



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 Firesound Original Grey




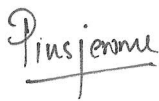


Job number: FRT200212

Test date: 26 August 2020 Revision: R1.1

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
			Pius Jerome	Masis Altun	Mandeep Kamal
					
R1.1	22 September 2020	Description	Amendment to the specimen.		
		Name Signature	Prepared by	Reviewed by	Authorised by
			Pius Jerome	Mandeep Kamal	Mandeep Kamal
					

Executive summary

This report documents the findings of the fire resistance test of control joints undertaken on 26 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 tested	Six	
Number of control joints reported	Three	
Restraint conditions	Restrained on all edges	

Table 2 Test specimen

Control joint	Service	Local fire-stopping protection	Aperture size (mm)	Sealant depth (mm)
A	Control Joint	H B Fuller Firesound Original Grey - 3620062810	35 x 1000	25 mm on the unexposed side only
B	Control Joint	H B Fuller Firesound Original Grey - 3620062810	20 x 1000	15 mm on the unexposed side only
C	Control Joint	H B Fuller Firesound Original Grey - 3620062810	10 x 1000	10 mm on the unexposed side only

Table 3 Test results

Control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	-/240/90
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 105 minutes	
B	Structural adequacy	Not applicable	-/240/120
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 124 minutes	
C	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 183 minutes	

Note:

- 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 26 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 were measured by Warringtonfire Australia – 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
	Concrete wall
	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
	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.	
Backing rod	
3.	Item name
	Open cell backing rod
	Material
	Polyurethane
Size	Control joint
	Backing rod
35 mm wide	40 mm wide x 20 mm deep

Item	Description		
		20 mm wide	30 mm wide × 20 mm deep
		10 mm wide	15 mm wide × 15 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 × 35 mm wide, 25 mm deep. Backing rod and sealant applied on the unexposed side only.	
	Aperture size	35 mm × 1000 mm	
	Local fire-stopping protection		
	Protection	40 mm wide × 20 mm deep open cell backing rod (item 3), was installed into the control joint at a depth of 25 mm from the unexposed side. The sealant (item 2) was applied into the control joint to the depth of the backing rod and finished flush with the unexposed face of the separating element only. See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.	
Control joint B			
B	Control joint size	Nominally 1000 mm long × 20 mm wide, 15 mm deep. Backing rod and sealant applied on the unexposed side only.	
	Aperture size	20 mm × 1000 mm	
	Local fire-stopping protection		
	Protection	30 mm wide × 20 mm deep open cell backing rod (item 3), was installed into the control joint at a depth of 15 mm from the unexposed side. The sealant (item 2) was applied into the control joint to the depth of the backing rod and finished flush with the unexposed face of the separating element only. See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.	
Control joint C			
C	Control joint size	Nominally 1000 mm long × 10 mm wide, 10 mm deep. Backing rod and sealant applied on the unexposed side only.	
	Aperture size	10 mm × 1000 mm	
	Local fire-stopping protection		
	Protection	15 mm wide × 15 mm deep open cell backing rod (item 3), was installed into the control joint at a depth of 10 mm from the unexposed side. The sealant (item 2) was applied into the control joint to the depth of the backing rod and finished flush with the unexposed face of the separating element only. See Figure 1, Figure 2 and Figure 3 in Appendix A for more details.	

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	15 July 2020
Start date of installation of fire-stopping protection of the control joints	28 July 2020
Completion date of constructing and installing the test specimen	18 August 2020
Separating element constructed by	Representatives of Warringtonfire
Fire-stopping protection of control joints installed by	Representatives of the test sponsor
Orientation	Asymmetrical, due to the backing rods and sealant installed on the unexposed side only for control joints A, B and C.

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.	
Variations	None	
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	14 °C
	Minimum temperature	14 °C
	Maximum temperature	22 °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 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	-/240/90
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 105 minutes	
B	Structural adequacy	Not applicable	-/240/120
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 124 minutes	
C	Structural adequacy	Not applicable	-/240/180
	Integrity	No failure at 241 minutes	
	Insulation	Failure at 183 minutes	

Note:

- 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.

