

TEST REPORT **No. 867****Commercial name of the material: Calacata****Extraction location : cava Calacata – Comune di Carrara
(MS) Cava No. 10****Client: Guido M. Fabbricotti Fu B. Successori SRL****E.R.I.C.A. SOC. CONS. A R.L.
TECHNOLOGICAL LABORATORY FOR TESTING ON STONE AND
COMPOSITE MATERIALS****PERFORMED TESTS:**

- | | |
|--|------------------|
| 1) Petrographic examination (EN 12407) | Sheet 1-2 |
| 2) Bulk specific gravity (EN 1936) | Table 1 |
| 3) Water absorption at atmospheric pressure (EN 13755) | Table 2 |
| 4) Flexural strength under concentrated load (EN 12372) (conditioning: dry and after freeze/thaw cycles). | Table 3-4 |
| 5) Compressive Strength (EN 1926) (conditioning: dry) | Table 5 |
| 6) Determination of Rupture energy (EN 14158) | Table 6 |

The Test Report No. 867 is composed by No. 36 pages including this one.

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| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | Eng. Mariano Fusco | DATE: September 05 th , 2007 |
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| E.R.I.C.A. Soc. Cons. a r.l. Technological Laboratory A.S.T.M. Member No. 000122808 U.N.I. Member No. 30737 Via Dorsale, 13 - 54100 Massa - Italia Tel. +39 0585 255398 - Fax +39 0585 255598 E-mail: erica@bicnet.it | TEST REPORT No. 867 (RESULTS SUMMARY TABLE) Page 1 of 1 |
|---|---|

By request of *Guido M. Fabbricotti Fu B. Successori SRL* the under listed tests have been performed on specimens of a stone material named by *Guido M. Fabbricotti Fu B. Successori SRL* "Calacata" quarried in "Cava Calacata - Comune di Carrara (MS) Cava No. 10", and the related results have been included within this Test Report. The information concerning the quarry location has been given to this laboratory by *Guido M. Fabbricotti Fu B. Successori SRL*.

The specimens submitted to the tests have been consigned to this laboratory by Eng. Stefano Hoffmann on July 12th, 2007.

The No. 48 Freeze/Thaw cycles have been conducted in accordance with the cycle expressed EN 12371 (Determination of Frost Resistance).

NOTE: the standard deviation and the coefficient of variation of the mechanical tests have been indicated in the tables enclosed to this Test Report.

| Type of Test | European Normative | Unit | Conditioning | Average values |
|--|--------------------|-------------------|-------------------------------|----------------|
| Petrographic examination <i>(Sheet 1-2)</i> | EN 12407 | Marble | | |
| Bulk specific gravity <i>(Table 1)</i> | EN 1936 | Kg/m ³ | - | 2719.70 |
| Water absorption at atmospheric pressure <i>(Table 2)</i> | EN 13755 | % | - | 0.09 |
| Flexural strength under concentrated load <i>(Table 3)</i> | EN 12372 | MPa | Dry | 18.78 |
| Flexural strength under concentrated load <i>(Table 4)</i> | EN 12372 | MPa | After Freeze/Thaw cycles, Dry | 12.74 |
| Compressive strength <i>(Table 5)</i> | EN 1926 | MPa | Dry | 98.93 |
| Determination of rupture energy <i>(Table 6)</i> | EN 14158 | Joule | - | 10.5 |

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| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | Eng. Mariano Fusco | DATE: September 05 th , 2007 |
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| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER NO. 30737 | PETROGRAPHIC EXAMINATION (EN 12407) | Client: Guido M. Fabbriotti Fu B. Successori SRL |
|---|---|---|

COMMERCIAL NAME OF THE ROCK: CALACATA

Three thin sections respectively called 1, 2 e 3 dimensioned 4cm x 3cm, of a rock called by Guido M. Fabbriotti Fu B. Successori SRL “*Calacata*” quarried in “Cava Calacata – Comune di Carrara (MS) Cava No. 10”, have been analysed.

The three sections come from a specimen dimensioned 300 mm x 300 mm x 30 mm, consigned to this laboratory by Guido M. Fabbriotti Fu B. Successori SRL in date July 12th, 2007.

