warringtonfire
Proud to be part of element

Fire resistance test report

Test standard: Sections 2 and 10 of AS 1530.4:2014

Test sponsor: HB Fuller Aust P/L

Job number: FRT210007

Test date: 22 June 2021 Revision: R1.0

Warringtonfire: accredited for compliance with ISO/IEC 17025 – Testing

ilac-MRA NATA Accreditation No. 3277

Quality management

Revision	Date	Information about the report			
R1.0	23 June 2021	Description	Initial issue		
			Prepared by	Reviewed by	Authorised by
		Name	Kai Loh	Mandeep Kamal	Mandeep Kamal
		Signature			

Executive summary

This report documents the findings of the fire resistance test of control joints in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 22 June 2021.

Warringtonfire performed the test at the request of HB Fuller Aust P/L.

Table 1 provides details of the test assembly, and Table 2 provides a summary of the test specimen. A summary of the results is provided in Table 3.

Table 1 Test assembly

Item	Detail	
Separating element	A 96 mm thick steel stud fire rated plasterboard wall system clad with 16 mm thick fire rated plasterboard either side and a 90 mm thick steel stud fire rated plasterboard wall system clad with 13 mm thick fire rated plasterboard either side.	
Overall separating element size	Width	1600 mm
	Height	1400 mm
	Thickness	96 mm / 90 mm thick
Number of control joints	Eight	
Restraint conditions	Restrained on all edges	

Table 2 Test specimen

Control joint	Aperture size	Local fire-stopping protection	Sealant thickness	Sealant height / width
A	1000 mm wide × 20 mm high × 16 mm deep	• HB Fuller Firesound™	16 mm	20 mm
B	16 mm wide × 1400 mm high × 16 mm deep	• HB Fuller Firesound™	16 mm	16 mm
C	15 mm wide × 1400 mm high × 96 mm deep	• HB Fuller Firesound™ • Open cell backing rod	16 mm	15 mm
D	1000 mm wide × 10 mm high × 16 mm deep	• HB Fuller Firesound™	16 mm	10 mm
E	584 mm wide × 20 mm high × 13 mm deep	• HB Fuller Firesound™	13 mm	20 mm
F	15 mm wide × 1400 mm high × 90 mm deep	• HB Fuller Firesound™ • Open cell backing rod	13 mm	15 mm
G	13 mm wide × 1400 mm high × 13 mm deep	• HB Fuller Firesound™	13 mm	13 mm
H	584 mm wide × 10 mm high × 13 mm deep	• HB Fuller Firesound™	13 mm	10 mm

Table 3 Test results

Control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 98 minutes	
B	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 97 minutes	
C	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 87 minutes	
D	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 114 minutes	
E	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 76 minutes	
F	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 64 minutes	
G	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 73 minutes	
H	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 94 minutes	

Note: "*" indicates that no FRL was assigned because of the variations listed in Table 7 in section 3.

Contents

1. Introduction

This report documents the findings of the fire resistance test of control joints in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 22 June 2021.

Warringtonfire performed the test at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor details

Test sponsor	Address
HB Fuller Aust P/L	16-22 Redgum Drive Dandenong South VIC 3175 Australia

2. Test specimen

2.1 Schedule of components

Table 5 describes the test specimen and lists the schedule of components. These were provided by the test sponsor and surveyed by Warringtonfire.

All measurements were done by Warringtonfire – unless indicated otherwise.

Detailed drawings of the test specimen are provided in Appendix A.

Table 5 Schedule of components

Item	Description	
Separating element (SE)		
1.	Item name	16 mm thick fire rated plasterboard
	Product name	16 mm thick USG Boral Firestop®
	Density	831 kg/m^3
	Size	3000 mm wide × 1200 mm high × 16 mm thick (cut to size)
2.	Item name	13 mm thick fire rated plasterboard
	Product name	13 mm thick USG Boral Firestop®
	Density	923 kg/m^3
	Size	3000 mm wide × 1200 mm high × 13 mm thick (cut to size)
3.	Item name	Steel frame
	Products	• Rondo 64 mm × 36 mm steel stud with hem • Rondo 64 mm × 28 mm wall track with hem • Rondo 64 mm × 50 mm deflection head track
SE	Overall size	1600 mm wide × 1400 mm high × 96 mm / 90 mm thick
	Restraint conditions	Restrained on all edges
	Installation	The steel frame (item 3) consisted of steel studs installed vertically, and a wall track and deflection head track installed horizontally. The edge frames were secured to the test frames with masonry anchors. The steel frames were sized to fit the varying control joint sizes – see Figure 1.

Item	Description		
		The western side separating element consisted of a 500 mm wide × 1400 mm high steel frame and a 485 mm wide × 1400 mm high steel frame. They were both clad with one layer of 16 mm thick fire rated plasterboard (item 1) on either side of the steel frame. The 16 mm thick fire rated plasterboard finished at a nominal 20 mm from the top edge and 10 mm from the bottom edge of the steel frame. The 16 mm thick fire rated plasterboard on the 500 mm wide steel frame finished 16 mm from the western edge and flush with the steel frame on the eastern edge. The 16 mm fire rated plasterboard on the 485 mm wide steel frame finished flush with the steel frame on both western and eastern edges. The eastern side separating element consisted of a 269 mm wide × 1400 mm high steel frame and a 300 mm wide × 1400 mm high steel frame. They were clad with one layer of 13 mm thick fire rated plasterboard (item 2) on either side of the steel frame. The 13 mm thick fire rated plasterboard finished at a nominal 20 mm from the top edge and 10 mm from the bottom edges of the steel frame. The 13 mm thick fire rated plasterboard on the 300 mm wide steel frame finished 13 mm from the eastern edge and flush with the steel frame on the eastern edge. The 13 mm fire rated plasterboard on the 269 mm wide steel frame finished flush with the steel frame on both western and eastern edges. The fire rated plasterboards were secured to the steel frame with 6g × 32 mm long plasterboard screws at 300 mm centres. Both sections of separating element were separated by a layer of 16 mm thick fire rated plasterboard.
Fire-stopping protections			
Sealant			
4.	Item name	Sealant	
	Product name	HB Fuller Firesound™	
	Density	1900 kg/m^3 (26 days of curing)	
Backing rod			
5.	Item name	Open cell backing rod	
	Material	Polyurethane	
Control joint A			
A	Aperture size	1000 mm wide × 20 mm high × 16 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the wall track of the steel frame (item 3) between the 16 mm thick fire rated plasterboard (item 1) and the brickwork of the test frame.	
		Sealant thickness	16 mm
		Sealant height	20 mm
Control joint B			
B	Aperture size	16 mm wide × 1400 mm high × 16 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the steel stud track of the steel frame (item 3) between the 16 mm thick fire rated plasterboard (item 1) and the brickwork of the test frame.	

Item	Description		
		Sealant thickness	16 mm
		Sealant width	16 mm
Control joint C			
C	Aperture size	15 mm wide × 1400 mm high × 96 mm deep	
	Local fire-stopping protection		
	Protection	An open cell backing rod (item 5) was inserted into the aperture to a depth of 16 mm from both the exposed and unexposed face of the separating element. Sealant (item 4) was then applied onto the open cell backing rod, finishing flush with the exposed and unexposed face of the separating element.	
		Backing rod depth	16 mm
		Sealant thickness	16 mm
		Sealant width	15 mm
Control joint D			
D	Aperture size	1000 mm wide × 10 mm high × 16 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the wall track of the steel frame (item 3) between the 16 mm thick fire rated plasterboard (item 1) and the brickwork of the test frame.	
		Sealant thickness	16 mm
		Sealant height	10 mm
Control joint E			
E	Aperture size	584 mm wide × 20 mm high × 13 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the wall track of the steel frame (item 3) between the 13 mm thick fire rated plasterboard (item 2) and the brickwork of the test frame.	
		Sealant thickness	13 mm
		Sealant height	20 mm
Control joint F			
F	Aperture size	15 mm wide × 1400 mm high × 90 mm deep	
	Local fire-stopping protection		
	Protection	An open cell backing rod (item 5) was inserted into the aperture to a depth of 13 mm from both the exposed and unexposed face of the separating element. Sealant (item 4) was then applied onto the open cell backing rod, finishing flush with the exposed and unexposed face of the separating element.	
		Backing rod depth	13 mm
		Sealant thickness	13 mm
		Sealant width	15 mm

Item	Description		
Control joint G			
G	Aperture size	13 mm wide × 1400 mm high × 13 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the steel stud track of the steel frame (item 3) between the 13 mm thick fire rated plasterboard (item 2) and the brickwork of the test frame.	
		Sealant thickness	13 mm
		Sealant width	13 mm
Control joint H			
H	Aperture size	584 mm wide × 10 mm high × 13 mm deep	
	Local fire-stopping protection		
	Protection	Sealant (item 4) was applied into the aperture on both the exposed and unexposed side of the separating element. It was applied onto the wall track of the steel frame (item 3) between the 13 mm thick fire rated plasterboard (item 2) and the brickwork of the test frame.	
		Sealant thickness	13 mm
		Sealant height	10 mm

2.2 Installation details

Table 6 lists the installation details for the test specimen.

