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Fire assessment report

Sabre Seal FRA fire retardant sealant in control joints in walls and floors

Sponsor: Sabre Adhesives

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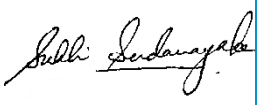
			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 30 Sep 2027	**Name**	Sukhi Sendanayake	Omar Saad	Mahmoud Akl
		Signature			

Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of control joints in walls and floors protected with Sabre Seal FRA fire retardant sealant – in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Sabre Seal FRA is an acrylic-based fire-retardant sealant that provides movement capability for fire-rated joint applications.

The analysis in sections 5 and 6 of this report found that the proposed systems, together with the described variations, are expected to achieve the fire resistance levels (FRL) as show in Table 1, in accordance with AS 1530.4:2014 and AS 4072.1:2005.

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 7 of this report. The results of this report are valid until 30 September 2027.

Table 1 Assessment outcome for linear joints in walls and floors protected with Sabre Seal FRA fire retardant sealant

Separating element	Orientation of control joint	Maximum width of sealant	Application side	FRL
Minimum 250 mm thick concrete, masonry or AAC walls with minimum nominal density of 475 kg/m^3	Vertical or horizontal	Up to 50 mm	Both exposed and unexposed sides	-/300/300
Minimum 250 mm thick concrete or AAC floors with minimum nominal density of 475 kg/m^3	As tested in EWFA 43878800a.1	Up to 12 mm	Both exposed and unexposed sides OR Unexposed side only	-/240/180
		From 12 mm to 30 mm		-/240/90
		From 30 mm to 50 mm		-/180/90

Note:

- The depth of the applied sealant must be half of the width of the linear joint. This means that the width-to-depth ratio must be maintained at 2:1.
- Sealant must be applied to be flush with the surface of the separating element.
- Open or closed cell backing rods can be used interchangeably to control the depth of the applied sealant.
- The separating element must have an established FRL as tested or assessed by an accredited testing laboratory (ATL). The assessed FRL for any control joint will be the lower of the FRL given in this table or the established FRL of the separating element.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of control joints in walls and floors protected with Sabre Seal FRA fire retardant sealant – in accordance with AS 1530.4:2014[1] and AS 4072.1:2005[2].

This report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code (NCC) to support the use of the material, product, form of construction or design as given within the scope of this assessment report. It also references test evidence for meeting deemed to satisfy (DTS) provisions of the NCC as applicable to the assessed systems.

This assessment was carried out at the request of Sabre Adhesives. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Sabre Adhesives	40-42 Cambridge Street South Lenin 5510 New Zealand

2. Framework for the assessment

2.1 Assessment approach

An assessment is an opinion about the expected performance of a component or element of structure if it was subject to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021[3].

This guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- The interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments will vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

This assessment uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance if the elements were to be tested in accordance with AS 1530.4:2014.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer's stated design.

[1] Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[2] Standards Australia, 2005, Components for the protection of openings in fire-resistant separating elements: Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.
[3] Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the Evidence of Suitability requirements of the NCC 2019, including amendments[4] under A5.2 (1) (d).

This assessment has been written in accordance with the general principles outlined in EN 15725:2010[5] for extended application reports on the fire performance of construction products and building elements. It also references test evidence for meeting a performance requirement or deemed to satisfy (DTS) provision of the NCC under A5.4 for fire resistance levels as applicable to the assessed systems.

This assessment report may also be used to demonstrate compliance with the requirements for Evidence of Suitability under NCC 2016, including amendments[6].

2.3 Declaration

The 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal on 16 May 2022, Sabre Adhesives. confirmed that:

- To their knowledge, the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.

3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results that are expected if the systems were tested in accordance with AS 1530.4:2014 and assessed in accordance with AS 4072.1:2005.
- This assessment is applicable to floor systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014 where horizontal elements must be exposed to heat from the underside only or wall systems exposed to fire from each side in accordance with the requirements of AS 1530.4:2014 where vertical elements must be exposed to heat from the direction required to resist fire exposure.
- This report is only valid for the assessed system/s and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL) that is accredited to the same nominated standards of this report.
- The documentation that forms the basis for this report is listed in Appendix A.

