



Centro Tecnológico
del mármol

PN003E2201

TEST REPORT

Natural stone – Water absorption

REPORT Nº: **222927PN003**

DATE: **01-02-2023**

PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

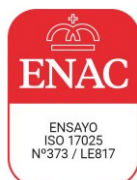
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **6 cubic specimens of nominal dimensions 50x50x50 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**

* Information declared by the petitioner

TEST METHOD: **EN 13755:2008 Natural stone test methods. Determination of water absorption at atmospheric pressure**

Deviations –
Specimen preparation –
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **03-01-2023 / 12-01-2023**



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Tecnológico del Mármol, la Piedra y Materiales
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TEST REPORT

Natural stone – Water absorption

REPORT Nº: **222927PN003**

DATE: **01-02-2023**

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RESULTS:

Specimen

Water absorption, A_b (%)

Mean value of water absorption, \bar{A}_b

01	02	03	04	05	06
0,1	0,1	0,1	0,1	0,1	0,1
0,1 %					

Remarks: The uncertainties are calculated and at the client's disposal
The results are expressed to the nearest 0,1 %

DISCLAIMER:

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Director Técnico



Natural stone – Apparent density and open porosity

REPORT Nº: **222927PN004A** DATE: **01-02-2023**

PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

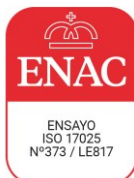
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **6 cubic specimens of nominal dimensions 50x50x50 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**

* Information declared by the petitioner

TEST METHOD: **EN 1936:2007 Natural stone test methods. Determination of real density and apparent density, and of total and open porosity. Section 8.1**

Deviations –
Specimen preparation –
Date of preparation –
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **03-01-2023 / 10-01-2023**





TEST REPORT

Natural stone – Apparent density and open porosity

REPORT Nº: **222927PN004A** DATE: **01-02-2023**

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RESULTS:

Specimen	07	08	09	10	11	12
Apparent density, ρ_b (kg/m ³)	3060	3060	3060	3060	3060	3060
Open porosity, p_o (%)	0,2	0,2	0,2	0,2	0,2	0,2
Mean value of apparent density, $\bar{\rho}_b$	3060 kg/m ³					
Mean value of open porosity, \bar{p}_o	0,2 %					

Remarks: The uncertainties are calculated and at the client's disposal
The results of density are expressed to the nearest 10 kg/m³
The results of porosity are expressed to the nearest 0,1 %

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Natural stone – Abrasion resistance (Capon method)

REPORT Nº: **222927PN006** DATE: **01-02-2023** PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

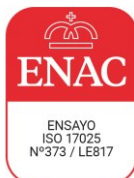
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **6 polished slabs of 150x150x30 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 14157:2017 Natural stone test methods. Determination of the abrasion resistance. Section 3**

Deviations **–**
Specimen preparation **–**
Calibration factor **0,3 mm**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **16-01-2023 / 19-01-2023**





TEST REPORT

Natural stone – Abrasion resistance (Capon method)

REPORT Nº: **222927PN006**

DATE: **01-02-2023**

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RESULTS:

Specimen	13	14	15	16	17	18
Groove lengths (mm)	10,0	9,5	10,0	10,5	10,0	10,0
	10,5	10,5	9,5	10,0	10,0	10,0
Mean value of groove length	10,0 mm					
Standard deviation	0,3 mm					
Higher expected value, E_H	11,0 mm					

Remarks:

The uncertainties are calculated and at the client's disposal
The results are expressed to the nearest 0,5 mm
According to EN 14157, only the biggest grooves of each specimen are considered

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Natural stone – Frost resistance (technological test)

REPORT Nº: **222927PN008B** DATE: **01-02-2023**

PAGE: **1/4**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

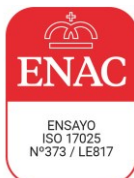
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **2 sets of 10 specimens of nominal dimensions 300x50x50 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 12371:2010 Natural stone test methods. Determination of frost resistance. Section 7.3.1**

Deviations **–**
Specimen preparation **–**
Conditioning **Drying in oven at 70±5°C to constant mass**
Load direction **–**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **12-12-2022 / 19-01-2023**



Natural stone – Frost resistance (technological test)

REPORT Nº: **222927PN008B** DATE: **01-02-2023**

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RESULTS:

