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(Art. 46 rate, Part II, DPR N° 642 of  
26.10.72 and amendments thereto)

**DISTART**  
**DEPARTMENT OF STRUCTURAL, TRANSPORTATION,**  
**WATER, SURVEYING AND TERRITORIAL ENGINEERING**  
**EXPERIMENTAL MATERIAL RESISTANCE LABORATORY**

Bologna, September 5, 2005

**CERTIFICATE n° 394/05/1**  
Registration n° 510  
Sept. 7, 2005

Messrs.  
Marmi Scaligera s.a.s.  
Via del Marmo, 543/B  
37020 Verona (VR)

Sardinian White Granite

## **CERTIFICATE**

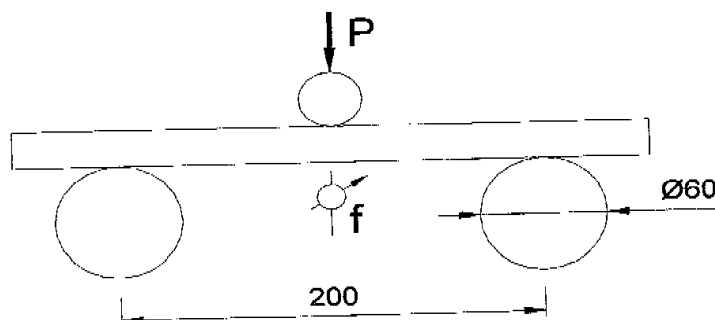
of flexural tests performed on slabs of granite, both standard and reinforced with Betontex RC225 TH12 heat-sealed carbon fiber mesh, supplied by Ardea Progetti e Sistemi of Bologna, as applied for on August 5, 2005.

On August 4, 2005, staff at the Materials Resistance Laboratory performed flexural tests on 15 slabs of granite with nominal dimensions of 20x30 cm. 6 of these were reinforced at their intrados with a layer of "Betontex RC225 TH12" carbon fiber mesh.

All the samples were prepared by the Client.

Test methods were agreed with Sig. Grigoli, representing the client, and Prof. Ing. Credali of Ardea Progetti e Sistemi, both of whom also supervised the tests.

A flexural load was applied to each sample as indicated in the static diagram shown in Figure 1. The upper blade and one of the two support blades were articulated.



Nominal measurements in mm

Figure 1

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LABORATORY – VIA TERRACINI, 34 – 40136 BOLOGNA – ITALY – TEL. 051 2090500 – FAX 051 2090503 – LaRM@mail.ing.unibo.it

The load was applied at the speed defined in point 9 of ASTM C120-05.

For samples 1 through 12, monotonic loading was applied until failure. For samples 13 through 15, increasing load/unload cycles were performed up to 10 daN. As regards sample 14, in particular, when 350 daN was reached, the load was totally removed and an inspection was made of the extrados surface which showed no appreciable signs of damage.

During each test, load "P" and deflection "f" were recorded, the latter measured as the displacement of the heads of the test machine.

Figures 2 through 8 show the load-deflection diagrams obtained. Each curve is identified by the number of the sample it refers to.

In the diagrams of the samples subject to loads in excess of 80 daN during testing, an almost horizontal section is present due to the settling of the upper head of the test machine.

During testing of the reinforced slabs, deflection clearance was progressively reduced to approximately 18 cm due to the high deflection and the diameter of the support blades.

Table 1 presents the experimental test results. Width and length were evaluated as the average of three readings obtained with a double decimeter; thickness is the average of two measurements made in the midline section using a 1/20 gauge. For the reinforced samples, the thickness measurement is the gross thickness with the carbon fiber mesh. "f" measures deflection at maximum load.

Table 1

No.	initials	dimensions			P	f	Notes
		width	length	thickness			
		mm	mm	mm	daN	mm	
1	6 TQ - 1	200	301	6.4	29.1	0.99	
2	6 TQ - 2	199	301	6.0	25.9	1.27	
3	6 TQ - 3	198	300	6.2	29.3	0.82	
4	20 TQ - 1	201	302	21.7	376.9	0.79	
5	20 TQ - 2	203	299	21.8	359.8	0.74	
6	20 TQ - 3	202	298	21.6	382.9	0.87	
7	30 TQ - 1	202	299	32.2	860.7	0.83	
8	30 TQ - 2	202	302	32.2	842.1	0.77	
9	30 TQ - 3	202	302	32.2	817.8	0.83	
10	6 R - 1	201	301	5.6	412.4	12.02	①
11	6 R - 2	199	301	5.9	426.2	11.71	②
12	6 R - 3	200	300	5.7	436.7	12.64	①
13	6 R - 4	200	300	5.1	347.1	12.70	②
14	6 R - 5	201	300	5.7	428.2	12.25	②
15	6 R - 6	201	300	5.2	364.1	13.09	②

Notes: ① Compressive strength of the marble and tensile strength of the carbon fiber mesh.

② Compressive strength of the marble and tensile strength of some carbon wires.



