MEHRAN UNIVERSITY OF ENGINEERING & TECHNOLOGY
JAMSHORO, SINDH, PAKISTAN (Postal Code 7602)
DEPARTMENT OF CIVIL ENGINEERING
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CONCRETE LABORATORY

No. MUET/CED/CL-175-22
Date: 02-12-2022

CONCRETE MIX DESIGN FOR 3000 psi CUBICAL COMPRESSIVE STRENGTH @ 28 Days

PROJECT: C.C Lining of Sultani Branch & its 06 Nos. Off Taking Channels
CLIENT: Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
CONTRACTOR: M/S Al-Ramzan Construction Company

I. GENERAL:

M/s Al-Ramzan Construction Company. Supplied samples of cement, fine aggregate and coarse aggregate for performing concrete mix design for 3000 psi cubical strength at 28 days.

Following input data was used in mix design:

Cement type:	Pakland (OPC)
Fine Aggregate:	Bolhari Sand
Coarse Aggregate:	Nooriabad
Slump Required:	25 mm – 75 mm

Mix design is based on specified input data and test results of supplied fine and coarse aggregates are included in this report.

The design concrete mix has been verified by workability (slump test) and compressive strength test on trial mixes. The optimum mix proportions yielding desired workability and strength are recommended in this report.

2. TEST ON AGGREGATE:

Following tests were performed on fine and coarse aggregate sample:

(i) Gradation
(ii) Water absorption
(iii) Unit weight (Dry Un-rodded)

(a) Test on Fine Aggregate:

The gradation results of fine aggregate as supplied by M/s Al-Ramzan Construction Company are shown in Table 2.1

Table 2.1: Gradation of Fine Aggregate

Sieve size		Weight retained (gm)	Percentage Weight retained	Cumulative Percentage Weight retained	Percentage Passing
BS	ASTM				
9.5 mm	3/8"	0	0	0	100
4.75 mm	#4	80	4.98	4.98	95.02
2.36 mm	#8	365	22.82	27.80	72.20
1.18 mm	#16	467	29.20	57.00	43.00
600 µm	#30	349	21.79	78.79	21.21
300 µm	#50	193	12.06	90.85	9.15
150 µm	#100	112	7.00	97.85	2.15
Pan		34	2.15	100	-

Other tests on fine aggregate yielded the following results:

Water absorption : 1.14 %

Unit weight : 1750 kg/m^3

(b) Tests on Coarse Aggregate:

A Sample of Coarse aggregate was supplied by M/s Al-Ramzan Construction Company. The gradation results of sample are given in Table 2.2

Table 2.3: Gradation of Coarse Aggregate

Sieve size		Weight retained (gm)	Percentage Weight retained	Cumulative Percentage Weight retained	Percentage Passing
BS	ASTM				
50 mm	2"	0	0	0	100
37.5 mm	1 ½"	0	0	0	100
19.5 mm	¾"	292	6.95	6.95	93.05
14 mm	½"	1082	25.75	32.67	67.33
9.5 mm	3/8"	1186	28.23	60.90	39.10
4.75 mm	3/16"	1521	36.22	97.12	2.88
Pan		121	2.88	100	-

Other tests on coarse aggregate yielded the following results:

Water absorption : 0.96 %

Unit weight : 1410 kg/m³

3. MIX DESIGN:

Various trial mixes were formulated to verify the required strength and workability; however, only two trial mixes are summarized in this report. The details of these trial mixes are given in Table 3.1

Table 3.1: Details of Trial Mixes

Mix ID	Cement	Fine Aggregate (kg/m³)	Coarse Aggregate (kg/m³)	Water (kg/m³)	Mix Proportions by Weight
Trial Mix-1	325	615	1110	173	1 : 1.89 : 3.41 @ 0.53 w/c
Trail Mix-2	350	615	1110	190	1 : 1.76 : 3.17 @ 0.54 w/c

A total of three cubes were cast for each trial mix, which were tested at the age of 07 and 28 days. The average compressive strength test results along with the slump test results of each trial mix are presented in Table 3.2