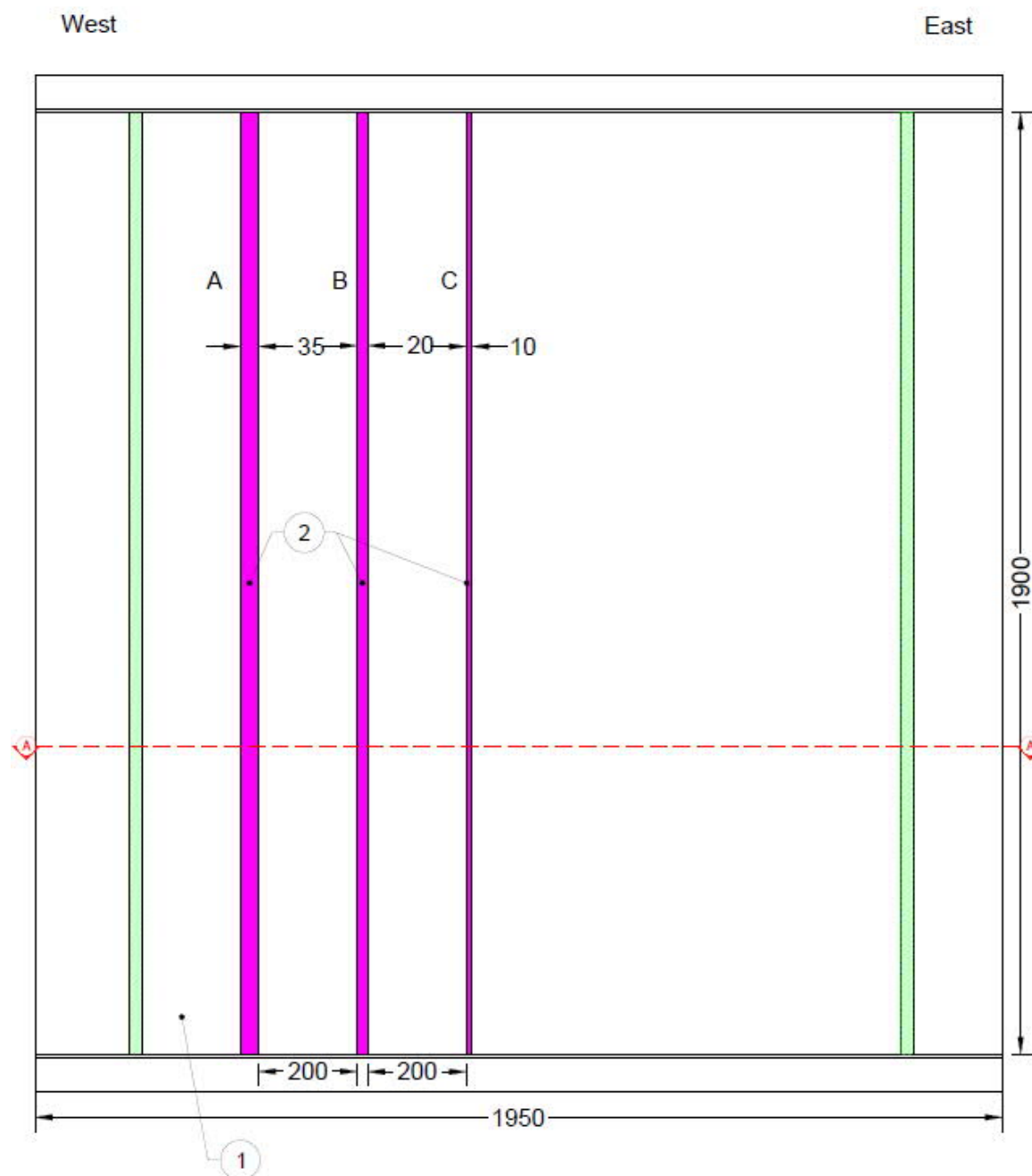


Figure 1 Elevation view of test specimen (unexposed side)

