GEOTECHNICAL INVESTIGATION REPORT

FOR

PROPOSED B+G+20 STORIED BUILDING

AT

PLOT NO – 13816, 13817, 13827, 13828
KHAITIAN NO – 11336, MOUZA – KONNAGAR 2
MIRPARA UNDER KONNAGAR MUNICIPALITY
WARD NO – 15, DIST – HOOGHLY

JOB ENTRUSTED BY

M/S BHAWANI URBAN HOUSING DEVELOPMENT LTD

829/A, LAKE TOWN BLOCK – A, J.J.HOUSE
KOLKATA – 700 089

JOB CONDUCTED BY

JP GEO CONSULTANTS
AN ISO 9001:2015 CERTIFIED ORGANISATION

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P R E F A C E

A detailed geotechnical investigation including laboratory testing was carried out for the **Proposed B+G+20 Storied Building at Plot No – 13816, 13817, 13827, 13828, Khaitian No – 11336, Mouza – Konnagar 2 Mirpara Under Konnagar Municipality Ward No – 15, Dist – Hooghly.** The objective of this investigation was to evaluate the soil parameters for design of foundation for proposed structure with particular reference to safe bearing capacity and anticipated settlement.

The Geo-technical investigation was awarded by **M/S Bhawani Urban Housing Development Ltd, 829/A, Lake Town Block – A, J.J.House, Kolkata – 700 089.** The investigation work for this project was started on **25th June 2022** and completed on **4th July 2022.**

The report has been prepared after careful study of all data collected during fieldwork and laboratory testing and it deals with geotechnical properties of the sub-soil. **Section – I** of this report covers the fieldwork while **Section – II** contains the results of all the laboratory test and discussions thereon. **Section – III** deals with the engineering appraisal and recommendations.

SECTION – I

1.0 INTRODUCTION

M/S Bhawani Urban Housing Development Ltd, 829/A, Lake Town Block – A, J.J.House, Kolkata – 700 089, entrusted the soil investigation work for the **Proposed B+G+20 Storied Building at Plot No – 13816, 13817, 13827, 13828, Khaitian No – 11336, Mouza – Konnagar 2 Mirpara Under Konnagar Municipality Ward No – 15, Dist – Hooghly**. At the onset of the work, four (04) nos. of boreholes are sunk.

2.0 AIMS AND OBJECTIVES

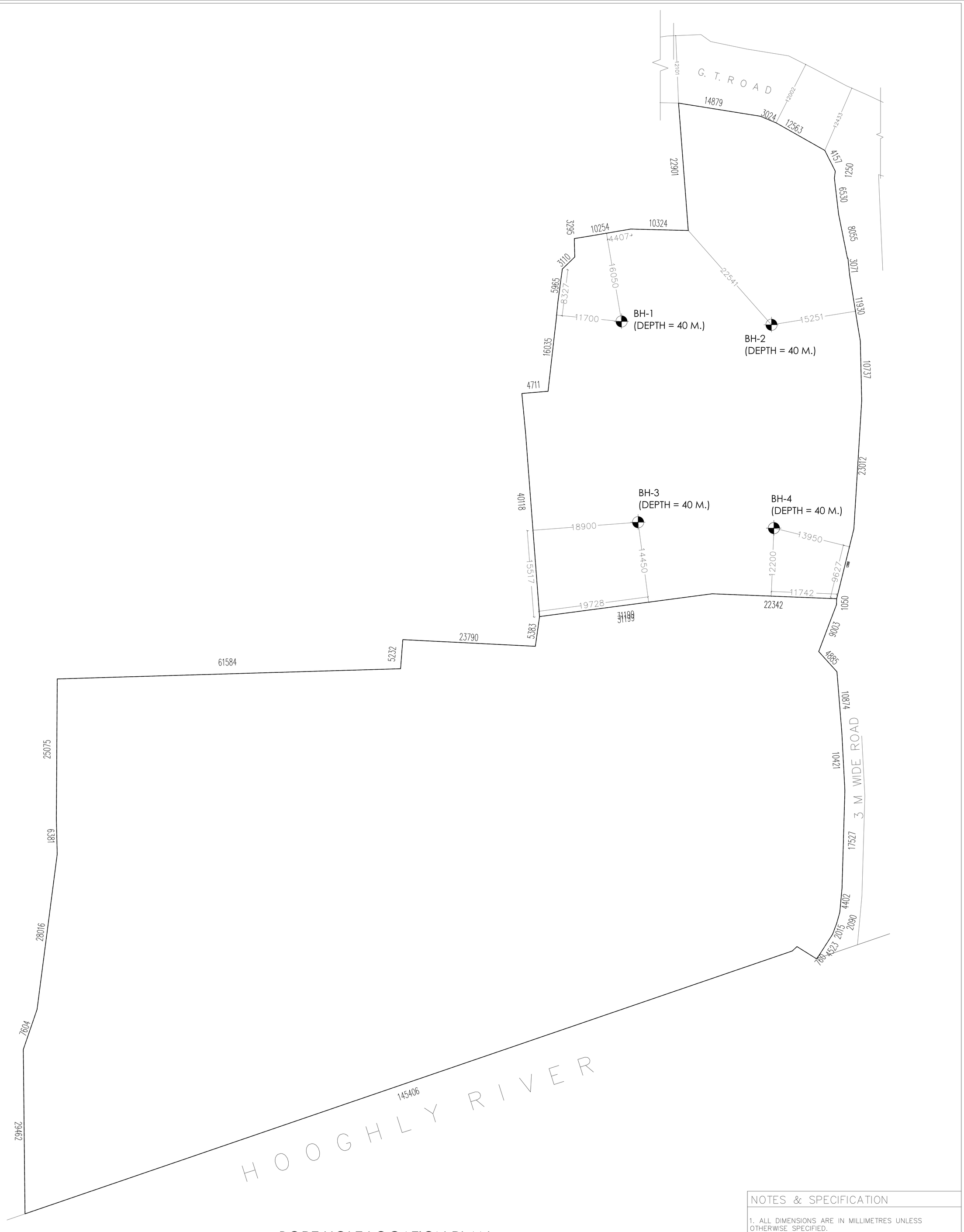
The aim of the present study was to bring out the stratiography, strength characteristics of the sub-strata at the site, by conducting bore holes studies including in situ tests and laboratory investigations the findings were to be applied for realistic selection.

3.0 INVESTIGATION SCHEME AND LOCATION OF TESTS

The scheme of investigation was formulated by the Clients, which involved sinking of four (04) nos. of boreholes with the depth of 40.00m depth respectively from existing ground level, collection of undisturbed samples from cohesive deposit, carrying out standard penetration tests within the borehole, performing necessary laboratory tests on selected soil samples and submission of a report.



Sketch showing location of boreholes is given in the following page



BORE HOLE LOCATION PLAN

BH = BORE HOLE

NOTES & SPECIFICATION

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. WRITTEN DIMENSIONS TO BE FOLLOWED.
3. ANY AMBIGUITY IN THE DRG. SHOULD BE IMMEDIATELY BROUGHT TO THE NOTICE OF THE CONSULTANT BEFORE COMMENCING THE WORK.
4. THIS DRAWING IS SANCTION PURPOSE ONLY.
5. ALL EXTERNAL WALL WILL BE 200 MM THK. AND INTERNAL WALL IS 100/75 MM THK.
6. FLY ASH AND FLY ASH BASED MATERIAL WILL BE USED IN THIS PROJECT
7. SOLAR ENERGY OF 1% OF THE CONNECTED LOAD WILL BE USED IN THE PROJECT

CERTIFICATE OF STRUCTURAL ENGINEER

I HEREBY CERTIFY THAT THE FOUNDATION AND SUPERSTRUCTURE OF THE BUILDING PROPOSED FOR CONSTRUCTION AT 63/A G.T. ROAD, L.R. PLOT NOS– 13816, KHATIAN NO– 17699 MKD AS LOT A, MOUZA – KONNAGAR, UNDER KONNAGAR MUNICIPALITY WARD NO. 15, DIST. HOOGHLY HAVE BEEN PERSONALLY INSPECTED AND SO DESIGNED BY US WILL MAKE SUCH FOUNDATION AND SUPER STRUCTURE SAFE IN ALL RESPECT INCLUDING THE CONSIDERATION OF BEARING CAPACITY AND SETTLEMENT OF SOIL AND OTHER CONDITIONS. IF ANY. CONFORMING TO ALL STIPULATION OF ALL RELEVANT I.S CODE OF PRACTICE AND NATIONAL BUILDING CODE.

SIGNATURE OF STRUCTURAL ENGINEER

CERTIFICATION OF ARCHITECT

I DO HEREBY CERTIFY THAT PLANS, ELEVATIONS AND SECTIONS AND OTHER STRUCTURAL DETAILS OF THE PROPOSED BUILDING AT 63/A G.T. ROAD, L.R. PLOT NOS– 13816, KHATIAN NO– 17699 MKD AS LOT A, MOUZA – KONNAGAR, UNDER KONNAGAR MUNICIPALITY WARD NO. 15, DIST. HOOGHLY HAVE BEEN PREPARED IN CONFORMITY WITH ALL RELEVANT PROVISIONS UNDER THE W.B MUNICIPAL (BUILDING) RULES, 2007 OTHERWISE MENTIONED. THIS ALSO CERTIFY THAT ALL RELEVANT NOC FROM RESPECTIVE AUTHORITIES, AS APPLICABLE IN THIS REGARD, ARE ALSO ENCLOSED WITH THE APPLICATION FOR SEEKING APPROVAL OF THE PLAN TO CONSTRUCT THE BUILDING ON THE SAID PLOT.

SIGNATURE OF ARCHITECT

CERTIFICATE OF APPLICANT

CERTIFIED THAT I SHALL NOT ON LATER DATE MAKE ANY ADDITION OR ALTERATION TO THIS PLAN SO AS TO CONVERT IT FOR USE . THAT I HAVE GONE THROUGH THE WEST BENGAL MUNICIPAL BUILDING RULES, 2007, AND ALSO UNDERTAKE TO ABIDE BY THOSE RULES DURING AND AFTER THE CONSTRUCTION OF THE BUILDINGS AT 63/A G.T. ROAD, L.R. PLOT NOS– 13816, KHATIAN NO– 17699 MKD AS LOT A, MOUZA – KONNAGAR, UNDER KONNAGAR MUNICIPALITY WARD NO. 15, DIST. HOOGHLY

SIGNATURE OF APPLICANT

TITLE

BORE HOLE LOCATION PLAN

PROJECT

PROPOSED B+G+20 STORIED RESIDENTIAL COMPLEX AT 63/A G.T. ROAD, L.R. PLOT NOS– 13816, KHATIAN NO– 17699 MKD AS LOT A, MOUZA – KONNAGAR, UNDER KONNAGAR MUNICIPALITY WARD NO. 15, DIST. HOOGHLY

DWG. NO– DF/KONNAGAR/SANC/01/R0

REVISION OF –

DATE – 06.06.2022

SCALE– 1:200,
ALL THE DIMENSIONS ARE IN MM

SHEET–01

N

4.0 FIELD EXPLORATION

At the proposed project site, four (04) nos. of boreholes were sunk. Locations were finalized by client/consultants. The field operations consisted of boring, field test, and collection of disturbed and undisturbed samples, identification, labeling and preservations of the samples collected. The soil samples were collected by pushing a sampling tube in the bore hole at suitable intervals and depth and then taken out. The samples so recovered and collected in plastic bags, sealed, marked and taken for laboratory analysis. The boring operation has been done in two stages (Auger and Rotary Wash Boring).

4.1 BORING

The boring was done by a combination of Auger & Rotary wash boring at lower depths. Flush jointed steel casing tubes were used to prevent side collapse of boreholes in Shell method of boring. No casing was provided in the Rotary wash borings since stabilization of hole was made by circulation of bentonite mud. The depth of casings at various stages of sampling, borehole depths, depth of collection of undisturbed soil samples (UDS), description of soil, 'N' values during SPT at various depths and the depth at which ground water was encountered at different locations are shown in the respective borehole logs in Appendix-I of this report.

4.2 SAMPLING

Disturbed samples were taken at suitable intervals of depth and at changes of strata in order to physical examination of the nature of all the representative strata. These were collected from the auger and the barrel of the split spoon sampler after the standard penetration tests. The depth wise locations of the entire disturbed and standard penetration test samples have been given in the bore log data sheets, enclosed with this report.

4.2.1 COLLECTION OF UN-DISTURBED SAMPLES

Un-disturbed samples were collected as per specifications given in IS: 1892-1979. After recovery of the samples, the sample tubes were properly sealed at both ends by wax, marked and sent for laboratory testing.

4.3 IN-SITU TEST

a) Standard Penetration Test:

Standard penetration tests (SPT) were carried out in soil strata inside boreholes to determine consistency and strength characteristics of the subsoil in accordance with IS: 2131. The number of blows (N-value) required to drive the standard split spoon sampler of 50mm diameter for a penetration of last 30cm when driven with a 63.5kg monkey falling freely from a height of 750mm is given in the borehole logs at corresponding depths (Appendix-I).

SECTION – II

5.0 LABORATORY TESTS

Laboratory tests have been conducted as per IS specifications on soil samples to determine the following properties.

i) Particle Size Distribution

By the term particle size distribution, we mean sieve and hydrometer analysis. Particle size distribution test is performed to determine the percentage of different grain sizes contained within a soil. The mechanical or sieve analysis is performed to determine the distribution of the coarser, larger sized particles and the hydrometer method is used to determine the distribution of the finer particles.

The distribution of different grain sizes affects the engineering properties of soil. Grain size analysis provides the grain size distribution, and it is required in classifying the soil.

The test has been performed in the laboratory as per IS: 2720 (Part 4) - 1985.

ii) Atterberg Limits

In 1911, the Swedish soil scientist Albert Atterberg (1846-1916) developed a series of tests to evaluate the relationship between moisture content and soil consistency (Atterberg,1911; Blackall, 1952). Then, in the 1930, Karl Terzaghi and Arthur Casagrande adapted these tests for civil engineering purpose, and they soon became a routine part of Geotechnical engineering. This series includes three separate tests : the liquid limit test, the plastic limit test, and the shrinkage limit test. Together they are known as the Atterberg limits test (ASTM D427 and D4318).

The liquid limit and plastic limit tests are routinely performed in many soil mechanics laboratories. However, the shrinkage limit test is less useful, and is rarely performed by civil engineers. Shrinkage limit test is very much required in finding the expansiveness of soil. In our laboratory, liquid limit and plastic limit tests have been done as per IS: 2720 (Part 5) – 1985. As per soil strata encountered in the field, we observed that the basic material is sand and silt and thus no shrinkage property will be observed. Thus considering of no use we have discarded shrinkage limit test.

iii) Specific Gravity of Soil

The ratio of the unit weight of a material to the unit weight of distilled water at 4^0C is a common definition of specific gravity. Soil specific gravities, however, are normally referred to the weight of water at 20^0C. In itself, the specific gravity is not an index property of a soil. It is, however, required for determination of the unit weight of soil and in many computations.**While it is possible to have a range of values from 2.2 to 3.5, most soils have specific gravity from 2.60 to 2.80. Any values outside of this latter range should be viewed sceptically and a retest should be made to verify the value.**
In our laboratory test, specific gravity has been determined as per IS: 2720 (Part 3 / Sec 2) – 1980.

iv) Direct Shear Test

The soil specimen used in the test is usually square in plan of size 60 mm x 60 mm and thickness about 20 to 25 mm. The direct shear test equipment essentially consists of shear box, loading yoke for applying normal force, geared jack for applying shear force and facilities for measuring shear force, shear displacement and vertical deformation for volume change. This test is particularly done for soil samples which are predominantly coarse grained soils.

v) Tri-axial shear Test and unconfined compressive strength tests

For triaxial shear and unconfined compressive strength tests, three no. 38 mm diameter 76 mm long specimens were obtained by jacking out the soil core, each into a thin-walled brass tube, having the wall thickness of 1/32". The inside of the tubes was coated with a thin layer of silicon oil.These were run on the clayey silt samples to determine their shear strengths. The cell pressures employed were 0.5, 1.0 and 1.5 kg/sq.cm. The samples were tested under quick condition at a rate of 1.25 mm/min and were loaded up to maximum 20% axial strain.

vi) Consolidation Test

To obtain specimens for consolidation test, the odometer ring was placed on the trimmed horizontal faces of the soil within the 10 cm diameter sampling tube and the soil around the cutting edge was gradually removed with a spatula as the ring was gently pushed into

the soil. The ring with the soil was then removed by cutting across the soil core with the help of a piano wire saw.

Consolidation tests were run in floating ring type odometers, in single & four unit consolidation frames under standard load increment ratio starting from 0.25 kg/sq.cm and going up to 8 kg/sq.cm in general. The pressure vs void ratio curves are given in this report.

vii) Natural Moisture Content

The natural moisture content of soil is determined from samples taken in the field and placed in a container which is then sealed to prevent loss of moisture by evaporation. **Natural moisture content determinations are valuable in interpreting information obtained from test borings**.

Generally, 100 gm of soil is enough to determine the moisture content of fine grained soils. Larger samples are required for soils that contain gravel. Normally, moisture content samples are placed in metal dishes (canisters) that have tight fitting covers. When the moisture content test is to be performed within 1 day after the sample is obtained, sealing of the container is not required. If a longer time interval will elapse between sampling and testing, the containers may be sealed. Natural moisture content have been determined in the laboratory as per IS : 2720 (Part 2) – 1973.

viii) Bulk Density and Dry Density

Soil Bulk density is defined as the ratio of the mass of dry solids to the bulk volume of the soil occupied by those dry solids. The bulk volume includes the volume of the solids and the pore space. **Bulk density is needed for converting water percentage by weight to content by volume, for calculating porosity and void ratio when the particle density is known, and for estimating the weight of a volume of soil too large to weight conveniently**.

The dry density = Bulk density / (1 + moisture content %)

6.0 GROUND CONDITION

On the basis of findings in the field, onsite identification & examination of samples the subsoil deposits of this site have been subdivided into **seven (07) different strata for the site**. Following table gives a brief description about the subsoil conditions and subsoil parameters at site obtained at site.

Stratum & Thickness (m)	Description of Soil	Average Field N value	Liquid Limit (%)	Plastic Limit (%)	Y_b KN/m^3	Shear Parameters		(m_v) m^2/kN×10^{-4} Range(kPa)		
						C (kPa)	Φ^0	25-50	50-100	100-200
I 0.60 to 5.00	Fillings dark grey mixed soil rubbish, few fly ash, concrit, brick bats and etc.	-	-	-	17.5*	-	-	-	-	-
II 4.50	Soft to medium stiff grey to bluish grey silty clay to clayey silt with fine mica flakes observed (CL).	3	33	21	18.0	26	-	3.00	3.30	3.07
III 6.00	Soft grey to dark grey silty clay with occasionally decomposed vegetation (CH).	5	70	24	18.0	32	-	3.20	3.65	3.37
IV 3.30	Stiff bluish grey silty clay with a few calcereous nodules pieces (CH).	12	60	20	18.6	67	-	1.50	1.68	1.53
IV 6.40	Very stiff yellowish brown silty clay to clayey silt with few rusty brown spots (CH-CI).	16	52	19	19.4	82	-	1.15	1.25	1.10
V 5.50	Dense light brownish grey silty sand with fine mica particles(SM).	38	NP	NP	19.0*	-	34*	E = 40 MPa, μ = 0.35		
VII >12.65	Very dense light brownish grey silty sand with mica particles(SM-SP).	55	NP	NP	20.0*	-	35*	E = 50 MPa, μ = 0.35		

* Suggested Value

Generalized Soil Profile With Design Parameters

NP: Non Plastic

Standing Water Level was found to be at a depth 1.00m below Existing Ground Level however for design purposes the same should be considered at the Finished Ground Level.

SECTION – III

7.0 ENGINEERING APPRAISAL & RECOMMENDATIONS

The proposed structure for the sites will be proposed **B+G+20 Storied Building**. Depending upon the load coming from the structure and depending upon the subsoil conditions, deep foundation in the form of bored cast in situ piles is recommended. However for ancillary and minor structures aspect of open foundations is also discussed.

7.1 OPEN FOUNDATIONS

The net safe bearing capacity and settlement of open foundation is determined using the design soil parameters presented in the generalized soil profile of Section II of this report. Factor of safety has been considered as 2.50 and the ground water table considered at the ground level itself, conservative side. Values of net safe bearing capacity and settlement of footing under different imposed intensity have been presented in tabular form. Both shear and settlement criteria should be checked and considered.

It is desirable and convenient to rest all open foundation under similar stratum condition. For this purpose, it may be suggested to inspect all foundation pits during its excavation. The recognition of the competent founding material should be made by identification of the type of soil, its colour and approximate strength characteristics. In case, the sub-soil is found to be of softer consistency at the founding depth, the same should, however, be excavated, removed and backfilled with lean concrete upto the founding level.Open foundation is recommended both the founding level of 2.00m depth below EGL.

Footing Size (m^2)		**Depth of foundation (m)**	**Bearing Capacity (kPa)**		**Settlement(mm) corresponding to Net Safe Bearing Capacity (kPa)**
Width	**Length**	**Foundation placed within Stratum-II**	**Net Ultimate**	**Net Safe**	
1.50	1.50	2.00	221	88	16
2.00	2.00	2.00	208	83	25
1.50	2.00	2.00	195	79	17
2.00	3.00	2.00	181	72	26
1.50	Strip	2.00	170	68	31
2.00	Strip	2.00	160	64	41

All foundation shall be placed within Stratum-II. Heterogonous filled up soil was found to extend upto a depth of about 5.00m in case of BH-03, hence if the same is found at the founding level, it shall be replaced with well graded well compacted sand

7.2 PILE FOUNDATION

Deep foundation in the form of pile foundation is convenient solutions for heavily loaded structures. Based on sub-soil condition, both bored cast in situ piles and driven type of pile are feasible for this site however driven type of pile causes considerable vibrations hence if any case driven type of piles is not feasible, bored cast in situ piles may be opted.

7.2.1 DISCUSSION ON ESTIMATION OF LOAD CARRYING CAPACITY OF PILES

Normally two types of piles are used to transfer higher foundation loads to underlying soil. Load carrying capacity of pile depends primarily on two factors, (1) structural capacity of pile shaft and (2) resistance offered by surrounding soils by means of side friction and tip resistance. Accordingly, piles are classified as friction and end bearing types depending upon mechanism of load transfer. It is essential that the pile shaft be formed ensuring proper contact with surrounding soils. Also, proper seating of pile tip in firm soil is essential towards development of tip resistance. In case of driven piles, formation of proper pile shaft and proper seating of pile tip is not difficult. Moreover, driving resistance provides reasonable assessment of pile capacity during installation process.

The situation is quite different for bored pile. Possibility of formation of improper pile shaft and inadequate seating of pile tip are not uncommon. Therefore, performance of bored pile depends largely on the methodology, piling equipment, piling experience and quality control. Based on experience on large number of bored piling works, it is observed that, formation of proper pile shaft including proper seating should not be taken for granted.

Pile Dia.	Safe Vertical Capacity in Compression	Safe Vertical Capacity in Tension	Shaft Length	Bored Depth From EGL
(mm)	(kN)	(KN)	(m)	(m)
500	1000	600	25.50	30.00
550	1200	700	25.50	30.00
600	1400	775	25.50	30.00
750	2200	1100	25.50	30.00
600	1700	1000	30.50	35.00
750	2650	1450	30.50	35.00
1000	5050	2400	30.50	35.00

Cut-off-level = 4.50m below EGL

(Note: Pile capacity shall be verified by load tests).

Lateral Load Carrying Capacities of Piles

Pile Dia. (mm)	Free Head		Fixed Head	
	Depth of Fixity (m)	Lateral Capacity (KN)	Depth of Fixity (m)	Lateral Capacity (KN)
500	4.81	10	5.57	27
550	5.29	13	6.12	32
600	5.77	15	6.68	38
750	7.21	23	8.35	60
1000	9.61	41	11.13	107

Calculation is based upon considering 1% of deflection of the diameter of the pile at pile cut-off, Grade of Concrete: M25

Allowable increase in pile capacities under wind/seismic loading condition should be in accordance with the provisions of BIS. As per IS: 1904 – 1986 "Code of Practice for Design and Construction of Foundations in Soils: General Requirements" allowable increase in pile capacity may be considered up to 25% under DL + LL + WL combination when WL is more than 25% of DL and LL. For the seismic loading, as per Table-1 of IS: 1893 (Part 1): 2002 "Criteria for Earthquake Resistant Design of Structures" the allowable increase in pile capacity may be considered up to 50% when pile tip rests on and soil having N – value higher than 30. For piles resting on weaker strata, allowable increase in pile capacity under seismic loading may be considered as 25% as per Table-1 of IS: 1893 (Part 1): 2002. In order to assess adequacy of piling methodology, equipment etc., it is recommended to carry out trial boring and install test pile prior to commencement of working piles. The safe capacity of pile shall be verified by conducting actual load test on pile following provisions of BIS code of practice. The grade of concrete such pile shall be minimum M25.

8.0 CHEMICAL ACTION

Results of chemical tests carried out on water samples falls under Class-1 as per IS 456-200 and does not call for use of any special treatment or special cement. Provision of IS: 456-2000 shall be followed. Concrete should be dense with proper control on water-cement ratio.

9.0 GENERAL RECOMMENDATIONS

a) All foundation design should be carried out as per latest BIS code of practice.
b) Backfilling should be done with excavated earth in layers with proper compaction and addition of water, as required.
c) The surface of the excavated area should not be left exposed and immediate mud mat must be carried out.
d) Special care needs to be taken during excavation for foundations so that the founding stratum does not get disturbed by excavation process and especially by ground/seepage water.
e) The net safe allowable bearing capacities have been calculated without considering the influence of adjacent foundation.
f) The foundation bed should be properly shaped, levelled and properly compacted before laying the mud mat and the mud mat should also be compacted.

FOR JP Geo Consultants

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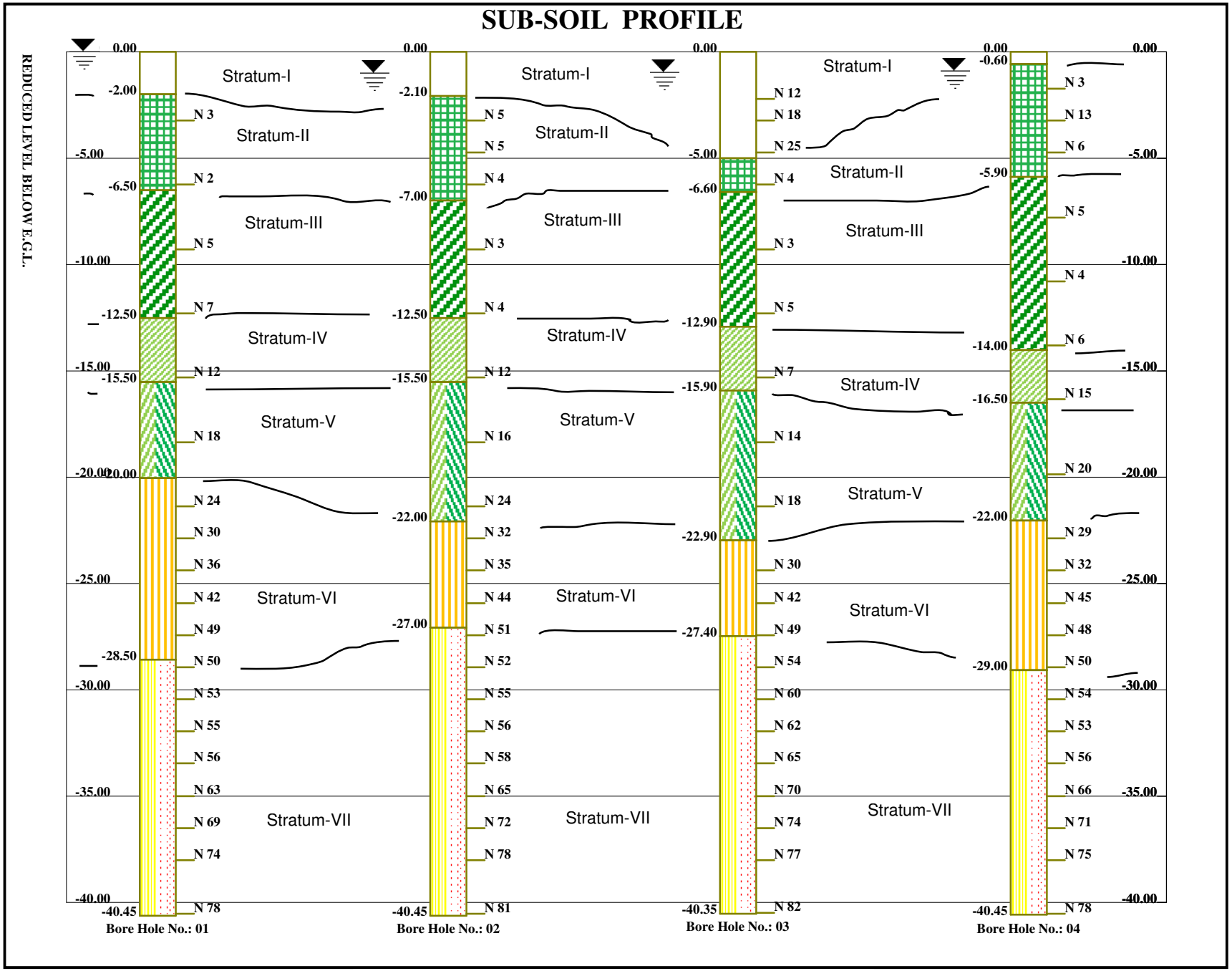
SUB-SOIL PROFILE



Stratum-I: Fillings dark grey mixed soil rubbish, few fly ash, concrit, brick bats and etc.
Stratum-II: Soft to medium stiff grey to bluish grey silty clay to clayey silt with fine mica flakes observed (CL).
Stratum-III: Soft grey to dark grey silty clay with occasionally decomposed vegetation (CH).
Stratum-IV: Stiff bluish grey silty clay with a few calcereous nodules pieces (CH).
Stratum-V: Very stiff yellowish brown silty clay to clayey silt with few rusty brown spots (CH-CI).
Stratum-VI: Dense light brownish grey silty sand with fine mica particles(SM).
Stratum-VII: Very dense light brownish grey silty sand with mica particles(SM-SP).

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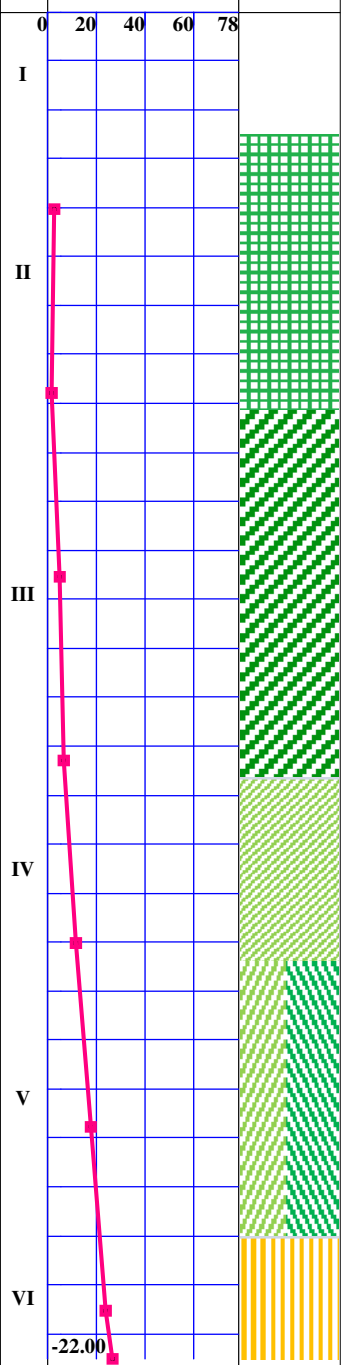
Borehole Name.: 01			Existing Ground Level(m): 0.000	Standing Water Level(m): 1.200
Type of Boring	Auger with casing	Wash without casing	Commenced on : 03 July 2022	Completed on : 04 July 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-3.00	3.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
								Dark grey pond muck.	I
2.00	D					0.00 To -2.00	2.00		
3.00 To 3.45	P	1	1	2	3			Soft grey clayey silt with fine mica flakes observed, note: pond water found up to 1.20m and pond muck up to 2.00m depth.	II
4.50 To 4.95	U								
6.00 To 6.45	P	1	1	1	2	-2.00 To -6.50	4.50		
7.50 To 7.95	U								
9.00 To 9.45	P	2	2	3	5			Medium stiff grey to dark grey silty clay with occasionally decomposed vegetation.	III
10.50 To 10.95	U								
12.00 To 12.45	P	3	3	4	7	-6.50 To -12.50	6.00		
13.50 To 13.95	U							Stiff bluish grey silty clay with a few calcereous nodules pieces.	IV
15.00 To 15.45	P	4	6	6	12	-12.50 To -15.50	3.00		
16.50 To 16.95	U								
18.00 To 18.45	P	6	8	10	18			Very stiff yellowish brown silty clay with few rusty brown spots.	V
19.50 To 19.95	U					-15.50 To -20.00	4.50		
21.00 To 21.45	P	9	11	13	24	-20.00 To -28.50	8.50	Medium dense to dense light brownish grey silty sand with fine mica particles.	VI



Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

Site Person-J.Halder

D:1 U:6 V:0 C:0 P:19 W: 0

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Borehole Name.: 01		Existing Ground Level(m): 0.000	Standing Water Level(m): 1.200
Type of Boring	Auger with casing / Wash without casing	Commenced on : 03 July 2022	Completed on : 04 July 2022
Dia of Hole (mm):	150 / 150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-3.00 / 3.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
22.50 To 22.95	P	11	14	16	30				
24.00 To 24.45	P	12	16	20	36		-24	Medium dense to dense light brownish grey silty sand with fine mica particles.	VI
25.50 To 25.95	P	14	19	23	42		-26		
27.00 To 27.45	P	17	23	26	49		-28		
28.50 To 28.95	P	18	24	26	50	-20.00 To -28.50	8.50		
30.00 To 30.45	P	20	25	28	53		-30		
31.50 To 31.95	P	20	25	30	55		-32		
33.00 To 33.45	P	22	26	30	56		-34	Very dense light brownish grey silty sand with mica particles.	VII
34.50 To 34.95	P	23	30	33	63		-36		
36.00 To 36.45	P	25	33	36	69		-38		
37.50 To 37.95	P	27	35	39	74		-40		
40.00 To 40.45	P	29	37	41	78	-28.50 To -40.45	11.95		
							-42		

SPT Curve: 0 20 40 60 78 — -40.45

Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

Site Person-J.Halder

D:1 U:6 V:0 C:0 P:19 W: 0

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Borehole Name.: 02			Existing Ground Level(m): 0.000	Standing Water Level(m): -1.020
Type of Boring	Auger with casing	Wash without casing	Commenced on : 22 June 2022	Completed on : 25 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-3.00	3.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
0.50	D					0.00 To -2.10	2.10	Fillings dark grey mixed soil rubbish, few fly ash, concrit, brick bats and etc.	I
1.50	D								
3.00 To 3.45	P	2	2	3	5			Soft to medium stiff grey to bluish grey silty clay to clayey silt with fine mica flakes observed,.	II
4.50 To 4.95	P	1	2	3	5				
6.00 To 6.45	P	2	2	2	4	-2.10 To -7.00	4.90		
7.50 To 7.95	U								
9.00 To 9.45	P	1	1	2	3			Soft grey to dark grey silty clay with occasionally decomposed vegetation.	III
10.50 To 10.95	U								
12.00 To 12.45	P	1	2	2	4	-7.00 To -12.50	5.50		
13.50 To 13.95	U							Stiff bluish grey silty clay with few calcereous nodules pieces.	IV
15.00 To 15.45	P	4	5	7	12	-12.50 To -15.50	3.00		
16.50 To 16.95	U								
18.00 To 18.45	P	6	8	8	16			Very stiff yellowish brown silty clay to clayey silt with few rusty brown spots.	V
19.50 To 19.95	U								
21.00 To 21.45	P	9	11	13	24	-15.50 To -22.00	6.50		

SPT Curve: 0 20 40 60 80 | -2 -4 -6 -8 -10 -12 -14 -16 -18 -20 | -22.00

Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

Site Person-J.Halder

D:2 U:5 V:0 C:0 P:20 W: 0

JP GEO CONSULTANTS

Borehole Name.: 02			Existing Ground Level(m): 0.000	Standing Water Level(m): -1.020
Type of Boring	Auger with casing	Wash without casing	Commenced on : 22 June 2022	Completed on : 25 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-3.00	3.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
22.50 To 22.95	P	12	15	17	32				
24.00 To 24.45	P	13	16	19	35		-24	Dense light brownish grey silty sand with fine mica particles.	VI
25.50 To 25.95	P	16	20	24	44		-26		
						-22.00 To -27.00	5.00		
27.00 To 27.45	P	19	24	27	51		-28		
28.50 To 28.95	P	20	25	27	52				
30.00 To 30.45	P	21	26	29	55		-30		
31.50 To 31.95	P	22	26	30	56		-32		
33.00 To 33.45	P	24	27	31	58		-34	Very dense light brownish grey silty sand with mica particles.	VII
34.50 To 34.95	P	27	31	34	65				
36.00 To 36.45	P	33	35	37	72		-36		
37.50 To 37.95	P	33	37	41	78		-38		
40.00 To 40.45	P	35	39	42	81	-27.00 To -40.45	13.45		
							-40		
							-42		

SPT Curve: 0 20 40 60 80 -40.45

Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

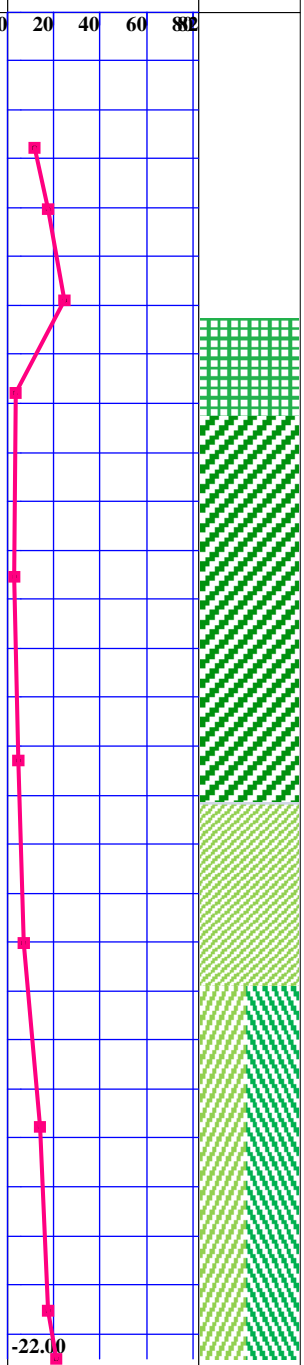
Site Person-J.Halder

D:2 U:5 V:0 C:0 P:20 W: 0

JP GEO CONSULTANTS

Borehole Name.: 03			Existing Ground Level(m): 0.000	Standing Water Level(m): -1.000
Type of Boring	Auger with casing	Wash without casing	Commenced on : 28 June 2022	Completed on : 30 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-2.00	2.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
0.50	D								
1.00	D								
2.00 To 2.45	P	3	5	7	12			Fillings dark grey mixed soil rubbish, few fly ash, concrit, brick bats and etc.	I
3.00 To 3.45	P	5	7	11	18				
4.50 To 4.95	P	7	10	15	25	0.00 To -5.00	5.00	Soft bluish grey clayey silt with few fine mica flakes observed,.	II
6.00 To 6.45	P	2	2	2	4	-5.00 To -6.60	1.60		
7.50 To 7.95	U								
9.00 To 9.45	P	1	1	2	3			Soft to medium stiff grey to dark grey silty clay with decomposed vegetation, high% decomposed/peat at 7.50m depth.	III
10.50 To 10.95	U								
12.00 To 12.45	P	1	2	3	5	-6.60 To -12.90	6.30		
13.50 To 13.95	U							Medium stiff bluish grey silty clay with calcereous nodules pieces.	IV
15.00 To 15.45	P	3	3	4	7	-12.90 To -15.90	3.00		
16.50 To 16.95	U								
18.00 To 18.45	P	5	6	8	14			Stiff to very stiff yellowish brown silty clay to clayey silt with few rusty brown spots.	V
19.50 To 19.95	U								
21.00 To 21.45	P	6	8	10	18	-15.90 To -22.90	7.00		



