GEO DEEP ROCK AND GEOTECH ENGINEERING SERVICES

For

A-Z FOUNDATION: SCHOOL AND COLLEGE - ABBASPUR, AJK

GEOTECHNICAL STUDY FOR

REPORT ON SUB-SOIL INVESTIGATION FOR THE CONSTRUCTION OF THE PROPOSED SCHOOL AND COLLEGE ABBASPUR AZAD KASHMIR

Office: #15, 3rd Floor, Silver city Plaza, G-11 Markaz Islamabad.
Contact Nos. 0300-3926433, 0346-5999169,
E-mail: zeeshan.mes10@gmail.com

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REPORT ON GEOTECHNICAL INVESTIGATIONS

CONSTRUCTION OF PROPOSED A-Z FOUNDATION SCHOOL ABBASPUR KASHMIR

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1. INTRODUCTION

1.1 General

A-Z Foundation School Multi storied building is to be constructed in Abbaspur Kashmir. This report presents the findings of the geotechnical investigation conducted at the site of the proposed building site. The work of geotechnical investigation was entrusted to *M/s GEO DEEP ROCK GEOTECH ENGINEERING SERVICES.*

The geotechnical investigation program comprised field investigations in the form of performing Digital SPT through Electrical Resistivity Survey (ERS) at the project site. The field work at the site was executed on 8th December, 2020.

1.2 Purpose and Scope of Work

The primary objective of this investigation is to determine the subsurface stratigraphy of the project site area for ascertaining the geotechnical design parameters required for the design and construction of foundation of the proposed School building. For this purpose, the following aspects have been addressed:

1. Determination of subsurface stratigraphy (soil and rock strata) within the influence zone of the proposed facility.

2. Determination of physical and engineering characteristics of the soil and rock formation and the location of ground water table.

3. Recommendation of geotechnical design parameters to be used for foundation design of the proposed facility.

4. Performance of geotechnical analysis to evaluate allowable bearing capacity of the foundation.

The scope of work for carrying out subsoil investigations at the project site included:

- Performance of Electrical Resistivity Survey (ERS) in three pits excavated to 2 m depth within project site.

- Preparation of geotechnical investigation report, which would include, but not limited to, subsurface stratigraphy, evaluation of geotechnical design parameters and the recommendations for:

    - Seismicity of project site

    - Evaluation of geotechnical design parameters of the site.

    - Recommendations for allowable bearing capacity

2. GEOLOGY AND SEISMICITY OF SITE AREA

2.1 Geology of Site Area

Topography

The topography of AJK can be described as mainly hilly and mountainous with valleys in between from Neelum district to Poonch district and stretches of plains to the south of Poonch district. The districts of Neelum, Muzaffarabad, Bagh, Poonch, Kotli and Sudhnuti are in the mountainous zone while Mirpur and Bhimber districts lie in the foothills. The mountainous area has thick forests on its top, and fast flowing rivers and winding streams in its valleys. The forest cover is about 566,969 hectares, which is 42.6% of the total geographical area of AJK. The landforms of AJK comprise the meta-sedimentary rocks of the Himalayan zone in its northern districts viz. Neelum, Muzaffarabad, Bagh, Poonch, Kotli and Sudhnoti. The high altitude mountainous zone with deeply cut valleys, steep slopes, often widening out into upper slopes forming alpine pasture uplands, characterizes the landform of these districts. Glaciers and avalanches are active in this region in eroding the landscape and modifying the topography. In the extreme north the high mountains of the Himalayas form the lofty ridges of the Nanga Parbat massif, with the highest point being 6,359 metres. The Sub-Himalayan zone constitutes the lower part of Neelum Valley, while the lesser Himalayas form its central part and are separated from the former by the main boundary thrust exposed near Nauseri in the south and from the Higher Himalayas in the north by the main central thrust identified near Lawat village. The Jhelum-Neelum watershed in Muzaffarabad district as well as Poonch and Sudhnoti districts form a mountainous terrain in the north, which comprises the foothill ranges of the outer Himalayas that rise to 3,758 metres above sea level in the Pir Panjal in the centre but generally form the mountain ridges averaging from 1800 to 2750 metres in height.

Location and Accessibility

Abbaspur the area under investigation is located at 33°48′50″N 73°58′40″E and an elevation of 1,161 m (3,809 ft). Abbaspur is approximately 25 kilometres (16 mi) from the Poonch city, Indian state of Jammu and Kashmir and 167 kilometres (104 mi) from Islamabad, Pakistan.

Climate

Kashmir Valley has a moderate climate, which is largely defined by its geographic location, with the towering Karakoram Range in the north, Pir Panjal Range in the south and west and Zanskar Range in the east. It can be generally described as cool in the spring and autumn, mild in the summer and cold in the winter. As a large valley with significant differences in geo-location among various districts, the weather is often cooler in the hilly areas compared to the flat lower part.

Summer is usually mild and fairly dry, but relative humidity is generally high and the nights are cool. The precipitation occurs throughout the year and no month is particularly dry. The hottest month is July (mean minimum temperature 16 °C, mean maximum temperature 32 °C) and the coldest are December–January (mean minimum temperature −15 °C, mean maximum temperature 0 °C).

Structure of the Area

The Hazara-Kashmir (HK) terrain is located on the northwestern margin of the Lesser Himalaya. The Hazara-Kashmir syntaxis (HKS) is one of the bold tectonic scars which physically isolate this terrain from rest of the Himalaya.

The Hazara– Kashmir Syntaxis is bounded to the west by the Murree Thrust which brings westerly Hazara Formation phyllites and slates over Miocene Murree Formation siltstones and sandstones. The Murree Thrust (also termed the Jhelum Fault), trends N–S in the region of Muzaffarabad before turning to the south-east further north, defining the Main Boundary Thrust (MBT) in this region (Avouac et al., 2006). It is at Muzaffrabad that the Murree Thrust intersects with the Muzaffarabad Fault (also termed Jhelum Thrust or Balakot–Bagh Fault) and its south-eastern continuation, the Tanda Fault. The Muzaffarabad Fault exhibits an opposite sense of motion to the Murree Thrust and has brought Neoproterozoic Muzaffarabad Formation dolomites south-westerly over Murree Formation rocks.

The Muzaffarabad fault was recognized along the overturned limb of the Balakot-Muzaffarabad anticline (Calkins et al., 1975; Ghazanfar et al., 1986). The Muzaffarabad Fault was also called as Himalayan Frontal Thrust (Baig and Lawrence, 1987), Tanda Fault (Nakata and Kumahara, 2006) and Balakot-Bagh Fault (Yeats et al., 2006). n the northern region of

Pakistan, active faults are scarcely found, although the major geological structures such as Main Boundary Fault (Thrust) and the Main Mantle Thrust are clearly recognizable. In the Hazara-Kashmir syntaxis around the sharp bend of the Jhelum river about 80km north of Islamabad, Nakata et al. (1991) mapped Muzaffarabad fault and Tanda fault as active faults. Muzaffarabad fault was initially regarded an N-S trending 8 km long fault from clear eastward facing reverse scarplets that cut Pleistocene river terraces of the Jhelum river in the south of Muzaffarabad town. Tanda fault was mapped as an NW-SE trending 16 km long active fault that dislocated Pleistocene alluvial fan surfaces up to the east on the east bank of the Jhelum river.

To the north of Muzaffarabad, Muzaffarabad fault extends NNW-SSE for about 20km on the east bank of Kunhar river.

Factors influencing Bearing Capacity

Bearing capacity of soil depends on many factors. The following are some important ones.

1. Type of soil
2. Unit weight of soil
3. Surcharge load
4. Depth of foundation
5. Mode of failure

2.2 Seismicity of Site Area

The project site is located in *Zone-4* as per Seismic Zoning Map of Pakistan (BCP-2007) and for *Zone-4*, the peak horizontal ground acceleration (PGA) is at least of the order of 0.32g.

Keeping in view the seismicity of the project site and the degree of importance of the proposed structures, it is recommended that the project structures should be designed against seismic loading as per project specifications.

2.3 Seismic Soil Profile Characterization

In accordance with the procedures described in Building Code of Pakistan (Seismic Provision 2007), the criteria for classification of un-cemented soil profiles are to be based on;

Age	Formation	Lithology
Quaternary	Alluvium	Rounded, sub-rounded, boulders, cobbles, pebbles, gravels embedded loosely with matrix of sand, silt and clay.
---unconformity---		
Early Miocene	Murree Formation	Sand stone, shale, siltstone, mudstone, cyclic deposition.
---unconformity---		
Early Eocene	Kuldana Formation	Variegated shale, calcareous sandstone and limestone
Early Eocene	Chorgalli Formation	Limestone and Shale.
Early Eocene	Margalla Hill Limestone	Nodular limestone
Late Paleocene	Patala Formation	Shale with intercalations of nodular limestone.
Paleocene	Lockhart limestone	Nodular limestone
Early Paleocene	Hangu Formation	Laterite, bauxite, ferruginous sandstone, fireclay, coal seems.
---unconformity---		
Early Cambrian	Abbotabad Formation	Dolomite & Dolomitic limestone
Pre-Cambrian	Hazara Formation	Slates, Phyllites

- Vs=average shear wave velocity of top 30m soil profile

- N=average field SPT resistance for the top 30m soil profile
- Su=average undrained shear strength for the top 30m soil profile

The following table defines the various seismic soil profile based on the above-mentioned soil parameters

Soil Profile Type	Soil Profile Name/ Generic Description	Average Properties for Top 30 M (100 ft) of Soil Profile		
		Shear Wave Velocity, v_s m/sec (ft/sec)	**Standard Penetration Tests, N [or N_{CH} for cohesionless soil layers] (blows/foot)**	**Undrained Shear Strength, s_u kPa (psf)**
S_A	Hard Rock	>1,500 (>4,920)	–	–
S_B	Rock	750 to 1,500 (2,460 to 4,920)		
S_C	Very Dense Soil and Soft Rock	350 to 750 (1,150 to 2,460)	>50	>100 (>2,088)
S_D	Stiff Soil Profile	175 to 350 (575 to 1,150)	15 to 50	50 to 100 (1,044 to 2,088)
S_E[1]	Soft Soil Profile	<175 (<575)	<15	<50 (<1,044)
S_F	Soil requiring Site-specific Evaluation. See 4.4.2			

Based on the above mentioned parameters derived through field and laboratory investigations for project site area, the average soil profile in top 20 m depth as per Building Code of Pakistan (Seismic Provision 2007) is classified as ***S_D to S_C***

3. FIELD AND LABORARORY INVESTIGATIONS

3.1 Field Investigations

The following activities were carried out in the field for accomplishing the geotechnical investigations at the site in accordance with the scope of work

- Execution of exploratory Points, 03 no. in total, 20 m deep

- Performance of SPTs in the Points at 1m interval
- Recovering disturbed and undisturbed soil sample from Points.

Specifically, following are the details of field investigations at the project site.

3.1.1 Execution of Exploratory Boreholes

All exploratory Points were Execution using Digital SPT methods.

3.1.2 Standard Penetration Test

Standard Penetration Tests (SPTs) were performed in the boreholes in accordance with ASTM D-1586 at 1~1.5~2 m intervals up to the final depth explored. A donut type hammer, weighing 64 kg was used for conducting the test. The SPT blows were recorded for penetration of 45.7 cm of split spoon samples and the number of blows required for the last 30.5 cm penetration was recorded as SPT-N values. The detailed description of the subsoils encountered and the depth at which SPTs were performed are plotted in the borehole logs presented in *APPENDIX-A.* As a part of the SPT, disturbed representative soil samples were recovered from split spoon sampler for classification tests.

3.1.3 Soil Sampling

Disturbed and undisturbed soil samples were obtained during the field work from the Points. Disturbed soil samples from the boreholes were obtained through split spoon sampler while performing SPTs in accordance with ASTM D-1586. These samples were placed in polythene bags. The polythene bags were clearly labeled to indicate the project name, borehole designation and depth of the sample.

Undisturbed soil samples were obtained from cohesive strata encountered in the holes through Shelby tube as per ASTM D-1587. The samples were properly waxed and clearly labeled to indicate the project name, borehole designation and the depth of the sample. All the soil samples were carefully transported to laboratory for soil testing.

3.2 Laboratory Testing

Selected representative subsoil samples were tested in Geo Deep Rock Geotech Engineering Services, for the determination of physical and engineering characteristics of the subsoils. The following tests were conducted in accordance with relevant ASTM method.

- Grain Size Analysis
- Direct Shear Tests
- Unconfined Compression test

The detailed Lab test results are presented under *APPENDIX-B ,C and D.* Following is brief discussion on various laboratory test procedures:

- Grain Size Analysis

In most of the soil classification systems the percentage of material passing through US sieve #4 and #200 have been considered prominently to identify the soil with their variety of grain sizes. The grain size distribution curves give the exact idea regarding the gradation of the soils. In non-cohesive soils, it is very important to identify whether the soil is well graded, uniform graded or poorly graded.

For this, particle size is determined against 10%, 30%, and 60% passing, this may be denoted as D10,s D30 and D60 respectively.

Uniformity Co-efficient (Cu) = D_{60}/ D_{10}

Co-efficient of Curvature (Cc) = $D^2_{30} / (D_{10} \times D_{60})$

The above parameters are used to decide about granular soil whether they are poorly or well-graded type. Also D10 is used to determine permeability of soil through some well known correlations. The soil percentage passing through US sieve # 4 and retaining on US sieve # 200 indicate the percentage of Sand and passing through US sieve #200 show the percentage of Silt and Clay.

