Test Report No. 22081A

Sponsor

Solar Limpets Ltd
New Yatt Business Centre, New Yatt
OX29 6TJ, Witney
United Kingdom

Trade name of the roof covering

Solar Limpet

Manufacturer of the roof covering

Solar Limpets Ltd
New Yatt Business Centre, New Yatt
OX29 6TJ, Witney
United Kingdom

Supplier of the roof covering

Solar Limpets Ltd
New Yatt Business Centre, New Yatt
OX29 6TJ, Witney
United Kingdom

Nature of the tests

Fire Tests on Building Materials and Structures – Classification and method of test for External Fire Exposure to Roofs, according to BS 476 - Part 3 (2004).

PREPARED BY	APPROVED BY
Mikel Nachtergaele (Signature) Project coordinator 2022.07.26 09:38:35 +02'00'	Bart Sette (Signature) General Manager Ghent 2022.07.27 09:33:17 +02'00'

This report consists of 14 pages including 2 annexes

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1. DATA CONCERNING THE TEST SPECIMENS

Type of specimen: Covering and sealing systems including any insulating layers or vapour barriers.

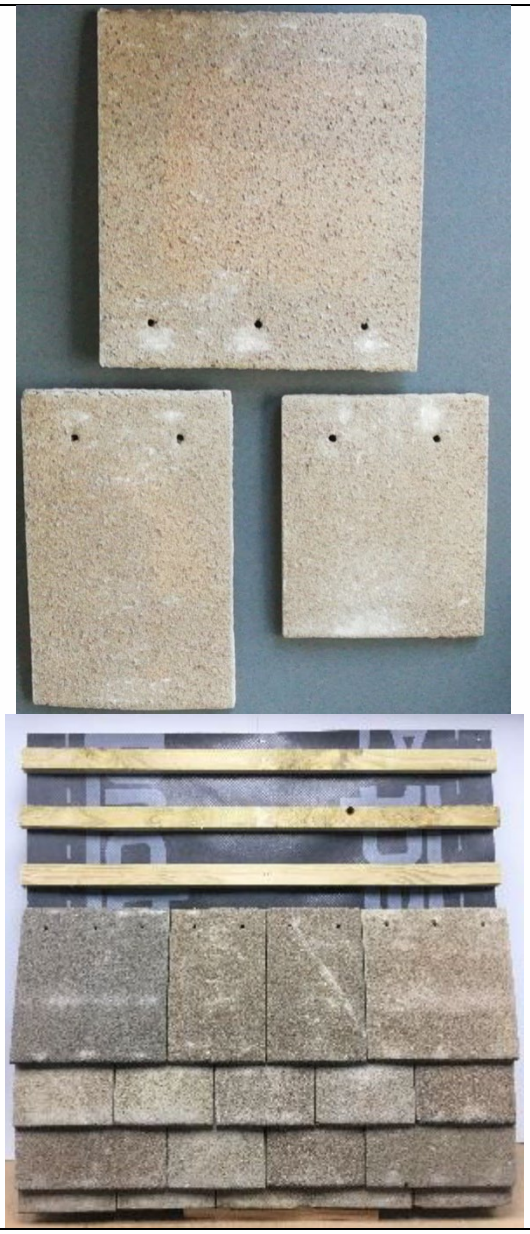
The firm Solar Limpet Ltd has provided the laboratory, on 04/05/2022, with mounted roof specimens. These roof specimens were prepared conforming to the prescriptions of the above-mentioned standard. The laboratory performed the specimen fabrication. The tests have been carried out at WFRGent NV, located at Ottergemsesteenweg Zuid 711, 9000 Ghent, Belgium.

Sampling by	:	Mr. Carl Reynolds (the sponsor)
Sampling date	:	08/04/2022
Sample ID	:	Embossed on base of product
Production place	:	Unit 5 Oppenheiner Ctre, England
Production line	:	N/A
Production date	:	08/04/2022
Identification within the quality system	:	150 9001-2015 Registered

2. DESCRIPTION OF THE TEST ROOF DECK

This description is based on information given by the sponsor.

	Nominal values (1)	Measured values (2)
VAPOUR BARRIER		
Material	A polymeric composition AVCL, comprising of a polypropylene non-woven layer, coated on one surface with a continuous film of polypropylene / polyethylene blend.	
Trade name	Protect A1	
Manufacturer	Glidevale protect	
Supplier	Glidevale protect	
Thickness (mm)	0,6	(4)
Surface weight (g/m²)	145	(4)
Flame retardants	No	(3)
Fixing method	Fixed with timber battens	
WOODEN SUPPORT STRUCTURE		
Material	Supporting structure, created by mechanically fixing wooden battens horizontally onto the vapour control layer.	
Photograph:		
Thickness (mm)	25	(4)
Distance between battens (mm)	100	(4)
Dimensions (mm x mm)	38 x 835	(4)
Surface weight (g/m) of one batten	375	(4)
Flame retardants	No	(3)
Fixing method	Mechanically fixed	

