



Test Report n° 0412/11 of the 28th September 2011

Client:	TENAX USA Viale, 6 36030 Mo (Vicenza)		
Commercial name:	GRANTO BIANCO		
Specimen provenance:	not specified		
Date of delivery:	03/08/2011	Specimen entrance number:	704; 705; 706; 707; 708; 709; 710

Date of thin section sending:	--	Date of testing:	20/07/2011
Number of samples:	28	Shape:	180x60x30 mm
Test performer:	dott. Anna Maria Ferrari		
Instrument:	Stereomicroscope Olympus SZX-FOF 4J02049		

This Test Report refers only to the tested sample; no liability about sampling accuracy can be accepted.
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1. Introduction

On the 3rd of August 2011 there have been delivered to GeoLab, 28 granitic samples.

Samples were so delivered and numbered:

sample n° 704 A B C D;

sample n° 705 A B C D;

sample n° 706 A B C D;

sample n° 707 A B C D;

sample n° 708 A B C D;

sample n° 709 A B C D;

sample n° 710 A B C D;

2. Required request

To improve the characteristics of a granitic material flexion resistance, it has been asked to the laboratory to evaluate the possibility to reinforce it using a rod glued into the samples.

Three different kind of rods fastened with three different kind of resins were tested.

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(responsabile GeoLab)



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The question carried out to the laboratory is:

1- which rod is better and which kind of binding is to prefer?

3. Analytic Methods used for the investigation

The investigation program to answer the question foresees a macroscopic study of the material, the choose of three different rods and of three gluing systems.

All the 28 samples were partially cutted just to create a mark down for the supporting rod.

After gluing the supporting bars and after resins consolidation, flexural tests according UNI EN 12372:2007 were performed to evaluate the stronger system.



1

Photo 1: a sample with a mark down where to glue the supporting rod.

2

Photo 2: samples with rods glued in the marks down.

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4. Synthesis of the analytic results and answers to the required question.

4.1 – The materials

4.1 a - WHITE GRANITE



Photo3: the white granite tested, stereomicroscope 7m.

Macroscopic description

It is a white light greyish holocrystalline material composed by quartz, feldspars and black minerals mainly biotites and maybe amphiboles too. It is compact, homogeneous and it looks like unaltered. It does not reacts with hydrochloric acid and can't be scratched by a metallic point. It is likely a granite.

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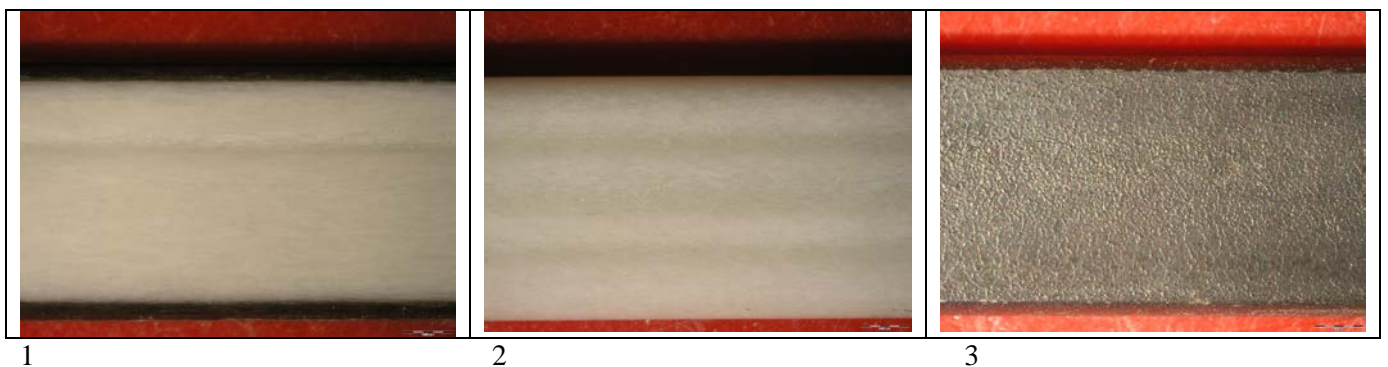