- Specific Gravity Test, G_s

Specific gravity of any substance is defined as the ratio of unit weight of that substance to the unit weight of water at 4°C. This definition simply means that how many times a substance (soil solids) is heavier than water. Geotechnical engineer is commonly interested in specific gravity which is defined as the ratio of unit weight of soil grains to the unit weight of water. It is denoted by G_s and expressed as:

$G_s = \gamma_s/\gamma_w$

- Direct Shear (DS) Test

The strength parameters c and ϕ are determined for cohesive and non-cohesive soils by direct shear test. This test is quick to evaluate the un-drained shear strength parameters. The sample is sheared along a predetermined shearing plane. The resistance to shear in non-cohesive and cohesive soils is derived from friction between grains and interlocking of grains. The behaviour is similar such as the top block is slide along the bottom block; a shear force to the surface of the bottom block, which is equal to the normal force acting between the blocks multiplied by a coefficient of friction. Normal stress is taken as (σ_n = Normal Load / Area of the Sheared Surface), while the shearing stress is τs = Shearing Force / Area of the Sheared Surface). The test was conducted in accordance with ASTM D-3080.

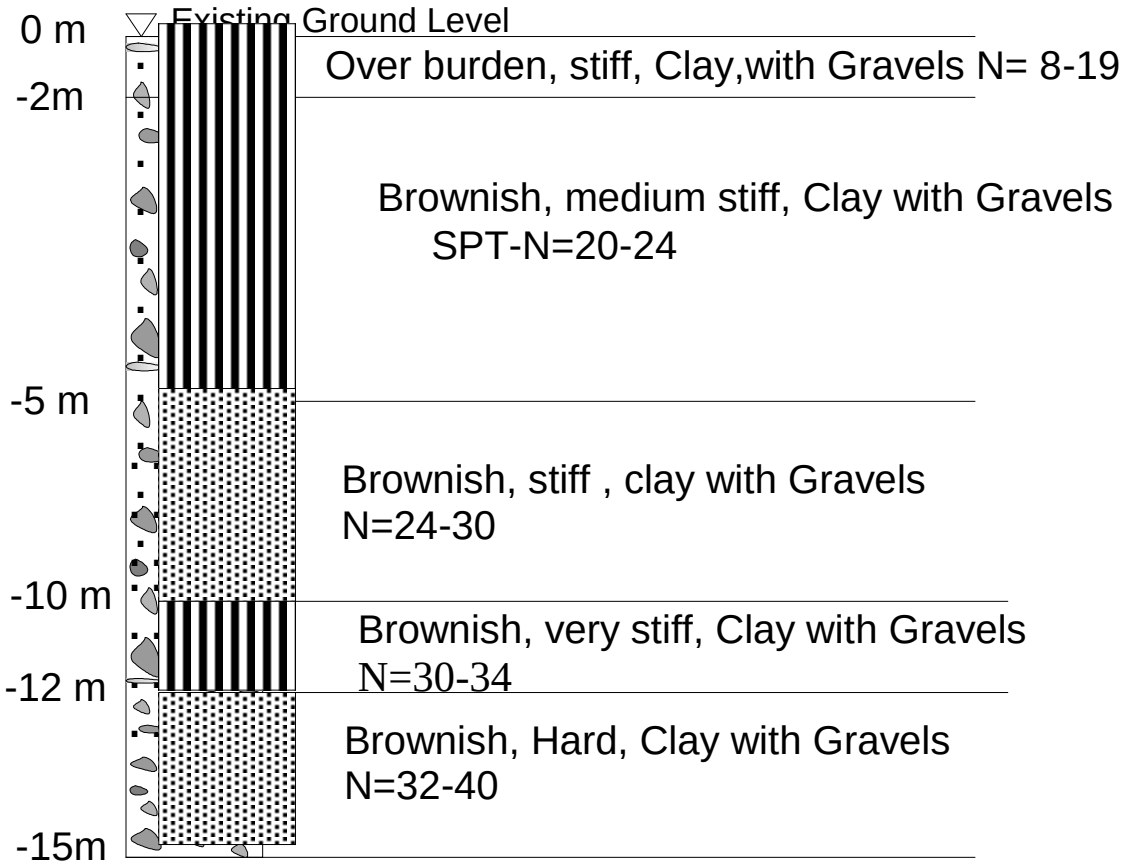
4. GEOTECHNICAL EVALUATIONS

4.1 General

The geotechnical investigations carried out at the proposed site comprised field and laboratory works. The studies were aimed at evaluating the engineering characteristics of the foundation soils. The subsurface conditions and the engineering characteristics of the subsoils at the proposed project site are discussed in the following section.

4.2 Stratigraphy

The subsoil conditions disclosed through three exploratory Points located in the project site area indicate that the stratigraphy, in general, consists of stiff to hard Silty Clay with Gravels followed by Hard Silty Clay with trace Gravels up to the investigated depth. The average stratigraphy at the project site is shown by the following figure.



Average Subsoil Profile at Site of BH-1, BH-2 & BH-3 of A-Z Foundation

4.3 Groundwater Table

Ground Water Table (GWT) was encountered in the boreholes at 14 m depth below the existing ground level during the period of these investigations.

4.4 Geotechnical Design Parameters

The basic subsoil profile and geotechnical design parameters of subsoils for foundation design are being summarized below: The parameters have been selected based on field and laboratory test data, consulting relevant literature and using general engineering judgment.

1. Geotechnical Design Parameters for the Project Site to be used in Foundation Design

Soil Properties	Original Soil Condition			
	Stratum-I	**Stratum-II**	**Stratum-III**	**Stratum-III**
	(0-1 m)	**(1-5 m)**	**(5 -10 m)**	**(10 - 15 m)**
Soil/ Rock Type	Clay, Gravel(Boulders)	Clay, Gravels	Clay, Gravels	Clay, trace Gravels
Design SPT- N value	16	22	30	35
Bulk unit weight (kN/m^3)	20	22	22	22
Undrained Cohesion, *Cu* (kPa)	1200	1000	1300	1000
Angle of internal friction, ϕ, (deg)	20	30	20	30
Elastic Modulus, Es (MPa)	40	75	50	75
Poison ratio, μ	0.40	0.45	0.40	0.35

5. RECOMMENDATIONS FOR FOUNDATIONS DESIGN

5.1 Foundation Design Criteria

When designing foundations for any structure, there are two criteria, which must be considered and satisfied separately:

- There must be an adequate factor of safety (FOS) against a shear failure or ground break, generally called bearing capacity failure. The factor of safety against shear failure is generally taken as 3.

- The settlement should remain within reasonable limits. In case of shallow spread foundations, the permissible settlement, in general, is 25 mm and for mat, generally the permissible settlement is 50 mm.

- A safety factor of 3 has been taken in to account against shear failure in shallow foundation design and the permissible settlement limits are taken as 25 mm for spread foundations and 50 mm for raft foundation.

Furthermore, the foundation system selected must be compatible, economical, and feasible for construction. Preferably, the foundation should be constructed using local resources and should be environment friendly.

5.3 Foundation Design Recommendations

In our opinion, the proposed building may be supported either on isolated footings connected with tie beams or on raft foundation. The foundations should be founded at 4 to 6 ft below the existing ground level. In the following section, the bearing capacity for isolated footings connected with tie beams and for raft foundation is given.

A. Bearing capacity for Isolated Footings connected with Tie Beams

In this case, the building should be designed as a frame structure consisting of columns and beams. The columns may be supported on isolated footings, however all footings should be connected with tie beams in a grid pattern. For isolated footings, bearing capacity w.r.t. shear failure criterion and for permissible settlement of 25 mm has been analyzed. Based on the analysis, an allowable bearing capacity **1.3 tsf** is recommended for the design of the footings.

B. Allowable Bearing Capacity for Raft Foundation

The frame structure can also be supported on a raft foundation to support the frame structure building. Based on the bearing capacity analysis w.r.t. shear failure and for a permissible

settlement of 2 inches, an allowable gross bearing capacity of **1.8 ton/ft^2** is recommended for the design of the raft slab.

Modulus of Subgrade Reaction for Raft Design

By using the following equation as suggested by J.E. Bowles, the vertical modulus of subgrade reaction, k_s has been estimated from the allowable bearing capacity recommended for the soil under the foundation:

$k_s = 6$ (FOS) q_a for 2 inch settlement

The k_s value for the medium stiff to stiff silty clay/silty sand has been estimated as *80.0 kip/ft^3* for an allowable bearing capacity of 2.0 ton/ft^2.

In both the cases, we recommend the following procedure for the constructing the above mentioned foundations.

- Excavate the soil at the footprint of the foundation up to 2~3 ft so that the loose soil from top surface is removed.
- Compact the bottom of the excavated area to 95% of Modified Proctor (ASTM-1557) density using appropriate compaction equipment. The field density should be checked either by core cutter or sand cone method to check the above compaction requirement.
- Provide a pad of lean concrete (1:4:8) under the foundation at least 6 inches thick.
- Construct the foundation on the PCC layer.

6. CONSTRUCTIONAL ASPECTS AND LIMITATIONS

We recommend the following measures for the long-term stability of structures.

- Plinth protection slab sloping away from the building should be provided around the structure to reduce ingress of water to foundation soils.
- Proper surface drainage should be provided in the project area and the area should be graded to keep the surface runoff away from the structure.
- Experienced Engineer should observe the construction activities to check that the work is performed in accordance with the plans and specifications. Field density tests should be performed to check the compaction requirements as recommended above.
- The analyses and recommendations submitted in this report are based on the results gathered from three Points down to 15 m depth below existing surface level. The recommendations have been prepared on the basis of information of three Points; however, if during the course of construction/excavation the nature of the ground varies from the results of the investigation, the recommendations need to be reviewed.
- This report has been prepared for the construction of A-Z Foundation School. Paragraphs, statements, test results, boring logs, diagrams etc., should not be taken out of context and should not be utilized for any other structure at any site.

For Geodeep Rock Geotech Engineering Services

Report Prepared By:

(Engineer Abdullah)

BS, Geological Engineering

Checked and Approved By:

Zeeshan

Geotech Director

GDR, Isl, Pk

Appendix-A

BORE HOLE LOGS

GEO DEEP ROCK

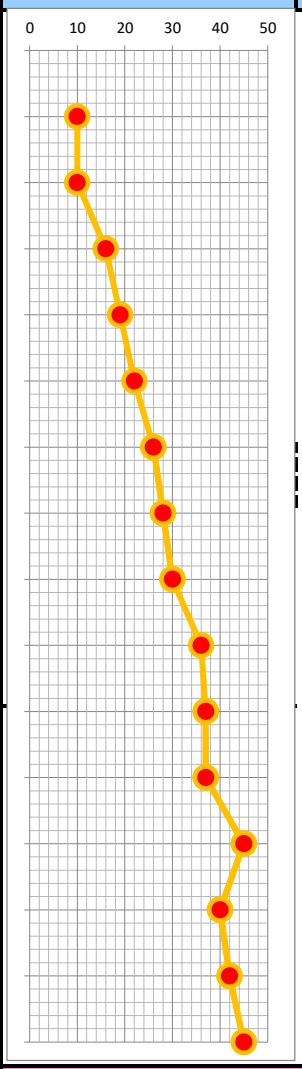
GEOTECH ENGINEERING SERVICES

GDR GEO DEEP ROCK

BORE HOLE LOGS

	Loction:Abbaspur Kashmir	Project:A-Z	
	Bore Hole No: BH 01	Fig No. 01	
	Termination Depth: 15 Meter	Started Date	8-Dec-20
		End Date	8-Dec-20
	Ground Water Table: 14m	Logged by: Abdullah(Geologist)	

Depth (m)	Geotechnical Description (ASTM D2487)	Classification Sumbol	Legend	Sample Type	Moisture	penetration Value 15cm	30cm	45cm	SPT N Blows	SPT 'N' PROFILE	C:R)%	R:Q:D)%	Remarks
1	Overburden Brownish, Silty Clay, Soft with Gravels	CL GW		DS		2	4	6	10				
2	Brownish, medium Stiff Silty Clay with Gravels			DS		3	3	7	10				
3	do			DS		5	8	8	16				
4	do			DS		4	7	12	19				
5	Brownish, Stiff Silty Clay with Gravels			DS		7	10	12	22				
6	do			DS		9	12	14	26				
7	do	CL GM		DS		8	11	17	28				
8	do			DS		11	14	16	30				
9	do			DS		10	17	19	36				
10	Brownish, Very Stiff to hard Silty Clay with Gravels			DS		13	20	17	37				
11	do			DS		16	18	19	37				
12	do			DS		14	20	25	45				
13	do	GW CL		DS		12	19	21	40				
14	do			DS		17	22	20	42				
15	do			DS		19	20	25	45				



GWL	14m	CPT=15		REMARKS

GEO DEEP ROCK

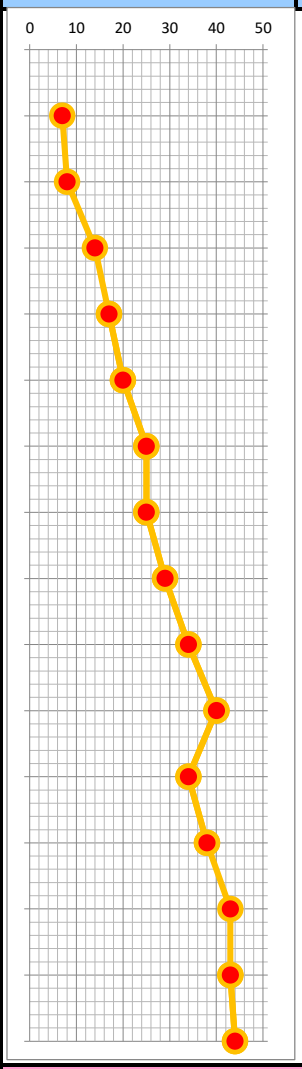
GEOTECH ENGINEERING SERVICES

GDR GEO DEEP ROCK

BORE HOLE LOGS

Loction:Abbaspur Kashmir		Project:A-Z	
Bore Hole No: BH 02		Fig No. 01	
Termination Depth: 15 Meter		Started Date	8-Dec-20
		End Date	8-Dec-20
Ground Water Table: 14m		Logged by: Abdullah(Geologist)	

