Stone mtg Initiatives
the stone quality & care specialist

NATA Accreditation to ISO17025

24 August 2011

Bellstone & Slate Pty Ltd
8 Bond Crescent
WETHERILL PARK NSW 2164

Attention: Mr. Sandy Yeates

Testing of Tapco Slate

– Reporting of deemed-to-satisfy requirements

CLIENT REFERENCE	Request S. Yeates
OUR REFERENCE	BEL0711-2
INVESTIGATING OFFICER	James P. Mann & Graham Baggs
REPORT PREPARED BY	James P. Mann

James P Mann
Laboratory Manager

Stone Initiatives + Materials Testing Group Pty Ltd
P.O. Box 906
(1 Pitt Lane, Mount Barker Road)
Littlehampton
South Australia 5250

Web: www.stonemtg.biz

ABN: 82 462 051 744
ACN: 106 166 296

Phone: +61 8 83916844
Fax: +61 8 83916855
Mobile: 0400 251 020
Email: info@stonemtg.com.au

1. INTRODUCTION & SCOPE

A request was received from the client to evaluate samples of Tapco Slate shingles that were considered representative of supply. The aim of the evaluation was to determine if the samples were deemed to satisfy the performance requirements of Australian Standard AS2049-2002 "Roof Tiles".

This report aims to summarize all relevant testing performed on the product and satisfy the requirements of Section 1.2 "Acceptance of Design and Construction" of the Australian Building Codes Board requirements.

2. PRODUCT DESCRIPTION

Tapco Slate is produced by Inspire Roofing Products and is described as a synthetic roofing slate (look-alike) shingle produced from "…an exclusive 100% recyclable blend of virgin resins and natural limestone that has been compression-moulded"[1].

3. TEST PROGRAM

The report covers the performance, marking and workmanship requirements of AS 2049-2002 as below:

- Materials Marking
    - Surface Treatments
- Design and Dimensions
    - Dynamic weather resistance
    - Dimensional Tolerances
    - Permitted Distortion
    - Batten Lugs and Squareness
- Workmanship and Finish
- Provision for Fixing
- Performance Requirements
    - Transverse Breaking Load
    - Water Absorption
    - Permeability
    - Freeze/thaw
    - Resistance to Salt Attack
- Marking

Although the deemed-to-satisfy provisions laid out in AS2049 do not include an evaluation of the Fire Resistance Level (FRL) or accelerated weathering for this product, its performance against these parameters has also been evaluated and included within the report

A range of performance test reports prepared by other independent laboratories were provided by the client that in part provide evidence of satisfactory performance. These results are included within the report where appropriate.

[1] As quoted by the manufacturer.

3. RESULT SUMMARY

Results are summarised in the table below; full test data are detailed in Appendix A and B of this report.

Property	Tapco Slate Performance	AS 2049-2002 Roof Tile Specification
Materials		
Surface Treatments	No surface treatment used.	No objectionable taste colour or odour from surface treatments.
Design and Dimensions		
Dynamic weather resistance	No water infiltration @ 44m/sec.	No water infiltration allowed @ 16m/sec wind speed.
Dimensional Tolerances		
Width	0.3%	±2% (max)
Length	0.2%	±2% (max)
Permitted Distortion		
Plain Tiles	1 mm	3 mm (max)
Batten Lug Squareness	No lugs used within design	Not applicable
Workmanship and Finish	No defect affecting function were found.	Free from defects affecting function.
Provision for Fixing	Not applicable	Applicable to concrete and terracotta tiles only.

The summary of the performance results for Tapco Slate is continued below.

Property	Tapco Slate Performance	AS 2049-2002 Roof Tile Specification
Performance Requirements		
Transverse Breaking Load	4.1 N/mm	4 N/mm exposed width (mean, min)
Water Absorption	0.3%	10% (max)
Permeability	No water visible on underside of tile.	No water on underside of tile allowed.
Freeze/thaw	No loss or damage after 350 cycles.	No significant loss after 5 cycles.
Resistance to Salt Attack	< 0.1 gram loss, no damage after 40 cycles.	<0.4 gram loss after 40 cycles.
Marking	Tiles marked with manufacturer's name, colour and manufacture date.	Clearly and permanently marked with manufacturer's details.
Fire Resistance [2]		
Flame Spread (Class A)	3ft 10 inches – no flaming of deck underside	6 foot (max spread)
Flame Spread (Class C)	5ft 7.5 inches – no flaming of deck underside	13 foot (max spread)
Accelerated Weathering[3]		
UV exposure (2000hrs)	Maximum 8.1% reduction in tensile strength Maximum 20.6% reduction in elongation	- -

[2] Fire Resistance presented as additional performance evaluation. Not part of AS 2049.
[3] Accelerated weathering is presented as additional performance evaluation. Not part of AS 2049.

4. EVALUATION

Results of the evaluation are summarised below with supporting documentation presented in Appendices A and B of this report.

4.1 Surface Treatments

The Tapco Slate shingles are produced from a resin / crushed limestone composite without the application of a surface treatment. The tiles are therefore considered inert and free of any surface treatment which may impart to rainwater, which may be collected from the roof, any objectionable taste, colour or odour of any element or chemical in a concentration known to be hazardous to health.

Technical bulletin 3-07 prepared by the manufacturer states that the "…tiles will not react adversely when exposed to acids, bases and salts".

4.2 Dynamic Weather Resistance

4.2.1 Wind-driven Rain

The results of a wind load performance test are presented in Technical Bulletin 4-07R prepared by the manufacturer as well QAI report T615-2. The report states the tiles have been tested and have passed all requirements in accordance with Miami-Dade County Protocol TAS 100-95 "Test Procedure for Wind driven Rain Resistance of Discontinuous Roof Systems". The protocol is designed to test roofing products at wind speeds equivalent to 110 mph (~176 km/hr).

The 100mph (44 m/sec) wind speed used within test protocol TAS 100-95 can be compared to the wind speed of 16m/sec used within the Australian Standard AS 4046.9 "Methods of testing roof tiles Method 9: Determination of dynamic weather resistance".

The test result for the tiles tested to the TAS 100-95 protocol is summarised as "No water infiltration through sheathing. No tiles blew off, tore or blew upward".

4.2.2 Hail Impact

The Tapco Slate tiles were also tested by a third party (Intertek) according to Class A and C of UL 2218 "Impact Resistance of Prepared Roof Covering Materials". The test involves mounting the tiles on a test deck and repeatedly dropping a 2 inch diameter (~50mm) stainless steel ball weighing 1.18lbs (~535 grams) onto the tile from a height of 20 feet (~6.1 metres) at six different impact locations. Following the test the condition of the tile is examined at 5X magnification.

The test report states that there was no visible depression, testing, cracking, splitting or crazing in any of the test sites.

4.2.3 Summary

Based on the wind load and hail impact performance test carried out, the Tapco Slate tiles can be deemed to satisfy the dynamic weather resistance requirements for roof tiles.

4.3 Dimensional Tolerances

Section 5.2 of AS2049 states a requirement that the length and exposed width of the tiles shall be within ±2% of the manufacturer's nominated dimensions.

Results

Full test data is presented in Appendix A. The maximum variation of the twelve tiles examined was 0.3%. The Tapco Slate tiles can be deemed to satisfy the dimensional tolerance requirements of Section 5.2 of AS2049:2002 for roof tiles.

4.4 Permitted Distortion

Section 5.3 of AS2049 allows a maximum distortion gap of 3mm between adjacent plain tiles (as measured at the top, bottom and both sides).

Results

Full test data is presented in Appendix A. Taking into account the design gap between tiles in the same row, the maximum gap was found to be 1mm[4]. The Tapco Slate tiles can be deemed to satisfy the distortion requirements of Section 5.2 of AS2049:2002 for plain roof tiles.

4.5 Batten Lugs and Squareness

Section 5.4 of AS2049 states that "where the design of the tile requires batten lugs, one or more shall be provided on the underside of each tile such that they engage over the upper edge of the tiling battens to provide for the horizontal alignment and vertical restraint of tiles when fixed".

Tapco Slate tiles do not include batten lugs within there design as they are fixed directly onto a plywood (or similar) deck. Horizontal alignment is facilitated by V-shaped tabs on each side of the tile. Vertical restraint is provided by nailing directly onto the deck substrate.

4.6 Workmanship and Finish

The surface of twenty tiles was examined and found to be free from defects, irregularities or excrescences that would detract from the function of the completed roof, as specified in Clause 5.1

Based on the inspection carried out, the Tapco Slate tiles can be deemed to satisfy the workmanship and finish requirements of Section 6 of AS2049:2002 for roof tiles.

4.7 Provision for Fixing

Section 7 of AS2049 states a requirement that "All concrete and terracotta roofing tiles and accessories shall be capable of being fixed in accordance with AS 2050 and have a fixing system designed to meet the appropriate loading requirements of AS 1170.2 or AS 4055".

Tapco Slate tiles are not manufactured from concrete of terracotta therefore can be considered exempt from this clause. The tiles do clearly indicate two locations where nails are to be placed when fixing the tiles.

[4] Rounded to the nearest mm.

4.8 Transverse Breaking Load

Section 8.2 of AS2049 requires the transverse breaking load of the tiles to be determined in accordance with AS 4046.3 "Methods of testing roof tiles Method 3: Determination of transverse strength". The loading span is determined by the spacing of the battens normally used to fix the tiles. In this case the tiles are fixed to a decking material which as a minimum is specified as "0.5 inch plywood deck or equal".

As battens are not used to fix the tiles it is not possible to test the tiles completely in exact accordance with the test method. As an alternative, the tiles were tested with the 190 mm span presented by the nail fixing points of overlapping tiles with a tile exposure of 7.5 inches.

A tile was nailed to the fixing support battens along with another tile fixed at the maximum exposure[5] to simulate standard installation. Load was applied through a batten at mid-span to determine the maximum load at fracture.

Results

Section 8.2 of AS2049 states a requirement that "the average transverse breaking load for the six test specimens shall be not less than 4 N per millimetre of exposed width for all tiles. Additionally, the transverse breaking load for each of the individual test specimens shall be not less than 3.325 N per millimetre of exposed width for all tiles".

The tiles did not fracture under load although significant deflection (120° deflection) did occur with the tile regaining most of its original shape once unloaded. The tiles achieved a maximum average transverse breaking load of 4.1 N/mm exposed width with an individual minimum of 3.8 N/mm of exposed width.

Based on the testing carried out, the Tapco Slate tiles can be deemed to satisfy the transverse breaking load requirements of Section 8.2 of AS2049:2002 for roof tiles.

4.9 Water Absorption

Section 8.3 of AS2049 states "When roof tiles or accessories are tested in accordance with AS 4046.4, the percentage of water absorption of any test pieces shall be not more than 10% for tiles graded as 'General Purpose'".

Results

The mean water absorption of the six tiles tested was found to be 0.3% by weight absorption.

Based on the testing carried out, the Tapco Slate tiles can be deemed to satisfy the water absorption requirements of Section 8.3 of AS2049:2002 for roof tiles.

[5] 7.5 inches exposure (as marked) of the bottom tile.

