



Report by :

**CENGRS GEOTECHNICA PVT. LTD.**  
**SOIL AND FOUNDATION EXPERTS**

**Final Factual Report on:**

**Geotechnical Investigation for  
Exhibition cum Convention Centre  
Dwarka, New Delhi**

Report Volume	Report Contents	Structures Covered	Number of Boreholes Covered
<b>Volume-2D</b>	<b>Field and Laboratory Test Data of Boreholes</b>	Five Star Hotel 9, Five Star Hotel 12, Four Star Hotel 19, Four Star Hotel 20, Service Apartment 22	<b>31</b>

**Submitted to:**

**M/s. Delhi-Mumbai Industrial Corridor Development Corporation Ltd.**

Room 341-B, 3<sup>rd</sup> Floor, Hotel Ashok, Diplomatic Enclave, 50-B, Chanakyapuri, New Delhi-110021

Project No. 217048

Date: 21<sup>st</sup> July, 2017

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21<sup>st</sup> July, 2017

Project No. 217048-2D

M/s. Delhi-Mumbai Industrial Corridor Development Corporation Ltd.  
Room 341-B 3<sup>rd</sup> Floor  
Hotel Ashok  
Diplomatic Enclave  
50-B, Chanakyapuri  
New Delhi-110021

Subject: **Geotechnical Investigation for Exhibition cum Convention Centre Dwarka, New Delhi**

We have carried out the captioned study in accordance with your work order dated 31<sup>st</sup> March, 2017. We thank you for your business, and hope that you are satisfied with our services rendered.

This Factual Report presents our findings based on the geotechnical investigations conducted by us at the project site. This report presents the field and laboratory test data based on the investigations completed on site.

We have prepared this report based on our findings on site, as well as our experience gained in over 5000 projects completed over the past 28 years. We are pleased to have been of service to you on this project and will be glad to consult further with you and your design team.

Yours faithfully,  
CENGRS GEOTECHNICA PVT. LTD.

Sanjay Gupta  
Managing Director

Ravi Sundaram  
Director



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## DEFINITION OF ACRONYMS

CENGRS	Cengrs Geotechnica Pvt. Ltd.
UTM	Universal Transverse Mercator coordinates system
NABL	National Accreditation Board for Testing and Calibration Laboratories
ISO	International Standards Organization
BIS	Bureau of Indian Standards
EGL	Existing Ground Level
NGL	Natural Ground Level
RL	Reduced Level
SPT	Standard Penetration Test
DS	Consolidated drained direct shear test

## BIS REFERENCES

- Compendium of Indian Standard on Soil Engineering (***Part-2, Field Testing of Soils for Civil Engineering Purposes***) ***SP36 (Part-2:1988) RA 2006***
- Compendium of Indian Standard on Soil Engineering (***Part-1, Laboratory Testing of Soils for Civil Engineering Purposes***) ***SP36 (Part-1:1987) RA 2006***



## 1.0 INTRODUCTION

### 1.1 Project Description

Government of India (GOI) is planning to develop an Exhibition cum Convention Center at Sector-25, Dwarka, New Delhi. GOI has envisaged M/s. Delhi-Mumbai Industrial Corridor Development Corporation (DMICDC) to establish, promote and facilitate the development of the overall project.

The various agencies involved in the design of the facility are as follows:

- |     |  |                              |
|-----|--|------------------------------|
| (a) | Government of India                                      | : Owner                      |
| (b) | Delhi-Mumbai Industrial Corridor Development Corporation | : Client                     |
| (c) | AECOM India Pvt. Ltd.                                    | : Detailed Design Consultant |
| (d) | Cengrs Geotechnica Pvt. Ltd.                             | : Geotechnical Consultant    |

Delhi-Mumbai Industrial Corridor Development Corporation (DMICDC) has awarded the work of detailed geotechnical investigation at the project site to Cengrs Geotechnica Pvt. Ltd (CENGRS). A layout plan indicating the locations of our field investigation is presented on Plates 1 to 7.

The scope of our investigations includes drilling of about one hundred and sixty two (162) boreholes (including 60 priority boreholes as specified by AECOM), conducting hundred (100) field California bearing ratio (FCBR), ten (10) trial pits, one (1) electrical resistivity test (ERT), ten (10) plate load test and installation of one (1) piezometer at the specified location.

**This report volume (Volume-2D) presents the field and laboratory results of thirty one (31) boreholes drilled at the site.**

### 1.2 Scope of Work

The overall purposes of this study are to investigate the stratigraphy at the site and submission of this factual report. To accomplish these purposes, the study is being conducted in the following phases:

- (a) drilling one hundred and sixty two (162) boreholes to 30 m depth or refusal (N>100), in order to determine the site stratigraphy and to collect soil and groundwater samples;
- (b) conducting hundred (100) field California bearing ratio (FCBR) tests to provide data for the design of internal roads;
- (c) excavating ten (10) trial pits to provide additional information on the stratigraphy at shallow depths;
- (d) conducting one (1) electrical resistivity tests (ERT's) to provide data for the grounding systems;
- (e) performing ten (10) plate load test at specified locations to assess the load-settlement behaviour of soils under loading;
- (f) installing one (1) piezometer for long-term monitoring of ground water level to aid in foundation construction;
- (g) testing selected soil and groundwater samples in the laboratory to determine pertinent index and engineering properties; and
- (h) compiling all field and laboratory data and submission of this factual report



### 1.3 Report Format

Our final report shall be presented in seven (7) volumes. The content of each of these report volumes is summarized below:

Report Volume	Report Content	Structures Covered	Number of Boreholes / Tests Covered
Volume I	Engineering Analysis & Recommendations	All structures	-
Volume 2A	Field and Laboratory Test Data of Boreholes	Exhibition Hall 1, Exhibition Hall 5, Convention 7, Retail 10	34
Volume 2B	Field and Laboratory Test Data of Boreholes	Arena 8, Five Star Hotel 11, Office 13, Office 14, Office 15, Retail 16, Office 17, Office 18, Four Star Hotel 21	35
Volume 2C	Field and Laboratory Test Data of Boreholes	Exhibition Hall 2, Exhibition Hall 3, Exhibition Hall 4	33
<b>Volume 2D</b>	<b>Field and Laboratory Test Data of Boreholes</b>	<b>Five Star Hotel 9, Five Star Hotel 12, Four Star Hotel 19, Four Star Hotel 20, Service Apartment 22</b>	<b>31</b>
Volume 2E	Field and Laboratory Test Data of Boreholes	Office 23, Office 24, Three Star Hotel 25, Office 26	29
Volume 2F	Field test results of FCBR, PLT, ERT, Trial pits etc.	-	-

This report volume (Volume-2D) presents the field and laboratory results of thirty one (31) boreholes drilled at the site.

### 1.4 Scope of Work Covered in this Report Volume

Details of boreholes drilled on site and presented in this report volume are as follows:

S.No.	Structure	Borehole No.	UTM Coordinates (Zone 43 R)		Ground Level (RL), m	Borehole Termination Depth (m)
			Easting	Northing		
1	-	BH-60	700006	3160288	212.968	30.45
2	Five Star Hotel 12	BH-68	699919	3160144	213.188	30.45
3		BH-69	699995	3160088	212.441	30.45
4		BH-70	699941	3160094	212.986	30.45
5		BH-71	699887	3160101	213.500	30.45
6		BH-72	699964	3160044	212.576	30.45
7	Four Star Hotel 19	BH-78	699832	3159950	212.293	30.45
8		BH-79	699872	3159920	212.000	30.45
9		BH-80	699837	3159913	213.125	30.45
10		BH-81	699801	3159908	212.996	30.45
11		BH-82	699840	3159878	213.166	30.45
12	-	BH-83	699722	3159900	212.937	30.45
13	Service Apartment 22	BH-84	699771	3159867	212.925	30.45
14		BH-85	699810	3159838	213.248	30.45
15		BH-86	699768	3159833	212.000	30.45
16		BH-87	699739	3159825	211.500	30.45
17		BH-88	699779	3159796	212.928	30.45
18	-	BH-97	699497	3159695	212.381	30.45



S.No.	Structure	Borehole No.	UTM Coordinates (Zone 43 R)		Ground Level (RL), m	Borehole Termination Depth (m)
			Easting	Northing		
19	Four Star Hotel 20	BH-110	699884	3159845	213.350	30.45
20		BH-111	699920	3159818	213.500	30.45
21		BH-112	699918	3159854	213.406	30.45
22		BH-113	699917	3159888	213.379	30.45
23		BH-114	699953	3159862	213.485	30.45
24	Five Star Hotel 9	BH-129	700274	3160168	213.487	30.45
25		BH-130	700306	3160125	213.387	30.45
26		BH-132	700252	3160128	213.611	30.45
27	-	BH-131R	699797	3160112	212.500	30.45
28	-	PBH-148R	699695	3159561	213.000	30.45
29	-	BH-160	700204	3160526	212.990	30.45
30	-	BH-161	699862	3160660	212.500	30.45
31	-	BH-162R	699852	3159474	213.506	30.45

- A layout plan indicating the test locations of our field investigations is presented on Plates 1 to 7.
- The test locations were marked on the field by us in the presence of a client representative using a hand-held Global Positioning System (GPS). A satellite image indicating the test locations (as recorded by GPS) is presented on Plate 8.
- The reduced levels at the test locations were given to us by the client.

## 2.0 FIELD INVESTIGATION

### 2.1 Exploratory Boreholes

The boreholes were progressed using a mechanized calyx drilling rig to the specified depth. The diameter of the borehole was 150 mm. Where caving of the borehole occurred, casing was used to keep the borehole stable. The work was in general accordance with IS: 1892-1979 RA 2002.

Standard Penetration Tests (SPT) was conducted in the boreholes at specified depth intervals. The test was conducted by connecting a split spoon sampler to 'A' rods and driving it by 45 cm using a 63.5 kg hammer falling freely from a height of 75 cm. The tests were conducted in accordance with IS: 2131-1981 RA 2002. The SPT 'N'-values are described as follows:-

1. The number of blows for each 15 cm of penetration of the split spoon sampler is recorded.
2. The blows required to penetrate the initial 15 cm of the split spoon for seating the sampler is ignored due to the possible presence of loose materials or cuttings from the drilling operation.
3. The cumulative number of blows required to penetrate the balance 30 cm of the 45 cm split spoon sampler is termed the SPT value or the 'N' value. For example, a SPT value reported as "20" means that 20 blows were imparted to penetrate the split spoon sampler by the last 30 cm.
4. Where the number of blows required to penetrate the balance 30 cm of the split spoon sampler exceeds 100, the number of blows is presented along with the corresponding penetration. For example, an SPT value reported as "101 / 5 cm" means that 101 blows were imparted to penetrate the split spoon sampler by 5 cm after the first 15 cm initial (seating) penetration.



5. Where refusal ( $N > 100$ ) to further penetration of the split spoon sampler is encountered in the first 15 cm of seating penetration itself, SPT test could not be completed and "Ref" is indicated in the bore logs, along with the penetration achieved. For example, an SPT value reported as "Ref / 5 cm" means that more than 100 blows were imparted to penetrate the split spoon sampler by a total of 5 cm only, and the 15 cm seating penetration could not be achieved.

Disturbed samples were collected from the split spoon after conducting SPT. Undisturbed soil samples were collected by attaching a thin walled 'Shelby' tubes and driving the sampler by light-hammering using a 63.5 kg hammer in accordance with IS: 2132-1986 RA 2002. The tubes were sealed with wax at both ends. Wherever undisturbed samples were not available due to slippages, disturbed samples were collected. All samples were transported to our NABL-accredited laboratory at Noida for further examination and testing.

## 2.2 Groundwater

Groundwater level is measured in the boreholes after drilling and sampling is completed. The measured water levels are recorded on the individual soil profiles.

## 3.0 LABORATORY TEST

The laboratory testing was carried out in our NABL accredited laboratory. The quality procedure in our laboratory conforms to ISO/IEC-17025-2005.

Laboratory tests were conducted on selected soil and groundwater samples to determine their physical and engineering properties. The testing procedures are in accordance with current applicable IS specifications.

The following tests were conducted on selected soil and groundwater samples recovered from the boreholes:

Laboratory Test		IS Code Referred
Bulk Density		By calculations
Natural moisture content		IS : 2720 (Part-2)-1973, RA-2010
Specific Gravity		IS : 2720 (Part-3)-1980, RA-2007
Grain size analysis		IS : 2720 (Part-4)-1985, RA-2010
Liquid Limit and Plastic Limit		IS : 2720 (Part-5)-1985, RA-2010
Free Swell Index		IS : 2720 (Part-40) -1977, RA-2007
Consolidated drained direct shear test		IS : 2720 (Part-13)-1986, RA-2010
Chemical Analysis of water*	pH value	IS : 3025 (Part-11)-1983, RA-2006
	sulphates	IS : 3025 (Part-24)-1986, RA-2009
	chlorides	IS : 3025 (Part-32)-1988, RA-2009
Chemical Analysis of soil*	pH value	IS : 2720 (Part 26)-1987, RA-2007
	Sulphates	IS : 2720 (Part-27)-1977, RA-2010
	Chlorides	IS : 3025 (Part-32)-1988, RA-2009

\*Outside NABL Scope

Engineering terms used to describe soils are explained on Plate 9. A note on our NABL accreditation together with the uncertainty in laboratory measurements is presented on Plate 10.



#### 4.0 GENERAL SITE CONDITIONS

##### 4.1 Site Description

The site for the proposed Exhibition cum Convention center is located at Sec-25 Dwarka and lies at Latitude 28°33'7.76"N and Longitude 77° 2'35.31"E. The site is situated about 3.0 km west of Terminal-3, IGI Airport and about 1.5 km west of Dwarka Sec-21 Metro Station.

The site is bounded by roads on all the sides and covers about 221 acres on plan. Localized construction debris was observed at the site at the time of our field investigations.

##### 4.2 Regional Geology

The deposits in the project area belong to the "Indo Gangetic Alluvium" and are river deposits of the Yamuna, and its tributaries. The alluvial tract<sup>(1)</sup> is in the nature of a synclinal basin formed concomitantly with the elevation of the Himalayas to its north. It was formed during the later stages of the Himalayan Orogeny by the buckling down of the northern border of the peninsular shield beneath the sediments thrust over it from the north.

The Pleistocene and Recent Deposits of the Indo-Gangetic Basin are composed of gravels, sands, silts and clays with remains of animal and plants. A generalized description of geological formations encountered in Gurgaon and Delhi is as follows:

