-		-
		12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-		-
		13.00	13.45	0.45	P	5	8	10	-	18	-	-	-	-		-
14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: A.Majumdar

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-12

Location : N:2439566.0 E:618042.0

Ground Elevation : +91.0m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.70m a.b.l (min) at 7:30 hrs on 12/12
6.20m a.b.l (max) at 10:20 hrs on 11/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Zx,Sx

Casing Lowered : Zx-15.74m, Sx-31.50m

Date : From 08.12.15 To 12.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
09/12	+76.0	15.00	15.45	0.45	P	2	3	3	-	6	-	-	-	-	15.00m	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-		
		17.00	17.45	0.45	P	3	4	5	-	9	-	-	-	-		
		18.00	18.50	0.50	U	-	-	-	-	-	-	-	-	-		
		19.00	19.45	0.45	P	5	5	6	-	11	-	-	-	-		
		20.00	20.50	0.50	U	-	-	-	-	-	-	-	-	-		
		21.00	21.45	0.45	P	4	4	9	-	13	-	-	-	-		
		22.00	22.50	0.50	U	-	-	-	-	-	-	-	-	-		
		23.00	23.45	0.45	P	3	4	4	-	8	-	-	-	-		
		24.00	24.50	0.50	U	-	-	-	-	-	-	-	-	-		
		25.00	25.45	0.45	P	5	5	5	-	10	-	-	-	-		
		26.00	26.50	0.50	U	-	-	-	-	-	-	-	-	-		
27.00	27.45	0.45	P	5	6	7	-	13	-	-	-	-				
NOTES	1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test 2. Level at which Artesian Condition experienced and its pressure, if any : 3. Water Loss with depth, if any : 4. Colour of water during drilling :															
Site Engineer : A.Sarkar					Driller: A.Majumdar					Job No.: XCSPL/1372						

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-12

Location : N:2439566.0 E:618042.0

Ground Elevation : +91.0m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.70m a.b.l (min) at 7:30 hrs on 12/12
6.20m a.b.l (max) at 10:20 hrs on 11/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Zx,Sx

Casing Lowered : Zx-15.74m, Sx-31.50m

Date : From 08.12.15 To 12.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
10/12	+61.0	28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	
		29.00	29.45	0.45	P	4	5	7	-	12	-	-	-	-		
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-	30.00m	
		31.00	31.45	0.45	P	6	8	10	-	18	-	-	-	-	Very stiff grey / bluish grey sandy silty clay with kankars	
	+59.0	32.00	32.50	0.50	U	Slipped					-	-	-	-	32.00m	
		33.00	33.36	0.36	P	22	68	33	-	>100	-	-	-	-	Dense / very dense yellowish grey silty sand	
		35.00	35.40	0.40	P	24	60	40	-	>100	-	-	-	-		
		+54.0	37.00	37.45	0.45	P	10	12	16	-	28	-	-	-	-	37.00m
			38.00	38.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff bluish grey / grey silty clay with yellow spots
		39.00	39.45	0.45	P	12	14	14	-	28	-	-	-	-		
11/12	40.00	40.50	0.50	U	-	-	-	-	-	-	-	-	-			
	41.00	41.45	0.45	P	6	7	8	-	15	-	-	-	-			
	42.00	42.50	0.50	U	-	-	-	-	-	-	-	-	-			
	43.00	43.45	0.45	P	8	9	10	-	19	-	-	-	-			

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : A.Sarkar

Driller: A.Majumdar

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.**BORE / DRILL LOG**

Project: Geotechnical investigation at Haldia terminal

Bore Hole No. : BH-12

Location : N:2439566.0 E:618042.0

Ground Elevation : +91.0m

Method of Boring / Drilling : Shell / Rotary

Water Level : 2.70m a.b.l (min) at 7:30 hrs on 12/12
6.20m a.b.l (max) at 10:20 hrs on 11/12

Boring / Drilling Equipment : Mechanical Winch

Dia.of Boring / Drilling : Zx,Sx

Casing Lowered : Zx-15.74m, Sx-31.50m

Date : From 08.12.15 To 12.12.15

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description	
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value						
12/12	+39.3	44.00	44.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff bluish grey / grey silty clay with yellow spots.	
		45.00	45.45	0.45	P	6	8	8	-	16	-	-	-	-		
		46.00	46.50	0.50	U	-	-	-	-	-	-	-	-	-		
		47.00	47.45	0.45	P	10	12	14	-	26	-	-	-	-		
		48.00	48.50	0.50	U	-	-	-	-	-	-	-	-	-		
		49.00	49.45	0.45	P	8	9	12	-	21	-	-	-	-		
		50.00	50.50	0.50	U	-	-	-	-	-	-	-	-	-		
		51.00	51.45	0.45	P	10	12	16	-	28	-	-	-	-		
		52.00	52.50	0.50	U	Slipped					-	-	-	-		51.70m Medium dense to dense / very dense grey silty fine sand
		53.00	53.45	0.45	P	20	34	50	-	84	-	-	-	-		
		55.00	55.25	0.25	P	60	40	-	-	>100	-	-	-	-		
		57.00	57.13	0.13	P	100	-	-	-	>100	-	-	-	-		
		60.30	60.56	0.26	P	24	101	-	-	>100	-	-	-	-		
	+30.7	60.30	(Termination Depth)													

NOTES

1. Abbreviation Used : U-Undisturbed Sample C-Core Sample D-Disturbed Sample P-Standard Penetration Test V-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

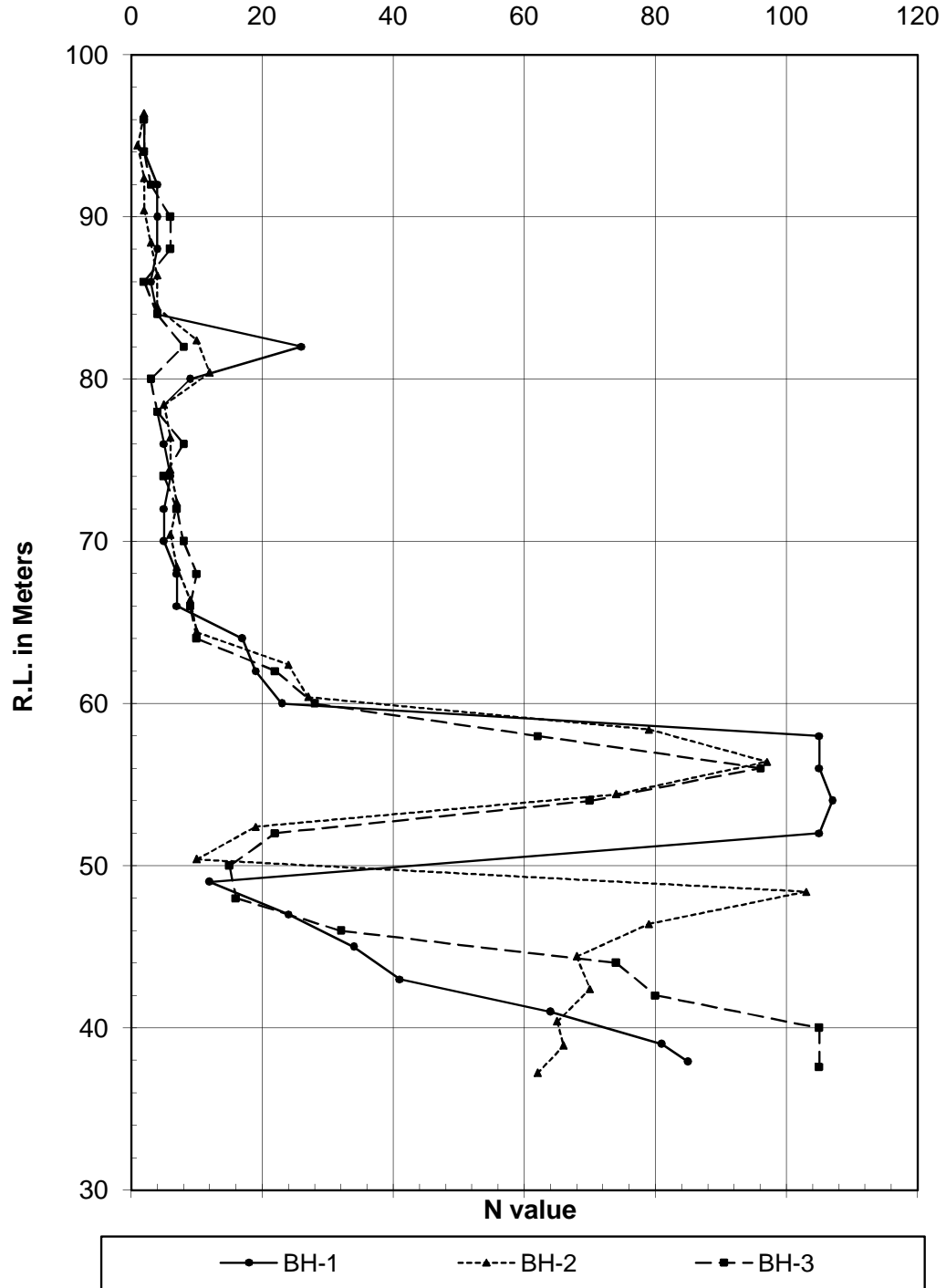
Site Engineer : A.Sarkar

Driller: A.Majumdar

Job No.: XCSPL/1372

XPLORER Consultancy Services Pvt. Ltd.

**GRAPHICAL REPRESENTATION OF
FIELD N-VALUE WITH R.L.**



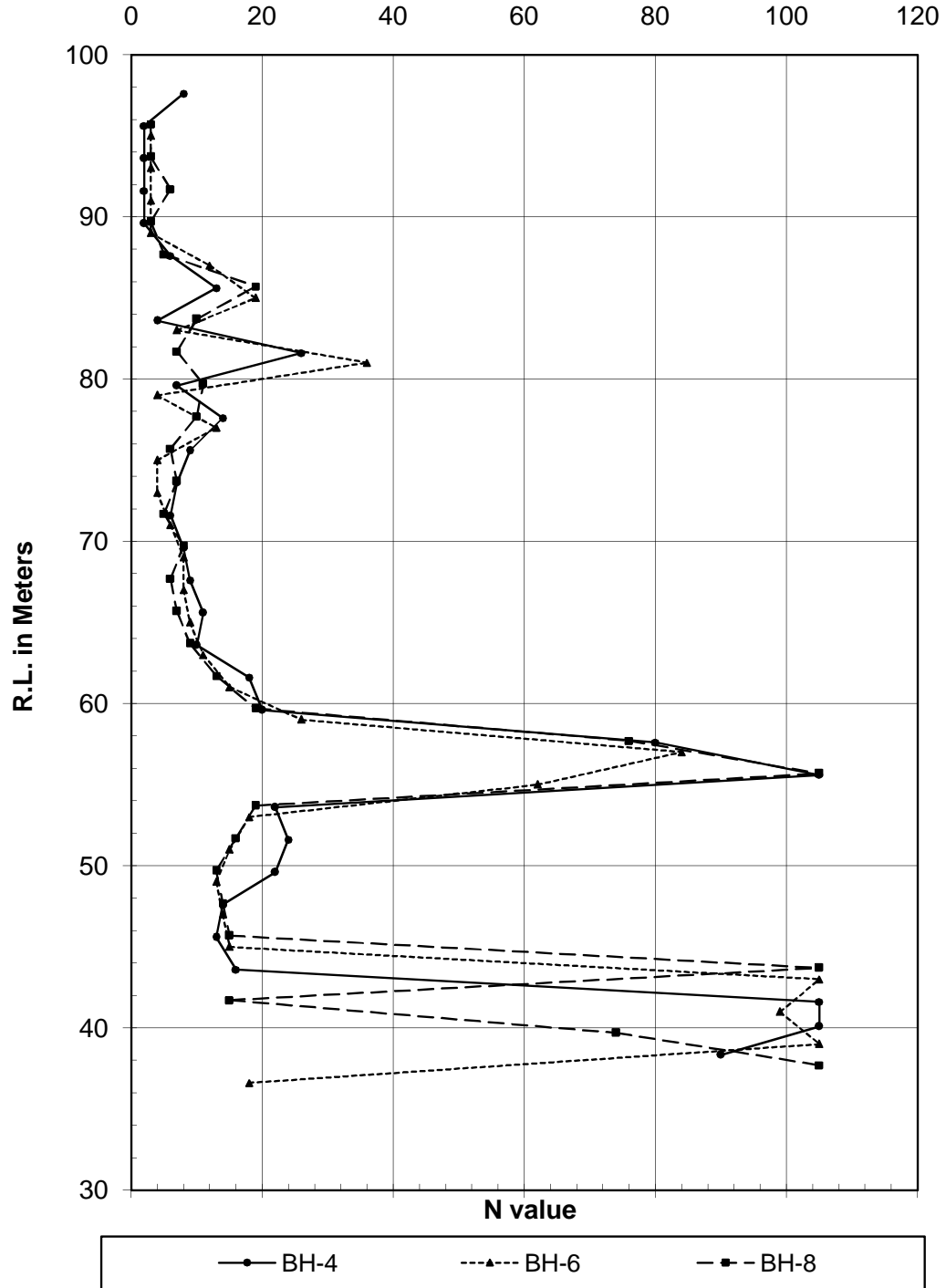
Project : Geotechnical investigation at Haldia terminal

Job No.: XC SPL/1372

Fig No.: B/1

XPLORER Consultancy Services Pvt. Ltd.

**GRAPHICAL REPRESENTATION OF
FIELD N-VALUE WITH R.L.**



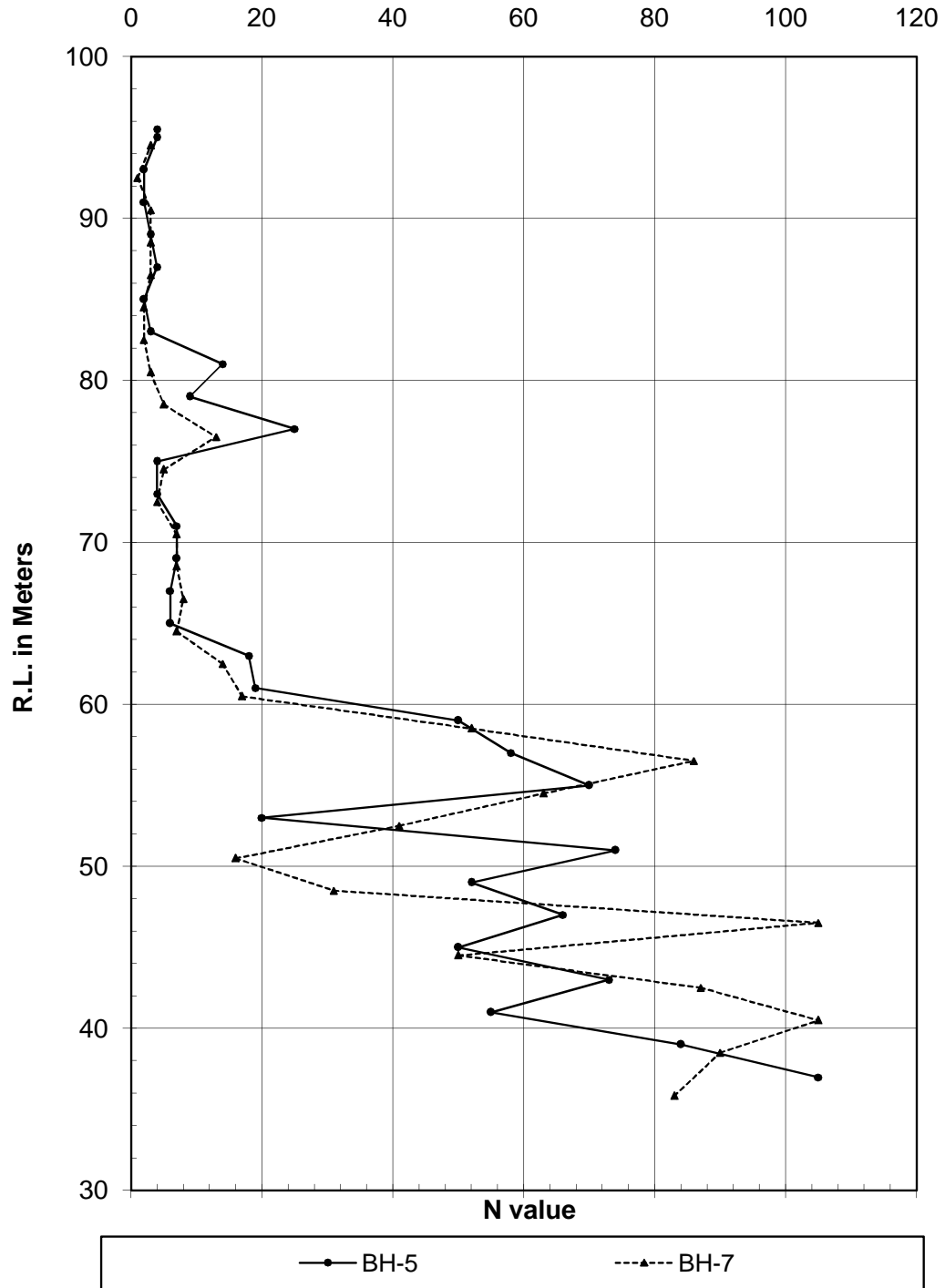
Project : Geotechnical investigation at Haldia terminal

Job No.: XC SPL/1372

Fig No.: B/2

XPLORER Consultancy Services Pvt. Ltd.

**GRAPHICAL REPRESENTATION OF
FIELD N-VALUE WITH R.L.**



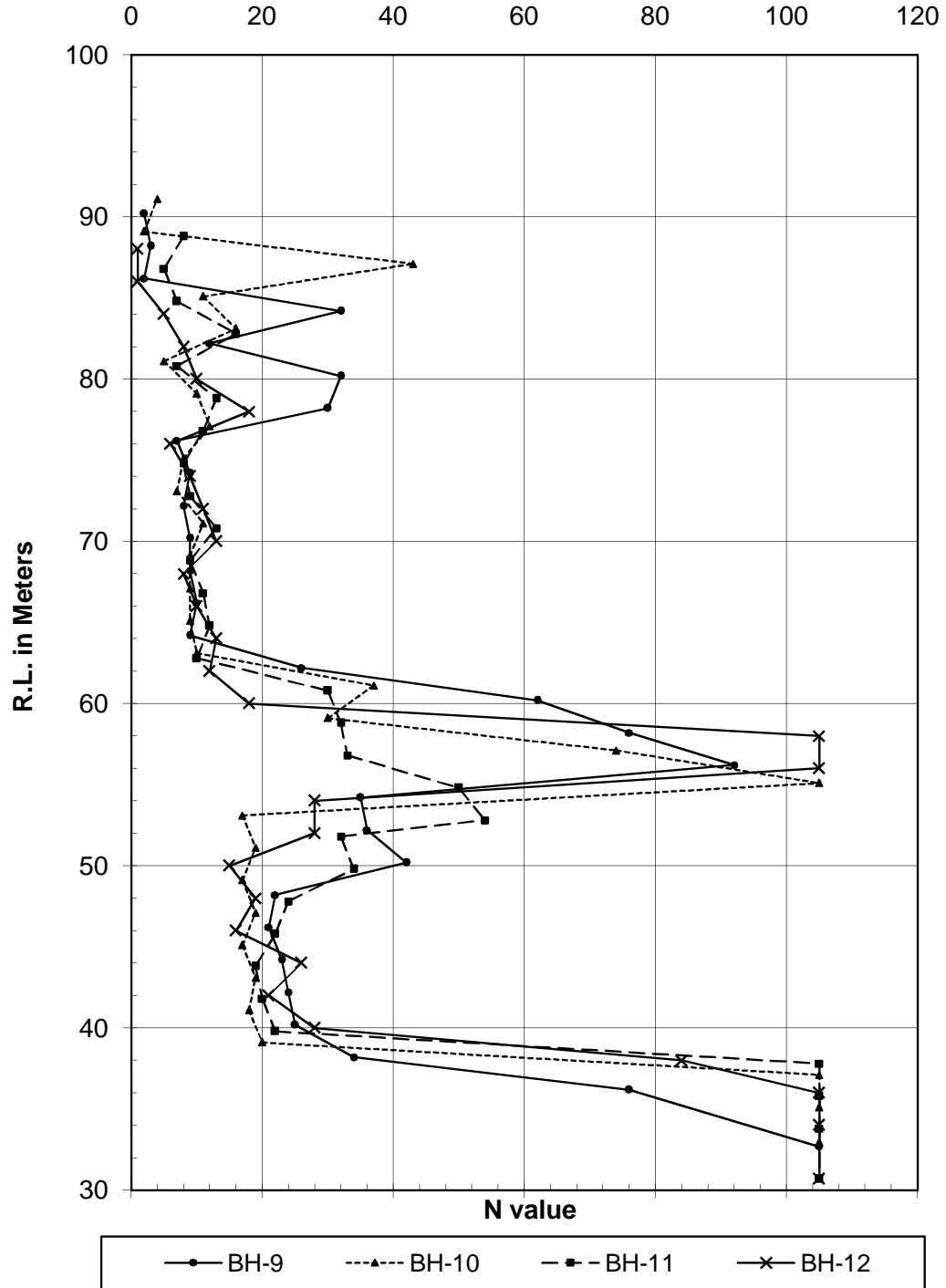
Project : Geotechnical investigation at Haldia terminal

Job No.: XCSPL/1372

Fig No.: B/3

XPLORER Consultancy Services Pvt. Ltd.

**GRAPHICAL REPRESENTATION OF
FIELD N-VALUE WITH R.L.**

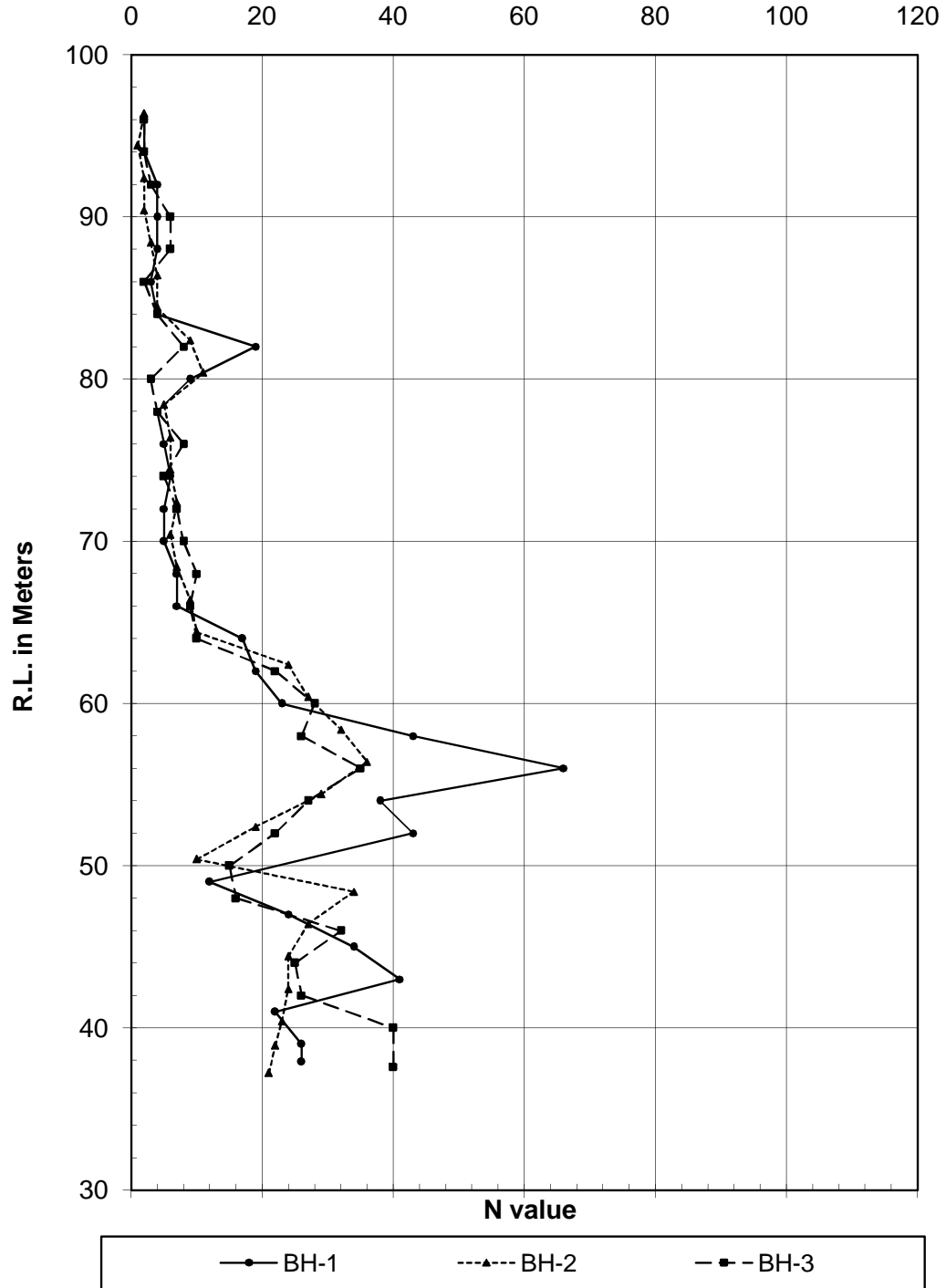


Project : Geotechnical investigation at Haldia terminal

Job No.: XCSPL/1372

Fig No.: B/4

**GRAPHICAL REPRESENTATION OF
CORRECTED N-VALUE WITH R.L.**

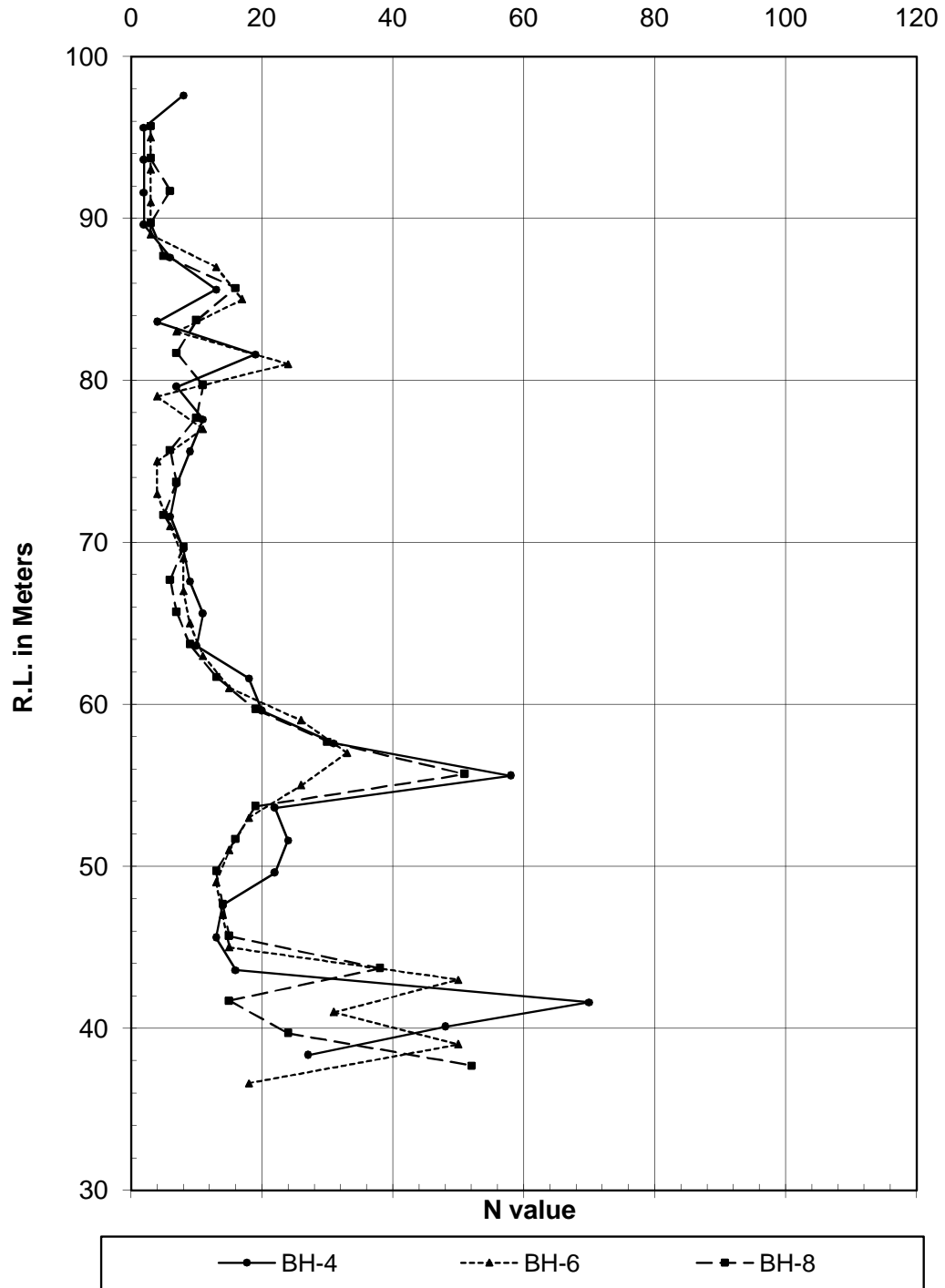


Project : Geotechnical investigation at Haldia terminal

Job No.: XC SPL/1372

Fig No.: B/5

**GRAPHICAL REPRESENTATION OF
CORRECTED N-VALUE WITH R.L.**

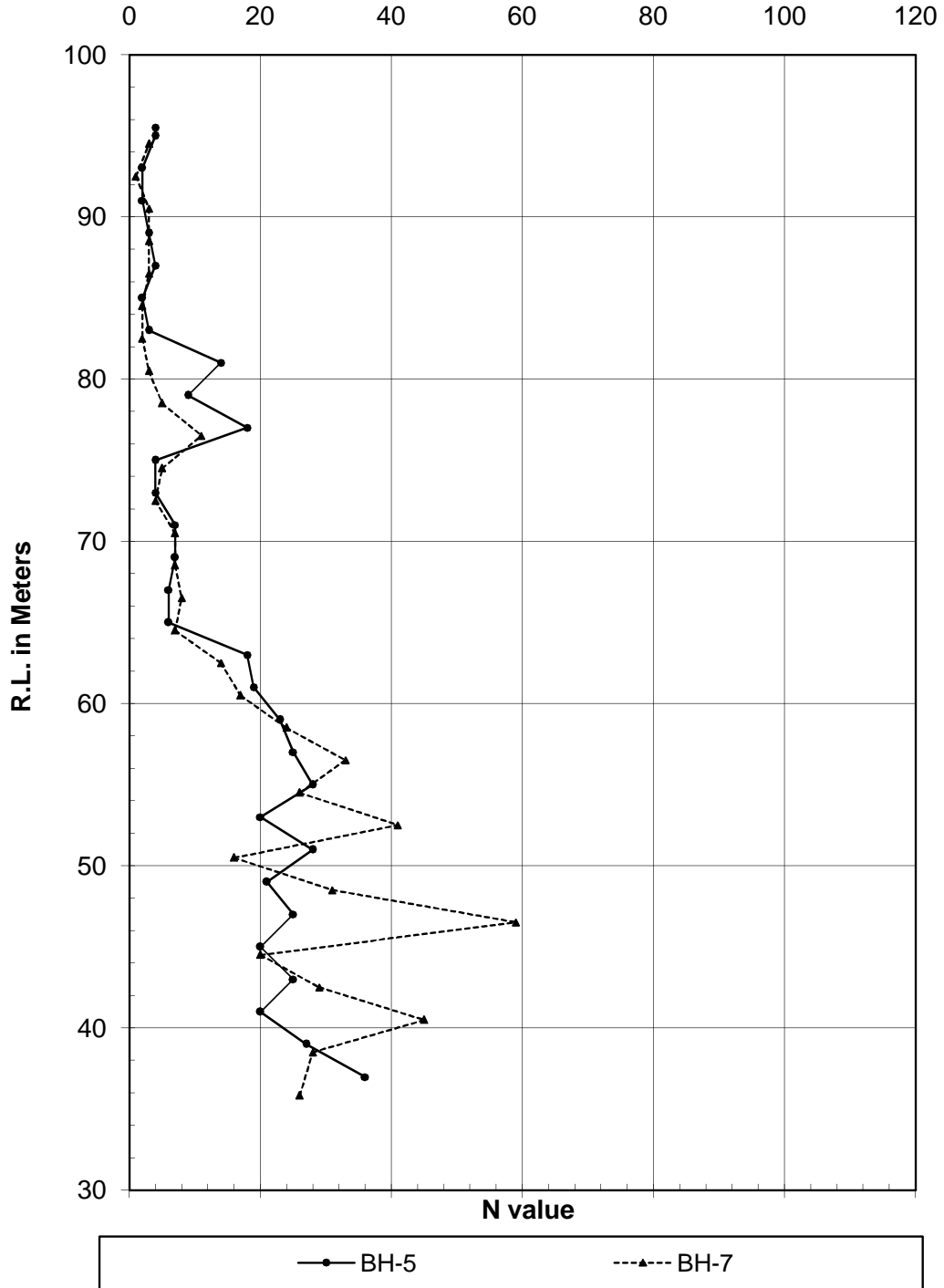


Project : Geotechnical investigation at Haldia terminal

Job No.: XC SPL/1372

Fig No.: B/6

**GRAPHICAL REPRESENTATION OF
CORRECTED N-VALUE WITH R.L.**



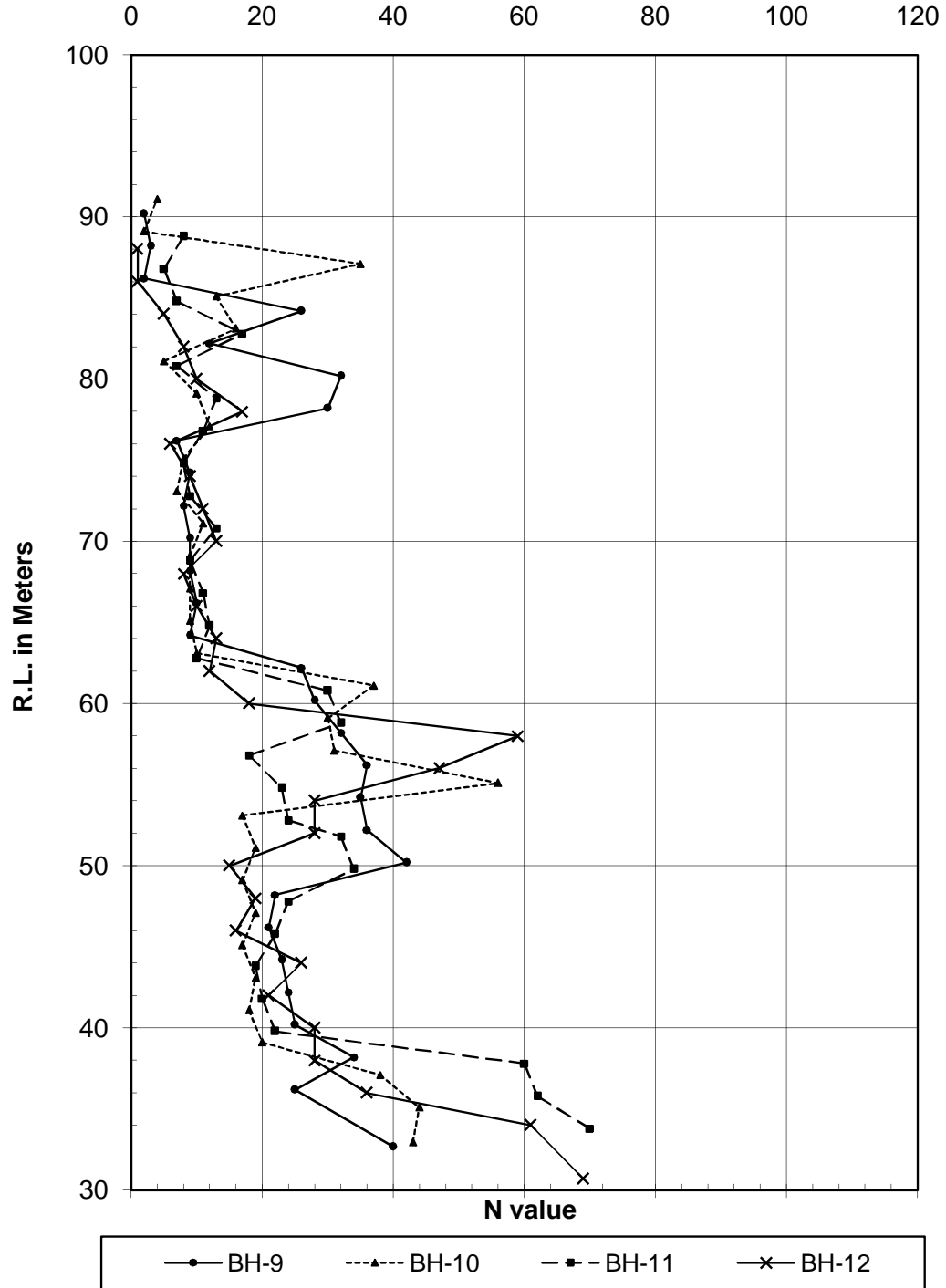
Project : Geotechnical investigation at Haldia terminal

Job No.: XCSP/L/1372

Fig No.: B/7

XPLORER Consultancy Services Pvt. Ltd.

**GRAPHICAL REPRESENTATION OF
CORRECTED N-VALUE WITH R.L.**



Project : Geotechnical investigation at Haldia terminal

Job No.: XCSPL/1372

Fig No.: B/8

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-1	1.00	Soft / firm grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 15.0m to 18.0m depth	-	-	-	0.8	77.8	21.4	30.4	1.809	1.387	42.9	20.9	22.0	CI	UU	0.16	2.0	-	-	-	-	-	
	2.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.00		-	-	-	0.5	78.6	20.9	33.6	1.822	1.364	44.4	20.9	23.5	CI	UU	0.20	2.5	2.66	0.2758	0.1414	0.9505	-	
	6.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	0.3	75.7	24.0	34.5	1.815	1.349	44.2	22.1	22.1	CI	UU	0.17	2.5	-	-	-	-	-	-
	10.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	5.8	75.3	18.9	32.8	1.835	1.382	42.9	22.7	20.2	CI	UU	0.22	2.5	-	-	-	-	-	-
	14.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00		-	-	-	79.6	*20.4	24.8	1.895	1.518	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	16.00		26	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	19.00		-	-	-	4.9	75.0	20.1	32.1	1.837	1.391	42.3	23.2	19.1	CI	UU	0.24	2.5	-	-	-	-	-	-
	20.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/1-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-1	22.00	#####	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	-	-	-	0.7	74.8	24.5	40.7	1.756	1.248	56.6	26.1	30.5	CH	UU	0.25	2.5	2.64	-	-	-	-
	24.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.00		-	-	-	2.6	69.1	28.3	40.7	1.760	1.251	60.4	25.2	35.2	CH	UU	0.27	1.5	-	-	-	-	-
	26.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		-	-	-	0.5	66.8	32.7	43.5	1.736	1.210	66.2	30.0	36.2	CH	UU	0.24	2.0	-	-	-	-	-
	28.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		-	-	-	0.5	70.7	28.8	38.2	1.769	1.280	60.9	27.7	33.2	CH	UU	0.33	2.0	2.63	0.4858	0.2364	1.0546	-
	32.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/1-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-1	34.00	#####	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	35.00	Very stiff bluish grey to grey sandy silty clay with occasional traces of kankars.	-	-	6.2	18.9	42.7	32.2	23.2	1.976	1.604	####	19.3	32.8	CH	UU	0.78	3.0	2.68	0.2387	0.1428	0.6709	-
	36.00		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00		-	-	-	39.9	35.5	24.6	22.0	2.006	1.644	####	18.7	26.0	CI	UU	0.87	3.5	-	-	-	-	-
	38.00		23	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.00	#####	>100	43	-	87.2	*12.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	42.00	Dense greyish yellow silty sand.	>100	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00		107	38	1.4	87.0	*11.6	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	46.00		>100	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00	#####	-	-	-	1.1	65.1	33.8	28.8	1.913	1.485	57.9	22.5	35.4	CH	UC	0.60	-	2.69	-	-	-	-
49.00	Stiff to very stiff/ hard grey / bluish grey silty clay with yellow spots.	12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50.00		-	-	-	1.1	65.4	33.5	25.8	1.970	1.566	60.9	21.7	39.2	CH	UC	1.02	-	-	-	-	-	-	

*Combined percentage of silt & clay

**LL and PL Test conducted on sample passing through 425μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/1-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-1	51.00	Stiff to very stiff/ hard grey / bluish grey silty clay with yellow spots.	24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	53.00		34	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	55.00		41	41	-	9.6	66.5	23.9	-	-	-	40.8	18.9	21.9	CI	-	-	-	-	-	-	-	-	-
	57.00	#####	64	22	-	59.2	*40.8	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	59.00	Medium dense grey / yellowish grey silty fine sand	81	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60.09		85	26	-	73.7	*26.3	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/1-4
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-2	1.00	Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 15.0m to 17.5m depth.	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2.00		-	-	-	0.3	79.7	20.0	34.1	1.805	1.346	41.8	23.2	18.6	CI	UU	0.15	2.0	-	-	-	-	-	
	3.00		1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	-	2.4	79.9	17.7	38.0	1.782	1.291	44.7	24.2	20.5	CI	UU	0.10	2.0	2.62	-	-	-	-	-
	5.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		-	-	-	2.1	81.7	16.2	35.3	1.797	1.328	42.9	23.7	19.2	CI	UU	0.16	2.5	-	-	-	-	-	-
	9.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		-	-	-	0.5	74.7	24.8	35.0	1.804	1.336	47.2	22.4	24.8	CI	UU	0.18	2.0	2.66	0.2882	0.1448	0.9906	-	
	11.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		-	-	-	1.8	79.0	19.2	33.6	1.826	1.367	43.7	22.8	20.9	CI	UU	0.21	2.5	-	-	-	-	-	-
	13.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00		10	9	-	67.4	*32.6	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	17.00		12	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/2-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-2	18.00	Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 15.0m to 17.5m depth.	-	-	-	3.2	78.8	18.0	33.0	1.831	1.377	44.9	22.5	22.4	CI	UU	0.26	2.0	2.64	-	-	-	-
	19.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20.00		-	-	-	19.5	65.0	15.5	32.9	1.845	1.388	42.3	24.7	17.6	CI	-	-	-	-	-	-	-	-
	21.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	22.00		-	-	-	3.7	80.2	16.1	31.7	1.852	1.406	40.3	24.2	16.1	CI	UU	0.32	2.5	2.67	-	-	-	-
	23.00		#####	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.	-	-	-	0.7	71.3	28.0	39.8	1.763	1.261	55.6	25.4	30.2	CH	UU	0.26	2.5	2.63	-	-	-	-
	25.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		-	-	-	2.8	62.0	35.2	40.2	1.782	1.271	68.8	30.1	38.7	CH	UU	0.27	2.0	-	-	-	-	-
	29.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		-	-	-	2.8	64.0	33.2	38.6	1.794	1.294	63.6	28.5	35.1	CH	UU	0.35	3.0	2.63	-	-	-	-
	33.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.00	-	-	-	0.6	59.0	40.4	37.8	1.798	1.305	68.1	28.2	39.9	CI	UU	0.38	2.5	-	-	-	-	-		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/2-2
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Sheet No.:C-6

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀		
BH-2	35.00	#####	24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	36.00	Very stiff bluish grey / grey sandy silty clay with kankars.	-	-	4.0	18.1	44.0	33.9	22.6	2.008	1.638	48.8	18.4	30.4	CI	UU	0.90	3.5	2.68	-	-	-	-	-	
	37.00	#####	27	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	39.00	Medium dense / dense greyish yellow silty sand.	79	32	-	86.8	*13.2	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	41.00	#####	97	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.00	#####	74	29	-	88.3	*11.7	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	45.00	Stiff grey silty clay with brown spots.	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.00	#####	-	-	-	0.8	61.5	37.7	30.1	1.888	1.451	57.9	22.3	35.6	CH	UC	0.48	-	-	-	-	-	-	-	-
	47.00	#####	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00	#####	-	-	-	1.0	59.4	39.6	29.9	1.903	1.465	57.6	22.8	34.8	CH	UC	0.52	-	2.69	-	-	-	-	-	-
	49.00	#####	103	34	-	81.3	*18.7	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	51.00	Medium dense yellowish grey to grey silty fine sand.	79	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	53.00	#####	68	24	-	69.7	*30.3	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	55.00	#####	70	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	57.00	#####	65	23	-	54.2	*45.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-
	58.50	#####	66	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60.18	#####	62	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XC SPL/1372	TABLE NO.: C/2-3
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Sheet No.: C-7

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-3	1.00	Fill consisting of grey silty clay with traces of sand, brick pieces etc.	-	-	4.8	10.1	*85.1	-	25.2	1.828	1.460	-	-	-	-	-	-	-	-	-	-	-	-	
	2.00	1.50m Soft / firm grey silty clay with occasional laminations of silt / fine sand.	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3.00		-	-	-	2.6	81.7	15.7	32.4	1.802	1.361	39.7	22.1	17.6	CI	UU	0.14	2.5	2.63	-	-	-	-	
	4.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.00		-	-	-	7.0	78.2	14.8	33.2	1.815	1.363	39.4	23.0	16.4	CI	UU	0.16	3.0	-	-	-	-	-	
	6.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	0.9	85.0	14.1	31.6	1.835	1.394	40.3	23.8	16.5	CI	UU	0.24	2.5	2.67	0.2727	0.1424	0.9148	-	
	8.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	1.9	83.9	14.2	31.7	1.841	1.398	40.9	23.8	17.1	CI	-	-	-	-	-	-	-	-	-
	10.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	8.7	74.5	16.8	33.8	1.821	1.361	41.6	24.7	16.9	CI	UU	0.18	2.5	-	-	-	-	-	-
	14.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/3-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀		
BH-3	17.00	Soft / firm grey silty clay with occasional laminations of silt / fine sand.	-	-	-	14.6	71.7	13.7	33.0	1.817	1.366	40.9	24.3	16.6	CI	UU	0.20	2.0	-	-	-	-	-		
	18.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	19.00		-	-	-	1.1	79.0	19.9	32.4	1.830	1.382	46.6	22.8	23.8	CI	UU	0.23	2.0	2.67	-	-	-	-	-	
	20.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	22.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23.00	-	-	-	0.9	74.7	24.4	30.6	1.851	1.417	46.3	21.2	25.1	CI	UU	0.37	2.0	-	-	-	-	-	-	-	
	24.00	#####	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.00	-		-	-	4.7	66.5	28.8	45.3	1.726	1.188	63.1	30.6	32.5	CH	UU	0.23	2.5	-	-	-	-	-	-	-
	26.00	7		7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00	-		-	-	0.6	63.2	36.2	40.7	1.760	1.251	62.7	27.5	35.2	CH	UU	0.30	2.0	2.64	-	-	-	-	-	-
	28.00	8		8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00	-		-	-	1.7	68.0	30.3	41.3	1.763	1.248	65.1	31.0	34.1	CH	UU	0.35	2.0	-	-	-	-	-	-	-
	30.00	10		10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00	-		-	-	0.4	66.2	33.4	38.3	1.799	1.301	63.5	28.8	34.7	CH	UU	0.37	2.5	-	-	-	-	-	-	-
	32.00	9		9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00	-		-	-	1.4	65.5	33.1	42.1	1.748	1.230	69.3	29.0	40.3	CH	UU	0.27	2.0	2.64	0.6083	0.2834	1.1461	-	-	
34.00	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/3-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-3	35.00	##### Very stiff grey sandy silty clay.	-	-	-	40.2	42.4	17.4	22.0	2.001	1.640	40.4	20.2	20.2	CI	UU	0.88	4.5	-	-	-	-	-	
	36.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	37.00		-	-	-	30.9	47.0	22.1	21.1	2.013	1.662	45.5	19.7	25.8	CI	UU	0.95	3.0	2.68	-	-	-	-	
	38.00		28	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	40.00	##### Medium dense / dense greyish yellow silty sand.	62	26	-	85.2	*14.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	42.00		96	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00		70	27	0.7	88.1	*11.2	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	46.00	##### Stiff / very stiff bluish grey / grey silty clay with brown spots; hard grey silty sandy clay observed at 52.0m depth.	22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00		-	-	-	0.3	62.3	37.4	25.9	1.967	1.562	55.0	21.7	33.3	CH	UC	0.95	-	2.70	-	-	-	-	-
	48.00		15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	49.00		-	-	-	2.5	74.4	23.1	27.7	1.930	1.511	47.6	22.2	25.4	CI	UU	0.64	2.5	-	-	-	-	-	-
	50.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	51.00		-	-	-	3.1	67.3	29.6	27.9	1.942	1.518	55.7	22.9	32.8	CH	UC	0.75	-	2.69	-	-	-	-	-
	52.00		32	32	0.3	47.1	35.5	17.1	-	-	-	36.1	19.0	17.1	CI	-	-	-	-	-	-	-	-	-
	54.00	##### Medium dense to dense greyish yellow / grey silty fine sand	74	25	-	63.8	*36.2	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
56.00		80	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
58.00		>100	40	-	84.5	*15.5	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	
60.40		>100	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB NO: XCSPL/1372	TABLE NO.: C/3-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor				
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀			
BH-4	1.00	Fill consisting of yellowish grey silty clay with sand, kankars, brick pieces etc.	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	2.00		2.00m	-	-	-	2.9	78.6	18.5	31.5	1.820	1.384	39.3	20.0	19.3	CI	UU	0.14	2.5	2.67	0.2952	0.1530	0.9291	-		
	3.00	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt / fine sand.	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4.00		-	-	-	1.3	80.5	18.2	33.1	1.805	1.356	39.3	21.1	18.2	CI	-	-	-	-	-	-	-	-	-	-	
	5.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.00		-	-	-	0.7	73.1	26.2	34.0	1.817	1.356	46.4	20.1	26.3	CI	UU	0.16	1.0	-	-	-	-	-	-	-	-
	7.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		-	-	-	5.2	77.7	17.1	32.9	1.818	1.368	42.8	23.0	19.8	CI	UU	0.18	2.5	2.66	0.2718	0.1398	0.9445	-	-	-	
	11.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		-	-	-	12.1	70.8	17.1	31.7	1.839	1.396	43.3	22.7	20.6	CI	UU	0.25	3.0	-	-	-	-	-	-	-	-
	13.00		13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	16.00	-	-	-	-	3.2	79.5	17.3	33.1	1.826	1.372	43.2	22.6	20.6	CI	UU	0.23	2.0	2.66	-	-	-	-	-	-	

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/4-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-4	17.00	#####	26	19	-	88.0	*12.0	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	19.00	Medium dense grey silty fine sand with a thin band of firm grey silty clay from 18.6m to 20.0m depth.	7	7	-	5.5	*94.5	-	-	-	46.0	21.0	25.0	CI	-	-	-	-	-	-	-	-	-
	20.00		-	-	-	87.5	*12.5	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	21.00		14	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23.00	#####	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	-	-	-	0.9	73.8	25.3	40.9	1.746	1.239	58.8	26.5	32.3	CH	UU	0.28	2.5	-	-	-	-	-
	25.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		-	-	-	0.7	62.9	36.4	43.3	1.731	1.208	68.7	28.3	40.4	CH	-	-	-	-	-	-	-	-
	29.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		-	-	-	1.2	67.8	31.0	40.9	1.757	1.247	65.7	26.0	39.7	CH	UU	0.36	1.5	2.63	0.5403	0.2562	1.1091	-
	33.00	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	34.00	-	-	-	1.1	65.9	33.0	38.9	1.781	1.282	66.9	29.0	37.9	CH	UU	0.40	2.0	-	-	-	-	-	
35.00	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
37.00	#####	Stiff to very stiff grey silty sandy clay	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
38.00	-		-	-	40.1	38.1	21.8	21.9	1.988	1.631	40.8	18.8	22.0	CI	UU	0.72	4.0	2.67	0.2544	0.1554	0.6372	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/4-2

Sheet No.:C-12

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-4	39.00	Stiff to very stiff grey silty sandy clay	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		#####																					
	41.00	Dense to very dense grey silty sand.	80	31	0.3	85.6	*14.1	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	43.00		>100	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		#####																					
	45.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.00	Stiff / very stiff greyish yellow to grey silty clay with brown spots.	-	-	-	1.3	62.5	36.2	25.3	1.965	1.568	52.2	21.1	31.1	CH	UU	0.96	2.0	2.69	-	-	-	-
	47.00		24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	49.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50.00		-	-	-	0.9	67.4	31.7	29.3	1.922	1.486	51.8	22.2	29.6	CH	UC	0.63	-	-	-	-	-	-
	51.00		14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	53.00		13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	54.00		-	-	-	1.4	69.8	28.8	28.8	1.935	1.502	55.0	22.2	32.8	CH	UC	0.72	-	-	-	-	-	-
	55.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	#####																						
57.00	Medium dense/ dense grey silty fine sand.	>100	70	-	89.4	*10.6	-	-	-	-	-	-	-	SM-SP	-	-	-	-	-	-	-	-	
58.50		>100	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60.25		90	27	-	83.2	*16.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/4-3

Sheet No.:C-13

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm^2)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0				
BH-5	1.00	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt / fine sand	-	-	-	0.3	72.8	26.9	31.2	1.836	1.399	49.9	20.5	29.4	CI	UU	0.23	2.0	-	-	-	-	-			
	1.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	2.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.00		-	-	-	4.0	79.3	16.7	34.4	1.802	1.341	42.6	23.8	18.8	CI	UU	0.14	2.5	2.67	0.2970	0.1491	0.9914	-	-		
	6.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.00		-	-	-	3.4	79.4	17.2	33.4	1.820	1.364	42.6	23.5	19.1	CI	-	-	-	-	-	-	-	-	-	-	-
	8.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00		-	-	-	13.2	71.2	15.6	34.0	1.813	1.353	42.6	23.2	19.4	CI	UU	0.16	2.0	-	-	-	-	-	-	-	-
	12.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/5-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-5	14.00	Soft / firm yellowish grey to grey silty clay with occasional laminations of silt / fine sand	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00		-	-	-	3.9	79.0	17.1	32.2	1.836	1.389	41.7	22.0	19.7	CI	UU	0.20	2.5	2.66	-	-	-	-
	16.00		14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		-	-	-	12.4	69.7	17.9	30.5	1.867	1.431	41.1	22.0	19.1	CI	UU	0.40	3.5	2.68	-	-	-	-
	18.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20.00	#####	25	18	-	68.0	*32.0	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	22.00	#####	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	-	-	-	0.5	64.0	35.5	41.6	1.742	1.230	57.4	27.4	30.0	CH	UU	0.24	2.0	2.63	-	-	-	-
	24.00	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26.00	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	-	-	-	-	1.3	60.6	38.1	40.0	1.750	1.250	64.7	26.8	37.9	CH	UU	0.33	2.5	-	-	-	-	-	
28.00	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/5-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-5	30.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	31.00		-	-	-	0.7	59.6	39.7	41.1	1.772	1.256	60.3	26.8	33.5	CH	UU	0.31	2.0	2.64	0.6364	0.3027	1.1022	-
	32.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			#####																				
	34.00	Stiff to very stiff grey silty sandy clay	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	35.00		-	-	-	42.7	33.5	23.8	21.6	1.994	1.640	41.0	19.0	22.0	CI	UU	0.74	3.5	2.68	0.2353	0.1440	0.6343	-
	36.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			#####																				
	38.00	Medium dense yellowish grey silty sand	50	23	0.2	86.7	*13.1	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	40.00		58	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	42.00		70	28	-	88.6	*11.4	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
			#####																				
44.00	Very stiff grey to bluish grey silty clay with yellow spots	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
45.00		-	-	-	0.6	62.1	37.3	26.1	1.956	1.551	55.0	21.6	33.4	CH	UC	0.88	-	2.69	0.2565	0.1479	0.7342	-	
46.00		74	28	-	54.2	*45.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	
48.00	Medium dense yellowish grey silty fine sand	52	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/5-3
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Sheet No.:C-16

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-5	50.00	Medium dense yellowish grey silty fine sand	66	25	-	75.5	*24.5	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-		
	52.00		50	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	54.00		73	25	-	82.1	*17.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	
	56.00		55	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	58.00		84	27	-	84.1	*15.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	60.03		>100	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLOER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSP/L/1372	TABLE NO.: C/5-4
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0			
BH-6	1.00	Soft/ firm yellowish grey to grey silty clay with occasional laminations of silt; medium dense grey silty sand with clay as binder observed from 10.0m to 13.5m depth.	-	-	-	1.0	76.3	22.7	30.9	1.836	1.403	42.3	19.7	22.6	CI	UU	0.22	2.5	-	-	-	-	-		
	2.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3.00		-	-	-	0.5	66.9	32.6	32.7	1.823	1.374	50.2	19.9	30.3	CH	UU	0.20	1.5	2.67	0.3123	0.1607	0.9435	-		
	4.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.00		-	-	-	0.5	74.8	24.7	33.5	1.820	1.363	46.7	20.4	26.3	CI	UU	0.17	2.0	2.68	-	-	-	-	-	
	6.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	-	2.5	81.5	16.0	32.7	1.827	1.377	42.2	23.3	18.9	CI	-	-	-	2.66	-	-	-	-	-
	10.00		12	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00		-	-	-	-	72.7	*27.3	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	12.00	19	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	13.00	-	-	-	-	64.6	29.7	5.7	31.3	1.840	1.401	-	-	-	SM	-	-	-	-	-	-	-	-	-	
	14.00	7	7	-	-	11.9	*88.1	-	-	-	-	38.8	23.6	15.2	CI	-	-	-	-	-	-	-	-	-	
	15.00	#####	-	-	-	83.1	*16.9	24.2	1.930	1.554	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	
16.00	Medium dense grey silty fine sand with a thin band of firm grey silty clay from 18.0m to 19.0m depth.	36	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/6-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0				
BH-6	18.00	Medium dense grey silty fine sand with a thin band of firm grey silty clay from 18.0m to 19.0m depth.	4	4	-	4.4	*95.6	-	-	-	41.3	20.8	20.5	CI	-	-	-	-	-	-	-	-	-			
	19.00		-	-	-	89.6	*10.4	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-		
	20.00		13	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	22.00	#####	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	23.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	-	-	-	1.4	67.7	30.9	42.9	1.736	1.215	58.4	27.4	31.0	CH	UU	0.25	2.0	-	-	-	-	-	-	-	
	24.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	26.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		-	-	-	0.7	65.0	34.3	42.4	1.753	1.231	70.9	28.7	42.2	CH	UU	0.31	2.0	-	-	-	-	-	-	-	-
	28.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		-	-	-	1.1	60.5	38.4	42.9	1.758	1.230	66.9	27.5	39.4	CH	-	-	-	-	-	-	-	-	-	-	-
	30.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00	-	-	-	0.8	65.0	34.2	38.5	1.773	1.280	62.2	26.2	36.0	CH	UU	0.38	2.5	2.63	0.4857	0.2364	1.0545	-	-	-		
	34.00	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/6-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-6	36.00	#####	15	15	-	26.4	43.4	30.2	-	-	-	49.3	19.5	29.8	CI	-	-	-	-	-	-	-	-
	37.00	Stiff to very stiff grey sandy silty clay with traces of kankars.	-	-	6.8	33.1	34.4	25.7	20.8	2.013	1.666	43.0	18.8	24.2	CI	UU	0.93	4.0	-	-	-	-	-
	38.00		26	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.00	#####	84	33	-	83.2	*16.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	42.00	Medium dense/ dense yellowish grey silty sand.	62	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00		18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	45.00	Stiff / very stiff yellowish grey to grey silty clay with brown spots	-	-	-	1.1	64.4	34.5	28.3	1.940	1.512	52.8	22.4	30.4	CH	UC	0.82	-	2.68	0.2665	0.1504	0.7724	-
	46.00		15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	49.00	-	-	-	-	1.9	66.6	31.5	29.4	1.927	1.489	53.9	22.1	31.8	CH	UC	0.65	-	-	-	-	-	-
	50.00	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	52.00	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	53.00	-	-	-	-	1.2	66.4	32.4	29.0	1.932	1.498	54.8	22.7	32.1	CH	UC	0.68	-	2.69	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLOER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/6-3
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Sheet No.: C-20

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$	
BH-6	54.00	#####	>100	50	4.4	83.5	*12.1	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	56.00	Dense grey silty fine sand with kankars; stiff grey silty clay with lamination of sand observed at 60.39m depth.	99	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	58.00		>100	50	-	85.7	*14.3	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	60.39		18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/6-4

Sheet No.:C-21

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0			
BH-7	1.00	Very soft / soft to firm grey silty clay with occasional laminations of silt.	-	-	-	6.2	73.0	20.8	30.5	1.838	1.408	43.5	20.4	23.1	CI	-	-	-	-	-	-	-	-		
	2.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3.00		-	-	-	0.4	69.4	30.2	35.9	1.788	1.316	46.0	21.3	24.7	CI	UU	0.10	2.0	2.66	0.3155	0.1561	1.0218	-		
	4.00		1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.00		-	-	-	2.8	74.4	22.8	33.2	1.828	1.372	42.9	21.9	21.0	CI	UU	0.17	1.5	-	-	-	-	-	-	
	6.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	0.9	81.0	18.1	33.4	1.834	1.375	43.1	23.1	20.0	CI	UU	0.20	1.5	-	-	-	-	-	-	-
	8.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	9.2	76.7	14.1	32.6	1.832	1.382	41.2	24.4	16.8	CI	UU	0.18	2.5	2.62	-	-	-	-	-	-
	10.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00		-	-	-	5.4	78.0	16.6	32.9	1.824	1.372	40.8	23.3	17.5	CI	UU	0.16	2.5	-	-	-	-	-	-	-
	12.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	4.7	79.4	15.9	35.6	1.793	1.322	41.9	24.7	17.2	CI	UU	0.15	2.0	2.64	-	-	-	-	-	-
	14.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/7-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor				
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀			
BH-7	17.00	Very soft / soft to firm grey silty clay with occasional laminations of silt.	-	-	-	6.8	75.4	17.8	32.4	1.838	1.388	42.6	22.8	19.8	CI	UU	0.21	2.5	-	-	-	-	-			
	18.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	19.00		-	-	-	0.6	82.0	17.4	31.0	1.846	1.409	43.2	23.3	19.9	CI	UU	0.26	2.5	2.66	-	-	-	-	-		
	20.00	##### Medium dense grey silty fine sand.	13	11	-	75.0	*25.0	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-		
	22.00	##### Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.	-	-	-	3.4	68.6	28.0	42.9	1.738	1.216	64.7	29.0	35.7	CH	UU	0.22	2.5	2.63	-	-	-	-	-	-	
	24.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	25.00		-	-	-	0.9	70.0	29.1	41.6	1.745	1.232	63.2	29.4	33.8	CH	UU	0.26	2.0	-	-	-	-	-	-	-	
	26.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		-	-	-	1.4	66.6	32.0	41.1	1.762	1.249	63.4	28.5	34.9	CH	UU	0.34	2.0	2.63	0.5365	0.2547	1.1061	-	-	-	
	28.00	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29.00	-	-	-	1.3	62.0	36.7	37.8	1.784	1.295	63.3	26.0	37.3	CH	UU	0.40	2.5	-	-	-	-	-	-	-	-	
	30.00	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/7-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-7	31.00	Firm grey silty clay with varying percentage of decomposed/ semi decomposed wood.	-	-	-	1.2	66.3	32.5	39.8	1.777	1.271	64.4	28.5	35.9	CH	UU	0.31	2.0	-	-	-	-	-	
	32.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	33.00		-	-	-	0.5	66.5	33.0	39.4	1.791	1.285	66.8	26.4	40.4	CH	-	-	-	-	-	-	-	-	-
	34.00	#####	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	35.00	Stiff to very stiff grey sandy silty clay with occasional traces of kankars.	-	-	-	31.0	43.0	26.0	25.0	1.953	1.562	48.8	20.0	28.8	CI	UU	0.65	2.5	2.68	-	-	-	-	-
	36.00		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00		-	-	3.1	26.8	41.9	28.2	24.4	1.970	1.584	####	18.5	35.3	CH	UU	0.76	3.0	-	-	-	-	-	-
	38.00	#####	52	24	0.8	83.9	*15.3	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	40.00	Medium dense yellowish grey / greyish yellow silty sand.	86	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	42.00		63	26	0.6	84.5	*14.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	44.00	#####	41	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	45.00	Very stiff bluish grey silty clay with yellow spots.	-	-	-	1.0	60.1	38.9	27.6	1.942	1.522	61.1	20.9	40.2	CH	UC	0.81	-	2.69	0.2530	0.1431	0.7675	-	-
	46.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00		-	-	-	2.8	76.6	20.6	24.3	2.000	1.609	43.9	21.6	22.3	CI	UU	1.22	2.5	2.70	-	-	-	-	-
48.00	31	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

**LL and PL Test conducted on sample passing through 425μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/7-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$	
BH-7	50.00	##### Medium dense / dense yellowish grey / grey silty fine sand.	>100	59	-	79.8	*20.2	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	52.00		50	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	54.00		87	29	-	83.9	*16.1	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	56.00		>100	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	58.00		90	28	-	82.1	*17.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-
	60.68		83	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Combined percentage of silt & clay																						
Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength																						
XPLORER GURGAON			Bore hole data and Laboratory test results for Haldia terminal													JOB No.: XCSPL/1372		TABLE NO.: C/7-4				

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀		
BH-8	1.00	Soft / firm to stiff yellowish grey to grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty sand with clay as binder observed from 12.0m to 14.5m	-	-	-	0.7	72.0	27.3	29.4	1.826	1.411	50.0	22.0	28.0	CH	UU	0.20	2.5	-	-	-	-	-		
	2.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3.00		-	-	-	1.9	70.6	27.5	33.9	1.818	1.358	50.4	22.4	28.0	CH	UU	0.19	2.0	2.64	-	-	-	-	-	
	4.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.00		-	-	-	0.6	72.2	27.2	32.9	1.821	1.370	53.8	22.9	30.9	CH	UU	0.21	2.5	-	-	-	-	-	-	-
	8.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00		-	-	-	14.3	65.7	20.0	32.4	1.832	1.384	43.3	24.4	18.9	CI	UU	0.25	2.0	2.67	0.2524	0.1308	0.9296	-	-	
	12.00		19	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14.00		10	10	-	53.1	40.9	6.0	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	16.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		-	-	-	5.8	78.1	16.1	30.6	1.841	1.410	44.1	24.1	20.0	CI	UU	0.32	3.5	-	-	-	-	-	-	-
	18.00		11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/8-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-8	19.00	Soft / firm to stiff yellowish grey to grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty sand with clay as binder observed from 12.0m to 14.5m #####	-	-	-	1.3	78.0	20.7	29.0	1.868	1.448	47.3	23.1	24.2	CI	UU	0.35	2.5	-	-	-	-	-	
	20.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21.00	Grey silty fine sand. #####	-	-	-	83.4	*16.6	30.3	1.825	1.401	-	-	-	SM	-	-	-	2.65	-	-	-	-	-	
	22.00	#####	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	23.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.	-	-	-	0.9	70.0	29.1	39.9	1.767	1.263	57.3	26.6	30.7	CH	UU	0.29	2.0	2.64	-	-	-	-	-
	24.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.00		-	-	-	0.5	62.6	36.9	41.3	1.756	1.243	59.6	27.6	32.0	CH	UU	0.27	2.5	-	-	-	-	-	-
	26.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		-	-	-	1.1	68.0	30.9	40.8	1.758	1.249	55.1	28.1	27.0	CH	UU	0.28	3.0	-	-	-	-	-	-
	28.00	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00	-	-	-	0.8	55.3	43.9	41.6	1.760	1.243	75.1	26.8	48.3	CH	UU	0.33	2.5	2.66	-	-	-	-	-	-
	30.00	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32.00	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/8-2
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Sheet No.:C-27

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-8	33.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.	-	-	-	0.3	58.2	41.5	40.5	1.777	1.265	68.6	28.1	40.5	CH	UU	0.37	2.0	2.64	0.5031	0.2410	1.0873	-
	34.00	#####	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.00	#####	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00	Stiff to very stiff grey / bluish grey sandy silty clay with kankars.	-	-	6.7	28.6	33.6	31.1	24.7	1.964	1.575	####	18.5	34.7	CH	UU	0.76	2.5	2.70	-	-	-	-
	38.00	#####	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.00	Medium dense to dense grey silty sand.	76	30	-	87.1	*12.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	42.00	#####	>100	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00	stiff / very stiff grey silty clay with yellow / brown spots.	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	45.00	#####	-	-	-	1.1	58.9	40.0	27.0	1.942	1.529	58.5	21.5	37.0	CH	UC	0.84	-	2.68	-	-	-	-
	46.00	#####	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00	#####	-	-	-	10.0	55.2	34.8	29.5	1.924	1.486	56.8	21.4	35.4	CH	UU	0.62	2.0	2.69	-	-	-	-
	48.00	#####	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	49.00	#####	-	-	-	0.5	69.0	30.5	29.0	1.927	1.494	56.2	22.4	33.8	CH	UC	0.65	-	-	-	-	-	-
50.00	#####	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

**LL and PL Test conducted on sample passing through 425μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/8-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-8	51.00	stiff / very stiff grey silty clay with yellow / brown spots. ##### Medium dense / dense grey silty fine sand; stiff grey silty clay with laminations of sand observed at 56.0m depth.	-	-	-	0.7	65.1	34.2	28.7	1.930	1.500	53.5	22.1	31.4	CH	UC	0.69	-	-	-	-	-	-	
	52.00		15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	53.00		-	-	-	6.1	57.6	36.3	28.1	1.940	1.514	58.3	22.8	35.5	CH	UC	0.74	-	2.70	-	-	-	-	-
	54.00		>100	38	1.3	82.7	*16.0	-	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	56.00		15	15	0.3	10.7	68.2	20.8	-	-	-	-	41.3	21.0	20.3	CI	-	-	-	-	-	-	-	-
	58.00		74	24	-	70.9	*29.1	-	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	60.00		>100	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/8-4
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-9	2.00	Soft / firm to stiff grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand observed from 9.00m to 11.00m depth	-	-	-	3.2	77.9	18.9	38.3	1.736	1.255	44.5	24.7	19.8	CI	UU	0.16	2.0	2.63	-	-	-	2.80	
	3.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4.00		-	-	-	1.8	78.0	20.2	40.6	1.727	1.228	47.5	24.6	22.9	CI	UU	0.15	2.0	-	-	-	-	2.77	
	5.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6.00		-	-	-	1.5	79.2	19.3	37.5	1.746	1.270	45.2	23.7	21.5	CI	UU	0.18	1.5	2.64	0.3084	0.1483	1.0790	2.85	
	7.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		32	26	-	82.3	*17.7	-	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	0.70
	11.00		12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		-	-	-	2.8	76.5	20.7	29.2	1.906	1.475	47.9	22.6	25.3	CI	UU	0.52	3.0	2.68	-	-	-	-	3.44
	13.00		32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00	30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	16.00	-	-	-	0.8	75.9	23.3	28.5	1.928	1.500	46.0	23.4	22.6	CI	UU	0.58	3.0	-	-	-	-	-	3.52	
17.00	#####	7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
19.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
20.00	-	-	-	0.8	71.0	28.2	39.3	1.776	1.275	62.1	27.0	35.1	CH	UU	0.30	2.0	2.64	-	-	-	-	3.10		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/9-1
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Sheet No.:C-30

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor				
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀			
BH-9	21.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	23.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	24.00		-	-	-	0.8	70.2	29.0	39.1	1.783	1.282	63.5	27.6	35.9	CH	UU	0.29	2.5	-	-	-	-	-	3.08		
	25.00	-	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	26.00	-	-	-	0.4	71.6	28.0	37.7	1.790	1.300	64.6	28.3	36.3	CH	UU	0.34	2.0	2.66	-	-	-	-	-	3.17		
	27.00	-	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29.00	-	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30.00	-	-	-	0.7	72.0	27.3	38.5	1.788	1.291	60.9	26.9	34.0	CH	UU	0.32	2.5	2.66	0.4953	0.2404	1.0605	3.13				
	31.00	#####	26	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	32.00	Very stiff bluish grey / grey sandy silty clay with kankars	-	-	4.3	40.4	33.0	22.3	22.0	2.002	1.641	**42.5	18.2	24.3	CI	UU	0.85	5.0	2.68	-	-	-	-	-	-	
	33.00	#####	62	28	2.0	80.5	*17.5	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-
	35.00	Medium dense to dense grey to greyish yellow silty sand	76	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00	#####	92	36	-	87.3	*12.7	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-
39.00	Very stiff / hard bluish grey silty clay with yellow spots;	35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40.00	grey sandy silty clay observed at 54.00m depth	-	-	-	2.0	72.0	26.0	23.0	2.028	1.649	45.9	20.0	25.9	CI	UU	1.26	2.5	2.70	-	-	-	-	-	-		

*Combined percentage of silt & clay

** LL and PL Test conducted on sample passing through 425μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/9-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-9	41.00	Very stiff / hard bluish grey silty clay with yellow spots; grey sandy silty clay observed at 54.00m depth	36	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	42.00		-	-	-	0.4	62.8	36.8	22.3	2.033	1.662	51.3	20.9	30.4	CH	UC	1.40	-	-	-	-	-	-	-
	43.00		42	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	45.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.00		-	-	-	8.6	56.8	34.6	26.0	1.970	1.563	55.3	21.6	33.7	CH	UC	0.92	-	2.70	0.2570	0.1488	0.7269	-	
	47.00		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		-	-	-	4.8	68.5	26.7	25.7	1.975	1.571	49.2	21.9	27.3	CI	UU	0.96	2.0	2.69	-	-	-	-	-
	49.00		23	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	51.00		24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	52.00		-	-	-	5.8	63.7	30.5	25.3	1.981	1.581	51.3	21.1	30.2	CH	UC	1.04	-	-	-	-	-	-	-
	53.00		25	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	54.00		-	-	-	31.3	48.5	20.2	-	-	-	40.1	20.4	19.7	CI	-	-	-	-	-	-	-	-	-
	55.00		34	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	57.00		76	25	0.5	65.3	*34.2	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	60.52		>100	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/9-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀		
BH-10	2.00	Soft / firm to stiff grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 5.5m to 11.5m depth	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	3.00		-	-	-	2.7	81.7	15.6	34.6	1.806	1.342	42.3	23.6	18.7	CI	UU	0.13	2.5	2.67	0.2908	0.1461	0.9899	2.72		
	4.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	5.00		-	-	-	5.0	78.0	17.0	32.8	1.823	1.373	43.2	22.8	20.4	CI	UU	0.17	2.0	2.63	-	-	-	2.82		
	6.00		43	35	-	73.3	*26.7	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	0.62	
	8.00		11	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00		-	-	-	69.2	*30.8	30.8	1.834	1.402	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	0.56
	12.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	4.4	80.3	15.3	31.4	1.842	1.402	41.0	23.9	17.1	CI	UU	0.28	3.0	-	-	-	-	-	-	3.06
	14.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00		-	-	-	1.7	74.0	24.3	29.6	1.897	1.464	49.3	23.7	25.6	CI	UU	0.48	2.0	2.68	-	-	-	-	3.39	
16.00	12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/10-1

Sheet No.:C-33

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-10	17.00	#####	-	-	-	0.8	74.9	24.3	38.4	1.765	1.275	51.9	26.8	25.1	CH	UU	0.28	2.5	2.64	-	-	-	3.06
	18.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.00		-	-	-	1.1	69.9	29.0	40.0	1.771	1.265	58.7	25.6	33.1	CH	UU	0.31	2.0	-	-	-	-	3.11
	22.00		11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.00		-	-	-	1.4	73.0	25.6	41.3	1.765	1.249	58.7	29.4	29.3	CH	UU	0.29	2.0	-	-	-	-	3.08
	26.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		-	-	-	0.7	64.7	34.6	40.3	1.772	1.263	65.2	26.6	38.6	CH	UU	0.32	2.0	2.66	0.5685	0.2699	1.1061	3.13
	30.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00	#####	-	-	1.7	33.0	38.5	26.8	21.7	2.035	1.672	**49.0	18.1	30.9	CI	UU	1.03	3.0	2.68	-	-	-	-
	32.00	Very stiff/ hard bluish grey sandy silty clay with kankars	37	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	34.00	#####	30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36.00	Dense yellowish grey silty sand.	74	31	-	83.9	*16.1	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	
38.00		>100	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

** LL and PL Test conducted on sample passing through 425µ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSP/1372	TABLE NO.: C/10-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor	
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀
BH-10	39.00	#####	-	-	-	2.1	62.5	35.4	27.4	1.947	1.528	54.0	21.9	32.1	CH	UC	0.81	-	-	-	-	-	-
	40.00	Very stiff yellowish grey / grey silty clay with brown spots	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	42.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.00		-	-	-	1.4	70.6	28.0	26.7	1.951	1.540	55.5	21.6	33.9	CH	UC	0.84	-	2.69	-	-	-	-
	44.00		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00	-	-	-	1.3	70.0	28.7	27.1	1.943	1.529	53.9	22.9	31.0	CH	UC	0.82	-	-	-	-	-	-	-
	48.00	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	49.00	-	-	-	1.4	68.7	29.9	26.8	1.950	1.538	55.5	21.7	33.8	CH	UC	0.89	-	-	-	-	-	-	-
	50.00	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	52.00	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	53.00	-	-	-	13.1	49.4	37.5	26.0	1.955	1.552	54.8	22.0	32.8	CH	UU	0.90	2.5	2.70	-	-	-	-	-
	54.00	#####	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	56.00	Dense grey silty fine sand.	>100	38	2.8	78.4	*18.8	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	58.00		>100	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60.15	>100		43	-	82.7	*17.3	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/10-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor				
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀			
BH-11	2.00	Firm to stiff grey silty clay with occasional laminations of silt; medium dense grey silty fine sand observed from 8.0m to 10.0m	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	3.00		-	-	-	3.3	81.5	15.2	32.0	1.832	1.388	40.3	24.0	16.3	CI	UU	0.27	3.0	2.64	-	-	-	-	3.04		
	4.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	6.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	7.00		-	-	-	5.7	82.1	12.2	30.5	1.847	1.415	38.7	24.1	14.6	CI	UU	0.32	3.5	-	-	-	-	-	-	3.13	
	8.00		16	17	-	79.5	*20.5	-	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	0.70
	10.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11.00		-	-	-	1.7	82.9	15.4	30.7	1.864	1.426	40.6	24.0	16.6	CI	UU	0.35	3.0	2.68	0.2593	0.1380	0.8792	-	-	3.18	
	12.00		13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	1.7	83.1	15.2	28.6	1.910	1.485	41.0	24.4	16.6	CI	UU	0.53	3.5	-	-	-	-	-	-	-	-
	14.00	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	15.00	#####	-	-	-	1.1	74.0	24.9	38.9	1.764	1.270	52.1	26.8	25.3	CH	UU	0.26	3.0	2.63	-	-	-	-	-	-	3.02
	16.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		-	-	-	0.3	70.4	29.3	38.0	1.773	1.285	54.0	27.0	27.0	CH	UU	0.29	2.5	-	-	-	-	-	-	-	3.08
18.00	9		9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/11-1

Sheet No.:C-36

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0				
BH-11	20.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	21.00		-	-	-	1.1	68.3	30.6	37.9	1.779	1.290	63.1	28.7	34.4	CH	UU	0.32	2.5	-	-	-	-	3.13			
	22.00		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	24.00		11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	25.00		-	-	-	0.6	66.7	32.7	36.9	1.798	1.313	66.7	26.6	40.1	CH	UU	0.40	3.0	2.66	-	-	-	-	3.26		
	26.00		12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	28.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29.00		#####	-	-	-	34.6	39.1	26.3	22.0	2.033	1.666	####	20.8	30.2	CH	UU	1.05	3.5	2.69	-	-	-	-	4.05	
	30.00		Very stiff bluish grey sandy silty clay.	30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00			-	-	-	18.8	64.2	17.0	23.0	2.030	1.650	38.8	21.1	17.7	CI	-	-	-	2.67	-	-	-	-	-	-
32.00	32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
34.00	#####	33	18	0.2	86.4	*13.4	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-		
36.00	Medium dense greyish yellow silty sand with traces of kankars.	50	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
38.00		54	24	0.4	87.6	*12.0	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

** LL and PL Test conducted on sample passing through 425 μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON

Bore hole data and Laboratory test results for Haldia terminal

JOB No.:
XCSPL/1372

TABLE NO.:
C/11-2

Sheet No.:C-37

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-11	39.00	##### Very stiff bluish grey / grey silty clay with yellow spots	32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	40.00		-	-	-	0.9	71.2	27.9	23.0	2.022	1.644	52.2	21.5	30.7	CH	UU	1.29	2.0	2.70	-	-	-	-	
	41.00		34	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	43.00		24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	44.00		-	-	-	0.3	63.4	36.3	26.1	1.975	1.566	53.0	22.6	30.4	CH	UC	0.93	-	-	-	-	-	-	
	45.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		-	-	-	0.3	64.6	35.1	26.6	1.964	1.551	59.1	22.3	36.8	CH	UC	0.90	-	2.70	0.2585	0.1485	0.7404	-	
	49.00		20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	51.00		22	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	52.00		-	-	-	1.8	58.6	39.6	26.2	1.972	1.563	58.6	22.2	36.4	CH	UC	0.96	-	-	-	-	-	-	-
	53.00	##### Dense / very dense grey silty fine sand.	>100	60	-	84.5	*15.5	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
55.00		>100	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
57.00		>100	70	-	85.1	*14.9	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	
60.10		>100	-	-	88.3	*11.7	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-	

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/11-3
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor			
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀		
BH-12	3.00	Very soft / soft to firm grey silty clay with occasional laminations of silt / fine sand; medium dense grey silty fine sand with clay as binder observed from 12.0m to 14.0m depth	1	1	-	8.6	78.5	12.9	-	-	-	38.1	23.6	14.5	CI	-	-	-	-	-	-	-	-		
	5.00		1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6.00		-	-	-	13.8	73.3	12.9	32.1	1.822	1.379	40.0	24.0	16.0	CI	UU	0.24	4.0	2.67	-	-	-	2.98		
	7.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10.00		-	-	-	9.1	77.0	13.9	28.8	1.851	1.437	38.6	23.6	15.0	CI	UU	0.36	3.5	2.66	0.2627	0.1420	0.8509	3.20		
	11.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	12.00		-	-	-	53.8	38.4	7.8	28.0	1.874	1.464	-	-	-	SM	-	-	-	-	-	-	-	-	0.54	
	13.00		18	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	14.00		-	-	-	15.1	66.5	18.4	27.0	1.919	1.511	39.3	22.6	16.7	CI	UU	0.56	4.0	-	-	-	-	-	3.50	
	15.00		#####	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00		Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	-	-	-	3.6	68.4	28.0	40.3	1.752	1.249	62.4	28.0	34.4	CH	UU	0.25	2.5	2.64	-	-	-	3.00	
	17.00		-	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	-	-	-	-	1.7	67.0	31.3	38.9	1.772	1.276	58.2	26.2	32.0	CH	UU	0.28	3.5	-	-	-	-	3.06			
19.00	-	11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/12-1
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-12	21.00	Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	22.00		-	-	-	0.7	66.6	32.7	37.6	1.787	1.299	63.7	29.0	34.7	CH	UU	0.32	3.5	-	-	-	-	3.13	
	23.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	25.00		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	26.00		-	-	-	0.4	66.4	33.2	37.2	1.789	1.304	65.5	28.9	36.6	CH	UU	0.37	2.0	2.66	-	-	-	3.22	
	27.00		13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	29.00		12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	30.00		#####	-	-	1.7	25.9	41.8	30.6	23.4	1.974	1.600	**49.4	18.8	30.6	CI	UU	0.77	3.0	2.68	0.2378	0.1420	0.6753	3.75
	31.00		Very stiff grey / bluish grey sandy silty clay with kankars	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00		#####	>100	59	0.7	89.0	*10.3	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-
	35.00	Dense / very dense yellowish grey silty sand	>100	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	37.00	#####	28	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	38.00	Very stiff bluish grey / grey silty clay with yellow spots	-	-	-	6.9	57.9	35.2	23.9	1.994	1.609	52.8	21.4	31.4	CH	UC	1.18	-	2.69	-	-	-	-	
	39.00	-	28	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40.00	-	-	-	-	0.4	65.3	34.3	28.3	1.940	1.512	55.4	22.2	33.2	CH	UC	0.72	-	-	-	-	-	-		

*Combined percentage of silt & clay

** LL and PL Test conducted on sample passing through 425μ sieve

Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

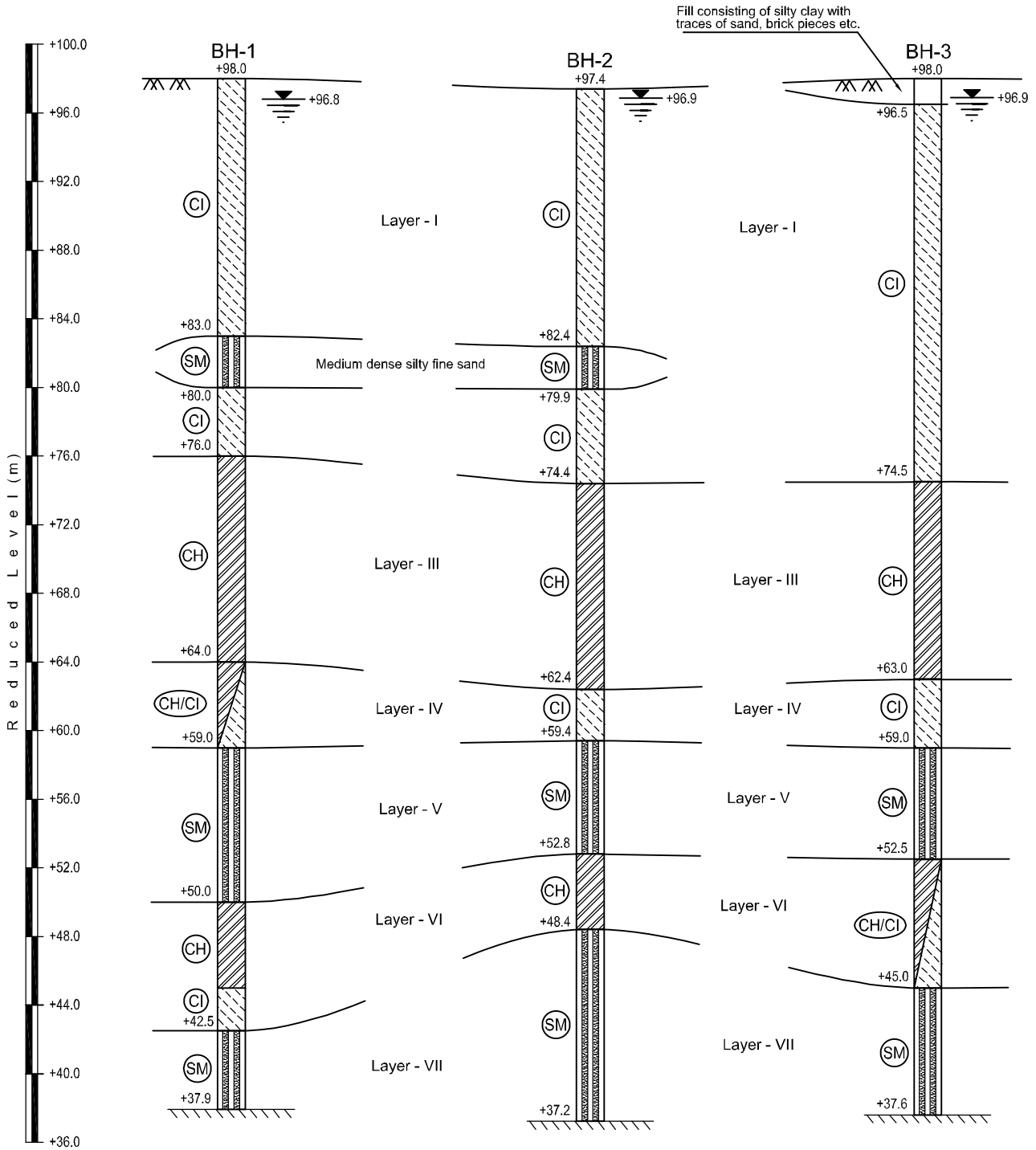
XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/12-2
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			IS Classification	Shear Strength Parameters			Consolidation Characteristics			Silt Factor		
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)		Type of Test	C (kg/cm ²)	φ (degrees)	Specific Gravity G _s	C _c	$\frac{C_c}{1+e_0}$		Void Ratio, e ₀	
BH-12	41.00	Very stiff bluish grey / grey silty clay with yellow spots ##### Medium dense to dense / very dense grey silty fine sand	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	43.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	44.00		-	-	-	0.7	66.6	32.7	27.5	1.955	1.533	54.8	22.5	32.3	CH	UU	0.82	2.0	2.68	0.2548	0.1458	0.7478	-	
	45.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	47.00		26	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	48.00		-	-	-	3.6	63.2	33.2	26.1	1.986	1.575	58.8	21.1	37.7	CH	UC	1.15	-	2.70	-	-	-	-	-
	49.00		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	51.00		28	28	-	10.3	58.9	30.8	-	-	-	50.2	20.8	29.4	CH	-	-	-	-	-	-	-	-	-
	53.00		84	28	-	77.6	*22.4	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-
	55.00		>100	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57.00	>100	61	0.6	76.8	*22.6	-	-	-	-	-	-	-	SM	-	-	-	-	-	-	-	-	-		
60.30	>100	69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

*Combined percentage of silt & clay

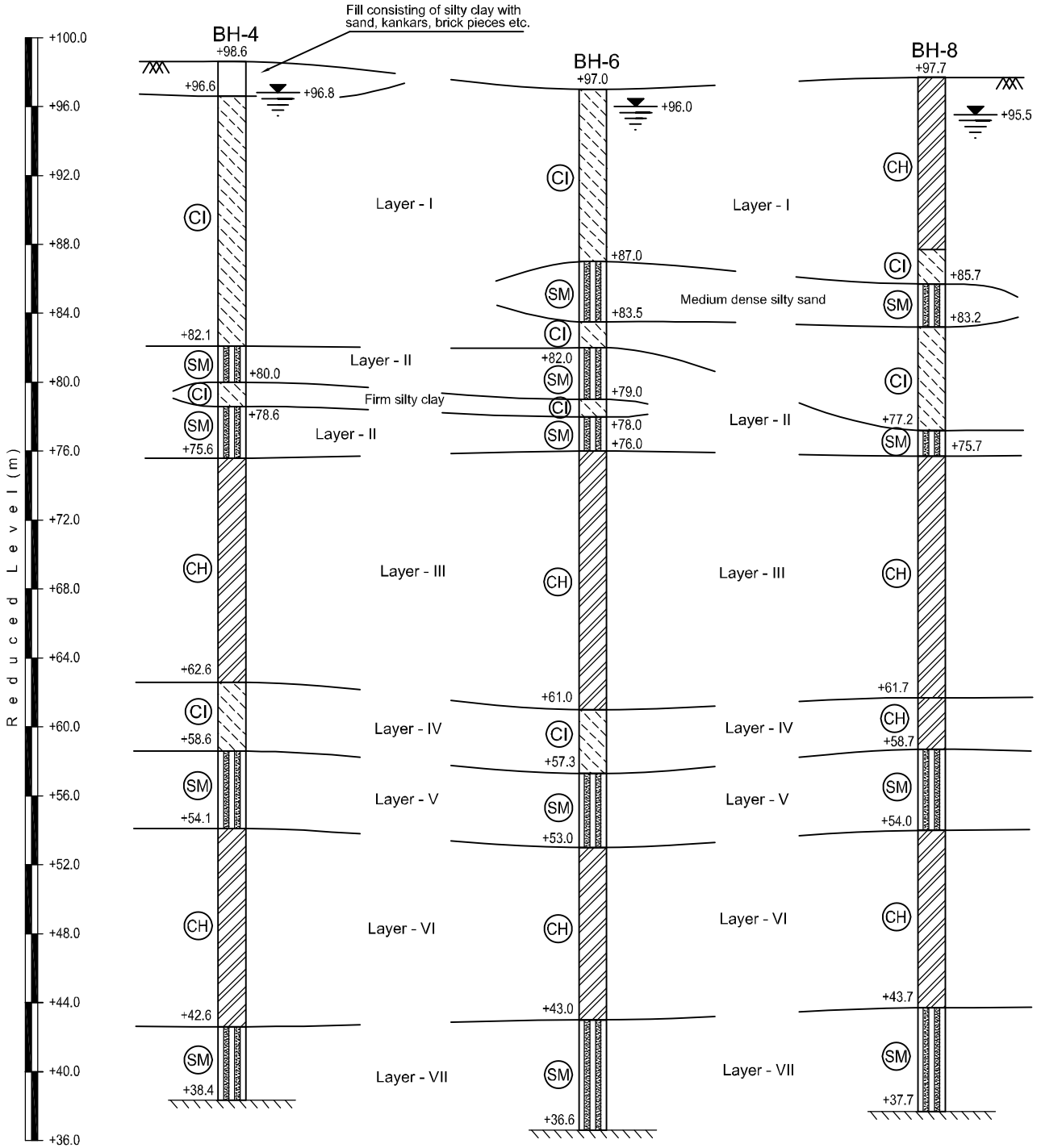
Abbreviations used: (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength

XPLORER GURGAON	Bore hole data and Laboratory test results for Haldia terminal	JOB No.: XCSPL/1372	TABLE NO.: C/12-3
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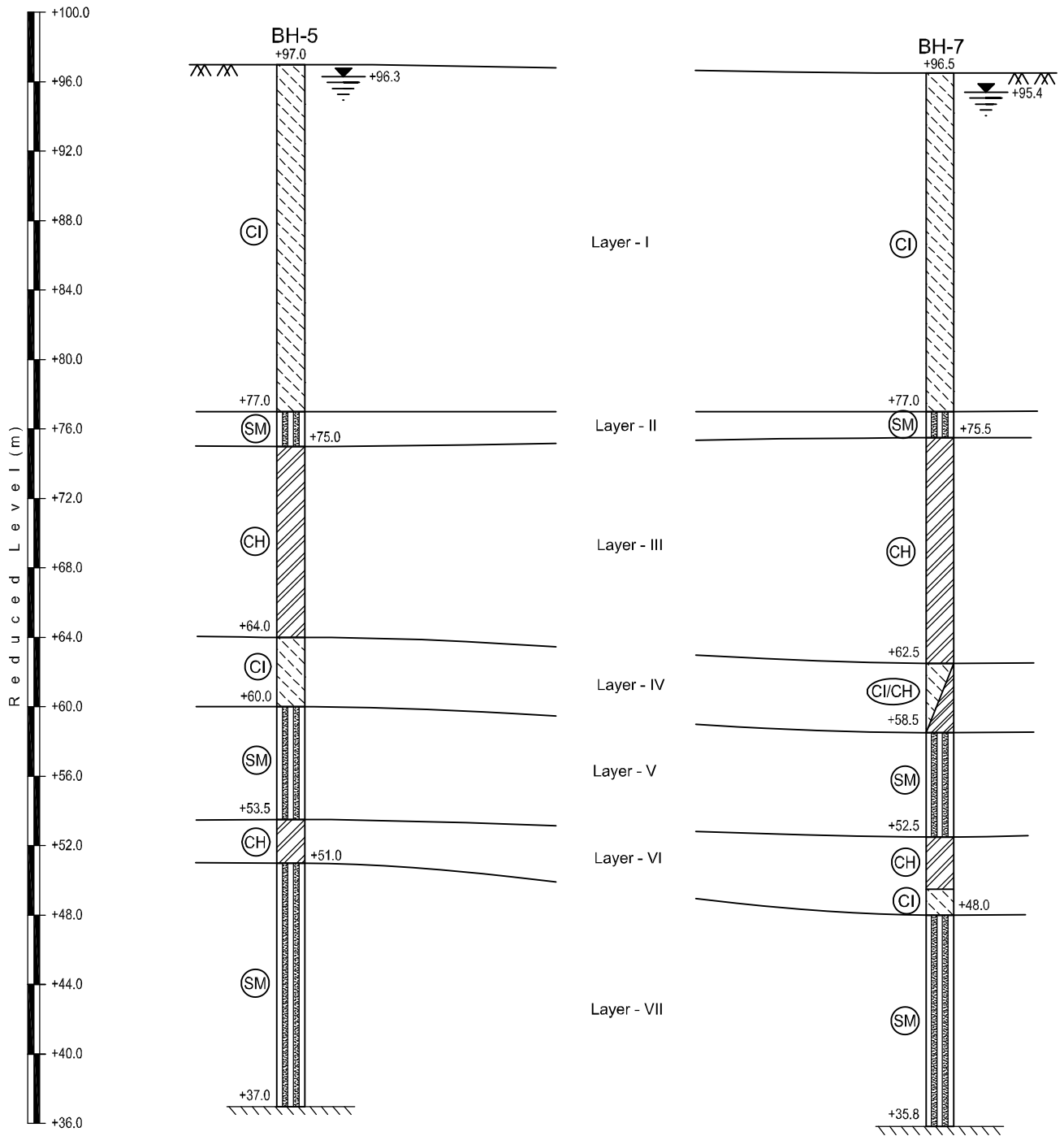
- Layer - I : Very soft / soft / firm silty clay with occasional laminations of silt / fine sand.
- Layer - III : Firm silty clay with varying percentage of decomposed / semi-decomposed wood.
- Layer - IV : Very stiff sandy silty clay.
- Layer - V : Medium dense / dense silty sand.
- Layer - VI : Stiff / very stiff silty clay with yellow / brown spots.
- Layer - VII : Medium dense / dense silty fine sand.

Generalised Soil Profile at Haldia Terminal



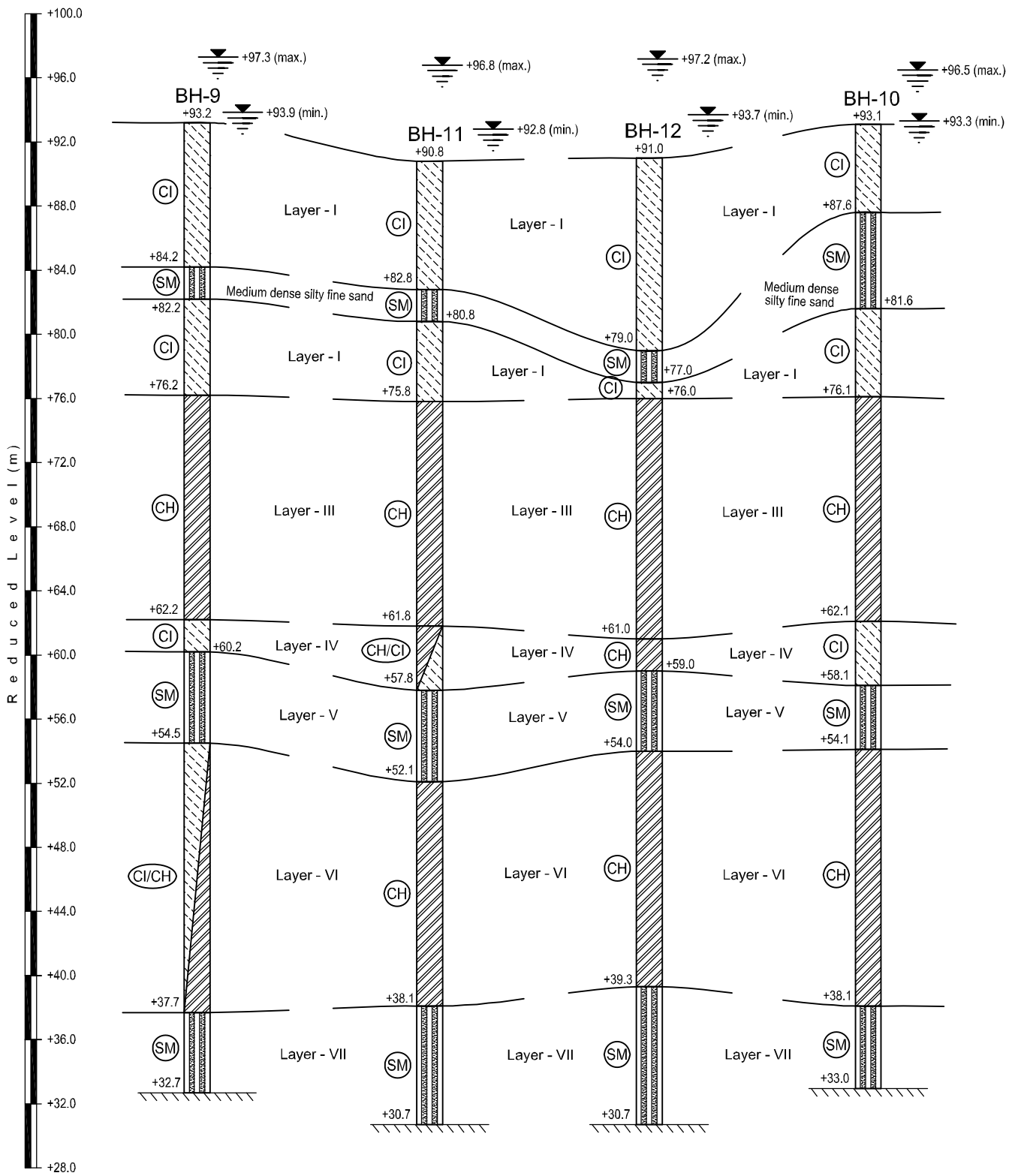
- Layer - I : Soft / firm / stiff silty clay with occasional laminations of silt / fine sand.
- Layer - II : Medium dense silty fine sand.
- Layer - III : Firm silty clay with varying percentage of decomposed / semi-decomposed wood.
- Layer - IV : Stiff to very stiff sandy silty clay.
- Layer - V : Medium dense / dense silty sand.
- Layer - VI : Stiff / very stiff silty clay with yellow / brown spots.
- Layer - VII : Medium dense / dense silty fine sand.

Generalised Soil Profile at Haldia Terminal



- Layer - I : Very soft / soft / firm silty clay with occasional laminations of silt / fine sand.
- Layer - II : Medium dense silty fine sand.
- Layer - III : Firm silty clay with varying percentage of decomposed / semi-decomposed wood.
- Layer - IV : Stiff to very stiff sandy silty clay.
- Layer - V : Medium dense silty sand.
- Layer - VI : Very stiff silty clay with yellow spots.
- Layer - VII : Medium dense / dense silty fine sand.

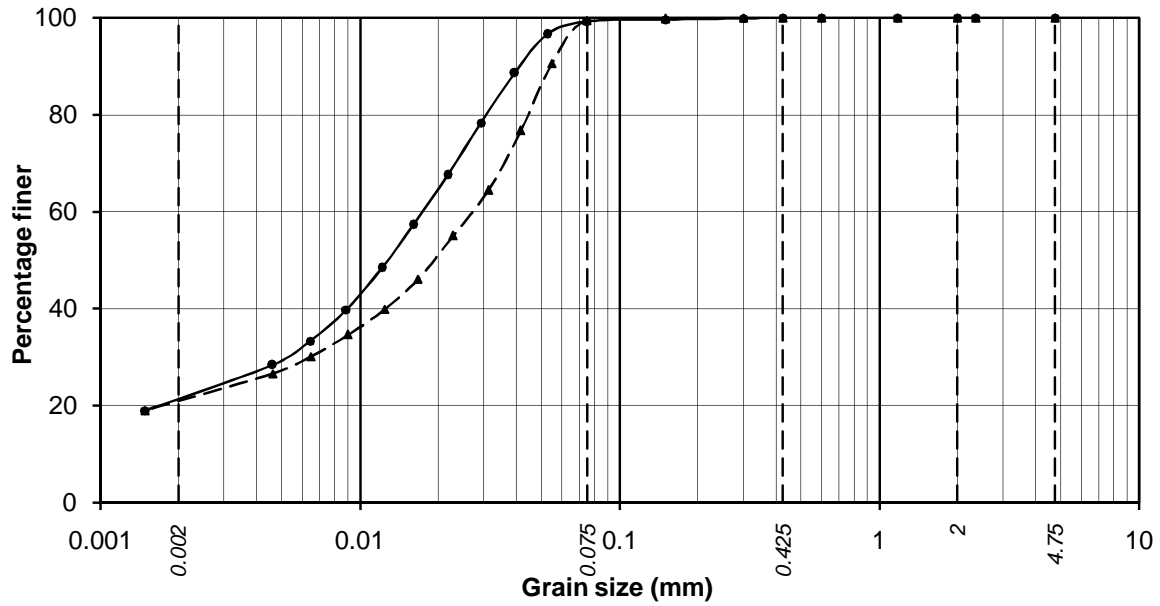
Generalised Soil Profile at Haldia Terminal



- Layer - I : Very soft / soft / firm / stiff silty clay with occasional laminations of silt / fine sand.
- Layer - III : Firm grey silty clay with varying percentage of decomposed / semi-decomposed wood.
- Layer - IV : Very stiff sandy silty clay.
- Layer - V : Medium dense / dense silty sand.
- Layer - VI : Very stiff silty clay with yellow / brown spots.
- Layer - VII : Medium dense / dense / very dense silty fine sand.

