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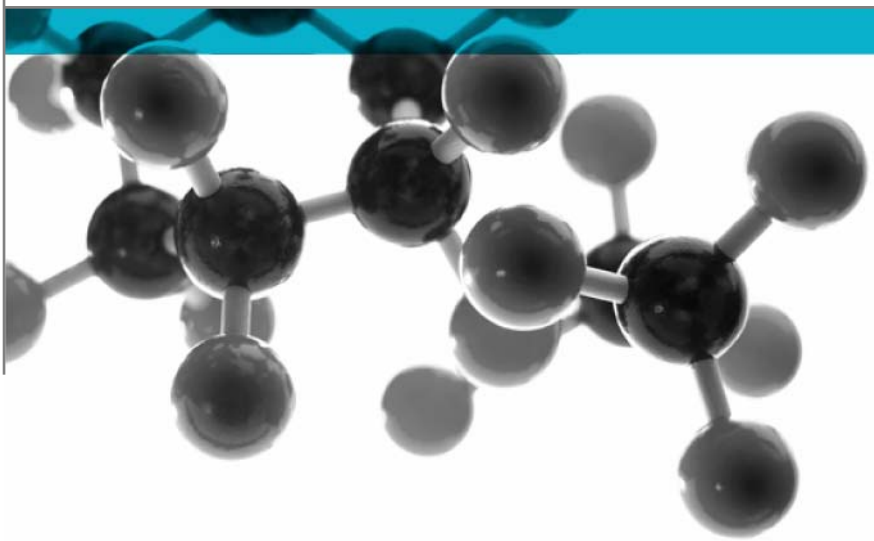
BS 476 Part 3: 2004



External Fire Exposure Roof Test

A Report To: Tuff Waterproofing Limited

Document Reference: 325184

Date: 12th June 2013

Issue No.: 2

Testing
Advising
Assuring

Registered Office: Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian EH28 8PL United Kingdom. Reg No.SC 70429
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UKAS TESTING
0249

Executive Summary

Objective To determine the fire performance of the following product when tested in accordance with BS 476: Part 3: 2004

Generic Description	Product reference	Thickness	Weight per unit area or density
GRP waterproofing system on 18mm OSB decking	"TuffStuff GRP Waterproofing System"	18.50mm *	12.61kg/m^2 *
Individual components used to manufacture composite:			
Top coat	"TuffStuff Roofing Topcoat"	Not stated	1.20
Moulded sheet	"TuffStuff GRP Laminate"	1.5mm	1.8kg/m^2
Timber	"OSB3"	18mm	11.7kg/m^2
Please see page 5 & 6 of this test report for the full description of the product tested			
*Determined by **Exova Warringtonfire**			

Test Sponsor Tuff Waterproofing Limited, Unit 7 Guardian Park, Station Road, Tadcaster, North Yorkshire, LS24 9SG

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

Date of Test: 29th January 2013

Reason for Revision: This document replaces issue 1 (dated 21st May 2013) of the same number which has been withdrawn. The sponsor's name and address details have been altered on this Issue 2 report.

Signatories

Responsible Officer
K. Hughes *
Technical Officer

Approved
T. Mort *
Senior Technical Officer

Authorised
S. Deeming *
Operations Manager

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 12th June 2013

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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^{o} to the horizontal (sloping position) unless the roof construction is used at an angle of less than 10^{o} to the horizontal, in which case the specimens are tested horizontally (flat position).

Fire test study group/EGOLF

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 29th January 2013 at the request of a representative of the sponsor of the test.

Provision of test specimens

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

Conditioning of specimens

The specimens were received on the 3rd January 2013. 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 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			GRP waterproofing system on 18mm OSB decking
Product reference of composite			"TuffStuff GRP Waterproofing System"
Name of manufacturer of composite			**See Note 1 below**
Thickness of composite			18.50mm (determined by **Exova Warringtonfire**)
Weight per unit area of composite			12.61kg/m^2 (determined by **Exova Warringtonfire**)
Topcoat (test face)		Generic type	Polyester resin
		Product reference	"TuffStuff Roofing Topcoat"
		Name of manufacturer	**See Note 1 below**
		Colour reference	"RAL 7011" "Grey" (as observed by **Exova Warringtonfire**)
		Number of coats	One
		Application rate	0.5kg/m^2
		Specific gravity	1.20
		Application method	Roller / brush applied
		Flame retardant details	**See Note 1 below**
		Curing process per coat	10 days at 20^{o}C
Moulded sheet	Product reference of GRP		"TuffStuff GRP Laminate"
	Name of manufacturer of GRP		**See Note 1 below**
	Overall thickness of GRP		1.5mm
	Weight per unit area of GRP		1.8kg/m^2
	Basecoat	Generic type	Polyester resin
		Product reference	"TuffStuff Roofing Resin"
		Name of manufacturer	**See Note 1 below**
		Specific gravity	1.23
		Flame retardant details	**See Note 2 below**
	Glass reinforcement	Generic type	Chopped strand mat
		Product reference	"TuffStuff Reinforcement Mat"
		Number of layers	One
		Weight per unit area of each layer	450g/m^2
		Configuration of glass reinforcement	Chopped strand mat
		Name of manufacturer	**See Note 1 below**
	Resin to glass ratio (by weight)		3:1
	Percentage glass reinforcement (by weight)		25%
	Curing process (duration and temperature)		10 days at 20^{o}C

Continued on next page

Timber	Generic type	Oriented Strand Board
	Product reference	"OSB3"
	Timber species	Mixed
	Thickness	18mm
	Weight per unit area	11.7kg/m^2
	Name of manufacturer	Norbord
	Amount of flame retardant	**See Note 2 below**
	Cycle details	**See Note 1 below**
Brief description of manufacturing process		OSB3 18mm T & G decking. 450g/m^2 laminate constructed from 450g/m^2 reinforcement mat, 1.35lg/m^2 polyester resin, MEKP catalyst at 2%. 0.5kg/^{2} polyester topcoat, MEKP catalyst at 2%

Note 1. The sponsor was unwilling to provide this information.

Note 2. The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component.

Test Results

Results

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.

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Table 1

PRELIMINARY IGNITION TEST WITH BURNING BRANDS (STAGE 1)	Specimen No:
	1
Room temperature at start of test (°C)	26
Time to fire penetration (if applicable) (min:sec)	Not applicable
Duration of flaming after withdrawal of the test flame (if applicable) (min:sec)	0:10
Maximum flame spread distance (if applicable) (mm)	Nil

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)	22	27	27
Duration of flaming after withdrawal of the test flame (if applicable) (min:sec)	44:00	38:12	35:12
Maximum flame spread distance (if applicable) (mm)	427	411	392
Additional observations: In the case of all three specimens, ignition occurred within the first minute. An average distance of 430mm flame spread was recorded.			

PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 3)	Specimen No:		
	5	6	7
Room temperature at start of test (°C)	29	30	28
Time to fire penetration (if applicable) (min:sec)	N/A	N/A	N/A
Additional observations: In the case of all three specimens, ignition occurred within the first minute upon application of the brand. In the case of all three specimens, no flaming penetration was observed.			

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.

Revision History

Issue No : 2	Issue Date: 12th June 2013
Revised By: K Hughes	Approved By: T Mort
Reason for Revision: This document replaces issue 1 (dated 21st May 2013) of the same number which has been withdrawn. The sponsor's name and address details have been altered on this Issue 2 report.	

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