

TEST REPORT No. 50

MATERIAL NAME: Moca Beige (Grey)

CLIENT : A&G 23 S.r.l.

STONELAB BY IMM


TECHNOLOGICAL LABORATORY FOR TESTING ON STONES



PERFORMED TESTS:

- 1. Water Absorption & Bulk Specific Gravity (ASTM C97-09)** **Table 1**
- 2. Modulus of Rupture (ASTM C99-09)** **Table 2**
(Dry+Wet; Perpendicular to rift edges)
- 3. Compressive Strength (ASTM C170-09)** **Table 3**
(Dry+Wet; Perpendicular to rift)
- 4. Abrasion Resistance (ASTM C1353-09)** **Table 4**

The Test Report No. 50 consists of 10 pages including this one.

Technological Laboratory Dr. Geol. Marco Mazzoni		DATE: May 25 th , 2015
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<p style="text-align: center;">STONELAB by IMM Technological Laboratory Viale G.Galilei, 133 - 54033 M. di Carrara - Italy Tel. +39 0585 787963 - Fax. +39 0585 787602 E-mail: m.mazzoni@immcarrara.it A.S.T.M. MEMBER No. 1741518</p>	<p>TEST REPORT No. 50</p> <p>RESULTS SUMMARY TABLES</p>
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By request of **A&G 23 S.R.L.**, the under listed Tests have been performed on specimens of the material named by **A&G 23 S.R.L.**, “**Moca Beige (Grey)**”, quarried in Turkey.

The relevant results have been reported in the tables enclosed to this document. The specimens under testing have been consigned to this laboratory by **A&G 23 S.R.L.** in date May 14th, 2015. No further information about the geological setting of this rock was given.

NOTE: the standard deviation and the coefficient of variation of mechanical tests have been indicated inside the tables enclosed to this test report.

Type of Test	Ref. Std.	Units	Conditioning (Load applying dir.)	Average values	Std. Dev.
Water Absorption (Table 1)	ASTM C97-09	%	-	2.64	-
Bulk Specific Gravity (Table 1)	ASTM C97-09	Kg/m ³	-	2457.69 (medium density)	-
		lb/ft ³	-	153.36 (medium density)	-
Modulus of Rupture (Table 2)	ASTM C99-09	MPa	DRY (Perp. to rift edges)	12.97	0.43
		Psi		1880.8	61.7
Modulus of Rupture (Table 2)	ASTM C99-09	MPa	WET (Perp. to rift edges)	10.26	0.70
		Psi		1488.4	101.9
Compressive Strength (Table 3)	ASTM C170-09	MPa	DRY (Perp. to rift)	100.17	3.70
		Psi		14528.4	537.1
Compressive Strength (Table 3)	ASTM C170-09	MPa	WET (Perp. to rift)	71.84	5.41
		Psi		10419.8	784.6
Abrasion Resistance (Table 4)	ASTM C1353-09	Ha	Dry	16.64	-

The density data indicate that the medium density limestones reference values (ASTM C568) should be taken into account.



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Table 1

		Water Absorption and Bulk Specific Gravity (ASTM C97-09)			Client: A&G 23 S.r.l.			
ASTM MEMBER NO. 1741518								
Material: Moca Beige (Grey)						Block No.: unknown		
Test Report No.: 50						Test Standard: ASTM C97-09		
Specim No.	Specimens' weight					B.S.G. [kg/m ³] [lb/ft ³]	Water Absorption (%)	Specimen Dimension (mm)
	After Dry conditioning (>48 hrs. / 60°C)		After Wet conditioning (>48 hrs. / 20°C)					
	Date	g (m _d)	Date	g (m _s)	g (m _h)			
01	19/05/15	312.37	21/05/15	320.59	193.58	2459.41 153.47	2.63	50.9x50.3x50.0
02	19/05/15	311.28	21/05/15	319.44	192.84	2458.77 153.43	2.62	50.6x50.0x50.2
03	19/05/15	309.88	21/05/15	318.08	191.95	2456.83 153.31	2.65	50.5x50.1x50.1
04	19/05/15	311.66	21/05/15	319.94	193.03	2455.76 153.24	2.66	50.8x50.0x50.1
05	19/05/15	310.87	21/05/15	319.08	192.59	2457.66 153.36	2.64	50.7x50.0x50.0
				Min.	Avg.	Max.		
Apparent Density ρ_b [kg/m³] [lb/ft³]				2455.76 153.24	2457.69 153.36	2459.41 153.47		
Water Absorption [%]				2.62	2.64	2.66		