Depth (m)	Geotechnical Description (ASTM D2487)	Classification Sumbol	Legend	Sample Type	Moisture	penetration Value 15cm	30cm	45cm	SPT N Blows	SPT 'N' PROFILE	C:R)%	R:Q:D)%	Remarks
1	Overburden Brownish, Silty Clay, Soft with Gravels	CL GW		DS		1	3	4	7				
2	Brownish, medium Stiff Silty Clay with Gravels			DS		2	3	5	8				
3	do			DS		4	6	8	14				
4	do	CL GW		DS		4	7	10	17				
5	do			DS		3	9	11	20				
6	Brownish, Stiff Silty Clay with Gravels			DS		6	10	15	25				
7	do			DS		5	11	14	25				
8	do	CL GW		DS		8	12	17	29				
9	do			DS		10	14	20	34				
10	do			DS		12	18	22	40				
11	Brownish, Very Stiff to hard Silty Clay with Gravels			DS		15	15	19	34				
12	do			DS		14	17	21	38				
13	do	CL GW		DS		13	20	23	43				
14	do			DS		16	21	22	43				
15	do			DS		18	19	25	44				



GWL	14m	CPT=15		REMARKS

Checked by :_____

GEO DEEP ROCK

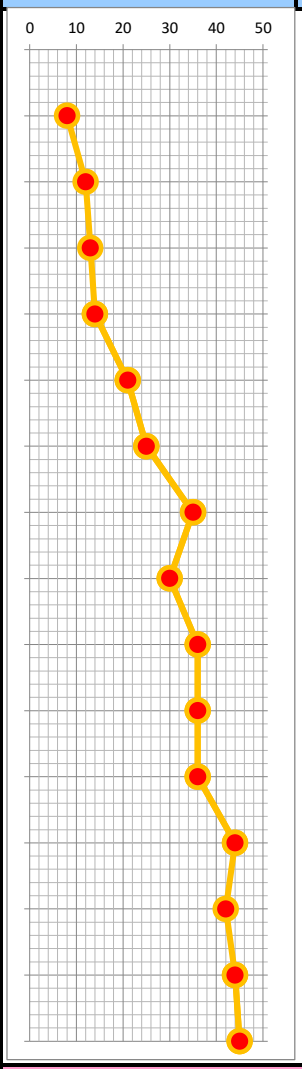
GEOTECH ENGINEERING SERVICES

GDR GEO DEEP ROCK

BORE HOLE LOGS

Loction:Abbaspur Kashmir		Project:A-Z	
Bore Hole No: BH 03		Fig No. 01	
Termination Depth: 15 Meter		Started Date	8-Dec-20
		End Date	8-Dec-20
Ground Water Table: 14m		Logged by: Abdullah(Geologist)	

Depth (m)	Geotechnical Description (ASTM D2487)	Classification Sumbol	Legend	Sample Type	Moisture	penetration Value 15cm	30cm	45cm	SPT N Blows	SPT 'N' PROFILE	C:R)%	R:Q:D)%	Remarks
1	Overburden Brownish, Silty Clay, Soft with Gravels	CL GW		DS		3	4	4	8				
2	Brownish, medium Stiff Silty Clay with Gravels			DS		5	5	7	12				
3	do			DS		4	7	6	13				
4	do			DS		6	6	8	14				
5	do			DS		6	10	11	21				
6	Brownish, Stiff Silty Clay with Gravels			DS		8	11	14	25				
7	do	CL GW		DS		10	10	15	35				
8	do			DS		12	12	18	30				
9	Brownish, Very Stiff to hard Silty Clay with Gravels			DS		11	15	19	36				
10	do			DS		9	17	19	36				
11	do			DS		13	16	20	36				
12	Brownish, hard Silty Clay with Gravels	CL GW		DS		15	21	23	44				
13	do			DS		12	17	25	42				
14	do			DS		16	20	24	44				
15	do			DS		17	19	26	45				



GWL	14m	CPT=15		REMARKS

Checked by :_____

Appendix-B

SIEVE ANALYSIS

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

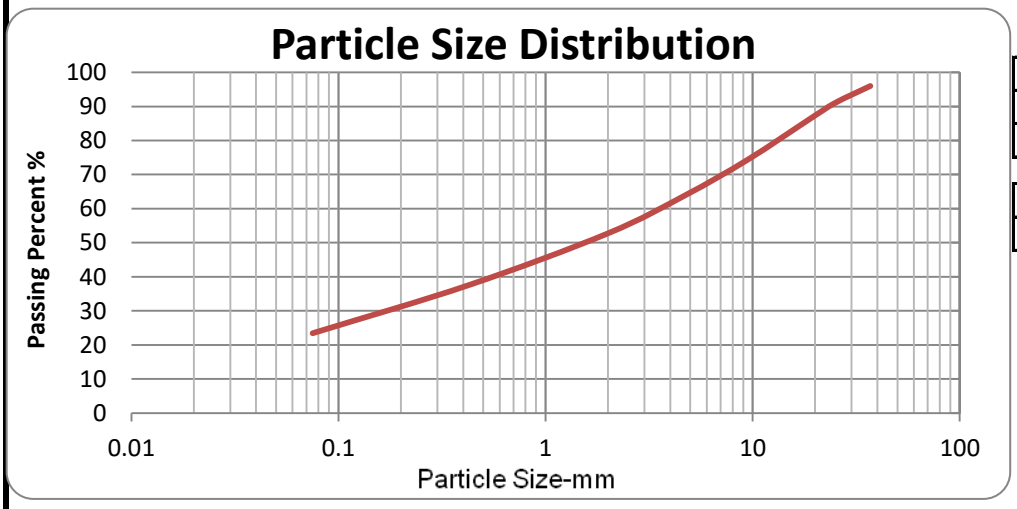
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**1**
Weight(gr):	3500	**Sample No:**	**2**
Sample taken by:	**GDR**	**Depth (m):**	**3**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	140	140	4.00	96.00	
25	1"	174	314	8.97	91.03	36.00
19	3/4"	161	475	13.57	86.43	
9.5	3/8"	420	895	25.57	74.43	
4.75	No 4	365	1260	36.00	64.00	
2	No 10	394	1654	47.26	52.74	40.57
0.425	No 40	532	2186	62.46	37.54	
0.075	No 200	494	2680	76.57	23.43	23.43
Wash No 200 Passing		820				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	36.00	40.57	23.43	CL GW	Silty Clay with Gravel



D10=	
D30=	
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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

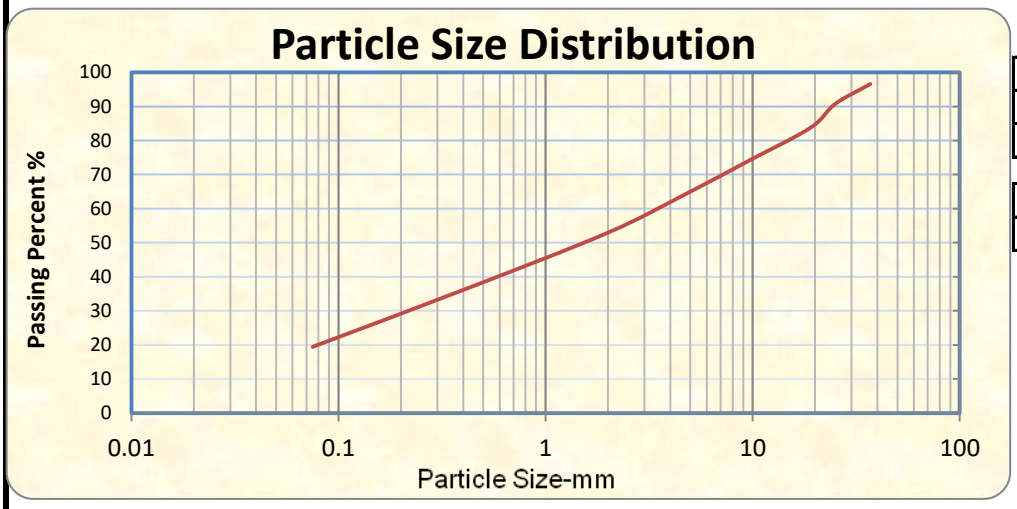
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**1**
Weight(gr):	3500	**Sample No:**	**3**
Sample taken by:	**GDR**	**Depth (m):**	**6**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	120	120	3.43	96.57	
25	1"	205	325	9.29	90.71	35.71
19	3/4"	245	570	16.29	83.71	
9.5	3/8"	342	912	26.06	73.94	
4.75	No 4	338	1250	35.71	64.29	
2	No 10	397	1647	47.06	52.94	44.86
0.425	No 40	567	2214	63.26	36.74	
0.075	No 200	606	2820	80.57	19.43	19.43
Wash No 200 Passing		680				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	35.71	44.86	19.43	CL GW	Silty Clay with Gravel



D10=	
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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

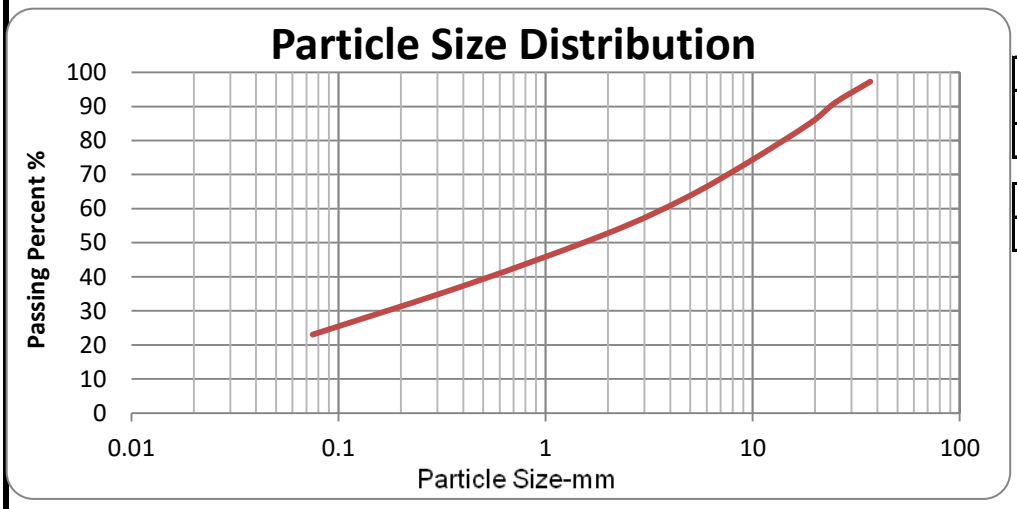
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**1**
Weight(gr):	3500	**Sample No:**	**4**
Sample taken by:	**GDR**	**Depth (m):**	**9**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	95	95	2.71	97.29	
25	1"	217	312	8.91	91.09	36.83
19	3/4"	208	520	14.86	85.14	
9.5	3/8"	405	925	26.43	73.57	
4.75	No 4	364	1289	36.83	63.17	
2	No 10	363	1652	47.20	52.80	40.14
0.425	No 40	523	2175	62.14	37.86	
0.075	No 200	519	2694	76.97	23.03	23.03
Wash No 200 Passing		806				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	36.83	40.14	23.03	CL GW	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

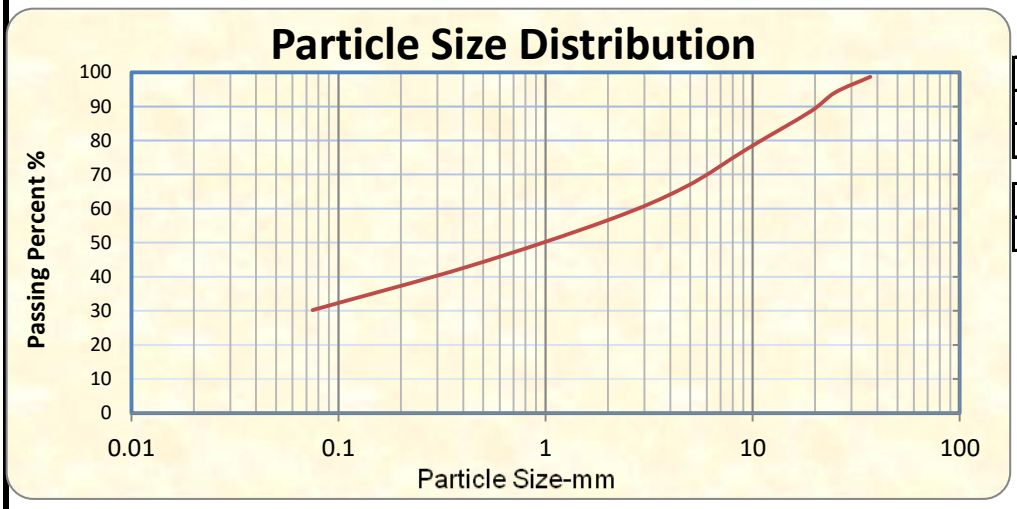
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**1**
Weight(gr):	4000	**Sample No:**	**5**
Sample taken by:	**GDR**	**Depth (m):**	**12**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	52	52	1.30	98.70	
25	1"	185	237	5.93	94.08	33.58
19	3/4"	223	460	11.50	88.50	
9.5	3/8"	432	892	22.30	77.70	
4.75	No 4	451	1343	33.58	66.43	
2	No 10	392	1735	43.38	56.63	36.20
0.425	No 40	543	2278	56.95	43.05	
0.075	No 200	513	2791	69.78	30.23	30.23
Wash No 200 Passing		1209				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	33.58	36.20	30.23	CL GW	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

