



EN 12326-1:2014

Commercial document issued by: LBS, Sheepwalk Road, Lisburn. BT28 3RD.

Location of the Quarry: Minas Gerais, Brazil

This document records the conformity of the product described below and is incomplete without the explanation of the meaning of the test results and the requirements of EN 12326-1:2014. The tests referred to and the criteria are contained in EN 12326-1:2014 & -2:2011

Date Issued: Sep- 14

Date of Sampling: Jun-Jul- 14

Date of Testing: Sep- 14

Product description & commercial name:

Rio Graphite Natural Roofing
Slate 50x25cm

Conformity

1) DIMENSIONAL TOLERANCES

| | | | |
|--|---|------|------------|
| Format | Rectangular | | |
| Deviation from declared Length | < +/- 5mm | | PASS |
| Deviation from declared Width | < +/- 5mm | | PASS |
| Deviation from squareness | < +/- 1% | | PASS |
| Deviation from Straightness of Edges | Length ≤ 500mm = ≤ 5mm deviation Length > 500mm = ≤ 1% deviation | 0.3% | PASS |
| Slate Type for Deviation from Flatness | | | FLAT (7mm) |
| Deviation from Flatness | < 1.0% | | PASS |

2) THICKNESS

| | | |
|---------------------------------|--------------------------|------|
| Nominal Thickness and Variation | +/- 5mm Decl. +/- 35% | PASS |
|---------------------------------|--------------------------|------|

3) STRENGTH

| | | | | | |
|----------|---------------------------|-------------------|-------|---------------------|-------|
| Strength | Characteristic MOR | <i>Transverse</i> | 55MPa | <i>Longitudinal</i> | 52MPa |
| | Mean Failure Load | <i>Transverse</i> | 593N | <i>Longitudinal</i> | 562N |

4) WATER ABSORPTION

| | | |
|------------------|-------|----|
| Water absorption | 0.36% | W1 |
|------------------|-------|----|

5) FREEZE THAW

| | | |
|--|--------------|----|
| | Not Required | NR |
|--|--------------|----|

6) THERMAL CYCLE TEST

| | | |
|--|----|------|
| | T1 | PASS |
|--|----|------|

7) CALCIUM CARBONATE CONTENT

| | | |
|--|-------|------|
| | 1.09% | PASS |
|--|-------|------|

8) SULPHUR DIOXIDE EXPOSURE

| | | |
|--|-------|----|
| | < 20% | S1 |
|--|-------|----|

9) NON CARBONATE CARBON CONTENT

| | | |
|--|-------|------|
| | 0.09% | PASS |
|--|-------|------|

10) EXTERNAL FIRE PERFORMANCE

| | | |
|--|-------------------|------|
| | Deemed to Satisfy | PASS |
|--|-------------------|------|

11) REACTION TO FIRE

| | | |
|--|----------------------|------|
| | Deemed to Satisfy-A1 | PASS |
|--|----------------------|------|

12) RELEASE OF DANGEROUS SUBSTANCES

| | | |
|--|--|------|
| | | NONE |
|--|--|------|

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| | | | | | | |
|---|---|---|---------------------|----------------|-------------------|---------------------|
| Date of sampling & testing | If more than one date is applicable to sampling or testing they should be indicated against individual test results. | | | | | |
| Product description | Slate for roofing and external cladding or carbonate slate for roofing and external cladding. | | | | | |
| 1. Dimensional tolerances | | | | | | |
| Length & Width | Maximum Deviation ± 5mm | | | | | |
| Deviation from squareness | Maximum Deviation ± 1% of the length | | | | | |
| Deviation from straightness of edges | Slate length ≤ 500mm permitted deviation ≤ 5mm | | | | | |
| | Slate length > 500mm permitted deviation ≤ 1% of the length | | | | | |
| Flatness: The limits of deviation from the flatness are defined for 4 types of slate. The bevelled edges shall be applied to the convex face. Slates with deviation from flatness in excess of the limit may be used for special applications. | SLATE TYPE | Maximum deviation from flatness as a % of slate length | | | | |
| | Very smooth | < 0.9 | | | | |
| | Smooth | < 1.0 | | | | |
| | Normal | < 1.5 | | | | |
| Textured | < 2.0 | | | | | |
| 2. Thickness: | The basic nominal thickness is determined as a function of the bending strength using the equations given in 3, local climate conditions and traditional construction techniques. The basic nominal thickness is increased in relation to the slates performance in the appropriate sulphur dioxide test (if required) as shown in 7 and 8 below. | | | | | |
| 3. Strength | Longitudinal and transverse bending strength and modulus of rupture; there is no limit for bending strength or modulus. However, the basic nominal thickness is determined as a function of the bend strength using the equations given below, local climate conditions and traditional construction techniques. | | | | | |
| $e_l = X \sqrt{\frac{l}{R_{cl}}}$ $e_t = X \sqrt{\frac{b}{R_{ct}}}$ | <p>Where</p> <p>e_l is the longitudinal thickness, in millimetres (mm);</p> <p>e_t is the transverse thickness, in millimetres (mm);</p> <p>l is the length of the slate, in millimetres (mm);</p> <p>b is the width of the slate, in millimetres (mm);</p> <p>R_{cl} is the characteristic longitudinal modulus of rupture in Megapascals (Mpa);</p> <p>R_{ct} is the characteristic transverse modulus of rupture in Megapascals (Mpa);</p> <p>X is a constant determined as a function of climate and the traditional construction techniques, (in N112:2000 ½). Note – it may be different for each formula and is selected for the country of use according to the table below.</p> | | | | | |
| <i>National factors X</i> | Country | Transverse | Longitudinal | Country | Transverse | Longitudinal |
| | Belgium | 1.35 | 1.35 | Italy | 1.2 | 1.2 |
| | France | 1.25 | 1.4 | Spain | 1.2 | 1.2 |
| | Germany | 1.2 | 1.2 | UK | 0.9 | 1.1 |
| <p>e_l and e_t are determined by using the length l and the width b of the slates. The maximum value determined is the basic individual thickness of the slate, e_{bi}. The basic individual thickness is increased in relation to the slates performance in the appropriate sulphur dioxide test as shown in 7) and 8) below.</p> | | | | | | |
| 4. Water Absorption | Code W1 (≤ 0.6), W1 (> 0.6) or W2 | | | | | |

