test report

BS 476: Part 3: 2004

External Fire Exposure Roof Test

WF Report Number:

151009

Date:

19th December 2005

Test Sponsor:

Phoenix Dichtungstechnik Gmbh

UKAS TESTING
0249

warringtonfire
global safety
TESTING

Warringtonfire Test Report No 151009

BS 476: Part 3: 2004
External Fire Exposure Roof Test

Sponsored By

Phoenix Dichtungstechnik GmbH
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Waltershausen
Germany

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Test Details

Purpose of test

To determine the performance of specimens of a roof construction when they are subjected to the conditions of the test specified in BS 476: Part 3: 2004, "British Standard Specification for Fire Tests on Building Materials and Structures - External Fire Exposure Roof Tests".

The test was performed in accordance with the test procedures specified in BS 476: Part 3: 2004 and this report should be read in conjunction with that British Standard.

Scope of test

The tests are designed to enable measurement of:

a) capacity of a representative section of a roof to resist penetration by fire when the external surface is exposed to radiation and flame; and
b) distance of the spread of flame on the outer surface of the roof covering under certain conditions.

Roofs are graded according to the angle at which they are tested, the time for which they resist penetration by fire and the distance of superficial spread of flame on their external surface.

The test specimens are tested at an angle of 45° to the horizontal (sloping position) unless the roof construction is used at an angle of less than 10° to the horizontal, in which case the specimens are tested horizontally (flat position).

Fire test study group

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

Instruction to test

The test was conducted on the 1st and 6th December 2005 at the request of Phoenix Dichtungstechnik GmbH

the sponsor of the test.

Provision of test specimens

The specimens were supplied by the sponsor of the test. Warringtonfire was not involved in any selection or sampling procedure.

Conditioning of specimens

The specimens were received on the 16th November 2005. Prior to testing the specimens were conditioned to equilibrium in an atmosphere having a temperature of 23 ±2°C and a relative humidity of 45 to 55%.

Orientation of specimens

The specimens were tested in position the flat position.

Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description			An insulated roof construction applied to a plywood deck
Product reference			Self-adhesive system
Specimen configuration			Cap sheet / Insulation / Vapour control layer / Plywood deck
Overall thickness			Approx. 101.5 mm
Overall weight per unit area			17.85kg/m² (as determined by warringtonfire)
Cap Sheet (test face)	General description	Generic type	Heat-weldable synthetic rubber (EPDM) waterproofing membrane
		Product reference	"Resitrix SK"
		Colour reference	"Black"
		Weight per unit area	2.75 kg/m²
		Thickness	2.5 mm
		Flame retardant details	**See Note 1 Below**
	External layer (Test face)	Generic type	Synthetic rubber (EPDM) waterproofing membrane
		Product reference	EPDM Sheet
		Colour reference	"Black"
		Weight per unit area	Approximately 1400 g/m²
		Thickness	1.30 mm
		Flame retardant details	**See Note 1 below**
	Self adhesive layer	Generic type	Polymer modified self-adhesive bitumen
		Product reference	Self-adhesive bitumen layer
		Colour reference	"Black"
		Weight per unit area	Approximately 1200 g/m²
		Thickness	1.20 mm
		Flame retardant details	**See Note 1 Below**
Primer (Bonding cap sheet to insulation)		Generic type	Surface primer
		Product reference	"FG 35"
		Colour reference	black
		Application rate	Approximately 200g/m²
		Thickness	**See Note 2 below**
		Flame retardant details	**See Note 1 below**