4.10 Permeability

Section 8.4 of AS2049 requires the transverse breaking load of the tiles to be determined in accordance with AS 4046.5 “Methods of testing roof tiles Method 3: Determination of permeability”. In the test a tile is used as the bottom of a container holding 50mm of water for a period of two hours to ascertain if water penetrates to the underside of the tile”.

Results

Section 8.4 of AS2049 states a requirement that “at the end of 2 hours, no drop of water shall have formed on the underside of any of the specimens”.

On completion of testing there was no sign of moisture on the underside of any of the three tiles tested.

4.11 Freeze/thaw

Section 8.5 of AS2049 requires the freeze/thaw resistance of the tiles to be determined in accordance with AS 4046.6 “Methods of testing roof tiles Method 3: Determination of resistance to freeze-thaw”. The method involves cycling the samples from -20°C to 20°C. The standard states that “each tile shall endure a minimum of five complete freeze/thaw cycles without significant loss of particles”.

According to the CCMC report (see Appendix A) a freeze-thaw test was carried out on the Tapco Slate Tiles in accordance with ASTM C666 which involves cycling the product from 4°C to -18°C for 350 cycles.

Results

The CCMC report states that the Tapco Slate tiles withstood 350 cycles without any sign of cracking or damage.

The ASTM C666 test procedure has a similar temperature range requirement but is more prolonged than the Australian Standard. Based on the test results supplied, the Tapco Slate tiles can be deemed to satisfy an equivalent freeze-thaw requirement to Section 8.5 of AS2049:2002 for roof tiles.

4.12 Resistance to Salt Attack

Section 8.6 of AS2049 requires the salt attack resistance of the tiles to be determined in accordance with AS 4046.7 “Methods of testing roof tiles Method 3: Determination of resistance to salt attack”. The method involves cycling the samples through a salt solution followed by overnight drying. The standard requires that the sample must have a weight loss of less than 0.4 grams after 40 cycles to be considered to suitable for Exposure grade.

Results

On completion of the salt attack resistance testing the Tapco slate tile specimens gave a weight loss of less than 0.1 grams and did not show any sign of decay, colour loss or any other change which may affect performance. Based on the test results the tiles can be considered suitable for Exposure grade.

4.13 Marking

Section 9 of Australian Standard AS2049-2002 states that "Each tile shall be clearly and permanently marked with the manufacturer's name, trade name or brand". Inspection of a batch lot of tiles revealed the following details:

- Manufacturer's name: Inspire Roofing Products
- Manufacturer's website: www.inspireroofing.com
- Colour batch: 705
- Part Number: 010207 CAV #24
- Manufacturing date (month / year): 6/11

Typical permanent markings on the tiles are shown in Plates 1 and 2 below.

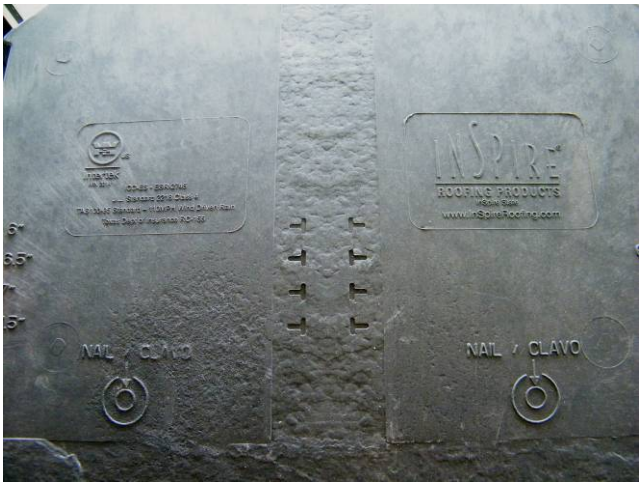


Plate 1: Front view of tile showing manufacturer's details. Note fixing locations.

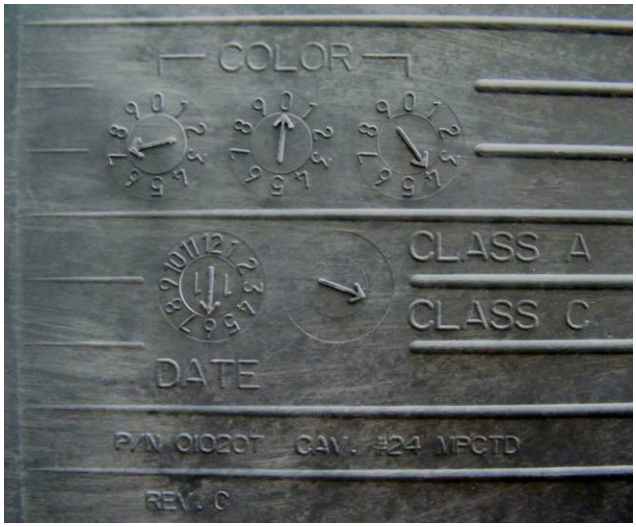


Plate 2: Rear view of tile showing manufacturing date and colour batch details.

Based on the markings on the samples supplied, the Tapco Slate tiles can be deemed to satisfy the Marking requirements of Section 9 of AS2049:2002 for roof tiles.

4.14 Fire Resistance

Fire resistance does not form part of AS2049:2002 but has been included to provide additional information on performance and fitness for purpose. The tiles were tested by Intertek in accordance with ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"* for Spread of Flame, Intermittent Flame, and Burning Brand tests for Class A and C fire ratings.

The test methods provide a basis for relative comparison of roof coverings including simulated fire exposure to the outside of the roof coverings. The test methods measure the surface spread of flame and the ability of the roof covering material or system to resist fire penetration from the exterior to the underside of a roof deck under the conditions of exposure. The methods also provide criteria to determine if the roof covering material will develop flying burning material (flying brands) when subjected to a 5.3 metre/second wind during the simulated fire exposure tests.

Results

The results of the Fire resistance tests are summarised below.

Test	Acceptance Level Class A	Acceptance Level Class C
Spread of Flame	Max spread 3ft 10 inch (6ft spread allowable)	Max spread 5ft 7.5 inch (13ft spread allowable)
Intermittent Flame	No flaming of underside of deck	No flaming of underside of deck
Burning Brand	No flaming of underside of deck	No flaming of underside of deck

The testing carried out by Intertek shows that the Tapco (Inspire) Slate tiles comply with the ASTM E108 requirements for both Class A and C fire ratings.

4.15 Accelerated Weathering

Accelerated weathering by exposure to ultraviolet radiation does not form part of AS2049:2002 but has been included to provide additional information on performance and fitness for purpose. Representative sections of the tiles were tested by Intertek and were subjected to 2000 hours of UV exposure from a xenon arc light source in accordance with ASTM G155-05a "Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials".

Following exposure the tensile strength and elongation of the specimens was determined and compared to a set of control (not exposed) specimens.

Results

According to the Intertek report the samples of Tapco Slate tiles tested did not show any signs of cracking, crazing, chalking, pitting or discolouration after the 2000 hours UV exposure. Results of the tensile tests are summarised below and presented in full with Appendix B.

Test	Acceptance Level Class A	Acceptance Level Class C
Tensile Strength (after exposure)	14.5 MPa 8.1% reduction compared to control	16.5 MPa 8.1% reduction compared to control
Elongation (after exposure)	8.3% 20.6% reduction compared to control	8.3% 13.0% reduction compared to control

5. CONCLUSION

A review of testing documentation carried out by other independent laboratories along with additional testing carried out by Stone Initiatives has shown that the Tapco Slate tiles produced by Inspire Roofing Products comply with the relevant sections of AS 2049:2002 with regards to:

- performance, fit and finish;
- quality of materials; and
- quality of the finished product.

Due to the design of the tiles it was not possible to carry out the Transverse Breaking Load test in strict accordance with the standard requirements. The modified test method does indicate a general compliance with the standard loading requirements without the additional support provided by the underlying decking.

It is considered that this evaluation report shows the suitability of Tapco Slate tiles for use in building construction. Based on this evaluation the Tapco Tile product tested is deemed to satisfy the Acceptance of Design and Construction requirements as set out by the Australian Building Codes Board.

Appendix A

Test Data

Stone mtg Initiatives
Testing and Consulting - from the ground up

ASTM INTERNATIONAL MEMBER

Maximum Distortion
TEST CERTIFICATE

TEST METHOD: AS 4046.1-200 & AS 2049-2002
TEST DATE: 10-Aug-11
CLIENT: Belstone & Slate Pty Ltd
OUR REF : BEL0711-2

SAMPLE: Tapco Pewter Grey composite roof tile
Manufacture Date: May-11

SPECIMEN (Work) SIZE: 445 x 305 x 6 mm

Specimen Identification	Gap Above (Nearest mm)	Gap Below (Nearest mm)	Gap Left (Nearest mm)	Gap Right (Nearest mm)	Variation from Spec (6.4mm)	Max Gap (Distortion)
O217/6	0	0	7	6	0.6	1
O217/7	0	0	7	7	0.6	1
O217/8	1	0	6	6	0.4	1
O217/9	1	0	7	7	0.6	1
O217/10	0	0	7	6	0.6	1
O217/11	0	0	6	6	0.4	0
O217/12	1	0	7	6	0.6	1
O217/13	0	1	6	7	0.6	1
O217/14	0	0	6	6	0.4	0
O217/15	0	1	7	6	0.6	1
O217/16	0	0	6	6	0.4	0
O217/17	1	0	7	6	0.6	1

COMMENTS (Including variations to procedure):
The tiles are designed by the manufacturer to be installed with a side gap of 6.4mm, so distortions are reported as the difference between the actual gap in the test and the design standard.

Testing Officer: G Baggs

Approved Signatory:

Name: James P. Mann

Stone Initiatives Materials Testing Group Pty Ltd
P.O. Box 906
1 Pitt Lane, Mount Barker Road
Littlehampton
South Australia SA 5250

ABN 82 462 051 744
ACN 106 166 296
Phone +61 8 83916844
Fax +61 8 83916855
Email info@stonemtg.com.au

Stone mtg Initiatives
Testing and Consulting - from the ground up

ASTM INTERNATIONAL MEMBER

Design & Dimensional Accuracy
TEST CERTIFICATE

TEST METHOD: AS 4046.2-2002 & AS 2049-2002
TEST DATE: 10-Aug-11
CLIENT: Belstone & Slate Pty Ltd
OUR REF : BEL0711-2

SAMPLE: Tapco Pewter Grey composite roof tile
Manufacture Date: May-11

SPECIMEN (Work) SIZE: 445 x 305 x 6 mm

Nominated Exposed width: 293 mm
Nominated Length: 445 mm

Specimen Identification	Exposed Width (mm)	Length (mm)	Top-Bottom Difference (mm)	Variation in width %	Variation in length %	Thickness
O217/6	292	445	0.27	0.3	0.0	6
O217/7	293	445	0.12	0.0	0.0	6.2
O217/8	292	446	0.14	0.3	-0.2	6.2
O217/9	292	445	0.37	0.3	0.0	6.1
O217/10	293	445	0.09	0.0	0.0	6.2
O217/11	293	445	0.08	0.0	0.0	5.9
O217/12	293	445	0.19	0.0	0.0	6.4
O217/13	292	445	0.07	0.3	0.0	6.4
O217/14	293	445	0.07	0.0	0.0	6.5
O217/15	293	446	0.38	0.0	-0.2	5.5
O217/16	294	446	0.3	-0.3	-0.2	5.8
O217/17	294	446	0.08	-0.3	-0.2	5.6
		AVERAGE:	**0.18**	**0.1**	**-0.1**	**6.07**
			MAX Variation (%):	**0.3**	**0.2**	

