

FIRE ASSESSMENT REPORT

FC21382-01-1

FIRE RESISTANCE OF HB FULLER FULACAULK FR SEALANT AS CONTROL JOINTS IN FIRE RATED CONCRETE AND MASONRY WALLS IN ACCORDANCE WITH AS 1530.4:2014

CLIENT

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ASSESSMENT OBJECTIVE

To assess the fire resistance of HB Fuller Fulacaulk FR Sealant fire rated control joints in accordance with AS 1530.4:2014 and with reference to AS 4072.1-2005 (including Amendment No. 1) with reference to Section 4, when installed in fire rated concrete or masonry walls.

CONCLUSION

It is considered that the HB Fuller Fulacaulk FR sealant fire rated control joints would be expected to achieve the stated FRL if tested in accordance with AS 1530.4:2014 with reference to AS 4072.1-2005 (including Amendment No. 1) with reference to Section 4, as stated in the following table.

Summary of Fulacaulk FR Sealant Control Joints

Wall Thickness*	Sealant Backing	Sealant Installed From	Joint Width W (mm)	Sealant Depth D (mm)	FRL
Double Sided Control Joints – Installed From Both Faces					
120 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/120/120
			20	10	
			30	15	
			40	20	
150 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/180/180
			20	10	
			30	15	
			40	20	
175 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/240/240
			20	10	
			30	15	
			40	20	
Single Sided Control Joints – Installed From Either Face					
120 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/120/120
150 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/180/180
175 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/240/240
Single Sided Control Joints – Installed From The Fire Unexposed Face Only					
150 mm	Backing rod	Unexposed (Figure 3)	20	20	-/180/120
	Backing rod		30	30	-/180/120
175 mm	Backing rod		20	20	-/240/120
	Backing rod		30	30	-/240/120

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* Note Concrete walls to be built in accordance with the relevant concrete standard to achieve the FRL's.

In addition it is considered the control joints may be installed in solid or concrete filled fire rated masonry walls of the same minimum wall thickness as stated above. The masonry walls shall be built to comply with the relevant masonry standard as appropriate.

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this assessment if information becomes available which indicates the stated fire performance may not be achieved.

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TERMS AND CONDITIONS

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CONTENTS

TABLES

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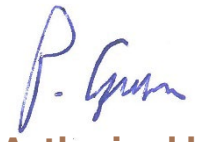

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1. INTRODUCTION

This report gives BRANZ's assessment on the fire resistance of HB Fuller Fulacaulk FR sealant control joints in fire rated concrete walls if tested in accordance with AS 1530.4:2014 with reference to AS 4072.1-2005 (including Amendment No. 1) with reference to Section 4.

2. BACKGROUND

In Warringtonfire Australia Pty Ltd fire resistance test FRT180011a.1 a number of control joints were tested in a nominal 120 mm thick concrete wall in accordance with AS 1530.4:2014. HB Fuller Fulacaulk FR sealant was applied to each face of the wall and backed by an open cell backing rod. See Table 1 for a summary of the tested control joints and results.

Table 1: Summary of Fire Resistance Test FRT180011a.1

Specimen	Control Joint Aperture	Sealant Backing	Sealant Installed From	Joint Width (mm)	Sealant Depth (mm)	FRL
A	10 mm x 1,000 mm	Backing rod	Exposed Unexposed	10	10	-/240/120
B	20 mm x 1,000 mm	Backing rod	Exposed Unexposed	20	10	-/240/120
C	30 mm x 1,000 mm	Backing rod	Exposed Unexposed	30	15	-/240/120
D	40 mm x 1,000 mm	Backing rod	Exposed Unexposed	40	20	-/240/120

In Warringtonfire Australia Pty Ltd fire resistance test FRT180400 a number of control joints were tested in a nominal 120 mm thick concrete wall in accordance with AS 1530.4:2014. HB Fuller Fulacaulk FR sealant was applied from either the exposed face or unexposed face and backed by an open cell backing rod. See Table 2 for a summary of the relevant tested control joints and results.

