

Bellaterra: On June 10, 2021
Dossier No: 21-32302040-1
Petitioner reference: Pulycort Natural Stone SL
NIF: B03021946
Ctra. Novelda-La Romana km 8
03669 La Romana (Alicante)

TEST REPORT

Record N°: 21474

MATERIAL RECEIVED:

On April 28, 2021, a sample of NATURAL STONE was received at LGAI - Applus+ Laboratorie, with the following references according to the Petitioner:

NATURAL STONE

Reference: Regimental Grey

TESTS REQUESTED:

- Determination of the abrasion resistance. Wide disc method (method A). UNE-EN 14157:2018
- Determination of water absorption at atmospheric pressure. UNE-EN 13755:2008
- Determination of the slip resistance by means of pendulum tester (wet conditions). UNE-EN 14231:2004
- Determination of flexural strength under concentrated load. UNE-EN 12372:2007
- Determination of rupture energy (impact). UNE-EN 14158:2004
- Determination of apparent density and apparent porosity. UNE-EN 1936:2007
- Petrographic description. UNE-EN 12407:2020
- Determination of uniaxial compressive strength. UNE-EN 1926:2007
- Determination of frost resistance (Technological test). UNE-EN 12371:2011
- Determination of resistance to ageing by thermal shock. UNE-EN 14066:2014
- Determination of the breaking load at dowel hole. UNE-EN 13364:2002

DATE OF TESTS: from 29.04.2021 to 10.06.2021.

RESULTS: Please refer to attached pages.



Firmado digitalmente por
JUAN MARTINEZ EGEA

Responsible for Construction Materials
LGAI Technological Center S.A.



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The results specified in the present document correspond exclusively to the material received by Applus which was tested in accordance with the instructions shown. The present document is a translation of the report nº21/32302040. In case of dispute, the valid is the spanish version.

Statement Responsible LGAI Technological Center, SA, Registration No. L0600161, the RD410/2010, D.257/2003 and Law 25/2009. Query: <http://www.gencat.cat>

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Page 1 - The present document consist of 15 pages of which 0 are attachments.

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

RESULTS:

Determination of uniaxial compressive strength. UNE-EN 1926:2007.

Test tubes measuring approximately 50 x 50 x 50 mm were received cut, and they were tested without any other type of superficial finish.

The tests tubes were dried until they achieved a constant mass in a convection oven at a temperature of 70±5°C. Next, they were stored in a dessicator until they reached the lab's ambient temperature. The test was conducted in a 24 hour-interval after the test tubes were removed from the oven.

The load was increased in a uniform manner at a velocity of (1±0.5) Mpa/sec, until rupture occurred.

Test tube (n°)	Length (mm)	Width (mm)	Height (mm)	Cross-section area (mm ²)	Rupture load (N)	Uniaxial compression resistance (Mpa)
1	49,8	50,1	50,5	2493	200124	80,3
2	49,4	50,2	50,0	2480	205029	82,7
3	49,8	50,2	50,3	2496	217782	87,2
4	50,6	50,2	50,2	2538	198849	78,3
5	50,2	49,8	50,2	2498	200516	80,3
6	50,2	50,0	50,1	2512	192472	76,6
7	49,7	50,2	50,5	2493	208070	83,5
8	49,7	50,4	50,3	2503	220136	87,9
9	50,1	50,1	50,3	2510	193453	77,1
10	50,2	50,3	50,1	2527	206599	81,8
MEAN VALUE (Mpa)						81,6
STANDARD DEFLECTION (Mpa)						3,89
COEFFICIENT OF VARIATION						0,05
MINIMUM EXPECTED VALUE (Mpa)						73,8

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

Determination of apparent density and apparent porosity. UNE-EN 1936:2007.

Test tubes measuring approximately 50x50x50 mm were received cut, and they were tested without any other type of superficial finish.

The tests tubes were dried until they achieved a constant mass in a convection oven at a temperature of 70 ±5°C. Next, they were stored in a dessicator until they reached the lab's ambient temperature. The test was conducted in a 24 hour-interval after the test tubes were removed from the oven.

Test tube (n°)	Final dry weight (g)	Saturated weight (g)	Saturated submerged weight (g)	Apparent porosity (%)	Apparent density (Kg/m ³)
1	309,3	321,4	196,9	9,7	2480
2	308,8	321,9	196,7	10,4	2462
3	307,5	320,7	195,8	10,6	2457
4	306,7	319,4	195,4	10,2	2468
5	297,9	315,2	189,9	13,8	2373
6	304,9	319,8	194,3	11,8	2426
MEAN VALUE				11,1 %	2444 Kg/m³

Determination of the abrasion resistance. Wide disc method (method A). UNE-EN 14157:2018.

