Government of the People's Republic of Bangladesh
Ministry of Road Transport and Bridges (MoRTB)
Roads and Highways Department (RHD)

Sylhet-Charkhai-Sheola Highway Improvement Project

Geotechnical Investigation Report (Part-3)

May, 2022

GOVERNMENT OF
THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGES
ROADS AND HIGHWAYS DEPARTMENT

ADB LOAN 3295 - BAN
FEASIBILITY STUDY, DETAILED DESIGN AND
TENDERING SUPPORT OF TECHNICAL ASSISTANCE FOR
SUB REGIONAL ROAD TRANSPORT PROJECT PREPARATORY FACILITY-II

ROAD 04: SYLHET - CHARKHAI - SHEOLA - SUTARKANDI

FINAL DETAILED DESIGN REPORT

APPENDIX H-1: PAVEMENT INVESTIGATION REPORT (PART - 03)

MAY 2022

In association with

HIFAB International AB, Sweden

Oriental Consultants Global Co. Ltd., Japan (JV)
BCL Associates Ltd., Bangladesh (Sub-consultant)
Development Design Consultants Ltd., Bangladesh (Sub-consultant)

PROJECT NAME:

SUB-REGIONAL ROAD TRANSPOT PROJECT

PREPARATORY FACILITY II

CLIENT:

ROADS AND HIGHWAYS DEPARTMENT (RHD)

PAVEMENT INVESTIGATION FINAL REPORT FOR SHYLET TO SUTARKANDI ROAD

REPORT ON

MATERIAL COLLECTION AND TESTING, PACKAGE - 1

SUBMITTED BY

HIFAB INTERNATINAL AB

Table of Contents

ABBREVIATIONS

California Bearing Ratio – CBR

Dynamic Cone Penetration Test – DCPT

Maximum Dry Density – MDD

Natural Moisture Content – NMC

Los Angeles Abrasion Test – LAA

Ten Percent Fine Value Test – TFV

Aggregate Crushing Value Test – ACV

Flakiness Index – FI

Elongation Index – EI

Specific Gravity – SG

Sodium Sulphate Soundness Test – SSS

Fineness Modulus – FM

LIST OF APPENDICES

1 INTRODUCTION

This report has been prepared on the basis of an agreement in between consultant and soil Test Company to conduct the assignment names material collections and testing for **Sub Regional Road Transport Project Preparatory Facility (SRTPPF-II).** Accordingly, a detailed pavement investigation program has been undertaken by Consultant and to carry out by the soil test company during the month of March 2017. The subsurface investigation work includes execution of eight test pits, 12 DCPTs extended to a variable depth, performance of a variety of field and laboratory tests to determine the subgrade conditions. The information, so far has been obtained from carrying out the above subsurface investigation program, is provided in detail, in the following article.

1.1 LOCATION

The Pavement Investigation Works has been undertaken for the design and construction of part of the **Sub Regional Road Transport Project Preparatory Facility (SRTPPF-II)**.

1.2 PURPOSE OF STUDY

The purpose of this Pavement Investigation was to determine the properties of subgrade materials and to suggest for the safe appropriate type of foundation for the prevailing sub-soil condition.

1.3 CLASSIFICATION OF SOIL

The system used for preparation of this report in the identification of soil is the Unified Soil Classification system (USC) which was developed by the US Army Corps of Engineers during World War II and has since gained international acceptance and has been adopted in its metricated form by the Standards Association of Australia.

2 SCOPE OF THE WORK

The Investigation consisted of field studies and laboratory tests. The field portion of the investigation consist of Test Pits and DCPTs. Laboratory studies included tests to determine soil properties including physical and mechanical properties. The scope of work for the pavement consultancy services of the project are summarized as follows:

- Mobilization and Demobilization.
- Test Pits sampling, DCP Test, Borrow Pit sampling (soil outside of the road), Quarry material sampling (stone aggregate).
- Laboratory testing of obtained soil samples to determine the properties of the existing subgrade soil.
- Reporting.

3 FIELD INVESTIGATION

Field investigation program was conducted during the February and March 2018.

3.1 DIGGING PITS AND PAVEMENT COMPOSITION IN PIT LOCATION

The location of pits was at the interface of pavement and shoulder i.e. about 50% was in the shoulder and 50% in the pavement, during the easement of digging pits (comparing in the pavement only) the traffic flow kept normal with disrupting surrounding area. The pits normal size was 1mx1m and the depth was varied depending on the pavement thickness and in most cases, it was more than 700 mm, thus the pit size stood 1mx1mx0.75m in general including the pavement thickness. Normally pits were excavated @ 6 km in staggered way. Strip plans are followed for pit/DCP test locations. Photographs were taken for each pit focusing pavement layer/composition very distinctly. Layer thickness of each component and total depth of pavement was measured accurately and preserved for future reference or use. Each soil sample was identified by tagging with proper "Sample Identification Card" duly authenticated by the Consultant's Engineer. The sample card was kept in water-tight polythene bag. The sample size was around 50 kg. As soon full operation was completed the pits were filled up with materials in layers compacting with suitable type of rammer with ensuring effective compaction is achieved and the surface was treated with cementing material to resist deterioration at lesser rate.

3.2 DYNAMIC CONE PENETRATION TEST (DCPT)

ASTM D6951/D6951M-09: Standard Test Method was Used for the Dynamic Cone Penetration Test.

3.3 BORROW PIT

As per indication in ToR total two nos. borrow pit material was collected from the outside of the existing road for laboratory testing. Around 50 Kg sample was collected for each of the Borrow pit material location.

3.4 QUARRY MATERIAL SAMPLING (STONE AGGREGATE)

Total two nos. Quarry materials were collected from different locations, one imported from Vietnam and another one local. Around 50 Kg sample was collected for each of the Quarry material location.

3.5 TRANPORTATION & SAMPLING

3.5.1 STORAGE AND TRANSPORTATION OF SAMPLES

Soil Test Company has stored samples in a place that avoids contact direct sun-light, secured and free from any disturbance and transported within a week of extraction to the laboratory of Dhaka office.

3.5.2 LABORATORY TESTING

The laboratory tests performed were as per requirement of the tests decided by Consultant's Geotechnical Engineer are listed below.

Table 1: list of laboratory tests Quantity information

Laboratory Testing:	
a) Grain Size Analysis AASHTO T-127 & T-11/ ASTM D-422	12
b) Natural Moisture Content AASHTO T-265	10
c) Atterberg Limits and Plasticity Index ASTM D423-66	10
d) Maximum Dry Density (MDD), modified AASHTO T-180	06
e) California Bearing Ration (CBR)**, AASHTO T-193	06
f) Dynamic Cone Penetration Test (DCPT), ASTM D-6951	12
g) LAA, ASTM C-131	02
h) ACV & TFV, IS: 2386-PART 4-1963	02
i) Flakiness Index (FI) BS 812:105.1 & Elongation index (EI)	02
j) Specific gravity & Absorption (SG), AASHTO T- 84/85	02
k) Sodium Sulfate Soundness (SSS), AASHTO T-104,	02
l) Fineness Modulus (Sand/Fine Aggregates), AASHTO T 27	02

All tests have been carried out in the laboratory previously approved by Consultant's Engineer.

3.5.3 SAMPLING

Bulk soil samples were collected from different TP, Borrow Pit and Quarry materials were collected from different source as indicated in ToR/ directed by Consultant Engineer.

4 LABORATORY TESTING

Geotechnical laboratory tests were performed on the soil samples to classify soil and to determine their engineering characteristics. All laboratory tests were conducted in accordance with ASTM & AASHTO Standards. The soils were also classified based on the Unified Soil Classification System (USCS).

4.1 SIEVE ANALYSIS TEST

Sieve analyses were performed by means of sieving AASHTO T-27 &T-11/ ASTM D 422.

4.2 ATTER-BERG LIMIT TEST

Atter-berg limits were determined (ASTM D423-66 & D424-59) on representative soil samples of cohesive soils.

4.3 SPECIFIC GRAVITY TEST

Specific gravity of soil was performed as per AASHTO T- 84/85 Standard.

4.4 CALIFORNIA BEARING RATIO TEST

California Bearing Ratio test was performed as per AASHTO T-193 Standard.

4.5 NATURAL MOISTURE CONTENT TEST

Moisture content of in-situ soil was performed by following AASHTO T-265 Standard.

4.6 MOISTURE DENSITY RELATION (COMPACTION TEST)

Moisture Density Test was performed following modified AASHTO T-180 Standard

4.7 AGGREGATE 10% FINES VALUE (IS: 2386-PART 4-1963)

Aggregate 10% Fines Value was determined following IS:2386-Part 4-1963

4.8 LAA

Los Angeles abrasion test on aggregates was measured following AASHTO T 96 or ASTM C 131:

4.9 AGGREGATE CRUSHING VALUE TEST

This test helps to determine the aggregate crushing value of coarse aggregates as per IS: 2386 (Part IV) – 1963.

4.10 DETERMINATION OF FLAKINESS INDEX AND ELONGATION INDEX

FI & EI of was determined following BS 812:105.1

5 REPORTING

5.1 LOGS

All bore logs have been written in English and presented in a form acceptable to Hifab that contains a summary of all the information on the daily site records, a description of all strata and levels of changes of strata.

5.2 LABORATORY TEST RESULTS

Soil Test Company has submitted two copies of preliminary laboratory test results to the Consultant's Representative and after review of the Consultant's Representative the test results have been included in the Final Report.

5.3 FINAL REPORT

Following completion of the field and laboratory testing, a comprehensive Material Investigation Report has been prepared comprising:

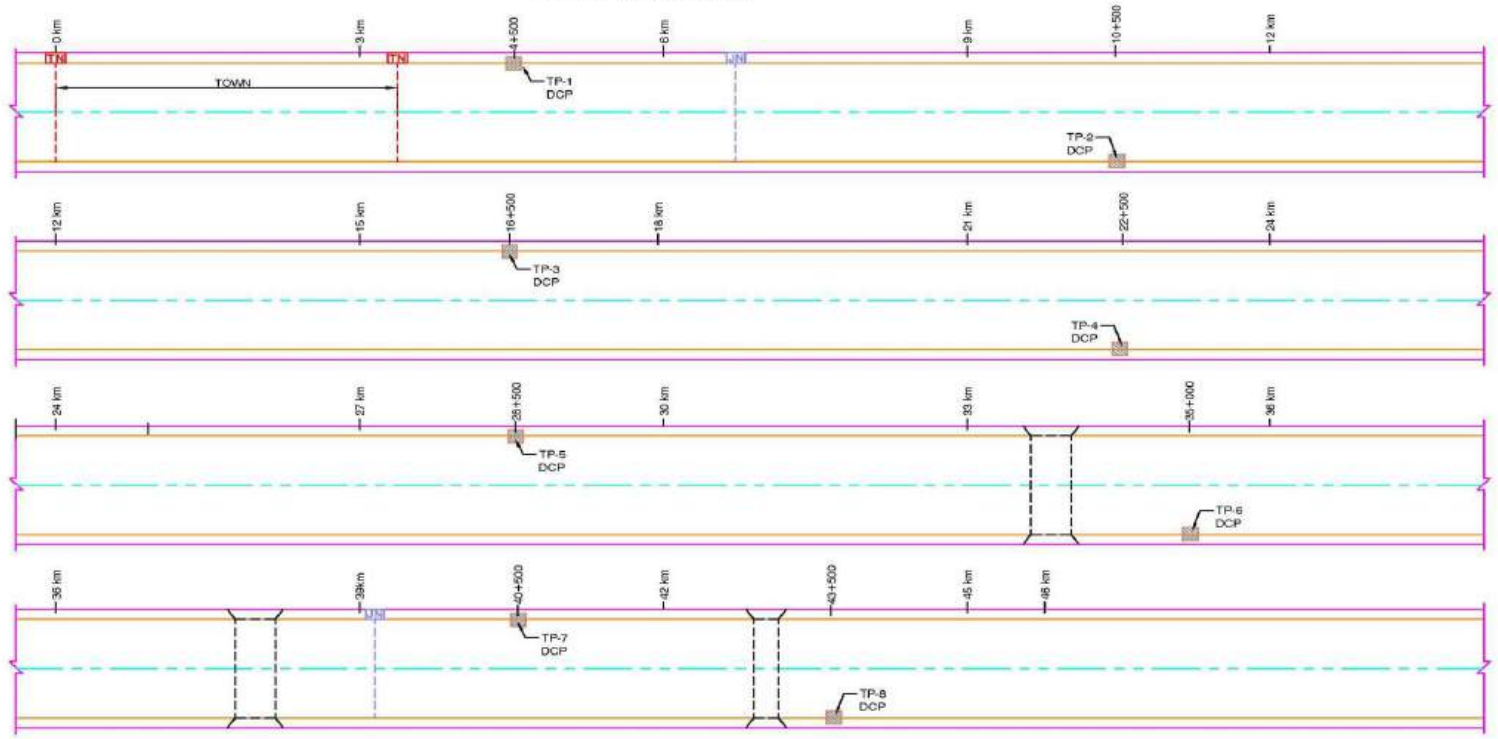
- Site description and site plan
- Investigation methodology
- Detailed logs, and location plans
- Laboratory test results (with summary of test results)

APPENDIX A

TEST PIT AND DCPT LOCATION PLAN

SYLHET-CHARKHAI-SHEWLA-SUTARKANDI ROAD (46 km)

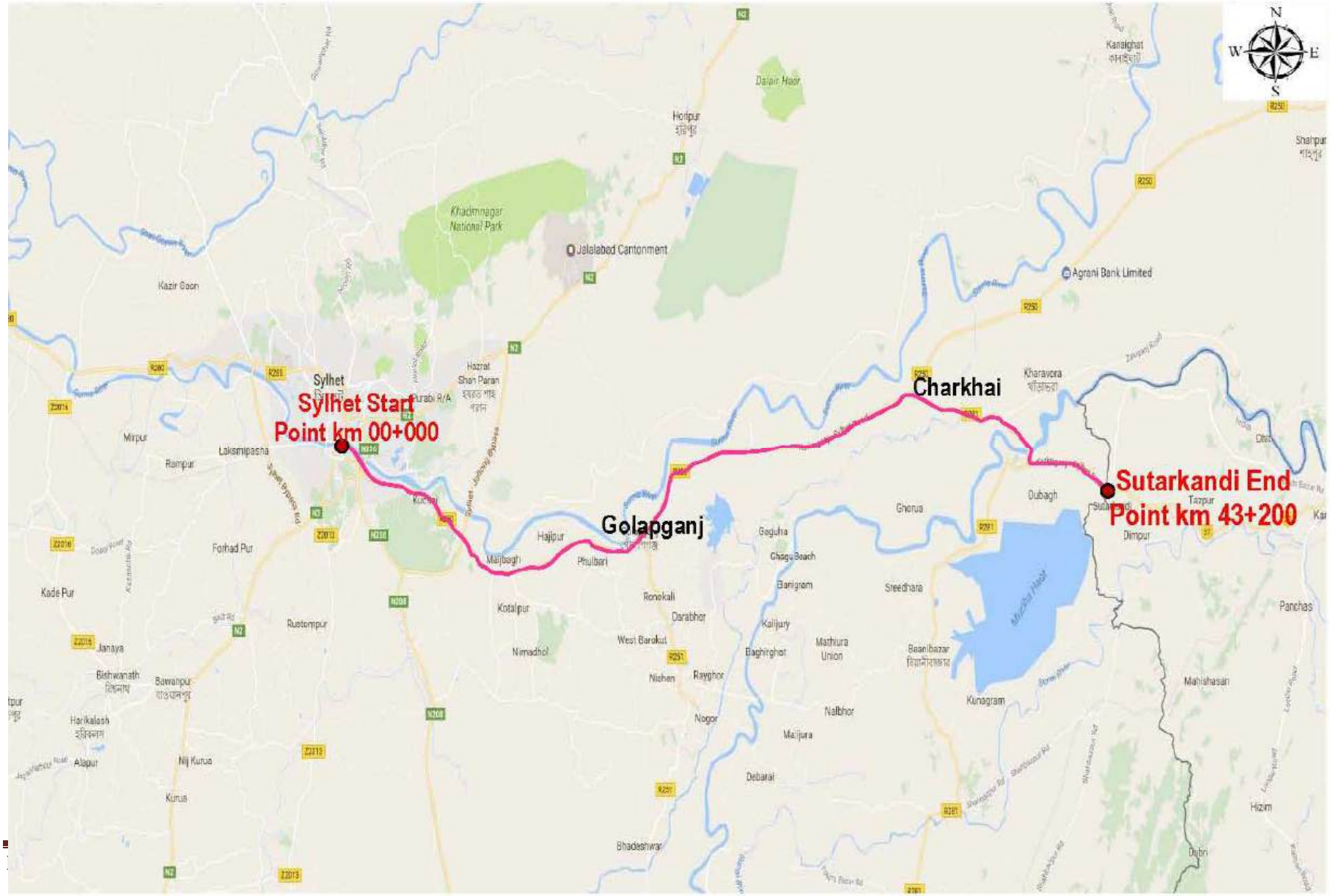
PAVEMENT INVENTORY



LEGEND

- Center line
- Pavement edge
- Verge edge
- Rail crossing
- Underpass
- Bridge
- Junction
- Town
- TP/DCP = Test to be done : Sub grade materials-CBR,LL-PI

Sylhet-Charkhai-Sheola-Sutarkandi Road (46 Km)



APPENDIX B

SUMMARY OF COORDINATES

Test Pit Coordinates for Sylhet-Charkhai-Sheola-Sutarkandi Road

Road Name	Length, Km	No. of Pits	Sl No. of Test Pit	Date of Test	Location	Chainage	Northing	Easting	Size of Test Pit	Remarks
Sylhet-Charkhai-Sheola-Sutarkandi Road	46	8	TP-01	26.02.18	Kuchai	4+500	2751210.00	389571.00	1.1mX1.02mX0.68m	On Pavement
			TP-02	26.02.18	Hetimgonj	10+500	2748527.00	394601.00	1mX1.1mX0.54m	On Pavement
			TP-03	26.02.18	Golapganj	16+500	2749451.00	400246.00	1.1mX1.2mX0.5m	On Pavement
			TP-04	27.02.18	Ranapin	22+500	2752548.00	404928.00	1mX1mX0.5m	On Pavement
			TP-05	27.02.18	Biyani Bazar	28+500	2753303.00	410803.00	1.1mX1.2mX0.5m	On Pavement
			TP-06	25.02.18	Shodakhal	35+000	2753787.00	417025.00	1.6mX1.1mX0.61m	On Pavement
			TP-07	25.02.18	Dubag	40+500	2752075.00	421394.00	1.1mX1.3mX0.71m	On Pavement
			TP-08	25.02.18	Sutarkandi	43+500	2750980.00	424108.00	1.1mX1.3mX1.1m	On Pavement

DCPT Coordinates for Sylhet-Charkhai-Sheola-Sutarkandi Road

Road Name	Length, Km	No. of DCPT	Sl No. of DCPT	Date of Test	Location	Chainage	Northing	Easting	Remarks
Sylhet-Charkhai-Sheola-Sutarkandi Road	46	12	DCPT-04	26.02.18	Kuchai	4+500	2751210.00	389571.00	On Improved Subgrade
			DCPT-05	26.02.18	Hetimgonj	10+503	2748527.00	394605.00	On Shoulder
			DCPT-06	26.02.18	Hetimgonj	10+500	2748527.00	394601.00	On Improved Subgrade
			DCPT-07	26.02.18	Golapganj	16+500	2749451.00	400246.00	On Improved Subgrade
			DCPT-08	27.02.18	Ranapin	22+500	2752548.00	404928.00	On Improved Subgrade
			DCPT-09	27.02.18	Biyani Bazar	28+485	2753303.00	410789.00	On Shoulder
			DCPT-10	27.02.18	Biyani Bazar	28+500	2753303.00	410803.00	On Improved Subgrade
			DCPT-11	25.02.18	Biyani Bazar	35+000	2753787.00	417025.00	On Improved Subgrade

DCPT Coordinates for Sylhet-Charkhai-Sheola-Sutarkandi Road

Road Name	Length, Km	No. of DCP	Sl No. of DCPT	Date of Test	Location	Chainage	Northing	Easting	Remarks
Sylhet-Charkhai-Sheola-Sutarkandi Road	46	12	DCPT-12	25.02.18	Shodakhal	35+010	2753787.00	417025.00	On Shoulder
			DCPT-13	25.02.18	Dubag	40+500	2752075.00	421394.00	On Improved Subgrade
			DCPT-14	25.02.18	Sutarkandi	43+485	2750980.00	424100.00	On Shoulder
			DCPT-15	25.02.18	Sutarkandi	43+500	2750980.00	424108.00	On Improved Subgrade

Borrow Pit Coordinates for Sylhet-Charkhai-Sheola-Sutarkandi Road (Outside of the Pavement)

Road Name	Length, Km	No. of Sample	Sl No. of Borrow Pit	Date of Test	Location	Source of Material	Northing	Easting	Remarks
Sylhet-Charkhai-Sheola-Sutarkandi Road	46	2	BP-01	25.02.18	Zero Point	Surma River	2753470.00	418668.00	30m Away from Existing Road
			BP-02	25.02.18	Khanaghat	Brick Field Soil	2751978.00	421129.00	120m Away from Existing Road

Quarry Materials Coordinates for Sylhet-Charkhai-Sheola-Sutarkandi Road (Outside of the Pavement)

Road Name	Length, Km	No. of Sample	Sl No. of Quarry Materials/Fine Aggregate	Date of Test	Location	Source of Material	Northing	Easting	Remarks
Sylhet-Charkhai-Sheola-Sutarkandi Road	46	4	QM-01	03.03.18	Shalutikor Ghat	Bichanakandi Coarse Agg.	2764576.00	384222.00	Bichanakandi
			FA-01	03.03.18	Shalutikor Ghat	Sylhet Sand	2764144.00	384386.00	Shalutikor
			QM-02	03.03.18	Laalbhag	Volagonj Coarse Agg.	2762263.00	384931.00	Volagonj
			FA-02	03.03.18	Laalbhag	Sylhet Sand	2762263.00	384931.00	Laalbhag

APPENDIX C

Test Pit logs

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**1**	**CH:**	**4+500 Km**	**N:**	**2751210**	**E:**	**389571**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.1mx1.02mx0.67m**	
Location :		**Kuchai Sylhet**			**Date**	**26.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	50	Bituminous Binder Course	
100			
150			
200			
250	420	Base and Sub-base Course (Stone Chips & Sand)	
300			
350			
400			
450			
500	200	Improved Subgrade (Silty fine SAND)	
550			
600			
650			
700			
750			
800			
850			
900			
950			
1000			
1050			
1100			
1150			
1200			
1250			
1300			

End of the Test Pit

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**2**	**CH:**	**10+500 Km**	**N:**	**2748527**	**E:**	**394601**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1mx1.1mx0.54m**	
Location :		**Hetimgonj Sylhet**			**Date**	**26.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	220	Bituminous Binder Course	
250	130	Base and Sub-base Course (Stone Chips & Sand)	
350	80	Brick Soling	
450	110	Improved Subgrade (Lean Clay)	

End of the Test Pit

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**3**	**CH:**	**16+500 Km**	**N:**	**2749451**	**E:**	**400246**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.1mx1.2mx0.5m**	
Location :		**Golapganj Sylhet**			**Date**	**26.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	90	Bituminous Binder Course	
100			
150			
200			
250	360	Base and Sub-base Course (Stone Chips & Sand)	
300			
350			
400			
450	50	Improved Subgrade (Silty fine SAND)	
500			

End of the Test Pit

550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**4**	**CH:**	**22+500 Km**	**N:**	**2752548**	**E:**	**404928**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.0mx1.0mx0.5m**	
Location :		**Ranapin, Sylhet**			**Date**	**27.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	50	Bituminous Binder Course	
100	110	Base & Sub-base (Uncrushed Stone Aggregates)	
150			
200	90	Clayey SILT	
250			
300	250	Improved Subgrade (Silty fine SAND)	
350			
400			
450			
500			
550			
600			
650			
700			
750			
800			
850			
900			
950			
1000			
1050			
1100			
1150			
1200			
1250			
1300			

End of the Test Pit

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**5**	**CH:**	**28+500 Km**	**N:**	**2753303**	**E:**	**410803**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.1mx1.2mx0.5m**	
Location :		**Biyani Bazar Sylhet**			**Date**	**27.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	100	Bituminous Binder Course	
100			
150	80	Base & Sub-base Course (Stone Chips & Sand)	
200			
250	120	Bituminous Binder Course	
300			
350			
400	200	Base & Sub-base Course (Stone Chips & Sand)	
450			
500			
550	180	Improved Subgrade (Silty fine SAND)	
600			
650			
700			
750			
800			
850			
900			
950			
1000			
1050			
1100			
1150			
1200			
1250			
1300			

End of the Test Pit

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**6**	**CH:**	**35+000 Km**	**N:**	**2753787**	**E:**	**417025**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.6mx1.10mx0.74m**	
Location :		**Shodakhal, Sylhet**			**Date**	**25.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	170	Bituminous Binder Course	
200	170	Base Course (Brick Chips & Sand)	
350	270	Sub-base Course (Stone Chips & Sand)	
600	130	Improved Subgrade (Lean Clay)	
750		**End of the Test Pit**	

1000
1050
1100
1150
1200
1250
1300

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**7**	**CH:**	**40+500 Km**	**N:**	**2752075**	**E:**	**421394**
Client :		**Roads and Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.1mx1.30mx0.74m**	
Location :		**Dubag Sylhet**			**Date**	**25.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	110	Bituminous Binder Course	
150	380	Base Course (Stone Chips & Sand)	
500	220	Sub-base Course (Stone Chips and Sand)	
700	30	Improved Subgrade (Silty fine SAND)	
750		**End of the Test Pit**	

1000
1050
1100
1150
1200
1250
1300

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

TEST PIT On (ON EXISTING PAVEMENT), Package-1

TP NO:	**8**	**CH:**	**43+500 Km**	**N:**	**2750980**	**E:**	**424108**
Client :		**Roads ad Highways Department**			**Method of digging**	**Manual**	
Project :		**SRTPPF-II**			**Size of the Pit**	**1.1mx1.30mx1.10m**	
Location :		**Sutarkandi Sylhet**			**Date**	**25.02.2018**	

Depth(mm)	Thickness(mm)	DESCRIPTION OF MATERIALS	LOG
50	40	Bituminous Binder Course	
100	80	Base Course (Stone Chips and Sand)	
150	40	Bituminous Binder Course	
200	600	Base & Sub-base Course (Stone Chips & Sand)	
750	350	Improved Subgrade (Lean Clay)	
1100		**End of the Test Pit**	

Note(s):

EHAN FOUNDATION SOLUTION

Prepared by: Kaiser	**Checked by: Moheful**	**Date: 11.03.2018**

APPENDIX D

CBR Calculation from DCP

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-04

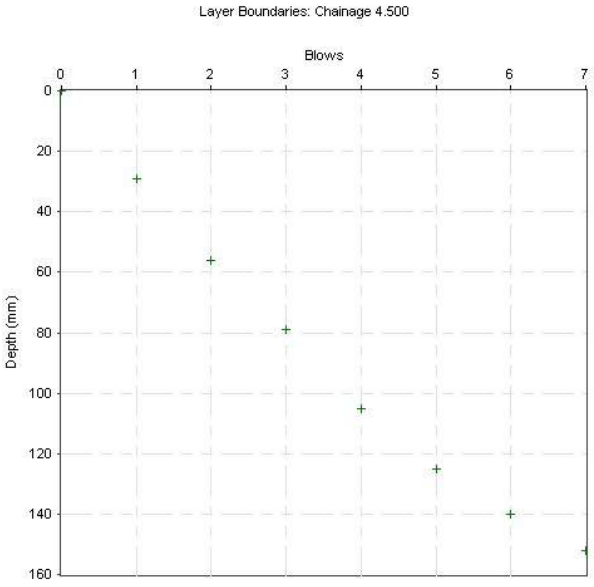
Chainage (km): 4.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	29	29.00					
3	1	2	56	27.00					
4	1	3	79	23.00					
5	1	4	105	26.00					
6	1	5	125	20.00					
7	1	6	140	15.00					
8	1	7	152	12.00					

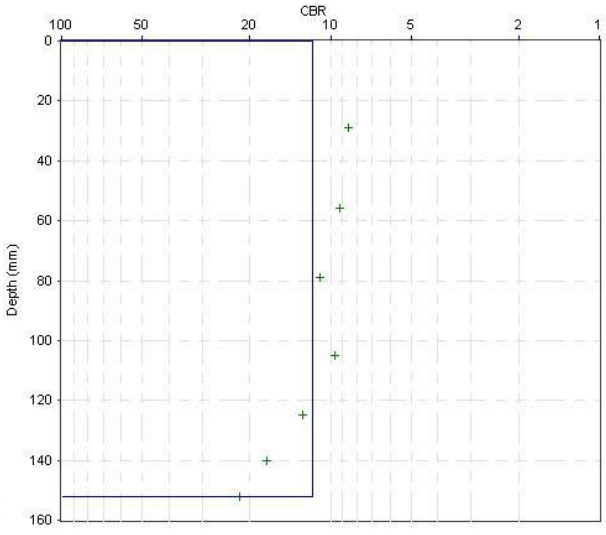
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-04

