



**COLEGIO OFICIAL DE INGENIEROS INDUSTRIALES
"LABORATORIO SEBASTIAN CARPI"**

C.I.F.: Q - 4670001- I

AVENIDA DEL MAR, Nº 46 – 12003 CASTELLÓN

TEL: 964 208 583 – FAX: 964 723 141

www.laboratoriocarpi.com



TEST REPORT

PETITIONER: TERRAKLINKER, S.L.L.

ADDRESS: C/ Rosario, 44

CITY: CASTELSERAS (Teruel)

TEST REPORT Nº: 57.275

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DATE OF TEST REPORT: 19/12/2018

DATE OF RECEIPT OF THE SAMPLE: 30/11/2018

DATE OF TESTS PERFORMANCE: 30/11 - 17/12/2018

NUMBER OF TILES SUPPLIED: 30

DESCRIPTION OF THE SAMPLE:

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

TEST CARRIED OUT:

- UNE-EN-ISO 10545-2 and ERRATUM: DETERMINATION OF DIMENSIONS AND SURFACE QUALITY.
- UNE-EN-ISO 10545-3 : DETERMINATION OF WATER ABSORPTION.
- UNE-EN-ISO 10545-4 : DETERMINATION OF MODULUS OF RUPTURE AND BREAKING STRENGTH.
- UNE-EN-ISO 10545-6 : DETERMINATION OF RESISTANCE TO DEEP ABRASION. UNGLAZED TILES.
- UNE-EN-ISO 10545-8 : DETERMINATION OF LINEAR THERMAL EXPANSION.
- UNE-EN-ISO 10545-9 : DETERMINATION OF RESISTANCE TO THERMAL SHOCK.
- UNE-EN-ISO 10545-12 : DETERMINATION OF FROST RESISTANCE.
- UNE-EN-ISO 10545-13 : DETERMINATION OF CHEMICAL RESISTANCE.
- UNE-EN-ISO 10545-14 : DETERMINATION OF RESISTANCE TO STAINS.

**José A. Estibález Catalán
MANAGER**

The samples and his description have been chosen by the petitioner.

The reported results relate only to the samples tested.

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The uncertainties have been evaluated according to recommendations of the document ISO/TAG5/WGE : June 95.

The expanded uncertainties indicated in this report are based on a standard uncertainty multiplied by a coverage factor k=2 wich a normal distribution provides a level of confidence of about 95 %.



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DETERMINATION OF DIMENSIONS

*** MEASUREMENTS OF LENGTH AND WIDTH ***

DESCRIPTION OF THE SAMPLE. -

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS. - (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* Work size: **328 mm x 328 mm**

<u>Tile</u>	<u>Individuals measurements (mm)</u>									
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>L1</u>	328.8	328.5	330.2	328.9	327.7	328.5	328.0	329.0	328.2	330.1
<u>L2</u>	327.5	327.6	326.8	327.0	325.9	328.5	327.6	328.4	327.6	326.2
<u>L3</u>	329.2	327.3	329.3	329.4	329.3	328.6	329.3	328.0	329.1	328.6
<u>L4</u>	328.0	326.8	328.3	329.0	325.7	326.5	327.0	326.6	327.6	328.0
	<u>Average measurements (mm)</u>									
<u>Length</u>	328.4	327.6	328.7	328.6	327.2	328.0	328.0	328.0	328.1	328.2
	<u>Deviations from the work size</u>									
<u>D_{Lw}</u> (%)	0.12	-0.12	0.21	0.18	-0.24	0.00	0.00	0.00	0.03	0.06
<u>D_{Lw}</u> (mm)	0.4	-0.4	0.7	0.6	-0.8	0.0	0.0	0.0	0.1	0.2
	<u>Deviations from the average size of the sample (%)</u>									
<u>D_{Lm}</u>	0.09	-0.15	0.18	0.15	-0.27	-0.03	-0.03	-0.03	0.00	0.03

* Average length of the sample: **328.1 mm**

* Maximum deviations of the average measurements form the work size: **0.21 % / -0.24 %**

* Maximum deviations of the average measurements form the work size: **0.7 mm / -0.8 mm**

