JENSEN HUGHES

Fire assessment report

Linear gaps protected by Boss FireSilicone-EMA sealant

Sponsor: Boss Products (Australia) Pty Ltd

Report number: FAS190037 Revision: R2.0

Issued date: 16 December 2024 Expiry date: 30 September 2029

Quality management

Version	Date	Information about the report			
R1.0	Issue: 20 Sep 2019	Reason for issue	Report issued to Boss Products (Australia) for review and comment.		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Yomal Dias	Omar Saad	Omar Saad
R1.1	Issue: 24 Sep 2019	Reason for issue	Minor typographical amendments		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Yomal Dias	Omar Saad	Omar Saad
R1.2	Issue: 10 Nov 2019	Reason for issue	Tables 1 and 2 in executive summary section were reformatted		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Yomal Dias	Omar Saad	Omar Saad
R1.3	Issue: 11 Nov 2019	Reason for issue	Test sponsor revised as Boss Products (Australia) Pty Ltd		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Yomal Dias	Omar Saad	Omar Saad
R2.0	Issue: 16 Dec 2024	Reason for issue	Reassessment and extension of validity for 5 years		
			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 30 September 2029	**Name**	Zak Awad	Omar Saad	Omar Saad

Jensen Hughes Fire Testing Pty Ltd
ABN 81 050 241 524

Formerly Warringtonfire Australia Pty Ltd[1]

[1] *Warringtonfire Australia Pty Ltd was acquired by Jensen Hughes in December 2023. Jensen Hughes Fire Testing Pty Ltd is not affiliated, associated, authorised, or endorsed by Warringtonfire Australia Pty Ltd, Warringtonfire Testing and Certification Limited or its "Warringtonfire" or "Certifire" brands.*

Executive summary

This report documents the findings of the assessment undertaken to determine the fire resistance level (FRL) of various linear gaps protected with BOSS FireSilicone-EMA sealant – in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The analysis in sections 5 to 7 of this report found that the proposed systems, together with the described variations, will achieve FRLs as shown in Table 1 – in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 8 of this report. The results of this report are valid until 30 September 2029.

Table 1 Overview of variations and assessment outcome – in AAC or normal weight concrete floor separating elements

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	Governing requirements	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)				150 mm	175 mm
A	WF 187564	12	670	As per AS 3600	1 × Ø13 PEF backing rod on the unexposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the unexposed side	S1C2(b) and S1C2(c)	-/180/120	-/240/120
B		30			1 × Ø30 PEF backing rod on the unexposed side	BOSS FireSilicone sealant, minimum depth of 15mm, on the unexposed side		-/180/180	-/240/180
C		50			2 × Ø25 PEF backing rods on the unexposed side	BOSS FireSilicone sealant, minimum depth of 25mm, on the unexposed side		-/180/60	-/240/60
D	WF 372207	60			3 × Ø20 PEF backing rods	BOSS FireSilicone		-/180/120	-/240/120

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	Governing requirements	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)				150 mm	175 mm
					on the unexposed side	sealant, minimum depth of 30mm, on the unexposed side			
E		60			Stone wool insulation, minimum depth of 50mm, on unexposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the unexposed side		-/180/180	-/240/180
F		60			Stone wool insulation, minimum depth of 50mm, on exposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the exposed side		-/90/60	
G	WF 187564	12	760		1 × Ø13 PEF backing rod on both sides	BOSS FireSilicone sealant, minimum depth of 6mm, on both sides		-/180/180	-/300/300
H		30			1 × Ø30 PEF backing rod on both sides	BOSS FireSilicone sealant, minimum depth of 15mm, on both sides		-/180/180	-/300/300
I	WF 372207	50			3 × Ø13 PEF backing rods on both sides	BOSS FireSilicone sealant, minimum depth of 25mm, on both sides		-/180/180	-/240/180

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	Governing requirements	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)				150 mm	175 mm
J		60			Stone wool insulation, minimum depth of 50mm, on both sides	BOSS FireSilicone sealant, minimum depth of 5mm, on both sides		-/180/180	-/240/240
K	LPC TE 82045	25	2400**	215	2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene foam on unexposed side	BOSS FireSilicone sealant, minimum 10 mm depth on both sides		-/240/240	
L	LPC TE 82045	50			2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene foam on unexposed side	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side and 15 mm depth on exposed side		-/240/240	
M	LPC TE 82045	100			2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side and 15 mm depth on exposed side		-/240/240	

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	Governing requirements	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)				150 mm	175 mm
					foam on unexposed side				
N	LPC TE 82045	150			1 layer of 25 mm thick rockwool 825 Firebatt on both sides	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side		-/240/240	

*Walls and floors must be designed in accordance with AS 3600:2018

**The density of the concrete slab was not given in the test report and hence, the typical density of concrete is to be used.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the fire resistance level (FRL) of various linear gaps protected with BOSS FireSilicone-EMA sealant – in accordance with AS 1530.4:2014[2] and AS 4072.1:2005 (R2016)[3].

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 that apply to the assessed systems.

This assessment was carried out at the request of Boss Products (Australia) Pty Ltd. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Boss Products (Australia) Pty Ltd	Unit 1/16 Atkinson Rd, Taren Point NSW 2229 Australia

2. Framework for the assessment

2.1 Assessment approach

An assessment is a professional opinion about the expected performance of a component or element of structure subjected to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking 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[4].

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 can 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 and performance based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance of the elements in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

[2] 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.
[3] 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.
[4] 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.

This assessment has been written in accordance with the general principles outlined in EN 15725:2023[5] for extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports.

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.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the NCC 2022[6] under A5G3(1)(d). It references test evidence for meeting deemed-to-satisfy (DTS) provisions of the NCC under A5G5 for fire resistance level that apply to the assessed systems based on Specifications 1 and 2 for fire resistance for building elements.

The proposed details and systems (building elements) in this report are confirmed to be assessed, without the aid of an active fire suppression system, based on prototype tests that are equivalent to or more severe than a standard fire test as specified in section 4.4, in accordance with NCC 2022 S1C2(b). It is also confirmed that the differences between the proposed systems and details compared to the tested prototypes are considered minor in accordance with NCC 2022 S1C2(c).

This assessment report may also be used to demonstrate compliance with the requirements for evidence of suitability under the relevant sections of previous versions of the NCC.

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 11 October 2024, Boss Products (Australia) Pty Ltd confirmed that:

- To their knowledge, the variations to the component or element of structure, which is the subject of this assessment, have 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. Requirements and 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 in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).
- This assessment applies to floor/ceiling 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
- This assessment applies to wall systems exposed to fire from one 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.