| | | | |
|---|--|---|--|
| 5. Freeze-thaw test: | Tested slates indicate the mean value of modulus of rupture after 50 cycles in transverse and longitudinal directions before and after the freeze/thaw test, if relevant, (test (if $W1 > 0.6$)), or not required.) | | |
| 6. Thermal Cycle Test : The following table explains the meanings of the test codes: | | | |
| Code | Observation in test | Conformity to the standard | |
| T1 | No changes in appearance. Surface oxidation of metallic minerals. Colour changes that neither affect the structure nor | Acceptable | |
| T2 | Oxidation or appearance changes of the metallic inclusions with runs of discolouration but without structural changes. | Acceptable | |
| T3 | Oxidation or appearance changes of metallic minerals which penetrate the slate and risk the formation of holes. | Acceptable subject to the note below. | |
| NOTE: It is best only to use slates within code T3, which potentially may result in water penetration selectively with suitable methods of construction that avoid such penetration. Slates showing exfoliation splitting or other structural changes in this test are not acceptable. | | | |
| 7. Apparent calcium carbonate content: There is no such limit on apparent calcium carbonate content. However, the apparent calcium carbonate content determines which sulfur dioxide exposure test procedure should be carried out and, together with the strength, the minimum nominal thickness of the product. If the carbonate content is less than or equal to 20% then the sulfur dioxide exposure test procedure in EN 12326-2:2011, 14.1, applies. If the carbonate content is more than 20%, the sulfur dioxide exposure test procedure in EN 12326-2:2011, 14.2 applies. The minimum thickness is calculated using the table below | | | |
| 8. Minimal nominal thickness in relation to apparent calcium carbonate content and sulfur dioxide exposure code. | | | |
| Carbonate content (%) | SO₂ exposure test code from EN 12326-2:2011, 14.1 | Depth of softened layer from EN 12326-2:2011, 14.2 | Thickness adjustment |
| ≤5.0 | S1 | | None |
| | S2 | | ebi + 5% |
| | S3 | | ebi ≥8.0 mm or switch to the test in EN 12326-2:2011, 14.2 |
| >5.0 ≤20.0 | S1 | | ebi + 5% |
| | S2 | | ebi+10% |
| | S3 | | ebi ≥ 8.0mm or switch to the test in EN 12326-2:2011, 15.2 |
| >20.0 | | 0mm to 0.70mm | ebi + 0.50 mm + 7t ² |
| <i>ebi is the basic individual thickness obtained from 3 above (in mm). t is the thickness of the softened layer obtained from EN 12326-2:2011, 14.2 (in mm).</i> | | | |
| 9. Non-carbonate content: The non-carbonate carbon content should be less than 2%. | | | |

CE Marking

Lagan Building Solutions Ltd (LBS) products conform to the requirements of the CE mark. The following table provides the necessary information required to demonstrate conformity of RIO GRAPHITE roofing slate



Lagan Building Solutions Ltd, 11B Sheepwalk Road, Lisburn. Co Antrim. BT28 3RD.

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Roofing and external cladding slate

| | | | | | |
|---------------------------------------|--------------------|--|-------|--------------|-------|
| Dimensions and dimensional variation | | Complies (deviation: $\pm 5\text{mm}$) | | | |
| Nominal thickness and variation | | 7.0mm ($\pm 35\%$) | | | |
| Mechanical Resistance | Characteristic MoR | Transverse | 55MPa | Longitudinal | 52MPa |
| | Mean failure load | Transverse | 593N | Longitudinal | 562N |
| Water Permeability – water absorption | | Complies <math>< 0.36\%</math> | | | |
| Carbonate content | | $\leq 5\%$ | | | |
| Durability water absorption | | Complies <math>< 0.36\%</math> | | | |
| Durability Freeze thaw cycling | | Not required | | | |
| Durability thermal cycling | | Complies with code T1 | | | |
| Durability sulphur dioxide exposure | | Complies with code S1 | | | |
| Durability non-carbonate carbon | | Complies:<math>< 2\%</math> | | | |
| Release of dangerous substances | | None in conditions as roofing or external cladding | | | |
| External fire performance | | Deemed to satisfy | | | |
| Reaction to fire | | Deemed to satisfy class A1 | | | |