Flexural test  
Samples 6 TQ

Prova a flessione  
Campioni 6 TQ

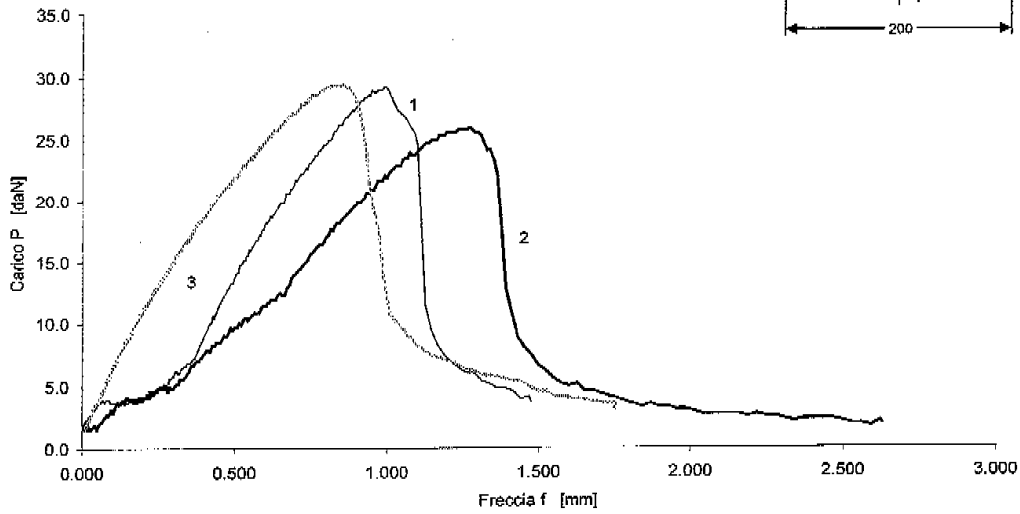
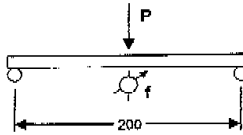


Figure 2

Flexural test  
Samples 20 TQ

Prova a flessione  
Campioni 20 TQ

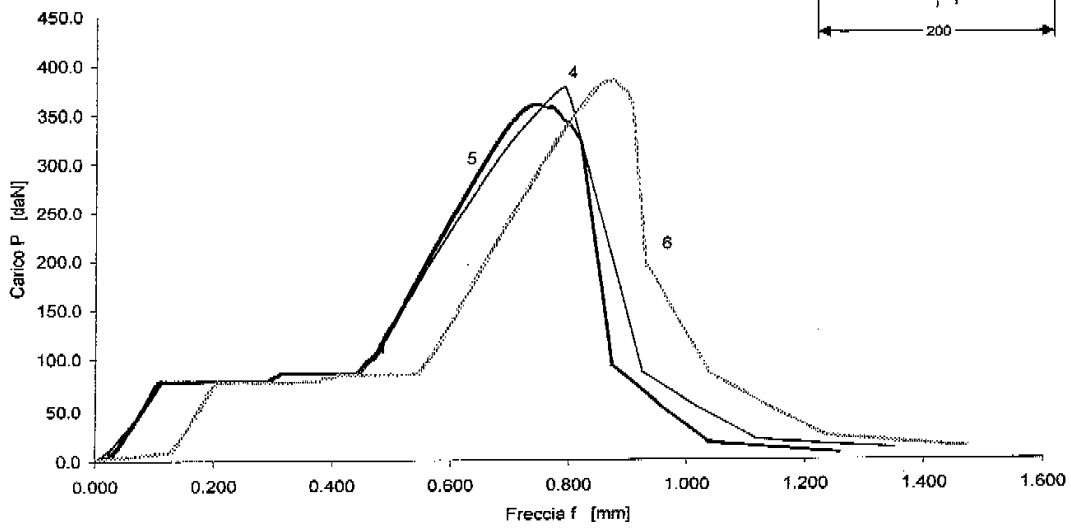
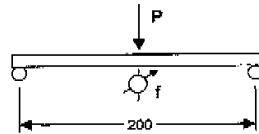


