



Fire resistance test report

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

Test sponsor: H B Fuller Australia Pty Ltd

Products: H B Fuller FulaFlex FR and H B Fuller Firesound Original Grey

Job number: FRT200213

Test date: 25 August 2020 Revision: R1.0

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



Quality management

Revision	Date	Information about the report			
R1.0	31 August 2020	Description	Initial issue		
		Name Signature	Prepared by	Reviewed by	Authorised by
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Executive summary

This report documents the findings of the fire resistance test of control joints undertaken on 25 August 2020 in accordance with sections 2 and 10 of AS 1530.4:2014.

Warringtonfire Australia did the test at the request of H B Fuller Australia Pty Ltd.

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	Floor system	
Nominal separating element size	Width	1950 mm
	Height	1900 mm
	Thickness	150 mm
Number of control joints	Five	
Restraint conditions	Restrained on all edges	

Table 2 Test specimen

Penetration system	Service	Local fire-stopping protection	Aperture size (mm)	Sealant depth (mm)
A	Control Joint	H B Fuller Firesound Original Grey - 3620062810	30 × 1000	15 mm
B	Control Joint	H B Fuller Firesound Original Grey - 3620062810	50 × 1000	25 mm
C	Control Joint	H B Fuller FulaFlex FR - 3620013240	10 × 1000	10 mm
D	Control Joint	H B Fuller FulaFlex FR - 3620013240	20 × 1000	10 mm
E	Control Joint	H B Fuller FulaFlex FR - 3620013240	30 × 1000	15 mm

Table 3 Test results

Control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 215 minutes	
B	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 213 minutes	
C	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 225 minutes	

Control joint	Criteria	Results	Fire resistance level (FRL)
D	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 218 minutes	
E	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 217 minutes	

The FRLs for the specimens are only applicable to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

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1. Introduction

This report documents the findings of the fire resistance test of control joints undertaken on 25 August 2020 in accordance with sections 2 and 10 of AS 1530.4:2014.

Warringtonfire Australia did the test at the request of the test sponsors listed in Table 4.

Table 4 Test sponsor details

Test sponsor	Address
H B Fuller Australia Pty Ltd	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 Australia.

All measurements – unless indicated – were measured by Warringtonfire Australia.

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

Table 5 Schedule of components

Item	Description	
Separating element (SE)		
1.	Item name	Concrete floor
	Product name	150 mm thick concrete
	Density	2438 kg/m ³
	Installation	The concrete strips were cast on 15 July 2020 and stored at Warringtonfire Australia (WFA). The concrete strips were aligned as per the varying control joint sizes. The concrete strips were supported at the north and south edges by Parallel flange channels (PFC). Masonry anchors were used to fix the concrete strips to the PFC's.
SE	Size	1950 mm wide x 1900 mm high x 150 mm deep
	Restraint conditions	Restrained on all edges
Fire-stopping protections		
Sealant		
2.	Item name	Firesound sealant
	Product name	H B Fuller Firesound Original Grey - 3620062810
	Density	1497 kg/m ³
	Installation	The sealant was installed in the control joints as detailed in the various service descriptions below.
3.	Item name	FulaFlex FR sealant
	Product name	H B Fuller FulaFlex FR - 3620013240
	Density	1607 kg/m ³
	Installation	The sealant was installed in the control joints as detailed in the various service descriptions below.

Item	Description		
Backing rod			
4.	Item name	Open cell backing rod	
	Material	Polyurethane	
	Size	Control joint	Backing rod
		30 mm wide	40 mm wide x 20 mm deep
		50 mm wide	60 mm wide x 40 mm deep
		10 mm wide	15 mm wide x 15 mm deep
		20 mm wide	30 mm wide x 20 mm deep
Installation	The backing rods of varying sizes were installed in all the control joints as detailed in the various service descriptions below.		
Control joint A			
A	Control joint size	Nominally 1000 mm long x 30 mm wide, 15 mm deep.	
	Aperture size	30 mm x 1000 mm	
	Local fire-stopping protection		
	Protection	<p>40 mm wide x 20 mm deep open cell backing rod (item 4), was installed into the control joint at a depth of 15 mm from the separating element on both the unexposed and exposed sides.</p> <p>The Firesound sealant (item 2) was applied into the control joint to the depth of the backing rod and finished flush with the face of the separating element on both the unexposed and exposed sides.</p> <p>See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.</p>	
Control joint B			
B	Control joint size	Nominally 1000 mm long x 50 mm wide, 25 mm deep.	
	Aperture size	50 mm x 1000 mm	
	Local fire-stopping protection		
	Protection	<p>60 mm wide x 40 mm deep open cell backing rod (item 4), was installed into the control joint at a depth of 25 mm from the separating element on both the unexposed and exposed sides.</p> <p>The Firesound sealant (item 2) was applied into the control joint to the depth of the backing rod and finished flush with the face of the separating element on both the unexposed and exposed sides.</p> <p>See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.</p>	
Control joint C			
C	Control joint size	Nominally 1000 mm long x 10 mm wide, 10 mm deep.	
	Aperture size	10 mm x 1000 mm	
	Local fire-stopping protection		
	Protection	<p>15 mm wide x 15 mm deep open cell backing rod (item 4), was installed into the control joint at a depth of 10 mm from the separating element on both the unexposed and exposed sides.</p> <p>The FulaFlex FR sealant (item 3) was applied into the control joint to the depth of the backing rod and finished flush with the face of the separating element on both the unexposed and exposed sides.</p> <p>See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.</p>	

Item	Description	
Control joint D		
D	Control joint size	Nominally 1000 mm long x 20 mm wide, 10 mm deep.
	Aperture size	20 mm x 1000 mm
	Local fire-stopping protection	
	Protection	30 mm wide x 20 mm deep open cell backing rod (item 4), was installed into the control joint at a depth of 10 mm from the separating element on both the unexposed and exposed sides. The FulaFlex FR sealant (item 3) was applied into the control joint to the depth of the backing rod and finished flush with the face of the separating element on both the unexposed and exposed sides. See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.
Control joint E		
E	Control joint size	Nominally 1000 mm long x 30 mm wide, 15 mm deep.
	Aperture size	30 mm x 1000 mm
	Local fire-stopping protection	
	Protection	40 mm wide x 20 mm deep open cell backing rod (item 4), was installed into the control joint at a depth of 15 mm from the separating element on both the unexposed and exposed sides. The FulaFlex FR sealant (item 3) was applied into the control joint to the depth of the backing rod and finished flush with the face of the separating element on both the unexposed and exposed sides. See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.

2.2 Installation details

Table 6 lists the installation and orientation details for the test specimen.