Set 1 (not subjected to freeze-thaw cycles)

Specimen	49	50	51	52	53	54	55	56	57	58
Breaking thickness, h (mm)	49,9	49,9	49,9	50,2	50,0	49,9	50,0	49,9	50,2	50,1
Breaking width, b (mm)	50,0	49,8	49,9	49,9	50,0	49,9	49,8	50,1	50,2	50,0
Span, l (mm)	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0
Load increase (MPa/s)	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25
Breaking load, F (N)	8470	8390	8640	8360	9180	9230	8380	8390	8840	8890
Distance fracture to centre (mm)	9,9	3,6	1,9	2,2	2,4	3,0	10,6	3,7	6,6	11,7
Flexural strength, R_{tf} (MPa)	25,5	25,3	26,1	25,0	27,6	27,8	25,2	25,3	26,2	26,6

Set 2 (subjected to 56 freeze-thaw cycles)

Specimen	19	20	21	22	23	24	25	26	27	28
Breaking thickness, h (mm)	50,0	49,8	50,0	50,0	50,1	50,1	50,2	50,1	49,8	49,9
Breaking width, b (mm)	50,0	50,2	50,1	50,0	50,2	50,3	50,1	50,2	49,8	50,2
Span, l (mm)	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0
Load increase (MPa/s)	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25
Breaking load, F (N)	8090	8140	8170	8180	8100	8090	8280	8360	8310	7600
Distance fracture to centre (mm)	14,7	2,7	2,8	4,9	11,1	2,5	7,2	5,1	2,7	3,3
Flexural strength, R_{tf} (MPa)	24,3	24,5	24,5	24,6	24,1	24,0	24,6	24,9	25,2	22,8



TEST REPORT

Natural stone – Frost resistance (technological test)

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Mean value of flexural strength, F_0

26,1 MPa

Standard deviation, s

1,0 MPa

Mean value of flexural strength after 56 cycles, F_{56}

24,4 MPa

Standard deviation, s

0,6 MPa

Decrease of flexural strength after 56 cycles

7,0 %

Remarks: The uncertainties are calculated and at the client's disposal

The sample received consisted of 20 undifferentiated specimens. The separation between the two sets of 10 specimens to be tested, was carried out at random by the laboratory

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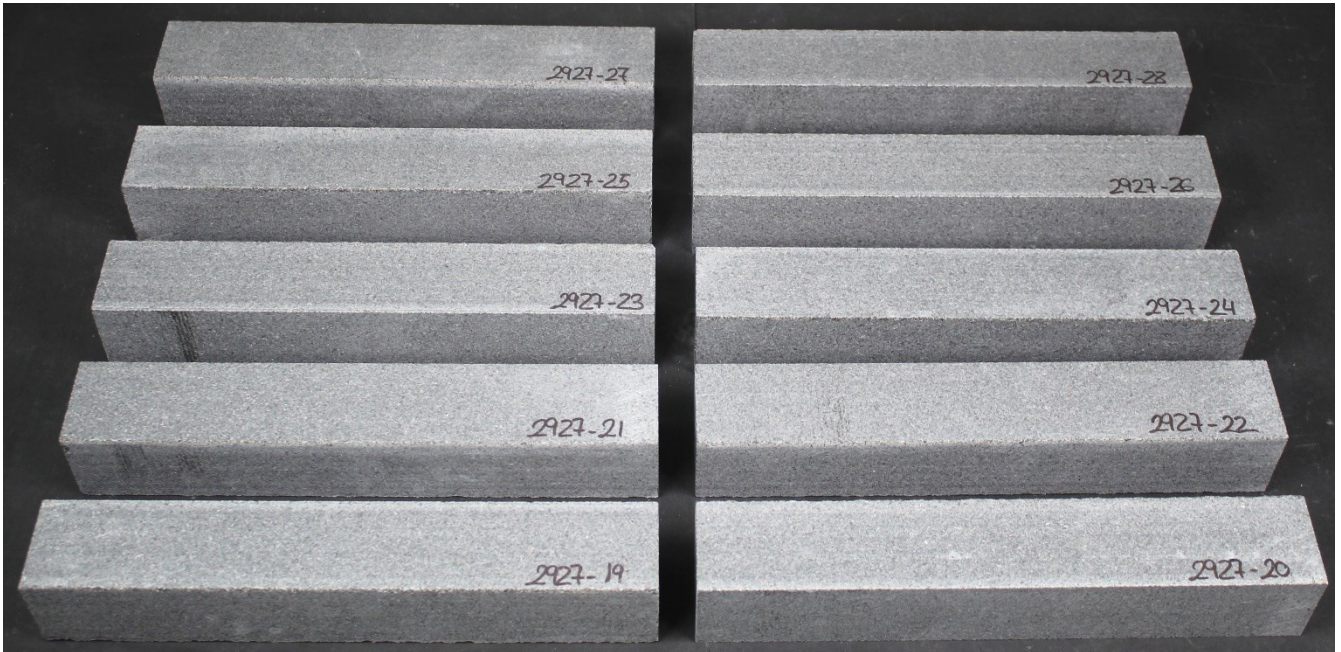
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Director Técnico