Macroscopic observation

The stone material named “*Calacata*” is a metamorphic, carbonatic rock presenting a widespread colouration *White* (N 9 – Color table Chart of Munsell) with presence of streaks and veins (crossing one to each other according to different angles) characterised by variable shapes and dimensions (with thickness from millimetric to centimetric referring to the analysed specimen) with colouration from *Medium gray* (N 5) to *Light gray* (N 7); some streaks are coloured *Light brownish gray* (5 YR 6/1) and *Light Olive Gray* (5 Y 4/1).

Microscopic observation

Texture

Metamorphic rock with carbonatic composition showing an eteroblastic texture and shapes of the blasts mainly xenoblastic. The dimension of the blasts of calcite varies 0.08 mm to 0.6 mm with average dimension 0.3 mm. The rock shows an iso-oriented texture with the major axis of the calcite blasts directed parallel to the shorter side of thin section No. 2. The blasts have uneven borders, often bent, rarely straight; it can be noted the presence of triple joints. The degree of indentation is medium-high. It can be noted on almost all the blasts of calcite both the polysynthetic twinning and the cleavage traces.

We can observe the presence of streaks/veins (thickness till 0.2 mm) showing a development from rectilinear to “zig-zag” type, in which the calcite shows a dust-like appearance with average dimension of the blasts: 0.02 mm; the veins are characterised by the presence of pyrite (with a higher modal abundance than the one for the whole rock) showing average dimensions 0.01 mm. It can be underlined in the nearing of the veins the presence of a few number of blasts of feldspar and quartz with average dimension 0.12 mm. Rarely some blasts of calcite are surrounded by Fe-oxide/hydroxides (probably limonite), showing brownish colouration.

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| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | Eng. Mariano Fusco | DATE: September 03 rd , 2007 |
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| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER NO. 30737 | PETROGRAPHIC EXAMINATION (EN 12407) | Client: Guido M. Fabbriotti Fu B. Successori SRL |
|---|--|---|

Mineralogical composition

Calcite (Dolomite) 99% ; accessory minerals (1%) : pyrite, quartz (few blasts), white mica (few blasts).

The distinction between calcite and dolomite can be made with a chemical analysis (rays - X diffraction) of the stone material.

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|----------------------------|
| Mineral description |
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Name: calcite

Dimension: from 0.02 mm to 0.6 mm (average dimension 0.3 mm)

Main features: xenoblastic, it shows at parallel Nicols vision the typical cleavage traces. At crossed Nicols vision we can observe both the high birefringence colours and the polysynthetic twinning planes (more evident on the larger blasts). In the coloured “White” areas (see macroscopic observation), calcite shows average dimension 0.3 mm; in the areas of the rock that appear characterised by streaks and veins the blasts of calcite show shorter average dimension: 0.02 mm. It can be underlined the iso – orientation of the blasts, with the major axis directed parallel to the shorter side of thin section No. 2.

Name: pyrite

Dimension: average dimension in the rock: 0.08 mm, with dimension up to 0.3 mm – average dimension inside the veins: 0.01 mm

Main features: xenoblastic (elements characterised by sub-rounded shapes). It is present in isolated blasts randomly distributed in the rock with a relative higher modal abundance inside veins/streaks (here the sulphur has average dimension 0.01 mm without showing significant oxidation phenomena).

Name: quartz e feldspar

Dimension: average dimension 0.12 mm

Main features: in few isolated blasts, limpid, with low birefringence and sub-rounded shapes.

Petrographic classification (Metamorphic Rocks Classification Chart) : MARBLE

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| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | Eng. Mariano Fusco | DATE: September 03 rd , 2007 |
|---|--------------------|--|

