

APPENDIX D-5

Laboratory Tests

D-5 Laboratory Tests

1 Aggregate Tests for Dirout Construction

The aggregate tests for the New Dirout Group of Regulators are as follows:

- (1) Preliminary test by CRI (Construction Research Institute)
- (2) Preliminary test by Cairo University
- (3) Aggregate tests by CRI (Construction Research Institute)
- (4) Additional tests by HBRC (Housing and Building National Research Center)
- (5) Second tests by HBRC (Housing and Building National Research Center)
- (6) Second test by Cairo University

The quarry sites for the test samples are three, Assuit, Dirout and Minia and coarse and fine aggregates are collected as the samples. The laboratory which performs the aggregate tests was CRI at first but CRI could not perform Alkali-silica reactivity test and the results of chlorides test are all higher more than the standard value. Then the laboratory was changed to HBRC and Cairo University.

The second test by HBRC and Cairo University finished on March 2017.

1-1 Quarry Site

The Quarry sites of sampling for laboratory tests are three locations, Dirout, Minia and Assuit.

(1) Minia Quarry Site

The constructions of the Minya stadium use coarse aggregate and fine aggregate. The coarse aggregates are brought from the Dirout quarry site and the fine aggregate are brought from the Minya quarry site. The location of the Minya quarry site is the north area of Minya city and 100 km from Dirout construction site as shown at Figure 1-4.



Figure 1-1 Minya Quarry Site



Figure 1-2 Location Map of Minia and Dirout Quarry Sites

(2) Dirout Quarry Site

The Dirout quarry site is located at Dashlut and the distance from the New Dirout Group of Regulators is approximately 30 km. This quarry site is managed by a private company and has the sand and gravel in alternate layer. The company excavates directly at the exposed sand and gravel layer and screen the excavated materials by machine, then it can provide the aggregate and sand for concrete materials



Figure 1-3 Quarry Site and Aggregate



Figure 1-4 Sand and Screening Machine



Figure 1-5 Sand and Gravel Layer



Figure 1-6 Location Map of Dirout Quarry Site

(3) Assuit Quarry Site

There are two quarry sites of the aggregates, the quarry site No.1 is located 28 km East from the Assuit Barrage site (is located 85 km from Dirout Regulators site) and the quarry site No.2 is located 20 km South from the Assuit Barrage site (is located 85 km from Dirout Regulators site, too).

The coarse aggregates are used from the quarry site No.1 and the fine aggregates are used the combined materials which mixed the fine aggregates of the quarry site No.1 with the quarry site No.2.



Figure 1-7 Quarry Site No.1, No.2

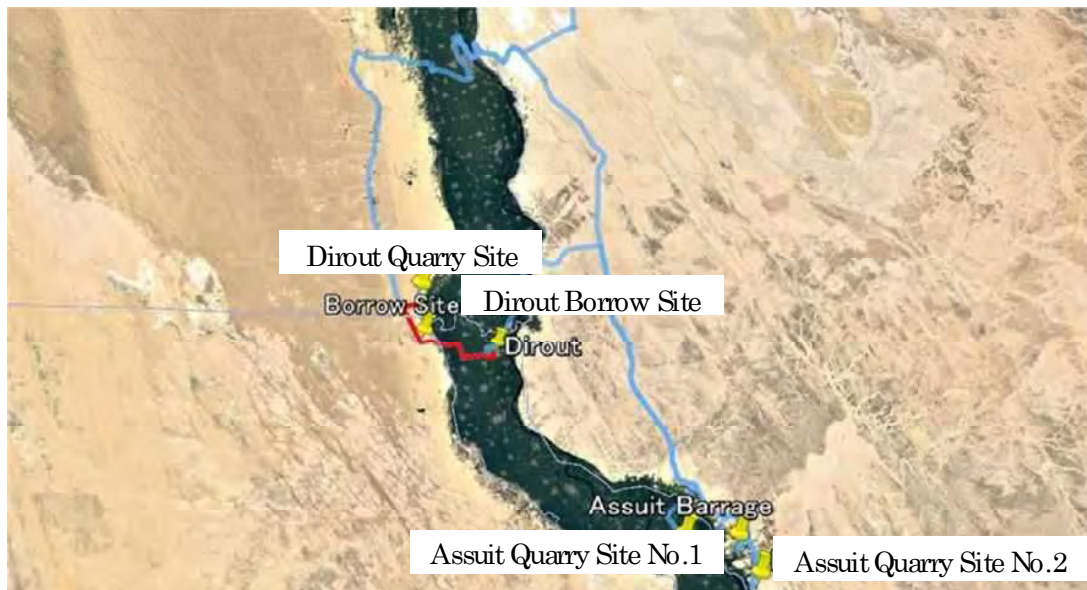


Figure 1-8 Location Map of Dirout and Assuit Quarry Sites

1-2 Preliminary Test by CRI (April 2016)

Collected 3 test samplings at Borrow site 1 of Dirout

Specific gravity Fine aggregate 2.52
 Coarse aggregate 2.76, 2.51

Bulk density Fine aggregate 1.63
(t/m^3) Coarse aggregate 1.57, 1.57

Absorption Fine aggregate 2.28
 (%) Coarse aggregate 0.78, 0.69

1-3 Preliminary Test by Cairo University (April 2016)

Specific gravity Fine aggregate 2.577
 Coarse aggregate 2.556, 2.507

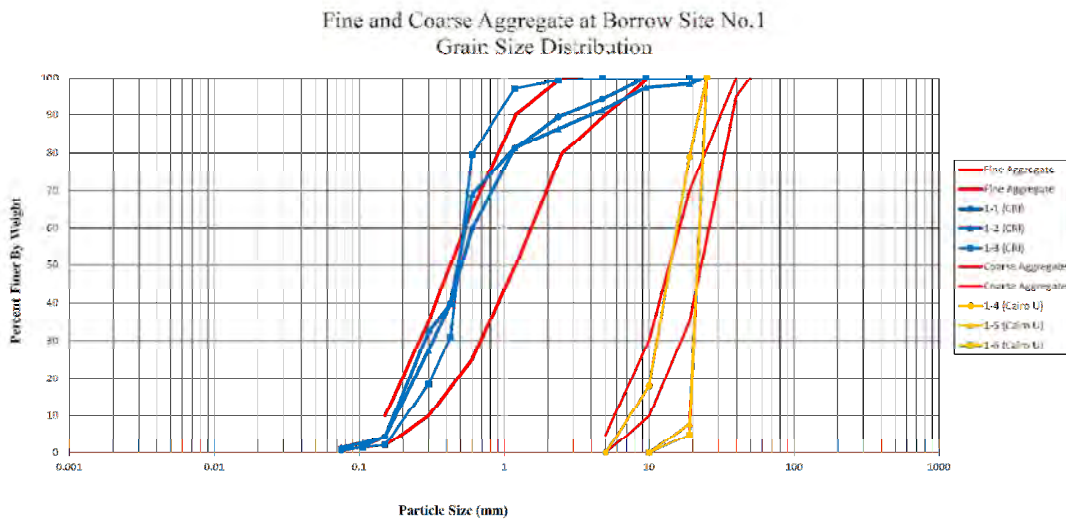
Bulk density Fine aggregate 1.538
 (loose, t/m³) Coarse aggregate 1.530, 1.587

Bulk density Fine aggregate 1.685
 (dense, t/m³) Coarse aggregate 1.667, 1.747

Absorption Fine aggregate 0.442
 Coarse aggregate 0.167, 0.235

Salt content 0.039 < 0.06 Cl⁻ Chlorides
 0.007 < 0.4 SO₃ Sulfates

Figure 3-1 Grain Size Distribution of Preliminary Tests



1-4 Aggregate Test by CRI (October 2016)

We, the Consultants collected the samplings at Assuit and Dirout borrow site.

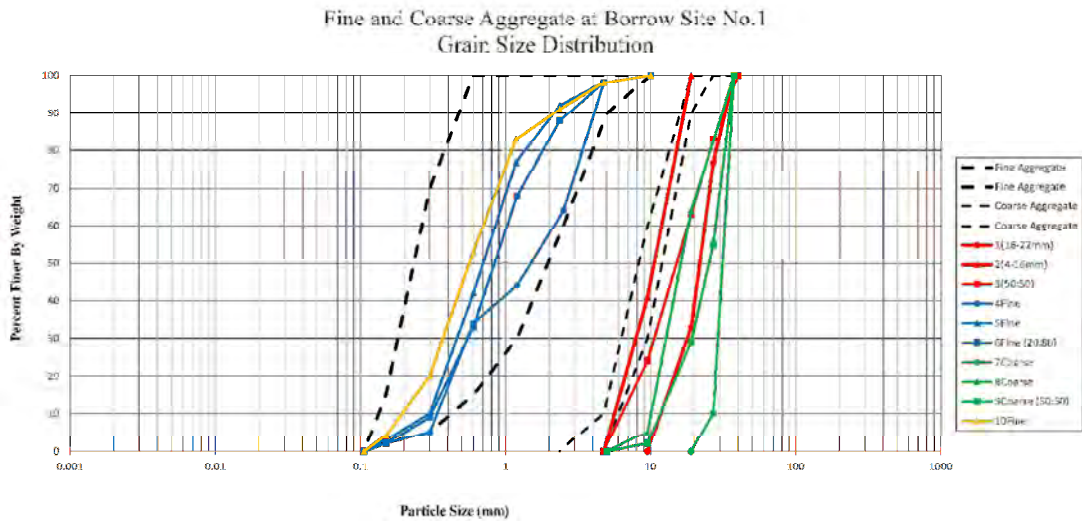
The test results are as follows. We asked CRI to perform the tests including both salt content test and alkali-silica activity test but CRI did not perform them. Then we asked to perform both tests again and we obtained the results of the salt contain tests which are all large values so much. We request the additional one salt contain test and the result is also large values.

Table 4-1 Test Results by CRI ○: good, △: ?, ×: no good

Location	No.	Aggregate	Bulk density (g/cm ³)	Specific gravity	Absorption (%)	Abrasion (%)	Water content (%)	Cl ⁻ (%)	Standard value	
Assuit	1	Coarse	1.57	2.50	1.03	18.0	0.4	0.26	>0.04	×
	2	Coarse	1.66	2.57	0.98	17.76	1.0	0.217	>0.04	×
	3	Mixed	1.62	2.60	0.83	16.80	0.4	0.35	>0.06	×
	4	Fine	1.47	2.66	0.4		0.3	0.409	>0.06	×
	5	Fine	1.61	2.30	2.04			0.075	>0.06	×
	6	Mixed						0.639	>0.06	×
Dirout	7	Coarse	1.54	2.43	0.01	24.00	0.13	0.062	>0.04	×
	8	Coarse	1.58	2.46	0.18	19.20	0.0	0.106	>0.04	×
	9	Mixed	1.55	2.52	0.16	13.6	0.8	0.071	>0.06	×
	10	Fine	1.61	2.52	1.83			0.213	>0.06	×

* Chlorides value (Cl⁻) of No.4 sample was 2.84 % at first and the additional test result was 0.409. The other test values would also be reduced, if the additional tests were performed.

Figure 4-1 Grain Size Distribution of Aggregate Test by CRI



1-5 HBRC Test (Housing & Building National Research Center) (December 2016)

According to the aggregate tests by CRI, we judged that salt content test and alkali-silica activity test were unreliable and we asked the additional aggregate test to perform by HBRC. We used the two samples which were remained in CRI laboratory after all test finished and were from Assuit borrow site. The test results of the salt contain were less than standard values and the alkali-silica activity tests were larger than standard values a little.

The test results are as follow's table:

Table 5-1 Test Results by HBRC

Location	No.	Aggregate	Cl ⁻ (%)	Standard Value (%)	SO ₃ (%)	Standard Value (%)	Alkali-silica activity test (%)	Standard Value (%)
Assuit	1	Coarse	0.018	<0.04	0.047	<0.4	0.249	>0.1
	2	Coarse	0.035	<0.04	0.139	<0.4	0.110	>0.1

1-6 Second Aggregate Test by HBRC and Cairo University (March 2017)

We asked HBRC and Cairo University to perform the aggregate tests of Assuit, Dirout and Minia borrow sites.

Figure 6-1 Grain Size Distribution of Second Aggregate Test

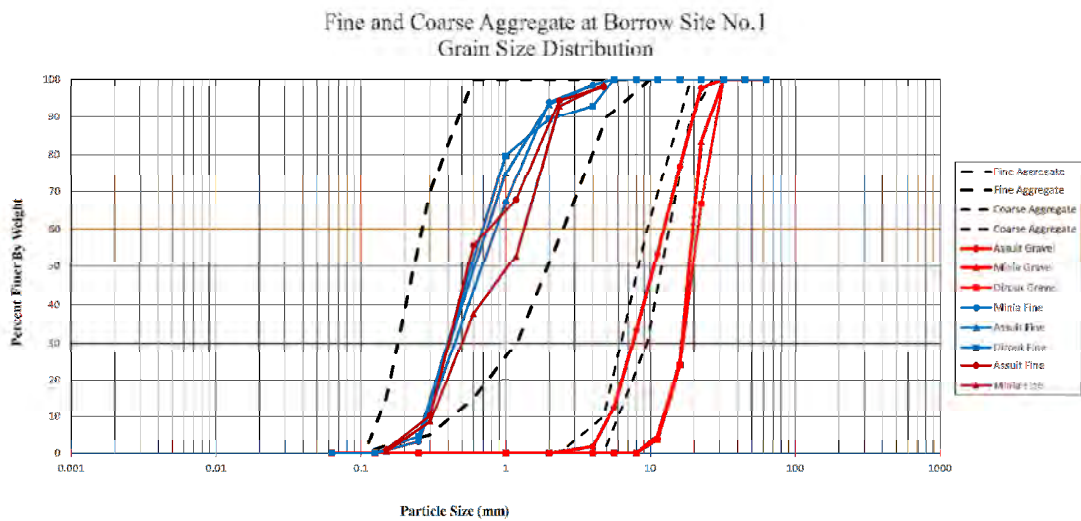


Table 6-1 Test Results of Second Aggregate Tests

Location	Aggregate	Absorption (%)	Cl ⁻ (%)	Standard value (%)	SO ₃ (%)	Standard value (%)	Alkali-silica activity test (%)	Laboratory
Assuit	Coarse	1.0	0.020	<0.04○	0.009	<0.4○	0.341>0.1×	HBRC
	Fine		0.054	<0.06○	0.173	<0.4○		HBRC
	Fine		0.058	<0.06○	0.014	<0.4○		Cairo Univ.
Dirout	Coarse	0.16	0.006	<0.04○	0.007	<0.4○	0.076<0.1○	HBRC
	Fine		0.099	>0.06×	0.036	<0.4○		HBRC
Minia	Coarse	0.16	0.026	<0.04○	0.011	<0.4○	0.098<0.1○	HBRC
	Fine		0.019	<0.06○	0.079	<0.4○		HBRC
	Fine		0.049	<0.06○	0.006	<0.4○		Cairo Univ.

○: good, △: ?, ×: no good

1-7 Conclusion

We conclude the test results from the Assuit, Dirout and Minia borrow sites as follows:

- a) All of three borrow sites are located at west side of Nile river and the borrow sites exist in sand area.
- b) The layers at the borrow sites consist from the deposits by Nile river and have sand and gravel in alternate layer. Assuit area has two borrow sites, one is for coarse aggregate and the other is for fine aggregate. Minia area has one borrow site for fine aggregate and coarse aggregate is brought from Dirout borrow site.
- c) The quarry company of each borrow site excavates and selects aggregate by machine.
- d) The grain size distributions of sand and gravel at three borrow sites are not different from each other and the values of chlorides are different from each other, because the location of limestone under sand and gravel layer.

The following materials can be used for construction by the test results. At Dirout borrow site, the coarse aggregate can be used but fine aggregate cannot be used because the value of chlorides is large a little and rust inhibitor equipment needs, if fine aggregate use. At Assuit borrow site, fine aggregate can be used and coarse aggregate cannot be used. At Minia borrow site, both coarse and fine aggregates can be used and coarse aggregate is brought from Dirout.

Table 7-1 Aggregate at Borrow Sites

Location	Aggregate	Chbrides	Alkalir'silica activity test	Remark
Assuit	Coarse	○	×	disable
	Fine	○		enable
Dirout	Coarse	○	○	enable
	Fine	△		Enable with rust inhibitor
Minia	Coarse	○	○	enable
	Fine	○		enable

○: good, △: ?, ×: no good

1-8 Test Data

1. Preliminary test by CRI 9
2. Preliminary test by Cairo University 17
3. Aggregate test by CRI 24
4. Additional test by HBRC 47
5. Second test by HBRC 60
6. Second test by Cairo University 87
- 7.

1. Preliminary test by GRI

Aggregates and soil Tests for the New Dirout Group of Regulators
(Specific Gravity)

Site No.	Sample No.	Volume of water (cm ³)	total volume (cm ³)	dry weight (gm)	Soil Volume (cm ³)	Specific Gravity
1	1a	70.00	89.00	47.99	19.00	2.52
	1b	70.00	89.00	47.82	19.00	
	1c	70.00	89.00	47.71	19.00	
	2a	70.00	87.00	47.76	17.00	2.76
	2b	70.00	88.00	47.85	18.00	
	2c	70.00	87.00	47.73	17.00	
	3a	70.00	89.00	47.67	19.00	2.51
	3b	70.00	89.00	47.74	19.00	
	3c	70.00	89.00	47.76	19.00	
2	1a	70.00	88.00	47.47	18.00	2.64
	1b	70.00	88.00	47.66	18.00	
	1c	70.00	88.00	47.68	18.00	
	2a	70.00	88.00	47.87	18.00	2.66
	2b	70.00	88.00	47.79	18.00	
	2c	70.00	88.00	47.75	18.00	

Aggregates and soil Tests for the New Dirout Group of Regulators
(The bulk density)

No.	Sample code	γ (t/m ³)
1	Fine Agg. (8-28 mm) sample(1)	1.63
2	Coarse Agg. (28-40 mm) sample (1)	1.57
3	Coarse Agg. (28-40 mm) sample (2)	1.57

Aggregates and soil Tests for the New Dirout Group of Regulators
(the absorption test)

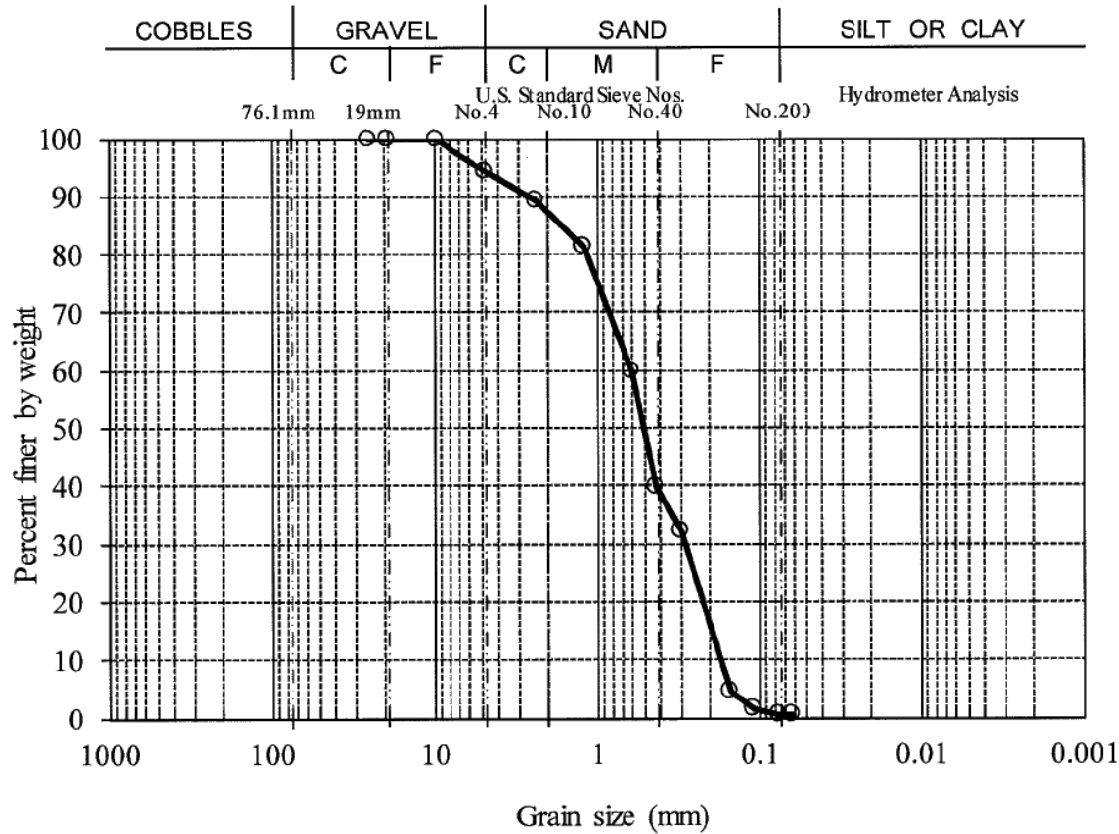
No.	Sample code	α (%)	Notes
1	Fine Agg. (8-28 mm) sample (1)	2.28	The sample contains high percentage of fines (limes, shells).
2	Coarse Agg. (28-40 mm) sample (1)	0.78	
3	Coarse Agg. (28-40 mm) sample(2)	0.69	

Grain Size Analysis

Project:
Client:

Dairout New Barrage

Site No. 1
Sample No.: 1



Sieve opening (mm)	Percent finer (%)
25	100.0
19	100.0
9.5	100.0
4.75	94.2
2.36	89.4
1.18	81.3
0.6	59.9
0.425	39.8
0.3	32.2
0.15	4.5
0.106	1.6
0.075	0.6

Gravel:	5.79 %
Sand:	80.72 %
Fines:	0.58 %

D ₁₀ =	0.172 mm
D ₃₀ =	0.284 mm
D ₆₀ =	0.603 mm
Cu =	3.501
Cc =	0.778

USCS SP

D-1076

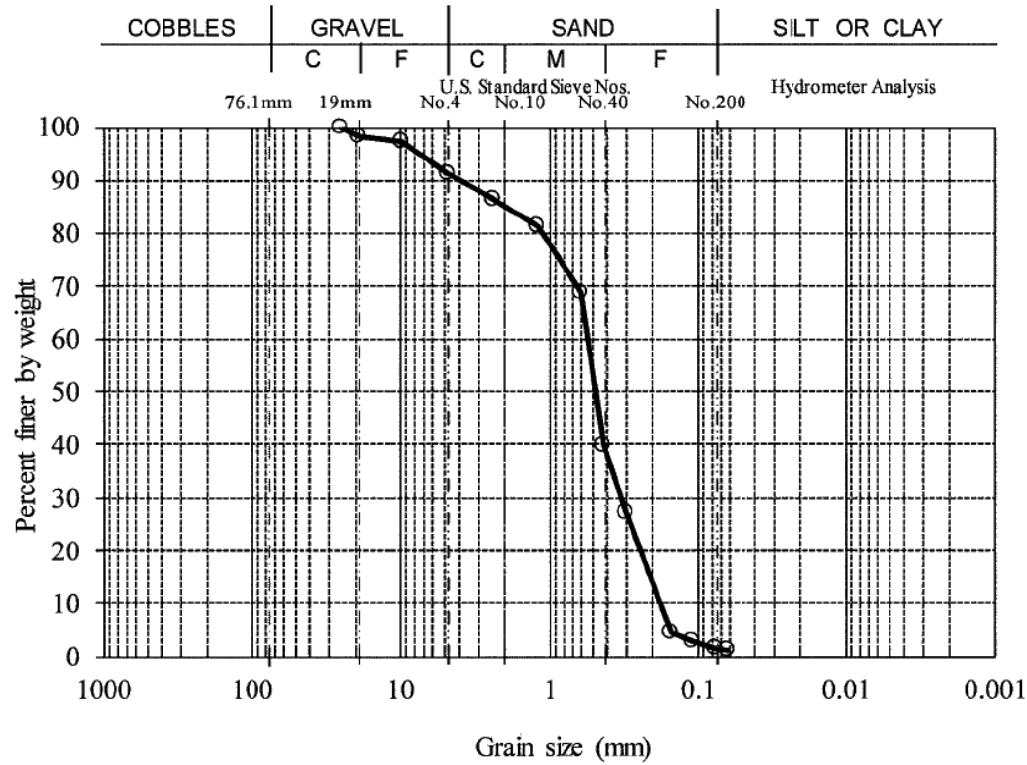
Grain Size Analysis

Project:
Client:

Dairout New Barrage

Site No.
Sample No.:

1
2



Sieve opening (mm)	Percent finer (%)
25	100.0
19	98.3
9.5	97.3
4.75	91.2
2.36	86.4
1.18	81.4
0.6	69.0
0.425	39.8
0.3	27.3
0.15	4.5
0.106	2.7
0.075	1.4

Gravel:	8.75 %
Sand:	79.95 %
Fines:	1.45 %

D ₁₀ =	0.177 mm
D ₃₀ =	0.323 mm
D ₆₀ =	0.540 mm
C _u =	3.041
C _c =	1.091

USCS SP

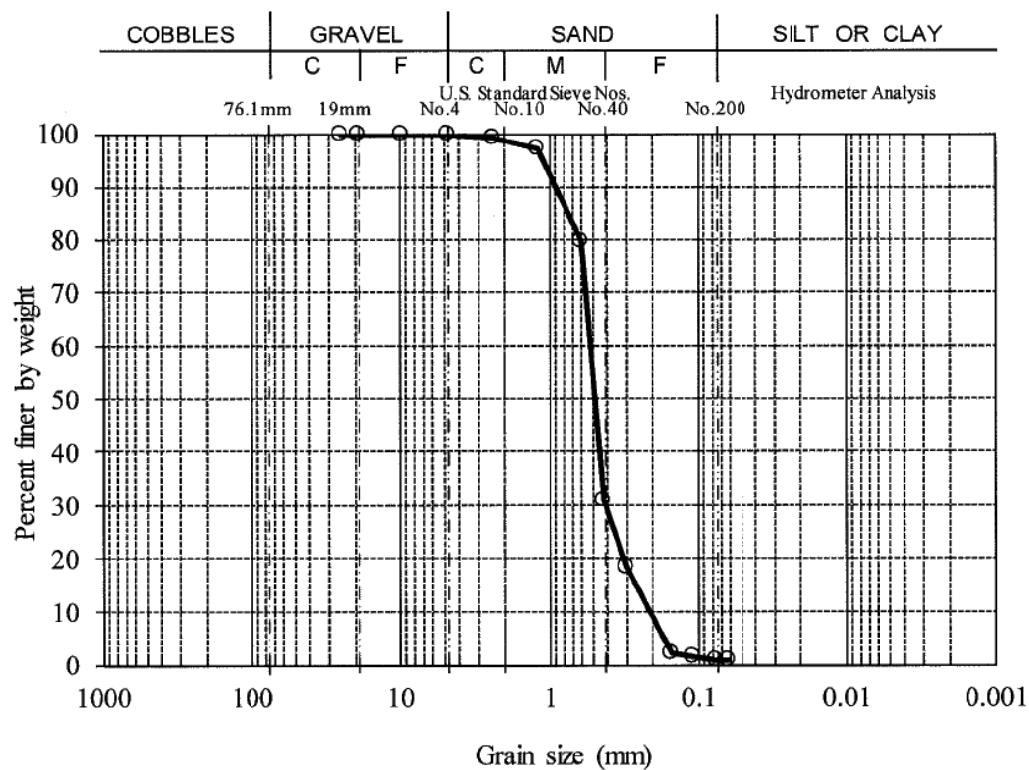
D-1077

Grain Size Analysis

Project:
Client:

