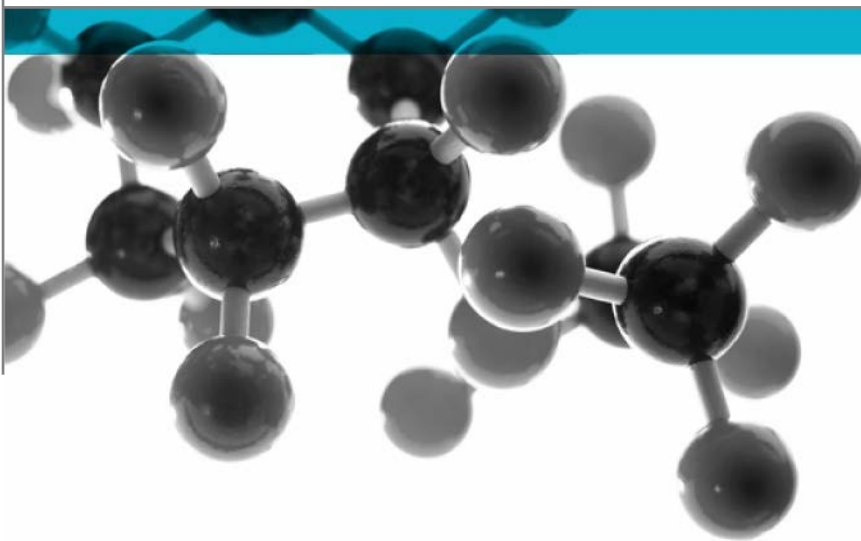


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# BS 476 Part 3: 2004



## External Fire Exposure Roof Test

A Report To: Res-Tec Limited

Document Reference: 348167

Date: 6<sup>th</sup> February 2015

Issue No.: 2

Page 1

Testing  
Advising  
Assuring



## 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 |
|---|---|------------|---------------------------------|
| Flame retardant grade GRP coating over 18mm oriented strand board                                 | "Res-Tec GRP Roof 1010 System"          | 19.65 mm   | 13.44kg/m <sup>2</sup>          |
| <b>Individual components used to manufacture composite:</b>                                       |   |            |                                 |
| Top coat  | "Res-Tec GRP Roof 1010 Top Coat Resin"  | Not stated | 0.5l/m <sup>2</sup>             |
| Base coat   | "Res-Tec GRP Roof 1010 Base Coat Resin" | Not stated | 1.0l/m <sup>2</sup>             |
| Glass reinforcement   | Not stated                              | Not stated | 450g/m <sup>2</sup>             |
| Substrate   | "Sterling OSB 3"                        | 18mm       | 10.8kg/m <sup>2</sup>           |
| <b>Please see page 5 and 6 of this test report for the full description of the product tested</b> |   |            |                                 |

**Test Sponsor**

Res-Tec Limited, Unit 25, Castle Park Industrial Estate, Flint, Flintshire, CH6 5XA

**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:**

26<sup>th</sup> January 2015

**Reason for revision**

This document replaces Issue 1 (dated 30<sup>th</sup> January 2015) of the same number which has been withdrawn. The sponsor has requested that an amendment to be made to the generic description.

## Signatories

|   |  |
|---|--|
|  |  |
| Responsible Officer<br>K. Hughes *<br>Technical Officer                             | Authorised<br>S. Deeming *<br>Business Unit Head                                     |

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

Report Issued: 6<sup>th</sup> February 2015

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Document No.: 348167

Page No.: 2 of 10

Author: K. Hughes

Issue Date: 6<sup>th</sup> February 2015

Client: Res-Tec Limited

Issue No.: 2



0249

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## Test Details

|                                    |  |
|------------------------------------|--|
| <b>Purpose of test</b>             | <p>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".</p> <p>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.</p>  |
| <b>Scope of test</b>               | <p>The tests are designed to enable measurement of:</p> <ul style="list-style-type: none"> <li>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</li> <li>b) distance of the spread of flame on the outer surface of the roof covering under certain conditions.</li> </ul> <p>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.</p> <p>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).</p> |
| <b>Fire test study group/EGOLF</b> | <p>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.</p>   |
| <b>Instruction to test</b>         | <p>The test was conducted on the 26<sup>th</sup> January 2015 at the request of Res-Tec Limited, the sponsor of the test.</p>  |
| <b>Provision of test specimens</b> | <p>The specimens were supplied by the sponsor of the test. <b>Exova Warringtonfire</b> was not involved in any selection or sampling procedure.</p>  |
| <b>Conditioning of specimens</b>   | <p>The specimens were received on the 8<sup>th</sup> January 2015. 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%.</p>   |
| <b>Orientation of specimens</b>    | <p>The specimens were tested in the flat position.</p>   |