Table 6 Installation details

Item	Detail
Start date for construction of separating element	30 April 2021
Start date for installation of fire-stopping protection for the control joints	11 May 2021
Completion date for constructing and installing the test specimen	11 May 2021
Separating element constructed by	Representatives of Warringtonfire
Fire-stopping protection for control joints installed by	Representatives of the test sponsor
Symmetry	Symmetrical

3. Test procedure

Table 7 details the test procedure for this fire resistance test.

Table 7 Test procedure

Item	Detail	
Statement of compliance	The test was performed in accordance with the requirements of sections 2 and 10 of AS 1530.4:2014 for control joints, subject to the variations below.	
Variations	• Control joint E and H were shorter than the full length specified in clause 10.4.2 of AS 1530.4:2014. • The furnace pressure was measured at mid-height of the vertical control joints and not at mid-height of control joint D and H as specified in clause 10.8.2 of AS 1530.4:2014. This means that the test was not conducted in strict accordance with AS 1530.4:2014 for control joint D, E and H, so an FRL cannot be assigned. The data obtained is for information purposes only.	
Pre-test conditioning	The construction and installation of the test specimen was completed on 11 May 2021. The test specimen was subjected to normal laboratory temperatures and conditions between the completion of construction of the test specimen and the start of the test.	
Sampling / specimen selection	The laboratory was not involved in sampling or selecting the test specimen for the fire resistance test. The results obtained during the test only apply to the test samples as received and tested by Warringtonfire.	
Ambient laboratory temperature	Start of the test Minimum temperature Maximum temperature	12 °C 12 °C 20 °C
Test duration	121 minutes	
Instrumentation and equipment	The instrumentation was provided in accordance with AS 1530.4:2014 as follows: • The furnace temperature was measured by four mineral insulated metal sheathed (MIMS) Type K thermocouples – with wire diameters not greater than 1 mm, an overall diameter of 3 mm, and the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25 mm from steel supporting tubes. • The unexposed side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5 mm soldered to 12 mm diameter × 0.2 mm thick copper discs covered by 30 mm × 30 mm × 2.0 mm thick inorganic insulating pads. • The thermocouple positions are shown in Table 10 and in Figure 5 in Appendix D. • A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples. • Cotton pads were available during the test to assess the performance of the specimen under the criteria of integrity. • The furnace pressure was measured at approximately 120 mm below the mid-height of the vertical control joints and corrected to mid-height of the vertical control joints.	

4. Test measurements and results

Table 8 summarises the results the specimen achieved against the performance criteria listed in sections 2 and 10 of AS 1530.4:2014, subject to the variations listed in section 3.

Appendix E includes details of the measurements taken during the test.

Table 9 in Appendix B includes observations of any significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4:2014.

Photographs of the specimen are included in Appendix F.

Table 8 Test results

Control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 98 minutes	
B	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 97 minutes	
C	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 87 minutes	
D	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 114 minutes	
E	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 76 minutes	
F	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 64 minutes	
G	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 73 minutes	
H	Structural adequacy	Not applicable	**NA***
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 94 minutes	

Note: "*" indicates that no FRL was assigned because of the variations listed in Table 7 in section 3.

5. Application of test results

5.1 Test limitations

The results of these fire tests 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 fire conditions.

These results only relate to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, and they do not necessarily reflect the actual behaviour in fires.

5.2 Variations from the tested specimen

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described here was tested following the procedure outlined in AS 1530.4:2014. Any significant variation with respect to size, construction details, loads, stresses, edge or end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

It is recommended that any proposed variation to the tested configuration – other than as permitted under the field of direct application specified in Appendix C – should be referred to the test sponsor. They should then obtain appropriate documentary evidence of compliance from Warringtonfire or another accredited testing authority.

5.3 Uncertainty of measurements

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy for the result.

Appendix A Drawings of test assembly

The leaders in the drawings represent the items listed in section 2.1. All measurements – unless indicated – are in millimetres.

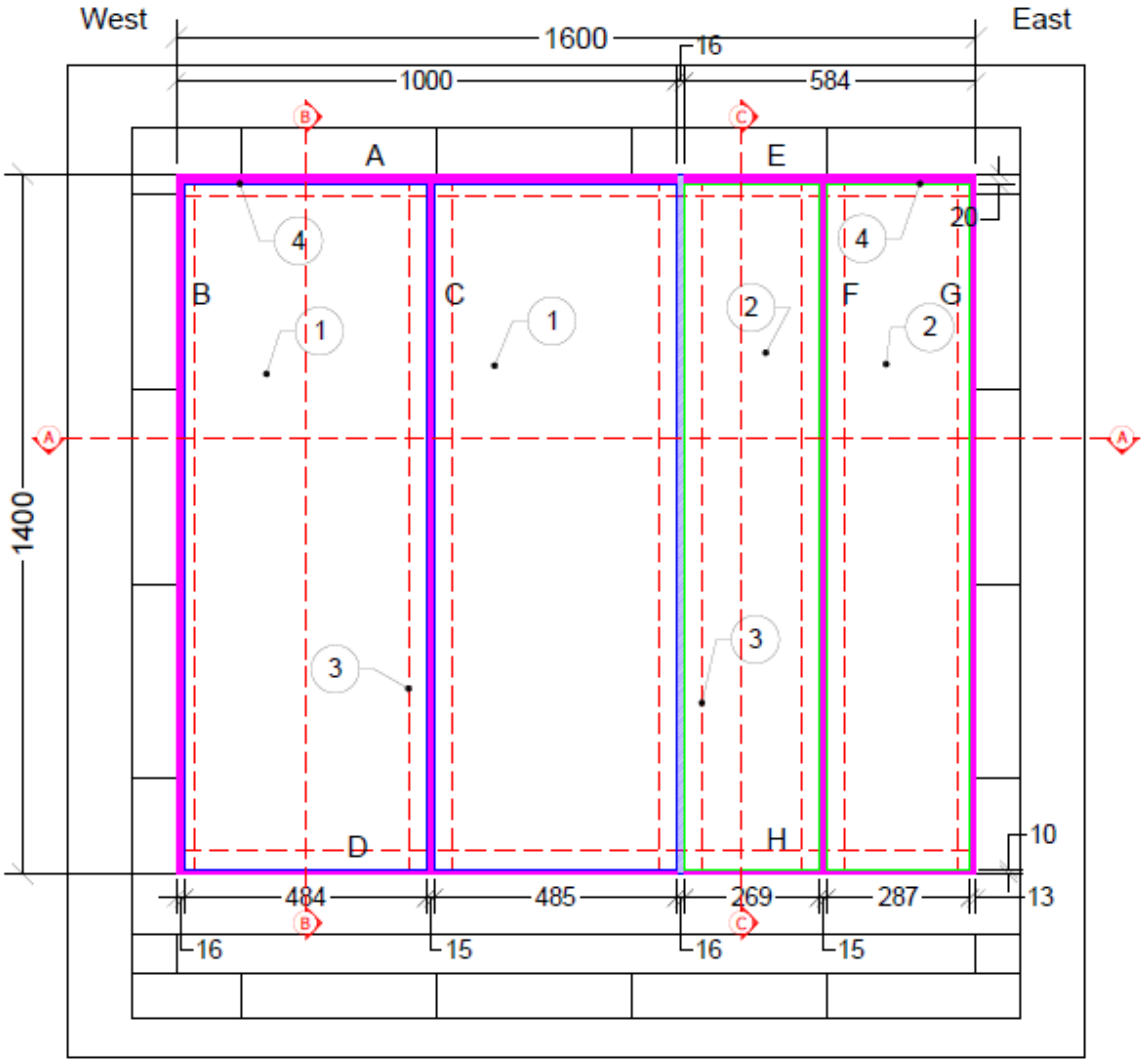


Figure 1 Elevation view of test specimen (unexposed side)