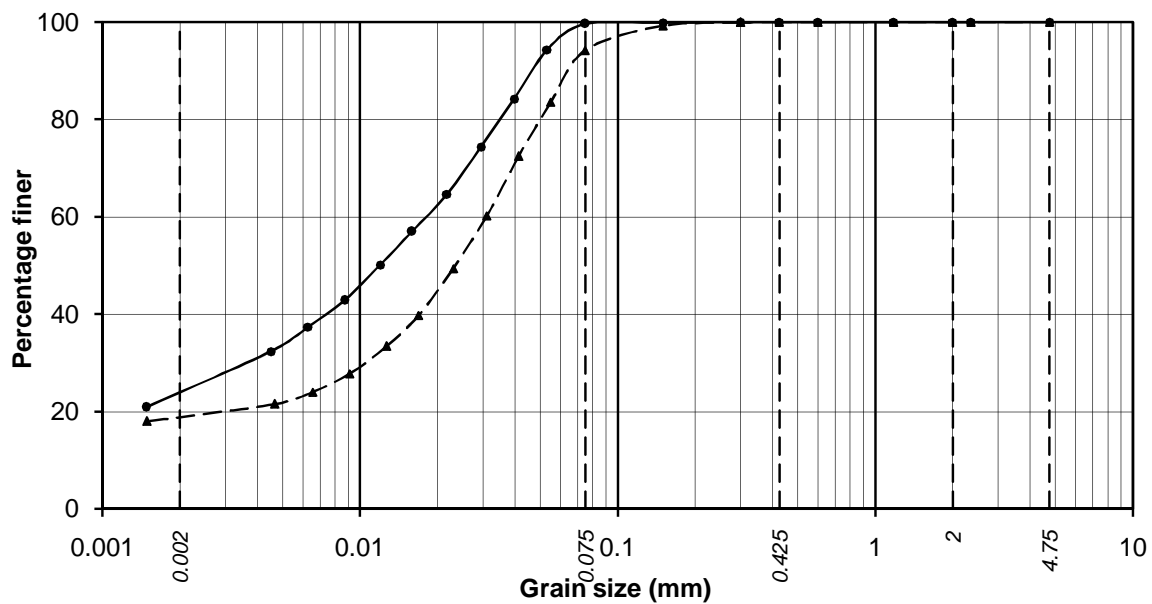
Generalised Soil Profile at Haldia Terminal

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-1 , 1.00 m -▲- BH-1 , 5.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-1 , 1.00 m	21.4	77.8	0.8	0.0	0.0	0.0
BH-1 , 5.00 m	20.9	78.6	0.5	0.0	0.0	0.0



—●— BH-1 , 9.00 m -▲- BH-1 , 13.00 m

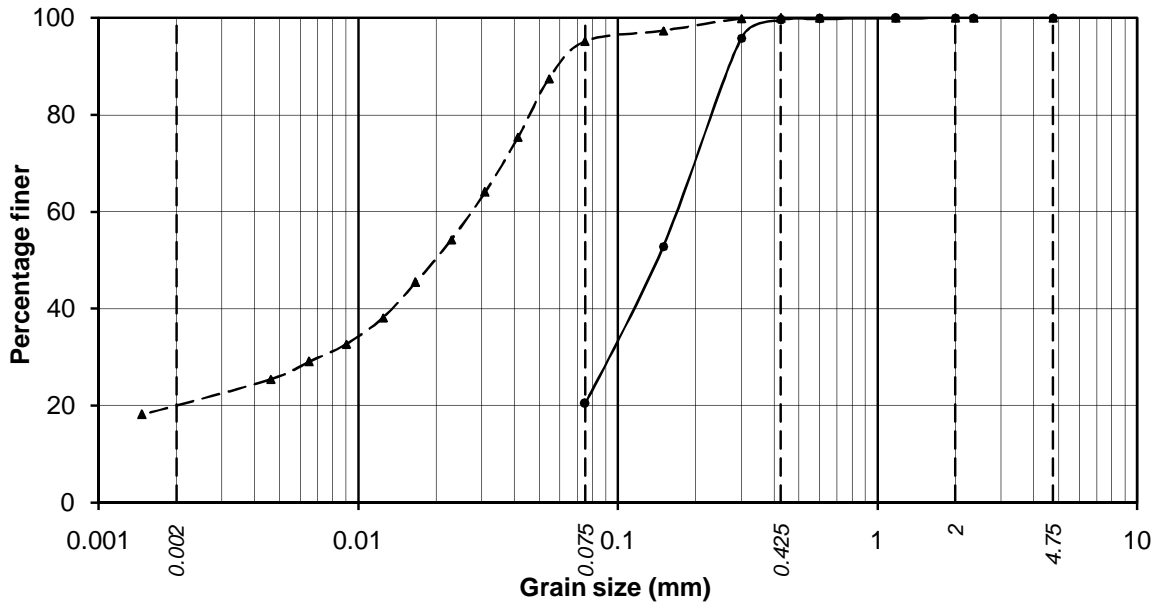
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-1 , 9.00 m	24.0	75.7	0.3	0.0	0.0	0.0
BH-1 , 13.00 m	18.9	75.3	5.8	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/1

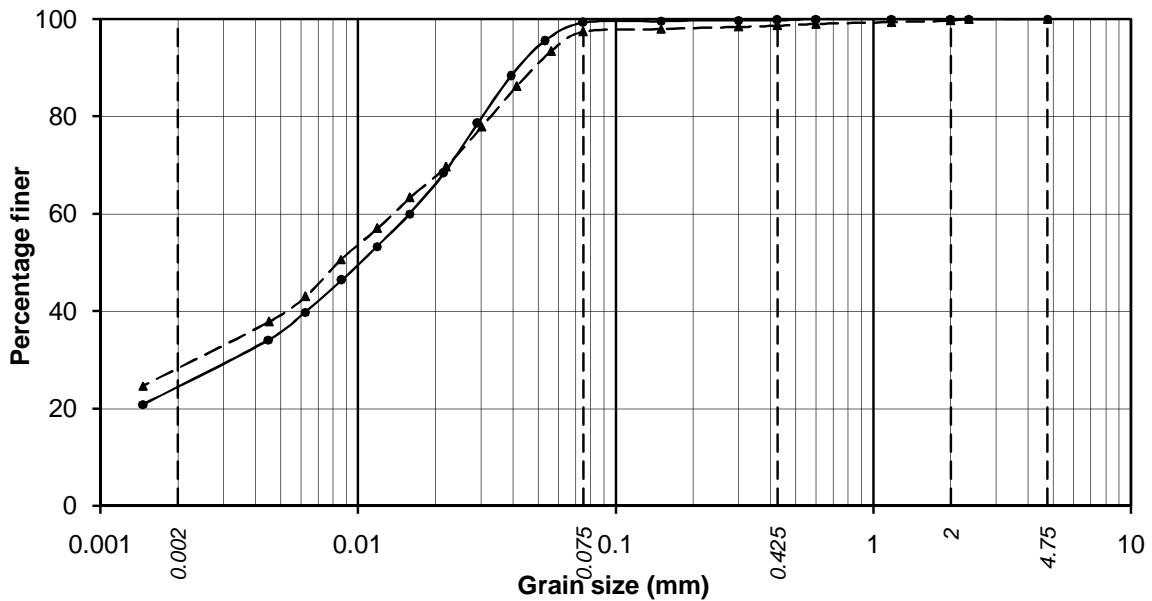
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-1 , 15.00 m -▲- BH-1 , 19.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-1 , 15.00 m		*20.4	79.1	0.5	0.0	0.0
BH-1 , 19.00 m	20.1	75.0	4.8	0.1	0.0	0.0

*Silt & Clay



—●— BH-1 , 23.00 m -▲- BH-1 , 25.00 m

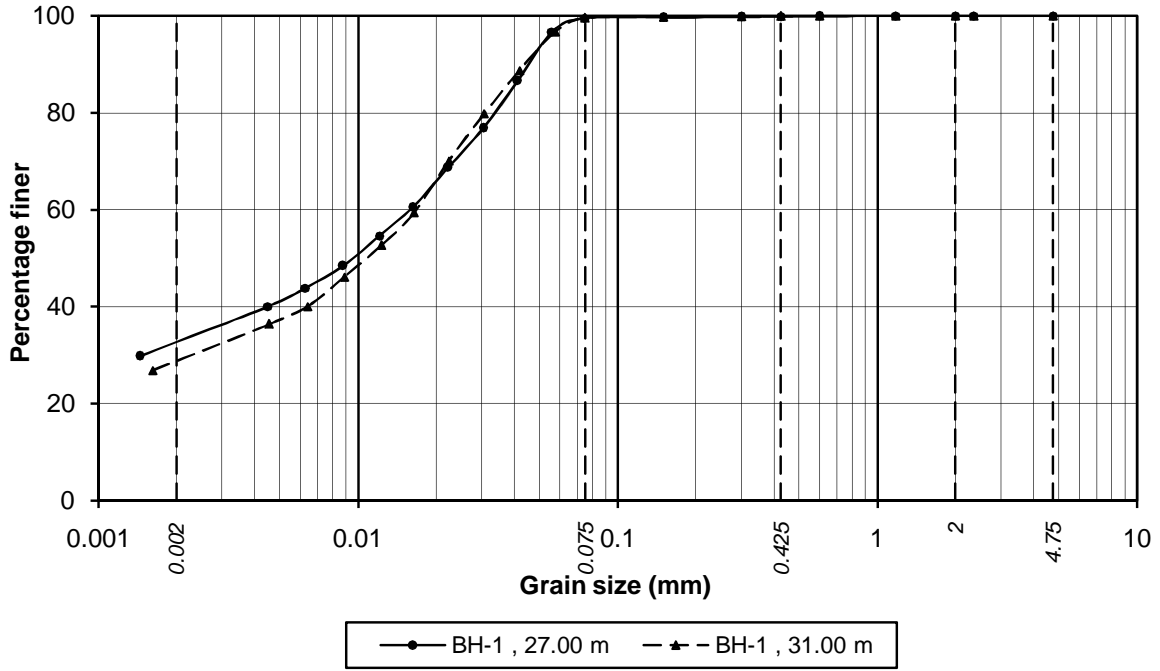
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-1 , 23.00 m	24.5	74.8	0.5	0.2	0.0	0.0
BH-1 , 25.00 m	28.3	69.1	1.3	1.0	0.3	0.0

Project: Geotechnical Investigation at Haldia Terminal

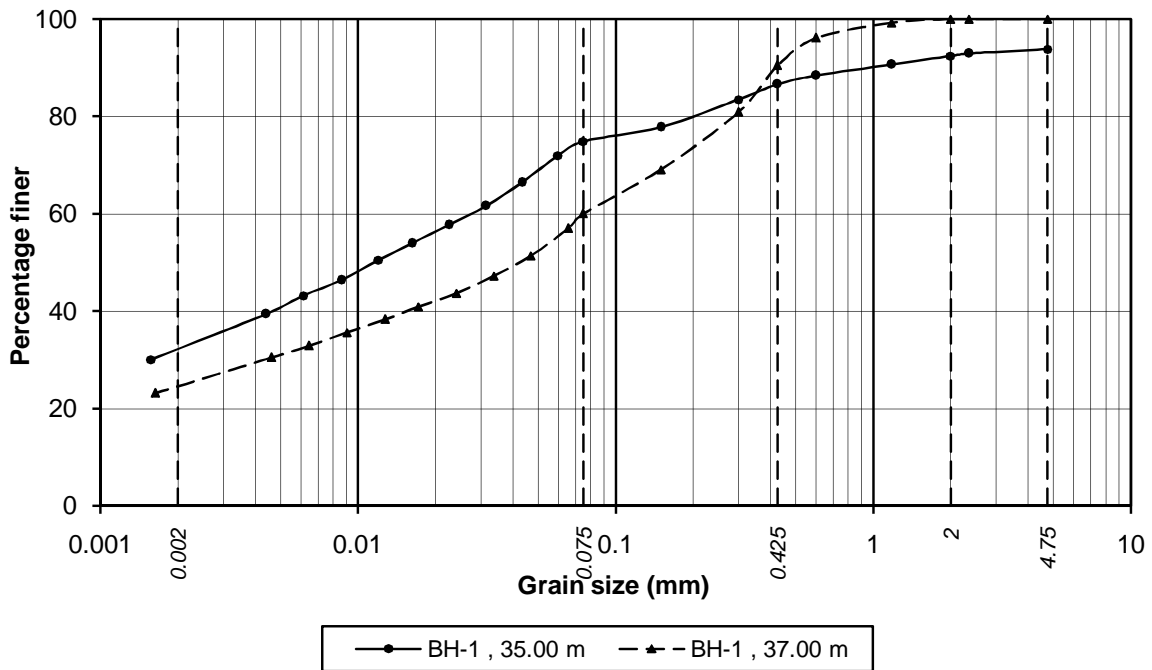
Job No.
XCSPL/1372

Fig. No.
E/2

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-1, 27.00 m	32.7	66.8	0.4	0.1	0.0	0.0
BH-1, 31.00 m	28.8	70.7	0.4	0.1	0.0	0.0



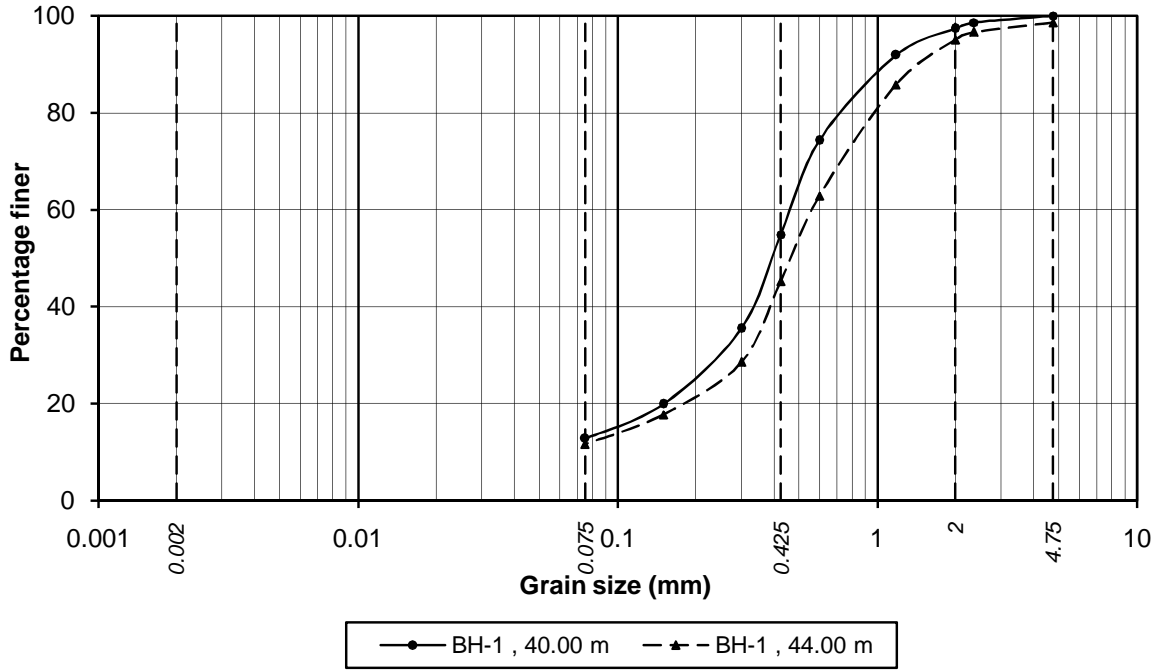
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-1, 35.00 m	32.2	42.7	11.8	5.7	1.4	6.2
BH-1, 37.00 m	24.6	35.5	30.4	9.5	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

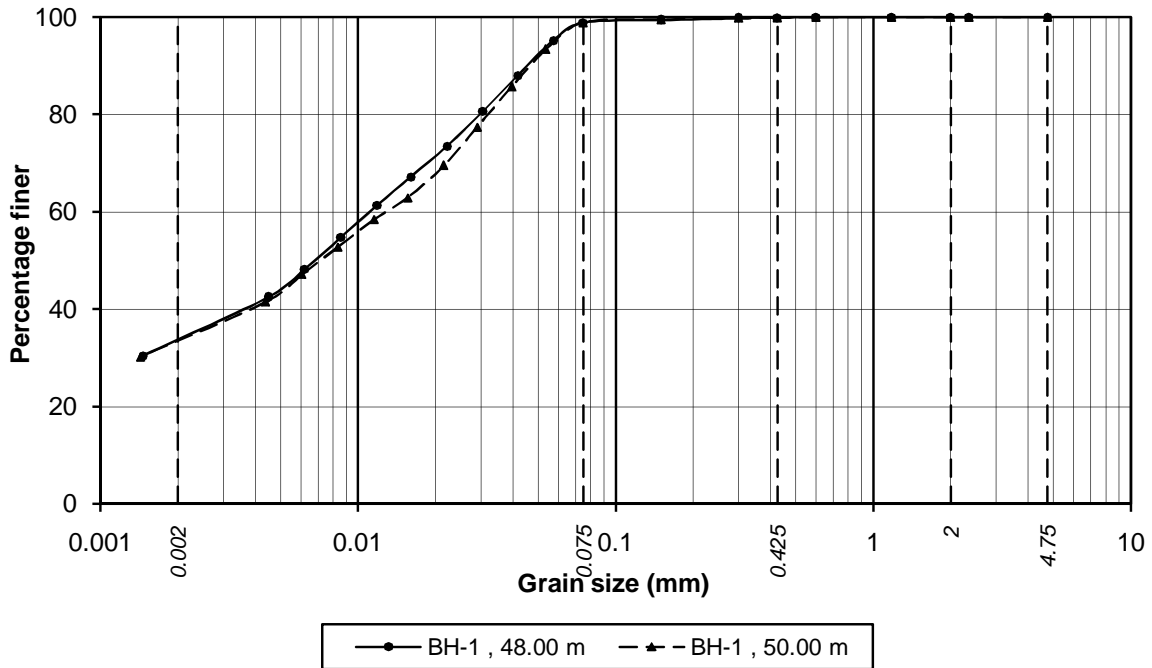
Fig. No.
E/3

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-1 , 40.00 m		*12.8	42.0	42.6	2.6	0.0
BH-1 , 44.00 m		*11.6	33.6	49.8	3.6	1.4

*Silt & Clay



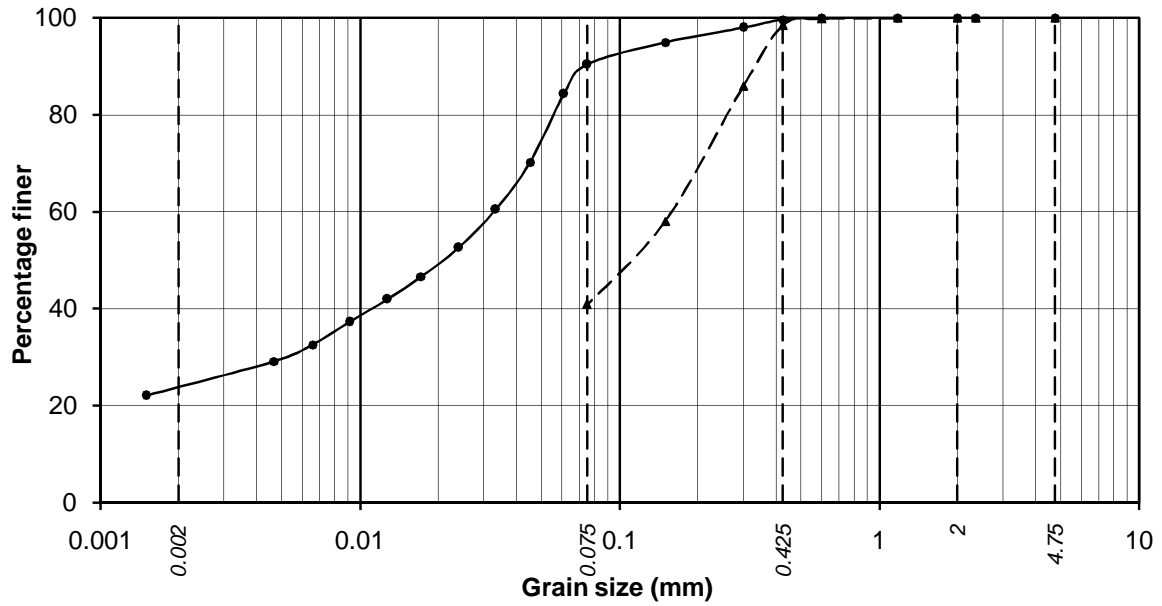
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-1 , 48.00 m	33.8	65.1	1.0	0.1	0.0	0.0
BH-1 , 50.00 m	33.5	65.4	1.0	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

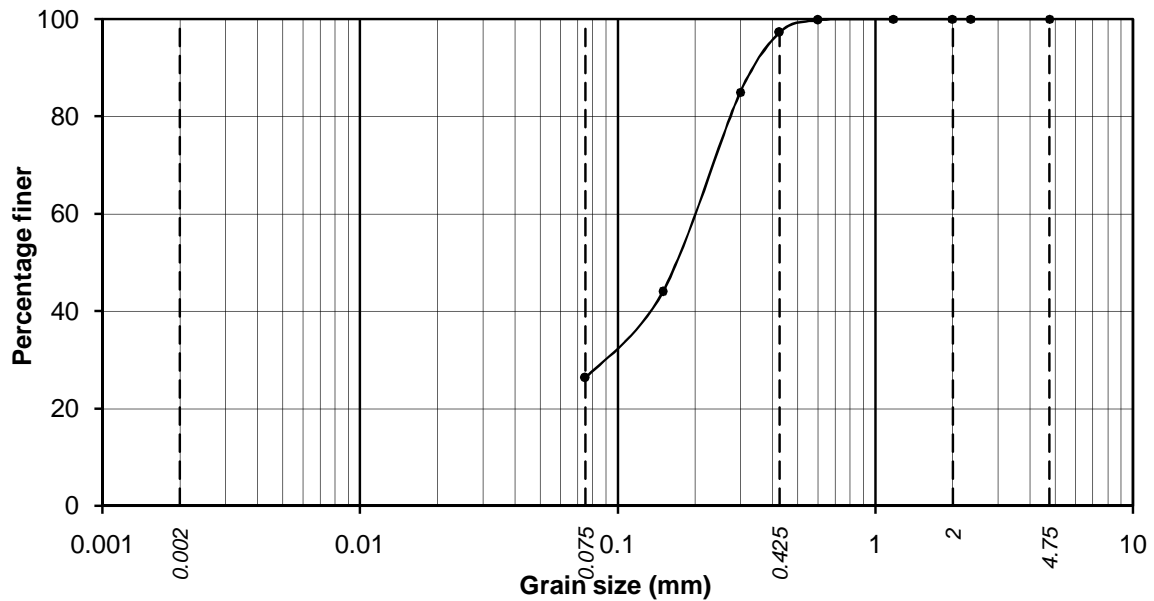
Fig. No.
E/4

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-1 , 55.00 m -▲- BH-1 , 57.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-1 , 55.00 m	23.9	66.5	9.2	0.4	0.0	0.0
BH-1 , 57.00 m	*40.8		57.6	1.6	0.0	0.0
*Silt & Clay						



—●— BH-1 , 60.09 m

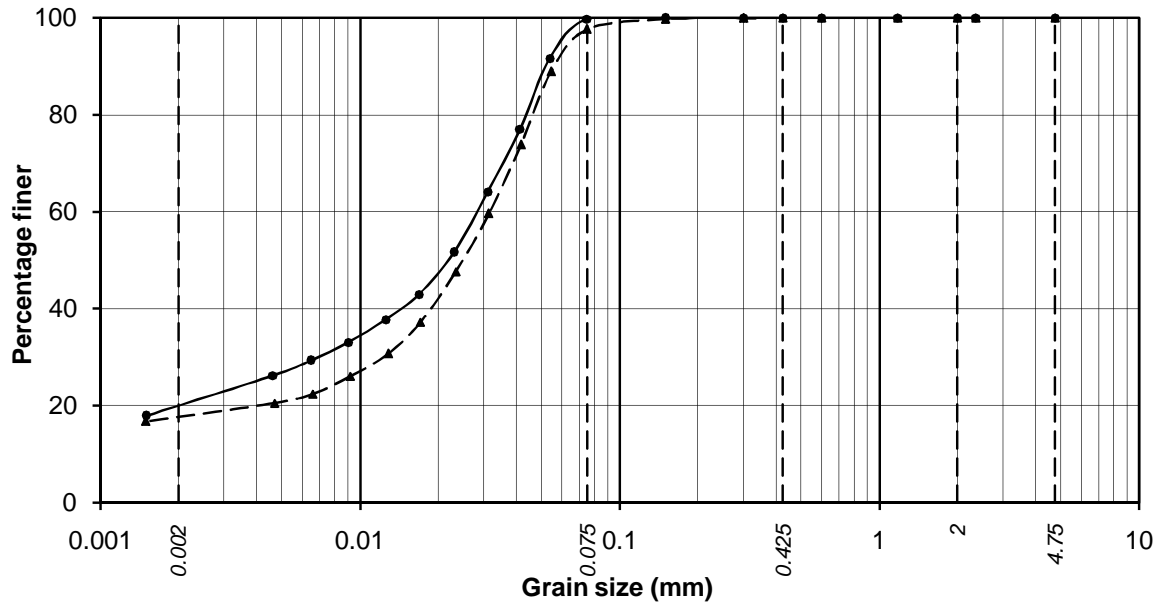
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-1 , 60.09 m	*26.3		71.0	2.7	0.0	0.0
*Silt & Clay						

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

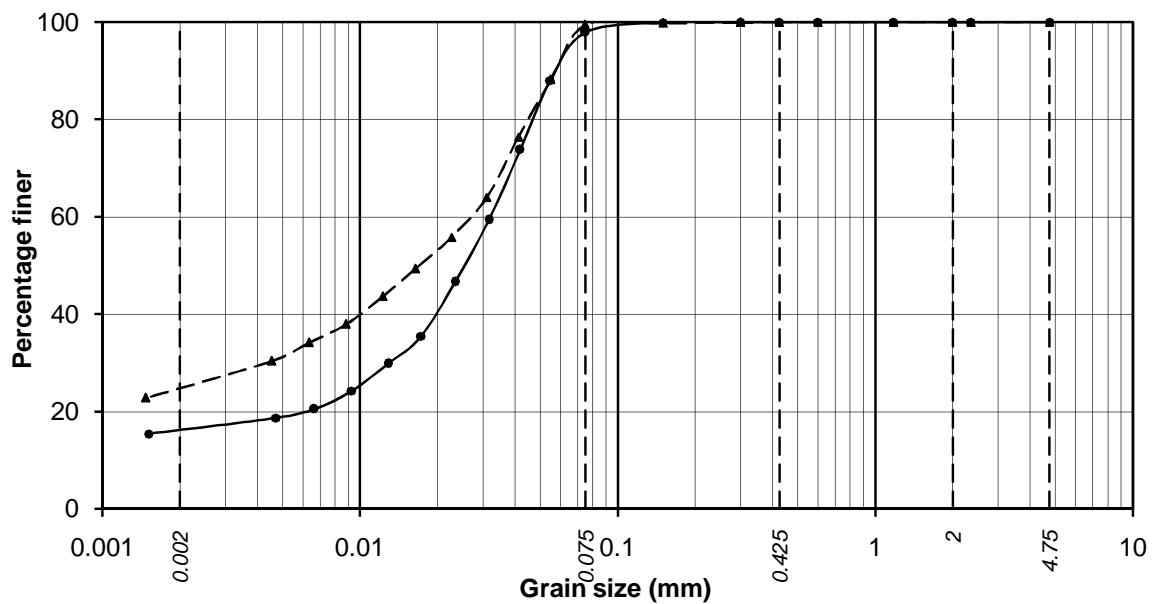
Fig. No.
E/5

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-2 , 2.00 m -▲- BH-2 , 4.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 2.00 m	20.0	79.7	0.3	0.0	0.0	0.0
BH-2 , 4.00 m	17.7	79.9	2.4	0.0	0.0	0.0



—●— BH-2 , 8.00 m -▲- BH-2 , 10.00 m

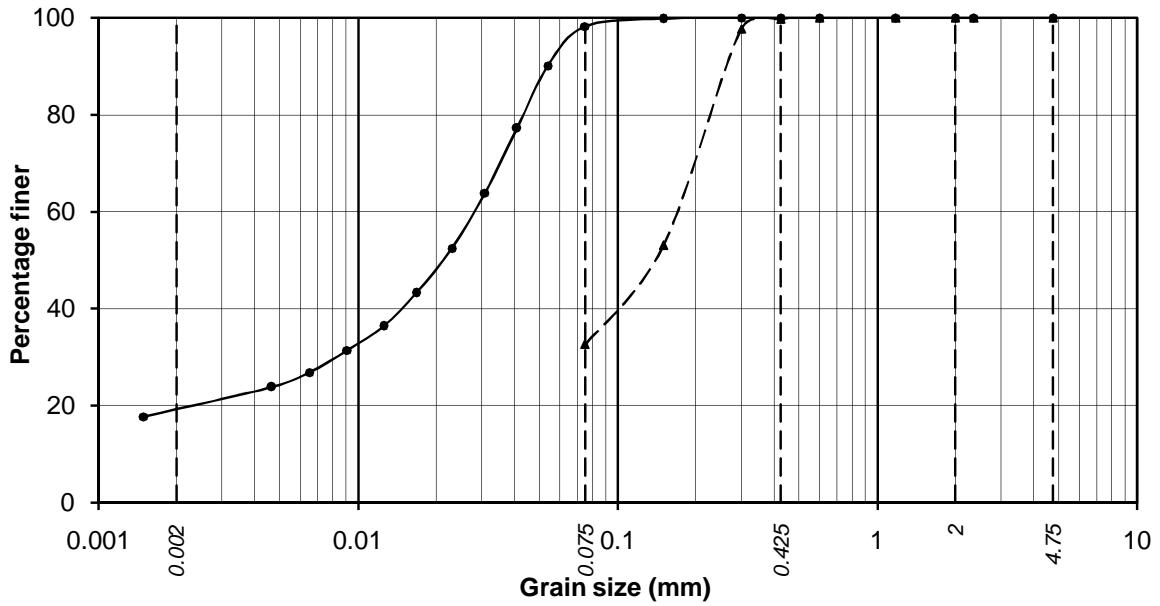
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 8.00 m	16.2	81.7	2.1	0.0	0.0	0.0
BH-2 , 10.00 m	24.8	74.7	0.5	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/6

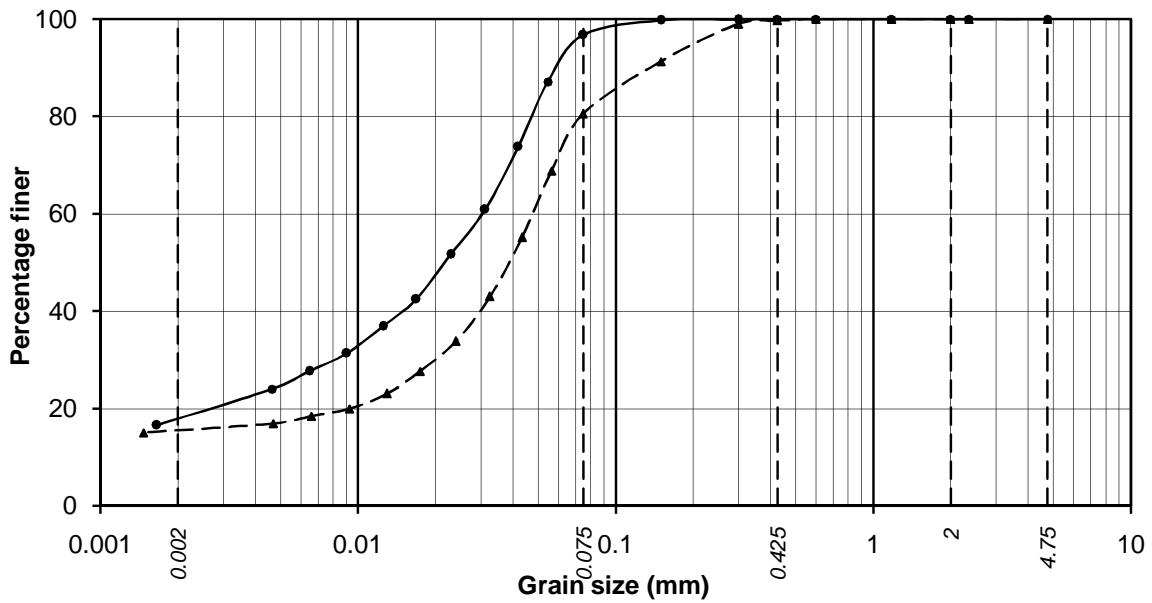
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-2 , 12.00 m -▲- BH-2 , 15.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 12.00 m	19.2	79.0	1.8	0.0	0.0	0.0
BH-2 , 15.00 m	*32.6		67.1	0.3	0.0	0.0

*Silt & Clay



—●— BH-2 , 18.00 m -▲- BH-2 , 20.00 m

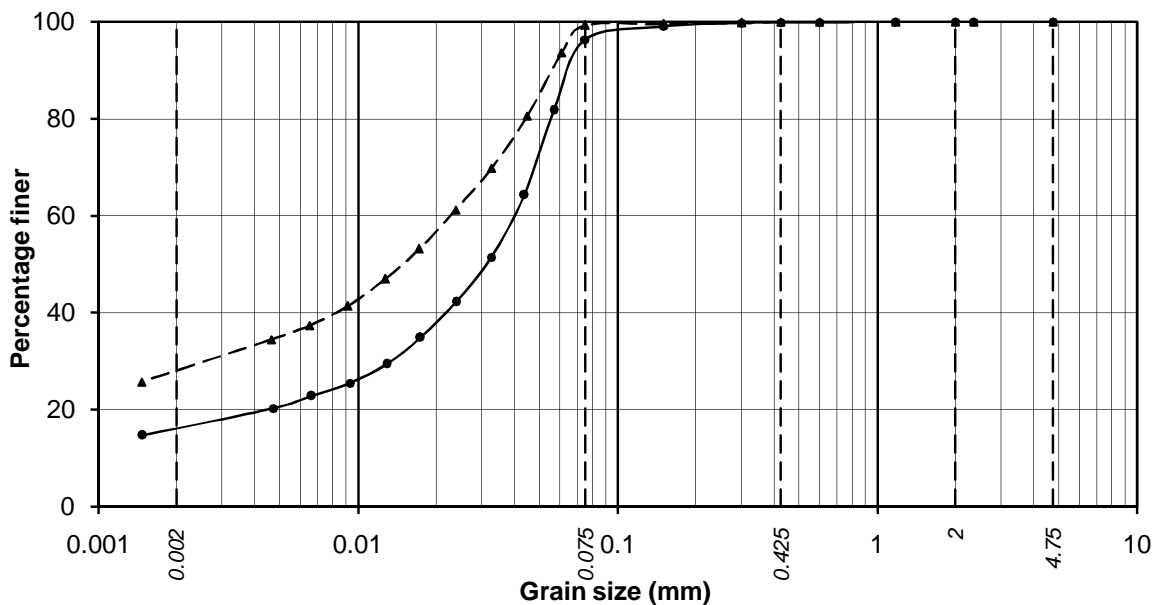
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 18.00 m	18.0	78.8	3.2	0.0	0.0	0.0
BH-2 , 20.00 m	15.5	65.0	19.2	0.3	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

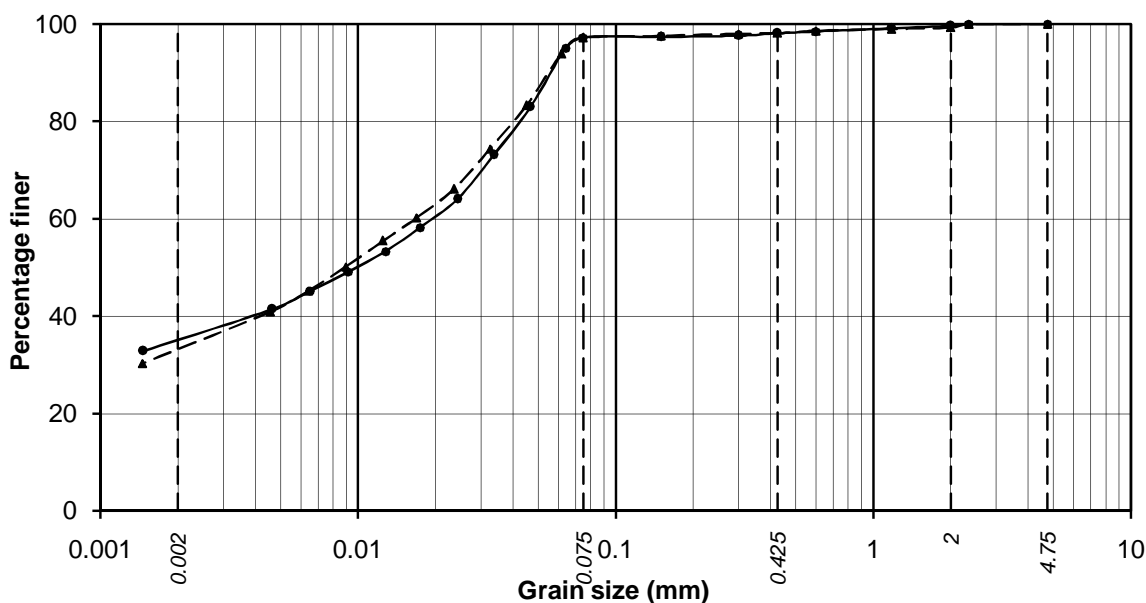
Fig. No.
E/7

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-2 , 22.00 m -▲- BH-2 , 24.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 22.00 m	16.1	80.2	3.6	0.1	0.0	0.0
BH-2 , 24.00 m	28.0	71.3	0.7	0.0	0.0	0.0



—●— BH-2 , 28.00 m -▲- BH-2 , 32.00 m

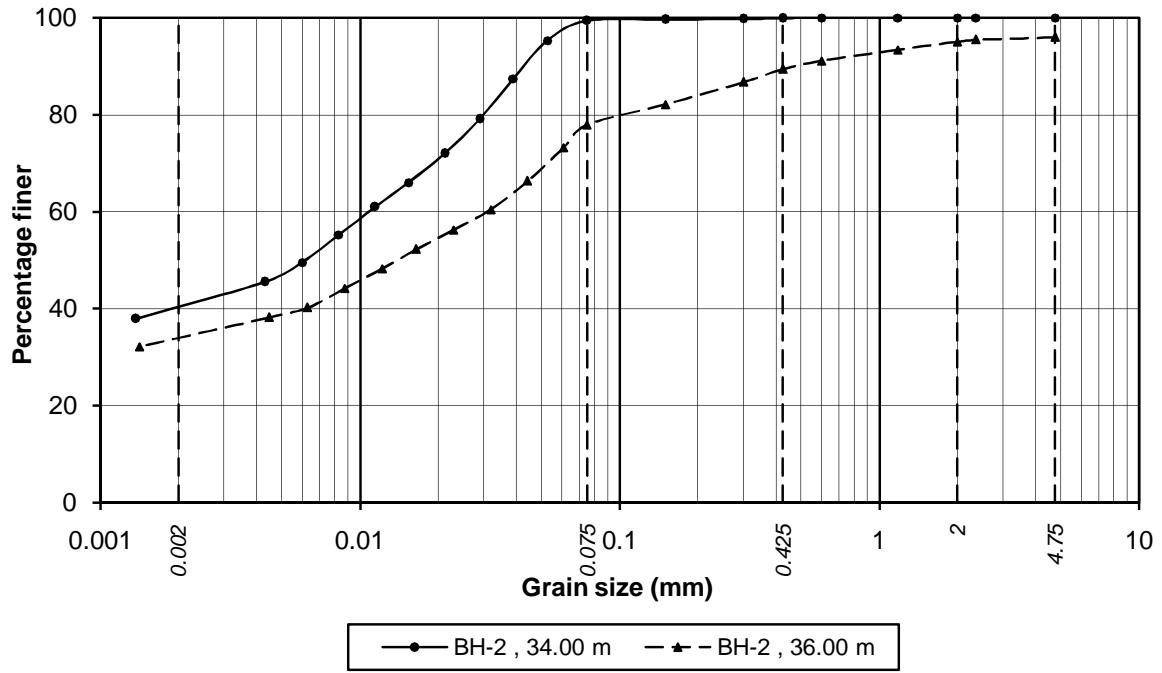
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-2 , 28.00 m	35.2	62.0	1.0	1.5	0.3	0.0
BH-2 , 32.00 m	33.2	64.0	1.0	1.1	0.7	0.0

Project: Geotechnical Investigation at Haldia Terminal

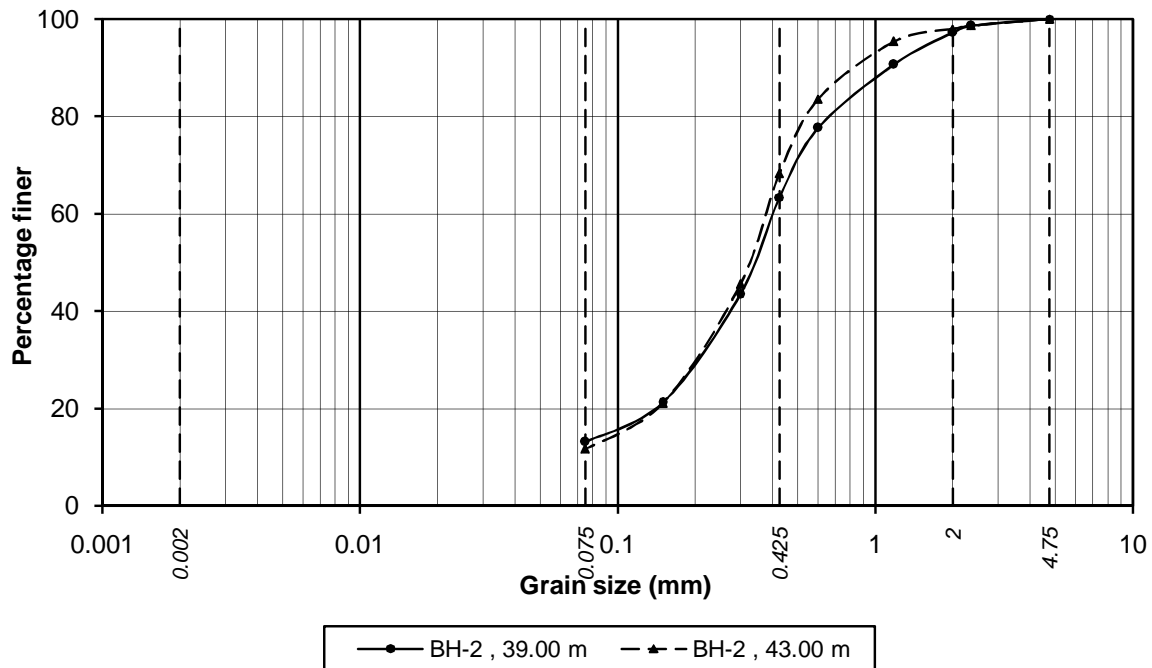
Job No.
XCSPL/1372

Fig. No.
E/8

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-2, 34.00 m	40.4	59.0	0.5	0.1	0.0	0.0
BH-2, 36.00 m	33.9	44.0	11.5	5.6	1.0	4.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-2, 39.00 m	*13.2	50.2	33.9	2.7	0.0	0.0
BH-2, 43.00 m	*11.7	56.6	29.7	2.0	0.0	0.0

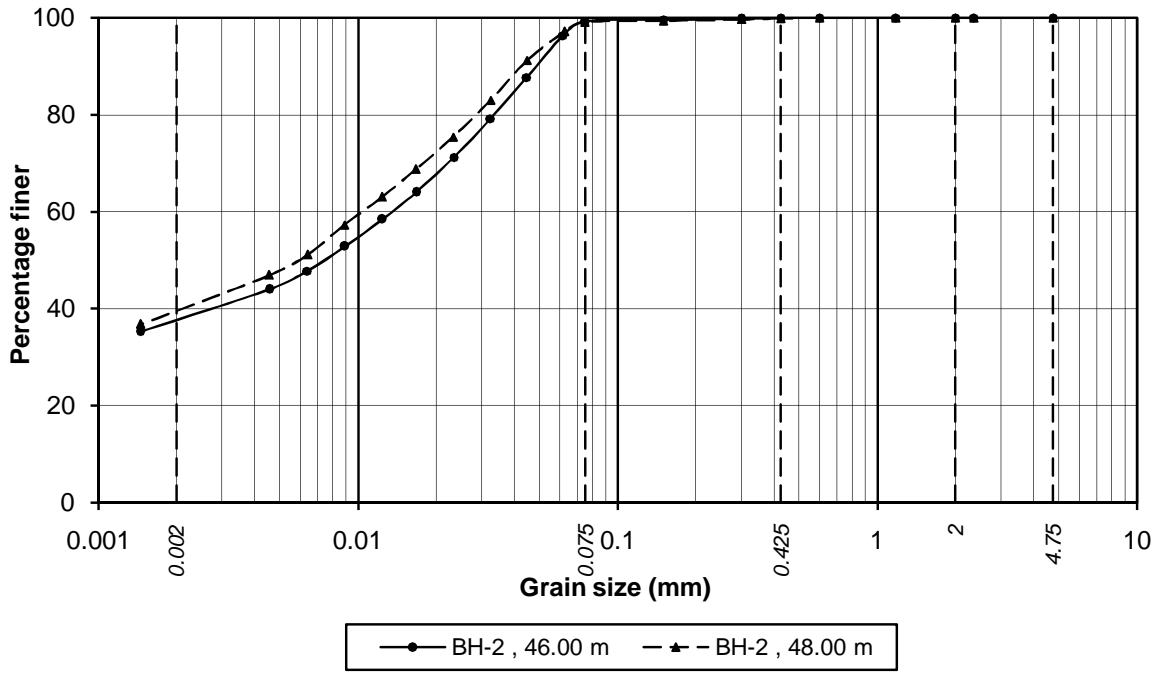
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

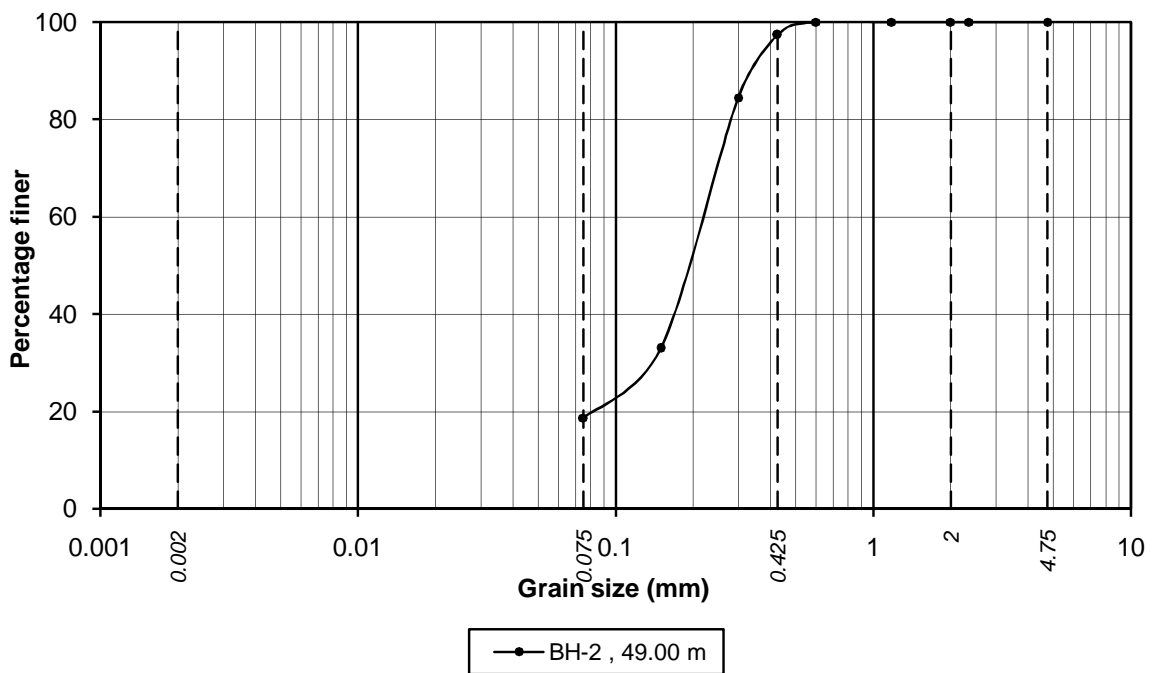
Job No.
XCSPL/1372

Fig. No.
E/9

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-2 , 46.00 m	37.7	61.5	0.8	0.0	0.0	0.0
BH-2 , 48.00 m	39.6	59.4	0.8	0.2	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-2 , 49.00 m		*18.7	78.7	2.6	0.0	0.0

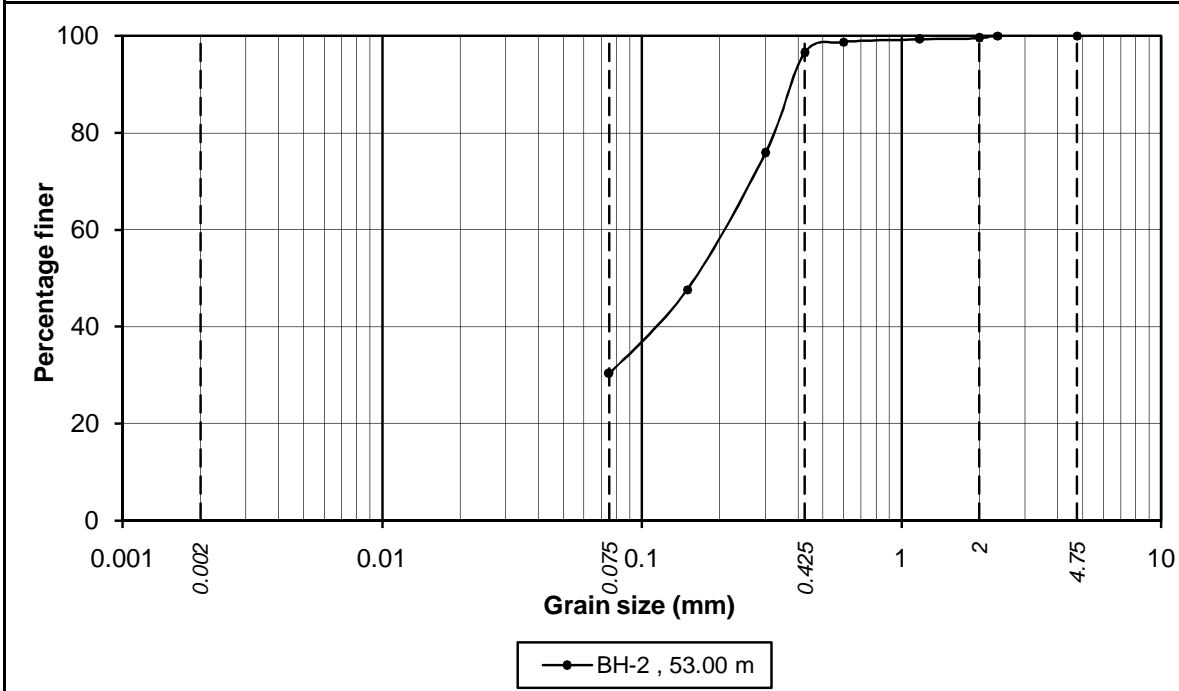
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

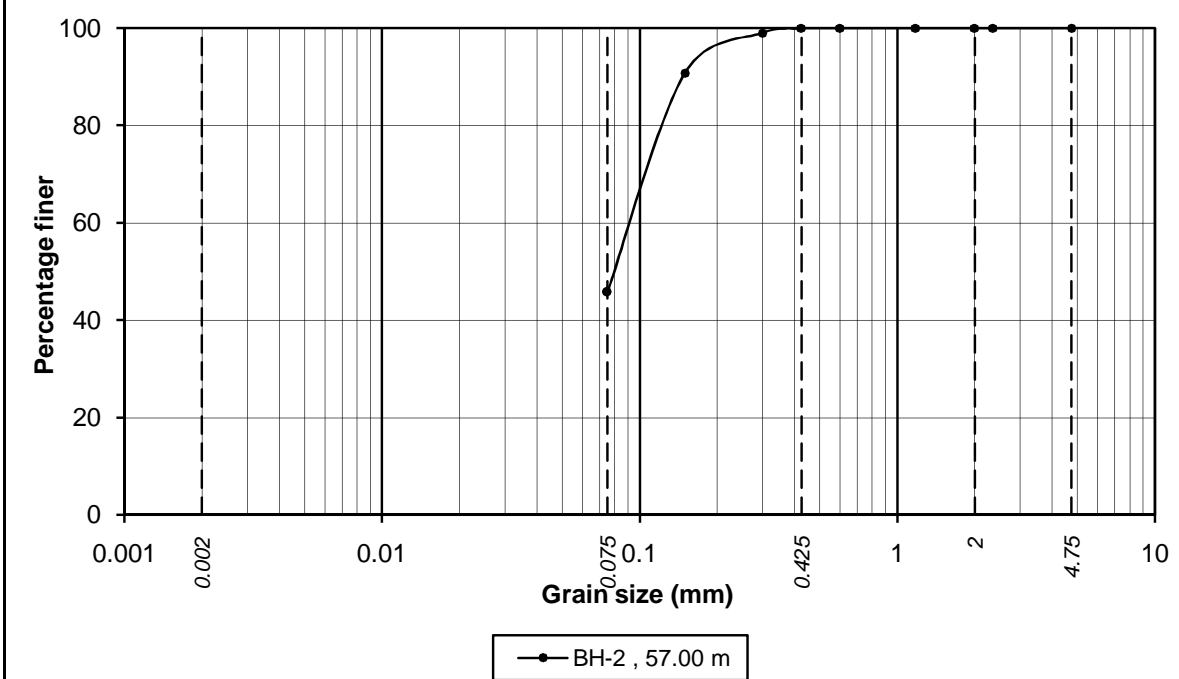
Job No.
XCSPL/1372

Fig. No.
E/10

GRAIN SIZE DISTRIBUTION CURVES



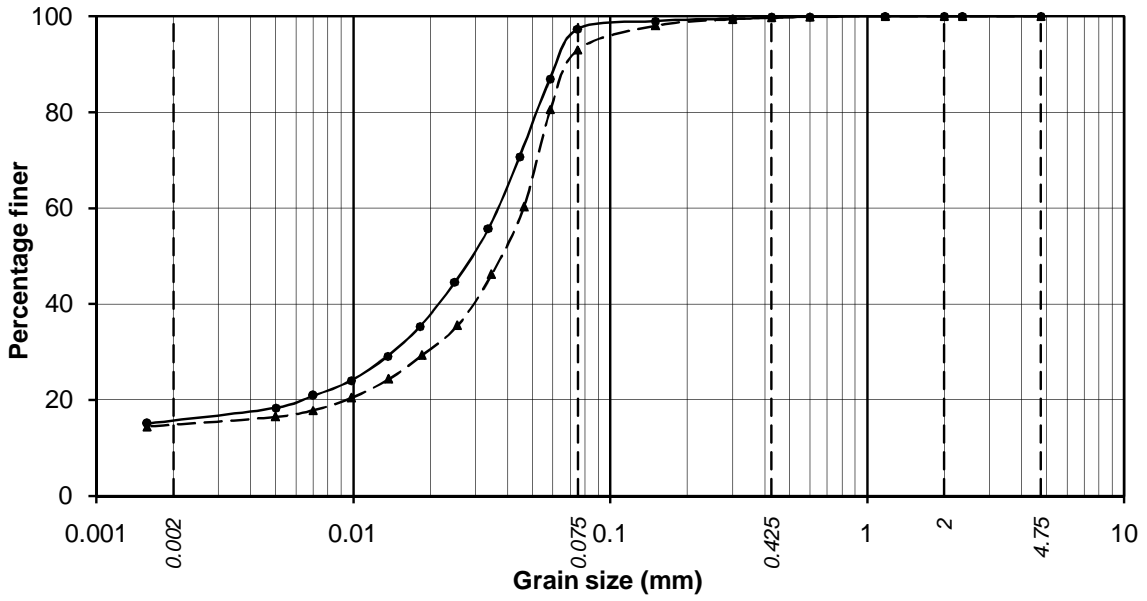
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-2 , 53.00 m		*30.3	66.2	3.0	0.5	0.0
*Silt & Clay						



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-2 , 57.00 m		*45.8	54.2	0.0	0.0	0.0
*Silt & Clay						

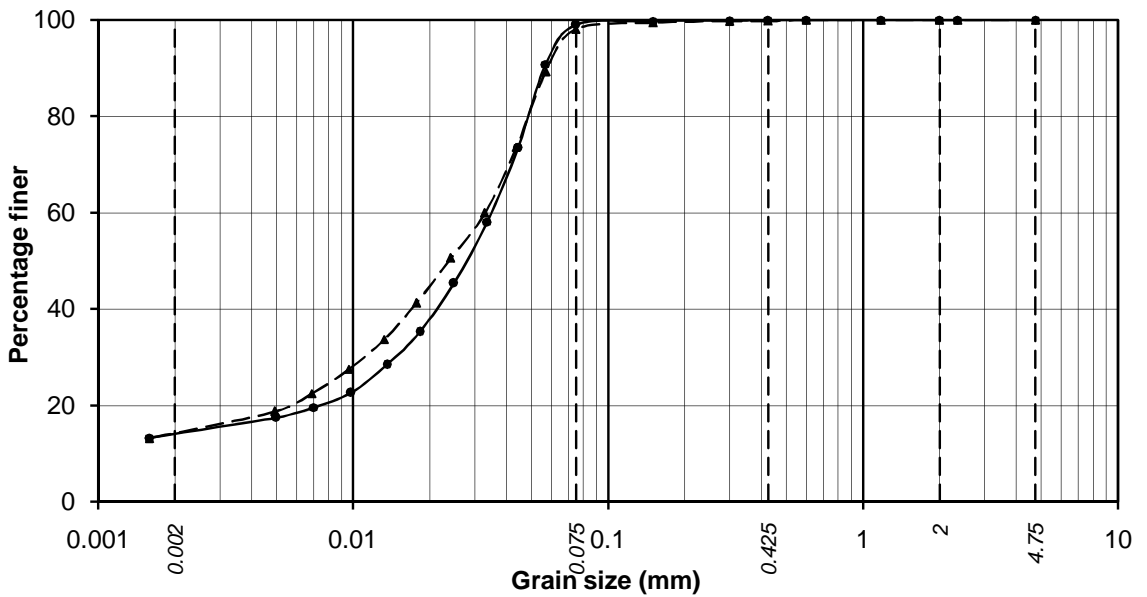
Project: Geotechnical Investigation at Haldia Terminal	Job No. XCSPL/1372	Fig. No. E/11
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GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 3.00 m -▲- BH-3 , 5.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 3.00 m	15.7	81.7	2.3	0.3	0.0	0.0
BH-3 , 5.00 m	14.8	78.2	6.7	0.3	0.0	0.0



—●— BH-3 , 7.00 m -▲- BH-3 , 9.00 m

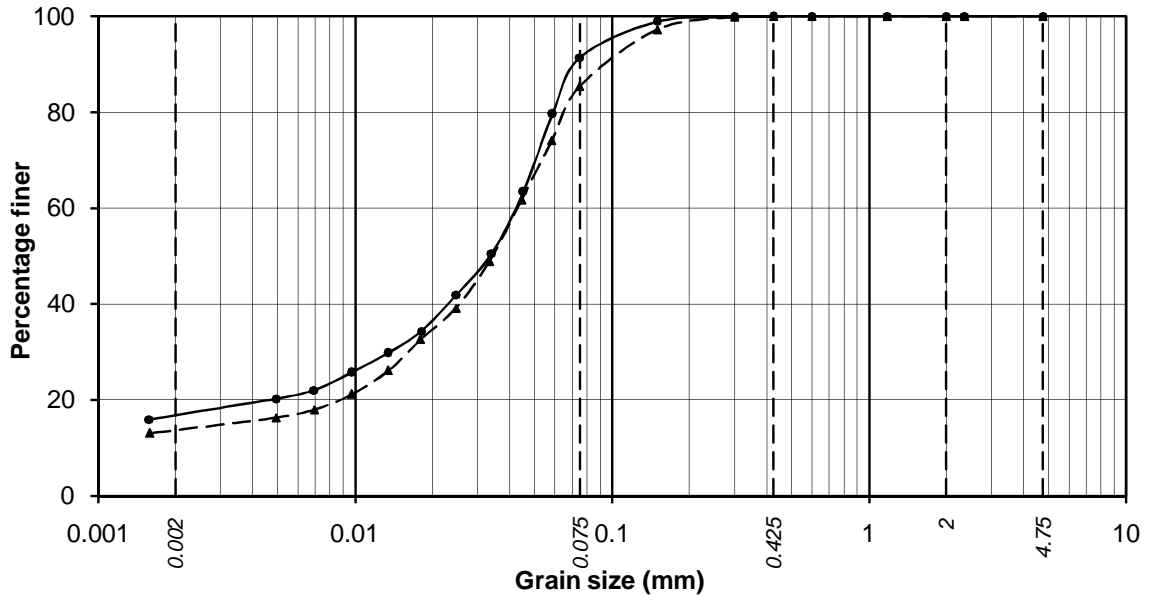
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 7.00 m	14.1	85.0	0.9	0.0	0.0	0.0
BH-3 , 9.00 m	14.2	83.9	1.7	0.2	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

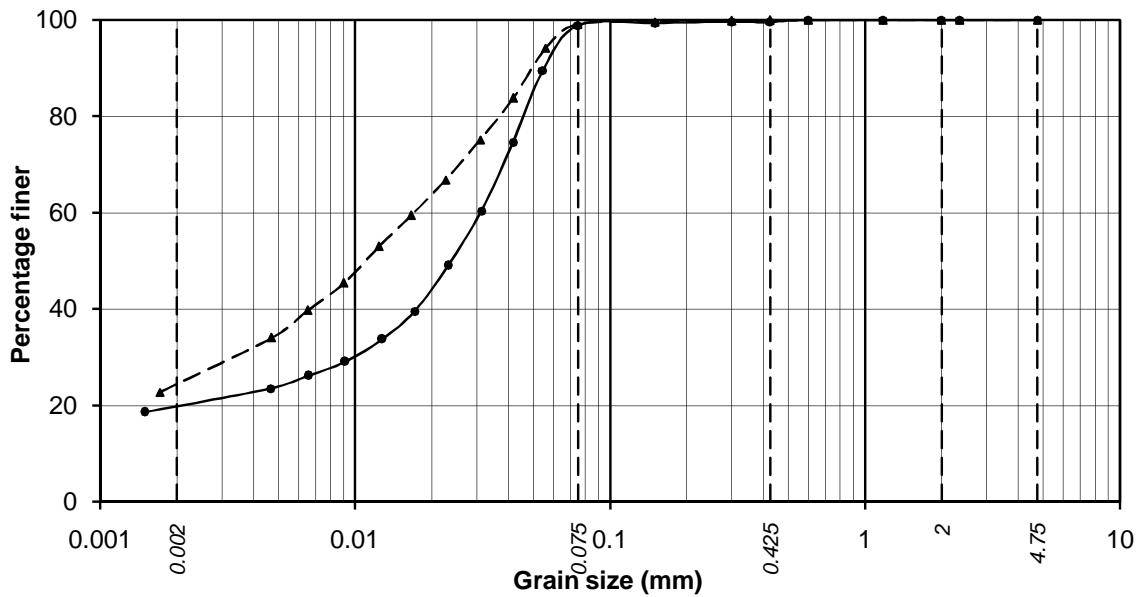
Fig. No.
E/12

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 13.00 m -▲- BH-3 , 17.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 13.00 m	16.8	74.5	8.6	0.1	0.0	0.0
BH-3 , 17.00 m	13.7	71.7	14.6	0.0	0.0	0.0



—●— BH-3 , 19.00 m -▲- BH-3 , 23.00 m

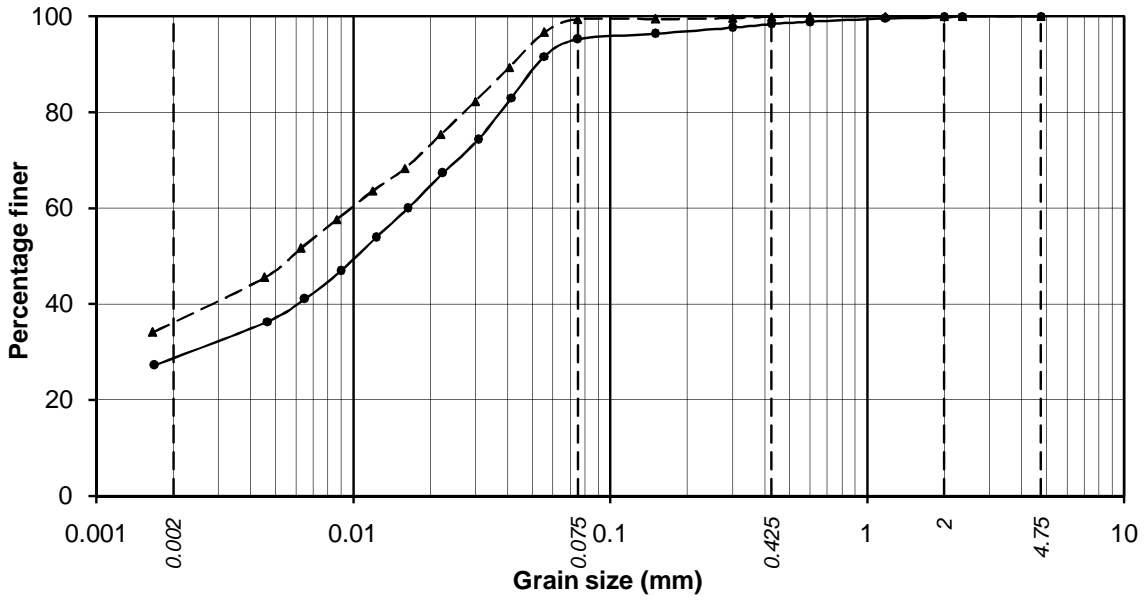
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 19.00 m	19.9	79.0	0.7	0.4	0.0	0.0
BH-3 , 23.00 m	24.4	74.7	0.8	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

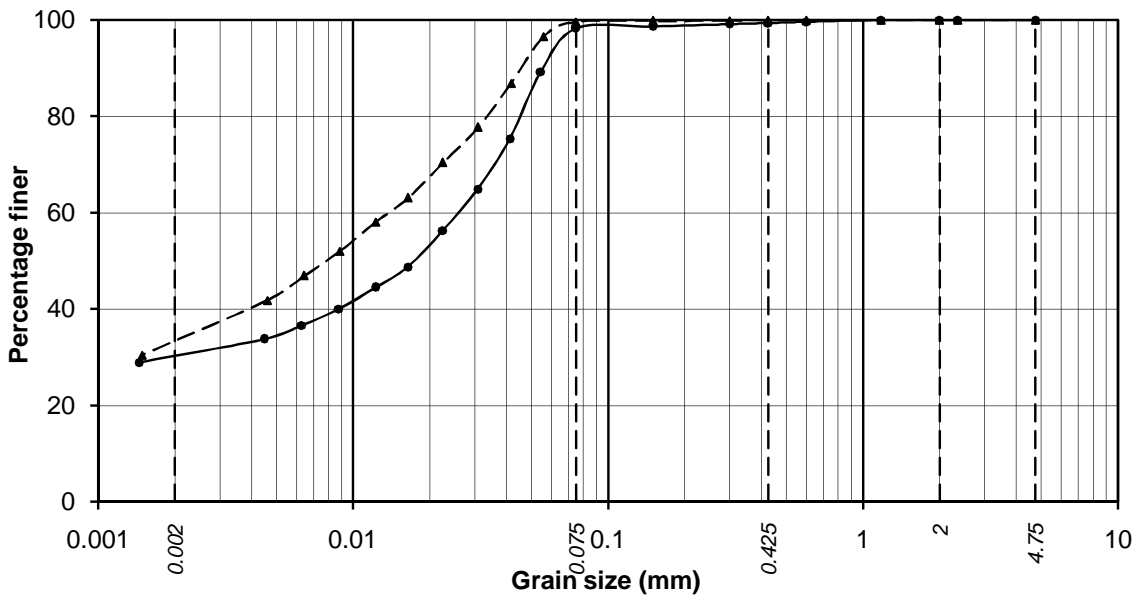
Fig. No.
E/13

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 25.00 m -▲- BH-3 , 27.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 25.00 m	28.8	66.5	3.1	1.4	0.2	0.0
BH-3 , 27.00 m	36.2	63.2	0.5	0.1	0.0	0.0



—●— BH-3 , 29.00 m -▲- BH-3 , 31.00 m

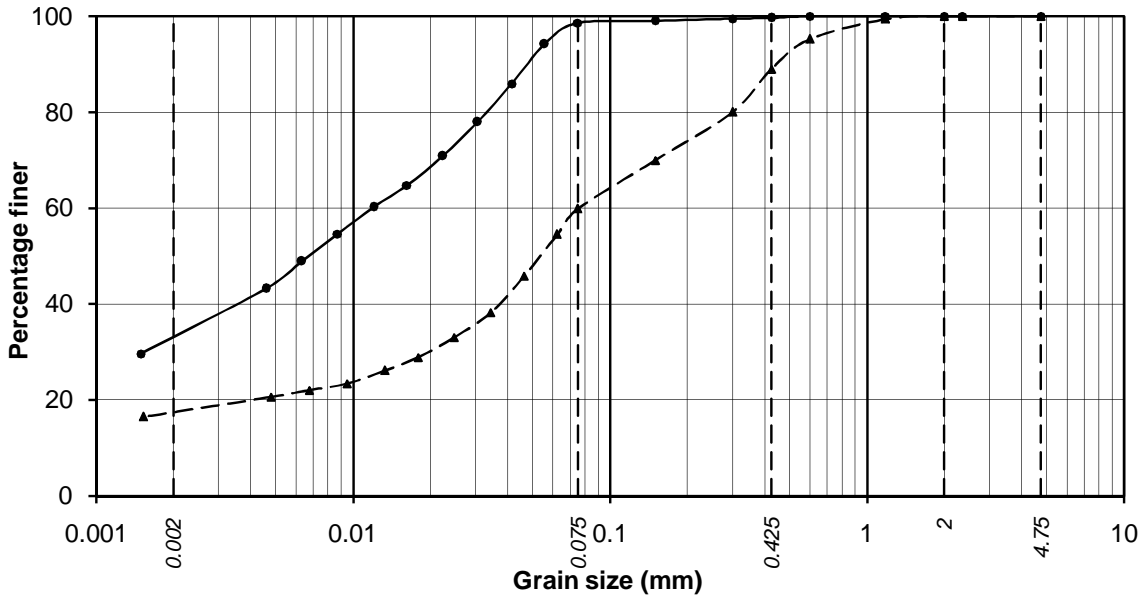
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 29.00 m	30.3	68.0	1.1	0.6	0.0	0.0
BH-3 , 31.00 m	33.4	66.2	0.4	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

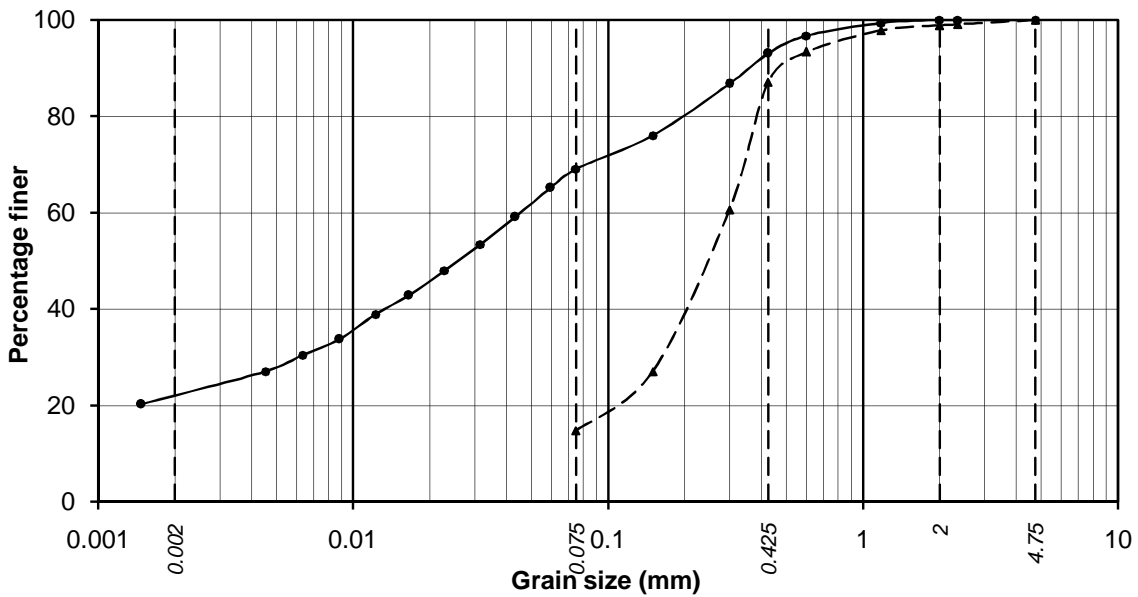
Fig. No.
E/14

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 33.00 m -▲- BH-3 , 35.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 33.00 m	33.1	65.5	1.1	0.3	0.0	0.0
BH-3 , 35.00 m	17.4	42.4	29.1	11.1	0.0	0.0



—●— BH-3 , 37.00 m -▲- BH-3 , 40.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 37.00 m	22.1	47.0	24.0	6.9	0.0	0.0
BH-3 , 40.00 m	*14.8		72.3	11.8	1.1	0.0

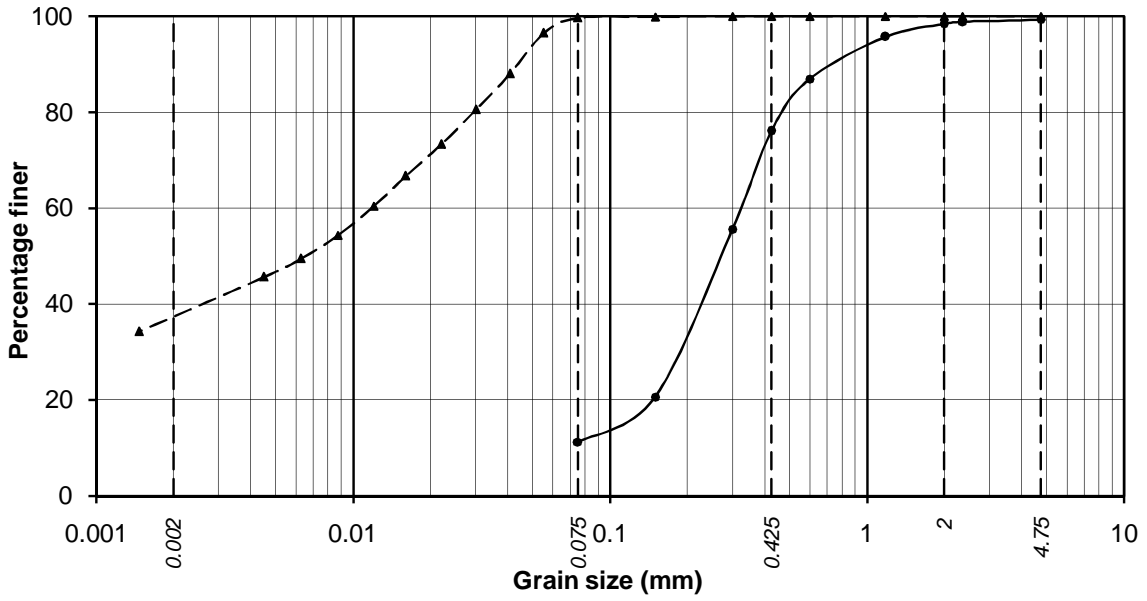
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/15

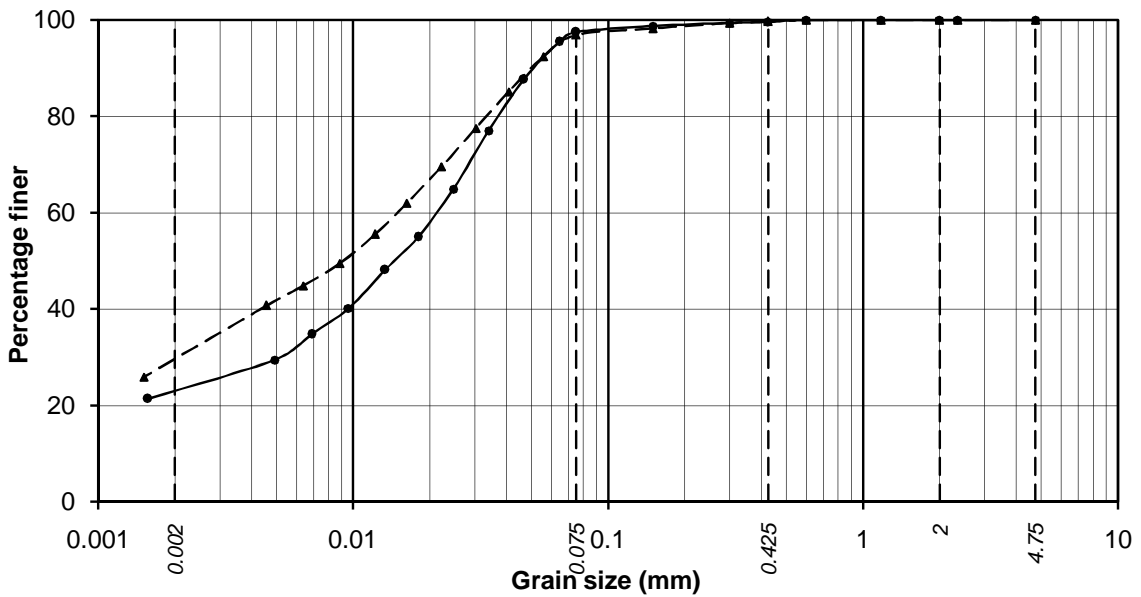
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 44.00 m -▲- BH-3 , 47.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 44.00 m	*11.2		64.9	22.3	0.9	0.7
BH-3 , 47.00 m	37.4	62.3	0.3	0.0	0.0	0.0

*Silt & Clay



—●— BH-3 , 49.00 m -▲- BH-3 , 51.00 m

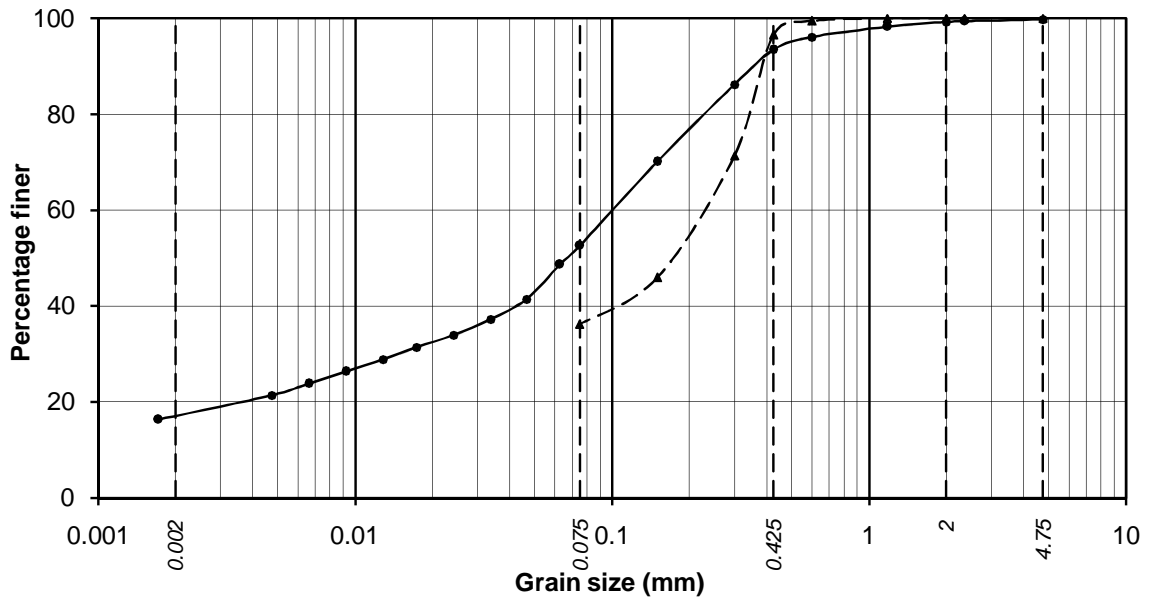
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-3 , 49.00 m	23.1	74.4	2.1	0.4	0.0	0.0
BH-3 , 51.00 m	29.6	67.3	2.8	0.3	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/16

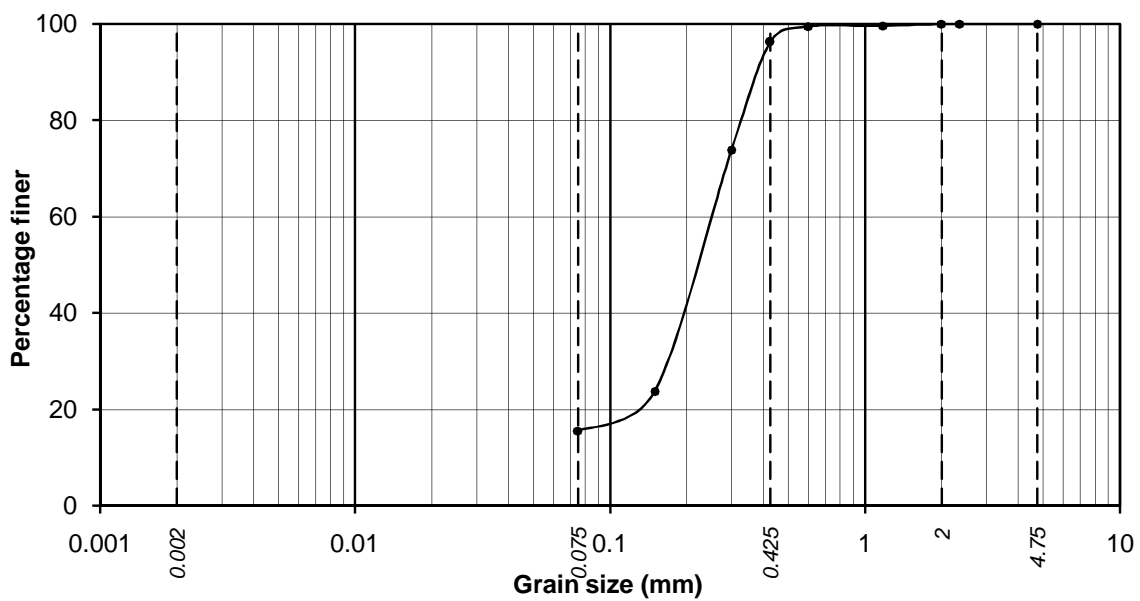
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-3 , 52.00 m -▲- BH-3 , 54.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 52.00 m	17.1	35.5	40.9	5.7	0.5	0.3
BH-3 , 54.00 m	*36.2		60.3	3.5	0.0	0.0

*Silt & Clay



—●— BH-3 , 58.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-3 , 58.00 m	*15.5		80.8	3.7	0.0	0.0

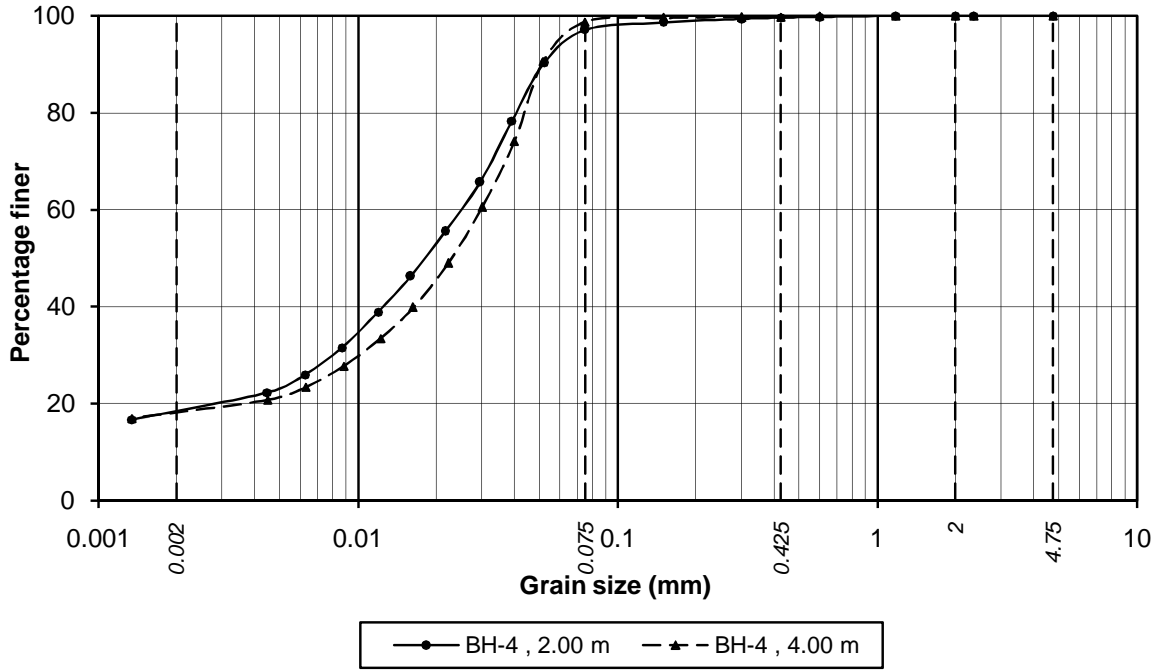
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

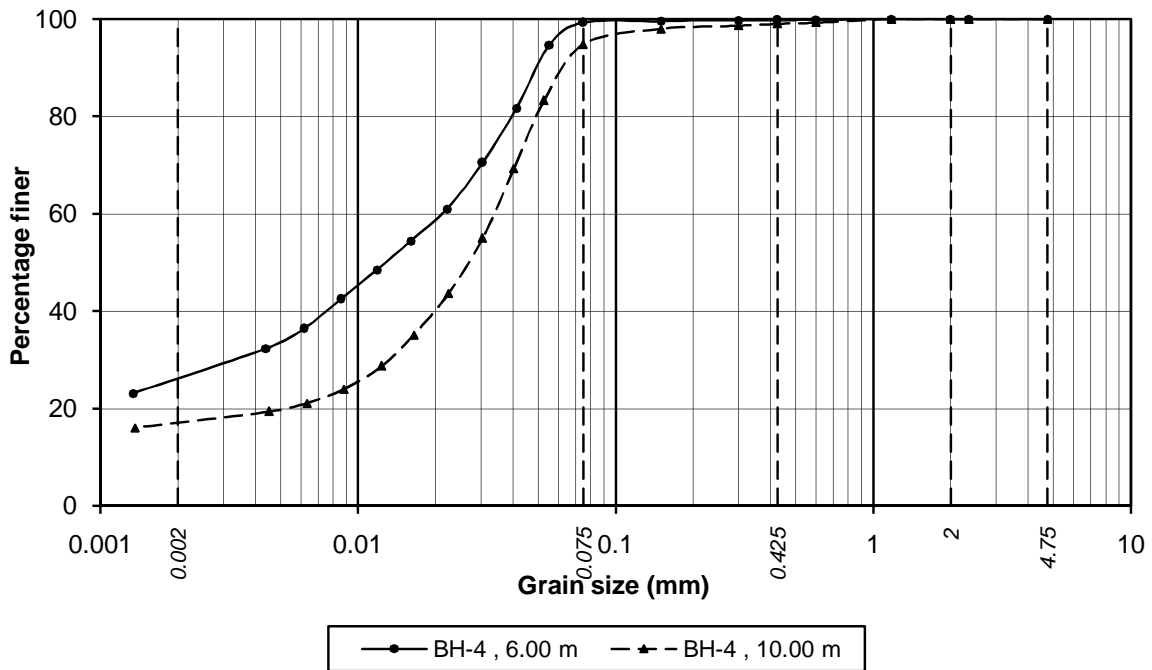
Job No.
XCSPL/1372

Fig. No.
E/17

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 2.00 m	18.5	78.6	2.5	0.4	0.0	0.0
BH-4 , 4.00 m	18.2	80.5	1.0	0.3	0.0	0.0



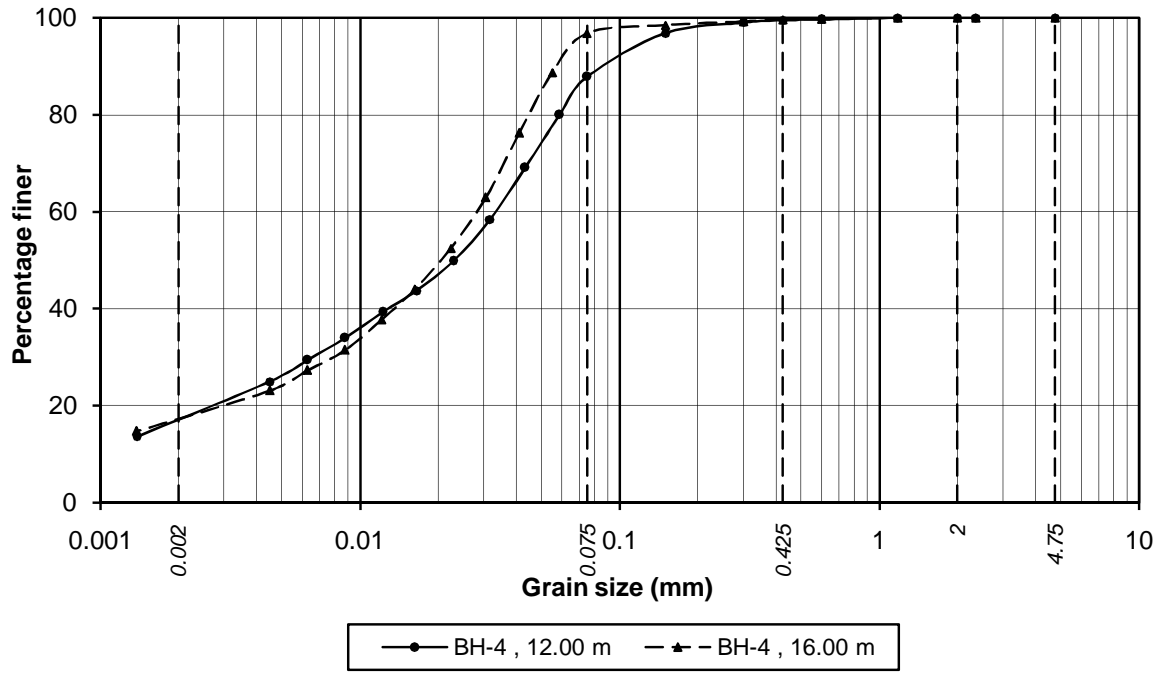
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 6.00 m	26.2	73.1	0.5	0.2	0.0	0.0
BH-4 , 10.00 m	17.1	77.7	4.3	0.9	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

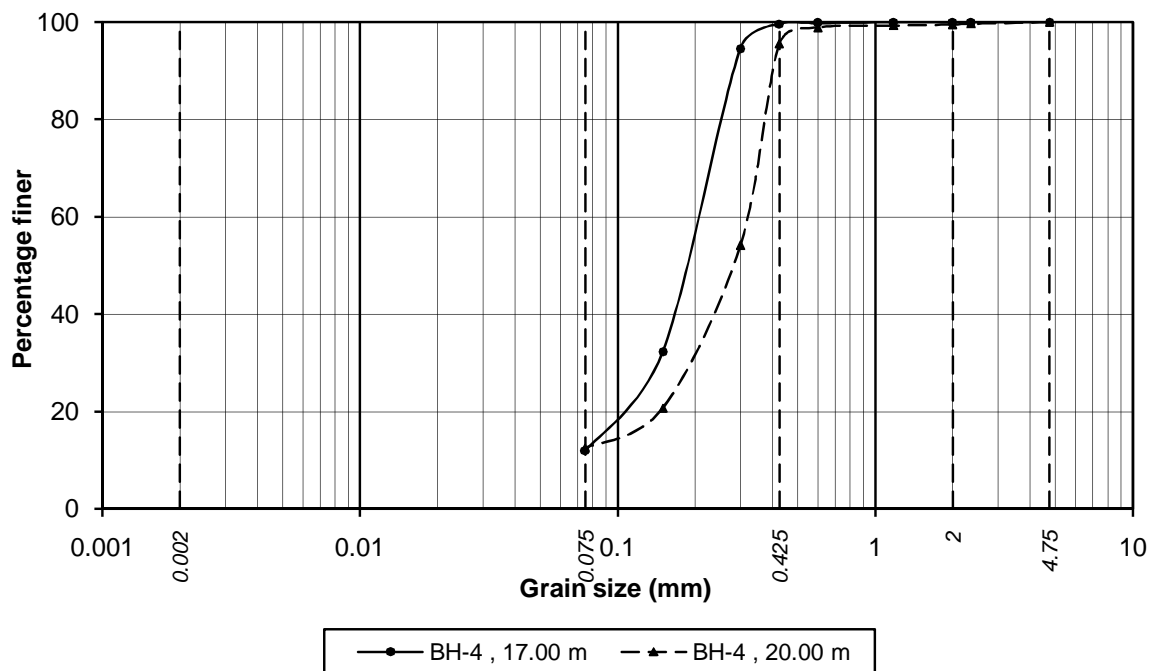
Job No.
XCSPL/1372

Fig. No.
E/18

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-4 , 12.00 m	17.1	70.8	11.6	0.5	0.0	0.0
BH-4 , 16.00 m	17.3	79.5	2.8	0.4	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-4 , 17.00 m	*12.0	87.6	0.4	0.0	0.0	0.0
BH-4 , 20.00 m	*12.5	83.1	3.9	0.5	0.0	0.0

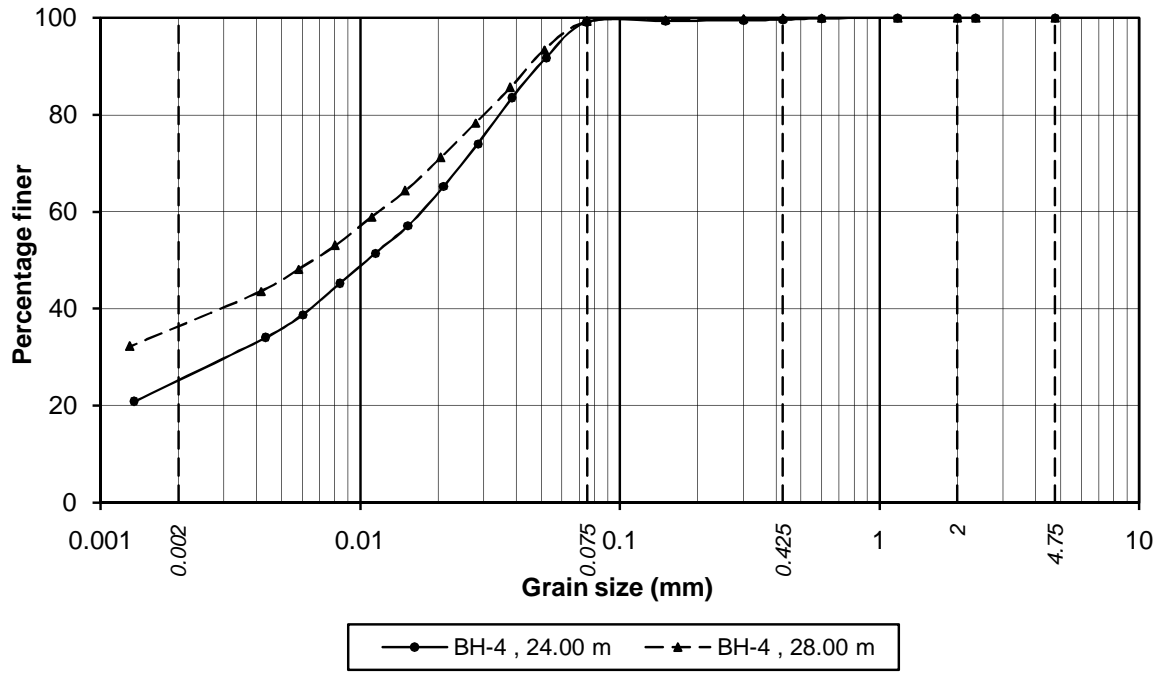
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

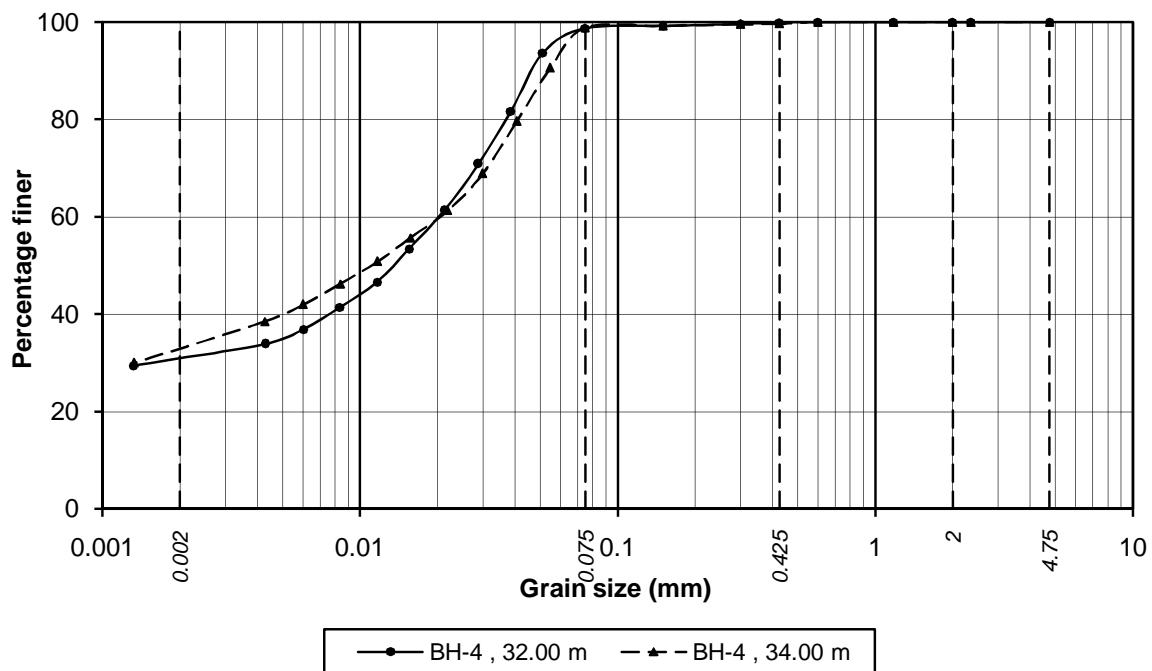
Job No.
XCSPL/1372

Fig. No.
E/19

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 24.00 m	25.3	73.8	0.5	0.4	0.0	0.0
BH-4 , 28.00 m	36.4	62.9	0.7	0.0	0.0	0.0



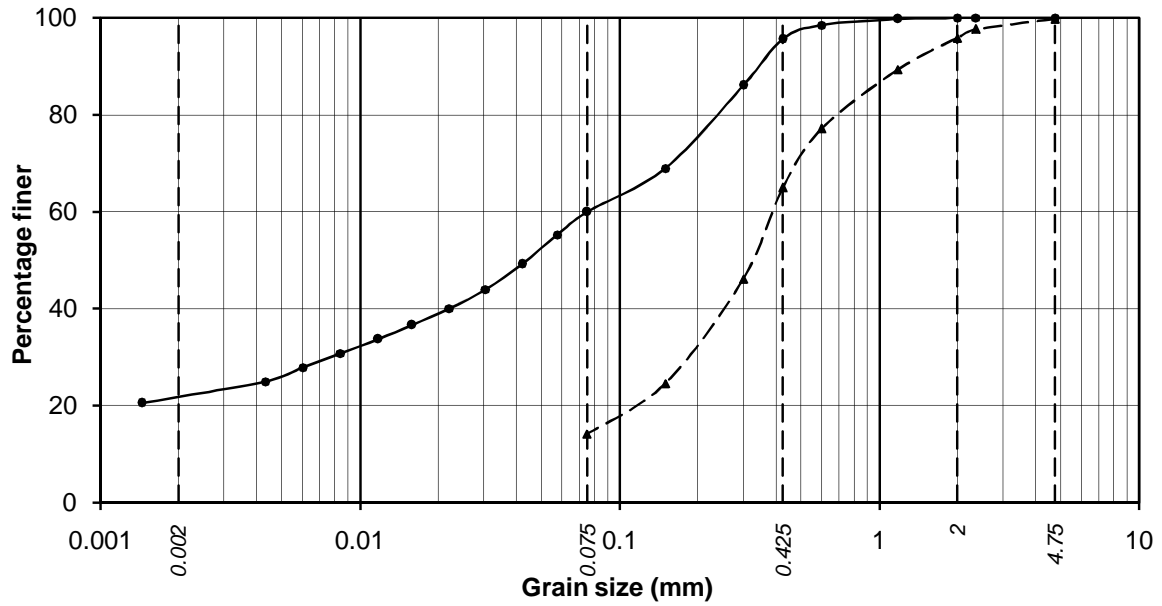
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 32.00 m	31.0	67.8	1.1	0.1	0.0	0.0
BH-4 , 34.00 m	33.0	65.9	0.8	0.3	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/20

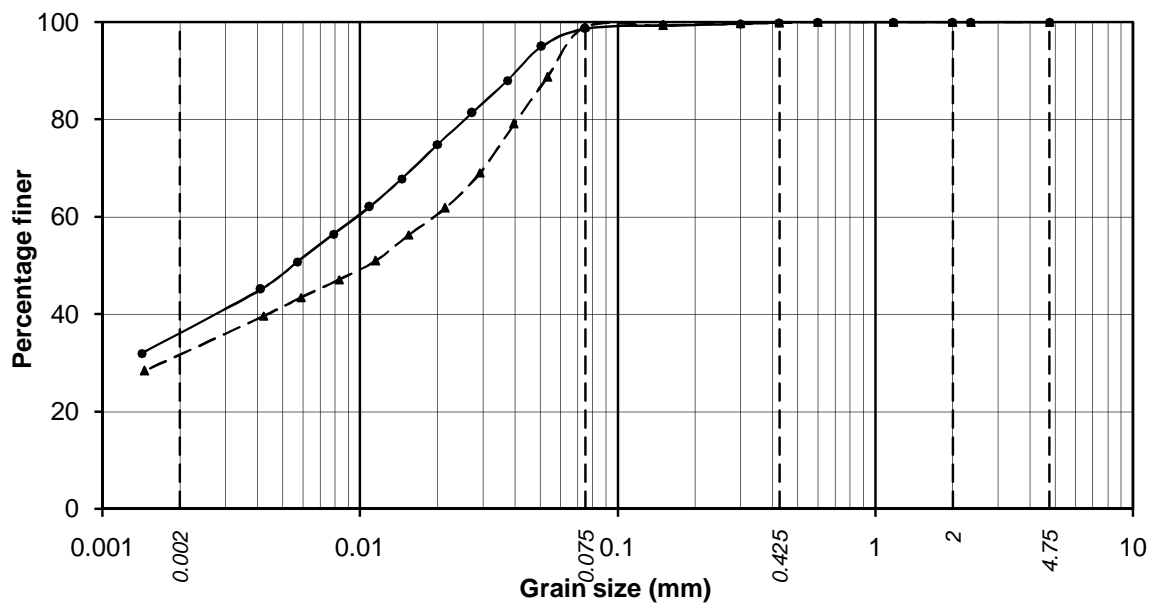
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-4 , 38.00 m -▲- BH-4 , 41.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 38.00 m	21.8	38.1	35.7	4.4	0.0	0.0
BH-4 , 41.00 m	*14.1		50.8	30.9	3.9	0.3

