REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

DETAILED DESIGN OF BISRI DAM PROJECT

CONTRACT NO.17909

SOIL/ROCK SAMPLING & LABORATORY TESTING (LEBANON)
SAND/GRAVEL & ROCK MATERIAL SOURCES
TEST PITS/BOREHOLES

GEOTECHNICAL INVESTIGATION REPORT X

FACTUAL

November 2014

Founded 1956
DAR AL HANDASAH NAZIH TALEB & PARTNERS
دار الهندسة نزيه طالب وشركاه

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	Signature:	

1. Introduction

Representative soil (sand/gravel) and rock (rock material sources) samples from the boreholes and test pits (*please refer to Report Volume VII and IX*) at different depths were selected and tested in order to determine the physical and chemical properties of the sand/gravel and rock materials. Lists of sampling and laboratory testing are presented in Appendix 1 of this factual report.

In-situ Field Density (Sand-Cone Method) and Moisture Content (Speedy Moisture Testing Kit) tests were carried out during the execution of the test pits (sand/gravel, *please refer to Report Volume VIII*).

Laboratory (Lebanon) test results (*sand/gravel and rock material sources, except Wetting-Drying Loss*) are presented in Appendices 2 and 3.

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APPENDIX 1. LISTS OF SAMPLING & LABORATORY TESTING (SAND/GRAVEL & ROCK MATERIAL SOURCES)

BISRI DAM LABORATORY TESING - NEW TEST PITS / SAND & GRAVEL / LEBANON					Testing																	
Sampling																						
					Unit (U)	13	13	13	13	13	13	13	13	13	9	9	18	9	13	7	8	**190**
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description	Date of Sampling		Sieve (including Cobbles and Boulders)	Sand Equivalent	Clay Content	Atterberg Limits (passing sieve No.40)	Specific Gravity	Bulk (moist) and Saturated Density	Void Ratio	Field Density (Sand-cone method)	In-situ moisture content (Speedy)	Proctor Density	Soaked CBR at 100% Proctor Density	LA (500 Revolutions)	Soundnes	Organic Content	AAR (Alkali aggregate reactions)	Sulfate, Chloride, PH	**General Total**
NTP9	0.7	Bulk	Slightly silty SAND.	10.09.2014		1	1	1	1	1	1	1	1	1					1			
	2		Very gravely SAND with few Cobbles.			1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
NTP10	2	Bulk	SAND and GRAVEL with few Cobbles.	10.09.2014		1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
	3.5					1	1	1	1	1	1	1	1	1	1	1	2	1	1		1	
NTP11	1.7	Bulk	SAND and GRAVEL with some Cobbles.	10.09.2014		1	1	1	1	1	1	1	1	1					1		1	
	4					1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		
NTP12	1.5	Bulk	SAND and GRAVEL with few Cobbles.	11.09.2014		1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		
	3		SAND and GRAVEL with some Cobbles and few Boulders.			1	1	1	1	1	1	1	1	1					1		1	
NTP13	1.5	Bulk	SAND and GRAVEL with many Cobbles.	11.09.2014		1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		
	3.5		Very gravely SAND with few Cobbles.			1	1	1	1	1	1	1	1	1	1	1	2	1	1		1	
NTP14	1.4	Bulk	SAND and GRAVEL with many Cobbles	11.09.2014		1	1	1	1	1	1	1	1	1					1		1	
	3.4		SAND and Gravel with many Cobbles and some Boulders.			1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		
NTP15	1.8	Bulk	SAND and GRAVEL with some Cobbles and few Boulders.	12.09.2014		1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	

BISRI DAM LABORATORY TESING - NEW TEST PITS / SAND & GRAVEL / LEBANON					Testing																	
Sampling																						
				Unit (U)		11	11	11	11	11	11	11	11	11	9	9	9	18	11	7	8	**170**
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description	Date of Sampling		Sieve (including Cobbles and Boulders)	Sand Equivalent	Clay Content	Atterberg (passing sieve No.40)	Specific Gravity	Bulk (moist) and Saturated Density	Void Ratio	Field Density (Sand-cone method)	In-situ moisture content (Speedy)	Proctor Density	Soaked CBR at 100% Proctor Density	LA (500 Revolutions)	Soundnes	Organic Content	AAR (Alkali aggregate reactions)	Sulfate, Chloride, PH	**General Total**
NTP16	1.7	Bulk	SAND and GRAVEL with some Cobbles and Boulders.	12.09.2014		1	1	1	1	1	1	1	1	1					1			
	3.5					1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
NTP17	1.8	Bulk	SAND and GRAVEL with some Cobbles and Boulders.	12.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
NTP18	1	Bulk	SAND and GRAVEL with some Cobbles and Boulders.	12.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
NTP19	0.4	Bulk	SAND and GRAVEL.	10.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
	1.2		Gravely SAND.			1	1	1	1	1	1	1	1	1	1	1	1	2	1			
NTP20	0.8	Bulk	SAND and GRAVEL with few Cobbles.	10.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
NTP21	1.5	Bulk	SAND and GRAVEL with few Cobbles.	10.09.2014		1	1	1	1	1	1	1	1	1					1			
	3.5					1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
NTP22	1	Bulk	SAND and GRAVEL with Cobbles and Boulders.	11.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1		1	
NTP23	1.5	Bulk	SAND and GRAVEL with Cobbles and Boulders.	11.09.2014		1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	

BISRI DAM LABORATORY TESING - NEW TEST PITS / SAND & GRAVEL / LEBANON					Testing		
Sampling							
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description	Date of Sampling	Unit (U)	3	3
						Petrography & Hardness	
NTP12	3	Bulk	Cobble	28.10.2014		1	
NTP16	3.5	Bulk	Cobble	28.10.2014		1	
NTP22	1	Bulk	Cobble	28.10.2014		1	

BISRI DAM LABORATORY TESING - BOREHOLES (BHRQ) / ROCK MATERIAL SOURCES / RQ-1b

Sampling					Testing											
					Unit (U)	2	2	2	2	2	1	2	2	1	2	16
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description	Date of Sampling		Crushing (Sample Preparation)	Water Absorption	Dry & Soaked Density	LA (500 revolutions)	Soundness (Sodium Sulphate)	Wetting – Drying Loss (35 cycles)	Dry Uni-Axial Compressive Strength	Soaked Uni-Axial Compressive Strength	AAR (Alkali aggregate reactions)	Petrography (including Hardness)	**General Total**
BHRQ3	from 4.5 to 7.8m	Core	Light olive brown to cream slightly weathered blocky/seamy to massive strong occasionally karstified and porous dolomitic LIMESTONE	15.10.2014		1	1	1	1	1		1	1	1	1	
BHRQ1	from 12 to 16m	Core	Light olive brown to cream slightly weathered mainly blocky and seamy occasionally crushed strong rarely karstified dolomitic LIMESTONE			1	1	1	1	1	1	1	1		1	

BISRI DAM LABORATORY TESING - BOREHOLES (BHRQ) / ROCK MATERIAL SOURCES / RQ-2a/2b					Testing											
Sampling																
					Unit (U)	5	5	5	5	5	2	5	5	3	4	**40**
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description (Site)	Date of Sampling		Crushing (Sample Preparation)	Water Absorption	Dry & Soaked Density	LA (500 revolutions)	Soundness (Sodium Sulphate)	Wetting – Drying Loss (35 cycles)	Dry Uni-Axial Compressive Strength	Soaked Uni-Axial Compressive Strength	AAR (Alkali aggregate reactions)	Petrography (including Hardness)	**General Total**
BHRQ8	from 6 to 9.3m	Core	Light olive brown to cream slightly weathered blocky/seamy to fractured moderately strong to strong occasionally/slightly karstified dolomitic LIMESTONE.	15.10.2014		1	1	1	1	1		1	1	1	1	
BHRQ6	from 3 to 6m	Core	Light olive brown to cream slightly weathered blocky/seamy to fracture moderately strong to strong slightly dolomitic LIMESTONE.			1	1	1	1	1	1	1	1			
	from 13.5 to 16.8m		Light olive brown to cream and white faintly weathered blocky/seamy to fracture moderately strong to strong slightly dolomitic LIMESTONE.			1	1	1	1	1		1	1	1	1	
BHRQ5	from 1.5 to 4.5m		Light olive brown to cream slightly sometimes moderately weathered blocky/seamy to fractured and crushed strong occasionally karstified (karst voids are filled with clay) dolomitic LIMESTONE.			1	1	1	1	1		1	1	1	1	
BHRQ4	from 10.5 to 14m		Light olive brown to cream and white slightly and slightly to moderately weathered blocky/seamy to fractured and crushed strong slightly marly (rarely) dolomitic LIMESTONE			1	1	1	1	1	1	1	1		1	

BISRI DAM LABORATORY TESING - BOREHOLES (BHRQ) / ROCK MATERIAL SOURCES / RQ-3a					Testing											
Sampling																
					Unit (U)	1	1	1	1	1	1	1	1	1	1	**9**
No. of Test Pit	Depth of Sampling (m)	Type of Sample	Sample Description	Date of Sampling		Crushing (Sample Preparation)	Water Absorption	Dry & Soaked Density	LA (500 revolutions)	Soundness (Sodium Sulphate)	Wetting – Drying Loss (35 cycles)	Dry Uni-Axial Compressive Strength	Soaked Uni-Axial Compressive Strength	AAR (Alkali aggregate reactions)	Petrography (including Hardness)	**General Total**
EV10	from 22.5 to 30m	Core	Beige slightly weathered fractured and crushed strong to very strong occasionally karstified slightly sandy and dolomitic LIMESTONE	15.10.2014		1	1	1	1	1	1	1	1	1	1	

APPENDIX 2. SAND/GRAVEL MATERIAL SOURCES (LABORATORY TEST RESULTS - LEBANON)

ASSACO

Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 03/11/14

TEST DATA SUMMARY - ASTM Designations D422 / D4318 / D415 / D2140 / D1557 / D1883 / D 854 / C40 / C88 / C131 / C289 / BS 812 - parts 117-118 / AASHTO T176

Sample I.D	Depth m	B.S. Soil Class.	Grain Size distribution Gravel %	Sand %	Fines %	Sand Equiv. %	Clay Cont. %	Atterberg LL %	PL %	MC %	Spec. grav. %	Bulk dens. g/cm³	Sat. dens. g/cm³	Void ratio	Modified Proctor Max. dry density g/cm³	Opt. moist content %	Soacked CBR at 95% proc. dens.	LA %	MgSO4 soundness Finer than No.4 %	Coarser than No.4 %	Org. Cont. %	AAR S_C mmol/l	R_C mmol/l	$SO4^{-}$ cont. ppm	CL^{-} cont. ppm	PH
NTP9	0.70	SM	0	66	34	32	4.2	0	0	4.5	2.65	1.64	1.72	0.701	-	-	-	-	-	-	0.8	-	-	-	-	-
	2.00	GPM	55	37	8	58	2.0	0	0	6.3	2.68	2.12	2.24	0.348	2.16	9.3	58	27	3.0	5.4	0.9	1	180	160	65	7.6
NTP10	2.00	GW	70	25	5	43	2.0	0	0	7.9	2.70	2.13	2.25	0.363	2.20	7.9	67	26	2.8	4.9	1.4	3	230	145	63	7.5
	3.50	GPM	74	20	6	41	1.5	0	0	5.2	2.72	2.15	2.27	0.336	2.22	7.5	70	24	1.9	3.7	1.3	-	-	137	55	7.3
NTP11	1.70	GP	65	33	2	81	2.6	0	0	3.9	2.72	2.11	2.23	0.333	-	-	-	-	-	-	1.3	-	-	141	53	7.4
	4.00	GP	52	44	4	80	1.7	0	0	4.1	2.68	2.14	2.26	0.307	2.17	9.0	55	29	3.3	6.1	1.2	1	170	-	-	-
NTP12	1.50	GW	72	27	1	70	1.7	0	0	2.3	2.73	2.17	2.28	0.291	2.19	8.0	67	27	2.7	5.6	1.1	4	250	-	-	-
	3.00	GP	78	21	1	77	1.6	0	0	4.7	2.71	2.15	2.27	0.326	-	-	-	-	-	-	1.0	-	-	149	61	7.7
NTP13	1.50	GP	75	23	2	77	4.8	0	0	3.2	2.71	2.13	2.25	0.319	2.21	7.4	72	25	2.5	4.6	1.3	5	260	-	-	-
	3.50	GPM	59	33	8	79	1.8	0	0	7.3	2.72	2.17	2.28	0.342	2.17	9.2	64	28	3.1	5.9	0.8	-	-	173	74	7.8
NTP14	1.40	GP	75	24	1	77	2.8	0	0	4.5	2.70	2.14	2.25	0.313	-	-	-	-	-	-	1.3	-	-	171	69	7.5
	3.40	GW	76	22	2	69	1.7	0	0	5.7	2.74	2.20	2.27	0.311	2.21	8.2	73	27	2.9	5.3	1.3	4	260	-	-	-
NTP15	1.80	GW	69	29	2	81	2.5	0	0	8.3	2.69	2.19	2.26	0.335	2.20	7.3	68	25	2.0	4.8	1.1	3	240	139	57	7.1

N.B: Clay content tests were carried out on samples passing No.4.
Alkali Aggregate Reaction AAR tests were carried out as per ASTM C289 (Chemical method).

Head of Laboratory Section

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Material Testing - Geotechnical Study

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 03/11/14

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TEST DATA SUMMARY - ASTM Designations D422 / D4318 / D415 / D2140 / D1557 / D1883 / D 854 / C40 / C88 / C131 / C289 / BS 812 - parts 117-118 / AASHTO T176

Sample I.D	Depth	B.S. Soil Class.	Grain Size distribution			Sand Equiv.	Clay Cont.	Atterberg		MC	Spec. grav.	Bulk dens.	Sat. dens.	Void ratio	Modified Proctor		Soacked CBR	LA	MgSO4 soundness		Org. Cont.	AAR		SO_4^{-} cont.	CL^{-} cont.	PH
			Gravel	Sand	Fines			LL	PL						Max. dry density	Opt. moist content	at 95% pro. dens.		Finer than No.4	Coarser than No.4		S_C	R_C			
	m		%	%	%	%	%	%	%	%	%	g/cm^3	g/cm^3		g/cm^3	%		%	%	%	%	mmol/l	mmol/l	ppm	ppm	
NTP16	1.70	GW	75	24	1	72	1.8	0	0	3.8	2.74	2.13	2.24	0.337	-	-	-	-	-	-	1.2	-	-	-	-	-
	3.50	GP	82	17	1	63	1.5	0	0	5.0	2.75	2.15	2.26	0.348	2.22	7.2	70	23	1.8	3.4	1.9	5	280	124	51	7.2
NTP17	1.80	GP	79	18	3	60	2.3	0	0	6.2	2.74	2.16	2.28	0.342	2.21	8.0	66	25	2.4	4.9	1.8	5	260	142	56	7.4
NTP18	1.00	GW	77	22	1	79	2.0	0	0	4.6	2.72	2.15	2.26	0.327	2.22	7.6	63	26	3.5	5.0	1.4	6	270	148	61	7.6
NTP19	0.40	GW	86	13	1	82	1.9	0	0	2.8	2.71	2.13	2.24	0.304	2.20	7.5	73	23	2.1	3.6	1.7	5	270	126	53	7.3
	1.20	GP	55	43	2	73	2.5	0	0	4.2	2.69	2.08	2.19	0.343	2.17	8.8	52	27	2.9	5.1	2.6	-	-	-	-	-
NTP20	0.80	GP	59	40	1	92	1.8	0	0	3.1	2.70	2.09	2.20	0.336	2.15	9.1	59	25	2.0	4.3	1.2	2	200	145	55	7.4
NTP21	1.50	GP	61	36	3	71	2.2	0	0	8.6	2.68	2.10	2.22	0.384	-	-	-	-	-	-	1.0	-	-	-	-	-
	3.50	GWM	68	25	7	55	2.8	0	0	5.5	2.69	2.12	2.24	0.333	2.18	8.0	61	27	3.1	5.5	1.4	1	220	161	68	7.6
NTP22	1.00	GP	85	14	1	94	2.6	0	0	9.0	2.70	2.11	2.22	0.395	2.21	7.7	71	24	2.4	4.1	1.3	-	-	143	57	7.2
NTP23	1.50	GP	87	12	1	86	2.4	0	0	3.6	2.72	2.13	2.24	0.327	2.19	8.1	74	23	2.7	3.3	1.4	4	280	129	52.00	7.3

N.B: Clay content tests were carried out on samples passing No.4.
Alkali Aggregate Reaction AAR tests were carried out as per ASTM C289 (Chemical method).

Head of Laboratory Section

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Material Testing - Geotechnical Study

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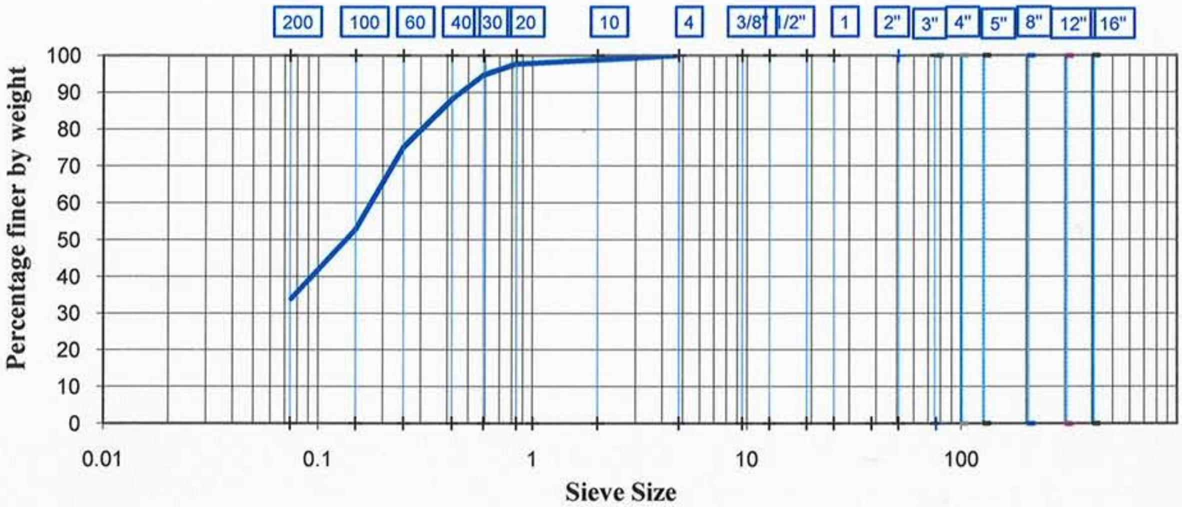
Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 1062 g

Sample I.D : -
BH / TP : **NTP9**
Depth (m) : **0.70**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		
2"		
1 1/2"		
1"		
3/4"		
1/2"		
3/8"		
4		1062
10	12	1050
20	12	1038
30	32	1006
40	67	939
60	141	798
100	237	561
200	201	360

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	
50.800	
38.100	
25.400	
19.000	
12.700	
9.500	
4.750	100
2.000	99
0.840	98
0.590	95
0.425	88
0.250	75
0.149	53
0.075	34

Head of Laboratory Section

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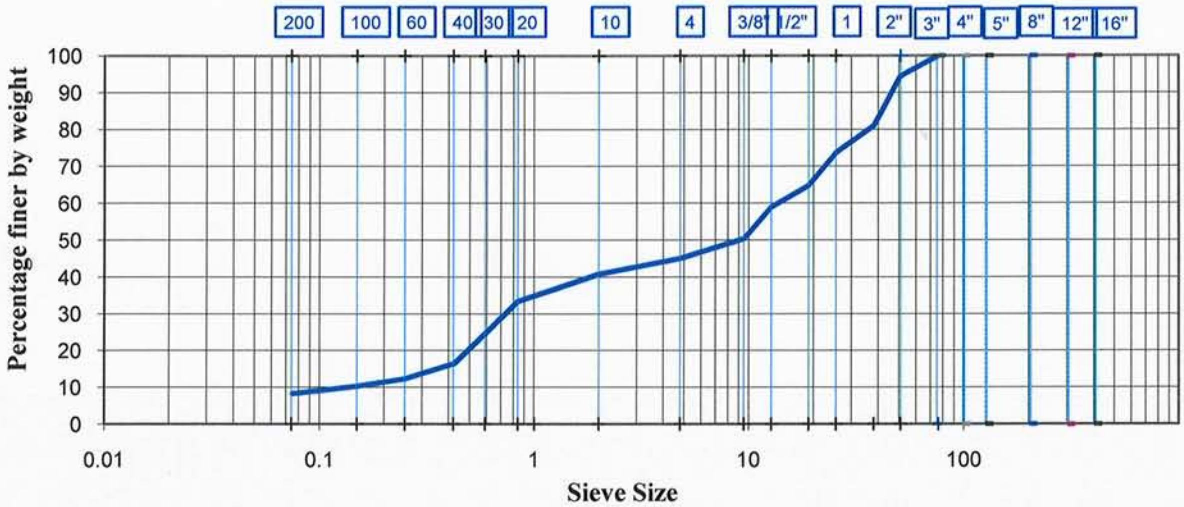
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : **13461** g

Sample I.D : -
BH / TP : **NTP9**
Depth (m) : **2.00**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		13461
2"	741	12720
1 1/2"	1833	10887
1"	982	9905
3/4"	1196	8709
1/2"	778	7931
3/8"	1156	6775
4	727	6048
10	559	5489
20	999	4490
30	1185	3305
40	1086	2219
60	566	1653
100	269	1384
200	267	1117

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	94
38.100	81
25.400	74
19.000	65
12.700	59
9.500	50
4.750	45
2.000	41
0.840	33
0.590	25
0.425	16
0.250	12
0.149	10
0.075	8

Head of Laboratory Section

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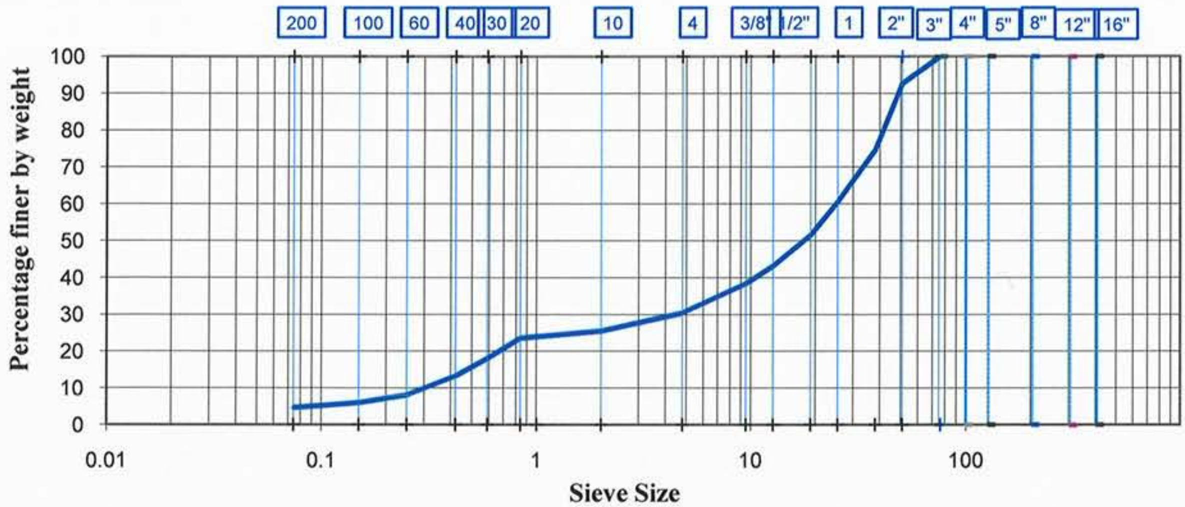
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : **11768** g

Sample I.D : -
BH / TP : **NTP10**
Depth (m) : **2.00**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		11768
2"	869	10899
1 1/2"	2112	8787
1"	1668	7119
3/4"	1060	6059
1/2"	988	5071
3/8"	562	4509
4	943	3566
10	574	2992
20	226	2766
30	656	2110
40	540	1570
60	620	950
100	256	694
200	145	549

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	93
38.100	75
25.400	60
19.000	51
12.700	43
9.500	38
4.750	30
2.000	25
0.840	24
0.590	18
0.425	13
0.250	8
0.149	6
0.075	5

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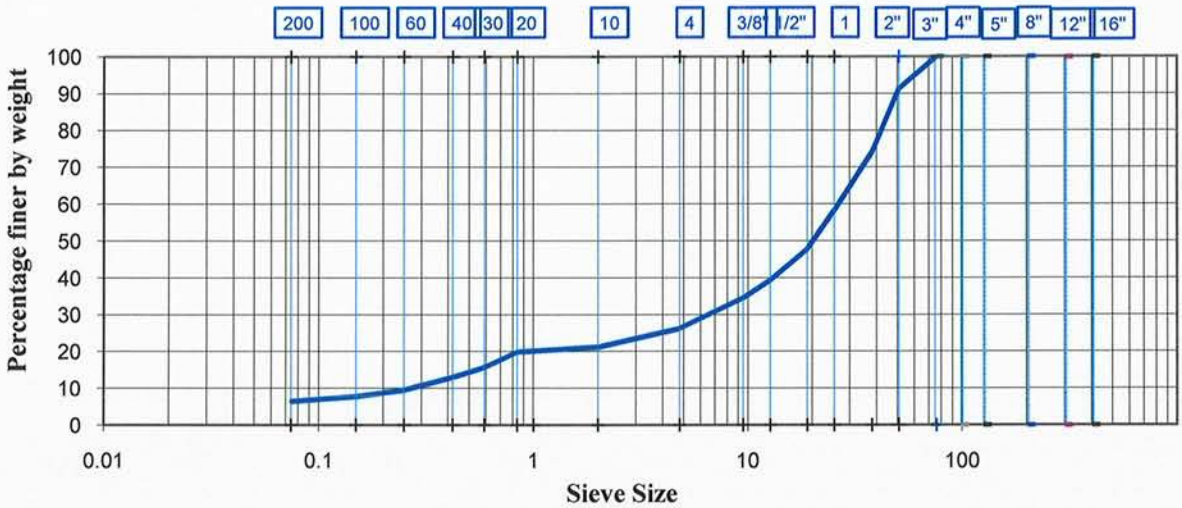

Weight of sample : **10252** g

Sample I.D : -
BH / TP : **NTP10**
Depth (m) : **3.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		10252
2"	894	9358
1 1/2"	1768	7590
1"	1621	5969
3/4"	1079	4890
1/2"	862	4028
3/8"	491	3537
4	858	2679
10	510	2169
20	132	2037
30	427	1610
40	269	1341
60	365	976
100	183	793
200	134	659

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	91
38.100	74
25.400	58
19.000	48
12.700	39
9.500	35
4.750	26
2.000	21
0.840	20
0.590	16
0.425	13
0.250	10
0.149	8
0.075	6

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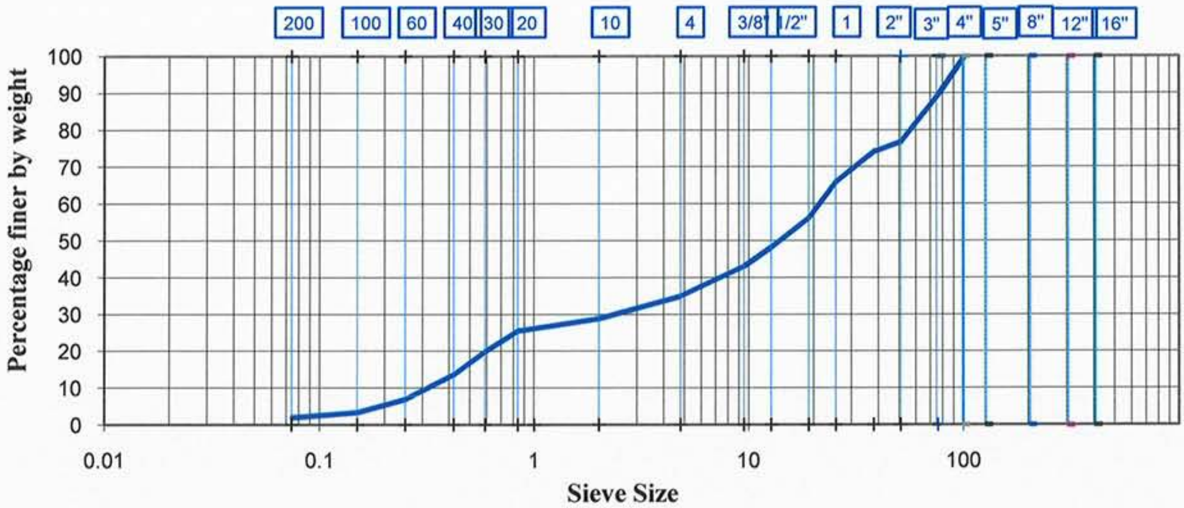

Weight of sample : 12806 g

Sample I.D : -
BH / TP : **NTP11**
Depth (m) : **1.70**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		12806
3"	1348	11458
2"	1632	9826
1 1/2"	350	9476
1"	1049	8427
3/4"	1240	7187
1/2"	1013	6174
3/8"	658	5516
4	1055	4461
10	772	3689
20	421	3268
30	727	2541
40	776	1765
60	881	884
100	454	430
200	184	246

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	100
76.200	89
50.800	77
38.100	74
25.400	66
19.000	56
12.700	48
9.500	43
4.750	35
2.000	29
0.840	26
0.590	20
0.425	14
0.250	7
0.149	3
0.075	2

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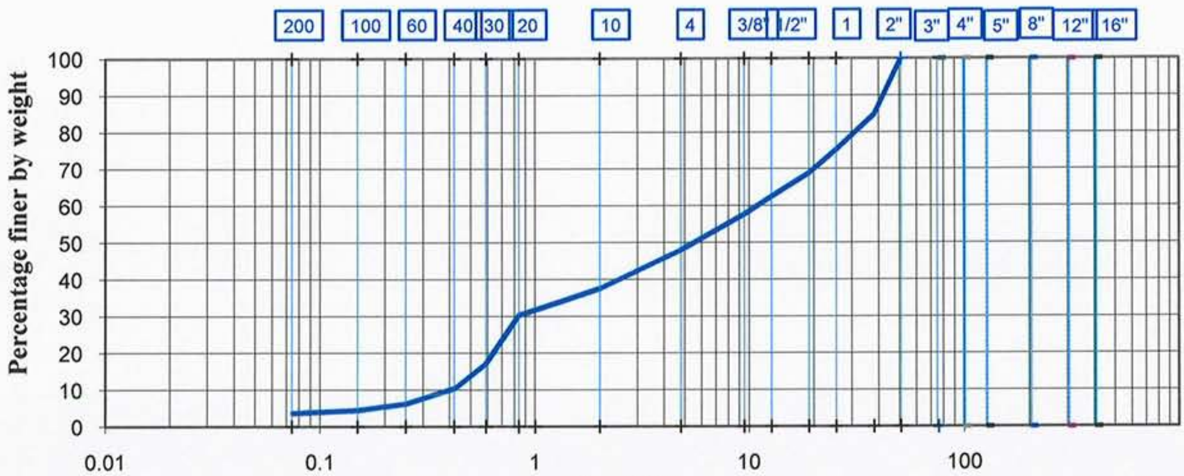

Weight of sample : **10693** g

Sample I.D : -
BH / TP : **NTP11**
Depth (m) : **4.00**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		
2"		10693
1 1/2"	1644	9049
1"	1017	8032
3/4"	685	7347
1/2"	675	6672
3/8"	513	6159
4	1054	5105
10	1095	4010
20	781	3229
30	1406	1823
40	699	1124
60	461	663
100	185	478
200	88	390

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	
50.800	100
38.100	85
25.400	75
19.000	69
12.700	62
9.500	58
4.750	48
2.000	38
0.840	30
0.590	17
0.425	11
0.250	6
0.149	4
0.075	4

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Weight of sample : **14726** g

Sample I.D : -
BH / TP : **NTP12**
Depth (m) : **1.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		14726
4"	2256	12470
3"	1225	11245
2"	1160	10085
1 1/2"	1447	8638
1"	1184	7454
3/4"	941	6513
1/2"	1047	5466
3/8"	515	4951
4	843	4108
10	625	3483
20	471	3012
30	643	2369
40	592	1777
60	1016	761
100	445	316
200	150	166

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	85
76.200	76
50.800	68
38.100	59
25.400	51
19.000	44
12.700	37
9.500	34
4.750	28
2.000	24
0.840	20
0.590	16
0.425	12
0.250	5
0.149	2
0.075	1

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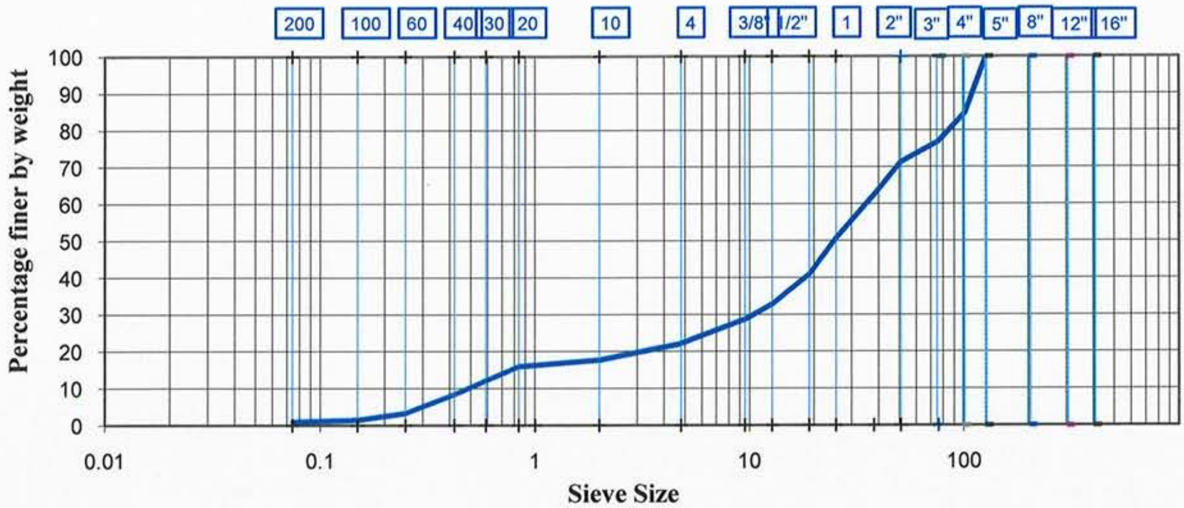

Weight of sample : 20341 g

Sample I.D : -
BH / TP : **NTP12**
Depth (m) : **3.00**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		20341
4"	3100	17241
3"	1583	15658
2"	1138	14520
1 1/2"	1818	12702
1"	2389	10313
3/4"	2004	8309
1/2"	1638	6671
3/8"	847	5824
4	1333	4491
10	885	3606
20	365	3241
30	779	2462
40	746	1716
60	1060	656
100	369	287
200	107	180

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	85
76.200	77
50.800	71
38.100	62
25.400	51
19.000	41
12.700	33
9.500	29
4.750	22
2.000	18
0.840	16
0.590	12
0.425	8
0.250	3
0.149	1
0.075	1

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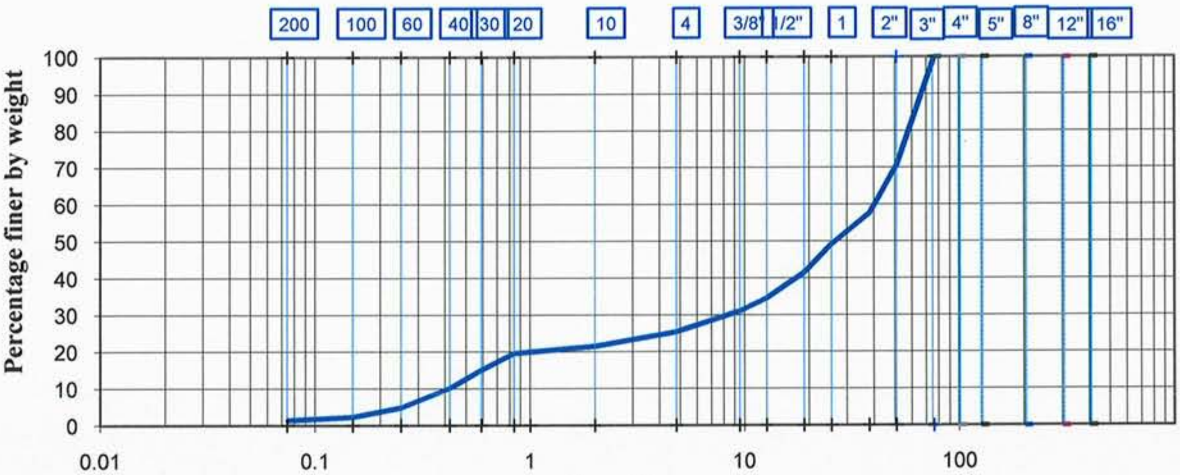

Weight of sample : 16288 g

Sample I.D : -
BH / TP : **NTP13**
Depth (m) : **1.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		16288
2"	4798	11490
1 1/2"	2106	9384
1"	1383	8001
3/4"	1263	6738
1/2"	1116	5622
3/8"	563	5059
4	932	4127
10	621	3506
20	318	3188
30	728	2460
40	782	1678
60	883	795
100	415	380
200	130	250

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	71
38.100	58
25.400	49
19.000	41
12.700	35
9.500	31
4.750	25
2.000	22
0.840	20
0.590	15
0.425	10
0.250	5
0.149	2
0.075	2

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Weight of sample : 17325 g

Sample I.D : -
BH / TP : **NTP13**
Depth (m) : **3.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		17325
2"	2650	14675
1 1/2"	1004	13671
1"	1180	12491
3/4"	1357	11134
1/2"	1537	9597
3/8"	1021	8576
4	1462	7114
10	1003	6111
20	530	5581
30	1211	4370
40	1215	3155
60	1272	1883
100	479	1404
200	104	1300

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	85
38.100	79
25.400	72
19.000	64
12.700	55
9.500	50
4.750	41
2.000	35
0.840	32
0.590	25
0.425	18
0.250	11
0.149	8
0.075	8

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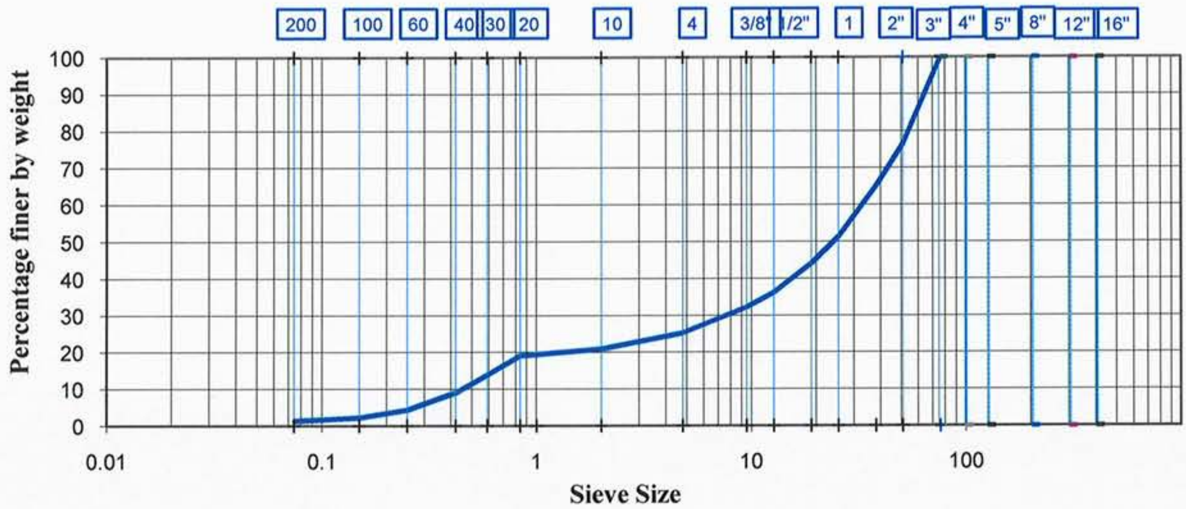