Chainage (km): 4.500



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	21.71	12	152	152	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-05

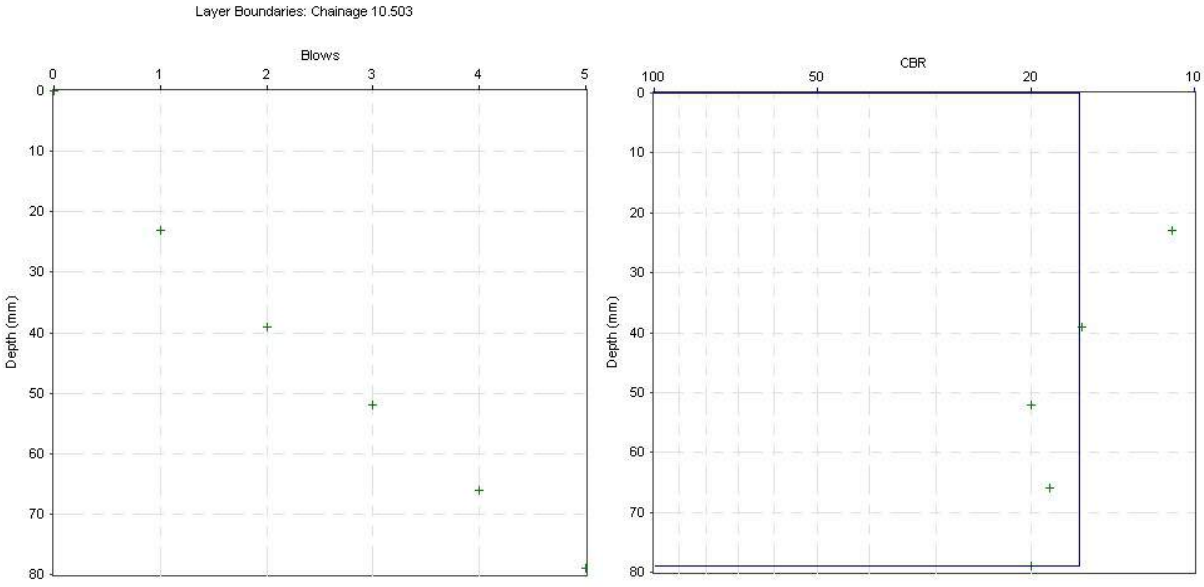
Chainage (km): 10.503

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	23	23.00					
3	1	2	39	16.00					
4	1	3	52	13.00					
5	1	4	66	14.00					
6	1	5	79	13.00					

DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-05

Chainage (km): 10.503



Layer Boundaries Chart

CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	15.80	16	79	79	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-06

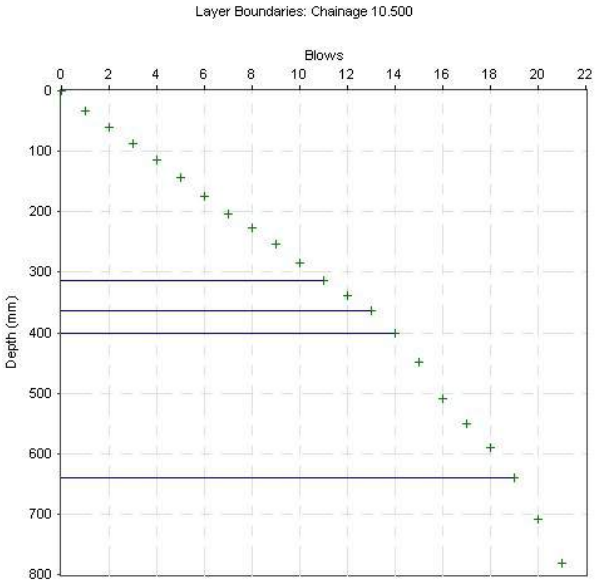
Chainage (km): 10.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	34	34.00					
3	1	2	60	26.00					
4	1	3	87	27.00					
5	1	4	114	27.00					
6	1	5	144	30.00					
7	1	6	174	30.00					
8	1	7	203	29.00					
9	1	8	227	24.00					
10	1	9	254	27.00					
11	1	10	284	30.00					
12	1	11	314	30.00					
13	1	12	339	25.00					
14	1	13	364	25.00					
15	1	14	400	36.00					
16	1	15	449	49.00					
17	1	16	509	60.00					
18	1	17	550	41.00					
19	1	18	591	41.00					
20	1	19	639	48.00					
21	1	20	709	70.00					
22	1	21	781	72.00					

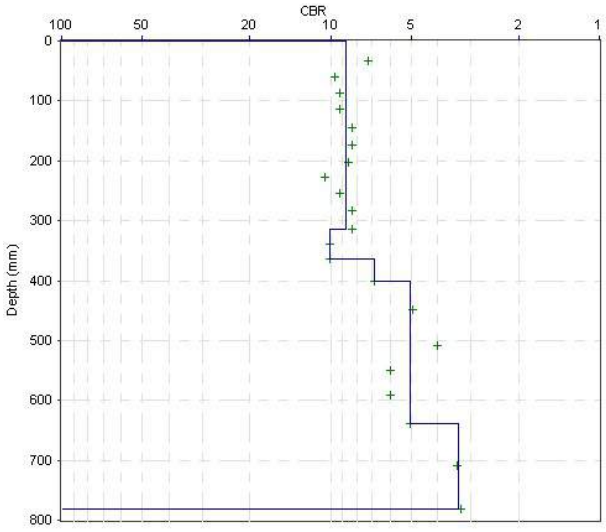
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-06

Chainage (km): 10.500



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	28.55	9	314	314	Subgrade	--	--	--	--
2	25.00	10	50	364	Subgrade	--	--	--	--
3	36.00	7	36	400	Subgrade	--	--	--	--
4	47.80	5	239	639	Subgrade	--	--	--	--
5	71.00	3	142	781	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-07

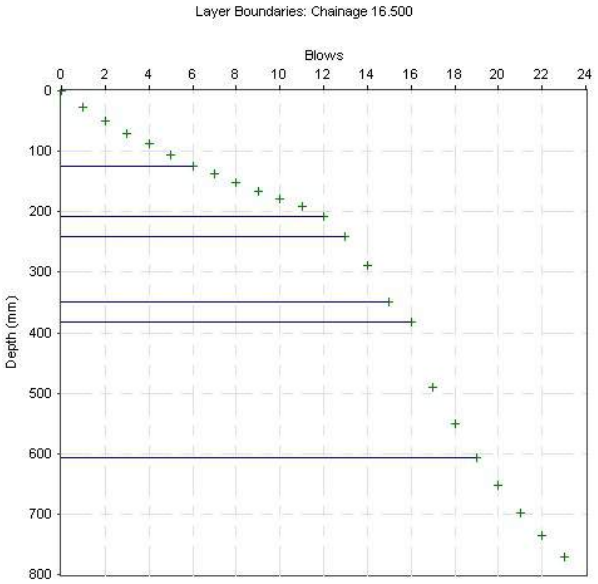
Chainage (km): 16.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	26	26.00					
3	1	2	49	23.00					
4	1	3	71	22.00					
5	1	4	88	17.00					
6	1	5	106	18.00					
7	1	6	125	19.00					
8	1	7	138	13.00					
9	1	8	152	14.00					
10	1	9	167	15.00					
11	1	10	178	11.00					
12	1	11	191	13.00					
13	1	12	208	17.00					
14	1	13	242	34.00					
15	1	14	288	46.00					
16	1	15	349	61.00					
17	1	16	382	33.00					
18	1	17	491	109.00					
19	1	18	551	60.00					
20	1	19	606	55.00					
21	1	20	653	47.00					
22	1	21	698	45.00					
23	1	22	735	37.00					
24	1	23	770	35.00					

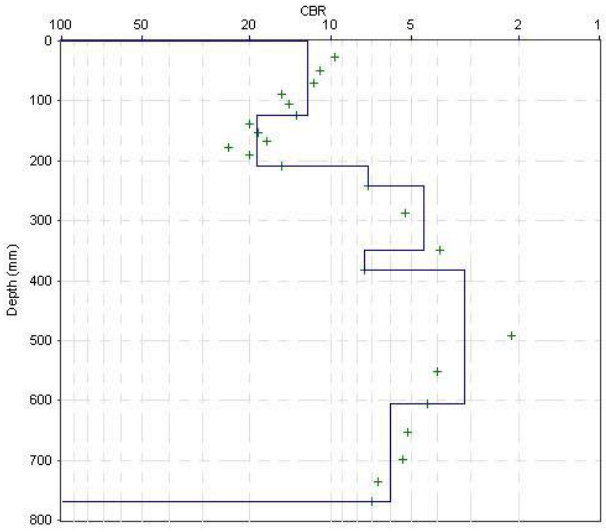
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-07

Chainage (km): 16.500



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	20.83	12	125	125	Subgrade	--	--	--	--
2	13.83	19	83	208	Subgrade	--	--	--	--
3	34.00	7	34	242	Subgrade	--	--	--	--
4	53.50	4	107	349	Subgrade	--	--	--	--
5	33.00	7	33	382	Subgrade	--	--	--	--
6	74.67	3	224	606	Subgrade	--	--	--	--
7	41.00	6	164	770	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-08

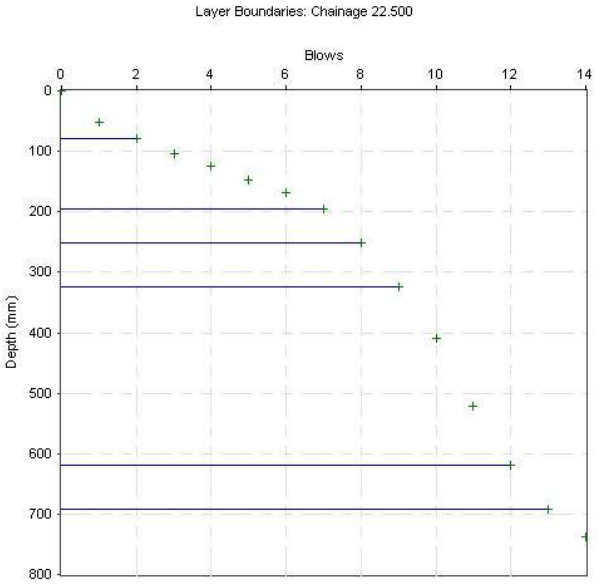
Chainage (km): 22.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	51	51.00					
3	1	2	79	28.00					
4	1	3	103	24.00					
5	1	4	125	22.00					
6	1	5	148	23.00					
7	1	6	169	21.00					
8	1	7	196	27.00					
9	1	8	252	56.00					
10	1	9	324	72.00					
11	1	10	409	85.00					
12	1	11	521	112.00					
13	1	12	619	98.00					
14	1	13	692	73.00					
15	1	14	738	46.00					

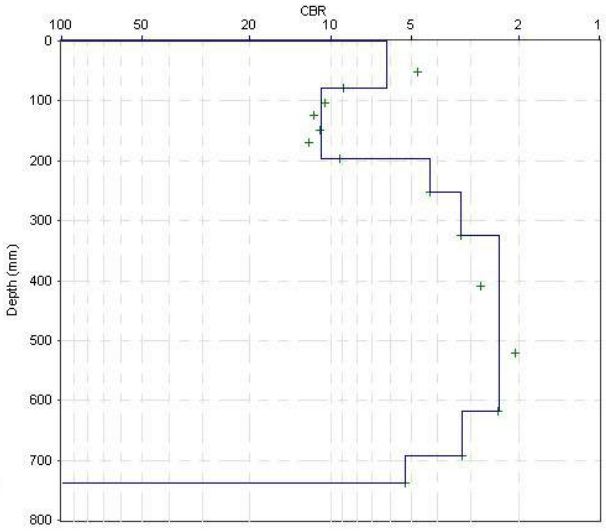
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-08

Chainage (km): 22.500



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	39.50	6	79	79	Subgrade	--	--	--	--
2	23.40	11	117	196	Subgrade	--	--	--	--
3	56.00	4	56	252	Subgrade	--	--	--	--
4	72.00	3	72	324	Subgrade	--	--	--	--
5	98.33	2	295	619	Subgrade	--	--	--	--
6	73.00	3	73	692	Subgrade	--	--	--	--
7	46.00	5	46	738	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-09

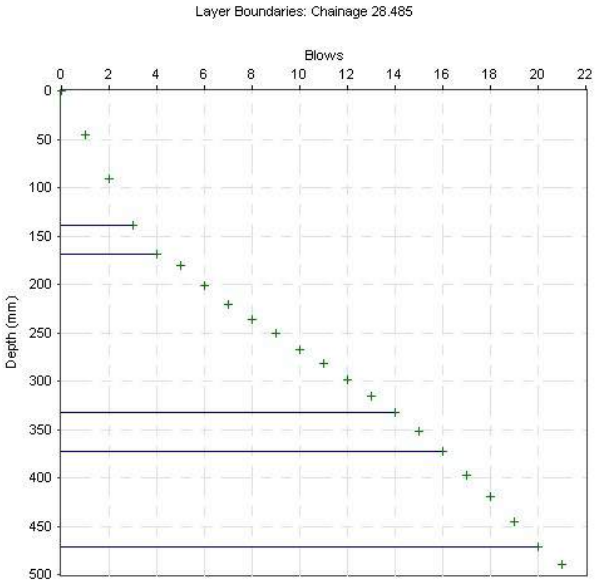
Chainage (km): 28.485

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	46	46.00					
3	1	2	91	45.00					
4	1	3	139	48.00					
5	1	4	169	30.00					
6	1	5	180	11.00					
7	1	6	201	21.00					
8	1	7	221	20.00					
9	1	8	237	16.00					
10	1	9	251	14.00					
11	1	10	267	16.00					
12	1	11	282	15.00					
13	1	12	299	17.00					
14	1	13	315	16.00					
15	1	14	332	17.00					
16	1	15	352	20.00					
17	1	16	373	21.00					
18	1	17	397	24.00					
19	1	18	420	23.00					
20	1	19	445	25.00					
21	1	20	471	26.00					
22	1	21	490	19.00					

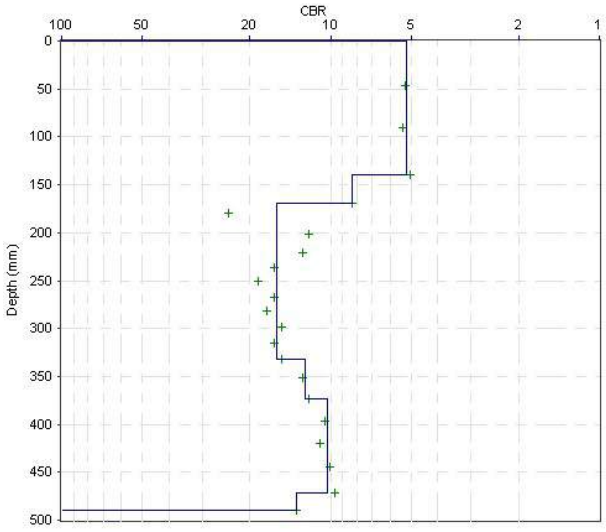
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-09

Chainage (km): 28.485



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	46.33	5	139	139	Subgrade	--	--	--	--
2	30.00	8	30	169	Subgrade	--	--	--	--
3	16.30	16	163	332	Subgrade	--	--	--	--
4	20.50	12	41	373	Subgrade	--	--	--	--
5	24.50	10	98	471	Subgrade	--	--	--	--
6	19.00	13	19	490	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-10

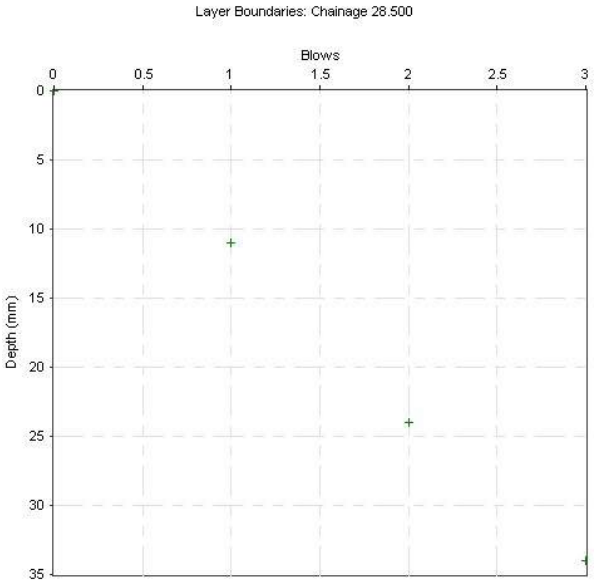
Chainage (km): 28.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	11	11.00					
3	1	2	24	13.00					
4	1	3	34	10.00					

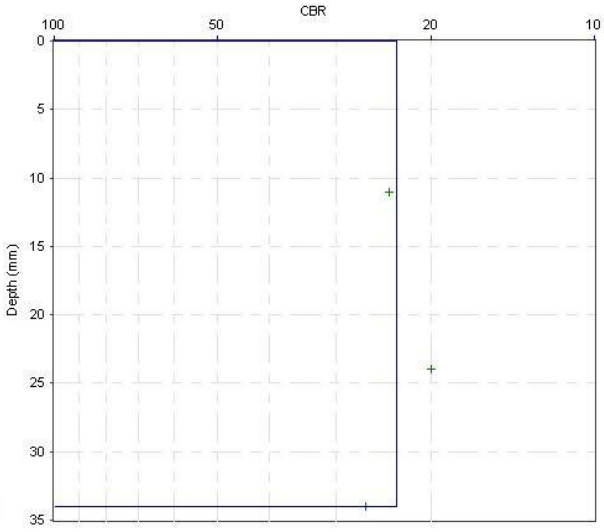
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-10

Chainage (km): 28.500



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	11.33	23	34	34	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-11

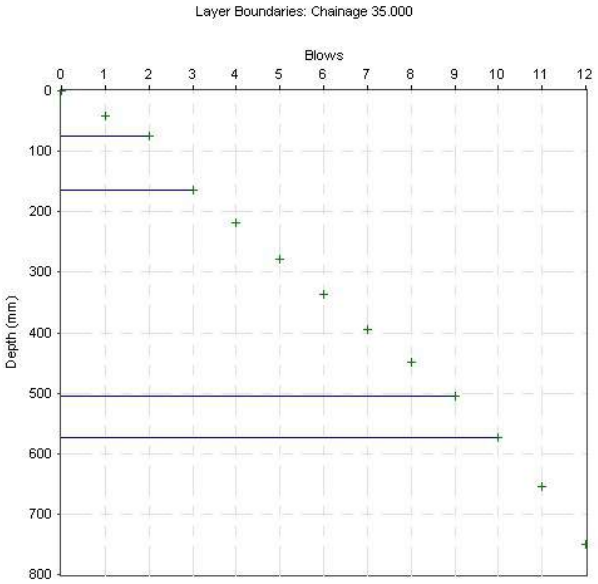
Chainage (km): 35.000

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	41	41.00					
3	1	2	75	34.00					
4	1	3	164	89.00					
5	1	4	219	55.00					
6	1	5	279	60.00					
7	1	6	336	57.00					
8	1	7	394	58.00					
9	1	8	449	55.00					
10	1	9	505	56.00					
11	1	10	574	69.00					
12	1	11	655	81.00					
13	1	12	751	96.00					

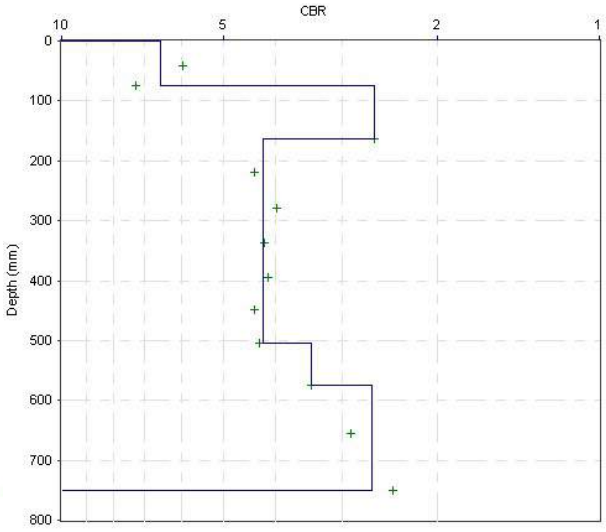
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-11

Chainage (km): 35.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	37.50	7	75	75	Subgrade	--	--	--	--
2	89.00	3	89	164	Subgrade	--	--	--	--
3	56.83	4	341	505	Subgrade	--	--	--	--
4	69.00	3	69	574	Subgrade	--	--	--	--
5	88.50	3	177	751	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-12

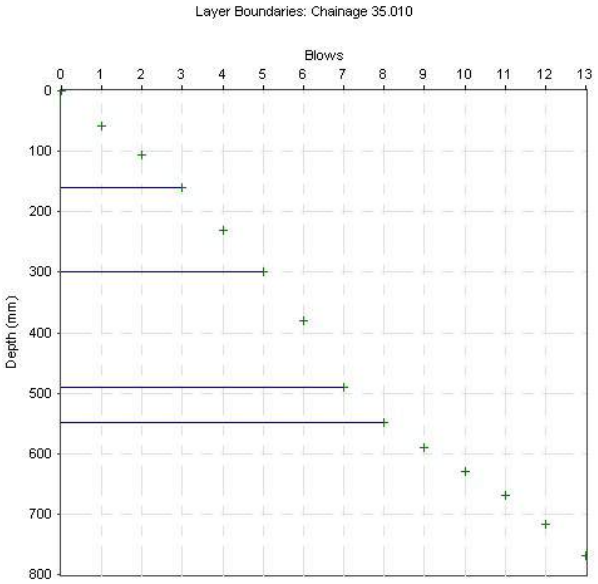
Chainage (km): 35.010

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	58	58.00					
3	1	2	107	49.00					
4	1	3	161	54.00					
5	1	4	230	69.00					
6	1	5	300	70.00					
7	1	6	381	81.00					
8	1	7	490	109.00					
9	1	8	549	59.00					
10	1	9	590	41.00					
11	1	10	630	40.00					
12	1	11	670	40.00					
13	1	12	717	47.00					
14	1	13	769	52.00					

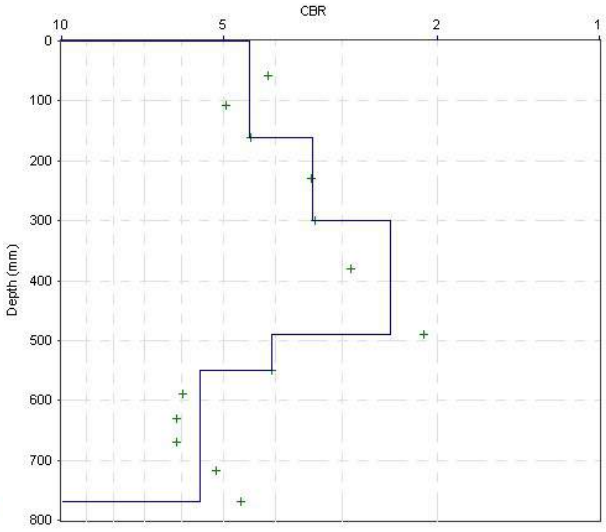
DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-12

Chainage (km): 35.010



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	53.67	4	161	161	Subgrade	--	--	--	--
2	69.50	3	139	300	Subgrade	--	--	--	--
3	95.00	2	190	490	Subgrade	--	--	--	--
4	59.00	4	59	549	Subgrade	--	--	--	--
5	44.00	6	220	769	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-13

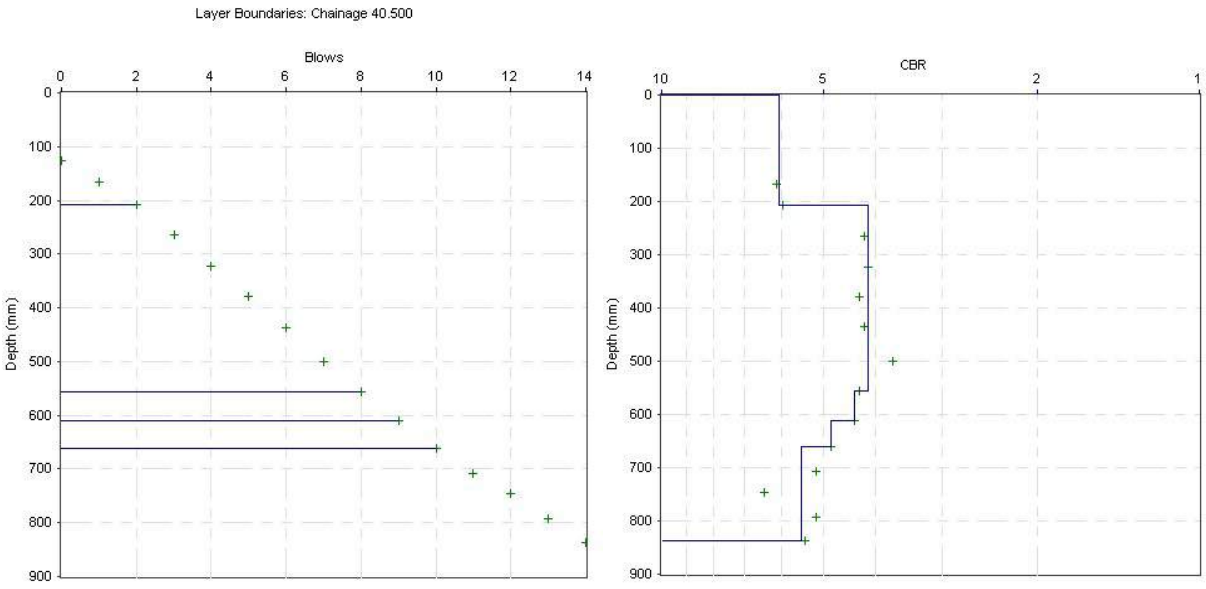
Chainage (km): 40.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	127	0.00					
2	1	1	167	40.00					
3	1	2	208	41.00					
4	1	3	265	57.00					
5	1	4	323	58.00					
6	1	5	379	56.00					
7	1	6	436	57.00					
8	1	7	500	64.00					
9	1	8	556	56.00					
10	1	9	611	55.00					
11	1	10	661	50.00					
12	1	11	708	47.00					
13	1	12	746	38.00					
14	1	13	793	47.00					
15	1	14	838	45.00					

DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-13

Chainage (km): 40.500



Layer Boundaries Chart

CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	40.50	6	208	208	Subgrade	--	--	--	--
2	58.00	4	348	556	Subgrade	--	--	--	--
3	55.00	4	55	611	Subgrade	--	--	--	--
4	50.00	5	50	661	Subgrade	--	--	--	--
5	44.25	5	177	838	Subgrade	--	--	--	--

Report produced by .....

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-14

Chainage (km): 43.485

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	17	17.00					
3	1	2	29	12.00					
4	1	3	40	11.00					

Penetration Data Report

Project Name: Sylhet Sutarkand Road DCPT-15

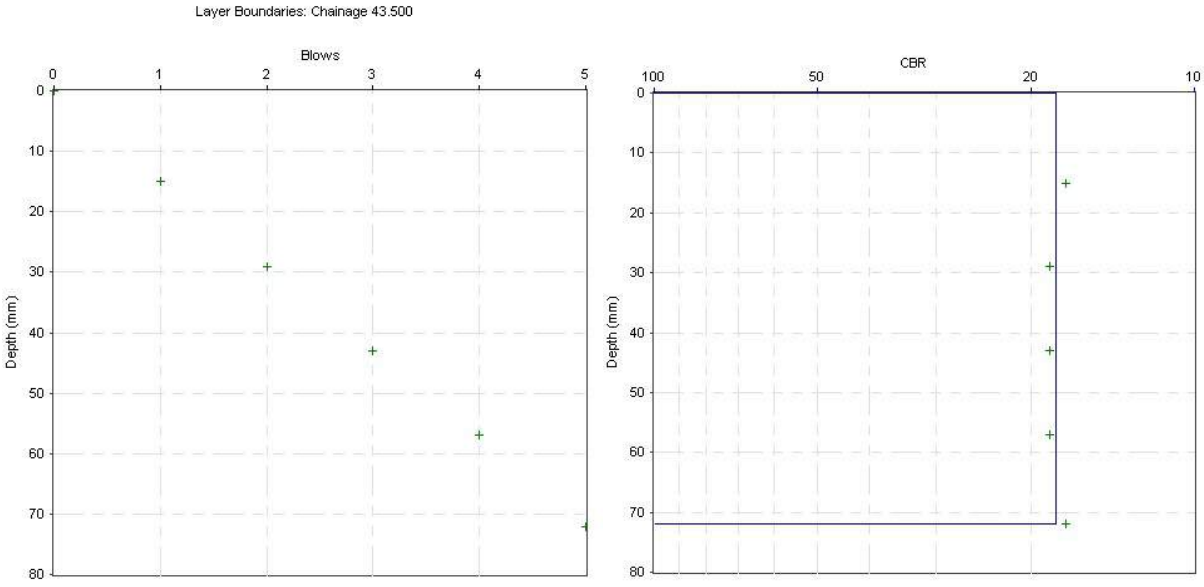
Chainage (km): 43.500

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	0	0.00					
2	1	1	15	15.00					
3	1	2	29	14.00					
4	1	3	43	14.00					
5	1	4	57	14.00					
6	1	5	72	15.00					

DCP Layer Strength Analysis Report

Project Name: Sylhet Sutarkand Road DCPT-15

Chainage (km): 43.500



Layer Boundaries Chart

CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)	Position	Strength Coefficient	SN	SNC	SNP
1	14.40	18	72	72	Subgrade	--	--	--	--

Report produced by .....