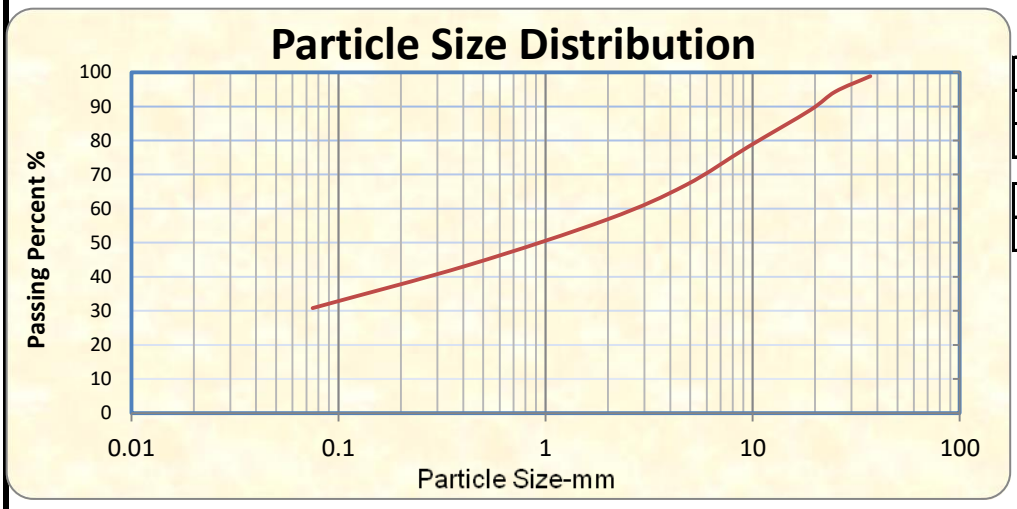
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**1**
Weight(gr):	4000	**Sample No:**	**6**
Sample taken by:	**GDR**	**Depth (m):**	**15**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	45	45	1.13	98.88	
25	1"	183	228	5.70	94.30	33.10
19	3/4"	214	442	11.05	88.95	
9.5	3/8"	433	875	21.88	78.13	
4.75	No 4	449	1324	33.10	66.90	
2	No 10	400	1724	43.10	56.90	36.10
0.425	No 40	538	2262	56.55	43.45	
0.075	No 200	506	2768	69.20	30.80	30.80
Wash No 200 Passing		1232				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	33.10	36.10	30.80	CL GW	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

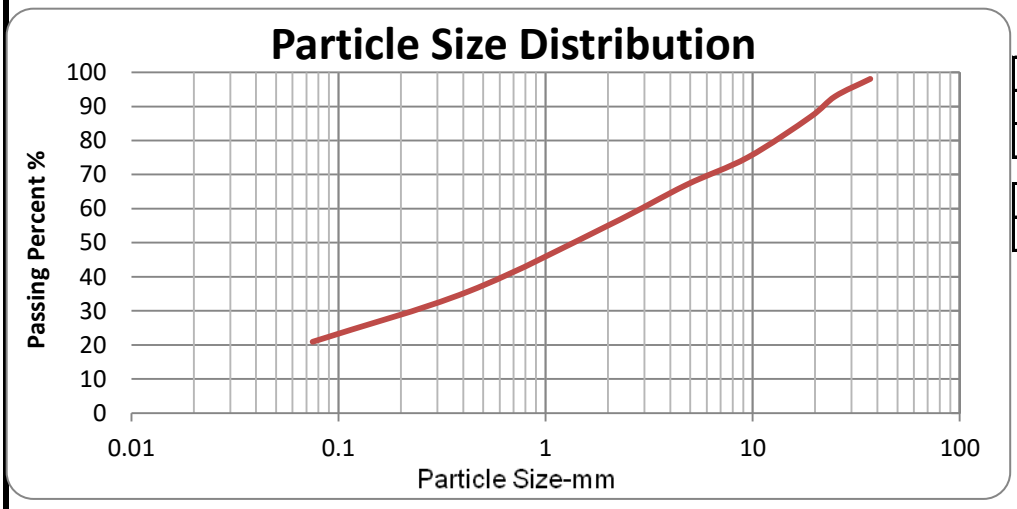
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**2**
Weight(gr):	3500	**Sample No:**	**1**
Sample taken by:	**GDR**	**Depth (m):**	**3**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	67	67	1.91	98.09	
25	1"	180	247	7.06	92.94	33.11
19	3/4"	211	458	13.09	86.91	
9.5	3/8"	414	872	24.91	75.09	
4.75	No 4	287	1159	33.11	66.89	
2	No 10	415	1574	44.97	55.03	45.97
0.425	No 40	676	2250	64.29	35.71	
0.075	No 200	518	2768	79.09	20.91	20.91
Wash No 200 Passing		732				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	33.11	45.97	20.91	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

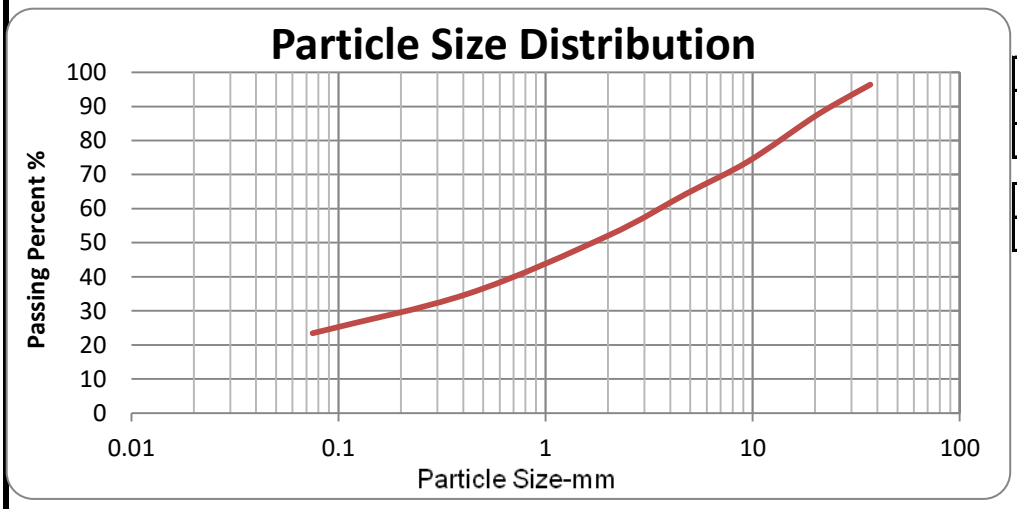
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**2**
Weight(gr):	3500	**Sample No:**	**2**
Sample taken by:	**GDR**	**Depth (m):**	**6**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	126	126	3.60	96.40	
25	1"	201	327	9.34	90.66	35.71
19	3/4"	155	482	13.77	86.23	
9.5	3/8"	434	916	26.17	73.83	
4.75	No 4	334	1250	35.71	64.29	
2	No 10	428	1678	47.94	52.06	40.86
0.425	No 40	594	2272	64.91	35.09	
0.075	No 200	408	2680	76.57	23.43	23.43
Wash No 200 Passing		820				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	35.71	40.86	23.43	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

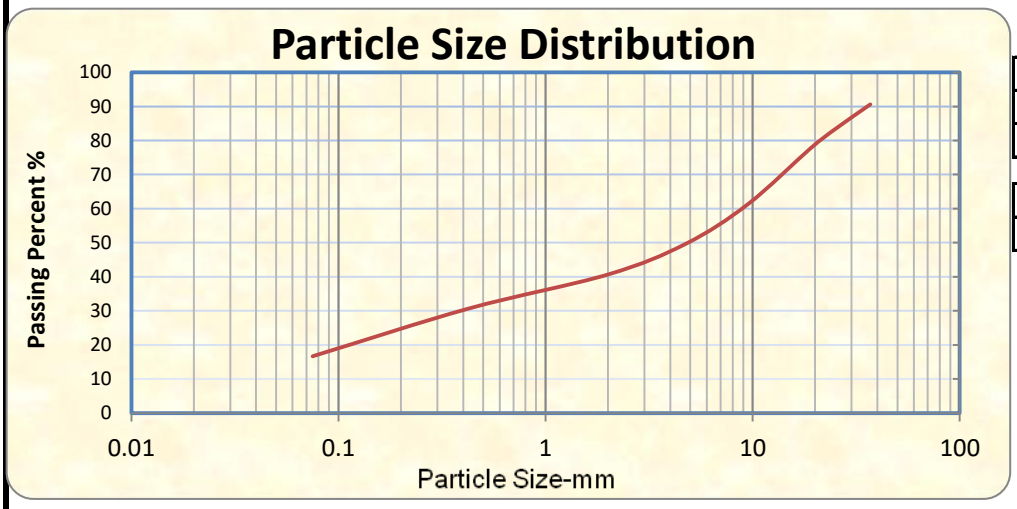
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**2**
Weight(gr):	1500	**Sample No:**	**3**
Sample taken by:	**GDR**	**Depth (m):**	**9**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	141	141	9.40	90.60	
25	1"	109	250	16.67	83.33	50.33
19	3/4"	85	335	22.33	77.67	
9.5	3/8"	245	580	38.67	61.33	
4.75	No 4	175	755	50.33	49.67	
2	No 10	135	890	59.33	40.67	33.00
0.425	No 40	150	1040	69.33	30.67	
0.075	No 200	210	1250	83.33	16.67	16.67
Wash No 200 Passing		250				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	50.33	33.00	16.67	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

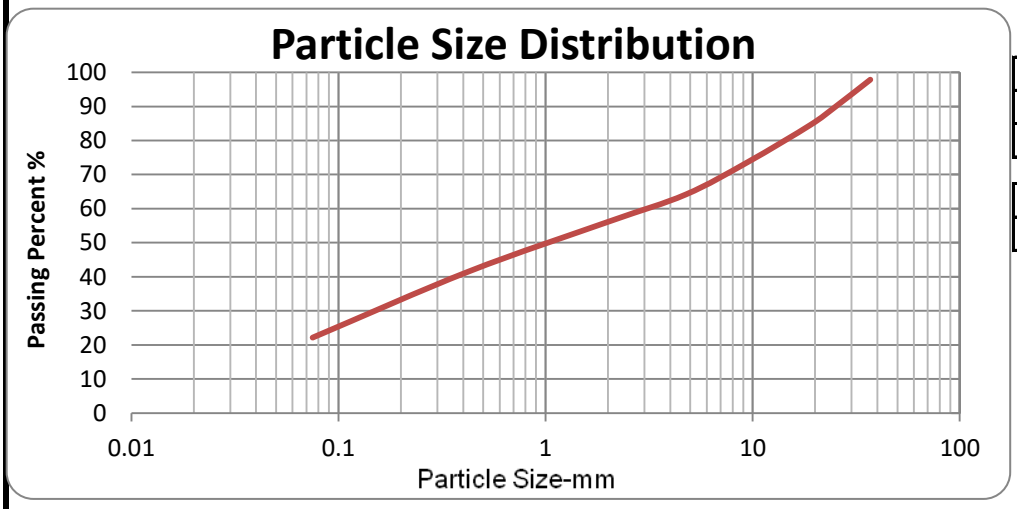
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**2**
Weight(gr):	3500	**Sample No:**	**4**
Sample taken by:	**GDR**	**Depth (m):**	**12**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	75	75	2.14	97.86	
25	1"	281	356	10.17	89.83	35.86
19	3/4"	184	540	15.43	84.57	
9.5	3/8"	380	920	26.29	73.71	
4.75	No 4	335	1255	35.86	64.14	
2	No 10	281	1536	43.89	56.11	42.00
0.425	No 40	510	2046	58.46	41.54	
0.075	No 200	679	2725	77.86	22.14	22.14
Wash No 200 Passing		775				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	35.86	42.00	22.14	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