Period	Formation	Description
Recent	Newer Alluvium (Younger alluvium)	Unconsolidated, inter-bedded lenses of sand, silt gravel and clay confined to flood plains of Yamuna river.
Quaternary	Older Alluvium	Unconsolidated inter-bedded, inter-fingering deposit sand, clay and kankar, moderately sorted, thickness variable, at places more than 300 m.
~~~~~ Unconformity ~~~~~		
Pre-Cambrian	Pegmatite and Quartz Veins Quartzites and minor Schist Bands	Well stratified, thick-bedded brown to buff colour, hard and compact, intruded locally by pegmatite and quartz veins inter-bedded with mica schists.

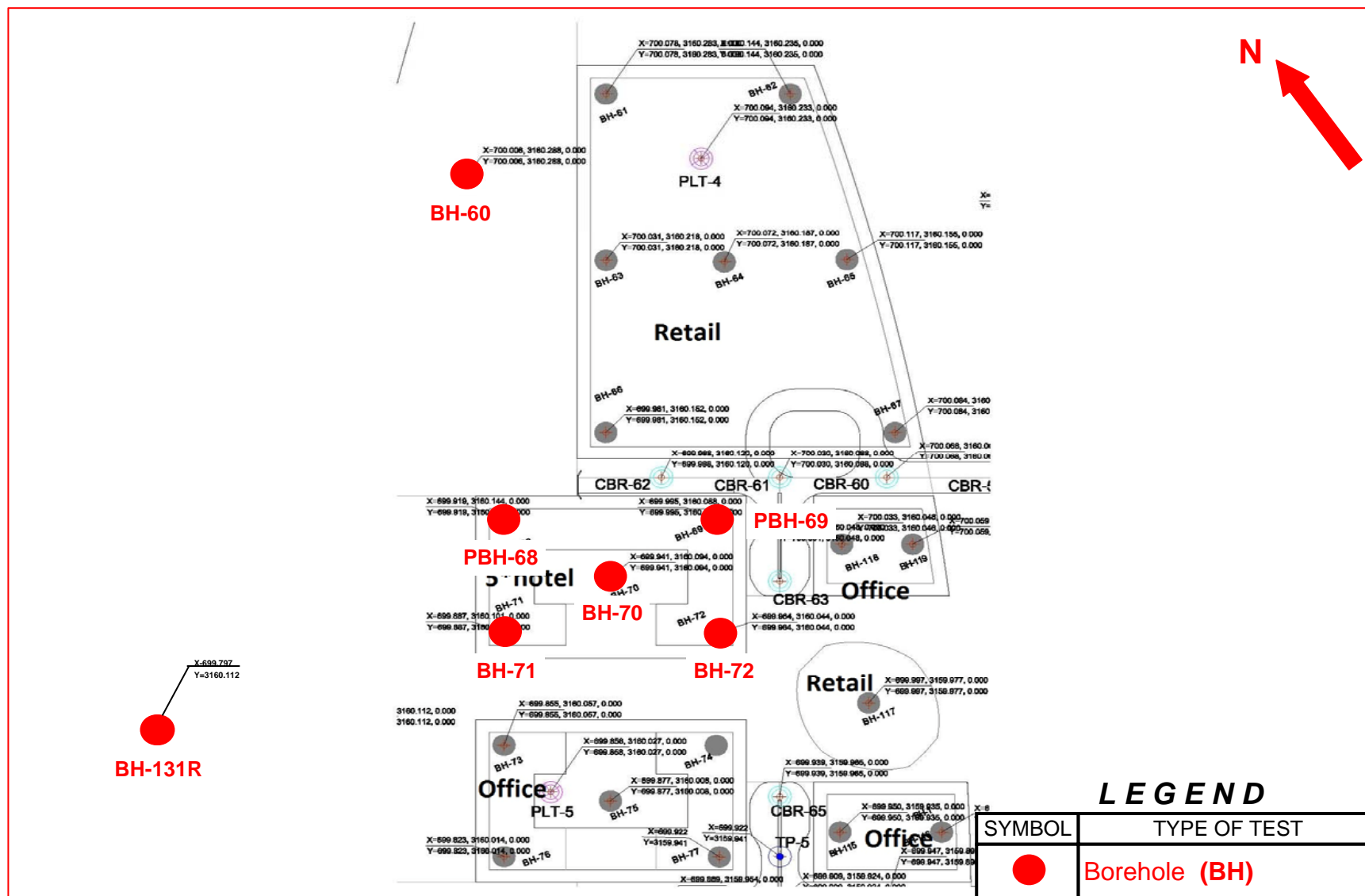
The older alluvium is rather dark colored (locally called "Bhanger") and is generally, rich in concretions or nodules of impure calcium carbonate (kankars). The kankars are of all shapes and sizes, varying from small sand sized grains to big grains and big lumps. The age of the "Bhanger" alluvium is Middle to Upper Pleistocene.

The newer alluvium (locally called "Khadar") is light colored and poor in concretions. It contains lenticular beds of sand and gravel as well as peat beds. It is merged by insensible gradations into the Recent or deltaic alluvia and its age is Upper Pleistocene to Recent.

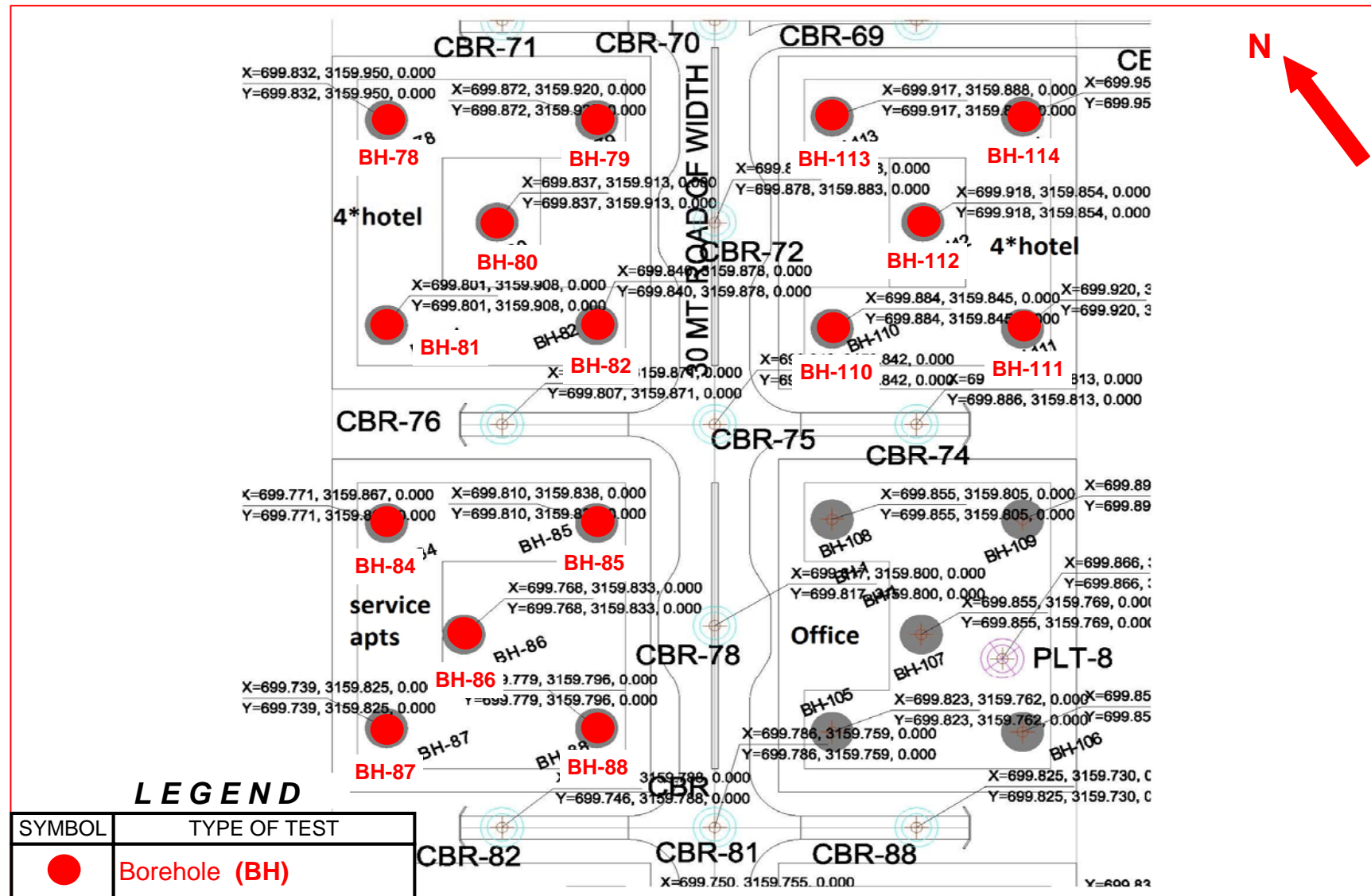
#### 5.0 VARIABILITY IN SUBSURFACE CONDITIONS

Subsurface conditions encountered during construction may vary somewhat from the conditions encountered during the site investigation. In case significant variations are encountered during construction, we request to be notified so that our engineers may review the recommendations in this report in light of these variations.

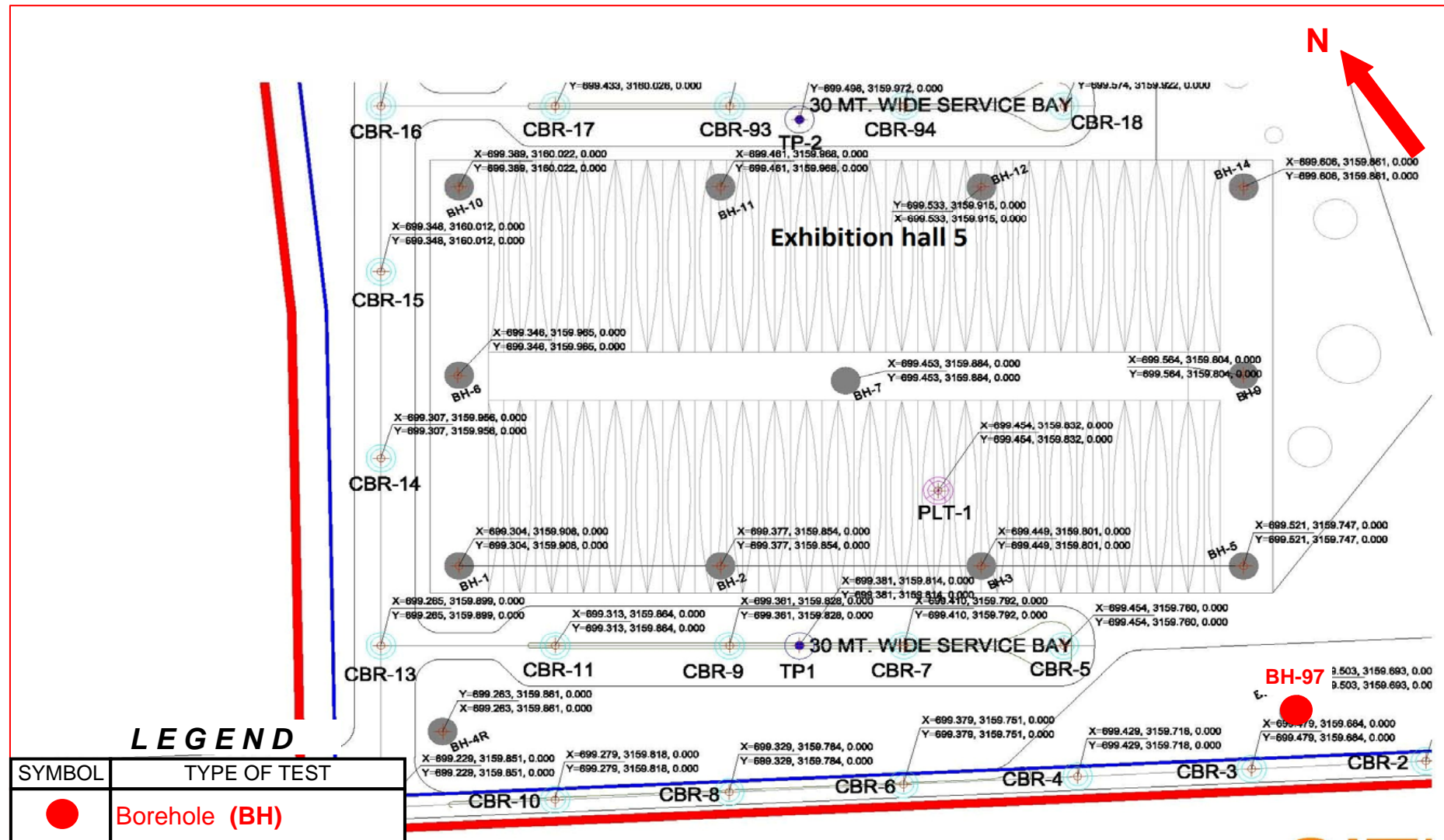
<sup>(1)</sup> Krishnan, M.S. (1986), "**Geology of India & Burma**", CBS Publishers, New Delhi.



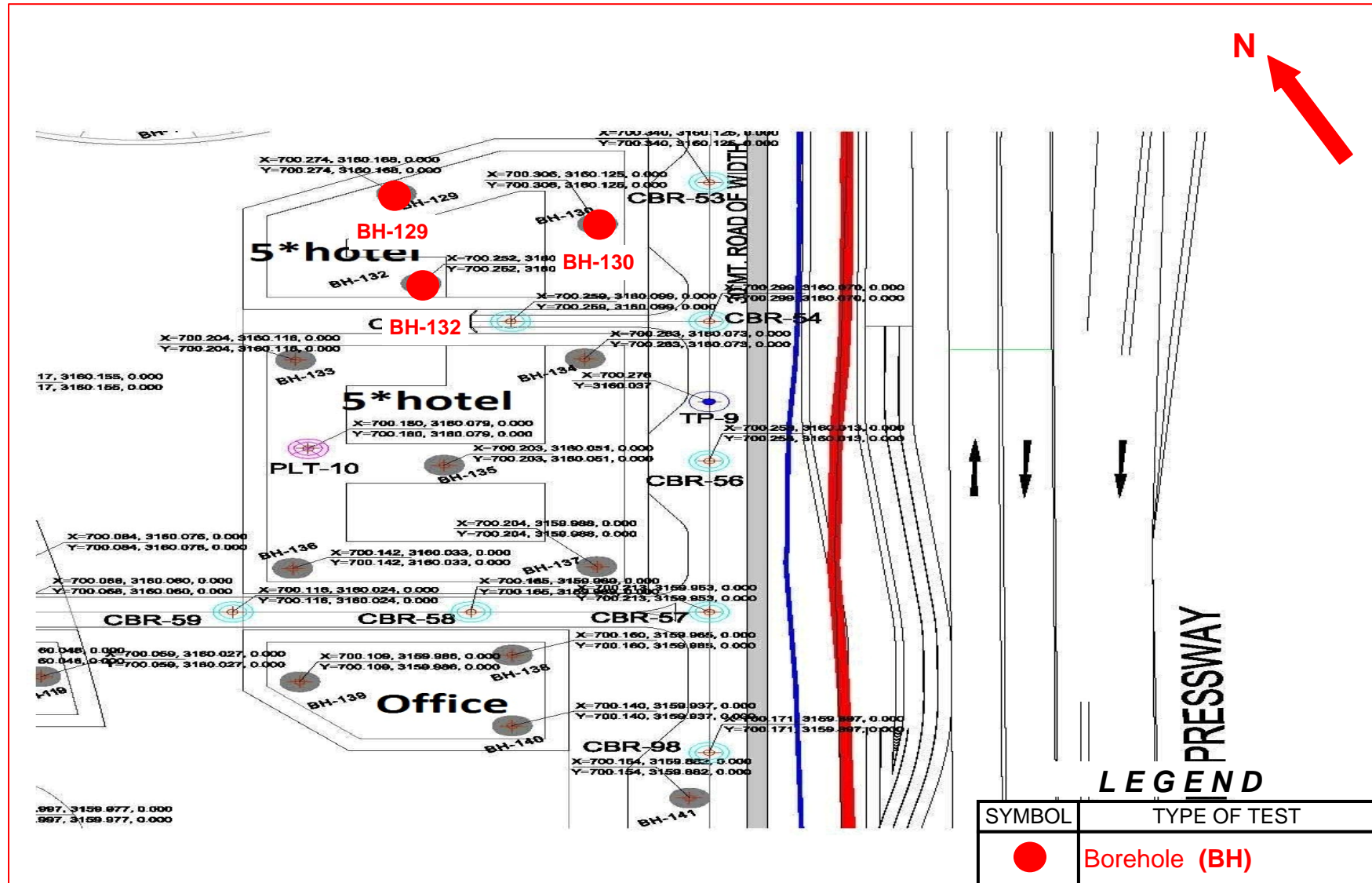
Plan of Field Investigations



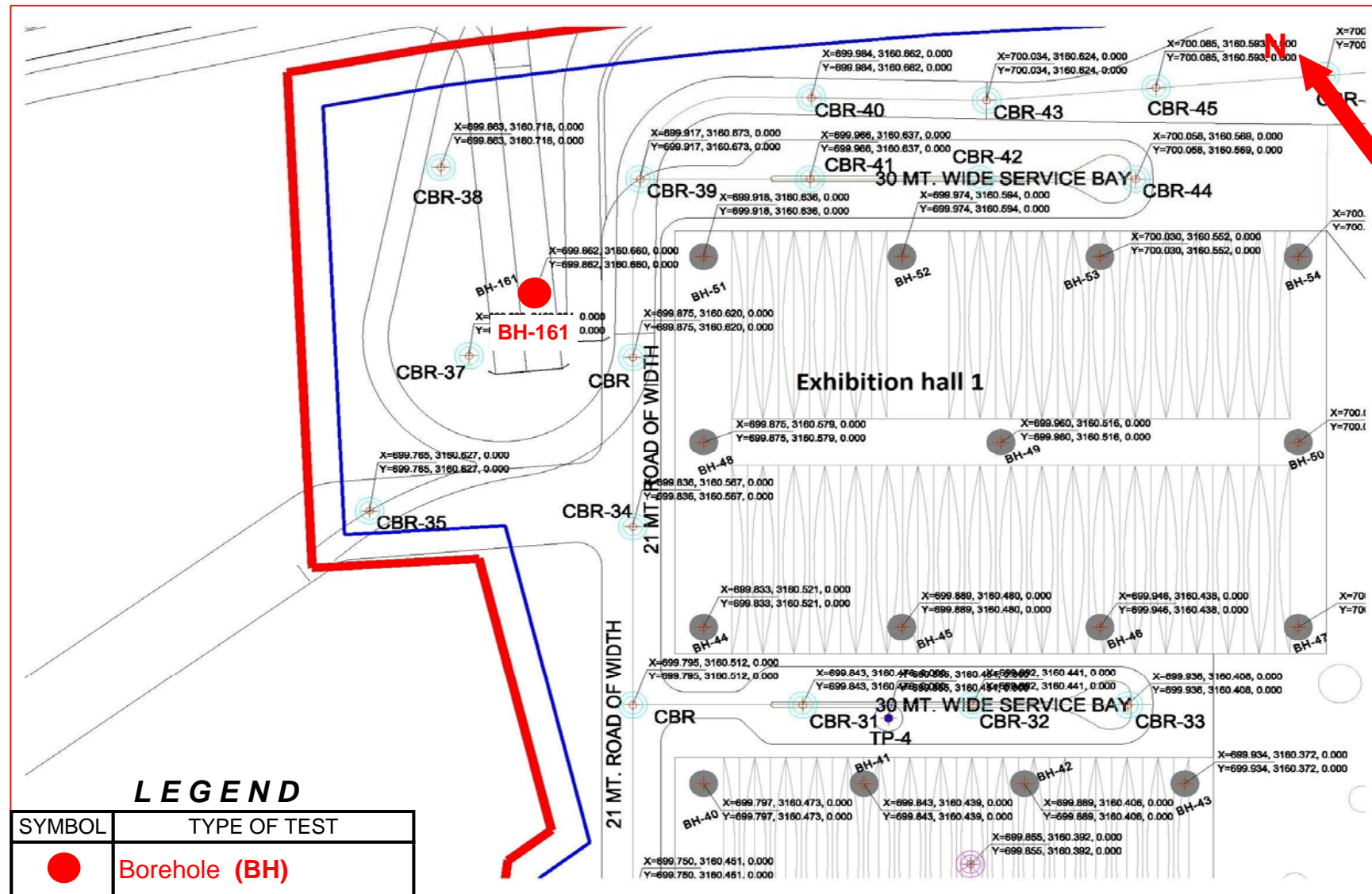
Plan of Field Investigations



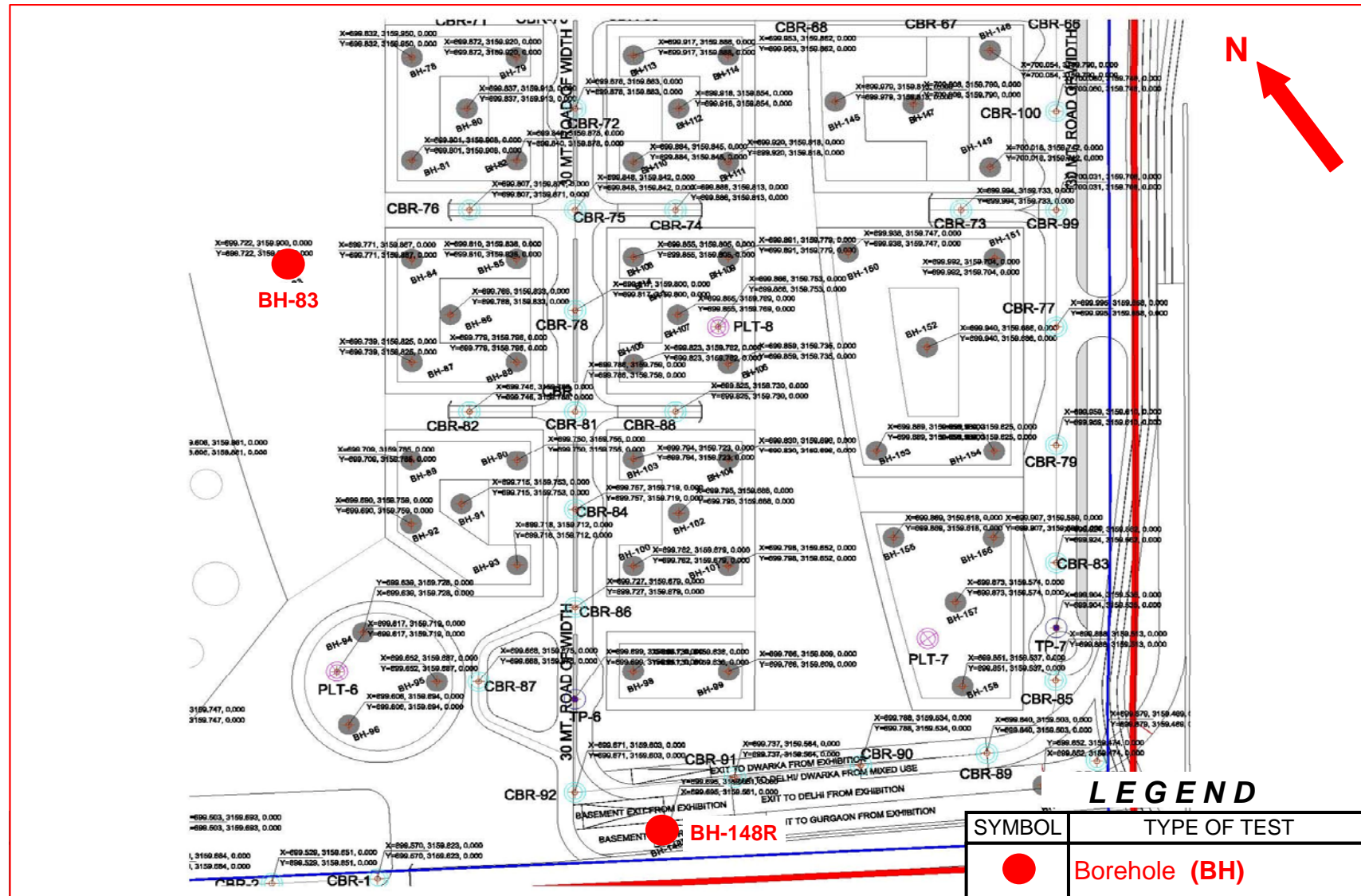




Plan of Field Investigations

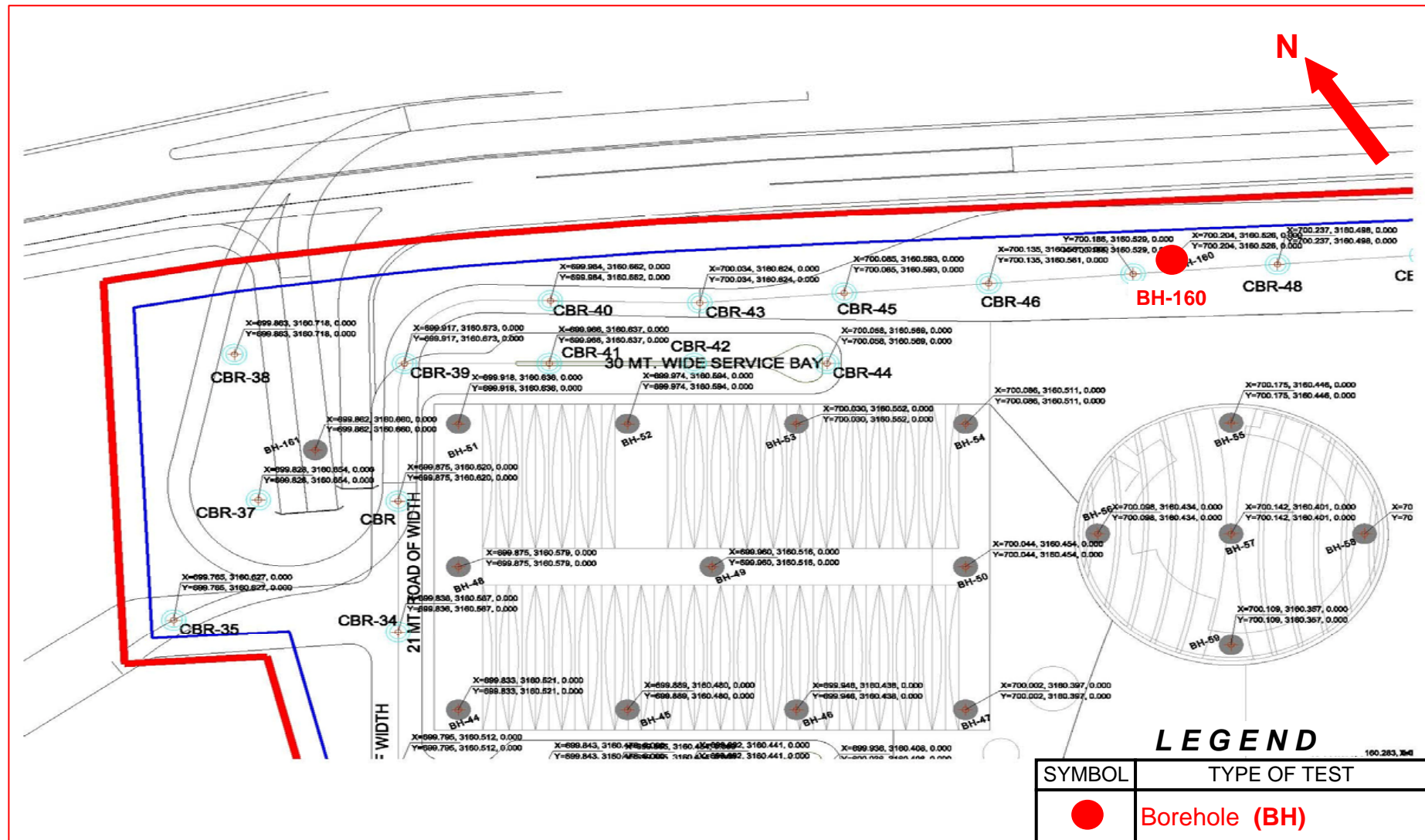


Plan of Field Investigations



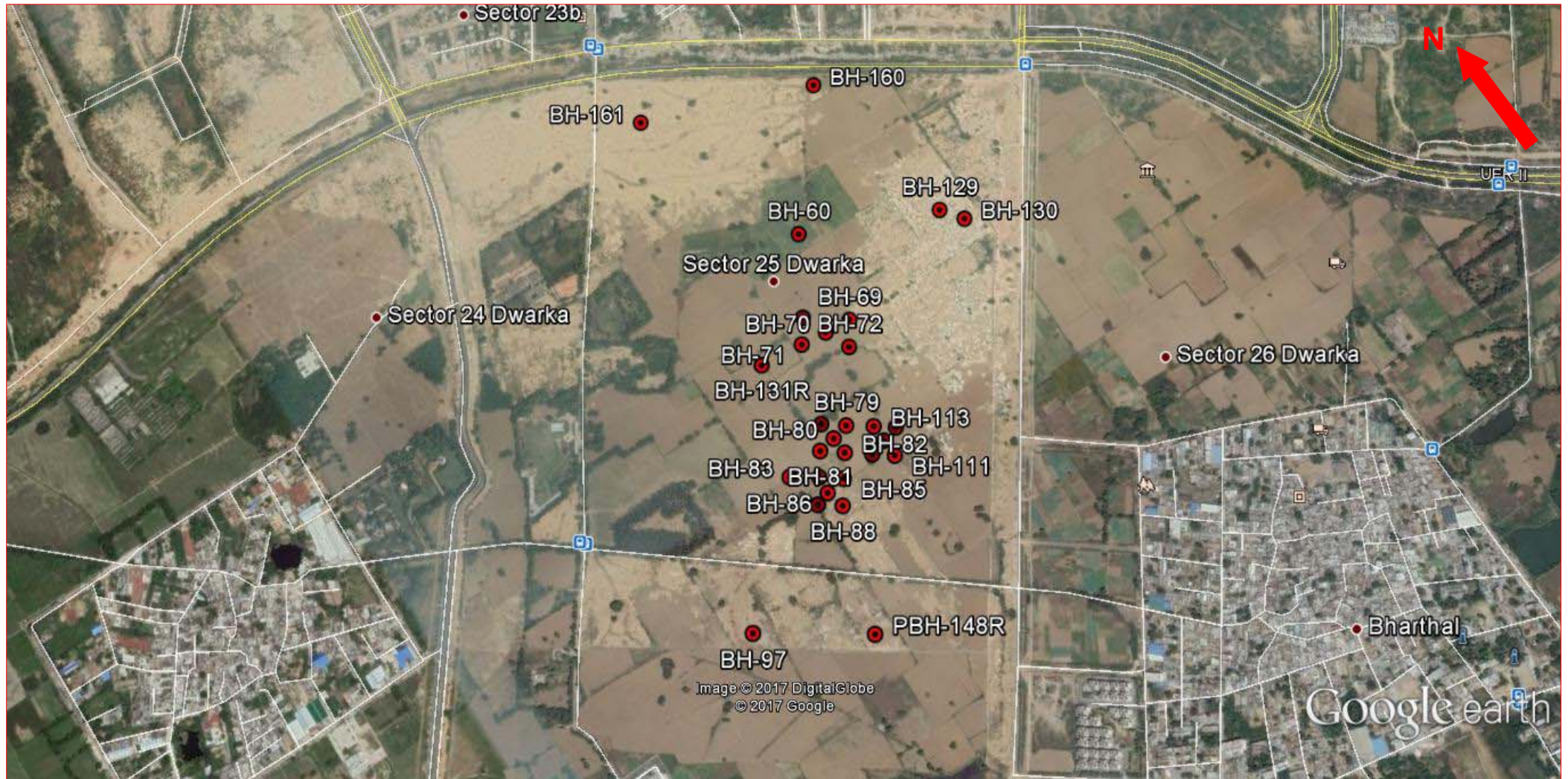
Plan of Field Investigations





Plan of Field Investigations





- Satellite image taken from Google Earth®
- Test Locations marked as per GPS coordinates taken on site using hand-held Garmin® device
- Accuracy of hand-held GPS device generally ranges from 4-6m, and varies depending on the availability of satellite connection at the site

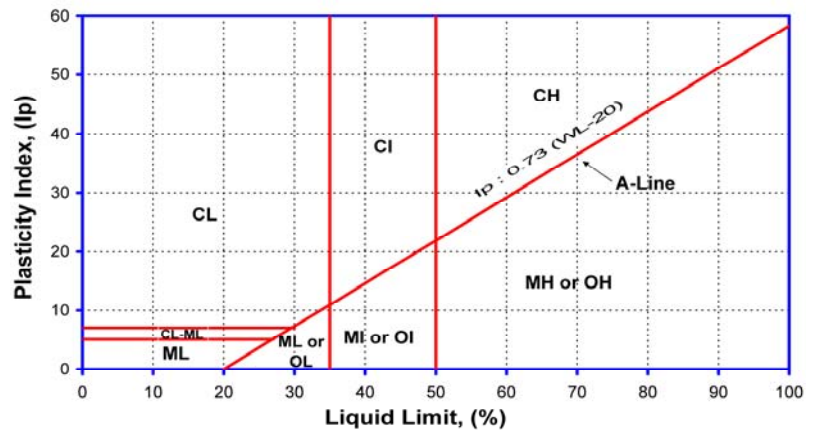
### Satellite Image of Site and Test Locations



### Plasticity of Clay

Plasticity	Liquid Limit
Low Plastic	< 35
Medium Plastic	35 to 50
High Plastic	> 50

### Plasticity Chart



### Consistency of Cohesive Soils

Consistency	Cohesion Intercept, kg/sq.cm	SPT (N) Value
Very Soft	< 0.1	0 to 2
Soft	0.1 to 0.25	2 to 4
Firm/Medium	0.25 to 0.5	4 to 8
Stiff	0.5 to 1.0	8 to 15
Very Stiff	1.0 to 2.0	15 to 30
Hard	> 2.0	> 30

### Density Condition of Granular Soils

Density Descriptor	SPT (N) Value	Static Cone Tip Resistance kg/sq.cm
Very Loose	0 to 4	< 20
Loose	4 to 10	20 to 40
Medium Dense	10 to 30	40 to 120
Dense	30 to 50	120 to 200
Very dense	> 50	> 200

### Degree of Expansion of Fine Grained Soils

Liquid Limit	Plasticity Index	Shrinkage Index	Free Swell Percent	Degree of Expansion	Degree of Severity
20 - 35	< 12	< 15	< 50	Low	Non-critical
35 - 50	12 - 23	15 - 30	50 - 100	Medium	Marginal
50 - 70	23 - 32	30 - 60	100 - 200	High	Critical
70 - 90	> 32	> 60	> 200	Very High	Severe

## Engineering Description of Soils



### NABL Accredited Laboratory

Our laboratory is accredited to **National Accreditation Board for Testing and Calibration Laboratories (NABL)**, New Delhi. The quality procedures in our laboratory conform to the International Standard **ISO/IEC: 17025-2005**.

The accreditation assures our clients of work quality in conformance with international norms and practices. It authorizes us to use the NABL logo on test results.

To maintain the necessary level of quality and reliability in all measurements on a continual basis, we indulge in the following:

- Use of calibrated equipment, regular maintenance and good housekeeping are a part of our work culture.
- Inter-laboratory comparison, proficiency testing and replicate testing, continuing education - ensure uniform quality of results.
- Internal Audit of quality procedures is done by our qualified ISO 17025 auditors to maintain the requisite standards. NABL conducts external audit.

### Uncertainty

Every measurement entails an uncertainty. It is well known that no measuring instrument can determine the true value of any measurement. The cumulative effect of factors such as sensitivity of equipment, accuracy in calibration, human factors and environmental conditions will determine the overall uncertainty in the parameter determined from these measurements.

As a part of our commitment to our clients, we have worked out the uncertainty in the parameters reported by our laboratory. Although this does not form a part of our contract agreement, we present below our statistical estimate of uncertainty of various parameters based on our most recent evaluation (February, 2016).

Test / Parameter		Uncertainty*	Test / Parameter		Uncertainty*	
Moisture Content		± 0.29%	Free Swell Index, %		± 2.6%	
Bulk & Dry Density		± 0.01 g/cc	Swell Pressure		± 0.43 kg/cm <sup>2</sup>	
Specific Gravity		± 0.01	Consolidation	Pressure	± 0.03 kg/cm <sup>2</sup>	
Liquid Limit		± 0.29%		Void Ratio	±0.01	
Plastic Limit			Density Index (relative density) of cohesionless soils		± 5 %	
Shrinkage Limit						
Unconfined Compression	c	± 0.054 kg/cm <sup>2</sup>	CD Direct Shear Test	φ	± 0.29 degrees	
UU Triaxial Test	c	± 0.01 kg/cm <sup>2</sup>	Soil Gradation		± 0.5% of particle size	
	φ	± 0.48 degree				
Std/Mod Proctor Compaction	MDD	± 0.14 g/cc	Coefficient of Permeability		± 2.7 x 10 <sup>-5</sup> cm/s	
	OMC	± 0.29%	Rock		Crushing Strength	± 3.1 kg/cm <sup>2</sup>
Laboratory CBR		± 0.58%			Point Load Strength Index	± 8.89 kg/cm <sup>2</sup>

\* at 95 percent confidence level for coverage factor of 2

### **Uncertainty in Laboratory Measurements**

ISO/IEC 17025:2005  
Certified Laboratory  
(NABL)  
Certificate No. T-1741



### Soil Profile (BH-60)

Location : - Termination Depth : 30.45 m (RL 182.518 m) Boring Method : Rotary Drilling  
UTM Coordinates : 700006 E, 3160288 N Ground Water Depth : 19.90 m Casing Depth : -  
Surface Elevation : RL 212.97 m Boring Start : 11-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 14-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Firm to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	7	11		- firm, 0.0 to 3.0 m																	8
2.00	2.30	UDS1				- with traces of gravel, 2.0 to 3.0 m		4	30	62	4				1.74	1.50	16.3						13
3.00	3.45	SPT2	10	12		- stiff, 3.0 to 5.0 m						27.5	14.5	13.0									5
4.00	4.30	UDS2													1.81	1.58	14.3						11
5.00	5.45	SPT3	16	17		- very stiff, 5.0 to 7.0 m																	
6.00	6.30	UDS3													1.88	1.64	14.9		DS	0.5, 1, 1.5	0.0	31.6	
7.00	7.45	SPT4	34	32		- hard, 7.0 to 14.0 m		0	16	79	5												
8.00	8.30	DS2										25.5	12.5	13.0									
9.50	9.95	SPT5	32	27																			
11.00	11.30	UDS4													1.84	1.58	16.1	2.62					
12.50	12.95	SPT6	36	26				0	30	66	4												

<sup>(1)</sup> SPT is outside NABL scope.


ISO/IEC 17025:2005  
Certified Laboratory  
(NABL)  
Certificate No. T-1741



Location : -  
UTM Coordinates : 700006 E, 3160288 N

### Soil Profile (BH-60)

Termination Depth : 30.45 m (RL 182.518 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.90 m Casing Depth : -  
Surface Elevation : RL 212.97 m Boring Start : 11-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 14-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)	
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)		
14.00	14.30	UDS5	37	25		Hard brown sandy silt, low plastic (CL)	30.45	5	27	64	4	25.5	16.5	9.0	1.83	1.57	16.5							
15.50	15.95	SPT7																						
17.00	17.30	DS3																						
18.50	18.95	SPT8				43									26									
20.00	20.30	UDS6																				1.92	1.63	17.6
22.00	22.45	SPT9				45									20	- with gravel, 22.0 to 24.0 m								
24.00	24.30	UDS7																				1.97	1.63	20.8
26.00	26.45	SPT10				52									21									
28.00	28.30	DS4																						
30.00	30.45	SPT11				55									21									

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699919 E, 3160144 N

### Soil Profile (BH-68)

Termination Depth : 30.45 m (RL 182.738 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.40 m Casing Depth : -  
Surface Elevation : RL 213.19 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to very stiff brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	9	14		- stiff, 0.0 to 5.0 m																	7
2.00	2.30	UDS1					2	36	59	3					1.74	1.54	12.8						9
3.00	3.45	SPT2	11	13								34.2	17.2	17.0									19
4.00	4.30	UDS2													1.82	1.59	14.8						7
5.00	5.45	SPT3	15	16		- very stiff, 5.0 to 14.0 m																	
6.00	6.30	UDS3													1.83	1.59	14.8		DS	0.5, 1, 1.5	0.0	30.1	
7.00	7.45	SPT4	17	16			4	32	61	3													
8.00	8.30	UDS4										26.2	16.2	10.0	1.88	1.64	14.8						
9.50	9.95	SPT5	22	18																			
11.00	11.30	DS2																					
12.50	12.95	SPT6	25	18			3	15	78	4													

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699919 E, 3160144 N

### Soil Profile (BH-68)

Termination Depth : 30.45 m (RL 182.738 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.40 m Casing Depth : -  
Surface Elevation : RL 213.19 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5				Very stiff to hard brown sandy silt, low plastic (CL)						24.9	14.2	10.7	1.86	1.62	14.6	2.67					
15.50	15.95	SPT7	29	19		- very stiff, 14.0 to 28.5 m																	
17.00	17.30	DS3																					
18.50	18.95	SPT8	31	19		- hard, 18.5 to 30.4 m																	
20.00	20.30	UDS6													1.94	1.66	17.0						
22.00	22.45	SPT9	35	17		- with gravel, 22.0 to 24.0 m		6	28	63	3												
24.00	24.30	UDS7													1.95	1.59	22.6						
26.00	26.45	SPT10	42	19																			
28.00	28.30	UDS8													1.99	1.64	21.3						
30.00	30.45	SPT11	38	17			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-69)

Location : 5\*hotel - 12

UTM Coordinates : 699995 E, 3160088 N

Termination Depth : 30.45 m (RL 181.991 m) Boring Method : Rotary Drilling

Ground Water Depth : 19.20 m

Casing Depth : -

Surface Elevation : RL 212.44 m

Boring Start : 16-Jun-17

Ground Water Level : RL 193.2 m

Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to very stiff brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	8	12		- stiff, 0.0 to 5.0 m		1	45	51	3												7
2.00	2.30	UDS1				- with traces of gravel, 1.0 to 7.0 m						31.9	14.2	17.7	1.79	1.58	13.4						12
3.00	3.45	SPT2	11	13																			11
4.00	4.30	UDS2													1.83	1.60	14.6						11
5.00	5.45	SPT3	14	15		- very stiff, 7.0 to 14.0 m																	
6.00	6.30	UDS3						4	34	59	3				1.85	1.63	13.8	2.62					
7.00	7.45	SPT4	17	16								29.9	16.2	13.7									
8.00	8.30	DS2																					
9.50	9.95	SPT5	20	17																			
11.00	11.30	UDS4				- with gravel, 11.0 to 12.5 m		5	29	63	3				1.85	1.61	14.7		DS	0.5, 1, 1.5	0.0	31.2	
12.50	12.95	SPT6	22	16								21.9	20.2	1.7									

<sup>(1)</sup> SPT is outside NABL scope.



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Location : 5\*hotel - 12  
UTM Coordinates : 699995 E, 3160088 N

### Soil Profile (BH-69)

Termination Depth : 30.45 m (RL 181.991 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.20 m Casing Depth : -  
Surface Elevation : RL 212.44 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.2 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5				Very stiff to hard brown sandy silt, low plastic (CL)									1.90	1.63	16.3						
15.50	15.95	SPT7	28	19		- very stiff, 14.0 to 18.5 m																	
17.00	17.30	UDS6													1.86	1.61	15.4						
18.50	18.95	SPT8	33	20		- hard, 18.5 to 30.4 m																	
20.00	20.30	UDS7						0	27	69	4				1.92	1.66	15.4						
22.00	22.45	SPT9	37	18																			
24.00	24.30	UDS8													1.93	1.56	23.4						
26.00	26.45	SPT10	41	19																			
28.00	28.30	DS3																					
30.00	30.45	SPT11	46	19																			

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699941 E, 3160094 N

### Soil Profile (BH-70)

Termination Depth : 30.45 m (RL 182.536 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.99 m Boring Start : 15-Jun-17  
Ground Water Level : RL 193.3 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	18	28		- very stiff, 0.0 to 3.0 m		0	18	78	4												13
2.00	2.30	UDS1										31.0	16.2	14.8	1.73	1.50	15.3						5
3.00	3.45	SPT2	13	16		- stiff, 3.0 to 5.0 m																	18
4.00	4.30	UDS2													1.80	1.57	14.9						14
5.00	5.45	SPT3	20	21		- very stiff, 5.0 to 9.5 m																	
6.00	6.30	DS2				- with traces of gravel, 6.0 to 7.5 m		2	43	52	3												
7.00	7.45	SPT4	26	24								23.0	12.2	10.8									
8.00	8.30	UDS3													1.85	1.60	15.5		DS	0.5, 1, 1.5	0.0	31.2	
9.50	9.95	SPT5	35	29		- hard, 9.5 to 14.0 m												2.65					
11.00	11.30	DS3						0	40	57	3												
12.50	12.95	SPT6	41	30								34.0	19.2	14.8									

<sup>(1)</sup> SPT is outside NABL scope.


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Location : 5\*hotel - 12  
UTM Coordinates : 699941 E, 3160094 N

### Soil Profile (BH-70)

Termination Depth : 30.45 m (RL 182.536 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.99 m Boring Start : 15-Jun-17  
Ground Water Level : RL 193.3 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)												
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)													
14.00	14.30	UDS4	45	30		Hard brown sandy silt, low plastic (CL)	30.45	2	26	68	4				1.86	1.59	16.7																		
15.50	15.95	SPT7				DS4																													
17.00	17.30	DS4																																	
18.50	18.95	SPT8	40	24	- with traces of gravel, 20.0 to 22.0 m																														
20.00	20.30	UDS5																																	
22.00	22.45	SPT9	41	19																															
24.00	24.30	UDS6																																	
26.00	26.45	SPT10	35	17																															