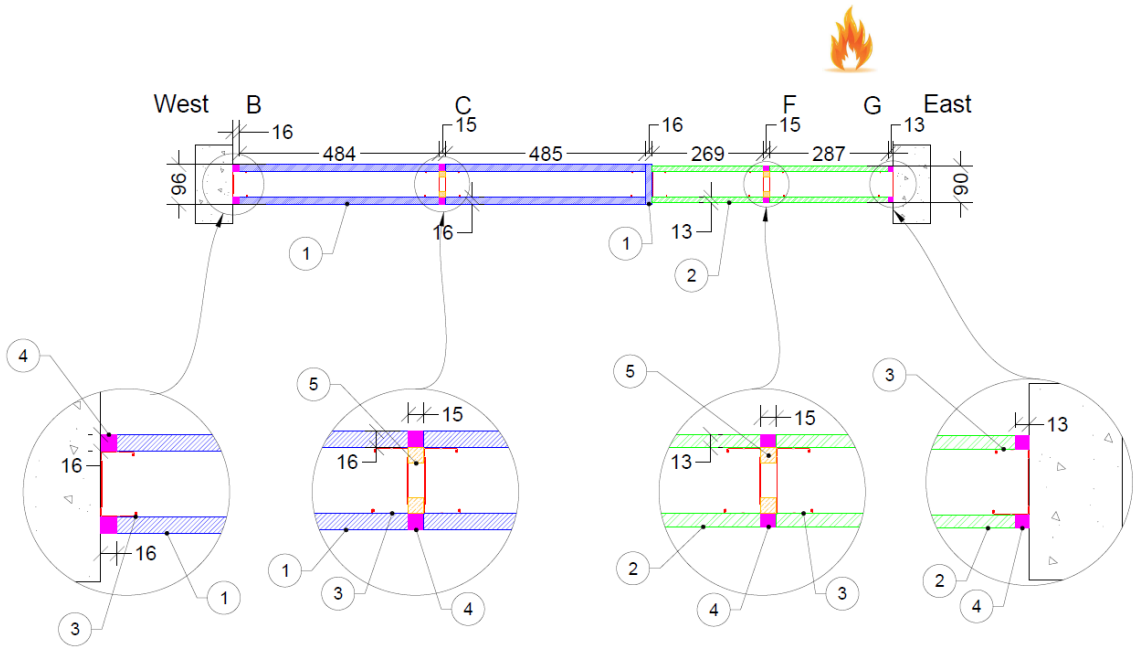


Figure 2 Cross section A-A

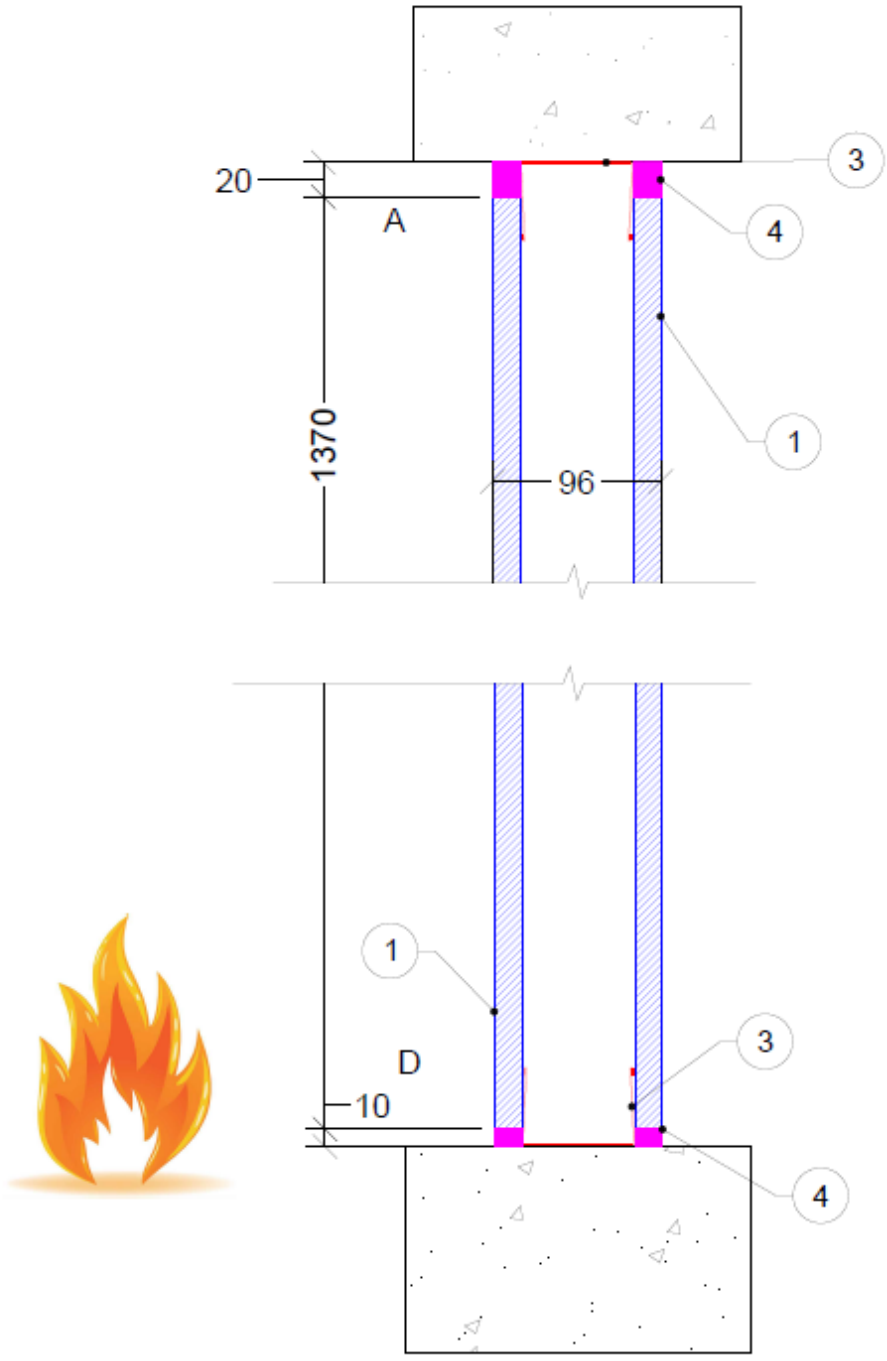


Figure 3 Cross section B-B

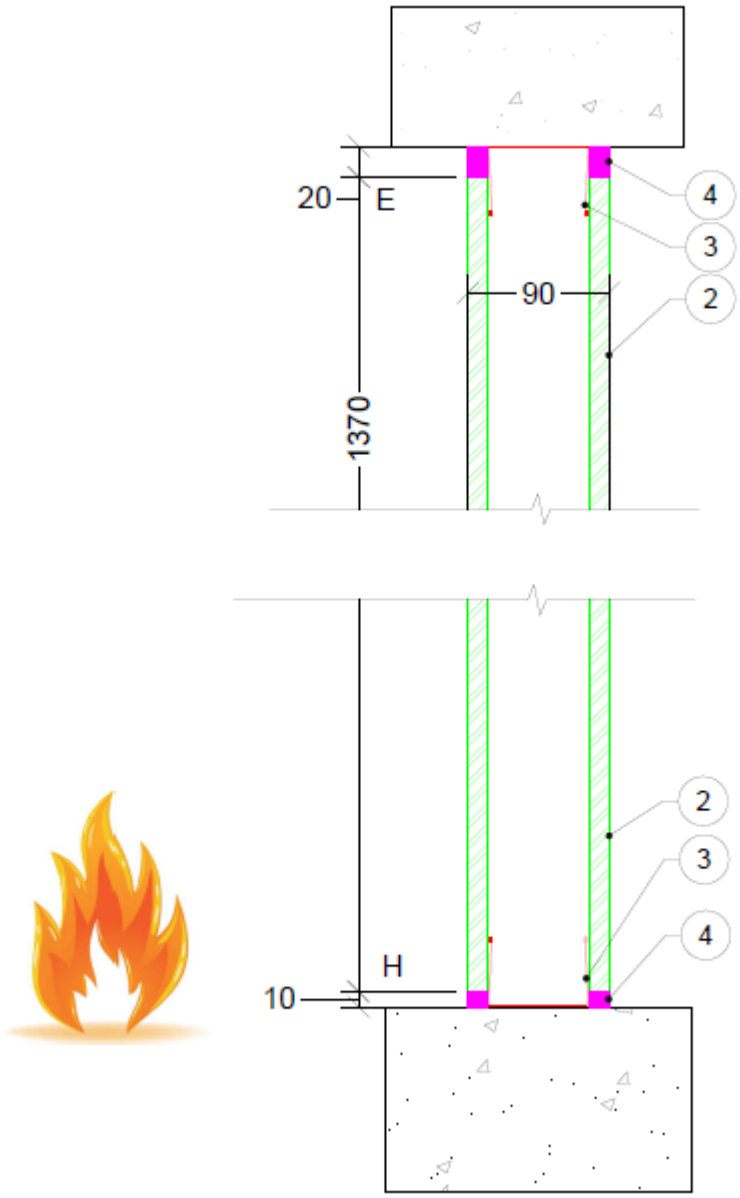


Figure 4 Cross section C-C

Appendix B Test observations

Table 9 shows the observations of any significant behaviour of the specimen during the test.

Table 9 Test observations

Time		Observation
Min	**Sec**	
Control joint A		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 12 °C.
6	04	Smoke emitting from control joint.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
87	00	The sealant had expanded.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
		The fixings of the separating element had discoloured
98	**05**	**TC008, on the plasterboard, 25 mm from the control joint, 35 mm from the centre, recorded a temperature of 192 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC008 exceeded the initial temperature by more than 180 K.**
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint B		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 12 °C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
87	00	The sealant had expanded.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
		The fixings of the separating element had discoloured

Time		Observation
Min	**Sec**	
98	**00**	**TC016, on the plasterboard, 25 mm from the control joint, 250 mm up from the centre, recorded a temperature of 192 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC016 exceeded the initial temperature by more than 180 K.**
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint C		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 14 °C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
87	00	The sealant had expanded.
87	**35**	**TC019, on the plasterboard, 25 mm from the control joint, 375 mm up from the centre, recorded a temperature of 193 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC019 exceeded the initial temperature by more than 180 K.**
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
		The fixings of the separating element had discoloured
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint D		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 12 °C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
87	00	The sealant had expanded.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
		The fixings of the separating element had discoloured

Time		Observation
Min	**Sec**	
114	**05**	**TC026, on the plasterboard, 25 mm from the control joint, 250 mm west of the centre, recorded a temperature of 192 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC026 exceeded the initial temperature by more than 180 K.**
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint E		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 12 °C.
6	04	Smoke emitting from control joint.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
		The sealant had started to expand.
42	00	The sealant had expanded.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
64	00	The plasterboard had started to discolour and deform at mid-width of the control joint.
76	**45**	**TC036, On the plasterboard, 25 mm from the control joint, 146 mm west of the centre, recorded a temperature of 193 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC036 exceeded the initial temperature by more than 180 K.**
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint F		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 14 °C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
42	00	The sealant had started to expand.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
64	00	The plasterboard had started to discolour.