Table 3.2: Workability and Compressive strength Test Results of Trial Mixes

Mix ID	Mix Proportions by Weight	Slump (mm)	Average compressive strength, Psi	
			At 7 Days	At 28 Days
Trial Mix-1	1 : 1.89 : 3.41 @ 0.53 w/c	50	2011	2927
Trail Mix-2	1 : 1.76 : 3.17 @ 0.54 w/c	60	2424	3302

4. RECOMMENDED MIX PROPORTIONS:

Table 3.2 indicates that for the given specifications and design input data, Trial Mix-2 is most satisfactory from the workability and strength point of view. Hence, the proportions of Trial Mix-2 are recommended. The recommended mix proportions are as follows:

Cement	:	350 kg/m³
Fine Aggregate Content	:	615 kg/m³
Coarse Aggregate Content	:	1110 kg/m³
Water Content	:	190 kg/m³
Water/cement ratio	:	0.54
Mix proportion by Weight	**:**	**1 : 1.76 : 3.17**
Mix proportion by Volume	**:**	**1 : 1.25 : 2.82**

NOTE:
For mix design to remain valid, the material Properties must remain consistent.

Teacher Incharge
Concrete Laboratory

02/12/2022
Professor Incharge,
Concrete Laboratory

02/12/22
Chairman, CED
MUET, Jamshoro

Department of Civil Engineering
CHAIRMAN
MUET

MEHRAN UNIVERSITY OF ENGINEERING & TECHNOLOGY
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MATERIALS TESTING LABORATORY

No. MUET/CED/CL-34-22
Date: 07-12-2022

Project: C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor: M/s Al-Ramzan Construction Company
Client: Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Name of Test: Basic and Band Tests of (Amreli Steel) Deformed 60 Grades
Sample brought by: A Representative of Contractor & Client Jointly
Sample Received &Tested on: 25-11-2022
Information of Bar Sizes: Provided by Contactor with the steel samples

Results are summarized as under

Bar Size (mm)	Area (Sq.mm)	Weight (kg/m)	Elonga-tion (%)	Yield* Load (N)	Ultimate Load (N)	Yield Strength (N/mm²)	Yield Strength (psi)	Ultimate Strength (N/mm²)	Ultimate Strength (psi)	Remarks about Bend Test 180°C
12	113.14	1.38925	12	56475	74256	499.16	72378	656.32	95166	Ok
12	113.14	1.39835	11	54848	75847	484.78	70293	670.38	97205	Ok
20	314.29	2.02179	13	141214	218611	449.31	65150	695.57	100858	Ok
20	314.29	2.25367	12	143976	205680	458.11	66425	654.44	94893	Ok

*Yield load is calculated from the Ultimate load.

Lab. Technician
Material Testing Laboratory

Teacher Incharge,
Material Testing Laboratory

Professor Incharge,
Material Testing Laboratory

Chairman, CED
MUET, Jamshoro

Department of Civil Engineering
CHAIRMAN
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MATERIALS TESTING LABORATORY

No. MUET/CED/CL-55-22
Date: 02-12-2022

Project: C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor: M/s Al-Ramzan Construction Company
Client: Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Name of Test: Compressive Strength & Water Absorption of Brunt Kiln Bricks
Sample brought by: A Representative of Contractor & Client Jointly
Sample Received &Tested on: 25-11-2022
Information of Bar Sizes: Provided by Contactor with the samples
Results are summarized as under:

Sample No.	Dimensions of Brick (mm)	Frog Mark	Load		Compressive Strength		Water Absorption
			(N)	(lbs)	(N/mm)	(lbs/in²)	
1	217 x 102 x 64		332500	74764	15.09	2188	17.25
2	215 x 107 x 66		341000	76568	14.63	2121	16.15
3	220 x 108 x 63		328700	73815	14.37	2084	15.41
4	221 x 102 x 65		338000	75920	14.57	2113	15.80

Lab. Technician
Material Testing Laboratory

Teacher Incharge,
Material Testing Laboratory

Professor Incharge,
Material Testing Laboratory

C/S 02/12/22
Chairman, CED
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ENVIRONMENTAL LABORATORY