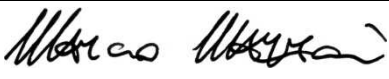
Technological Laboratory Dr.Geol. Marco Mazzoni		Date: May 25 th , 2015
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Table 2


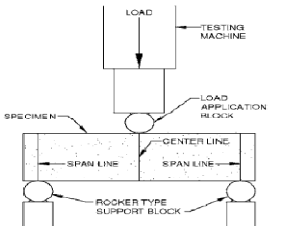

 <p>Natural Stone Test STONE LAB BY IMM CARRARA ASTM MEMBER No. 1741518</p>		Modulus of Rupture (ASTM C99-09) - R -			Client: A&G 23 S.r.l.				
Material: Moca Beige (Grey)				Test Report No.: 50					
Block No.: unknown				Test Standard: ASTM C 99-09					
Specimen No.	Dimensions [mm] a x b x h	Conditioning	Actual Values						Notes
		Dry >48hrs/60°C	Fmax [kN]	R [MPa]	R [Psi]	R _{avdL} [MPa]	R _{avdL} [Psi]	Strain F _{max} [mm]	
01 D _⊥	200x99.8x61.1	Dry	18.85	13.66	1981.2			0.30	
02 D _⊥	200x100.3x61.0	Dry	17.54	12.69	1840.5			0.17	
03 D _⊥	200x99.8x61.1	Dry	17.55	12.72	1844.9	12.97	1880.8	0.18	
04 D _⊥	200x99.9x61.6	Dry	18.39	13.10	1900.0			0.19	
05 D _⊥	200x99.8x60.8	Dry	17.34	12.67	1837.6			0.17	
Note: Load applied perpendicular to rift Average M.O.R. (Dry - ⊥ to rift), R_{avdL} = 12.97 MPa ⇒ (R_{avdL} = 1880.8 Psi) Standard deviation (Dry), S_{dL} = 0.43 MPa ⇒ (S_{dL} = 61.7 Psi) Coefficient of Variation (Dry ⊥) = 3.28 %									
Specimen No.	Dimensions [mm] a x b x h	Conditioning	Actual Values						Notes
		Wet >48hrs/20°C	Fmax [kN]	R [MPa]	R [Psi]	R _{avwL} [MPa]	R _{avwL} [Psi]	Strain F _{max} [mm]	
01 W _⊥	200x1001.1x61.0	Dry	13.96	10.12	1467.8			0.16	
02 W _⊥	200x99.9x61.3	Dry	12.92	9.30	1348.9			0.15	
03 W _⊥	200x99.9x61.2	Dry	15.06	10.83	1570.8	10.26	1488.4	0.17	
04 W _⊥	200x100.1x61.1	Dry	15.31	11.06	1604.1			0.17	
05 W _⊥	200x99.4x60.6	Dry	13.52	10.00	1450.4			0.15	
Note: Load applied perpendicular to rift Average M.O.R. (Wet - ⊥ to rift), R_{avwL} = 10.26 MPa ⇒ (R_{avwL} = 1488.4 Psi) Standard deviation (Dry), S_{wL} = 0.70 MPa ⇒ (S_{wL} = 101.9 Psi) Coefficient of Variation (Wet ⊥) = 6.85 %									
Load system schematic 			Technological Laboratory Dr. Geol. Marco Mazzoni 			DATE: May 25 th , 2015			