Test tubes measuring approximately 120 x 120 mm were received cut, and they were tested without any other type of superficial finish.

The tests tubes were dried until they achieved a constant mass in a convection oven at a temperature of 70 ±5°C. Next, they were stored in a dessicator until they reached the lab's ambient temperature. The test was conducted in a 24 hour-interval after the test tubes were removed from the oven.

Test tube n°	Individual wear (mm)
1	24,5
2	22,5
3	23,0
4	24,5
5	25,0
6	23,5
MEAN VALUE	23,8
MAXIMUM VALUE	25,0

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

Determination of the slip resistance by means of pendulum tester (wet conditions). UNE-EN 14231:2004.

The test was performed on a 126 mm net length, with wide slider.

Temperature at time of test: 21,1 °C.

The test was carried out for 3 types of surface finish: polished, honed and sawn.

SURFACE FINISH POLISHED	
Determination (n°)	Slip resistance SRV (R_d) (wet surface)
1	25
2	24
3	24
4	29
5	30
6	24
SRV (wet)	26

SURFACE FINISH HONED	
Determination (n°)	Slip resistance SRV (R_d) (wet surface)
1	39
2	39
3	36
4	37
5	37
6	36
SRV (wet)	37

SURFACE FINISH SAWN	
Determination (n°)	Slip resistance SRV (R_d) (wet surface)
1	67
2	70
3	70
4	68
5	69
6	65
SRV (wet)	68

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

INFORMATION NOTE

According to the Technical Building Code of Spain, Section SU1 insurance against the risk of falls, making the test for resistance to sliding / slippage of pavements (PTV) with the wet surface with water as indicated by the UNE 41901:2017 EX, provides the following classification:

Table 1.1; Classification of the soils according to their slipperiness

Slip resistance Rd	Class
$R_d \leq 15$	0
$15 < R_d \leq 35$	1
$35 < R_d \leq 45$	2
$R_d > 45$	3

Table 1.2; Class required of soils according to their location

Location and soil characteristics	Class
Interior dry areas:	
sloping surfaces <6%	1
sloping surfaces $\geq 6\%$ and stairs	2
Interior wet areas such as entrances to buildings from outer space ⁽¹⁾ , covered terraces, changing rooms, bathrooms, toilets, kitchens, etc.	
sloping surfaces <6%	2
sloping surfaces $\geq 6\%$ and stairs	3
Outdoor areas. pools ⁽²⁾ . Showers	3

⁽¹⁾ Except in the case of direct access to restricted areas.

⁽²⁾ Areas planned for barefoot users and at the bottom of the vessels, in areas where the depth does not exceed 1,5m.

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PULYCORT NATURAL STONES SL	Reference: Regimental Grey

Determination of rupture energy (impact). UNE-EN 14158:2004.

Test tubes measuring approximately 200x200x30 mm were received cut, and they were tested without any other type of superficial finish.

The specimens were dried at $(70 \pm 5) ^\circ\text{C}$ until constant mass. A ball with a normalized weight of 1000 g is dropped from a height of 100 mm onto the sample, it is observed if the sample shows any type of breakage or the appearance of cracks. If the specimen does not break, the height is increased in intervals of 50 mm until it breaks.

Test tube (n°)	Height of rupture resistance (m)	Rupture energy (J)
1	0,45	4
2	0,45	4
3	0,45	4
4	0,40	4
5	0,45	4
6	0,40	4
MEAN VALUE:		4

Determination of water absorption at atmospheric pressure. UNE-EN 13755:2008.

Test tubes measuring approximately 50x50x50 mm were received cut, and they were tested without any other type of superficial finish.

The test specimens have been dried to a constant mass in a ventilated oven at a temperature of $70 \pm 5^\circ\text{C}$. Next, they have been kept in a desiccator until they attained the room temperature in the laboratory. The test has been performed within 24 hours after withdrawing them from the oven.

Test tube n°	Total water absorption (%)
1	2,8
2	3,3
3	2,4
4	2,6
5	2,5
6	3,0
MEAN VALUE	2,8
MAXIMUM VALUE	3,3

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PULYCORT NATURAL STONES SL	Reference: Regimental Grey

Determination of flexural strength under concentrated load. UNE-EN 12372:2007.

Test tubes measuring approximately 300x50x50 mm were received cut, and they were tested without any other type of superficial finish.