[5] European Committee for Standardization, 2023, Extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports, EN 15725:2023, European Committee for Standardization, Brussels, Belgium
[6] National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia

- This assessment report has been prepared based on the fire resistance performance and condition of the systems at the time they were tested. Any deterioration of fire resistance performance due to external factors including but not limited to passage of time and exposure to elements – is not considered in this report.
- Jensen Hughes has provided this report on the fire performance of building elements in a controlled laboratory setting, strictly within the parameters allowed by the test standards and building regulations. The outcomes of this report are intended to assist in verifying the suitability of the product or system for practical use in specific applications.
- This report is only valid for the assessed systems 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.
- This report has been prepared using information provided by others. Jensen Hughes has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may have been 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 Description of assessed system

The assessed system consists of various linear gaps ranging between 12 mm and 60 mm in width within 150 mm thick masonry, concrete and AAC floor slabs / lintels, as well as masonry, concrete and AAC block walls protected by BOSS FireSilicone-EMA sealant in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The assessed system also consists of 4 gaps ranging between 25 mm and 150 mm in 215 mm thick concrete slabs protected by BOSS FireSilicone-EMA sealant in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

4.2 Referenced test data

The assessment of the variations to the tested systems and the determination of the performance are 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
WF 187564	Firestopit Limited	24 April 2009	Warringtonfire UK
WF372207	FSi Limited	29 September 2016	Warringtonfire UK
Supplement report to TE 82045	Trade Fireseal Systems Ltd	14 February 1992	LPC Testing (known as BRE Global)

4.3 Variations to the tested systems

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

Table 4 Variations to tested systems

Item	Reference test	Description	Variations
Linear gaps	WF 187564 (BS EN 1363-1:1999[7] and EN 1366-4:2006[8])	• 150 mm thick AAC Floor with linear gaps • 150 mm thick AAC wall with linear gaps Tested in accordance with BS EN 1366-4:2006	Assessment of the applicability of test results in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016) **For floor elements (A to F):** Concrete with a density not less than 670kg/m^3, and a thickness not less than 150mm may be used instead of autoclaved aerated concrete to form the floor separating element **For wall elements (G to J):** Concrete or masonry blocks with a density not less than 760kg/m^3, and a thickness not less than 150mm may be used instead of autoclaved aerated concrete to form the wall separating element
	WF 372207 (EN 1366-4:2006+A1:2010)	• 150 mm thick AAC wall with linear gaps • 150 mm thick AAC floor with linear gaps • Tested in accordance with EN 1366-4: 2006 +A1:2010	
	Supplement to LPC TE82045 (BS 476.20:1987[9])	• 215 mm thick concrete slab with linear gaps • Tested in general accordance with BS 476.20:1987	Assessment of the applicability of test results in general accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016) **For floor elements (K to N):** The assessment outcomes are applicable to identical linear gaps in wall separating elements. The proposed wall separating elements shall be similar to the tested floor separating element in terms of thickness and density.[10]

4.4 Test standard

AS 1530.4:2014 sets out procedures and methods for fire tests on building materials, components, structures, and fire-resistance tests for elements of construction. Section 10 discusses the procedures and methods for service penetrations and control joints.

4.5 Reference standard

AS 4072.1:2005 (R2016) sets out the minimum requirements for the construction, installation and application of fire resistance tests to sealing systems around penetrations through separating building elements that are required to have an FRL.

[7] British Standards Institute (1999) *Fire resistance tests*, General requirements, BS EN 1363.1:1999
[8] British Standards Institute (2006) *Fire resistance tests for service installations*, Linear joint seals, BS EN 1366.4:2006
[9] British Standards Institute (1987) *Fire tests on building materials and structures,* Method for determination of the fire resistance of elements of construction (general principles), BS 476.20:1987
[10] The assessment outcome holds no validity if knowledge on the fire resistance performance of the proposed systems becomes available through testing.

4.6 Schedule of components

Table 5 outlines the schedule of components for the assessed systems. We have based this schedule of component from the reference test reports shown in Table 3.

Table 5 Schedule of components of assessed systems

Item		Description
1	**Name**	Separating floor lintels/slabs
	Material	Autoclaved aerated concrete or normal-weight concrete
	Density	Minimum 670 kg/m^3
	Thickness	Minimum 150 mm
2	**Name**	Separating wall blockwork
	Material	Autoclaved aerated concrete, normal-weight concrete or masonry blocks
	Density	Minimum 760 kg/m^3
	Thickness	Minimum 150 mm
3	**Name**	Separating floor/wall construction
	Material	Normal-weight concrete
	Density	Minimum 2400 kg/m^3
	Thickness	Minimum 215 mm
Floor linear gap system A (See Figure 1 for more details)		
A	**Joint width**	12 mm
	Details of backing rod	
	Material	Polyethylene
	Size	Single 13 mm diameter rod
	Fixing method	Friction fit within the cavity at the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	6 mm
	Application method	Cartridge gunned at the unexposed face of the cavity
Floor linear gap system B (See Figure 2 for more details)		
B	**Joint width**	30 mm
	Details of backing rod	
	Material	Polyethylene
	Size	Single 30 mm diameter rod
	Fixing method	Friction fit within the cavity at the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	15 mm
	Application method	Cartridge gunned at the unexposed face of the cavity
Floor linear gap system C (See Figure 3 for more details)		
C	**Joint width**	50 mm
	Details of backing rod	

Item		Description
	Material	Polyethylene
	Size	Two 25 mm diameter rods
	Fixing method	Friction fit within the cavity at the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	25 mm
	Application method	Cartridge gunned at the unexposed face of the cavity
Floor linear gap system D (See Figure 4 for more details)		
D	**Joint width**	60 mm
	Details of backing rod	
	Material	Polyethylene
	Thickness	Three 20 mm diameter rods
	Fixing method	Friction fit within the cavity at the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	30 mm
	Application method	Cartridge gunned at the unexposed face of the cavity
Floor linear gap system E (See Figure 5 for more details)		
E	**Joint width**	60 mm
	Details of backing material	
	Material	Stone wool insulation
	Density	45.2 kg/m^3
	Thickness	50 mm
	Fixing method	Friction fit within the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	5 mm
	Application method	Cartridge gunned at the unexposed face of the cavity
Floor linear gap system F (See Figure 6 for more details)		
F	**Joint width**	60 mm
	Details of backing material	
	Material	Stone wool insulation
	Density	45.2 kg/m^3
	Thickness	50 mm
	Fixing method	Friction fit within the cavity at the exposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	5 mm
	Application method	Cartridge gunned at the exposed face of the cavity

Item		Description
Wall linear gap system G (See Figure 7 for more details)		
G	**Joint width**	12 mm
	Details of backing rod	
	Material	Polyethylene
	Size	Single 13 mm diameter rod
	Fixing method	Friction fit within the cavity on both exposed and unexposed sides
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	6 mm
	Application method	Cartridge gunned at both exposed and unexposed faces of the cavity
Wall linear gap system H (See Figure 8 for more details)		
H	**Joint width**	30 mm
	Details of backing rod	
	Material	Polyethylene
	Size	Single 30 mm diameter rod
	Fixing method	Friction fit within the cavity on both exposed and unexposed sides
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	15 mm
	Application method	Cartridge gunned at both exposed and unexposed faces of the cavity
Wall linear gap system I (See Figure 9 for more details)		
I	**Joint width**	50 mm
	Details of backing rod	
	Material	Polyethylene
	Thickness	Three 20 mm diameter rods
	Fixing method	Friction fit within the cavity on both exposed and unexposed sides
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	25 mm
	Application method	Cartridge gunned at both exposed and unexposed faces of the cavity
Wall linear gap system J (See Figure 10 for more details)		
J	**Joint width**	60 mm
	Details of backing material	
	Material	Stone wool insulation
	Density	45.2 kg/m^3
	Thickness	50 mm
	Fixing method	Friction fit within the cavity on both exposed and unexposed sides
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant

Item		Description
	Thickness	5 mm
	Application method	Cartridge gunned at both exposed and unexposed faces of the cavity
Floor linear gap system K (See Figure 11 for more details)		
K	**Joint width**	150 mm
	Details of backing material	
	Material	Stone wool insulation
	Density	110 kg/m^3
	Thickness	25 mm
	Fixing method	Friction fit within the cavity at both exposed and unexposed faces of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness	10 mm
	Application method	At the unexposed face of the cavity
Floor linear gap system L (See Figure 12 for more details)		
L	**Joint width**	100 mm
	Details of backing materials	
	Material 1	Ceramic fibre insulation
	Density	96 kg/m^3
	Thickness	12.5 mm
	Fixing method	Two layers friction fit within the cavity near the exposed face of the cavity
	Material 2	Polyethylene foam
	Density	34 kg/m^3
	Thickness	15 mm
	Fixing method	Single layer friction fit within the cavity near the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness and application method	• 10 mm, Mastic gunned at the unexposed face of the cavity • 15 mm, Mastic gunned at the exposed face of the cavity
Floor linear gap system M (See Figure 13 for more details)		
M	**Joint width**	50 mm
	Details of backing materials	
	Material 1	Ceramic fibre insulation
	Density	96 kg/m^3
	Thickness	12.5 mm
	Fixing method	Two layers friction fit within the cavity near the exposed face of the cavity
	Material 2	Polyethylene foam
	Density	34 kg/m^3
	Thickness	15 mm

Item		Description
	Fixing method	Single layer friction fit within the cavity near the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness and application method	• 10 mm, Mastic gunned at the unexposed face of the cavity • 15 mm, Mastic gunned at the exposed face of the cavity
Floor linear gap system N (See Figure 14 for more details)		
N	**Joint width**	100 mm
	Details of backing materials	
	Material 1	Ceramic fibre insulation
	Density	96 kg/m^3
	Thickness	12.5 mm
	Fixing method	Two layers friction fit within the cavity near the exposed face of the cavity
	Material 2	Polyethylene foam
	Density	34 kg/m^3
	Thickness	15 mm
	Fixing method	Single layer friction fit within the cavity near the unexposed face of the cavity
	Details of sealant	
	Material	BOSS FireSilicone EMA sealant
	Thickness and application method	• 10 mm, Mastic gunned at the unexposed face of the cavity • 15 mm, Mastic gunned at the exposed face of the cavity

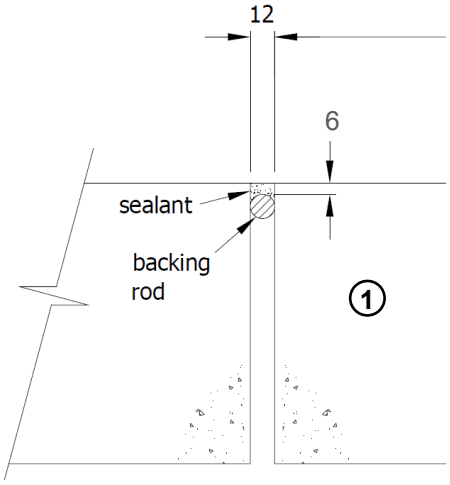

Figure 1 **Floor linear gap system A – Assessment 1 (As shown in WF 187564 and WF 372207) - dimensions in mm**

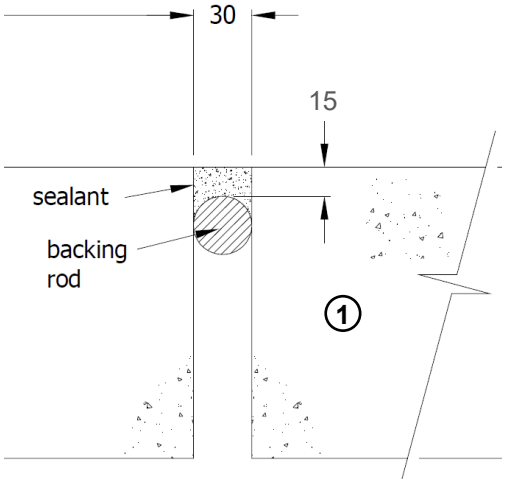

Figure 2 **Floor linear gap system B – Assessment 1 (As shown in WF 187564) - dimensions in mm**

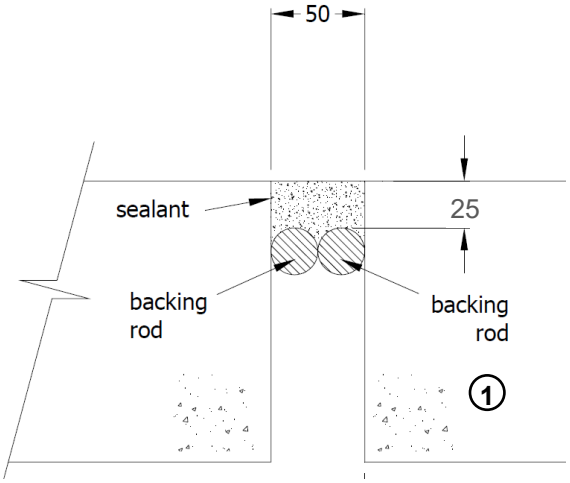

Figure 3 **Floor linear gap system C – Assessment 1 (As shown in WF 187564) - dimensions in mm**

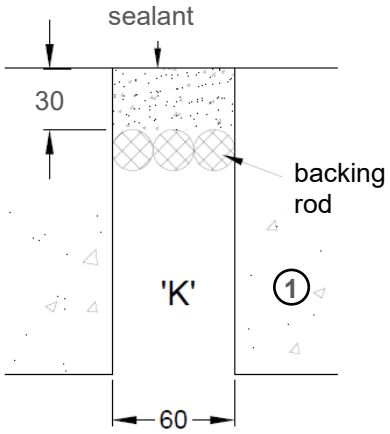

Figure 4 Floor linear gap system D – Assessment 1 (As shown in WF 372207) - dimensions in mm

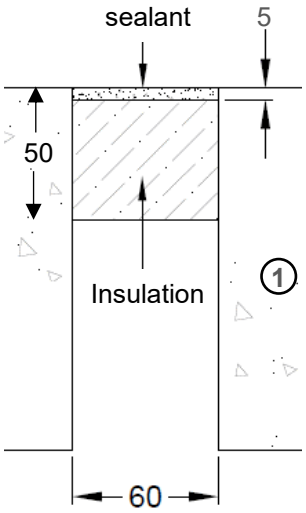

Figure 5 Floor linear gap system E – Assessment 1 (As shown in WF 372207) - dimensions in mm

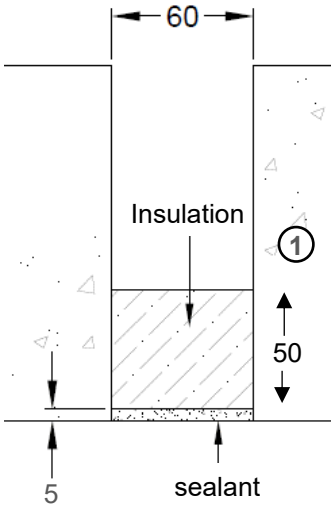

Figure 6 Floor linear gap system F – Assessment 1 (As shown in WF 372207) - dimensions in mm