APPENDIX E

Laboratory Test Reports with Summary Sheet

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-01**
Date Sampled: 11.03.18
Date Tested: 11.03.18
Location of Sample: Kuchai

Description of Material: Silty Sand
Dry Constant Weight: 322.38 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	3.90	3.9	1.7	98.3	
8	2.36	5.24	9.14	4.0	96.0	
16	1.18	4.98	14.12	6.1	93.9	
30	0.600	3.01	17.13	7.4	92.6	
40	0.425	3.26	20.39	8.8	91.2	
50	0.300	3.70	24.09	10.5	89.5	
100	0.150	68.73	92.82	40.3	59.7	
200	0.075	133.88	226.70	98.4	1.6	
Pan		3.71	230.41			
Total		230.41				

Fineness Modulus (FM) = 0.79

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Kuchai

Area represented: Shylet to sutarkandi

Material description: Silty Sand

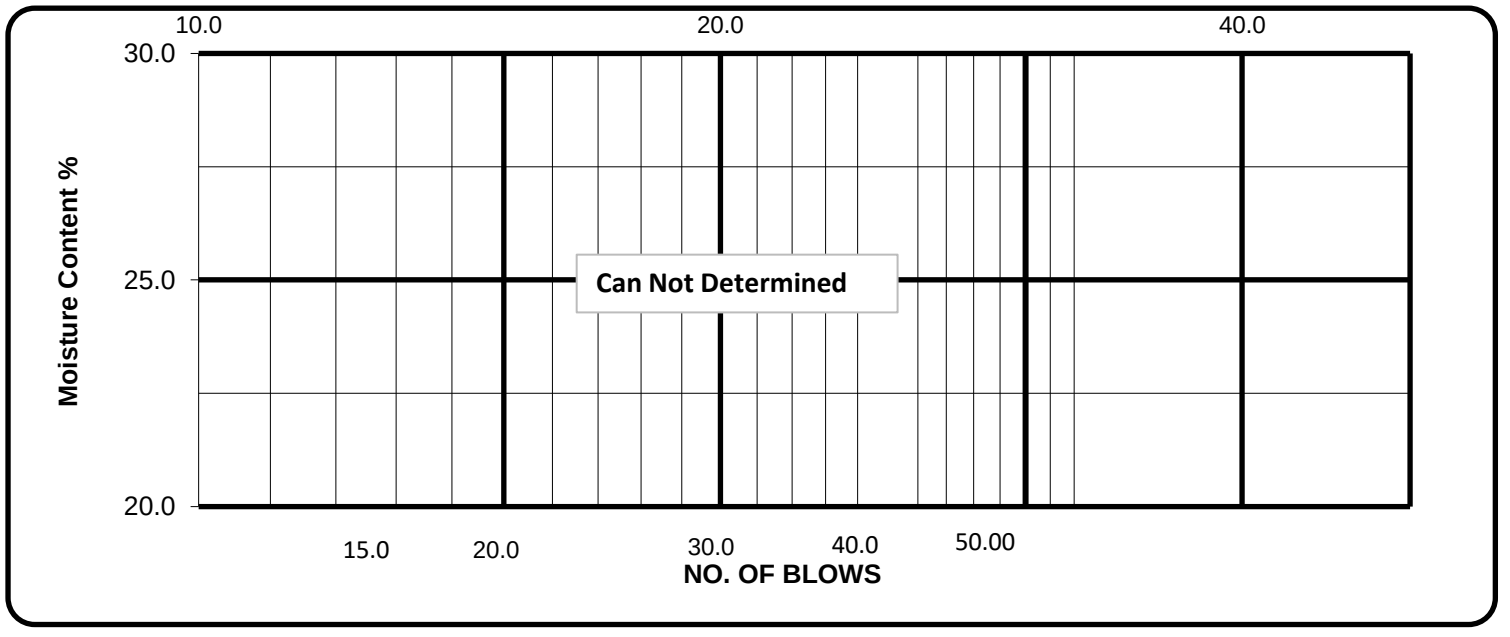
Sample No.: **TP-01**

Date Sampled: **16.03.18**

Date Tested: **16.03.18**

Tested at: **Chittagong Lab**

TEST									
	LIQUID LIMIT					PLASTIC LIMIT			
Determination Number	1	2	3	4		1	2	3	4
Container Number	L 6								
Mass of Container + Wet Soil m_1 gm	55.66								
Mass of Container + DrySoil m_2 gm	50.28								
Mass. of Water $m_3=(m_1-m_2)$ gm	5.38								
Mass of Container m_4 gm	26.10								
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	24.18								
Moisture Content $((m_3/m_5) \times 100)$ %	22.2								
Number of Blows	8								



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
NP	NP	NP

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Kuchai

Area represented: Shylet to sutarkandi

Material description: Silty Sand

Sample No.: **TP-01**

Date Sampled: **16.03.18**

Date Tested: **16.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		H	R		
Mass of Container + Wet Soil, m_1 gm		410.52	391.07		
Mass of Container + DrySoil, m_2 gm		355.96	339.53		
Mass. of Water, $m_3=(m_1 - m_2)$ gm		54.56	51.54		
Mass of Container, m_4 gm		61.32	57.54		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		294.64	281.99		
Moisture Content, $((m_3/m_5) \times 100)$ %		18.5	18.3		
Average Moisture Content %		18.40			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample : Kuchai
Description of Materials: Silty Sand

Sample No: **TP-01**
Date Sampled: 3/12/2018
Date Tested: 3/12/2018
Tested by: **Chittagong Lab**
Drop Height: 450 mm
Initial Moisture: 4.25

Dia of Mould : 152 mm
Volume of Mould: 2114 cc
No. of Layer: 5

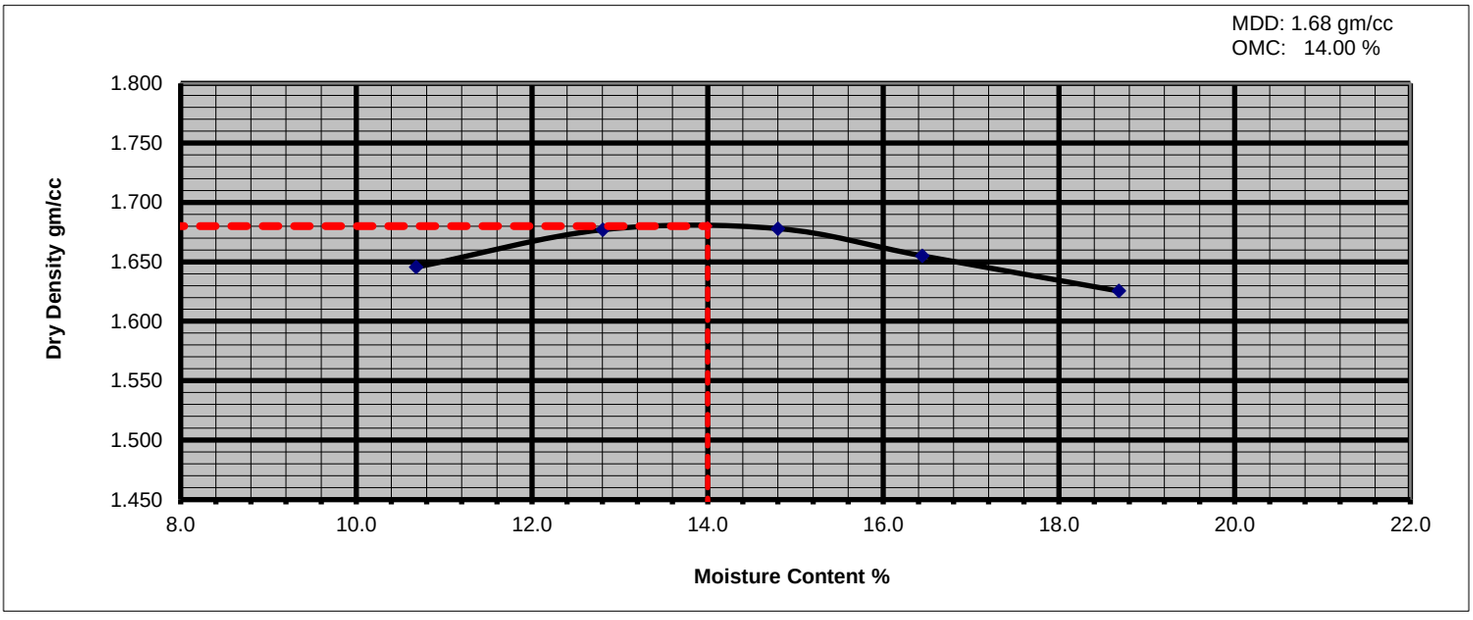
Ht. of Mould : 116.5 mm
Wt of Hammer: 4.5 kg
Blows/Layer.: 56

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
Traget W/C	%	11	13	15	17	19	
Water Added	g	324	420	516	612	708	
Wt.of Mould +Wet Soil	g	6669	6818	6891	6893	6897	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	3850	3999	4072	4074	4078	
Bulk Density	gm/cc	1.821	1.892	1.926	1.927	1.929	
Dry Density	gm/cc	1.645	1.677	1.678	1.655	1.625	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		N	S	Q	G	L	T	R	M	H	P	F
Wt of Can +Wet Soil	g	240.1	242.3	229.8	261.3	232.4	278.8	262.2	254.5	268.8	274.8	210.10
Wt of Can +Dry Soil	g	221.7	224.6	209.2	240.3	208.9	248.6	233.7	227.2	235.8	239.5	203.39
Wt.of Water	g	18.3	17.7	20.6	21.0	23.4	30.2	28.5	27.3	33.0	35.3	6.71
Wt.of Can	g	50.13	59.38	49.63	75.30	49.86	45.25	60.50	60.87	59.61	50.30	45.60
Wt.of Dry Soil	g	171.6	165.2	159.6	165.0	159.1	203.3	173.2	166.3	176.2	189.2	157.79
Mousture Content	%	10.6	10.7	12.9	12.7	14.7	14.9	16.4	16.4	18.7	18.7	4.25
Ave.Moisture Content	%	10.7		12.8		14.8		16.4		18.7		4.25



Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3
AASHTO T-193

Location/ Source of Sample : Kuchai
Area represented: Shylet to Sutarkandi
Description of Material: Silty Sand

Sample No: ***TP-01***
Date Sampled: 16.03.2018
Date Tested: 16.03.2018
Tested at: **Chittagong Lab**
MDD 1.680 gm/cc
OMC 14.0 %

UNIT WEIGHT DATA (BEFORE SOAKING)

No. of Mould		10	11	12
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	8255	8431	8370
Mass of Mould m_2	gm	4166	4116	3886
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4089	4315	4484
Volume of Mould V	cm3	2305	2323	2323
Wet Unit Weight m_3/V	gm/cm3	1.774	1.858	1.930
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.551	1.625	1.690
% Compaction (Modified Proctor)		92.3	96.7	100.6

MOISTURE CONTENT DATA

No. of Mould		10		11		12	
Container No.		B	C	A	F	E	D
Mass of Container + Wet Soil m_4	gm	229.8	232.2	241.18	210.8	219.9	229.31
Mass of Container + Dry Soil m_5	gm	206.2	208.3	216.3	190.2	197.9	206.4
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	23.57	23.9	24.9	20.64	22.01	22.9
Mass of Container m_7	gm	43.13	41.87	42.84	45.06	43.55	44.90
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	163.1	166.45	173.47	145.10	154.34	161.51
Moisture Content	%	14.5	14.3	14.3	14.2	14.3	14.2
Average Moisture Content	%	14.40		14.28		14.22	

Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 16.03.2018

SWELLING DATA

Sample No: **TP-01**

Day and Month	Time Soaking Hours	Time Elapsed	Mould No. 10 Specimen Ht.=127mm			Mould No. 11 Specimen Ht.=127mm			Mould No. 12 Specimen Ht.=127mm		
			Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell
17-Mar-18	10:30	0	0			0			0		
18-Mar-18	"	24									
19-Mar-18	"	48									
20-Mar-18	"	72									
21-Mar-18	"	96	130	1.3	1.02	110	1.1	0.87	80	0.8	0.63

SOAKING DATA

		Mould No. 10	Mould No. 11	Mould No. 12
Mass. of Soil + Mould + Base Plate (Before Soaking) m_1	gm	10667	12547	12268
Mass. of Soil + Mould + Base Plate (After Soaking) m_2	gm	10878	12722	12400
Mass of Mould + Base Plate m_3		4166	4116	3886
Water Absorbed $m_4=(m_2-m_1)$		211	175	132
Mass. of Dry Soil in Mould	gm	3574	3776	3926
Water Absorbed $((m_4/m_5)x100)$	%	5.90	4.6	3.4

MOISTURE CONTENT (AFTER SOAKING)

		Mould No. 10		Mould No. 11		Mould No. 12	
Container No.	gm	B	D	C	F	A	E
Mass. of Wet Soil + Container m_6	gm	219.10	198.90	212.20	229.10	199.92	205.50
Mass. of Dry Soil + Container m_7	gm	189.77	174.07	185.00	201.32	176.53	182.11
Mass. of Water $m_8=(m_6-m_7)$	gm	29.33	24.83	27.2	27.78	23.39	23.39
Mass.of Container m_9	gm	43.13	44.90	41.87	45.60	42.84	43.55
Mass. of Dry soil $m_{10}=(m_7-m_9)$	gm	146.64	129.17	143.13	155.72	133.69	138.56
Moisture Content $((m_8/m_{10})x100)$	gm	20.0	19.2	19.0	17.8	17.5	16.9
Ave. Moisture Content	%	19.6		18.4		17.2	

CBR DATA

Penetration	Mould No. 10				Mould No. 11				Mould No. 12			
	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	3	0.264			5	0.404			6.5	0.509		
0.050 (1.27 mm)	6.5	0.509			8.5	0.649			10	0.754		
0.075 (1.91 mm)	9.0	0.684			18.0	1.315			21	1.525		
0.100 (2.54 mm)	13.0	0.965		7.31	20.5	1.490		11.29	28	2.016		15.27
0.150 (3.81 mm)	17.0	1.245			30.0	2.156			42	2.998		
0.200 (5.08 mm)	24.5	1.671		8.40	38.0	2.717		13.65	52	3.699		18.59
0.300 (7.62 mm)	33.0	2.367			48.0	3.418			65	4.610		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

Raemarks: ……

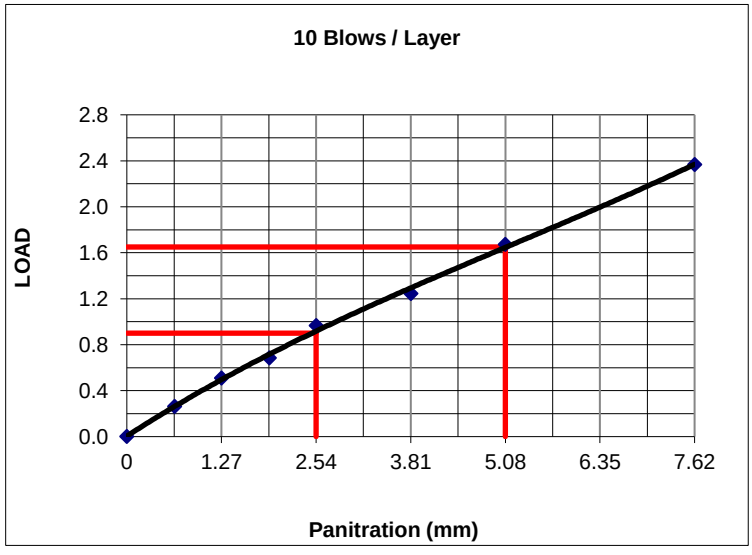
Lab. Technician.

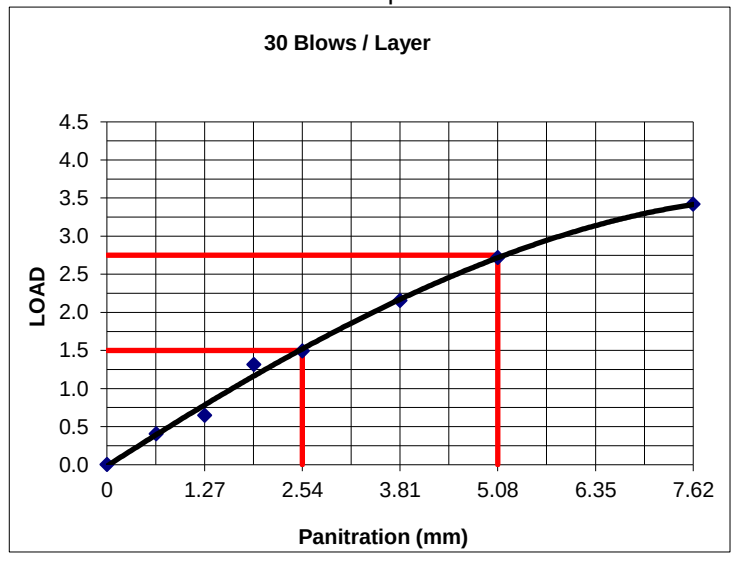
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Date : 21-Mar-18

Sample No. : **TP-01**



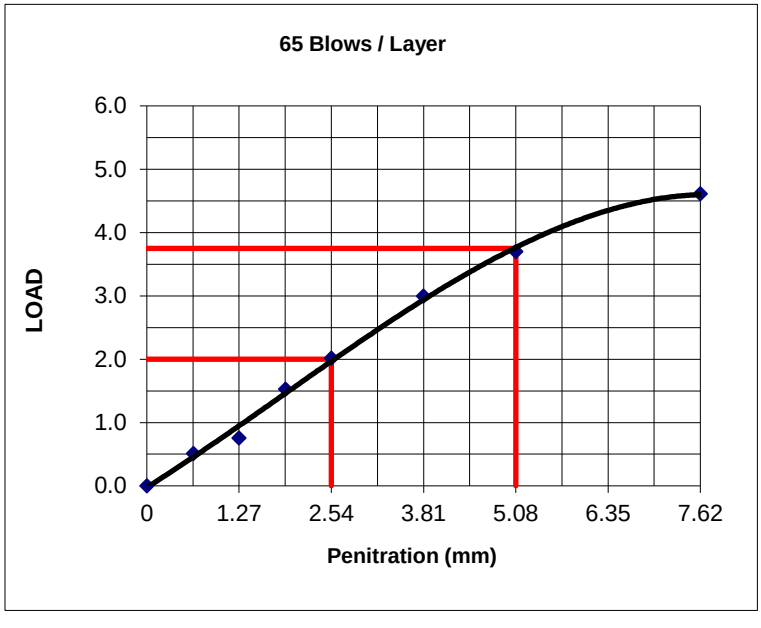


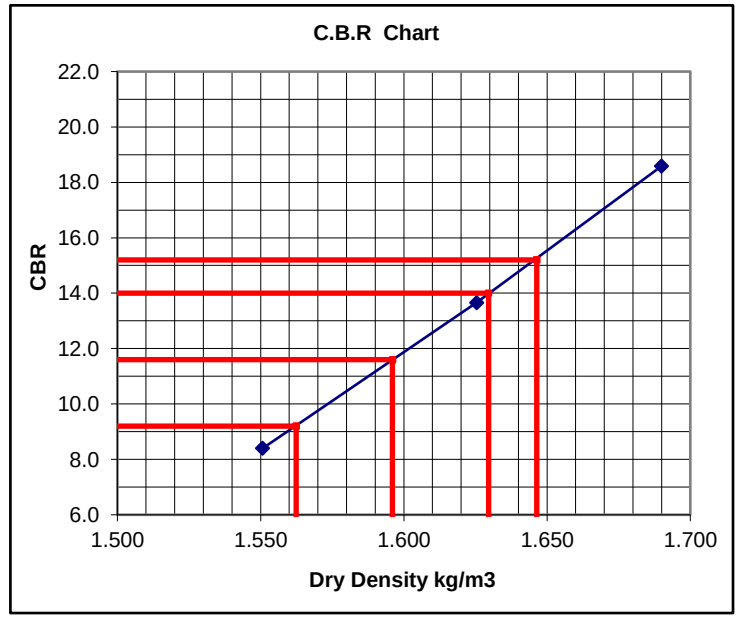
CBR at 2.54 mm Penetration:… 7.3

CBR at 5.08 mm Penetration:… 8.4

CBR at 2.54 mm Penetration: 11.3

CBR at 5.08 mm Penetration:… 13.7





CBR at 2.54 mm Penetration:	15.27
CBR at 5.08 mm Penetration:	18.59
MDD	1.680
OMC	14.0%

CBR at 98% Compaction	15.2
CBR at 97% Compaction	14.0
CBR at 95% Compaction	11.6
CBR at 93% Compaction	9.2

Standard Load for 2.54mm Penetration= 13.2 KN

Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-02**
Date Sampled: 13.03.18
Date Tested: 13.03.18
Location of Sample: Hatimgonj

Description of Material: Silty Clay
Dry Constant Weight: 326.13 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	0.28	0.28	0.1	99.9	
16	1.18	1.02	1.30	0.4	99.6	
30	0.600	3.12	4.42	1.4	98.6	
40	0.425	2.61	7.03	2.2	97.8	
50	0.300	1.34	8.37	2.6	97.4	
100	0.150	3.17	11.54	3.5	96.5	
200	0.075	24.44	35.98	11.0	89.0	
Pan		290.15	326.13			
Total		326.13				

Fineness Modulus (FM) = 0.10

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Hatimgonj

Area represented: Hatimgonj

Material description: Silty Clay

Sample No.: **TP-02**

Date Sampled: 14.03.18

Date Tested: 14.03.18

Tested at: **Chittagong Lab**

TEST									
	LIQUID LIMIT					PLASTIC LIMIT			
Determination Number	1	2	3	4		1	2	3	4
Container Number	L 8	L 10	L 4	L 1		L 20	L 11		
Mass of Container + Wet Soil m_1 gm	58.82	49.32	62.35	59.62		44.65	42.32		
Mass of Container + DrySoil m_2 gm	48.91	42.37	51.15	49.19		40.65	39.48		
Mass. of Water $m_3=(m_1-m_2)$ gm	9.91	6.95	11.20	10.43		4.00	2.84		
Mass of Container m_4 gm	24.65	25.53	24.50	25.05		21.61	26.10		
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	24.26	16.84	26.65	24.14		19.04	13.38		
Moisture Content $((m_3/m_5) \times 100)$ %	40.8	41.3	42.0	43.2		21.0	21.2		
Number of Blows	50	35	21	15		Av:	21.1		

SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
42.0	21.1	20.9

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Hatimgonj

Area represented: Shylet to sutarkandi

Material description: Silty Clay

Sample No.: **TP-02**

Date Sampled: **13.03.18**

Date Tested: **13.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		S	T		
Mass of Container + Wet Soil, m_1 gm		362.17	406.69		
Mass of Container + DrySoil, m_2 gm		317.93	355.01		
Mass. of Water, $m_3=(m_1-m_2)$ gm		44.24	51.68		
Mass of Container, m_4 gm		49.82	51.17		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		268.11	303.84		
Moisture Content, $((m_3/m_5) \times 100)$ %		16.5	17.0		
Average Moisture Content %		16.75			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample : Hatimgonj
Description of Materials: Silty Clay

Sample No: **TP-02**
Date Sampled: 3/15/2018
Date Tested: 3/15/2018
Tested by: **Chittagong Lab**
Drop Height: 450 mm
Initial Moisture: 5.65

Dia of Mould : 152 mm
Volume of Mould: 2114 cc
No. of Layer: 5

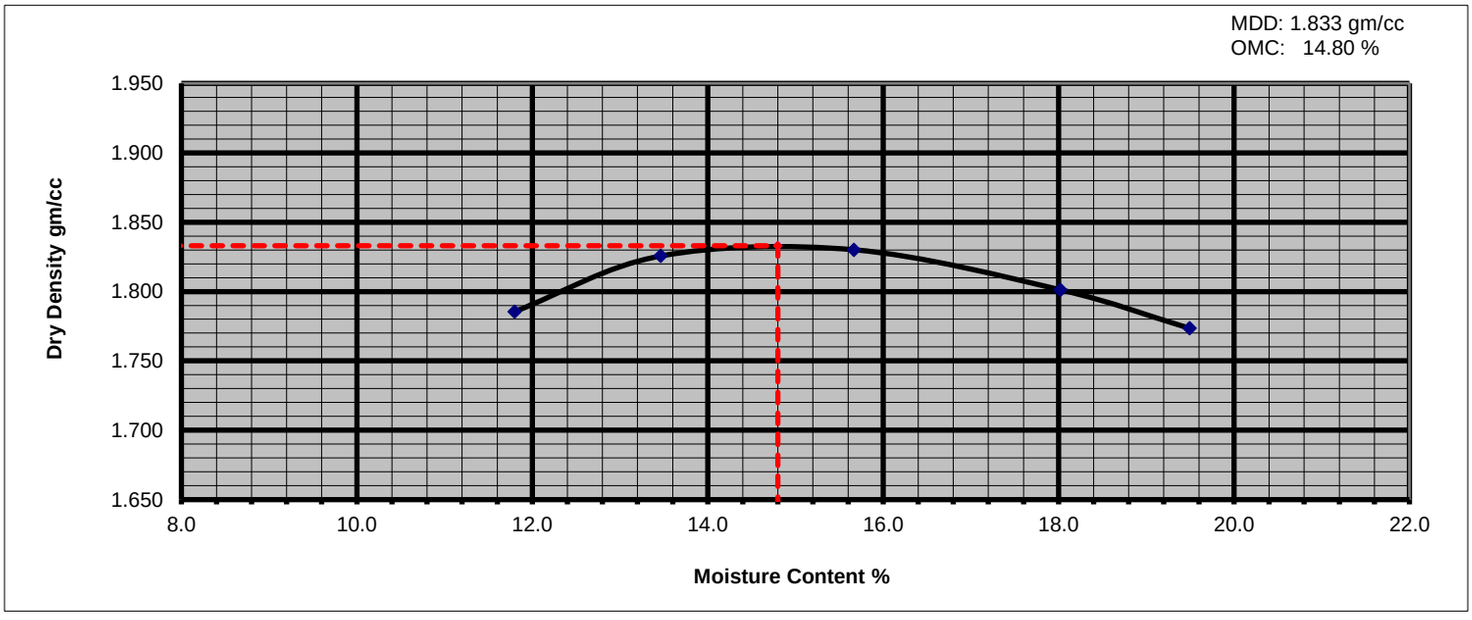
Ht. of Mould : 116.5 mm
Wt of Hammer: 4.5 kg
Blows/Layer.: 56

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
Target W/C	%	12	14	16	18	20	
Water Added	g	301	396	491	585	680	
Wt.of Mould +Wet Soil	g	7039	7198	7294	7313	7299	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	4220	4379	4475	4494	4480	
Bulk Density	gm/cc	1.996	2.071	2.117	2.126	2.119	
Dry Density	gm/cc	1.786	1.826	1.830	1.801	1.773	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		N	S	Q	G	L	T	R	M	H	P	F
Wt of Can +Wet Soil	g	290.6	284.6	265.3	266.7	277.7	278.1	296.5	269.8	298.4	273.4	277.65
Wt of Can +Dry Soil	g	270.9	265.1	241.0	242.5	245.7	247.0	266.7	240.1	266.6	240.8	268.29
Wt.of Water	g	19.7	19.5	24.4	24.2	32.0	31.1	29.8	29.7	31.8	32.6	9.4
Wt.of Can	g	103.7	99.8	60.52	62.30	43.55	46.68	101.1	75.50	103.7	73.50	102.68
Wt.of Dry Soil	g	167.2	165.3	180.4	180.2	202.1	200.3	165.7	164.6	162.9	167.3	165.61
Mousture Content	%	11.8	11.8	13.5	13.4	15.8	15.5	18.0	18.0	19.5	19.5	5.65
Ave.Moisture Content	%	11.8		13.5		15.7		18.0		19.5		5.65



Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3
AASHTO T-193

Location/ Source of Sample : Hatimgonj
Area represented: Sylhet to Sutarkandi
Description of Material: Silty Clay

Sample No: ***TP-02***
Date Sampled: 16.03.18
Date Tested: 16.03.18
Tested at: **Chittagong Lab**
MDD 1.833 gm/cc
OMC 14.8 %

UNIT WEIGHT DATA (before soaking)

No. of Mould		2	5	10
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	7900	8779	8956
Mass of Mould m_2	gm	3516	4000	4038
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4384	4779	4918
Volume of Mould V	cm3	2305	2353	2323
Wet Unit Weight m_3/V	gm/cm3	1.902	2.031	2.117
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.647	1.760	1.836
% Compaction (Modified Proctor)		89.8	96.0	100.2

MOISTURE CONTENT DATA

No. of Mould		2		5		10	
Container No.		G	I	D	A	L	N
Mass of Container + Wet Soil m_4	gm	217.7	223.3	265.5	275.6	270.25	290.26
Mass of Container + Dry Soil m_5	gm	196.4	201.9	236.4	249.6	240.0	258.4
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	21.25	21.5	29.1	26.02	30.28	31.87
Mass of Container m_7	gm	61.96	60.50	44.90	82.84	42.12	50.13
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	134.44	141.35	191.49	166.76	197.85	208.26
Moisture Content	%	15.8	15.2	15.2	15.6	15.3	15.3
Average Moisture Content	%	15.49		15.40		15.30	

Remarks:

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 16.03.18

SWELLING DATA

Sample No: TP-02

Area represented: Sylhet to Sutarkandi	Time Soaking Hours	Time Elapsed	Mould No. 8 Specimen Ht.=127mm			Mould No. 5 Specimen Ht.=127mm			Mould No. 3 Specimen Ht.=127mm		
			Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell
16-Mar-18	11:10	0	0			0			0		
17-Mar-18	"	24									
18-Mar-18	"	48									
19-Mar-18	"	72									
20-Mar-18	"	96	91	0.91	0.72	55	0.55	0.43	37	0.37	0.29

SOAKING DATA

		Mould No. 8	Mould No. 5	Mould No. 3
Mass. of Siol + Mould + Base Plate (Before Soaking) m_1	gm	10674	11091	10176
Mass. of Siol + Mould + Base Plate (After Soaking) m_2	gm	10892	11301	10314
Mass of Mould + Base Plate m_3		3516	4000	4038
Water Absorbed $m_4=(m_2-m_{1)}$		218	210	138
Mass. of Dry Soil in Mould	gm	3796	4141	4265
Water Absorbed $((m_4/m_5)x100)$	%	5.74	5.1	3.2

MOISTURE CONTENT (AFTER SOAKING)

			Mould No. 8		Mould No. 5		Mould No. 3	
Container No.		gm	13	15	17	22	8	4
Mass. of Wet Soil + Container	m_6	gm	266.62	277.23	266.96	271.82	266.32	261.55
Mass. of Dry Soil + Container	m_7	gm	228.12	244.41	230.71	239.77	240.14	236.24
Mass. of Water	$m_8=(m_6-m_7)$	gm	38.5	32.82	36.25	32.05	26.18	25.31
Mass.of Container	m_9	gm	53.10	71.88	60.79	62.21	102.40	87.40
Mass. of Dry soil	$m_{10}=(m_7-m_9)$	gm	175.02	172.53	169.92	177.56	137.74	148.84
Moisture Content	$((m_8/m_{10})x100)$	gm	22.0	19.0	21.3	18.1	19.0	17.0
Ave. Moisture Content		%	20.5		19.7		18.0	

CBR DATA

Penetration	Mould No. 8				Mould No. 5				Mould No. 3			
	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	2.0	0.194			5.0	0.404			6.0	0.474		
0.050 (1.27 mm)	4.0	0.334			8.0	0.614			10.0	0.754		
0.075 (1.91 mm)	5.0	0.404			13.0	0.965			14.0	1.035		
0.100 (2.54 mm)	7.0	0.544		4.12	14.0	1.035		7.8	18.0	1.315		9.96
0.150 (3.81 mm)	10.0	0.754			18.0	1.315			24.0	1.736		
0.200 (5.08 mm)	11.0	0.824		4.14	22.0	1.596		8.0	29.0	2.086		10.47
0.300 (7.62 mm)	14.0	1.035			27.0	1.946			36.0	2.577		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

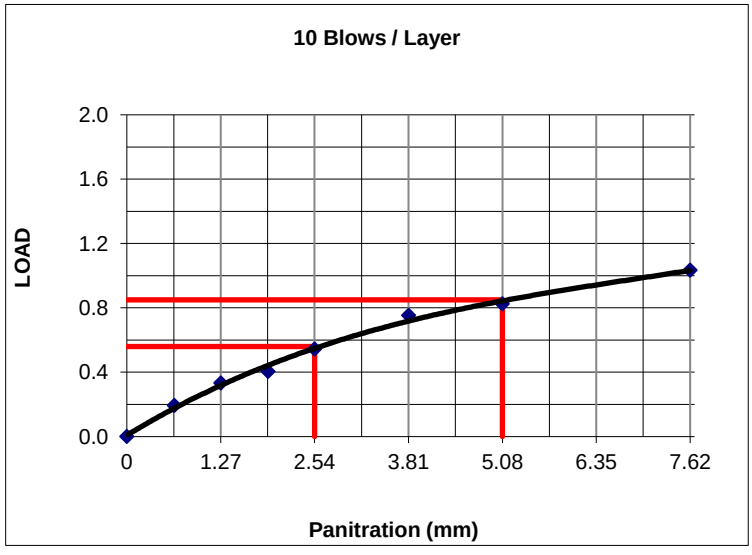
Lab. Technician.

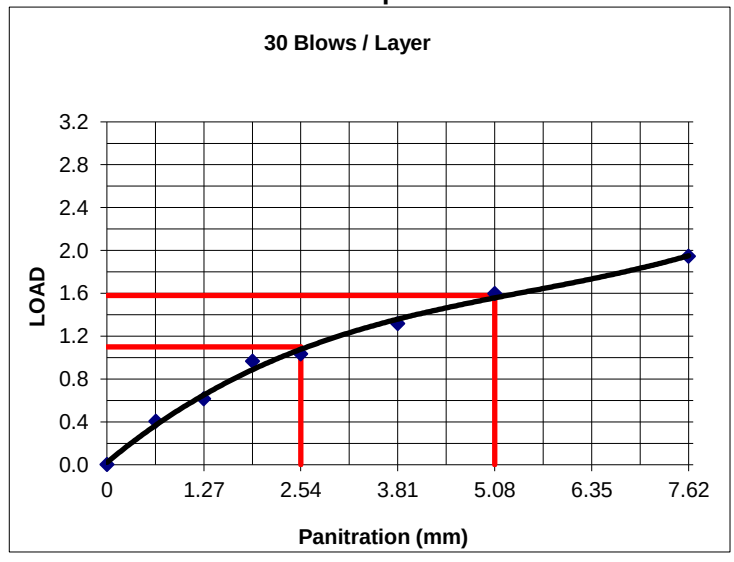
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Area r 16.03.18

Sample No. : TP-02



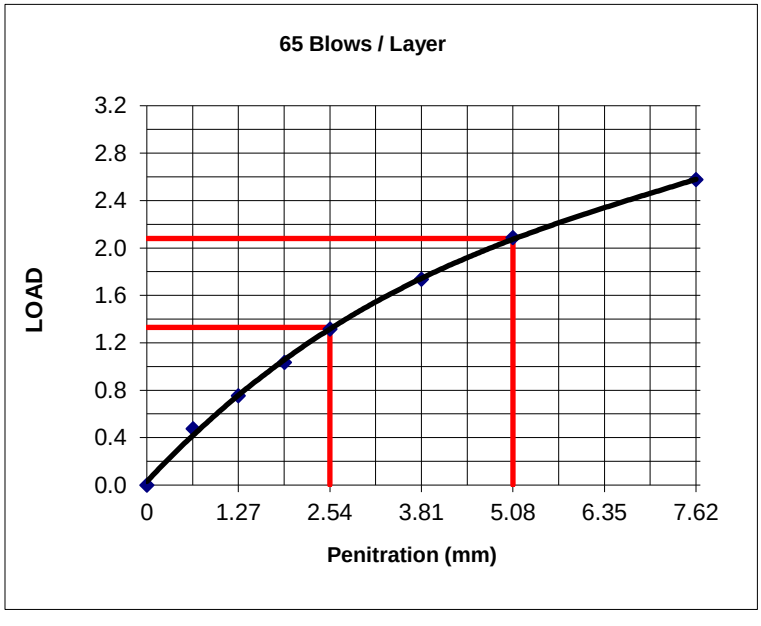


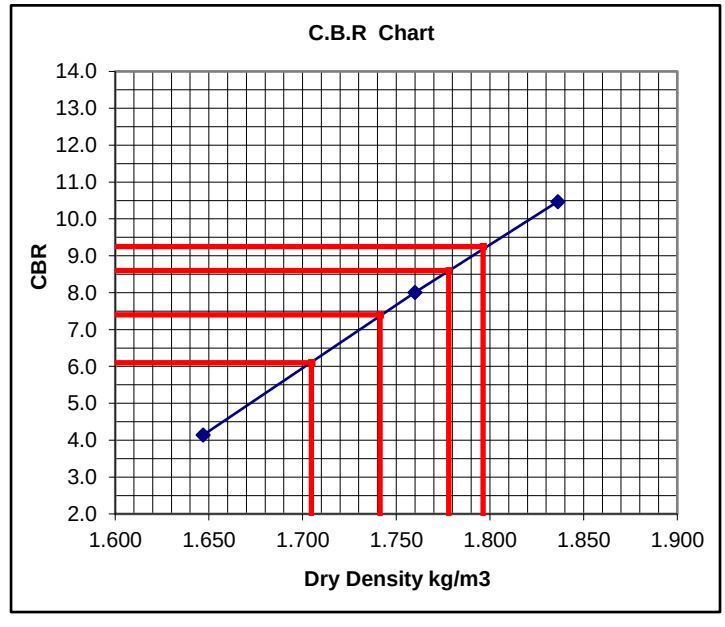
CBR at 2.54 mm Penetration:… 4.1

CBR at 5.08 mm Penetration:… 4.1

CBR at 2.54 mm Penetration: 7.8

CBR at 5.08 mm Penetration:… 8.0





CBR at 2.54 mm Penetration	9.96
CBR at 5.08 mm Penetration	10.47
MDD	1.833
OMC	14.8%

CBR at 98% Compaction	9.3
CBR at 97% Compaction	8.6
CBR at 95% Compaction	7.4
CBR at 93% Compaction	6.1

Standard Load for 2.54mm Penetration= 13.2 KN

Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-03**
Date Sampled: 17.03.18
Date Tested: 17.03.18
Location of Sample: Golapgonj

Description of Material: Silty Sand
Dry Constant Weight: 320.38 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	0.00	0.00	0.0	100.0	
16	1.18	0.08	0.08	0.0	100.0	
30	0.600	0.08	0.16	0.0	100.0	
40	0.425	0.18	0.34	0.1	99.9	
50	0.300	2.26	2.60	0.8	99.2	
100	0.150	151.06	153.66	48.0	52.0	
200	0.075	151.98	305.64	95.4	4.6	
Pan		14.74	320.38			
Total		320.38				

Fineness Modulus (FM) = 0.49

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Golapgonj

Area represented: Shylet to sutarkandi

Material description: Silty Sand

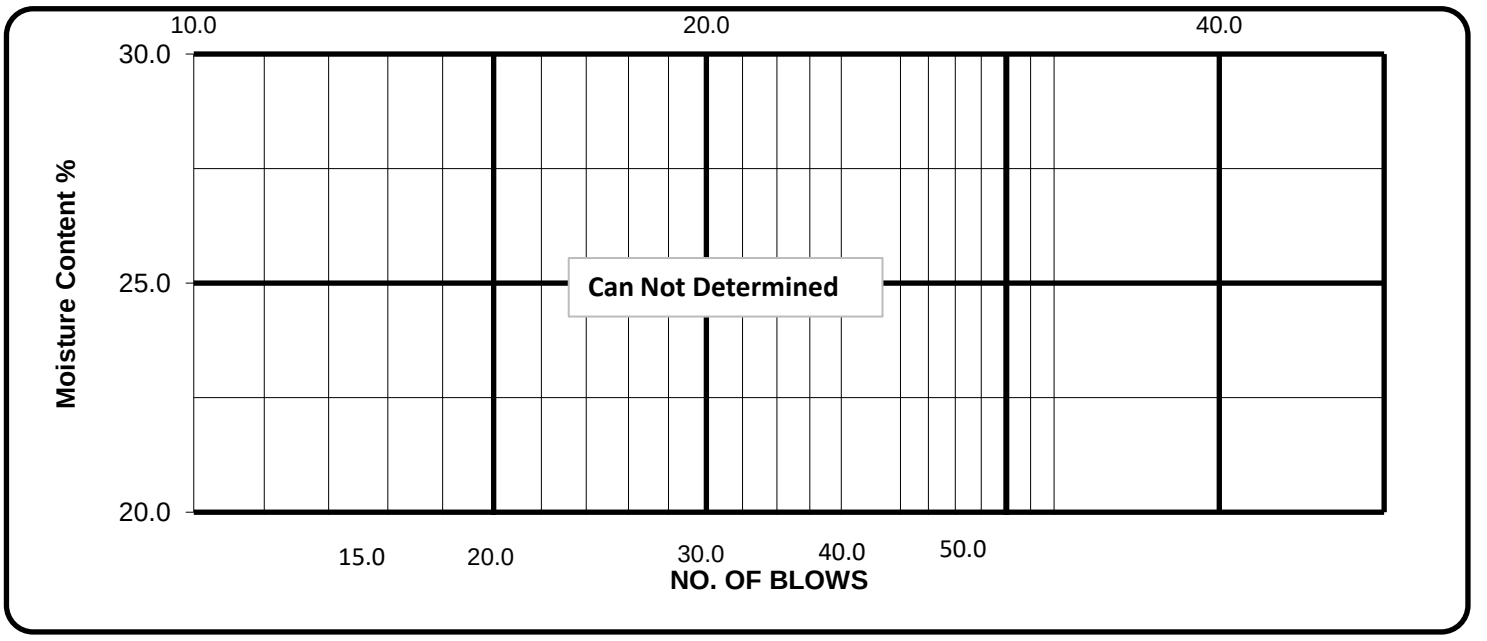
Sample No.: **TP-03**

Date Sampled: 17.03.18

Date Tested: 17.03.18

Tested at: **Chittagong Lab**

TEST								
	LIQUID LIMIT					PLASTIC LIMIT		
Determination Number	1	2	3	4		1	2	3	4
Container Number									
Mass of Container + Wet Soil m_1 gm									
Mass of Container + DrySoil m_2 gm									
Mass. of Water $m_3=(m_1-m_2)$ gm									
Mass of Container m_4 gm									
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm									
Moisture Content $((m_3/m_5) \times 100)$ %									
Number of Blows									



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
NP	NP	NP

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Golapgonj

Area represented: Shylet to sutarkandi

Material description: Silty Sand

Sample No.: **TP-03**

Date Sampled: **16.03.18**

Date Tested: **16.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		K	G		
Mass of Container + Wet Soil, m_1 gm		302.70	319.44		
Mass of Container + DrySoil, m_2 gm		278.43	293.86		
Mass. of Water, $m_3=(m_1-m_2)$ gm		24.27	25.58		
Mass of Container, m_4 gm		49.63	49.55		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		228.80	244.31		
Moisture Content, $((m_3/m_5) \times 100)$ %		10.6	10.5		
Average Moisture Content %		10.54			

Remarks: .....

Lab. Technician

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-04**
Date Sampled: 17.03.18
Date Tested: 17.03.18
Location of Sample: Ranapin

Description of Material: Silty Sand
Dry Constant Weight: 316.87 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	0.00	0.00	0.0	100.0	
16	1.18	0.17	0.17	0.1	99.9	
30	0.600	0.16	0.33	0.1	99.9	
40	0.425	0.15	0.48	0.2	99.8	
50	0.300	1.00	1.48	0.5	99.5	
100	0.150	229.05	230.53	72.8	27.2	
200	0.075	84.54	315.07	99.4	0.6	
Pan		1.80	316.87			
Total		316.87				

Fineness Modulus (FM) = 0.74

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Ranapin

Area represented: Shylet to sutarkandi

Material description: Silty Sand

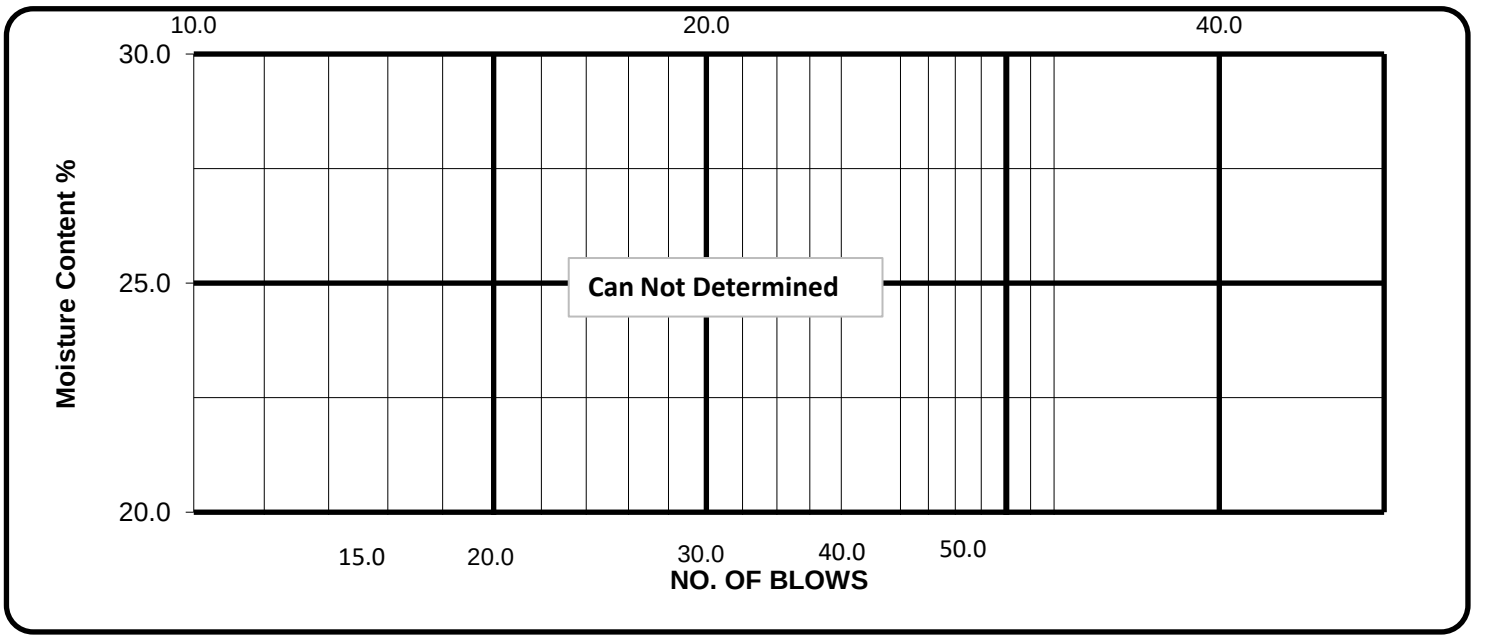
Sample No.: **TP-04**

Date Sampled: 17.03.18

Date Tested: 17.03.18

Tested at: **Chittagong Lab**

TEST								
	LIQUID LIMIT					PLASTIC LIMIT		
Determination Number	1	2	3	4		1	2	3	4
Container Number									
Mass of Container + Wet Soil m_1 gm									
Mass of Container + DrySoil m_2 gm									
Mass. of Water $m_3=(m_1-m_2)$ gm									
Mass of Container m_4 gm									
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm									
Moisture Content $((m_3/m_5) \times 100)$ %									
Number of Blows									



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
NP	NP	NP

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Ranapin

Area represented: Shylet to sutarkandi

Material description: Silty Sand

Sample No.: **TP-04**

Date Sampled: **16.03.18**

Date Tested: **16.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		J	K		
Mass of Container + Wet Soil, m_1 gm		347.76	300.02		
Mass of Container + DrySoil, m_2 gm		333.09	287.59		
Mass. of Water, $m_3=(m_1 - m_2)$ gm		14.67	12.43		
Mass of Container, m_4 gm		60.52	57.00		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		272.57	230.59		
Moisture Content, $((m_3/m_5) \times 100)$ %		5.4	5.4		
Average Moisture Content %		5.39			

Remarks: .....

Lab. Technician

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-05**
Date Sampled: 16.03.18
Date Tested: 16.03.18
Location of Sample: Biyani Bazar

Description of Material: Silty Clay
Dry Constant Weight: 174.62 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	0.66	0.66	0.4	99.6	
16	1.18	0.10	0.76	0.4	99.6	
30	0.600	1.80	2.56	1.5	98.5	
40	0.425	1.69	4.25	2.4	97.6	
50	0.300	0.76	5.01	2.9	97.1	
100	0.150	4.56	9.57	5.5	94.5	
200	0.075	15.05	24.62	14.1	85.9	
Pan		150.00	174.62			
Total		174.62				

Fineness Modulus (FM) = 0.13

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Biyani Bazar

Area represented: Shylet to sutarkandi

Material description: Silty Clay

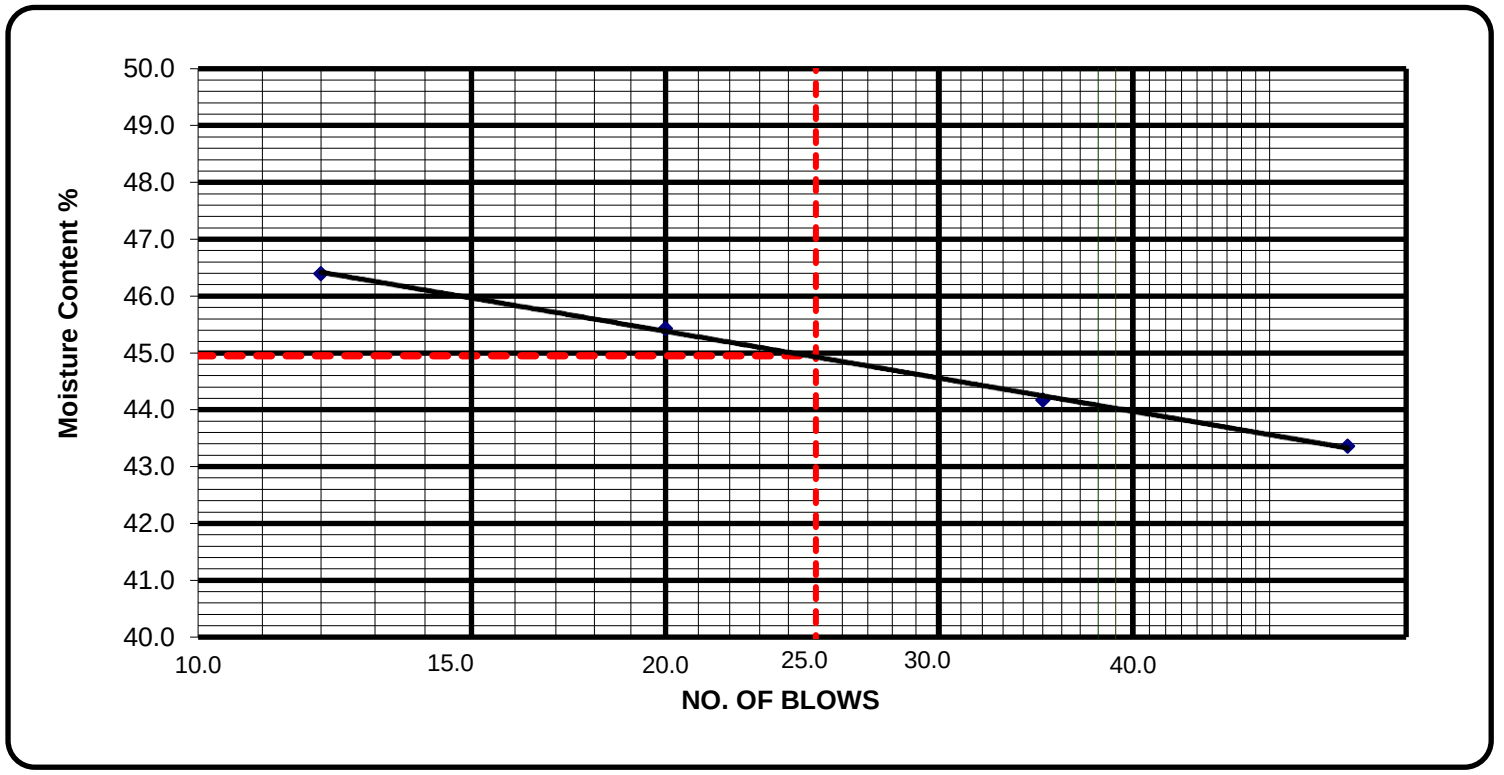
Sample No.: **TP-05**

Date Sampled: 15.03.18

Date Tested: 15.03.18

Tested at: **Chittagong Lab**

TEST									
	LIQUID LIMIT					PLASTIC LIMIT			
Determination Number	1	2	3	4		1	2	3	4
Container Number	L 7	L 11	L 5	L 3		L 8	L 12		
Mass of Container + Wet Soil m_1 gm	53.65	55.22	60.65	48.56		45.33	42.65		
Mass of Container + DrySoil m_2 gm	45.45	45.75	49.67	41.22		41.48	38.69		
Mass. of Water $m_3=(m_1-m_2)$ gm	8.20	9.47	10.98	7.34		3.85	3.96		
Mass of Container m_4 gm	26.54	24.31	25.50	25.40		24.65	21.61		
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	18.91	21.44	24.17	15.82		16.83	17.08		
Moisture Content $((m_3/m_5) \times 100)$ %	43.4	44.2	45.4	46.4		22.9	23.2		
Number of Blows	55	35	20	12		Av:	23.0		



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
44.95	23.03	21.9

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Biyani Bazar

Area represented: Shylet to sutarkandi

Material description: Silty Clay

Sample No.: **TP05**

Date Sampled: **15.03.18**

Date Tested: **15.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		R	H		
Mass of Container + Wet Soil, m_1 gm		409.95	418.46		
Mass of Container + DrySoil, m_2 gm		381.40	387.10		
Mass. of Water, $m_3=(m_1 - m_2)$ gm		28.55	31.36		
Mass of Container, m_4 gm		58.17	61.33		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		323.23	325.77		
Moisture Content, $((m_3/m_5) \times 100)$ %		8.8	9.6		
Average Moisture Content %		9.23			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample : Biyani Bazar
Description of Materials: Silty Clay

Sample No: **TP-05**
Date Sampled: 3/15/2018
Date Tested: 3/15/2018
Tested by: **Chittagong Lab**
Drop Height: 450 mm
Initial Moisture: 4.40

Dia of Mould : 152 mm
Volume of Mould: 2114 cc
No. of Layer: 5

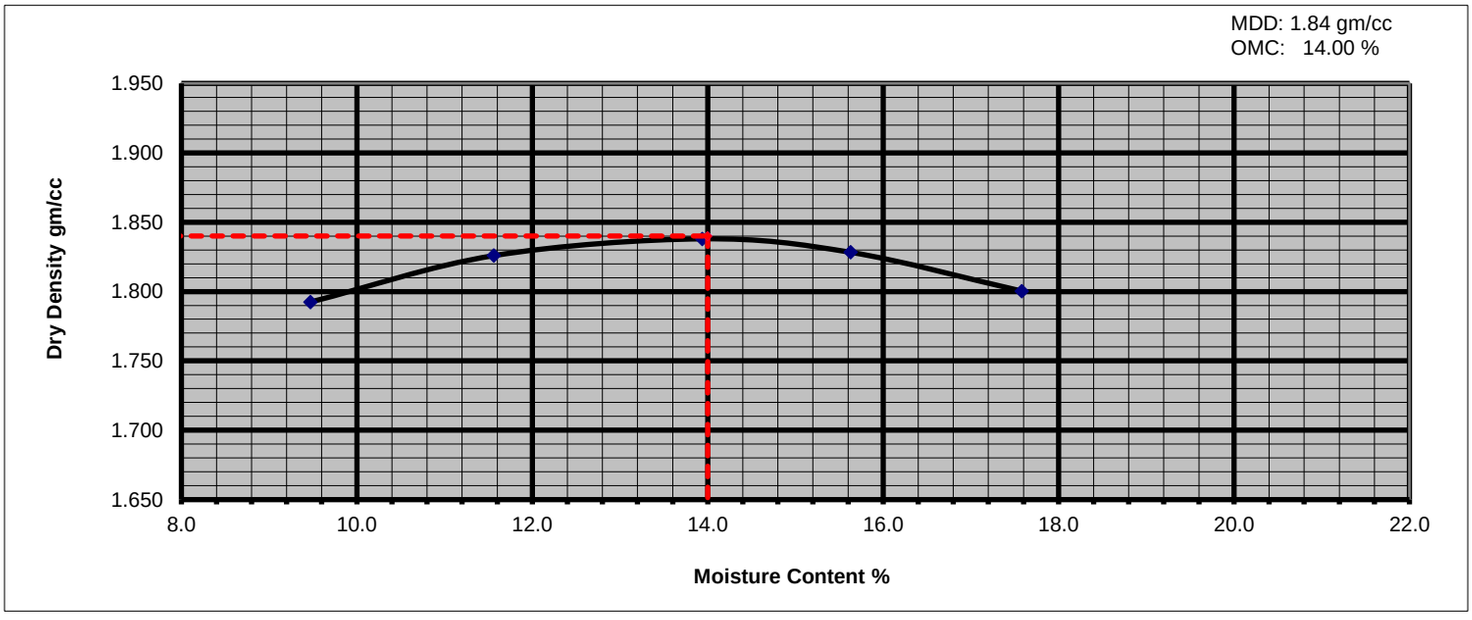
Ht. of Mould : 116.5 mm
Wt of Hammer: 4.5 kg
Blows/Layer.: 56