Dairout New Barrage

Site No. 1
Sample No.: 3



Sieve opening (mm)	Percent finer (%)
25	100.0
19	100.0
9.5	100.0
4.75	100.0
2.36	99.3
1.18	97.0
0.6	79.6
0.425	30.8
0.3	18.4
0.15	2.1
0.106	1.4
0.075	0.9

Gravel:	0.00 %
Sand:	96.11 %
Fines:	0.94 %

D10 =	0.210 mm
D30 =	0.415 mm
D60 =	0.522 mm
Cu =	2.489
Cc =	1.573

USCS SP

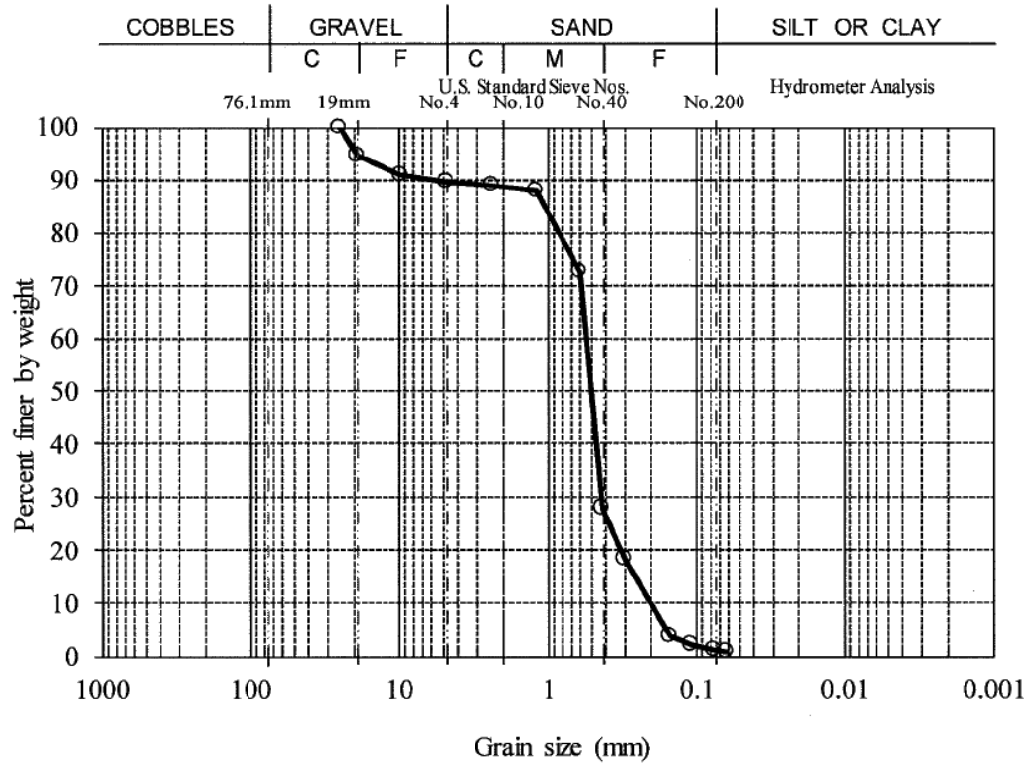
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Grain Size Analysis

Project:
Client:

Dairout New Barrage

Site No. 2
Sample No.: 1



Sieve opening (mm)	Percent finer (%)
25	100.0
19	94.5
9.5	90.9
4.75	89.7
2.36	89.0
1.18	88.0
0.6	72.7
0.425	27.9
0.3	18.3
0.15	3.7
0.106	2.1
0.075	1.0

Gravel:	10.27 %
Sand:	86.97 %
Fines:	1.02 %

D10 =	0.202 mm
D30 =	0.432 mm
D60 =	0.544 mm
Cu =	2.689
Cc =	1.693

USCS SP

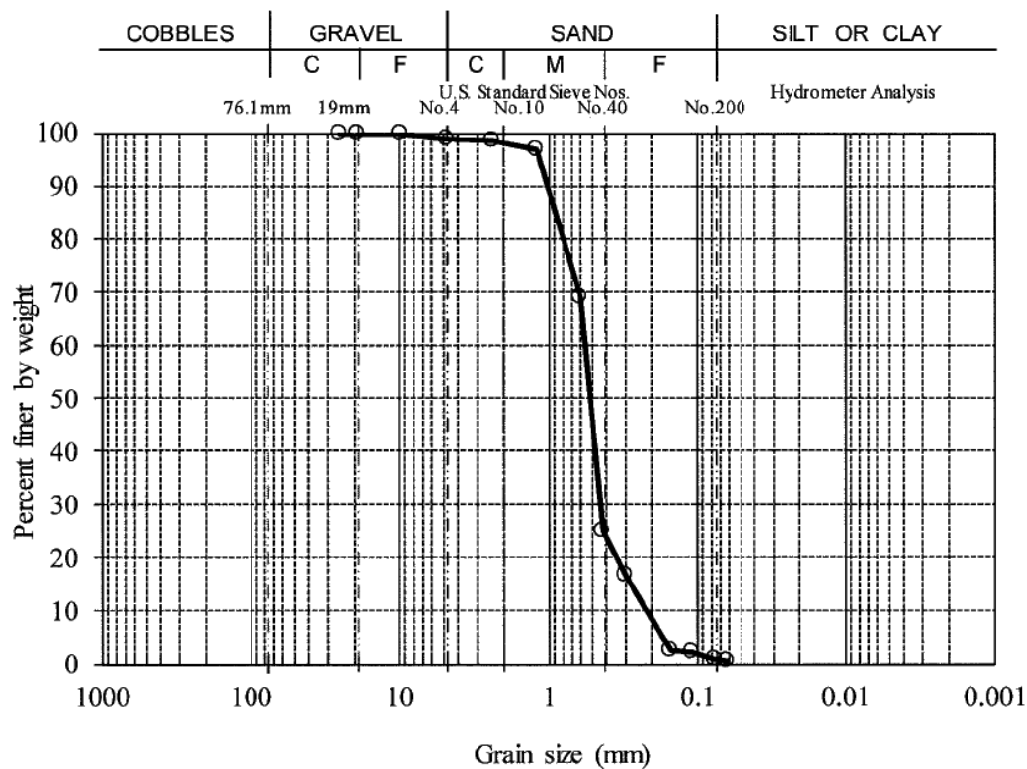
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Grain Size Analysis

Project:
Client:

Dairout New Barrage

Site No. 2
Sample No.: 1



Sieve opening (mm)	Percent finer (%)
25	100.0
19	100.0
9.5	100.0
4.75	98.7
2.36	98.4
1.18	96.8
0.6	69.2
0.425	25.0
0.3	16.6
0.15	2.4
0.106	2.3
0.075	0.8

Gravel:	1.27 %
Sand:	96.03 %
Fines:	0.81 %

D10 =	0.218 mm
D30 =	0.442 mm
D60 =	0.559 mm
Cu =	2.568
Cc =	1.608

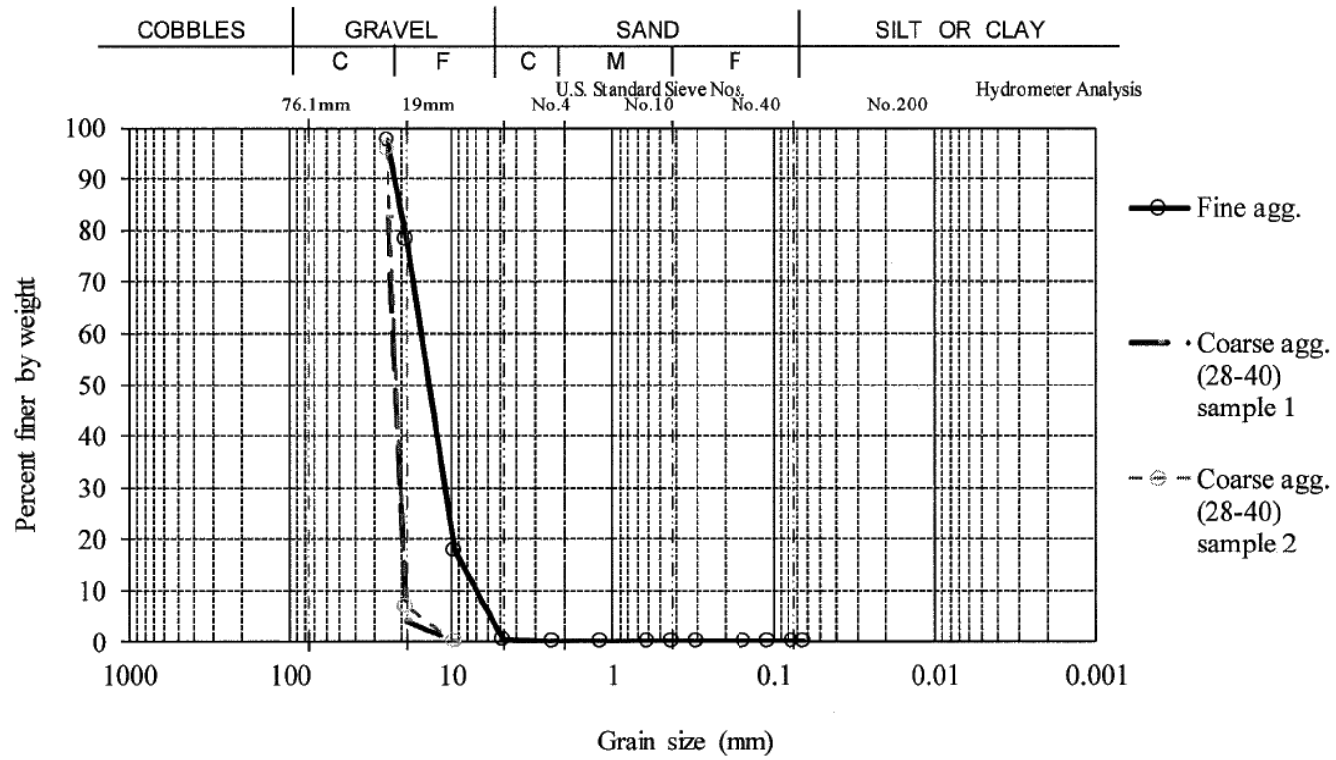
USCS SP

D-1080

Project:
Client:

Dairout New Barrage

Coarse Aggregate & Fine Aggregate Analysis
Sample No.: 1



2. Preliminary test by Cairo University

Your Ref. Date: 10/4/2016

Applicant: SANYU CONSULTANTS INC

Lab Ref. No. : MTL/496 - 1/2016

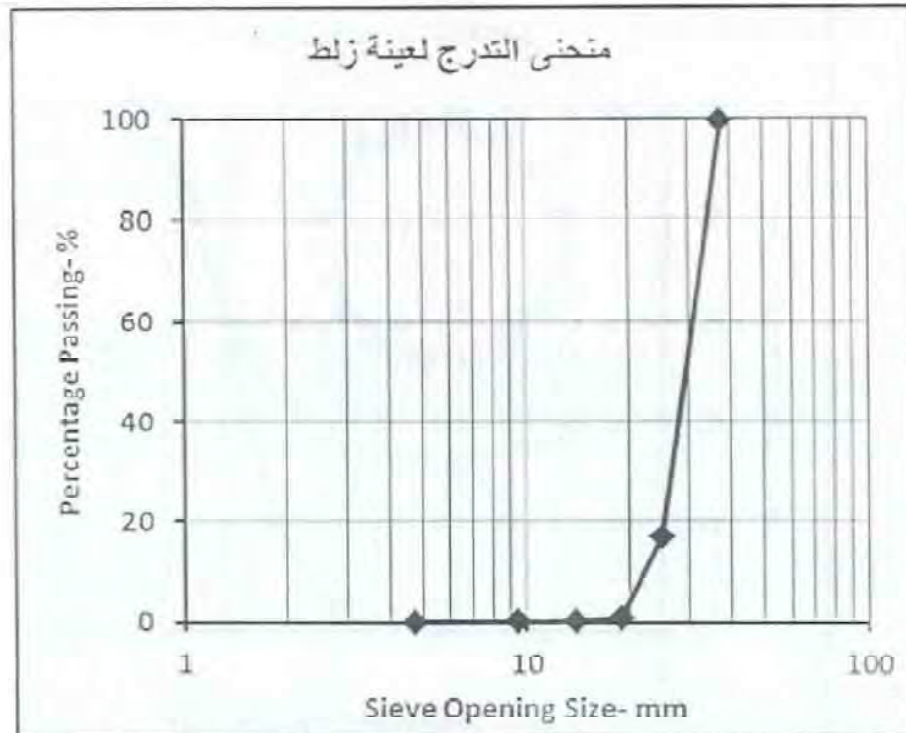
Project: Construction of New Dirout Group of Regulators

Date : 10/4/2016

Specimens: One gravel Specimen supplied by applicant
(Specimen No 1)

RESULTS OF SIEVE ANALYSIS

Sieve Size (mm)	37.5	25.0	19.0	14.0	9.5	4.76
Percentage Passing	99.4	16.6	0.9	0.3	0.1	0.0



Head of Materials Testing Lab.


(Prof. Dr. Hossam A. HODHOD)



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Cairo University

معمل اختبار المواد
Materials testing Lab



كلية الهندسة
Faculty of Engineering

Your Ref. Date: 10/ 4/ 2016

Applicant: SANYU CONCLTANTS INC

Lab Ref. No. : MTL/ 496 - 2 / 2016

Project: Construction of New Dirout Group of Regulators

Date : 10 / 4 / 2016

Specimens: One gravel Specimen supplied by applicant
(Specimen No 2)

RESULTS OF SIEVE ANALYSIS

Sieve Size (mm)	37.5	25.0	19.0	14.0	9.5	4.76
Percentage Passing	100.0	81.7	52.1	21.0	2.7	0.1



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Faculty of Engineering

Your Ref. Date: 10/4/2016

Applicant: SANYU CONSULTANTS INC

Lab Ref. No. : MTL/496 - 3 / 2016

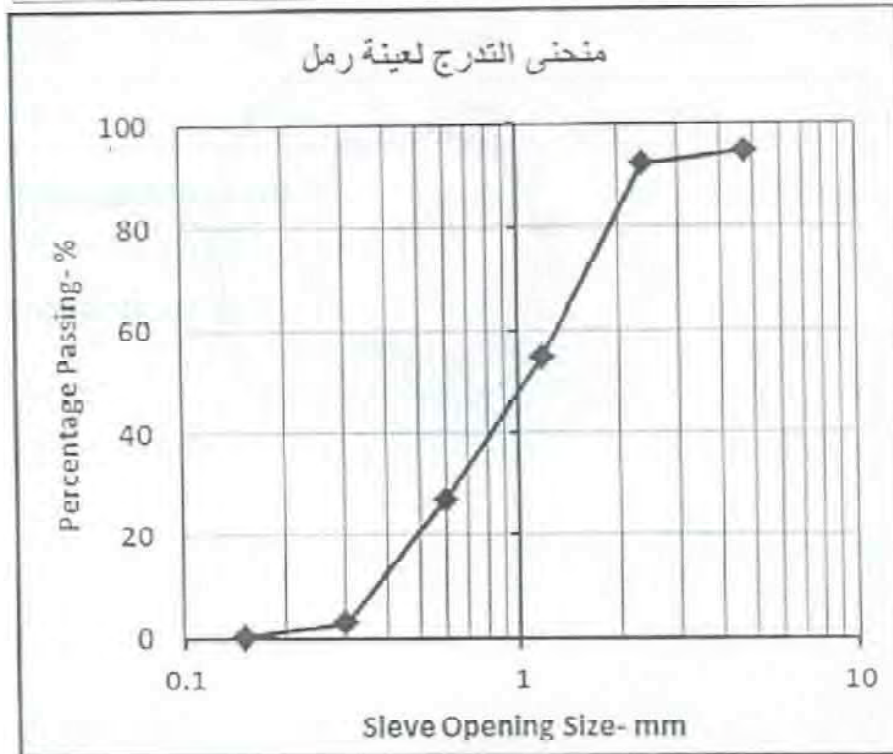
Project: Construction of New Dirout Group of Regulators

Date : 10/4/2016

Specimens: One sand Specimen supplied by applicant

RESULTS OF SIEVE ANALYSIS

Sieve Size (mm)	4.76	2.36	1.18	0.600	0.300	0.150
Percentage Passing	94.7	92.2	54.5	26.9	2.9	0.3



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كلية الهندسة
Faculty of Engineering

Your Ref. Date: 10/4/2016

Applicant: SANYU CONSULTANTS INC.

Lab Ref. No. : MTL/496-4/2016

Project: Construction of New Dirout Group of Regulators

Date : 11/4/2016

Specimens: One sand and two gravel specimens supplied by applicant

RESULTS OF SPECIFIC GRAVITY TEST

No	Specimen	Weight of Oven-dry Specimen (g)	Weight of Replaced Water (g)	Specific Gravity
1	Gravel - 1	639	250	2.556
2	Gravel - 2	519	207	2.507
3	Sand	500	194	2.577



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Faculty of Engineering

Your Ref. Date: 10 / 4 / 2016 Applicant: SANYU CONSULTANT INC
Project: Construction of New Dirout Group of Regulators
Lab Ref. No. : MTL/ 496- 6/ 2016
Specimens: One Sand and Two Gravel Specimens
supplied by applicant
Date : 13 / 4 / 2016

RESULTS OF WATER ABSORPTION TEST

Sp, No,	Weight of Oven-Dry Specimen (g)	Weight of Saturated Specimen in air (g)	Weight of Absorbed Water (g)	Absorption (%)	Remarks
1	2998	3003	5	0.167	Gravel - 1
2	2983	2990	7	0.235	Gravel - 2
3	904	908	4	0.442	Sand



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Your Ref. Date: 10 / 4 / 2016

Applicant: SANYU CONSULTANT INC

Project: Construction of New Dirout Group of Regulators

Lab Ref. No. : MTL/ 496- 5/ 2016

Specimens: One Sand and Two Gravel Specimens
supplied by applicant

Date : 13 / 4 / 2016

RESULTS OF BULK DENSITY TEST

No	Weight (g)	Volume of Standard Container (Liter)	Bulk Density* (kg/L)	Remarks
1	22950	15	1.530	Gravel - 1
2	23800	15	1.587	Gravel - 2
3	4615	3	1.538	Sand

* Measured in Loose State

No	Weight (g)	Volume of Standard Container (Liter)	Bulk Density* (kg/L)	Remarks
1	25000	15	1.667	Gravel - 1
2	26200	15	1.747	Gravel - 2
3	5055	3	1.685	Sand

* Measured in Compacted State



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Your Ref. Date: 10 / 4 / 2016

Applicant: SANYU CONSULTANT INC
Project: Construction of New Dirout Group of Regulators

Lab Ref. No. : MTL/ 496- 7/ 2016

Specimens: One Sand Specimen supplied by applicant

Date : 19 / 4 / 2016

RESULTS OF SALT CONTENT MEASUREMENT TEST

Specimen	Sand	Remarks*
TDS (%)	0.155	-----
Chlorides as Cl ⁻ (%)	0.039	0.060 (max.)
Sulfates as SO ₃ (%)	0.007	0.400 (max.)

* Limits of ECP 203/2007.

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(Prof. Dr. Hossam A. Hodhod)



3. Aggregate test by CRI

**Material Tests For
Constructing New Dayrout Regulators**

By

Prof Dr. Mohamed I. Abu-Khashaba

Dr. Mohamed S. Khalafalla

CRI Director

Prof. Dr. Mohamed Anwar

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1.3 Results of Laboratory Tests.....	2

Appendix 1: Laboratory Tests Results

Material Tests for Constructing New Dayrout Regulators

1. Introduction

This report aims to evaluate the concrete material properties (AGGREGATE) of New Dayrout Regulators. CRI have been received four sample of Assuit Barrage resources and three samples from borrow No. 1 taken by the Japanese team.

2. Required Laboratory Tests

The required laboratory material investigations tests, including various laboratory tests are shown in **Table (1)**.

Table (1): Required Laboratory Tests

	Laboratory Test	Sample
1	Sieve analysis of aggregates	1
2	Amount of material passing test sieve 75 μ m in aggregates	1
3	Bulk density of aggregates and solid content in aggregates	1
4	Density and water absorption of fine aggregates	1
5	Density and water absorption of coarse aggregate	1
6	Resistance to abrasion of coarse aggregate by use of the Los Angeles machine	1
7	Soundness of aggregate by use of sodium sulfate	N/A
8	Moisture content of aggregate and surface moisture in aggregate by drying	1
9	Content of soft particles in coarse aggregate by scraching	N/A
10	Clay lump contained in aggregates	-
11	Chlorides contained in aggregate	N/A
12	Alkali-silica reactivity of aggregate by mortat-bar method	N/A

3. Results of Laboratory Tests

3.1 Sieve Analysis of Aggregates (ECP-Test Method 2-2 & JIS A 1102)

This test was carried out according to ECP-test methods 2-2 to determine the sieve analysis of aggregate. The test can be considered one of the important tests to evaluate the aggregate valid for designing the concrete mixture. Standard Grain Size and Finesses Modulus were also determined for the investigated samples. Results are illustrated in **Table (2)**. In addition the sieve analysis results are presented in Apenddix-1.

Table (2): Standard Grain Size and Finesses Modulus of Samples

NO	Borrow	Description	Standard Grain Size (mm)	Finesses Modulus (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	37.5	99.56
2		CA Dol. (4-16)mm	20	98.81
3		Mix CA Dol. (50:50)%	37.5	99.37
4		FA Large Scale	4.75	99.32
5		FA Small Scale	4.75	97.83
6		Mix FA Sand (20:80)%	4.75	97.83
7	Borrow 1	CA Gravel max size	37.5	99.86
8		CA Gravel min size	28	99.56
9		Mix CA Gravel (50:50)%	37.5	99.78
10		FA Sand	4.75	96.32

3.2 Amount of Material Passing Test Sieve 75 μ m in Aggregates (ECP-Test Method 2-11 & JIS A 1103)

This test was carried out according to ECP-test methods 2-11 to determine the amount of clay and fine materials in aggregates by weight. The test is considered one of the primary tests to evaluate the aggregate used for concrete mix. The sample weight was approximately taken 5 kg according to standard grain size. Test results are illustrated in Apenddix-1, **Table (A)**.

3.3 Bulk Density of Aggregates and Solid Content in Aggregates (ECP-Test Method 2-5 & JIS A 1104)

The test was carried out according to ECP-test methods 2-5 to determine the bulk density (Volumetric Weight) and percentage of voids for aggregate. The test is

used to convert a given volume to equivalent weight and vice. Test results are illustrated in Appendix-1 **Table (B)**.

3.4 Density and Water Absorption of Fine Aggregates (ECP-Test Method 2-3 & JIS A 1109)

3.5 Density and Water Absorption of Coarse Aggregates (ECP-Test Method 2-3 & JIS A 1110)

The test was carried out according to ECP-test methods 2-3 under title of *test method to determine the percentage of absorption for aggregate (A. Coarse Aggregate and B. Fine Aggregate)*. The test aims to determine the percentage of aggregate absorption by weight. The specific density was estimated by the pervious test clarified in sector 3.2 beside volumetric weight through the method to determine the void ratios. Test results are shown in Appendix-1 **Table (B and C)**.

3.6 Resistance to abrasion of coarse aggregate by use of the Los Angeles machine (ECP-Test Method 2-17 & JIS A 1121)

The test was carried out according to ECP-test methods 2-17 to determine the abrasion resistance. The abrasion resistance can be expressed by the percentage ratio of weight loss by using Los Angeles machine. Test results are illustrated in Appendix-1 **Table (D)**.

3.7 Soundness of aggregate by use of sodium sulfate (JIS A 1122)

The test is not applicable.

3.8 Moisture content of aggregate and surface moisture in aggregate by drying (ECP-Test Method 2-10 & JIS A 1125)

This test was carried out according to ECP-test methods 2-10. The test aims to estimate the absorption of aggregate by weight. Test results are illustrated in Appendix-1 **Table (E)**.

3.9 Content of soft particles in coarse aggregate by scratching (JIS A 1126)

The test is not applicable.

3.10 Clay lump contained in aggregates (ECP-Test Method 2-11 & JIS A 1137)

This test is the same as Test 3.2 that was previously conducted according to Egyptian code.

3.11 Chlorides contained in aggregate (ECP-Test Method 2-22 & JIS A 5002)

This test was carried out according to ECP-test methods 2-22. This test was conducted to determine the harmful salts found in fine and coarse aggregate represented in the chlorides content. Test results are illustrated in Appendix-1 **Table (F)**.

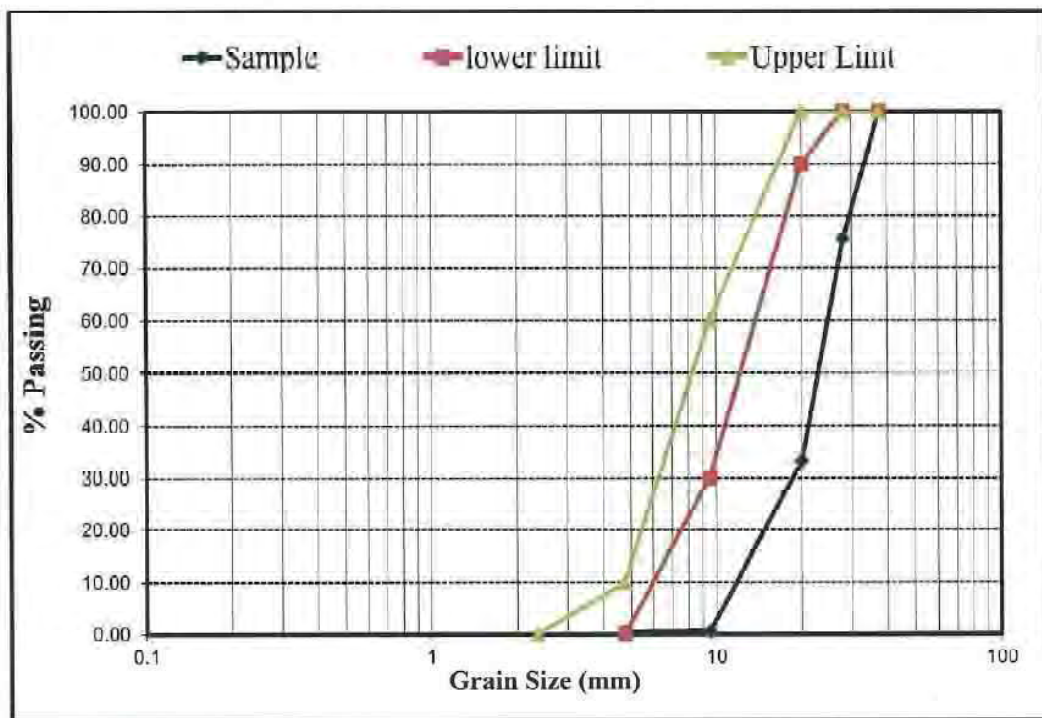
3.12 Alkali-silica reactivity of aggregate by mortar-bar method (JIS A 1146)

The test is not applicable.