COMMENTS (Including variations to procedure):

Testing Officer: G Baggs & K Tonkin

Approved Signatory:

Name: James P. Mann

Stone Initiatives Materials Testing Group Pty Ltd
P.O. Box 906
1 Pitt Lane, Mount Barker Road
Littlehampton
South Australia SA 5250

ABN 82 462 051 744
ACN 106 166 296
Phone +61 8 83916844
Fax +61 8 83916855
Email info@stonemtg.com.au

Stone mtg Initiatives
Testing and Consulting - from the ground up

ASTM INTERNATIONAL MEMBER

ABSORPTION & BULK SPECIFIC GRAVITY OF DIMENSION STONE

TEST CERTIFICATE

TEST METHOD: AS4046.4-2002
TEST DATE: 8/8/11 - 10/8/11
CLIENT: Belstone & Slate Pty Ltd
OUR REF : BEL0711-2

SAMPLE: Tapco Pewter Grey composite roof tile
QUARRY LOCATION: NA
SAMPLING LOCATION: Not known

SPECIMEN SIZE: 445 x 305 x 6.0mm
SPECIMEN PREPARATION METHOD: Soaked for 24 hours at 20 deg C

Test Number	Specimen Identification	Dried Mass (g)	Soaked Mass (g)	Absorption by Weight %
O1598	O217/6	710.37	712.16	0.25
O1599	O217/7	686.63	689.45	0.41
O1600	O217/8	702.73	704.22	0.21
O1601	O217/9	677.80	680.43	0.39
O1602	O217/10	699.93	701.77	0.26
O1603	O217/11	708.47	710.35	0.27
			AVERAGE:	**0.30**

COMMENTS (Including variations to procedure):

Testing Officer: G Baggs & K Tonkin

Approved Signatory:

Name: James P. Mann

Stone Initiatives Materials Testing Group Pty Ltd
P.O. Box 906
1 Pitt Lane, Mount Barker Road
Littlehampton
South Australia SA 5250

ABN 82 462 051 744
ACN 106 166 296
Phone +61 8 83916844
Fax +61 8 83916855
Email info@stonemtg.com.au

Stone mtg Initiatives
Testing and Consulting - from the ground up

ASTM INTERNATIONAL MEMBER

Determination of Transverse Strength

Test Method: AS4046-3
Client: Bellstone & Slate Pty Ltd
Job: BEL0711-2
Date: 16-Aug-11
Sample: Tapco Slate Composite Roof Tiles

Test Span: 190 mm

Sample Conditioning: Soaked for 24 hours at 20 Deg C

Specimen	Exposed Width (mm)	Maximum Load Applied (N)	Transverse Breaking Load N/mm
1 O217/18	290	1230	4.2
2 O217/19	290	1090	3.8
3 O217/20	290	1280	4.4
4 O217/21	290	1190	4.1
5 O217/22	290	1225	4.2
6 O217/23	290	1200	4.1
Avg:	**290**	**1203**	**4.1**

Remarks: Tiles reached a maximum load under load but did not fracture.

Tested by: G. Baggs **Aproved Signatory:**

Date: 16-Aug-11 **Name:** James P. Mann

Stone Initiatives Materials Testing Group Pty Ltd
P.O. Box 906
1 Pitt Lane, Mount Barker Road
Littlehampton
South Australia SA 5250

ABN 82 462 051 744
ACN 106 166 296
Phone +61 8 83916844
Fax +61 8 83916855
Email info@stonemtg.com.au

Stone mtg Initiatives
Testing and Consulting - from the ground up

ASTM INTERNATIONAL MEMBER

DETERMINATION OF RESISTANCE TO SALT ATTACK

Test Certificate

TEST METHOD	AS 4046.7-2002		
TEST DATE	24-Jul-11 to 23-Aug-11		
CLIENT	Bellstone & Slate Pty Ltd		
OUR REFERENCE	BEL0711-2		
SAMPLE	Tapco Pewter Grey composite roof tile		
SURFACE FINISH	As molded		
SAMPLE ORIGIN	Not Known		
SAMPLING DATE	Not Known	**SAMPLE LOCATION**	Not Known
NOMINAL SIZE	25x50x5 mm		
SOLUTION USED	Sodium Sulphate Solution		

Conditioning: Dried for minimum 48 hours @ 115 deg C

Test Number	Specimen Identification	Initial Mass (g)	Total Mass Loss (g)	Cycles
X1176	O217/1	7.57	0.03	40
X1177	O217/2	7.73	0.03	40
X1178	O217/3	8.68	0.01	40
X1179	O217/4	7.83	0.05	40
X1180	O217/5	8.89	0.05	40

MEAN MASS LOSS (g): **0.0 ± 1.25** (U_{95})

Standard Deviation: **0.0**

NOTE: The expanded measurement uncertainty values (u95) quoted in this report are at a confidence level of 95 % with a nominal coverage factor of 2. These values do not include any estimate of the effects associated with sampling.

COMMENTS/VARIATIONS Sample meets the requirements in Table 1 of AS2049-2002 for classification as Exposure Grade
Salt solution used was 6.2% Sodium Sulphate

TESTED BY: Graham Baggs
APPROVED SIGNATORY:
NAME: Graham J Baggs

ISSUE DATE: 23-Aug-11

Stone Initiatives Materials Testing Group Pty Ltd
P.O.Box 906
1 Pitt Lane, Mount Barker Road
Littlehampton
South Australia 5250

ABN 82 462 051 744
ACN 106 166 296
Phone +61 8 83916844
Fax +61 8 83916855
Email info@stonemtg.com.au

Appendix B
Supporting Documentation from Other Laboratories

INSPIRE™ ROOFING PRODUCTS
The Tapco™ GROUP A HEADWATERS COMPANY
29797 Beck Road • Wixom, MI 48393 • 248-668-6400 • Fax 248-668-6470

Technical Bulletin 3-07

Chemical Compatibility of Inspire Roof Tiles
Class A and Class C

Inspire roof tiles are chemically compatible with most substances and products which are normally present in a roof deck environment. Our roof tiles will not react adversely when exposed to acids, bases and salts. They are also compatible with EPDM, PVC, Uncured Neoprene, and asphalt compounds that are typically present in roofing underlayments and self-adhered membranes.

Inspire Roof Tiles have been tested with the following materials with the result of "no change" to the roof tile samples when immersed for one week with items to follow:

- ✓ Asphalt
- ✓ Oleic Acid (animal fat)
- ✓ Mineral Spirits
- ✓ Mineral Oil
- ✓ Hydrochloric Acid
- ✓ Sulfuric Acid

Although the test results confirm the durable and impermeable characteristics of the Inspire Roof Tiles, it is not recommended to expose the roof tiles to those substances that would normally not be present on roof deck environments and/or for periods of time beyond the test period (one week).

Refer to 4.1 Surface Treatments

INSPIRE™ ROOFING PRODUCTS
The Tapco™ GROUP A HEADWATERS COMPANY
29797 State Road • Wixom, MI 48393 • 800-971-4148 • Fax 800-971-4147

Technical Bulletin 4-07R

Windload Performance of Inspire Roof Tiles

Inspire roof tiles have been tested and have passed all requirements in accordance with Miami-Dade County Protocol *TAS 100-95 –Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems*. For general information, this protocol is designed to test roofing products at wind speeds equivalent to 110 mph.

As a result of additional calculations, increased windload capacities for Inspire Roofing Tiles Board are determined to be as follows:

Oriented Strand Board

7" Exposure
120 MPH * all roof zones-**exposure B up to a max mean roof height of 45'
110 MPH * all roof zones-**exposure C up to a max mean roof height of 20'

7.5" Exposure
120 MPH * for all roof zones-**exposure B up to a max mean roof height of 35'
110 MPH * for all zones- **exposure C up to a max mean roof height of 15' **

½" Plywood

7" Exposure
130 MPH * for all roof zones - **exposure C up to a max mean roof height of 60'
140 MPH * for all roof zones - **exposure C up to a max mean roof height of 50'
150 MPH *for all roof zones - ***exposure B up to a max mean roof height of 60' and **exposure C up to a max mean roof height of 25'

7.5" Exposure
130 MPH *wind zone areas, for all roof zones - **exposure C up to a max mean roof height of 60'
140 MPH *wind zone areas, for all roof zones - **exposure C up to a max mean roof height of 35'
150 MPH *wind zone areas, ***exposure B up to a max mean roof height of 60' and **exposure C up to a max mean roof height of 20'

Based on calculations, Inspire Roofing Tiles are approved for installation in all US coastal zones outside Miami-Dade County Jurisdiction – including but not limited to The 2007 Florida Building, and The Texas Department of Insurance jurisdictions.

The roof tile test applications were performed using galvanized, ring shank nails (minimum 1.5" in length with 1/8" diameter shank, and 3/8" diameter head) on a minimum slope roof deck of 4:12. The windspeed requirements were calculated from an allowable design windload uplift load of 129.6 psf for 7" exposure and 123.1 for 7.5" exposure

For applications of the Inspire Roofing Tiles installed at a 6" exposure, anticipated design windload uplift load will increase by approximately 25% or 30 psf.

For specific application questions related to installations of tiles at <7", please direct your inquiries to Matt Michalski, Product Specialist, Inspire (matt_michalski@tapcoint.com).

**Wind zone areas are defined as Basic Windspeed in MPH determined by American Society of Civil Engineers (ASCE) 7-98 – Minimum design load for Buildings and Other Structures*
***Exposure C – defined by code as open terrain with scattered obstructions*
****Exposure B - defined by code as urban and suburban also to encompass wooded areas*

Quality Auditing Institute

2825 MURRAY STREET
PORT MOODY
BRITISH COLUMBIA
V3H 1X3
T: 604.461.8378
F: 604.461.8377
www.qai.org • info@qai.org

ENGINEERING EVALUATION REPORT

REPORT NUMBER T615-2

Edition 1: November 25, 1009
Contents: Pages 1-27

TAPCO INTERNATIONAL CORPORATION
29797 Beck Road
Wixon, Michigan
48393

MODEL NUMBER: Inspire Slate Roof Shingles

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

1) Introduction

Quality Auditing Institute Ltd. (QAI) was retained by Tapco International Corporation to conduct an Engineering Evaluation in accordance with the requirements of the 2005 National Building Code (NBC) on Inspire Slate Roof Shingle Product. The purpose of this evaluation was to compare the roofing product to the applicable standards for products of similar application. The Inspire product was also compared to a similar polymer roofing product compliant with past Canadian Construction Materials Centre (CCMC) requirements.

2) Product Description

The Inspire Slate Roof Shingles are compression-molded from a proprietary blend of polymer-based materials to emulate natural slate tile roofing. The shingles are nominally 12 inches wide by 17 inches in length by ¼ inches thick. Inspire slate shingles are offered in a variety of different standard or premium colors and also in several color blends. The shingles are available in either a Cass "A" or Class "C" fire rating.

The formulation for the Inspire Slate Roof Shingles is kept on file at QAI under Intertek Report No. 3094086-QCM2.