D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

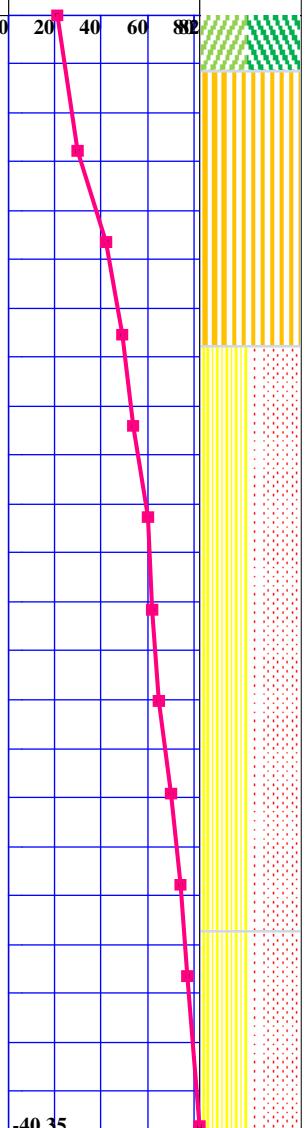
Site Person-J.Halder

D:2 U:6 V:0 C:0 P:20 W: 0

JP GEO CONSULTANTS

Borehole Name.: 03			Existing Ground Level(m): 0.000	Standing Water Level(m): -1.000
Type of Boring	Auger with casing	Wash without casing	Commenced on : 28 June 2022	Completed on : 30 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-2.00	2.00-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
22.00 To 22.45	U					-15.90 To -22.90	7.00	Stiff to very stiff yellowish brown silty clay to clayey silt with few rusty brown spots.	V
24.00 To 24.45	P	9	13	17	30			Dense light brownish grey silty sand with fine mica particles.	VI
25.50 To 25.95	P	16	18	24	42				
27.00 To 27.45	P	17	22	27	49	-22.90 To -27.40	4.50		
28.50 To 28.95	P	17	26	28	54				
30.00 To 30.45	P	18	28	32	60				
31.50 To 31.95	P	19	29	33	62				
33.00 To 33.45	P	19	31	34	65			Very dense light brownish grey silty sand with mica particles.	VII
34.50 To 34.95	P	21	33	37	70				
36.00 To 36.45	P	24	35	39	74				
37.50 To 37.95	P	27	37	40	77				
40.00 To 40.35	P	31	39	43	82	-27.40 To -40.35	12.95		



Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

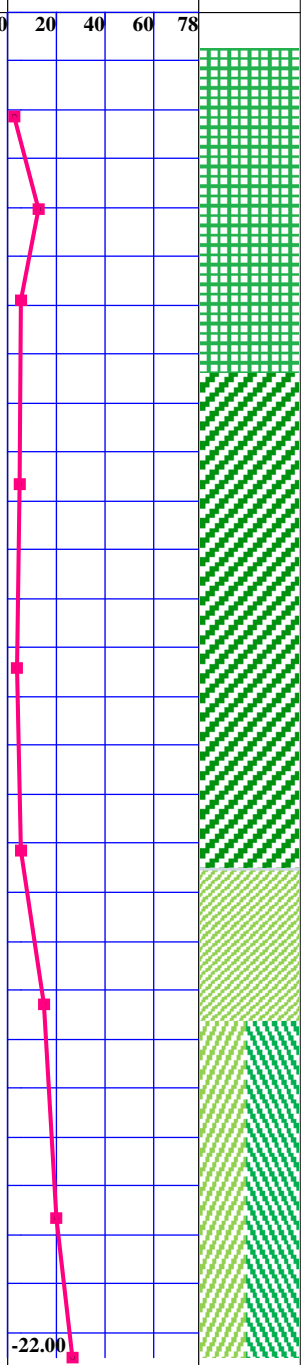
Site Person-J.Halder

D:2 U:6 V:0 C:0 P:20 W: 0

JP GEO CONSULTANTS

Borehole Name.: 04			Existing Ground Level(m): 0.000	Standing Water Level(m): -0.950
Type of Boring	Auger with casing	Wash without casing	Commenced on : 25 June 2022	Completed on : 27 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-1.50	1.50-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
0.50	D					0.00 To -0.60	0.60		I
1.50 To 1.95	P	1	1	2	3				
3.00 To 3.45	P	6	6	7	13			Soft to stiff light brownish grey clayey silt with fine mica flakes observed,.	II
4.50 To 4.95	P	2	3	3	6				
6.00 To 6.45	U					-0.60 To -5.90	5.30		
7.50 To 7.95	P	2	2	3	5				
9.00 To 9.45	U							Soft to medium grey to dark grey silty clay with decomposed vegetation.	III
10.50 To 10.95	P	1	2	2	4				
12.00 To 12.45	U								
13.50 To 13.95	P	2	3	3	6	-5.90 To -14.00	8.10		
15.00 To 15.45	U							Medium stiff bluish grey silty clay with few calcereous nodules pieces.	IV
16.00 To 16.45	P	6	7	8	15	-14.00 To -16.50	2.50		
18.00 To 18.45	U							Medium stiff to very stiff yellowish brown silty clay to clayey silt with fewfine mica flakes and rusty brown spots.	V
19.50 To 19.95	P	7	9	11	20				
21.00 To 21.45	U					-16.50 To -22.00	5.50		



D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

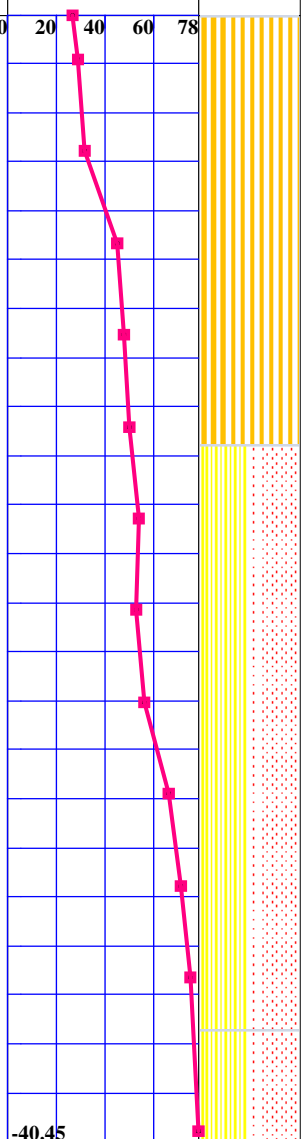
Site Person-J.Halder

D:1 U:6 V:0 C:0 P:20 W: 0

JP GEO CONSULTANTS

Borehole Name.: 04			Existing Ground Level(m): 0.000	Standing Water Level(m): -0.950
Type of Boring	Auger with casing	Wash without casing	Commenced on : 25 June 2022	Completed on : 27 June 2022
Dia of Hole (mm):	150	150	Site :Aqua View (Konnagar)	
Depth(m):	0.00-1.50	1.50-40.45	Job No. : 20317	

Sample Depth(m)	Sample Type	SPT Record 0-150	150-300	300-450	N	Depth in Meter	Thickness	Description of Strata	Stratum
22.50 To 22.95	P	10	13	16	29				
24.00 To 24.45	P	12	15	17	32			Medium dense to dense light brownish grey silty sand with fine mica particles.	VI
25.50 To 25.95	P	16	20	25	45				
27.00 To 27.45	P	17	21	27	48				
28.50 To 28.95	P	18	23	27	50	-22.00 To -29.00	7.00		
30.00 To 30.45	P	19	26	28	54				
31.50 To 31.95	P	19	23	30	53				
33.00 To 33.45	P	21	24	32	56				
34.50 To 34.95	P	22	30	36	66			Very dense light brownish to bluish grey silty sand with mica particles.	VII
36.00 To 36.45	P	26	33	38	71				
37.50 To 37.95	P	30	35	40	75				
40.00 To 40.45	P	32	36	42	78	-29.00 To -40.45	11.45		



Symbol

D-Disturbed Sample, U-Undisturbed Sample, P-Standerd Penetration Test,C-Core, W-Water Sample, V-Vane Test

Site Person-J.Halder

D:1 U:6 V:0 C:0 P:20 W: 0

LABORATORY TEST RESULTS

Borehole No.	Type	Sample No	Sampling Depth (m)		N-Value	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	GRAIN SIZE ANALYSIS (%)				SHEAR TEST (kPa)					DENSITY (KN/m^3)		Specific Gravity
									Gravel	Sand	Silt	Clay	Unconfined Compression Test	Unconsolidated Undrained		Direct Shear		Bulk	Dry	
			From	To									Undisturbed	C	Φ	C	Φ			
1	U	3	4.50	4.95		28	36	22		7	78	15		26	4			18.00	14.00	2.65
	U	5	7.50	7.95		29	68	23		1	65	34	28					18.20	14.10	
	U	7	10.50	10.95		29	66	23		1	67	32		37	1			18.50	14.30	2.64
	U	9	13.50	13.95		26	58	20	3	1	69	27	45					19.00	15.10	2.67
	U	11	16.50	16.95		24	52	19		2	73	25		82	2			19.40	15.60	
	U	13	19.50	19.95		22	48	19		4	71	25	92					19.80	16.20	2.67
	P	15	22.50	22.95	30		NP	NP								0.32	35			
	P	17	25.50	25.95	42		NP	NP		83	17									
	P	19	28.50	28.95	50		NP	NP								0.54	37			
	P	21	31.50	31.95	55		NP	NP		87	13									
	P	23	34.50	34.95	63		NP	NP								0.27	40			
	P	25	37.50	37.95	74		NP	NP		95	5									2.69

LABORATORY TEST RESULTS

Borehole No.	Type	Sample No	Sampling Depth (m)		N-Value	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	GRAIN SIZE ANALYSIS (%)				SHEAR TEST (kPa)					DENSITY (KN/m^3)		Specific Gravity
			From	To					Gravel	Sand	Silt	Clay	Unconfined Compression Test	Unconsolidated Undrained		Direct Shear		Bulk	Dry	
													Undisturbed	C	Φ	C	Φ			
2	P	4	4.50	4.95	5		NP	NP		9	89	2						17.90	13.90	2.62
	U	6	7.50	7.95		29	68	25		1	65	34		28	0			18.00	14.00	
	U	8	10.50	10.95		28	66	28		1	67	32	27					18.60	15.00	2.67
	U	10	13.50	13.95		24	60	27	4	1	61	34		67	3			19.10	15.50	
	U	12	16.50	16.95		23	52	20		3	70	27	65					19.70	16.30	2.67
	U	14	19.50	19.95		21	39	19		5	74	21		87	2					
	P	16	22.50	22.95	32		NP	NP								0.2	36			
	P	18	25.50	25.95	44		NP	NP		85	15									
	P	20	28.50	28.95	52		NP	NP								0.33	38			
	P	22	31.50	31.95	56		NP	NP		88	12									2.69
	P	24	34.50	34.95	65		NP	NP								0.45	40			
	P	26	37.50	37.95	78		NP	NP		95	5									
	P	27	40.00	40.45	81		NP	NP		97	3					0.94	41			

LABORATORY TEST RESULTS

Borehole No.	Type	Sample No	Sampling Depth (m)		N-Value	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	GRAIN SIZE ANALYSIS (%)				SHEAR TEST (kPa)					DENSITY (KN/m^3)		Specific Gravity
									Gravel	Sand	Silt	Clay	Unconfined Compression Test	Unconsolidated Undrained		Direct Shear		Bulk	Dry	
			From	To									Undisturbed	C	Φ	C	Φ			
3	P	6	6.00	6.45	4		45	22												
	U	7	7.50	7.95		70	130	50		0.5	63.5	36		28	0			16.80	9.90	
	U	9	10.50	10.95		30	67	25		1	63	36	31					18.10	13.90	2.62
	U	11	13.50	13.95		25	60	20	5	2	63	30		37	3			18.90	15.10	
	U	13	16.50	16.95		23	50	19		3	72	25	54					19.30	15.70	2.66
	U	15	19.50	19.95		22	47	18		4	73	23	74					19.60	16.00	
	U	17	22.50	22.95		21	38	18		7	73	20		98	3			20.00	16.50	
	P	19	25.50	25.95	42		NP	NP								0.38	36			
	P	21	28.50	28.95	54		NP	NP		86	14									
	P	23	31.50	31.95	62		NP	NP		90	10									
	P	25	34.50	34.95	70		NP	NP								0.47	38			
	P	27	37.50	37.95	77		NP	NP		96	4									

LABORATORY TEST RESULTS

Borehole No.	Type	Sample No	Sampling Depth (m)		N-Value	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	GRAIN SIZE ANALYSIS (%)				SHEAR TEST (kPa)					DENSITY (KN/m^3)		Specific Gravity
									Gravel	Sand	Silt	Clay	Unconfined Compression Test	Unconsolidated Undrained		Direct Shear		Bulk	Dry	
			From	To									Undisturbed	C	Φ	C	Φ			
4	P	2	1.50	1.95	3		30	21		5	84	11								
	P	4	4.50	4.95	6		NP	NP		8	90	2								
	U	5	6.00	6.45		30	70	24		1	63	36		32	0			18.00	13.80	2.58
	U	7	9.00	9.45		42	88	32		0.5	63.5	36	27					17.90	12.60	
	U	9	12.00	12.45		29	68	23		1	65	34		31	1			18.30	14.20	2.62
	U	11	15.00	15.45		24	60	20	3	1	63	33	40					18.60	15.00	2.67
	U	13	18.00	18.45		23	52	19		2	71	27	79					19.50	15.80	
	U	15	21.00	21.45		21	38	18		5	76	19	95					20.00	16.50	2.67
	P	17	24.00	24.45	32		NP	NP								0.65	36			
	P	19	27.00	27.45	48		NP	NP		85	15									
	P	21	30.00	30.45	54		NP	NP								0.22	39			
	P	23	33.00	33.45	56		NP	NP		88	12									2.69
	P	25	36.00	36.45	71		NP	NP								0.17	39			
	P	27	40.00	40.45	78		NP	NP		96	4									

CHEMICAL TEST RESULTS

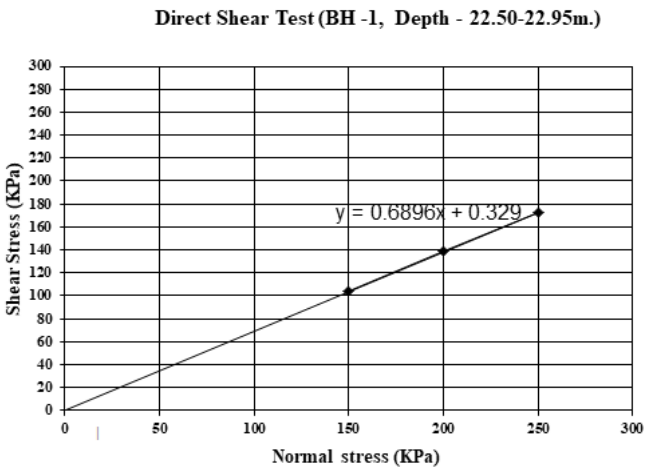
Borehole Number	Depth (m)	Type of Sample	Temp (^{0}C)	PH Value	Chloride (ppm)	Chloride (%)	Sulphate SO_3 (ppm)	Sulphate SO_3 (%)
02	1.02	Water	30.3	7.6	108.843	0.0109	54.878	0.0055
03	1.0	Water	30.3	7.6	108.843	0.0109	54.878	0.0055
03	1.00	Soil	30.3	6.8	69.264	0.0069	ND	ND
04	1.50-1.95	Soil	30.3	6.5	49.474	0.0049	ND	ND

ND: NOT DETECTED

m_v Value(m^2/KN x 10^{-4})

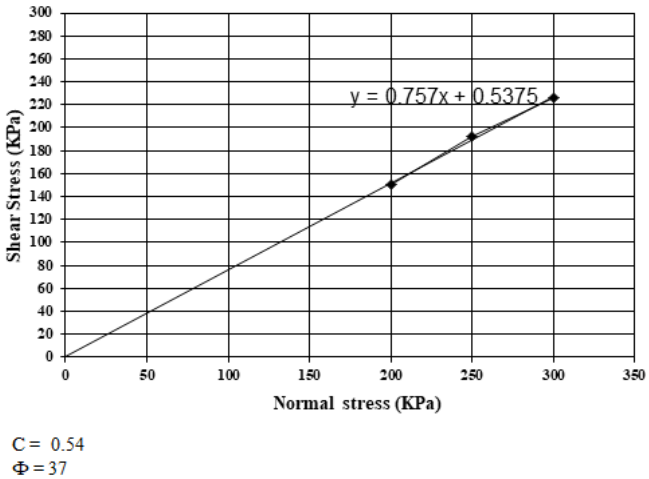
BH No.	Depth (m)	00-10	10-25	25-50	50-100	100-200	200-400	400-800
		Range (kPa)						
1	4.50-4.95	2.25	2.60	3.00	3.30	3.07	2.29	1.44
1	10.50-10.95	2.00	2.20	2.60	3.05	2.88	2.21	1.41
1	13.50-13.95	1.00	1.40	1.50	1.75	1.60	1.21	0.84
1	19.50-19.95	0.75	1.10	1.20	1.48	1.35	0.99	0.65
2	7.50-7.95	2.50	2.80	3.20	3.65	3.37	2.41	1.55
2	13.50-13.95	1.00	1.30	1.50	1.68	1.53	1.05	0.67
2	19.50-19.95	0.50	1.00	1.20	1.30	1.17	0.85	0.56
3	10.50-10.95	2.10	2.30	2.70	3.10	2.92	2.24	1.41
3	16.50-16.95	1.25	1.50	1.70	1.95	1.75	1.36	0.90
4	6.00-6.45	2.00	2.24	2.60	3.00	2.83	2.21	1.39
4	15.00-15.45	1.20	1.50	1.70	1.95	1.83	1.26	0.79
4	21.00-21.45	0.50	0.90	1.15	1.25	1.10	0.81	0.52

DIRECT SHEAR TEST CURVE



C = 0.32
Φ = 35

N.M.C = 22%
B.D = 19.5
D.D = 16.0

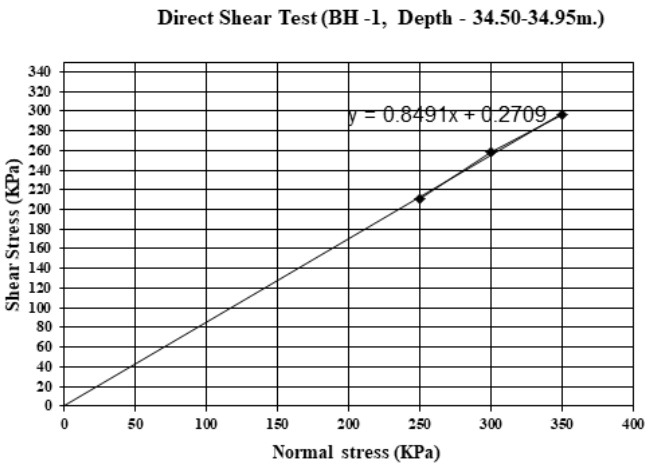


C = 0.54
Φ = 37

N.M.C = 20%
B.D = 20.6
D.D = 17.2

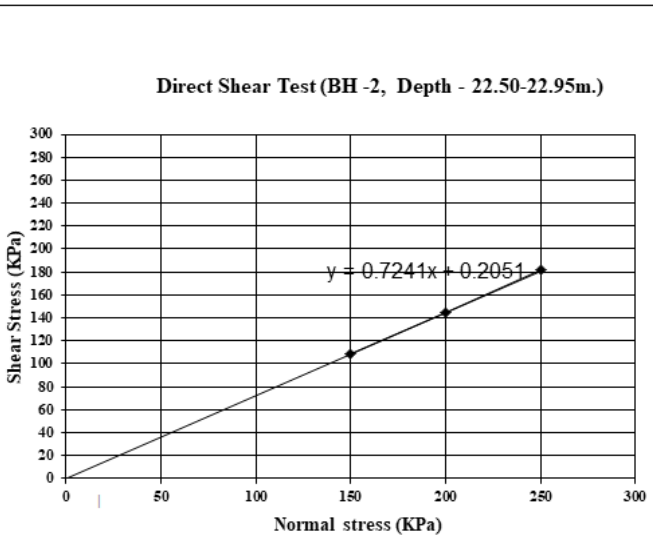
Note: NMC-Natural Moisture Content (%), **B.D**. – Bulk Density (KN/m3), **D.D.** – Dry Density (KN/m3)

DIRECT SHEAR TEST CURVE



C = 0.27
Φ = 40

N.M.C = 20%
B.D = 20.8
D.D = 17.3

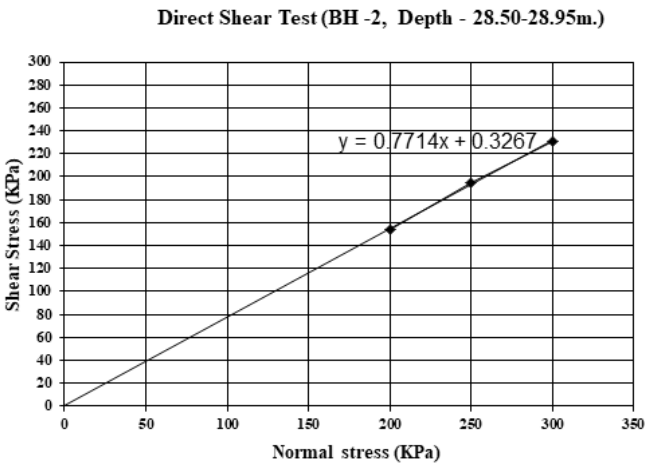


C = 0.20
Φ = 36

N.M.C = 22%
B.D = 19.6
D.D = 16.0

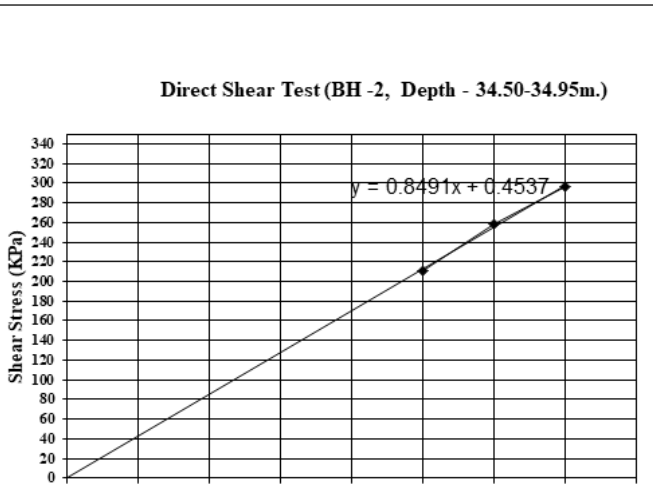
Note: NMC-Natural Moisture Content (%), **B.D**. – Bulk Density (KN/m3), **D.D.** – Dry Density (KN/m3)

DIRECT SHEAR TEST CURVE



C = 0.33
Φ = 38

N.M.C = 19%
B.D = 20.7
D.D = 17.4

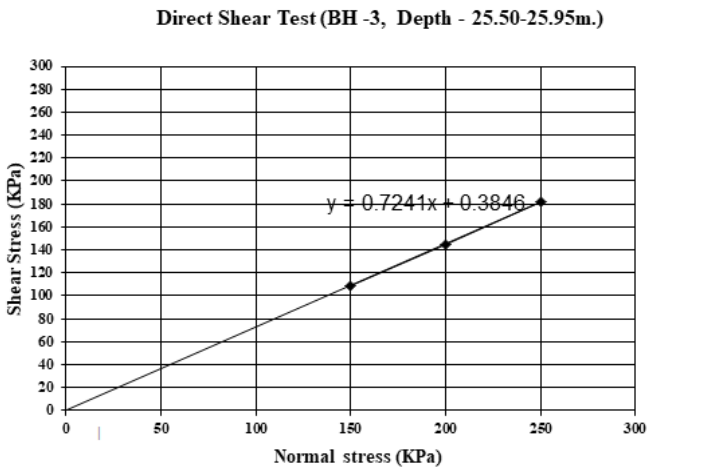


C = 0.45
Φ = 40

N.M.C = 19%
B.D = 20.8
D.D = 17.5

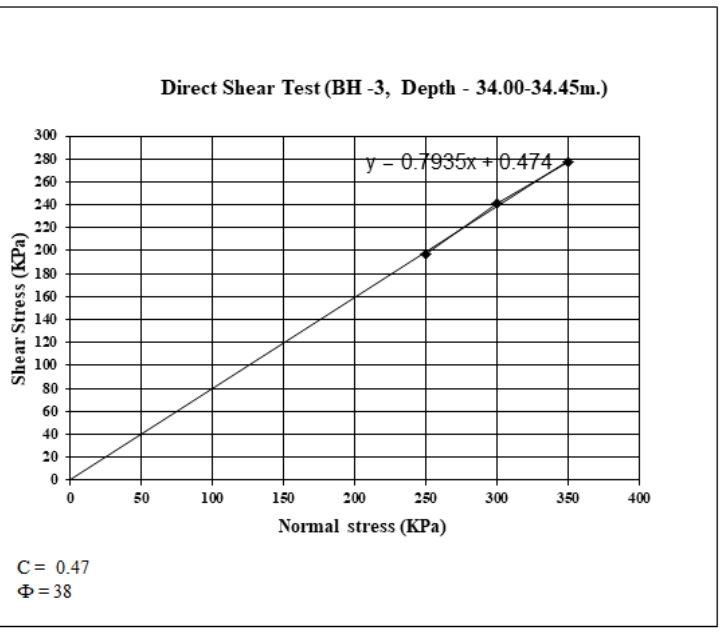
Note: NMC-Natural Moisture Content (%), **B.D**. – Bulk Density (KN/m3), **D.D.** – Dry Density (KN/m3)

DIRECT SHEAR TEST CURVE



C = 0.38
Φ = 36

N.M.C = 20%
B.D = 19.8
D.D = 16.5

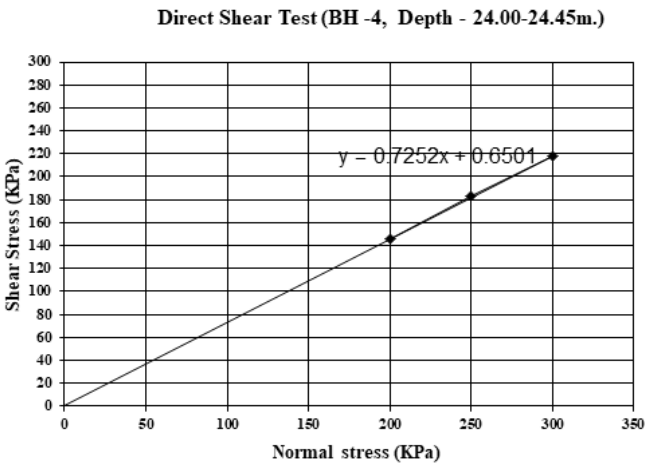


C = 0.47
Φ = 38

N.M.C = 20%
B.D = 20.4
D.D = 17.0

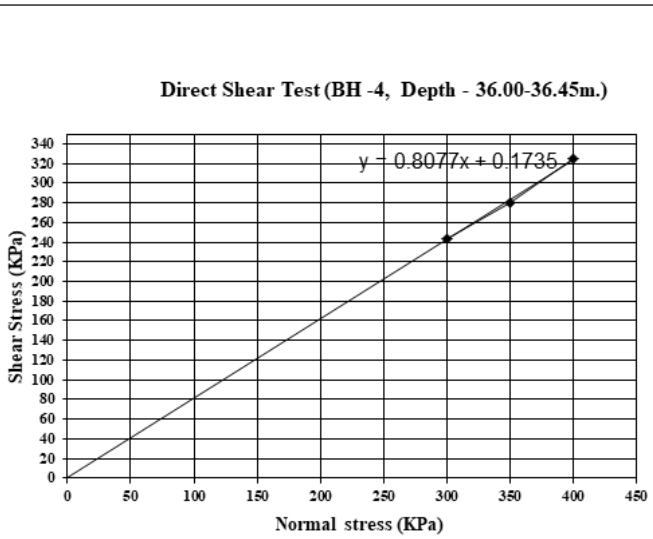
Note: NMC-Natural Moisture Content (%), **B.D**. – Bulk Density (KN/m3), **D.D.** – Dry Density (KN/m3)

DIRECT SHEAR TEST CURVE



C = 0.65
Φ = 36

N.M.C = 21%
B.D = 20.0
D.D = 16.4

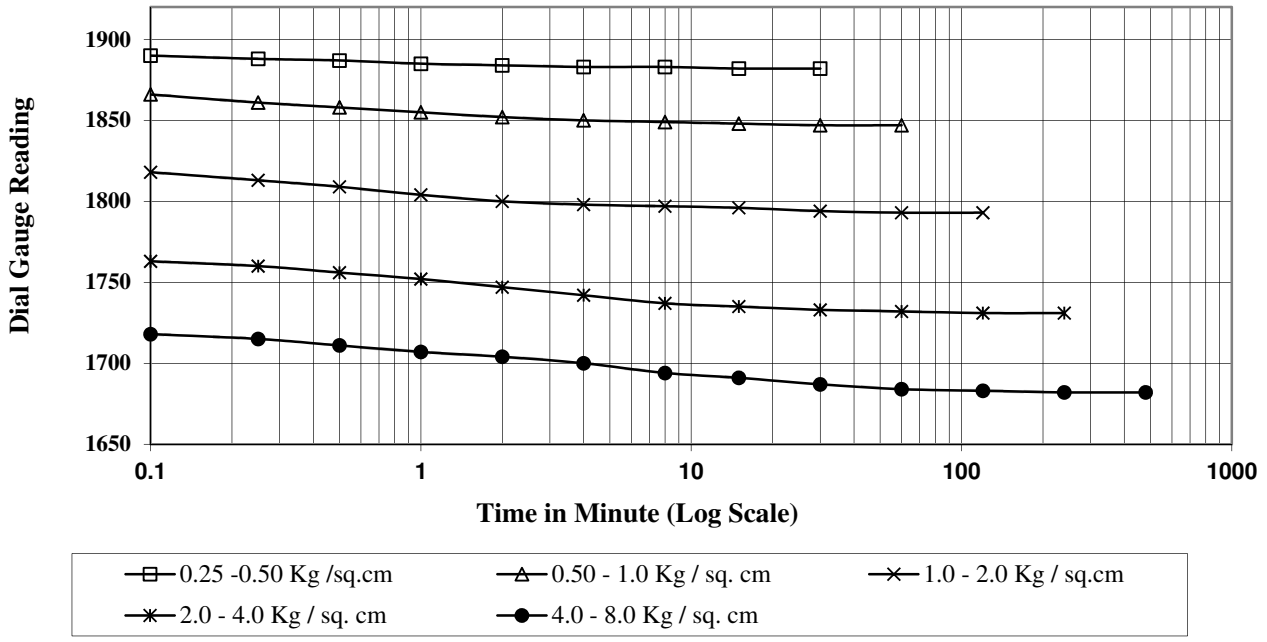


C = 0.17
Φ = 39

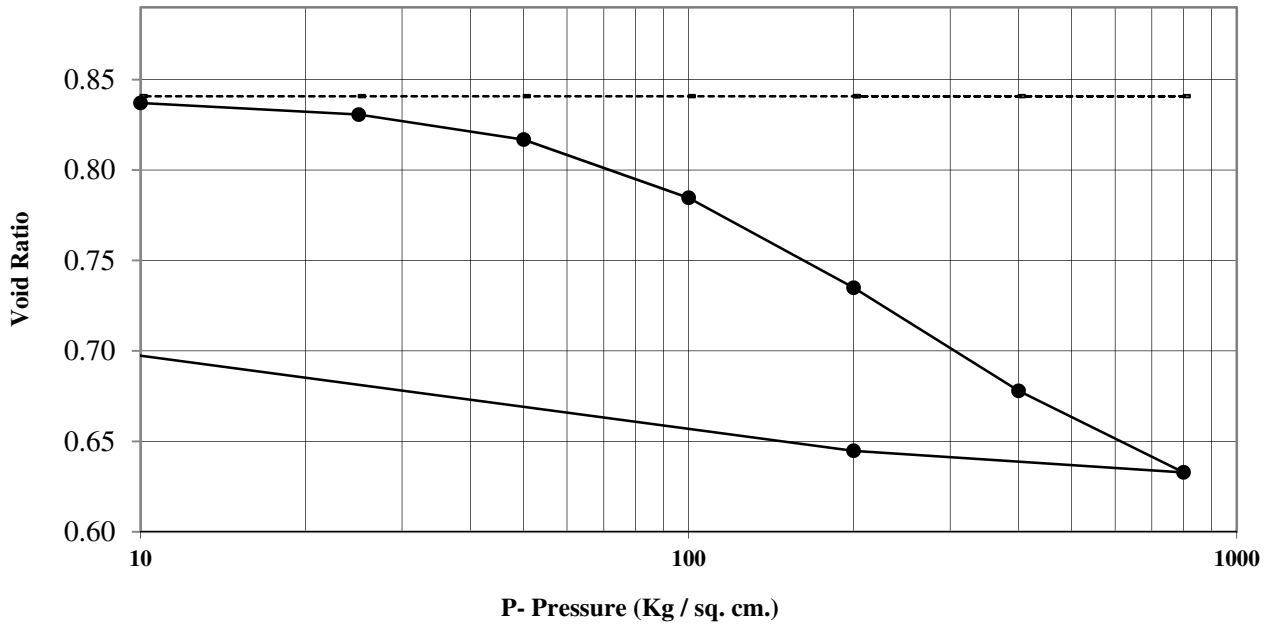
N.M.C = 19%
B.D = 20.7
D.D = 17.4

Note: NMC-Natural Moisture Content (%), **B.D**. – Bulk Density (KN/m3), **D.D.** – Dry Density (KN/m3)

LOG TIME VS SETTLEMENT CURVE

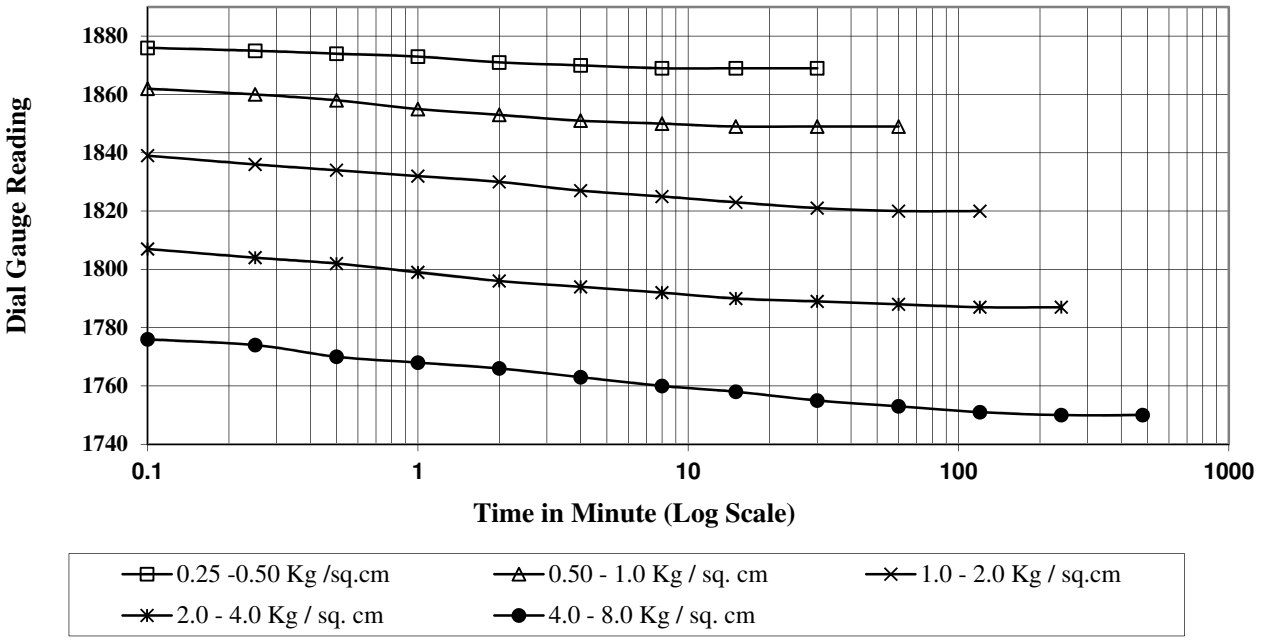


e log P CURVE

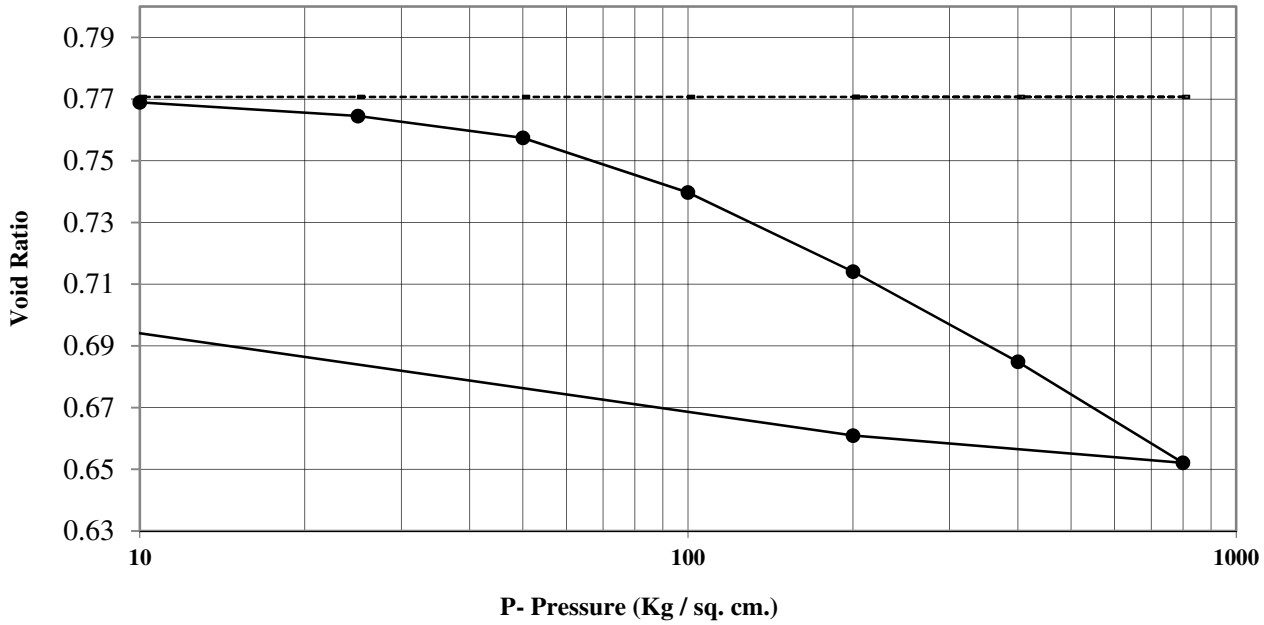


Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
1	10.50-10.95	2.00	2.20	2.60	3.05	2.88	2.21	1.41	0.85	0.17

LOG TIME VS SETTLEMENT CURVE

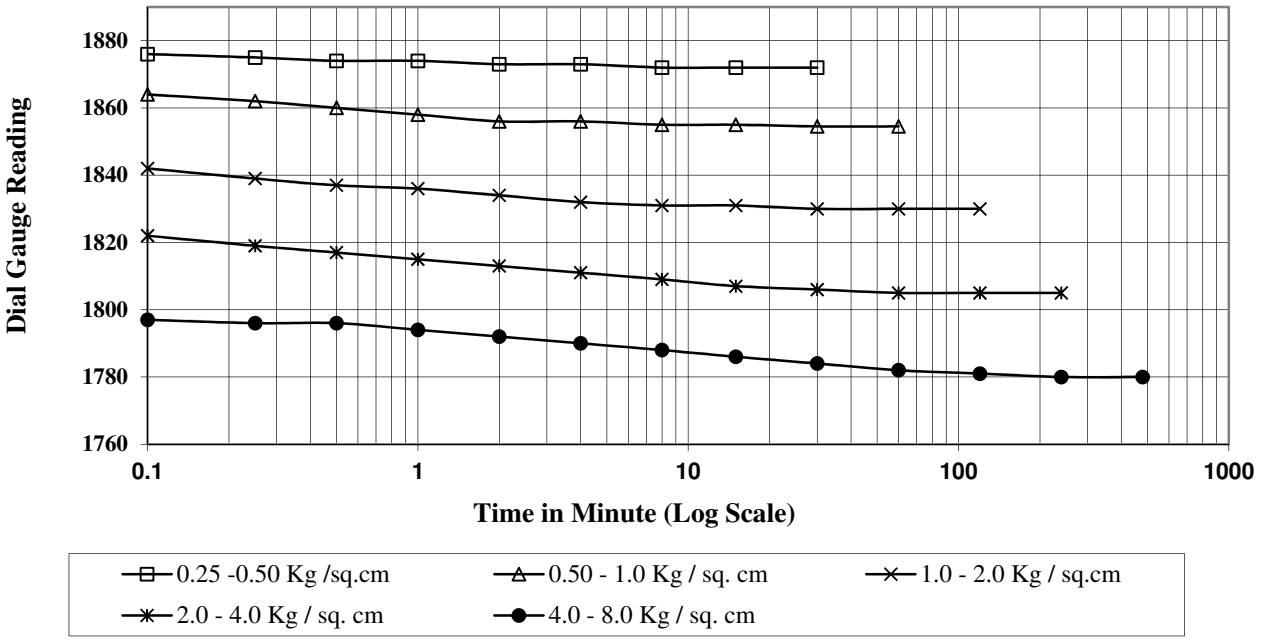


e log P CURVE

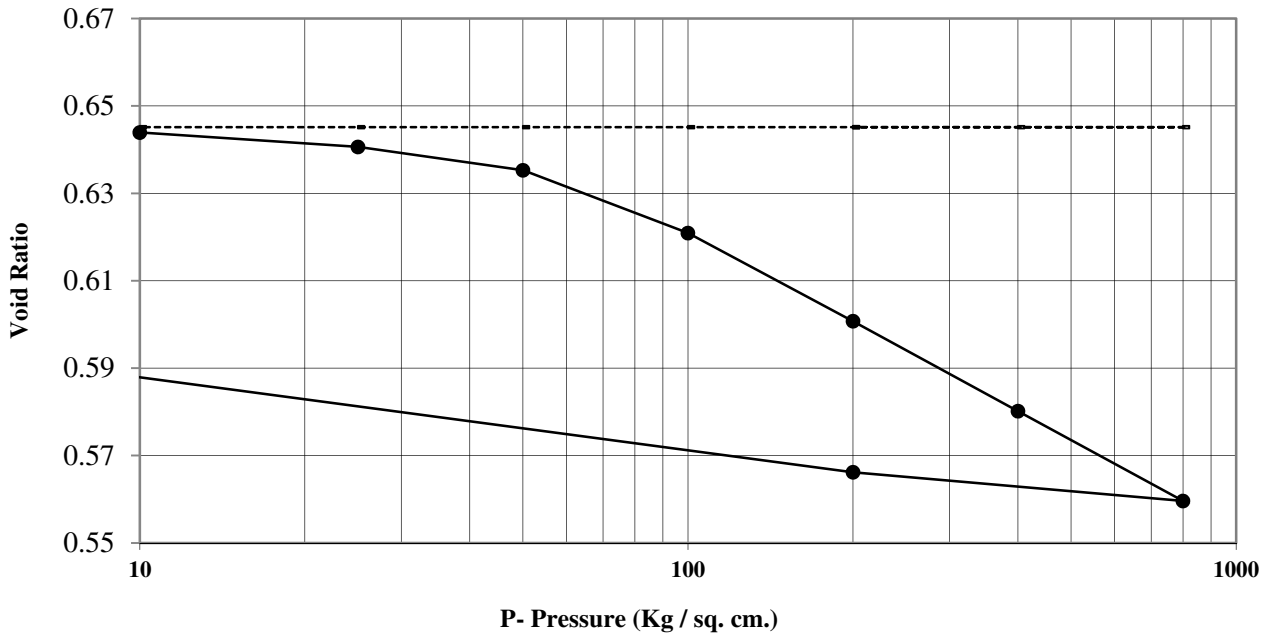


Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
1	13.50-13.95	1.00	1.40	1.50	1.75	1.60	1.21	0.84	0.77	0.10