Appendix 1
Laboratory Tests Results

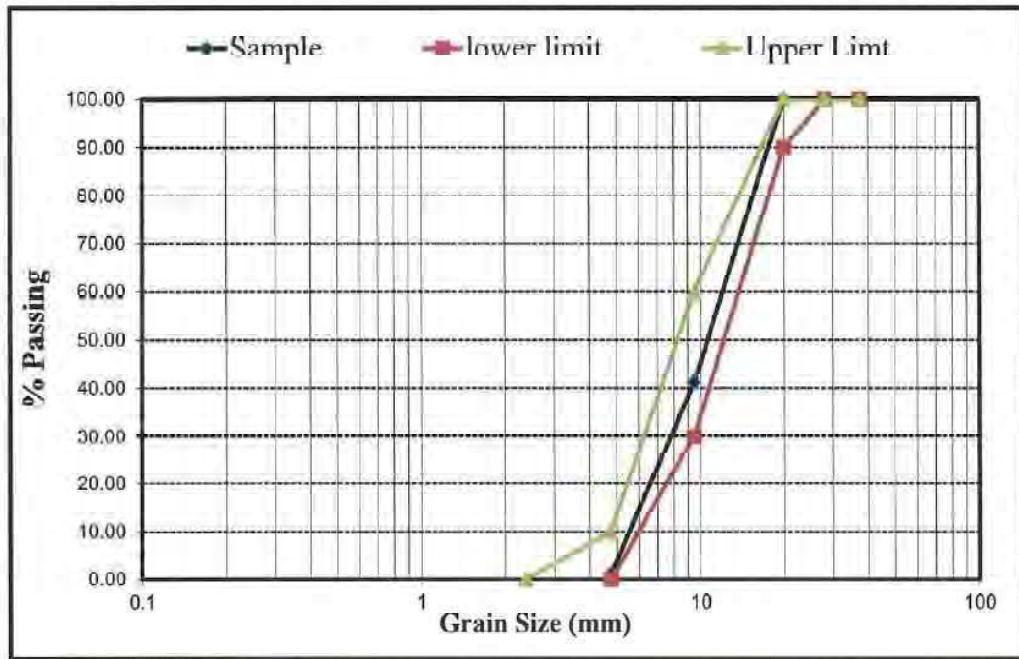


Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Coarse Aggeragte Dol. (16-22) mm	Date:	14/07/2016





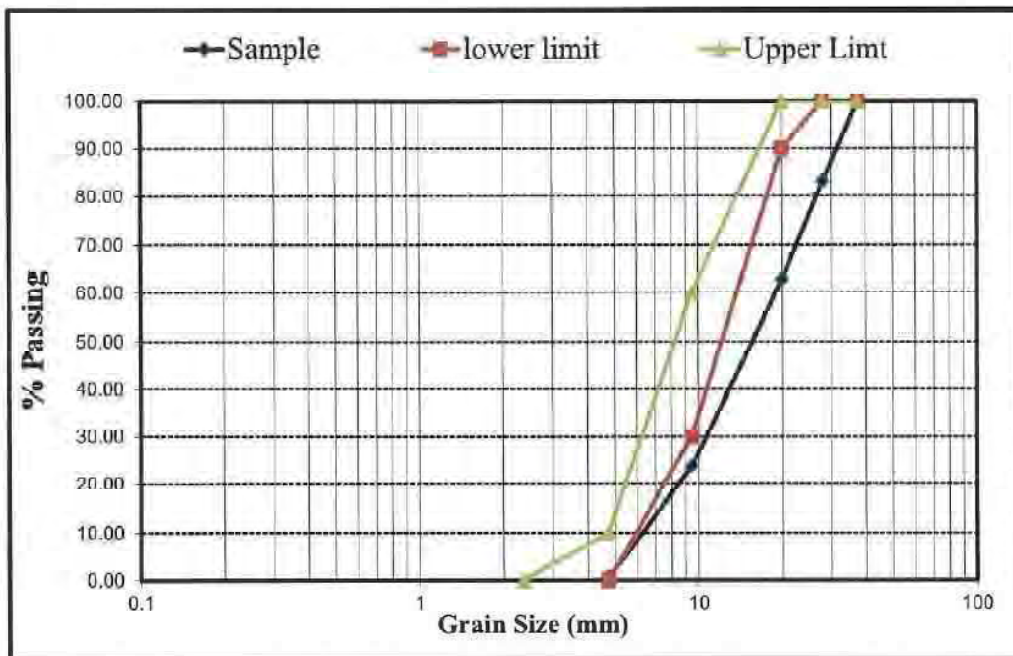
Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Coarse Aggeragte Dol. (4-16) mm	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code



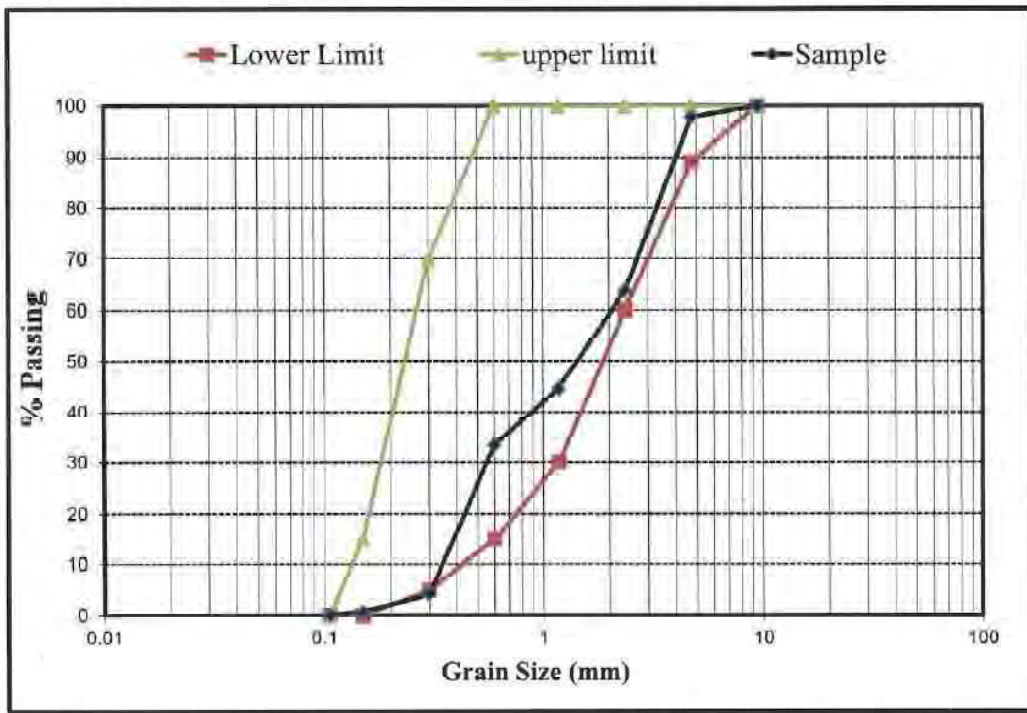
Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Mix Coarse Aggeragte Dol. (50:50)%	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code



Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Fine Aggregate (Dol.Large Scale)	Date:	14/07/2016

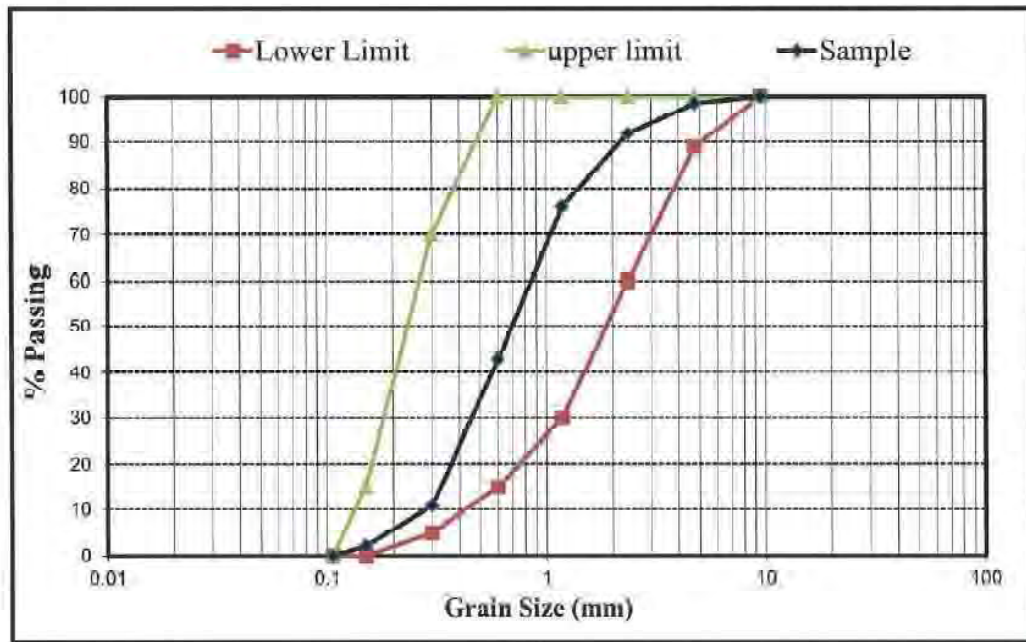


* Upper and Lower Limit according to Egyptian Code

القناطر الخيرية ١٣٦٢١ - القنوبية ت ٢١٨٣٣٠٧ - ٢١٨٨٥٠٨ - فاكس ٢١٨٨٥٠٨
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Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Fine Aggregate sand.Small Scale	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code

القناطر الخيرية ١٣٦٢١ - القنوبية ت ٢١٨٣٣٠٧ - ٢١٨٨٥٠٨ - فاكس ٢١٨٨٥٠٨
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Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage	Test Name:	Sieve Analysis
Specimens:	Fine Aggregate sand.(20:80)%	Date:	14/07/2016



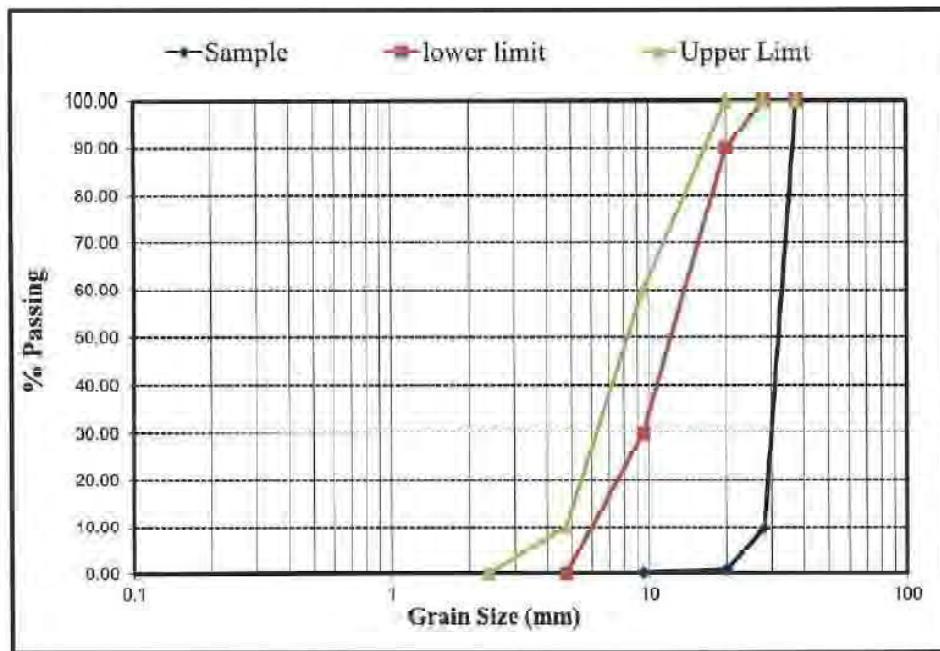
* Upper and Lower Limit according to Egyptian Code

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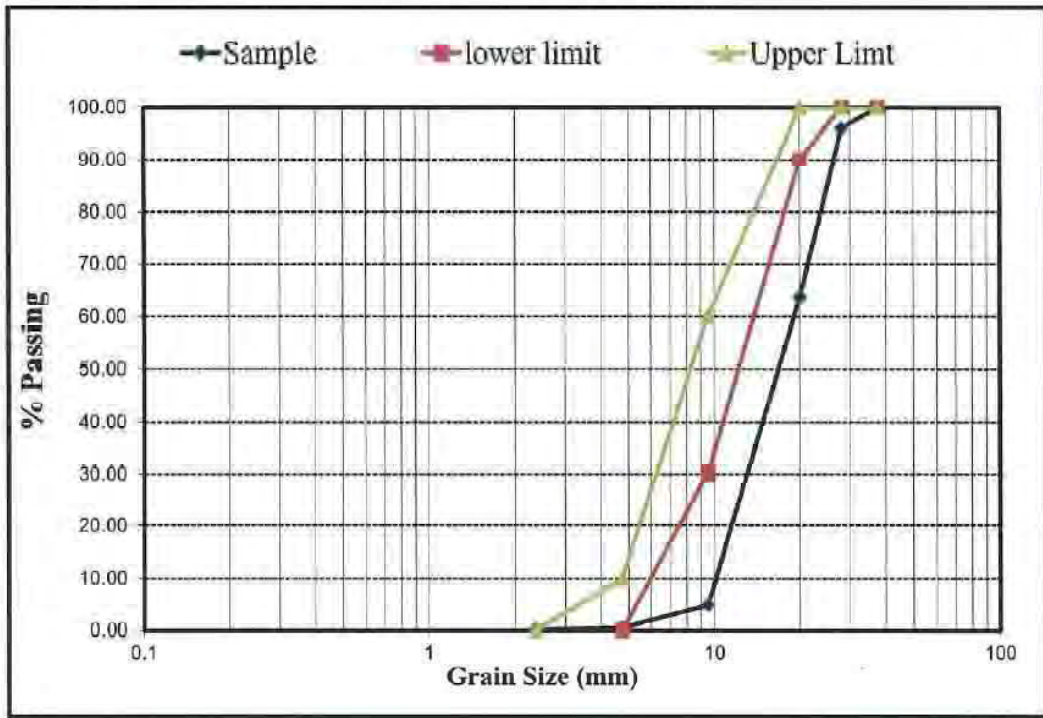
Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Borrow 1	Test Name:	Sieve Analysis
Specimens:	Coarse Aggeragte Gravel Max Size	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code



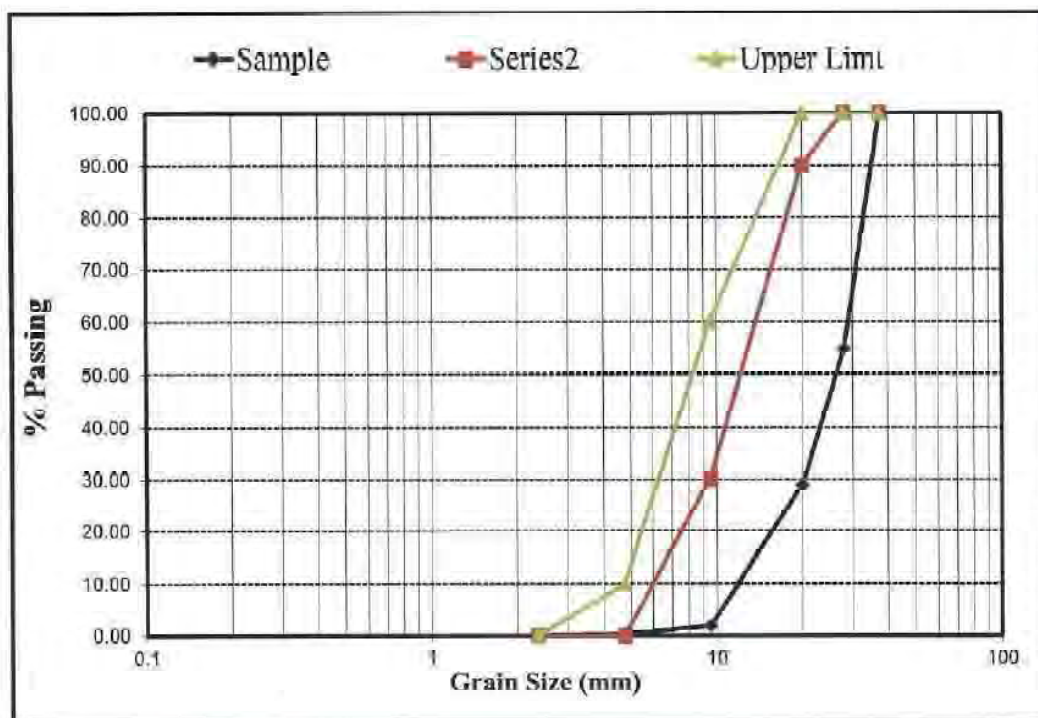
Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Borrow 1	Test Name:	Sieve Analysis
Specimens:	Coarse Aggeragte Gravel Min Size	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code



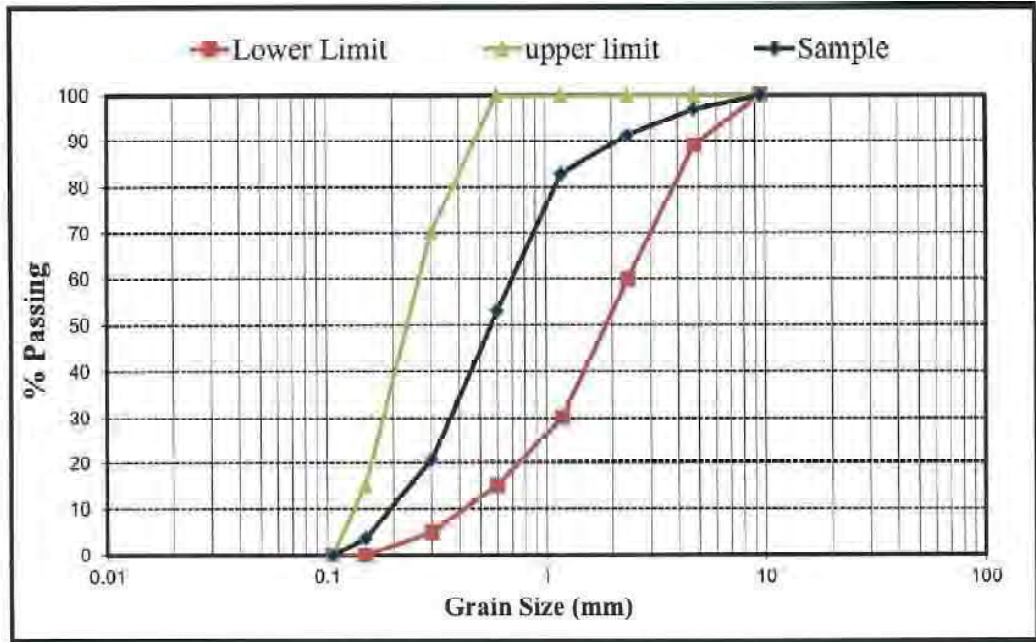
Project:	Diroat Barrage	Test Type:	Aggrcgate Valid
Borrow	Borrow 1	Test Name:	Sieve Analysis
Specimens:	Coarse Aggeragte Mix Gravel (50:50)	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code



Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Borrow 1	Test Name:	Sieve Analysis
Specimens:	Fine Aggregate Sand	Date:	14/07/2016



* Upper and Lower Limit according to Egyptian Code

القناطر الخيرية ١٣٦٢١ - القليوبية ت ٢١٨٣٣٠٧ - ٢١٨٨٥٠٨ - فاكس ٢١٨٨٥٠٨
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Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage + Borrow 1	Test Name:	Pass 75 μ
Specimens:	-	Date:	14/07/2016

Table (A): Amount of material passing test from sieve 75 μ m

No	Borrow	Description	Pass #No. 75 μ (%)	limits (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	1.11	<2
2		CA Dol. (4-16)mm	0.49	<2
4		FA Large Scale	2.52	<5
5		FA Small Scale	3.06	<3
7	Borrow 1	CA Gravel max size	0.00	<1
8		CA Gravel small size	0.39	<1
10		FA Sand	6.90	<3

* According to Egyptian Code

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Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage + Borrow 1	Test Name:	Bulk Density
Specimens:		Date:	14/07/2016

Table (B): Bulk density of aggregates and solid content in aggregates

Code No	Borrow	Description	Bulk Density (g/cm ³)	Specific Gravity (g/cm ³)	Void Ratio (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	1.57	2.50	37.18
2		CA Dol. (4-16)mm	1.66	2.57	35.26
3		Mix CA Dol. (50:50)%	1.62	2.60	37.87
4		FA Large Scale	1.47	2.66	44.59
5		FA Small Scale	1.61	2.30	30.14
7	Borrow 1	CA Gravel max size	1.54	2.43	36.52
8		CA Gravel small size	1.58	2.46	35.45
9		Mix CA Gravel (50:50)%	1.55	2.52	38.61
10		FA Sand	1.61	2.52	36.32

* According to Egyptian Code

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Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage+Borrow1	Test Name:	Absorption
Specimens:		Date:	14/07/2016

Table (C): Water absorption of fine and coarse aggregates

Code No	Borrow	Description	Absorption (%)	Limits (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	1.03	(0.50-1.00)
2		CA Dol. (4-16)mm	0.98	(0.50-1.00)
3		Mix CA Dol. (50:50)%	0.83	(0.50-1.00)
4		FA Large Scale	0.40	(0.00-2.00)
5		FA Small Scale	2.04	(0.00-2.00)
7	Borrow 1	CA Gravel max size	0.01	(0.50-1.00)
8		CA Gravel small size	0.18	(0.50-1.00)
9		Mix CA Gravel (50:50)%	0.16	(0.50-1.00)
10		FA Sand	1.83	(0.00-2.00)

* According to Egyptian Code

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Project: Diroat Barrage	Test Type: Aggregate Valid
Borrow Assuit Barrage+Borrowl	Test Name: Abrasion
Specimens:	Date: 14/07/2016

Table (D): Resistance to abrasion of coarse aggregate by use of the Los Angeles machine

Code No	Borrow	Description	Abrasion (%)	Limits (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	18.00	(0.00-30.00)
2		CA Dol. (4-16)mm	17.76	(0.00-30.00)
3		Mix CA Dol. (50:50)%	16.80	(0.00-30.00)
7	Borrow 1	CA Gravel max size	24.00	(0.00-20.00)
8		CA Gravel small size	19.20	(0.00-20.00)
9		Mix CA Gravel (50:50)%	13.60	(0.00-20.00)

* According to Egyptian Code



Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow:	Assuit Barrage+Borrow1	Test Name:	Moisture Content
Specimens:		Date:	14/07/2016

Table (E) : Moisture content of aggregate in aggregate by drying

No	Borrow	Description	Moisture Content %
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	0.40
2		CA Dol. (4-16)mm	1.00
4		FA Large Scale	0.40
5		FA Small Scale	0.30
7	Borrow 1	CA Gravel max size	0.13
8		CA Gravel small size	0.00
10		FA Sand	0.80

* According to Egyptian Code



Project:	Diroat Barrage	Test Type:	Aggregate Valid
Borrow	Assuit Barrage+Borrow 1	Test Name:	Chloride Content
Specimens:	-	Date:	14/07/2016

Table (F) : Chlorides % contained in aggregate

No	Borrow	Description	Cl %	Limits (%)
1	Assuit Barrage Borrow	CA Dol. (16-22)mm	0.260	≤0.04%
2		CA Dol. (4-16)mm	0.217	< 0.04%
3		Mix CA Dol. (50:50)%	0.350	< 0.04%
4		FA Large Scale	0.409	< 0.06%
5		FA Small Scale	0.075	< 0.06%
6		Mix FA Sand (20:80)%	0.639	< 0.06%
7	Borrow 1	CA Gravel max size	0.062	< 0.04%
8		CA Gravel min size	0.106	< 0.04%
9		Mix CA Gravel (50:50)%	0.071	< 0.04%
10		FA Sand	0.213	< 0.06%

* According to Egyptian Code

4. Additional test by HBRC

Housing & Building National Research Center
Vice Chairman Office
for Research and Studies Affairs



المركز القومي لبحوث الإسكان والبناء
مكتب نائب رئيس مجلس الإدارة
لشئون البحوث والدراسات

نموذج النموذج : RAW-FRM-21-02

خطاب إرسال نتائج إختبارات إلى العميل

مرجعيات: ٢٠١٦/٣/٩٥٢ م
عدد الصفحات: (....)

تليفون:- ٠١٢٨٢٢٨٨١٦٥ اسم المشروع : قطار بيروط التابع لوزارة الري
الموقع : - كود العينة : Rag2143, Rsa2144 تاريخ الطلب:
٢٠١٦/١١/٢ ميمد الاستلام ٢٠١٦/١٢/٢

السادة/ مكتب سانيو الإستشاري
تحية طيبة وبعد:

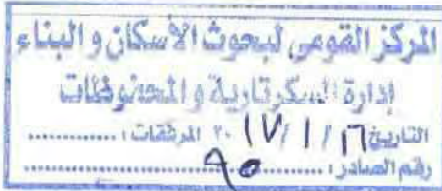
بالإشارة إلى طلب سيادتكم بخصوص قيام المركز بأجراء أختبارات تفاعل القلوى (للزلط)،
تحديد المحتوى من الكلوريدات والكبريتات - نسبة الشوائب العضوية (للرمل) على عدد (٢) عينة
(زلط - رمل) الموردة بمعرفتكم .

يشرفنا أن نرسل طيه نتائج الاختبارات التي أعدت في هذا الشأن من المعهد المختص . وقد
تم سداد التكلفة المطلوبة للمركز بمبلغ (٧٥٠ ج) فقط (سبعمئة وخمسون جنيها) ايصالات أرقام

٨٨٣٢٢٠ ، ٨٨٣٢٤٥ بتاريخ ٢٠١٦/١١/٢ ، ٢٠١٦/١١/٢ .

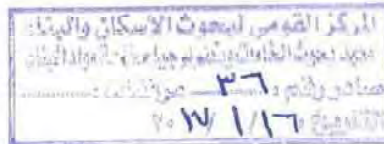
وتفضلوا سيادتكم بقبول فائق الاحترام .

تحريرا في : ٢٠١٦/١/١٦ م



نائب رئيس مجلس الإدارة
لشئون البحوث والدراسات

أ.د. خالد محمد يسرى
٢٠١٦/١١/١٦



(Cover Page)



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Housing and Building National Research Center

XRD Mineralogical Analysis Result

RAW - FRM-21-11
lah - 6 / 2141 / 016

Customer name: SANYU Consultant Inc. (مكتب سانيو الاستشاري)

Project name : New Dirrout regulator group project.

Ambient environmental conditions: Temp. : 25 ± 3 °C
Relative humidity : 35 ± 5 %

Sample Code: Rug 2143
Sample Type: Aggregate
Test date : 4/11/2016
Remarks : ---

Compound Name	Chemical Formula
Calcite	CaCO ₃
Quartz	SiO ₂

- The identification of the most probable phases is carried out using PANalytical computer certified program * with the aid of the International Center of Diffraction Database (ICDD) ** received with the X-ray diffraction equipment. ***

* X'Pert HighScore Software 2006 - Licensed modules: PW3209.

** PDF-2 Database / CD-Release 2005 - Type No. 9430 500 01611.

*** X'Pert Pro PANalytical - Manufactured by Panalytical B.V Co., Netherlands (ISO 9001/14001 KEMA - 0.75160).

Additional Information:

Scan type : Continuous.
Anode material: Copper (Cu).
General setting: 30 mA & 40 KV.

Notes:

- * The sample will be retained for 30 days, after which they will be discarded.
- * The examination result is valid only for the sample delivered.