Table 6 Installation and orientation details

Item	Detail
Start date for construction of separating element	15 July 2020
Start date of installation of fire-stopping protection of the control joints	28 July 2020
Completion date of for constructing and installing the test specimen	18 August 2020
Separating element constructed by	Representatives of Warringtonfire Australia
Fire-stopping protection of control joints installed by	Representatives of the test sponsor
Orientation	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 appropriate for control joints with the variations listed below.	
Variations	The pressure was up to 2 Pa below the limits prescribed in the standard during the 215-220 minute period. The pressure and temperature were within the limits for the rest of the test. Due to the nature of the specimen and the fact that no significant events occurred during this time period, this under pressure is unlikely to have invalidated the test result.	
Pre-test conditioning	The construction and installation of the test specimen was completed on 18 August 2020. 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.	
Ambient laboratory temperature	Start of the test	13 °C
	Minimum temperature	13 °C
	Maximum temperature	20 °C
Test duration	241 minutes	
Instrumentation and equipment	<p>The instrumentation was provided in accordance with AS 1530.4:2014 as follows:</p> <ul style="list-style-type: none"> • 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 x 0.2 mm thick copper discs covered by 30 mm x 30 mm x 2.0 mm thick inorganic insulating pads. • The thermocouple positions are shown in Table 10 and in Figure 4 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 at 150 mm below the underside of the slab and corrected to 100 mm below the underside of the slab. 	

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.

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	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 215 minutes	
B	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 213 minutes	
C	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 225 minutes	
D	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 218 minutes	
E	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 217 minutes	

The FRLs for the specimens are only applicable to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

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 Australia Pty Ltd or another registered 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 of the result.

Appendix A Drawings of test assembly

The drawings of the test assembly were prepared by Warringtonfire Australia. The leaders in the drawings represent the items listed in section 2.1. All measurements – unless indicated – are in millimetres.

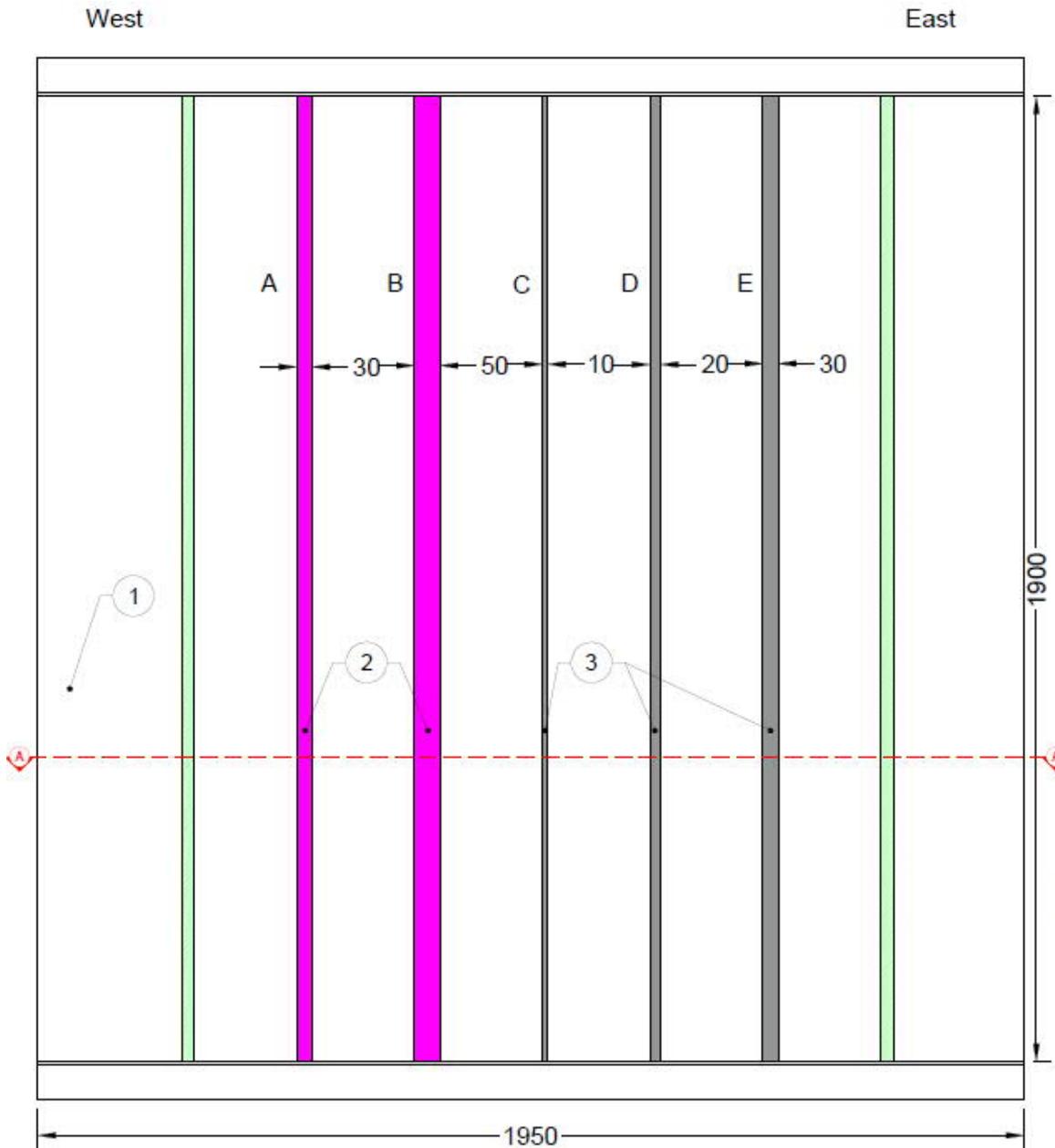


Figure 1 Elevation view of test specimen (unexposed side)