No. MUET/CED/LT/E12/101
Date: 02-12-2022

WATER ANALYSIS REPORT

Name of Project: C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Name of Contractor: M/s Al – Ramzan Construction Company
Name of Client: Irrigation Department Government of Sindh (Executive Engineer Phulleli Canal Division Badin)
Date of Sample Received: 25-11-2022 (Sample was Sealed and brought by the Representative of Concerned Contractor & Client)
Date of Sample Analysis: 28-11-2022

Result: Mean of three readings of each parameter.

Parameter	pH Value	TDS mg/L	Sulphates mg/L
WHO Guideline value for Drinking Water	6.5-8.5	1000	400
Source In Site	**7.4**	**355**	**169**

02/12/2022
Lab In-charge
Environmental Lab

02/12/22
Chairman
CED

Department of Civil Engineering
CHAIRMAN
MUET

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

LAB: No. **CESML**: 112-22
Dated: 02/12/2022

SOIL CLASSIFICATION AS PER AASHTO

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 01 (Collected from Site)

Note: Sample & Information is Provided by the Contractor & Client in the Lab. On **(Dated: 25-11-2022)**

Grain size distribution (by wet sieving)

Sieve Sizes:	4.75mm (No.4)	2.00 mm (No.10)	0.425 mm (No.40)	0.075mm (No.200)
Percentage passing:	100	100	98.15	97.65

Atterberg Limits	Liquid Limit	Plastic Limit	Plasticity Index	Remarks: Roots Content
Percent:	34	22	12	
Group Classification of Sample as per AASHTO-Table (Attached)				A-6

Tested by

Lab. Technician
03059612352
03313391252

Professor Incharge 4/12/2022

Chairman (CED). 02/12/22

Department of Civil Engineering
CHAIRMAN
MUET

The Classification of Soils and Soil –Aggregate Mixtures

General	Granular material (35% or less passing No. 200 sieve)							Silty clay material (More than (35% passing NO. 200 sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5* A-7-6
Sieve Analysis, Percentage Passing											
No. 10sieve #	50 max.										
No. 40 sieve #	30 max	50 max	51 min								
No. 200 sieve #	15 max	25 max	10max	35 max	35 max	35max	35 max	36 min	36min	36 min	36min
Characteristics of Fraction Passing No. 40 Sieve											
Liquid Limit (%)			N.P	40 max	41 min	40 max	41 min	40 max	41min	40 max	41 min
Plasticity Index (%)	6 max			10 max	10 max	11 min	11 min	10 max	10 max	11min	11 min
Group Index b	0		0	0		4 max		8 max	12 max	16 max	20 max
Usual Types Significant Constituent materials	Stone fragments, Gravel and sand		Fine Sand	Silty of clayey gravel and sand				Silty soils		Clayey soils	
General rating as a sub Grade	Excellent to good					Fair to poor					

CLASSIFICATION PROCEDURE: with required test data available, proceed from left to right on above chart and correct group willbe found by process of elimination. The first group from the left into which the test data will fit is the correct classification.

a) Plasticity index of A-7-5 subgroup is equal to or less than liquid limit minus 30. Plasticity index of A-7-6 subgroup is greater than liquid limit minus 30.
b) Group index should be shown in parentheses after group symbol

As: A-7-6 (3) A-4 (5) A-6 (12) A-7-5 (17) etc

Sieve size are American
Approximate British equivalents are Follows.