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4.1 b - SUPPORTING RODS

Three different kind of rods were used:



1 Fiberglass profile WEHA 8160061

2 Fiberglass wavy profile [®]Pat SMC013

3 Iron rod

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4.1 c - STRENGTHENING SYSTEMS

Three different kind of glues were used to incorporate the rods into the mark down of the samples, to evaluate which coupling of products would be better :

Epoxy strong edge: Epoxy glue with honey like viscosity. It is suggested to glue and laminate marble, granite and agglomerate. It is also used to glue fix bolts, anchors and similar metal items on natural stone and to mend natural stone. It has a medium pot life which enable its use even in hot weather conditions. STRONG EDGE is considered to have an excellent adhesion on all natural stone and good adhesion on metals, and good reactivity on low temperature. STRONG EDGE could be coloured and is for indoor and outdoor application. See Annex 1 for Technical Data Sheet

Fluido trasparente: Transparent liquid glue used to glue and repair in horizontal marbles and similar stones. The hardened product looks shiny and is very polishable. Good the reactivity at low temperature. Adhesion force and mechanical properties are the most important qualities. See Annex 2 for Technical Data Sheet

Liquido paglierino: Liquid glue with low viscosity suitable to glue and to fix marbles, onix and stone in horizontal. The glue can be used to fill holes too. The hard product is well polishable and grindable. The reactivity is very good in cold condition too. The product has low shrinkage, good adhesion in many stones. See Annex 3 for Technical Data Sheet

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4. 2 - Samples

The 28 white granite samples were afterwards so organized and tested:

sample	rod	glue	Test
701 A	WEHA 8160061	Epoxy Strong Edge	stored
701 B	WEHA 8160061	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
701 C	WEHA 8160061	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
701 D	WEHA 8160061	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
702 A	WEHA 8160061	Fluido Trasparente	stored
702 B	WEHA 8160061	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
702 C	WEHA 8160061	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
702 D	WEHA 8160061	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
703 A	WEHA 8160061	Liquido Paglierino	stored
703 B	WEHA 8160061	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
703 C	WEHA 8160061	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
703 D	WEHA 8160061	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght

sample	rod	glue	Test
704 A natural stone	none	none	stored
704 B natural stone	none	none	UNI EN 12372:2007 Flexural strenght
704 C natural stone	none	none	UNI EN 12372:2007 Flexural strenght
704 D natural stone	none	none	UNI EN 12372:2007 Flexural strenght

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sample	rod	glue	Test
705 A	Iron rod	Epoxy Strong Edge	stored
705 B	Iron rod	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
705 C	Iron rod	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
705 D	Iron rod	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
706 A	Iron rod	Fluido Trasparente	stored
706 B	Iron rod	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
706 C	Iron rod	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
706 D	Iron rod	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
707 A	Iron rod	Liquido Paglierino	stored
707 B	Iron rod	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
707 C	Iron rod	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
707 D	Iron rod	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght

sample	rod	glue	Test
708 A	wavy profile ®Pat SMC013	Epoxy Strong Edge	stored
708 B	wavy profile ®Pat SMC013	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
708 C	wavy profile ®Pat SMC013	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
708 D	wavy profile ®Pat SMC013	Epoxy Strong Edge	UNI EN 12372:2007 Flexural strenght
709 A	wavy profile ®Pat SMC013	Fluido Trasparente	stored
709 B	wavy profile ®Pat SMC013	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
709 C	wavy profile ®Pat SMC013	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
709 D	wavy profile ®Pat SMC013	Fluido Trasparente	UNI EN 12372:2007 Flexural strenght
710 A	wavy profile ®Pat SMC013	Liquido Paglierino	stored
710 B	wavy profile ®Pat SMC013	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
710 C	wavy profile ®Pat SMC013	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght
710 D	wavy profile ®Pat SMC013	Liquido Paglierino	UNI EN 12372:2007 Flexural strenght

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4.3 - TESTS

Each A,B,C sample was tested on the 20th of July keeping track of European standard UNI EN 12372:2007 after drying.