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
Target W/C	%	10	12	14	16	18	
Water Added	g	268	364	459	555	651	
Wt.of Mould +Wet Soil	g	6967	7125	7246	7288	7294	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	4148	4306	4427	4469	4475	
Bulk Density	gm/cc	1.962	2.037	2.094	2.114	2.117	
Dry Density	gm/cc	1.792	1.826	1.838	1.828	1.800	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		N	S	Q	G	L	T	R	M	H	P	F
Wt of Can +Wet Soil	g	245.1	257.3	238.3	261.3	254.2	271.3	245.1	269.8	238.2	270.0	218.20
Wt of Can +Dry Soil	g	227.9	240.4	219.2	241.3	230.0	247.0	218.0	242.1	208.7	240.8	211.31
Wt.of Water	g	17.3	16.9	19.2	20.1	24.2	24.3	27.2	27.7	29.4	29.2	6.9
Wt.of Can	g	46.0	61.4	53.31	67.54	54.79	74.51	42.8	66.34	41.6	74.50	54.79
Wt.of Dry Soil	g	181.9	179.1	165.8	173.7	175.2	172.5	175.2	175.8	167.1	166.3	156.52
Mousture Content	%	9.5	9.4	11.6	11.5	13.8	14.1	15.5	15.8	17.6	17.6	4.40
Ave.Moisture Content	%	9.5		11.6		13.9		15.6		17.6		4.40



Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3
AASHTO T-193

Location/ Source of Sample : Biyani Bazar
Area represented: Sylhet to Sutarkandi
Description of Material: Silty Clay

Sample No: ***TP-05***
Date Sampled: 27.02.2018
Date Tested: 18.03.2018
Tested at: **Chittagong Lab.**
MDD 1.840 gm/cc
OMC 14.0 %

UNIT WEIGHT DATA (before soaking)

No. of Mould		2	5	10
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	8637	8801	8358
Mass of Mould m_2	gm	4175	4098	3487
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4462	4703	4871
Volume of Mould V	cm3	2305	2305	2308
Wet Unit Weight m_3/V	gm/cm3	1.936	2.040	2.110
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.700	1.793	1.856
% Compaction (Modified Proctor)		92.4	97.4	100.9

MOISTURE CONTENT DATA

No. of Mould		2		5		10	
Container No.		3	7	10	27	4	26
Mass of Container + Wet Soil m_4	gm	271.6	263.15	248.3	251.7	238.13	231.17
Mass of Container + Dry Soil m_5	gm	251.6	244.2	231.1	234.2	221.7	215.8
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	19.99	18.9	17.2	17.54	16.45	15.39
Mass of Container m_7	gm	107.81	107.76	106.93	106.21	102.40	102.68
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	143.76	136.45	124.13	127.95	119.28	113.1
Moisture Content	%	13.9	13.9	13.9	13.7	13.8	13.6
Average Moisture Content	%	13.89		13.80		13.70	

Remarks:

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 18.03.2018

SWELLING DATA

Sample No: TP-05

Area represented: Sylhet to Sutarkandi	Time Soaking Hours	Time Elapsed	Mould No. 6 Specimen Ht.=127mm			Mould No. 7 Specimen Ht.=127mm			Mould No. 8 Specimen Ht.=127mm		
			Guage Reading	Swell (mm)	% Swell	Guage Reading	Swell (mm)	% Swell	Guage Reading	Swell (mm)	% Swell
18-Mar-18	11:10	0	0			0			0		
19-Mar-18	"	24									
20-Mar-18	"	48									
21-Mar-18	"	72									
22-Mar-18	"	96	150	1.5	1.18	140	1.4	1.10	100	1.0	0.79

SOAKING DATA

		Mould No. 6	Mould No. 7	Mould No. 8
Mass. of Siol + Mould + Base Plate (Before Soaking) m_1	gm	10768	11547	11132
Mass. of Siol + Mould + Base Plate (After Soaking) m_2	gm	10912	11687	11262
Mass of Mould + Base Plate m_3		4175	4098	3487
Water Absorbed $m_4=(m_2-m_1)$		144	140	130
Mass. of Dry Soil in Mould	gm	3918	4133	4284
Water Absorbed $((m_4/m_5)x100)$	%	3.68	3.4	3.0

MOISTURE CONTENT (AFTER SOAKING)

		Mould No. 6		Mould No. 7		Mould No. 8	
Container No.	gm	10	15	40	3	1	33
Mass. of Wet Soil + Container m_6	gm	245.72	239.41	231.11	248.70	251.81	262.00
Mass. of Dry Soil + Container m_7	gm	225.45	228.15	206.51	228.53	230.74	239.75
Mass. of Water $m_8=(m_6-m_7)$	gm	20.27	11.26	24.6	20.17	21.07	22.25
Mass.of Container m_9	gm	106.93	161.94	60.12	107.81	102.29	103.69
Mass. of Dry soil $m_{10}=(m_7-m_9)$	gm	118.52	66.21	146.39	120.72	128.45	136.06
Moisture Content $((m_8/m_{10})x100)$	gm	17.1	17.0	16.8	16.7	16.4	16.4
Ave. Moisture Content	%	17.1		16.8		16.4	

CBR DATA

Penetration	Mould No. 6				Mould No. 7				Mould No. 8			
	Dila Reading	Load (KN)	Correct Load	CBR	Dila Reading	Load (KN)	Correct Load	CBR	Dila Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	5.0	0.404			9.0	0.684			9.0	0.684		
0.050 (1.27 mm)	10.0	0.754			14.0	1.035			16.0	1.175		
0.075 (1.91 mm)	15.0	1.105			20.0	1.455			21.0	1.525		
0.100 (2.54 mm)	18.0	1.315		9.96	24.0	1.736		13.1	26.0	1.876		14.21
0.150 (3.81 mm)	23.0	1.666			29.0	2.086			31.0	2.226		
0.200 (5.08 mm)	28.0	2.016		10.12	38.0	2.717		13.6	44.0	3.138		15.74
0.300 (7.62 mm)	32.0	2.297			44.0	3.138			50.0	3.558		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

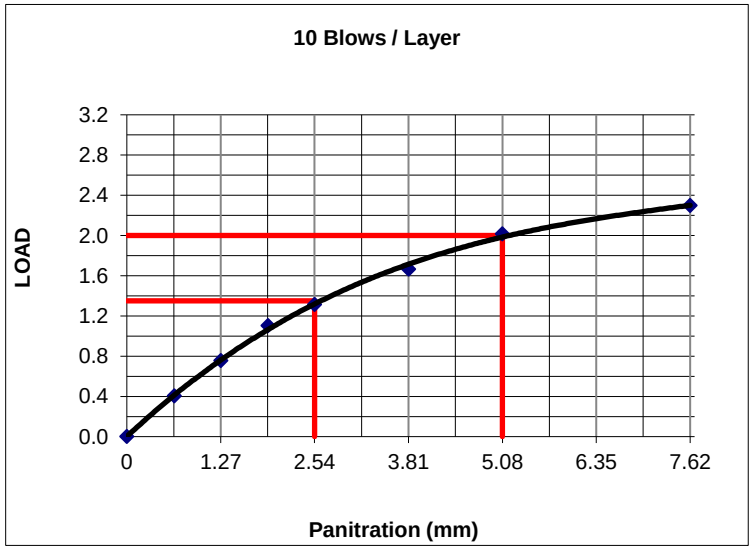
Lab. Technician.

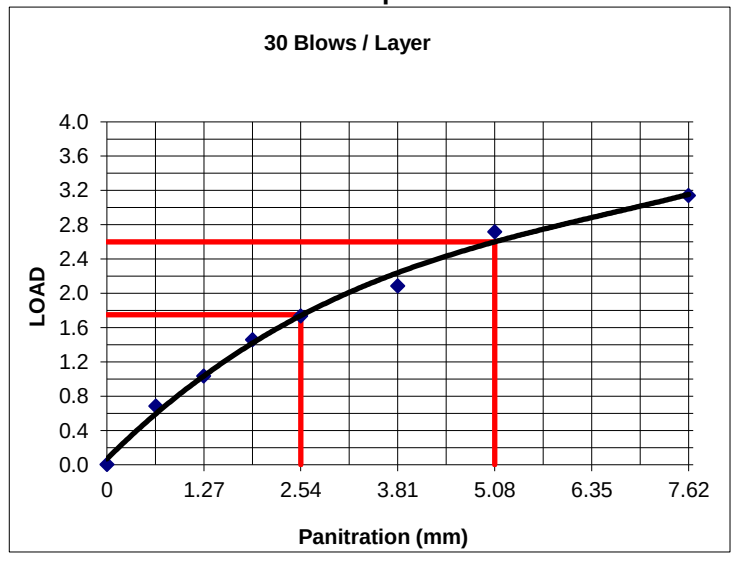
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Area r 22-Mar-18

Sample No. : TP-05



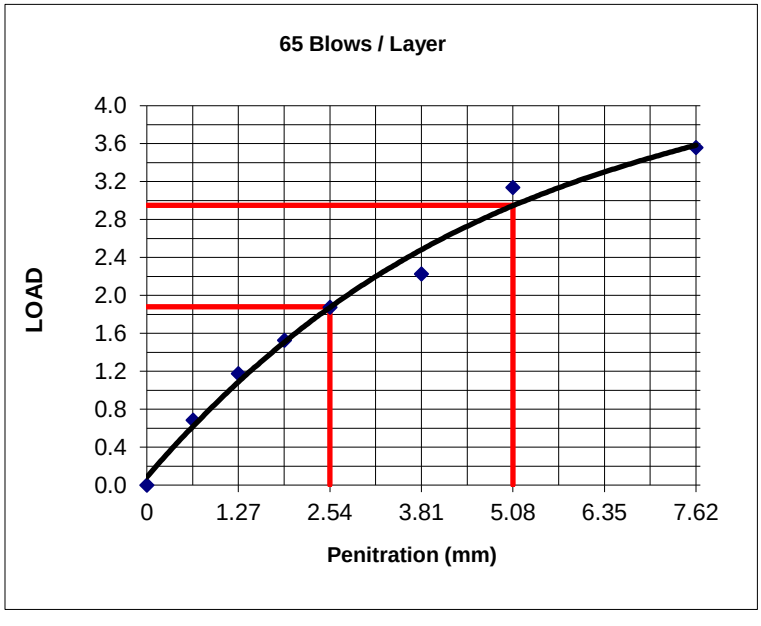


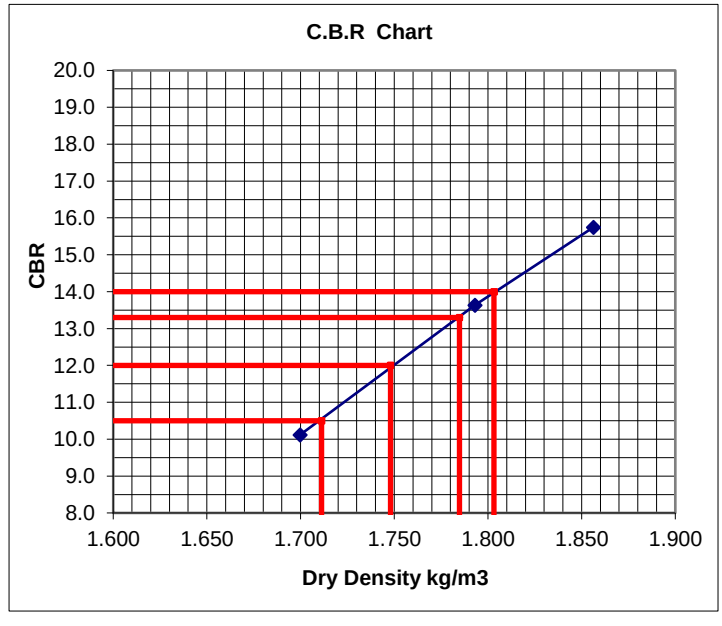
CBR at 2.54 mm Penetration:… 10.0

CBR at 5.08 mm Penetration:… 10.1

CBR at 2.54 mm Penetration: 13.1

CBR at 5.08 mm Penetration:… 13.6





CBR at 2.54 mm Penetration	14.21
CBR at 5.08 mm Penetration	15.74
MDD	1.840
OMC	14.0%

CBR at 98% Compaction	14.0
CBR at 97% Compaction	13.3
CBR at 95% Compaction	12.0
CBR at 93% Compaction	10.5

Standard Load for 2.54mm Penetration= 13.2 KN

Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-06**
Date Sampled: 16.03.18
Date Tested: 16.03.18
Location of Sample: Shodakhal

Description of Material: Silty Clay
Dry Constant Weight: 270.59 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	0.84	0.84	0.3	99.7	
16	1.18	0.12	0.96	0.4	99.6	
30	0.600	1.15	2.11	0.8	99.2	
40	0.425	0.98	3.09	1.1	98.9	
50	0.300	0.23	3.32	1.2	98.8	
100	0.150	1.73	5.05	1.9	98.1	
200	0.075	15.32	20.37	7.5	92.5	
Pan		250.22	270.59			
Total		270.59				

Fineness Modulus (FM) = 0.06

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Shodakhal

Area represented: Shylet to sutarkandi

Material description: Silty Clay

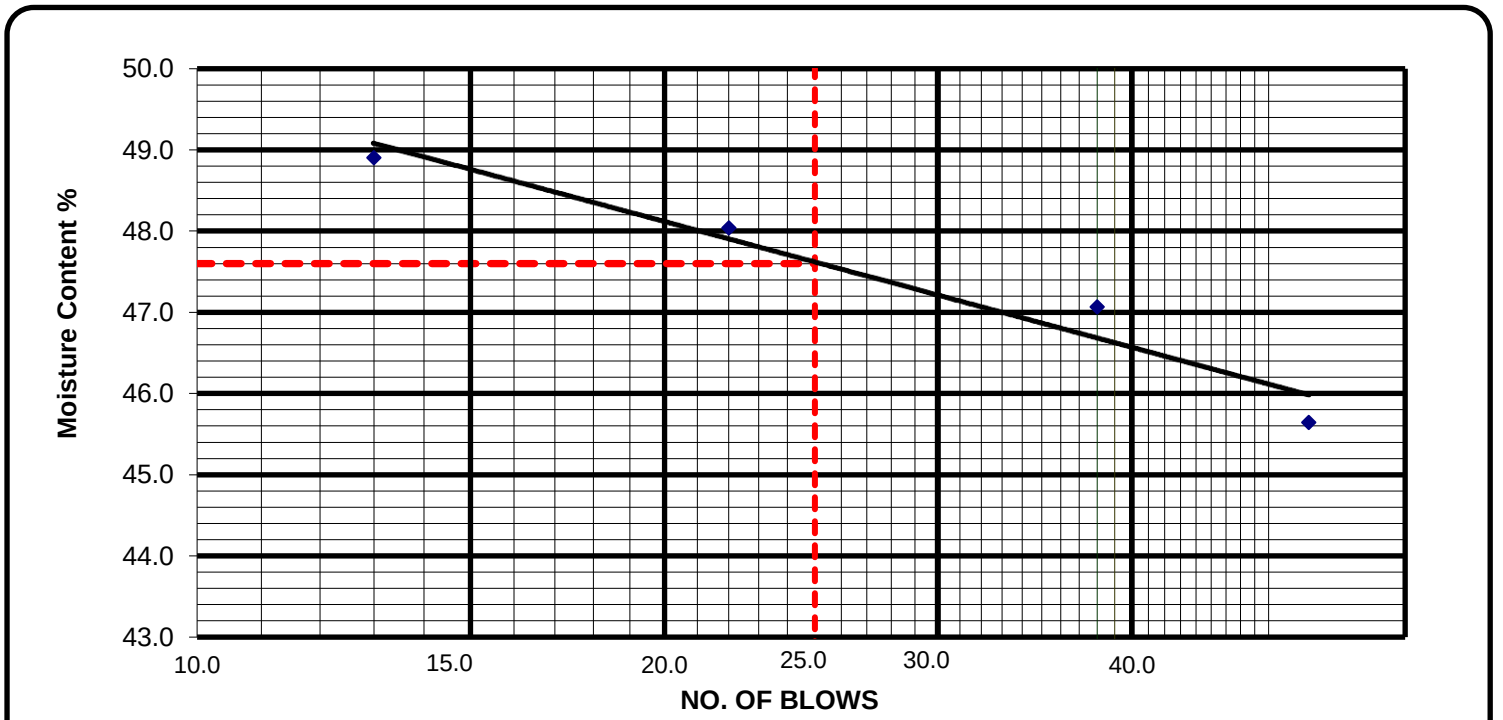
Sample No.: **TP-06**

Date Sampled: 15.03.18

Date Tested: 15.03.18

Tested at: **Chittagong Lab**

TEST									
	LIQUID LIMIT					PLASTIC LIMIT			
Determination Number	1	2	3	4		1	2	3	4
Container Number	L 12	L 1	L 6	L 10		L 11	L 7		
Mass of Container + Wet Soil m_1 gm	63.22	55.38	58.21	53.36		42.22	40.65		
Mass of Container + DrySoil m_2 gm	50.18	45.68	47.79	44.22		38.77	37.97		
Mass. of Water $m_3=(m_1-m_2)$ gm	13.04	9.70	10.42	9.14		3.45	2.68		
Mass of Container m_4 gm	21.61	25.07	26.10	25.53		24.31	26.54		
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	28.57	20.61	21.69	18.69		14.46	11.43		
Moisture Content $((m_3/m_5) \times 100)$ %	45.6	47.1	48.0	48.9		23.9	23.4		
Number of Blows	52	38	22	13		Av:	23.7		



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
47.6	23.7	23.9

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Shodakhal

Area represented: Shylet to sutarkandi

Material description: Silty Clay

Sample No.: **TP-06**

Date Sampled: **15.03.18**

Date Tested: **15.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		I	G		
Mass of Container + Wet Soil, m_1 gm		402.29	331.20		
Mass of Container + DrySoil, m_2 gm		341.96	283.90		
Mass. of Water, $m_3=(m_1-m_2)$ gm		60.33	47.30		
Mass of Container, m_4 gm		60.52	60.50		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		281.44	223.40		
Moisture Content, $((m_3/m_5) \times 100)$ %		21.4	21.2		
Average Moisture Content %		21.30			

Remarks: .....

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Dubag

Area represented: Shylet to sutarkandi

Material description: Silty Sand

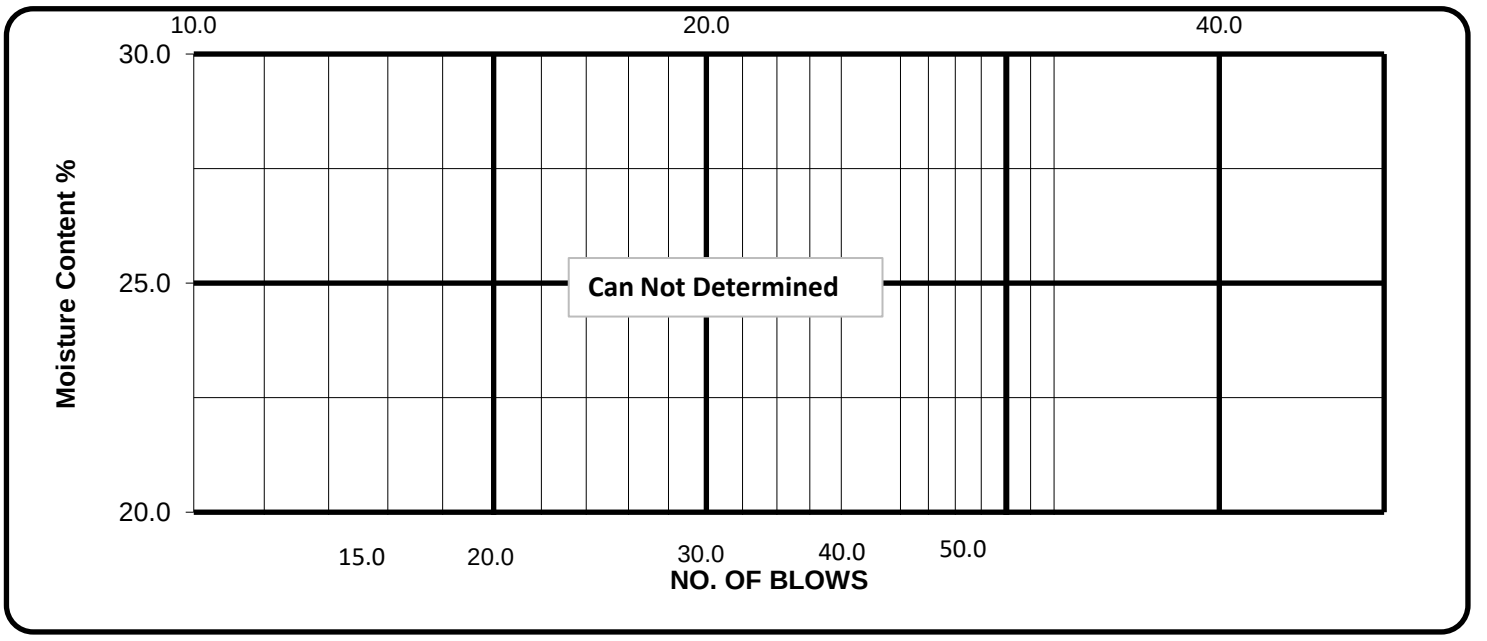
Sample No.: **TP-07**

Date Sampled: 10.03.18

Date Tested: 10.03.18

Tested at: **Chittagong Lab**

TEST								
	LIQUID LIMIT					PLASTIC LIMIT		
Determination Number	1	2	3	4	1	2	3	4
Container Number	L 5							
Mass of Container + Wet Soil m_1 gm	63.08							
Mass of Container + DrySoil m_2 gm	56.36							
Mass. of Water $m_3=(m_1-m_2)$ gm	6.72							
Mass of Container m_4 gm	25.50							
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	30.86							
Moisture Content $((m_3/m_5) \times 100)$ %	21.8							
Number of Blows	7							



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
NP	NP	NP

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Dubag

Area represented: Shylet to sutarkandi

Material description: Silty Sand

Sample No.: **TP-07**

Date Sampled: **10.03.18**

Date Tested: **10.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		K	G		
Mass of Container + Wet Soil, m_1 gm		272.20	271.86		
Mass of Container + DrySoil, m_2 gm		249.77	249.82		
Mass. of Water, $m_3=(m_1-m_2)$ gm		22.43	22.04		
Mass of Container, m_4 gm		57.00	61.96		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		192.77	187.86		
Moisture Content, $((m_3/m_5) \times 100)$ %		11.6	11.7		
Average Moisture Content %		11.68			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample : Dubag
Description of Materials: Silty Sand

Sample No: **TP-07**
Date Sampled: 3/10/2018
Date Tested: 3/10/2018
Tested by: **Chittagong Lab**
Drop Height: 450 mm
Initial Moisture: 3.65

Dia of Mould : 152 mm
Volume of Mould: 2114 cc
No. of Layer: 5

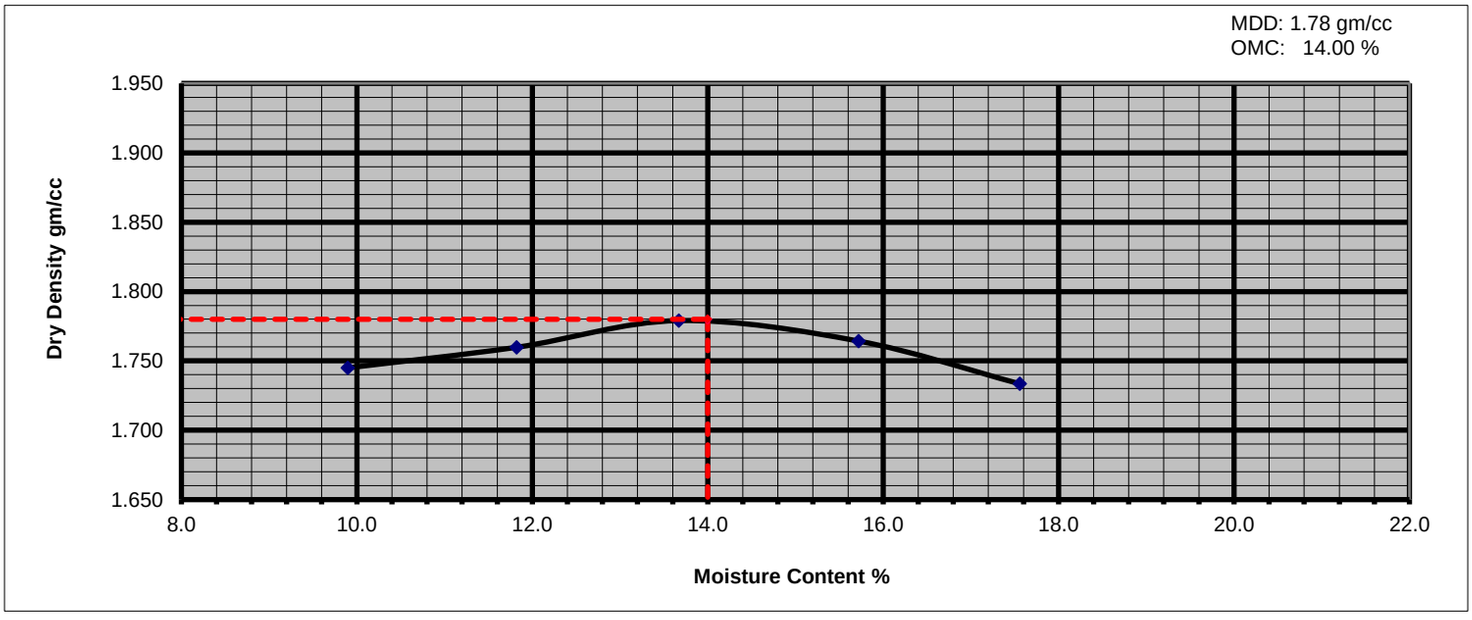
Ht. of Mould : 116.5 mm
Wt of Hammer: 4.5 kg
Blows/Layer.: 56

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
Target W/C	%	10	12	14	16	18	
Water Added	g	306	402	499	595	692	
Wt.of Mould +Wet Soil	g	6873	6979	7094	7135	7127	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	4054	4160	4275	4316	4308	
Bulk Density	gm/cc	1.918	1.968	2.022	2.042	2.038	
Dry Density	gm/cc	1.745	1.760	1.779	1.764	1.733	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		N	S	Q	G	L	T	R	M	H	P	F
Wt of Can +Wet Soil	g	229.9	251.3	212.2	256.9	280.6	296.3	241.2	269.8	205.9	270.0	228.80
Wt of Can +Dry Soil	g	214.4	235.5	195.1	239.6	254.3	267.5	216.7	242.1	181.4	241.6	222.50
Wt.of Water	g	15.5	15.8	17.1	17.3	26.4	28.8	24.5	27.7	24.5	28.4	6.3
Wt.of Can	g	57.8	75.8	49.87	93.54	60.50	58.10	60.5	66.34	42.1	79.50	49.87
Wt.of Dry Soil	g	156.6	159.7	145.2	146.1	193.8	209.4	156.2	175.8	139.3	162.1	172.63
Mousture Content	%	9.9	9.9	11.8	11.8	13.6	13.7	15.7	15.8	17.6	17.5	3.65
Ave.Moisture Content	%	9.9		11.8		13.7		15.7		17.6		3.65



Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3
AASHTO T-193

Location/ Source of Sample : Dubag
Area represented: Sylhet to Sutarkandi
Description of Material: Silty Sand