United State A.S.T.M. E.11/26		Great Britian B.S. 410
(2.0 mm)	10	8
(0.425 mm)	40	36
(0.075 mm)	200	200

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

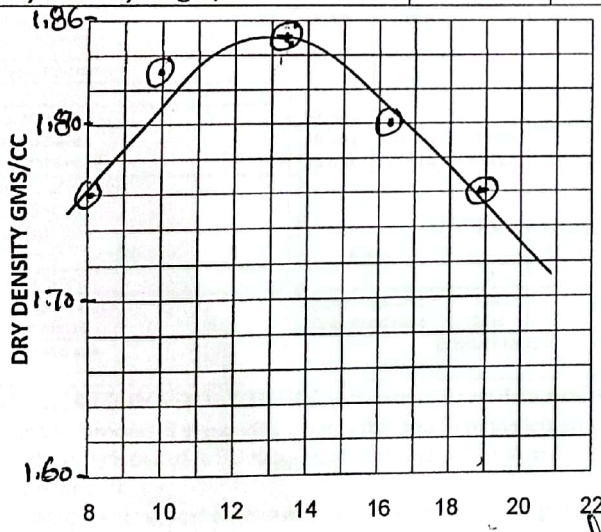
LAB: No. **CESML:** 112-22
Dated : 02/12/2022

MOISTURE -DENSITY RELATIONSHIP (MODIFIED PROCTOR)

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 01 (Collected from Site)

Blows/Layer 25 No. Of Layers 05 WT, of Hammer 10 Lbs
Mold No. N -01 Dia 10.10 cm. Height. 11.650 cms, vol.931.75 cc
Note: Sample & information is provided by the Contractor & Client in the Lab. On (25/11/2022)

Container No	NA-64	NA-69	NA-11	NA-50	NA-90	-
W. of Can + Wet Soil (gms)	157.80	175.40	190.00	189.20	191.00	-
Wt. of Can + Dry Soil (gms)	149.00	162.00	170.00	166.00	165.00	-
Wt. of Water (gms)	8.60	13.40	20.00	23.10	26.00	-
Wt. of Can (gms)	24.00	28.00	22.00	24.00	28.00	-
Wt. of Dry Soil (gms)	125.00	134.00	148.00	142.00	137.00	-
Water Content w %	7.00	10.00	13.50	16.30	19.00	-
Assumed Water Content	-	-	-	-	-	-
Water Content W %	7.00	10.00	13.50	16.30	19.00	-
Wt. of Wet soil + Mold(gms)	4369	4490	4570	4565	4565	-
Wt. of Mold (gms)	2614	2614	2614	2614	2614	-
Wt. of Wet Soil (gms)	1755	1876	1956	1951	1951	-
Wet. Density gm/cc	1.88	2.01	2.10	2.09	2.09	-
Dry Density gm/cc	1.76	1.83	1.85	1.80	1.76	-



Max. Dry Density, (gms/cc) 1.85
Optimum M.C (%) 13.50

Tested by
Lab. Technician
03059612352
03313391252

Professor Incharge 02/12/2022

C/S 02/12/22
Chairman CED

Department of Civil Engineering
CHAIRMAN
MUET

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

LAB: No. **CESML:** 112-22
Dated: 02/12/2022

SOIL CLASSIFICATION AS PER AASHTO

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 02 (Collected from Site)

Note: Sample & Information is Provided by the Contractor & Client in the Lab. On **(Dated: 25-11-2022)**

Grain size distribution (by wet sieving)

Sieve Sizes:	4.75mm (No.4)	2.00 mm (No.10)	0.425 mm (No.40)	0.075mm (No.200)
Percentage passing:	100	99.00	98.22	96.10

Atterberg Limits

	Liquid Limit	Plastic Limit	Plasticity Index	Remarks: Roots Content
Percent:	32	21	11	
Group Classification of Sample as per AASHTO-Table (Attached)				A-6

Tested by

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03059612352
03313391252

02/12/2022
Professor Incharge

C/S
02/12/22
Chairman (CED)