[4] National Construction Code Volumes One and Two - Building Code of Australia 2019 including Amendments, Australian Building Codes Board, Australia
[5] European Committee for Standardization, 2010, Extended application reports on the fire performance of construction products and building elements, EN 15725:2010, European Committee for Standardization, Brussels, Belgium.
[6] National Construction Code Volumes One and Two - Building Code of Australia 2016 including Amendments, Australian Building Codes Board, Australia

- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

4. Description of the specimen and variations

4.1 System description

The test specimen in EWFA 38838800b.1 consisted of three vertical control joints protected with a sealant identical to Sabre Seal FRA in a 250 mm thick wall constructed of Hebel blocks. The control joints were 1 m long and had widths of 12 mm, 30 mm and 50 mm. The joints were sealed from both the exposed and unexposed sides at a depth of half the width of the control joint with a closed or open cell Polyethylene foam backing rod placed in the control joint.

The test specimen in EWFA 43878800a.1 consisted of three vertical control joints protected with a sealant identical to Sabre Seal FRA in a 250 mm thick floor constructed of Hebel panels. The control joints were 1 m long and had widths of 12 mm, 30 mm and 50 mm. The joints were sealed from the unexposed sides at a depth of half the width of the control joint with a closed or open cell Polyethylene foam backing rod placed in the control joint.

4.2 Referenced test data

The assessment of the variation to the tested systems and the determination of the expected performance is based on the results of the fire tests documented in the reports summarised in Table 3. Further details of the tested systems are included in Appendix A.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
EWFA 38838800b.1	Sponsor known to Warringtonfire	5 December 2016	Warringtonfire (formerly T/A Exova Warringtonfire)
EWFA 43878800a.1		15 June 2017	

4.3 Variations to the tested systems

The variations to the tested systems – together with the referenced standard fire tests – are described in Table 4.

Table 4 Variations to tested systems

Item	Reference tests	Description	Variations
1.	EWFA 38838800b.1 EWFA 43878800a.1	Referenced tests were conducted in accordance with EN 1366-4:2006[7] in Hebel walls and floors.	It is proposed to assess the systems tested in accordance with EN 1366-4:2006 to AS 1530.4:2014.
2.		The test specimen in EWFA 38838800b.1 consisted of three vertical control joints protected with a sealant identical to Sabre Seal FRA in a 250 mm thick wall constructed of Hebel blocks. The control joints were 1 m long and had widths of 12 mm, 30 mm and 50 mm. The joints were sealed from both the exposed and unexposed sides at a depth of half the width of the control	It is proposed that: • The floor separating element is varied to be minimum 250 mm thick concrete or AAC slabs • The wall separating element is varied to be minimum 250 mm thick concrete, masonry or AAC walls • Horizontal and vertical joints in walls sealed on both sides

[7] European Committee for Standardization, 2006, Fire resistance tests for service installations – Linear joint seals, EN 1366-4:2006, European Committee for Standardization, Brussels, Belgium.

Item	Reference tests	Description	Variations
		joint with a closed or open cell Polyethylene foam backing rod placed in the control joint. The test specimen in EWFA 43878800a.1 consisted of three vertical control joints protected with a sealant identical to Sabre Seal FRA in a 250 mm thick floor constructed of Hebel panels. The control joints were 1 m long and had widths of 12 mm, 30 mm and 50 mm. The joints were sealed from the unexposed sides at a depth of half the width of the control joint with a closed or open cell Polyethylene foam backing rod placed in the control joint.	• Linear joints in floors sealed on both sides or the unexposed side only

4.4 Schedule of components

Table 5 outlines the schedule of components for the assessed systems

Table 5 Schedule of components of assessed systems

Item	Description
Substrate	Rigid concrete, masonry of AAC wall (density: ± 15% of 558 kg/m^3; thickness ≥ 250 mm) with an established FRL greater than that assessed for the control joints as tested or assessed by an accredited testing laboratory OR Rigid concrete or AAC floor (density: ± 15% of 558 kg/m^3; thickness ≥ 250 mm) with an established FRL greater than that assessed for the control joints as tested or assessed by an accredited testing laboratory
Sealant	Sabre Seal FRA acrylic-based fire-retardant sealant applied on the unexposed side only in floors and on both the exposed and unexposed sides of walls. Density: 1410 kg/m^3
Backing rod	Open cell or closed cell Polyethylene foam backing rod (diameter to suit)

5. Applicability of test results in accordance with AS 1530.4:2014

5.1 Description of variation

This assessment refers to fire test reports EWFA 38838800b.1 and EWFA 43878800a.1, which detail the testing of linear seals protected with a sealant identical to Sabre Seal FRA (measured density of 1410 kg/m^3) in Hebel walls and floors. These tests were conducted in accordance with EN 1366-4:2006 and EN 1363-1:2012 and it has been proposed to assess the expected fire resistance performance of linear seals in accordance with AS 1530.4:2014 and AS 4072.1:2005.