Time		Observation
Min	Sec	
64	**55**	**TC040, on the control joint, 250 mm up from the centre, recorded a temperature of 194 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC040 exceeded the initial temperature by more than 180 K.**
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint G		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 11 °C.
3	00	Smoke emitting the concrete blockwork between the bricks.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
42	00	The sealant had started to expand.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
64	00	The plasterboard had started to discolour.
73	**45**	**TC046, on the plasterboard, 25 mm from the control joint, at the centre, recorded a temperature of 192 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC046 exceeded the initial temperature by more than 180 K.**
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.
Control joint H		
0	00	The fire resistance test started. The initial temperature of the test specimen was approximately 12 °C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
64	00	The plasterboard had started to discolour.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
95	**00**	**TC054, on the plasterboard, 25 mm from the control joint, 146 mm west of the centre, recorded a temperature of 192 °C.** **Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC054 exceeded the initial temperature by more than 180 K.**
120	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
121	00	Test stopped.

Appendix C Direct field of application

The text, figures and tables in this appendix have been taken from section 10 of AS 1530.4:2014.

C.1 General

The results of the fire test contained in the test report are directly applicable without reference to the testing authority to similar constructions where one or more of the changes set out in clauses 10.12.2 to 10.12.6 of AS 1530.4:2014 have been made.

C.2 Separating elements

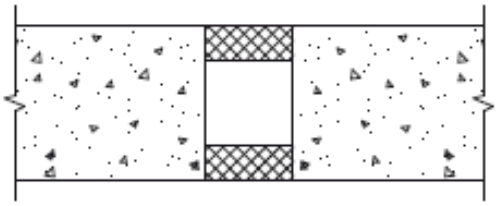
Results obtained for sealing systems in various types of masonry and concrete construction may be applied as follows:

- For elements manufactured from similar types of concrete or masonry, the results of the prototype test may be applied to materials of density within ±15% of the tested specimen. For greater variations, the opinion of a registered testing authority shall be obtained.
- Test results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The reverse does not apply.
- Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.
- Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.
- Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the studs.

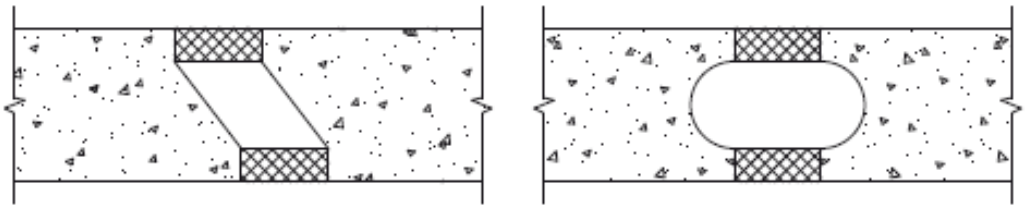
C.3 Control joints

The following variations are permitted:

- Results obtained from single test on a butt joints may be applied to contoured joints, provided the joints have —
  - equal width and equal or greater depth of sealant; and
  - equal or greater thickness of fire-separating element.
  - Note: Examples of butt and contoured control joints are shown in figure 10.12.6 of AS 1530.4:2014.
- Facings may be applied to the surface of the fire-stopping system.



(a) Butt joint



(b) Contoured joints

LEGEND:

= Fire-separating element

= Fire-stopping material

FIGURE 10.12.6 CONTOURED CONTROL JOINTS

Appendix D Instrumentation locations

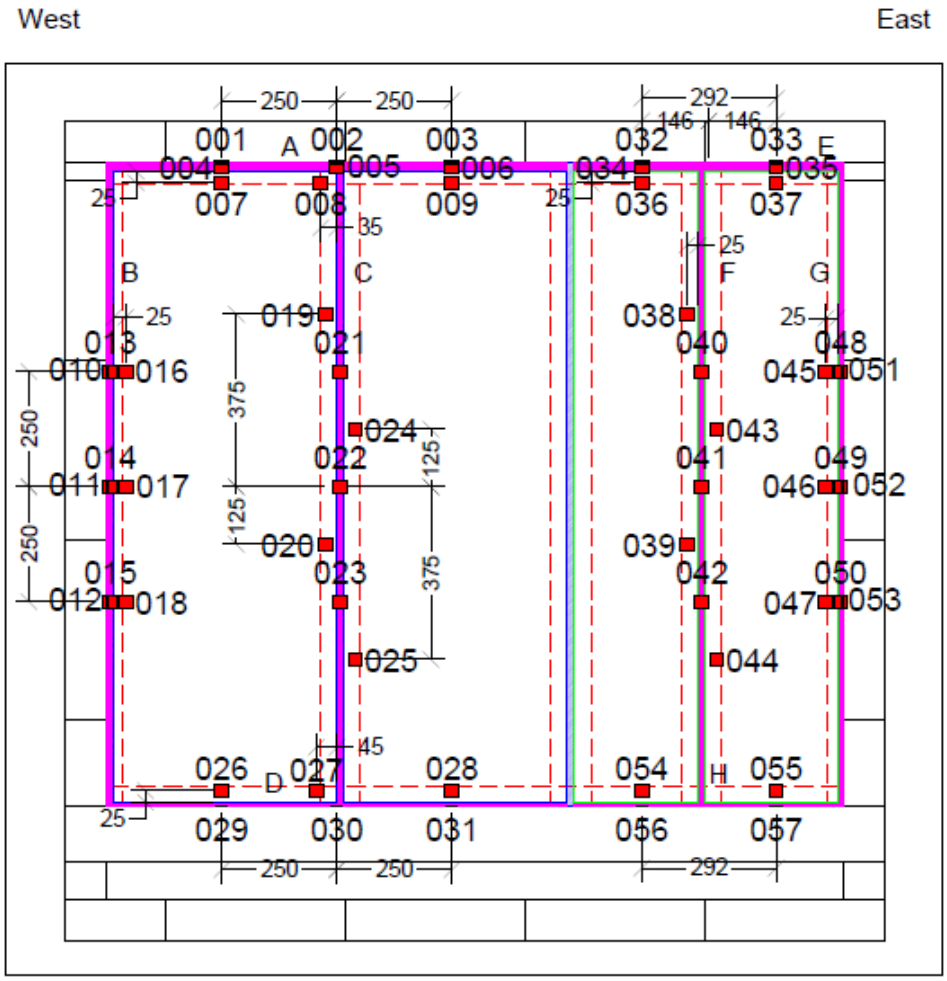


Figure 5 Instrumentation location

Table 10 Thermocouple locations

Control joint	T/C #	Description
A	001	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm west of the centre.
	002	On the concrete blockwork of the test frame, 25 mm from the control joint, at the centre.
	003	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm east of the centre.
	004	On the control joint, 250 mm west of the centre.
	005	On the control joint, at the centre.
	006	On the control joint, 250 mm east of the centre.
	007	On the plasterboard, 25 mm from the control joint, 250 mm west of the centre.
	008	On the plasterboard, 25 mm from the control joint, 35 mm from the centre.
	009	On the plasterboard, 25 mm from the control joint, 250 mm east of the centre.

Control joint	T/C #	Description
B	010	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm up from the centre.
	011	On the concrete blockwork of the test frame, 25 mm from the control joint, at the centre.
	012	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm down from the centre.
	013	On the control joint, 250 mm up from the centre.
	014	On the control joint, at the centre.
	015	On the control joint, 250 mm down from the centre.
	016	On the plasterboard, 25 mm from the control joint, 250 mm up from the centre.
	017	On the plasterboard, 25 mm from the control joint, at the centre.
	018	On the plasterboard, 25 mm from the control joint, 250 mm down from the centre.
C	019	On the plasterboard, 25 mm from the control joint, 375 mm up from the centre.
	020	On the plasterboard, 25 mm from the control joint, 125 mm down from the centre.
	021	On the control joint, 250 mm up from the centre.
	022	On the control joint, at the centre.
	023	On the control joint, 250 mm down from the centre.
	024	On the plasterboard, 25 mm from the control joint, 125 mm up from the centre.
	025	On the plasterboard, 25 mm from the control joint, 375 mm down from the centre.
D	026	On the plasterboard, 25 mm from the control joint, 250 mm west of the centre.
	027	On the plasterboard, 25 mm from the control joint, 25 mm west of the centre.
	028	On the plasterboard, 25 mm from the control joint, 250 mm east of the centre.
	029	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm west of the centre.
	030	On the concrete blockwork of the test frame, 25 mm from the control joint, 45 mm from the centre.
	031	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm east of the centre.
E	032	On the concrete blockwork of the test frame, 25 mm from the control joint, 146 mm west of the centre.
	033	On the concrete blockwork of the test frame, 25 mm from the control joint, 146 mm east of the centre.
	034	On the control joint, 146 mm west of the centre.
	035	On the control joint, 146 mm east of the centre.
	036	On the plasterboard, 25 mm from the control joint, 146 mm west of the centre.
	037	On the plasterboard, 25 mm from the control joint, 146 mm east of the centre.
F	038	On the plasterboard, 25 mm from the control joint, 375 mm up from the centre.
	039	On the plasterboard, 25 mm from the control joint, 125 mm down from the centre.
	040	On the control joint, 250 mm up from the centre.
	041	On the control joint, at the centre.
	042	On the control joint, 250 mm down from the centre.
	043	On the plasterboard, 25 mm from the control joint, 125 mm up from the centre.
	044	On the plasterboard, 25 mm from the control joint, 375 mm down from the centre.