Natural stone – Frost resistance (technological test)

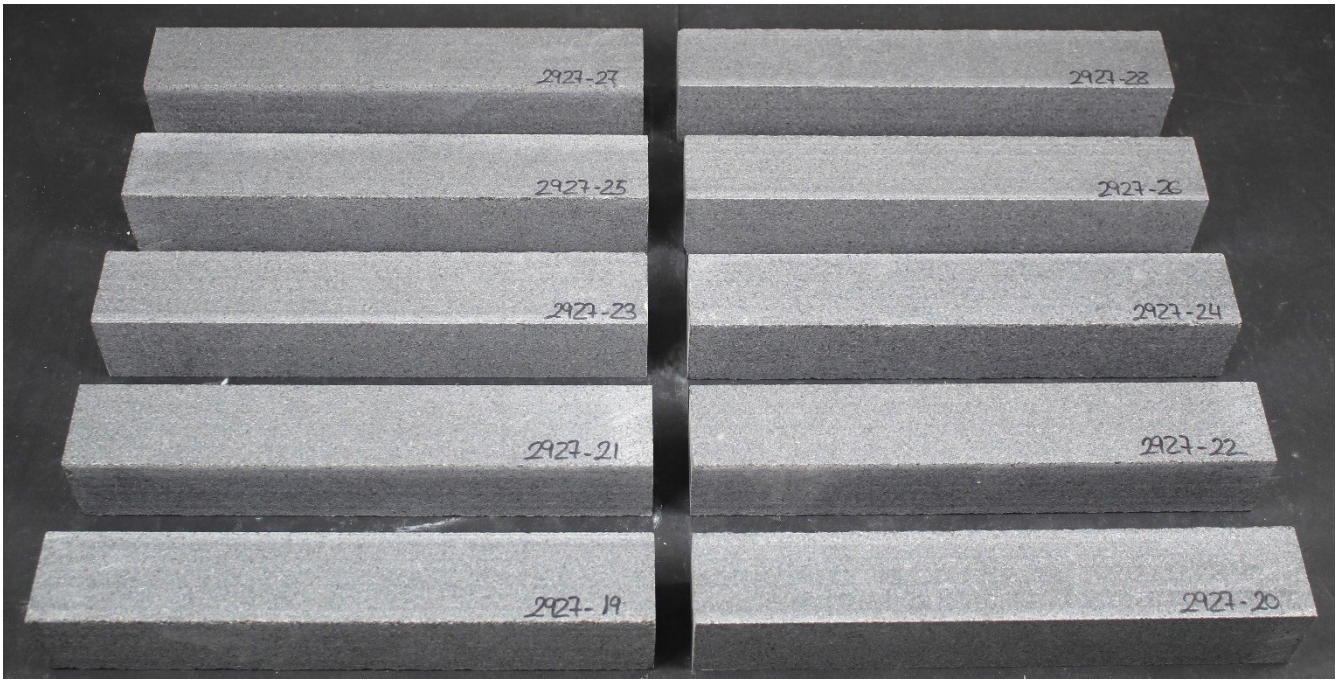
REPORT Nº: 222927PN008B DATE: 01-02-2023

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Set 2 before freeze-thaw cycles



Set 2 after 56 freeze-thaw cycles



Natural stone – Frost resistance (technological test)

