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Fire assessment report

Trafalgar FyreFLEX® sealant in control joints

Sponsor: Trafalgar Group

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Quality management

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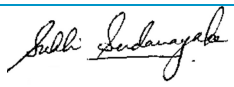
		Signature			

Executive summary

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of control joints protected with Trafalgar FyreFLEX® sealant in various wall and floor separating elements in accordance with AS 1530.4:2014 and AS 4072.1:2005.

Trafalgar FyreFLEX® sealant is a water-based fire-rated acrylic sealant used as a fire stopping measure for various penetrations and joints. In this report, Trafalgar FyreFLEX® sealant is assessed as the primary means of fire protection in control joints in various configurations. 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 FRLs shown in Table 1 – in accordance with AS 1530.4:2014 and AS 4072.1:2005.

The variations and outcomes 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 June 2028.

Table 1 Variations and assessment outcome

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
Head of wall joints	2 × 13 mm or 2 × 16 mm plasterboard walls (minimum 116 mm thick)	Maximum 30 mm wide	16 mm from both sides	Backed by ceiling track	-/120/120
	1 × 16 mm plasterboard walls (minimum 96 mm thick)	Maximum 30 mm wide	16 mm from both sides	Backed by ceiling track	-/90/90
	Masonry or concrete walls (minimum 140 mm thick)	Maximum 50 mm wide	20 mm from both sides	Polyethylene backing rod	-/180/180
Vertical control joints in walls	2 × 16 mm plasterboard on C-H stud with 25 mm shaftliner on the other side (minimum 95 mm thick)	Maximum 20 mm wide	16 mm from both sides	Backing optional	-/120/90
	2 × 13 mm or 2 × 16 mm plasterboard walls (minimum 116 mm thick)	Maximum 20 mm wide	Full depth both sides	Backing optional	-/120/120
	1 × 16 mm plasterboard walls (minimum 96 mm thick)	Maximum 20 mm wide	16 mm from both sides	Backing optional	-/90/90
	Solid masonry or concrete walls (minimum 90 mm thick)	Maximum 30 mm wide	12 mm from both sides	Polyethylene backing rod	-/120/120
			25 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side	Polyethylene backing rod	-/120/120 one-way FRL

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
	Solid masonry or concrete walls (minimum 140 mm thick)	Maximum 20 mm wide	30 mm from the unexposed side	Polyethylene backing rod	-/240/180 one-way FRL
		Maximum 30 mm wide	30 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side		-/240/240 one-way FRL
		Maximum 20 mm wide	30 mm from both sides		-/240/240
Control joints between perpendicular wall systems	**Plasterboard to plasterboard walls**				
	2 × 13 mm or 2 × 16 mm plasterboard wall to 2 × 13 mm or 2 × 16 mm plasterboard wall	Maximum 20 mm wide	Full depth both sides	Backing optional	-/120/120
	2 × 13 mm or 2 × 16 mm plasterboard wall to 1 × 16 mm plasterboard wall				-/90/90
	2 × 13 mm or 2 × 16 mm plasterboard wall to Minimum 95 mm thick shaftwall				-/120/90
	1 × 16 mm plasterboard wall to 1 × 16 mm plasterboard wall				-/90/90
	1 × 16 mm plasterboard wall to Minimum 95 mm thick shaftwall				-/90/90
	Minimum 95 mm thick shaftwall to Minimum 95 mm thick shaftwall	Maximum 20 mm wide	16 mm from both sides		-/120/90

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
	Rigid to Rigid walls				
	Concrete / solid masonry to concrete / solid masonry walls (minimum 90 mm thick)	Maximum 30 mm	12 mm from both sides	Polyethylene backing rod	-/120/120
			25 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side		-/120/120 one-way FRL
	Concrete / solid masonry to concrete / solid masonry walls (minimum 140 mm thick)	Maximum 20 mm	30 mm from both sides		-/240/240
		Maximum 30 mm wide	30 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side		-/240/240 one-way FRL
		Maximum 20 mm wide	30 mm from both sides		-/240/240
	Plasterboard to rigid walls				
	Minimum 90 mm thick masonry / concrete wall to 2 × 13 mm or 2 × 16 mm plasterboard walls	Maximum 20 mm wide	Full depth both sides	Polyethylene backing rod	-/120/120
	Minimum 90 mm thick masonry / concrete wall to 1 × 16 mm plasterboard walls				-/90/90
	Minimum 90 mm thick masonry / concrete wall to Minimum 95 mm thick shaftwall	Maximum 20 mm wide	16 mm from both sides		-/120/90
Horizontal control joints in between concrete slabs	Concrete floor slabs (minimum 175 mm thick)	Maximum 40 mm wide	40 mm from unexposed (top) side	Polyethylene backing rod	-/240/120 one-way FRL

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL

Notes:

- All control joints must be installed with the relevant sealant backing as included in the discussions in section 6 of this report.
- All wall systems must have an established FRL obtained through testing or assessment by an ATL that is equal to or greater than the assessed FRLs for the control joints.
- The minimum stud depth must be 64 mm for plasterboard walls.
- FRLs assessed for control joints in framed wall systems can be extended to rigid walls of greater or equal thickness to the tested/assessed framed wall. In rigid walls, the sealant must be backed by a polyethylene backing rod.
- Masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively. Concrete floor slabs must be designed by a professional engineer in accordance with AS 3600:2018.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the expected fire resistance level (FRL) of control joints protected with Trafalgar FyreFLEX® sealant in various wall and floor separating elements 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 that apply to the assessed systems.

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

Table 2 Sponsor details

Sponsor	Address
Trafalgar Group	26A Ferndell Street South Granville NSW 2142

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[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 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.

[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.

This assessment has been written in accordance with the general principles outlined in EN 15725:2010[4] for extended application reports on the fire performance of construction products and building elements.

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[5] 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.

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 2 May 2023, Trafalgar Group 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 expected in accordance with AS 1530.4:2014.
- This assessment applies to control joints in floor systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014.
- Unless stated otherwise specifically, this assessment applies to control joints in wall systems exposed to fire from either side in accordance with the requirements of AS 1530.4:2014.
- All separating elements must be tested or assessed in accordance with AS 1530.4:2014 by an accredited testing laboratory to achieve an established FRL equivalent to or greater than the FRL assessed for the control joint systems.
- Masonry and concrete walls must be designed by a professional engineer in accordance with AS 3700:2018[6] or AS 3600:2018[7] respectively.
- 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

[4] 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
[5] National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia
[6] Standards Australia, 2018, Masonry structures, AS 3700:2018 (Incorporating Amendment No. 1), Standards Australia, NSW.
[7] Standards Australia, 2018, Concrete structures, AS 3600:2018 (Incorporating Amendment No. 1), Standards Australia, NSW.

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. Warringtonfire 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 systems

It is proposed that Trafalgar FyreFLEX® sealant is applied at control joint seals – in one-sided or two-sided applications – in various types of separating elements. The proposed control joints are:

- Horizontal head details in walls
- Vertical control joints in walls
- Horizontal control joints in floors
- Control joints between perpendicular walls.

The joints are protected with Trafalgar FyreFLEX® sealant with and without polyethylene backing rods.

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. Permission has been received from the test sponsors listed below to reference the relevant test reports.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
NI1688	Wormald International	7 September 1988	Fire Research Laboratories
NI2088		26 September 1988	
NI2388		13 October 1988	
NI2588		17 October 1988	
NI2188		30 October 1988	
NI1189		15 March 1989	
NI0790		18 April 1990	
FRT190292 R4.0	Trafalgar Fire	16 January 2020	Warringtonfire