## 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  |                         | Flame retardant grade GRP coating over 18mm oriented strand board   |
| Product reference    |                         | "Res-Tec GRP Roof 1010 System"  |
| Name of manufacturer |                         | Res-Tec Ltd   |
| Thickness            |                         | 19.65 mm (Stated by sponsor)<br>20.04mm (determined by <b>Exova Warringtonfire</b> )                              |
| Weight per unit area |                         | 13.44kg/m <sup>2</sup> (Stated by sponsor)<br>13.02kg/m <sup>2</sup> (determined by <b>Exova Warringtonfire</b> ) |
| Top coat             | Generic type            | Pigmented polyester   |
|                      | Product reference       | "Res-Tec GRP Roof 1010 Top Coat Resin"  |
|                      | Name of manufacturer    | Res-Tec Ltd   |
|                      | Colour reference        | "Dark Admiralty Grey"   |
|                      | Number of coats         | One   |
|                      | Application rate        | 0.5l/m <sup>2</sup>   |
|                      | Specific gravity        | 1.32  |
|                      | Application method      | Roller  |
|                      | Curing process per coat | Ambient temperature cure  |
|                      | Flame retardant details | <b>See Note 1 Below</b>   |
| Base coat            | Generic type            | Polyester resin   |
|                      | Product reference       | "Res-Tec GRP Roof 1010 Base Coat Resin"   |
|                      | Name of manufacturer    | Res-Tec Ltd   |
|                      | Colour reference        | "Non Pigmented"   |
|                      | Number of coats         | One   |
|                      | Application rate        | 1.0l/m <sup>2</sup>   |
|                      | Specific gravity        | 1.17  |
|                      | Application method      | Roller  |
|                      | Curing process per coat | Ambient temperature cure  |
|                      | Flame retardant details | <b>See Note 1 Below</b>   |

Continued on next page

|  |                                      |  |
|--|--------------------------------------|--|
| Glass reinforcement                        | Generic type                         | Emulsion bound chopped strand mat  |
|  | Product reference                    | <b>See Note 2 Below</b>  |
|  | Number of layers                     | One  |
|  | Weight per unit area of each layer   | 450g/m <sup>2</sup>  |
|  | Configuration of glass reinforcement | Random   |
|  | Name of manufacturer                 | <b>See Note 2 Below</b>  |
|  | Flame retardant details              | <b>See Note 2 Below</b>  |
| Substrate                                  | Generic type                         | Oriented strand board  |
|  | Product reference                    | "Sterling OSB 3"   |
|  | Timber species                       | <b>See Note 3 Below</b>  |
|  | Thickness                            | 18mm   |
|  | Weight per unit area                 | 10.8kg/m <sup>2</sup>  |
|  | Name of supplier                     | Norbord Ltd  |
|  | Flame retardant details              | <b>See Note 3 Below</b>  |
| Brief description of manufacturing process |                                      | Batch blending process of resins. Roller application of resins to substrate. |

**Note 1: The sponsor of the test has provided this information but at the specific request of the sponsor, these details have been omitted from the report and are instead held on the confidential file relating to this investigation.**