Weight of sample : 17472 g

Sample I.D : -

BH / TP : **NTP14**

Depth (m) : **1.40**

Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		17472
2"	4112	13360
1 1/2"	1991	11369
1"	2411	8958
3/4"	1252	7706
1/2"	1378	6328
3/8"	697	5631
4	1231	4400
10	746	3654
20	314	3340
30	918	2422
40	826	1596
60	829	767
100	375	392
200	144	248

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	76
38.100	65
25.400	51
19.000	44
12.700	36
9.500	32
4.750	25
2.000	21
0.840	19
0.590	14
0.425	9
0.250	4
0.149	2
0.075	1

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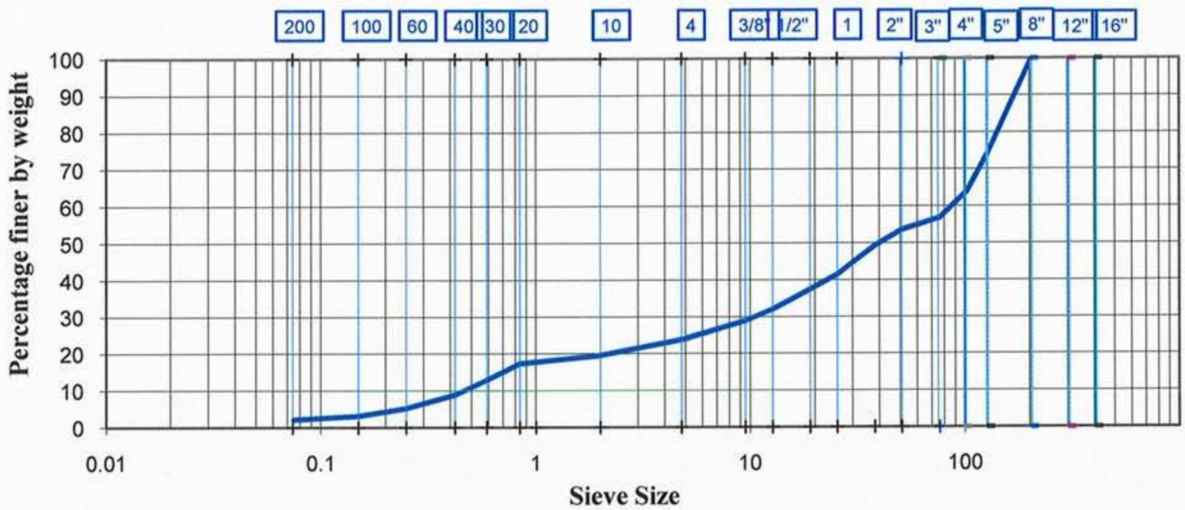

Weight of sample : 21119 g

Sample I.D : -
BH / TP : **NTP14**
Depth (m) : **3.40**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		21119
5"	5508	15611
4"	2155	13456
3"	1470	11986
2"	676	11310
1 1/2"	910	10400
1"	1653	8747
3/4"	849	7898
1/2"	1145	6753
3/8"	657	6096
4	1083	5013
10	895	4118
20	462	3656
30	929	2727
40	824	1903
60	787	1116
100	449	667
200	208	459

D(mm)	Passing %
406.400	
304.800	
203.800	100
127.000	74
101.600	64
76.200	57
50.800	54
38.100	49
25.400	41
19.000	37
12.700	32
9.500	29
4.750	24
2.000	19
0.840	17
0.590	13
0.425	9
0.250	5
0.149	3
0.075	2

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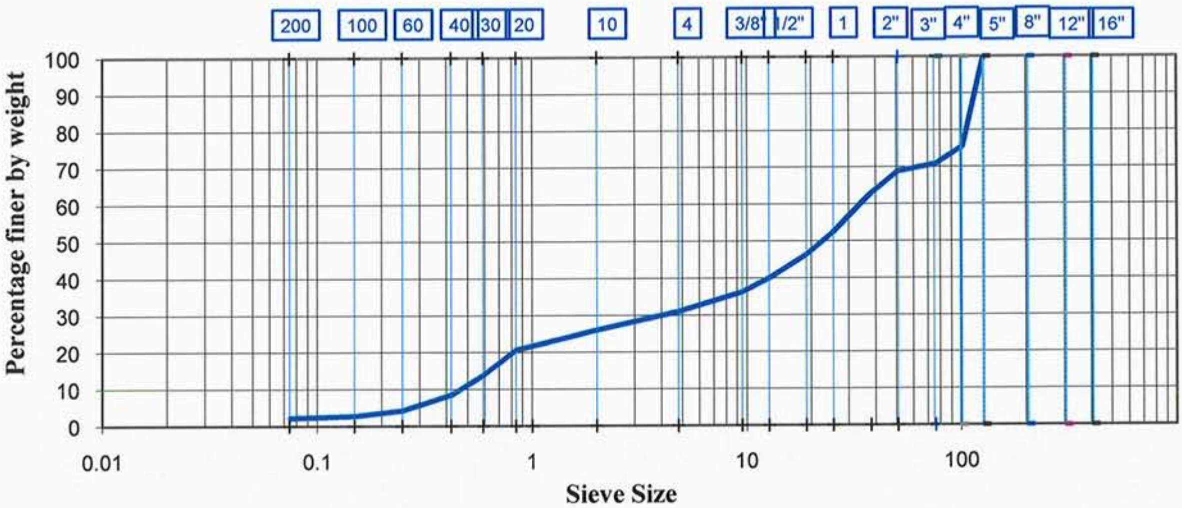

Weight of sample : 19018 g

Sample I.D : -
BH / TP : **NTP15**
Depth (m) : **1.80**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		19018
4"	4641	14377
3"	889	13488
2"	391	13097
1 1/2"	1118	11979
1"	1999	9980
3/4"	1172	8808
1/2"	1205	7603
3/8"	710	6893
4	1016	5877
10	923	4954
20	1025	3929
30	1302	2627
40	999	1628
60	830	798
100	284	514
200	90	424

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	76
76.200	71
50.800	69
38.100	63
25.400	52
19.000	46
12.700	40
9.500	36
4.750	31
2.000	26
0.840	21
0.590	14
0.425	9
0.250	4
0.149	3
0.075	2

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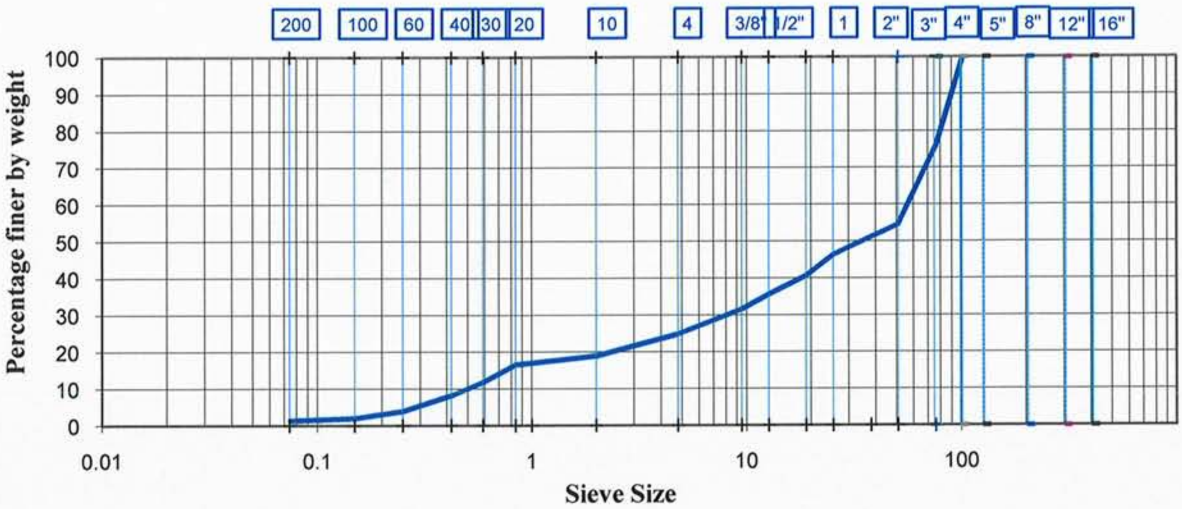

Weight of sample : **10941** g

Sample I.D : -
BH / TP : **NTP16**
Depth (m) : **1.70**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		10941
3"	2654	8287
2"	2318	5969
1 1/2"	378	5591
1"	533	5058
3/4"	612	4446
1/2"	556	3890
3/8"	438	3452
4	742	2710
10	644	2066
20	252	1814
30	527	1287
40	378	909
60	480	429
100	204	225
200	69	156

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	100
76.200	76
50.800	55
38.100	51
25.400	46
19.000	41
12.700	36
9.500	32
4.750	25
2.000	19
0.840	17
0.590	12
0.425	8
0.250	4
0.149	2
0.075	1

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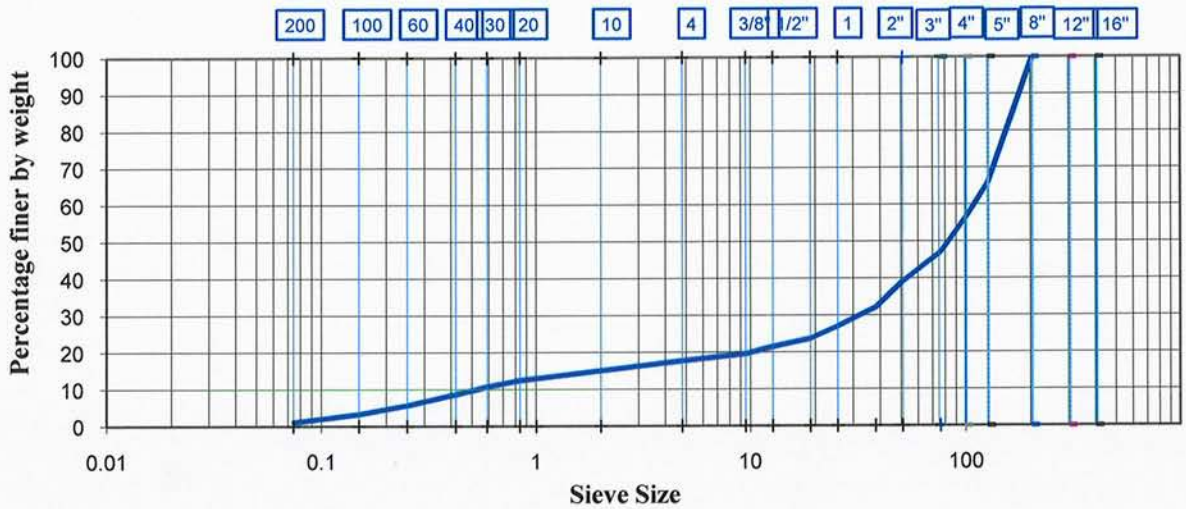

Weight of sample : 26084 g

Sample I.D : -
BH / TP : **NTP16**
Depth (m) : **3.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		26084
5"	8874	17210
4"	2340	14870
3"	2610	12260
2"	2048	10212
1 1/2"	1842	8370
1"	1340	7030
3/4"	877	6153
1/2"	549	5604
3/8"	513	5091
4	501	4590
10	684	3906
20	671	3235
30	452	2783
40	525	2258
60	789	1469
100	623	846
200	558	288

D(mm)	Passing %
406.400	
304.800	
203.800	100
127.000	66
101.600	57
76.200	47
50.800	39
38.100	32
25.400	27
19.000	24
12.700	21
9.500	20
4.750	18
2.000	15
0.840	12
0.590	11
0.425	9
0.250	6
0.149	3
0.075	1

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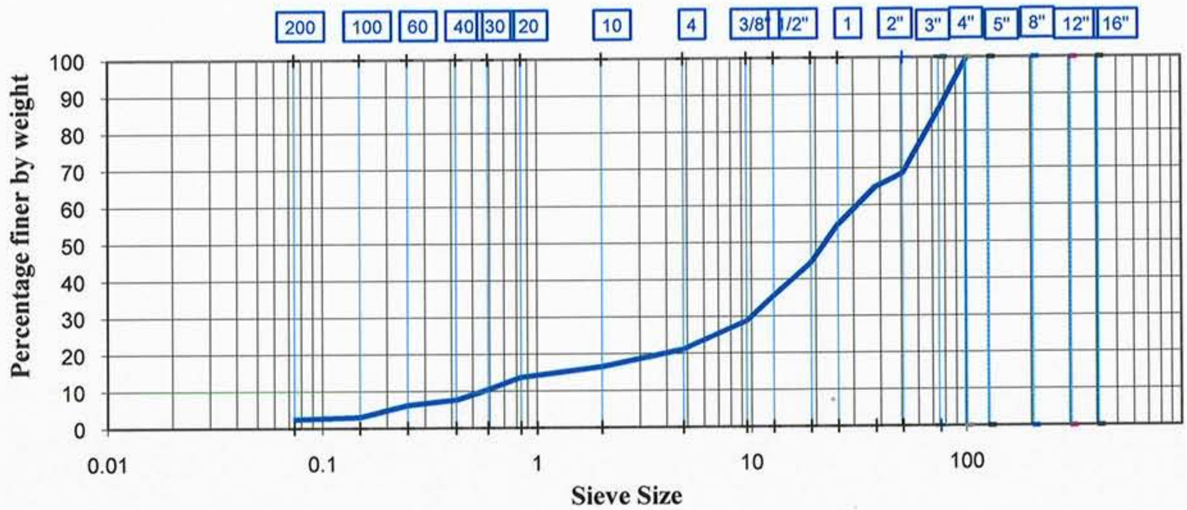

Weight of sample : 14700 g

Sample I.D : -
BH / TP : **NTP17**
Depth (m) : **1.80**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		14700
3"	1974	12726
2"	2638	10088
1 1/2"	536	9552
1"	1504	8048
3/4"	1512	6536
1/2"	1315	5221
3/8"	991	4230
4	1130	3100
10	666	2434
20	403	2031
30	491	1540
40	395	1145
60	225	920
100	471	449
200	78	371

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	100
76.200	87
50.800	69
38.100	65
25.400	55
19.000	44
12.700	36
9.500	29
4.750	21
2.000	17
0.840	14
0.590	10
0.425	8
0.250	6
0.149	3
0.075	3

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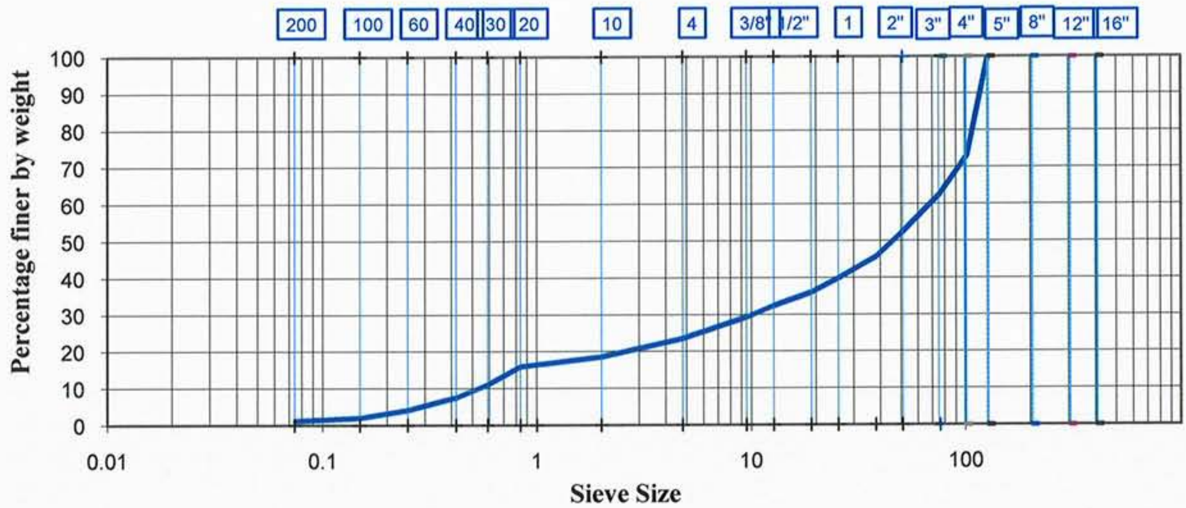
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 18476 g

Sample I.D : -
BH / TP : **NTP18**
Depth (m) : **1.00**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		18476
4"	4977	13499
3"	1894	11605
2"	1932	9673
1 1/2"	1252	8421
1"	1084	7337
3/4"	710	6627
1/2"	659	5968
3/8"	580	5388
4	1071	4317
10	907	3410
20	483	2927
30	896	2031
40	626	1405
60	639	766
100	390	376
200	145	231

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	73
76.200	63
50.800	52
38.100	46
25.400	40
19.000	36
12.700	32
9.500	29
4.750	23
2.000	18
0.840	16
0.590	11
0.425	8
0.250	4
0.149	2
0.075	1

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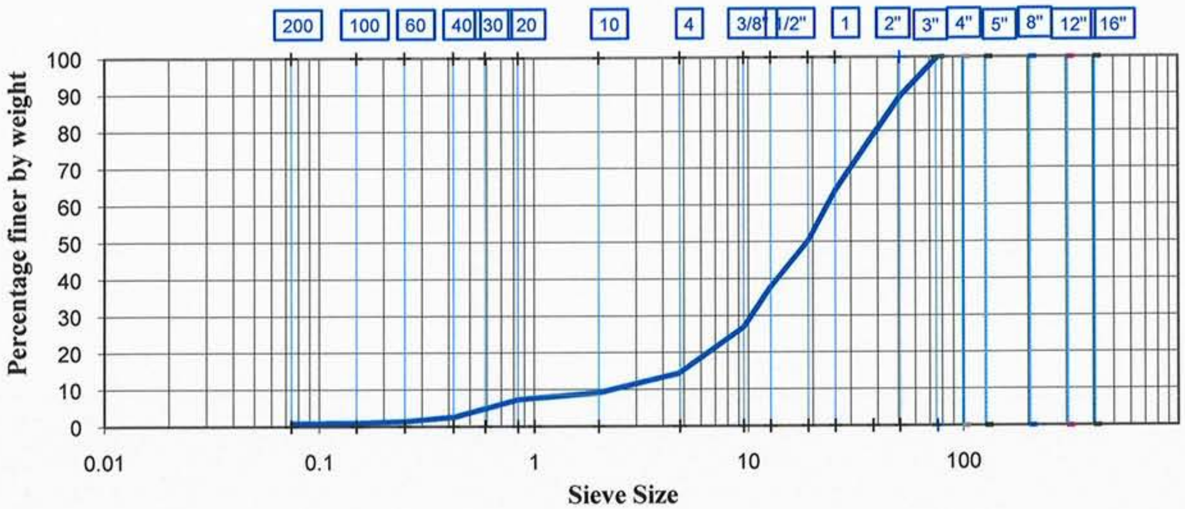
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 17325 g

Sample I.D : -
BH / TP : **NTP19**
Depth (m) : **0.40**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		17325
2"	1859	15466
1 1/2"	1804	13662
1"	2604	11058
3/4"	2354	8704
1/2"	2159	6545
3/8"	1895	4650
4	2154	2496
10	915	1581
20	312	1269
30	418	851
40	387	464
60	213	251
100	75	176
200	24	152

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	89
38.100	79
25.400	64
19.000	50
12.700	38
9.500	27
4.750	14
2.000	9
0.840	7
0.590	5
0.425	3
0.250	1
0.149	1
0.075	1

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ASTM C-136

Weight of sample : 14007 g

Sample I.D : -

BH / TP : **NTP19**

Depth (m) : **1.20**

Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		14007
2"	1054	12953
1 1/2"	1138	11815
1"	1772	10043
3/4"	865	9178
1/2"	1134	8044
3/8"	655	7389
4	1075	6314
10	850	5464
20	437	5027
30	1528	3499
40	1652	1847
60	1165	682
100	314	368
200	102	266

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	92
38.100	84
25.400	72
19.000	66
12.700	57
9.500	53
4.750	45
2.000	39
0.840	36
0.590	25
0.425	13
0.250	5
0.149	3
0.075	2

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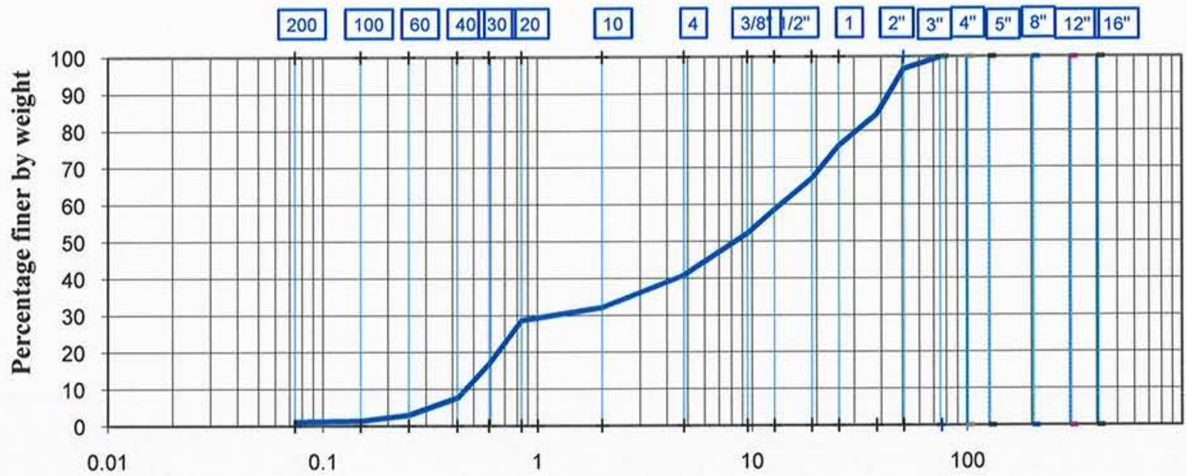
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 15091 g

Sample I.D : -
BH / TP : **NTP20**
Depth (m) : **0.80**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		15091
2"	504	14587
1 1/2"	1869	12718
1"	1285	11433
3/4"	1336	10097
1/2"	1260	8837
3/8"	979	7858
4	1722	6136
10	1286	4850
20	519	4331
30	1797	2534
40	1357	1177
60	733	444
100	229	215
200	43	172

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	97
38.100	84
25.400	76
19.000	67
12.700	59
9.500	52
4.750	41
2.000	32
0.840	29
0.590	17
0.425	8
0.250	3
0.149	1
0.075	1

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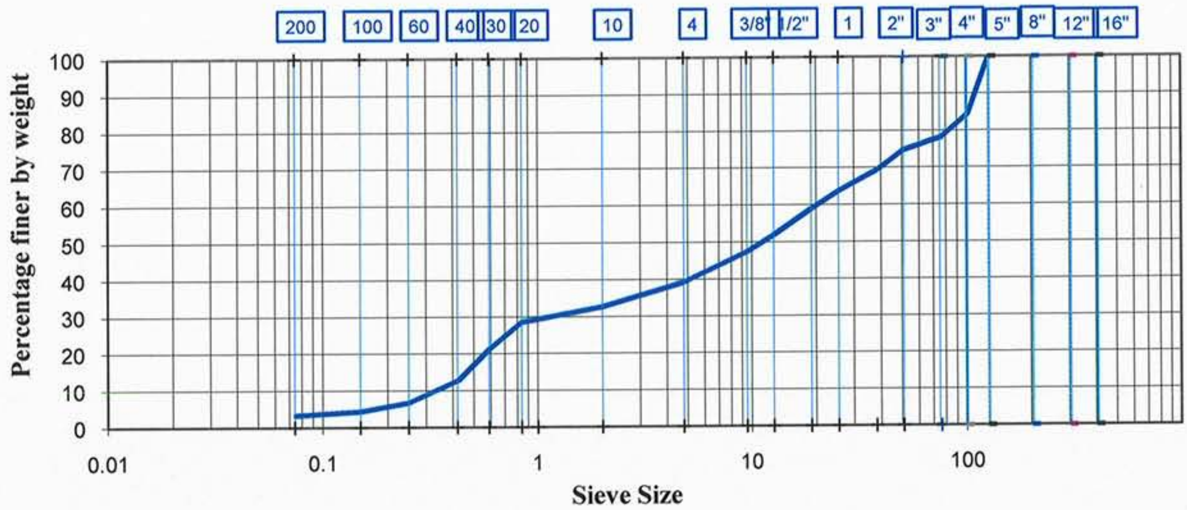
ASTM C-136



Weight of sample : **20017** g

Sample I.D : -
BH / TP : **NTP21**
Depth (m) : **1.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		20017
4"	3114	16903
3"	1247	15656
2"	706	14950
1 1/2"	1094	13856
1"	1117	12739
3/4"	949	11790
1/2"	1409	10381
3/8"	916	9465
4	1653	7812
10	1281	6531
20	825	5706
30	1472	4234
40	1673	2561
60	1211	1350
100	469	881
200	222	659

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	84
76.200	78
50.800	75
38.100	69
25.400	64
19.000	59
12.700	52
9.500	47
4.750	39
2.000	33
0.840	29
0.590	21
0.425	13
0.250	7
0.149	4
0.075	3

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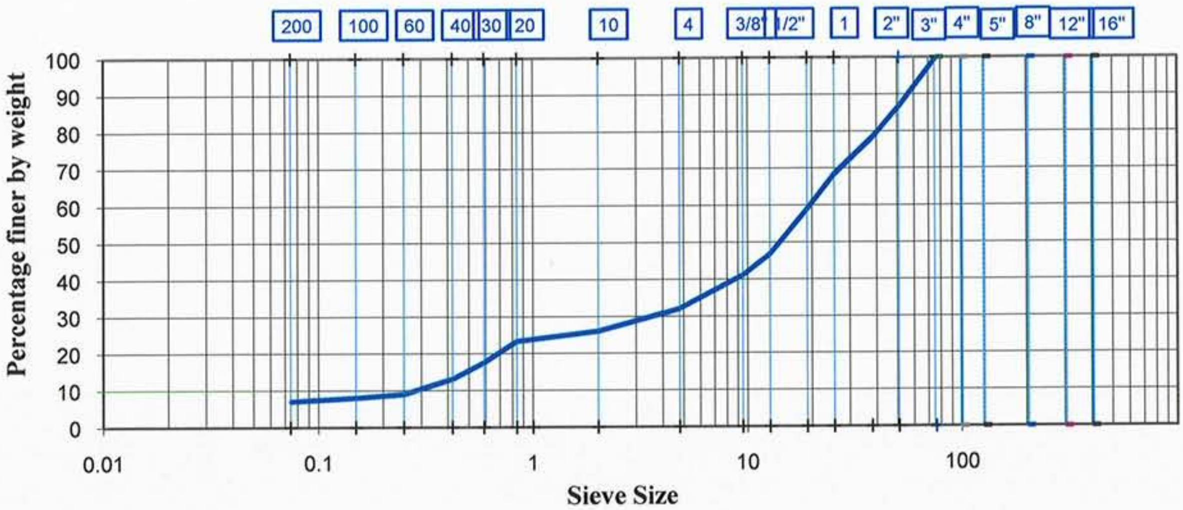
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 16380 g

Sample I.D : -
BH / TP : **NTP21**
Depth (m) : **3.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		
4"		
3"		16380
2"	2184	14196
1 1/2"	1382	12814
1"	1609	11205
3/4"	1541	9664
1/2"	2003	7661
3/8"	932	6729
4	1487	5242
10	977	4265
20	434	3831
30	952	2879
40	708	2171
60	701	1470
100	149	1321
200	163	1158

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	
101.600	
76.200	100
50.800	87
38.100	78
25.400	68
19.000	59
12.700	47
9.500	41
4.750	32
2.000	26
0.840	23
0.590	18
0.425	13
0.250	9
0.149	8
0.075	7

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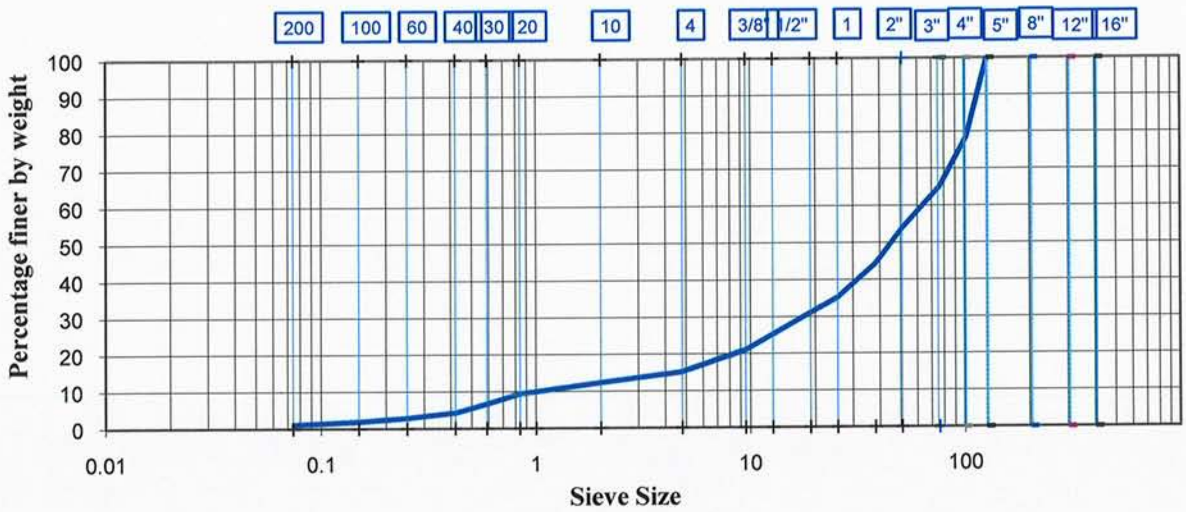
PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : 22456 g

Sample I.D : -

BH / TP : **NTP22**

Depth (m) : **1.00**

Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		
5"		22456
4"	4817	17639
3"	3012	14627
2"	2520	12107
1 1/2"	2158	9949
1"	2041	7908
3/4"	923	6985
1/2"	1315	5670
3/8"	932	4738
4	1336	3402
10	621	2781
20	674	2107
30	602	1505
40	513	992
60	347	645
100	218	427
200	159	268

D(mm)	Passing %
406.400	
304.800	
203.800	
127.000	100
101.600	79
76.200	65
50.800	54
38.100	44
25.400	35
19.000	31
12.700	25
9.500	21
4.750	15
2.000	12
0.840	9
0.590	7
0.425	4
0.250	3
0.149	2
0.075	1

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Project : Bisri Dam

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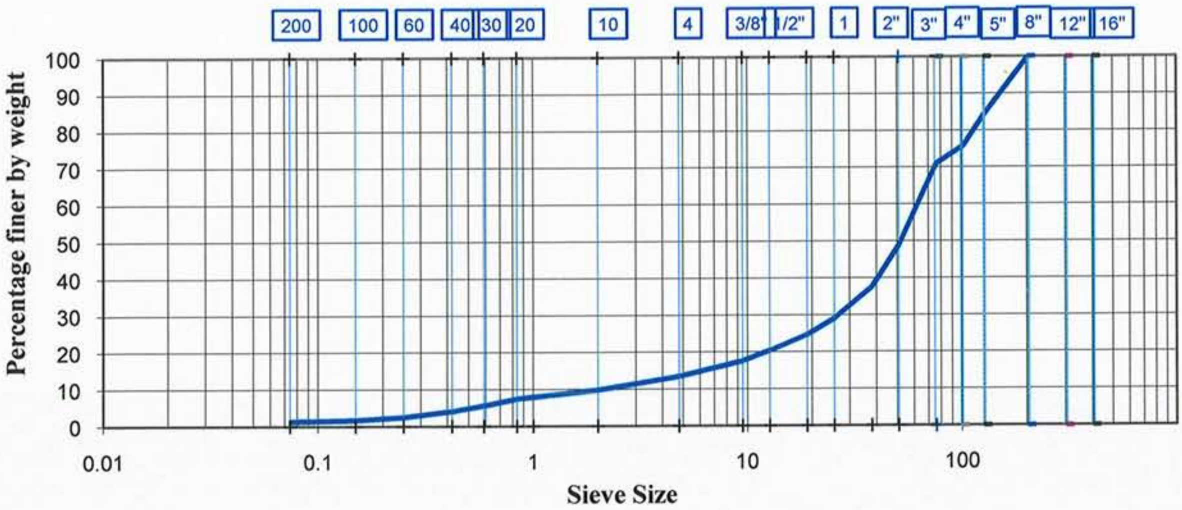
Date : 31/10/14

PARTICLE SIZE DISTRIBUTION
ASTM C-136



Weight of sample : **31012** g

Sample I.D : -
BH / TP : **NTP23**
Depth (m) : **1.50**
Nr : -

Sieve No.	Retained	Passing
16"		
12"		
8"		31012
5"	4906	26106
4"	2615	23491
3"	1487	22004
2"	6842	15162
1 1/2"	3507	11655
1"	2650	9005
3/4"	1352	7653
1/2"	1327	6326
3/8"	878	5448
4	1277	4171
10	1100	3071
20	747	2324
30	570	1754
40	438	1316
60	522	794
100	260	534
200	105	429

D(mm)	Passing %
406.400	
304.800	
203.800	100
127.000	84
101.600	76
76.200	71
50.800	49
38.100	38
25.400	29
19.000	25
12.700	20
9.500	18
4.750	13
2.000	10
0.840	7
0.590	6
0.425	4
0.250	3
0.149	2
0.075	1

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	10/09/14	
Sampled by:	ASSACO	
Sample #	NTP9 - 0.70 m	
Total reading	5.7	
Sand reading	1.8	
Sand equivalent	32%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	10/09/14
Sampled by:	ASSACO

Sample #	NTP9 - 2.00 m	
Total reading	5.0	
Sand reading	2.9	
Sand equivalent	58%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	10/09/14
Sampled by:	ASSACO

Sample #	NTP10 - 2.00 m	
Total reading	5.8	
Sand reading	2.5	
Sand equivalent	43%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	10/09/14
Sampled by:	ASSACO

Sample #	NTP10 - 3.50 m	
Total reading	5.8	
Sand reading	2.4	
Sand equivalent	41%	
Average Sand equivalent	-	

Remarks:

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SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	10/09/14	
Sampled by:	ASSACO	
Sample #	NTP11- 1.70 m	
Total reading	4.3	
Sand reading	3.5	
Sand equivalent	81%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	10/09/14	
Sampled by:	ASSACO	
Sample #	NTP11-4.00 m	
Total reading	4.4	
Sand reading	3.5	
Sand equivalent	80%	
Average Sand equivalent	-	
Remarks:		

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Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	11/09/14	
Sampled by:	ASSACO	
Sample #	NTP12-1.50 m	
Total reading	4.9	
Sand reading	3.4	
Sand equivalent	70%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	11/09/14	
Sampled by:	ASSACO	
Sample #	NTP12-3.00 m	
Total reading	4.4	
Sand reading	3.4	
Sand equivalent	77%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	11/09/14	
Sampled by:	ASSACO	
Sample #	NTP13-1.50 m	
Total reading	4.7	
Sand reading	3.6	
Sand equivalent	77%	
Average Sand equivalent	-	
Remarks:		

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Date : 31/10/14

SAND EQUIVALENT TEST

AASHTO T176

Sample description: -
Source: Bisri
Sampling date: 11/09/14
Sampled by: ASSACO

Sample #	NTP13-3.50 m	
Total reading	4.5	
Sand reading	3.5	
Sand equivalent	79%	
Average Sand equivalent	-	

Remarks:

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	11/09/14	
Sampled by:	ASSACO	
Sample #	NTP14-1.40 m	
Total reading	4.6	
Sand reading	3.5	
Sand equivalent	77%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	11/09/14
Sampled by:	ASSACO

Sample #	NTP14-3.40 m	
Total reading	4.8	
Sand reading	3.3	
Sand equivalent	69%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	12/09/14	
Sampled by:	ASSACO	
Sample #	NTP15-1.80 m	
Total reading	4.3	
Sand reading	3.5	
Sand equivalent	81%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	12/09/14	
Sampled by:	ASSACO	
Sample #	NTP16-1.70 m	
Total reading	4.7	
Sand reading	3.4	
Sand equivalent	72%	
Average Sand equivalent	-	
Remarks:		

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Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description: -
Source: Bisri
Sampling date: 12/09/14
Sampled by: ASSACO

Sample #	NTP16-3.50 m	
Total reading	5.2	
Sand reading	3.3	
Sand equivalent	63%	
Average Sand equivalent	-	

Remarks:

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Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	12/09/14	
Sampled by:	ASSACO	
Sample #	NTP17-1.80 m	
Total reading	5.5	
Sand reading	3.3	
Sand equivalent	60%	
Average Sand equivalent	-	
Remarks:		

Head of laboratory section

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Client : **M/S Dar Al Handasah Nazih Taleb & Partners**
Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	12/09/14	
Sampled by:	ASSACO	
Sample #	NTP18-1.00 m	
Total reading	4.5	
Sand reading	3.5	
Sand equivalent	79%	
Average Sand equivalent	-	
Remarks:		

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Client : **M/S Dar Al Handasah Nazih Taleb & Partners**
Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description: -
Source: Bisri
Sampling date: 10/09/14
Sampled by: ASSACO

Sample #	NTP19-0.40 m	
Total reading	3.9	
Sand reading	3.2	
Sand equivalent	82%	
Average Sand equivalent	-	

Remarks:

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Client : **M/S Dar Al Handasah Nazih Taleb & Partners**
Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	10/09/14	
Sampled by:	ASSACO	
Sample #	NTP19-1.20 m	
Total reading	4.9	
Sand reading	3.6	
Sand equivalent	73%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-	
Source:	Bisri	
Sampling date:	10/09/14	
Sampled by:	ASSACO	
Sample #	NTP20-0.80 m	
Total reading	3.8	
Sand reading	3.5	
Sand equivalent	92%	
Average Sand equivalent	-	
Remarks:		

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Client : **M/S Dar Al Handasah Nazih Taleb & Partners**
Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	10/09/14
Sampled by:	ASSACO

Sample #	NTP21-1.50 m	
Total reading	4.9	
Sand reading	3.5	
Sand equivalent	71%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	10/09/14
Sampled by:	ASSACO

Sample #	NTP21-3.50 m	
Total reading	5.6	
Sand reading	3.1	
Sand equivalent	55%	
Average Sand equivalent	-	
Remarks:		

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Project : **Bisri Dam**
Location : **Upstream of the Dam, SAND and GRAVEL Material Sources**
Date : **31/10/14**