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 tests	Description	Variations
Applicability of test data in accordance with AS 1530.4:2014	NI1688, NI2088, NI2388, NI2588, NI2188, NI1189, NI0790	Referenced tests were conducted in AS 1530.4:1985[8]. and AS 1530.4:1990[9].	It is proposed to assess the tested systems in accordance with AS 1530.4:2014.
Wall head details	NI2388, NI1189	The test specimen in NI2388 consisted of an upper half of a 1.93 m wide × 2.97 m high × 140 mm thick hollow concrete block wall with two horizontal control joints. Joint A was 50 mm wide × 20 mm deep × 1800 mm applied on both exposed and unexposed sides. Joint B was 20 mm wide × 10 mm deep × 1200 mm applied on both exposed and unexposed sides. The joints were backed with polyethylene backing rods. The test specimen in NI1189 consisted of a 128 mm thick plasterboard partition with 2 × 16 mm plasterboard on both sides of a 64 mm deep steel stud. The specimen contained a deflection head and a vertical control joint. The deflection head was 30 mm wide × 16 mm deep × 1930 mm long with Trafalgar FyreFLEX® sealant.	It is proposed to assess various wall deflection head details as given below: • Maximum 30 mm wide joint protected to a depth of minimum 16 mm from both the exposed and unexposed sides in 2 × 13 mm fire-rated plasterboard walls. • Maximum 30 mm wide joint protected to a depth of minimum 16 mm from both the exposed and unexposed sides in 2 × 16 mm fire-rated plasterboard walls. • Maximum 30 mm wide joint protected to a depth of minimum 16 mm from both the exposed and unexposed sides in 1 × 16 mm fire-rated plasterboard walls. • Maximum 0 mm wide joint protected to a depth of minimum 16 mm from both the exposed and unexposed sides in minimum 116 mm thick masonry or concrete walls. • Maximum 50 mm wide joint protected to a depth of minimum 20 mm from both the exposed and unexposed sides in minimum 140 mm thick masonry walls.
Vertical control joints in walls	NI1688, NI2088, NI2588, NI2188, NI1189, NI0709	The test specimen in NI1688 consisted of a 140 mm thick concrete wall constructed in two halves; one half with hollow concrete blocks and the other half with solid concrete blocks for a 4-hour rating. Two vertical control joints were tested in each half of the wall. The control joints 3 and 4 in solid concrete block wall are relevant to this assessment. Joint 3 was 20 mm wide × 20 mm deep × 2800 mm long (with Ø25 mm backing rod and Joint 4	It is proposed to assess various vertical control joints as given below: • Maximum 20 mm wide joint protected to the full depth of the plasterboards from both the exposed and unexposed sides in a 2 × 13 mm fire-rated plasterboard walls. • Maximum 20 mm wide joint protected to the full depth of the plasterboards from both the exposed and unexposed sides in a 2 × 16 mm fire-rated plasterboard walls.

[8] Standards Australia, 1985, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests of elements of building construction, AS 1530.4:1985, Standards Australia, NSW.
[9] Standards Australia, 1990, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests of elements of building construction, AS 1530.4:1990, Standards Australia, NSW.

Item	Reference tests	Description	Variations
		was 35 mm wide × 25 mm deep × 2800 mm long (with Ø40 mm backing rod). The test specimen in NI2588 consisted of a 1110 mm wide × 1160 mm high × 150 mm thick masonry wall with two vertical control joints. Joint A was 10 mm wide × 15 mm deep × 1000 mm long with Fyrejoint sealant on the unexposed side. The sealant was backed with a backing rod. Joint B was 20 mm wide × 30 mm deep × 1000 mm long with Fyrejoint sealant on the unexposed side. The sealant was backed with a backing rod. The test specimen in NI2188 consisted of a 1000 mm × 1000 mm × 90 mm thick concrete block wall with two vertical joints. Vertical joint A was 30 mm wide protected to a depth of 12 mm on both the exposed and unexposed side with Fyrejoint. The sealant was backed with a backing rod. Vertical joint B was 30 mm wide protected to a depth of 25 mm on the exposed side. The unexposed side was protected to a depth of 5 mm with polyurethane sealant. Both sealants were backed with polyethylene backing rods. The test specimen in NI1189 consisted of a 128 mm thick plasterboard partition with 2 × 16 mm plasterboard on both sides of a 64 mm deep steel stud. The specimen contained a deflection head and a vertical control joint. The vertical control joint was 20 mm wide × 16 mm deep × 2540 mm long with Trafalgar FyreFLEX® sealant.	• Maximum 20 mm wide joint protected to the full depth of the plasterboards from both the exposed and unexposed sides in a 1 × 16 mm fire-rated plasterboard walls. • Maximum 20 mm wide joint protected to a depth of minimum 16 mm from both the exposed and unexposed sides in shaftwalls with 2 × 16 mm fire-rated plasterboard layers on one side of a C-H stud with 25 mm shaftliner panel on the other side for an overall wall thickness of 95 mm. • Maximum 30 mm wide joint protected to a depth of minimum 12 mm from both the exposed and unexposed sides in minimum 90 mm thick solid masonry or concrete walls. • Maximum 20 mm wide joint protected to a depth of minimum 30 mm on the unexposed side in minimum 140 mm thick solid masonry or concrete walls. • Maximum 30 mm wide joint protected to a depth of minimum 30 mm on the exposed side and to a depth of minimum 5 mm with non fire-rated sealant on the unexposed side in minimum 140 mm thick solid masonry or concrete walls. • Maximum 20 mm wide joint protected to a depth of minimum 30 mm from both the exposed and unexposed sides in minimum 140 mm thick solid masonry or concrete walls.
Vertical control joints between perpendicular wall systems		The test specimen in NI0709 consisted of a 95 mm thick shaft wall with two layers of 16 mm thick plasterboard (exposed face) and one layer of 25 mm thick shaftliner. The framing was made of 64 mm deep C-H studs. The wall consisted of penetrations as well as a deflection head detail and a vertical control joint. The vertical control joint was 22 mm wide × 16 mm deep × 2540 mm long filled on both exposed and unexposed sides.	It is proposed to assess vertical control joints between perpendicular wall systems, which include: • Plasterboard walls to plasterboard wall junctions • Rigid walls to rigid wall junctions • Plasterboard walls to rigid wall junctions
Horizontal control joints in floors	FRT190292 R4.0	The test specimen in FRT190292 consisted of a 3500 mm wide × 4500 mm long × 175 mm thick concrete floor slab with a control. Service D was a 40 mm wide × 40 mm deep × 1000 mm long control joint filled with	It is proposed to assess horizontal control joints in floors as tested in FRT190292.

Item	Reference tests	Description	Variations
		Trafalgar FyreFLEX® sealant on the unexposed side. The sealant was backed with a backing rod.	
Applicability of control joints in rigid walls	-	-	It is proposed to extend the fire resistance performance of control joints assessed in framed wall systems to rigid masonry or concrete walls.

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	
Separating element[1]		
1.	Product name	Minimum 116 mm thick plasterboard wall system
	Product specification	The wall system must consist of either 2 × 13 mm or 2 × 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing.
2.	Product name	Minimum 96 mm thick plasterboard wall system
	Product specification	The wall system must consist of a single layer of 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing.
3.	Product name	Minimum of 95 mm thick plasterboard – shaftliner wall system
	Product specification	The wall system must consist of 2 × 16 mm fire-rated plasterboard on one side of a C-H stud with 25 mm thick shaftliner on the other side.
4.	Product name	Minimum 90 mm thick hollow / solid masonry or concrete wall system
	Product specification	Designed in accordance with AS 3700:2018 and AS 3600:2018 respectively.
5.	Product name	Minimum 175 mm thick concrete floor slab
	Product specification	Designed in accordance with AS 3600:2018.
Fire-stopping protections		
Sealant		
6.	Item name	Acrylic sealant
	Product name	Trafalgar FyreFlex™ sealant
	Density	1335 kg/m^3 (provided by the sponsor)
	Installation	The sealant must be installed as applicable to the varying systems as detailed in section 6 of this report.
Backing rod		
7.	Item name	Backing rod
	Material	Polyethylene
	Size	To fit the width of the joint.

[1] All separating elements must have an established FRL obtained through testing or assessment by an ATL that is equivalent to or greater than the FRLs attributed to the control joint details in this report.

5. Applicability of tested systems in accordance with AS 1530.4:2014

5.1 Description of variation

Fire resistance test NI0790 was conducted in accordance with AS 1530.4:1990, and fire resistance tests NI1688, NI2088, NI2188, NI2388, NI2588 and NI1189 were conducted in accordance with AS 1530.4:1985. These standards differ from AS 1530.4:2014, and the effect these differences have on the fire resistance performance of the referenced test specimens is discussed below.

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 and comparative

5.3 Tests conducted in accordance with AS 1530.4:1990

5.3.1 Specimen size

AS 1530.4:2014 states that for control joints, the test assembly must not be less than 1 m × 1 m and the length of the control joint exposed to the furnace chamber must be not less than 1 m.
AS 1530.4:1990 does not specify the specimen sizes for control joints. However, in NI0790, at least 1 m of the joint was exposed to the furnace.

5.3.2 Furnace temperature

The main difference between the heating curve specified in AS 1530.4:2014 and AS 1530.4:1990 is the definition of the ambient temperature conditions. In AS 1530.4:1990, the actual ambient temperature at the start of the test is used (T_0), whereas in AS 1530.4:2014 a constant value of 20 ºC is used.