Department of Civil Engineering
CHAIRMAN
MUET

The Classification of Soils and Soil –Aggregate Mixtures

General	Granular material (35% or less passing No. 200 sieve)							Silty clay material (More than 35% passing NO. 200 sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7 A-7-5 A-7-6*
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				
Sieve Analysis, Percentage Passing											
No. 10sieve #	50 max.										
No. 40 sieve #	30 max	50 max	51 min								
No. 200 sieve #	15 max	25 max	10max	35 max	35 max	35max	35 max	36 min	36min	36 min	36min
Characteristics of Fraction Passing No. 40 Sieve											
Liquid Limit (%)			N.P	40 max	41 min	40 max	41 min	40 max	41min	40 max	41 min
Plasticity Index (%)	6 max			10 max	10 max	11 min	11 min	10 max	10 max	11min	11 min
Group Index b	0		0	0		4 max		8 max	12 max	16 max	20 max
Usual Types Significant Constituent materials	Stone fragments, Gravel and sand		Fine Sand	Silty of clayey gravel and sand				Silty soils		Clayey soils	
General rating as a sub Grade	Excellent to good					Fair to poor					

CLASSIFICATION PROCEDURE: with required test data available, proceed from left to right on above chart and correct group willbe found by process of elimination. The first group from the left into which the test data will fit is the correct classification.

a) Plasticity index of A-7-5 subgroup is equal to or less than liquid limit minus 30. Plasticity index of A-7-6 subgroup is greater than liquid limit minus 30.

b) Group index should be shown in parentheses after group symbol

As: A-7-6 (3) A-4 (5) A-6 (12) A-7-5 (17) etc

Sieve size are American
Approximate British equivalents are Follows.

United State A.S.T.M. E.11/26		Great Britian B.S. 410
(2.0 mm)	10	8
(0.425 mm)	40	36
(0.075 mm)	200	200

SINDH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

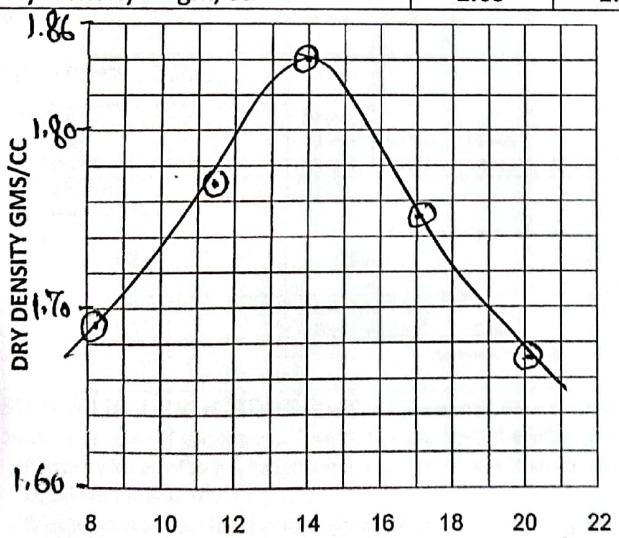
LAB: No. **CESML:** 112-22
Dated : 02/12/2022

MOISTURE -DENSITY RELATIONSHIP (MODIFIED PROCTOR)

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 02 (Collected from Site)

Blows/Layer 25 No. Of Layers 05 WT, of Hammer 10 Lbs
Mold No. N -01 Dia 10.150 cm. Height. 11.650 cms, vol.943.04 cc
Note: Sample & information is provided by the Contractor & Client in the Lab. On (25/11/2022)

Container No	NA-64	NA-69	NA-11	NA-50	NA-90	-
W. of Can + Wet Soil (gms)	243.52	250.57	247.75	268.50	267.26	-
Wt. of Can + Dry Soil (gms)	229.61	230.53	248.00	238.81	232.00	-
Wt. of Water (gms)	13.91	20.04	26.75	29.69	35.25	-
Wt. of Can (gms)	62.48	55.49	57.58	63.90	56.67	-
Wt. of Dry Soil (gms)	167.13	175.04	190.42	174.91	175.33	-
Water Content w %	8.32	11.45	14.05	16.97	20.10	-
Assumed Water Content	-	-	-	-	-	-
Water Content W %	8.32	11.45	14.05	16.97	20.10	-
Wt. of Wet soil + Mold(gms)	5076	5212	5334	5283	5241	-
Wt. of Mold (gms)	3353	3353	3353	3353	3353	-
Wt. of Wet Soil (gms)	1723	1859	1981	1930	1888	-
Wet. Density gm/cc	1.83	1.97	2.10	2.05	2.00	-
Dry Density gm/cc	1.69	1.77	1.84	1.75	1.67	-