* Maximum deviations of the average measurements from the average size of the sample:
0.18 % / -0.27 %

* Deviations uncertainty: **U= ± 0.03 % ; U= ± 0.1 mm (k=2)**



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DETERMINATION OF DIMENSIONS
*** MEASUREMENTS OF THICKNESS ***

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* Work size thickness: **20.0 mm**

Measurements of thickness (mm)										
<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
G1	19.2	20.6	20.5	20.0	20.9	20.0	19.3	20.6	20.5	20.8
G2	20.0	20.3	20.9	20.5	20.8	20.9	19.5	19.8	19.5	20.8
G3	19.8	20.5	20.2	20.1	19.5	20.5	20.2	19.5	19.8	20.9
G4	20.5	20.0	20.4	20.1	20.0	20.5	19.8	20.2	19.5	20.7
Average thickness (mm)	19.9	20.4	20.5	20.2	20.3	20.5	19.7	20.0	19.8	20.8
Deviation from the work size thickness (%)	-0.50	2.00	2.50	1.00	1.50	2.50	-1.50	0.00	-1.00	4.00
Deviation from the work size thickness (mm)	-0.1	0.4	0.5	0.2	0.3	0.5	-0.3	0.0	-0.2	0.8

* Average thickness of the sample: **20.2 mm**

* Maximum deviation of the thickness from the work size thickness: **4.00 % / -1.50 %**

* Maximum deviation of the thickness from the work size thickness: **0.8 mm / -0.3 mm**

* Deviations uncertainty: **U= ± 0.50 % ; U= ± 0.1 mm (k=2)**

Note: In calculating the deviations, the work size thickness has been chosen by the laboratory



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DETERMINATION OF DIMENSIONS

*** MEASUREMENTS OF STRAIGHTNESS OF SIDES ***

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* Work size: **328 mm x 328 mm**

Measurements of straightness (mm)

<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>R1</u>	-0.1	0.1	-1.1	-1.1	-0.2	0.0	-0.1	-0.5	-0.2	-0.4
<u>R2</u>	-0.5	-0.2	-0.2	-0.1	0.2	0.0	-0.1	0.2	-0.3	-0.1
<u>R3</u>	0.4	0.4	0.3	0.9	0.0	-0.6	-0.3	-0.7	0.4	0.9
<u>R4</u>	0.0	-0.3	-0.1	-0.1	-0.1	0.1	-0.4	-0.1	-0.1	0.1

* Maximum deviation from straightness, related to the work size: **0.27 % / -0.34%**

* Deviations uncertainty: **U= ± 0.03 % (k=2)**



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DETERMINATION OF DIMENSIONS
*** MEASUREMENTS OF RECTANGULARITY ***

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* Work size: **328 mm x 328 mm**

Measurements of rectangularity (mm)

<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>O1</u>	0.5	-1.2	-0.3	1.7	0.7	-1.1	0.6	-1.6	1.2	-0.5
<u>O2</u>	-0.4	0.1	1.0	-0.3	-1.6	-1.4	-1.8	-0.2	-0.9	1.6
<u>O3</u>	-0.4	0.9	-1.2	-0.2	-0.8	0.2	-0.3	1.3	0.0	-0.2
<u>O4</u>	-0.6	-0.1	-0.8	-1.9	0.9	1.4	0.7	0.3	-0.2	-1.9

* Maximum deviation from rectangularity, related to the work size: **0.52 % / -0.58 %**

* Deviations uncertainty: **U= ± 0.03 % (k=2)**



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DETERMINATION OF DIMENSIONS
*** MEASUREMENTS OF SURFACE FLATNESS ***

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* Work size: **328 mm x 328 mm**

* Diagonal calculated from the work size: **463.9 mm**

Measurements of centre curvature (mm)										
<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
CC1	-0.7	-1.2	-0.4	-0.4	0.4	0.1	0.2	-0.4	0.2	1.2
CC2	0.0	-0.7	-0.2	-0.2	0.4	0.2	0.5	-0.2	0.3	0.8
CC3	-0.8	-1.2	0.0	-0.2	0.5	0.1	0.5	-0.3	0.4	1.3
CC4	-0.1	-0.5	-0.3	-0.4	0.3	0.2	0.3	-0.2	0.3	0.7