Sample No: ***TP-07***
Date Sampled: 11.03.18
Date Tested: 11.03.18
Tested at: **Chittagong Lab.**
MDD 1.780 gm/cc
OMC 14.0 %

UNIT WEIGHT DATA (before soaking)

No. of Mould		13	14	25
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	7928	8735	8240
Mass of Mould m_2	gm	3646	4186	3560
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4282	4549	4680
Volume of Mould V	cm3	2305	2323	2305
Wet Unit Weight m_3/V	gm/cm3	1.858	1.958	2.030
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.630	1.720	1.785
% Compaction (Modified Proctor)		91.6	96.6	100.3

MOISTURE CONTENT DATA

No. of Mould		13		14		25	
Container No.		4	5	11	20	27	8
Mass of Container + Wet Soil m_4	gm	210.1	232.2	212.8	224.1	260.6	248
Mass of Container + Dry Soil m_5	gm	190.5	209.9	193.0	203.1	235.9	223.2
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	19.62	22.3	19.9	20.98	24.69	24.81
Mass of Container m_7	gm	50.13	49.87	49.86	51.17	57.00	42.12
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	140.35	160.01	143.09	151.95	178.91	181.07
Moisture Content	%	14.0	13.9	13.9	13.8	13.8	13.7
Average Moisture Content	%	13.96		13.84		13.75	

Remarks:

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 11.03.18

SWELLING DATA **Sample No: TP-07**

Day and Month	Time Soaking Hours	Time Elapsed	Mould No. 13 Specimen Ht.=127mm			Mould No. 14 Specimen Ht.=127mm			Mould No. 25 Specimen Ht.=127mm		
			Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell
11-Mar-18	11:10	0	0			0			0		
12-Mar-18	"	24									
13-Mar-18	"	48									
14-Mar-18	"	72									
15-Mar-18	"	96	170	1.7	1.34	128	1.28	1.01	95	1.0	0.75

SOAKING DATA

		Mould No. 13	Mould No. 14	Mould No. 25
Mass. of Siol + Mould + Base Plate (Before Soaking) m_1	gm	11874	11091	12104
Mass. of Siol + Mould + Base Plate (After Soaking) m_2	gm	12067	11253	12237
Mass of Mould + Base Plate m_3		3646	4186	3560
Water Absorbed $m_4=(m_2-m_1)$		193	162	133
Mass. of Dry Soil in Mould	gm	3757	3996	4114
Water Absorbed $((m_4/m_5)x100)$	%	5.14	4.1	3.2

MOISTURE CONTENT (AFTER SOAKING)

		Mould No. 13		Mould No. 14		Mould No. 25	
Container No.	gm	D	C	F	A	E	B
Mass. of Wet Soil + Container m_6	gm	229.90	219.90	232.20	230.30	198.90	229.90
Mass. of Dry Soil + Container m_7	gm	200.41	192.74	204.12	202.99	176.26	203.97
Mass. of Water $m_8=(m_6-m_7)$	gm	29.49	27.16	28.08	27.31	22.64	25.93
Mass.of Container m_9	gm	44.90	41.87	45.60	42.84	43.55	43.13
Mass. of Dry soil $m_{10}=(m_7-m_9)$	gm	155.51	150.87	158.52	160.15	132.71	160.84
Moisture Content $((m_8/m_{10})x100)$	gm	19.0	18.0	17.7	17.1	17.1	16.1
Ave. Moisture Content	%	18.5		17.4		16.6	

CBR DATA

Penetration	Mould No. 13				Mould No. 14				Mould No. 25			
	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	4.0	0.334			4.0	0.334			6.5	0.509		
0.050 (1.27 mm)	6.5	0.509			12.5	0.930			12.0	0.895		
0.075 (1.91 mm)	12.5	0.930			14.0	1.035			17.0	1.245		
0.100 (2.54 mm)	15.5	1.141		8.65	18.0	1.315		10.0	22.0	1.596		12.09
0.150 (3.81 mm)	21.0	1.525			26.5	1.911			31.0	2.226		
0.200 (5.08 mm)	28.0	2.016		10.12	33.5	2.402		12.1	45.0	3.208		16.10
0.300 (7.62 mm)	38.5	2.752			43.5	3.103			56.5	4.014		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

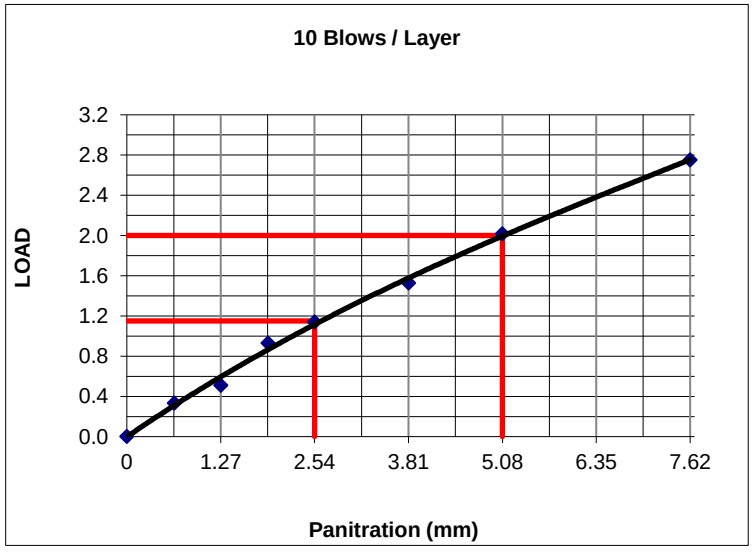
Lab. Technician.

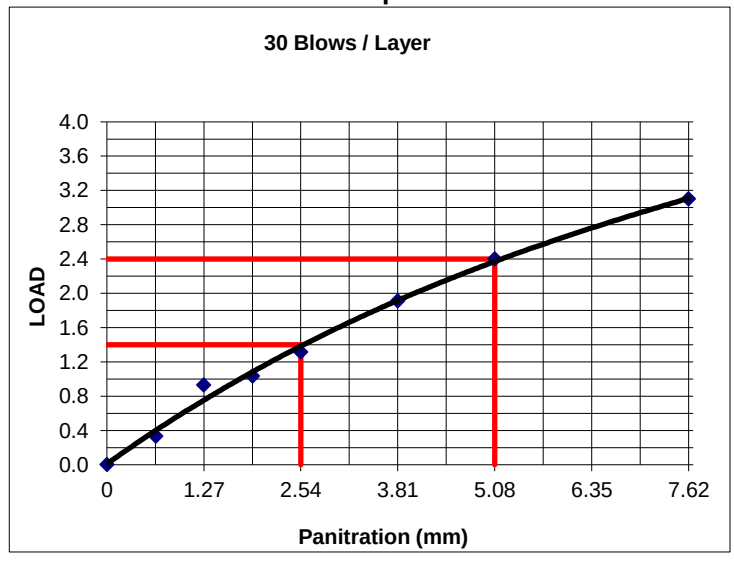
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Date : 15-Mar-18

Sample No. : TP-07



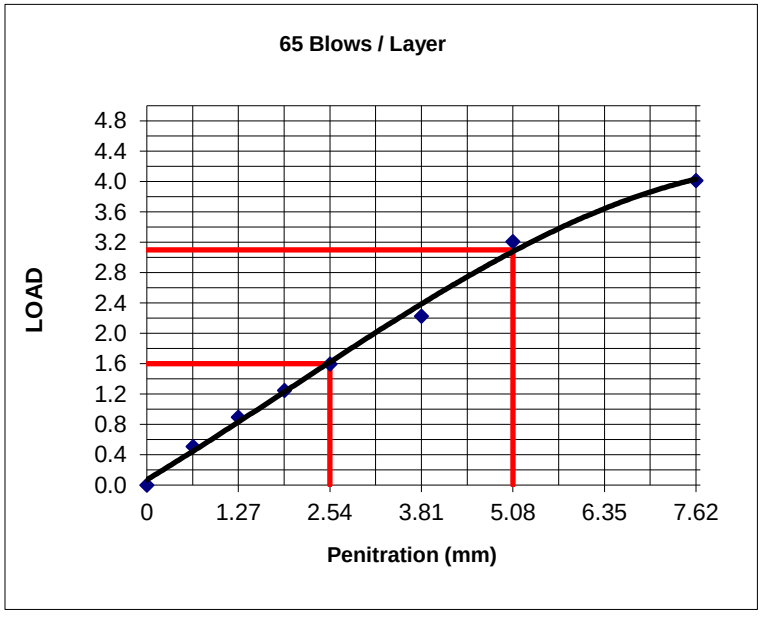


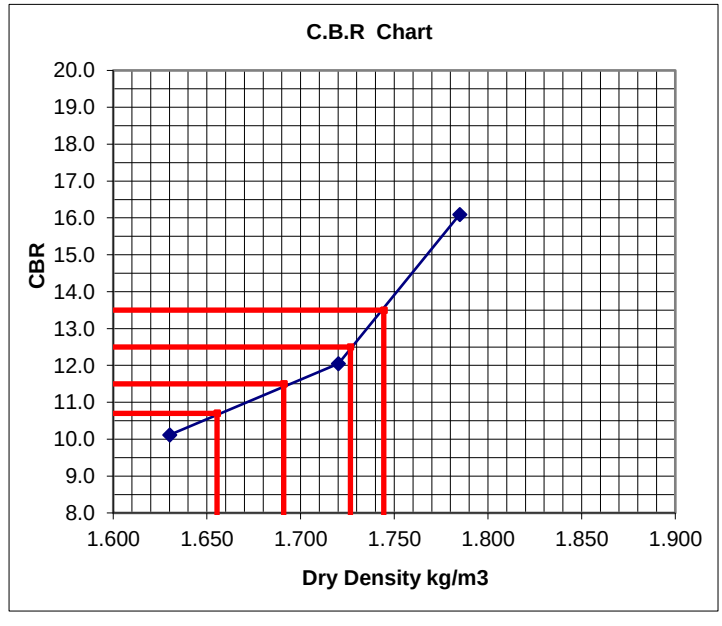
CBR at 2.54 mm Penetration:… 8.6

CBR at 5.08 mm Penetration:… 10.1

CBR at 2.54 mm Penetration: 10.0

CBR at 5.08 mm Penetration:… 12.1





CBR at 2.54 mm Penetration	12.09
CBR at 5.08 mm Penetration	16.10
MDD	1.780
OMC	14.0%

CBR at 98% Compaction	13.5
CBR at 97% Compaction	12.5
CBR at 95% Compaction	11.5
CBR at 93% Compaction	10.7

Standard Load for 2.54mm Penetration= 13.2 KN
Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **TP-08**
Date Sampled: 13.03.18
Date Tested: 13.03.18
Location of Sample: Sadarkhali Border

Description of Material: Silty Clay
Dry Constant Weight: 353.63 gm
Tested at: **Chittagong Lab**

ASTM Sieve No	Size (mm)	WT. Retained (g)	Cumulative Wt. Retained (g)	Cumulative % Retained	Percent Passing %	Specification Passing %
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75	0.00	0.0	0.0	100.0	
8	2.36	1.44	1.44	0.4	99.6	
16	1.18	1.58	3.02	0.9	99.1	
30	0.600	2.55	5.57	1.6	98.4	
40	0.425	2.04	7.61	2.2	97.8	
50	0.300	0.94	8.55	2.4	97.6	
100	0.150	3.21	11.76	3.3	96.7	
200	0.075	6.91	18.67	5.3	94.7	
Pan		334.96	353.63			
Total		353.63				

Fineness Modulus (FM) = 0.11

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: Sadarkhali Border

Area represented: Shylet to sutarkandi

Material description: Silty Clay

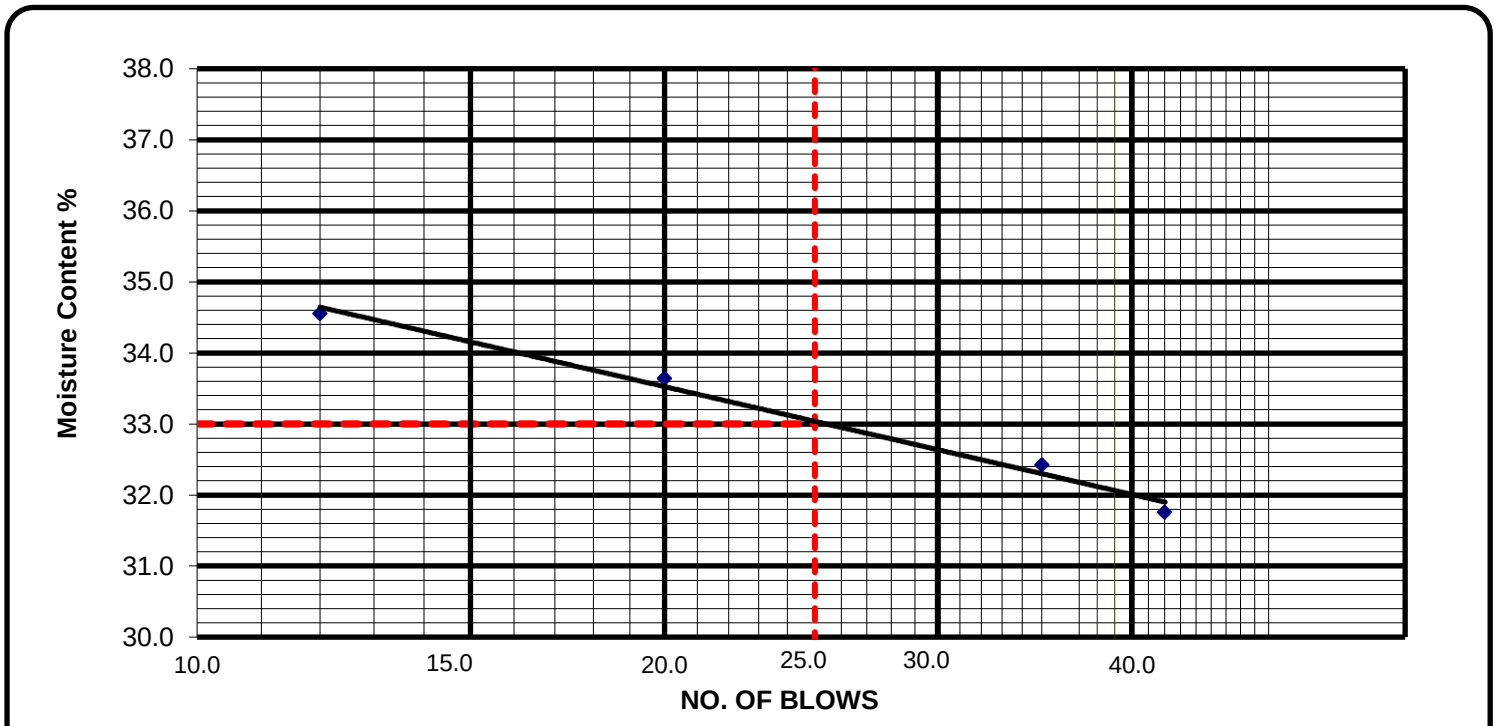
Sample No.: **TP-08**

Date Sampled: 13.03.18

Date Tested: 13.03.18

Tested at: **Chittagong Lab**

TEST									
	LIQUID LIMIT					PLASTIC LIMIT			
Determination Number	1	2	3	4		1	2	3	4
Container Number	L 2	L 6	L 11	L 15		L 10	L 8		
Mass of Container + Wet Soil m_1 gm	95.32	102.33	55.39	62.65		48.22	52.62		
Mass of Container + DrySoil m_2 gm	86.15	89.19	47.78	53.84		44.59	48.41		
Mass. of Water $m_3=(m_1-m_2)$ gm	9.17	13.14	7.61	8.81		3.63	4.21		
Mass of Container m_4 gm	59.61	50.13	24.31	26.10		25.53	26.54		
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	26.54	39.06	23.47	27.74		19.06	21.87		
Moisture Content $((m_3/m_5) \times 100)$ %	34.6	33.6	32.4	31.8		19.0	19.3		
Number of Blows	12	20	35	42		Av:	19.1		



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
33.0	19.1	13.9

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Sadarkhali Border

Area represented: Shylet to sutarkandi

Material description: Silty Clay

Sample No.: **TP-08**

Date Sampled: **12.03.18**

Date Tested: **12.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		L 13	L 15		
Mass of Container + Wet Soil, m_1 gm		328.60	334.59		
Mass of Container + DrySoil, m_2 gm		290.46	298.32		
Mass. of Water, $m_3=(m_1-m_2)$ gm		38.14	36.27		
Mass of Container, m_4 gm		53.10	71.88		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		237.36	226.44		
Moisture Content, $((m_3/m_5) \times 100)$ %		16.1	16.0		
Average Moisture Content %		16.04			

Remarks: .....

Lab. Technician

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **BP-01**

Date Sampled: 10.03.18

Date Tested: 10.03.18

Location of Sample: **Zero Point,Sylhet**

Description of Material: Surma River Sand

Dry Constant Weight: 374.94 gm

Tested at: **Chittagong Lab**

ASTM SIEVE NO	SIZE (MM)	WT. Retained (g)	Cumulative Wt. Retained (g)	Percent Retained	Percent Passing %	Specified Limit
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75					
8	2.36	0.0	0.0	0.0	100.0	
10	2.0	0.16	0.2	0.1	100.0	
16	1.18	0.3	0.5	0.1	99.9	
30	0.600	1.14	1.6	0.4	99.6	
40	0.425	6.4	8.0	2.1	97.9	
50	0.300	11.71	19.7	5.2	94.8	
100	0.150	182.68	202.3	54.0	46.0	
200	0.075	163.6	365.9	97.6	2.4	
Pan		9.02	374.94			
Total		374.94				

Fineness Modulus (FM) = 0.62

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: **Surma River,Sylhet**

Area represented: Mahtab Dredging,Zero Point,Sylhet

Material description: Surma River Sand

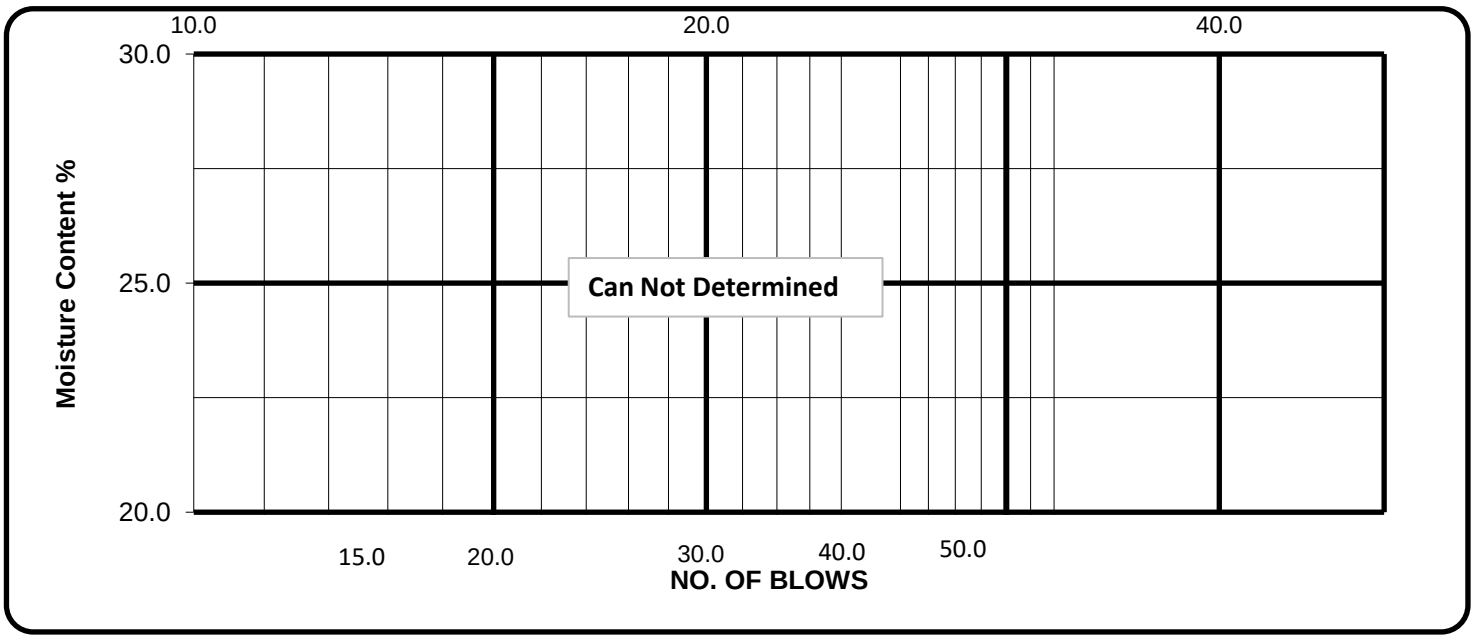
Sample No.**:** **BP-01**

Date Sampled**:** 12.03.18

Date Tested**:** 12.03.18

Tested at**:** **Chittagong Lab**

TEST								
	LIQUID LIMIT					PLASTIC LIMIT		
Determination Number	1	2	3	4	1	2	3	4
Container Number	L 5							
Mass of Container + Wet Soil m_1 gm	63.08							
Mass of Container + DrySoil m_2 gm	60.13							
Mass. of Water $m_3=(m_1-m_2)$ gm	2.95							
Mass of Container m_4 gm	25.50							
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	34.63							
Moisture Content $((m_3/m_5) \times 100)$ %	8.5							
Number of Blows	7							



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
NP	NP	NP

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: Surma River,Sylhet

Area represented: Zero Point

Material description: Silty Sand

Sample No.: **BP-01**

Date Sampled: **13.03.18**

Date Tested: **13.03.18**

Tested at: **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		H	R		
Mass of Container + Wet Soil, m_1 gm		261.65	287.65		
Mass of Container + DrySoil, m_2 gm		254.29	277.85		
Mass. of Water, $m_3=(m_1-m_2)$ gm		7.4	9.80		
Mass of Container, m_4 gm		93.0	65.30		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		161.3	212.55		
Moisture Content, $((m_3/m_5) \times 100)$ %		4.6	4.6		
Average Moisture Content %		4.59			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample: **Surma River,Sylhet**
Description of Materials: Silty Sand

Sample No: **BP-01**
Date Sampled: 13.03.18
Date Tested: 13.03.18
Tested by: **Chittagong Lab.**

Dia of Mould : 152 mm
Volume of Mould: 2114
No. of Layer: 5

Ht. of Mould : 116.5 mm
Wt of Hammer 4.5 kg
Blows/Layer.: 56

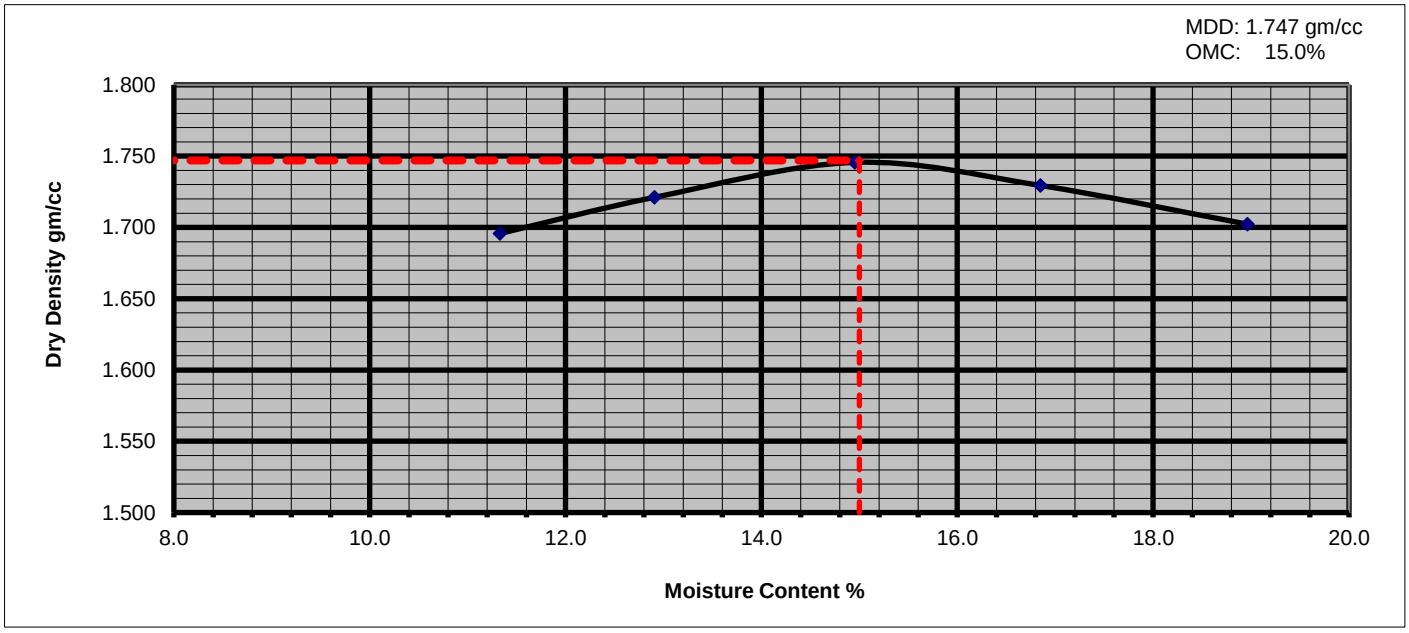
Drop Height: 450 mm
Initial Moisture: 3.73

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
target W/C	%	13	15	17	19	21	
Water Added	g	447	543	628	733	837	
Wt.of Mould +Wet Soil	g	6810	6927	7061	7091	7100	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	3991	4108	4242	4272	4281	
Bulk Density	gm/cc	1.888	1.943	2.007	2.021	2.025	
Dry Density	gm/cc	1.696	1.721	1.746	1.729	1.702	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		W	O	J	N	E	C	A	L	G	K	S
Wt of Can +Wet Soil	g	277.3	247.1	280.3	253.8	265.5	268.8	276.3	258.7	250.6	278.6	261.7
Wt of Can +Dry Soil	g	252.6	229.8	252.3	233.5	233.9	249.1	246.0	237.3	218.4	252.3	254.29
Wt.of Water	g	24.7	17.3	28.0	20.3	31.6	19.7	30.2	21.4	32.1	26.3	7.4
Wt.of Can	g	59.6	54.3	60.52	52.3	43.55	101.2	82.84	96.3	61.96	101.2	93.0
Wt.of Dry Soil	g	193.0	175.5	191.8	181.2	190.4	147.9	163.2	141.0	156.5	151.1	161.3
Mousture Content	%	12.8	9.9	14.6	11.2	16.6	13.3	18.5	15.2	20.5	17.4	4.6
Ave.Moisture Content	%	11.3		12.9		15.0		16.8		19.0		4.56



Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3
AASHTO T-193

Location/ Source of Sample : Surma River,Sylhet
Area represented: Mahtab Dredging,Zero Point,Sylhet
Description of Material: Silty Sand

Sample No: ***BP-01***
Date Sampled: 09.03.2018
Date Tested: 14.03.2018
Tested at: **Chittagong Lab**
MDD 1.747 gm/cc
OMC 15.0 %

UNIT WEIGHT DATA (BEFORE SOAKING)

No. of Mould		6	7	8
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	8368	8584	8214
Mass of Mould m_2	gm	4175	4184	3516
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4193	4400	4698
Volume of Mould V	cm3	2305	2305	2308
Wet Unit Weight m_3/V	gm/cm3	1.819	1.909	2.036
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.560	1.637	1.748
% Compaction (Modified Proctor)		89.3	93.7	100.0

MOISTURE CONTENT DATA

No. of Mould		6		7		8	
Container No.		7	37	28	25	10	5
Mass of Container + Wet Soil m_4	gm	266.2	270.36	233.28	288.3	266.6	256.82
Mass of Container + Dry Soil m_5	gm	243.4	240.7	213.7	261.3	243.8	232.9
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	22.82	29.7	19.6	27.02	22.76	23.88
Mass of Container m_7	gm	107.76	59.91	93.61	101.05	106.9	86.68
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	135.65	180.79	120.07	160.25	136.9	146.26
Moisture Content	%	16.8	16.4	16.3	16.9	16.6	16.3
Average Moisture Content	%	16.61		16.59		16.48	

Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 14.03.2018

SWELLING DATA

Sample No: **BP-01**

Day and Month	Time Soaking Hours	Time Elapsed	Mould No. 13 Specimen Ht.=127mm			Mould No. 14 Specimen Ht.=127mm			Mould No. 15 Specimen Ht.=127mm		
			Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell
14-Mar-18	11:00	0	0	0	0	0	0	0	0	0	0
15-Mar-18	"	24	15	0.15	0.11	9	0.09	0.07	5	0.05	0.03
16-Mar-18	"	48	15	0.15	0.11	10	0.1	0.07	5	0.05	0.03
17-Mar-18	"	72	15	0.15	0.11	10	0.1	0.07	5	0.05	0.03
18-Mar-18	"	96	15	0.15	0.11	11	0.11	0.08	5	0.05	0.03

SOAKING DATA

		Mould No. 6	Mould No. 7	Mould No. 8
Mass. of Siol + Mould + Base Plate (Before Soaking) m_1	gm	10499	11330	10888
Mass. of Siol + Mould + Base Plate (After Soaking) m_2	gm	10700	11515	11048
Mass of Mould + Base Plate m_3		4175	4184	3516
Water Absorbed $m_4=(m_2-m_1)$		210	185	160
Mass. of Dry Soil in Mould	gm	4193	4400	4598
Water Absorbed $((m_4/m_5)x100)$	%	5.01	4.2	3.5

MOISTURE CONTENT (AFTER SOAKING)

		Mould No. 6		Mould No. 7		Mould No. 8	
Container No.	gm	6	9	7	3	8	15
Mass. of Wet Soil + Container m_6	gm	295.33	298.65	296.36	288.65	286.65	265.33
Mass. of Dry Soil + Container m_7	gm	257.04	265.60	262.57	259.10	254.77	235.23
Mass. of Water $m_8=(m_6-m_7)$	gm	38.29	33.05	33.79	29.55	31.88	30.1
Mass.of Container m_9	gm	92.16	102.03	107.76	107.81	102.40	71.88
Mass. of Dry soil $m_{10}=(m_7-m_9)$	gm	164.88	163.57	154.81	151.29	152.37	163.35
Moisture Content $((m_8/m_{10})x100)$	gm	23.2	20.2	21.8	19.5	20.9	18.4
Ave. Moisture Content	%	21.7		20.7		19.7	

CBR DATA

Penetration	Mould No. 6				Mould No. 7				Mould No. 8			
	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	4	0.334			6	0.474			11	0.824		
0.050 (1.27 mm)	8.0	0.614			13.5	1.000			19	1.385		
0.075 (1.91 mm)	13.0	0.965			14.0	1.035			28	2.016		
0.100 (2.54 mm)	16.0	1.175		8.9	21.0	1.525		11.6	38	2.717		20.58
0.150 (3.81 mm)	21.0	1.525			28.0	2.016			51	3.628		
0.200 (5.08 mm)	25.0	1.806		9.0	34.0	2.437		12.1	59	4.189		21.02
0.300 (7.62 mm)	32.0	2.297			42.0	2.998			68	4.820		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

Remarks: .....