XRD Lab Manager

Dr. M. El-Mahllawy

Prof. D. Medhat S. El-Mahllawy

(ICDD Member, USA)

Technical Manager

Dr. B. Medhat

Prof. D. Ayman M. Kandool

Page No. /

87 El-Tahrir St., Dokki, Giza 11511
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Phone: (+202) 7617102, 7617092 Fax: 3351564, 7628736
E mail: hbrc@hbrc.edu.eg Web: www.hbrc.edu.eg

D-1113



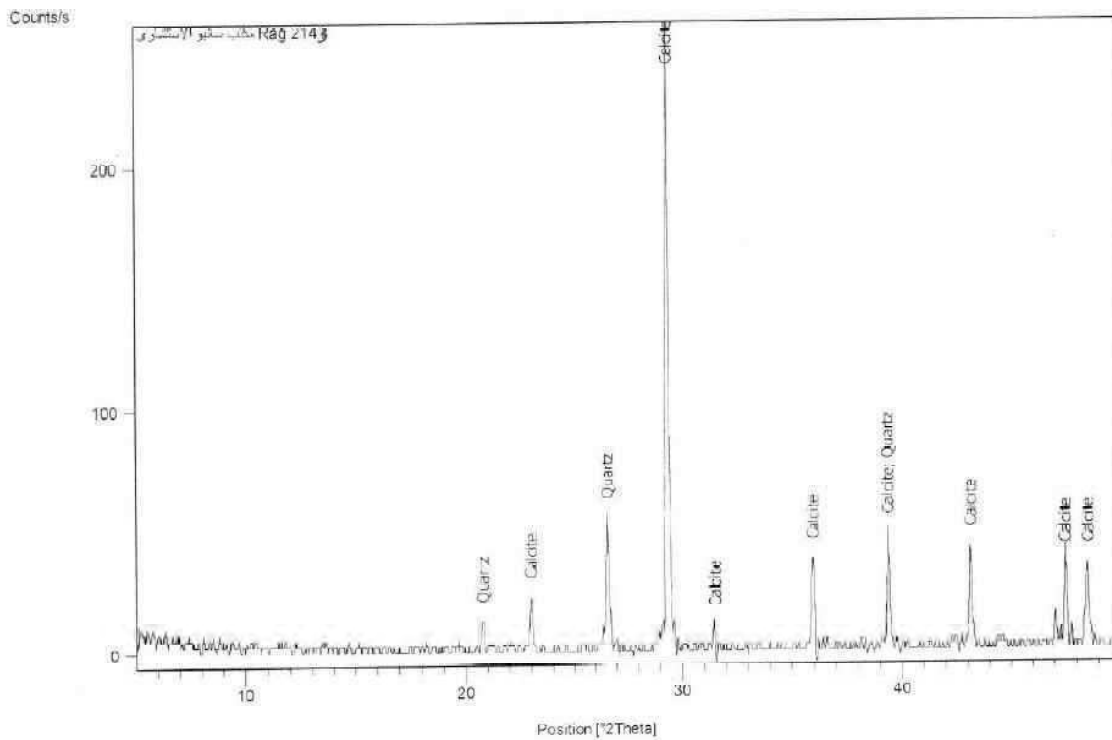
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XRD Pattern

RAW-FRM-21-01
Lab - 6 / 2141 /016



Revised by:

Geologist: Maged El-fakharany



Page No. /

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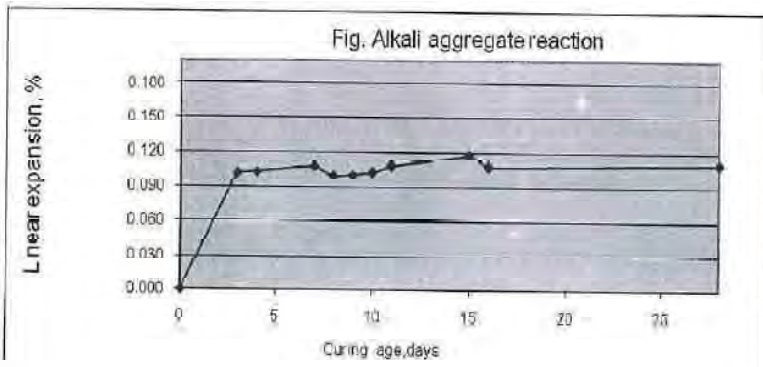
كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (148) (01/LAB-3/2016)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 2143	Sample type: Gravel
Test date: 17/12/2016	Sample reception: 18/12/2016
Test code :RAW/LAB-3/Test 01-alkali	
The Test: Potential Alkali Reactivity of Aggregates*	
Environmental Condition:	Temperature of the mixing :21±1C°, Temperature of the curing:80±2C°

Test Result



curing time (days) from casting	Average Percentage Expansion of four samples	Notes
0	0.000	
3	0.103	
4	0.103	
7	0.108	
8	0.099	
9	0.101	
10	0.103	
11	0.109	
15	0.118	
16	0.108	
28	0.110	

Notes

The above results are only valid for the delivered samples from customer

Type and source of the used cement:

Ordinary Portland cement with grade 42.5N from beni suef cement company

Date of production of cement: 1/12/2016

Alkali content of cement: 0.59%

W/C: 0.47%

Visual examination: There are no changes on the surface of the tested sample.

Chemist

Signature: *Reham Abu-Elmagda*

Review and supervision

Signature: *Sayda Rawsh Zedou*

Test	(%)	The Limits of ASTM C1260-014 *
Alkali reaction with aggregates after 28 days	0.110	No more than 0.1%

*According to the ASTM C 1260-014

Expansion limits:

1-Expansions of less than 0.1% at 16 days after casting are indicative of innocuous behavior in most cases.

2-Expansions of more than 0.2% at 16 days after casting are indicative of potentially deleterious expansion.

3-Expansions between 0.1 and 0.2% at 16 days after casting include both aggregates that are known to be innocuous and deleterious in field performance. It may useful to take comparator readings until 28 days



Laboratory manager

Signature: *[Signature]*



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Housing and Building National Research Center

Determination of Chlorides and Sulphates in Aggregates (Coarse – Fine)

Code Form: RAW-FRM-21-03

Samples code: Rsa 2144
Samples type: Sand
Chemical Lab : 2
Delivery date: 2/11/2016
Testing date.: 6/11/2016

Client

SANYU CONSULTANT INC

Location/project

New Dirrout regulator group project .

Test required

Determination of chlorides & sulphates content and organic matter .

Other data

Results

Test	sand	Limits**
*Total Chlorides (Cl)%	0.035	Not more than 0.06% for fine aggregates and not more than 0.04% for coarse aggregates.
*Total Sulphates (SO ₃) %	0.139	Not more than 0.40% for both fine and coarse aggregates.
Organic mater content	Nil	Sample must be free of organic impurities

Notes

*Tests were carried out according to En. 1744-1/09.

** Limits as stated in the Egyptian Code (ECCS 203/07).

-The above results are only valid for the delivered samples.

Tested by:

N.A. Elgalil
Fatma Shokry

Lab Manger

Prof. Tarek Amin



87 El-Tahrir St., Dokki, Giza 11511
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كود النموذج : RAW-FRM-21-02

خطاب إرسال نتائج إختبارات إلى العميل

تلفون:- ١٢٨٢٢٨٨١٦٥ اسم المشروع : قناطر ديروط التابع لوزارة الري
الموقع :- كود العينة : Rag2141, Rsa2142 تاريخ الطلب:
٢٠١٦/١١/٢ مهلة الاستلام: ٢٠١٦/١٢/٢

مرجعيات: ٢٠١٦/٣/٩٥١ م
عدد الصفحات: (....)

السادة/ مكتب سانيو الإستشاري
تحية طيبة وبعد:

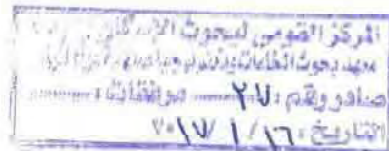
بالإشارة إلى طلب سيادتكم بخصوص قيام المركز بإجراء أختبارات XRD - تحديد المحتوى من الكلوريدات والكبريتات - التفاعل القلوي - الثبات الحجمي - الفحص البتروجرافي (اللسن)، تحديد المحتوى من الكلوريدات والكبريتات - نسبة الشوائب العضوية (للرمل) على عده (٢) عينة (سن خليط - رمل) المورددة بمعرفتكم .
يشرفنا أن نرسل طيه نتائج الاختبارات التي أعدت في هذا الشأن من المعهد المختص . وقد تم سداد التكلفة المطلوبة للمركز بمبلغ (٢٣٥٠ ج) فقط (الفان وثلاثمائة وخمسون جنيتها) ايصالات أرقام ٨٨٣٢١٩ ، ٨٨٣٢٤٤ بتاريخ ٢٠١٦/١١/٢ ، ٢٠١٦/١١/٣ .

وتفضلوا سيادتكم بقبول فائق الاحترام .

تحريرا في : ٢٠١٦/١/١٦ م



نائب رئيس مجلس الإدارة
لشئون البحوث والدراسات
أ.د. خالد محمد يسرى
٢٠١٦/١١/١٦



(Cover Page)



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
Raw Building Materials and Processing Technology
Research Institute



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Housing and Building National Research Center

RAW - FRM-21-11
lab - 6 / 2141 /016

XRD Mineralogical Analysis Result

Customer name: SANYU Consultant Inc. (مكتب سانيو الاستشارات)

Project name : New Dirrout regulator group project.

Ambient environmental conditions: Temp. : 25 ± 3 °C
Relative humidity : 35 ± 5 %

Sample Code: Rag 2141
Sample Type: Aggregate
Test date : 4/11/2016
Remarks : ---

Compound Name	Chemical Formula
Calcite	CaCO ₃
Quartz	SiO ₂

- The identification of the most probable phases is carried out using PANalytical computer certified program[™] with the aid of the International Center of Diffraction Database (ICDD) ** received with the X-ray diffraction equipment^{***}.

* X'Pert HighScore Software 2006 - Licensed modules: PW3209.

** PDF-2 Database / CD Release 2005 - Type No. 9430 500 01611

*** X'Pert Pro PANalytical - Manufactured by Panalytical B.V Co., Netherlands (ISO 9001/14001 KEMA - 0.75160).

Additional Information:

Scan type : Continuous.

Anode material: Copper (Cu).

General setting: 30 mA & 40 KV.

• Notes:

- *. The sample will be retained for 30 days, after which they will be discarded.
- *. The examination result is valid only for the sample delivered.

XRD Lab Manager

Prof. D. Medhat S. El-Mahallawy
(ICDD Member, USA)



Technical Manager

O.B. Medhat

Page No. /

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Housing and Building National
Research Center

نموذج النموذج RAW - FRM-21-12

Petrographical and Mineralogical Test Report for coarse aggregates

Customer
Name

Sanyo Consultant Office

Project Name

Dayrot Barrage belongs to ministry of
irrigation, Egypt

Other

Sample Code: Rag 2141
Sample Type: Aggregate
Date: 2/11/2016

and Specimen Description:

Source : Natural Hardness : Hard Color : Brownish grey

Mineral Grain Size : Fine-grained Surface Texture: Rough Shape : Irregular

Weathering Degree: fresh Other Features :

Petrographic Description:

The thin-section photomicrograph shows that the studied sample is consists mainly of complete and fragmented of hard parts of carbonate-secreting organisms particularly *Nummlites*. It can be also clearly observed that *Nummlites* and others are embedded in fine matrix called micritic matrix. The overall texture of studied sample shows *Sparce Bio-micrite*.

X-Ray Diffraction Result:

The mineralogical analysis by XRD of the studied sample revealed that it is composed mainly of calcite mineral. Moreover, quartz mineral were detected as trace.

Conclusion

: From the above results, the investigated sample is *Fossiliferous limestone (Fossiliferous Bio-micrite)*.

- The test was applied according to the Egyptian code for designing and execution of building works, Code No. 203(2009).
- The obtained results are valid only for the sample delivered by the customer.

Test Staff Member

Ahmad Abou Bakr

Petrography Lab Manager

Dr. Ma 11 22



Technical Manager



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Housing and Building National
Research Center

Petrographical and Mineralogical Test Report for coarse aggregates

Pattern Code: RAW - FRM - 21- 10



Thin section photomicrographs of the sample submitted by

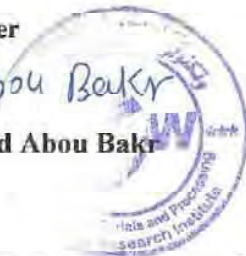
Sanyo Consultant Office- Rag 2141

Mic: micritic calcite, **Num:** Nummlites (XPL, 4)

Test Staff Member

Ahmad Abou Bakr

Geologist: Ahmad Abou Bakr



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معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
Raw Building Materials Technology and Processing Research Institute



المركز القومي لبحوث الإسكان والبناء
Housing and Building National Research Center

Determination of Chlorides and Sulphates in Aggregates (Coarse – Fine)

Code Form: RAW-FRM-21-03

Samples code: Rag 2141
Rsa 2142
Samples type: Aggregate
& Sand
Chemical Lab : 2
Delivery date: 2/11/2016
Testing date.: 6/11/2016

Client

SANYU CONSULTANT INC

Location/project

New Dirrout regulator group project .

Test required

Determination of chlorides & sulphates content
and organic matter for sand only .

Other data

Results

Test	Mixtures of 2 sizes coarse aggregates (1&2)	sand	Limits**
*Total Chlorides (Cl) ⁻ %	0.018	0.016	Not more than 0.06% for fine aggregates and not more than 0.04% for coarse aggregates.
*Total Sulphates (SO ₃) %	0.047	0.090	Not more than 0.10% for both fine and coarse aggregates.
Organic mater content	=	Nil	Sample must be free of organic impurities

Notes

*Tests were carried out according to En. 1744-1/09.

** Limits as stated in the Egyptian Code (ECCS 203/07).

-The above results are only valid for the delivered samples.

Tested by:

N.A. Elgali
Fatma Shokry



Lab Manger

Tarek Amin
8-11-2016
Prof. Tarek Amin

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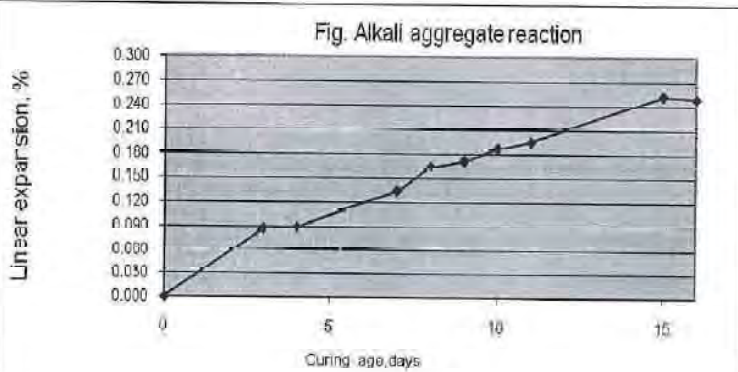
كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (147) (01/LAB-3/2016)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 2141	Sample type: Aggregate mix
Test date: 17/12/2016	Sample reception: 18/12/2016
Test code :RAW/LAB-3/Test 01-alkali	
The Test: Potential Alkali Reactivity of Aggregates*	
Environmental Condition:	Temperature of the mixing :21±1C°, Temperature of the curing:80±2C°

Test Results



curing time (days) from casting	Average Percentage Expansion of four samples	Notes
0	0.000	
3	0.087	
4	0.089	
7	0.134	
8	0.165	
9	0.172	
10	0.187	
11	0.196	
15	0.252	
16	0.249	

Notes:

The above results are only valid for the delivered samples from customer

Type and source of the used cement:

Ordinary Portland cement with grade 42.5N from beni suef cement company

Date of production of cement: 1/12/2016

Alkali content of cement: 0.59%

W/C =0.47%

Visual examination: There are no changes on the surface of the tested sample.

Chemist: *Reham Abu-Elmagh*
Signature: *Reham Abu-Elmagh*

Review and supervision

Signature: *Prof. Sayi edou zcedain*

Test	(%)	The Limits of ASTM C1260-014 *
Alkali reaction with aggregates after 16 days	0.249	No more than 0.1%

*According to the ASTM C 1260-014

Expansion limits:

1-Expansions of less than 0.1% at 16 days after casting are indicative of innocuous behavior in most cases.

2-Expansions of more than 0.2% at 16 days after casting are indicative of potentially deleterious expansion.

3-Expansions between 0.1 and 0.2% at 16 days after casting include both aggregates that are known to be innocuous and deleterious in field performance. It may useful to take comparator readings until 28 days

Laboratory manager

Signature: *Prof. L. Elmagh*



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
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كود النموذج RAW-FRM-21-08B

Test Report
Report Number: (111) (02/LAB-3/2016)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 2141	Sample type: Aggregate mix
Test date: 17/12/2016	Date of receipt of sample: 17/12/2016
Test code :RAW/LAB-3/Test 02-soundness	
The Test: Determination of soundness of aggregate*	
Environmental Condition: Temperature :11 21C°	

Test Results

Sieve Size	Percentage of aggregate fractions	Weight of Test Fractions Before Test ,(g)	Percentage Passing Designated Sieve After Test ,(%)	Weighted Percentage Loss, (%)
50mm	--	--	--	--
37mm	--	--	--	--
25mm	--	--	--	--
19mm	26.32	519.53	14.92	3.93
12.5mm	29.83	672.84	19.3	5.76
9.5mm	20.81	331.7	0.02	1.88
4.75mm	23.04	299.21	1.28	0.29
Totals	100			11.86
Result in weight loss,(%)		The Limits of ASTM C 88-2013**		
11.86		No more than 18% for Coarse aggregate		

*Standard test Methods for soundness of aggregates by use of Sodium Sulfate

** According to ASTM C 88-2013

Note: The above results are only valid for the delivered samples from the customer.

Chemist
Signature: *Reham Abu-Elwafa*

Depends

Review and supervision

Laboratory manager

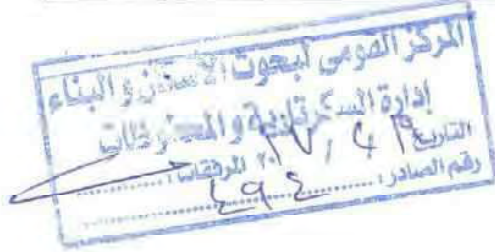
Signature: *Prof. Saajida Zeklan*

signature: *Prof. Saajida Zeklan*

5. Second aggregate test by HBRC



المركز القومي لبحوث الإسكان والبناء
معهد بحوث مواد البناء وضبط الجودة



الجهة الطالبة / Sanyu consultants INC

تحية طيبة وبعد ،،،،

إيماء إلى خطاب سيادتكم بتاريخ ٢٠١٧ / ٢ / ١٢ بخصوص الموضوع عاليه نرفق مع هذا تقريراً بالنتائج - هذا وقد سددت للسركز الرسوم المقررة وقدرها ٧٥٠ جنيهاً (ستمائة وخمسون جنيهاً لا غير) خصماً من القسيمة رقم ٠٨٨٥٣٢٦ بتاريخ ٢٠١٧ / ٢ / ١٢ .

وتفضلوا بقبول وافر الاحترام ،،،،

نائب رئيس مجلس
الإدارة لشتون البحوث والدراسات

أ.د.م. / خالد محمد يسرى

مدير المعهد

أ.د.م. / زينب صلاح الدين
٢٠١٧ / ٢ / ١٩

تحريراً في : ٢٠١٧ / ٢ / ١٩

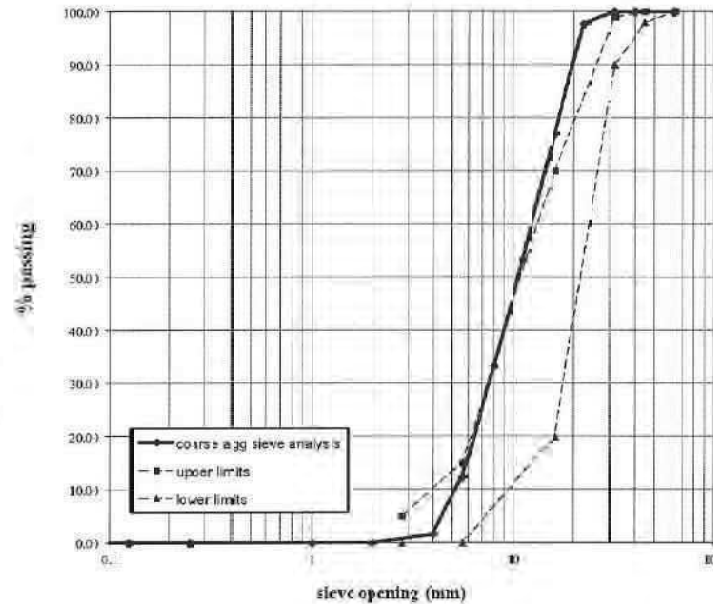
Seive Analysis Testing Report for Concrete Aggregate

Client: Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample for Assuit

Aggregate Type : Crushed stone
Letter Delivery No. and Date: 703 - 12/2/2017
Sample code: MTL/AG/2017/340

General notes :

- Aggregate sieve analysis satisfies the main grade C_{90/15} and the additional grade G_{25/15} limits according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request

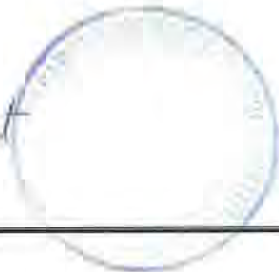


% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
97.70	22.4
77.00	16
53.40	11.2
33.30	8
12.50	5.6
1.70	4
0.00	2
0.00	1
0.00	0.25
0.00	0.125
0.00	0.063

D-1126

Prepared By

Eng Isaly Safwat



Supervisor

Amr El Hefnawy
19/2/2017

General Supervisor

Prof. Dr. / Hazem

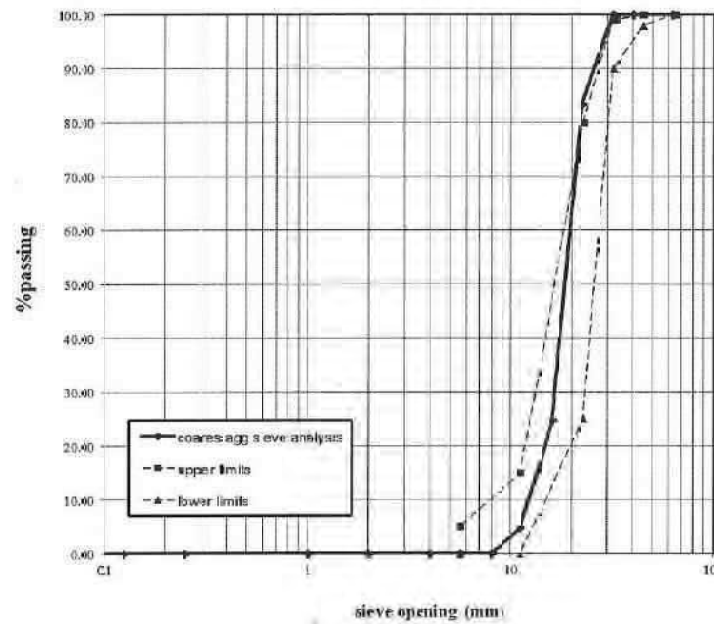
Seive Analysis Testing Report for Concrete Aggregate

Client : Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample from El-Minya

Aggregate Type : Gravel
Letter Delivery No. and Date: 703 - 12/2/2017
Sample code: MTL/AG/2017/336

General notes :

- Aggregate sieve analysis satisfies the main grade G_{c90/15} and the additional grade G_{25/13} limits according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request



% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
83.40	22.4
24.70	16
4.70	11.2
0.00	8
0.00	5.6
0.00	4
0.00	2
0.00	1
0.00	0.25
0.00	0.125
0.00	0.063

D-1127

Prepared By

Eng. Sally Safwat



Supervisor

Amr El Helwany
19/2/2017

General Supervisor

Prof. Dr. Hazem

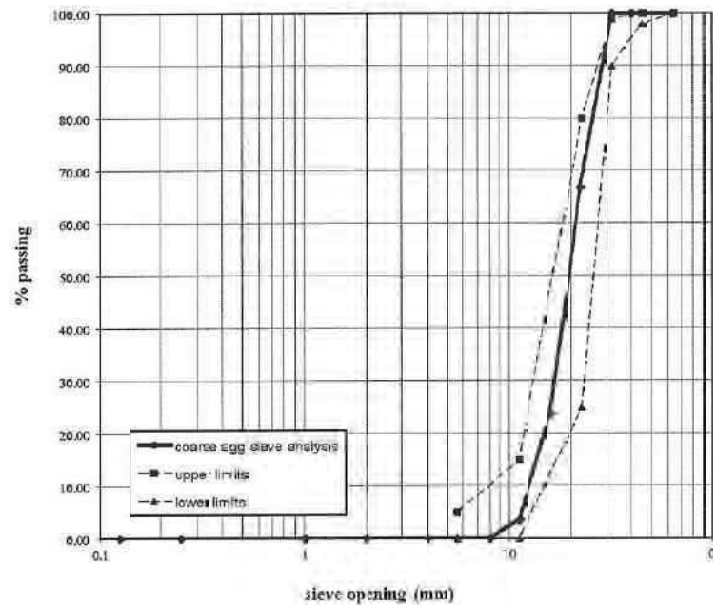
Seive Analysis Testing Report for Concrete Aggregate

Client: Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample from Dirout

Aggregate Type: Gravel
Letter Delivery No. and Date: 703 - 12/2/2017
Sample code: MTL/AGG/2017/333

General notes :

- Aggregate sieve analysis satisfies the main grade G_{c90/15} and the additional grade G_{25/15} limits according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request



% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
86.80	22.4
23.80	16
3.50	11.2
0.00	8
0.00	5.6
0.00	4
0.00	2
0.00	1
0.00	0.25
0.00	0.125
0.00	0.063

D-1128

Prepared By

Eng. Sally Safwat



Supervisor

Amr El Helwanly
19/2/2017

General Supervisor

Prof. Dr. Hazem

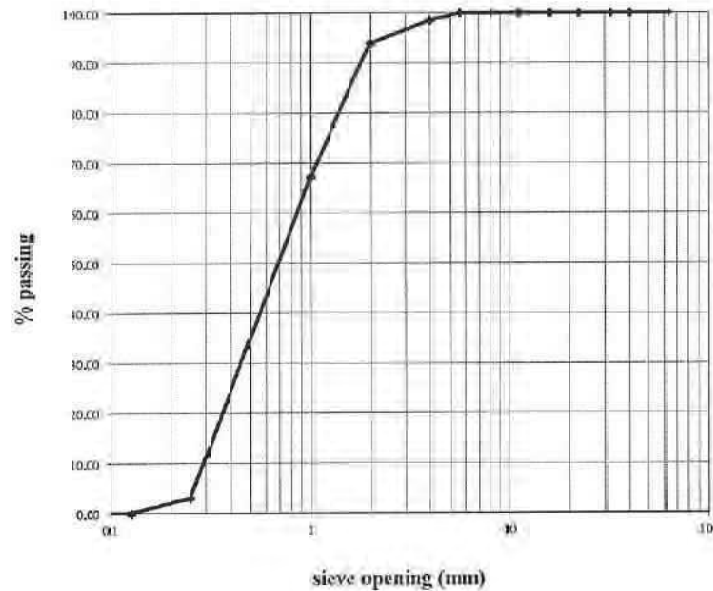
Seive Analysis Testing Report for Concrete Aggregate

