Testing Services Stone & Tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

TESTING APPLICANT:	Cobra Stone, Incorporated 1085 County Road 239 Florence, TX 76527-4600 USA
	TEL: +1 512.746-5600 FAX: +1 512-746-5657 www.cobrastone.com
FABRICATOR/QUARRY:	Cobra Stone, Incorporated USA
SAMPLES RECEIVED DATE:	19 June 2019
SAMPLE PLAN:	Natural Stone cut to the sizes stated in the Standards below were received in "NEW" condition. Samples submitted by client.
DATE OF SAMPLING:	14 June 2019
LOCATION OF SAMPLING:	Florence, TX USA
SCOPE / PURPOSE OF TESTING:	To determine compliance with ASTM C 503 "Standard Specification for Marble Dimension Stone (Exterior)" or ASTM C 568 "Standard Specification for Limestone Dimension Stone"
STANDARD(S) EVALUATED:	ASTM C97-15 "Standard Test Method for Absorption and Bulk Specific Gravity of Dimensional Stone" and ASTM C1353-15 "Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser"[1]
TESTING DATE(S):	19 June – 01 August 2019
PRODUCT DESCRIPTION(S):	Natural Stone identified: Grey Lueders Limestone

COMPLIANCE SUMMARY: Natural Stone identified above cut to shape as required by the standards listed above:

Average % Absorption		5.70	
Average Bulk Specific Gravity		140.3 lbs/ft^3	2 249 kg/m^3
Abrasion Resistance	– Dry	13.5 Iw	
Abrasion Resistance	– Wet	13.0 Iw	

See test results for further details

[1]NOTE: For Igneous Samples we run ASTM C 241 for Sedimentary and Metamorphic Samples we run ASTM C 1353

Form: TEi-TS-S&T002 Revision 10/07

Merrill Gee P.E. – Engineer in Charge

Testing sm Services
stone & tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

TABLE OF CONTENTS

Testing Services Stone & Tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

ASTM C97
"Standard Test Methods for Absorption and Bulk Specific Gravity of Dimensional Stone"

1.0 SCOPE

1.1 These test methods cover the tests for determining the absorption and bulk specific gravity of all types of dimension stone, except slate.

2.0 REFERENCED DOUCMENTS – Omitted, see Standard

3.0 TERMINOLOGY

3.1 Definitions - All definitions are in accordance with Terminology C 119.

4.0 SIGNIFICANCE AND USE

4.1 These test methods are useful in indicating the differences in absorption between the various dimension stones. These test methods also provide one element in comparing stones of the same type.

ABSORPTION

5.0 SAMPLING

5.1 NOTE: Sampling was done by the Client.

6.0 TEST SPECIMENS

6.1 NOTE: The test specimens were tested "As Received". See RESULTS

7.0 PROCEDURE

7.1 NOTE: The specimens were tested in accordance with the requirements of this Section

8.0 CALCULATION

8.1 Calculate the weight percentage absorption for each specimen as follows:

$$\text{Absorption, weight \%} = [(B-A)/A] \times 100$$

where A = weight of the dried specimen, and
B = weight of the specimen after immersion

9.0 REPORT – Omitted, see Standard and RESULTS

Testing Services Stone & Tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

BULK SPECIFIC GRAVITY

10.0 PROCEDURE

10.1 NOTE: The specimens were tested in accordance with the requirements of this Section

11.0 CALCULATION

11.1 Calculate the bulk specific gravity as follows:

$$\text{Bulk specific gravity} = \frac{A}{(B-C)}$$

where: A = weight of the dried specimen,
B = weight of the soaked and surface dried specimen in air,
C = weight of soaked specimen in water.

11.2 Calculate the results to three decimal places and round off to two. Report the Average, Maximum and Minimum values.

12.0 REPORT – Omitted, see Standard and RESULTS

13.0 PRECISION AND BIAS – Omitted, see Standard

14.0 KEYWORDS – Omitted, see Standard

RESULTS

Results – As Received						
Sample	Dry Weight	Soaked/Dried Weight	Wet Weight	% Absorption	Bulk Specific Gravity X 1 000	Bulk Specific Gravity X 62.4
A	463.21	489.20	283.64	5.6108	2253.4	140.6
B	447.58	473.29	274.08	5.7442	2246.8	140.2
C	449.31	475.31	275.63	5.7867	2250.2	140.4
D	455.80	481.45	278.65	5.6275	2247.5	140.2
E	457.83	484.02	280.05	5.7205	2244.6	140.1

Average % Absorption – 5.70

Average Bulk Specific Gravity – 2 249 kg/m^3 or 140.3 lb/ft^3

Testing Services stone & tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

ASTM C1353[1]
"Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser"

1.0 SCOPE

1.1 This test method covers the establishment of an index of abrasion resistance by determination of loss of volume resulting from abrasion of dimension stone as described in Terminology C119 and is based on Guide G195.

1.2 Omitted, see Standard

1.3 This test method uses a rotary platform abraser to determine the loss in volume of dimension stone caused by abrasion under controlled conditions.

1.4 This test method is useful in indicating the differences in abrasion resistance between the various dimension stones. This test method provides one element in comparing stones of the same type.

1.5 Omitted, see Standard

2.0 REFERENCED DOCUMENTS – Omitted, see Standard

3.0 TERMINOLOGY

3.1 Definitions of Terms Specific to This Standard:

3.1.1 abraser—wear testing instrument to evaluate abrasion resistance, also referred to as an abrader.

3.1.2 abrasion cycle—in abrasion testing, one or more movements of the abradant across a material surface, or the material surface across the abradant, that permits a return to its starting position. In the case of the rotary platform test method, it consists of one complete rotation of the specimen.

