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Fire assessment report

HB Fuller FireSound Acrylic sealant protecting control joints

Sponsor: HB Fuller Australia Company Pty Ltd

Report number: 28122 Revision: R4.0 Reference number: FAS200102

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Quality management

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			Prepared by	**Reviewed by**	**Authorised by**
		Name	S. Hu	K.G Nicholls	–
01	Issue: 27/03/2013	Reason for issue	Typographical amendments in Appendix A		
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		Name	S. Hu	K.G Nicholls	–
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		Name	K.G Nicholls	D. Nicholson	–
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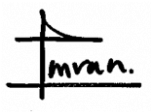
			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 30/11/2025	**Name**	Alim Rasel	Omar Saad	Imran Ahamed
		Signature			

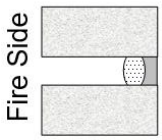
Executive summary

This report documents the findings of the assessment undertaken to determine the likely fire resistance level (FRL) of control joints if sealed with HB Fullers FireSound Acrylic sealant and tested in accordance with AS 1530.4:2014, and assessed in compliance with AS 4072.1:2005.

Firesound is described as a flexible water-based construction sealant formulated to perform as a barrier to the passage of fire through construction joints such as concrete walls.

The analysis in section 5 of this report found that the proposed variations are likely to achieve the following FRLs as shown in Table 1, if tested in accordance with AS 1530.4:2014 and assessed in compliance with AS 4072.1:2005.

Table 1 Variations and assessment outcome

Separating element	Sealant	Maximum joint width	Minimum sealant depth	Backing rod depth	Seal position	FRL**
Minimum 140 mm hollow core concrete*	HB Fuller FireSound Acrylic sealant	30 mm	15 mm	20 mm		-/180/60
		10 mm	10 mm	–		-/180/120
* The separating element must be designed such a way that a minimum effective thickness of 120 mm is maintained as per AS 3600:2018. ** The listed FRL is applicable to control joints with fire exposure from the side as illustrated under seal position column.						

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 6 of this report. The results of this report are valid until 30 November 2025.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the likely fire resistance level (FRL) of control joints if sealed with HB Fullers FireSound Acrylic sealant and tested in accordance with AS 1530.4:2014[1], and assessed in compliance with AS 4072.1:2005[2].

This assessment was carried out at the request of HB Fuller Australia Company Pty Ltd. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
H.B Fuller Australia Company Pty Ltd	H.B Fuller Australia Company Pty Ltd 16-20 Red Gum Drive Dandenong South VIC 3175

2. Framework for the assessment

2.1 Assessment approach

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

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2019[3].

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

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

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

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

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

[1]Standards Australia 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[2] Standards Australia 2005, Components for the protection of openings in fire-resistant separating elements Service penetrations and control joints, AS 4072.1:2005, Standards Australia, NSW.
[3] Passive Fire Protection Forum (PFPF) 2019, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the National Construction Code Volumes One and Two – Building Code of Australia (NCC) 2019 Amendment 1[4] under A.5.2.(1) (d) and 2016 under specification A2.3, including amendments.

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

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 15 April 2020, HB Fuller Australia Company Pty Ltd confirmed that:

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

3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results that are expected if the systems were tested in accordance with AS 1530.4:2014.
- The results of this assessment are applicable to control joints with fire exposure from one side. The applicable direction of fire exposure is illustrated in Table 1
- This report is only valid for the assessed systems and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL).
- The documentation that forms the basis for this report is listed in Appendix A.
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and the expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

[4] National Construction Code Volume One – Building Code of Australia 2019 Amendment 1, Australian Building Codes Board, Australia.
[5] European Committee for Standardization, EN 15725:2010: Extended application reports on the fire performance of construction products and building elements, European Committee for Standardization, Brussels, Belgium.

4. Description of the specimen and variations

4.1 System description

The proposed system consists of two control joints in a 140 mm thick hollow core concrete wall. The proposed joints are 30 mm and 10 mm wide and are sealed with HB Fullers FireSound Acrylic sealant.

4.2 Referenced test data

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

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
WFRA 41003	HB Fuller Australia Company Pty Ltd	15 August 2003	Warringtonfire Australia

4.3 Variations to the tested system

An identical system has not been subjected to a standard fire test. We have therefore assessed the system using baseline test information for similar systems. The variations to the tested systems – together with the referenced standard fire tests – are described in Table 4.

Table 4 Variation to tested systems

Item number	Reference test	Description	Variations
Sealant depth	WFRA 41003	In the tested system the 10 mm wide control joint was sealed with FB Fuller FireSound Acrylic sealant up to 5 mm depth.	It is proposed that the sealant depth will be increased up to 10 mm.

4.4 Purpose of the test

AS 1530.4:2014 sets out the procedure for a fire resistance test of element of construction.

AS 4072.1:2005 sets out minimum requirements for construction, installation and application of fire resistance tests to sealing systems.