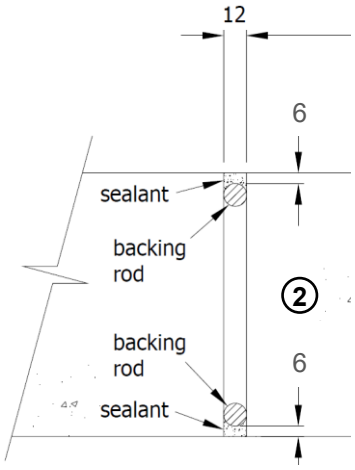

Figure 7 Wall linear gap system G – Assessment 1 (As shown in WF 187564) - dimensions in mm

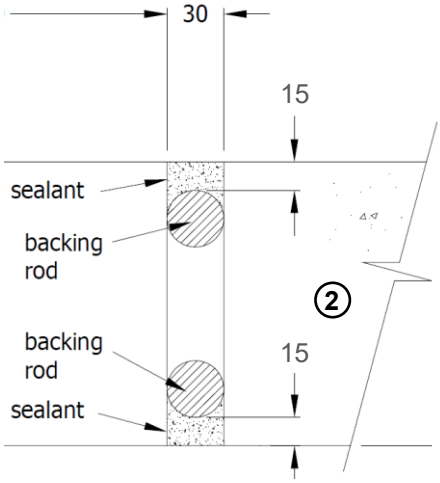

Figure 8 Wall linear gap system H – Assessment 1 (As shown in WF 187564) - dimensions in mm

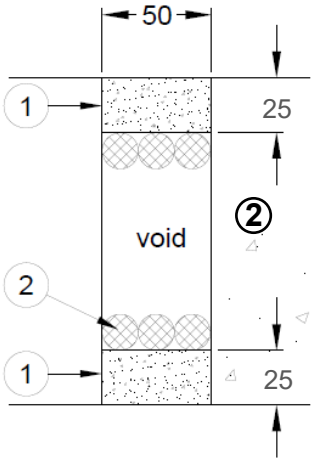

Figure 9 Wall linear gap system I – Assessment 1 (As shown in WF 372207) - dimensions in mm

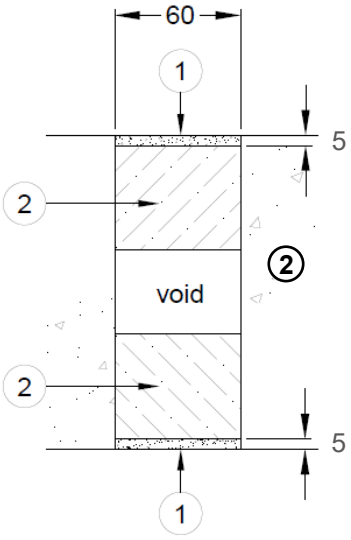

Figure 10 Wall linear gap system J – Assessment 1 (As shown in WF 372207) - dimensions in mm

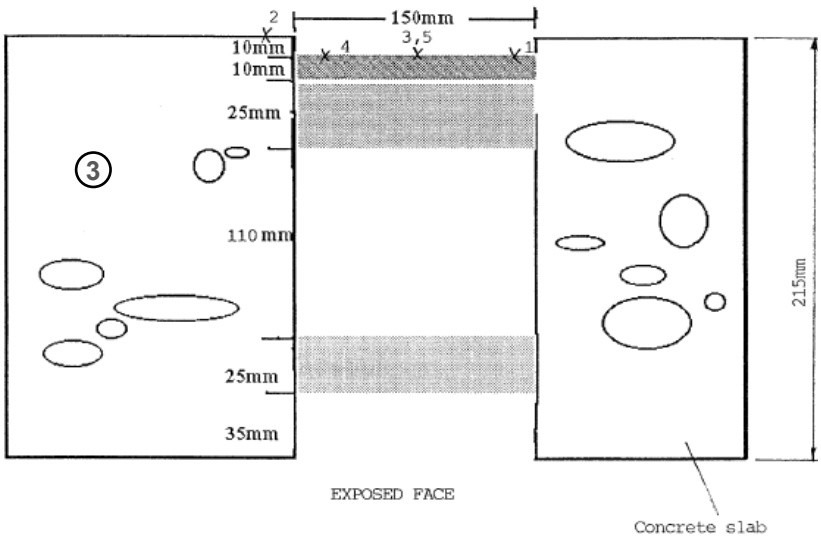

Figure 11 Floor linear gap system K – Assessment 2 (As shown in supplement to LPC TE82045)

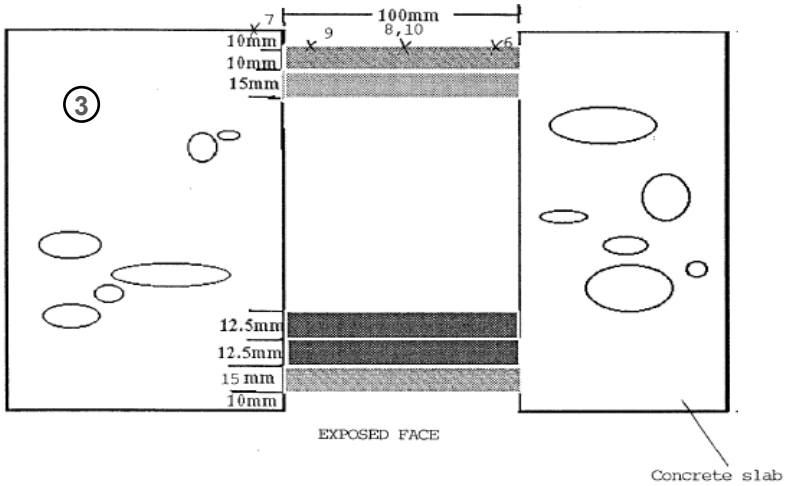

Figure 12 Floor linear gap system L– Assessment 2 (As shown in supplement to LPC TE82045)

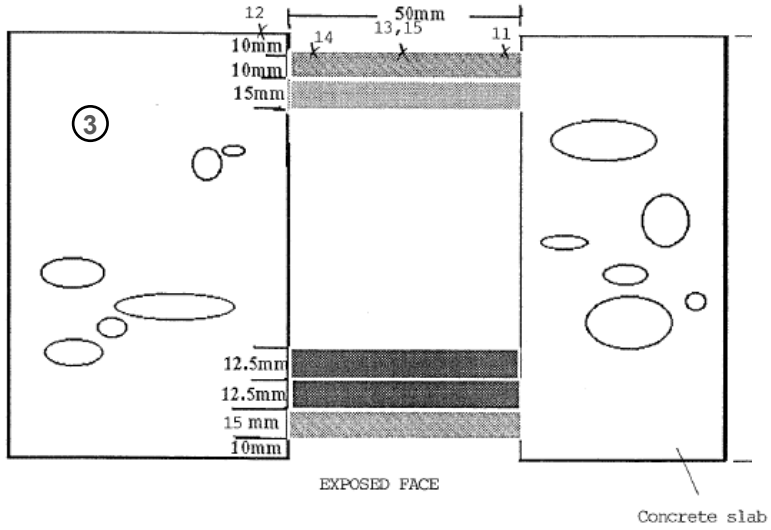

Figure 13 Floor linear gap system M – Assessment 2 (As shown in supplement to LPC TE82045)