28.00	28.30	DS5																																	
30.00	30.45	SPT11	47	19																															

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699887 E, 3160101 N

### Soil Profile (BH-71)

Termination Depth : 30.45 m (RL 183.05 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 213.50 m Boring Start : 15-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	15	23		- very stiff, 0.0 to 12.5 m																	13
2.00	2.30	DS2					1	41	55	3													16
3.00	3.45	SPT2	18	22																			15
4.00	4.30	UDS1													1.78	1.54	15.5		DS	0.5, 1, 1.5	0.0	29.2	10
5.00	5.45	SPT3	24	25								29.0	14.2	14.8									
6.00	6.30	UDS2													1.88	1.62	15.9						
7.00	7.45	SPT4	27	25																			
8.00	8.30	UDS3													1.81	1.59	14.1						
9.50	9.95	SPT5	29	24			1	40	56	3													
11.00	11.30	UDS4										35.0	14.2	20.8	1.84	1.60	14.9						
12.50	12.95	SPT6	33	24		- hard, 12.5 to 14.0 m																	

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699887 E, 3160101 N

### Soil Profile (BH-71)

Termination Depth : 30.45 m (RL 183.05 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 213.50 m Boring Start : 15-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5				Hard brown sandy silt with gravel, low plastic (CL)									1.87	1.62	15.3	2.62					
15.50	15.95	SPT7	37	25				5	42	50	3												
17.00	17.30	DS3										22.0	20.2	1.8									
18.50	18.95	SPT8	40	24																			
20.00	20.30	UDS6													1.93	1.70	13.4						
22.00	22.45	SPT9	43	20																			
24.00	24.30	UDS7													1.94	1.57	23.4						
26.00	26.45	SPT10	47	20				7	30	60	3												
28.00	28.30	DS4																					
30.00	30.45	SPT11	52	21			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699964 E, 3160044 N

### Soil Profile (BH-72)

Termination Depth : 30.45 m (RL 182.126 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.20 m Casing Depth : -  
Surface Elevation : RL 212.58 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.4 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	9	14		- stiff, 0.0 to 5.0 m		2	34	61	3												5
2.00	2.30	UDS1													1.75	1.54	13.9						12
3.00	3.45	SPT2	13	16																			17
4.00	4.30	UDS2										21.9	19.2	2.7	1.85	1.60	15.6						13
5.00	5.45	SPT3	20	21		- very stiff, 5.0 to 7.0 m																	
6.00	6.30	UDS3						0	34	63	3				1.80	1.55	15.9		DS	0.5, 1, 1.5	0.0	30.4	
7.00	7.45	SPT4	31	29		- hard, 7.0 to 14.0 m																	
8.00	8.30	UDS4													1.81	1.58	14.6						
9.50	9.95	SPT5	41	34								33.9	17.2	16.7									
11.00	11.30	UDS5													1.88	1.63	15.6	2.69					
12.50	12.95	SPT6	53	39																			

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 12  
UTM Coordinates : 699964 E, 3160044 N

### Soil Profile (BH-72)

Termination Depth : 30.45 m (RL 182.126 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.20 m Casing Depth : -  
Surface Elevation : RL 212.58 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.4 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	DS2				Hard brown sandy silt, low plastic (CL)		4	39	54	3												
15.50	15.95	SPT7	56	37		- with traces of gravel, 14.0 to 15.5 m						23.0	16.2	6.7									
17.00	17.30	UDS6													1.87	1.64	14.2						
18.50	18.95	SPT8	62	37																			
20.00	20.30	UDS7													1.97	1.69	16.4						
22.00	22.45	SPT9	62	25																			
24.00	24.30	DS3				- with gravel, 24.0 to 26.0 m		7	17	69	7												
26.00	26.45	SPT10	76	28																			
28.00	28.30	DS4																					
30.00	30.45	SPT11	84	29			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 19  
UTM Coordinates : 699832 E, 3159950 N

### Soil Profile (BH-78)

Termination Depth : 30.45 m (RL 181.843 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.29 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.6 m Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	20	31		- very stiff, 0.0 to 5.0 m																	21
2.00	2.30	UDS1													1.74	1.52	14.2						10
3.00	3.45	SPT2	28	34				2	42	51	5												22
4.00	4.30	UDS2										31.0	13.2	17.7	1.81	1.57	15.3		DS	0.5, 1, 1.5	0.0	29.5	10
5.00	5.45	SPT3	39	40		- hard, 5.0 to 14.0 m																	
6.00	6.30	UDS3													1.81	1.57	15.6						
7.00	7.45	SPT4	32	30																			
8.00	8.30	UDS4						4	19	70	7				1.79	1.56	15.1						
9.50	9.95	SPT5	43	36								35.0	15.2	19.7				2.68					
11.00	11.30	DS2																					
12.50	12.95	SPT6	47	35																			

<sup>(1)</sup> SPT is outside NABL scope.




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Location : 4\*hotel - 19  
UTM Coordinates : 699832 E, 3159950 N

### Soil Profile (BH-78)

Termination Depth : 30.45 m (RL 181.843 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.29 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.6 m Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)		
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)			
14.00	14.30	UDS5	33	22		Hard brown sandy silt, low plastic (CL)  - with gravel, 14.0 to 15.5 m		5	24	64	7				1.89	1.63	15.9								
15.50	15.95	SPT7																							
17.00	17.30	DS3																							
18.50	18.95	SPT8						38	23																
20.00	20.30	UDS6														1.93	1.70					13.8			
22.00	22.45	SPT9						55	23																
24.00	24.30	UDS7										0	28	65	7	1.98	1.61					22.8			
26.00	26.45	SPT10						67	26																
28.00	28.30	DS4																							
30.00	30.45	SPT11						58	22			30.45													

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 19  
UTM Coordinates : 699872 E, 3159920 N

### Soil Profile (BH-79)

Termination Depth : 30.45 m (RL 181.55 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.60 m Casing Depth : 10.5 m  
Surface Elevation : RL 212.00 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.4 m Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt , low plastic (CL)																	
1.00	1.45	SPT1	13	20		- very stiff, 0.0 to 7.0 m		4	39	52	5												21
2.00	2.30	UDS1				- with traces of gravel, 1.0 to 8.0 m									1.70	1.48	14.9						5
3.00	3.45	SPT2	14	17								23.0	18.2	4.7									12
4.00	4.30	UDS2													1.79	1.56	14.8						19
5.00	5.45	SPT3	24	25																			
6.00	6.30	UDS3													1.82	1.59	14.8						
7.00	7.45	SPT4	34	32		- hard, 7.0 to 14.0 m		4	15	73	8												
8.00	8.30	UDS4										32.0	18.2	13.7	1.83	1.58	15.8		DS	0.5 ,1, 1.5	0.0	29.9	
9.50	9.95	SPT5	33	27																			
11.00	11.30	UDS5													1.84	1.60	14.8						
12.50	12.95	SPT6	36	26		- with gravel, 12.5 to 14.0 m		5	34	55	6												

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 19  
UTM Coordinates : 699872 E, 3159920 N

### Soil Profile (BH-79)

Termination Depth : 30.45 m (RL 181.55 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.60 m Casing Depth : 10.5 m  
Surface Elevation : RL 212.00 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.4 m Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS6				Hard brown sandy silt, low plastic (CL)  - with traces of gravel, 22.0 to 24.0 m						30.0	18.3	11.7	1.88	1.63	15.6	2.67					
15.50	15.95	SPT7	40	27																			
17.00	17.30	UDS7													1.89	1.68	12.8						
18.50	18.95	SPT8	42	25																			
20.00	20.30	UDS8													1.94	1.69	14.5						
22.00	22.45	SPT9	34	17			4	36	55	5													
24.00	24.30	UDS9													1.96	1.61	21.6						
26.00	26.45	SPT10	44	19																			
28.00	28.30	UDS10													2.00	1.61	24.5						
30.00	30.45	SPT11	39	17			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-80)

Location : 4\*hotel - 19

UTM Coordinates : 699837 E, 3159913 N

Termination Depth : 30.45 m (RL 182.675 m) Boring Method : Shell & Auger

Ground Water Depth : 19.40 m

Casing Depth : 12.1 m

Surface Elevation : RL 213.13 m

Boring Start : 14-Jun-17

Ground Water Level : RL 193.7 m

Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	16	25		- with gravel, 0.0 to 3.0 m		7	26	61	6												5
2.00	2.30	UDS1										26.0	18.3	7.7	1.71	1.51	13.4						4
3.00	3.45	SPT2	15	18																			13
4.00	4.30	UDS2													1.78	1.53	16.3						7
5.00	5.45	SPT3	18	19																			
6.00	6.30	UDS3				- with traces of gravel, 6.0 to 7.0 m		3	26	67	4				1.81	1.56	15.9						
7.00	7.45	SPT4	28	26								28.3	16.3	12.0				2.66					
8.00	8.30	UDS4													1.85	1.60	15.7		DS	0.5, 1, 1.5	0.0	31.1	
9.50	9.95	SPT5	28	23																			
11.00	11.30	UDS5				- with gravel, 11.0 to 12.5 m		7	25	62	6				1.85	1.62	14.3						
12.50	12.95	SPT6	30	22								22.3	20.3	2.0									

<sup>(1)</sup> SPT is outside NABL scope.








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Location : 4\*hotel - 19  
UTM Coordinates : 699837 E, 3159913 N

### Soil Profile (BH-80)

Termination Depth : 30.45 m (RL 182.675 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : 12.1 m  
Surface Elevation : RL 213.13 m Boring Start : 14-Jun-17  
Ground Water Level : RL 193.7 m Boring Finish : 15-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS6	26	17		Very stiff to hard brown sandy silt, low plastic (CL)								1.84	1.58	16.3							
15.50	15.95	SPT7																					
17.00	17.30	UDS7	27	16										1.83	1.61	13.8							
18.50	18.95	SPT8																					
20.00	20.30	DS2	34	17		- with traces of gravel, 20.0 to 22.0 m		4	45	47	4												
22.00	22.45	SPT9																					
24.00	24.30	UDS8	28	15		- hard, 22.0 to 26.0 m								1.95	1.61	20.9							
26.00	26.45	SPT10																					
28.00	28.30	DS3	45	19		- very stiff, 26.0 to 30.0 m																	
30.00	30.45	SPT11																					
						- hard, 30.0 to 30.4 m	30.45																
																							

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 19  
UTM Coordinates : 699801 E, 3159908 N

### Soil Profile (BH-81)

Termination Depth : 30.45 m (RL 182.546 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.50 m Casing Depth : -  
Surface Elevation : RL 213.00 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.5 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	17	27				0	29	65	6												13
2.00	2.30	UDS1										21.9	18.3	3.6	1.73	1.51	14.5						7
3.00	3.45	SPT2	18	22																			11
4.00	4.30	UDS2													1.80	1.57	14.9						18
5.00	5.45	SPT3	20	21																			
6.00	6.30	UDS3				- with traces of gravel, 6.0 to 14.0 m		4	15	74	7				1.85	1.60	15.6						
7.00	7.45	SPT4	21	19								29.9	12.3	17.6									
8.00	8.30	UDS4													1.83	1.59	15.3	2.64	DS	0.5, 1, 1.5	0.0	30.2	
9.50	9.95	SPT5	18	15																			
11.00	11.30	UDS5						2	32	60	6				1.85	1.59	16.3						
12.50	12.95	SPT6	24	18								22.9	18.3	4.6									

<sup>(1)</sup> SPT is outside NABL scope.






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Location : 4\*hotel - 19  
UTM Coordinates : 699801 E, 3159908 N

### Soil Profile (BH-81)

Termination Depth : 30.45 m (RL 182.546 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.50 m Casing Depth : -  
Surface Elevation : RL 213.00 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.5 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS6	33	22		Hard to very stiff brown sandy silt, low plastic (CL)		4	29	61	6				1.87	1.60	16.7						
15.50	15.95	SPT7				- hard, 14.0 to 18.5 m																	
17.00	17.30	DS2																					
18.50	18.95	SPT8				- very stiff, 18.5 to 26.0 m																	
20.00	20.30	DS3	- with traces of gravel, 20.0 to 22.0 m																				
22.00	22.45	SPT9	24	14																			
24.00	24.30	DS4																					
26.00	26.45	SPT10	55	22		- hard, 26.0 to 30.4 m																	
28.00	28.30	UDS7																					
30.00	30.45	SPT11	67	25											30.45								
																							

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-82)

Location : 4\*hotel - 19

UTM Coordinates : 699840 E, 3159878 N

Termination Depth : 30.45 m (RL 182.716 m) Boring Method : Shell & Auger

Ground Water Depth : 19.70 m

Casing Depth : -

Surface Elevation : RL 213.17 m

Boring Start : 15-Jun-17

Ground Water Level : RL 193.5 m

Boring Finish : 16-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	18	28		- very stiff, 0.0 to 9.5 m																	22
2.00	2.30	UDS1				- with traces of gravel, 2.0 to 4.0 m		1	14	77	8				1.72	1.51	13.7						7
3.00	3.45	SPT2	22	26								28.3	15.3	13.0									4
4.00	4.30	UDS2													1.80	1.57	14.8		DS	0.5, 1, 1.5	0.0	29.9	9
5.00	5.45	SPT3	21	22														2.62					
6.00	6.30	DS2																					
7.00	7.45	SPT4	24	22		- with gravel, 7.0 to 8.0 m		6	32	57	5												
8.00	8.30	UDS3										30.3	14.3	16.0	1.84	1.60	14.9						
9.50	9.95	SPT5	31	26		- hard, 9.5 to 14.0 m																	
11.00	11.30	UDS4													1.84	1.59	15.7						
12.50	12.95	SPT6	44	32		- with traces of gravel, 12.5 to 14.0 m		3	14	75	8												

<sup>(1)</sup> SPT is outside NABL scope.




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Location : 4\*hotel - 19  
UTM Coordinates : 699840 E, 3159878 N

### Soil Profile (BH-82)

Termination Depth : 30.45 m (RL 182.716 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 213.17 m Boring Start : 15-Jun-17  
Ground Water Level : RL 193.5 m Boring Finish : 16-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)						
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)							
14.00	14.30	UDS5	46	30		Hard brown sandy silt, low plastic (CL)	30.45	4	28	62	6	25.9	15.3	10.6	1.91	1.65	15.8												
15.50	15.95	SPT7				DS3						- with traces of gravel, 22.0 to 24.0 m	4	28	62	6	25.9					15.3	10.6	1.93	1.68	15.2			
17.00	17.30	DS3				UDS6																							
18.50	18.95	SPT8																									45	20	
20.00	20.30	UDS6																											24.00
22.00	22.45	SPT9	58	22																									
24.00	24.30	UDS7			30.00																			30.45					
26.00	26.45	SPT10				DS4																							
28.00	28.30	DS4																							SPT11				
30.00	30.45	SPT11																											

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-83)

Location : - Termination Depth : 30.45 m (RL 182.487 m) Boring Method : Rotary Drilling  
UTM Coordinates : 699722 E, 3159900 N Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.94 m Boring Start : 17-Jun-17  
Ground Water Level : RL 193.2 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	8	12		- stiff, 0.0 to 5.0 m																	7