Client: Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample from El-Minya

Aggregate Type: Fine Agg.
Letter Delivery No. and Date: 703 - 12/2/2017
Sample Code: MTL/AG/2017/335

General notes :

- Aggregate sieve analysis satisfies grade G_p-85 according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request



% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
100.00	22.4
100.00	16
100.00	11.2
100.00	8
100.00	5.6
58.48	4
53.94	2
67.17	1
3.03	0.25
0.00	0.125
0.00	0.063

D-1129

Prepared By

Eng. Sally Safwat



Supervisor

Amr El Helwanly
19/2/2017

General Supervisor

P. F. D. : Hacer

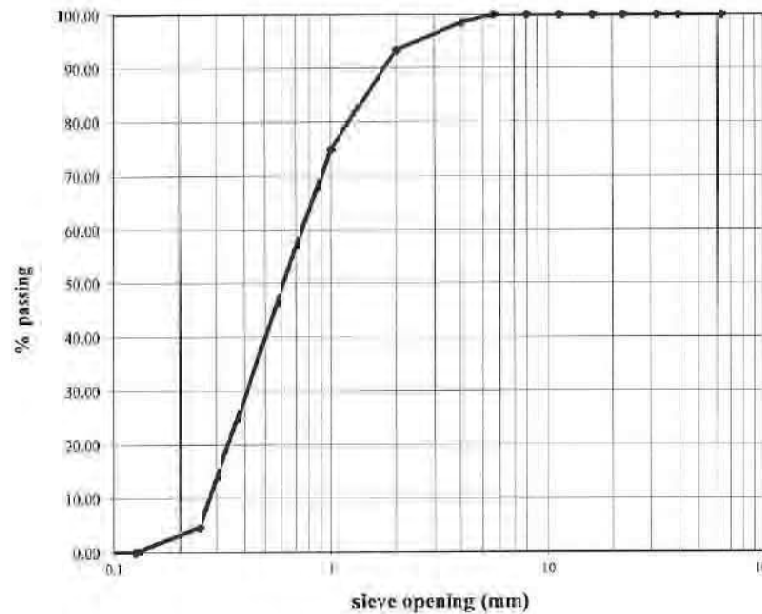
Seive Analysis Testing Report for Concrete Aggregate

Client: Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample from Assuit

Aggregate Type: Fine Agg.
Letter Delivery No. and Date: 7C3 - 12/2/2017
Sample Code: MTL/AG/2017/339

General notes :

- Aggregate sieve analysis satisfies grade G_p85 according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request



% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
100.00	22.4
100.00	16
100.00	11.2
100.00	8
100.00	5.6
98.46	4
93.33	2
74.87	1
4.62	0.25
0.00	0.125
0.00	0.075

D-1130

Prepared By

Eng. Sally Seif

Supervisor

Amr El Helwany
19/2/2017

General Supervisor

Prof. Dr. H. Hase

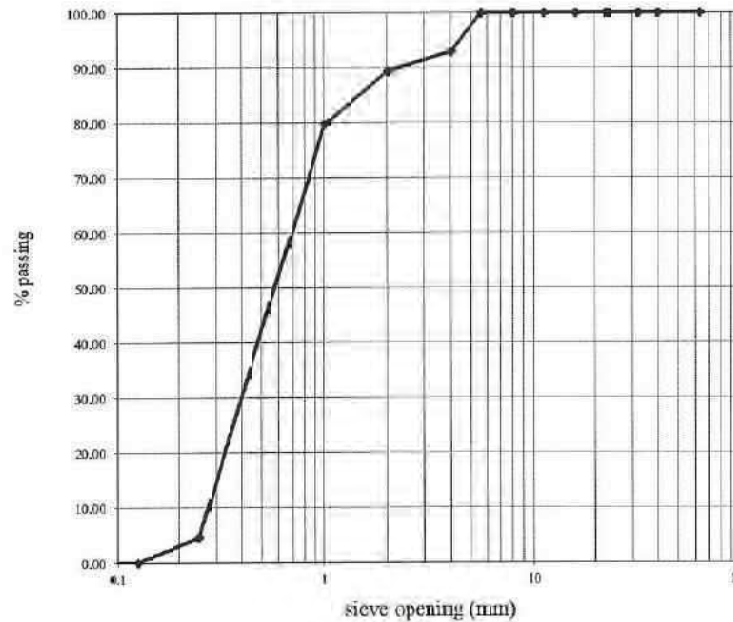
Seive Analysis Testing Report for Concrete Aggregate

Client: Sanyu consultants
Project: New Dirout group regulators
Additional data: Sample from Dirout

Aggregate Typ:: Fine Agg.
Letter Delivery No. and Date: 703 - 12/2/2017
Sample code: MTL/AG/2017/337

General notes :

- Aggregate sieve analysis satisfies grade G_r85 according to EN 12620-2013
- Test was carried out according to EN 933-1
- The results are valid only for the tested sample delivered by the client
- The above information is according to the client request



% Passing	Sieve Opening (mm)
100.00	63
100.00	45
100.00	32
100.00	22.4
100.00	16
100.00	11.2
100.00	8
100.00	5.6
92.89	4
89.34	2
79.70	1
4.57	0.25
0.00	0.125
0.00	0.063

D-1131

Prepared By

Eng Isabella Safwat



Supervisor

Amr El Refnany
19/2/2019

General Supervisor

Prof. Dr. Hany

Coarse Aggregates Test Results

Client: Sanyu consultants
Letter Delivery No. and date: 703 - 12/2/2017
Project Name: New Dirout group regulators
Sample code: MTL/AG/2017/338
Aggregate Type: Gravel
Additional data: Sample from Dirout

Test	Result	⁺ Maximum allowable percentage
Absorption %	0.16	1%

- ⁺ Maximum allowable percentage according to Egyptian code for design and construction of concrete structures 203-2007
- Test was carried out according to European specification EN 1097-6.
- The above information is according to the client request.
- All the above results are valid only for the tested specimens.

Tested By

Eng. Sally Safwat

Supervisor

Amr ElHefnawy
19/2/2017

General Supervisor

Prof. Dr. Hossam



Coarse Aggregates Test Results

Client: Sanyu consultants

Letter Delivery No. and date: 703 - 12/2/2017

Project Name: New Dirout group regulators

Sample code: MTL/AG/2017/ 340

Aggregate Type: Crushed stone

Additional data: Sample from Assuit
~~Additional data: Sample from Assuit~~

Test	Result	† Maximum allowable percentage
Absorption %	1.00	2.5%

- † Maximum allowable percentage according to Egyptian code for design and construction of concrete structures 203-2007
- Test was carried out according to European specification EN 1097-6.
- The above information is according to the client request.
- All the above results are valid only for the tested specimens.

Tested By

Eng. Sally Safwat

Supervisor

Amr El Hefnawy
19/2/2017

General Supervisor

Prof. Dr. Hani



كود النموذج : RAW-FRM-21-02

خطاب إرسال نتائج إختبارات إلى العميل

مرجعنا ت: ٢٠١٧/٣/١٢٩ م
عدد الصفحات : (....)

التقرون :- الاسم : العنوان :- اسم المشروع : New Direct Regulator Group
Project الموقع :- كود الخط :- Rag 366, 367, 368, Rsa369, 370,
371 تاريخ الطلب : ٢٠١٧/٢/١٢ ميعاد الاستلام : ٢٠١٧/٣/١٠ م

السادة/ مكتب سانيو الإستشارى (Sanyu)

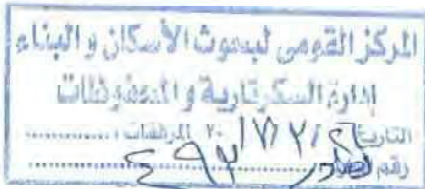
تحية طيبة وبعد:

بالإشارة إلى طلب سيادتكم بخصوص قيام المركز بإجراء أختبارات (XRD- كلوريدات وكبريتات - الفحص البتروجرافى - الثبات الحجمى - تفاعل قلووى (للسنن) ، تحديد المحتوى من الكلوريدات والكبريتات (للرمل)) على عدد (٦) عينات (٣ سن - ٣ رمل) المورددة بمعرفتكم .
بشرفنا أن نرسل طيه نتائج الاختبارات التى أعدت فى هذا الشأن من المعهد المختص . وقد تم سداد التكلفة المطلوبة للمركز بمبلغ (٧٢٠٠ ج) فقط (سبعة آلاف ومائتان جنيبها) قسيمة رقم

٨٨٦٠٣٨ ، ٨٨٥٣٢٧ بتاريخ ٢٠١٧/٢/١٢ ، ٢٠١٧/٣/١٢ .

وتفضلوا سيادتكم بقبول فائق الاحترام .

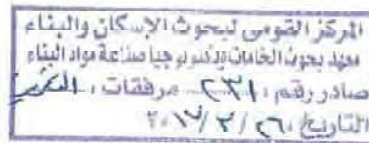
تحريرا فى : ٢٠١٧/٣/٢٦ م



نائب رئيس مجلس الإدارة
لشئون البحوث والدراسات
أ.د. خالد محمد يسرى



(Cover Page)





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Housing and Building National Research Center

XRD Mineralogical Analysis Result

RAW - ERVI-21-41
lab - 67366/016

Customer name: SANYU Consultant Inc. (مكتب سانوي الاستشاري)

Project name: New Dirrout regulator group project.

Ambient environmental conditions: Temp: $23 \pm 3^{\circ}\text{C}$
Relative humidity: $35 \pm 5\%$

Sample Code: Rag 300
Sample Type: Aggregate
Test date: 19/2/2017
Remarks: Assuit

Compound Name	Chemical Formula	SemiQuant[%]
Calcite	CaCO ₃	84
Quartz	SiO ₂	16

- The identification of the most probable phases is carried out using PANalytical computer certified program* with the aid of the International Center of Diffraction Database (ICDD)** received with the X ray diffraction equipment***.

* X'Pert HighScore Software 2006 - Licensed modules: PW3209.

** PDF-2 Database / CD-Release 2005 - Type No. 9430.500.01611.

*** X'Pert Pro PANalytical - Manufactured by Panalytical B.V. Co., Netherlands (ISO 9001:4-001 KEMA - 0.75160).

Additional Information:

Scan type: Continuous.
Anode material: Copper (Cu).
General setting: 30 mA & 40 kV.

Notes:

- * The sample will be retained for 30 days, after which they will be discarded.
- ** The examination result is valid only for the sample delivered.
- + The semi-quantitative percentages, if found, are associated with the analytical capability of the used software.

XRD Lab Manager

Prof. D. Medhat S. El-Mahllawy
(ICDD Member, USA)

Technical Manager

Page No.

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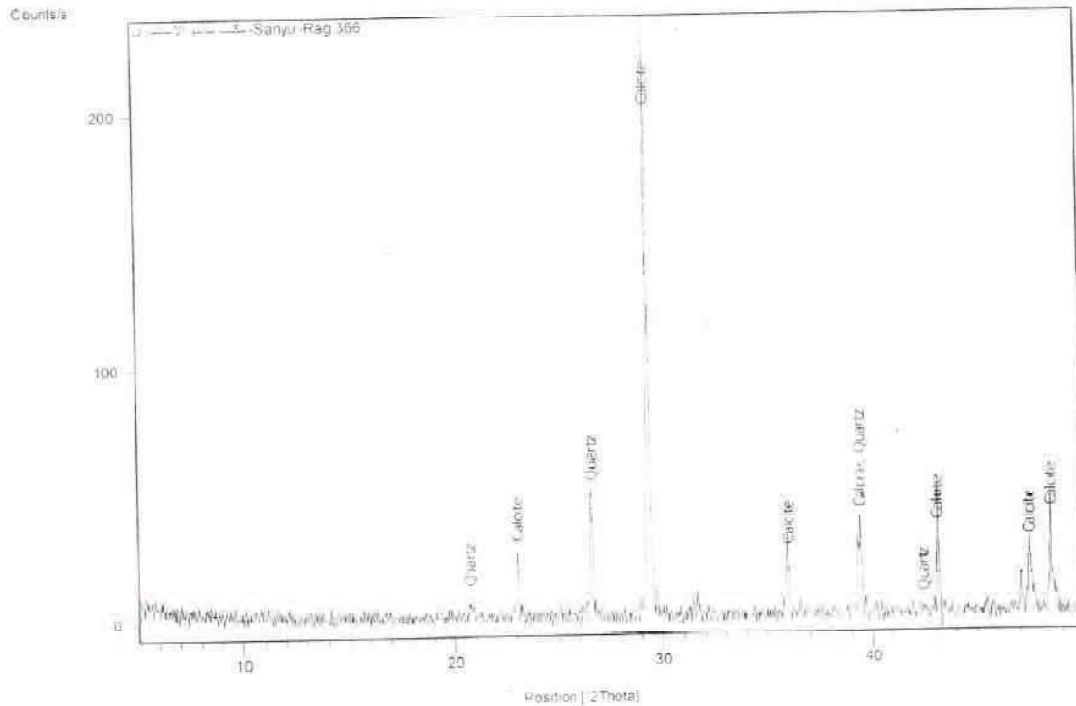
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XRD Pattern

RAW-FRM-21-01
Lab - 6 / 366 / 016



Revised by:

Geologist: Maged El-fakhrany



Page No:

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RAW - FRM-21-12 عود النموذج

تقرير الفحص البتروجرافي والمعدني لعينات الزكام الكبير

كود العينة: Rag 366
نوع العينة: Aggregate
تاريخ التوريد: 2017/2/19

مكتب سانيو الاستثماری (sanyu)

New dirrout regulator group project

الجهة
الموردة/العميل:
الموقع/اسم المشروع:
بيانات اخرى

Hand Specimen Description:

Source : Natural Hardness : Hard Color : creamy
Mineral Grain Size : Fine-grained Surface Texture: rough Shape : Irregular
Weathering Degree: fresh Other Features :

Petrographic Description:

The thin-section photomicrograph shows that the studied sample is composed predominantly of fine calcite crystals (micritic matrix). Subsidiary of sparitic shell fragments and fossils were observed as embedded grains in the micritic matrix. Also, veins of coarse grains of calcite crystals were observed penetrating the fabric of the studied sample. Traces of fine anhedral quartz grains were also observed. The overall texture of studied sample shows *Porphyrotopic texture*.

X-Ray Diffraction Result:

The studied sample revealed that it is composed mainly of calcite with subsidiary of quartz minerals.

Conclusion

: From the above results, the investigated sample is *siliceous limestone*.

*تم تنفيذ الاختبار طبقاً الى دليل الاختبارات المعملية لمواد الخرسانه (الملحق الثالث) الكود المصري لتصميم وتنفيذ المنشآت الخرسانيه رقم 203 اصدار 2015.

ملاحظة: النتائج الموضحة بعاليه تسري فقط على العينة الموردة من الجهة طلبية الاختبار.

القائم بالاختبار:



مدير المعمل
د. عمرو لطيف
215
2017
عدد الصفحات:



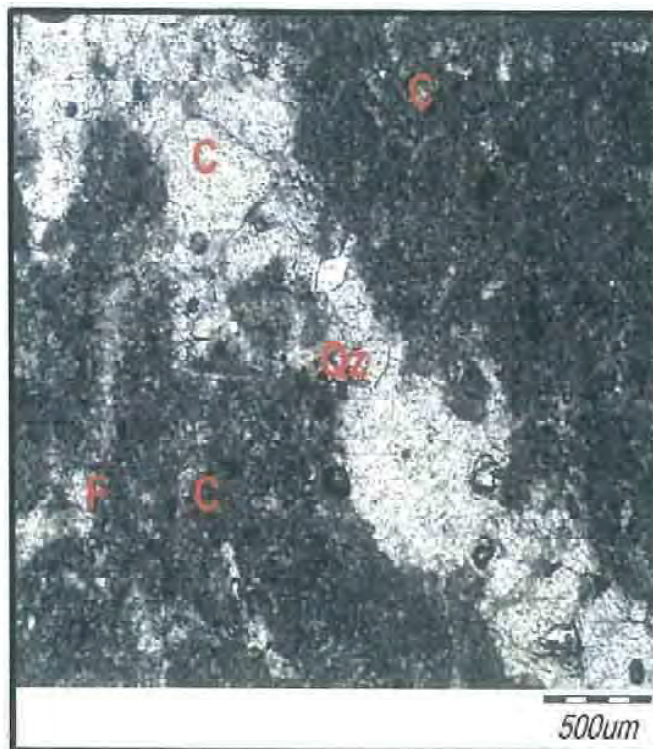
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Research Center

Petrographical and Mineralogical Test Report

Pattern Code: RAW - FRM - 21- 10



Thin section photomicrograph of the sample submitted by

مكتب سانيو الاستثمارى (sanyu)-Rag 366

G: Calcite, Qz: Quartz, F: Fossil (XPL, 4)

Test Staff Member

Ahmed Abou Bakr

Geologist: Ahmad Abou Bakr

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نموذج الترميز - RAW - FRM-21-12

تقرير الفحص البتروجرافي والمعدني لعينات الركام الكبير

نوع العينة: Rag 367
نوع العينة: Aggregate
تاريخ التوريد: 2017/2/19

مكتب سانيو الاستثماري (sanyu)

New Dirout regulator group project

زلط ديروط

الجهة

الموردة/العميل:

الموقع/اسم المشروع:

بيانات أخرى

Hand Specimen Description:

Source :	Natural	Hardness :	Hard	Color :	Yellowish black
Mineral Grain Size :	Fine-grained	Surface Texture:	smooth	Shape :	rounded
Weathering Degree:	Fresh	Other Features :			

Petrographic Description:

The thin-section photomicrograph shows that the studied sample is composed mainly of coarse quartz crystals. The quartz crystals are characterized by its parallel cracked pattern and 2nd order reference color. The quartz crystals are contained nodules (inclusions-rich). Traces of calcite crystals were observed outer side the periphery of the gravel as a coating.

Maturation: Immature to submature.

X-Ray Diffraction Result:

The studied sample revealed that it is composed mainly of quartz and calcite minerals.

Conclusion :

From the above results, the investigated sample is siliceous gravel. It is recommended to measure its potential alkali reactivity.

*تم تنفيذ الاختبار طبقا الى دليل الاختبارات المعملية لمواد الخرسانة (الملحق الثالث). الكود المصري لتصميم و تنفيذ المنشآت الخرسانية رقم 203 اصدار 2015.

ملحوظة : النتائج الموضحة بعاليه تسرى فقط على العينة الموردة من الجهة طالبة الاختبار.

القائم بالاختبار: محمد محمود عليم

مدير المعمل

عدد الصفحات:





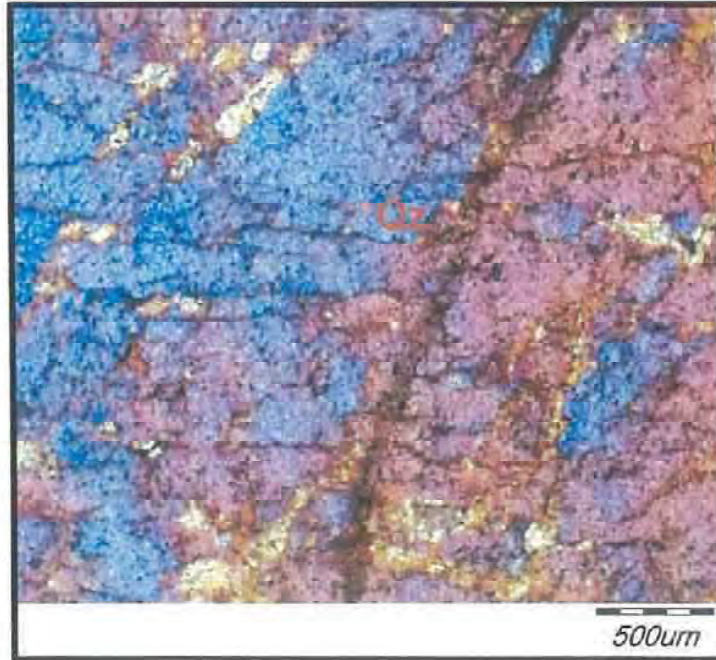
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Research Center

Petrographical and Mineralogical Test Report

Pattern Code: RAW - FRM - 21- 10



Thin section photomicrograph of the sample submitted by

مكتب سانينو الاستثمارى (sanyu) - Rag 367-

Qz: Quartz (XPL, 4)

Test Staff Member

Ahmed Abou Bakr

Geologist: Ahmad Abou Bakr



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RAW - FRM-21-12 كود الترميز

تقرير الفحص البترولوجرافي والمعدني لعينات الركام الكبير

كود العينة: Rag 368
نوع العينة: Aggregate
تاريخ التوريد: 2017/2/19

مكتب ساتيو الإستثماري (sanyu)

New Dirrout regulator group project

زلط المنيا

الجهة
الموردة/العميل:
الموقع/اسم المشروع:
بيانات اخرى

Hand Specimen Description:

Source : Natural Hardness : Hard Color : Yellowish black
Mineral Grain Size : Fine-grained Surface Texture: smooth Shape : rounded
Weathering Degree: fresh Other Features :

Petrographic Description:

The thin-section photomicrograph shows that the studied sample is composed mostly of microcrystalline quartz mineral. In addition, stained brown nodules were clearly observed most likely due to iron oxides contents (inclusion-rich).

Maturation: MATURE

X-Ray Diffraction Result:

The studied sample revealed that it is composed mainly of quartz mineral.

Conclusion

: From the above results, the investigated sample is siliceous gravel

تم تنفيذ الاختبار طبقاً الى دليل الاختبارات المعملية لمواد الخرسانه (الملحق الثالث) - القود المصري لتصميم وتنفيذ المنشآت الخرسانيه رقم 203 اصدار 2015.

ملحوظة : النتائج الموضحة بعاليه تسري فقط على العينة الموردة من الجهة طالبة الاختبار.

القائم بالاختبار: كمال أبو بكر



مدير المعمل
د. محمد رمضان

عدد الصفحات:



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
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Housing and Building National
Research Center

Petrographical and Mineralogical Test Report

Pattern Code: RAW - FRM - 21- 10



Thin section photomicrograph of the sample submitted by

Rag 368 - (sanyu) مكتب سانيو الاستثمارى

Qz: Quartz (XPL, 4)

Test Staff Member

Ahmed Abou Bakr

Geologist: Ahmad Abou Bakr



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
Raw Building Materials Technology and Processing Research Institute



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Housing and Building National Research Center

Determination of Chlorides and Sulphates in Aggregates (Coarse - Fine)

Code Form: RAW-FRM-21-03

Sample code: Rsa 366-368
Samples type: Coarse aggregates
Chemical Lab : 2
Delivery date: 12/2/2017
Testing date.: 19/2/2017

Client: SANYU CONSULTANT INC
Location/project: New Dirrout regulator group project .
Test required: Determination of chlorides & sulphates content .
Other data:

Results

Test	Dolomite Dirrout	Gravil Assuit	Gravil Minia	Limits**
*Total Chlorides (Cl)%	0.006	0.020	0.026	Not more than 0.06% for fine aggregates and not more than 0.04% for coarse aggregates.
*Total Sulphates (SO ₃) %	0.007	0.009	0.011	Not more than 0.40% for both fine and coarse aggregates.

Notes

- *Tests were carried out according to En. 1744-1/09.
- ** Limits as stated in the Egyptian Code (ECCS 203/07).
- The above results are only valid for the delivered samples.

Tested by:

Nasser Mahmood
Supervisor
El-Sayed Alim

Lab Manger

T. Amier 20-2-2017
Prof. Tarek Amin
Osman

87 El-Tahrir St., Dokki, Giza 11511
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Determination of Chlorides and Sulphates in Aggregates (Coarse – Fine)

Code Form: RAW-FRM-21-03

Samples code: Rsa 369-371
Samples type: Sand
Chemical Lab : 2
Delivery date: 12/2/2017
Testing date.: 19/2/2017

Client **SANYU CONSULTANT INC**
Location/project New Dirrout regulator group project
Test required Determination of chlorides & sulphates content .
Other data

Results

Test	Sand Dirrout	Sand Assuit	Sand Minia	Limits**
*Total Chlorides (Cl) ⁻ %	0.099	0.054	0.019	Not more than 0.06% for fine aggregates and not more than 0.04% for coarse aggregates.
*Total Sulphates (SO ₃) %	0.036	0.173	0.079	Not more than 0.40% for both fine and coarse aggregates.

Notes

*Tests were carried out according to En. 1744-1/09.

** Limits as stated in the Egyptian Code (ECCS 203/07).

-The above results are only valid for the delivered samples.

Tested by:

Nasser Mahmoud

Supervisor

El-Sayid Ahmed

Lab Manger

T. Osman 20-2-2017

Prof. Tarek Amin
Osman

87 El-Tahrir St., Dokki, Giza 11511
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ص.ب: ١٧٧٠ القاهرة



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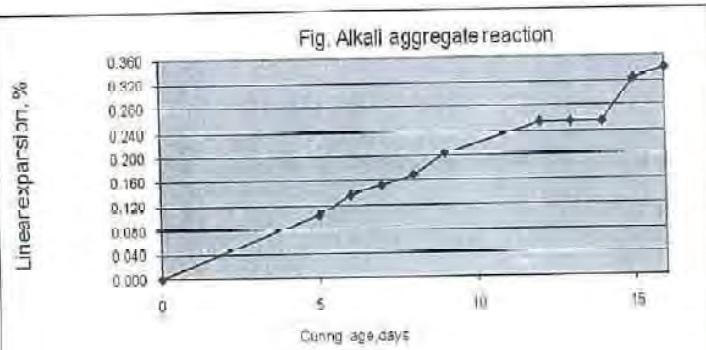
كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (22) (01/LAB-3/2017)

Project: New Dirrout regulator group	Customer: SANYU CONSULTANT INC
Sample Code: Rag 366	Sample type: Aggregate mix
Test date: 22/2/2017	Sample reception: 21/2/2017
Test code : RAW/LAB-3/Test 01-alkali	
The Test: Potential Alkali Reactivity of Aggregates*	
Environmental Condition:	Temperature of the mixing : 21+ 1C°, Temperature of the curing: 80±2C°

Test Results



curing time (days) from casting	Average Percentage Expansion of four samples	Notes
0	0.000	
3	0.103	
6	0.135	
7	0.151	
8	0.169	
9	0.204	
12	0.254	
13	0.255	
14	0.254	
15	0.325	
16	0.341	

Notes:

The above results are only valid for the delivered samples from customer

Type and source of the used cement:

Ordinary Portland cement with grade 42.5N from beini suef cement company

Date of production of cement: 1/12/2016

Alkali content of cement: 0.59%

W/C = 0.47%

Visual examination: There are no changes on the surface of the tested sample.