Measurements of edge curvature (mm)										
<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
CL1	-0.1	-1.0	-0.5	0.5	-0.1	0.5	0.1	-0.7	0.4	0.2
CL2	0.0	-0.4	0.8	-0.5	0.0	-0.5	0.7	-0.1	-0.1	0.0
CL3	-0.9	-0.4	-0.7	0.4	0.4	0.2	0.6	-0.3	0.4	0.3
CL4	-0.4	0.3	0.7	-0.6	0.6	0.1	-0.1	0.5	-0.2	1.2

Measurements of warpage (mm)										
<u>Tile</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
A1	-1.3	-1.3	-0.3	-0.6	0.3	-0.4	0.1	-0.5	-0.1	1.5
A2	1.0	0.8	-0.2	0.2	-0.1	0.3	-0.3	0.2	0.0	-1.0
A3	-0.8	-1.3	-0.1	0.2	0.3	-0.4	0.1	-0.4	0.5	1.0
A4	1.2	1.1	-0.1	0.3	0.0	0.3	-0.3	0.4	0.1	-0.8

* Maximum centre curvature, related to the diagonal: **0.28 % / -0.26 %**

* Maximum edge curvature, related to the work size: **0.37 % / -0.30 %**

* Maximum warpage, related to the diagonal: **0.32 % / -0.28 %**

* Deviations uncertainty: **U= ± 0.03 % (k=2)**



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DETERMINATION OF SURFACE QUALITY

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 2 and Erratum:1998**)

* The number of tiles tested: **30 tiles.**

* The percentage of tiles without defects: **100 %**

* Observations: The tiles tested are free from visible defects.





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DETERMINATION OF WATER ABSORPTION

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 3:2018**)

* We have tested specimens 200 mm x 200 mm, obtained by cutting.

* Water absorption for each tile:

<u>Specimen</u>	<u>Water absorption (E_v) (%)</u>
1	7.0
2	7.1
3	6.8
4	7.4
5	7.3

* Average water absorption of the sample: **7.1 %**

* Measurement uncertainty: **U = ± 0.4 % (k=2)**

* Average value uncertainty: **U = ± 0.5 % (k=2)**



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DETERMINATION OF MODULUS OF RUPTURE
AND BREAKING STRENGTH

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 4:2015**)

* Parameters: $l_2 = 310 \text{ mm}$; $l_1 = 9 \text{ mm}$; $t = 5 \text{ mm}$; $d = 20 \text{ mm}$

<u>Tile</u>	<u>Breaking load "F"</u> (N)	<u>Breaking strength "S"</u> (N)	<u>Modulus of rupture "R"</u> (N/mm²)
1	2845.9	2687.3	24.2
2	3163.4	2989.8	26.5
3	2840.0	2699.0	24.7
4	2978.2	2809.6	25.3
5	2822.4	2673.2	24.1
6	3101.7	2925.2	26.0
7	3058.6	2894.3	25.7
Average	2973	2811	25

* Measurement uncertainty: $U_F = 35.7 \text{ N}$; $U_S = 35.0 \text{ N}$; $U_R = 0.6 \text{ N/mm}^2$ (**k=2**)

* Average value uncertainty: $U_F = 111 \text{ N}$; $U_S = 103 \text{ N}$; $U_R = 1 \text{ N/mm}^2$ (**k=2**)



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DETERMINATION OF RESISTANCE TO DEEP ABRASION

*** UNGLAZED TILES ***

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 6:2012**)

<u>Specimen</u>	<u>Chord length</u>		<u>Volume of material removed</u>	
	<u>(mm)</u>	<u>(mm)</u>	<u>(mm³)</u>	<u>(mm³)</u>
	<u>L₁</u>	<u>L₂</u>	<u>V₁</u>	<u>V₂</u>
1	31.5	31.0	262	250
2	29.5	30.0	215	227
3	31.0	31.5	250	262
4	30.0	31.5	227	262
5	30.0	30.0	227	227