*Silt & Clay



—●— BH-4 , 46.00 m -▲- BH-4 , 50.00 m

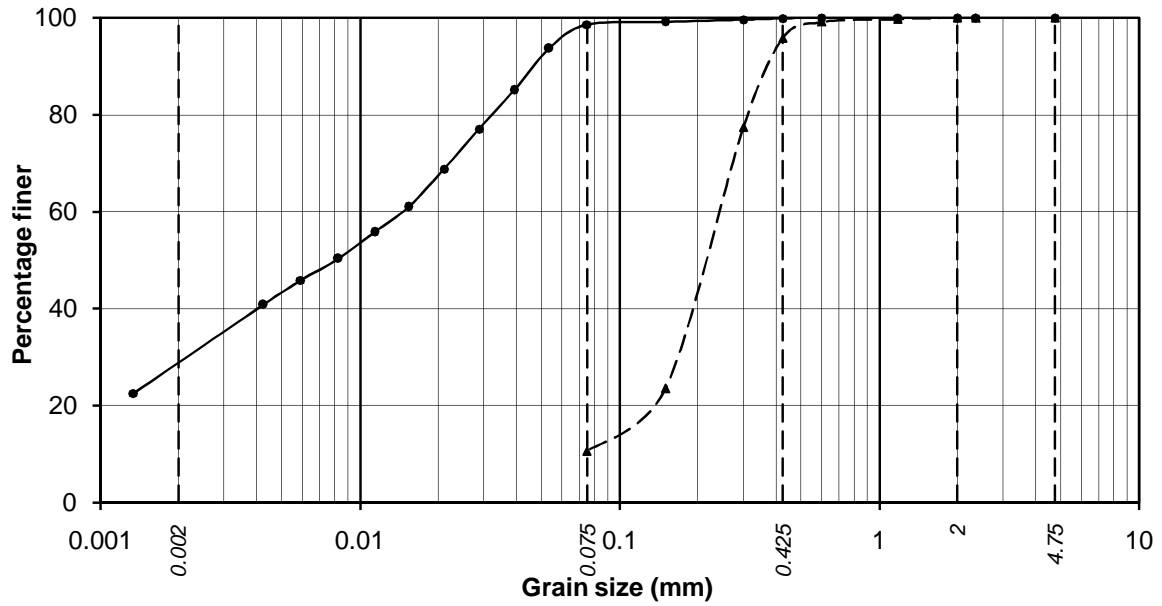
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-4 , 46.00 m	36.2	62.5	1.2	0.1	0.0	0.0
BH-4 , 50.00 m	31.7	67.4	0.8	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

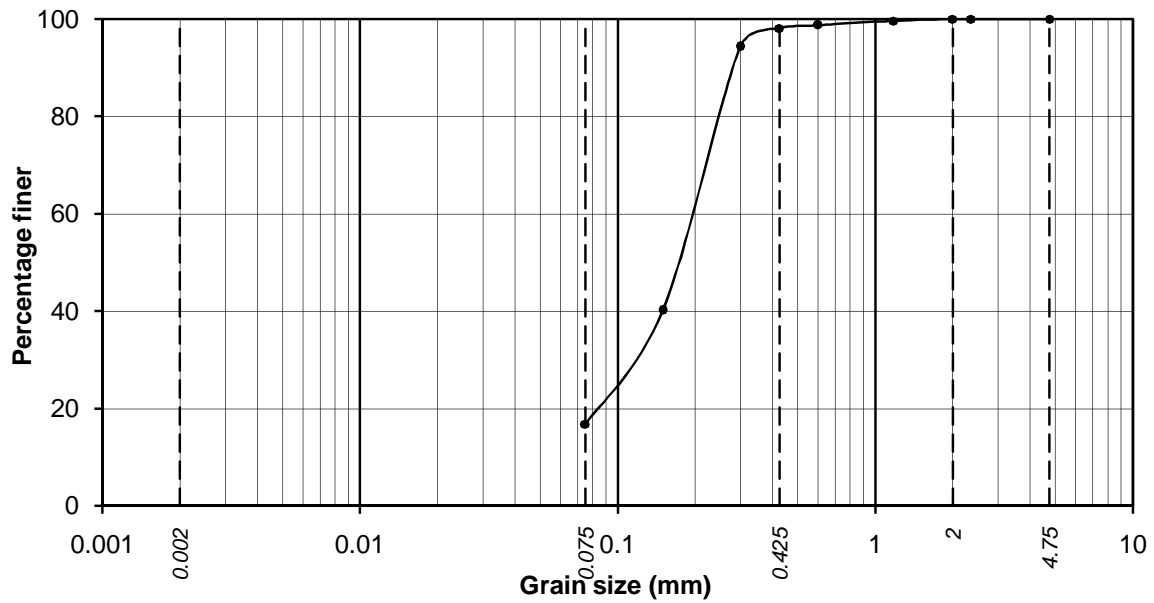
Fig. No.
E/21

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-4 , 54.00 m -▲- BH-4 , 57.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-4 , 54.00 m	28.8	69.8	1.3	0.1	0.0	0.0
BH-4 , 57.00 m	*10.6		85.2	4.2	0.0	0.0
*Silt & Clay						



—●— BH-4 , 60.25 m

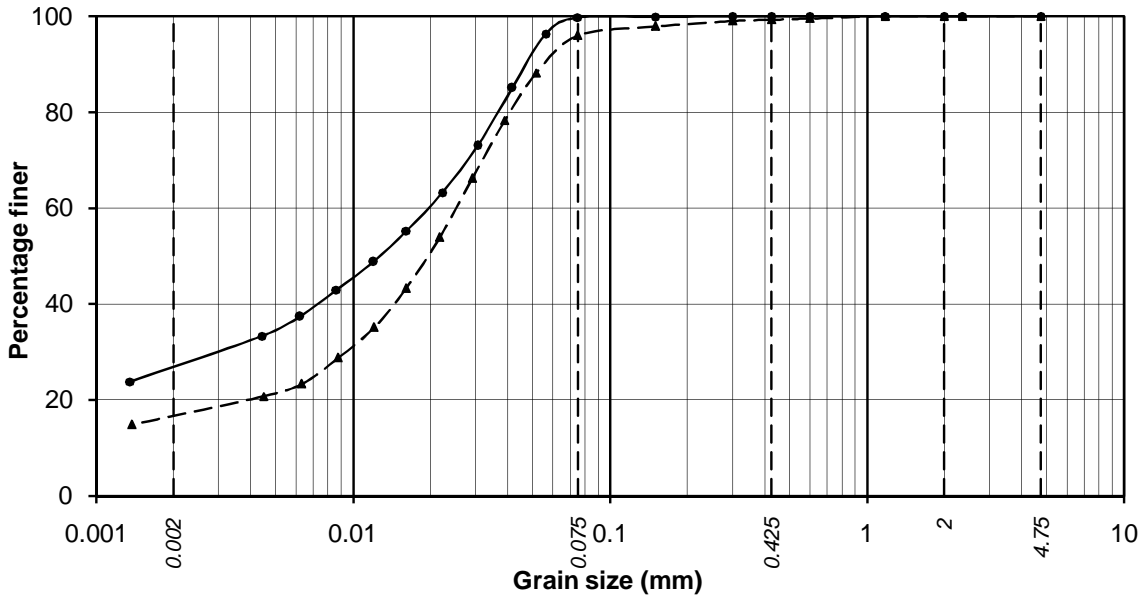
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-4 , 60.25 m	*16.8		81.3	1.9	0.0	0.0
*Silt & Clay						

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

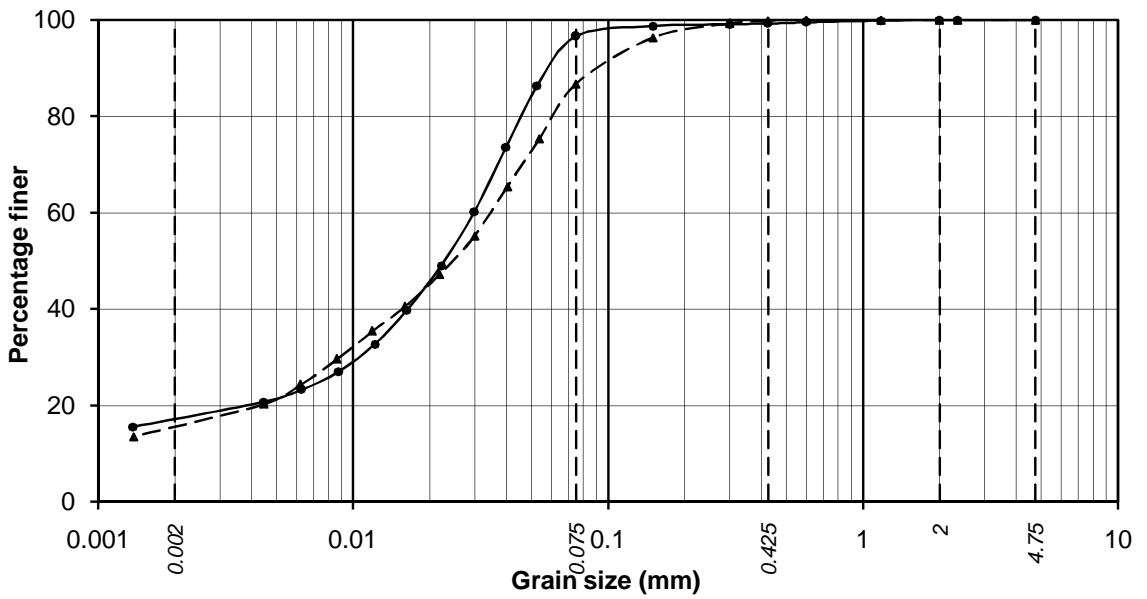
Fig. No.
E/22

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-5 , 1.00 m -▲- BH-5 , 5.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 1.00 m	26.9	72.8	0.3	0.0	0.0	0.0
BH-5 , 5.00 m	16.7	79.3	3.3	0.7	0.0	0.0



—●— BH-5 , 7.00 m -▲- BH-5 , 11.00 m

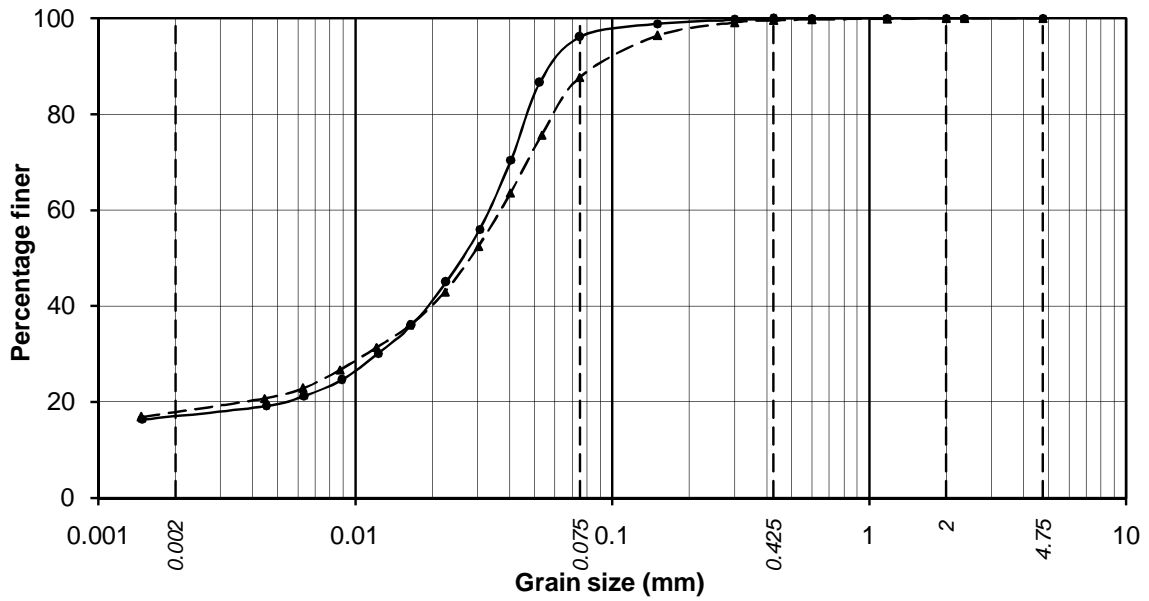
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 7.00 m	17.2	79.4	2.7	0.7	0.0	0.0
BH-5 , 11.00 m	15.6	71.2	13.1	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

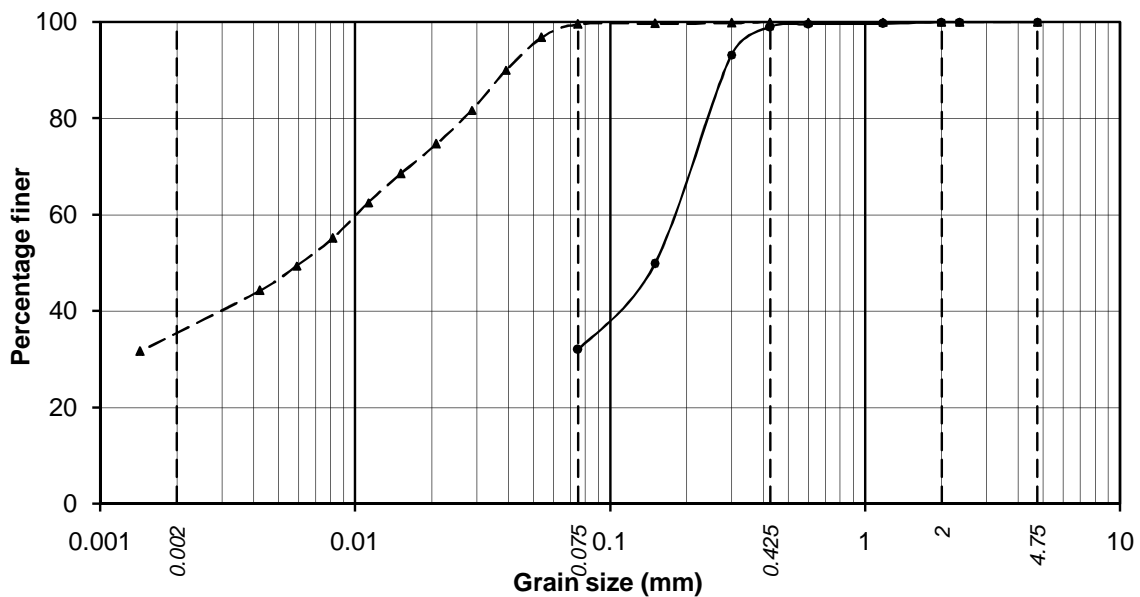
Fig. No.
E/23

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-5 , 15.00 m -▲- BH-5 , 17.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-5 , 15.00 m	17.1	79.0	3.8	0.1	0.0	0.0
BH-5 , 17.00 m	17.9	69.7	11.9	0.5	0.0	0.0



—●— BH-5 , 20.00 m -▲- BH-5 , 23.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-5 , 20.00 m	*32.0		67.0	1.0	0.0	0.0
BH-5 , 23.00 m	35.5	64.0	0.5	0.0	0.0	0.0

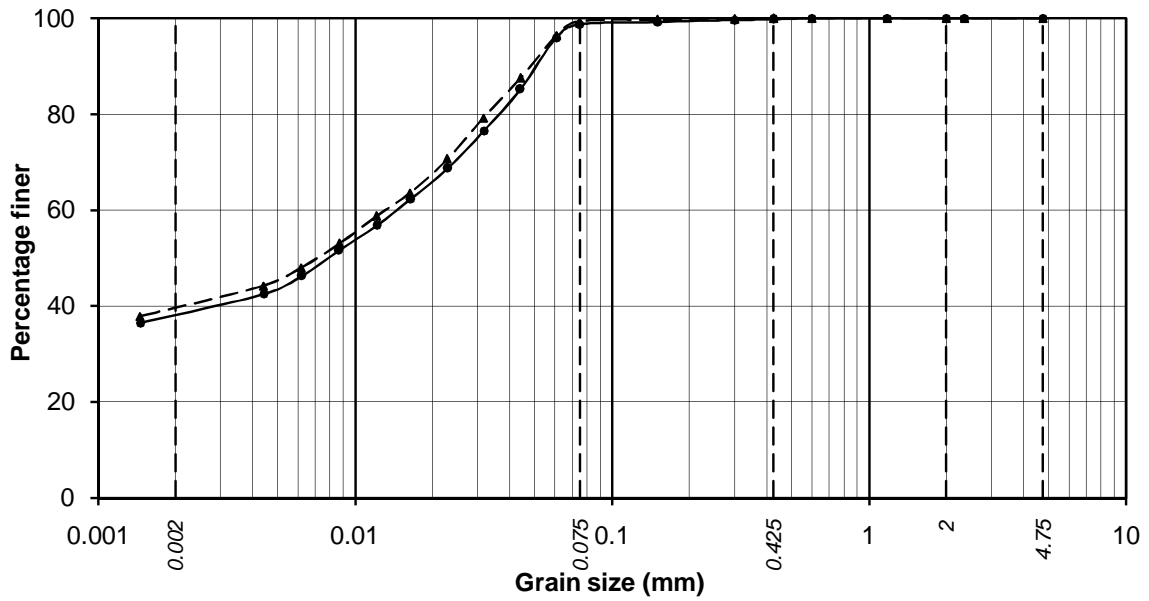
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

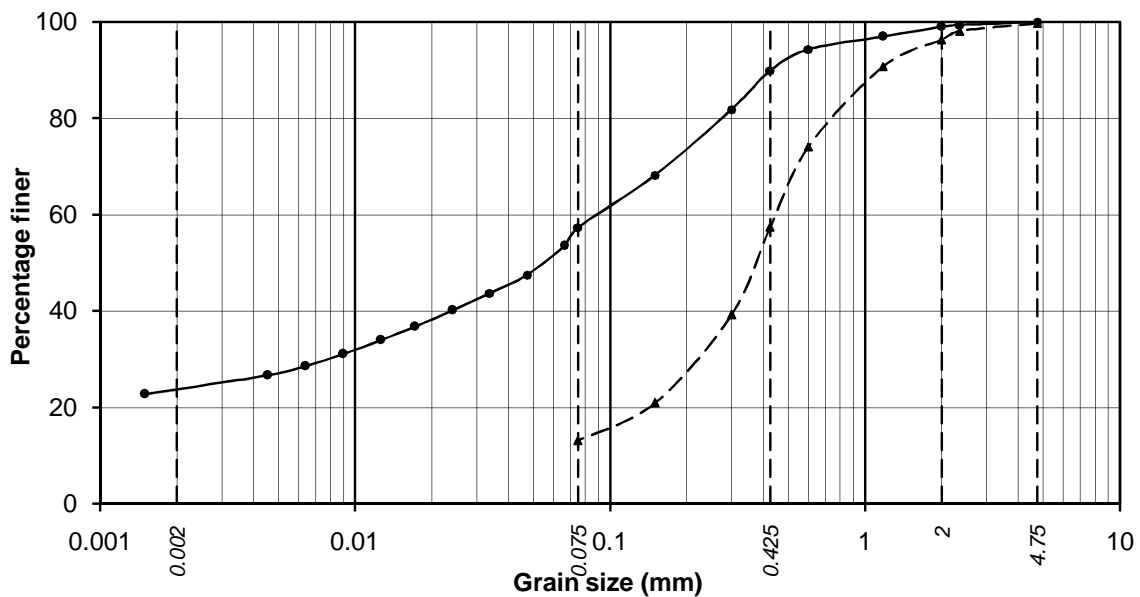
Fig. No.
E/24

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-5 , 27.00 m -▲- BH-5 , 31.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 27.00 m	38.1	60.6	1.1	0.2	0.0	0.0
BH-5 , 31.00 m	39.7	59.6	0.6	0.1	0.0	0.0



—●— BH-5 , 35.00 m -▲- BH-5 , 38.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 35.00 m	23.8	33.5	32.6	9.2	0.9	0.0
BH-5 , 38.00 m	*13.1		44.4	38.9	3.4	0.2

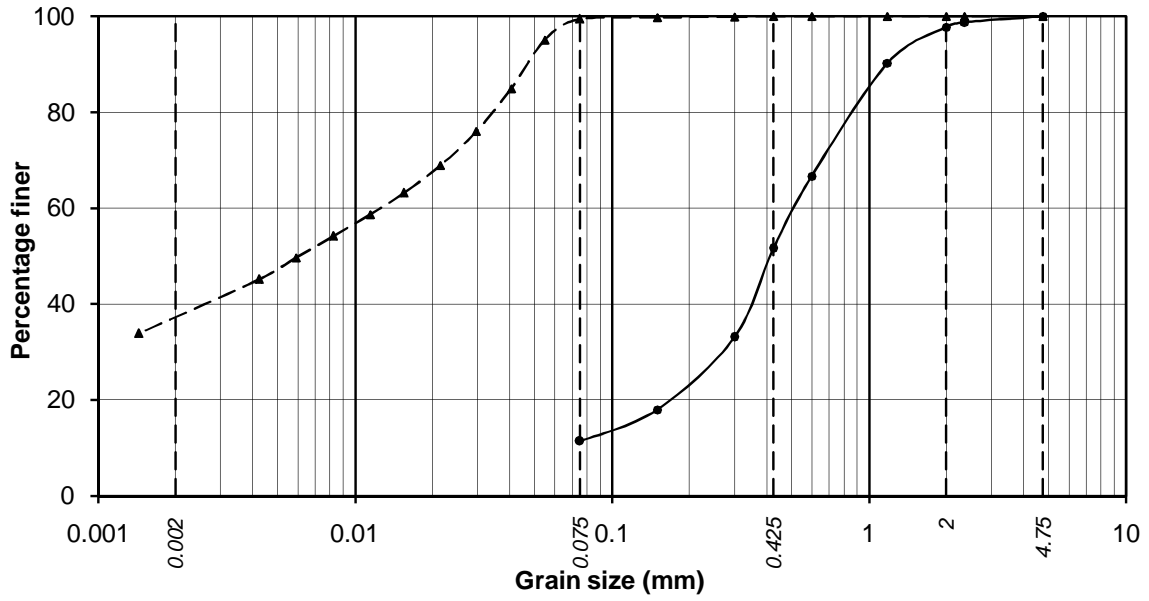
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/25

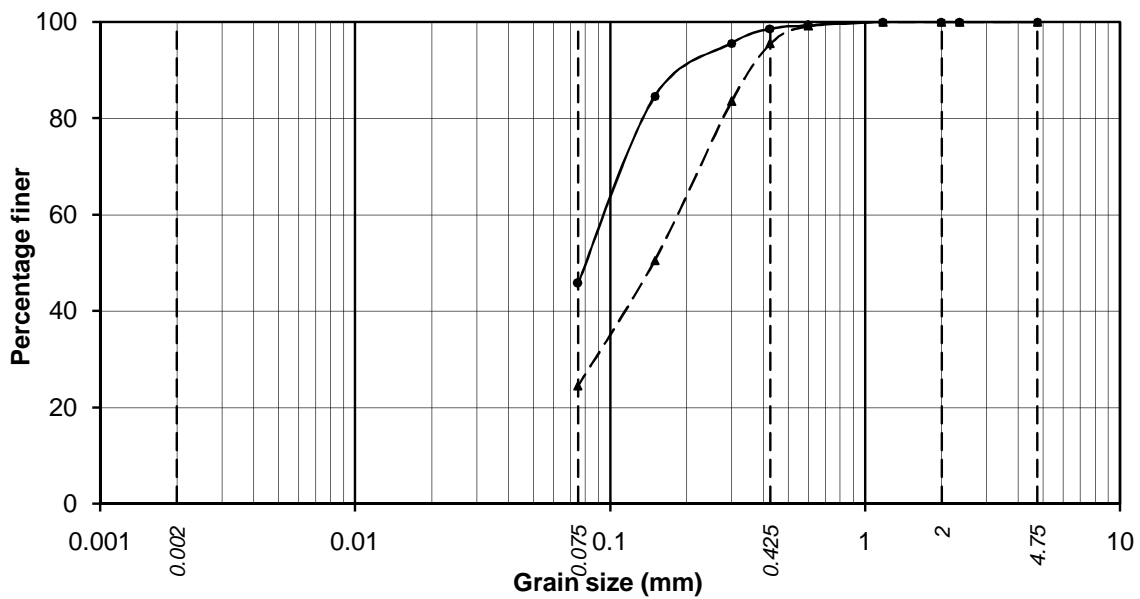
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-5 , 42.00 m -▲- BH-5 , 45.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-5 , 42.00 m		*11.4	40.2	46.1	2.3	0.0
BH-5 , 45.00 m	37.3	62.1	0.6	0.0	0.0	0.0

*Silt & Clay



—●— BH-5 , 46.00 m -▲- BH-5 , 50.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-5 , 46.00 m		*45.8	52.8	1.4	0.0	0.0
BH-5 , 50.00 m		*24.5	71.0	4.5	0.0	0.0

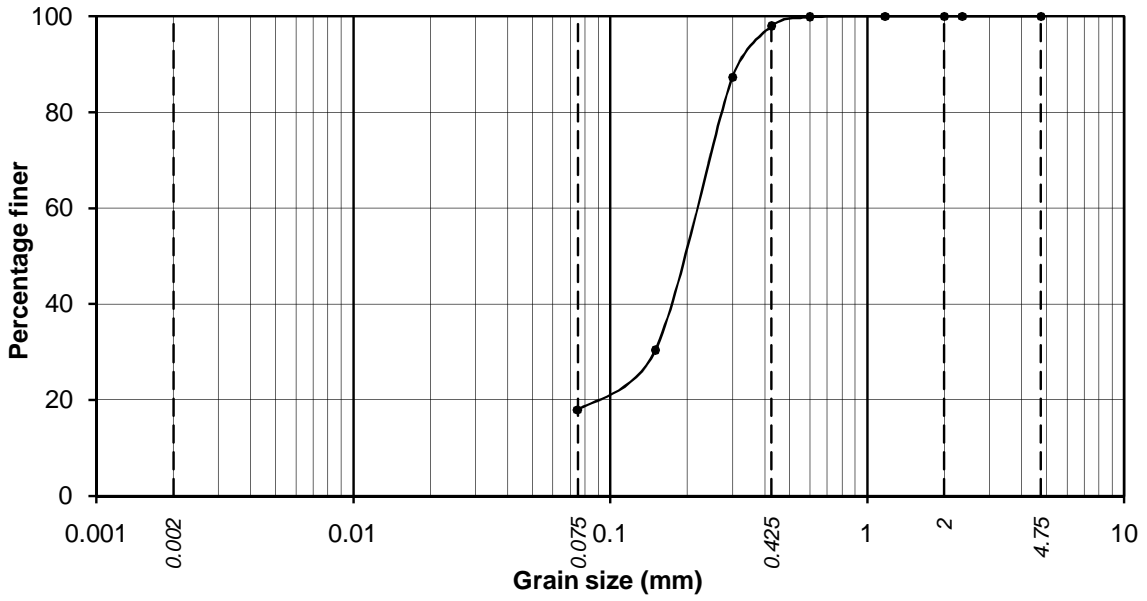
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/26

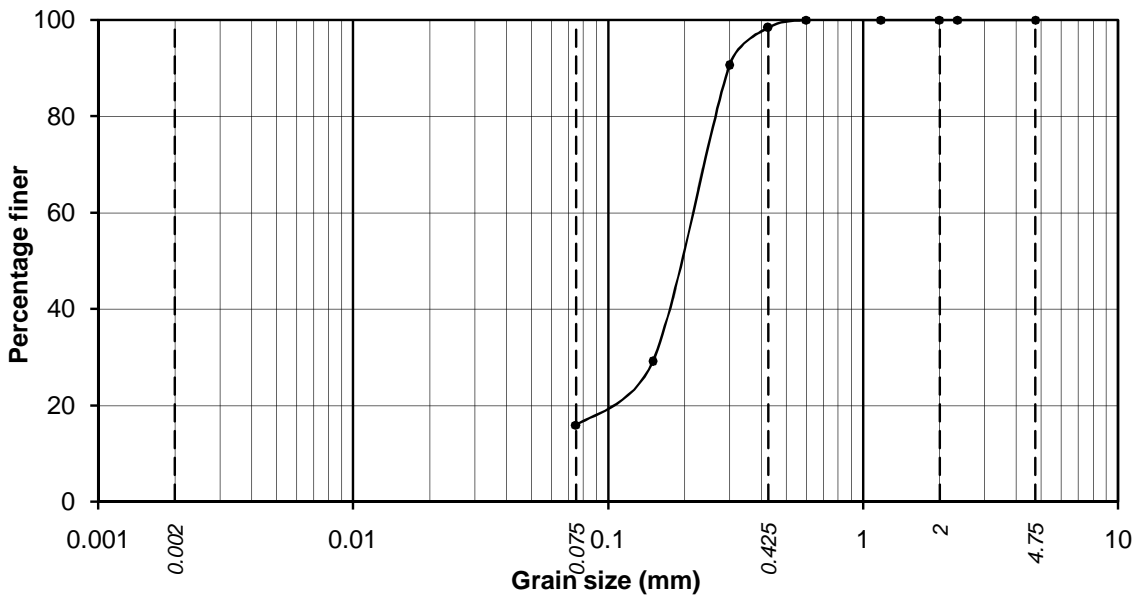
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-5 , 54.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 54.00 m		*17.9	80.0	2.1	0.0	0.0

*Silt & Clay



—●— BH-5 , 58.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-5 , 58.00 m		*15.9	82.5	1.6	0.0	0.0

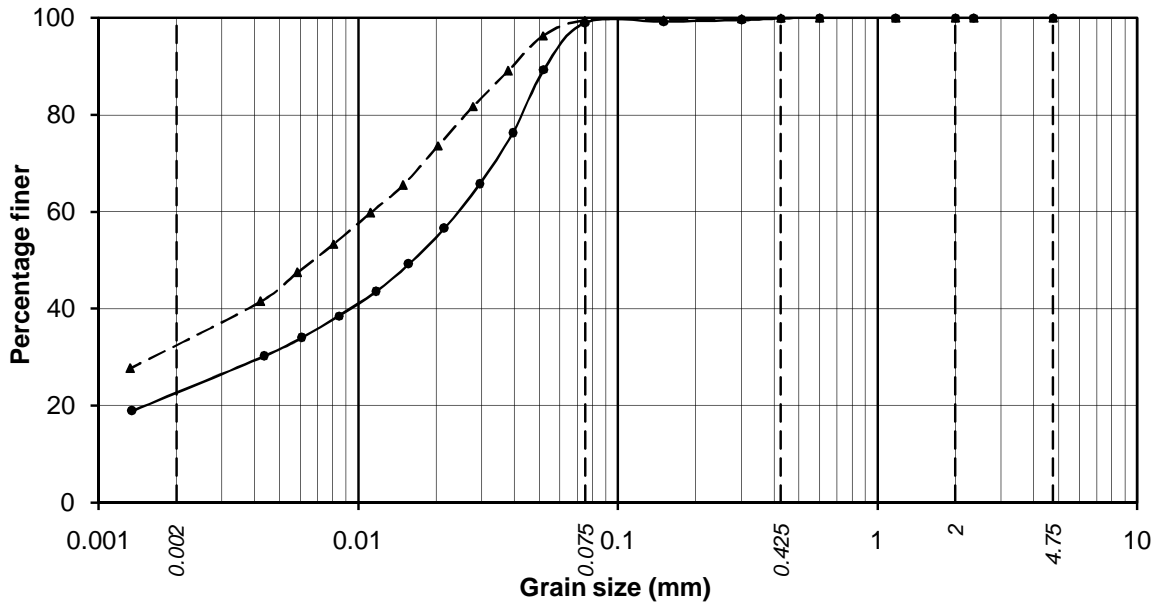
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

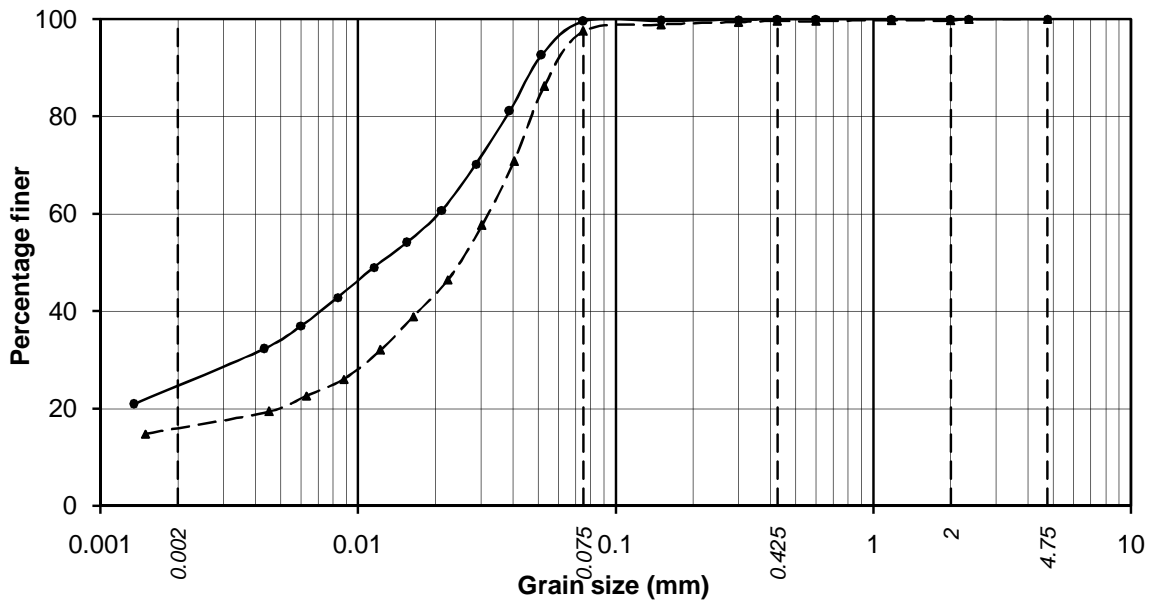
Fig. No.
E/27

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-6 , 1.00 m -▲- BH-6 , 3.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-6 , 1.00 m	22.7	76.3	0.9	0.1	0.0	0.0
BH-6 , 3.00 m	32.6	66.9	0.5	0.0	0.0	0.0



—●— BH-6 , 5.00 m -▲- BH-6 , 9.00 m

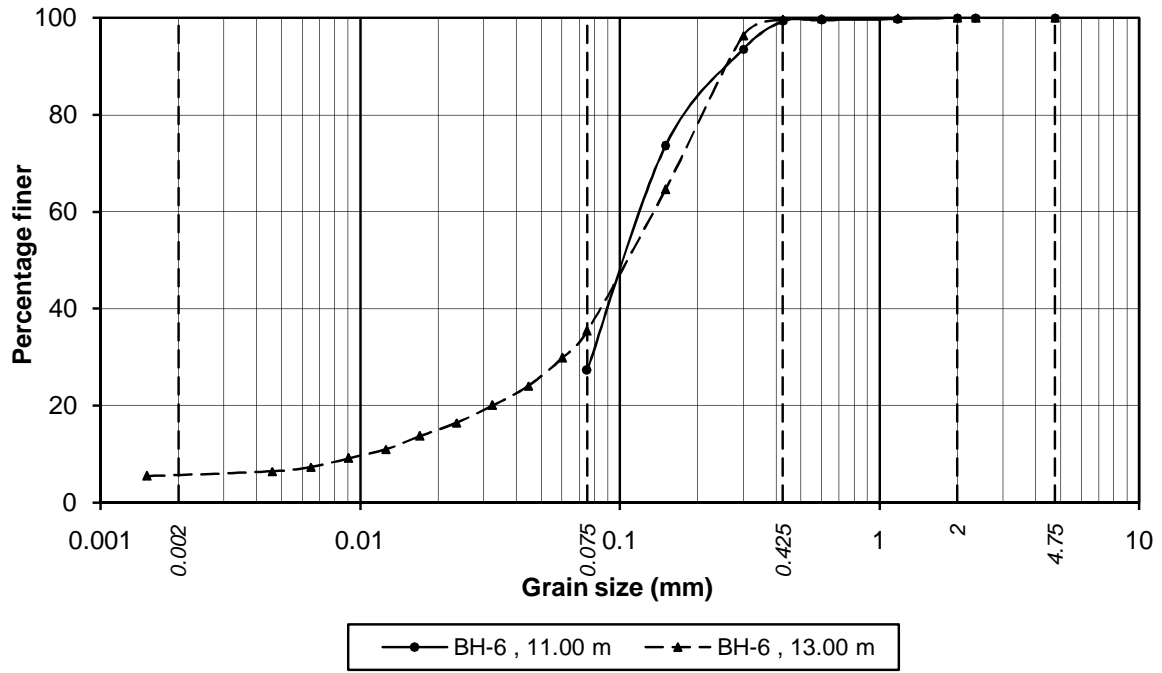
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-6 , 5.00 m	24.7	74.8	0.5	0.0	0.0	0.0
BH-6 , 9.00 m	16.0	81.5	2.1	0.1	0.3	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

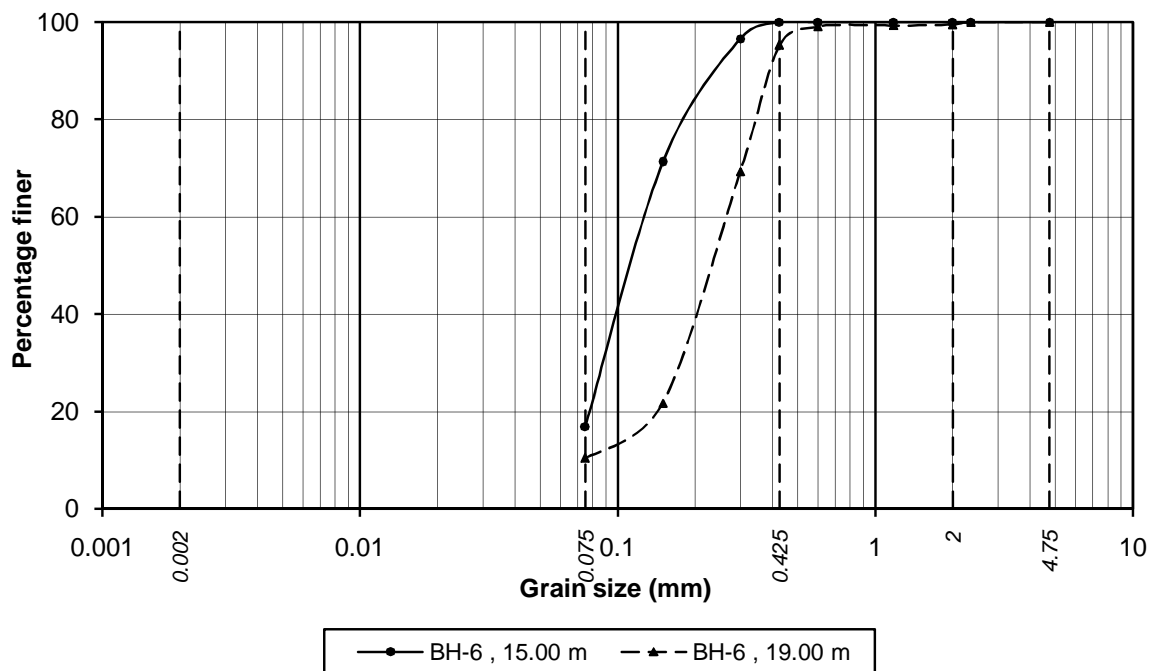
Fig. No.
E/

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-6 , 11.00 m	*27.3		72.0	0.7	0.0	0.0
BH-6 , 13.00 m	5.7	29.7	64.3	0.3	0.0	0.0

*Silt & Clay



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-6 , 15.00 m	*16.9		83.1	0.0	0.0	0.0
BH-6 , 19.00 m	*10.4		84.9	4.2	0.5	0.0

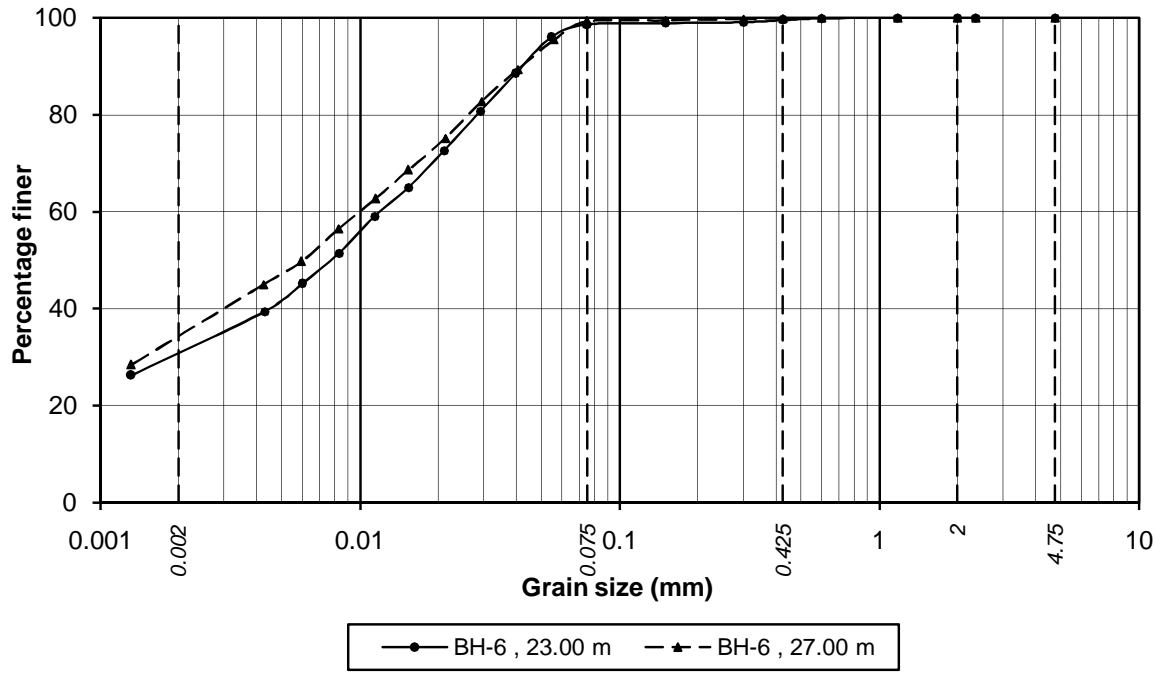
*Silt & Clay

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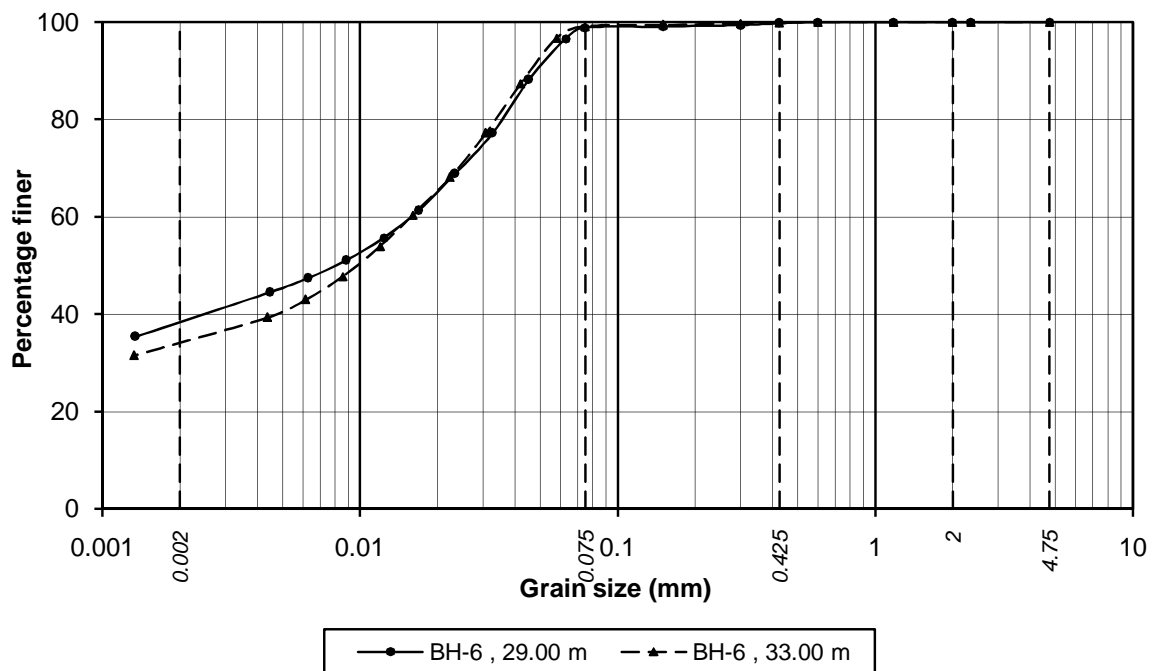
Job No.
XCSPL/1372

Fig. No.
E/29

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-6, 23.00 m	30.9	67.7	0.9	0.5	0.0	0.0
BH-6, 27.00 m	34.3	65.0	0.6	0.1	0.0	0.0



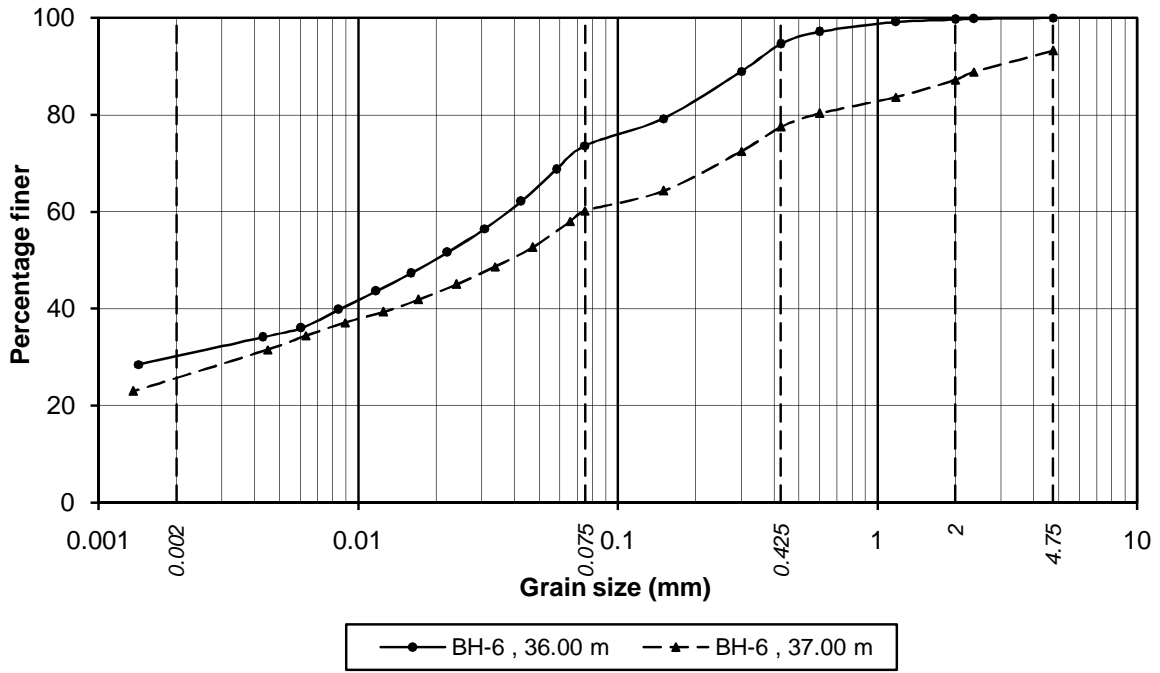
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-6, 29.00 m	38.4	60.5	0.9	0.2	0.0	0.0
BH-6, 33.00 m	34.2	65.0	0.7	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

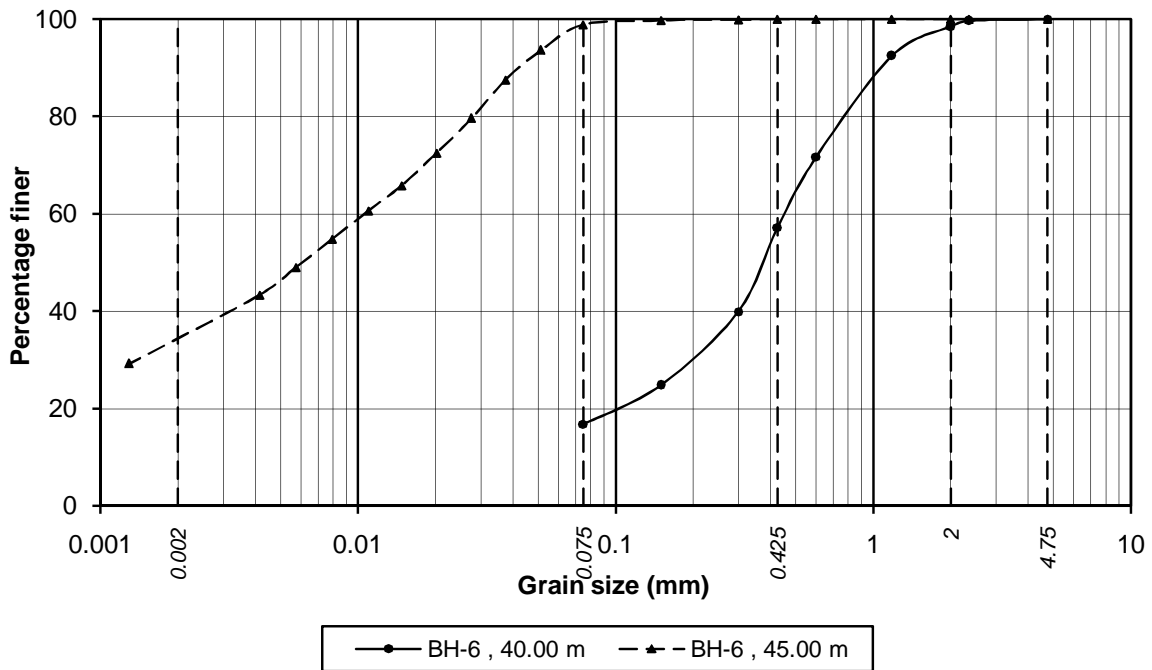
Job No.
XCSPL/1372

Fig. No.
E/30

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-6, 36.00 m	30.2	43.4	21.0	5.1	0.3	0.0
BH-6, 37.00 m	25.7	34.4	17.3	9.7	6.1	6.8



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-6, 40.00 m	*16.8		40.4	41.3	1.5	0.0
BH-6, 45.00 m	34.5	64.4	1.1	0.0	0.0	0.0

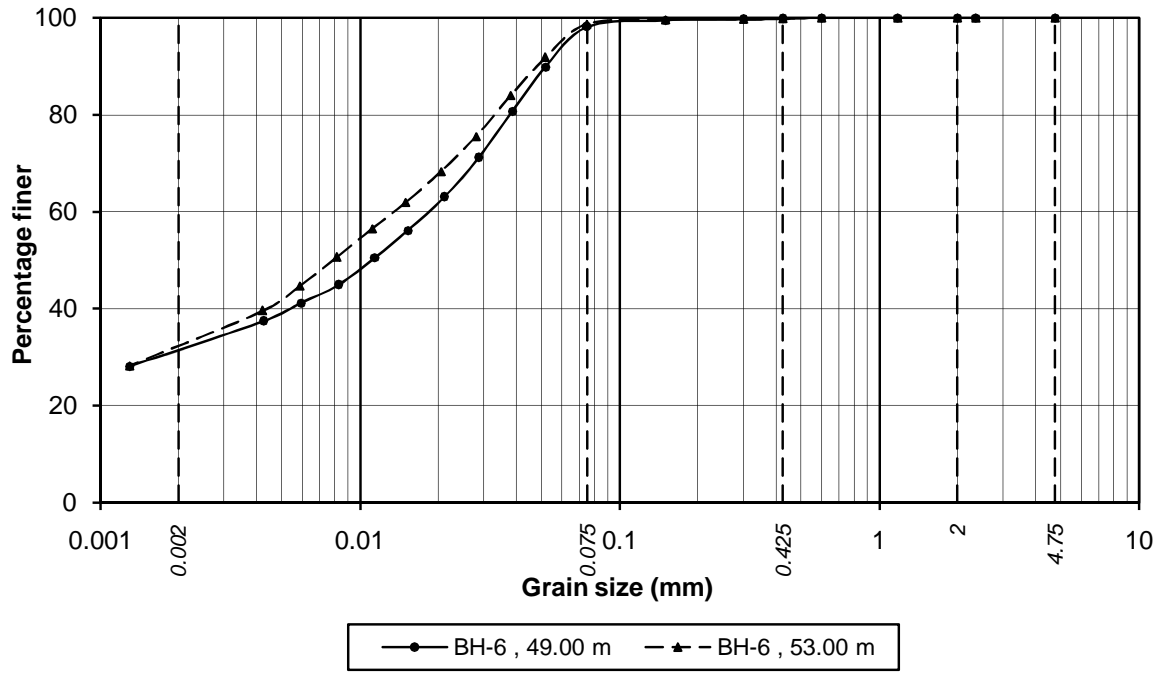
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

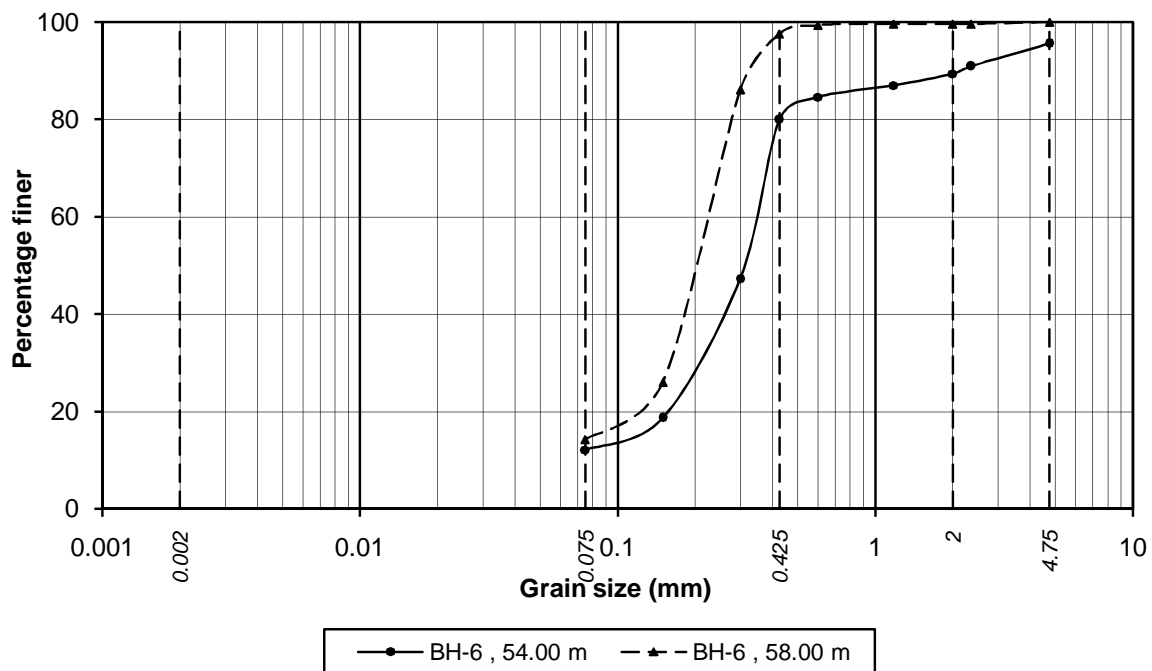
Job No.
XCSPL/1372

Fig. No.
E/31

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-6 , 49.00 m	31.5	66.6	1.7	0.2	0.0	0.0
BH-6 , 53.00 m	32.4	66.4	1.1	0.1	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-6 , 54.00 m	*12.1		67.8	9.4	6.3	4.4
BH-6 , 58.00 m	*14.3		83.3	2.0	0.4	0.0

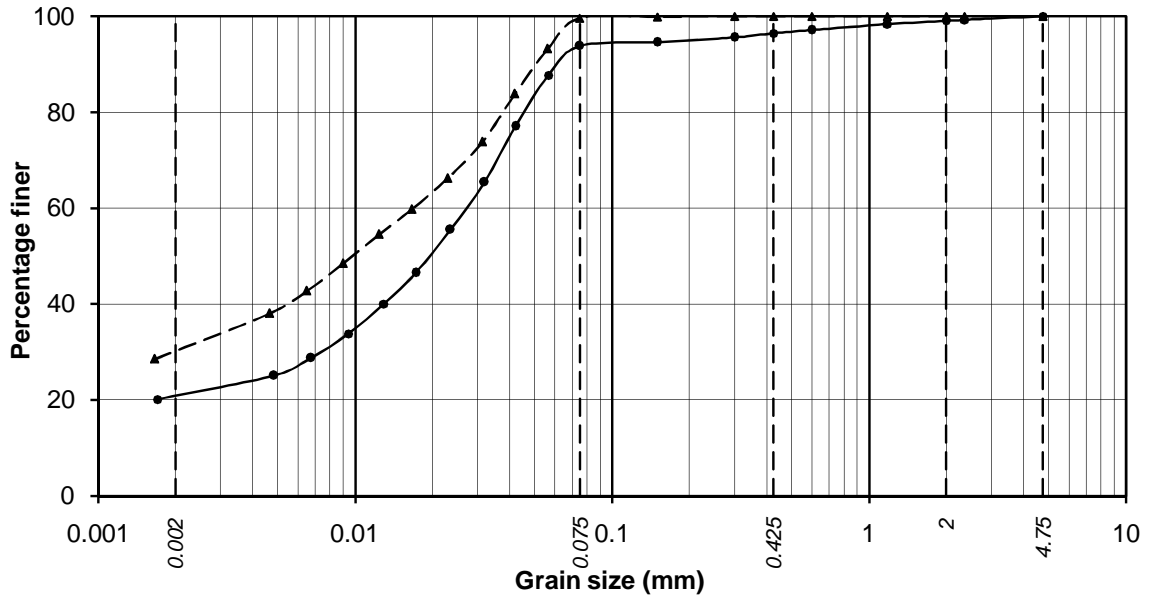
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

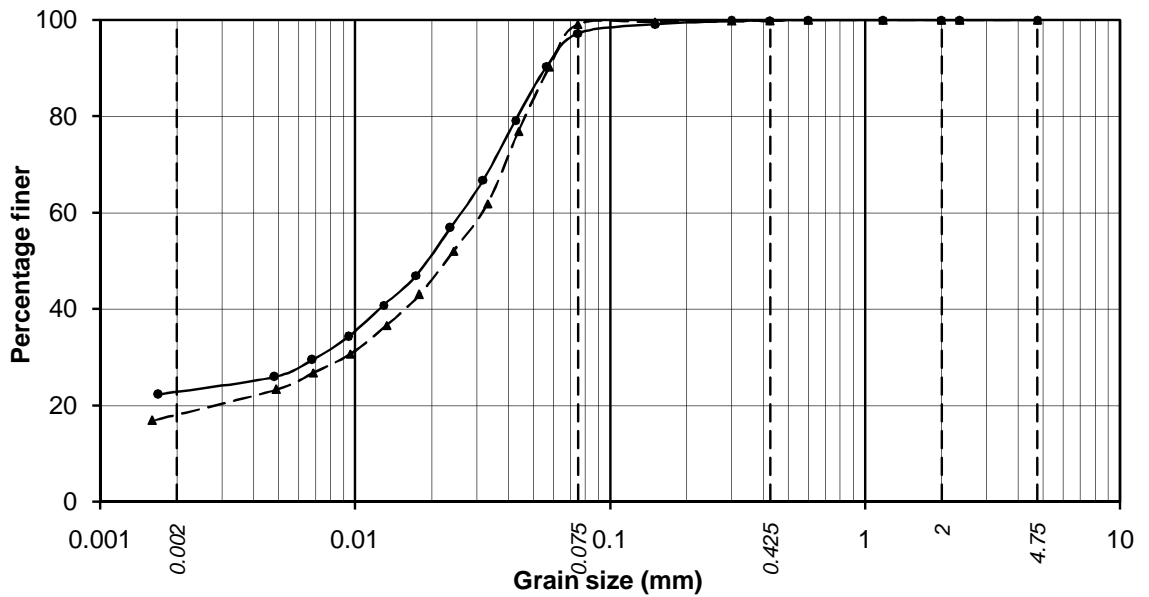
Fig. No.
E/32

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 1.00 m -▲- BH-7 , 3.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 1.00 m	20.8	73.0	2.6	2.6	1.0	0.0
BH-7 , 3.00 m	30.2	69.4	0.4	0.0	0.0	0.0



—●— BH-7 , 5.00 m -▲- BH-7 , 7.00 m

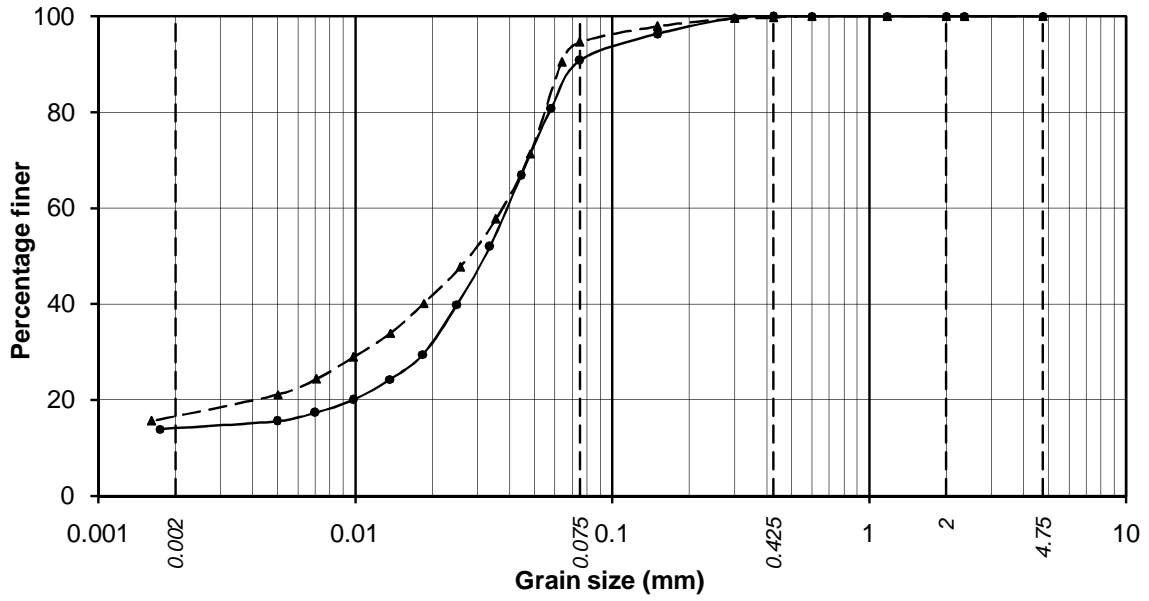
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 5.00 m	22.8	74.4	2.7	0.1	0.0	0.0
BH-7 , 7.00 m	18.1	81.0	0.8	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

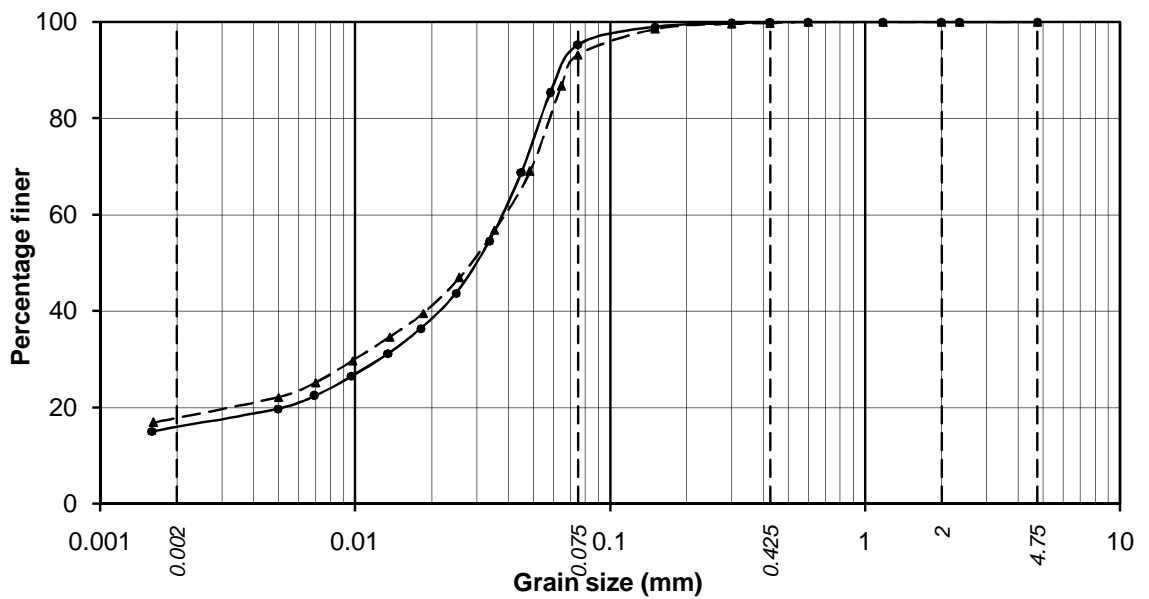
Fig. No.
E/33

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 9.00 m -▲- BH-7 , 11.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 9.00 m	14.1	76.7	9.1	0.1	0.0	0.0
BH-7 , 11.00 m	16.6	78.0	5.1	0.3	0.0	0.0



—●— BH-7 , 13.00 m -▲- BH-7 , 17.00 m

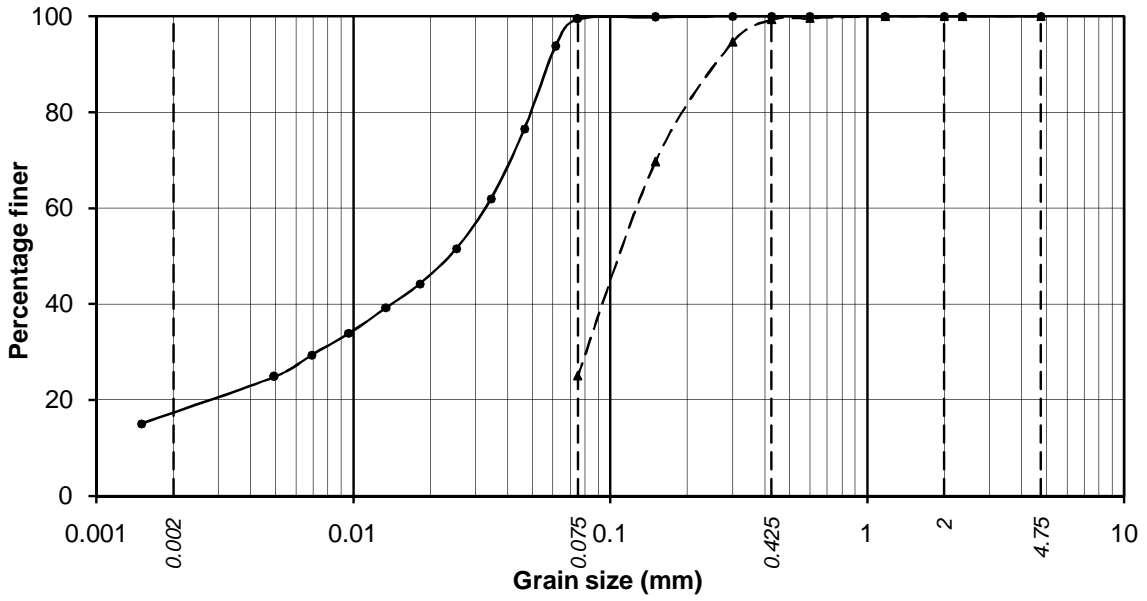
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 13.00 m	15.9	79.4	4.7	0.0	0.0	0.0
BH-7 , 17.00 m	17.8	75.4	6.5	0.3	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/34

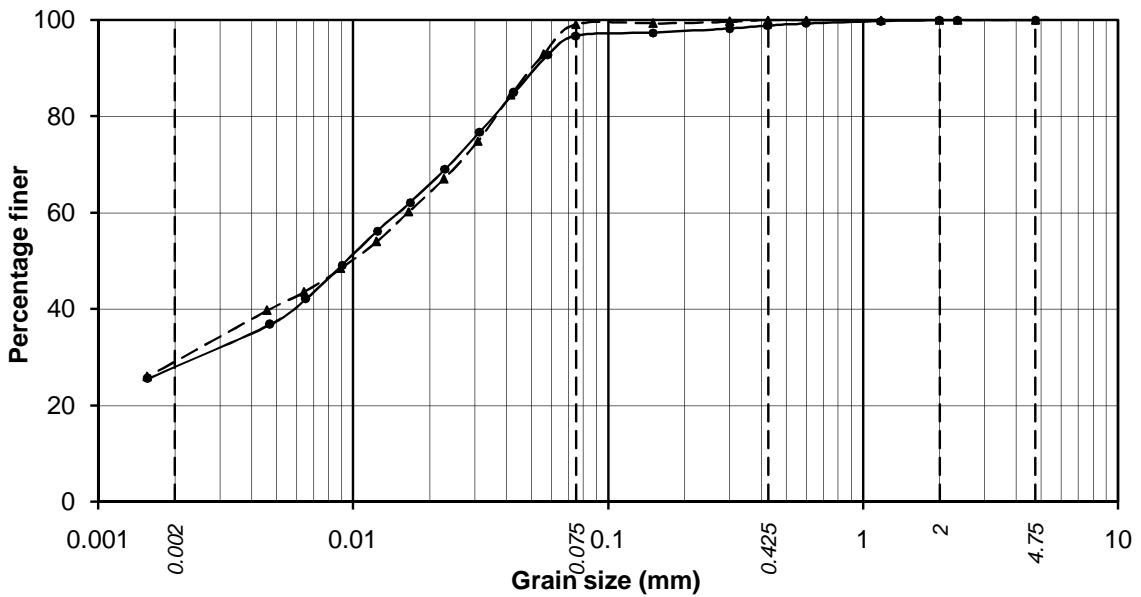
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 19.00 m -▲- BH-7 , 20.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 19.00 m	17.4	82.0	0.6	0.0	0.0	0.0
BH-7 , 20.00 m	*25.0		74.3	0.7	0.0	0.0

*Silt & Clay



—●— BH-7 , 23.00 m -▲- BH-7 , 25.00 m

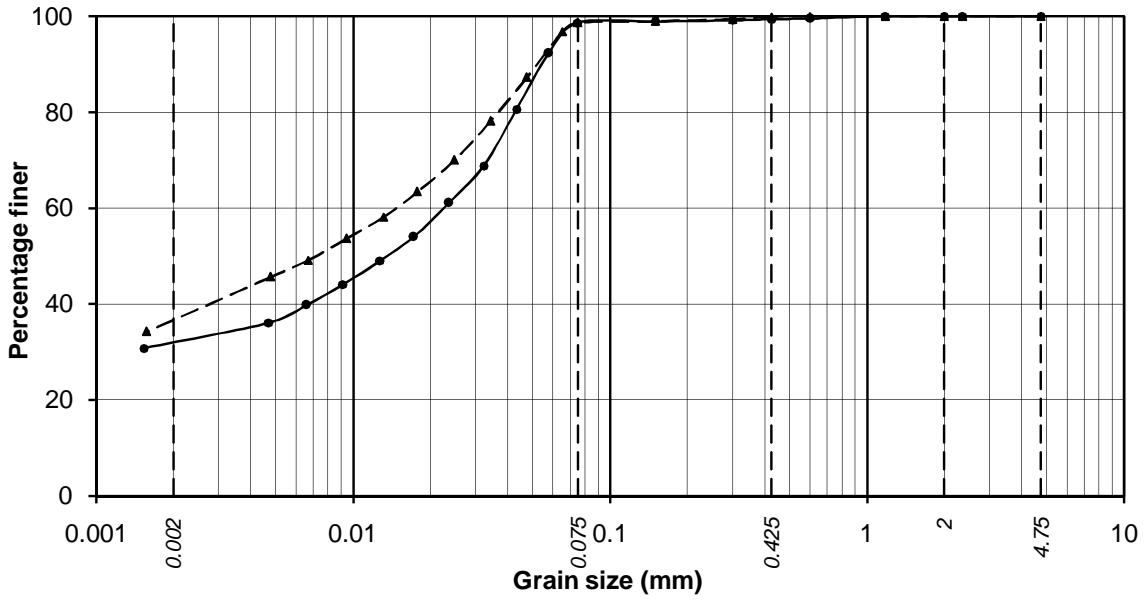
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 23.00 m	28.0	68.6	2.2	1.2	0.0	0.0
BH-7 , 25.00 m	29.1	70.0	0.9	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

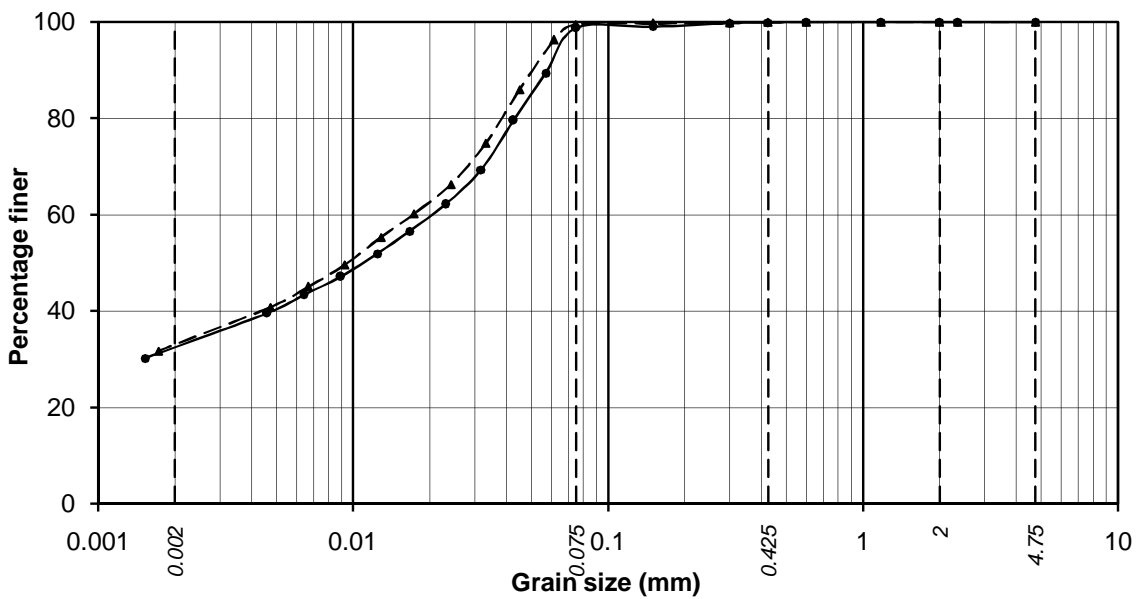
Fig. No.
E/35

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 27.00 m -▲- BH-7 , 29.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 27.00 m	32.0	66.6	0.7	0.7	0.0	0.0
BH-7 , 29.00 m	36.7	62.0	1.2	0.1	0.0	0.0



—●— BH-7 , 31.00 m -▲- BH-7 , 33.00 m

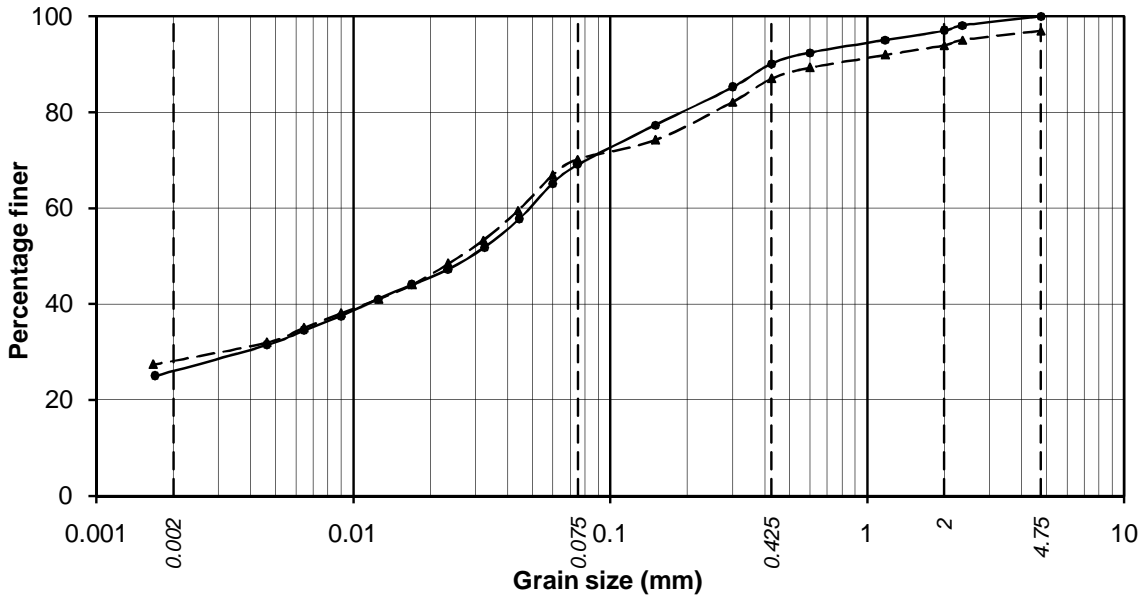
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 31.00 m	32.5	66.3	1.1	0.1	0.0	0.0
BH-7 , 33.00 m	33.0	66.5	0.5	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

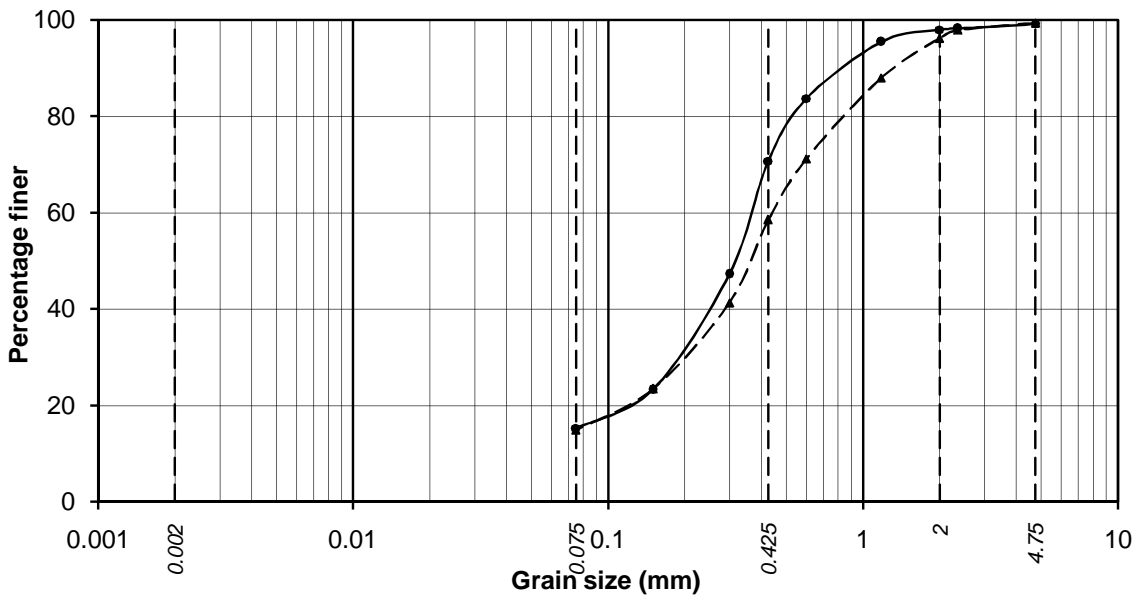
Fig. No.
E/36

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 35.00 m -▲- BH-7 , 37.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 35.00 m	26.0	43.0	21.0	7.0	3.0	0.0
BH-7 , 37.00 m	28.2	41.9	16.8	7.0	3.0	3.1



—●— BH-7 , 38.00 m -▲- BH-7 , 42.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 38.00 m		*15.3	55.4	27.3	1.2	0.8
BH-7 , 42.00 m		*14.9	43.6	37.7	3.2	0.6

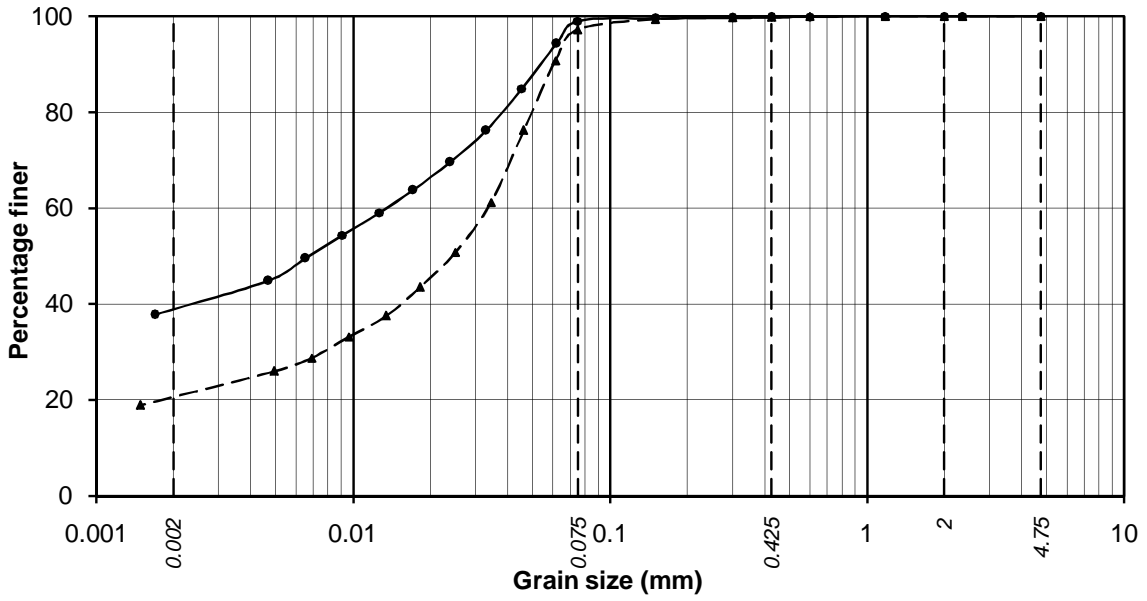
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

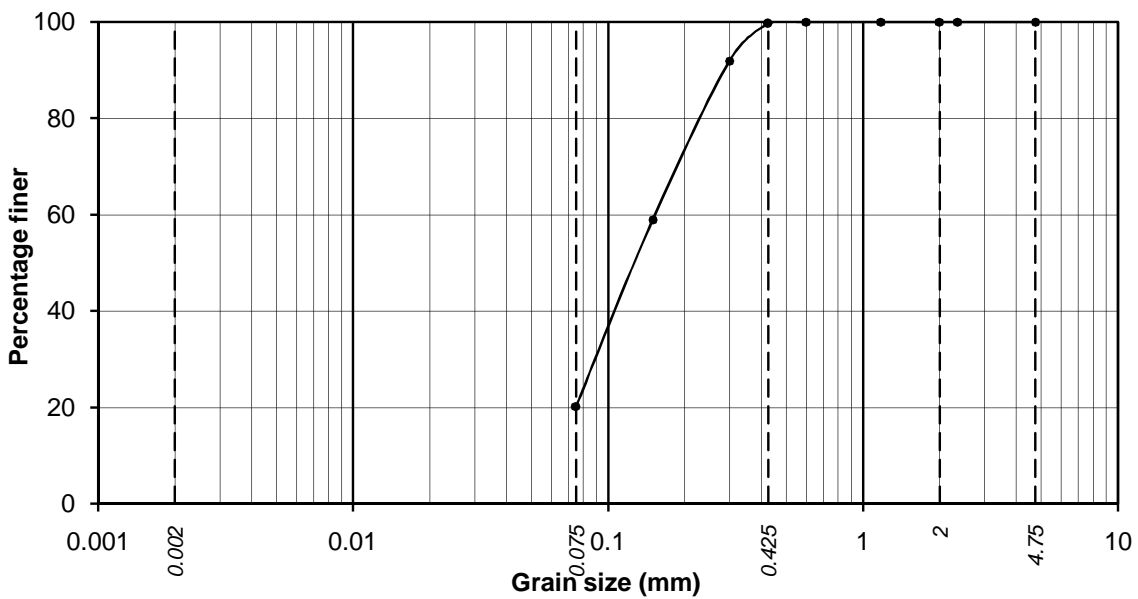
Fig. No.
E/37

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 45.00 m -▲- BH-7 , 47.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 45.00 m	38.9	60.1	0.8	0.2	0.0	0.0
BH-7 , 47.00 m	20.6	76.6	2.6	0.2	0.0	0.0



—●— BH-7 , 50.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-7 , 50.00 m	*20.2		79.5	0.3	0.0	0.0

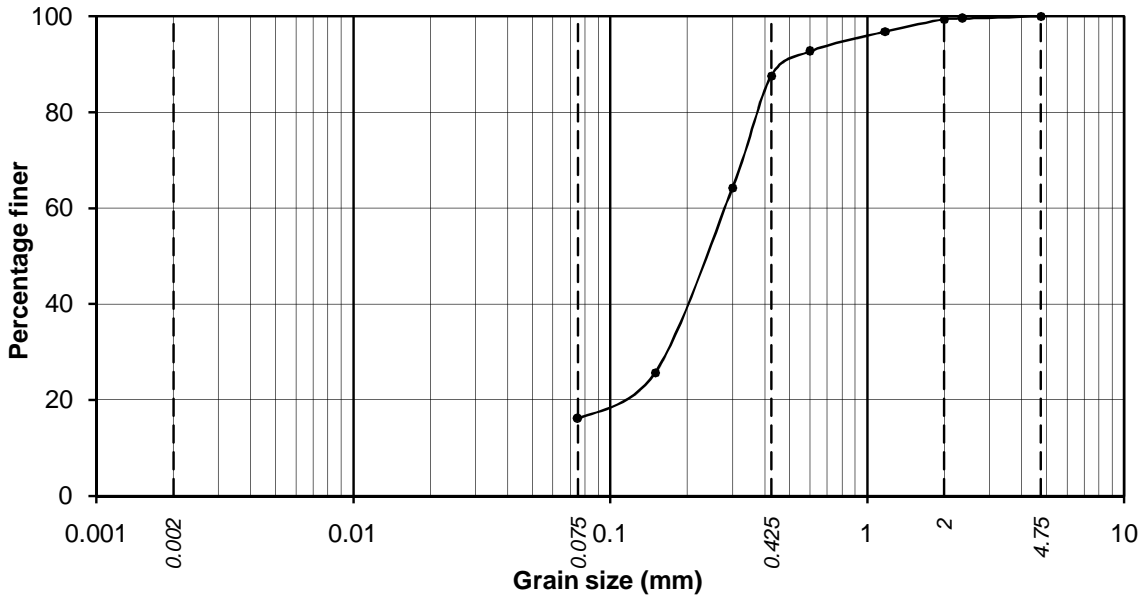
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

Fig. No.
E/38

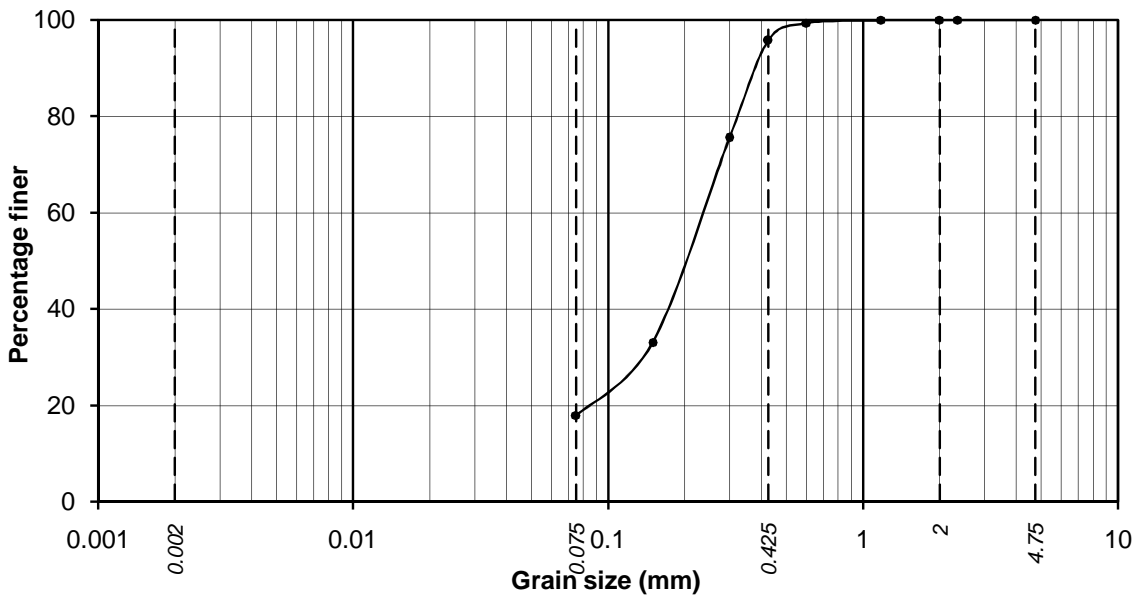
GRAIN SIZE DISTRIBUTION CURVES



—●— BH-7 , 54.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 54.00 m		*16.1	71.4	11.8	0.7	0.0

*Silt & Clay



—●— BH-7 , 58.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-7 , 58.00 m		*17.9	77.9	4.2	0.0	0.0

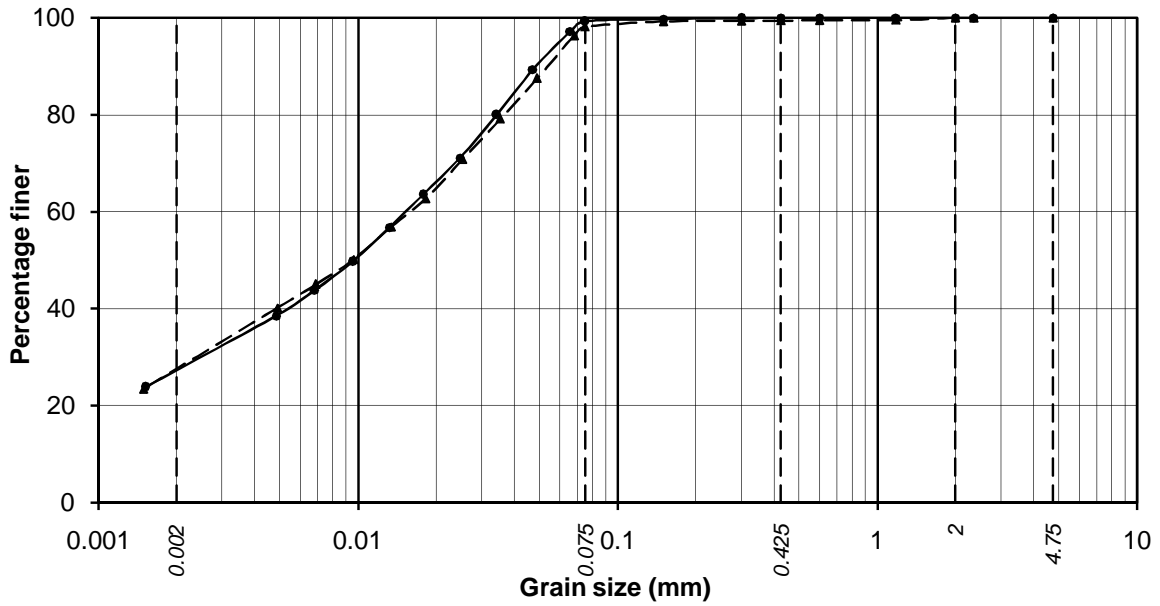
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

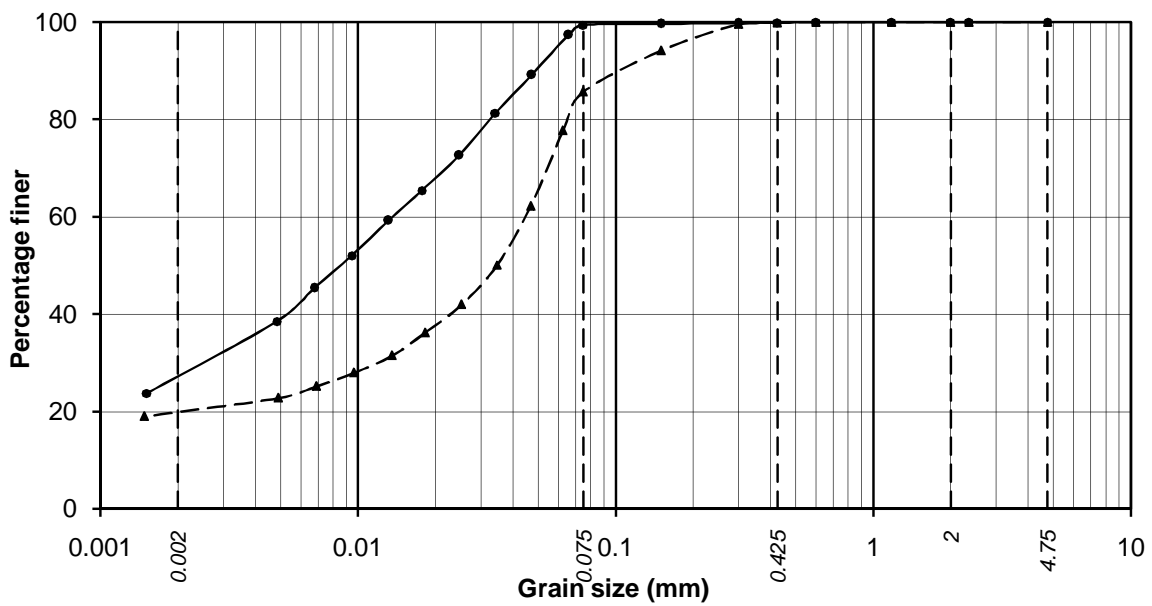
Fig. No.
E/39

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-8 , 1.00 m -▲- BH-8 , 3.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8 , 1.00 m	27.3	72.0	0.7	0.0	0.0	0.0
BH-8 , 3.00 m	27.5	70.6	1.3	0.6	0.0	0.0



—●— BH-8 , 7.00 m -▲- BH-8 , 11.00 m

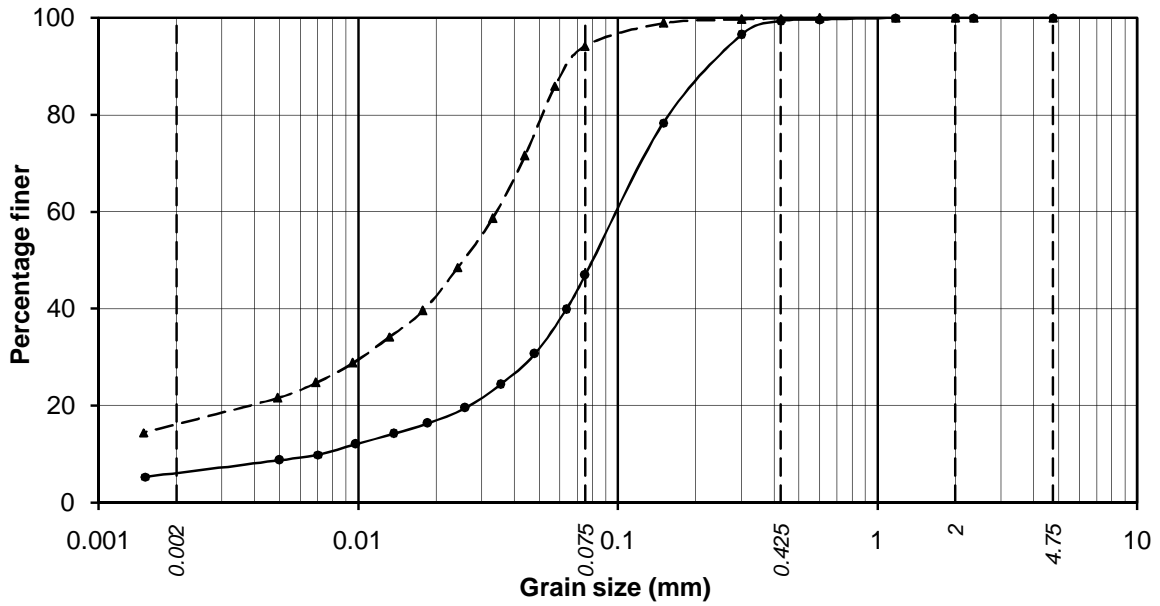
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8 , 7.00 m	27.2	72.2	0.5	0.1	0.0	0.0
BH-8 , 11.00 m	20.0	65.7	14.2	0.1	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

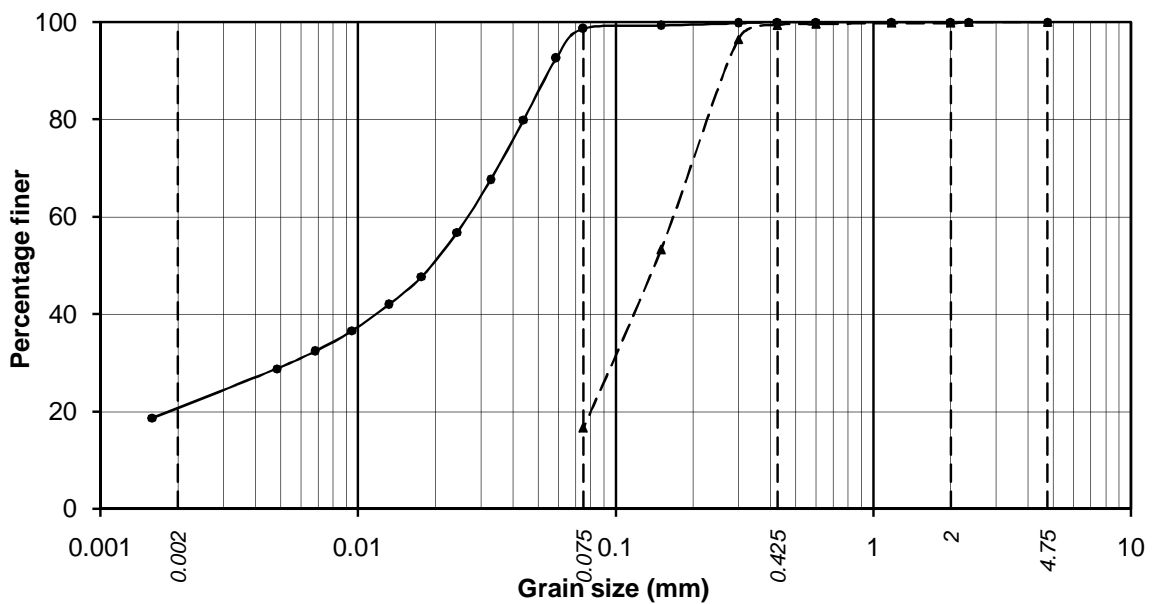
Fig. No.
E/40

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-8 , 14.00 m -▲- BH-8 , 17.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-8 , 14.00 m	6.0	40.9	52.4	0.7	0.0	0.0
BH-8 , 17.00 m	16.1	78.1	5.7	0.1	0.0	0.0



—●— BH-8 , 19.00 m -▲- BH-8 , 21.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-8 , 19.00 m	20.7	78.0	1.3	0.0	0.0	0.0
BH-8 , 21.00 m	*16.6		82.8	0.4	0.2	0.0

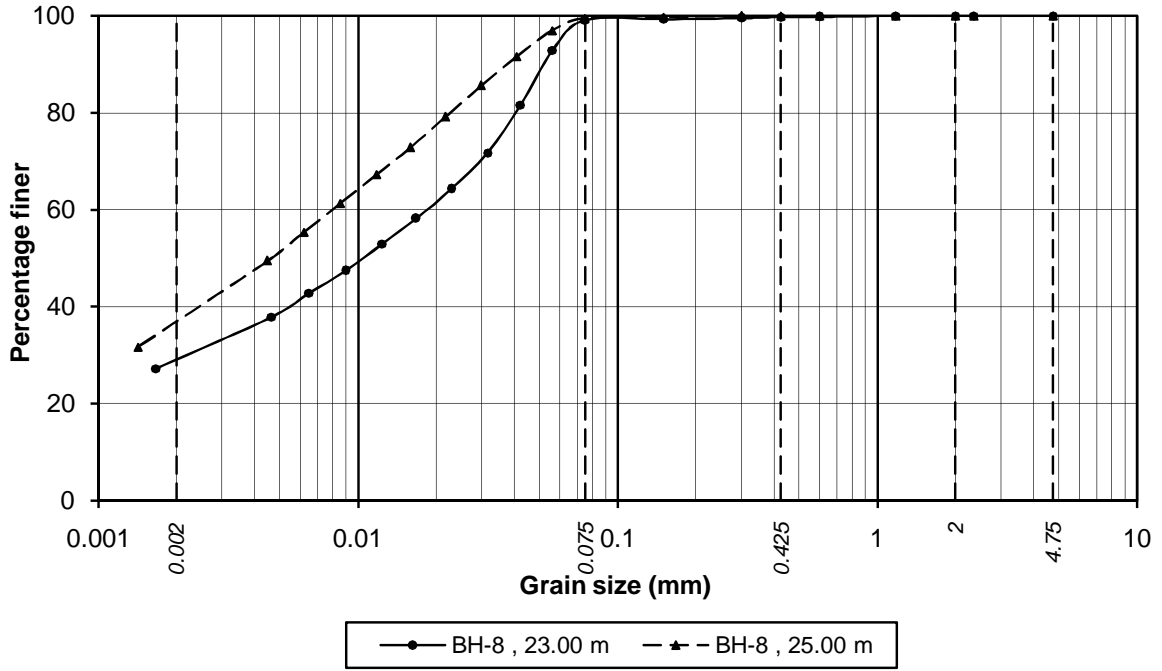
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

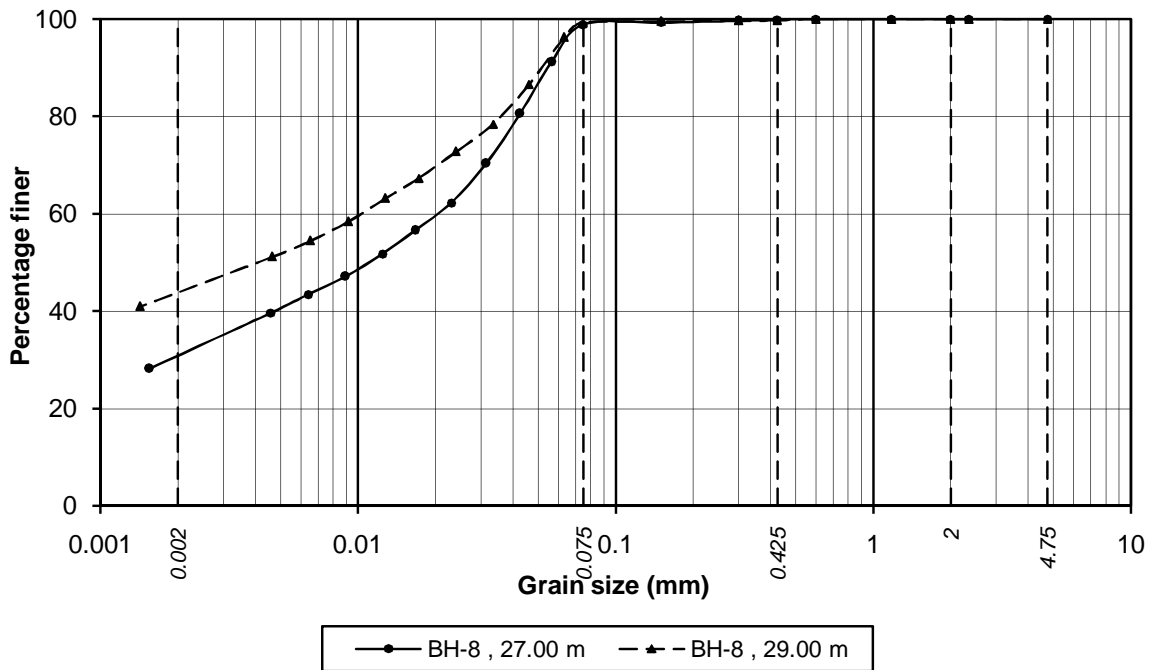
Job No.
XCSPL/1372

Fig. No.
E/41

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 23.00 m	29.1	70.0	0.6	0.3	0.0	0.0
BH-8, 25.00 m	36.9	62.6	0.5	0.0	0.0	0.0