Figure 3



Flexural test  
Samples 30 TQ

Prova a flessione  
Campioni 30 TQ

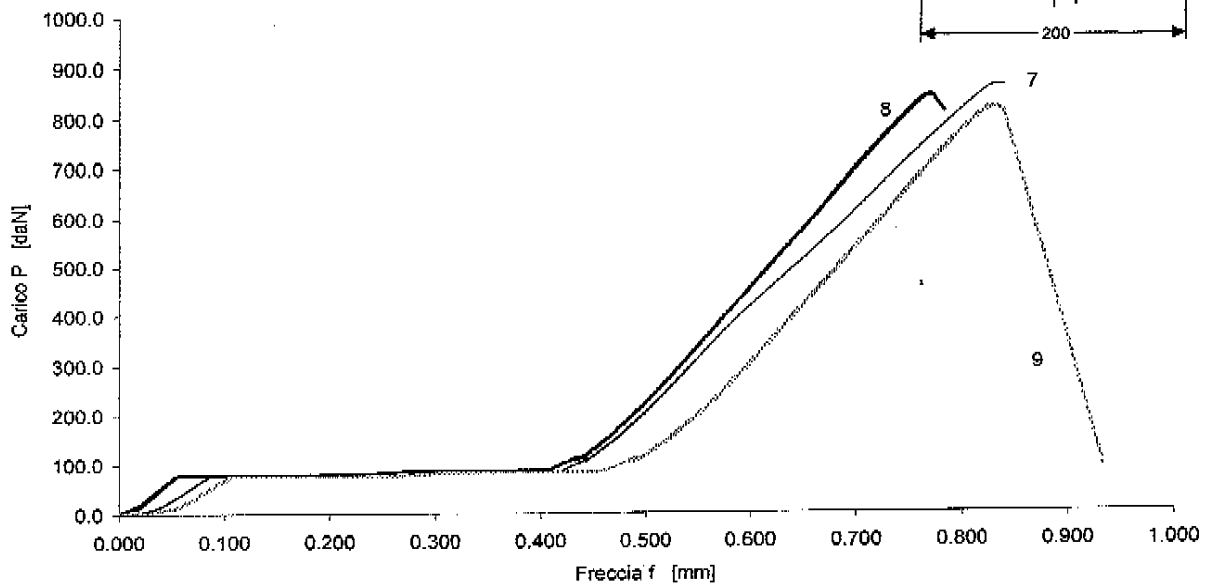
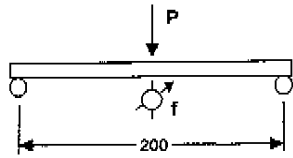


Figure 4

Flexural test  
Samples 6 R

Prova a flessione  
Campioni 6 R

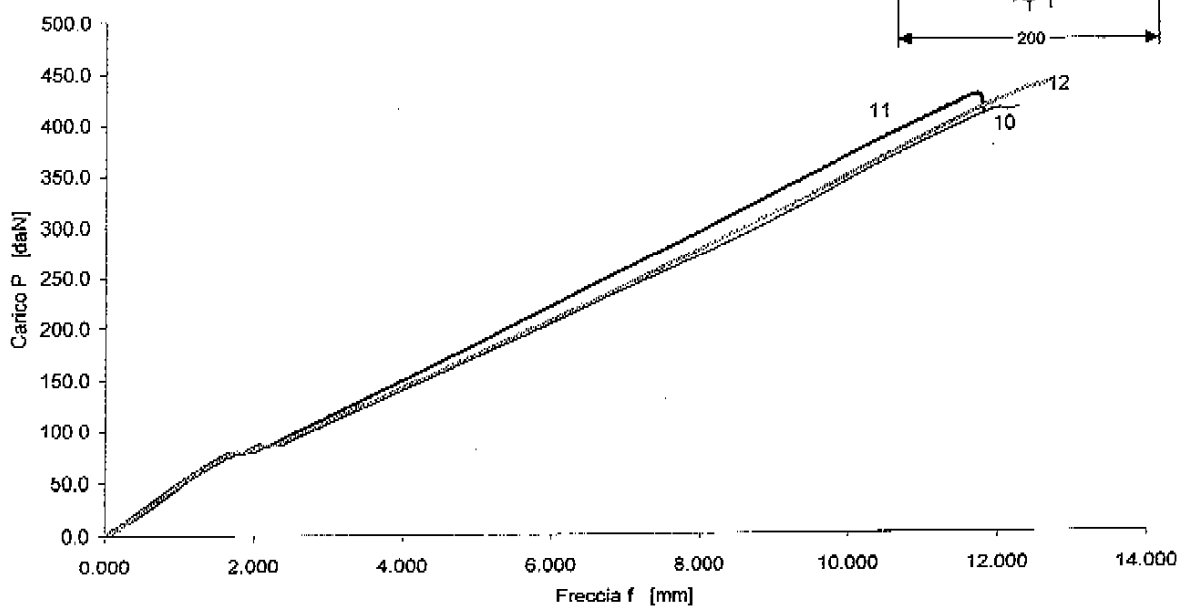
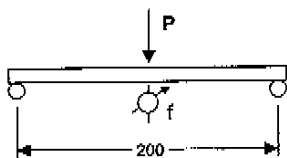