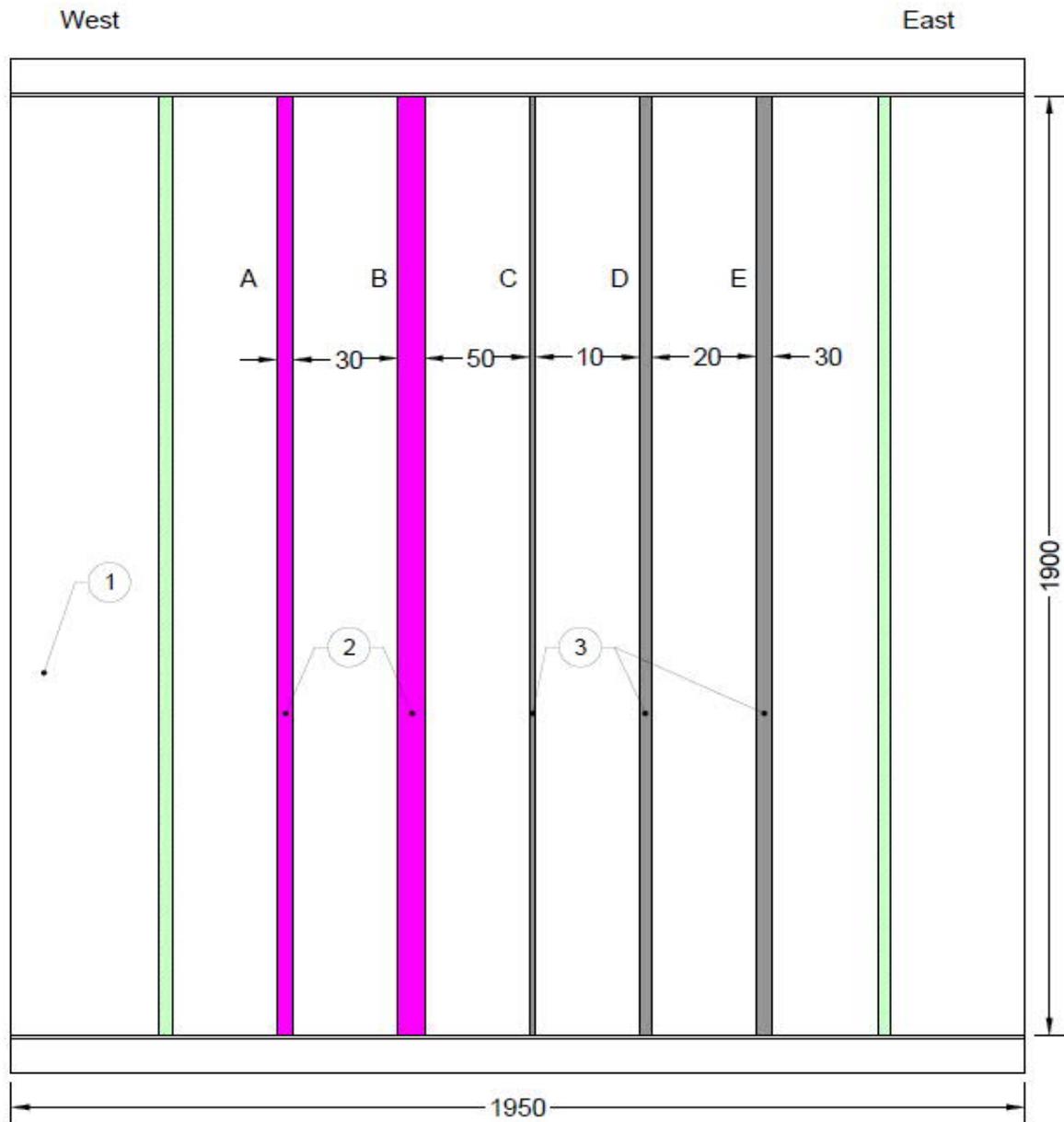


Figure 2 Elevation view of test specimen (exposed side)

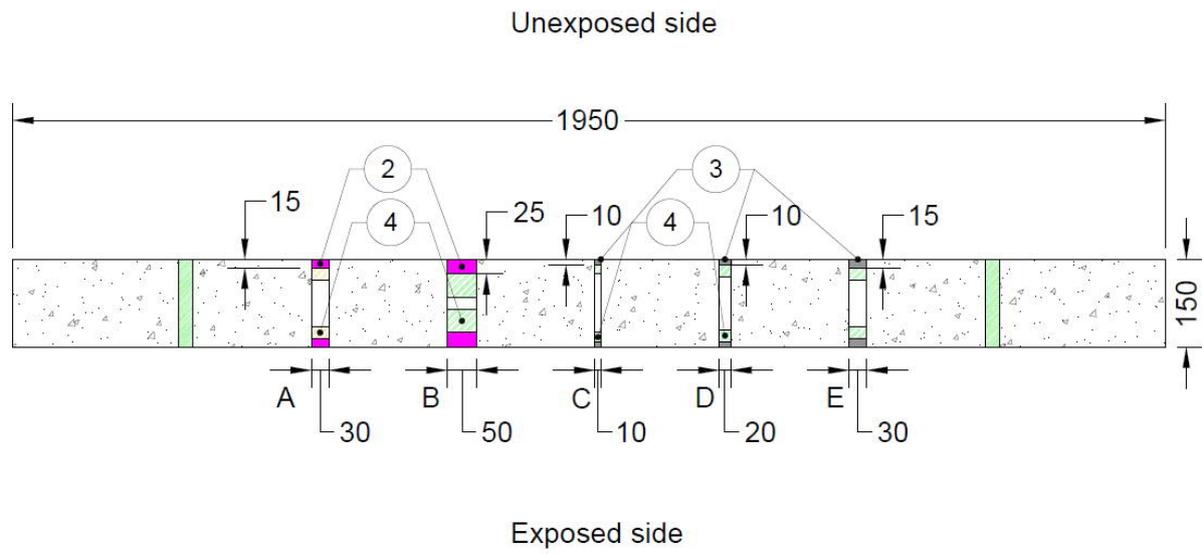


Figure 3 Cross-section A-A

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		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 13°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.
60	20	The separating element seems deformed towards the furnace side from the centre of specimen.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
126	40	The sealant seems expanded and bulged towards unexposed side.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
204	12	The sealant seems expanded and bulged more towards unexposed side.
204	55	Cracks appeared on the surface of sealant and at the interface of sealant to the separating element.
215	20	TC017 located on the separating element, 375 mm south from the centre of the control joint and 25 mm from the east edge of the control joint 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 TC017 exceeded the initial temperature by more than 180 K.
240	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
241	00	Test stopped.
Control joint B		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 13°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.

Time		Observation
Min	Sec	
60	20	The separating element seems deformed towards the furnace side from the centre of specimen.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
132	50	The sealant seems expanded and bulged towards unexposed side.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
204	12	The sealant seems expanded and bulged more towards unexposed side.
204	55	Cracks appeared on the surface of sealant and at the interface of sealant to the separating element.
210	00	Smoke rising from the cracks on the sealant.
213	10	TC025 located on the separating element, 125 mm north from the centre of the control joint and 25 mm from the east edge of the control joint 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 TC025 exceeded the initial temperature by more than 180 K.
240	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
241	00	Test stopped.
Control joint C		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 13°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.
60	10	The sealant seems expanded and bulged more towards unexposed side.
60	20	The separating element seems deformed towards the furnace side from the centre of specimen.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
110	00	The sealant seems expanded and bulged more towards unexposed side.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
123	00	Cracks appeared at the interface of sealant to the separating element.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
204	55	Cracks appeared on the surface of sealant.

Time		Observation
Min	Sec	
225	40	TC035 located on the separating element, 125 mm north from the centre of the control joint and 25 mm from the east edge of the control joint 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 TC035 exceeded the initial temperature by more than 180 K.
240	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
241	00	Test stopped.
Control joint D		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 13°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.
60	20	The separating element seems deformed towards the furnace side from the centre of specimen.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
110	00	The sealant seems expanded and bulged more towards unexposed side.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
123	00	Cracks appeared at the interface of sealant to the separating element.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
204	55	Cracks appeared on the surface of sealant.
210	00	Smoke rising from the cracks on the sealant.
218	45	TC046 located on the separating element, 125 mm south from the centre of the control joint and 25 mm from the west edge of the control joint 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 TC046 exceeded the initial temperature by more than 180 K.
240	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
241	00	Test stopped.
Control joint E		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 13°C.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
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.
60	20	The separating element seems deformed towards the furnace side from the centre of specimen.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
110	00	The sealant seems expanded and bulged more towards unexposed side.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
204	55	Cracks appeared on the surface of sealant and at the interface of sealant to separating element.
210	00	Smoke rising from the cracks on the sealant.
217	15	TC054 located on the separating element, 375 mm north from the centre of the control joint and 25 mm from the west edge of the control joint 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 TC054 exceeded the initial temperature by more than 180 K.
240	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
241	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 $\pm 15\%$ 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.

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.