SAND EQUIVALENT TEST
AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	11/09/14
Sampled by:	ASSACO

Sample #	NTP22-1.00 m	
Total reading	3.9	
Sand reading	3.6	
Sand equivalent	94%	
Average Sand equivalent	-	
Remarks:		

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

SAND EQUIVALENT TEST

AASHTO T176

Sample description:	-
Source:	Bisri
Sampling date:	11/09/14
Sampled by:	ASSACO

Sample #	NTP23-1.50 m	
Total reading	4.1	
Sand reading	3.5	
Sand equivalent	86%	
Average Sand equivalent	-	
Remarks:		

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Determination of Clay Content in Soils

Sample No.	Sample Depth (m)	Clay reading	Total reading	Clay content (%)
NTP9	0.70	0.25	5.95	4.2
	2.00	0.10	5.10	2.0
NTP10	2.00	0.10	5.00	2.0
	3.50	0.10	6.60	1.5
NTP11	1.70	0.15	5.85	2.6
	4.00	0.10	5.80	1.7
NTP12	1.50	0.10	5.95	1.7
	3.00	0.10	6.10	1.6
NTP13	1.50	0.30	6.30	4.8
	3.50	0.10	5.50	1.8
NTP14	1.40	0.15	5.45	2.8
	3.40	0.10	5.95	1.7
NTP15	1.80	0.15	6.10	2.5

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Determination of Clay Content in Soils

Sample No.	Sample Depth (m)	Clay reading	Total reading	Clay content (%)
NTP16	1.70	0.1	5.50	1.8
	3.50	0.1	6.80	1.5
NTP17	1.80	0.15	6.45	2.3
NTP18	1.00	0.1	5.05	2.0
NTP19	0.40	0.15	7.75	1.9
	1.20	0.15	6.00	2.5
NTP20	0.80	0.10	5.65	1.8
NTP21	1.50	0.15	6.75	2.2
	3.50	0.15	5.30	2.8
NTP22	1.00	0.15	5.72	2.6
NTP23	1.50	0.10	4.20	2.4

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.			NTP9	NTP9	NTP10	NTP10
Depth (m)			0.70	2.00	2.00	3.50

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B		613.01	617.57	615.74
Apparent weight in water of the basket empty	(g)	C		112.52	115.74	109.58
Weight of the oven-dried aggregate in air	(g)	D		800.46	795.64	797.24
Apparent relative density				2.67	2.71	2.74

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	761.42	762.47	762.18	761.85
Specific gravity (SG)			2.65	2.69	2.67	2.66

Percentage of Retained on Sieve #4	%		55	70	74
Percentage of Passing on Sieve #4	%		45	30	26

Weighted Average Specific Gravity	Gavg	2.65	2.68	2.70	2.72

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.			NTP11	NTP11	NTP12	NTP12
Depth (m)			1.70	4.00	1.50	3.00

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B	615.17	613.69	616.75	617.49
Apparent weight in water of the basket empty	(g)	C	110.18	112.06	111.57	110.42
Weight of the oven-dried aggregate in air	(g)	D	800.29	800.43	795.24	802.39
Apparent relative density			2.71	2.68	2.74	2.72

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	763.55	762.25	763.15	762.14
Specific gravity (SG)			2.72	2.68	2.71	2.67

Percentage of Retained on Sieve #4	%	65	52	72	78
Percentage of Passing on Sieve #4	%	35	48	28	22

Weighted Average Specific Gravity	Gavg	2.72	2.68	2.73	2.71

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.	NTP13	NTP13	NTP14	NTP14
Depth (m)	1.50	3.50	1.40	3.40

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B	614.33	615.13	618.75	616.42
Apparent weight in water of the basket empty	(g)	C	109.47	107.21	111.84	109.68
Weight of the oven-dried aggregate in air	(g)	D	798.68	800.34	804.57	795.68
Apparent relative density			2.72	2.74	2.70	2.75

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	761.95	762.76	762.15	762.39
Specific gravity (SG)			2.67	2.70	2.67	2.68

Percentage of Retained on Sieve #4	%	75	59	75	76
Percentage of Passing on Sieve #4	%	25	41	25	24

Weighted Average Specific Gravity	Gavg	2.71	2.72	2.70	2.74

Head of laboratory section

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.	NTP15	NTP16	NTP16	NTP17
Depth (m)	1.80	1.70	3.50	1.80

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B	614.30	615.74	616.87	615.74
Apparent weight in water of the basket empty	(g)	C	111.72	108.29	109.62	107.55
Weight of the oven-dried aggregate in air	(g)	D	800.26	795.39	795.84	797.49
Apparent relative density			2.69	2.76	2.76	2.76

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	762.44	761.88	762.75	761.85
Specific gravity (SG)			2.68	2.66	2.70	2.66

Percentage of Retained on Sieve #4	%	69	75	82	79
Percentage of Passing on Sieve #4	%	31	25	18	21

Weighted Average Specific Gravity	Gavg	2.69	2.74	2.75	2.74

Head of laboratory section

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Geotechnical Study

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
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Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.	NTP18	NTP19	NTP19	NTP20
Depth (m)	1.00	0.40	1.20	0.80

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B	611.59	614.75	609.93	615.74
Apparent weight in water of the basket empty	(g)	C	108.23	109.67	105.65	109.72
Weight of the oven-dried aggregate in air	(g)	D	794.76	799.82	800.38	801.17
Apparent relative density			2.73	2.71	2.70	2.71

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	762.18	762.15	762.44	761.98
Specific gravity (SG)			2.67	2.67	2.68	2.67

Percentage of Retained on Sieve #4	%	77	86	55	59
Percentage of Passing on Sieve #4	%	23	14	45	41

Weighted Average Specific Gravity	Gavg	2.72	2.71	2.69	2.70

Head of laboratory section

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Specific Gravity of Soils
ASTM D854

Sample No.	NTP21	NTP21	NTP22	NTP23
Depth (m)	1.50	3.50	1.00	1.50

Retained on Sieve #4

Apparent weight in water (basket + aggregate)	(g)	B	613.83	614.62	609.59	615.24
Apparent weight in water of the basket empty	(g)	C	108.76	110.35	105.63	108.71
Weight of the oven-dried aggregate in air	(g)	D	803.55	802.25	800.36	799.52
Apparent relative density			2.69	2.69	2.70	2.73

Passing Sieve # 4

Weight of oven dried soil	(g)	W_o	200.00	200.00	200.00	200.00
Weight of Pycnometer filled with water only	(g)	W_a	636.95	636.95	636.95	636.95
Weight of Pycnometer filled with water and soil	(g)	W_b	761.84	762.27	762.54	761.55
Specific gravity (SG)			2.66	2.68	2.69	2.65

Percentage of Retained on Sieve #4	%	61	68	85	87
Percentage of Passing on Sieve #4	%	39	32	15	13

Weighted Average Specific Gravity	Gavg	2.68	2.69	2.70	2.72

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LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

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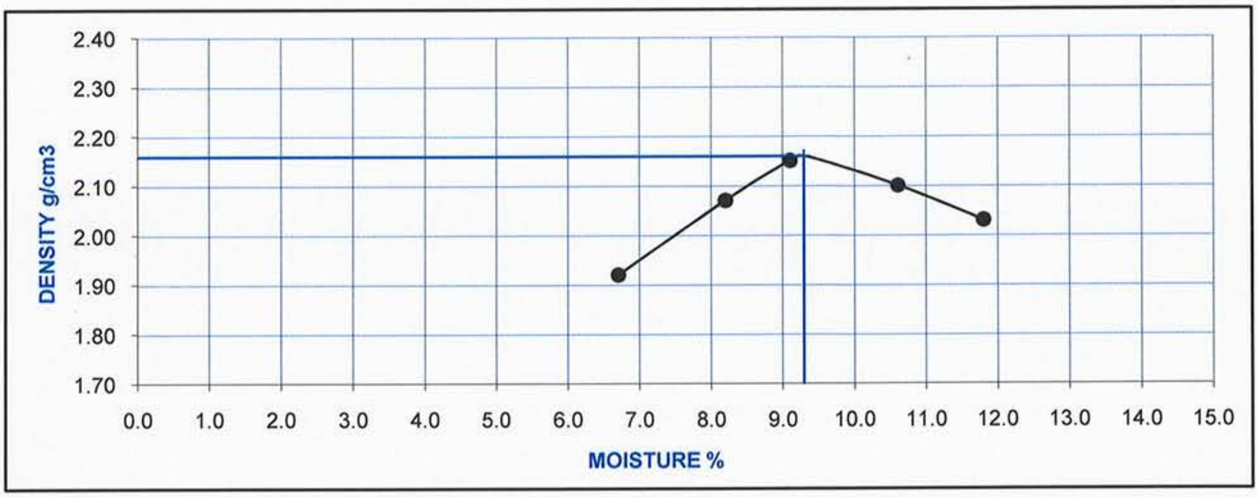
ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP9**	Mold diameter (in)	:	6"
Depth (m)	:	**2.00**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GPM**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **9.3**
Maximum dry density g/cm³ : **2.16**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13815.9	14436.2	14780.0	14705.2	14532.9	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6649.9	7270.2	7614.0	7539.2	7366.9	
Wet Density	g/cm³	2.05	2.24	2.35	2.32	2.27	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	214.5	200.7	231.1	168.3	199.8	
Wt. of can + dry Sample	g	201.0	185.5	211.8	152.2	178.7	
Wt. of moisture	g	13.5	15.2	19.3	16.1	21.1	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	201.0	185.5	211.8	152.2	178.7	
Moisture content	%	6.7	8.2	9.1	10.6	11.8	
Dry Density	g/cm³	1.92	2.07	2.15	2.10	2.03	

Head of laboratory section **F / ASSACO**

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ASSACO LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASSACO اسـاكو

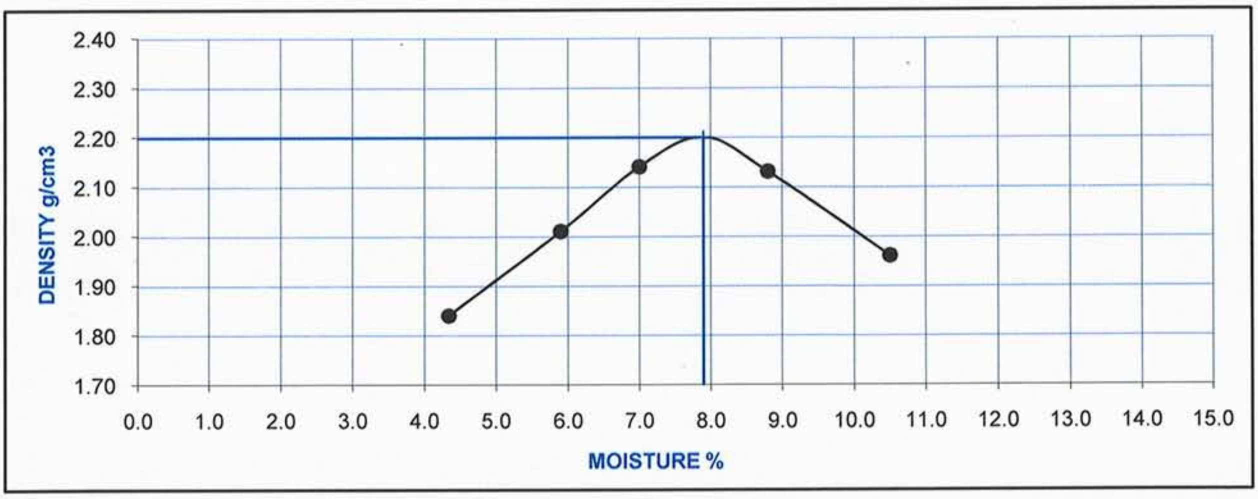
ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	**-**
Date	:	**03/11/14**
Sample I.D.	:	**NTP10**
Depth (m)	:	**2.00**
Sample received on	:	**-**
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GW**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : 7.9

Maximum dry density g/cm³ : 2.20



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13397.9	14075.4	14598.7	14688.4	14196.2	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6231.9	6909.4	7432.7	7522.4	7030.2	
Wet Density	g/cm³	1.92	2.13	2.29	2.32	2.17	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	210.3	198.6	206.0	157.1	184.2	
Wt. of can + dry Sample	g	201.6	187.5	192.5	144.4	166.7	
Wt. of moisture	g	8.7	11.1	13.5	12.7	17.5	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	201.6	187.5	192.5	144.4	166.7	
Moisture content	%	4.3	5.9	7.0	8.8	10.5	
Dry Density	g/cm³	1.84	2.01	2.14	2.13	1.96	

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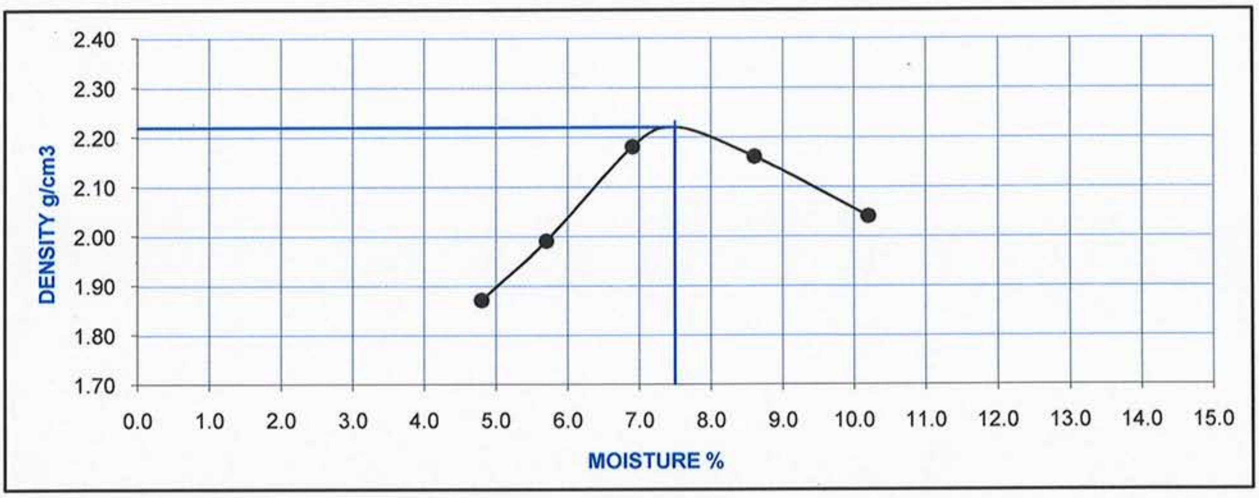
LABORATORY COMPACTION CHARACTERISTICS OF SOIL
USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	-			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP10**	Mold diameter (in)	:	6"
Depth (m)	:	**3.50**	Material passing	:	3/4"
Sample received on	:	-	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GPM**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : 7.5
Maximum dry density g/cm³ : 2.22



Description	**Trial No.**	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13527.4	13993.7	14730.5	14780.3	14463.3	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6361.4	6827.7	7564.5	7614.3	7297.3	
Wet Density	g/cm³	1.96	2.10	2.33	2.35	2.25	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	198.4	231.7	187.1	168.9	244.6	
Wt. of can + dry Sample	g	189.3	219.2	175.0	155.5	222.0	
Wt. of moisture	g	9.1	12.5	12.1	13.4	22.6	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	189.3	219.2	175.0	155.5	222.0	
Moisture content	%	4.8	5.7	6.9	8.6	10.2	
Dry Density	g/cm³	1.87	1.99	2.18	2.16	2.04	

Head of laboratory section **F / ASSACO**

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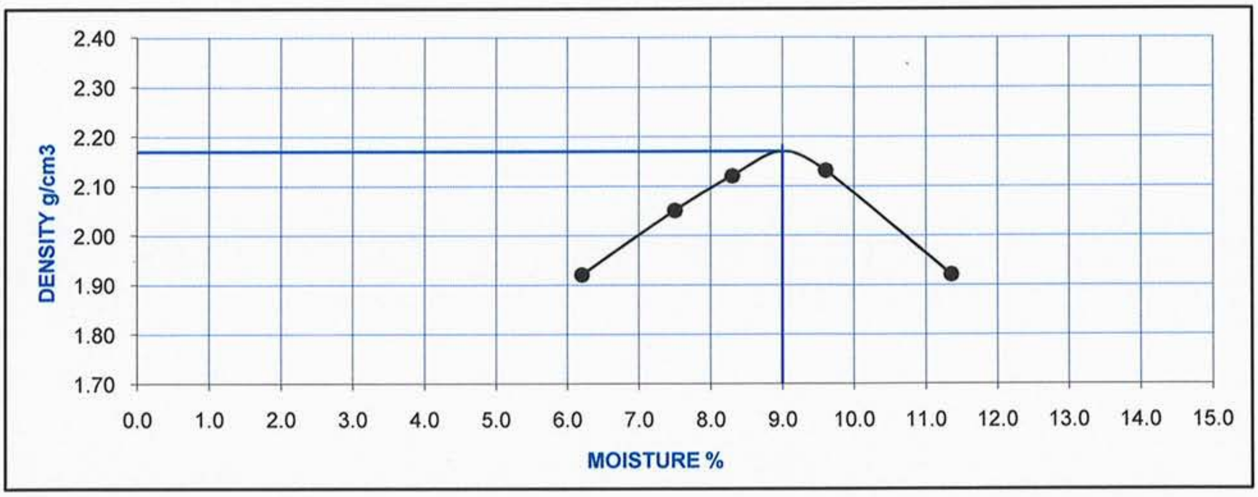
ASSACO اساكو

LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	**:**	**Bisri Dam**			
Location	**:**	**Upstream of the Dam**			
Consultant	**:**	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	**:**	**-**			
Date	**:**	**03/11/14**	**Procedure**	**:**	**C**
Sample I.D.	**:**	**NTP11**	Mold diameter (in)	:	6"
Depth (m)	**:**	**4.00**	Material passing	:	3/4"
Sample received on	**:**	**-**	Layers number	:	5
Sampled by	**:**	**ASSACO**	Blows per layer	:	56
Sample I.D.	**:**	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	**:**	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **9.0**
Maximum dry density g/cm³ : **2.17**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13784.7	14319.4	14618.7	14743.7	14105.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6618.7	7153.4	7452.7	7577.7	6939.7	
Wet Density	g/cm³	2.04	2.20	2.30	2.33	2.14	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	211.2	242.6	194.3	205.8	228.9	
Wt. of can + dry Sample	g	198.9	225.7	179.4	187.8	205.6	
Wt. of moisture	g	12.3	16.9	14.9	18.0	23.3	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	198.9	225.7	179.4	187.8	205.6	
Moisture content	%	6.2	7.5	8.3	9.6	11.4	
Dry Density	g/cm³	1.92	2.05	2.12	2.13	1.92	

Head of laboratory section **F / ASSACO**

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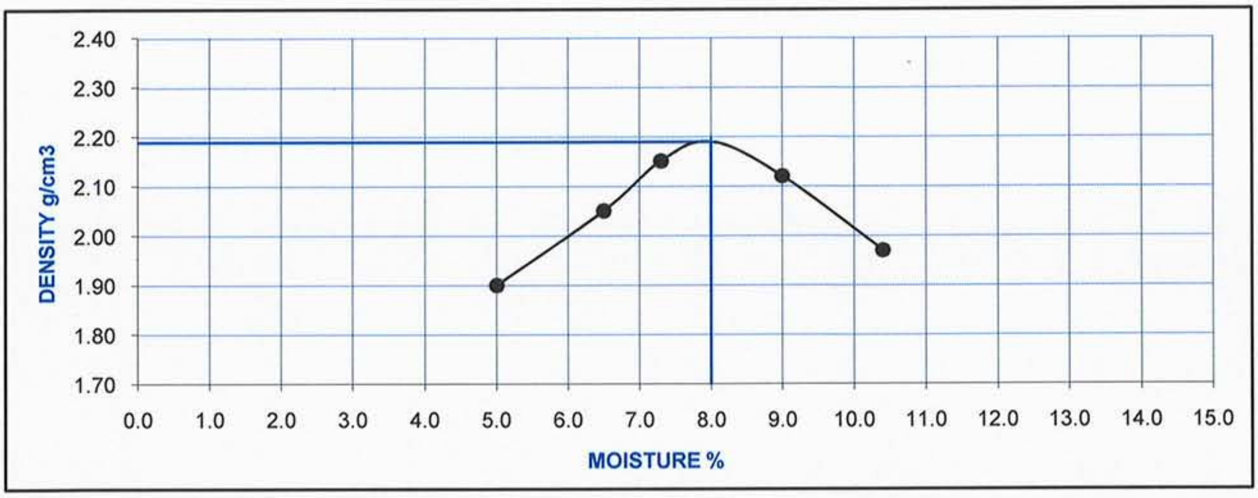
ASSACO
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)
ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	**-**
Date	:	**03/11/14**
Sample I.D.	:	**NTP12**
Depth (m)	:	**1.50**
Sample received on	:	**-**
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GW**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : **8.0**
Maximum dry density g/cm³ : **2.19**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13641.8	14252.8	14654.4	14666.9	14225.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6475.8	7086.8	7488.4	7500.9	7059.7	
Wet Density	g/cm³	2.00	2.18	2.31	2.31	2.17	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	209.6	158.2	187.3	214.7	227.9	
Wt. of can + dry Sample	g	199.6	148.5	174.6	197.0	206.4	
Wt. of moisture	g	10.0	9.7	12.7	17.7	21.5	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	199.6	148.5	174.6	197.0	206.4	
Moisture content	%	5.0	6.5	7.3	9.0	10.4	
Dry Density	g/cm³	1.90	2.05	2.15	2.12	1.97	

Head of laboratory section **F / ASSACO**

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ASSACO LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

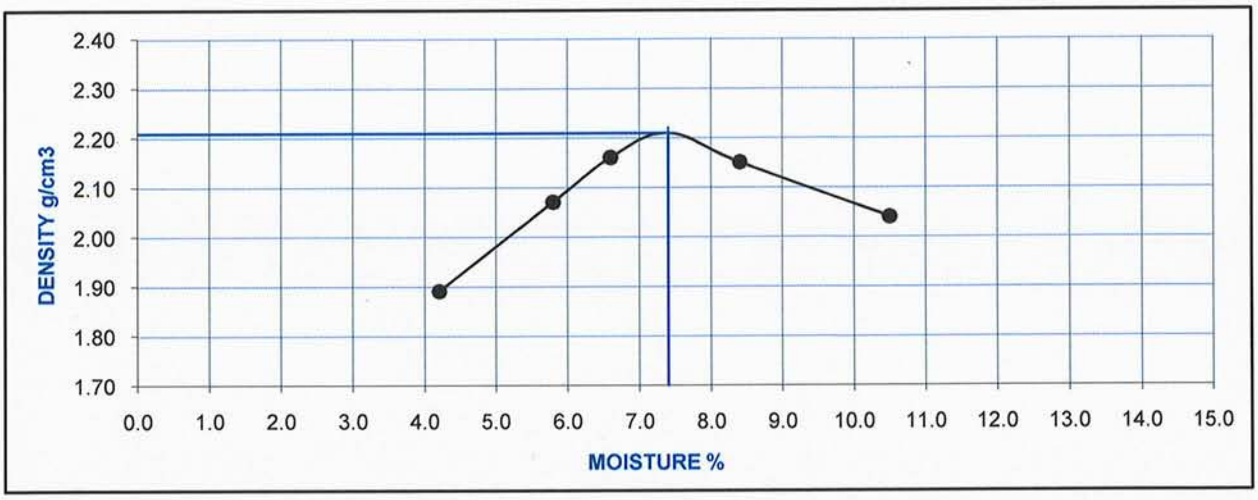
أسساكو

ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	**-**
Date	:	**03/11/14**
Sample I.D.	:	**NTP13**
Depth (m)	:	**1.50**
Sample received on	:	**-**
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GP**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : 7.4
Maximum dry density g/cm³ : 2.21



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13558.6	14274.9	14640.1	14731.1	14483.1	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6392.6	7108.9	7474.1	7565.1	7317.1	
Wet Density	g/cm³	1.97	2.19	2.30	2.33	2.25	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	196.1	189.7	241.9	217.5	243.5	
Wt. of can + dry Sample	g	188.2	179.3	226.9	200.6	220.4	
Wt. of moisture	g	7.9	10.4	15.0	16.9	23.1	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	188.2	179.3	226.9	200.6	220.4	
Moisture content	%	4.2	5.8	6.6	8.4	10.5	
Dry Density	g/cm³	1.89	2.07	2.16	2.15	2.04	

Head of laboratory section **F / ASSACO**

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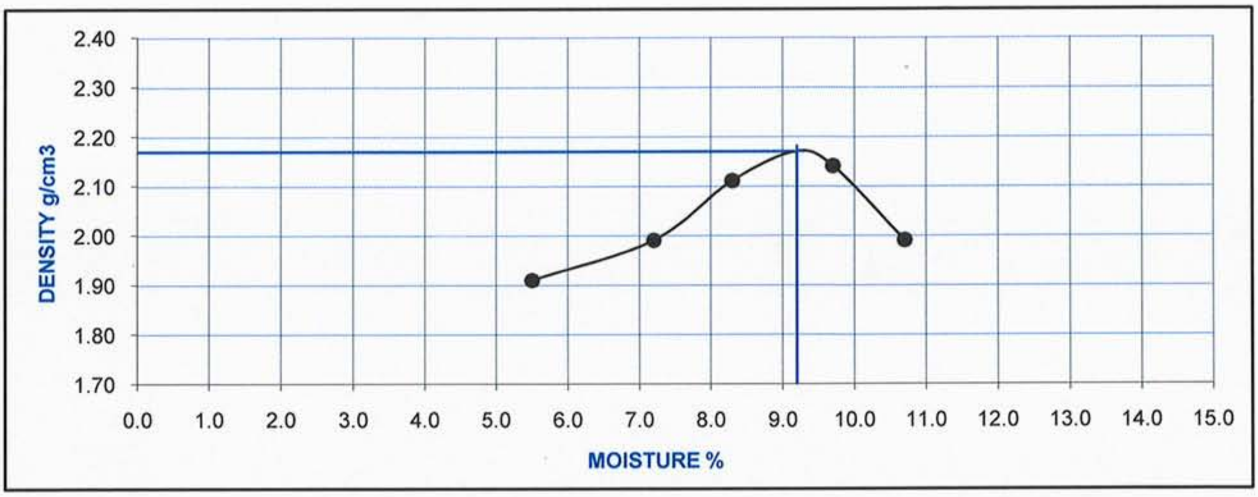
ASSACO اسـاكو

LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	-			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP13**	Mold diameter (in)	:	6"
Depth (m)	:	**3.50**	Material passing	:	3/4"
Sample received on	:	-	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GPM**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : 9.2
Maximum dry density g/cm³ : 2.17



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13706.9	14090.6	14583.5	14786.2	14316.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6540.9	6924.6	7417.5	7620.2	7150.7	
Wet Density	g/cm³	2.02	2.13	2.29	2.35	2.20	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	201.5	152.6	167.4	200.9	225.7	
Wt. of can + dry Sample	g	191.0	142.4	154.6	183.1	203.9	
Wt. of moisture	g	10.5	10.2	12.8	17.8	21.8	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	191.0	142.4	154.6	183.1	203.9	
Moisture content	%	5.5	7.2	8.3	9.7	10.7	
Dry Density	g/cm³	1.91	1.99	2.11	2.14	1.99	

Head of laboratory section **F / ASSACO**

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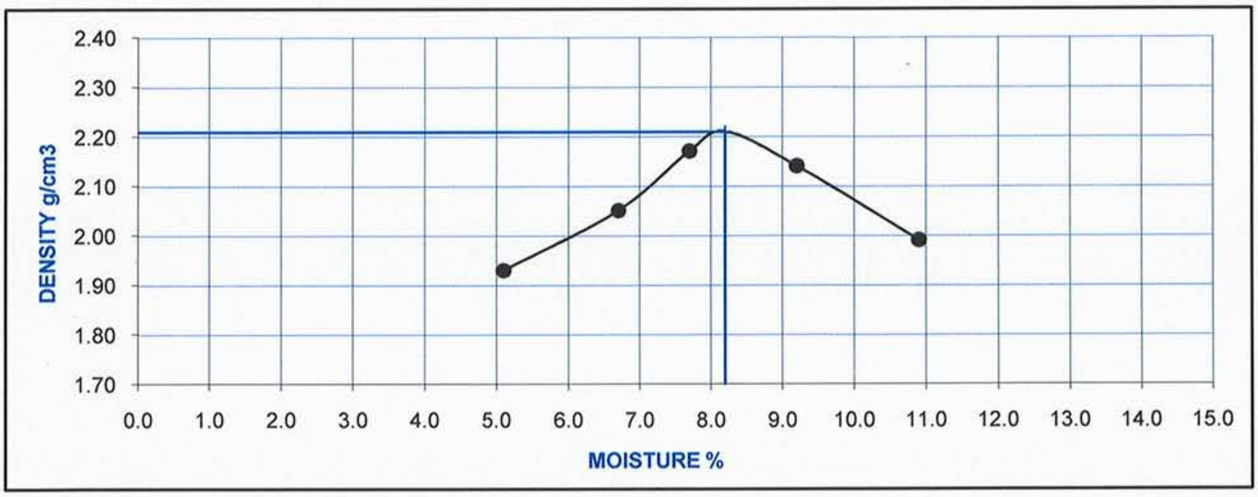
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	**-**
Date	:	**03/11/14**
Sample I.D.	:	**NTP14**
Depth (m)	:	**3.40**
Sample received on	:	**-**
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GW**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : **8.2**
Maximum dry density g/cm³ : **2.21**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13750.3	14266.1	14752.2	14751.5	14329.6	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6584.3	7100.1	7586.2	7585.5	7163.6	
Wet Density	g/cm³	2.03	2.19	2.34	2.34	2.21	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	225.3	209.9	174.8	158.3	219.1	
Wt. of can + dry Sample	g	214.4	196.7	162.3	145.0	197.6	
Wt. of moisture	g	10.9	13.2	12.5	13.3	21.5	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	214.4	196.7	162.3	145.0	197.6	
Moisture content	%	5.1	6.7	7.7	9.2	10.9	
Dry Density	g/cm³	1.93	2.05	2.17	2.14	1.99	

Head of laboratory section **F / ASSACO**

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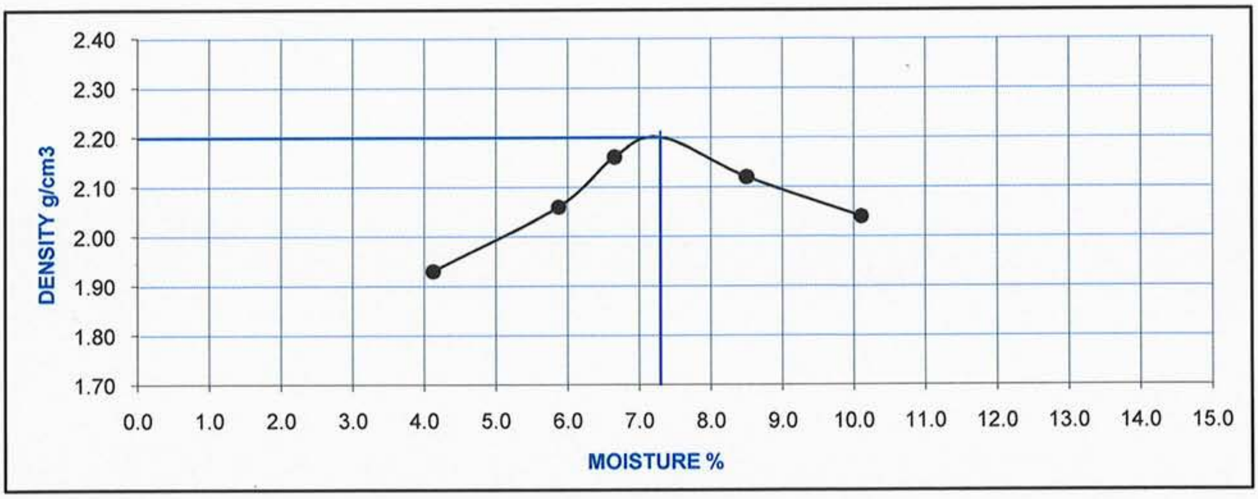
ASSACO اساكو

LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m³)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP15**	Mold diameter (in)	:	6"
Depth (m)	:	**1.80**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GW**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : 7.3
Maximum dry density g/cm³ : 2.20



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13688.9	14245.3	14643.6	14632.4	14456.6	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6522.9	7079.3	7477.6	7466.4	7290.6	
Wet Density	g/cm³	2.01	2.18	2.30	2.30	2.25	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	177.1	218.6	235.7	161.2	219.5	
Wt. of can + dry Sample	g	170.1	206.5	221.0	148.6	199.4	
Wt. of moisture	g	7.0	12.1	14.7	12.6	20.1	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	170.1	206.5	221.0	148.6	199.4	
Moisture content	%	4.1	5.9	6.7	8.5	10.1	
Dry Density	g/cm³	1.93	2.06	2.16	2.12	2.04	

Head of laboratory section **F / ASSACO**

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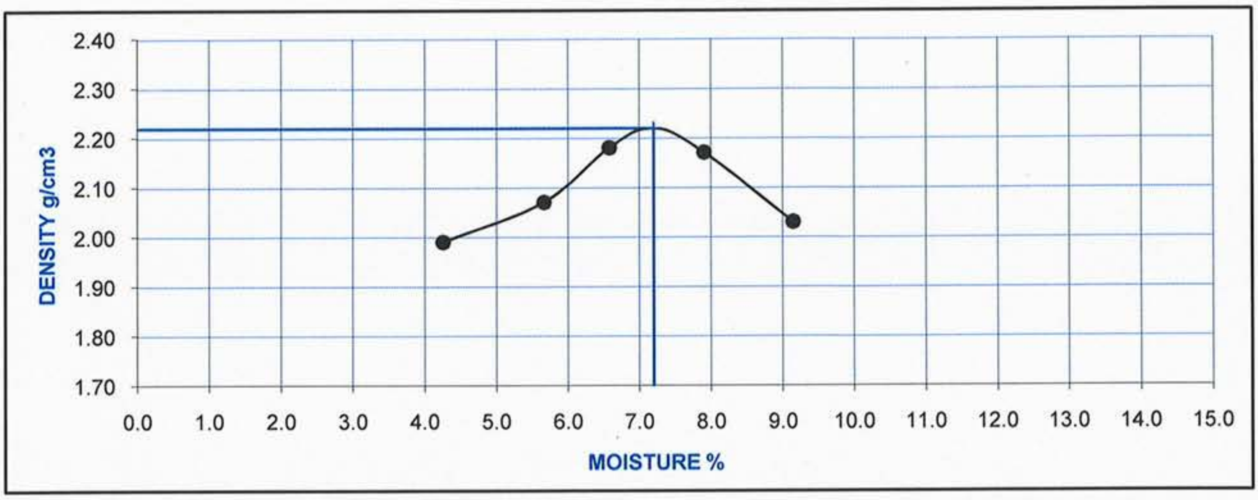
ASSACO أساكو

LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP16**	Mold diameter (in)	:	6"
Depth (m)	:	**3.50**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **7.2**
Maximum dry density g/cm³ : **2.22**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13900.1	14265.5	14707.9	14766.3	14357.6	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6734.1	7099.5	7541.9	7600.3	7191.6	
Wet Density	g/cm³	2.07	2.19	2.32	2.34	2.22	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	177.1	218.6	235.7	161.2	219.5	
Wt. of can + dry Sample	g	169.9	206.9	221.1	149.4	201.1	
Wt. of moisture	g	7.2	11.7	14.6	11.8	18.4	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	169.9	206.9	221.1	149.4	201.1	
Moisture content	%	4.3	5.7	6.6	7.9	9.1	
Dry Density	g/cm³	1.99	2.07	2.18	2.17	2.03	

Head of laboratory section **F / ASSACO**

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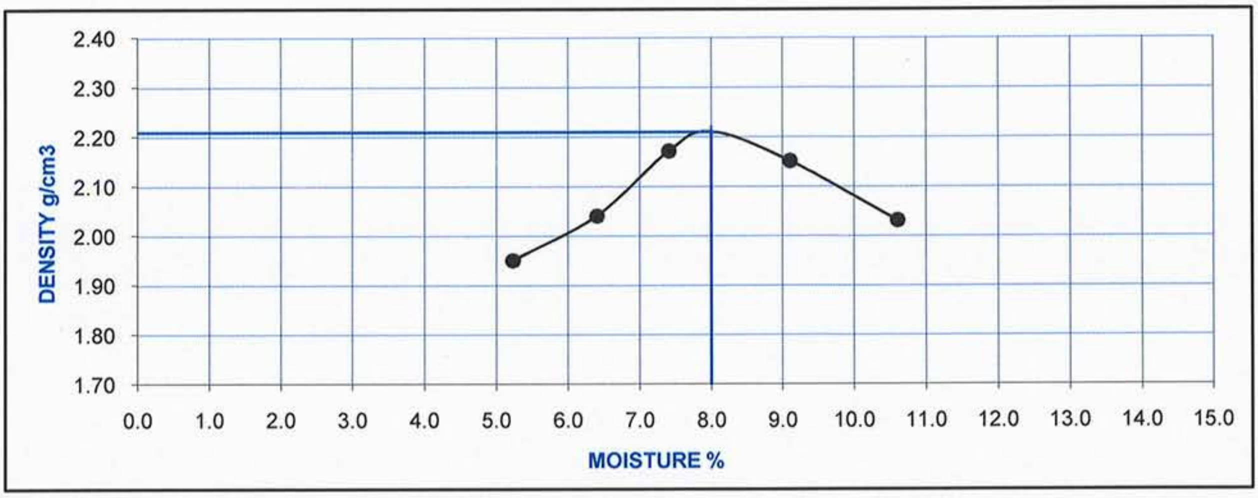
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP17**	Mold diameter (in)	:	6"
Depth (m)	:	**1.80**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **8.0**

Maximum dry density g/cm³ : **2.21**



Description	**Trial No.**	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13826.7	14211.6	14731.1	14780.0	14453.9	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6660.7	7045.6	7565.1	7614.0	7287.9	
Wet Density	g/cm³	2.05	2.17	2.33	2.35	2.25	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	177.1	218.6	235.7	161.2	219.5	
Wt. of can + dry Sample	g	168.3	205.5	219.5	147.8	198.5	
Wt. of moisture	g	8.8	13.1	16.2	13.4	21.0	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	168.3	205.5	219.5	147.8	198.5	
Moisture content	%	5.2	6.4	7.4	9.1	10.6	
Dry Density	g/cm³	1.95	2.04	2.17	2.15	2.03	