Max. Dry Density, (gms/cc) 1.84
Optimum M.C (%) 14.16

Tested by
Lab. Technician
03059612352
03313391252

Professor Incharge 02/12/2022

C/S
Chairman CED 02/12/22

Department of Civil Engineering
CHAIRMAN

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

LAB: No. **CESML**: 112-22
Dated: 02/12/2022

SOIL CLASSIFICATION AS PER AASHTO

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 03 (Collected from Site)

Note: Sample & Information is Provided by the Contractor & Client in the Lab. On **(Dated: 25-11-2022)**

Grain size distribution (by wet sieving)

Sieve Sizes:	4.75mm (No.4)	2.00 mm (No.10)	0.425 mm (No.40)	0.075mm (No.200)
Percentage passing:	100	99.32	98.00	96.70

Atterberg Limits

	Liquid Limit	Plastic Limit	Plasticity Index	Remarks: Roots Content
Percent:	30	20	10	
Group Classification of Sample as per AASHTO-Table (Attached)				A-4

Tested by

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03313391252

Professor Incharge 02/12/2022

Chairman (CED) 02/12/22

Department of Civil Engineering
CHAIRMAN
MUET

The Classification of Soils and Soil –Aggregate Mixtures

General	Granular material (35% or less passing No. 200 sieve)							Silty or clayey material (More than 35% passing NO. 200 sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7 A-5 A-7-6
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				
Sieve Analysis, Percentage Passing											
No. 10sieve #	50 max.										
No. 40 sieve #	30 max	50 max	51 min								
No. 200 sieve #	15 max	25 max	10max	35 max	35 max	35max	35 max	36 min	36min	36 min	36min
Characteristics of Fraction Passing No. 40 Sieve											
Liquid Limit (%)			N.P	40 max	41 min	40 max	41 min	40 max	41min	40 max	41 min
Plasticity Index (%)	6 max			10 max	10 max	11 min	11 min	10 max	10 max	11min	11 min
Group Index b	0		0	0		4 max		8 max	12 max	16 max	20 max
Usual Types Significant Constituent materials	Stone fragments, Gravel and sand		Fine Sand	Silty of clayey gravel and sand				Silty soils		Clayey soils	
General rating as a sub Grade	Excellent to good					Fair to poor					

CLASSIFICATION PROCEDURE: with required test data available, proceed from left to right on above chart and correct group willbe found by process of elimination. The first group from the left into which the test data will fit Is the correct classification.

a) Plasticity index of A-7-5 subgroup is equal to or less than liquid limit minus 30. Plasticity index of A-7-6 subgroup is greater than liquid limit minus 30.
b) Group index should be shown in parentheses after group symbol

As: A-7-6 (3) A-4 (5) A-6 (12) A-7-5 (17) etc

Sieve size are American
Approximate British equivalents are Follows.

United State A.S.T.M. E.11/26		Great Britian B.S. 410
(2.0 mm)	10	8
(0.425 mm)	40	36
(0.075 mm)	200	200

AN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

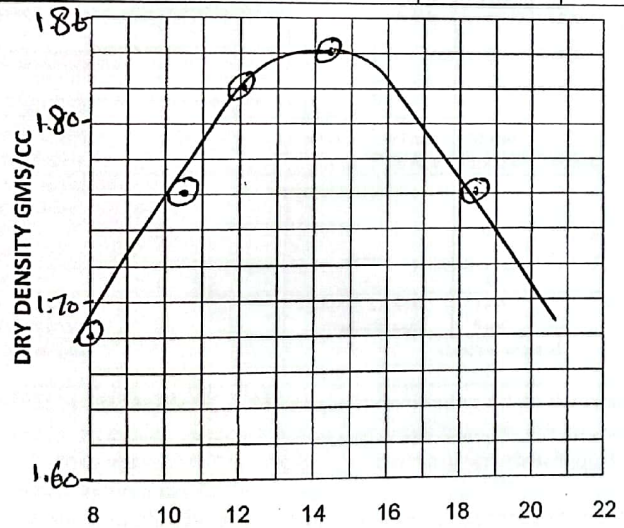
LAB: No. **CESML**: 112-22
Dated : 02/12/2022