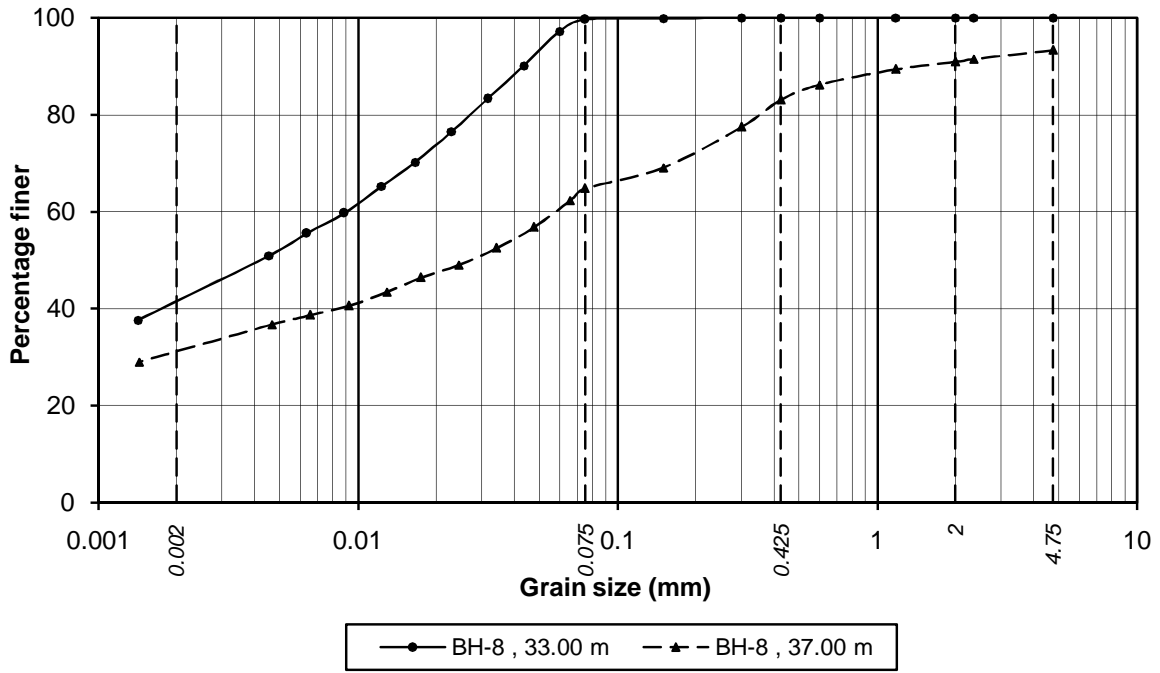
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 27.00 m	30.9	68.0	1.0	0.1	0.0	0.0
BH-8, 29.00 m	43.9	55.3	0.5	0.3	0.0	0.0

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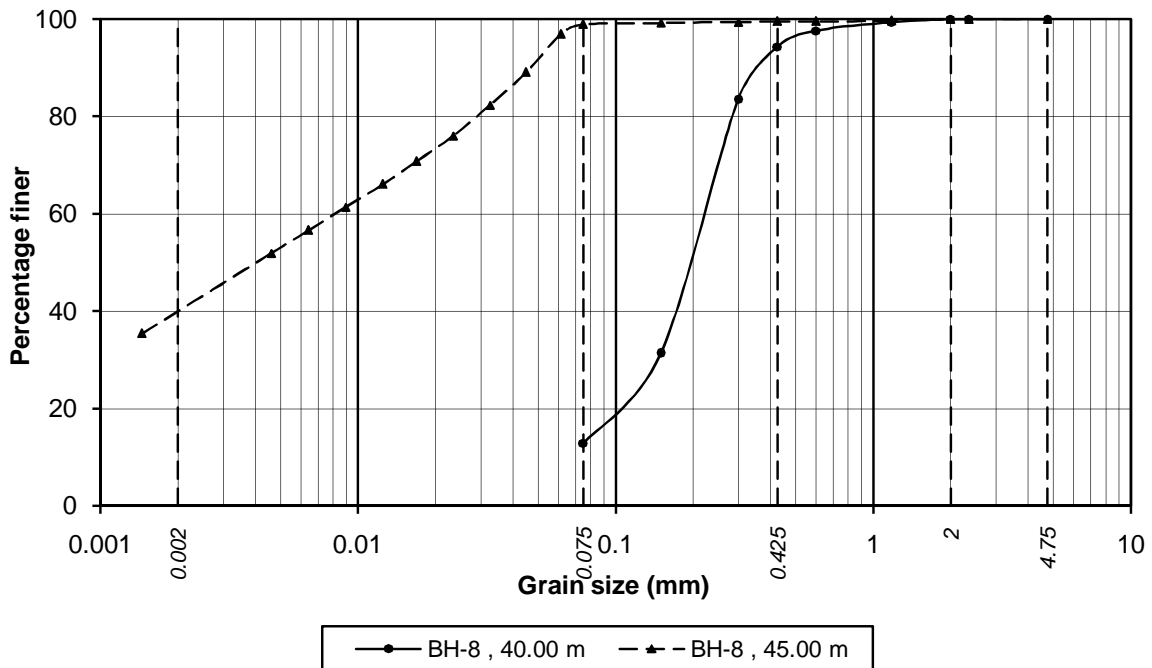
Job No.
XCSPL/1372

Fig. No.
E/42

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 33.00 m	41.5	58.2	0.3	0.0	0.0	0.0
BH-8, 37.00 m	31.1	33.6	18.3	7.9	2.4	6.7



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 40.00 m	*12.9		81.4	5.7	0.0	0.0
BH-8, 45.00 m	40.0	58.9	0.6	0.5	0.0	0.0

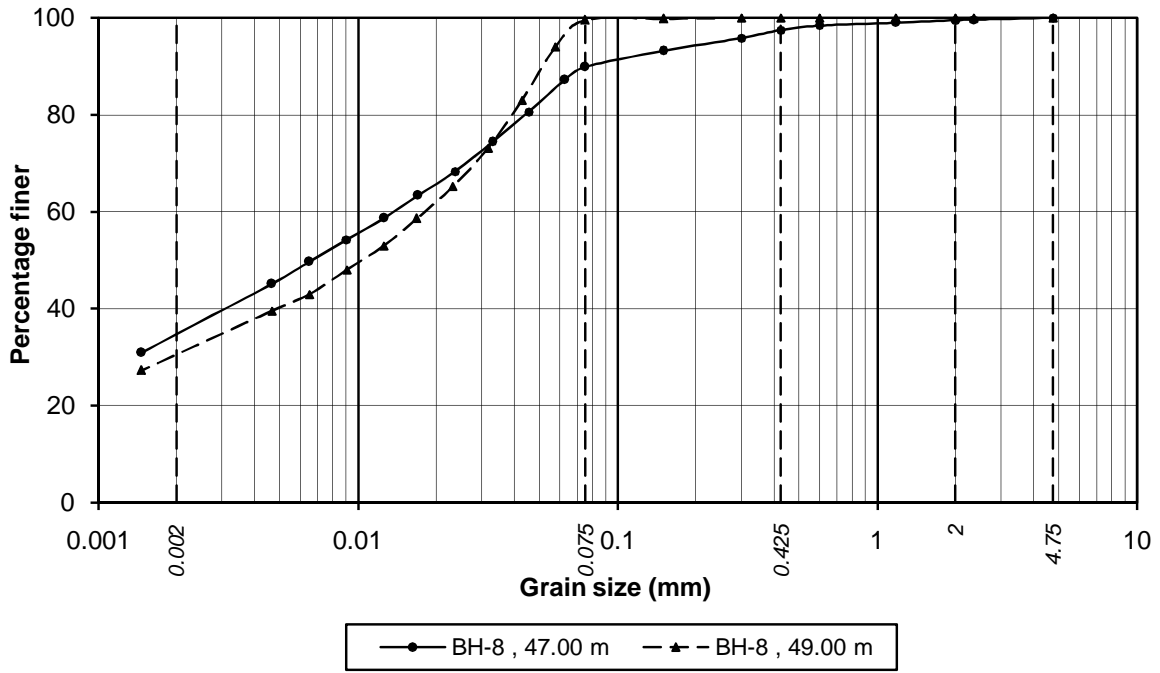
*Silt & Clay

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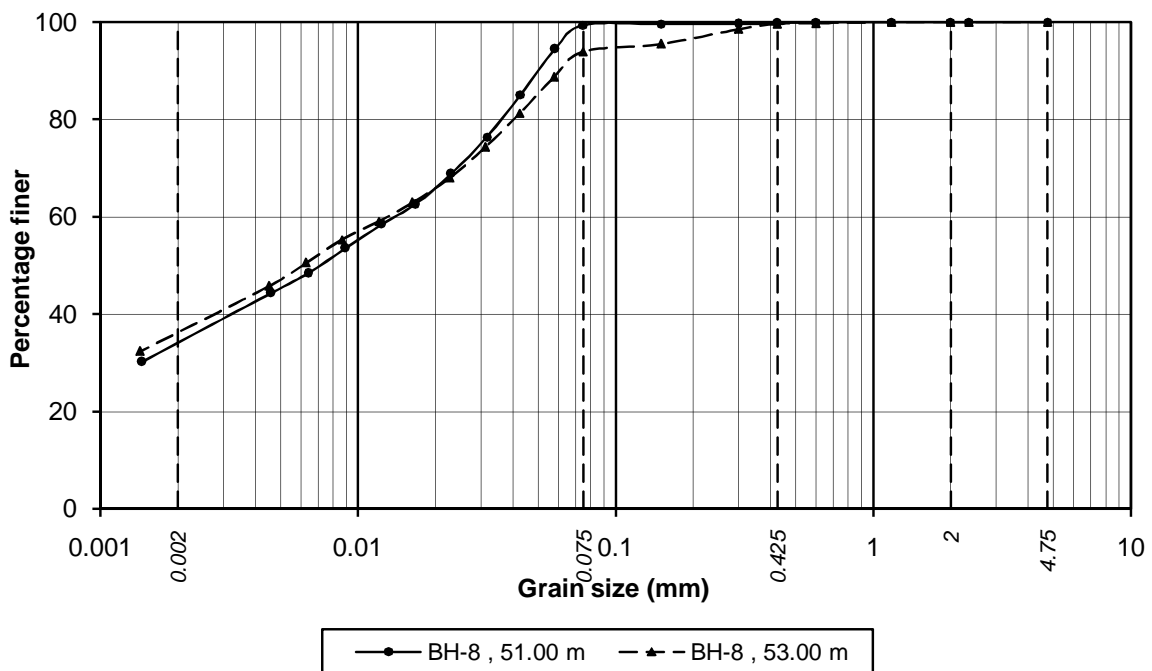
Job No.
XCSPL/1372

Fig. No.
E/43

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-8 , 47.00 m	34.8	55.2	7.5	2.0	0.5	0.0
BH-8 , 49.00 m	30.5	69.0	0.5	0.0	0.0	0.0



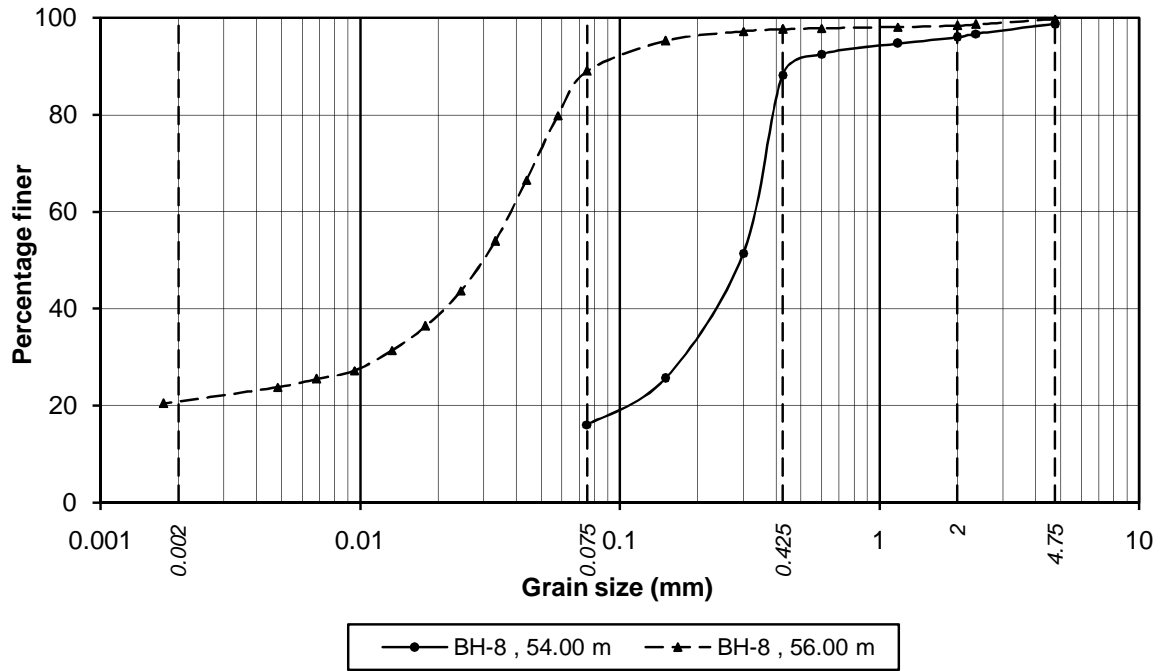
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-8 , 51.00 m	34.2	65.1	0.5	0.2	0.0	0.0
BH-8 , 53.00 m	36.3	57.6	5.7	0.4	0.0	0.0

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Job No.
XCSPL/1372

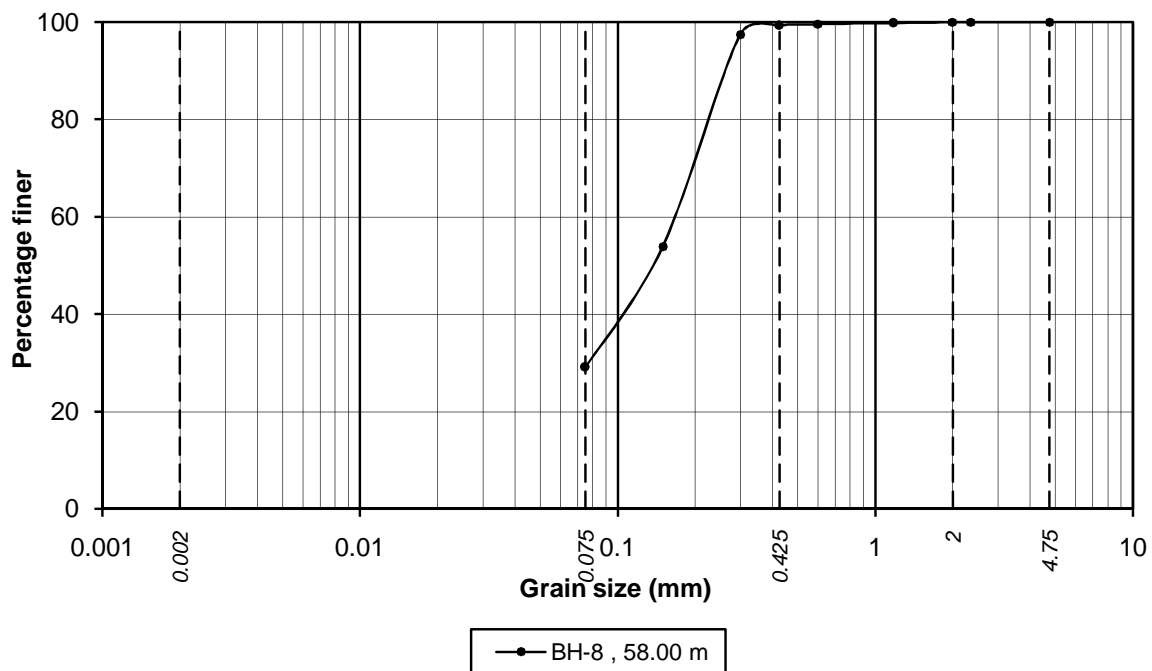
Fig. No.
E/44

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 54.00 m	*16.0		72.2	7.8	2.7	1.3
BH-8, 56.00 m	20.8	68.2	8.6	0.8	1.3	0.3

*Silt & Clay



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-8, 58.00 m	*29.1		70.2	0.7	0.0	0.0

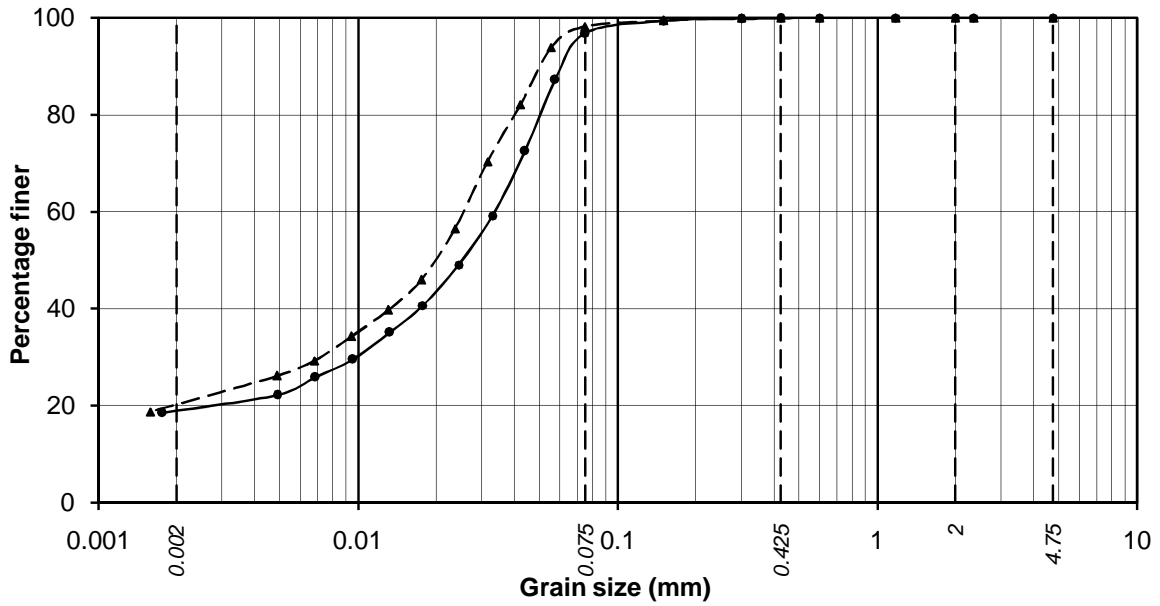
*Silt & Clay

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Job No.
XCSPL/1372

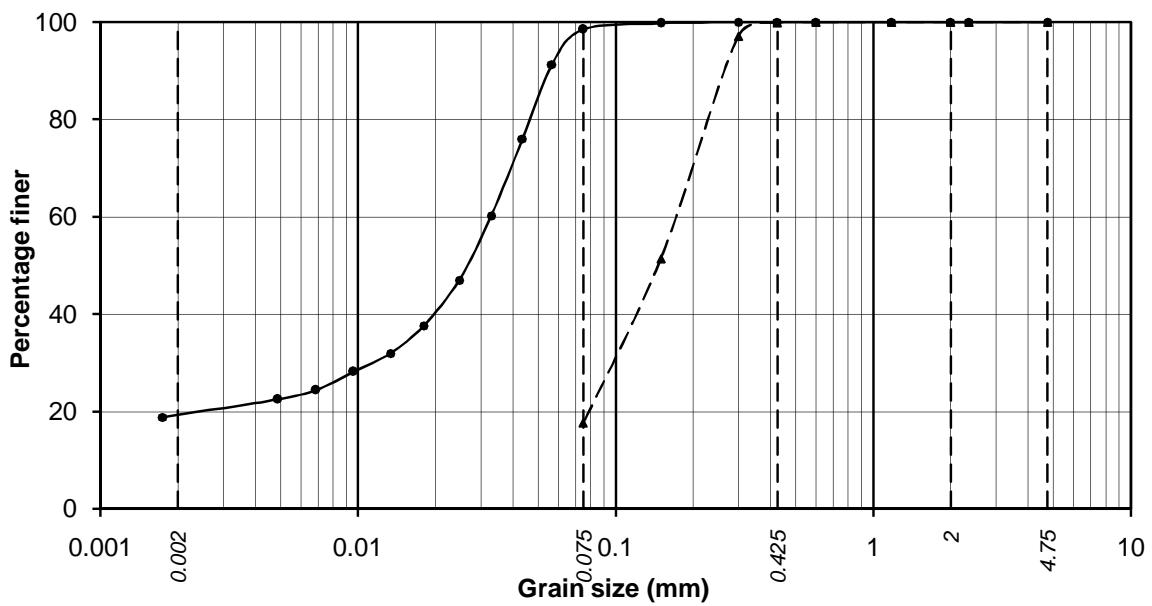
Fig. No.
E/45

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-9 , 2.00 m -▲- BH-9 , 4.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-9 , 2.00 m	18.9	77.9	3.1	0.1	0.0	0.0
BH-9 , 4.00 m	20.2	78.0	1.8	0.0	0.0	0.0



—●— BH-9 , 6.00 m -▲- BH-9 , 9.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-9 , 6.00 m	19.3	79.2	1.5	0.0	0.0	0.0
BH-9 , 9.00 m	*17.7		82.2	0.1	0.0	0.0

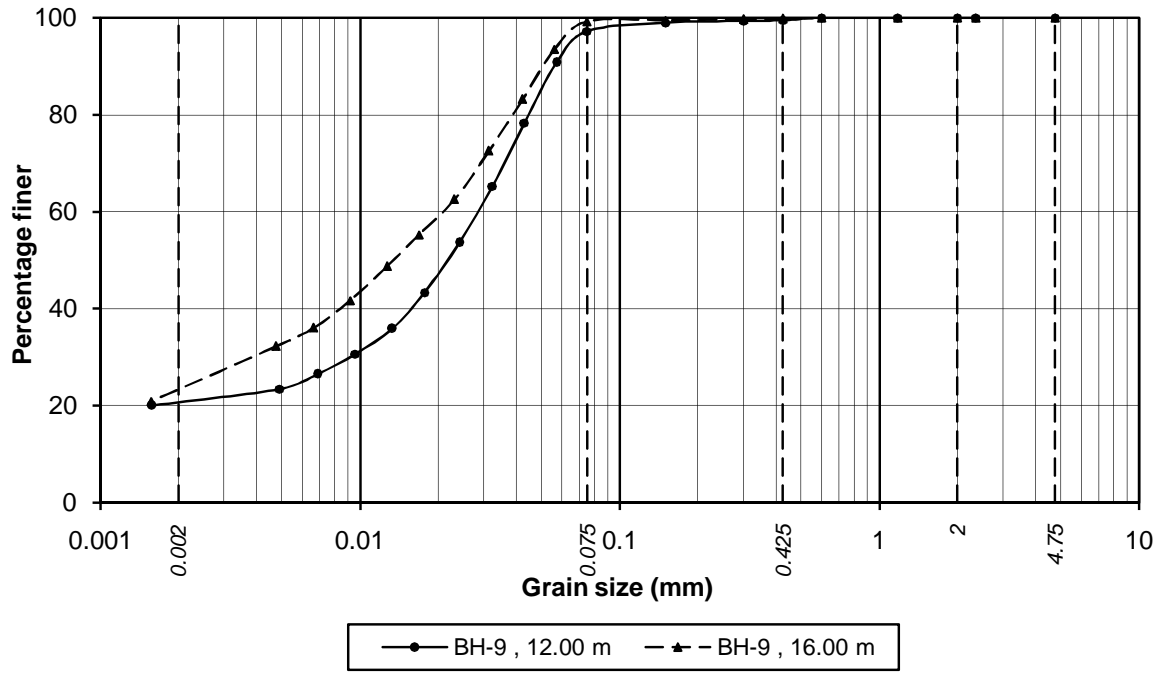
*Silt & Clay

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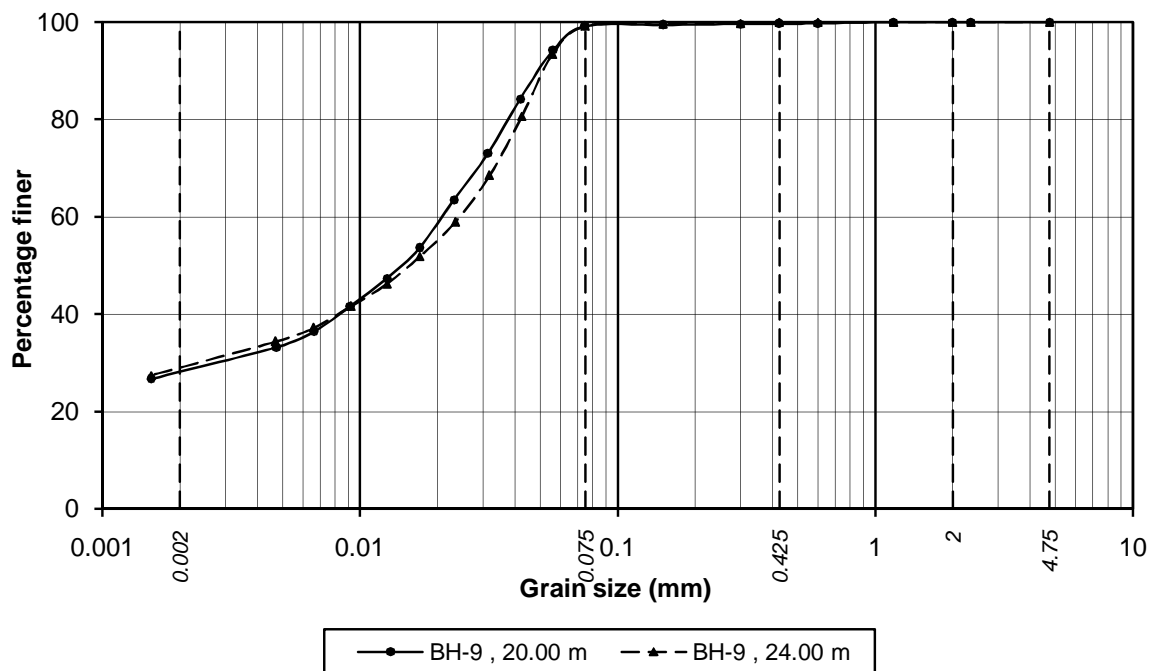
Job No.
XCSPL/1372

Fig. No.
E/46

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 12.00 m	20.7	76.5	2.3	0.5	0.0	0.0
BH-9 , 16.00 m	23.3	75.9	0.6	0.2	0.0	0.0



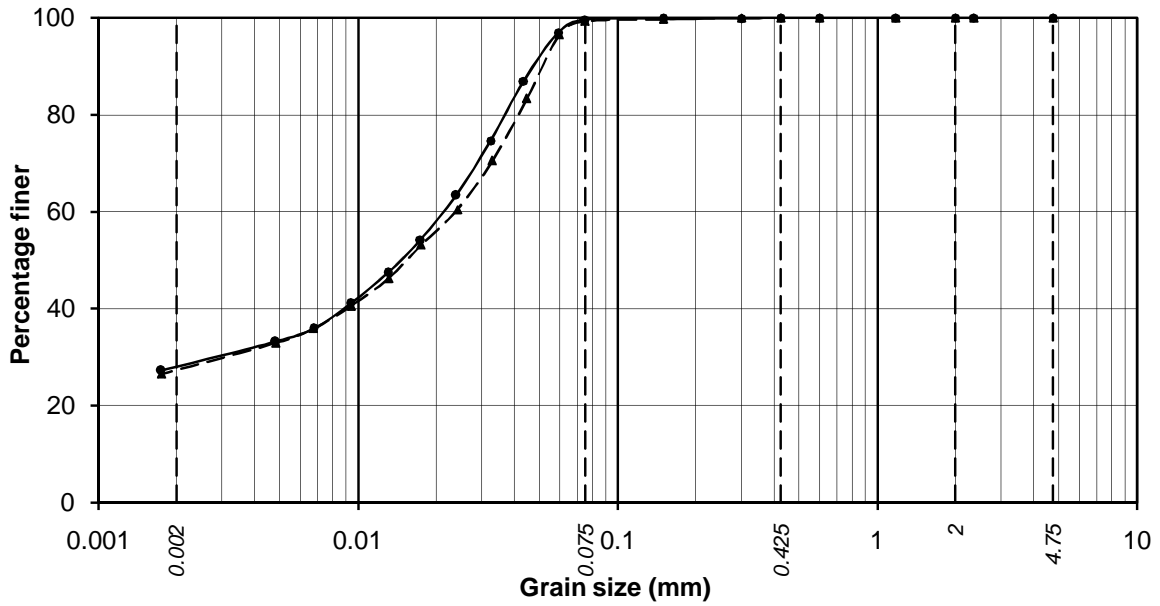
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 20.00 m	28.2	71.0	0.5	0.3	0.0	0.0
BH-9 , 24.00 m	29.0	70.2	0.8	0.0	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

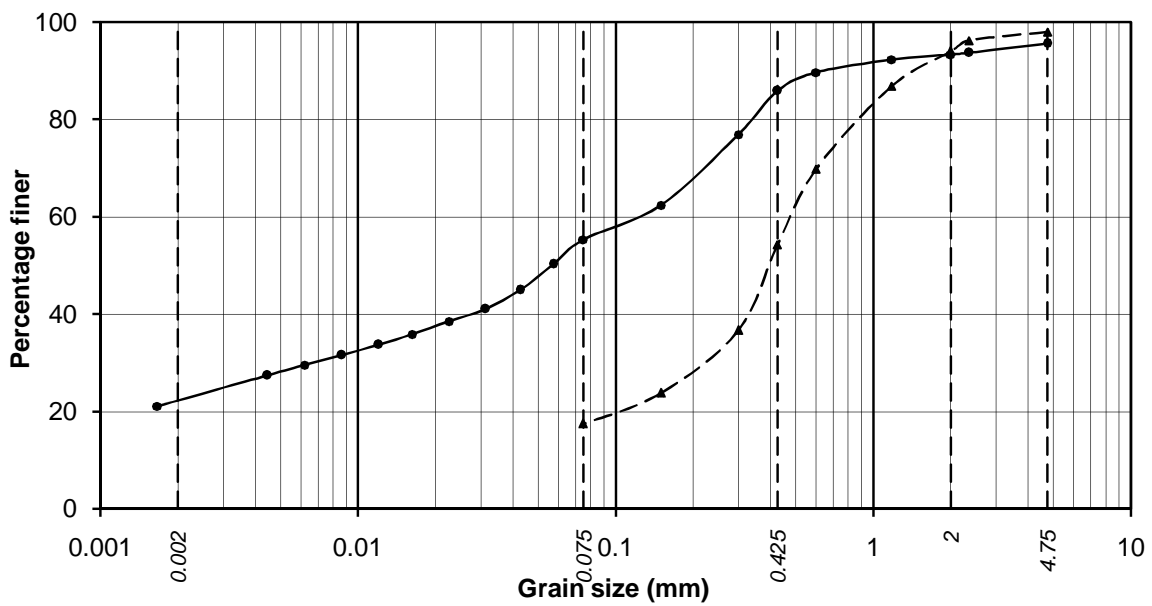
Fig. No.
E/47

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-9 , 26.00 m -▲- BH-9 , 30.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 26.00 m	28.0	71.6	0.4	0.0	0.0	0.0
BH-9 , 30.00 m	27.3	72.0	0.7	0.0	0.0	0.0



—●— BH-9 , 32.00 m -▲- BH-9 , 33.00 m

Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 32.00 m	22.3	33.0	30.6	7.4	2.4	4.3
BH-9 , 33.00 m	*17.5		36.8	39.7	4.0	2.0

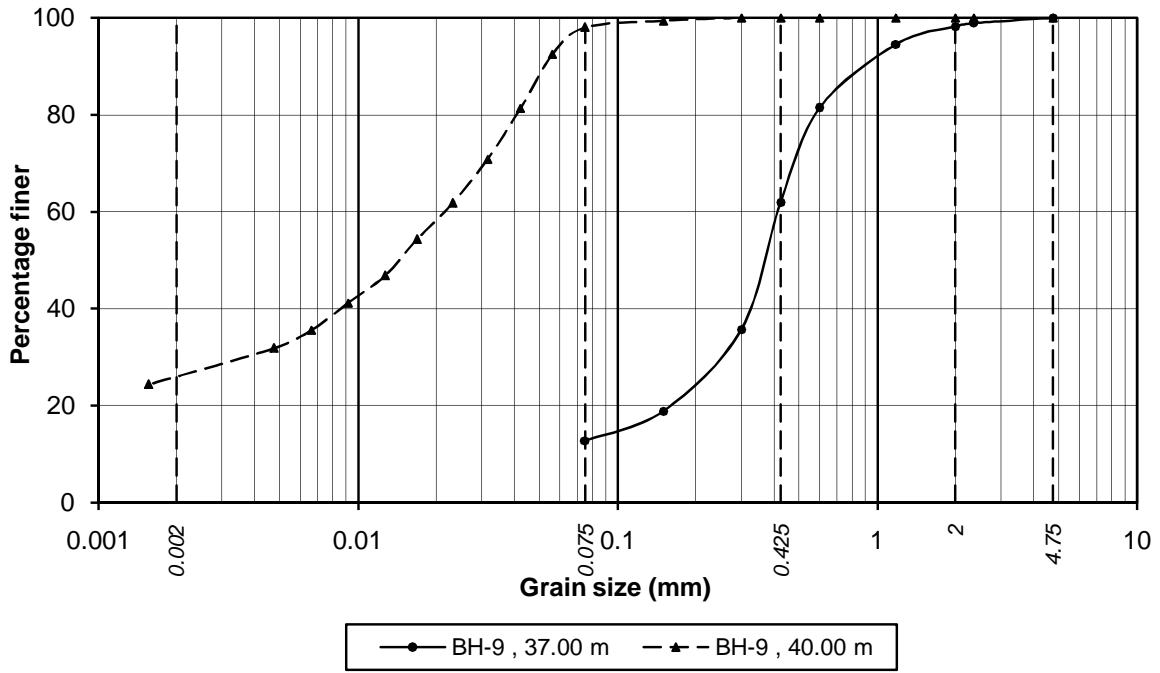
*Silt & Clay

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Job No.
XCSPL/1372

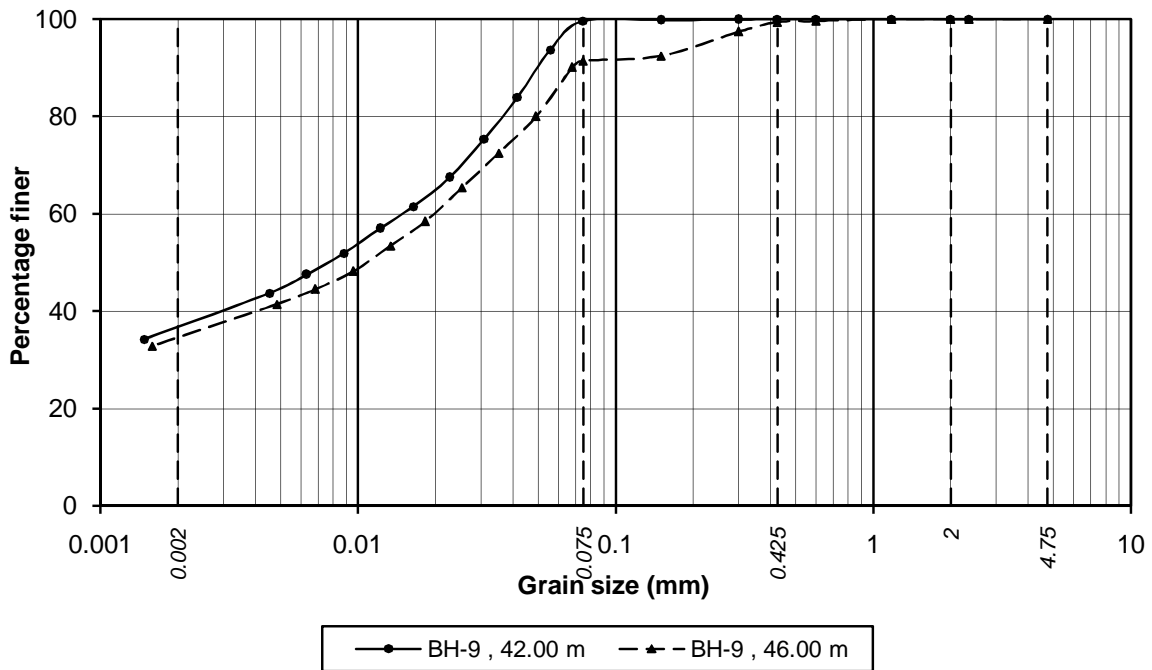
Fig. No.
E/48

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-9, 37.00 m	*12.7	72.0	15.3	0.0	0.0	0.0
BH-9, 40.00 m	26.0	46.0	28.0	0.0	0.0	0.0

*Silt & Clay



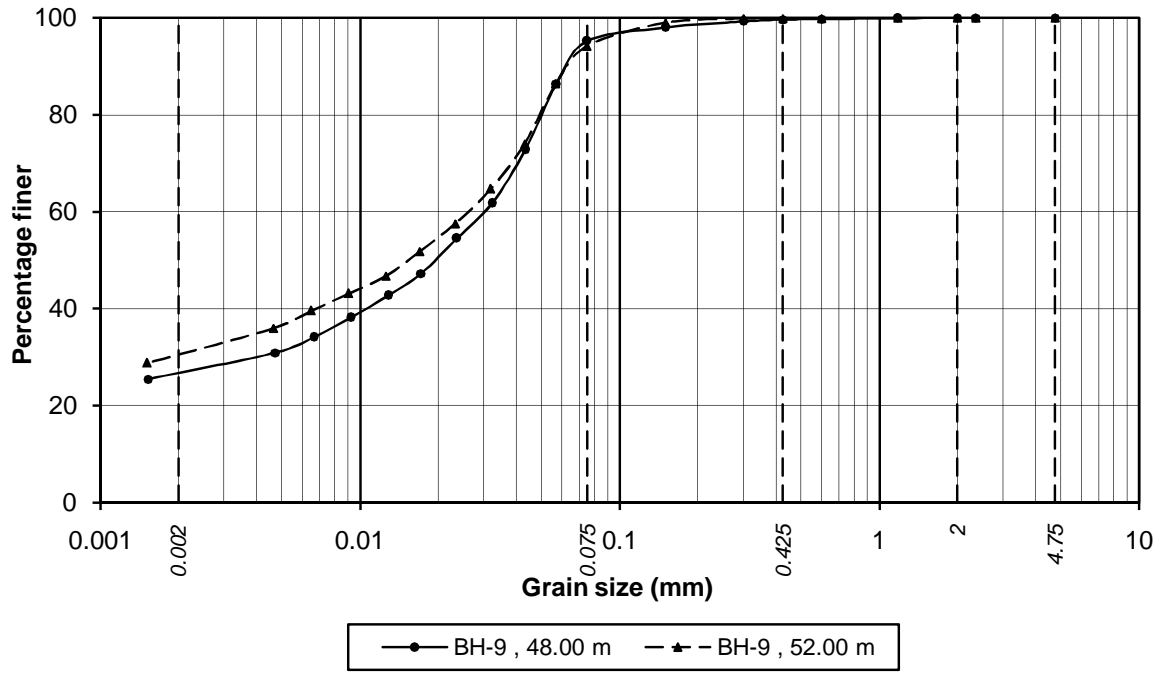
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-9, 42.00 m	36.8	26.0	37.2	0.0	0.0	0.0
BH-9, 46.00 m	34.6	22.2	43.2	0.0	0.0	0.0

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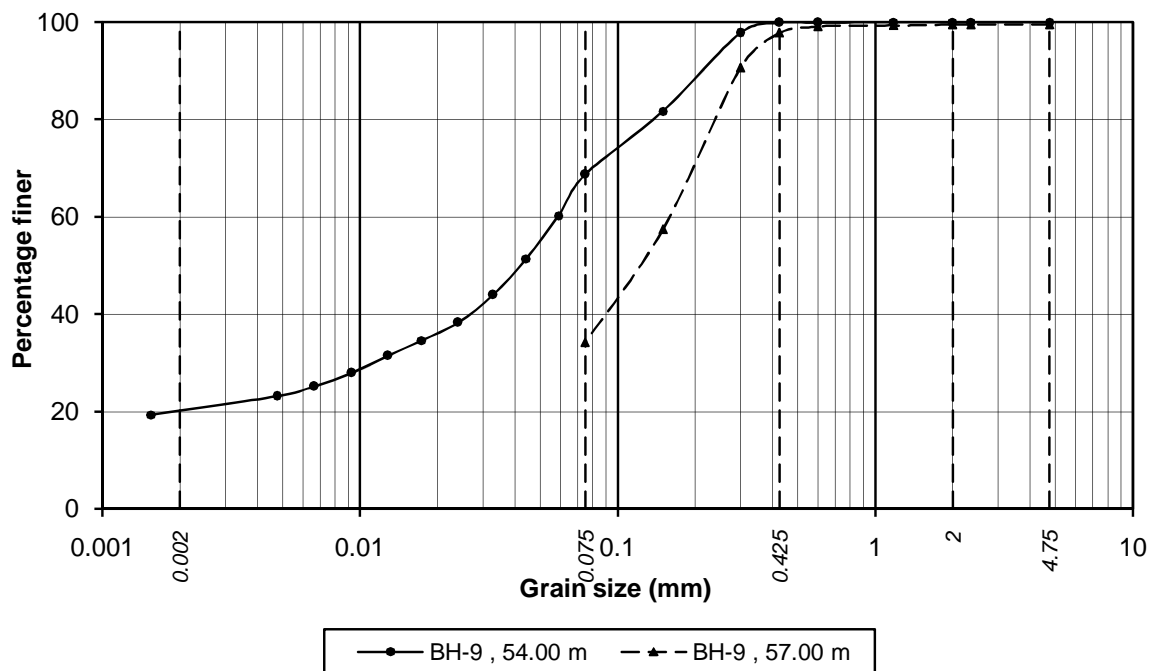
Job No.
XCSPL/1372

Fig. No.
E/49

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 48.00 m	26.7	68.5	4.4	0.4	0.0	0.0
BH-9 , 52.00 m	30.5	63.7	5.7	0.1	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-9 , 54.00 m	20.2	48.5	31.2	0.1	0.0	0.0
BH-9 , 57.00 m	*34.2		63.6	1.7	0.0	0.5

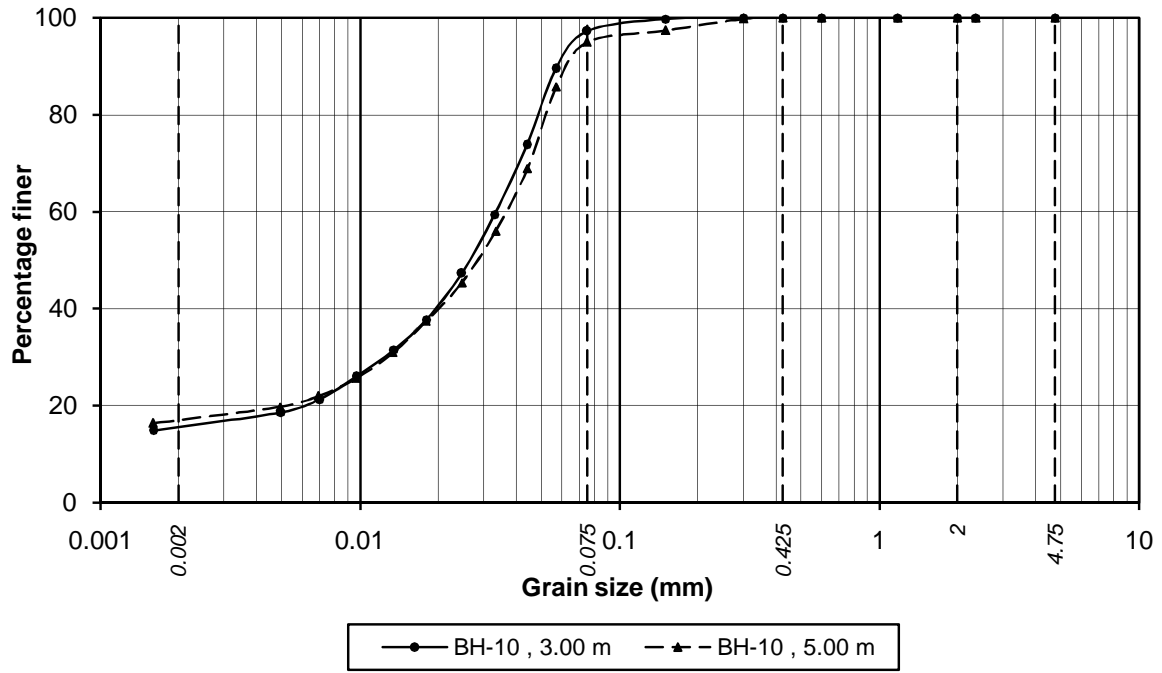
*Silt & Clay

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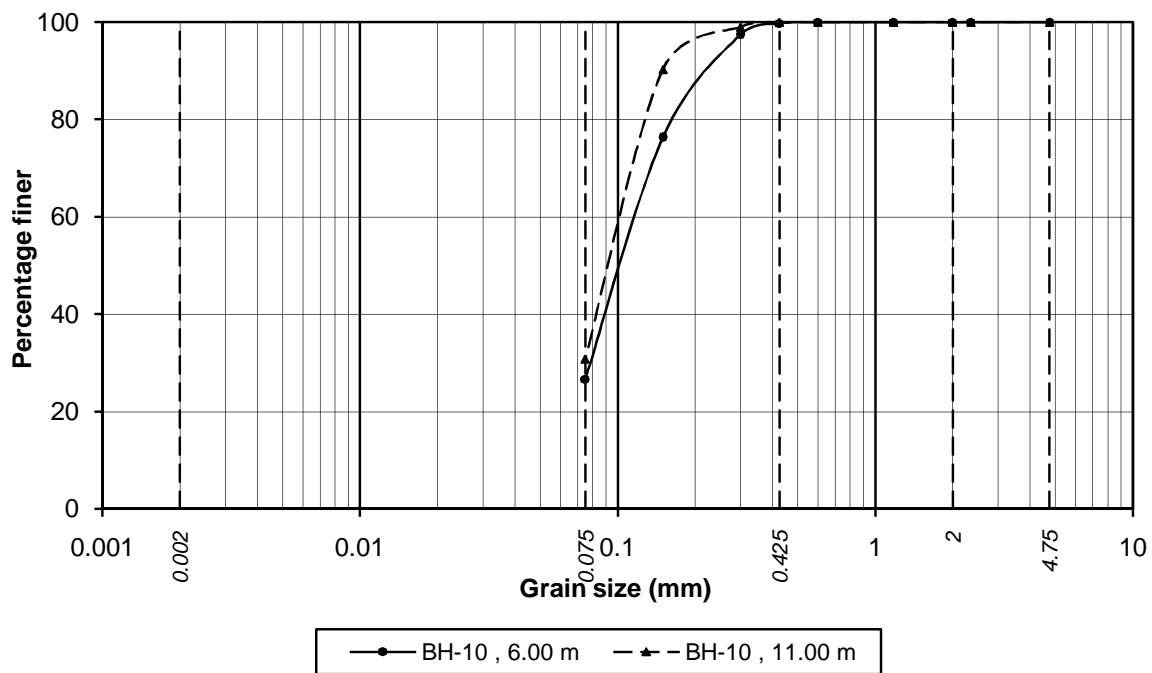
Job No.
XCSPL/1372

Fig. No.
E/50

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-10 , 3.00 m	15.6	81.7	2.7	0.0	0.0	0.0
BH-10 , 5.00 m	17.0	78.0	5.0	0.0	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-10 , 6.00 m	*26.7		73.1	0.2	0.0	0.0
BH-10 , 11.00 m	*30.8		69.2	0.0	0.0	0.0

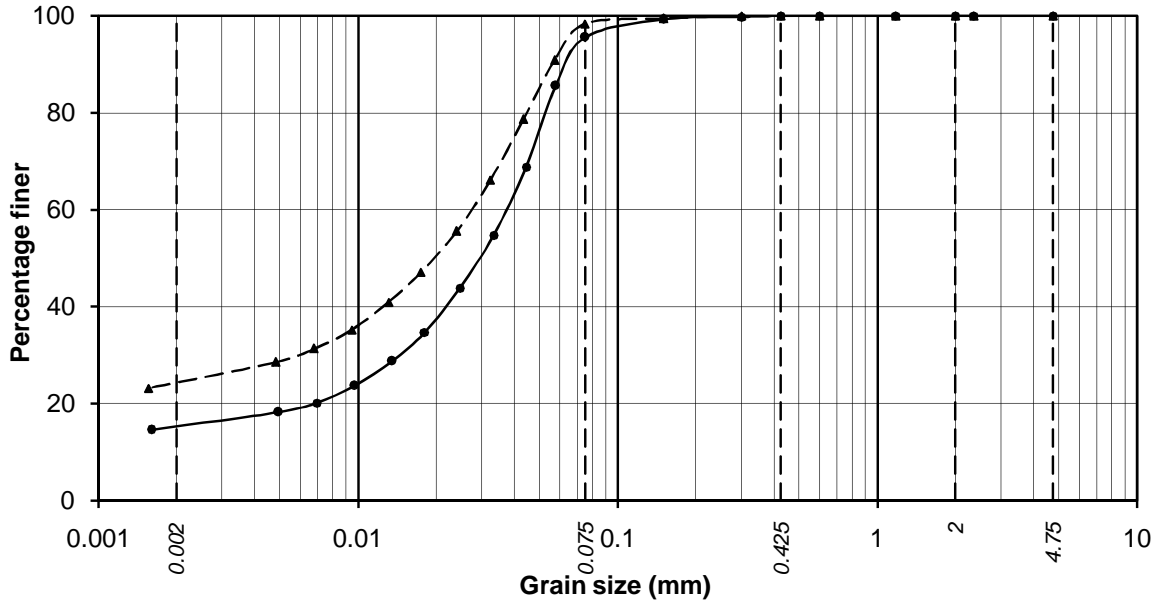
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

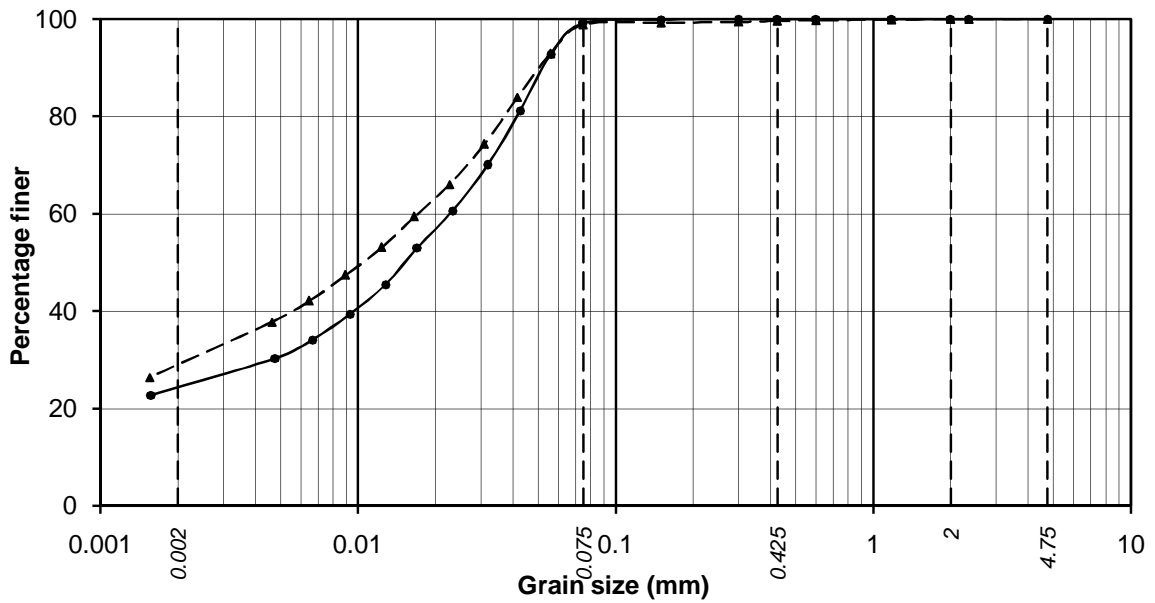
Fig. No.
E/51

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-10 , 13.00 m -▲- BH-10 , 15.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-10 , 13.00 m	15.3	80.3	4.4	0.0	0.0	0.0
BH-10 , 15.00 m	24.3	74.0	1.7	0.0	0.0	0.0



—●— BH-10 , 17.00 m -▲- BH-10 , 21.00 m

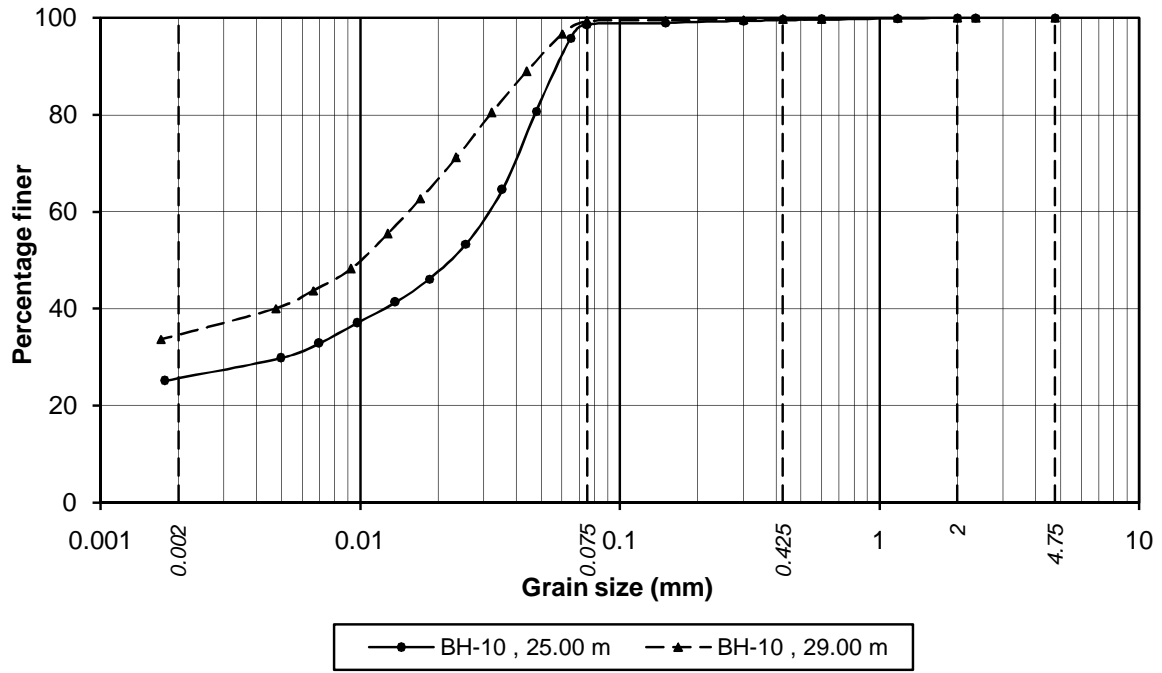
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-10 , 17.00 m	24.3	74.9	0.8	0.0	0.0	0.0
BH-10 , 21.00 m	29.0	69.9	0.7	0.4	0.0	0.0

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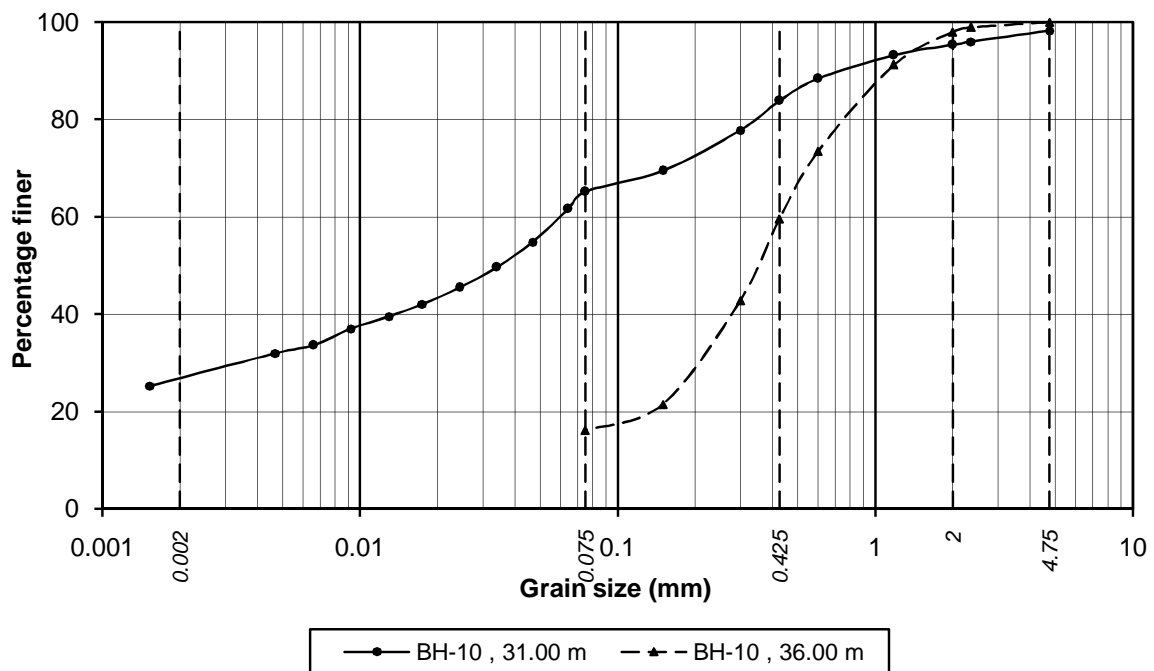
Job No.
XCSPL/1372

Fig. No.
E/52

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-10 , 25.00 m	25.6	73.0	0.9	0.5	0.0	0.0
BH-10 , 29.00 m	34.6	64.7	0.4	0.3	0.0	0.0



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-10 , 31.00 m	26.8	38.5	18.6	11.5	2.9	1.7
BH-10 , 36.00 m	*16.1		43.5	38.4	2.0	0.0

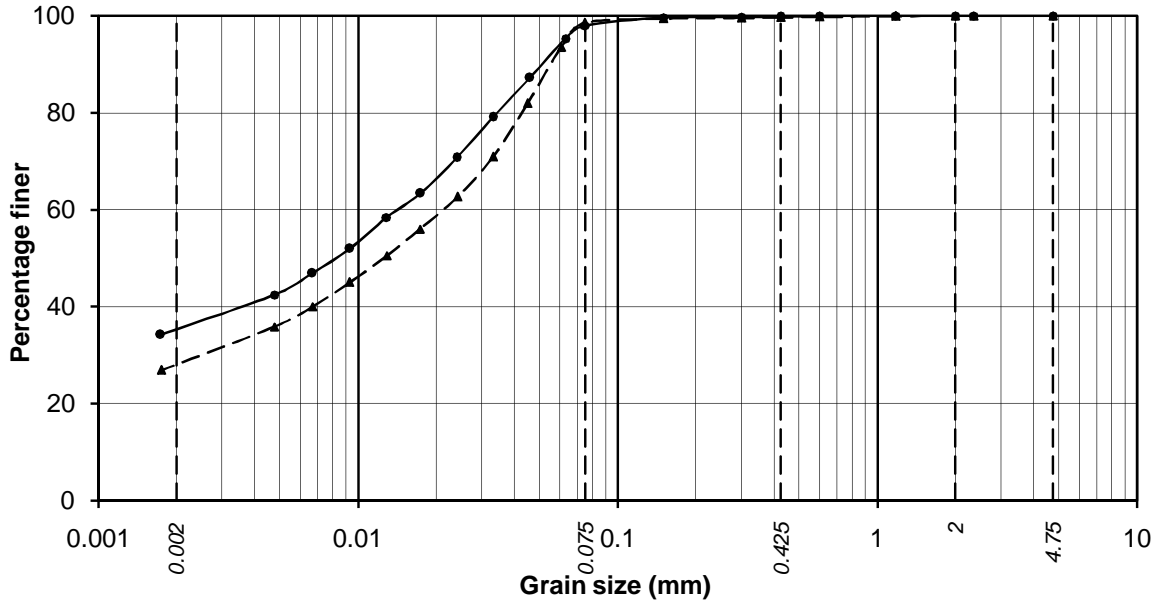
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

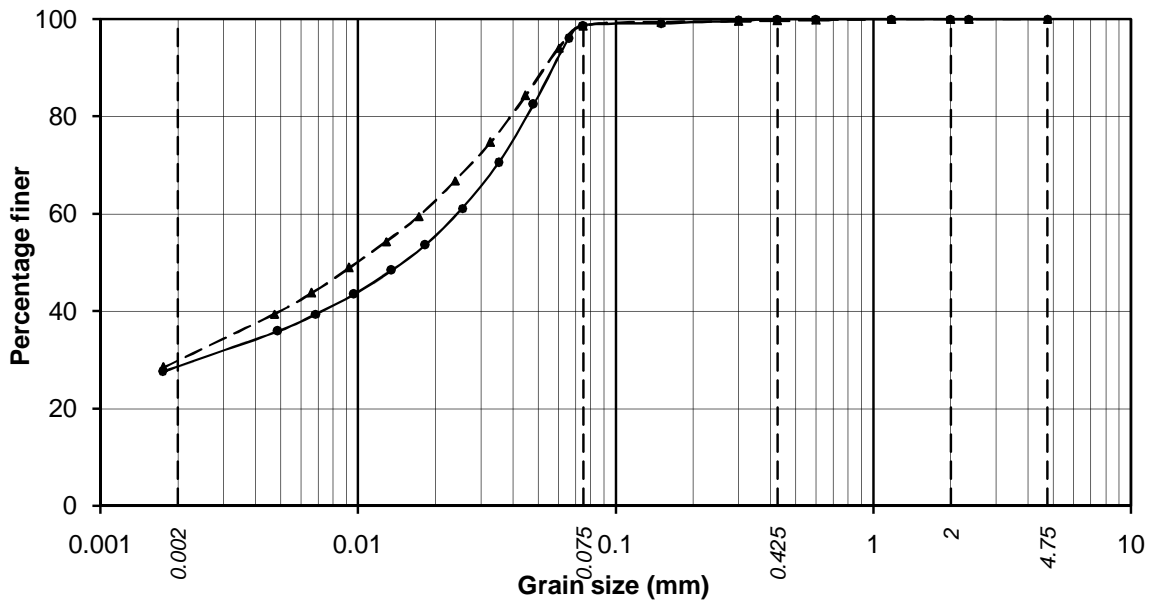
Fig. No.
E/53

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-10 , 39.00 m -▲- BH-10 , 43.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-10 , 39.00 m	35.4	62.5	1.9	0.2	0.0	0.0
BH-10 , 43.00 m	28.0	70.6	1.1	0.3	0.0	0.0



—●— BH-10 , 47.00 m -▲- BH-10 , 49.00 m

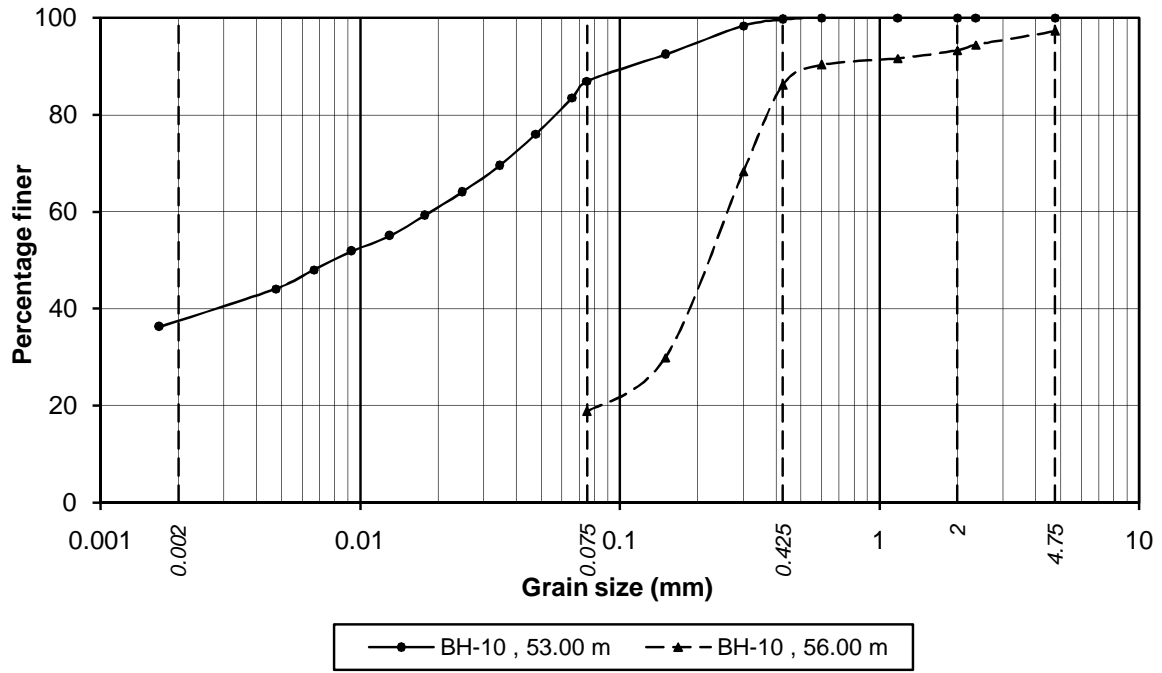
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-10 , 47.00 m	28.7	70.0	1.3	0.0	0.0	0.0
BH-10 , 49.00 m	29.9	68.7	1.1	0.3	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

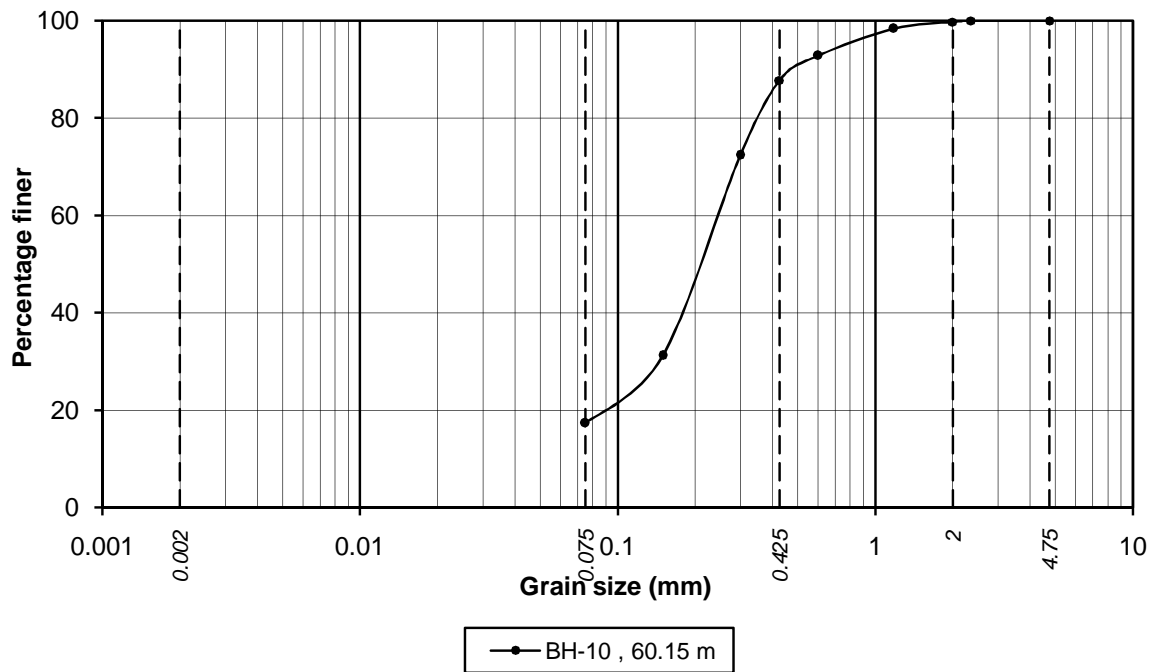
Fig. No.
E/54

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-10 , 53.00 m	37.5	49.4	12.8	0.3	0.0	0.0
BH-10 , 56.00 m	*18.8		67.2	7.2	4.0	2.8

*Silt & Clay



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
Sample No.						
BH-10 , 60.15 m	*17.3		70.5	12.0	0.2	0.0

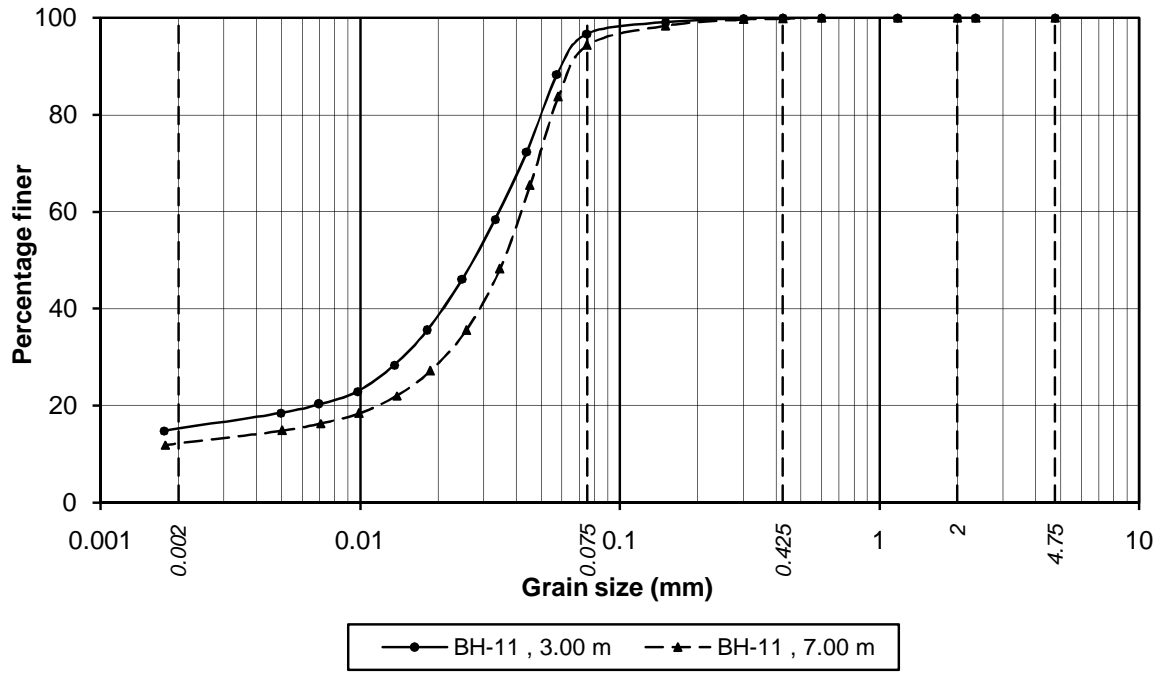
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

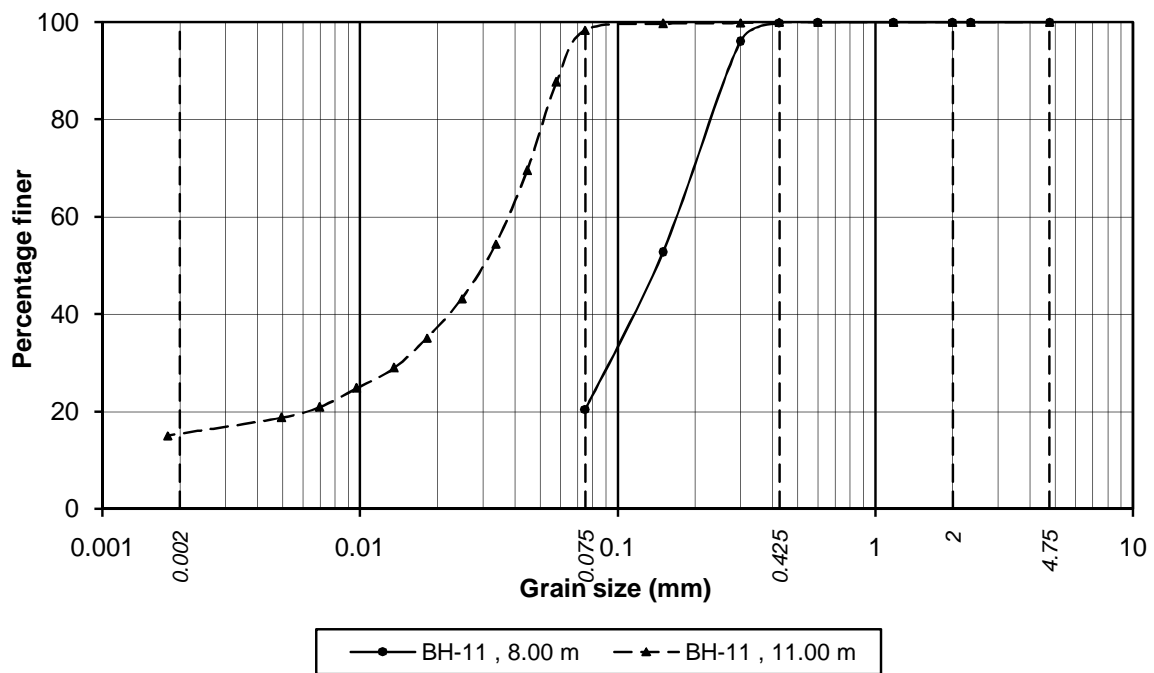
Job No.
XCSPL/1372

Fig. No.
E/55

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 3.00 m	15.2	81.5	3.3	0.0	0.0	0.0
BH-11 , 7.00 m	12.2	82.1	5.5	0.2	0.0	0.0



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 8.00 m	*20.5	79.3	0.2	0.0	0.0	0.0
BH-11 , 11.00 m	15.4	82.9	1.7	0.0	0.0	0.0

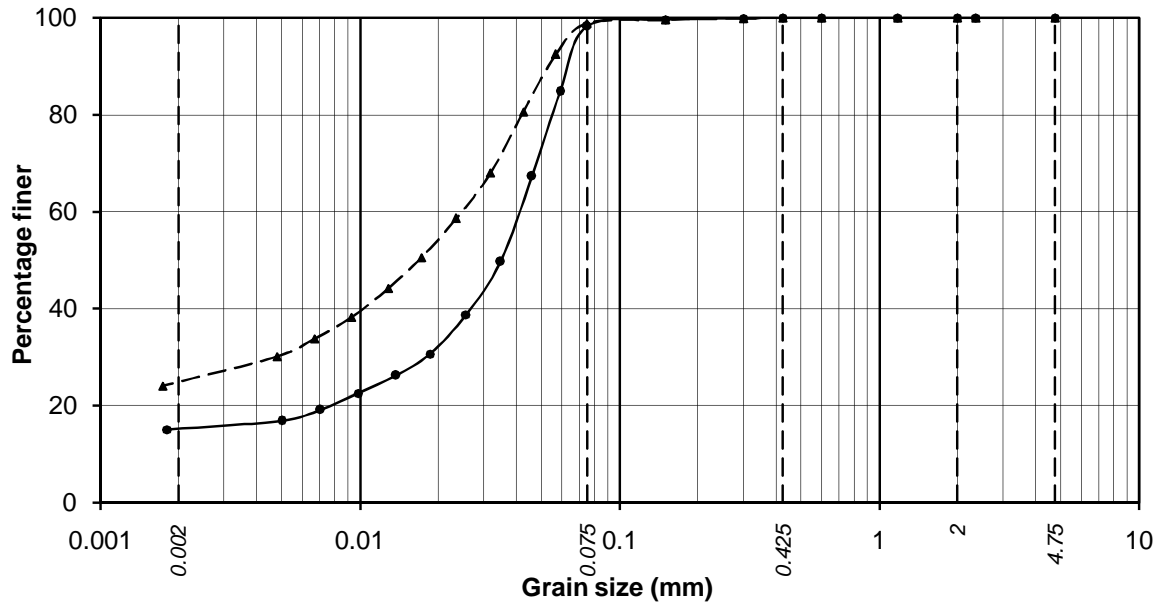
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

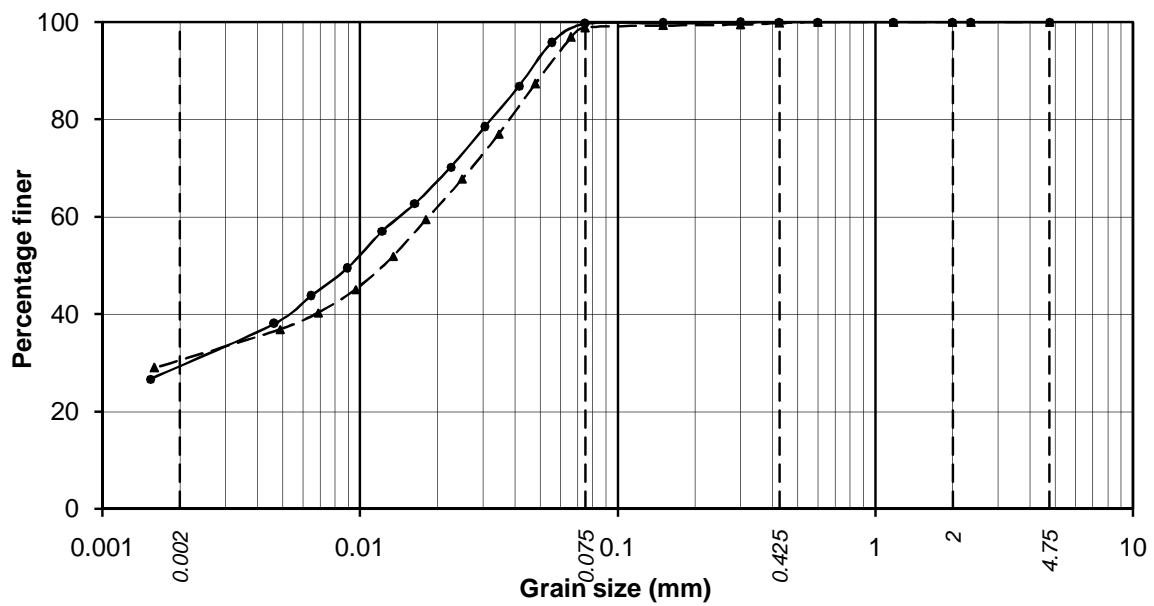
Fig. No.
E/56

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-11 , 13.00 m -▲- BH-11 , 15.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 13.00 m	15.2	83.1	1.7	0.0	0.0	0.0
BH-11 , 15.00 m	24.9	74.0	1.1	0.0	0.0	0.0



—●— BH-11 , 17.00 m -▲- BH-11 , 21.00 m

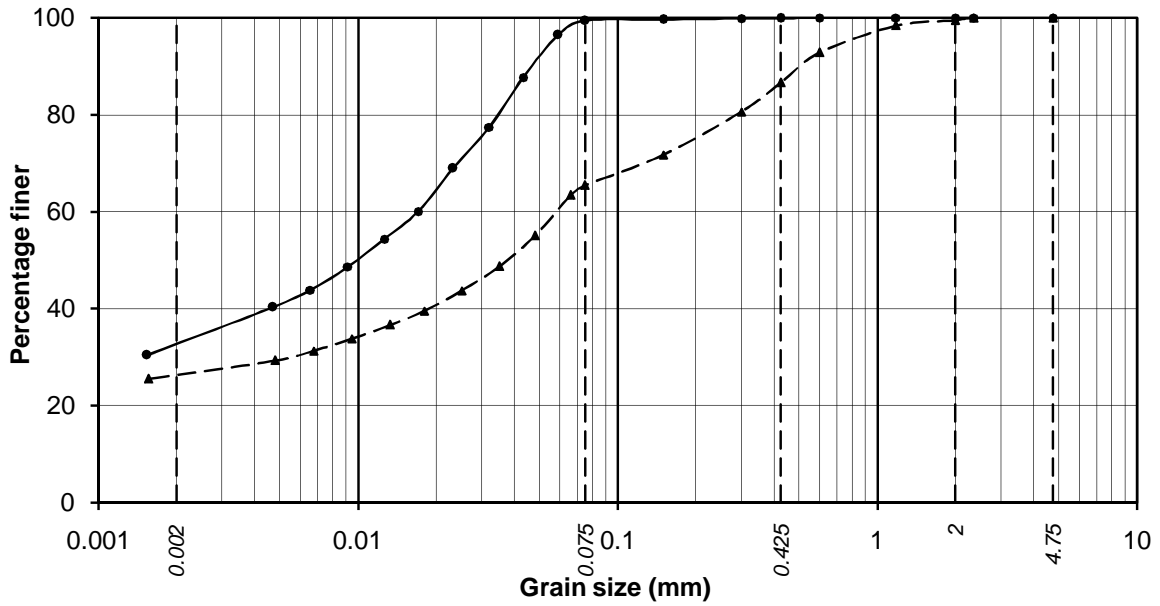
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 17.00 m	29.3	70.4	0.3	0.0	0.0	0.0
BH-11 , 21.00 m	30.6	68.3	0.9	0.2	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

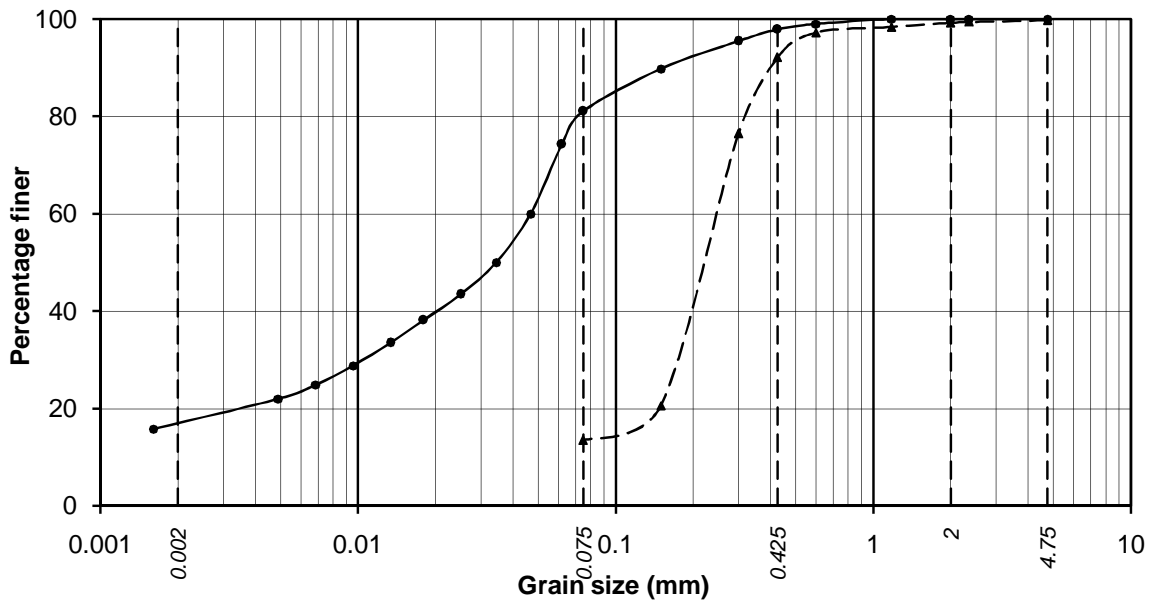
Fig. No.
E/57

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-11 , 25.00 m -▲- BH-11 , 29.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 25.00 m	32.7	66.7	0.5	0.1	0.0	0.0
BH-11 , 29.00 m	26.3	39.1	21.2	12.9	0.5	0.0



—●— BH-11 , 31.00 m -▲- BH-11 , 34.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 31.00 m	17.0	64.2	16.7	2.1	0.0	0.0
BH-11 , 34.00 m	*13.4		78.7	7.1	0.6	0.2

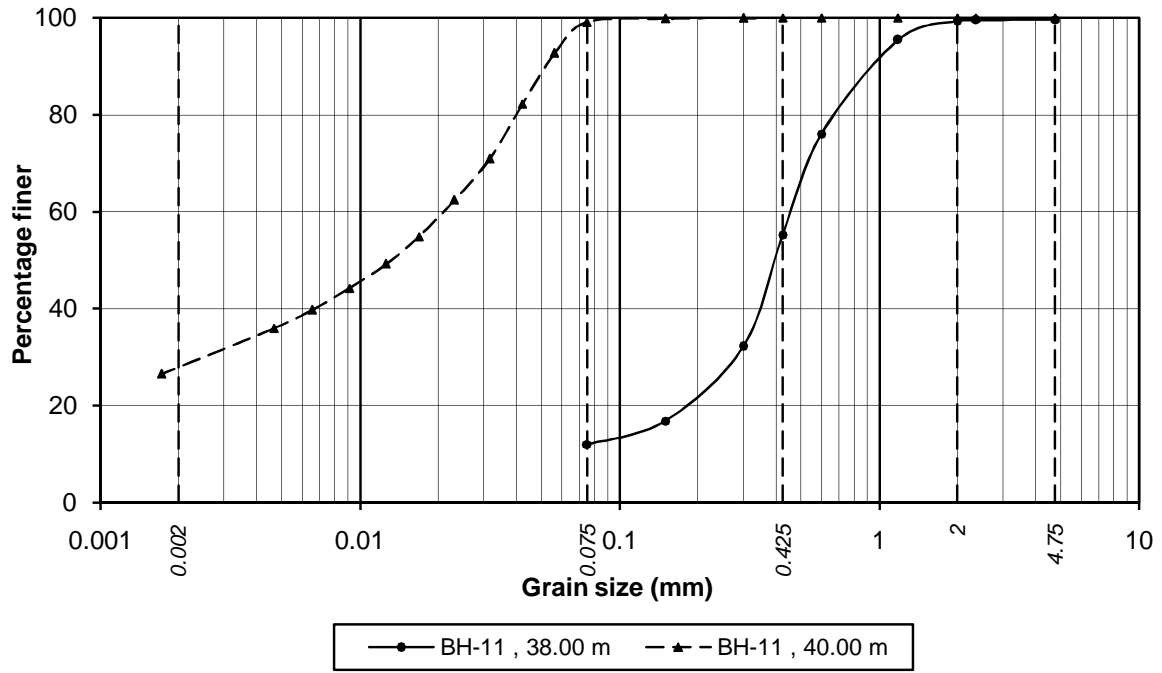
*Silt & Clay

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Job No.
XCSPL/1372

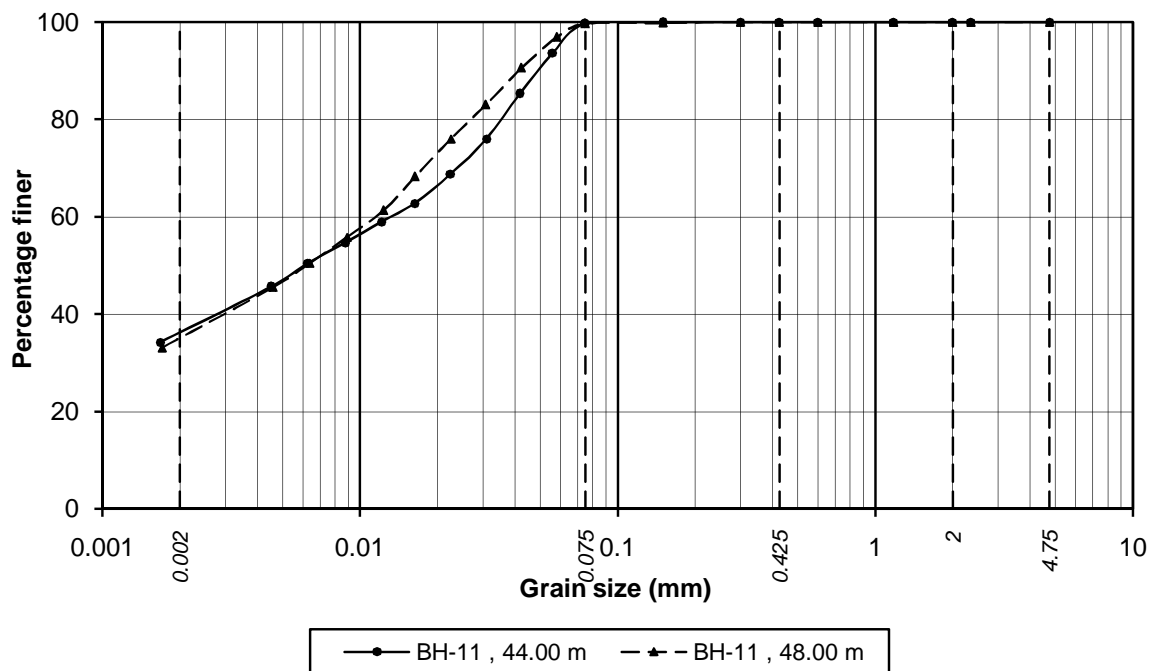
Fig. No.
E/58

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-11, 38.00 m	*12.0	43.2	44.1	0.3	0.0	0.0
BH-11, 40.00 m	27.9	71.2	0.9	0.0	0.0	0.0

*Silt & Clay



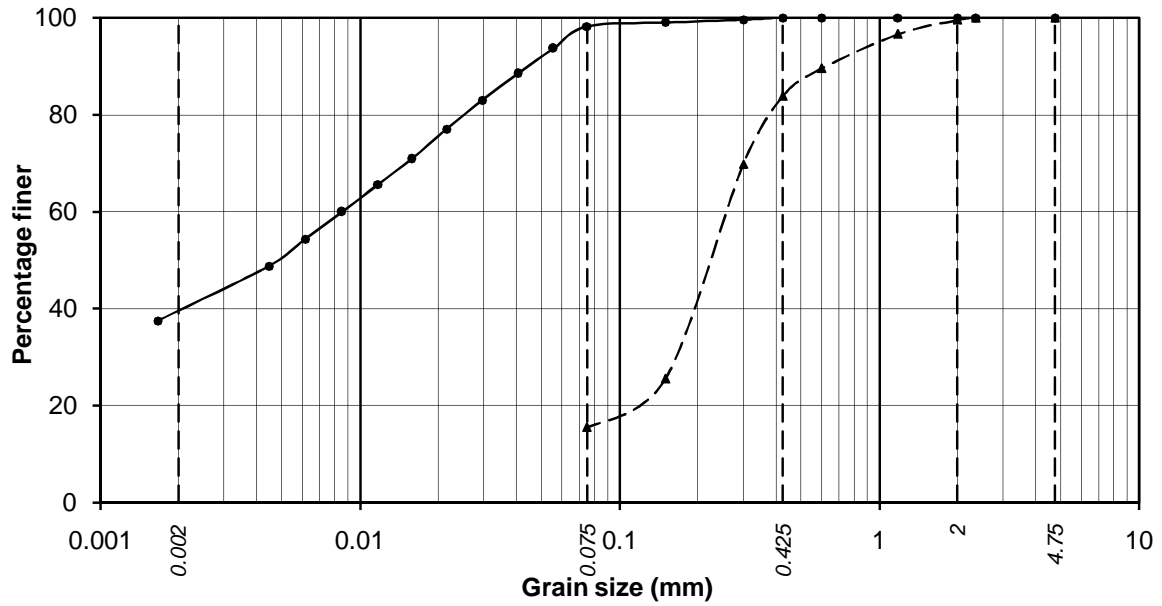
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-11, 44.00 m	36.3	63.4	0.3	0.0	0.0	0.0
BH-11, 48.00 m	35.1	64.6	0.3	0.0	0.0	0.0

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Job No.
XCSPL/1372

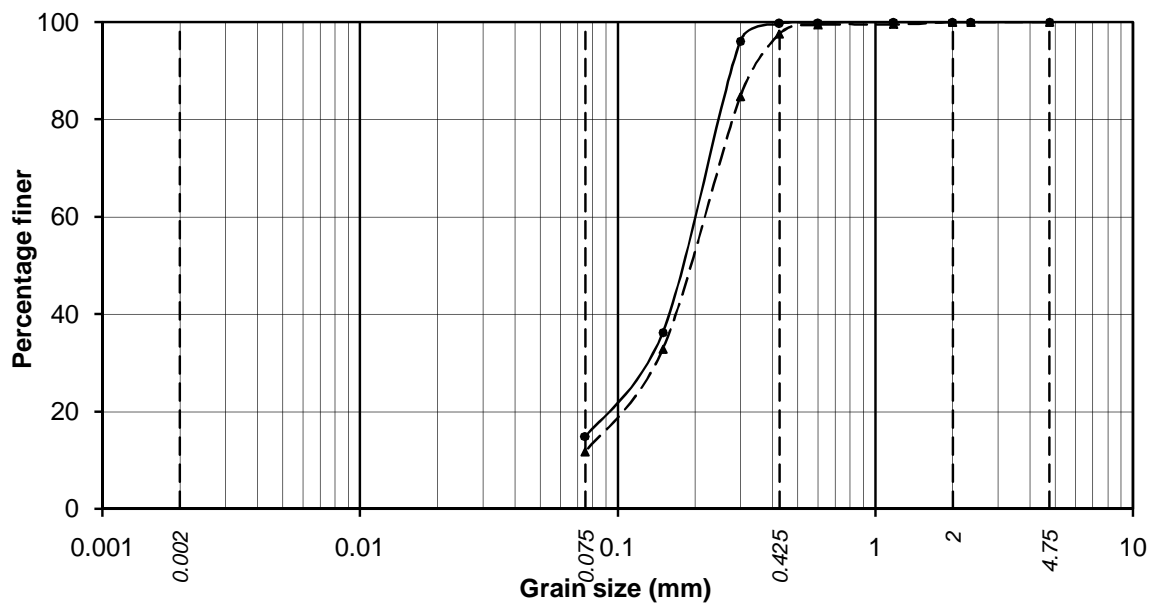
Fig. No.
E/59

GRAIN SIZE DISTRIBUTION CURVES



—●— BH-11 , 52.00 m -▲- BH-11 , 53.00 m

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 52.00 m	39.6	58.6	1.8	0.0	0.0	0.0
BH-11 , 53.00 m	*15.5		68.3	15.7	0.5	0.0
*Silt & Clay						



—●— BH-11 , 57.00 m -▲- BH-11 , 60.10 m

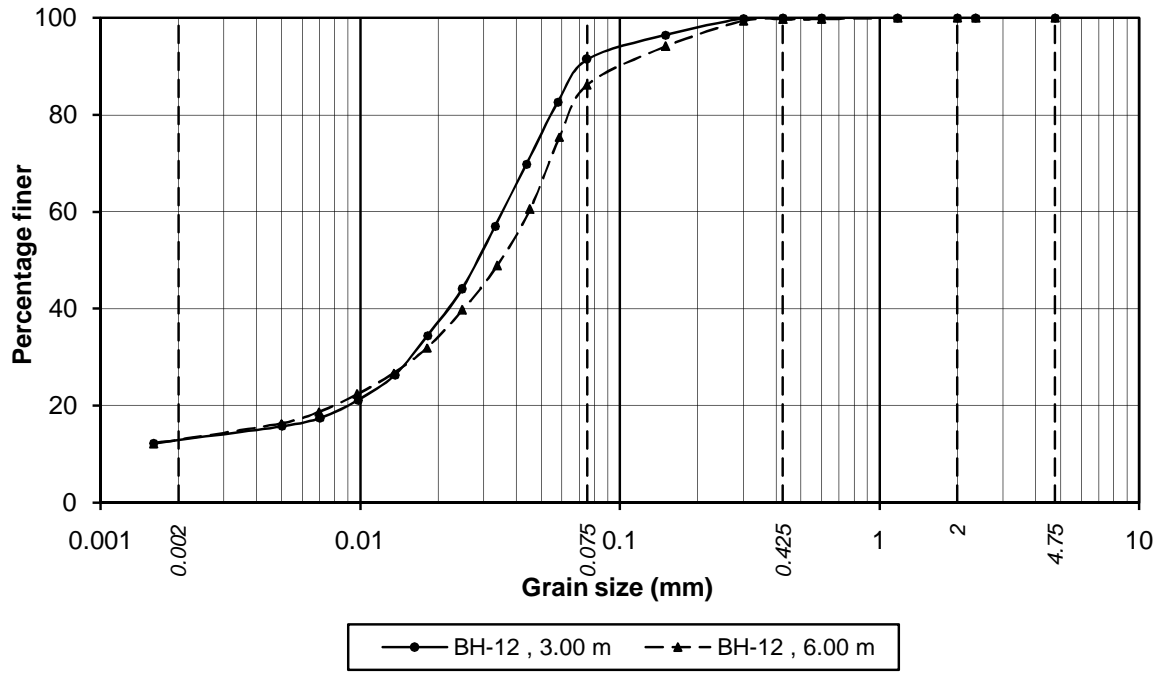
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-11 , 57.00 m	*14.9		84.8	0.3	0.0	0.0
BH-11 , 60.10 m	*11.7		85.9	2.4	0.0	0.0
*Silt & Clay						

Project: Geotechnical Investigation at Haldia Terminal

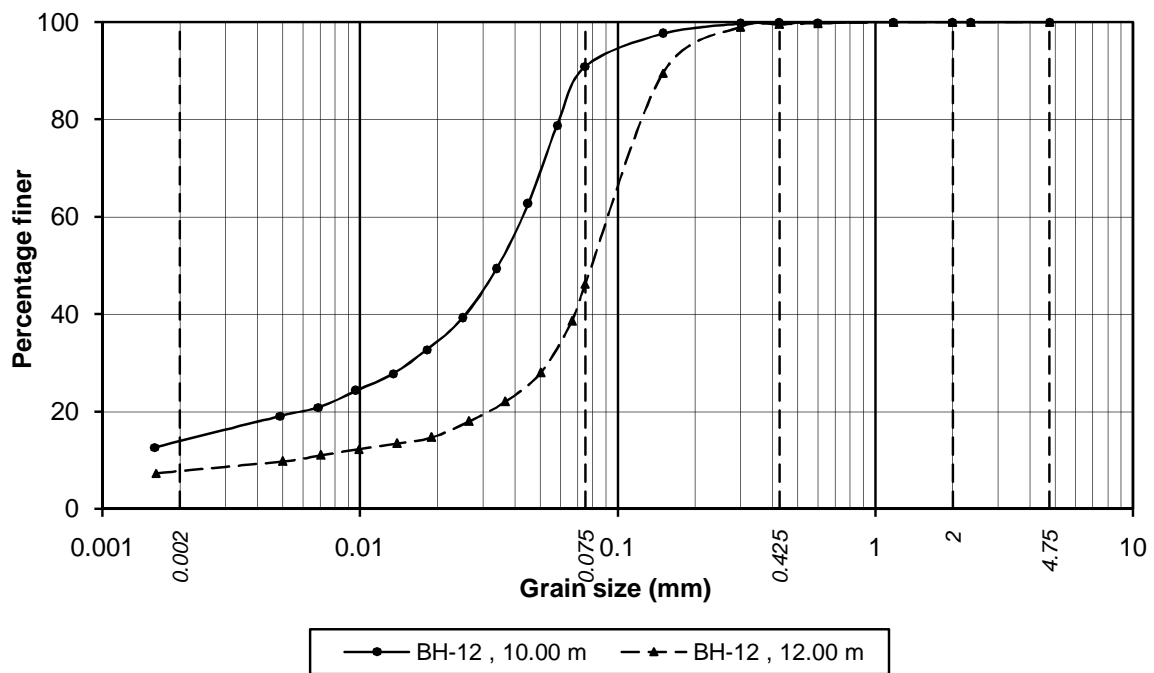
Job No.
XCSPL/1372

Fig. No.
E/60

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12 , 3.00 m	12.9	78.5	8.6	0.0	0.0	0.0
BH-12 , 6.00 m	12.9	73.3	13.5	0.3	0.0	0.0



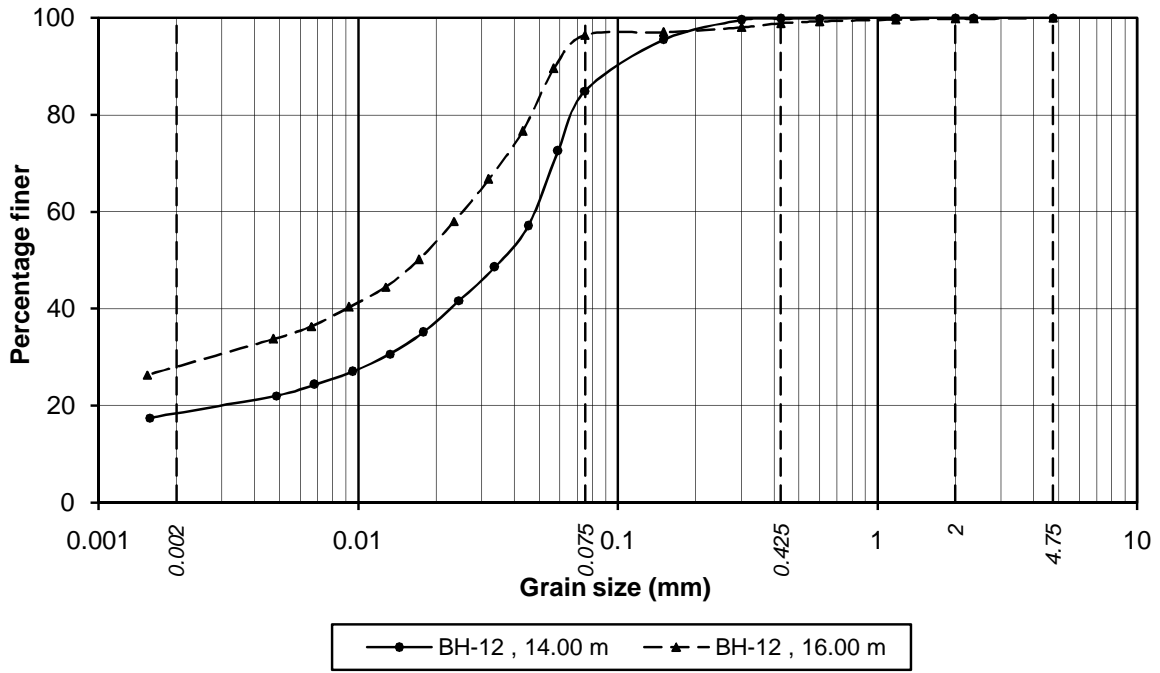
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12 , 10.00 m	13.9	77.0	8.9	0.2	0.0	0.0
BH-12 , 12.00 m	7.8	38.4	53.4	0.4	0.0	0.0