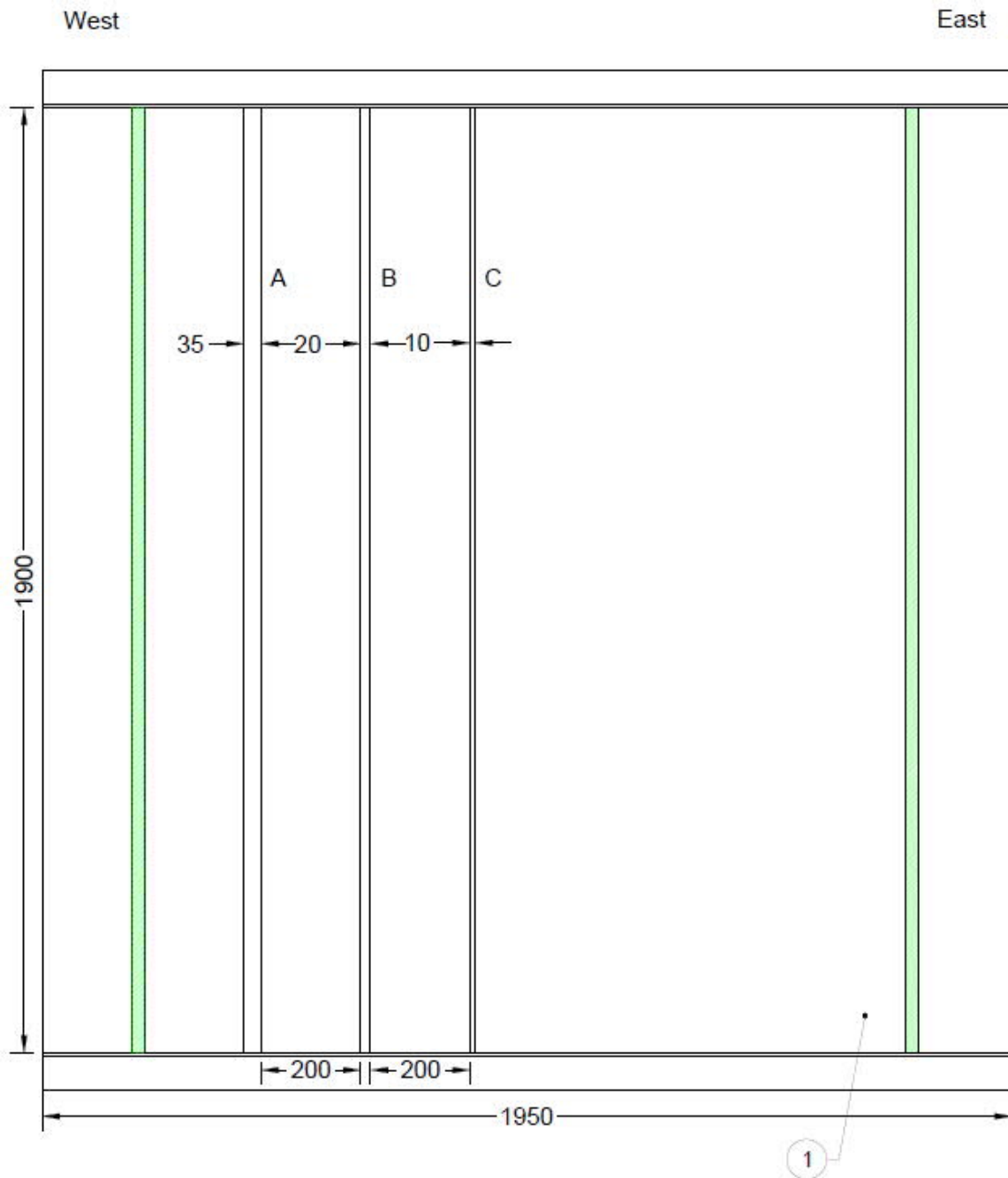


Figure 2 Elevation view of test specimen (exposed side)

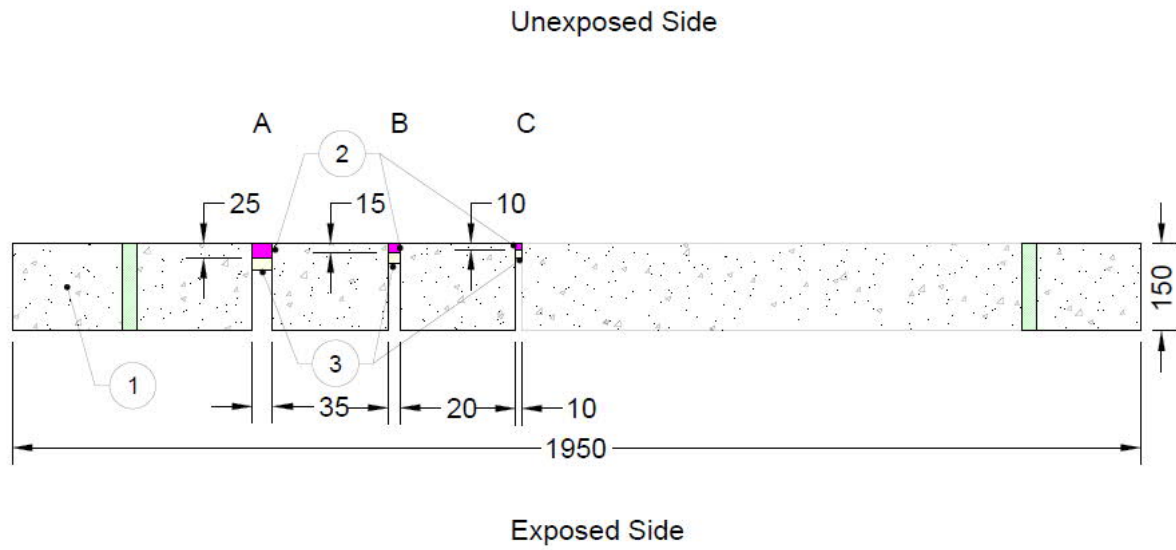


Figure 3 Cross-section A-A

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 14°C.
08	56	Pop up sound heard from the specimen.
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.
52	00	The sealant had expanded and bulged towards the unexposed side.
55	00	Cracks appeared at the interface of sealant to the separating element.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
105	05	TC013 located on the control joint, 250 mm south 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 TC013 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.
180	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
181	00	Discoloration on the separating element near the control joints.
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 14°C.
08	56	Pop up sound heard from the specimen.
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.
70	00	The sealant had expanded and bulged towards unexposed side.

Time		Observation
Min	Sec	
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
115	00	Cracks appeared at the interface of sealant to the separating element.
120	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
124	05	TC021 located on the control joint, 250 mm north 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 TC021 exceeded the initial temperature by more than 180 K.
180	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
181	00	Discoloration on the separating element near the control joints.
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 14°C.
08	56	Pop up sound heard from the specimen.
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.
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.
180	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
183	05	TC034 located on the separating element, 250 mm north from the centre on the control joint and 25 mm from the east edge of the control joint 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 TC034 exceeded the initial temperature by more than 180 K.
181	00	Discoloration on the separating element near the control joints.
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.

