

POLYTECHNIC UNIVERSITY SCHOOL OF TURIN DEPARTMENT OF GEO-RESOURCES AND TERRITORY

[...]

MARBLE LABORATORY

Prot. Nr. 327

11.09.2003

SERPENTINO E GRANITI

Factory: 23030 CHIURO (SO) – Italy – Via Nazionale, 43 Tel. +39 (0342) 489032 – Fax: +39 (0342) 489612 e-mail: info@serpentino.com - http://www.serpentino.com

CERTIFICATE NR. 44/08/2003

PHYSICAL AND MECHANICAL ANALYSIS OF A ROCK SAMPLE CALLED SERPENTINO VERDE GIADA, COMING FROM THE "SASSO BASCI" QUARRY, IN THE TOWN OF TORRE DI S.MARIA (SO) - ITALY

The operator: (Dr. Paola Marini) Approved: The director (Prof. Eng. Sergio Dequal)



Certificate Nr. 44/08/2003

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Requested by:

Serpentino e Graniti S.r.I., Via Tornadú 16 – 23020 Torre di S. Maria (SO) – VAT-Nr. 00635350143

Data of request:

Letter registered on arrival on 08.09.2003 with the number 317.

Supplied samples:

The customer provided us with samples having the shape and the dimensions required for the tests.

Material description (in accordance with UNI EN 12440)

Traditional name: Petrographic name: Place of origin: Serpentino Verde Giada Serpentinite "Sasso Basci" quarry in the town of Torre di S. Maria (SO) - Italy

Tests Required:

Following tests have been required on stone slabs for external paving according to UNI EN 1341, also in order to apply for the CE marking.

- petrographic examination, according to UNI EN 12407
- water absorption at atmospheric pressure, according to UNI EN 13755
- flexural strength, according to UNI EN 12372

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- freeze-thaw resistance, according to UNI EN 12371 and UNI EN 12372
- abrasion resistance, according to UNI EN 1341 Annex C
- slip resistance, according to UNI EN 1341 Annex D

The operator: (Dr. Paola Marini)

The test coordinator (Prof. Eng. Angelica Frisa Morandini)



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PETROGRAPHIC EXAMINATION

Test method

The test has been performed in accordance with UNI EN 12407 "Natural stone test methods . Petrographic examination" – 2000.

Number, shape and dimensions of the tested samples

Thin section 30 µm

Macroscopic description

The hand specimen appears fine grained and has a light-green colour. Its texture is minutely schistose.

Microscopic description

In thin section the rock has a felty texture in the serpentine antagorite lamellae, that are more or less parallely arranged each other.

The constituents are:

- antigorite serpentine (70%), made up of crystals whose length varies from 0.1 mm to 0.5 mm.
- pyroxene (20%), made up of sometimes altered crystals whose average dimensions are about 0.4 mm.
- opaque minerals (10%)

The rock is a serpentinite.

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DETERMINATION OF WATER ABSORPTION AT ATMOSPHERIC PRESSURE

Test method

The water absorption has been determined according to UNI EN 13755 "Natural stone test methods . Determination of water absorption at atmospheric pressure "-2001

l ested san	nples : 6 cubes	s having approx. 50 n	nm edge	
Sample	Mass of the	Mass of the	Water absor	otion coefficient
identification	dry sample	saturated sample		
nr.		weighted in air		
			single values	average value
	(g)	(g)	(%)	(%)
1	359,75	360,00	0,07	
2	353,71	353,98	0,08	
3	363,72	363,99	0,07	
4	369,16	369,45	0,08	
5	369,52	369,78	0,07	
6	368,55	368,79	0,07	0,07

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DETERMINATION OF THE FLEXURAL STRENGTH ON SAMPLES BOTH IN NATURAL CONDITIONS AND SUBJECTED TO FROST TEST

Test method¹

- The flexural strength under load concentrated on the centre line has been determined according UNI EN 12372 "Natural stone test methods . Determination of the flexural strength under concentrated load " 2001
- The frost test has been determined according to EN 12371 "Natural stone test methods . Determination of frost resistance " – 2001. The samples have been submitted to 48 frost/thaw cycles according to UNI EN 1341 "Natural stone slabs for external paving" – 2003 (see paragraph 4.2) and to UNI EN 1343 "Natural stone curbs for external paving" – 2003 (see paragraph 4.3).
- The load assignment direction is perpendicular to the anisotropy plane.

1) 1000	ea campiee.	re paranelep	npeae er a			Shannon
Sample	Distance	Height	Width	Breaking load	Flexural	Strength
identification	between	-		-	σ (Ι	MPa)
nr.	supports	h (mm)	b (mm)	P (kN)	single values	average value
	1 (mm)				-	-
1	125	23,3	50,9	7,82	52,9	
2	125	24,8	51,2	7,79	46,6	
3	125	23,9	51,1	6,74	43,2	
4	125	23,7	51,1	6,35	41,4	
5	125	22,9	51,0	6,48	45,4	
6	125	23,1	51,0	7,00	48,1	
7	125	22,2	50,6	7,44	56,1	
8	125	23,5	51,2	6,21	41,4	
9	125	23,6	50,9	8,63	56,9	
10	125	24,3	50,8	7,97	49,6	48,2

1) Tested samples: 10 parallelepipeds of approx. 25x50x150mm in natural conditions

¹ See picture on the original certificate

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2) T	ested samples:	10 parallelepipeds	of approx.	25x50x150mm	submitted to
-	-	48 frost/th	aw cycles		

Sample identification	Distance between	Height	Width	Breaking load	Flexura σ (I	l Strength MPa)
nr.	supports 1 (mm)	h (mm)	b (mm)	P (kN)	single values	average value
11	125	25,4	50,5	8,54	49,2	
12	125	24,6	50,8	4,85	29,6	
13	125	24,9	50,8	7,05	42,0	
14	125	22,6	50,9	6,22	45,0	
15	125	23,1	50,9	7,60	52,6	
16	125	24,0	50,9	8,06	51,7	
17	125	23,5	50,6	8,00	53,6	
18	125	24,9	51,0	5,17	30,8	
19	125	22,7	51,0	7,01	50,1	
20	125	24,3	51,2	6,84	42,6	44,7

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DETERMINATION OF ABRASION RESISTANCE

Test method

The abrasion resistance has been determined according to UNI EN 1341 "Natural stone slabs for external paving - Test methods and requirements" Annex C - 2003; and according to UNI EN 1342 "Natural stone setts for external paving – Test methods and requirements" Annex B – 2003

Tested samples: 6 parallelepipeds of approx. 100x70x30 mm

Sample identification	Groove length (mm)	Abrasion resistance (mm) - average value -
nr.	, , , , , , , , , , , , , , , , , , ,	J. J
1	19,50	
2	21,17	
3	21,01	
4	22,57	
5	22,78	
6	20,80	21,31

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DETERMINATION OF THE UNPOLISHED SLIP RESISTANCE VALUE (USRV)

Test method

The slip resistance value has been determined according to UNI EN 1341 "Natural stone slabs for external paving – Test methods and requirements" Annex D - 2003 and according to UNI EN 1342 "Natural stone setts for external paving – Test methods and requirements" Annex C - 2003

Samples having diamond surface finishing

Tested samples: 6 small slabs of approx. 200x200x10 mm					
Sample	USRV	USRV			
identification					
nr.		- Sample average value -			
1	72				
2	76				
3	68				
4	71				
5	71				
6	76	72			

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