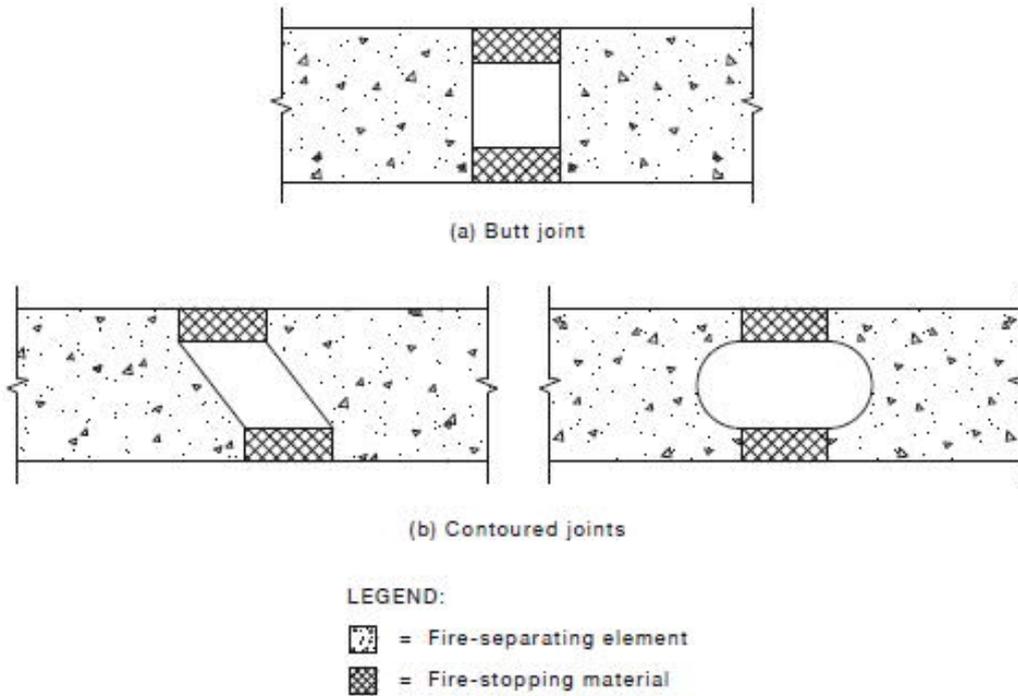


FIGURE 10.12.6 CONTOURED CONTROL JOINTS

Appendix D Instrumentation locations

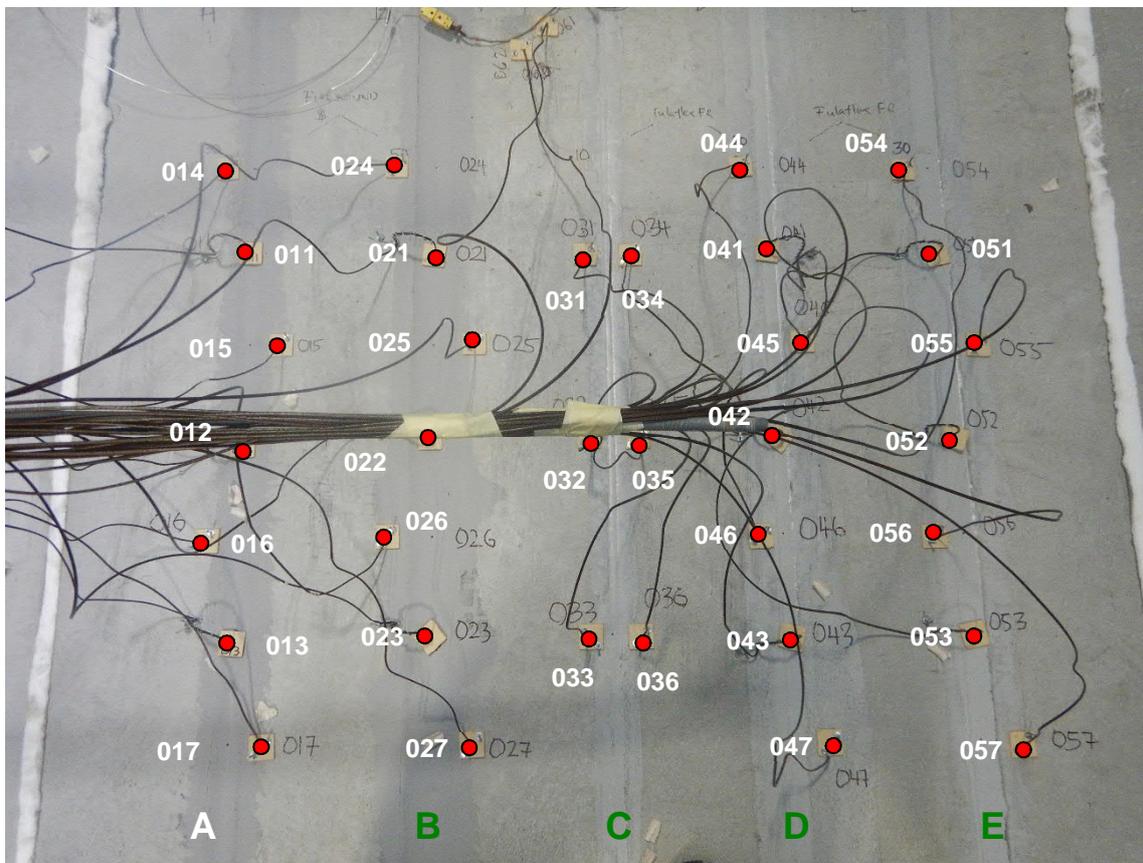


Figure 4 Unexposed side thermocouples

Table 10 Thermocouple locations

Control joint	T/C #	Description
A	011	On control joint, 250 mm north from the centre.
	012	On control joint, at the centre
	013	On control joint, 250 mm south from the centre.
	014	On the separating element, 25 mm from the west edge of the control joint and 375 mm north from the centre
	015	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre
	016	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre
	017	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre
B	021	On control joint, 250 mm north from the centre.
	022	On control joint, at the centre
	023	On control joint, 250 mm south from the centre.

Control joint	T/C #	Description
	024	On the separating element, 25 mm from the west edge of the control joint and 375 mm north from the centre
	025	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre
	026	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre
	027	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre
C	031	On the separating element, 25 mm from the west edge of the control joint and 250 mm north from the centre of the control joint.
	032	On the separating element, 25 mm from the west edge of the control joint at the centre of the control joint.
	033	On the separating element, 25 mm from the west edge of the control joint and 250 mm south from the centre of the control joint.
	034	On the separating element, 25 mm from the east edge of the control joint and 250 mm north from the centre of the control joint.
	035	On the separating element, 25 mm from the east edge of the control joint at the centre of the control joint.
	036	On the separating element, 25 mm from the east edge of the control joint and 250 mm south from the centre of the control joint.
D	041	On control joint, 250 mm north from the centre.
	042	On control joint, at the centre
	043	On control joint, 250 mm south from the centre.
	044	On the separating element, 25 mm from the west edge of the control joint and 375 mm north from the centre
	045	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre
	046	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre
	047	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre
E	051	On control joint, 250 mm north from the centre.
	052	On control joint, at the centre
	053	On control joint, 250 mm south from the centre.
	054	On the separating element, 25 mm from the west edge of the control joint and 375 mm north from the centre
	055	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre
	056	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre
	057	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre

Appendix E Test data

E.1 Furnace temperature and severity

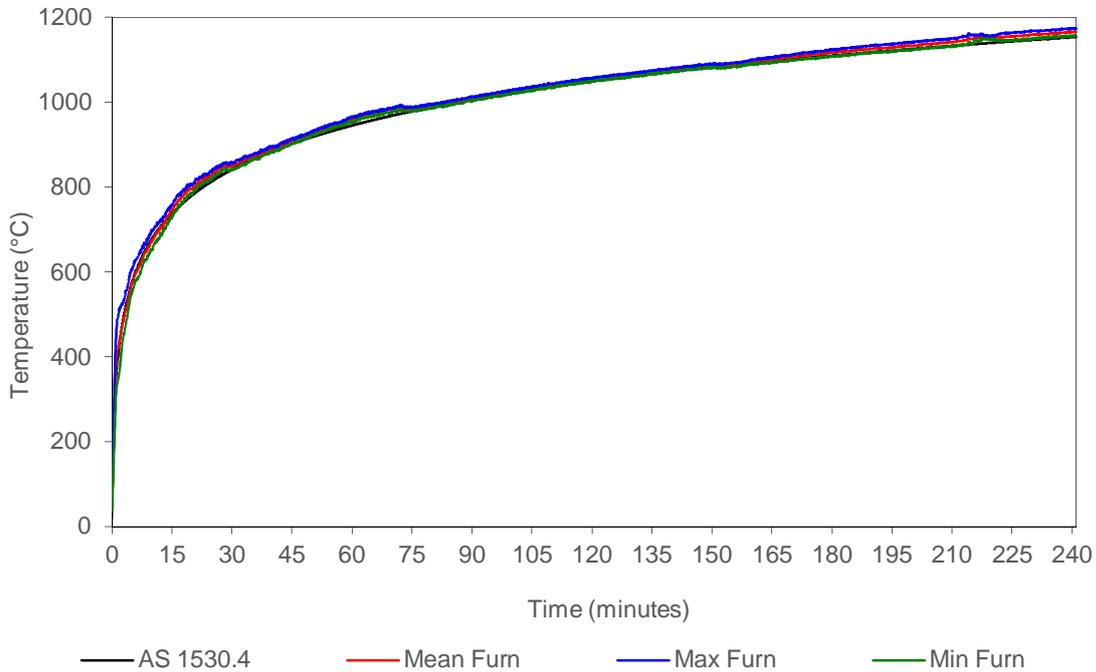


Figure 5 Furnace thermocouple temperature vs time

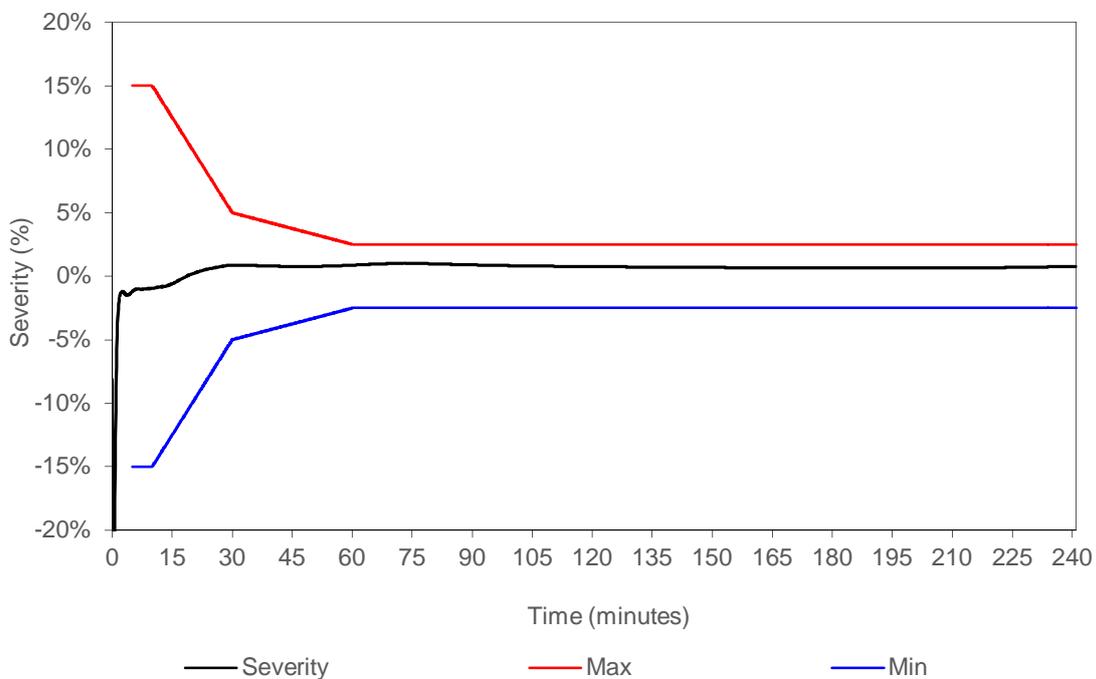


Figure 6 The percentage deviation of exposure severity vs time

E.2 Furnace pressure

The furnace pressure was measured at approximately at 150 mm below the underside of the slab and corrected to 100 mm below the underside of the slab.

Table 11 Furnace pressure

Time (minutes)	Average pressure (Pa)	Time (minutes)	Average pressure (Pa)	Time (minutes)	Average pressure (Pa)
5-10	22	85-90	20	165-170	20
10-15	22	90-95	20	170-175	22
15-20	21	95-100	21	175-180	22
20-25	20	100-105	20	180-185	22
25-30	21	105-110	21	185-190	22
30-35	21	110-115	20	190-195	21
35-40	20	115-120	21	195-200	21
40-45	20	120-125	20	200-205	21
45-50	19	125-130	20	205-210	21
50-55	21	130-135	20	210-215	18
55-60	20	135-140	20	215-220	15
60-65	20	140-145	20	220-225	19
65-70	20	145-150	20	225-230	19
70-75	19	150-155	20	230-235	20
75-80	20	155-160	20	235-240	21
80-85	20	160-165	19		