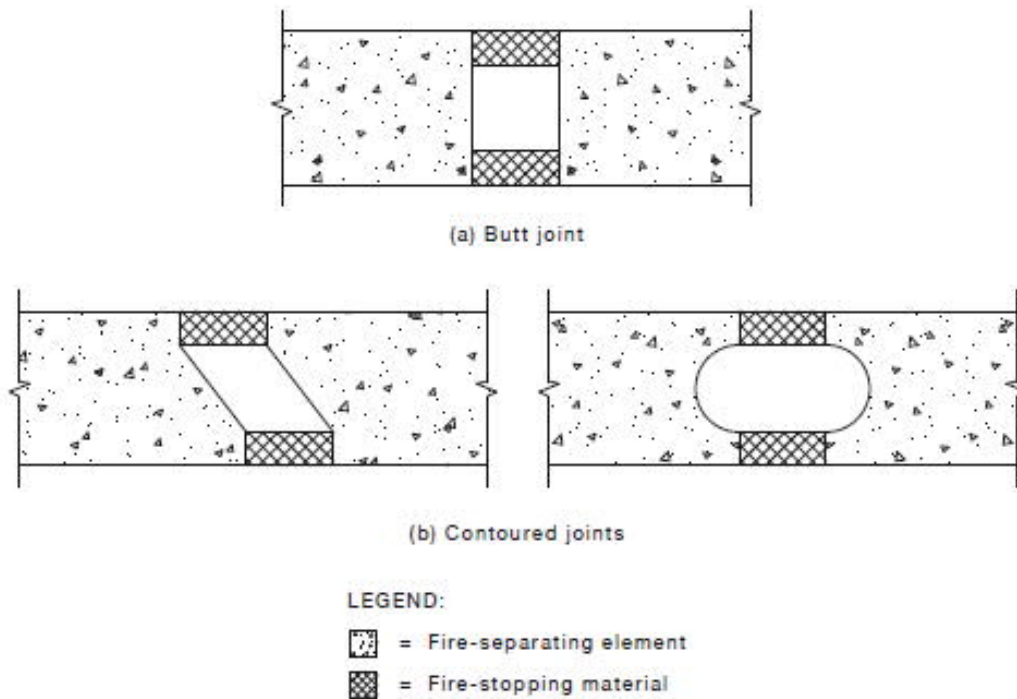


FIGURE 10.12.6 CONTOURED CONTROL JOINTS

Appendix D Instrumentation locations

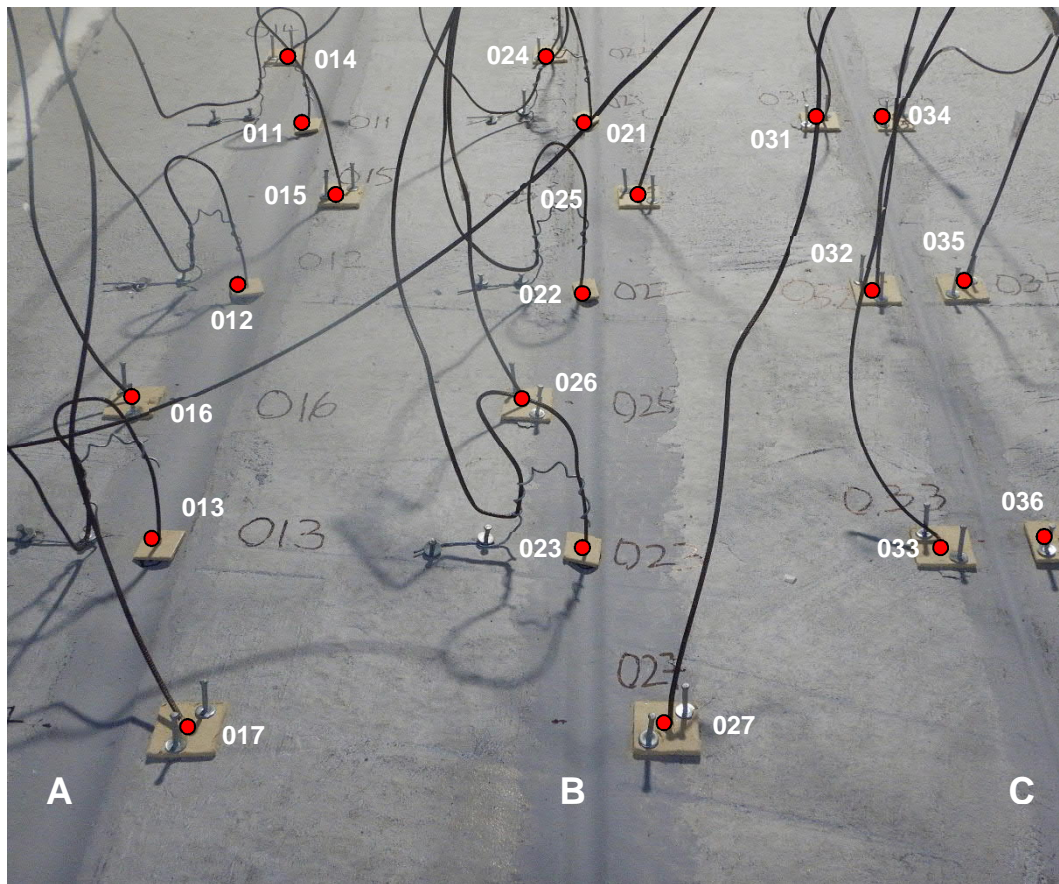


Figure 4 Unexposed side thermocouples – Control joints A, B and C

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 of the control joint.
	015	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre of the control joint.
	016	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre of the control joint.
	017	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre of the control joint.
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.
	024	On the separating element, 25 mm from the west edge of the control joint and 375 mm north from the centre of the control joint.
	025	On the separating element, 25 mm from the east edge of the control joint and 125 mm north from the centre of the control joint.
	026	On the separating element, 25 mm from the west edge of the control joint and 125 mm south from the centre of the control joint.
	027	On the separating element, 25 mm from the east edge of the control joint and 375 mm south from the centre of the control joint.
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.