Figure 5



Flexural test  
Sample 6 R

Prova a flessione  
Campione 6 R

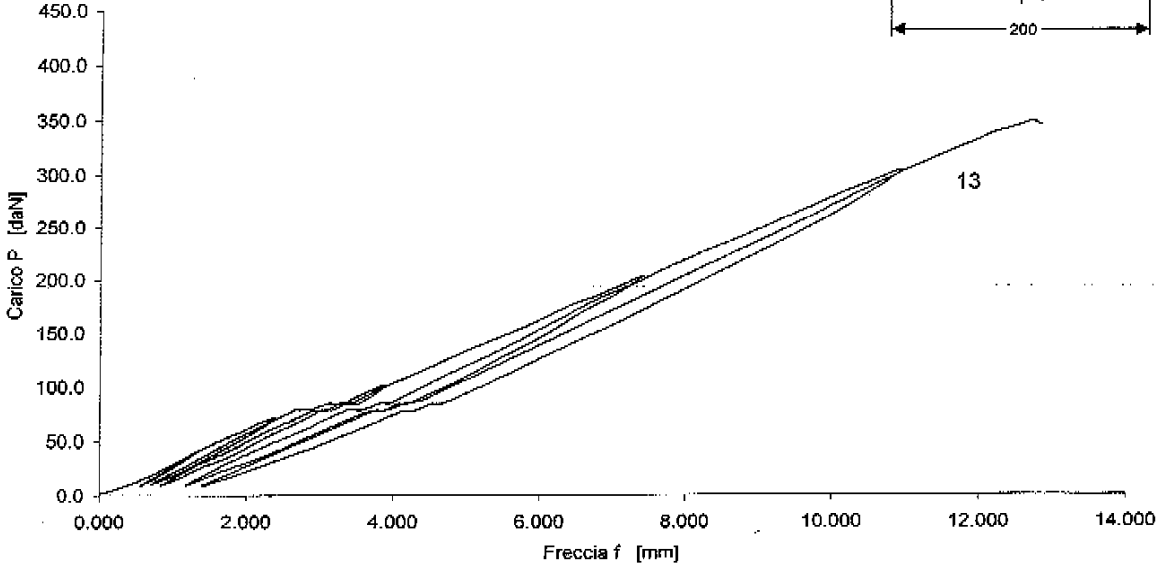
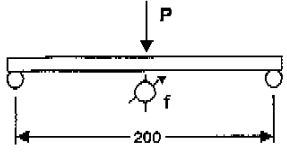


Figure 6

Flexural test  
Sample 6 R

Prova a flessione  
Campione 6 R

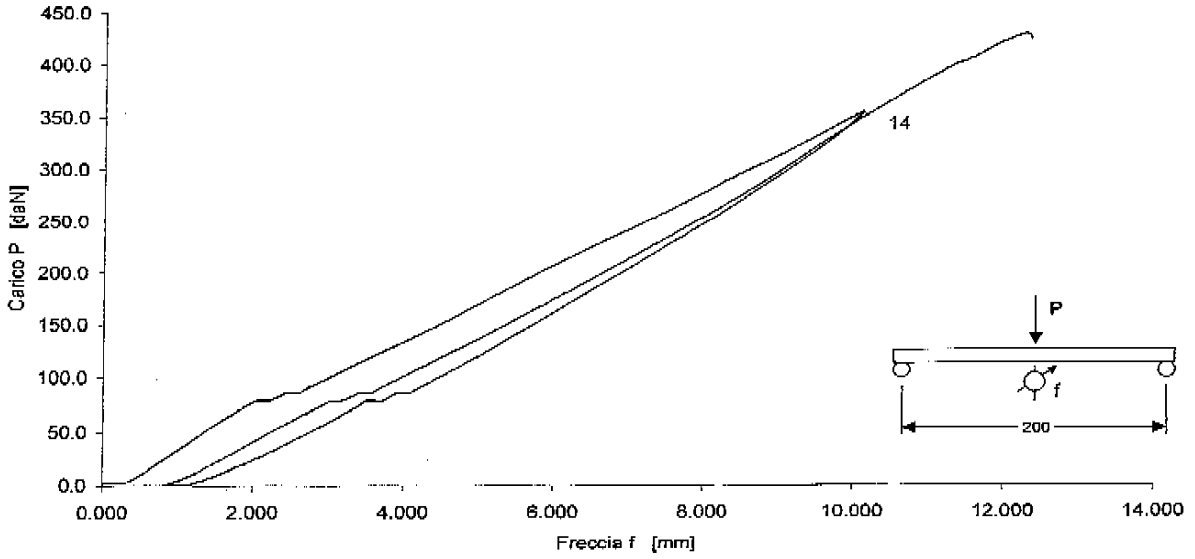
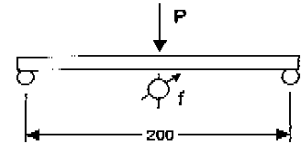