LOG TIME VS SETTLEMENT CURVE



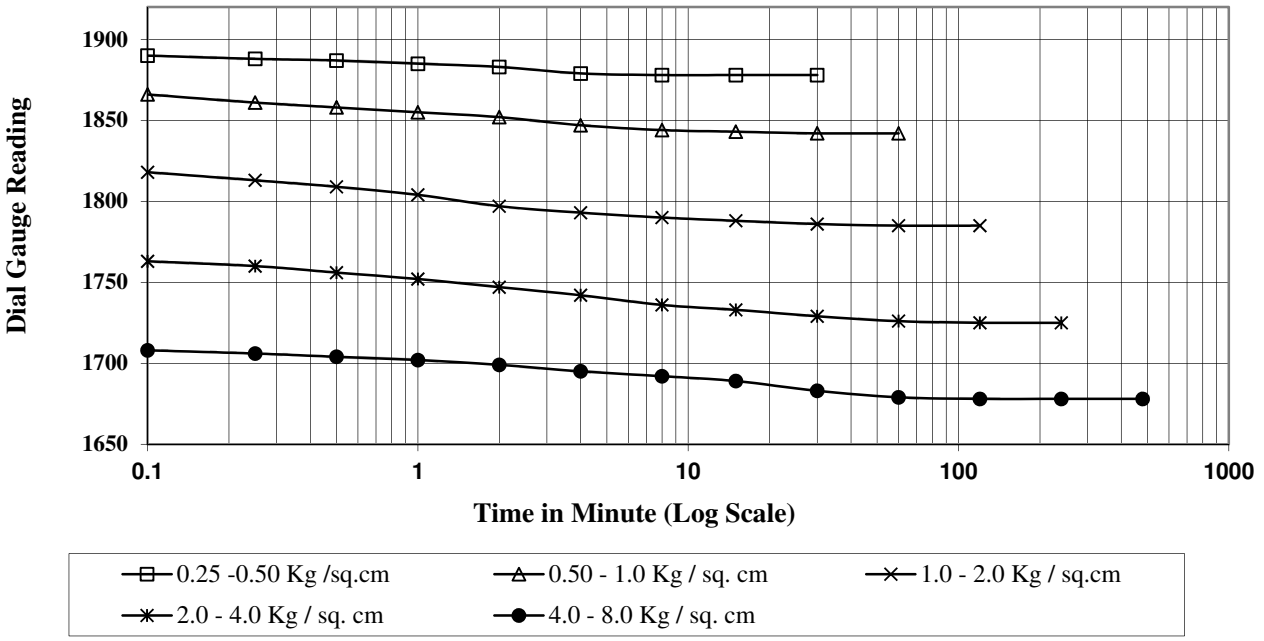
e log P CURVE



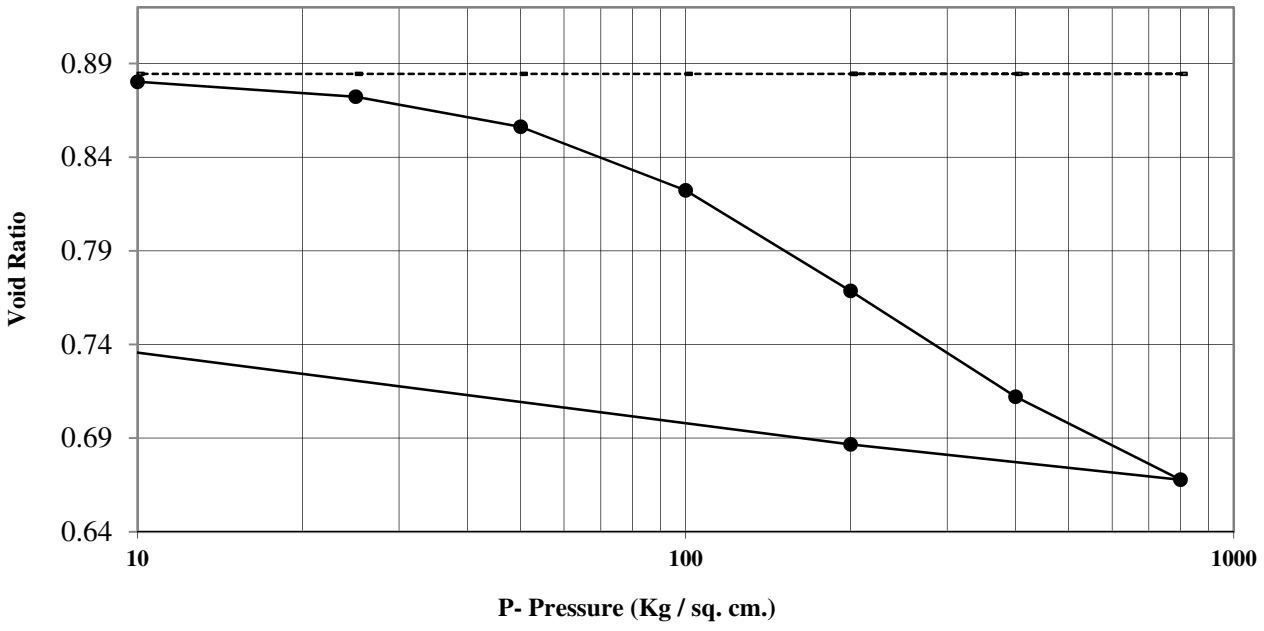
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
1	19.50-19.95	0.75	1.10	1.20	1.48	1.35	0.99	0.65	0.65	0.07

JP Geo Consultants *Job No.: 20317*

LOG TIME VS SETTLEMENT CURVE

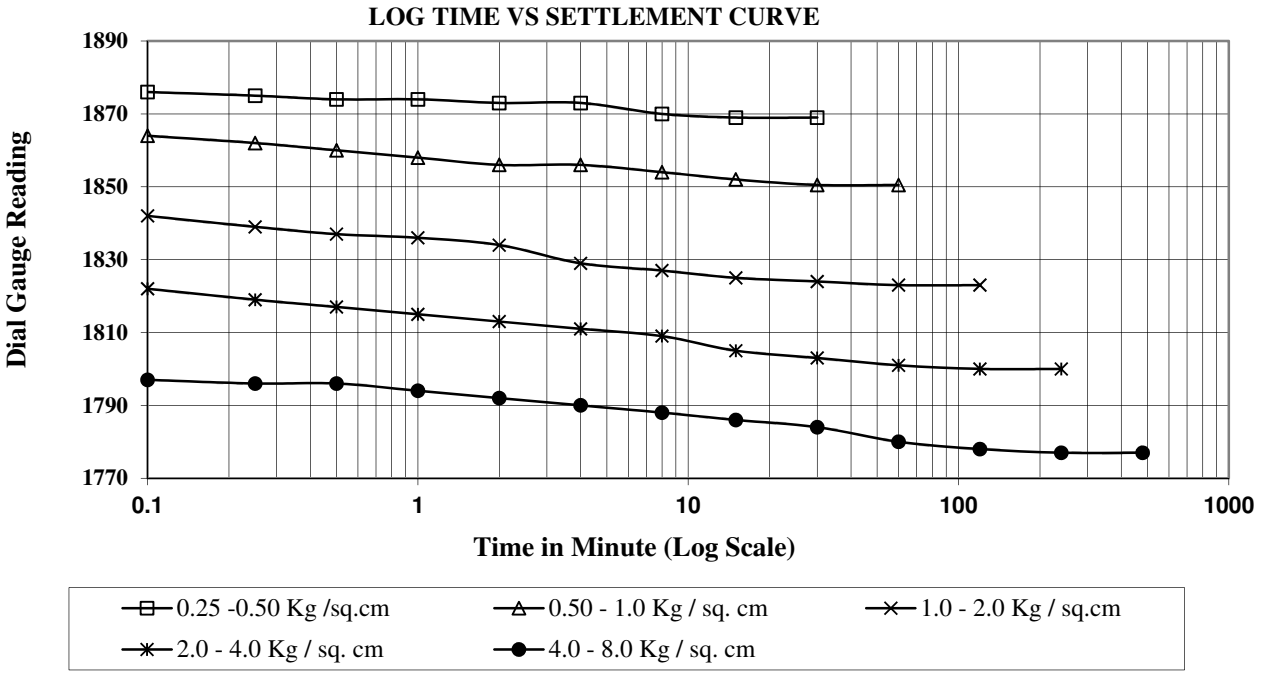


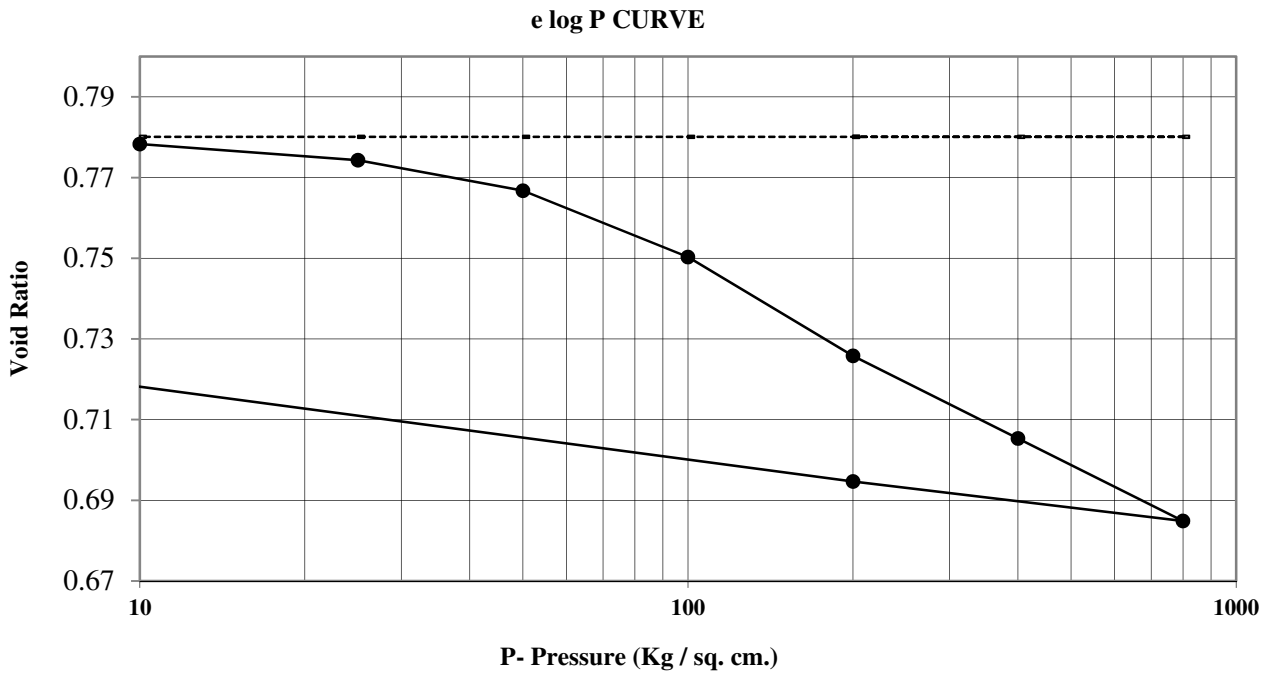
e log P CURVE



Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
1	4.50-4.95	2.25	2.60	3.00	3.30	3.07	2.29	1.44	0.89	0.17

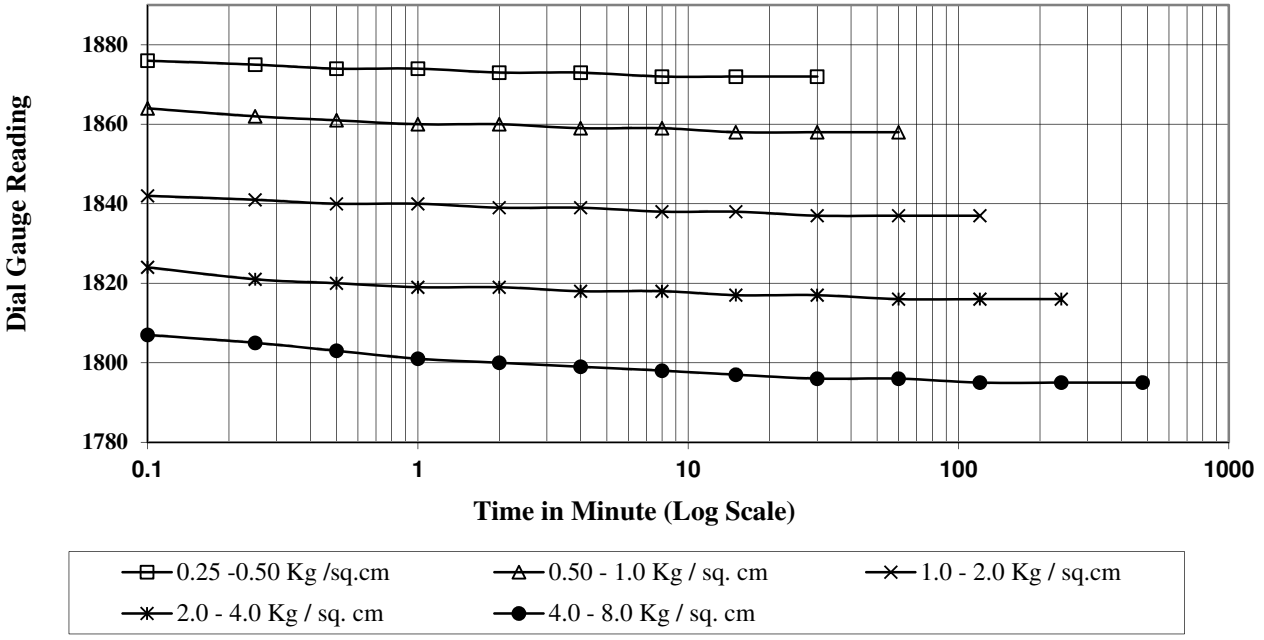
JP Geo Consultants *Job No.: 20317*



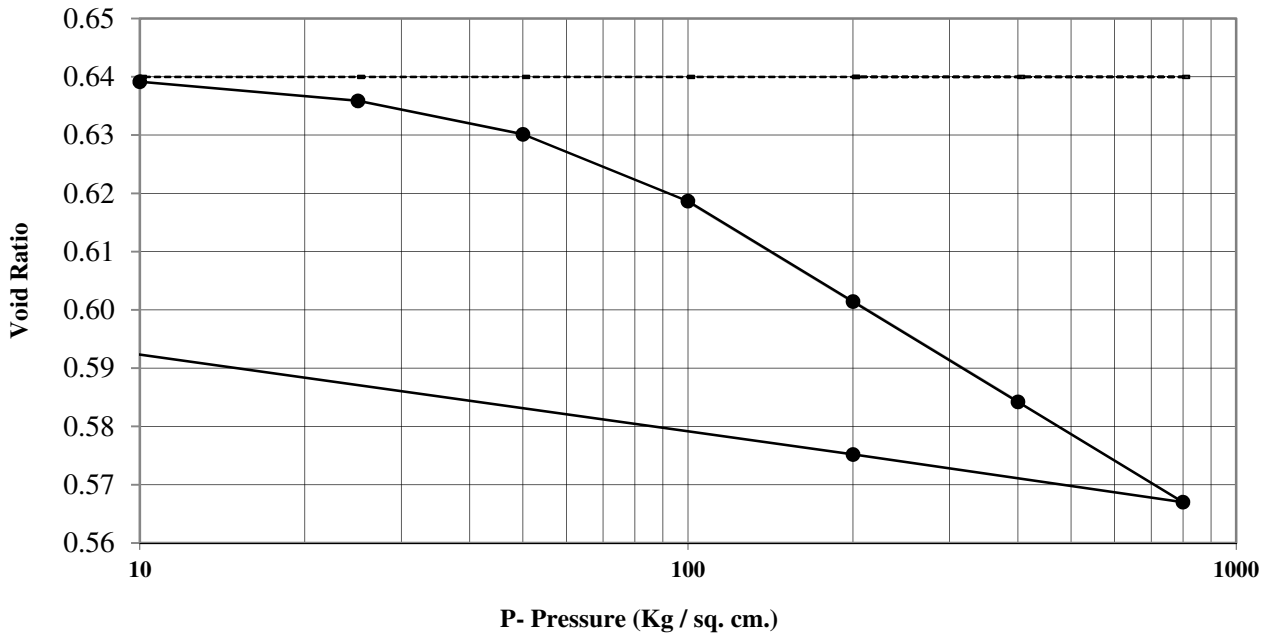


Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
2	13.50-13.95	1.00	1.30	1.50	1.68	1.53	1.05	0.67	0.78	0.07

LOG TIME VS SETTLEMENT CURVE



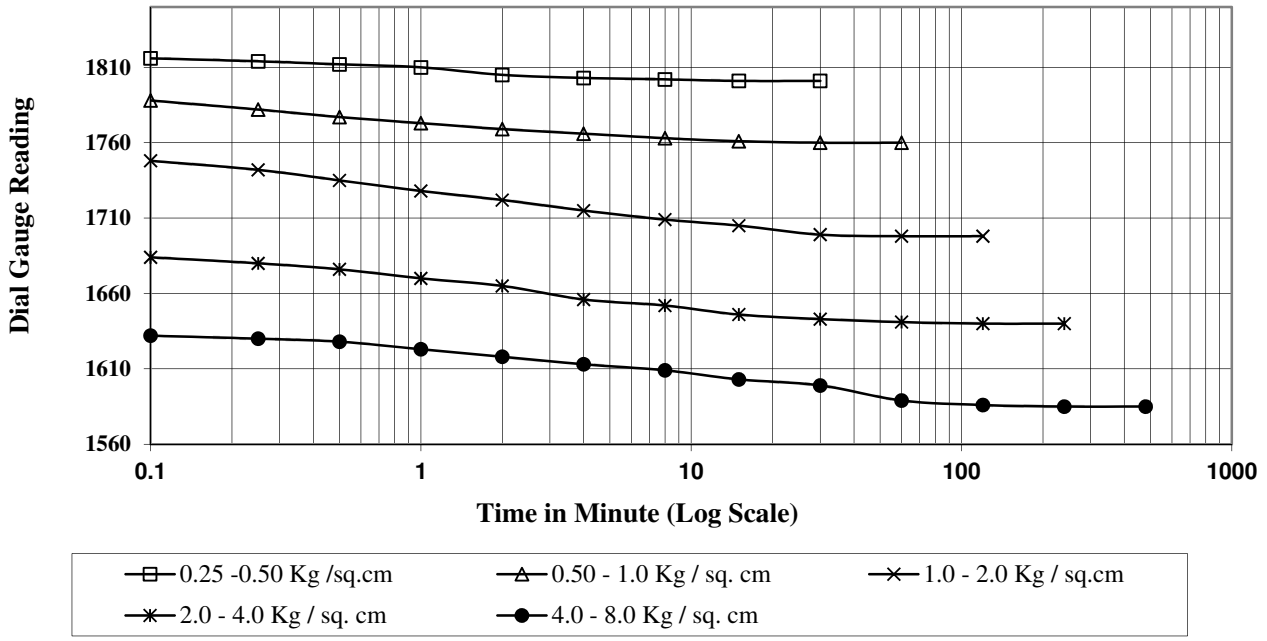
e log P CURVE



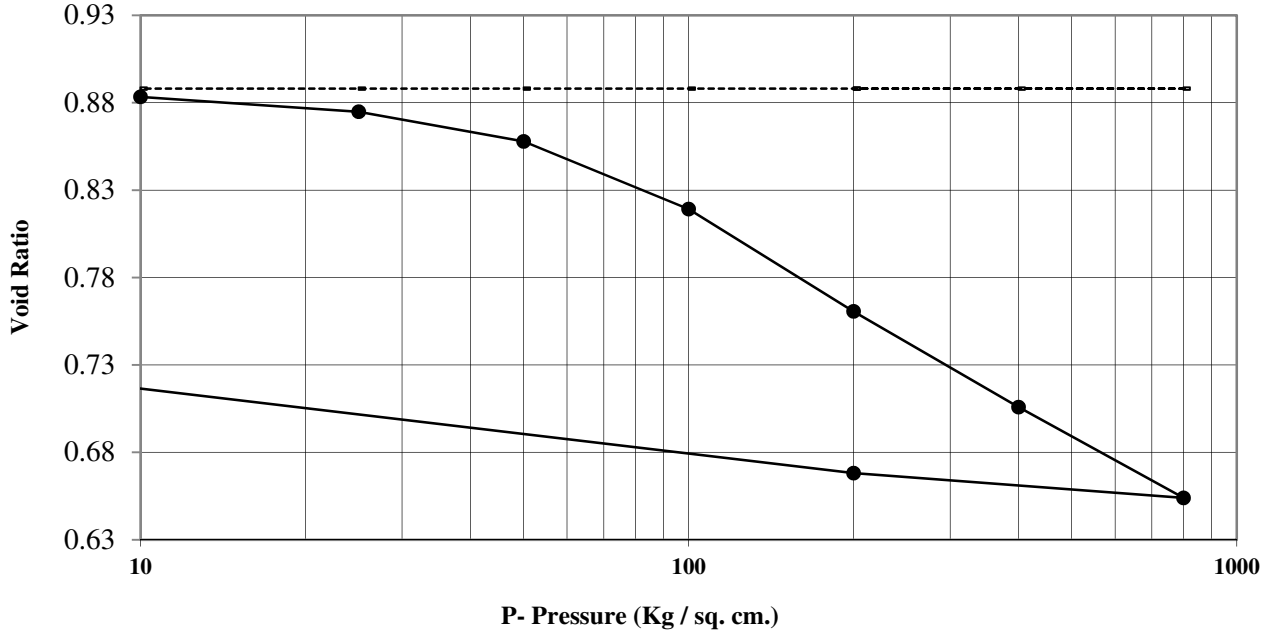
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
2	19.50-19.95	0.50	1.00	1.20	1.30	1.17	0.85	0.56	0.64	0.06

JP Geo Consultants *Job No.: 20317*

LOG TIME VS SETTLEMENT CURVE

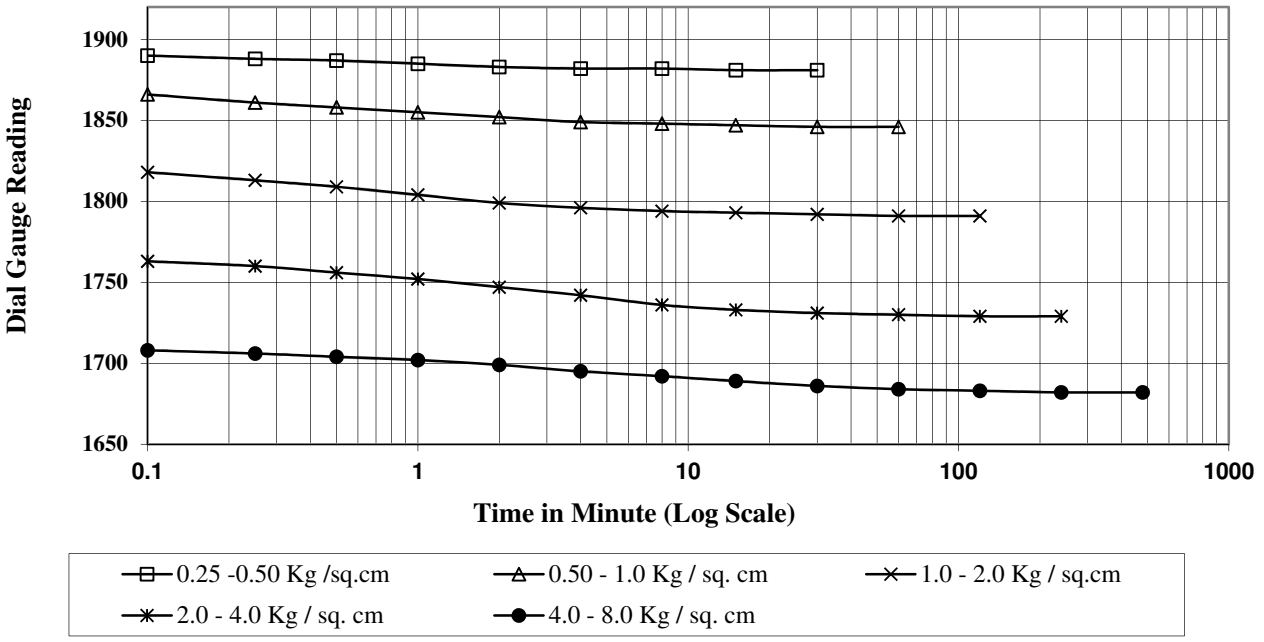


e log P CURVE

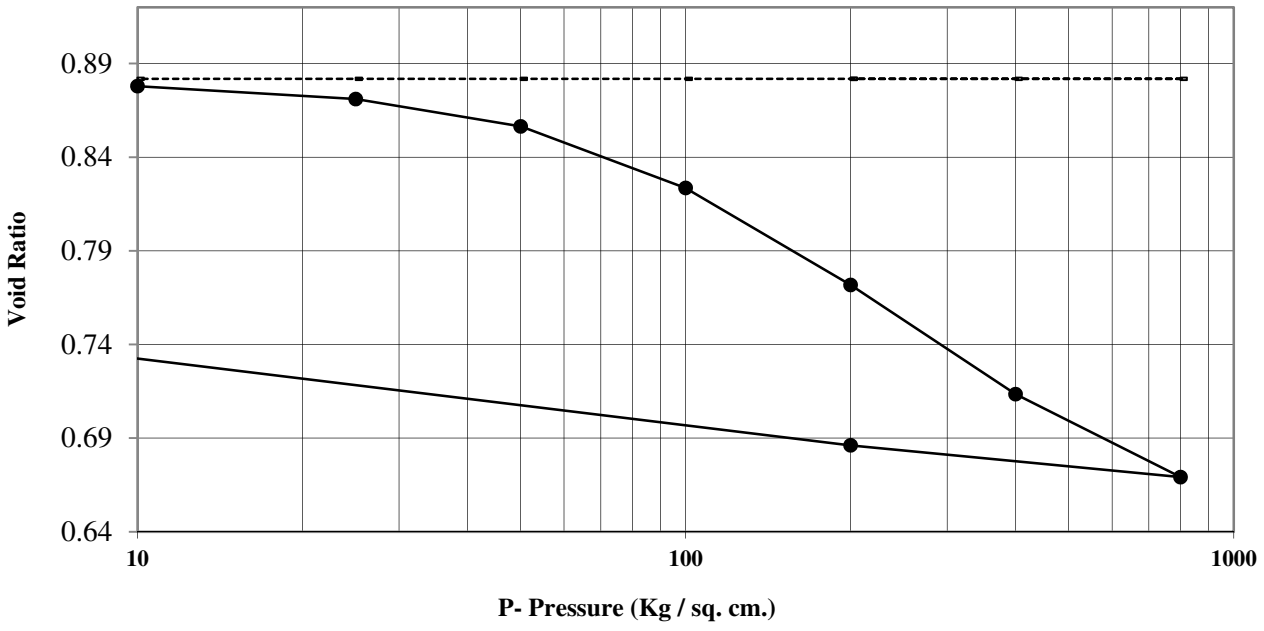


Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
2	7.50-7.95	2.50	2.80	3.20	3.65	3.37	2.41	1.55	0.88	0.18

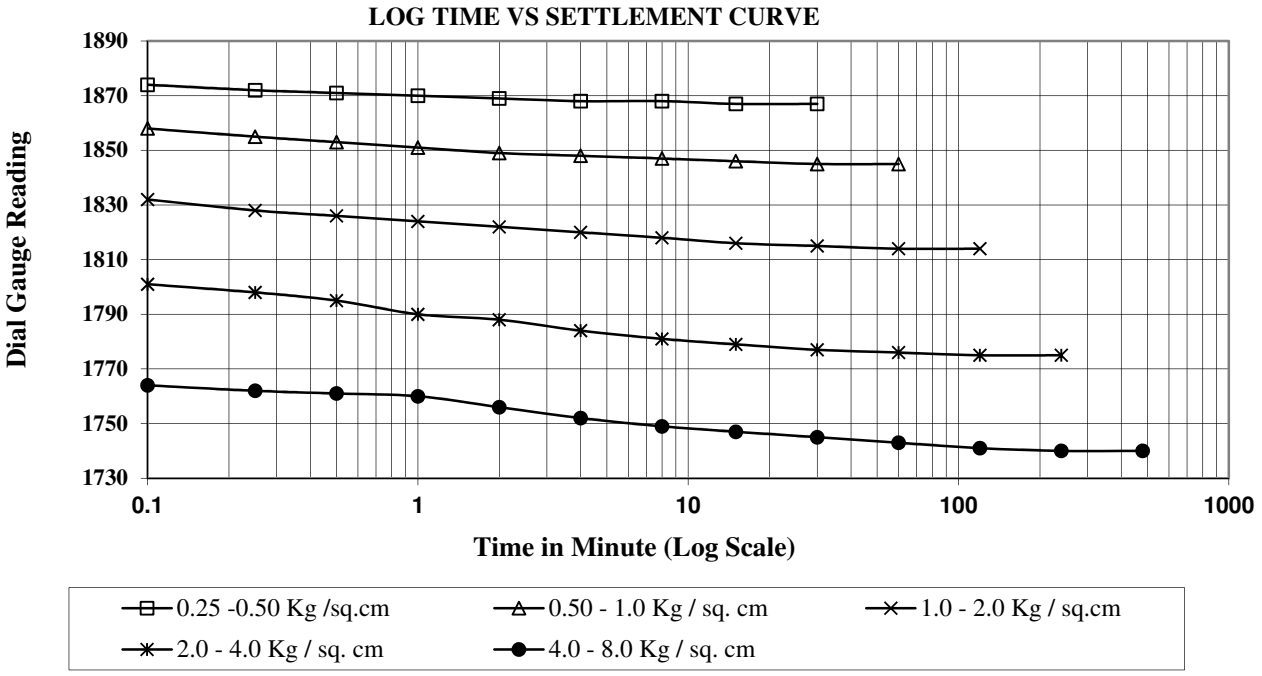
LOG TIME VS SETTLEMENT CURVE

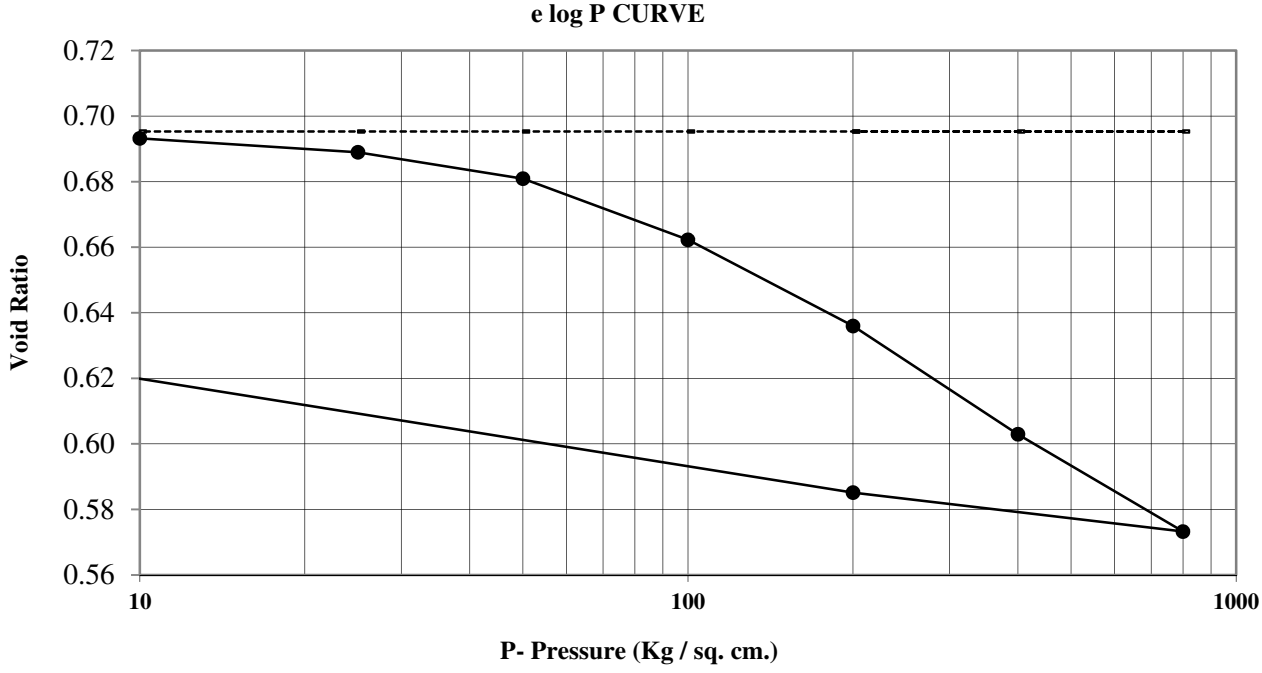


e log P CURVE

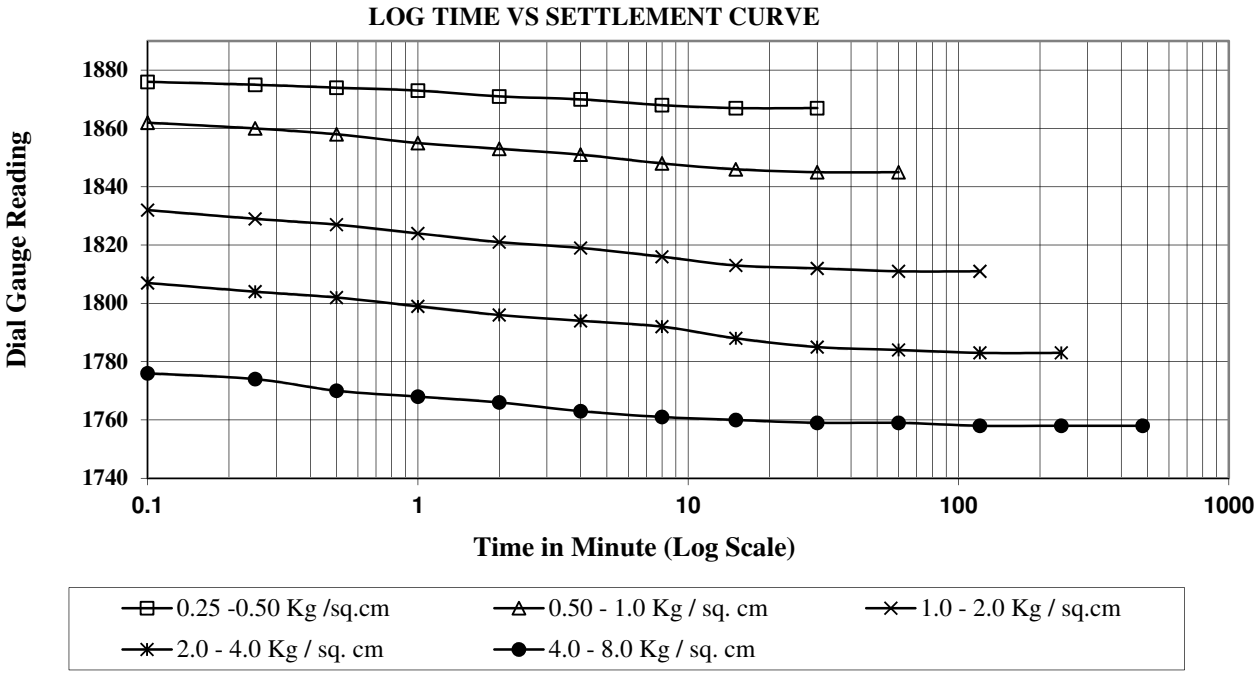


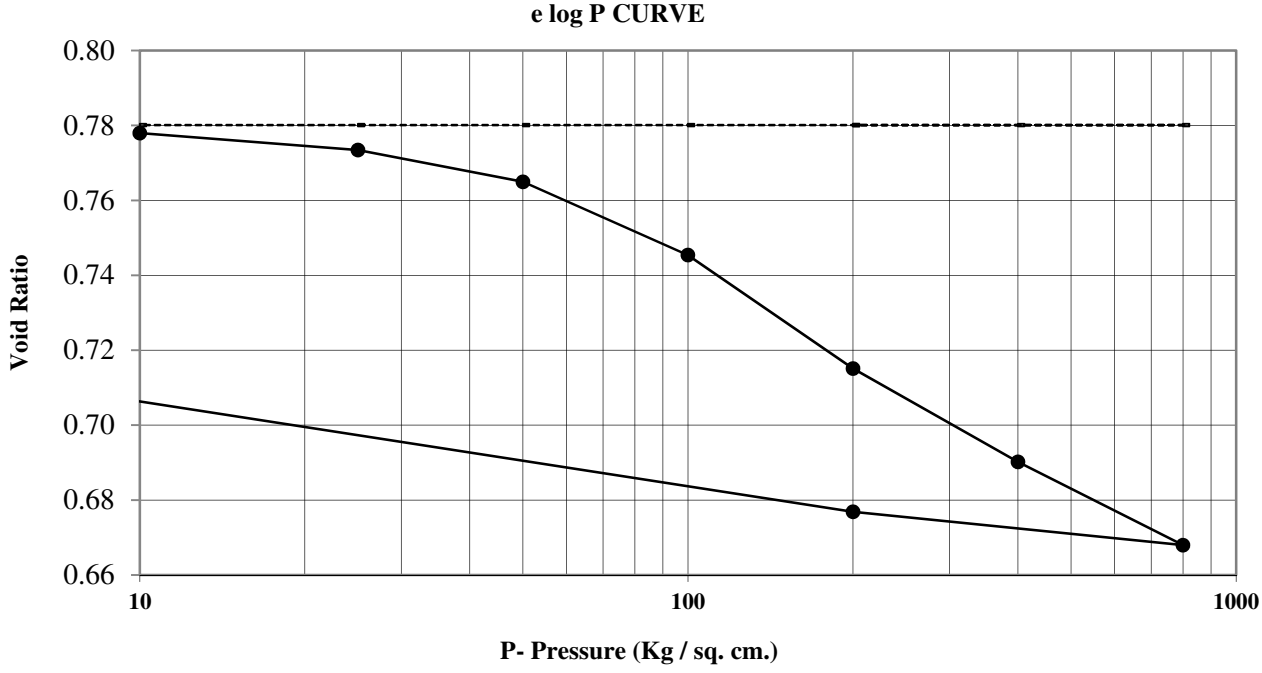
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
3	10.50-10.95	2.10	2.30	2.70	3.10	2.92	2.24	1.41	0.88	0.17