2.00	2.30	UDS1				- with gravel, 2.0 to 4.0 m		5	17	74	4				1.74	1.53	13.6						9
3.00	3.45	SPT2	11	13								32.5	19.5	13.0									13
4.00	4.30	UDS2													1.86	1.60	16.5						8
5.00	5.45	SPT3	16	17		- very stiff, 5.0 to 12.5 m																	
6.00	6.30	UDS3													1.78	1.55	15.3		DS	0.5, 1, 1.5	0.0	29.4	
7.00	7.45	SPT4	20	19		- with traces of gravel, 7.0 to 8.0 m		2	27	64	7							2.68					
8.00	8.30	DS2										31.5	20.5	11.0									
9.50	9.95	SPT5	29	24																			
11.00	11.30	UDS4				- with traces of gravel, 11.0 to 14.0 m									1.81	1.58	14.5						
12.50	12.95	SPT6	32	24		- hard, 12.5 to 14.0 m		1	17	73	9												

<sup>(1)</sup> SPT is outside NABL scope.


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Location : -  
UTM Coordinates : 699722 E, 3159900 N

### Soil Profile (BH-83)

Termination Depth : 30.45 m (RL 182.487 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.70 m Casing Depth : -  
Surface Elevation : RL 212.94 m Boring Start : 17-Jun-17  
Ground Water Level : RL 193.2 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)															
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)																
14.00	14.30	UDS5	36	24		Hard brown sandy silt, low plastic (CL)	30.45	3	43	49	5	25.5	20.5	5.0	1.89	1.62	16.8																					
15.50	15.95	SPT7				- with traces of gravel, 22.0 to 24.0 m																																
17.00	17.30	UDS6																												1.84	1.60	15.1						
18.50	18.95	SPT8				40									24																							
20.00	20.30	DS3																																				
22.00	22.45	SPT9				44									20																							
24.00	24.30	UDS7																													1.94	1.58	22.8					
26.00	26.45	SPT10				49									21																							
28.00	28.30	DS4																																				
30.00	30.45	SPT11				56									22																							

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-84)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 182.475 m) Boring Method : Shell & Auger  
UTM Coordinates : 699771 E, 3159867 N Ground Water Depth : 19.60 m Casing Depth : -  
Surface Elevation : RL 212.93 m Boring Start : 23-Jun-17  
Ground Water Level : RL 193.3 m Boring Finish : 24-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)		2	14	80	4												
1.00	1.45	SPT1	13	20		- stiff, 0.0 to 3.0 m						21.4	14.4	7.0									15
2.00	2.30	UDS1				- with traces of gravel, 0.0 to 1.0 m									1.76	1.56	12.8						16
3.00	3.45	SPT2	19	23		- very stiff, 3.0 to 7.0 m																	15
4.00	4.30	UDS2													1.77	1.57	12.8						19
5.00	5.45	SPT3	30	31		- with gravel, 5.0 to 7.0 m		7	26	64	3												
6.00	6.30	UDS3										31.4	16.4	15.0	1.78	1.55	14.5						
7.00	7.45	SPT4	42	39		- hard, 7.0 to 14.0 m																	
8.00	8.30	UDS4													1.84	1.58	16.3	2.67					
9.50	9.95	SPT5	40	33		- with traces of gravel, 9.5 to 14.0 m		2	41	54	3												
11.00	11.30	UDS5										33.4	13.4	20.0	1.84	1.58	16.7		DS	0.5, 1, 1.5	0.0	29.6	
12.50	12.95	SPT6	42	31																			





<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-84)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 182.475 m) Boring Method : Shell & Auger  
UTM Coordinates : 699771 E, 3159867 N Ground Water Depth : 19.60 m Casing Depth : -  
Surface Elevation : RL 212.93 m Boring Start : 23-Jun-17  
Ground Water Level : RL 193.3 m Boring Finish : 24-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	DS2	35	23		Hard to very stiff brown sandy silt, low plastic (CL)		6	25	65	4				1.85	1.61	14.8						
15.50	15.95	SPT7				- hard, 14.0 to 18.5 m																	
17.00	17.30	UDS6																					
18.50	18.95	SPT8				- with gravel, 18.5 to 20.0 m																	
20.00	20.30	UDS7				- very stiff, 18.5 to 22.0 m																	
22.00	22.45	SPT9	67	27		- hard, 22.0 to 30.4 m									1.95	1.66	17.5						
24.00	24.30	DS3	54	22											1.95	1.60	21.6						
26.00	26.45	SPT10																					
28.00	28.30	UDS8																					
30.00	30.45	SPT11	80	28			30.45								1.99	1.61	23.4						

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-85)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 182.798 m) Boring Method : Shell & Auger  
UTM Coordinates : 699810 E, 3159838 N Ground Water Depth : 19.40 m Casing Depth : 13.5 m  
Surface Elevation : RL 213.25 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	19	30		- with gravel, 3.0 to 5.0 m									1.74	1.50	15.7						6
2.00	2.30	UDS1																					6
3.00	3.45	SPT2	24	29			6	39	52	3													16
4.00	4.30	UDS2										27.5	12.4	15.0	1.76	1.53	15.1						16
5.00	5.45	SPT3	18	19		- with traces of gravel, 8.0 to 10.5 m																	
6.00	6.30	UDS3													1.83	1.57	16.8		DS	0.5, 1, 1.5	0.0	30.8	
7.00	7.45	SPT4	24	22																			
8.00	8.30	UDS4					3	18	75	4					1.84	1.60	14.7						
9.50	9.95	SPT5	25	21								33.5	17.4	16.0									
11.00	11.30	UDS5													1.87	1.64	13.7						
12.50	12.95	SPT6	30	22														2.65					

<sup>(1)</sup> SPT is outside NABL scope.





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Location : Service apt - 22  
UTM Coordinates : 699810 E, 3159838 N

### Soil Profile (BH-85)

Termination Depth : 30.45 m (RL 182.798 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : 13.5 m  
Surface Elevation : RL 213.25 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 18-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests					Free Swell Index, (%)							
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)									
14.00	14.30	UDS6	30	20		Hard brown sandy silt, low plastic (CL)		0	25	71	4				1.86	1.63	13.8														
15.50	15.95	SPT7																													
17.00	17.30	UDS7																													
18.50	18.95	SPT8						38	23																						
20.00	20.30	DS2																													
22.00	22.45	SPT9	45	20		- with gravel, 24.0 to 26.0 m		5	36	56	3				1.95	1.59	22.4														
24.00	24.30	UDS8																													
26.00	26.45	SPT10	60	24																											
28.00	28.30	UDS9																													
30.00	30.45	SPT11	61	23																											
							30.45																								

<sup>(1)</sup> SPT is outside NABL scope.

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Location : Service apt - 22  
UTM Coordinates : 699768 E, 3159833 N

### Soil Profile (BH-86)

Termination Depth : 30.45 m (RL 181.55 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.86 m Casing Depth : 10.0 m  
Surface Elevation : RL 212.00 m Boring Start : 25-Jun-17  
Ground Water Level : RL 192.1 m Boring Finish : 25-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	8	12		- stiff, 0.0 to 7.0 m		0	24	72	4												10
2.00	2.30	UDS1										26.4	12.4	14.0	1.76	1.55	13.8						17
3.00	3.45	SPT2	22	26		- very stiff, 3.0 to 7.0 m																	19
4.00	4.30	UDS2													1.75	1.52	14.9		DS	0.5, 1, 1.5	0.0	29.3	15
5.00	5.45	SPT3	25	26																			
6.00	6.30	UDS3				- with traces of gravel, 6.0 to 7.0 m		2	28	66	4				1.79	1.55	15.7						
7.00	7.45	SPT4	36	33		- hard, 7.0 to 9.5 m						21.4	16.4	5.0									
8.00	8.30	UDS4													1.84	1.60	14.7						
9.50	9.95	SPT5	29	24		- very stiff, 9.5 to 12.5 m																	
11.00	11.30	UDS5						1	41	55	3				1.89	1.63	15.8						
12.50	12.95	SPT6	38	28		- hard, 12.5 to 14.0 m						21.4	12.4	9.0									

<sup>(1)</sup> SPT is outside NABL scope.

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Location : Service apt - 22  
UTM Coordinates : 699768 E, 3159833 N

### Soil Profile (BH-86)

Termination Depth : 30.45 m (RL 181.55 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.86 m Casing Depth : 10.0 m  
Surface Elevation : RL 212.00 m Boring Start : 25-Jun-17  
Ground Water Level : RL 192.1 m Boring Finish : 25-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	DS2				Hard brown sandy silt, low plastic (CL)									1.83	1.61	13.9	2.66					
15.50	15.95	SPT7	43	28																			
17.00	17.30	DS3													1.84	1.62	13.4						
18.50	18.95	SPT8	50	30																			
20.00	20.30	UDS6					0	27	69	4					1.96	1.72	13.8						
22.00	22.45	SPT9	67	27																			
24.00	24.30	DS4													1.98	1.62	22.4						
26.00	26.45	SPT10	59	23																			
28.00	28.30	UDS7													2.04	1.68	21.4						
30.00	30.45	SPT11	52	21			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-87)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 181.05 m) Boring Method : Shell & Auger  
UTM Coordinates : 699739 E, 3159825 N Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 211.50 m Boring Start : 26-Jun-17  
Ground Water Level : RL 191.1 m Boring Finish : 27-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	17	27		- very stif, 0.0 to 5.0 m		4	31	62	3												18
2.00	2.30	UDS1										29.4	18.4	11.0	1.79	1.56	14.5						19
3.00	3.45	SPT2	28	34																			14
4.00	4.30	UDS2													1.80	1.58	13.9						20
5.00	5.45	SPT3	34	35		- hard, 5.0 to 7.0 m																	
6.00	6.30	UDS3						3	26	67	4				1.80	1.55	16.4						
7.00	7.45	SPT4	25	23		- very stiff, 7.0 to 9.5 m						28.4	16.4	12.0									
8.00	8.30	UDS4													1.83	1.58	15.8		DS	0.5, 1, 1.5	0.0	30.1	
9.50	9.95	SPT5	37	31		- hard, 9.5 to 14.0 m												2.62					
11.00	11.30	UDS5						1	40	56	3				1.84	1.58	16.7						
12.50	12.95	SPT6	47	35								22.4	12.4	10.0									


<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-87)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 181.05 m) Boring Method : Shell & Auger  
UTM Coordinates : 699739 E, 3159825 N Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 211.50 m Boring Start : 26-Jun-17  
Ground Water Level : RL 191.1 m Boring Finish : 27-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)					
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)						
14.00	14.30	DS2	62	41		Hard brown sandy silt, low plastic (CL)		1	35	61	3				1.89	1.63	15.6											
15.50	15.95	SPT7																										
17.00	17.30	DS3																										
18.50	18.95	SPT8				72									43											1.83	1.61	13.5
20.00	20.30	UDS6														- with traces of gravel, 20.0 to 22.0 m										1.97	1.70	15.6
22.00	22.45	SPT9				82									31													
24.00	24.30	DS4																								1.95	1.57	24.3
26.00	26.45	SPT10				75									27													
28.00	28.30	UDS7																								2.01	1.63	23.4
30.00	30.45	SPT11				73									26							30.45						

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-88)

Location : Service apt - 22 Termination Depth : 30.45 m (RL 182.478 m) Boring Method : Shell & Auger  
UTM Coordinates : 699779 E, 3159796 N Ground Water Depth : 19.82 m Casing Depth : -  
Surface Elevation : RL 212.93 m Boring Start : 26-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 26-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	18	28		- very stiff, 0.0 to 12.5 m																	12
2.00	2.30	UDS1													1.80	1.58	13.7						13
3.00	3.45	SPT2	16	19																			17
4.00	4.30	UDS2						2	29	65	4				1.79	1.56	14.7						4
5.00	5.45	SPT3	25	26								26.5	16.4	10.0									
6.00	6.30	UDS3													1.82	1.60	13.8						
7.00	7.45	SPT4	27	25																			
8.00	8.30	UDS4													1.79	1.54	16.4		DS	0.5, 1, 1.5	0.0	29.2	
9.50	9.95	SPT5	28	23				4	29	64	3												
11.00	11.30	UDS5										33.5	17.4	16.0	1.85	1.60	15.9						
12.50	12.95	SPT6	36	26		- hard, 12.5 to 14.0 m																	

<sup>(1)</sup> SPT is outside NABL scope.



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Location : Service apt - 22  
UTM Coordinates : 699779 E, 3159796 N

### Soil Profile (BH-88)

Termination Depth : 30.45 m (RL 182.478 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.82 m Casing Depth : -  
Surface Elevation : RL 212.93 m Boring Start : 26-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 26-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	DS2				Hard brown sandy silt, low plastic (CL)									1.85	1.58	16.8	2.66					
15.50	15.95	SPT7	50	33		- with gravel, 15.5 to 18.5 m		5	44	49	2												
17.00	17.30	DS3										24.5	16.4	8.0	1.87	1.66	12.7						
18.50	18.95	SPT8	68	41																			
20.00	20.30	UDS6													1.93	1.63	18.7						
22.00	22.45	SPT9	72	28																			
24.00	24.30	DS4													1.89	1.54	22.4						
26.00	26.45	SPT10	63	24		- with traces of gravel, 26.0 to 28.0 m		2	16	78	4												
28.00	28.30	UDS7													2.05	1.69	21.5						
30.00	30.45	SPT11	68	25			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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Location : -  
UTM Coordinates : 699497 E, 3159695 N

### Soil Profile (BH-97)

Termination Depth : 30.45 m (RL 181.931 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : -  
Surface Elevation : RL 212.38 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193 m Boring Finish : 20-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Firm to very stiff brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	7	11		- firm, 0.0 to 3.0 m																	4
2.00	2.30	UDS1													1.79	1.58	13.6						19
3.00	3.45	SPT2	9	11		- stiff, 3.0 to 7.0 m																	8
4.00	4.30	UDS2						2	17	76	5				1.74	1.52	14.8						22
5.00	5.45	SPT3	13	13								29.5	13.5	16.0									
6.00	6.30	UDS3													1.79	1.53	17.1						
7.00	7.45	SPT4	15	14		- very stiff, 7.0 to 14.0 m																	
8.00	8.30	UDS4													1.81	1.57	15.6		DS	0.5, 1, 1.5	0.0	30.6	
9.50	9.95	SPT5	22	18				3	42	52	3												
11.00	11.30	UDS5										33.5	14.5	19.0	1.82	1.59	14.8						
12.50	12.95	SPT6	23	17																			

<sup>(1)</sup> SPT is outside NABL scope.

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Location : -  
UTM Coordinates : 699497 E, 3159695 N

### Soil Profile (BH-97)

Termination Depth : 30.45 m (RL 181.931 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : -  
Surface Elevation : RL 212.38 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193 m Boring Finish : 20-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS6				Hard brown sandy silt, low plastic (CL)									1.85	1.58	16.8	2.65					
15.50	15.95	SPT7	25	17		- with traces of gravel, 14.0 to 17.0 m		2	42	53	3												
17.00	17.30	UDS7										34.5	17.5	17.0	1.87	1.60	16.7						
18.50	18.95	SPT8	29	17																			
20.00	20.30	UDS8													1.90	1.67	13.8						
22.00	22.45	SPT9	31	16																			