E.3 Specimen temperatures

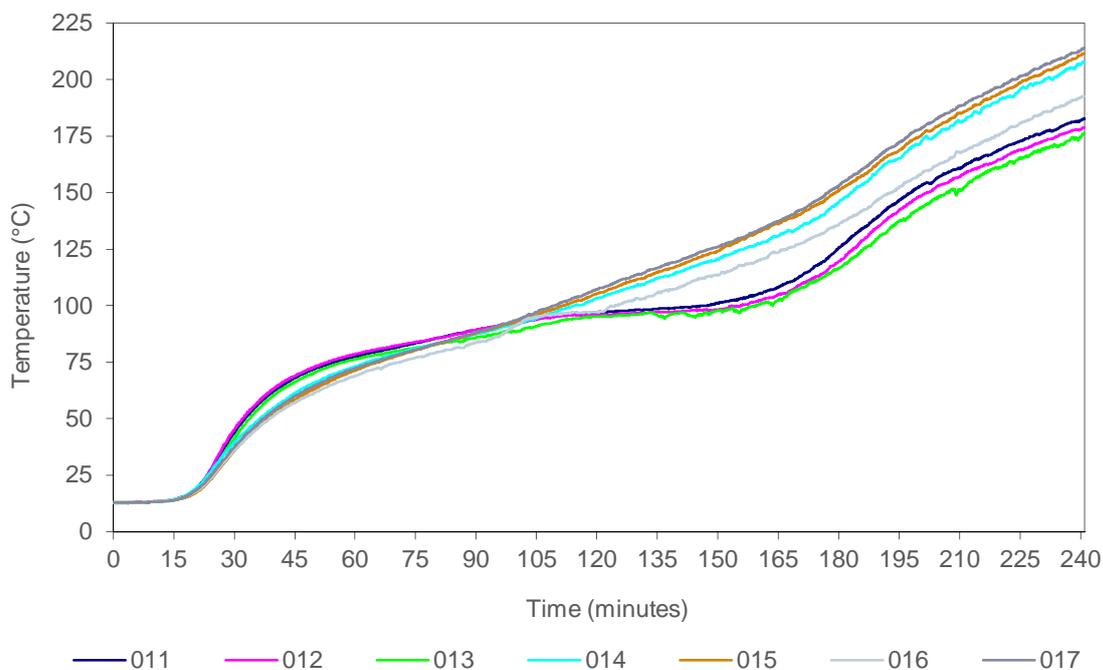


Figure 7 Control joint A– temperature vs time

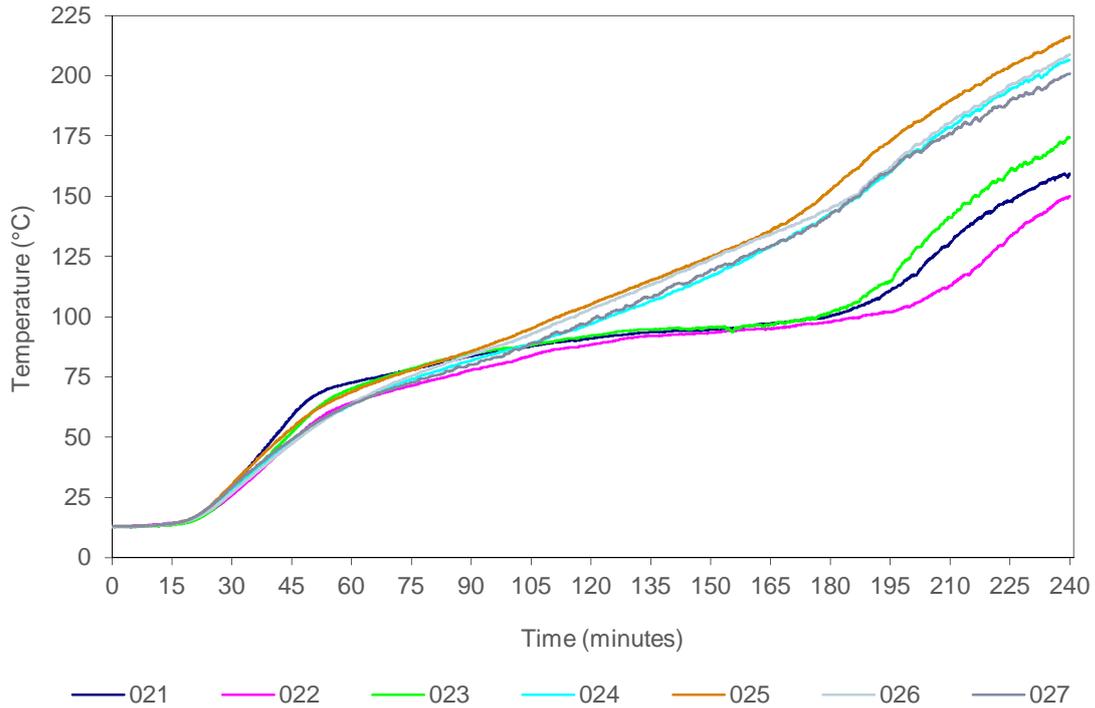


Figure 8 Control joint B- temperature vs time

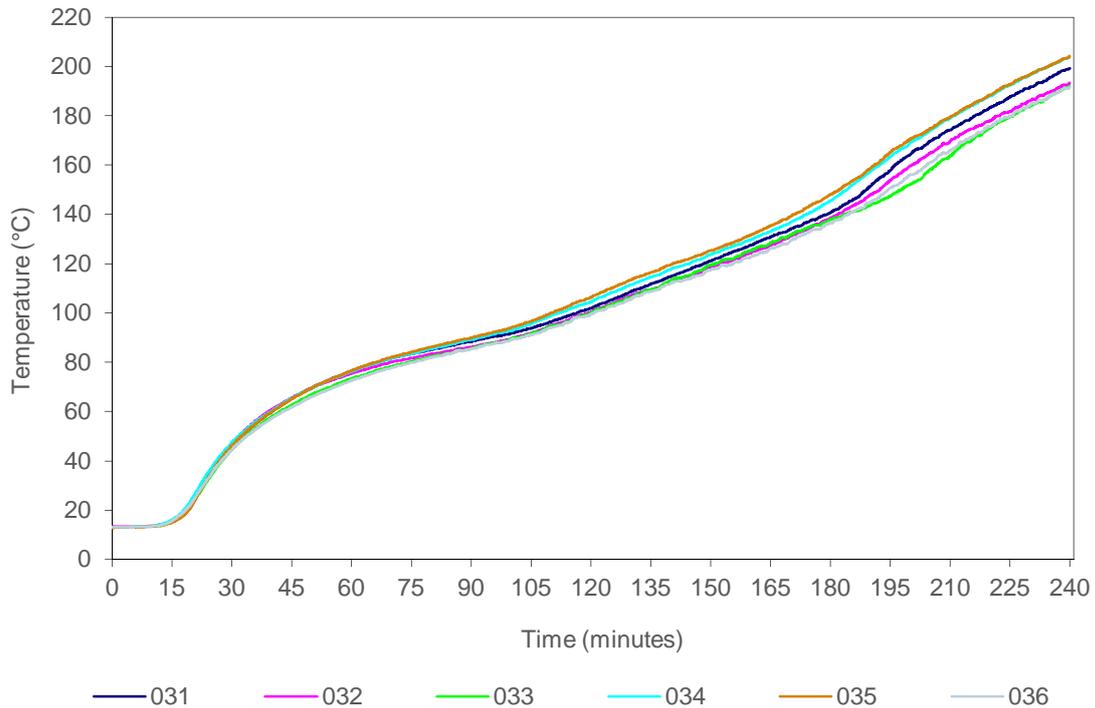


Figure 9 Control joint C- temperature vs time

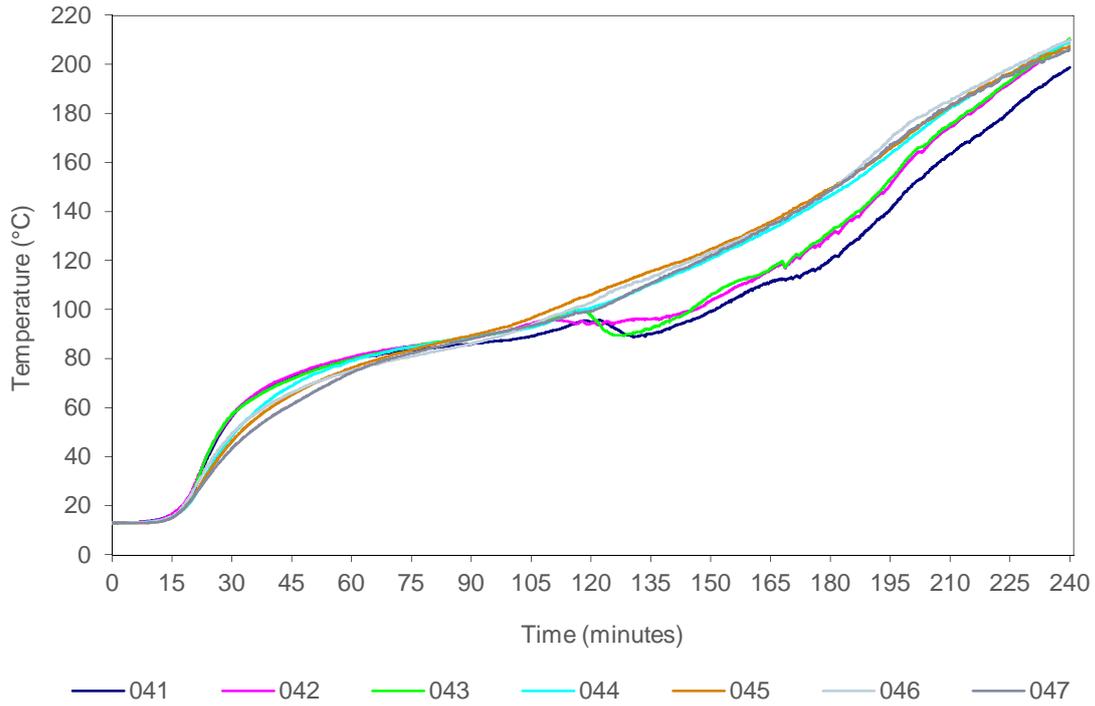


Figure 10 Control joint D- temperature vs time

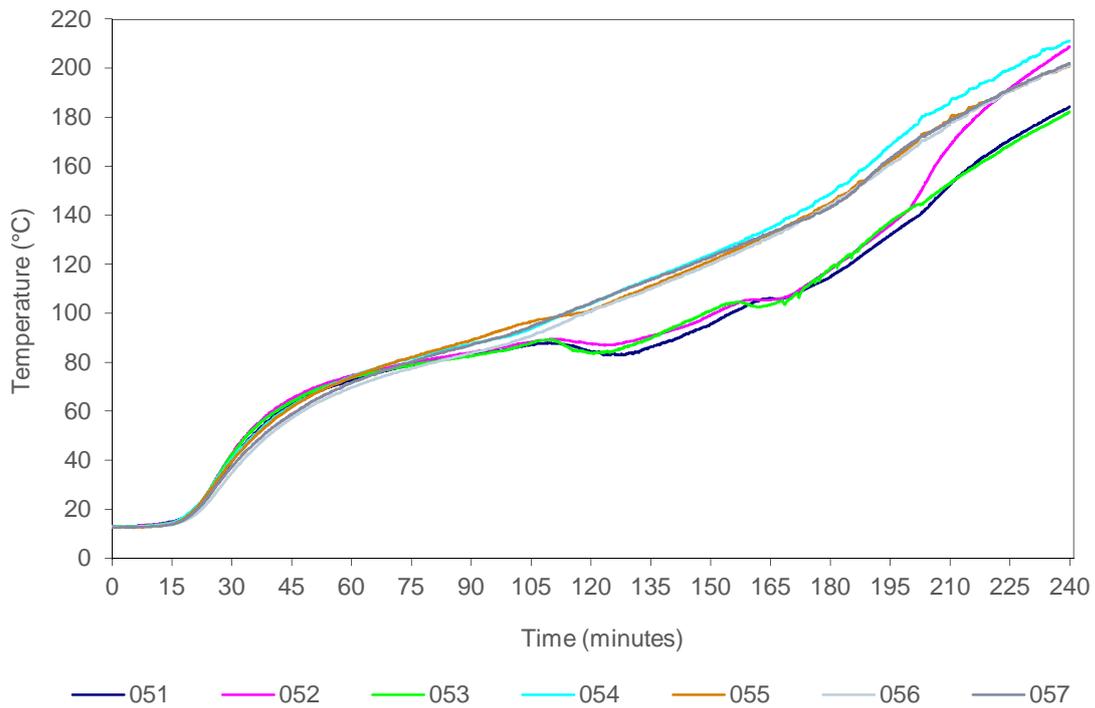


Figure 11 Control joint E- temperature vs time

Table 12 Test specimen temperatures

Control joint	T/C #	Description ¹	Temp (°C) at t (minutes)					Limit ² (minutes)
			t=0	t=60	t=120	t=180	t=240	
A	011	On control joint.	13	78	97	126	182	-
	012	On control joint.	13	79	96	120	178	-
	013	On control joint.	13	76	95	117	175	-
	014	25 mm from the west edge of the control joint.	13	73	103	146	207	222
	015	25 mm from the east edge of the control joint.	13	71	105	151	211	218
	016	25 mm from the west edge of the control joint.	13	69	97	136	192	-
	017	25 mm from the east edge of the control joint.	13	72	107	153	213	215
B	021	On control joint.	13	73	91	100	159	-
	022	On control joint.	13	64	88	98	150	-
	023	On control joint.	13	70	92	102	174	-
	024	25 mm from the west edge of the control joint.	13	64	97	143	207	224
	025	25 mm from the east edge of the control joint.	13	69	105	153	216	213
	026	25 mm from the west edge of the control joint.	13	64	103	145	209	222
	027	25 mm from the east edge of the control joint.	13	64	99	143	201	228
C	031	25 mm from the west edge of the control joint.	13	77	102	141	199	231