Table 3




Natural Stone Test STONE LAB BY IMM CARRARA ASTM MEMBER No. 1741518		Compressive Strength (ASTM C170-09) - C -			Client: A&G 23 S.r.l.				
Material: Moca Beige (Grey)				Test Report No.: 50					
Block No.: unknown				Test Standard: ASTM C170-09					
Specimen No.	Dimensions [mm] a x b x h	Conditioning	Actual Values						Notes
			Dry >48hrs/60°C	Fmax [kN]	C [MPa]	C [Psi]	C _{avdL} [MPa]	C _{avdL} [Psi]	
01 D _⊥	51.2x49.6x49.8	Dry	244.58	96.31	13968.6			0.410	
02 D _⊥	50.1x50.7x50.1	Dry	266.83	105.05	15236.2			0.406	
03 D _⊥	50.6x50.0x50.0	Dry	244.90	96.80	14039.6	100.17	14528.4	0.374	
04 D _⊥	50.6x50.5x50.7	Dry	261.53	102.35	14844.6			0.357	
05 D _⊥	50.8x49.8x50.0	Dry	253.84	100.34	14553.1			0.371	
<p>Note: Load applied perpendicular to rift</p> <p>Avg. Compressive Strength (Dry - ⊥ to rift), $\sigma_{avd\perp} = 100.17$ MPa \Rightarrow ($\sigma_{avd\perp} = 14528.4$ Psi)</p> <p>Standard deviation (Dry - ⊥ to rift), $s_{d\perp} = 3.70$ MPa \Rightarrow ($s_{d\perp} = 537.1$ Psi)</p> <p>Coefficient of Variation (Dry - ⊥ to rift) = 3.70 %</p>									
Specim. No.	Dimensions [mm] a x b x h	Conditioning	Actual Values						Notes
			Wet >48hrs/60°C	Fmax [kN]	C [MPa]	C [Psi]	C _{avwL} [MPa]	C _{avwL} [Psi]	
01 W _⊥	50.9x50.3x50.0	Wet	188.21	73.51	10661.7			0.312	
02 W _⊥	50.6x50.0x50.2	Wet	160.35	63.38	9192.5			0.393	
03 W _⊥	50.5x50.1x50.1	Wet	186.44	73.69	10687.8	71.84	10419.8	0.340	
04 W _⊥	50.8x50.0x50.1	Wet	179.43	70.64	10245.5			0.339	
05 W _⊥	50.7x50.0x50.0	Wet	197.70	77.99	11311.5			0.315	
<p>Note: Load applied parallel to rift</p> <p>Avg. Compressive Strength (Wet - ⊥ to rift), $\sigma_{avw\perp} = 71.84$ MPa \Rightarrow ($\sigma_{avw\perp} = 10419.8$ Psi)</p> <p>Standard deviation (Wet - ⊥ to rift), $s_{w\perp} = 5.41$ MPa \Rightarrow ($s_{w\perp} = 784.6$ Psi)</p> <p>Coefficient of Variation (Wet - ⊥ to rift) = 7.53 %</p>									
Technological Laboratory Dr.Geol. Marco Mazzoni							DATE: May 25 th , 2015		

Table 4

 ASTM MEMBER No. 1741518		Abrasion resistance of Dimension Stone Subjected to Foot Traffic (ASTM C1353-09)			Client: A&G 23 S.r.l.	
Material name: Moca Beige (Grey) Test Report No.: 50				Specimens' surface under testing: polished Test Standard: ASTM C1353-09		
Specimen No.	Specimen Weight				Ha	Specimen dimensions [mm]
	Before Testing natural T=20°C	After Testing natural T=20°C	B.S.G (G) g/cm ³	Wa=(A-B) [g.]		
	g. (A)	g. (B)				
01	155.46	149.52	2.46	5.94	15.22	100.0x99.7x6.3
02	169.75	164.76	2.46	4.99	18.12	100.3x100.3x6.9
03	163.56	158.11	2.46	5.45	16.59	100.2x100.1x6.6