5.2 Methodology

The method of assessment used is summarised in Table 6.

Table 6 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative

5.3 Assessment

5.3.1 General

Referenced fire test reports EWFA 38838800b.1 and EWFA 43878800a.1 were conducted in accordance with EN 1366-4:2006 with instrumentation and heating and furnace conditions provided in accordance with EN 1363-1:2012, as prescribed by EN 1366-4:2006.

The requirements of these standards differ in some respects from those prescribed in AS 1530.4:2014 and AS 4072.1:2005. The effect that these differences have on the fire resistance performance of the tested linear seals is discussed in sections 5.3.2 to 5.3.7.

5.3.2 Furnace temperature measurement

The furnace thermocouples specified in AS 1530.4:2014 are type K, mineral insulated metal sheathed (MIMS) with a stainless-steel sheath having a wire diameter of less than 1.0 mm and an overall diameter of 3.0 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouples specified in EN 1363-1:2012 are made from folded steel plate that faces the furnace chamber. A thermocouple is fixed to the side of the plate facing the specimen, with the thermocouple hot junction protected by a pad of insulating material. The plate part is to be constructed from 150 ±1 mm long by 100 ±1 mm wide by 0.7 ±0.1 mm thick nickel alloy sheet strips.

The measuring junction consists of nickel chromium/nickel aluminium (Type K) wire as defined in IEC 60584-1, contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter of 1 mm, the hot junctions being electrically insulated from the sheath.

The furnace control thermocouples required by EN 1363-1:2012 are less responsive than those specified by AS 1530.4:2014. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN 1363-1:2012, particularly when the furnace temperature is changing quickly in the early stages of the test.

As required by AS 1530.4:2014, furnace thermocouples must be arranged so that they are initially 100 ± 10 mm from the exposed face of the specimen and maintained, where practicable, at a distance of 50 mm to 150 mm during the test. The furnace thermocouples are not to be installed closer than 100 mm to the furnace wall or the burner flames. For EN 1363-1:2012, it is required that furnace thermocouples are placed 100 ± 50 mm from the nearest point of the exposed face of the test construction, and they must be maintained at this distance during the test. In addition, thermocouples are not to be installed closer than 450 mm from any wall, floor or roof of the furnace.

With regards to the positioning of the furnace thermocouples, the differences between the standards are in the required distance from the exposed face of the specimen at the commencement of the test and the location of the thermocouples relative to the walls of the furnace. These differences are expected to delay the time taken for the plate thermocouples of EN 1363-1:2012 to heat and accurately measure the furnace temperature when compared to the thermocouples in AS 1530.4:2014 and therefore will likely present a more onerous condition.

However, the distance to be maintained from the specimen during the test is relatively the same and is not expected to affect results obtained following the two standards.

5.3.3 Furnace pressure regime

It is a requirement of AS 1530.4:2014 that, for vertical elements with a height of more than 1 m, a furnace pressure of 20 ± 3 Pa must be established at the top of the separating element and all the penetration services must have a pressure greater than 10 Pa.

Similarly, EN 1366-4:2006 requires that, a vertical furnace be operated so that a minimum pressure of 15 Pa exists in the centre of the test specimen mounted in the lowest position. Therefore, linear seals in walls subjected to furnace pressure of 15 Pa as per EN 1366-4:2012 will be compliant with the requirements of AS 1530.4:2014.

It is a requirement of both AS 1530.4:2014 and EN 1366-4:2006 that for horizontal elements, a furnace gauge pressure of 20 Pa is established at a position of 100 ± 10 mm below the floor soffit level. Therefore, there are no differences between the requirements of the two standards for horizontal elements such as floors.