REPORT Nº: **222927PN008D** DATE: **01-02-2023**

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PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **2 sets of 10 cubic specimens of nominal dimensions 70x70x70 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 12371:2010 Natural stone test methods. Determination of frost resistance. Section 7.3.1**

Deviations **–**
Specimen preparation **–**
Conditioning **Drying in oven at 70±5°C to constant mass**
Load direction **–**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **12-12-2022 / 20-01-2023**



TEST REPORT

Natural stone – Frost resistance (technological test)

REPORT Nº: **222927PN008D** DATE: **01-02-2023**

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RESULTS:

Set 1 (not subjected to freeze-thaw cycles)

Specimen	39	40	41	42	43	44	45	46	47	48
Average width of faces, \bar{l} (mm)	70,1	70,0	70,0	69,9	70,1	69,9	69,9	69,9	70,1	70,5
Height, h (mm)	70,1	69,7	70,0	70,2	71,1	69,7	70,0	69,6	71,1	69,7
Breaking load, F (kN)	1710	1580	1660	1620	1680	1670	1710	1510	1670	1620
Compressive strength, R (MPa)	348	322	339	331	342	343	350	309	341	326

Set 2 (subjected to 56 freeze-thaw cycles)

Specimen	29	30	31	32	33	34	35	36	37	38
Average width of faces, \bar{l} (mm)	70,2	70,0	70,1	69,9	69,9	70,0	70,4	70,2	70,2	70,0
Height, h (mm)	71,0	70,1	70,6	69,6	71,0	70,1	70,1	70,0	71,0	71,0
Breaking load, F (kN)	1730	1670	1570	1650	1710	1650	1760	1570	1650	1740
Compressive strength, R (MPa)	351	340	318	338	350	336	356	319	336	356



TEST REPORT

Natural stone – Frost resistance (technological test)

REPORT Nº: **222927PN008D** DATE: **01-02-2023**

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Mean value of compressive strength, R_0

335 MPa

Standard deviation, s

13 MPa

Mean value of compressive strength after 56 cycles, R_{56}

340 MPa

Standard deviation, s

14 MPa

Decrease of compressive strength after 56 cycles

0,0 %

Remarks: The uncertainties are calculated and at the client's disposal

The sample received consisted of 20 undifferentiated specimens. The separation between the two sets of 10 specimens to be tested, was carried out at random by the laboratory

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Natural stone – Frost resistance (technological test)

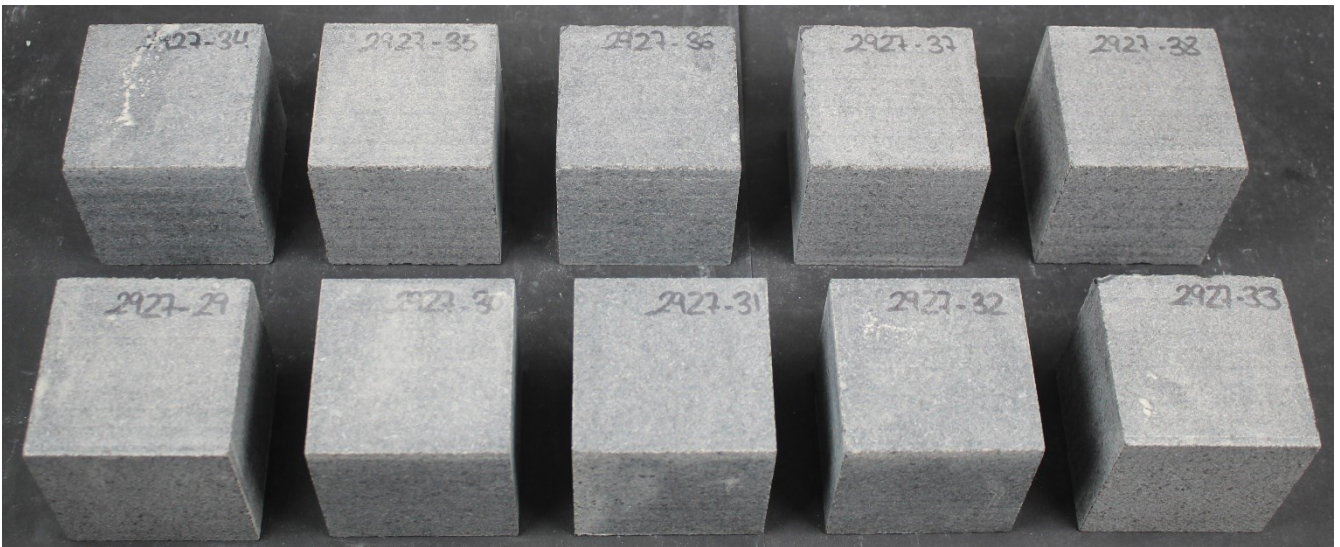
REPORT Nº: 222927PN008D DATE: 01-02-2023