Appendix E Test data

E.1 Furnace temperature and severity

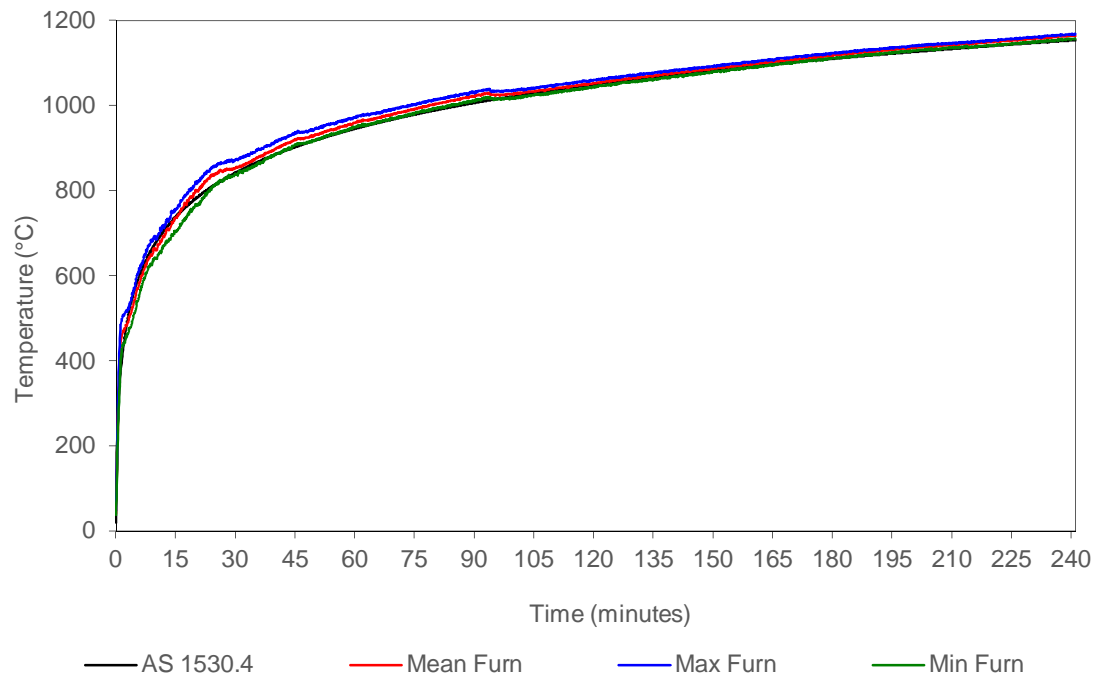


Figure 5 Furnace thermocouple temperature vs time

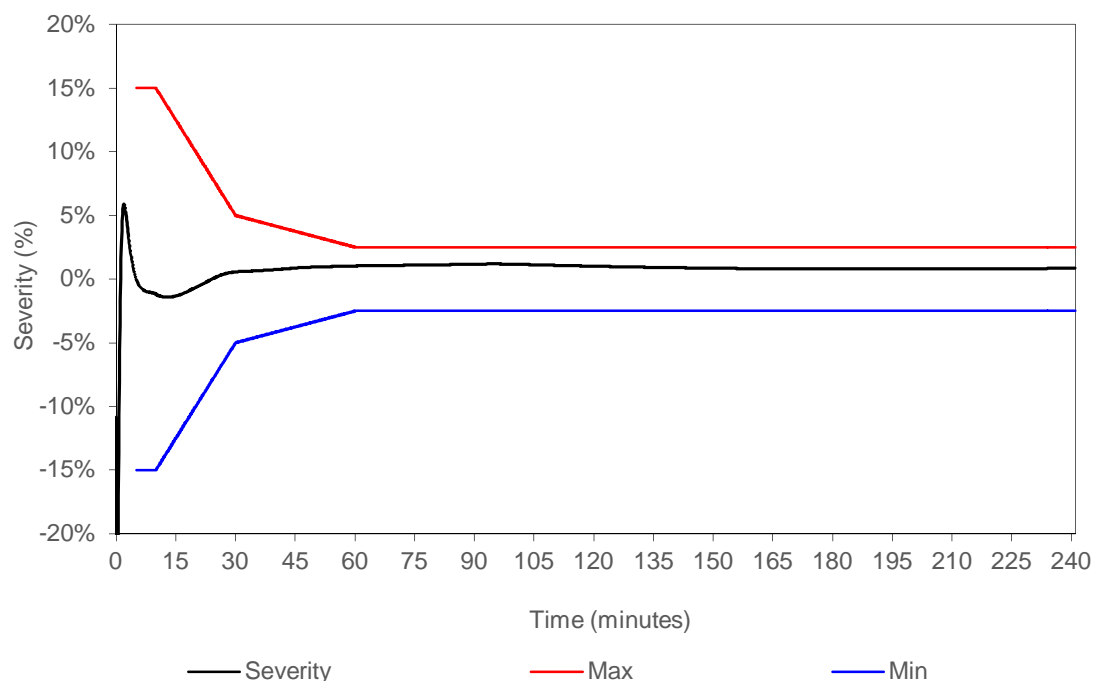


Figure 6 The percentage deviation of exposure severity vs time

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	20	85-90	21	165-170	21
10-15	20	90-95	21	170-175	21
15-20	20	95-100	19	175-180	21
20-25	17	100-105	20	180-185	21
25-30	21	105-110	19	185-190	20
30-35	19	110-115	20	190-195	19
35-40	20	115-120	20	195-200	19
40-45	20	120-125	20	200-205	19
45-50	20	125-130	21	205-210	20
50-55	20	130-135	21	210-215	20
55-60	21	135-140	21	215-220	20
60-65	20	140-145	20	220-225	20
65-70	20	145-150	20	225-230	20
70-75	20	150-155	20	230-235	21
75-80	20	155-160	20	235-240	21
80-85	21	160-165	21		