Head of laboratory section **F / ASSACO**

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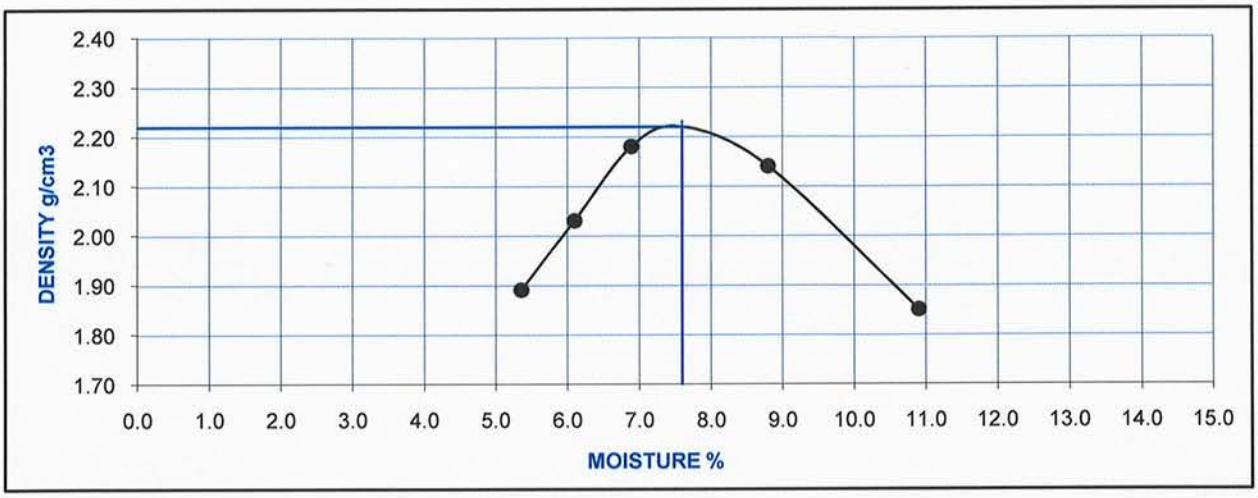
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	-
Date	:	**03/11/14**
Sample I.D.	:	**NTP18**
Depth (m)	:	**1.00**
Sample received on	:	-
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GW**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : 7.6
Maximum dry density g/cm³ : 2.22



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13629.8	14157.3	14729.8	14723.7	13825.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6463.8	6991.3	7563.8	7557.7	6659.7	
Wet Density	g/cm³	1.99	2.15	2.33	2.33	2.05	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	193.3	227.1	202.6	155.1	215.9	
Wt. of can + dry Sample	g	183.5	214.0	189.5	142.6	194.7	
Wt. of moisture	g	9.8	13.1	13.1	12.5	21.2	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	183.5	214.0	189.5	142.6	194.7	
Moisture content	%	5.4	6.1	6.9	8.8	10.9	
Dry Density	g/cm³	1.89	2.03	2.18	2.14	1.85	

Head of laboratory section

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ASSACO Material Testing - Geotechnical Study

Tel: (961 - 1) 646930 - 631882; Fax:(961 - 1) 646931; P.O.Box.:11/9217; E-mail:assaco@terra.net.lb

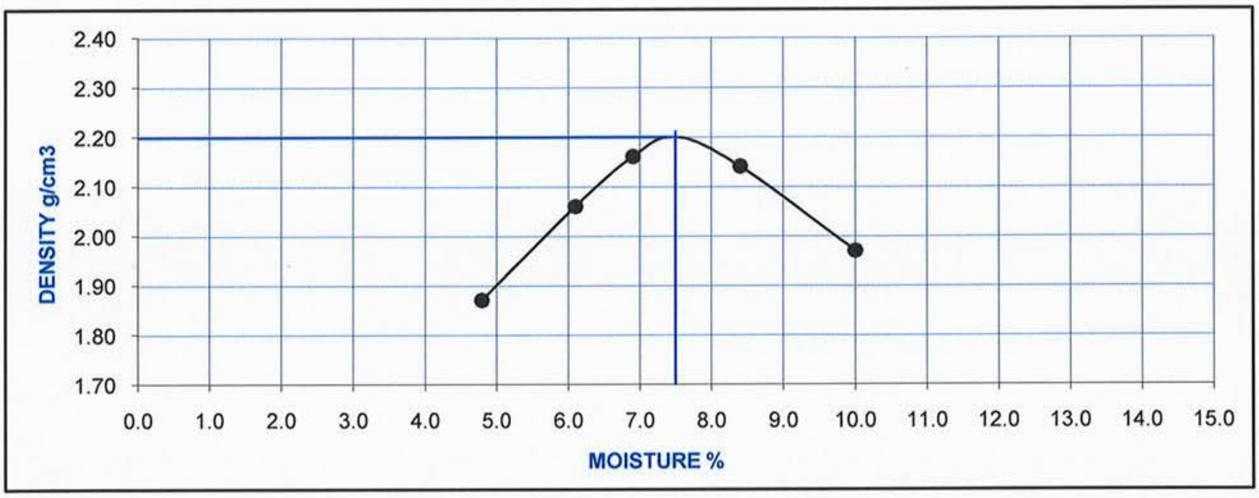
ASSACO LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

أساكو

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP19**	Mold diameter (in)	:	6"
Depth (m)	:	**0.40**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GW**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **7.5**
Maximum dry density g/cm³ : **2.20**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13526.8	14260.7	14661.1	14695.9	14200.1	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6360.8	7094.7	7495.1	7529.9	7034.1	
Wet Density	g/cm³	1.96	2.19	2.31	2.32	2.17	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	214.7	174.8	207.6	157.3	233.6	
Wt. of can + dry Sample	g	204.9	164.8	194.2	145.1	212.4	
Wt. of moisture	g	9.8	10.0	13.4	12.2	21.2	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	204.9	164.8	194.2	145.1	212.4	
Moisture content	%	4.8	6.1	6.9	8.4	10.0	
Dry Density	g/cm³	1.87	2.06	2.16	2.14	1.97	

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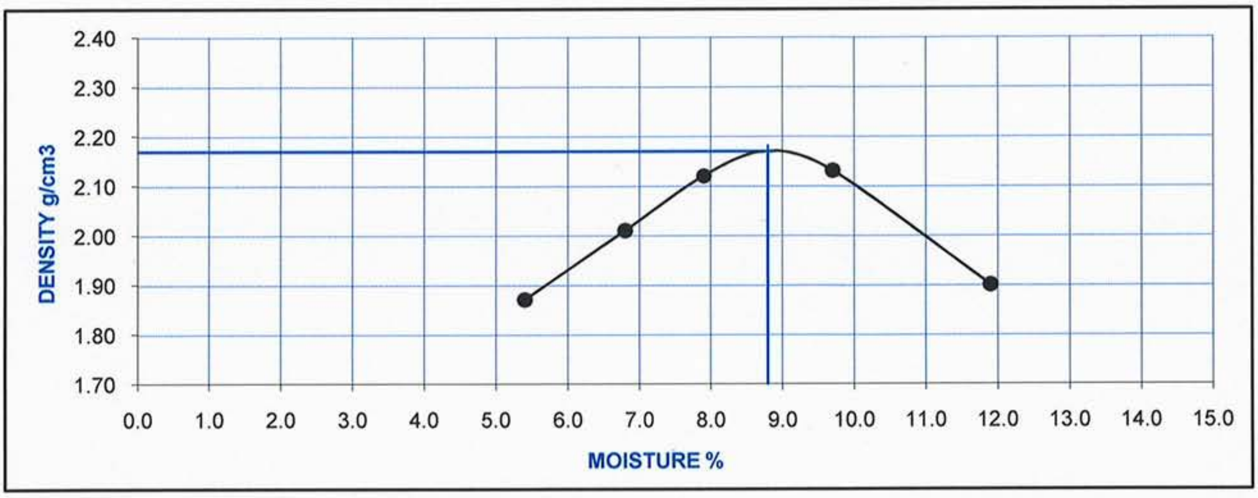
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m³)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP19**	Mold diameter (in)	:	6"
Depth (m)	:	**1.20**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **8.8**

Maximum dry density g/cm³ : **2.17**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13563.8	14134.1	14591.2	14750.6	14067.3	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6397.8	6968.1	7425.2	7584.6	6901.3	
Wet Density	g/cm³	1.97	2.15	2.29	2.34	2.13	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	158.3	187.9	239.5	207.4	221.3	
Wt. of can + dry Sample	g	150.2	175.9	222.0	189.1	197.8	
Wt. of moisture	g	8.1	12.0	17.5	18.3	23.5	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	150.2	175.9	222.0	189.1	197.8	
Moisture content	%	5.4	6.8	7.9	9.7	11.9	
Dry Density	g/cm³	1.87	2.01	2.12	2.13	1.90	

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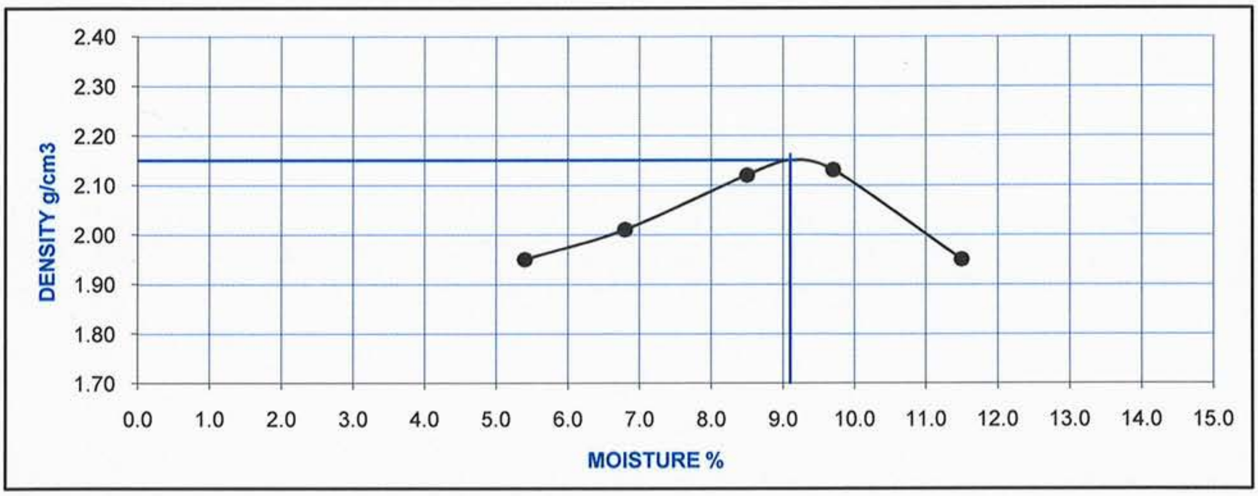
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP20**	Mold diameter (in)	:	6"
Depth (m)	:	**0.80**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **9.1**
Maximum dry density g/cm³ : **2.15**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13837.5	14134.1	14632.4	14750.6	14223.6	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6671.5	6968.1	7466.4	7584.6	7057.6	
Wet Density	g/cm³	2.06	2.15	2.30	2.34	2.17	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	169.2	219.9	231.0	207.4	221.3	
Wt. of can + dry Sample	g	160.5	205.9	212.9	189.1	198.5	
Wt. of moisture	g	8.7	14.0	18.1	18.3	22.8	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	160.5	205.9	212.9	189.1	198.5	
Moisture content	%	5.4	6.8	8.5	9.7	11.5	
Dry Density	g/cm³	1.95	2.01	2.12	2.13	1.95	

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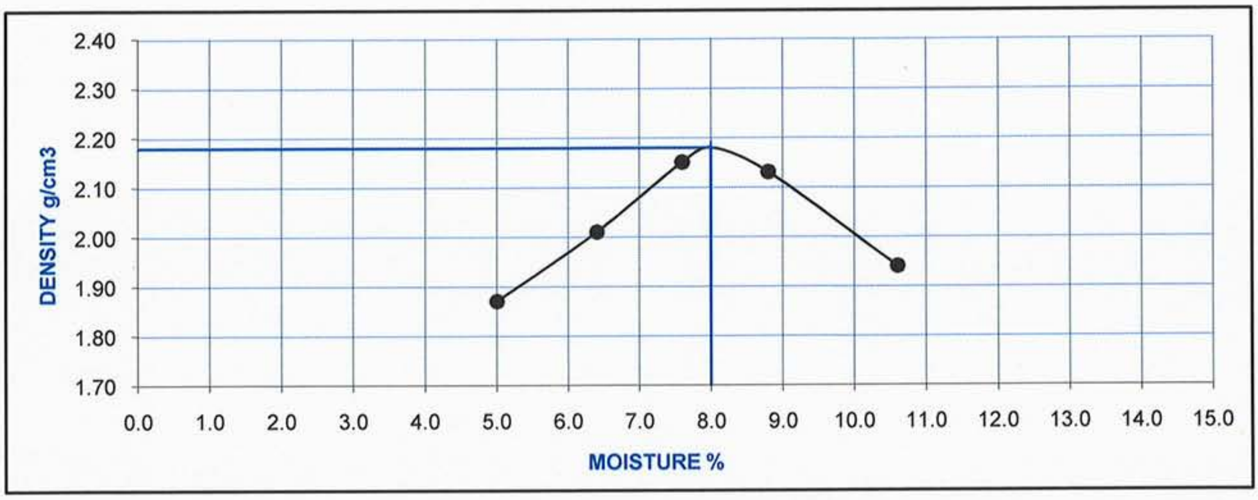
ASSACO LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m³)

ASTM Designation D1557-91

Project	:	**Bisri Dam**
Location	:	**Upstream of the Dam**
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**
Contractor	:	**-**
Date	:	**03/11/14**
Sample I.D.	:	**NTP21**
Depth (m)	:	**3.50**
Sample received on	:	**-**
Sampled by	:	**ASSACO**
Sample I.D.	:	**Sand & Gravel**
Classification	:	**GWM**

Procedure	:	**C**
Mold diameter (in)	:	6"
Material passing	:	3/4"
Layers number	:	5
Blows per layer	:	56
Mold Wt (g)	:	7166
Mold V (cm^3)	:	3246
Height of drop (in)	:	18

Optimum moisture content % : **8.0**
Maximum dry density g/cm³ : **2.18**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13539.5	14108.0	14675.3	14688.4	14130.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6373.5	6942.0	7509.3	7522.4	6964.7	
Wet Density	g/cm³	1.96	2.14	2.31	2.32	2.15	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	209.6	249.2	152.1	217.5	173.6	
Wt. of can + dry Sample	g	199.6	234.2	141.4	199.9	157.0	
Wt. of moisture	g	10.0	15.0	10.7	17.6	16.6	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	199.6	234.2	141.4	199.9	157.0	
Moisture content	%	5.0	6.4	7.6	8.8	10.6	
Dry Density	g/cm³	1.87	2.01	2.15	2.13	1.94	

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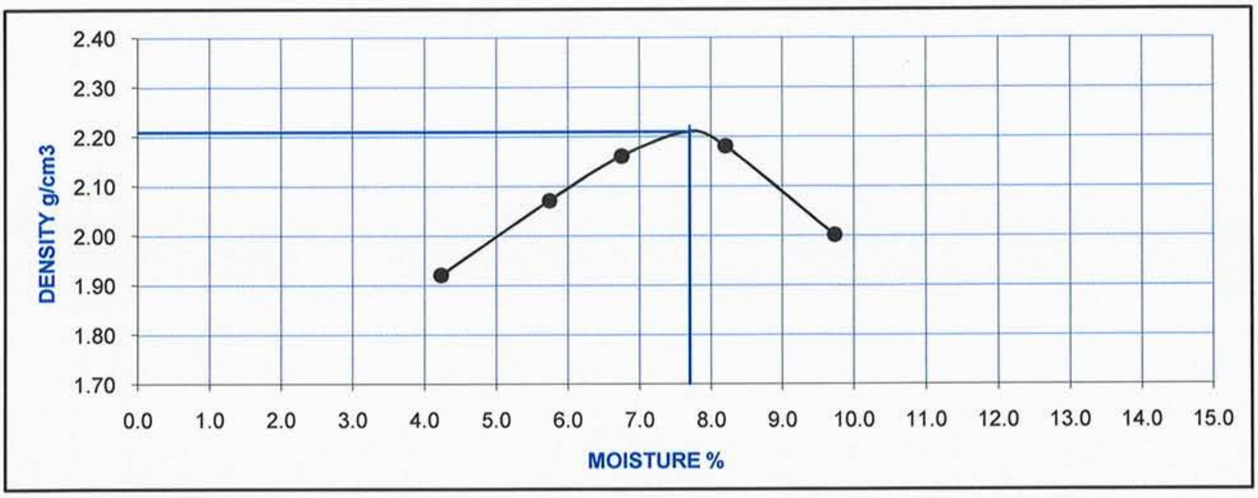
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 $kN\text{-}m/m^3$)

ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP22**	Mold diameter (in)	:	6"
Depth (m)	:	**1.00**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **7.7**

Maximum dry density g/cm³ : **2.21**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13661.9	14270.9	14650.6	14822.5	14289.7	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6495.9	7104.9	7484.6	7656.5	7123.7	
Wet Density	g/cm³	2.00	2.19	2.31	2.36	2.19	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	209.6	249.2	152.1	217.5	173.6	
Wt. of can + dry Sample	g	201.1	235.7	142.5	201.0	158.2	
Wt. of moisture	g	8.5	13.5	9.6	16.5	15.4	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	201.1	235.7	142.5	201.0	158.2	
Moisture content	%	4.2	5.7	6.8	8.2	9.7	
Dry Density	g/cm³	1.92	2.07	2.16	2.18	2.00	

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ASSACO LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (2,700 kN-m/m^3)

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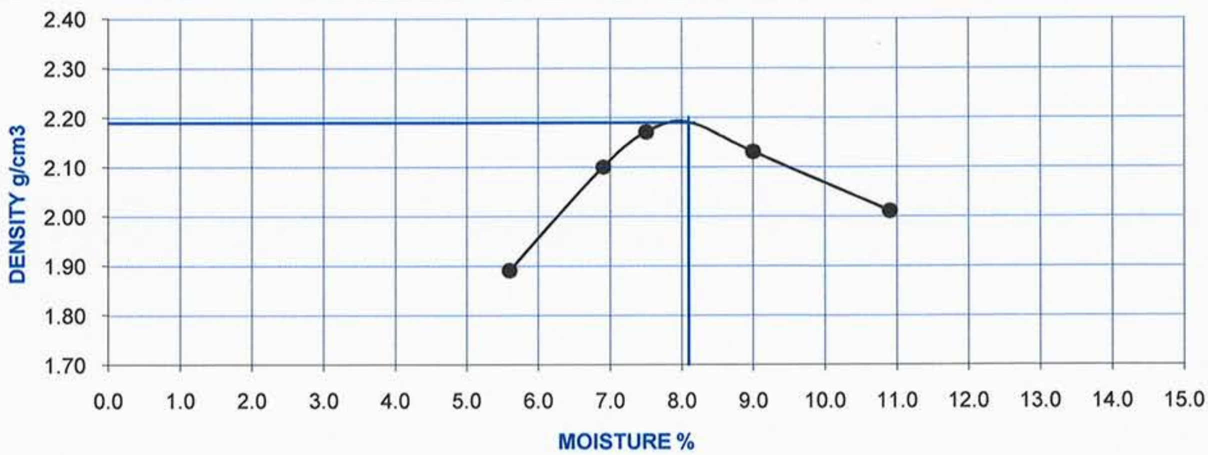
ASTM Designation D1557-91

Project	:	**Bisri Dam**			
Location	:	**Upstream of the Dam**			
Consultant	:	**Dar Al-Handasah-Nazih Taleb & Partners**			
Contractor	:	**-**			
Date	:	**03/11/14**	**Procedure**	:	**C**
Sample I.D.	:	**NTP23**	Mold diameter (in)	:	6"
Depth (m)	:	**1.50**	Material passing	:	3/4"
Sample received on	:	**-**	Layers number	:	5
Sampled by	:	**ASSACO**	Blows per layer	:	56
Sample I.D.	:	**Sand & Gravel**	Mold Wt (g)	:	7166
Classification	:	**GP**	Mold V (cm^3)	:	3246
			Height of drop (in)	:	18

Optimum moisture content % : **8.1**
Maximum dry density g/cm³ : **2.19**



Description	Trial No.	1	2	3	4	5	
Wt. of wet Sample + Mold	g	13644.5	14452.9	14738.1	14702.2	14401.6	
Wt. of Mold	g	7166	7166	7166	7166	7166	
Wt. of wet sample	g	6478.5	7286.9	7572.1	7536.2	7235.6	
Wet Density	g/cm³	2.00	2.24	2.33	2.32	2.23	
Can number		1	2	3	4	5	
Wt.of can + wet Sample	g	186.3	208.1	214.7	199.3	237.1	
Wt. of can + dry Sample	g	176.4	194.7	199.7	182.8	213.8	
Wt. of moisture	g	9.9	13.4	15.0	16.5	23.3	
Wt. of Can	g	-	-	-	-	-	
Wt.of Dry Sample	g	176.4	194.7	199.7	182.8	213.8	
Moisture content	%	5.6	6.9	7.5	9.0	10.9	
Dry Density	g/cm³	1.89	2.10	2.17	2.13	2.01	

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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP9
Depth (m): 2.00

Proctor density (g/cm3) : 2.16
Optimum moisture (%) : 9.3
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	49.6	223.6	211.3	12.29	161.7	7.6
B	**25**	50.3	241.8	227.0	14.84	176.7	8.4
C	**56**	48.6	231.8	216.4	15.43	167.8	9.2

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10920	4472	2124	2.11	1.96	91
B	**25**	6448	11239	4791	2124	2.26	2.08	96
C	**56**	6448	11475	5027	2124	2.37	2.17	100

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	199	10	238	12	311	16
0.050	1.270	398	21	475	25	622	32
0.075	1.905	543	28	648	33	849	44
0.100	**2.540**	**668**	**35**	**814**	**42**	**988**	**51**
0.150	3.810	797	41	971	50	1156	60
0.175	4.445	834	43	1015	52	1203	62
0.200	**5.080**	881	**46**	1071	**55**	1263	**65**
0.300	7.620	945	49	1149	59	1347	70
0.400	10.160	1001	52	1216	63	1419	73
0.500	12.70	1038	54	1261	65	1467	76

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.893	0.893	0.000	11.64	**0.000**	50	44	**50**
B	**25**	2.057	2.057	0.000	11.64	**0.000**	61	54	**61**
C	**56**	2.335	2.335	0.000	11.64	**0.000**	74	63	**74**

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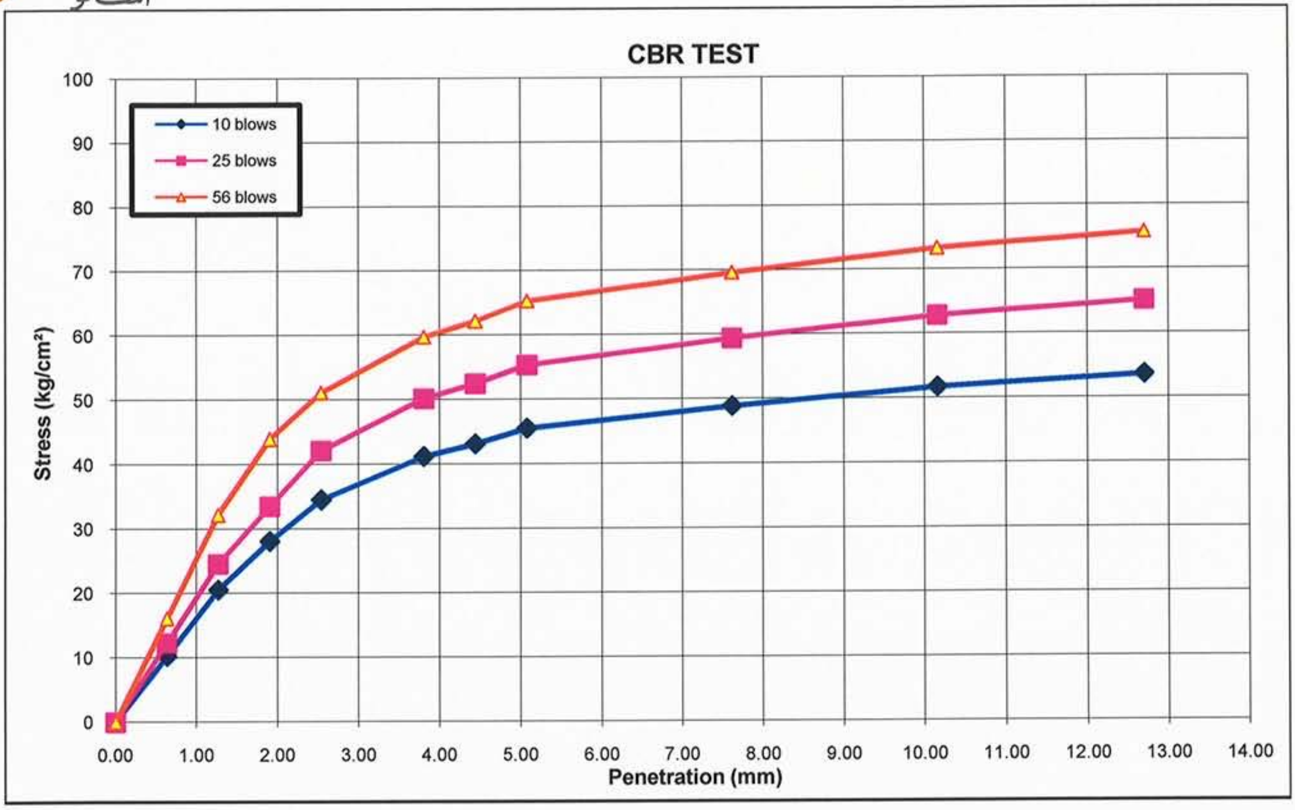
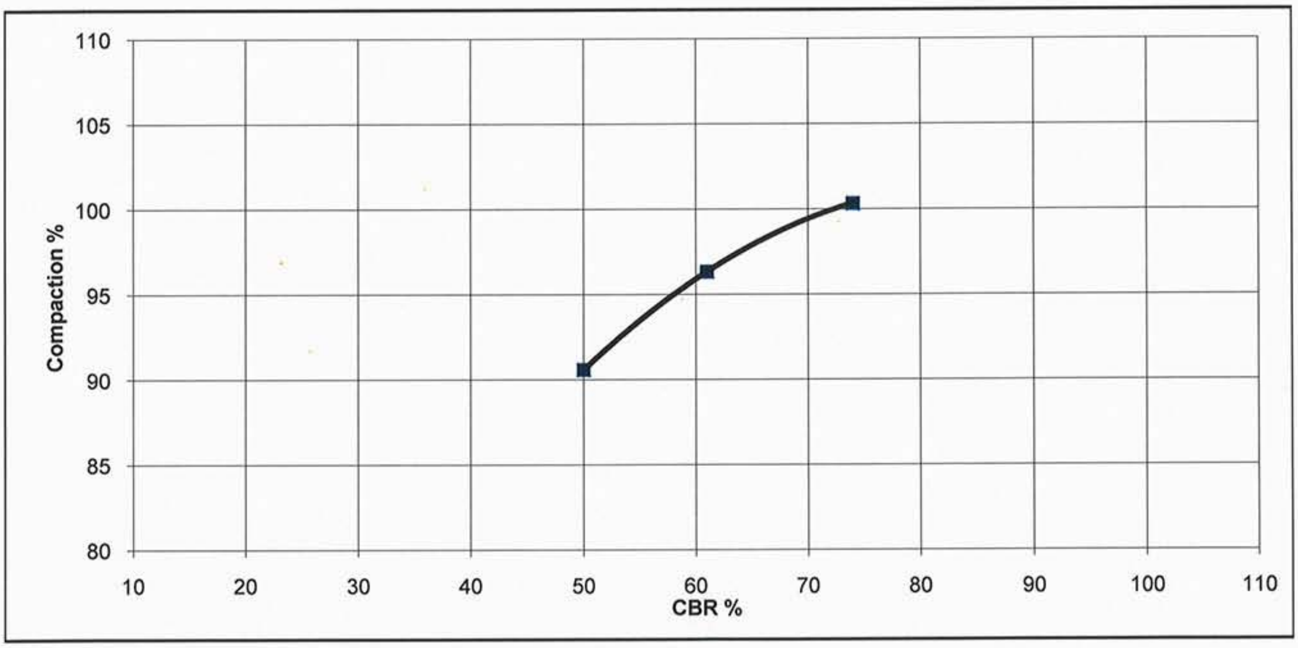


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	50	44	50	91
25	61	54	61	96
56	74	63	74	100

NTP9	58	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP10
Depth (m): 2.00

Proctor density (g/cm3) : 2.20
Optimum moisture (%) : 7.9
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	51.2	223.6	214.0	9.60	162.8	5.9
B	**25**	50.1	241.8	230.4	11.36	180.3	6.3
C	**56**	50.6	231.8	219.2	12.64	168.6	7.5

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10985	4537	2124	2.14	2.02	92
B	**25**	6448	11298	4850	2124	2.28	2.15	98
C	**56**	6448	11593	5145	2124	2.42	2.25	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
		Load	Stress	Load	Stress	Load	Stress
Inch	mm	kg	kg/cm^2	kg	kg/cm^2	kg	kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	247	13	276	14	353	18
0.050	1.270	494	26	553	29	707	37
0.075	1.905	674	35	754	39	963	50
0.100	**2.540**	**828**	**43**	**948**	**49**	**1122**	**58**
0.150	3.810	967	50	1113	58	1312	68
0.175	4.445	1007	52	1160	60	1366	71
0.200	**5.080**	1057	**55**	1219	**63**	1434	**74**
0.300	7.620	1127	58	1301	67	1529	79
0.400	10.160	1186	61	1372	71	1611	83
0.500	12.70	1226	63	1419	73	1665	86

SWELL

Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR VALUES: soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.448	1.448	0.000	11.64	**0.000**	62	53	**62**
B	**25**	1.247	1.247	0.000	11.64	**0.000**	71	61	**71**
C	**56**	2.992	2.992	0.000	11.64	**0.000**	84	72	**84**

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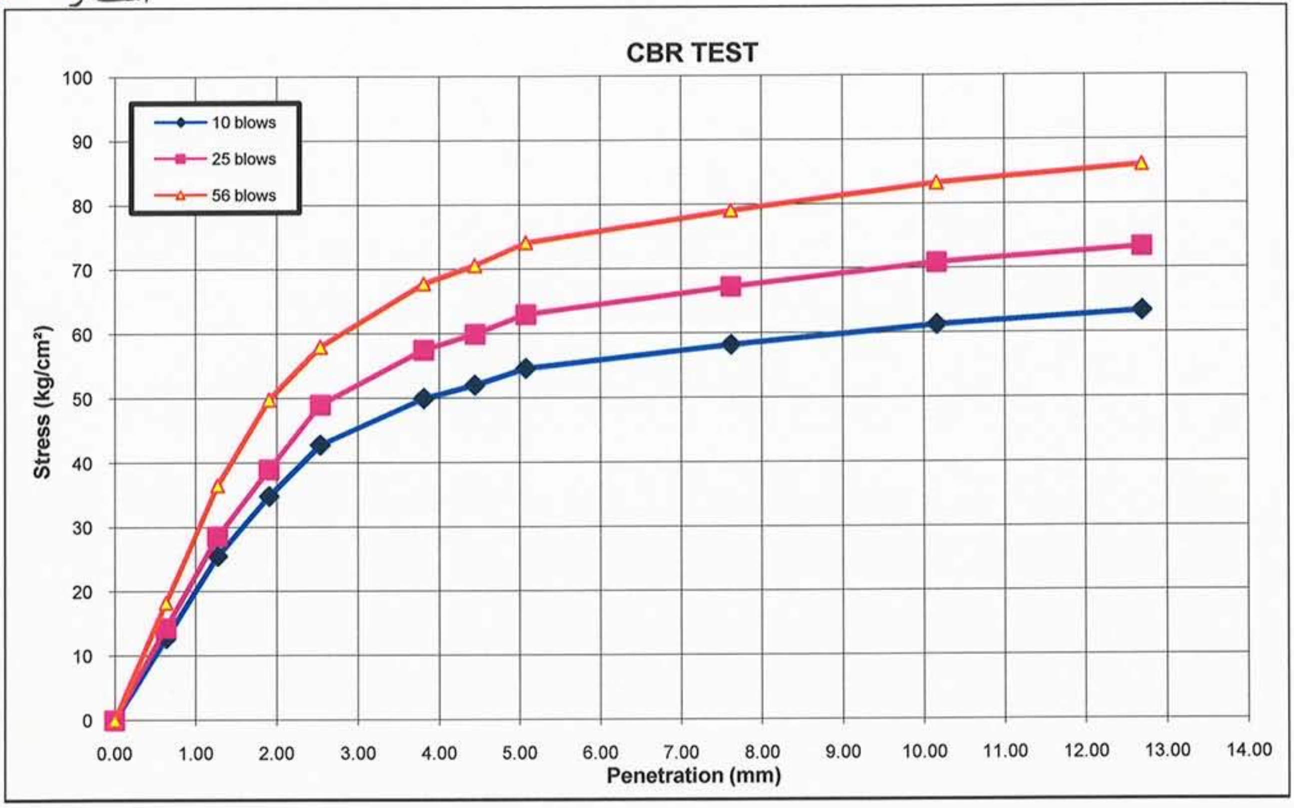
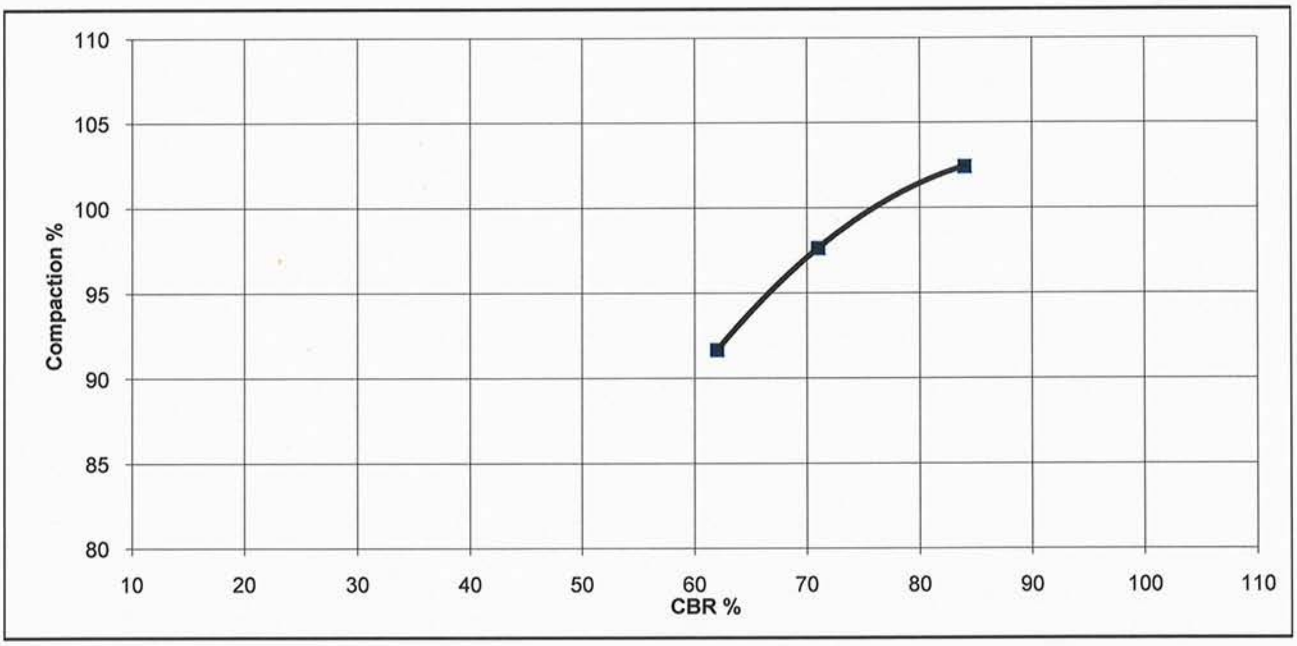


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	62	53	62	92
25	71	61	71	98
56	84	72	84	102

NTP10	67	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP10
Depth (m): 3.50

Proctor density (g/cm3) : 2.22
Optimum moisture (%) : 7.5
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	50.9	223.6	215.8	7.75	164.9	4.7
B	**25**	49.1	241.8	231.1	10.74	182.0	5.9
C	**56**	52.3	231.8	219.9	11.90	167.6	7.1

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10851	4403	2124	2.07	1.98	89
B	**25**	6448	11215	4767	2124	2.24	2.12	95
C	**56**	6448	11504	5056	2124	2.38	2.22	100

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	247	13	276	14	362	19
0.050	1.270	494	26	553	29	723	37
0.075	1.905	674	35	754	39	986	51
0.100	**2.540**	**828**	**43**	**948**	**49**	**1148**	**59**
0.150	3.810	967	50	1113	58	1343	69
0.175	4.445	1007	52	1160	60	1399	72
0.200	**5.080**	1057	**55**	1219	**63**	1468	**76**
0.300	7.620	1127	58	1301	67	1566	81
0.400	10.160	1186	61	1372	71	1649	85
0.500	12.70	1226	63	1419	73	1705	88

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.095	0.095	0.000	11.64	**0.000**	62	53	**62**
B	**25**	1.117	1.117	0.000	11.64	**0.000**	71	61	**71**
C	**56**	2.019	2.019	0.000	11.64	**0.000**	86	74	**86**