Figure 7

Flexural test  
Sample 6 R

Prova a flessione  
Campione 6 R

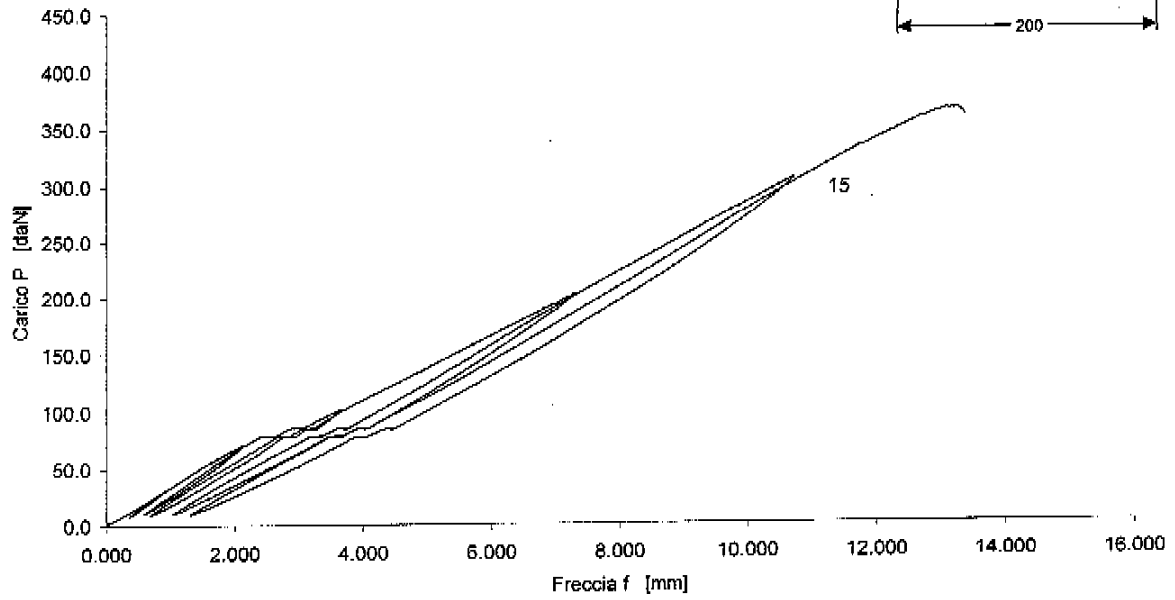
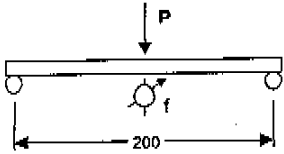


Figure 8

Investigator  
P.I. Roberto Carli

Laboratory Coordinator  
Prof. Ing. Giovanni Pascale

Departmental Director  
Prof. Ing. Pier Paolo Diotallevi



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DISTART  
DEPARTMENT OF STRUCTURAL, TRANSPORTATION,  
WATER, SURVEYING AND TERRITORIAL ENGINEERING  
EXPERIMENTAL MATERIAL RESISTANCE LABORATORY

Bologna, October 4, 2005

**CERTIFICATE n° 395/05/1**

Registration n° 647

Oct. 26, 2005

Messrs.  
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37020 Verona (VR)

Sardinian White Granite

## CERTIFICATE

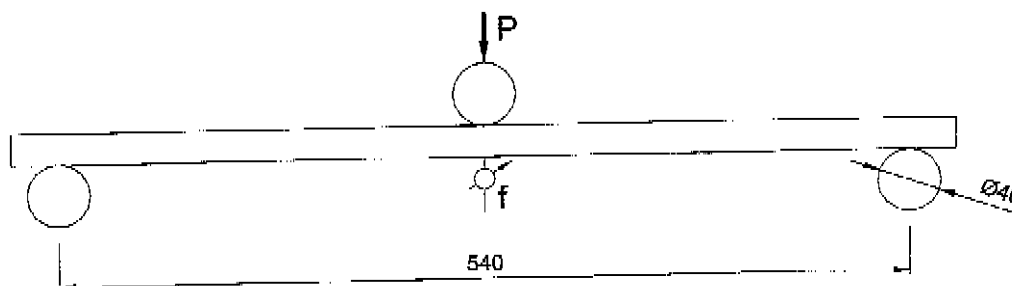
of flexural test performed on slabs of granite, reinforced with Betontex RC225 TH12 heat-sealed carbon fiber mesh, supplied by Ardea Progetti e Sistemi of Bologna, as applied for on August 5, 2005.

On October 4, 2005, staff at the Materials Resistance Laboratory performed flexural tests on 3 slabs of granite with nominal dimensions of 10x60 cm, reinforced at their intrados with a layer of “Betontex RC225 TH12” carbon fiber mesh.

All the samples were prepared by the Client.

Test methods were agreed with Sig. Grigoli, representing the client, and Prof. Ing. Credali of Ardea Progetti e Sistemi, both of whom also supervised the tests.

A flexural load was applied to each sample as indicated in the static diagram shown in Figure 1.



Nominal measurements in mm

Figure 1

Increasing monotonic loading was applied until failure at the speed defined in point 9 of ASTM C120-05.

During each test, load “P” and deflection “f” were recorded, the latter measured as the displacement of the heads of the test machine.