Chemist

Signature: *Reham Ab Elwa*

Review and supervision

Signature: *Sayyeda Zedan*

Test	(%)	The Limits of ASTM C1260-014 *
Alkali reaction with aggregates after 16 days	0.341	No more than 0.1%

*According to the ASTM C 1260-014

Expansion limits:

- 1-Expansions of less than 0.1% at 16 days after casting are indicative of innocuous behavior in most cases.
- 2-Expansions of more than 0.2% at 16 days after casting are indicative of potentially deleterious expansion.
- 3-Expansions between 0.1 and 0.2% at 16 days after casting include both aggregates that are known to be innocuous and deleterious in field performance. It may useful to take comparator readings until 28 days

Laboratory manager

Signature: *Walid*



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كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (22) (02/LAB-3/2017)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 366	Sample type: Aggregate mix
Test date: 22/2/2017	Date of receipt of sample: 21/2/2017
Test code :RAW/LAB-3/Test 02-soundness	
The Test: Determination of soundness of aggregate*	
Environmental Condition: Temperature :+ 21C°	

Test Results


Sieve Size	Percentage of aggregate fractions, (%)	Weight of Test Fractions Before Test ,(g)	Percentage Passing Designated Sieve After Test, (%)	Weighted Percentage Loss, (%)
50mm	--	--	--	--
37.5mm	--	--	--	--
25mm	--	--	--	--
19mm	25.25	509.8	5.79	1.46
12.5mm	40.37	661.25	0.65	0.26
9.5mm	12.13	303.28	7.93	0.96
4.75mm	22.25	292.49	1.84	0.42
Totals	100			3.10
Result in weight loss,(%)			The Limits of ASTM C 88-2013**	
3.10			No more than 18% for Coarse aggregate	

*Standard test Methods for soundness of aggregates by use of Sodium Sulfate

** According to ASTM C 88-2013

Note: The above results are only valid for the delivered samples from the customer.

Chemist

Signature: 

Depends

Review and supervision

Signature: 

Laboratory manager

signature: 



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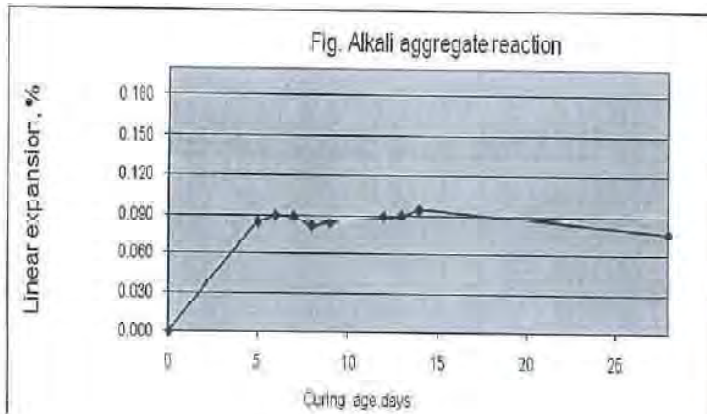
كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (24) (01/LAB-3/2017)

Project: New Dirrout regulator group		Customer:	SANYU CONSULTANT INC
Sample Code:	Rag 367	Sample type:	Gravel Dirrout
Test date:	22/2/2017	Sample reception:	21/2/2017
Test code : RAW/LAB-3/Test 01-alkali			
The Test: Potential Alkali Reactivity of Aggregates*			
Environmental Condition:	Temperature of the mixing : $21 \pm 1^\circ\text{C}$, Temperature of the curing: $80 \pm 2^\circ\text{C}$		

Test Results



curing time (days) from casting	Average Percentage Expansion of four samples	Notes
0	0.000	
5	0.084	
6	0.090	
7	0.088	
8	0.081	
9	0.084	
12	0.088	
13	0.089	
14	0.095	
28	0.076	

Notes:

The above results are only valid for the delivered samples from customer

Type and source of the used cement:

Ordinary Portland cement with grade

42.5N from beni suef cement company

Date of production of cement: 1/12/2016

Alkali content of cement: 0.59%

W/C = 0.47%

Visual examination: There are no changes on the surface of the tested sample.

Chemist

Signature: *Reham Abdel Wahab*

Review and supervision

Signature: *Sayyeda Zohra*

Test	(%)	The Limits of ASTM C1260-014 *
Alkali reaction with aggregates after 28 days	0.076	No more than 0.1%

*According to the ASTM C 1260-014

Expansion limits:

- 1-Expansions of less than 0.1% at 16 days after casting are indicative of innocuous behavior in most cases.
- 2-Expansions of more than 0.2% at 16 days after casting are indicative of potentially deleterious expansion.
- 3-Expansions between 0.1 and 0.2% at 16 days after casting include both aggregates that are known to be innocuous and deleterious in field performance. It may useful to take comparator readings until 28 days

Laboratory manager

Signature: *Reham Abdel Wahab*



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المركز القومي لبحوث الإسكان والبناء
Housing and Building National Research Center

كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (20) (02/LAB-3/2017)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 367	Sample type: Gravel Dirrout
Test date: 22/2/2017	Date of receipt of sample: 21/2/2017
Test code :RAW/LAB-3/Test 02-soundness	
The Test: Determination of soundness of aggregate*	
Environmental Condition: Temperature :1±21C°	

نتائج الاختبار

Sieve Size	Percentage of aggregate fractions, (%)	Weight of Test Fractions Before Test, (g)	Percentage Passing Designated Sieve After Test, (%)	Weighted Percentage Loss, (%)
50mm	--	--	--	--
37.5mm	51.78	1501.09	0.11	0.06
25mm	25.04	991.47	0.13	0.03
19mm	23.18	515.60	2.53	0.59
12.5mm	---	---	---	---
9.5mm	---	---	---	---
4.75mm	--	--	--	--
Totals	100			0.68

حدود الكود المصري**	نتائج الفاقد في الوزن, (%)
لا يزيد عن 1% للركام الصغير - 1.8% للركام الكبير	0.68

ملحوظة: لا تسرى هذه النتائج بعالية الاعلى العينات الموردة من الجهة طالبة الاختبار فقط

*Standard test Methods for soundness of aggregates by use of Sodium Sulfate ASTM C88-2013

**حدود الكود وفقا للكود المصري لتصميم وتنفيذ المنشآت الخرسانية رقم 203 اصدار 2009

التوقيع: محمد جمال
القائم بالاختبار

يعتمد،

التوقيع: ممدوح المعيل
مدير المعمل

التوقيع: محمد جمال
مراجعة واشراف



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
Raw Building Materials Technology and Processing Research Institute



المركز القومي لبحوث الإسكان والبناء
Housing and Building National Research Center

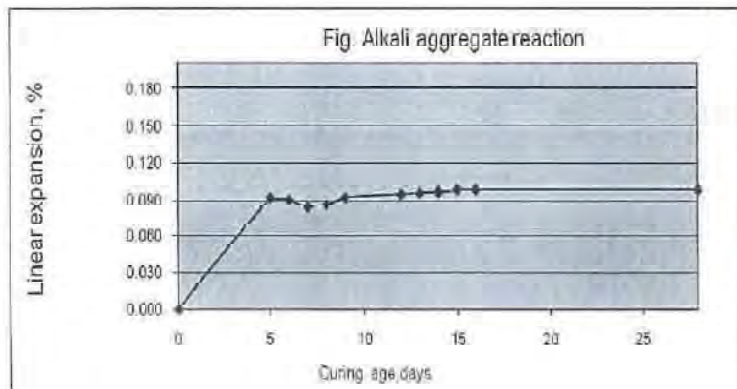
كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (23) (01/LAB-3/2017)

Project: New Dirrout regulator group		Customer: SANYU CONSULTANT INC	
Sample Code: Rag 368	Sample type: Garvel Elmenya		
Test date: 22/2/2017	Sample reception: 21/2/2017		
Test code : RAW/LAB-3/Test 01-alkali			
The Test: Potential Alkali Reactivity of Aggregates*			
Environmental Condition:	Temperature of the mixing : $21 \pm 1^\circ\text{C}$, Temperature of the curing: $80 \pm 2^\circ\text{C}$		

Test Results



curing time (days) from casting	Average Percentage Expansion of four samples	Notes
0	0.000	
5	0.092	
6	0.091	
7	0.084	
8	0.086	
9	0.092	
12	0.095	
13	0.096	
14	0.096	
15	0.098	
16	0.098	
28	0.098	

Notes:

The above results are only valid for the delivered samples from customer

Type and source of the used cement:

Ordinary Portland cement with grade 42.5N from Beni Suez cement company

Date of production of cement: 1/12/2016

Alkali content of cement: 0.59%

W/C = 0.47%

Visual examination: There are no changes on the surface of the tested sample.

Chemist

Signature: *Rehan Ab Elwafa*

Review and supervision

Signature: *Prof. Sayida Zeidan*

Test	(%)	The Limits of ASTM C1260-014 *
Alkali reaction with aggregates after 28 days	0.098	No more than 0.1%

*According to the ASTM C 1260-014

Expansion limits:

- 1-Expansions of less than 0.1% at 16 days after casting are indicative of innocuous behavior in most cases.
- 2-Expansions of more than 0.2% at 16 days after casting are indicative of potentially deleterious expansion.
- 3-Expansions between 0.1 and 0.2% at 16 days after casting include both aggregates that are known to be innocuous and deleterious in field performance. It may be useful to take comparator readings until 28 days

Laboratory manager

Emk Elsh



معهد بحوث الخامات وتكنولوجيا صناعة مواد البناء
Raw Building Materials Technology and Processing Research Institute



المركز القومي لبحوث الإسكان والبناء
Housing and Building National Research Center

كود النموذج RAW-FRM-21-08B

Test Report

Report Number: (20) (02/LAB-3/2017)

Project: New Dirrout regulator group project	Customer: SANYU CONSULTANT INC
Sample Code: Rag 368	Sample type: Gravel El menia
Test date: 22/2/2017	Date of receipt of sample: 21/2/2017
Test code :RAW/LAB-3/Test 02-soundness	
The Test: Determination of soundness of aggregate*	
Environmental Condition: Temperature : $\pm 21^{\circ}$	

نتائج الأختبار

Sieve Size	Percentage of aggregate fractions, (%)	Weight of Test Fractions Before Test ,(g)	Percentage Passing Designated Sieve After Test, (%)	Weighted Percentage Loss, (%)
12.5mm	61.55	664.48	0.081	0.049
9.5mm	38.45	325.9 5	0.064	0.025
Totals	100			0.074
حدود الكود المصري **			نتائج الفاقد في الوزن, (%)	
لا يزيد عن ١٥% للركام الصغير - ١٨% للركام الكبير			0.074	

ملحوظة: Y تسرى هذه النتائج بعاليه الاعلى العينات الموردة من الجهة طالبة الاختبار فقط

*Standard test Methods for soundness of aggregates by use of Sodium Sulfate ASTM C88-2013

**حدود الكود وفقا للكود المصري لتصميم وتنفيذ المنشآت الخرسانية رقم ٢٠٣ اصدار ٢٠٠٩

القائم بالأختبار
التوقيع: صلاح أبو الربيع

بمعدل،،

مراجعة وإشراف

التوقيع: محمد عبد الوهاب



6. Second aggregate test by Cairo University



جامعة القاهرة
Cairo University

معمل اختبار المواد
Materials Testing Lab



كلية الهندسة
Faculty of Engineering

Your Ref. : 12 / 2 / 2017

Applicant: SANYU Consultant Incorporation
New Dairout Group Regulators Project

Our Ref. No. : MTL/ 426 - 2 / 2017

Specimens: One Sand specimen supplied by applicant
(Meniya)

Date : 13 / 2 / 2017

RESULTS OF SIEVE ANALYSIS

Sieve Size (mm)	4.76	2.36	1.18	0.600	0.300	0.150
Percentage Passing	98.5	92.9	52.8	37.6	8.6	0.5



Head of Materials Testing Lab.

(Prof. Dr. Hossam A. Hodhod)



جامعة القاهرة
Cairo University

معمل اختبار المواد
Materials Testing Lab



كلية الهندسة
Faculty of Engineering

Your Ref. : 12 / 2 / 2017

Applicant: SANYU Consultant Incorporation
New Dairout Group Regulators Project

Our Ref. No. : MTL/ 426 - 1 / 2017

Specimens: One Sand specimen supplied by applicant
(Assiut)

Date : 13 / 2 / 2017

RESULTS OF SIEVE ANALYSIS

Sieve Size (mm)	4.76	2.36	1.18	0.600	0.300	0.150
Percentage Passing	98.0	94.4	67.9	55.6	10.2	1.0



Head of Materials Testing Lab.

Hossam A. Hodhod

(Prof. Dr. Hossam A. Hodhod)



جامعة القاهرة
Cairo University

معمل اختبار المواد
Materials Testing Lab



كلية الهندسة
Faculty of Engineering

Your Ref. : 12 / 2 / 2017

Applicant: SANYU Consultant Incorporation
New Dairout Group Regulators Project

Our Ref. No. : MTL/ 426 - 3 / 2017

Specimens: Two Sand specimens supplied by applicant

Date : 14 / 2 / 2017

RESULTS OF CHEMICAL ANALYSIS

Element	Assiut Sand	Menyia Sand	Limits of ECP 203/2007
TDS (%)	0.215	0.150	-----
Cl ⁻ (%)	0.058	0.049	0.06 (max.)
SO ₃ (%)	0.014	0.006	0.40 (max.)

Head of Materials Testing Lab.

(Prof. Dr. Hossam A. Hodhod)



2 Embankment Material Tests

The embankment material tests performed by CRI (Construction Research Institute) and the test samples of the embankment materials collected at the borrow site. The two times of the laboratory tests were performed as follows:

1. Preliminary test by CRI (April 2016)
2. Geotechnical study by CRI (October 2016)

2-1 Borrow Site

The borrow site is located near the junction of the desert road. The backfill material can be provided from the site. The distance from the NDGR is approximately 19km. The road is wide enough for a dump truck to pass through. The geological conditions are the same as those in the quarry site, and have sand and gravel in alternate layers.



Figure 1-1 Locations of borrow site around Dirout



Figure 1-2 Borrow Site

2-2 Preliminary test by CRI

Test Samples

The tests of the borrow site at Dirout are as follows:

Table 2-1 List of Soil Test

Soil Laboratory test	Sand 2-1	Sand 2-2	Total
1. Test for specific gravity of soils	1	1	2
2. Test for grain size analysis of soils	1	1	2

Test Results of Borrow Site

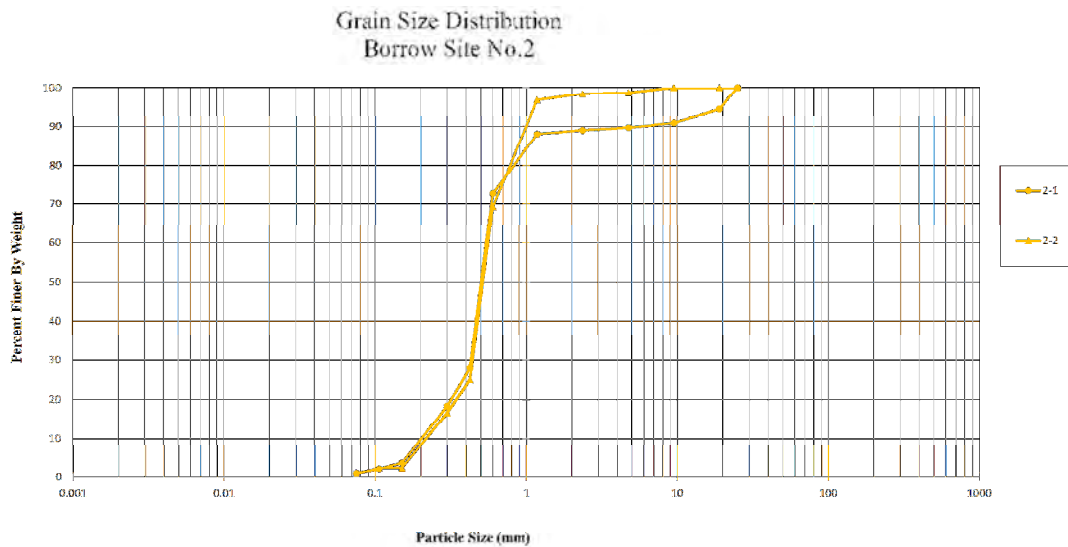
The test results of the specific gravity are as following table:

Table 2-2 Specific Gravity of Sand

No.	Specific Gravity
2-1	2.64>2.5
2-2	2.66>2.5

The grain size curves of the borrow site are as follows:

Figure 2-1 Grain Size Curves of Borrow Site



2-3 Geotechnical study by CRI

The three test samples collected at the borrow site and the laboratory tests are as follows:

Table 3-1 Required Laboratory Tests

No.	Soil Laboratory Test	Sample 1	Sample 2	Sample 3
1	Physical properties			
1-1	Soil density test	2	2	2
1-2	Water contents test	2	2	2
1-3	Atterberg limits test	Non available		
2	Mechanical properties			

2-1	Compaction test	1	1	1
2-2	Permeability test	2	2	2
2-3	Consolidation test	Non available		
2-4	Direct shear test	2	2	2
2-5	Tri-axial compaction test (UU)	Non available without back data		
2-6	Tri-axial compaction test (CU)	Non available		
2-7	Tri-axial compaction test (CD)	Non available		

2-4 Test results

The soil test results are as follow's table.

Table 4-1 Results of Soil Laboratory Tests

No.	Soil classification	Water Content (%)	Density (g/cm ³)	Compaction test	
				Max dry density (g/cm ³)	Optimum moisture Content (%)
1-A	Sand and Gravel	4.56	1.82	1.97	8.51
1-B	Sand and Gravel				
2-A	Sand and Gravel	0.41	1.78	2.03	9.43
2-B	Sand and Gravel				
3-A	Sand and Gravel	0.5	1.81	2.01	10.0
3-B	Sand and Gravel				

*Compaction test values of sample 3 are revised from laboratory test results

No.	Soil classification	Max dry density (g/cm ³)	e _{max}	Specific gravity	Permeability K (m/sec)	Direct shear test Friction angle ϕ (deg.)
1-A	Sand and Gravel	1.97	0.35	2.66	6.83×10^{-5}	38.3
1-B	Sand and Gravel					36.0
2-A	Sand and Gravel	2.03	0.33	2.70	4.02×10^{-5}	41.0
2-B	Sand and Gravel					38.2
3-A	Sand and Gravel	2.03	0.33	2.64	3.95×10^{-5}	38.1
3-B	Sand and Gravel					40.8



Figure 4-1 Grain size Distribution

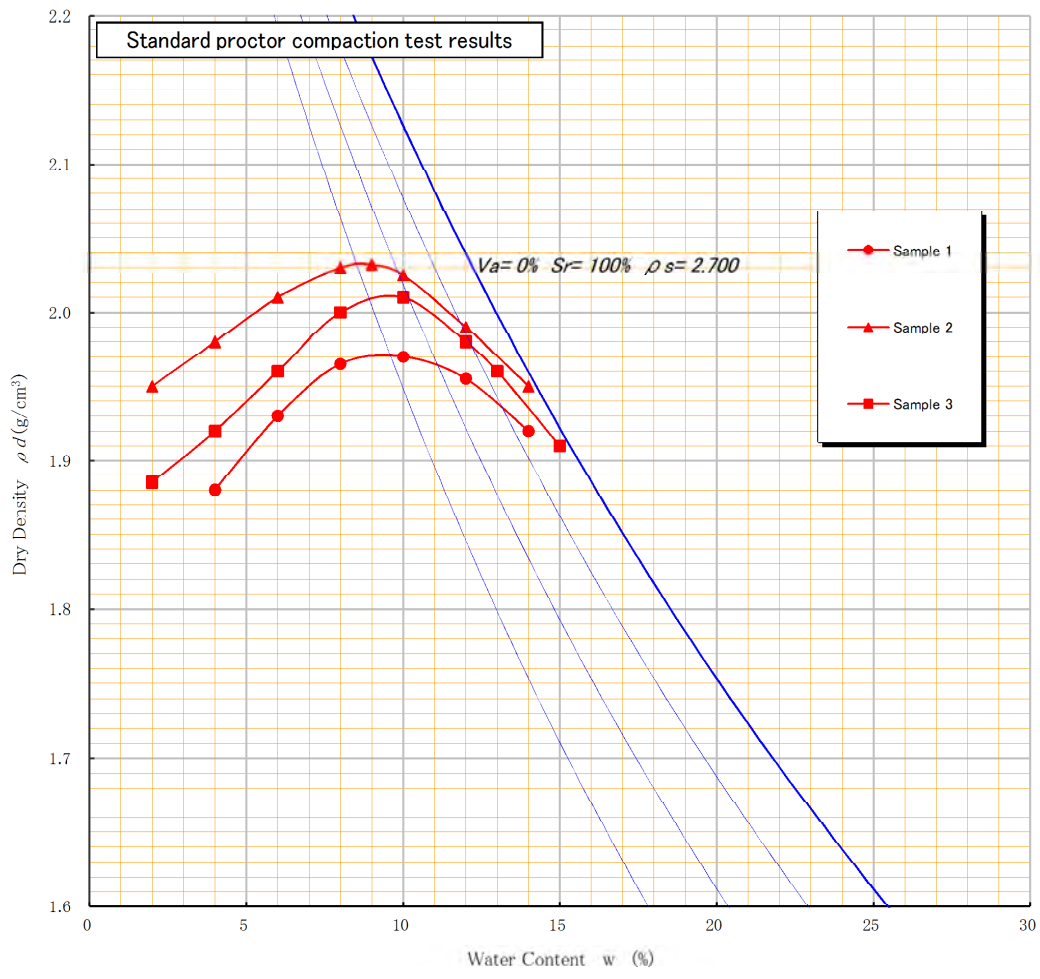


Figure 4-2 Compaction Test

**Geotechnical Study For
Constructing of New Dayrout Regulators**

By

Dr. Mohie EL Mashad

Eng. Ahmed Mohamed Ahmed

CRI Director

Prof. Dr. Mohamed Anwar

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Appendix 1

Laboratory Tests Results

<u>Symbol</u>	<u>Term</u>	<u>Unit</u>
L.L. :	Liquid limit	(%)
P.L. :	Plastic limit	(%)
P.I. :	Plasticity Index	(%)
Hyd. :	Hydrometer	
G.S. :	Grain size distribution	
Ws :	Unit weight	(t/m ³)
Gs :	Specific weight	
Wc :	Water content	(%)
Ch :	Chemical analysis	
pH :	Hydrogen ion concentration	
T.D.S:	Total dissolved salts	
SO ₃ :	Sulphates	(ppm)
CL :	Chlorides	(ppm)
Ca CO ₃	Calcium Carbonates	(%)
O.M. :	Organic matter	(%)
q _{ur} :	Unconfined test	
C:	Soil Cohesion	(kg/cm ²)
D.S. :	Direct shear box test	
Cons :	Consolidation test	
Sf:	Free Swelling	(%)
S.R	Split Resistance	(kg/cm ²)
L.S.	Lime Stone	
K	Coefficient of permeability	m/sec
γ _d	Dry density	gm/cm ³
O.M.C	Optimum moisture content	(%)
Ø	Friction angle	degree
CU	Uniformity coefficient	
CC	Coefficient of curvature	

Geotechnical Study for Construction of New Dayrout Regulators

1. Introduction

This report presents the geotechnical study for construction of New Dayrout Regulators. CRI have been received three samples for borrow No. 2 from Jabaneis side to investigate the different physical and mechanical properties from laboratory tests.

2. Required Laboratory Tests

The required laboratory geotechnical investigations tests, including various laboratory tests are shown in table (1).

Table (1): Required Laboratory Tests Number.

	Soil Laboratory Test	Sample 1	Sample 2	Sample 3
1. Tests for physical properties				
1-1	Soil density	2	2	2
1-2	Water content of soils	2	2	2
1-3	Atterberg limits	N.A	N.A	N.A
2. Tests for Mechanical properties				
2-1	Compaction test	1	1	1
2-2	Permeability test	2	2	2
2-3	Consolidation test	N.A	N.A	N.A
2-4	Direct shear test	2	2	2
2-5	Tri- axial compression test (UU)	2	2	2
2-6	Tri- axial compression test (CU)	2	2	2
2-7	Tri- axial compression test (CD)	N.A	N.A	N.A

3. Laboratory Tests

3.1 Soil Classifications (ASTM D 2487 & ASTM D 2488)

The soil is classified according to ASTM D2487- D2488 "Standard Test method for Classification of soils for Engineering Purposes". Laboratory tests as particle size analyses are used where precise classification is required. From the received samples no. 1, 2 and 3 of borrow No. 2 the main soil formation is graded sand with some gravel. The proportions of the soil formation were determined and summarized as follows in table (2) and inserted in curve of grain size distributions in Appendix-1.

Table (2): Soil Description of Tested Samples.

Sample No.	Sand %	Gravel %	Silt %	Description
1-A	91.60	8.78	0.06	Graded Sand with some Gravel
1-B	91.22	8.70	0.07	Graded Sand with some Gravel
2-A	92.52	7.39	0.09	Graded Sand with some Gravel
2-B	89.85	10.01	0.15	Graded Sand with some Gravel
3-A	91.53	8.39	0.09	Graded Sand with some Gravel
3-B	89.99	9.94	0.07	Graded Sand with some Gravel

3.2 Grain size Analysis (ASTM D 422)

In order to classify the sandy soil, particle size analyses were carried out using B.S. sieves. The ASTM particle size classification system is used for soil type determination. The results are presented in appendix-1. In addition, the effective grain size (D₁₀), uniformity coefficient (Cu) and coefficient of curvature (Cc) were determined and the results also were presented in appendix-1.

3.3 Water content (ASTM D 2216)

Natural water content was determined for samples. Results are illustrated in table no. (3).

Table (3): Water Content Tests Results of Tested Samples

Sample No.	Wc					Density(γ_b) (gm/cm ³)
	Wt. of con	Wt. of con-wet soil	Wt. of con+dry soil	Wc %	Average Wc	
1	43.002	152.458	147.509	4.74	4.56	1.82
	43.681	141.466	136.44	5.42		
	41.732	173.334	168.84	3.54		
2	42.911	148.905	148.529	0.36	0.41	1.78
	43.67	159.736	159.336	0.35		
	41.708	150.642	150.07	0.53		
3	42.903	122.184	121.766	0.53	0.50	1.81
	43.658	118.775	118.423	0.47		
	41.701	123.207	122.811	0.49		

3.4 Direct shear Test (ASTM D 3080)

Direct shear tests were performed on the samples obtained from borrow No.2 in order to determine the shear resistance parameters. The shearing device is motorized and strain-controlled. The normal force is applied by a lever loading arm. The results are tabulated in table no. (4) and curves in appendix-1.

Table (4): Direct Shear Tests Results of Tested Samples

Sample No.	Soil Type	Friction Angle (Φ)(deg.)
1-A	Graded Sand with some Gravel	38.36
1-B	Graded Sand with some Gravel	36.0
2-A	Graded Sand with some Gravel	41.0
2-B	Graded Sand with some Gravel	38.23
3-A	Graded Sand with some Gravel	38.17
3-B	Graded Sand with some Gravel	40.88

3.5 Compaction Test (ASTM D 1557)

Compaction test were performed on the samples obtained from borrow No.2 in order to determine the Optimum Moisture Content (O.M.C) corresponding the Max Dry Density (γ_d)_{max}. Laboratory moisture–density relationships were developed following the modified (ASTM D1557, ASTM 2000a) Proctor method using seven or eight moisture–density points. The results are tabulated in table no. (5) and curves in Appendix-1.

Table (5): Modified proctor compaction test results of tested samples

Sample No.	Max Dry Density(γ_d) max (gm/cm ³)	Optimum Moisture Content (O.M.C) (%)
1	1.97	8.51
2	2.03	9.43
3	2.03	11.91

So, we can calculate (G_s) as follow using next equation.

$$(\gamma_d)_{\max} = G_s \gamma_w / (1 + e_{\min})$$

Table (5*): Specific Gravity (G_s) as per mention equation

Sample No.	Density(γ_d) max (gm/cm ³)	e_{\min}	G_s
1	1.97	0.352	2.659
2	2.03	0.33	2.70
3	2.03	0.34	2.64

(γ_d)_{max}:Max Dry Density (γ_d)_{max}

3.6 Permeability Test (ASTM D 2434)

Constant Head Permeability test was carried out on tow soil sample according to ASTM D 2434 –” Standard Test Method for Permeability of granular soils (Constant Head)”. The soil sample was compacted to different densities and the quantity of water passing through the sample in a certain time is collected and the Coefficient of Permeability “ K “ was then determined. The results are shown in table No. (6) and Appendix-1.