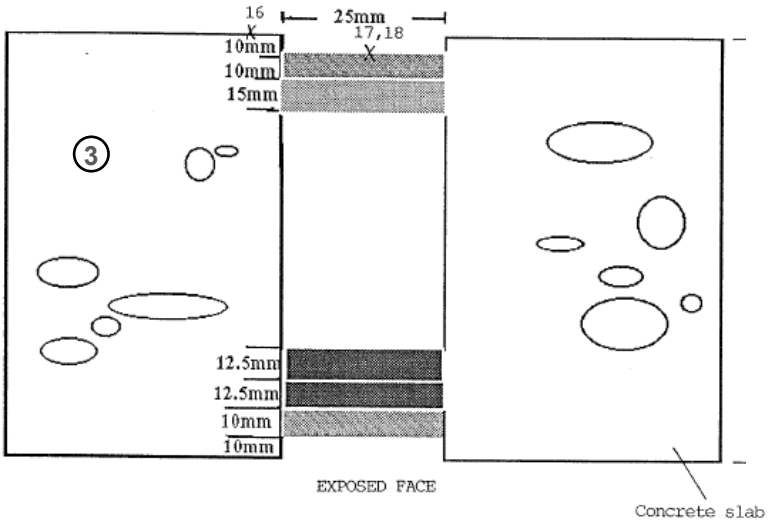

Figure 14 Floor linear gap system N – Assessment 2 (As shown in supplement to LPC TE82045)

5. Assessment 1 – BOSS FireSilicone – EMA sealant protecting linear gaps

5.1 Description of variation / background

BOSS FireSilicone – EMA sealant was tested in tests WF 187564, WF 372207 and TE 82045. These reports comprise of fire tests of linear gaps within floor and wall separating elements (Systems A to J in Table 5). The proposed variations are as follows.

For all systems:

Assessment of the applicability of test results in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

For Systems A to F (Floor separating elements)

The separating element may be made of aerated concrete or normal-weight concrete with a density greater than 670 kg/m^3, and a thickness not less than 150 mm.

For Systems G to J (Wall separating elements)

The separating element may be made of autoclaved aerated concrete, normal-weight concrete or masonry blockwork with a density greater than 760 kg/m^3, and a thickness not less than 150 mm.

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
NCC procedure for determining FRL	Differs in only a minor degree from a tested prototype S1C2(b) and (c)
Type of assessment	Qualitative and comparative

5.3 Assessment

5.3.1 Linear gaps through rigid floors (Systems A – F)

WF 187564 and WF 372207 comprised of various horizontal linear gaps with widths varying between 12mm to 60mm (Figure 1 to Figure 6). The floor separating element was made of 150mm thick autoclaved aerated concrete slabs/ lintels with a density of 670kg/m^3.

The tests were conducted in accordance with BS EN 1366-4:2006 and BS EN 1363-1:1999. A comparison of the guidelines between these and the Australian standards AS 1530.4:2014 and AS 4072.1:2005 (R2016) is provided in Section 6. As per the discussion presented in Section 6.1.6, the tests are considered to be in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The proposed variation is to use autoclaved aerated concrete or normal-weight concrete with a density not less than 670 kg/m^3 for the floor separating element, provided that their thickness is not less than 150 mm. As per AS 3600:2018, the density of normal-weight concrete can be taken as 2400 kg/m^3.

Compared to autoclaved aerated concrete, a normal-weight concrete separating element of the same size has a higher mass and a greater moisture content in its finished state. Consequently, normal-weight concrete possesses a greater thermal mass than aerated concrete. When exposed to fire, normal-weight concrete results in more steaming, releasing its internally trapped moisture. It also absorbs more heat to elevate the temperature of its mass.

The surface finish characteristics of autoclaved aerated concrete are different from normal-weight concrete. However, the difference in the interaction characteristics between the linear gap elements (backing rods, stone wool insulation backing and sealant) and the separating element surface are unlikely to affect the performance of the proposed systems significantly. This is partly because the backing materials are mostly friction fit within the linear gap.

As per the above discussion, if the separating elements of floor linear gap systems A to F were changed to aerated concrete or normal-weight concrete with a density not less than 670 kg/m^3, while maintaining the minimum 150 mm thickness, they are expected to achieve the required FRL as per Table 7.

5.3.2 Linear gaps through rigid walls (Systems G – J)

WF 187564 and WF 372207 comprised of various vertical linear gaps with widths varying between 12 mm to 60 mm (Figure 7 to Figure 10). The floor separating element was made of 150 mm thick autoclaved aerated concrete blocks.

It was previously established that the tests described in these referenced reports are in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

The proposed variation is to use either aerated concrete, normal-weight concrete or masonry blocks with a density not less than 760 kg/m^3 as the wall separating element, provided that their thickness is not less than 150 mm.

It was previously established that the variation in the surface interaction characteristics with the use of normal-weight concrete is unlikely to affect the friction fit backing materials and sealant. The variation in the surface interaction characteristics with the use of masonry blocks is also unlikely to considerably affect the behaviour of the friction fitted backing materials and the sealant. As per the above discussion, normal weight concrete or masonry blocks are expected to achieve the required FRLs as per Table 7.

5.4 Assessment outcome

Table 7 Linear gaps in rigid floors and walls protected with BOSS FireSilicone-EMA sealant - in AAC or normal weight concrete floor separating elements

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)			150 mm	175 mm
A	WF 187564	12	670	As per AS 3600	1 × Ø13 PEF backing rod on the unexposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the unexposed side	-/180/120	-/240/120
B		30			1 × Ø30 PEF backing rod on the unexposed side	BOSS FireSilicone sealant, minimum depth of 15mm, on the unexposed side	-/180/180	-/240/180
C		50			2 × Ø25 PEF backing rods on the unexposed side	BOSS FireSilicone sealant, minimum depth of 25mm, on the unexposed side	-/180/60	-/240/60
D	WF 372207	60			3 × Ø20 PEF backing rods on the unexposed side	BOSS FireSilicone sealant, minimum depth of 30mm, on the unexposed side	-/180/120	-/240/120
E		60			Stone wool insulation, minimum depth of 50mm, on unexposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the unexposed side	-/180/180	-/240/180
F		60			Stone wool insulation, minimum depth of 50mm, on exposed side	BOSS FireSilicone sealant, minimum depth of 6mm, on the exposed side	-/90/60	

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)			150 mm	175 mm
G	WF 187564	12	760		1 × Ø13 PEF backing rod on both sides	BOSS FireSilicone sealant, minimum depth of 6mm, on both sides	-/180/180	-/300/300
H		30			1 × Ø30 PEF backing rod on both sides	BOSS FireSilicone sealant, minimum depth of 15mm, on both sides	-/180/180	-/300/300
I	WF 372207	50			3 × Ø13 PEF backing rods on both sides	BOSS FireSilicone sealant, minimum depth of 25mm, on both sides	-/180/180	-/240/180
J		60			Stone wool insulation, minimum depth of 50mm, on both sides	BOSS FireSilicone sealant, minimum depth of 5mm, on both sides	-/180/180	-/240/240
K	LPC TE 82045	25	2400**	215	2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene foam on unexposed side	BOSS FireSilicone sealant, minimum 10 mm depth on both sides	-/240/240	
L	LPC TE 82045	50			2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side and 15 mm depth on exposed side	-/240/240	