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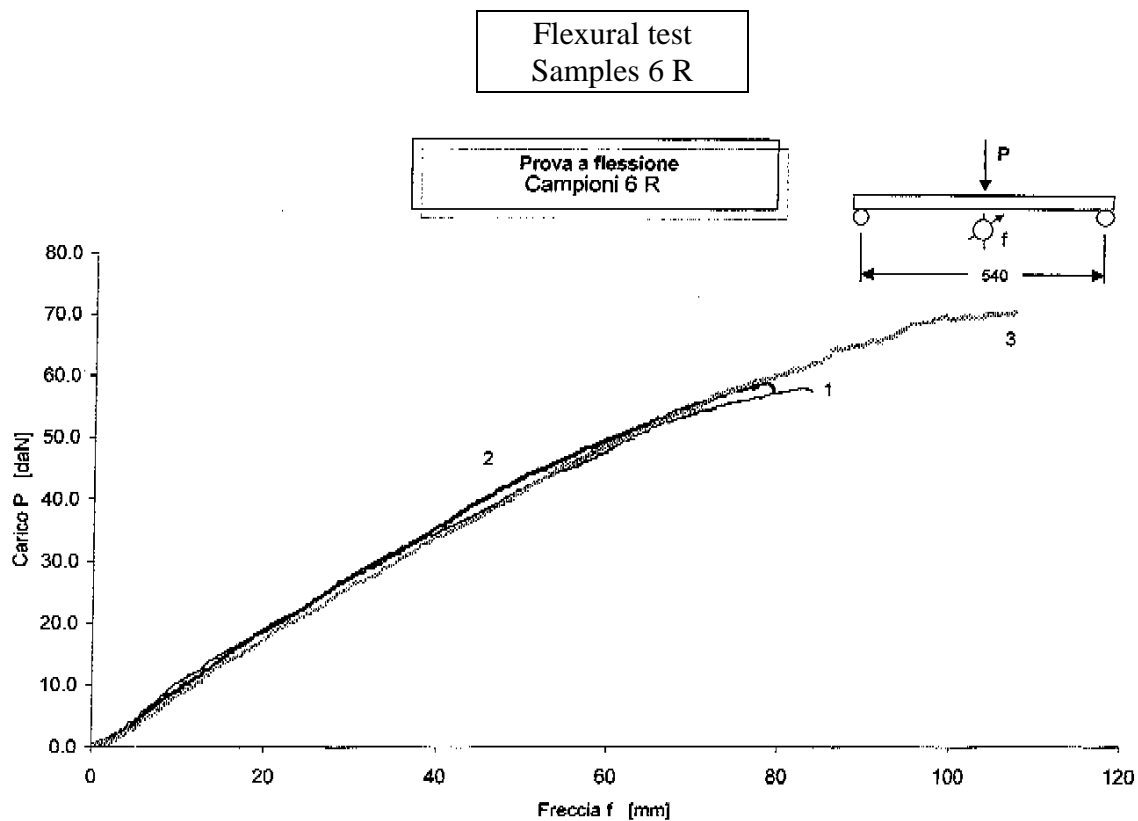
Figure 2 shows the load-deflection diagrams obtained. Each curve is identified by the number of the sample it refers to.

Table 1 presents the experimental test results. Width and length were evaluated as the average of three readings obtained with a double decimeter. The thickness is the gross thickness with the carbon fiber mesh. “f” measures the deflection at maximum load.

Table 1

No.	initials	dimensions			P	f	Notes
		width	length	thickness			
		mm	mm	mm	daN	mm	
1	6 R - 1	100	602	5.7	58.2	82.0	①
2	6 R - 2	102	603	5.5	59.0	77.6	①
15	6 R - 3	101	607	5.6	70.6	107.2	②

Notes: ① Compressive strength of the marble and tensile strength of the carbon fiber mesh.  
 ② Compressive strength of the marble and tensile strength of some carbon wires.



Investigator  
P.I. Roberto Carli

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Departmental Director  
Prof. Ing. Pier Paolo Diotallevi



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**DISTART**  
**DEPARTMENT OF STRUCTURAL, TRANSPORTATION,**  
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**EXPERIMENTAL MATERIAL RESISTANCE LABORATORY**

Bologna, May 17, 2006

**CERTIFICATE n° 219/06/1**

Registration n° 260

May 29, 2006

Messrs.  
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**CERTIFICATE**

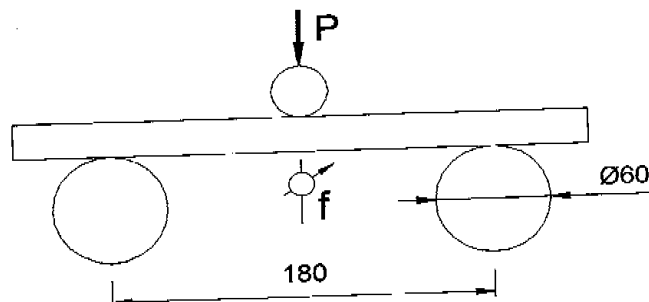
of flexural tests performed on slabs of granite, reinforced with Betontex RC225TH12 heat-sealed carbon fiber mesh and with Betontex RV320TH12 heat-sealed glass fiber mesh, as applied for on May 2, 2006.

On May 17, 2006, staff at the Materials Resistance Laboratory performed flexural tests on 9 slabs of granite with nominal dimensions of 20x20 cm. 3 of these were reinforced at the intrados with a layer of “Betontex RC225TH12” carbon fiber mesh (hereinafter known as “10 RC”), 3 were reinforced with a layer of “Betontex RV320TH12” heat-sealed glass fiber mesh (hereinafter known as “10 RV”) and 3 were not reinforced at all (hereinafter known as “10 TQ”).

All the samples were prepared by the Client.

Test methods were agreed with Prof. Ing. Credali of Ardea Progetti e Sistemi who also supervised the tests.

A flexural load was applied to each sample as indicated in the static diagram shown in Figure 1. The upper blade and one of the two support blades were articulated.



