

ملحق رقم (1) نتائج التجارب التي أجريت علي الركام

ملحق رقم (1-1) نتائج التدرج الحبيبي للركام ($\frac{3}{4}$) بوصة

Gradation of Aggregate ($\frac{3}{4}$)

Sample(1)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	Cum. Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	2475.6	100
1/2 "	2013.9	461.7	18.7
3/8 "	2442.1	33.5	1.4
1/4 "			
No.4	2451.9	23.7	1.0
No.8			
No.10	2466.3	9.3	0.4
No.16			
No.30			
No.40	2470.2	5.4	0.2
No.50			
No.60			
No.80	2471.4	4.2	0.2
No.100			
No.140			
No.200	2473.4	2.2	0.09
pan			
Wash	-		
Passing			
No.200	-		
TOTAL	2475.6		

Sample(2)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	Cum. Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	3291.1	100
1/2 "	2528.4	762.7	23.2
3/8 "	3096.8	194.3	5.9
1/4 "			
No.4	3135.9	155.2	4.7
No.8			
No.10	3197.8	93.3	2.8
No.16			
No.30			
No.40	3236.4	54.7	1.7
No.50			
No.60			
No.80	3257.6	33.5	1.0
No.100			
No.140			
No.200	3266.1	25.0	0.76
pan			
Wash	-		
Passing			
No.200	-		
TOTAL	3291.1		

Sample(3)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	Cum. Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	2780.3	100
1/2 "	2112.5	667.8	24.0
3/8 "	2672.1	108.2	3.9
1/4 "			
No.4	2737.2	43.1	1.6
No.8			
No.10	2754.6	25.7	0.9
No.16			
No.30			
No.40	2772.9	7.4	0.3
No.50			
No.60			
No.80	2773.6	6.7	0.2
No.100			
No.140			
No.200	2775.0	5.3	0.19
pan			
Wash	-		
Passing No.200	-		
TOTAL	2780.3		

ملحق رقم (2-1) نتائج التدرج الحبيبي للركام $(\frac{3}{8})$ بوصة

Gradation of Aggregate $(\frac{3}{8})$

Sample(1)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	2376.4	100
1/2 "	105.7	2270.7	95.6
3/8 "	799.1	1577.3	66.4
1/4 "			
No.4	2196.1	180.3	7.6
No.8			
No.10	2368.7	7.7	0.3
No.16			
No.30			
No.40	2372.8	3.6	0.2
No.50			
No.60			
No.80	2374.7	1.7	0.1
No.100			
No.140			
No.200	2374.9	1.5	0.06
pan			
Wash	-		
Passing			
No. 200	-		
TOTAL	2376.4		

Sample(2)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	2376.4	100
1/2 "	105.7	2270.7	95.6
3/8 "	799.1	1577.3	66.4
1/4 "			
No.4	2196.1	180.3	7.6
No.8			
No.10	2368.7	7.7	0.3
No.16			
No.30			
No.40	2372.8	3.6	0.2
No.50			
No.60			
No.80	2374.7	1.7	0.1
No.100			
No.140			
No.200	2374.9	1.5	0.06
pan			
Wash	-		
Passing			
No. 200	-		
TOTAL	2376.4		

Sample(3)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "	0	2437.9	100
1/2 "	78.6	2359.3	96.8
3/8 "	846.1	1591.8	65.3
1/4 "			
No.4	2264.9	173.0	7.1
No.8			
No.10	2423.2	14.7	0.6
No.16			
No.30			
No.40	2424.9	13.0	0.5
No.50			
No.60			
No.80	2425.5	12.4	0.5
No.100			
No.140			
No.200	2427.5	10.4	0.43
pan			
Wash	-		
Passing			
No. 200	-		
TOTAL	2437.9		

ملحق رقم (3-1) نتائج التدرج الحبيبي للركام ($\frac{3}{16}$) بوصة

Gradation of Crushed sand ($\frac{3}{16}$)

Sample(1)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "	0	1253.8	100
3/8 "	5.2	1248.6	99.6
1/4 "			
No.4	42.7	1211.1	96.6
No.8			
No.10	377.5	876.3	69.9
No.16			
No.30			
No.40	905.6	348.2	27.8
No.50			
No.60			
No.80	1085.3	168.5	13.4
No.100			
No.140			
No.200	1188.2	65.6	5.23
pan			
Wash Passing No.200			
TOTAL	1253.8		