3) Reference Documents and Standards

- Intertek Quality Control Manual – 3094086-QCM2 (Dated April 27, 2007)
- Intertek Test Report – 3096431COQ-002 (Dated October 24, 2006)
- Radco Test Report – RAD-4557 (Dated July 6, 2009)
- Radco Test Report – RAD-4639 (Dated November 20, 2009)
- National Building Code 2005
- ASTM D792 "Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement"
- CGSB-37.58-M86, para 7.2.3 "Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing"
- ASTM C272 "Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions"
- ASTM D790 "Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials"
- ASTM G154 "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials"
- ASTM G155 "Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials"
- TAS 100-95 " Test Procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems"
- ASTM D1037 "Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials"
- ASTM C666/C666M "Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing"
- ASTM E661 "Standard Test Method for Performance of Wood and Wood-based Floor and Roof Sheathing Under Concentrated Static and Impact Loads"

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

4) Engineering Evaluation

Density

Test Standard:	ASTM D792
Requirement:	Report value
Inspire Tested Standard:	-
Result:	Class A Shingle ≈ 757 kg/m³ Class C Shingle ≈ 662 kg/m³
Evaluation:	The finished product dimensions for each tile are 12 inches ± 0.125 wide by 17.5 inches ±0.125 long by 1/4" thick. The weight for the Class A Shingle is 23 oz. ±1.0 and Class C Shingle is 20 oz. ±1.0. This satisfies the requirements of CCMC.

Dimensional Stability

Test Standard:	CGSB-37.58-M86, para 7.2.3
Requirement:	5.0% maximum dimensional change 3.0% maximum average mass change
Inspire Tested Standard:	CGSB-37.58-M86, para 7.2.3 (as per Radco Report #RAD-4639)
Result:	0.04% average length change -0.08% average width change -0.71% average thickness change 0.06% average mass change
Evaluation:	Five 18" x 12" (457mm x 305mm) Inspire Roofing Tile specimens were tested to the above standard. The shingle was within the maximum dimensional and mass change of the standard. This satisfies the requirements of CCMC.

Water Absorption

Test Standard:	As per CCMC Technical Guide
Requirement:	≤ 3.0%
Inspire Tested Standard:	ASTM C272 (as per Radco Report #RAD-4557)
Result:	No appreciable weight gain
Evaluation:	Past CCMC test criteria required the samples to be placed in a vacuum of 2.5±0.5kPa for 2 hours and then immersed in water for 24 hours. ASTM C272 requires the sample to be cooled in a desiccator and then immersed in water for 24 hours. The Inspire Slate Roof Shingle is a closed cell compressed polymer product and has very little water absorption capabilities. When tested to ASTM C272, the product did not absorb a measureable amount of water. It can be concluded that when tested to the Water Absorption test method of CCMC, the results will be within the 3.0% requirement.

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

Flexural Strength

Test Standard:	ASTM D790 Procedure A
Requirement:	>5.2 MPa (754.2 PSI) max
Inspire Tested Standard:	ASTM D790 Procedure A (as per Radco Report #RAD-4639)
Result:	18.1 MPa (2624 PSI) – machine direction 17.4 MPa (2527 PSI) – cross direction
Evaluation:	Five 4" x 0.5" (101.6mm x 12.7mm) Inspire Roofing Tile specimens were tested to the above standard. The shingles were tested in the machine and cross direction. Results in both directions were within allowable limits. This satisfies the requirements of CCMC.

Wind Uplift

Test Standard:	As per CCMC Technical Guide
Requirement:	No loss of integrity or damage
Inspire Tested Standard:	Miami Dade County TAS 100-95 (as per PRI Report #MMLL-003-02-05 and MMLL-04-05)
Result:	Up to 110 mph. No water infiltration through sheathing. No tiles blew off, tore or blew upward.
Evaluation:	The CCMC requirement for Wind Uplift is a modified version of the Dade County Protocol PA 100-95 "Test procedure for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems". The modifications involve a modified test frame size and the specified areas for observational notes to be taken. Overall, testing to TAS 100-95 is representative of testing to the modified version of the CCMC Wind Uplift requirement. As per the applicable test report, no tiles blew off, tore, or blew upward; therefore Inspire Roofing Product meets this requirement.

Dynamic Pressure Water Infiltration

Test Standard:	As per CCMC Technical Guide
Requirement:	No leakage or damage to assembly
Inspire Tested Standard:	Miami Dade County TAS 100-95 (as per PRI Report #MMLL-003-02-05 and MMLL-04-05)
Result:	Up to 110 mph. No water infiltration through sheathing. No tiles blew off, tore or blew upward.
Evaluation:	When tested to TAS 100-95, which was the standard used to develop the CCMC Dynamic Pressure Water Infiltration CCMC requirement, the sample exhibited zero water infiltration. With the two test protocols being almost identical as noted above, the Inspire Roofing Product meets this requirement.

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

Nail Pull-Through

Test Standard:	ASTM D1037 Paragraph 54-60
Requirement:	> 440N (99 lbs)
Inspire Tested Standard:	ASTM D1037 Paragraph 54-60 (as per Radco Report #RAD-4639)
Result:	841N (189 lbs)
Evaluation:	Ten 3" x 6" (76mm x 152mm) Inspire Roofing Tile specimens were tested to the above standard. The shingles were tested using a 1-1/2" stainless steel ring shank hand nail. Results exceeded the minimum requirements. This satisfies the requirements of CCMC.

Accelerated Weathering

Test Standard:	ASTM G155
Requirement:	No deleterious effects
Inspire Tested Standard:	ASTM G154 (as per Intertek Report #3096431COQ-002)
Result:	Tile exhibited virtually no fade and with no trace of cracking, spalling or deformation.
Evaluation:	The ASTM G154 and ASTM G155 both reproduce the weathering effects that occur when materials are exposed to sunlight (either direct or through window glass) and moisture as rain or dew. ASTM G155 uses xenon arc light, while ASTM G154 uses fluorescent UV light. It is of QAI's opinion that similar results would be seen when one product is subjected to both standards and that the Inspire roofing product would meet the CCMC requirements for accelerated weathering.

Traffic Load

Test Standard:	As per CCMC Technical Guide
Requirement:	>900N (202 lbs)
Inspire Tested Standard:	ASTM E661 (as per Radco Report #RAD-4639)
Result:	6672N (1500 lbs) - no cracks or any signs of breakage
Evaluation:	Forty-eight Inspire Roof tiles were installed using 1-1/2" ring shank nails to a 4ft x 8ft panel with a 7.5" exposure. Construction details were as noted in the test report. A 3" diameter metal disk was used to apply a load at a rate of 0.1" in/min. The CCMC Technical Guide requires the load to be applied using a 5" x 5" metal plate instead of the round disk. This will distribute the load over a greater area; therefore the 3" diameter metal disk is a worst case scenario. The concentrated load was applied to the top and bottom side of the deck. Results exceeded the minimum requirements. This satisfies the requirements of CCMC.

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

Freeze Thaw Cycle

Test Standard:	24 cycles as per CCMC Technical Guide
Requirement:	No deleterious effects
Inspire Tested Standard:	ASTM C666/C666M (as per Radco Report #RAD-4557)
Result:	No signs of damage or cracking after 350 cycles
Evaluation:	The Freeze-Thaw requirements of CCMC involve cycling the product from 15°C to -20°C for the first 12 cycles and then 15°C to -5°C for the next 12 cycles. ASTM C666 involves cycling the product from 4.44°C to -17.78°C for 350 cycles. Both standards evaluate the effects of rapid freezing and thawing cycles. Based on the number of cycles and temperature change, the ASTM C666 standard is a more severe test requirement. Since the Inspire Roofing Product passed the requirements of ASTM C666, it would also meet the CCMC requirements for Freeze-Thaw Cycle.

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

The Slate Roof Shingles described in this report and manufactured by the Tapco Group (dba Inspire Roofing Products) has been evaluated by QAI to Section 9.26.2.1 of the 2005 National Building Code.

The objective statements for each sentence have been tabulated below:

Table 1: Objective Statements for Roofing Materials Section 9.26.2.1 of the 2005 NBC

Sentence	Functional Statement	Objective	Summary of Area of Performance
9.26.2.1	F61	OH1.1	To resist the ingress of precipitation, water or moisture from the exterior or from the ground so it does not affect indoor air quality
	F61	OH1.2	To resist the ingress of precipitation, water or moisture from the exterior or from the ground so it does not affect the thermal performance of the exterior wall
	F61	OH1.3	To resist the ingress of precipitation, water or moisture from the exterior or from the ground to keeps the interior dry
	F61	OS2.3	To resist the ingress of precipitation, water or moisture from the exterior or from the ground so there is no damage or deterioration to building elements.
9.26.2.2	F20	OH1.1	To support and withstand expected loads and forces so it does not affect indoor air quality
	F20	OH1.2	To support and withstand expected loads and forces so it does not affect the thermal performance of the exterior wall
	F20	OH1.3	To support and withstand expected loads and forces to keeps the interior dry
	F20	OS2.3	To support and withstand expected loads and forces so there is no damage or deterioration to building elements.
	F80	OH1.1	To resist deterioration resulting from expected service conditions so it does not affect indoor air quality
	F80	OH1.2	To resist deterioration resulting from expected service conditions so it does not affect the thermal performance of the exterior wall
	F80	OH1.3	To resist deterioration resulting from expected service conditions to keeps the interior dry
	F80	OS2.3	To resist deterioration resulting from expected service conditions so there is no damage or deterioration to building elements.

Quality Auditing Institute
Test Report #: T615-2
Client: Tapco International Corporation
Date: November 25, 2009

QAI has interpreted the objective and functional statements applicable to the Inspire Slate Roof Shingle Product. The interpretations and the alternative solutions of the Division B requirements are tabulated below:

Table 2: Confirmation of Level of Performance

Division B Requirement (Description of Level of Performance Div. B Achieves)	Objective Statements for Roofing Materials Section 9.26.2	Alternative Solution (Description of Alternative Solution Level of Performance Achieved)
The intent of the code is that the roofing system is able to withstand wind loads and forces that they may be subject to.	F61 - OH1.1	Inspire has conducted wind load testing as per the Miami Dade Protocol TAS100-95. The wind load requirement for this standard is intended for hurricane zones with extreme wind conditions. This requirement is much more severe than the conditions that would be encountered in Canada, therefore the Inspire Slate Roof Shingles would meet this criteria of the National Building Code
There are no direct requirements for this product to control inadequate indoor air quality.	F61 - OH1.2	The roofing system is separated from the interior environment by several systematic layers. The air quality is not affected by this product.
There are no direct requirements for this product to control inadequate thermal comfort.	F61 - OH1.3	The Inspire product is not a primary component of the thermal wall barrier system.
The intent of the code is to resist the ingress of precipitation, water or moisture from the exterior or the ground.	F61 - OS2.3	This product has been tested to Dynamic Pressure Water Infiltration requirements of TAS100-95 and Water Absorption requirements of ASTM 272. Both these protocols/standards evaluated the products ability to resist the ingress of precipitation from the interior of the building. The Inspire Slate Roof Shingles met the criteria of the National Building Code.