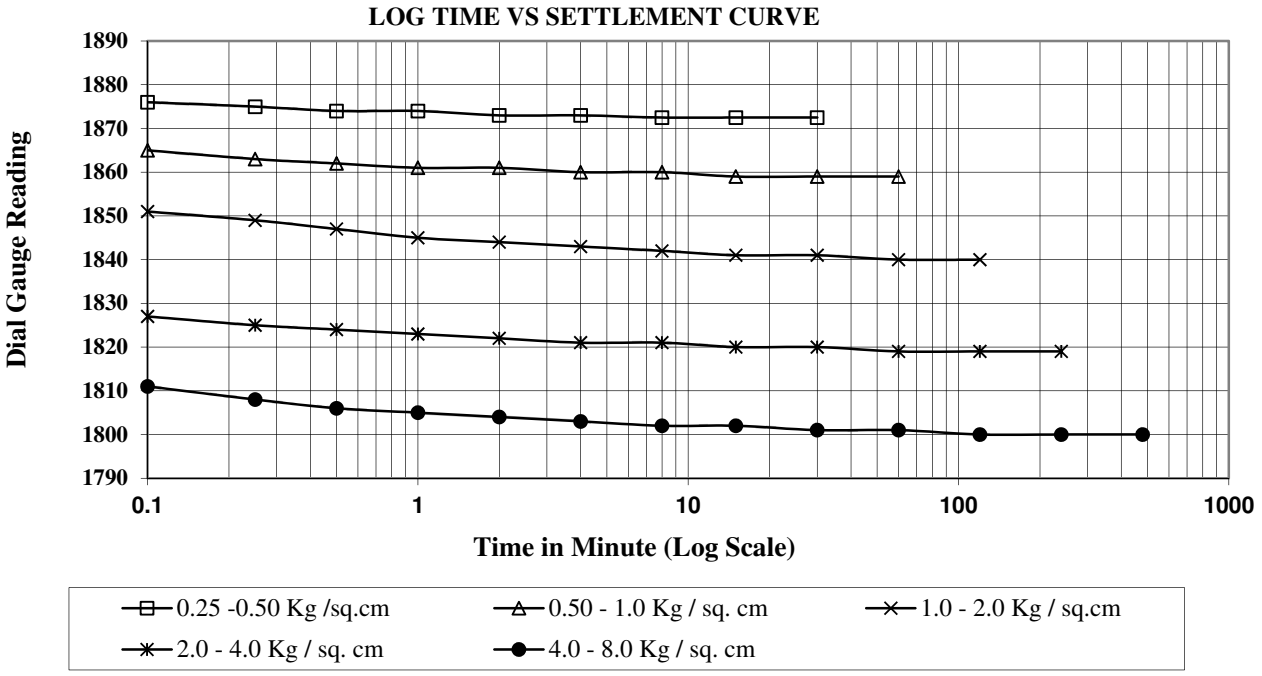


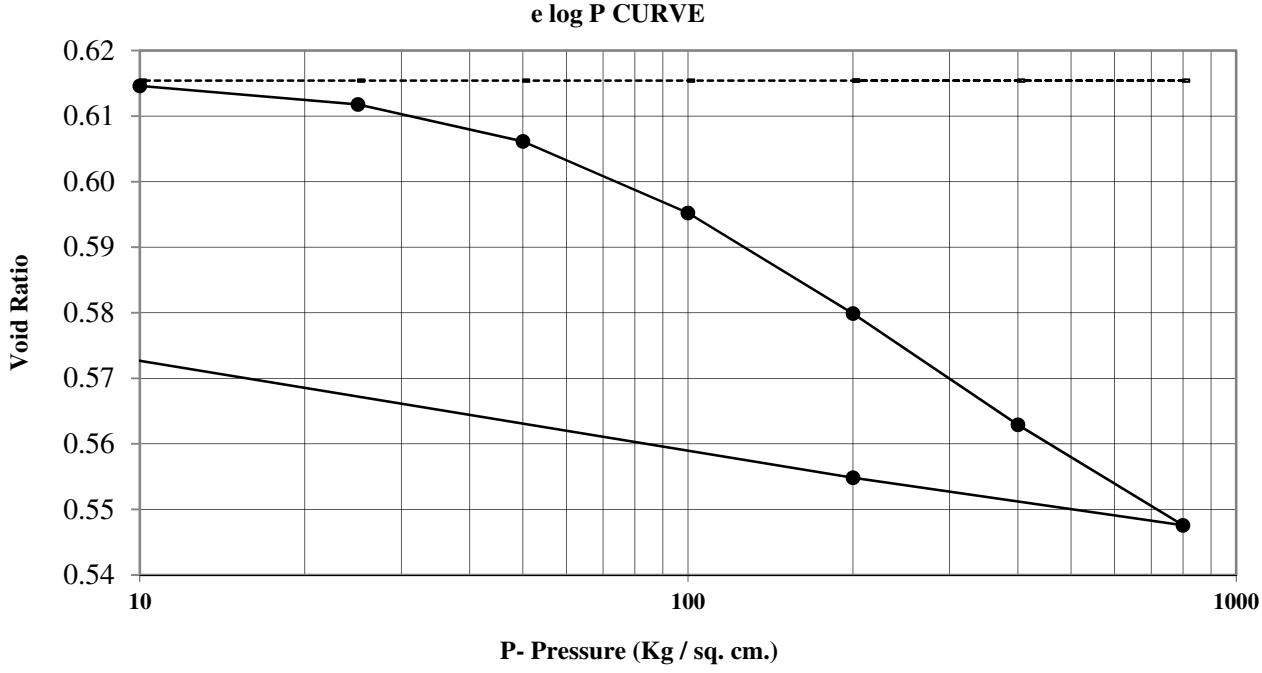
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
3	16.50-16.95	1.25	1.50	1.70	1.95	1.75	1.36	0.90	0.69	0.10





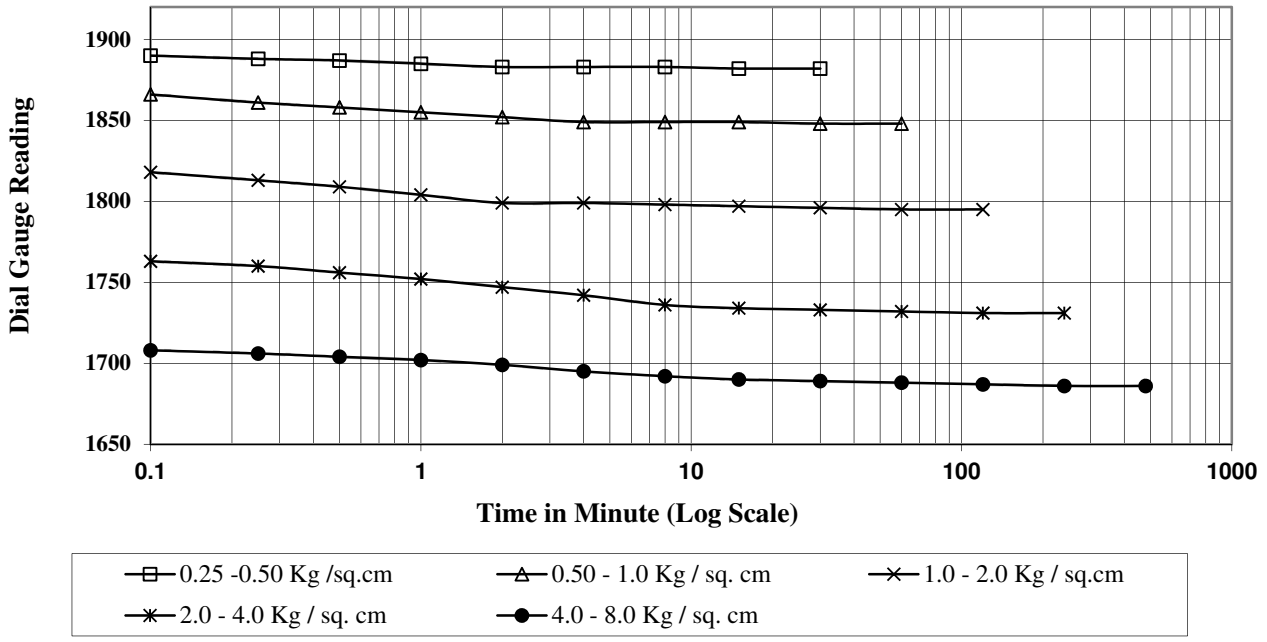
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
4	15.00-15.45	1.20	1.50	1.70	1.95	1.83	1.26	0.79	0.78	0.08



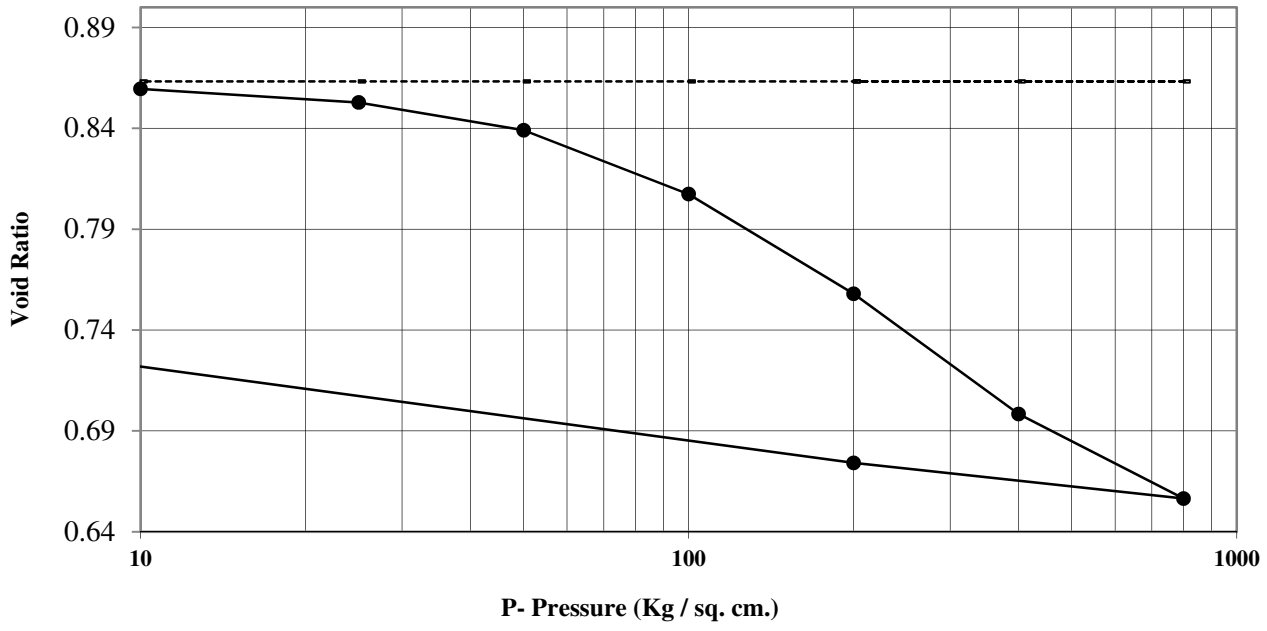


Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
4	21.00-21.45	0.50	0.90	1.15	1.25	1.10	0.81	0.52	0.62	0.05

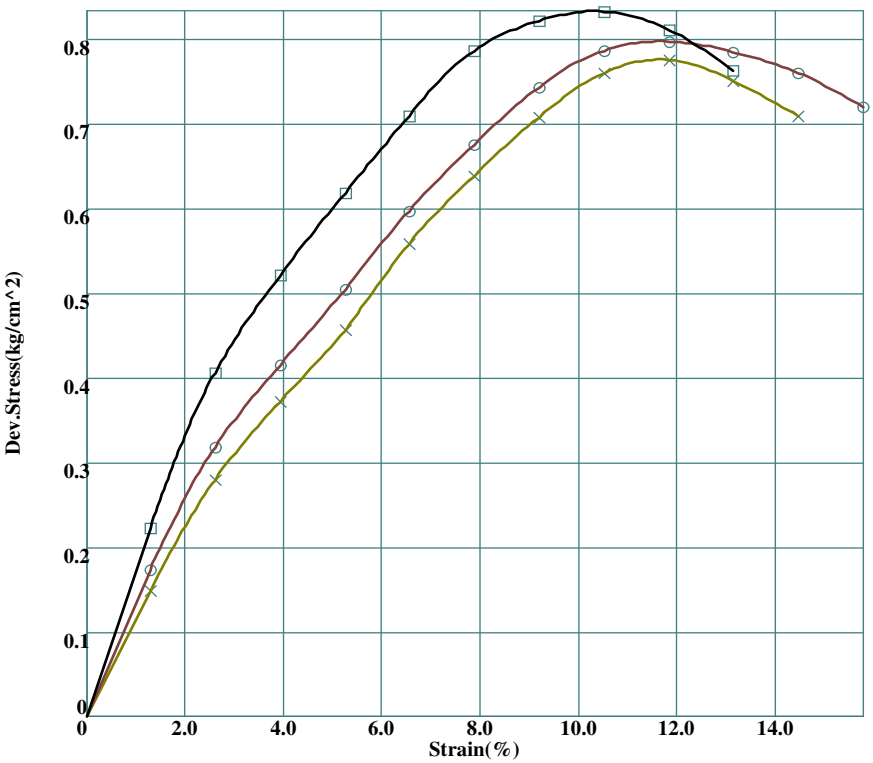
LOG TIME VS SETTLEMENT CURVE



e log P CURVE



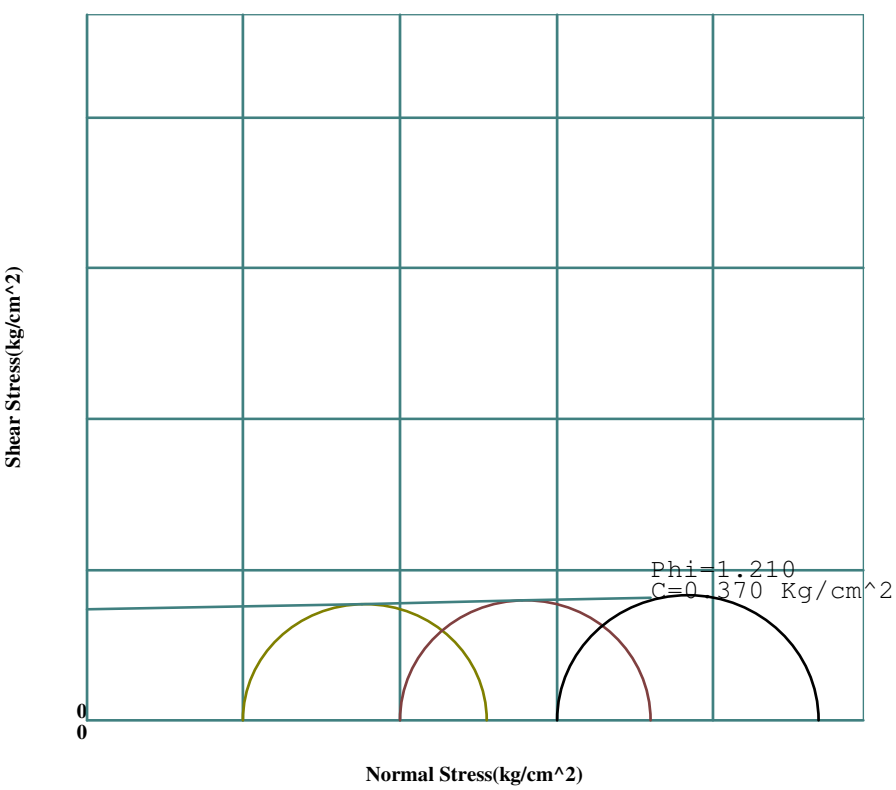
Borehole No.	Depth (m)	mv Value(m2/KN x 10-4) / Pressure in kPa							Initial void ratio (e0)	Compression Index (C_C)
		0-10	10-25	25-50	50-100	100-200	200-400	400-800		
4	6.00-6.45	2.00	2.24	2.60	3.00	2.83	2.21	1.39	0.88	0.17



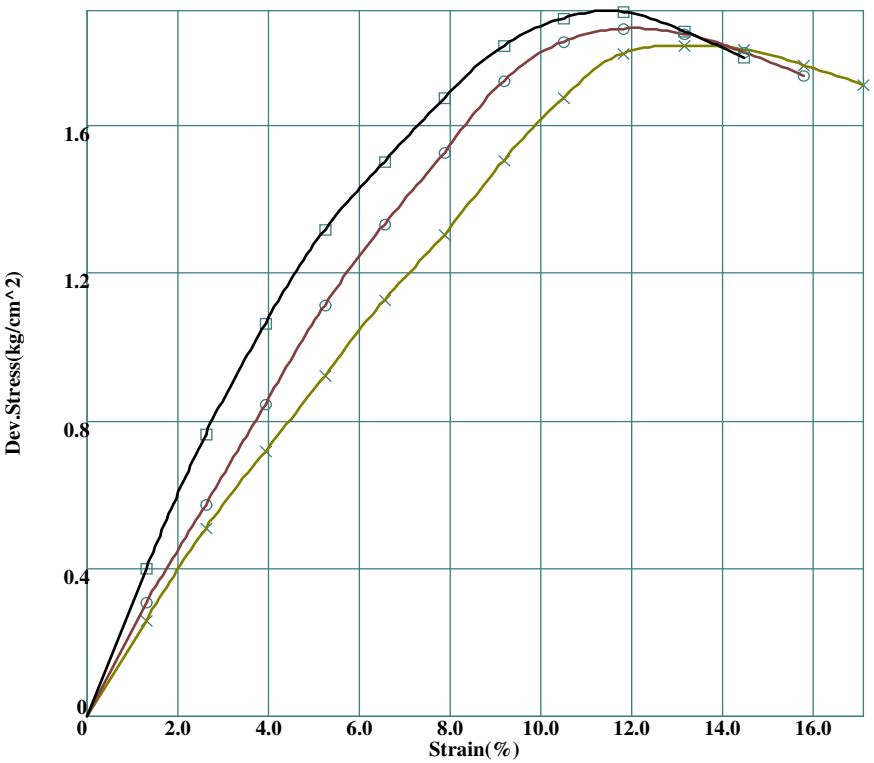
Strain % at Failure
10.2 %-- Set 3
11.6 %-- Set 2
11.6 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=10.7M

Bore Hole No.= 01



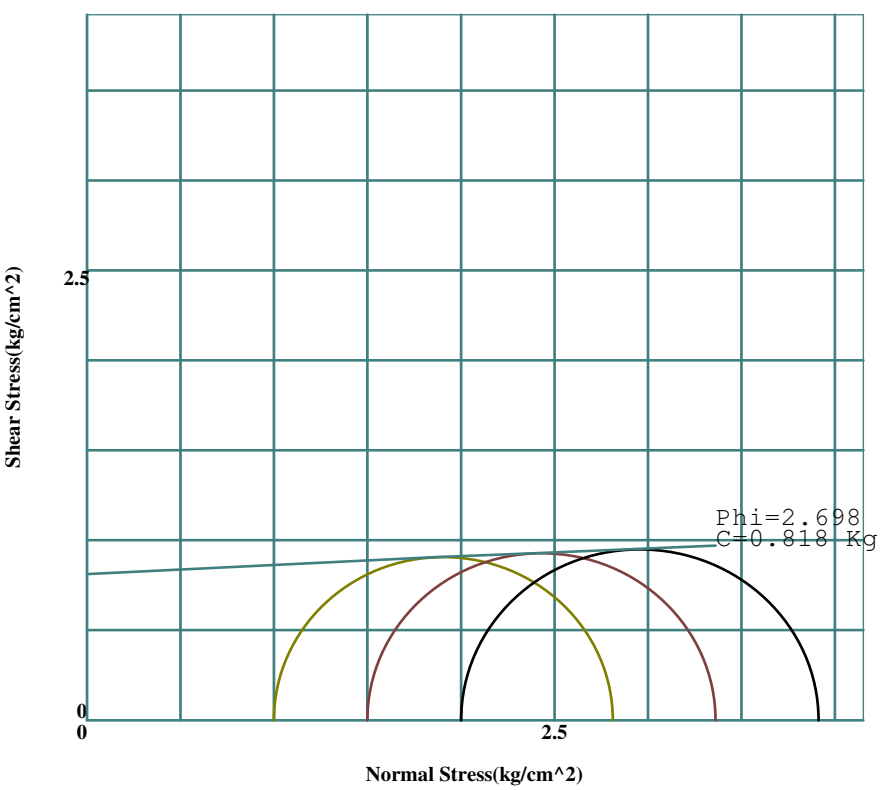
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.3 kg/cm^2-- Set 3
1.8 kg/cm^2-- Set 2
1.3 kg/cm^2-- Set 1



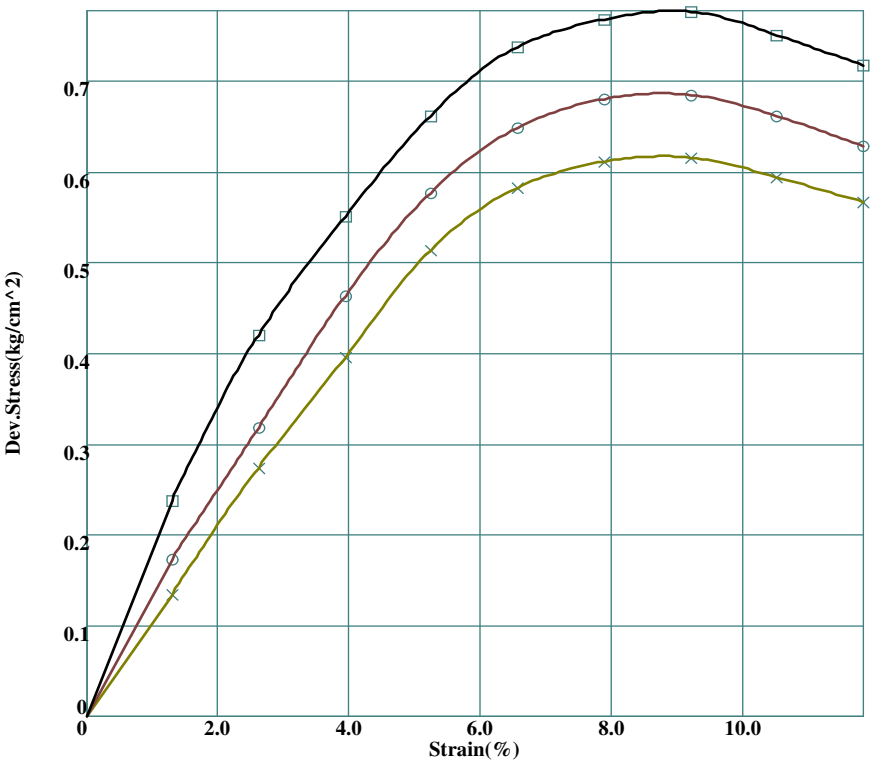
Strain % at Failure
11.2 %-- Set 3
11.9 %-- Set 2
12.5 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=16.7M

Bore Hole No.= 01



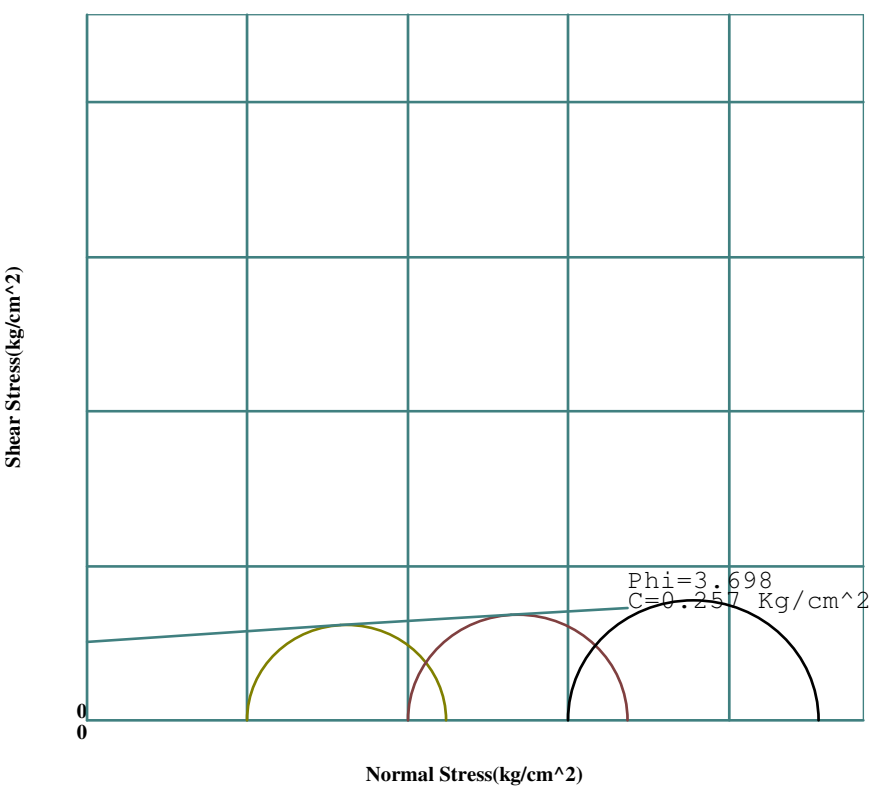
Minor Principal Stress(kg/cm^2)
2.0 kg/cm^2-- Set 3
1.5 kg/cm^2-- Set 2
1.0 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
3.9 kg/cm^2-- Set 3
3.4 kg/cm^2-- Set 2
2.8 kg/cm^2-- Set 1



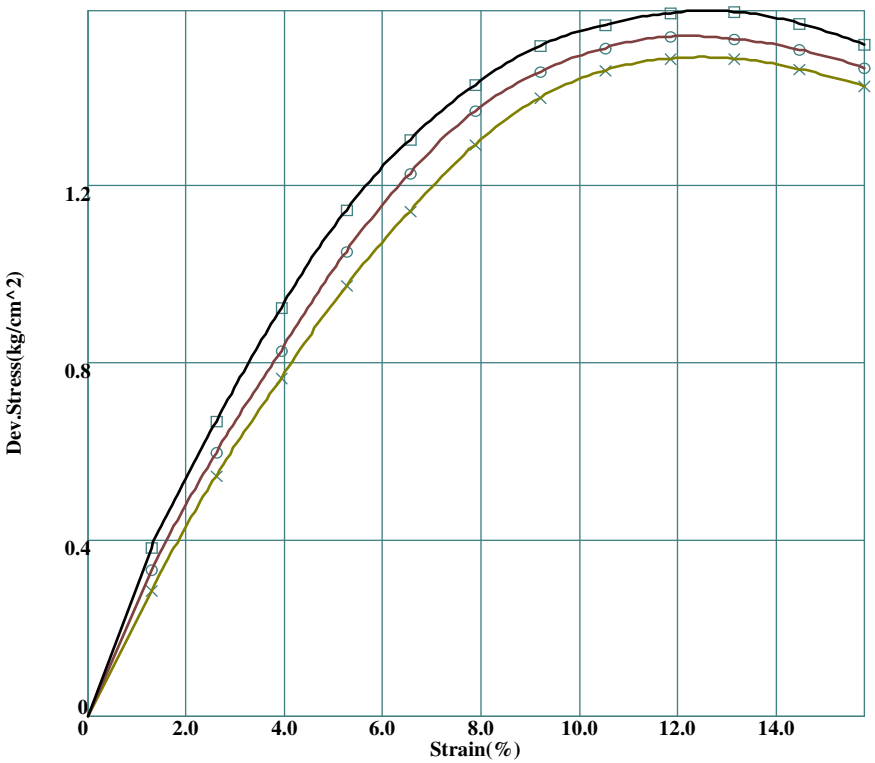
Strain % at Failure
8.7 %-- Set 3
8.6 %-- Set 2
8.7 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=4.7M

Bore Hole No.= 01



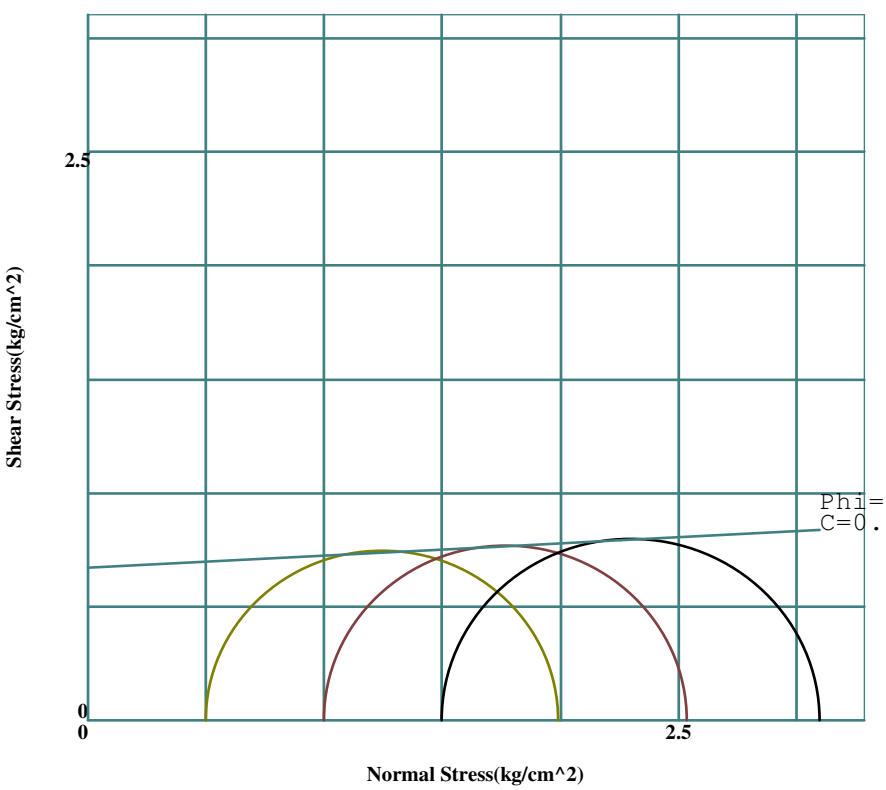
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.3 kg/cm^2-- Set 3
1.7 kg/cm^2-- Set 2
1.1 kg/cm^2-- Set 1



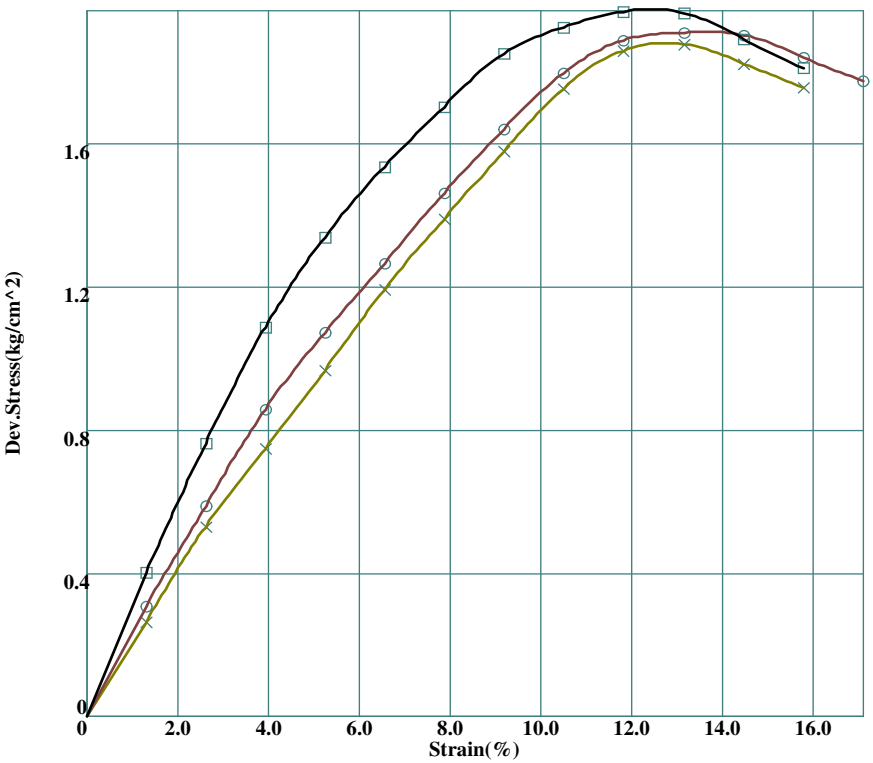
Strain % at Failure
12.2 %-- Set 3
12.0 %-- Set 2
12.4 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=13.7M

Bore Hole No.= 02



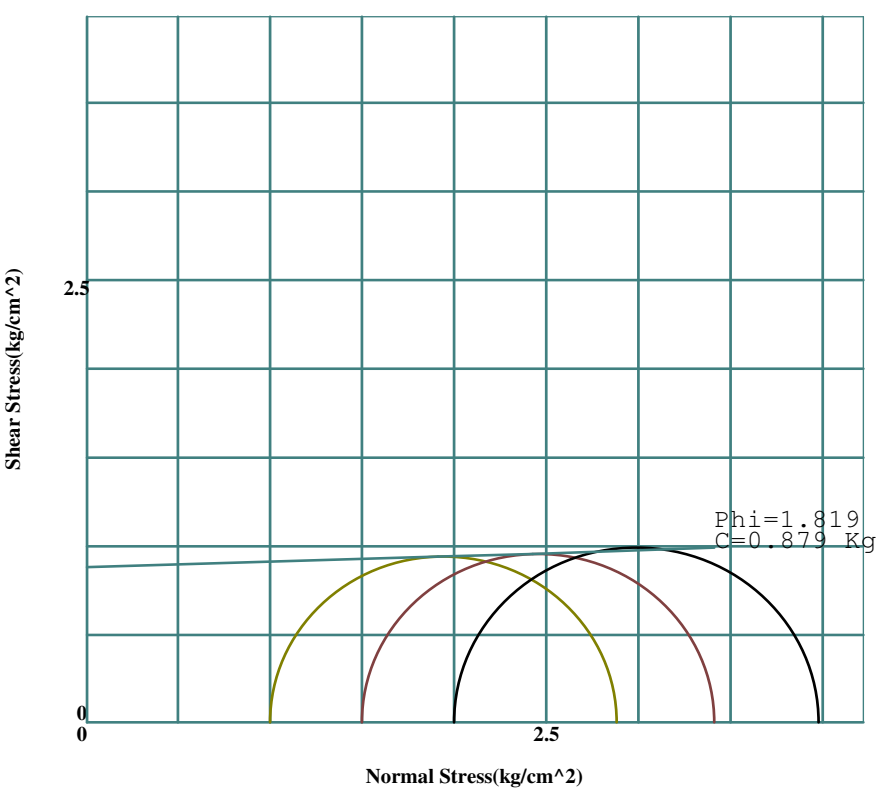
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
3.1 kg/cm^2-- Set 3
2.5 kg/cm^2-- Set 2
2.0 kg/cm^2-- Set 1



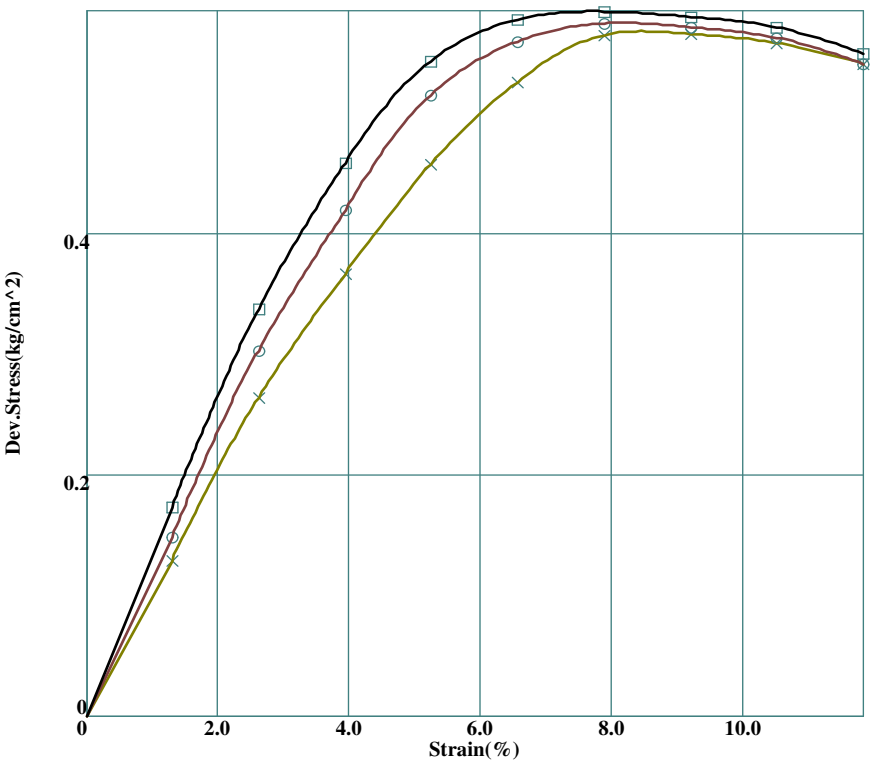
Strain % at Failure
12.1 %-- Set 3
13.3 %-- Set 2
12.4 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=19.7M

Bore Hole No.= 02



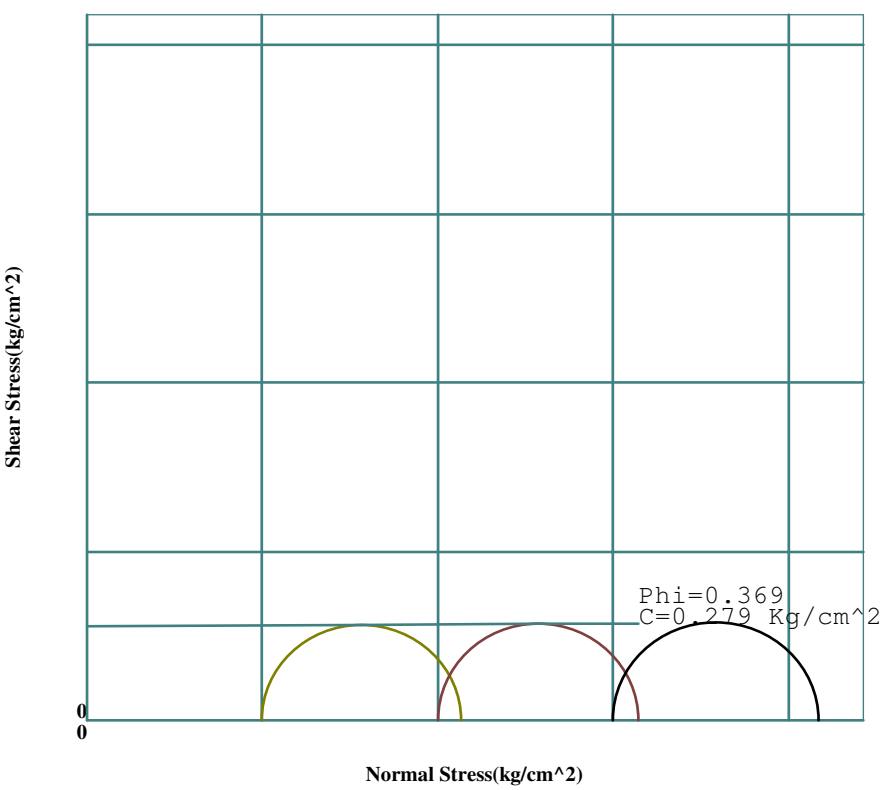
Minor Principal Stress(kg/cm^2)
2.0 kg/cm^2-- Set 3
1.5 kg/cm^2-- Set 2
1.0 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
4.0 kg/cm^2-- Set 3
3.4 kg/cm^2-- Set 2
2.9 kg/cm^2-- Set 1



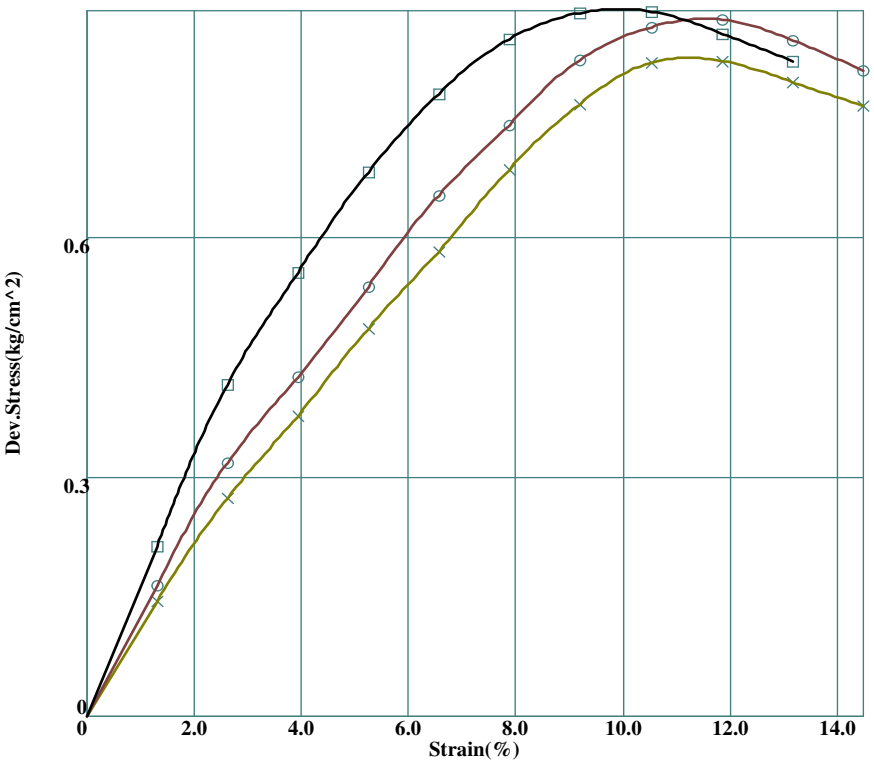
Strain % at Failure
7.6 %-- Set 3
8.0 %-- Set 2
8.4 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=7.7M

Bore Hole No.= 02



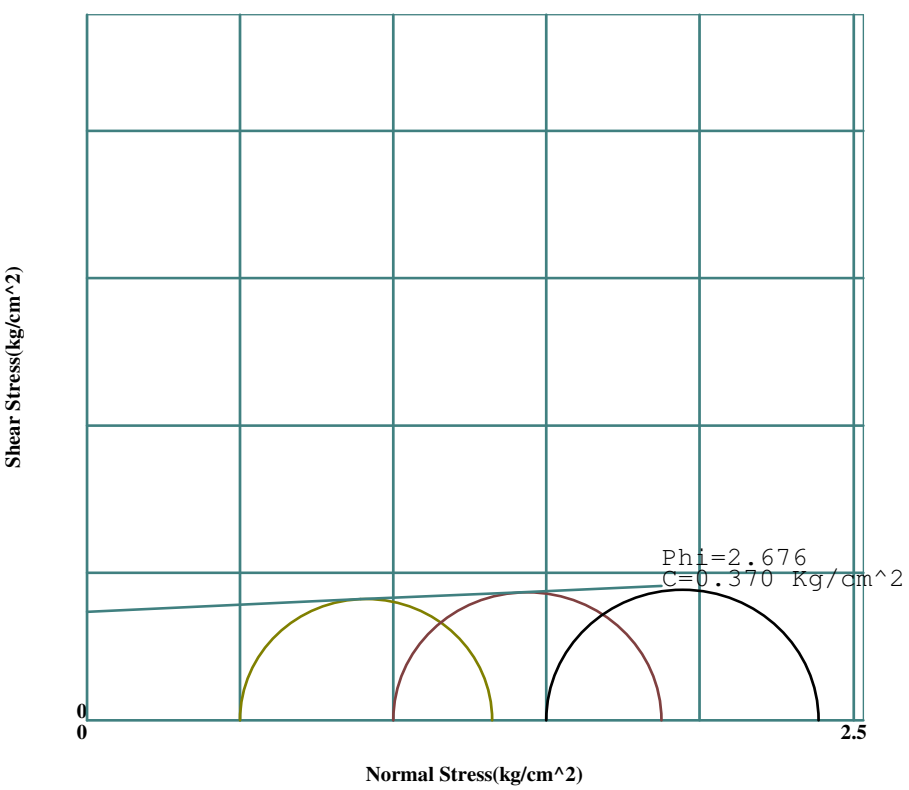
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.1 kg/cm^2-- Set 3
1.6 kg/cm^2-- Set 2
1.1 kg/cm^2-- Set 1



