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BRE Global Assessment Report

An assessment of the fire performance of Fireshield Acoustic Intumescent FR Acrylic sealant when used to seal between the frame of a timber doorset and the surrounding supporting construction against the adopted criteria of BS 476: Part 20: 1987

Prepared for: VJ Technology Limited

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1 Introduction

A fire resistance test in accordance with EN 1634-1:2014+A1:2018 has been carried out on two doorsets comprising timber door leaves hung in timber frames. The doorsets were installed in a steel stud partition and the perimeters of the frames were sealed against this using Fireshield Acoustic Intumescent FR Acrylic sealant. The test specimen construction included two further linear gaps, also sealed using Fireshield Acoustic Intumescent FR Acrylic sealant, which were tested in accordance with EN 1366-4:2021. These linear gap seals were designed to simulate the seal between the rear of a door frame and the supporting construction.

This assessment considers the field of application for the seals based on this test against the adopted integrity criteria of BS 476: Part 20: 1987.

2 Scope

This assessment report covers the fire performance of Fireshield Acoustic Intumescent FR Acrylic sealant when used as a linear joint seal to seal the gap between the frame of timber doorsets and the supporting construction against the adopted integrity criteria of BS 476: Part 20: 1987, for fire exposures of up to 30 or 60 minutes, as appropriate, from either side.

3 Supporting data

3.1 United Kingdom Testing and Certification report no. 20210723-000714 Revision: C

A fire resistance test in accordance with EN 1634-1:2014+A1:2018, with additional guidance taken from EN 1366-4:2021, has been carried out on two single-acting, single-leaf, hinged, timber doorsets comprising a timber leaf hung in a timber frame and two linear gap seals on 22 November 2021. The test duration was 69 minutes.

The test construction incorporated four specimens, two single-acting, single-leaf, hinged, timber doorsets (specimens A and B) and two linear gap seals (specimens C and D). These were installed in a drywall partition system comprising 50mm deep steel C-section studs at nominal 600mm centres lined on each face with two layers of 12.5mm-thick British Gypsum Gyproc FireLine plasterboard. The core of the partition, between the studs, was filled with 50mm-thick Saint Gobain Isover mineral wool insulation, nominal density 33kg/m^3.

The partition incorporated two openings for the doors, each nominally 970mm wide x 2060mm high, and two for the linear gap seals, each nominally 1000mm long x 50mm wide, one vertical and one horizontal. In all cases the openings were lined around their perimeters with sections of steel stud.

Specimen A comprised a frame of European Redwood, nominal density 510kg/m^3, with overall dimensions 930mm wide x 2040mm high. The head and jambs each had overall dimensions of 70mm

deep x 42mm wide with a rebate 27mm deep x 15mm wide. The jambs were fixed to the head using stub tenons, 16mm x 16mm x 32mm, fixed with two 5mm-diameter x 100mm-long woodscrews in each case.

Specimen B comprised a frame of Sapele, nominal density 620 to 660kg/m^3, with overall dimensions 930mm wide x 2040mm high. The head and jambs each had overall dimensions of 95mm deep x 42mm wide with a rebate 39mm deep x 15mm wide. The jambs were fixed to the head using stub tenons, 16mm x 16mm x 32mm, fixed with two 5mm-diameter x 100mm-long woodscrews in each case.

In both cases the frame was fixed to the supporting partition using single-thread screws, 5mm diameter x 80mm long, 150mm from the top and bottom corners of the jamb with the intermediate fixings at no more than 600mm centres. Certitek PVCu shims, 101mm x 43mm, of assorted thicknesses, were used at each fixing location.

The nominally 20mm-wide gap between the outside face of the door frame in each case was sealed using 50mm-thick Saint-Gobain Isover mineral wool insulation, nominal density 10kg/m^3, which was compression fitted. Fireshield Acoustic Intumescent FR Acrylic sealant was then applied over the insulation using a cartridge gun to a depth of 10mm.

Specimen C comprised a horizontal linear gap, 1000mm long x 100mm deep x 20mm wide, faced on one side with a section of MDF (medium density fibre board), 30mm thick with a nominal density of 720kg/m^3, designed to simulate a door frame.

Specimen D comprised a vertical linear gap, 1000mm long x 100mm deep x 20mm wide, faced on one side with a section of MDF, 30mm thick with a nominal density of 720kg/m^3, designed to simulate a door frame.

These gaps were sealed using 50mm-thick Saint Gobain Isover mineral wool insulation, nominal density 10kg/m^3, which was compression fitted. Fireshield Acoustic Intumescent FR Acrylic sealant was then applied over the insulation using a cartridge gun to a depth of 10mm.