Table 1

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Bulk Specific Gravity (EN 1936) | | | Client: Guido M. Fabbricotti Fu B. Successori SRL | | |
|---|--|--|---|------------------------|--|--|-------------------------|
| Test Report No.: 867 Commercial name of the material: Calacata Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 Date of delivery of the specimens: July 12 th , 2007 | | | | | | | |
| Specimen No. | Specimens weight | | | | | Bulk Specific Gravity [kg/m ³] | Specimen dimension (mm) |
| | After conditioning Dry (>48 hrs. / 70°C) | | After conditioning Wet (>48hrs. / 20°C) | | | | |
| | Date | gr. (m _d) | Date | gr (m _s) | gr (m _h) | | |
| 01 | 19/07/07 | 356.79 | 23/07/07 | 357.13 | 226.15 | 2724.00 | 51.1x50.7x50.9 |
| 02 | 19/07/07 | 357.88 | 23/07/07 | 358.20 | 226.75 | 2722.56 | 51.0x50.8x51.0 |
| 03 | 19/07/07 | 358.50 | 23/07/07 | 358.81 | 227.00 | 2719.82 | 50.8x50.9x51.1 |
| 04 | 19/07/07 | 358.96 | 23/07/07 | 359.25 | 227.12 | 2716.72 | 51.1x51.1x50.9 |
| 05 | 19/07/07 | 356.95 | 23/07/07 | 357.23 | 225.90 | 2717.96 | 51.0x50.7x51.2 |
| 06 | 19/07/07 | 356.49 | 23/07/07 | 356.78 | 225.58 | 2717.15 | 51.0x50.8x50.7 |
| Bulk Specific Gravity ρ_b [kg/m³] | | | | Min. 2716.72 | Average 2719.70 | Max. 2724.00 | |

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|---|--------------------|---|
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | Eng. Mariano Fusco | DATE: July 23 rd , 2007 |
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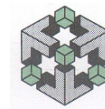
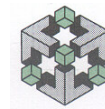


Table 2

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Water absorption at atmospheric pressure (EN 13755) | | | Client: Guido M. Fabbriotti Fu B. Successori SRL | | | | | | | | | | |
|--|--|--|---|-----------------------|---|--|-----------------------------------|--|------|---------|------|---|------|------|------|
| Test Report No.: 867 | | | | | | | | | | | | | | | |
| Commercial name of the material: Calacata | | | | | | | | | | | | | | | |
| Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 | | | | | | | | | | | | | | | |
| Date of delivery of the specimens: July 12 th , 2007 | | | | | | | | | | | | | | | |
| Specimen No. | Specimens weight | | | | | | Specimen dimension (mm) | | | | | | | | |
| | After conditioning Dry (>48 hrs. / 70°C) | | After conditioning Wet (>48 hrs./ 20°C) | | (m _s -m _d) | 100x (m _s -m _d)/m _d | | | | | | | | | |
| | Date | gr. (m _d) | Date | gr. (m _s) | [gr.] | [%] | | | | | | | | | |
| 01 | 19/07/07 | 356.79 | 23/07/07 | 357.13 | 0.34 | 0.10 | 51.1x50.7x50.9 | | | | | | | | |
| 02 | 19/07/07 | 357.88 | 23/07/07 | 358.20 | 0.32 | 0.09 | 51.0x50.8x51.0 | | | | | | | | |
| 03 | 19/07/07 | 358.50 | 23/07/07 | 358.81 | 0.31 | 0.09 | 50.8x50.9x51.1 | | | | | | | | |
| 04 | 19/07/07 | 358.96 | 23/07/07 | 359.25 | 0.29 | 0.08 | 51.1x51.1x50.9 | | | | | | | | |
| 05 | 19/07/07 | 356.95 | 23/07/07 | 357.23 | 0.28 | 0.08 | 51.0x50.7x51.2 | | | | | | | | |
| 06 | 19/07/07 | 356.49 | 23/07/07 | 356.78 | 0.29 | 0.08 | 51.0x50.8x50.7 | | | | | | | | |
| <table style="margin: auto;"> <tr> <td></td> <td>Min.</td> <td style="border: 2px solid black;">Average</td> <td>Max.</td> </tr> <tr> <td>Water absorption A_b. weight (%)</td> <td>0.08</td> <td style="border: 2px solid black;">0.09</td> <td>0.10</td> </tr> </table> | | | | | | | | | Min. | Average | Max. | Water absorption A_b. weight (%) | 0.08 | 0.09 | 0.10 |
| | Min. | Average | Max. | | | | | | | | | | | | |
| Water absorption A_b. weight (%) | 0.08 | 0.09 | 0.10 | | | | | | | | | | | | |
| Maximum expected value A_b. weight (%): 0.10 | | | | | | | | | | | | | | | |
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | | | Eng. Mariano Fusco | | | DATE: July 23 rd , 2007 | | | | | | | | | |