Furthermore, the parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and EN 1363-1:2012 are also not appreciably different.

5.3.4 Specimen size

EN 1366-4:2006 states that a linear joint seal shall be of uniform design cross sectional area and for non-movement joints, a length of not less than 900 mm can be used. AS 1530.4:2014 states that the length of the control joint exposed to the furnace chamber must not be less than 1 m.

The linear seals tested in the referenced test reports all have a length of 1 m. Therefore, they are compliant with the requirements of AS 1530.4:2014.

5.3.5 Integrity performance criterion

Both EN 1366-4:2006 and AS 1530.4:2014 state that gap gauges are not to be used to evaluate integrity for linear seals, and therefore, integrity criteria in EN 1363-1:2012 can generally be applied in a comparable manner.

In accordance with AS 1530.4:2014, while a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion if it collapses or sustains flaming or other conditions on the unexposed face which ignite the cotton pad when applied for up to 30 seconds.

Specimens shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 when any of the following occurs:

- A gap forms that allows the passage of hot gases to the unexposed face and ignites a 100 mm × 100 mm × 20 mm cotton pad when applied for up to 30 seconds.
- Sustained flaming for 10 seconds.

EN 1366-4:2006 states that the integrity of the specimen must be assessed as described in EN 1363-1. According to EN 1363-1:2012, integrity performance is breached when any of the following occurs (excluding gaps that allow gap gauges to be used as applicable to this assessment):

- A gap forms that allows the passage of hot gases to the unexposed face and ignites a 100 mm × 100 mm × 20 mm cotton pad when applied for up to 30 seconds. During measurements, a clearance of minimum 30 mm must be maintained between the cotton pad and the surface of the specimen that is parallel to it. There must also be at least a 10 mm clearance between the periphery of the pad and the specimen.

- Sustained flaming.

Other than the sustained flaming criterion, the requirements for integrity failure of AS 1530.4:2014 and EN 1363-1:2012 are not appreciably different. As such, EN 1363-1:2012 can be considered more onerous than AS 1530.4:2014 with regards to the criterion of sustained flaming, as sustained flaming of less than 10 seconds may also be captured as a failure in a test in accordance with EN 1363-1.

5.3.6 Insulation performance criterion and specimen temperature measurement

Both EN 1366-4:2012 and AS 1530.4:2014 denote that insulation failure is deemed to occur when a maximum temperature rise of 180ºC is recorded by the thermocouples placed on the unexposed surface of the specimen or by a roving thermocouple.

For linear seals, AS 1530.4:2014 clause 10.5.1 (f) specifies the following requirements when placing thermocouples on the unexposed face:

- At least three on the surface of the seal, with one thermocouple for each 0.3 m^2 of surface area, up to a maximum of five, uniformly distributed over the area (one thermocouple being located at the centre of the seal).
- On the surface of the seal, 25 mm from the edge of the opening, with one thermocouple for every 500 mm of the perimeter.
- On the surface of the separating element, 25 mm from the edge of the opening, with one thermocouple for each 500 mm of the perimeter.

Furthermore, clause 10.5.3 of AS 1530.4:2014 specifies that thermocouples used for the evaluation of the insulation performance of linear seals shall be positioned on the unexposed face of the sealing system and the separating element, except where the unexposed face of the seal is recessed within the separating element. Where this occurs, thermocouples shall only be fitted to the seal when the joint width is greater than or equal to 12 mm, and the size of the pad may be reduced to facilitate the fitting of the thermocouple.

Similar to AS 1530.4:2014, EN 1366-4:2006 specifies that thermocouples must be placed at the centre line of the linear joint seals. It is noted that in test reports EWFA 38838800b.1 and EWFA 43878800a.1, 3 thermocouples were placed on the surface of the seal, with one thermocouple being located at the centre of the seal. Therefore, the requirements of AS 1530.4:2014, which stipulate that at least 3 thermocouples should be placed on the surface of the seal, are fulfilled in the tests.

However, one key difference between the requirements of the two standards is that in EN 1366-4:2006, the thermocouples placed on the separating element are to be installed 15 mm away from the linear joint, whereas AS 1530.4: 2014 requires thermocouples to be placed 25 mm from the edge of the seal. Therefore, as EN 1366-4:2006 locations are more onerous, if these thermocouples were to be placed as per AS 1530.4:2014, then the insulation performance is expected to be similar to or better than the achieved test results in EWFA 38838800b.1 and EWFA 43878800a.1.