Joint	Reference test	Max gap width (mm)	Separating element details*		Backing material	Local fire protection	FRL (based on separating element thickness)	
			Min. Density (kg/m³)	Min. Thickness (mm)			150 mm	175 mm
					foam on unexposed side			
M	LPC TE 82045	100			2 layers of 12.5 mm thick kaowool on exposed side and 1 × 15 mm polyethylene foam on unexposed side	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side and 15 mm depth on exposed side	-/240/240	
N	LPC TE 82045	150			1 layer of 25 mm thick rockwool 825 Firebatt on both sides	BOSS FireSilicone sealant, minimum 10 mm depth on unexposed side	-/240/240	

This assessment demonstrates that the BOSS FireSilicone-EMA sealant will achieve the listed FRLS in Table 7 in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016).

6. Assessment 2 – Relevance of BS EN 1363-1:1999 and BS EN 1366-4:2006 test data with respect to AS 1530.4:2014 and AS 4072.1:2005 (R2016)

6.1.1 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 of diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouple specified in BS EN 1363-1:1999 is 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 is to consist of Nickel Chromium/Nickel Aluminium (Type K) wire as defined in IEC 60584-1[11], contained within mineral insulation in a heat-resisting steel alloy sheath of nominal diameter 1 mm, the hot junctions being electrically insulated from the sheath.

The thermocouple hot junction is to be fixed to the geometric centre of the plate, by a small steel strip made from the same material as the plate. The steel strip can be welded to the plate or may be screwed to it to facilitate replacement of the thermocouple. The strip should be approximately 18 mm by 6 mm if it is spot-welded to the plate, and nominally 25 mm by 6 mm if it is to be screwed to the plate. The screw is to be 2 mm in diameter.

The assembly of plate and thermocouple should be fitted with a pad of inorganic insulation material 97 ±1 mm by 97 ±1 mm by 10 ±1 mm thick with a density of 280 ±30 kg/m^3.

The relative location of the furnace thermocouples for the exposed face of the specimen, for AS 1530.4:2014 and BS EN 1363.1:1999, is 100 mm +10 mm and 100 mm +50 mm respectively.

The furnace control thermocouples required by BS EN 1363.1:1999 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 BS EN 1363.1:1999, particularly when the furnace temperature is changing quickly in the early stages of the test.

6.1.2 Furnace Pressure Regime

It is a requirement of AS 1530.4:2014 that for a single horizontal penetration tested in a vertical separation element that has a height of more than 1m, it shall be tested with a pressure of 20±3 Pa at the top of the separation element and in such cases the horizontal penetrating service shall be included in the zone where the positive pressure exceeds 10Pa.

Furthermore, if more than one penetration sealing system is tested in a vertical separation element, the pressure conditions specified above shall apply to the lowest penetration.

Similarly, as per BS EN 1366-4:2006, a vertical furnace shall be operated so that a minimum pressure of 15 Pa exists in the centre of the test specimen mounted in the lowest position.

It is a requirement of AS 1530.4:2014 and BS EN 1363-1:1999 that for horizontal elements, a furnace gauge pressure of 20 Pa is established at a height 100 mm below the floor soffit level.

[11] Thermocouples - Part 1: EMF specifications and tolerances

The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and BS EN 1363-1:1999 are also not appreciably different.

6.1.3 Specimen Size

BS EN 1366-4:2006 states that a linear joint seal shall be of uniform design cross sectional area and for non-movement joints, a shorter length of not less than 900 mm can be used.

AS 1530.4:2014 states that the length of the linear gap exposed to the furnace chamber shall not be less than 1 m. The linear gaps tested in the reference test reports all have a length of 1 m. Therefore, they are in agreement with the Australian Standards' requirements.

6.1.4 Integrity Performance Criteria

The integrity criteria differ slightly between AS 1530.4:2014 and BS EN 1363.1:1999

While a specimen maintains its insulation performance, the specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 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. Gap gauges are not used to evaluate integrity.

Except for minor technical variations, the integrity criteria in BN EN 1363.1:1999 are generally applied in a comparable manner.

6.1.5 Specimen Temperature Measurement and insulation performance criteria

For linear gaps, AS 1530.4:2014 specifies the following requirements when placing thermocouples on the unexposed face in Clause 10.5.1 (f).

a. 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)

b. On the surface of the seal, 25 mm from the edge of the opening, with one thermocouple for each 500 mm of the perimeter.

c. 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 gaps 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 12mm. Under such circumstances, the size of the pad may be reduced to facilitate the fitting of the thermocouple.

A review of Figures 5 to 11 of BS EN 1366-4:2006 show that while the unexposed surface thermocouple locations specified are in agreement with those specified in AS 1530.4:2014, the BS EN standard is more onerous in certain aspects.

6.1.6 Application of Test Data to AS 1530.4:2014

The variations in furnace heating regimes, furnace thermocouples and the responses of the different thermocouple types to the furnace conditions are not expected to have significant effect on the outcome of the referenced fire resistance test.

It is noted that test report WF 187564, a thermocouple on the unexposed surface sealant was not placed at the bottom end of the tested wall joint specimens. Hence, it is not in strict accordance with AS 1530.4:2014 which stipulates that at least 3 thermocouples should be placed on the surface of the seal. The bottom end of the vertical seal is subjected to a lower pressure from the exposed side. Therefore, the outcome of the test is unlikely to have significantly been altered due to the presence of these thermocouples.

Based on the above discussion it is considered that the results relating to the integrity and insulation performance of the referenced tests can be used as a basis to assess the FRL of the specimens if tested in accordance with AS 1530.4:2014.

7. Assessment 3 – Relevance of BS 476.20:1987 test data with respect to AS 1530.4:2014 and AS 4072.1:2005 (R2016)

7.1.1 General

The fire resistance test LPC TE82045 was conducted utilising the heating conditions of BS 476.20:1987, which differs from AS 1530.4:2014. The effects these differences have on the fire resistance performance of test specimens are discussed below.

7.1.2 Furnace Temperature Regime

The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4:2014 follows a similar trend to BS 476.20:1987.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and BS 476.20:1987are not appreciably different.

7.1.3 Furnace Thermocouples

For furnace thermocouples specified in AS 1530.4:2014 are Type K, mineral insulated metal sheathed (MIMS) with a stainless steel sheath having a wire of diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouple types in BS 476.20:1987 shall be one of the following two types:

a. Bare Nickel Chromium/Nickel Aluminium wires, 0.75 mm to 1.5 mm in diameter, welded or crimped together at their ends and supported and insulated from each other in a twin bore porcelain insulator. However, for 25 mm approximately from the weld/crimp, the wires shall be exposed and be separated from each other by at least 5 mm. (To be replaced or recalibrated after 6hrs of usage).

b. Nickel Chromium/Nickel Aluminium wire contained within mineral insulation in a heat resisting steel sheath of diameter 1.5 mm, the hot junctions being electrically insulated from the sheath. The thermocouple hot junction shall project 25 mm from a porcelain insulator. The assembly shall have a response time on cooling in air of not greater than 30 seconds.