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Set 2 before freeze-thaw cycles



Set 2 after 56 freeze-thaw cycles



Natural stone – Compressive strength

REPORT Nº: **222927PN009A** DATE: **01-02-2023**

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PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

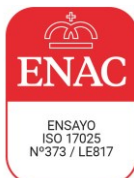
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **10 cubic specimens of nominal dimensions 70x70x70 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 1926:2006 Natural stone test methods. Determination of uniaxial compressive strength**

Deviations **–**
Specimen preparation **–**
Conditioning **Drying in oven at 70±5°C to constant mass**
Load direction **–**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **11-01-2023 / 17-01-2023**





TEST REPORT

Natural stone – Compressive strength

REPORT Nº: **222927PN009A** DATE: **01-02-2023**

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RESULTS:

Specimen	39	40	41	42	43	44	45	46	47	48
Average width of faces, \bar{l} (mm)	70,1	70,0	70,0	69,9	70,1	69,9	69,9	69,9	70,1	70,5
Height, h (mm)	70,1	69,7	70,0	70,2	71,1	69,7	70,0	69,6	71,1	69,7
Breaking load, F (kN)	1710	1580	1660	1620	1680	1670	1710	1510	1670	1620
Compressive strength, R (MPa)	348	322	339	331	342	343	350	309	341	326
Average compressive strength, \bar{R}	335 MPa									
Standard deviation, s	13 MPa									
Coefficient of variation, v	0,04									
Lower expected value, E	309 MPa									

Remarks: The uncertainties are calculated and at the client's disposal

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Natural stone – Flexural strength

REPORT Nº: **222927PN010** DATE: **01-02-2023** PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

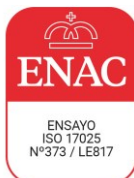
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **10 specimens of nominal dimensions 300x50x50 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 12372:2006 Natural stone test methods. Determination of flexural strength under concentrated load**

Deviations **–**
Specimen preparation **–**
Conditioning **Drying in oven at 70±5°C to constant mass**
Load direction **–**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **11-01-2023 / 17-01-2023**





TEST REPORT

Natural stone – Flexural strength

REPORT Nº: **222927PN010**

DATE: **01-02-2023**

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RESULTS:

Specimen	49	50	51	52	53	54	55	56	57	58
Breaking thickness, h (mm)	49,9	49,9	49,9	50,2	50,0	49,9	50,0	49,9	50,2	50,1
Breaking width, b (mm)	50,0	49,8	49,9	49,9	50,0	49,9	49,8	50,1	50,2	50,0
Span, l (mm)	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0
Load increase (MPa/s)	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25
Breaking load, F (N)	8470	8390	8640	8360	9180	9230	8380	8390	8840	8890
Distance fracture to centre (mm)	9,9	3,6	1,9	2,2	2,4	3,0	10,6	3,7	6,6	11,7
Flexural strength, R_{tf} (MPa)	25,5	25,3	26,1	25,0	27,6	27,8	25,2	25,3	26,2	26,6
Average flexural strength, \bar{R}_{tf}	26,1 MPa									
Standard deviation, s	1,0 MPa									
Lower expected value, E	24,1 MPa									

Remarks: The uncertainties are calculated and at the client's disposal

DISCLAIMER:

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Natural stone – Breaking load at dowel hole

REPORT Nº: **222927PN012A** DATE: **01-02-2023**

PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

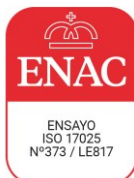
SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **10 slabs of nominal dimensions 200x200x30 mm**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**
Planes of anisotropy * **–**

* Information declared by the petitioner

TEST METHOD: **EN 13364:2001 Natural stone test methods. Determination of the breaking load at dowel hole**