Control joint	T/C #	Description
G	045	On the plasterboard, 25 mm from the control joint, 250 mm up from the centre.
	046	On the plasterboard, 25 mm from the control joint, at the centre.
	047	On the plasterboard, 25 mm from the control joint, 250 mm down from the centre.
	048	On the control joint, 250 mm up from the centre.
	049	On the control joint, at the centre.
	050	On the control joint, 250 mm down from the centre.
	051	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm up from the centre.
	052	On the concrete blockwork of the test frame, 25 mm from the control joint, at the centre.
	053	On the concrete blockwork of the test frame, 25 mm from the control joint, 250 mm down from the centre.
H	054	On the plasterboard, 25 mm from the control joint, 146 mm west of the centre.
	055	On the plasterboard, 25 mm from the control joint, 146 mm east of the centre.
	056	On the concrete blockwork of the test frame, 25 mm from the control joint, 146 mm west of the centre.
	057	On the concrete blockwork of the test frame, 25 mm from the control joint, 146 mm east of the centre.

Appendix E Test data

E.1 Furnace temperature and severity

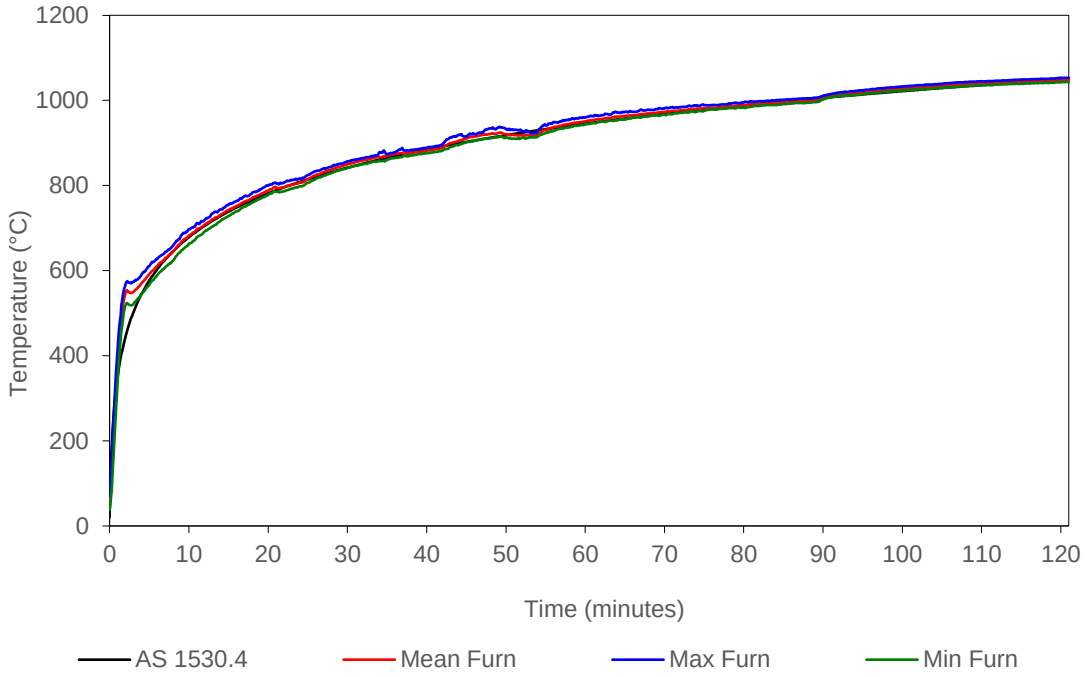


Figure 6 Furnace thermocouple temperature vs time

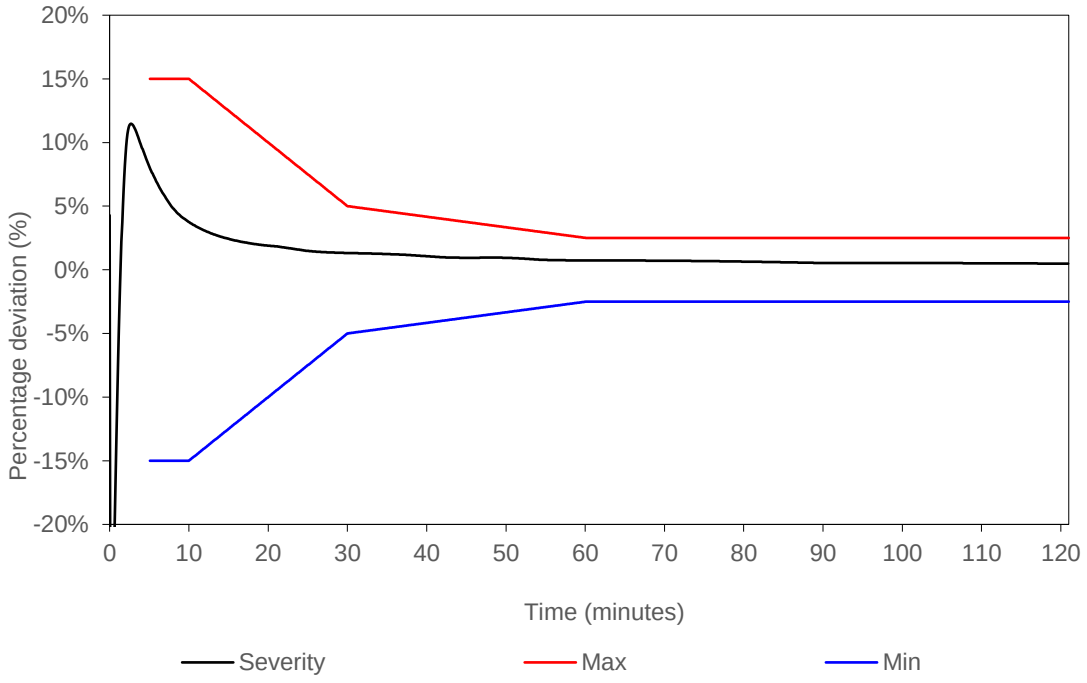


Figure 7 Percentage deviation of exposure severity vs time

E.2 Furnace pressure

The furnace pressure was measured at approximately 120 mm below the mid-height of the vertical control joints and corrected to mid-height of the vertical control joints.

Table 11 Furnace pressure

Time (minutes)	Average pressure (Pa)	Time (minutes)	Average pressure (Pa)	Time (minutes)	Average pressure (Pa)
5-10	16	45-50	16	85-90	16
10-15	16	50-55	15	90-95	16
15-20	16	55-60	15	95-100	16
20-25	16	60-65	16	100-105	15
25-30	17	65-70	17	105-110	16
30-35	17	70-75	15	110-115	16
35-40	17	75-80	15	115-120	17
40-45	16	80-85	16		