Table 2: Continued

The intent of the code is that the roofing shingle is capable of withstanding impact and sustained loads when installed on a roof.	F20 - OH1.1 F20 - OH1.2 F20 - OH1.3 F20 - OS2.3	The product has been subjected to the flexural strength test. When tested to ASTM D790 Procedure A "Standard Test Methods for Fire Tests of Roof Coverings" for flexural strength, samples obtained an average rating of 18.1 MPa and 17.4 MPa in the machine and cross direction respectively. Similar materials are required to meet a flexural strength of 5.2 MPa minimum by the CCMC. The product has also been tested to ASTM E661 "Standard Test Method for Performance of Wood and Wood-based Floor and Roof Sheathing Under Concentrated Static and Impact Loads" and achieved maximum loads of 6672N. Similar materials are required to meet a traffic load strength of 900N minimum by the CCMC. Nail pull-through testing was performed to evaluate the products ability to stay fastened to the substrate. The standard used was ASTM D1037 "Standard Test Methods for Evaluation Properties of Wood-Base Fiber and Particle Panel Materials". Using a 1-1/2" stainless steel ring shank hand nail, the average result was 841N ultimate load. Similar materials are required to meet a minimum requirement of 440N by the CCMC. The Inspire Slate Roof Shingles met the criteria of the National Building Code.
The intent of the code is that the roofing material is durable and will not deteriorate significantly over time.	F80 - OH1.1 F80 - OH1.2 F80 - OH1.3 F80 - OS2.3	The product has been subjected to the Freeze-thaw resistance test. This test evaluates the ability of the product to resist temperature cycling while not showing any signs of cracking or deterioration. When tested to ASTM C666/C666M, the product showed no signed of any deleterious effects. The product has also been tested to ASTM G154 "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials" which evaluates the shingle materials ability to withstand UV fluorescent light and moisture. After testing to this requirement, the product showed no signs of fading, cracking, spalling or deformation. The Inspire Slate Roof Shingles met the criteria of the National Building Code.

5) Comments/Conclusions

QAI was retained by Tapco International Corporation to conduct an Engineering Evaluation in accordance with requirements of the 2005 National Building Code (NBC) on Inspire Slate Roof Shingle Product. The Inspire product was also compared to a similar polymer roofing product compliant with the Canadian Construction Materials Centre (CCMC).

The report relates only to the items specified. Test results in this report may not be reproducible in the field.

Person(s) Authorizing Report:

Name (Signature)	Name (Printed)	Title	(dd/mm/yy)
Kevin Saito	Kevin Saito	Division Manager	25/11/09

Reviewed by:

Name (Signature)	Name (Printed)	Title	(dd/mm/yy)
L Gibson	Lawrence Gibson,P.Eng	President	26/11/09

Intertek ETL SEMKO

INTERTEK TEST REPORT #3102473

REPORT

OF

IMPACT RESISTANCE

TESTS OF

INSPIRE SLATE (CLASS A FORMULA)
SIMULATED SLATE ROOFING TILES

FOR

INSPIRE ROOFING PRODUCTS
1101 INDUSTRIAL BLVD.
ALBION , MI 49224

BY

INTERTEK TESTING SERVICES NA INC.
8431 MURPHY DRIVE
MIDDLETON, WISCONSIN 53562

TEST DATE: AUGUST 11, 2006
REPORT DATE: AUGUST 11, 2006

Intertek Testing Services NA, Inc.
8431 Murphy Drive, Middleton, WI 53562
Telephone: 608-836-4400 Fax: 608-831-9279 Web: www.intertek-etlsemko.com

INTRODUCTION

This report gives the results of the evaluation of the provided sample (Job #3099991). The test results described in this report are limited to the submitted items. On June 30, 2006 Intertek conducted tests on Inspire Slate Roofing Tiles at the Intertek Middleton, Wisconsin facility for Inspire Roofing Products. The tests conducted are listed in the procedure section. The samples were tested according to UL 2218, "Impact Resistance of Prepared Roof Covering Materials", dated January 25, 2002.

SPECIMEN DESCRIPTION

INSPIRE SLATE:

Shingle Type: Compression Molded Polymer Roofing Tile
Dimensions: 17-3/4 inches long by 12 inches wide by ¼ inch thick
Weight per Square: 240 lbs.
Color: Grey

PROCEDURE

A 3 foot by 3 foot square base frame was constructed, using nominal 2 inch by 4 inch wood studs, with a stud positioned centrally, running parallel to the edges. The frame was sheathed with 15/32 inch A-C Grade plywood, with the 'A' side facing up. The roofing material was applied with the recommended maximum exposure of 7-1/4 inches using galvanized 1-1/2 inch long roofing nails with 3/8 inch diameter heads (2 nails per tile). All materials used in construction of the test samples were stored at ambient temperatures of approximately 70 degrees F for 48 hours prior to testing. The test decks were then placed on a concrete floor and a 2 inch diameter stainless steel ball, weighing 1.18 lbs., was elevated to 20 feet with an electromagnetic clamp and then released. The ball was dropped twice on the same impact location, and depression measurements and observations were made. This procedure was repeated for 6 different impact locations on each test deck. Observations were made using 5X magnification.

INTERTEK TEST REPORT #3102473
MODEL: INSPIRE SLATE 10% FORMULA
CLIENT: INSPIRE ROOFING PRODUCTS
TEST DATE: AUGUST 11, 2006

IMPACT RESISTANCE TESTS

pp 3/4

RESULTS

INSPIRE SLATE

Drop Location	Distance Between Depressions	Depth of Depression	Observations
Edge over Seam	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Corner	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Center	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Center	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Seam	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Corner	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system

CONCLUSION

The Inspire Slate roofing tiles, as described herein, met the requirements of UL 2218 "Impact Resistance of Prepared Roof Covering Material" after testing with a 2.00 inch diameter ball at a 20 foot drop distance.

Test Conducted by:

Russ Burt
Associate Engineer

Report Reviewed by:

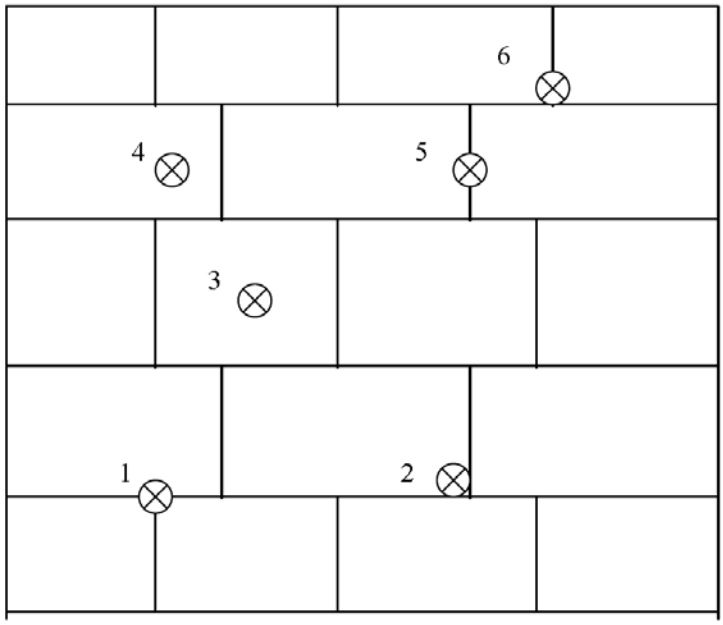
Jim Turgeson
Project Manager

INTERTEK TEST REPORT #3102473
MODEL: INSPIRE SLATE 10% FORMULA
CLIENT: INSPIRE ROOFING PRODUCTS
TEST DATE: AUGUST 11, 2006

IMPACT RESISTANCE TESTS

pp 4/4

IMPACT LOCATIONS



Intertek ETL SEMKO

INTERTEK TEST REPORT #3099991

REPORT

OF

IMPACT RESISTANCE

TESTS OF

INSPIRE SLATE (CLASS C FORMULA)
SIMULATED SLATE ROOFING TILES

FOR

INSPIRE ROOFING PRODUCTS
1101 INDUSTRIAL BLVD.
ALBION , MI 49224

BY

INTERTEK TESTING SERVICES NA INC.
8431 MURPHY DRIVE
MIDDLETON, WISCONSIN 53562

TEST DATE: JUNE 30, 2006
REPORT DATE: JUNE 30, 2006

Intertek Testing Services NA, Inc.
8431 Murphy Drive, Middleton, WI 53562
Telephone: 608-836-4400 Fax: 608-831-9279 Web: www.intertek-etlsemko.com

INTRODUCTION

This report gives the results of the evaluation of the provided sample (Job #3099991). The test results described in this report are limited to the submitted items. On June 30, 2006 Intertek conducted tests on Inspire Slate Roofing Tiles at the Intertek Middleton, Wisconsin facility for Inspire Roofing Products. The tests conducted are listed in the procedure section. The samples were tested according to UL 2218, "Impact Resistance of Prepared Roof Covering Materials", dated January 25, 2002.

SPECIMEN DESCRIPTION

INSPIRE SLATE:

Shingle Type: Compression Molded Polymer Roofing Tile
Dimensions: 17-3/4 inches long by 12 inches wide by ¼ inch thick
Weight per Square: 240 lbs.
Color: Grey

PROCEDURE

A 3 foot by 3 foot square base frame was constructed, using nominal 2 inch by 4 inch wood studs, with a stud positioned centrally, running parallel to the edges. The frame was sheathed with 15/32 inch A-C Grade plywood, with the 'A' side facing up. The roofing material was applied with the recommended maximum exposure of 7-1/4 inches using galvanized 1-1/2 inch long roofing nails with 3/8 inch diameter heads (2 nails per tile). All materials used in construction of the test samples were stored at ambient temperatures of approximately 70 degrees F for 48 hours prior to testing. The test decks were then placed on a concrete floor and a 2 inch diameter stainless steel ball, weighing 1.18 lbs., was elevated to 20 feet with an electromagnetic clamp and then released. The ball was dropped twice on the same impact location, and depression measurements and observations were made. This procedure was repeated for 6 different impact locations on each test deck. Observations were made using 5X magnification.

INTERTEK TEST REPORT #3099991
MODEL: INSPIRE SLATE
CLIENT: INSPIRE ROOFING PRODUCTS
TEST DATE: JUNE 30, 2006

IMPACT RESISTANCE TESTS

pp 3/4

RESULTS

INSPIRE SLATE

Drop Location	Distance Between Depressions	Depth of Depression	Observations
Edge over Seam	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Corner	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Center	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Center	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Seam	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system
Corner	Less than ½"	No Visible Depression	No evidence of tearing, fracturing, cracking, splitting, rupture, crazing, or other evidence of opening in the roof covering system

CONCLUSION

The Inspire Slate roofing tiles, as described herein, met the requirements of UL 2218 "Impact Resistance of Prepared Roof Covering Material" after testing with a 2.00 inch diameter ball at a 20 foot drop distance.