Sample (2)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "	0	1475.6	100
3/8 "	13.1	1462.5	99.1
1/4 "			
No.4	63.8	1411.8	95.7
No.8			
No.10	572.5	903.1	61.2
No.16			
No.30			
No.40	1084.6	391.0	26.5
No.50			
No.60			
No.80	1289.5	186.1	12.6
No.100			
No.140			
No.200	1416.1	59.5	4.03
pan			
Wash			
Passing			
No.200			
TOTAL	1475.6		

Sample (3)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "	0	1259.6	100
3/8 "	3.5	1256.1	99.7
1/4 "			
No.4	13.1	1246.5	99.0
No.8			
No.10	266.4	993.2	78.9
No.16			
No.30			
No.40	862.7	396.9	31.5
No.50			
No.60			
No.80	1087.5	172.1	13.7
No.100			
No.140			
No.200	1208.8	50.8	4.03
pan			
Wash			
Passing			
No.200			
TOTAL	1259.6		

Sieve Size/ Percentage Passing	3/4" Passing , Hot Bin # 1				1/2" Passing , Hot Bin # 2				Crushed Sand , Hot Bin # 3				Filler(Lime stone), Hot Bin # 4			
	1A	1B	1C	AVG	2A	2B	2C	AVG	3A	3B	3C	AVG	4A	4B	4C	AVG
3/4	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1/2"	18.7	23.2	24.0	22.0	95.6	97.6	96.8	96.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3/8"	1.3	5.9	3.9	3.7	66.4	75.4	65.3	69.0	99.7	99.6	99.1	99.5	100.0	100.0	100.0	100.0
#4	0.9	4.7	1.6	2.4	7.6	9.5	7.1	8.1	99.0	96.6	95.7	97.1	100.0	100.0	100.0	100.0
#10	0.4	2.8	0.9	1.4	0.3	0.6	0.6	0.5	78.9	69.9	61.2	70.0	100.0	100.0	100.0	100.0
#40	0.2	1.7	0.3	0.7	0.2	0.5	0.5	0.4	31.5	27.8	26.5	28.6	99.8	99.8	99.8	99.8
#80	0.2	1.0	0.2	0.5	0.1	0.4	0.5	0.3	13.7	13.4	12.6	13.2	97.9	97.6	97.9	97.8
#200	0.09	0.76	0.19	0.35	0.06	0.30	0.43	0.26	4.03	5.20	4.03	4.42	83.56	83.62	82.17	83.12

ملحق رقم (2) اختبار الثقل النوعي والامتصاص

(ASTM C – 127 QC 128)

ملحق رقم (1-2) اختبار الثقل النوعي والامتصاص للركام ($\frac{3}{4}$)

Specific gravity and absorption test for aggregate ($\frac{3}{4}$) inch

TRIAL NO.	1	2	3
a. wt. Of oven-dry sample in air, g	4716.0	4792.1	4329.4
b. wt. Of saturated surface dry sample in air,	4760.0	4835.0	4360.0
c. wt. Of saturated sample in water, g	2970.0	3017.0	2718.0
1. Bulk Specific Gravity (oven-dry) = $a/(b - c)$	2.635	2.636	2.637
Average Bulk Specific Gravity	2.636		
2. Bulk Specific Gravity (S.S.D) = $b/(b - c)$	2.659	2.660	2.655
Average Bulk Specific Gravity	2.658		
3. Apparent Specific Gravity = $a/(a - c)$	2.701	2.700	2.687
Average Apparent Specific Gravity	2.696		
4. Absorption = $(b - a)/a \times 100$	0.93	0.90	0.71
Average absorption	0.85		

ملحق رقم (2-2) اختبار الثقل النوعي والامتصاص للركام ($\frac{3}{8}$)