Apart from the discussed variation in the thermocouple location, the general insulation criteria of AS 1530.4:2014 and EN 1366-4:2006 are not appreciably different.

5.3.7 Application of test data to AS 1530.4:2014

It must be noted that according to test report EWFA 43878800a.1, when conducting the fire resistance test on the Hebel floor system, the furnace pressure for the 5-30, 60-65, 75-85, 110-115, 209-240, and 270-275 minute periods was above the limits prescribed in EN 1366-4:2006 by up to 10 Pa. This exceeded the pressure requirement of the standard and was therefore more severe than that required by EN 1366-4:2006. Therefore, it can be considered that the same fire performance of the specimens observed during those time periods can be achieved if the pressure conditions were as prescribed in the standard.

Conversely, the furnace pressure was below the limits stated in EN 1366-4:2006 by 10 Pa between 135 and 145 minutes due to the deterioration of the specimen. As detailed in the test report, due to the state of the specimen at the time, the reduction in pressure is not expected to have invalidated the result.

The variations in furnace pressure, furnace thermocouples, and specimen thermocouple locations are not expected to have a significant effect on the outcome of the referenced fire resistance tests as described in sections 5.3.2 to 5.3.6. Therefore, based on the above discussion and the discussions presented in sections 5.3.2 to 5.3.6, it is considered that the results relating to the integrity and insulation performance of the referenced tests, EWFA 38838800b.1 and EWFA 43878800a.1, can be used as a basis to assess the FRL of the specimens in accordance with AS 1530.4:2014 and AS 4072.1:2005.

6. Control joints in walls and floors protected with Sabre Seal FRA

6.1 Description of variation

This assessment was done to determine the expected performance of linear joints in both rigid walls and floors based on test evidence with the following variations:

- The floor separating element is varied to be minimum 250 mm thick concrete or AAC slabs
- The wall separating element is varied to be minimum 250 mm thick concrete, masonry or AAC walls
- Horizontal and vertical joints in walls sealed on both sides or the unexposed side only.
- Linear joints in floors sealed on both sides or the unexposed side only

6.2 Methodology

The method of assessment used is summarised in Table 7.

Table 7 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative

6.3 Control joints in walls

6.3.1 Sealed on both exposed and unexposed sides

Vertical joints

Three vertical control joints in a 250 mm thick Hebel block wall protected with a sealant identical to Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides were tested as detailed in EWFA 38838800b.1.

Specimen A was a 50 mm wide linear joint with an open cell backing rod (Ø50 mm) installed for the full length of the control joint on the exposed and unexposed sides at a depth of 25 mm. The sealant was then applied on the exposed and unexposed sides to a depth of 25 mm.

Specimen B was a 30 mm wide linear joint with an open cell backing rod (Ø50 mm) installed for the full length of the control joint on the exposed and unexposed sides at a depth of 15 mm. The sealant was then applied on the exposed and unexposed sided to a depth of 15 mm.

Specimen C was 12 mm wide with a closed cell backing rod (Ø12 mm) installed for the full length of the control joint. It was installed on the exposed and unexposed sides at a depth of 6 mm. The sealant was then applied on the exposed and unexposed sides to a depth of 6 mm.

In all three joints, the sealant was installed such that the surface was flush with the face of the Hebel blocks. All tested linear joints maintained integrity and insulation performance for 301 minutes, and these results are applicable in accordance with AS 1530.4:2014 as discussed in section 5. Therefore, the tested joints (specimens A, B and C) can be attributed an FRL of -/300/300 in accordance with AS 1530.4:2014.

Accordingly, it can be expected that vertical linear joints with widths up to 50 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on both exposed and unexposed sides, will achieve a fire resistance level of -/300/300 in accordance with AS 1530.4:2014 in minimum 250 mm thick Hebel block walls. Open or closed cell backing rods can be used for depth control.

Horizontal joints

It is proposed that linear joints protected with Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides are assessed when installed in the horizontal orientation in Hebel walls.