The tests tubes were dried until they achieved a constant mass in a convection oven at a temperature of 70±5°C. Next, they were stored in a dessicator until they reached the lab's ambient temperature. The test was conducted in a 24 hour-interval after the test tubes were removed from the oven.

The test tube was placed centred over two supporting rollers and the loading roller was placed in the middle of the test tube through the upper section. The load was increased in a uniform manner at a velocity of (0.25±0.5) Mpa/sec, until rupture occurred.

Test tube	Distance between axis (mm)	Width (mm)	Thickness (mm)	Rupture load (N)	Bending resistance (N/mm ²)
1	250	50,3	50,3	2916	8,58
2	250	49,5	50,2	2817	8,45
3	250	50,2	49,7	3344	10,10
4	250	50,2	50,7	2328	6,77
5	250	50,3	49,8	2783	8,35
6	250	50,3	50,9	3207	9,23
7	250	50,1	50,1	3017	8,98
8	250	49,8	50,4	2648	7,85
9	250	50,2	50,2	2288	6,78
10	250	49,7	49,7	2421	7,40
MEAN VALUE (Mpa)					8,25
STANDARD DEFLECTION (Mpa)					1,07
MINIMUM EXPECTED VALUE (Mpa)					6,22

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

Petrographic description. UNE-EN 12407:2020

METHODOLOGY:

A representative portion of the sample has been taken to carry out a macroscopic petrographic study preliminary to visu and, on the other hand, the same portion of the sample has been impregnated with epoxy resin to make a *thin sheet* and carry out its corresponding microscopic petrographic analysis.

The preliminary visual examination of the sample was carried out using the binocular magnifying glass, equipped with different magnifications (x0.8, x1.0, x1.2, x1.6, x2.0, x2.5, x3.2, x4 .0, x5.0), in order to macroscopically establish the main differences in the compositional and textural properties of the sample.

The petrographic analysis of the impregnated sample on a thin sheet by means of the polarization microscope has been carried out in order to establish with greater precision the textural characteristics of the sediment and the minerals present in it, as well as a semi-quantitative estimate of its content. The thin sheet thus obtained is part of the documentation that accompanies this report.

1.1 MACROSCOPIC DESCRIPTION:

The macroscopic characteristics of the sample received are summarized in the table below.

MACROSCOPIC CHARACTERISTICS	
TYPE OF ROCK	Sedimentary rock
COLOR	Grey-brownish
TEXTURE	Clastic
CLASSIFICATION	Carbonatic sandstone
GRAIN SIZE	Fine
OPEN AND FILLED MACROSCOPIC FRACTURES, PORES AND CAVITIES	Not present
WEATHERING AND ALTERATION FEATURES	Not present
PRESENCE OF VEINING	Not present
PRESENCE OF MACROFOSSILS	Not present

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PULYCORT NATURAL STONES SL	Reference: Regimental Grey

1.2 MICROSCOPIC DESCRIPTION:

Texture: Fine clastic well sorted sandstone made of equidimensional and sub-rounded grains.

Components:

1. Grains: (75-85%)

Size: Fine (0,125-0,250 mm).

Habit: Equidimensional.

Shape: Sub-rounded. Low sphericity.

Sorting: Well-sorted.

Distribution: Homogeneous.

Orientation: Isotropic.

Evidences of alteration and weathering: Not present.

Recrystallization textures: Not present.

Main Components:

a.- MONO-MINERAL GRAINS:

Dolomite (15-25%): $MgCaCO_3$

Mainly monocrystalline but also polycrystalline.

Quartz (5-15%): SiO_2

Mainly monocrystalline but also polycrystalline. Some grains show inherited cement of quartz overgrowths.

Bioclasts (1-10%): $CaCO_3$

Mainly, bivalves and bryozoans fragments.

b.- POLI-MINERAL GRAINS:

Limestone rock fragments (30-40%):

Mainly micritic and biomicritic limestones.

Accessory minerals (<1%):

K-feldspars ($KAlSi_3O_8$) y **Tourmaline** ($(Na(Mg,Fe,Li,Al)_3Al_6(Si_6O_{18})(BO_3)_3(OH,F)_4$).

2. Matrix: Not present.

3. Cement (1-10%):

Dolomitic (1-10%): Both intergranular (dolosparite and dolo-microsparite) and crystalline overgrowth on detrital dolomite grains, a fact that greatly hinders its percentage estimation.

Quartz (1%): Crystalline overgrowth on detrital quartz grains, a fact that greatly hinders its percentage estimation.

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

Determination of the breaking load at dowel hole. UNE-EN 13364:2002.