MOISTURE -DENSITY RELATIONSHIP (MODIFIED PROCTOR)

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 03 (Collected from Site)

Blows/Layer 25 No. Of Layers 05 WT, of Hammer 10 Lbs
Mold No. N -01 Dia 10.10 cm Height. 11.650 cms, vol.931.75 cc
Note: Sample & information is provided by the Contractor & Client in the Lab. On (25/11/2022)

Container No	NA-64	NA-69	NA-11	NA-50	NA-90	-
W. of Can + Wet Soil (gms)	128.60	156.50	178.80	200.90	202.00	-
Wt. of Can + Dry Soil (gms)	121.00	144.00	162.00	179.00	175.00	-
Wt. of Water (gms)	07.60	12.50	16.80	21.90	27.00	-
Wt. of Can (gms)	26.00	24.00	22.00	27.00	28.00	-
Wt. of Dry Soil (gms)	95.00	120.00	140.00	152.00	147.00	-
Water Content w %	8.00	10.40	12.00	14.40	18.40	-
Assumed Water Content	-	-	-	-	-	-
Water Content W %	8.00	10.40	12.00	14.40	18.40	-
Wt. of Wet soil + Mold(gms)	4305	4424	4573	4575	4556	-
Wt. of Mold (gms)	2614	2614	2614	2614	2614	-
Wt. of Wet Soil (gms)	1691	1810	1899	1961	1942	-
Wet. Density gm/cc	1.81	1.94	2.04	2.10	2.08	-
Dry Density gm/cc	1.68	1.76	1.82	1.84	1.76	-



Max. Dry Density, (gms/cc) 1.84
Optimum M.C (%) 14.40

Tested by
Lab Technician
03059612352
03313391252

Professor Incharge 02/12/2022

C/f 02/12/22
Chairman CED

Department of Civil Engineering
CHAIRMAN
MUET

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

LAB: No. **CESML**: 112-22
Dated: 02/12/2022

SOIL CLASSIFICATION AS PER AASHTO

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 04 (Collected from Site)

Note: Sample & Information is Provided by the Contractor & Client in the Lab. On **(Dated: 25-11-2022)**

Grain size distribution (by wet sieving)

Sieve Sizes:	4.75mm (No.4)	2.00 mm (No.10)	0.425 mm (No.40)	0.075mm (No.200)
Percentage passing:	100	98.60	97.42	93.50

Atterberg Limits

	Liquid Limit	Plastic Limit	Plasticity Index	Remarks: Roots Content
Percent:	30	22	08	

Group Classification of Sample as per AASHTO-Table (Attached) — A-4

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Chairman (CED) 02/12/22

Department of Civil Engineering CHAIRMAN MUET

The Classification of Soils and Soil –Aggregate Mixtures

General	Granular material (35% or less passing No. 200 sieve)							Silty clay material (More than 35% passing NO. 200 sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7 A-7-5 A-7-6
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				
Sieve Analysis, Percentage Passing											
No. 10sieve #	50 max.										
No. 40 sieve #	30 max	50 max	51 min								
No. 200 sieve #	15 max	25 max	10max	35 max	35 max	35max	35 max	36 min	36min	36 min	36min
Characteristics of Fraction Passing No. 40 Sieve											
Liquid Limit (%)			N.P	40 max	41 min	40 max	41 min	40 max	41min	40 max	41 min
Plasticity Index (%)	6 max			10 max	10 max	11 min	11 min	10 max	10 max	11min	11 min
Group Index b	0		0	0		4 max		8 max	12 max	16 max	20 max
Usual Types Significant Constituent materials	Stone fragments, Gravel and sand		Fine Sand	Silty of clayey gravel and sand				Silty soils		Clayey soils	
General rating as a sub Grade	Excellent to good					Fair to poor					

CLASSIFICATION PROCEDURE: with required test data available, proceed from left to right on above chart and correct group willbe found by process of elimination. The first group from the left into which the test data will fit is the correct classification.

a) Plasticity index of A-7-5 subgroup is equal to or less than liquid limit minus 30. Plasticity index of A-7-6 subgroup is greater than liquid limit minus 30.
b) Group index should be shown in parentheses after group symbol

As: A-7-6 (3) A-4 (5) A-6 (12) A-7-5 (17) etc

Sieve size are American
Approximate British equivalents are Follows.