The relative distance of the furnace thermocouples from the exposed face of the specimen, for both AS 1530.4:2014 and BS 476.20:1987, is 100 mm +10 mm.

7.1.4 Furnace Pressure

- It is a requirement of AS 1530.4:2014 that for horizontal elements, a furnace pressure of 20 Pa is established at 100 mm below the underside of the floor assembly.
- Similar conditions are required by BS 476.20:1987 for horizontal elements

7.1.5 Performance Criteria

- AS 1530.4:2014 specifies the following performance criteria for building materials and structures:

  a. Structural Adequacy – (Not relevant to the referenced test)

  b. Integrity

c. Insulation

7.1.6 Integrity

The integrity criteria differ slightly between AS 1530.4:2014 and BS 476.20:1987.

For uninsulated specimens or, for specimens that have exceeded their insulation criteria performance, the specimen shall be deemed to have failed the integrity criterion in accordance with AS 1530.4:2014 if it sustains flaming for 10 seconds, or if the ignition of the cotton pad occurs.

The integrity criteria for BS 476.20:1987 are similar to the above. However, the use of cotton pad is not as strictly regulated in the BS standard. Therefore, the AS standard is considered more onerous in measuring the integrity performance of linear gaps.

7.1.7 Insulation

The thermocouple locations for measuring insulation in AS 1530.4:2014 and BS 476.20:1987 are different. AS 1530.4:2014 specifically nominates positions for thermocouples for maximum temperature rise and allows the application of a roving thermocouple anywhere on the specimen. In BS 476.20:1987 there is a requirement to measure temperatures at specified minimum number locations, with additional thermocouples fitted at the discretion of the laboratory. Similarly, a roving thermocouple can be applied at any location.

The failure criteria for insulation in AS 1530.4:2014 and BS 476.20:1987 are relatively different in terms of the positioning of thermocouples as noted above.

7.1.8 Application of referenced test data to AS 1530.4:2014 and AS 4072.1:2005 (R2016)

The variations in furnace heating regimes, furnace pressure conditions, furnace thermocouples and the responses of the different thermocouple types to the furnace conditions are not expected to have an overall significant effect on the outcome of the referenced fire resistance test.

However, the BS 476.20:1987 is known to be less onerous than AS 1530.4:2014 with respect to the application of cotton pads to determine integrity failure.

The requirement for having at least two thermocouples on the separating element was not strictly followed as described in the supplement to report TE 82045, however, the seals maintained integrity for 250 minutes. As per AS 3600:2018, a 175 mm thick concrete floor is expected to achieve an insulation of 240 minutes. The tested slab was 215 mm thick which provides confidence in the insulation performance of the slab in lieu of the thermocouple.

Based on the above discussion, it is considered that the results of the referenced report (supplement to LPC TE 82045) are applicable in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016). The FRLs are listed in Table 7.

8. Validity

Jensen Hughes does not endorse the tested or assessed products and systems 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 sponsor is responsible for formally notifying Jensen Hughes of any additional testing performed on their product/system. This obligation applies regardless of where the test was conducted, the results of the test, or whether it was initially considered part of Jensen Hughes' ongoing assessment. The primary goal of this notification is to allow Jensen Hughes to review the changes and determine whether they require re-evaluation or re-testing to determine whether the changes have affected the product's performance. It is important that the client promptly notify Jensen Hughes if any such changes are implemented.

The procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. The sponsor 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 that is expected to be demonstrated when subjected to test conditions in accordance with AS 1530.4:2014 and AS 4072.1:2005 (R2016), based on the evidence referred to in this report.

This assessment is provided to Boss Products (Australia) Pty Ltd 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 – WF187564

Table 8 Information about test report

Item	Information about test report
Report sponsor	Firestopit Limited
Test laboratory	Warringtonfire UK (formerly Bodycote Warringtonfire)
Test date	The fire resistance test was completed on 24/04/2009
Test standards	The test was done in accordance with BS EN 1366-4:2006 and BS EN 1363-1:1999.
Variation to test standards	No variation to test standard
General description of tested specimen	The test comprised of wall and floor separating elements incorporating various gap sealing systems. The blockwork wall comprised of 150 mm thick autoclaved aerated concrete blocks with a density of 760 kg/m^3. The concrete floor comprised of 150 mm thick autoclaved aerated concrete lintels with a density of 670 kg/m^3. The separating floor element had the overall dimensions of 2240 mm (L) × 1730 mm (W) × 150 mm (T) and was made up of autoclaved aerated concrete lintels arranged to provide 2-off 12 mm (W) × 1000 mm (L), 2-off 30 mm (W) × 1000 mm (L) and 2-off 50 mm (W) × 1000 mm (L) linear gaps. The separating wall element had the overall dimensions of 1500 mm (H) × 1500 mm (W) × 150 mm (T) and was made up of autoclaved aerated blockwork arranged to provide 4-off 12 mm (W) × 1000 mm (L) and 2-off 30 mm (W) × 1000 mm (L) linear gaps. Each gap was sealed with silicone based intumescent sealant referenced “Pyrolastic Fire Rated Silicone” (known as BOSS FireSilicone EMA sealant in Australia). Each seal was cartridge gunned into the gaps. A description of each gap seal is given in Table 9.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:1999.

Table 9 Test specimen description for WF187564

System	Gap width (mm)	Gap facing	Description
A	12	Masonry to masonry	6 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 13 mm diameter polyethylene backing rod
B	30	Masonry to masonry	15mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 30mm diameter polyethylene backing rod
C	50	Masonry to masonry	25mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 2-off 25 mm diameter polyethylene backing rods
D	12	Steel to masonry	6 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 13 mm diameter polyethylene backing rod
E	30	Steel to masonry	15 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 30 mm diameter polyethylene backing rod
F	50	Steel to masonry	25 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 2-off 25 mm diameter polyethylene backing rods

System	Gap width (mm)	Gap facing	Description
G	12	Masonry to masonry	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
H	30	Masonry to masonry	15 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 30 mm diameter polyethylene backing rods
I	12	Timber to masonry	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
J	30	Timber to masonry	15 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 30 mm diameter polyethylene backing rods
K	12	Timber to masonry	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
L	12	Steel to masonry	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods

Only systems A, B, C, G and H were referenced in the current assessment.

The test specimen achieved the results shown in Table 10.

Table 10 Summary of test results for WF187564

Reference	Integrity (min)		Insulation (min)
	Cotton pad	Sustained flaming	
A	244	300*	122
B	300*	300*	186
C	246	300*	65
D	300*	300*	48
E	300*	300*	43
F	229	300*	33
G	300*	300*	300*
H	300*	300*	300*
I	199	199	145
J	143	143	143
K	208	208	208
L	300*	300*	69

*Test duration. The test was discontinued after a period of 300 minutes.