The doorsets, which opened towards the furnace, achieved the following performance against the test standard:

<u>Specimen A</u>

Integrity -	Sustained flaming:	30 minutes
	Gap gauge:	30 minutes
	Cotton pad:	28 minutes
Insulation -	Mean temperature rise:	28 minutes
	Maximum temperature rise (supplementary procedure):	28 minutes
	Maximum temperature rise (normal procedure):	28 minutes

<u>Specimen B</u>

Integrity -	Sustained flaming:	60 minutes
	Gap gauge:	60 minutes
	Cotton pad:	59 minutes
Insulation -	Mean temperature rise:	59 minutes
	Maximum temperature rise (supplementary procedure):	59 minutes

	Maximum temperature rise (normal procedure):	59 minutes

The linear gap seals achieved the following performance against the test standard:

Specimen C

Integrity -	Sustained flaming:	69 minutes
	Cotton pad:	69 minutes
Insulation -	Maximum temperature rise:	69 minutes

Specimen D

Integrity -	Sustained flaming:	69 minutes
	Cotton pad:	69 minutes
Insulation -	Maximum temperature rise:	69 minutes

For full details see United Kingdom Testing and Certification report no. 20210723-000714 Revision: C.

4 Description of the proposed system

The proposed seals comprise Fireshield Acoustic Intumescent FR Acrylic sealant with Saint Gobain Isover mineral wool insulation backing. The seals are designed to seal gaps between the rear of a timber door frame and the supporting construction into which the door is installed. The maximum sealant width is 20mm and the maximum depth 10mm.

The minimum overall depths of the timber door frame are as follows:

Door frame material	Fire resistance period	
	30 minutes	60 minutes
Softwood, minimum density 510kg/m^3	70mm deep	Not applicable
Hardwood, minimum density, 660kg/m^3	70mm deep	95mm deep
MDF, minimum density 720kg/m^3	100mm deep	100mm deep

The supporting construction can be a rigid masonry supporting construction, minimum thickness 100mm, or a flexible partition system, minimum thickness 100mm, comprising steel studs, minimum depth 50mm, lined with a minimum of two layers of 12.5mm-thick type 5 plasterboard.

5 Assumptions

It is assumed for the purposes of this assessment that both the doorset and the supporting construction have a fire resistance at least that required of the seal around the door frame perimeter.

6 Comparison of standards

The test detailed in United Kingdom Testing and Certification report no. 20210723-000714 Revision: C was carried in accordance with EN 1634-1:2014+A1:2018, with additional guidance taken from EN 1366-4:2021, whereas this assessment considers the fire performance of the linear gap seal around the door perimeter against the adopted integrity criteria of BS 476: Part 20: 1987.

If a similar test had been conducted in accordance with BS 476: Parts 20/22: 1987 there would have been two significant differences with regard to the way in which the test was carried out. The first of these relates to the furnace temperature. In EN 1634-1 this is measured using plate thermometers whereas in BS 476: Parts 20/22 it is measured using bare-wire thermocouples. This means that although the same furnace temperature/time curve is used in both standards, the EN is more onerous. This is because the plate thermometers detect the rising temperature in the furnace more slowly. The other difference is the furnace pressure. In the test on the timber door, the pressure would have been set so that there was a neutral pressure plane 500mm above the sill. This resulted in a furnace pressure at the top of the doorset of approximately 13Pa. If the test had been carried out in accordance with BS 476: Part 22, the pressure at this location would have been set at 9Pa. In this respect, the EN is slightly more severe.

There is no equivalent British Standard to EN 1366-4, but it is reasonable to assume that similar pressure conditions would be applied in an ad-hoc test carried out using the appropriate procedures, requirements and criteria of BS 476: Part 20: 1987.

It should be noted that doorset A, which was designed to satisfy the integrity and insulation criteria of EN 1634-1 for a period of 30 minutes, failed the integrity criteria at 28 minutes and doorset B, which was designed to satisfy the integrity and insulation criteria for 60 minutes, failed the integrity criteria at 59 minutes. In both cases, the failure was related to the doorset alone and not to the seal around its perimeter.

It is therefore reasonable to assume that the seal around specimen A would have satisfied the adopted integrity criteria of BS 476: Part 20: 1987 for 30 minutes, the seal around specimen B for 60 minutes, and the linear gap seals forming specimens C and D for 60 minutes.