	032	25 mm from the west edge of the control joint.	13	76	101	138	193	239
	033	25 mm from the west edge of the control joint.	13	73	100	138	192	-
	034	25 mm from the east edge of the control joint.	13	76	105	146	204	226
	035	25 mm from the east edge of the control joint.	13	77	107	148	204	225
	036	25 mm from the east edge of the control joint.	13	73	100	137	192	-
D	041	On control joint.	13	80	95	120	199	234
	042	On control joint.	13	81	95	130	210	225
	043	On control joint.	13	80	98	132	211	224
	044	25 mm from the west edge of the control joint.	13	79	101	146	209	221
	045	25 mm from the east edge of the control joint.	13	76	106	149	207	221
	046	25 mm from the west edge of the control joint.	13	75	103	149	210	218
	047	25 mm from the east edge of the control joint.	13	74	99	149	206	221

Control joint	T/C #	Description ¹	Temp (°C) at t (minutes)					Limit ² (minutes)
			t=0	t=60	t=120	t=180	t=240	
E	051	On control joint.	13	73	84	115	184	-
	052	On control joint.	13	75	88	118	209	226
	053	On control joint.	13	74	84	118	182	-
	054	25 mm from the west edge of the control joint.	13	74	104	149	211	217
	055	25 mm from the east edge of the control joint.	13	74	101	145	201	227
	056	25 mm from the west edge of the control joint.	13	70	101	144	201	227
	057	25 mm from the east edge of the control joint.	13	72	104	143	202	227

- Note:**
- ¹ Refer to Table 10 for 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.
 - ³ 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