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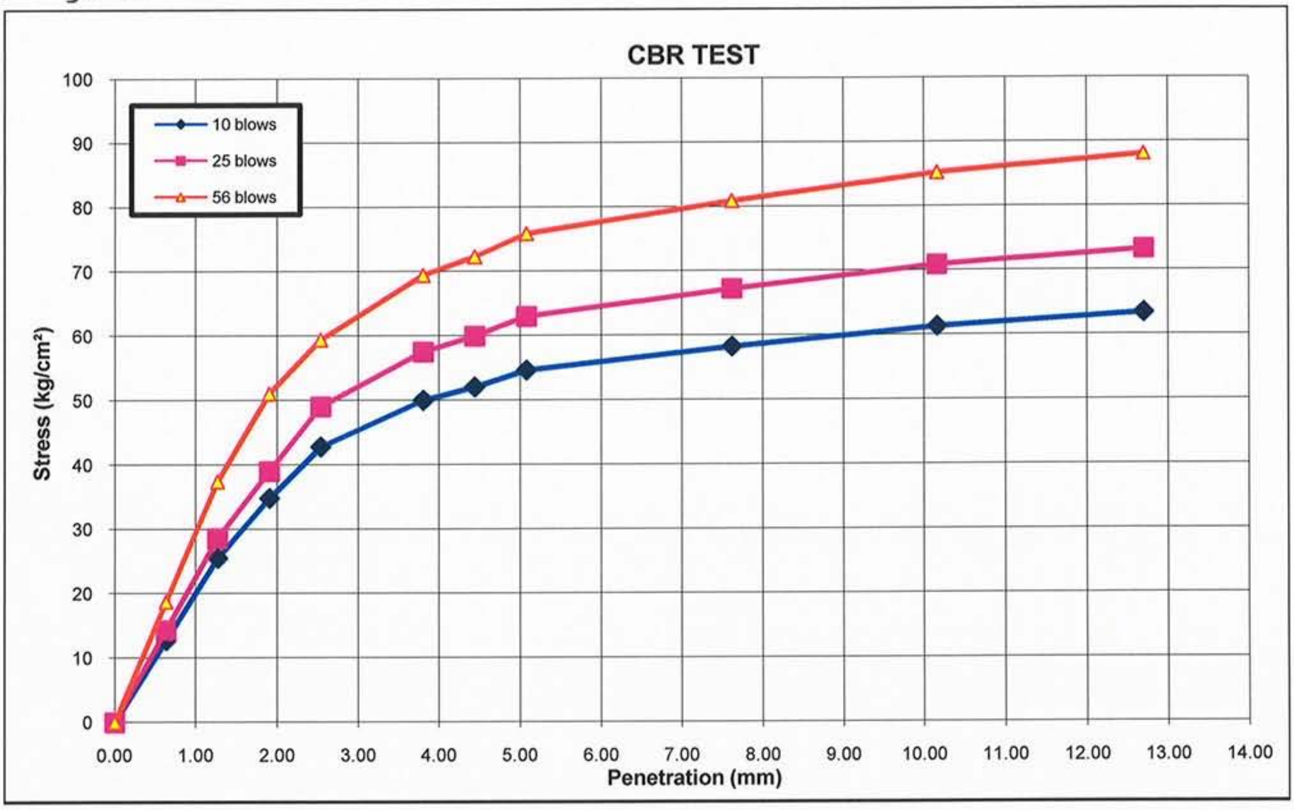
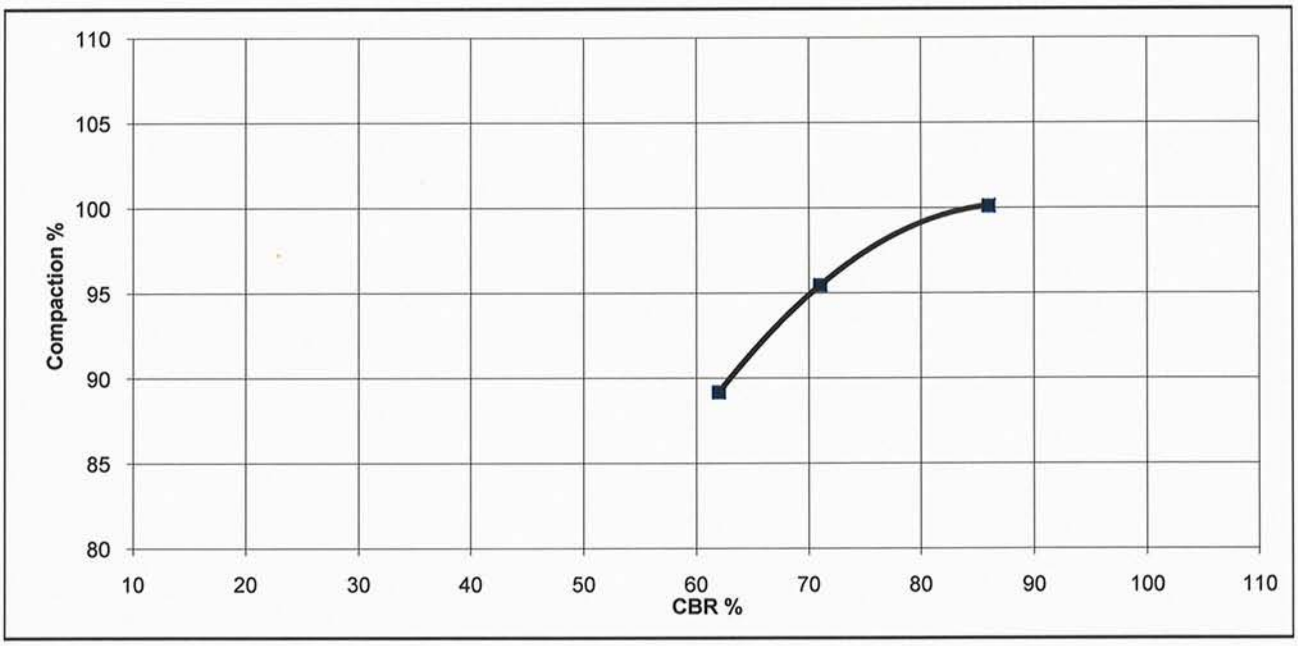


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	62	53	62	89
25	71	61	71	95
56	86	74	86	100

NTP10	70	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: **Bisri Dam**
Location: **Upstream of the Dam, Sand & Gravel Material Sources**
Client: **Dar Al Handasah Nazih Taleb & Partners**
Date: **03/11/14**
Sample ID: **NTP11**
Depth (m): **4.00**

Proctor density (g/cm3) : **2.17**
Optimum moisture (%) : **9.0**
No of layers : **5**
No of blows / layer : **10 \ 25 \ 56**

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	48.2	223.6	213.2	10.40	165.0	6.3
B	**25**	51.6	241.8	228.5	13.27	176.9	7.5
C	**56**	50.9	231.8	217.2	14.63	166.3	8.8

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10814	4366	2124	2.06	1.93	89
B	**25**	6448	11119	4671	2124	2.20	2.05	94
C	**56**	6448	11443	4995	2124	2.35	2.16	100

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	175	9	208	11	290	15
0.050	1.270	351	18	417	22	580	30
0.075	1.905	478	25	568	29	791	41
0.100	**2.540**	**587**	**30**	**714**	**37**	**921**	**48**
0.150	3.810	686	35	838	43	1078	56
0.175	4.445	715	37	874	45	1122	58
0.200	**5.080**	750	**39**	918	**47**	1178	**61**
0.300	7.620	799	41	980	51	1256	65
0.400	10.160	842	44	1033	53	1323	68
0.500	12.70	870	45	1069	55	1368	71

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.394	1.394	0.000	11.64	**0.000**	44	38	**44**
B	**25**	2.915	2.915	0.000	11.64	**0.000**	54	46	**54**
C	**56**	2.142	2.142	0.000	11.64	**0.000**	69	59	**69**

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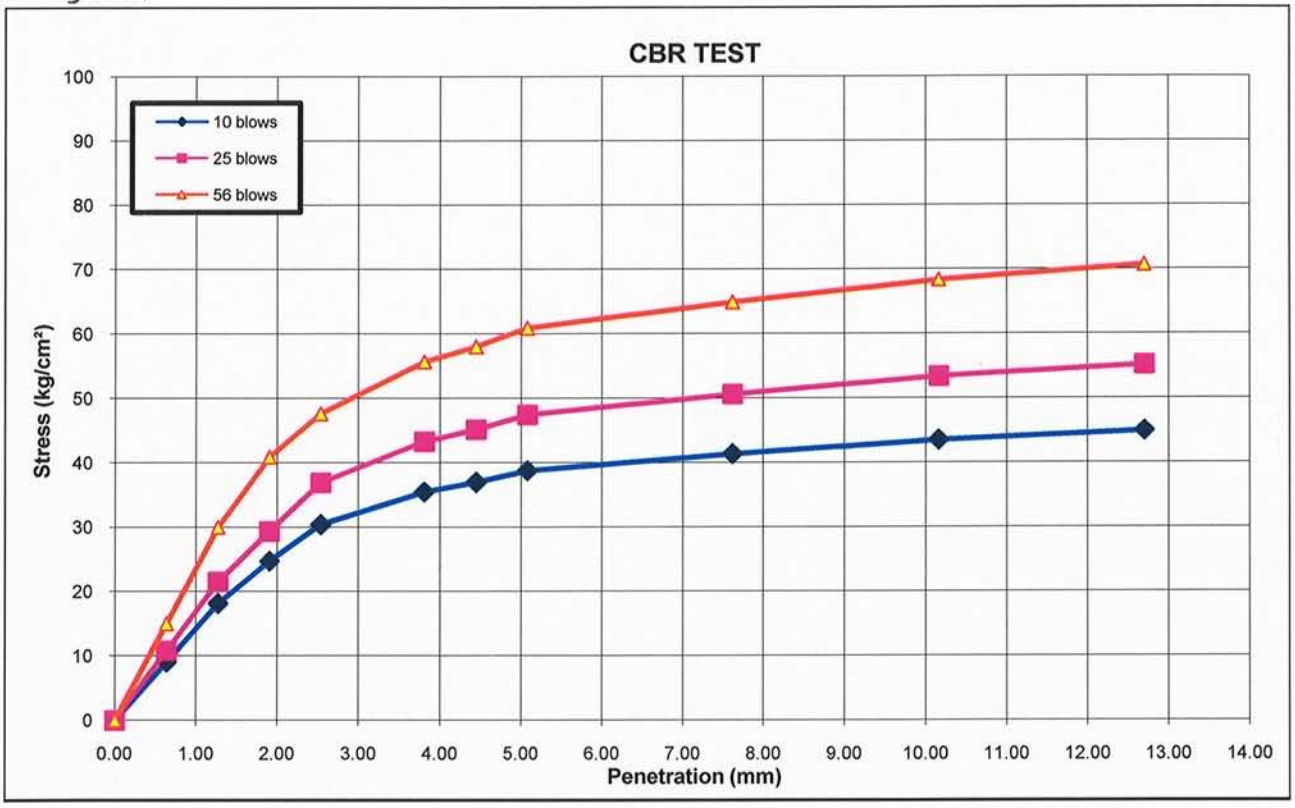
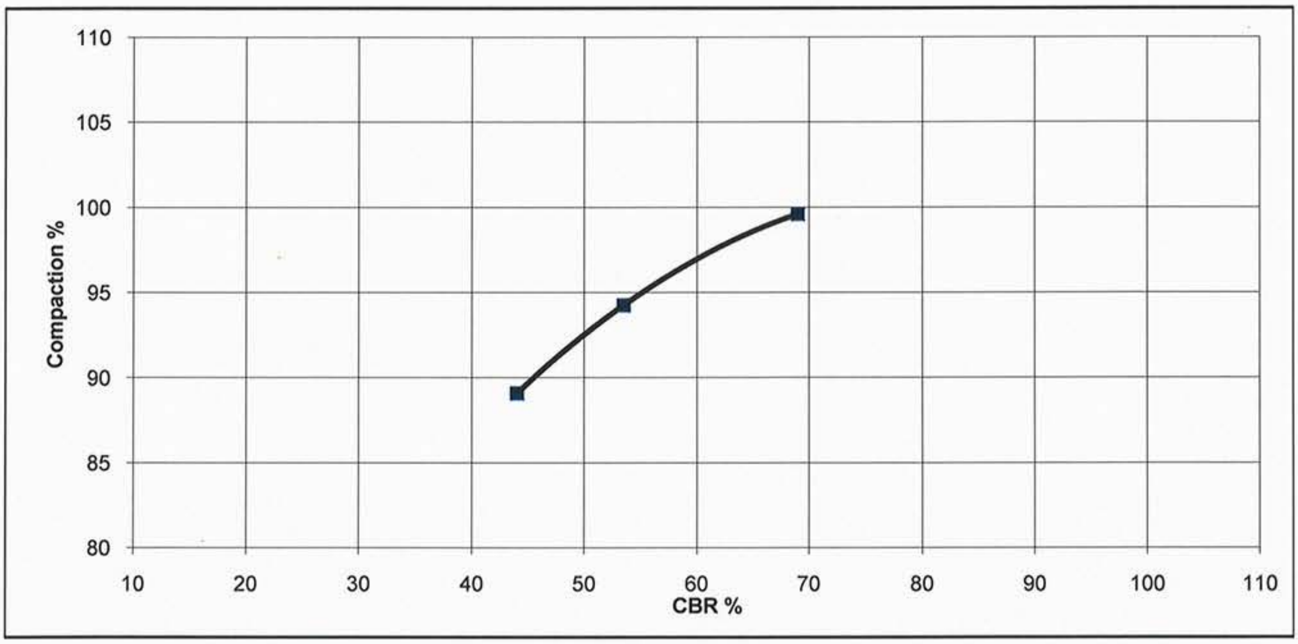


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	44	38	44	89
25	54	46	54	94
56	69	59	69	100

NTP11	55	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP12
Depth (m): 1.50

Proctor density (g/cm3) : 2.19
Optimum moisture (%) : 8.0
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	47.3	223.6	213.8	9.82	166.5	5.9
B	**25**	49.1	241.8	229.0	12.77	179.9	7.1
C	**56**	51.4	231.8	217.8	13.98	166.4	8.4

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10942	4494	2124	2.12	2.00	91
B	**25**	6448	11236	4788	2124	2.25	2.10	96
C	**56**	6448	11532	5084	2124	2.39	2.21	101

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	231	12	273	14	357	18
0.050	1.270	462	24	545	28	715	37
0.075	1.905	630	33	743	38	975	50
0.100	**2.540**	**774**	**40**	**935**	**48**	**1135**	**59**
0.150	3.810	904	47	1097	57	1327	69
0.175	4.445	941	49	1143	59	1382	71
0.200	**5.080**	987	**51**	1201	**62**	1451	**75**
0.300	7.620	1052	54	1283	66	1547	80
0.400	10.160	1107	57	1352	70	1630	84
0.500	12.70	1144	59	1399	72	1685	87

SWELL / **soaked CBR VALUES**

Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.695	1.695	0.000	11.64	**0.000**	58	50	**58**
B	**25**	0.541	0.541	0.000	11.64	**0.000**	70	60	**70**
C	**56**	2.419	2.419	0.000	11.64	**0.000**	85	73	**85**

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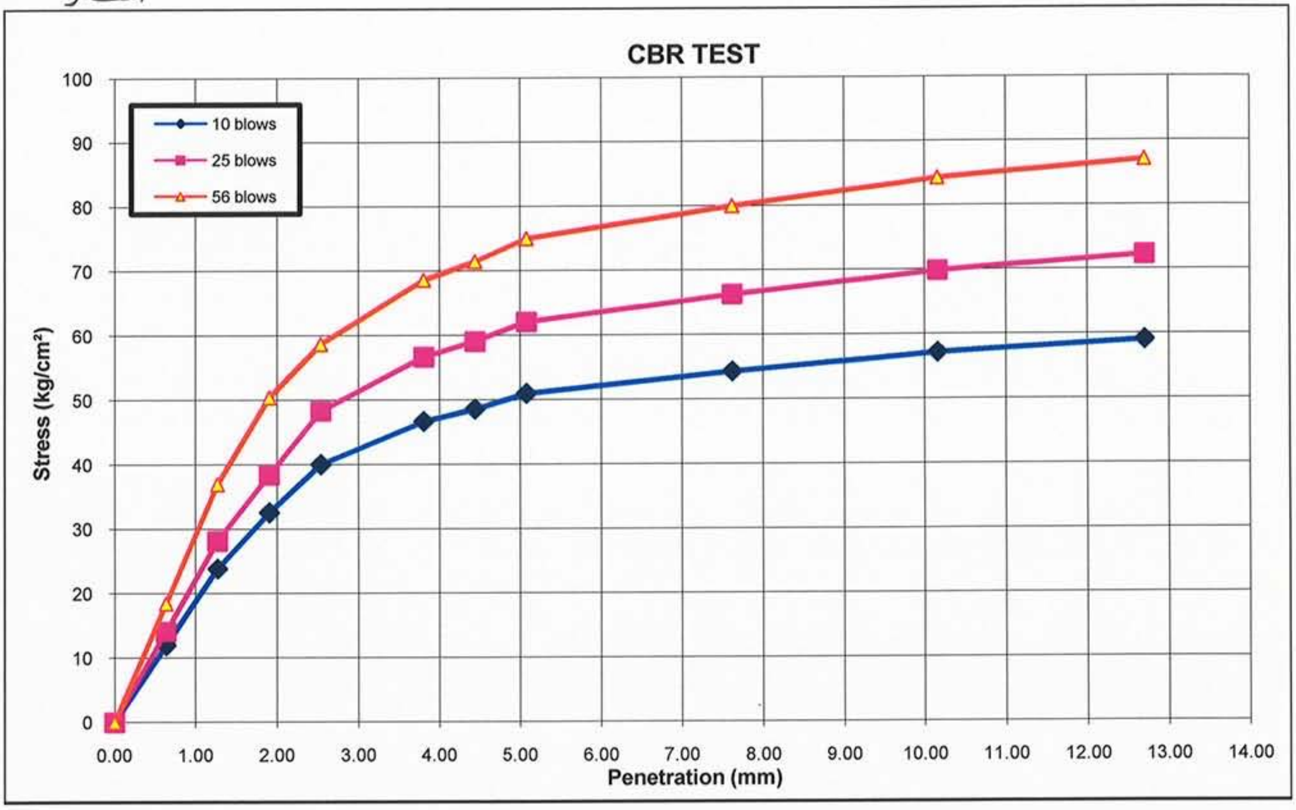
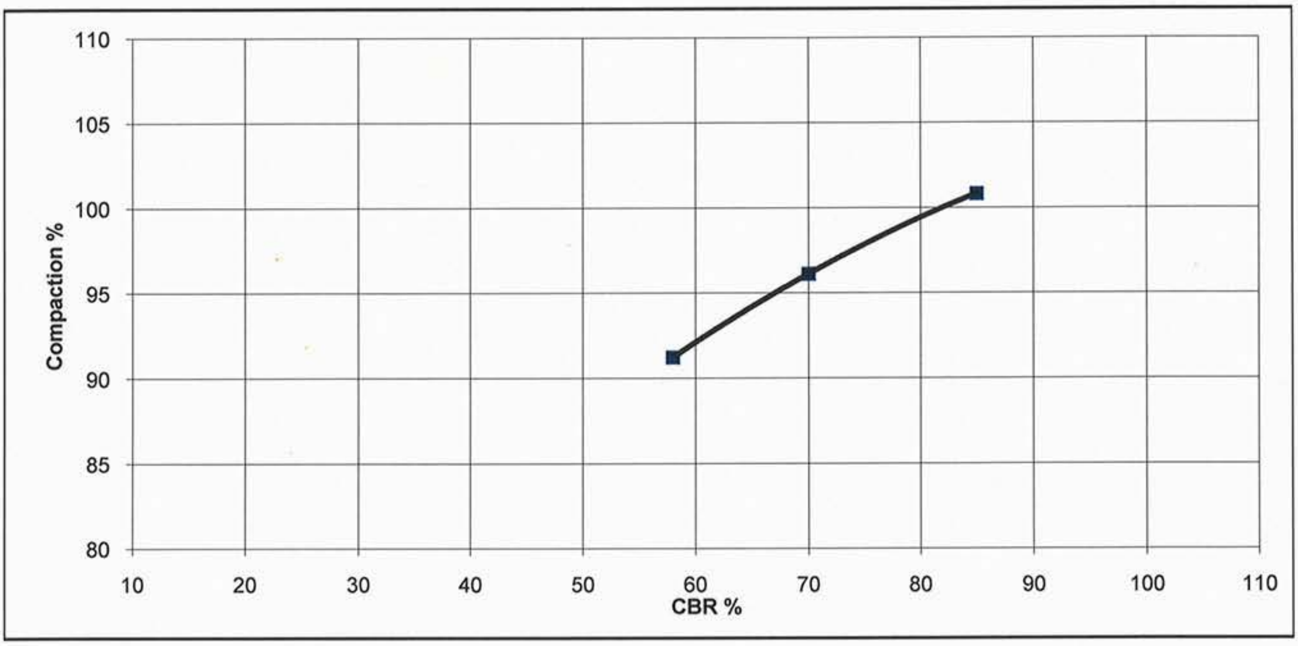


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	58	50	58	91
25	70	60	70	96
56	85	73	85	101

NTP12	67	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP13
Depth (m): 1.50

Proctor density (g/cm3) : 2.21
Optimum moisture (%) : 7.4
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	50.3	223.6	215.2	8.41	164.9	5.1
B	**25**	50.9	241.8	230.5	11.31	179.6	6.3
C	**56**	51.3	231.8	219.7	12.12	168.4	7.2

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10815	4367	2124	2.06	1.96	89
B	**25**	6448	11245	4797	2124	2.26	2.12	96
C	**56**	6448	11598	5150	2124	2.42	2.26	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	251	13	288	15	374	19
0.050	1.270	502	26	576	30	749	39
0.075	1.905	684	35	786	41	1021	53
0.100	**2.540**	**841**	**43**	**988**	**51**	**1188**	**61**
0.150	3.810	982	51	1160	60	1390	72
0.175	4.445	1022	53	1209	62	1447	75
0.200	**5.080**	1072	**55**	1270	**66**	1519	**79**
0.300	7.620	1142	59	1356	70	1620	84
0.400	10.160	1203	62	1429	74	1707	88
0.500	12.70	1243	64	1479	76	1764	91

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.126	0.126	0.000	11.64	**0.000**	63	54	**63**
B	**25**	1.098	1.098	0.000	11.64	**0.000**	74	64	**74**
C	**56**	1.516	1.516	0.000	11.64	**0.000**	89	76	**89**

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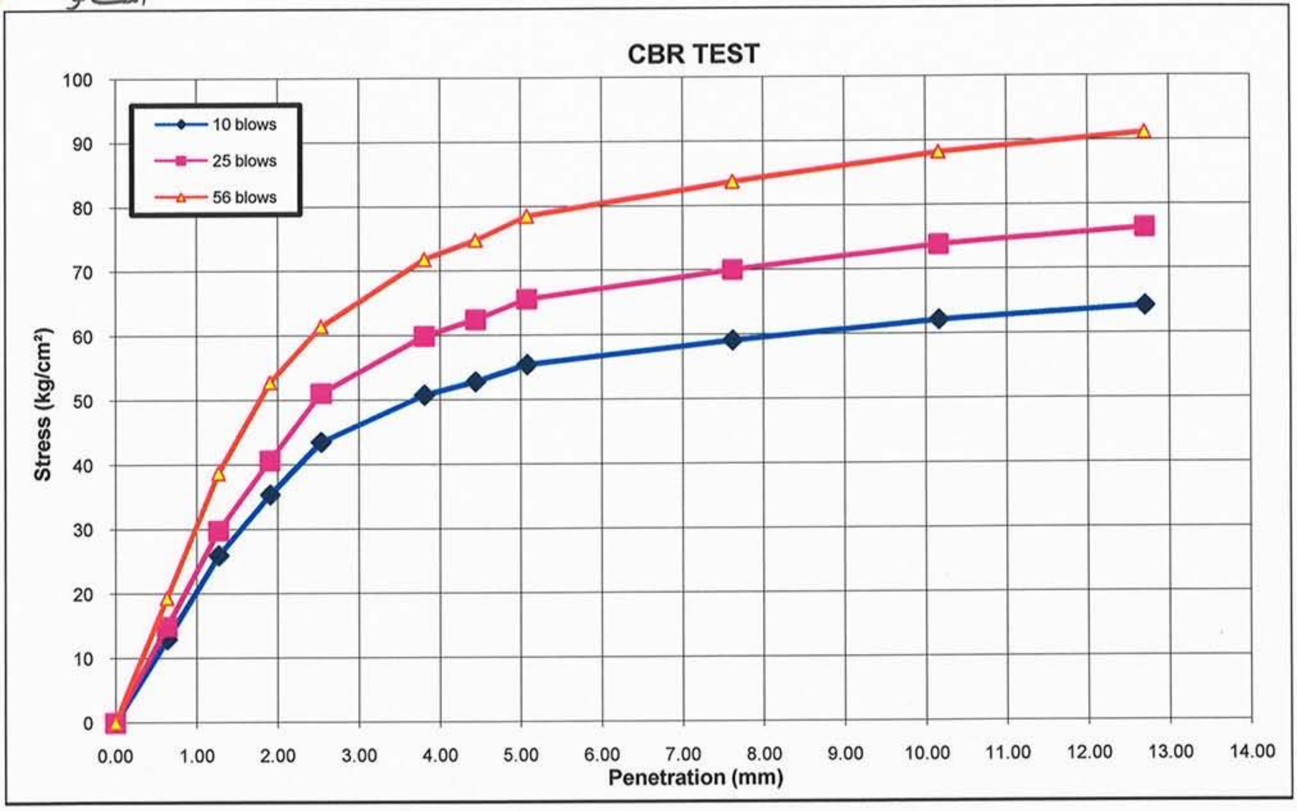
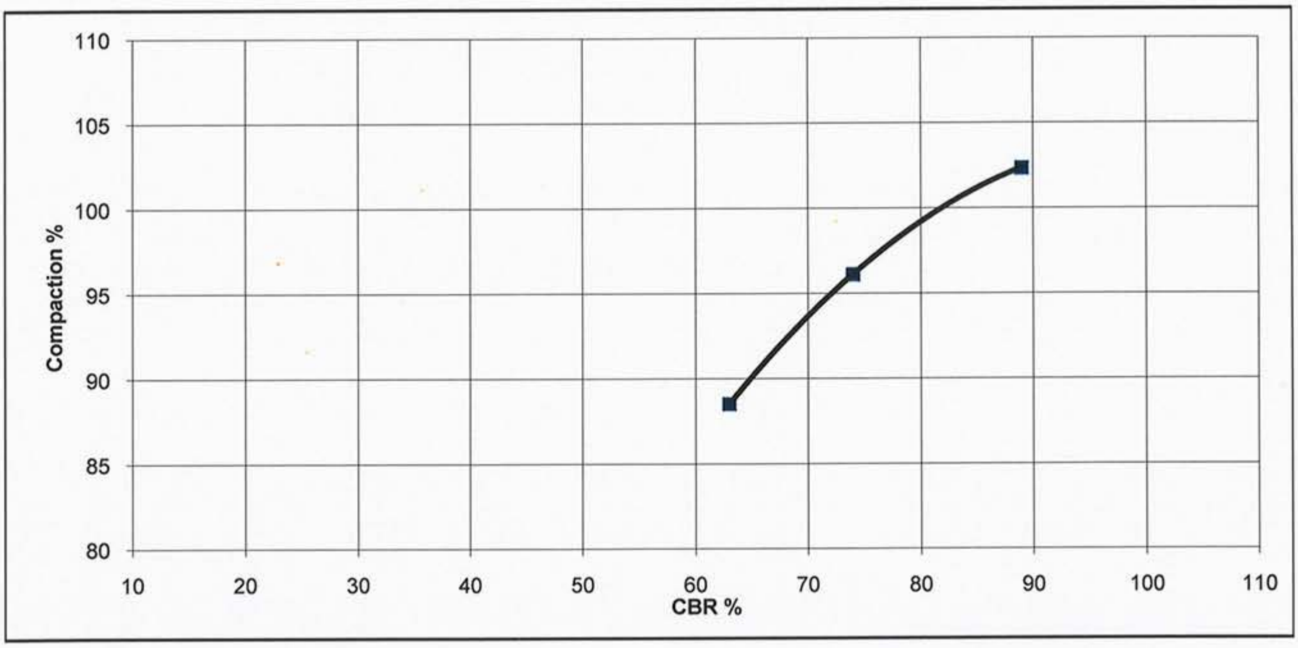


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	63	54	63	89
25	74	64	74	96
56	89	76	89	102

NTP13	72	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP13
Depth (m): 3.50

Proctor density (g/cm3) : 2.17
Optimum moisture (%) : 9.2
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	49.3	223.6	213.9	9.71	164.6	5.9
B	**25**	50.1	241.8	228.1	13.71	178.0	7.7
C	**56**	51.6	231.8	216.9	14.88	165.3	9.0

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10918	4470	2124	2.10	1.99	92
B	**25**	6448	11258	4810	2124	2.26	2.10	97
C	**56**	6448	11551	5103	2124	2.40	2.20	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	231	12	265	14	357	18
0.050	1.270	462	24	530	27	715	37
0.075	1.905	630	33	722	37	975	50
0.100	**2.540**	**774**	**40**	**908**	**47**	**1135**	**59**
0.150	3.810	904	47	1066	55	1373	71
0.175	4.445	941	49	1111	57	1441	74
0.200	**5.080**	987	**51**	1167	**60**	1526	**79**
0.300	7.620	1052	54	1246	64	1646	85
0.400	10.160	1107	57	1314	68	1748	90
0.500	12.70	1144	59	1359	70	1816	94

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.561	0.561	0.000	11.64	**0.000**	58	50	**58**
B	**25**	1.915	1.915	0.000	11.64	**0.000**	68	59	**68**
C	**56**	2.417	2.417	0.000	11.64	**0.000**	85	77	**85**

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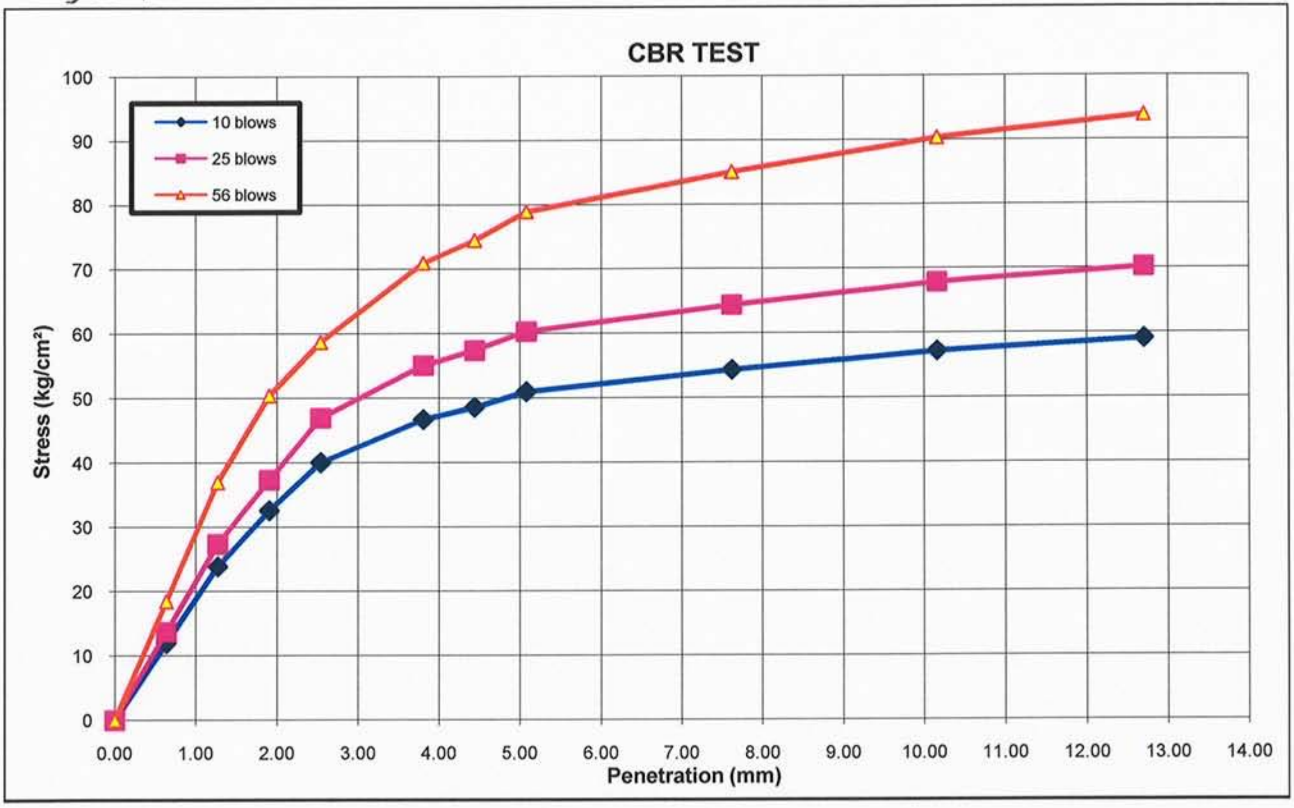
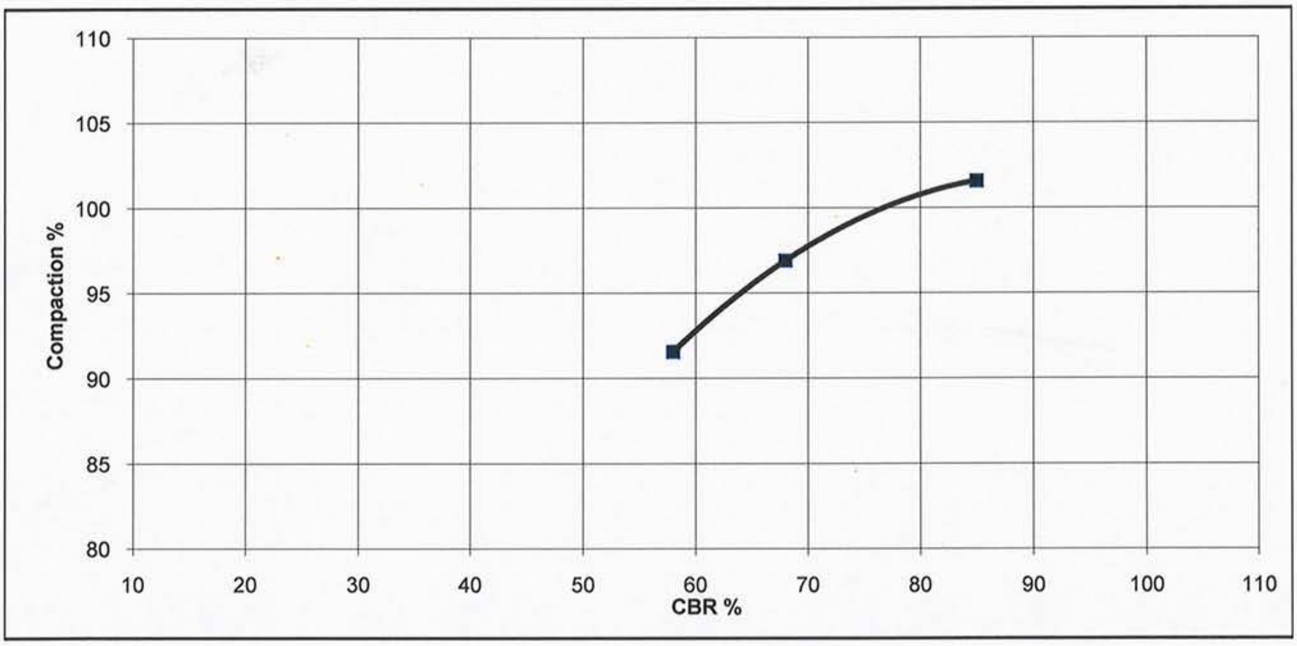


Number of blows	soaked CBR 0.1"	0.2"	Retained	Compaction %
10	58	50	58	92
25	68	59	68	97
56	85	77	85	102

NTP13	**64**	**95**



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP14
Depth (m): 3.40

Proctor density (g/cm3) : 2.21
Optimum moisture (%) : 8.2
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	47.2	223.6	214.4	9.20	167.2	5.5
B	**25**	49.5	241.8	229.4	12.41	179.9	6.9
C	**56**	50.9	231.8	218.2	13.55	167.3	8.1

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10862	4414	2124	2.08	1.97	89
B	**25**	6448	11168	4720	2124	2.22	2.08	94
C	**56**	6448	11512	5064	2124	2.38	2.21	100

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	255	13	276	14	357	18
0.050	1.270	510	26	553	29	715	37
0.075	1.905	696	36	754	39	975	50
0.100	**2.540**	**828**	**43**	**948**	**49**	**1135**	**59**
0.150	3.810	971	50	1113	58	1327	69
0.175	4.445	1012	52	1160	60	1382	71
0.200	**5.080**	1063	**55**	1219	**63**	1451	**75**
0.300	7.620	1134	59	1301	67	1547	80
0.400	10.160	1195	62	1372	71	1630	84
0.500	12.70	1236	64	1419	73	1685	87

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.912	0.912	0.000	11.64	**0.000**	62	53	**62**
B	**25**	2.118	2.118	0.000	11.64	**0.000**	71	61	**71**
C	**56**	2.871	2.871	0.000	11.64	**0.000**	85	73	**85**

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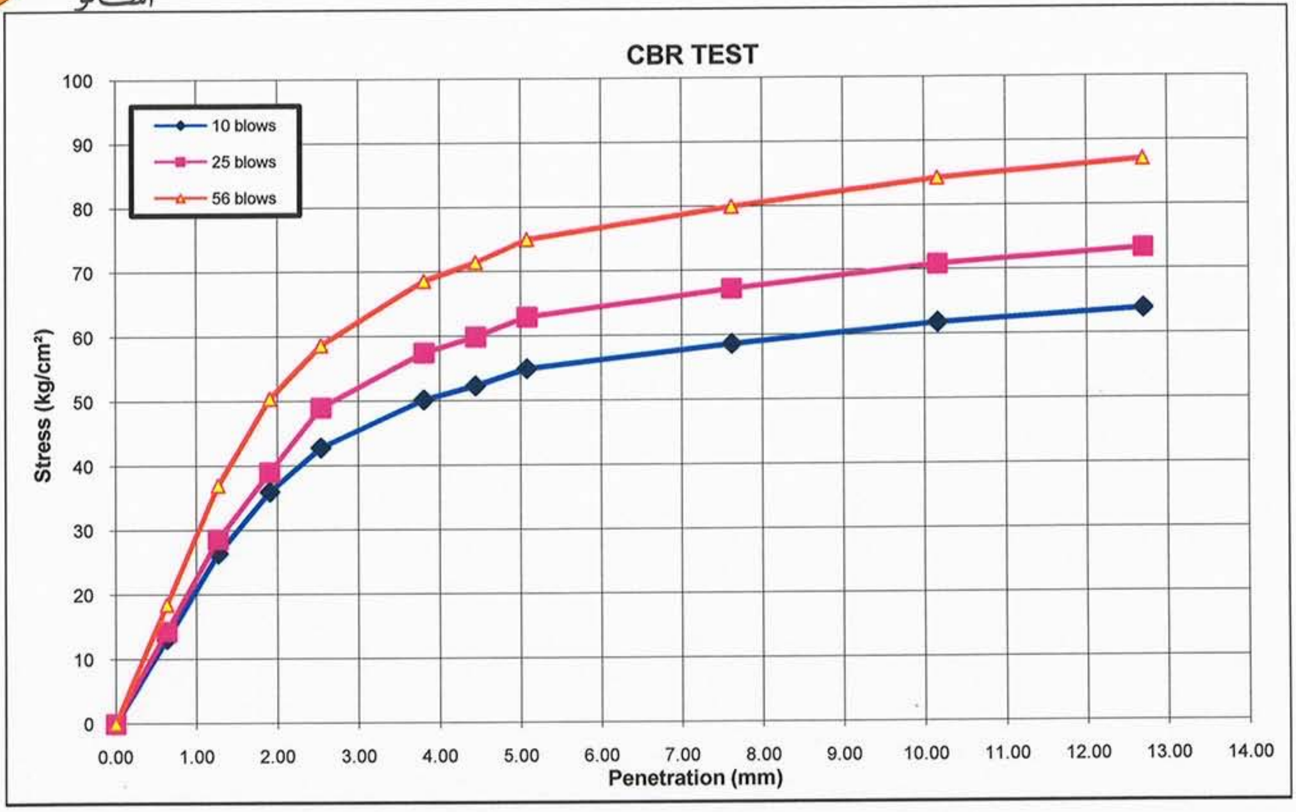
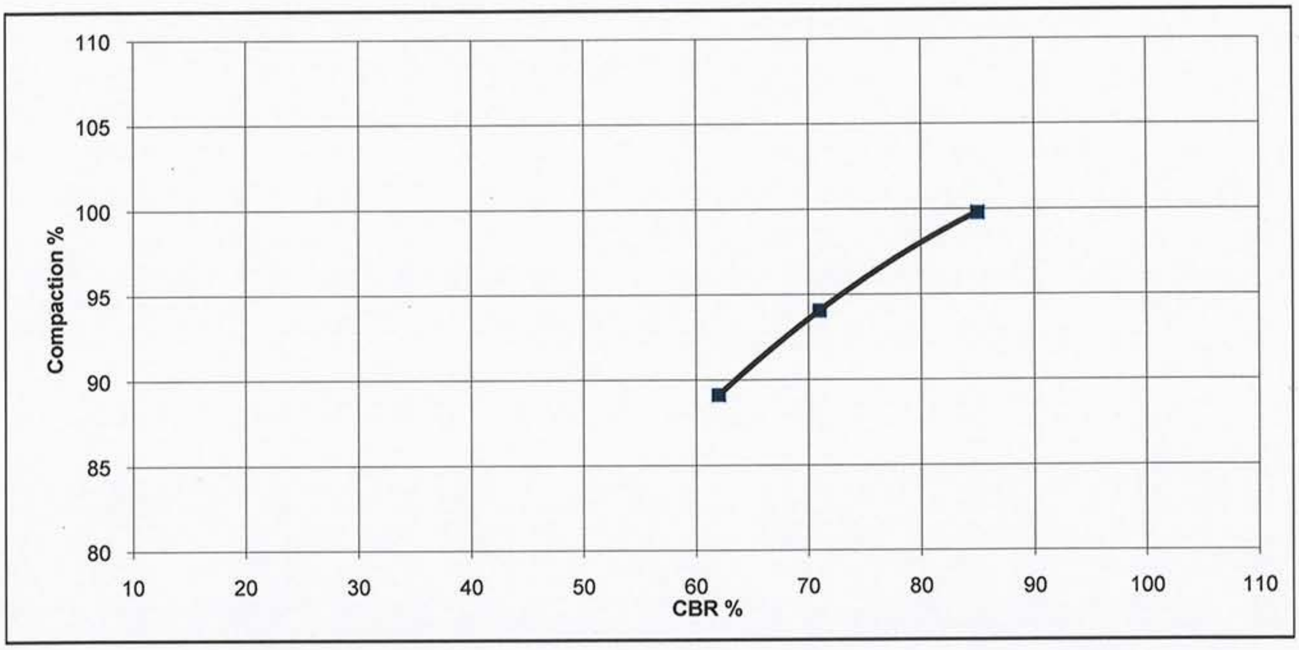