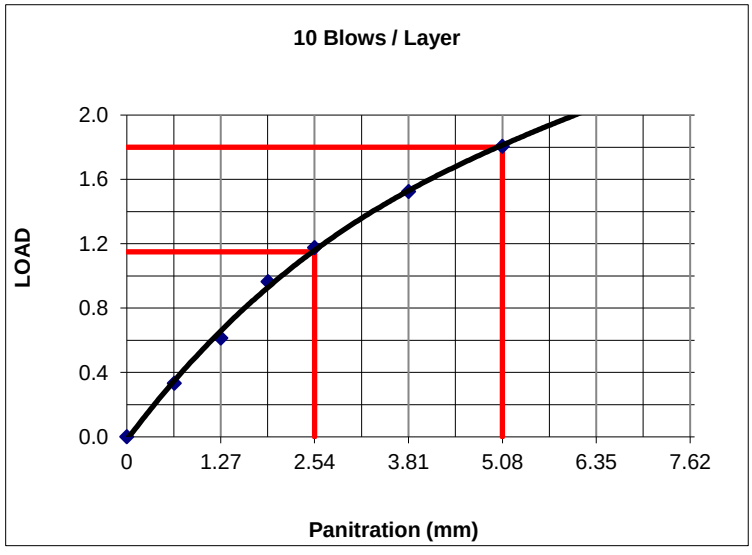
Lab. Technician.

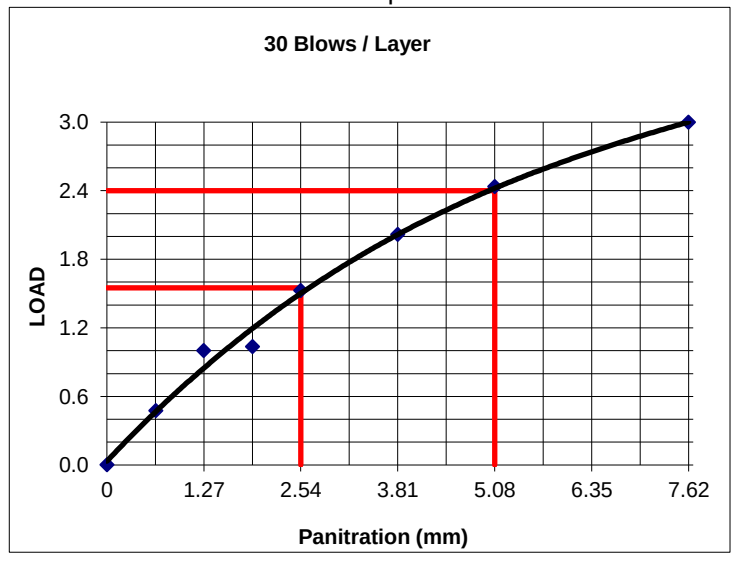
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Date : 18-Mar-18

Sample No. : **BP-01**



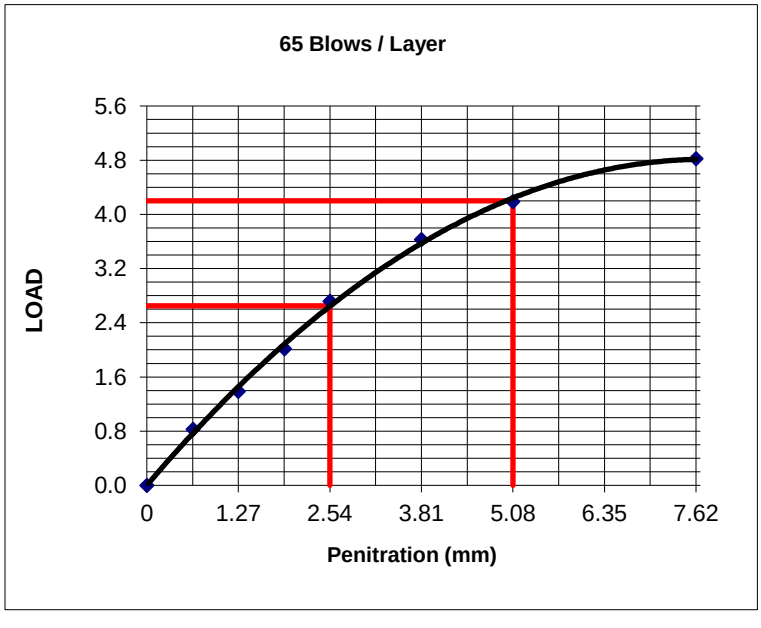


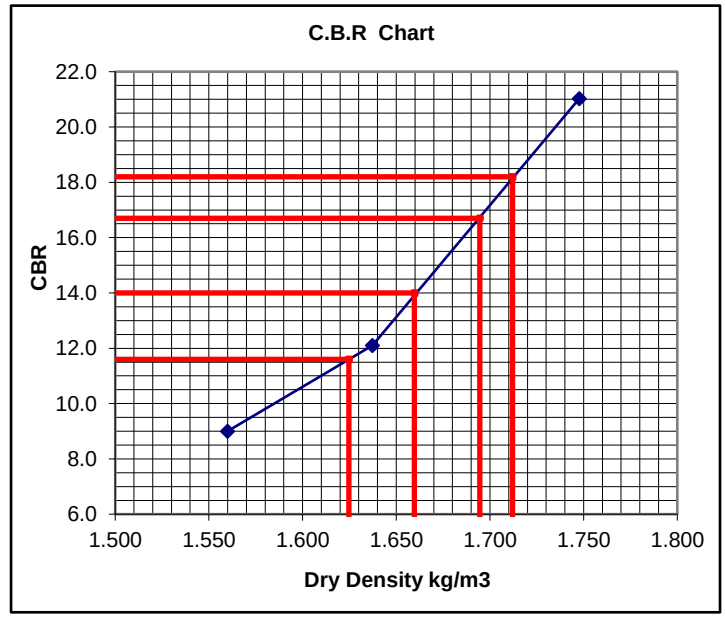
CBR at 2.54 mm Penetration:… 8.9

CBR at 5.08 mm Penetration:… 9.0

CBR at 2.54 mm Penetration: 11.6

CBR at 5.08 mm Penetration:… 12.1





CBR at 2.54 mm Penetration:	20.58
CBR at 5.08 mm Penetration:	21.02
MDD	1.747
OMC	15.0%

CBR at 98% Compaction	18.2
CBR at 97% Compaction	16.7
CBR at 95% Compaction	14.0
CBR at 93% Compaction	11.6

Standard Load for 2.54mm Penetration= 13.2 KN

Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **BP-02**

Date Sampled: 10.03.18

Date Tested: 10.03.18

Location of Sample: **Khanaghat,Sylhet**

Description of Material: Brickfield Soil

Dry Constant Weight: 346.45 gm

Tested at: **Chittagong Lab**

ASTM SIEVE NO	SIZE (MM)	WT. Retained (g)	Cumulative Wt. Retained (g)	Percent Retained	Percent Passing %	Specified Limit
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5					
4	4.75					
8	2.36	0.0	0.0	0.0	100.0	
10	2.0	0.03	0.03	0.01	99.99	
16	1.18	0.1	0.13	0.04	99.96	
30	0.600	0.22	0.35	0.09	99.91	
40	0.425	0.2	0.57	0.15	99.85	
50	0.300	0.12	0.69	0.18	99.82	
100	0.150	0.55	1.24	0.33	99.67	
200	0.075	14.0	15.28	4.08	95.92	
Pan		331.22	374.94			

Fineness Modulus (FM) = 0.01

Remarks: ……

Lab. Technician

Quality Control Engineer

ATTERBERG LIMITS (AASHTO T89 & T 90)

Location/ Source of Sample: **Khanaghat,Sylhet**

Area represented: Chairman Brickfill,Dubag,Sylhet

Material description: Brickfield Soil

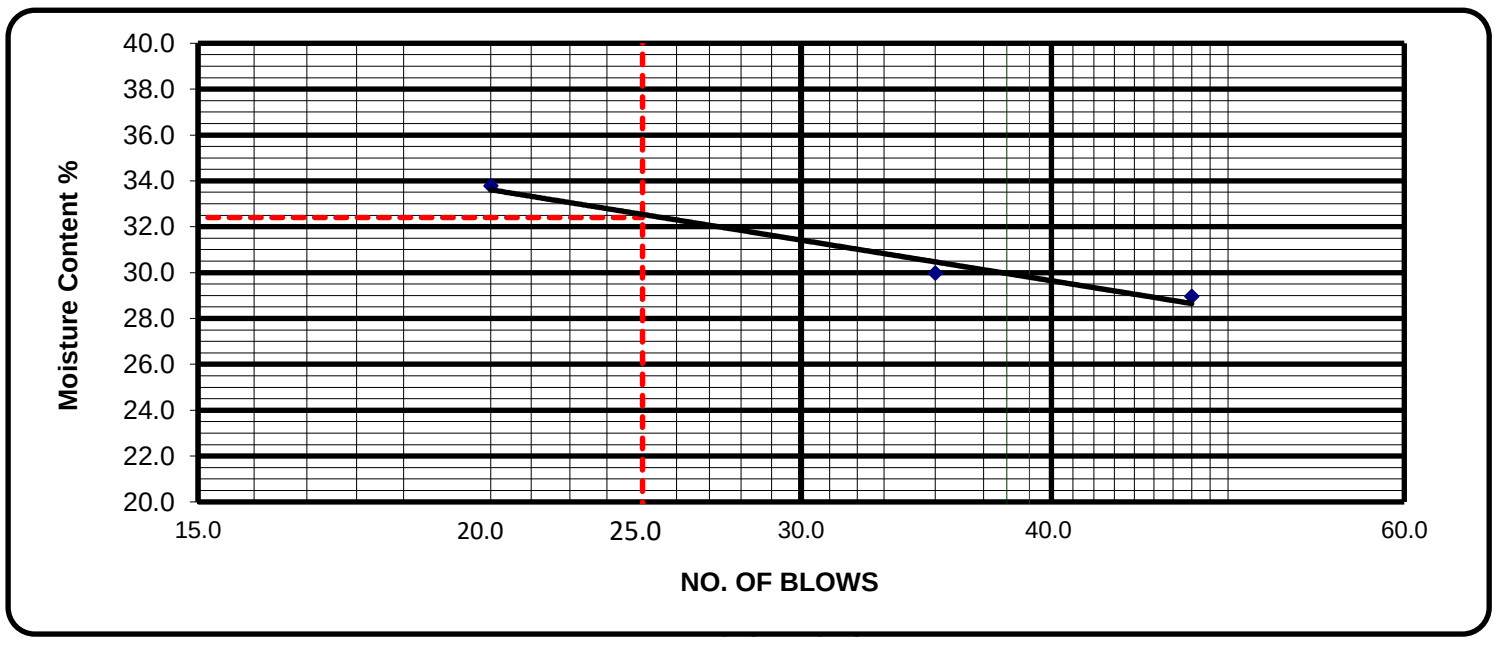
Sample No.: **BP-02**

Date Sampled: **12.03.18**

Date Tested: **12.03.18**

Tested at: **Chittagong Lab**

TEST								
	LIQUID LIMIT					PLASTIC LIMIT		
Determination Number	1	2	3	4		1	2	3
Container Number	G	H	J	I		K	L	
Mass of Container + Wet Soil m_1 gm	82.80	83.30	80.20	84.50		67.95	53.20	
Mass of Container + DrySoil m_2 gm	78.12	78.23	75.23	78.21		66.20	51.43	
Mass. of Water $m_3=(m_1-m_2)$ gm	4.68	5.07	4.97	6.29		1.75	1.77	
Mass of Container m_4 gm	61.96	61.32	60.52	60.50		57.00	42.12	
Mass. of Dry Soil $m_5=(m_2-m_4)$ gm	16.16	16.91	14.71	17.71		9.20	9.31	
Moisture Content $((m_3/m_5) \times 100)$ %	29.0	30.0	33.8	35.32		19.02	19.01	
Number of Blows	47	35	21	16		Avg. WC	19.015	



SUMMARY

LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
LL	PL	PI
32.4	19.02	14.0

Lab. Technician

Quality Control Engineer

NATURAL MOISTURE CONTENT TEST (AASHTO T 265)

Location/ Source of Sample: **Khanaghat,Sylhet**

Area represented: Shylet

Material description: Brickfield Soil

Sample No**.:** **BP-02**

Date Sampled**:** **25.02.18**

Date Tested**:** **13.03.18**

Tested at**:** **Chittagong Lab**

TEST DATA					
Determination Number		1	2	3	4
Container Number		H	R		
Mass of Container + Wet Soil, m_1 gm		271.7	261.62		
Mass of Container + DrySoil, m_2 gm		265.03	255.41		
Mass. of Water, $m_3=(m_1 - m_2)$ gm		5.3	6.21		
Mass of Container, m_4 gm		90.0	46.30		
Mass. of Dry Soil, $m_5=(m_2-m_4)$ gm		175.03	209.11		
Moisture Content, $((m_3/m_5) \times 100)$ %		3.0	3.0		
Average Moisture Content %		3.00			

Remarks: .....

Lab. Technician

Quality Control Engineer

DRY DENSITY MOISTURE CONTENT RELATION TEST (AASHO T-180)

Origin of Sample: **Khanaghat,Sylhet**
Description of Materials: Brickfield Soil

Sample No: **BP-02**
Date Sampled: 13.03.18
Date Tested: 13.03.18
Tested by: **Chittagong Lab.**
Drop Height: 450 mm
Initial Moisture: 3

Dia of Mould : 152 mm
Volume of Mould: 2115 cc
No. of Layer: 5

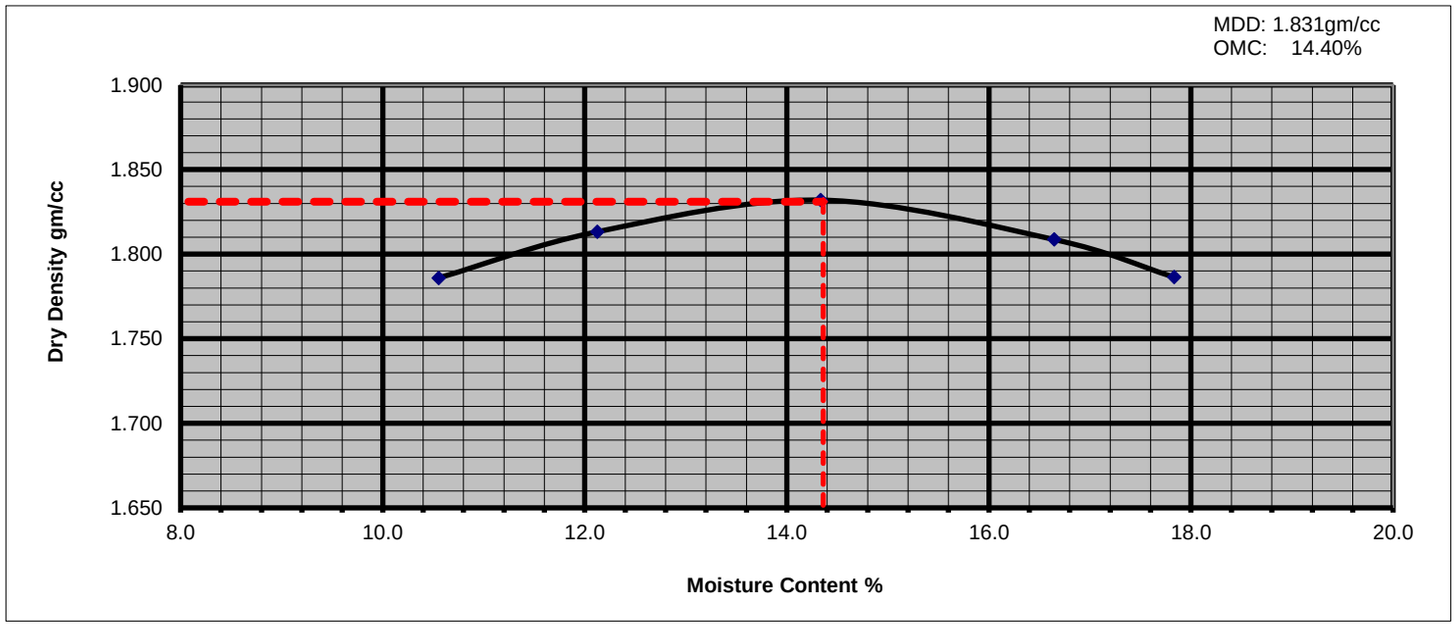
Ht. of Mould : 116.5 mm
Wt of Hammer 4.5 kg
Blows/Layer.: 56

DENSITY DETERMINATION

Trial No.		1	2	3	4	5	
Target W/C	%	11	13	15	17	19	
Water Added	g	388	485	583	680	777	
Wt.of Mould +Wet Soil	g	6995	7119	7249	7281	7271	
Wt.of Mould	g	2819	2819	2819	2819	2819	
Wt.of Wet Soil Mould	g	4176	4300	4430	4462	4452	
Bulk Density	gm/cc	1.974	2.033	2.095	2.110	2.105	
Dry Density	gm/cc	1.786	1.813	1.832	1.809	1.786	

MOISTURE CONTENT DETERMINATION

Sample Number		1		2		3		4		5		Initial MC
Can No.		B	I	D	Q	H	U	M	R	F	T	A
Wt of Can +Wet Soil	g	245.7	255.1	241.3	264.2	231.8	272.5	247.4	269.4	250.8	274.8	271.7
Wt of Can +Dry Soil	g	225.9	236.7	219.5	247.3	207.7	249.7	218.1	236.7	218.8	247.1	265.03
Wt.of Water	g	19.8	18.4	21.8	16.9	24.1	22.8	29.3	32.7	32.0	27.7	5.3
Wt.of Can	g	43.13	57.33	44.9	103.4	41.87	88.72	41.55	40.75	45.6	85.7	90.0
Wt.of Dry Soil	g	182.7	179.4	174.6	143.9	165.9	161.0	176.5	196.0	173.2	161.4	175.0
Mousture Content	%	10.9	10.3	12.5	11.7	14.5	14.2	16.6	16.7	18.5	17.2	3.0
Ave.Moisture Content	%	10.6		12.1		14.3		16.6		17.8		3.03



Remarks: .....

Lab. Technician

Quality Contyrol Engineer

CALIFORNIA BEARING RATIO (CBR) - Sheet 1 of 3

AASHTO T-193

Location/ Source of Sample : **Khanaghat,Sylhet**
Area represented: Chairman Brickfill,Dubag,Sylhet
Description of Material: Brickfield Soil

Sample No: ***BP-02***
Date Sampled: 10.03.2018
Date Tested: 14.03.2018
Tested at: **Chittagong Lab**
MDD 1.831 gm/cc
OMC 14.40 %

UNIT WEIGHT DATA (BEFORE SOAKING)

No. of Mould		10	25	13
No. of Layers		5	5	5
No. of Blows per Layer	gm	10	30	65
Mass of Wet Soil + Mould+ Base Plate m_1	gm	8566	8167	8470
Mass of Mould m_2	gm	4166	3560	3646
Mass of Wet Soil $m_3 = (m_1 - m_2)$	gm	4400	4607	4824
Volume of Mould V	cm3	2305	2305	2305
Wet Unit Weight m_3/V	gm/cm3	1.909	1.999	2.093
Dry Unit Weight (Wet/100+moisture*100)	gm/cm3	1.670	1.750	1.835
% Compaction (Modified Proctor)		91.2	95.6	100.2

MOISTURE CONTENT DATA

No. of Mould		10		25		13	
Container No.		M	N	P	Q	I	H
Mass of Container + Wet Soil m_4	gm	241.5	238.7	237.6	232.9	252.1	243.9
Mass of Container + Dry Soil m_5	gm	217.5	215.1	214.3	210.0	228.6	221.3
Mass of Moisture $m_6 = (m_4 - m_5)$	gm	24.02	23.6	23.4	22.91	23.53	22.57
Mass of Container m_7	gm	49.55	50.13	49.87	49.13	60.50	61.32
Mass of Dry Soil $m_8=(m_5-m_7)$	gm	167.93	164.94	164.38	160.86	168.07	160.01
Moisture Content	%	14.3	14.3	14.2	14.2	14.0	14.1
Average Moisture Content	%	14.32		14.22		14.05	

Remarks: .....

Lab. Technician

Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 2 of 3

Date: 14.03.2018

SWELLING DATA

Sample No: **BP-02**

Day and Month	Time Soaking Hours	Time Elapsed	Mould No. 6 Specimen Ht.=127mm			Mould No. 8 Specimen Ht.=127mm			Mould No. 25 Specimen Ht.=127mm		
			Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell	Guage Reading	Sweell (mm)	% Swell
14-Mar-18	23:15	0	0			0			0		
15-Mar-18	"	24									
16-Mar-18	"	48									
17-Mar-18	"	72									
18-Mar-18	"	96	145	1.45	1.14	130	1.3	1.02	110	1.1	0.87

SOAKING DATA

		Mould No. 10	Mould No. 25	Mould No. 13
Mass. of Soil + Mould + Base Plate (Before Soaking) m_1	gm	10978	12031	12416
Mass. of Soil + Mould + Base Plate (After Soaking) m_2	gm	11123	12169	12541
Mass of Mould + Base Plate m_3		4166	3560	3646
Water Absorbed $m_4=(m_2-m_{1)}$		145	138	125
Mass. of Dry Soil in Mould	gm	4400	4607	4824
Water Absorbed $((m_4/m_5)x100)$	%	3.30	3.0	2.6

MOISTURE CONTENT (AFTER SOAKING)

			Mould No. 10		Mould No. 25		Mould No. 13	
Container No.		gm	C	D	A	E	F	B
Mass. of Wet Soil + Container	m_6	gm	245.11	238.14	248.70	239.16	233.92	241.11
Mass. of Dry Soil + Container	m_7	gm	214.69	209.63	218.45	210.59	207.04	213.49
Mass. of Water	$m_8=(m_6-m_7)$	gm	30.42	28.51	30.25	28.57	26.88	27.62
Mass.of Container	m_9	gm	41.87	44.90	42.84	43.55	45.60	43.13
Mass. of Dry soil	$m_{10}=(m_7-m_9)$	gm	172.82	164.73	175.61	167.04	161.44	170.36
Moisture Content	$((m_8/m_{10})x100)$	gm	17.6	17.3	17.2	17.1	16.7	16.2
Ave. Moisture Content		%	17.5		17.2		16.4	

CBR DATA

Penetration	Mould No. 10				Mould No. 25				Mould No. 13			
	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR	Dial Reading	Load (KN)	Correct Load	CBR
0.025 (0.64 mm)	5	0.404			9	0.684			9	0.684		
0.050 (1.27 mm)	9.0	0.684			13.0	0.965			14	1.035		
0.075 (1.91 mm)	14.0	1.035			19.0	1.385			20	1.455		
0.100 (2.54 mm)	17.0	1.245		9.43	23.0	1.666		12.6	25	1.806		13.68
0.150 (3.81 mm)	20.0	1.455			28.0	2.016			30	2.156		
0.200 (5.08 mm)	26.0	1.876		9.41	36.0	2.577		12.9	39	2.787		13.98
0.300 (7.62 mm)	31.0	2.226			42.0	2.998			48	3.418		
0.400 (10.16 mm)												
0.500 (12.70 mm)												
Proving Ring factor	y=0.0701 x+0.0533											

Remarks: .....

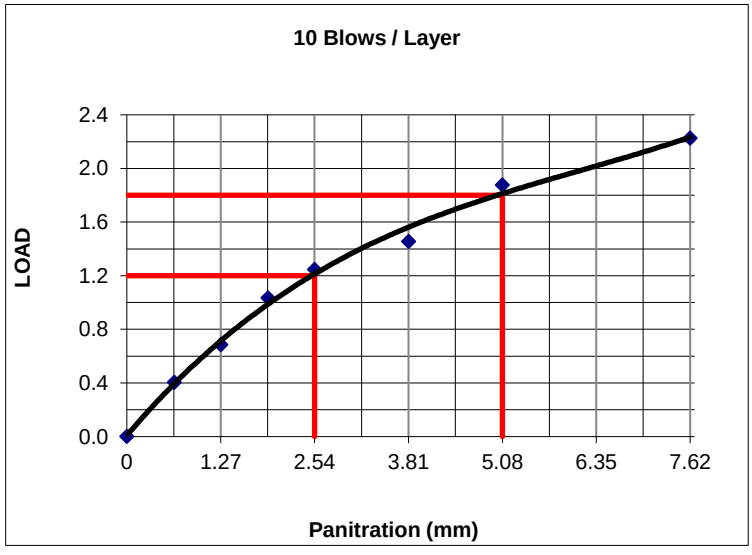
Lab. Technician.