Reference is made to the vertical linear joints tested in EWFA 38838800b.1, which achieved an FRL of -/300/300 in accordance with AS 1530.4:2014. In vertical linear joints, stresses are expected to develop along the vertical edges as the sealant is pulled by its own weight along the height of the joint and due to shrinkage when exposed to fire conditions. This movement is expected to be reduced by the bonding forces along the vertical edges.

Observations and post-test photographs from EWFA 38838800b.1 show that the tested sealant on all three joints remained intact on the unexposed side. There were some cracks along the edges on the exposed surface of the sealants for Specimens A and B (50 mm wide and 30 mm wide, respectively), but there were only minimal cracks on the exposed face of Specimen C (12 mm wide).

When orientated horizontally, it is expected that the sealant will detach from the top edges along the length of the joint due to shrinkage under fire conditions and due to the self-weight of the sealant. This would potentially cause high stresses on the sealant edges and open gaps that allow hot gases to pass through. However, this can be considered less onerous compared to the potential detachment of sealant from both edges in vertical joints as described above.

Considering the above discussion, it is expected that horizontally orientated linear joints protected with Sabre Seal FRA on both exposed and unexposed sides with widths up to 50 mm (width-to-depth ratio of 2:1) in minimum 250 mm thick Hebel block walls will achieve an FRL of -/300/300 in accordance with AS 1530.4:2014.

6.3.2 Applicability to masonry, concrete or AAC walls

In both EWFA 38838800b, the main separating element was constructed of Hebel blocks, and in EWFA 43878800a.1, the main separating element was constructed of Hebel panels. The measured density of Hebel blocks/panels is 558 kg/m^3.

In accordance with clause 10.12.2 (a), for elements manufactured from similar types of concrete or masonry, the results from tests can be applied to materials of a density with ±15% of the tested specimen.

Therefore, provided that the density is maintained in the range of ±15% of 558 kg/m^3 and the thickness is greater than the tested 250 mm, the FRLs assessed for walls in section 6.3.1 can be extended to masonry, concrete and AAC walls.

6.4 Control joints in floors

6.4.1 Sealed on unexposed side only

Three control joints in a 250 mm thick Hebel panel floor protected with a sealant identical to Sabre Seal FRA fire retardant sealant on the unexposed side were tested as detailed in EWFA 43878800a.1.

Specimen A was a 12 mm wide linear joint with a closed cell backing rod (Ø20 mm) installed for the full length of the control joint on the unexposed side at a depth of 6 mm. The sealant was then applied on the unexposed side to a depth of 6 mm. The achieved FRL was -/240/180.

Specimen B was a 30 mm wide linear joint with a closed cell backing rod (Ø20 mm – doubled up) installed for the full length of the control joint on the unexposed side at a depth of 15 mm. The sealant was then applied on the unexposed side to a depth of 15 mm. The achieved FRL was -/240/90.

Specimen C was a 50 mm wide linear joint with an open cell backing rod (Ø50 mm) installed for the full length of the control joint on the unexposed side at a depth of 25 mm. The sealant was then applied on the unexposed side to a depth of 25 mm. The achieved FRL was -/180/90.

The sealant in all three joints was installed such that the surface was flush with the face of the Hebel blocks.

Based on these results, it can be expected that linear joints with widths up to 12 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on the unexposed side, will

achieve a fire resistance level of -/240/180 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. A closed cell backing rod must be used.

Furthermore, linear joints with widths from 12 mm up to 30 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on the unexposed side, can be expected to achieve a fire resistance level of -/240/90 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. A closed cell backing rod must be used.

Additionally, linear joints with widths from 30 mm up to 50 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on the unexposed side, can be expected to achieve a fire resistance level of -/180/90 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. An open cell backing rod must be used.

6.4.2 Sealed on both exposed and unexposed sides

It is proposed that control joints up to 50 mm in width, protected with Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides, are assessed in minimum 250 mm thick Hebel panel floors.

When sealed from both the exposed and unexposed sides of the control joint, the fire performance can be expected to be less onerous than that achieved by the specimens in EWFA 43878800a.1 where the sealant was only applied on the unexposed face. This is due to the additional depth of sealant on the exposed, side which will prevent the passage of flaming and/or hot gasses into the control joint.

Based on these results, it can be expected that linear joints with widths up to 12 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides, will achieve a fire resistance level of -/240/180 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. A closed cell backing rod must be used.