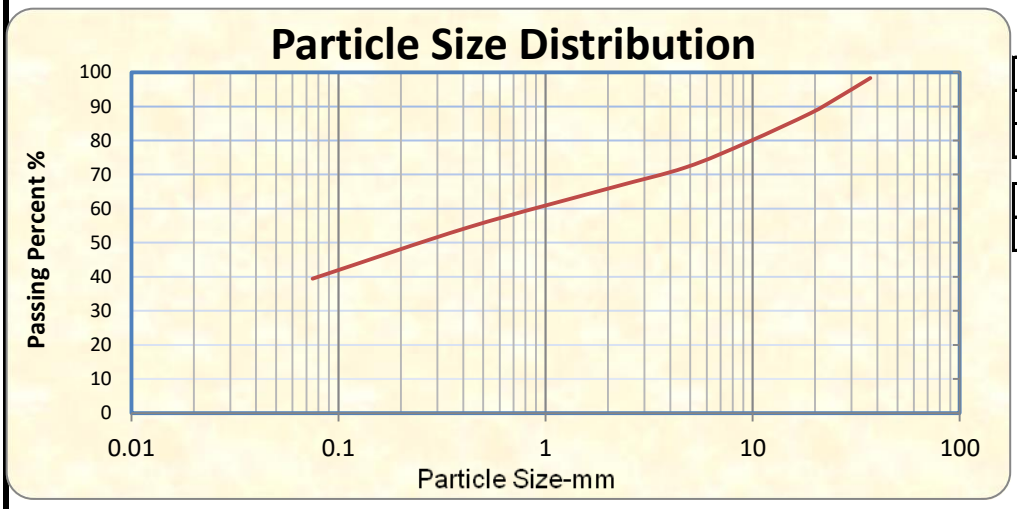
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**2**
Weight(gr):	4500	**Sample No:**	**5**
Sample taken by:	**GDR**	**Depth (m):**	**15**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	75	75	1.67	98.33	
25	1"	281	356	7.91	92.09	27.89
19	3/4"	184	540	12.00	88.00	
9.5	3/8"	380	920	20.44	79.56	
4.75	No 4	335	1255	27.89	72.11	
2	No 10	281	1536	34.13	65.87	32.67
0.425	No 40	510	2046	45.47	54.53	
0.075	No 200	679	2725	60.56	39.44	39.44
Wash No 200 Passing		1775				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	27.89	32.67	39.44	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

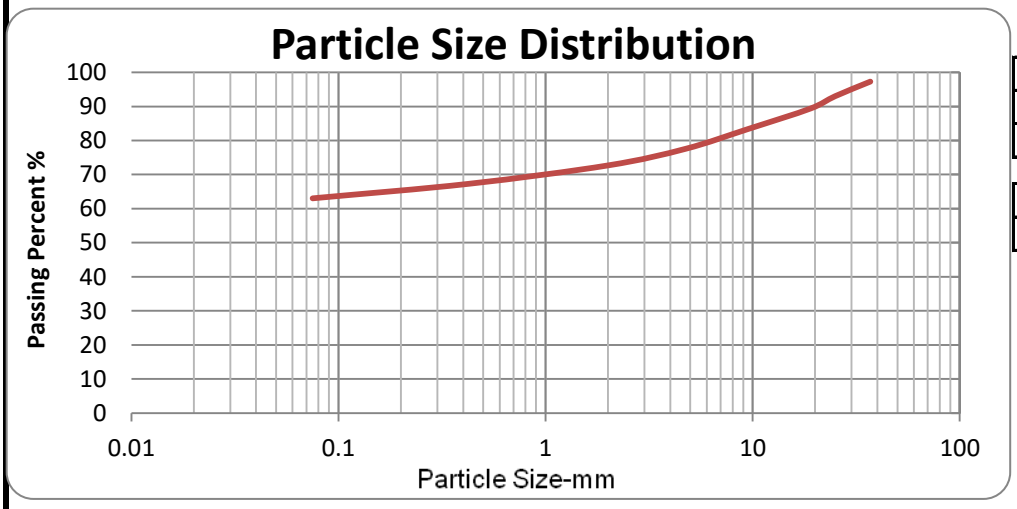
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**3**
Weight(gr):	3500	**Sample No:**	**1**
Sample taken by:	**GDR**	**Depth (m):**	**3**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	95	95	2.71	97.29	
25	1"	150	245	7.00	93.00	22.43
19	3/4"	127	372	10.63	89.37	
9.5	3/8"	210	582	16.63	83.37	
4.75	No 4	203	785	22.43	77.57	
2	No 10	171	956	27.31	72.69	14.54
0.425	No 40	189	1145	32.71	67.29	
0.075	No 200	149	1294	36.97	63.03	63.03
Wash No 200 Passing		2206				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	22.43	14.54	63.03	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

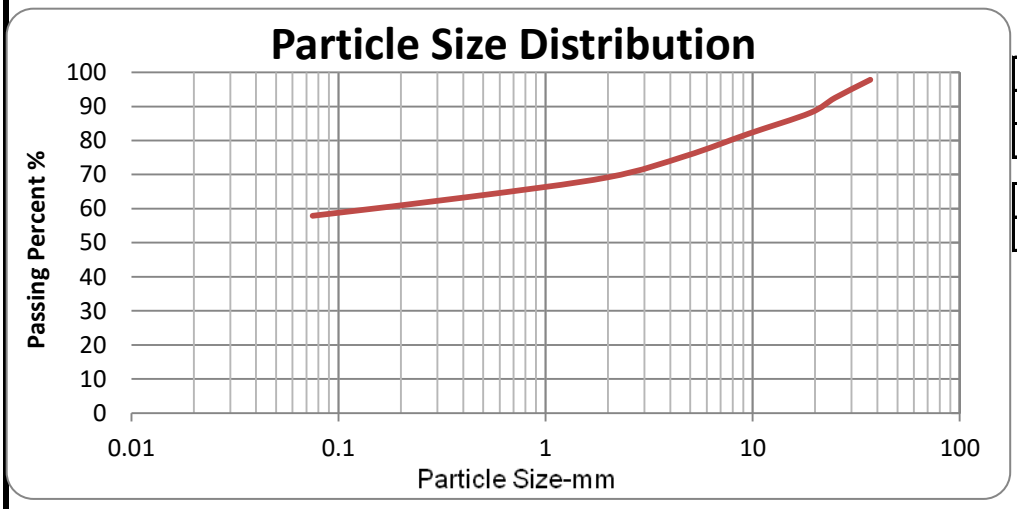
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**3**
Weight(gr):	3000	**Sample No:**	**2**
Sample taken by:	**GDR**	**Depth (m):**	**6**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	65	65	2.17	97.83	
25	1"	159	224	7.47	92.53	24.53
19	3/4"	132	356	11.87	88.13	
9.5	3/8"	186	542	18.07	81.93	
4.75	No 4	194	736	24.53	75.47	
2	No 10	188	924	30.80	69.20	17.57
0.425	No 40	173	1097	36.57	63.43	
0.075	No 200	166	1263	42.10	57.90	57.90
Wash No 200 Passing		1737				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	24.53	17.57	57.90	CL GM	Silty Clay with Gravel



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Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

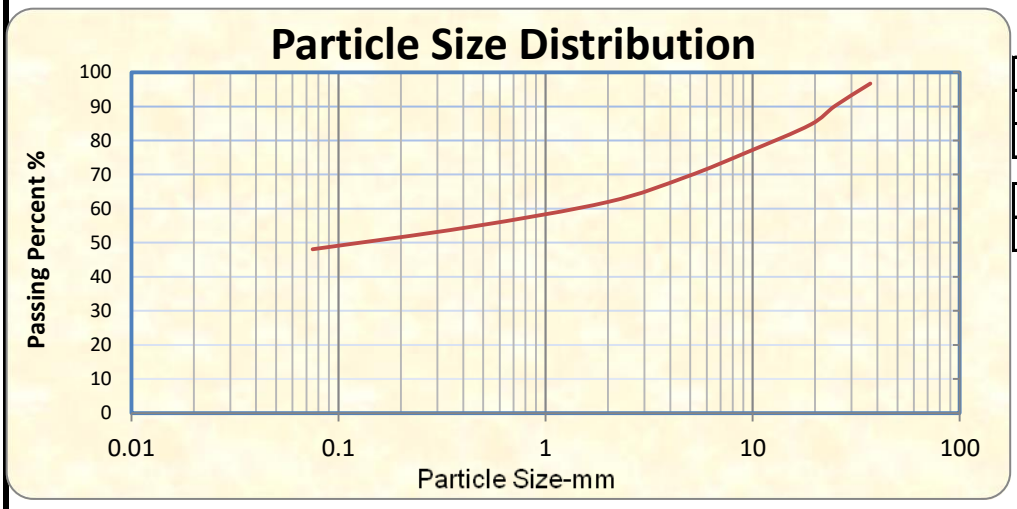
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**3**
Weight(gr):	2500	**Sample No:**	**3**
Sample taken by:	**GDR**	**Depth (m):**	**9**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	82	82	3.28	96.72	
25	1"	164	246	9.84	90.16	30.72
19	3/4"	138	384	15.36	84.64	
9.5	3/8"	199	583	23.32	76.68	
4.75	No 4	185	768	30.72	69.28	
2	No 10	183	951	38.04	61.96	21.20
0.425	No 40	185	1136	45.44	54.56	
0.075	No 200	162	1298	51.92	48.08	48.08
Wash No 200 Passing		1202				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	30.72	21.20	48.08	CL GM	Silty Clay with Gravel



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Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

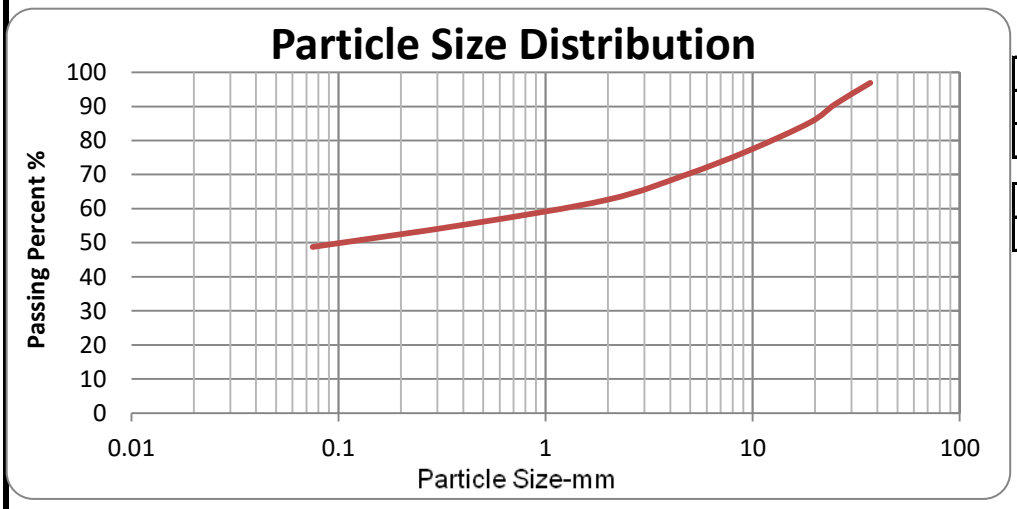
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**3**
Weight(gr):	2500	**Sample No:**	**4**
Sample taken by:	**GDR**	**Depth (m):**	**12**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	77	77	3.08	96.92	
25	1"	157	234	9.36	90.64	30.08
19	3/4"	132	366	14.64	85.36	
9.5	3/8"	210	576	23.04	76.96	
4.75	No 4	176	752	30.08	69.92	
2	No 10	182	934	37.36	62.64	21.16
0.425	No 40	179	1113	44.52	55.48	
0.075	No 200	168	1281	51.24	48.76	48.76
Wash No 200 Passing		1219				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	30.08	21.16	48.76	CL GM	Silty Clay with Gravel



D10=	
D30=	
D60=	
Cu=	
Cc=	

Tested by:

Lab Manager
Engr:Abdullah

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Quality Control Section

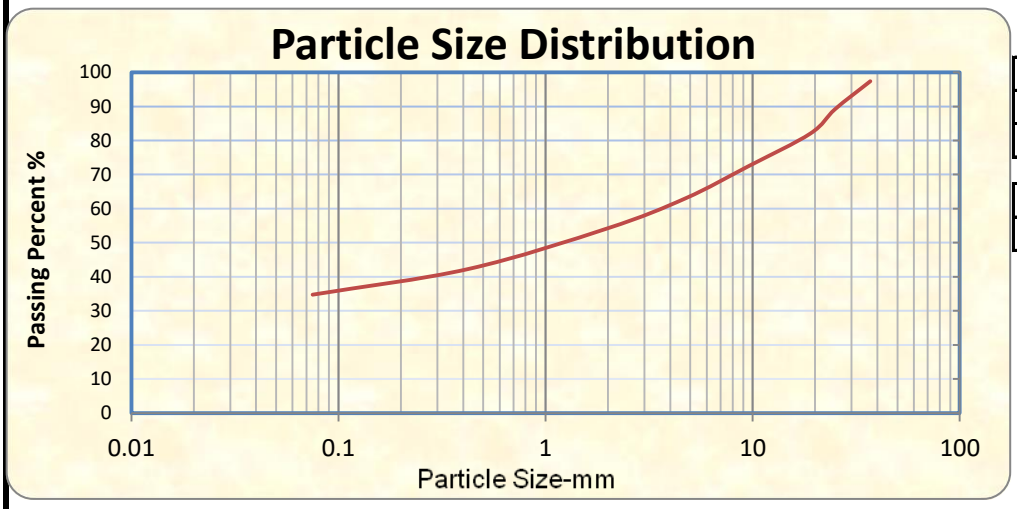
SIEVE ANALYSIS RESULT SHEET

ASTM D-422

For:	**School Building**	**Sampling Date:**	**8/12/2020**
Project Name:	**A-Z Foundation**	**Testing Date:**	**10/12/2020**
Location of Project:	**Abbaspur Kashmir**	**B.H No:**	**3**
Weight(gr):	2000	**Sample No:**	**5**
Sample taken by:	**GDR**	**Depth (m):**	**15**

Sieve Size		Mass Retained(gr)	Cumulative			Remark
mm	inches / No		Mass Retained(gr)	Retained %	Passing Limit %	
37	1.5"	52	52	2.60	97.40	
25	1"	164	216	10.80	89.20	36.95
19	3/4"	143	359	17.95	82.05	
9.5	3/8"	193	552	27.60	72.40	
4.75	No 4	187	739	36.95	63.05	
2	No 10	176	915	45.75	54.25	28.30
0.425	No 40	239	1154	57.70	42.30	
0.075	No 200	151	1305	65.25	34.75	34.75
Wash No 200 Passing		695				