Nominal measurements in mm

Figure 1

ALMA MATER STUDIORUM – UNIVERSITY OF BOLOGNA

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The load was applied at the speed defined in point 9 of ASTM C120-05.

During each test, load “P” and deflection “f” were recorded.

Figures 2 through 4 show the load-deflection diagrams obtained. Each curve is identified by the number of the sample it refers to.

Table 1 presents the experimental test results. Width and length were evaluated as the average of three readings obtained with a double decimeter, thickness is the average of two measurements made in the midline section using a 1/20 gauge. For the reinforced samples, the thickness measurement is the gross thickness with the reinforcing mesh. “f” measures deflection at maximum load.

For sample 4, marked “10 RV – 1”, when a deflection of approximately 2.3 mm was reached, the load was totally removed. During the subsequent loading phase, the sample was accidentally damaged. The table reports the loads and deflections for the initial phase of the test.

As requested, the source data for the diagrams was provided by Prof. Ing. Credali of Ardea Progetti e Sistemi.

Table 1

No.	initials	dimensions			P daN	f mm
		width mm	length mm	thickness mm		
1	10 TQ – 1	200	200	12.23	158.9	0.35
2	10 TQ – 2	201	200	12.11	163.2	0.37
3	10 TQ – 3	200	200	12.15	162.0	0.38
4	10 RV – 1	200	200	12.59	421.7	2.30
5	10 RV – 2	200	200	12.67	729.5	5.35
6	10 RV – 3	200	200	12.54	651.8	5.10
7	10 RC – 1	200	200	12.62	1126.3	4.23
8	10 RC – 2	200	201	12.74	1149.8	4.01
9	10 RC – 3	200	201	12.40	1231.6	4.61



Flexural test  
Samples 10 TQ

Prova a flessione  
Campioni 10 TQ

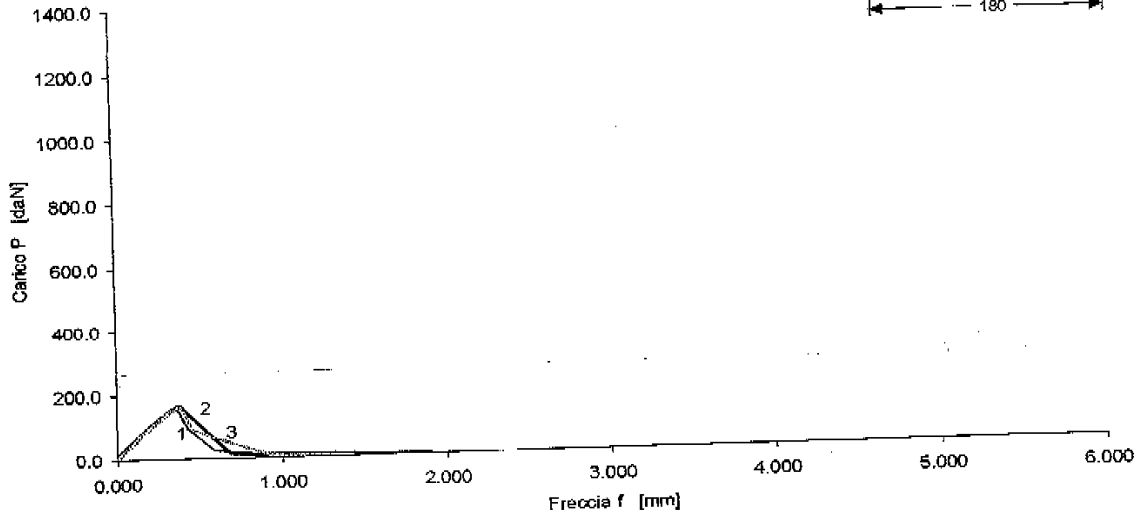
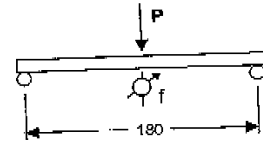