E.3 Specimen temperatures

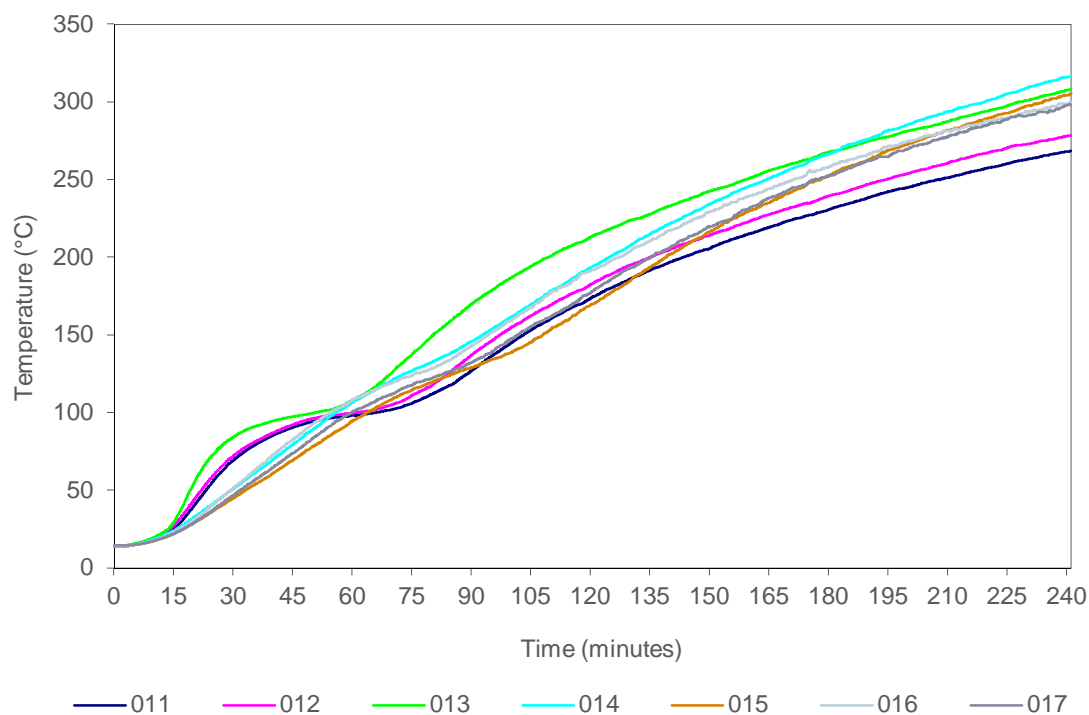


Figure 7 Control joint A– temperature vs time

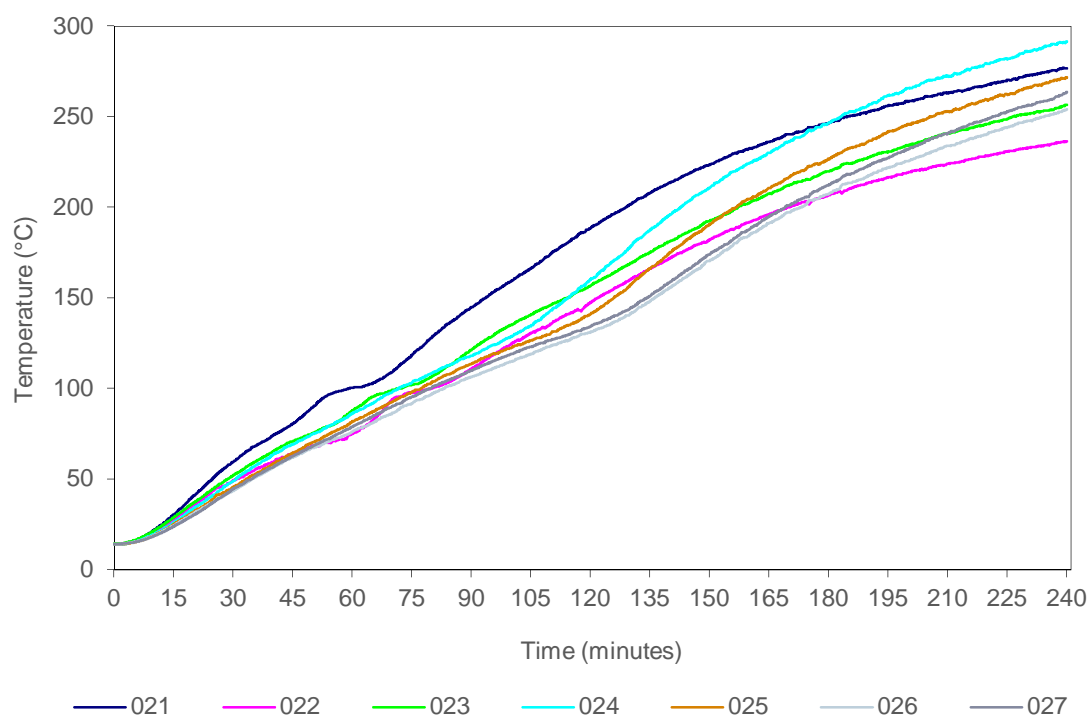


Figure 8 Control joint B– temperature vs time

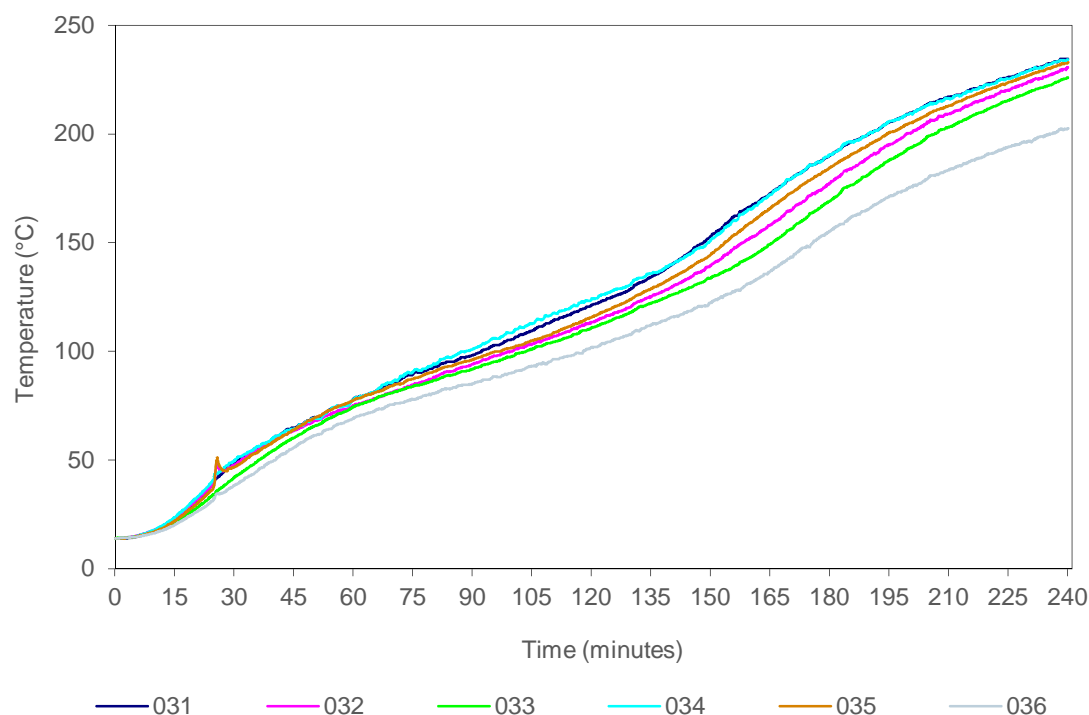


Figure 9 Control joint C– temperature vs time

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.	14	98	174	231	268	137
	012	On control joint.	14	100	182	239	278	129
	013	On control joint.	14	108	213	268	308	105
	014	25 mm from the west edge of the control joint.	14	107	193	266	316	120
	015	25 mm from the east edge of the control joint.	14	94	169	252	304	135
	016	25 mm from the west edge of the control joint.	14	108	191	258	299	122
	017	25 mm from the east edge of the control joint.	14	100	177	252	298	131
B	021	On control joint.	14	100	189	246	276	124
	022	On control joint.	14	75	147	207	236	162
	023	On control joint.	14	88	157	220	257	152
	024	25 mm from the west edge of the control joint.	14	86	160	246	291	139
	025	25 mm from the east edge of the control joint.	14	82	141	227	272	152
	026	25 mm from the west edge of the control joint.	14	76	131	208	254	167

Control joint	T/C #	Description ¹	Temp (°C) at t (minutes)					Limit ² (minutes)
			t=0	t=60	t=120	t=180	t=240	
	027	25 mm from the east edge of the control joint.	14	79	134	213	264	164
C	031	25 mm from the west edge of the control joint.	14	78	121	190	235	183
	032	25 mm from the west edge of the control joint.	14	75	114	177	231	193
	033	25 mm from the west edge of the control joint.	14	74	111	169	226	201
	034	25 mm from the east edge of the control joint.	14	78	124	190	234	183
	035	25 mm from the east edge of the control joint.	14	78	116	185	233	189
	036	25 mm from the east edge of the control joint.	14	69	102	155	203	225

- 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.