Soil Classification	Gravel %	Sand %	Passing No.200	Symbol	Group Name
	36.95	28.30	34.75	CL GM	Silty Clay with Gravel



D10=	
D30=	
D60=	
Cu=	
Cc=	

Tested by:

Lab Manager
Engr:Abdullah

Appendix-C

DIRECT SHEAR TEST

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Zampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 1	Sample Depth: 5 m

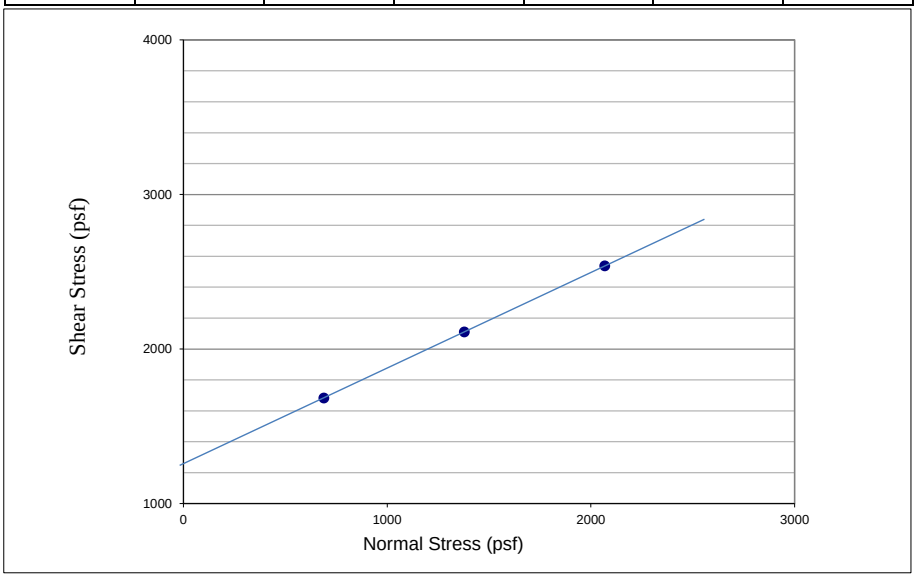
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	122.0	0.4	690	1683
2	40	0.029	153.0	0.4	1379	2110
3	60	0.029	184.0	0.4	2069	2538



Angle of Friction = **35.5** **Degree**

0.62 **Radian**

Undrained Cohesion (Psf) = **1280**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Zampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 1	Sample Depth: 10 m

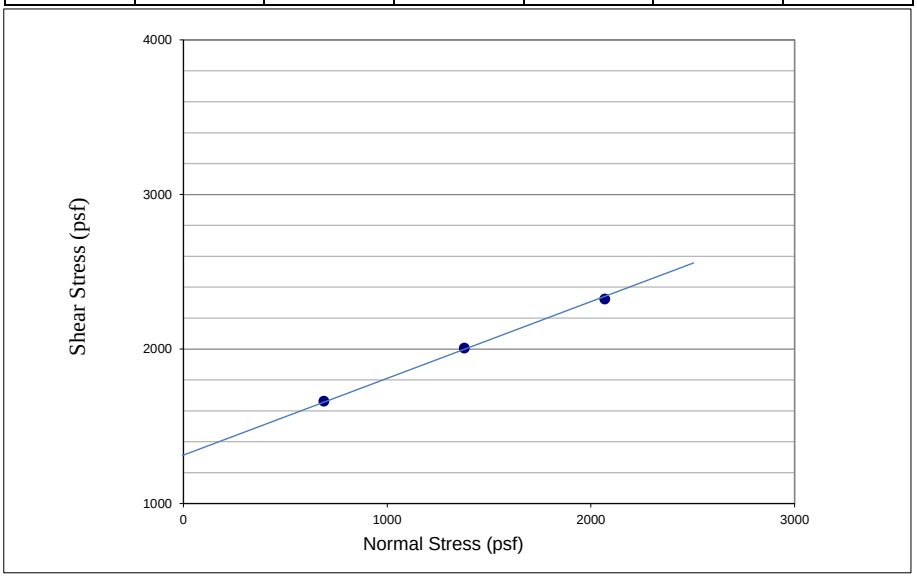
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	120.5	0.4	690	1662
2	40	0.029	145.5	0.4	1379	2007
3	60	0.029	168.5	0.4	2069	2324



Angle of Friction = **27.5** **Degree**

0.48 **Radian**

Undrained Cohesion (Psf) = **1340**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Zampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 1	Sample Depth: 15 m

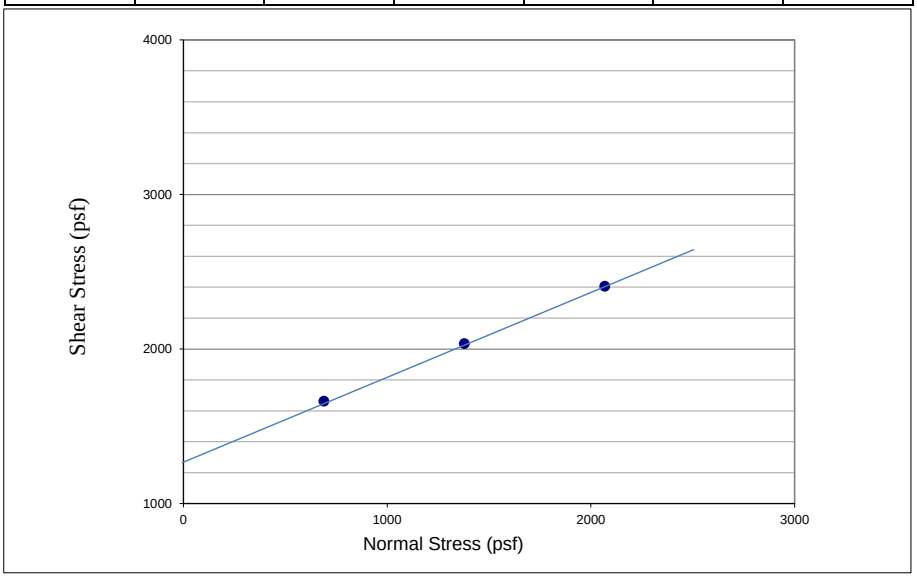
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	120.5	0.4	690	1662
2	40	0.029	147.5	0.4	1379	2034
3	60	0.029	174.5	0.4	2069	2407



Angle of Friction = **30.9** **Degree**

0.54 **Radian**

Undrained Cohesion (Psf) = **1280**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 2	Sample Depth: 5 m

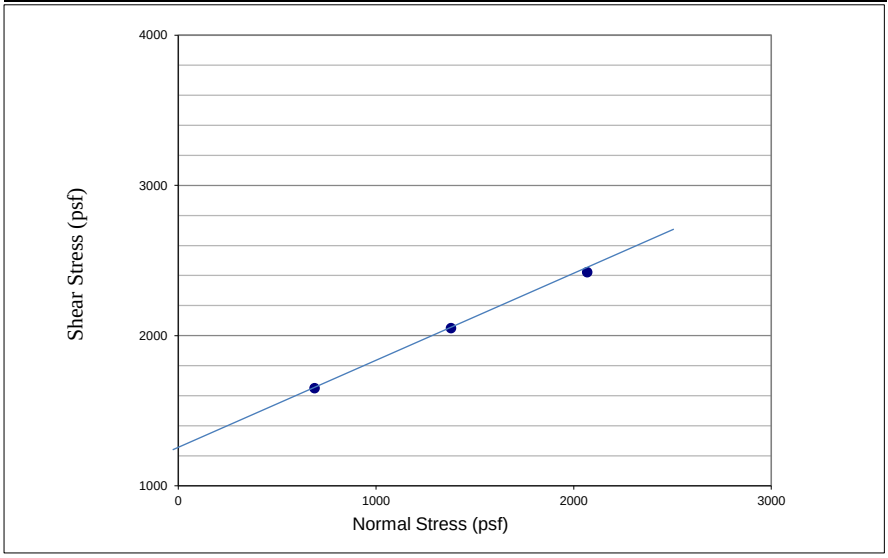
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	119.5	0.4	690	1648
2	40	0.029	148.5	0.4	1379	2048
3	60	0.029	175.5	0.4	2069	2421



Angle of Friction = **32.1** **Degree**

0.56 **Radian**

Undrained Cohesion (Psf) = **1230**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 2	Sample Depth: 10 m

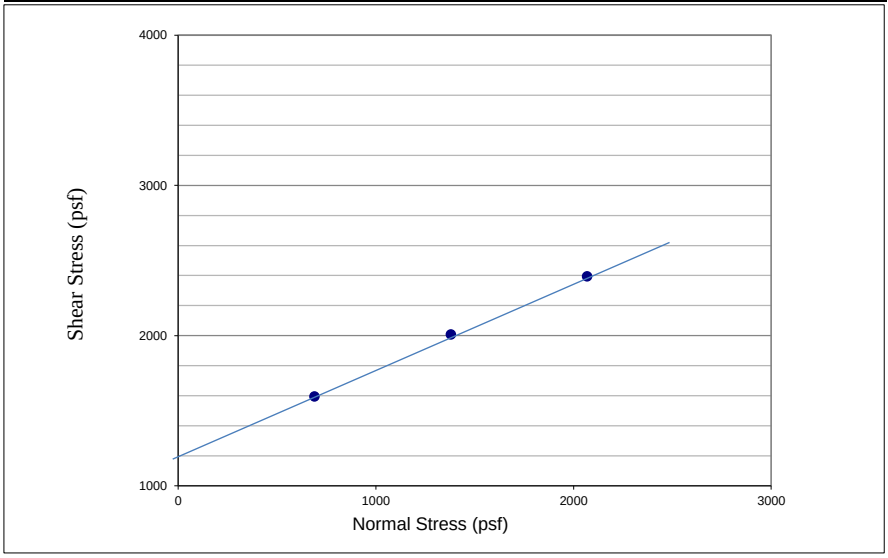
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	115.5	0.4	690	1593
2	40	0.029	145.5	0.4	1379	2007
3	60	0.029	173.5	0.4	2069	2393



Angle of Friction = **33.2** **Degree**

0.58 **Radian**

Undrained Cohesion (Psf) = **1200**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 2	Sample Depth: 15 m

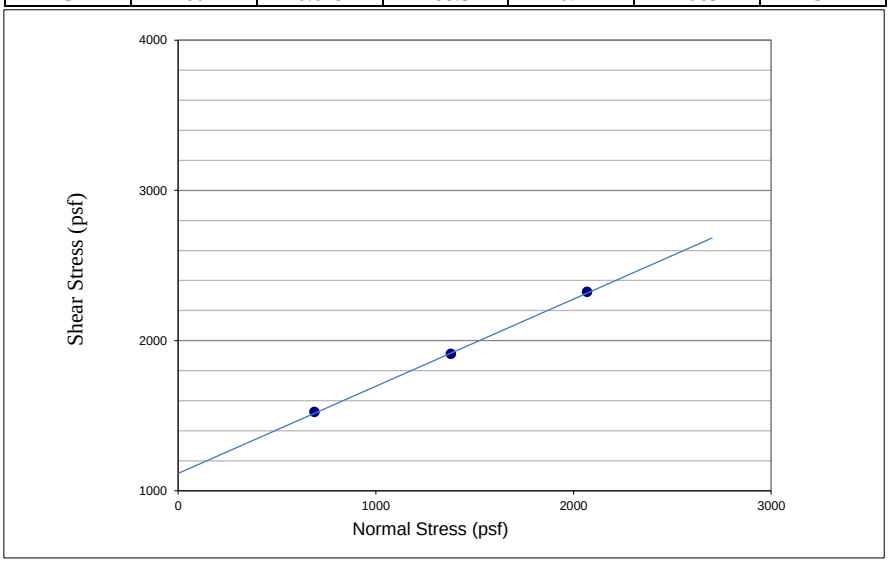
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	110.5	0.4	690	1524
2	40	0.029	138.5	0.4	1379	1910
3	60	0.029	168.5	0.4	2069	2324



Angle of Friction = **33.2** **Degree**

0.58 **Radian**

Undrained Cohesion (Psf) = **1100**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 3	Sample Depth: 5 m

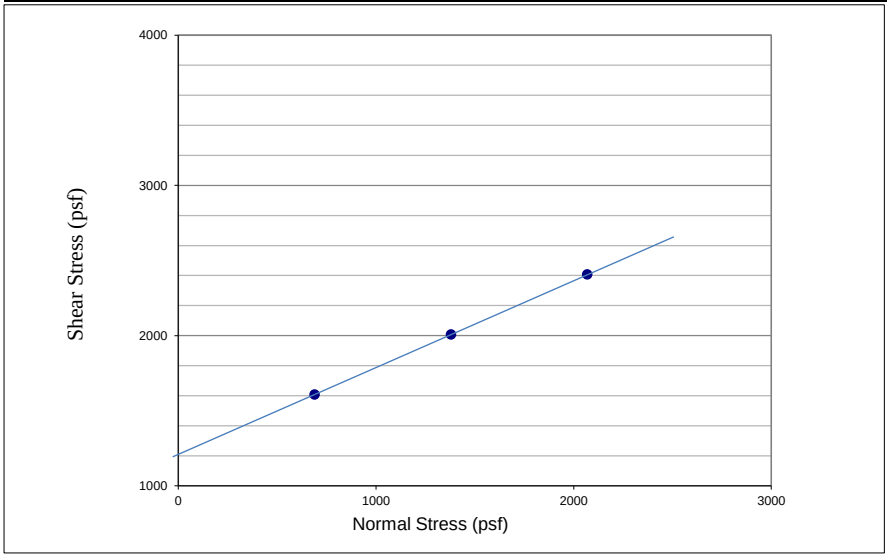
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	116.5	0.4	690	1607
2	40	0.029	145.5	0.4	1379	2007
3	60	0.029	174.5	0.4	2069	2407