Min.	Average Ha	Max.
15.22	16.64	18.12

Notes:**B.S.G. = Bulk Specific Gravity****Wa = Loss of Weight during grinding operation****Ha = Abrasive hardness value**

Technological Laboratory Dr.Geol. Marco Mazzoni		DATE: May 25 th , 2015
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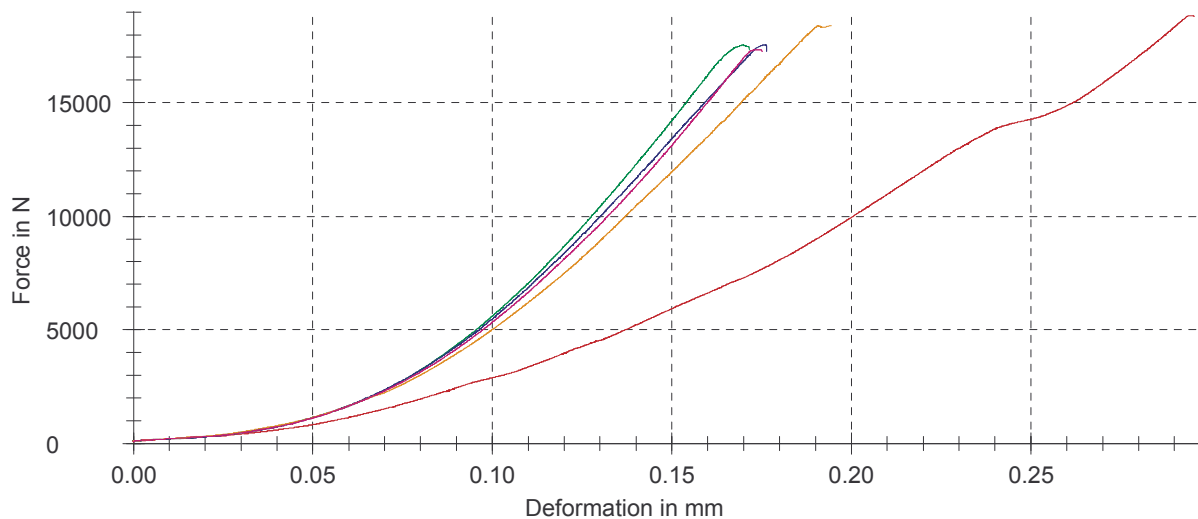
Test Report No.50

Client : A&G 23 S.r.l.
 Ref. Norm : ASTM C99-09
 Material name : Moca Beige (Grey) - Honed - Dry - Perpendicular to rift edges
 Pre-load : 50 N
 Test speed : 80 N/s

Test results:

Legenda	No.	Specim.No.	Date	M.O.R. MPa	F.max N	Def. at Fmax mm	Span mm	Spec.Thk mm	Specim.Width mm
■	1	01D	20/05/2015	13,66	18847,84	0,30	180	61,1	99,8
■	2	02D	20/05/2015	12,69	17541,77	0,17	180	61,0	100,3
■	3	03D	20/05/2015	12,72	17553,28	0,18	180	61,1	99,8
■	4	04D	20/05/2015	13,10	18390,68	0,19	180	61,6	99,9
■	5	05D	20/05/2015	12,67	17334,89	0,17	180	60,8	99,9

Load/Strain Graphs:



Statistics:

A&G 23 S.r.l. n = 5	M.O.R. MPa	F.max N	Def. at Fmax mm	Span mm	Spec.Thk mm	Specim.Width mm
\bar{x}	12,97	17933,69	0,20	180	61,1	99,94
s	0,42	652,19	0,05	0,00	0,29	0,21
v	3,27	3,64	26,22	0,00	0,48	0,21