Specific gravity and absorption test for aggregate ($\frac{3}{8}$) inch

TRIAL NO.	1	2	3
a. wt. Of oven-dry sample in air, g	3723.1	3304.1	3309.1
b. wt. Of saturated surface dry sample in air,	3760.0	3345.0	3333.0
c. wt. Of saturated sample in water, g	2350.0	2082.0	2074.0
1. Bulk Specific Gravity (oven-dry) = $a/(b - c)$	2.640	2.616	2.628
Average Bulk Specific Gravity	2.628		
2. Bulk Specific Gravity (S.S.D) = $b/(b - c)$	2.667	2.648	2.647
Average Bulk Specific Gravity	2.654		
3. Apparent Specific Gravity = $a/(a - c)$	2.711	2.704	2.679
Average Apparent Specific Gravity	2.698		
4. Absorption = $(b - a)/a \times 100$	0.99	1.24	0.72
Average absorption	0.98		

ملحق رقم (3-2) اختبار الثقل النوعي والامتصاص للركام
crushed sand
Specific gravity and absorption test for aggregate crushed sand

TRIAL NO.	1	2	3
a. wt. Of oven-dry sample in air, g	490.20	489.80	488.90
b. wt. Of volumetric flask filled with water, g	645.5	643.0	643.0
c. wt. Of saturated dry sample in air (500g)	500.0	500.0	500.0
d. wt. Of volumetric flask + water + sample, g	954.8	952.5	952.9
e. Volume of sample (b+ c - d), cc	190.7	190.5	190.1
1. Bulk specific Gravity (Oven-Dry) = a/e	2.571	2.571	2.572
Average Bulk Specific Gravity	2.571		
2. Bulk Specific Gravity (S.S.D) = c/e	2.622	2.625	2.630
Average Bulk Specific Gravity	2.626		
3. Apparent Speccific Gravity = a/(a + b - d)	2.710	2.717	2.731
Average Bulk Specific Gravity	2.719		
4. Absorption = (c-a)/a x 100	1.999	2.082	2.270
Average Absorption	2.12		

Combined Specific Gravity of Aggregate

Aggregate Size: Hot Bin No.	Specific Gravity			Absorption	% Used
	Bulk Dry	Bulk SSD	Apparent		
19 mm Passing : HB # 1	2.636	2.658	2.696	0.85	17
12.5 mm Passing : HB # 2	2.628	2.654	2.698	0.98	28
Crushed Sand : HB # 3	2.571	2.626	2.719	2.12	50
Filler : HB # 4	2.8	2.8	2.8		5

Combined Bulk Specific Gravity : Gsb(Dry)

$$\text{Gsb (Dry)} = \frac{100}{\frac{17}{2.636} + \frac{28}{2.628} + \frac{50}{2.571} + \frac{5}{2.80}} = 2.608$$

2- Combined Bulk Specific Gravity : Gsb (SSD).

$$\text{Gsb (SSD)} = \frac{100}{\frac{17}{2.658} + \frac{28}{2.654} + \frac{50}{2.626} + \frac{5}{2.800}} = 2.647$$

3- Combined Apparent Specific Gravity : Gsa.

$$\text{Gsa} = \frac{100}{\frac{17}{2.696} + \frac{28}{2.698} + \frac{50}{2.719} + \frac{5}{2.800}} = 2.713$$

ملحق رقم (3) اختبار لوس انجلوس للتآكل :

ملحق (1-3) اختبار التآكل للركام ($\frac{3}{4}$) بوصة

Determination of los anglos abrasion value of aggregate ($\frac{3}{4}$)

<i>Trials</i>	1st.	2st.	3st.
<i>Total Wt. Of tested Agg. (W1) gr</i>	5000.0	5000.0	5000.0
<i>Wt. Of Container (W2) gr</i>	450.0	450.0	450.0
<i>Wt. Of Container +tested Agg. Passing 1.7 mm(W3) gr</i>	825.3	834.8	829.1
<i>Wt. Of tested Agg. Passing 1.7mm(W3-w2) gr</i>	375.3	384.8	379.1
<i>Los Anglos Abrasion Value %</i>	7.5	7.7	7.6
<i>Average Los Anglos Abrasion value %=$w3-w2 \div w1$</i>		7.6	

