Burlington Slate Ltd
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EN 12326-1:2004			
Number of this commercial document	WGS001	Date of issue	October 2013
Commercial document issued by; *Burlington Slate Ltd, Cavendish House, Kirkby-in-Furness, Cumbria LA17 7UN*			
Location of the mine or quarry: *Elterwater, Langdale Valley, Cumbria, United Kingdom*			
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 12326-1:2004. The tests referred to and the criteria are contained in EN 12326-1:2004 & -2:2000			
Date of Sampling	June 2013	Date of Testing	June 2013

Product Description & Name	Westmorland Green Roofing Slate, Strong Grade				Conformity
1 Dimensional tolerances:					
Format				Rectangular	
Deviation from declared length				± 2.0 mm	YES
Deviation from declared width				± 2.0 mm	YES
Deviation from declared squareness				0.4 %	YES
Deviation from straightness of edges				≤ 1%	YES
Slate type for deviation from flatness	Very Smooth	Smooth (Best)	Normal (Strong)	Textured (Extra Strong)	
Deviation from flatness			0.6		YES
2 Thickness:					
Slate type for packed thickness calculation	Very Smooth	Smooth (Best)	Normal (Strong)	Textured (Extra Strong)	
Nominal thickness and variation			7-15mm		YES
3 Strength:					
Characteristic MoR	Transverse	28MPa	Longitudinal	30MPa	
Mean failure load	Transverse	1500N	Longitudinal	1950N	
4 Water absorption:				0.3%	YES
5 Freeze thaw:				Not required	
6 Thermal cycle test:				**T1**	YES
7 Carbonate content:				17.5%	YES
8 Sulfur dioxide exposure test <20% carbonate				**S1**	YES
8 Sulfur dioxide exposure test >20% carbonate					
9 Non-carbonate carbon content				0.1%	YES
10 External fire performance	Deemed to satisfy				YES
11 Reaction to fire	Deemed to satisfy			**Class A1**	YES
12 Release of dangerous substances	None in conditions of use as roofing or external cladding				YES

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Date of sampling and testing	If more than one date is applicable to sampling or testing they should be indicated against the individual test results
Product description	Slate for roofing and external cladding or carbonate slate for roofing and external cladding
1 Dimensional tolerances	
Length and width	Maximum deviation ± 5 mm
Deviation from squareness	Maximum deviation ≤ ± 1 % of the length
Deviation from straightness of edges	Slate length ≤ 500 mm Permitted deviation ≤ 5 mm. Slate length > 500 mm Permitted deviation ≤ 1 % of the length

Flatness: The limits of deviation from flatness are defined for four types of slate. The beveled 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 the slate length.
Very smooth	< 0,68
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 below, local climate conditions and traditional construction techniques. The basic nominal thickness is increased in relation to the slate's performance in the appropriate sulfur dioxide test (if required) as shown in 7 & 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.

$$e_l = X\sqrt{\frac{b}{R_{cl}}}$$

$$e_t = X\sqrt{\frac{b}{R_{ct}}}$$

Where
ecl is the longitudinal thickness, in millimeters (mm);
ect is the transverse thickness, in millimeters (mm);
l Is the length of the slate, in millimeters (mm);
b is the width of the slate, in millimeters (mm);
Rcl is the characteristic longitudinal modulus of rupture in mega Pascals (MPa);
Rct is the characteristic transverse modulus of rupture in mega Pascals (MPa)
X is a constant determined as a function of climate and the traditional construction techniques in root Newton millimeters (N½.mm½). It may be different for each equation and is selected for the country of use according to the table below

National Factors: X

Country	Transverse	Longitudinal	Country	Transverse	Longitudinal
Belgium	1,35	1,35	Italy	1,2	1,2
France	1,25	1,40	Spain	1,2	1,2
Germany	1,2	1,2	UK	0,9	1,1

Those countries that have not declared a national value should select a value or a pair of values in relation to their countries climate and traditional construction techniques. It should not be less than the minimum value or pair of values given above.

el and *et* 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, *ebi*. The basic individual thickness is increased in relation to the slates performance in the appropriate sulfur dioxide test as shown in 7 and 8 below. For a significant difference between the longitudinal and transverse modulus of rupture the *t*-statistic is greater than 2,021.

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4 Water Absorption

The water absorption of slates shall not exceed 0, 6 % unless they can satisfy the requirements of the freeze-thaw test.

5 Freeze-thaw test

Slates with a water absorption greater than 0, 6 % shall show no significant reduction in bending strength using a one-sided Student's t test at the 2, 5 % significance level. (Slates with water absorption of 0, 60 % or less are not required to undergo a freeze-thaw test).

6 Thermal Cycle Test

The following table explains the meaning of the test codes:

Code	Observation in the test	Conformity to the standard
T1	No changes in appearance. Surface oxidation of metallic minerals. Colour changes that neither affect the structure nor form runs of discolouration	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 Slates within Code T3, which potentially may result in water penetration should only be used 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 Carbonate content

There is no limit on carbonate content. However, the 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 20 % then the sulfur dioxide exposure test procedure in EN 12326-2:2000, 15.1 applies. If the carbonate content is 20 % or more, the sulfur dioxide exposure test procedure in EN 12326-2:2000, 15.2 applies. The minimum thickness is calculated using the table below.

8 Minimum nominal thickness in relation to carbonate content and sulfur dioxide exposure code

Carbonate Content %	SO2 exposure test code from EN 12326-2:2000, 15.1	Depth of softened layer from EN 12326-2:2000, 15.2	Thickness adjustment
≤ 5,0	S1		None
	S2		*ebi* + 5 %
	S3		*ebi* ³ 8.0 mm or switch to the test in EN 12326-2:2000, 15.2
>5,0 < 20,0	S1		*ebi* + 5 %
	S2		*ebi* + 10 %
	S3		*ebi* ³ 8.0 mm or switch to the test in EN 12326-2:2000, 15.2
> 20,0		0 - 0,70 mm	*ebi* + 0,50 mm + 7 t2

ebi is the basic individual thickness in mm obtained from 3 above in millimeters
t is the thickness of the softened layer obtained from EN 12326-2:2000, 15.2 in millimeters

9 Non-carbonate carbon content

The non-carbonate carbon content shall be less than 2 %.