Test tubes measuring approximately 200x200x30 mm were received cut, and they were tested without any other type of superficial finish.

The specimens have been received drilled with a diameter of 10 mm and a depth of 30 ± 2 mm. The anchors were placed to a depth of 25 mm using a CEM I 52.2 R cement slurry. The specimens were broken towards the exposed side at a speed of (50 ± 5) N / s.

Anchors	Thickness (mm)	Hole-face distance, d1 (mm)	Max. Hole center distance to fracture edge, bA (mm)	Breaking load (N)
1.1	29,7	10	42	1535
1.2	29,6	10	51	1295
1.3	29,7	10	40	1640
1.4	29,7	10	37	1503
2.1	29,7	9	30	1358
2.2	29,7	10	32	1474
2.3	29,8	11	47	1219
2.4	29,7	9	34	1482
3.1	29,6	10	41	1156
3.2	29,7	9	36	1549
3.3	29,7	10	33	1187
3.4	29,7	10	31	1694
4.1	29,7	10	40	1571
4.2	29,8	10	32	1180
4.3	29,8	10	34	1091
4.4	29,8	10	40	1831
	Mean value	10	38	1423
		Minimum expected value		1035

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PULYCORT NATURAL STONES SL	Reference: Regimental Grey

Determination of frost resistance. UNE-EN 12371:2011
(Technological test)

Test tubes measuring approximately 300x50x50 mm were received cut, and they were tested without any other type of superficial finish.

Two groups of test tubes were tested: one group was to be tested further to subjecting the test tubes to frosting/defrosting cycles, while the other was to be tested without subjecting the test tubes to such cycles. The tests tubes were dried until they achieved a constant mass in a convection oven at a temperature of 70±5 °C. Next, they were stored in a dessicator until they reached the lab's ambient temperature. The test was conducted in a 24 hour-interval after the test tubes were removed from the oven.

The test tube was placed centred over two supporting rollers and the loading roller was placed in the middle of the test tube through the upper section. The load was increased in a uniform manner at a velocity of (0.25±0.5) Mpa/sec, until rupture occurred.

Test tube	Distance between axis (mm)	Width (mm)	Thickness (mm)	Rupture load (N)	Bending resistance (N/mm ²)
1	250	50,3	50,3	2916	8,58
2	250	49,5	50,2	2817	8,45
3	250	50,2	49,7	3344	10,10
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8	250	49,8	50,4	2648	7,85
9	250	50,2	50,2	2288	6,78
10	250	49,7	49,7	2421	7,40
MEAN VALUE (Mpa)					8,25
STANDARD DEFLECTION (Mpa)					1,07
MINIMUM EXPECTED VALUE (Mpa)					6,22

Next, the test tubes were placed vertically in the freezer, separated at least 10 mm from the adjacent test tubes, and 20 mm away from the sides of the chamber. They were subjected to 56 frosting/defrosting cycles, under the following conditions: Temperature dropped from 20 °C to -8 °C in two hours, and from -8 °C to -12 °C in four hours, after which they were submerged in 20 °C water for six hours.

Further to completing the prescribed number of cycles (56), the test tubes were to be tested according to the method described earlier.

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PULYCORT NATURAL STONE SL	Reference: Regimental Grey

Determination of resistance to ageing by thermal shock. UNE-EN 14066:2014.

20 specimens of 300x50x50 mm are selected in two groups of 10, one of which will be subjected to thermal shock cycles in order to later be able to compare the results obtained with the group that has not been subjected to the cycles.

The specimens are dried for 1 week at $40 \pm 5^{\circ}\text{C}$, and are subjected to temperature changes according to the following procedure: (18 ± 1) hours in a ventilated oven at $(105 \pm 5)^{\circ}\text{C}$, then followed by (6 ± 0.5) hours completely immersed in distilled or demineralized water at $20 \pm 5^{\circ}\text{C}$.

After 20 cycles a visual inspection is performed, and the open porosity and flexural strength are determined.

A.- Visual aspect:

Modifications visually observed by comparison with the reference specimen:

Test tube n°	Defects after cycles									
	1	2	3	4	5	6	7	8	9	10
Oxidations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Stains	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Swellings	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Chipped	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Cracking	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

B.- Flexural strength:

<i>Specimens tested without being subjected to thermal shock cycles</i>					
Test tube	Distance between axis (mm)	Width (mm)	Thickness (mm)	Rupture load (N)	Bending resistance (N/mm ²)
1	250	50,3	50,3	2916	8,58
2	250	49,5	50,2	2817	8,45
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