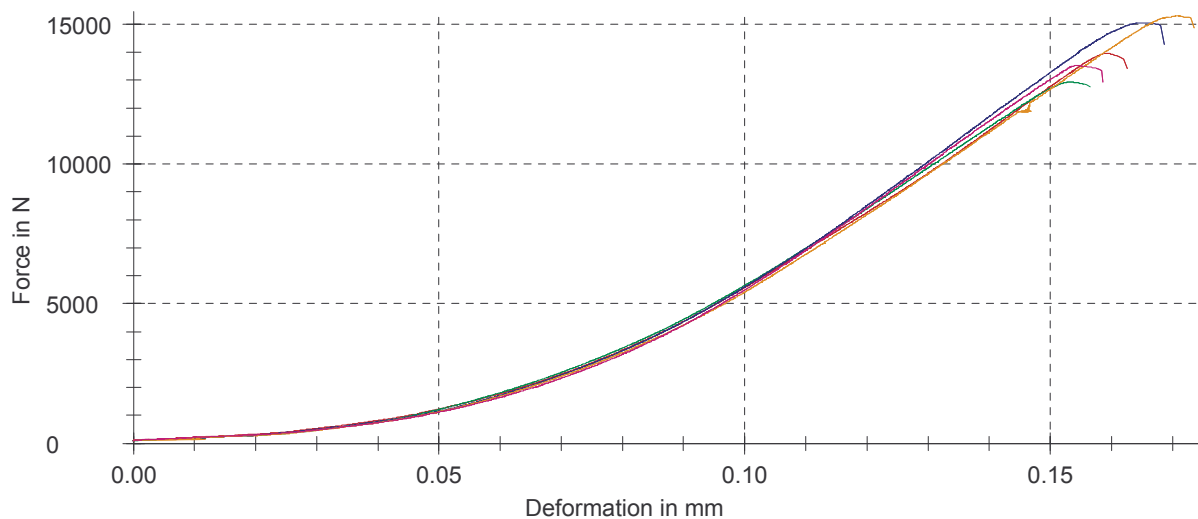
Test Report No.50

Client : A&G 23 S.r.l.
 Ref. Norm : ASTM C99-09
 Material name : Moca Beige (Grey) - Honed - Wet - Perpendicular to rift edges
 Pre-load : 50 N
 Test speed : 80 N/s

Test results:

Legenda	No.	Specim.No.	Date	M.O.R. MPa	F.max N	Def. at Fmax mm	Span mm	Spec.Thk mm	Specim.Width mm
■	1	01W	20/05/2015	10,12	13955,89	0,16	180	61,0	100,1
■	2	02W	20/05/2015	9,30	12924,03	0,15	180	61,3	99,9
■	3	03W	20/05/2015	10,83	15057,55	0,17	180	61,3	99,9
■	4	04W	20/05/2015	11,06	15312,46	0,17	180	61,1	100,1
■	5	05W	20/05/2015	10,00	13516,15	0,15	180	60,6	99,4

Load/Strain Graphs:



Statistics:

A&G 23 S.r.l. n = 5	M.O.R. MPa	F.max N	Def. at Fmax mm	Span mm	Spec.Thk mm	Specim.Width mm
\bar{x}	10,26	14153,22	0,16	180	61,1	99,88
s	0,71	1014,56	0,01	0,00	0,29	0,29
v	6,87	7,17	4,63	0,00	0,47	0,29

TEST REPORT NO.50

Date: 22/05/15

Ref. Norm.: ASTM C170-09

Client: A&G 23 S.r.l.

Material: Moca Beige (Grey)