Table 2: Selected summary of Fire Resistance Test FRT180400

Specimen	Control Joint Aperture	Sealant Backing	Sealant Installed From	Joint Width (mm)	Sealant Depth (mm)	FRL
C	10 mm x 1,000 mm	Backing rod	Exposed	10	10	-/240/120
F	10 mm x 1,000 mm	Backing rod	Unexposed	10	10	-/240/120

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3. DISCUSSION

3.1 Compliance with NCC 2022

This report has been prepared to meet the NCC 2022 deemed-to-satisfy (DTS) provision Specification 1 which states:

***"S1C2 Rating** [2019: Sch. 5: 2]*

A building element meets the requirements of this Specification if—

(b) it is identical with a prototype that has been submitted to the Standard Fire Test, or an equivalent or more severe test, and the FRL achieved by the prototype without the assistance of an active fire suppression system is confirmed in a report from an Accredited Testing Laboratory which—

(i) describes the method and conditions of the test and the form of construction of the tested prototype in full; and

(ii) certifies that the application of restraint to the prototype complied with the Standard Fire Test; or

(c) it differs in only a minor degree from a prototype tested under (b) and the FRL attributed to the building element is confirmed in a report from an Accredited Testing Laboratory which—

(i) certifies that the building element is capable of achieving the FRL despite the minor departures from the tested prototype; and

(ii) describes the materials, construction and conditions of restraint which are necessary to achieve the FRL; "

For the purposes of assessing the proposed systems in this report they are confirmed as meeting NCC 2022 S1C2 (b) and/or NCC 2022 S1C2 (c) as appropriate.

This assessment report may be used to demonstrate compliance with the requirements for evidence of suitability under NCC A5G3 (1) d.

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3.2 HB Fuller Fulacaulk FR Sealant Control Joints

3.2.1 General

HB Fuller has commissioned a number of fire resistance tests on control joints in fire rated concrete walls. The configurations tested and considered in this report are where the sealant is applied from both sides of the wall or one side only. In both cases the Fulacaulk FR sealant is backed by a polyethylene open cell backing rod sized to suit the gap width.

3.2.2 Fulacaulk FR to both faces of the wall

In Warringtonfire Australia Pty Ltd fire resistance test FRT180011a.1 the Fulacaulk FR was installed from both faces of a nominal 120 mm thick concrete wall. The test specimens maintained the Integrity criteria for the 241 minute duration of the test. The concrete wall was nominally 120 mm thick which is deemed to achieve 120 minutes fire resistance performance. In each case the control joints failed Insulation criteria on the perimeter concrete followed by on the seal where this was required to be measured in accordance with the test standard.

It is proposed to install the tested control joints into thicker fire rated walls as follows:

- 150 mm thick FRL 180/180/180
- 175 mm thick FRL 240/240/240

It is expected that the concrete walls will comply with the appropriate standard which defines the FRL of the wall and may have additional requirements and increased wall thickness to the minimum given above.

3.2.2.1 Integrity Performance

In all cases the tested control joints maintained the Integrity criteria for the 241 minute duration for the test in a nominal 120 mm thick concrete wall with an FRL of 120/120/120. It is considered that increasing the thickness of the wall will not reduce the Integrity performance of the control joint and would therefore be expected to maintain the Integrity performance of the fire rated wall.

3.2.2.2 Insulation Performance

In all cases the tested control joints maintained the Insulation performance of the wall for at least 120 minutes which is expected for a wall nominally 120 mm thick. The time to Insulation failure on the concrete ranged from 148 to 160 minutes without a clear link to the joint width. The time to Insulation failure on the sealant (Specimen B, C & D) suggests that this is related to the thickness of the sealant rather than the joint width. As the Insulation performance increased with increasing sealant thickness (and joint width).

While the control joints maintained the Insulation criteria for the FRL of the wall they did however exceed the failure criteria. Therefore, it needs to be determined that if by increasing the thickness of the wall it will also increase the Insulation performance of the control joint such that it maintains the Insulation performance of the wall for 180 and 240 minutes.

In fire resistance test FRT180400 six single sided control joints were tested, three on the exposed face and three on the unexposed face of the 120 mm thick concrete wall. In reviewing the test data it is quite clear that when the control joint is positioned on the fire exposed face, the insulation performance of the concrete wall is maintained. However, the temperatures

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measured on the sealant exceeded the insulation failure criteria, whereas when the control joint is positioned on the unexposed face of the concrete wall the insulation performance of the wall is reduced, nevertheless the sealants maintain the insulation performance of the concrete wall for at least 120 minutes.

Based on this it is expected that where the double sided Fulacaulk FR control joints as tested are installed into a nominal 150 mm thick or 175 mm thick concrete wall they would be expected to maintain the insulation performance for at least 180 minutes and 240 minutes respectively. See Table 3 for the expected performance of the control joints and wall FRL's. See Figure 1 for a drawing of the fire exposure from either direction and control joint installation details.