Table (6): Permeability Tests Results of Tested Samples

Sample No.	Coefficient of Permeability “K “ m/sec.
1-A	6.83E-05
1-B	6.83E-05
2-A	4.02E-05
2-B	4.02E-05
3-A	3.95E-05
3-B	3.95E-05

3.7 Tri-axial Compression Test

Tri-axial compression test was performed by method (UU) on the samples obtained from borrow no.2 in order to determine the shear stress parameters. The results are tabulated in table no. (7).

Table (7): Triaxial test results of tested samples

Sample No.	Friction Angle (Φ)(deg.)
1-A	37.0
1-B	36.0
2-A	40.0
2-B	38.0
3-A	38.0
3-B	40.0

Appendix 1

Laboratory Tests Results

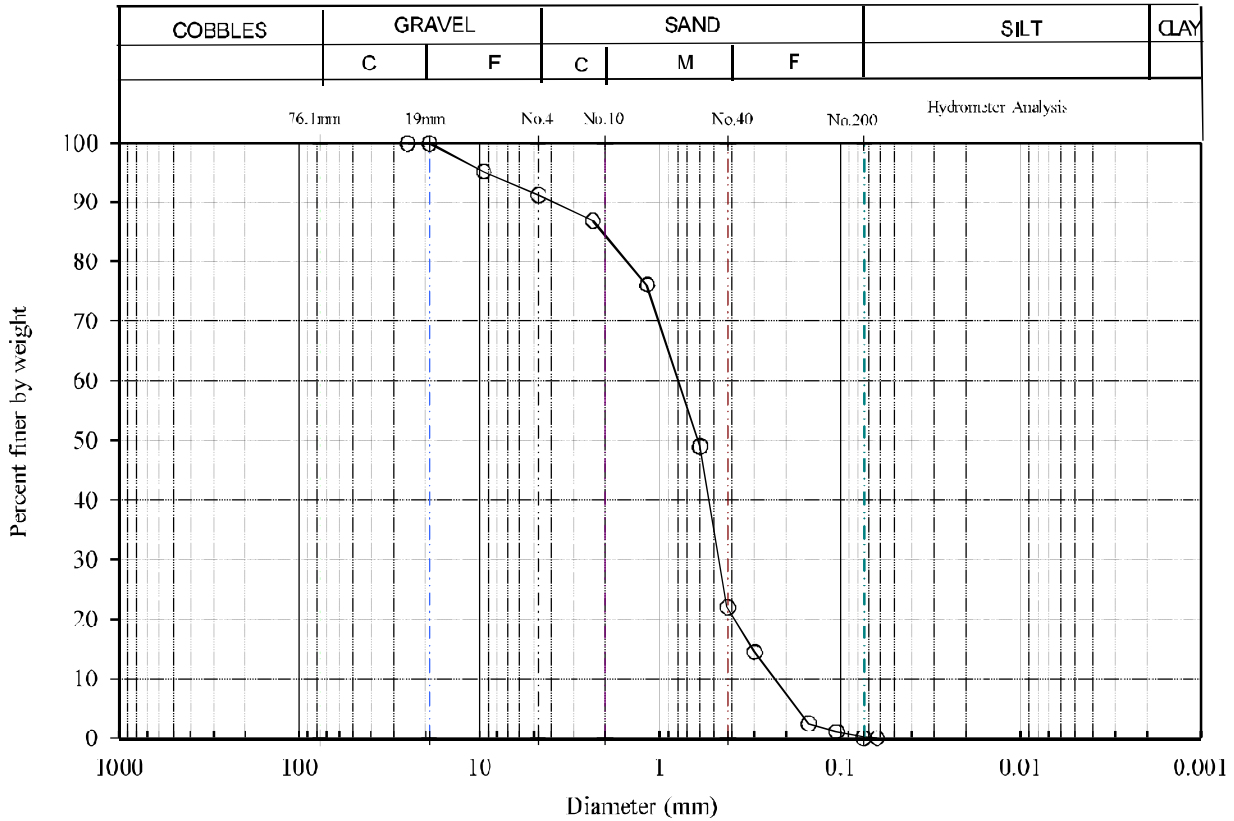


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 1-A
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size (mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075	
% passing	100.00	100.00	95.20	91.22	86.90	76.07	49.04	22.05	14.58	2.46	1.10	0.6	0.06	
Effective Diameter (D_{10})	0.231				D_{30} (mm)	0.470	D_{60} (mm)	0.789	Uniformity coefficient (C_u)			3.419		
Description	Graded Sand with some Gravel										coefficient of curvature (C_c)			1.215
% gravel	8.78				% sand	91.16			% silt	0.06		% clay	0.00	

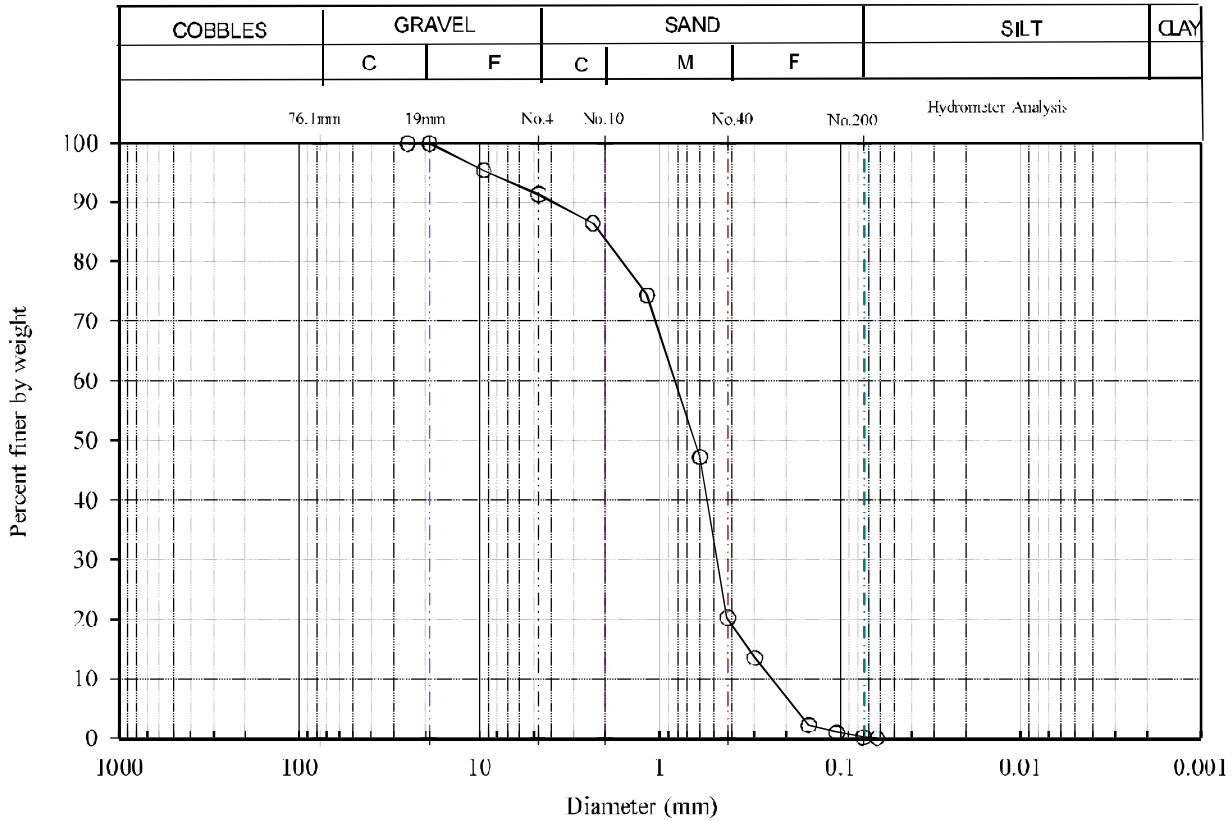


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 1-B
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size(mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075		
% passing	100.00	100.00	95.38	91.30	86.50	86.50	74.39	47.24	20.33	13.61	2.13	0.94	0.07		
Effective Diameter (D_{10})	0.241		D_{30} (mm)		0.431	D_{60} (mm)		0.824	Uniformity coefficient (C_u)		3.417				
Description	Graded Sand with some Gravel										coefficient of curvature(C_c)			1.163	
%gravel	8.70		%sand		91.22			%silt		0.07		%clay		0.00	

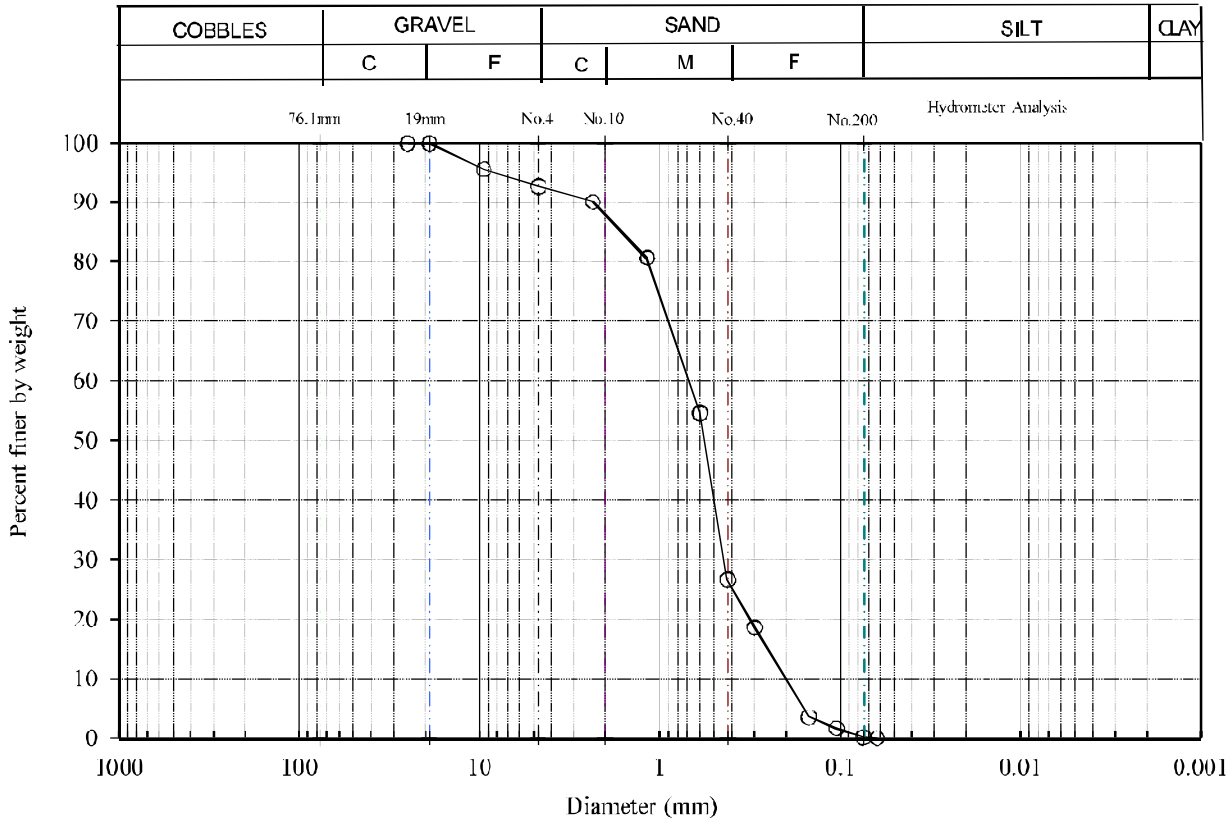


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 2-A
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size (mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075	
% passing	100.00	100.00	95.56	92.61	92.61	90.11	80.66	54.58	26.64	18.65	3.57	1.64	0.09	
Effective Diameter (D_{10})	0.232				D_{30} (mm)	0.443	D_{60} (mm)	0.691	Uniformity coefficient (C_u)				3.426	
Description	Graded Sand with some Gravel										coefficient of curvature (C_c)		1.410	
% gravel	7.39				% sand	92.52			% silt	0.09		% clay	0.00	

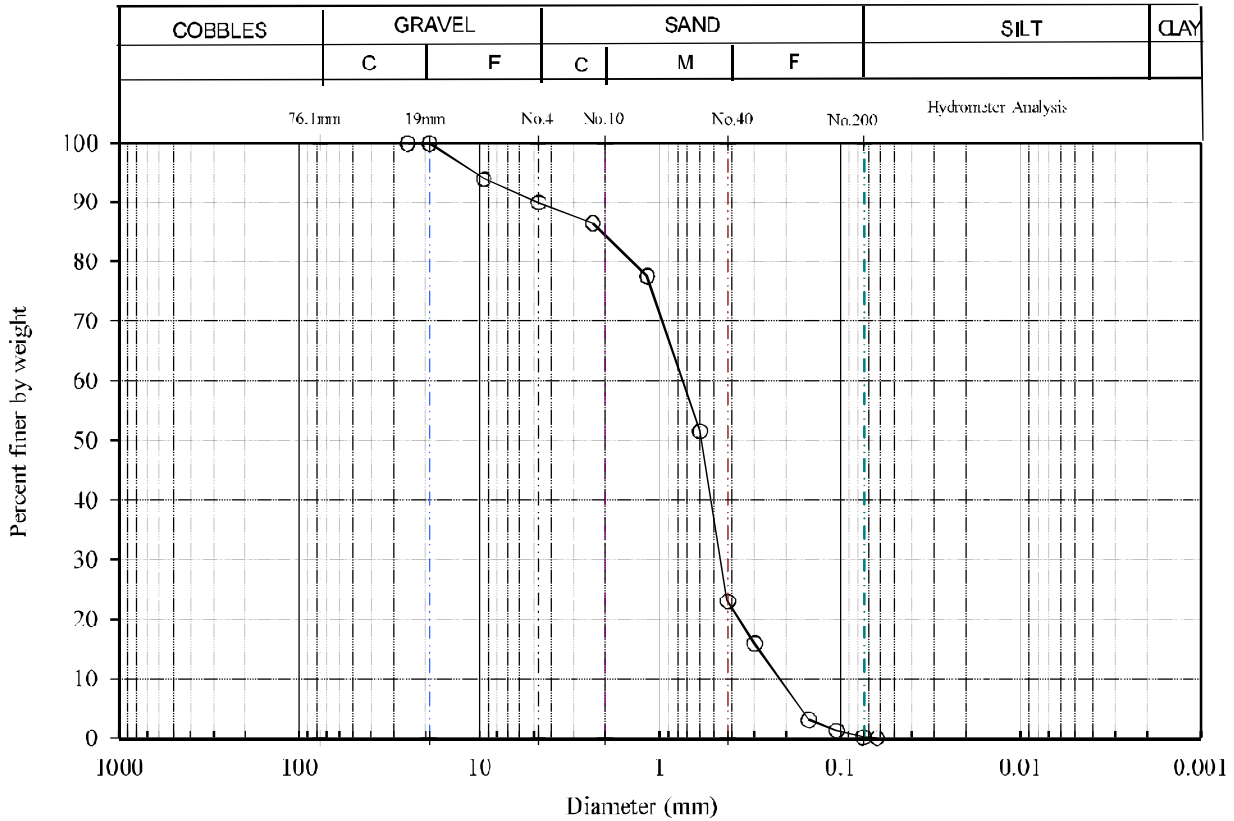


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 2-B
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size(mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075	
% passing	100.00	100.00	93.33	89.99	89.99	86.49	77.64	51.58	23.10	15.03	3.08	1.27	0.15	
Effective Diameter (D_{10})	0.217				D_{30} (mm)	0.462	D_{60} (mm)	0.746	Uniformity coefficient (C_u)				3.436	
Description	Graded Sand with some Gravel										coeffert of curvature(C_c)			1.316
%gravel	10.01				%sand	89.85			%silt	0.15		%clay	0.00	

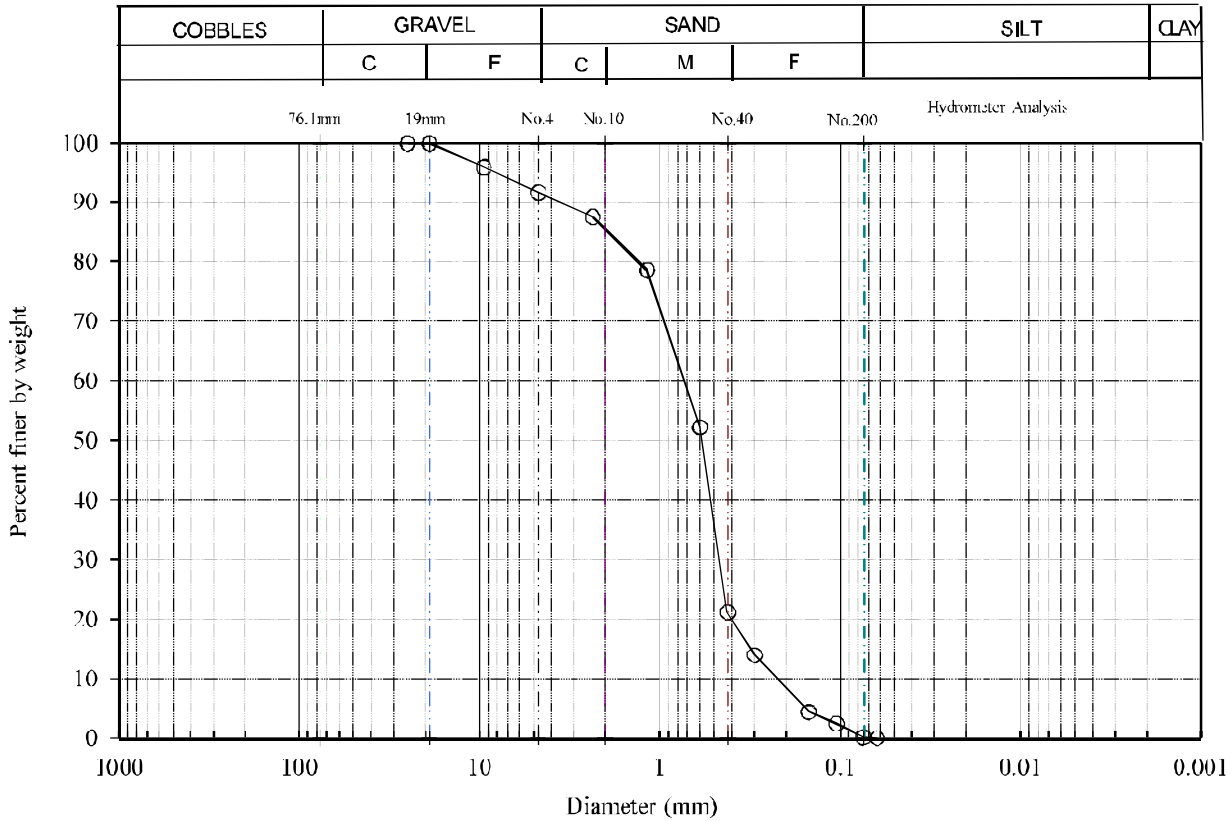


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 3-A
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size (mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075			
% passing	100.00	100.00	95.33	91.61	91.61	87.54	78.58	52.28	21.21	14.08	4.42	2.50	0.09			
Effective Diameter (D_{10})	0.224				D_{30} (mm)	0.469	D_{60} (mm)	0.732	Uniformity coefficient (C_u)				3.269			
Description	Graded Sand with some Gravel										coefficient of curvature (C_c)		1.340			
% gravel	8.39				% sand				91.53		% silt		0.09	% clay		0.00

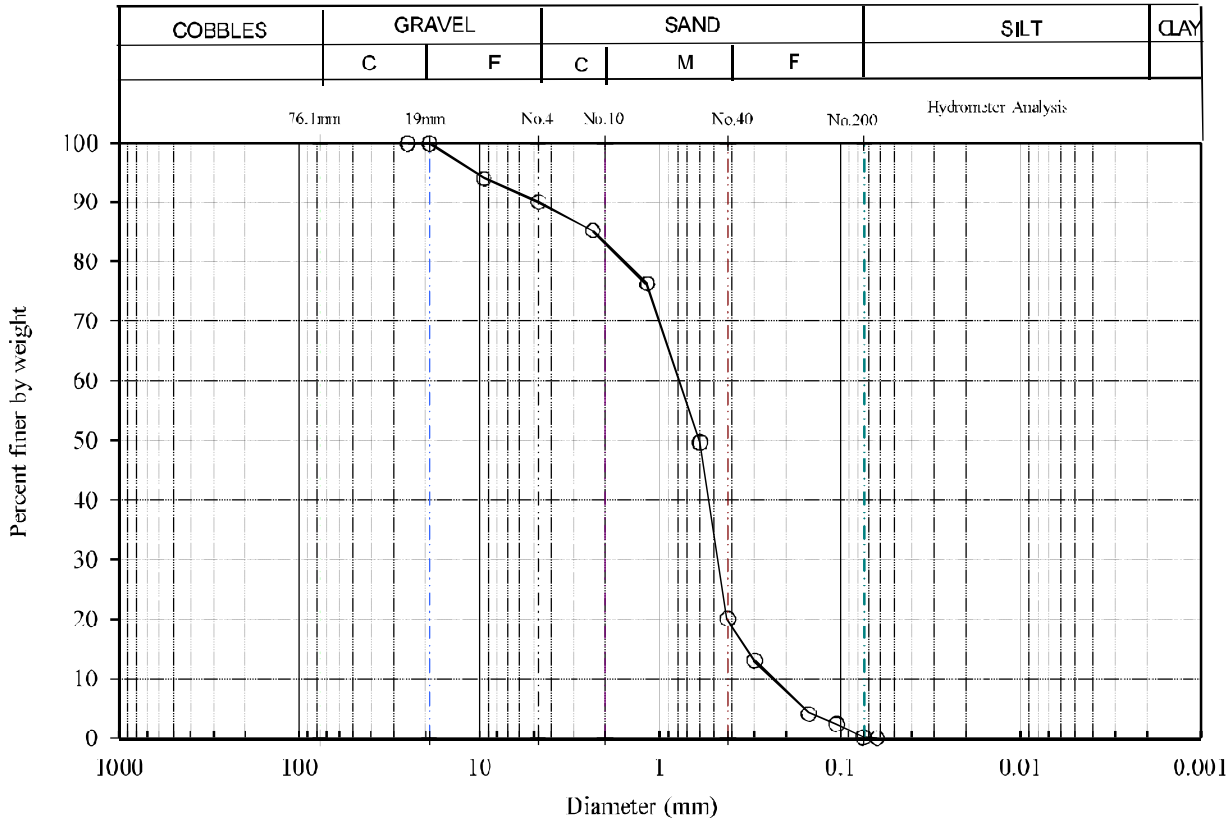


CLASSIFICATION OF SOILS (ASTM D-2487)

Project : New Diroat Barrage
Client : Reservoirs and Grand Barrages Sector
Location: Diroat Barrage

Sampl No. : 3-B
Depth (m.) :
Date : Aug-16

1. GRAIN SIZE DISTRIBUTION (ASTM D422)



Sieve Size (mm)	25.000	19.000	12.500	9.500	4.750	2.360	1.180	0.600	0.425	0.300	0.150	0.106	0.075			
% passing	100.00	100.00	94.00	90.06	90.06	85.24	76.28	49.70	20.12	13.03	4.17	2.35	0.07			
Effective Diameter (D_{10})	0.237				D_{30} (mm)	0.477	D_{60} (mm)	0.780	Uniformity coefficient (C_u)				3.295			
Description	Graded Sand with some Gravel										coefficient of curvature (C_c)		1.232			
% gravel	9.94				% sand				89.99		% silt		0.07	% clay		0.00



Project:	Diroat Barrage	Test Type:	Lab Test
Borrow:	Assuit Barrage (2)	Test Name:	Water Content Test
Specimens:	1,2,3	Date:	28/07/2016

Water Content Test Calculations

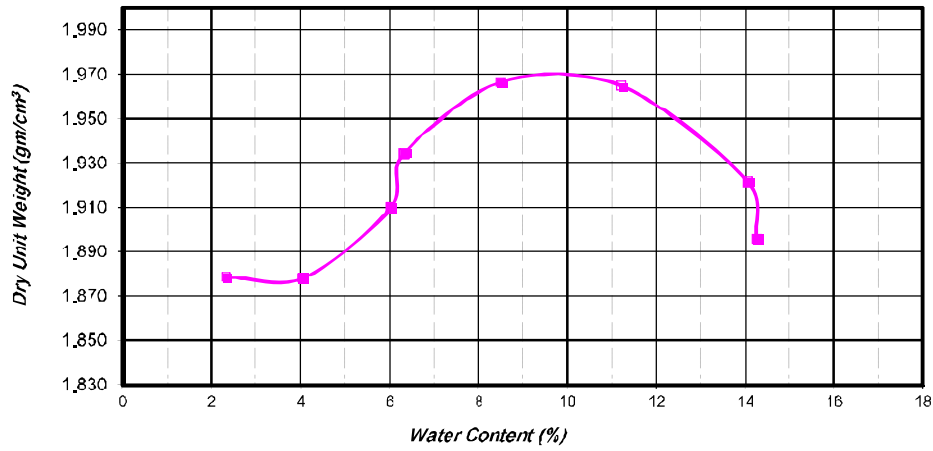
Sample No.	Wc				Average Wc
	Wt. of can	Wt. of can+wet soil	Wt. of can+dry soil	Wc %	
1	43.002	152.458	147.509	4.74	
	43.681	141.466	136.44	5.42	4.56
	41.732	173.334	168.84	3.54	
2	42.911	148.905	148.529	0.36	
	43.67	159.736	159.336	0.35	0.41
	41.708	150.642	150.07	0.53	
3	42.903	122.184	121.766	0.53	
	43.658	118.775	118.423	0.47	0.50
	41.701	123.207	122.811	0.49	

Lab. Director Dr. Eng. Mohie Elmashad



Project:	Diroat Barrage	Test Type:	Lab Test
Borrow:	Assuit Barrage (2)	Test Name:	Compaction Test
Specimens:	1	Date:	28/07/2016

Compaction Test (I)



Max Dry Density (gm/cm ³) =		1.96653
Optimum Water Content (%) =		8.51

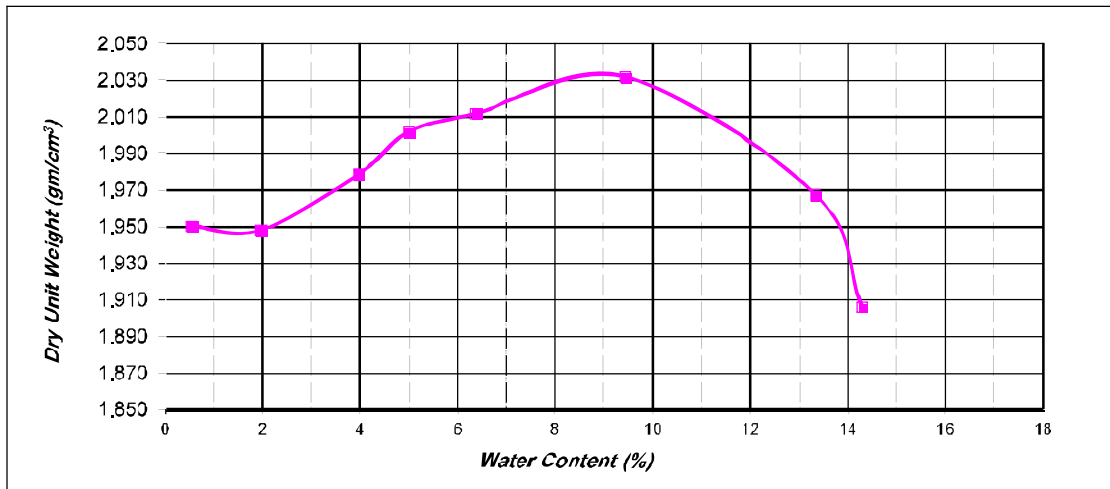
Lab. Director Dr. Eng. Mohie Elmashad



Project: Diroat Barrage
Borrow Assuit Barrage (2)
Specimens: 2

Test Type: Lab Test
Test Name: Compaction Test
Date: 28/07/2016

Compaction Test (2)