Furthermore, linear joints with widths from 12 mm up to 30 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides, can be expected to achieve a fire resistance level of -/240/90 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. A closed cell backing rod must be used.

Additionally, linear joints with widths from 30 mm up to 50 mm and a width-to-depth ratio of 2:1, protected with Sabre Seal FRA fire retardant sealant on both the exposed and unexposed sides, can be expected to achieve a fire resistance level of -/180/90 in accordance with AS 1530.4:2014 in a minimum 250 mm thick Hebel floor system. An open cell backing rod must be used.

6.4.3 Applicability to concrete floor systems

In EWFA 43878800a.1, the main separating element was constructed of Hebel panels. The measured density of Hebel blocks/panels is 558 kg/m^3.

In accordance with clause 10.12.2 (a), for elements manufactured from similar types of concrete or masonry, the results from tests can be applied to materials of a density with ±15% of the tested specimen.

Therefore, provided that the density is maintained in the range of ±15% of 558 kg/m^3 and the thickness is greater than the tested 250 mm, the FRLs assessed for floors in section 6.4.1 can be extended to concrete slabs.

6.5 Conclusion

This assessment demonstrates that control joints in walls and floors protected with Sabre Seal FRA fire retardant sealant are expected to achieve the FRLs shown in Table 8 in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Table 8 Assessment outcome for linear joints in walls and floors protected with Sabre Seal FRA fire retardant sealant

Separating element	Orientation of control joint	Maximum width of sealant	Application side	FRL
Minimum 250 mm thick concrete, masonry or AAC walls with minimum nominal density of 475 kg/m^3	Vertical or horizontal	Up to 50 mm	Both exposed and unexposed sides	-/300/300
Minimum 250 mm thick concrete or AAC floors with minimum nominal density of 475 kg/m^3	As tested in EWFA 43878800a.1	Up to 12 mm	Both exposed and unexposed sides OR Unexposed side only	-/240/180
		From 12 mm to 30 mm		-/240/90
		From 30 mm to 50 mm		-/180/90

Note:

- The depth of the applied sealant must be half of the width of the linear joint. This means that the width-to-depth ratio must be maintained at 2:1.
- Sealant must be applied to be flush with the surface of the separating element.
- Open or closed cell backing rods can be used interchangeably to control the depth of the applied sealant.
- The separating element must have an established FRL as tested or assessed by an accredited testing laboratory (ATL). The assessed FRL for any control joint will be the lower of the FRL given in this table or the established FRL of the separating element.

7. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire resistance, but it should be recognised that a single test method will not provide a full assessment of fire resistance under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on test data, information and experience available at the time of preparation. If contradictory evidence becomes available to the assessing authority, the assessment will be unconditionally withdrawn, and the report sponsor 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 published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance of the proposed systems expected to be demonstrated on a test in accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to Sabre Adhesives. for their own specific purposes. This report may be used as Evidence of Suitability in accordance with the requirements of the relevant National Construction Code. Building certifiers and other third parties must determine the suitability of the systems described in this report for a specific installation.

Appendix A Summary of supporting test data

A.1 Test report – EWFA 38838800b.1

Table 9 Information about test report

Item	Information about test report
Report sponsor	Report sponsor known to Warringtonfire Australia
Test laboratory	Warringtonfire Australia (formerly T/A Exova Warringtonfire), 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was done on 5 December 2016.
Test standards	The test was done in accordance with EN 1366-4:2006.
Variation to test standards	None
General description of tested specimen	The test assembly consisted of three vertical control joints in a nominally 1600 mm wide × 1600 mm high × 250 mm thick wall constructed of Hebel blocks. The control joints were a nominal length of 1000 mm. Starting from the eastern side, the vertical joint widths were 12 mm, 30 mm and 50 mm, respectively. The control joints were protected with a sealant identical to Sabre Seal FRA Fire Retardant Sealant (measured density: 1410 kg/m^3). The control joints were sealed from both the exposed and unexposed sides at a depth of half the width of the control joint with a closed or open cell Polyethylene foam backing rod placed in the control joint.
Instrumentation	The test report states that the instrumentation was in accordance with EN 1366-4:2006 and EN 1363-1.

The test specimen achieved the following results – see Table 10.