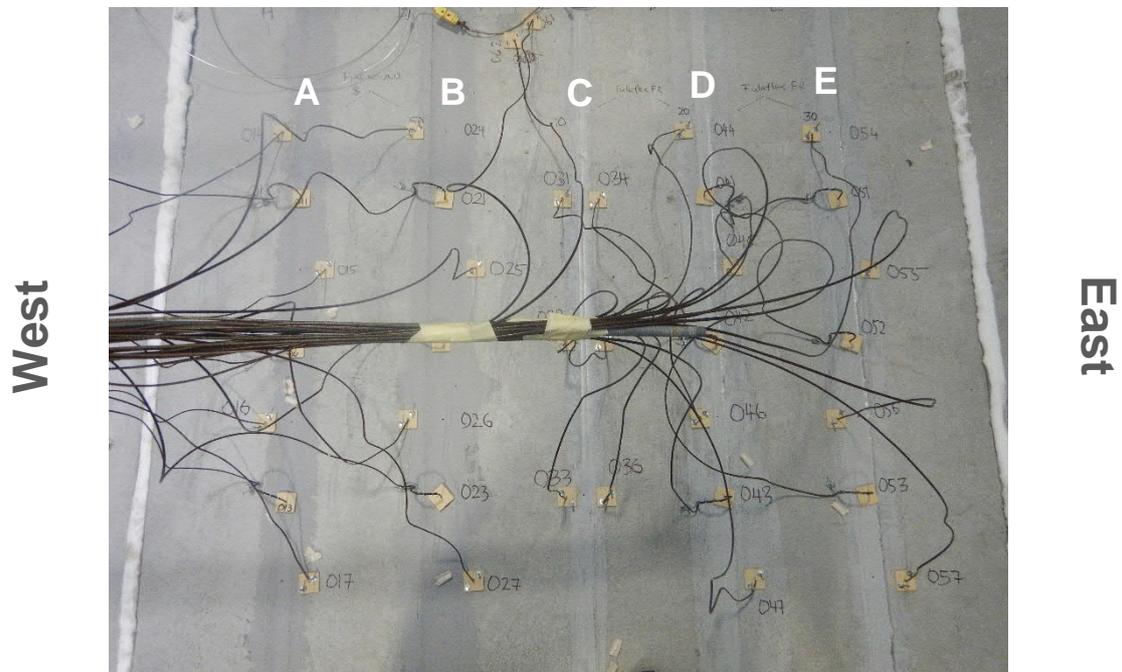


Figure 12 Unexposed face of the specimen before the start of the test



Figure 13 Exposed face of the specimen before the start of the test

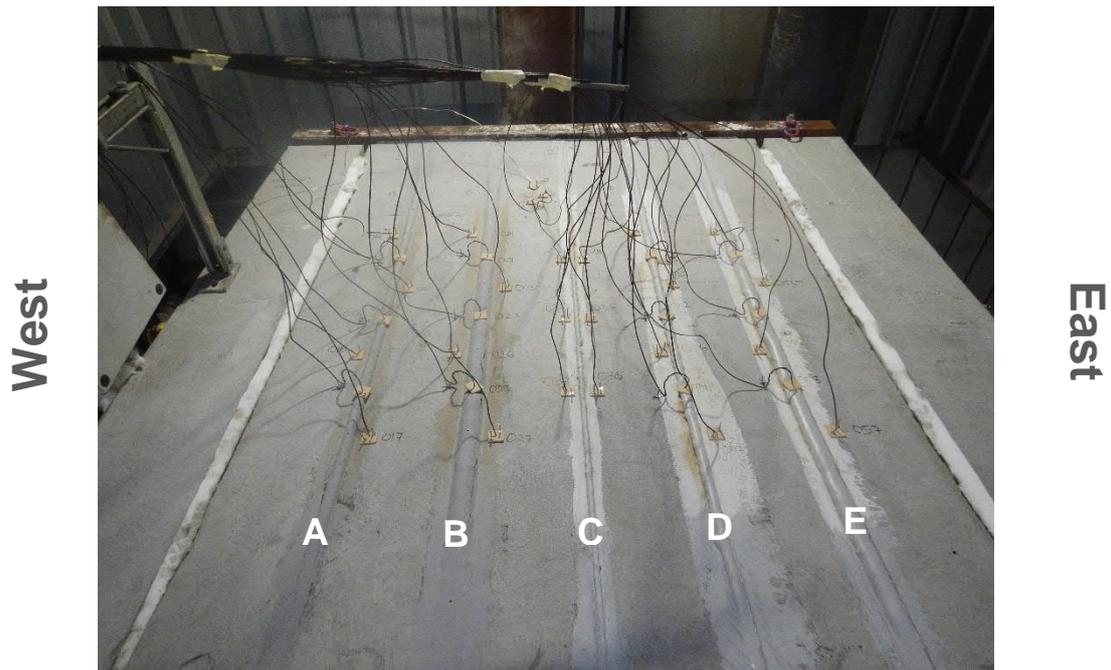


Figure 14 Unexposed face of the specimen at the end of the test

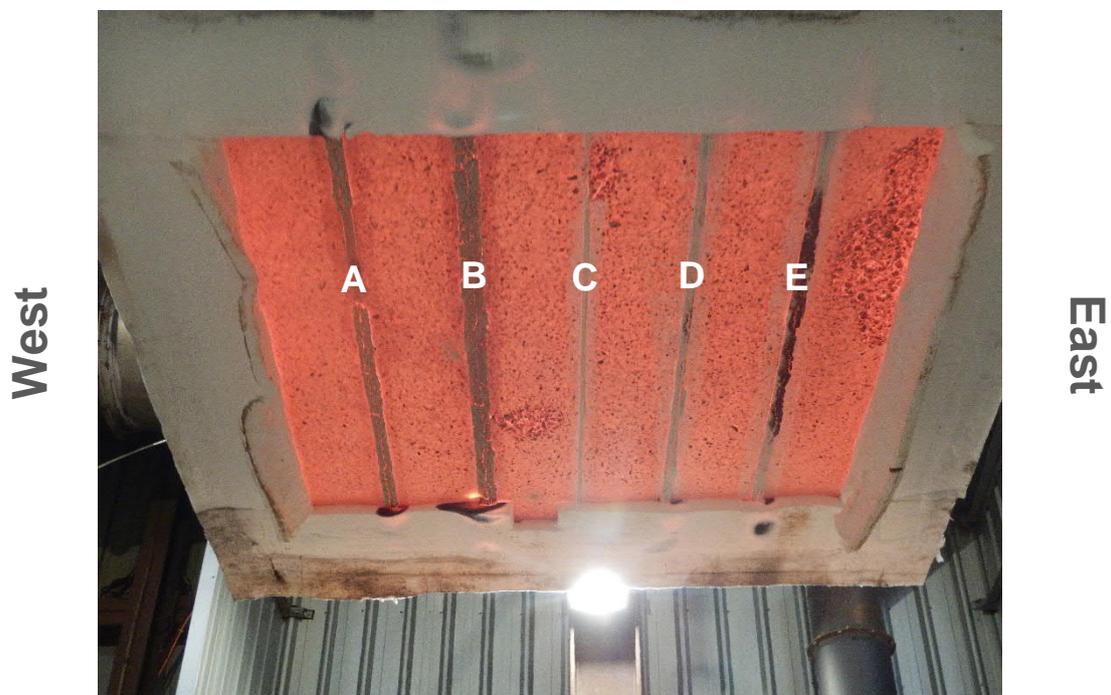


Figure 15 Exposed face of the specimen at the end of the test

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