Test Conducted by:

Russ Burt
Associate Engineer

Report Reviewed by:

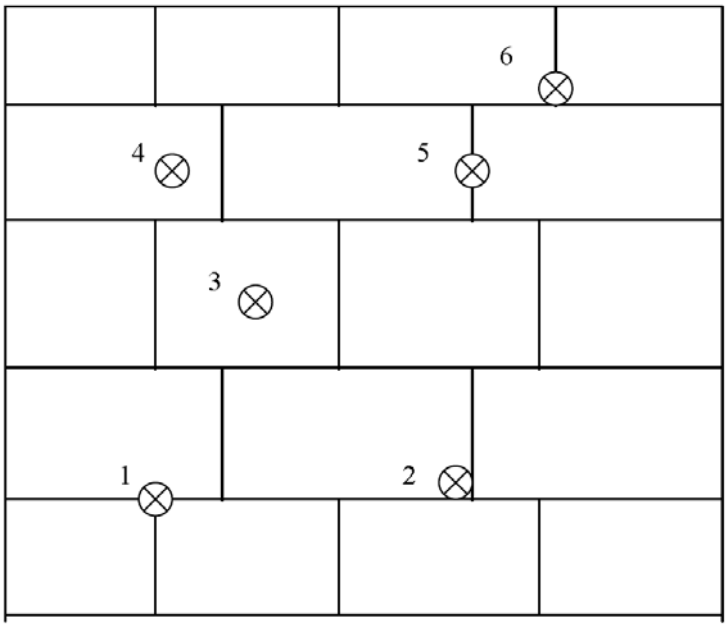
Jim Turgeson
Project Manager

INTERTEK TEST REPORT #3099991
MODEL: INSPIRE SLATE
CLIENT: INSPIRE ROOFING PRODUCTS
TEST DATE: JUNE 30, 2006

IMPACT RESISTANCE TESTS

pp 4/4

IMPACT LOCATIONS



Intertek ETL SEMKO

TEST DATES: JULY 21-28, 2006 REPORT DATE: AUGUST 3, 2006

INTERTEK TEST REPORT NUMBER 3094086-002

SPREAD OF FLAME, INTERMITTENT FLAME, AND BURNING BRAND TESTS
CONDUCTED ON

INSPIRE SLATE – 10% $MgOH_2$ COMPOSITE ROOFING MATERIAL
WITH
MB TECHNOLOGIES TU35 LAYFAST UNDERLAYMENT
CLASS "A" APPLICATION

FOR:

INSPIRE ROOFING PRODUCTS
1101 INDUSTRIAL BOULEVARD
ALBION, MI 49224
PHONE: 517-629-2170

Reported by:

Kevin Weber
Project Manager – BP Documentation
Building Products Group
Intertek

Report reviewed by:

Kent Kelsey
Project Manager – Fire
Building Products Group
Intertek

Intertek Testing Services NA, Inc.
8431 Murphy Drive, Middleton, WI 53562
Telephone: 608-836-4400 Fax: 608-831-9279 Web: www.intertek-etlsemko.com

INTERTEK

INTRODUCTION

Intertek Testing Services NA (Intertek) Fire Testing Laboratory in Middleton, Wisconsin conducted an investigation of the external fire resistance characteristics of Inspire Slate composite roofing material for a class "A" application. The samples were received at the laboratory July 20, 2006 in good condition.

The tests were conducted in accordance with the criteria of ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*, UL 790 (1997), and UBC 15-2 (1997) for Spread of Flame, Intermittent Flame, and Burning Brand tests.

TEST MATERIAL

The test samples were 17-1/2" long x 12" wide x varying thickness, 23 oz. composite simulated slate shingles manufactured by Inspire Roofing Products (Albion, MI).

TEST ASSEMBLY CONSTRUCTION

The plywood decks were constructed by Intertek employees according to the specifications of test standard ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*.

1. The sample material was selected by a representative of Intertek.
2. The test material was submitted by the client.
3. The test materials were applied by the client at the laboratory per the installation instructions of the materials manufacturers.

Deck Construction

Deck	Nominal 1/2" thick AC grade exterior plywood deck
Underlayment	MB Technologies TU35 Layfast underlayment
Surface	Inspire Slate – 10% $MgOH_2$

INTERTEK

TEST OBSERVATIONS AND RESULTS

Test Deck #1 – Spread of Flame (Class A)

Test Conditions

Test Date	7/21/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Test Observations

Time (min:sec)	Distance (feet-inches)	Observations/Comments
00:00		Burner ignited.
04:50	1’	Ignition of deck surface.
05:50	2’	
07:50	3’	
10:00	3' 6"	Gas turned off, end of test.

Acceptance Level: Class “A” – Maximum flame spread 3' 6", less than 6' allowed by the test standards.

Test Deck #2 – Spread of Flame (Class A)

Test Conditions

Test Date	7/21/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Test Observations

Time (min:sec)	Distance (feet-inches)	Observations/Comments
00:00		Burner ignited.
03:22	1’	Ignition of deck surface.
04:36	2’	
10:00	3' 10"	Gas turned off, end of test.

Acceptance Level: Class “A” – Maximum flame spread 3' 10", less than 6' allowed by the test standards.

INTERTEK

Test Deck #3 – Intermittent Flame (Class A)

Test Conditions

Test Date	7/21/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate – $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Test Observations

Cycle		Time To:		Observations/Comments (Include Off Cycles)
No.	Min.	Ignition (min : sec)	Flame Out (min : sec)	
1	Start			
2	4			
3	8	09:50		
4	12			
5	16			19:00 – Nothing to report on underside of the deck.
6	20			
7	24			
8	28			
9	32			
10	36			36:00 – Light scorching at the plywood joint on the underside of the deck. 37:24 – Light smoke from the underside of the deck.
11	40			
12	44			
13	48			
14	52			55:00 – Moderate scorching of the underside of the deck.
15	56			64:00 – Moderate smoke from the underside of the deck. 83:00 – Heavy scorching and smoking of the underside of the deck. Flaming continues on the top surface of the deck. 118:00 – Test stopped, no flaming of the underside of the deck.

Acceptance Level: Class "A" – No flaming of the underside of the deck.

INTERTEK

Test Deck #4 – Intermittent Flame (Class A)

Test Conditions

Test Date	7/21/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Test Observations

Cycle		Time To:		Observations/Comments (Include Off Cycles)
No.	Min.	Ignition (min : sec)	Flame Out (min : sec)	
1	Start			
2	4			
3	8			
4	12	13:30		
5	16			
6	20			
7	24			
8	28			
9	32			
10	36			
11	40			
12	44			44:00 – Light scorching and smoking of the underside of the deck.
13	48			
14	52			
15	56			71:00 – Moderate scorching and smoking of the underside of the deck. 83:00 – Heavy smoke from the underside of the deck. 118:00 – Test stopped, no flaming of the underside of the deck.

Acceptance Level: Class "A" – No flaming of the underside of the deck.

INTERTEK

Test Deck #5 – Burning Brand (Class A)

Test Date	7/24/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	76°F
Brand Type/Weight	Class A/4.13 lb
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Brand#	Time (min:sec)	Observations
1	00:00	Brand placed on deck.
	01:20	Ignition of the top surface of the deck.
	05:00	Approximately 25% of the brand consumed.
	10:00	Approximately 50% of the brand consumed.
	15:00	Approximately 75% of the brand consumed.
	18:00	Slight discoloration at the plywood joint on the underside of the deck.
	22:00	Brand completely consumed. Flaming continues on area surrounding the brand.
	30:00	Discoloration of the underside of the deck continues.
	60:00	Light smoking from the underside of the deck. Light flames continue on the top surface of the deck.
	90:00	No flaming or smoking of the underside of the deck, no flaming of the top surface of the deck.
	92:00	Test stopped.

Acceptance Level: Class “A” – No flaming of the underside of the deck.

INTERTEK

Test Deck #6 – Burning Brand (Class A)

Test Date	7/27/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	78°F
Brand Type/Weight	Class A/4.34 lb
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Brand#	Time (min:sec)	Observations
1	00:00	Brand placed on deck.
	02:10	Ignition of the top surface of the deck.
	13:00	Top surface continues to flame, no change of the underside of the deck.
	37:00	Discoloration at the plywood joint on the underside of the deck, flaming of the top surface of the deck continues. Brand completely consumed.
	45:00	Flaming of the top surface of the deck continues.
	60:00	Top surface continues to flame, smoke developing from the underside of the deck. Discoloration of the underside of the deck directly beneath the brand area.
	90:00	No flaming or smoking of the underside of the deck, no flaming of the top surface of the deck.
	92:00	Test stopped.

Acceptance Level: Class “A” – No flaming of the underside of the deck.

INTERTEK

Test Deck #7 – Burning Brand (Class A)

Test Date	7/27/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	77°F
Brand Type/Weight	Class A/4.74 lb
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Brand#	Time (min:sec)	Observations
1	00:00	Brand placed on deck.
	02:00	Ignition of the top surface of the deck.
	02:50	Flames have spread upslope to the trailing edge of the top surface of the deck.
	10:00	Approximately 50% of the brand consumed.
	19:30	Slight discoloration at the plywood joint on the underside of the deck, approximately 90% of the brand consumed.
	30:00	Brand completely consumed, top surface continues to flame.
	40:00	Approximately 5" circle of discoloration on the underside of the deck. Light smoke from the underside of the deck.
	60:00	Top surface continues to flame, smoking and discoloration continue on the underside of the deck.
	87:15	Flaming of the top surface of the deck stopped, smoking from the underside of the deck continues.
	90:00	No flaming or smoking of the underside of the deck.
	92:00	Test stopped.

Acceptance Level: Class “A” – No flaming of the underside of the deck.

INTERTEK

Test Deck #8 – Burning Brand (Class A)

Test Date	7/28/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	77°F
Brand Type/Weight	Class A/4.13 lb
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate – 10% $MgOH_2$
Underlayment	MB Technologies TU35 Layfast underlayment

Brand#	Time (min:sec)	Observations
1	00:00	Brand placed on deck.
	02:30	Flames have spread upslope to the trailing edge of the top surface of the deck.
	10:00	Approximately 50% of the brand consumed.
	30:00	Brand completely consumed, discoloration at the plywood joint on the underside of the deck.
	58:00	Top surface continues to flame.
	60:00	Plywood on the underside of the deck continues to discolor/smoke.
	75:00	Small flame continues on the top surface of the deck. Smoking and discoloration continues on the underside of the deck.
	90:32	Flaming of the top surface of the deck stopped.
	92:00	Test stopped.

Acceptance Level: Class “A” – No flaming of the underside of the deck.

INTERTEK

SUMMARY

Test Deck #	Test	Acceptance Level
1	Spread of Flame	Class "A"
2	Spread of Flame	Class "A"
3	Intermittent Flame	Class "A"
4	Intermittent Flame	Class "A"
5	Burning Brand	Class "A"
6	Burning Brand	Class "A"
7	Burning Brand	Class "A"
8	Burning Brand	Class "A"

CONCLUSION

The Inspire Slate – 10% $MgOH_2$ composite roofing material with MB Technologies TU35 Layfast underlayment, as described herein, complied with the acceptance criteria of ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*, UL 790 (1997), and UBC 15-2 (1997) for a "Class A" rating.