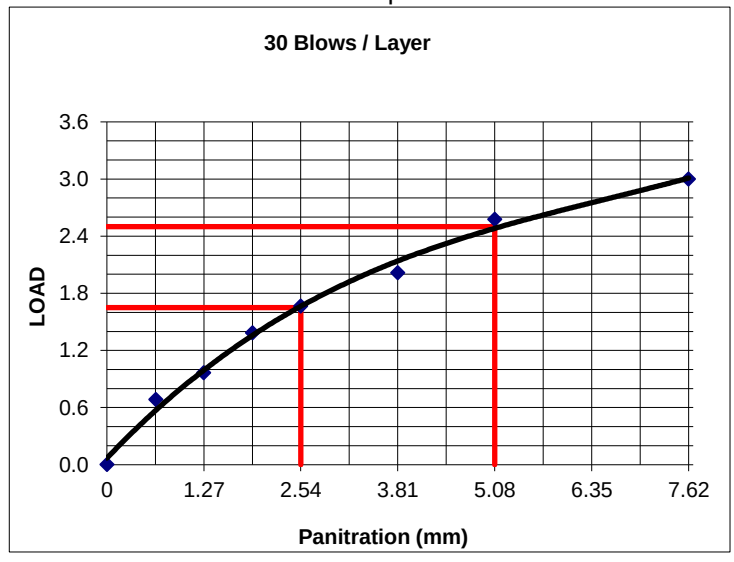
Quality Control Engineer

CALIFORNIA BEARING RATIO (CBR) Sheet 3 of 3

Date : 14.03.2018

Sample No. : **BP-02**



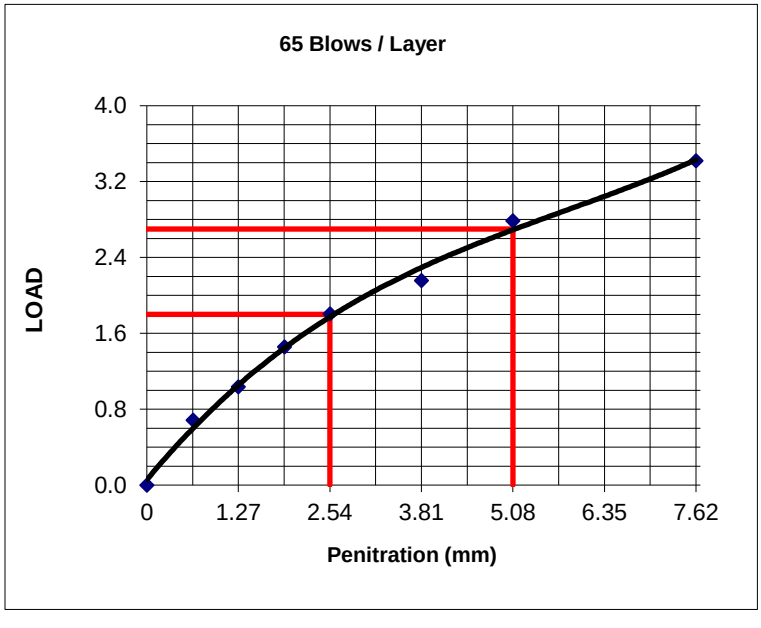


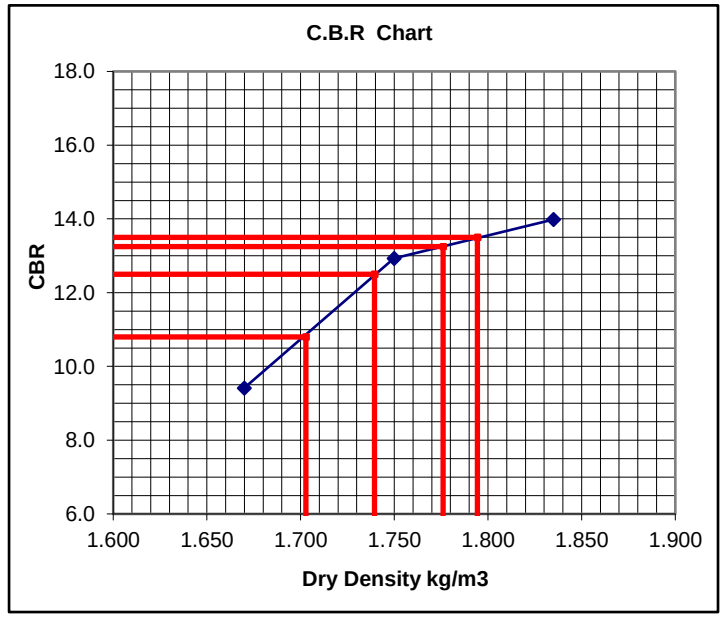
CBR at 2.54 mm Penetration:… 9.4

CBR at 5.08 mm Penetration:… 9.4

CBR at 2.54 mm Penetration: 12.6

CBR at 5.08 mm Penetration:… 12.9





CBR at 2.54 mm Penetration:	13.68
CBR at 5.08 mm Penetration:	13.98
MDD	1.831
OMC	14.4%

CBR at 98% Compaction	13.50
CBR at 97% Compaction	13.25
CBR at 95% Compaction	12.50
CBR at 93% Compaction	10.80

Standard Load for 2.54mm Penetration= 13.2 KN

Standard Load for 5.08mm Penetration= 20.0 KN

Lab. Technician.

Quality Control Engineer

SPECIFIC GRAVITY & WATER ABSORPTION (AASHTO T-85)

Sample No **QM-01**
Date Sample: 03.03.18 Description of Material : 25 mm Stone Chips (Bichanakandi)
Date Test : 17.03.18 Tested at : **Chittagong Lab**
Location of Sample : **Bichanakandi,Sylhet**

COARSE AGGREGATE

Test No			1	2	Average
1. Weight of Saturated Surface Dry (SSD) sample in Air	(gm)		1494	1393	
2. Weight of Oven Dried sample in Air	(gm)		1476	1378	
3. Weight of Basket + Sample in Water	(gm)		1048.5	988.2	
4. Weight of empty Basket in water	(gm)		118.0	118.0	
5. Absorption	(%)	$\frac{((1)-(2))*100}{(2)}$	1.220	1.089	1.154
6. Bulk specfic gravity (SSD)		$\frac{(1)}{(1)-((3)-(4))}$	2.651	2.664	2.658
7. Bulk specific gravity(Dry)		$\frac{(2)}{(1)-((3)-(4))}$	2.619	2.636	2.628
8. Apparent specific gravity		$\frac{(2)}{(2)-((3)-(4))}$	2.706	2.714	2.710

FINE AGGREGATE

Test No			1	2	Average
1.weight in air saturated surface dry sample	(g)				
2.weight in air of oven dried sample	(g)				
3.Weight of pycnometer bottle filled withwater	(g)				
4.pycnometer bottle+sample	(g)				
5.Absorption	(%)	$\frac{(1)-(2)X100}{2}$			
6.Bulk specific gravity (SSD)		$\frac{(1)}{(1)+(3)-(4)}$			
7.Bulk specific gravity		$\frac{(2)}{(1)+(3)-(4)}$			
8.Apparent specific gravity		$\frac{(2)}{(2)+(3)-(4)}$			

Remarks: ……..

Lab .Technician

Quality Control Engineer

AGGREGATE CRUSHING VALUE AND TEN PERCENT FINES VALUE

Location/Source of Sample: **Bichanakandi,Sylhet**
Area Represented: Amin Enterprise & Stone Crusher,Saluthikor Ghat,Sylhet
Description of Material: 25 mm Stone Chips (Bichanakandi)

Sample No: **QM-01**
Date of Sampled: 03.03.18
Date of Tested: 18.03.18
Tested at: **Chittagong Lab**

AGGREGATE CRUSHING VALUE(STP 7.7.1)

Description			Run No		
			1	2	3
Mass of Sample Surface dry	m1	gm	2785	2777	
Masst Passing 2.36mm Test Sieve	m2	gm	707	722	
Aggregate Crushing Value	((m2/m1)x100)	%	25.4	26.0	
Mean or Mediad aggregate Crushing Value(ACV)		%	25.7		

Notes:

1. Load is slowly aplied at a rate so that the total load of 400kN is reached in 10 minutes.
2. Calculate the mean of 2 results. If individual result differ by more than 0.07 times the mean, repeat the test on two further samples and report the median of the results as the ACV.

TEN PERCENT FINES VALUE(STP 7.7.2)

Run No			1	2	3
Maximum Load Applied (kn)	f	KN	180		
Mass of Sample SSD/ Oven dry	m1	gm	2783		
Mass Passing 2.36mm Test sieve	m2		273		
Percent Fines (y)	((m2x100)/m1)	%	9.8		
Mean or Mediad Value for Ten Percent Fines	ym	%	9.8		
Load Required to Produce Ten Percent Fines Value	$\frac{14 \times f}{ym+4}$	KN	182.5		

Notes:

1. Measured 10% Fines value to fall in the range 7.5~12.5% .
2. Calculate the mean of 2 results. If result differ by more than 10kn and by more than 0.1 times the mean, carry out 2 further tests and report the median of the four results as the 10% Fines Value.

Remarks : ……..

Lab.Technician

Quality Control Engineer

FLAKINESS AND ELONGATION INDEX (ASTM D4791)

Location/Source of Sample: **Bichanakandi, Sylhet**
Area Represented: Amin Stone Crusher, Saluthikor Ghat, Sylhet
Description of Material: 25 mm Stone Chips (Bichanakandi)

Sample No: **QM-01**
Date of Sampled: 03.03.18
Date of Tested: 16.03.18
Tested at: **Chittagong Lab**

Sieve Size (mm)		Flakiness (BS- 812:105.1)			Elongation (BS-812:105.2)		
Passing	Retained	Mass of the fraction Gauged (gm)	Mass of Material Passing through Flakiness Guage	% Flaky	Mass of the fraction Gauged (gm)	Mass of Material retained by Elogation Guage	% Elogation
		m_1	m_2	$(m_2/m_1)*100$	m_3	m_4	$(m_4/m_3)*100$
63	50	0	0	0	0	0	0.0
50	37.5	0	0	0.0	0	0	0.0
37.5	28	0	0	0.0	0	0	0.0
28	20	1624	181	11.2	1624	39	2.4
20	14	1528	141	9.2	1528	197	12.9
14	10	178	13	7.3	178	68	38.2
10	6.3	0	0	0.0	0	0	0.0
Total		3330	335	**10.1**	3330	304	**9.1**

Note:
1. If retained % of any fraction is equal or less then 5% than, the fraction is not considered for test.
2. Minimum 200 pieces should be taken on each fraction for test.

Flakiness Index (%): $(m_2/m_1)x100$ = **10.1**
Elongation Index (%): $(m_4/m_3)x100$ = **9.1**
Sum of Elongation and Flakiness Indices(%) = **19.2**

Remarks :……

Lab. Technician

Quality Control Engineer

LOS ANGELES ABRASION (AASHTO T:96)

Location/Source of Sample: **Bichanakandi,Sylhet**
Area Represented: Amin Enterprise & Stone Crusher,Saluthikor Ghat,Sylhet
Description of Material: 25 mm Stone Chips (Bichanakandi)

Sample No: **QM-01**
Date of Sampled: 03.03.18
Date of Tested: 23.03.18
Tested at: **Chittagong Lab**

Test Fraction		Mass of Fraction (gm)	Total Mass before Test (gm)	Grade	No. of Sphere	Number of Revolutions	Total Mass after Test(gm)		Abration Value (%)
Passing	Retained on						Retained on 1.70 mm Sieve (gm)	Passing Through 1.70 mm Sieve (gm)	
37.5 mm	**25.0 mm**								
25.0 mm	**19.0 mm**								
19.0 mm	**12.5 mm**								
12.5 mm	**9.5 mm**								
9.5 mm	**6.3 mm**	**2500**							
6.3 mm	**4.75 mm**	**2500**	**5000**	**"B"**	**11**	**500**	**3630**	**1370**	**27.4**
4.75 mm	**2.36 mm**								

Remarks: Total Weight of the Specimen Should be 5000+40 gm

For A- Grading use 12 Sphere of total weight 5000+25 gm
For B- Grading use 11 Sphere of total weight 4584+25 gm
For C- Grading use 8 Sphere of total weight 3330+15 gm
For C- Grading use 6 Sphere of total weight 2500+15 gm

Lab. Technician

Quality Control Engineer

SOUNDNESS TEST OF AGGREGATE BY USE OF SODIUM SULPHATE (AASHTO T-104 ASTM C 88)

Location/Source of Sample: **Bichanakandi,Sylhet**

Area Represented: Amin Stone Crusher,Saluthikor Ghat,Sylhet

Description of Materials: 25 mm Stone Chips (Bichanakandi)

Sample No: **QM-01**

Date Sampled: 05.03.18

Date Tested: 10.03.18

Tested at: **Chittgong Lab**

Immersion			
Cycle	Date	Time	
		Remove Solusion	Immersion
Start	05.03.18	-	15.30
1st	06.03.18	9.00	15.30
2nd	07.03.18	9.10	15.30
3rd	08.03.18	9.30	15.30
4th	09.03.18	9.30	15.45
5th	10.03.18	9.00	-

	Sieve Size in mm (Sieve Number)		Gradation of Original Sample Percent (%) **A**	Mass of Test Fraction Before Test (gm)	Weight of Sample Before Test (gm) **B**	Test Sieve	Weight of Retain Sample After Test (gm) **C**	Percent Passing Designeted After Test (gm) **D = (B-C)**	Weight of Percent Loss Afte Test % **E = (D/C)X100**	Weighted Average Loss % **F = (AXC)/100**
	Passing (mm)	Retained (mm)								
Coarse Aggregate	9.5 (3/8")	4.75 (No 4)	**0**	300 ± 5	**0**	4.0 (No.5)	**0**	**0.0**	**0.0**	**0.00**
	12.5 (1/2")	9.5 (No.3/8")	**0.0**	330 ± 5	**0**	8.0 (5/16")	**0**	**0.0**	**0.0**	**0.00**
	19 (3/4")	12.5 (1/2")	**50.1**	670 ± 10	**2550**	8.0 (5/16")	**2509**	**41.0**	**1.6**	**0.82**
	25 (1")	19 (3/4")	**44.9**	500 ± 30	**2285**	16.0 (5/8")	**2252**	**33.0**	**1.5**	**0.66**
	37.5 (1 1/2")	25 (1")	**5.0**	1000 ± 50	**255**	16.0 (5/8")	**250**	**5.0**	**2.00**	**0.10**
	50 (2")	37.5 (1 1/2")	**0**	2000 ± 200	**0**	31.5 (1 1/4")	**0**	**0.0**	**0.00**	**0.00**
	63 (2 1/2")	50 (2")	**0**	3000 ± 300	**0**	31.5 (1 1/4")	**0**	**0.0**	**0**	
	Total		**100**		**5090**		**5011**		**5.10**	**1.58**

Remarks :

Specific Gravity of Solution = 1.6

Specific Limit of Solution 1.154 ~ 1.171

Lab. Technician

Quality Control Engineer

SPECIFIC GRAVITY & WATER ABSORPTION (AASHTO T-85)

Sample No **QM-02**
Date Sample: 03.03.18 Description of Material : 25 mm Stone Chips (Volagonj)
Date Test : 17.03.18 Tested at : **Chittagong Lab**
Location of Sample : **Volagonj,Sylhet**

COARSE AGGREGATE

Test No			1	2	Average
1. Weight of Saturated Surface Dry (SSD) sample in Air	(gm)		1553	1533	
2. Weight of Oven Dried sample in Air	(gm)		1539	1517.6	
3. Weight of Basket + Sample in Water	(gm)		1090	1073.4	
4. Weight of empty Basket in water	(gm)		116.0	116.0	
5. Absorption	(%)	$\frac{((1)-(2))*100}{(2)}$	0.910	1.015	0.962
6. Bulk specfic gravity (SSD)		$\frac{(1)}{(1)-((3)-(4))}$	2.682	2.663	2.673
7. Bulk specific gravity(Dry)		$\frac{(2)}{(1)-((3)-(4))}$	2.658	2.637	2.647
8. Apparent specific gravity		$\frac{(2)}{(2)-((3)-(4))}$	2.724	2.709	2.716

FINE AGGREGATE

Test No			1	2	Average
1.weight in air saturated surface dry sample	(g)				
2.weight in air of oven dried sample	(g)				
3.Weight of pycnometer bottle filled withwater	(g)				
4.pycnometer bottle+sample	(g)				
5.Absorption	(%)	$\frac{(1)-(2)X100}{2}$			
6.Bulk specific gravity (SSD)		$\frac{(1)}{(1)+(3)-(4)}$			
7.Bulk specific gravity		$\frac{(2)}{(1)+(3)-(4)}$			
8.Apparent specific gravity		$\frac{(2)}{(2)+(3)-(4)}$			

Remarks: ……..

Lab .Technician

Quality Control Engineer

AGGREGATE CRUSHING VALUE AND TEN PERCENT FINES VALUE

Location/Source of Sample: **Volagonj,Sylhet**
Area Represented: Shapla Stone Crusher,Atkiari,Laalbhag,Sylhet
Description of Material: 25 mm Stone Chips (Volagonj)

Sample No: **QM-02**
Date of Sampled: 03.03.18
Date of Tested: 18.03.18
Tested at: **Chittagong Lab**

AGGREGATE CRUSHING VALUE(STP 7.7.1)

Description			Run No		
			1	2	3
Mass of Sample Surface dry	m1	gm	2780	2785	
Masst Passing 2.36mm Test Sieve	m2	gm	642	652	
Aggregate Crushing Value	((m2/m1)x100)	%	23.1	23.4	
Mean or Mediad aggregate Crushing Value(ACV)		%	23.3		

Notes:

1. Load is slowly aplied at a rate so that the total load of 400kN is reached in 10 minutes.
2. Calculate the mean of 2 results. If individual result differ by more than 0.07 times the mean, repeat the test on two further samples and report the median of the results as the ACV.

TEN PERCENT FINES VALUE(STP 7.7.2)

Run No			1	2	3
Maximum Load Applied (kn)	f	KN	180		
Mass of Sample SSD/ Oven dry	m1	gm	2769		
Mass Passing 2.36mm Test sieve	m2		260		
Percent Fines (y)	((m2x100)/m1)	%	9.4		
Mean or Mediad Value for Ten Percent Fines	ym	%	9.4		
Load Required to Produce Ten Percent Fines Value	$\frac{14 \times f}{ym+4}$	KN	188.2		

Notes:

1. Measured 10% Fines value to fall in the range 7.5~12.5% .
2. Calculate the mean of 2 results. If result differ by more than 10kn and by more than 0.1 times the mean, carry out 2 further tests and report the median of the four results as the 10% Fines Value.

Remarks : ……..

Lab.Technician

Quality Control Engineer

FLAKINESS AND ELONGATION INDEX (ASTM D4791)

Location/Source of Sample: **Volagonj,Sylhet**
Area Represented: Shapla Stone Crusher,Atkiari,Laalbhag,Sylhet
Description of Material: 25 mm Stone Chips (Volagonj)

Sample No: **QM-02**
Date of Sampled: 03.03.18
Date of Tested: 16.03.18
Tested at: **Chittagong Lab**

Sieve Size (mm)		Flakiness (BS- 812:105.1)			Elongation (BS-812:105.2)		
Passing	Retained	Mass of the fraction Gauged (gm)	Mass of Material Passing through Flakiness Guage	% Flaky	Mass of the fraction Gauged (gm)	Mass of Material retained by Elogation Guage	% Elogation
		m_1	m_2	$(m_2/m_1)*100$	m_3	m_4	$(m_4/m_3)*100$
63	50	0	0	0	0	0	0.0
50	37.5	0	0	0.0	0	0	0.0
37.5	28	0	0	0.0	0	0	0.0
28	20	966	118	12.2	966	51	5.3
20	14	775	62	8.0	775	182	23.5
14	10	106	11	10.4	106	17	16.0
10	6.3	0	0	0.0	0	0	0.0
Total		1847	191	**10.3**	1847	250	**13.5**

Note:

1. If retained % of any fraction is equal or less then 5% than, the fraction is not considered for test.
2. Minimum 200 pieces should be taken on each fraction for test.

Flakiness Index (%): $(m_2/m_1)x100$ = **10.3**
Elongation Index (%): $(m_4/m_3)x100$ = **13.5**
Sum of Elongation and Flakiness Indices(%) = **23.9**

Remarks :……

Lab. Technician

Quality Control Engineer

LOS ANGELES ABRASION (AASHTO T:96)

Location/Source of Sample: **Volagonj,Sylhet**
Area Represented: Shapla Stone Crusher,Atkiari,Laalbhag,Sylhet
Description of Material: 25 mm Stone Chips (Volagonj)

Sample No: **QM-02**
Date of Sampled: 03.03.18
Date of Tested: 23.03.18
Tested at: **Chittagong Lab**

Test Fraction		Mass of Fraction (gm)	Total Mass before Test (gm)	Grade	No. of Sphere	Number of Revolutions	Total Mass after Test(gm)		Abration Value (%)
Passing	Retained on						Retained on 1.70 mm Sieve (gm)	Passing Through 1.70 mm Sieve (gm)	
37.5 mm	**25.0 mm**								
25.0 mm	**19.0 mm**								
19.0 mm	**12.5 mm**								
12.5 mm	**9.5 mm**								
9.5 mm	**6.3 mm**	**2500**							
6.3 mm	**4.75 mm**	**2500**	**5000**	**"B"**	**11**	**500**	**3750**	**1250**	**25**
4.75 mm	**2.36 mm**								

Remarks: Total Weight of the Specimen Should be 5000+40 gm

For A- Grading use 12 Sphere of total weight 5000+25 gm
For B- Grading use 11 Sphere of total weight 4584+25 gm
For C- Grading use 8 Sphere of total weight 3330+15 gm
For C- Grading use 6 Sphere of total weight 2500+15 gm

Lab. Technician

Quality Control Engineer

SOUNDNESS TEST OF AGGREGATE BY USE OF SODIUM SULPHATE (AASHTO T-104 ASTM C 88)

Location/Source of Sample: **Volagonj,Sylhet**

Area Represented: Shapla Stone Crusher,Atkiari,Laalbhag,Sylhet

Description of Materials: 25 mm Stone Chips (Volagonj)

Sample No: **QM-02**

Date Sampled: 05.03.18

Date Tested: 10.03.18

Tested at: **Chittgong Lab**

Immersion			
Cycle	Date	Time	
		Remove Solusion	Immersion
Start	05.03.18	-	15.30
1st	06.03.18	9.00	15.30
2nd	07.03.18	9.10	15.30
3rd	08.03.18	9.30	15.30
4th	09.03.18	9.30	15.45
5th	10.03.18	9.00	-

	Sieve Size in mm (Sieve Number)		Gradation of Original Sample Percent (%) A	Mass of Test Fraction Before Test (gm)	Weight of Sample Before Test (gm) B	Test Sieve	Weight of Retain Sample After Test (gm) C	Percent Passing Designeted After Test (gm) D = (B-C)	Weight of Percent Loss Afte Test % E = (D/C)X100	Weighted Average Loss % F = (AXC)/100
	Passing (mm)	Retained (mm)								
Coarse Aggregate	9.5 (3/8")	4.75 (No 4)	**0**	300 ± 5	**0**	4.0 (No.5)	**0**	**0.0**	**0.0**	**0.00**
	12.5 (1/2")	9.5 (No.3/8")	**0.0**	330 ± 5	**0**	8.0 (5/16")	**0**	**0.0**	**0.0**	**0.00**
	19 (3/4")	12.5 (1/2")	**49.9**	670 ± 10	**2784**	8.0 (5/16")	**2753**	**31.0**	**1.1**	**0.56**
	25 (1")	19 (3/4")	**45.3**	500 ± 30	**2530**	16.0 (5/8")	**2497**	**33.0**	**1.3**	**0.60**
	37.5 (1 1/2")	25 (1")	**4.8**	1000 ± 50	**270**	16.0 (5/8")	**261**	**9.0**	**3.45**	**0.17**
	50 (2")	37.5 (1 1/2")	**0**	2000 ± 200	**0**	31.5 (1 1/4")	**0**	**0.0**	**0.00**	**0.00**
	63 (2 1/2")	50 (2")	**0**	3000 ± 300	**0**	31.5 (1 1/4")	**0**	**0.0**	**0**	
	Total		**100**		**5584**		**5511**		**5.90**	**1.33**

Remarks :

Specific Gravity of Solution = 1.61

Specific Limit of Solution 1.154 ~ 1.171

Lab. Technician

Quality Control Engineer

SPECIFIC GRAVITY & WATER ABSORPTION (AASHTO T-85)

Sample No **FA-01**
Date Sample: 12.03.18
Date Test : 12.03.18
Location of Sample : **Saluthikor Ghat,Sylhet**

Description of Material : Sylhet Sand
Tested at : **Chittagong Lab**

COARSE AGGREGATE

Test No			1	2	Average
1. Weight of Saturated Surface Dry (SSD) sample in Air	(gm)				
2. Weight of Oven Dried sample in Air	(gm)				
3. Weight of Basket + Sample in Water	(gm)				
4. Weight of empty Basket in water	(gm)				
5. Absorption	(%)	$\frac{((1)-(2))*100}{(2)}$			
6. Bulk specfic gravity (SSD)		$\frac{(1)}{(1)-((3)-(4))}$			
7. Bulk Specific Gravity(Dry)		$\frac{(2)}{(1)-((3)-(4))}$			
8. Apparent Specific Gravity		$\frac{(2)}{(2)-((3)-(4))}$			

FINE AGGREGATE

Test No			1	2	Average
1.weight in air Saturated Surface Dry (SSD) sample	(g)		250.9	240.9	
2.Weight in Air of Oven Dried sample	(g)		244.35	235.3	
3.Weight of Pycnometer bottle filled with water	(g)		665.4	665.4	
4.Pycnometer bottle + Sample + Water	(g)		820.5	814.7	
5.Absorption	(%)	$\frac{(1)-(2)X100}{(2)}$	2.68	2.38	2.53
6.Bulk specific gravity (SSD)		$\frac{(1)}{(1)+(3)-(4)}$	2.619	2.630	2.624
7.Bulk specific gravity		$\frac{(2)}{(1)+(3)-(4)}$	2.551	2.569	2.560
8.Apparent specific gravity		$\frac{(2)}{(2)+(3)-(4)}$	2.738	2.736	2.737

Remarks: ……..

Lab .Technician

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **FA-01**

Date Sampled: 03.03.18

Date Tested: 10.03.18

Location of Sample: **Saluthikor Ghat,Sylhet**

Description of Material: Sylhet Sand

Dry Constant Weight: 621.18 gm

Tested at: **Chittagong Lab**

ASTM SIEVE NO	SIZE (MM)	WT. Retained (g)	Cumulative Wt. Retained (g)	Percent Retained	Percent Passing %	Specified Limit
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0	0	0	0.0	100.0	
3/8"	9.5	0	0	0.0	100.0	
4	4.75	1.4	1.4	0.2	99.8	
8	2.36	44.1	45.5	7.3	92.7	
10	2.0	3.2	48.7	7.8	92.2	
16	1.18	10.04	58.7	9.5	90.6	
30	0.600	263.4	322.1	52.5	47.5	
40	0.425	149.8	471.9	76.0	24.0	
50	0.300	56.14	528.1	85.0	15.0	
100	0.150	66.14	594.2	95.7	4.3	
200	0.075	23.7	617.9	99.5	0.5	
Pan		3.27	621.18			

Fineness Modulus (FM) = 3.3

Remarks: ……

Lab. Technician

Quality Control Engineer

SPECIFIC GRAVITY & WATER ABSORPTION (AASHTO T-85)

Sample No **QM-02**
Date Sample: 12.03.18
Date Test : 12.03.18
Location of Sample : **Saluthikor Ghat,Sylhet**

Description of Material : Sharighat Sand
Tested at : **Chittagong Lab**

COARSE AGGREGATE

Test No			1	2	Average
1. Weight of Saturated Surface Dry (SSD) sample in Air	(gm)				
2. Weight of Oven Dried sample in Air	(gm)				
3. Weight of Basket + Sample in Water	(gm)				
4. Weight of empty Basket in water	(gm)				
5. Absorption	(%)	$\frac{((1)-(2))*100}{(2)}$			
6. Bulk specfic gravity (SSD)		$\frac{(1)}{(1)-((3)-(4))}$			
7. Bulk Specific Gravity(Dry)		$\frac{(2)}{(1)-((3)-(4))}$			
8. Apparent Specific Gravity		$\frac{(2)}{(2)-((3)-(4))}$			

FINE AGGREGATE

Test No			1	2	Average
1.weight in air Saturated Surface Dry (SSD) sample	(g)		249.1	238.3	
2.Weight in Air of Oven Dried sample	(g)		242.3	232.3	
3.Weight of Pycnometer bottle filled with water	(g)		665.4	665.4	
4.Pycnometer bottle + Sample + Water	(g)		818.3	812.4	
5.Absorption	(%)	$\frac{(1)-(2)X100}{(2)}$	2.81	2.58	2.69
6.Bulk specific gravity (SSD)		$\frac{(1)}{(1)+(3)-(4)}$	2.589	2.610	2.600
7.Bulk specific gravity		$\frac{(2)}{(1)+(3)-(4)}$	2.519	2.544	2.532
8.Apparent specific gravity		$\frac{(2)}{(2)+(3)-(4)}$	2.710	2.723	2.717

Remarks: ……..

Lab .Technician

Quality Control Engineer

SIEVE ANALYSIS (AASHTO "T-127" "T -11")

Sample No: **FA-02**
Date Sampled: 03.03.18
Date Tested: 10.03.18
Location of Sample: **Saluthikor Ghat,Sylhet**

Intended to be use for: Pavement Material
Description of Material: Sharighat Sand
Dry Constant Weight: 479.41 gm
Tested at: **Chittagong Lab**

ASTM SIEVE NO	SIZE (MM)	WT. Retained (g)	Cumulative Wt. Retained (g)	Percent Retained	Percent Passing %	Specified Limit
21/2"	63.0					
2"	50.0					
11/2"	37.5					
1"	25.0					
	20.0					
3/4"	19.0					
	14.0					
1/2"	12.5					
	10.0					
3/8"	9.5	0	0	0.0	100.0	
4	4.75	0.0	0.0	0.0	100.0	
8	2.36	11.1	11.1	2.3	97.7	
10	2.0	1.1	12.2	2.5	97.5	
16	1.18	2.08	14.3	3.0	97.0	
30	0.600	97.53	111.8	23.3	76.7	
40	0.425	164.6	276.5	57.7	42.3	
50	0.300	78.27	354.7	8.0	26.0	
100	0.150	100.05	454.8	94.9	5.1	
200	0.075	19.7	474.5	99.0	2.0	
Pan		4.92	479.41			

Fineness Modulus (FM)= = 1.92

Remarks: ……

Lab. Technician

Quality Control Engineer