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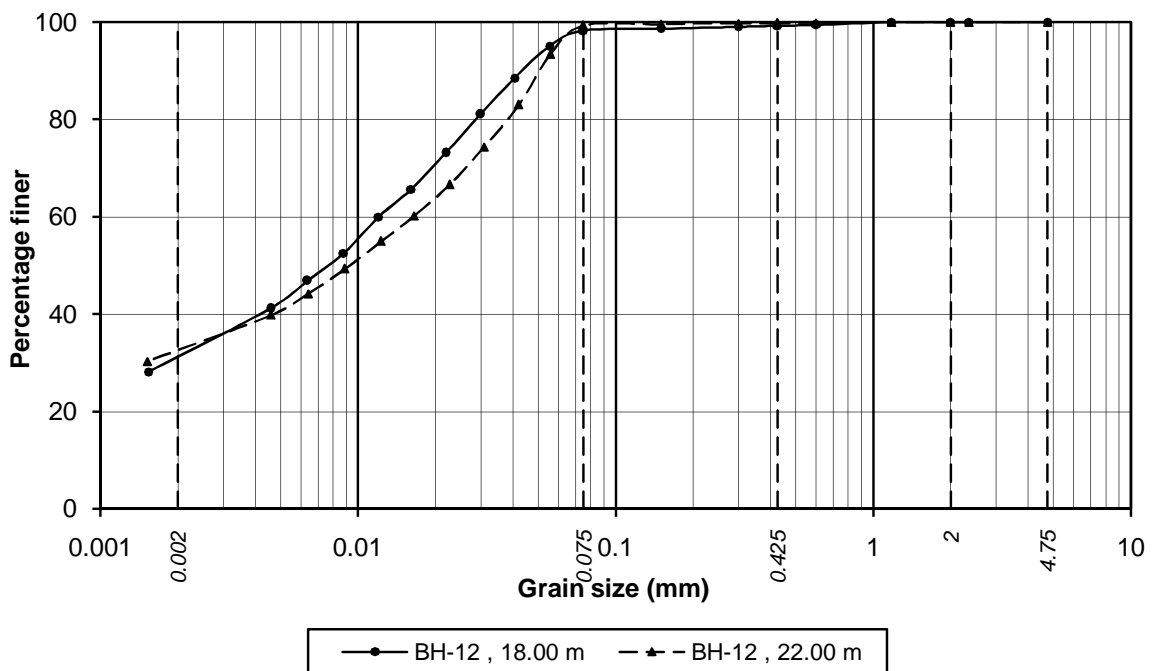
Job No.
XCSPL/1372

Fig. No.
E/61

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-12 , 14.00 m	18.4	66.5	14.9	0.2	0.0	0.0
BH-12 , 16.00 m	28.0	68.4	2.4	1.0	0.2	0.0



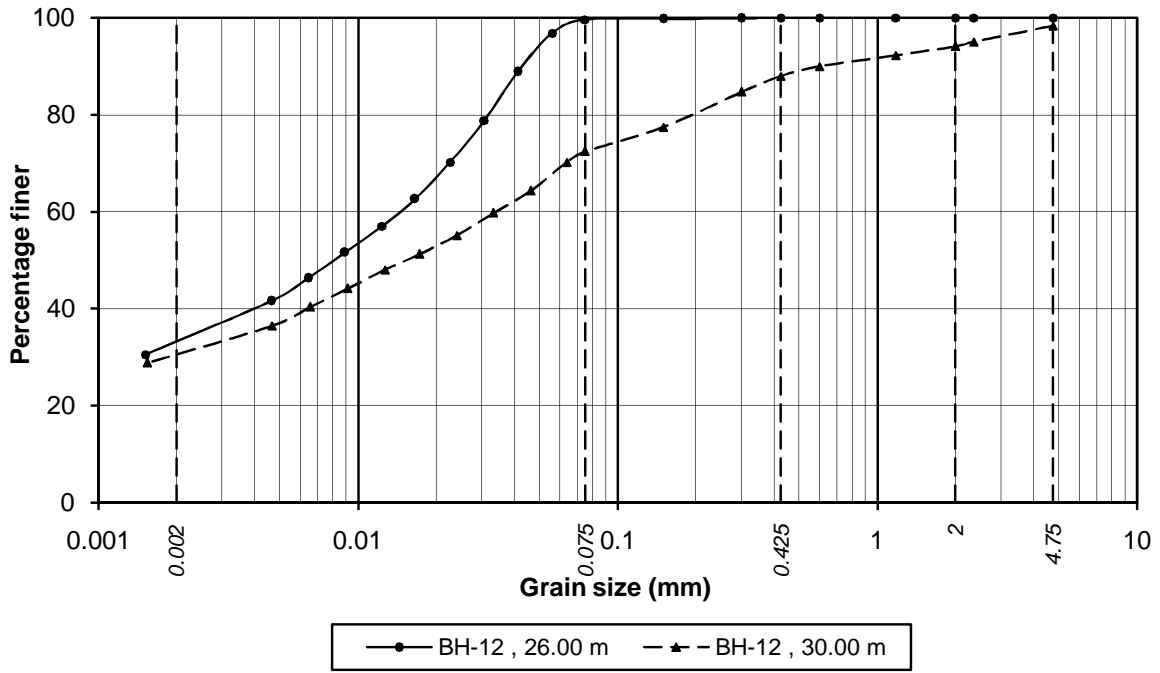
Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-12 , 18.00 m	31.3	67.0	1.0	0.7	0.0	0.0
BH-12 , 22.00 m	32.7	66.6	0.5	0.2	0.0	0.0

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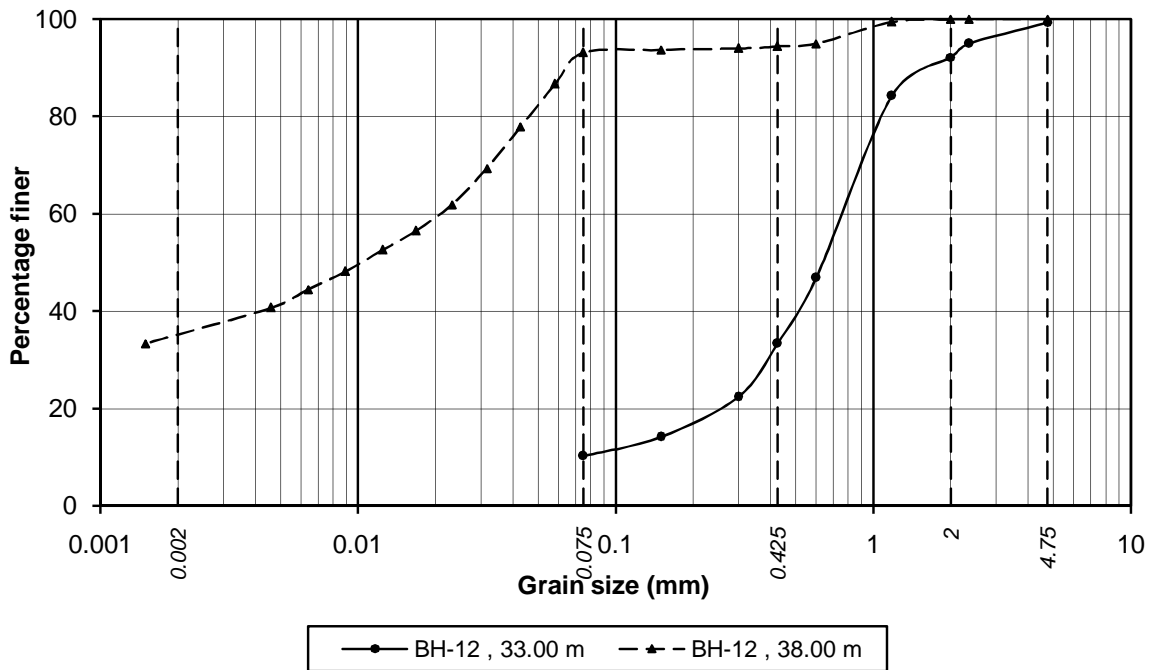
Job No.
XCSPL/1372

Fig. No.
E/62

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12, 26.00 m	33.2	66.4	0.4	0.0	0.0	0.0
BH-12, 30.00 m	30.6	41.8	15.5	6.1	4.3	1.7



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12, 33.00 m	*10.3		23.1	58.8	7.1	0.7
BH-12, 38.00 m	35.2	57.9	1.3	5.6	0.0	0.0

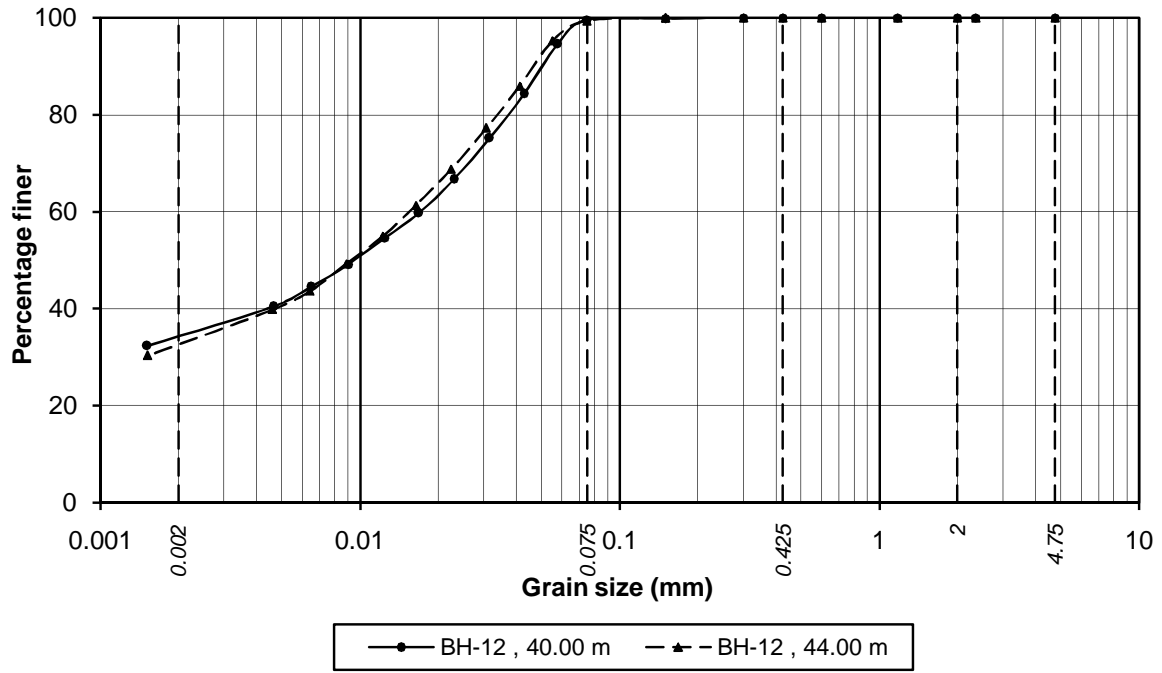
*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal

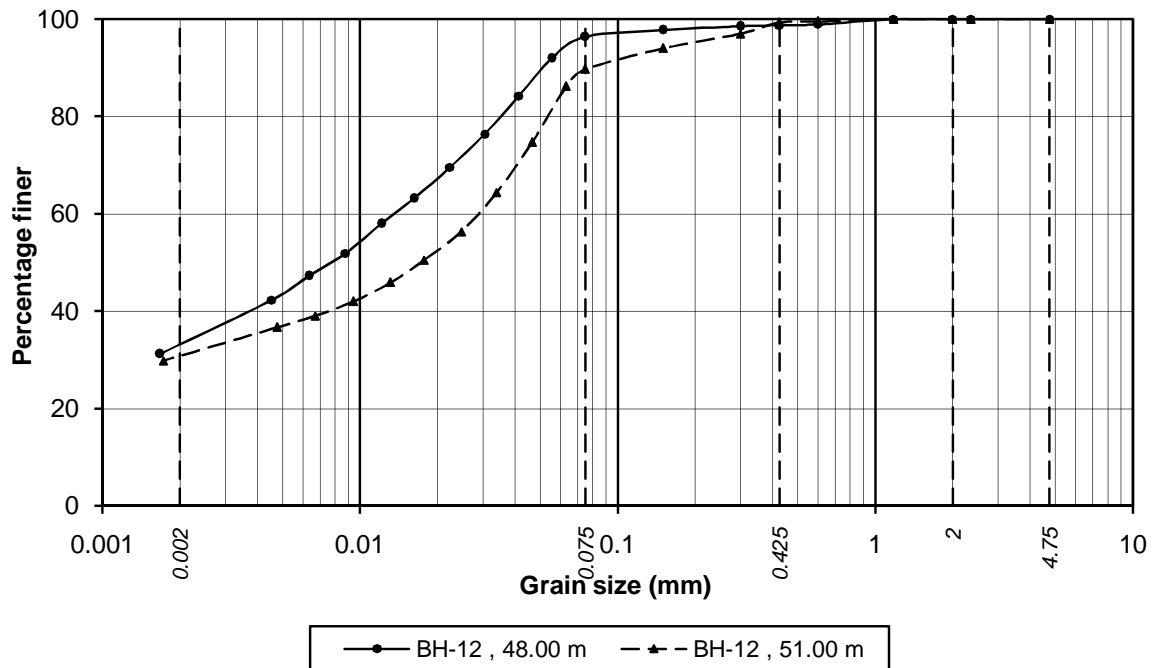
Job No.
XCSPL/1372

Fig. No.
E/63

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12 , 40.00 m	34.3	65.3	0.4	0.0	0.0	0.0
BH-12 , 44.00 m	32.7	66.6	0.7	0.0	0.0	0.0



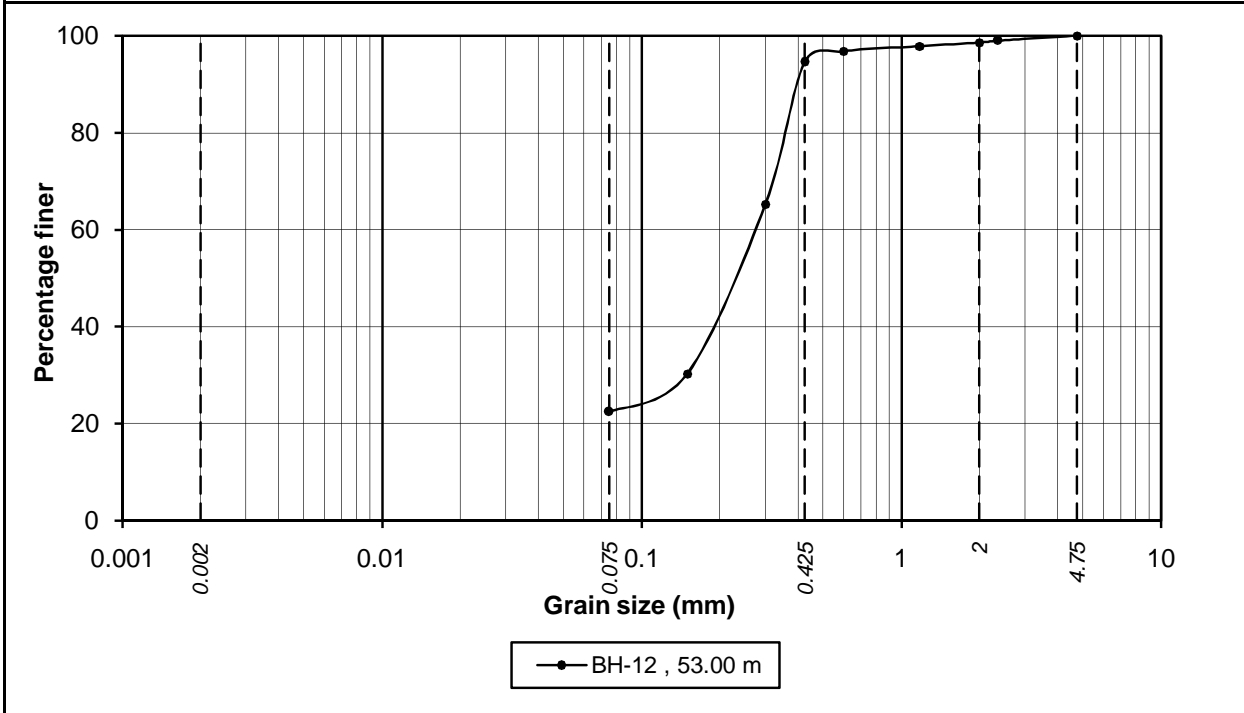
Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	Clay (%)	Silt (%)	Fine sand (%)	Medium sand (%)	Coarse sand (%)	Gravel (%)
BH-12 , 48.00 m	33.2	63.2	2.3	1.3	0.0	0.0
BH-12 , 51.00 m	30.8	58.9	9.6	0.7	0.0	0.0

Project: Geotechnical Investigation at Haldia Terminal

Job No.
XCSPL/1372

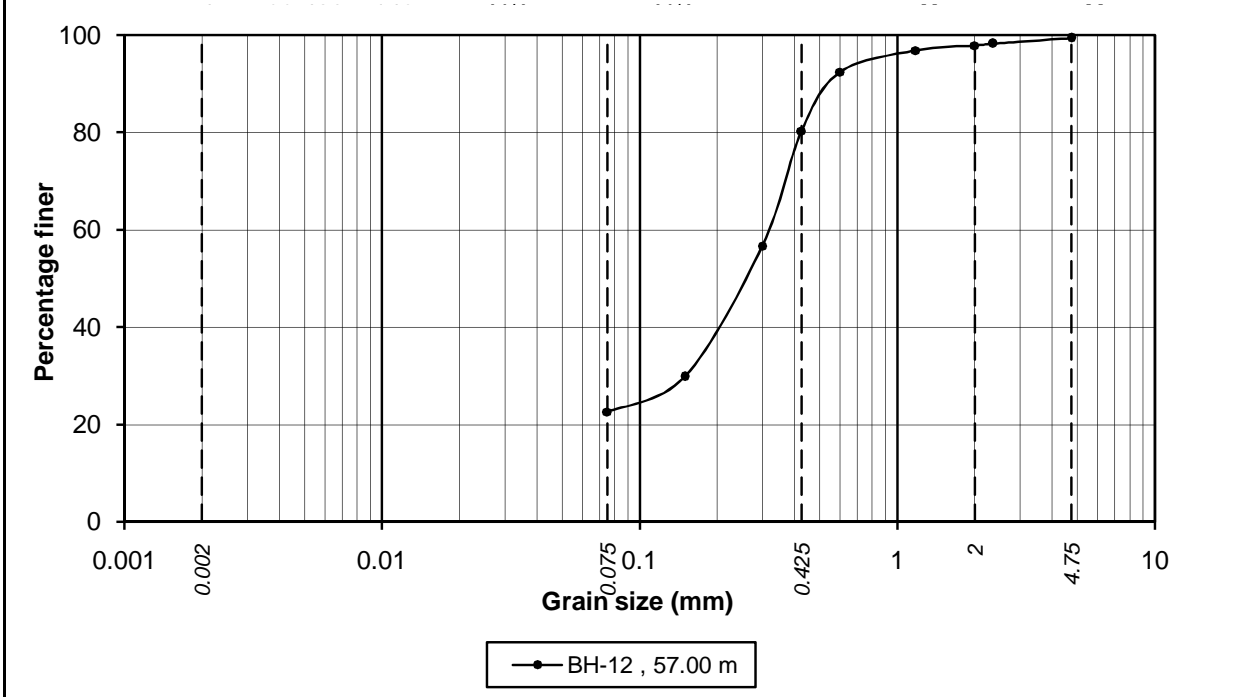
Fig. No.
E/64

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-12 , 53.00 m		*22.4	72.2	4.0	1.4	0.0

*Silt & Clay

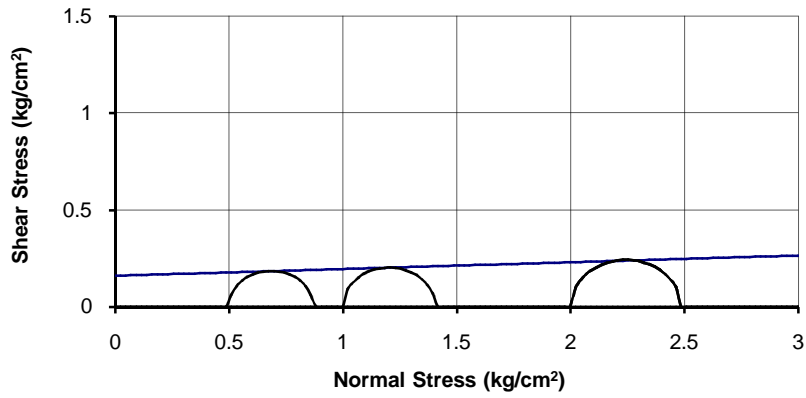


Grain size (mm)	<0.002 Clay (%)	0.002-0.075 Silt (%)	0.075-0.425 Fine sand (%)	0.425-2.0 Medium sand (%)	2.0-4.75 Coarse sand (%)	>4.75 Gravel (%)
BH-12 , 57.00 m		*22.6	57.6	17.6	1.6	0.6

*Silt & Clay

Project: Geotechnical Investigation at Haldia Terminal	Job No. XCSPL/1372	Fig. No. E/65
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Mohr-Diagram

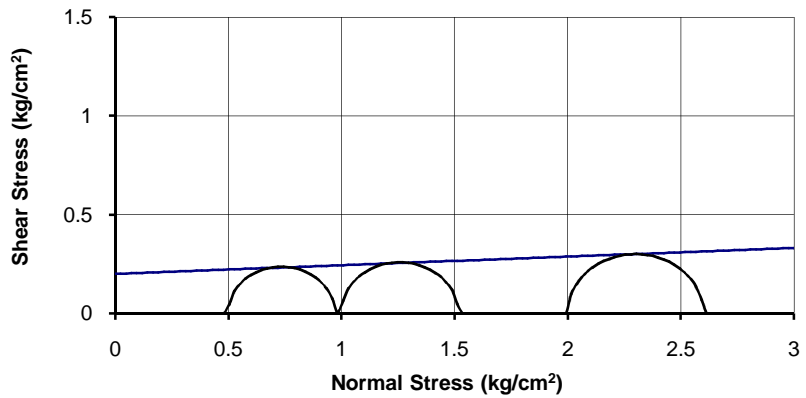


BH No.: BH-1
Depth: 1.00 m

Test Type: UU

c : 0.16 kg/sq. cm
φ : 2 degree

Mohr-Diagram

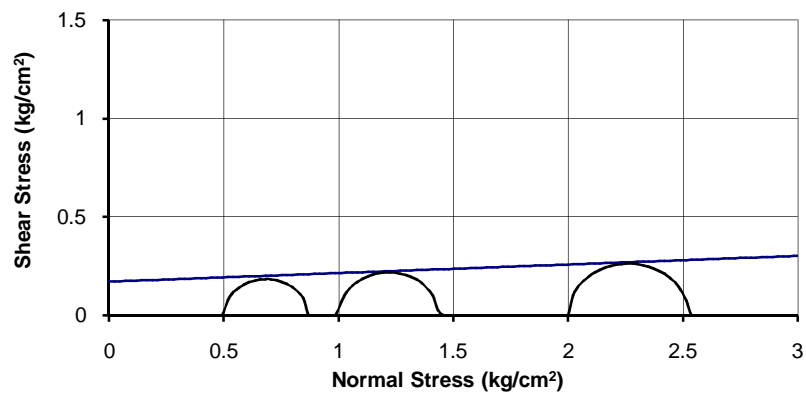


BH No.: BH-1
Depth: 5.00 m

Test Type: UU

c : 0.20 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-1
Depth: 9.00 m

Test Type: UU

c : 0.17 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

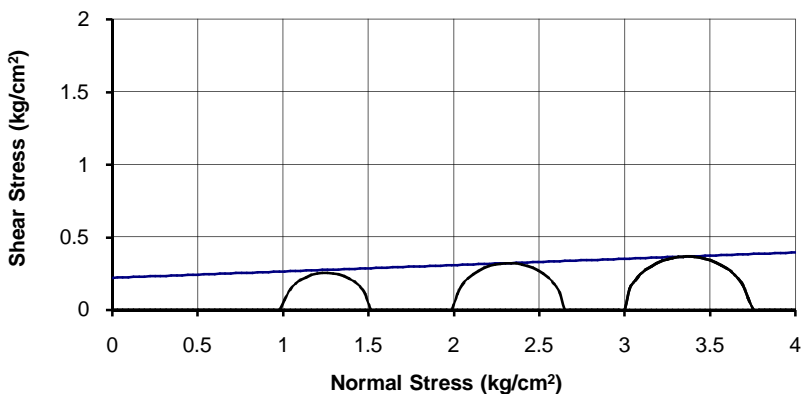
Job No.

Fig. No.

XCSPL/1372

F/1

Mohr-Diagram

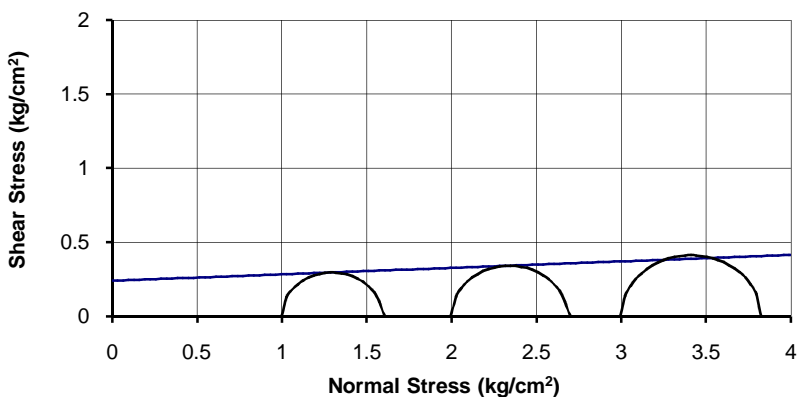


BH No.: BH-1
Depth: 13.00 m

Test Type: UU

c : 0.22 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

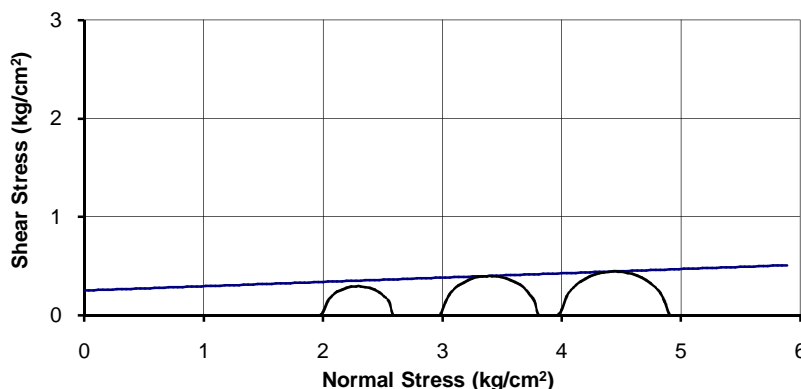


BH No.: BH-1
Depth: 19.00 m

Test Type: UU

c : 0.24 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-1
Depth: 23.00 m

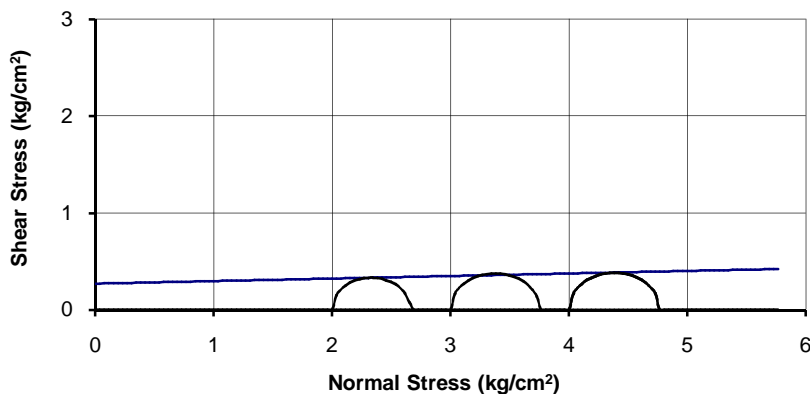
Test Type: UU

c : 0.25 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/2

Mohr-Diagram

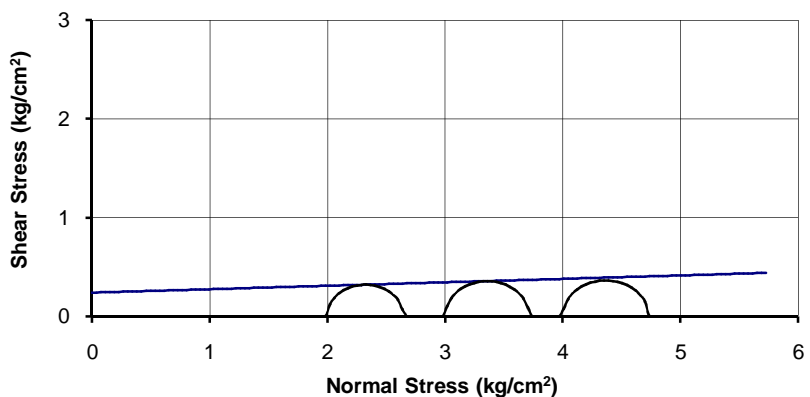


BH No.: BH-1
Depth: 25.00 m

Test Type: UU

c : 0.27 kg/sq. cm
φ : 1.5 degree

Mohr-Diagram

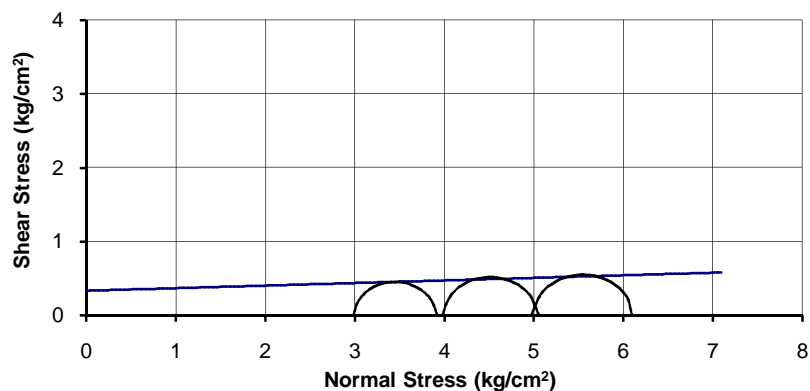


BH No.: BH-1
Depth: 27.00 m

Test Type: UU

c : 0.24 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-1
Depth: 31.00 m

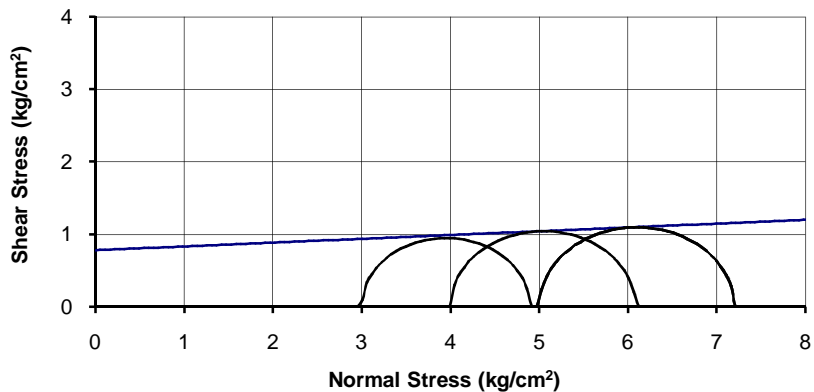
Test Type: UU

c : 0.33 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/3

Mohr-Diagram

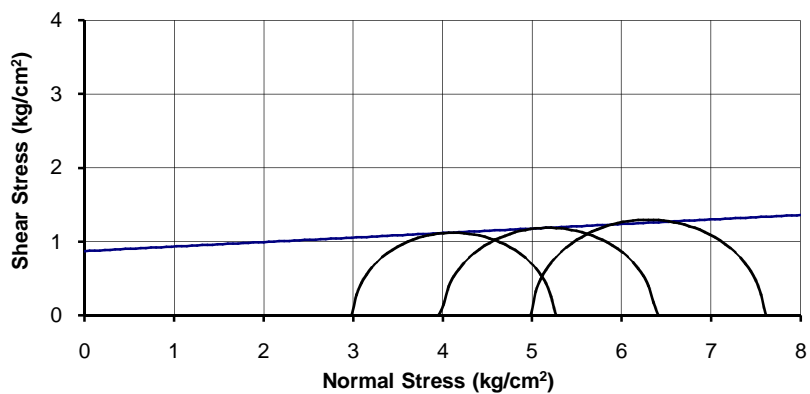


BH No.: BH-1
Depth: 35.00 m

Test Type: UU

c : 0.78 kg/sq. cm
 ϕ : 3 degree

Mohr-Diagram



BH No.: BH-1
Depth: 37.00 m

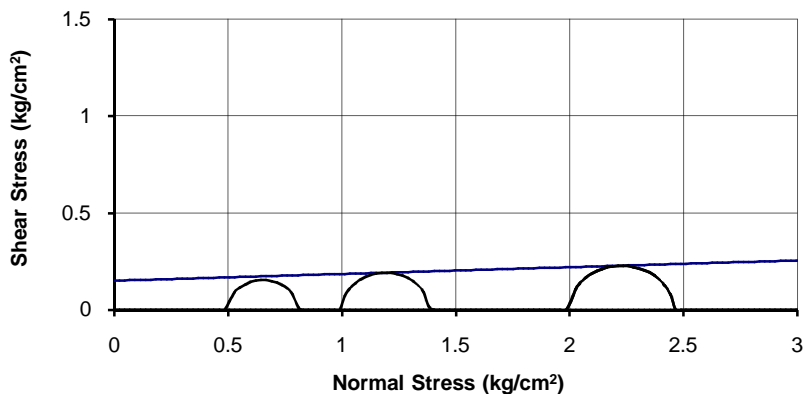
Test Type: UU

c : 0.87 kg/sq. cm
 ϕ : 3.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/4

Mohr-Diagram

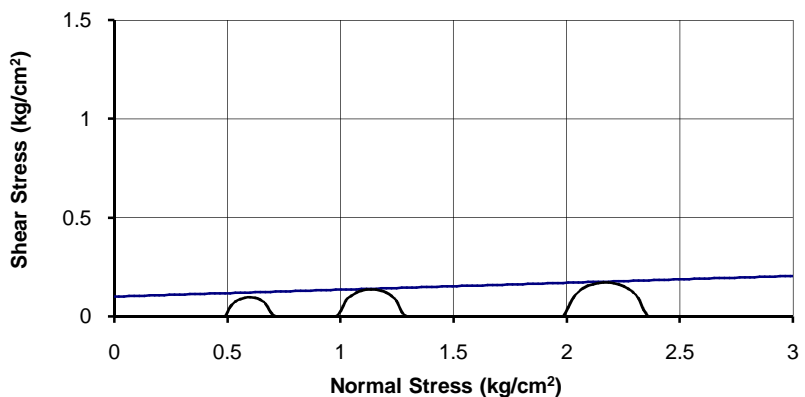


BH No.: BH-2
Depth: 2.00 m

Test Type: UU

c : 0.15 kg/sq. cm
φ : 2 degree

Mohr-Diagram

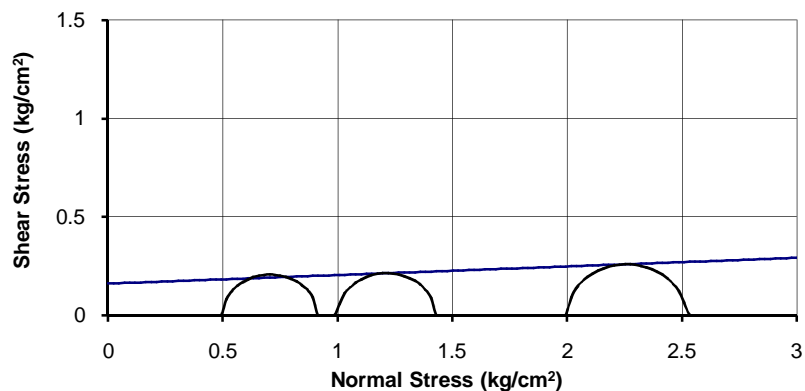


BH No.: BH-2
Depth: 4.00 m

Test Type: UU

c : 0.10 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-2
Depth: 8.00 m

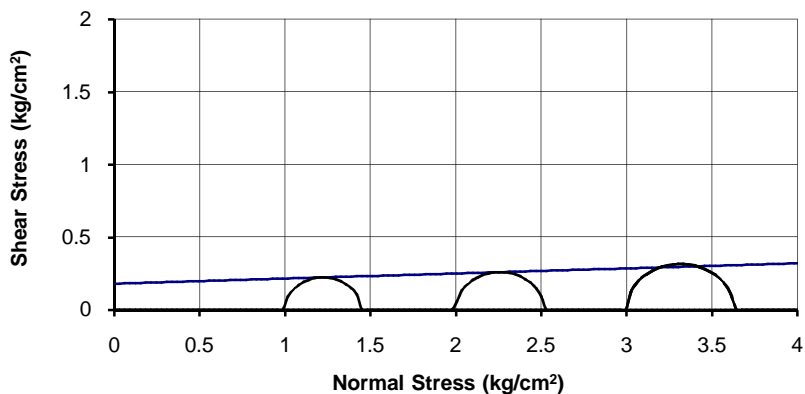
Test Type: UU

c : 0.16 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/5

Mohr-Diagram

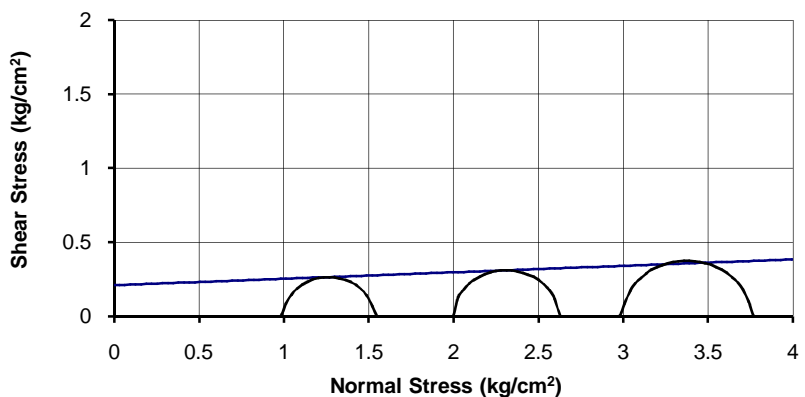


BH No.: BH-2
Depth: 10.00 m

Test Type: UU

c : 0.18 kg/sq. cm
φ : 2 degree

Mohr-Diagram

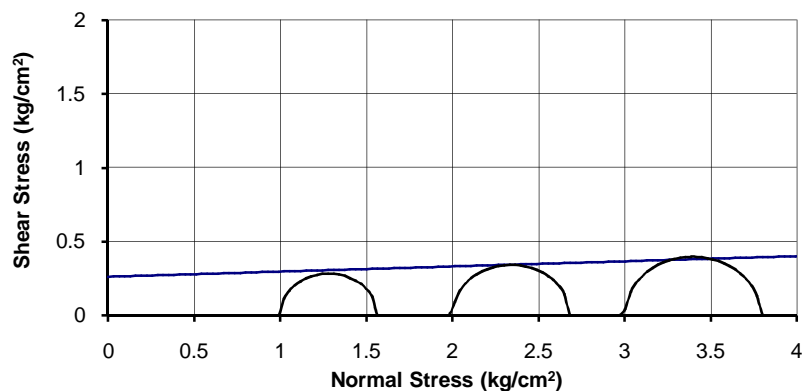


BH No.: BH-2
Depth: 12.00 m

Test Type: UU

c : 0.21 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-2
Depth: 18.00 m

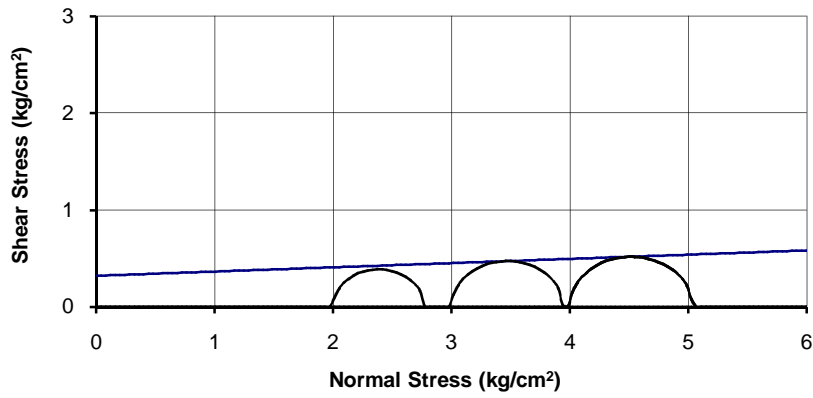
Test Type: UU

c : 0.26 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/6

Mohr-Diagram

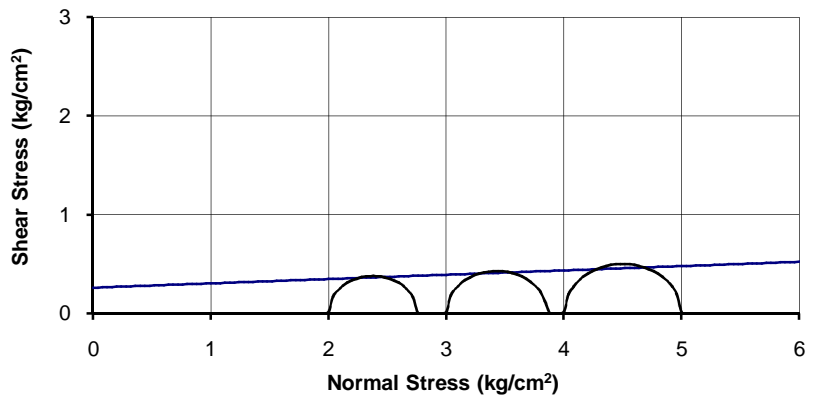


BH No.: BH-2
Depth: 22.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

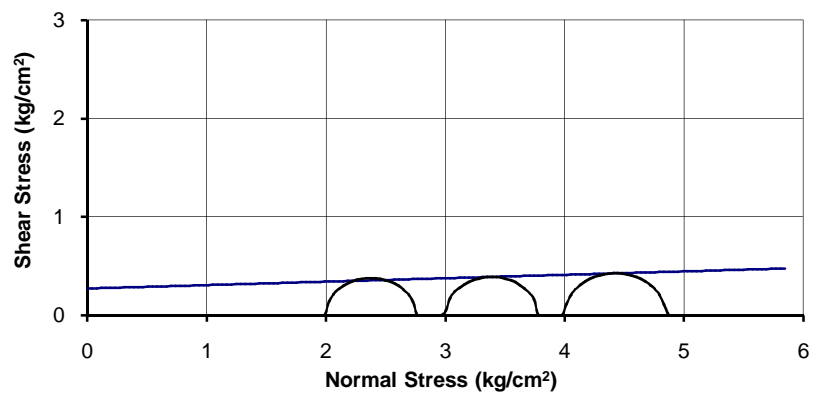


BH No.: BH-2
Depth: 24.00 m

Test Type: UU

c : 0.26 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-2
Depth: 28.00 m

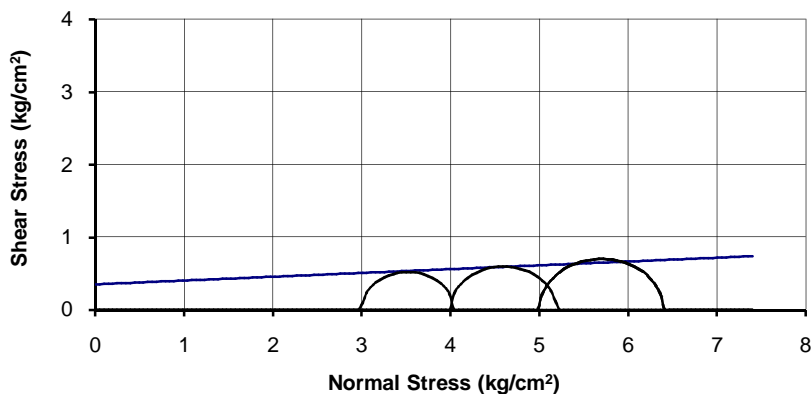
Test Type: UU

c : 0.27 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/7

Mohr-Diagram

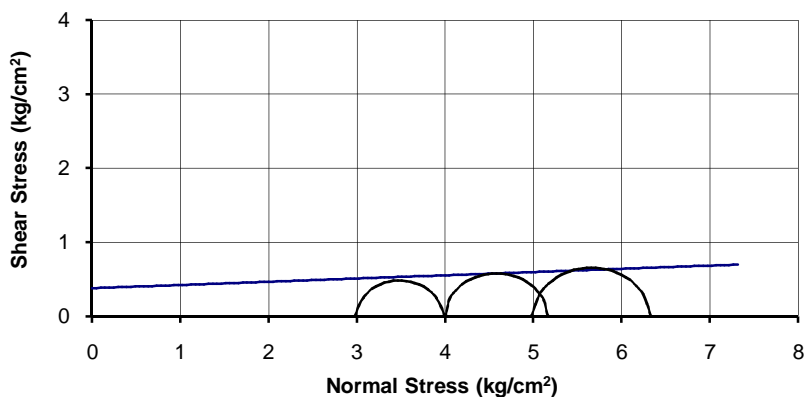


BH No.: BH-2
Depth: 32.00 m

Test Type: UU

c : 0.35 kg/sq. cm
φ : 3 degree

Mohr-Diagram

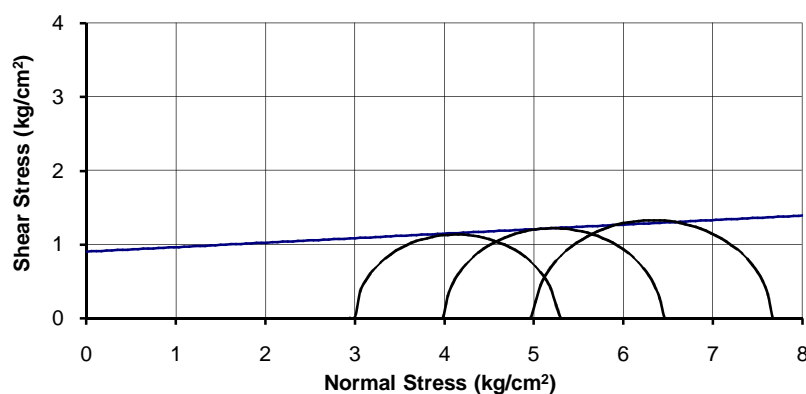


BH No.: BH-2
Depth: 34.00 m

Test Type: UU

c : 0.38 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-2
Depth: 36.00 m

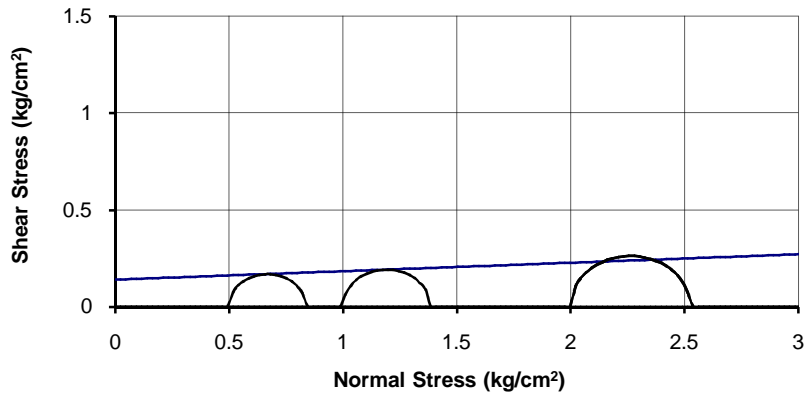
Test Type: UU

c : 0.90 kg/sq. cm
φ : 3.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/8

Mohr-Diagram

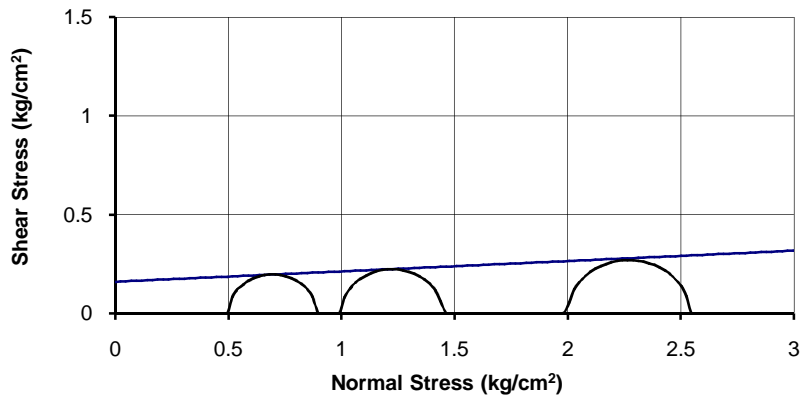


BH No.: BH-3
Depth: 3.00 m

Test Type: UU

c : 0.14 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

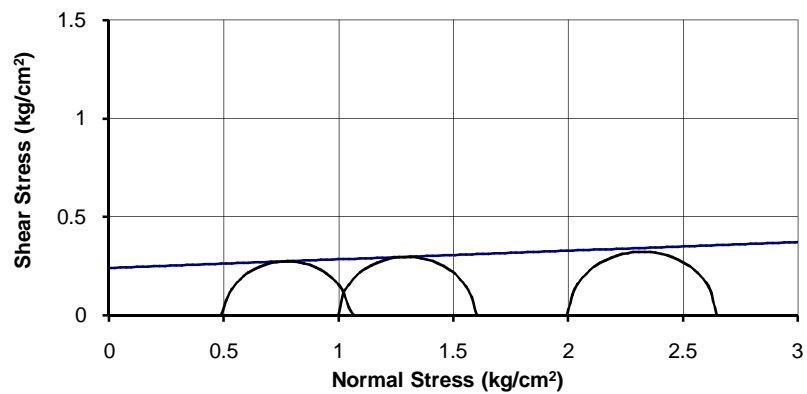


BH No.: BH-3
Depth: 5.00 m

Test Type: UU

c : 0.16 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-3
Depth: 7.00 m

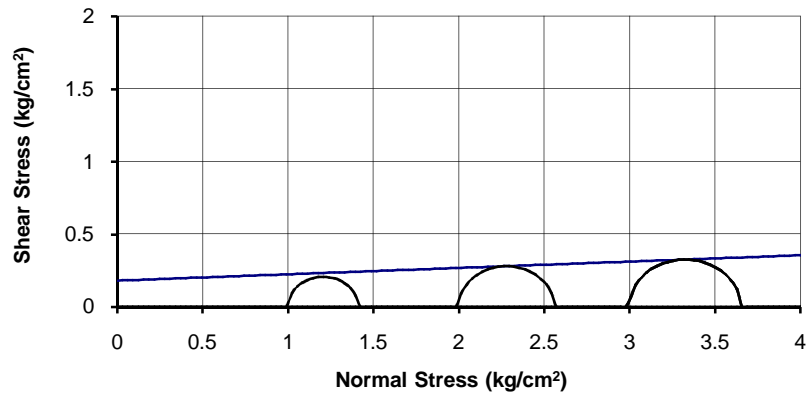
Test Type: UU

c : 0.24 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/9

Mohr-Diagram

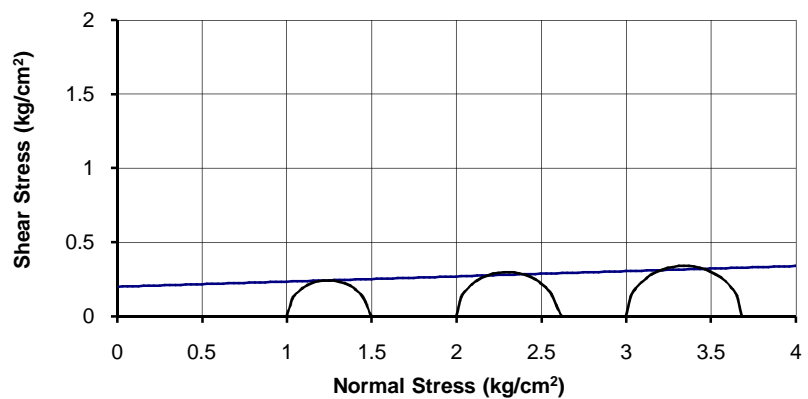


BH No.: BH-3
Depth: 13.00 m

Test Type: UU

c : 0.18 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

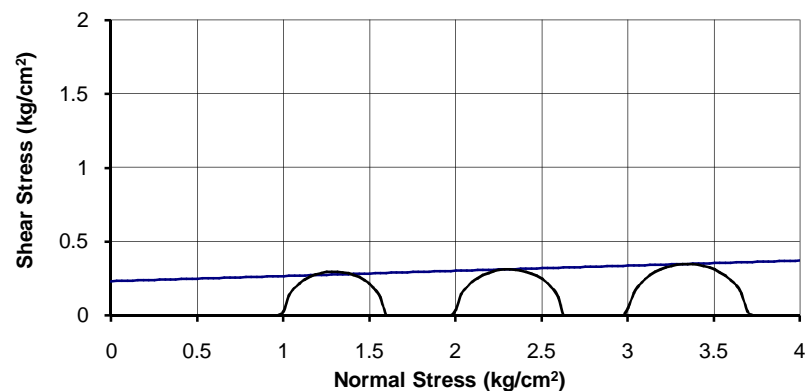


BH No.: BH-3
Depth: 17.00 m

Test Type: UU

c : 0.20 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-3
Depth: 19.00 m

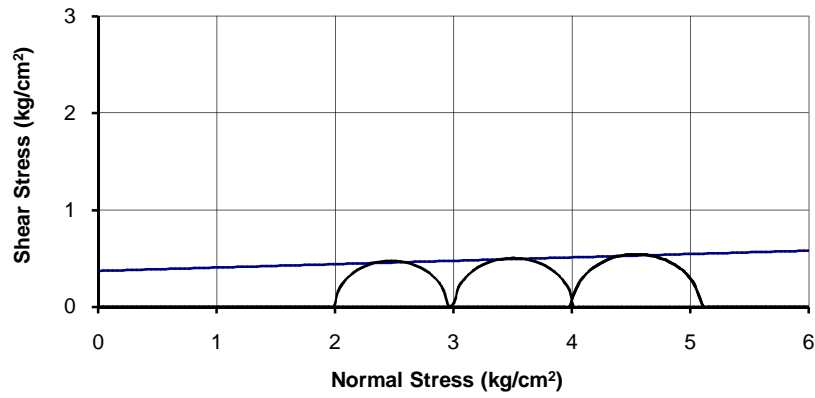
Test Type: UU

c : 0.23 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSP/1372	F/10

Mohr-Diagram

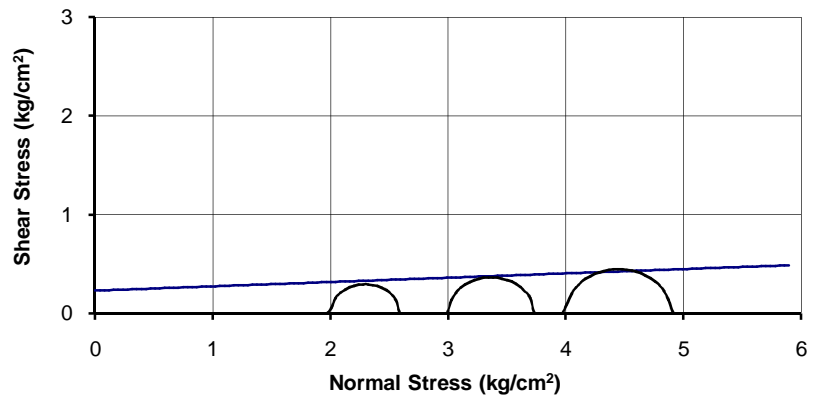


BH No.: BH-3
Depth: 23.00 m

Test Type: UU

c : 0.37 kg/sq. cm
φ : 2 degree

Mohr-Diagram

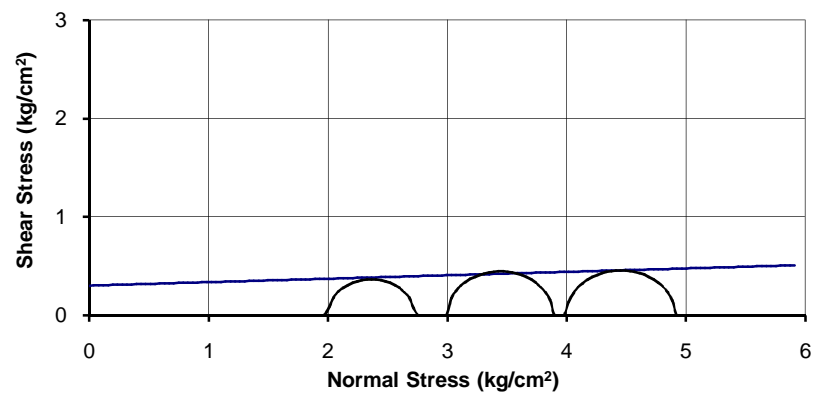


BH No.: BH-3
Depth: 25.00 m

Test Type: UU

c : 0.23 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-3
Depth: 27.00 m

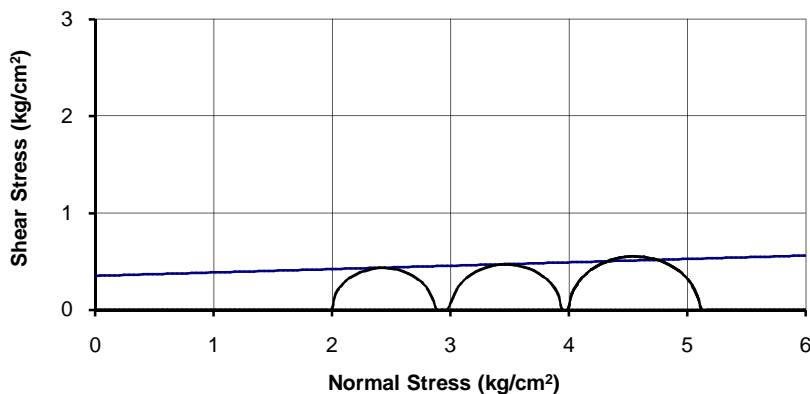
Test Type: UU

c : 0.30 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/11

Mohr-Diagram

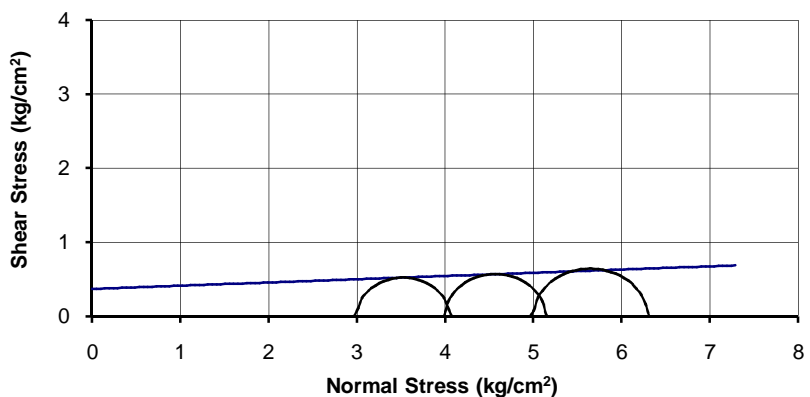


BH No.: BH-3
Depth: 29.00 m

Test Type: UU

c : 0.35 kg/sq. cm
φ : 2 degree

Mohr-Diagram

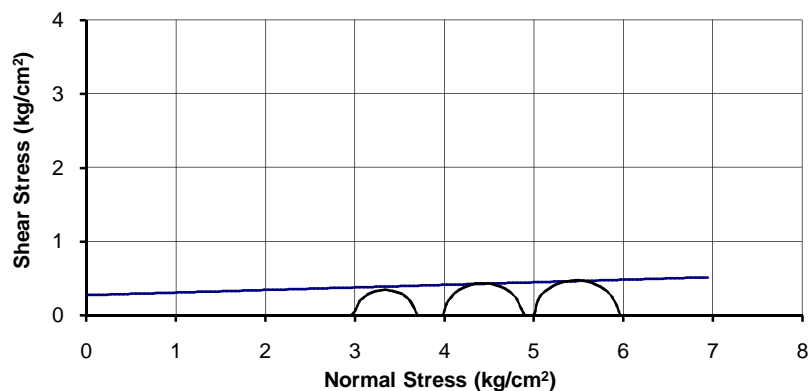


BH No.: BH-3
Depth: 31.00 m

Test Type: UU

c : 0.37 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-3
Depth: 33.00 m

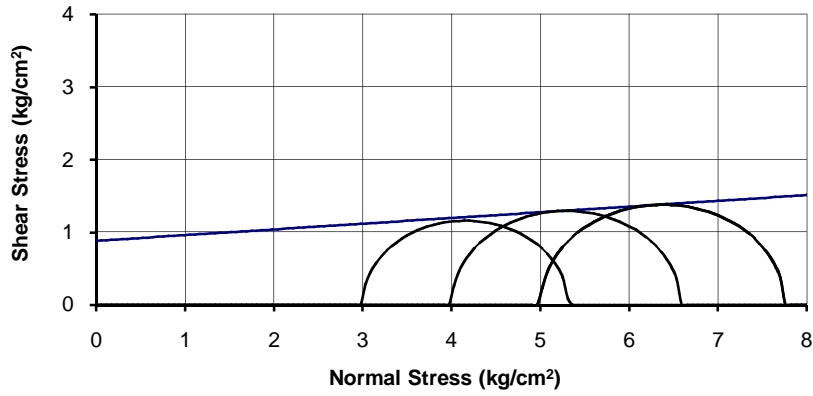
Test Type: UU

c : 0.27 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/12

Mohr-Diagram

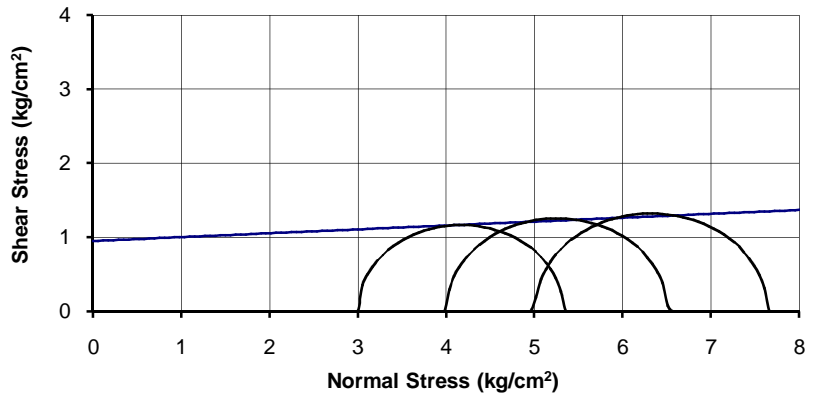


BH No.: BH-3
Depth: 35.00 m

Test Type: UU

c : 0.88 kg/sq. cm
φ : 4.5 degree

Mohr-Diagram

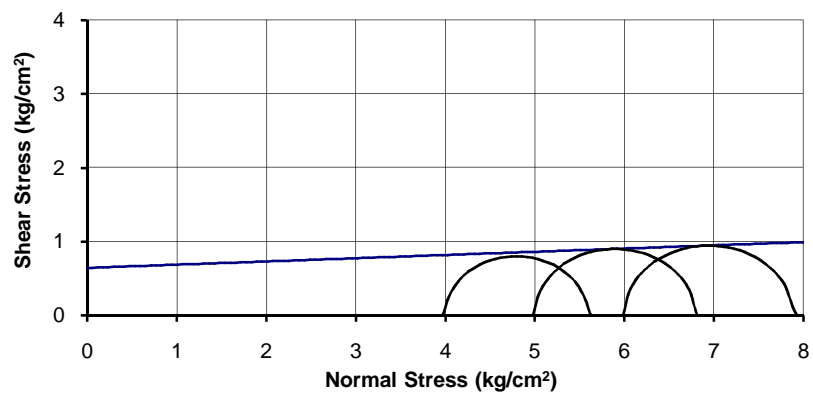


BH No.: BH-3
Depth: 37.00 m

Test Type: UU

c : 0.95 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-3
Depth: 49.00 m

Test Type: UU

c : 0.64 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

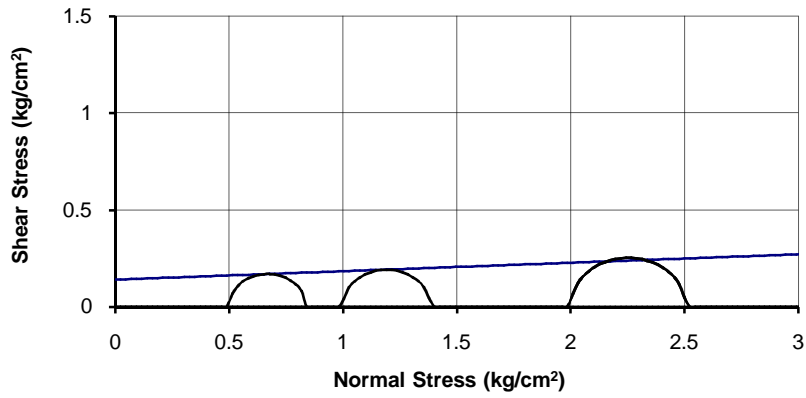
Job No.

Fig. No.

XCSPL/1372

F/13

Mohr-Diagram

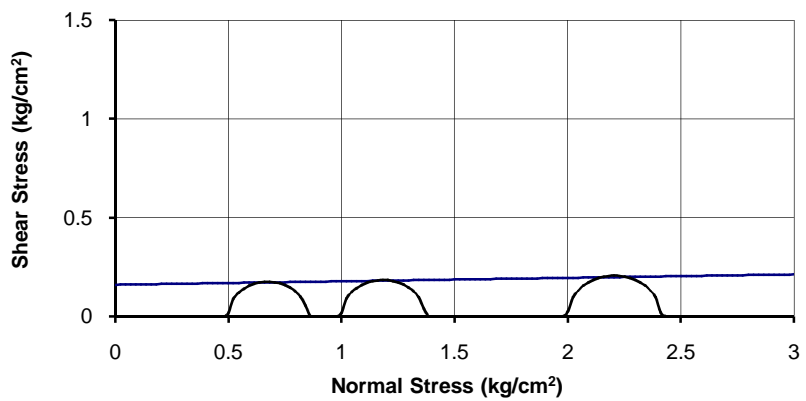


BH No.: BH-4
Depth: 2.00 m

Test Type: UU

c : 0.14 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

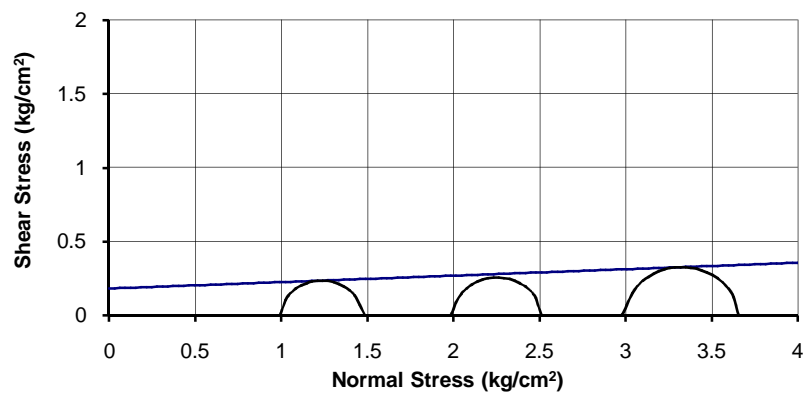


BH No.: BH-4
Depth: 6.00 m

Test Type: UU

c : 0.16 kg/sq. cm
φ : 1 degree

Mohr-Diagram



BH No.: BH-4
Depth: 10.00 m

Test Type: UU

c : 0.18 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

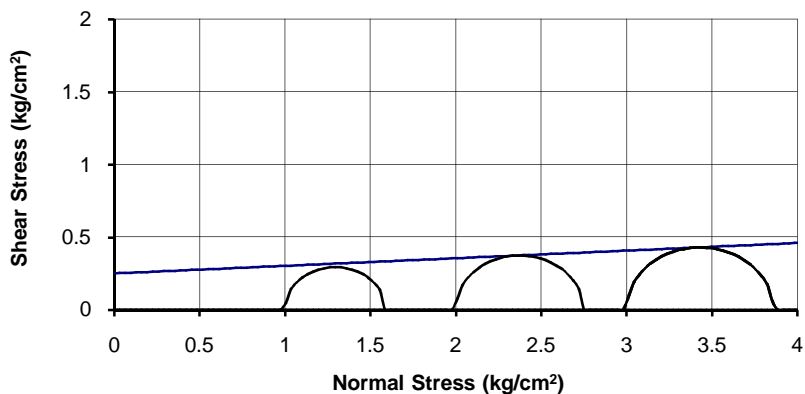
Job No.

Fig. No.

XCSPL/1372

F/14

Mohr-Diagram

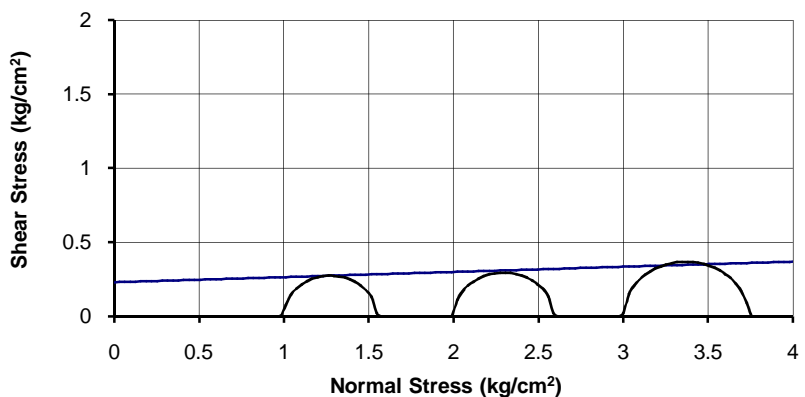


BH No.: BH-4
Depth: 12.00 m

Test Type: UU

c : 0.25 kg/sq. cm
φ : 3 degree

Mohr-Diagram

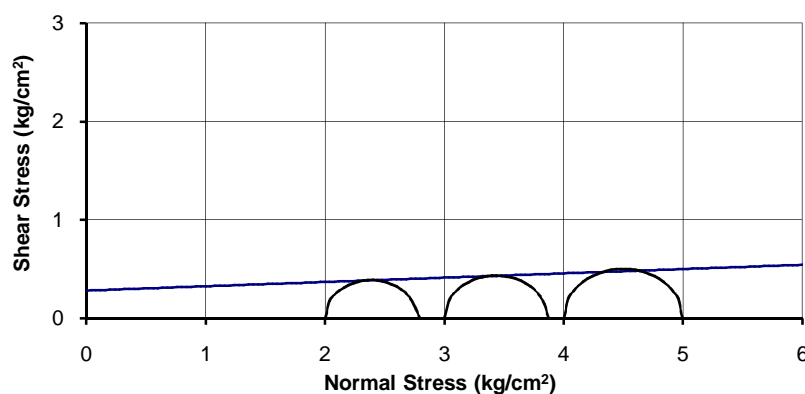


BH No.: BH-4
Depth: 16.00 m

Test Type: UU

c : 0.23 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-4
Depth: 24.00 m

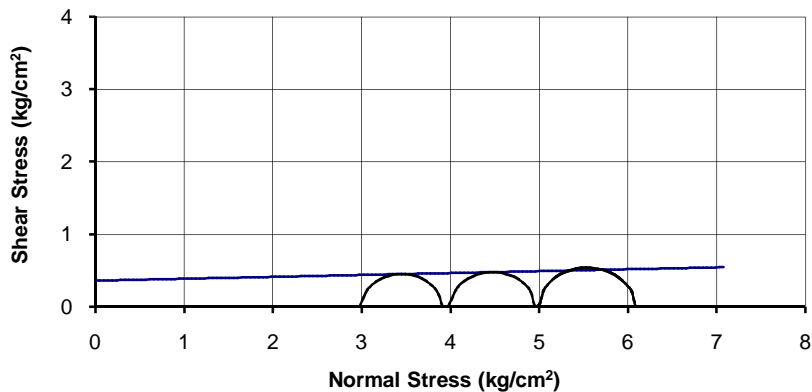
Test Type: UU

c : 0.28 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/15

Mohr-Diagram

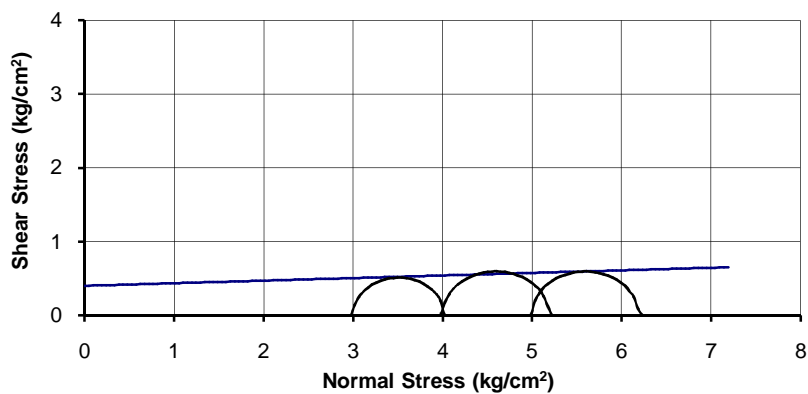


BH No.: BH-4
Depth: 32.00 m

Test Type: UU

c : 0.36 kg/sq. cm
φ : 1.5 degree

Mohr-Diagram



BH No.: BH-4
Depth: 34.00 m

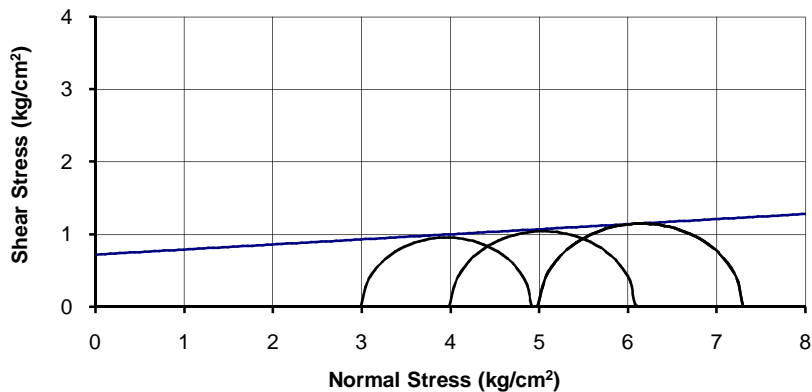
Test Type: UU

c : 0.40 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/16

Mohr-Diagram

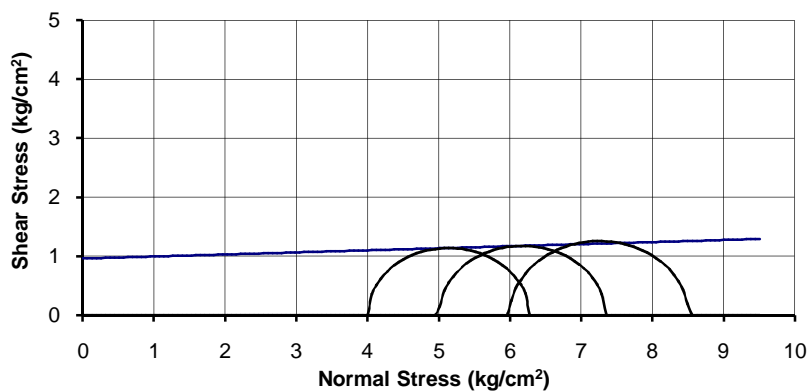


BH No.: BH-4
Depth: 38.00 m

Test Type: UU

c : 0.72 kg/sq. cm
φ : 4 degree

Mohr-Diagram



BH No.: BH-4
Depth: 46.00 m

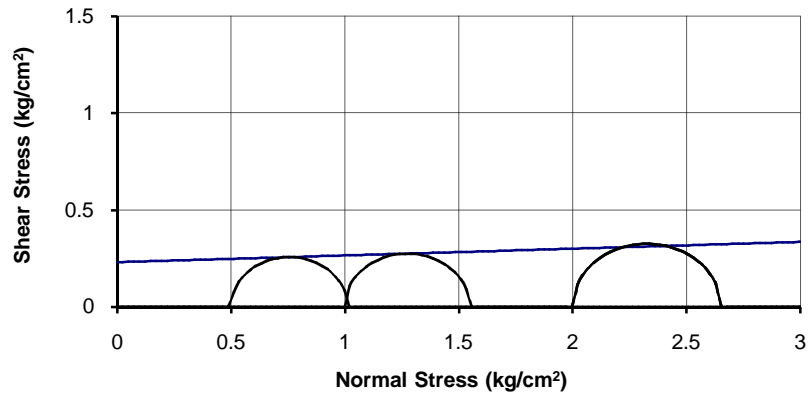
Test Type: UU

c : 0.96 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/17

Mohr-Diagram

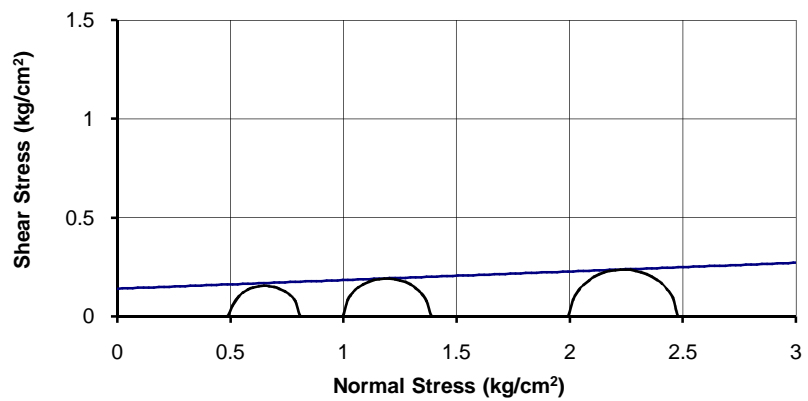


BH No.: BH-5
Depth: 1.00 m

Test Type: UU

c : 0.23 kg/sq. cm
φ : 2 degree

Mohr-Diagram

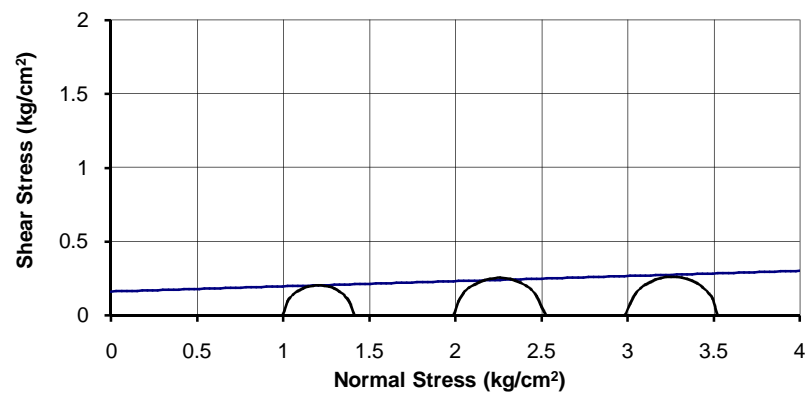


BH No.: BH-5
Depth: 5.00 m

Test Type: UU

c : 0.14 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-5
Depth: 11.00 m

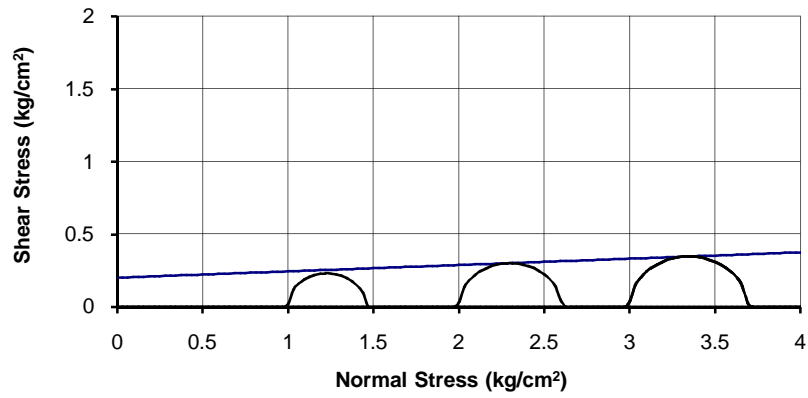
Test Type: UU

c : 0.16 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/18

Mohr-Diagram

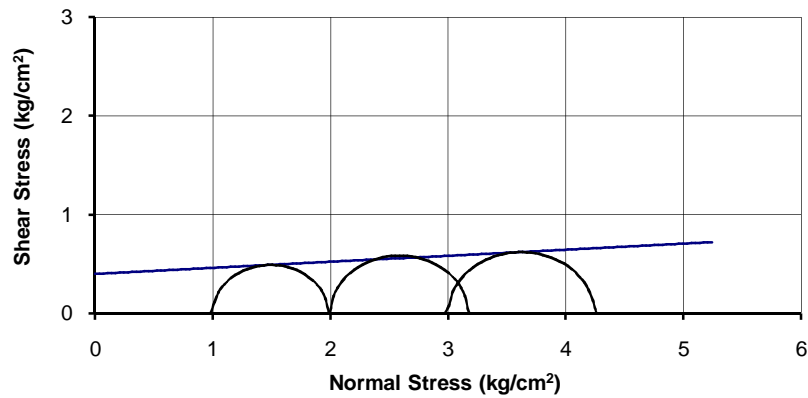


BH No.: BH-5
Depth: 15.00 m

Test Type: UU

c : 0.20 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

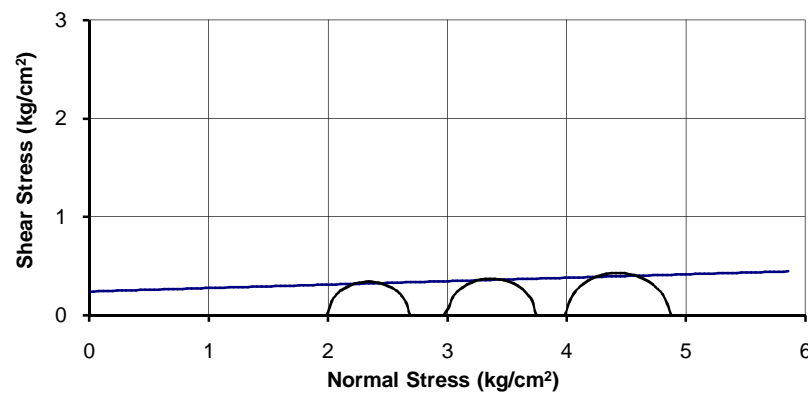


BH No.: BH-5
Depth: 17.00 m

Test Type: UU

c : 0.40 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-5
Depth: 23.00 m

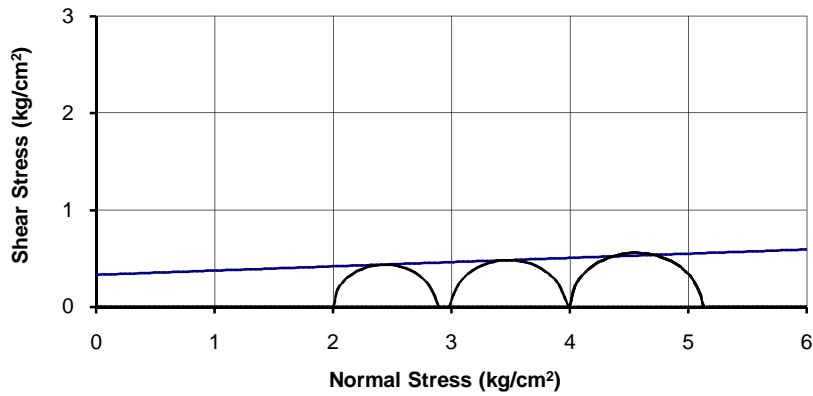
Test Type: UU

c : 0.24 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/19

Mohr-Diagram

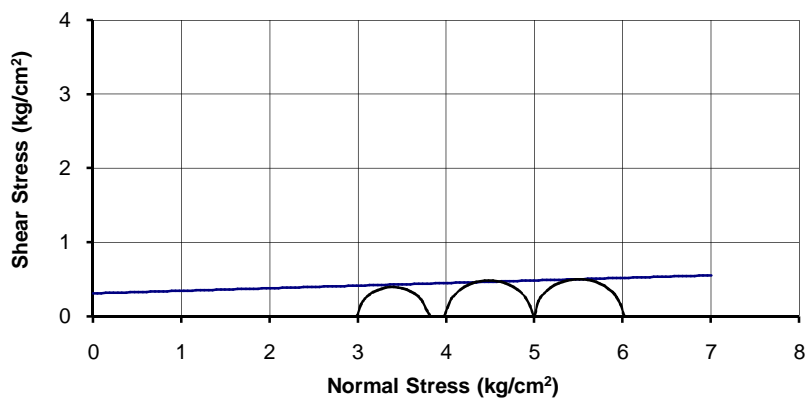


BH No.: BH-5
Depth: 27.00 m

Test Type: UU

c : 0.33 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

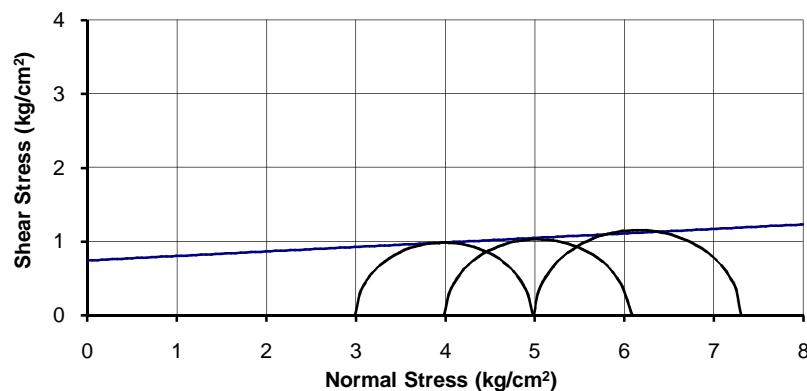


BH No.: BH-5
Depth: 31.00 m

Test Type: UU

c : 0.31 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-5
Depth: 35.00 m

Test Type: UU

c : 0.74 kg/sq. cm
φ : 3.5 degree

Project: Geotechnical Investigation at Haldia Terminal

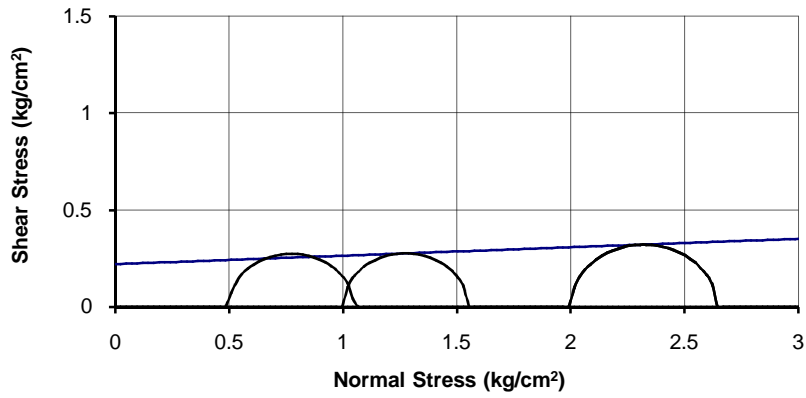
Job No.

Fig. No.

XCSPL/1372

F/20

Mohr-Diagram

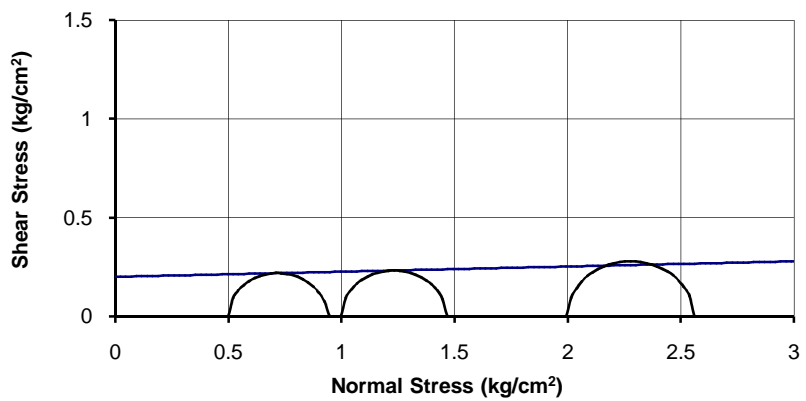


BH No.: BH-6
Depth: 1.00 m

Test Type: UU

$c : 0.22 \text{ kg/sq. cm}$
 $\phi : 2.5 \text{ degree}$

Mohr-Diagram

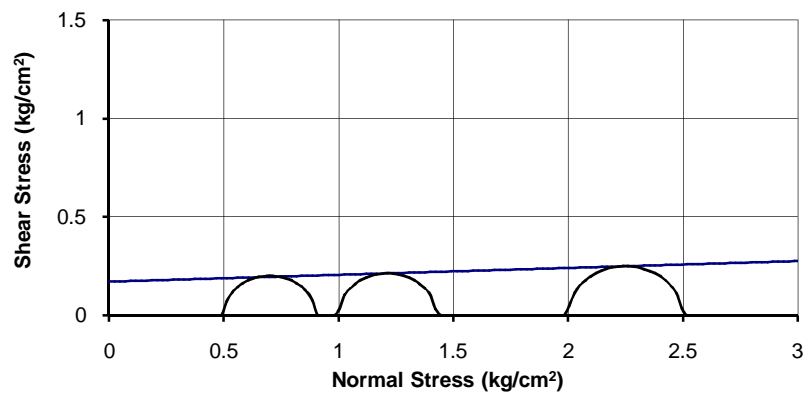


BH No.: BH-6
Depth: 3.00 m

Test Type: UU

$c : 0.20 \text{ kg/sq. cm}$
 $\phi : 1.5 \text{ degree}$

Mohr-Diagram



BH No.: BH-6
Depth: 5.00 m

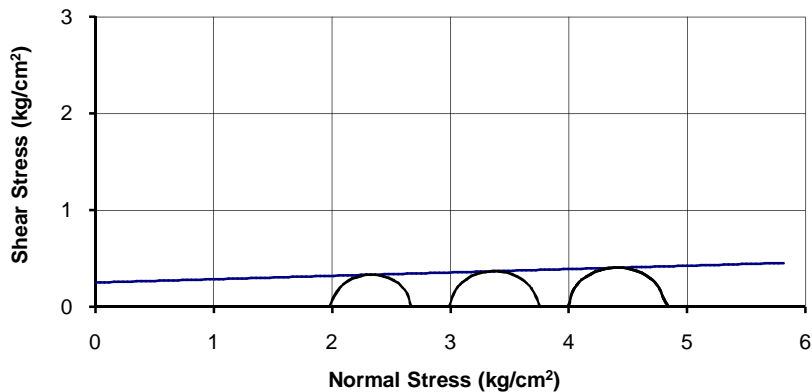
Test Type: UU

$c : 0.17 \text{ kg/sq. cm}$
 $\phi : 2 \text{ degree}$

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/21

Mohr-Diagram

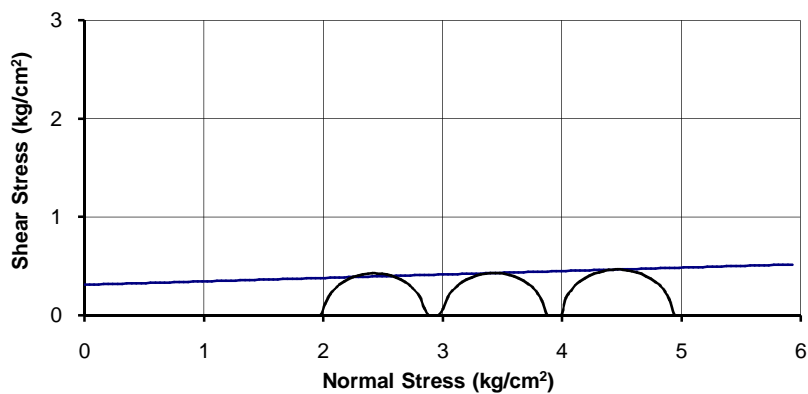


BH No.: BH-6
Depth: 23.00 m

Test Type: UU

c : 0.25 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-6
Depth: 27.00 m

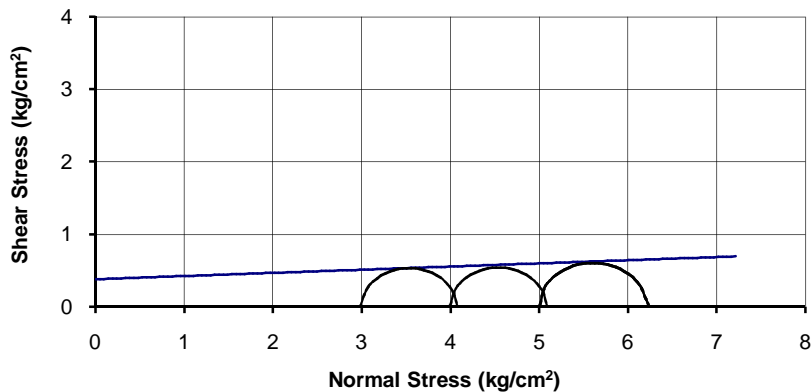
Test Type: UU

c : 0.31 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/22

Mohr-Diagram

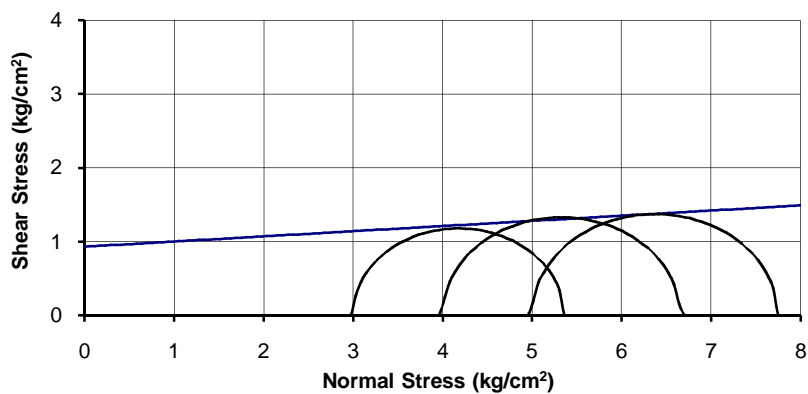


BH No.: BH-6
Depth: 33.00 m

Test Type: UU

c : 0.38 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-6
Depth: 37.00 m

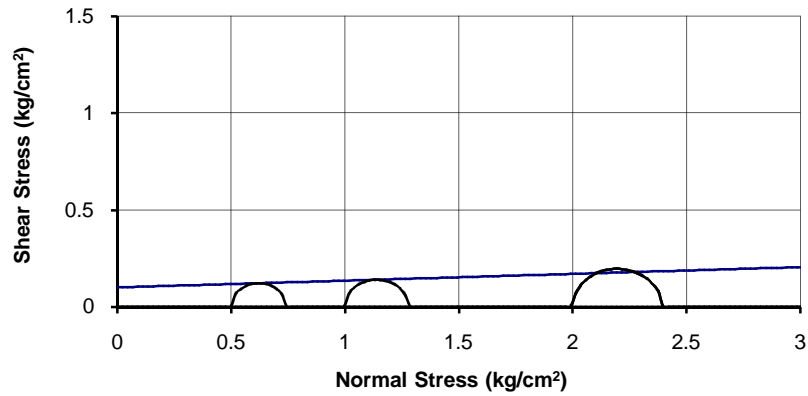
Test Type: UU

c : 0.93 kg/sq. cm
φ : 4 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/23

Mohr-Diagram

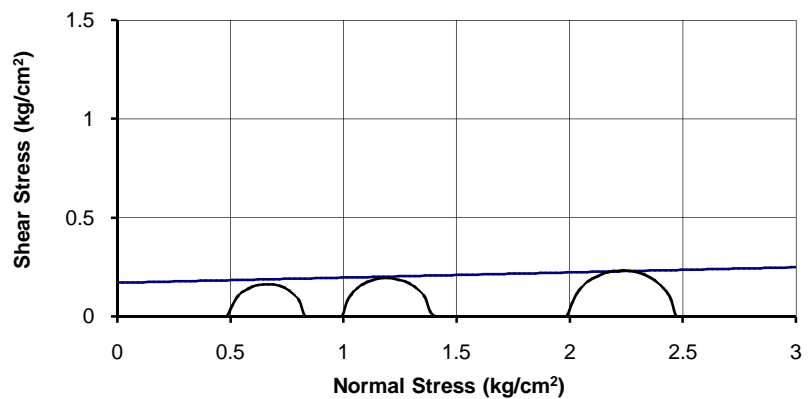


BH No.: BH-7
Depth: 3.00 m

Test Type: UU

c : 0.10 kg/sq. cm
φ : 2 degree

Mohr-Diagram

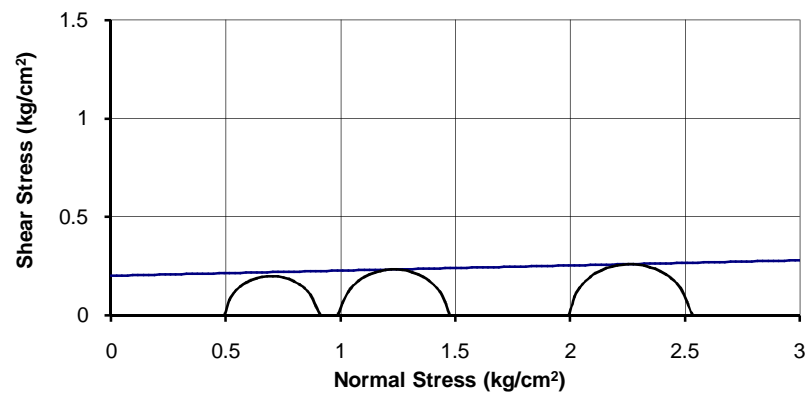


BH No.: BH-7
Depth: 5.00 m

Test Type: UU

c : 0.17 kg/sq. cm
φ : 1.5 degree

Mohr-Diagram



BH No.: BH-7
Depth: 7.00 m

Test Type: UU

c : 0.20 kg/sq. cm
φ : 1.5 degree

Project: Geotechnical Investigation at Haldia Terminal

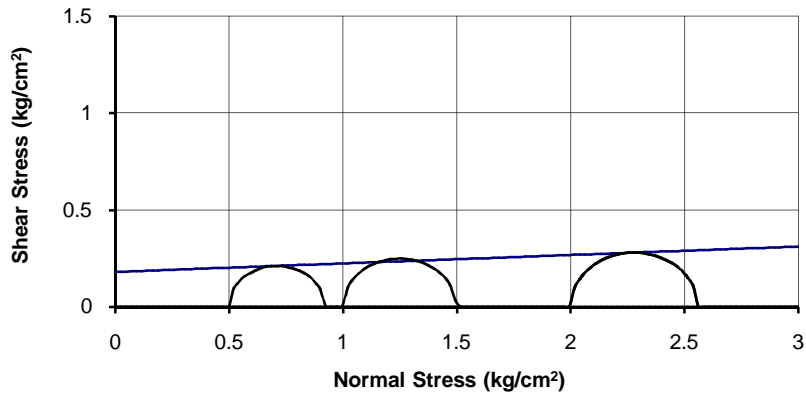
Job No.

Fig. No.

XCSPL/1372

F/24

Mohr-Diagram

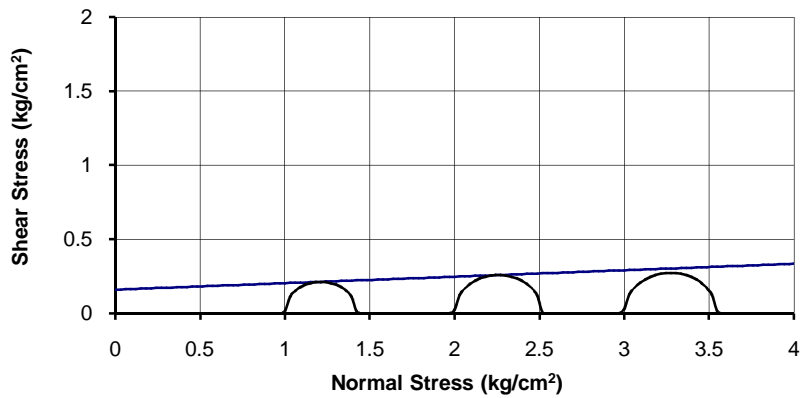


BH No.: BH-7
Depth: 9.00 m

Test Type: UU

c : 0.18 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

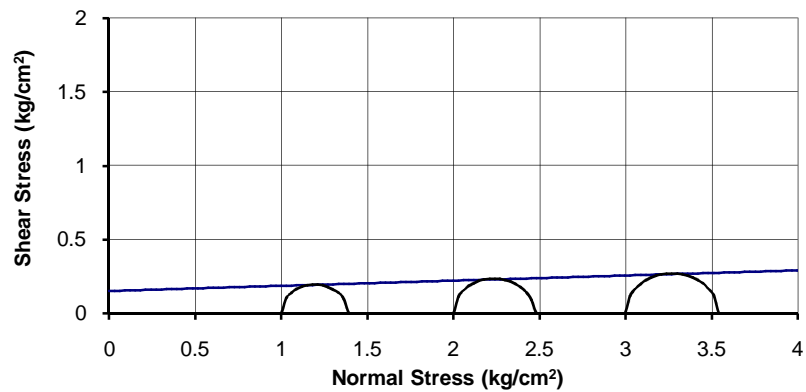


BH No.: BH-7
Depth: 11.00 m

Test Type: UU

c : 0.16 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-7
Depth: 13.00 m

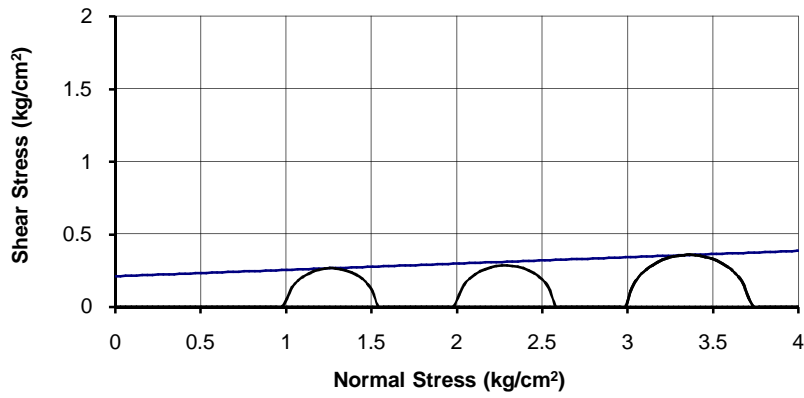
Test Type: UU

c : 0.15 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/25

Mohr-Diagram

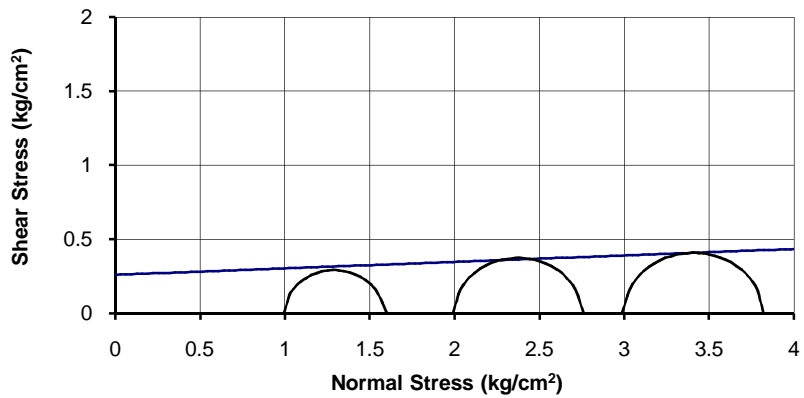


BH No.: BH-7
Depth: 17.00 m

Test Type: UU

c : 0.21 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

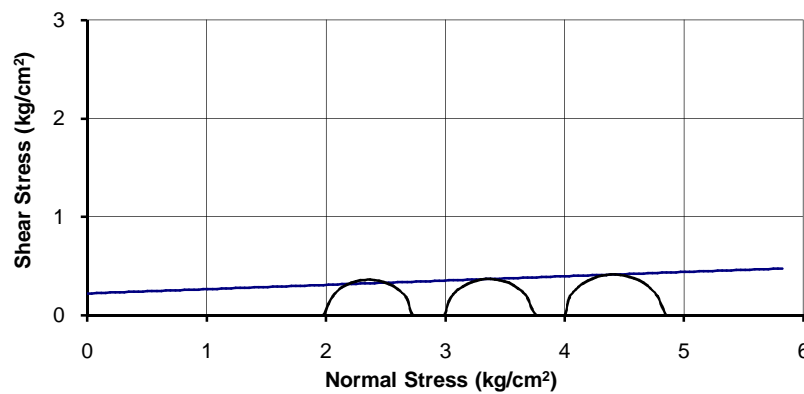


BH No.: BH-7
Depth: 19.00 m

Test Type: UU

c : 0.26 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-7
Depth: 23.00 m

Test Type: UU

c : 0.22 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

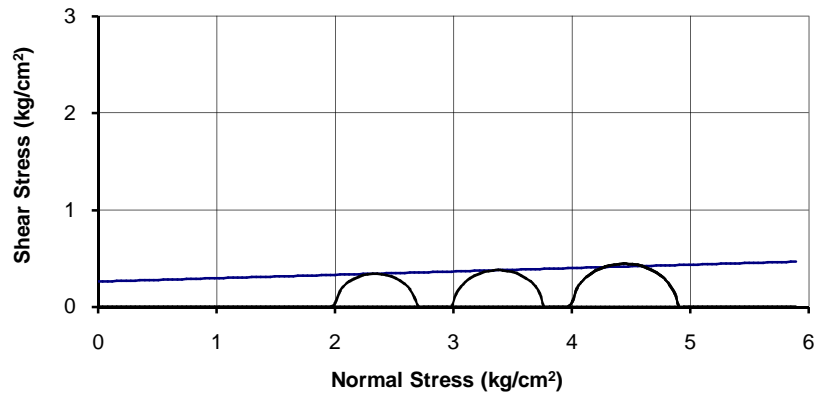
Job No.