E.3 Specimen temperatures

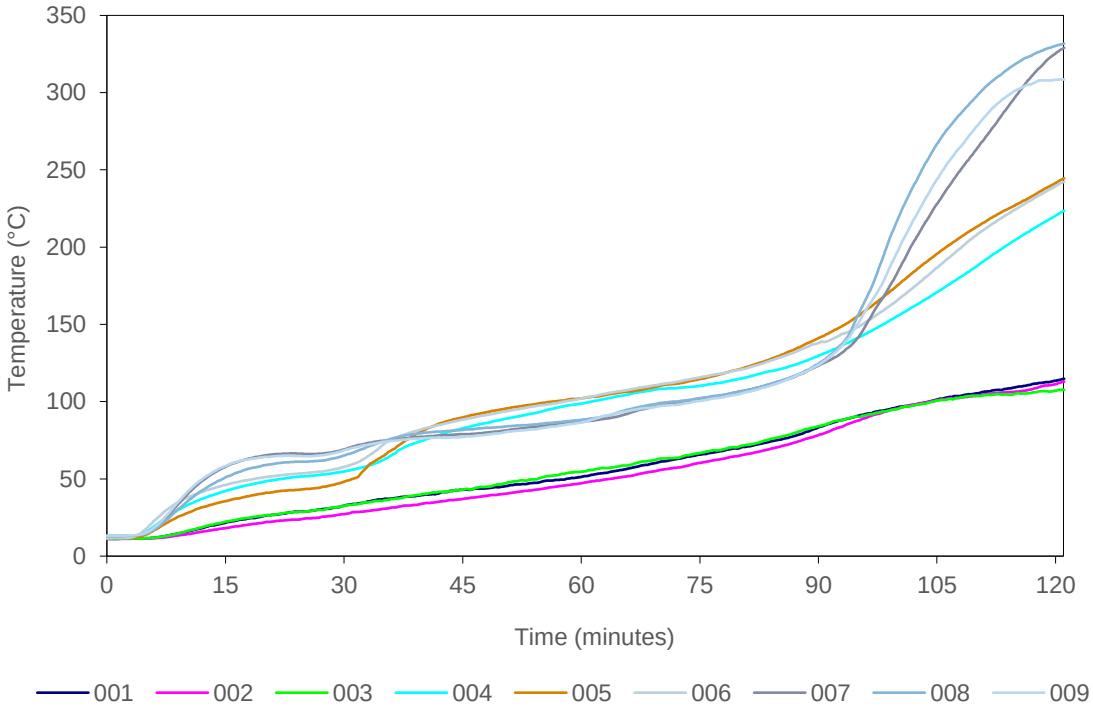


Figure 8 Control joint A – temperature vs time

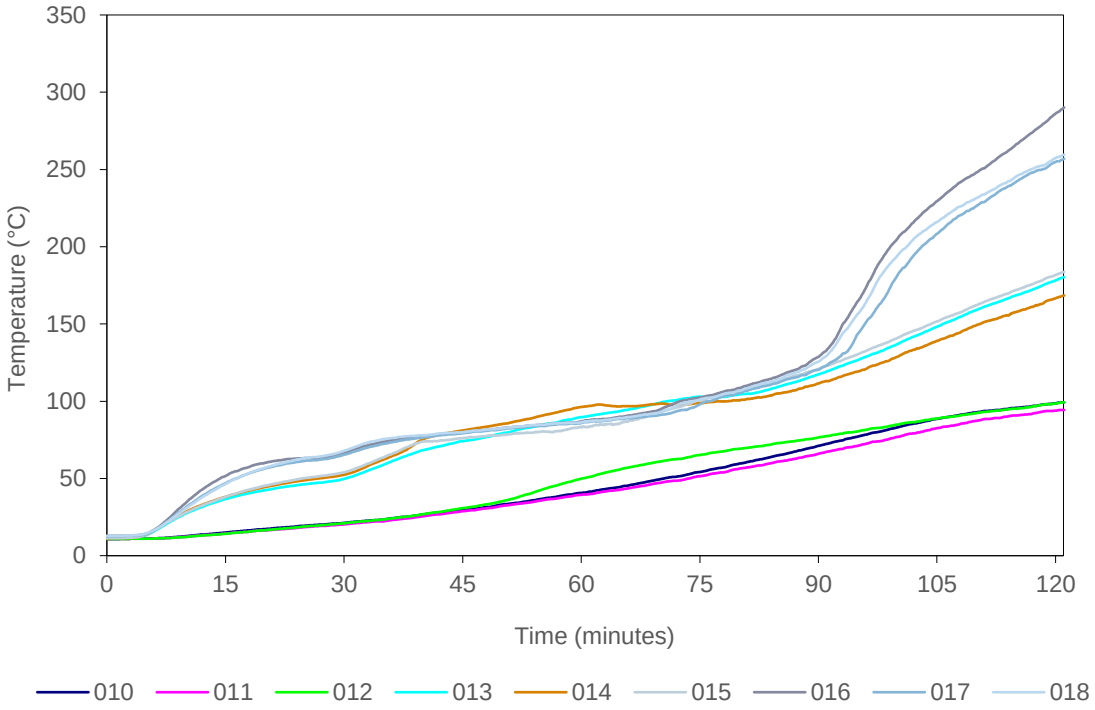


Figure 9 Control joint B – temperature vs time

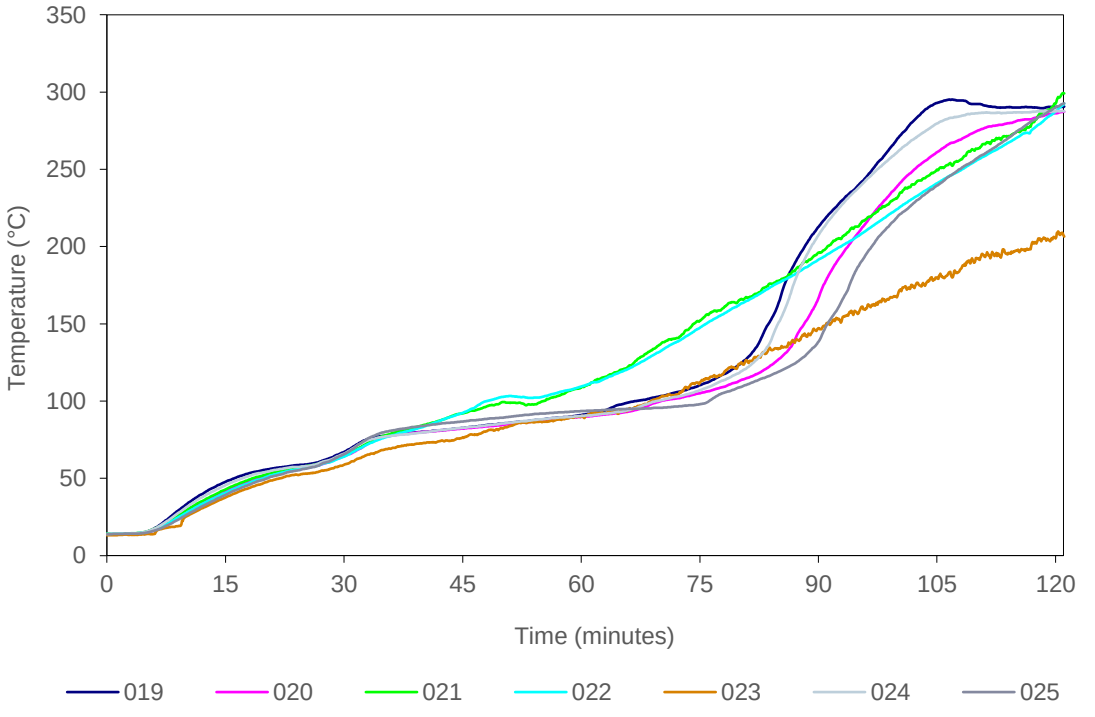


Figure 10 Control joint C – temperature vs time

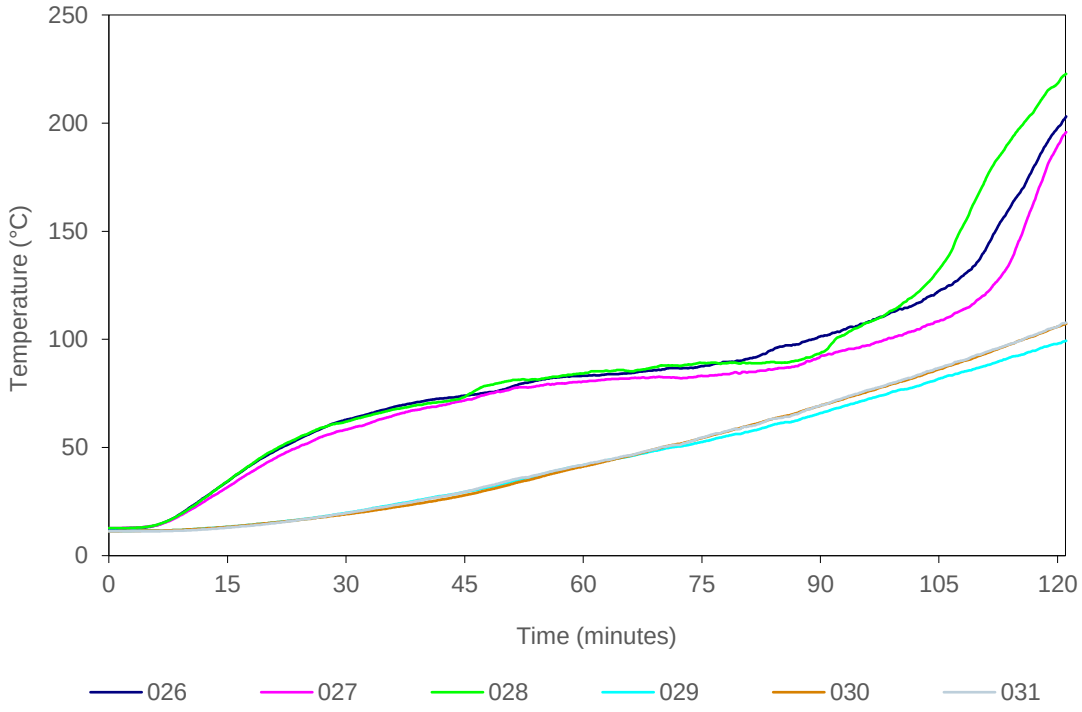


Figure 11 Control joint D – temperature vs time

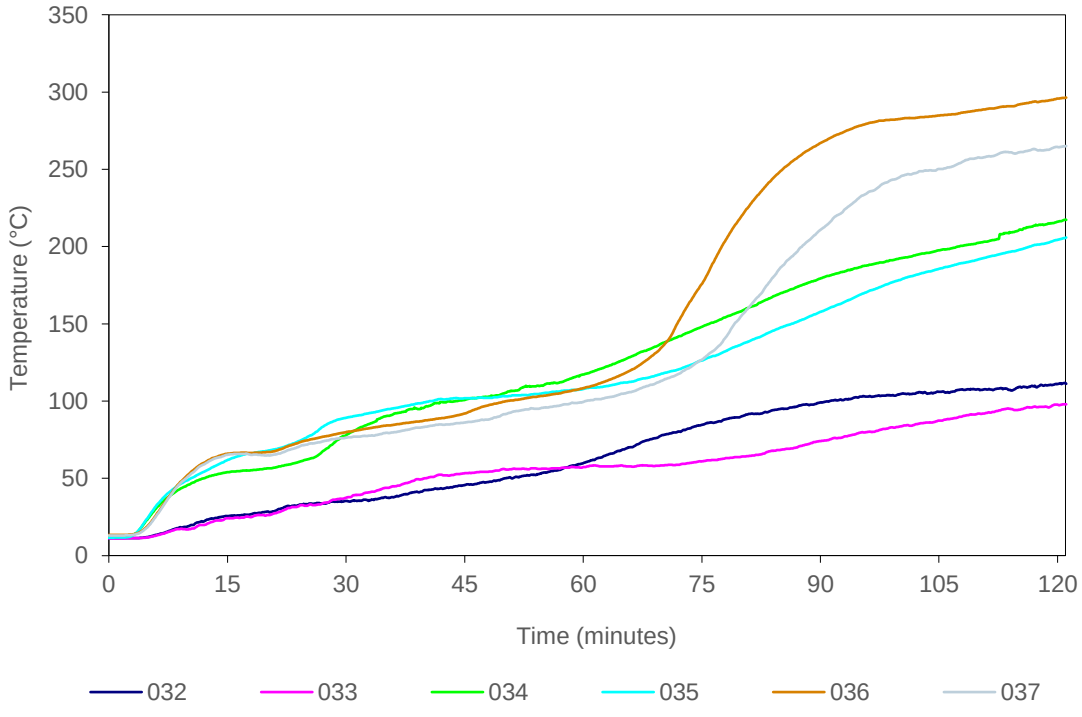


Figure 12 Control joint E – temperature vs time

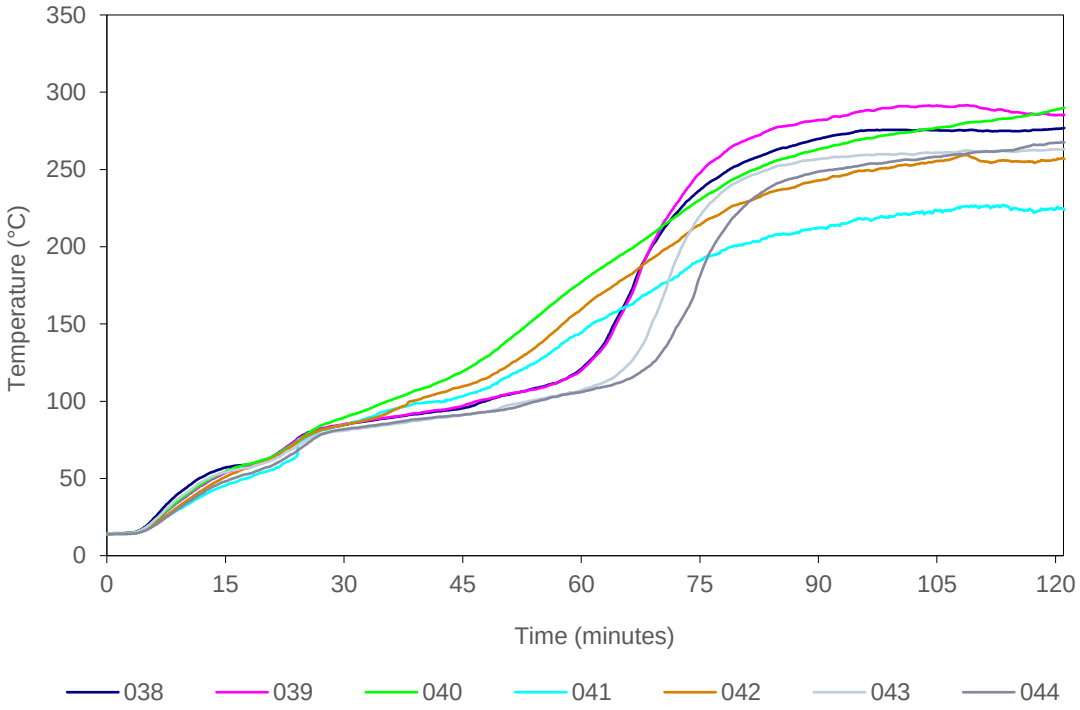


Figure 13 Control joint F – temperature vs time

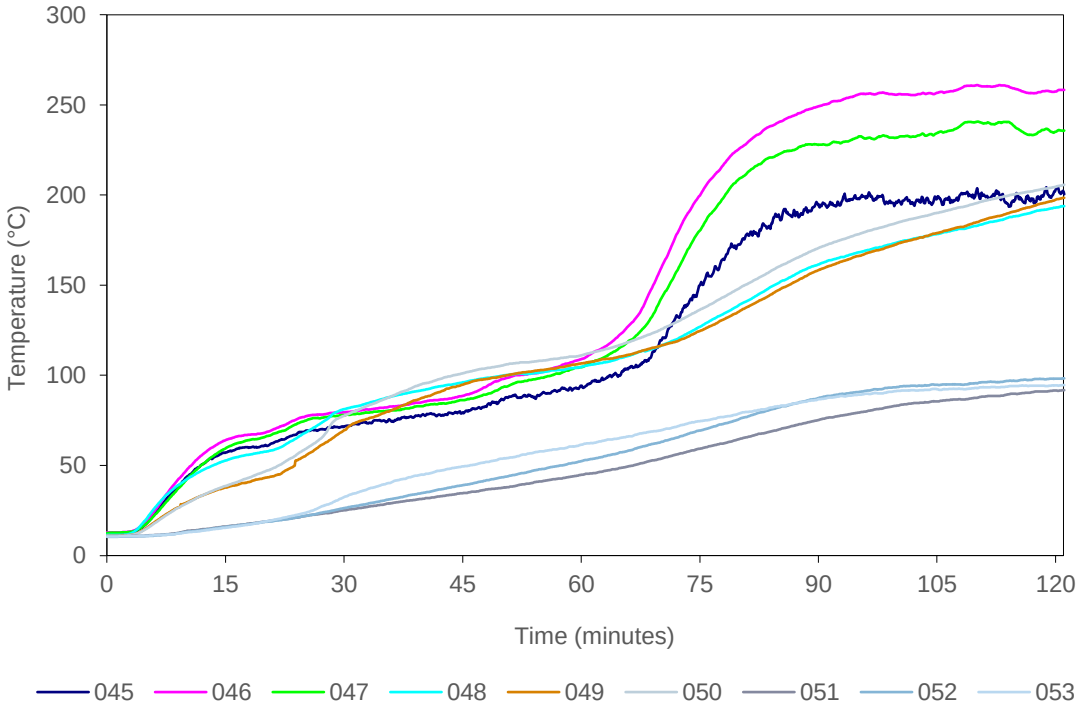


Figure 14 Control joint G – temperature vs time

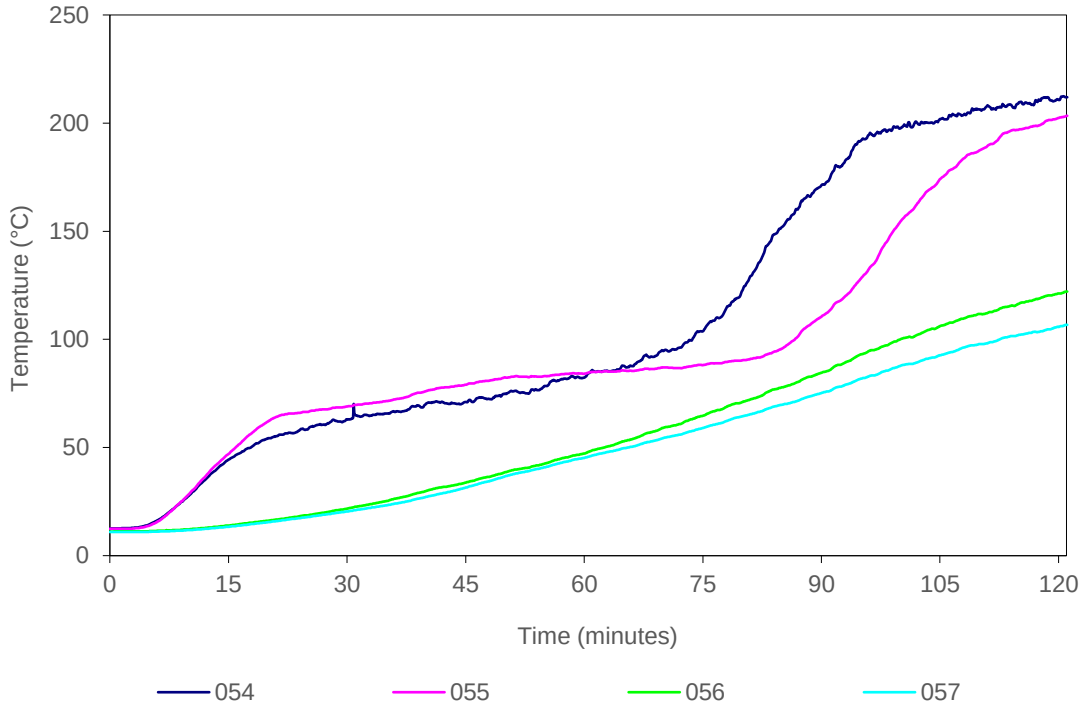


Figure 15 Control joint H – temperature vs time

Table 12 Test specimen temperatures

Control joint	T/C #	Description[1]	Temp (°C) at t (minutes)					Limit[2] (minutes)
			t=0	t=30	t=60	t=90	t=120	
A	001	On the concrete blockwork of the test frame.	11	33	51	83	114	-
	002	On the concrete blockwork of the test frame.	11	27	47	78	111	-
	003	On the concrete blockwork of the test frame.	11	33	55	84	107	-
	004	On the control joint.	11	55	99	130	220	111
	005	On the control joint.	12	48	102	141	242	104
	006	On the control joint.	12	58	102	138	240	106
	007	On the plasterboard.	13	69	87	123	325	100
	008	On the plasterboard.	13	65	88	125	330	98
	009	On the plasterboard.	13	68	87	124	308	99
B	010	On the concrete blockwork of the test frame.	11	21	41	71	99	-
	011	On the concrete blockwork of the test frame.	11	20	39	66	94	-
	012	On the concrete blockwork of the test frame.	11	21	50	77	99	-
	013	On the control joint.	11	50	90	117	178	-
	014	On the control joint.	11	52	96	112	167	-
	015	On the control joint.	11	54	84	121	182	-
	016	On the plasterboard.	13	67	87	129	286	97