Figure 2  
Flexural test  
Samples 10 RV

Prova a flessione  
Campioni 10 RV

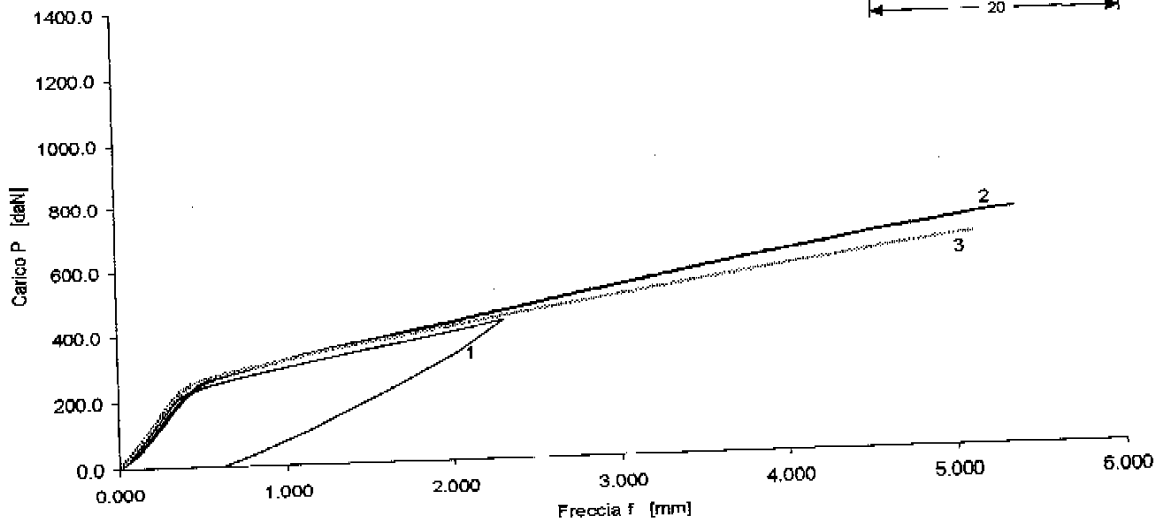
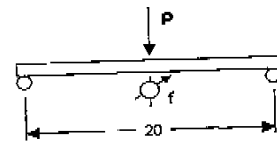


Figure 3

Flexural test  
Samples 10 RC

Prova a flessione  
Campioni 10 RC

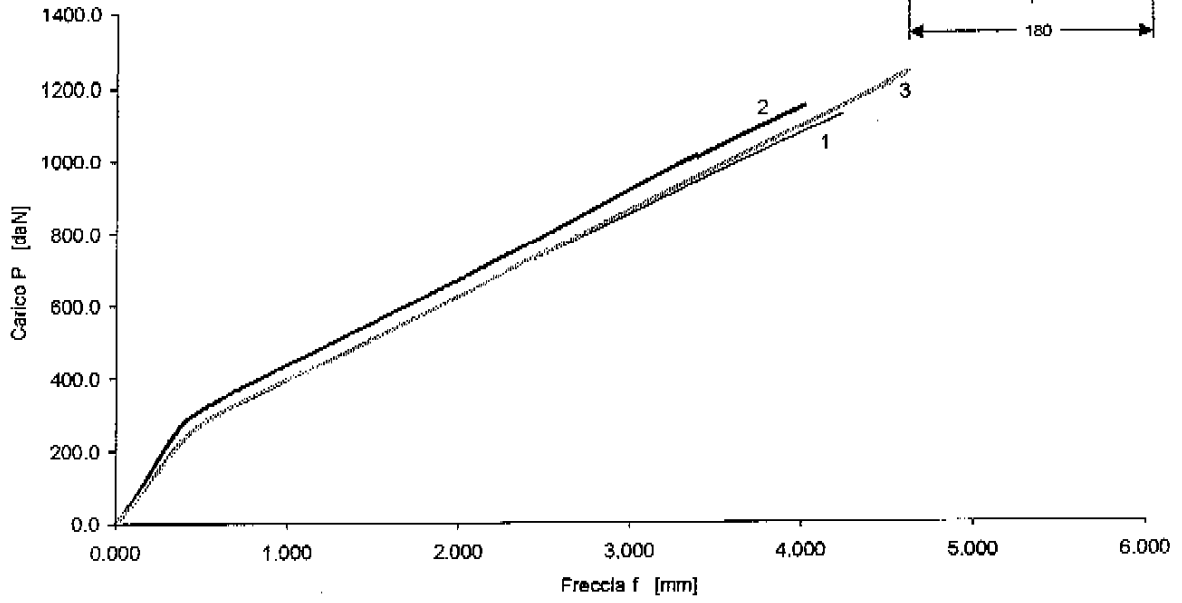
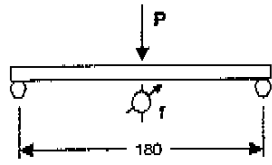


Figure 4

Investigator  
P.I. Roberto Carli

Laboratory Coordinator  
Prof. Ing. Giovanni Pascale

Departmental Director  
Prof. Ing. Pier Paolo Diotallevi



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**DISTART**  
**DEPARTMENT OF STRUCTURAL, TRANSPORTATION,**  
**WATER, SURVEYING AND TERRITORIAL ENGINEERING**  
**EXPERIMENTAL MATERIAL RESISTANCE LABORATORY**

Bologna, July 3, 2006

**Attachment to CERTIFICATE n° 219/06/1**

Registration n° 354

July 6, 2006

Messrs.  
Marmi Scaligera s.a.s.  
Via del Marmo, 543/B  
37020 Verona (VR)

**SUPPLEMENT TO CERTIFICATE**

Pursuant to our certificate n° 219/06/1 dated May 17, 2006 regarding “flexural tests on slabs of granite, reinforced with Betontex RC225TH12 heat-sealed carbon fiber mesh and with Betontex RV320TH12 heat-sealed glass fiber mesh”, we hereby declare that the Client has informed us that the material in the slabs is “Silver White granite”.

This supplement is an integral part of certificate n° 219/06/1 dated May 17, 2006.

Investigator  
P.I. Roberto Carli

Laboratory Coordinator  
Prof. Ing. Giovanni Pascale