Angle of Friction = **33.2** **Degree**

0.58 **Radian**

Undrained Cohesion (Psf) = **1200**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 3	Sample Depth: 10 m

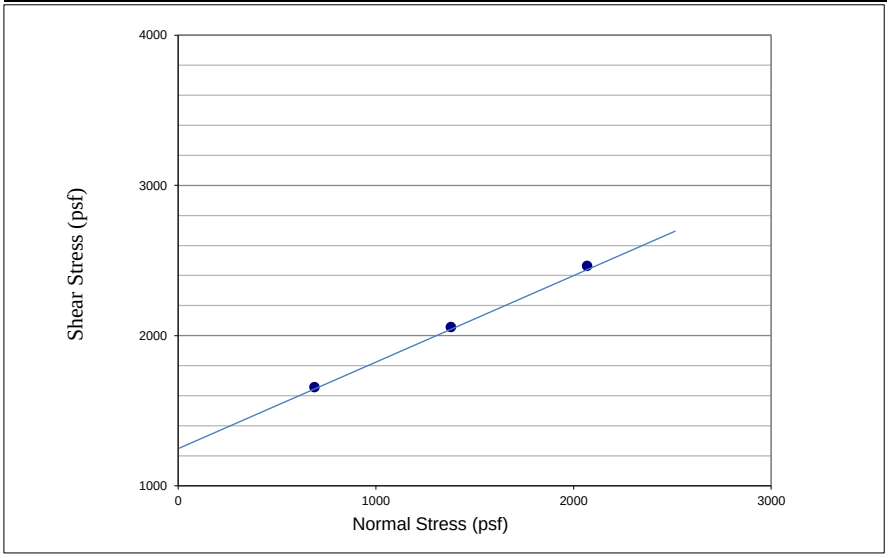
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	120.0	0.4	690	1655
2	40	0.029	149.0	0.4	1379	2055
3	60	0.029	178.5	0.4	2069	2462



Angle of Friction = **33.5** **Degree**

0.585 **Radian**

Undrained Cohesion (Psf) = **1230**

Tested By

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

Direct Shear Test	Project Name:	A-Z Sampling Date: 8/12/2020	
	Location:	Abbaspur Kashmir	Testing Date: 10/12/2020
	Building Project	BH No : 3	Sample Depth: 15 m

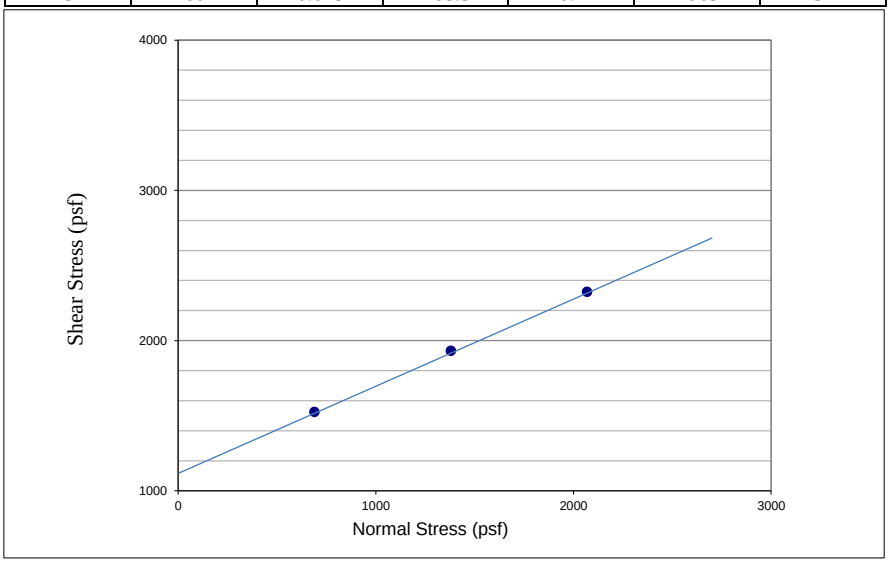
Bulk Density (pcf) -

Insitu Moisture Content (%) -

Sample Type Remoulded (Gravel, Boulder Free)

Under Saturation Condition

Sample No.	Applied Load (lb)	Sample Area (Sq. ft)	Dial Reading	Ring Factor (lbs/div)	Normal stress (psf)	Shear stress (psf)
1	20	0.029	110.5	0.4	690	1524
2	40	0.029	140.0	0.4	1379	1931
3	60	0.029	168.5	0.4	2069	2324



Angle of Friction = **33.2** **Degree**

0.58 **Radian**

Undrained Cohesion (Psf) = **1120**

Tested By

Appendix-D

UNCONFINED COMPRESSION TEST

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

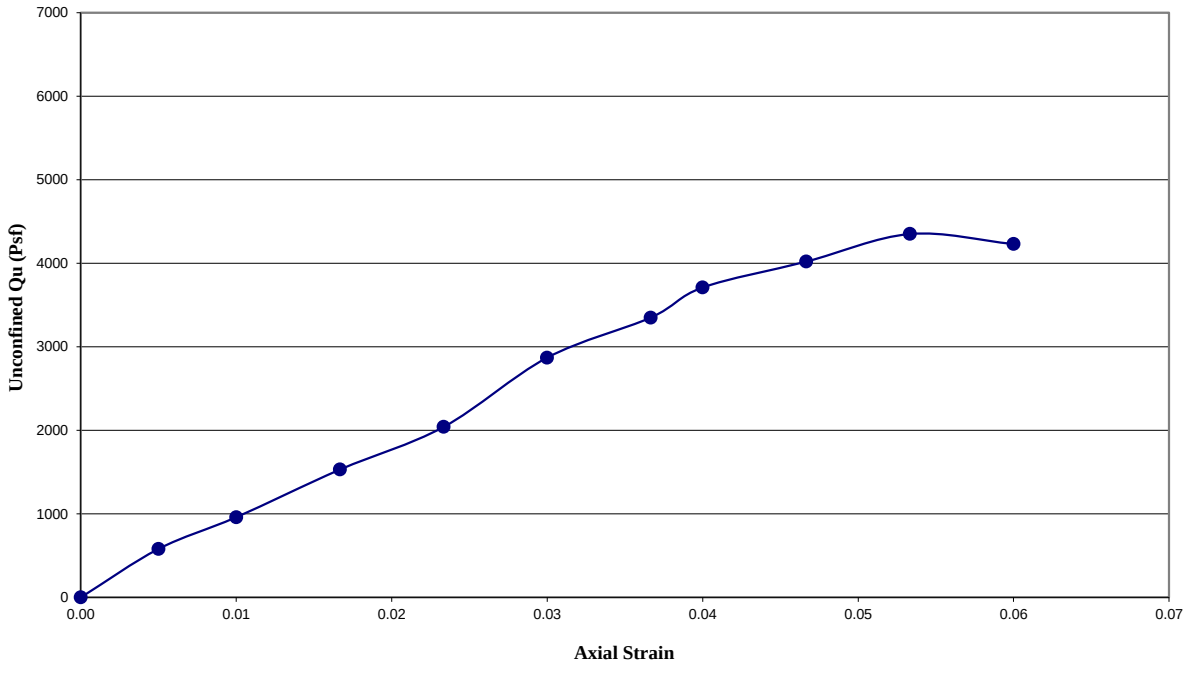
BH No: 1 | **Sample Depth: 6 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2

Rate of Strain: 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	5.5	7	0.015	0.005	0.995	0.0124	580
30	9.2	12	0.030	0.010	0.990	0.0124	960
50	14.7	19	0.050	0.017	0.983	0.0125	1530
70	19.8	26	0.070	0.023	0.977	0.0126	2040
90	28.0	36	0.090	0.030	0.970	0.0127	2870
110	32.9	43	0.110	0.037	0.963	0.0128	3350
120	36.6	48	0.120	0.040	0.960	0.0128	3710
140	25.0	52	0.140	0.047	0.953	0.0129	4020
160	43.5	57	0.160	0.053	0.947	0.0130	4350
180	42.6	55	0.180	0.060	0.940	0.0131	4230



Unconfined Compressive Strength (TSF) = 1.942

Axial Strain = 0.5

LAB TECHNICIAN

MATERIAL ENGINEER

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

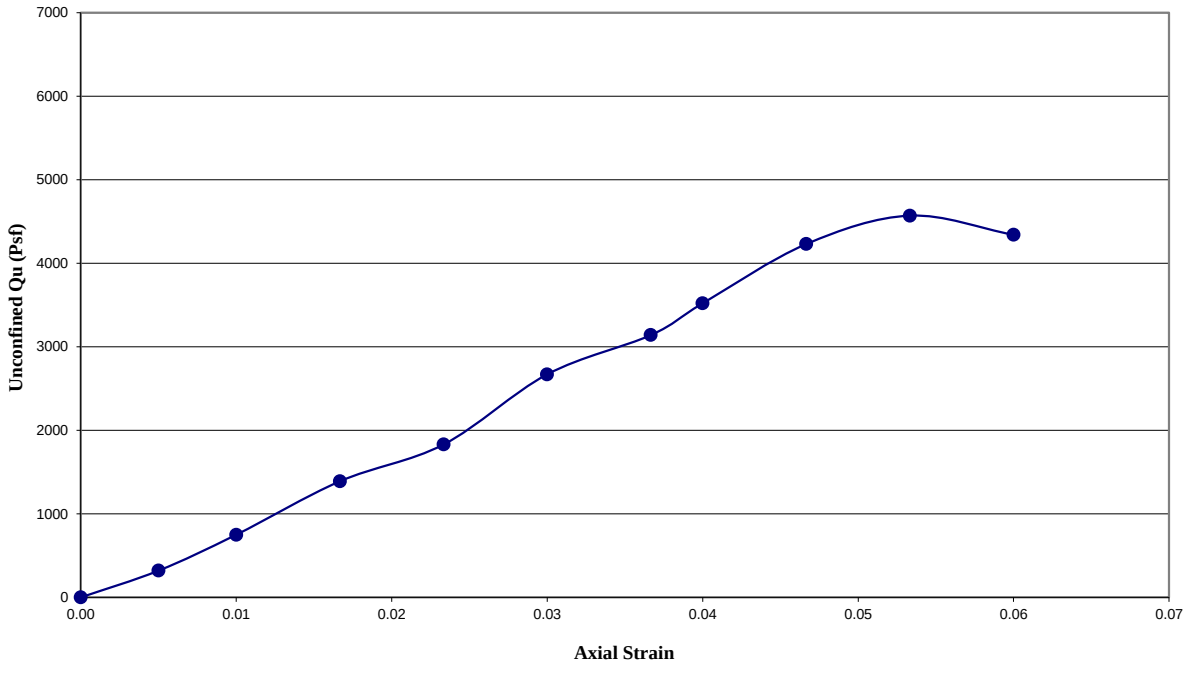
BH No: 1 | **Sample Depth: 15 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2

Rate of Strain: 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	3.0	4	0.015	0.005	0.995	0.0124	320
30	7.2	9	0.030	0.010	0.990	0.0124	750
50	13.4	17	0.050	0.017	0.983	0.0125	1390
70	17.7	23	0.070	0.023	0.977	0.0126	1830
90	26.0	34	0.090	0.030	0.970	0.0127	2670
110	30.8	40	0.110	0.037	0.963	0.0128	3140
120	34.7	45	0.120	0.040	0.960	0.0128	3520
140	25.0	55	0.140	0.047	0.953	0.0129	4230
160	45.7	59	0.160	0.053	0.947	0.0130	4570
180	43.7	57	0.180	0.060	0.940	0.0131	4340



Unconfined Compressive Strength (TSF) = 2.040

Axial Strain = 0.53

LAB TECHNICIAN

MATERIAL ENGINEER

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

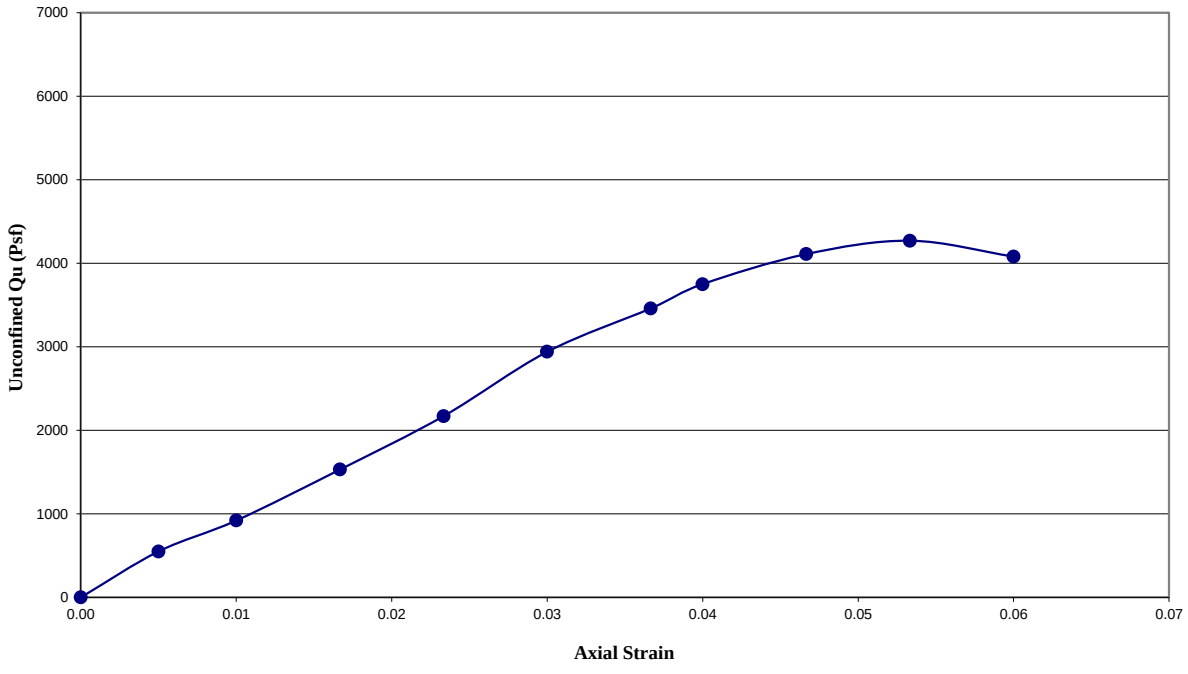
BH No: 1 | **Sample Depth: 3 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2