24.00	24.30	UDS9													1.95	1.60	21.6						
26.00	26.45	SPT10	38	18		- with gravel, 26.0 to 28.0 m		5	31	60	4												
28.00	28.30	UDS10													2.00	1.63	22.4						
30.00	30.45	SPT11	55	22			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 20  
UTM Coordinates : 699884 E, 3159845 N

### Soil Profile (BH-110)

Termination Depth : 30.45 m (RL 182.9 m)  
Ground Water Depth : 19.85 m  
Surface Elevation : RL 213.35 m  
Ground Water Level : RL 193.5 m  
Boring Method : Shell & Auger  
Casing Depth : 8.3 m  
Boring Start : 20-Jun-17  
Boring Finish : 21-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	15	23		- very stiff, 0.0 to 9.5 m																	5
2.00	2.30	UDS1						0	45	50	5				1.75	1.52	15.3						19
3.00	3.45	SPT2	18	22								32.9	14.3	18.6									10
4.00	4.30	UDS2													1.81	1.55	16.4		DS	0.5, 1, 1.5	0.0	29.2	16
5.00	5.45	SPT3	20	21											1.86	1.61	15.4						
6.00	6.30	UDS3																					
7.00	7.45	SPT4	22	20		- with gravel, 7.0 to 8.0 m		5	24	65	6												
8.00	8.30	UDS4										27.9	18.3	9.6	1.83	1.57	16.7						
9.50	9.95	SPT5	33	27		- hard, 9.5 to 14.0 m																	
11.00	11.30	UDS5													1.84	1.60	14.8	2.68					
12.50	12.95	SPT6	33	24		- with traces of gravel, 12.5 to 14.0 m		1	35	58	6												

<sup>(1)</sup> SPT is outside NABL scope.


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Location : 4\*hotel - 20  
UTM Coordinates : 699884 E, 3159845 N

### Soil Profile (BH-110)

Termination Depth : 30.45 m (RL 182.9 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.85 m Casing Depth : 8.3 m  
Surface Elevation : RL 213.35 m Boring Start : 20-Jun-17  
Ground Water Level : RL 193.5 m Boring Finish : 21-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)								
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)									
14.00	14.30	UDS6	42	28		Hard brown sandy silt, low plastic (CL)	30.45	6	37	52	5	25.0	14.3	10.6	1.84	1.58	16.8														
15.50	15.95	SPT7				DS2						17.00	17.30	18.50	18.95	20.00	20.30					22.00	22.45	24.00	24.30	26.00	26.45	28.00	28.30	30.00	30.45

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 20  
UTM Coordinates : 699920 E, 3159818 N

### Soil Profile (BH-111)

Termination Depth : 30.45 m (RL 183.05 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.91 m Casing Depth : -  
Surface Elevation : RL 213.50 m Boring Start : 20-Jun-17  
Ground Water Level : RL 193.6 m Boring Finish : 22-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	9	14		- stiff, 0.0 to 3.0 m		1	37	56	6												9
2.00	2.30	UDS1				- with traces of gravel, 1.0 to 3.0 m						28.0	18.3	9.6	1.77	1.54	14.9						11
3.00	3.45	SPT2	17	20		- very stiff, 3.0 to 7.0 m																	4
4.00	4.30	UDS2													1.85	1.61	14.8						16
5.00	5.45	SPT3	27	28																			
6.00	6.30	UDS3				- with gravel, 6.0 to 8.0 m		7	41	47	5				1.87	1.63	14.6		DS	0.5, 1, 1.5	0.0	31.8	
7.00	7.45	SPT4	33	31		- hard, 7.0 to 9.5 m						24.0	13.3	10.6									
8.00	8.30	UDS4													1.86	1.60	15.9	2.70					
9.50	9.95	SPT5	27	22		- very stiff, 9.5 to 12.5 m																	
11.00	11.30	DS2						0	42	53	5												
12.50	12.95	SPT6	37	27		- hard, 12.5 to 14.0 m						24.0	13.3	10.6									

<sup>(1)</sup> SPT is outside NABL scope.




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Location : 4\*hotel - 20  
UTM Coordinates : 699920 E, 3159818 N

### Soil Profile (BH-111)

Termination Depth : 30.45 m (RL 183.05 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.91 m Casing Depth : -  
Surface Elevation : RL 213.50 m Boring Start : 20-Jun-17  
Ground Water Level : RL 193.6 m Boring Finish : 22-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)					
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)						
14.00	14.30	UDS5	30	20		Hard brown sandy silt, low plastic (CL)		6	27	61	6				1.86	1.59	17.3											
15.50	15.95	SPT7																										
17.00	17.30	UDS6																										
18.50	18.95	SPT8				48									29													
20.00	20.30	UDS7														- with gravel, 20.0 to 24.0 m										1.92	1.65	16.7
22.00	22.45	SPT9				53									23													
24.00	24.30	DS3																										
26.00	26.45	SPT10				68									26													
28.00	28.30	UDS8																								2.03	1.65	23.4
30.00	30.45	SPT11				51									21													
							30.45																					

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 20  
UTM Coordinates : 699918 E, 3159854 N

### Soil Profile (BH-112)

Termination Depth : 30.45 m (RL 182.956 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.60 m Casing Depth : 10.5 m  
Surface Elevation : RL 213.41 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 19-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	17	27		- with gravel, 2.0 to 4.0 m																	13
2.00	2.30	UDS1					6	21	66	7					1.78	1.54	15.7						5
3.00	3.45	SPT2	19	23								24.0	13.3	10.6									4
4.00	4.30	UDS2													1.84	1.58	16.7						4
5.00	5.45	SPT3	29	30		- with traces of gravel, 7.0 to 8.0 m																	
6.00	6.30	UDS3													1.83	1.59	14.8						
7.00	7.45	SPT4	28	26			2	31	61	6													
8.00	8.30	UDS4										21.4	20.4	1.0	1.87	1.63	14.8		DS	0.5, 1, 1.5	0.0	31.1	
9.50	9.95	SPT5	20	17		- with gravel, 12.5 to 14.0 m																	
11.00	11.30	UDS5													1.86	1.63	13.8	2.69					
12.50	12.95	SPT6	27	20			6	35	54	5													

<sup>(1)</sup> SPT is outside NABL scope.


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Location : 4\*hotel - 20  
UTM Coordinates : 699918 E, 3159854 N

### Soil Profile (BH-112)

Termination Depth : 30.45 m (RL 182.956 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.60 m Casing Depth : 10.5 m  
Surface Elevation : RL 213.41 m Boring Start : 18-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 19-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests					Free Swell Index, (%)			
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)					
14.00	14.30	UDS6	32	21		Hard brown sandy silt, low plastic (CL)	30.45	5	36	54	5	34.4	19.4	15.0	1.84	1.59	15.8										
15.50	15.95	SPT7																									
17.00	17.30	DS2																									
18.50	18.95	SPT8				35									21												
20.00	20.30	UDS7																					1.97	1.66	18.8		
22.00	22.45	SPT9				44									20	- with gravel, 22.0 to 24.0 m											
24.00	24.30	UDS8																					1.94	1.59	22.0		
26.00	26.45	SPT10				49									21												
28.00	28.30	DS3																									
30.00	30.45	SPT11				54									21												

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-113)

Location : 4\*hotel - 20

UTM Coordinates : 699917 E, 3159888 N

Termination Depth : 30.45 m (RL 182.929 m) Boring Method : Shell & Auger

Ground Water Depth : 19.55 m

Casing Depth : -

Surface Elevation : RL 213.38 m

Boring Start : 16-Jun-17

Ground Water Level : RL 193.8 m

Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	17	27																			11
2.00	2.30	UDS1													1.78	1.55	14.8						19
3.00	3.45	SPT2	19	23		- with traces of gravel, 3.0 to 5.0 m		1	35	58	6												13
4.00	4.30	UDS2										30.0	17.3	12.6	1.83	1.59	15.3						18
5.00	5.45	SPT3	17	18																			
6.00	6.30	UDS3													1.84	1.59	15.6						
7.00	7.45	SPT4	20	19																			
8.00	8.30	UDS4				- with gravel, 8.0 to 9.5 m		7	32	56	5				1.87	1.62	15.4		DS	0.5, 1, 1.5	0.0	31.9	
9.50	9.95	SPT5	20	17								26.0	20.3	5.6									
11.00	11.30	UDS5													1.81	1.55	16.7						
12.50	12.95	SPT6	28	21														2.64					

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 20  
UTM Coordinates : 699917 E, 3159888 N

### Soil Profile (BH-113)

Termination Depth : 30.45 m (RL 182.929 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.55 m Casing Depth : -  
Surface Elevation : RL 213.38 m Boring Start : 16-Jun-17  
Ground Water Level : RL 193.8 m Boring Finish : 17-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	Free Swell Index, (%)
14.00	14.30	DS2				Hard brown sandy silt, low plastic (CL)		0	30	64	6												
15.50	15.95	SPT7	49	32								22.0	12.3	9.6									
17.00	17.30	UDS6													1.81	1.59	13.7						
18.50	18.95	SPT8	44	27																			
20.00	20.30	DS3																					
22.00	22.45	SPT9	47	21																			
24.00	24.30	DS4				- with gravel, 24.0 to 26.0 m		5	40	50	5												
26.00	26.45	SPT10	55	22																			
28.00	28.30	DS5																					
30.00	30.45	SPT11	47	19			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 4\*hotel - 20  
UTM Coordinates : 699953 E, 3159862 N

### Soil Profile (BH-114)

Termination Depth : 30.45 m (RL 183.035 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : 10.5 m  
Surface Elevation : RL 213.49 m Boring Start : 18-Jun-17  
Ground Water Level : RL 194.1 m Boring Finish : 20-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt with traces of gravel, low plastic (CL)																	
1.00	1.45	SPT1	13	20		- stiff, 0.0 to 3.0 m																	17
2.00	2.30	UDS1													1.74	1.50	16.2						17
3.00	3.45	SPT2	23	28		- very stiff, 3.0 to 5.0 m																	16
4.00	4.30	UDS2						1	35	58	6				1.79	1.56	14.6						10
5.00	5.45	SPT3	37	38		- hard, 5.0 to 14.0 m						21.4	19.4	2.0									
6.00	6.30	UDS3													1.79	1.54	15.9		DS	0.5, 1, 1.5	0.0	29.2	
7.00	7.45	SPT4	48	45																			
8.00	8.30	UDS4													1.89	1.63	15.9						
9.50	9.95	SPT5	55	46				4	39	52	5												
11.00	11.30	DS2										28.4	17.4	11.0									
12.50	12.95	SPT6	42	31																			

<sup>(1)</sup> SPT is outside NABL scope.





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Location : 4\*hotel - 20  
UTM Coordinates : 699953 E, 3159862 N

### Soil Profile (BH-114)

Termination Depth : 30.45 m (RL 183.035 m) Boring Method : Shell & Auger  
Ground Water Depth : 19.40 m Casing Depth : 10.5 m  
Surface Elevation : RL 213.49 m Boring Start : 18-Jun-17  
Ground Water Level : RL 194.1 m Boring Finish : 20-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests					Free Swell Index, (%)								
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)										
14.00	14.30	UDS5	56	37		Hard brown sandy silt with traces of gravel, low plastic (CL)		2	19	72	7	26.4	12.4	14.0	1.86	1.59	16.7	2.66														
15.50	15.95	SPT7																														
17.00	17.30	DS3																														
18.50	18.95	SPT8																														
20.00	20.30	UDS6						72	43																							
22.00	22.45	SPT9																														
24.00	24.30	UDS7																														
26.00	26.45	SPT10																														
28.00	28.30	DS4						55	22																							
30.00	30.45	SPT11																														
			49	20			30.45																									

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-129)

Location : 5\*hotel - 09

Termination Depth : 30.45 m (RL 183.037 m) Boring Method : Shell & Auger

UTM Coordinates : 700274 E, 3160168 N

Ground Water Depth : 21.20 m

Casing Depth : -

Surface Elevation : RL 213.49 m

Boring Start : 10-Jun-17

Ground Water Level : RL 192.3 m

Boring Finish : 11-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	13	20		- stiff, 0.0 to 3.0 m		0	46	49	5												16
2.00	2.30	UDS1				- with traces of gravel, 2.0 to 3.5 m		4	16	67	13				1.73	1.52	13.5						18
3.00	3.45	SPT2	17	20		- very stiff, 3.0 to 5.0 m						30.9	13.1	17.8									8
4.00	4.30	UDS2													1.79	1.59	12.5	2.62	DS	0.5, 1, 1.5	0.0	29.7	18
5.00	5.45	SPT3	31	32		- hard, 5.0 to 9.5 m		0	20	62	18												
6.00	6.30	DS2																					
7.00	7.45	SPT4	31	29		- with traces of gravel, 7.0 to 8.0 m		2	38	55	5												
8.00	8.30	UDS3				- with gravel, 8.0 to 9.5 m		5	36	45	14	22.9	19.1	3.8	1.88	1.64	14.3						
9.50	9.95	SPT5	26	22		- very stiff, 9.5 to 12.5 m																	
11.00	11.30	UDS4													1.84	1.59	15.7						
12.50	12.95	SPT6	33	24		- hard, 12.5 to 14.0 m		1	20	72	7												

<sup>(1)</sup> SPT is outside NABL scope.








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Location : 5\*hotel - 09  
UTM Coordinates : 700274 E, 3160168 N

### Soil Profile (BH-129)

Termination Depth : 30.45 m (RL 183.037 m) Boring Method : Shell & Auger  
Ground Water Depth : 21.20 m Casing Depth : -  
Surface Elevation : RL 213.49 m Boring Start : 10-Jun-17  
Ground Water Level : RL 192.3 m Boring Finish : 11-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5	32	21		Hard to very stiff brown sandy silt, low plastic (CL)						23.9	15.1	8.8	1.83	1.61	13.5						
15.50	15.95	SPT7																					
17.00	17.30	UDS6	36	22		- had, 14.0 to 22.0 m									1.88	1.63	15.5						
18.50	18.95	SPT8																					
20.00	20.30	UDS7	29	16		- with traces of gravel,18.5 to 22.0 m		2	24	56	18				1.88	1.63	15.3						
22.00	22.45	SPT9																					
24.00	24.30	DS3	38	17		- very stiff, 22.0 to 26.0 m																	
26.00	26.45	SPT10																					
28.00	28.30	DS4	38	17		- hard, 26.0 to 30.4 m																	
30.00	30.45	SPT11																					
							30.45																
																							

<sup>(1)</sup> SPT is outside NABL scope.

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Location : 5\*hotel - 09  
UTM Coordinates : 700306 E, 3160125 N

### Soil Profile (BH-130)

Termination Depth : 30.45 m (RL 182.937 m) Boring Method : Shell & Auger  
Ground Water Depth : 21.15 m Casing Depth : -  
Surface Elevation : RL 213.39 m Boring Start : 12-Jun-17  
Ground Water Level : RL 192.2 m Boring Finish : 13-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	10	16		- stiff, 0.0 to 3.0 m																	9
2.00	2.30	UDS1				- with traces of gravel, 3.0 to 4.0 m									1.75	1.53	14.2						20
3.00	3.45	SPT2	19	23		- very stiff, 3.0 to 7.0 m		3	43	49	5												15
4.00	4.30	UDS2													1.85	1.63	13.5						17
5.00	5.45	SPT3	21	22								26.9	20.1	6.8									
6.00	6.30	UDS3													1.83	1.59	14.9		DS	0.5, 1, 1.5	0.0	30.1	
7.00	7.45	SPT4	31	29		- hard, 7.0 to 9.5 m												2.59					
8.00	8.30	UDS4				- with gravel, 8.0 to 9.5 m		7	26	61	6				1.84	1.59	15.5						
9.50	9.95	SPT5	29	24		- very stiff, 9.5 to 12.5 m																	
11.00	11.30	DS2																					
12.50	12.95	SPT6	33	24		- hard, 12.5 to 14.0 m																	

<sup>(1)</sup> SPT is outside NABL scope.


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Location : 5\*hotel - 09  