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	62	53	62	89
25	71	61	71	94
56	85	73	85	100

NTP14	73	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP15
Depth (m): 1.80

Proctor density (g/cm3) : 2.20
Optimum moisture (%) : 7.3
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	51.2	223.6	215.2	8.37	164.0	5.1
B	**25**	51.9	241.8	230.2	11.59	178.3	6.5
C	**56**	52.1	231.8	218.6	13.16	166.5	7.9

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10754	4306	2124	2.03	1.93	88
B	**25**	6448	11168	4720	2124	2.22	2.09	95
C	**56**	6448	11619	5171	2124	2.43	2.26	103

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	245	13	265	14	366	19
0.050	1.270	490	25	530	27	732	38
0.075	1.905	668	35	722	37	998	52
0.100	**2.540**	**734**	**38**	**908**	**47**	**1162**	**60**
0.150	3.810	871	45	1066	55	1384	72
0.175	4.445	911	47	1111	57	1448	75
0.200	**5.080**	960	**50**	1167	**60**	1527	**79**
0.300	7.620	1028	53	1246	64	1639	85
0.400	10.160	1087	56	1314	68	1734	90
0.500	12.70	1126	58	1359	70	1798	93

SWELL / **soaked CBR VALUES**

Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.015	0.015	0.000	11.64	**0.000**	55	48	**55**
B	**25**	2.914	2.914	0.000	11.64	**0.000**	68	59	**68**
C	**56**	1.966	1.966	0.000	11.64	**0.000**	87	77	**87**

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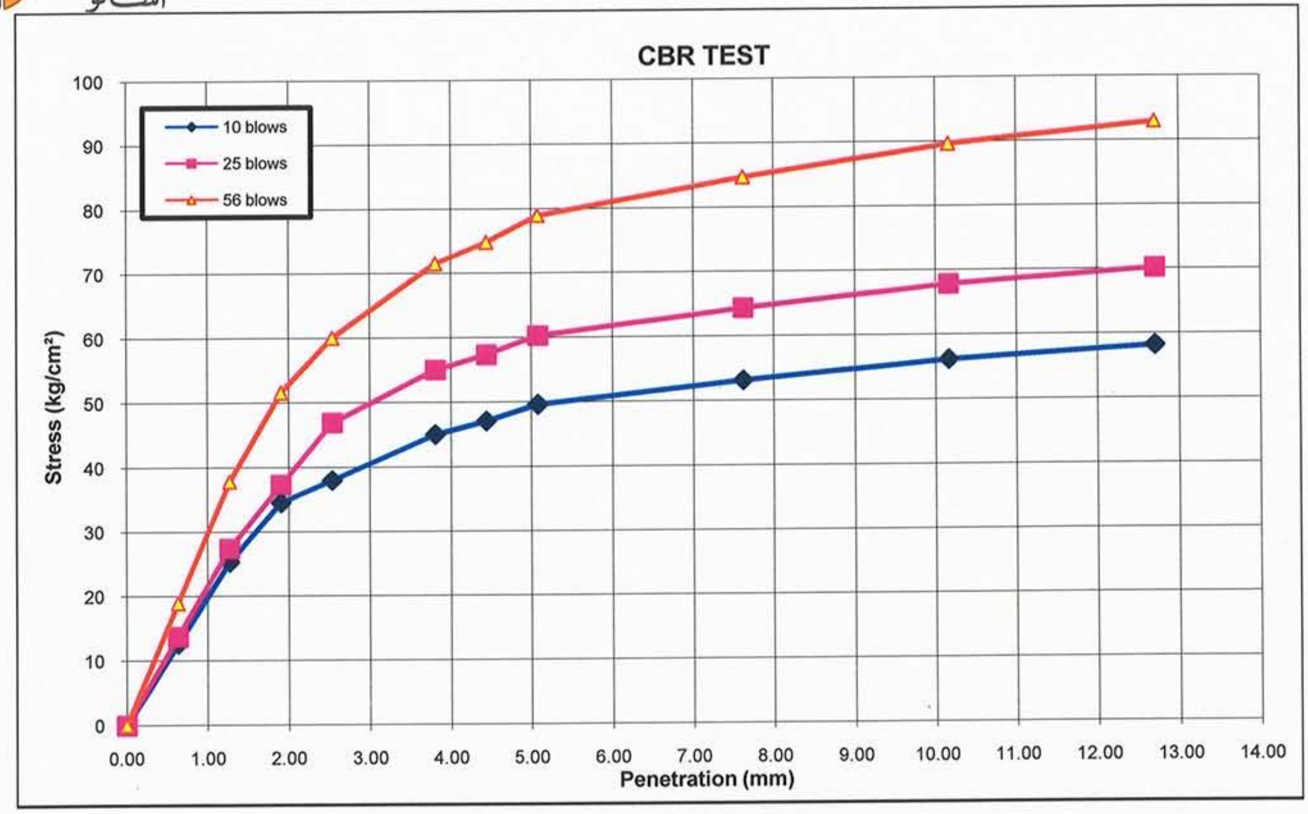
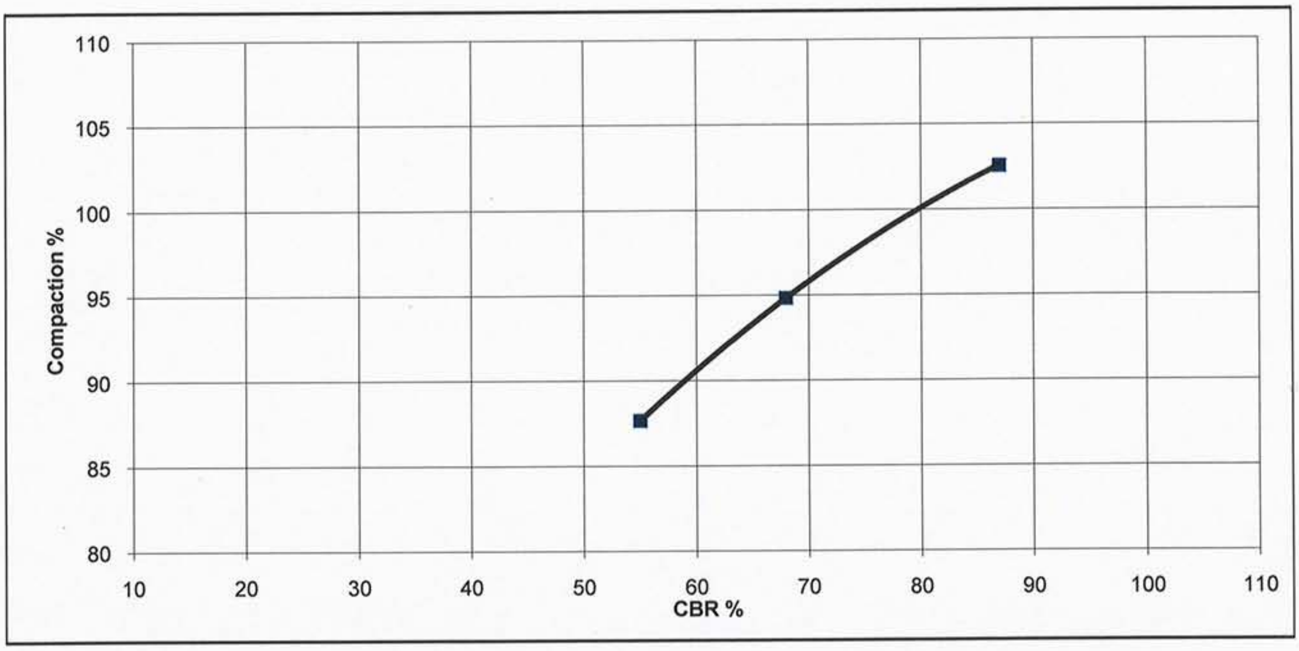


Number of blows	soaked CBR 0.1"	soaked CBR 0.2"	Retained	Compaction %
10	55	48	55	88
25	68	59	68	95
56	87	77	87	103

NTP15	68	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP16
Depth (m): 3.50

Proctor density (g/cm3) : 2.22
Optimum moisture (%) : 7.2
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	49.2	223.6	216.1	7.51	166.9	4.5
B	**25**	51.1	241.8	231.3	10.45	180.2	5.8
C	**56**	50.7	231.8	219.8	12.01	169.1	7.1

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10892	4444	2124	2.09	2.00	90
B	**25**	6448	11254	4806	2124	2.26	2.14	96
C	**56**	6448	11633	5185	2124	2.44	2.28	103

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	257	13	280	14	362	19
0.050	1.270	513	27	561	29	723	37
0.075	1.905	700	36	765	40	986	51
0.100	**2.540**	**814**	**42**	**961**	**50**	**1148**	**59**
0.150	3.810	958	50	1128	58	1351	70
0.175	4.445	999	52	1176	61	1409	73
0.200	**5.080**	1050	**54**	1236	**64**	1481	**77**
0.300	7.620	1122	58	1319	68	1582	82
0.400	10.160	1184	61	1391	72	1669	86
0.500	12.70	1225	63	1439	74	1727	89

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.019	1.019	0.000	11.64	**0.000**	61	53	**61**
B	**25**	2.154	2.154	0.000	11.64	**0.000**	72	62	**72**
C	**56**	1.617	1.617	0.000	11.64	**0.000**	86	74	**86**

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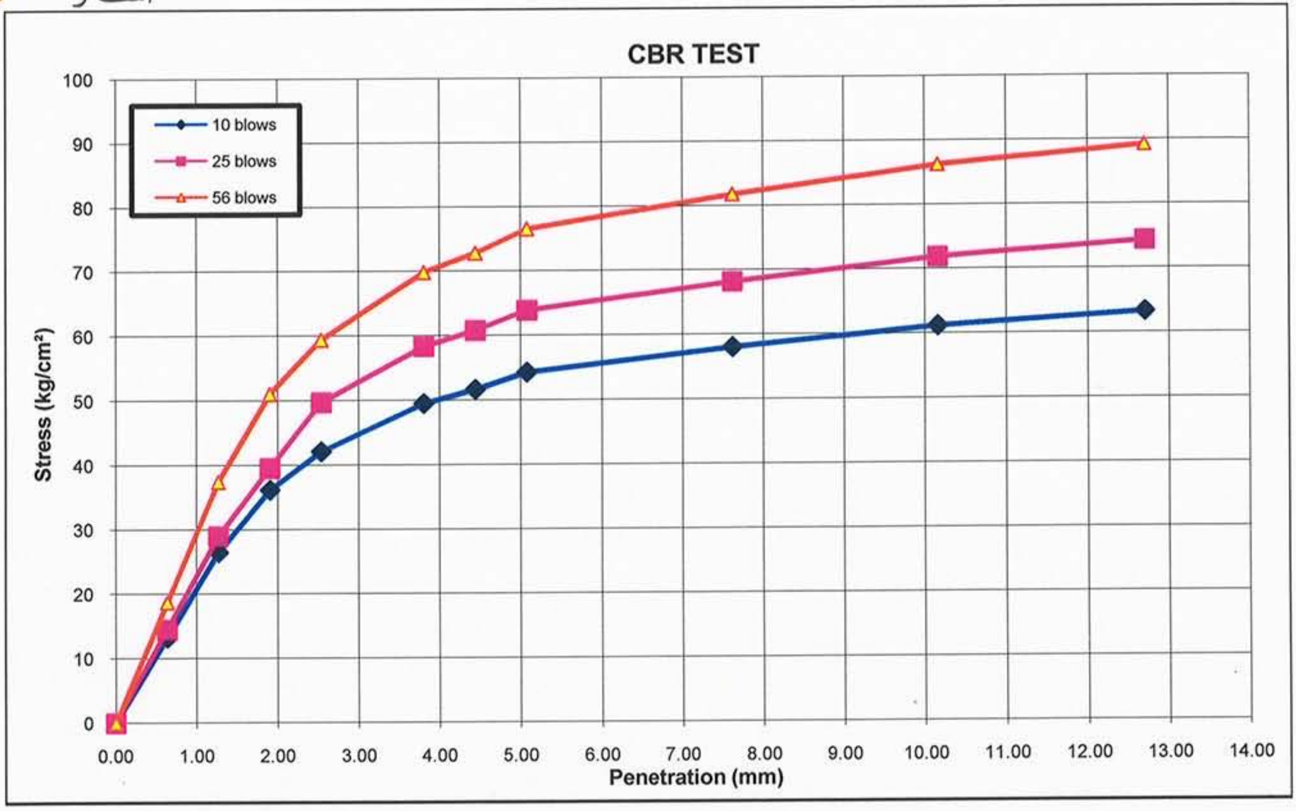
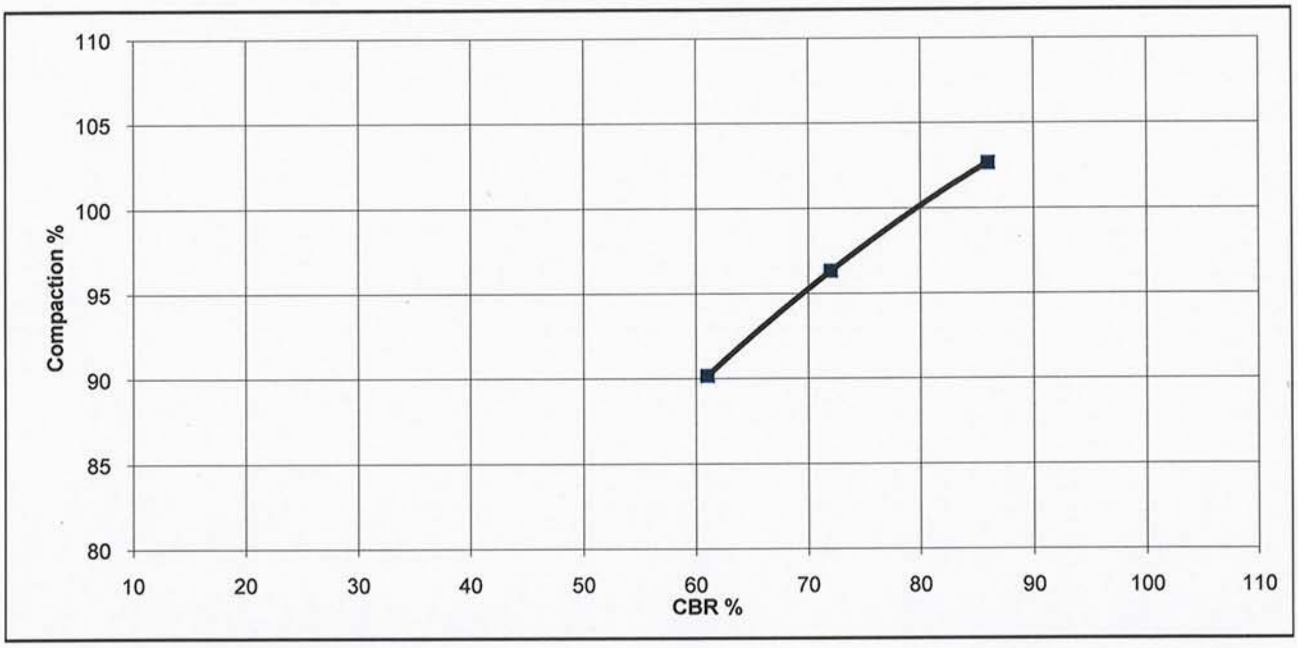


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	61	53	61	90
25	72	62	72	96
56	86	74	86	103

NTP16	70	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP17
Depth (m): 1.80

Proctor density (g/cm3) : 2.21
Optimum moisture (%) : 8.0
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	48.1	223.6	216.0	7.56	167.9	4.5
B	**25**	51.3	241.8	231.4	10.44	180.1	5.8
C	**56**	50.5	231.8	219.0	12.81	168.5	7.6

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10734	4286	2124	2.02	1.93	87
B	**25**	6448	11087	4639	2124	2.18	2.06	93
C	**56**	6448	11454	5006	2124	2.36	2.19	99

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	240	12	249	13	307	16
0.050	1.270	479	25	498	26	614	32
0.075	1.905	654	34	680	35	837	43
0.100	**2.540**	**761**	**39**	**854**	**44**	**975**	**50**
0.150	3.810	895	46	986	51	1147	59
0.175	4.445	934	48	1024	53	1196	62
0.200	**5.080**	982	**51**	1071	**55**	1257	**65**
0.300	7.620	1049	54	1137	59	1343	69
0.400	10.160	1106	57	1193	62	1417	73
0.500	12.70	1145	59	1231	64	1466	76

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	2.115	2.115	0.000	11.64	**0.000**	57	49	**57**
B	**25**	1.874	1.874	0.000	11.64	**0.000**	64	54	**64**
C	**56**	1.536	1.536	0.000	11.64	**0.000**	73	63	**73**

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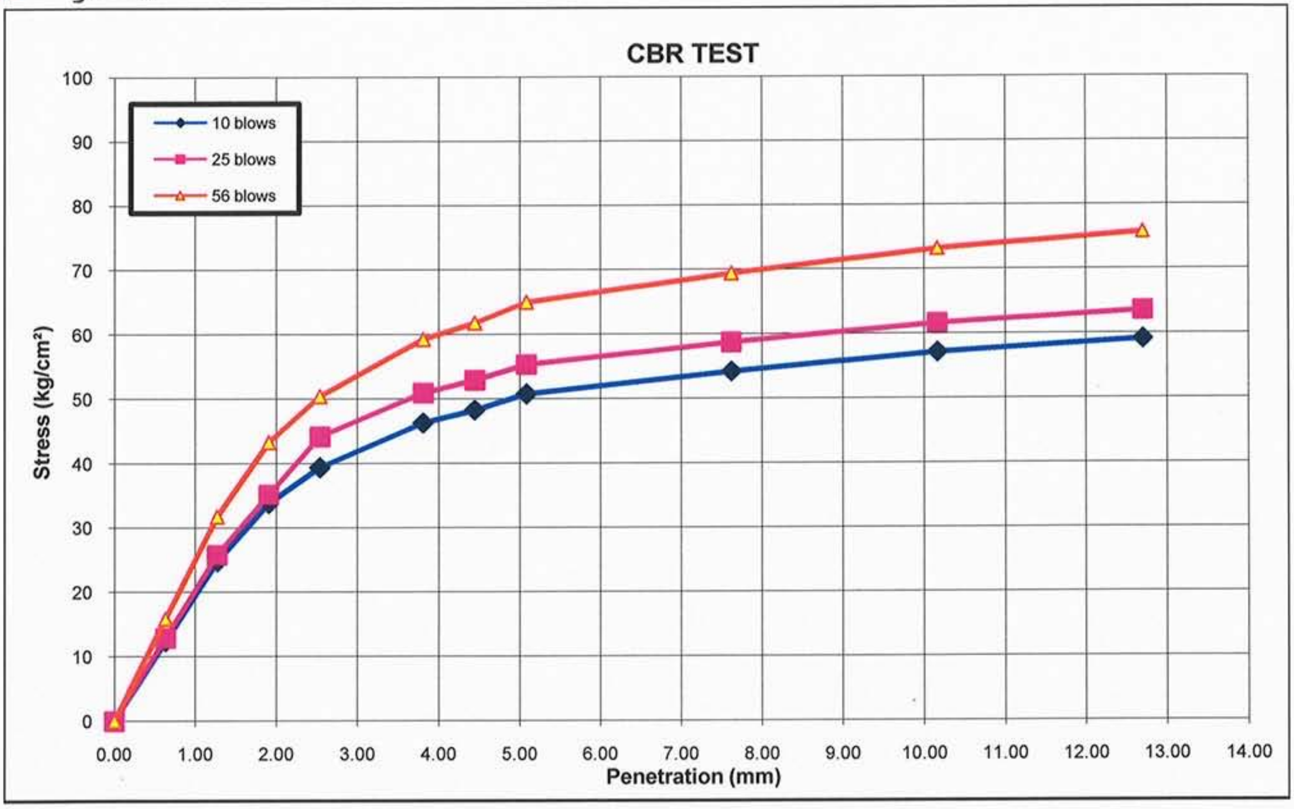
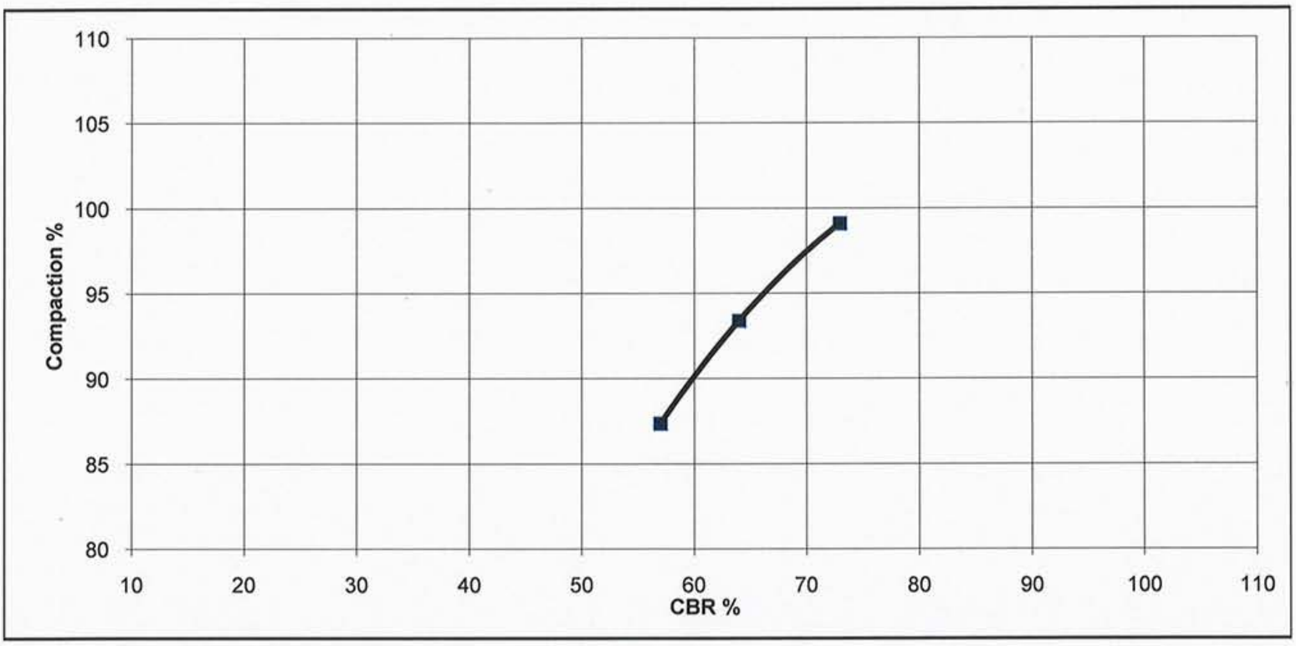


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	57	49	57	87
25	64	54	64	93
56	73	63	73	99

NTP17	**66**	**95**



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project:	**Bisri Dam**		
Location:	**Upstream of the Dam, Sand & Gravel Material Sources**		
Client:	**Dar Al Handasah Nazih Taleb & Partners**	**Proctor density (g/cm3) :**	**2.22**
Date:	**03/11/14**	**Optimum moisture (%) :**	**7.6**
Sample ID:	**NTP18**	**No of layers :**	**5**
Depth (m):	**1.00**	**No of blows / layer :**	**10 \ 25 \ 56**

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	50.3	223.6	216.8	6.83	166.5	4.1
B	**25**	50.9	241.8	231.7	10.12	180.8	5.6
C	**56**	49.2	231.8	219.4	12.42	170.2	7.3

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10842	4394	2124	2.07	1.99	90
B	**25**	6448	11257	4809	2124	2.26	2.14	97
C	**56**	6448	11584	5136	2124	2.42	2.25	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	223	12	257	13	336	17
0.050	1.270	446	23	514	27	673	35
0.075	1.905	608	31	701	36	918	47
0.100	**2.540**	**708**	**37**	**881**	**46**	**1068**	**55**
0.150	3.810	832	43	1017	53	1233	64
0.175	4.445	868	45	1056	55	1281	66
0.200	**5.080**	913	**47**	1104	**57**	1340	**69**
0.300	7.620	975	50	1172	61	1422	74
0.400	10.160	1029	53	1230	64	1493	77
0.500	12.70	1064	55	1269	66	1540	80

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.915	1.915	0.000	11.64	**0.000**	53	46	**53**
B	**25**	1.174	1.174	0.000	11.64	**0.000**	66	55	**66**
C	**56**	1.633	1.633	0.000	11.64	**0.000**	80	67	**80**

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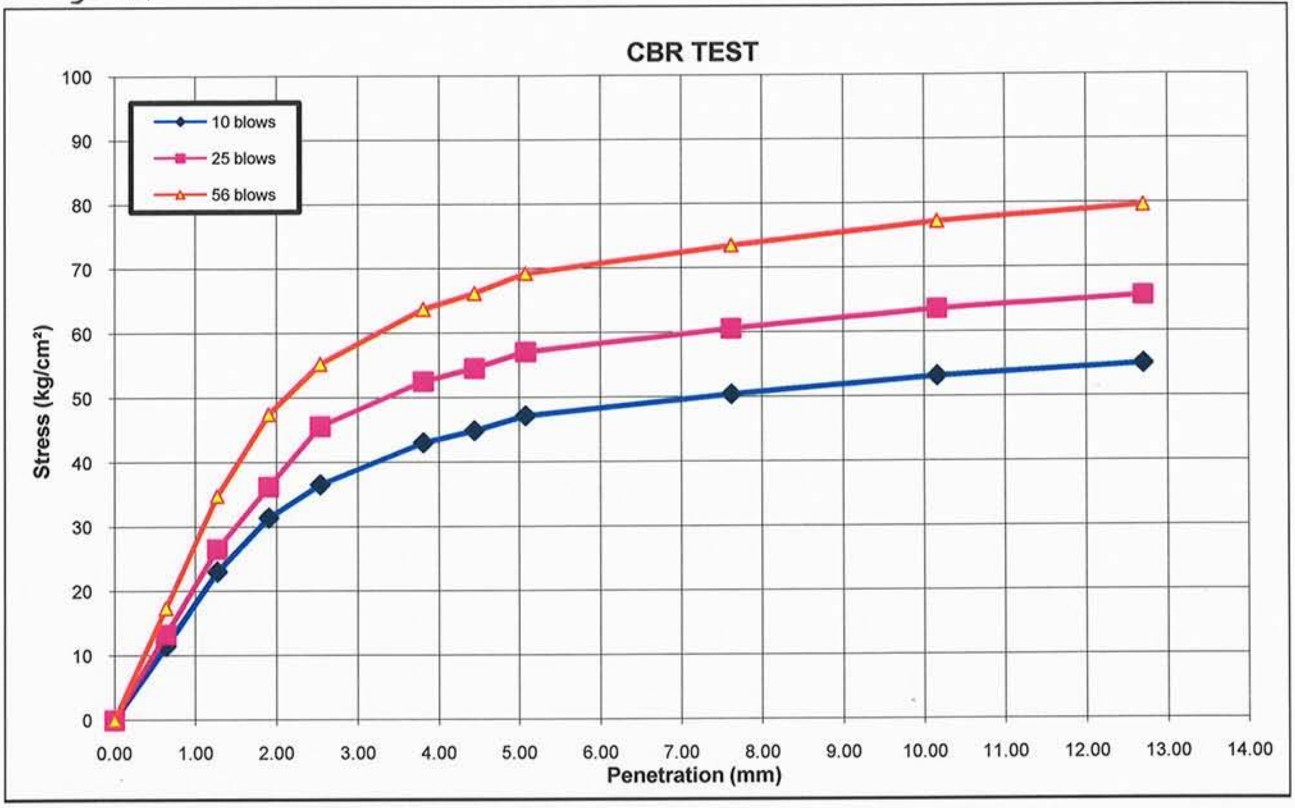
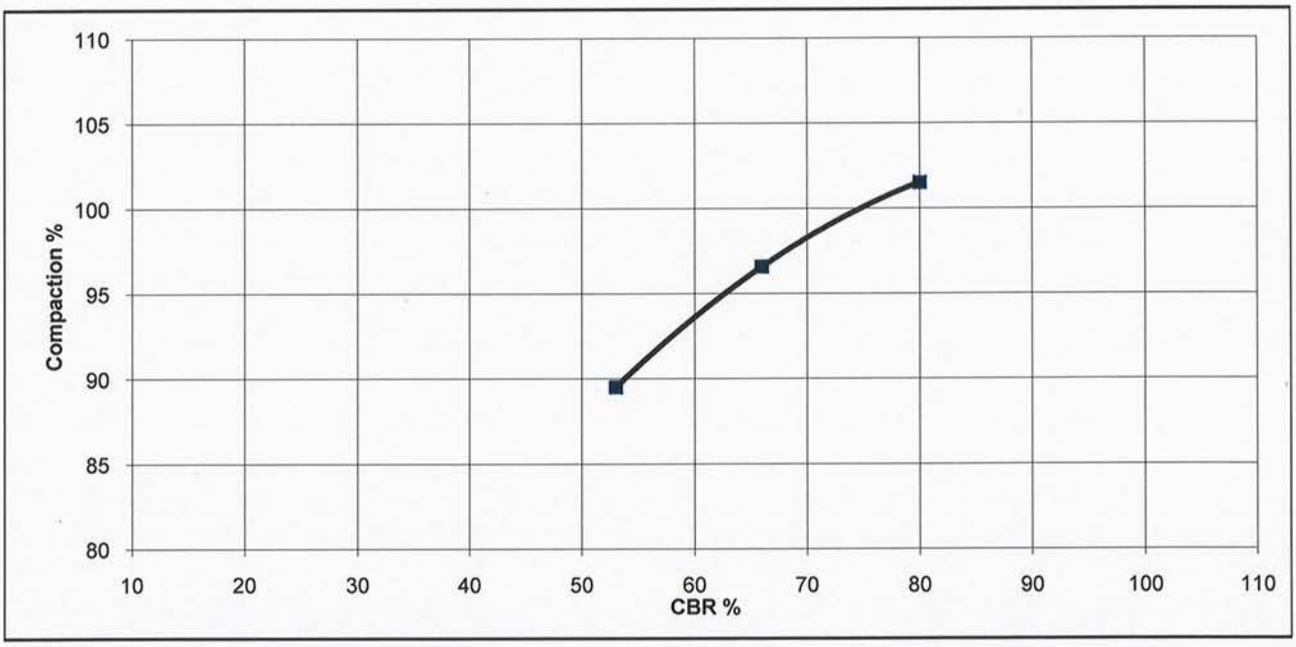


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	53	46	53	90
25	66	55	66	97
56	80	67	80	102

NTP18	63	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP19
Depth (m): 0.40

Proctor density (g/cm3) : 2.20
Optimum moisture (%) : 7.5
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	51.6	223.6	216.2	7.41	164.6	4.5
B	**25**	50.7	241.8	231.2	10.65	180.5	5.9
C	**56**	51.3	231.8	219.4	12.44	168.1	7.4

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10875	4427	2124	2.08	1.99	91
B	**25**	6448	11271	4823	2124	2.27	2.14	97
C	**56**	6448	11592	5144	2124	2.42	2.25	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	253	13	300	15	347	18
0.050	1.270	506	26	600	31	693	36
0.075	1.905	690	36	818	42	945	49
0.100	**2.540**	**868**	**45**	**1028**	**53**	**1188**	**61**
0.150	3.810	1010	52	1186	61	1359	70
0.175	4.445	1050	54	1232	64	1407	73
0.200	**5.080**	1101	**57**	1288	**67**	1468	**76**
0.300	7.620	1172	61	1368	71	1553	80
0.400	10.160	1232	64	1435	74	1626	84
0.500	12.70	1273	66	1481	77	1675	87

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	0.015	0.015	0.000	11.64	**0.000**	65	55	**65**
B	**25**	0.944	0.944	0.000	11.64	**0.000**	77	65	**77**
C	**56**	1.271	1.271	0.000	11.64	**0.000**	89	74	**89**

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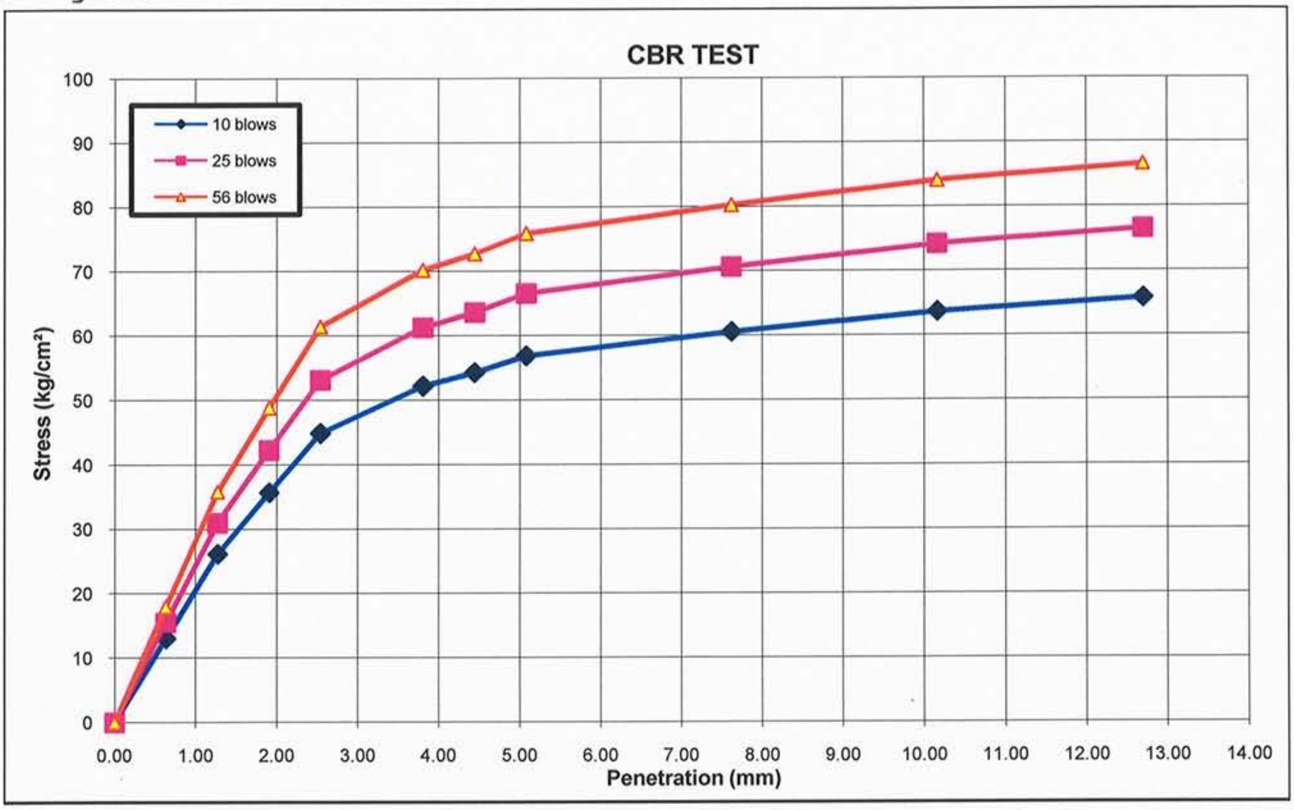
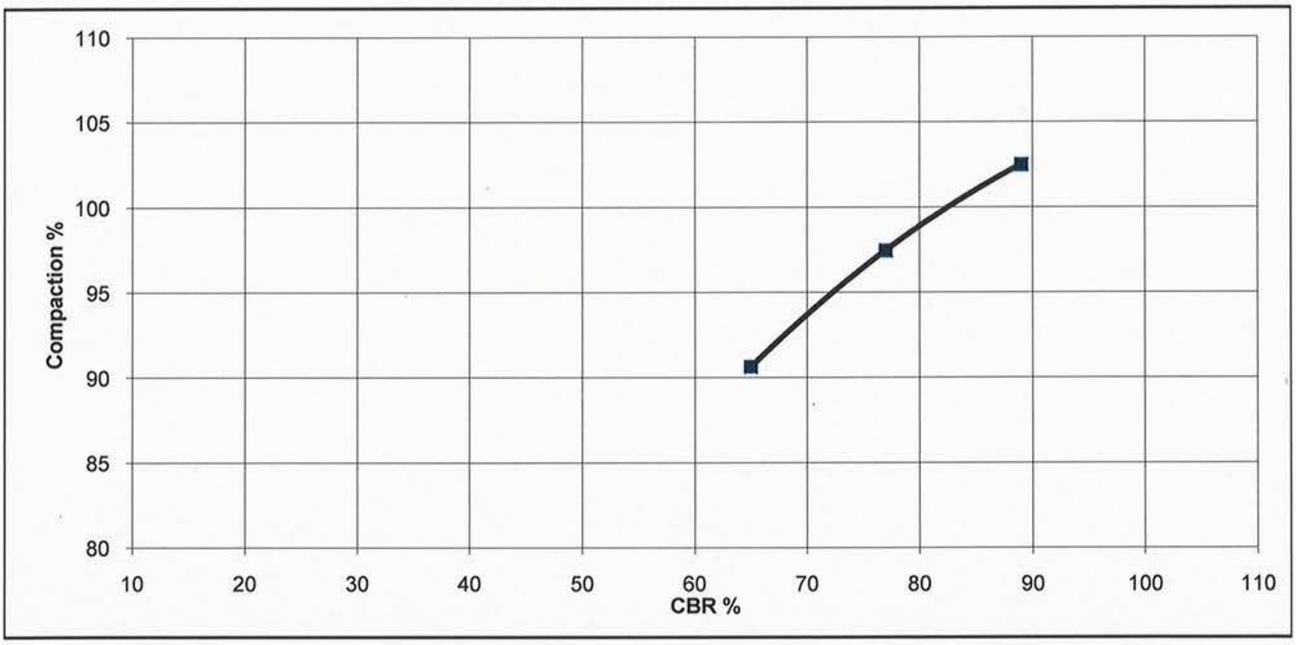