A.2 Test report – WF372207

Table 11 Information about test report

Item	Information about test report
Report sponsor	FSi Limited
Test laboratory	Warringtonfire UK (Formerly Exova Warringtonfire)
Test date	The fire resistance test was completed on 29/09/2016
Test standards	The test was done in accordance with BS EN 1366-4:2006 and BS EN 1363-1:1999.
Variation to test standards	No variation to test standard
General description of tested specimen	The test comprised of wall and floor separating elements incorporating various gap sealing systems. The blockwork wall comprised of 150 mm thick autoclaved aerated concrete blocks with a density of 760kg/m^3. The concrete floor comprised of 150 mm thick steel reinforced autoclaved aerated concrete slabs with a density of 670kg/m^3. The separating floor element had the overall dimensions of 2240 mm (L) × 1730 mm (W) × 150 mm (T) and was made up of autoclaved aerated concrete lintels arranged to provide 6-off linear gaps of varying widths which were all 1000 mm long. Two of the gaps were fitted with steel substrates. The separating wall element had the overall dimensions of 1500 mm (H) × 1500 mm (W) × 150 mm (T) and was made up of autoclaved aerated blockwork arranged to provide 5-off linear gaps of varying widths which were all 1000 mm long. Two of the gaps were fitted with timber substrates and one fitted with a steel substrate.
Instrumentation	The test report states that the instrumentation was in accordance with the requirements of BS EN 1366-4:2006+A1:2010.

Table 12 Test specimen description for WF187564

System	Gap width (mm)	Gap facing	Description
A	60	Concrete to concrete	60 mm wide linear gap, sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to both faces of the wall and backed with a 50 mm deep Rockwool stone wool insulation
B	60	Concrete to steel	60 mm wide linear gap with one face of the gap opening fitted with 8 mm thick steel plate substrate. The gap was sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to both faces of the wall and backed with a 50 mm deep Rockwool stone wool insulation friction fit into the void.
C	50	Concrete to hardwood	60 mm wide linear gap with one face of the gap opening fitted with 15 mm thick hardwood timber substrate with a measured density of 638kg/m^3. The gap was sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to both faces of the wall and backed with a 50 mm deep Rockwool stone wool insulation friction fit into the void.
D	12	Concrete to softwood	60 mm wide linear gap with one face of the gap opening fitted with 15 mm thick softwood timber substrate with a measured density of 544kg/m^3. The gap was sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to both faces of the wall and backed with a 50 mm deep Rockwool stone wool insulation friction fit into the void.
E	30	Concrete to concrete	50 mm wide linear gap, sealed with a 25 mm depth of Pyrolastic silicone sealant, cartridge gunned to both faces of the wall and backed with three 20 mm diameter closed cell PE backing rods.

System	Gap width (mm)	Gap facing	Description
F	50	Concrete to steel	60 mm wide linear gap with one face of the gap opening fitted with 8 mm thick steel plate substrate. The gap was sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to the unexposed face of the floor and backed with a 50 mm deep Rockwool stone wool insulation friction fit into the void.
G	12	Concrete to steel	60 mm wide linear gap with one face of the gap opening fitted with 8 mm thick steel plate substrate. The gap was sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to the unexposed face of the floor and backed with a 50 mm deep Rockwool stone wool insulation friction fit into the void.
H	30	Concrete to concrete	60 mm wide linear gap, sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to the unexposed face of the floor and backed a 50 mm deep Rockwool stone wool insulation friction fit into the void.
I	12	Concrete to concrete	60 mm wide linear gap, sealed with a 5 mm depth of Pyrolastic silicone sealant, cartridge gunned to the exposed face of the floor and backed a 50 mm deep Rockwool stone wool insulation friction fit into the void.
J	30	Concrete to concrete	12 mm wide linear gap, sealed with a 6 mm depth of Pyrolastic silicone sealant, cartridge gunned to the unexposed face of the floor and backed with a single 20 mm diameter closed cell PE backing rod.
K	12	Concrete to concrete	60 mm wide linear gap, sealed with a 30 mm depth of Pyrolastic silicone sealant, cartridge gunned to the unexposed face of the floor and backed with three 20 mm diameter closed cell PE backing rods.

Only systems A, E, H, I, J and K were referenced in the current assessment.

The test specimen achieved the results shown in Table 13.

Table 13 Summary of test results for WF372207

Reference	Integrity (min)		Insulation (min)
	Cotton pad	Sustained flaming	
A	264*	264*	264*
B	248	248#	74
C	224	224#	224
D	218	218#	218
E	264*	264*	214
F	97	97	29
G	150	150	64
H	264*	264*	190
I	112	112	61
J	264*	264*	152
K	264*	264*	128

*Test duration. The test was discontinued after a period of 264 minutes.

#The specimen blanked off after failure to allow the test to continue.

A.3 Test report – Supplement to LPC TE82045

Table 14 Information about test report

Item	Information about test report
Report sponsor	Trade Fireseal Systems Ltd
Test laboratory	LPC Testing (Known as BRE Global)
Report issue date	The supplement to report TE 82045 was issued on 22/04/1994
Test standards	The test was done in accordance with BS EN 1366-4:2006 and BS EN 1363-1:1999.
Variation to test standards	This was an Ad-Hoc test and it varied from the standard as it didn't have 2 thermocouples on the separating element
General description of tested specimen	Slabs were installed in horizontal linear gaps, 25, 50, 100 and 150 mm (W) × 10 mm (L), between dense concrete lintels, 215 mm (W) × 215 mm (T). For seals up to 100 mm wide, the gap was sealed with 10 mm thick Pyro-plus silicone sealant over 15 mm thick polyethylene foam in the top of the gap and 15 mm thick Pyro plus silicone sealant covering two layers of 125 mm thick Kaowool ceramic blanket in the bottom of the gap. For the 150 mm wide gap, the seal comprised of 10 mm thick Pyro plus silicone sealant (known as BOSS FireSilicone EMA sealant in Australia) over 25 mm thick Rockwool Firebatt 825 in the top of the gap and 25 mm thick Rockwool Fire batt 825 in the bottom of the gap.
Instrumentation	The test report states that the instrumentation was in accordance with BS EN 1363-1:1999.

The test specimen achieved the results shown in Table 15.

Table 15 Summary of test results for LPC TE 82045

Description	Integrity (min)	Insulation (min)
150 mm wide gap sealed with 10 mm thick Pyro plus silicone over 25 mm thick Rockwool Firebatt 825 in the top of the gap, and 25 mm thick Rockwool Firebatt 825 in the bottom of the gap.	250	250
100 mm wide gap sealed with 10 mm thick Pyro plus silicone over 15 mm thick polyethylene foam in the top of the gap, and 15 mm thick Pyroplus silicone covering two layers of 12.5 mm thick Kao wool ceramic fibre blanket in the bottom of the gap.	250	244
50 mm wide gap sealed with 10 mm thick Pyro plus silicone over 15 mm thick polyethylene foam in the top of the gap, and 15 mm thick Pyroplus silicone covering two layers of 12.5 mm thick Kao wool ceramic fibre blanket in the bottom of the gap.	250	250
25 mm wide gap sealed with 10 mm thick Pyro plus silicone over 15 mm thick polyethylene foam in the top of the gap, and 15 mm thick Pyroplus silicone covering two layers of 12.5 mm thick Kao wool ceramic fibre blanket in the bottom of the gap.	250	250

Specific information on the use of a cotton pad is not available. The guidelines of AS 1530.4:2014 on the use of cotton pads are more stringent than those of BS 476.20:1987.