Table 3: Summary of Double Sided Fulacaulk FR Control Joints

Wall Thickness*	Sealant Backing	Sealant Installed From	Joint Width W (mm)	Sealant Depth D (mm)	FRL
120 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/120/120
			20	10	
			30	15	
			40	20	
150 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/180/180
			20	10	
			30	15	
			40	20	
175 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/240/240
			20	10	
			30	15	
			40	20	

* Note Concrete walls to be built in accordance with the relevant concrete standard to achieve the FRL's.

3.2.3 Fulacaulk FR to one face of the wall

In fire resistance test FRT180400 two nominal 10 mm wide control joints were tested with 10 mm thick Fulacaulk FR sealant on the exposed face and unexposed face, respectively, in a 120 mm thick concrete wall. Both control joints (C and F) maintained the integrity criteria for the 241 minute duration of the test and the insulation criteria for in excess of the nominal fire resistance level of 120 minutes.

Based on the tested performance it is considered increasing the thickness of the wall will not prejudice the expected Integrity performance in a 150 mm or 175 mm thick concrete wall with an established FRL of 180/180/180 and 240/240/240 respectively.

Both the tested 10 mm wide control joints maintained the insulation performance of the concrete wall for in excess of 120 minutes. It is considered if the wall was increased to 150 mm or 175 mm thick they would also be expected to maintain the insulation performance of the wall for at least an FRL of 180/180/180 and 240/240/240 respectively. See Table 4 for the

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expected performance of single sided control joints and wall FRL's. See Figure 2 and Figure 3 for drawings of the fire exposed and fire unexposed control joint configurations.

Table 4: Summary of Single Sided Fulacaulk FR Control Joints

Wall Thickness*	Sealant Backing	Sealant Installed From	Joint Width W (mm)	Sealant Depth D (mm)	FRL
120 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/120/120
150 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/180/180
175 mm	Backing rod	Exposed (Figure 2) / Unexposed (Figure 3)	10	10	-/240/240

* Note Concrete walls to be built in accordance with the relevant concrete standard to achieve the FRL's.

3.2.4 Fulacaulk FR to the Fire Unexposed Face of the Wall

In fire resistance test FRT180400 a 30 mm wide x 30 mm deep and 20 mm wide x 20 mm deep control joints were tested (D & E) on the unexposed face of the 120 mm thick concrete wall and maintained the Integrity criteria for the 241 minute duration of the test. They exceeded the insulation criteria at 109 minutes and 106 minutes respectively on the concrete wall 25 mm from the joint. The temperatures measured on the Fulacaulk FR sealant exceeded the insulation criteria at 217 minutes and 120 minutes respectively.

It is proposed to increase the thickness of the concrete wall to nominally 150 mm or 175 mm to achieve an insulation performance of at least 120 minutes. The tested control joints maintained the integrity criteria for the 241 minute duration of the test so would be expected to maintain the integrity performance of the thicker walls for 180 and 240 minutes respectively.

While the control joints as tested did reduce the insulation performance of the concrete wall it is proposed that if the thickness of the wall was increased to at least 150 mm or 175 mm it is expected that the thicker concrete would improve the insulation performance of the tested control joints such that they would be expected to achieve at least 120 minutes insulation if tested in accordance with AS 1530.4:2014. See Table 5 for the expected performance of the Fulacaulk FR control joints in the fire unexposed face of the wall. See Figure 3 for a drawing of the control joint configuration.

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Table 5: Summary of Fulacaulk FR Control Joints to the Fire Unexposed Face

Wall Thickness*	Sealant Backing	Sealant Installed From	Joint Width W (mm)	Sealant Depth D (mm)	FRL
150 mm	Backing rod	Unexposed (Figure 3)	20	20	-/180/120
	Backing rod	Unexposed (Figure 3)	30	30	-/180/120
175 mm	Backing rod	Unexposed (Figure 3)	20	20	-/240/120
	Backing rod	Unexposed (Figure 3)	30	30	-/240/120

* Note Concrete walls to be built in accordance with the relevant concrete standard to achieve the FRL's.

3.3 Control Joints in Masonry Walls

The control joints referenced in Section 2 were tested in 120 mm thick fire rated concrete walls. It is expected that where the concrete wall increases in thickness along with the FRL that the walls will be built in accordance with the relevant concrete standards. Nominally as follows:

- 120 mm thick concrete wall (FRL 120/120/120)
- 150 mm thick concrete wall (FRL 180/180/180)
- 175 mm thick concrete wall (FRL 240/240/240)

It is considered the same control joints could be installed in similar masonry walls as long as they are built in accordance with the relevant masonry standards and the wall thickness is not less than stated above.

Note this only applies to solid or concrete filled masonry units which have achieved the required fire resistance rating.