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	65	55	65	91
25	77	65	77	97
56	89	74	89	102

NTP19	73	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP19
Depth (m): 1.20

Proctor density (g/cm3) : 2.17
Optimum moisture (%) : 8.8
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	51.6	223.6	213.7	9.89	162.1	6.1
B	**25**	50.7	241.8	228.8	13.00	178.1	7.3
C	**56**	51.3	231.8	217.4	14.45	166.1	8.7

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10929	4481	2124	2.11	1.99	92
B	**25**	6448	11257	4809	2124	2.26	2.11	97
C	**56**	6448	11603	5155	2124	2.43	2.23	103

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
		Load	Stress	Load	Stress	Load	Stress
Inch	mm	kg	kg/cm^2	kg	kg/cm^2	kg	kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	193	10	214	11	292	15
0.050	1.270	387	20	428	22	585	30
0.075	1.905	528	27	584	30	797	41
0.100	**2.540**	**628**	**32**	**734**	**38**	**948**	**49**
0.150	3.810	726	38	847	44	1092	56
0.175	4.445	754	39	880	45	1133	59
0.200	**5.080**	789	**41**	920	**48**	1184	**61**
0.300	7.620	839	43	977	50	1256	65
0.400	10.160	881	46	1025	53	1317	68
0.500	12.70	909	47	1058	55	1358	70

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	2.417	2.417	0.000	11.64	**0.000**	47	40	**47**
B	**25**	0.026	0.026	0.000	11.64	**0.000**	55	46	**55**
C	**56**	0.754	0.754	0.000	11.64	**0.000**	71	59	**71**

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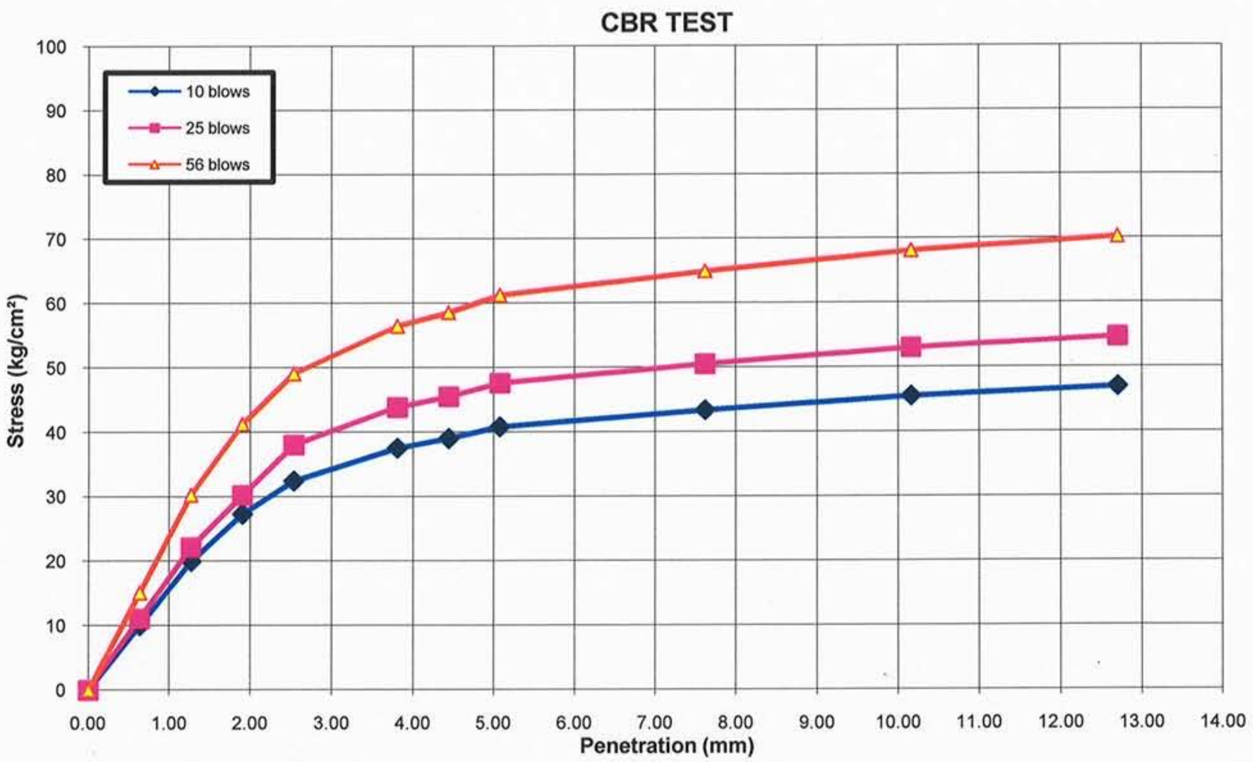
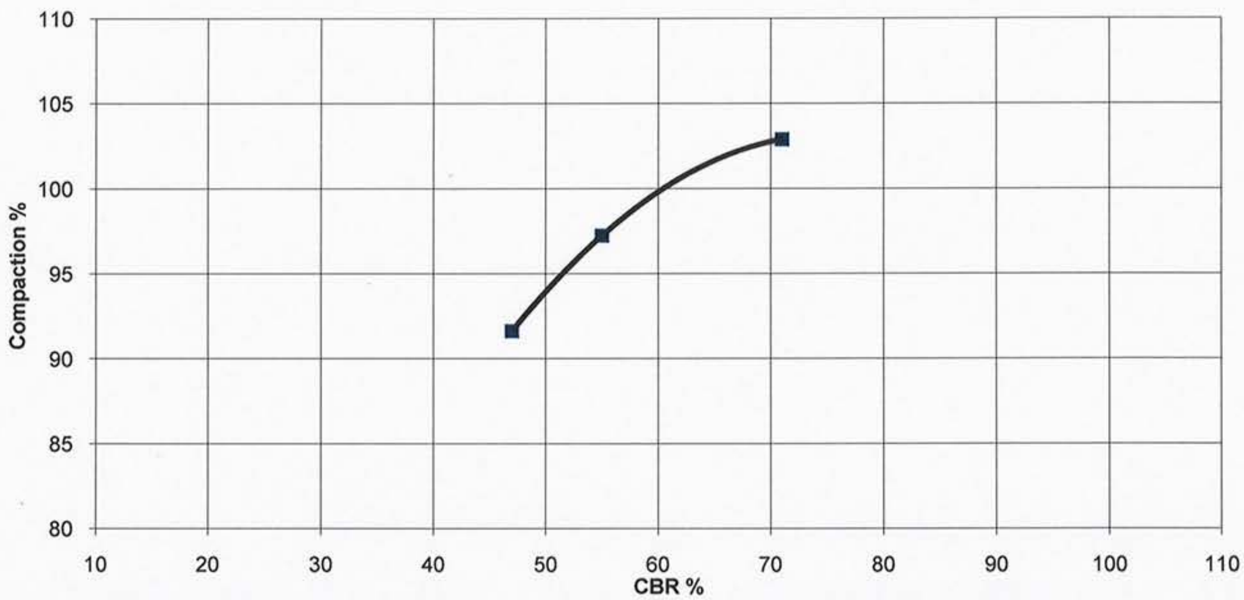


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	47	40	47	92
25	55	46	55	97
56	71	59	71	103

NTP19	52	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP20
Depth (m): 0.80

Proctor density (g/cm3) : 2.15
Optimum moisture (%) : 9.1
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	51.6	223.6	213.3	10.35	161.7	6.4
B	**25**	50.7	241.8	228.3	13.50	177.6	7.6
C	**56**	51.3	231.8	217.0	14.75	165.7	8.9

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10751	4303	2124	2.03	1.90	89
B	**25**	6448	11072	4624	2124	2.18	2.02	94
C	**56**	6448	11418	4970	2124	2.34	2.15	100

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
		Load	Stress	Load	Stress	Load	Stress
Inch	mm	kg	kg/cm^2	kg	kg/cm^2	kg	kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	202	10	226	12	296	15
0.050	1.270	403	21	452	23	593	31
0.075	1.905	550	28	616	32	808	42
0.100	**2.540**	**654**	**34**	**774**	**40**	**961**	**50**
0.150	3.810	780	40	894	46	1154	60
0.175	4.445	816	42	928	48	1209	63
0.200	**5.080**	860	**44**	970	**50**	1278	**66**
0.300	7.620	923	48	1030	53	1375	71
0.400	10.160	977	50	1081	56	1458	75
0.500	12.70	1013	52	1115	58	1513	78

SWELL / **soaked CBR VALUES**

Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.517	1.517	0.000	11.64	**0.000**	49	43	**49**
B	**25**	1.123	1.123	0.000	11.64	**0.000**	58	49	**58**
C	**56**	2.826	2.826	0.000	11.64	**0.000**	72	64	**72**

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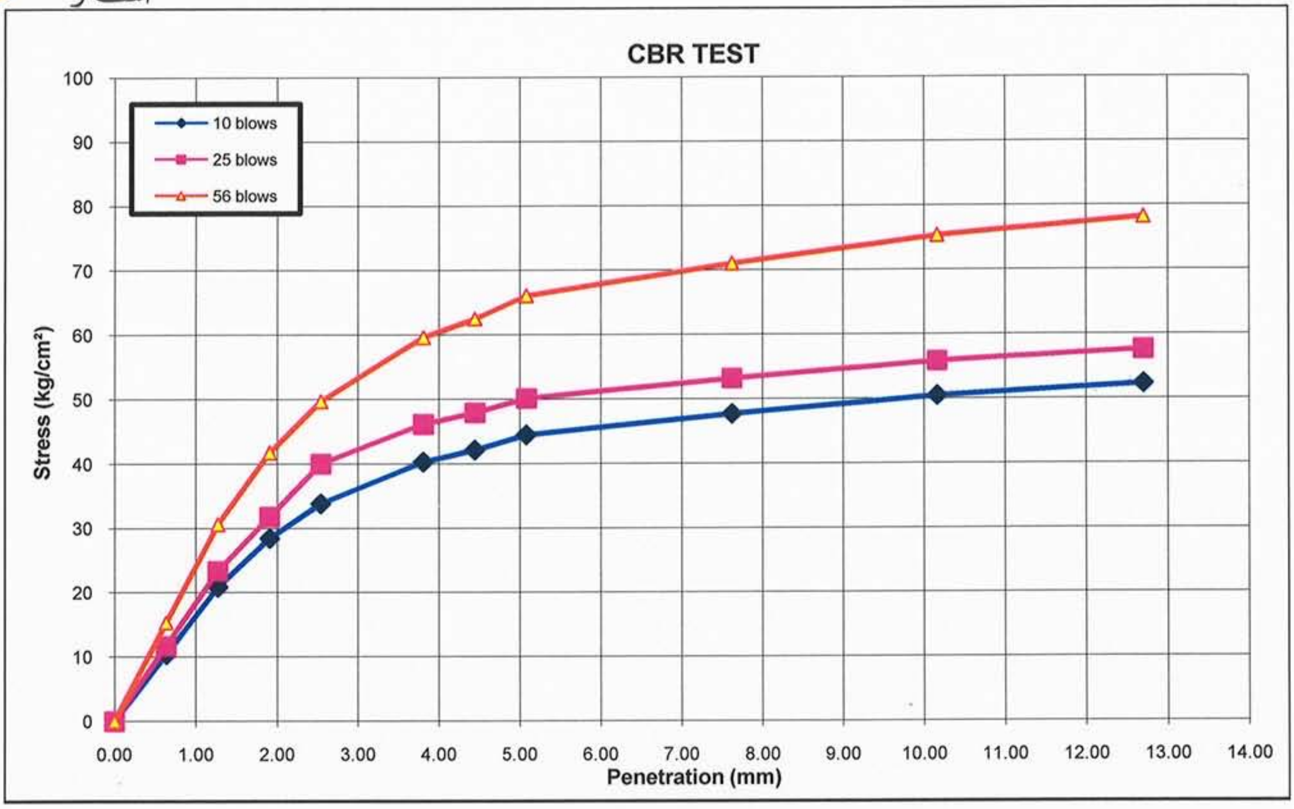
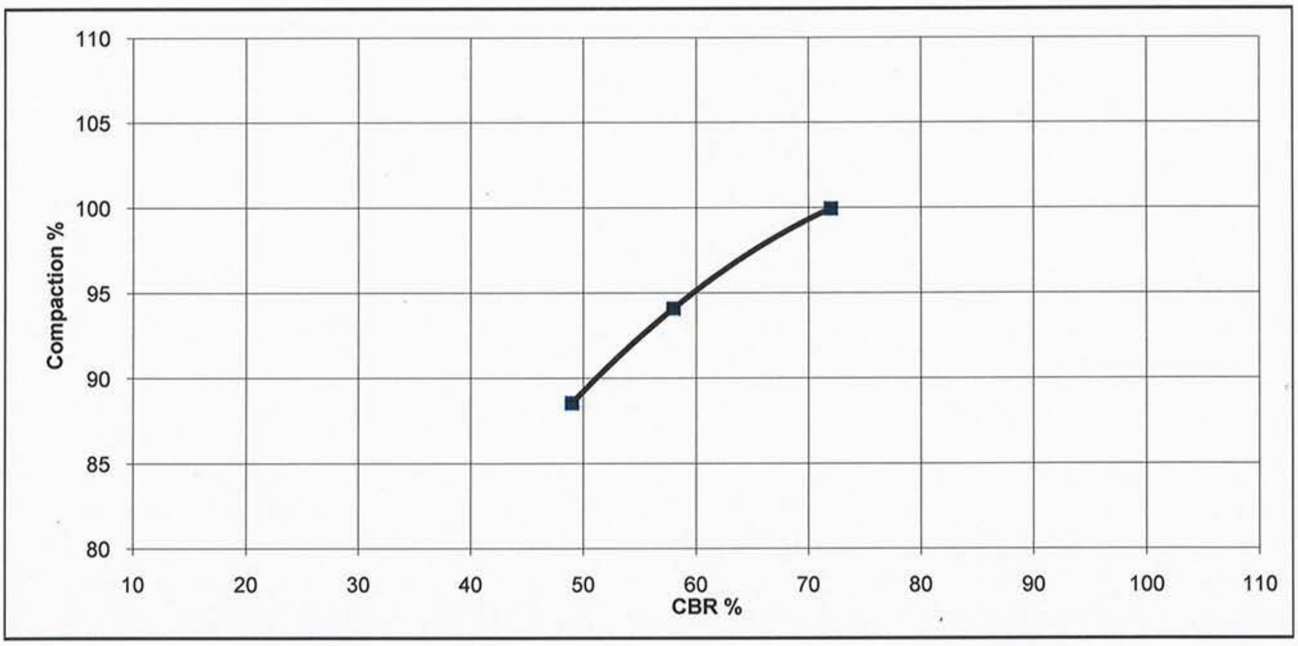


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	49	43	49	89
25	58	49	58	94
56	72	64	72	100

NTP20	59	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP21
Depth (m): 3.50

Proctor density (g/cm3) : 2.18
Optimum moisture (%) : 8.0
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT							
Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	49.2	223.6	215.1	8.46	165.9	5.1
B	**25**	50.9	241.8	230.7	11.14	179.8	6.2
C	**56**	49.5	231.8	218.8	13.03	169.3	7.7

DENSITY								
Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10858	4410	2124	2.08	1.98	91
B	**25**	6448	11275	4827	2124	2.27	2.14	98
C	**56**	6448	11687	5239	2124	2.47	2.29	105

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
		Load	Stress	Load	Stress	Load	Stress
Inch	mm	kg	kg/cm^2	kg	kg/cm^2	kg	kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	226	12	253	13	325	17
0.050	1.270	453	23	506	26	650	34
0.075	1.905	618	32	690	36	887	46
0.100	**2.540**	**734**	**38**	**868**	**45**	**1055**	**55**
0.150	3.810	875	45	1025	53	1257	65
0.175	4.445	915	47	1070	55	1315	68
0.200	**5.080**	966	**50**	1127	**58**	1387	**72**
0.300	7.620	1036	54	1205	62	1488	77
0.400	10.160	1097	57	1273	66	1575	81
0.500	12.70	1137	59	1318	68	1633	84

SWELL							soaked CBR VALUES		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	2.215	2.215	0.000	11.64	**0.000**	55	48	**55**
B	**25**	1.811	1.811	0.000	11.64	**0.000**	65	57	**65**
C	**56**	0.963	0.963	0.000	11.64	**0.000**	79	70	**79**

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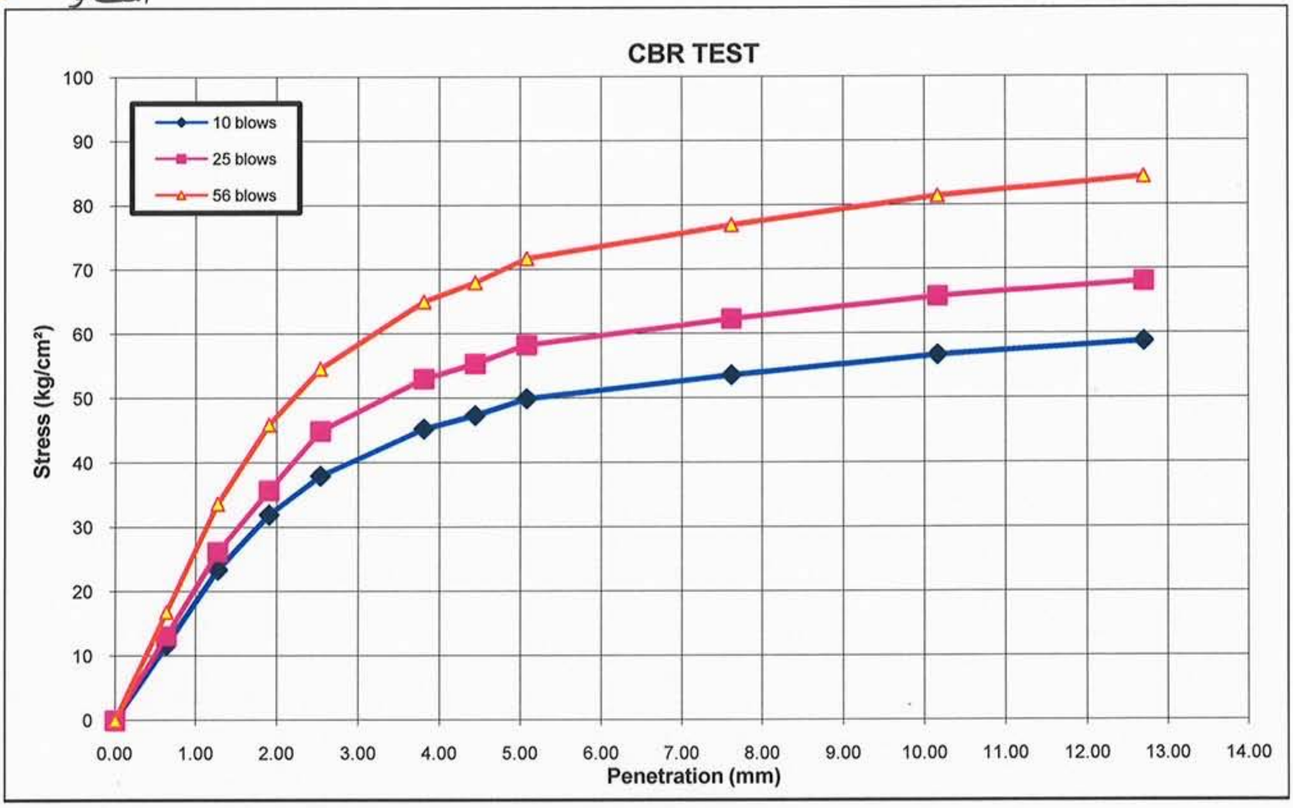
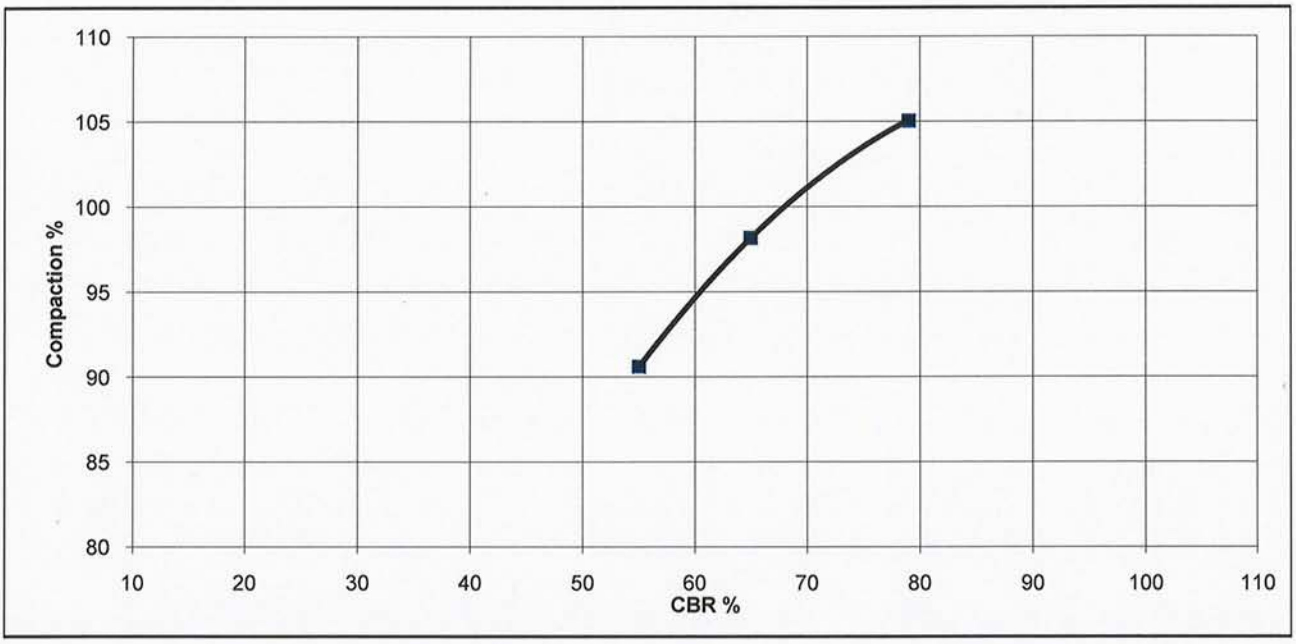


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	55	48	55	91
25	65	57	65	98
56	79	70	79	105

NTP21	61	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP22
Depth (m): 1.00

Proctor density (g/cm3) : 2.21
Optimum moisture (%) : 7.7
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	47.3	223.6	215.4	8.24	168.1	4.9
B	**25**	48.9	241.8	230.4	11.43	181.5	6.3
C	**56**	50.3	231.8	219.1	12.66	168.8	7.5

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10742	4294	2124	2.02	1.93	87
B	**25**	6448	11078	4630	2124	2.18	2.05	93
C	**56**	6448	11454	5006	2124	2.36	2.19	99

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
Inch	mm	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2	Load kg	Stress kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	243	13	264	14	350	18
0.050	1.270	486	25	528	27	700	36
0.075	1.905	662	34	721	37	954	49
0.100	**2.540**	**788**	**41**	**906**	**47**	**1135**	**59**
0.150	3.810	911	47	1040	54	1313	68
0.175	4.445	947	49	1079	56	1364	70
0.200	**5.080**	991	**51**	1127	**58**	1428	**74**
0.300	7.620	1053	54	1194	62	1517	78
0.400	10.160	1106	57	1252	65	1593	82
0.500	12.70	1141	59	1290	67	1644	85

SWELL / **soaked CBR VALUES**

Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	1.915	1.915	0.000	11.64	**0.000**	59	50	**59**
B	**25**	1.262	1.262	0.000	11.64	**0.000**	68	57	**68**
C	**56**	2.547	2.547	0.000	11.64	**0.000**	85	72	**85**

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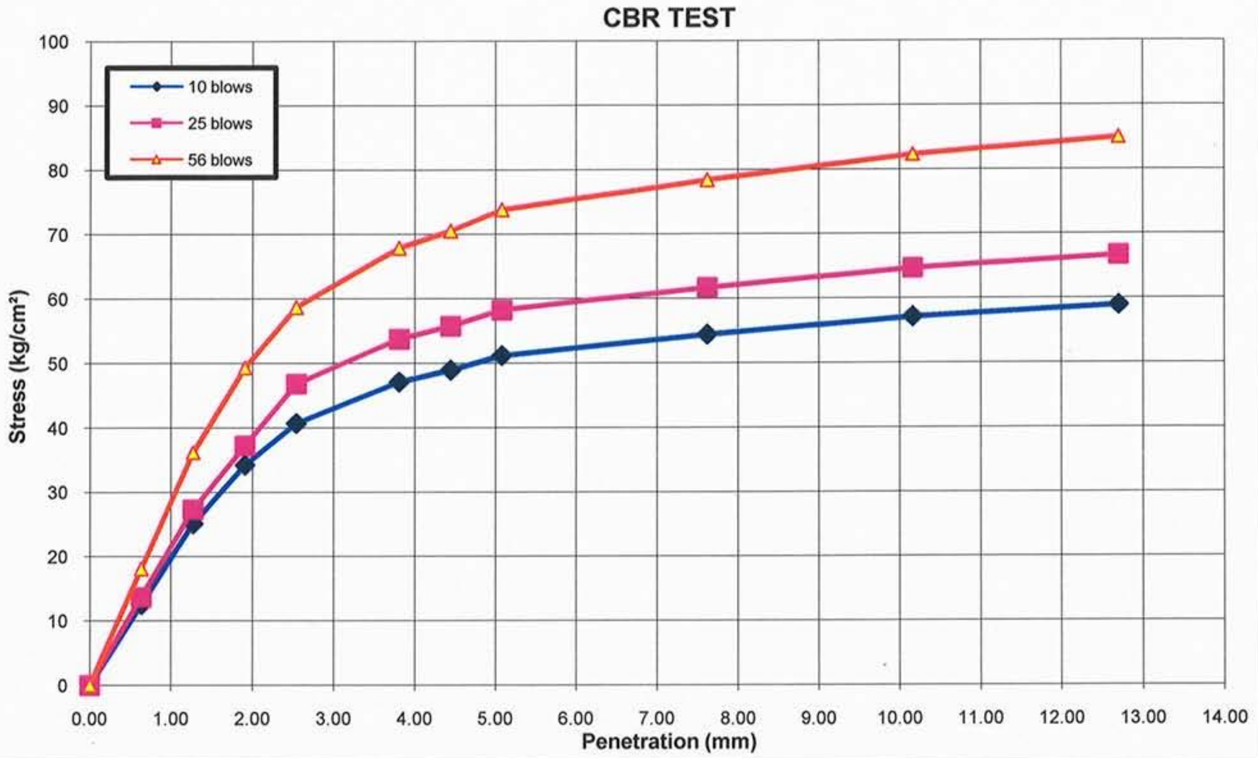
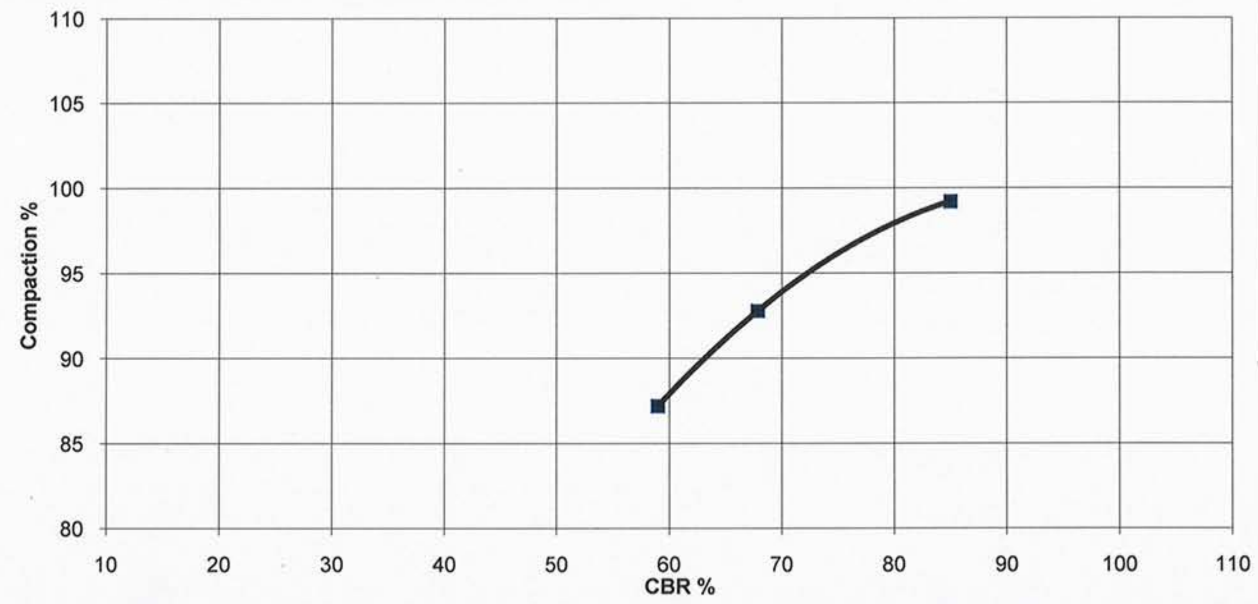


Number of blows	soaked CBR 0.1"	soaked CBR 0.2"	soaked CBR Retained	Compaction %
10	59	50	59	87
25	68	57	68	93
56	85	72	85	99

NTP22	71	95



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STANDARD TEST METHOD FOR SOAKED CBR OF LABORATORY-COMPACTED SOILS

ASTM Designation D1883-92

Project: Bisri Dam
Location: Upstream of the Dam, Sand & Gravel Material Sources
Client: Dar Al Handasah Nazih Taleb & Partners
Date: 03/11/14
Sample ID: NTP23
Depth (m): 1.50

Proctor density (g/cm3) : 2.19
Optimum moisture (%) : 8.1
No of layers : 5
No of blows / layer : 10 \ 25 \ 56

MOISTURE CONTENT

Can No.	No. of blows / layer	Weight of can gms	Weight of wet soil + can gms	Weight of dry soil + can gms	Weight of water gms	Weight of dry soil gms	Moisture content %
A	**10**	49.3	223.6	215.1	8.46	165.8	5.1
B	**25**	51.2	241.8	230.2	11.63	179.0	6.5
C	**56**	51.9	231.8	218.8	13.02	166.9	7.8

DENSITY

Mold No.	No. of blows / layer	Weight of mold (g)	Weight of mold and soil (g)	Weight of soil (g)	Volume of mold (cm^3)	Wet density (g/cm^3)	Dry density (g/cm^3)	% of Proc. density %
A	**10**	6448	10786	4338	2124	2.04	1.94	89
B	**25**	6448	11152	4704	2124	2.21	2.08	95
C	**56**	6448	11563	5115	2124	2.41	2.23	102

CBR TEST

Proving ring factor : 2.27

Penetration		Mold A - (10 blows)		Mold B - (25 blows)		Mold C - (56 blows)	
		Load	Stress	Load	Stress	Load	Stress
Inch	mm	kg	kg/cm^2	kg	kg/cm^2	kg	kg/cm^2
0.000	0.000	0	0	0	0	0	0
0.025	0.635	268	14	288	15	371	19
0.050	1.270	535	28	576	30	741	38
0.075	1.905	730	38	786	41	1010	52
0.100	**2.540**	**868**	**45**	**988**	**51**	**1202**	**62**
0.150	3.810	1004	52	1135	59	1409	73
0.175	4.445	1043	54	1177	61	1468	76
0.200	**5.080**	1092	**56**	1229	**64**	1542	**80**
0.300	7.620	1160	60	1302	67	1646	85
0.400	10.160	1218	63	1365	71	1735	90
0.500	12.70	1257	65	1407	73	1794	93

SWELL							**soaked CBR VALUES**		
Specimen No.	No. of blows / layer	Initial reading	Final reading	Difference	Height of specimen (cm)	Swell %	soaked CBR at 0.1in	soaked CBR at 0.2in	soaked CBR values
A	**10**	2.119	2.119	0.000	11.64	**0.000**	65	55	**65**
B	**25**	1.041	1.041	0.000	11.64	**0.000**	74	62	**74**
C	**56**	2.765	2.765	0.000	11.64	**0.000**	90	77	**90**

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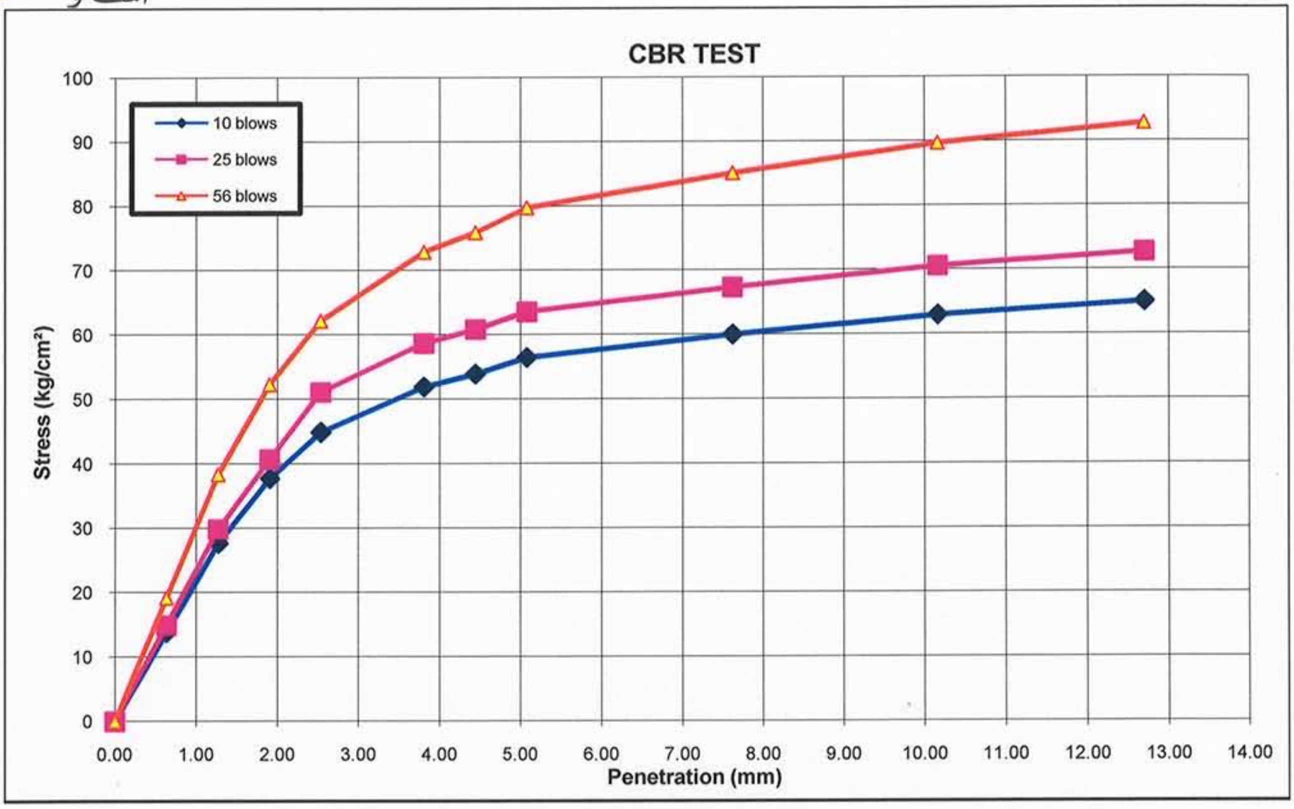
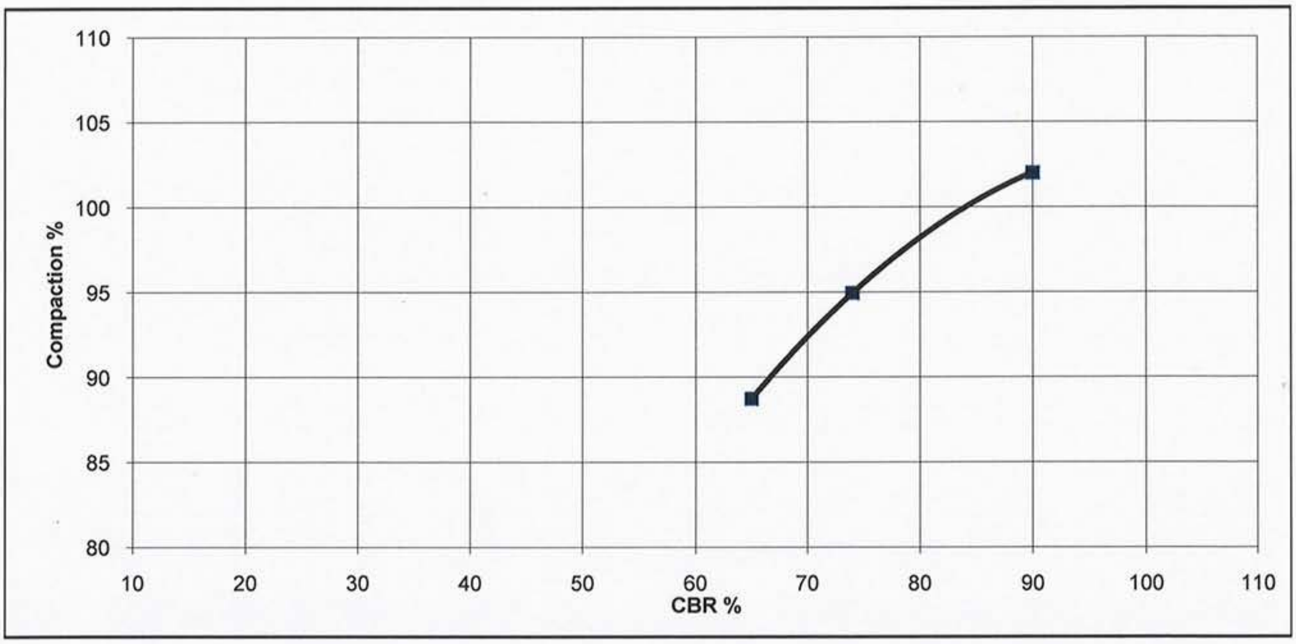


Number of blows	soaked CBR			Compaction %
	0.1"	0.2"	Retained	
10	65	55	65	89
25	74	62	74	95
56	90	77	90	102

NTP23	**74**	**95**



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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP9 - 2.00 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3652
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP10 - 2.00 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A
No. of revolutions	: 500
No. of spheres	: 12
Separating sieve	: No. 12

Total weight of sample	5000
Final weight (retained on No.12 sieve)	3709
Abrasion value (%)	**26**

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.		
Sample I.D.	:	NTP10 - 3.50 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	**A**	**B**	**C**	**D**
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3812
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**24**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP11 - 4.00 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3537
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**29**