Glass Tissue Faced Insulation	Facing	Trade name / product reference	"Kingspan TR 27"
		Generic type	Non – woven glass mat
		Name of manufacturer	Kingspan Insulation B.V.
		Density / weight per unit area	**See Note 2 Below**
		Thickness	**See Note 2 Below**
		Colour	"Grey"
		Flame retardant details	**See Note 1 Below**
	Bonding Details (Facing to insulation)		Auto adhesively bonded during the manufacturing process
	Insulation	Product reference	"Kingspan TR 27"
		Generic type	Polyisocyanurate
		Name of manufacturer	Kingspan Insulation B.V.
		Density	32 kg/m³
		Thickness	80 mm
		Colour reference	"Yellow"
		Flame retardant details	**See Note 1 Below**
Bonding details (insulation to vapour control layer)			Mechanically fixed to the plywood; Fixing agents : SFS IRD 40x82 ISO FAST
Vapour Control Layer	General description	General description of vapour control layer	Glass reinforced self adhesive aluminium vapour barrier
		Product reference	"ALUTRIX"
		Colour reference of vapour control layer	"Silver"
		Overall weight per unit area of vapour control layer	Approximately 0.9 kg/m²
		Overall thickness of vapour control layer	1.0 mm
	Layer 1 (Aluminium vapour barrier)	Product reference	**See Note 2 Below**
		Generic type	Aluminium layer
		Name of manufacturer	**See Note 2 Below**
		Thickness	31 microns
		Weight per unit area	Approximately 55g/m²
		Colour reference	"Silver"
		Flame retardant details	**See Note 1 Below**
	Layer 2 (reinforcement)	Product reference	**See Note 2 Below**
		Generic type	Glass reinforcement
		Name of manufacturer	**See Note 2 Below**
		Thickness	0.30 mm
		Weight per unit area	Approximately 60g/m²
		Flame retardant details	**See Note 1 Below**
	Layer 3 (self-adhesive layer)	Product reference	**See Note 2 Below**
		Generic type	Self-adhesive-bitumen
		Name of manufacturer	Phoenix-Dichtungstechnik GmbH
		Thickness	Approximately 0.60 mm
		Weight per unit area	Approximately 600 g/m²
		Colour reference	"Black"
		Flame retardant details	**See Note 1 Below**

Primer	Generic type	Surface primer
	Product reference	"FG 35"
	Colour reference	"Black"
	Application rate	Approximately 200 g/m²
	Application method	Brush and Roller
	Thickness	**See Note 2 Below**
	Flame retardant details	**See Note 1 Below**
Deck (Reverse Face)	Product reference	**See Note 2 Below**
	Generic type	Marine plywood
	Name of manufacturer	**See Note 2 Below**
	Weight per unit area	9.3 kg/ m²
	Thickness	18 mm
	Flame retardant details	**See Note 1 Below**
Jointing Details		50 mm side lap in cap sheet on one specimen subjected to the fire penetration section of the test. 50 mm end lap in cap sheet on one specimen subjected to the spread of flame section of the test.
Brief description of manufacturing process		▪ Priming of plywood with "FG35" ▪ Vapour control layer bonded to plywood (self adhesive) ▪ "Kingspan TR 27" mechanically fixed to the plywood. ▪ Priming the insulation for self-adhesion of Resitrix SK" utilising "FG 35" ▪ "Resitrix SK fully bonded on FG 35 to primed "Kingspan TR 27". (self adhesive)

Note 1 : The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component.

Note 2 : The sponsor was unwilling to provide this information.

Test Results

Results of test

The test results relate only to the behaviour of the test specimens of the construction under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the construction in use.

The test results relate only to the specimens of the roof construction which were tested. Small differences in the composition or thickness of the construction may significantly affect the results of the test and may therefore invalidate the test results. Care should be taken to ensure that any construction which is supplied or used is fully represented by the specimens which were tested.

The results of the tests on each of the specimens are given in Table 1.

In Accordance With The Designations Defined In BS 476: Part 3: 2004 The Test Specimens Are In Category "EXT.F.AB".

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

Signatories

Responsible Officer
A. Myler *

Approved
I. Moore *
Laboratory Supervisor *

* For and on behalf of warringtonfire.

Report Issued: 19th December 2005

Table 1

PRELIMINARY IGNITION TEST WITH BURNING BRANDS (STAGE 1)	Specimen No:
	1
Room Temperature at Start of Test (°C)	21
Time to Fire Penetration (if applicable) (min:sec)	n/a
Duration of Flaming after Withdrawal of the Test Flame (if applicable) (min:sec)	4:16
Maximum Flame Spread Distance (if applicable) (mm)	n/a

SPREAD OF FLAME TEST WITH BURNING BRANDS AND SUPPLEMENTARY RADIANT HEAT (STAGE 2)	Specimen No:		
	2	3	4
Room Temperature at Start of Test (°C)	24	25	25
Duration of Flaming after Withdrawal of the Test Flame (if applicable) (min:sec)	46:00	58:00	27:00
Maximum Flame Spread Distance (if applicable) (mm)	60	140	100
Other observations: In the case of each specimen ignition occurred from the first minute from application of the pilot flame, and flame spread began from the second minute of the test.			

PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 3)	Specimen No:		
	5	6	7
Room Temperature at Start of Test (°C)	28	29	29
Time to Fire Penetration (if applicable) (min:sec)	n/a	n/a	n/a
Other observations: In the case of each specimen no fire penetration occurred.			

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 there is not more than 533mm spread of flame
C. Those specimens on which there is more than 533mm spread of flame
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.