Control joint	T/C #	Description[1]	Temp (°C) at t (minutes)					Limit[2] (minutes)
			t=0	t=30	t=60	t=90	t=120	
	017	On the plasterboard.	13	65	86	120	255	101
	018	On the plasterboard.	13	68	86	126	257	99
C	019	On the plasterboard.	14	67	91	213	291	87
	020	On the plasterboard.	14	64	90	166	286	92
	021	On the control joint.	14	65	109	196	293	89
	022	On the control joint.	14	64	109	192	288	90
	023	On the control joint.	13	59	90	147	205	110
	024	On the plasterboard.	14	66	90	207	288	88
	025	On the plasterboard.	14	66	94	138	290	95
D	026	On the plasterboard.	13	63	83	101	198	118
	027	On the plasterboard.	13	58	81	92	189	120
	028	On the plasterboard.	13	62	84	94	218	114
	029	On the concrete blockwork of the test frame.	11	20	42	66	98	-
	030	On the concrete blockwork of the test frame.	11	19	41	69	106	-
	031	On the concrete blockwork of the test frame.	11	20	42	69	106	-
E	032	On the concrete blockwork of the test frame.	11	35	60	99	111	-
	033	On the concrete blockwork of the test frame.	11	37	57	74	98	-
	034	On the control joint.	12	78	117	179	216	99
	035	On the control joint.	12	89	108	158	204	110
	036	On the plasterboard.	13	80	108	267	296	76
	037	On the plasterboard.	13	76	99	211	265	86
F	038	On the plasterboard.	14	85	121	270	276	68
	039	On the plasterboard.	14	85	120	282	285	68
	040	On the control joint.	14	89	177	263	289	64
	041	On the control joint.	14	85	144	212	224	76
	042	On the control joint.	14	85	159	243	256	69
	043	On the plasterboard.	14	81	107	257	263	72
	044	On the plasterboard.	14	82	106	249	267	76
G	045	On the plasterboard.	13	72	94	195	203	85
	046	On the plasterboard.	13	79	109	249	258	73
	047	On the plasterboard.	13	78	105	228	235	76
	048	On the control joint.	11	81	105	162	193	117