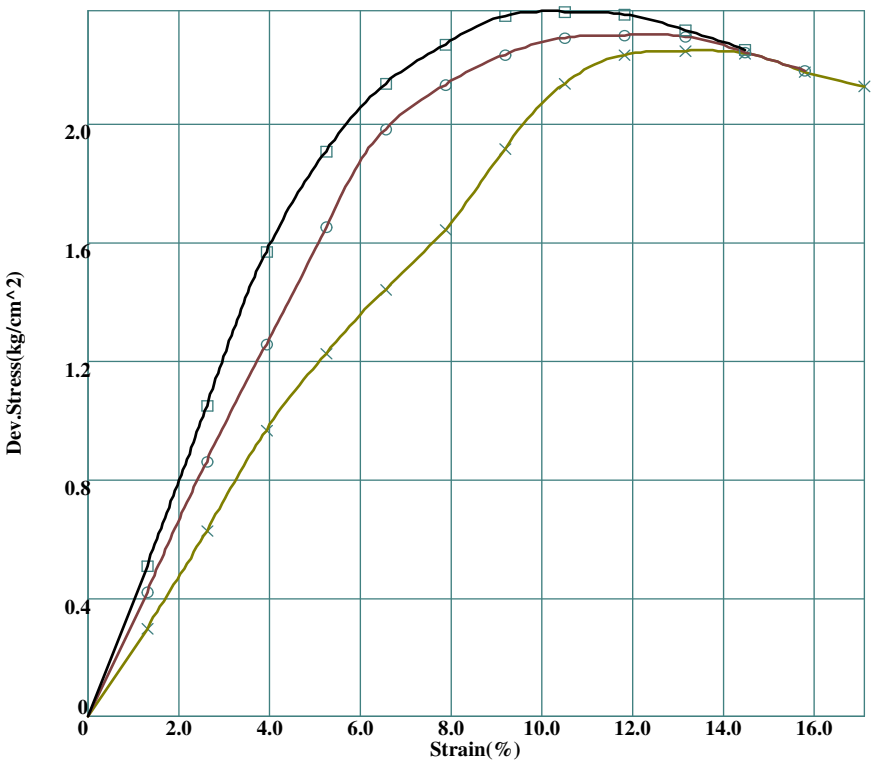
Strain % at Failure
9.6 %-- Set 3
11.3 %-- Set 2
11.0 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=13.7M

Bore Hole No.= 03



Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.4 kg/cm^2-- Set 3
1.9 kg/cm^2-- Set 2
1.3 kg/cm^2-- Set 1

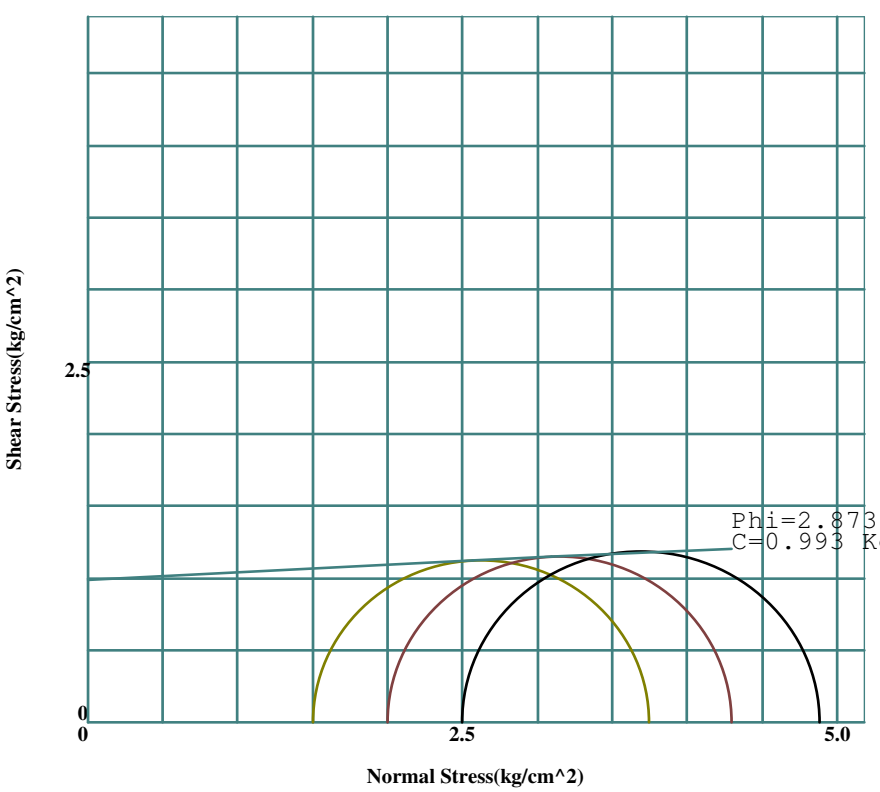


Strain % at Failure
10.0 %-- Set 3
11.9 %-- Set 2
13.3 %-- Set 1

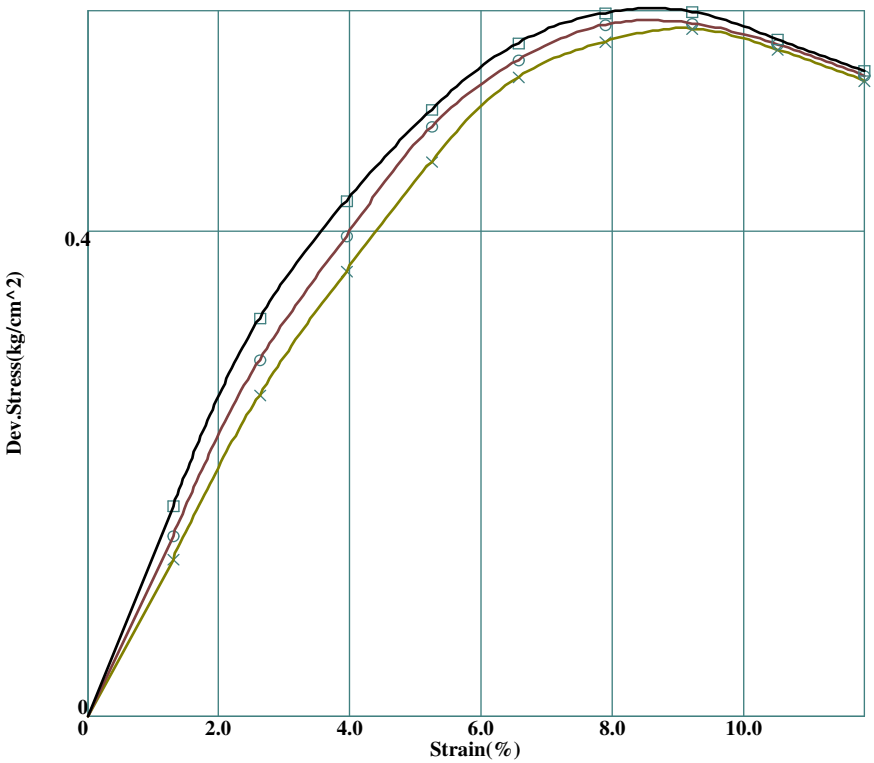
-- Set No 3
-- Set No 2
-- Set No 1

Type of Test= U.U.
Depth=22.2M

Bore Hole No.= 03



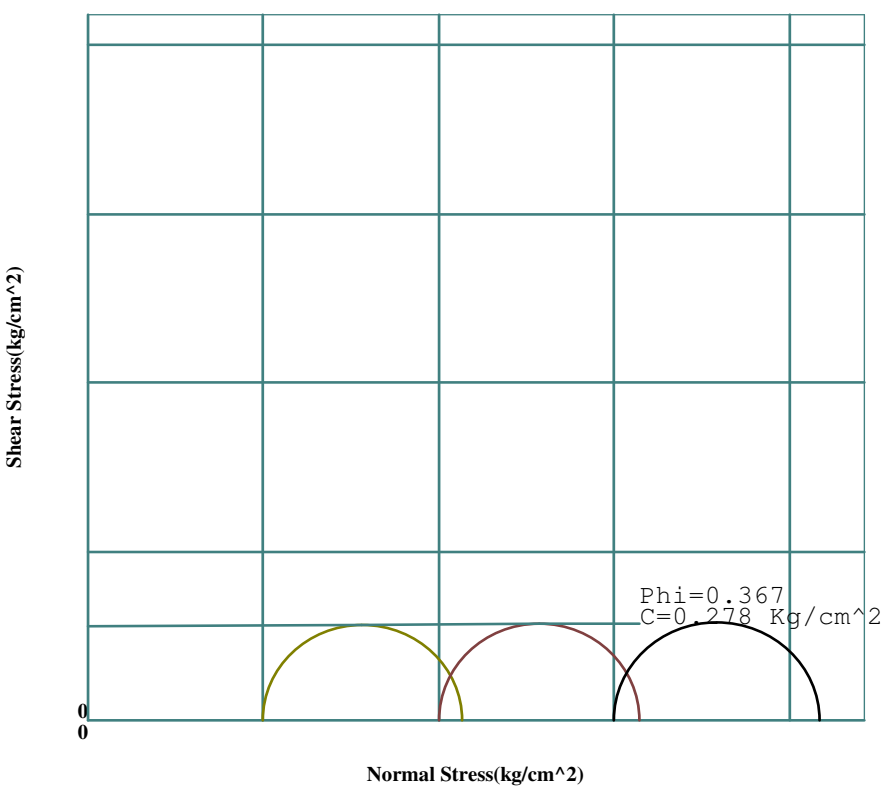
Minor Principal Stress(kg/cm^2)
2.5 kg/cm^2-- Set 3
2.0 kg/cm^2-- Set 2
1.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
4.9 kg/cm^2-- Set 3
4.3 kg/cm^2-- Set 2
3.7 kg/cm^2-- Set 1



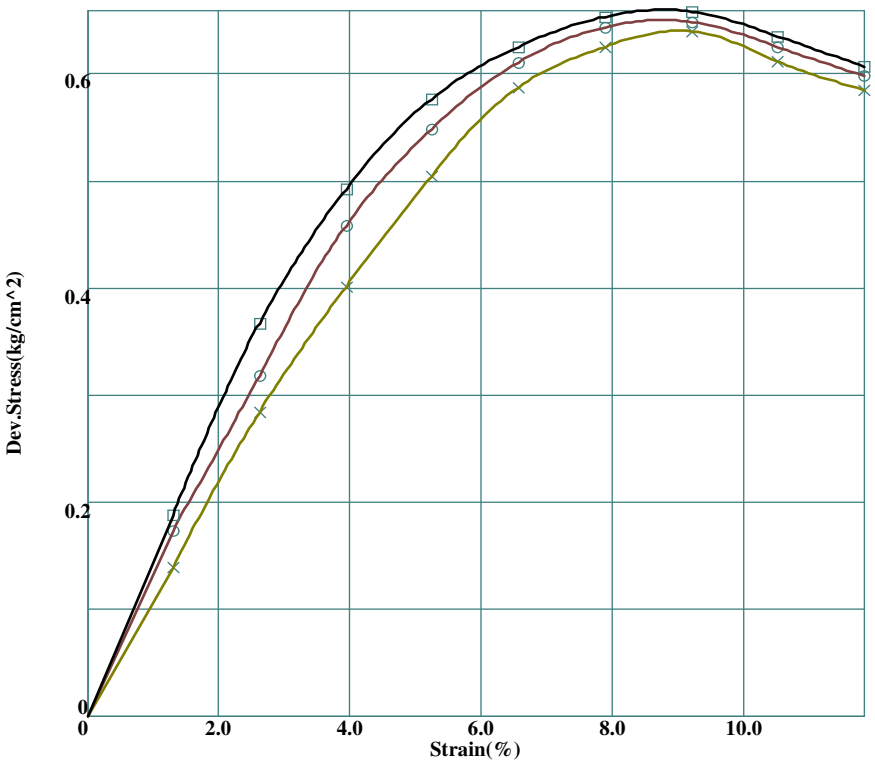
Strain % at Failure
8.4 %-- Set 3
8.4 %-- Set 2
9.0 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=7.7M

Bore Hole No.= 03



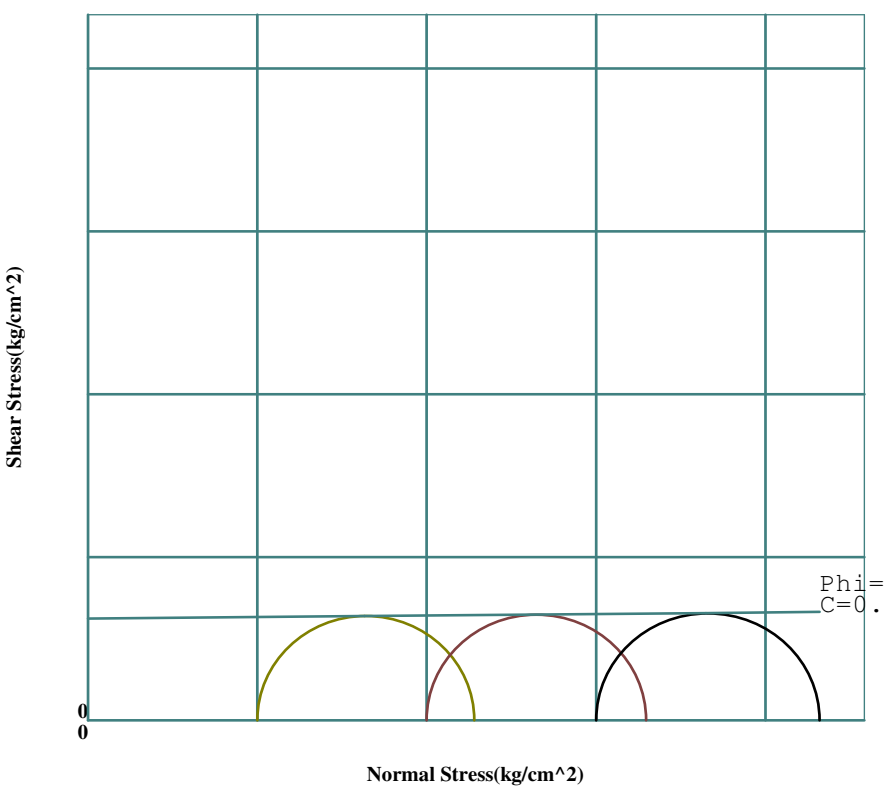
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.1 kg/cm^2-- Set 3
1.6 kg/cm^2-- Set 2
1.1 kg/cm^2-- Set 1



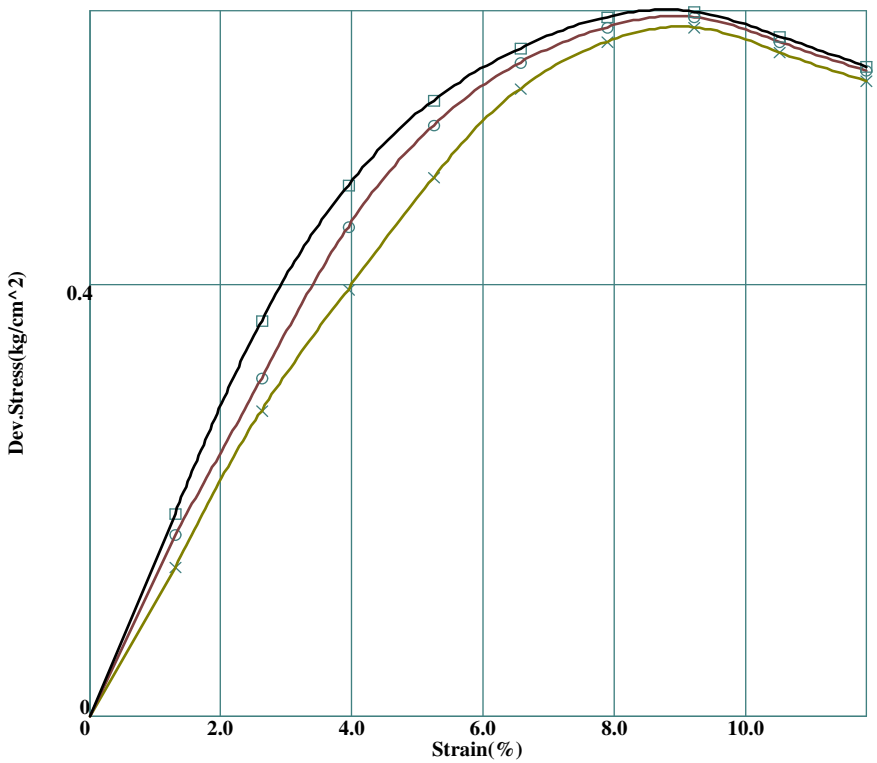
Strain % at Failure
8.6 %-- Set 3
8.5 %-- Set 2
8.9 %-- Set 1

-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=12.2M

Bore Hole No.= 04



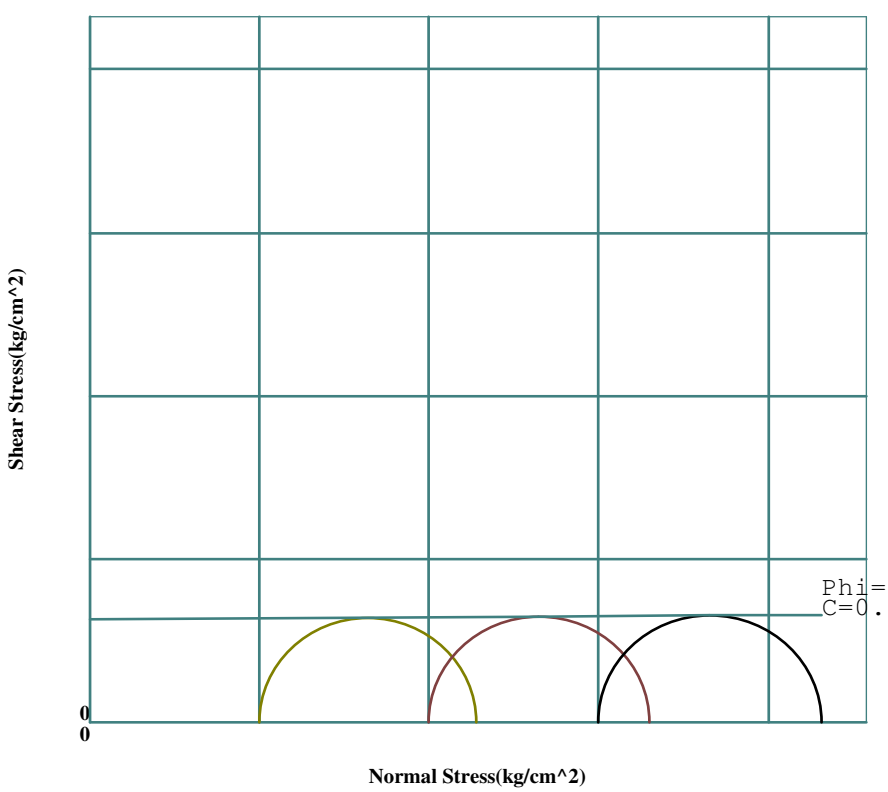
Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.2 kg/cm^2-- Set 3
1.6 kg/cm^2-- Set 2
1.1 kg/cm^2-- Set 1



Strain % at Failure
8.6 %-- Set 3
8.7 %-- Set 2
8.9 %-- Set 1

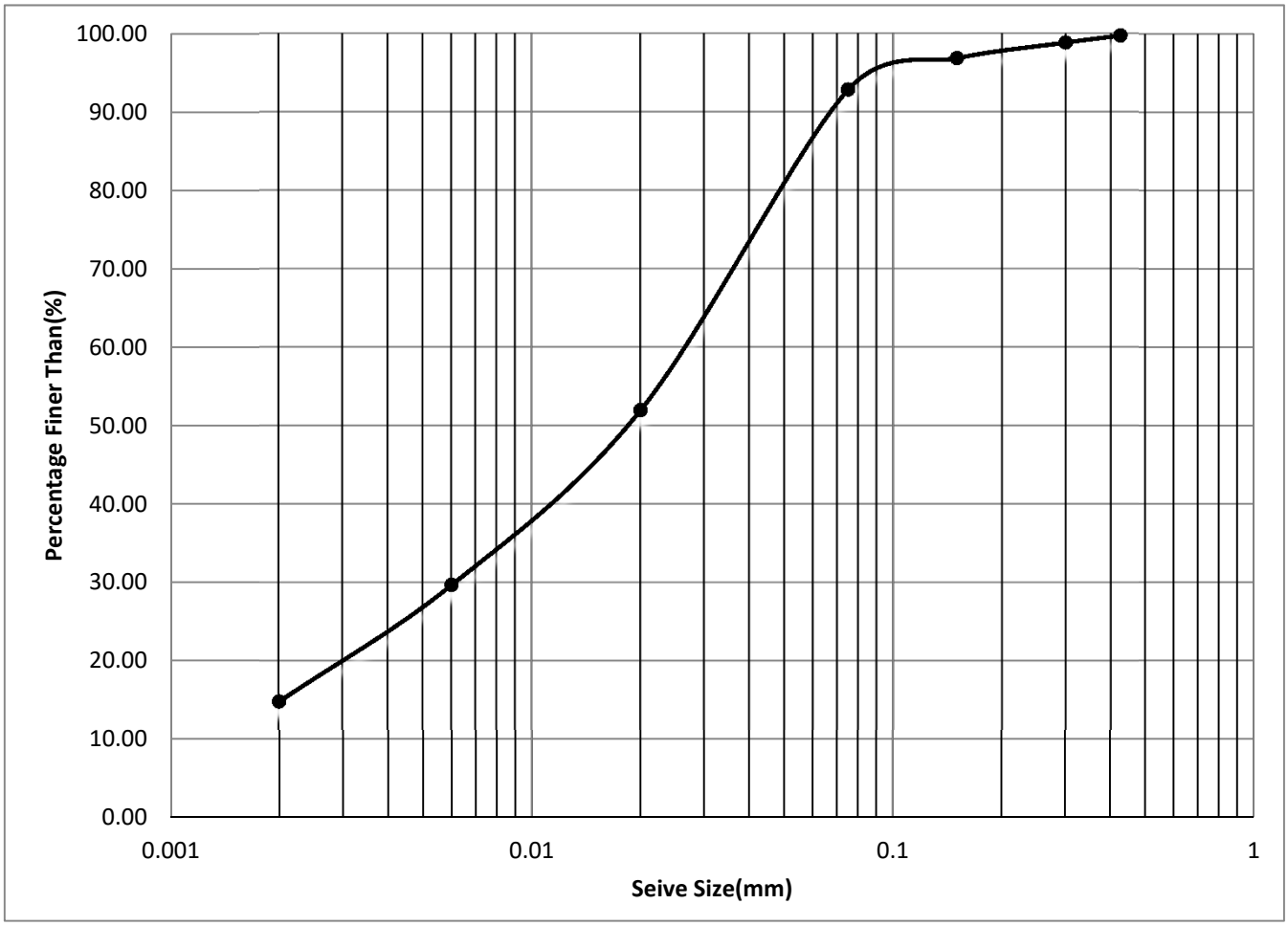
-- Set No 3
-- Set No 2
-- Set No 1
Type of Test= U.U.
Depth=7.7M

Bore Hole No.= 04

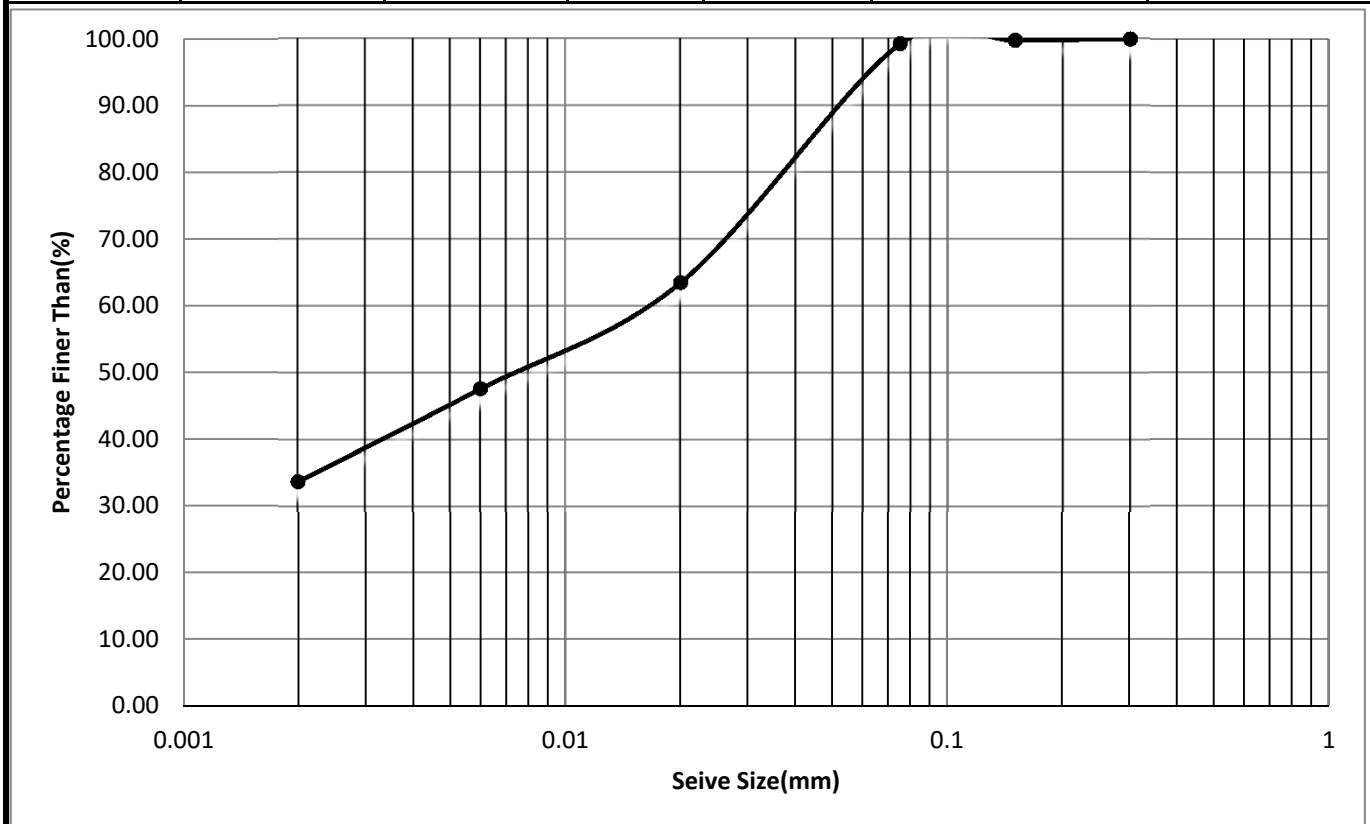


Minor Principal Stress(kg/cm^2)
1.5 kg/cm^2-- Set 3
1.0 kg/cm^2-- Set 2
0.5 kg/cm^2-- Set 1
Major Pricipal stress(kg/cm^2)
2.2 kg/cm^2-- Set 3
1.6 kg/cm^2-- Set 2
1.1 kg/cm^2-- Set 1

GRAIN SIZE CURVE

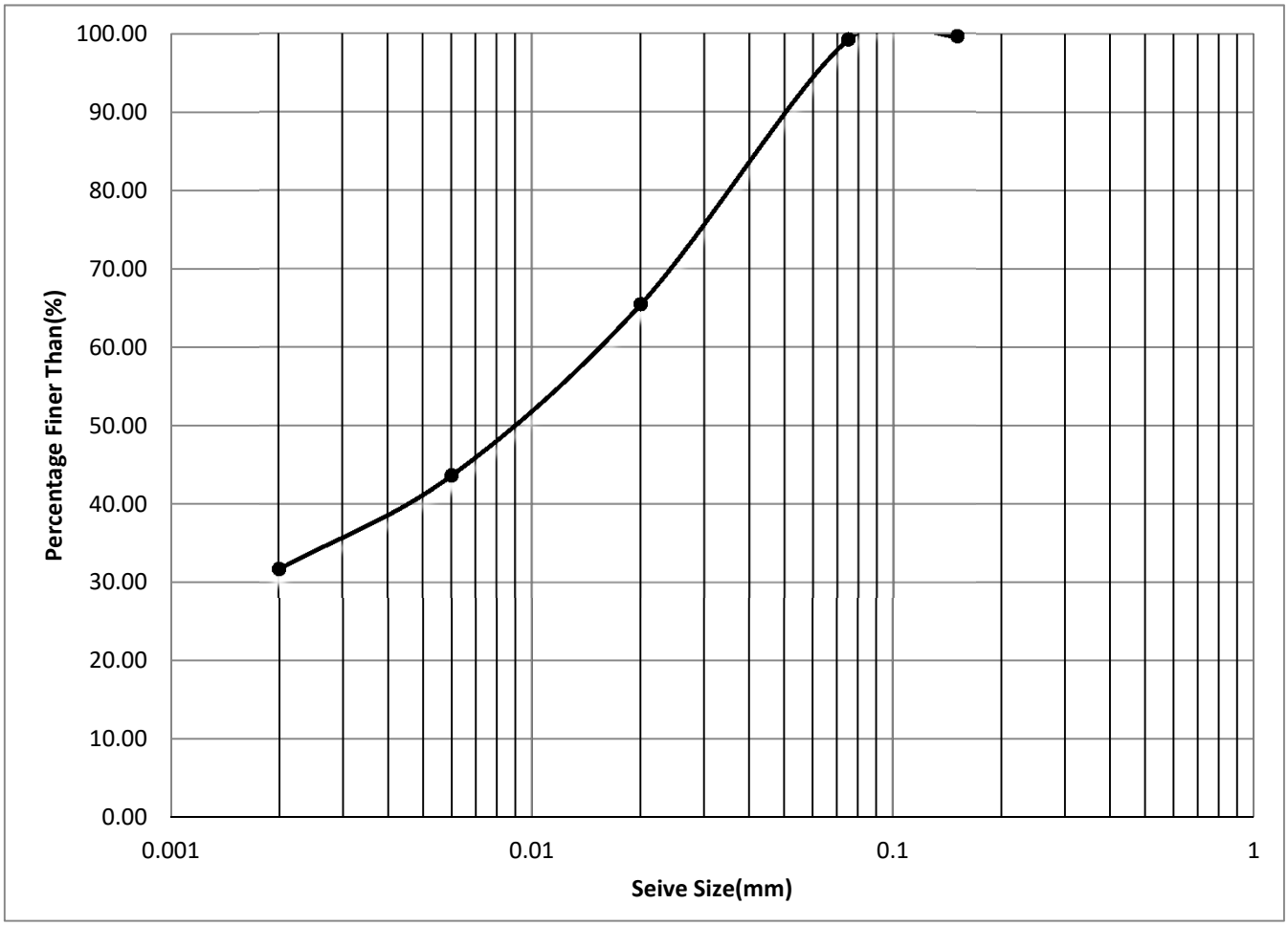


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	4.50-4.95	0.00	7.10	78.04	14.86

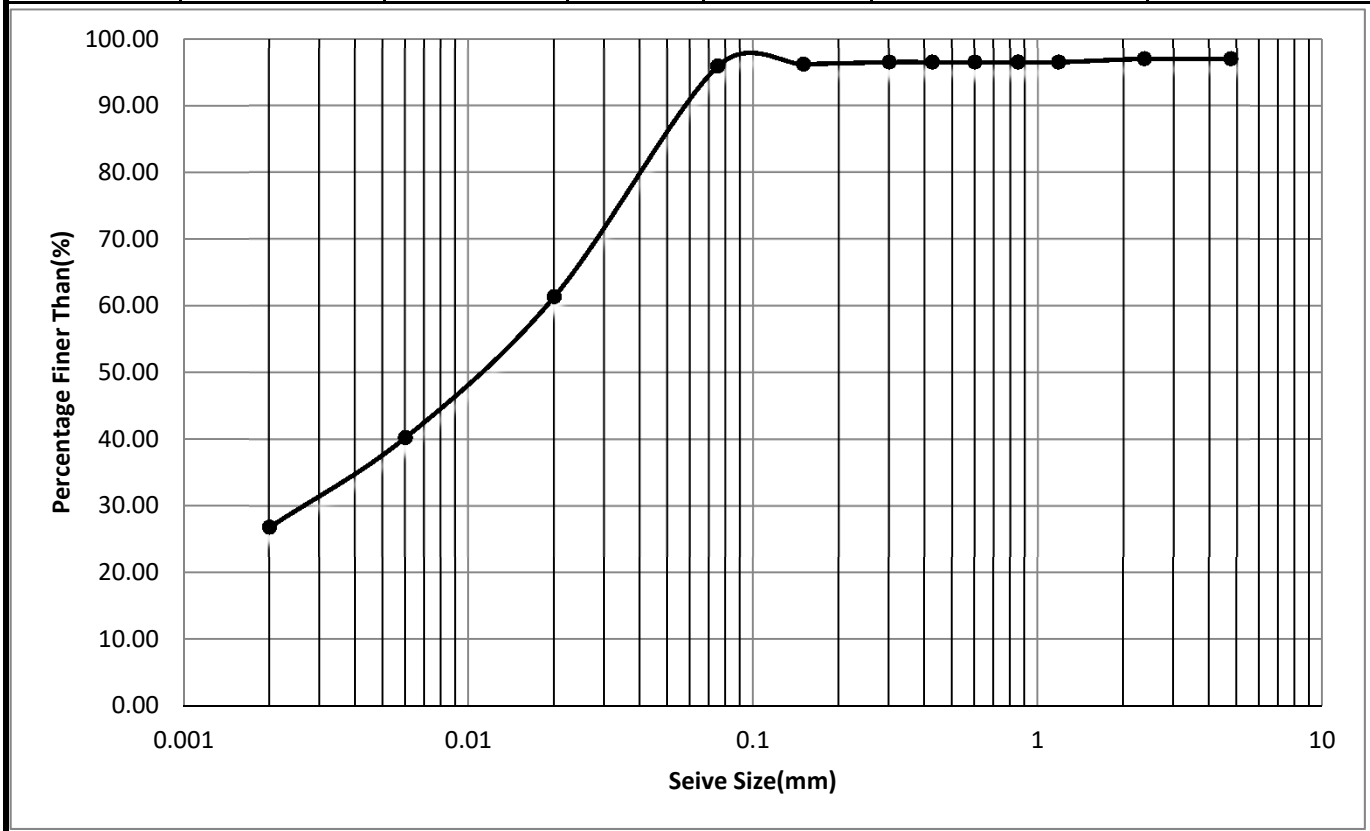


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	7.50-7.95	0.00	0.80	65.47	33.73

GRAIN SIZE CURVE

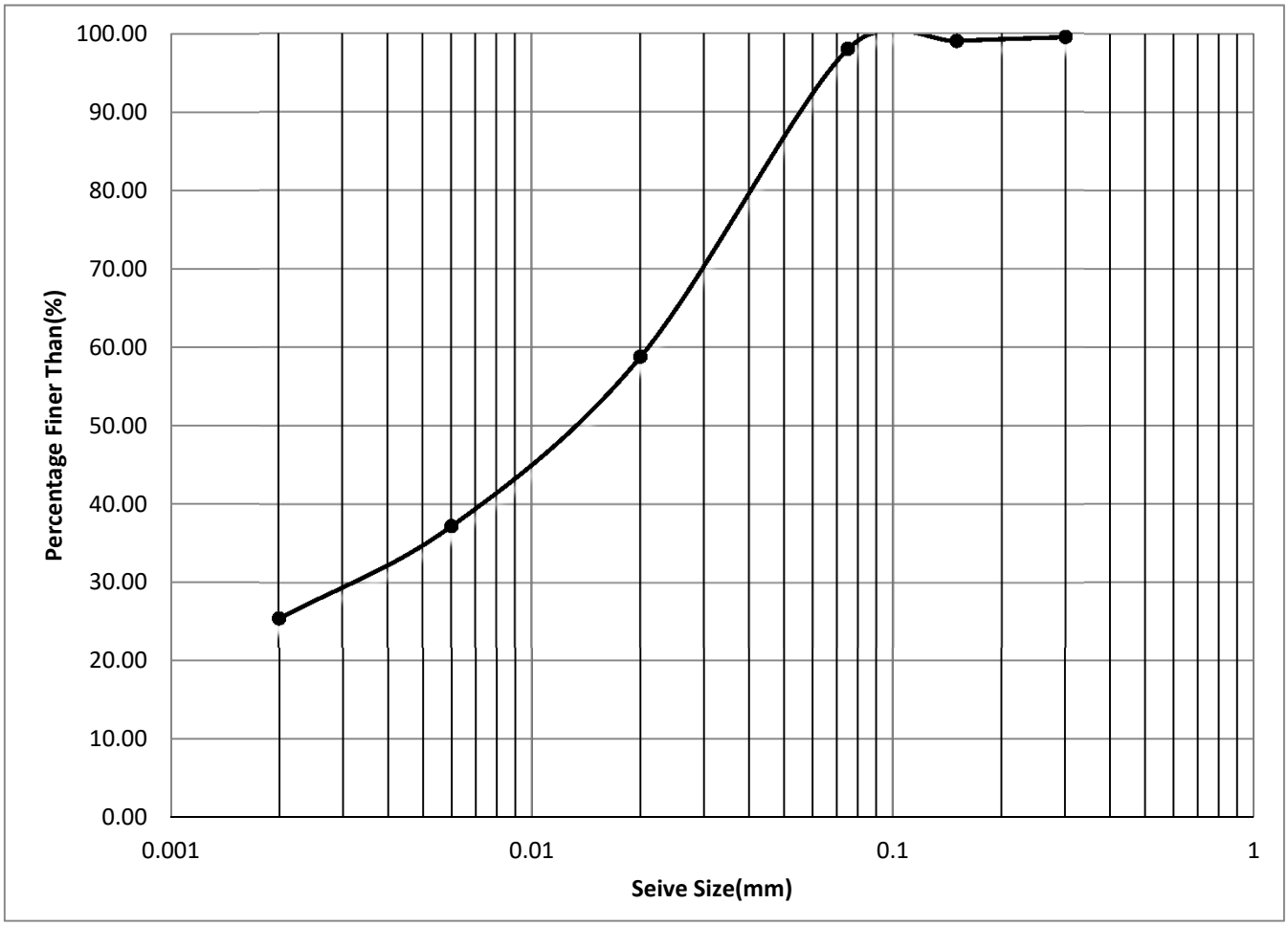


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	10.50-10.95	0.00	0.70	67.52	31.78

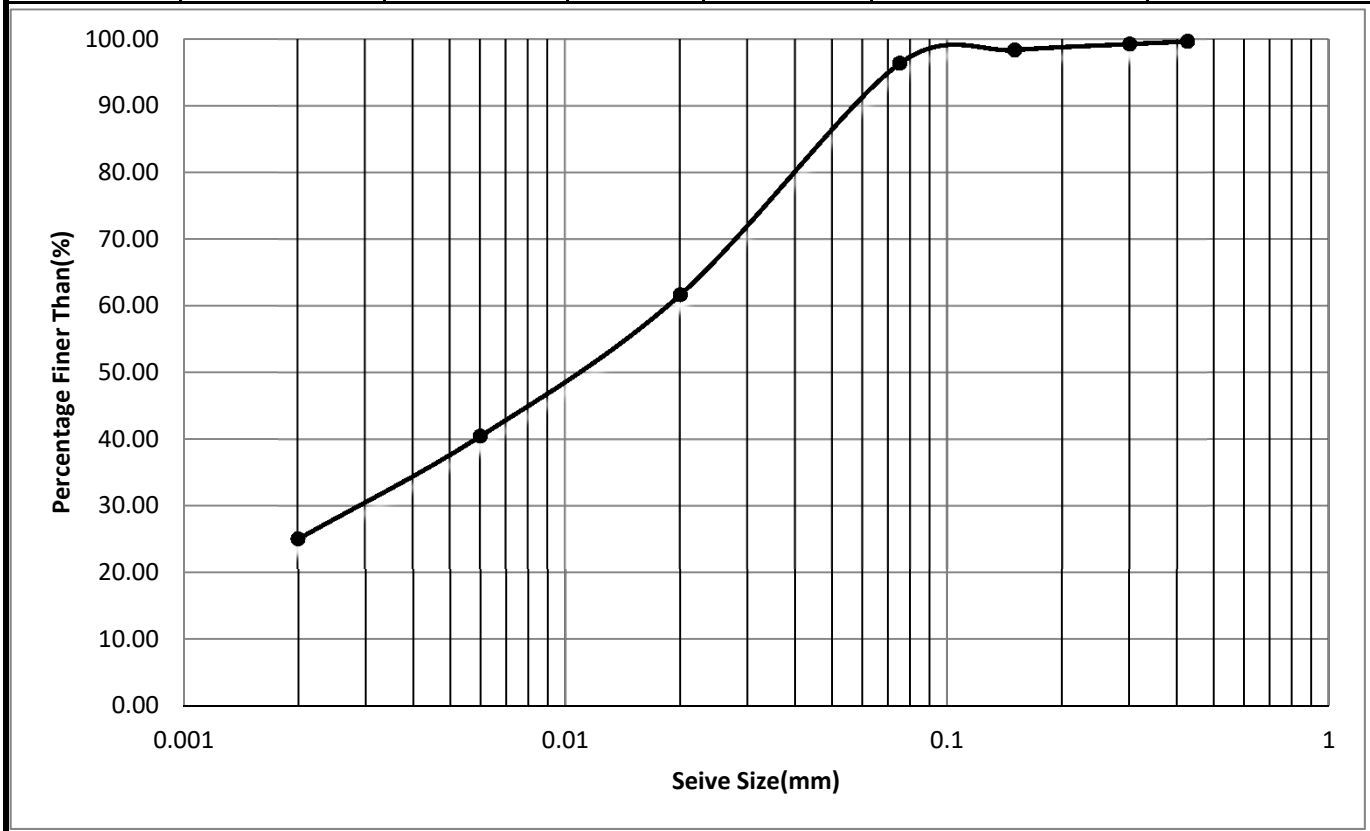


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	13.50-13.95	3.00	1.10	69.05	26.85