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4. CONCLUSION

It is considered that the HB Fuller Fulacaulk FR sealant fire rated control joints would be expected to achieve the stated FRL if tested in accordance with AS 1530.4:2014 with reference to AS 4072.1-2005 (including Amendment No. 1) with reference to Section 4, as stated in Table 6 below.

Table 6: Summary of Fulacaulk FR Sealant Control Joints

Wall Thickness*	Sealant Backing	Sealant Installed From	Joint Width W (mm)	Sealant Depth D (mm)	FRL
Double Sided Control Joints – Installed From Both Faces					
120 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/120/120
			20	10	
			30	15	
			40	20	
150 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/180/180
			20	10	
			30	15	
			40	20	
175 mm	Backing rod	Exposed/Unexposed (Figure 1)	10	10	-/240/240
			20	10	
			30	15	
			40	20	
Single Sided Control Joints – Installed From Either Face					
120 mm	Backing rod	Exposed (Figure 2)	10	10	-/120/120
		Unexposed (Figure 3)			
150 mm	Backing rod	Exposed (Figure 2)	10	10	-/180/180
		Unexposed (Figure 3)			
175 mm	Backing rod	Exposed (Figure 2)	10	10	-/240/240
		Unexposed (Figure 3)			
Single Sided Control Joints – Installed From The Fire Unexposed Face Only					
150 mm	Backing rod	Unexposed (Figure 3)	20	20	-/180/120
	Backing rod		30	30	-/180/120
175 mm	Backing rod		20	20	-/240/120
	Backing rod		30	30	-/240/120

* Note Concrete walls to be built in accordance with the relevant concrete standard to achieve the FRL's.

In addition it is considered the control joints may be installed in solid or concrete filled fire rated masonry walls of the same minimum wall thickness as stated above. The masonry walls shall be built to comply with the relevant masonry standard as appropriate.

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Figure 1: Double Sided - Fire Exposure Direction and Sealant Configuration

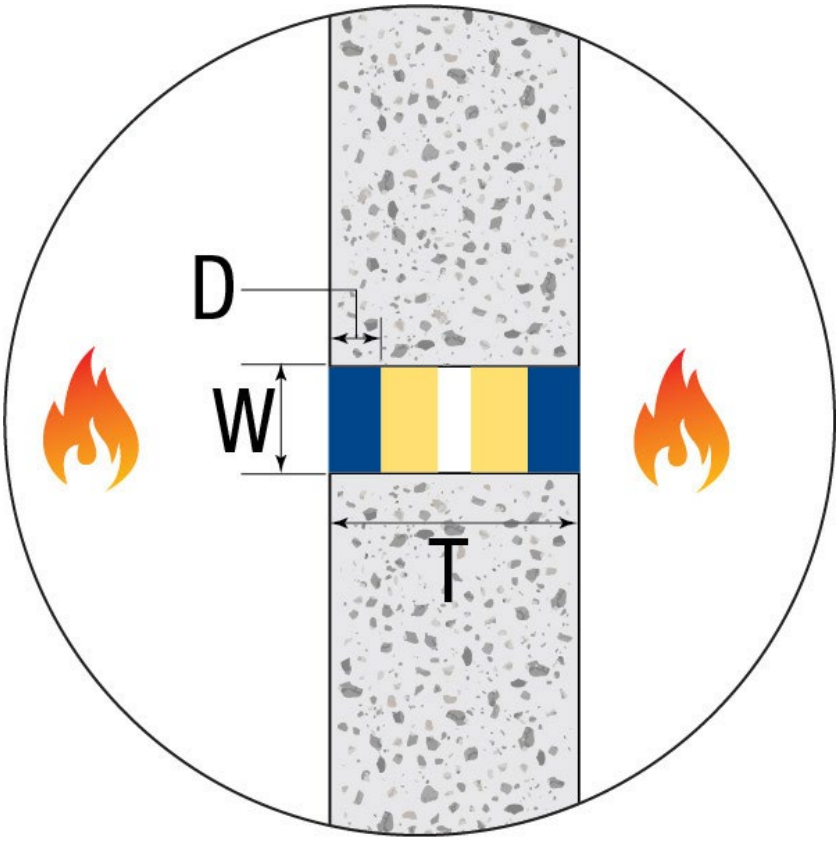

Figure 2: Single Sided - Fire Exposure Direction and Sealant Configuration Fire Side