ROOF COVERING		
1.1 First layer		
Material	Concrete roof tiles	
Photographs:		
Trade name	Plain Tiles	
Manufacturer	RedLand	
Supplier	Solar Limpets Ltd.	
Thickness (mm)	13	11,5
Surface weight (kg/m²)	75	(4)
Dimensions	Variable	(4)
Flame retardants	No	(3)
Fixing method	Mechanically fixed	

1.2 Second layer		
Material	A PVC tile built-in around the solar limpet, to replace ceramic tiles that broke or are vulnerable to breaking.	
Photograph:		
Trade name	Blank tile	
Manufacturer	Solar Limpets Ltd.	
Supplier	Solar Limpets Ltd.	
Colour	Brown	
Thickness (mm)	13	13,2
Surface weight (kg/m²)	21	(4)
Dimensions (mm x mm)	168 x 260	(4)
Flame retardants	No	(3)
Fixing method	Mechanically fixed	

1.3 Third layer		
Material	PVC tile built into an existing roof, so that it can hold PV-modules. There is an adjustable plastic part, allowing more space for a PV-module.	
Photographs:	 	
Trade name	Solar Limpet	
Manufacturer / Supplier	Solar Limpets Ltd.	
Thickness of the tile (mm)	10	9,7
Maximum thickness with the adjustable part (mm)	109	109
Dimensions (mm x mm)	165 x 268	(4)
Surface weight (kg/m²)	39	(4)
Flame retardants	No	(3)
Fixing method	Mechanically fixed	

(1) Based on the information given by the sponsor
(2) Values verified by the laboratory
(3) Unverifiable by the laboratory

Position of the specimen:

The specimens were tested in the pitched position. The preliminary and penetration tests (specimens 1, 5, 6 and 7) were carried out with the solar limpet in the center of the specimens, since the heat of the burners will be the highest. Additionally, the preliminary test has been carried out on both the solar limpet and the blank tile; due to both being fabricated from PVC. The spread of flame tests (specimens 2, 3 and 4) were carried out with the solar limpet at the top of the top layer.

Conditioning, according to EN 13238, § 4.2 to constant mass.

Start of conditioning : 04/05/2022

End of conditioning : 31/05/2022

3. TEST RESULTS AND OBSERVATIONS

a) Calibration

Calibration date: 31/05/2022

FOR THE SPREAD OF FLAME TEST WITH BURNING BRANDS AND SUPPLEMENTARY RADIANT HEAT (STAGE 2)

Burner No:	1	2	3	4
Heatflux (kW/m²)	8,2	8,4	4,1	4,2
Criterium (kW/m²)	8,5 ± 1,0	8,5 ± 1,0	3,5 ± 1,0	3,5 ± 1,0

FOR THE PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 3)

Burner No:	1	2	3	4
Heatflux (kW/m²)	11,9	11,5	11,9	11,6
Criterium (kW/m²)	12 ± 1,5	12 ± 1,5	12 ± 1,5	12 ± 1,5

b) Test conditions

Specimen No.	1.1 (*)	1.2 (*)	2	3
Date of test	31/05/2022	31/05/2022	31/05/2022	31/05/2022
Roof pitch	45°	45°	45°	45°
Room temperature at start of test (°C):	21	21	21	21
Substrate	Wooden support structure			

(*) 2 preliminary tests have been carried out instead on 1, due to different, potential ignitable, materials being present in the top layer of the specimen. 1.1 is the preliminary test on the blank tile and 1.2 is the preliminary test on the solar limpet.

Specimen No.	4	5	6	7
Date of test	31/05/2022	31/05/2022	31/05/2022	31/05/2022
Roof pitch	45°	45°	45°	45°
Room temperature at start of test (°C):	21	21	21	21
Substrate	Wooden support structure			

c) Test results

PRELIMINARY IGNITION TEST WITH BURNING BRANDS (STAGE 1)

Specimen No:	1.1 (*)	1.2 (*)	Criteria
Duration of flaming after withdrawal of the test flame (min:sec)	00:00	00:00	< 5min
Maximum flame spread distance (mm)	95	120	< 380mm
Time to fire penetration (min:sec)	Did not penetrate	Did not penetrate	No penetration
Nature of the penetration	N.a.	N.a.	-

(*) 2 preliminary tests have been carried out instead on 1, due to different, potential ignitable, materials being present in the top layer of the specimen. 1.1 is the preliminary test on the blank tile and 1.2 is the preliminary test on the solar limpet.

