



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

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MARBLE LABORATORY

Prot. Nr. 328

11.09.2003

SERPENTINO E GRANITI

*Factory:*

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**CERTIFICATE NR. 45/08/2003**

**PHYSICAL AND MECHANICAL ANALYSIS OF A ROCK SAMPLE CALLED  
SERPENTINO VERDE VITTORIA COMING FROM THE VALBRUTTA  
QUARRY IN THE TOWN OF LANZADA (SO).**

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The operator:  
(Dr. Paola Marini)

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

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Approved:  
The director  
(Prof. Eng. Sergio Dequal)



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PHYSICAL AND MECHANICAL ANALYSIS OF A ROCK SAMPLE CALLED VERDE VITTORIA SERPENTINE  
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**CERTIFICATE Nr. 45 - SERIES 08 FROM 2003**

**PHYSICAL AND MECHANICAL ANALYSIS OF A ROCK SAMPLE CALLED  
SERPENTINO VERDE VITTORIA COMING FROM THE VALBRUTTA  
QUARRY IN THE TOWN OF LANZADA (SO) - ITALY**

**Requested by:**

Serpentino e Graniti S.r.l., 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 319.

**Supplied samples:**

Our 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:	<i>Serpentino Verde Vittoria</i>
Petrographic name:	<i>Serpentine</i>
Place of origin:	<i>Valbrutta Quarry in the town of Lanzada (SO) - Italy</i>

**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

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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  $\mu\text{m}$

### **Macroscopic description**

The hand specimen appears fine grained and has a dark-green colour. Its texture is minutely schistose under recent fracture.

### **Microscopic description**

In thin section the rock has a felty texture in the serpentine antigorite lamellae, that are always subparallelly arranged each other.

The constituents are:

- antigorite serpentine (80%), made up of crystals whose length varies from 0.2 mm to 0.7 mm and whose width is less than 0.1 mm.
- epidote (15%), made up of isolated crystals in the whole section with allotriomorphic outlines; crystal average dimensions about 0.1 mm.
- opaque minerals (5%) in small dimensions

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

*Tested samples : 6 cubes having 50 mm edge approx.*

Sample identification nr.	Mass of the dry sample (g)	Mass of the saturated sample weighted in air (g)	Water absorption coefficient	
			single values (%)	average value (%)
1	359,03	359,25	0,06	
2	356,94	357,17	0,06	
3	363,45	363,68	0,06	
4	359,95	360,17	0,06	
5	358,37	358,59	0,06	
6	360,76	360,98	0,06	0,06

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

### Test method<sup>1</sup>

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

Sample identification nr.	Distance between supports 1 (mm)	Height h (mm)	Width b (mm)	Breaking load P (kN)	Flexural Strength $\sigma$ (MPa)	
					single values	average value
1	125	25,1	50,9	12,32	71,8	
2	125	26,1	51,1	10,16	54,8	
3	125	24,5	50,6	11,36	70,2	
4	125	24,6	50,6	12,31	75,5	
5	125	25,5	50,3	8,02	45,8	
6	125	25,4	50,6	13,23	76,3	
7	125	25,1	50,7	13,31	78,4	
8	125	24,7	50,8	12,58	76,2	
9	125	24,8	51,6	10,99	64,8	
10	125	25,2	50,2	13,13	77,0	69,1

<sup>1</sup> See picture on the original certificate

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*2) Tested samples: 10 parallelepipeds of approx. 25x50x150mm submitted to  
48 frost/thaw cycles*

Sample identification nr.	Distance between supports 1 (mm)	Height h (mm)	Width b (mm)	Breaking load P (kN)	Flexural Strength $\sigma$ (MPa)	
					single values	average value
11	125	25,4	50,3	10,25	59,1	
12	125	25,3	50,8	12,20	70,3	
13	125	25,2	51,0	12,32	71,3	
14	125	25,2	51,1	9,06	52,3	
15	125	26,1	51,1	10,98	59,3	
16	125	25,8	50,3	9,02	50,6	
17	125	25,3	50,8	13,17	75,8	
18	125	26,2	50,7	9,03	48,6	
19	125	25,4	50,8	13,08	74,8	
20	125	25,2	50,6	12,23	71,3	63,3

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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 nr.	Groove length (mm)	Abrasion resistance (mm) - average value -
1	16,70	
2	18,10	
3	18,30	
4	18,00	
5	18,80	
6	18,70	18,10

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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 identification	USRV	USRV
nr.	- Sample average value -	
1	57	
2	57	
3	63	
4	60	
5	52	
6	69	60

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