AS 1530.4:2014 specifies furnace temperature to follow the below trend:

$$T_{AS\ 1530.4:2014} = 345log_{10}(8 + 1) + 20$$

AS 1530.4:1990 specifies furnace temperature to follow the below trend:

$$T_{AS\ 1530.4:1990} = 345log_{10}(8t + 1) + T_0, 10\ °C \leq T_0 \leq 40\ °C$$

The furnace temperature in AS 1530.4:1990 may be slightly more onerous than in AS 1530.4:2014 if the ambient temperature at the start of the test is greater than 20 ºC. In NI0790, the ambient temperature was maximum 21 ºC and so the temperature of the furnace should not be appreciably different if tested in accordance with AS 1530.4:2014. The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and AS 1530.4:1990 are not appreciably different.

5.3.3 Furnace pressure

AS 1530.4:1990 specifies a pressure differential of minimum 8 Pa for vertical test specimens, where this pressure differential must apply to the top two-thirds of the test specimen. The pressure must be measured at a point located approximately one-third of the height of the opening of the furnace chamber.

Clause 10.8.2 of AS 1530.4:2014 requires that the following pressure conditions are met:

- A pressure of 15 ± 3 Pa must be established at the centre of a single horizontal penetration within a vertical separating element that has a maximum height of ≤ 1 m.

- If a single horizontal penetration is tested in a vertical separating element that has a height more than 1 m, the pressure at the top of the separating element must be 20 ± 3 Pa and the services must be included in the zone where positive pressure exceeds 10 Pa.
- If more than one penetration sealing system is tested in a vertical separating element, the pressure conditions specified in item (a) or (b) must apply to the lowest penetration.

The test specimen of NI0790 consisted of multiple penetrations in addition to the 2.54 m long control joint. In the test, the furnace pressure was measured approximately 1000 mm above the base of the specimen, ensuring that all penetration seals were subjected to an over pressure of at least 10 Pa. This is applicable to clause 10.8.2 (c) of AS 1530.4:2014.

This means that at least 1.5 m of the control joint is also subjected to a pressure greater than 10 Pa. AS 1530.4:2014 requires that the minimum length of a control joint exposed to furnace conditions must be 1 m, which is therefore satisfied in test NI0790. Additionally, there were no observed cracks or fissures in the test that could have potentially led to an early integrity failure under more onerous pressure conditions.

5.3.4 Performance criteria

AS 1530.4:2014 specifies the following performance criteria for penetrations and control joints in accordance with section 10:

- integrity
- insulation

Integrity

AS 1530.4:2014 defines integrity failure of the specimen has occurred when it:

- collapses.
- sustains flaming on the non-fire side for 10 seconds or longer.
- ignites a cotton pad within 30 seconds when applied.
- 6 mm gap gauge passes through the specimen into the furnace and can be moved 150 mm along the gap or a 25 mm gap gauge passes through the specimen into the furnace.

The cotton pad used for the measurement of integrity must be 20 mm thick × 100 mm square weighing between 3 g and 4 g – except when a smaller cotton pad (20 mm thick × 30 mm square) may be required for densely packed service penetrations. AS 1530.4:2014 also defines when the application of the cotton pad should be discontinued. It states that ‘except for penetration systems, the use of the cotton pad shall be discontinued over areas where the temperature exceeds 300 ºC measured by a thermocouple with the edge of the pad aligned with the edge of the gap.’

The specimen is deemed to have failed integrity in accordance with AS 1530.4:1990 if the specimen:

- collapses.
- develops cracks, fissures or other openings through which flames or hot gases can pass.
- has sustained flaming on the non-fire side.

The integrity criteria in accordance with AS 1530.4:1990 is generally more stringent and integrity failure would normally be deemed to have occurred prior to failure in accordance with AS 1530.4:2014.

There is no requirement for a cotton pad test in AS 1530.4:1990, which could potentially affect the integrity performance as measured in the test. However, in test NI0790, cotton pads were available in accordance with BS 476.20:1987[10] but was deemed not required for the control joint as there were no impending signs of integrity failure for the test duration. This means that integrity performance will be similar if conducted in accordance with AS 1530.4:2014.

[10] British Standards, 1987, Fire tests on building materials and structures – Part 20: Method for determination of the fire resistance of elements of construction (general principles), BS 472.20:1987, British Standards Institution, London, UK.

Insulation

The failure criteria for insulation as specified in AS 1530.4:2014 and AS 1530.4:1990 are not appreciably different. They are defined as:

- The average temperature on the unexposed face exceeds the initial temperature by more than 140 K or
- The temperature at any location on the unexposed face exceeds the initial temperature by more than 180 K.

AS 1530.4:2014 specifies that the temperature on the unexposed face must be measured every 1 minute, whereas AS 1530.4:1990 requires the temperature to be measured every 2 minutes. AS 1530.4:1990 can be considered less onerous in this requirement as the actual time to insulation failure may be skipped between temperature readings. However, considering that there was a safety margin between the tested insulation performance (105 minutes) and the insulation performance required in NI0790 (90 minutes), this is not expected to have a detrimental effect.

The requirements for the location of specimen thermocouples are also different between the two standards. According to AS 1530.4:2014, at least three thermocouples must be placed on the surface of the control joint and further thermocouples must be placed 25 mm away from the joint on the separating element (one thermocouple for each 500 mm of the perimeter).

There are no specific requirements for thermocouple placement for control joints in AS 1530.4:1990. In test NI0790, adequate thermocouples were placed on the vertical control joint and on the separating element to meet the specifications of AS 1530.4:2014.

5.3.5 Application of test data to AS 1530.4:2014

Based on the above discussion and in the absence of any foreseeable integrity and insulation risk, it is concluded that the results relating to the integrity and insulation performance of the vertical control joint specimen tested in NI0790 can be used to assess the integrity and insulation performance of the same specimen in accordance with AS 1530.4:2014.

5.4 Tests conducted in accordance with AS 1530.4:1985

5.4.1 Specimen size

AS 1530.4:2014 states that for control joints, the test assembly shall not be less than 1 m × 1 m and the length of the control joint exposed to the furnace chamber shall be not less than 1 m. AS 1530.4:1985 does not specifically set out specimen sizes for control joints; however, in all referenced tests, the control joint has at least 1 m of the joint exposed to the furnace. As such, the test data is applicable to AS 1530.4:2014.

5.4.2 Furnace temperature

The main difference between the heating curve specified in AS 1530.4:2014 and AS 1530.4:1985 is the definition of the ambient temperature conditions. In AS 1530.4:1985, the actual ambient temperature at the start of the test must be used (T_0), whereas in AS 1530.4:2014, a constant value of 20 ºC is used.

AS 1530.4:2014 specifies furnace temperature to follow the below trend:

$$T_{AS\,1530.4:2014} = 345log_{10}(8+1) + 20$$

AS 1530.4:1985 specifies furnace temperature to follow the below trend:

$$T_{AS\,1530.4:1985} = 345log_{10}(8t+1) + T_{0,}\ 10\ °C\ \leq T_0 \leq 40\ °C$$

The parameters outlining the accuracy of the control of the furnace temperature in AS 1530.4:2014, and AS 1530.4:1985 are not appreciably different. The furnace temperature in AS 1530.4:1985 may be slightly more onerous than in AS 1530.4:2014 if the ambient temperature at the start of the test is greater than 20 ºC. In the referenced fire resistance tests, the ambient temperature ranged from 18 ºC – 25 ºC and so the temperature of the furnace is not expected to be appreciably different if tested in accordance with AS 1530.4:2014.

5.4.3 Furnace pressure

AS 1530.4:1985 specifies a pressure differential of minimum 8 Pa for vertical test specimens, where this pressure differential must apply to the top two-thirds of the test specimen. The pressure must be measured at a point located approximately one-third of the height of the opening of the furnace chamber.

Clause 10.8.2 of AS 1530.4:2014 requires that the following pressure conditions are met:

- A pressure of 15 ± 3 Pa must be established at the centre of a single horizontal penetration within a vertical separating element that has a maximum height of ≤ 1 m.
- If a single horizontal penetration is tested in a vertical separating element that has a height more than 1 m, the pressure at the top of the separating element must be 20 ± 3 Pa and the services must be included in the zone where positive pressure exceeds 10 Pa.
- If more than one penetration sealing system is tested in a vertical separating element, the pressure conditions specified in item (a) or (b) must apply to the lowest penetration.

In NI1688, the pressure measured at the mid-height of the 2.8 m high specimen was 10 Pa. This means that the pressure condition on half of the length of the specimen is less onerous than that stipulated in AS 1530.4:2014. However, at least 1 m of the control joint is subjected to a pressure greater than 10 Pa and AS 1530.4:2014 requires the minimum length of a control joint to be 1 m, which is satisfied in test NI1688. Additionally, there were no observed cracks or fissures in the test that could have potentially led to an early integrity failure under more onerous pressure conditions.

