TESTING ENGINEERS, INC.

Quality Assurance Services
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May 18, 2015

Ms. Jackie Yamnitz
EARTHWORKS
19797 Eisenbeis bottom road
STE Genevieve, MO 63670

Lab. No.: H356

SUBJECT: Testing of "Gabouri" Limestone Stone Samples.

Dear Ms. Yamnitz;

At your request, we have completed the testing of the above referenced stone samples submitted to our laboratory. The test description and corresponding ASTM test method were as follows:

Test 1 - Absorption & Specific Gravity- ASTM C97

Test 2 - Compressive Strength, Dry, Wet, Perpendicular & Parallel to Rift – ASTM C170

Test 3 - Flexural Strength, Dry, Wet, Perpendicular to Rift – ASTM C880

Test 4 – Modulus of Rupture, Dry, Wet, Perpendicular & Parallel to Rift - ASTM C99

Test 5 – Coefficient of Friction – ASTM C1028

Test 6 – Solar Reflectance – ASTM E1980

Test 7 – Freeze/Thaw – ASTM C67

Test 8 – Freeze/Thaw & De-icing Salt Durability – ASTM C1645

PROCEDURES & RESULTS

The specimens for each test were prepared and tested in accordance with the above ASTM designations.

A 60 kip Instron 4486 S/N 11313J (calibration traceable to NIST) test machine was employed for tests 2 through 4.

The test results for tests 1 through 6 are presented in Tables I through VI. Tests 7 and 8 are long term exposure tests and have not been completed at this point.

If you have any questions regarding this report, please contact the undersigned at 510 835 3142.

Respectfully Submitted,
TESTING ENGINEERS, INC.

Hossein Arbabi, Ph.D., P.E.
Senior Engineer

TABLE I
Absorption – ASTM C97
"Gabouri" Limestone

Specimen No.	Absorption, %	Specific Gravity	Density, lbs/ft^3
1	0.41	2.6	162
2	0.23	2.7	168
3	0.42	2.7	168
4	0.33	2.7	168
5	0.42	2.6	162
Average	**0.36**	**2.7**	**167**

TABLE II
Compressive Strength, psi – ASTM C170
"Gabouri" Limestone

Specimen No.	Compressive Strength, Dry, Perpendicular to Rift	Compressive Strength, Dry, Parallel to Rift	Compressive Strength, Wet, Perpendicular to Rift	Compressive Strength, Wet, Parallel to Rift
1	12,500	11,700	9,500	13,100
2	13,300	10,400	8,800	9,100
3	12,100	11,500	11,800	9,900
4	12,500	10,300	11,900	8,600
5	9,800	9,400	13,200	5,900
Average	**12,040**	**10,660**	**11,040**	**9,320**

TABLE III
Modulus of Rupture, psi – ASTM C99
"Gabouri" Limestone

Specimen No.	Modulus of Rupture, Dry, Perpendicular to Rift	Modulus of Rupture, Dry, Parallel to Rift	Modulus of Rupture, Wet, Perpendicular to Rift	Modulus of Rupture, Wet, Parallel to Rift
1	1,196	1,323	1,533	1,358
2	1,043	1,149	1,140	1,401
3	1,119	1,238	1,193	906
4	972	1,315	1,282	1,858
5	1,021	1,103	1,499	1,563
Average	**1,070**	**1,226**	**1,329**	**1,417**

TABLE IV
Flexural Strength, psi - ASTM C880
"Gabouri" Limestone

Sample	Flexural Strength, Dry, psi	Flexural Strength, Wet, psi
1	742	775
2	765	583
3	722	972
4	624	732
5	990	486
Average	**769**	**710**
Standard Deviation	**135**	**187**

Table V
Coefficient of Friction – ASTM C1028
"Gabouri" Limestone

Frctional Force, lbf	
Dry	**Wet**
32.8	35.0
30.0	32.4
29.4	31.6
31.4	33.8
28.4	33.4
28.6	34.0
30.0	36.0
29.4	33.8
29.8	33.4
28.8	36.2
29.6	32.8
29.4	31.8
Average = 29.8	Average = 33.7
Average Coefficient of Friction = 0.89	**Average Coefficient of Friction = 0.65**

Table 6
Solar Reflectance - ASTM E1980
"Gabouri" Limestone

Sample ID	Solar Reflectance		Thermal Emittance		Solar Reflectance Index (SRI)		
	ASTM C1549		ASTM C1371		ASTM E1980		
	Average	Std. Dev.	Average	Std. Dev.	Low Wind	Medium Wind	High Wind
Limestone 6"x6"	**0.482**	**0.020**	**0.90**	**0.01**	**55**	**56**	**56**

TESTING ENGINEERS, INC.

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July 18, 2016

Ms. Jackie Yamnitz
EARTHWORKS
19797 Eisenbeis Bottom Road
STE Genevieve, MO 63670

Lab. No.: H356B

SUBJECT: Freeze/Thaw Testing of "Gabouri" Limestone Stone Samples.

Dear Ms. Yamnitz;

At your request, we have completed the testing of the above referenced stone samples submitted to our laboratory. The test description and corresponding ASTM test method were as follows:

Test 1 – Freeze/Thaw – ASTM C67.

Test 2 – Freeze/Thaw & De-icing Salt Durability – ASTM C1645.

PROCEDURES & RESULTS

The specimens for each test were prepared and tested in accordance with the above ASTM designations.

Five specimens with 2"x2"x4" were subjected to 50 cycles of freezing and thawing in accordance with ASTM C67. There were no indications of, cracking, or breakage on any of the five specimens tested, and the average weight loss on completion of testing was 0.14%. The results are presented in Table I. The specimens meet the requirements of AC51/ ASTM C67 for freeze/thaw.

Five specimens with dimensions 3"x3"x6" were subjected to 28 cycles of freeze/thaw with specimens submerged in salt water. The tests were performed in accordance with ASTM C1645. The results for 7 day and 28 day cycles are presented in Table II. Based on the data, the weight loss on all specimens was below the maximum of 225 grams/m^2 specified in ASTM C936.

If you have any questions regarding this report, please contact the undersigned at 510 835 3142 X199.

Respectfully Submitted,
TESTING ENGINEERS, INC.

Hossein Arbabi, Ph.D., P.E.
Senior Engineer

TABLE I
Freeze/Thaw – ASTM C67
"Gabouri" Limestone

Specimen No.	Orginal weight, g	Weight after 50 freeze/thaw cycles, g	Weight loss, g	Percent weight loss
1	716.0	715.1	0.9	0.13
2	698.3	697.4	0.9	0.13
3	746.8	745.7	1.1	0.15
4	729.7	728.5	1.2	0.16
5	687.6	686.8	0.8	0.12
Average	**715.7**	**714.7**	**01.0**	**0.14**

TABLE II
Salt Water Exposure-freeze/thaw – ASTM C1645
"Gabouri" Limestone

Specimen No.	7 Day Weight Loss, g	7 Day Weight Loss per Unit Area, g/m^2	28 Day Weight Loss per Unit Area, g	28 day Weight Loss per Unit Area, g/m^2
1	0.480	5.22	0.679	7.39
2	0.226	2.46	0.567	6.16
3	0.096	1.04	0.158	1.72
Average	**0.267**	**2.91**	**0.468**	**5.09**