ملحق (2-3) اختبار التآكل للركام ($\frac{3}{4}$) بوصة

Determination of los anglos abrasion value of aggregate ($\frac{3}{8}$)

<i>Trials</i>	1st.	2st.	3st.
<i>Total Wt. Of tested Agg. (W1) gr</i>	5000.0	5000.0	5000.0
<i>Wt. Of Container (W2) gr</i>	450.0	450.0	450.0
<i>Wt. Of Container +tested Agg. Passing 1.7 mm(W3) gr</i>	906.6	913.8	920.2
<i>Wt. Of tested Agg. Passing 1.7mm(W3-w2) gr</i>	456.6	463.8	470.2
<i>Los Anglos Abrasion Value %</i>	9.1	9.3	9.4
<i>Average Los Anglos Abrasion value %=$w3-w2 \div w1$</i>		9.3	

ملحق رقم (4) اختبار الصدمة

ملحق رقم (1-4) Determination of Aggregate Impact value ($\frac{3}{4}$)

<i>Trials</i>	1st.	2nd.	3rd.
<i>Wt. Of Mould Agg. (W1) gr</i>	2734.1	2734.1	2734.1
<i>Wt. Of Mould + Agg. (W2) gr</i>	3464.8	3465.2	3462.3
<i>Wt. Of tested Agg.(W2-W1) gr</i>	730.7	731.1	728.2
<i>Wt. Of tested Agg. Passing 2.36mm(W3) gr</i>	65.6	60.1	58.9
<i>Aggregate impact Value %</i>	8.98	8.22	8.09
<i>Average Aggregate impact Value %</i>		8.43	
<i>Fofmula</i>	Remarks		
<i>Aggregate impact Value = $w3 \div \frac{w3}{w2-w1} \times 100$</i>	Very Good		

ملحق رقم (2-4) ($\frac{3}{8}$) Determination of Aggregate Impact value

<i>Trials</i>	1st.	2nd.	3rd.
<i>Wt. Of Mould Agg. (W1) gr</i>	2734.1	2734.1	2734.1
<i>Wt. Of Mould + Agg. (W2) gr</i>	3489.6	3492.2	3491.0
<i>Wt. Of Tested Agg.(W2-W1) gr</i>	755.5	758.1	756.9
<i>Wt. Of tested Agg. Passing 2.36mm(W3) gr</i>	98.4	96.5	100.8
<i>Aggregate impact Value %</i>	13.02	12.73	13.32
<i>Average Aggregate impact Value %</i>		13.02	
<i>Fofmula</i>	Remarks		
<i>Aggregate impact Value = $w3 \frac{w3}{w2-w1} \times 100$</i>	Good		

ملحق رقم (5) اختبار التفكك الهيدروستاتيكي

ملحق رقم (1-5) ($\frac{3}{4}$) Determination of Aggregate Crushing value

<i>Trials</i>	1st.	2nd.	3rd.
<i>Wt. Of Mould Agg. (W1) gr</i>	3000	3000	3000
<i>Wt. Of Mould + Agg. (W2) gr</i>	5560.8	5562.1	5564.3
<i>Wt. Of Tested Agg.(W2-W1) gr</i>	2560.8	2562.1	2564.3
<i>Wt. Of tested Agg. Passing 2.36mm(W3) gr</i>	435.7	440.8	438.4
<i>Aggregate Crushing Value %</i>	17.01	17.20	17.10
<i>Average Aggregate Crushing Value %</i>		17.10	
<i>Fofmula</i>	Remarks		
<i>Aggregate Crushing Value = $w3 \frac{w3}{w2-w1} \times 100$</i>	Very Good		

ملحق رقم (2-5) ($\frac{3}{8}$) Determination of Aggregate Crushing value

<i>Trials</i>	1st.	2nd.	3rd.
<i>Wt. Of Mould Agg. (W1) gr</i>	3000	3000	3000
<i>Wt. Of Mould + Agg. (W2) gr</i>	5572.2	5570.9	5569.5
<i>Wt. Of Tested Agg.(W2-W1) gr</i>	2572.2	2570.9	2569.5
<i>Wt. Of tested Agg. Passing 2.36mm(W3) gr</i>	487.8	489.5	485.7
<i>Aggregate Crushing Value %</i>	18.96	19.04	18.90
<i>Average Aggregate Crushing Value %</i>		18.97	
<i>Fofmula</i>	Remarks		
<i>Aggregate Crushing Value = $w3 \frac{w3}{w2-w1} \times 100$</i>	very Good		