	049	On the control joint.	11	70	107	158	197	115
	050	On the control joint.	11	78	111	171	205	106
	051	On the concrete blockwork of the test frame.	11	25	45	75	92	-

Control joint	T/C #	Description[1]	Temp (°C) at t (minutes)					Limit[2] (minutes)
			t=0	t=30	t=60	t=90	t=120	
	052	On the concrete blockwork of the test frame.	10	26	52	87	98	-
	053	On the concrete blockwork of the test frame.	11	32	62	87	94	-
H	054	On the plasterboard.	13	63	82	171	211	95
	055	On the plasterboard.	12	69	84	111	202	112
	056	On the concrete blockwork of the test frame.	11	22	47	85	121	-
	057	On the concrete blockwork of the test frame.	11	20	45	75	106	-

Note:

1 Refer to Table 10 for the locations of thermocouples as only a generic description is included in the table.

2 Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180 K above the initial temperature.

'-' Under limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

Appendix F Photographs

Figure 16 Unexposed face of the specimen before the start of the test

Figure 17 Exposed face of the specimen before the start of the test

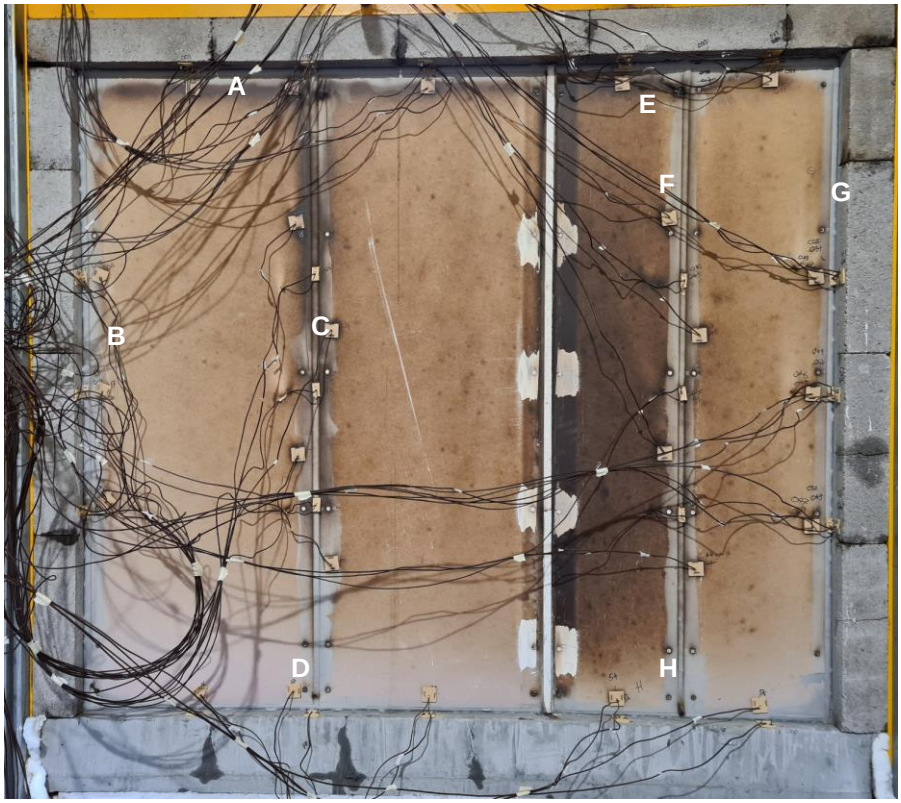


Figure 18 Unexposed face of the specimen at the end of the test

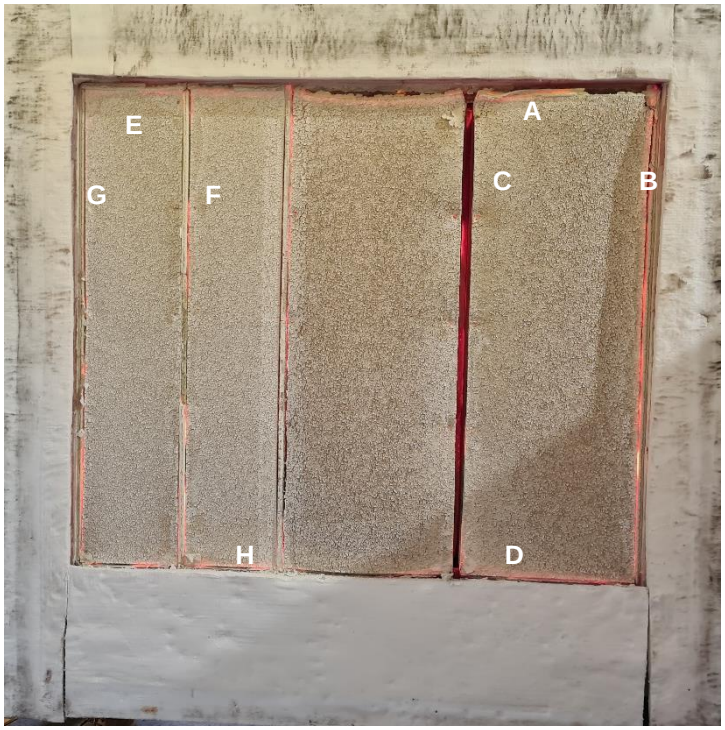


Figure 19 Exposed face of the specimen at the end of the test

warringtonfire

Proud to be part of element

Warringtonfire Australia Pty Ltd
ABN 81 050 241 524

Perth

Unit 22, 22 Railway Road
Subiaco WA 6008
Australia
T: +61 8 9382 3844

Canberra

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

Sydney

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

Brisbane

Suite 6, Level 12, 133 Mary Street
Brisbane QLD 4000
Australia
T: +61 7 3238 1700

Melbourne – NATA accredited laboratory

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