The following tables report the flexural strength obtained from each sample and their pertinent photographic documentation

Natural stone: no rod, no glue:		
sample n°	Breaking load F (N)	Flexural strength R_{ff} (MPa)
704B	3,159	11.7
704C	3,163	11.9
704D	3,249	12.1
Flexural strength average value (MPa)		11.9



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WEHA 8160061 Fiberglass rod ; Epoxy Strong Edge

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
701B	8,417	31.2
701C	7,780	28.9
701D	8,072	30.2
Flexural strength average value (MPa)		30.1



WEHA 8160061 Fiberglass rod ; Fluido Trasparente

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
702B	3,821	14.3
702C	3,743	14.3
702D	3,905	14.7
Flexural strength average value (MPa)		14.4



WEHA 8160061 Fiberglass rod ; Liquido

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
703B	4,090	15.2
703C	3,784	14.5
703D	4,127	15.4
Flexural strength average value (MPa)		15.0





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Iron rod ; Epoxy Strong Edge

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
705B	6,970	26.2
705C	6,687	24.9
705D	6,448	24.3
Flexural strength average value (MPa)		25.1



Iron rod; Fluido Trasparente

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
706B	4,594	17.2
706C	5,112	19.3
706D	4,374	16.5
Flexural strength average value (MPa)		17.7



Iron rod; Liquido Paglierino

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
707B	4,751	17.8
707C	5,233	19.8
707D	4,618	17.5
Flexural strength average value (MPa)		18.4





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Fiberglass wavy profile [®]Pat SMC013 ; Epoxy Strong Edge

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
708B	3,998	15.0
708C	3,804	14.4
708D	3,578	13.4
Flexural strength average value (MPa)		14.3



Fiberglass wavy profile [®]Pat SMC013; Fluido Trasparente

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
709B	3,534	13.3
709C	3,574	13.5
709D	3,828	14.3
Flexural strength average value (MPa)		13.7



Fiberglass wavy profile [®]Pat SMC013; I

sample n°	Breaking load F (N)	Flexural strength R _{ff} (MPa)
710B	3,852	14.3
710C	3,657	13.8
710D	3,749	14.1
Flexural strength average value (MPa)		14.1





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5. Conclusions

Sample / Glue	701	702	703	705	706	707	708	709	710	704 Natural stone
Epoxy stone edge	30.1			25.1			14.3			11.9
Fluidico trasparente		14.4			17.7			13.7		
Liquido paglierino			15.0			18.4			14.1	

Sample / Rod	701	702	703	705	706	707	708	709	710	704 Natural stone
WEHA fiberglass	30.1	14.4	15							11.9
Iron rod				25.1	17.7	18.4				
profile ® Pat SMC013							14.3	13.7	14.1	

Summarizing tables: average value of Flexural Strength in MPa. Most important data are shown in bold.

Samples 704 (B,C,D) refer to the granitic material and their flexural strength is the value of the magmatic material. All the three samples are broken and disjointed after the test.

All the other samples, on the other hand, give the flexural strength value influenced by the internal rod support and by the glue typology used to bind the support into the marks down.

Almost all the samples are not disjointed after the execution of the tests except for samples 701B and 706B which get fractured physically but after reaching up to several centimetric deformation.

For all the samples the average value of the flexural strength is improved.

According to the different kind of supports and glues, we can see that the best values are reached by supporting the rock with Fiberglass WEHA 8160061 glued with EPOXY STRONG EDGE (701 B; C; D). Indeed the average value of the flexural strength reaches 30 MPa vs 11.9 MPa of the only rock with no support.

The second best value is this of the rock supported by Iron rod and EPOXY STRONG EDGE (705 B; C; D). In this case the average value reaches 25.1 MPa.

All the other values are below 18.4 MPa, but while samples supported with Iron rod glued with Liquido Paglierino (707 B; C; D) reach 18.4 MPa and samples supported with Iron rod glued with Fluidico Trasparente (706 B; C; D), reach 17.7 MPa, all the other values lie below 15.0 MPa.

We are at your disposal for any further information you may need
best regards,

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