Fig. No.

XCSPL/1372

F/26

Mohr-Diagram

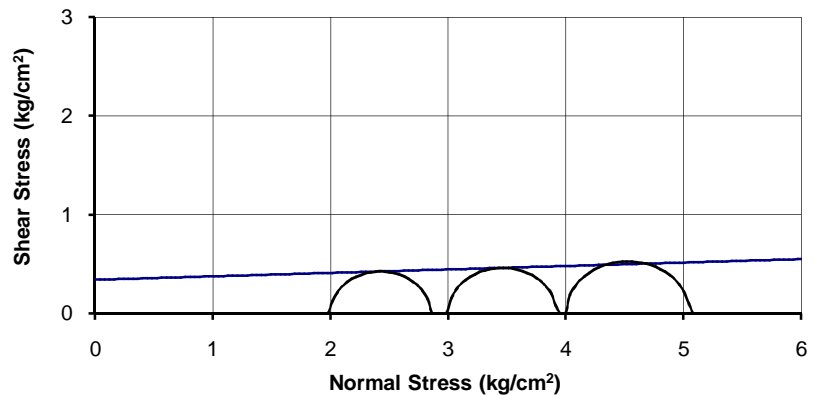


BH No.: BH-7
Depth: 25.00 m

Test Type: UU

c : 0.26 kg/sq. cm
φ : 2 degree

Mohr-Diagram

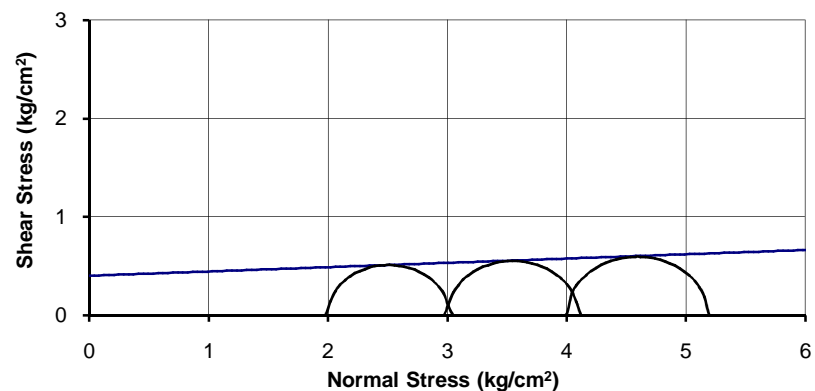


BH No.: BH-7
Depth: 27.00 m

Test Type: UU

c : 0.34 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-7
Depth: 29.00 m

Test Type: UU

c : 0.40 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

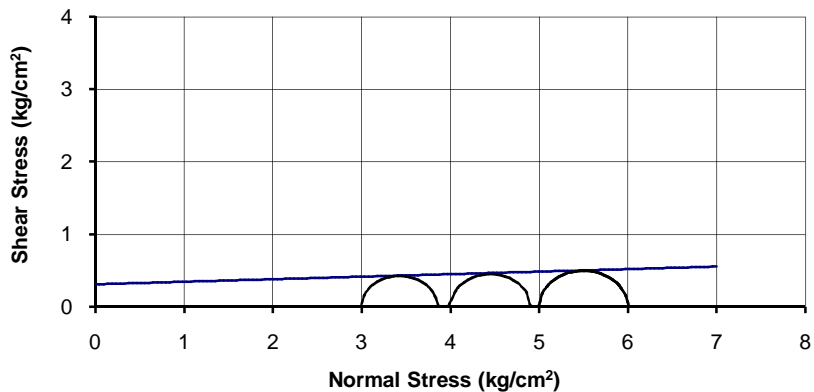
Job No.

Fig. No.

XCSP/L/1372

F/27

Mohr-Diagram

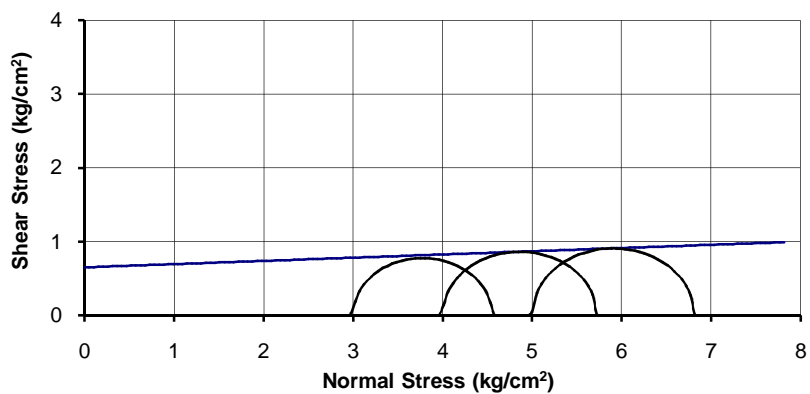


BH No.: BH-7
Depth: 31.00 m

Test Type: UU

$c : 0.31$ kg/sq. cm
 $\phi : 2$ degree

Mohr-Diagram



BH No.: BH-7
Depth: 35.00 m

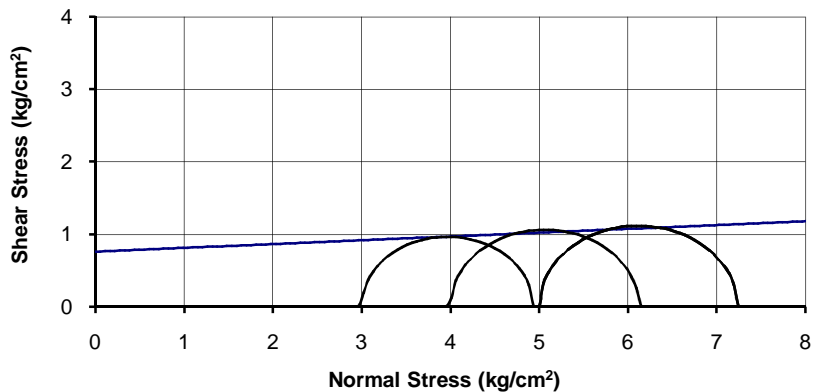
Test Type: UU

$c : 0.65$ kg/sq. cm
 $\phi : 2.5$ degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/28

Mohr-Diagram

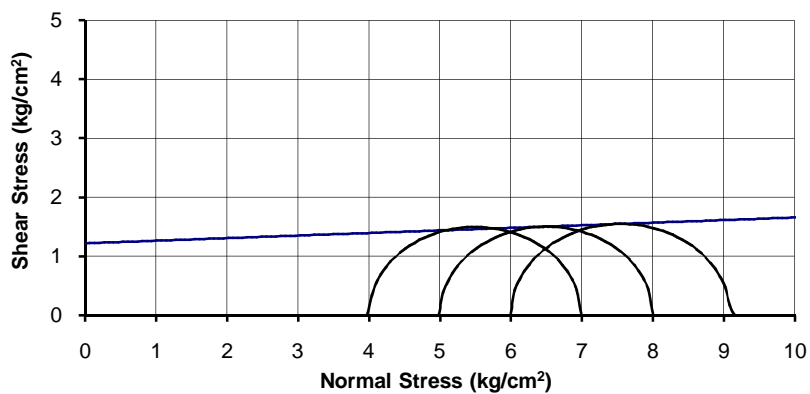


BH No.: BH-7
Depth: 37.00 m

Test Type: UU

c : 0.76 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-7
Depth: 47.00 m

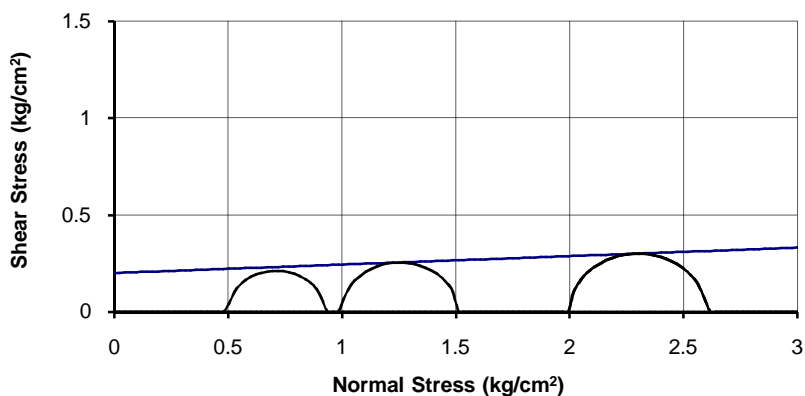
Test Type: UU

c : 1.22 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSP/L/1372	F/29

Mohr-Diagram

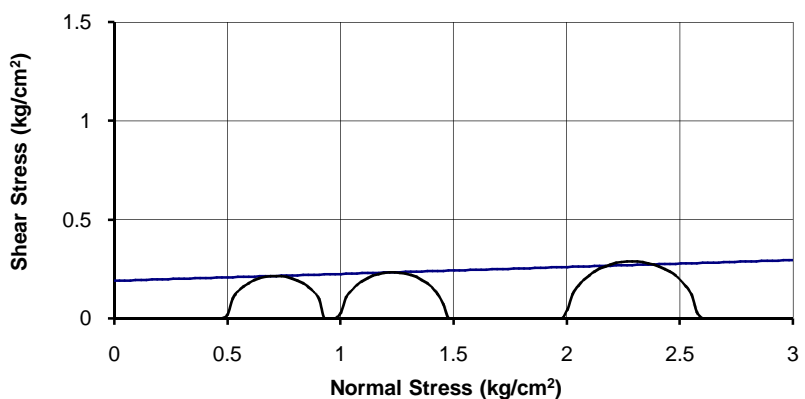


BH No.: BH-8
Depth: 1.00 m

Test Type: UU

c : 0.20 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

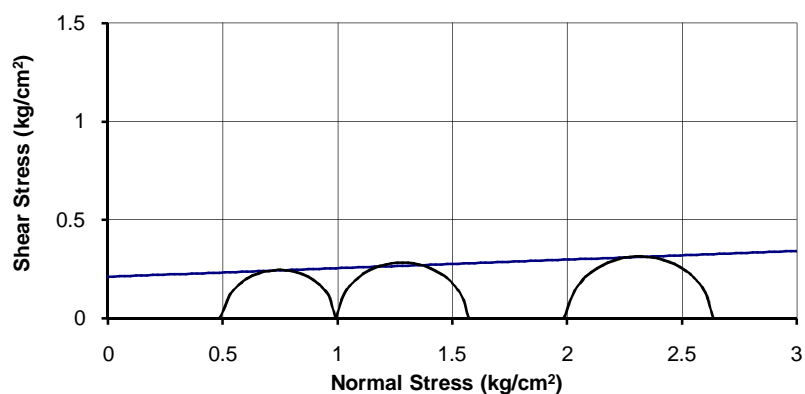


BH No.: BH-8
Depth: 3.00 m

Test Type: UU

c : 0.19 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-8
Depth: 7.00 m

Test Type: UU

c : 0.21 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

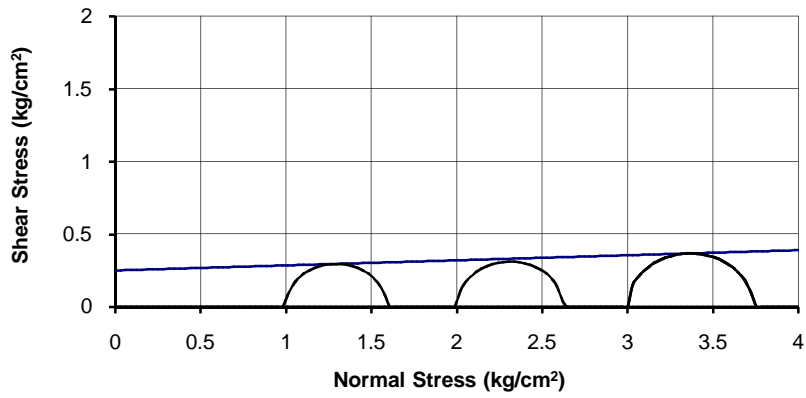
Job No.

Fig. No.

XCSPL/1372

F/30

Mohr-Diagram

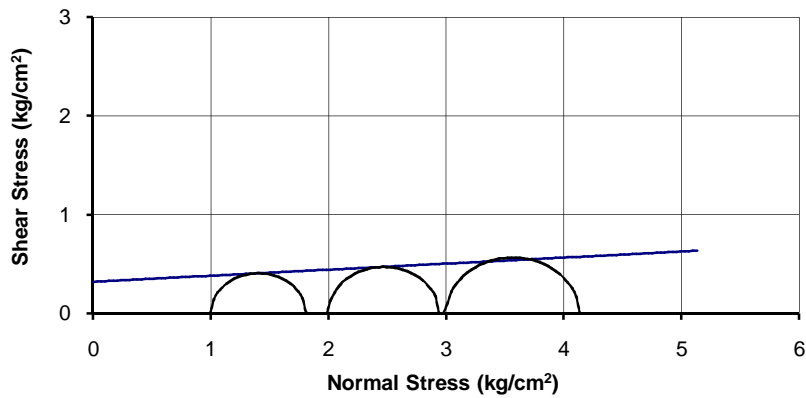


BH No.: BH-8
Depth: 11.00 m

Test Type: UU

c : 0.25 kg/sq. cm
φ : 2 degree

Mohr-Diagram

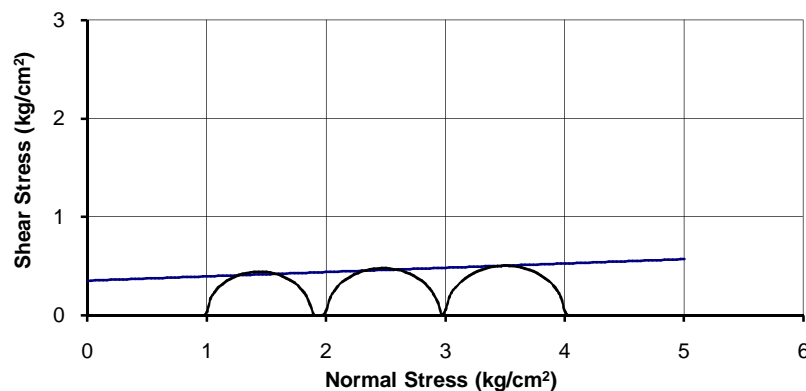


BH No.: BH-8
Depth: 17.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-8
Depth: 19.00 m

Test Type: UU

c : 0.35 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

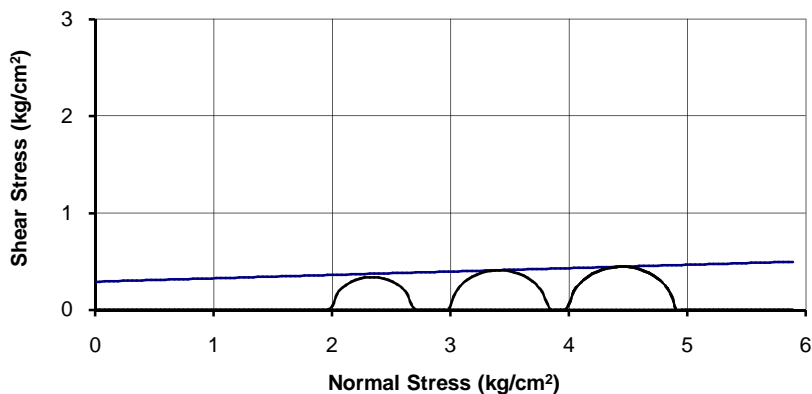
Job No.

Fig. No.

XCSPL/1372

F/31

Mohr-Diagram

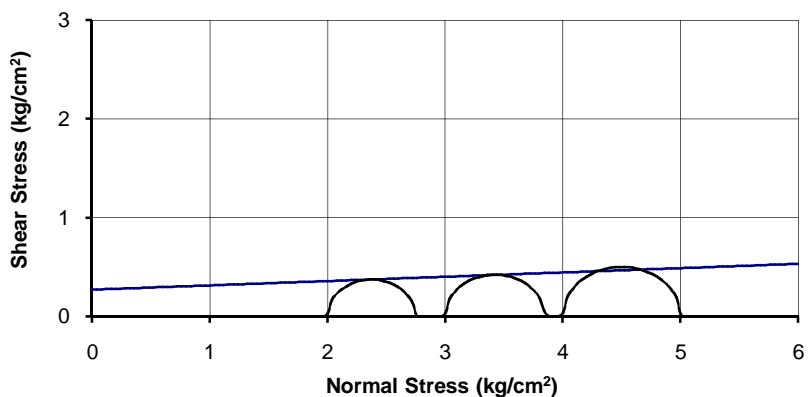


BH No.: BH-8
Depth: 23.00 m

Test Type: UU

c : 0.29 kg/sq. cm
φ : 2 degree

Mohr-Diagram

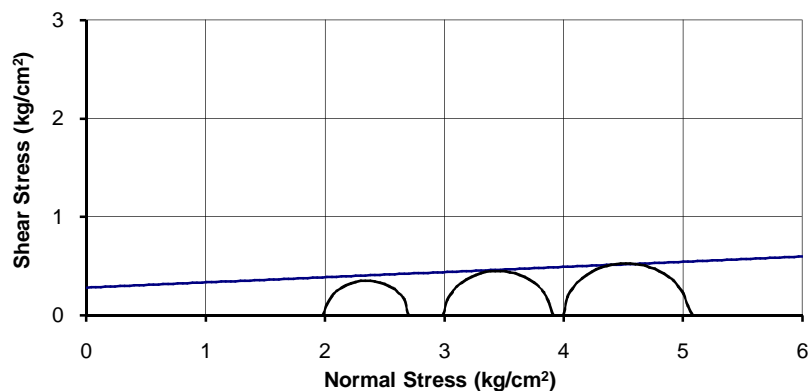


BH No.: BH-8
Depth: 25.00 m

Test Type: UU

c : 0.27 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-8
Depth: 27.00 m

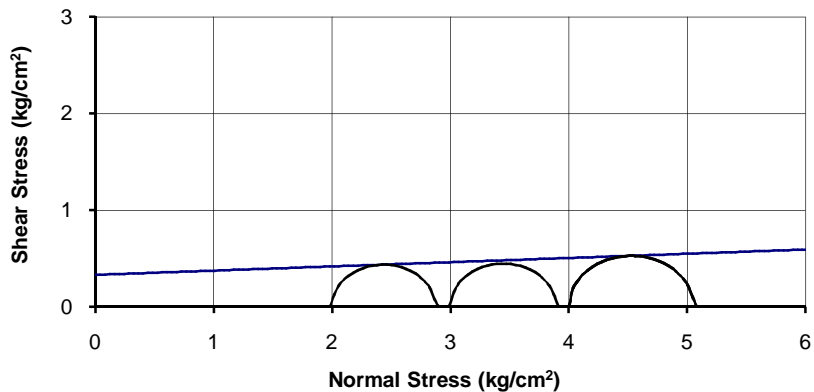
Test Type: UU

c : 0.28 kg/sq. cm
φ : 3 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/32

Mohr-Diagram

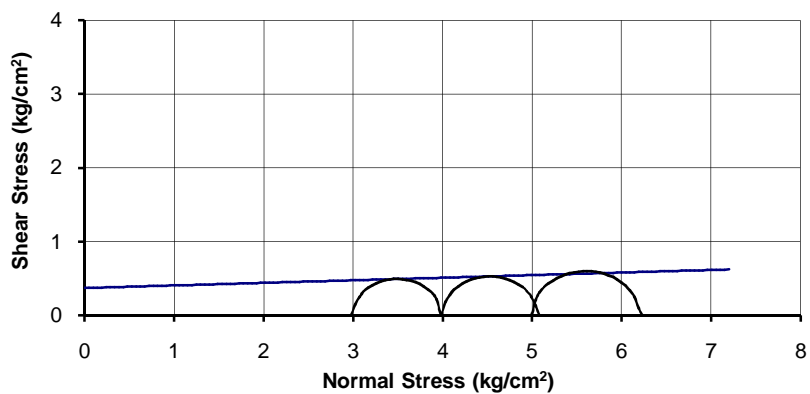


BH No.: BH-8
Depth: 29.00 m

Test Type: UU

c : 0.33 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-8
Depth: 33.00 m

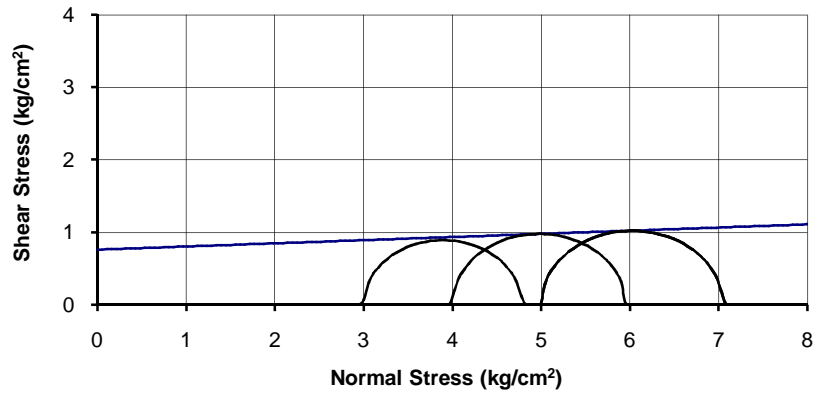
Test Type: UU

c : 0.37 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/33

Mohr-Diagram

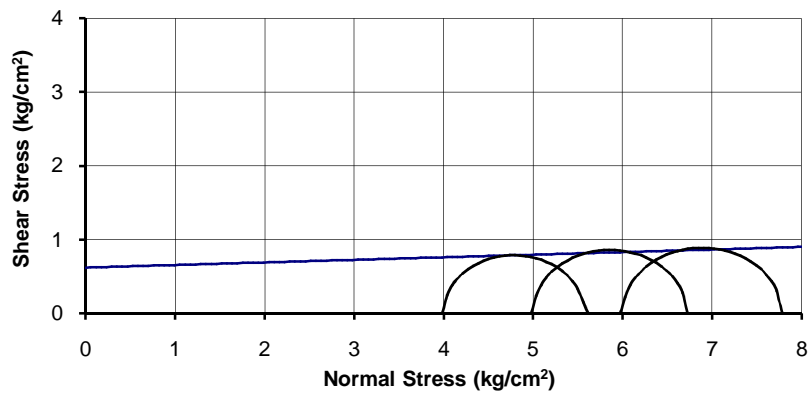


BH No.: BH-8
Depth: 37.00 m

Test Type: UU

c : 0.76 kg/sq. cm
 ϕ : 2.5 degree

Mohr-Diagram



BH No.: BH-8
Depth: 47.00 m

Test Type: UU

c : 0.62 kg/sq. cm
 ϕ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

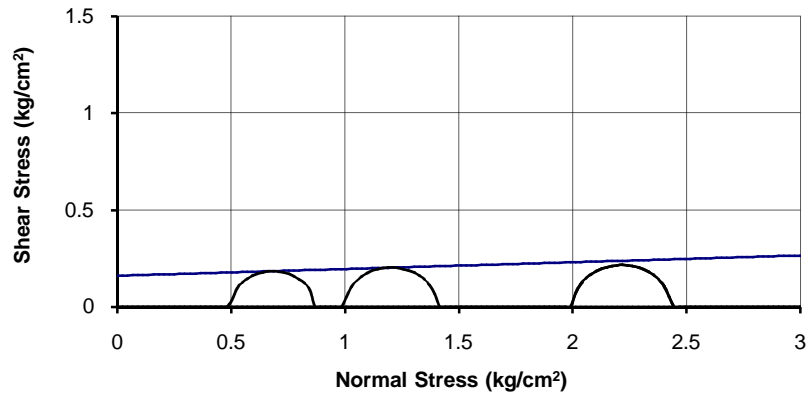
Job No.

Fig. No.

XCSPL/1372

F/34

Mohr-Diagram

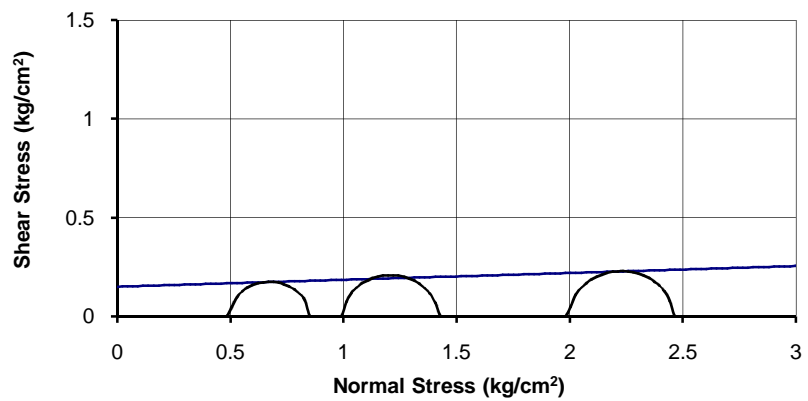


BH No.: BH-9
Depth: 2.00 m

Test Type: UU

c : 0.16 kg/sq. cm
φ : 2 degree

Mohr-Diagram

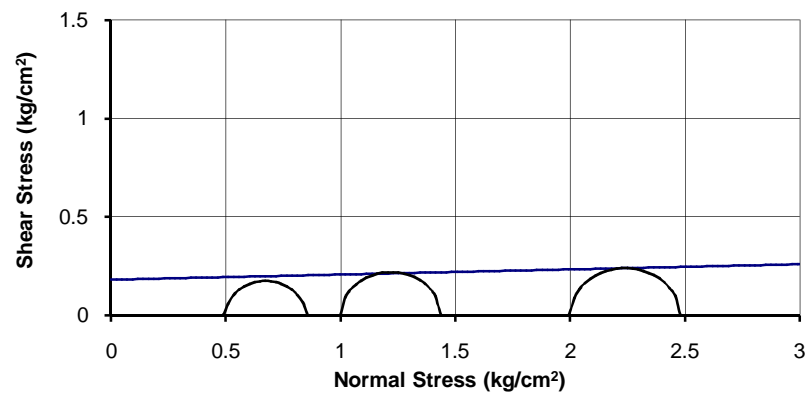


BH No.: BH-9
Depth: 4.00 m

Test Type: UU

c : 0.15 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-9
Depth: 6.00 m

Test Type: UU

c : 0.18 kg/sq. cm
φ : 1.5 degree

Project: Geotechnical Investigation at Haldia Terminal

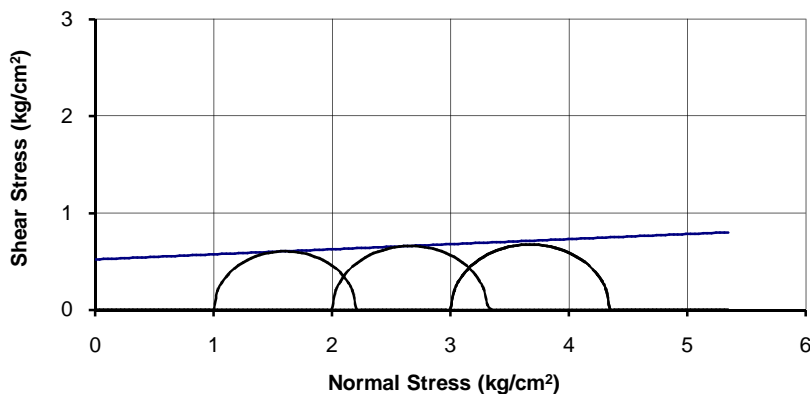
Job No.

Fig. No.

XCSPL/1372

F/35

Mohr-Diagram

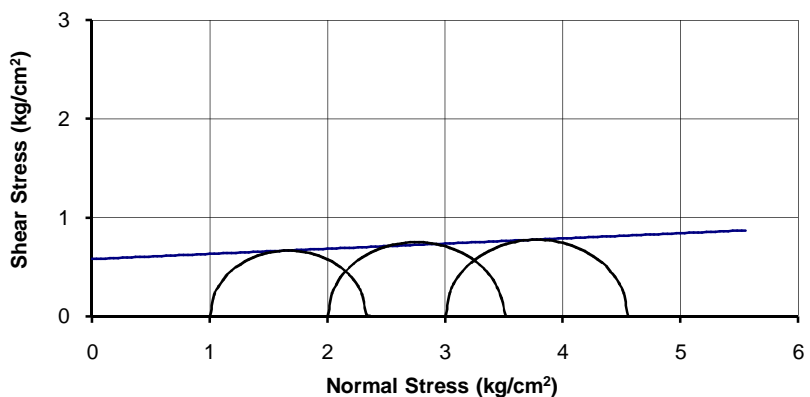


BH No.: BH-9
Depth: 12.00 m

Test Type: UU

c : 0.52 kg/sq. cm
φ : 3 degree

Mohr-Diagram

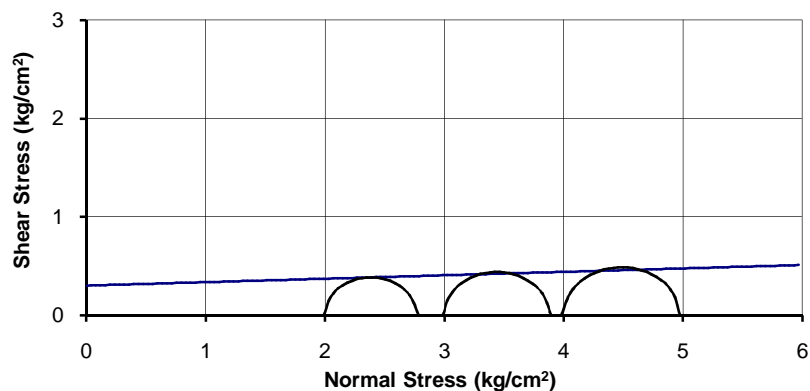


BH No.: BH-9
Depth: 16.00 m

Test Type: UU

c : 0.58 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-9
Depth: 20.00 m

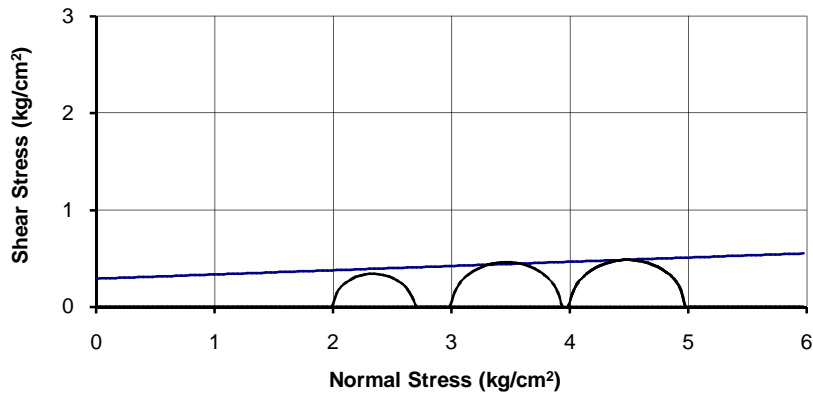
Test Type: UU

c : 0.30 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/36

Mohr-Diagram

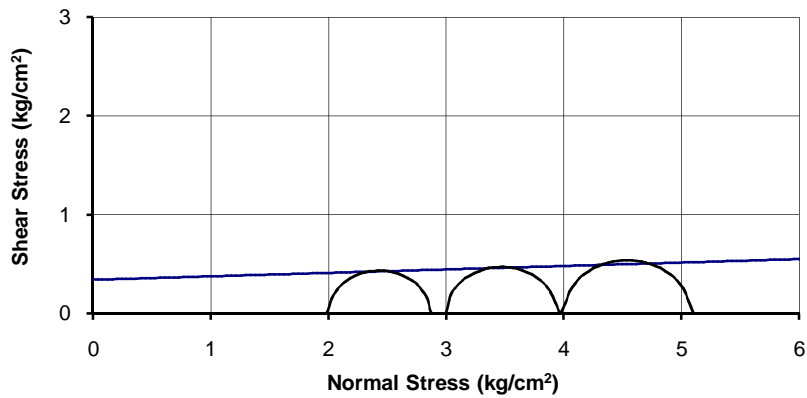


BH No.: BH-9
Depth: 24.00 m

Test Type: UU

c : 0.29 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

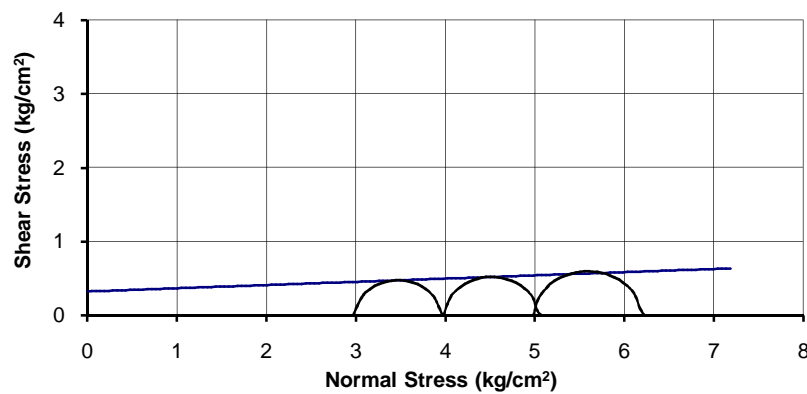


BH No.: BH-9
Depth: 26.00 m

Test Type: UU

c : 0.34 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-9
Depth: 30.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

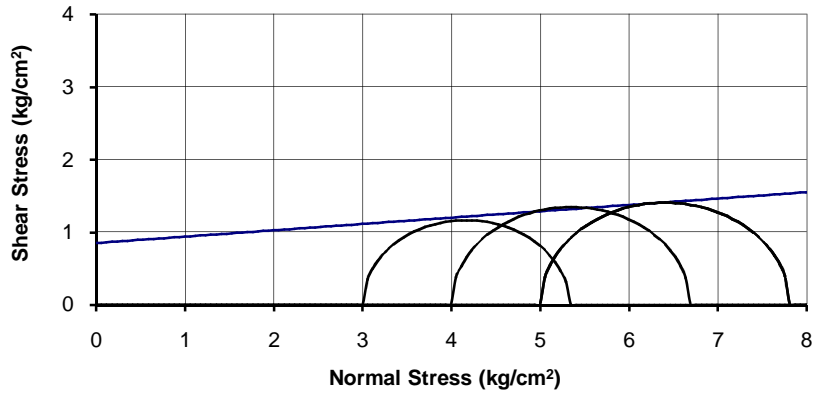
Job No.

Fig. No.

XCSPL/1372

F/37

Mohr-Diagram

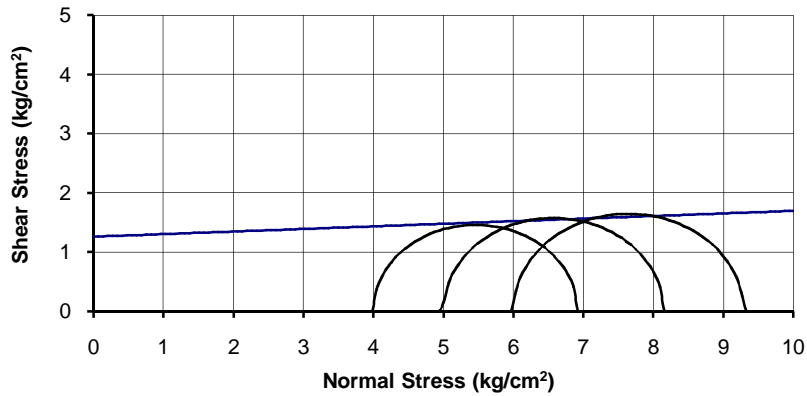


BH No.: BH-9
Depth: 32.00 m

Test Type: UU

c : 0.85 kg/sq. cm
 ϕ : 5 degree

Mohr-Diagram

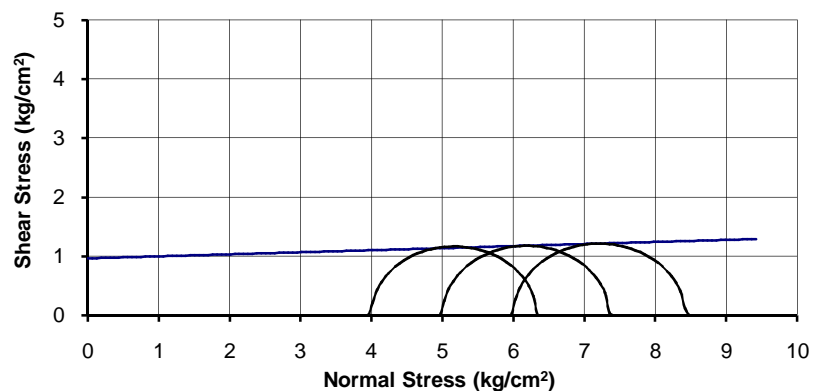


BH No.: BH-9
Depth: 40.00 m

Test Type: UU

c : 1.26 kg/sq. cm
 ϕ : 2.5 degree

Mohr-Diagram



BH No.: BH-9
Depth: 48.00 m

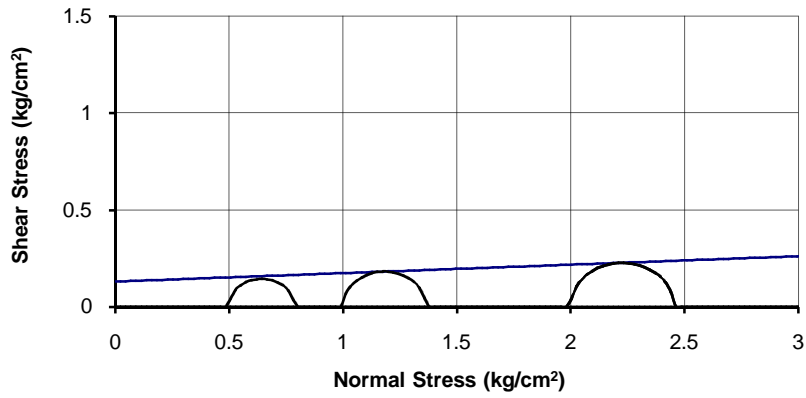
Test Type: UU

c : 0.96 kg/sq. cm
 ϕ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/38

Mohr-Diagram

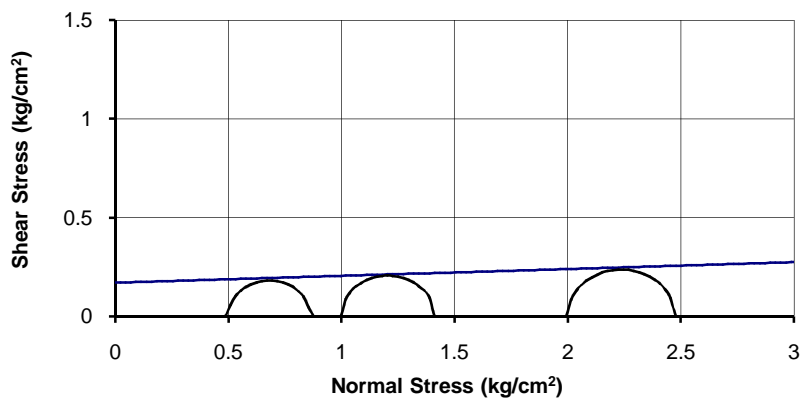


BH No.: BH-10
Depth: 3.00 m

Test Type: UU

c : 0.13 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

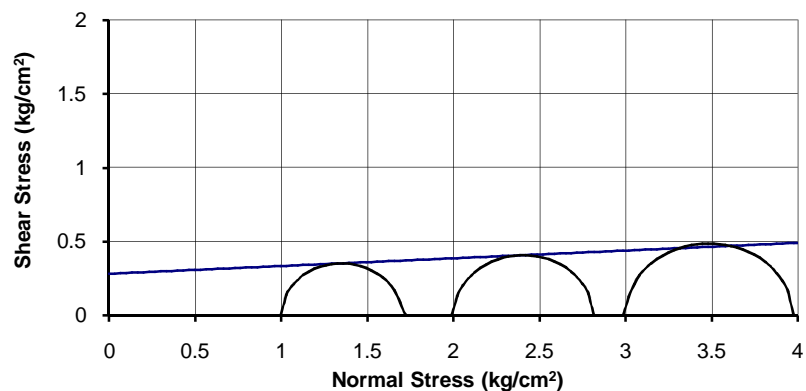


BH No.: BH-10
Depth: 5.00 m

Test Type: UU

c : 0.17 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-10
Depth: 13.00 m

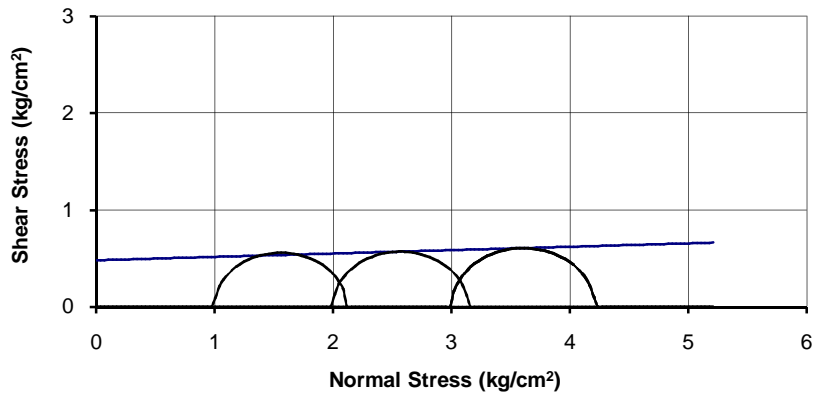
Test Type: UU

c : 0.28 kg/sq. cm
φ : 3 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/39

Mohr-Diagram

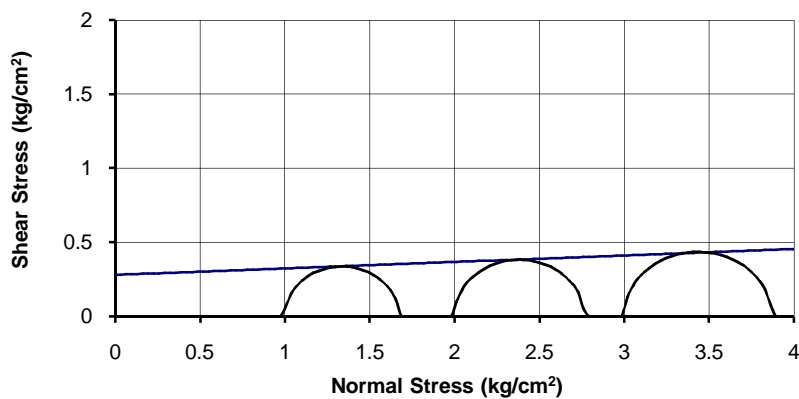


BH No.: BH-10
Depth: 15.00 m

Test Type: UU

c : 0.48 kg/sq. cm
φ : 2 degree

Mohr-Diagram

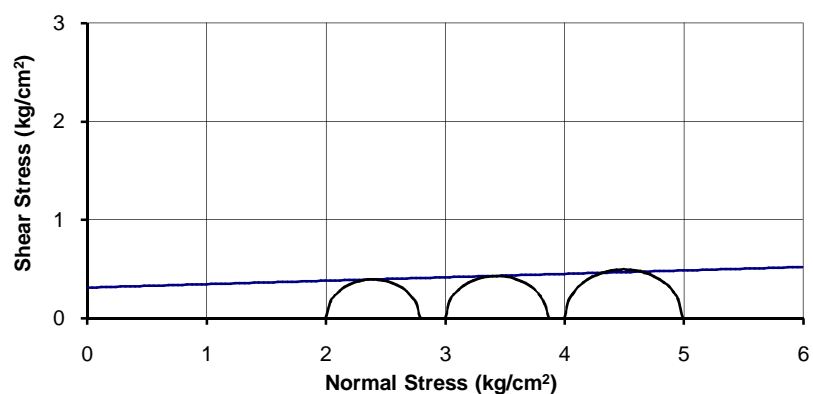


BH No.: BH-10
Depth: 17.00 m

Test Type: UU

c : 0.28 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-10
Depth: 21.00 m

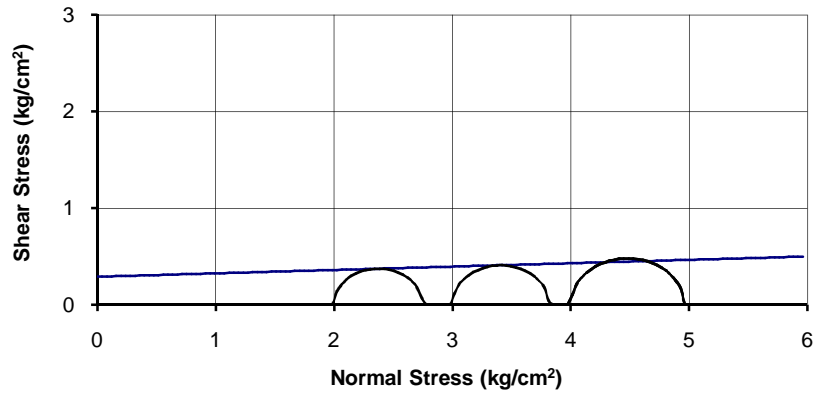
Test Type: UU

c : 0.31 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/40

Mohr-Diagram

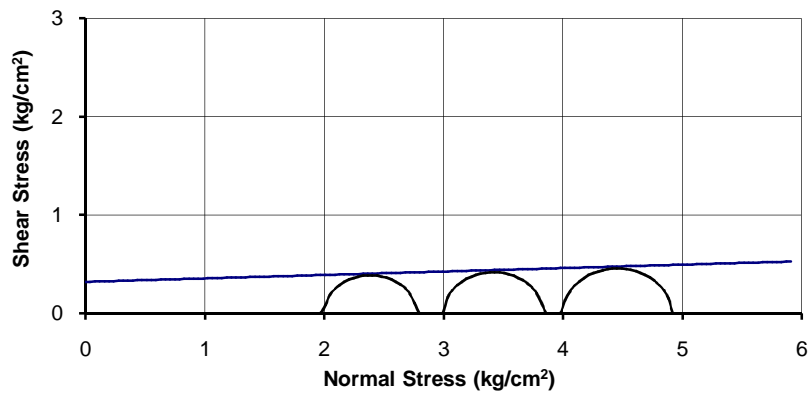


BH No.: BH-10
Depth: 25.00 m

Test Type: UU

c : 0.29 kg/sq. cm
φ : 2 degree

Mohr-Diagram



BH No.: BH-10
Depth: 29.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

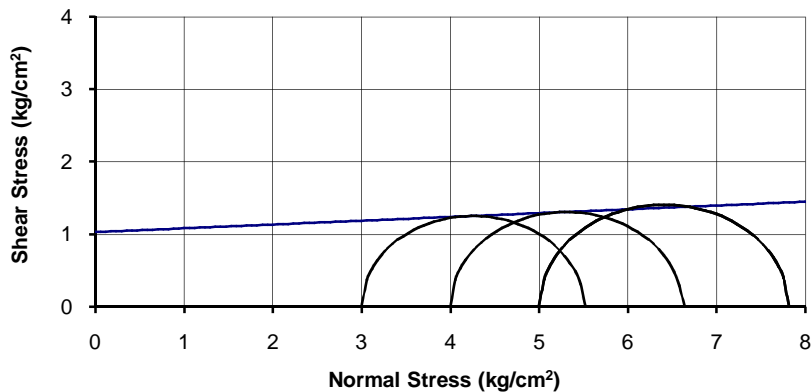
Job No.

Fig. No.

XCSPL/1372

F/41

Mohr-Diagram

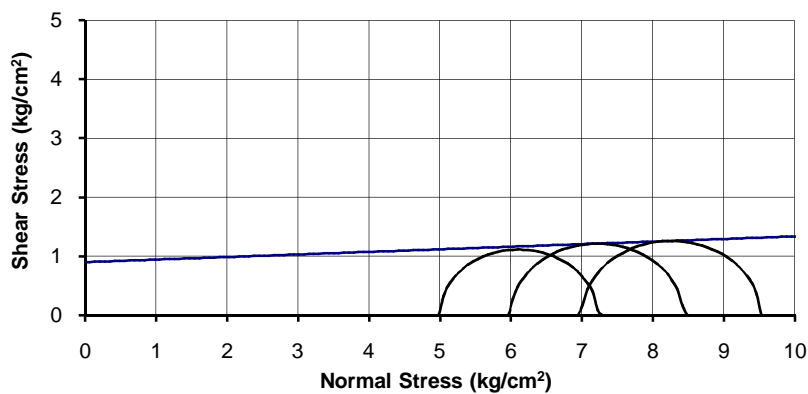


BH No.: BH-10
Depth: 31.00 m

Test Type: UU

c : 1.03 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-10
Depth: 53.00 m

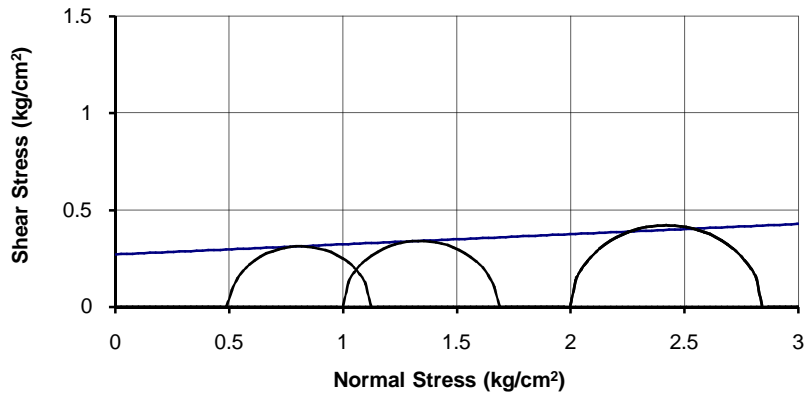
Test Type: UU

c : 0.90 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/42

Mohr-Diagram

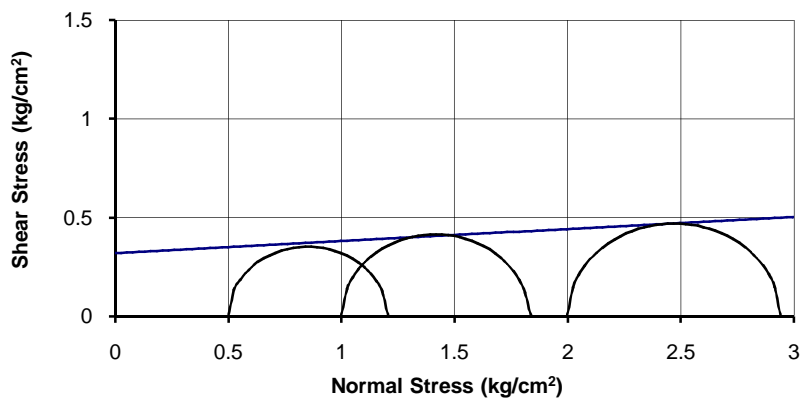


BH No.: BH-11
Depth: 3.00 m

Test Type: UU

c : 0.27 kg/sq. cm
φ : 3 degree

Mohr-Diagram

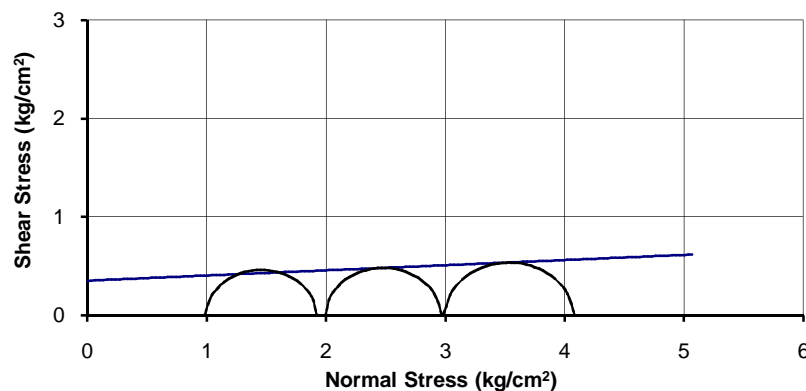


BH No.: BH-11
Depth: 7.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-11
Depth: 11.00 m

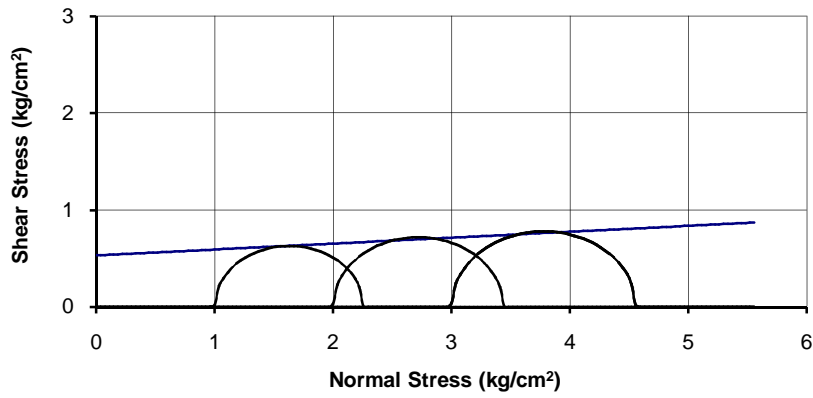
Test Type: UU

c : 0.35 kg/sq. cm
φ : 3 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/43

Mohr-Diagram

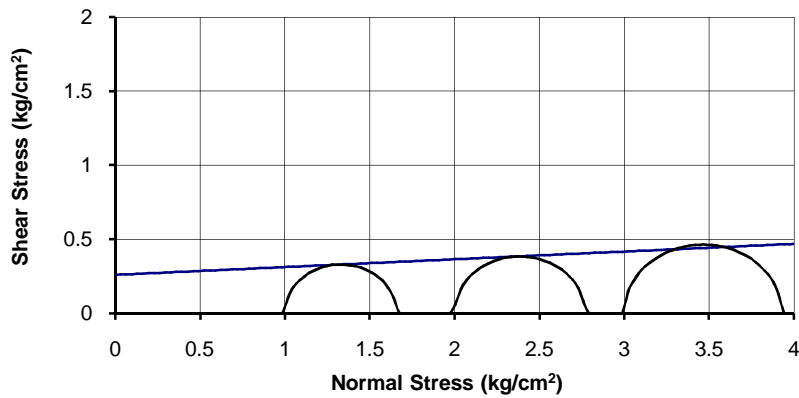


BH No.: BH-11
Depth: 13.00 m

Test Type: UU

c : 0.53 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram

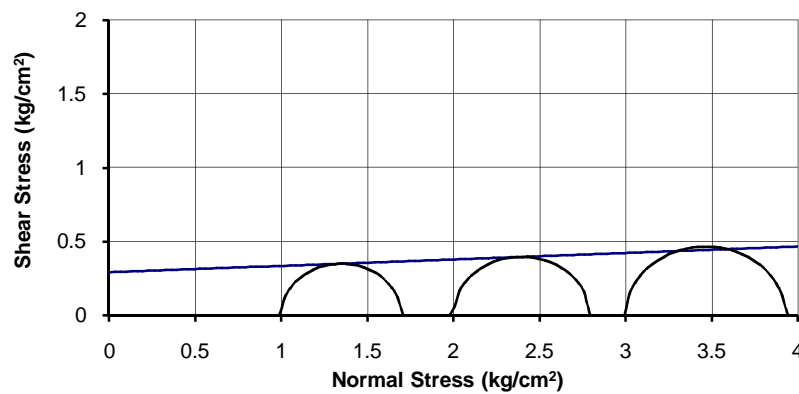


BH No.: BH-11
Depth: 15.00 m

Test Type: UU

c : 0.26 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-11
Depth: 17.00 m

Test Type: UU

c : 0.29 kg/sq. cm
φ : 2.5 degree

Project: Geotechnical Investigation at Haldia Terminal

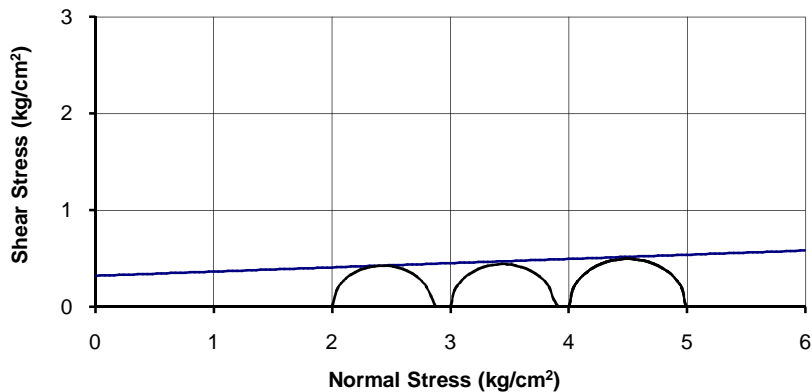
Job No.

Fig. No.

XCSPL/1372

F/44

Mohr-Diagram

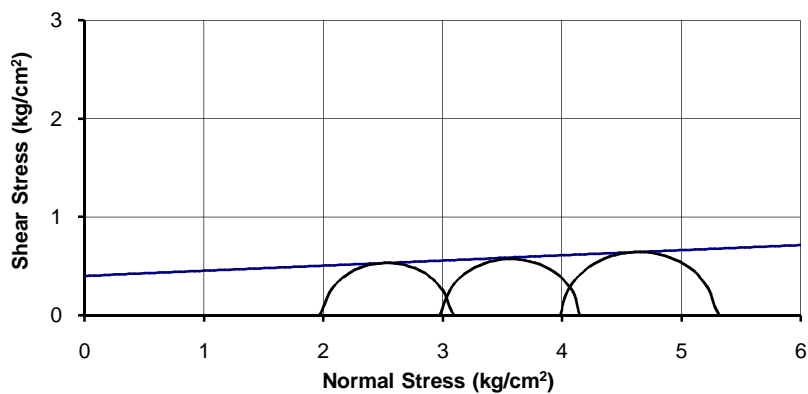


BH No.: BH-11
Depth: 21.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram



BH No.: BH-11
Depth: 25.00 m

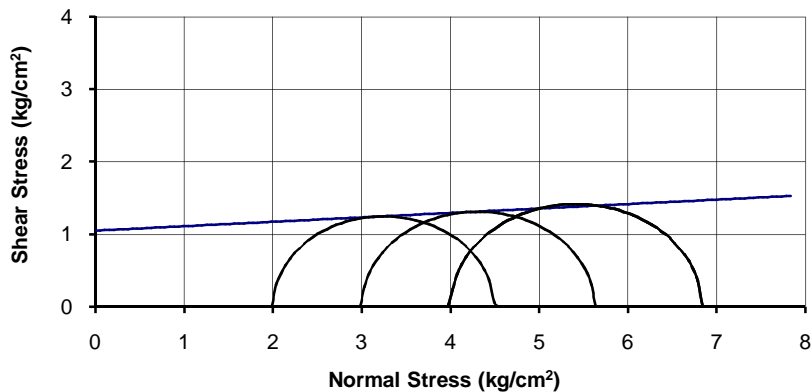
Test Type: UU

c : 0.40 kg/sq. cm
φ : 3 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/45

Mohr-Diagram

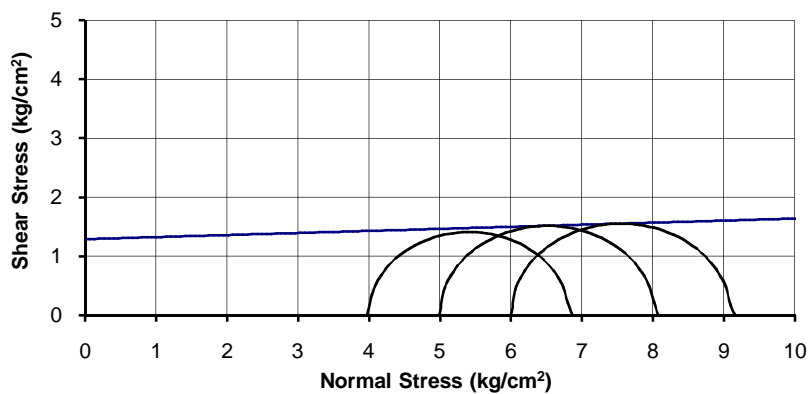


BH No.: BH-11
Depth: 29.00 m

Test Type: UU

c : 1.05 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-11
Depth: 40.00 m

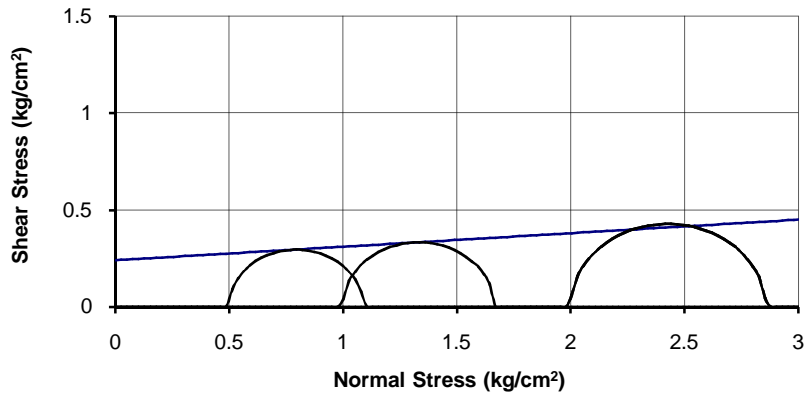
Test Type: UU

c : 1.29 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/46

Mohr-Diagram

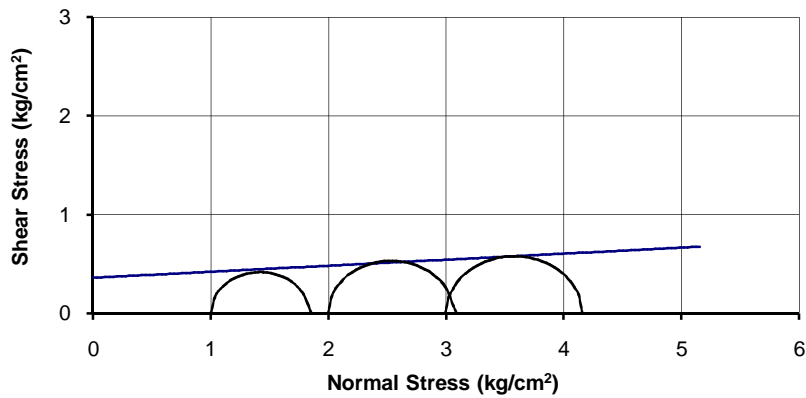


BH No.: BH-12
Depth: 6.00 m

Test Type: UU

c : 0.24 kg/sq. cm
φ : 4 degree

Mohr-Diagram

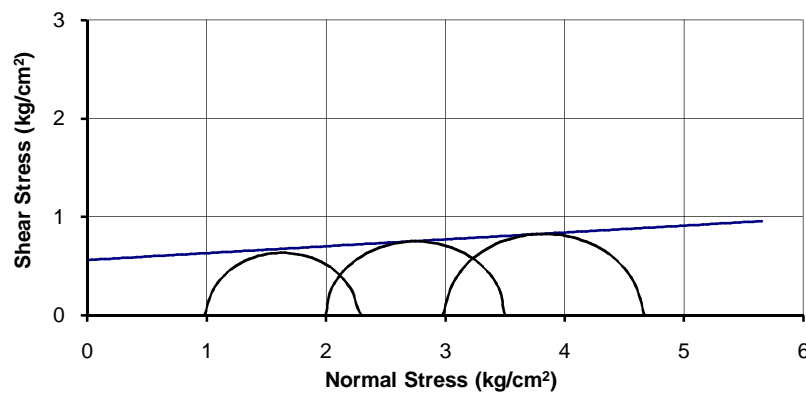


BH No.: BH-12
Depth: 10.00 m

Test Type: UU

c : 0.36 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-12
Depth: 14.00 m

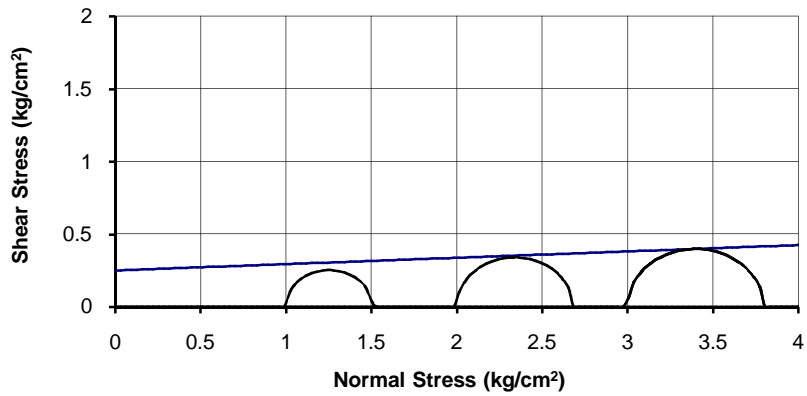
Test Type: UU

c : 0.56 kg/sq. cm
φ : 4 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/47

Mohr-Diagram

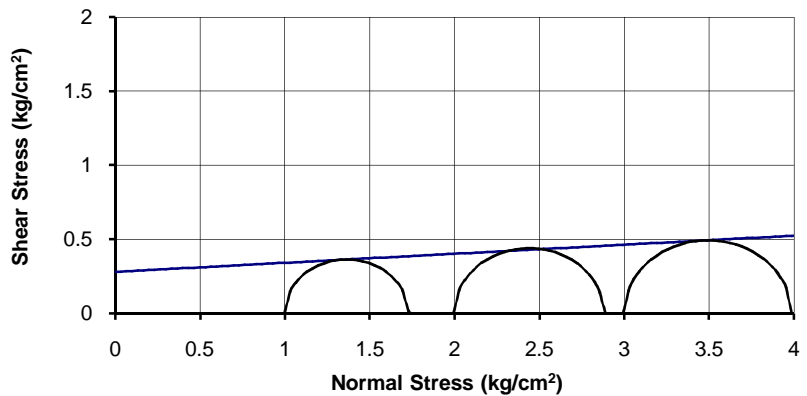


BH No.: BH-12
Depth: 16.00 m

Test Type: UU

c : 0.25 kg/sq. cm
φ : 2.5 degree

Mohr-Diagram

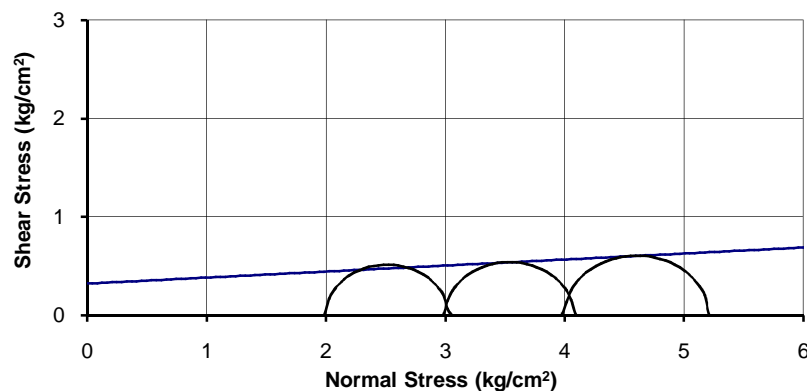


BH No.: BH-12
Depth: 18.00 m

Test Type: UU

c : 0.28 kg/sq. cm
φ : 3.5 degree

Mohr-Diagram



BH No.: BH-12
Depth: 22.00 m

Test Type: UU

c : 0.32 kg/sq. cm
φ : 3.5 degree

Project: Geotechnical Investigation at Haldia Terminal

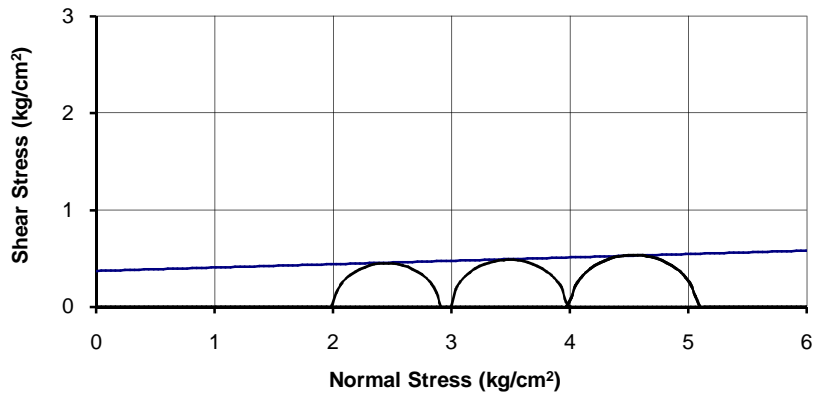
Job No.

Fig. No.

XCSPL/1372

F/48

Mohr-Diagram

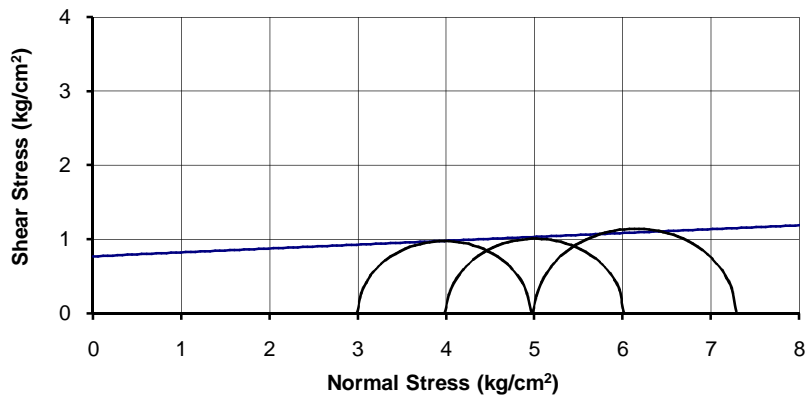


BH No.: BH-12
Depth: 26.00 m

Test Type: UU

c : 0.37 kg/sq. cm
φ : 2 degree

Mohr-Diagram

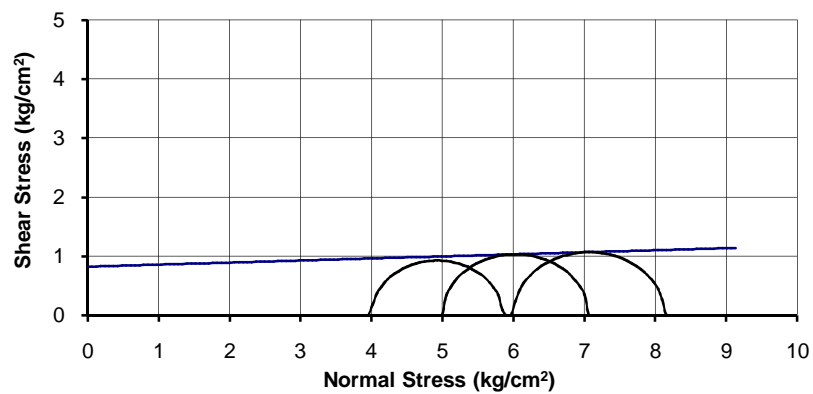


BH No.: BH-12
Depth: 30.00 m

Test Type: UU

c : 0.77 kg/sq. cm
φ : 3 degree

Mohr-Diagram



BH No.: BH-12
Depth: 44.00 m

Test Type: UU

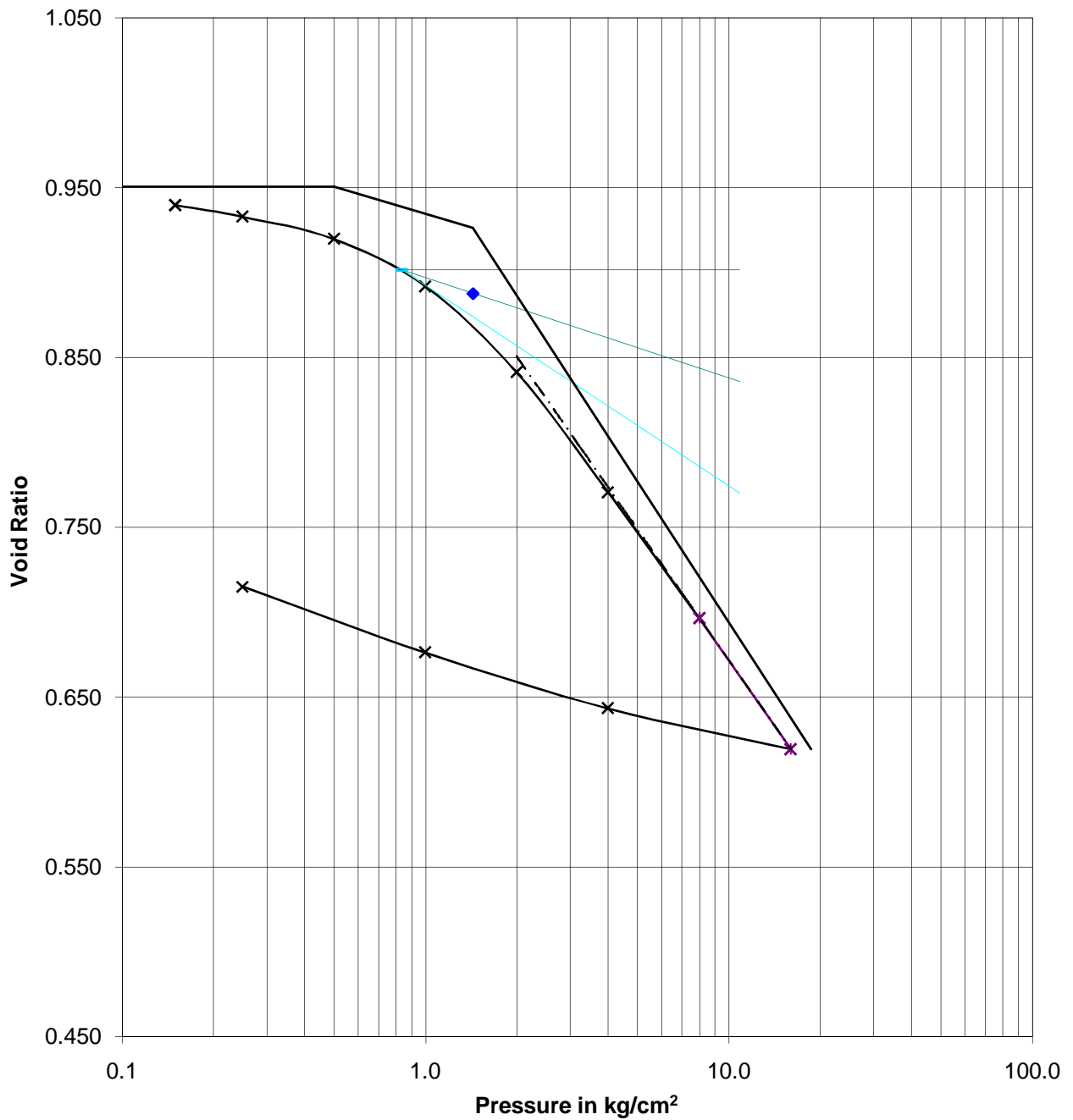
c : 0.82 kg/sq. cm
φ : 2 degree

Project: Geotechnical Investigation at Haldia Terminal

Job No.	Fig. No.
XCSPL/1372	F/49

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-1	C _c = 0.2758	0.25 - 0.50	0.0271
Depth : 5.0m	C _c /(1+e ₀) = 0.1414	0.50 - 1.00	0.0291
e ₀ = 0.9505	p _c = 1.43 kg/cm ²	1.00 - 2.00	0.0267
p ₀ = 0.50 kg/cm ²	C _s = 0.0531	2.00 - 4.00	0.0192
	C _r ≈ 0.0531	4.00 - 8.00	0.0105



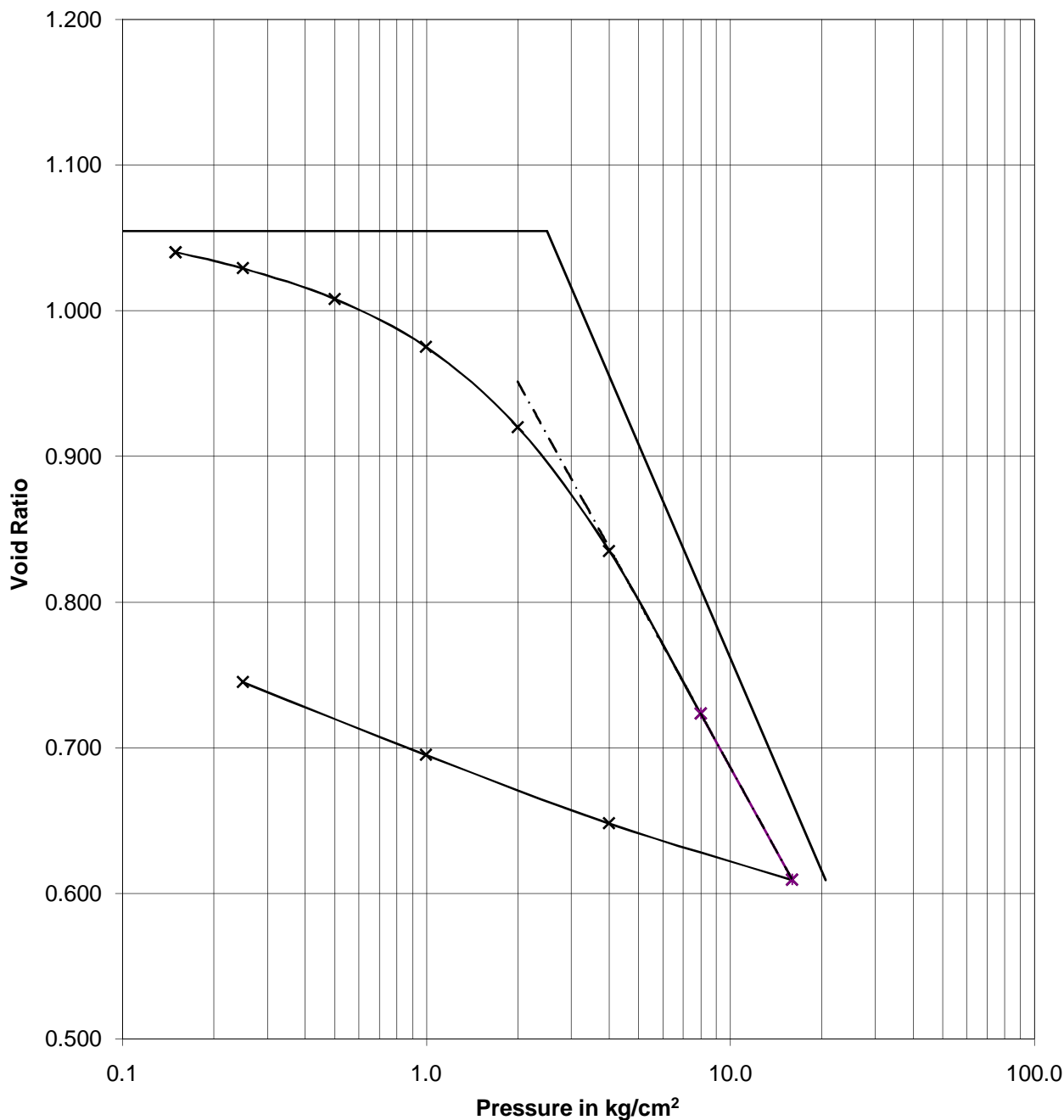
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/1

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-1	C _c = 0.4858	0.25 - 0.50	0.0414
Depth : 31.0m	C _c /(1+e ₀) = 0.2364	0.50 - 1.00	0.0329
e ₀ = 1.0546	p _c = -	1.00 - 2.00	0.0278
p ₀ = 2.49 kg/cm ²	C _s = 0.0752	2.00 - 4.00	0.0221
	C _r ≈ 0.0752	4.00 - 8.00	0.0152



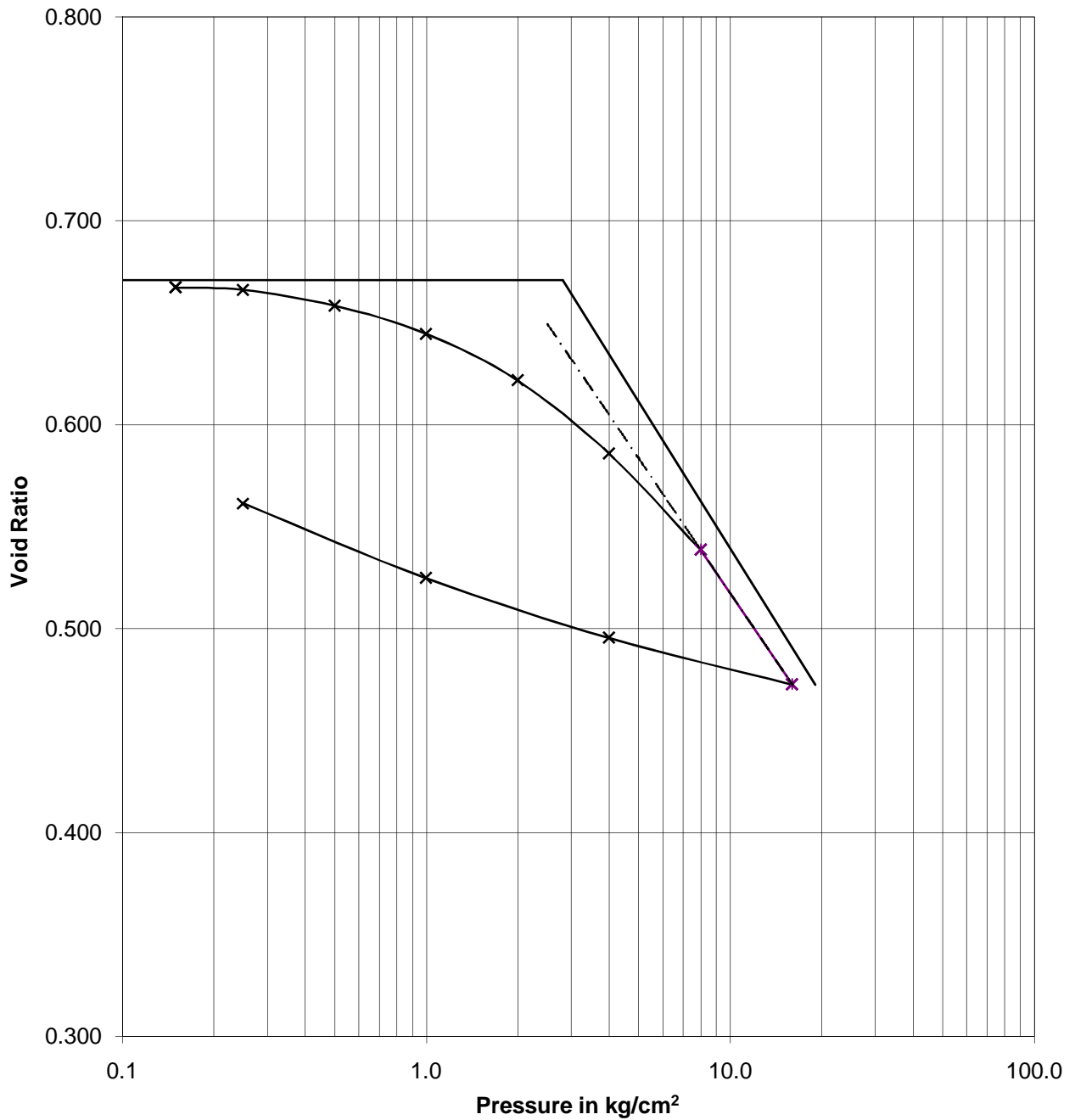
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/2

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-1	C _c = 0.2387	0.25 - 0.50	0.0185
Depth : 35.0m	C _c /(1+e ₀) = 0.1428	0.50 - 1.00	0.0166
e ₀ = 0.6709	p _c = -	1.00 - 2.00	0.0139
p ₀ = 2.81 kg/cm ²	C _s = 0.0492	2.00 - 4.00	0.0111
	C _r ≈ 0.0492	4.00 - 8.00	0.0074



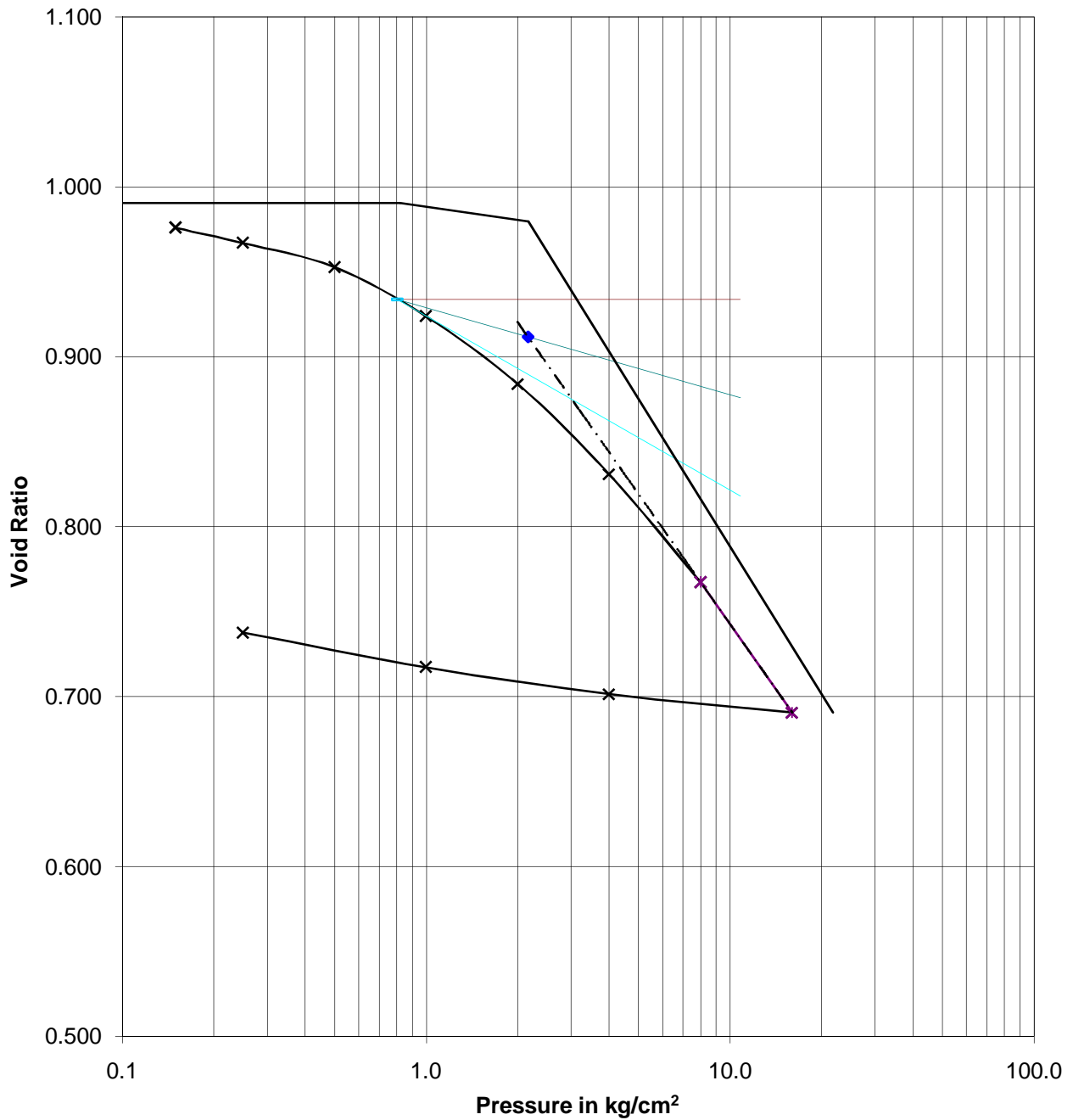
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/3

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-2	C _c = 0.2882	0.25 - 0.50	0.0290
Depth : 10.0m	C _c /(1+e ₀) = 0.1448	0.50 - 1.00	0.0295
e ₀ = 0.9906	p _c = 2.17 kg/cm ²	1.00 - 2.00	0.0207
p ₀ = 0.82 kg/cm ²	C _s = 0.0259	2.00 - 4.00	0.0141
	C _r ≈ 0.0259	4.00 - 8.00	0.0087



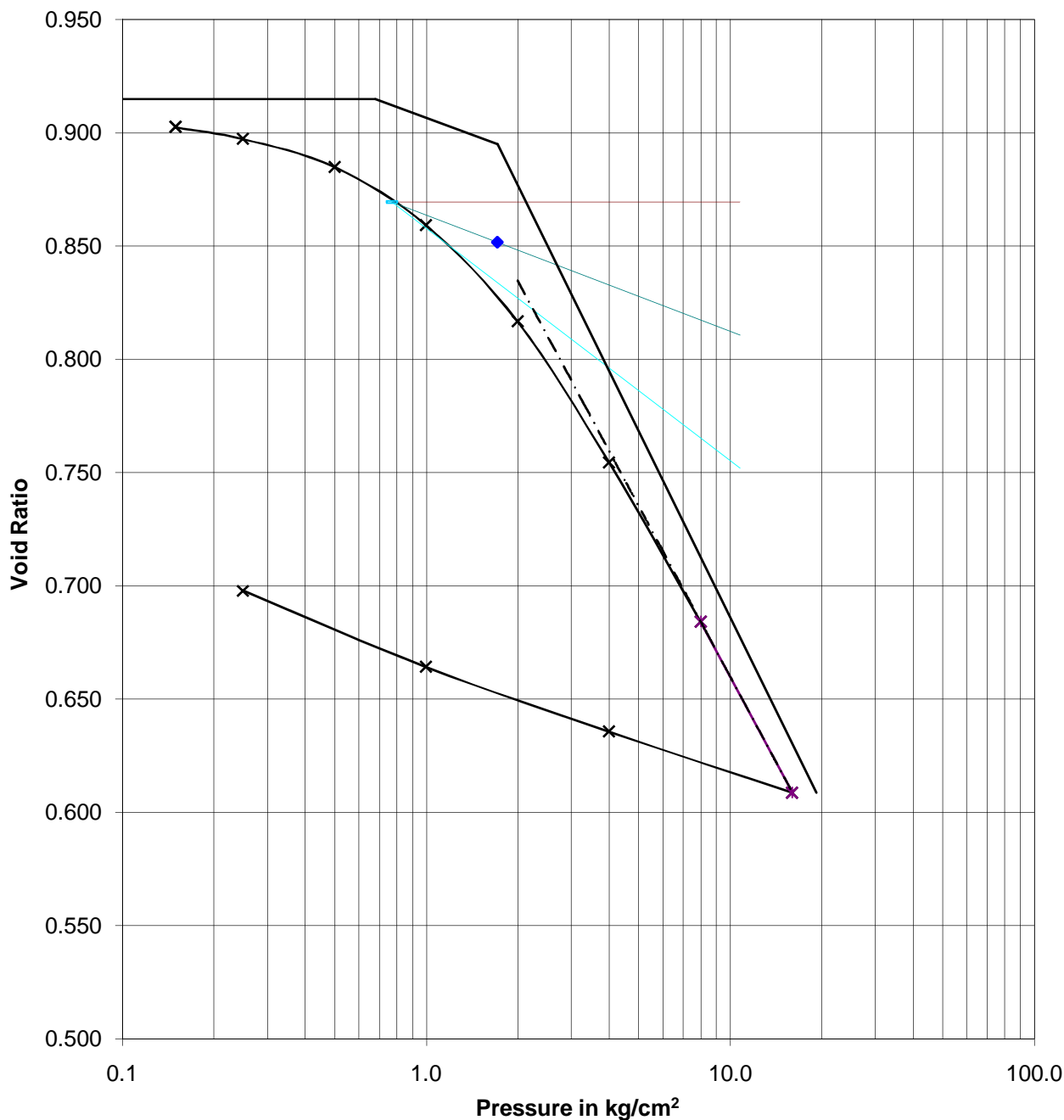
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/4

e-logp curve

BH-No. : BH-3	$C_c = 0.2727$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 7.0m	$C_c/(1+e_0) = 0.1424$	0.25 - 0.50 :	0.0261
$e_0 = 0.9148$	$p_c = 1.71$ kg/cm ²	0.50 - 1.00 :	0.0273
$p_0 = 0.68$ kg/cm ²	$C_s = 0.0494$	1.00 - 2.00 :	0.0229
	$C_r \approx 0.0494$	2.00 - 4.00 :	0.0171
		4.00 - 8.00 :	0.0100



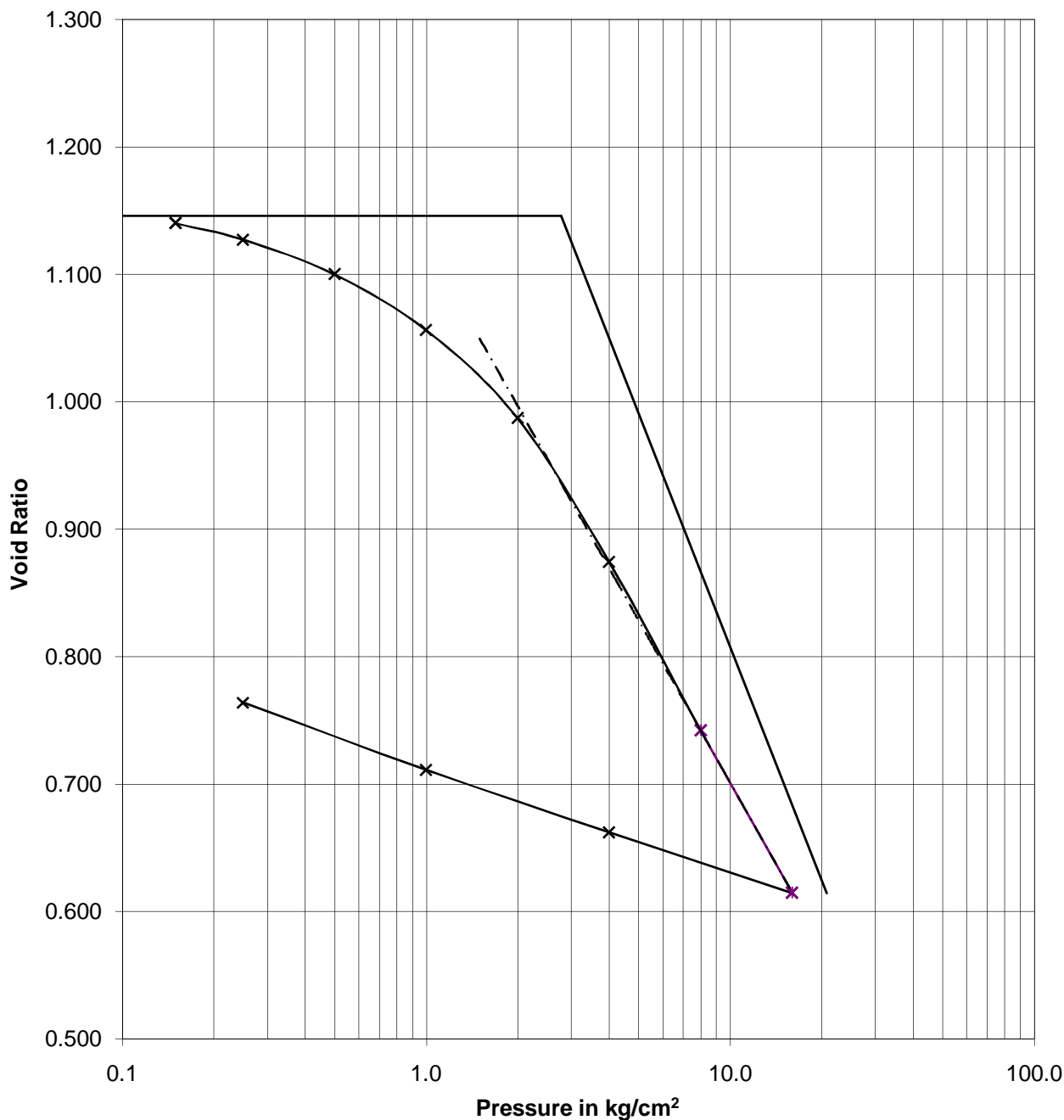
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/5

e-logp curve

BH-No. : BH-3	$C_c = 0.6083$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 33.0m	$C_c/(1+e_0) = 0.2834$	0.25 - 0.50 :	0.0508
$e_0 = 1.1461$	$p_c = -$	0.50 - 1.00 :	0.0419
$p_0 = 2.77$ kg/cm ²	$C_s = 0.0827$	1.00 - 2.00 :	0.0336
	$C_r \approx 0.0827$	2.00 - 4.00 :	0.0284
		4.00 - 8.00 :	0.0176



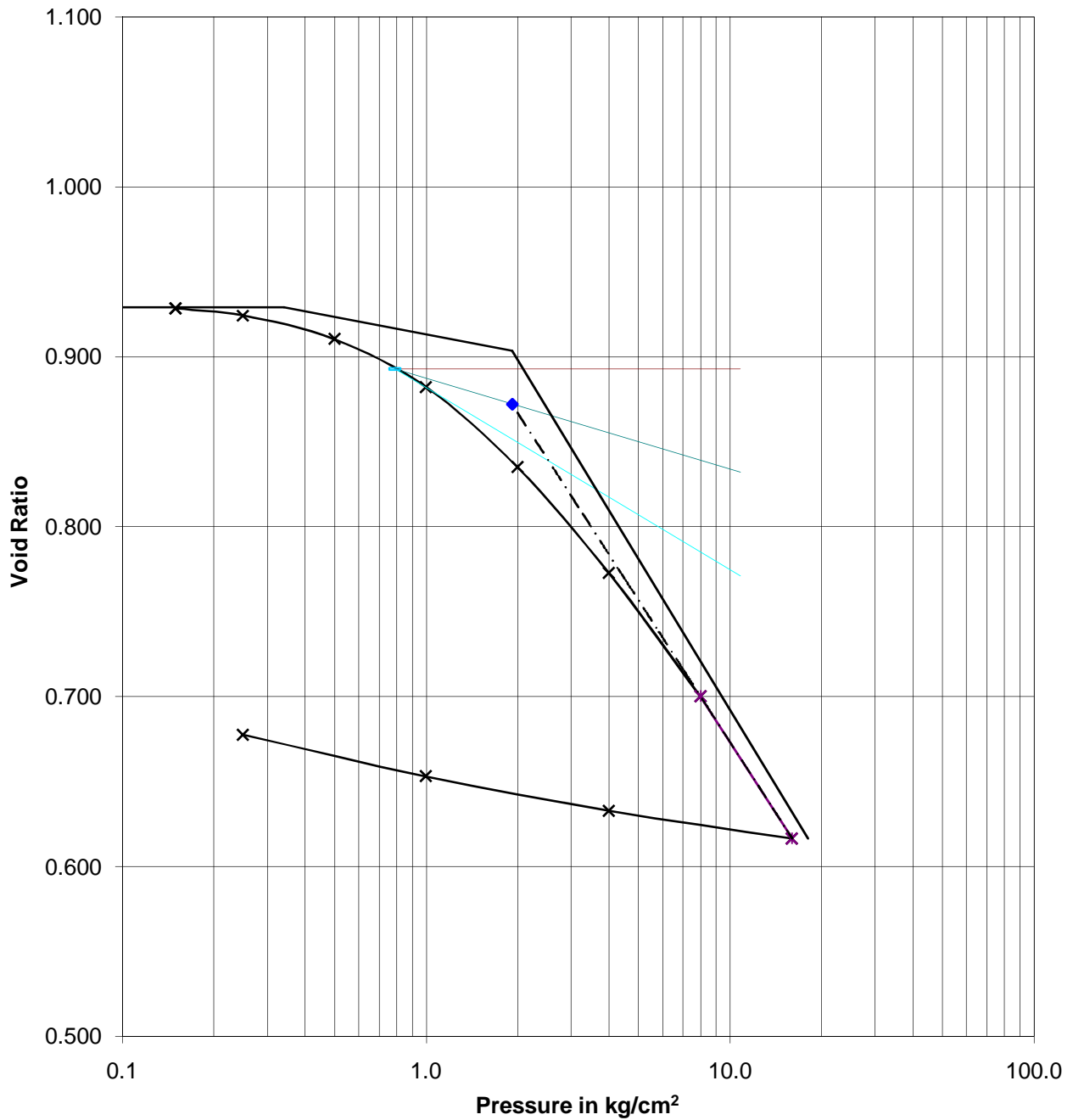
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/6

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-4	C _c = 0.2952	0.25 - 0.50	0.0289
Depth : 2.0m	C _c /(1+e ₀) = 0.1530	0.50 - 1.00	0.0297
e ₀ = 0.9291	p _c = 1.92 kg/cm ²	1.00 - 2.00	0.0250
p ₀ = 0.34 kg/cm ²	C _s = 0.0338	2.00 - 4.00	0.0170
	C _r ≈ 0.0338	4.00 - 8.00	0.0102



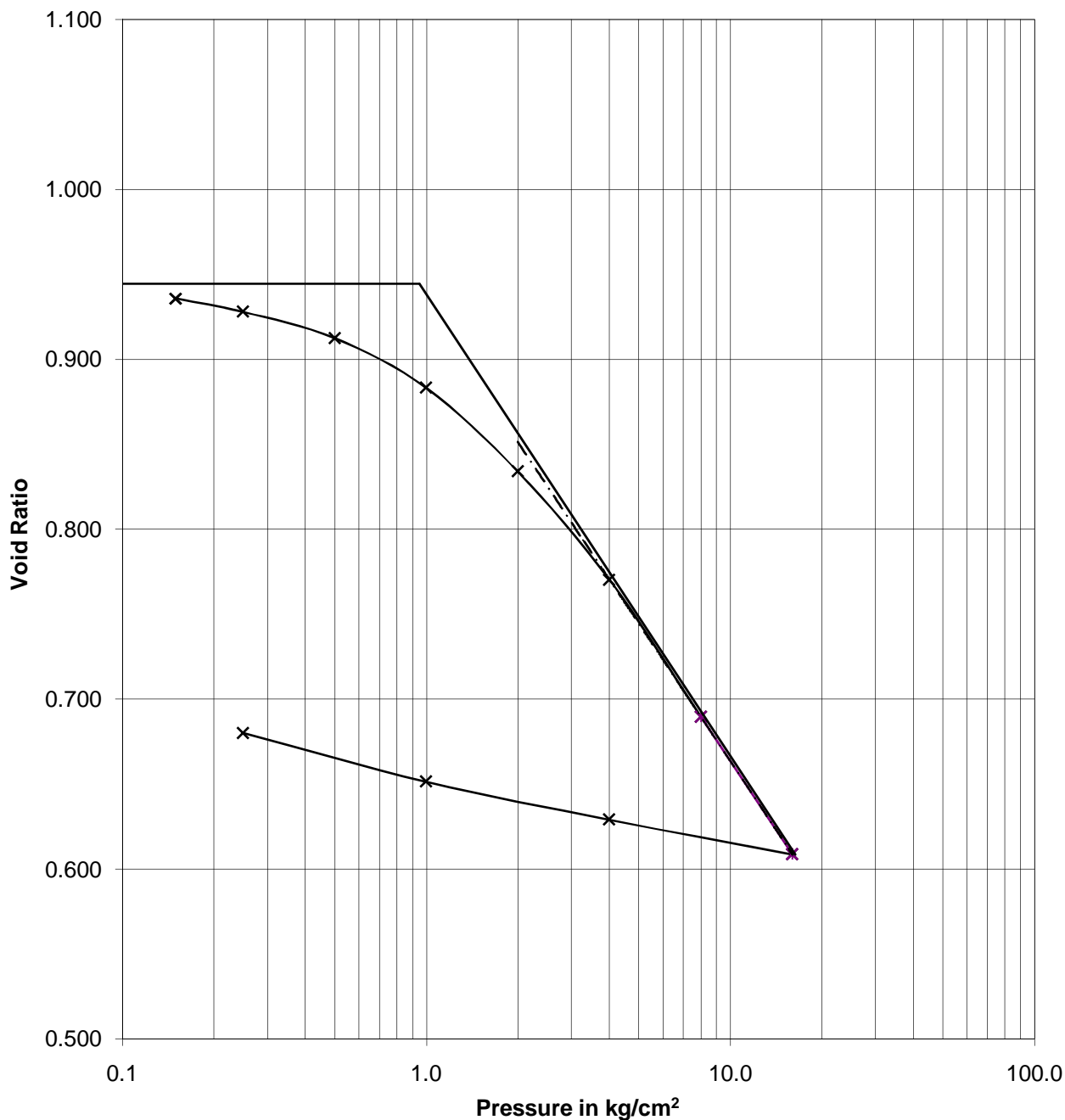
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/7