Intertek ETL SEMKO

TEST DATES: APRIL 13-19, 2006 REPORT DATE: JULY 18, 2006

INTERTEK TEST REPORT NUMBER 3094086-001

SPREAD OF FLAME, INTERMITTENT FLAME, AND BURNING BRAND TESTS CONDUCTED ON

INSPIRE SLATE
CLASS "C" APPLICATION

FOR:

INSPIRE ROOFING PRODUCTS
1101 INDUSTRIAL BOULEVARD
ALBION, MI 49224
PHONE: 517-629-2170

Reported by:

Kevin Weber
Project Manager – BP Documentation
Building Products Group
Intertek

Report reviewed by:

Kent Kelsey
Project Manager – Fire
Building Products Group
Intertek

Intertek Testing Services NA, Inc.
8431 Murphy Drive, Middleton, WI 53562
Telephone: 608-836-4400 Fax: 608-831-9279 Web: www.intertek-etlsemko.com

INTERTEK

INTRODUCTION

Intertek Testing Services NA (Intertek) Fire Testing Laboratory in Middleton, Wisconsin conducted an investigation of the external fire resistance characteristics of Inspire Slate composite roofing material for a class "C" application. The samples were received at the laboratory April 5, 2006 in good condition.

The tests were conducted in accordance with the criteria of ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*, UL 790 (1997), and UBC 15-2 (1997) for Spread of Flame, Intermittent Flame, and Burning Brand tests.

TEST ASSEMBLY CONSTRUCTION

The plywood decks were constructed by Intertek employees according to the specifications of test standard ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*.

1. The sample material was selected by a representative of Intertek.

2. The test material was submitted by the client.

3. The test materials were applied by the client at the laboratory per the installation instructions of the materials manufacturers.

Deck Construction

Deck	Nominal 1/2" thick AC grade exterior plywood deck.
Underlayment	Listed 30# saturated felt
Surface	Inspire Slate

INTERTEK

INSPIRE ROOFING PRODUCTS Page 3 of 8 REPORT #3094086 (4/13-19/2006

TEST OBSERVATIONS AND RESULTS

Test Deck #1 – Spread of Flame (Class C)

Test Conditions

Test Date	4/13/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate
Underlayment	#30 Saturated Felt

Test Observations

Time (min:sec)	Distance (feet-inches)	Observations/Comments
00:00		Burner ignited.
1:25	1'	
1:52	2'	
2:24	3'	
3:09	4'	
4:00	5'	
4:00	5' 7-1/2"	Gas turned off, end of test.

Acceptance Level: Class "C" – Maximum flame spread 5' 7-1/2", less than 13' allowed by the test standards.

INTERTEK

INSPIRE ROOFING PRODUCTS Page 4 of 8 REPORT #3094086 (4/13-19/2006)

Test Deck #2 – Spread of Flame (Class C)

Test Conditions

Test Date	4/13/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate
Underlayment	#30 Saturated Felt

Test Observations

Time (min:sec)	Distance (feet-inches)	Observations/Comments
00:00		Burner ignited.
1:40	1'	
2:12	2'	
3:10	3'	
3:37	4'	
4:00	4' 7"	Gas turned off, end of test.

Acceptance Level: Class "C" – Maximum flame spread 4' 7", less than 13' allowed by the test standards.

INTERTEK

Test Deck #2 – Spread of Flame (Class C)

Test Conditions

Test Date	4/13/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate
Underlayment	#30 Saturated Felt

Test Observations

Time (min:sec)	Distance (feet-inches)	Observations/Comments
00:00		Burner ignited.
1:40	1’	
2:12	2’	
3:10	3’	
3:37	4’	
4:00	4' 7"	Gas turned off, end of test.

Acceptance Level: Class “C” – Maximum flame spread 4' 7", less than 13' allowed by the test standards.

Test Deck #3 – Intermittent Flame (Class C)

Test Conditions

Test Date	4/14/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate
Underlayment	30# Saturated Felt

Test Observations

Cycle		Time To:		Observations/Comments (Include Off Cycles)
No.	Min.	Ignition (min : sec)	Flame Out (min : sec)	
1	Start			
2	3	3:44		Ignition of the top surface of the deck.
3	6			7:00 – Burner turned off. 22:00 – Light smoke on the bottom of the deck. 37:00 – End of test.

Acceptance Level: Class "C" – No flaming of the underside of the deck.

Test Deck #4 – Intermittent Flame (Class C)

Test Conditions

Test Date	4/14/2006
Air Velocity	1056 +/-44 fpm
Slope of Test Deck	5:12
Surface Material	Inspire Slate
Underlayment	30# Saturated Felt

Test Observations

Cycle		Time To:		Observations/Comments (Include Off Cycles)
No.	Min.	Ignition (min : sec)	Flame Out (min : sec)	
1	Start			
2	3	3:20		Ignition of the top surface of the deck.
3	6			22:00 – Light smoke on the bottom of the deck. 37:00 – End of test.

Acceptance Level: Class "C" – No flaming of the underside of the deck.

INTERTEK

Test Deck #5 – Burning Brand (Class C)

Test Date	4/19/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	69°F
Brand Type	Class C
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate
Underlayment	30# Saturated Felt

Brand#	Time (min:sec)	Observations			
		Ignition	Flame Out	Glow Out	Smoke Out
1	00:00	02:20	03:50	07:00	07:00
2	01:00	02:00	04:20	07:00	07:00
3	02:00	02:00	04:00	07:00	07:00
4	03:00	04:00	06:00	12:00	12:00
5	04:00	04:20	11:34	12:00	12:00
6	05:00	07:20	11:00	12:00	12:00
7	06:00	07:20	11:00	20:00	20:00
8	07:00	07:20	11:00	20:00	20:00
9	08:00	10:00	11:34	20:00	20:00
10	09:00	09:40	13:00	2:00	20:00
11	10:00	13:00	15:01	17:00	17:00
12	11:00	15:00	18:00	20:00	20:00
13	12:00	12:00	18:20	20:00	20:00
14	13:00	16:20	18:00	20:00	20:00
15	14:00	14:00	18:00	22:00	22:00
16	15:00	15:00	17:00	20:00	20:00
17	16:00	18:20	20:00	22:00	22:00
18	17:00	23:40	24:40	26:00	26:00
19	18:00	19:00	23:10	26:20	26:20
20	19:00	21:00	23:44	27:20	27:20

All smoke out by 45:00, test stopped at 60:00.

Acceptance Level: Class “C” – No flaming of the underside of the deck.

INTERTEK

Test Deck #6 – Burning Brand (Class C)

Test Date	4/19/2006
Air Velocity	1056 +/-44 fpm
Ambient Air Temperature	74°F
Brand Type	Class C
Slope of Test Deck	5:12 Inches
Surface Material	Inspire Slate
Underlayment	30# Saturated Felt

Brand#	Time (min:sec)	Observations			
		Ignition	Flame Out	Glow Out	Smoke Out
1	00:00			07:56	
2	01:00	02:07	07:24	08:30	
3	02:00	05:20	07:24	09:00	
4	03:00	03:00	06:28	08:48	
5	04:00	05:00	07:29	09:20	
6	05:00	05:00	07:25	11:00	
7	06:00	06:55	09:23	13:00	
8	07:00	07:00		13:00	
9	08:00	08:00	10:00	13:00	
10	09:00	09:00	10:27	13:00	
11	10:00	10:00	14:20	15:40	
12	11:00	11:00	12:23	14:37	
13	12:00	12:00	14:20		
14	13:00	13:24	17:00	17:44	
15	14:00	14:50	15:58		
16	15:00	16:00	18:17	21:38	
17	16:00	16:00	21:11	23:13	
18	17:00	17:00	21:25	23:32	
19	18:00	18:00	20:07	21:54	
20	19:00	19:00	19:38	24:18	

All smoke out by 45:00, test stopped at 60:00.

Acceptance Level: Class “C” – No flaming of the underside of the deck.

INTERTEK

SUMMARY

Test Deck #	Test	Acceptance Level
1	Spread of Flame	Class "C"
2	Spread of Flame	Class "C"
3	Intermittent Flame	Class "C"
4	Intermittent Flame	Class "C"
5	Burning Brand	Class "C"
6	Burning Brand	Class "C"

CONCLUSION

The Inspire Slate composite roofing material, as described herein, complied with the acceptance criteria of ASTM E108 (2004) *"Standard Test Methods for Fire Tests of Roof Coverings"*, UL 790 (1997), and UBC 15-2 (1997) for a "Class C" rating.

Intertek ETL SEMKO

Accelerated Weathering of 2000 Hours, and Tensile Properties Testing of Class A and Class C Inspire Slate Shingles

Final Report No.: 3096431COQ-002
Original Issued Date: October 24, 2006

Applicant:
Inspire Roofing Products
1101 Industrial Blvd
Albion, MI 49224

Intertek Testing Services NA Ltd.
1500 Brigantine Drive, Coquitlam, BC V3K 7C1
Telephone: 604-520-3321 Fax: 604-524-9186 Web: www.intertek-etlsemko.com

1 Table of Contents

2 Preface

All services undertaken are subject to the following general policy:

1) This report is for the exclusive use of Intertek Testing Services NA Ltd.'s (Intertek's) client and is provided pursuant to the agreement between Intertek and its client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report.

2) Only the client is authorized to copy or distribute this report and then only in its entirety. Intertek must first approve any use of the Intertek's name or one of its marks for the sale or advertisement of the tested material, product or service in writing.

3) The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product or service is or has ever been under an Intertek certification program.

3 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted accelerated weathering and tensile properties testing for Inspired Roofing Products on a discontinuous roofing product. The evaluation was conducted from March 2006 to October 2006 in accordance with the following criteria:

- ICC-ES AC 07 *"Acceptance Criteria for Special Roofing Systems"*, approved June 2006
- ASTM D638-03 "*Test Method for Tensile Properties of Plastics*"
- ASTM G155-05a "*Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials*"

4 Materials and Methods

4.1. SAMPLE SELECTION

Intertek representative, Dave Carter, selected a series of Class C shingles on April 3, 2006 and Class A shingles on July 19, 2006. The product was manufactured at Inspire Roofing Products LLC, 1101 Industrial Drive, Albion, MI, 49224. The product was identified as Inspire Slate Shingles Class A & C and composed of a polymer composite base material compression molded to emulate a natural slate tile roof. The raw material mix consists of 20 melt polyethylene polymer, magnesium hydroxide, inorganic pigment, UV protectant, calcium stearate, polyolefin plastomer additive.

The sample selection process was carried out in accordance with independent approved sampling procedures.

4.2. SPECIMEN PREPARATION

Specimens for the weatherometer were cut to the required dimensions using a straight edge and a sharp blade. Tensile samples were cut with a machined die conforming to ASTM D638-03.

4.3. TEST PROCEDURES

4.3.1. Conditioning

Before testing, the test specimens were conditioned for at least 24 hours at a temperature of 23°C ± 2°C and relative humidity of 50 ± 5 %.

4.3.2. Accelerated Weathering

Representative sections of the product were subjected to 2,000 hours of xenon arc light as per ASTM G155-05a.

4.3.3. Tensile Properties

Tensile strength and elongation tests were carried out as described in ASTM D638-03. Five specimens for each sample series were prepared to Type II coupon specifications with the following exceptions:

L = 1.25 in.
WO = 1.0 in.
LO = 4.5 in.
G = 1.0 in.
D = 3.0 in.

The test series are defined as control and after 2000 hours accelerated weathering. Each specimen was placed in a tensile testing machine equipped with self-aligning grips, and then loaded at a constant rate of 2.0 in/min. The tensile strength was calculated based on the cross-sectional area of the specimen and the maximum load attained. The elongation of the material was based on the extension that occurred at the point of the first significant break of the specimen.