United State A.S.T.M. E.11/26		Great Britian B.S. 410
(2.0 mm)	10	8
(0.425 mm)	40	36
(0.075 mm)	200	200

AN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS LABORATORY

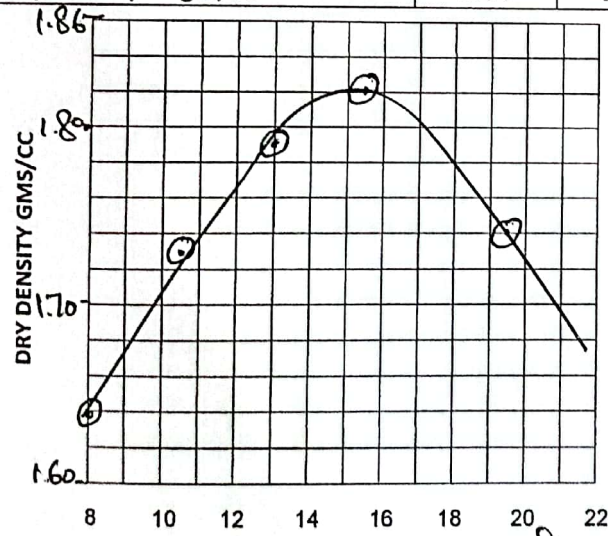
LAB: No. **CESML**: 112-22
Dated : 02/12/2022

MOISTURE -DENSITY RELATIONSHIP (MODIFIED PROCTOR)

Project : C. C Lining of Sultani Branch & Its 06 Nos. Off Taking Channels
Contractor : M/s Al – Ramzan Construction Company
Client : Irrigation Department Government of Sindh
(Executive Engineer Phulleli Canal Division Badin)
Sample No. : 04 (Collected from Site)

Blows/Layer 25 No. Of Layers 05 WT, of Hammer 10 Lbs
Mold No. N -01 Dia 10.10 cm. Height. 11.650 cms, vol.931.75 cc
Note: Sample & information is provided by the Contractor & Client in the Lab. On (25/11/2022)

Container No	NA-64	NA-69	NA-11	NA-50	NA-90	-
W. of Can + Wet Soil (gms)	141.80	161.80	176.20	190.30	186.00	-
Wt. of Can + Dry Soil (gms)	133.00	149.00	159.00	168.00	160.00	-
Wt. of Water (gms)	8.80	12.80	17.20	22.30	26.00	-
Wt. of Can (gms)	23.00	28.00	27.00	24.00	26.00	-
Wt. of Dry Soil (gms)	110.00	121.00	132.00	144.00	134.00	-
Water Content w %	8.00	10.60	13.00	15.50	19.40	-
Assumed Water Content	-	-	-	-	-	-
Water Content W %	8.00	10.60	13.00	15.50	19.40	-
Wt. of Wet soil + Mold(gms)	4264	4397	4499	4573	4550	-
Wt. of Mold (gms)	2614	2614	2614	2614	2614	-
Wt. of Wet Soil (gms)	1650	1783	1885	1959	1936	-
Wet. Density gm/cc	1.77	1.91	2.02	2.10	2.08	-
Dry Density gm/cc	1.64	1.73	1.79	1.82	1.74	-



Max. Dry Density, (gms/cc) 1.82
Optimum M.C (%) 15.50

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Professor Incharge 12/12/2022

C/Chairman CED 12/12/22

Department of Civil Engineering
CHAIRMAN