GRAIN SIZE CURVE

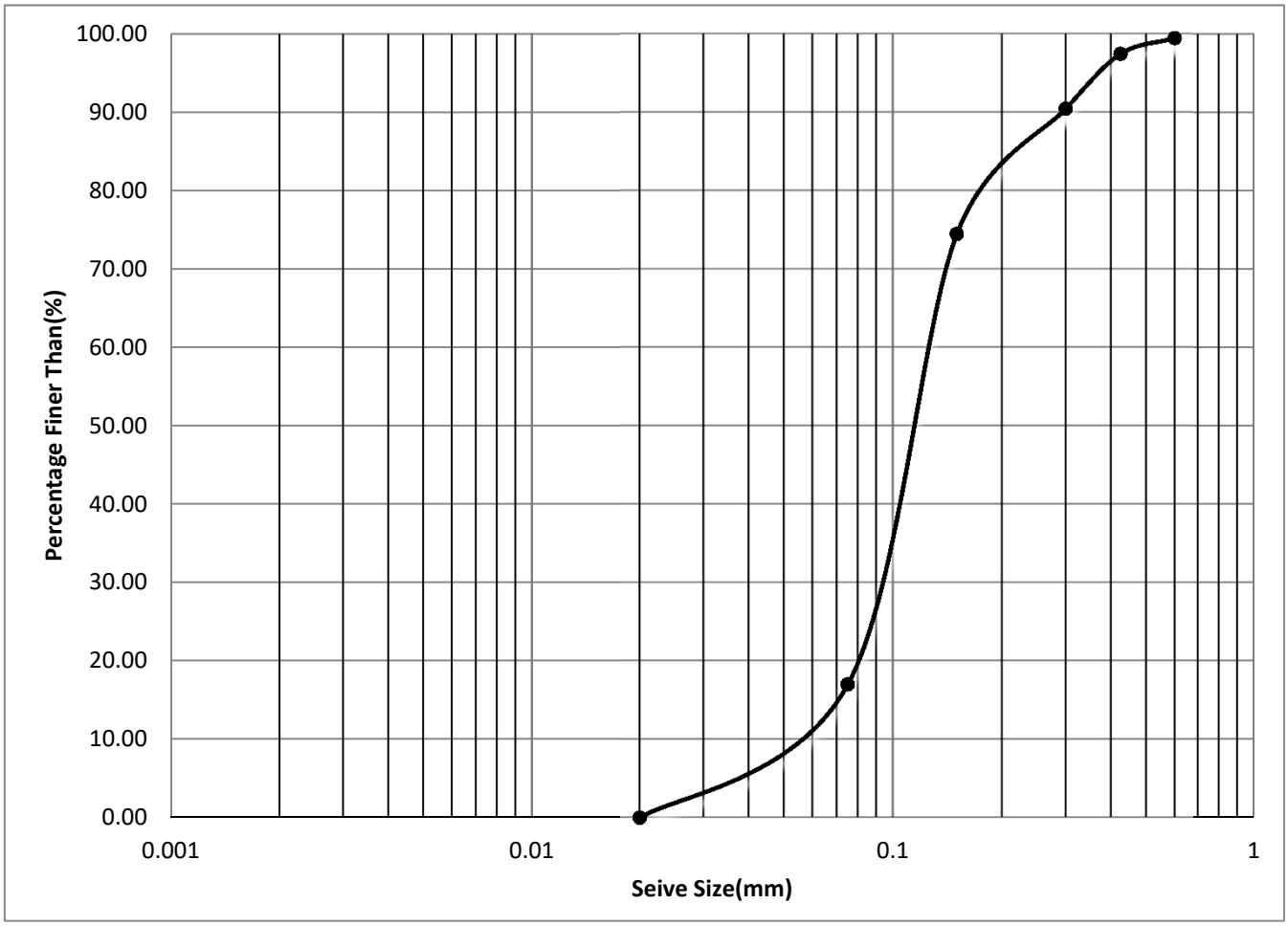


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	16.50-16.95	0.00	1.90	72.59	25.51

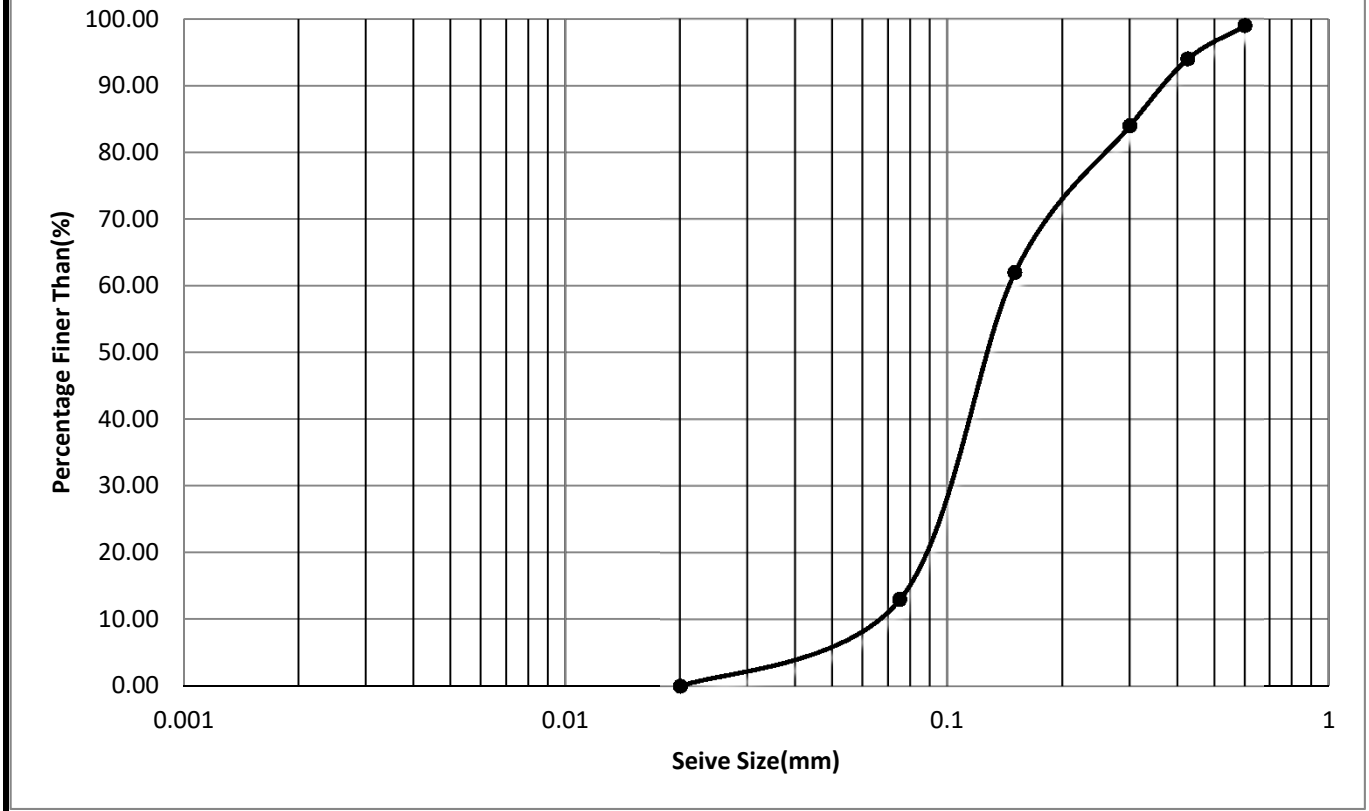


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	19.50-19.95	0.00	3.60	71.34	25.06

GRAIN SIZE CURVE

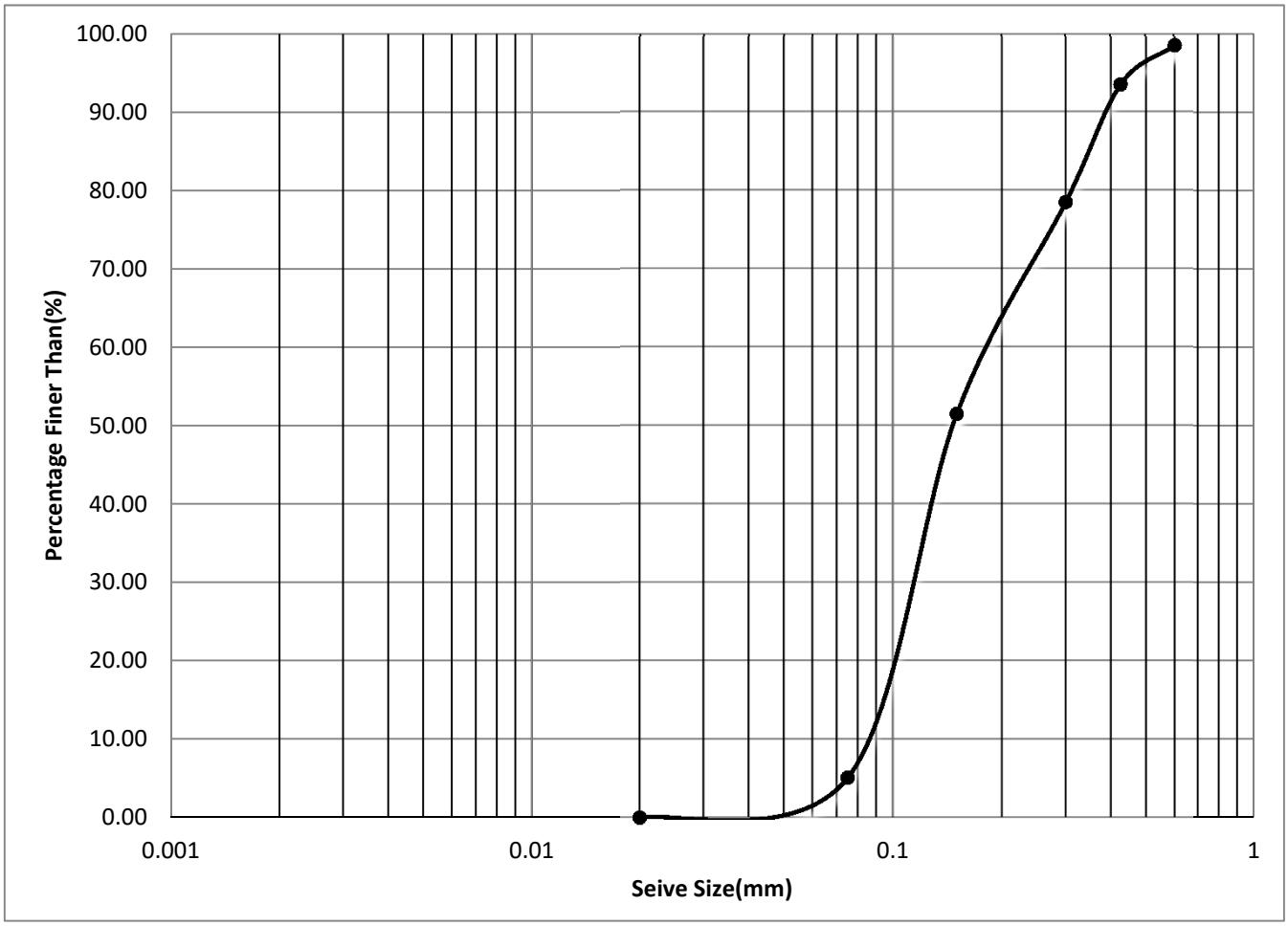


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	25.50-25.95	0.00	83.00	17.00	0.00

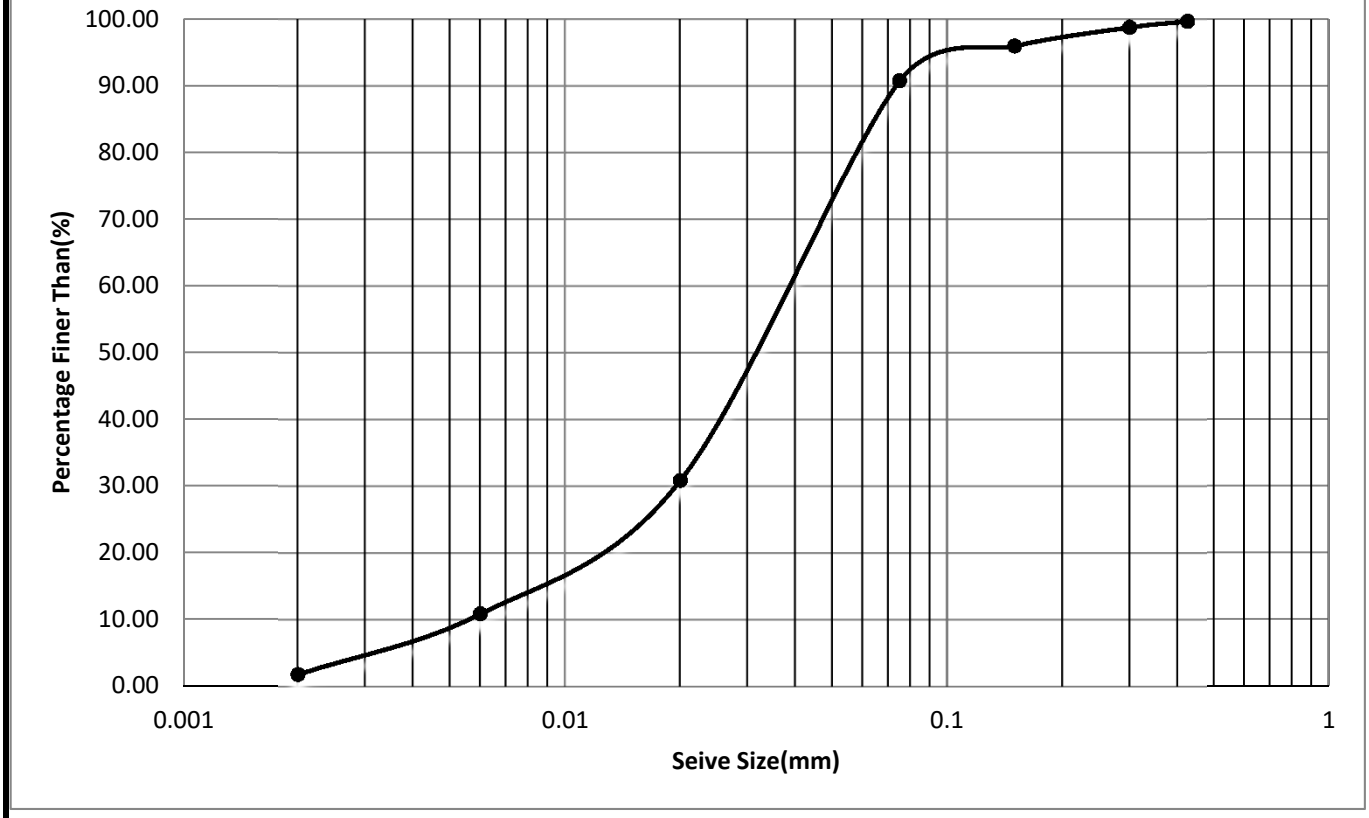


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	31.50-31.95	0.00	87.00	13.00	0.00

GRAIN SIZE CURVE

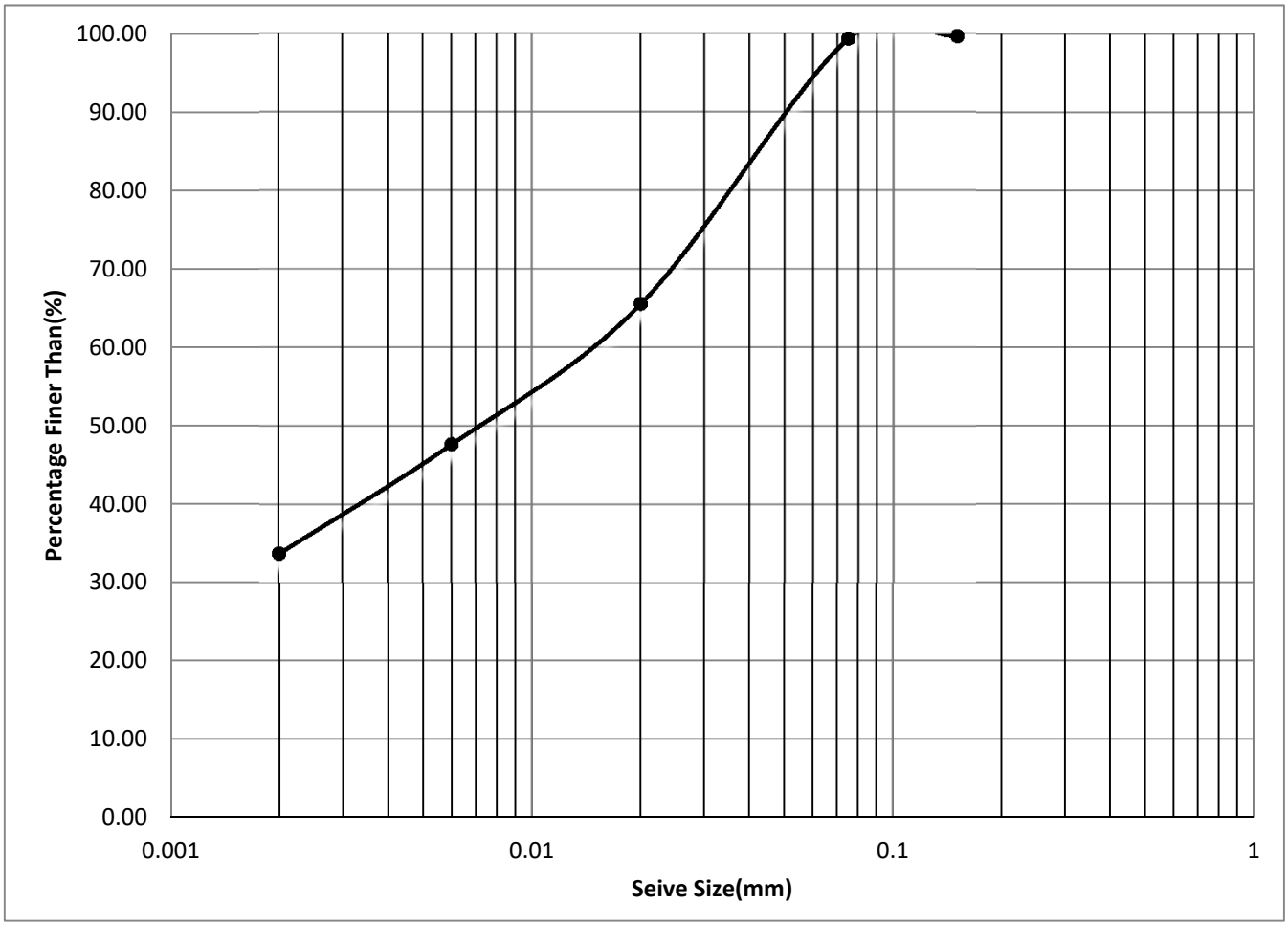


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
1	Aqua View	37.50-37.95	0.00	94.90	5.10	0.00

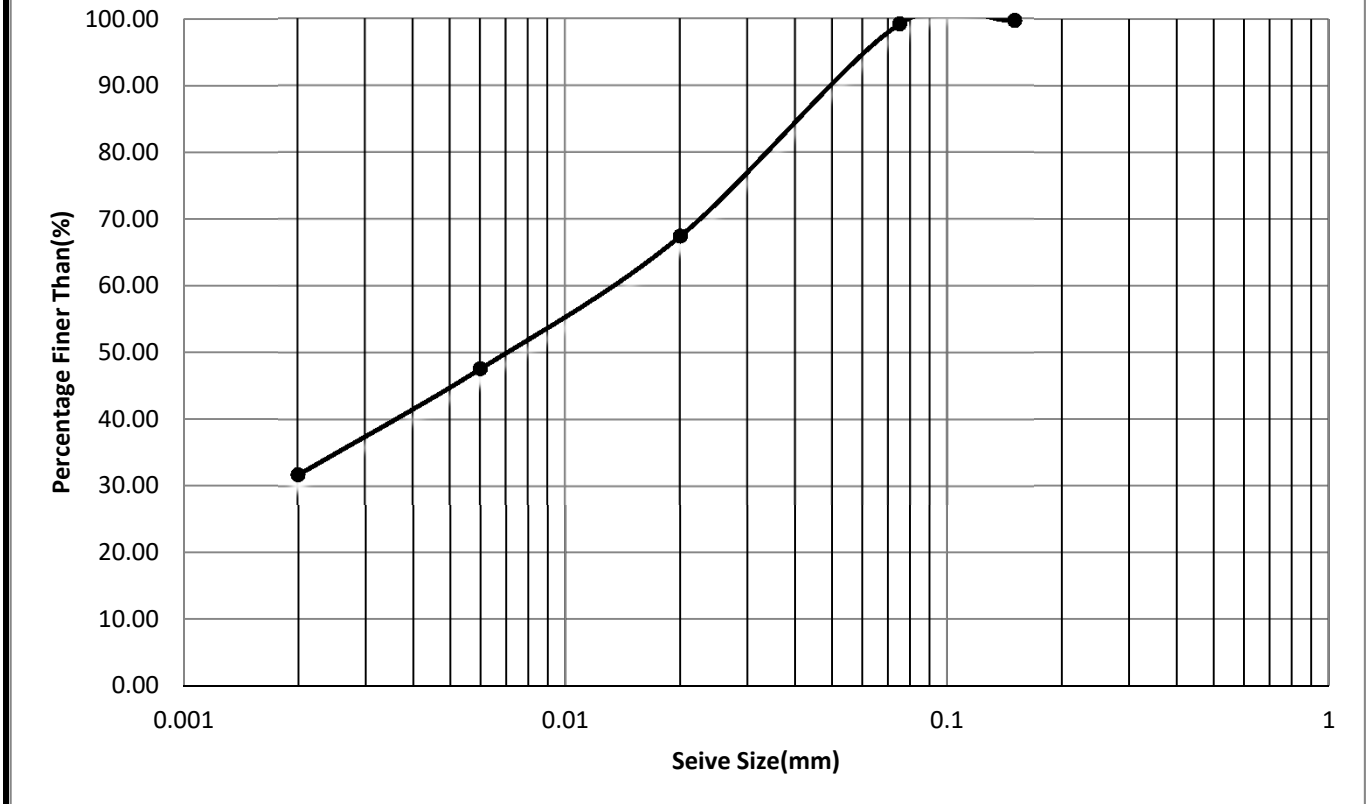


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	4.50-4.95	0.00	9.20	88.98	1.82

GRAIN SIZE CURVE

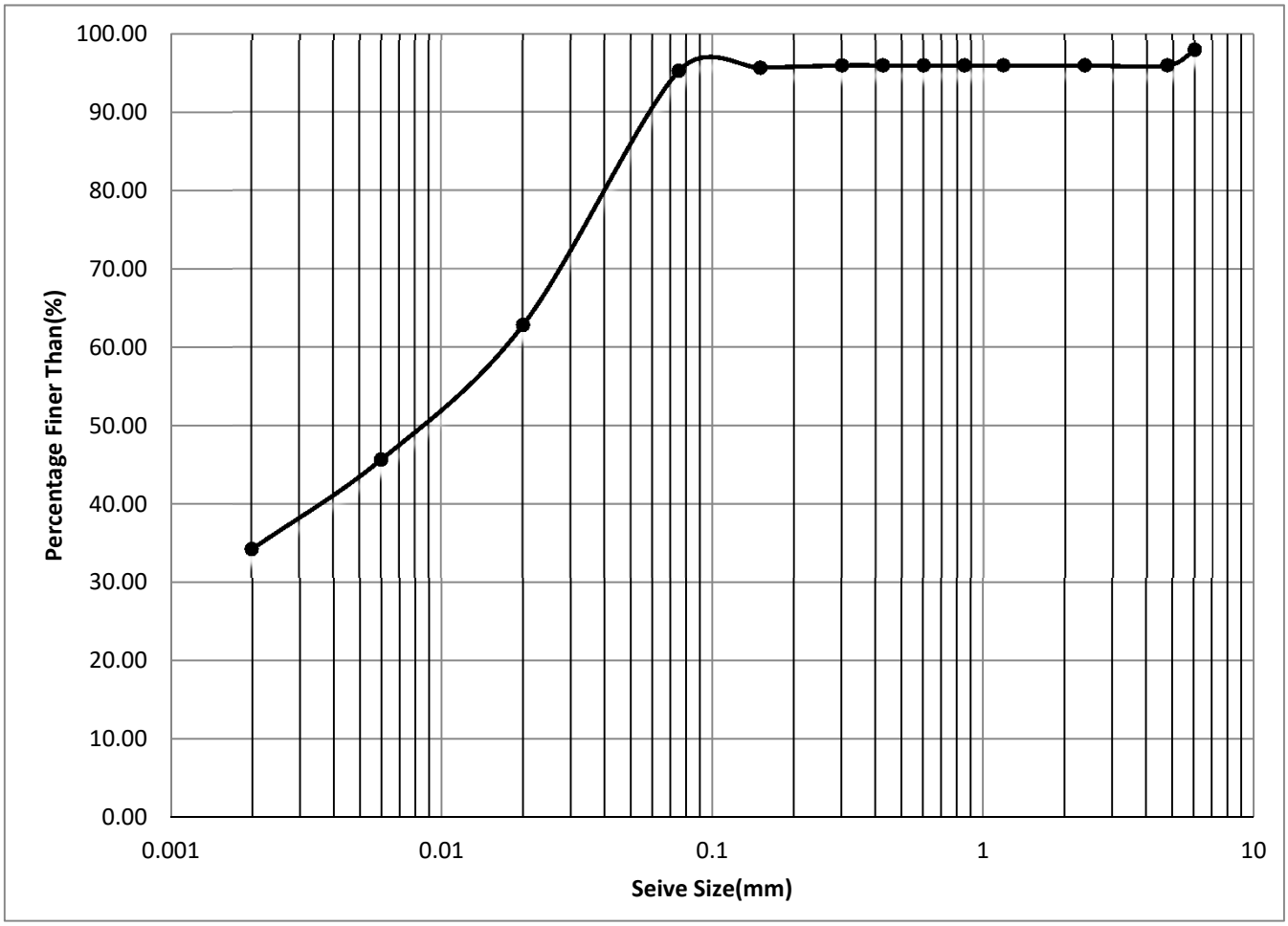


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	7.50-7.95	0.00	0.60	65.60	33.80

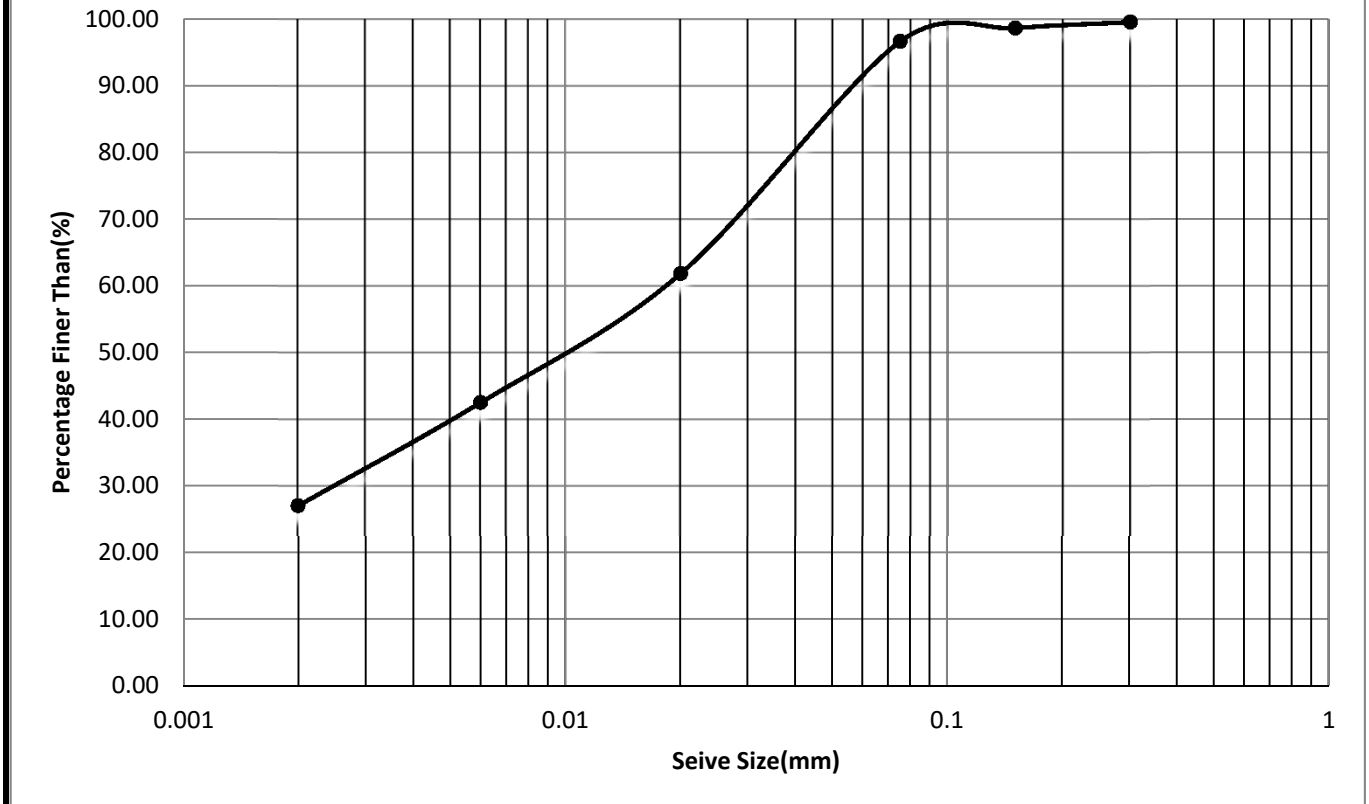


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	10.50-10.95	0.00	0.80	67.46	31.74

GRAIN SIZE CURVE

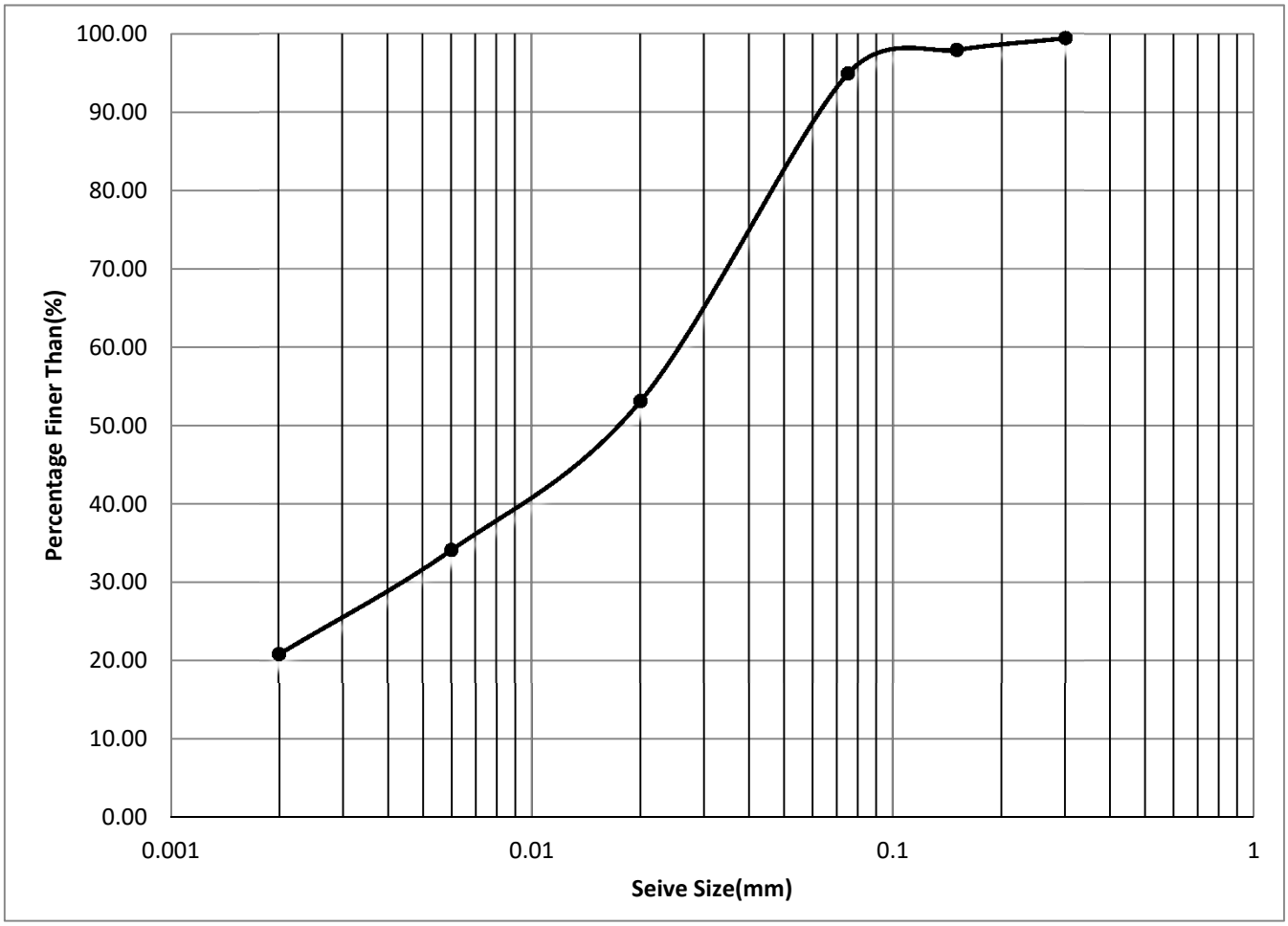


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	13.50-13.95	4.00	0.70	60.99	34.31

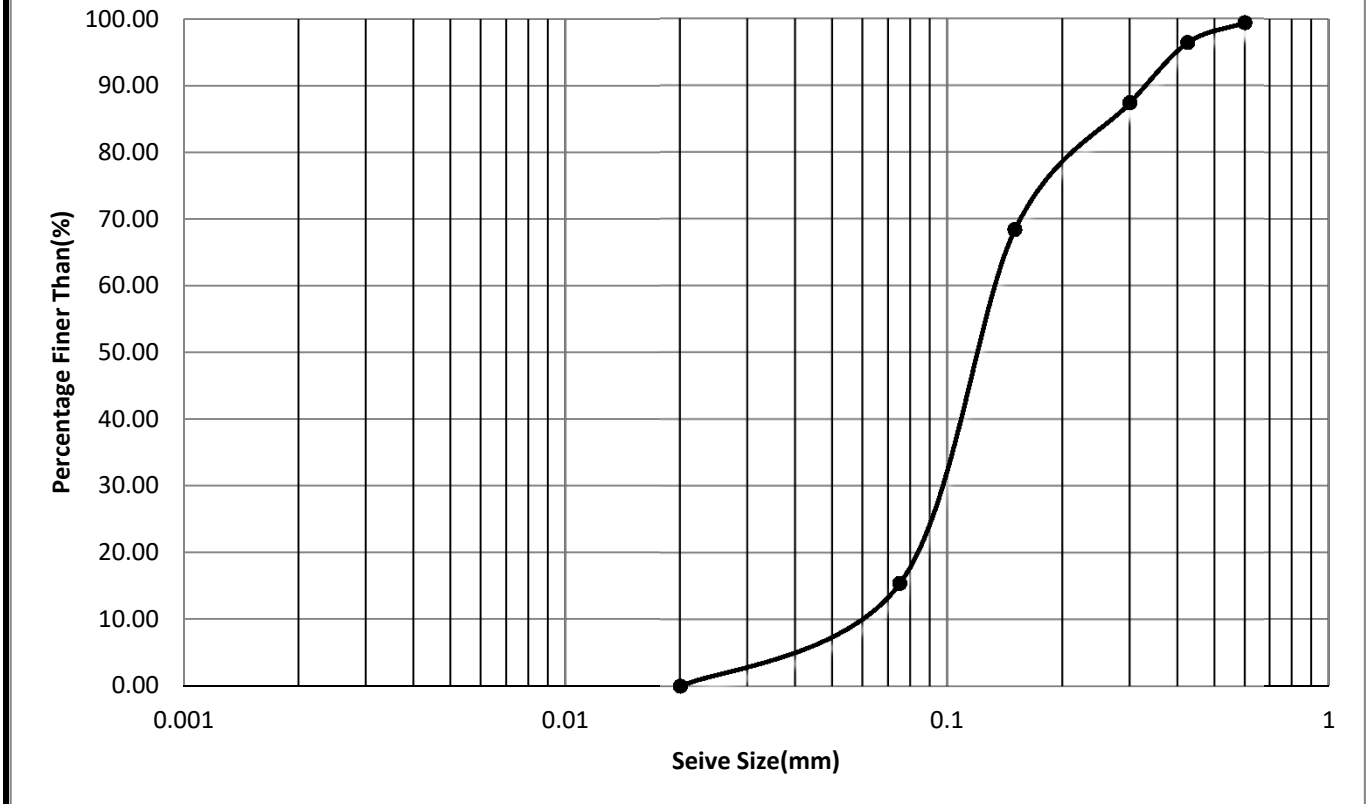


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	16.50-16.95	0.00	3.30	69.62	27.08

GRAIN SIZE CURVE

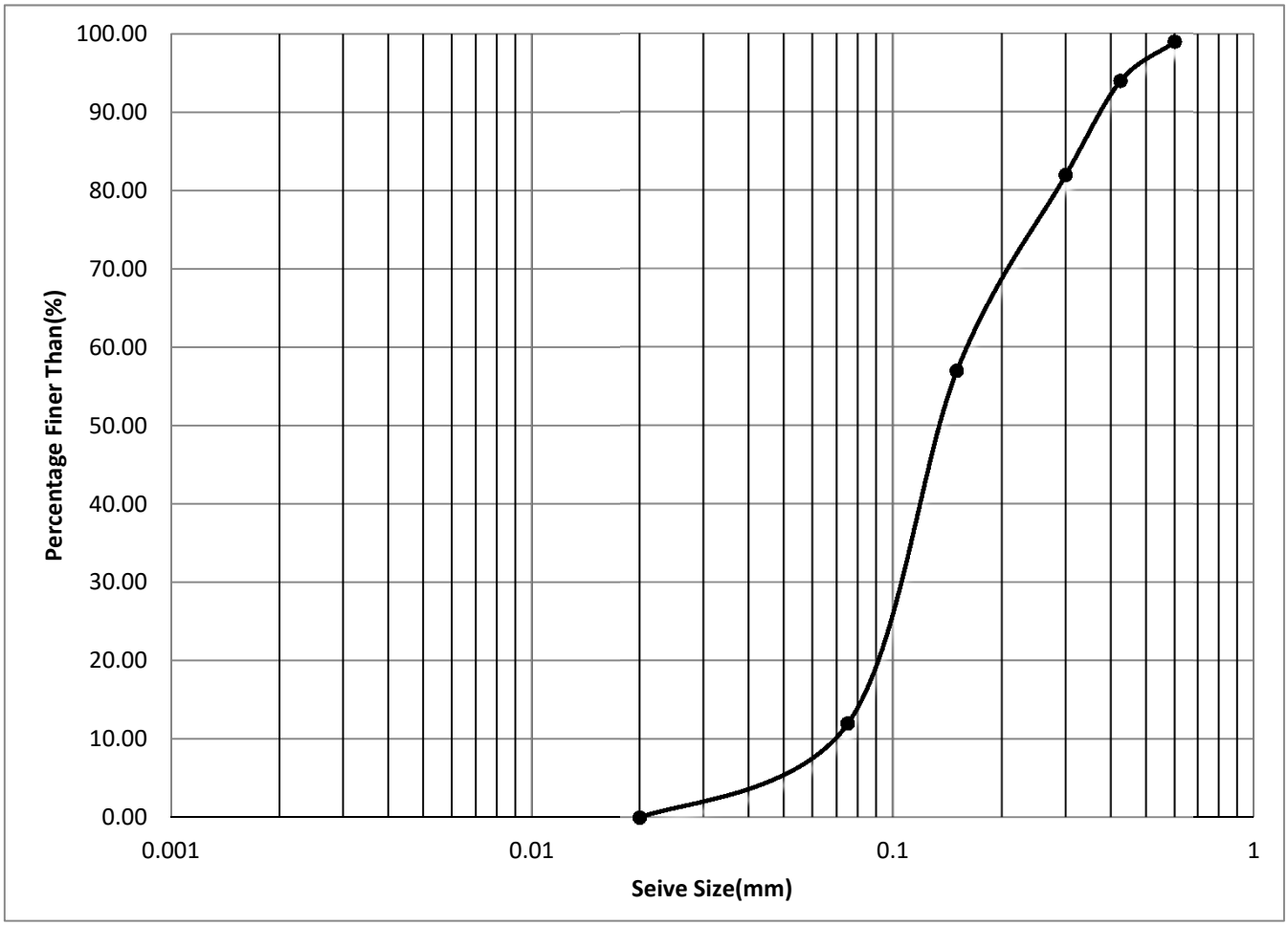


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	19.50-19.95	0.00	5.00	74.10	20.90