It should be noted that although no thermocouples were attached to the seals themselves, there was no indication that the temperatures on the unexposed face were excessive as there was no evidence of any bubbling or discolouration of the acrylic sealant or charring of the timber door frame adjacent to the seals.

7 Assessment

In order to extend the field of application for the tested seals around the doorset perimeters in United Kingdom Testing and Certification report no. 20210723-000714, we have used the National Annex from EN 1366-4:2021, *Fire resistance tests for service installation. Part 4: Linear joint seals* for guidance. The National Annex applies specifically to linear joint seal materials used to seal the gap between the back of timber fire doorset frames and the supporting construction. Specimens C and D in United Kingdom Testing and Certification report no. 20210723-000714 Revision: C were effectively carried out in accordance with this annex.

The field of direct application from this annex would allow the following:

a) The seal length may be increased both horizontally and vertically. This applies to all four specimens.

b) The seal width may be reduced to less than the 20mm tested, provided that the linear joint seal design and depth remain as tested. The seal width cannot be increased.

c) The timber door frame section size and supporting construction thickness may be increased but not reduced, provided that the linear joint seal material is also increased. The tested frame depths are as detailed in the table in section 4. The supporting construction depth was 100mm.

d) The type and density of the timber door frame may be increased in accordance with table A.1 of EN 15269-3, but not reduced, i.e. the tested timber can be replaced by other solid timber of the same group with an equal or higher density or solid timber of a higher group. The table is reproduced below:

Group no.	Type of timber	Medium density (kg/m^3)
1	Softwood and Beech	350-450
2	Hardwood excluding Beech	350-450
3	Softwood	≥450
4	Hardwood excluding Beech	≥450

The tested frame materials used in specimens A and B were European Redwood, a softwood with a nominal density of 510kg/m^3, which falls into group 3 and Sapele, a hardwood with a nominal density of 620 to 660kg/m^3, which falls into group 4.

e) Tests carried out with flexible supporting constructions, as in this case, cover rigid supporting constructions of the same or greater thickness.

f) Tests carried out on an aperture with an unlined flexible supporting construction may, in practice, be used with a lined aperture, but not vice versa. The apertures in the tests were unlined so the seals are suitable for lined apertures.

g) Any timber or alternative solid cellulose-based architrave material may be fitted over the linear joint seals as they were tested without an architrave.

h) Where mineral wool is used in the test as backing material, as in this case, the density of the mineral wool in practice may be increased but not decreased.

i) Symmetrical seal systems tested from one side only may be used in both directions. The tested seals were symmetrical.

8 Conclusion

Therefore it is our opinion that Fireshield Acoustic Intumescent FR Acrylic sealant when used as a linear joint seal to seal the gap between the frame of timber doorsets and the supporting construction is suitable for applications where a fire resistance of up to 30 minutes or 60 minutes is required against the adopted integrity criteria of BS 476: Part 20: 1987, as appropriate, for fire exposure from either side.

9 Validity of the assessment

9.1 Declaration by applicant

We the undersigned confirm that we have read and complied with the obligations placed on us by the Passive Fire Protection Forum (PFPF) Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence 2021.

We confirm that the change, which is the subject of this assessment, has not to our knowledge been tested to the standard against which this assessment has been made.

We agree to withdraw this assessment from circulation should the component or element of structure or any of its component parts be the subject of a failed fire test to the standard against which this assessment is being made.

We understand that this assessment is based on test evidence and will be withdrawn should evidence become available that causes the conclusion to be questioned. In that case, we accept that new test evidence may be required.

We are not aware of any information that could affect the conclusions of this assessment. If we subsequently become aware of any such information, we agree to ask BRE Global to withdraw the assessment.

Signed:

For and on behalf of:

9.2 BRE Global declaration

This assessment is issued on the basis of test data and information to hand at the time of issue. If contradictory evidence becomes available to BRE Global the assessment will be unconditionally

withdrawn and the applicant will be notified in writing. Similarly, the assessment should be re-evaluated if the assessed construction is subsequently tested since actual test data is deemed to take precedence.

The assessment is valid initially for five years after which time it is recommended that it be submitted to BRE Global for re-evaluation.

This assessment has been carried out in accordance with the Passive Fire Protection Forum (PFPF) Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence 2021. It relates to the fire performance of the product and does not cover aspects of quality, durability, maintenance nor service requirements. This assessment relates only to the specimen(s) assessed and does not by itself imply that the product is approved under any Loss Prevention Certification Board approval or certification scheme or any other endorsements, approval or certification scheme.

The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

Next review date: 28 April 2027

Report Ends