5 Test Results

Visual examination of the product after 2000 hours of accelerated weathering revealed no evidence of cracking, crazing, pitting, chalking, discoloration, or any other surface changes. The product tensile properties test results are shown in Tables 1 and 2 below. A full set of test results is included in Appendix A.

Table 1. Tensile Properties for Class A Shingles

Product Condition	Tensile Strength (psi)			Elongation (%)		
	Mean	Standard Deviation	Change from Control (%)	Mean	Standard Deviation	Change from Control (%)
Control ▪ Tile Direction ▪ Cross Direction	2293 2132	29 72	---	52.9 48.3	8.0 10.6	---
After Weathering ▪ Tile Direction ▪ Cross Direction	2108 2051	100 29	-8.1 -3.8	48.3 38.3	5.2 8.3	-8.7 -20.6

Table 2. Tensile Properties for Class C Shingles

Product Condition	Tensile Strength (psi)			Elongation (%)		
	Mean	Standard Deviation	Change from Control (%)	Mean	Standard Deviation	Change from Control (%)
Control ▪ Tile Direction ▪ Cross Direction	2282 2191	85 25	---	54.7 48.9	6.0 12.0	---
After Weathering ▪ Tile Direction ▪ Cross Direction	2398 2208	78 88	-5.1 0.8	53.6 42.5	10.8 8.3	-1.9 -13.0

6 Conclusion

The Inspire Slate Shingles Class A & C products identified and evaluated in this report have been tested in accordance with Section 3.2.1 of ICC-ES AC 07 *"Acceptance Criteria for Special Roofing Systems"*, approved June 2006. The product has shown properties and visual changes as presented in Section 5 of this test report.

INTERTEK TESTING SERVICES NA LTD.

Tested by: _____
Geri Nishio
Senior Technologist, Construction Products

Reported by: _____
Trevor Kwasnycia, ASc.T
Technologist, Construction Products

Inspire Roofing Products
Report No. 3096431COQ-002

October 24, 2006

Appendix A: Test Data (4 pages)

Intertek ETL SEMKO

Test:	**Tensile Strength**	As Received	
Date:	23-Oct-06	Project: 3096431	Eng/Tech: Geri Nishio
Client:	Inspire Roofing Products		
Product:	Inspire Slate Shingles: Class "A"		
Method:	ASTM D 638-03	Tensile Properties of Plastics	
Conditioning:	Cured for at least 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%		
Exposure:	None		
Crosshead speed:	2.0 ins/min	50.8 mm/min	
Gauge length:	1.0 ins.	25.4 mm/min	
Equipment:	*Loading:*	Instron 8516 Universal Testing Machine (Intertek ID D000568) calibration due July 07	
	Load Cell:	Instron 8516 Internal 25kN Load cell (Intertek ID D000567) calibration due July 07	
	Measurments:	Mitutoyo Digital Calipers (Intertek ID P52652) calibration due July 07	

Pull direction in length of tile

Sample #	Width (inches)	Thickness (inches)	Lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.27	0.20	1.64	121.60	454.6	2272.9	64.0%
2	0.26	0.21	1.59	123.10	473.5	2254.6	58.6%
3	0.27	0.19	1.47	117.00	440.7	2319.4	47.2%
4	0.25	0.21	1.45	120.10	482.3	2296.8	45.1%
5	0.24	0.21	1.50	118.10	487.0	2319.1	49.7%
				Mean	467.6	2292.5	52.9%
				Sdev	19.5	28.6	8.0%
				COV	4.2%	1.2%	15.2%

Pull direction across length of tile

Sample #	Width (inches)	Thickness (inches)	lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.26	0.18	1.65	103.70	404.3	2246.0	65.0%
2	0.25	0.27	1.36	140.80	573.5	2124.2	36.3%
3	0.26	0.22	1.43	120.30	459.2	2087.1	43.3%
4	0.26	0.20	1.50	108.70	411.7	2058.7	49.8%
5	0.26	0.22	1.47	120.50	471.6	2143.7	47.0%
				Mean	464.1	2132.0	48.3%
				Sdev	67.8	71.8	10.6%
				COV	14.6%	3.4%	22.0%

Intertek ETL SEMKO

Test:	**Tensile Strength**	After 2,000 hours UV	
Date:	23-Oct-06	Project: 3096431	Eng/Tech: Geri Nishio
Client:	Inspire Roofing Products		
Product:	Inspire Slate Shingles: Class "A"		
Method:	ASTM D 638-03	Tensile Properties of Plastics	
Conditioning:	Cured for at least 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%		
Exposure:	2,000 hours Xenon Arc Ultraviolet Light		
Crosshead speed:	2.0 ins/min	50.8 mm/min	
Gauge length:	1.0 ins.	25.4 mm/min	
Equipment:	*Loading:*	Instron 8516 Universal Testing Machine (Intertek ID D000568) calibration due July 07	
	Load Cell:	Instron 8516 Internal 25kN Load cell (Intertek ID D000567) calibration due July 07	
	Measurments:	Mitutoyo Digital Calipers (Intertek ID P52652) calibration due July 07	
	UV Exposure:	Atlas 25/18WT Xenon Arc Ultraviolet Weatherometer (Intertek ID xx) calibration due Sept 07	

Pull direction in length of tile

Sample #	Width (inches)	Thickness (inches)	Lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.27	0.18	1.43	94.47	356.5	1980.5	43.0%
2	0.26	0.17	1.44	96.58	365.1	2147.9	44.3%
3	0.27	0.17	1.51	94.41	345.8	2034.3	51.1%
4	0.26	0.17	1.56	99.75	379.3	2231.0	55.8%
5	0.28	0.18	1.47	106.60	386.2	2145.7	47.5%
				Mean	366.6	2107.9	48.3%
				Sdev	16.4	99.8	5.2%
				COV	4.5%	4.7%	10.8%
				% Change	-21.6%	-8.1%	-8.7%

Pull direction across length of tile

Sample #	Width (inches)	Thickness (inches)	lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.28	0.19	1.43	108.1	393.1	2068.9	43.5%
2	0.27	0.18	1.32	97.79	362.2	2012.1	32.0%
3	0.28	0.15	1.28	86.58	313.1	2087.5	. 28.5%
4	0.27	0.16	1.39	87.78	326.3	2039.5	39.1%
5	0.26	0.16	1.49	86.61	327.4	2046.6	48.8%
				Mean	344.4	2050.9	38.3%
				Sdev	32.7	28.8	8.29%
				COV	9.5%	1.4%	21.6%
				% Change	-25.8%	-3.8%	-20.6%

Class A-UV

Intertek ETL SEMKO

Test:	**Tensile Strength**	As Received	
Date:	23-Oct-06	Project: 3096431	Eng/Tech: Geri Nishio
Client:	Inspire Roofing Products		
Product:	Inspire Slate Shingles: Class "C"		
Method:	ASTM D 638-03	Tensile Properties of Plastics	
Conditioning:	Cured for at least 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%		
Exposure:	None		
Crosshead speed:	2.0 ins/min	50.8 mm/min	
Gauge length:	1.0 ins.	25.4 mm/min	
Equipment:	*Loading:*	Instron 8516 Universal Testing Machine (Intertek ID D000568) calibration due July 07	
	Load Cell:	Instron 8516 Internal 25kN Load cell (Intertek ID D000567) calibration due July 07	
	Measurments:	Mitutoyo Digital Calipers (Intertek ID P52652) calibration due July 07	

Pull direction in length of tile

Sample #	Width (inches)	Thickness (inches)	Lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.27	0.23	1.48	138.70	509.9	2217.1	47.8%
2	0.26	0.22	1.59	126.90	482.5	2193.2	59.2%
3	0.27	0.19	1.62	115.50	435.8	2293.9	61.7%
4	0.26	0.21	1.55	124.20	482.3	2296.8	55.0%
5	0.26	0.19	1.50	118.10	457.8	2409.2	49.7%
				Mean	473.7	2282.1	54.7%
				Sdev	28.1	84.6	6.0%
				COV	5.9%	3.7%	10.9%

Pull direction across length of tile

Sample #	Width (inches)	Thickness (inches)	lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.27	0.19	1.41	109.70	411.6	2166.5	41.0%
2	0.27	0.20	1.64	115.70	433.3	2166.7	63.5%
3	0.27	0.20	1.50	118.80	440.0	2200.0	50.4%
4	0.26	0.20	1.56	115.00	444.9	2224.4	56.4%
5	0.25	0.22	1.33	123.00	483.3	2196.8	33.3%
				Mean	442.6	2190.9	48.9%
				Sdev	26.0	24.6	12.0%
				COV	5.9%	1.1%	24.6%

Intertek ETL SEMKO

Test:	**Tensile Strength**	After 2,000 hours UV	
Date:	23-Oct-06	Project: 3096431	Eng/Tech: Geri Nishio
Client:	Inspire Roofing Products		
Product:	Inspire Slate Shingles: Class "C"		
Method:	ASTM D 638-03	Tensile Properties of Plastics	
Conditioning:	Cured for at least 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%		
Exposure:	2,000 hours Xenon Arc Ultraviolet Light		
Crosshead speed:	2.0 ins/min	50.8 mm/min	
Gauge length:	1.0 ins.	25.4 mm/min	
Equipment:	*Loading:*	Instron 8516 Universal Testing Machine (Intertek ID D000568) calibration due July 07	
	Load Cell:	Instron 8516 Internal 25kN Load cell (Intertek ID D000567) calibration due July 07	
	Measurments:	Mitutoyo Digital Calipers (Intertek ID P52652) calibration due July 07	
	UV Exposure:	Atlas 25/18WT Xenon Arc Ultraviolet Weatherometer (Intertek ID xx) calibration due Sept 07	

Pull direction in length of tile

Sample #	Width (inches)	Thickness (inches)	Lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.26	0.20	1.44	128.00	492.3	2461.5	44.4%
2	0.27	0.20	1.49	132.70	496.1	2480.4	48.6%
3	0.26	0.20	1.55	121.80	468.5	2342.3	55.5%
4	0.26	0.18	1.72	114.50	433.7	2409.5	71.6%
5	0.26	0.19	1.48	114.70	436.1	2295.4	48.2%
				Mean	465.3	2397.8	53.6%
				Sdev	29.7	78.4	10.8%
				COV	6.4%	3.3%	20.1%
				% Change	-1.8%	5.1%	-1.9%

Pull direction across length of tile

Sample #	Width (inches)	Thickness (inches)	lgth @ brk (inches)	Break load (lbs)	Brk. Str (lbs/inch)	Tensile (psi)	Elong. (%)
1	0.27	0.23	1.34	131.70	482.4	2097.5	34.3%
2	0.26	0.21	1.40	127.10	488.8	2327.8	40.3%
3	0.25	0.22	1.38	124.20	495.8	2253.7	37.6%
4	0.26	0.20	1.45	114.10	432.2	2161.0	45.1%
5	0.26	0.20	1.56	114.40	440.0	2200.0	55.5%
				Mean	467.9	2208.0	42.5%
				Sdev	29.5	87.9	8.3%
				COV	6.3%	4.0%	19.4%
				% Change	5.7%	0.8%	-13.0%