3.1.3 index of abrasion resistance, n—a number calculated from the weight loss of a specimen subjected to a given number of revolutions against a standard bonded abrasive wheel.

3.1.4 resurface—procedure of cleaning and refreshing the running surface of an abrasive wheel prior to or during use in testing.

3.1.5 sample, n—a geometrically regular block of stone.

3.1.6 test specimen, n—a flat prism of specified size and shape cut from the submitted sample.

4.0 SUMMARY OF TEST METHOD

4.1 A specimen is abraded using rotary rubbing action under controlled conditions of pressure and abrasive action. The test specimen is mounted on a turntable platform and turns on a vertical axis, against the sliding rotation of two abrading wheels. One abrading wheel rubs the specimen outward toward the periphery and the other, inward toward the center. The resulting abrasion marks form a pattern of crossed arcs over an area of approximately 5 in.^{2} [30 cm^2]. Resistance to abrasion is evaluated by determination of the loss of volume due to abrasion and calculation of an index of abrasion resistance.

Testing Services stone & tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

5.0 SIGNIFICANCE AND USE

5.1 This test method provides a means to quantify the abrasion resistance of dimension stone and may be related to end-use performance, or used to comparatively rank material performance, or both. The resistance of dimension stone to abrasion, as measured on a testing machine in the laboratory, is generally only one of several factors contributing to wear performance as experienced in the actual use of the material. Calculation of predicted life should not be based on specific abrasion data alone.

5.2 The resistance of dimension stone to abrasion may be affected by factors including test conditions; type of abradant; pressure between the specimen and abradant; mounting of the specimen; and type, kind, or amount of finishing materials.

5.3 Abrasion tests utilizing the rotary platform abraser may be subject to variation due to changes in the abradant during the course of specific tests. Depending on abradant type and test specimen, the abrading wheel surface may change (that is, become clogged) due to pick-up of finishing or other materials from test specimens. To reduce this variation, the abrading wheels may require resurfacing.

6.0 APPARATUS

NOTE: The Test Equipment used is in accordance with the Specifications found in the Section

7.0 TEST SPECIMENS

NOTE: The test specimens were tested "As Received". See RESULTS

8.0 PROCEDURE

NOTE: The Test Procedure was followed without exception as described in this Section.

9.0 CALCULATION

9.1 Calculate the index of abrasion resistance as follows:

$$I_w = \frac{36.75}{w_o - w_1} \times \rho \times \frac{n}{1000}$$

where:

Iw = index of abrasion resistance,
wo = initial weight of test specimen, g
w1 = weight of test specimen after 1000 revolutions, g
ρ = bulk specific gravity, and
n = number of revolutions actually run during the test.

10.0 REPORT

[1]NOTE: For Igneous Samples we run ASTM C 241 for Sedimentary and Metamorphic Samples we run ASTM C 1353

11.0 PRECISION AND BIAS – Omitted, see Standard

12.0 KEYWORDS – Omitted, see Standard

Testing Services stone & tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

RESULTS

Results - Dry					
Sample	Initial Weight	Weight Loss	Bulk Density	Number of Revolutions	Index of Resistance (Iw)
a	463.21	457.01	2.249	1 000	13.33
b	447.58	441.55		1 000	13.71
c	449.31	443.20		1 000	13.53

Results - Wet					
Sample	Initial Weight	Weight Loss	Bulk Density	Number of Revolutions	Index of Resistance (Iw)
a	455.80	449.41	2.249	1 000	12.93
b	457.83	451.51		1 000	13.08
c	456.16	449.84		1 000	13.08

The tests were conducted at 32% Relative Humidity @ 74 °F

Average Abrasion Resistance = Dry 13.5 Iw
Wet 13.0 Iw

CONCLUSION:

The material has the following average properties:

Average % Absorption		5.70	
Average Bulk Specific Gravity		140.3 lbs/ft^3	2 249 kg/m^3
Abrasion Resistance	Dry	13.5 Iw	
	Wet	13.0 Iw	

[1]NOTE: For Igneous Samples we run ASTM C 241 for Sedimentary and Metamorphic Samples we run ASTM C 1353

END OF ANALYSIS

Testing Services stone & tile Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

Requirements for Marble According to ASTM C 503

Physical Property	Classifications	Test Requirement
Average % Absorption (Max.)	I, II, III, IV	0.20
Average Density (lbs/ft^3) (Min.)	I Calcite II Dolomite III Serpentine IV Travertine	162.0 175.0 168.0 144.0
Modulus of Rupture (psi) (Min.)	I, II, III, IV	1 000
Compressive Strength (psi) (Min.)	I, II, III, IV	7 500
Abrasion Resistance (Min.)	I, II, III, IV	10.0
Flexural Strength (psi) (Min.)	I, II, III, IV	1 000

Requirements for Limestone According to ASTM C 568

Average % Absorption (Max.) –	12	(Low Density)
	7.5	(Medium Density)
	3	(High Density)
Average Density (Min.) (lbs/ft^3) –	110	(Low Density)
	135	(Medium Density)
	160	(High Density)
Compressive Strength (Min.) (psi) -	1800	(Low Density)
	4000	(Medium Density)
	8000	(High Density)
Modulus of Rupture (Min.) (psi) -	400	(Low Density)
	500	(Medium Density)
	1000	(High Density)
Abrasion Resistance (Min.) –	10	(Low, Medium & High Density)

Testing Services
stone & tile
Laboratory
3455 South 500 West
Salt Lake City, UT 84115-4234 USA
TEL: +1 801 262 2448
FAX: +1 801 262 9870

TEST REPORT

Sample as Received