In NI2088 and NI2188, the pressure measured at the mid-height of the 1 m high vertical control joints was 12 Pa and 10 Pa, respectively. If tested in accordance with AS 1530.4:2014, the pressure at mid-height of the specimen must be 15 Pa. Therefore, the pressure conditions in NI2088 are less onerous. However, in the absence of observed cracks and fissures that may be detrimentally affected in more onerous pressure conditions, NI2188 is deemed to be applicable in accordance with AS 1530.4:2014.

In NI2388, the pressure was measured to be 22 Pa to 26 Pa at joint A and 19 Pa to 23 Pa at joint B. Therefore, this is more onerous than the pressure requirements of AS 1530.4:2014, and the results are deemed to be applicable in accordance with AS 1530.4:2014.

In NI2588, the pressure at the mid-height of the 1 m high specimen was 10 Pa. Therefore, the pressure condition in NI2588 is less onerous than that required in AS 1530.4:2014. However, in the absence of observed cracks and fissures that may be detrimentally affected in more onerous pressure conditions, NI2588 is deemed to be applicable in accordance with AS 1530.4:2014.

In NI1189, the pressure was measured to be 17 Pa at 1700 mm from the base of the 2.54 m high partition. This means that the deflection head detail and at least 1 m of the control joint are subjected to a pressure greater than 10 Pa, and therefore the results are deemed to be applicable in accordance with AS 1530.4:2014.

5.4.4 Performance criteria

AS 1530.4:2014 specifies the following performance criteria for penetrations and control joints in accordance with section 10:

- integrity
- insulation

Integrity

AS 1530.4:2014 defines integrity failure of the specimen has occurred when it:

- collapses.
- sustains flaming on the non-fire side for 10 seconds or longer.
- ignites a cotton pad within 30 seconds when applied.
- 6 mm gap gauge passes through the specimen into the furnace and can be moved 150 mm along the gap or a 25 mm gap gauge passes through the specimen into the furnace.

The cotton pad used for the measurement of integrity must be 20 mm thick × 100 mm square, weighing between 3 g and 4 g – except when a smaller cotton pad (20 mm thick × 30 mm square) may be required for densely packed service penetrations. AS 1530.4:2014 also defines when the application of the cotton pad should be discontinued. It states that 'except for penetration systems, the use of the cotton pad shall be discontinued over areas where the temperature exceeds 300 ºC measured by a thermocouple with the edge of the pad aligned with the edge of the gap.'

The specimen is deemed to have failed to AS 1530.4:1985 if the specimen:

- collapses.
- develops cracks, fissures or, other openings through which flames or hot gases can pass.
- has sustained flaming on the non-fire side.

There is no requirement for a cotton pad test in AS 1530.4:1985 which could potentially affect the integrity performance as measured in the test. However, in all referenced tests, cotton pads were available in accordance with BS 476.20:1987 but was deemed not required for the control joint as there were no impending signs of integrity failure for the test duration. This means that integrity performance will be similar if conducted in accordance with AS 1530.4:2014.

Insulation

The failure criteria for insulation in AS 1530.4:2014 and AS 1530.4:1985 are not appreciably different. They are defined as:

- The average temperature on the unexposed face exceeds the initial temperature by more than 140 K or
- The temperature at any location on the unexposed face exceeds the initial temperature by more than 180 K.

However, the requirements for the location of specimen thermocouples are different between the two standards. According to AS 1530.4:2014, at least three thermocouples must be placed on the surface of the control joint and further thermocouples must be placed 25 mm away from the joint on the separating element (one thermocouple for each 500 mm of the perimeter). There are no specific requirements for thermocouple placement for control joints in AS 1530.4:1985.

In NI2188, three thermocouples are placed on the seal, including mid-height, and they were also placed 25 mm away from the joint. Therefore, this thermocouple placement is in accordance with AS 1530.4:2014. Similarly, in NI1688, NI2388, NI2588 and NI1189 an adequate number of thermocouples were placed on and 25 mm away from the joint to be applicable in accordance with AS 1530.4:2014.

5.4.5 Application of test data to AS 1530.4:2014

Based on the above discussion and in the absence of any foreseeable integrity and insulation risk, it is concluded that the results relating to the integrity and insulation performance of the vertical control joint specimens tested in NI1688, NI2188, NI2388, NI2588 and NI1189 can be used to assess the integrity and insulation performance of the same specimens in accordance with AS 1530.4:2014.

6. Control joints in walls and floors protected with Trafalgar FyreFLEX® sealant

6.1 Description of variation

This assessment addresses Trafalgar FyreFLEX® sealant applied to control joint seals –in one-sided or two-sided applications – in various types of separating elements. The joints are protected with Trafalgar FyreFLEX® sealant with and without polyethylene backing rods.

The control joint seals include:

- Horizontal head details in walls
- Vertical control joints in walls
- Horizontal control joints in floors
- Control joints between perpendicular walls.

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 and comparative

6.3 Wall head details

6.3.1 Minimum 116 mm thick plasterboard walls

Proposed configuration

It is proposed to assess the fire resistance performance of control joints at the head of minimum 116 mm thick plasterboard walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 16 mm from both the exposed and unexposed sides. The plasterboard walls must consist of either two layers of 13 mm or two layers of 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing. The proposed FRL is -/120/120.

Discussion

In test NI1189, a 2540 mm high × 1930 mm wide × 128 mm thick plasterboard wall system with 2 × 16 mm fire-rated plasterboard layers on both sides of a 64 mm deep steel stud framing was tested. The plasterboard wall contained a deflection head. The deflection head was 30 mm wide × 1930 mm long and was protected with Trafalgar FyreFLEX® sealant on both sides of the wall to a depth of 16 mm placed on the inner plasterboard layer. The sealant was backed by the 64 mm × 50 mm × 0.6 mm deflection head ceiling track. This deflection head maintained integrity and insulation performance for the test duration of 120 minutes.

Based on test NI1189, the proposed head detail can be assessed as tested in plasterboard wall systems with 2 × 16 mm fire-rated plasterboard layers on both sides of minimum 64 mm deep steel studs. The sealant must be applied on the inner plasterboard layer and supported by the ceiling track.

For walls with 2 × 13 mm thick plasterboard layers on both sides of minimum 64 mm steel studs, the overall wall thickness is reduced from the tested 128 mm to 116 mm. However, it is proposed that the sealant depth is maintained as 16 mm on both sides of the wall and the width be maintained at 30 mm. Therefore, the integrity and insulation performance of the head detail is expected to be the same as those observed in test NI1189. This means that the integrity and insulation performances of the overall wall system is expected to be limited by the FRL of the wall system itself, in which case the

2 × 13 mm plasterboard wall must be tested or assessed by an ATL to have an established FRL of at least -/120/120.

Based on the above discussion, the proposed head detail with a maximum width of 30 mm and minimum depth of 16 mm on both sides in wall systems with either 2 × 13 mm or 2 × 16 mm thick fire-rated plasterboard layers on both sides of minimum 64 mm steel framing is expected to maintain integrity and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014.

6.3.2 Minimum 96 mm thick plasterboard walls

Proposed configuration

It is proposed to assess the fire resistance performance of control joints at the head of minimum 96 mm thick plasterboard walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 16 mm from both the exposed and unexposed sides. The plasterboard walls must consist of one layer of 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing. The proposed FRL is -/90/90.

Discussion

Based on the integrity and insulation performances of the head detail tested in NI1189 – as discussed in section 6.3.1 – it is expected that a head detail protected with Trafalgar FyreFLEX® sealant for a maximum width of 30 mm and a minimum depth of 16 mm on both sides of the wall is capable of achieving integrity and insulation performances for up to 90 minutes.

For walls with 1 × 16 mm thick fire-rated plasterboard layers on both sides of minimum 64 mm steel studs, the overall wall thickness is reduced from the tested 128 mm to 96 mm. However, since the sealant depth is maintained as 16 mm on both sides of the wall and the width is maintained as 30 mm, the FRL of the wall system at the head is not expected to be detrimentally affected to be less than -/90/90. This means that the integrity and insulation performances of the overall wall system is expected to be limited by the FRL of the wall system itself in which case the 1 × 16 mm plasterboard wall must be tested or assessed by an ATL to have an established FRL of at least -/90/90. The sealant must be supported by the ceiling track from behind.

Based on the above discussion, the proposed head detail with a maximum width of 30 mm and minimum depth of 16 mm on both sides in wall systems with 1 × 16 mm thick fire-rated plasterboard layers on both sides of minimum 64 mm steel framing is expected to maintain integrity and insulation performance for up to 90 minutes – in accordance with AS 1530.4:2014.

6.3.3 Minimum 116 mm thick masonry or concrete walls

Proposed configuration

It is proposed to assess the fire resistance performance of control joints at the head of minimum 116 mm thick rigid masonry or concrete walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 16 mm from both the exposed and unexposed sides. The proposed FRL is -/120/120.