UTM Coordinates : 700306 E, 3160125 N

### Soil Profile (BH-130)

Termination Depth : 30.45 m (RL 182.937 m) Boring Method : Shell & Auger  
Ground Water Depth : 21.15 m Casing Depth : -  
Surface Elevation : RL 213.39 m Boring Start : 12-Jun-17  
Ground Water Level : RL 192.2 m Boring Finish : 13-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5	38	25		Hard brown sandy silt, low plastic (CL)  - with traces of gravel, 14.0 to 15.5 m		3	36	56	5				1.84	1.58	16.7						
15.50	15.95	SPT7																					
17.00	17.30	DS3																					
18.50	18.95	SPT8																					
20.00	20.30	UDS6						0	48	47	5				1.93	1.70	13.5						
22.00	22.45	SPT9						40	19														
24.00	24.30	UDS7												1.88	1.57	20.1							
26.00	26.45	SPT10						50	21														
28.00	28.30	DS4																					
30.00	30.45	SPT11	40	17		30.45																	

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (BH-131R)

Location : - Termination Depth : 30.45 m (RL 182.05 m) Boring Method : Rotary Drilling  
UTM Coordinates : 699797 E, 3160112 N Ground Water Depth : 19.80 m Casing Depth : -  
Surface Elevation : RL 212.50 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.7 m Boring Finish : 16-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Very stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	8	12		- stiff, 0.0 to 5.0 m																	7
2.00	2.30	UDS1													1.75	1.53	14.7						9
3.00	3.45	SPT2	11	13																			8
4.00	4.30	UDS2				- with teases of gravel, 4.0 to 5.0 m		3	34	60	3				1.82	1.58	15.4		DS	0.5, 1, 1.5	0.0	30.2	15
5.00	5.45	SPT3	15	16		- very stiff, 5.0 to 14.0 m						26.5	20.5	6.0									
6.00	6.30	DS2																					
7.00	7.45	SPT4	18	17																			
8.00	8.30	UDS3													1.84	1.61	14.5						
9.50	9.95	SPT5	21	17		- with gravel, 9.5 to 12.5 m		6	31	60	3												
11.00	11.30	DS3										32.5	18.5	14.0									
12.50	12.95	SPT6	25	18																			

<sup>(1)</sup> SPT is outside NABL scope.

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Location : -  
UTM Coordinates : 699797 E, 3160112 N

### Soil Profile (BH-131R)

Termination Depth : 30.45 m (RL 182.05 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.80 m Casing Depth : -  
Surface Elevation : RL 212.50 m Boring Start : 14-Jun-17  
Ground Water Level : RL 192.7 m Boring Finish : 16-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS4				Hard brown sandy silt, low plastic (CL)									1.84	1.60	14.8	2.69					
15.50	15.95	SPT7	30	20		- with gravel, 14.0 to 17.0 m		6	38	53	3												
17.00	17.30	UDS5										23.5	20.5	3.0	1.84	1.60	14.8						
18.50	18.95	SPT8	33	20																			
20.00	20.30	UDS6													1.93	1.62	19.1						
22.00	22.45	SPT9	38	18																			
24.00	24.30	UDS7													1.95	1.59	22.4						
26.00	26.45	SPT10	47	20		- with traces of gravel, 26.0 to 28.0 m		1	22	73	4												
28.00	28.30	DS4																					
30.00	30.45	SPT11	50	20			30.45																

<sup>(1)</sup> SPT is outside NABL scope.



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### Soil Profile (BH-132)

Location : 5\*hotel - 09

UTM Coordinates : 700252 E, 3160128 N

Termination Depth : 30.45 m (RL 183.161 m) Boring Method : Shell & Auger

Ground Water Depth : 20.97 m

Casing Depth : -

Surface Elevation : RL 213.61 m

Boring Start : 12-Jun-17

Ground Water Level : RL 192.6 m

Boring Finish : 13-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Firm to hard brown sandy silt, low plastic (CL)		0	47	48	5												
1.00	1.45	SPT1	4	6		- firm, 0.0 to 3.0 m						34.9	13.1	21.8									20
2.00	2.30	UDS1													1.77	1.56	13.7						11
3.00	3.45	SPT2	27	33		- very stiff, 3.0 to 9.5 m																	21
4.00	4.30	UDS2													1.82	1.59	14.5		DS	0.5, 1, 1.5	0.0	30.6	15
5.00	5.45	SPT3	25	26		- with traces of gravel, 5.0 to 11.0 m		4	18	71	7												
6.00	6.30	UDS3										35.0	13.1	21.8	1.80	1.60	12.5						
7.00	7.45	SPT4	22	20																			
8.00	8.30	UDS4													1.80	1.57	14.3	2.68					
9.50	9.95	SPT5	31	26		- hard, 9.5 to 12.5 m		1	31	62	6												
11.00	11.30	UDS5										26.0	15.1	10.8	1.86	1.61	15.7						
12.50	12.95	SPT6	21	15		- very stiff, 12.5 to 14.0 m																	

<sup>(1)</sup> SPT is outside NABL scope.


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Location : 5\*hotel - 09  
UTM Coordinates : 700252 E, 3160128 N

### Soil Profile (BH-132)

Termination Depth : 30.45 m (RL 183.161 m) Boring Method : Shell & Auger  
Ground Water Depth : 20.97 m Casing Depth : -  
Surface Elevation : RL 213.61 m Boring Start : 12-Jun-17  
Ground Water Level : RL 192.6 m Boring Finish : 13-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)						
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)							
14.00	14.30	UDS6	35	23		Hard brown sandy silt, low plastic (CL)		7	35	55	3				1.88	1.63	15.3												
15.50	15.95	SPT7																											
17.00	17.30	UDS7																											
18.50	18.95	SPT8				50									30	- with gravel, 18.5 to 20.0 m											1.84	1.62	13.4
20.00	20.30	DS2																											
22.00	22.45	SPT9				32									16														
24.00	24.30	UDS8																									1.92	1.56	23.1
26.00	26.45	SPT10				43									19														
28.00	28.30	DS3																											
30.00	30.45	SPT11				56									21		30.45												

<sup>(1)</sup> SPT is outside NABL scope.

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### Soil Profile (PBH-148R)

Location : - Termination Depth : 30.45 m (RL 182.55 m) Boring Method : Rotary Drilling  
UTM Coordinates : 699695 E, 3159561 N Ground Water Depth : 19.90 m Casing Depth : -  
Surface Elevation : RL 213.00 m Boring Start : 21-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 26-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	7	11		- stiff, 0.0 to 7.0 m																	7
2.00	2.30	UDS1													1.73	1.49	15.8						14
3.00	3.45	SPT2	9	11		- with traces of gravel, 3.0 to 4.0 m		3	40	51	6												5
4.00	4.30	UDS2										22.5	13.5	9.0	1.82	1.59	14.7						13
5.00	5.45	SPT3	13	13																			
6.00	6.30	UDS3													1.83	1.59	15.3						
7.00	7.45	SPT4	16	15		- very stiff, 7.0 to 14.0 m																	
8.00	8.30	UDS4						0	17	74	9				1.83	1.57	16.9		DS	0.5, 1, 1.5	0.0	29.4	
9.50	9.95	SPT5	19	16								32.5	13.5	19.0									
11.00	11.30	UDS5													1.80	1.54	16.7						
12.50	12.95	SPT6	29	21														2.62					

<sup>(1)</sup> SPT is outside NABL scope.

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Location : -  
UTM Coordinates : 699695 E, 3159561 N

### Soil Profile (PBH-148R)

Termination Depth : 30.45 m (RL 182.55 m) Boring Method : Rotary Drilling  
Ground Water Depth : 19.90 m Casing Depth : -  
Surface Elevation : RL 213.00 m Boring Start : 21-Jun-17  
Ground Water Level : RL 193.1 m Boring Finish : 26-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS6				Very stiff to hard brown sandy silt, low plastic (CL)		5	37	52	6				1.90	1.63	16.8						
15.50	15.95	SPT7	28	19		- very stiff, 14.0 to 18.5 m						32.5	20.6	12.0									
17.00	17.30	UDS7													1.83	1.62	13.3						
18.50	18.95	SPT8	31	19		- hard, 18.5 to 30.4 m																	
20.00	20.30	UDS8													1.94	1.64	18.3						
22.00	22.45	SPT9	32	17																			
24.00	24.30	DS2				- with traces of gravel, 24.0 to 26.0 m		2	26	65	7				1.96	1.61	21.6						
26.00	26.45	SPT10	40	18																			
28.00	28.30	UDS9													2.02	1.66	21.6						
30.00	30.45	SPT11	55	21			30.45																

<sup>(1)</sup> SPT is outside NABL scope.

ISO/IEC 17025:2005  
Certified Laboratory  
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Certificate No. T-1741



Location : -  
UTM Coordinates : 700204 E, 3160526 N

### Soil Profile (BH-160)

Termination Depth : 30.45 m (RL 182.54 m) Boring Method : Rotary Drilling  
Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 212.99 m Boring Start : 08-Jun-17  
Ground Water Level : RL 192.6 m Boring Finish : 10-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to hard brown sandy silt, low plastic (CL)		2	23	71	4												
1.00	1.45	SPT1	14	22		- stiff, 0.0 to 5.0 m						33.5	20.5	13.0									21
2.00	2.30	UDS1				- with traces of gravel, 0.0 to 6.0 m									1.81	1.59	14.1						20
3.00	3.45	SPT2	12	14																			9
4.00	4.30	UDS2													1.78	1.54	15.4						13
5.00	5.45	SPT3	27	28		- very stiff, 5.0 to 7.0 m		2	38	57	3												
6.00	6.30	UDS3										26.5	19.5	7.0	1.85	1.59	16.3		DS	0.5, 1, 1.5	0.0	30.4	
7.00	7.45	SPT4	33	31		- hard, 7.0 to 14.0 m																	
8.00	8.30	DS2																2.67					
9.50	9.95	SPT5	34	28		- with gravel, 9.5 to 11.0 m		5	21	70	4												
11.00	11.30	UDS4										30.5	20.5	10.0	1.83	1.56	17.3						
12.50	12.95	SPT6	38	28																			

<sup>(1)</sup> SPT is outside NABL scope.


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Certificate No. T-1741



Location : -  
UTM Coordinates : 700204 E, 3160526 N

### Soil Profile (BH-160)

Termination Depth : 30.45 m (RL 182.54 m) Boring Method : Rotary Drilling  
Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 212.99 m Boring Start : 08-Jun-17  
Ground Water Level : RL 192.6 m Boring Finish : 10-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
14.00	14.30	UDS5	36	24		Hard brown sandy silt, low plastic (CL)		5	23	68	4				1.87	1.62	15.3						
15.50	15.95	SPT7				Hard brown sandy silt, low plastic (CL)																	
17.00	17.30	UDS6				Hard brown sandy silt, low plastic (CL)																	
18.50	18.95	SPT8				- with gravel, 18.5 to 30.4 m																	
20.00	20.30	UDS7				- with gravel, 18.5 to 30.4 m																	
22.00	22.45	SPT9				- with gravel, 18.5 to 30.4 m																	
24.00	24.30	DS3				- with gravel, 18.5 to 30.4 m																	
26.00	26.45	SPT10				- with gravel, 18.5 to 30.4 m																	
28.00	28.30	DS4				- with gravel, 18.5 to 30.4 m																	
30.00	30.45	SPT11	47	19		30.45																	

<sup>(1)</sup> SPT is outside NABL scope.

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Certificate No. T-1741



Location : -  
UTM Coordinates : 699862 E, 3160660 N

### Soil Profile (BH-161)

Termination Depth : 30.45 m (RL 182.05 m) Boring Method : Rotary Drilling  
Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 212.50 m Boring Start : 06-Jun-17  
Ground Water Level : RL 192.1 m Boring Finish : 08-Jun-17

Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)	
0.00	0.50	DS1				Stiff to very stiff brown sandy silt, low plastic (CL)																	
1.00	1.45	SPT1	10	16		- stiff, 0.0 to 5.0 m		6	26	64	4												10
2.00	2.30	UDS1				- with gravel, 1.0 to 3.0 m						30.5	14.5	16.0	1.78	1.55	14.8						7
3.00	3.45	SPT2	12	14																			20
4.00	4.30	UDS2													1.79	1.54	16.1						11
5.00	5.45	SPT3	21	22		- very stiff, 5.0 to 14.0 m																	
6.00	6.30	UDS3				- with traces of gravel, 6.0 to 8.0 m		2	16	77	5				1.80	1.55	15.9						
7.00	7.45	SPT4	18	17								27.5	14.5	13.0									
8.00	8.30	UDS4													1.82	1.57	16.1						
9.50	9.95	SPT5	21	17														2.62					
11.00	11.30	UDS5				- with gravel, 11.0 to 12.5 m		6	14	75	5				1.84	1.59	15.6		DS	0.5, 1, 1.5	0.0	29.7	
12.50	12.95	SPT6	29	21								33.5	15.5	18.0									

<sup>(1)</sup> SPT is outside NABL scope.






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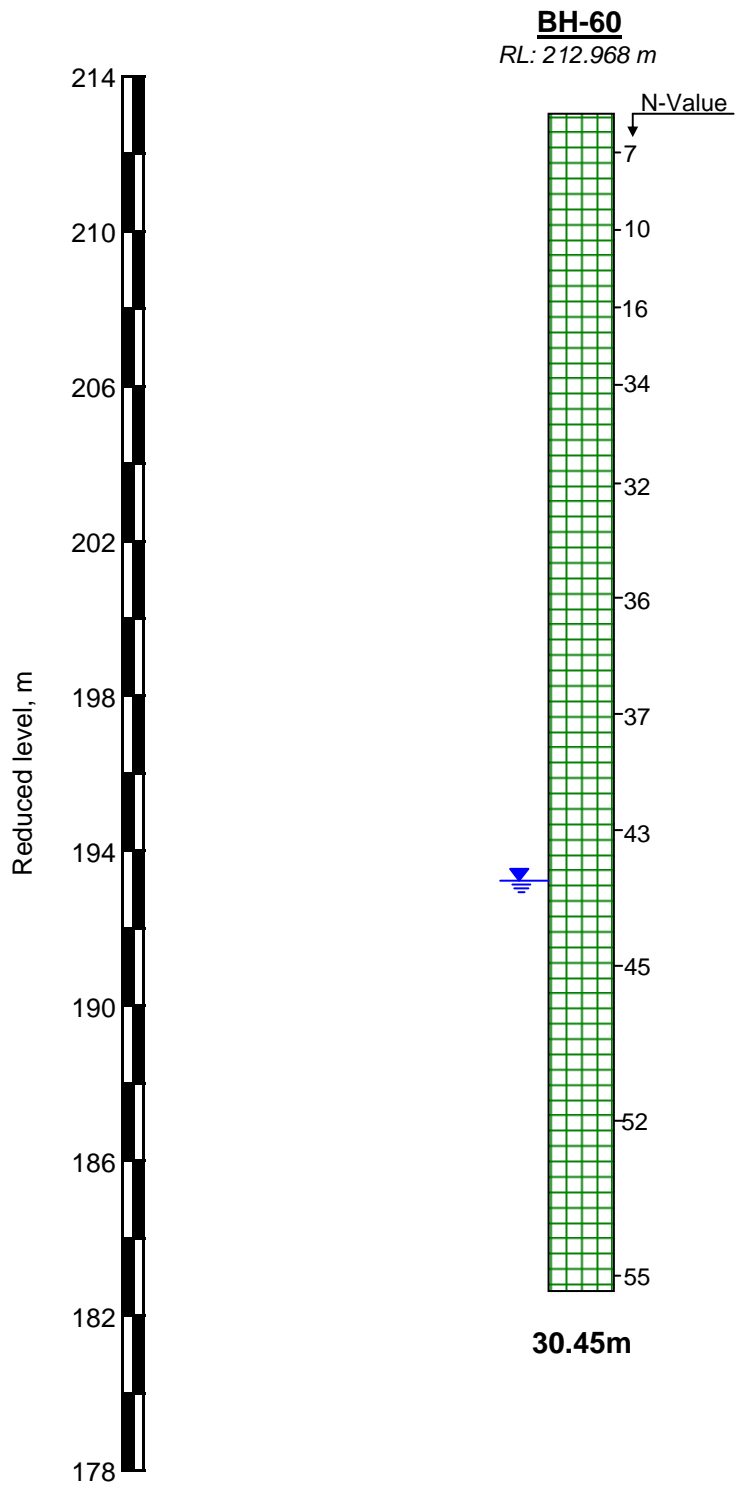
Location : -  
UTM Coordinates : 699862 E, 3160660 N

### Soil Profile (BH-161)

Termination Depth : 30.45 m (RL 182.05 m) Boring Method : Rotary Drilling  
Ground Water Depth : 20.40 m Casing Depth : -  
Surface Elevation : RL 212.50 m Boring Start : 06-Jun-17  
Ground Water Level : RL 192.1 m Boring Finish : 08-Jun-17

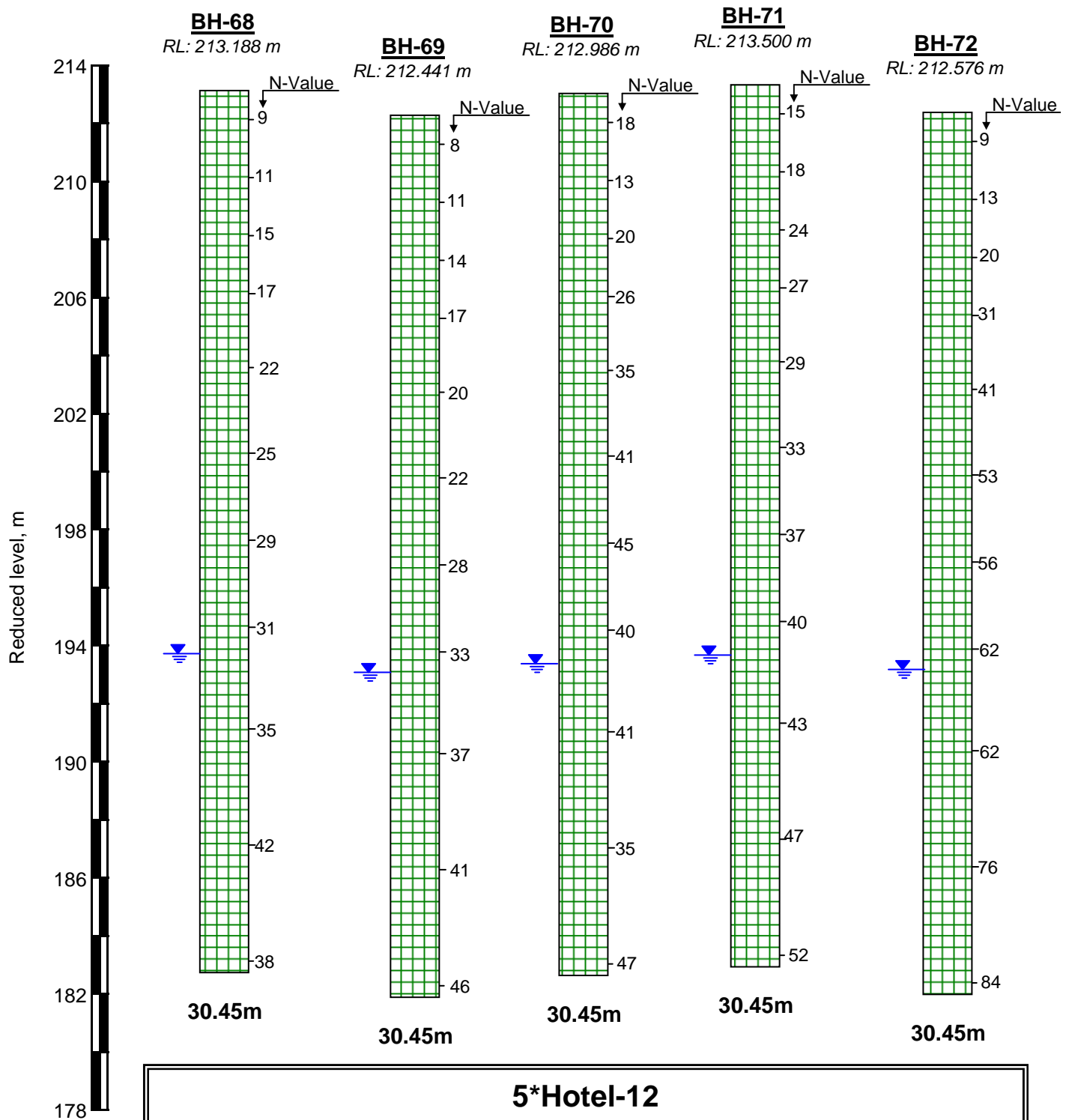
Depth, m		Sample No.	SPT <sup>(1)</sup>		Symbol	SOIL DESCRIPTION	Depth of Strata (m)	Grain Size Analysis				Atterberg Limits			Density and Moisture			Specific Gravity	Shear Tests				Free Swell Index, (%)												
From	To		Field Value, N <sub>f</sub>	Corrected Value, N <sub>c</sub>				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Plasticity Index (%)	Bulk Density (gms/cm <sup>3</sup> )	Dry Density (gms/cm <sup>3</sup> )	Moisture Content (%)		Type of Test	Confining Pressures (kg/cm <sup>2</sup> )	Cohesion Intercept, 'c' (kg/cm <sup>2</sup> )	Angle of Internal Friction, φ (degrees)													
14.00	14.30	UDS6	31	21		Hard brown sandy silt, low plastic (CL)	30.45	3	23	70	4				1.86	1.60	16.0																		
15.50	15.95	SPT7				DS2									1.86	1.60	16.0																		
17.00	17.30	DS2																																	
18.50	18.95	SPT8				35									21																				
20.00	20.30	UDS7	36	18		- with traces of gravel, 20.0 to 22.0 m									3	23	70						4				1.91	1.61	18.6						
22.00	22.45	SPT9																																	
24.00	24.30	DS3																																	
26.00	26.45	SPT10				70									26																				
28.00	28.30	UDS8	67	24																							2.01	1.63	23.5						
30.00	30.45	SPT11																																	

<sup>(1)</sup> SPT is outside NABL scope.



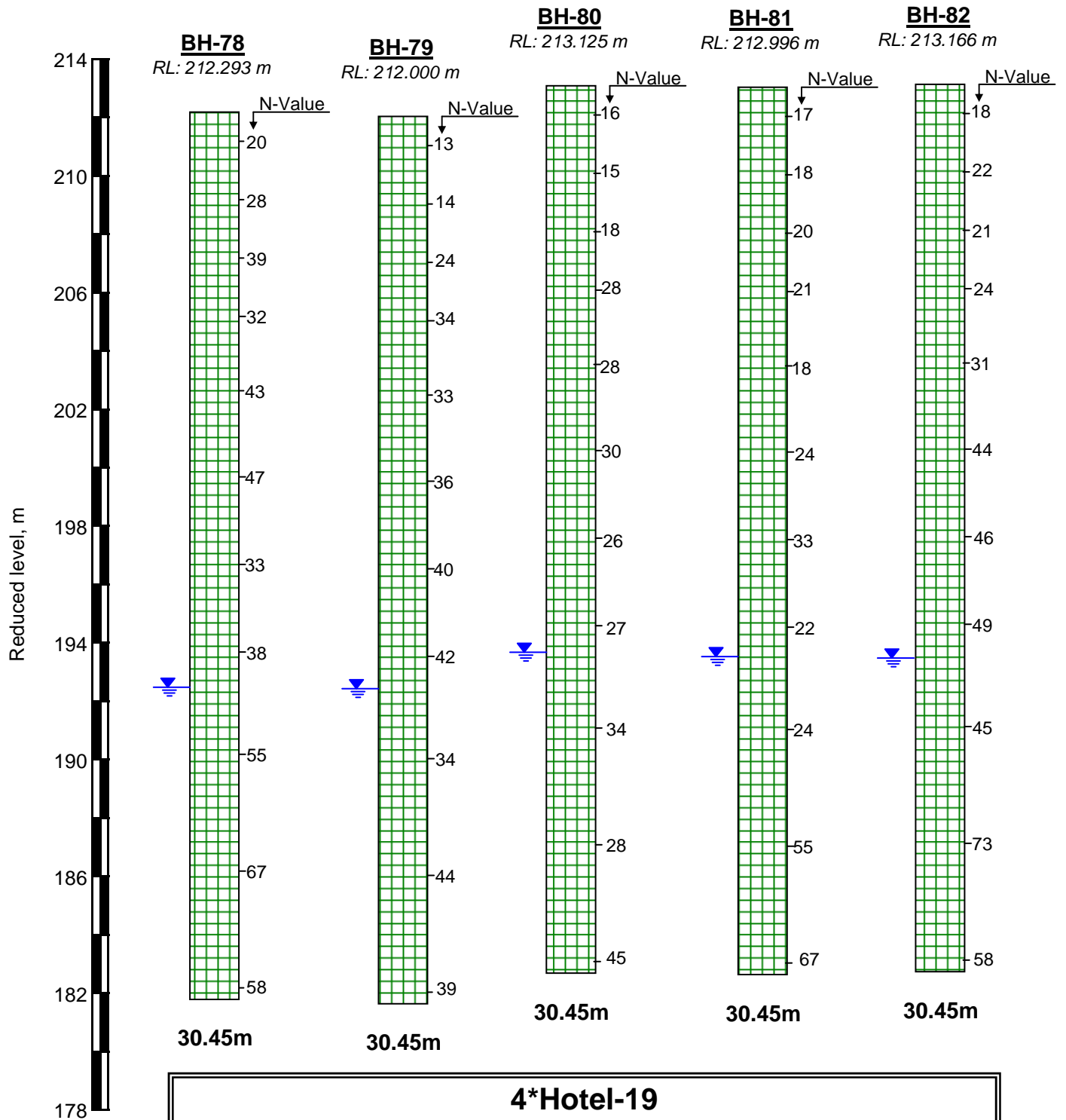
LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

### Summary of Borehole Profiles



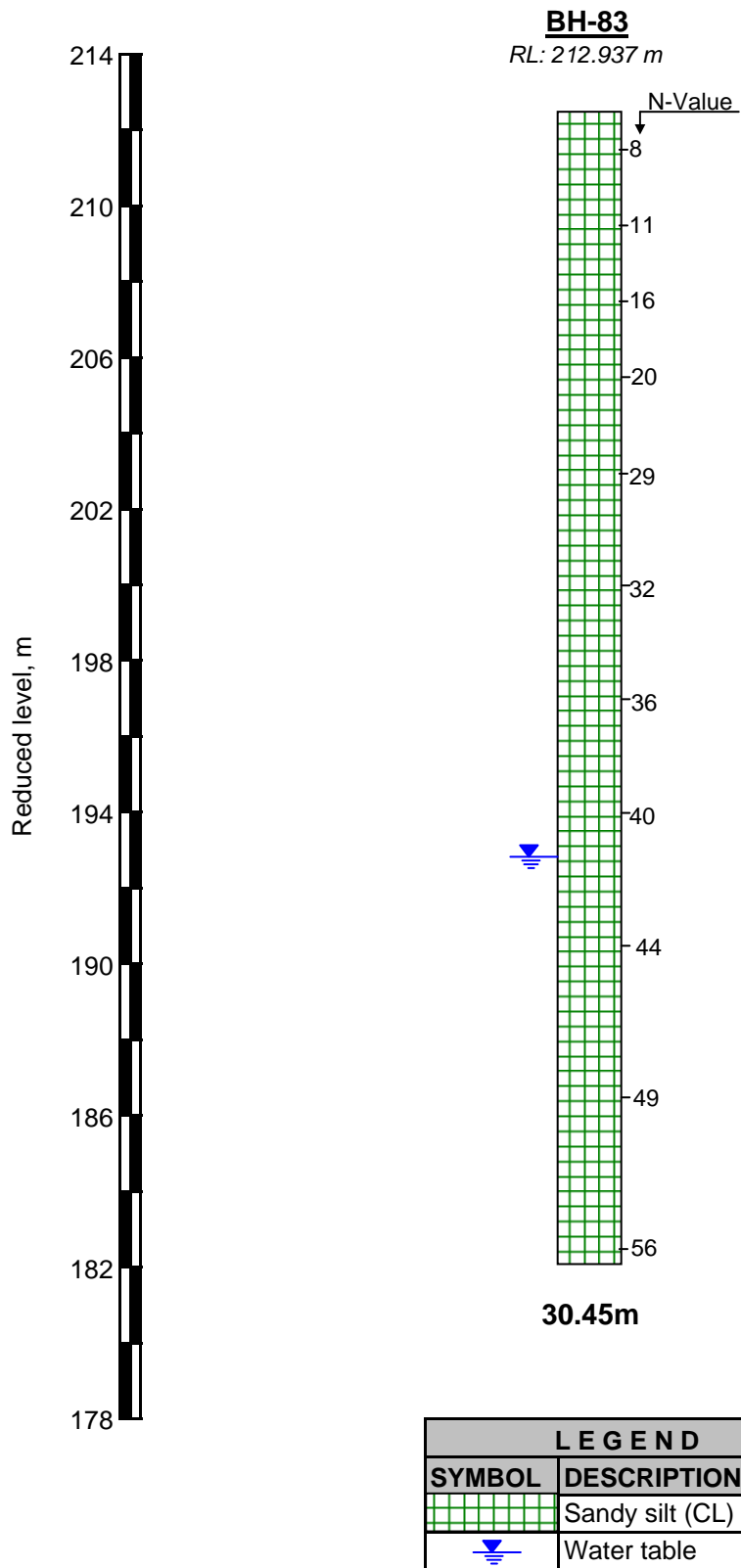
LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

Summary of Borehole Profiles

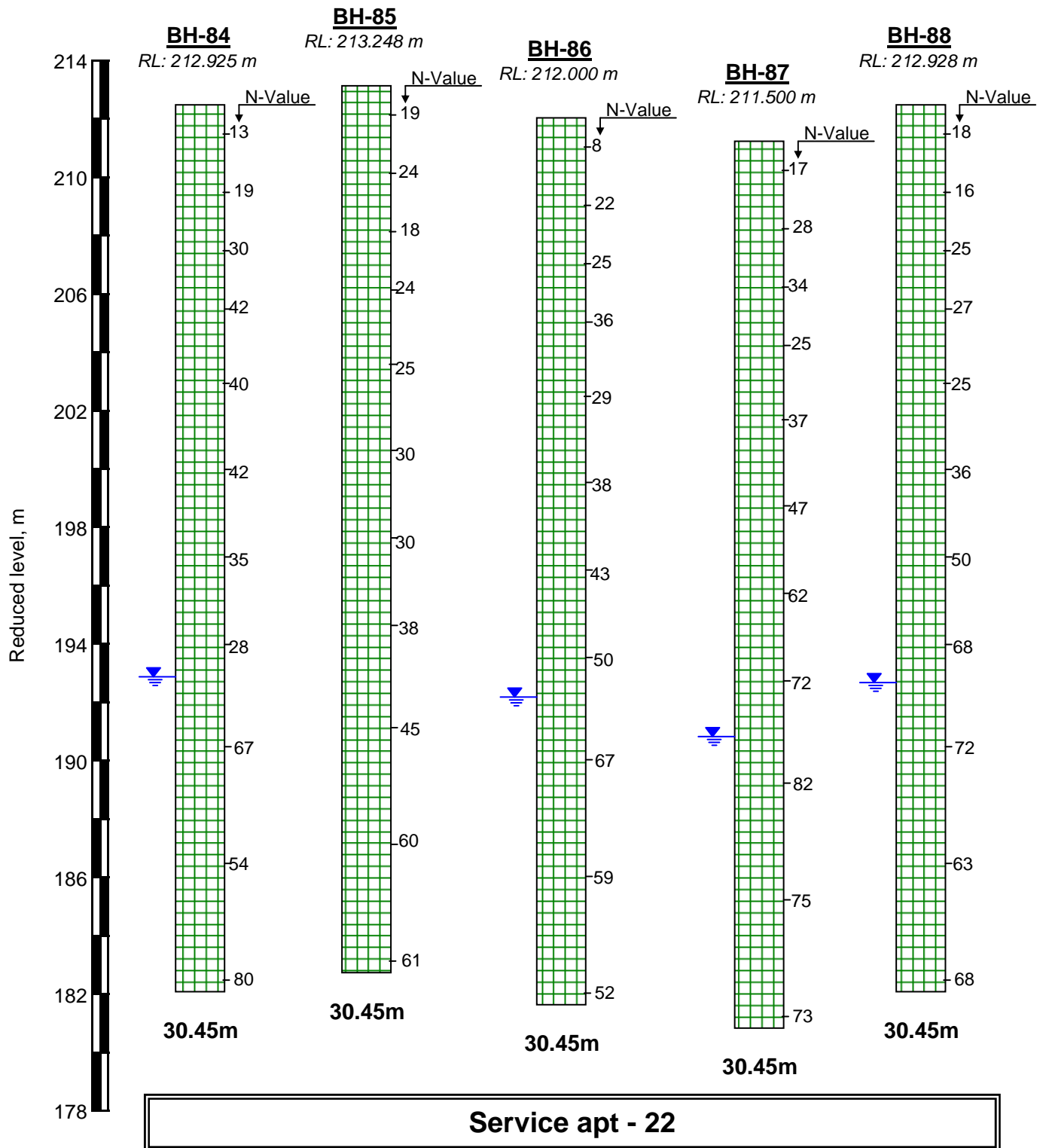


LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

Summary of Borehole Profiles

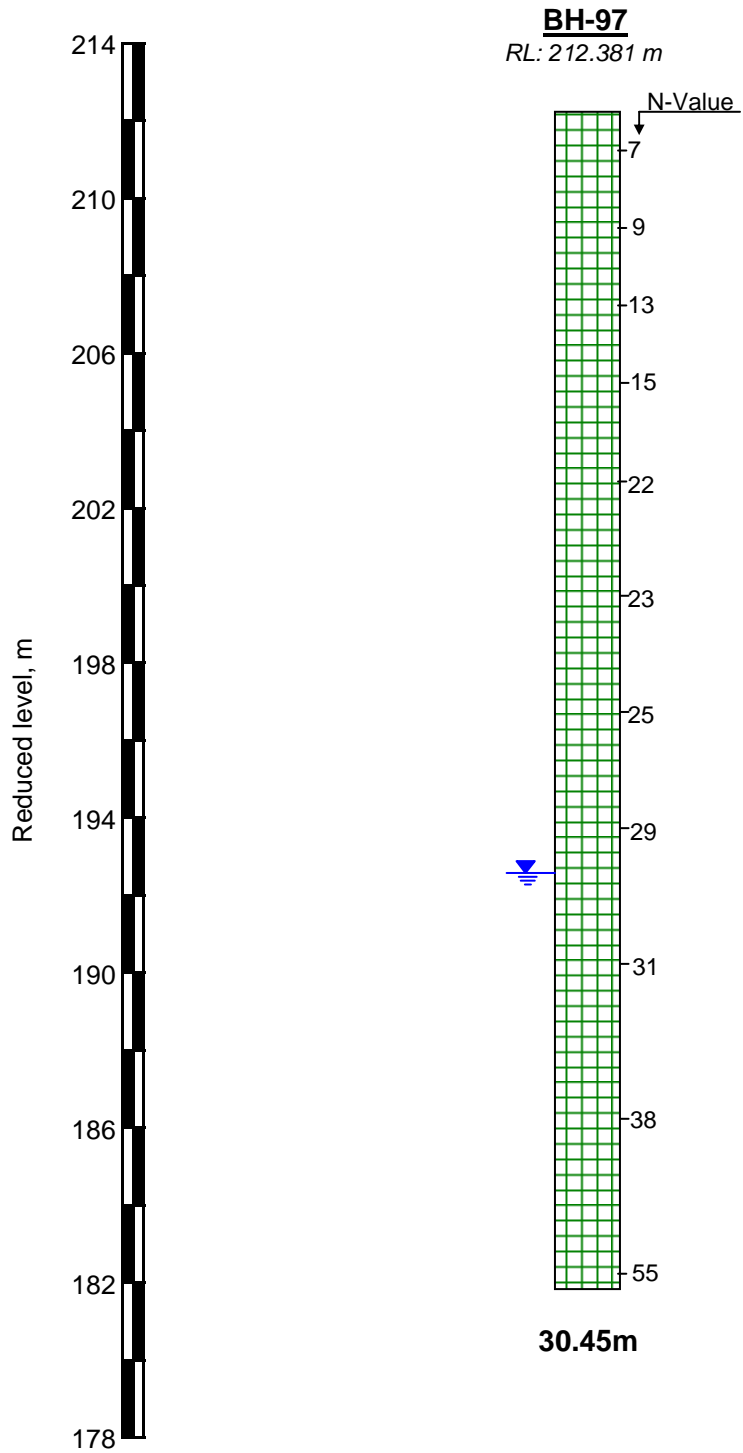


### Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

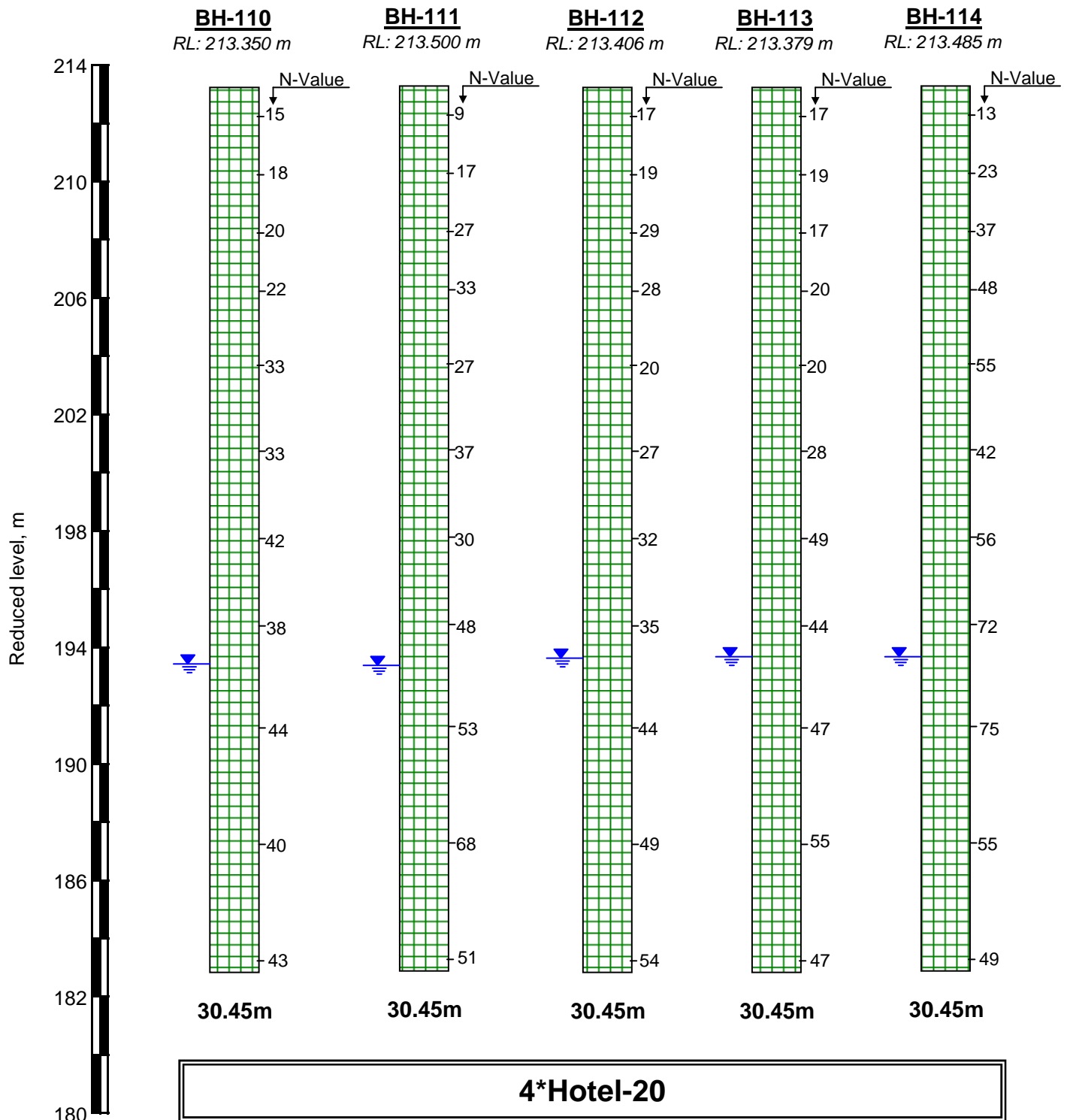
### Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

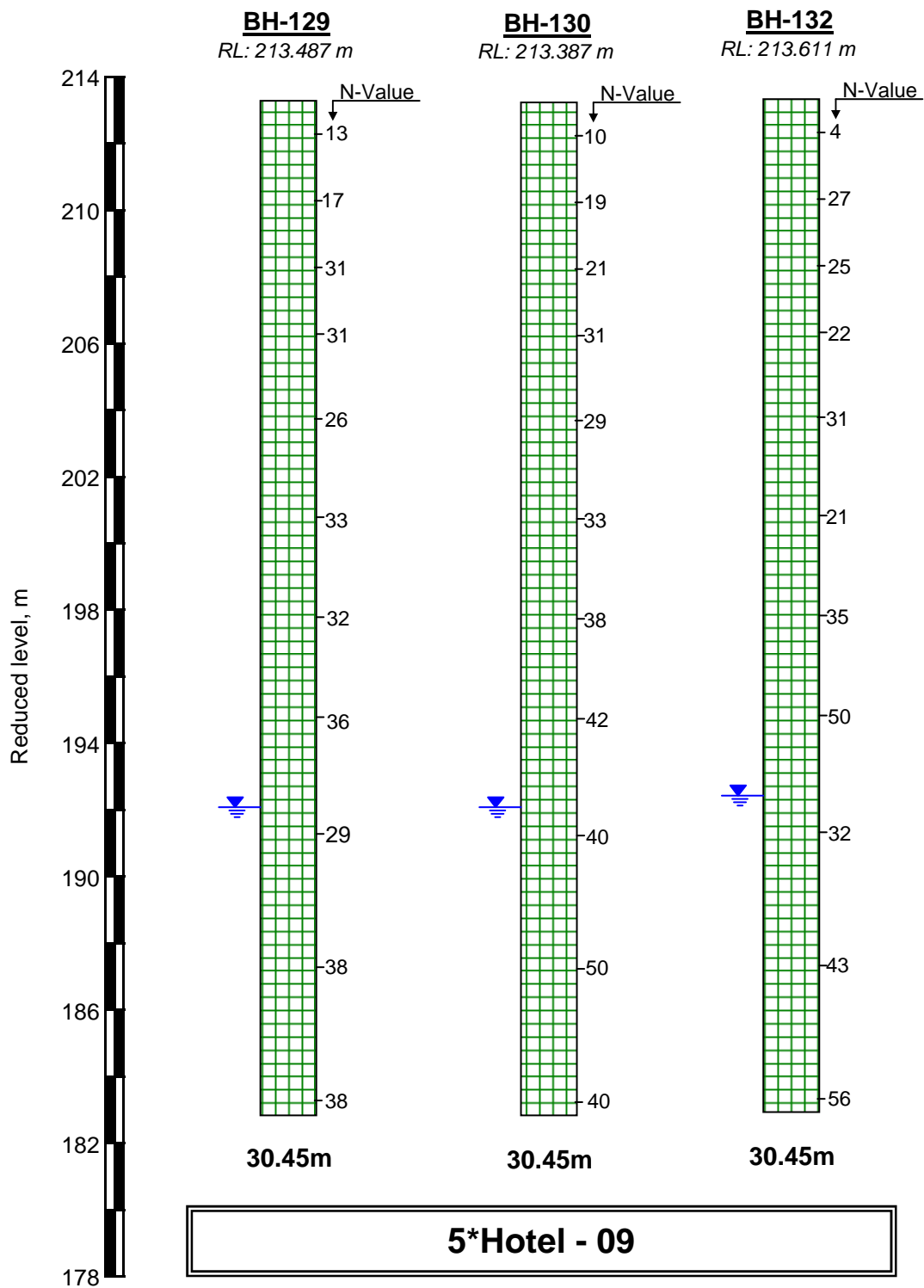
### Summary of Borehole Profiles





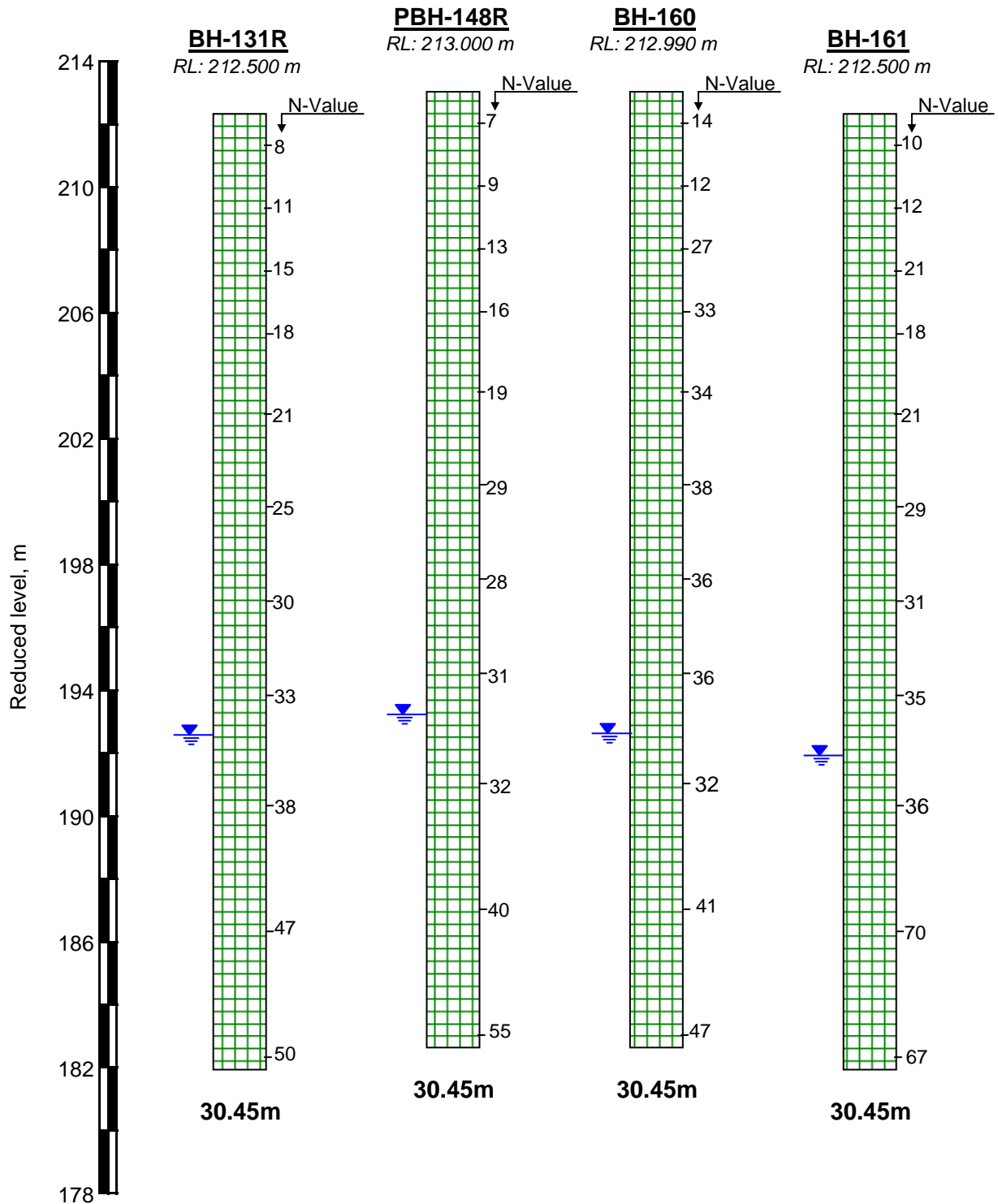
LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

### Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

Summary of Borehole Profiles




LEGEND	
SYMBOL	DESCRIPTION
	Sandy silt (CL)
	Water table

Summary of Borehole Profiles



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-60	212.968	-




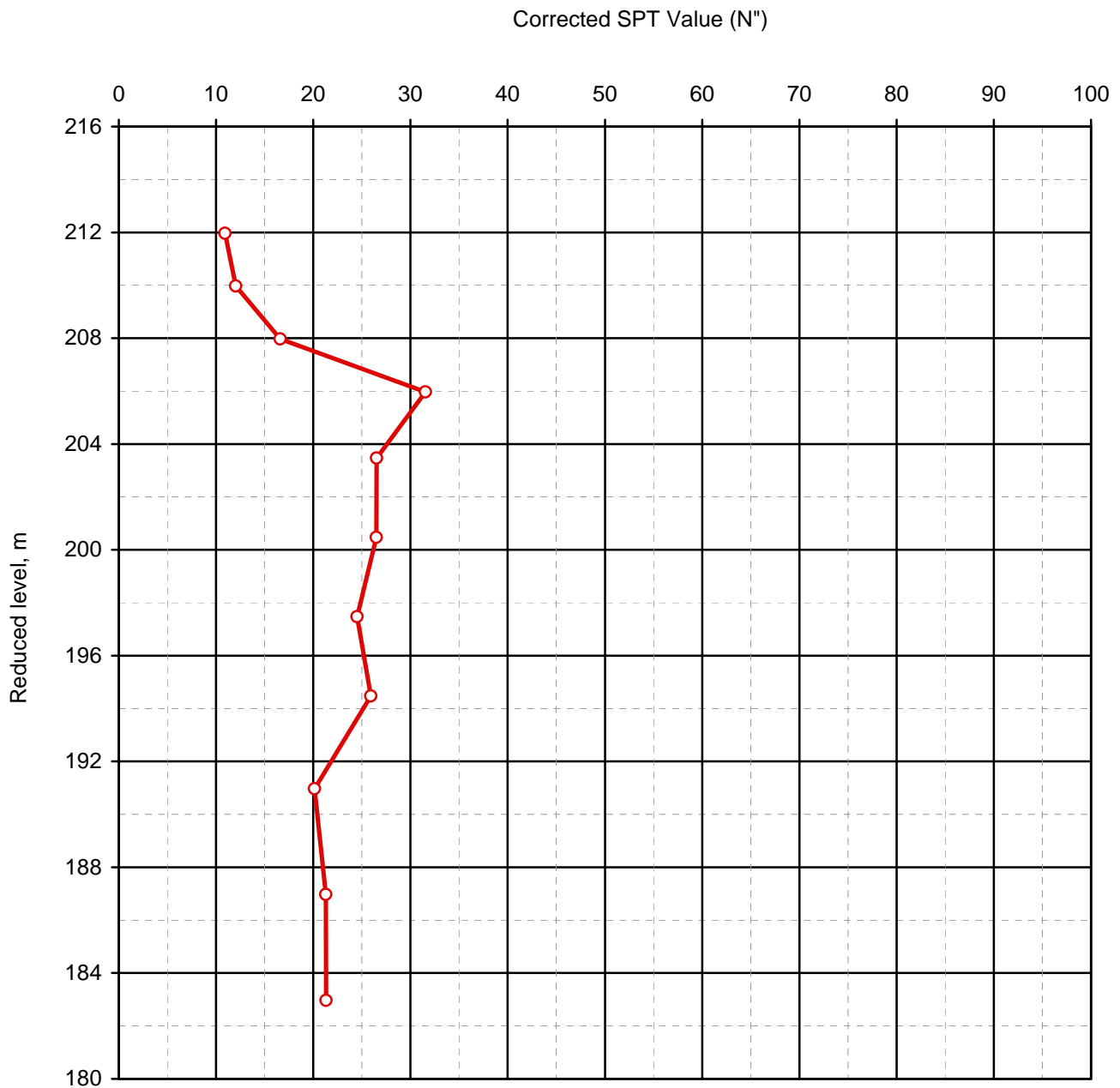
Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-60	212.968	-



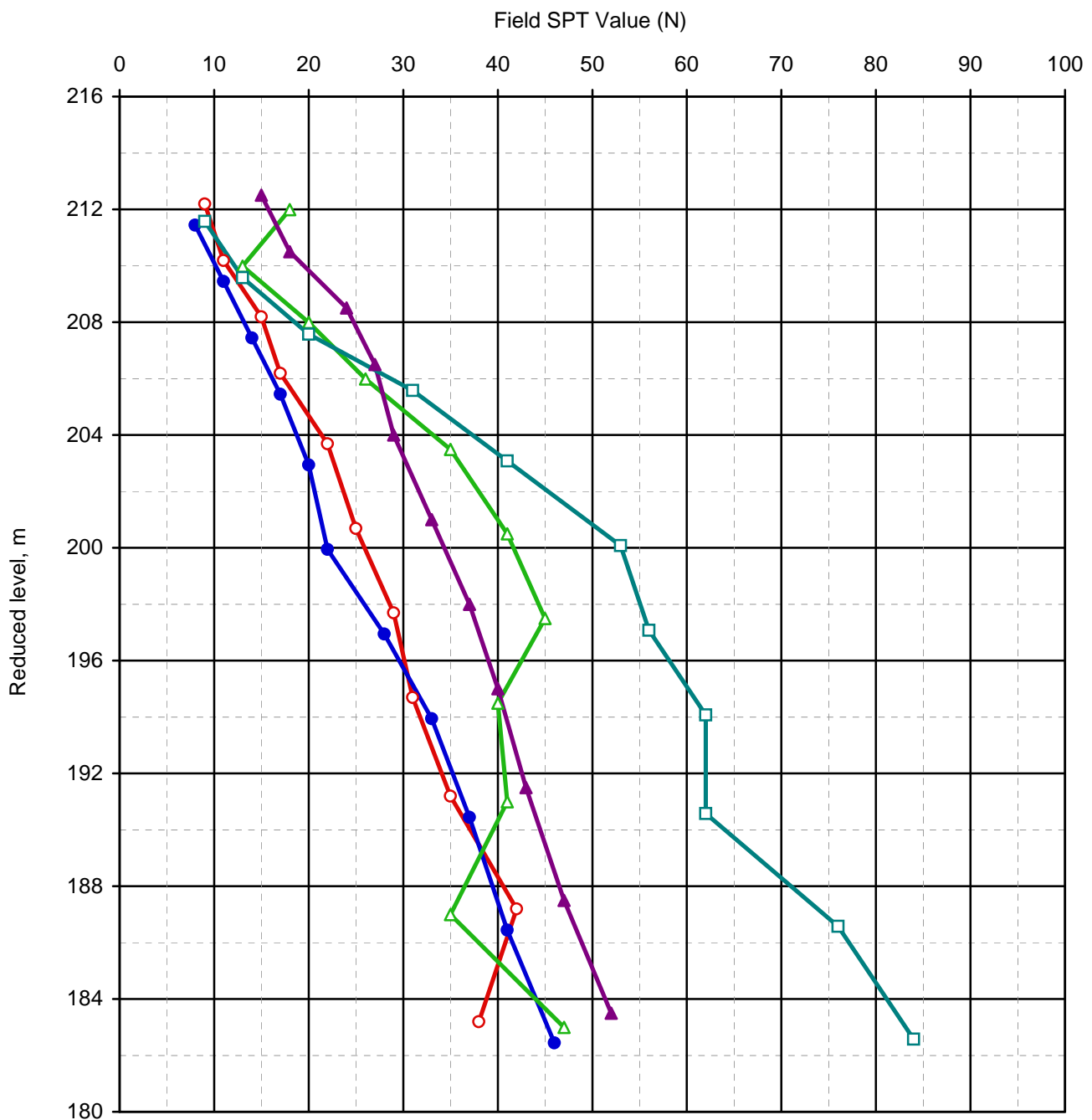
Corrected SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-68	213.188	5*hotel - 12