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

**Note 3: The sponsor was unable to provide this information.**

## 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**

| <b>PRELIMINARY IGNITION TEST WITH BURNING BRANDS (STAGE 1)</b>                   | Specimen No: |   |  |
|--|--------------|---|--|
|  |              | 1 |  |
| Room temperature at start of test (°C)   | 26           |   |  |
| Time to fire penetration (if applicable) (min:sec)                               | N/A          |   |  |
| Duration of flaming after withdrawal of the test flame (if applicable) (min:sec) | Nil          |   |  |
| Maximum flame spread distance (if applicable) (mm)                               | Nil          |   |  |

| <b>SPREAD OF FLAME TEST WITH BURNING BRANDS AND SUPPLEMENTARY RADIANT HEAT (STAGE 2)</b> | 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)         | 53:04        | 55:59 | 53:20 |
| Maximum flame spread distance (if applicable) (mm)                                       | 240          | 340   | 360   |
| Additional observations:   |              |       |       |
| In the case of all three specimens ignition occurred in the first minute of the test.    |              |       |       |

| <b>PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 3)</b> | Specimen No:      |                   |                   |
|--|-------------------|-------------------|-------------------|
|  | 5                 | 6                 | 7                 |
| Room temperature at start of test (°C)   | 27                | 28                | 28                |
| Time to fire penetration (if applicable) (min:sec)   | Did not penetrate | Did not penetrate | Did not penetrate |
| Additional observations:   |                   |                   |                   |
| In the case of all three specimens no ignition 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 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 : 1  | Issue Date: 6 <sup>th</sup> February 2015 |
| Revised By: K. Hughes   | Approved By: S. Deeming                   |
| Reason for Revision: This document replaces Issue 1 (dated 30 <sup>th</sup> January 2015) of the same number which has been withdrawn. The sponsor has requested that an amendment to be made to the generic description. |   |

|                      |              |
|----------------------|--------------|
| Issue No :           | Issue Date:  |
| Revised By:          | Approved By: |
| Reason for Revision: |              |

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Testing. Advising. Assuring.

**Title:**

CLASSIFICATION REPORT  
FOR ROOFS/ROOF  
COVERINGS EXPOSED TO  
EXTERNAL FIRE  
EN 13501-5: 2005 +A1:  
2009

**Notified Body No:**

0833

**Product Names:**

"Res-Tec GRP Roof  
1010 System"

**Report No:**

WF 348385

**Issue No:**

3

**Prepared for:**

Res-Tec Limited  
Unit 25 Castle Park  
Industrial Estate  
Flint  
Flintshire  
CH6 5XA

**Date:**

2<sup>nd</sup> February 2015



## 1. Introduction

This classification report defines the classification assigned to "Res-Tec GRP Roof 1010 System", which is fully described in paragraph 2.2, in accordance with the procedures given in EN 13501-5: 2005: + A1: 2009.

## 2. Details of classified product

### 2.1 General

The product, "Res-Tec GRP Roof 1010 System", is defined as being suitable for roof covering applications.

### 2.2 Product description

The product, "Res-Tec GRP Roof 1010 System", is fully described below and in the test reports provided in support of classification listed in Clause 3.1.

|                      |                         |   |
|----------------------|-------------------------|---|
| General description  |                         | Flame retardant grade GRP coating over 18mm oriented strand board   |
| Product reference    |                         | "Res-Tec GRP Roof 1010 System"  |
| Name of manufacturer |                         | Res-Tec Ltd   |
| Thickness            |                         | 19.65 mm (Stated by sponsor)<br>20.04mm (determined by Exova Warringtonfire)                              |
| Weight per unit area |                         | 13.44kg/m <sup>2</sup> (Stated by sponsor)<br>13.02kg/m <sup>2</sup> (determined by Exova Warringtonfire) |
| Top coat             | Generic type            | Pigmented polyester   |
|                      | Product reference       | "Res-Tec GRP Roof 1010 Top Coat Resin"  |
|                      | Name of manufacturer    | Res-Tec Ltd   |
|                      | Colour reference        | "Dark Admiralty Grey"   |
|                      | Number of coats         | One   |
|                      | Application rate        | 0.5l/m <sup>2</sup>   |
|                      | Specific gravity        | 1.32  |
|                      | Application method      | Roller  |
|                      | Curing process per coat | Ambient temperature cure  |
|                      | Flame retardant details | <b>See Note 1 Below</b>   |
| Base coat            | Generic type            | Polyester resin   |
|                      | Product reference       | "Res-Tec GRP Roof 1010 Base Coat Resin"   |
|                      | Name of manufacturer    | Res-Tec Ltd   |
|                      | Colour reference        | "Non Pigmented"   |
|                      | Number of coats         | One   |
|                      | Application rate        | 1.0l/m <sup>2</sup>   |
|                      | Specific gravity        | 1.17  |
|                      | Application method      | Roller  |
|                      | Curing process per coat | Ambient temperature cure  |
|                      | Flame retardant details | <b>See Note 1 Below</b>   |