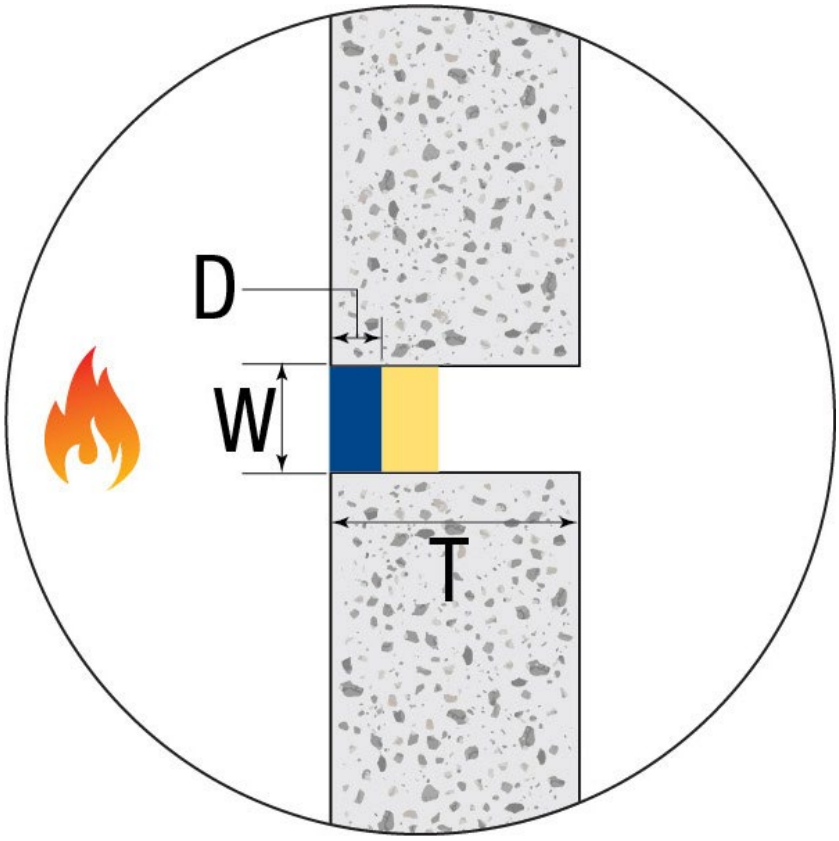

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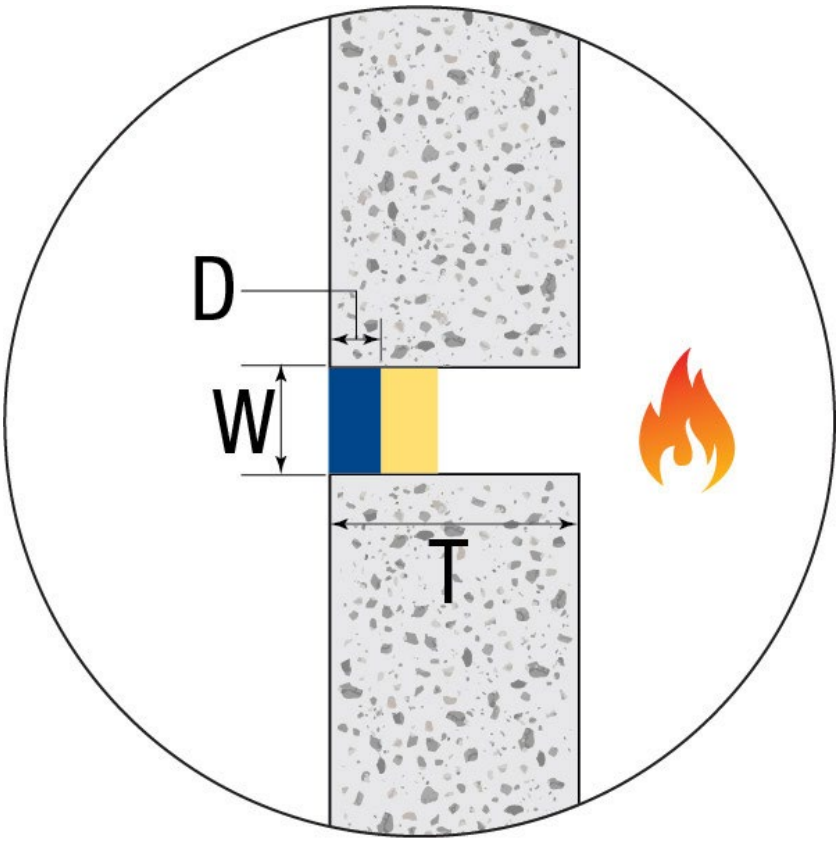
Figure 3: Single Sided - Fire Exposure Direction and Sealant Configuration Non-Fire Side



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