ملحق رقم (6) التجارب المعملية التي اجريت علي الاسفلت :

ملحق (1-6) اختبار الثقل النوعي للأسفلت Specif Grouity

ملحق (2-6) اختبار الفرز والاختراق Penetration test

Sample Description	1	2	3	4	5	Average	Penetration Grade
Sample 1	69	68	69	67	70	68.6	60-70

ملحق(3-6) Ductility المط أو المرونة

Sample Description	1	2	3	Av(mm)	Remarks
Ductility(mm)	88	87	89	88	Good

ملحق (4-6) Softing Point اختبار الليونة أو التميع

Sample Description	1	2	3	Av(mm)	Remarks
Softening Point C	55	53	51	53	Good

ملحق (5-6) Flash and Fire point اختبار درجة الوميض والاشتعال

Sample Description	1	2	3	Av(mm)	Remarks
Flash point	260	265	260	262	Good
fire point	280	290	285	285	Good

ملحق (7) اختبارات البودرة

ملحق (1-7) اختبارات التدرج الحبيبي

Gruadation of Aggregate (filler – Lime stone)

Sample(1)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "			
3/8 "			
1/4 "			
No.4			
No.8			
No.10	0	498.9	100.0
No.16			
No.30			
No.40	0.8	498.1	99.8
No.50			
No.60			
No.80	10.3	488.6	97.9
No.100			
No.140			
No.200	82	416.9	83.56
pan			
Wash Passing No.200			
TOTAL	498.9		

Sample (2)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "			
3/8 "			
1/4 "			
No.4			
No.8			
No.10	0	380.5	100.0
No.16			
No.30			
No.40	0.8	379.7	99.8
No.50			
No.60			
No.80	9.1	371.4	97.6
No.100			
No.140			
No.200	62.3	318.2	83.63
pan			
Wash Passing No.200			
TOTAL	380.5		

Sample (3)

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)
3"			
2 1/2 "			
2 "			
1 1/2"			
1"			
3/4 "			
1/2 "			
3/8 "			
1/4 "			
No.4			
No.8			
No.10	0	355.5	100.0
No.16			
No.30			
No.40	0.7	354.8	99.8
No.50			
No.60			
No.80	7.5	348.0	97.9
No.100			
No.140			
No.200	63.4	292.1	82.17
pan			
Wash			
Passing			
No.200			
TOTAL	355.5		

ملحق رقم (2-7) Gruadation of Cement dust powder

SIEVE SIZE	Cum.Wt. Retained (grams)	Cum. wt. Passing (grams)	CUM Passing (percent)	Retained (per cent)	Passing (per cent)	Remarks
3"						
2 1/2 "						
2 "						
1 1/2"						
1"						
3/4 "						
1/2 "						
3/8 "						
1/4 "						
No.4				-	-	
No.8						
No.10	0	396.6	100.0		-	
No.16						
No.30						
No.40	0.0	396.6	100.0			
No.50						
No.60						
No.80	3.0	393.6	99.2			
No.100					-	-
No.140						
No.200	18	378.6	95.46			
pan						
Wash						
Passing						
No.200						
TOTAL	396.6					

مواصفات أمانة مدينة الرياض

المملكة العربية السعودية

Bitumen wearing course class (A)

Description			Specification
Sieve Analysis			Passina Limits
	19.0mm	$\frac{3}{4}$	100
	12.5	$\frac{1}{2}$	80-95
	9.5	$\frac{3}{8}$	64-79
	4.75	No 4	48-62
	2.0	No 10	32-45
	0.425	No 40	16-26
	0.18	No 80	8-18
	0.078mm	No 200	4-8
Asphalt content %			4-7
Stability Kg			1000min
Loss of stability %			25% max
Air uoids %			3-5
Uoids fill with bitumen UFB %			70-80
Flow mm			2.4 – 4.0
Uoids mineral Aggregate %			14 min