Discussion

In accordance with clause 10.12.2 (c) of AS 1530.4:2014, results obtained from framed wall systems can be applied to the performance of that system in concrete or masonry walls of greater or equal thickness to the tested framed wall. Therefore, the assessed FRL for minimum 116 mm thick framed walls in section 6.3.1 can be extended for minimum 116 mm thick rigid walls made of concrete or masonry blocks. The sealant must be backed by a polyethylene backing rod, similar to test NI2388, where the deflection head detail in a masonry wall consisted of the sealant as well as a PE backing rod.

Based on the above discussion, the proposed head detail with a maximum width of 0 mm and minimum depth of 16 mm on both sides in minimum 116 mm thick concrete or masonry walls is expected to maintain integrity and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014. The masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively, or the separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than -/120/120.

6.3.4 Minimum 140 mm thick masonry walls

Proposed configuration

It is proposed to assess the fire resistance performance of control joints at the head of minimum 140 mm thick masonry walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 50 mm and a minimum depth of 20 mm from both the exposed and unexposed sides. The proposed FRL is - /180/180.

Discussion

In test NI2388, a 1930 mm wide × 2970 mm high × 140 mm thick hollow concrete block wall with two horizontal control joints was tested. Two horizontal gaps were provided in the wall simulating typical construction joints between the soffits of concrete slabs or beams and non-loadbearing walls. Only control joint A is relevant to this assessment.

Control joint A was 50 mm wide × 1800 mm long and was protected with Fyrejoint sealant on both sides of the wall to a depth of 20 mm. The joint was backed with Ø50 mm polyethylene backing rods. It is confirmed by the report sponsor that Fyrejoint is identical to Trafalgar FyreFLEX® sealant. Control joint A maintained integrity and insulation performance for the 182 minutes duration of the test.

Based on the above discussion, the proposed head detail with a maximum width of 50 mm and minimum depth of 20 mm on both sides backed by minimum Ø50 mm polyethylene backing rods in minimum 140 mm thick hollow masonry walls is expected to maintain integrity and insulation performance for up to 180 minutes – in accordance with AS 1530.4:2014.

Furthermore, it is proposed that the separating element can be varied to be solid masonry or concrete walls. In accordance with clause 10.12.2 (b) of AS 1530.4:2014, results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively, or the separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than -/180/180.

6.4 Vertical control joints in walls

6.4.1 Minimum 95 mm thick plasterboard – shaftliner wall

Proposed configuration

It is proposed to assess the fire resistance performance of vertical control joints in minimum 95 mm thick shaftliner walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 20 mm and a minimum depth of 16 mm from both the exposed and unexposed sides. The plasterboard walls must consist of 2 × 16 mm plasterboard sheets on one side of the C-H stud with 25 mm thick shaftliner panel on the other side. The proposed FRL is -/120/90.

Discussion

In test NI0790 a 95 mm thick shaft wall with 2 × 16 mm plasterboard sheets on the exposed face and one layer of 25 mm thick shaftliner on the unexposed face was tested. The wall consisted of penetrations as well as a deflection head detail and a vertical control joint. The vertical control joint was 22 mm wide × 2540 mm long protected with Trafalgar FyreFLEX® sealant on both sides of the wall to a depth of 16 mm. Paper tape was used as a backing material to ensure sealant fill to the correct depth. The vertical control joint showed no failure in integrity for the test duration of 127 minutes. However, insulation criteria was exceeded at 105 minutes as the thermocouple placed on the channel section 25 mm right of the joint and 225 mm down from the head of the wall measured a temperature rise of 180 ºC.

A reduction in the joint width is considered to be less onerous than the tested system, however the depth of the sealant must be maintained as tested. Therefore, based on test NI0790, the proposed vertical control joint can be assessed in the wall system consisting of 2 × 16 mm plasterboard sheets on C-H studs with 25 mm shaftliner on the other side and expected to maintain integrity and insulation performance for up to 120 minutes and 90 minutes respectively – in accordance with AS 1530.4:2014. The separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to

achieve an established FRL equivalent to or greater than -/120/90 for fire exposure from both directions due to the asymmetrical nature of the wall.

6.4.2 Minimum 116 mm thick plasterboard wall

Proposed configuration

It is proposed to assess the fire resistance performance of vertical control joints in minimum 116 mm thick plasterboard walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 20 mm and a minimum full depth of the plasterboards from both the exposed and unexposed sides. The plasterboard walls must consist of either two layers of 13 mm or two layers of 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing. The proposed FRL is -/120/120.

Discussion

In test NI1189, a 2540 mm high × 1930 mm wide × 128 mm thick plasterboard partition with 2 × 16 mm fire-rated plasterboard layers on both sides of a 64 mm deep steel stud was tested. The plasterboard partition contained a deflection head and a vertical control joint. The vertical control joint was 20 mm wide × 2540 mm long protected with Trafalgar FyreFLEX® sealant on both sides of the wall to a depth of 16 mm (inner plasterboard layer thickness). The vertical control joint maintained integrity and insulation performance for the test duration of 120 minutes.

Based on test NI1189 and the improvement on the tested system with an increase in the sealant depth, the proposed vertical control joint can be assessed in plasterboard wall systems with 2 × 16 mm fire-rated plasterboard layers on both sides of minimum 64 mm deep steel studs.

For walls with 2 × 13 mm thick plasterboard layers on both sides of minimum 64 mm steel studs, the overall wall thickness is reduced from the tested 128 mm to 116 mm. However, it is proposed that the sealant depth is increased to the full depth on both sides of the wall and the control joint width is maintained as 20 mm. Therefore, the integrity and insulation performance of the vertical control joint is expected to be the same as those observed in test NI1189. This means that the integrity and insulation performances of the overall wall system is expected to be limited by the FRL of the wall system itself in which case the 2 × 13 mm plasterboard wall must be tested or assessed by an ATL to have an established FRL of at least -/120/120.

Based on the above discussion, the proposed vertical control joint with a maximum width of 20 mm and minimum full depth on both sides in wall systems with either 2 × 13 mm or 2 × 16 mm thick fire-rated plasterboard layers on both sides of minimum 64 mm steel framing is expected to maintain integrity and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014.

6.4.3 Minimum 96 mm thick plasterboard wall

Proposed configuration

It is proposed to assess the fire resistance performance of vertical control joints in minimum 96 mm thick plasterboard walls – filled with Trafalgar FyreFLEX® sealant to a maximum width of 20 mm and a minimum depth of 16 mm from both the exposed and unexposed sides. The plasterboard walls must consist of one layer of 16 mm fire-rated plasterboard on both sides of minimum 64 mm deep steel framing. The proposed FRL is -/90/90.

Discussion

Based on the integrity and insulation performances of the head detail tested in NI1189 – as discussed in section 6.4.2 – it is expected that a vertical control joint protected with Trafalgar FyreFLEX® sealant for a maximum width of 20 mm and a minimum depth of 16 mm on both sides of the wall is capable of achieving integrity and insulation performances for up to 90 minutes.

For walls with 1 × 16 mm thick fire-rated plasterboard layers on both sides of minimum 64 mm steel studs, the overall wall thickness is reduced from the tested 128 mm to 96 mm. However, since the sealant depth is maintained at 16 mm on both sides of the wall and the width is maintained as 20 mm, the FRL of the wall system is not expected to be detrimentally affected to be less than -/90/90 due to the vertical control joint. This means that the integrity and insulation performances of the overall wall system is expected to be limited by the FRL of the wall system itself, in which case the 1 × 16 mm plasterboard wall must be tested or assessed by an ATL to have an established FRL of at least -/90/90. The sealant must be supported by the ceiling track from behind.

Based on the above discussion, the proposed vertical control joint with a maximum width of 20 mm and minimum depth of 16 mm on both sides in wall systems with a 1 × 16 mm thick fire-rated plasterboard layer on both sides of minimum 64 mm steel framing is expected to maintain integrity and insulation performance for up to 90 minutes – in accordance with AS 1530.4:2014.

6.4.4 Minimum 90 mm thick solid masonry or concrete wall

Proposed configuration

It is proposed to assess in minimum 90 mm thick solid masonry or concrete walls:

- the fire resistance performance of vertical control joints filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 12 mm from both the exposed and unexposed sides.
- the fire resistance performance of vertical control joints filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 25 mm from the exposed side with 5 mm deep non fire-rated sealant on the unexposed side.

The proposed FRL for both vertical control joints are -/120/120.