Rate of Strain: 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	5.2	7	0.015	0.005	0.995	0.0124	550
30	8.8	11	0.030	0.010	0.990	0.0124	920
50	14.7	19	0.050	0.017	0.983	0.0125	1530
70	21.0	27	0.070	0.023	0.977	0.0126	2170
90	28.7	37	0.090	0.030	0.970	0.0127	2940
110	34.0	44	0.110	0.037	0.963	0.0128	3460
120	37.0	48	0.120	0.040	0.960	0.0128	3750
140	40.8	53	0.140	0.047	0.953	0.0129	4110
160	42.7	55	0.160	0.053	0.947	0.0130	4270
180	41.1	53	0.180	0.060	0.940	0.0131	4080



Unconfined Compressive Strength (TSF) = 1.906

Axial Strain = 0.5

LAB TECHNICIAN

MATERIAL ENGINEER

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

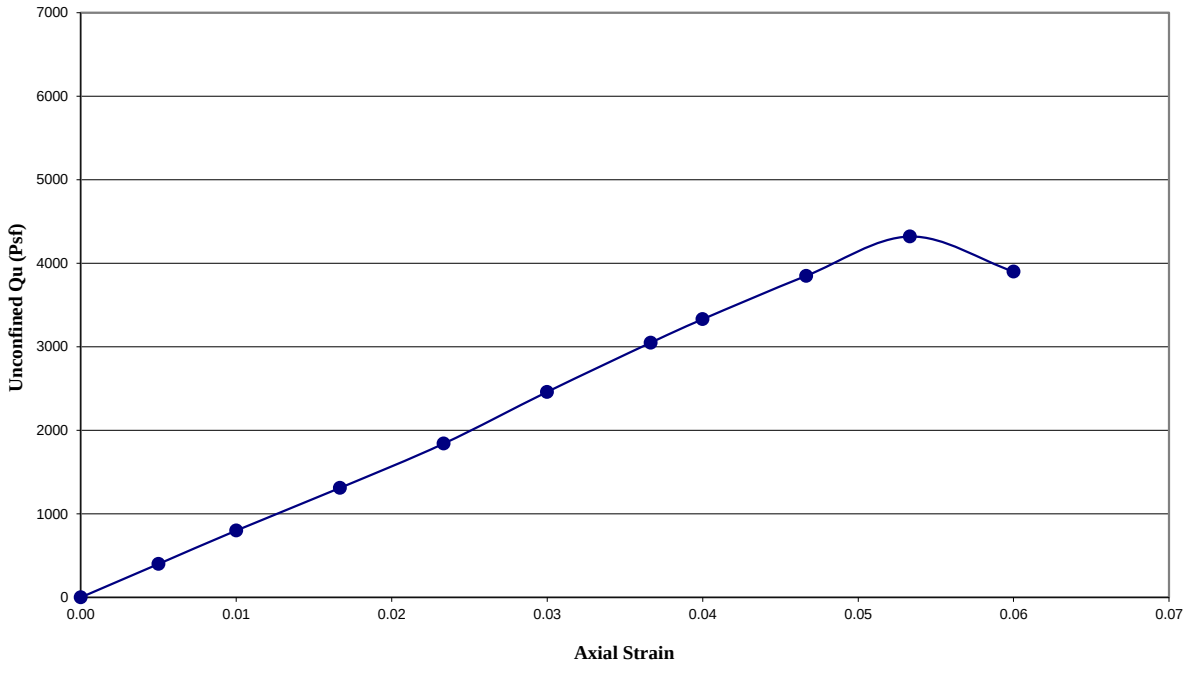
Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

BH No: 2 | **Sample Depth: 10 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2 **Rate of Strain:** 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	3.8	5	0.015	0.005	0.995	0.0124	400
30	7.6	10	0.030	0.010	0.990	0.0124	800
50	12.6	16	0.050	0.017	0.983	0.0125	1310
70	17.8	23	0.070	0.023	0.977	0.0126	1840
90	24.0	31	0.090	0.030	0.970	0.0127	2460
110	30.0	39	0.110	0.037	0.963	0.0128	3050
120	32.8	43	0.120	0.040	0.960	0.0128	3330
140	38.2	50	0.140	0.047	0.953	0.0129	3850
160	43.2	56	0.160	0.053	0.947	0.0130	4320
180	39.3	51	0.180	0.060	0.940	0.0131	3900



Unconfined Compressive Strength (TSF) = 1.929

Axial Strain = 0.53

LAB TECHNICIAN

MATERIAL ENGINEER

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

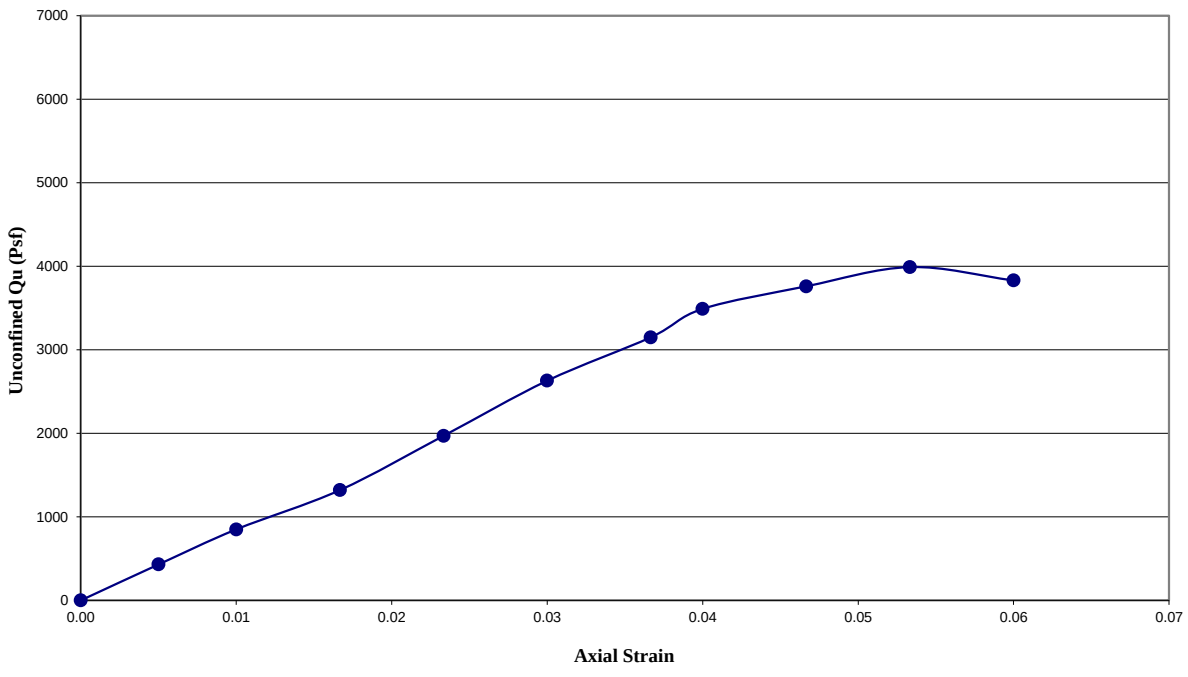
BH No: 3 | **Sample Depth: 5 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2

Rate of Strain: 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	4.1	5	0.015	0.005	0.995	0.0124	430
30	8.1	11	0.030	0.010	0.990	0.0124	850
50	12.7	17	0.050	0.017	0.983	0.0125	1320
70	19.1	25	0.070	0.023	0.977	0.0126	1970
90	25.7	33	0.090	0.030	0.970	0.0127	2630
110	30.9	40	0.110	0.037	0.963	0.0128	3150
120	34.4	45	0.120	0.040	0.960	0.0128	3490
140	25.0	49	0.140	0.047	0.953	0.0129	3760
160	39.9	52	0.160	0.053	0.947	0.0130	3990
180	38.6	50	0.180	0.060	0.940	0.0131	3830



Unconfined Compressive Strength (TSF) = 1.781

Axial Strain = 0.5

LAB TECHNICIAN

MATERIAL ENGINEER

GEO DEEP ROCK GEOTECH ENGINEERING SERVIES

UNCONFINED COMPRESSION TEST

Project Name:A-Z Sampling Date: 8/12/2020

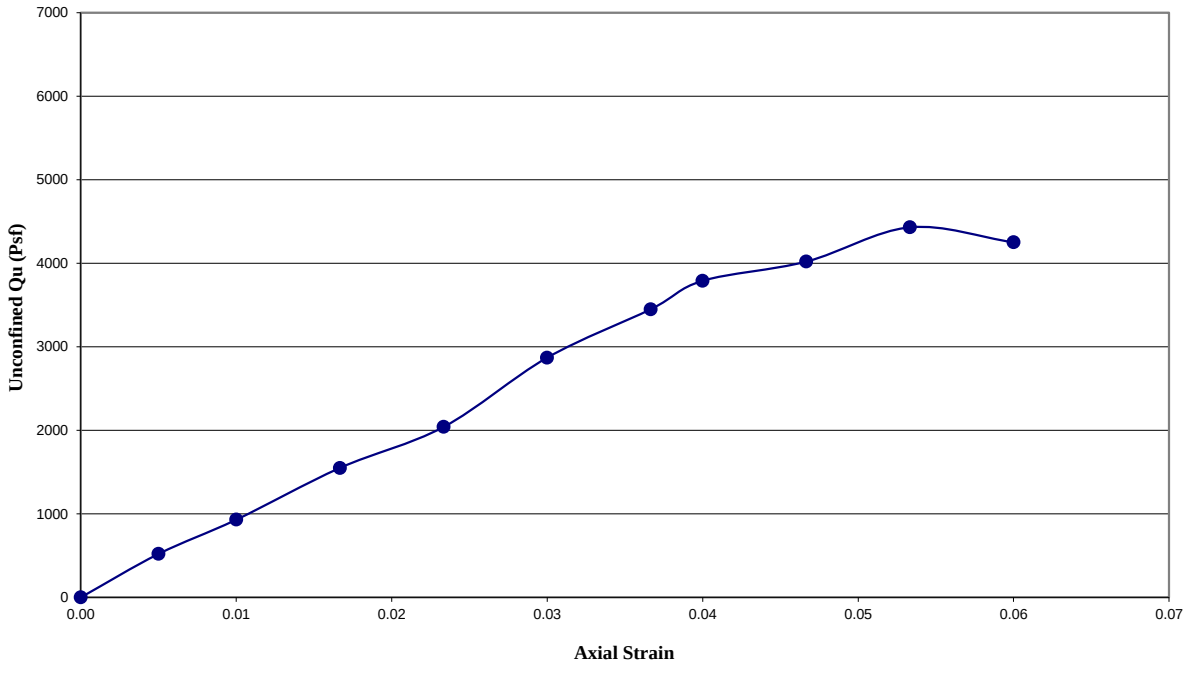
Location:Abbaspur Kashmir | **Testing Date: 10/12/2020**

BH No: 3 | **Sample Depth: 12 m**

Proving Ring Constant: 1.3 lbs/div

Original Area of Sample: 0.01227 ft^2 **Rate of Strain:** 10.0% / min

Strain dial reading	Dial reading	Load. P (lbs)	Vertical dial difference D L (inch)	Unit strain Î	1-Î	Corrected area (ft 2)	Unit stress (lb / sq. ft)
0	0	0	0	0	1	0	0
15	4.9	6	0.015	0.005	0.995	0.0124	520
30	8.9	12	0.030	0.010	0.990	0.0124	930
50	14.9	19	0.050	0.017	0.983	0.0125	1550
70	19.8	26	0.070	0.023	0.977	0.0126	2040
90	28.0	36	0.090	0.030	0.970	0.0127	2870
110	33.9	44	0.110	0.037	0.963	0.0128	3450
120	37.4	49	0.120	0.040	0.960	0.0128	3790
140	25.0	52	0.140	0.047	0.953	0.0129	4020
160	44.3	58	0.160	0.053	0.947	0.0130	4430
180	42.8	56	0.180	0.060	0.940	0.0131	4250



Unconfined Compressive Strength (TSF) = 1.978

Axial Strain = 0.53

LAB TECHNICIAN

MATERIAL ENGINEER