Test Device: Controls Mod.C56Z00

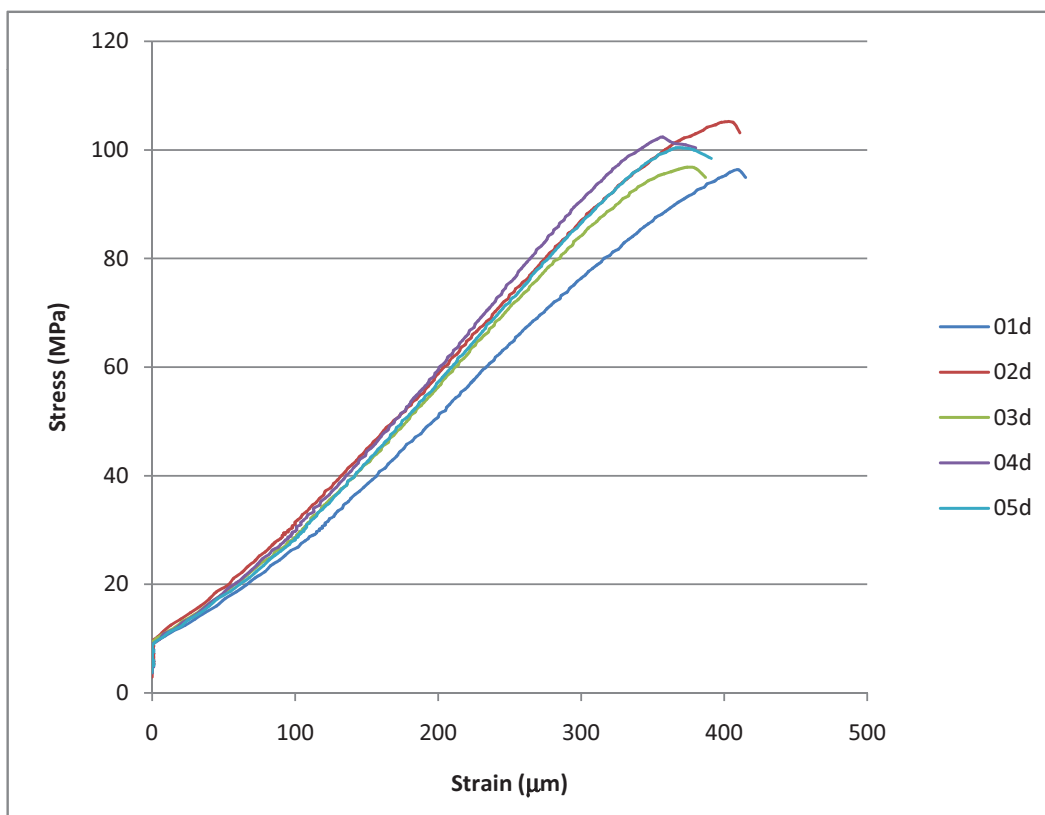
Test Speed: 0,5 MPa/sec

Load applying dir: perpendicular to the rift

Condition: Dry

Specim.No	a (mm)	b (mm)	c (mm)	Area (mm ²)	Force (kN)	Compr. Strength (MPa)	Strain at Fmax (μm)
01d	51,20	49,60	49,80	2539,52	244,58	96,31	410
02d	50,10	50,70	50,10	2540,07	266,83	105,05	406
03d	50,60	50,00	50,00	2530,00	244,90	96,80	374
04d	50,60	50,50	50,70	2555,30	261,53	102,35	357
05d	50,80	49,80	50,00	2529,84	253,84	100,34	371

Average Compr. Strength : 100,17 MPa
 Standard deviation : 3,70 MPa



TEST REPORT NO.50

Date: 22/05/15

Ref. Norm.: ASTM C170-09

Client: A&G 23 S.r.l.

Material: Moca Beige (Grey)

Test Device: Controls Mod.C56Z00

Test Speed: 0,5 MPa/sec

Load applying dir: perpendicular to the rift

Condition: Wet

Specim.No	a (mm)	b (mm)	c (mm)	Area (mm ²)	Force (kN)	Compr. Strength (MPa)	Strain at Fmax (μm)
01w	50,90	50,30	50,00	2560,27	188,21	73,51	312
02w	50,60	50,00	50,20	2530,00	160,35	63,38	393
03w	50,50	50,10	50,10	2530,05	186,44	73,69	340
04w	50,80	50,00	50,10	2540,00	179,43	70,64	339
05w	50,70	50,00	50,00	2535,00	197,70	77,99	315

Average Compr. Strength : 71,84 MPa
 Standard deviation : 5,41 MPa