Continued on next page

|  |                                      |  |
|--|--------------------------------------|--|
| Glass reinforcement                        | Generic type                         | Emulsion bound chopped strand mat  |
|  | Product reference                    | See Note 2 Below   |
|  | Number of layers                     | One  |
|  | Weight per unit area of each layer   | 450g/m <sup>2</sup>  |
|  | Configuration of glass reinforcement | Random   |
|  | Name of manufacturer                 | See Note 2 Below   |
|  | Flame retardant details              | See Note 3 Below   |
| Substrate                                  | Generic type                         | Oriented strand board  |
|  | Product reference                    | "Sterling OSB 3"   |
|  | Timber species                       | See Note 3 Below   |
|  | Thickness                            | 18mm   |
|  | Weight per unit area                 | 10.8kg/m <sup>2</sup>  |
|  | Name of supplier                     | Norbord Ltd  |
|  | Flame retardant details              | See Note 3 Below   |
| Brief description of manufacturing process |                                      | Batch blending process of resins. Roller application of resins to substrate. |

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

Note 3: The sponsor was unable to provide this information.

### 3. Test reports & test results in support of classification

#### 3.1 Test reports

| Name of Laboratory   | Name of sponsor | Test reports/extended application report Nos. | Test method / extended application rules & date |
|----------------------|-----------------|---|---|
| Exova warringtonfire | Res-Tec Ltd     | WF 348168 (Issue 2)                           | ENV 1187:2002 Test 4                            |

#### 3.2 Test results

##### 3.2.1 Test 4

Test pitch: 0 degrees

Substrate/Deck: 18mm oriented strand board

Supporting structure: N/A

**Preliminary test (Stage 1):**

| Parameter             | Criteria                | Test Results | Compliance              |
|-----------------------|-------------------------|--------------|-------------------------|
|                       | Class<br>$B_{ROOF}(t4)$ | Specimen 1   | Class<br>$B_{ROOF}(t4)$ |
| Burn time             | <5min                   | NIL          | Y                       |
| Flame spread distance | <0,38m                  | NIL          | Y                       |
| Penetration           | None                    | None         | Y                       |

**Penetration test (Stage 2):**

| Parameter        | Criteria                | Test Results |            |            |                   | Compliance              |
|------------------|-------------------------|--------------|------------|------------|-------------------|-------------------------|
|                  | Class<br>$B_{ROOF}(t4)$ | Specimen 1   | Specimen 2 | Specimen 3 | Mean <sup>a</sup> | Class<br>$B_{ROOF}(t4)$ |
| Penetration time | $\geq 60$ min           | 60min        | 60min      | 60min      | 60min             | Y                       |

<sup>a</sup> If one or two of the specimens have not failed at one hour, a time of 60min shall be used in calculating the mean time of penetration.

**4. Classification and field of application**

**4.1 Reference of classification**

This classification has been carried out in accordance with EN 13501-5: 2005: + A1: 2009.

**4.2 Classification**

The product, "Res-Tec GRP Roof 1010 System", in relation to its external fire performance is classified:

**$B_{ROOF}(t4)$**

**4.3 Field of application**

This classification is valid for the following conditions:

|                       |                           |
|-----------------------|---------------------------|
| Range of pitches      | 0 - 10 degrees            |
| Substrate/Deck        | 18mm oriented stand board |
| Product configuration | No variation allowed      |
| Product composition   | No variation allowed      |
| Product thickness     | No Variation allowed      |
| Supporting structure  | N/A                       |

## 5. Limitations

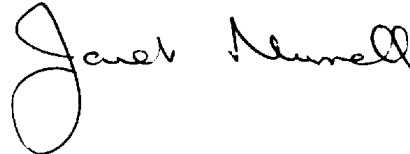
This document does not represent type approval or certification of the product

### SIGNED



.....  
**Mathew Dale**  
Certification Engineer  
Technical Department

### APPROVED



.....  
**Janet Murrell**  
Technical Manager  
Technical Department  
on behalf of:  
**Exova Warringtonfire**

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Issue 3: 5<sup>th</sup> February 2015