* Average volume of material removed: **241 mm³**

* Average value uncertainty: **U = ± 18 mm³ (k=2)**



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DETERMINATION OF LINEAR THERMAL EXPANSION

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 8:2014**)

<u>Specimen</u>	<u>Coefficient of linear thermal expansion (from 30 °C to 100 °C)</u>
1	7.4 x 10 ⁻⁶ /°C
2	7.8 x 10 ⁻⁶ /°C

* Measurement uncertainty: **U = ± 0.3 x 10⁻⁶/°C (k=2)**

* **Observations:** The dimensions of the test specimens are: P₁ = 50.42 x 4.34 x 5.48 mm and P₂ = 50.32 x 5.38 x 5.40 mm.



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DETERMINATION OF RESISTANCE TO THERMAL SHOCK

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 9:2013**)

- * Water absorption of the tiles: **Less than 10 %**
- * Type of test performed: **With immersion.**
- * Number of test specimens: **Five.**
- * Number of test specimens with visible defects: **Not - one.**
- * Observation: The tiles tested are free from visible defects.



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DETERMINATION OF FROST RESISTANCE

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 12:1997**)

* Number of tiles tested: **Ten.**

* Method used to impregnate the tiles: **Impregnation with water at pressure below of the atmospheric pressure.**

* The initial water content before the freeze-thaw test: **$E_1 = 3.9 \% \pm 0.3 \%$ (k=2)**

* The final water content after the freeze-thaw test: **$E_2 = 4.0 \% \pm 0.3 \%$ (k=2)**

* Number of damaged tiles after 100 cycles: **Not-one.**

* Description of defects after the freeze-thaw test: The tiles tested are free from visible defects.



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DETERMINATION OF CHEMICAL RESISTANCE

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 13:2017**)

* Testing method: Contact with the test surface.

<u>Test solutions</u>	<u>Classification</u>			<u>Visual Changes</u>
	<u>Specimen n°</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	
* <u>Household chemicals</u> - Ammonium Chloride (100 g/l)	A	A	A	No visible effects. Lines pencil removed
* <u>Swimming pool salts</u> - Sodium Hypochlorite (20 mg/l)	A	A	A	No visible effects. Lines pencil removed
* <u>Acids and Alkalis (Low concentrations)</u> - Hydrochloric Acid (3% v/v)	LA	LA	LA	No visible effects. Lines pencil removed
- Citric Acid (100 g/l)	LA	LA	LA	No visible effects. Lines pencil removed
- Potassium Hydroxide (30 g/l)	LA	LA	LA	No visible effects. Lines pencil removed
* <u>Acids and Alkalis (High concentrations)</u> - Hydrochloric Acid (18% v/v)	HA	HA	HA	No visible effects. Lines pencil removed
- Lactic Acid (5% v/v)	HA	HA	HA	No visible effects. Lines pencil removed
- Potassium Hydroxide (100 g/l)	HA	HA	HA	No visible effects. Lines pencil removed



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Test report n°: 57.275
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 Petitioner: TERRAKLINKER
 Date: 19/12/2018

DETERMINATION OF RESISTANCE TO STAINS

DESCRIPTION OF THE SAMPLE.-

Natural extruded ceramic tiles (split tiles), 330 mm x 330 mm, unglazed. Ref.:

-- **PAVIMENTO 33x33 NATURAL** --

Code laboratory: 336-18

RESULTS.- (Test performed after **UNE-EN-ISO 10545 Part 14:2015**)

* Number of test specimens used with each test solution: FIVE.

<u>Staining Agents</u>	<u>Cleaning Procedure</u>	<u>Class</u>	<u>Observations</u>
* <i>Stains having tracing action (Pastes).</i> - Green staining agent in light oil	- Running hot water for five minutes. (Procedure A).	5	Stain removed.
* <i>Stains having chemical / oxidizing action</i> - Iodine alcohol solution	- Running hot water for five minutes. (Procedure A).	5	Stain removed.
* <i>Stains having filming action</i> - Olive oil	- Running hot water for five minutes. (Procedure A).	5	Stain removed.

* Observations: The chromium oxide used as green staining agent have a grain size less than 80 microns, being the 50 % (m/m) of theirs down on 3 microns.