	BH-69	212.440	
	BH-70	212.990	
	BH-71	213.500	
	BH-72	212.576	



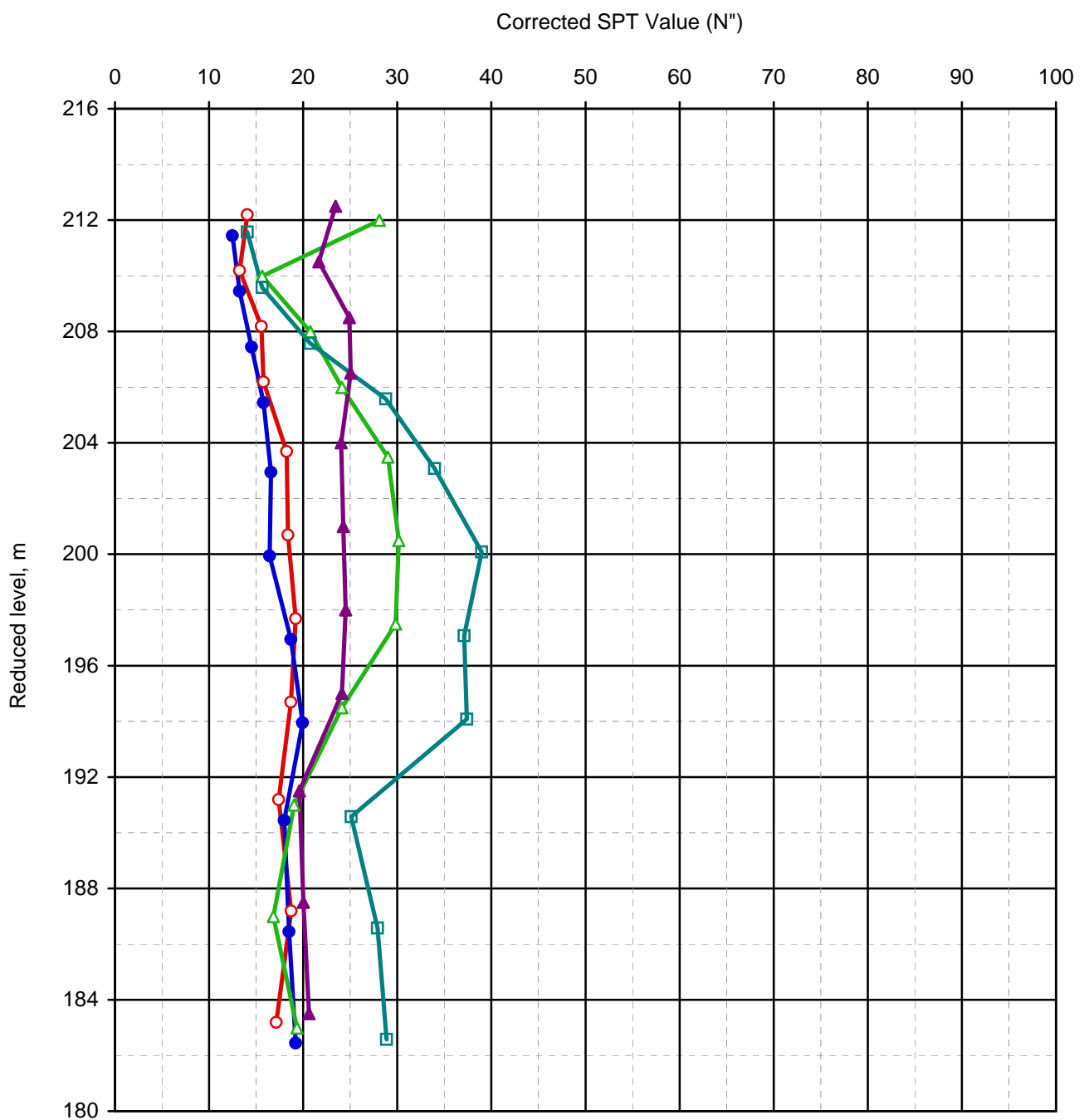
Field SPT Values vs. Reduced level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-68	213.188	5*hotel - 12
	BH-69	212.440	
	BH-70	212.990	
	BH-71	213.500	
	BH-72	212.576	



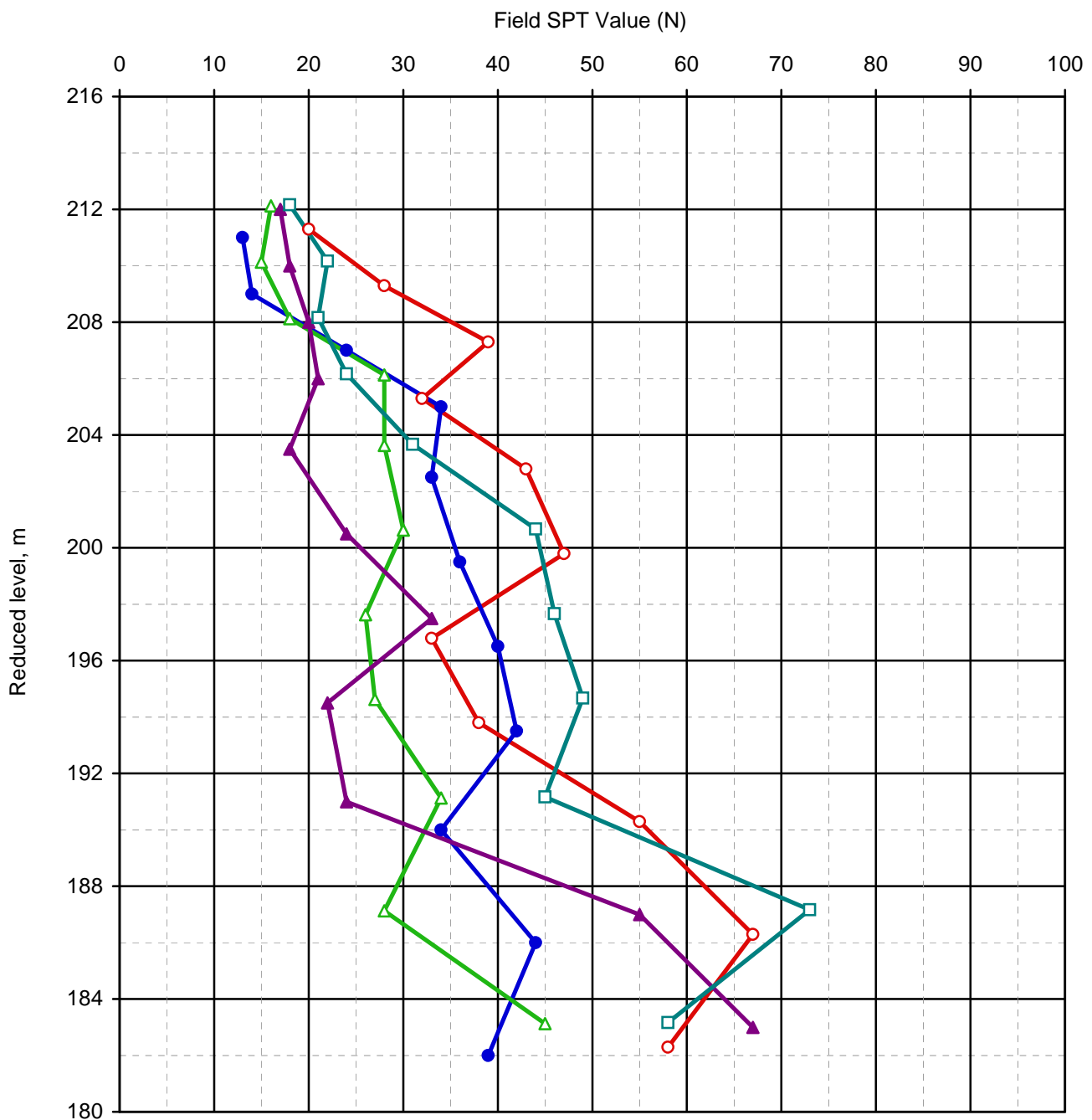




### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-78	212.293	4*hotel-19
	BH-79	212.000	
	BH-80	213.125	
	BH-81	212.996	
	BH-82	213.166	



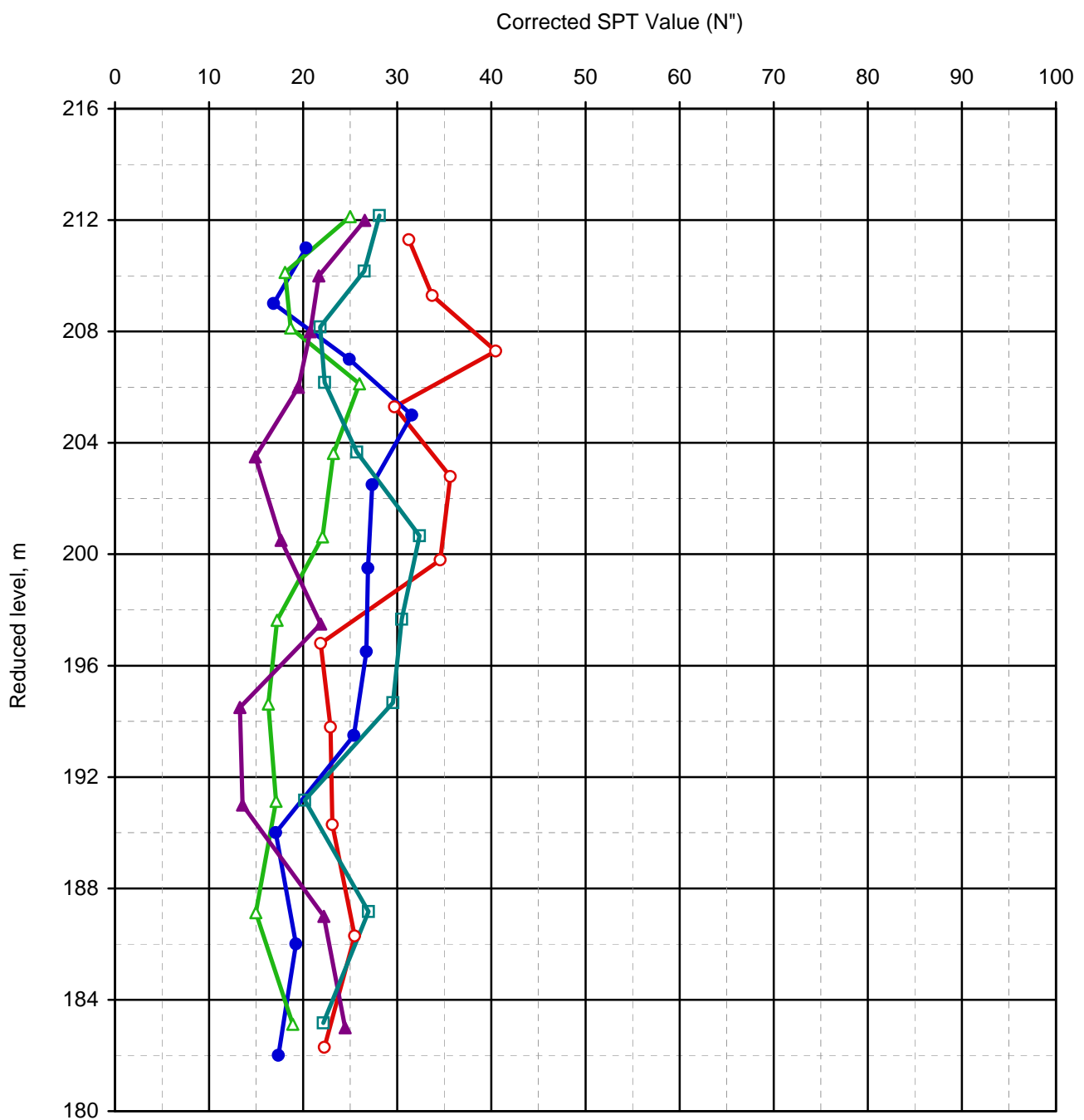
Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007


Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-78	212.293	4*hotel-19
	BH-79	212.000	
	BH-80	213.125	
	BH-81	212.996	
	BH-82	213.166	



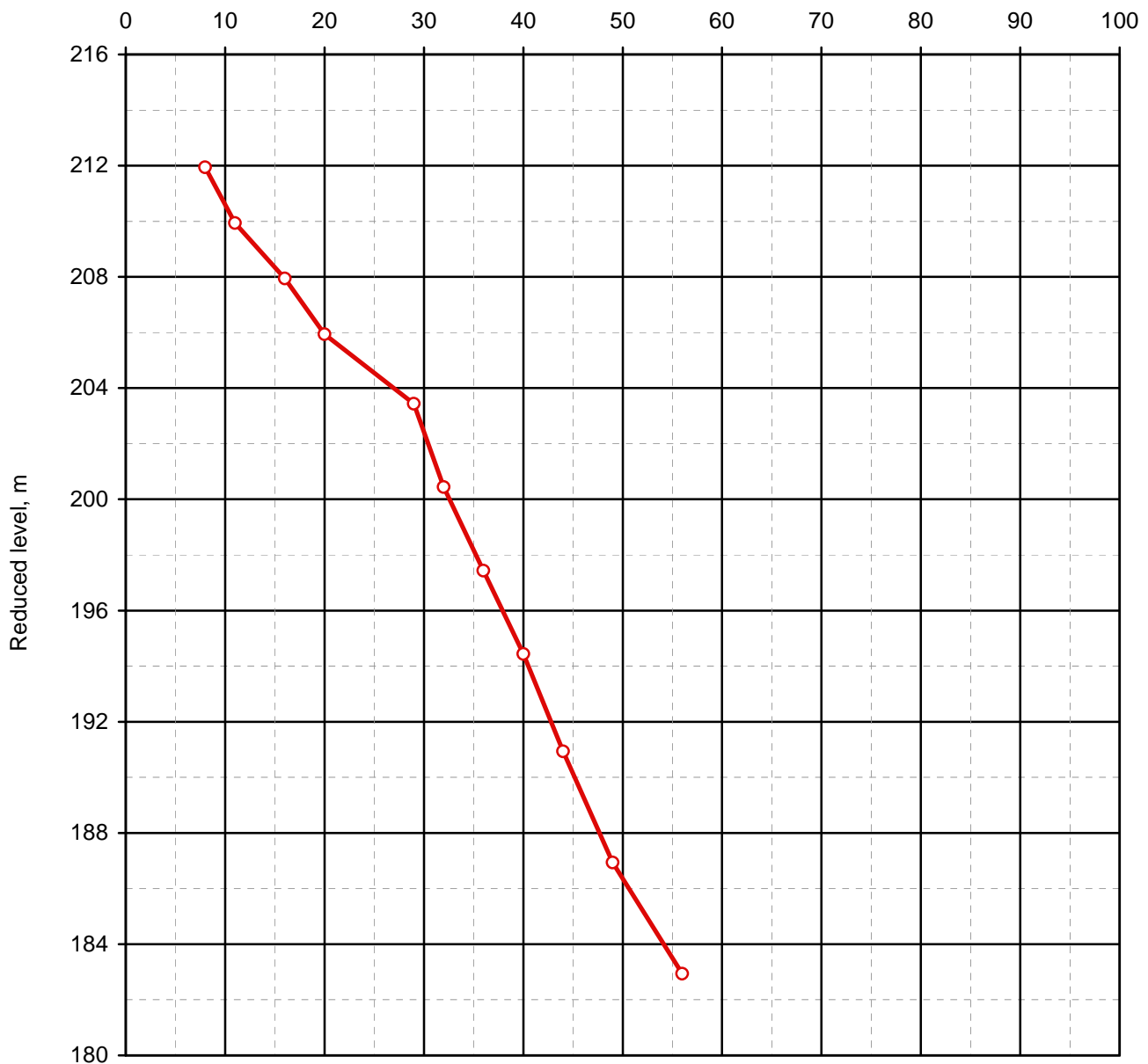


### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-83	212.937	-

Field SPT Value (N)




Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-83	212.937	-



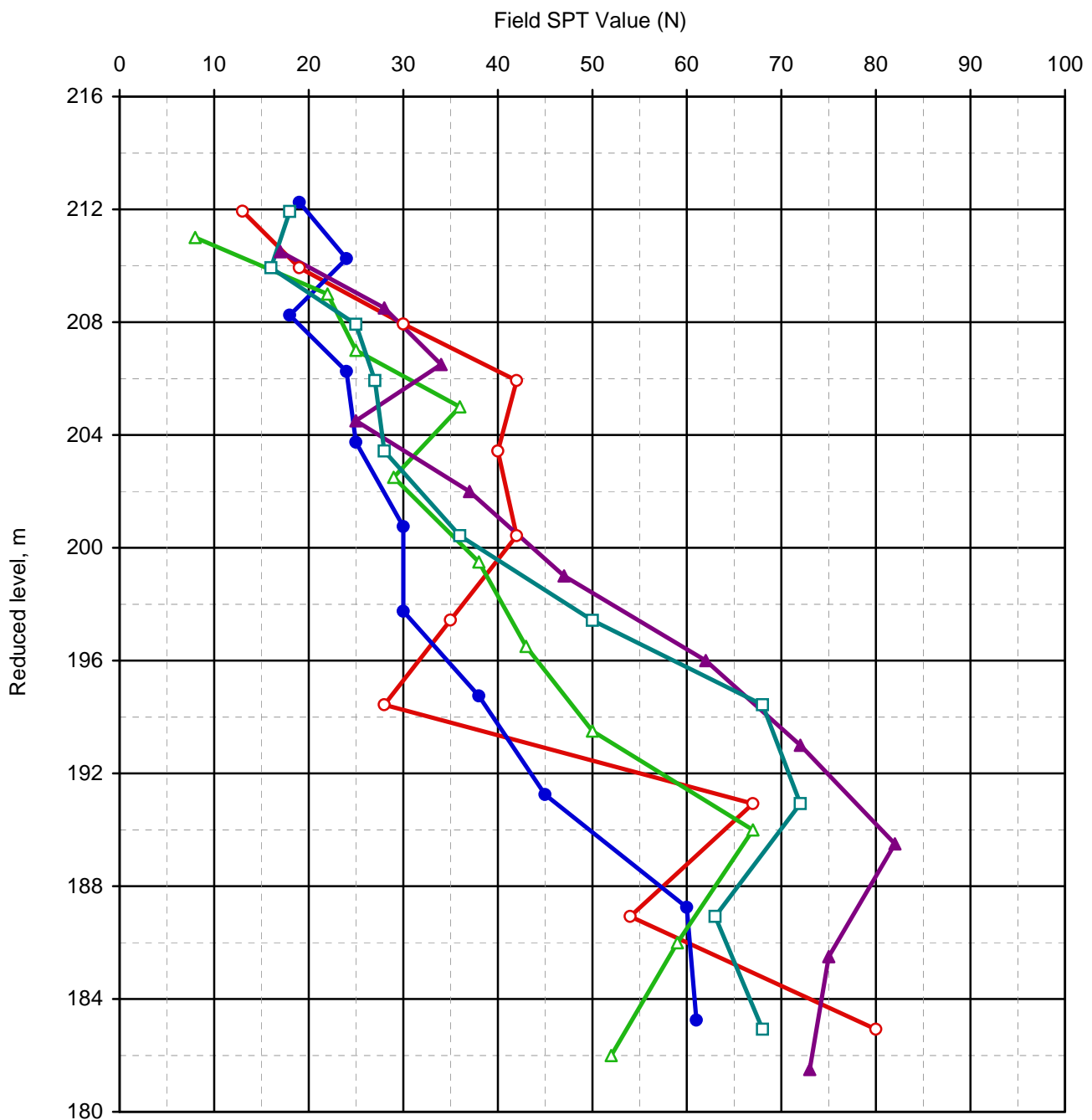
Corrected SPT Values vs. Reduced level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-84	212.930	Service apt-22
	BH-85	213.248	
	BH-86	212.000	
	BH-87	211.500	
	BH-88	212.928	



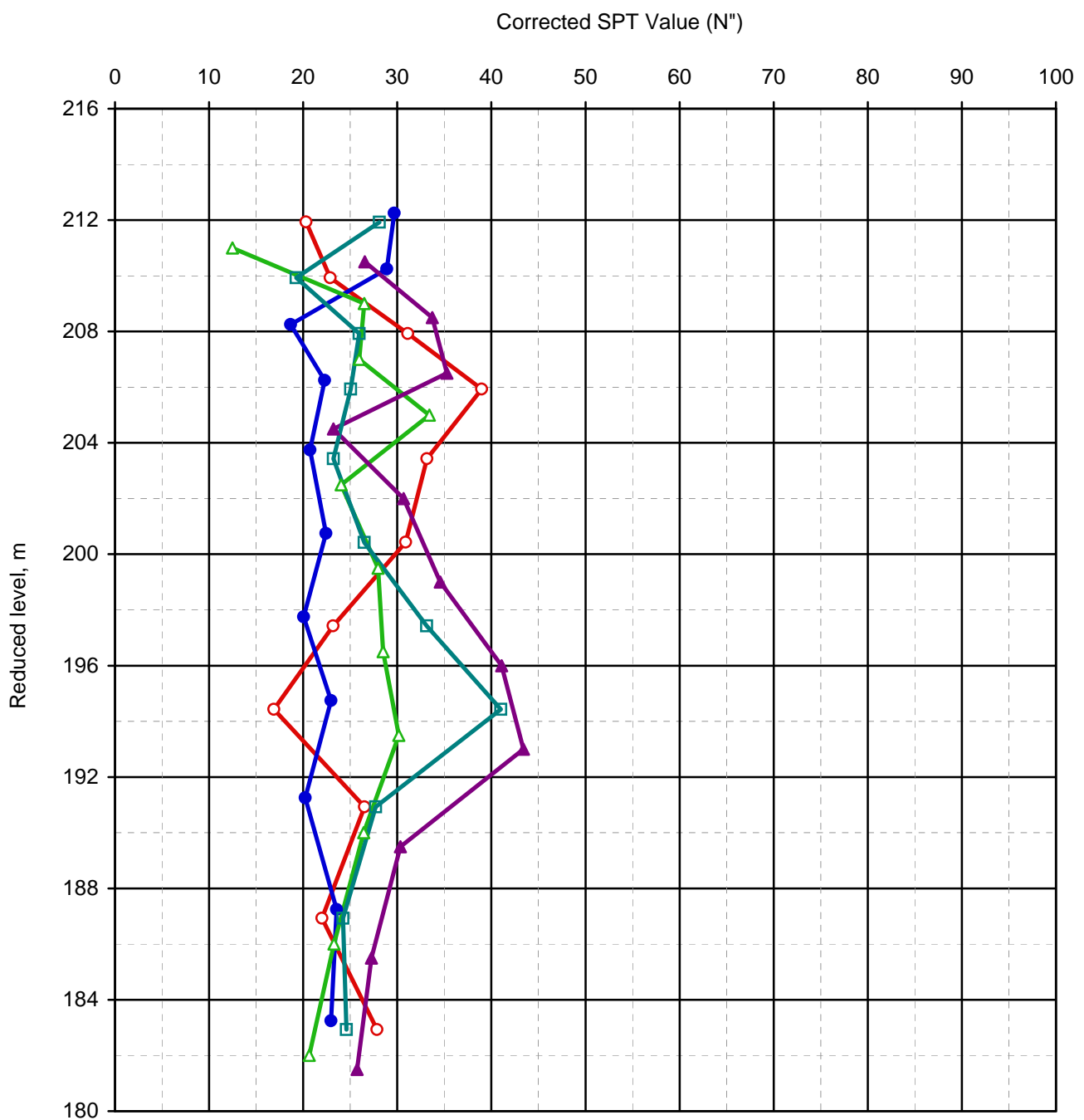
Field SPT Values vs. Reduced level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
○	BH-84	212.930	Service apt-22
●	BH-85	213.248	
△	BH-86	212.000	
▲	BH-87	211.500	
□	BH-88	212.928	




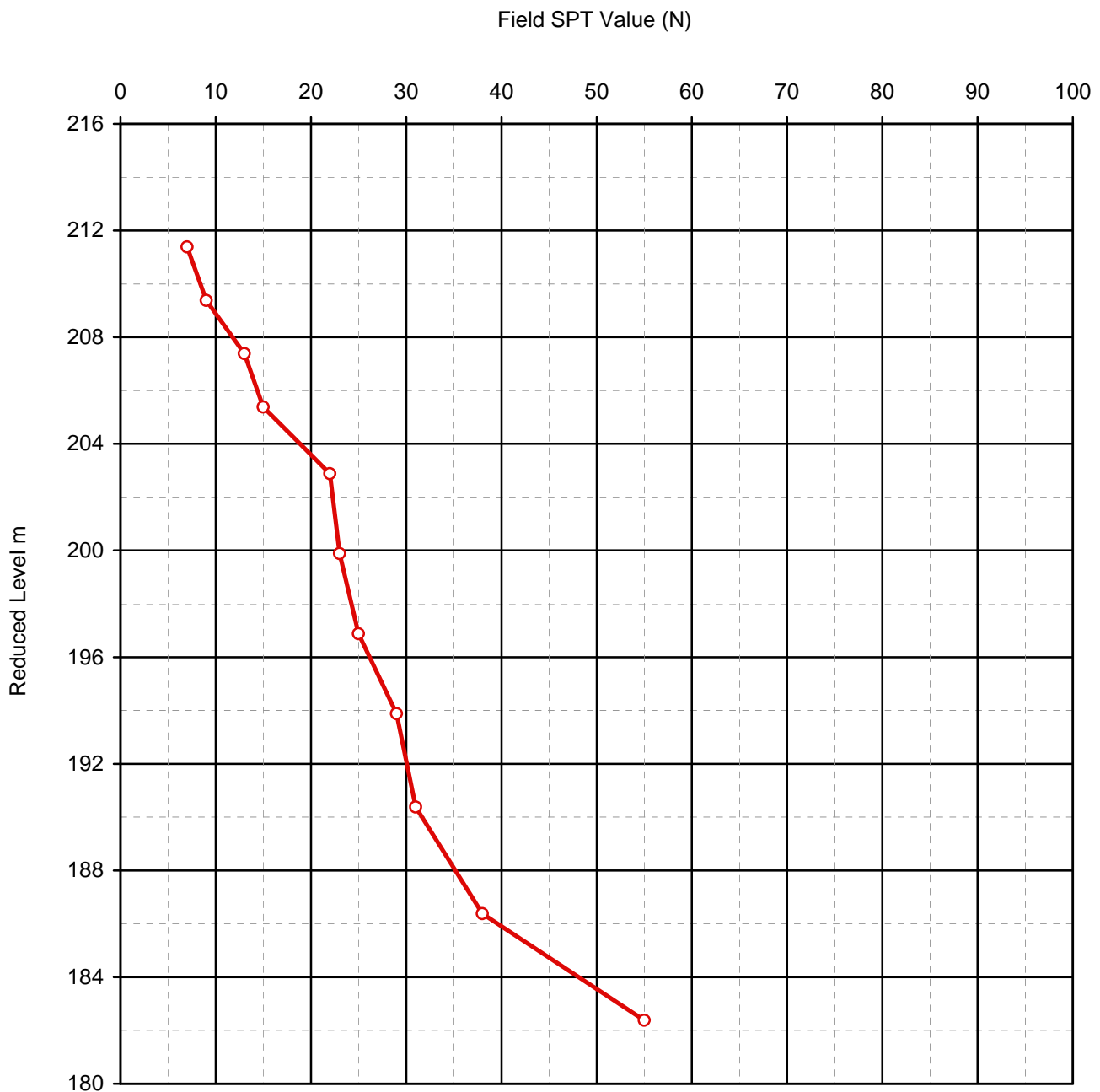
Corrected SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-97	212.381	-




Field SPT Values vs. Reduced Level

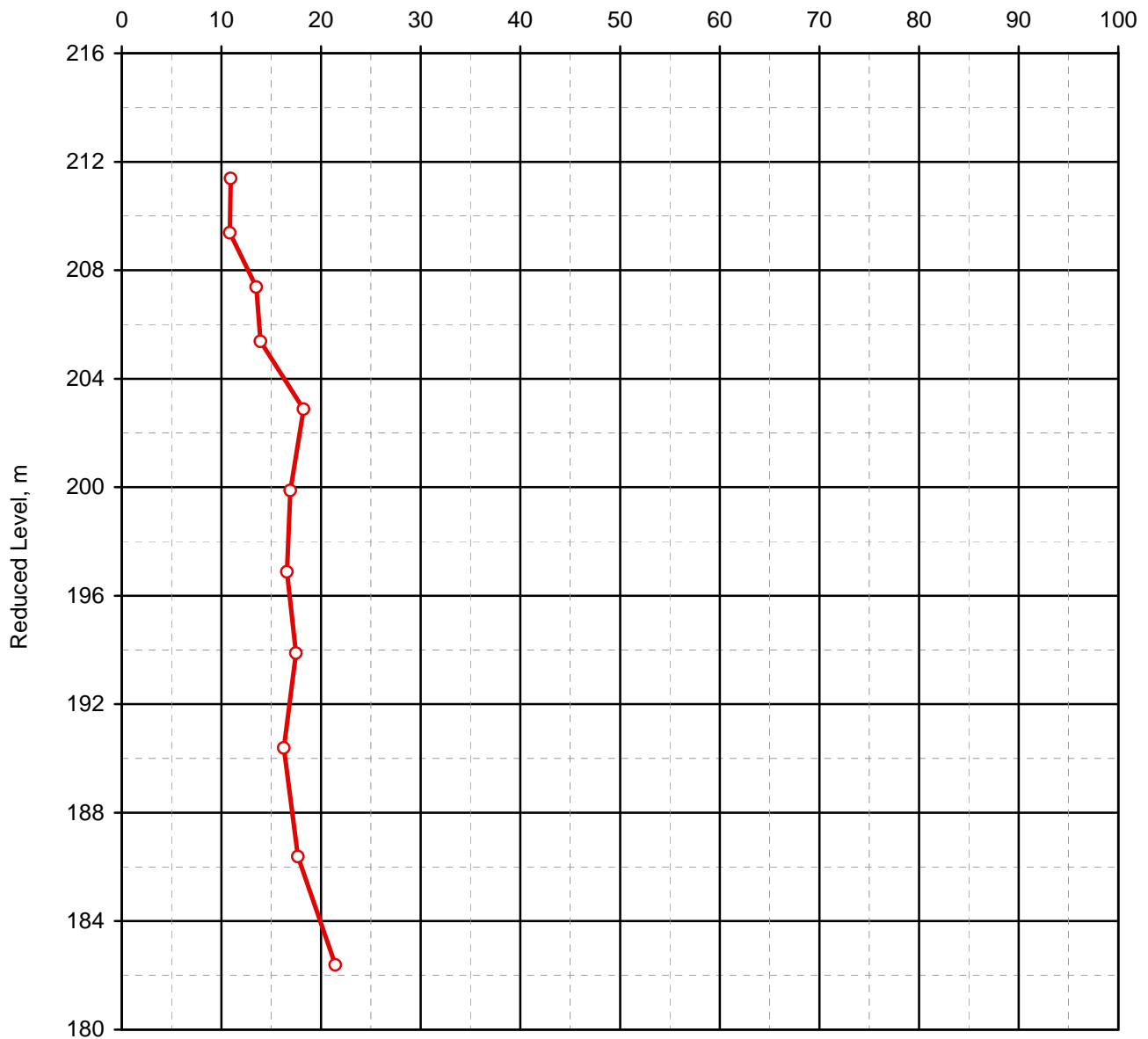


## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-97	212.381	-

Corrected SPT Value (N")



Corrected SPT Values vs. Reduced Level

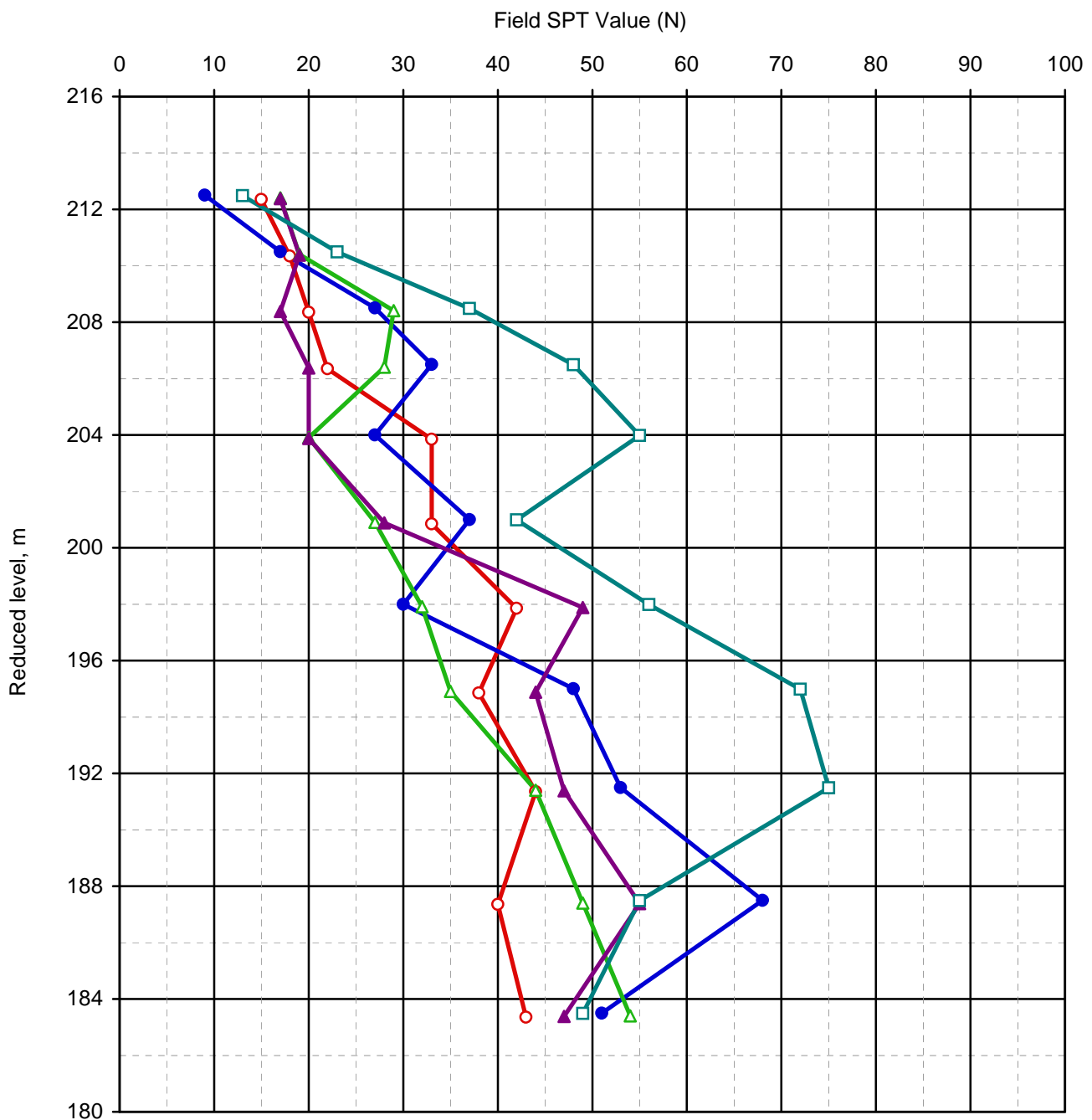




### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
○	BH-110	213.350	4*Hotel-20
●	BH-111	213.500	
△	BH-112	213.406	
▲	BH-113	213.379	
□	BH-114	213.485	



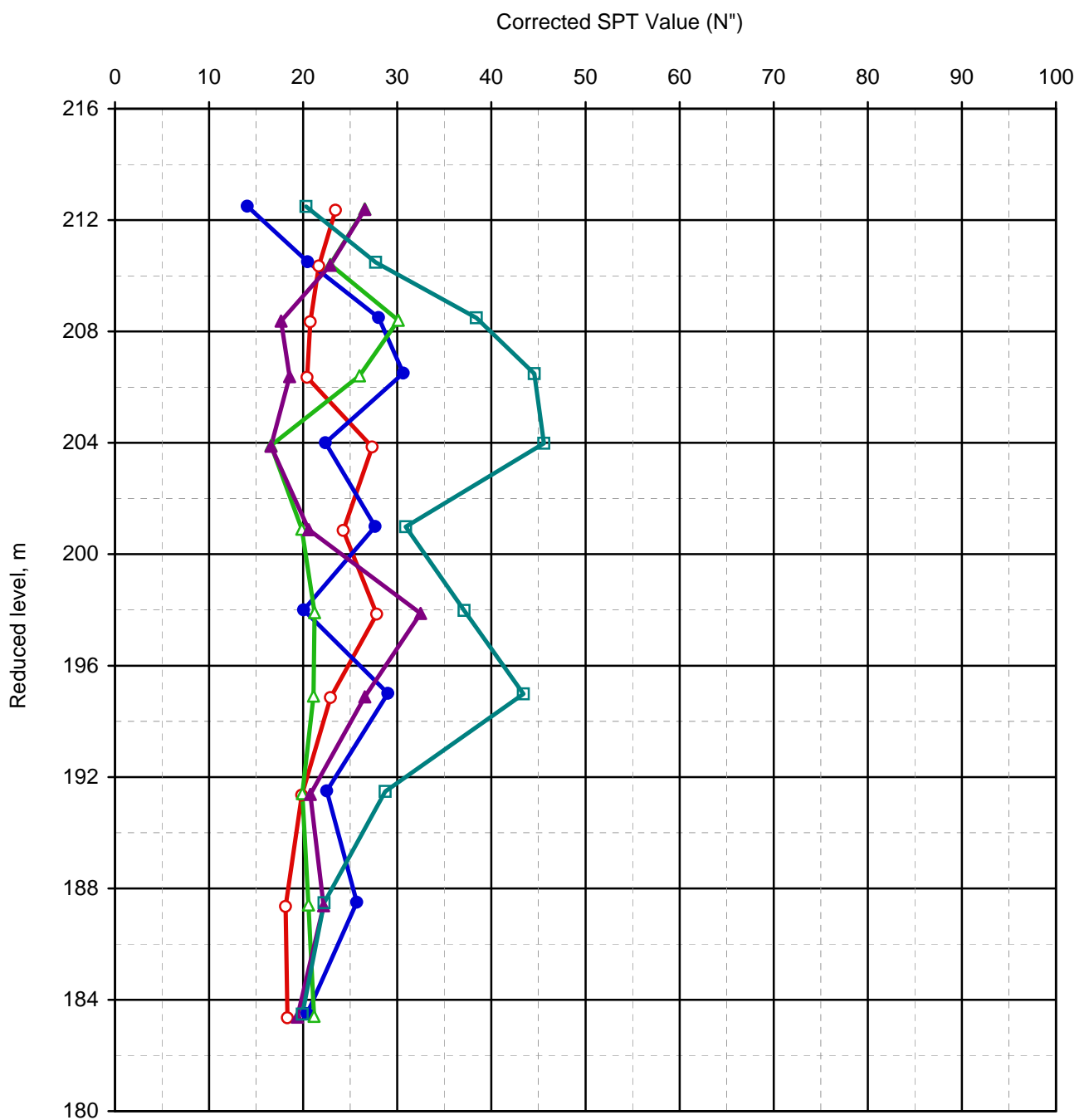
Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
○	BH-110	213.350	4*Hotel-20
●	BH-111	213.500	
△	BH-112	213.406	
▲	BH-113	213.379	
□	BH-114	213.485	



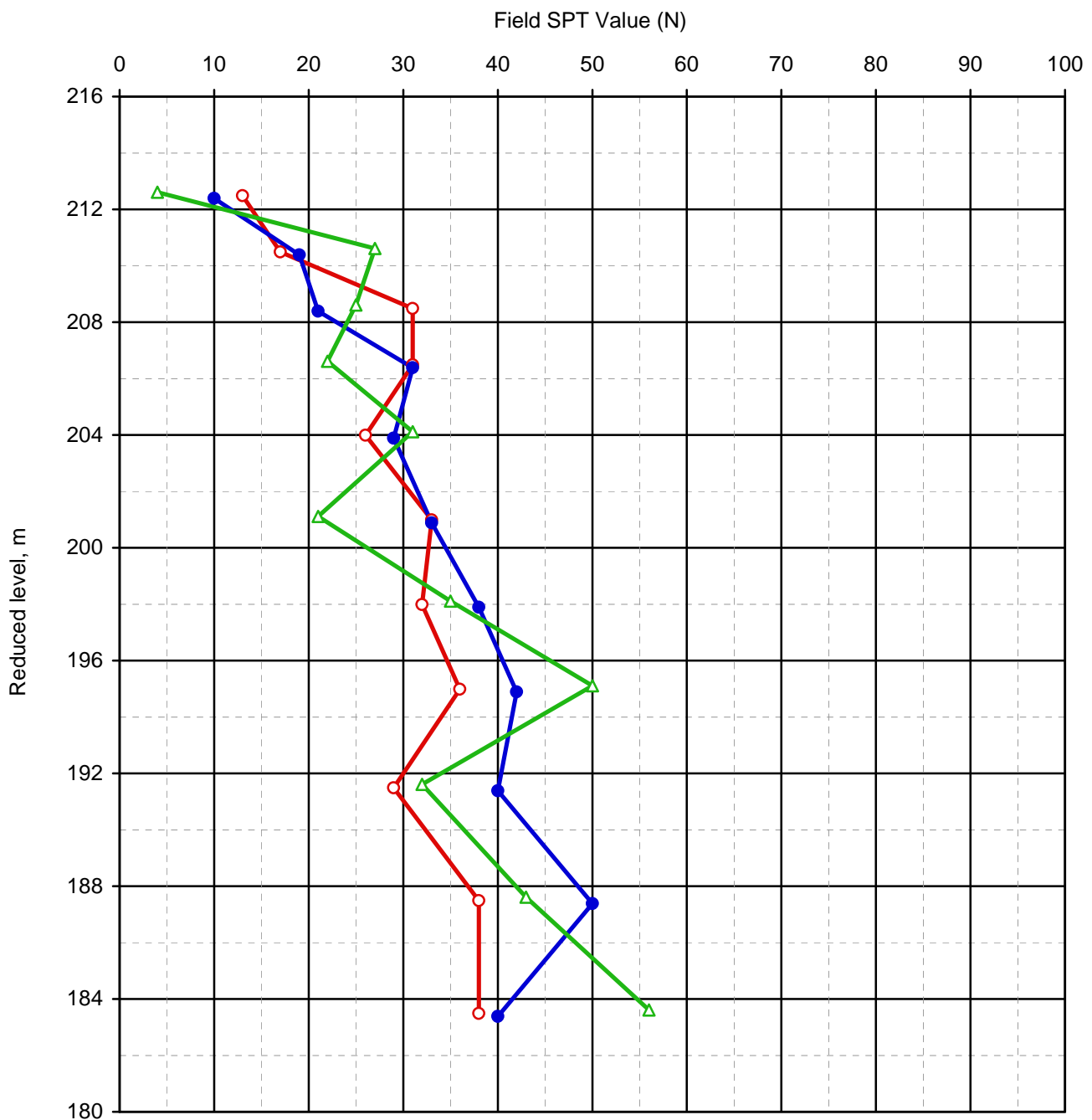
Corrected SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
○	BH-129	213.487	5*hotel-09
●	BH-130	213.387	
△	BH-132	213.611	



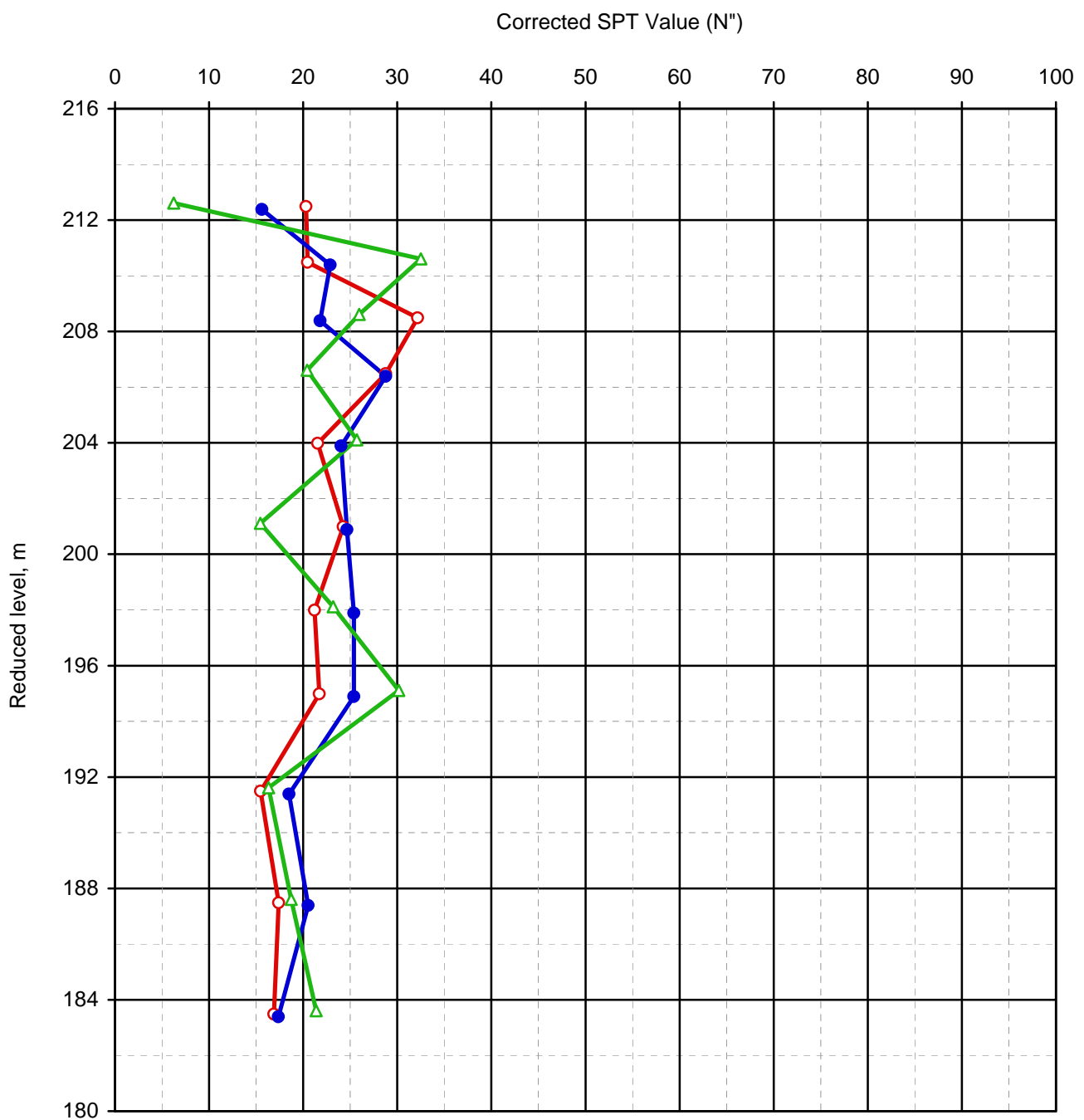
Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
○	BH-129	213.487	5*hotel-09
●	BH-130	213.387	
△	BH-132	213.611	




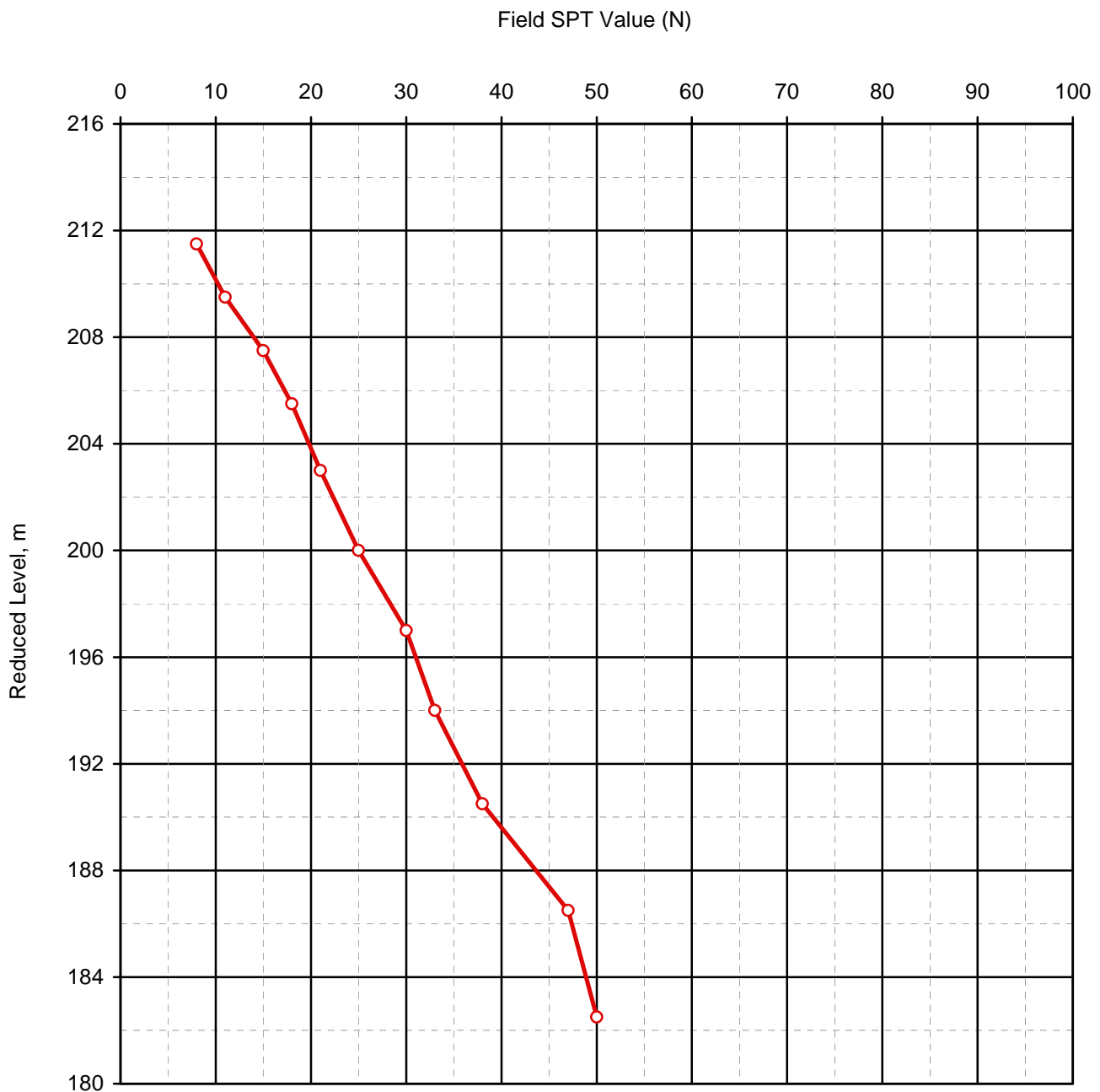
Corrected SPT Values vs. Reduced level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-131R	212.500	-




Field SPT Values vs. Reduced Level

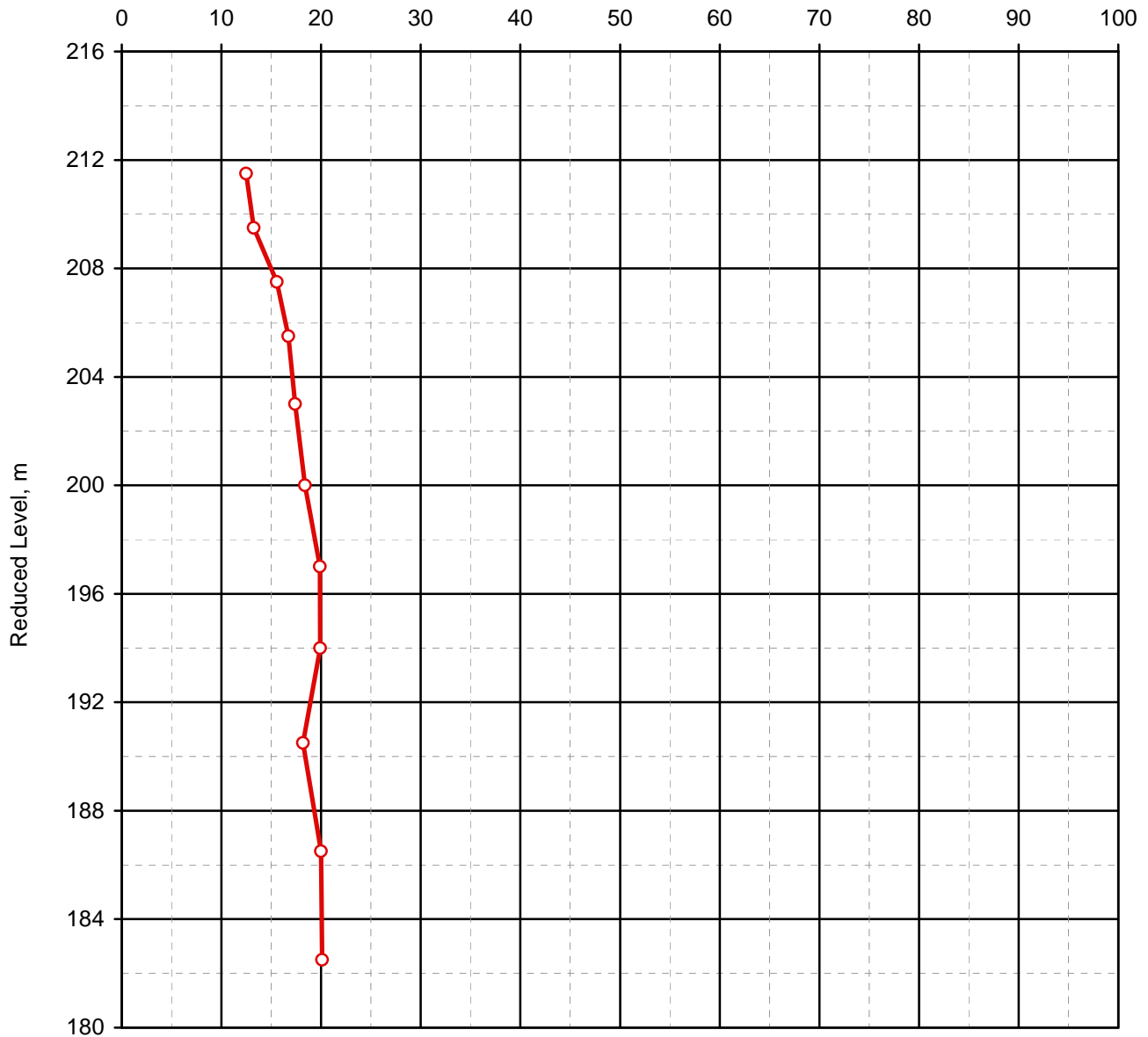


## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-131R	212.500	-

Corrected SPT Value (N")




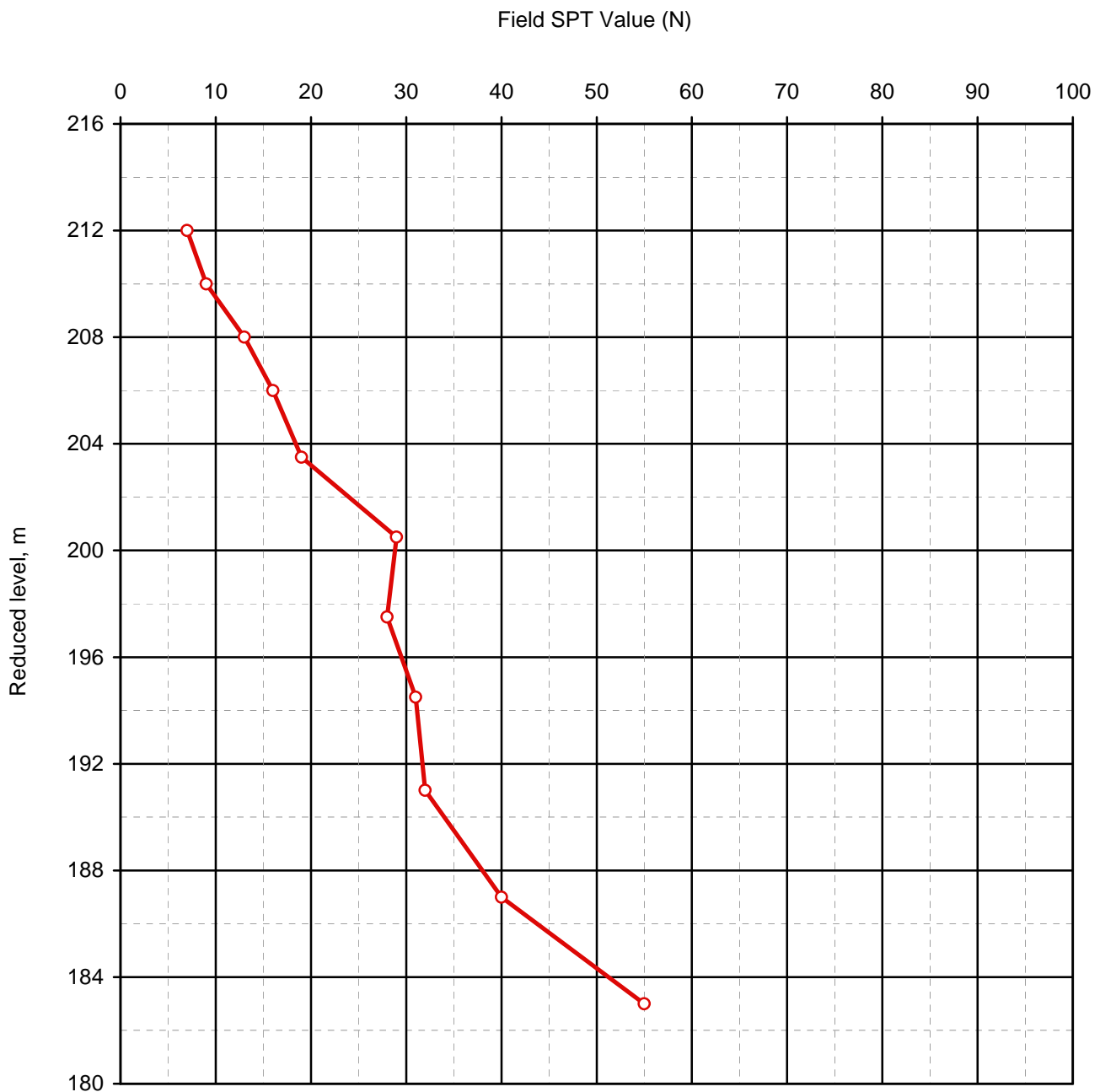
Corrected SPT Values vs. Reduced Level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	PBH-148R	213.000	-




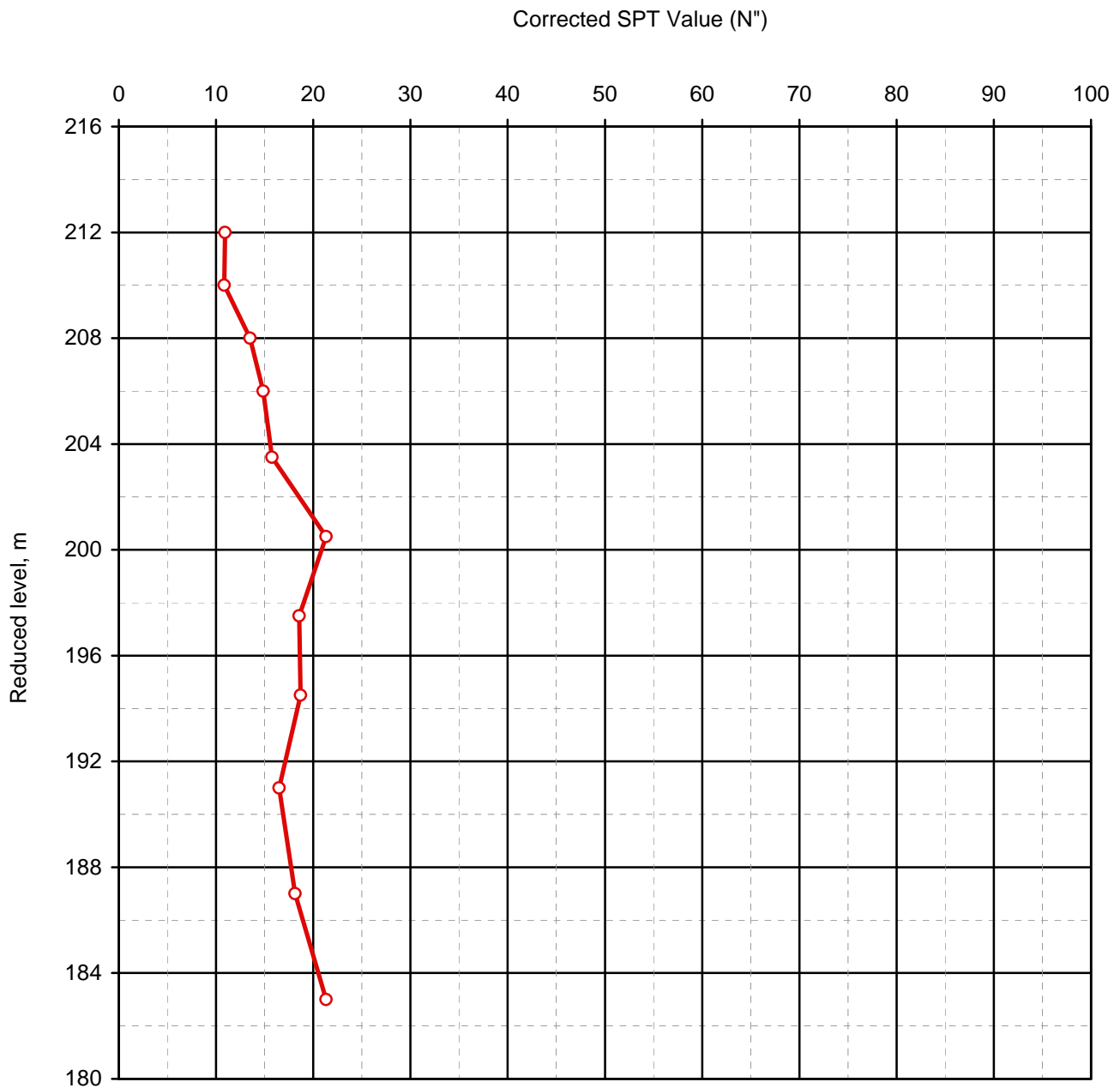
Field SPT Values vs. Reduced level



## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	PBH-148R	213.000	-




Corrected SPT Values vs. Reduced level

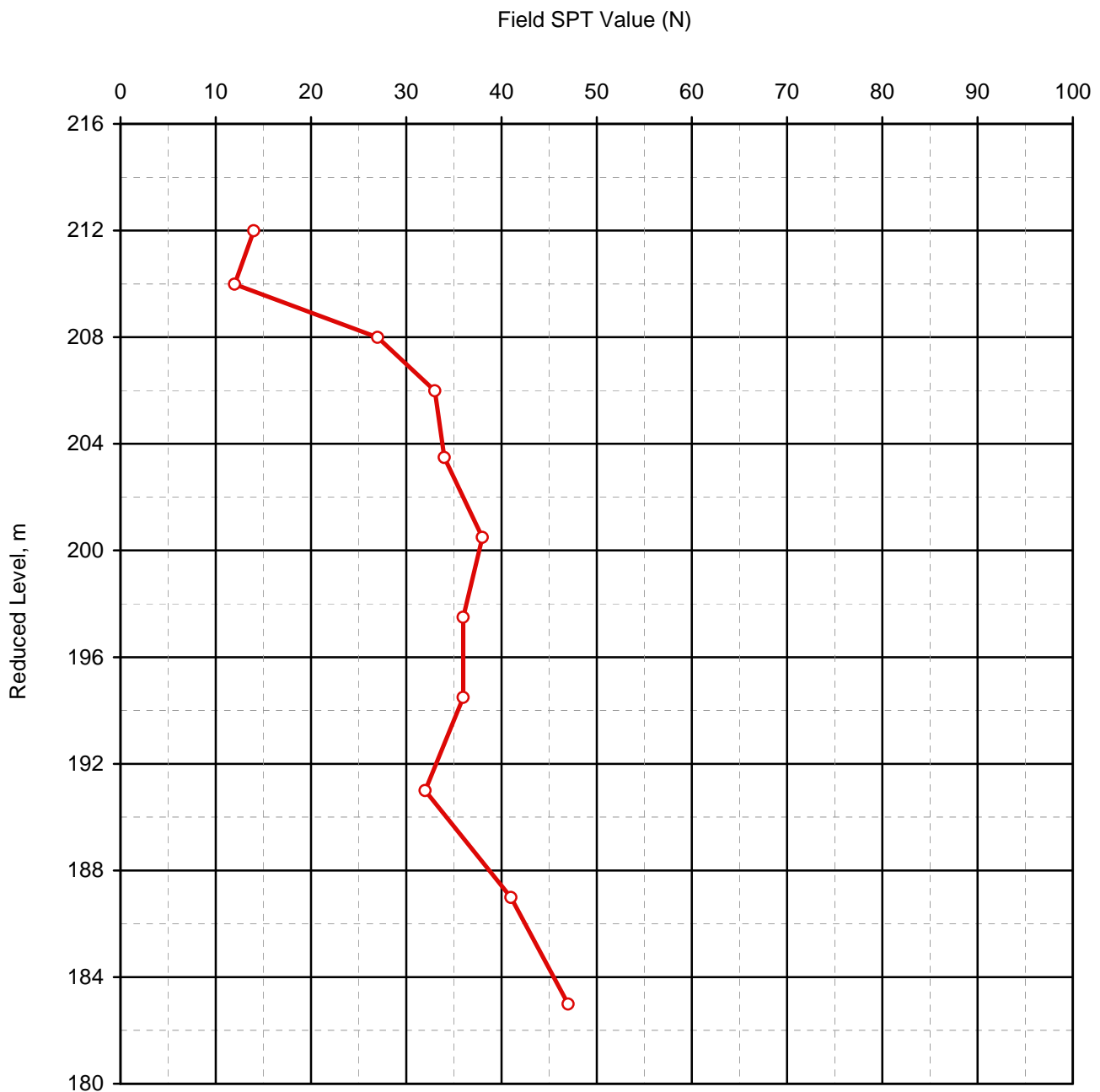




### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-160	212.990	-




Field SPT Values vs. Reduced Level

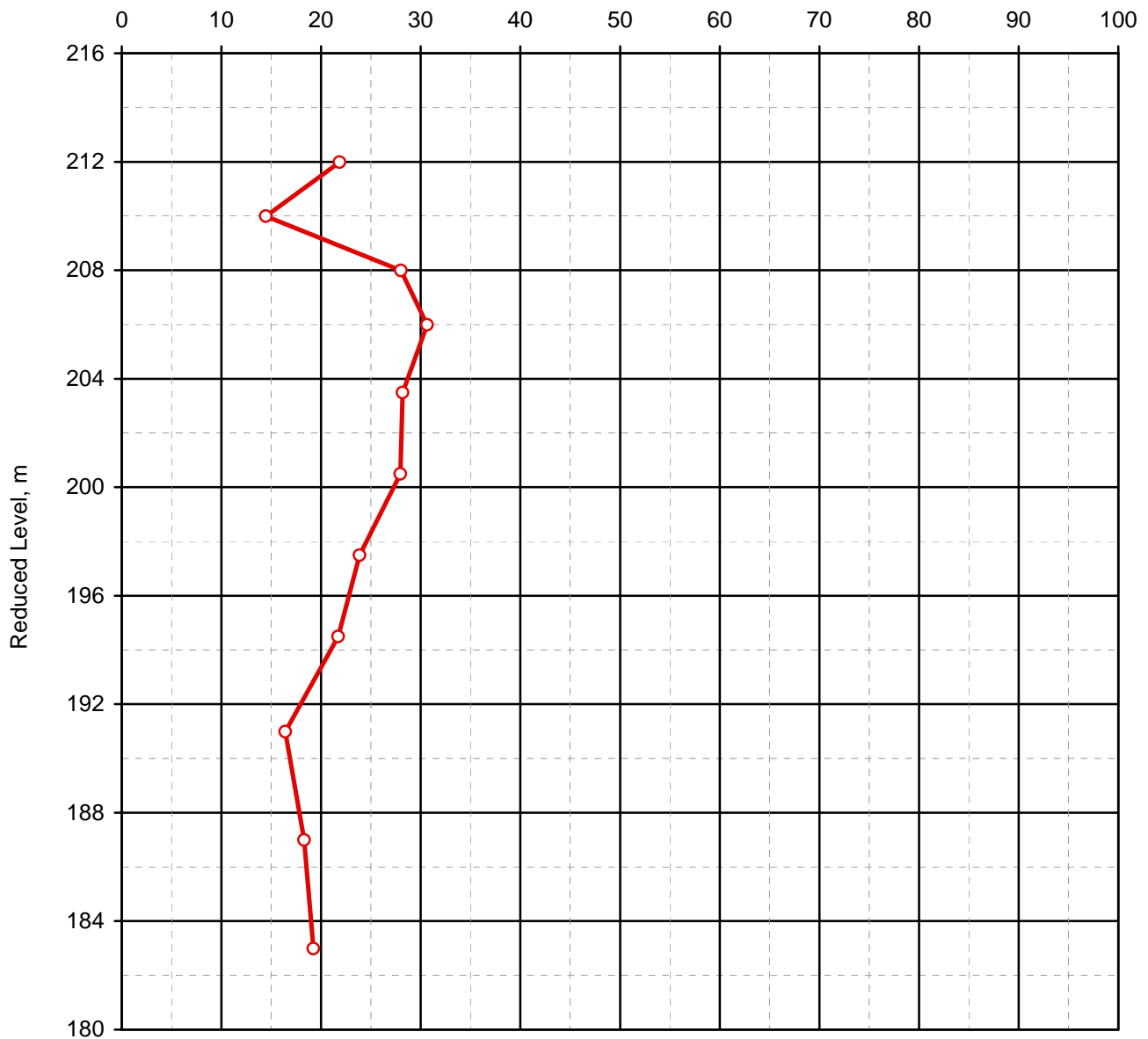


## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-160	212.990	-

Corrected SPT Value (N")




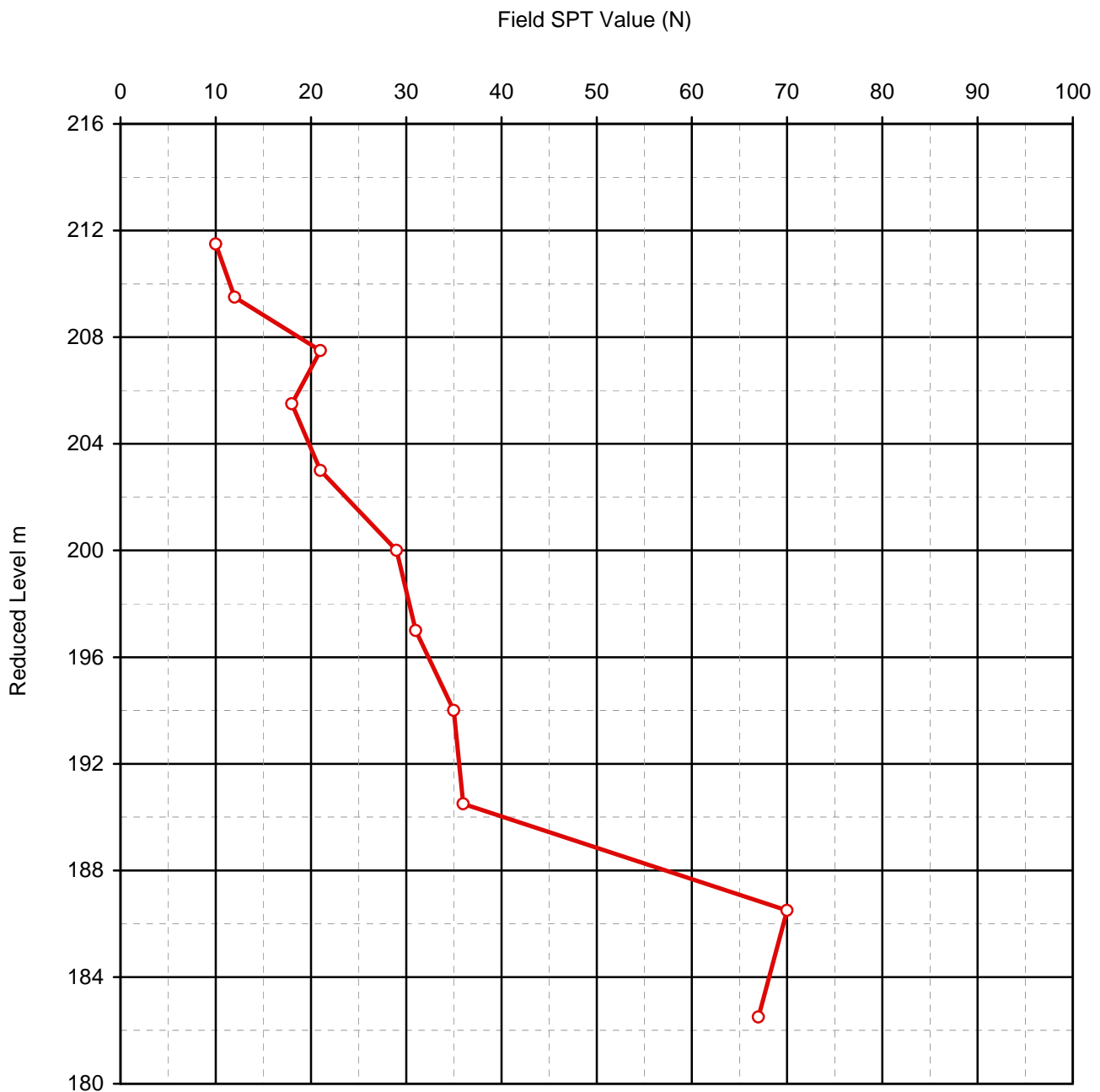
Corrected SPT Values vs. Reduced Level



### Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-161	212.500	-




Field SPT Values vs. Reduced Level

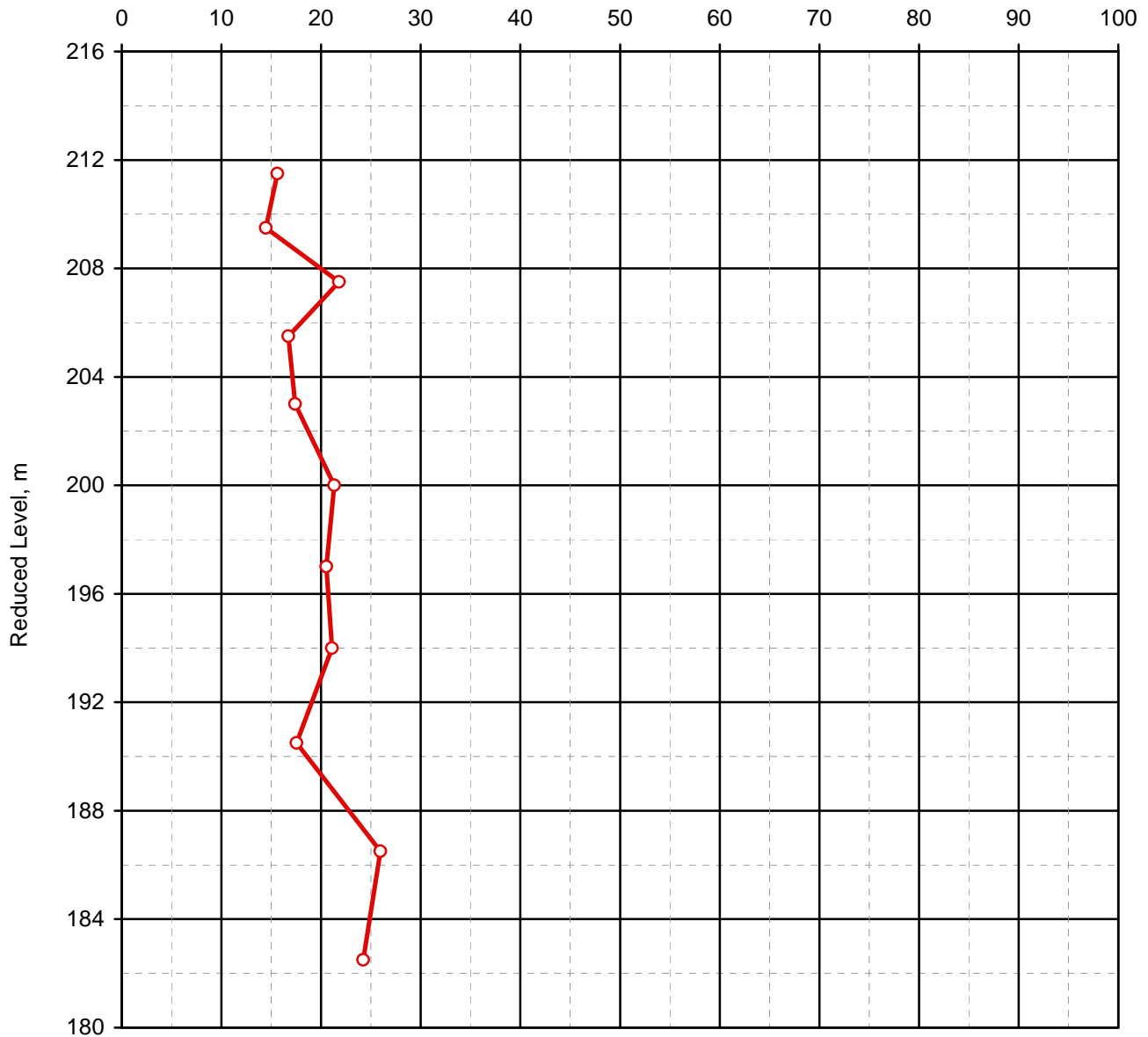


## Standard Penetration Test

IS : 2131-1981, RA-2007

Borehole Details			
Symbol	Borehole Number	Reduced Level,m	Location
	BH-161	212.500	-

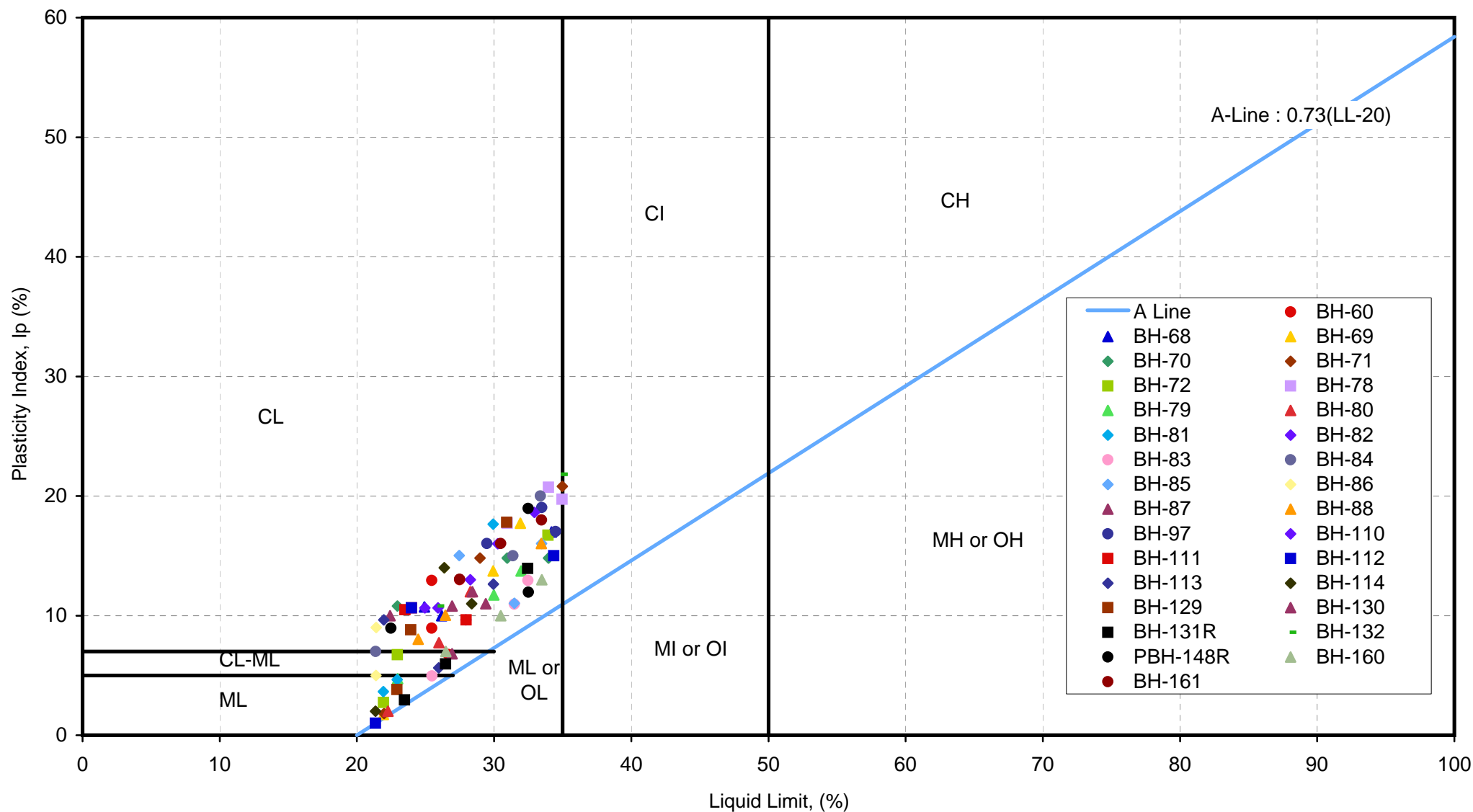
Corrected SPT Value (N")



Corrected SPT Values vs. Reduced Level

# Atterberg Test

IS : 2720 (Part-5)-1985, RA-2010



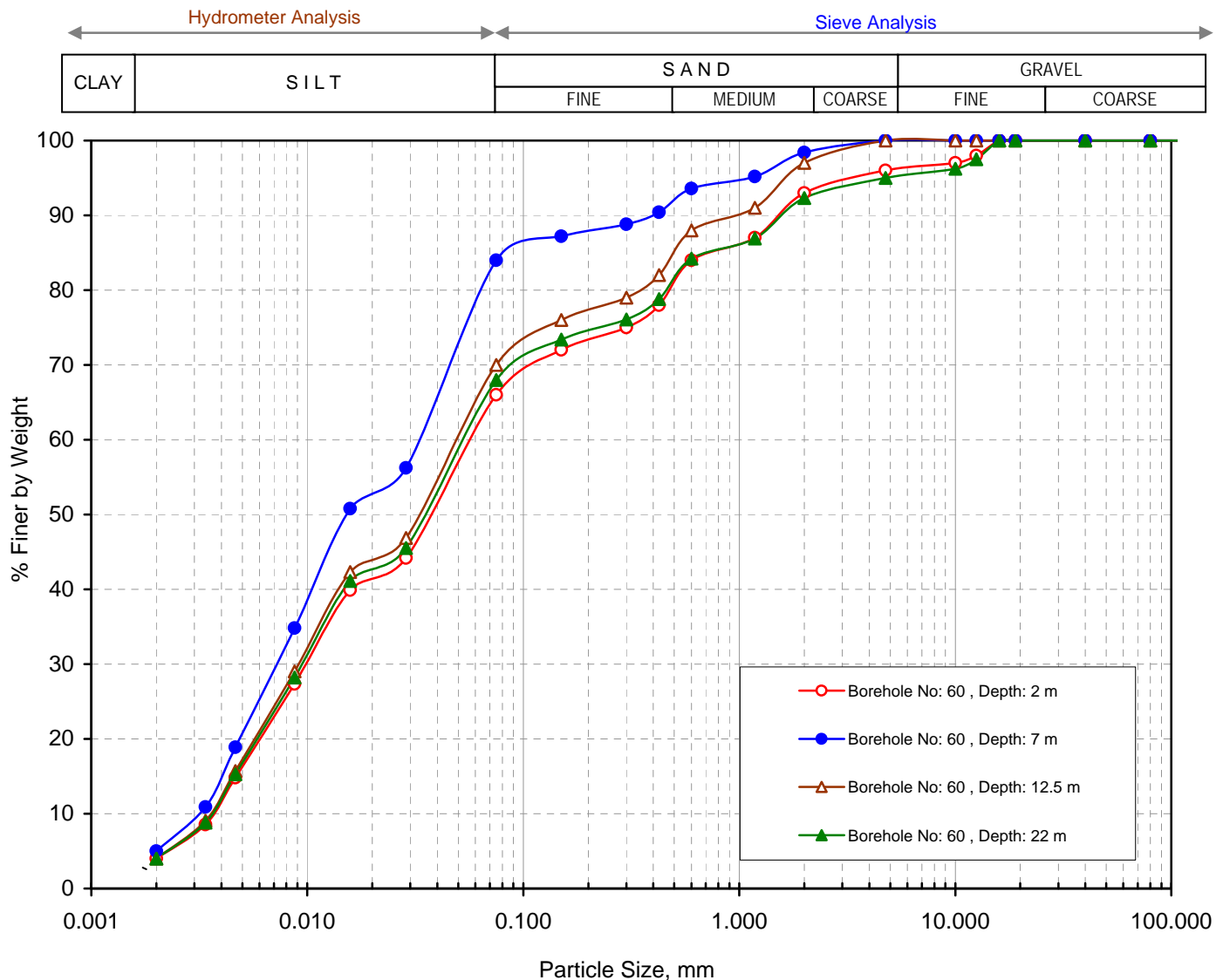
Plasticity Chart



## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-60	2.00	Sandy silt with traces of gravels (CL)	4	30	62	4	0.062	0.010	0.004	15.5	0.40
BH-60	7.00	Sandy silt (CL)	0	16	79	5	0.035	0.008	0.003	11.7	0.61
BH-60	12.50	Sandy silt (CL)	0	30	66	4	0.055	0.009	0.004	13.8	0.37
BH-60	22.00	Sandy silt with gravels (CL)	5	27	64	4	0.059	0.010	0.004	14.8	0.42



## Grain Size Distribution Curve

ISO/IEC 17025:2005  
Certified Laboratory  
(NABL)  
Certificate No. T-1741

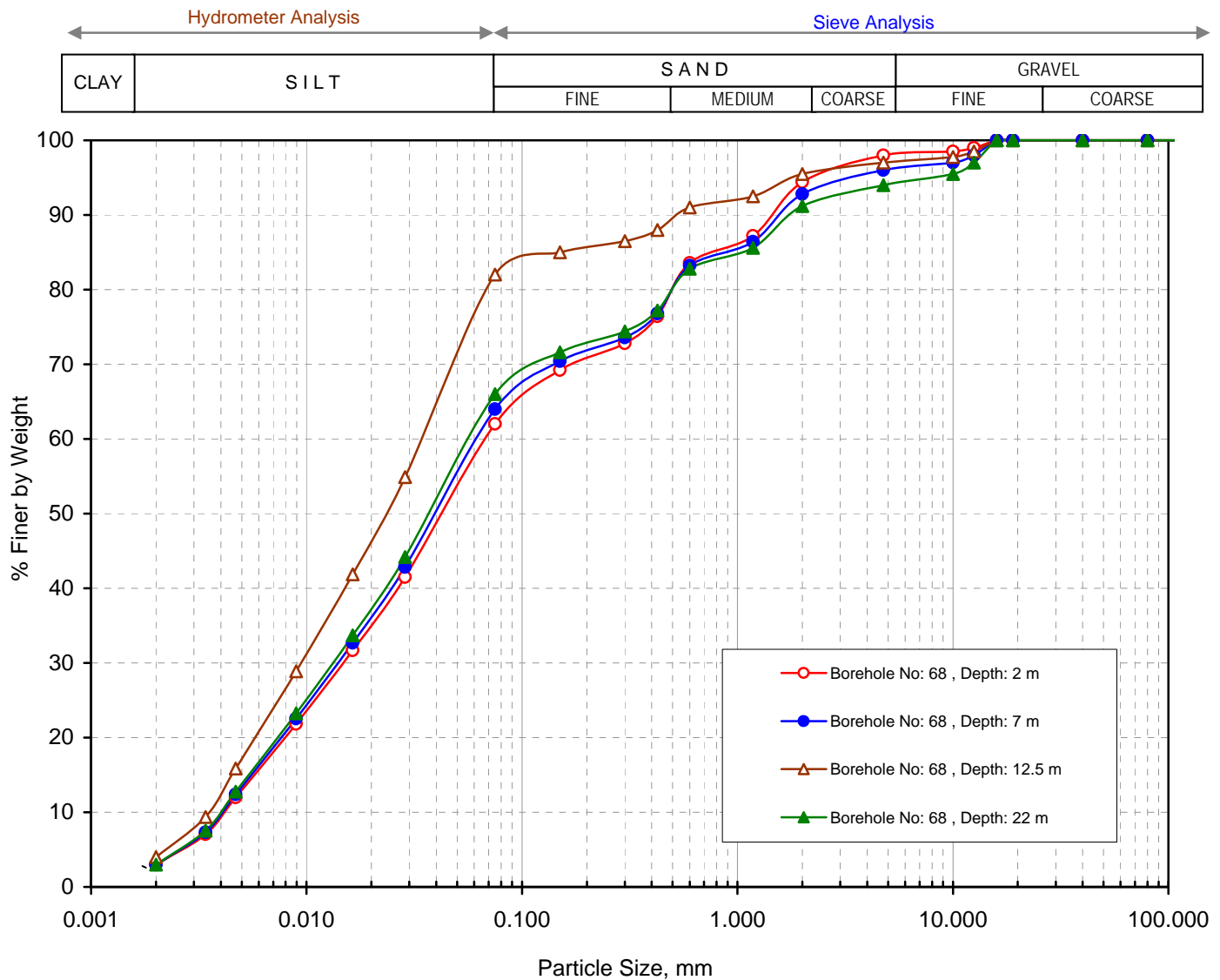




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-68	2.00	Sandy silt with traces of gravels (CL)	2	36	59	3	0.070	0.015	0.004	17.5	0.80
BH-68	7.00	Sandy silt with traces of gravels (CL)	4	32	61	3	0.066	0.014	0.004	16.5	0.74
BH-68	12.50	Sandy silt with traces of gravels (CL)	3	15	78	4	0.037	0.010	0.004	9.3	0.68
BH-68	22.00	Sandy silt with gravels (CL)	6	28	63	3	0.062	0.014	0.004	15.5	0.79



Grain Size Distribution Curve

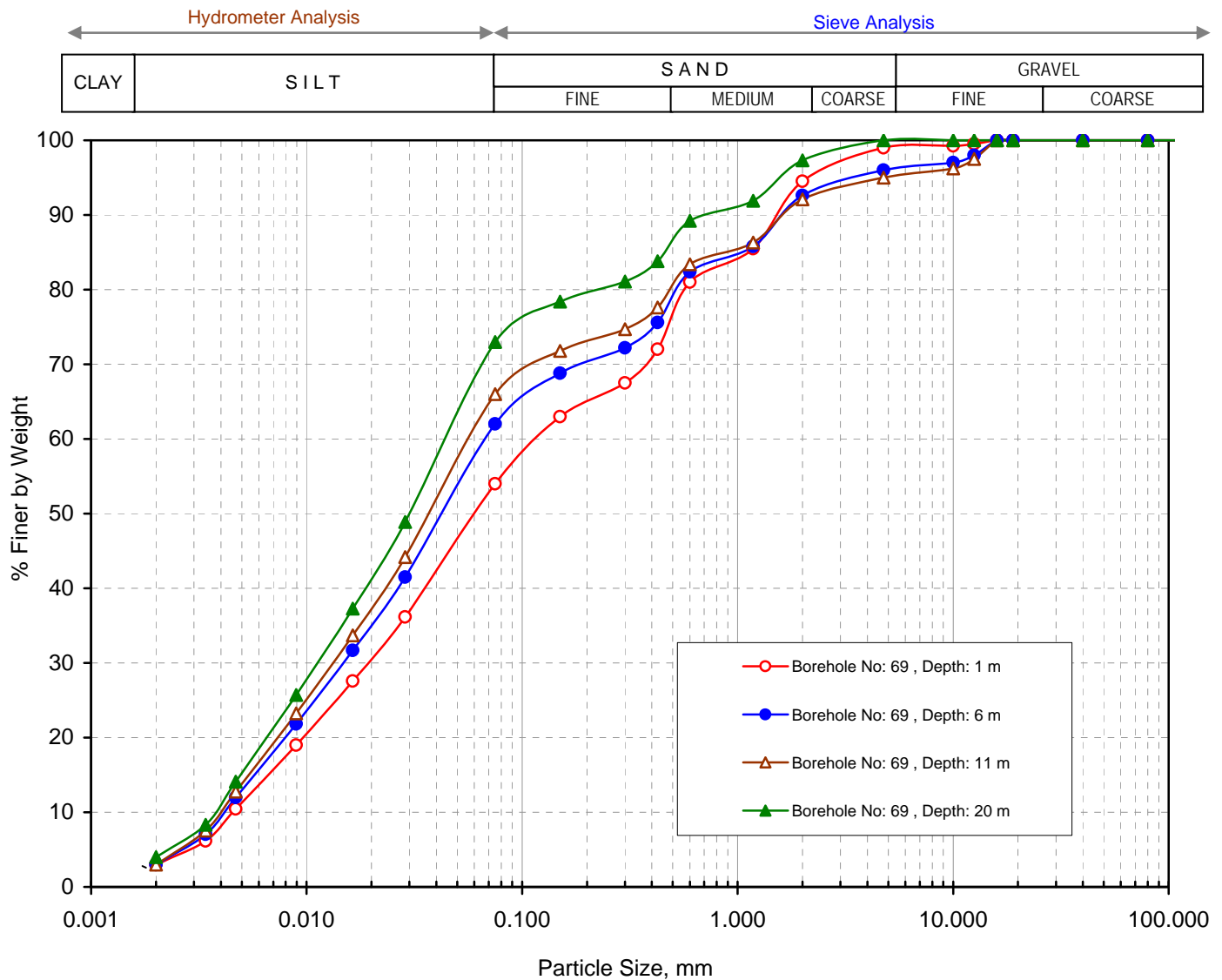




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-69	1.00	Sandy silt with traces of gravels (CL)	1	45	51	3	0.125	0.020	0.005	25.0	0.64
BH-69	6.00	Sandy silt with traces of gravels (CL)	4	34	59	3	0.070	0.015	0.004	17.5	0.80
BH-69	11.00	Sandy silt with gravels (CL)	5	29	63	3	0.062	0.014	0.004	15.5	0.79
BH-69	20.00	Sandy silt (CL)	0	27	69	4	0.050	0.012	0.004	12.5	0.72



Grain Size Distribution Curve



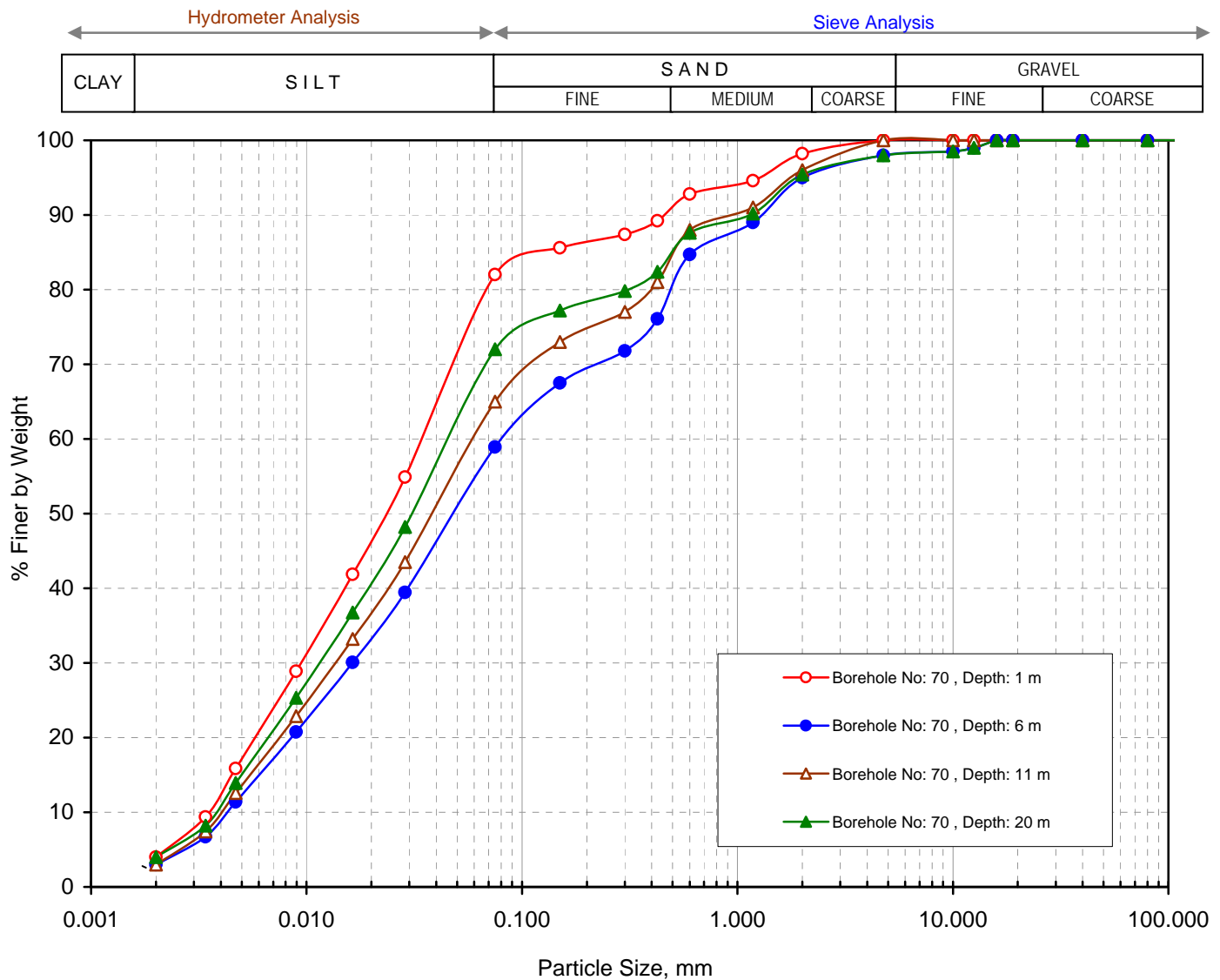




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-70	1.00	Sandy silt (CL)	0	18	78	4	0.037	0.010	0.004	9.3	0.68
BH-70	6.00	Sandy silt with traces of gravels (CL)	2	39	56	3	0.085	0.016	0.004	21.3	0.75
BH-70	11.00	Sandy silt (CL)	0	35	62	3	0.064	0.014	0.004	16.0	0.77
BH-70	20.00	Sandy silt with traces of gravels (CL)	2	26	68	4	0.052	0.012	0.004	13.0	0.69



Grain Size Distribution Curve

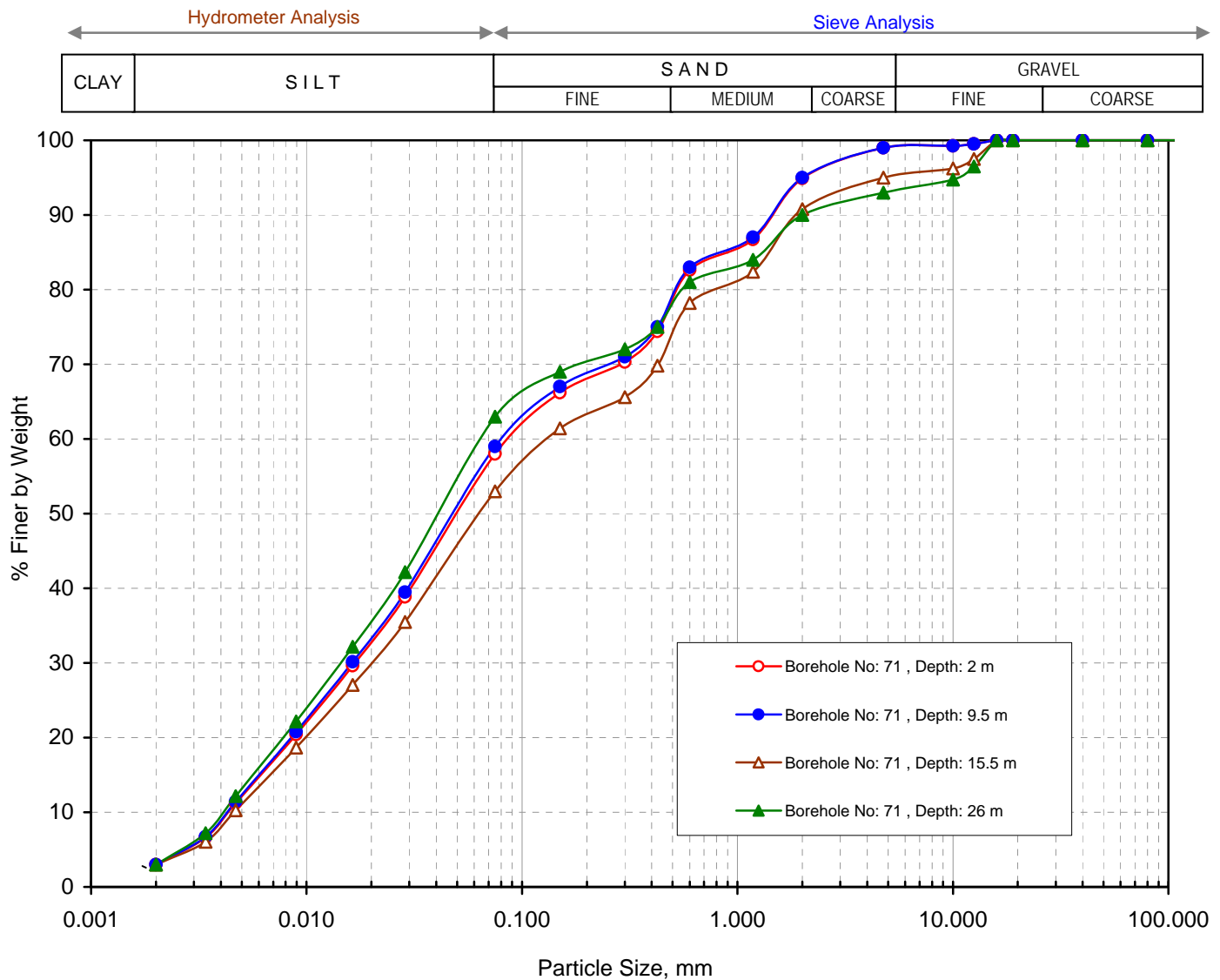




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-71	2.00	Sandy silt with traces of gravels (CL)	1	41	55	3	0.093	0.017	0.004	23.3	0.78
BH-71	9.50	Sandy silt with traces of gravels (CL)	1	40	56	3	0.084	0.016	0.004	21.0	0.76
BH-71	15.50	Sandy silt with gravels (CL)	5	42	50	3	0.138	0.021	0.005	27.6	0.64
BH-71	26.00	Sandy silt with gravels (CL)	7	30	60	3	0.068	0.015	0.004	17.0	0.83



Grain Size Distribution Curve

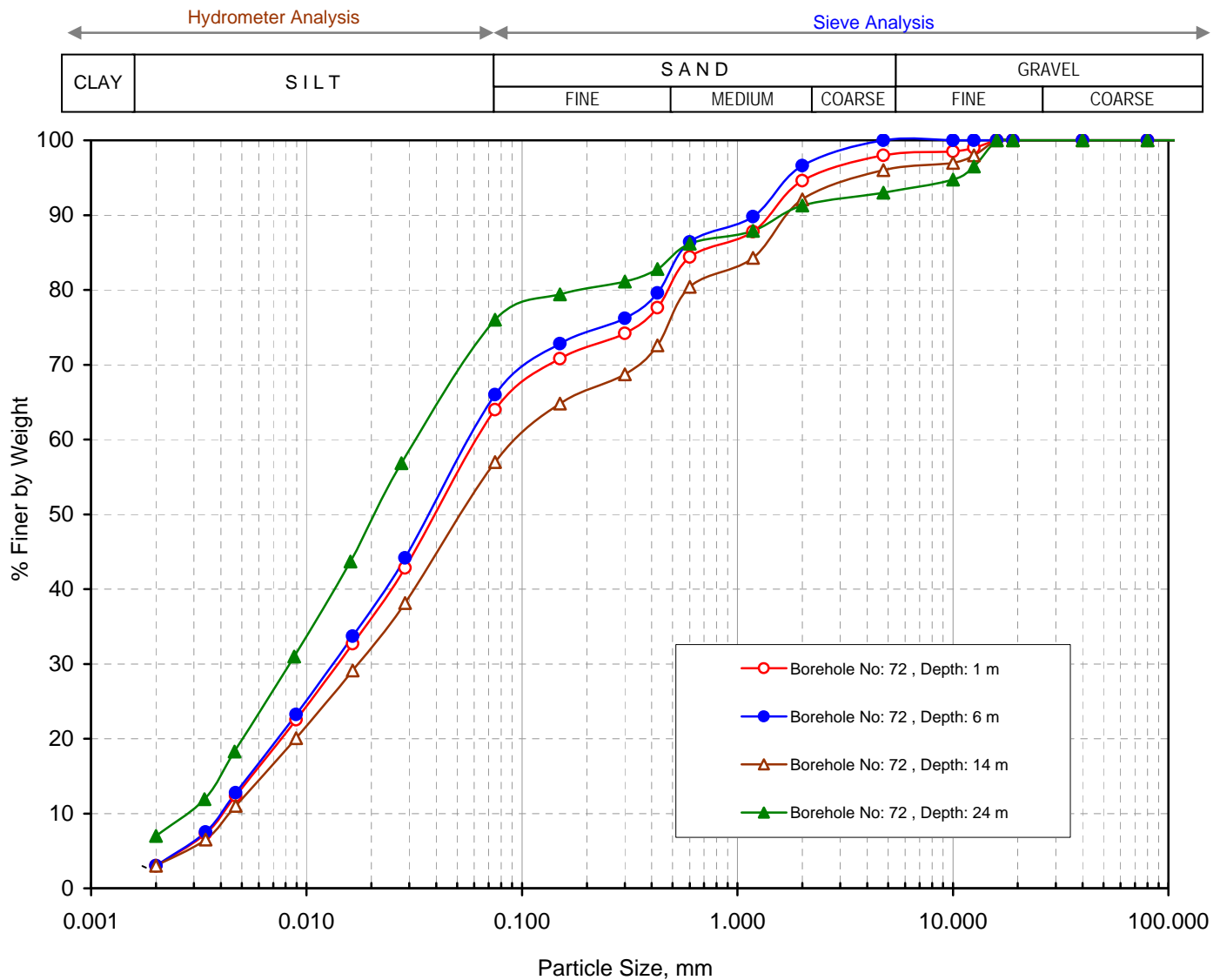




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-72	1.00	Sandy silt with traces of gravels (CL)	2	34	61	3	0.066	0.014	0.004	16.5	0.74
BH-72	6.00	Sandy silt (CL)	0	34	63	3	0.062	0.014	0.004	15.5	0.79
BH-72	14.00	Sandy silt with traces of gravels (CL)	4	39	54	3	0.104	0.018	0.004	26.0	0.78
BH-72	24.00	Sandy silt with gravels (CL)	7	17	69	7	0.035	0.008	0.003	11.7	0.61



Grain Size Distribution Curve

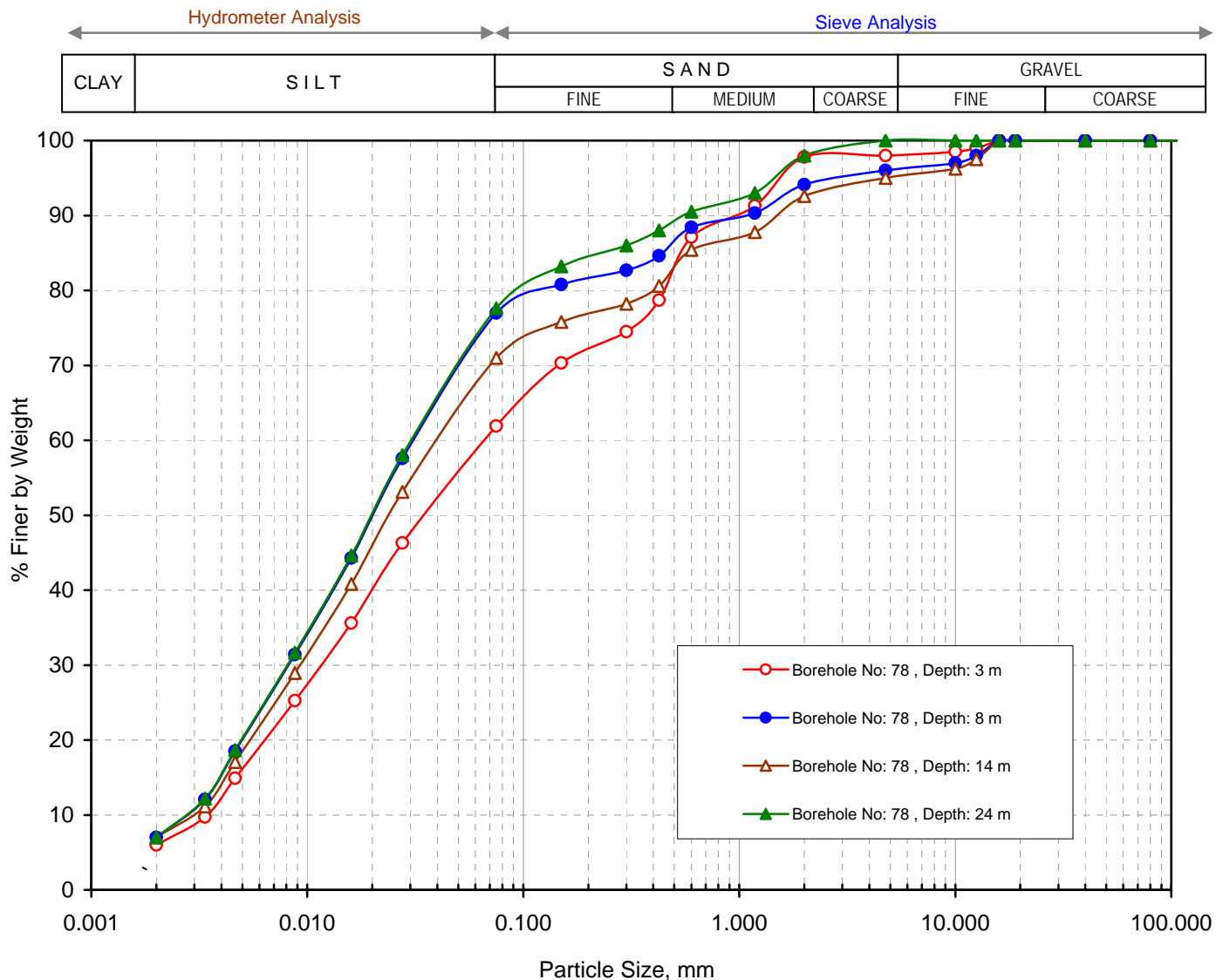




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-78	3.00	Sandy silt with traces of gravels (CL)	2	36	56	6	0.069	0.012	0.003	23.0	0.70
BH-78	8.00	Sandy silt with traces of gravels (CL)	4	19	70	7	0.033	0.008	0.003	11.0	0.65
BH-78	14.00	Sandy silt with gravels (CL)	5	24	64	7	0.046	0.009	0.003	15.3	0.59
BH-78	24.00	Sandy silt (CL)	0	22	71	7	0.032	0.008	0.003	10.7	0.67



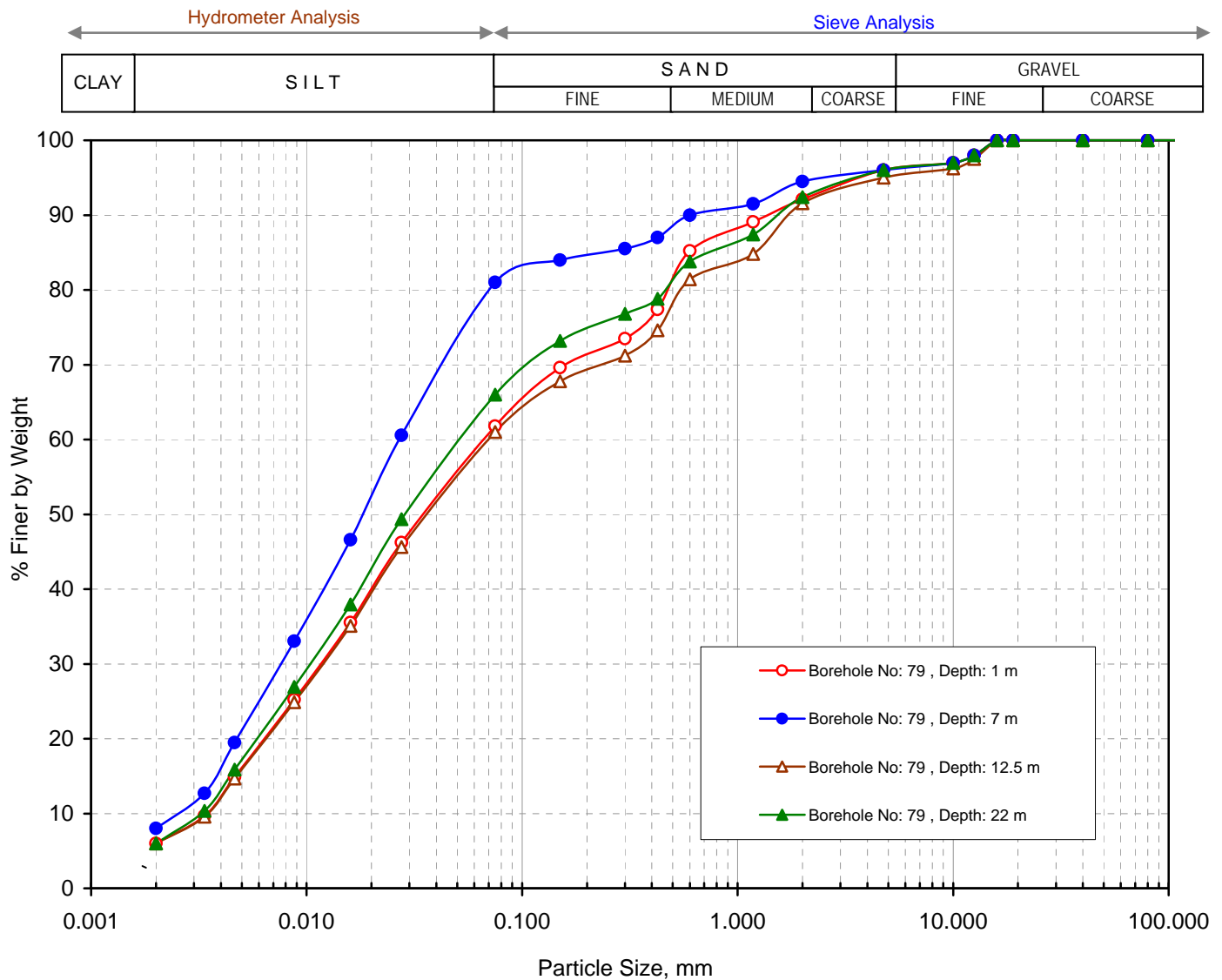
## Grain Size Distribution Curve



## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-79	1.00	Sandy silt with traces of gravels (CL)	4	34	56	6	0.070	0.012	0.003	23.3	0.69
BH-79	7.00	Sandy silt with traces of gravels (CL)	4	15	73	8	0.027	0.008	0.003	9.0	0.79
BH-79	12.50	Sandy silt with gravels (CL)	5	34	55	6	0.072	0.012	0.003	24.0	0.67
BH-79	22.00	Sandy silt with traces of gravels (CL)	4	30	60	6	0.058	0.011	0.003	19.3	0.70



Grain Size Distribution Curve

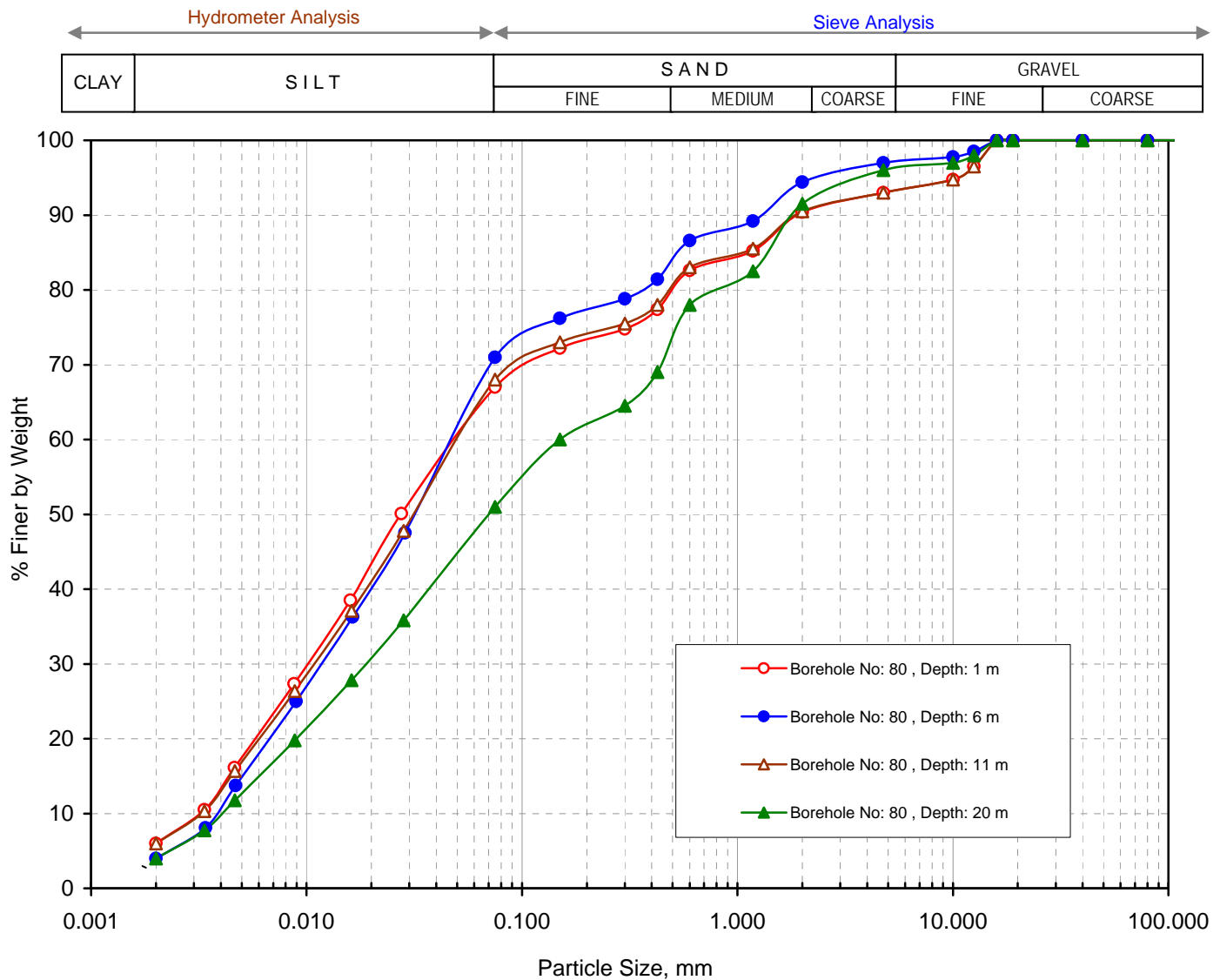




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-80	1.00	Sandy silt with gravels (CL)	7	26	61	6	0.055	0.010	0.003	18.3	0.61
BH-80	6.00	Sandy silt with traces of gravels (CL)	3	26	67	4	0.053	0.012	0.004	13.3	0.68
BH-80	11.00	Sandy silt with gravels (CL)	7	25	62	6	0.056	0.011	0.003	18.7	0.72
BH-80	20.00	Sandy silt with traces of gravels (CL)	4	45	47	4	0.150	0.019	0.004	37.5	0.60



Grain Size Distribution Curve

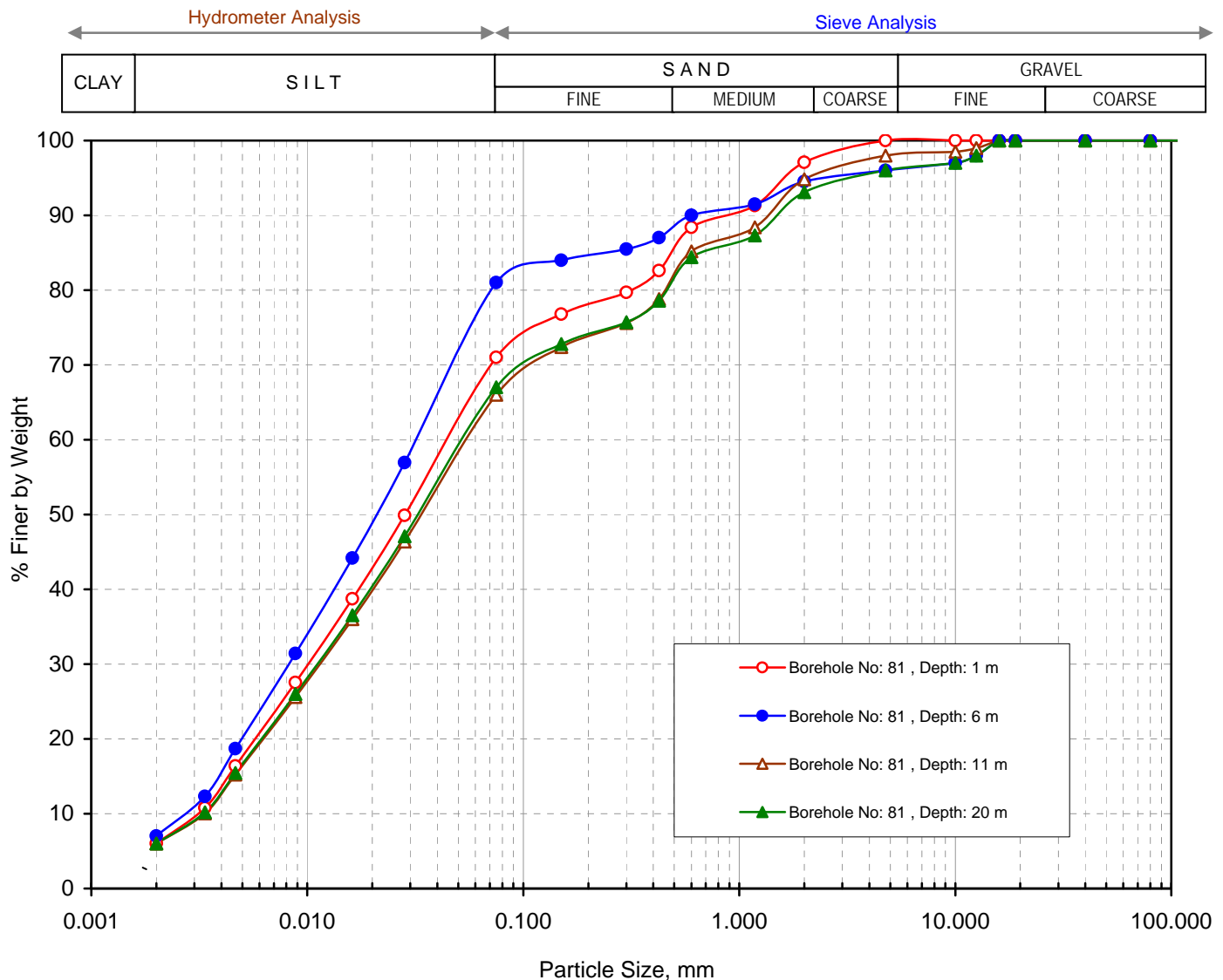




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-81	1.00	Sandy silt (CL)	0	29	65	6	0.051	0.010	0.003	17.0	0.65
BH-81	6.00	Sandy silt with traces of gravels (CL)	4	15	74	7	0.034	0.008	0.003	11.3	0.63
BH-81	11.00	Sandy silt with traces of gravels (CL)	2	32	60	6	0.061	0.012	0.003	20.3	0.79
BH-81	20.00	Sandy silt with traces of gravels (CL)	4	29	61	6	0.059	0.012	0.003	19.7	0.81



Grain Size Distribution Curve

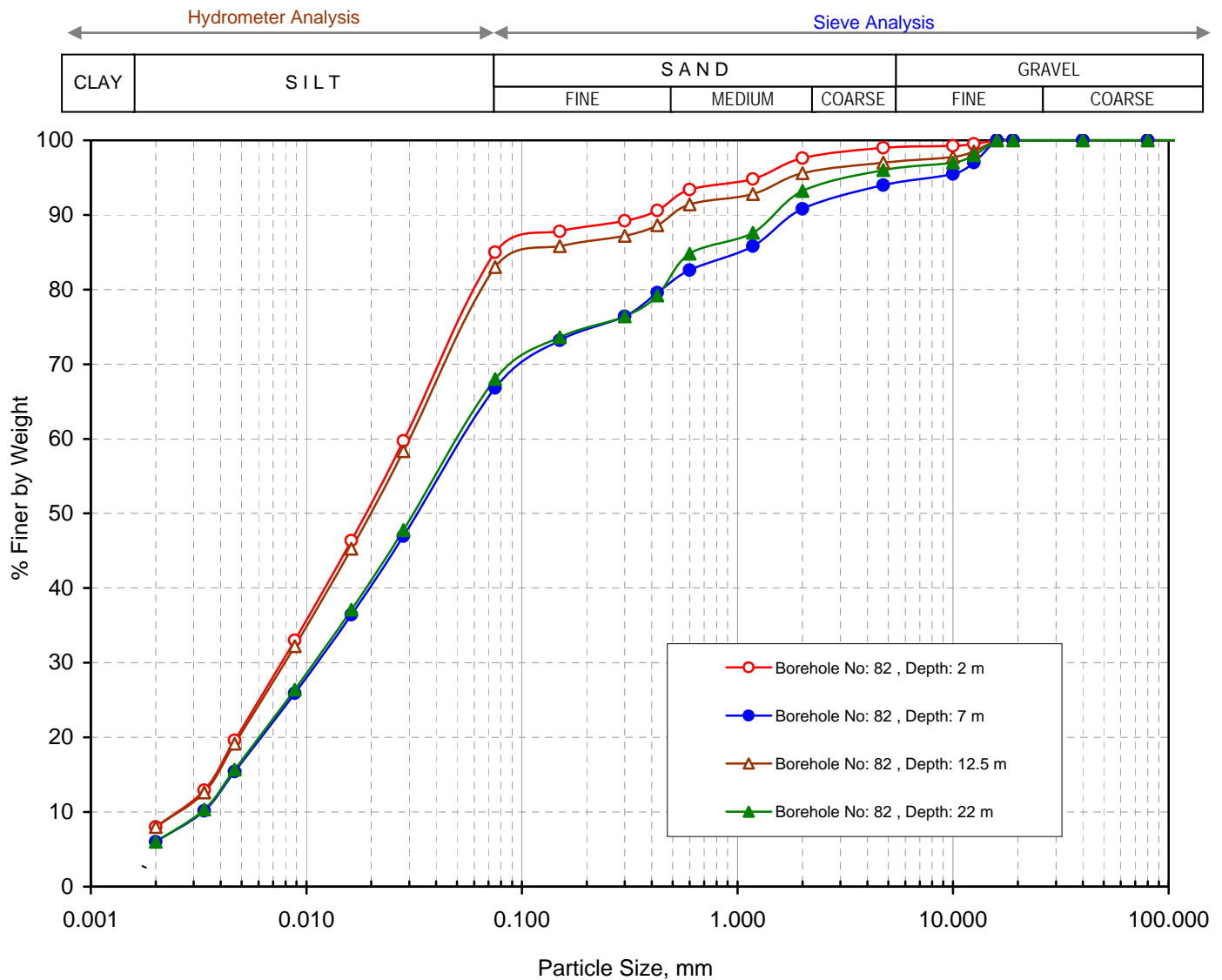




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-82	2.00	Sandy silt with traces of gravels (CL)	1	14	77	8	0.029	0.008	0.003	9.7	0.74
BH-82	7.00	Sandy silt with gravels (CL)	6	27	61	6	0.059	0.012	0.003	19.7	0.81
BH-82	12.50	Sandy silt with traces of gravels (CL)	3	14	75	8	0.031	0.008	0.003	10.3	0.69
BH-82	22.00	Sandy silt with traces of gravels (CL)	4	28	62	6	0.056	0.011	0.003	18.7	0.72



Grain Size Distribution Curve



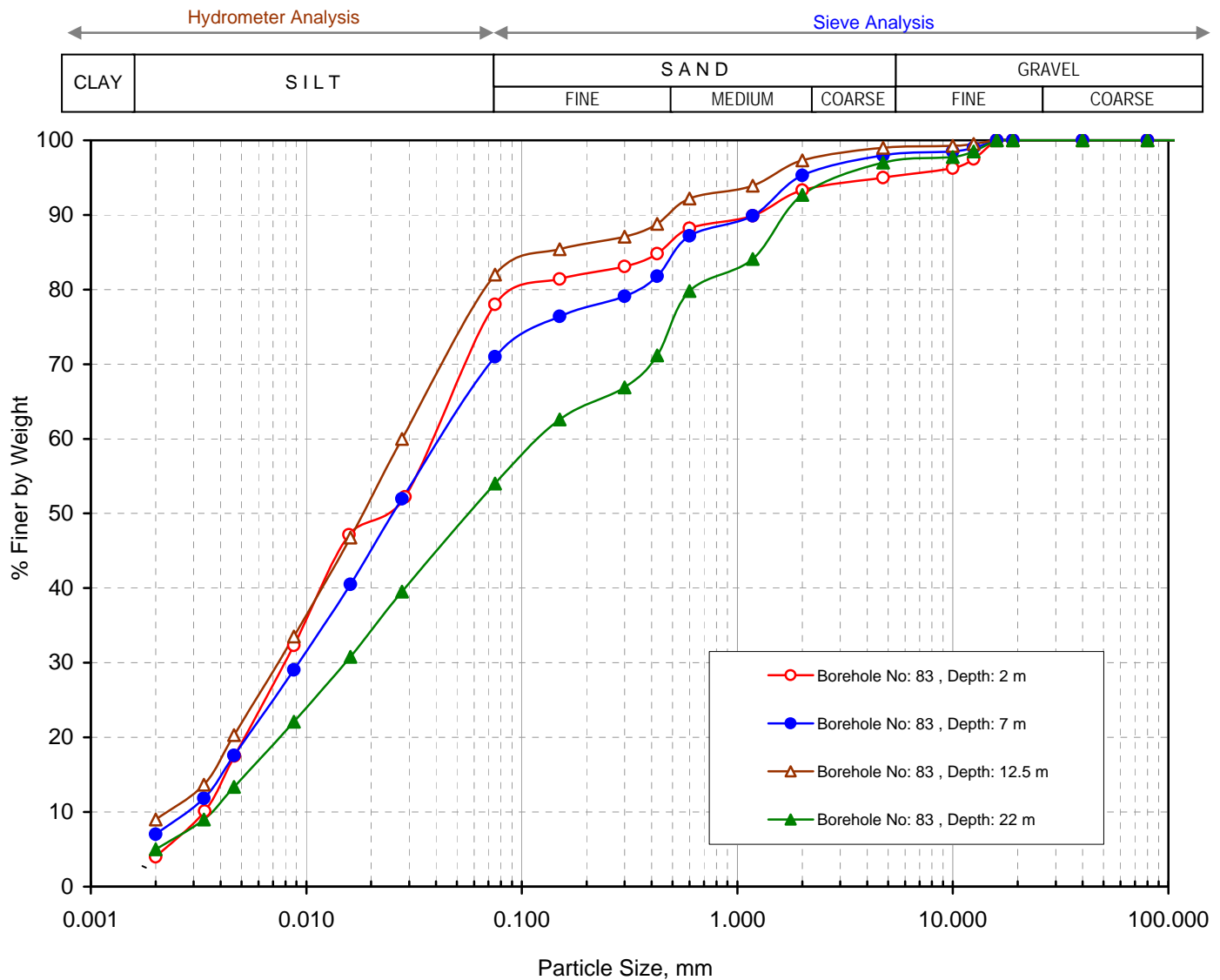




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-83	2.00	Sandy silt with gravels (CL)	5	17	74	4	0.043	0.008	0.003	14.3	0.50
BH-83	7.00	Sandy silt with traces of gravels (CL)	2	27	64	7	0.048	0.009	0.003	16.0	0.56
BH-83	12.50	Sandy silt with traces of gravels (CL)	1	17	73	9	0.028	0.008	0.002	14.0	1.14
BH-83	22.00	Sandy silt with traces of gravels (CL)	3	43	49	5	0.127	0.015	0.004	31.8	0.44



Grain Size Distribution Curve

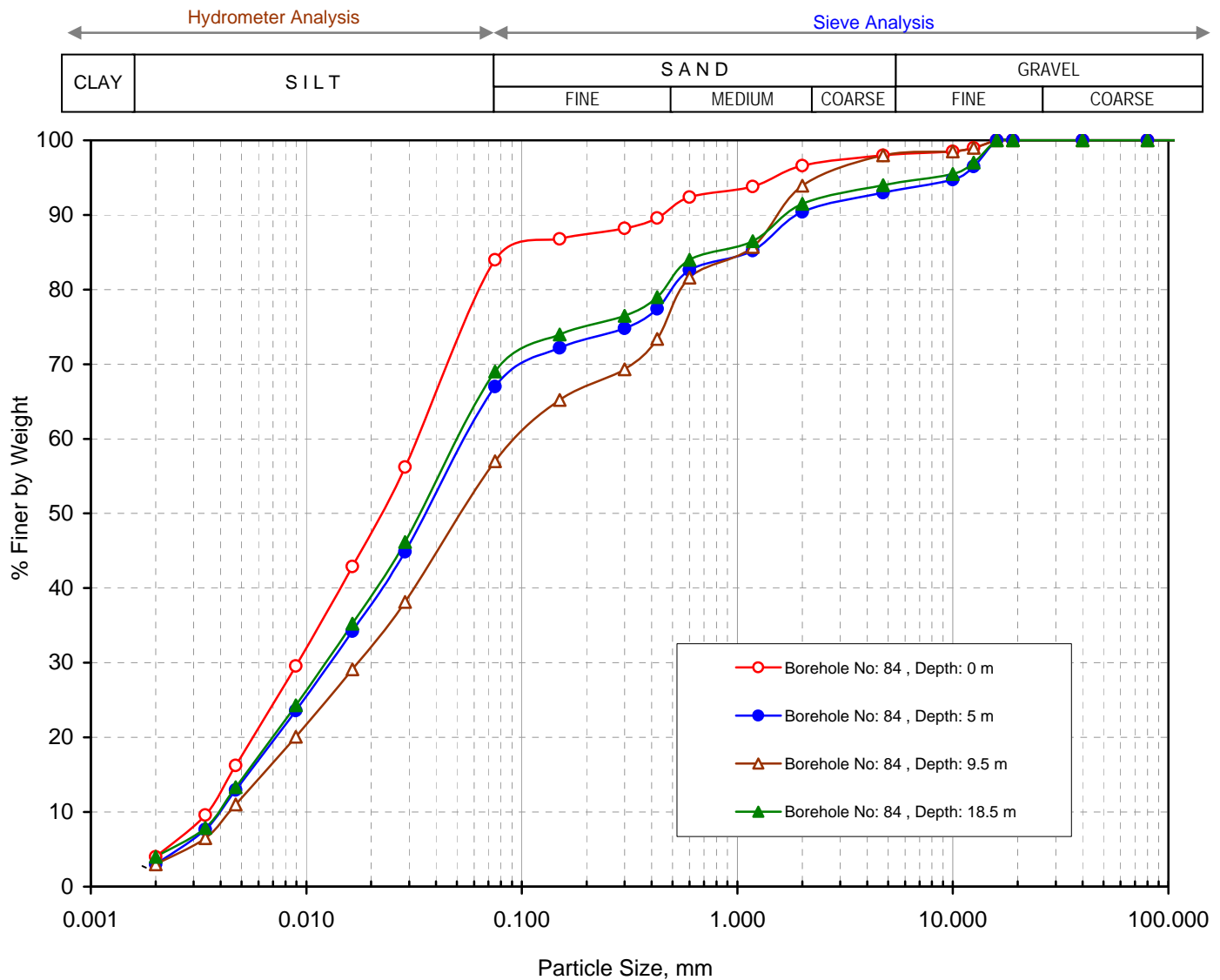




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-84	0.00	Sandy silt with traces of gravels (CL)	2	14	80	4	0.035	0.009	0.003	11.7	0.77
BH-84	5.00	Sandy silt with gravels (CL)	7	26	64	3	0.060	0.013	0.004	15.0	0.70
BH-84	9.50	Sandy silt with traces of gravels (CL)	2	41	54	3	0.102	0.018	0.004	25.5	0.79
BH-84	18.50	Sandy silt with gravels (CL)	6	25	65	4	0.057	0.013	0.004	14.3	0.74



Grain Size Distribution Curve

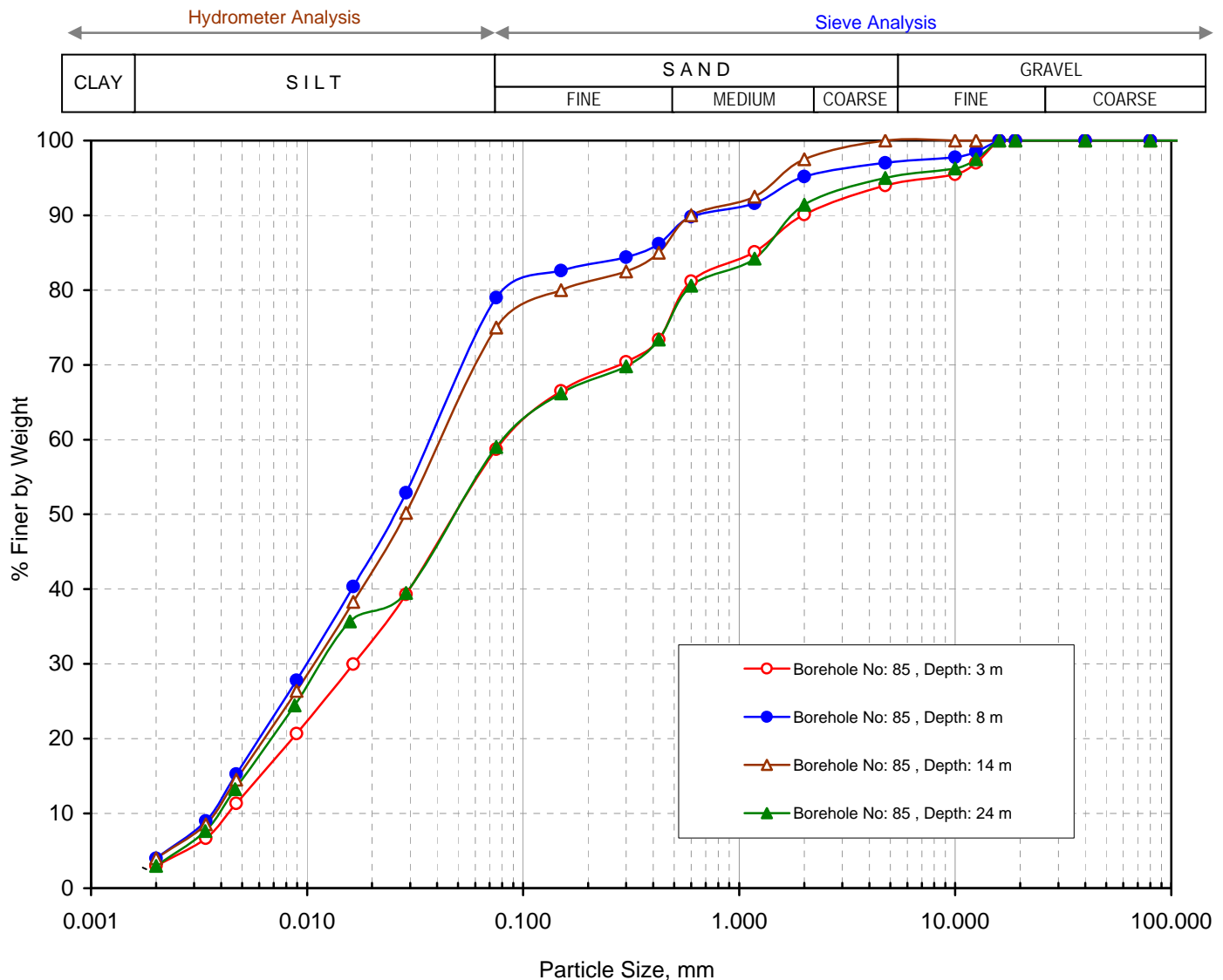




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-85	3.00	Sandy silt with gravels (CL)	6	35	56	3	0.088	0.016	0.004	22.0	0.73
BH-85	8.00	Sandy silt with traces of gravels (CL)	3	18	75	4	0.041	0.010	0.004	10.3	0.61
BH-85	14.00	Sandy silt (CL)	0	25	71	4	0.047	0.011	0.004	11.8	0.64
BH-85	24.00	Sandy silt with gravels (CL)	5	36	56	3	0.085	0.012	0.004	21.3	0.42



Grain Size Distribution Curve

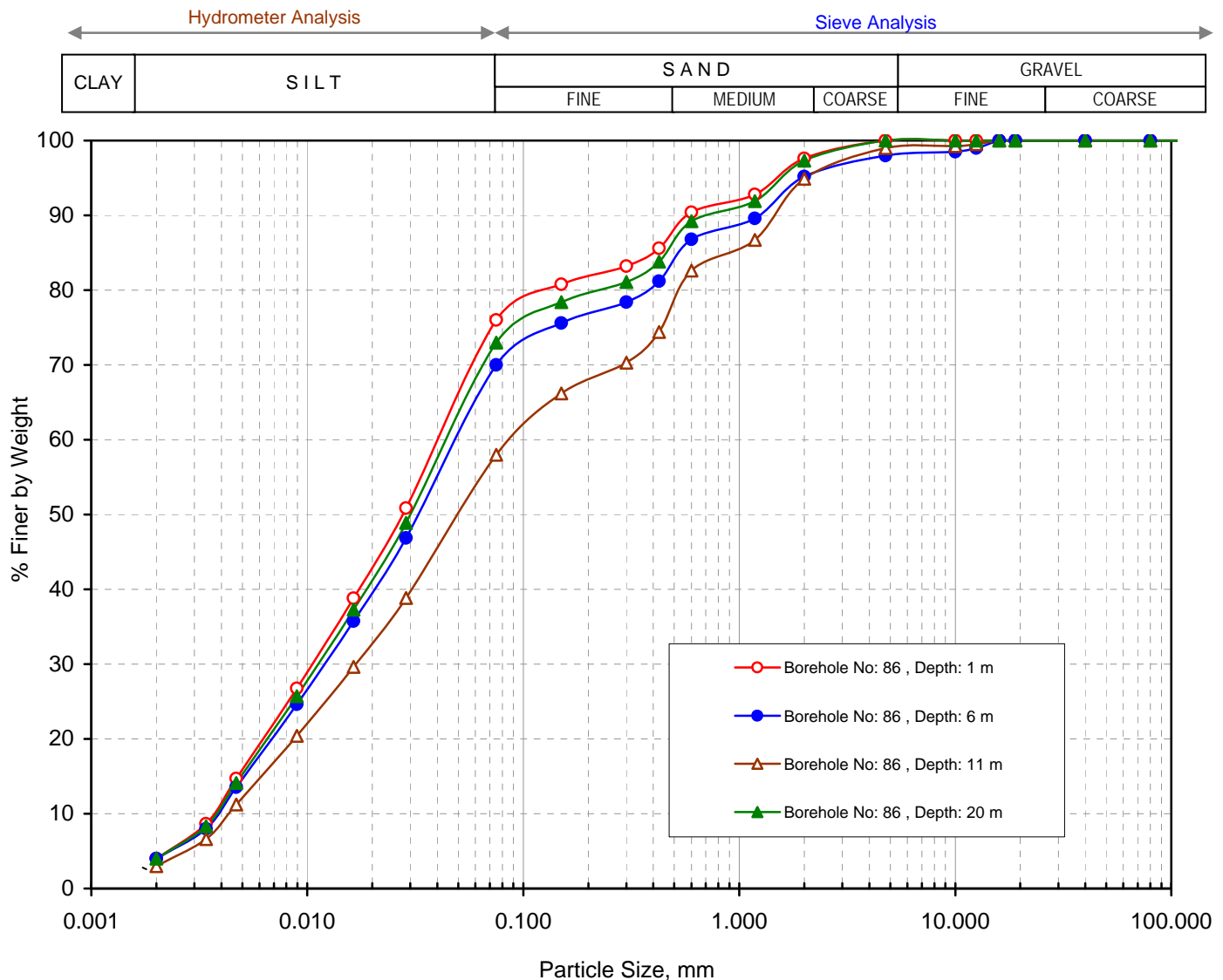




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-86	1.00	Sandy silt (CL)	0	24	72	4	0.046	0.011	0.004	11.5	0.66
BH-86	6.00	Sandy silt with traces of gravels (CL)	2	28	66	4	0.055	0.013	0.004	13.8	0.77
BH-86	11.00	Sandy silt with traces of gravels (CL)	1	41	55	3	0.093	0.017	0.004	23.3	0.78
BH-86	20.00	Sandy silt (CL)	0	27	69	4	0.050	0.012	0.004	12.5	0.72



Grain Size Distribution Curve

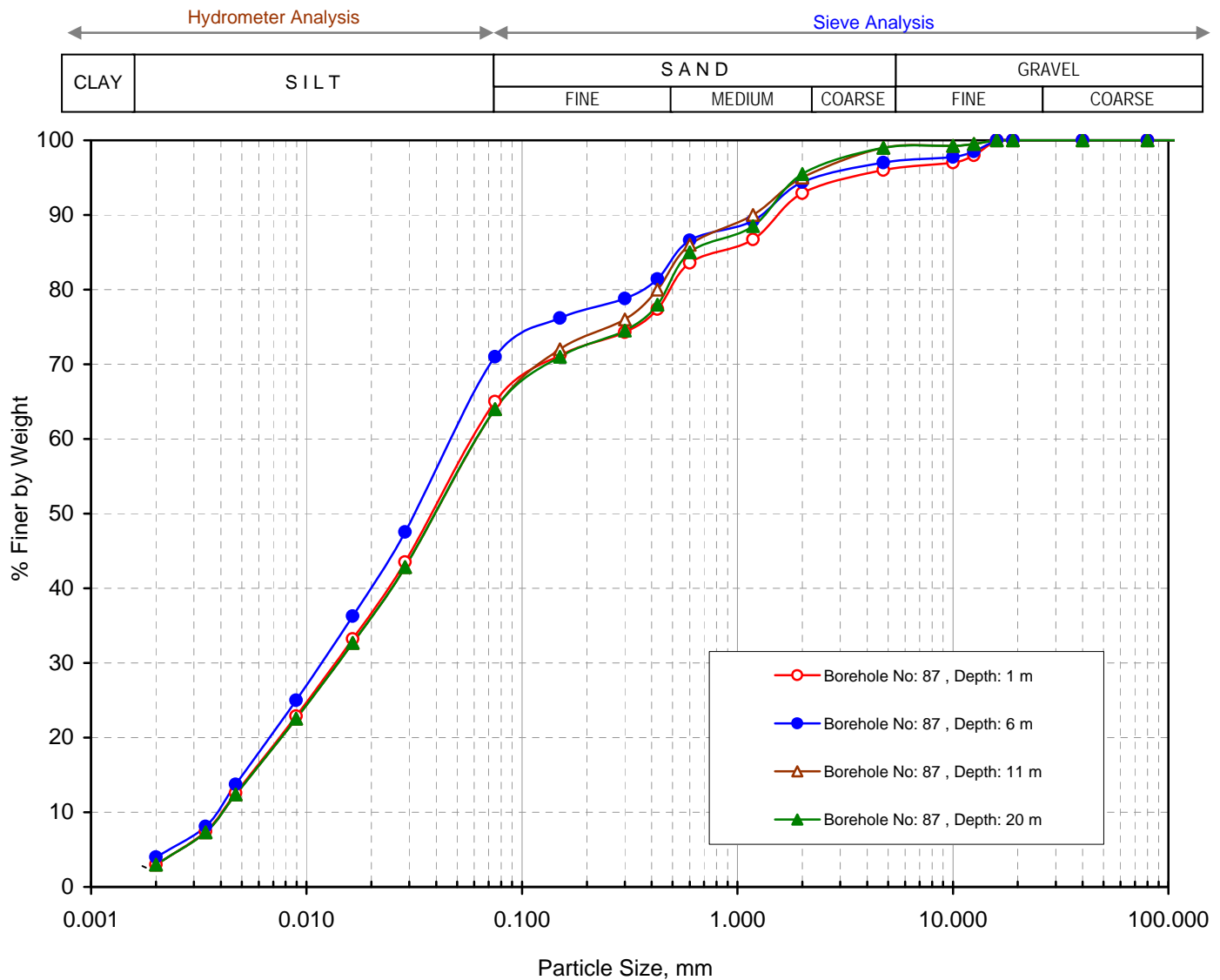




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-87	1.00	Sandy silt with traces of gravels (CL)	4	31	62	3	0.064	0.014	0.004	16.0	0.77
BH-87	6.00	Sandy silt with traces of gravels (CL)	3	26	67	4	0.053	0.012	0.004	13.3	0.68
BH-87	11.00	Sandy silt with traces of gravels (CL)	1	35	61	3	0.066	0.014	0.004	16.5	0.74
BH-87	20.00	Sandy silt with traces of gravels (CL)	1	35	61	3	0.066	0.014	0.004	16.5	0.74



Grain Size Distribution Curve

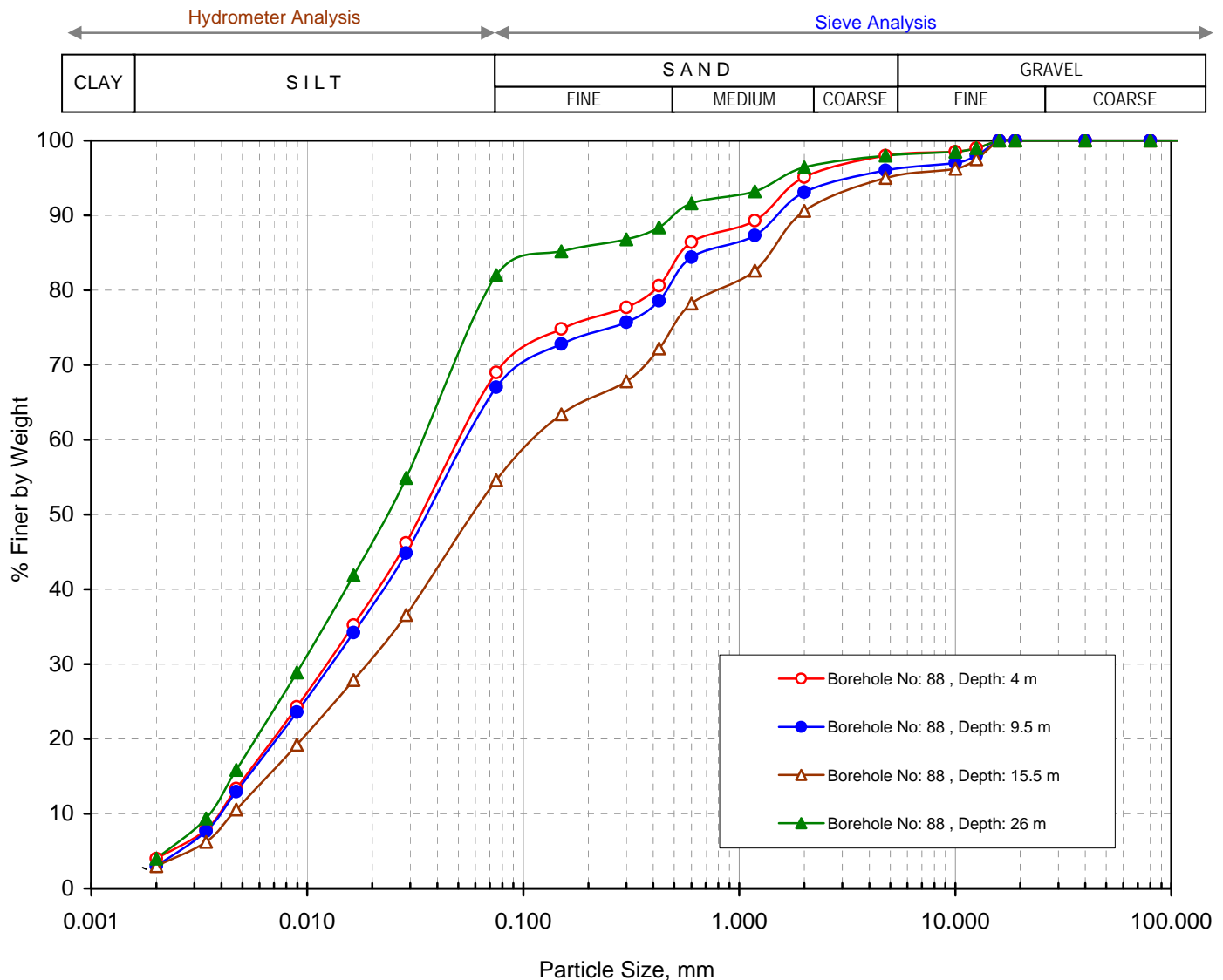




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-88	4.00	Sandy silt with traces of gravels (CL)	2	29	65	4	0.057	0.013	0.004	14.3	0.74
BH-88	9.50	Sandy silt with traces of gravels (CL)	4	29	64	3	0.060	0.013	0.004	15.0	0.70
BH-88	15.50	Sandy silt with gravels (CL)	5	40	52	3	0.121	0.019	0.005	24.2	0.60
BH-88	26.00	Sandy silt with traces of gravels (CL)	2	16	78	4	0.037	0.010	0.004	9.3	0.68



Grain Size Distribution Curve

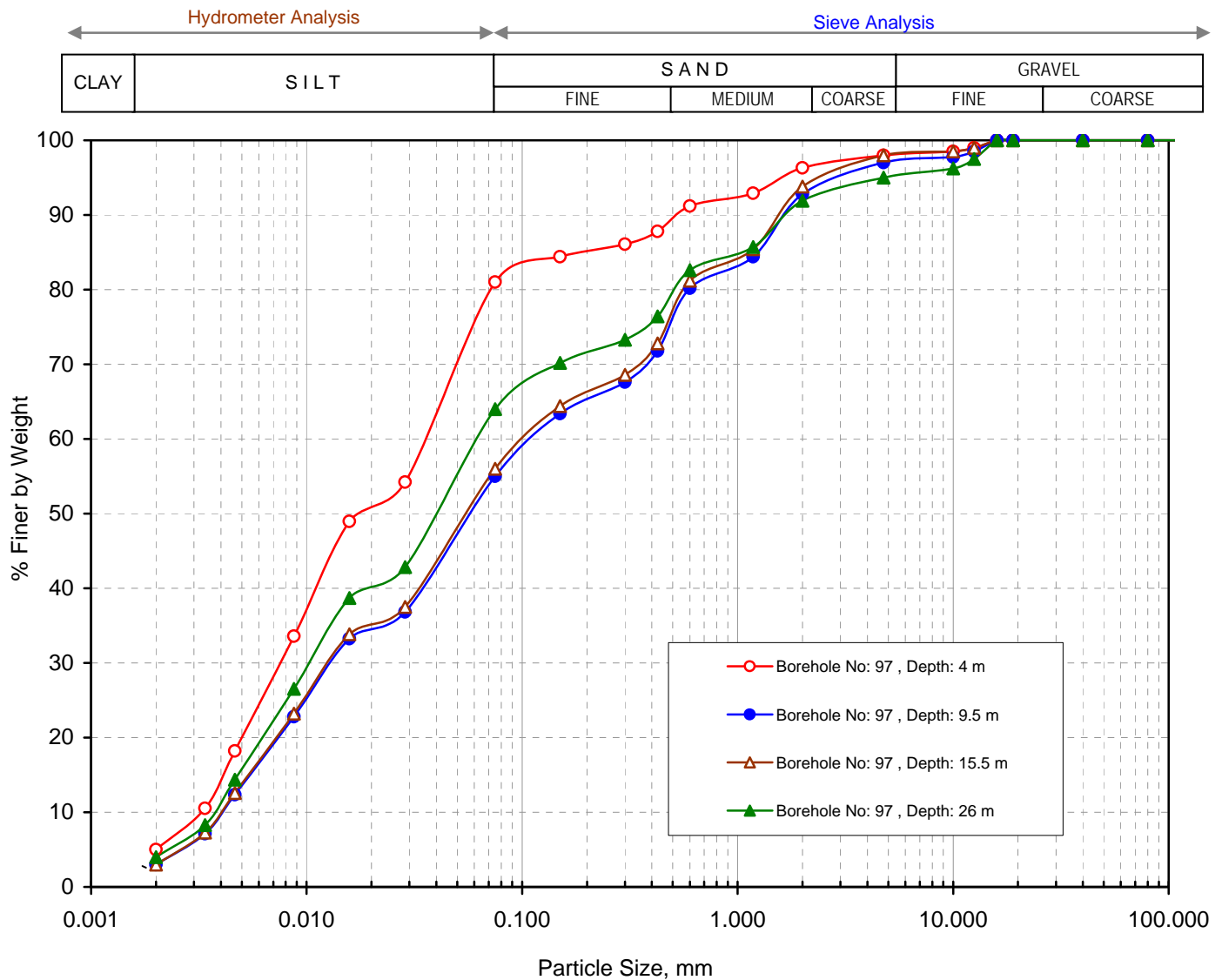




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-97	4.00	Sandy silt with traces of gravels (CL)	2	17	76	5	0.039	0.008	0.003	13.0	0.55
BH-97	9.50	Sandy silt with traces of gravels (CL)	3	42	52	3	0.120	0.014	0.004	30.0	0.41
BH-97	15.50	Sandy silt with traces of gravels (CL)	2	42	53	3	0.111	0.013	0.004	27.8	0.38
BH-97	26.00	Sandy silt with gravels (CL)	5	31	60	4	0.066	0.011	0.004	16.5	0.46



## Grain Size Distribution Curve

ISO/IEC 17025:2005  
Certified Laboratory  
(NABL)  
Certificate No. T-1741

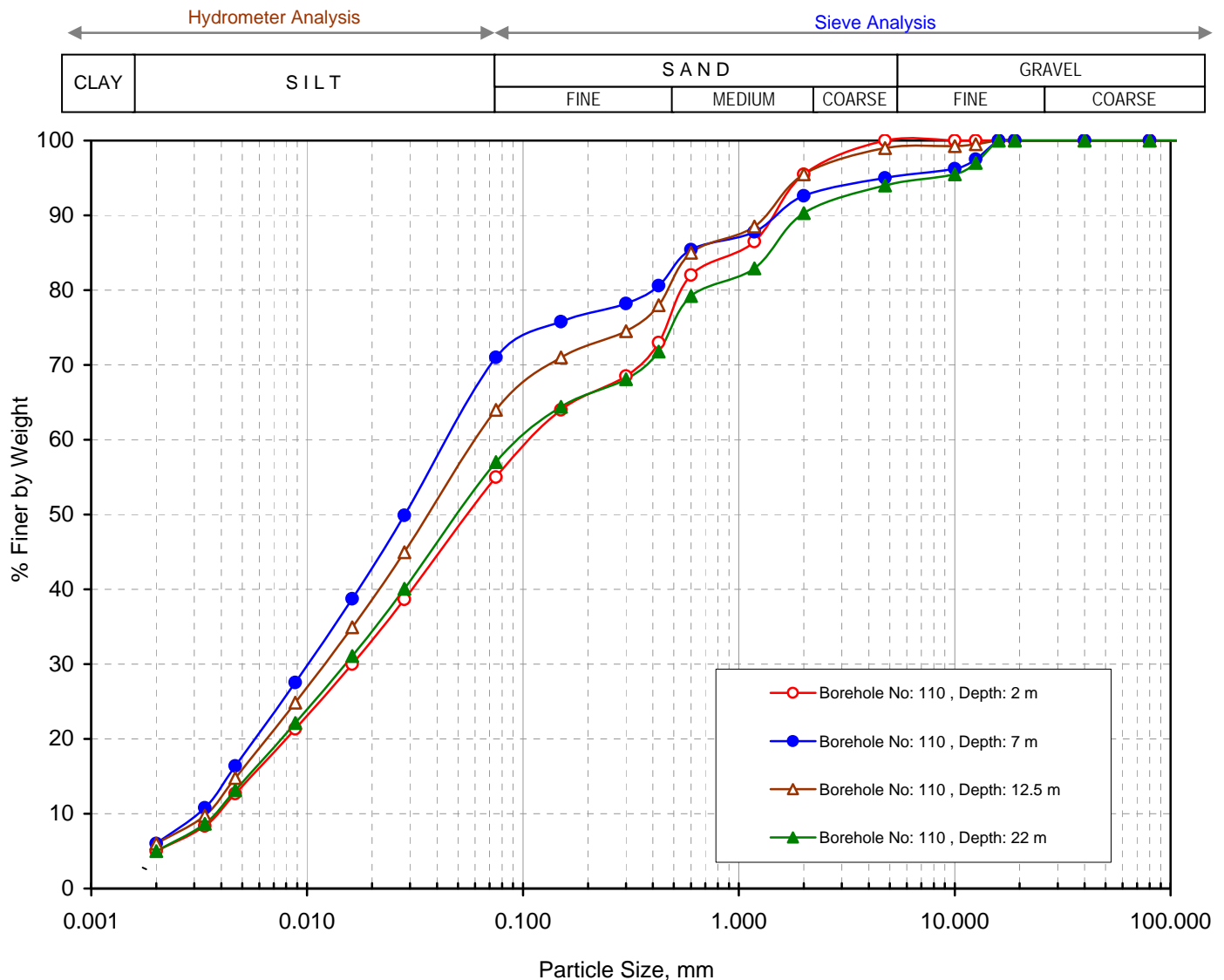




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-110	2.00	Sandy silt (CL)	0	45	50	5	0.117	0.016	0.004	29.3	0.55
BH-110	7.00	Sandy silt with gravels (CL)	5	24	65	6	0.051	0.010	0.003	17.0	0.65
BH-110	12.50	Sandy silt with traces of gravels (CL)	1	35	58	6	0.065	0.013	0.003	21.7	0.87
BH-110	22.00	Sandy silt with gravels (CL)	6	37	52	5	0.105	0.015	0.004	26.3	0.54



Grain Size Distribution Curve



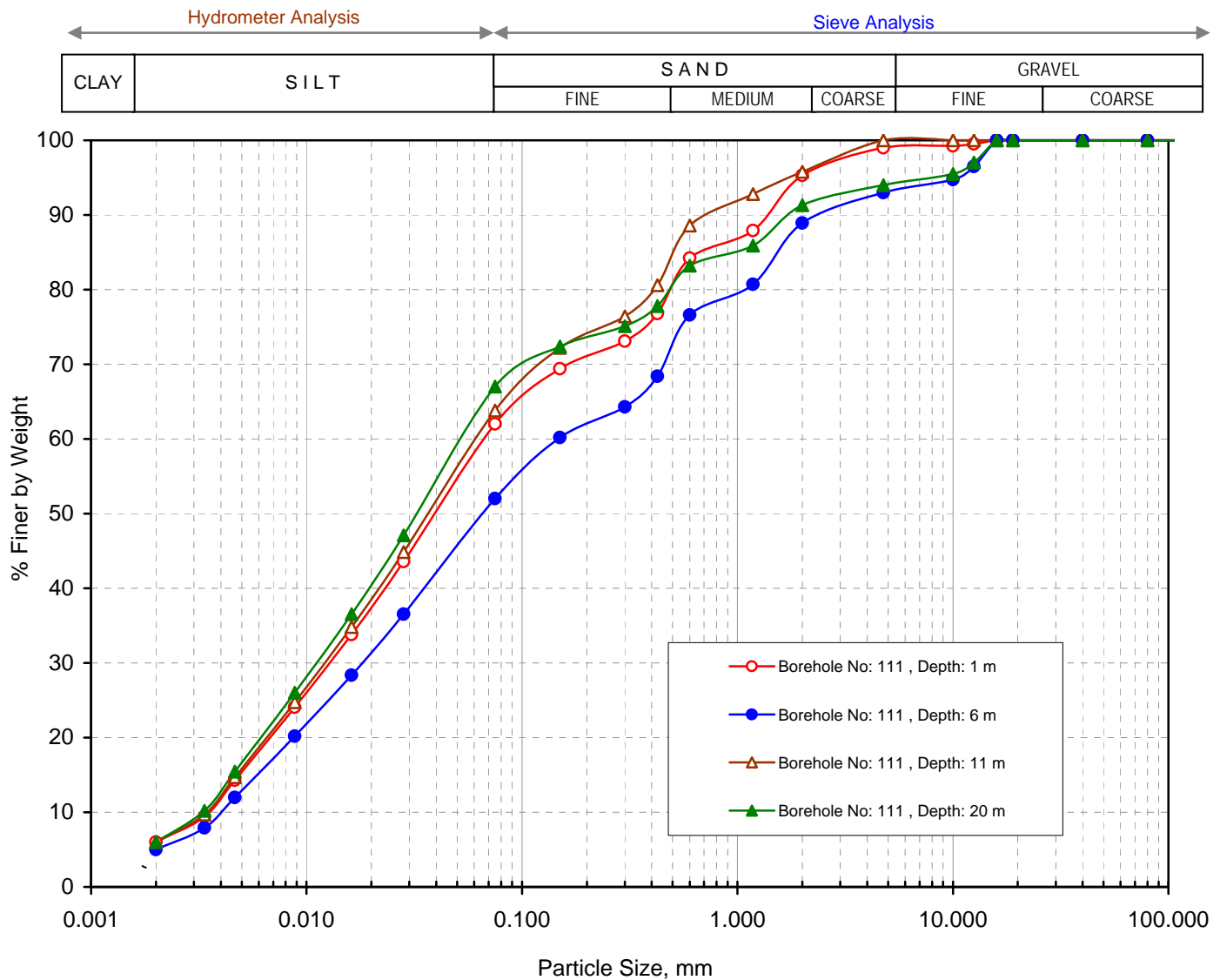




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-111	1.00	Sandy silt with traces of gravels (CL)	1	37	56	6	0.070	0.013	0.004	17.5	0.60
BH-111	6.00	Sandy silt with gravels (CL)	7	41	47	5	0.148	0.019	0.004	37.0	0.61
BH-111	11.00	Sandy silt (CL)	0	36	58	6	0.066	0.013	0.003	22.0	0.85
BH-111	20.00	Sandy silt with gravels (CL)	6	27	61	6	0.059	0.012	0.003	19.7	0.81



Grain Size Distribution Curve

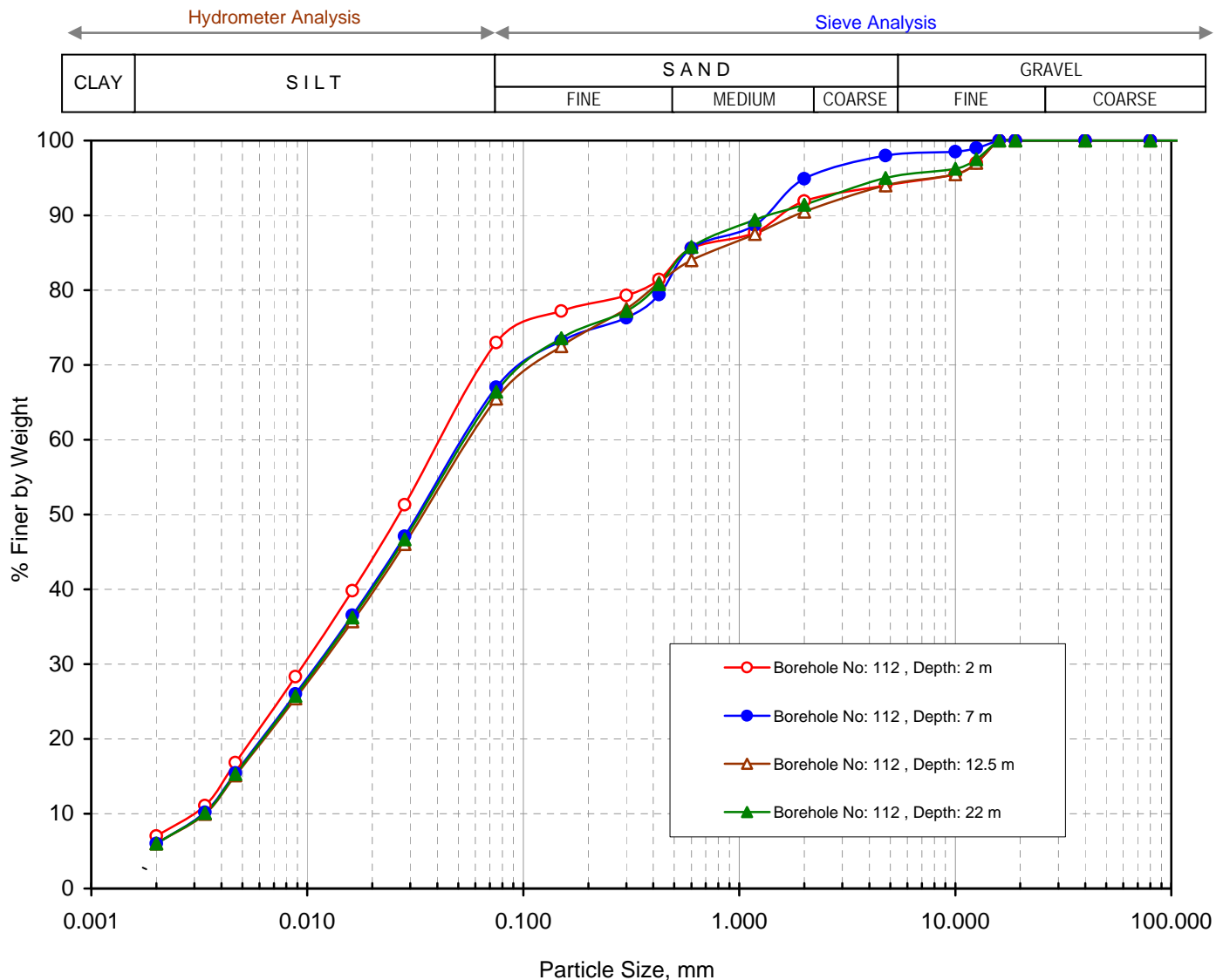




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-112	2.00	Sandy silt with gravels (CL)	6	21	66	7	0.047	0.010	0.003	15.7	0.71
BH-112	7.00	Sandy silt with traces of gravels (CL)	2	31	61	6	0.059	0.012	0.003	19.7	0.81
BH-112	12.50	Sandy silt with gravels (CL)	6	28	60	6	0.062	0.012	0.003	20.7	0.77
BH-112	22.00	Sandy silt with gravels (CL)	5	28	61	6	0.060	0.012	0.003	20.0	0.80



Grain Size Distribution Curve

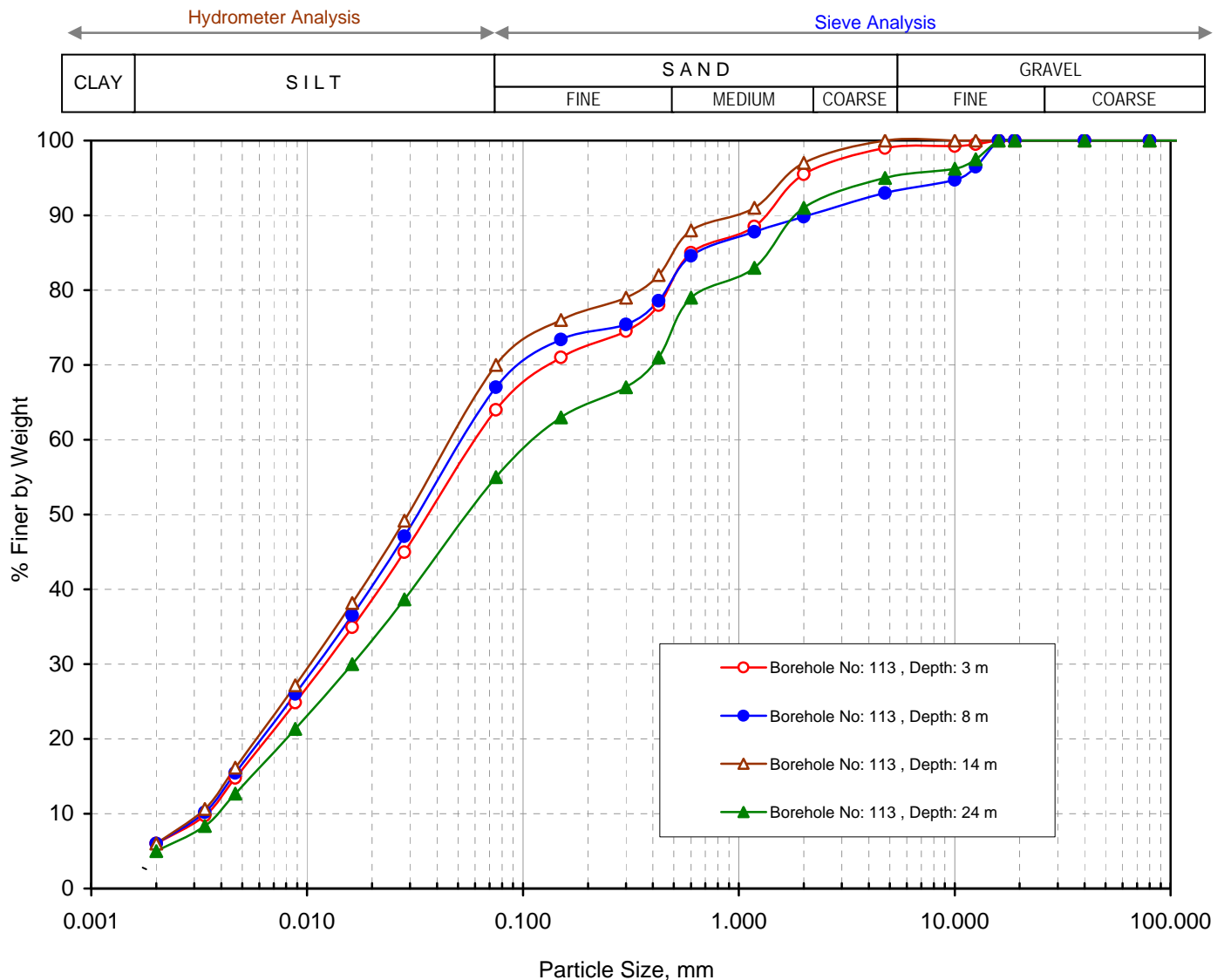




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-113	3.00	Sandy silt with traces of gravels (CL)	1	35	58	6	0.065	0.013	0.003	21.7	0.87
BH-113	8.00	Sandy silt with gravels (CL)	7	26	61	6	0.059	0.012	0.003	19.7	0.81
BH-113	14.00	Sandy silt (CL)	0	30	64	6	0.053	0.011	0.003	17.7	0.76
BH-113	24.00	Sandy silt with gravels (CL)	5	40	50	5	0.122	0.016	0.004	30.5	0.52



Grain Size Distribution Curve