**Table 3**

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Flexural strength under concentrated load (EN 12372) | | | Client: Guido M. Fabbriotti Fu B. Successori SRL | | |
|--|-----------------------------|---|---------------|---------|---|------------------------------|------|
| Test Report No.: 867 | | | | | | | |
| Commercial name of the material: Calacata | | | | | | | |
| Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 | | | | | | | |
| Date of delivery of the specimens: July 12 th , 2007 | | | | | | | |
| Specimen No. | Dimension [mm] a x b x h | Conditioning | Actual values | | | | Note |
| | | Dry >48 hrs./70°C | Fmax [kN] | R [MPa] | R _{md} [MPa] | Strain F _{max} [mm] | |
| 01 D | 180x91.3x29.0 | Dry | 6.05 | 17.72 | 18.78 | 0.132 | * |
| 02 D | 180x91.8x29.3 | Dry | 6.26 | 17.86 | | 0.115 | * |
| 03 D | 180x91.6x29.1 | Dry | 6.40 | 18.55 | | 0.122 | * |
| 04 D | 180x91.6x29.2 | Dry | 7.24 | 20.87 | | 0.130 | * |
| 05 D | 180x91.6x29.3 | Dry | 6.56 | 18.76 | | 0.124 | * |
| 06 D | 180x91.8x29.4 | Dry | 7.27 | 20.60 | | 0.129 | * |
| 07 D | 180x91.1x29.3 | Dry | 6.02 | 17.33 | | 0.120 | * |
| 08 D | 180x91.4x28.8 | Dry | 5.60 | 16.61 | | 0.119 | * |
| 09 D | 180x91.4x29.0 | Dry | 6.24 | 18.25 | | 0.124 | * |
| 10 D | 180x91.3x29.3 | Dry | 7.41 | 21.27 | | 0.134 | * |
| NOTE: 1) Load-application speed = 0.25 MPa/s *= load applied perpendicular to rift Average Flexural strength (Dry), R_{md} = 18.78 MPa Standard deviation (Dry), s_d = 1.60 MPa Coefficient of variation (Dry), v_d = 0.09 Minimum expected value R_d = 15.69 MPa | | | | | | | |
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | | Eng. Mariano Fusco | | | DATE: July 20 th , 2007 | | |

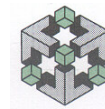


Table 4

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Flexural strength under concentrated load (EN 12372) | | Client: Guido M. Fabbriotti Fu B. Successori SRL | | | |
|---|--------------------------------|--|--------------|---|---------------------------|------------------------------------|-------|
| Test Report No.: 867 | | | | | | | |
| Commercial name of the material: Calacata | | | | | | | |
| Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 | | | | | | | |
| Date of delivery of the specimens: July 12 th , 2007 | | | | | | | |
| Specimen No. | Dimension [mm] a x b x h | Conditioning | Actual value | | | | Note |
| | | | Fmax [kN] | R [MPa] | R _{mgd} [MPa] | Strain F _{max} [mm] | |
| 01 GD | 180x91.4x29.2 | After No. 48 Freeze/ Thaw cycles (according to EN 12371); Dry | 3.97 | 11.46 | | 0.158 | * |
| 02 GD | 180x91.4x29.1 | | 3.80 | 11.04 | | 0.141 | * |
| 03 GD | 180x91.1x29.1 | | 4.73 | 13.80 | | 0.160 | * |
| 04 GD | 180x91.5x29.0 | | 4.42 | 12.91 | | 0.174 | * |
| 05 GD | 180x91.3x29.0 | | 4.45 | 13.04 | 12.74 | 0.160 | * |
| 06 GD | 180x91.2x29.1 | | 3.80 | 11.08 | | 0.133 | * |
| 07 GD | 180x91.1x29.1 | | 5.58 | 16.28 | | 0.155 | * |
| 08 GD | 180x91.2x29.1 | | 4.88 | 14.21 | | 0.160 | * |
| 09 GD | 180x91.4x29.1 | | 3.28 | 9.54 | | 0.145 | * |
| 10 GD | 180x91.4x28.9 | | | 4.77 | | 14.05 | 0.203 |
| | | | | | | | |
| NOTE: 1) Load-application speed = 0.25 MPa/s *= load applied perpendicular to rift | | | | | | | |
| Average Flexural strength (after Freeze/Thaw cycles), R_{mgd} = 12.74 MPa | | | | | | | |
| Standard deviation (after Freeze/Thaw cycles), s_{gd} = 1.98 MPa | | | | | | | |
| Coefficient of variation (after Freeze/Thaw cycles), v_{gd} = 0.16 | | | | | | | |
| Minimum expected value R_{gd} = 9.06 MPa | | | | | | | |
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | | Eng. Mariano Fusco | | DATE: September 03 rd , 2007 | | | |