Appendix F Photographs

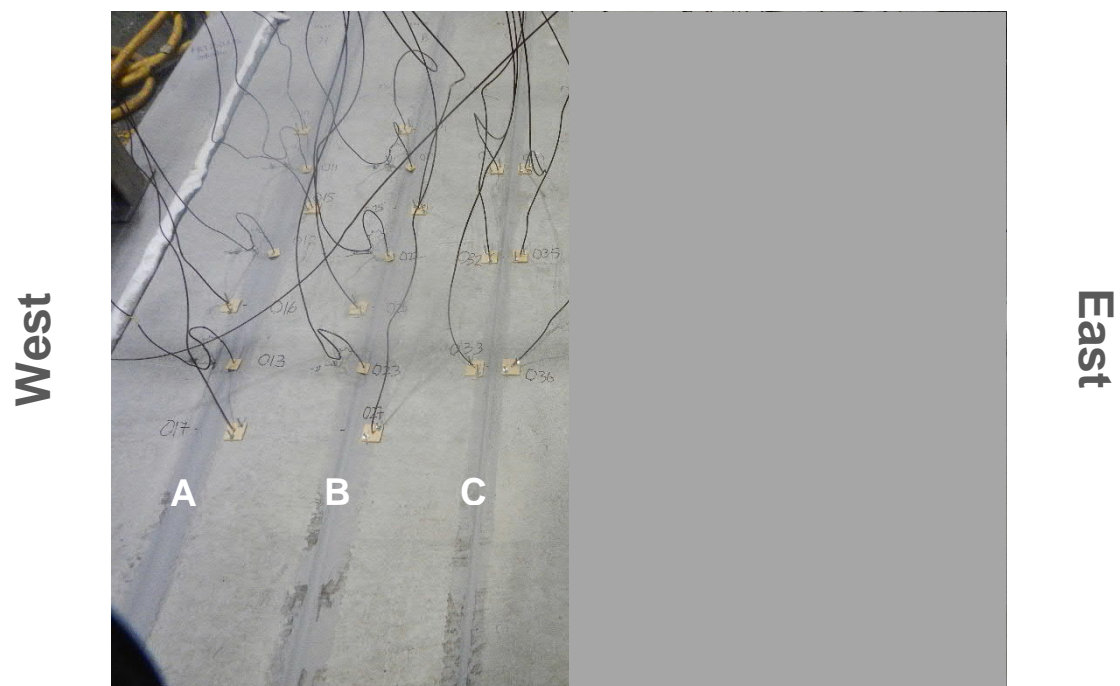


Figure 10 Unexposed face of the specimen before the start of the test



Figure 11 Exposed face of the specimen before the start of the test

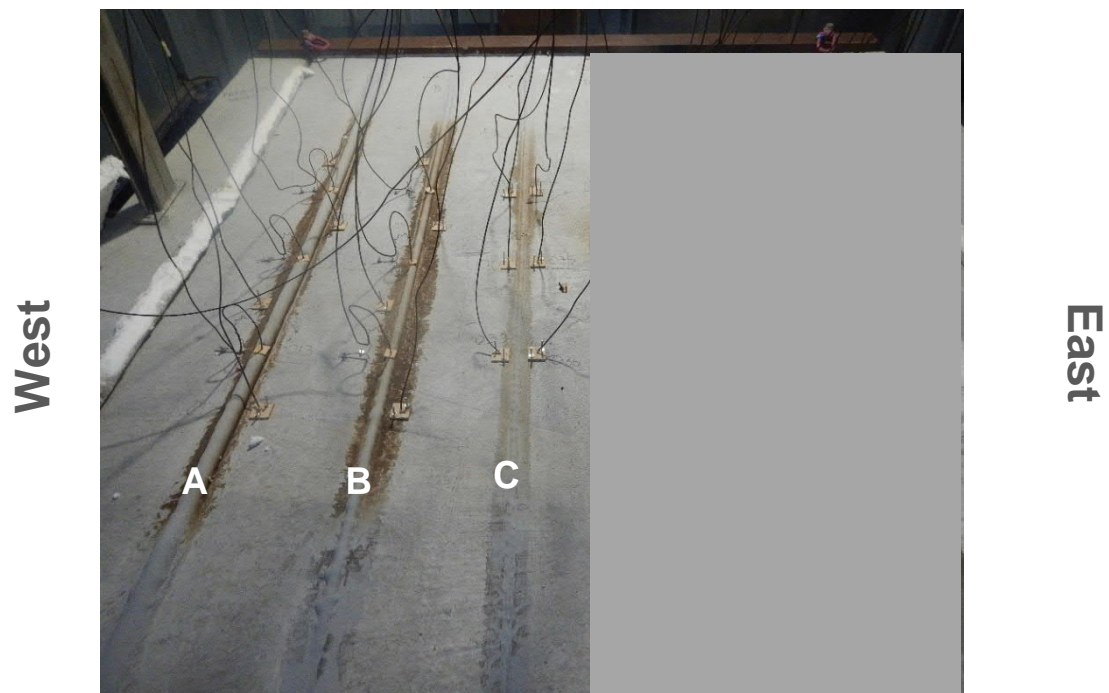


Figure 12 Unexposed face of the specimen at the end of the test

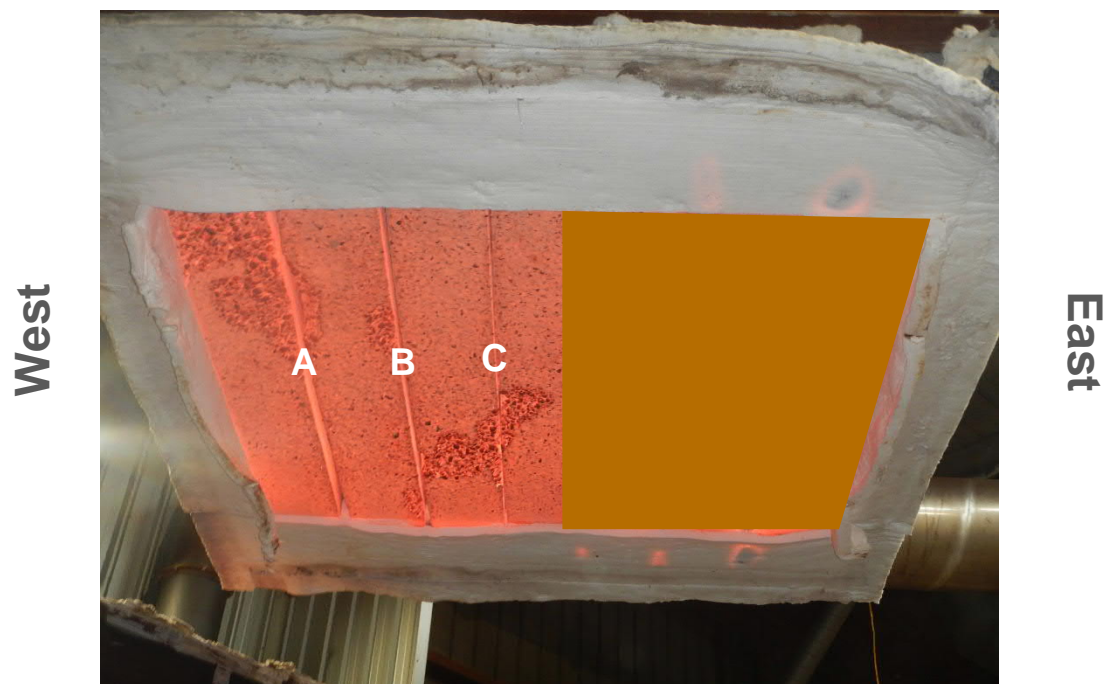


Figure 13 Exposed face of the specimen at the end of the test

warringtonfire

Proud to be part of  element



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