5. Assessment – Increase in control joint depth

5.1 Description of variation

In test WFRA 41003.1, two 30 mm and 10 mm wide control joints were tested within a in a 140 mm thick concrete wall. The joints were protected with HB Fuller FireSound Acrylic sealant. This test was conducted in accordance with AS 1530.4:1997[6]. It is proposed that, the applicability of test data obtained in WFRA 41003.1 is assessed in accordance with AS 1530.4:2014. In addition, it is proposed that the sealant depth of the 10 mm wide joint is increased to 10 mm.

5.2 Methodology

The method of assessment used is summarised in Table 5.

Table 5 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative – interpolation/Comparative

[6]Standards Australia 1997, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:1997, Standards Australia, NSW.

5.3 Assessment

In test WFRA 41003.1, two control joints within a 140 mm concrete separating element was tested in accordance with AS 1530.4:1997. The joints were recorded to be 30 mm and 10 mm wide and were sealed with FireSound Acrylic sealant on the unexposed side. The construction details and respective fire resistance performance observed in test WFRA 41003.1 are tabulated in Table 6.

Table 6 Control joints tested in WFRA 41003.1

Separating element	Specimen	Description	Integrity	Insulation
140 mm hollow core concrete wall	G	30 mm wide control joint sealed on non-exposed side with HB Fuller FireSound Acrylic sealant. Sealing: 30 mm wide × 15 mm deep with a urethane foam backing rod nominal 30 mm × 20 mm positioned directly behind the sealant prior to applying the sealant.	No failure at 181 minutes	75 minutes on sealant 92 minutes on blocks.
	H	Control joint sealed on non-exposed side with FireSound Acrylic sealant. Sealing: 10 mm wide × 5 mm deep.	No failure at 181 minutes	148 minutes on sealant 141 minutes on blocks

From the test data, it was observed that both control joints achieved 180 minutes of integrity performance. Specimen G failed insulation at 75 minutes while specimen H maintained insulation up to at 148 minutes. As previously mentioned, these performances where achieved when tested in accordance with AS 1530.4:1997. Part of the scope of this assessment is to reassess the obtained test data in WFRA 41003.1 in accordance with AS 1530.4:2014. The applicability of the test data acquired in WFRA 41003.1 in accordance with AS 1530.4:2014 is discussed in detail in Appendix B. After analysis it is concluded that, if specimen G and H were tested in accordance with AS 1530.4:2014 instead, the observed fire resistance performance will be retained.

It is further proposed that, the sealant depth of specimen H will be further increased from 5 mm to 10 mm. The proposed increase in sealant depth will increase the surface to mass ratio of the sealant. This is expected to provide additional thermal barrier which in turn should restrict the temperature rise on the unexposed side. As such, the proposed variation in sealant depth is estimated to improve the overall integrity performance of the system. This assessment can be further validated by the stipulation of AS 1530.4:2014 clause 10.12.6 (a)(i) were it stipulates that “results obtained from a single test on a butt joint may be applied to contoured joints provided the joints have equal width and equal or greater depth of sealant and equal or greater depth of fire separating element”.

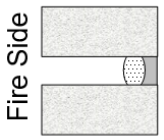
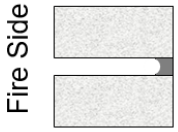
As per AS 3600:2018[7] the effective thickness of the concrete separating element must be at least 120mm for 120 minutes of insulation performance. For a hollow-core slab, the effective thickness is calculated as the net cross-sectional area divided by the width of the cross-section. As such, the hollow core separating element must be designed such a way that a minimum effective thickness of 120 mm is maintained.

5.4 Conclusion

Based on the above discussion, it can be concluded that the control joints listed in Table 7 will likely achieve the FRLs if tested in accordance with AS 1530.4:2014 and assessed in compliance with AS 4072.1:2005.

[7]Standards Australia 2018, Concrete structures, Standards Australia, NSW.

Table 7 Conclusion of assessment

Separating element	Sealant	Maximum joint width	Minimum sealant depth	Backing rod depth	Seal position	FRL**
Minimum 140 mm hollow core concrete wall*	HB Fuller FireSound Acrylic sealant	30 mm	15 mm	20 mm		-/180/60
		10 mm	10 mm	–		-/180/120
*the separating element must be designed such a way that a minimum effective thickness of 120 mm is maintained as per the stipulation of AS 3600:2018. ** The listed FRL is applicable to control joints with fire exposure from the side as illustrated under seal position column.						

6. Validity

Warringtonfire Australia does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard 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 information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance likely to be demonstrated on a test in accordance with AS 1530.4:2014 and assessed in accordance with AS 4072.1:2005, based on the evidence referred to in this report.

This assessment is provided to HB Fuller Australia Company Pty Ltd for their own purposes and we cannot express an opinion on whether it will be accepted by building certifiers or any other third parties for any purpose.