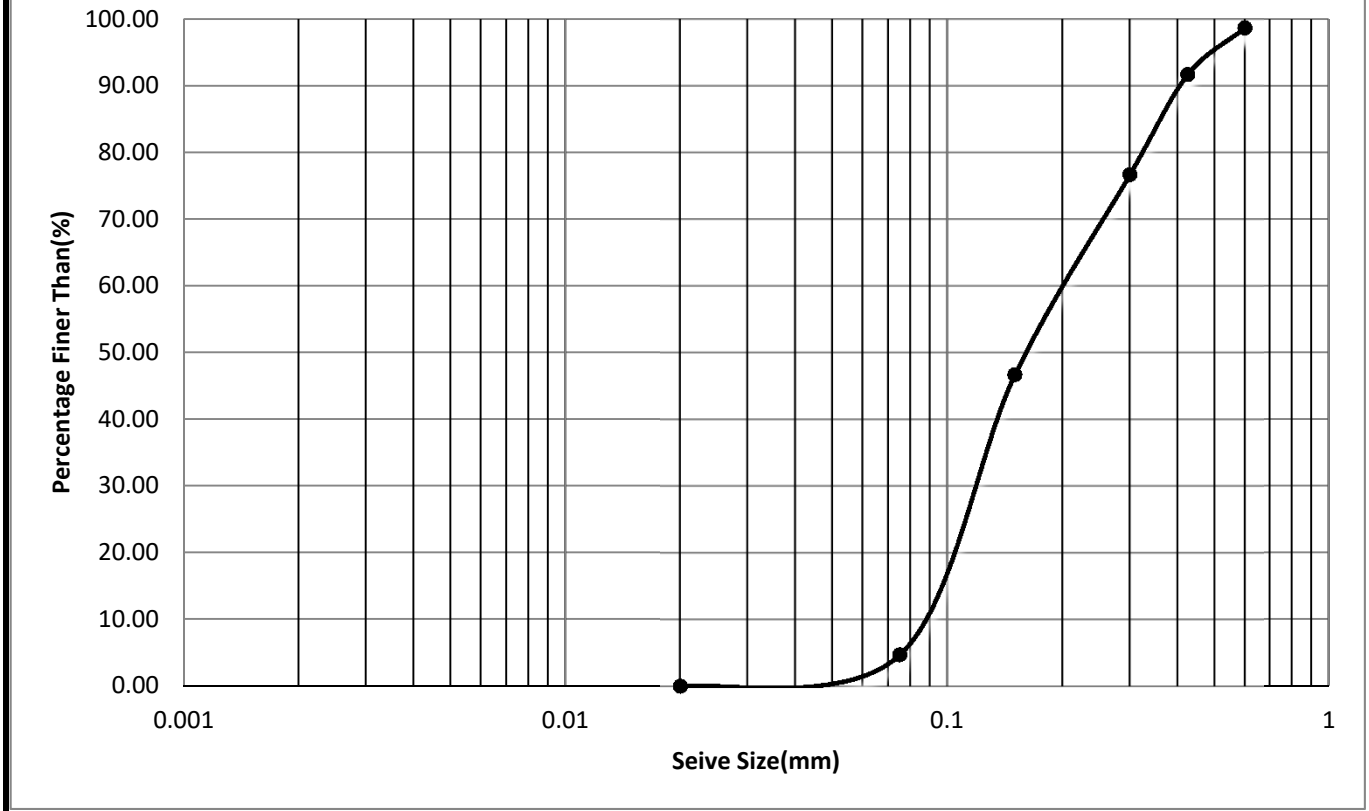


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	25.50-25.95	0.00	84.60	15.40	0.00

GRAIN SIZE CURVE

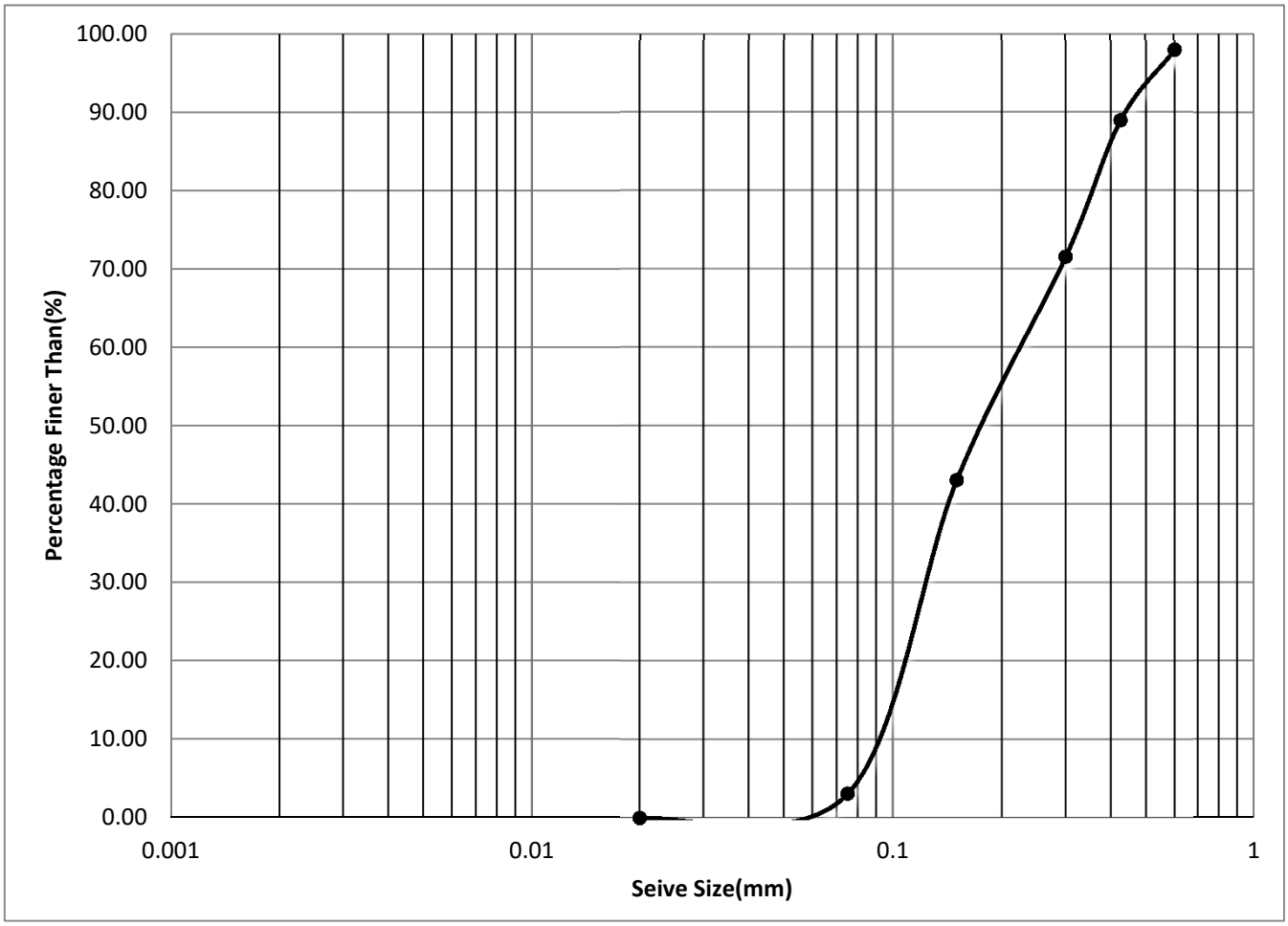


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	31.50-31.95	0.00	88.00	12.00	0.00

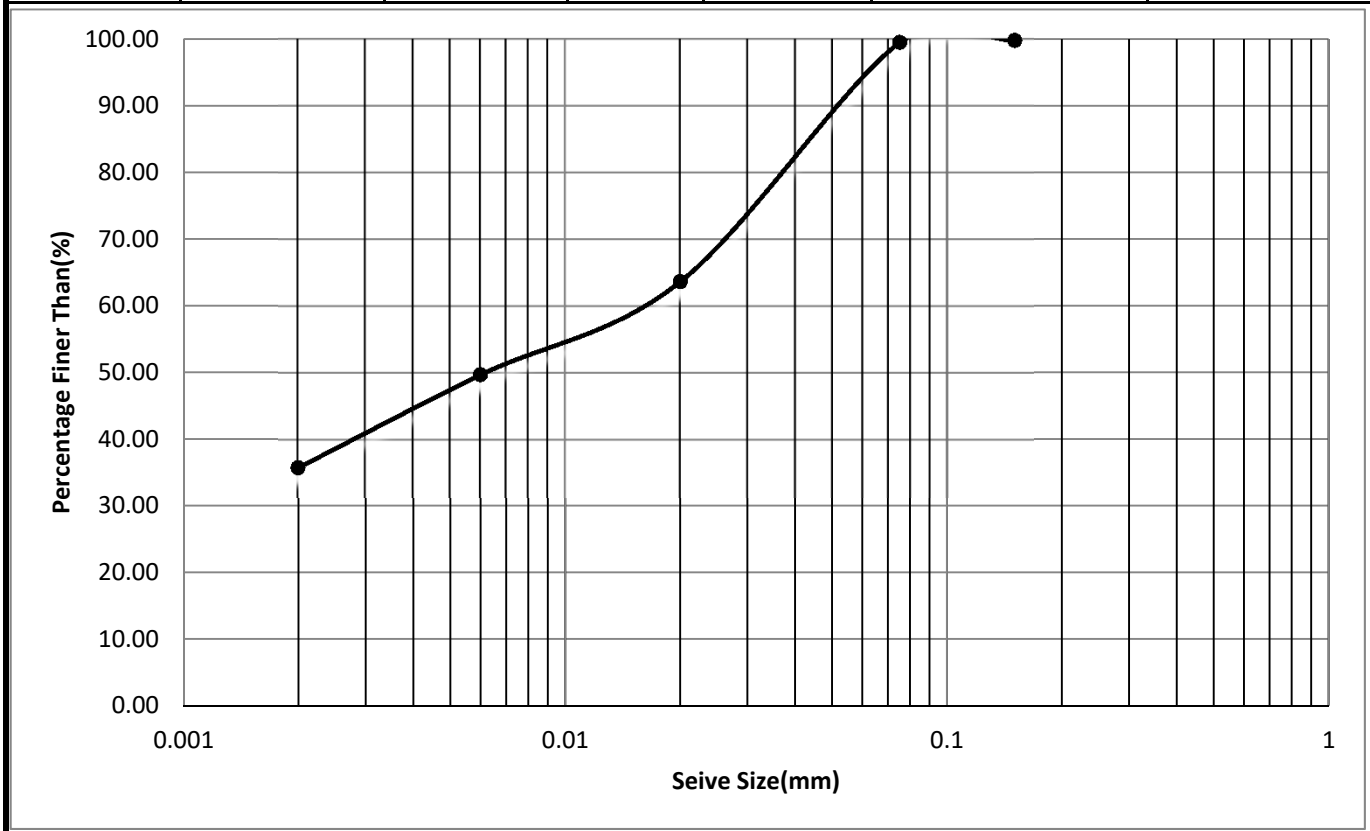


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	37.50-37.95	0.00	95.30	4.70	0.00

GRAIN SIZE CURVE

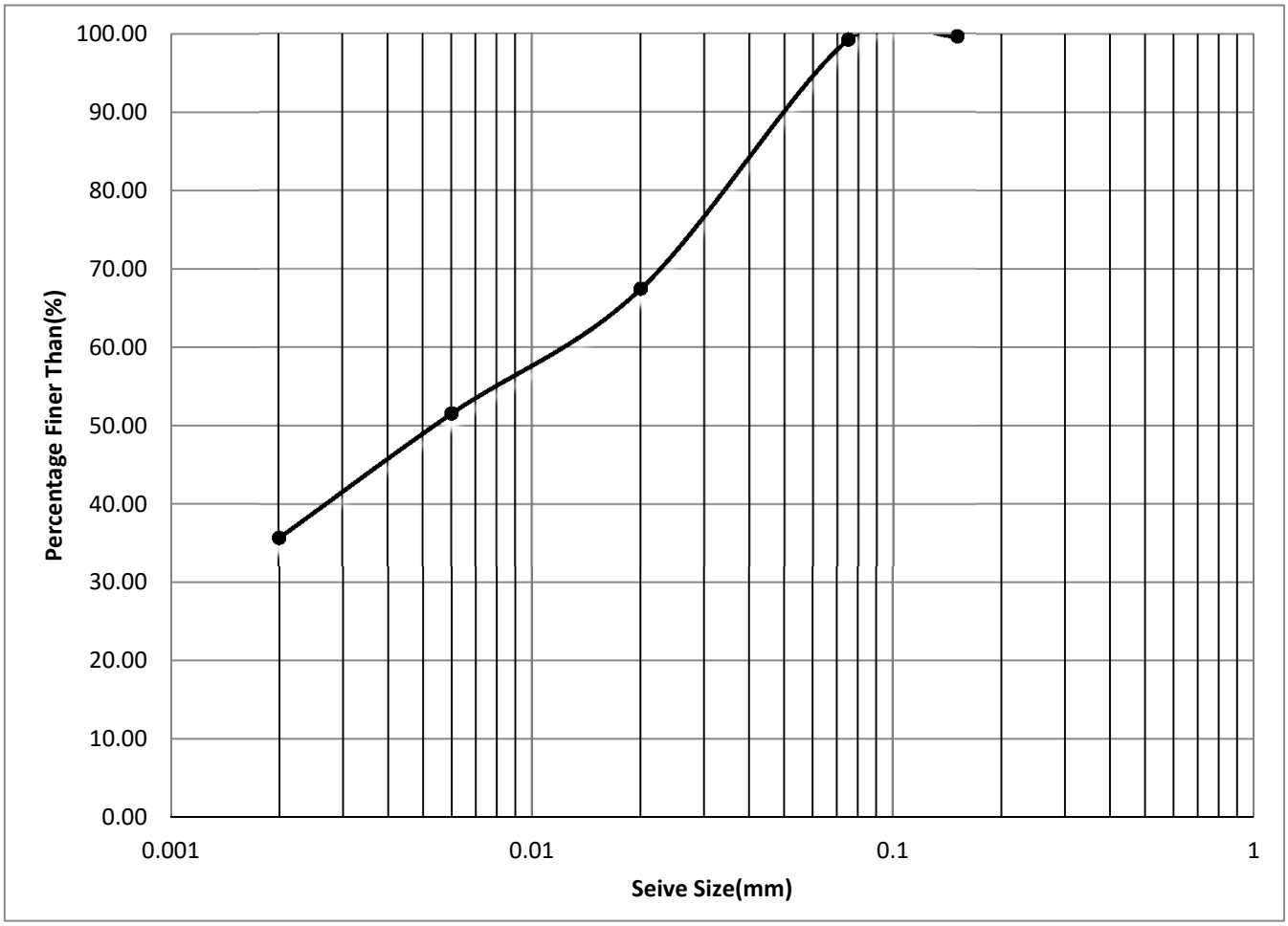


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
2	Aqua View	40.00-40.45	0.00	96.90	3.10	0.00

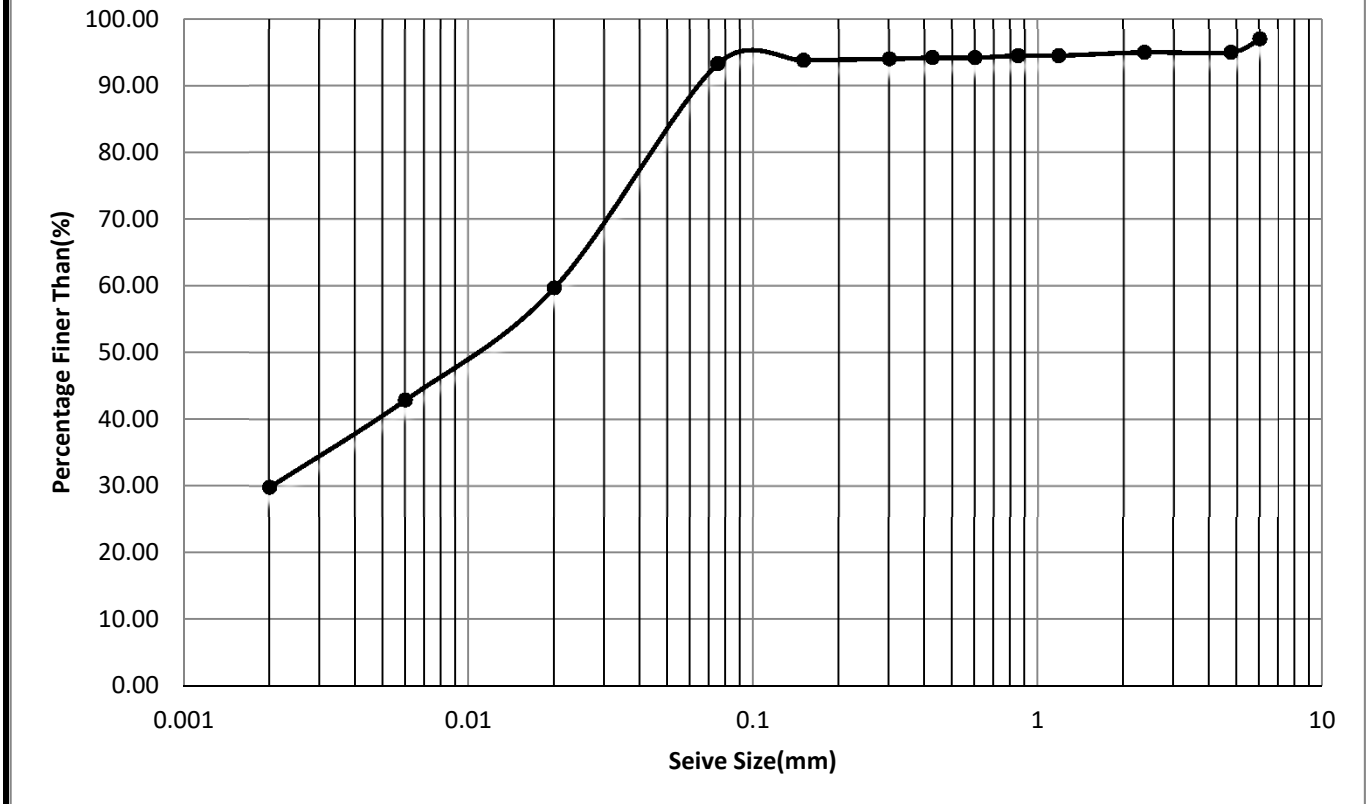


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	7.50-7.95	0.00	0.50	63.68	35.82

GRAIN SIZE CURVE

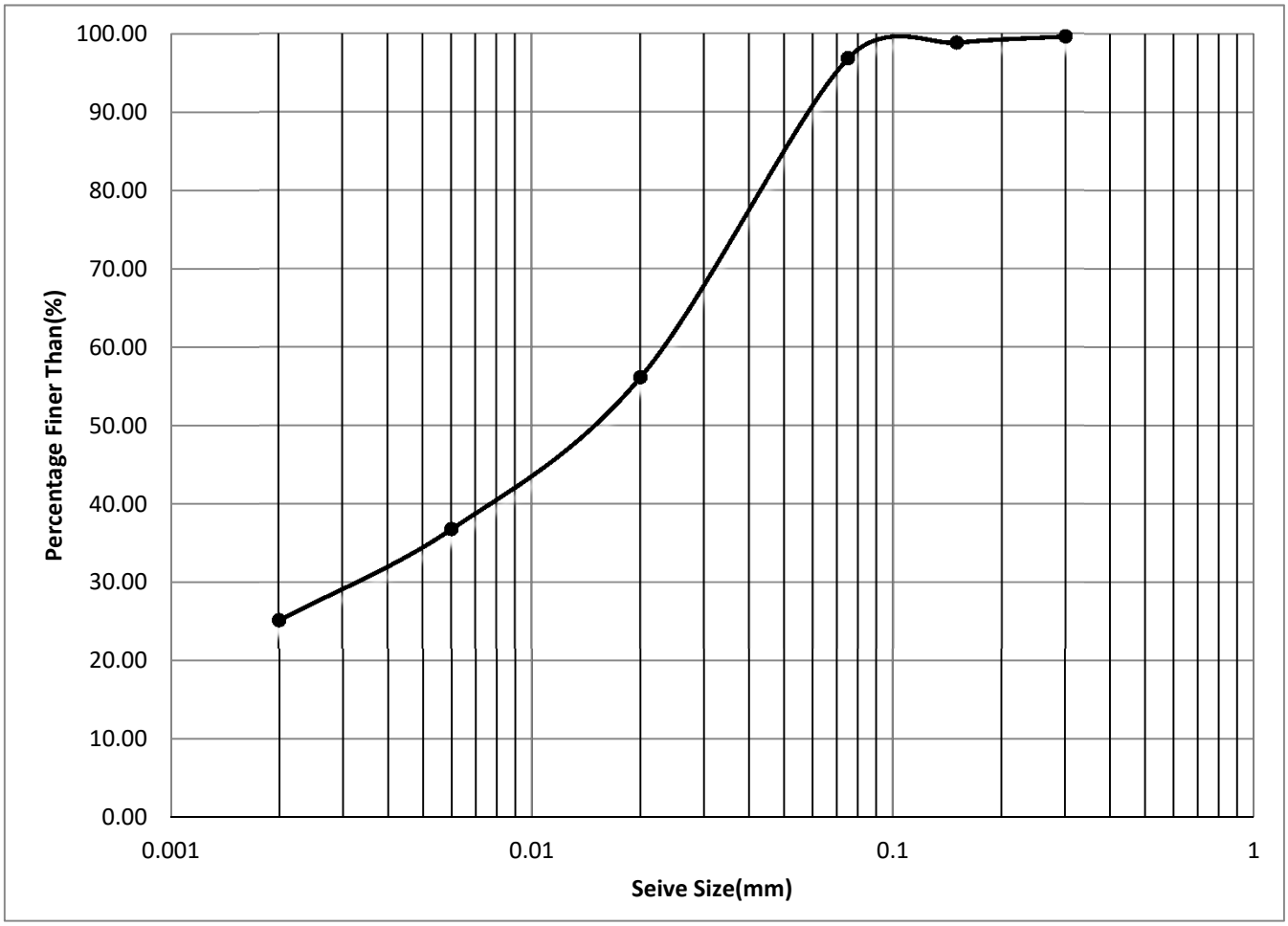


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	10.50-10.95	0.00	0.70	63.55	35.75

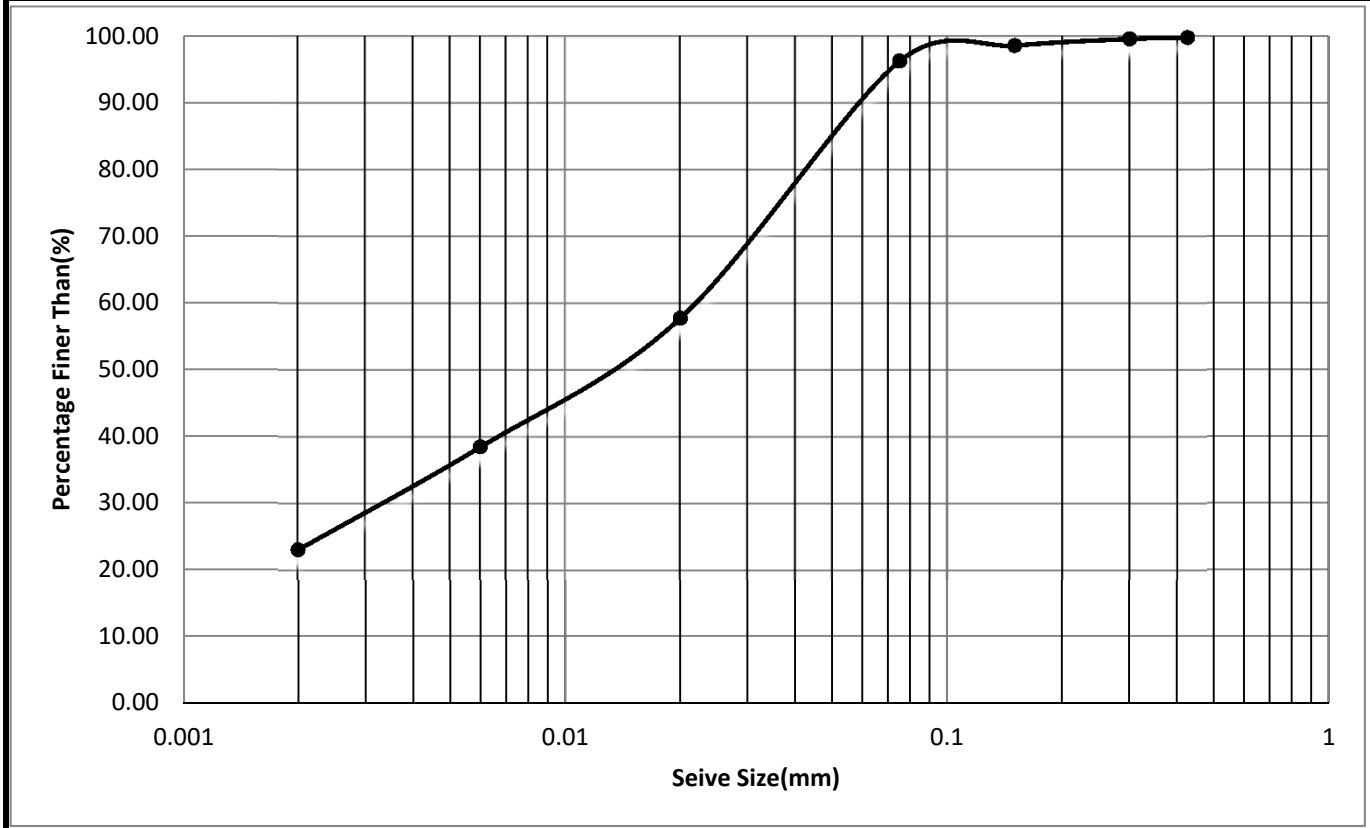


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	13.50-13.95	5.00	1.70	63.44	29.86

GRAIN SIZE CURVE

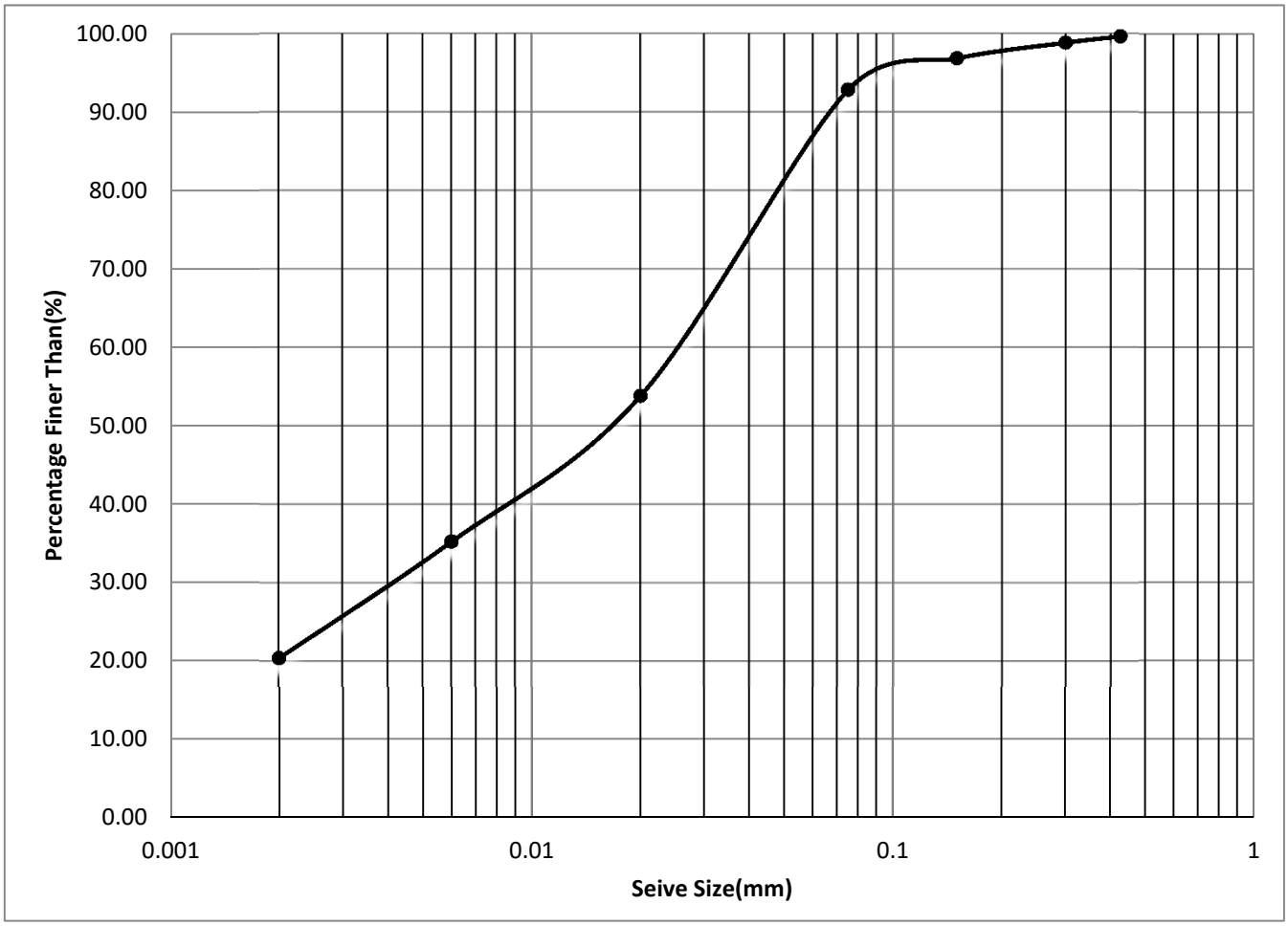


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	16.50-16.95	0.00	3.10	71.71	25.19

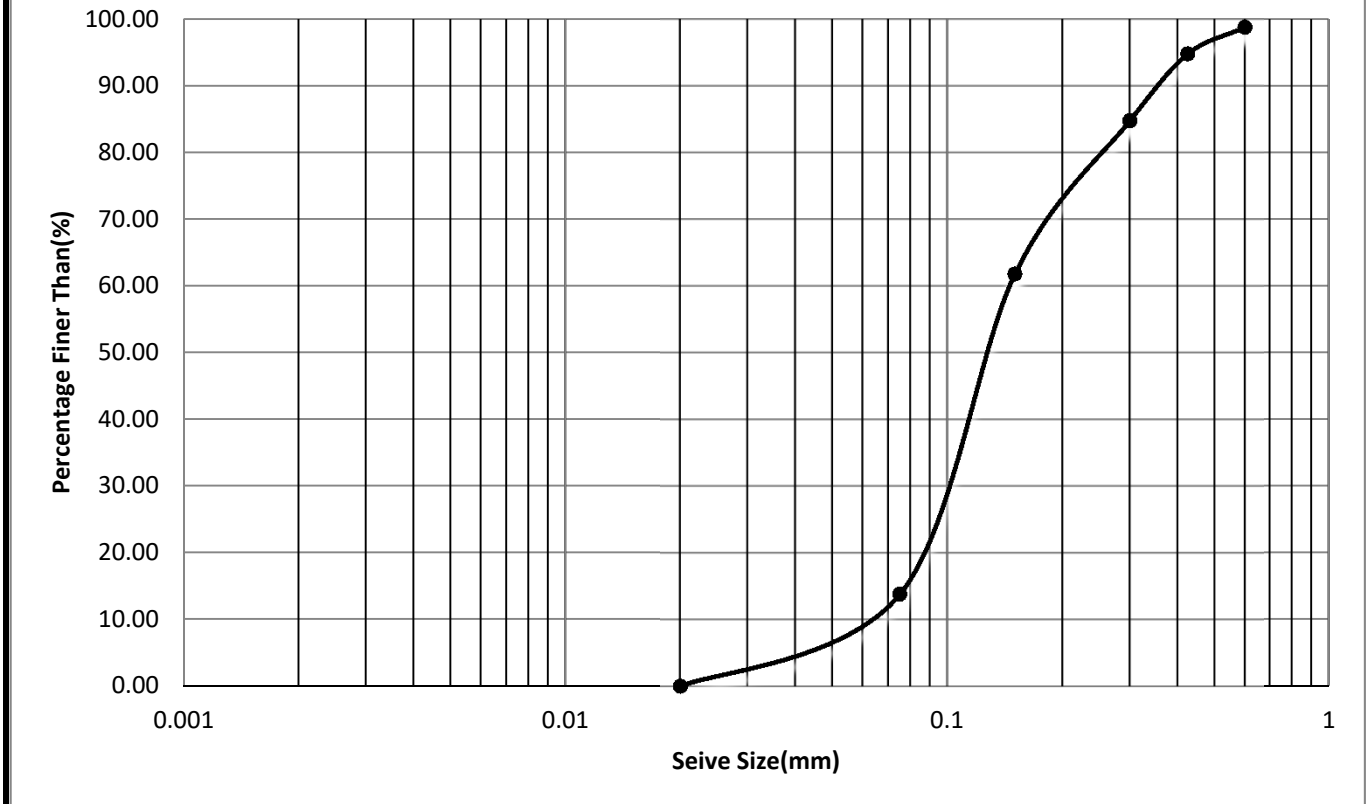


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	19.50-19.95	0.00	3.70	73.19	23.11

GRAIN SIZE CURVE

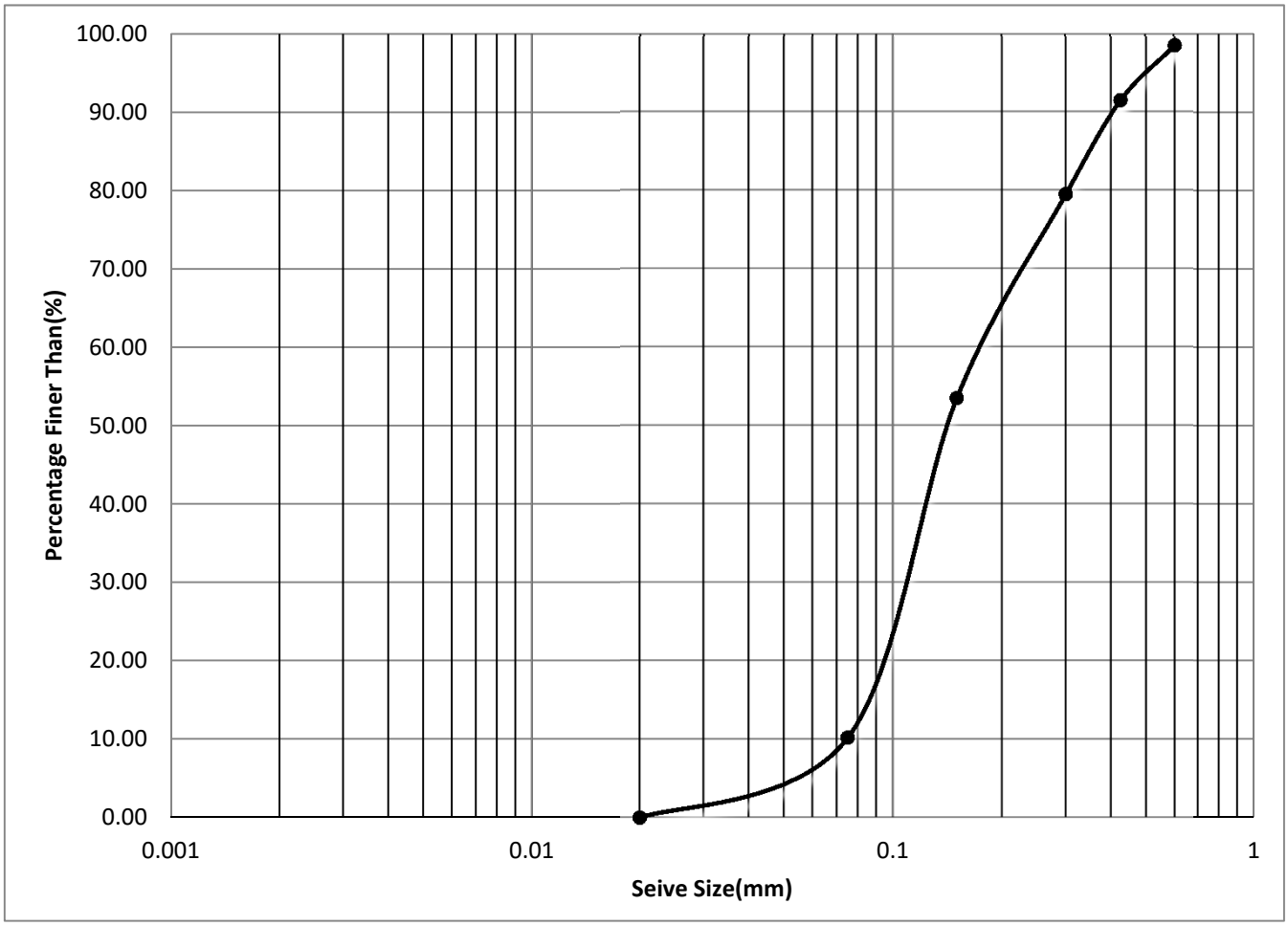


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	22.50-22.95	0.00	7.10	72.46	20.44

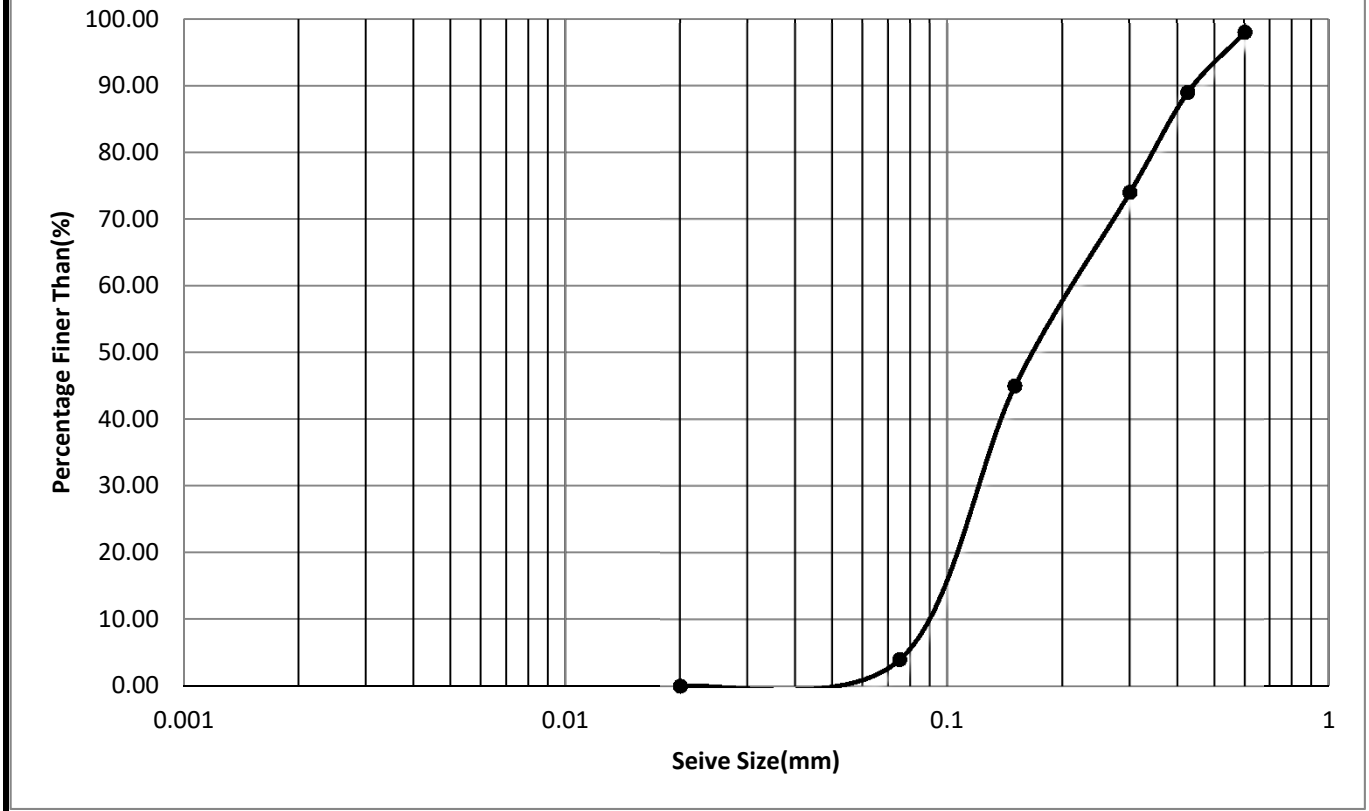


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	28.50-28.95	0.00	86.20	13.80	0.00