Discussion

In test NI2188, a 1000 mm wide × 1000 mm high × 128 mm thick solid concrete block wall was tested. The concrete block wall contained two vertical joints. Vertical control joint A was 30 mm wide × 1000 mm long protected with Fyrejoint sealant on both sides of the wall to a depth of 12 mm. Ø40 mm diameter polyethylene backing rods were placed behind the sealant on both sides. It is confirmed by the report sponsor that Fyrejoint is identical to Trafalgar FyreFLEX® sealant. The vertical control joint maintained integrity performance for the 153 minute duration of the test, while insulation failed at 150 minutes with the thermocouple placed on the sealant measuring a temperature rise of 180 ºC.

Based on the above discussion, the proposed vertical control joint with a maximum width of 30 mm and minimum depth of 12 mm on both sides backed by minimum Ø40 mm polyethylene backing rods in minimum 90 mm thick solid concrete block walls is expected to maintain integrity and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014.

Vertical joint B was 30 mm wide and protected with Fyrejoint to a depth of 25 mm on the exposed side. The unexposed side was protected to a depth of 5 mm with polyurethane non fire-rated sealant. Ø40 mm diameter polyethylene backing rods were placed behind the sealant on both sides. The vertical control joint maintained integrity and insulation performance for the 153 minute duration of the test. Therefore, the proposed vertical control joint with a maximum width of 30 mm and minimum depth of 25 mm on the exposed side and 5 mm deep non fire-rated sealant on the unexposed side backed by minimum Ø40 mm polyethylene backing rods on both sides in minimum 90 mm thick solid concrete block walls is expected to maintain integrity and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014.

This fire performance can also be extended to concrete walls with a density within ±15% of the tested specimen, which is 1750 kg/m^3. The masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively, or the separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than -/120/120.

6.4.5 Minimum 140 mm thick solid masonry or concrete wall

Proposed configuration

It is proposed to assess in minimum 140 mm thick solid masonry or concrete walls:

- the fire resistance performance of vertical control joints filled with Trafalgar FyreFLEX® sealant to a maximum width of 20 mm and a minimum depth of 30 mm from the unexposed side of the wall. The proposed FRL is -/240/180.
- the fire resistance performance of vertical control joints filled with Trafalgar FyreFLEX® sealant to a maximum width of 30 mm and a minimum depth of 30 mm from the exposed side

of the wall. The unexposed side is protected with 5 mm deep non fire-rated polyurethane sealant. The proposed FRL is - /240/240.

- the fire resistance performance of vertical control joints filled with Trafalgar FyreFLEX® sealant to a maximum width of 20 mm and a minimum depth of 30 mm from both the exposed and unexposed sides of the wall. The proposed FRL is -/240/240.

Discussion

In test NI2588, a 1100 mm wide × 1160 mm high × 140 mm thick masonry wall was tested. The concrete block wall contained two vertical joints and only vertical control joint B is relevant to this assessment. Vertical control joint B was 20 mm wide × 1000 mm long protected with Fyrejoint sealant on the unexposed side of the wall to a depth of 30 mm. A Ø20mm polyethylene backing rod was installed at the back of the sealant. It is confirmed by the report sponsor that Fyrejoint is identical to Trafalgar FyreFLEX® sealant. The vertical control joint maintained integrity performance for the 246-minute duration of the test while insulation failed at 198 minutes with the thermocouple 25 mm away from the joint and 300 mm from the top of the wall measuring a temperature rise of 180 ºC.

Based on the above, the proposed vertical control joint with a maximum width of 20 mm and minimum depth of 30 mm on the unexposed side backed by minimum Ø20 mm polyethylene backing rods in minimum 140 mm thick solid concrete block walls is expected to maintain integrity for up to 240 minutes and insulation for up to 180 minutes – in accordance with AS 1530.4:2014.

In test NI2088, a 1160 mm high × 1110 mm wide × 140 mm thick masonry wall was tested. The concrete block wall contained two vertical joints. Vertical control joint A was 30 mm wide × 1000 mm long protected with Fyrejoint sealant on the unexposed side of the wall to a depth of 30 mm. Vertical control joint B was 20 mm wide × 1000 mm long protected with Fyrejoint sealant on the unexposed side of the wall to a depth of 30 mm. The unexposed sides of both vertical joints were protected with 5 mm deep non fire-rated polyurethane sealant and Ø40 mm polyethylene backing rods were installed at the back of the sealant on both sides in both control joints. It is confirmed by the report sponsor that Fyrejoint is identical to Trafalgar FyreFLEX® sealant. Both vertical control joints achieved -/240/240 with no failure at test termination.

Therefore, the proposed vertical control joint with a maximum width of 30 mm and minimum depth of 30 mm on the exposed side and 30 mm wide × 5 mm deep non fire-rated sealant on the unexposed side in minimum 140 mm thick solid concrete block walls (backed by minimum Ø20 mm polyethylene backing rods on both sides) is expected to maintain integrity and insulation for up to 240 minutes – in accordance with AS 1530.4:2014.

In NI1688, a 1930 mm wide × 2985 mm high × 140 mm thick masonry wall constructed in two halves was tested – one half with hollow concrete blocks and the other half with solid concrete blocks. Two vertical control joints were tested in each half of the wall. The gaps were sealed with Fyrejoint fire stopping sealant which was applied to both faces of the wall over polyethylene backing strips. Fyrejoint is confirmed to be identical to Trafalgar FyreFLEX® sealant by the report sponsor. Joints 3 and 4 are relevant to this assessment and were installed in the solid concrete block half of the wall. Joint 3 was 20 mm wide × 2800 mm long protected with Fyrejoint sealant on both sides of the wall to a depth of 20 mm. A Ø25 mm polyethylene backing rod was applied in the system. The joint maintained integrity and insulation performance for 240 minutes. Joint 4 was 35 mm wide × 2800 mm long protected with Fyrejoint sealant on both sides of the wall to a depth of 25 mm. A Ø40 mm polyethylene backing rod was applied in the system. The joint maintained integrity and insulation performance for 240 minutes.

It is expected that decreasing the width of the control joint or increasing the depth of the sealant will present a less onerous system. Therefore, the proposed vertical control joint with a maximum width of 20 mm (as tested in joint 3) and minimum depth of 30 mm (which is greater than that tested in joints 3 and 4) on both sides backed by minimum Ø20 mm polyethylene backing rods on both sides in minimum 140 mm thick solid concrete block walls is expected to maintain integrity and insulation for up to 240 minutes – in accordance with AS 1530.4:2014.

This fire performance can also be extended to concrete walls with a density within ±15% of the tested specimen, which is 1750 kg/m^3. The masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively, or the separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than -/240/240.

6.5 Control joints between perpendicular wall systems

6.5.1 Proposed configuration

It is proposed to assess vertical control joints at the junction between two perpendicular wall systems based on the vertical control joints tested in NI1688, NI2088, NI2188, NI2588, NI1189 and NI0790 and assessed in section 6.4.

6.5.2 Plasterboard walls to plasterboard walls

When considering the junction between plasterboard walls, the possible combinations are:

- 2 × 13 mm or 2 × 16 mm plasterboard wall with 2 × 13 mm or 2 × 16 mm plasterboard wall
- 2 × 13 mm or 2 × 16 mm plasterboard wall with 1 × 16 mm plasterboard wall
- 1 × 16 mm plasterboard wall with 1 × 16 mm plasterboard wall
- 2 × 13 mm or 2 × 16 mm plasterboard wall with minimum 95 mm thick shaftwall
- 1 × 16 mm plasterboard wall with minimum 95 mm thick shaftwall
- Minimum 95 mm thick shaftwall with minimum 95 mm thick shaftwall

For all above-mentioned combinations, the FRL of the system will be limited by either the assessed FRL of the control joint at the interface or by the wall system with the lower established FRL. The FRL of the control joint can be determined based on the assessed systems in framed walls, as discussed in section 6.4. Accordingly, for all control joints at the perpendicular junction of the walls, the maximum width must be 20 mm and the sealant must be applied to the full depth of the plasterboard layers on both sides.

6.5.3 Rigid walls to rigid walls

When considering the junction between rigid walls, the possible combination is minimum 90 mm thick masonry / concrete walls with minimum 90 mm thick masonry / concrete walls. This also includes the 140 mm thick masonry / concrete walls assessed. The FRL of the system will be limited by either the assessed FRL of the control joint at the interface or by the wall system with the lower established FRL. The FRL of the control joint can be determined based on the assessed systems in rigid walls, as discussed in section 6.4.

6.5.4 Plasterboard walls to rigid walls

When considering the junction between rigid walls and plasterboard walls, the possible combinations are:

- 2 × 13 mm or 2 × 16 mm plasterboard wall with minimum 90 mm thick masonry / concrete walls
- 1 × 16 mm plasterboard wall with minimum 90 mm thick masonry / concrete walls
- Minimum 95 mm thick shaftwall with minimum 90 mm thick masonry / concrete walls

At the junction between rigid walls and plasterboard walls, it is considered that the plasterboard wall system will be the more onerous case in comparison to the masonry or concrete wall. As such, the plasterboard wall is deemed to be the limiting factor for the assessment of the control joints, and the corresponding plasterboard FRLs are considered for assessment.