Appendix A Summary of supporting test data

A.1 Test report – WFRA 41003

Table 8 Information about test report

Item	Information about test report
Report sponsor	HB Fuller Australia Company Pty Ltd
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 15 August 2003.
Test standards	The test was done in accordance with AS 1530.4:1997.
Variation to test standards	None
General description of tested specimen	The specimen comprised of a 140 mm hollow core concrete wall incorporating two control joints protected with HB Fuller FireSound Acrylic sealant and various other services. The control joints of interest in this report were designated as Joint G and H. Joint G was 30 mm wide and sealed with HB Fuller FireSound Acrylic Sealant up to 15 mm depth. Joint H was recorded to be 10 mm wide and sealed with HB Fuller FireSound Acrylic sealant up to 5 mm depth.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:1997.

The test specimen achieved the following results – see Table 9.

Table 9 Results summary for this test report

Joint	Integrity, minutes	Insulation, minutes
G	181	75
H	181	141

Appendix B Relevance of AS 1530.4:1997 test data to AS 1530.4:2014

B.1 General

The fire resistance test WF 41003.1 was conducted in accordance with AS 1530.4:1997 which differs from AS 1530.4:2014.

The differences in test method considered capable of significantly altering specimen performance are discussed below,

Furnace Temperature Measurement

The specification for furnace thermocouples in AS1530.4:2014 and AS1530.4:1997 is not appreciably different.

Furnace Temperature Regime

AS1530.4:2014 specifies furnace temperature to follow the following trend:

$$T_{AS1530.4-2014} = 345\,log_{10}(8t + 1) + 20$$

AS1530.4:1997 specifies furnace temperature to follow the following trend:

$$T_{AS1530.4-1997} = 345\,log_{10}(8t + 1) + T_o \; 10^oC \leq T_o \leq 40^oC$$

The ambient temperature of test WF 41003.1 was 17°C.

The parameters outlining the accuracy of control of the furnace temperature in AS1530.4:2014 and AS 1530.4:1997 are not appreciably different.

Furnace Pressure Regime

AS 1530.4:2014 specifies that a pressure of 15 ± 3Pa shall be established at the centre of the lowest penetration service.

Test report WF 41003.1 confirms that the pressure condition adhered to that prescribed by AS 1530.4:2014.

Specimen Temperature Measurement

AS 1530.4:2014 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless-steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3 mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12 mm diameter x 0.2 mm thick copper disc. The disc shall be covered by 30 ± 0.5 mm × 30 ± 0.5 mm × 2.0 ± 0.5 mm thick inorganic insulating pad having a density of 900 ± 100 kg/m^3.

AS 1530.4:1997 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless-steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3 mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12 mm diameter × 0.2 mm thick copper disc. The disc shall be covered by an oven-dry pad, not less than 30 mm square, made from material having a value $\sqrt{(k\rho c)}$ not greater than 600 at 150°C, and of such thickness as will give a thermal resistance (R = t/K) of 0.015 K/W – 0.025 K/W at 150°C.

For control joints installed in vertical separating elements, AS 1530.4:2014 requires thermocouples to be located as follows:

- At least three on the surface of the seal, with one thermocouple for each 0.3 m^2 of surface area, up to a maximum of five, uniformly distributed over the area (one thermocouple being located at the centre of the seal).

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

Thermocouples used for the evaluation of the insulation performance of control joints shall be positioned on the unexposed face of the sealing system and the separating element, except where the unexposed face of the seal is recessed within the separating element. Where this occurs, thermocouples shall only be fitted to the seal when the joint width is greater than or equal to 12 mm. under these circumstances, the size of the pad may be reduced to facilitate the fitting of the thermocouple.

Specimen H and G in test WF 41003.1 were sealed on the non-fire side of the wall separating element and recessed with the wall surface and the thermocouples were positioned in such a manner that they meet the requirements of AS 1530.4:2014.

Based on the above discussion, it is considered the insulation performance of specimens G and H can be used to assess the performance in accordance with AS 1530.4:2014.

Integrity Performance Criteria

AS 1530.4:2014 deems integrity failure to have occurred upon collapse, sustained (10 seconds) flaming, ignition of an applied cotton pad or if a 6 mm gap gauge can protrude into the furnace and can be moved 150 mm along the gap (not applicable at the sill), or if a 25 mm gap gauge can protrude into the furnace.

AS 1530.4:1997 deems integrity failure to occur upon collapse, the development of cracks, fissures, or other openings through which flames, or hot gases can pass.

There were no observations made for the specimen relevant to this assessment in WF 41003.1 which are considered likely to have warranted the application of a cotton pad. Data collected from thermocouples located on the seals indicate that surface temperatures did not exceed 325ºC, it is considered that a surface at this temperature not hot enough to cause flaming of a cotton pad.

Insulation Performance Criteria

The insulation criteria specified in AS 1530.4:2014 and the same as those specified in AS 1530.4:1997.

B.2 Application of Test Data to AS1530.4-2014

The minor variations in furnace heating regimes and specimen thermocouple specification are not considered likely to significantly affect the behaviour of the specimens relevant to this assessment.

In light of the above, it is considered that the integrity and insulation behaviour of the specimen G and H tested in WF 41003.1 can be used to assess the likely performance if the specimen was tested in accordance with AS 1530.4:2014.

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