GRAIN SIZE CURVE

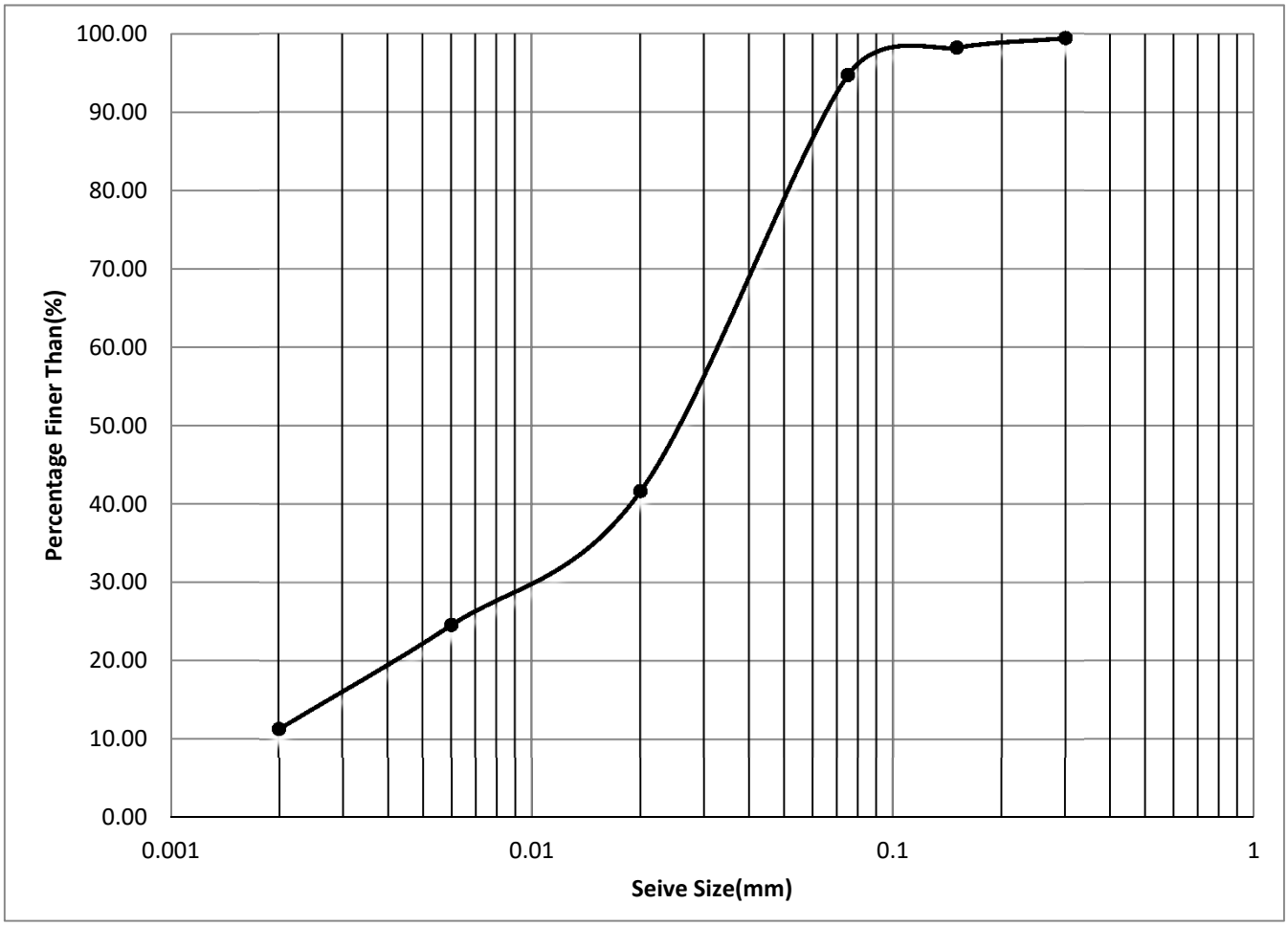


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	31.50-31.95	0.00	89.80	10.20	0.00

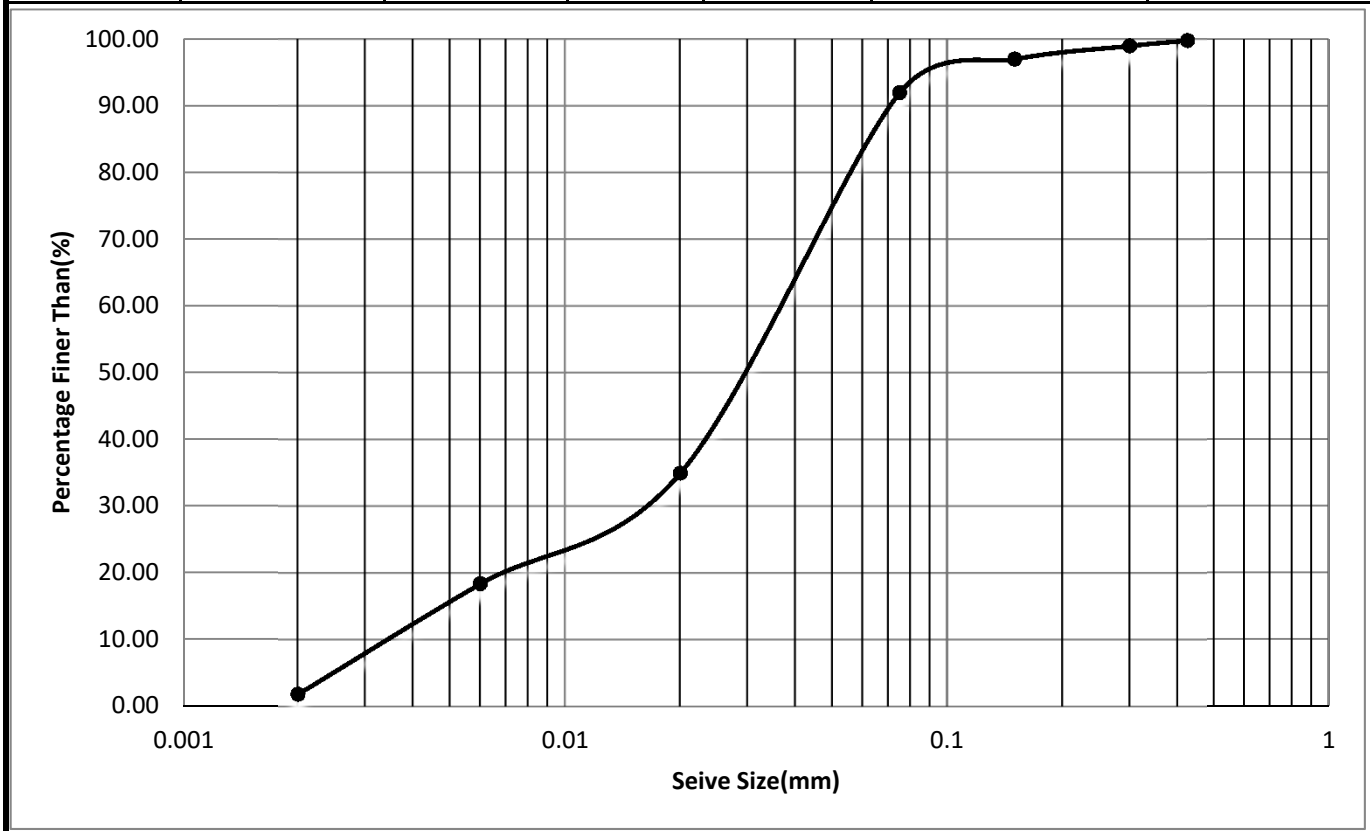


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
3	Aqua View	37.50-37.95	0.00	96.00	4.00	0.00

GRAIN SIZE CURVE

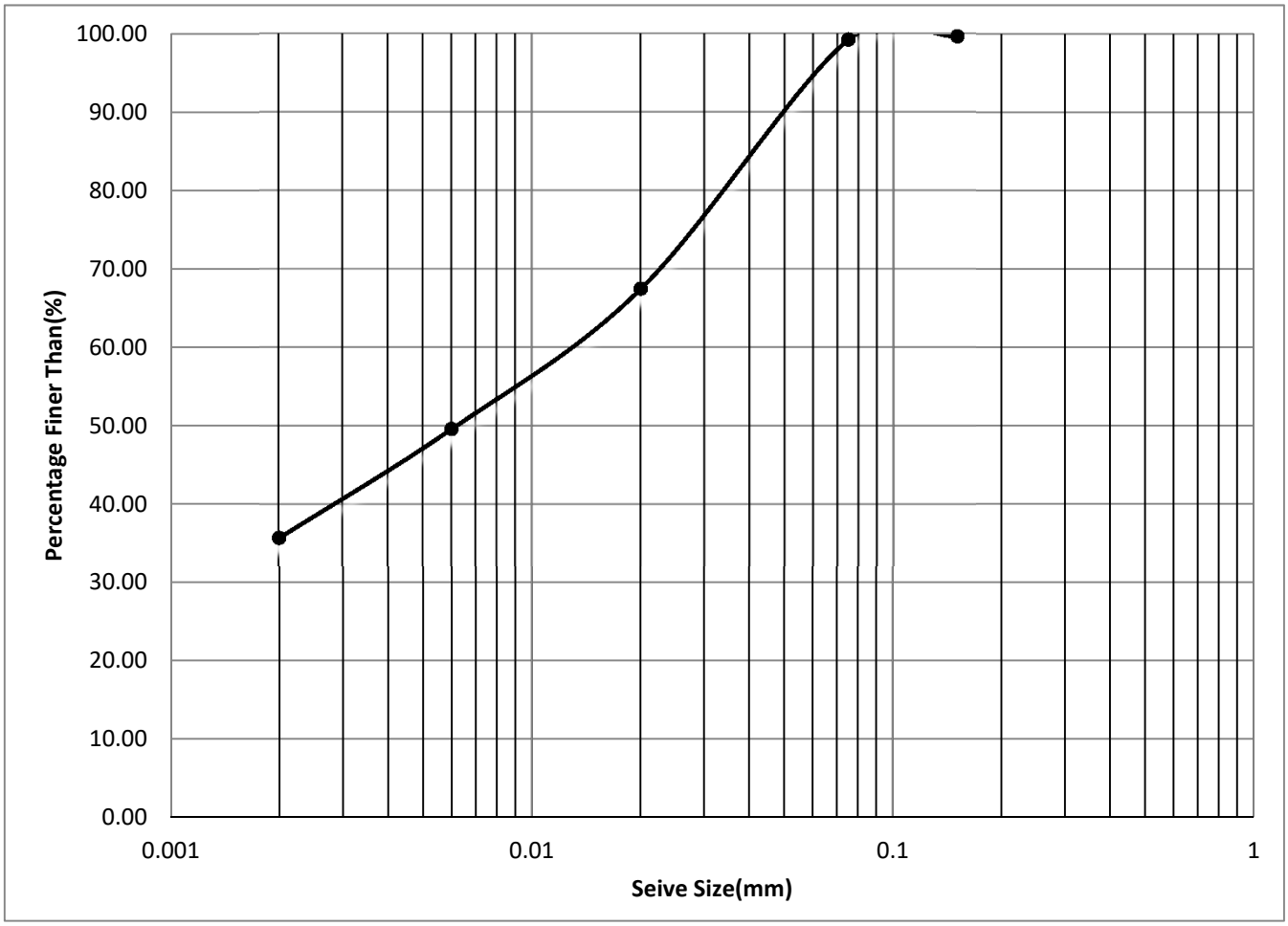


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	1.50-1.95	0.00	5.20	83.42	11.38

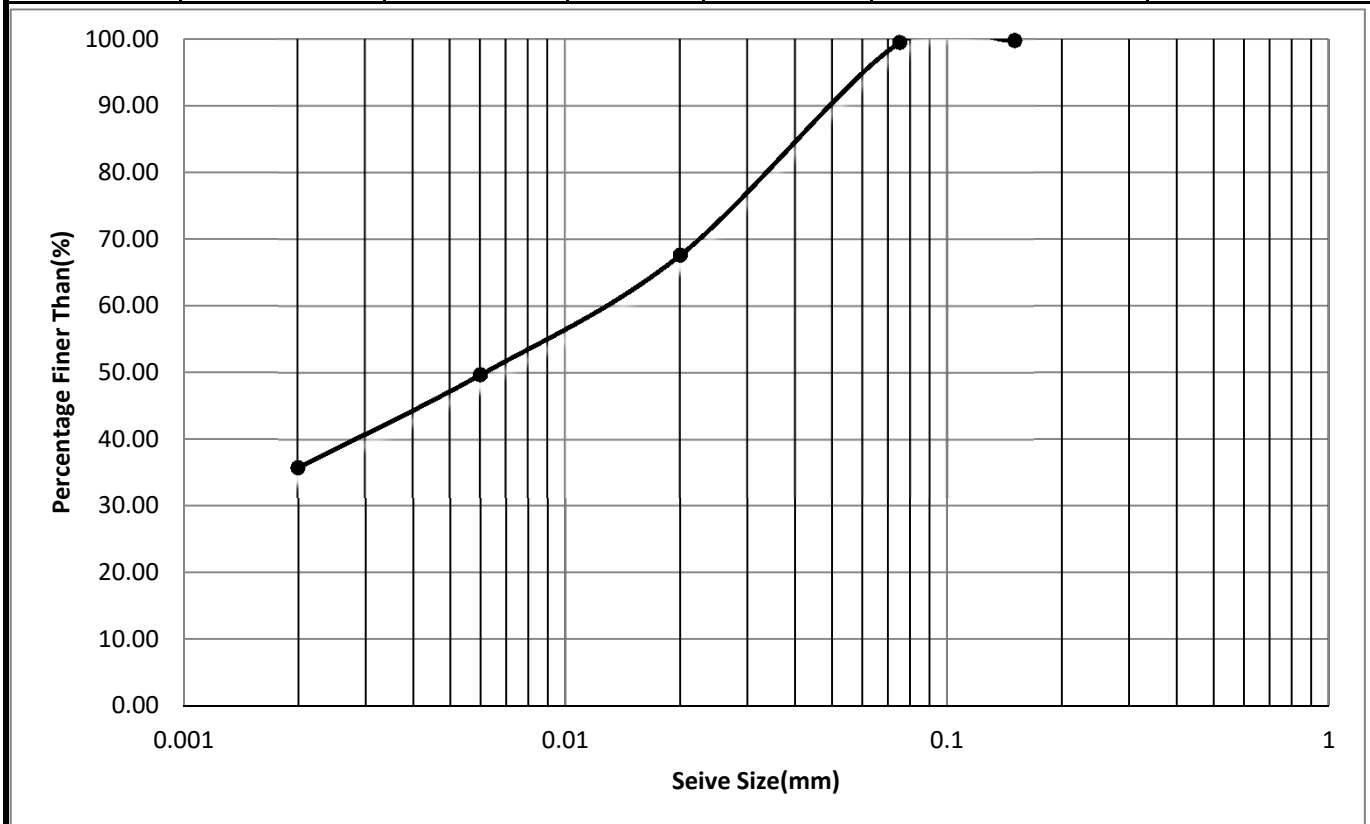


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	4.50-4.95	0.00	8.00	90.16	1.84

GRAIN SIZE CURVE

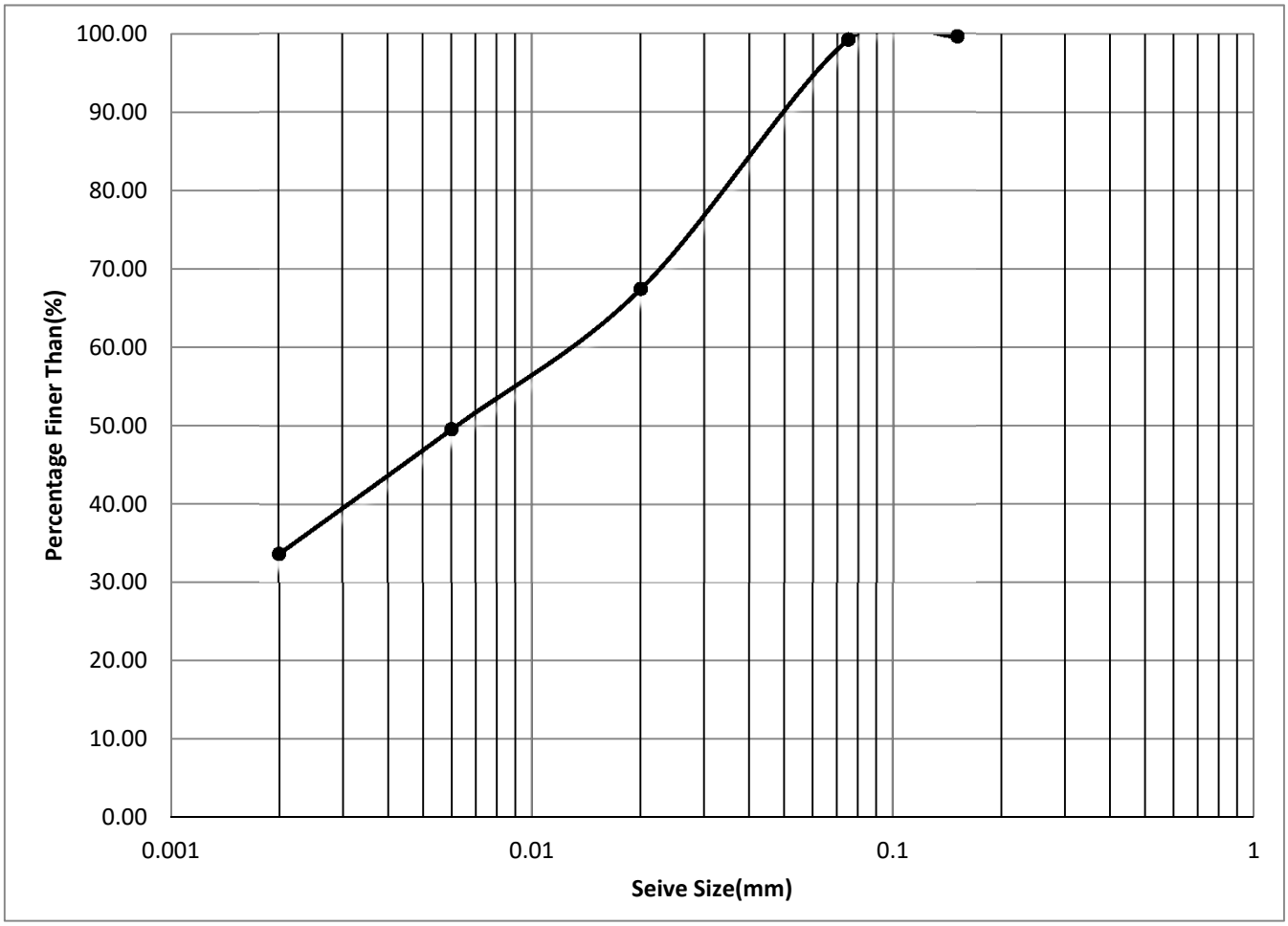


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	6.00-6.45	0.00	0.70	63.55	35.75

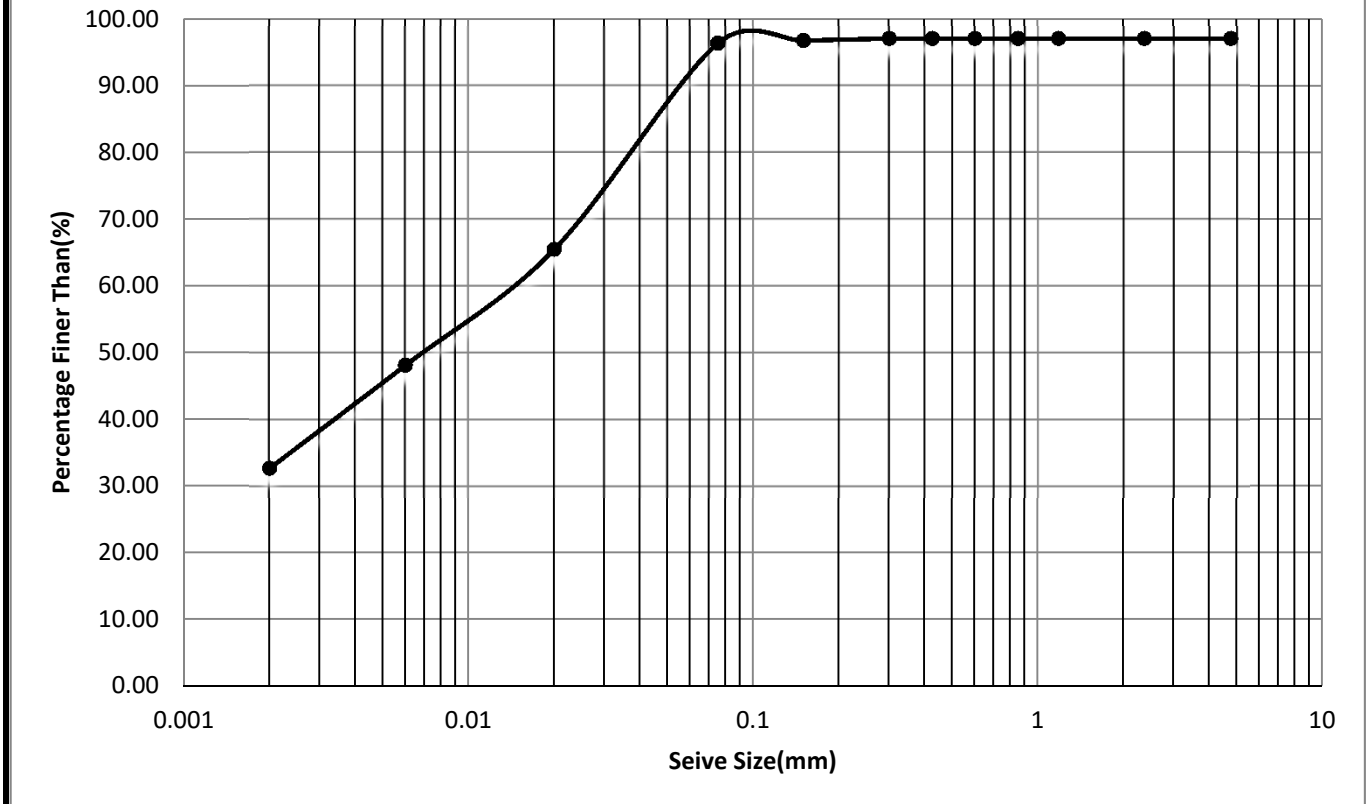


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	9.00-9.45	0.00	0.50	63.68	35.82

GRAIN SIZE CURVE

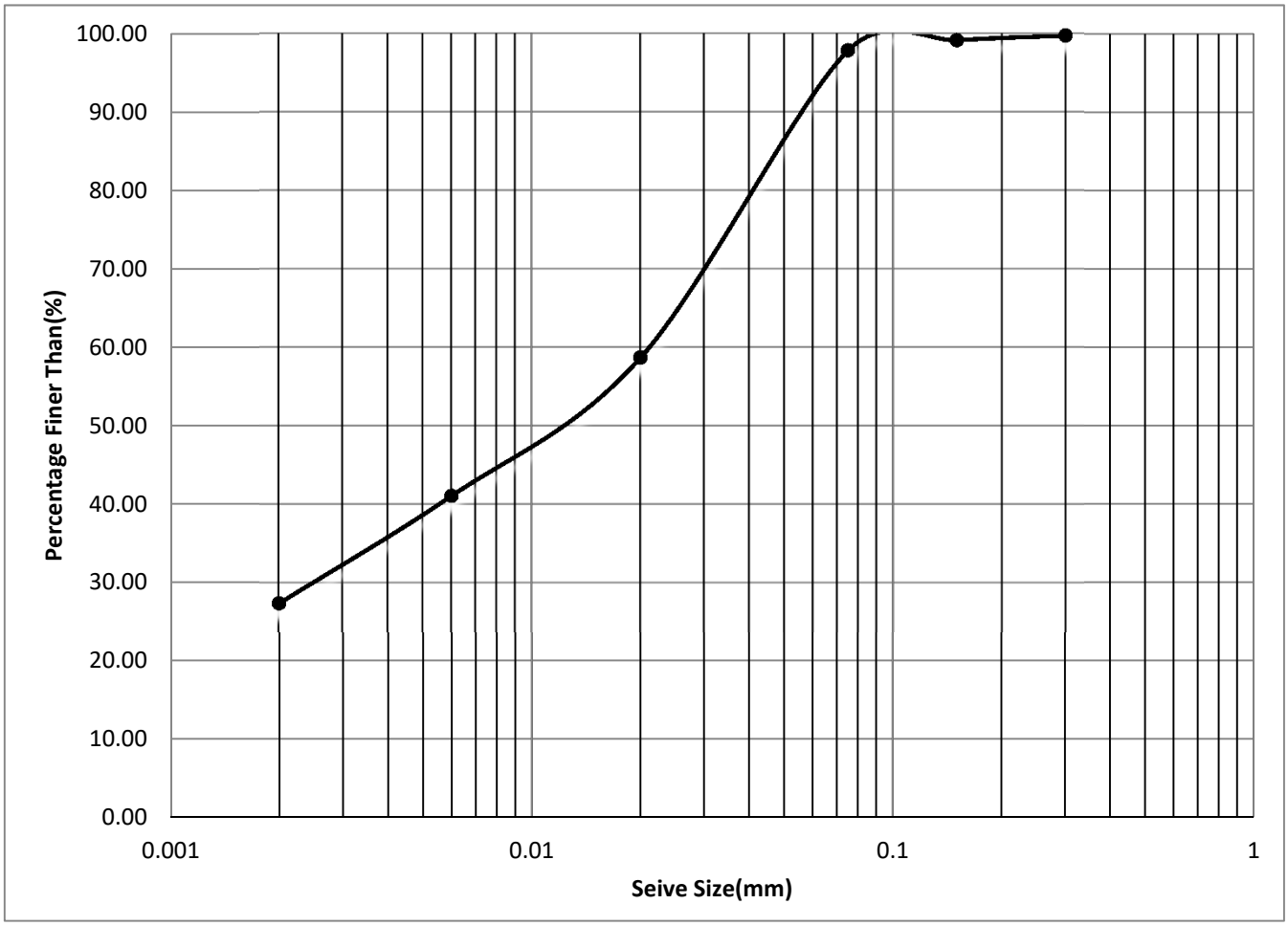


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	12.00-12.45	0.00	0.70	65.54	33.76

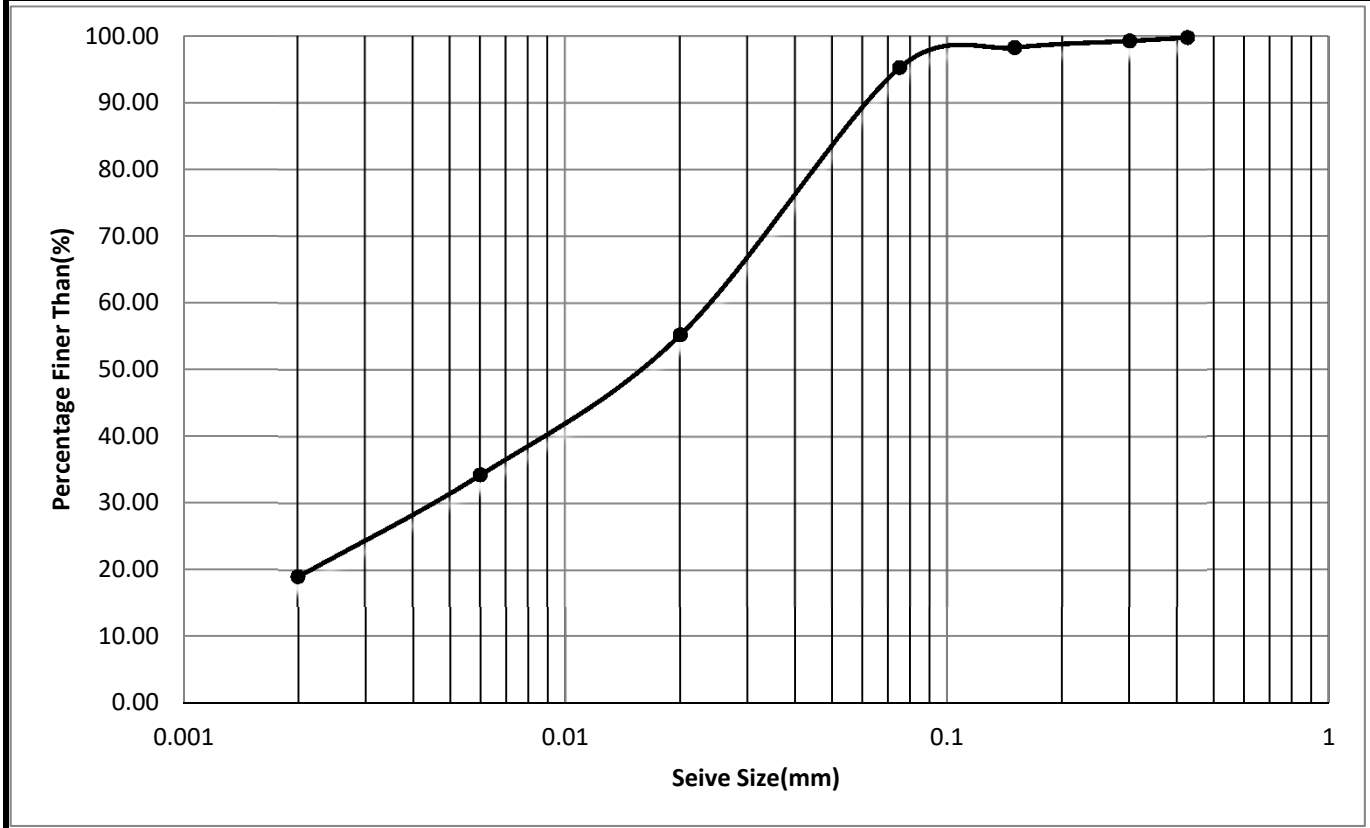


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	15.00-15.45	3.00	0.70	63.56	32.74

GRAIN SIZE CURVE

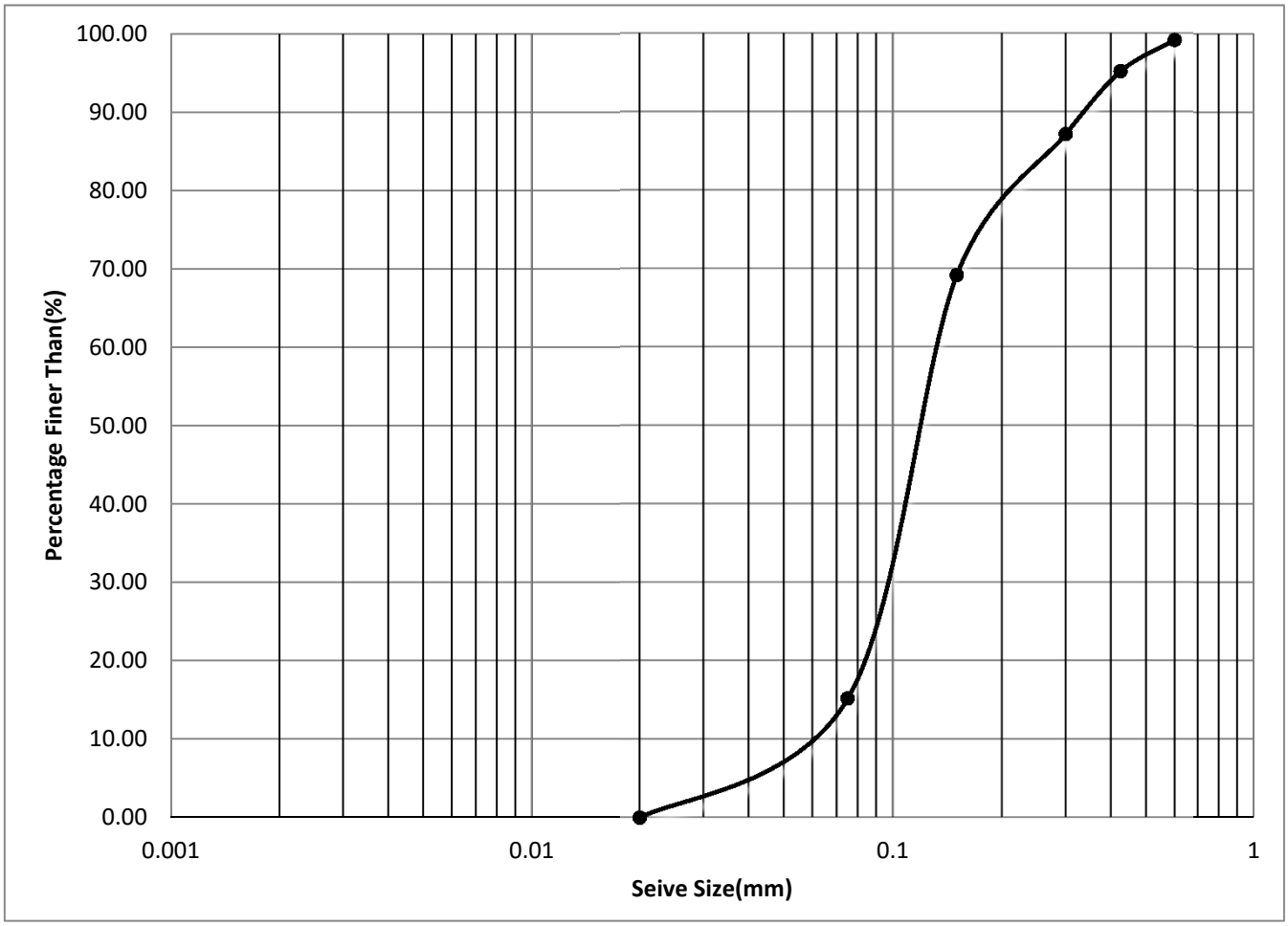


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	18.00-18.45	0.00	2.10	70.49	27.41

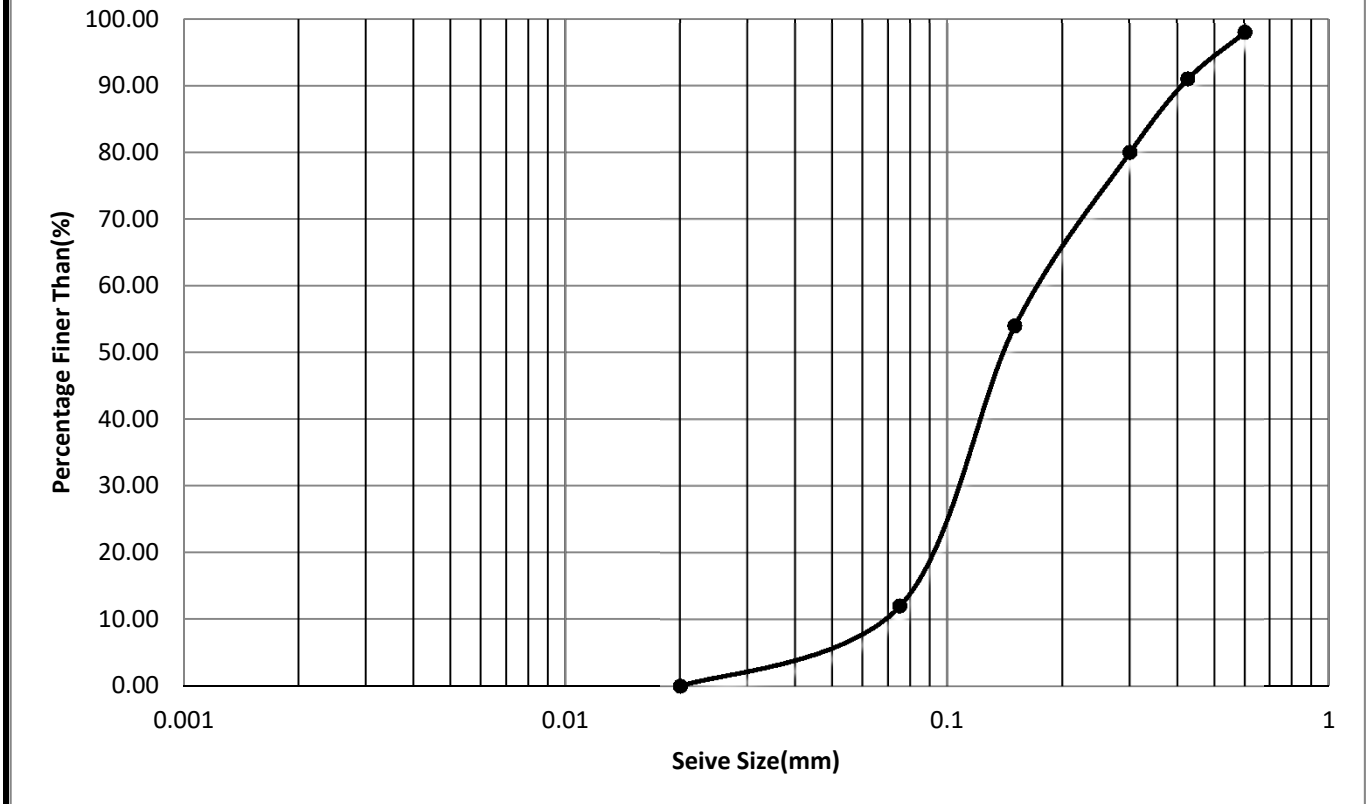


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	21.00-21.45	0.00	4.70	76.24	19.06

GRAIN SIZE CURVE

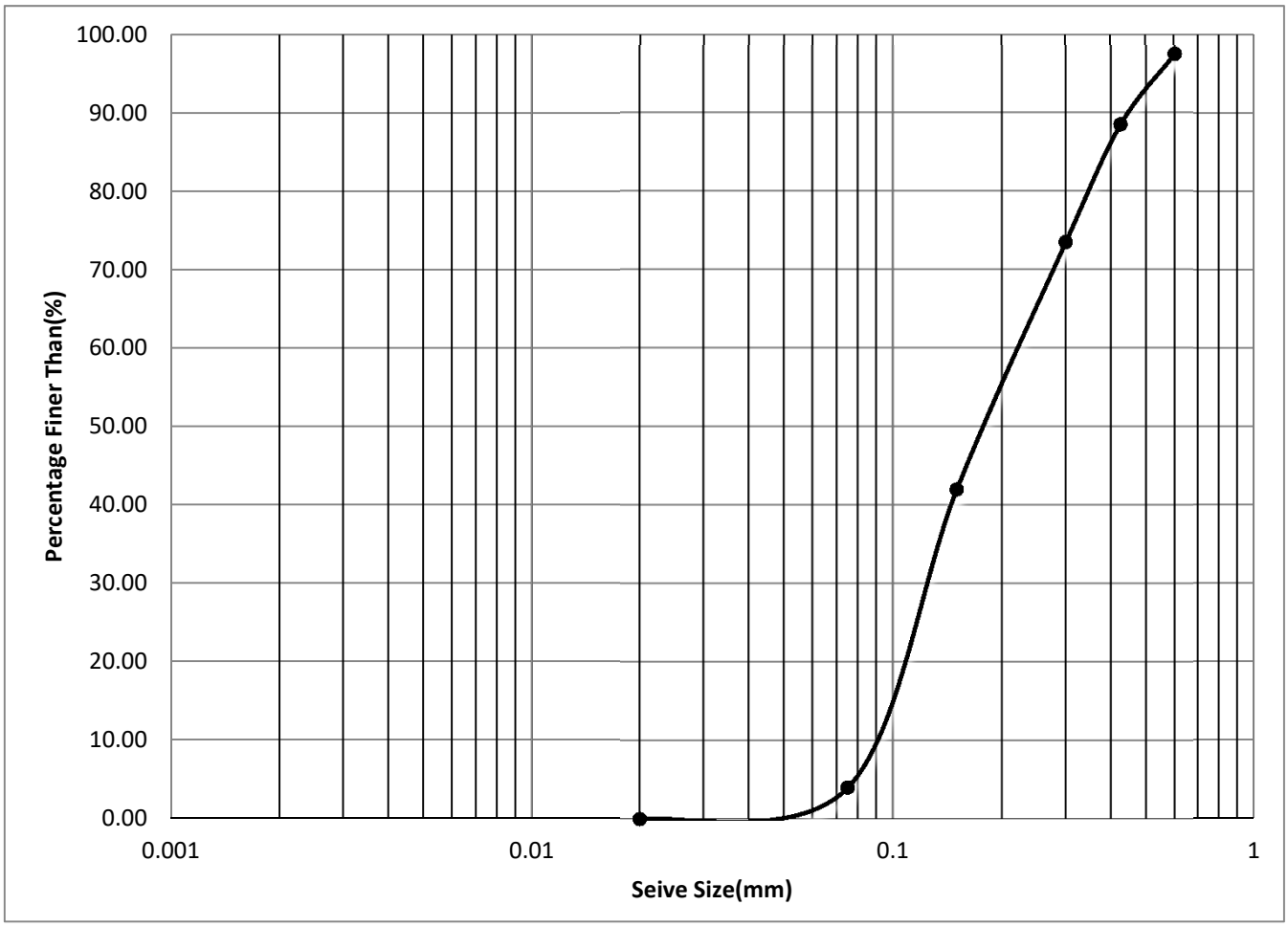


Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	27.00-27.45	0.00	84.80	15.20	0.00



Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	33.00-33.45	0.00	88.00	12.00	0.00

GRAIN SIZE CURVE



Borehole No.	Area	Depth(m)	Grain Size Analysis(%)			
			Gravel	Sand	Silt	Clay
4	Aqua View	40.00-40.45	0.00	96.00	4.00	0.00