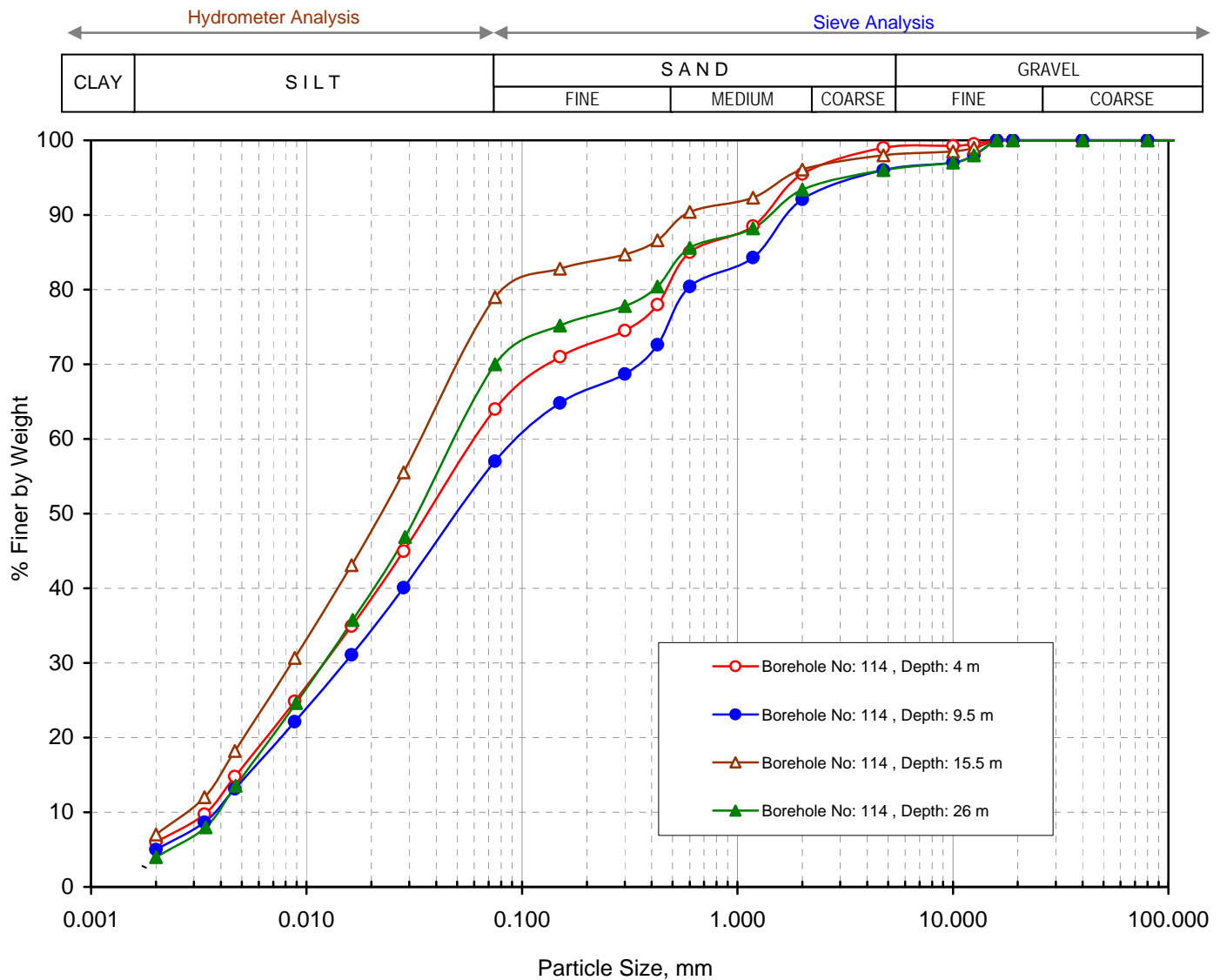




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-114	4.00	Sandy silt with traces of gravels (CL)	1	35	58	6	0.065	0.013	0.003	21.7	0.87
BH-114	9.50	Sandy silt with traces of gravels (CL)	4	39	52	5	0.104	0.015	0.004	26.0	0.54
BH-114	15.50	Sandy silt with traces of gravels (CL)	2	19	72	7	0.037	0.009	0.003	12.3	0.73
BH-114	26.00	Sandy silt with traces of gravels (CL)	4	26	66	4	0.055	0.013	0.004	13.8	0.77



Grain Size Distribution Curve

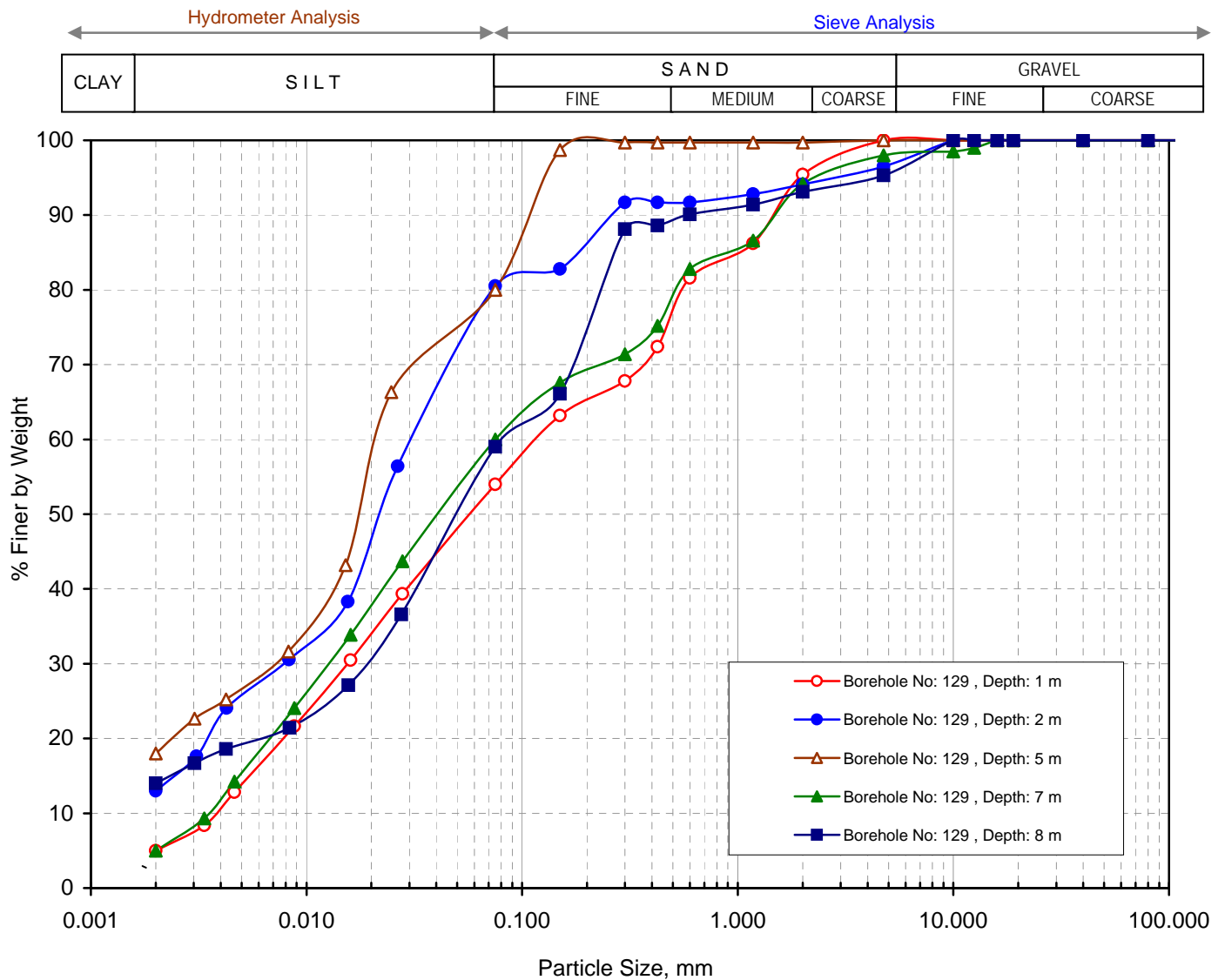




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-129	1.00	Sandy silt (CL)	0	46	49	5	0.124	0.016	0.004	31.0	0.52
BH-129	2.00	Sandy silt with traces of gravels (CL)	4	16	67	13	0.034	0.008			
BH-129	5.00	Sandy silt (CL)	0	20	62	18	0.022	0.007			
BH-129	7.00	Sandy silt with traces of gravels (CL)	2	38	55	5	0.075	0.013	0.004	18.8	0.56
BH-129	8.00	Sandy silt with gravels (CL)	5	36	45	14	0.086	0.019			



Grain Size Distribution Curve

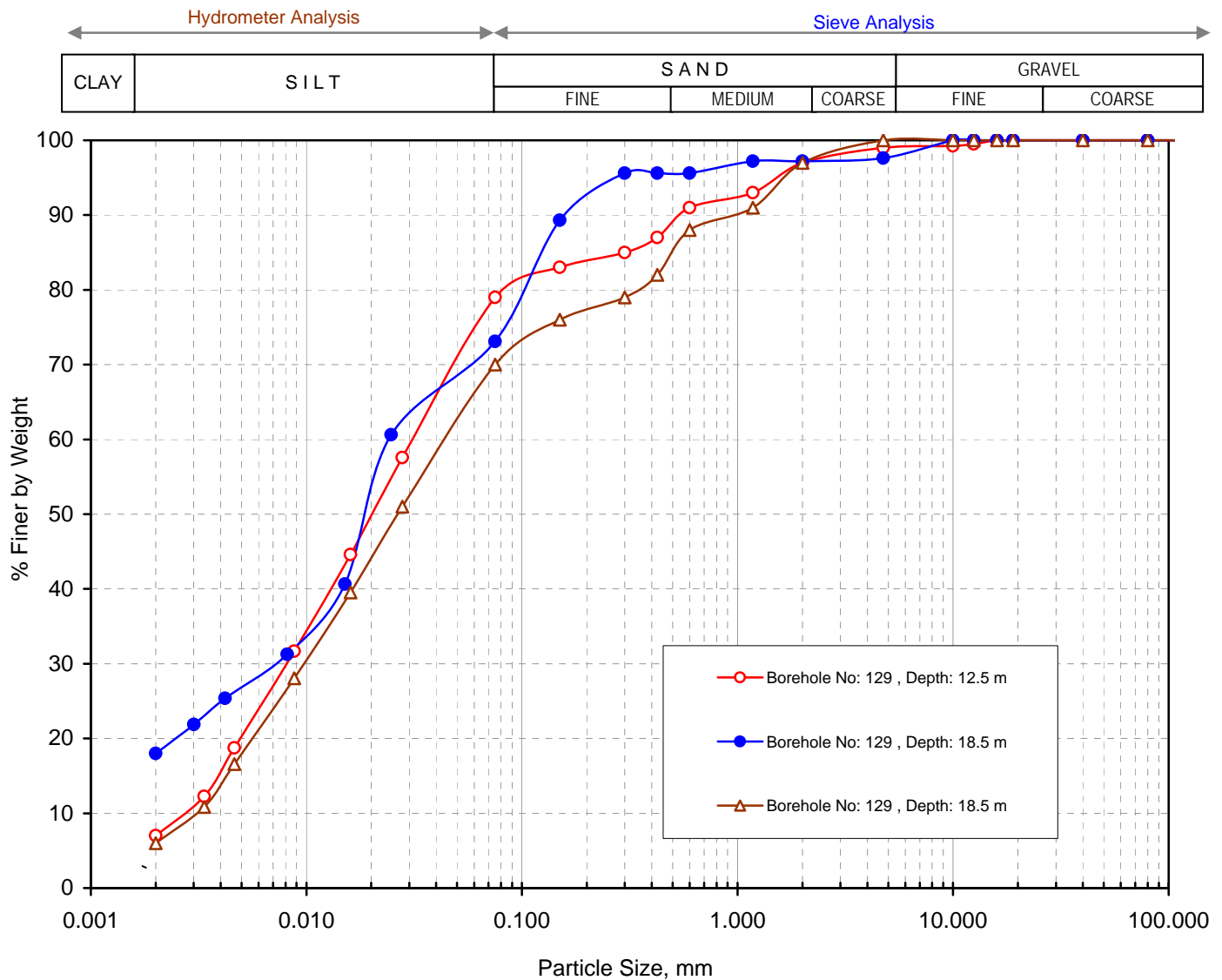




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-129	12.50	Sandy silt with traces of gravels (CL)	1	20	72	7	0.033	0.008	0.003	11.0	0.65
BH-129	18.50	Sandy silt with traces of gravels (CL)	2	24	56	18	0.024	0.007			

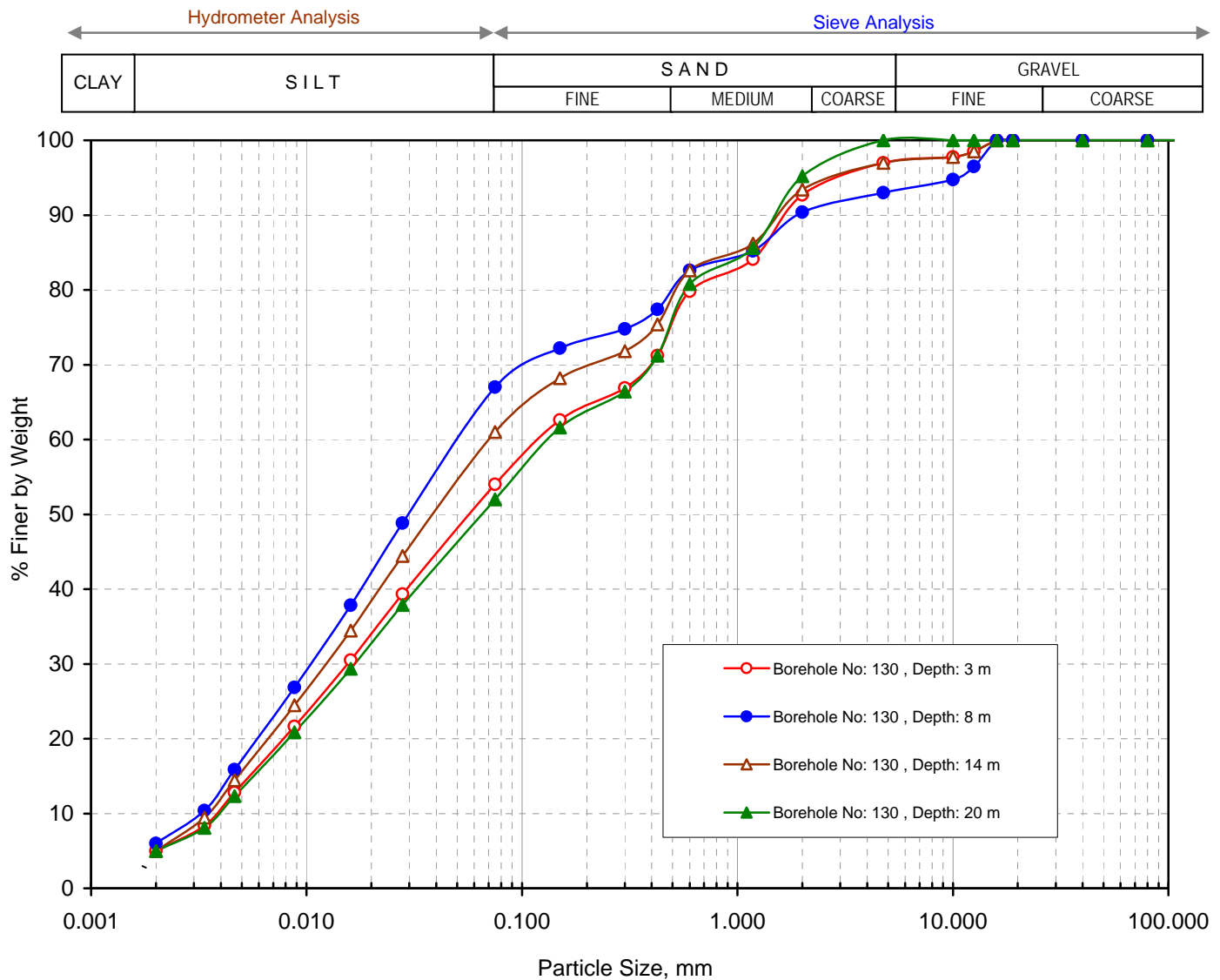




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-130	3.00	Sandy silt with traces of gravels (CL)	3	43	49	5	0.127	0.016	0.004	31.8	0.50
BH-130	8.00	Sandy silt with gravels (CL)	7	26	61	6	0.057	0.011	0.003	19.0	0.71
BH-130	14.00	Sandy silt with traces of gravels (CL)	3	36	56	5	0.072	0.013	0.003	24.0	0.78
BH-130	20.00	Sandy silt (CL)	0	48	47	5	0.138	0.017	0.004	34.5	0.52



Grain Size Distribution Curve

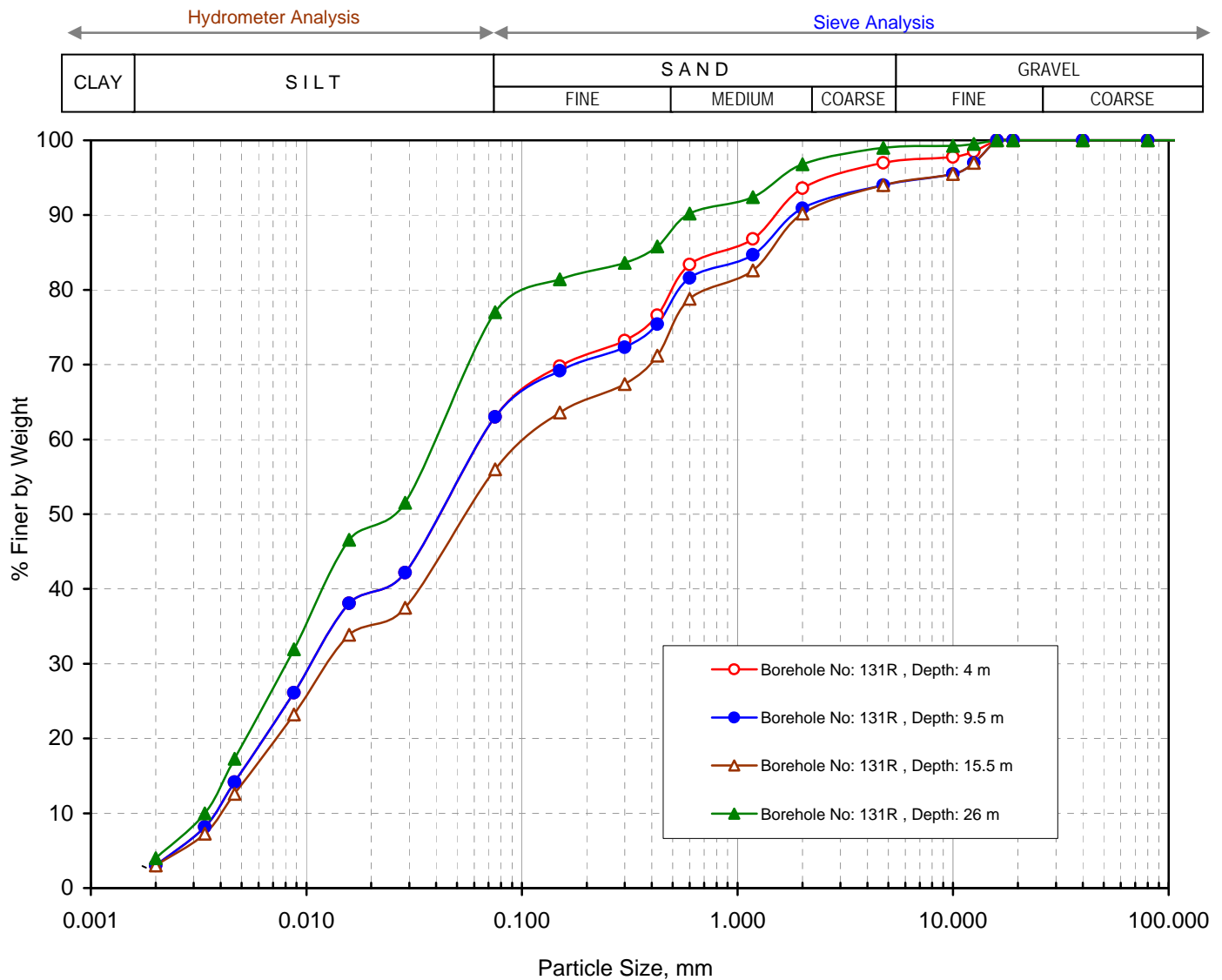




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-131R	4.00	Sandy silt (CL)	3	34	60	3	0.068	0.011	0.004	17.0	0.44
BH-131R	9.50	Sandy silt with gravels (CL)	6	31	60	3	0.068	0.011	0.004	17.0	0.44
BH-131R	15.50	Sandy silt with gravels (CL)	6	38	53	3	0.114	0.013	0.004	28.5	0.37
BH-131R	26.00	Sandy silt with traces of gravels (CL)	1	22	73	4	0.044	0.008	0.003	14.7	0.48



Grain Size Distribution Curve



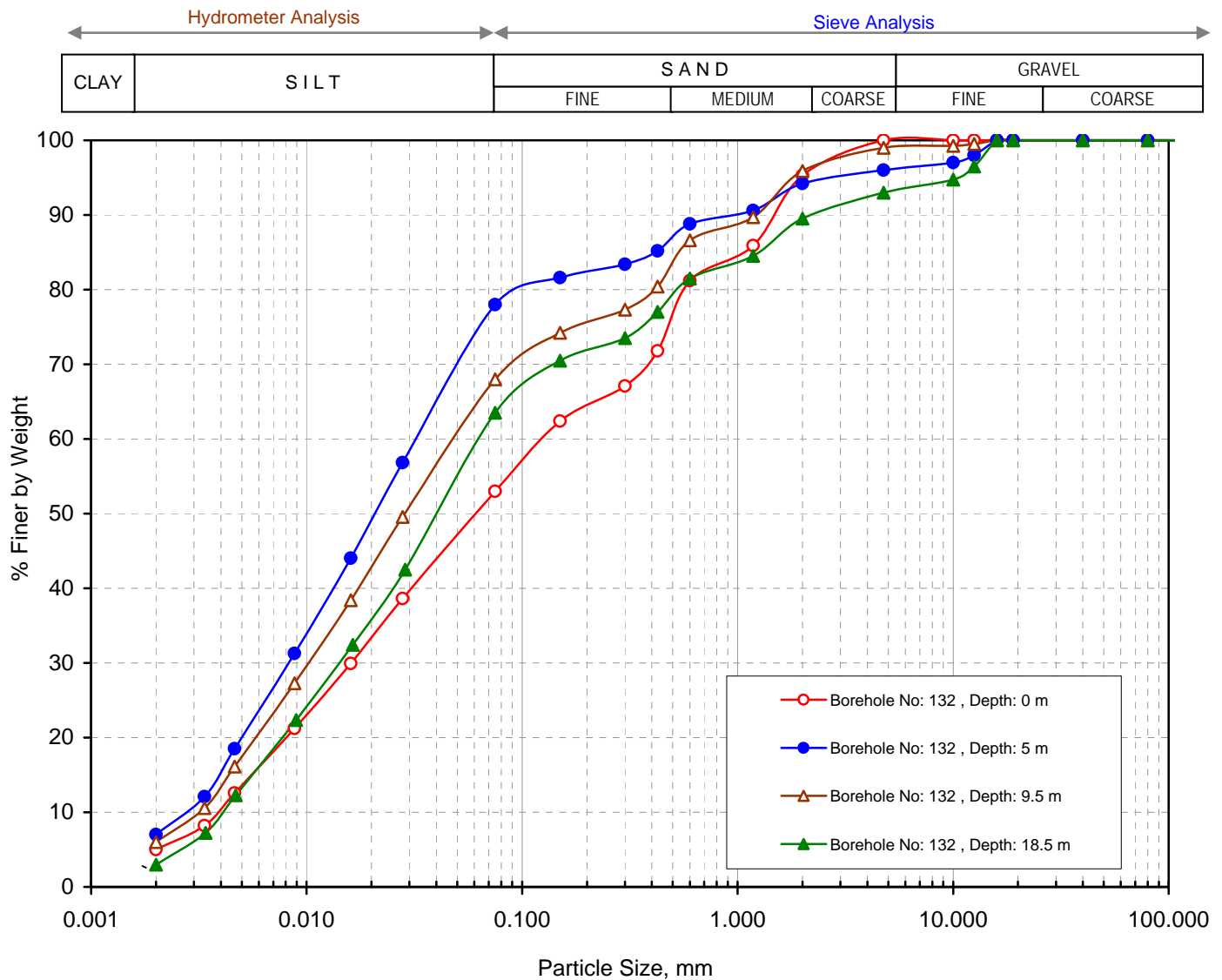




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-132	0.00	Sandy silt (CL)	0	47	48	5	0.131	0.016	0.004	32.8	0.49
BH-132	5.00	Sandy silt with traces of gravels (CL)	4	18	71	7	0.035	0.008	0.003	11.7	0.61
BH-132	9.50	Sandy silt with traces of gravels (CL)	1	31	62	6	0.055	0.011	0.003	18.3	0.73
BH-132	18.50	Sandy silt with gravels (CL)	7	29	61	3	0.067	0.015	0.004	16.8	0.84



Grain Size Distribution Curve

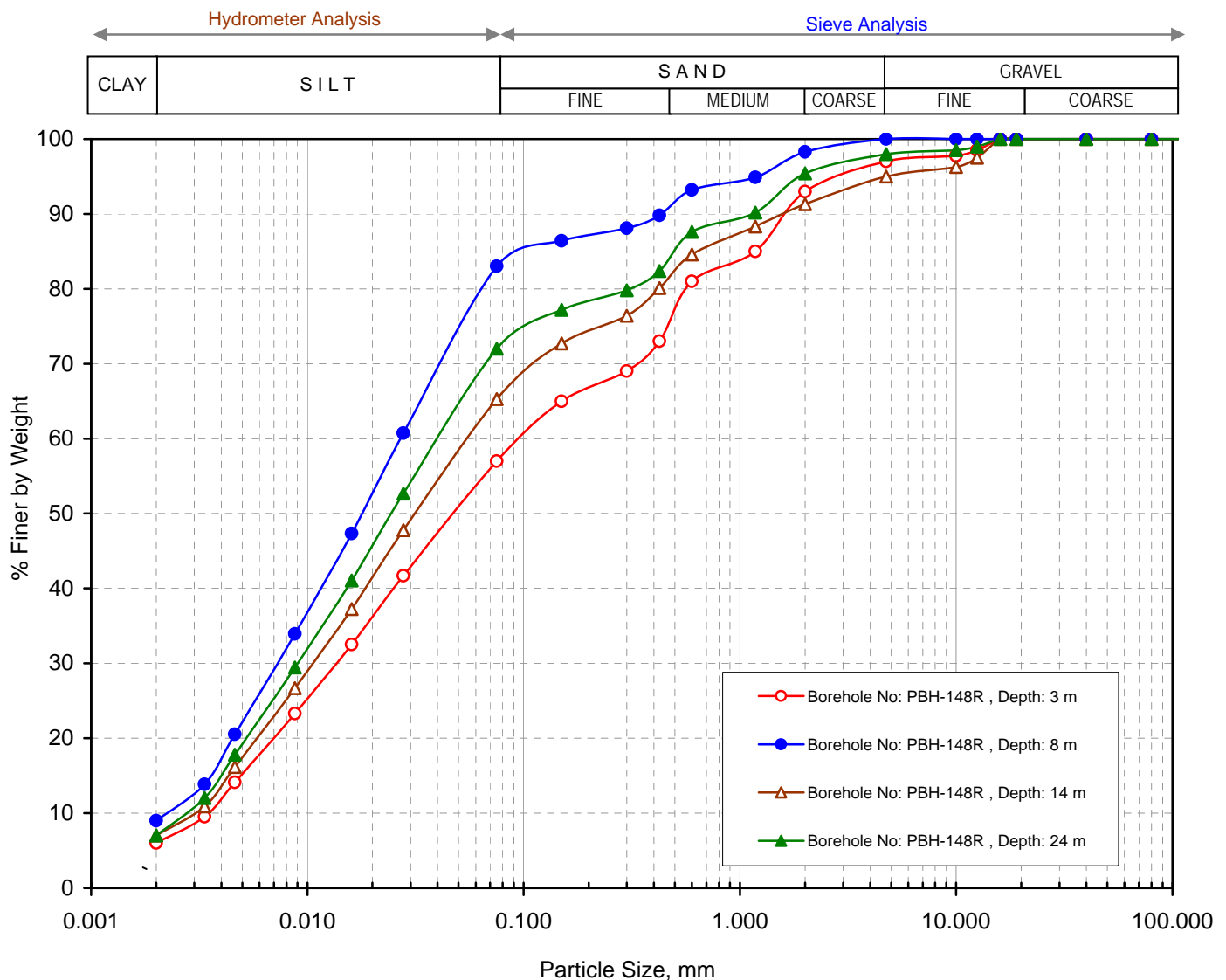




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
PBH-148R	3.00	Sandy silt with traces of gravels (CL)	3	40	51	6	0.103	0.014	0.003	34.3	0.63
PBH-148R	8.00	Sandy silt (CL)	0	17	74	9	0.027	0.008	0.002	13.5	1.19
PBH-148R	14.00	Sandy silt with gravels (CL)	5	29	59	7	0.061	0.011	0.003	20.3	0.66
PBH-148R	24.00	Sandy silt with traces of gravels (CL)	2	26	65	7	0.046	0.009	0.003	15.3	0.59



Grain Size Distribution Curve

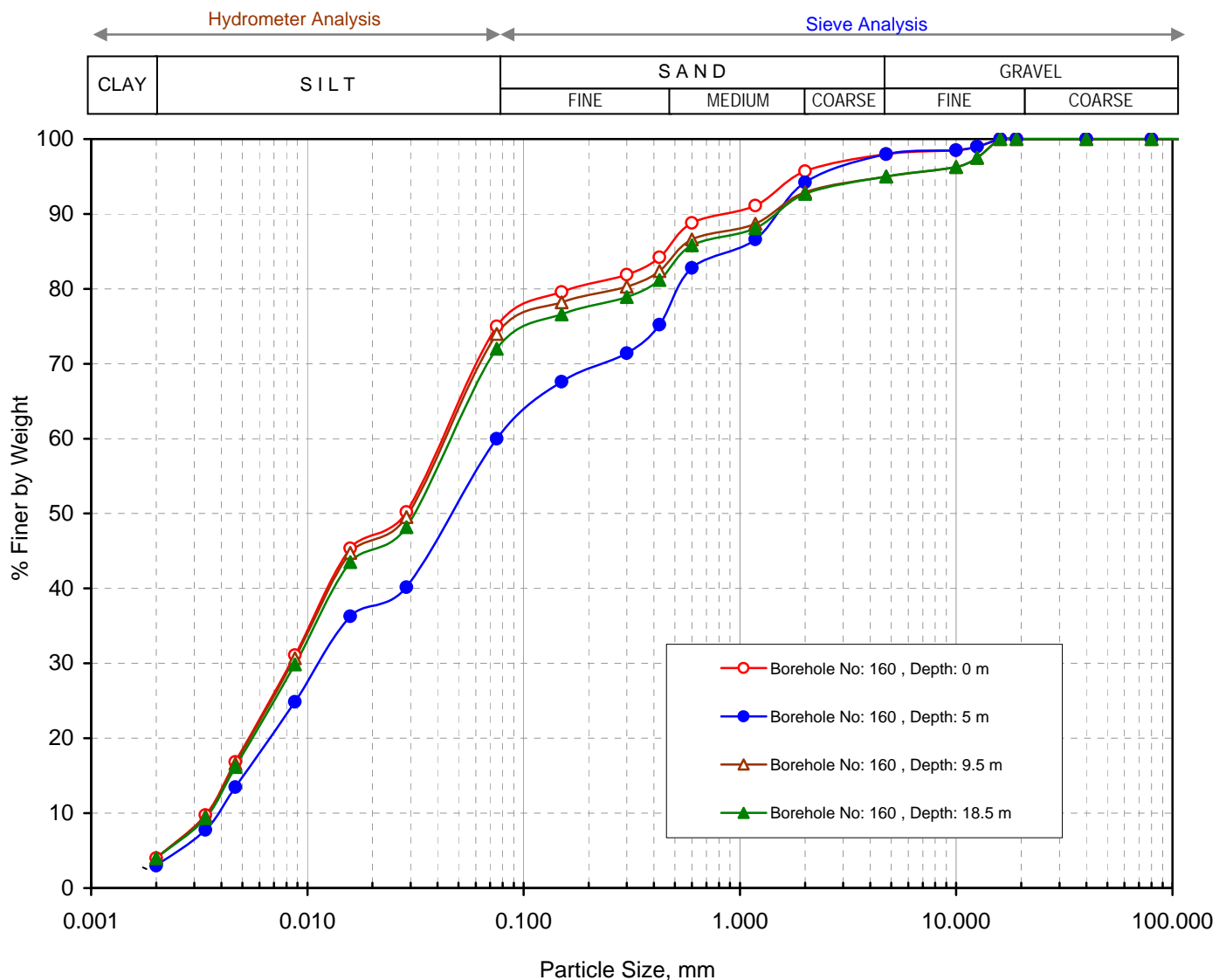




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-160	0.00	Sandy silt with traces of gravels (CL)	2	23	71	4	0.047	0.008	0.003	15.7	0.45
BH-160	5.00	Sandy silt with traces of gravels (CL)	2	38	57	3	0.075	0.012	0.004	18.8	0.48
BH-160	9.50	Sandy silt with gravels (CL)	5	21	70	4	0.048	0.009	0.003	16.0	0.56
BH-160	18.50	Sandy silt with gravels (CL)	5	23	68	4	0.052	0.009	0.004	13.0	0.39



Grain Size Distribution Curve

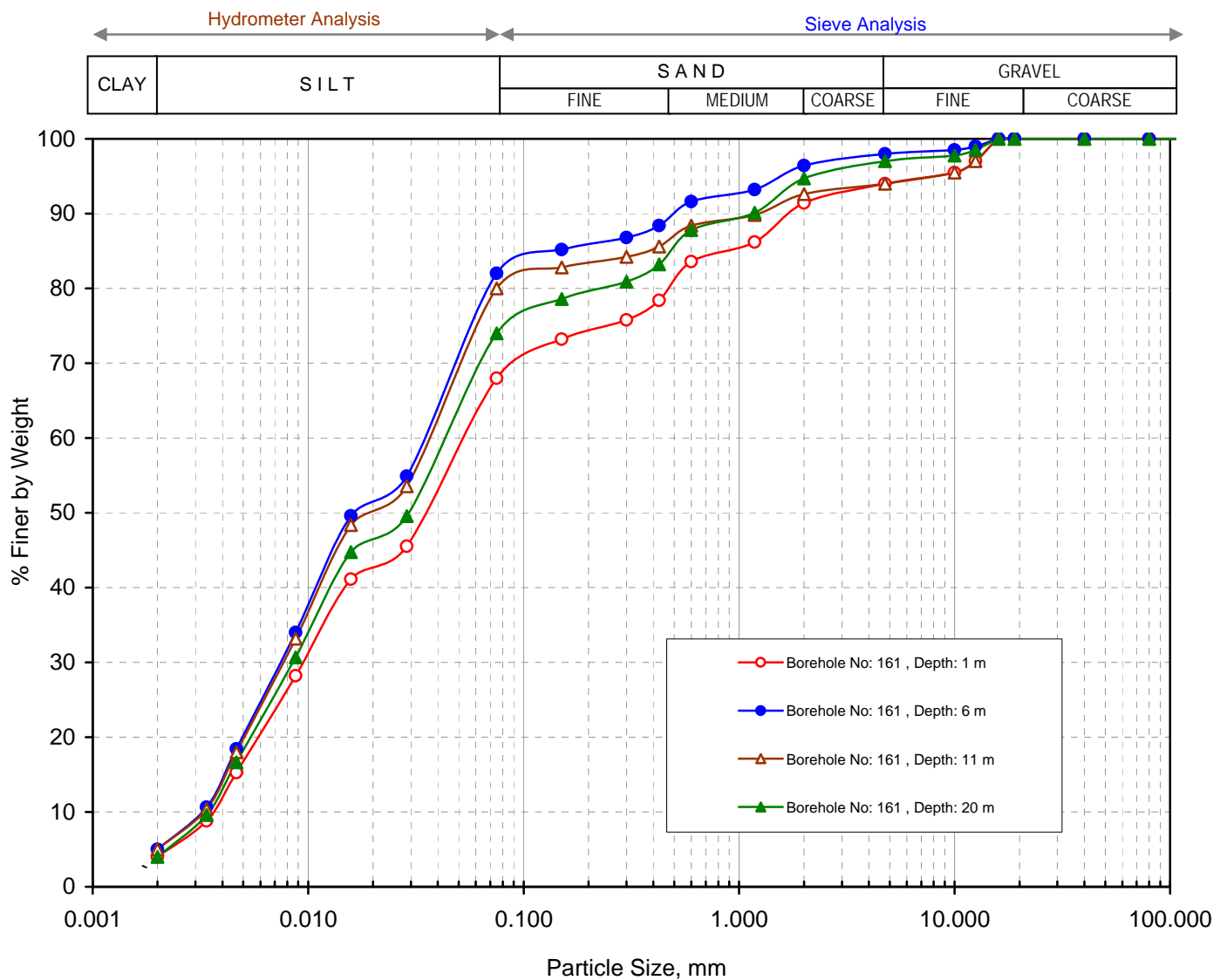




## Grain Size Analysis

IS : 2720 (Part 4) - 1985, RA-2010

Sample Details			Test Results								
Borehole Number	Sample Depth, m	Sample Description	% Gravel	% Sand	% Silt	% Clay	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	C <sub>u</sub>	C <sub>c</sub>
BH-161	1.00	Sandy silt with gravels (CL)	6	26	64	4	0.059	0.010	0.004	14.8	0.42
BH-161	6.00	Sandy silt with traces of gravels (CL)	2	16	77	5	0.037	0.008	0.003	12.3	0.58
BH-161	11.00	Sandy silt with gravels (CL)	6	14	75	5	0.040	0.008	0.003	13.3	0.53
BH-161	20.00	Sandy silt with traces of gravels (CL)	3	23	70	4	0.048	0.009	0.003	16.0	0.56



Grain Size Distribution Curve

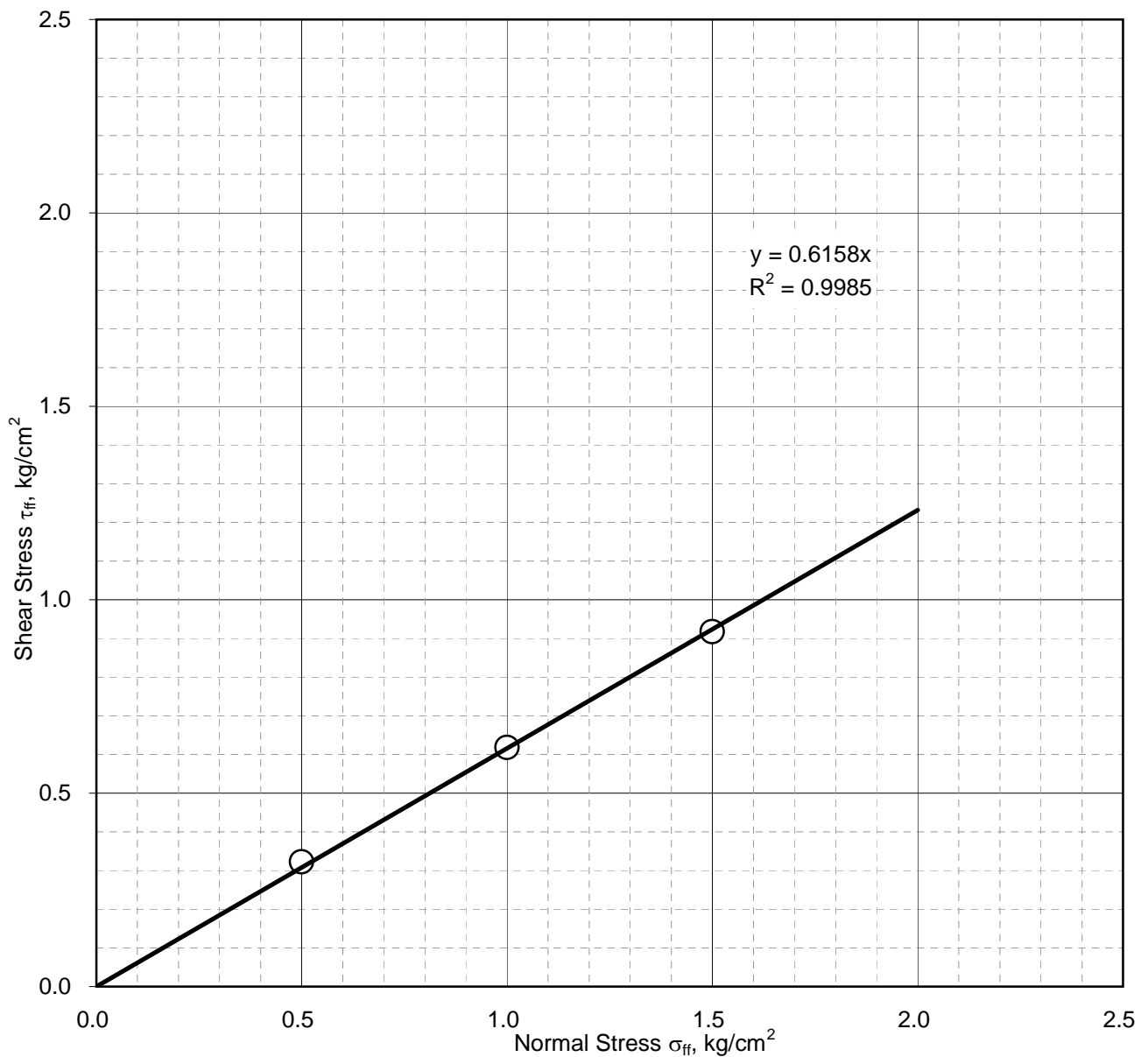




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-60	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.64
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.6 degrees



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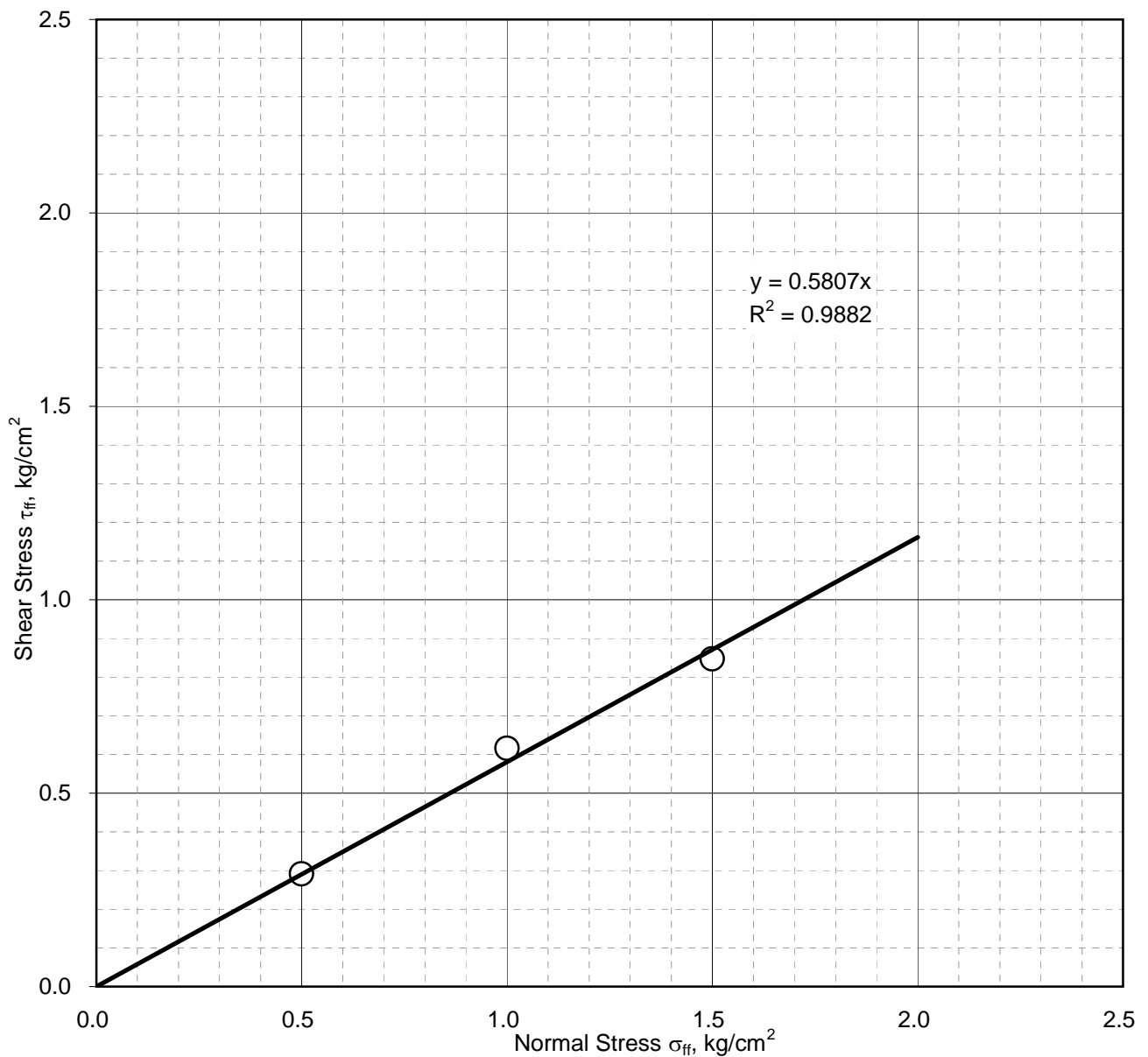




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-68	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.1 degrees



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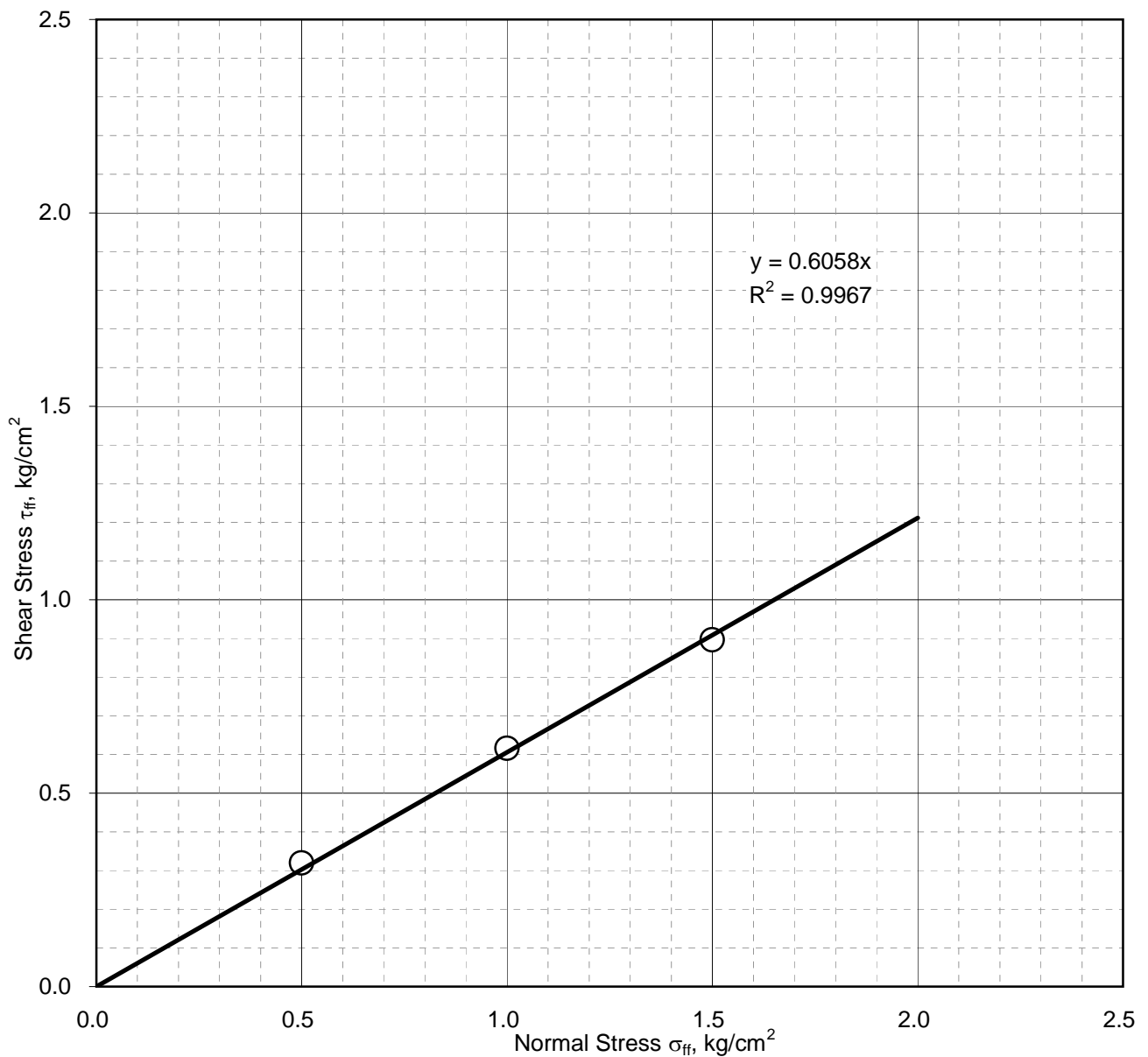




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-69	Sample Depth: 11 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.61
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.2 degrees



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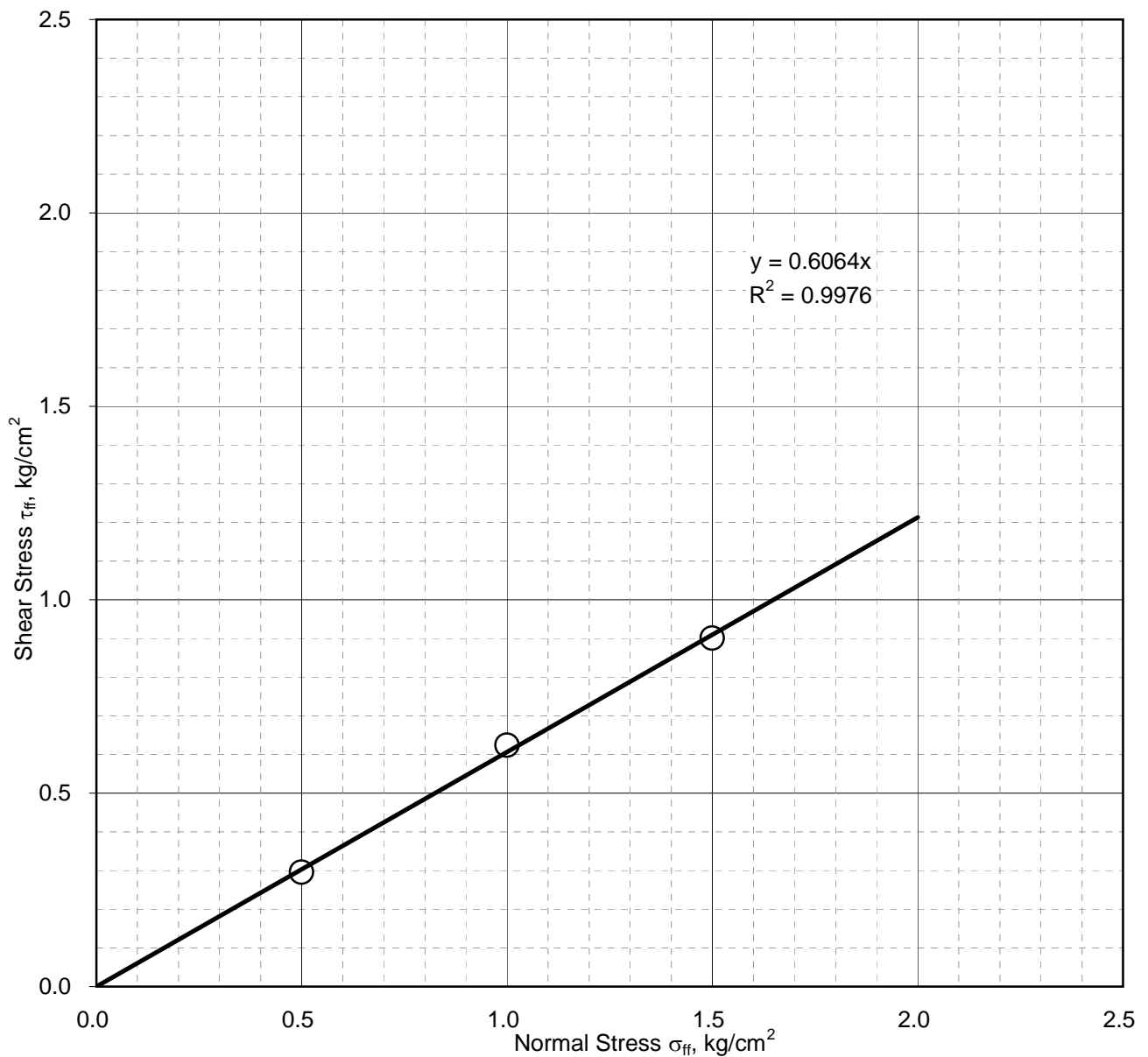




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-70	Sample Depth: 8 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.60
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.2 degrees



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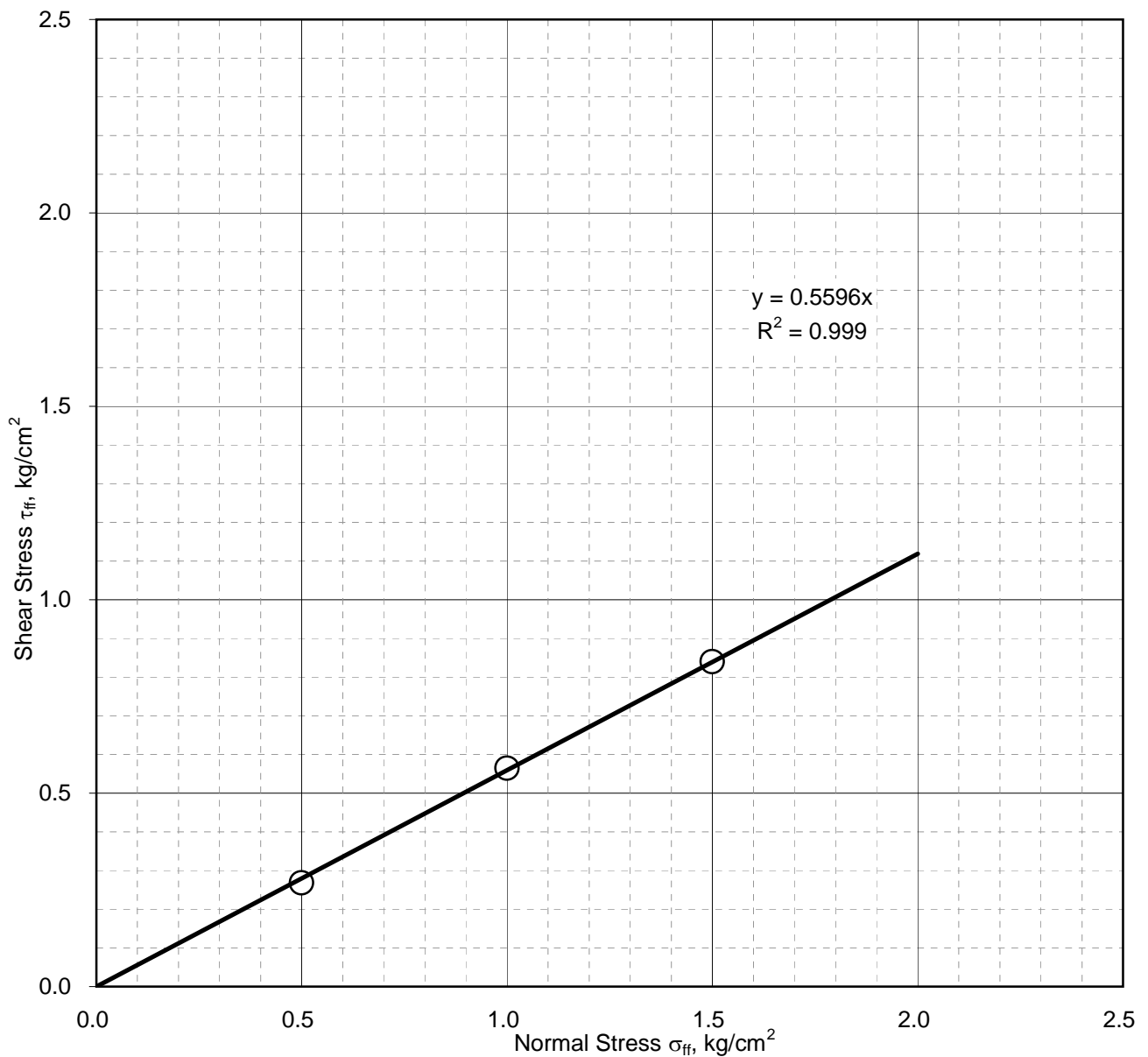




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-71	Sample Depth: 4 m
	Sample No.: UDS-1	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.54
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.2 degrees



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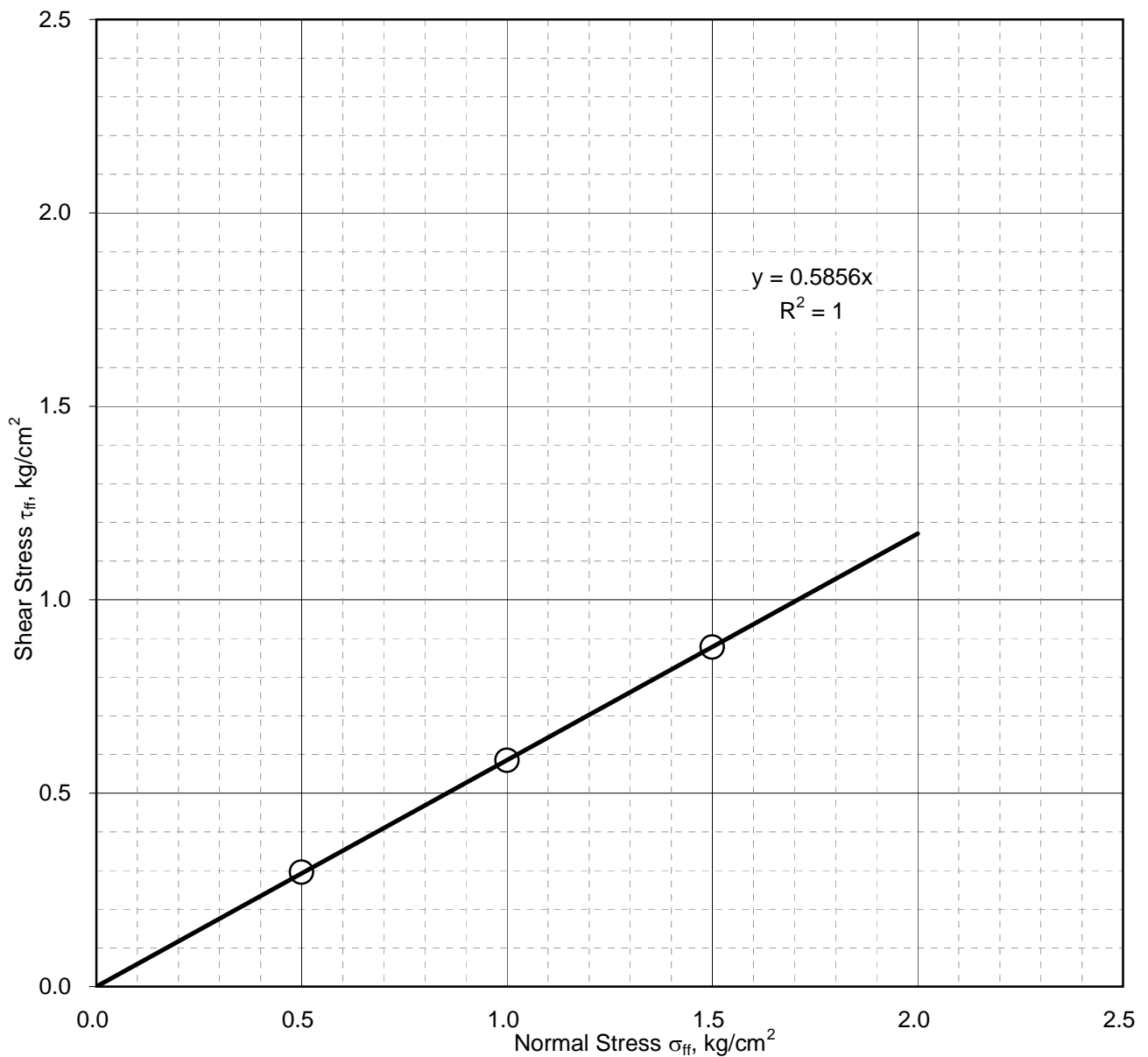




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-72	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.55
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.4 degrees



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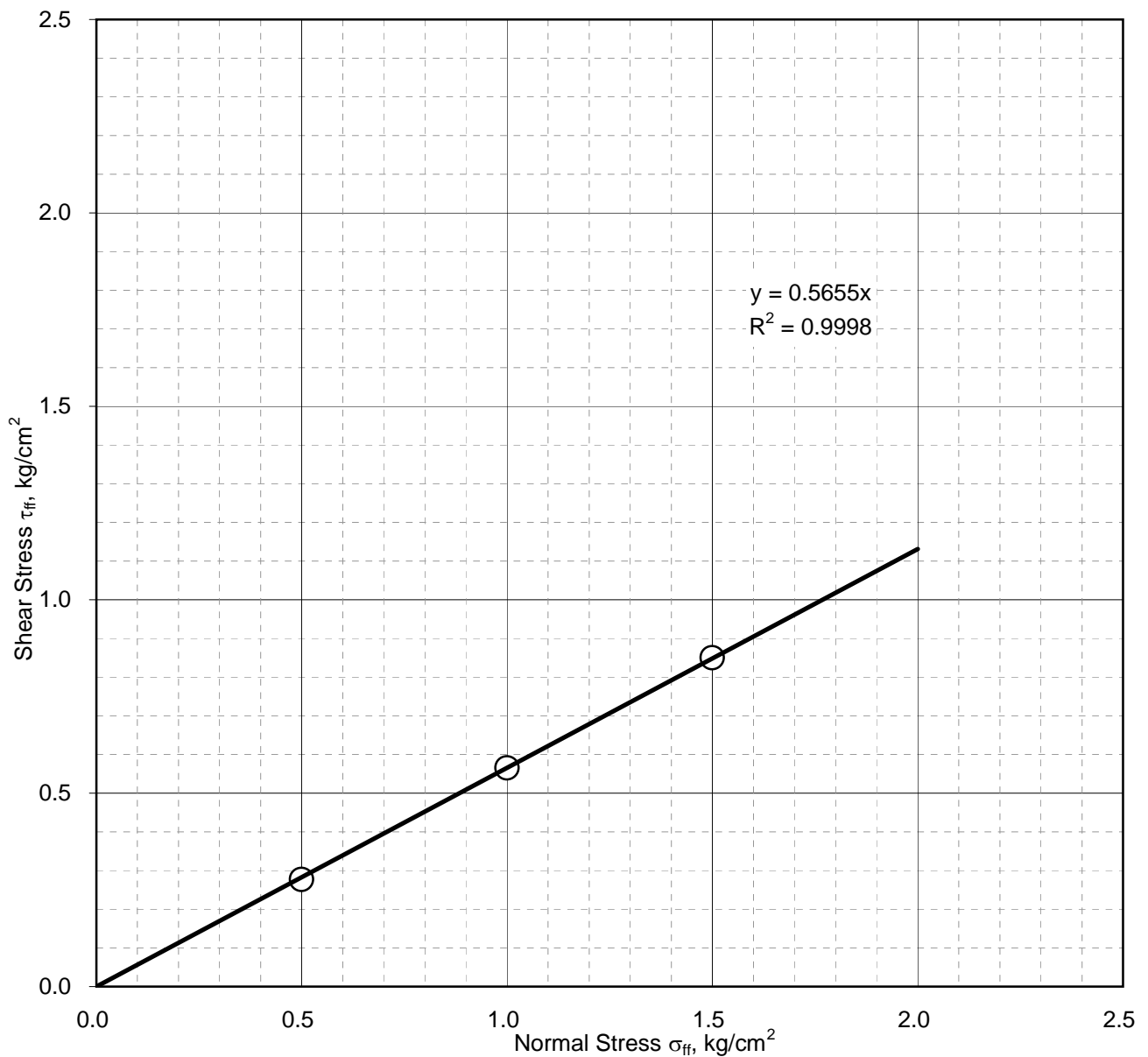




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-78	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.57
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.5 degrees



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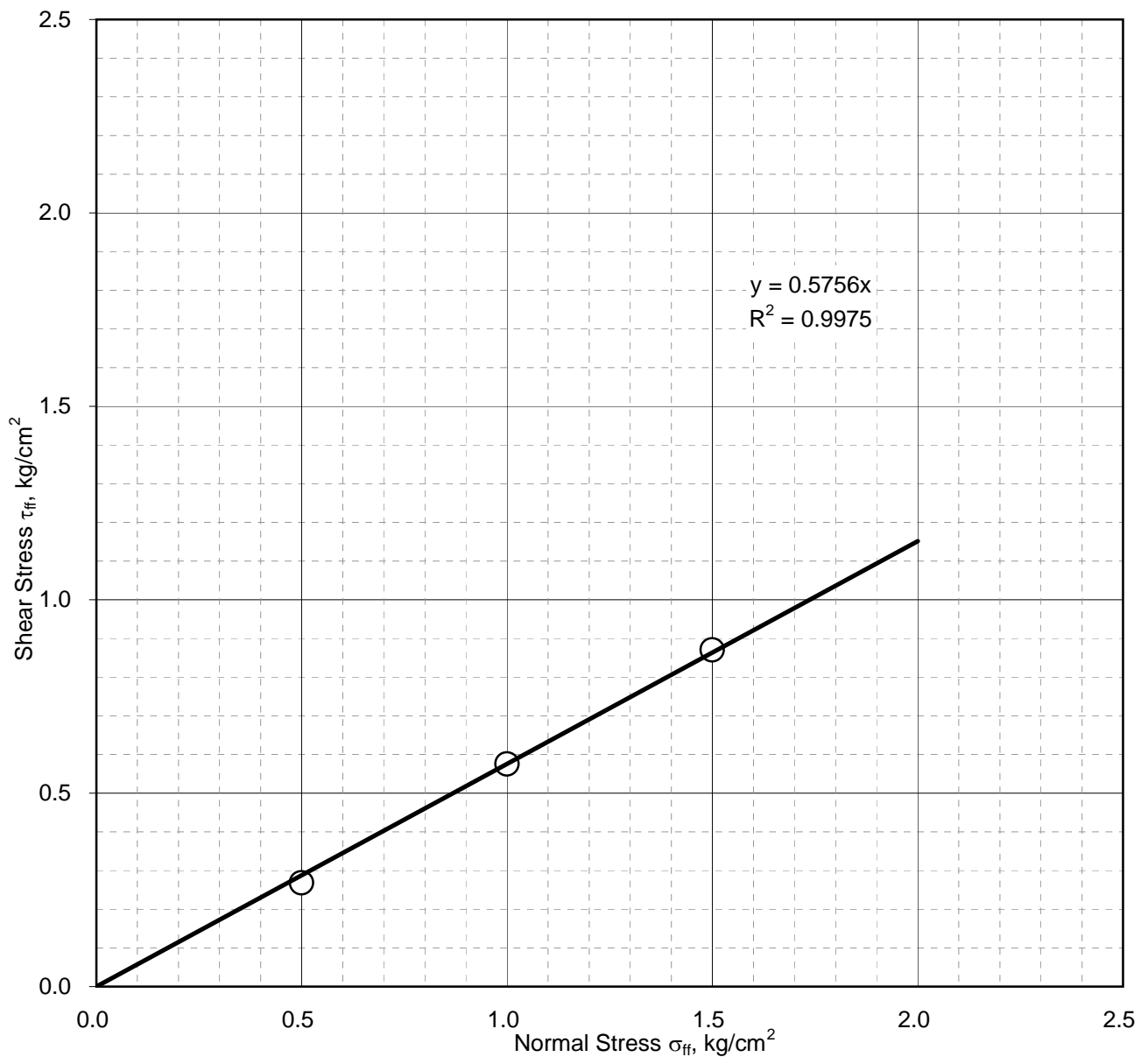




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-79	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.58
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.9 degrees



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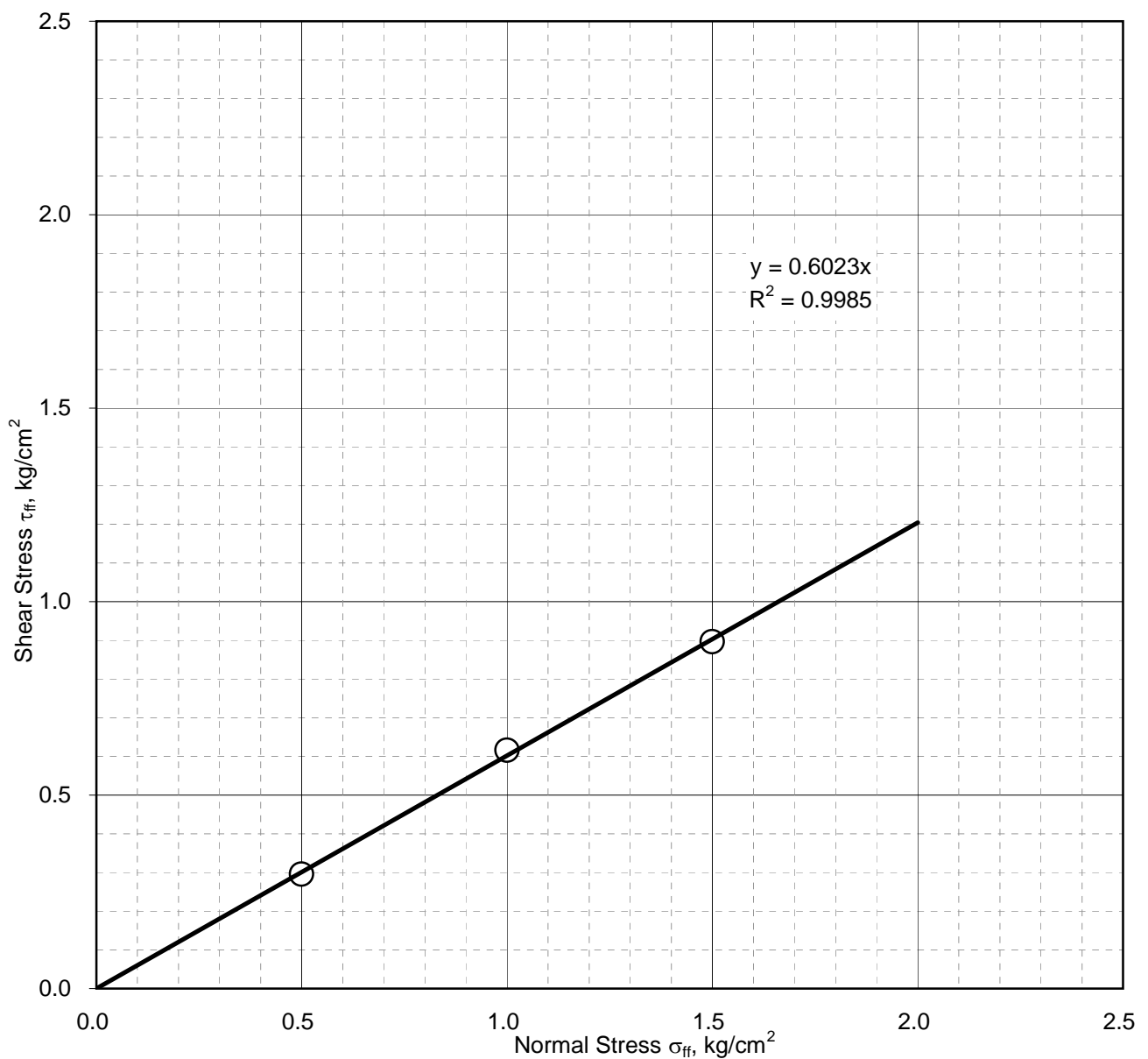




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-80	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.60
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.1 degrees



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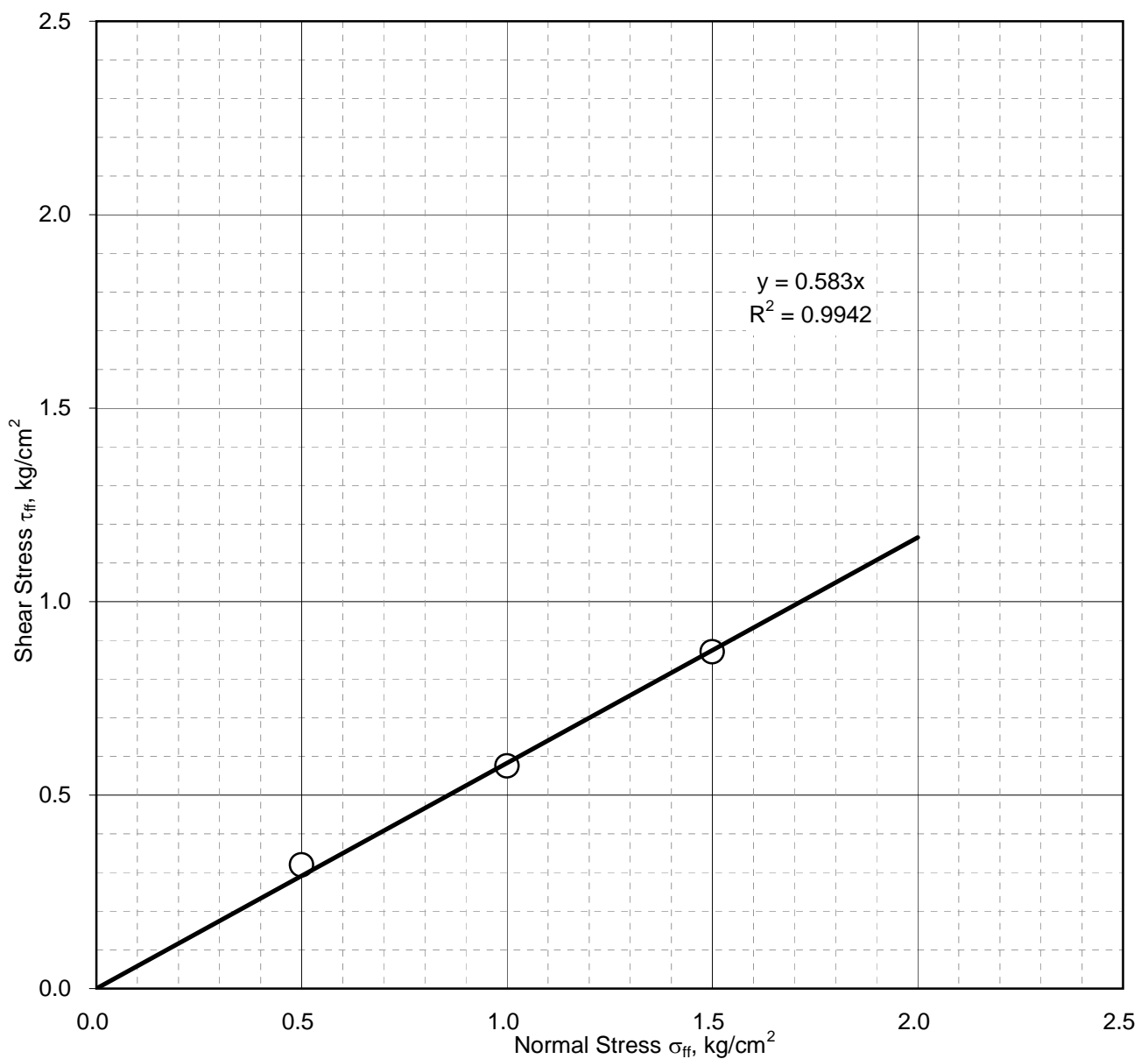




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-81	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.2 degrees



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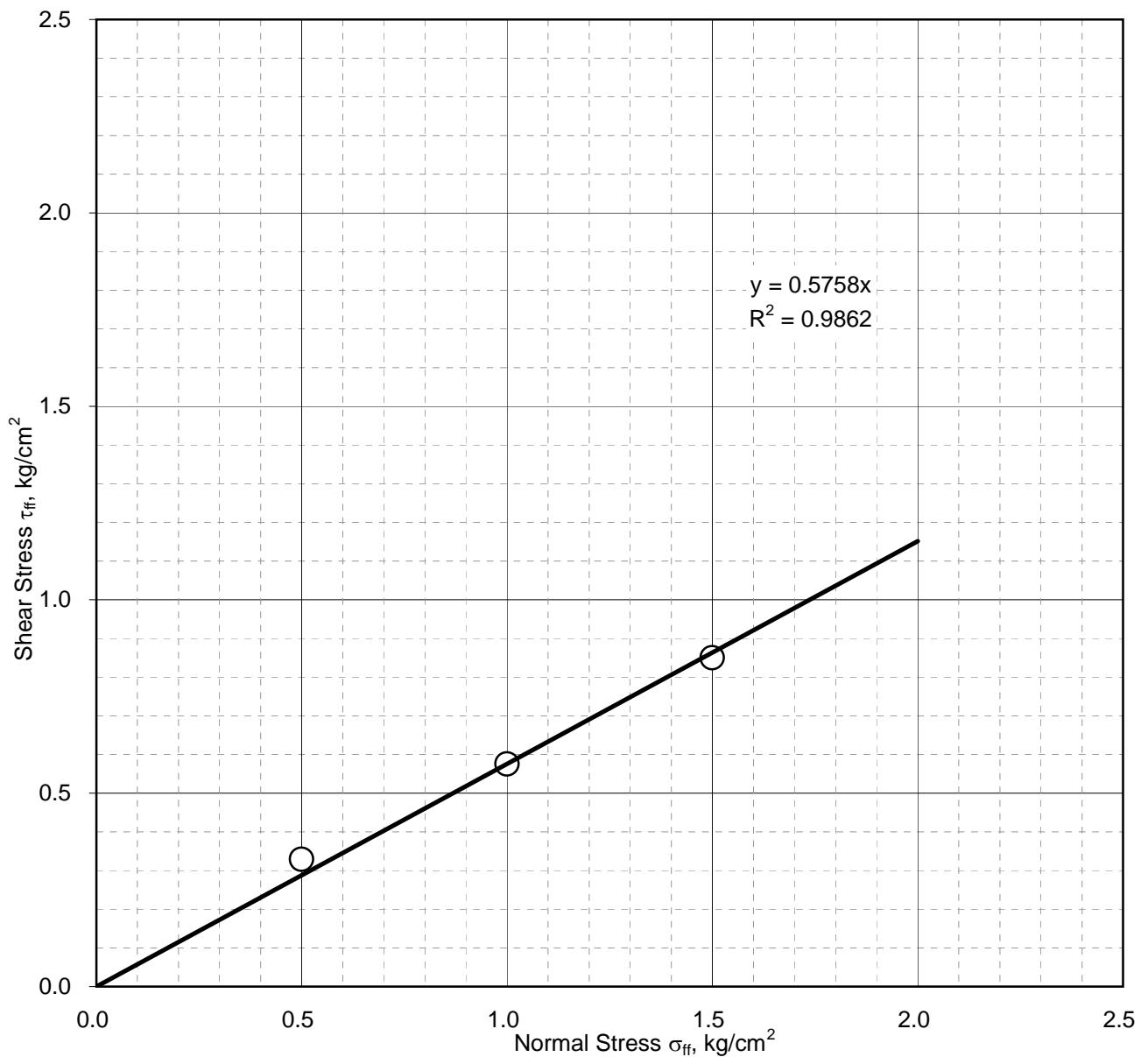




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-82	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.57
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.9 degrees



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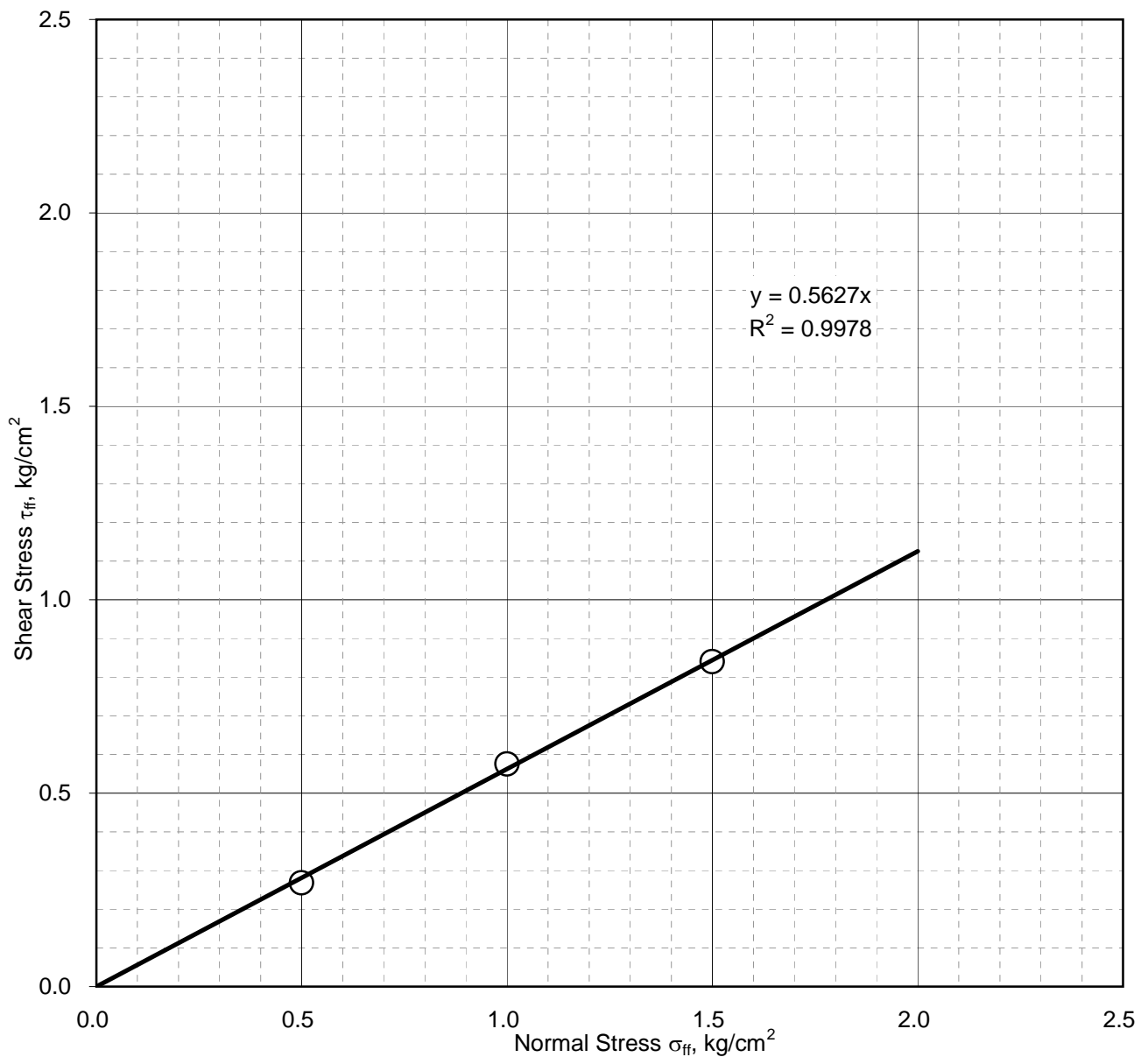




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-83	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.55
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.4 degrees



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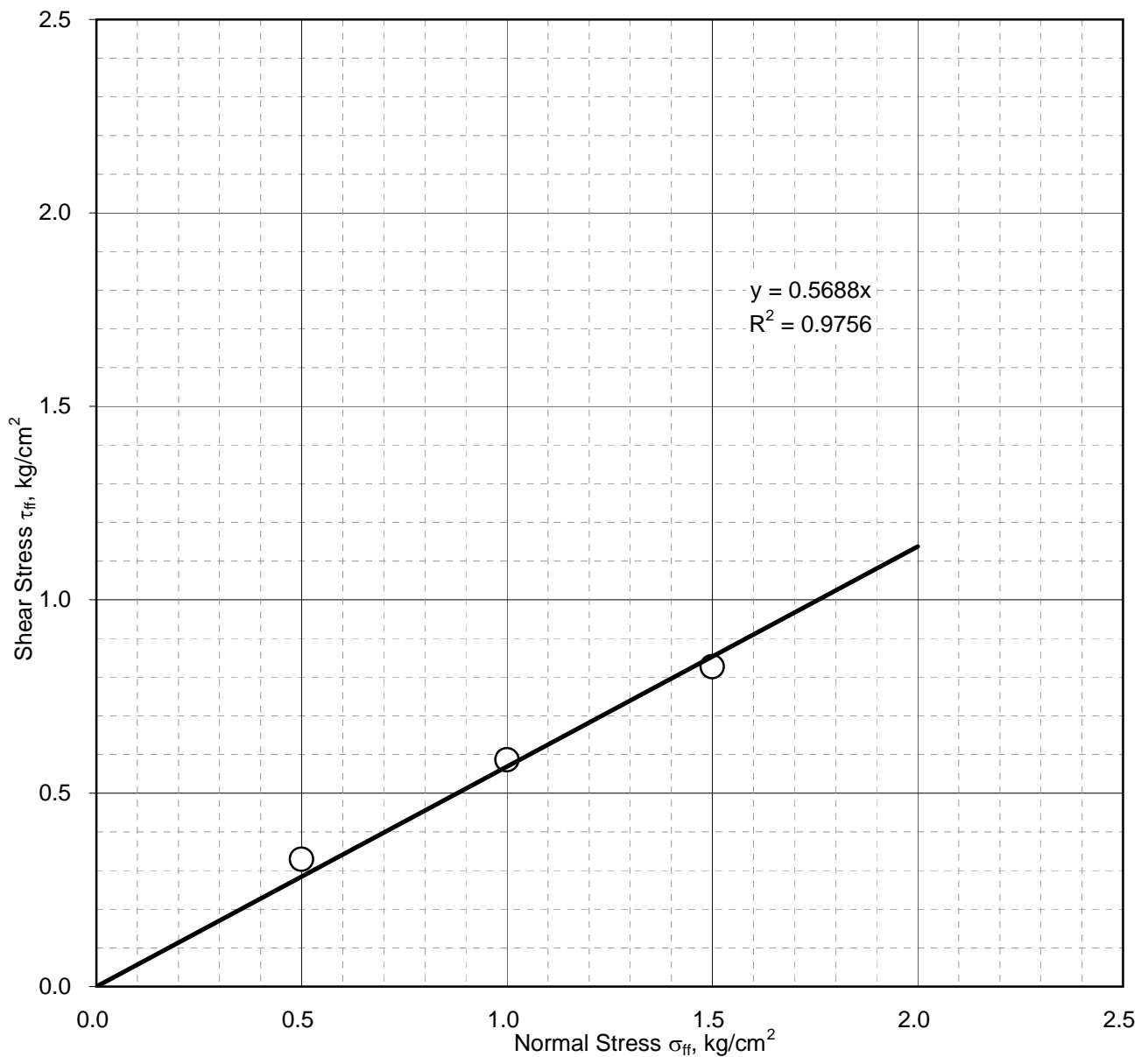




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-84	Sample Depth: 11 m
	Sample No.: UDS-5	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.58
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.6 degrees



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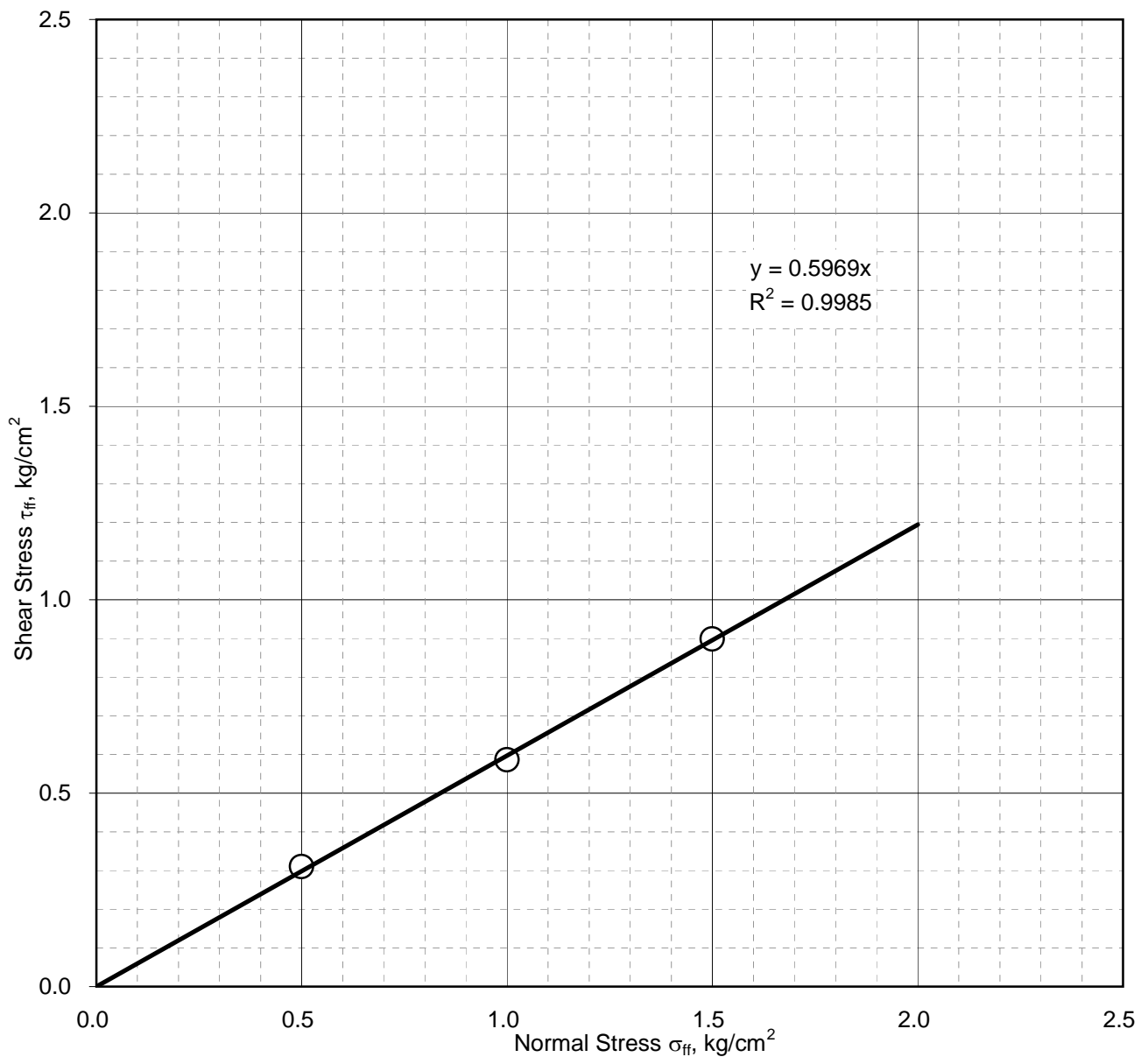




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-85	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.57
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.8 degrees



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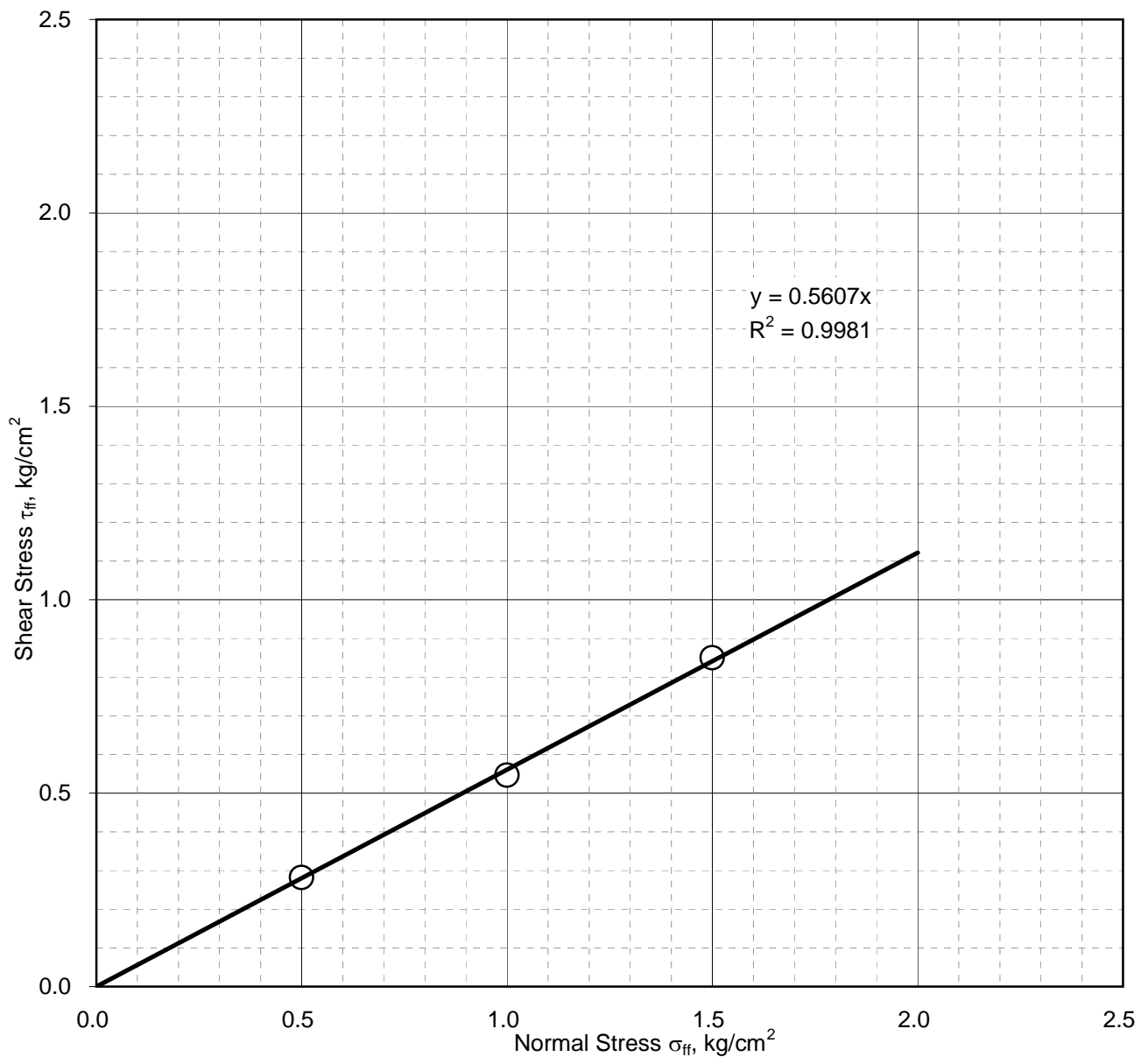




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-86	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.52
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.3 degrees



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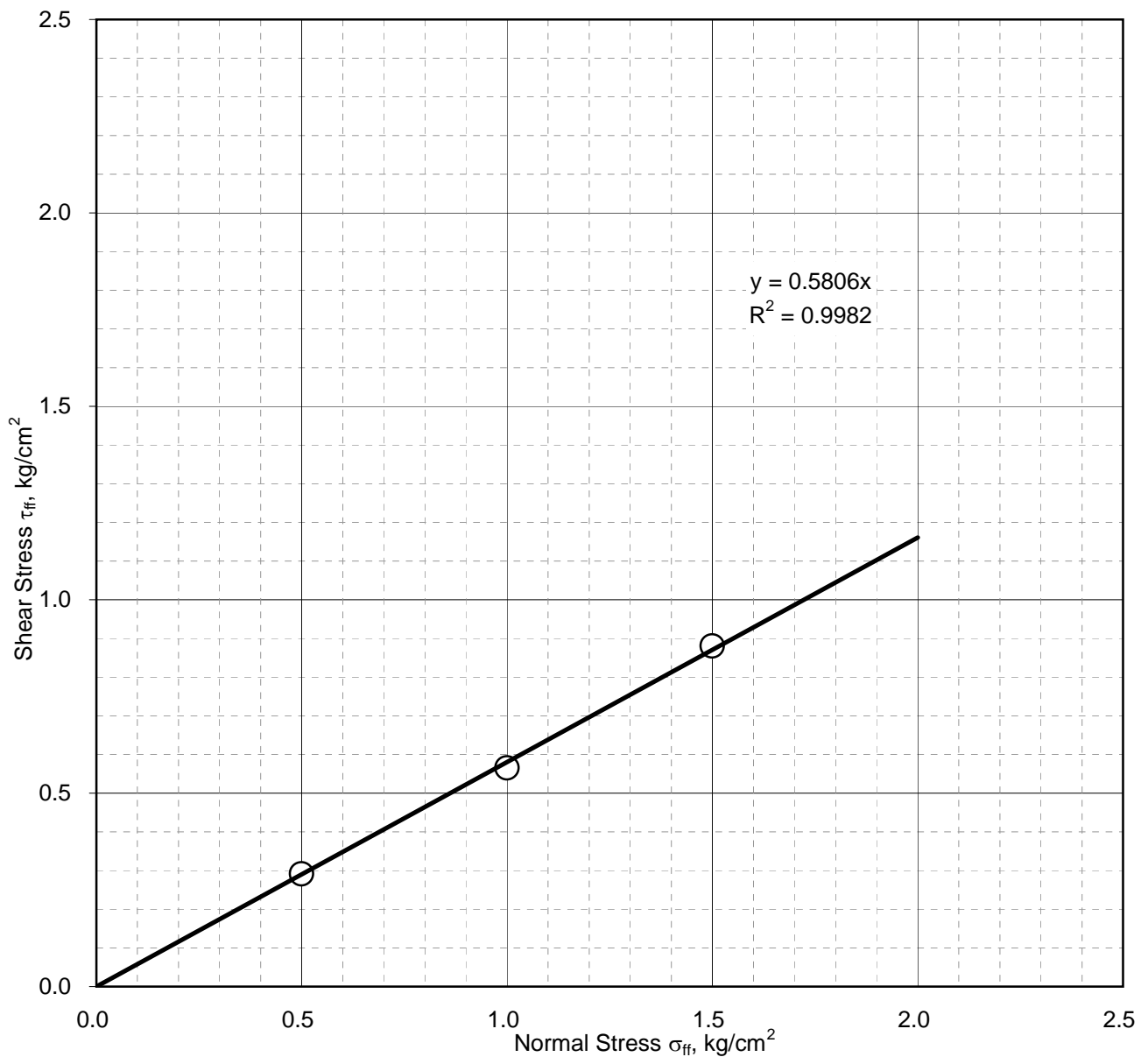




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-87	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.58
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.1 degrees



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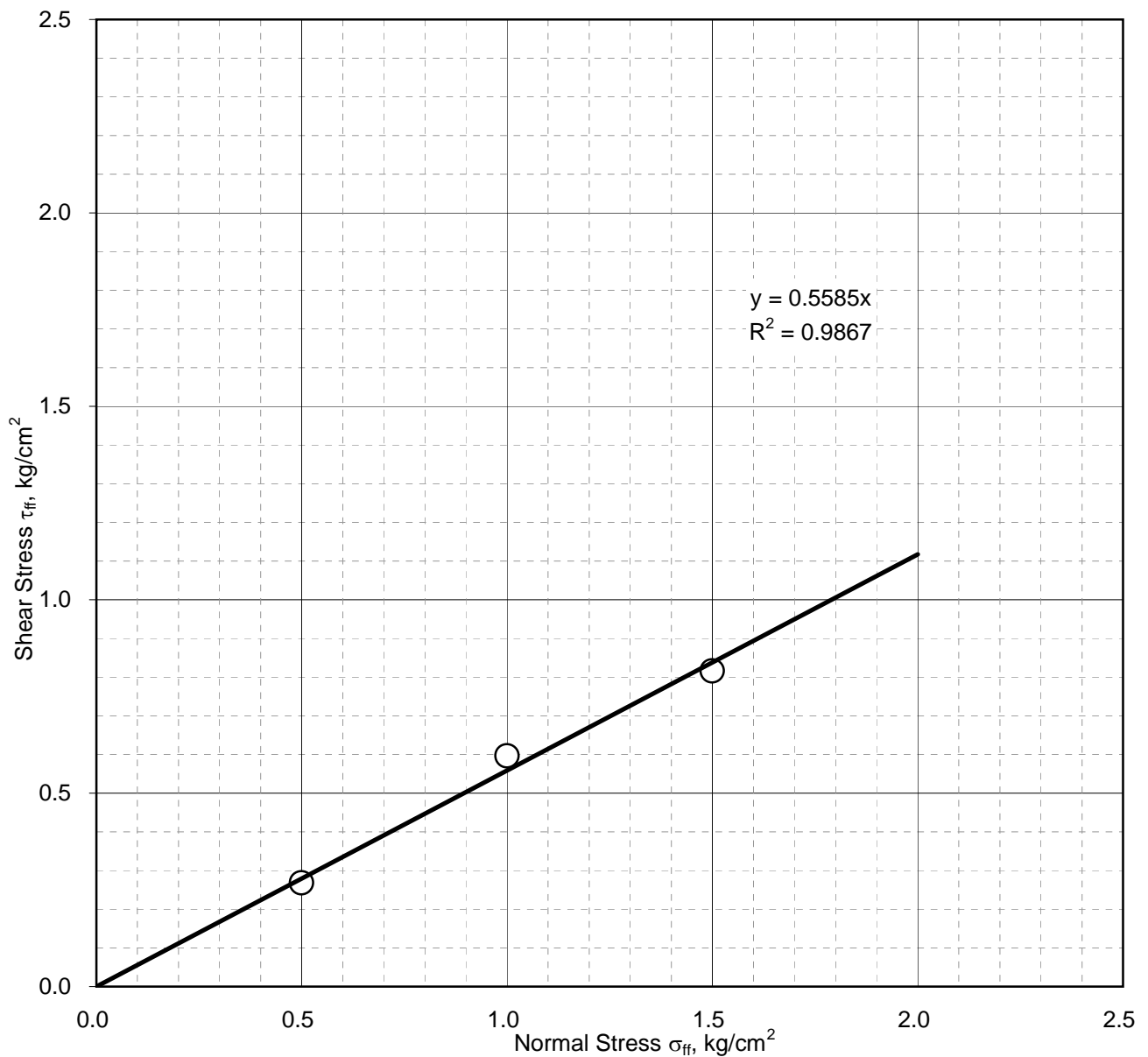




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-88	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.54
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.2 degrees



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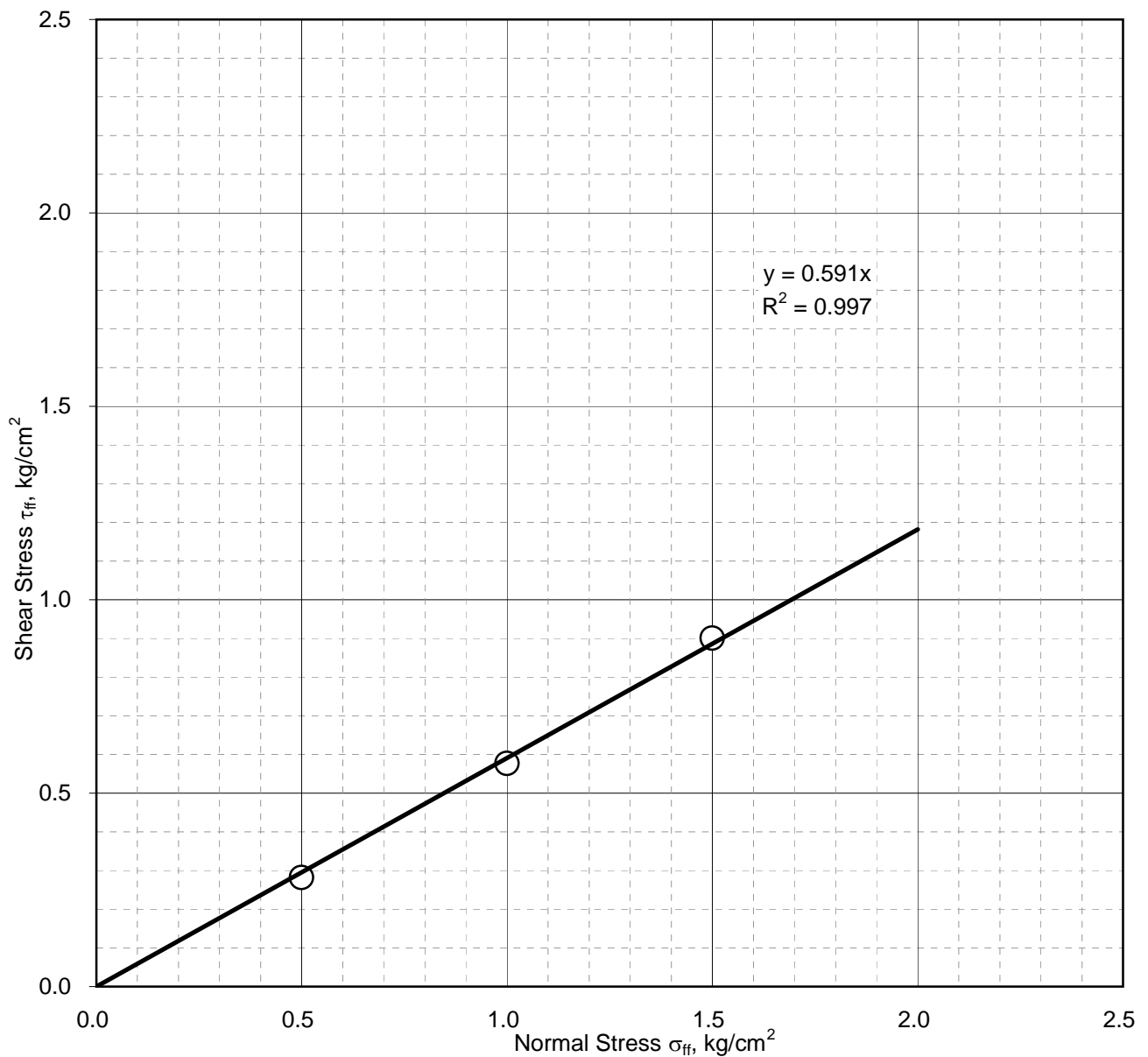




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-97	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.57
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.6 degrees



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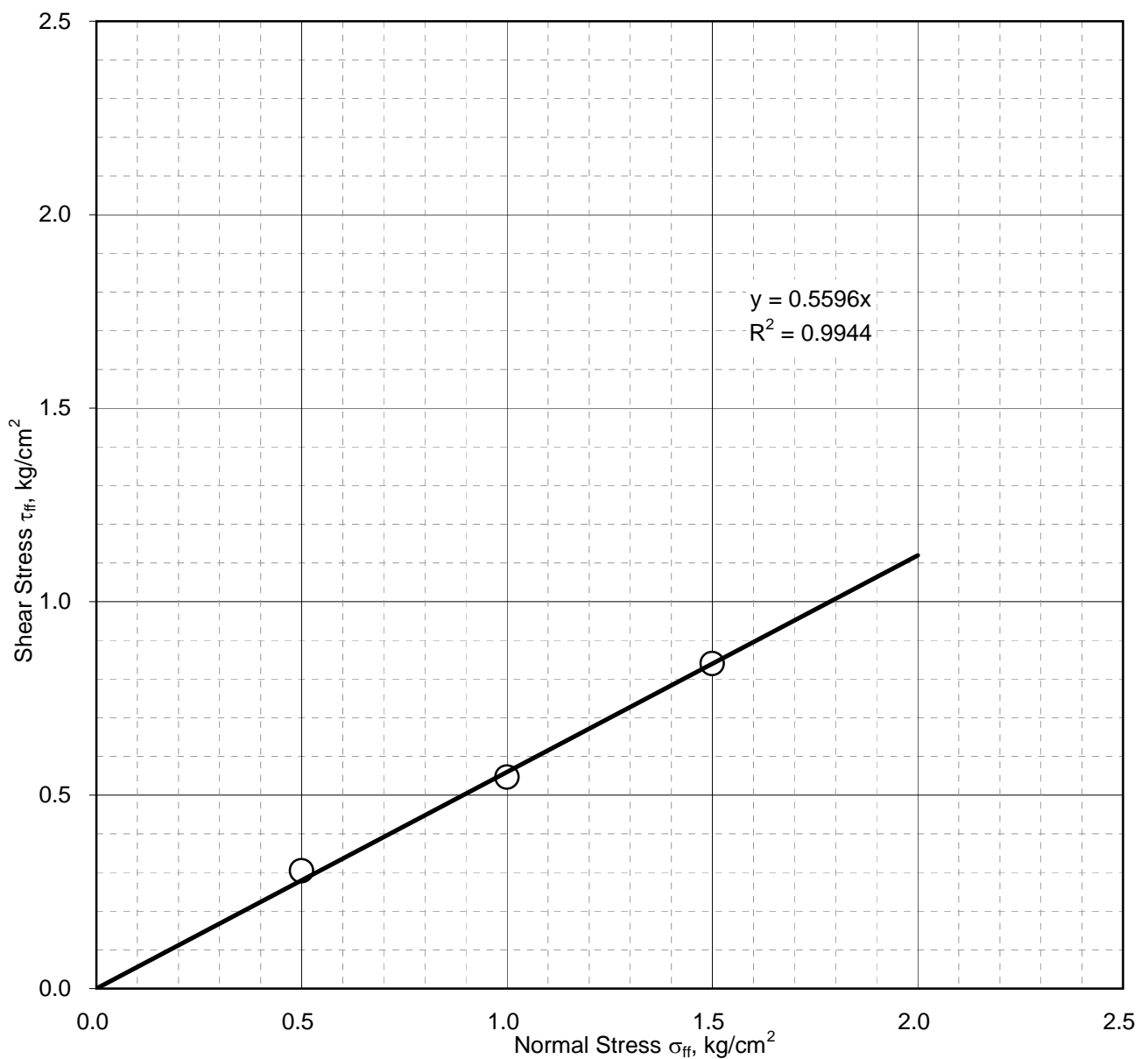




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Test Results	Borehole No.: BH-110		Sample Depth: 4 m	
	Sample No.: UDS-2		Sample Description: Sandy silt	
	Dry Density of Soil ( $\text{g/cm}^3$ ):		1.55	
	Moisture Content (%):		Saturated	
	Cohesion Intercept, $c$ :		0.00	$\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :		29.2	degrees



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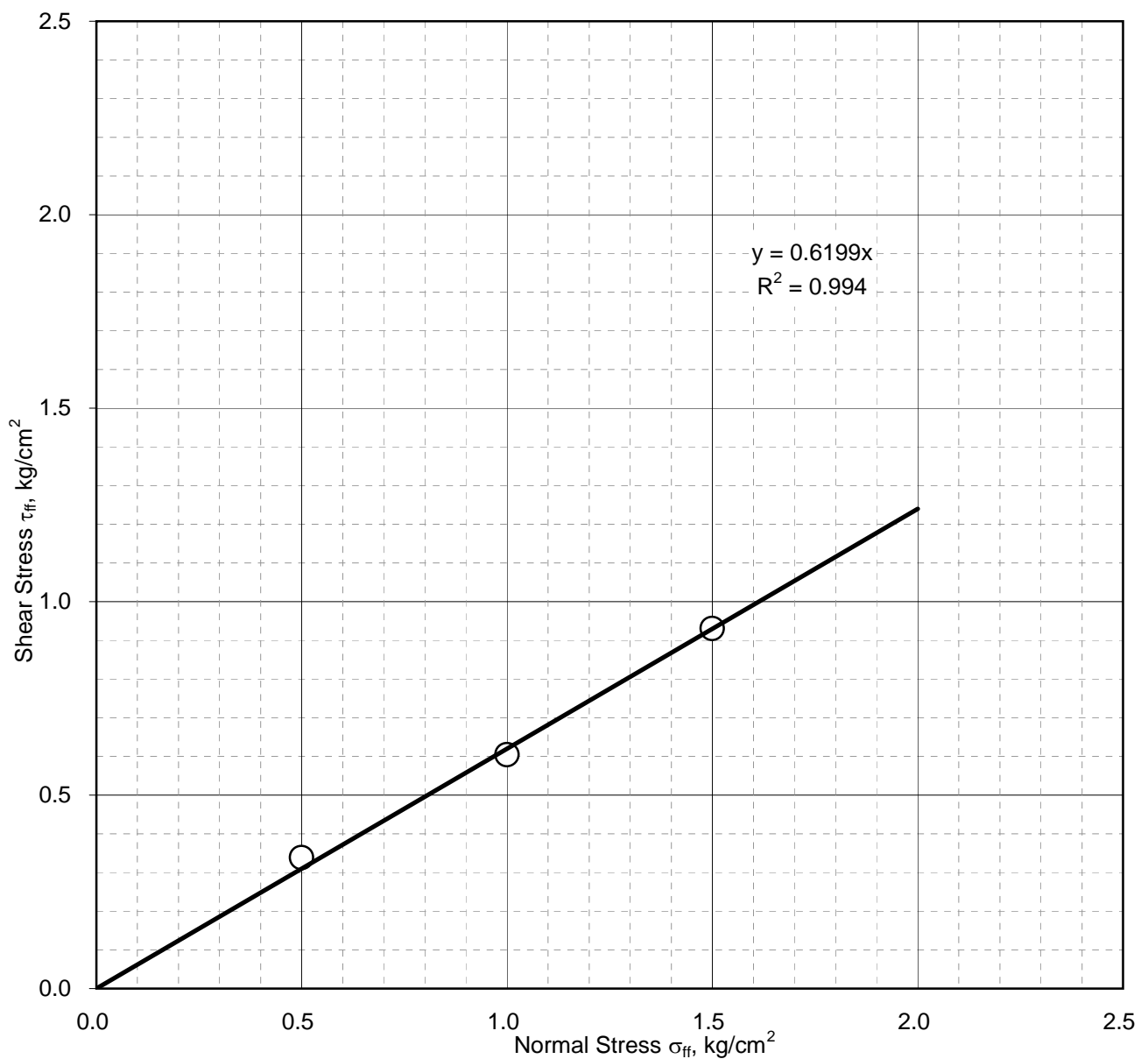




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-111	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.63
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.8 degrees



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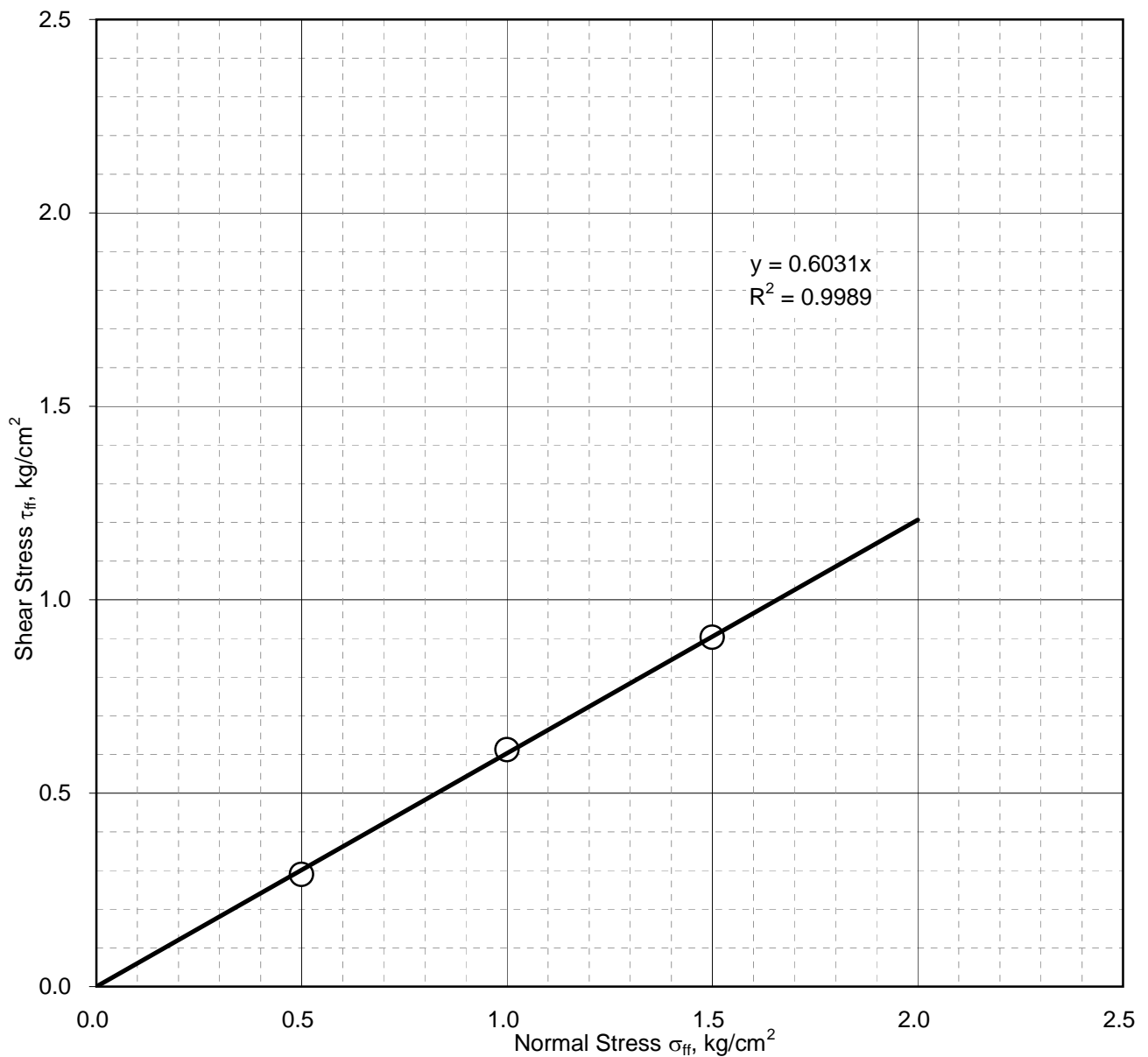




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-112	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.63
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.1 degrees



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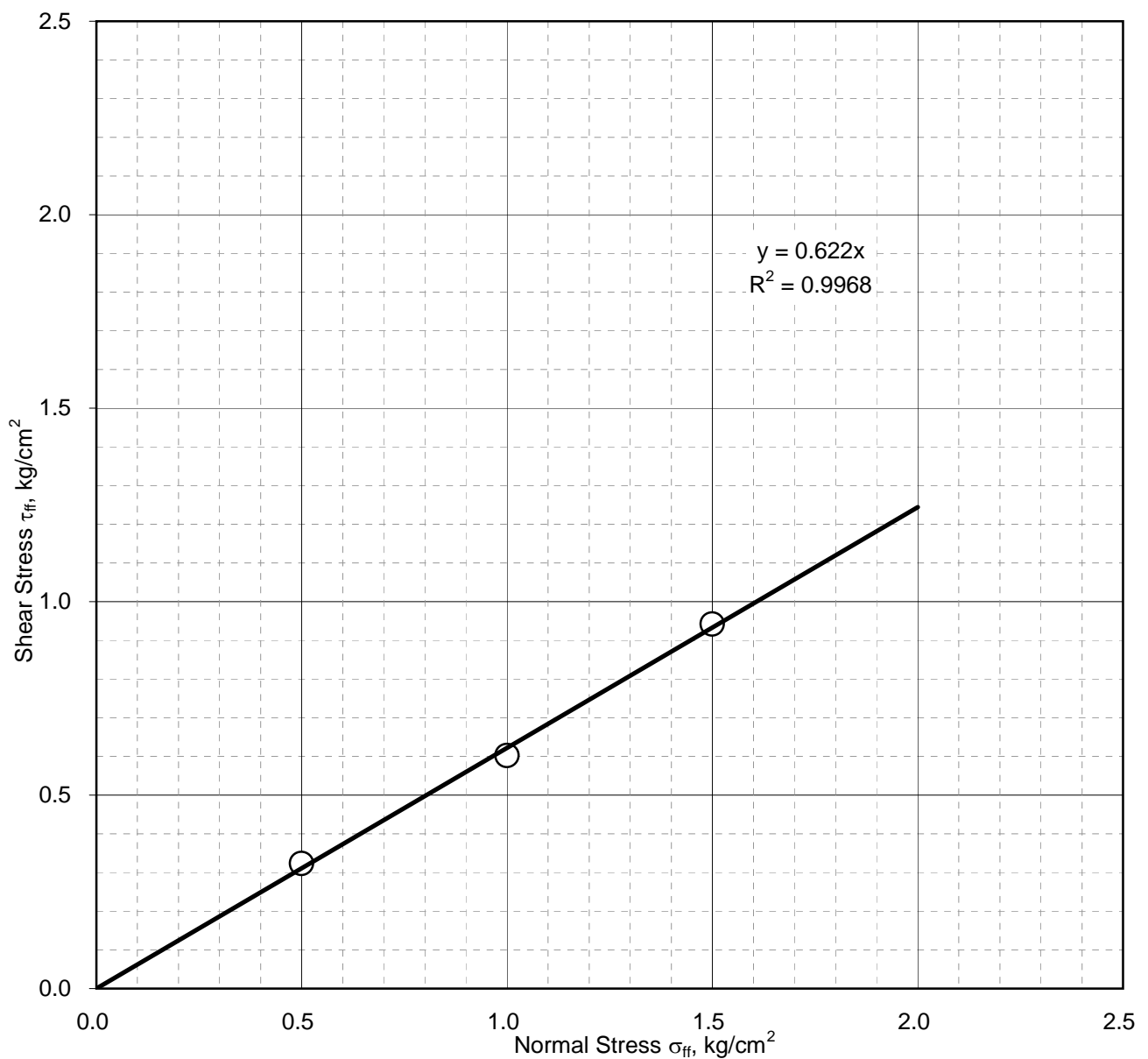




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-113	Sample Depth: 8 m
	Sample No.: UDS-4	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.62
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	31.9 degrees



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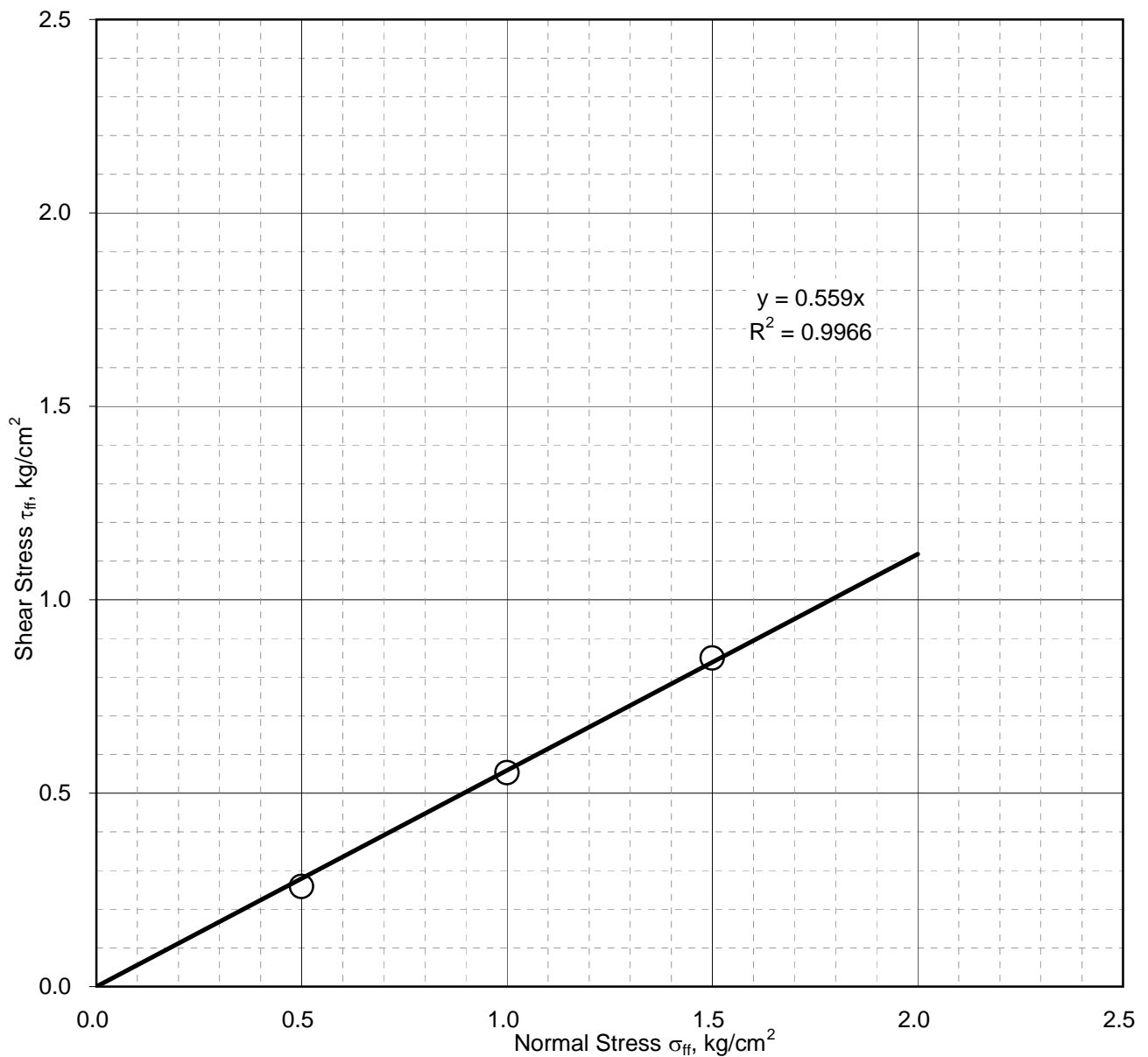




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-114	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.54
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.2 degrees



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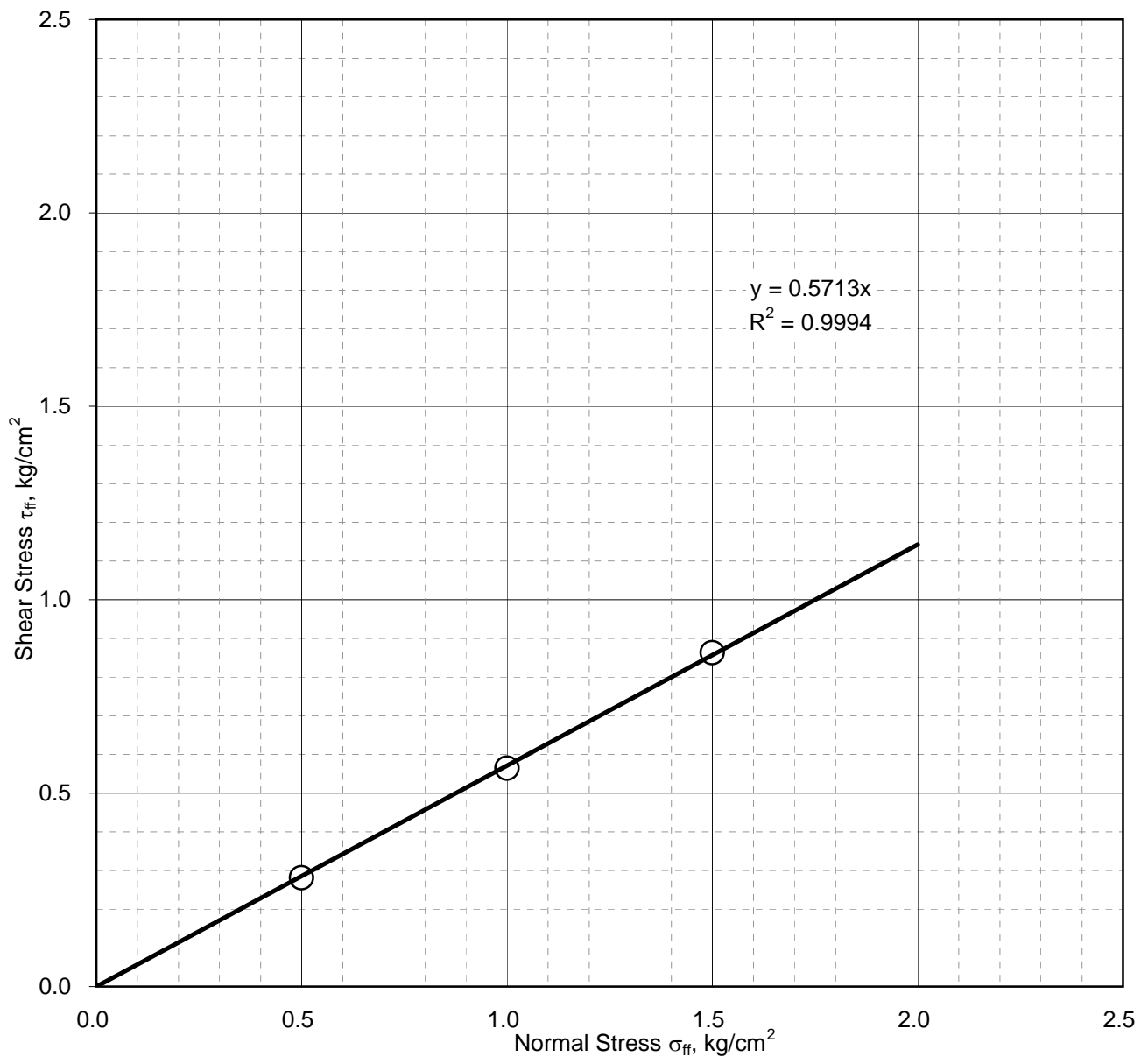




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-129	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.7 degrees



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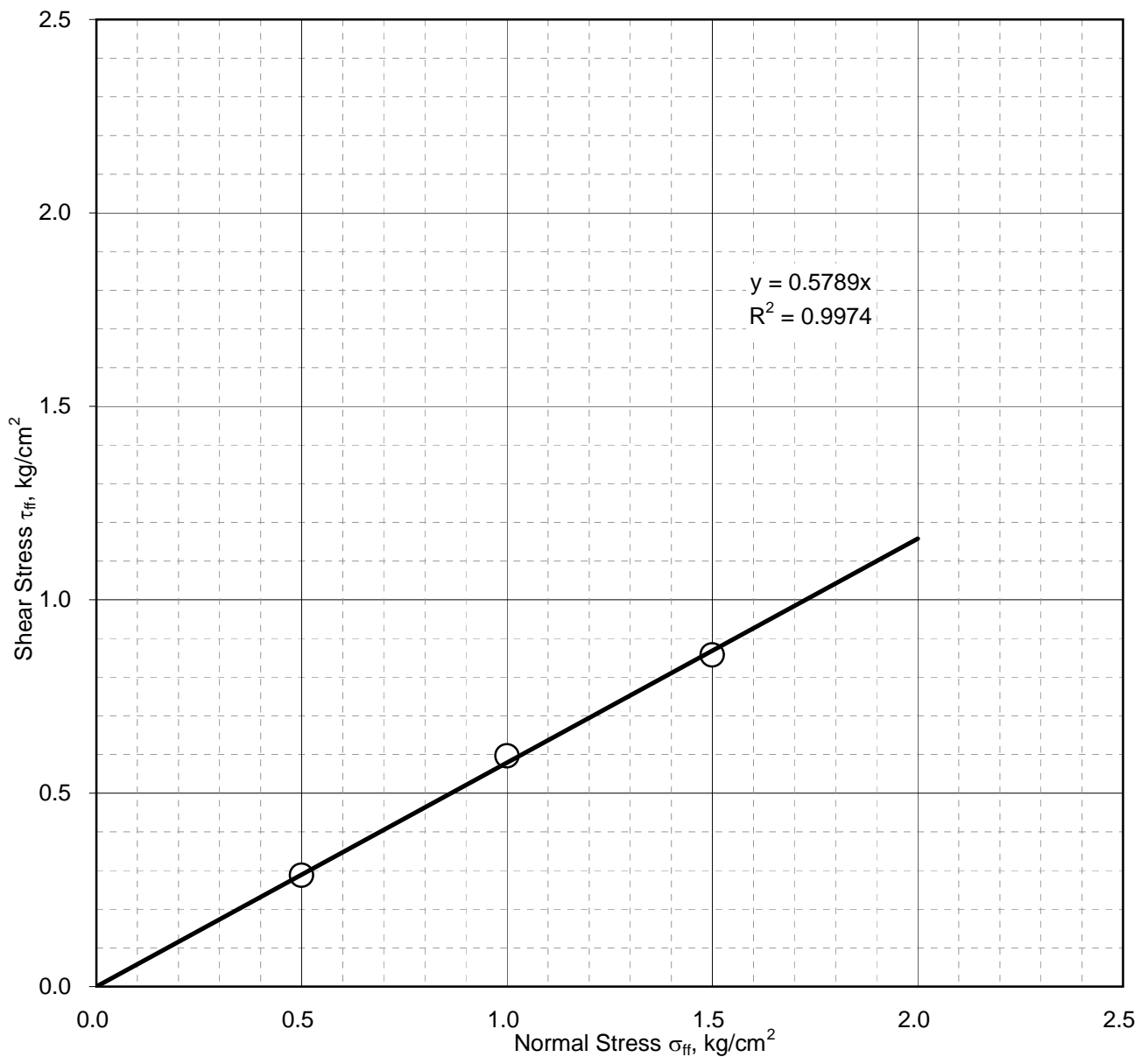




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-130	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.1 degrees



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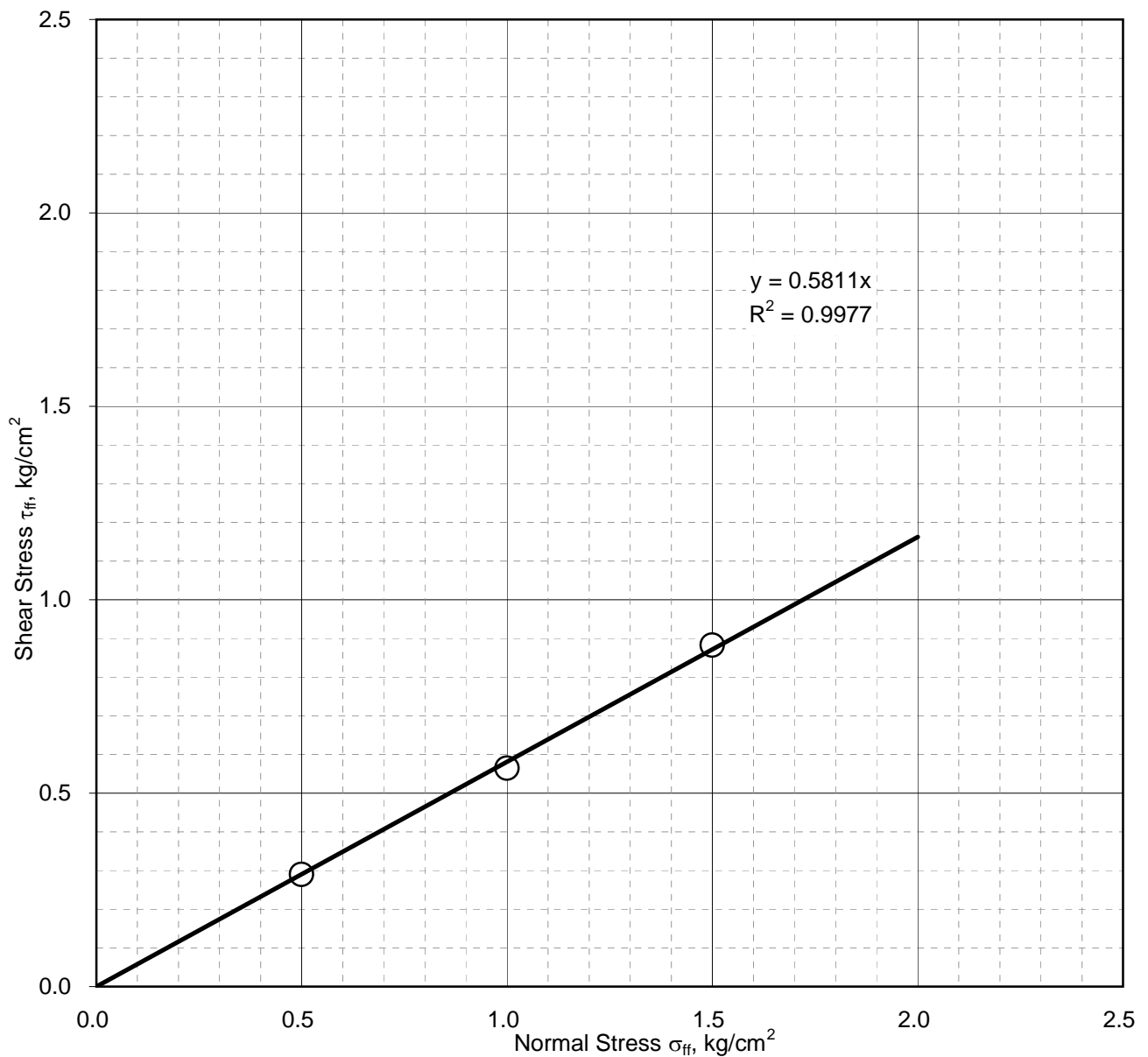




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-131R	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.58
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.2 degrees



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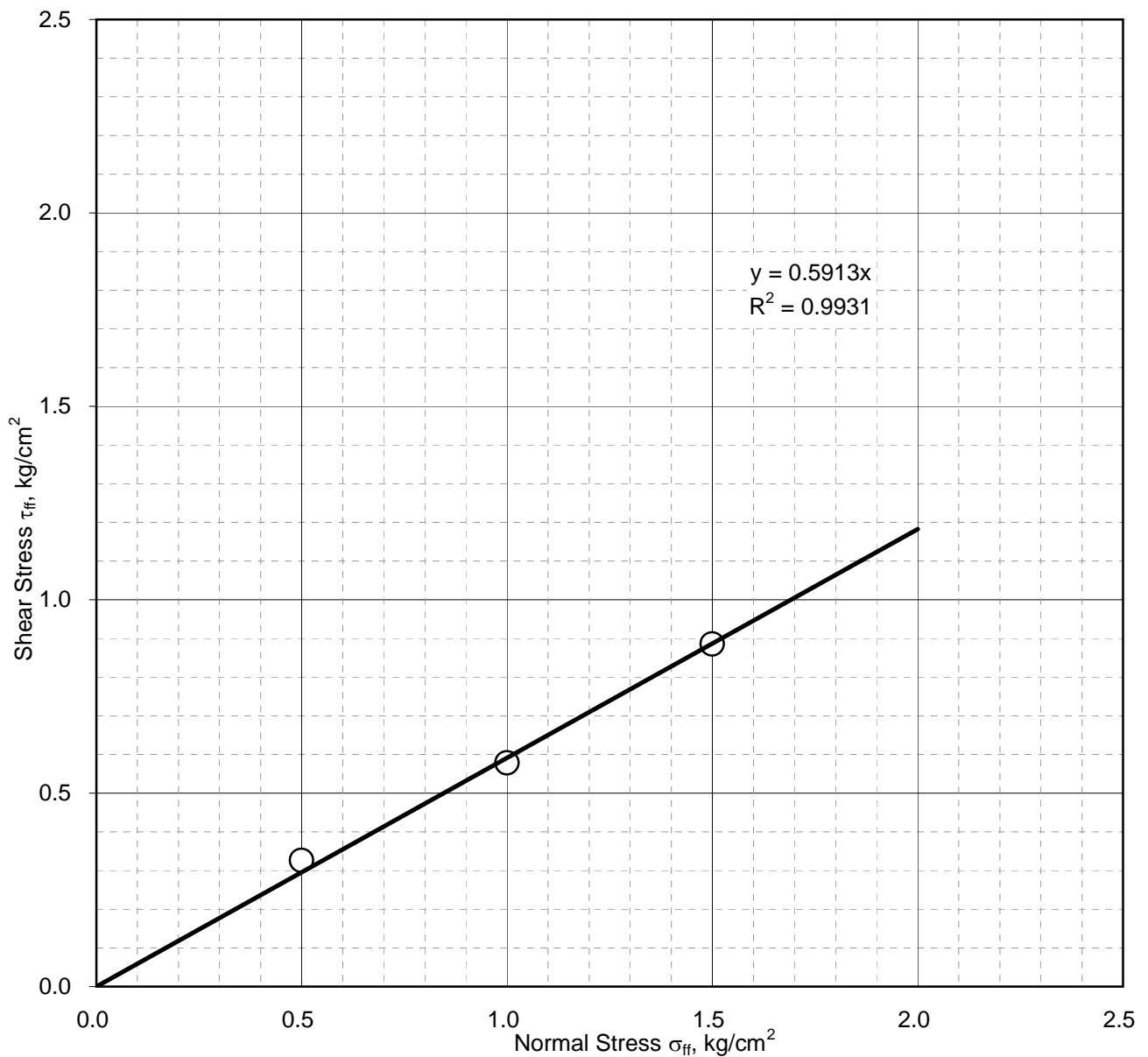




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-132	Sample Depth: 4 m
	Sample No.: UDS-2	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.6 degrees



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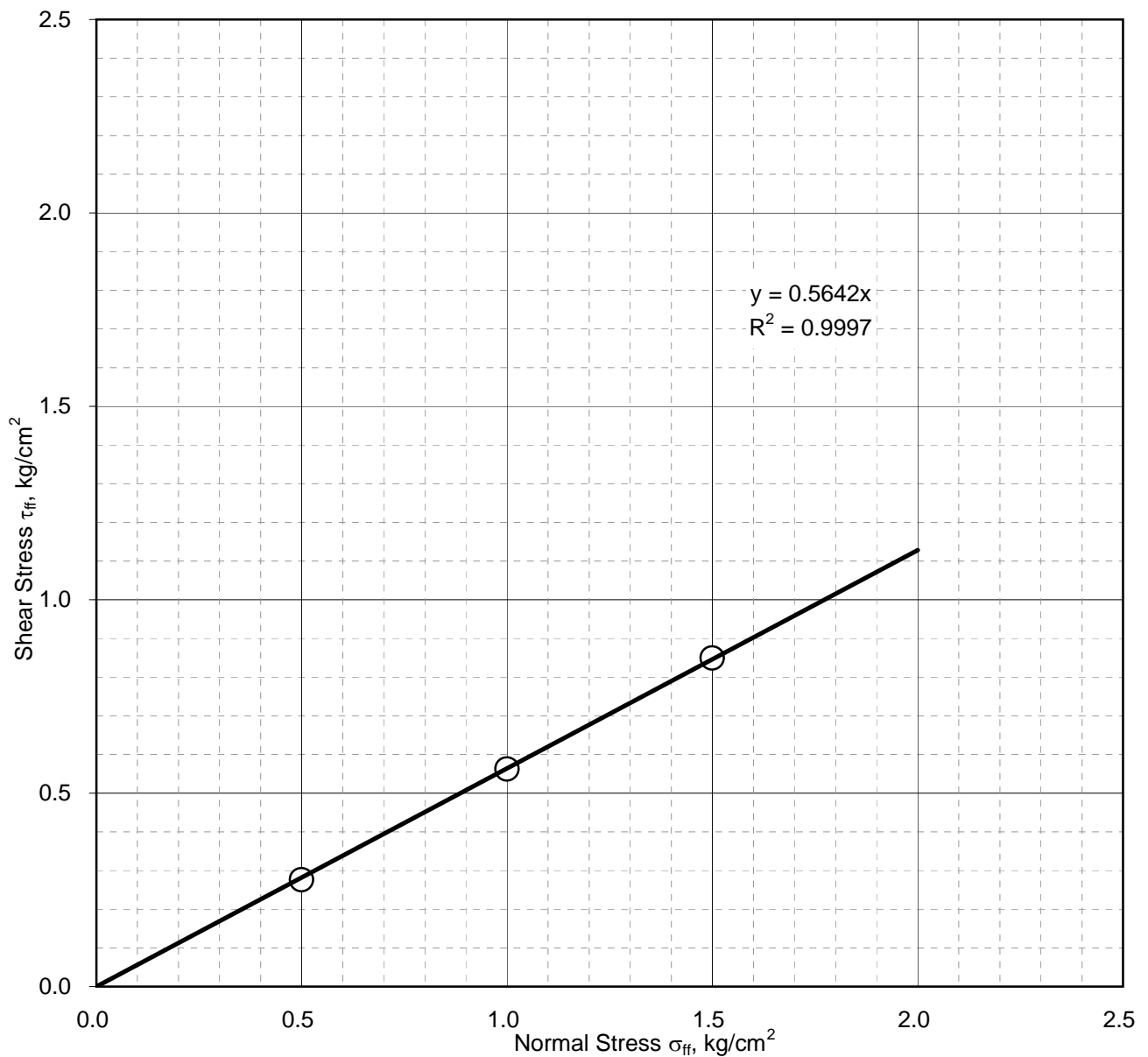




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Test Results	Borehole No.: BH-PBH-148R		Sample Depth: 8 m	
	Sample No.: UDS-4		Sample Description: Sandy silt	
	Dry Density of Soil ( $\text{g/cm}^3$ ):		1.57	
	Moisture Content (%):		Saturated	
	Cohesion Intercept, $c$ :		0.00	$\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :		29.4	degrees



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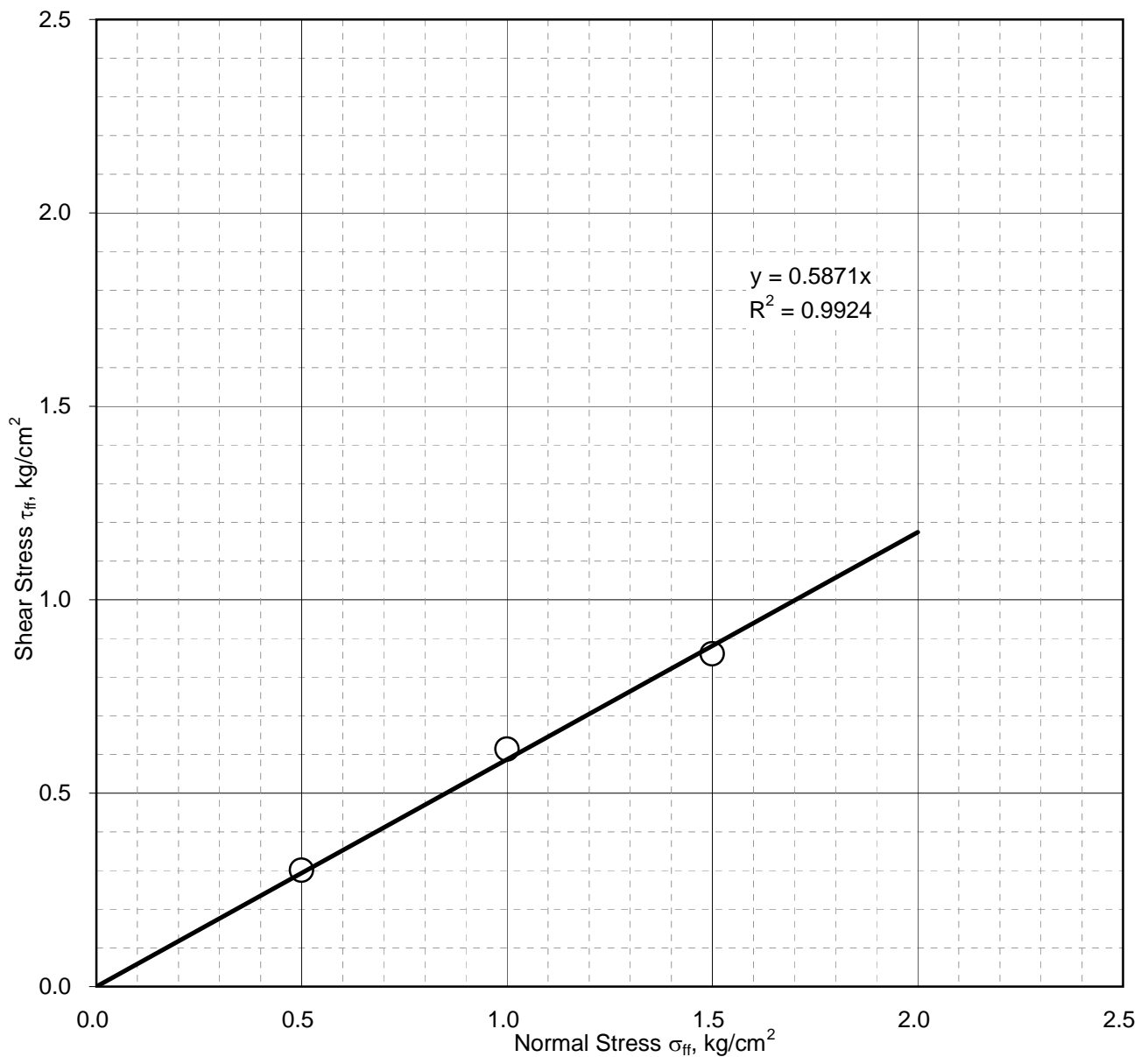




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-160	Sample Depth: 6 m
	Sample No.: UDS-3	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	30.4 degrees



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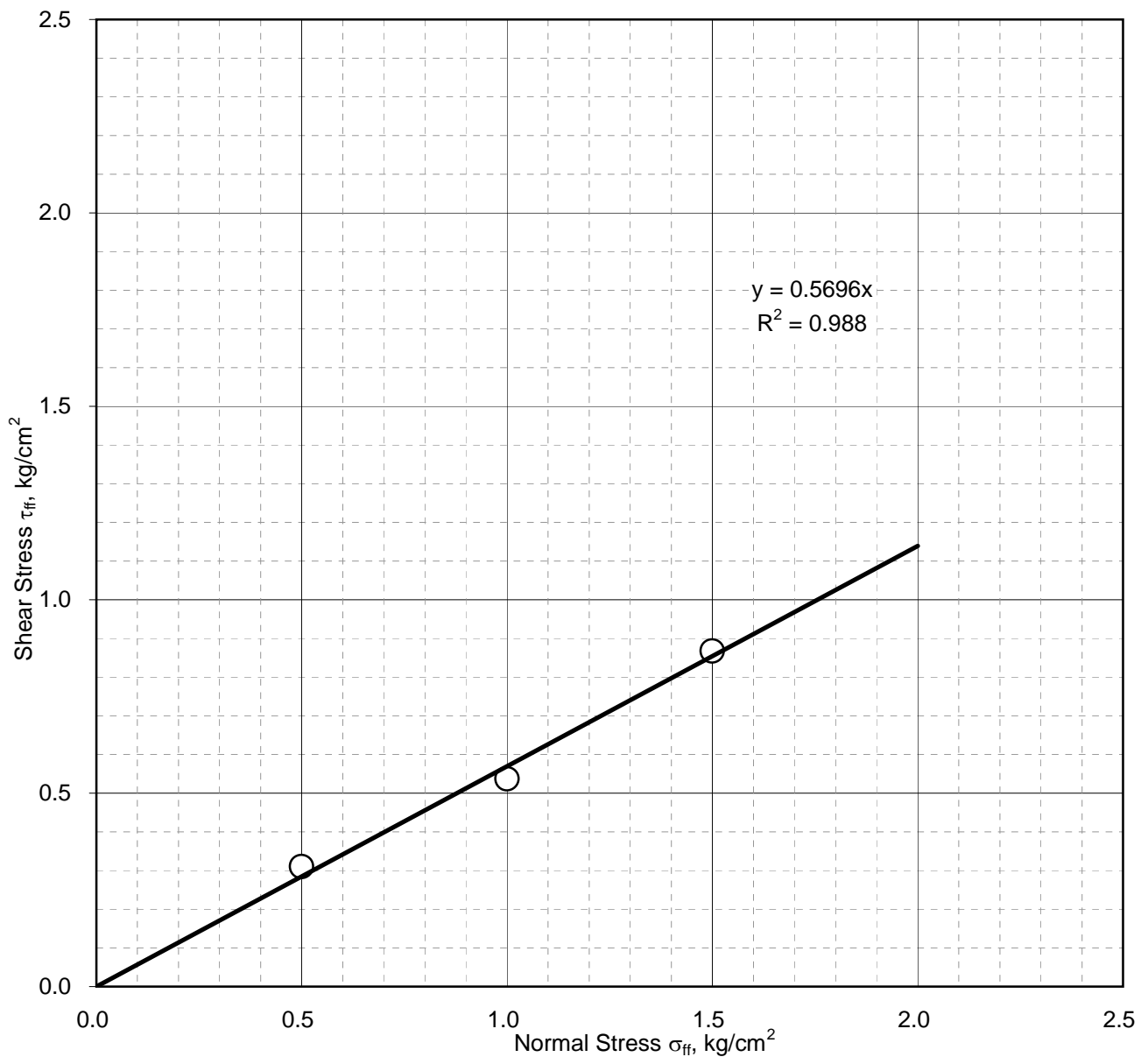




### Drained Direct Shear Test

IS : 2720 (Part-13)-1986, RA-2010

Sample Details	Borehole No.: BH-161	Sample Depth: 11 m
	Sample No.: UDS-5	Sample Description: Sandy silt
Test Results	Dry Density of Soil ( $\text{g/cm}^3$ ):	1.59
	Moisture Content (%):	Saturated
	Cohesion Intercept, $c$ :	0.00 $\text{kg/cm}^2$
	Angle of Internal Friction, $\phi$ :	29.7 degrees



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### TEST RESULTS

Soil-Water Extract Test Results				
Borehole No.	Depth, (m)	Sulphate Content (SO <sub>3</sub> ), %	Chloride Content (Cl), %	pH Value
BH-69	2.0	0.08	0.01	7.7

Groundwater Test Results			
Borehole No.	Sulphate Content (SO <sub>3</sub> ), mg/l	Chloride Content (Cl), mg/l	pH Value
BH-60	340	273	7.7
BH-129	331	254	7.8

### IS : 456-2000, SPECIFICATIONS

Requirements for Concrete Exposed to Sulphate Attack as per IS : 456-2000, Clauses 8.2.2.4 and 9.1.2, Table 4, Page-19

Class	Concentration of Sulphates, expressed as SO <sub>3</sub> In-Soil-Water Extract (Total) Percent	In Groundwater (mg/l)
1	Traces (<0.2)	Less than 300
2	0.2 to 0.5	300-1200
3	0.5 to 1.0	1200-2500
4	1.0 to 2.0	2500-5000
5	> 2.0	> 5000

#### Classification of Chloride Conditions in Groundwater\*

Classification	Chloride Limits	
	Temperate Climate	Tropical Climate
Negligible	0-2000 ppm	Not Applicable
Moderate	2000-10,000 ppm	0-2000 ppm
High	More than 10,000 ppm	2000-20,000 ppm
Very High	Generally not applicable	Only if considerably in excess of 20,000 ppm

\*Source : Institution of Civil Engineers, London (1979)

### **Chemical Test Results**

**APPENDIX-A**  
**SITE PHOTOGRAPHS**



Borehole No. 60



Borehole No. 78



Borehole No. 80



Borehole No. 81

### Site Photographs