Max Dry Density (gm/cm ³) =		2.03
Optimum Water Content (%) =		9.43

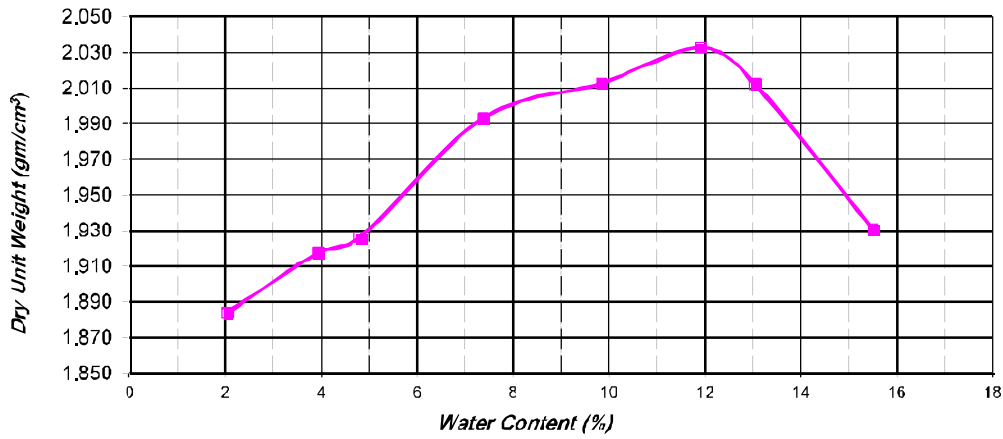
Lab. Director Dr. Eng. Mohie Elmashad



Project: Diroat Barrage
Borrow: Assuit Barrage (2)
Specimens: 3

Test Type: Lab Test
Test Name: Compaction Test
Date: 28/07/2016

Compaction Test (3)



Max Dry Density (gm/cm ³) =		2.03
Optimum Water Content (%) =		11.91

Lab. Director: Dr. Eng. Mohie Elmashad

القناطر الخيرية ١٣٦٢١ - القليوبية ت ٢١٨٣٣٠٧ - ٢١٨٨٥٠٨ - فاكس ٢١٨٨٥٠٨
Elkanater Elkhairiah, Tel. 2183307-2188508- Fax. 202/2188508



Project: New Dayroul Regulator

Date: 31/07/2016

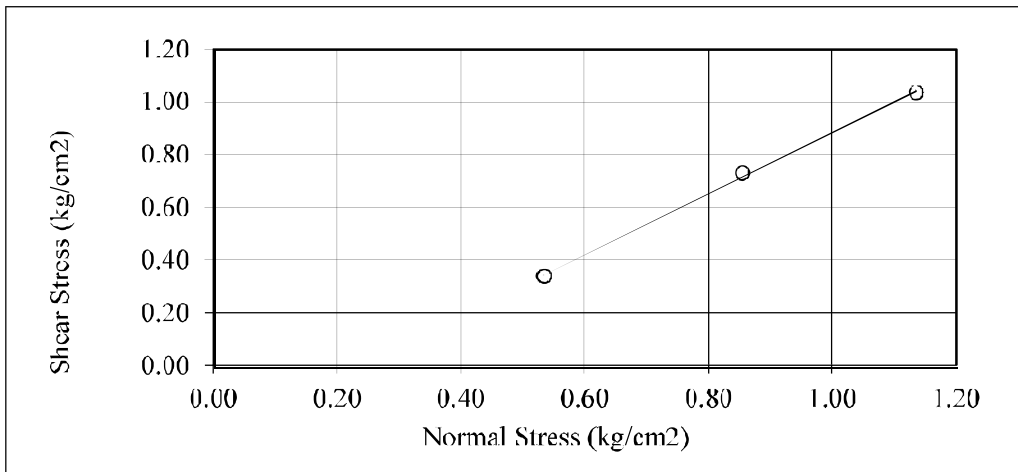
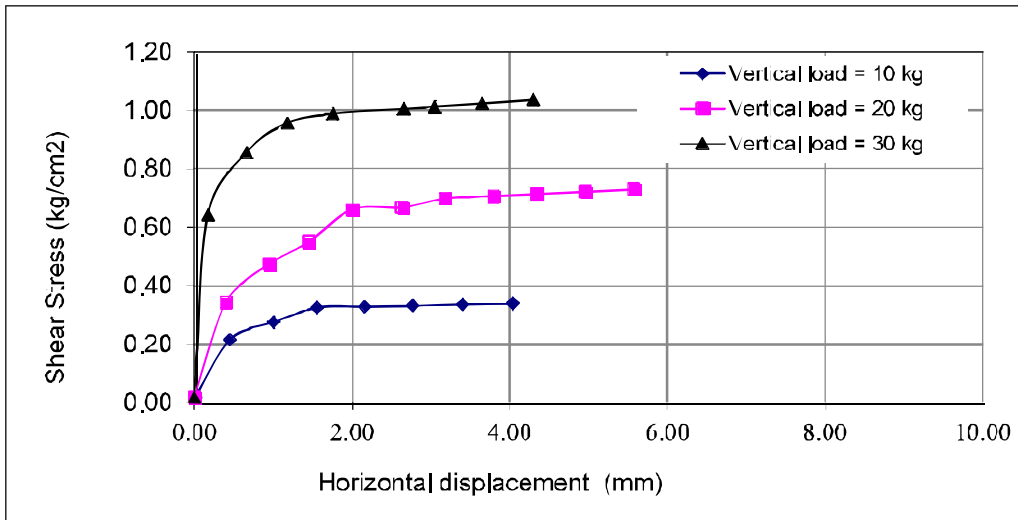
Client:

Sample No. 1-A

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.24 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.535	0.339	4.04
2	0.856	0.729	5.57
3	1.136	1.034	4.30

Friction Angle (Deg.):	38.36
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project: New Dayroul Regulator

Date: 31/07/2016

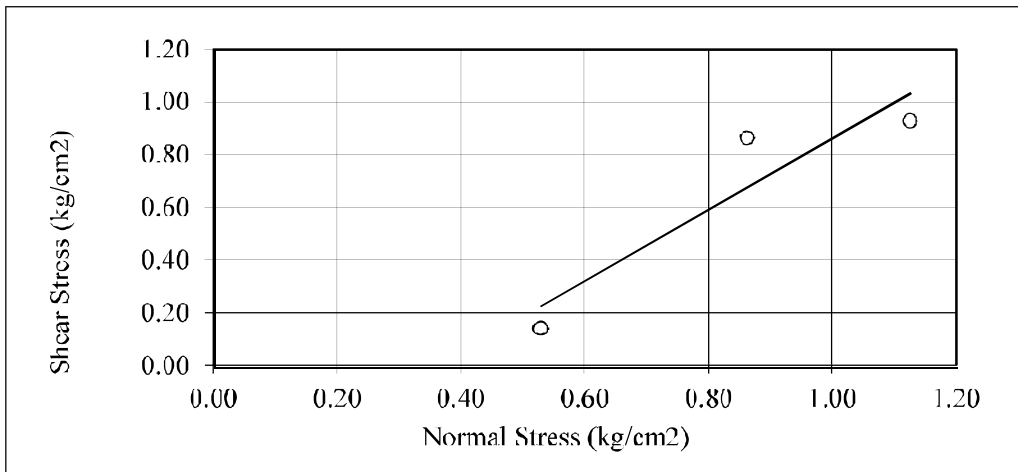
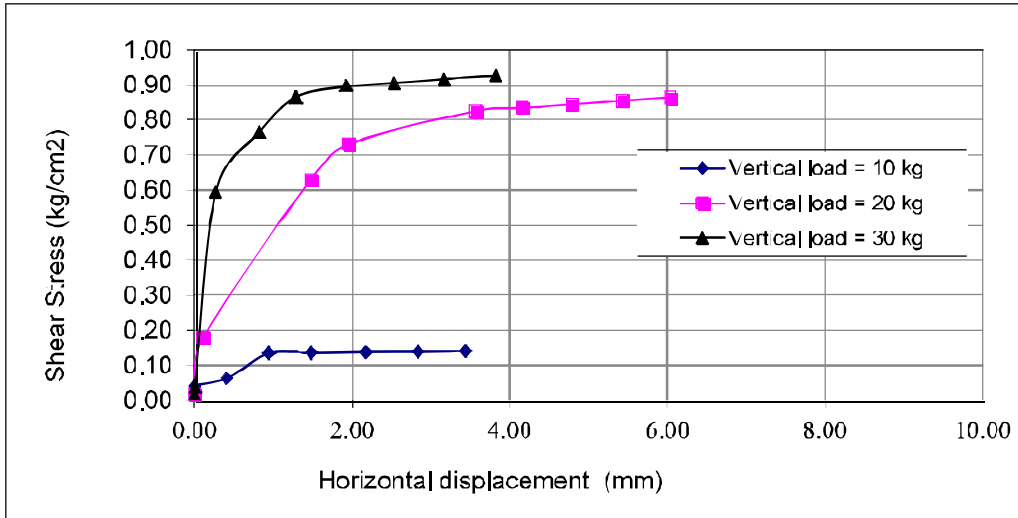
Client:

Sample No. L-B

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.25 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.529	0.140	3.44
2	0.863	0.863	6.03
3	1.126	0.927	3.82

Friction Angle (Deg.):	36.00
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project: New Dayroul Regulator

Date: 31/07/2016

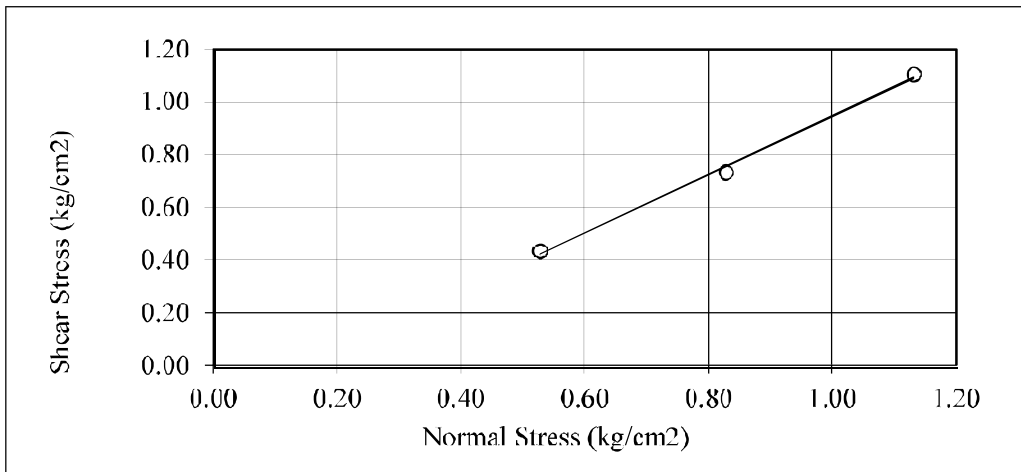
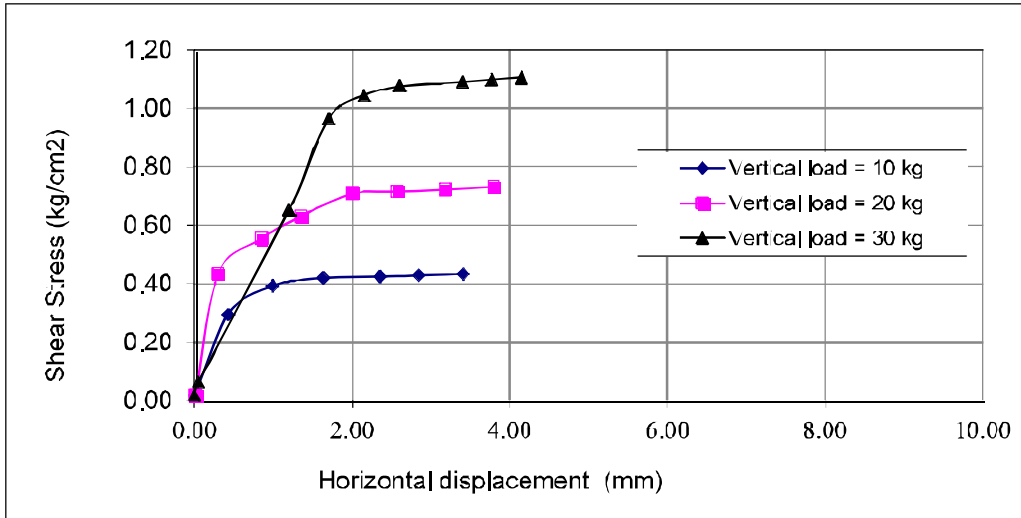
Client:

Sample No. 2-A

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.17 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.529	0.433	3.41
2	0.829	0.730	3.80
3	1.132	1.106	4.15

Friction Angle (Deg.):	41.00
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project: New Dayrout Regulator

Date: 31/07/2016

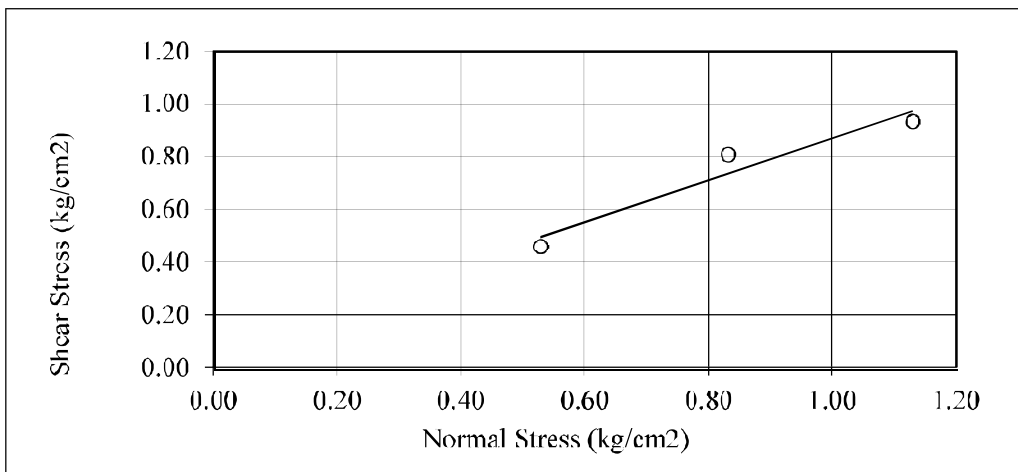
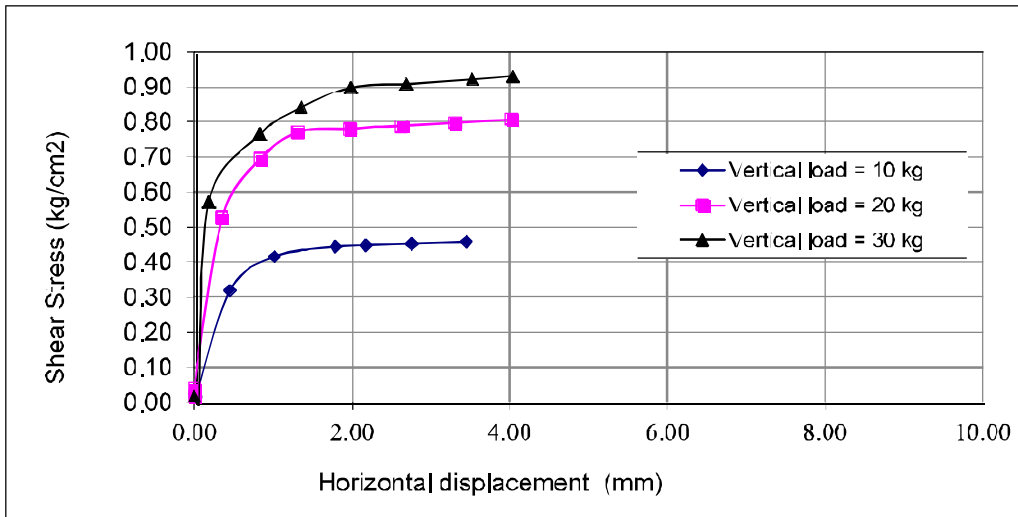
Client:

Sample No. 2-B

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.20 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.529	0.457	3.45
2	0.832	0.807	4.02
3	1.130	0.931	4.04

Friction Angle (Deg.):	38.23
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project: New Dayroul Regulator

Date: 31/07/2016

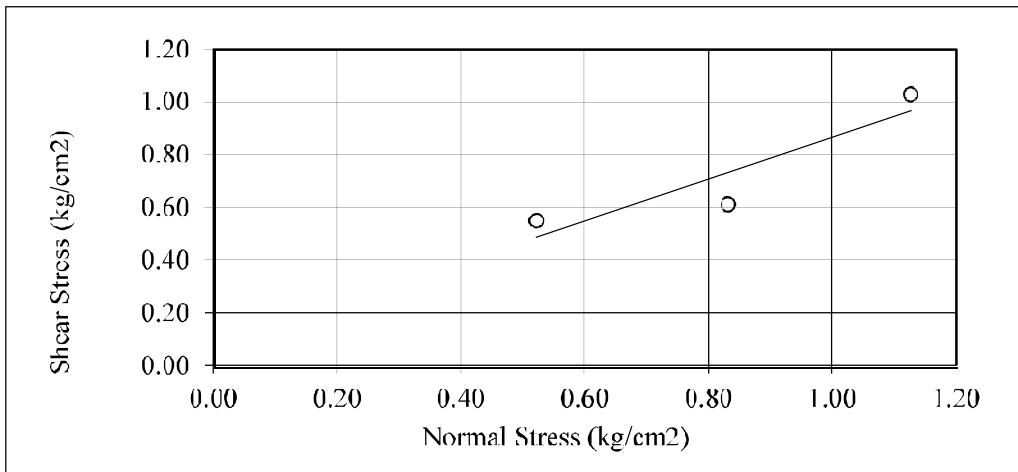
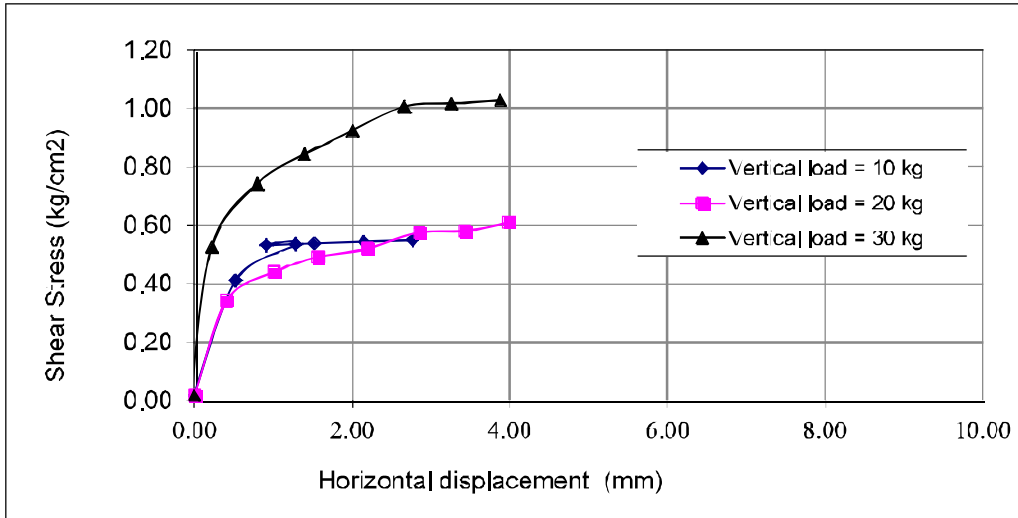
Client:

Sample No. 3-A

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.15 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.523	0.548	2.76
2	0.832	0.610	3.99
3	1.127	1.026	3.88

Friction Angle (Deg.):	38.17
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project: New Dayroul Regulator

Date: 31/07/2016

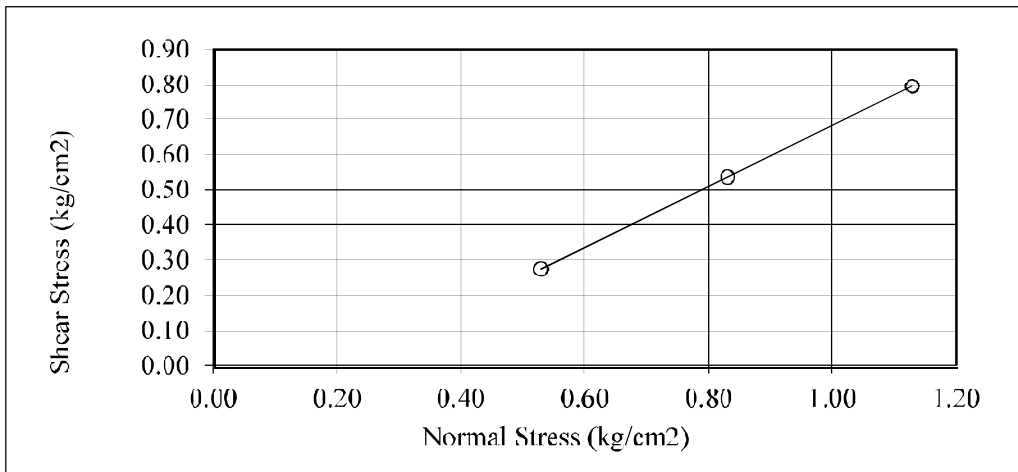
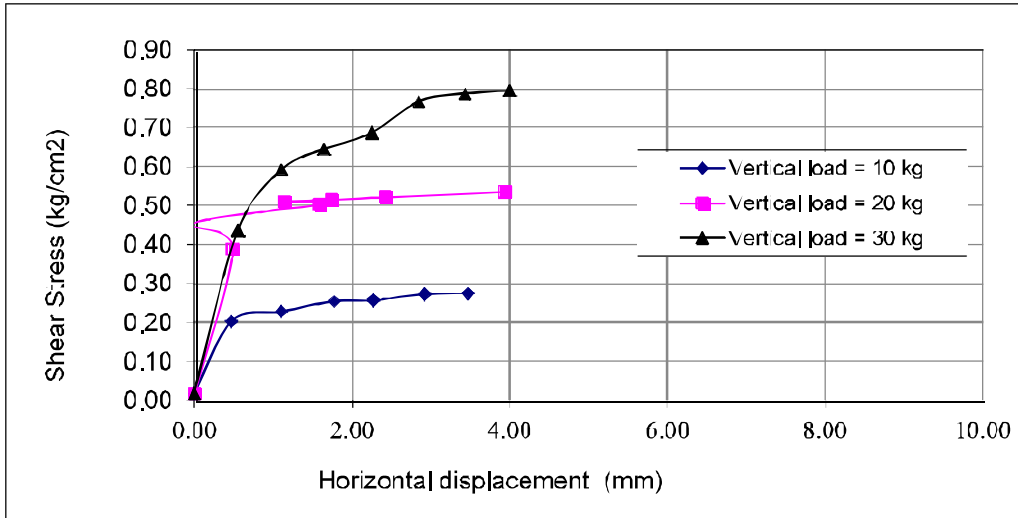
Client:

Sample No. 3-B

Depth (m):

Description:

Test Type: Wet
 Loading Rate: 0.5 mm/min
 Shearing Area: 36.00 cm²
 Molded Dry Density: 2.16 kN/m³



Test Results	Normal Stress (kg/cm ²)	Shear Stress (kg/cm ²)	Displacement at Max. Shear (mm)
	σ_n	$\tau_{Maximum}$	
1	0.529	0.275	3.47
2	0.831	0.535	3.94
3	1.129	0.795	4.00

Friction Angle (Deg.):	40.88
Cohesion (kg/cm ²):	0.000

Tested by:
Eng. Ahmad EL-Hanafy

Lab Director:
Dr. Eng. Mohic El-Washad



Project:	Diroat Barrage	Test Type:	Lab Test
Borrow	Assuit Barrage (2)	Test Name:	Permeability Test
Specimens:	1	Date:	28/07/2016

Permeability Test (1)

r pipe =	1.80 cm	R =	10 cm	weight of dry soil =	1700 gm
a =	2.544690049 cm ²	L =	11.5 cm		
A =	78.53981634 cm ²	h ₀ =	153 cm		

Reading (cm)	Time(min.)	t (min.)	h (cm)	h ₀ /h ₁	K(cm/min)	K(m/sec.)	K(m/day)
153	0	0	153	1	0	0	0
102	0.5	0.5	102	1.5	0.302	50.30E-6	4.346
67	1	1	70	2.186	0.291	48.50E-6	4.191
0	2	2	5	30.6	0.637	106.10E-6	9.167

k =	6.83E-05	m/sec.
k =	5.901	m/day

Lab. Director Dr. Eng. Mohie Elmashad



Project:	Diroat Barrage	Test Type:	Lab Test
Borrow	Assuit Barrage (2)	Test Name:	Permeability Test
Specimens:	2	Date:	28/07/2016

Permeability Test (2)

r =	1.80 cm	R mold =	10 cm	weight of dry soil =	1650 gm
a =	2.544690049 cm ²	L mold =	11.5 cm		
A =	78.53981634 cm ²	h ₀ =	153 cm		

Reading (cm)	Time(min.)	t (min.)	h (cm)	h ₀ /h ₁	K(cm/min)	K(m/sec.)	K(m/day)
153	0	0	153	0	0	0	0
111	0.5	0.5	111	1.378	0.239	39.81E-6	3.440
82	1	1	82	1.866	0.232	38.69E-6	3.343
20	3	3	20	7.35	0.252	42.07E-6	3.635

k =	4.02E-05	m/sec.
k =	3.472	m/day

Lab. Director Dr. Eng. Mohie Elmashad



Project:	Diroat Barrage	Test Type:	Lab Test
Borrow	Assuit Barrage (2)	Test Name:	Permeability Test
Specimens:	3	Date:	28/07/2016

Permeability Test (3)

r =	1.80 cm	R mold =	10 cm	weight of dry soil =	1600
a =	2.544690049 cm ²	L mold =	11.5 cm		
A =	78.53981634 cm ²	h ₀ =	153 cm		

Reading (cm)	Time(min.)	t (min.)	h (cm)	h ₀ /h ₁	K(cm/min)	K(m/sec.)	K(m/day)
153	0	0	153	0	0	0	0
113	0.5	0.5	113	1.354	0.226	37.60E-6	3.248
83	1	1	82	1.866	0.232	38.69E-6	3.343
20	3	3	20	7.65	0.252	42.07E-6	3.635

k =	3.95E-05	m/sec.
k =	3.409	m/day

Lab. Director Dr. Eng. Mohie Elmashad