Table 5

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Compressive strength (EN 1926) | | Client: Guido M. Fabbricotti Fu B. Successori SRL | | | |
|--|-----------------------------|---|---------------|--|----------------------------|-----------------------|------|
| Test Report No.: 867 Commercial name of the material: Calacata Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 Date of delivery of the specimens: July 12 th , 2007 | | | | | | | |
| Specimen No. | Dimension [mm] a x b x h | Conditioning | Actual values | | | | Note |
| | | Dry >48hrs/70°C | Fmax [kN] | R [MPa] | R _{md} Avg. [MPa] | S _{max} [mm] | |
| 01 D | 50.8x51.2x51.1 | Dry | 277.8 | 106.8 | | 0.619 | * |
| 02 D | 50.9x51.3x51.1 | Dry | 253.0 | 96.89 | | 0.612 | * |
| 03 D | 50.8x51.0x51.0 | Dry | 258.5 | 99.78 | 98.93 | 0.478 | * |
| 04 D | 50.9x51.1x51.0 | Dry | 255.6 | 98.27 | | 0.691 | * |
| 05 D | 51.2x51.0x50.8 | Dry | 258.5 | 99.00 | | 0.626 | * |
| 06 D | 51.2x50.8x51.0 | Dry | 241.5 | 92.85 | | 0.628 | * |
| NOTE: * = load-applying direction perpendicular to rift <p style="text-align: center;"> Average Compressive strength (Dry) R_{md} = 98.93 MPa Standard deviation (Dry), s_d = 4.57 MPa Coefficient of variation (Dry), v_d = 0.05 Minimum expected value R_d = 88.83 MPa </p> | | | | | | | |
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | | Eng. Mariano Fusco | | DATE: July 27 th , 2007 | | | |

Table 6

| E.R.I.C.A. Soc. Cons. a r.l. TECHNOLOGICAL LABORATORY FOR TESTS ON STONES AND COMPOSITE MATERIALS A.S.T.M. MEMBER No. 000122808 U.N.I. MEMBER No. 30737 | | Determination of Rupture energy (EN 14158) | | Client: Guido M. Fabbriotti Fu B. Successori SRL |
|---|-----------------------------|---|----------------------------|---|
| Test Report No.: 867 Commercial name of the material: Calacata Extraction location: Cava Calacata – Comune di Carrara (MS) Cava No. 10 Date of delivery of the specimens: July 12 th , 2007 | | | | |
| Specimen No. | Dimension (mm) a x b x h | Rupture height "h" (m) | Rupture energy "W" (joule) | COMMENTS |
| 01 | 300x300x30 | 1.00 | 9.8 | Specimen broken in two parts |
| 02 | 300x300x30 | 0.90 | 8.8 | Specimen broken in two parts |
| 03 | 300x300x30 | 1.40 | 13.7 | Specimen broken in two parts |
| 04 | 300x300x30 | 1.15 | 11.3 | Specimen broken in two parts |
| 05 | 300x300x30 | 0.90 | 8.8 | Specimen broken in two parts |
| Average Rupture energy (W) = 10.5 joule NOTE: the mass (m) of the iron spherical ball impacting the specimen surface is of 1000 g. | | | | |
| Technological Laboratory Dr. Marco Mazzoni Dr. Simone Salvetti | | Eng. Mariano Fusco | | DATE: September 04 th , 2007 |