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ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP12 - 1.50 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3649
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP13 - 1.50 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3762
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP13 - 3.50 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3617
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**28**

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Project : **Bisri Dam**
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Date : **31/10/14**

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP14 - 3.40 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	**A**	**B**	**C**	**D**
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3659
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP15 - 1.80 m
Source	:	Bisri
Sampling date	:	12.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3759
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP16 - 3.50 m
Source	:	Bisri
Sampling date	:	12.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	**A**	**B**	**C**	**D**
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3846
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**23**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP17 - 1.80 m
Source	:	Bisri
Sampling date	:	12.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3737
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP18 - 1.00 m
Source	:	Bisri
Sampling date	:	12.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A
No. of revolutions	: 500
No. of spheres	: 12
Separating sieve	: No. 12

Total weight of sample	5000
Final weight (retained on No.12 sieve)	3694
Abrasion value (%)	**26**

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Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP19 - 0.40 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A
No. of revolutions	: 500
No. of spheres	: 12
Separating sieve	: No. 12

Total weight of sample	5000
Final weight (retained on No.12 sieve)	3856
Abrasion value (%)	**23**

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Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP19 - 1.20 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3675
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

Head of laboratory section

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Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP20 - 0.80 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3765
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP21 - 3.50 m
Source	:	Bisri
Sampling date	:	10.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3639
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

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Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP22 - 1.00 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3785
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**24**

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Date : 31/10/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	NTP23 - 1.50 m
Source	:	Bisri
Sampling date	:	11.09.2014
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3831
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**23**

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP9	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 2.00 m	**Solution Temperature °C**	: 20
Source	: Bisri	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
No. 100		8					
No. 50	No. 100	5	100	92.2	8.0	7.98	0.40
No. 30	No. 50	11	100	92.0	8.0	8.00	0.88
No. 16	No. 30	12	100	92.4	7.9	7.88	0.95
No. 8	No. 16	5	100	92.3	7.8	7.79	0.39
No. 4	No. 8	4	100				0.39
Totals		45					3.0

Sample fraction coarser than No. 4 sieve:

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
2 1/2"	1 1/2"	19	5010	4510.6	499.4	9.97	1.89
1 1/2"	3/4"	16	1450	1309.1	140.9	9.72	1.55
3/4"	3/8"	15	1000	904.5	95.5	9.55	1.43
3/8"	No. 4	5	1008	912.7	95.3	9.45	0.47
Totals		55					5.4

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP10
Depth : 2.00 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

No. 100		6					
No. 50	No. 100	6	101	92.1	8.9	8.81	0.53
No. 30	No. 50	7	100	91.4	8.6	8.60	0.60
No. 16	No. 30	6	100	91.0	9.3	9.28	0.56
No. 8	No. 16	3	103				0.56
No. 4	No. 8	2	100				0.56
Totals		30					2.8

Sample fraction coarser than No. 4 sieve:

2 1/2"	1 1/2"	25	5002	4629.7	372.3	7.44	1.86
1 1/2"	3/4"	24	1512	1411.4	100.6	6.65	1.60
3/4"	3/8"	13	995	927.8	67.2	6.75	0.88
3/8"	No. 4	8	1009	931.6	77.4	7.67	0.61
Totals		70					4.9

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Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP10	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 3.50 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		8					
No. 50	No. 100	1	101				0.38
No. 30	No. 50	7	103	97.4	5.6	5.44	0.38
No. 16	No. 30	4	100				0.38
No. 8	No. 16	3	103				0.38
No. 4	No. 8	3	100				0.38
Totals		26					1.9
Sample fraction coarser than No. 4 sieve:							
2 1/2"	1 1/2"	26	5000	4732.8	267.2	5.34	1.39
1 1/2"	3/4"	26	1500	1421.4	78.6	5.24	1.36
3/4"	3/8"	13	1005	955.9	49.1	4.89	0.64
3/8"	No. 4	9	1000	963.2	36.8	3.68	0.33
Totals		74					3.7

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP11	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 4.00 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		4					
No. 50	No. 100	5	100	93.6	6.4	6.40	0.32
No. 30	No. 50	8	100	92.7	7.3	7.30	0.58
No. 16	No. 30	18	103	94.7	8.3	8.06	1.45
No. 8	No. 16	8	101	93.2	7.8	7.72	0.62
No. 4	No. 8	5	100	93.5	6.5	6.50	0.33
Totals		48					3.3

Sample fraction coarser than No. 4 sieve:

2 1/2"	1 1/2"	15	5126	4573.5	552.5	10.78	1.62
1 1/2"	3/4"	16	1547	1347.8	199.2	12.88	2.06
3/4"	3/8"	11	1004	898.5	105.5	10.51	1.16
3/8"	No. 4	10	996	874.3	121.7	12.22	1.22
Totals		52					6.1

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP12	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 1.50 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		1					
No. 50	No. 100	5	102	91.9	10.1	9.90	0.50
No. 30	No. 50	6	100	92.7	7.3	7.30	0.44
No. 16	No. 30	6	103	93.1	9.9	9.61	0.58
No. 8	No. 16	2					0.58
No. 4	No. 8	2					0.58
Totals		22					2.7
Sample fraction coarser than No. 4 sieve:							
4 1/2"	3 1/2"	26	6110	5795.3	314.7	5.15	1.34
3 1/2"	2 1/2"	9	6250	5819.3	430.7	6.89	0.62
2 1/2"	1 1/2"	3					1.04
1 1/2"	3/4"	21	1502	1397.2	104.8	6.98	1.47
3/4"	3/8"	12	1000	929.8	70.2	7.02	0.84
3/8"	No. 4	7	997	955.4	41.6	4.17	0.29
Totals		78					5.6

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP13
Depth : 1.50 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		2					
No. 50	No. 100	6	101	90.9	10.1	10.00	0.60
No. 30	No. 50	7	101	91.8	9.2	9.11	0.64
No. 16	No. 30	5	100	91.8	8.2	8.20	0.41
No. 8	No. 16	3	101				0.41
No. 4	No. 8	2	102				0.41
Totals		25					2.5

Sample fraction coarser than No. 4 sieve:

2 1/2"	1 1/2"	42	5087	4798.6	288.4	5.67	2.38
1 1/2"	3/4"	17	1512	1405.1	106.9	7.07	1.20
3/4"	3/8"	10	991	927.5	63.5	6.41	0.64
3/8"	No. 4	6	1002	938.1	63.9	6.38	0.38
Totals		75					4.6

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Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP13	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 3.50 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		8					
No. 50	No. 100	5	100	90.6	9.4	9.40	0.47
No. 30	No. 50	12	103	91.5	11.5	11.17	1.34
No. 16	No. 30	10	101	96.5	4.5	4.46	0.45
No. 8	No. 16	4	101				0.45
No. 4	No. 8	2	100				0.45
Totals		41					3.1
Sample fraction coarser than No. 4 sieve:							
2 1/2"	1 1/2"	21	5125	4598.7	526.3	10.27	2.16
1 1/2"	3/4"	15	1496	1316.7	179.3	11.99	1.80
3/4"	3/8"	14	1003	921.6	81.4	8.12	1.14
3/8"	No. 4	9	996	907.8	88.2	8.86	0.80
Totals		59					5.9

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP14
Depth : 3.40 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		2					
No. 50	No. 100	5	101	91.1	9.9	9.80	0.49
No. 30	No. 50	6	100	90.7	9.3	9.30	0.56
No. 16	No. 30	6	101	90.8	10.2	10.10	0.61
No. 8	No. 16	2	100				0.61
No. 4	No. 8	3	100				0.61
Totals		24					2.9
Sample fraction coarser than No. 4 sieve:							
7 1/2"	4 1/2"	30	6047	5652.1	394.9	6.53	1.96
4 1/2"	3 1/2"	12	6115	5697.5	417.5	6.83	0.82
3 1/2"	2 1/2"	3					0.58
2 1/2"	1 1/2"	6	5048	4758.3	289.7	5.74	0.34
1 1/2"	3/4"	12	1493	1397.2	95.8	6.42	0.77
3/4"	3/8"	8	1002	936.7	65.3	6.52	0.52
3/8"	No. 4	5	999	932.4	66.6	6.67	0.33
Totals		76					5.3

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Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP15
Depth : 1.80 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		2					
No. 50	No. 100	4					0.25
No. 30	No. 50	8	101	97.8	3.2	3.17	0.25
No. 16	No. 30	11	103	98.2	4.8	4.66	0.51
No. 8	No. 16	4	100				0.51
No. 4	No. 8	2	100				0.51
Totals		31					2.0
Sample fraction coarser than No. 4 sieve:							
4 1/2"	3 1/2"	28	6008	5678.1	329.9	5.49	1.54
3 1/2"	2 1/2"	2	6187				1.01
2 1/2"	1 1/2"	7	6247	5819.3	427.7	6.85	0.48
1 1/2"	3/4"	17	5025	4711.5	313.5	6.24	1.06
3/4"	3/8"	10	999	947.5	51.5	5.16	0.52
3/8"	No. 4	5	996	947.3	48.7	4.89	0.24
Totals		69					4.8

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Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP16
Depth : 3.50 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

Passing	Retained	Grading %	Before test g	After test g	Loss g	Actual loss %	Corrected loss %
No. 100		8					
No. 50	No. 100	5	102	96.3	5.7	5.59	0.28
No. 30	No. 50	11	100	95.6	4.4	4.40	0.48
No. 16	No. 30	12	100	95.9	4.4	4.39	0.53
No. 8	No. 16	5	100	94.6	5.5	5.49	0.27
No. 4	No. 8	4	100				0.27
Totals		45					1.8

Sample fraction coarser than No. 4 sieve:

Passing	Retained	Grading %	Before test g	After test g	Loss g	Actual loss %	Corrected loss %
7 1/2"	4 1/2"	40	6250	6015.8	234.2	3.75	1.50
4 1/2"	3 1/2"	10	6125	5871.3	253.7	4.14	0.41
3 1/2"	2 1/2"	7	6096	5819.3	276.7	4.54	0.32
2 1/2"	1 1/2"	11	4729	4621.5	107.5	2.27	0.30
1 1/2"	3/4"	8	1506	1451.6	54.4	3.61	0.29
3/4"	3/8"	4					0.29
3/8"	No. 4	2					0.29
Totals		82					3.4

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Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP17
Depth : 1.80 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
No. 100		3					
No. 50	No. 100	5	101	91.3	9.7	9.60	0.48
No. 30	No. 50	2	100				0.48
No. 16	No. 30	5	102	92.4	9.6	9.41	0.47
No. 8	No. 16	4	100				0.47
No. 4	No. 8	2	100				0.47
Totals		21					2.4

Sample fraction coarser than No. 4 sieve:

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
4 1/2"	3 1/2"	10	6315	5896.3	418.7	6.63	0.66
3 1/2"	2 1/2"	12	6011	5752.1	258.9	4.31	0.52
2 1/2"	1 1/2"	13	5209	4836.9	372.1	7.14	0.93
1 1/2"	3/4"	21	1496	1412.5	83.5	5.58	1.17
3/4"	3/8"	15	1007	932.1	74.9	7.44	1.12
3/8"	No. 4	8	993	931.6	61.4	6.18	0.49
Totals		79					4.9

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP18	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 1.00 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

No. 100		1					
No. 50	No. 100	6	101	90.9	10.1	10.00	0.60
No. 30	No. 50	4	101				0.67
No. 16	No. 30	7	104	92.9	11.1	10.67	0.75
No. 8	No. 16	2	100				0.75
No. 4	No. 8	3	100				0.75
Totals		23					3.5

Sample fraction coarser than No. 4 sieve:

4 1/2"	3 1/2"	32	6118	5714.5	403.5	6.60	2.11
3 1/2"	2 1/2"	10	6057	5748.1	308.9	5.10	0.51
2 1/2"	1 1/2"	12	5011	4751.4	259.6	5.18	0.62
1 1/2"	3/4"	10	1523	1412.5	110.5	7.26	0.73
3/4"	3/8"	7	1001	932.1	68.9	6.88	0.48
3/8"	No. 4	6	1000	915.6	84.4	8.44	0.51
Totals		77					5.0

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Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP19	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 0.40 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		1					
No. 50	No. 100	1	100				0.43
No. 30	No. 50	2	100				0.43
No. 16	No. 30	5	100	91.7	8.6	8.57	0.43
No. 8	No. 16	2	100				0.43
No. 4	No. 8	3	100				0.43
Totals		14					2.1
Sample fraction coarser than No. 4 sieve:							
2 1/2"	1 1/2"	21	5065	4811.2	253.8	5.01	1.05
1 1/2"	3/4"	29	1514	1460.9	53.1	3.51	1.02
3/4"	3/8"	23	1005	958.2	46.8	4.66	1.07
3/8"	No. 4	13	999	961.2	37.8	3.78	0.49
Totals		86					3.6

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Material Testing - Geotechnical Study

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : NTP19
Depth : 1.20 m
Source : Upstream of Bisri Dam
Sampled by : Assaco

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		5					
No. 50	No. 100	5	100	95.1	5.1	5.09	0.25
No. 30	No. 50	15	100	94.6	5.4	5.40	0.81
No. 16	No. 30	13	100	95.7	4.6	4.59	0.60
No. 8	No. 16	4	100				0.60
No. 4	No. 8	3	100				0.60
Totals		45					2.9
Sample fraction coarser than No. 4 sieve:							
2 1/2"	1 1/2"	16	4856	4398.6	457.4	9.42	1.51
1 1/2"	3/4"	18	1493	1357.2	135.8	9.10	1.64
3/4"	3/8"	13	997	902.5	94.5	9.48	1.23
3/8"	No. 4	8	1002	908.3	93.7	9.35	0.75
Totals		55					5.1

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP20	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 0.80 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						

Sample fraction finer than No. 4 sieve:

No. 100		2					
No. 50	No. 100	4	103				0.38
No. 30	No. 50	11	101	97.5	3.5	3.47	0.38
No. 16	No. 30	13	101	96.9	4.1	4.06	0.53
No. 8	No. 16	8	102	97.3	4.7	4.61	0.37
No. 4	No. 8	3	100				0.37
Totals		41					2.0

Sample fraction coarser than No. 4 sieve:

2 1/2"	1 1/2"	16	5008	4587.6	420.4	8.39	1.34
1 1/2"	3/4"	17	1506	1416.8	89.2	5.92	1.01
3/4"	3/8"	15	1000	917.8	82.2	8.22	1.23
3/8"	No. 4	11	1002	938.7	63.3	6.32	0.69
Totals		59					4.3

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP21	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 3.50 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		7					
No. 50	No. 100	3	100				0.82
No. 30	No. 50	8	102	91.6	10.4	10.20	0.82
No. 16	No. 30	7	101	91.8	9.2	9.11	0.64
No. 8	No. 16	5	102	93.5	8.5	8.33	0.42
No. 4	No. 8	2	100				0.42
Totals		32					3.1
Sample fraction coarser than No. 4 sieve:							
2 1/2"	1 1/2"	22	5109	4698.7	410.3	8.03	1.77
1 1/2"	3/4"	19	1523	1396.4	126.6	8.31	1.58
3/4"	3/8"	18	1000	926.5	73.5	7.35	1.32
3/8"	No. 4	9	1000	911.4	88.6	8.86	0.80
Totals		68					5.5

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP22	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 1.00 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained	Weight of test fraction before test	Weight of test fraction after test	Loss in weight after test	Actual loss after test in percent	Corrected weighted percent loss
Passing	Retained	%	g	g	g	%	%

Sample fraction finer than No. 4 sieve:

No. 100		1					
No. 50	No. 100	1	103				0.48
No. 30	No. 50	5	100	90.5	9.5	9.50	0.48
No. 16	No. 30	3	101				0.48
No. 8	No. 16	2	100				0.48
No. 4	No. 8	3	100				0.48
Totals		15					2.4

Sample fraction coarser than No. 4 sieve:

4 1/2"	3 1/2"	30	6118	5813.6	304.4	4.98	1.49
3 1/2"	2 1/2"	11	6057	5763.1	293.9	4.85	0.53
2 1/2"	1 1/2"	15	5011	4763.5	247.5	4.94	0.74
1 1/2"	3/4"	13	1523	1456.2	66.8	4.39	0.57
3/4"	3/8"	10	1001	956.8	44.2	4.42	0.44
3/8"	No. 4	6	1000	944.8	55.2	5.52	0.33
Totals		85					4.1

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Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: NTP23	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 1.50 m	**Solution Temperature °C**	: 20
Source	: Upstream of Bisri Dam	**Number of cycles**	: 5
Sampled by	: Assaco	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
Sample fraction finer than No. 4 sieve:							
No. 100		1					
No. 50	No. 100	1	100				0.53
No. 30	No. 50	5	101	90.2	10.8	10.69	0.53
No. 16	No. 30	2	100				0.53
No. 8	No. 16	2	100				0.53
No. 4	No. 8	2	100				0.53
Totals		13					2.7
Sample fraction coarser than No. 4 sieve:							
7 1/2"	4 1/2"	20	6074	5847.1	226.9	3.74	0.75
4 1/2"	3 1/2"	5	6133	5911.1	221.9	3.62	0.18
3 1/2"	2 1/2"	15	6231	5996.5	234.5	3.76	0.56
2 1/2"	1 1/2"	22	4918	4725.6	192.4	3.91	0.86
1 1/2"	3/4"	13	1526	1466.8	59.2	3.88	0.50
3/4"	3/8"	7	1002	961.2	40.8	4.07	0.29
3/8"	No. 4	5	996	959.4	36.6	3.67	0.18
Totals		87					3.3

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Determination of Organic Content in Soils by Loss On Ignition

AASHTO DESIGNATION T 267-86 (1993)

Sample No.	Sample Depth (m)	A	B	C	Percent Organic Matter, %
NTP9	0.70	80.08	79.75	40.02	0.8
	2.00	80.06	79.69	40.65	0.9
NTP10	2.00	80.15	79.59	39.80	1.4
	3.50	45.41	45.02	16.30	1.3
NTP11	1.70	45.17	44.79	16.73	1.3
	4.00	41.60	41.30	16.70	1.2
NTP12	1.50	80.04	79.58	39.80	1.1
	3.00	80.32	79.92	40.65	1.0
NTP13	1.50	80.28	79.74	40.04	1.3
	3.50	42.28	42.07	16.30	0.8
NTP14	1.40	40.80	40.49	16.71	1.3
	3.40	42.96	42.61	16.70	1.3
NTP15	1.80	44.61	44.29	16.70	1.1

A = Weight of crucible or evaporating dish and oven dried soil, before ignition, in g.
B = Weight of crucible or evaporating dish and oven dried soil, after ignition, in g.
C = Weight of crucible or evaporating dish,to the nearest 0.01 g.
Percent Organic Matter = (A-B)/(A-C)*100

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Determination of Organic Content in Soils by Loss On Ignition

AASHTO DESIGNATION T 267-86 (1993)

Sample No.	Sample Depth (m)	A	B	C	Percent Organic Matter, %
NTP16	1.70	44.76	44.43	16.71	1.2
	3.50	66.26	65.77	40.04	1.9
NTP17	1.80	65.71	65.25	40.67	1.8
NTP18	1.00	66.00	65.64	39.81	1.4
NTP19	0.40	41.80	41.37	16.3	1.7
	1.20	41.70	41.05	16.72	2.6
NTP20	0.80	40.65	40.36	16.70	1.2
NTP21	1.50	63.09	62.87	40.04	1.0
	3.50	64.85	64.51	40.67	1.4
NTP22	1.00	61.25	60.97	39.81	1.3
NTP23	1.50	35.00	34.73	16.30	1.4

A = Weight of crucible or evaporating dish and oven dried soil, before ignition, in g.
B = Weight of crucible or evaporating dish and oven dried soil, after ignition, in g.
C = Weight of crucible or evaporating dish,to the nearest 0.01 g.
Percent Organic Matter = (A-B)/(A-C)*100

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14

Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

ASTM Designation C289

Sample I.D.	Depth m	Dissolved Silica S_C mmoles/l	Reduction in Alkalinity R_C mmoles/l
NTP9	2.00	1	180
NTP10	2.00	3	230
NTP11	4.00	1	170
NTP12	1.50	4	250
NTP13	1.50	5	260
NTP14	3.40	4	260
NTP15	1.80	3	240
NTP16	3.50	5	280
NTP17	1.80	5	260
NTP18	1.00	6	270
NTP19	0.40	5	270
NTP20	0.80	2	200
NTP21	3.50	1	220
NTP23	1.50	4	280

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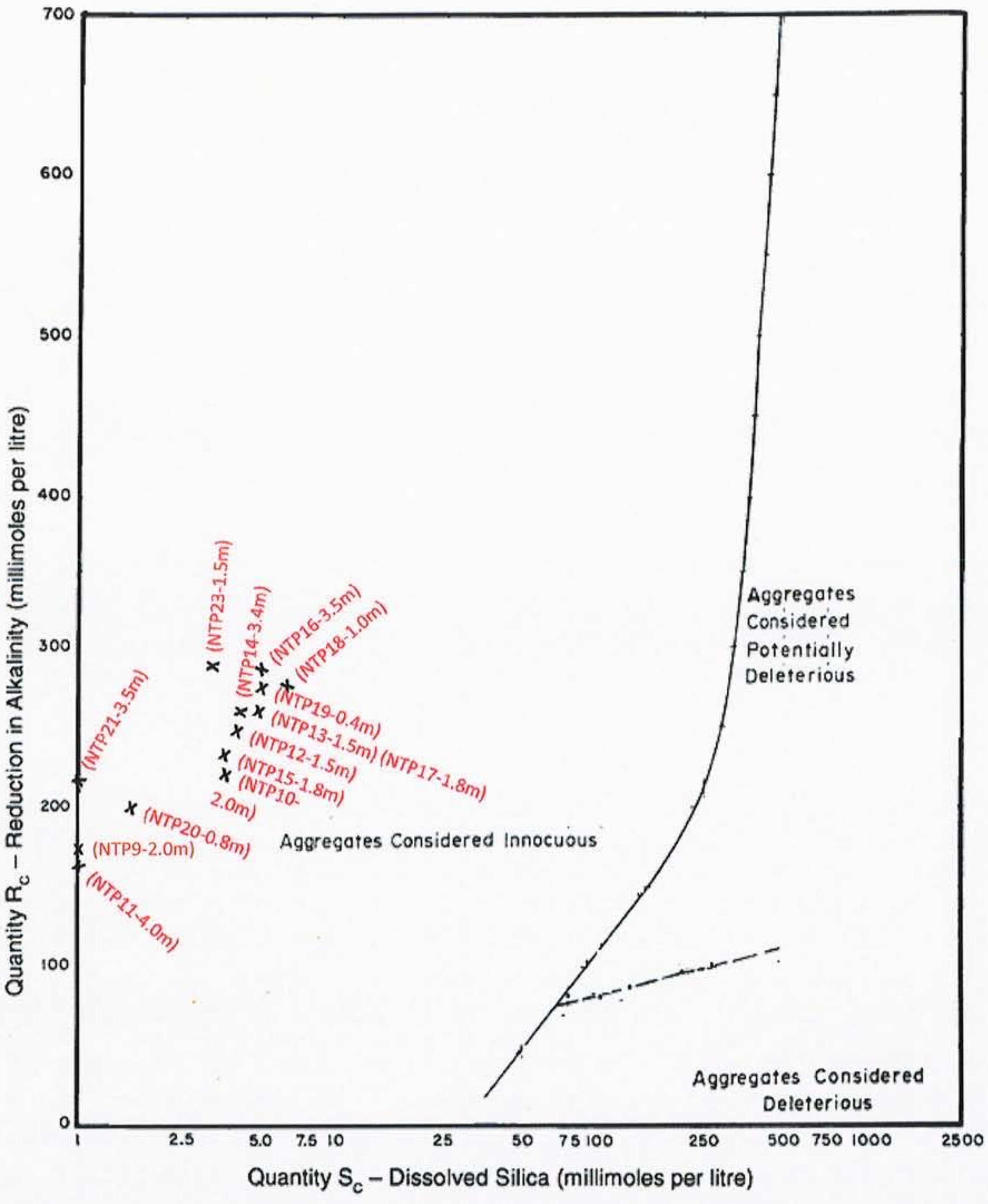
Project : Bisri Dam
Location : Upstream of the Dam, SAND and GRAVEL Material Sources
Date : 31/10/14



Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

APPENDIX 3. ROCK MATERIAL SOURCES (LABORATORY TEST RESULTS - LEBANON, EXCEPT WETTING-DRYING LOSS)

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

TEST DATA SUMMARY ROCK - ASTM Designations C88, C97, C289, C131, D2938, D4373, D4644, D4972, D5313, D5731

Sample ID	Depth m	Unit weight dry g/cm³	Unit weight saturated g/cm³	U.C.S. Dry kg/cm²	U.C.S. Saturated kg/cm²	Water Absorption %	$MgSO_4$ Soundness %	Los Angeles abrasion %	AAR	
									S_C mmol/l	R_C mmol/l
BHRQ8	6.00 - 9.30	2.671	2.695	1325	723	1.34	4.1	26	7	310
BHRQ6	3.00 - 6.00	2.707	2.739	1185	775	0.58	3.4	23	-	-
	13.50 - 16.80	2.653	2.666	921	872	0.53	2.9	26	6	280
BHRQ5	1.50 - 4.50	2.525	2.549	555	342	3.57	5.9	28	4	270
BHRQ4	10.50 - 14.00	2.609	2.636	829	561	1.89	3.6	25	-	-
BHRQ3	4.50 - 7.80	2.642	2.661	781	494	1.88	3.2	26	5	270
BHRQ1	12.00 - 16.00	2.605	2.630	962	801	0.43	3.0	25	-	-
EV10	22.50 - 30.00	2.652	2.684	1124	886	1.58	4.4	27	6	290

N.B.: Alkali Aggregate Reaction AAR tests were carried out as per ASTM C289 (Chemical method).

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 05/11/14

COMPRESSIVE STRENGTH OF ROCK CORES -DRY
ASTM Designation C170 - 90

Borehole No.	Depth m	Dimensions Diam cm	Dimensions Height cm	Area cm^2	Dry weight g	Unit weight dry g/cm^3	Load Kg	U.C.S. dry kg/cm^2
BHRQ8	6.00 - 9.30	6.2	13.0	30.2	1048.12	2.671	40003	1325
BHRQ6	3.00 - 6.00	6.7	12.8	35.3	1221.56	2.707	41767	1185
	13.50 - 16.80	6.7	13.0	35.3	1215.87	2.653	32457	921
BHRQ5	1.50 - 4.50	6.7	10.7	35.3	952.41	2.525	19558	555
BHRQ4	10.50 - 14.00	6.7	11.3	35.3	1039.60	2.609	29235	829
BHRQ3	4.50 - 7.80	6.7	12.8	35.3	1192.35	2.642	27532	781
BHRQ1	12.00 - 16.00	6.7	13.3	35.3	1221.58	2.605	33905	962
EV10	22.50 - 30.00	6.7	13.4	35.3	1252.92	2.652	39646	1124

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 05/11/14

COMPRESSIVE STRENGTH OF ROCK CORES - SATURATED

ASTM Designation C170 - 90

Borehole No.	Depth m	Dimensions Diam cm	Dimensions Height cm	Area cm^2	Saturated weight g	Unit weight saturated g/cm^3	Load Kg	U.C.S. saturated kg/cm^2
BHRQ8	6.00 - 9.30	6.2	13.0	30.2	1057.86	2.695	21842	723
BHRQ6	3.00 - 6.00	6.7	11.2	35.3	1081.42	2.739	27338	775
	13.50 - 16.80	6.7	13.0	35.3	1221.83	2.666	30744	872
BHRQ5	1.50 - 4.50	6.7	13.0	35.3	1168.19	2.549	12053	342
BHRQ4	10.50 - 14.00	6.7	10.3	35.3	957.41	2.636	19792	561
BHRQ3	4.50 - 7.80	6.7	12.7	35.3	1191.34	2.661	17416	494
BHRQ1	12.00 - 16.00	6.7	11.9	35.3	1103.40	2.630	28225	801
EV10	22.50 - 30.00	6.7	7.2	35.3	681.20	2.684	31244	886

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : BHRQ8
Depth : 6.00 - 9.30 m
Source : Bisri - Potential Rock Material Sources
Sampled by : Client

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

2 1/2"	1 1/2"						
1 1/2"	3/4"	29	1459.7	1399.0	60.7	4.16	1.21
3/4"	3/8"	42	991.6	955.7	35.9	3.62	1.52
3/8"	No. 4	29	298.1	284.1	14.0	4.70	1.36
Totals		100					4.1

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : BHRQ6
Depth : 3.00 - 6.00 m
Source : Bisri - Potential Rock Material Sources
Sampled by : Client

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
2 1/2"	1 1/2"						
1 1/2"	3/4"	38	1503.2	1452.8	50.4	3.35	1.27
3/4"	3/8"	32	996.3	956.2	40.1	4.02	1.29
3/8"	No. 4	30	305.6	297.3	8.3	2.72	0.81
Totals		100					3.4

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Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : BHRQ6
Depth : 13.50 - 16.80 m
Source : Bisri - Potential Rock Material Sources
Sampled by : Client

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

2 1/2"	1 1/2"						
1 1/2"	3/4"	31	1496.3	1463.5	32.8	2.19	0.68
3/4"	3/8"	41	1002.6	978.9	23.7	2.36	0.97
3/8"	No. 4	28	297.4	284.6	12.8	4.30	1.21
Totals		100					2.9

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Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: BHRQ5	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 1.50 - 4.50 m	**Solution Temperature °C**	: 20
Source	: Bisri - Potential Rock Material Sources	**Number of cycles**	: 5
Sampled by	: Client	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
2 1/2"	1 1/2"						
1 1/2"	3/4"	28	1512.1	1422.9	89.2	5.90	1.65
3/4"	3/8"	39	961.8	915.0	46.8	4.87	1.90
3/8"	No. 4	33	302.4	280.7	21.7	7.18	2.37
Totals		100					5.9

Head of laboratory section

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Material Testing - Geotechnical Study

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: BHRQ4	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 10.50 - 14.00 m	**Solution Temperature °C**	: 20
Source	: Bisri - Potential Rock Material Sources	**Number of cycles**	: 5
Sampled by	: Client	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

Passing	Retained	Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
2 1/2"	1 1/2"						
1 1/2"	3/4"	38	1485.6	1416.8	68.8	4.63	1.76
3/4"	3/8"	32	974.1	933.4	40.7	4.18	1.34
3/8"	No. 4	30	291.7	287.2	4.5	1.54	0.46
Totals		100					3.6

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Client : **M/S Dar Al Handasah Nazih Taleb & Partners**
Project : **Bisri Dam**
Location : **Potential Rock Material Sources**
Date : **06/11/14**

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: BHRQ3	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 4.50 - 7.80 m	**Solution Temperature °C**	: 20
Source	: Bisri - Potential Rock Material Sources	**Number of cycles**	: 5
Sampled by	: Client	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

2 1/2"	1 1/2"						
1 1/2"	3/4"	36	1506.7	1451.0	55.7	3.70	1.33
3/4"	3/8"	35	977.3	947.8	29.5	3.02	1.06
3/8"	No. 4	29	296.4	288.1	8.3	2.80	0.81
Totals		100					3.2

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D : BHRQ1
Depth : 12.00 - 16.00 m
Source : Bisri - Potential Rock Material Sources
Sampled by : Client

(Sod. / Mag.) Sulfate : Magnesium Sulfate
Solution Temperature °C : 20
Number of cycles : 5
Immersion hours / cycle : 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

2 1/2"	1 1/2"						
1 1/2"	3/4"	38	1511.2	1473.4	37.8	2.50	0.95
3/4"	3/8"	33	986.9	955.7	31.2	3.16	1.04
3/8"	No. 4	29	300.4	290.4	10.0	3.33	0.97
Totals		100					3.0

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Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 06/11/14

Soundness Of Aggregate Test

AASHTO T104 - 86
ASTM C88 - 83

Sample I.D	: EV10	**(Sod. / Mag.) Sulfate**	: Magnesium Sulfate
Depth	: 22.50 - 30.00 m	**Solution Temperature °C**	: 20
Source	: Bisri - Potential Rock Material Sources	**Number of cycles**	: 5
Sampled by	: Client	**Immersion hours / cycle**	: 16

Sieve Size		Grading of original sample retained %	Weight of test fraction before test g	Weight of test fraction after test g	Loss in weight after test g	Actual loss after test in percent %	Corrected weighted percent loss %
Passing	Retained						
No. 100							
No. 50	No. 100						
No. 30	No. 50						
No. 16	No. 30						
No. 8	No. 16						
No. 4	No. 8						
Totals							

2 1/2"	1 1/2"						
1 1/2"	3/4"	26	1476.1	1415.6	60.5	4.10	1.07
3/4"	3/8"	44	1000.8	954.1	46.7	4.67	2.05
3/8"	No. 4	30	291.3	278.9	12.4	4.26	1.28
Totals		100					4.4

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ8 - 6.00 - 9.30 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A
No. of revolutions	: 500
No. of spheres	: 12
Separating sieve	: No. 12

Total weight of sample	5000
Final weight (retained on No.12 sieve)	3689
Abrasion value (%)	**26**

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Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ6 3.00 - 6.00 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3854
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**23**

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Date : 07/11/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ6 13.50 - 16.80 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3715
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**26**

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Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ5 1.50 - 4.50 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3624
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**28**

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Project : **Bisri Dam**
Location : **Potential Rock Material Sources**
Date : **07/11/14**

Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ4 10.50 - 14.00 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3775
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ3 4.50 - 7.80 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A
No. of revolutions	: 500
No. of spheres	: 12
Separating sieve	: No. 12

Total weight of sample	5000
Final weight (retained on No.12 sieve)	3709
Abrasion value (%)	**26**

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Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test

ASTM C 131 - 89

Sample No.

Sample I.D.	:	BHRQ1 12.00 - 16.00 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3764
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**25**

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 07/11/14

Los Angeles Abrasion Test
ASTM C 131 - 89

Sample No.

Sample I.D.	:	EV10 22.50 - 30.00 m
Source	:	Bisri
Sampling date	:	-
Sampled by	:	Assaco

Sieve Size, mm (in.)		Grading			
Passing	Retained On	A	B	C	D
37.5 (11/2)	25.0 (1)	1250 ± 25			
25.0 (1)	19.0(3/4)	1250 ± 25			
19.0(3/4)	12.5(1/2)	1250 ± 10	2500 ± 10		
12.5(1/2)	9.5(3/8)	1250 ± 10	2500 ± 10		
9.5(3/8)	6.3(1/4)			2500 ± 10	
6.3(1/4)	4.75(No.4)			2500 ± 10	
4.75(No.4)	2.36(No.8)				5000 ± 10
Total		5000 ± 10	5000 ± 10	5000 ± 10	5000 ± 10

Grading type	: A	Total weight of sample	5000
No. of revolutions	: 500	Final weight (retained on No.12 sieve)	3657
No. of spheres	: 12		
Separating sieve	: No. 12	**Abrasion value (%)**	**27**

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Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 05/11/14

Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

ASTM Designation C289

Sample I.D.	Depth m	Dissolved Silica S_C mmoles/l	Reduction in Alkalinity R_C mmoles/l
BHRQ8	6.00 - 9.30	7	310
BHRQ6	13.50 - 16.80	6	280
BHRQ5	1.50 - 4.50	4	270
BHRQ3	4.50 - 7.80	5	270
EV10	22.50 - 30.00	6	290

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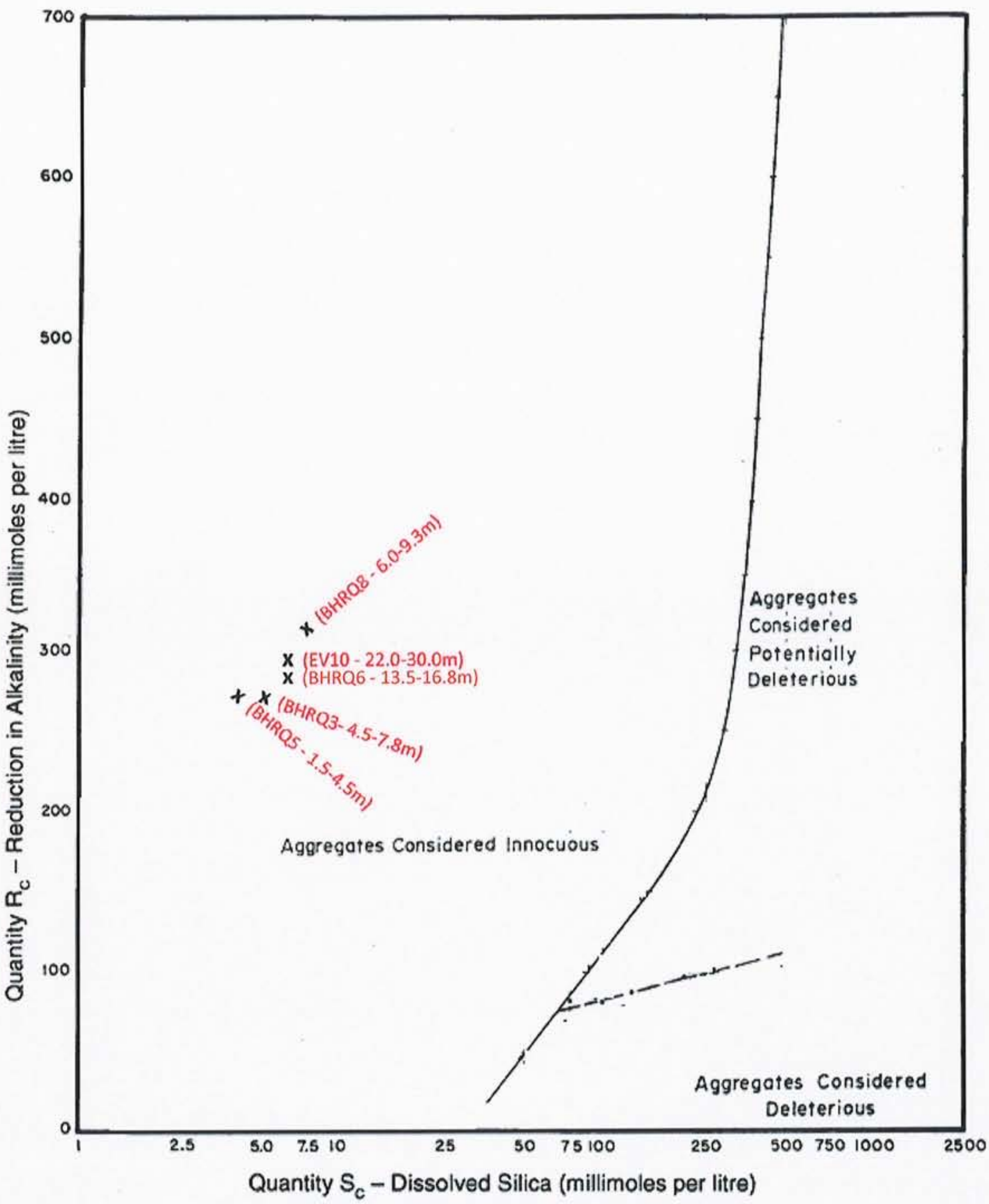
Client : M/S Dar Al Handasah Nazih Taleb & Partners
Project : Bisri Dam
Location : Potential Rock Material Sources
Date : 05/11/14



Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

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