6.6 Horizontal joints in between concrete slabs

Proposed configuration

It is proposed to assess the fire resistance performance of horizontal control joints in minimum 175 mm thick concrete floor slabs – filled with Trafalgar FyreFLEX® sealant to a maximum width of 40 mm and a minimum depth of 40 mm from the unexposed (top) side. The proposed FRL is -/240/120 for exposure from the underside of the floor.

Discussion

In test FRT190292 R4.0, a 3500 mm wide × 4500 mm long × 175 mm thick concrete floor slab was tested. The concrete floor slab contained a control joint, service D, relevant for this assessment. Service D was a 40 mm wide × 1000 mm long control joint protected with Trafalgar FyreFLEX® sealant on the unexposed (top) side to a depth of 40 mm. The sealant was backed with a Ø22mm open cell backing rod. Service D maintained integrity performance for the 241 minute test duration. Insulation failure occurred at 158 minutes when the thermocouple on the separating element 25 mm south and 125 mm east of the control joint exceeded a maximum temperature rise of 180 ºC.

Based on the above discussion, the proposed horizontal control joint with a maximum width of 40 mm and minimum depth of 40 mm on the unexposed side (top) backed by minimum Ø22 mm backing rods in minimum 175 mm thick concrete floor slabs is expected to maintain integrity up to 240 minutes and insulation performance for up to 120 minutes – in accordance with AS 1530.4:2014. This FRL is limited to fire exposure from the underside of the slab only. The backing rod can be polyethylene as tested in rigid wall systems in tests including NI2088 and NI2588, which showed that polyethylene backing rods do not introduce a detrimental weakness to the systems.

A variation to the test method was identified in test report FRT190292 R4.0 that, due to the proximity of certain services in grouped penetration systems, efforts to control the integrity failure of a service in that penetration system might have affected the temperature recordings of the other services around it in that system after the integrity failure period. As such, data for the adjacent services after this period should be considered with caution. However, this is not expected to affect the assessed performance of control joint D, as there is a significant safety margin between insulation failure and the assessed insulation performance.

Concrete slabs must be designed by a professional engineer in accordance with AS 3600:2018 or must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than -/240/120.

6.7 Applicability to rigid walls based on performance in framed walls

Proposed configuration

It is proposed to extend the fire resistance performance of control joints assessed for framed wall systems in sections 6.3 to 6.5 to rigid masonry or concrete walls.

Discussion

In accordance with clause 10.12.2 (c) of AS 1530.4:2014, results obtained from framed wall systems can be applied to the performance of that system in concrete or masonry walls of greater or equal thickness to the tested framed wall. Therefore, the assessed FRLs for framed wall systems such as the shaftliner wall system, 2 × 13 mm plasterboard wall system, 2 × 16 mm plasterboard wall system or the 1 × 16 mm plasterboard wall system can be extended to rigid walls made of concrete or masonry blocks with equivalent or greater wall thickness. The sealant must be backed by a polyethylene backing rod.

The masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively, or the separating element must be tested or assessed in accordance with AS 1530.4:2014 by an ATL to achieve an established FRL equivalent to or greater than that assessed for the control joints.

6.8 Assessment outcome

The assessment conducted in section 6 of this report demonstrates that the proposed control joints in various separating elements are capable of achieving the FRLs presented in Table 8 in accordance with AS 1530.4:2014.

Table 8 Assessment outcome

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
Head of wall joints	2 × 13 mm or 2 × 16 mm plasterboard walls (minimum 116 mm thick)	Maximum 30 mm wide	16 mm from both sides	Backed by ceiling track	-/120/120
	1 × 16 mm plasterboard walls (minimum 96 mm thick)	Maximum 30 mm wide	16 mm from both sides	Backed by ceiling track	-/90/90
	Masonry or concrete walls (minimum 140 mm thick)	Maximum 50 mm wide	20 mm from both sides	Polyethylene backing rod	-/180/180
Vertical control joints in walls	2 × 16 mm plasterboard on C-H stud with 25 mm shaftliner on the other side (minimum 95 mm thick)	Maximum 20 mm wide	16 mm from both sides	Backing optional	-/120/90
	2 × 13 mm or 2 × 16 mm plasterboard walls (minimum 116 mm thick)	Maximum 20 mm wide	Full depth both sides	Backing optional	-/120/120
	1 × 16 mm plasterboard walls (minimum 96 mm thick)	Maximum 20 mm wide	16 mm from both sides	Backing optional	-/90/90
	Solid masonry or concrete walls (minimum 90 mm thick)	Maximum 30 mm wide	12 mm from both sides	Polyethylene backing rod	-/120/120
			25 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side	Polyethylene backing rod	-/120/120 one-way FRL
	Solid masonry or concrete walls (minimum 140 mm thick)	Maximum 20 mm wide	30 mm from the unexposed side	Polyethylene backing rod	-/240/180 one-way FRL
		Maximum 30 mm wide	30 mm from the exposed side		-/240/240 one-way FRL

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
			5 mm non fire-rated sealant on the unexposed side		
		Maximum 20 mm wide	30 mm from both sides		-/240/240
Control joints between perpendicular wall systems	**Plasterboard to plasterboard walls**				
	2 × 13 mm or 2 × 16 mm plasterboard wall to 2 × 13 mm or 2 × 16 mm plasterboard wall	Maximum 20 mm wide	Full depth both sides	Backing optional	-/120/120
	2 × 13 mm or 2 × 16 mm plasterboard wall to 1 × 16 mm plasterboard wall				-/90/90
	2 × 13 mm or 2 × 16 mm plasterboard wall to Minimum 95 mm thick shaftwall				-/120/90
	1 × 16 mm plasterboard wall to 1 × 16 mm plasterboard wall				-/90/90
	1 × 16 mm plasterboard wall to Minimum 95 mm thick shaftwall				-/90/90
	Minimum 95 mm thick shaftwall to Minimum 95 mm thick shaftwall	Maximum 20 mm wide	16 mm from both sides		-/120/90
	Rigid to Rigid walls				
	Concrete / solid masonry to concrete / solid masonry walls (minimum 90 mm thick)	Maximum 30 mm	12 mm from both sides	Polyethylene backing rod	-/120/120
			25 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side		-/120/120 one-way FRL

Application	Separating element	Joint width	Joint depth	Sealant backing	FRL
	Concrete / solid masonry to concrete / solid masonry walls (minimum 140 mm thick)	Maximum 20 mm	30 mm from both sides		-/240/240
		Maximum 30 mm wide	30 mm from the exposed side 5 mm non fire-rated sealant on the unexposed side		-/240/240 one-way FRL
		Maximum 20 mm wide	30 mm from both sides		-/240/240
	Plasterboard to rigid walls				
	Minimum 90 mm thick masonry / concrete wall to 2 × 13 mm or 2 × 16 mm plasterboard walls	Maximum 20 mm wide	Full depth both sides	Polyethylene backing rod	-/120/120
	Minimum 90 mm thick masonry / concrete wall to 1 × 16 mm plasterboard walls				-/90/90
	Minimum 90 mm thick masonry / concrete wall to Minimum 95 mm thick shaftwall	Maximum 20 mm wide	16 mm from both sides		-/120/90
Horizontal control joints in between concrete slabs	Concrete floor slabs (minimum 175 mm thick)	Maximum 40 mm wide	40 mm from unexposed (top) side	Polyethylene backing rod	-/240/120 one-way FRL

Notes:

- All control joints must be installed with the relevant sealant backing as included in the discussions in section 6 of this report.
- All wall systems must have an established FRL obtained through testing or assessment by an ATL that is equal to or greater than the assessed FRLs for the control joints.
- The minimum stud depth must be 64 mm for plasterboard walls.
- FRLs assessed for control joints in framed wall systems can be extended to rigid walls of greater or equal thickness to the tested/assessed framed wall. In rigid walls, the sealant must be backed by a polyethylene backing rod.
- Masonry or concrete walls must be designed by a professional engineer in accordance with AS 3700:2018 or AS 3600:2018, respectively. Concrete floor slabs must be designed by a professional engineer in accordance with AS 3600:2018.

7. Validity

Warringtonfire Australia 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 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, based on the evidence referred to in this report.