SPREAD OF FLAME TEST WITH BURNING BRANDS AND SUPPLEMENTARY RADIANT HEAT (STAGE 2)

Specimen No:	2	3	4	Average	Criteria
Maximum downwards flame spread distance (mm)	0	0	0	0	≤ 533mm
Duration of flaming after withdrawal of the test flame (min:sec)	00:00	00:00	00:00	00:00	-
Additional observations: Carbonization and melting of the solar limpet and blank tile were visible for all specimens.					

PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 3)

Specimen No:	5	6	7	Average	Criteria
Time to fire penetration (min:sec)	Did not penetrate	Did not penetrate	Did not penetrate	Did not penetrate	30min or 60min
Nature of the penetration	N.a.	N.a.	N.a.	-	-
Additional observations: Carbonization and melting of the solar limpet and blank tile were visible for all specimens.					

Photos of the test specimens before and after the test: annex 1.

4. CLASSIFICATION AND DIRECT FIELD OF APPLICATION RESULTS

a) Classification

The test results relate only to the behaviour of the product under the particular conditions of the test. These results are not intended to be the sole criterion for assessing the potential fire hazard of the material in use.

The test results are only valid for the specimens of the product as they have been tested.

Small differences in the composition or thickness of the specimen may significantly affect the performance during the test and may therefore invalidate the test results.

In order to obtain test results which are representative for the product which is supplied or used, the conformity between the test specimen and the product should be assured. This is the role of the manufacturer and/or the supplier.

The system '**Solar limpet**', as described in § 2 and under the conditions of the test **is classified in class EXT.S.A.A**, according to the British Standard BS 476 - Part 3: 2004, clause 4 (see Annex 2).

b) Roof pitch

The roof as described has been tested with a roof pitch of 45°.

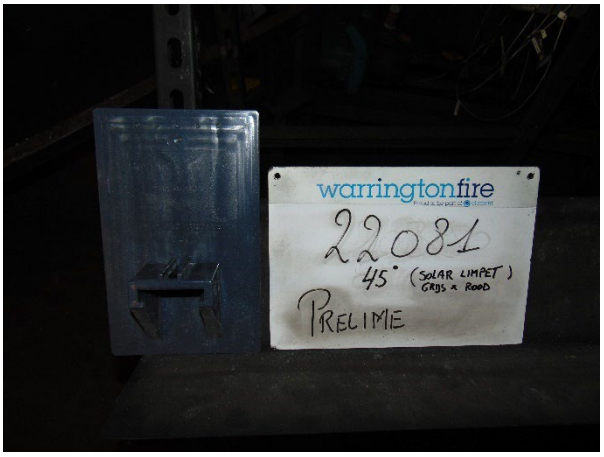
The test results apply to roofs with a pitch of > 10°, as defined in in the standard and in PD 476-3:2012.

Photos of the test specimen before and after the test

Specimen 1.1: Before

After

Specimen 1.2: Before



After

Specimen 2: Before

After

Photos of the test specimen before and after the test

Specimen 3: Before

After

Specimen 4: Before

After

Specimen 5: Before

After

Photos of the test specimen before and after the test

Specimen 6: Before

After

Specimen 7: Before

After

Classification Of Specimens

The following is reproduced from Clause 4 of BS 476: Part 3: 2004.

4 Classification

4.1 *Roof system*

Roof systems shall be designated by the letters EXT.F or EXT.S to indicate whether the test results apply to a flat (horizontal) or an inclined roof system, respectively

4.2 Fire Resistance of roof system

4.2.1 *Coding system*

Roof systems subject to conditions of external fire shall be classified according to both the time of penetration and the distance of spread of flame along their external surface.

Each category designation shall consist of two letters, e.g. AA, AC, BB, these being determined as specified in 4.22 and 4.23

4.2.2 *Fire penetration (first letter)*

A. Those specimens that have not been penetrated within one hour
B. Those specimens that are penetrated in not less than 30 min.
C. Those specimens that are penetrated in less than 30 min.
D. Those specimens that are penetrated in the preliminary flame test

4.2.3 *Spread of flame (second letter)*

A. Those specimens on which there is no spread of flame
B. Those specimens on which the spread of flame is less than or equal to 533mm, with averaged results rounded up or down to the whole number, as normally practised
C. Those specimens on which the spread of flame is greater than 533mm, with averaged results rounded up or down to the whole number, as normally practised
D. Those specimens that continue to burn for five minutes after withdrawal of the test flame or spread more than 381mm across the region of burning in the preliminary test.

4.2.4 *Suffix "X"*

Attention shall be drawn to dripping from the underside of the specimen, any mechanical failure, and any development of holes, by adding a suffix "X" to the designation to denote that one or more of these took place during the test.

EXAMPLE 1 EXT.F.AA is a flat roofing system with one hour fire penetration resistance on which there was no spread of flame.

EXAMPLE 2 EXT.S.CCX is an inclined roofing system with less than 30 min fire penetration resistance, on which the spread of flame exceeded 533mm and further deterioration took place.