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-4	C _c = 0.2718	0.25 - 0.50	0.0324
Depth : 10.0m	C _c /(1+e ₀) = 0.1398	0.50 - 1.00	0.0306
e ₀ = 0.9445	p _c = -	1.00 - 2.00	0.0261
p ₀ = 0.95 kg/cm ²	C _s = 0.0395	2.00 - 4.00	0.0174
	C _r ≈ 0.0395	4.00 - 8.00	0.0114



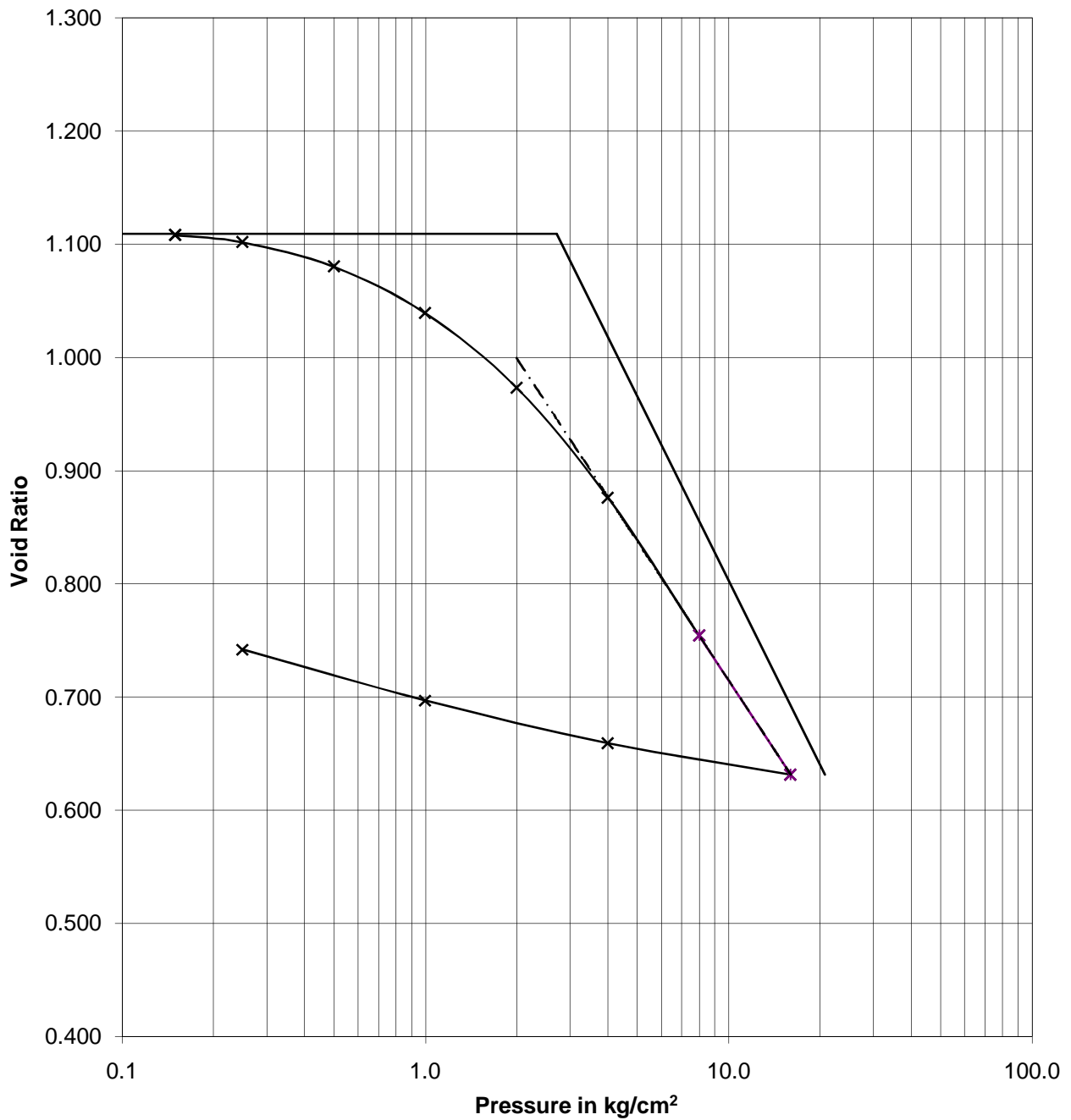
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/8

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-4	C _c = 0.5403	0.25 - 0.50	0.0412
Depth : 32.0m	C _c /(1+e ₀) = 0.2562	0.50 - 1.00	0.0394
e ₀ = 1.1091	p _c = -	1.00 - 2.00	0.0324
p ₀ = 2.71 kg/cm ²	C _s = 0.0613	2.00 - 4.00	0.0246
	C _r ≈ 0.0613	4.00 - 8.00	0.0163



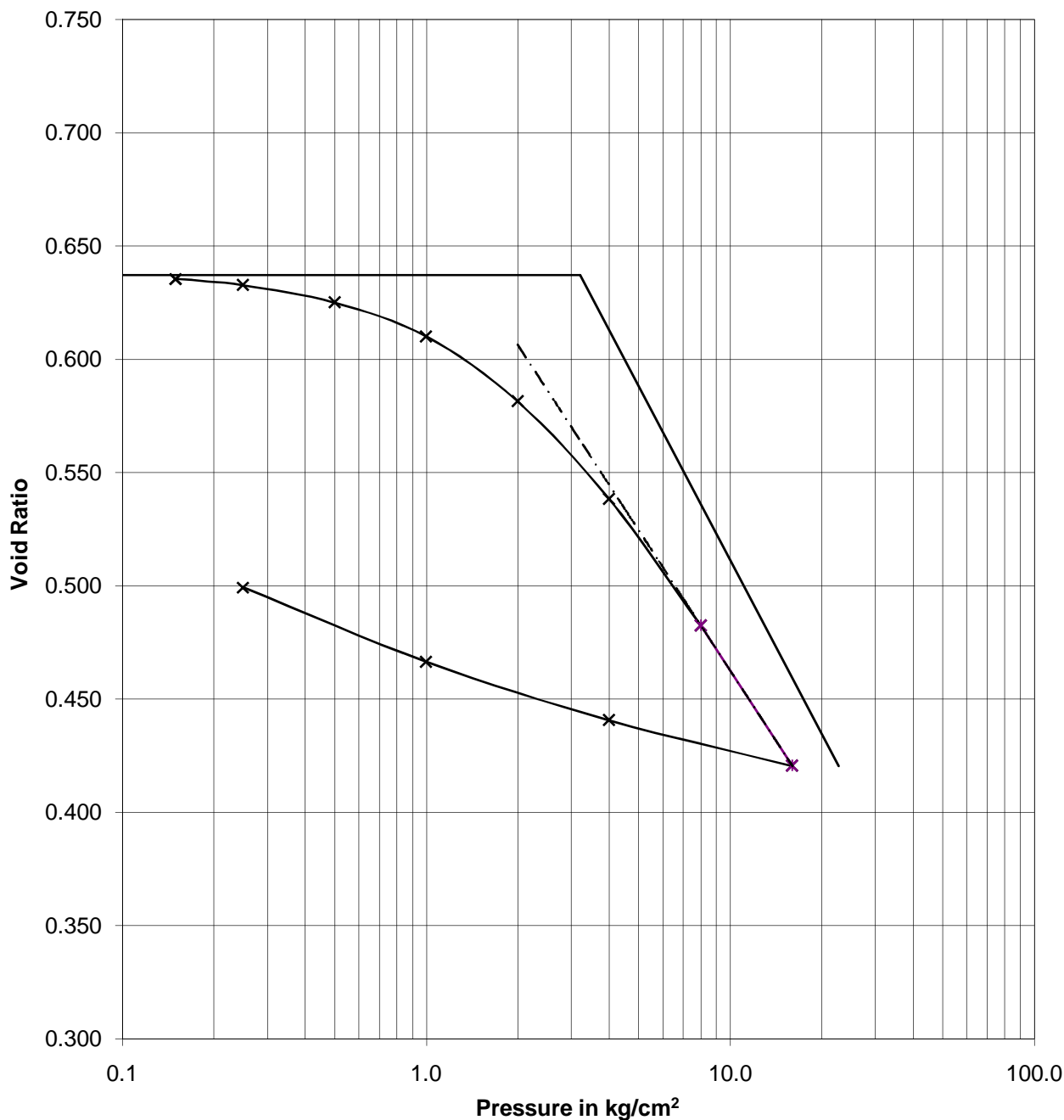
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/9

e-logp curve

BH-No. : BH-4	$C_c = 0.2544$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 38.0m	$C_c/(1+e_0) = 0.1554$	0.25 - 0.50	: 0.0188
$e_0 = 0.6372$	$p_c = -$	0.50 - 1.00	: 0.0185
$p_0 = 3.20$ kg/cm ²	$C_s = 0.0436$	1.00 - 2.00	: 0.0178
	$C_r \approx 0.0436$	2.00 - 4.00	: 0.0136
		4.00 - 8.00	: 0.0091



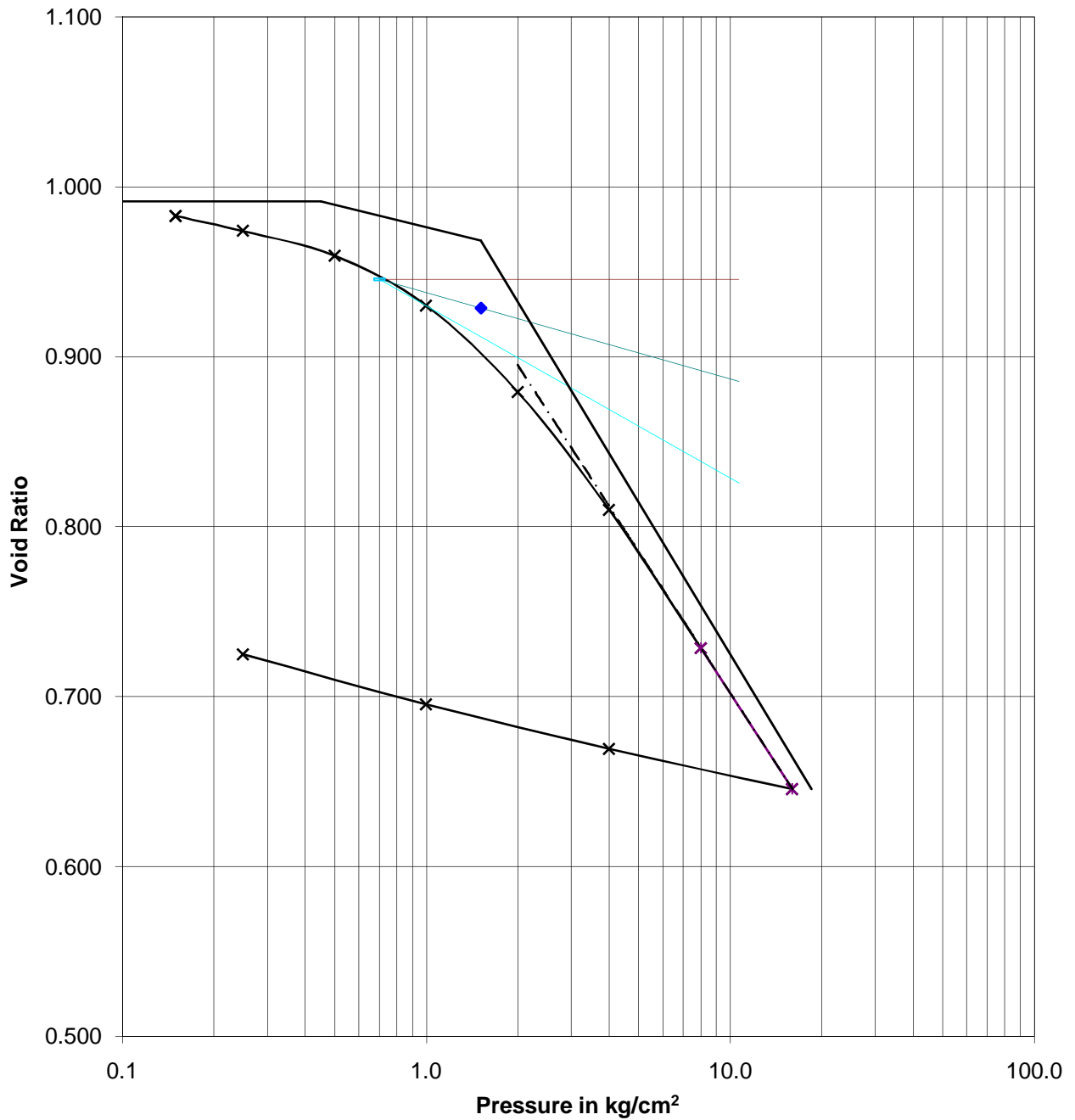
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/10

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-5	C _c = 0.2970		
Depth : 5.0m	C _c /(1+e ₀) = 0.1491	0.25 - 0.50	: 0.0294
e ₀ = 0.9914	p _c = 1.51 kg/cm ²	0.50 - 1.00	: 0.0300
p ₀ = 0.45 kg/cm ²	C _s = 0.0439	1.00 - 2.00	: 0.0263
	C _r ≈ 0.0439	2.00 - 4.00	: 0.0185
		4.00 - 8.00	: 0.0112



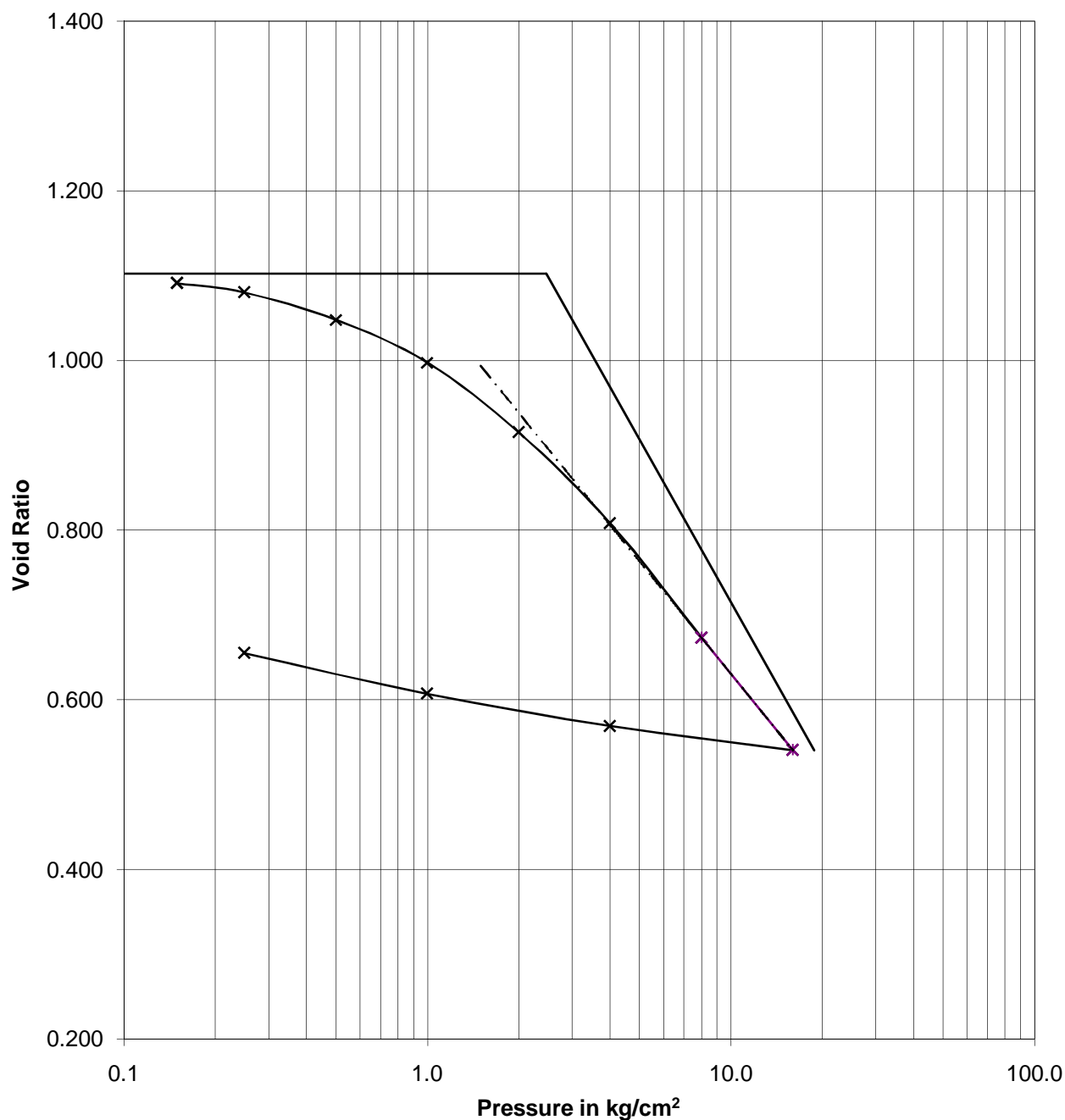
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/11

e-logp curve

BH-No. : BH-5	$C_c = 0.6364$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 31.0m	$C_c/(1+e_0) = 0.3027$	0.25 - 0.50	: 0.0615
$e_0 = 1.1022$	$p_c = -$	0.50 - 1.00	: 0.0493
$p_0 = 2.46$ kg/cm ²	$C_s = 0.0634$	1.00 - 2.00	: 0.0411
	$C_r \approx 0.0634$	2.00 - 4.00	: 0.0280
		4.00 - 8.00	: 0.0186



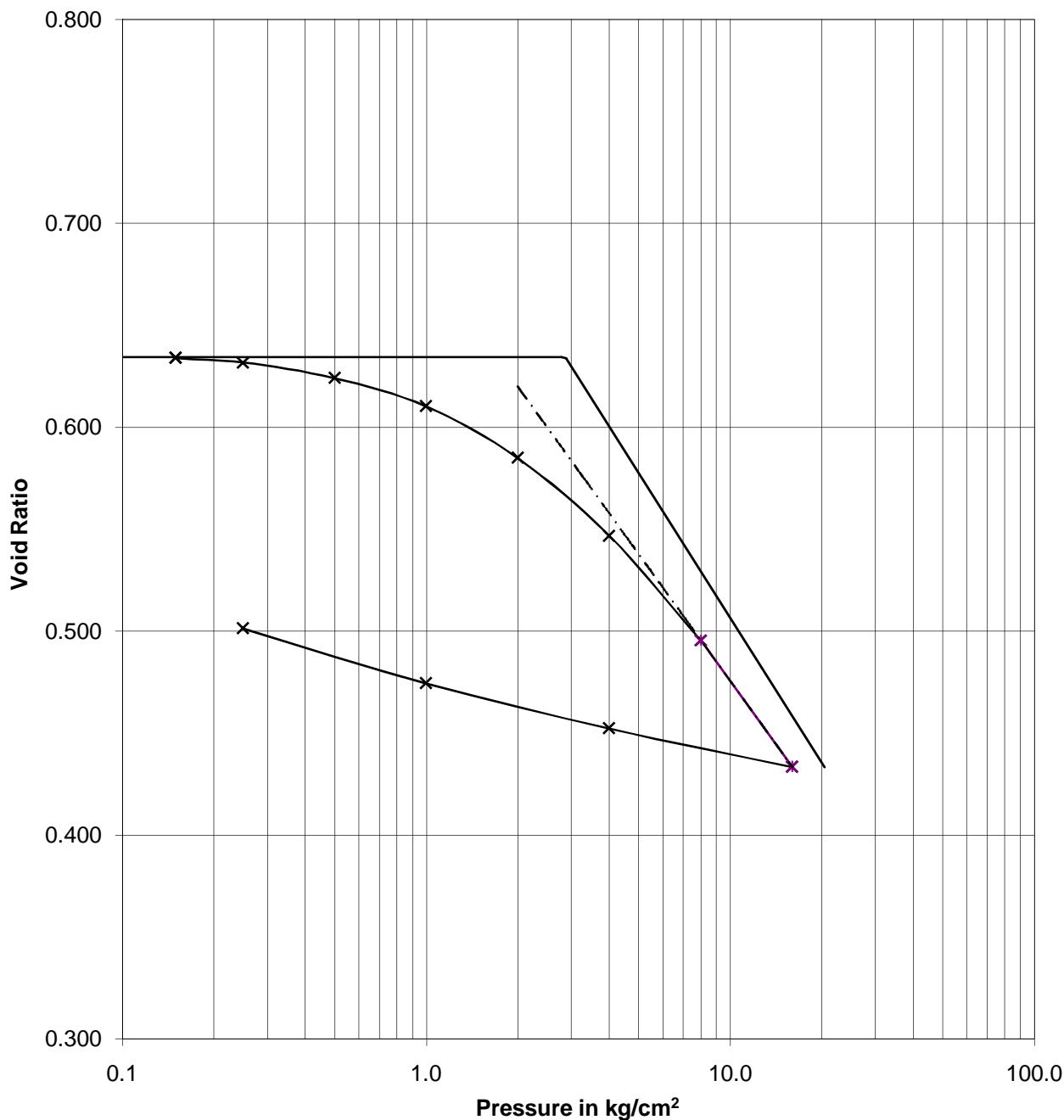
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/12

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-5	C _c = 0.2353		
Depth : 35.0m	C _c /(1+e ₀) = 0.1440	0.25 - 0.50	: 0.0187
e ₀ = 0.6343	p _c = 2.88 kg/cm ²	0.50 - 1.00	: 0.0170
p ₀ = 2.79 kg/cm ²	C _s = 0.0376	1.00 - 2.00	: 0.0157
	C _r ≈ 0.0376	2.00 - 4.00	: 0.0121
		4.00 - 8.00	: 0.0083



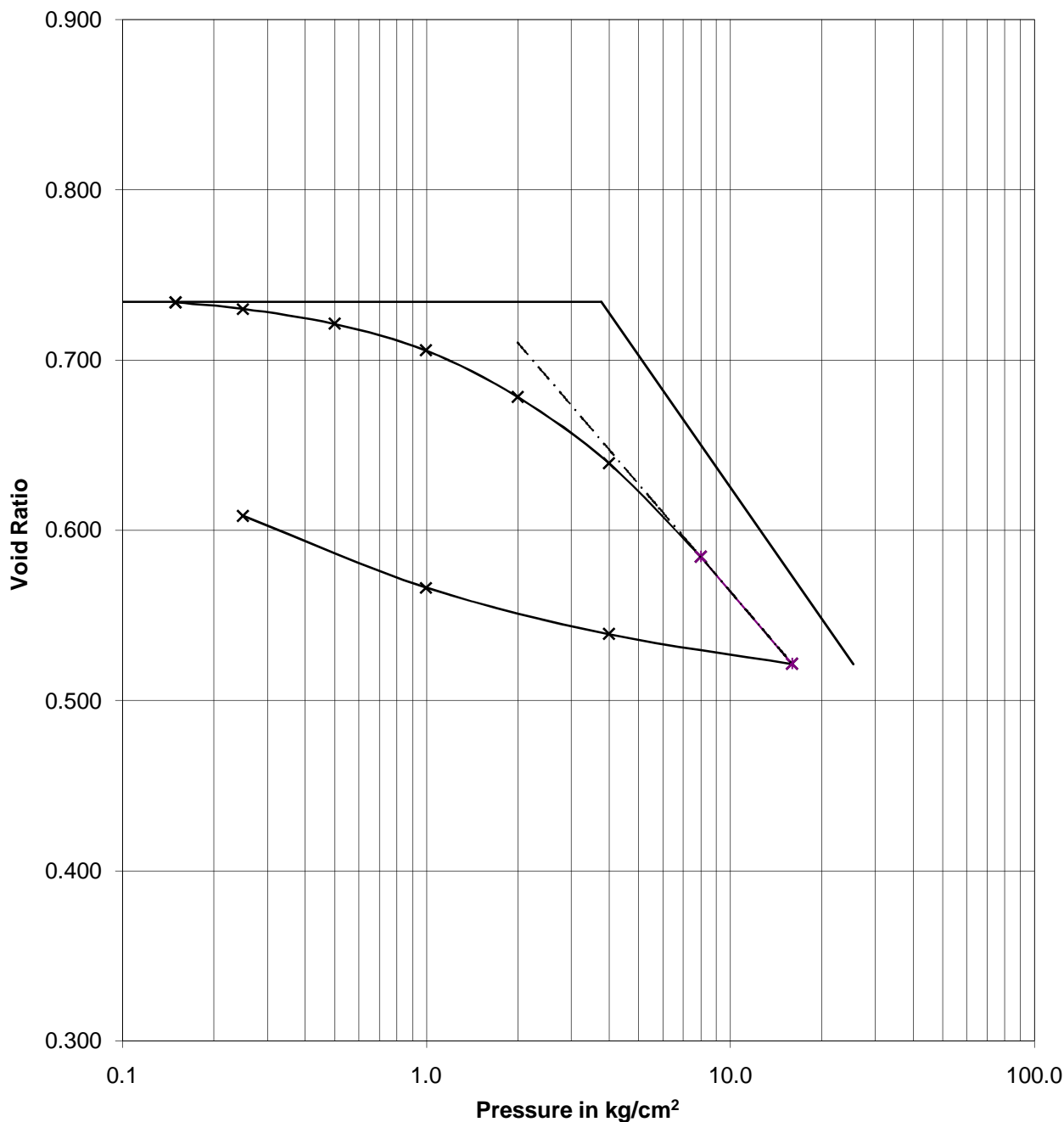
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/13

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-5	C _c = 0.2565	0.25 - 0.50	0.0203
Depth : 45.0m	C _c /(1+e ₀) = 0.1479	0.50 - 1.00	0.0182
e ₀ = 0.7342	p _c = -	1.00 - 2.00	0.0160
p ₀ = 3.76 kg/cm ²	C _s = 0.0481	2.00 - 4.00	0.0116
	C _r ≈ 0.0481	4.00 - 8.00	0.0083



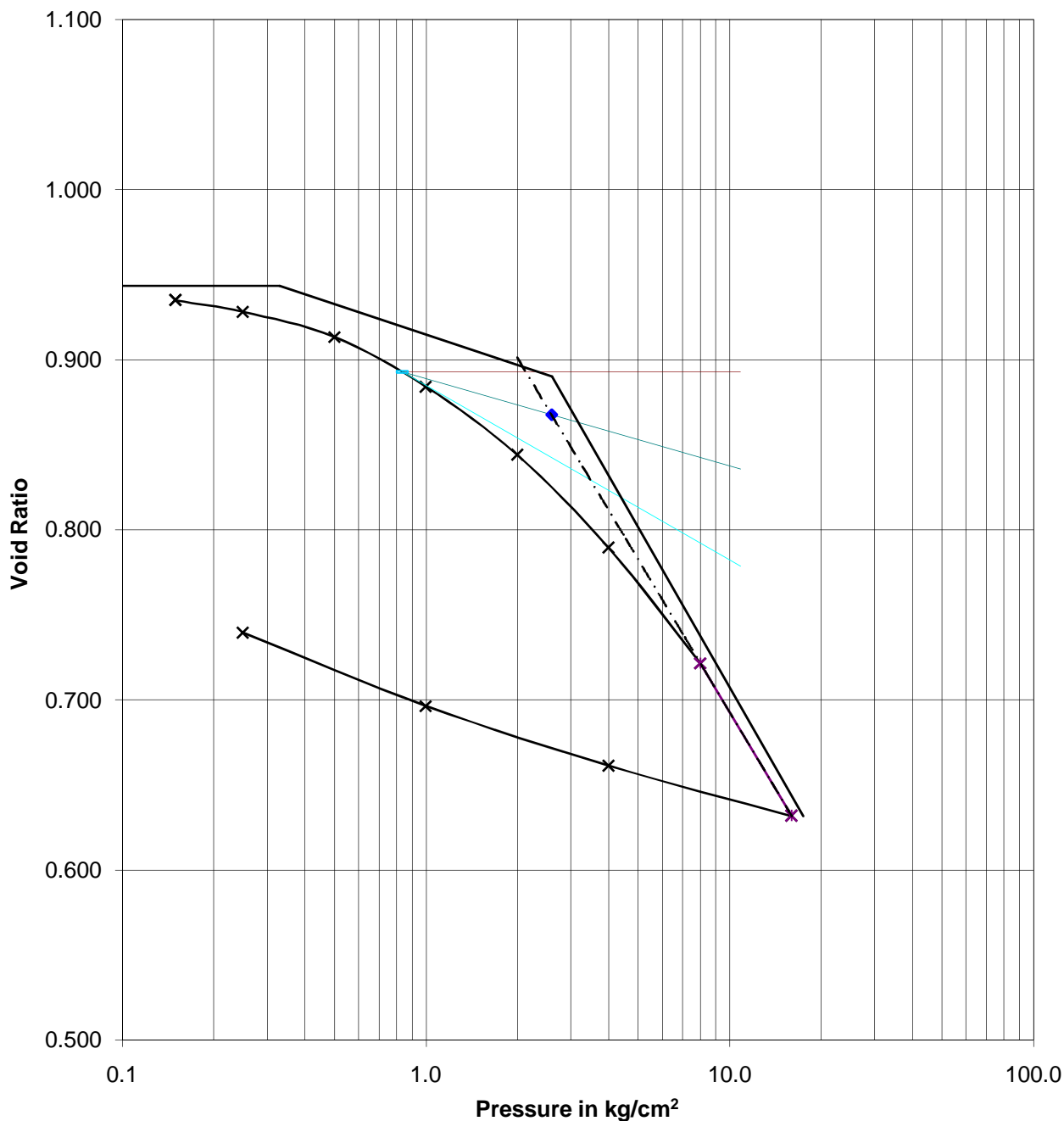
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/14

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-6	C _c = 0.3123	0.25 - 0.50	0.0303
Depth : 3.0m	C _c /(1+e ₀) = 0.1607	0.50 - 1.00	0.0307
e ₀ = 0.9435	p _c = 2.60 kg/cm ²	1.00 - 2.00	0.0212
p ₀ = 0.33 kg/cm ²	C _s = 0.0596	2.00 - 4.00	0.0148
	C _r ≈ 0.0596	4.00 - 8.00	0.0095



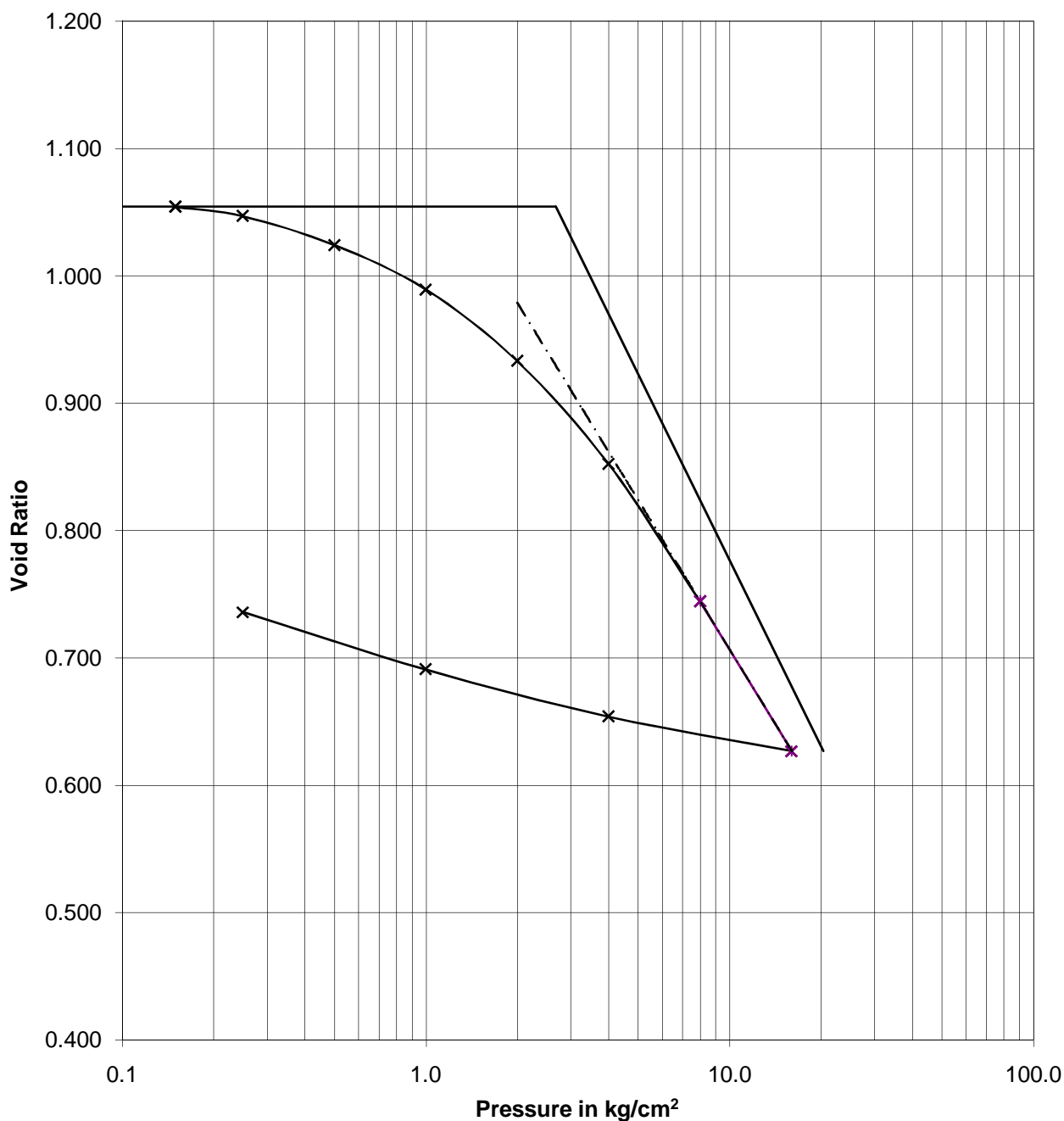
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/15

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-6	C _c = 0.4857	0.25 - 0.50	0.0446
Depth : 33.0m	C _c /(1+e ₀) = 0.2364	0.50 - 1.00	0.0346
e ₀ = 1.0545	p _c = -	1.00 - 2.00	0.0282
p ₀ = 2.68 kg/cm ²	C _s = 0.0604	2.00 - 4.00	0.0210
	C _r ≈ 0.0604	4.00 - 8.00	0.0145



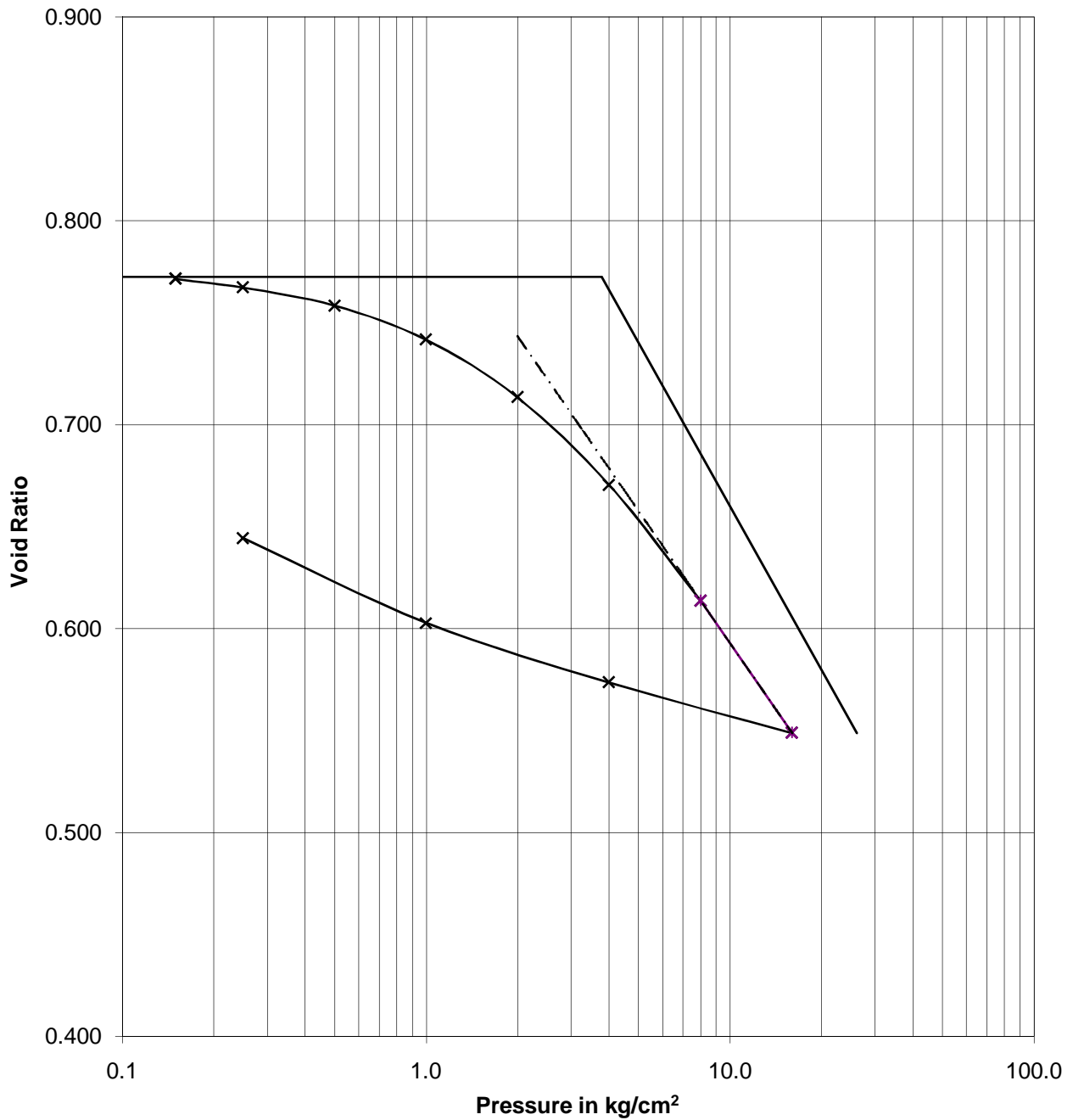
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/16

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-6	C _c = 0.2665	0.25 - 0.50	0.0201
Depth : 45.0m	C _c /(1+e ₀) = 0.1504	0.50 - 1.00	0.0189
e ₀ = 0.7724	p _c = -	1.00 - 2.00	0.0162
p ₀ = 3.78 kg/cm ²	C _s = 0.0529	2.00 - 4.00	0.0125
	C _r ≈ 0.0529	4.00 - 8.00	0.0085



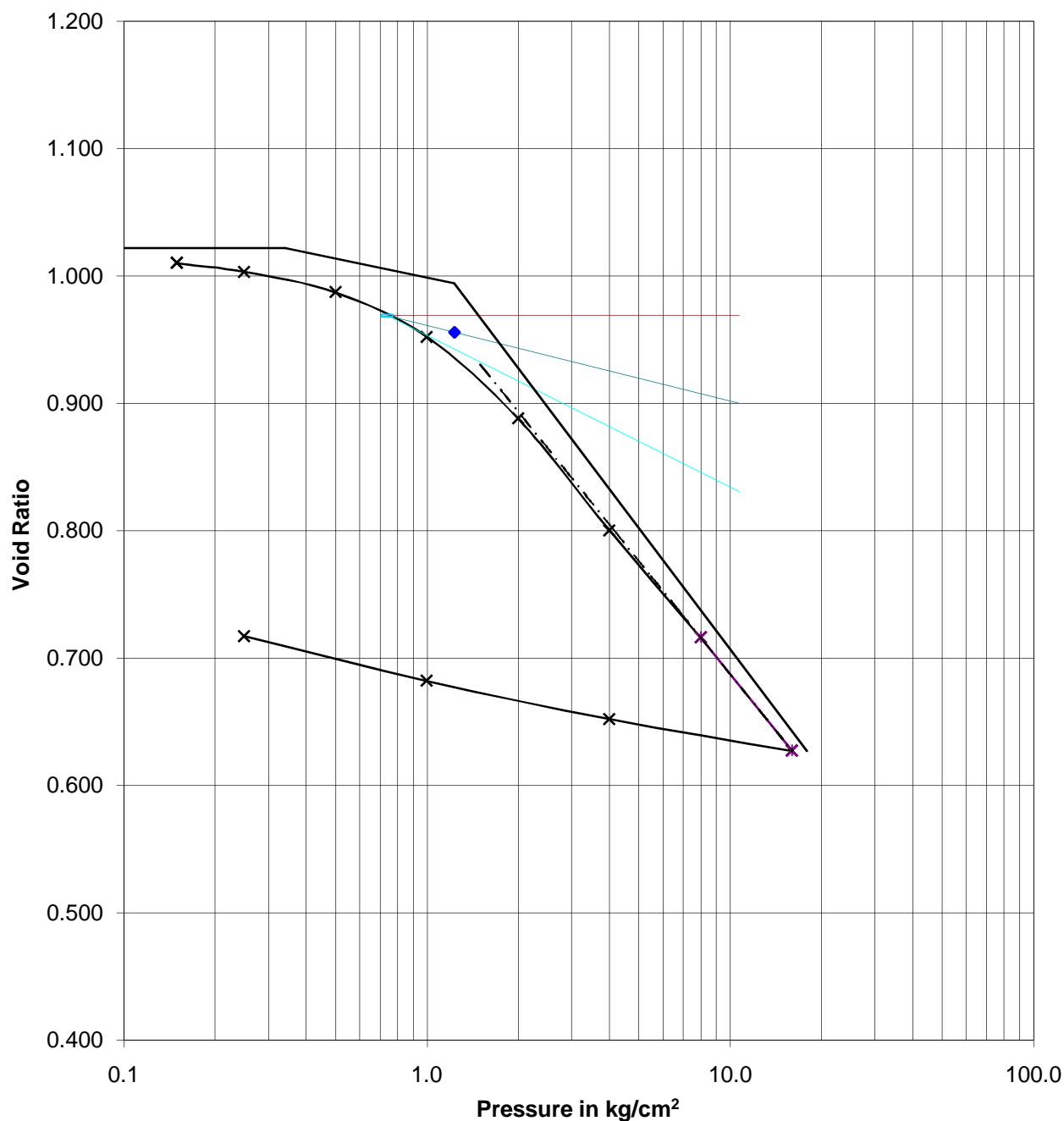
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/17

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-7	C _c = 0.3155	0.25 - 0.50	0.0320
Depth : 3.0m	C _c /(1+e ₀) = 0.1561	0.50 - 1.00	0.0352
e ₀ = 1.0218	p _c = 1.23 kg/cm ²	1.00 - 2.00	0.0328
p ₀ = 0.34 kg/cm ²	C _s = 0.0497	2.00 - 4.00	0.0233
	C _r ≈ 0.0497	4.00 - 8.00	0.0117



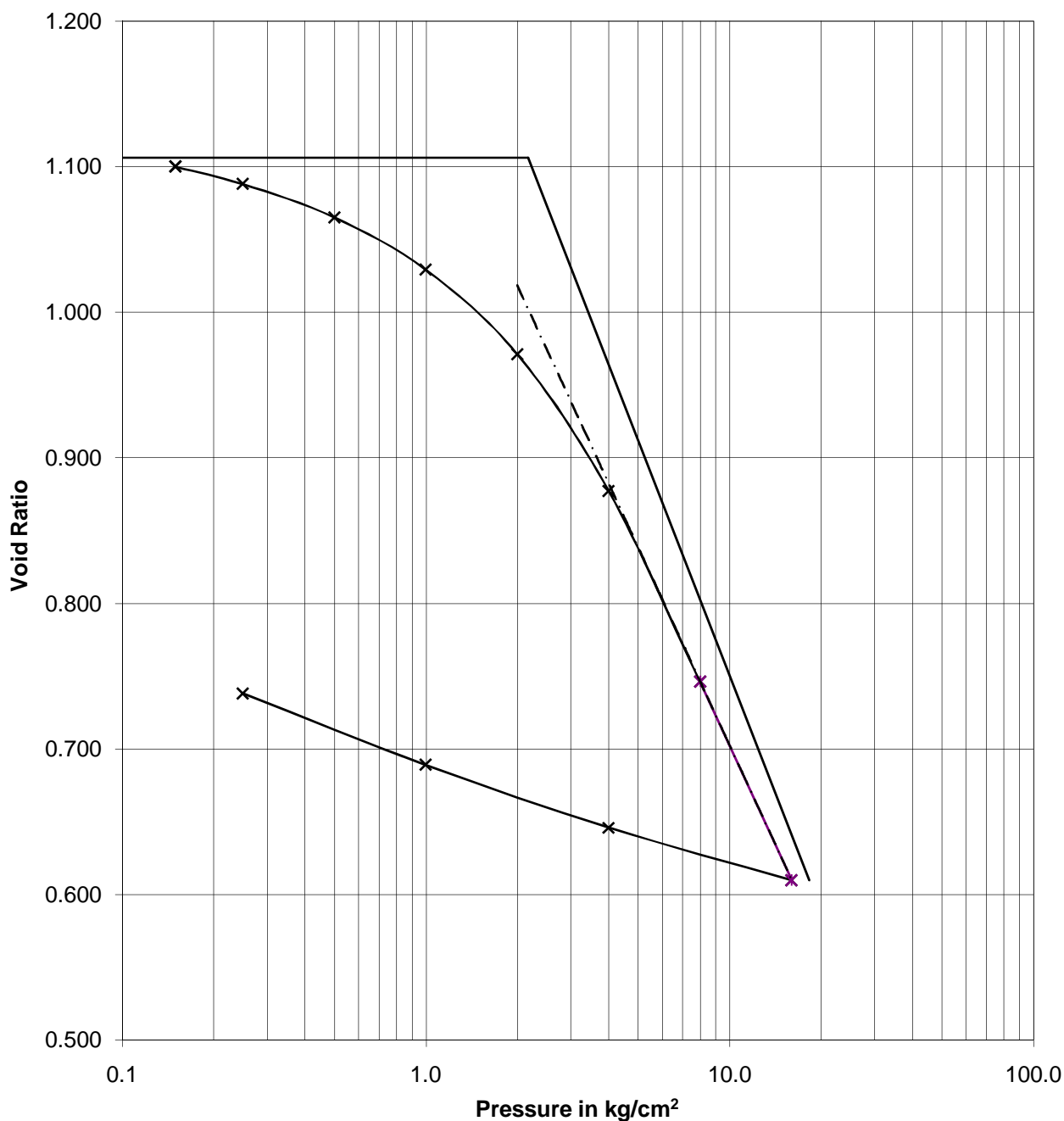
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/18

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-7	C _c = 0.5365	0.25 - 0.50	0.0441
Depth : 27.0m	C _c /(1+e ₀) = 0.2547	0.50 - 1.00	0.0349
e ₀ = 1.1061	p _c = -	1.00 - 2.00	0.0286
p ₀ = 2.17 kg/cm ²	C _s = 0.0710	2.00 - 4.00	0.0238
	C _r ≈ 0.0710	4.00 - 8.00	0.0174



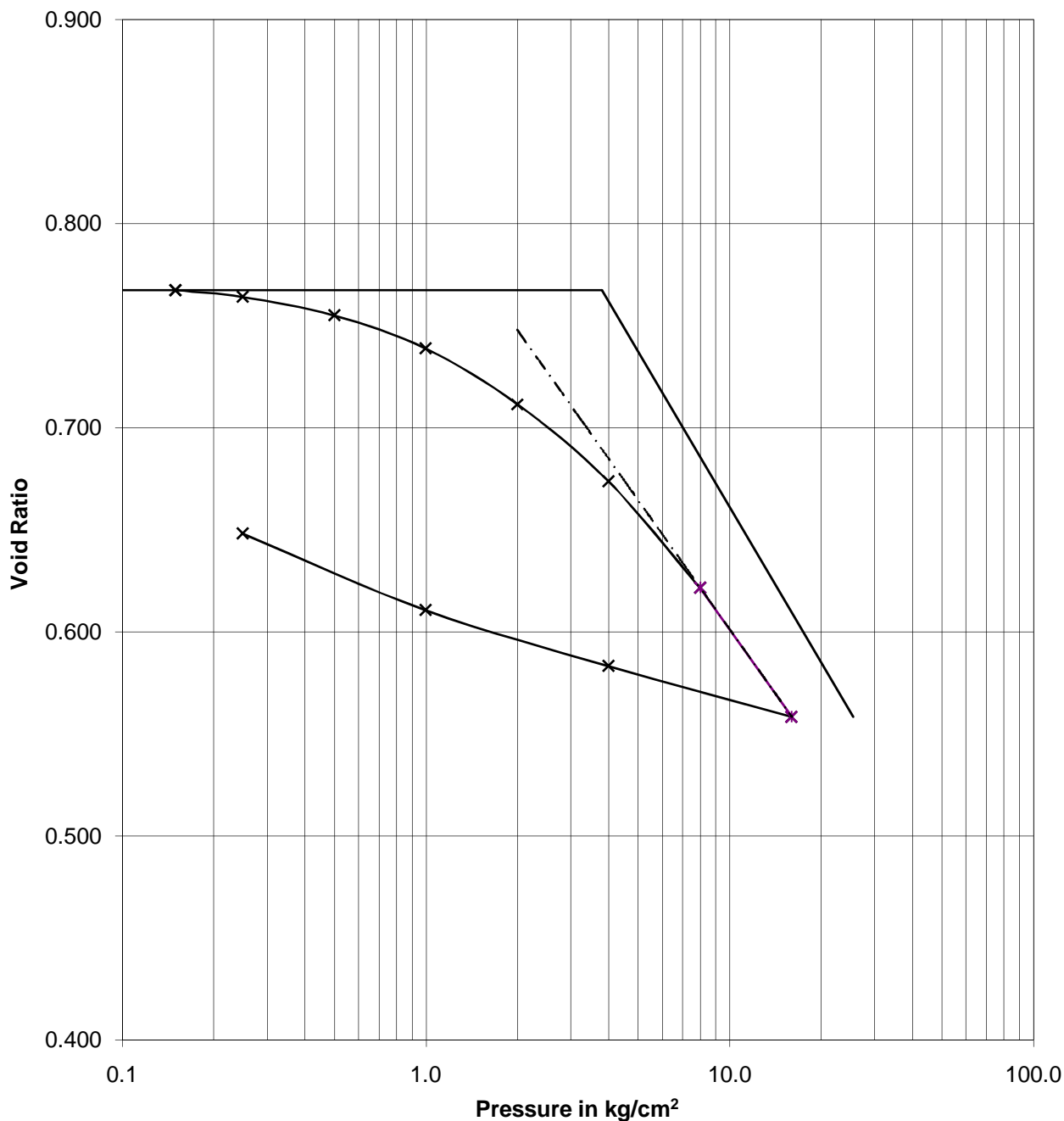
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/19

e-logp curve

BH-No. : BH-7	$C_c = 0.2530$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 45.0m	$C_c/(1+e_0) = 0.1431$	0.25 - 0.50	: 0.0204
$e_0 = 0.7675$	$p_c = -$	0.50 - 1.00	: 0.0185
$p_0 = 3.80$ kg/cm ²	$C_s = 0.0497$	1.00 - 2.00	: 0.0157
	$C_r \approx 0.0497$	2.00 - 4.00	: 0.0111
		4.00 - 8.00	: 0.0078



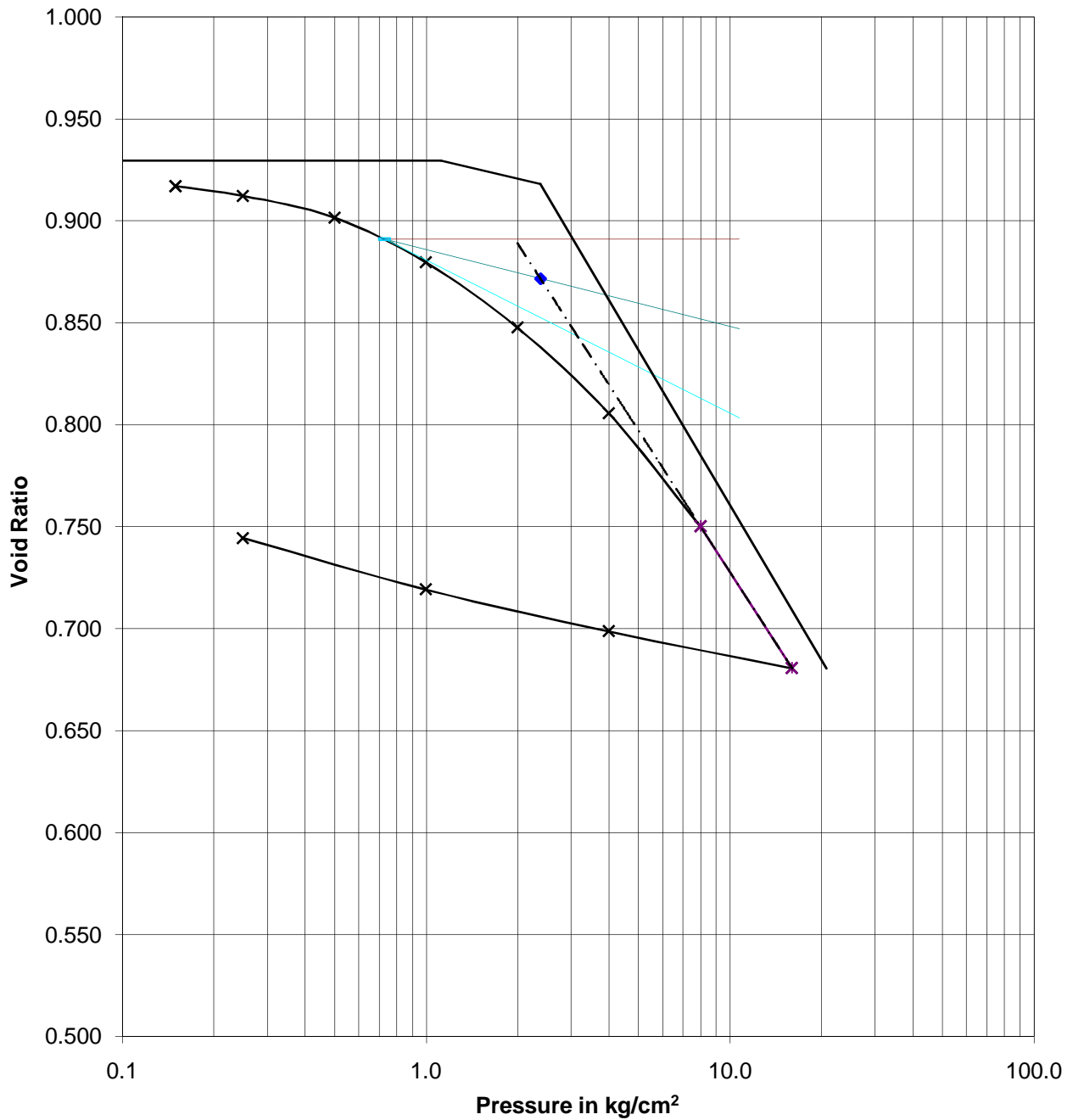
Project : Geotechnical Investigation at Haldia Terminal

Job No.:
XCSPL/1372

Fig No.
G/20

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-8	C _c = 0.2524		
Depth : 11.0m	C _c /(1+e ₀) = 0.1308	0.25 - 0.50	: 0.0222
e ₀ = 0.9296	p _c = 2.38 kg/cm ²	0.50 - 1.00	: 0.0231
p ₀ = 1.12 kg/cm ²	C _s = 0.0353	1.00 - 2.00	: 0.0170
	C _r ≈ 0.0353	2.00 - 4.00	: 0.0114
		4.00 - 8.00	: 0.0077



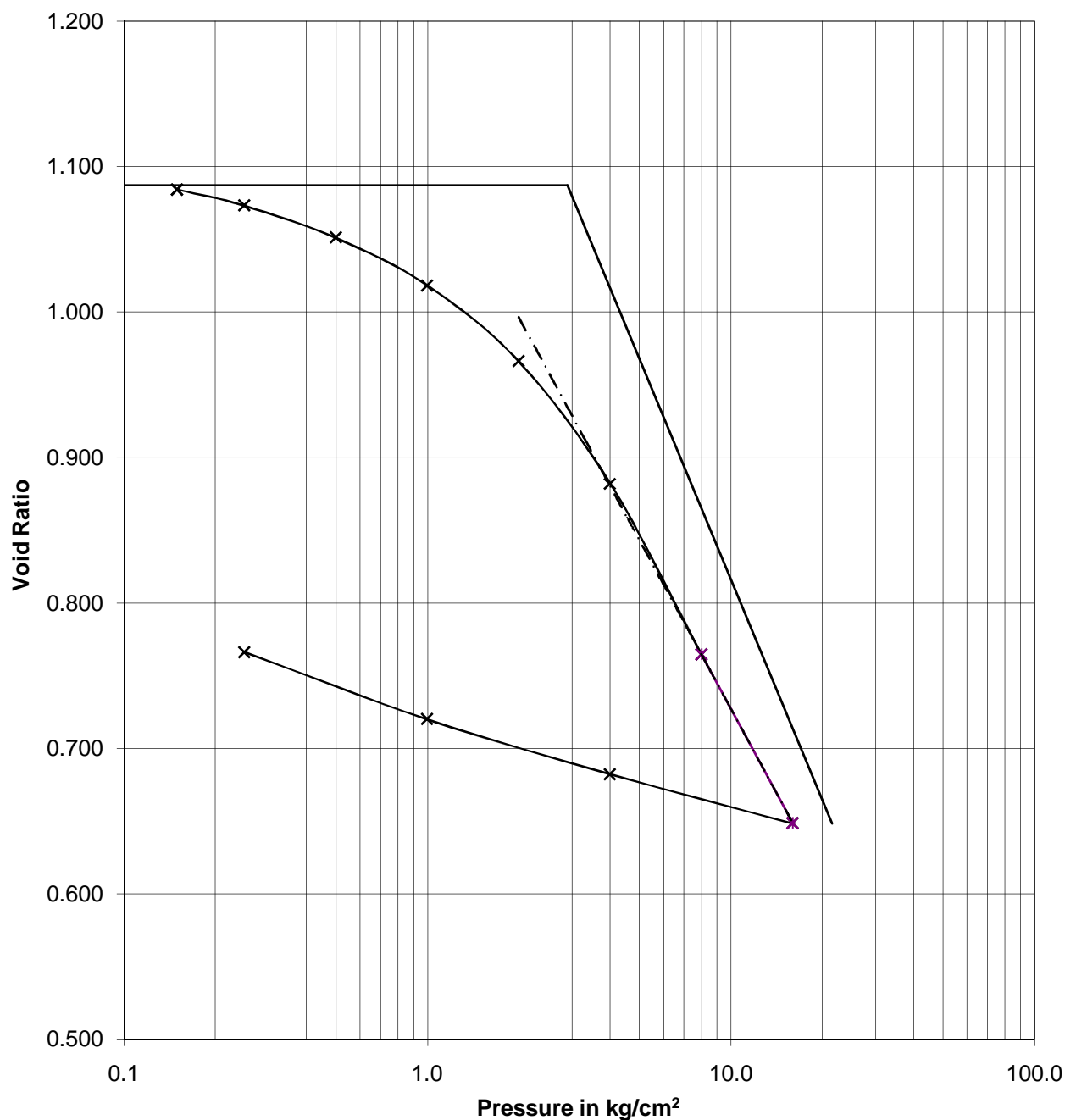
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Fig No.
G/21

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-8	C _c = 0.5031		
Depth : 33.0m	C _c /(1+e ₀) = 0.2410	0.25 - 0.50	: 0.0425
e ₀ = 1.0873	p _c = -	0.50 - 1.00	: 0.0322
p ₀ = 2.89 kg/cm ²	C _s = 0.0651	1.00 - 2.00	: 0.0258
	C _r ≈ 0.0651	2.00 - 4.00	: 0.0214
		4.00 - 8.00	: 0.0156



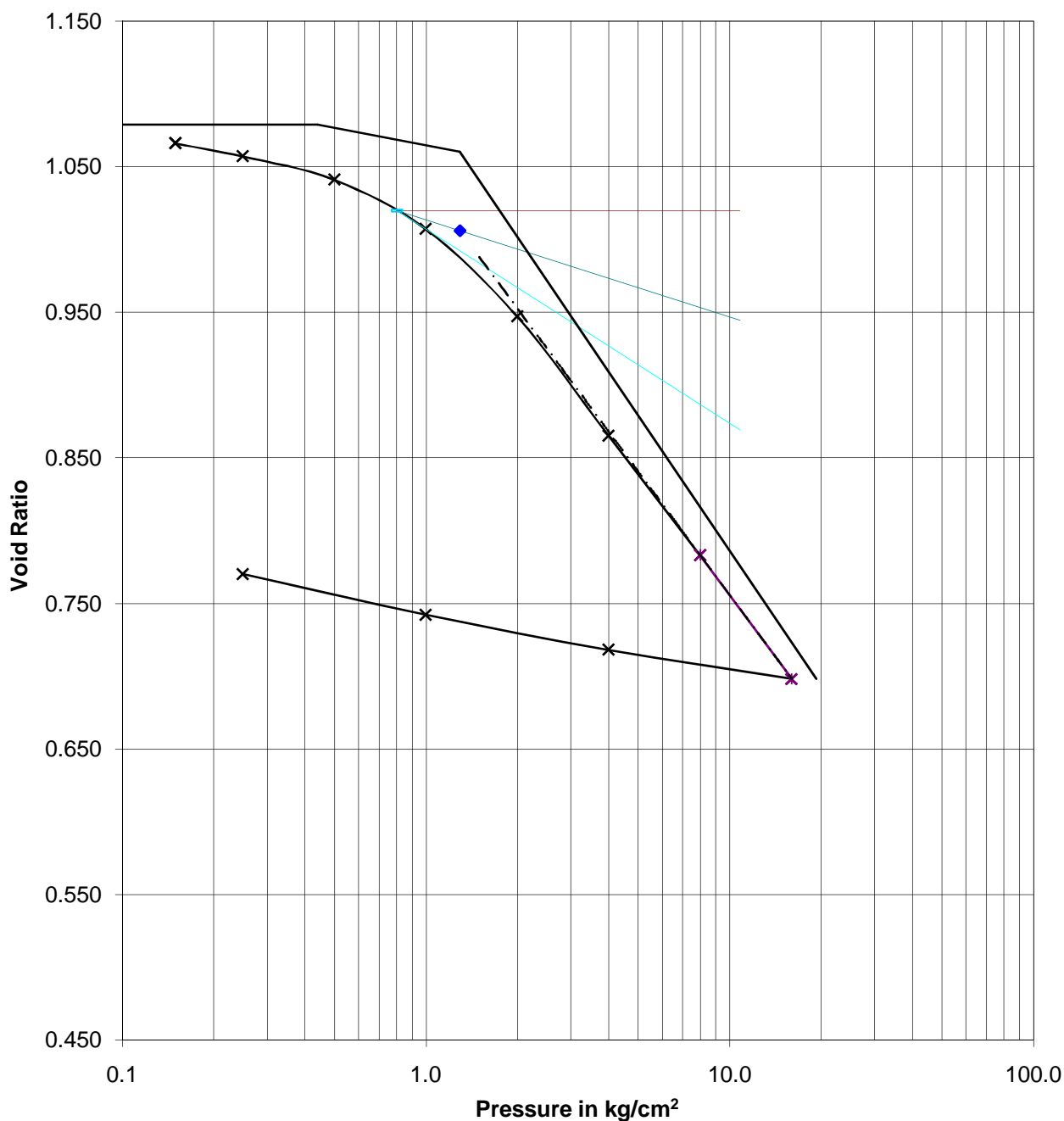
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Job No.:
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Fig No.
G/22

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-9	C _c = 0.3084	0.25 - 0.50	0.0311
Depth : 6.0m	C _c /(1+e ₀) = 0.1483	0.50 - 1.00	0.0333
e ₀ = 1.0790	p _c = 1.29 kg/cm ²	1.00 - 2.00	0.0299
p ₀ = 0.44 kg/cm ²	C _s = 0.0398	2.00 - 4.00	0.0211
	C _r ≈ 0.0398	4.00 - 8.00	0.0110



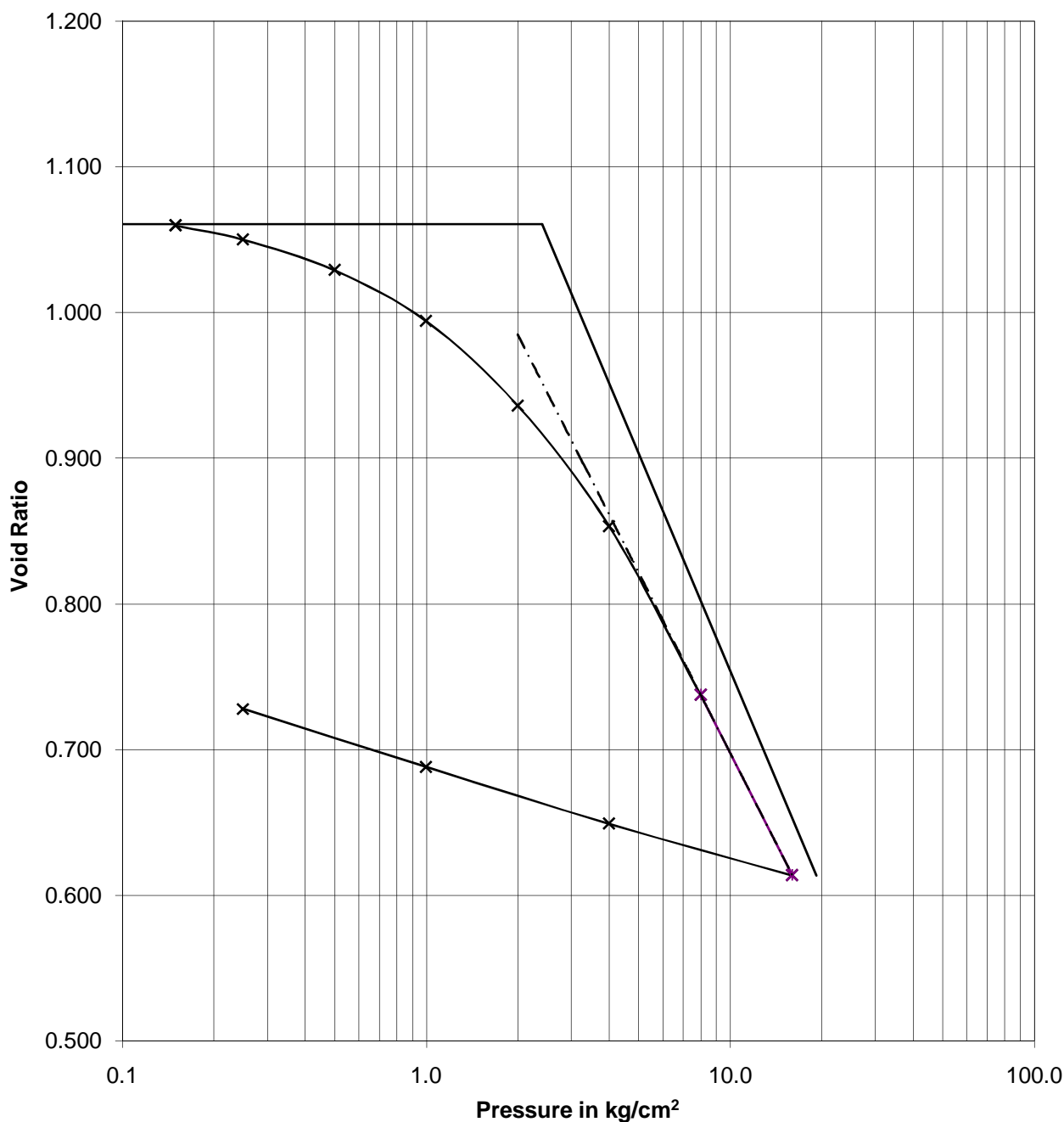
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Job No.:
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Fig No.
G/23

e-logp curve

BH-No. : BH-9	$C_c = 0.4953$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 30.0m	$C_c/(1+e_0) = 0.2404$	0.25 - 0.50	: 0.0410
$e_0 = 1.0605$	$p_c = -$	0.50 - 1.00	: 0.0345
$p_0 = 2.40$ kg/cm ²	$C_s = 0.0633$	1.00 - 2.00	: 0.0291
	$C_r \approx 0.0633$	2.00 - 4.00	: 0.0214
		4.00 - 8.00	: 0.0156



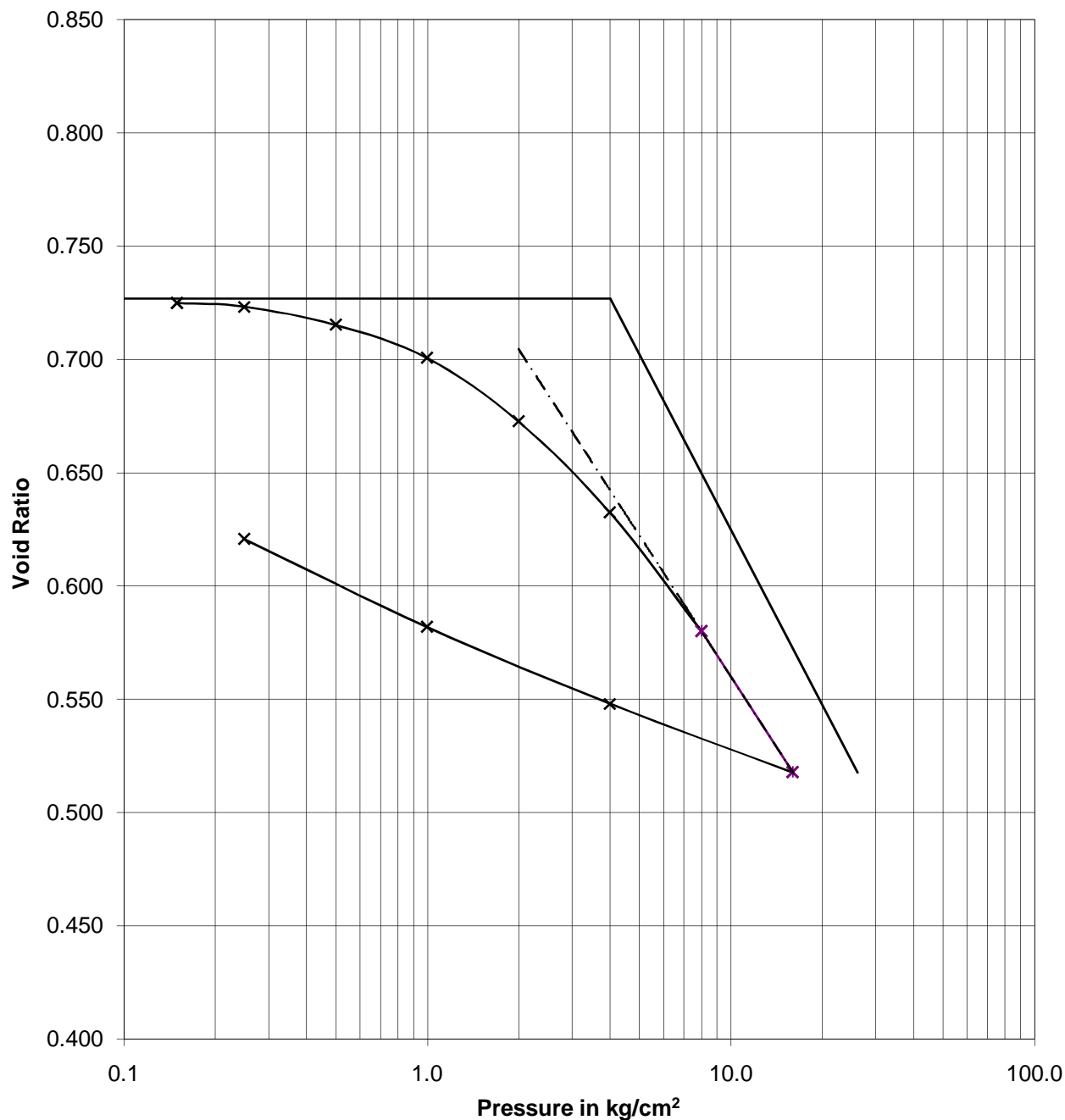
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Job No.:
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Fig No.
G/24

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-9	C _c = 0.2570	0.25 - 0.50	0.0188
Depth : 46.0m	C _c /(1+e ₀) = 0.1488	0.50 - 1.00	0.0170
e ₀ = 0.7269	p _c = -	1.00 - 2.00	0.0164
p ₀ = 4.01 kg/cm ²	C _s = 0.0570	2.00 - 4.00	0.0120
	C _r ≈ 0.0570	4.00 - 8.00	0.0080



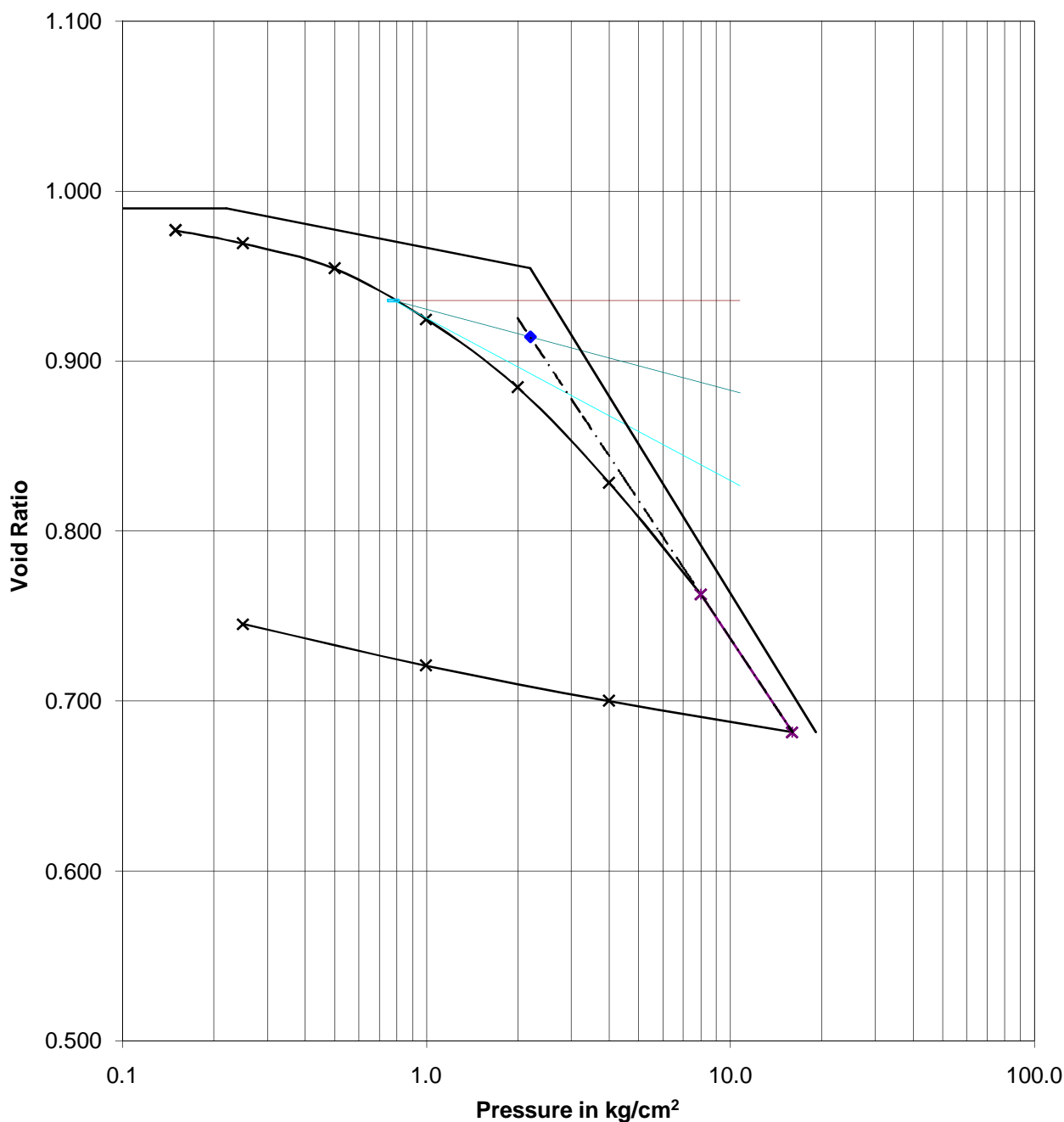
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Fig No.
G/25

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-10	C _c = 0.2908	0.25 - 0.50	0.0299
Depth : 3.0m	C _c /(1+e ₀) = 0.1461	0.50 - 1.00	0.0305
e ₀ = 0.9899	p _c = 2.20 kg/cm ²	1.00 - 2.00	0.0209
p ₀ = 0.22 kg/cm ²	C _s = 0.0352	2.00 - 4.00	0.0149
	C _r ≈ 0.0352	4.00 - 8.00	0.0089



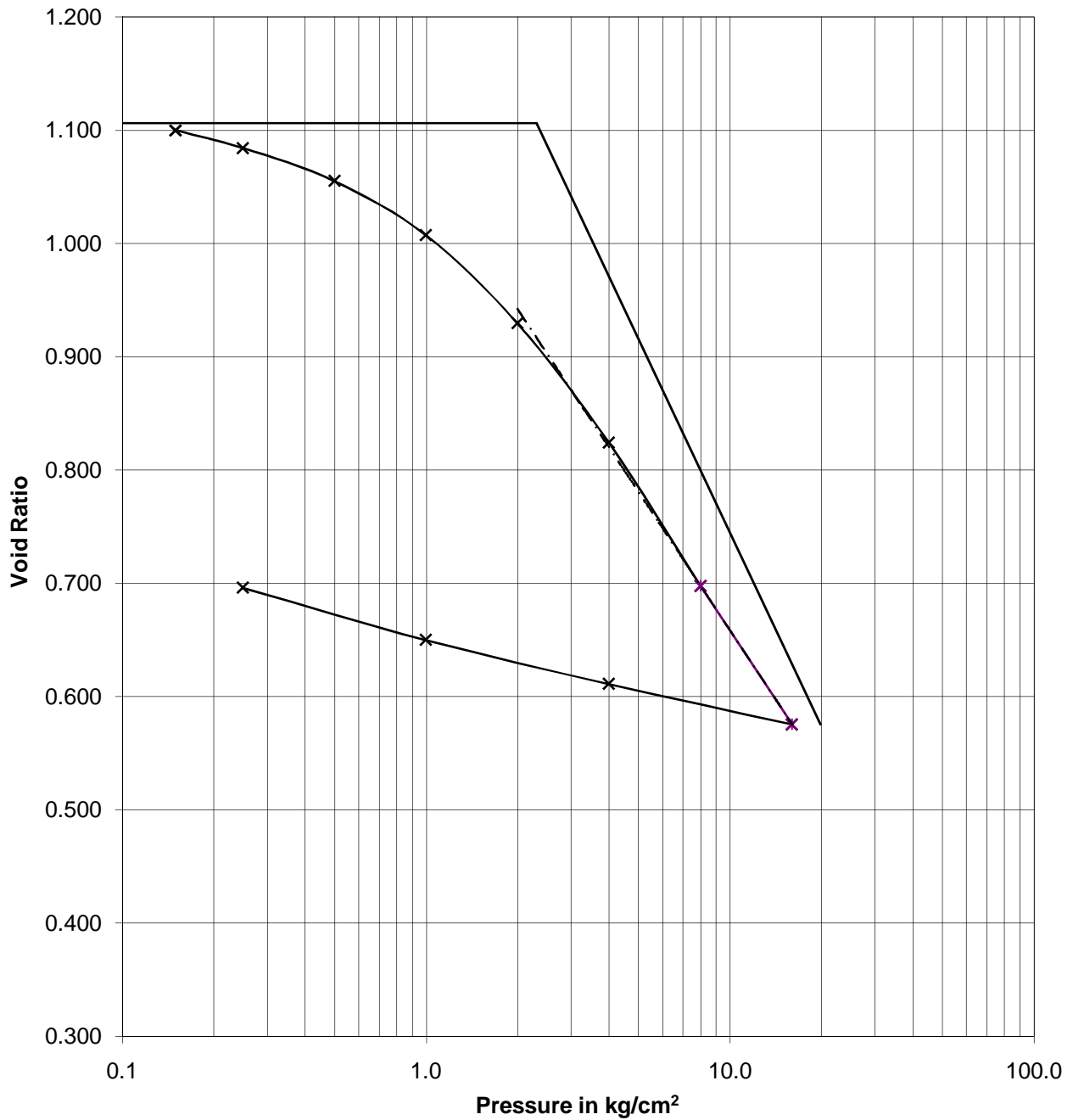
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Job No.:
XCSPL/1372

Fig No.
G/26

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-10	C _c = 0.5685		
Depth : 29.0m	C _c /(1+e ₀) = 0.2699	0.25 - 0.50 :	0.0555
e ₀ = 1.1061	p _c = -	0.50 - 1.00 :	0.0468
p ₀ = 2.31 kg/cm ²	C _s = 0.0669	1.00 - 2.00 :	0.0387
	C _r ≈ 0.0669	2.00 - 4.00 :	0.0273
		4.00 - 8.00 :	0.0173



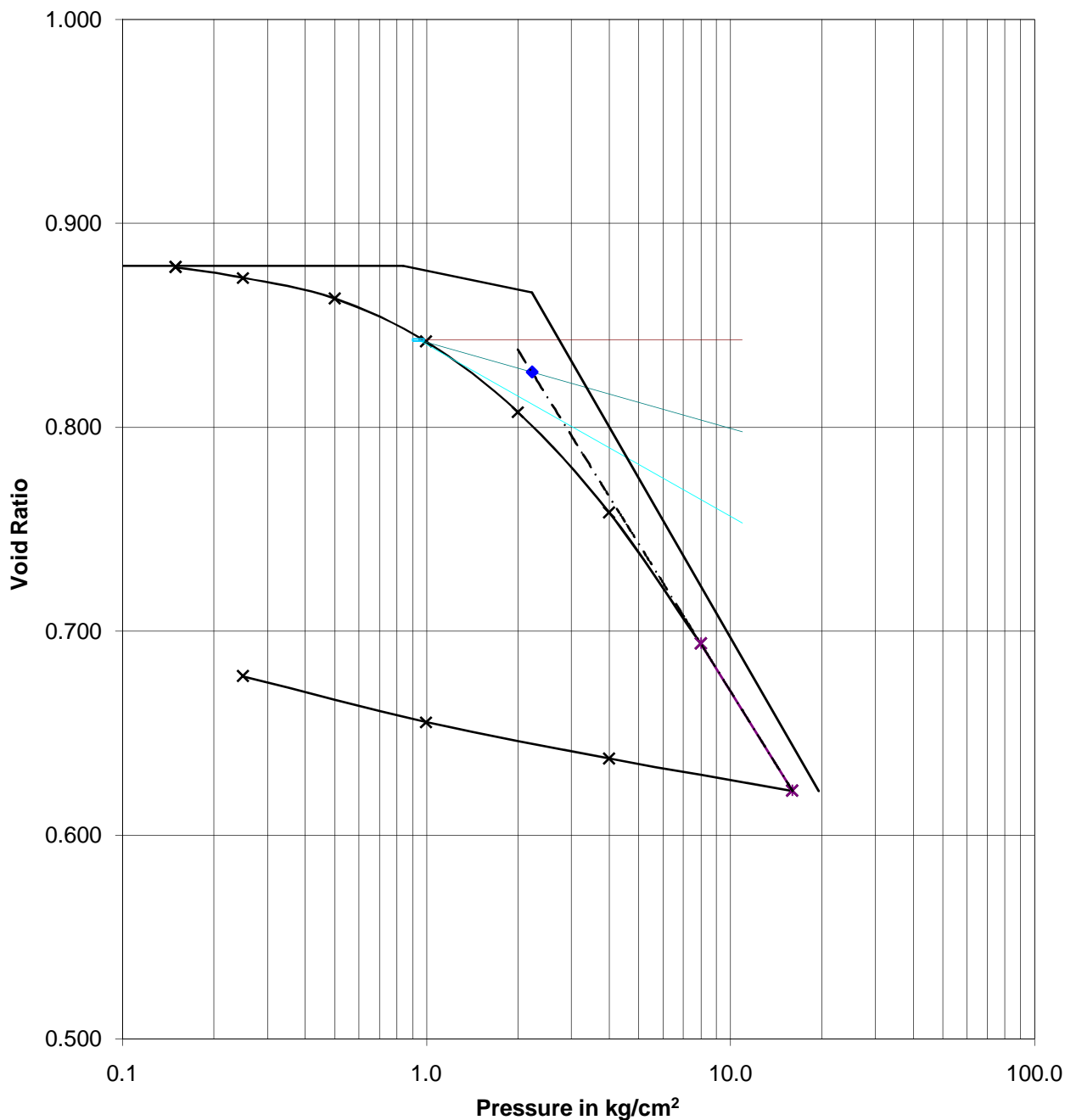
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Fig No.
G/27

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-11	C _c = 0.2593	0.25 - 0.50	0.0218
Depth : 11.0m	C _c /(1+e ₀) = 0.1380	0.50 - 1.00	0.0228
e ₀ = 0.8792	p _c = 2.22 kg/cm ²	1.00 - 2.00	0.0187
p ₀ = 0.84 kg/cm ²	C _s = 0.0311	2.00 - 4.00	0.0137
	C _r ≈ 0.0311	4.00 - 8.00	0.0091



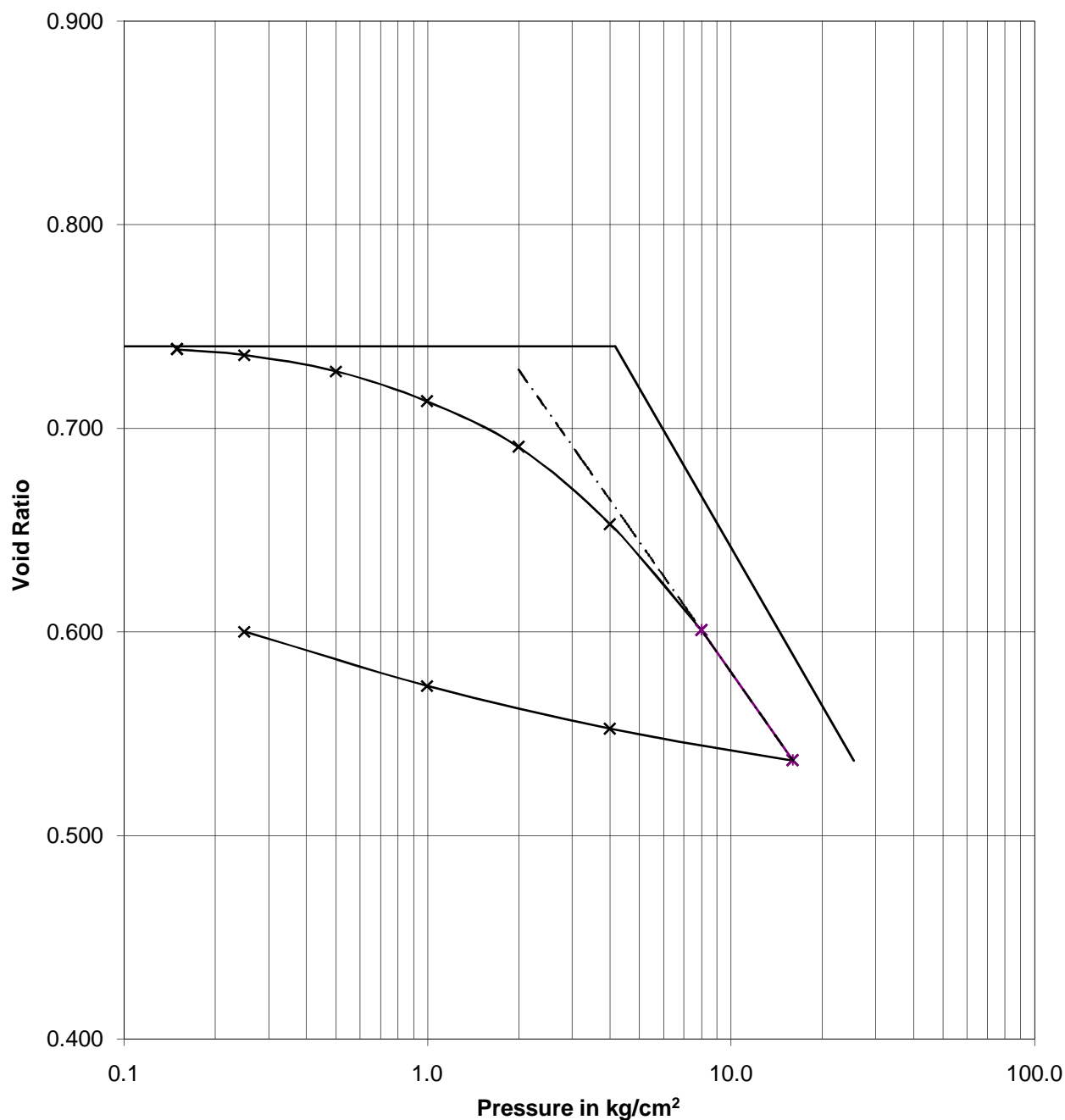
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Fig No.
G/28

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-11	C _c = 0.2585		
Depth : 48.0m	C _c /(1+e ₀) = 0.1485	0.25 - 0.50	: 0.0184
e ₀ = 0.7404	p _c = -	0.50 - 1.00	: 0.0171
p ₀ = 4.15 kg/cm ²	C _s = 0.0350	1.00 - 2.00	: 0.0131
	C _r ≈ 0.0350	2.00 - 4.00	: 0.0112
		4.00 - 8.00	: 0.0079



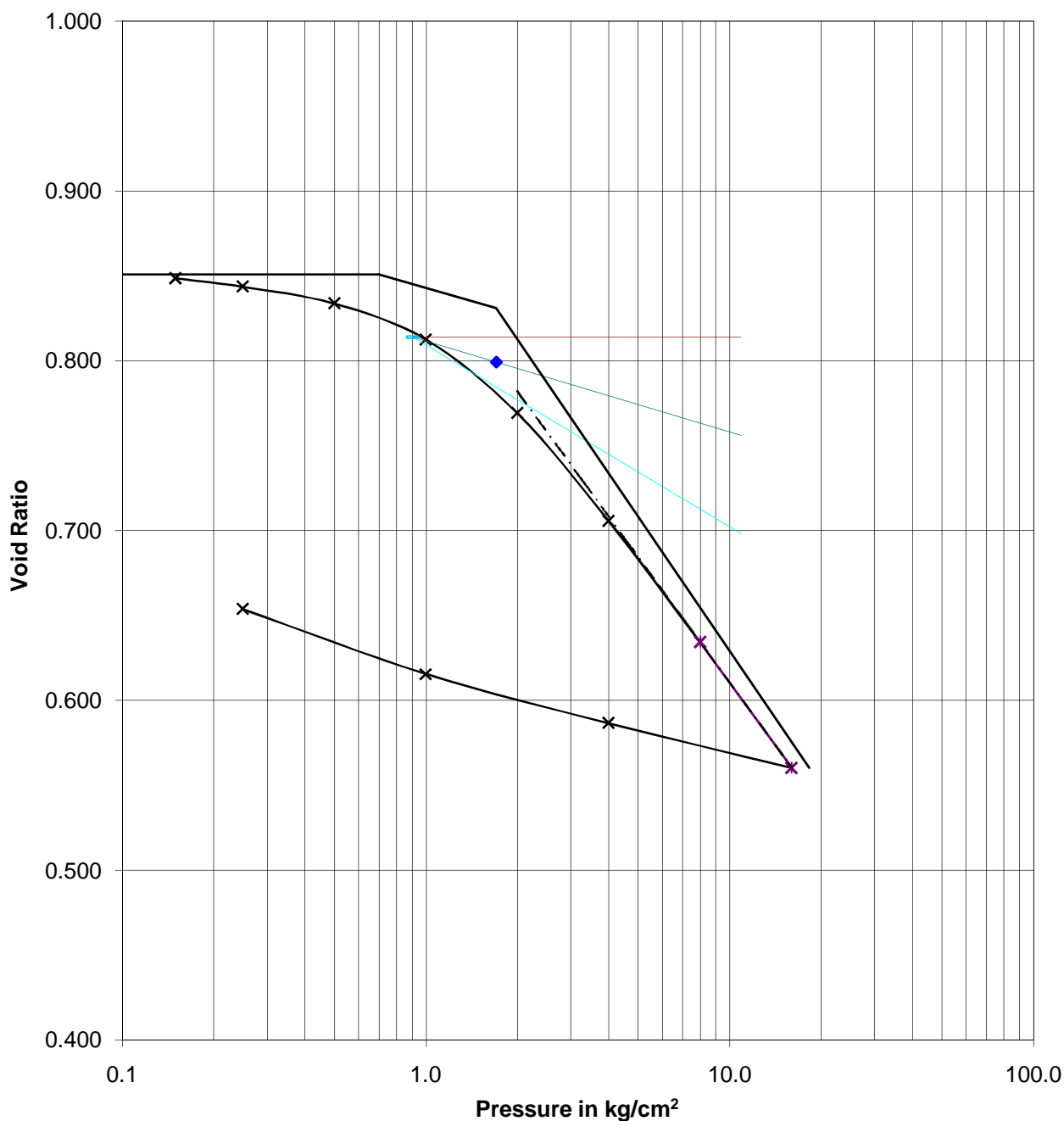
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Fig No.
G/29

e-logp curve

		Pressure range (kg/cm ²)	m _v (Lab) (cm ² /kg)
BH-No. : BH-12	C _c = 0.2627	0.25 - 0.50	0.0217
Depth : 10.0m	C _c /(1+e ₀) = 0.1420	0.50 - 1.00	0.0231
e ₀ = 0.8509	p _c = 1.70 kg/cm ²	1.00 - 2.00	0.0239
p ₀ = 0.70 kg/cm ²	C _s = 0.0518	2.00 - 4.00	0.0180
	C _r ≈ 0.0518	4.00 - 8.00	0.0105



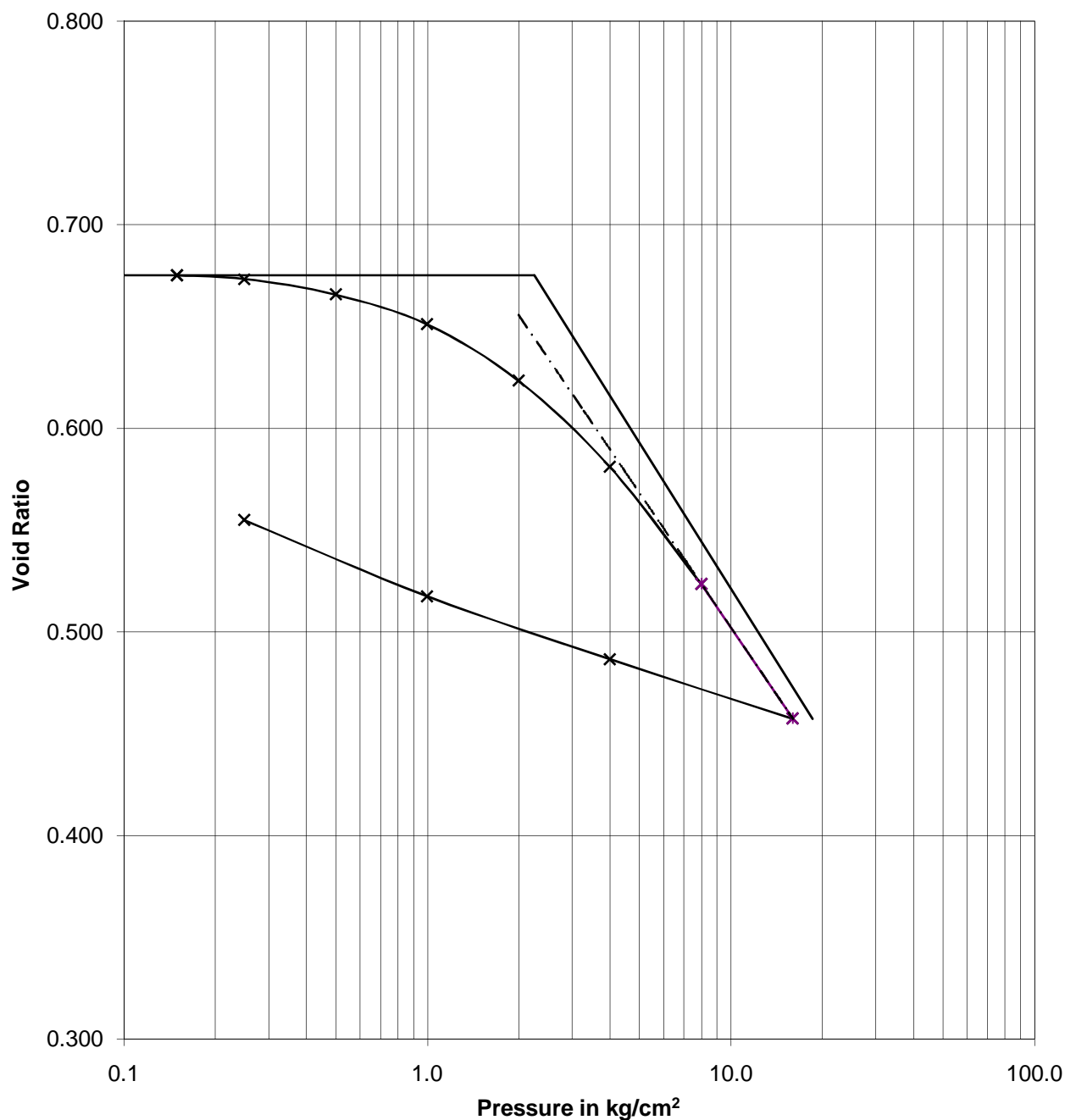
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Fig No.
G/30

e-logp curve

BH-No. : BH-12	$C_c = 0.2378$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 30.0m	$C_c/(1+e_0) = 0.1420$	0.25 - 0.50 :	0.0184
$e_0 = 0.6753$	$p_c = -$	0.50 - 1.00 :	0.0175
$p_0 = 2.25$ kg/cm ²	$C_s = 0.0540$	1.00 - 2.00 :	0.0168
	$C_r \approx 0.0540$	2.00 - 4.00 :	0.0131
		4.00 - 8.00 :	0.0091



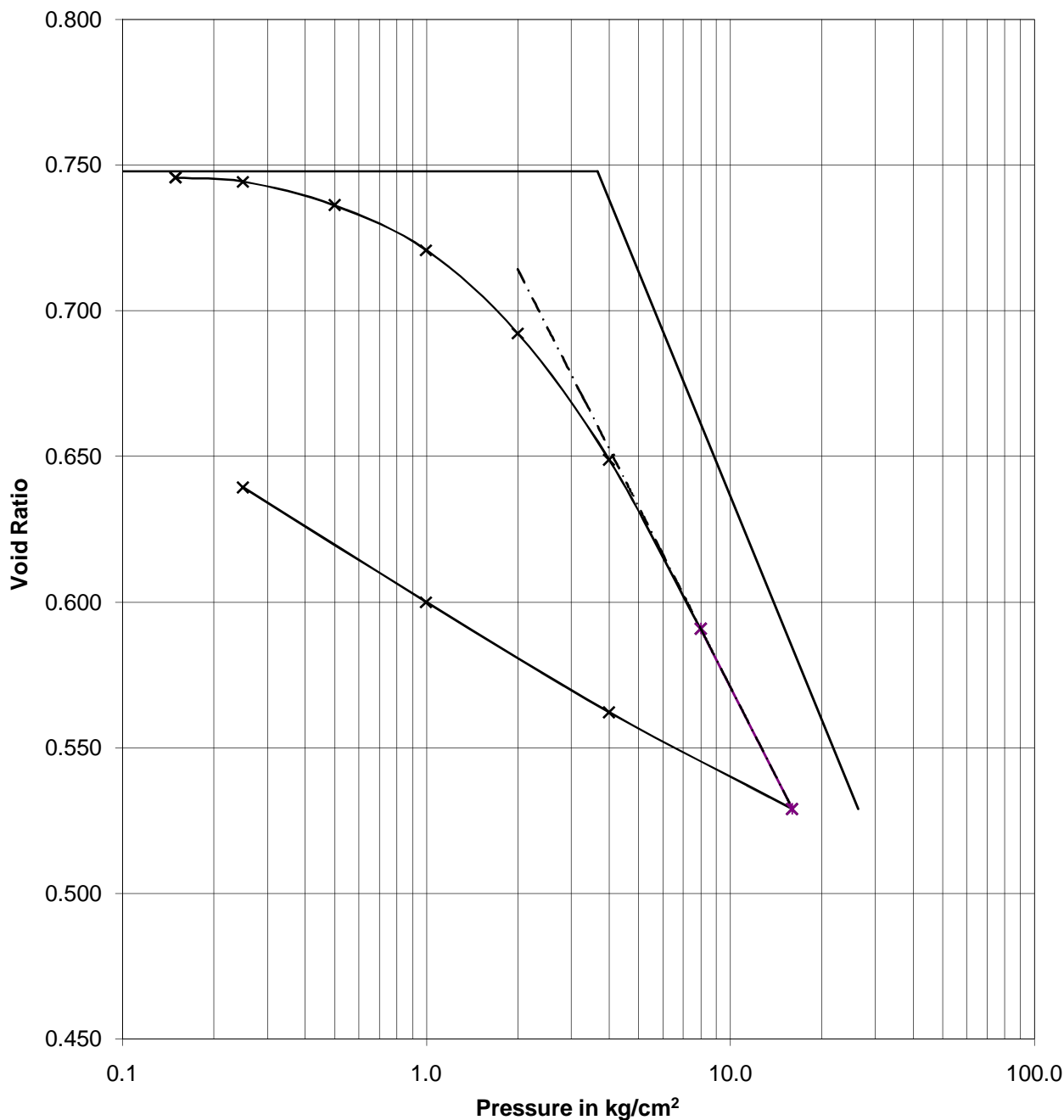
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Job No.:
XCSPL/1372

Fig No.
G/31

e-logp curve

BH-No. : BH-12	$C_c = 0.2548$	Pressure range (kg/cm ²)	m_v (Lab) (cm ² /kg)
Depth : 44.0m	$C_c/(1+e_0) = 0.1458$	0.25 - 0.50	: 0.0186
$e_0 = 0.7478$	$p_c = -$	0.50 - 1.00	: 0.0177
$p_0 = 3.65$ kg/cm ²	$C_s = 0.0611$	1.00 - 2.00	: 0.0166
	$C_r \approx 0.0611$	2.00 - 4.00	: 0.0129
		4.00 - 8.00	: 0.0088



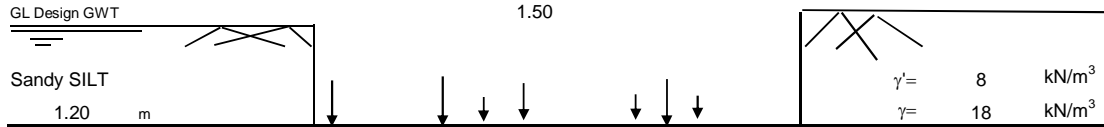
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Job No.:
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Fig No.
G/32

Calculation for Bearing Capacity for Strip Footing

Footing Size: 1.5 m
 Depth : 1.20 m



Layer - I	Silty CLAY	
N_{av}	3	
ϕ_{av}	0	degree
C_{av}	23	kPa
γ_{av}	8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q) s_q d_q i_q + 0.5 B \gamma N_s s_y d_y i_{yw}) / FS$$