This assessment is provided to Trafalgar Group 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 – NI1688

Table 9 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 7 September 1988.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 140 mm thick concrete wall 1930 mm wide × 2985 mm high constructed in two halves; one half was made of hollow concrete blocks for a 2-hour rating and the other half was made with solid concrete blocks for a 4-hour rating. The density was approximated to 1750 kg/m^3. Two vertical control joints were tested in each half of the wall. The control joints were sealed with Fyrejoint fire stopping sealant which was applied to both faces of the wall over polyethylene backing strips. Fyrejoint is confirmed to be identical to Trafalgar FyreFLEX® sealant by the report sponsor. Control joints in hollow concrete block wall were: • Joint 1: 20 mm wide × 10 mm deep × 2800 mm long (with Ø25 mm backing rod) • Joint 2: 20 mm wide × 15 mm deep × 2800 mm long (with Ø25 mm backing rod) Control joints in solid concrete block wall were: • Joint 3: 20 mm wide × 20 mm deep × 2800 mm long (with Ø25 mm backing rod) • Joint 4: 35 mm wide × 25 mm deep × 2800 mm long (with Ø40 mm backing rod) Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20: 1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

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

Table 10 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
Joint 1	–	120 minutes*	120 minutes*	Integrity maintained for 240 minutes, insulation failed at 209 minutes with the thermocouple placed 25 mm away from the joint measuring a temperature rise of 180ºC
Joint 2	–	120 minutes*	120 minutes*	Integrity maintained for 240 minutes, insulation failed at 223 minutes.
Joint 3	–	240 minutes	240 minutes	Integrity and insulation maintained for 240 minutes.
Joint 4	–	240 minutes	240 minutes	Integrity and insulation maintained for 240 minutes.
*The performance limited by the fire-rating of the wall				

A.2 Test report – NI2088

Table 11 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 26 September 1988.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 1160 mm high × 1110 mm wide × 140 mm thick solid concrete block wall with two vertical joints tested in a furnace with a clear opening of 1 m × 1 m. • Vertical joint A was 1 m long and was filled with Fyrejoint to a width and depth of 30 mm on the exposed side. On the unexposed side, the control joint was filled with non fire-rated polyurethane sealant to a width of 30 mm and a depth of 5 mm. The sealants on both sides were backed with a Ø40 mm backing rod. • Vertical joint B was 1 m long and was filled with Fyrejoint to a width of 20 mm and depth of 30 mm on the exposed side. On the unexposed side, the control joint was filled with non fire-rated polyurethane sealant to a width of 20 mm and a depth of 5 mm. The sealants on both sides were backed with a Ø25 mm backing rod. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

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

Table 12 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation
Joint A	-	240 minutes (test terminated)	240 minutes (test terminated)
Joint B	-	240 minutes (test terminated)	240 minutes (test terminated)

A.3 Test report – NI2388

Table 13 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 13 October 1988.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a block wall 2970 mm high × 1930 mm wide × 140 mm thick. The upper half of the hollow concrete block wall with two horizontal control joints (Fyrejoint systems) are relevant to this assessment. Fyrejoint is confirmed to be identical to Trafalgar FyreFLEX® sealant by the report sponsor. • Joint A was 50 mm wide × 20 mm deep × 1800 mm applied on both exposed and unexposed sides. • Joint B was 20 mm wide × 10 mm deep × 1200 mm applied on both exposed and unexposed sides. The joints were backed with Ø50 mm polyethylene backing rods. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

The test specimen achieved the following results – see Table 14.

Table 14 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation
Joint A	–	120 minutes*	120 minutes*
Joint B	–	120 minutes*	120 minutes*
*The performance limited by the fire-rating of the wall. The integrity and insulation performances were maintained for the test duration of 182 minutes.			

A.4 Test report – NI2588

Table 15 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 17 October 1988.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 1110 mm wide × 1160 mm high × 140 mm thick masonry wall with two vertical control joints. • Joint A was 10 mm wide × 15 mm deep × 1000 mm long with Fyrejoint sealant on the unexposed side. The sealant was backed with a backing rod (not relevant to this assessment). • Joint B was 20 mm wide × 30 mm deep × 1000 mm long with Fyrejoint sealant on the unexposed side. The sealant was backed with a backing rod. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

The test specimen achieved the following results – see Table 16.

Table 16 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
Joint A	–	240 minutes	240 minutes	Specimen maintained both integrity and insulation performance for the duration on the test
Joint B	–	240 minutes	180 minutes	Specimen maintained integrity performance for the duration of the test, insulation failed at 198 minutes with the thermocouple placed 25 mm away from the joint and 300 mm from the top of the wall measuring a temperature rise of 180 ºC

A.5 Test report – NI2188

Table 17 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 30 October 1988.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 1000 mm × 1000 mm × 90 mm thick concrete block wall with two 1 m long vertical joints protected with Fyrejoint. Fyrejoint is confirmed to be identical to Trafalgar FyreFLEX® sealant by the report sponsor. • Vertical joint A was 30 mm wide protected to a depth of 12 mm on both the exposed and unexposed side with Fyrejoint. • Vertical joint B was 30 mm wide protected to a depth of 25 mm on the exposed side. The unexposed side was protected to a depth of 5 mm with polyurethane sealant. Both sealants were backed with Ø40 mm polyethylene backing rods. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

The test specimen achieved the following results – see Table 18.

Table 18 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
Joint A	–	120 minutes	120 minutes	The integrity performance was maintained for 153 minutes (test duration) and insulation was maintained for 150 minutes with the thermocouple placed on the sealant itself measuring a temperature rise of 180 ºC
Joint B	–	120 minutes	120 minutes	The integrity and insulation performance were maintained for 153 minutes (test duration)

A.6 Test report – NI1189

Table 19 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 15 March 1989.
Test standards	The test was done in accordance with AS 1530.4:1985.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 128 mm thick plasterboard partition with 2 × 16 mm thick fire-rated plasterboard on both sides of a 64 mm deep steel stud. • The specimen contained a deflection head 30 mm wide × 16 mm deep × 1930 mm long with Trafalgar FyreFLEX® sealant. • The specimen contained a vertical control joint 20 mm wide × 16 mm deep × 2540 mm long with Trafalgar FyreFLEX® sealant. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1985.

The test specimen achieved the following results – see Table 20.

Table 20 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
Deflection head	–	120 minutes	120 minutes	No failure under criteria of integrity or insulation had occurred when the test was terminated after 120 minutes
Vertical control joint	–	120 minutes	120 minutes	No failure under criteria of integrity or insulation had occurred when the test was terminated after 120 minutes

A.7 Test report – NI0790

Table 21 Information about test report

Item	Information about test report
Report sponsor	Wormald International
Test laboratory	Fire Research Laboratories, 59 Normanby Road, Notting Hill, Victoria 3168, Australia.
Test date	The fire resistance test was done on 18 April 1990.
Test standards	The test was done in accordance with AS 1530.4:1990.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a 95 mm thick 2-hour fire-rated shaft wall with two layers of 16 mm thick fire-rated plasterboard (exposed face) and one layer of 25 mm thick shaftliner (unexposed face). The framing was made of 64 mm deep C-H studs. The wall consisted of penetrations as well as a deflection head detail and a vertical control joint. The vertical control joint was 22 mm wide × 16 mm deep × 2540 mm long filled on both exposed and unexposed sides. No backing rods were used with the sealant. Additionally, the cotton wool pad integrity test procedures specified in BS 476: Part 20:1987 were followed in this test.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1990.

The test specimen achieved the following results – see Table 22.

Table 22 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
Vertical control joint	–	120 minutes	90 minutes	The integrity performance was maintained for 127 minutes (test duration) and insulation was maintained for 105 minutes with the thermocouple placed on the channel section 25 mm right of the joint and 225 mm down from the head of the wall measuring a temperature rise of 180 ºC.

A.8 Test report – FRT190292 R4.0

Table 23 Information about test report

Item	Information about test report
Report sponsor	Trafalgar Fire
Test laboratory	Warringtonfire Australia, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was done on 16 January 2020.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	Due to the proximity of certain services in grouped penetration systems, efforts to control the integrity failure of a service in that penetration system might have affected the temperature recordings of the other services around it in that system after the integrity failure period. As such, data for the adjacent services after this period should be considered with caution.
General description of tested specimen	The test specimen consisted of a 3500 mm wide × 4500 long × 175 mm thick concrete floor slab. Service D was a 40 mm wide × 40 mm deep × 1000 mm long control joint filled with Trafalgar FyreFLEX® sealant on the unexposed side. The sealant was backed with a Ø22 mm open cell backing rod.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 24.

Table 24 Results summary for this test report

Specimen	Structural adequacy	Integrity	Insulation	Observations
D	–	240 minutes	120 minutes	The integrity performance was maintained for 241 minutes (test duration) and insulation was maintained for 158 minutes with the thermocouple placed on the separating element 25 mm south of the control joint and 125 mm east of the centre of the control joint measured a temperature rise of 180 ºC.

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