Table 10 Results summary for this test report

Specimen	Integrity and insulation
A – 50 mm wide × 1000 mm high. An open cell backing rod (Ø50 mm) the full length of the control joint was installed on the exposed and unexposed sides at a depth of 25 mm. The sealant was then applied on the exposed and unexposed sides to a depth of 25 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	No failure at 301 minutes
B – 30 mm wide × 1000 mm high. An open cell backing rod (Ø50 mm) the full length of the control joint was installed on the exposed and unexposed sides at a depth of 15 mm. The sealant was then applied on the exposed and unexposed sides to a depth of 15 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	
C – 12 mm wide × 1000 mm high. A closed cell backing rod (Ø12 mm) the full length of the control joint was installed on the exposed and unexposed sides at a depth of 6 mm. The sealant was then applied on the exposed and unexposed sides to a depth of 6 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	

A.2 Test report – EWFA 43878800a.1

Table 11 Information about test report

Item	Information about test report
Report sponsor	Report sponsor known to Warringtonfire Australia.
Test laboratory	Warringtonfire Australia (formerly T/A Exova Warringtonfire), 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was done on 15 June 2017.
Test standards	The test was done in accordance with EN 1366-4:2006.
Variation to test standards	The pressure for the 5-30, 60-65, 75-85, 110-115, 209-240, and 270-275 minute periods was above the limits prescribed in EN 1366-4:2006 up to 10 Pa. This exceeded the pressure requirement of the standard and was therefore more severe than required by the standard. Based on the above, the results of this test remain valid. The furnace pressure was below the limits stated in EN 1366-4:2006 by 10 Pa between 135 and 145 minutes due to deterioration of the specimen. Due to the state of the specimen at the time, the reduction in pressure is unlikely to have invalidated the result.
General description of tested specimen	The test assembly consisted of six control joints with a nominal length of 1000 mm in a nominally 1584 mm wide × 1600 mm long × 250 mm thick floor constructed of Hebel panels. Starting from the western side, the vertical joint widths were 12 mm, 30 mm and 50 mm, respectively. The control joints were protected with a sealant identical to Sabre Seal FRA (measured density: 1410 kg/m^3). The control joints were sealed from the unexposed side at a depth of half the width of the control joint with a closed or open cell Polyethylene foam backing rod placed in the control joint.
Instrumentation	The test report states that the instrumentation was in accordance with EN 1366-4:2006 and EN 1363-1.

The test specimen achieved the following results – see Table 12.

Table 12 Results summary for this test report

Specimen	Integrity	Insulation
A – 12 mm wide × 1000 mm high. A closed cell backing rod (Ø20 mm) the full length of the control joint was installed on the unexposed side at a depth of 6 mm. The sealant was then applied on the unexposed side to a depth of 6 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	Failure at 265 minutes	Failure at 184 minutes
B – 30 mm wide × 1000 mm high. A closed cell backing rod (Ø20 mm – doubled up) the full length of the control joint was installed on the unexposed side at a depth of 15 mm. The sealant was then applied on the unexposed side to a depth of 15 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	Failure at 266 minutes	Failure at 98 minutes
C – 50 mm wide × 1000 mm high. An open cell backing rod (Ø50 mm) the full length of the control joint was installed on the unexposed side at a depth of 25 mm. The sealant was then applied on the unexposed side to a depth of 25 mm. The sealant was installed such that the surface was flush with the face of the Hebel blocks.	Failure at 239 minutes	Failure at 98 minutes

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Global locations

Warringtonfire Australia Pty Ltd
ABN 81 050 241 524

Perth

Suite 4.01, 256 Adelaide Terrace
Perth WA 6000
Australia
T: +61 8 9382 3844

Canberra

Unit 10, 71 Leichhardt Street
Kingston ACT 2604
Australia
T: +61 2 6260 8488

Melbourne

Level 4, 152 Elizabeth Street
Melbourne VIC 3000
Australia
T: +61 3 9767 1000

Sydney

Suite 802, Level 8, 383 Kent Street
Sydney NSW 2000
Australia
T: +61 2 9211 4333

Brisbane

Suite B, Level 6, 133 Mary Street
Brisbane QLD 4000
Australia
T: +61 7 3238 1700

Melbourne – NATA accredited laboratory

409-411 Hammond Road
Dandenong VIC 3175
Australia
T: +61 3 9767 1000