FS =	2.5	w =	0.5	N_v =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_y =	1.00	
S_c =	1.000	S_q =	1.000			
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.16			
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.08			
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$	
$Q_{\text{safe-I}} =$	54.9	kPa				

Design Bearing Capacity = **55.0 kPa**

Settlement for Layer - I

$$\delta (\text{mm}) = m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$$

$m_v = 0.000291$ m²/kN

$\mu_g = 0.7$

for clay

$$\delta (\text{mm}) = [2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$$

$C = 1.5 * (C_{kd}/p_o) =$

0.0

$C_{kd}/N =$

kPa

for sand

1st layer I = 0.08

$p_o = 36.4$

$p = 55.0$

Depth Factor, $d_f =$

0.76

Rigidity factor = 0.8

$\delta_1 (\text{mm}) = 4.80$

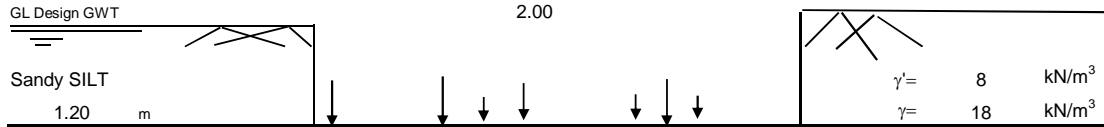
Total settlement = 4.80 mm

Allowable Bearing capacity for 25mm settlement =

55.0 KPa

Calculation for Bearing Capacity for Strip Footing

Footing Size: 2 m
 Depth : 1.20 m



Layer - I	Silty CLAY	
N_{av} =	3	
ϕ_{av} =	0	degree
c_{av} =	23	kPa
γ_{av} =	8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q) s_q d_q i_q + 0.5 B \gamma N_{\gamma} s_{\gamma} d_{\gamma} i_{\gamma w}) / FS$$

FS=	2.5	w=	0.5	N_{γ} =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_{γ} =	1.00	
S_c =	1.000	S_q =	1.000			
dc=	$1+0.2*(D/B)*\tan(45+\phi/2)$		1.12			
dq=d γ =	$1+0.1*(D/B)*\tan(45+\phi/2)$		1.06			
ic=iq=	$(1-\alpha/90)^2=$	1.00	ig=	$(1-\alpha/\phi)^2=$	1.00	$\alpha=0$
$Q_{\text{safe-I}}$=	53.0					kPa

Design Bearing Capacity= **53.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor (0.8)}$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p) / p_o)] * d_r * \text{Rigidity Factor (0.8)}$
 $C = 1.5 * (C_{kd} / p_o) = 0.0$ $C_{kd} / N =$ for sand
 $p_o = 36.4$ $p = 53.0$ kPa KN/m^2 1st layer I = 0.08
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.76$

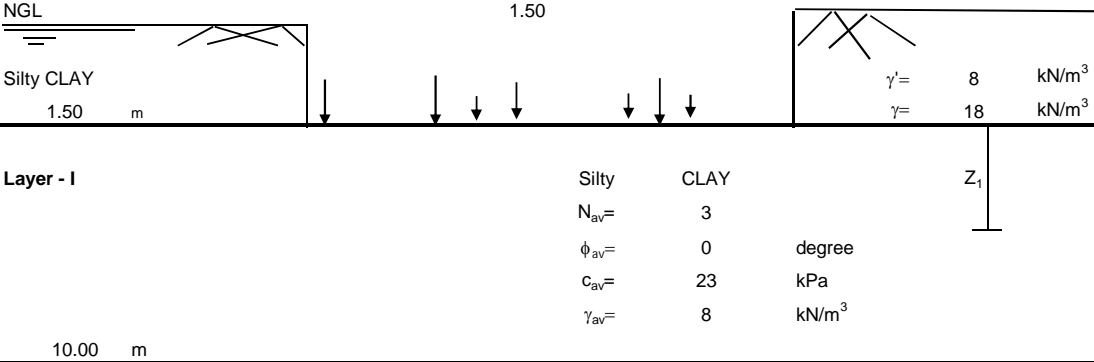
δ_1 (mm) = 4.62

Total settlement = 4.62 mm

Allowable Bearing capacity for 25mm settlement= 53.0 KPa

Calculation for Bearing Capacity for Square Footing

Footing Size: 1.5X1.5 m
 Depth : 1.50 m



Safe Bearing Capacity from Shear Failure

Design φ = 0 degree

For Layer - I

Q(safe) = (cN_cs_cd_ci_c + (γ'D)(N_q1)s_qd_qi_q + 0.5BγN_ss_vd_vi_v)/FS

FS =	2.5	w =	0.5		
N _c =	5.14	N _q =	1	N _v =	0.00
S _c =	1.300	S _q =	1.200	S _v =	0.80
dc =	1 + 0.2*(D/B)*tan(45+φ/2) =		1.20		
dq =	1 + 0.1*(D/B)*tan(45+φ/2) =		1.10		
ic =	(1 - α/90) ² =		1.00	ig =	(1 - α/φ) ² = 1.00
					α = 0
Q_{safe} =	73.8	kPa			

Design Bearing Capacity = **70.0 kPa**

Settlement for Layer - I

δ (mm) = m_v*H*Δp*μ_g*d_r*Rigidity Factor (0.8)

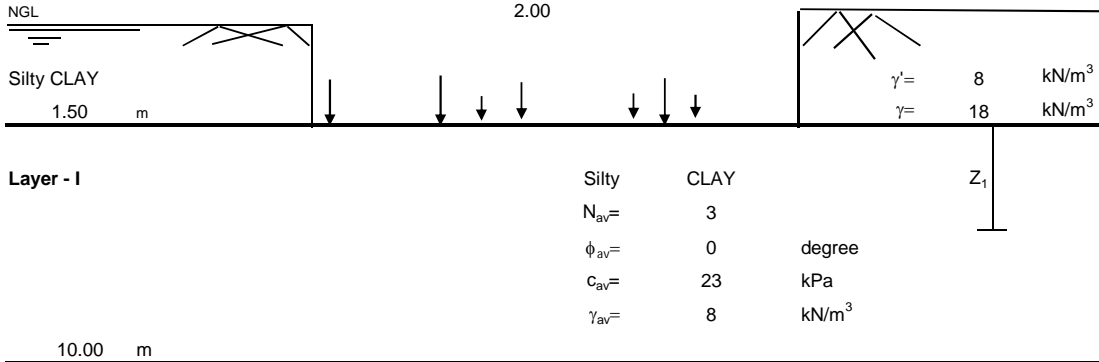
m _v =	0.000291			μ _g =	0.7	
						for clay
δ (mm) =	[2.303*(H/C)*log ₁₀ ((p _o +Δp)/p _o)]*d _r *Rigidity Factor (0.8)					} for sand 1st layer I = 0.08
C =	1.5*(C _{kd} /p _o) =	0.0	C _{kd} /N =			
p _o =	35.5	p =	70.0	kPa		
Rigidity factor =	0.8	Depth Factor, d _f =		0.725		
δ₁ (mm) =	5.62					

Total settlement = 5.62 mm

Allowable Bearing capacity for 25mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **70.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 2.0X2.0 m
 Depth : 1.50 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma D)(N_q) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$

FS =	2.5	w =	0.5		
N_c =	5.14	N_q =	1	N_v =	0.00
S_c =	1.300	S_q =	1.200	S_v =	0.80
d_c =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.15		
d_q =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2) =$		1.08		
$i_c = i_q =$	$(1 - \alpha/90)^2 =$	1.00	$i_g = (1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$
$Q_{\text{safe-I}} =$	70.7	kPa			

Design Bearing Capacity = **70.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 35.5$ $p = 70.0$ kPa $\text{1st layer I} = 0.08$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.78$

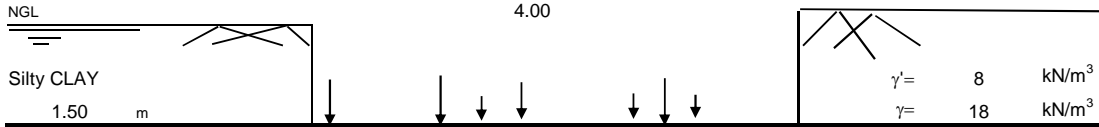
δ_1 (mm) = 6.05

Total settlement = 6.05 mm

Allowable Bearing capacity for 25mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **70.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 4.0x4.0 m
 Depth : 1.50 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q - 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_v}) / FS$$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.08	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.04	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$		66.1	kPa	$\alpha = 0$

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 55.5$ $p = 65.0$ kPa $\text{1st layer I} = 0.152$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.9$

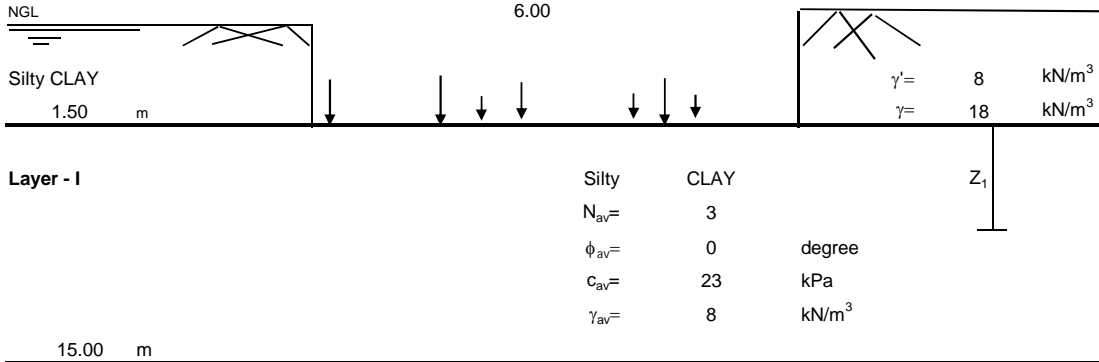
δ_1 (mm) = **19.56**

Total settlement = 19.56 mm

Allowable Bearing capacity for 25mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 6.0x6.0 m
 Depth : 1.50 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c1} i_c + (\gamma' D)(N_q - 1) s_q d_{q1} i_q + 0.5 B \gamma N_s s_v d_{v1} i_{vw}) / FS$$

FS =	2.5	w =	0.5		
N_c =	5.14	N_q =	1	N_v =	0.00
S_c =	1.300	S_q =	1.200	S_v =	0.80
dc =	1 + 0.2 * (D/B) * tan(45 + ϕ /2) =		1.05		
dq =	1 + 0.1 * (D/B) * tan(45 + ϕ /2) =		1.03		
ic = iq =	(1 - α /90) ² =		1.00	α =	0
$Q_{\text{safe-I}}$ =	64.5	kPa			

Design Bearing Capacity = **60.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v \cdot H \cdot \Delta p \cdot \mu_g \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 \cdot (H/C) \cdot \log_{10}((p_o + \Delta p)/p_o)] \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $C = 1.5 \cdot (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 55.5$ $p = 60.0$ kPa $\text{1st layer I} = 0.24$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.94$

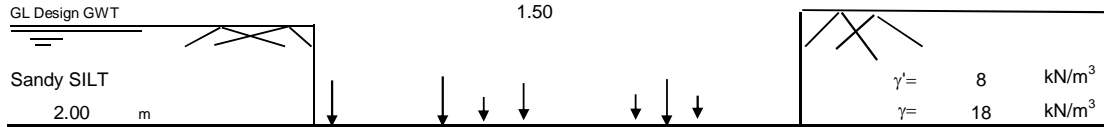
δ_1 (mm) = 29.78

Total settlement = 29.78 mm

Allowable Bearing capacity for 25mm settlement = **54.2 KPa**
 Allowable Bearing capacity for 50mm settlement = **60.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **60.0 KPa**

Calculation for Bearing Capacity for Strip Footing

Footing Size: 1.5 m
 Depth : 2.00 m



Layer - I	Silty CLAY	
N_{av}	3	
ϕ_{av}	0	degree
c_{av}	23	kPa
γ_{av}	8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q \cdot 1) s_q d_q i_q + 0.5 B \gamma N_{\gamma} s_{\gamma} d_{\gamma} i_{\gamma w}) / FS$$

FS =	2.5	w =	0.5	N_{γ} =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_{γ} =	1.00	
S_c =	1.000	S_q =	1.000			
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.27			
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.13			
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$	
$Q_{\text{safe-I}} =$	59.9	kPa				

Design Bearing Capacity = **60.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor (0.8)}$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor (0.8)}$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 34$ $p = 60.0$ kPa KN/m^2 1st layer I = 0.072
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.67$

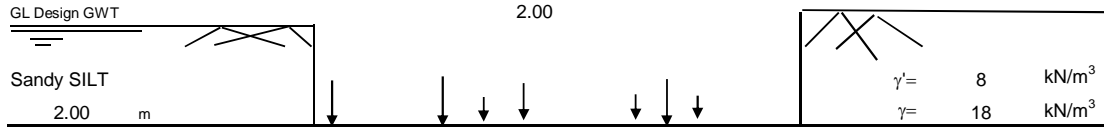
δ_1 (mm) = 3.77

Total settlement = 3.77 mm

Allowable Bearing capacity for 25mm settlement = 60.0 KPa

Calculation for Bearing Capacity for Strip Footing

Footing Size: 2 m
 Depth : 2.00 m



Layer - I	Silty CLAY		Z ₁
N _{av} =	3		
φ _{av} =	0	degree	
c _{av} =	23	kPa	
γ _{av} =	8	kN/m ³	

10.00 m

Safe Bearing Capacity from Shear Failure

Design φ= 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma \cdot D)(N_q \cdot 1) s_q d_q i_q + 0.5 B \gamma N_{\gamma} s_{\gamma} d_{\gamma} i_{\gamma}) / FS$$

FS=	2.5	w=	0.5		
N _c =	5.14	N _q =	1	N _γ =	0.00
S _c =	1.000	S _q =	1.000	S _γ =	1.00
dc=	1+0.2*(D/B)*tan(45+φ/2)=		1.20		
dq=	1+0.1*(D/B)*tan(45+φ/2)		1.10		
ic=iq=	(1-α/90) ² =	1.00	ig= (1-α/φ) ² =	1.00	α=0
Q_{safe-I}=	56.7	kPa			

Design Bearing Capacity= **55.0 kPa**

Settlement for Layer - I

δ (mm) = m_v * H * Δp * μ_s * d_r * Rigidity Factor (0.8)

m_v = 0.000291 m²/kN μ_s = 0.7 for clay

δ (mm) = [2.303 * (H/C) * log₁₀((p_o + Δp) / p_o)] * d_r * Rigidity Factor (0.8)

C = 1.5 * (C_{kα} / p_o) = 0.0 C_{kα} / N = for sand

p_o = 34 p = 55.0 kPa KN/m² 1st layer I = 0.152

Rigidity factor = 0.8 Depth Factor, d_r = 0.73

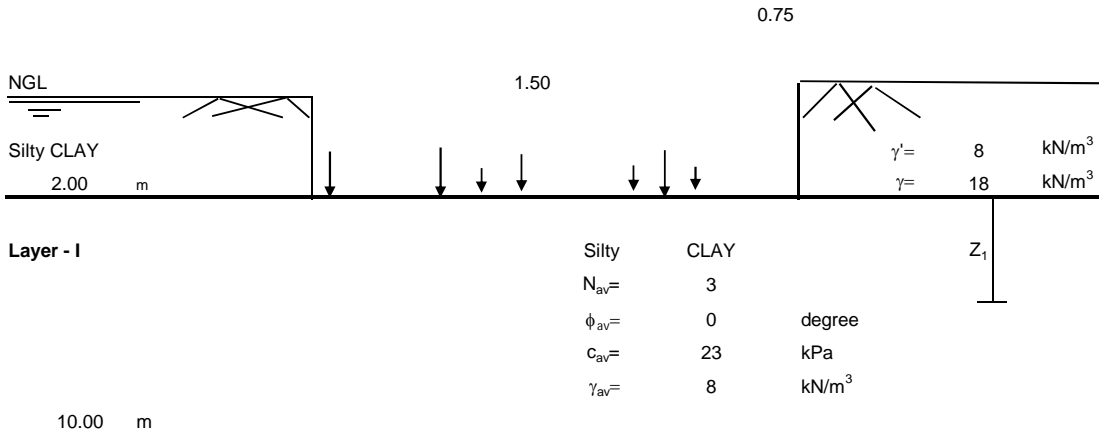
δ₁ (mm) = 7.96

Total settlement = 7.96 mm

Allowable Bearing capacity for 25mm settlement= 55.0 KPa

Calculation for Bearing Capacity for Square Footing

Footing Size: 1.5X1.5 m
 Depth : 2.00 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma \cdot D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vw}}) / FS$$

FS = 2.5 w = 0.5

$N_c = 5.14$ $N_q = 1$ $N_v = 0.00$ Local shear failure
 $S_c = 1.300$ $S_q = 1.200$ $S_v = 0.80$

$dc = 1 + 0.2 \cdot (D/B) \cdot \tan(45 + \phi/2) = 1.27$
 $dq = d\gamma = 1 + 0.1 \cdot (D/B) \cdot \tan(45 + \phi/2) = 1.13$
 $ic = iq = (1 - \alpha/90)^2 = 1.00$ $ig = (1 - \alpha/\phi)^2 = 1.00$ $\alpha = 0$

$Q_{\text{safe-I}} = 77.9$ kPa

Design Bearing Capacity = **75.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v \cdot H \cdot \Delta p \cdot \mu_g \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 \cdot (H/C) \cdot \log_{10}((p_o + \Delta p)/p_o)] \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $C = 1.5 \cdot (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 34$ $p = 75.0$ kPa $\text{1st layer I} = 0.072$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.67$

δ_1 (mm) = 4.72

Total settlement = 4.72 mm

Allowable Bearing capacity for 25mm settlement = **75.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **75.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **75.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 2.0X2.0 m
 Depth : 2.00 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c1c} + (\gamma' D)(N_q \cdot 1) s_q d_{q1q} + 0.5 B \gamma N_s s_v d_{v1v}) / FS$$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00 Local shear failure
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.20	
dq =	$d\gamma = 1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.10	
ic =	$i_q = (1 - \alpha/90)^2 =$	1.00	$i_g = (1 - \alpha/\phi)^2 =$	1.00 $\alpha = 0$
$Q_{\text{safe-I}} =$	73.8			kPa

Design Bearing Capacity = **70.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 34$ $p = 70.0$ kPa $\text{Rigidity factor} = 0.8$ $\text{Depth Factor, } d_f = 0.73$ 1st layer I = 0.152

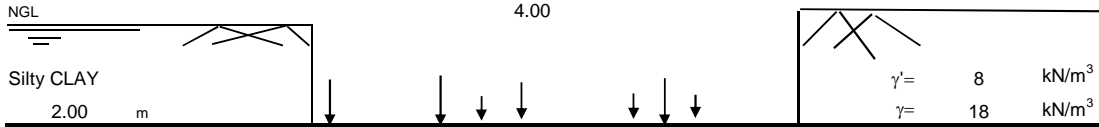
δ_1 (mm) = 10.13

Total settlement = 10.13 mm

Allowable Bearing capacity for 25mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **70.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 4.0x4.0 m
 Depth : 2.00 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00 Local shear failure
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.10	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.05	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00 $\alpha = 0$
$Q_{\text{safe-I}} =$	67.6		kPa	

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 54$ $p = 65.0$ kPa KN/m^2 } 1st layer I = 0.152
 Rigidity factor = 0.8 $\text{Depth Factor, } d_f = 0.85$

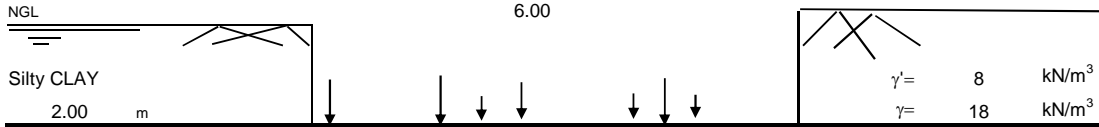
δ_1 (mm) = 17.79

Total settlement = 17.79 mm

Allowable Bearing capacity for 25mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 6.0x6.0 m
 Depth : 2.00 m



Layer - I	Silty	CLAY	
N_{av}	3		
ϕ_{av}	0	degree	
c_{av}	23	kPa	
γ_{av}	8	kN/m ³	

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma \cdot D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 \cdot (D/B) \cdot \tan(45 + \phi/2) =$		1.07	
dq = d γ =	$1 + 0.1 \cdot (D/B) \cdot \tan(45 + \phi/2)$		1.03	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$	65.6	kPa		$\alpha = 0$

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v \cdot H \cdot \Delta p \cdot \mu_g \cdot d_r \cdot \text{Rigidity Factor (0.8)}$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 \cdot (H/C) \cdot \log_{10}((p_o + \Delta p)/p_o)] \cdot d_r \cdot \text{Rigidity Factor (0.8)}$
 $C = 1.5 \cdot (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 54$ $p = 65.0$ kPa KN/m^2
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.92$ 1st layer I = 0.32

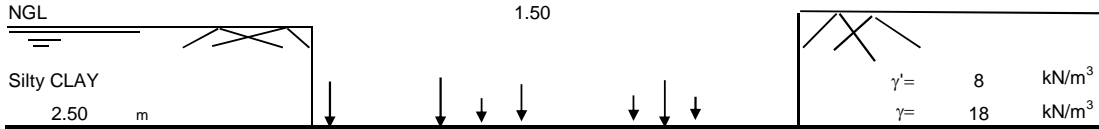
δ_1 (mm) = **40.54**

Total settlement = 40.54 mm

Allowable Bearing capacity for 25mm settlement = **40.4 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 1.5X1.5 m
 Depth : 2.50 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,i_c} + (\gamma \cdot D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vw}}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 \cdot (D/B) \cdot \tan(45 + \phi/2) =$		1.33	
dq =	$d\gamma = 1 + 0.1 \cdot (D/B) \cdot \tan(45 + \phi/2)$		1.17	
ic =	$i_q = (1 - \alpha/90)^2 =$	1.00	$i_g = (1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$	82.0	kPa		$\alpha = 0$

Design Bearing Capacity = **80.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v \cdot H \cdot \Delta p \cdot \mu_g \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 \cdot (H/C) \cdot \log_{10}((p_o + \Delta p)/p_o)] \cdot d_r \cdot \text{Rigidity Factor} (0.8)$
 $C = 1.5 \cdot (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 32.5$ $p = 80.0$ kPa KN/m^2
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.65$ 1st layer I = 0.072

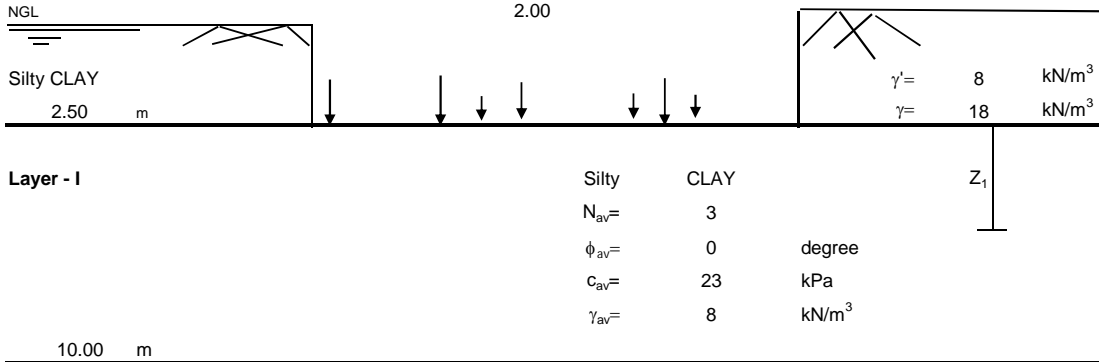
δ_1 (mm) = **4.58**

Total settlement = 4.58 mm

Allowable Bearing capacity for 25mm settlement = **80.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **80.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **80.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 2.0X2.0 m
 Depth : 2.50 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_{c,c} + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$$

FS = 2.5 w = 0.5

$N_c = 5.14$ $N_q = 1$ $N_v = 0.00$ Local shear failure
 $S_c = 1.300$ $S_q = 1.200$ $S_v = 0.80$

$dc = 1 + 0.2 * (D/B) * \tan(45 + \phi/2) = 1.25$
 $dq = d\gamma = 1 + 0.1 * (D/B) * \tan(45 + \phi/2) = 1.13$
 $ic = iq = (1 - \alpha/90)^2 = 1.00$ $ig = (1 - \alpha/\phi)^2 = 1.00$ $\alpha = 0$

$Q_{\text{safe-I}} = 76.8 \text{ kPa}$

Design Bearing Capacity = **75.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 32.5$ $p = 75.0$ kPa KN/m^2 1st layer I = 0.152
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.68$

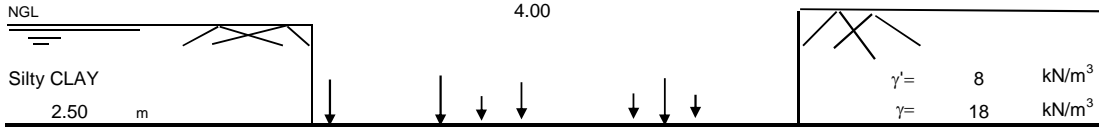
δ_1 (mm) = 9.47

Total settlement = 9.47 mm

Allowable Bearing capacity for 25mm settlement = **75.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **75.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **75.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 4.0x4.0 m
 Depth : 2.50 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q - 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vw}}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.13	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.06	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$		69.2	kPa	$\alpha = 0$

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 52.5$ $p = 65.0$ kPa $\text{1st layer I} = 0.152$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.82$

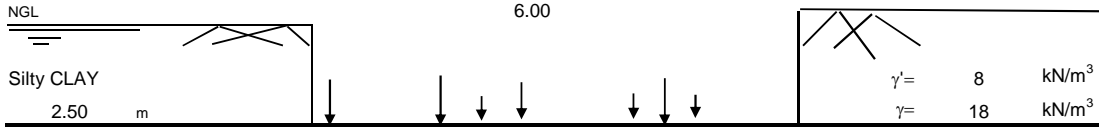
δ_1 (mm) = **16.50**

Total settlement = 16.50 mm

Allowable Bearing capacity for 25mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 6.0x6.0 m
 Depth : 2.50 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.08	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.04	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$		66.6	kPa	$\alpha = 0$

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 52.5$ $p = 65.0$ kPa $\text{1st layer I} = 0.32$
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.87$

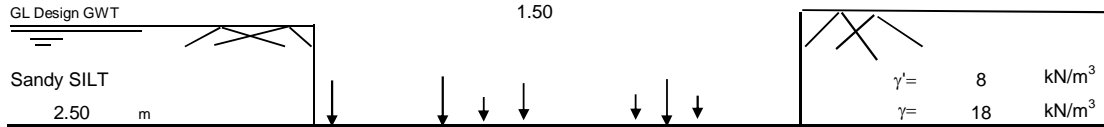
δ_1 (mm) = **36.86**

Total settlement = 36.86 mm

Allowable Bearing capacity for 25mm settlement = **45.2 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**

Calculation for Bearing Capacity for Strip Footing

Footing Size: 1.5 m
 Depth : 2.50 m



Layer - I	Silty CLAY	
N_{av}	3	
ϕ_{av}	0	degree
C_{av}	23	kPa
γ_{av}	8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q) s_q d_q i_q + 0.5 B \gamma N_{\gamma} s_{\gamma} d_{\gamma} i_{\gamma}) / FS$$

FS =	2.5	w =	0.5	N_{γ} =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_{γ} =	1.00	
S_c =	1.000	S_q =	1.000			
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.33			
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.17			
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$	
Q_{safe-I} =	63.1	kPa				

Design Bearing Capacity = **60.0 kPa**

Settlement for Layer - I

$$\delta (\text{mm}) = m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor (0.8)}$$

$m_v = 0.000291$ m²/kN

$\mu_g = 0.7$

for clay

$$\delta (\text{mm}) = [2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor (0.8)}$$

$C = 1.5 * (C_{kd}/p_o) =$

0.0

$C_{kd}/N =$

kPa

for sand

1st layer I = 0.072

$p_o = 32.5$

$p = 60.0$

Depth Factor, $d_f =$

0.65

Rigidity factor = 0.8

$\delta_1 (\text{mm}) = 3.43$

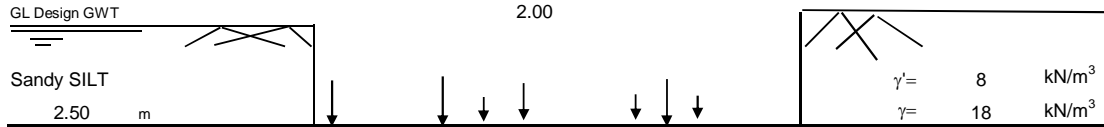
Total settlement = 3.43 mm

Allowable Bearing capacity for 25mm settlement =

60.0 KPa

Calculation for Bearing Capacity for Strip Footing

Footing Size: 2 m
 Depth : 2.50 m



Layer - I	Silty CLAY	
N_{av}	3	
ϕ_{av}	0	degree
C_{av}	23	kPa
γ_{av}	8	kN/m ³
		Z_1
10.00 m		

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q) s_q d_q i_q + 0.5 B \gamma N_s s_\gamma d_\gamma i_\gamma) / FS$$

FS =	2.5	w =	0.5	N_v =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_v =	1.00	
S_c =	1.000	S_q =	1.000			
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.25			
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.13			
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$	
$Q_{\text{safe-I}} =$	59.1	kPa				

Design Bearing Capacity = **55.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 32.5$ $p = 55.0$ kPa KN/m^2 } 1st layer I = 0.152
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.68$

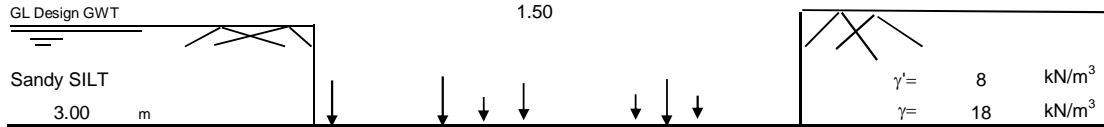
δ_1 (mm) = 6.95

Total settlement = 6.95 mm

Allowable Bearing capacity for 25mm settlement = 55.0 KPa

Calculation for Bearing Capacity for Strip Footing

Footing Size: 1.5 m
 Depth : 3.00 m



Layer - I	Silty CLAY	
N_{av}	3	
ϕ_{av}	0	degree
C_{av}	23	kPa
γ_{av}	8	kN/m ³

10.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q) s_q d_q i_q + 0.5 B \gamma N_s s_y d_y i_{yy}) / FS$$

FS =	2.5	w =	0.5	N_v =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_y =	1.00	
S_c =	1.000	S_q =	1.000			
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.40			
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.20			
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00	$\alpha = 0$	
$Q_{\text{safe-I}} =$	66.2	kPa				

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

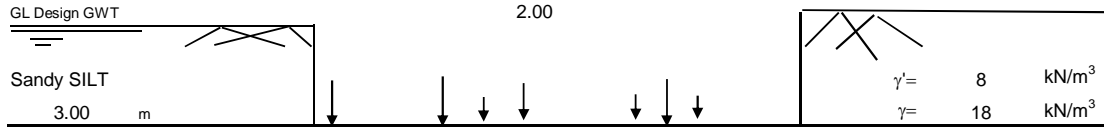
δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor (0.8)}$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay }
 δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor (0.8)}$ for sand }
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ KN/m² }
 $p_o = 31$ kPa $p = 65.0$ kPa }
 Rigidity factor = 0.8 $\text{Depth Factor, } d_r = 0.62$ }
 δ_1 (mm) = 3.31 }
 1st layer I = 0.072

Total settlement = 3.31 mm

Allowable Bearing capacity for 25mm settlement = 65.0 KPa

Calculation for Bearing Capacity for Strip Footing

Footing Size: 2 m
 Depth : 3.00 m



Layer - I	Silty CLAY	
N_{av} =	3	
ϕ_{av} =	0	degree
c_{av} =	23	kPa
γ_{av} =	8	kN/m ³
		Z ₁
	10.00 m	

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_c i_c + (\gamma' D)(N_q \cdot 1) s_q d_q i_q + 0.5 B \gamma N_{\gamma} s_{\gamma} d_{\gamma} i_{\gamma w}) / FS$$

FS=	2.5	w=	0.5	N_{γ} =	0.00	Local shear failure
N_c =	5.14	N_q =	1	S_{γ} =	1.00	
S_c =	1.000	S_q =	1.000			
dc=	$1+0.2*(D/B)*\tan(45+\phi/2)=$		1.30			
dq=d γ =	$1+0.1*(D/B)*\tan(45+\phi/2)$		1.15			
ic=iq=	$(1-\alpha/90)^2=$	1.00	ig= $(1-\alpha/\phi)^2=$	1.00	$\alpha=0$	
Q_{safe-I}=	61.5	kPa				

Design Bearing Capacity= **60.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v \cdot H \cdot \Delta p \cdot \mu_g \cdot d_r \cdot \text{Rigidity Factor (0.8)}$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 \cdot (H/C) \cdot \log_{10}((p_o + \Delta p)/p_o)] \cdot d_r \cdot \text{Rigidity Factor (0.8)}$
 $C = 1.5 \cdot (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 31$ $p = 60.0$ kPa $C_{kd}/N =$ KN/m²
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.66$ 1st layer I = 0.152

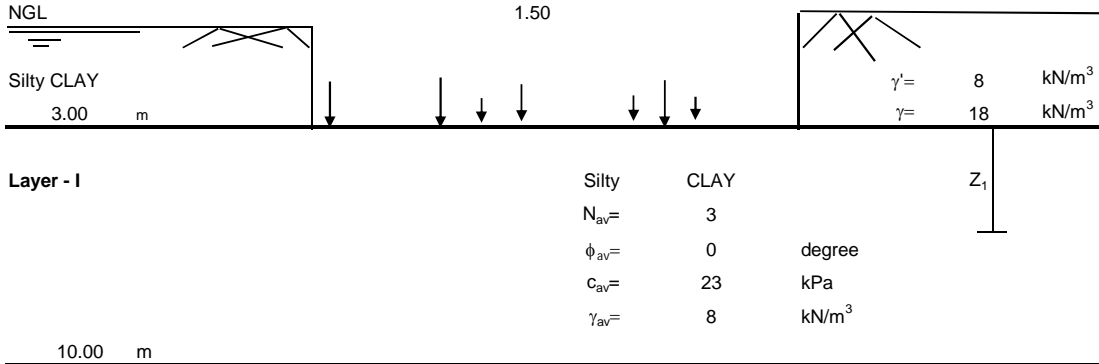
δ_1 (mm) = 6.87

Total settlement = 6.87 mm

Allowable Bearing capacity for 25mm settlement= 60.0 KPa

Calculation for Bearing Capacity for Square Footing

Footing Size: 1.5X1.5 m
 Depth : 3.00 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vw}}) / FS$$

FS = 2.5 w = 0.5

$N_c = 5.14$ $N_q = 1$ $N_v = 0.00$ Local shear failure
 $S_c = 1.300$ $S_q = 1.200$ $S_v = 0.80$

$dc = 1 + 0.2 * (D/B) * \tan(45 + \phi/2) = 1.40$
 $dq = d\gamma = 1 + 0.1 * (D/B) * \tan(45 + \phi/2) = 1.20$
 $ic = iq = (1 - \alpha/90)^2 = 1.00$ $ig = (1 - \alpha/\phi)^2 = 1.00$ $\alpha = 0$

$Q_{\text{safe-I}} = 86.1 \text{ kPa}$

Design Bearing Capacity = **85.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$ for clay }
 $m_v = 0.000291$ m^2/kN $\mu_g = 0.7$

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p) / p_o)] * d_r * \text{Rigidity Factor} (0.8)$ for sand }
 $C = 1.5 * (C_{kd} / p_o) = 0.0$ $C_{kd} / N =$ KN/m^2 1st layer I = 0.072
 $p_o = 31$ $p = 85.0$ kPa
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.62$

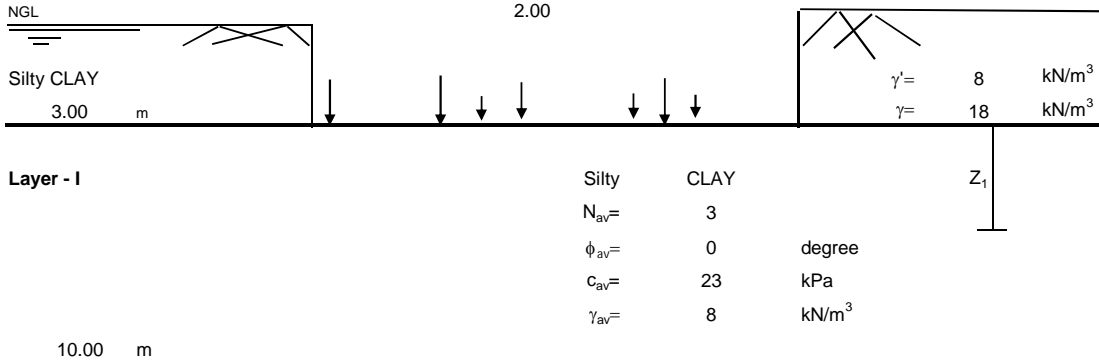
δ_1 (mm) = 4.33

Total settlement = 4.33 mm

Allowable Bearing capacity for 25mm settlement = **85.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **85.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **85.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 2.0X2.0 m
 Depth : 3.00 m



Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$$Q(\text{safe}) = (cN_c s_c d_{c,c} i_{c,c} + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vW}}) / FS$$

FS = 2.5 w = 0.5

$N_c = 5.14$ $N_q = 1$ $N_v = 0.00$ Local shear failure
 $S_c = 1.300$ $S_q = 1.200$ $S_v = 0.80$

$dc = 1 + 0.2 * (D/B) * \tan(45 + \phi/2) = 1.30$
 $dq = d\gamma = 1 + 0.1 * (D/B) * \tan(45 + \phi/2) = 1.15$
 $ic = iq = (1 - \alpha/90)^2 = 1.00$ $ig = (1 - \alpha/\phi)^2 = 1.00$ $\alpha = 0$

$Q_{\text{safe-I}} = 79.9$ kPa

Design Bearing Capacity = **80.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p) / p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd} / p_o) = 0.0$ $C_{kd} / N =$ for sand
 $p_o = 31$ $p = 80.0$ kPa KN/m^2 1st layer I = 0.152
 Rigidity factor = 0.8 Depth Factor, $d_f = 0.66$

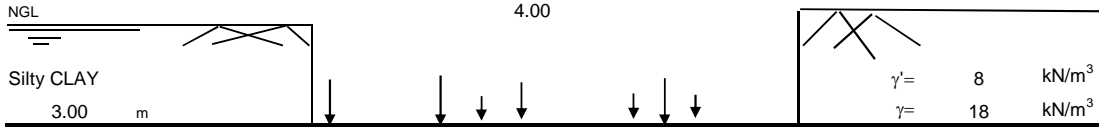
δ_1 (mm) = 9.15

Total settlement = 9.15 mm

Allowable Bearing capacity for 25mm settlement = **80.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **80.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **80.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 4.0x4.0 m
 Depth : 3.00 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q - 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_{v,i_{vw}}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00 Local shear failure
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.15	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.08	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00 $\alpha = 0$
$Q_{\text{safe-I}} =$	70.7		kPa	

Design Bearing Capacity = **70.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ m²/kN $\mu_g = 0.7$ for clay

δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 51$ $p = 70.0$ kPa KN/m^2 } 1st layer I = 0.152
 Rigidity factor = 0.8 $\text{Depth Factor, } d_f = 0.75$

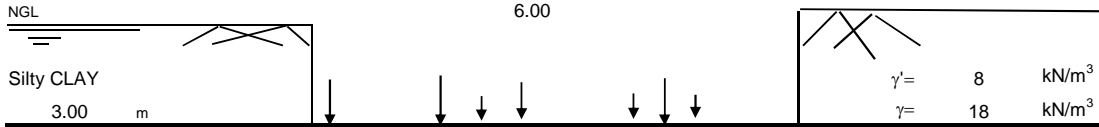
δ_1 (mm) = 15.61

Total settlement = 15.61 mm

Allowable Bearing capacity for 25mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 50mm settlement = **70.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **70.0 KPa**

Calculation for Bearing Capacity for Square Footing

Footing Size: 6.0x6.0 m
 Depth : 3.00 m



Layer - I	Silty	CLAY	
N_{av}		3	
ϕ_{av}		0	degree
c_{av}		23	kPa
γ_{av}		8	kN/m ³

15.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ = 0 degree

For Layer - I

$Q(\text{safe}) = (cN_c s_c d_{c,c} i_c + (\gamma' D)(N_q \cdot 1) s_q d_{q,i_q} + 0.5 B \gamma N_s s_v d_v i_{v,w}) / FS$

FS =	2.5	w =	0.5	
N_c =	5.14	N_q =	1	N_v = 0.00
S_c =	1.300	S_q =	1.200	S_v = 0.80
dc =	$1 + 0.2 * (D/B) * \tan(45 + \phi/2) =$		1.10	
dq = d γ =	$1 + 0.1 * (D/B) * \tan(45 + \phi/2)$		1.05	
ic = iq =	$(1 - \alpha/90)^2 =$	1.00	ig = $(1 - \alpha/\phi)^2 =$	1.00
$Q_{\text{safe-I}} =$	67.6	kPa		$\alpha = 0$

Design Bearing Capacity = **65.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v * H * \Delta p * \mu_g * d_r * \text{Rigidity Factor} (0.8)$
 $m_v = 0.000291$ $\mu_g = 0.7$ for clay

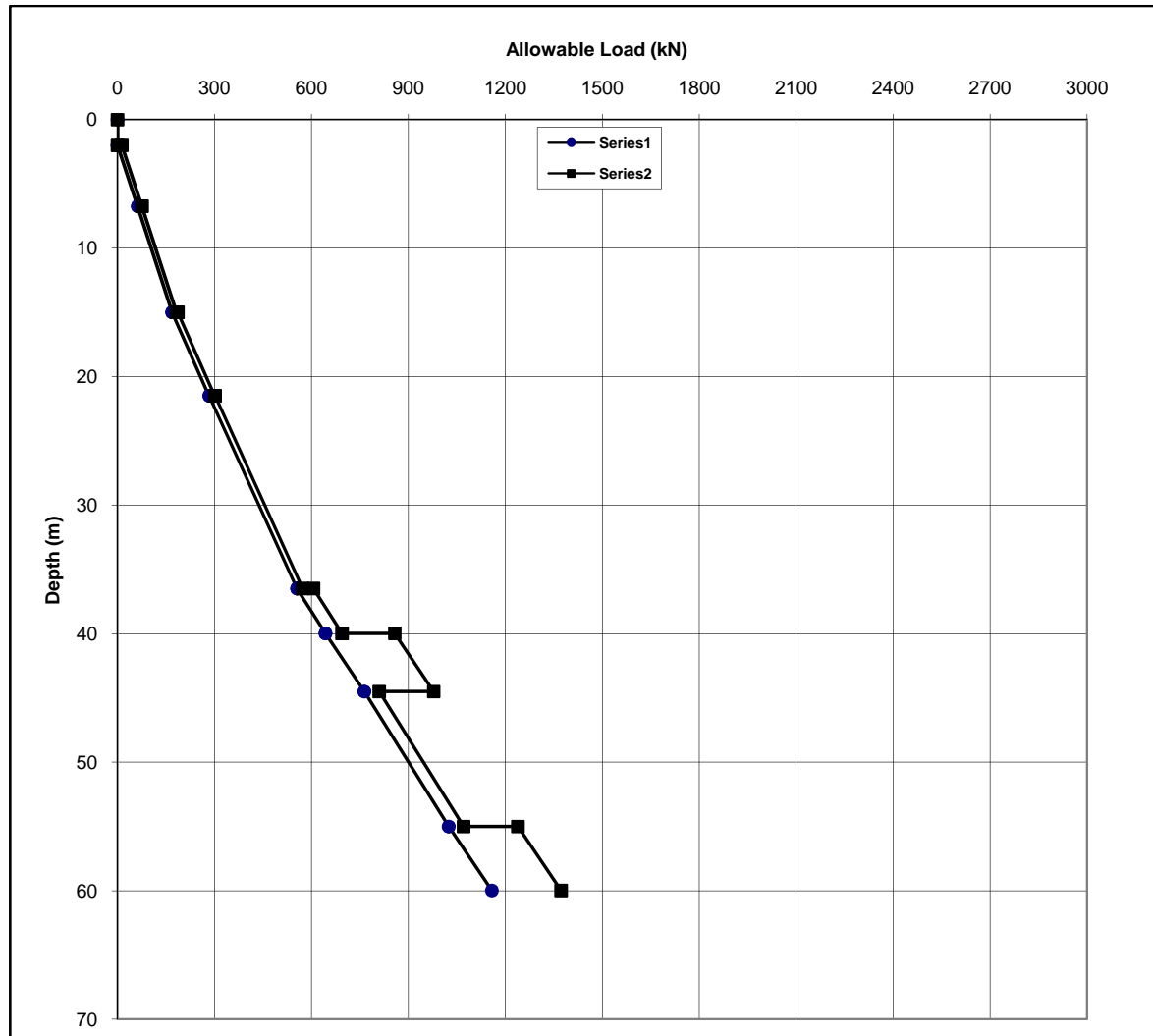
δ (mm) = $[2.303 * (H/C) * \log_{10}((p_o + \Delta p)/p_o)] * d_r * \text{Rigidity Factor} (0.8)$
 $C = 1.5 * (C_{kd}/p_o) = 0.0$ $C_{kd}/N =$ for sand
 $p_o = 51$ $p = 65.0$ kPa $\text{Depth Factor, } d_f = 0.85$ 1st layer I = 0.32

Rigidity factor = 0.8

δ_1 (mm) = **34.57**

Total settlement = 34.57 mm

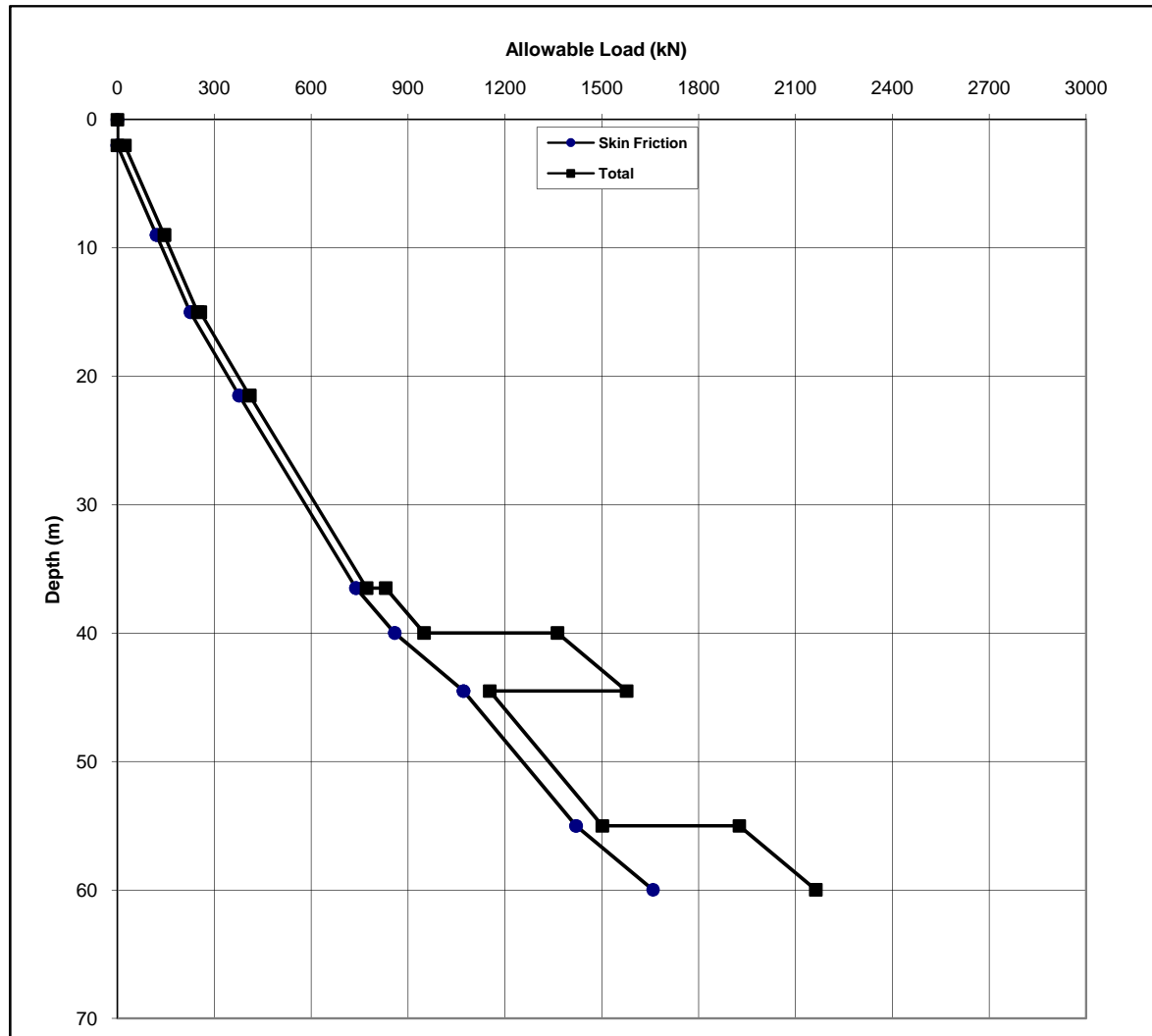
Allowable Bearing capacity for 25mm settlement = **48.9 KPa**
 Allowable Bearing capacity for 50mm settlement = **65.0 KPa**
 Allowable Bearing capacity for 75mm settlement = **65.0 KPa**



Allowable Pile Capacity for Land Zone

Pile Type= Bored
 Pile Dia (mm)= 450

Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5



Allowable Pile Capacity for Land Zone

Pile Type= Bored
 Pile Dia (mm)= 600

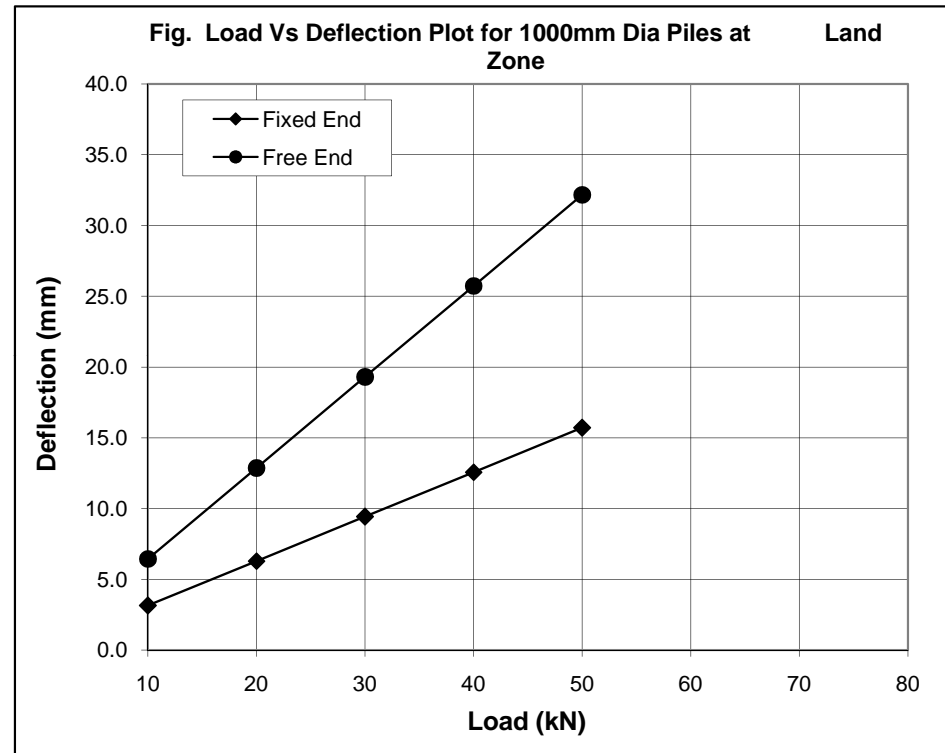
Factor of Safety = 2.5
 End Bearing = 2.5
 Skin Friction = 2.5

LATERAL CAPACITY OF 450 MM DIA BORED PILE FOR LAND ZONE (IS: 2911 - PART-1/SEC-2-2010)

D= 45 cm
 $K_1 = 0.360 \text{ kg/cm}^3$
 $E = 270000 \text{ kg/cm}^2$
 $I = 201289.0 \text{ cm}^4$
 $EI = 54348018926 \text{ kg-cm}^2$
 $K = (K_1 * 0.3) / (1.5B) = 0.16 \text{ kg/cm}^3$

$T = (EI/KB)^{0.25} = 294.76$
 $L_f/T = 2$ Fixed
 $L_f \text{ (Fixed)} = 589.51 \text{ cm}$
 $L_f/T = 1.6$ Free
 $L_f \text{ (Free)} = 471.61 \text{ cm}$
 $L_1 = 0 \text{ cm}$
 $d = Q(L_1 + L_f)^3 / 12EI$ Fixed
 $d = Q(L_1 + L_f)^3 / 3EI$ Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
10	3.14	6.43
20	6.28	12.87
30	9.42	19.30
40	12.57	25.73
50	15.71	32.17



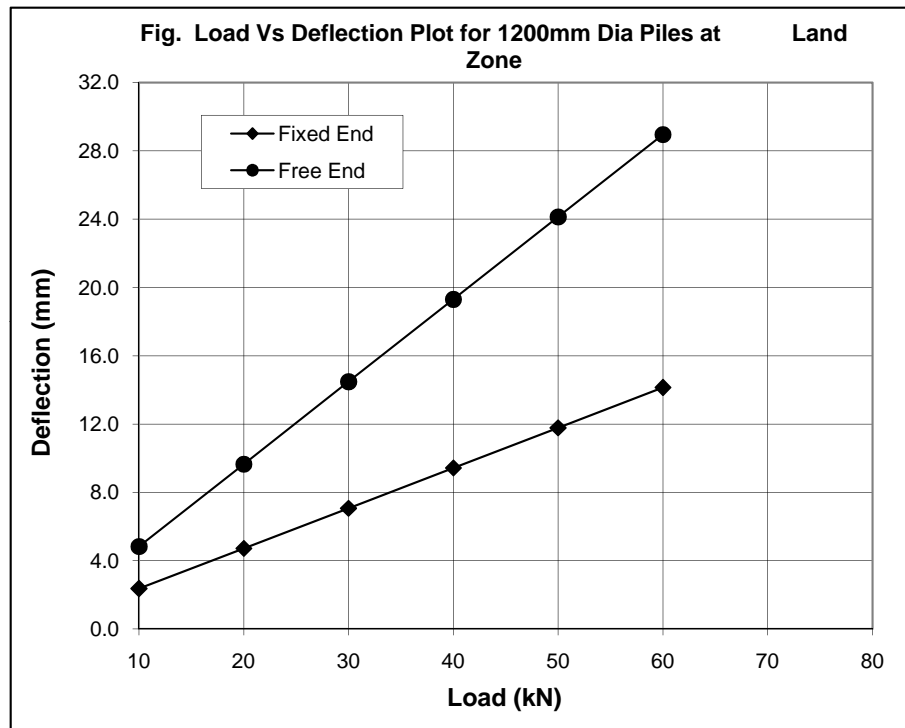
Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)
 = 30kN (for fixed head condition)
 = 15 kN (for free head condition)

LATERAL CAPACITY OF 600 MM DIA BORED PILE FOR LAND ZONE (IS: 2911 - PART-1/SEC-2-2010)

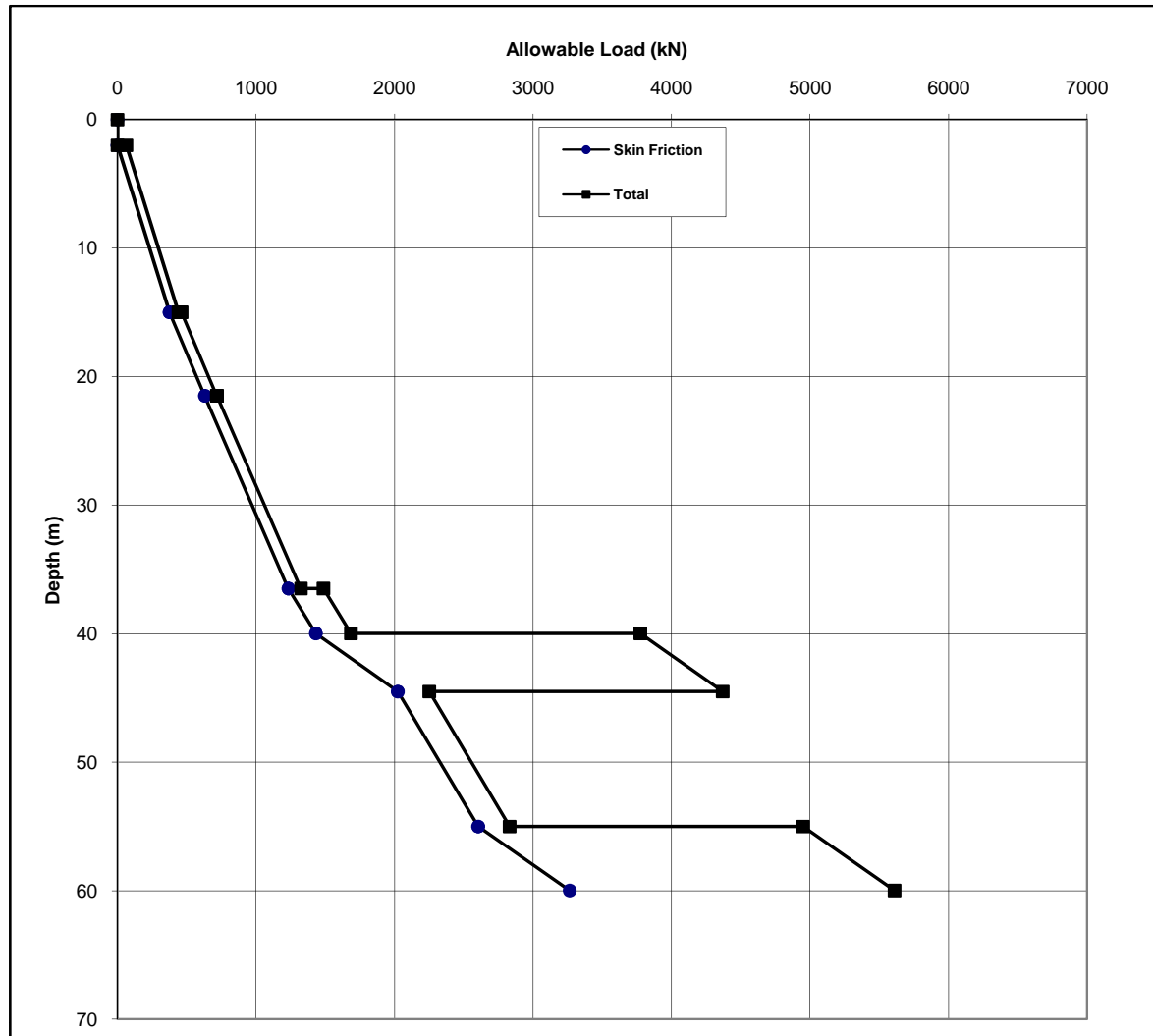
D= 60 cm
 K₁ 0.360 kg/cm³
 E= 270000 kg/cm²
 I= 636172.5 cm⁴
 EI= 1.71767E+11 kg-cm²
 K=(K₁*0.3)/(1.5B) 0.12 kg/cm³

T= (EI/KB)^{0.25}
 393.01
 L_f/T= 2 Fixed
 L_f (Fixed)= 786.02 cm
 L_f/T= 1.6 Free
 L_f (Free)= 628.81 cm
 L₁= 0 cm
 d= $\frac{Q(L_1+L_f)^3}{12EI}$ Fixed
 $\frac{Q(L_1+L_f)^3}{3EI}$ Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
10	2.36	4.83
20	4.71	9.65
30	7.07	14.48
40	9.42	19.30
50	11.78	24.13
60	14.14	28.95



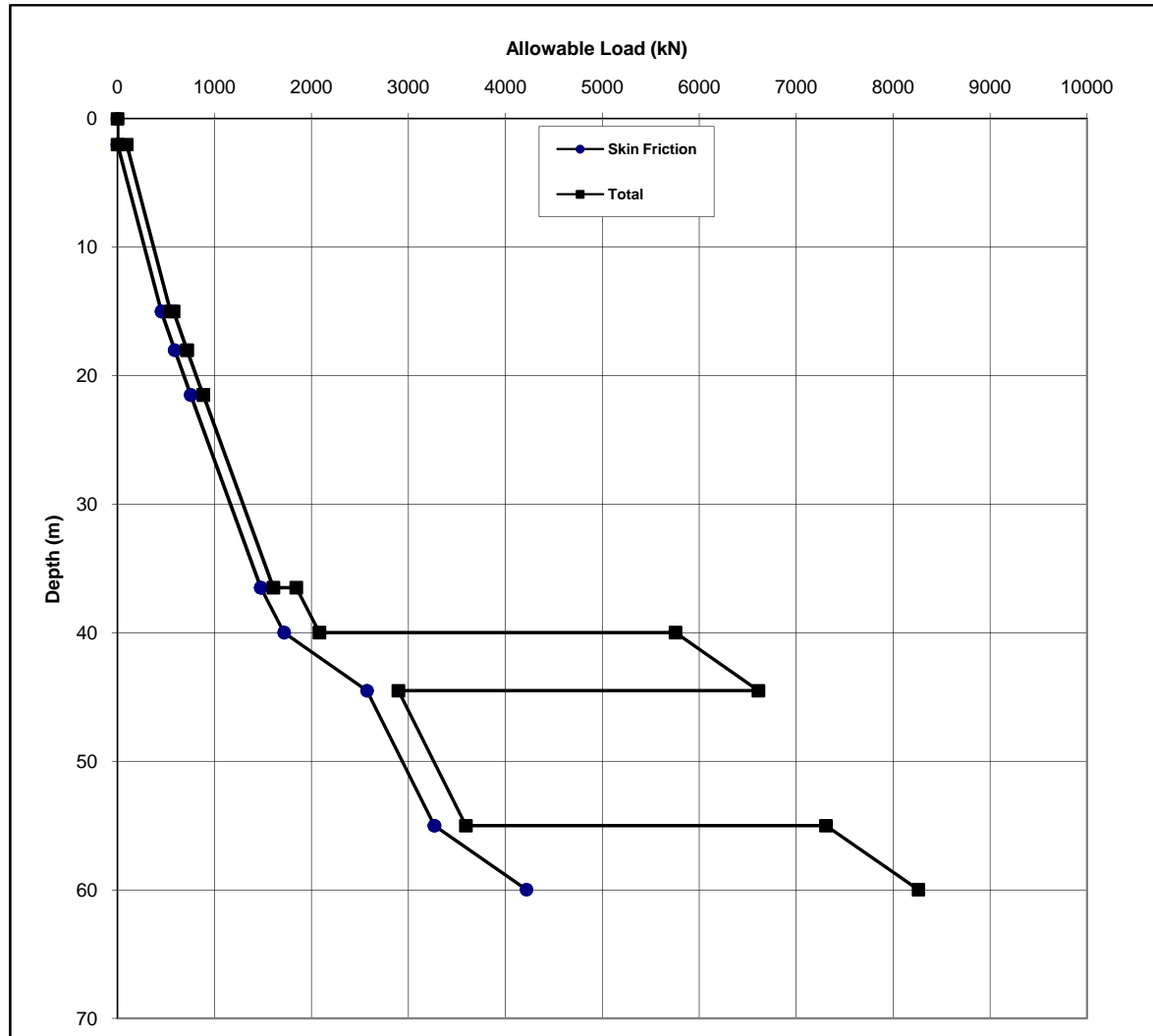
Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)
 = 50kN (for fixed head condition)
 = 25kN (for free head condition)



Allowable Pile Capacity for Land Zone

Pile Type= Bored
 Pile Dia (mm)= 1000

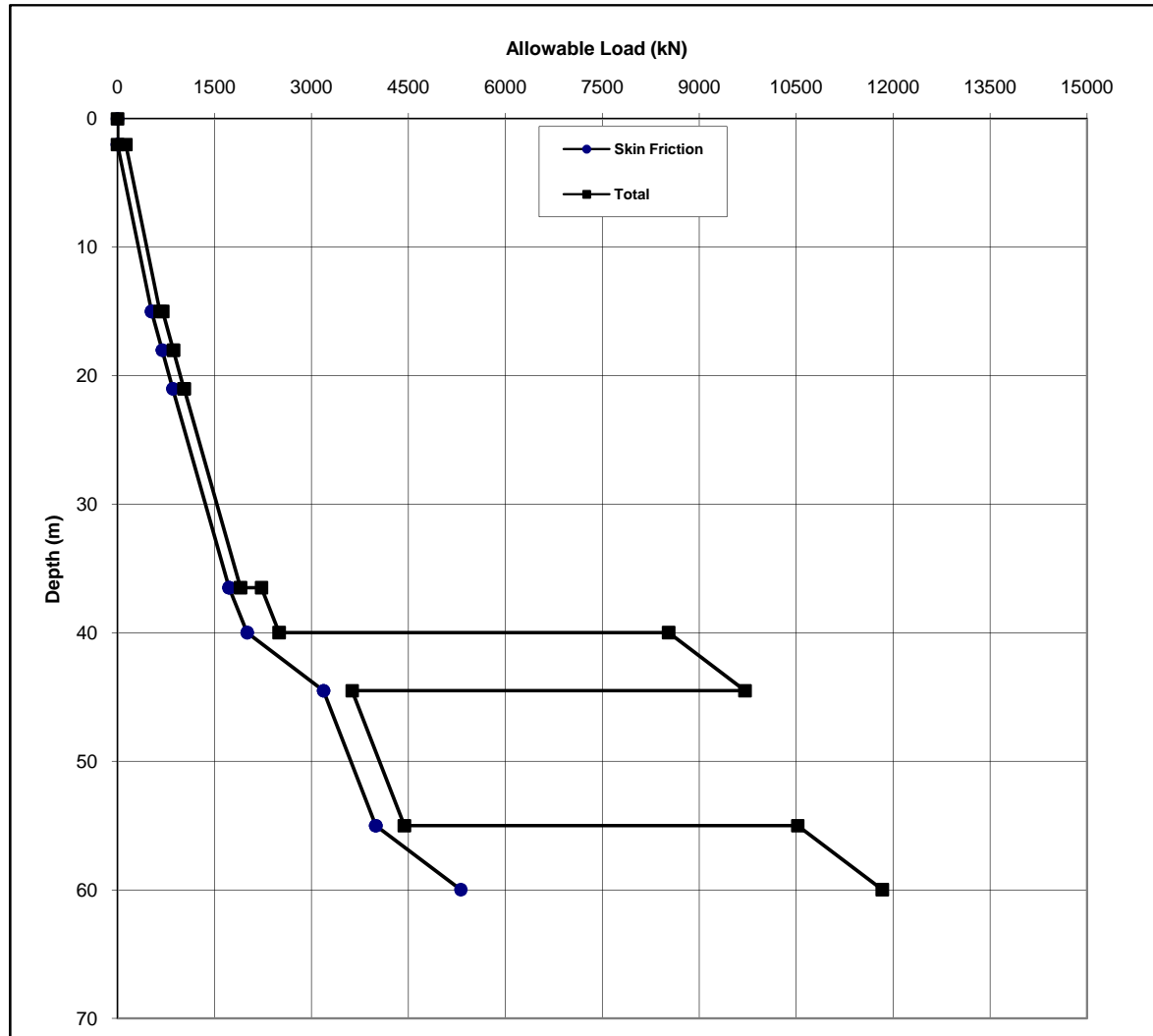
Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5



Allowable Pile Capacity for Land Zone

Pile Type= Bored
 Pile Dia (mm)= 1200

Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5



Allowable Pile Capacity for Land Zone

Pile Type= Bored
 Pile Dia (mm)= 1400

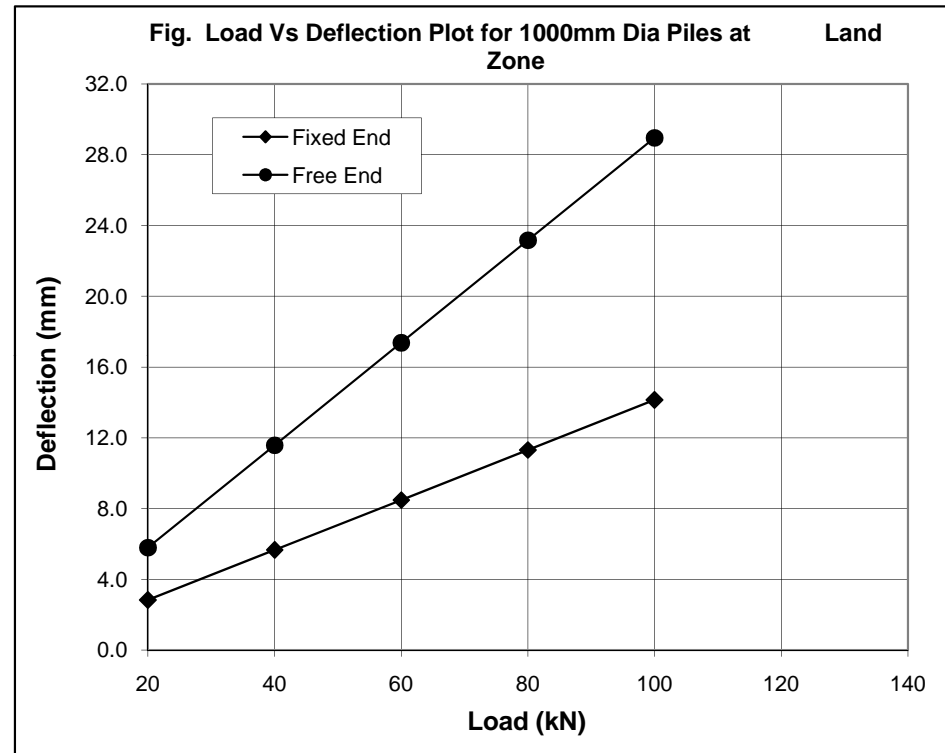
Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR LAND ZONE (IS: 2911 - PART-1/SEC-2-2010)

D= 100 cm
 $K_1 = 0.360 \text{ kg/cm}^3$
 $E = 270000 \text{ kg/cm}^2$
 $I = 4908738.5 \text{ cm}^4$
 $EI = 1.32536E+12 \text{ kg-cm}^2$
 $K = (K_1 * 0.3) / (1.5B) = 0.072 \text{ kg/cm}^3$

$T = (EI/KB)^{0.25} = 655.01$
 $L_f/T = 2$ Fixed
 $L_f \text{ (Fixed)} = 1310.03 \text{ cm}$
 $L_f/T = 1.6$ Free
 $L_f \text{ (Free)} = 1048.02 \text{ cm}$
 $L_1 = 0 \text{ cm}$
 $d = \frac{Q(L_1+L_f)^3}{12EI}$ Fixed
 $d = \frac{Q(L_1+L_f)^3}{3EI}$ Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	2.83	5.79
40	5.65	11.58
60	8.48	17.37
80	11.31	23.16
100	14.14	28.95



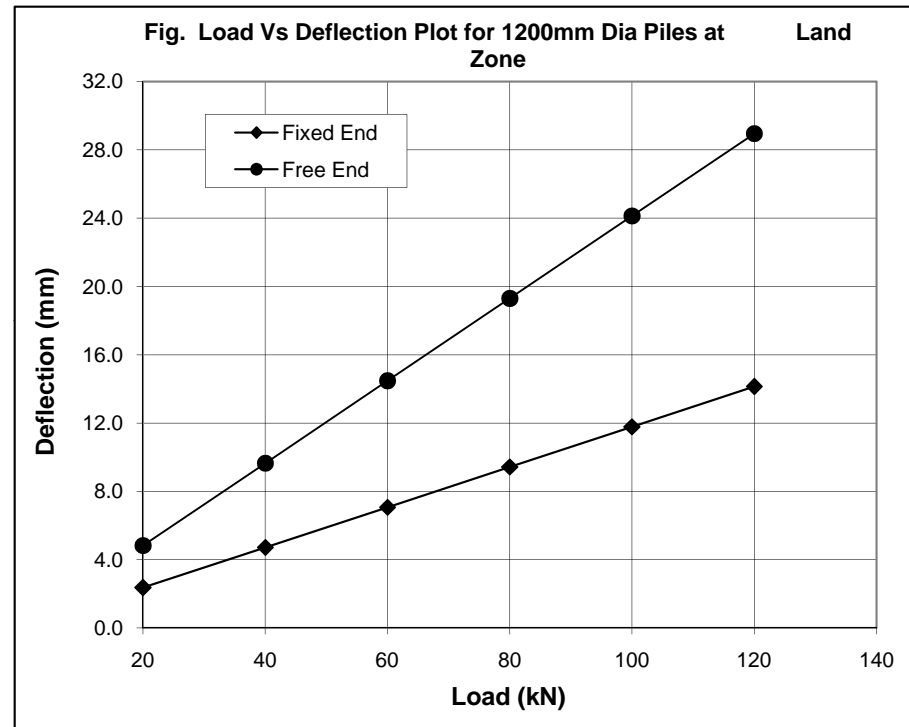
Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)
 = 70kN (for fixed head condition)
 = 35 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR LAND ZONE (IS: 2911 - PART-1/SEC-2-2010)

D= 120 cm
 K₁ 0.360 kg/cm³
 E= 270000 kg/cm²
 I= 10178760.2 cm⁴
 EI= 2.74827E+12 kg-cm²
 K=(K₁*0.3)/(1.5B) 0.06 kg/cm³

T= (EI/KB)^{0.25}
 786.02
 L_r/T= 2 Fixed
 L_r (Fixed)= 1572.03 cm
 L_r/T= 1.6 Free
 L_r (Free)= 1257.63 cm
 L₁= 0 cm
 d= Q(L₁+L_r)³/12EI Fixed
 Q(L₁+L_r)³/3EI Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	2.36	4.83
40	4.71	9.65
60	7.07	14.48
80	9.42	19.30
100	11.78	24.13
120	14.14	28.95



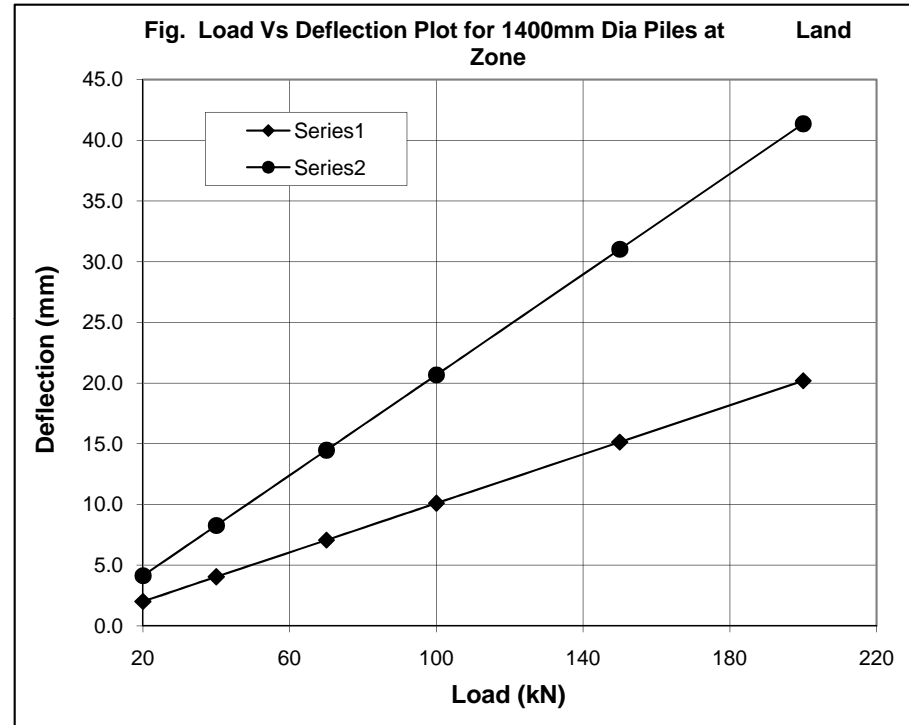
Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)
 = 100kN (for fixed head condition)
 = 40kN (for free head condition)

LATERAL CAPACITY OF 1400 MM DIA BORED PILE FOR LAND ZONE (IS: 2911 - PART-1/SEC-2-2010)

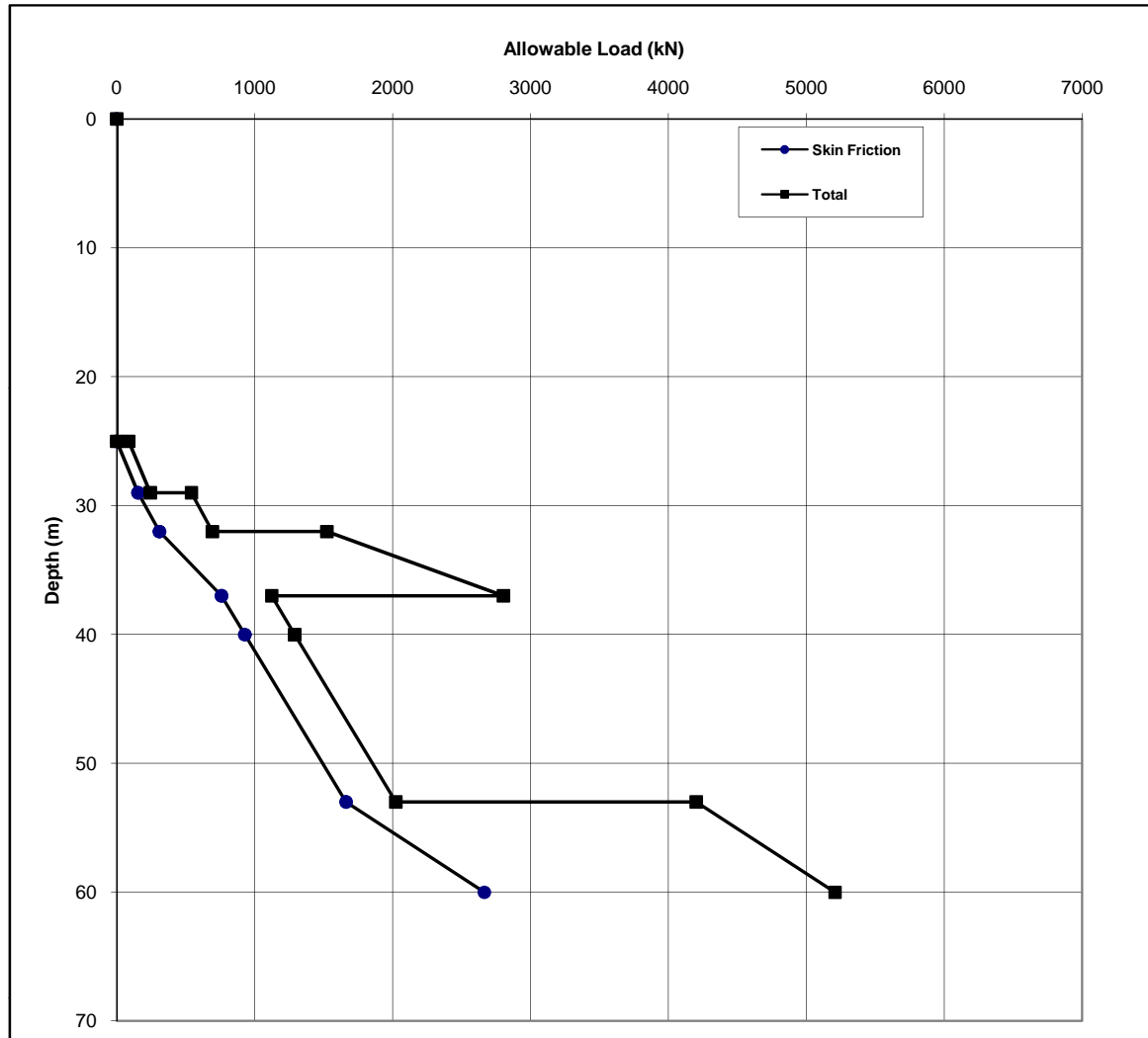
D= 140 cm
 K₁ 0.360 kg/cm³
 E= 270000 kg/cm²
 I= 18857409.9 cm⁴
 EI= 5.0915E+12 kg-cm²
 K=(K₁*0.3)/(1.5B) 0.051428571 kg/cm³

T= (EI/KB)^{0.25}
 917.02
 L_f/T= 2 Fixed
 L_f (Fixed)= 1834.04 cm
 L_f/T= 1.6 Free
 L_f (Free)= 1467.23 cm
 L₁= 0 cm
 d= Q(L₁+L_f)³/12EI Fixed
 Q(L₁+L_f)³/3EI Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	2.02	4.14
40	4.04	8.27
70	7.07	14.48
100	10.10	20.68
150	15.15	31.02
200	20.19	41.36



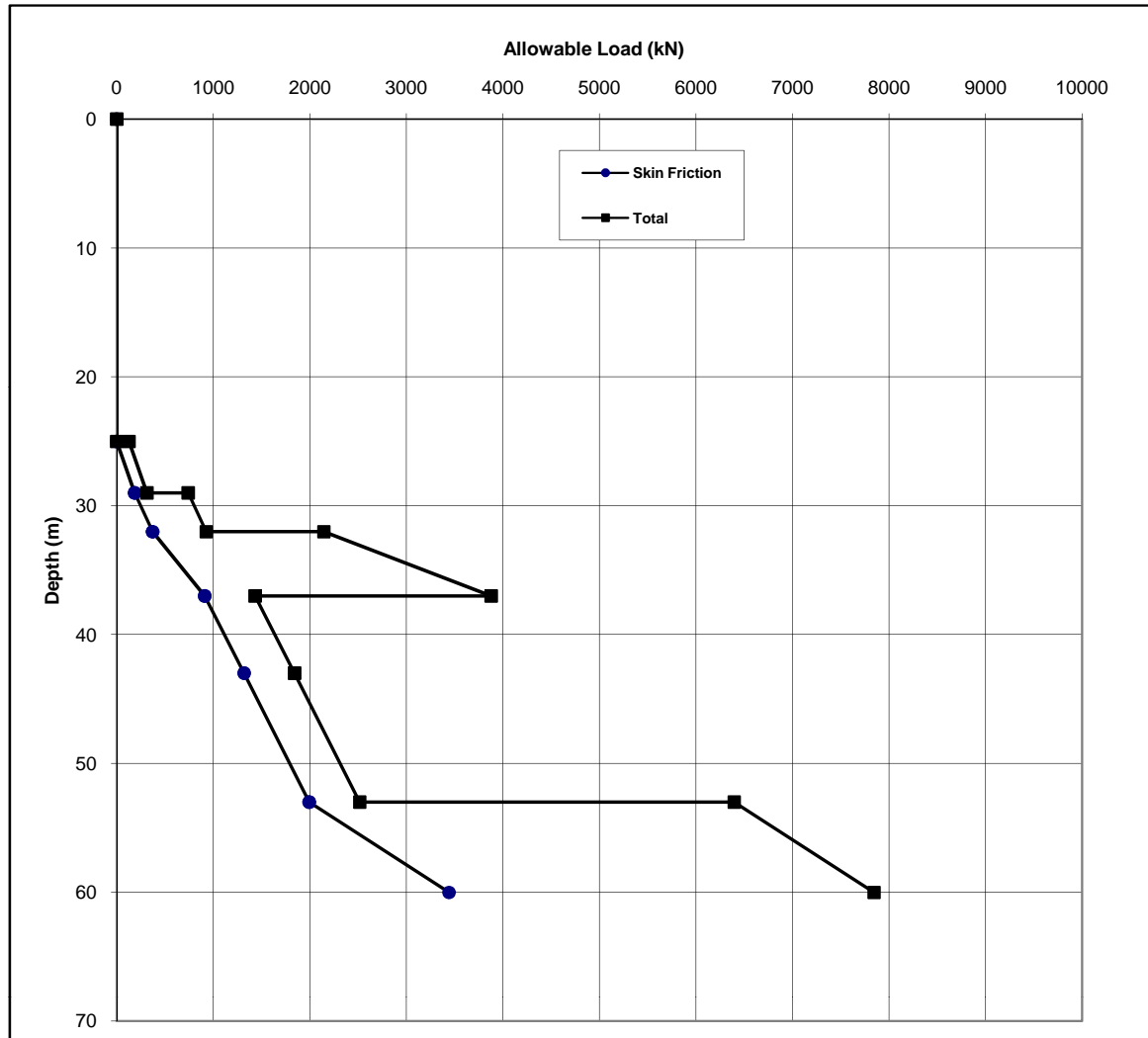
Hence lateral capacity (load corresponding to 1% of pile diameter=14mm deflection)
 = 140kN (for fixed head condition)
 = 60kN (for free head condition)



Allowable Pile Capacity at Water Zone

Pile Type= Bored
 Pile Dia (mm)= 1000

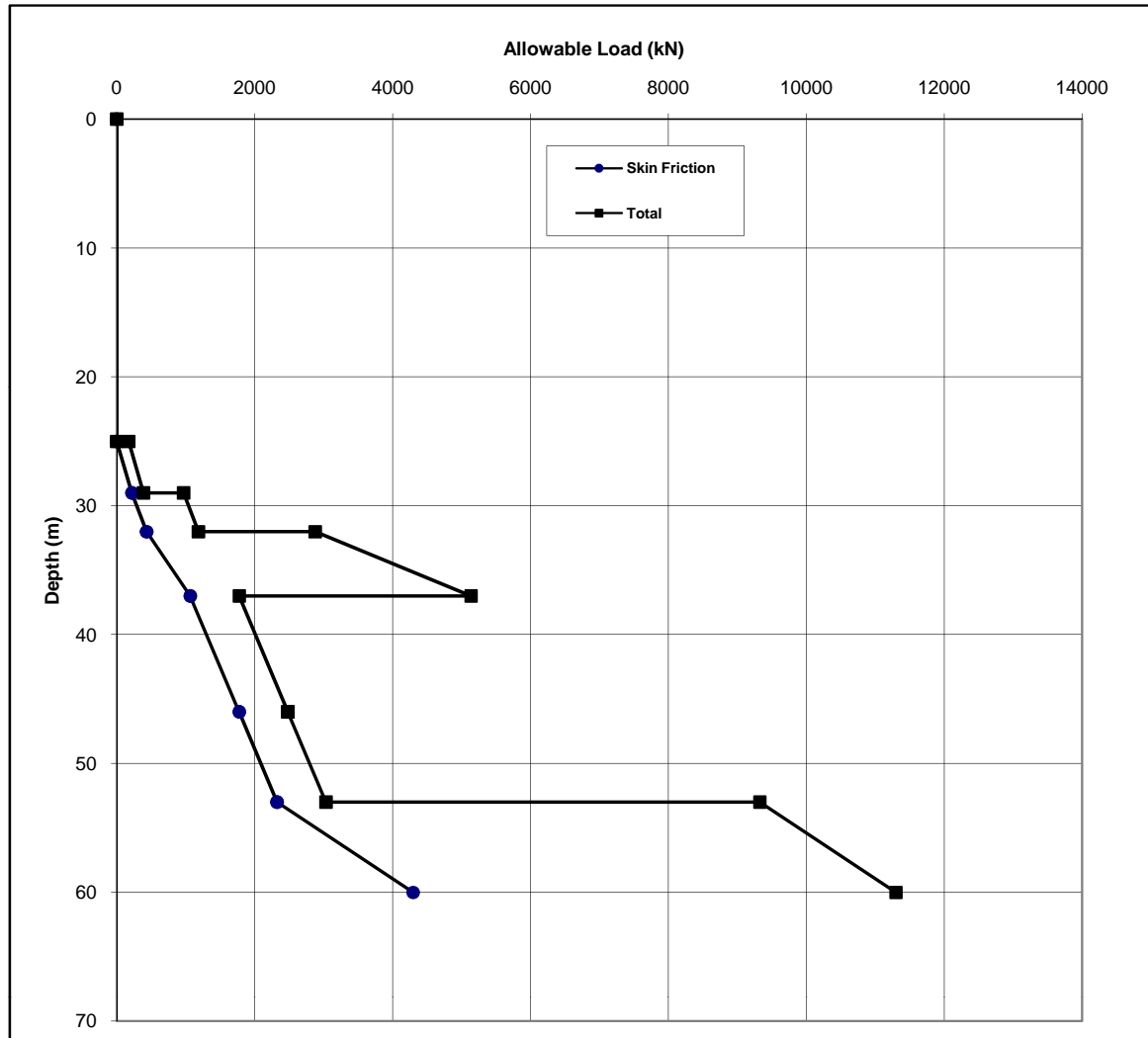
Factor of Safety = 2.5
 End Bearing = 2.5
 Skin Friction = 2.5



Allowable Pile Capacity at Water Zone

Pile Type= Bored
 Pile Dia (mm)= 1200

Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5



Allowable Pile Capacity at Water Zone

Pile Type= Bored
 Pile Dia (mm)= 1400

Factor of Safety
 End Bearing = 2.5
 Skin Friction = 2.5

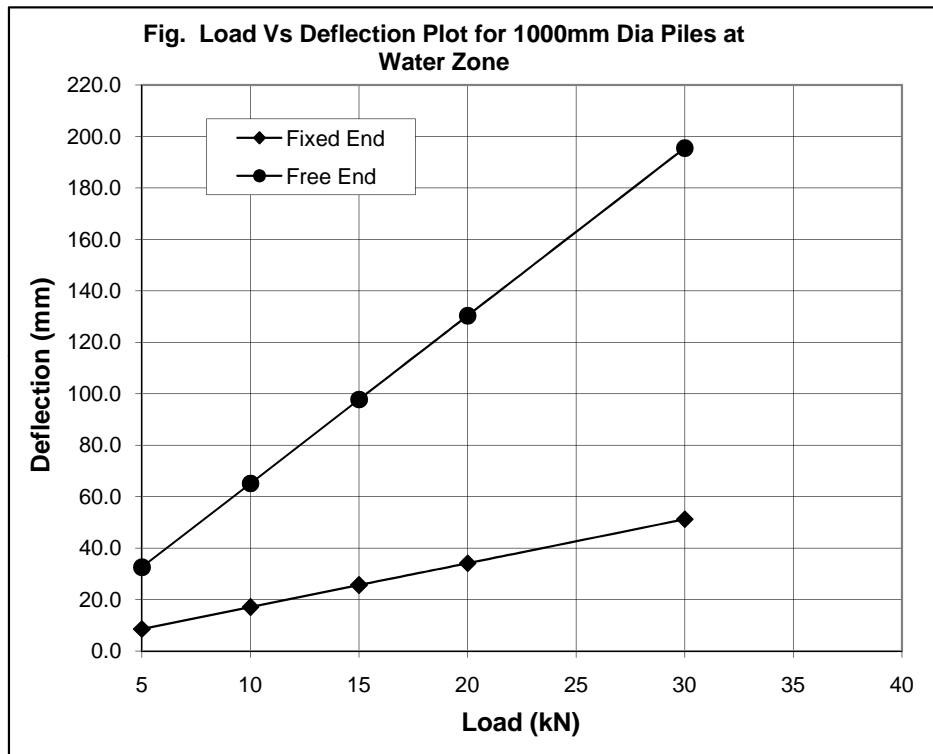
LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR WATER ZONE (IS: 2911 - PART-1/SEC-2-2010)

D= 100 cm
 $K_1 = 1.350 \text{ kg/cm}^3$
 $E = 270000 \text{ kg/cm}^2$
 $I = 4908738.5 \text{ cm}^4$
 $EI = 1.32536E+12 \text{ kg-cm}^2$
 $K = (K_1 * 0.3) / (1.5B) = 0.27 \text{ kg/cm}^3$

$T = (EI / KB)^{0.25} = 470.70$
 $L_f / T = 1.5$ Fixed
 $L_f \text{ (Fixed)} = 706.05 \text{ cm}$
 $L_f / T = 1.4$ Free
 $L_f \text{ (Free)} = 658.98 \text{ cm}$
 $L_1 = 2300 \text{ cm}$
 $d = \frac{Q(L_1 + L_f)^3}{12EI}$ Fixed
 $d = \frac{Q(L_1 + L_f)^3}{3EI}$ Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
5	8.54	32.58
10	17.08	65.16
15	25.62	97.74
20	34.16	130.32
30	51.24	195.48

Hence lateral capacity (load corresponding to 42mm deflection)



= 25kN (for fixed head condition)
 = 6.5 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR WATER ZONE (IS: 2911 - PART-1/SEC-2-2010)

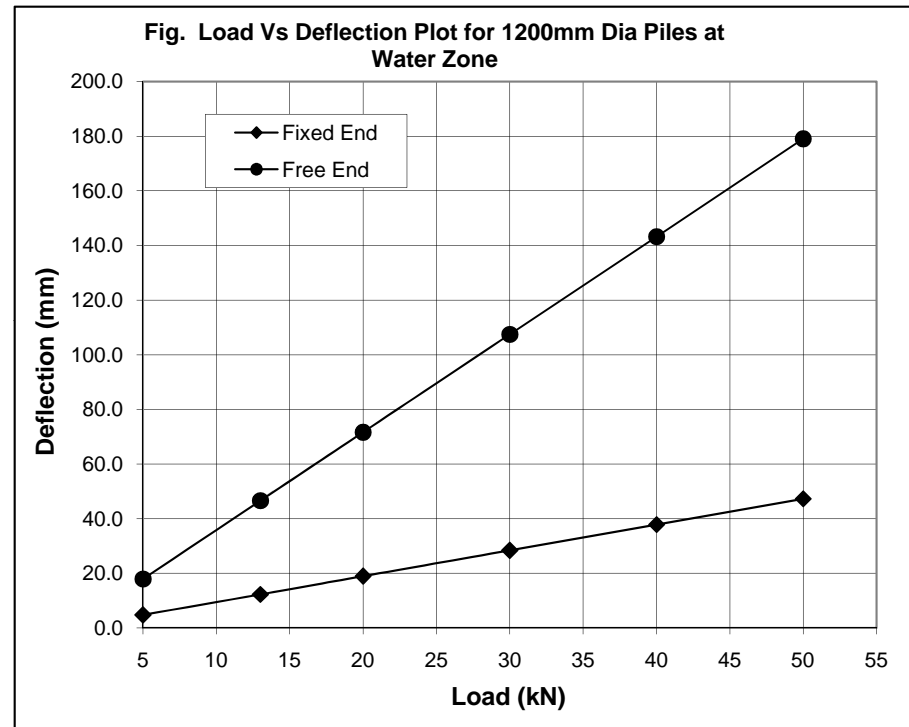
D= 120 cm
 K₁ 1.350 kg/cm³
 E= 270000 kg/cm²
 I= 10178760.2 cm⁴
 EI= 2.74827E+12 kg-cm²
 K=(K₁*0.3)/(1.5B) 0.225 kg/cm³

T= (EI/KB)^{0.25}
 564.84
 L_f/T= 1.5 Fixed
 L_f (Fixed)= 847.26 cm
 L_f/T= 1.4 Free
 L_f (Free)= 790.77 cm
 L₁= 2300 cm
 d= $\frac{Q(L_1+L_f)^3}{12EI}$ Fixed
 $\frac{Q(L_1+L_f)^3}{3EI}$ Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
5	4.73	17.91
13	12.29	46.55
20	18.91	71.62
30	28.36	107.43
40	37.81	143.25
50	47.26	179.06

Hence lateral capacity (load corresponding to 46 mm deflection)

= 50kN (for fixed head condition)
 = 10kN (for free head condition)

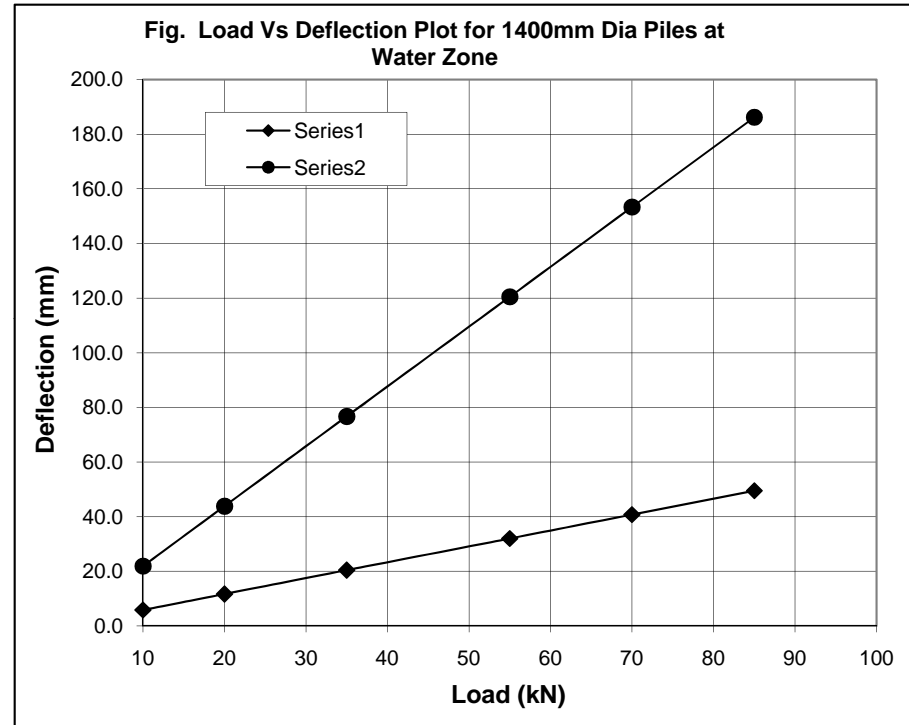


LATERAL CAPACITY OF 1400 MM DIA BORED PILE FOR WATER ZONE (IS: 2911 - PART-1/SEC-2-2010)

D= 140 cm
 K₁ 1.350 kg/cm³
 E= 270000 kg/cm²
 I= 18857409.9 cm⁴
 EI= 5.0915E+12 kg-cm²
 K=(K₁*0.3)/(1.5B) 0.192857143 kg/cm³

T= (EI/KB)^{0.25}
 658.98
 L_f/T= 1.5 Fixed
 L_f (Fixed)= 988.47 cm
 L_f/T= 1.4 Free
 L_f (Free)= 922.57 cm
 L₁= 2300 cm
 d= Q(L₁+L_f)³/12EI Fixed
 Q(L₁+L_f)³/3EI Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
10	5.82	21.91
20	11.64	43.82
35	20.37	76.68
55	32.01	120.50
70	40.74	153.37
85	49.47	186.23



Hence lateral capacity (load corresponding to 48mm deflection)

= 80kN (for fixed head condition)
 = 20kN (for free head condition)

Sample Calculation for Pile Capacity - Land Zone

Pile Diameter (m) = 1.2
 Perimeter (m) = 3.770
 Area (m²) = 1.131
 Factor of Safety
 Skin Friction = 2.5
 End Bearing = 2.5

Estimation of Skin Friction

Layer - II

$$f_{s3} = \alpha c A_s$$

$$= (1.0 \cdot 23) \cdot (3.77 \cdot 13)$$

$$= 1127.23 \text{ kN}$$

Layer - III

$$f_{s3} = \alpha c A_s$$

$$= (1.0 \cdot 31) \cdot (3.77 \cdot 3)$$

$$= 350.61 \text{ kN}$$

Layer-IV

$$f_{s3} = \alpha c A_s$$

$$= (1.0 \cdot 31) \cdot (3.77 \cdot 3.5)$$

$$= 409.05 \text{ kN}$$

Layer-V

$$f_{s5} = \alpha c A_s$$

$$= (1.0 \cdot 32) \cdot (3.77 \cdot 15)$$

$$= 1809.60 \text{ kN}$$

Layer-VI

$$f_{s5} = \alpha c A_s$$

$$= (0.5 \cdot 90) \cdot (3.77 \cdot 3.5)$$

$$= 593.78 \text{ kN}$$

Layer-VII

$$f_{s4} = K \cdot p_o \cdot \tan \delta \cdot A_s$$

$$= 1 \cdot (172) \cdot \tan 35^\circ \cdot (3.77 \cdot 4.5)$$

$$= 2014.09 \text{ kN}$$

Layer-VIII

$$f_{s5} = \alpha c A_s$$

$$= (0.55 \cdot 80) \cdot (3.77 \cdot 10.5)$$

$$= 1741.74 \text{ kN}$$

Layer-IX

$$f_{s4} = K \cdot p_o \cdot \tan \delta \cdot A_s$$

$$= 1 \cdot (172) \cdot \tan 35^\circ \cdot (3.77 \cdot 5)$$

$$= 2270.16 \text{ kN}$$

Total Ultimate Skin Friction = 10316.25 kN
 Safe Load in Friction = 4126.50 kN

Estimation of End Bearing

$$q_b = A_p \cdot (0.5 \cdot D \cdot Y \cdot N_Y + P_D \cdot N_q)$$

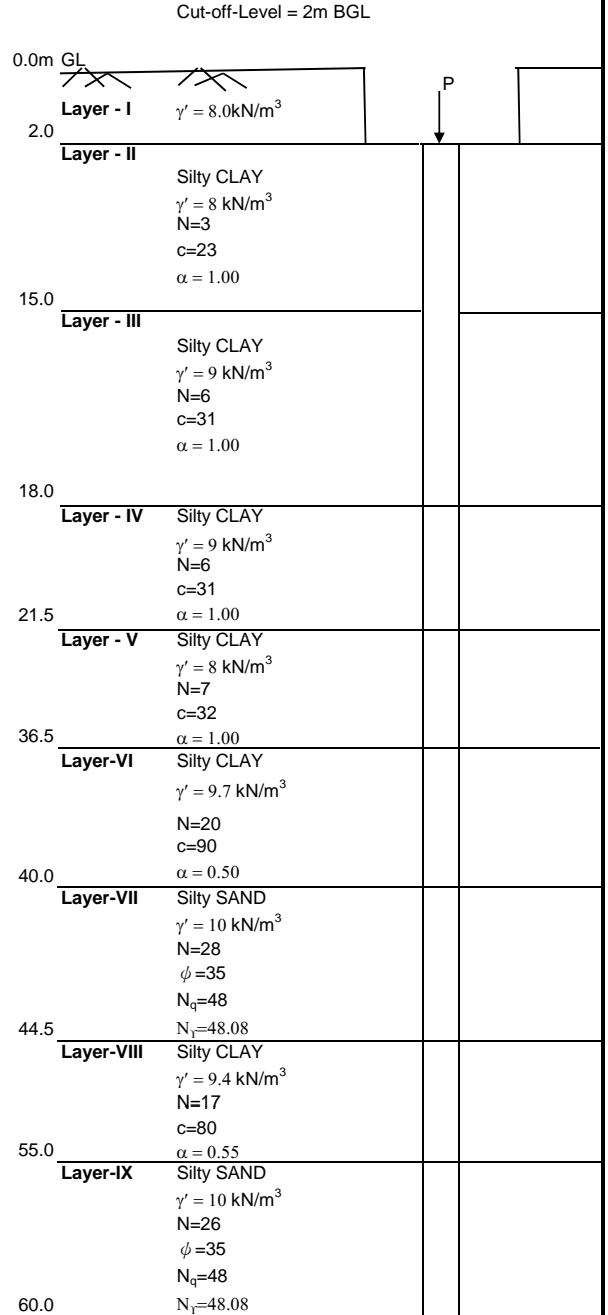
$$= 1.131 \cdot (0.5 \cdot 1.2 \cdot 11 \cdot 48.08 + 172 \cdot 48)$$

$$= 9696.43 \text{ kN}$$

Safe load in end bearing = 3878.57 kN

Hence Pile Capacity in Compression = 4206.21 + 4052.30 = 8005.07 kN

Uplift Capacity = Skin friction / FOS(3) = 3439 kN



60.0 m from GL

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-1



BH-2



FIELD WORK IN PROGRESS

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-3



BH-4



FIELD WORK IN PROGRESS

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-5



BH-6



FIELD WORK IN PROGRESS

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-7



BH-8



FIELD WORK IN PROGRESS

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-9



BH-10



FIELD WORK IN PROGRESS

GEOTECHNICAL INVESTIGATIONS WORK AT HALDIA TERMINAL

BH-11



BH-12



FIELD WORK IN PROGRESS