Deviations **–**
Specimen preparation **–**
Conditioning **Drying in oven at 70±5°C to constant mass**
Load direction **–**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **11-01-2023 / 18-01-2023**





TEST REPORT

Natural stone – Breaking load at dowel hole

REPORT Nº: **222927PN012A** DATE: **01-02-2023**

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RESULTS:

Specimen	59	60	61	62	63	64	65	66	67	68
Thickness, d (mm)	31	30	31	31	30	30	30	30	31	30
Breaking thickness, d_1 (mm)	10,7	11,8	11,4	11,2	10,6	11,1	10,0	10,3	10,6	11,3
Breaking load, F (N)	2700	3750	3900	4050	3750	3450	3250	3900	4500	3200
Maximum fracture length, b_A (mm)	37,2	39,3	43,3	41,6	46,6	43,2	32,1	48,1	55,9	42,0
Mean value of breaking load, \bar{F}	3650 N									
Standard deviation, s	500 N									
Lower expected value, E	2659 N									
Mean value of breaking thickness, \bar{d}_1	10,9 mm									
Mean value of maximum fracture lengths, \bar{b}_A	42,9 mm									

Remarks: The uncertainties are calculated and at the client's disposal
The results of breaking load and standard deviation are expressed to the nearest 50 N

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PN020AE2201

TEST REPORT

Natural stone – Slip resistance

REPORT Nº: **222927PN020A** DATE: **01-02-2023**

PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **3 slabs of 300x300x30 mm**
Surface finish * **Sawn**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**

* Information declared by the petitioner

TEST METHOD: **EN 14231:2003 Natural stone test methods. Determination of the slip resistance by means of the pendulum tester**

Deviations **–**
Specimen preparation **–**
Slider used **76,2 x 25,4 mm**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **09-01-2023 / 10-01-2023**



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TEST REPORT

Natural stone – Slip resistance

REPORT Nº: **222927PN020A** DATE: **01-02-2023**

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RESULTS:

Specimen	69.1	69.2	70.3	70.4	71.5	71.6
Individual values of the slip resistance, in dry condition	88	86	89	89	89	88
Individual values of the slip resistance, in wet condition	66	66	69	71	69	70
Average slip resistance, in dry condition (SRV “dry”)	88		Uncertainty		± 5	
Average slip resistance, in wet condition (SRV “wet”)	69		Uncertainty		± 3	

Remarks: The expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $K=2$, which for a normal distribution provides a level of confidence of about 95%

DISCLAIMER:

The laboratory is not responsible for the sampling or for the information declared by the client. The results refer only to the sample received at the laboratory, on the expressed date.

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Antonio Molina
Director Técnico



Centro Tecnológico
del mármol

PN020JE2201

TEST REPORT

Slip resistance (slipperiness)

REPORT Nº: **222927PN020J** DATE: **01-02-2023** PAGE: **1/2**

PETITIONER: **Kaavin Kivi Oy**
Kirjekuorentie 6. 73600 Kaavi (Finland)

SAMPLE IDENTIFICATION:

Date of delivery **02-12-2022**
Description **1 natural stone slab of 300x300x30 mm**
Surface finish * **Sawn**
Commercial name * **Varpaisjärvi Black**
Petrographic definition * **Diabase**
Place of quarrying * **Lapinlahti, Finland**
Supplier * **Kaavin Kivi Oy**
Sampled by * **Jani Toivanen (03-10-2022)**

* Information declared by the petitioner

TEST METHOD: **EN 16165:2021 Determination of slip resistance of pedestrian surfaces - Methods of evaluation. Annex C Pendulum test**

Deviations **–**
Type of slider used **57**
Place of testing **Centro Tecnológico del Mármol**
Dates of testing **09-01-2023 / 10-01-2023**



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TEST REPORT

Slip resistance (slipperiness)

REPORT Nº: **222927PN020J** DATE: **01-02-2023**

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RESULTS:

Test conditions	Dry	Wet
Slipperiness measured towards 0°	91	65
Slipperiness measured towards 90°	86	68
Slipperiness measured towards 45°	89	70
Value of the slipperiness, <i>PTV</i>	86	65
Uncertainty	± 5	± 2

Remarks: The expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $K=2$, which for a normal distribution provides a level of confidence of about 95%

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