



# Fire resistance test report

Control joints tested in accordance with AS 1530.4:2014

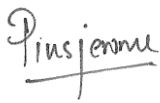


Test sponsor: HB Fuller Aust Co P/L

Products: HB Fuller Firesound 1930 and HB Fuller Firesound 2090

Job number: FRT190135

Test date: 26 June 2019 Revision: R1.0

## Amendment schedule

Version	Date	Information about the report			
R1.0	27/06/2019	Description	Initial issue		
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## Executive summary

This report documents the findings of the fire resistance test of four varying control joints undertaken on 26 June 2019 in accordance with Section 2 and 10 of AS 1530.4:2014.

Warringtonfire Australia did the test at the request of HB Fuller Aust Co P/L.

The test specimen consisted of 175mm thick concrete wall system incorporating four varying control joints.

A summary of the control joints is provided in Table 1.

**Table 1 Test summary**

Control joint	Service	Local fire-stopping protection	Aperture size (mm)	Sealant depth (mm)	Fire resistance level (FRL)
A	Control Joint	HB Fuller – Fire Sound Grey - 3619052090	20 x 1000	10	-/240/240
B	Control Joint	HB Fuller – Fire Sound Grey - 3619052090	40 x 1000	20	-/240/240
C	Control Joint	HB Fuller – Fire Sound Grey - 3619051930	20 x 1000	10	-/240/240
D	Control Joint	HB Fuller – Fire Sound Grey - 3619051930	40 x 1000	20	-/240/240

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## 1. Introduction

This report documents the findings of the fire resistance test of four varying control joints undertaken on 26 June 2019 in accordance with Section 2 and 10 of AS 1530.4:2014.

Warringtonfire Australia did the test at the request of HB Fuller Aust Co P/L.

**Table 2 Test sponsor details**

Test sponsor	Address
HB Fuller Aust Co P/L	16-22 Redgum Drive Dandenong South Victoria 3195 Australia

## 2. Construction details

Table 3 provides details of the test assembly. Table 4 provides a summary of the test specimen.

A full description of the specimen is provided in Appendix A and Section 3. shows the installation method and orientation of the test specimen.

**Table 3 Test assembly**

Item	Detail
Separating element	Concrete Wall system
Nominal separating element size	Width (w): 1125 mm Height (h): 1900 mm Thickness (t): 175 mm
Number of control joints	Four
Restraint conditions	Restrained on all edges.

**Table 4 Test specimen**

Control joint	Service	Local fire-stopping protection	Aperture size (mm)	Sealant depth (mm)
A	Control Joint	HB Fuller – Fire Sound Grey - 3619052090	20 × 1000	10
B	Control Joint	HB Fuller – Fire Sound Grey - 3619052090	40 × 1000	20
C	Control Joint	HB Fuller – Fire Sound Grey - 3619051930	20 × 1000	10
D	Control Joint	HB Fuller – Fire Sound Grey - 3619051930	40 × 1000	20

**Table 5**      **Installation method and orientation**

Item	Detail
Start date for construction of separating element	24 May 2019
Start date for installation of control joints	31 May 2019
Completion date for construction and installation of test specimen	31 May 2019
Separating element constructed by	Representatives of Warringtonfire Melbourne.
Control joints installed by	Representatives of the test sponsor.
Orientation	Symmetrical.

### 3. Schedule of components

Table 6 lists the schedule of components for the test specimen. These were provided by the test sponsor and surveyed by Warringtonfire Australia.

**Table 6 Schedule of components**

Item	Description	
Separating element		
1.	Item name	Concrete Wall
	Product name	175 mm thick concrete
	Density	2388 kg/m <sup>3</sup> (measured)
	Installation	The concrete strips were cast on 24 May 2019 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 top and bottom edges by Parallel flange channels (PFC). Masonry anchors were used to fix the concrete strips to the PFC's.
Fire-stopping protections		
Sealant		
2.	Product name	HB Fuller – Firesound Grey - 3619052090
	Density	1571 kg/m <sup>3</sup> (measured)
	Installation	The sealant was installed in control joints A and B as detailed in the control joint descriptions below.
3.	Product name	HB Fuller – Firesound Grey – 3619051930
	Density	1511 kg/m <sup>3</sup> (measured)
	Installation	The sealant was installed in all control joints C and D as detailed in the control joint descriptions below.
Backing Rod		
4.	Item name	Open cell backing rod
	Material	Polyethylene
	Size	Varying size as per the control joints.
	Installation	The backing rod of varying sizes were installed at all control joints as detailed in various service descriptions below.
Control Joint A		
A	Control joint detail	Control Joint - nominally 1000mm long × 20mm wide, 10mm deep
	Aperture size	20mm × 1000mm
	Local fire-stopping protection	
	Protection	Backing rod (item 4) of size 30mm × 20mm, was installed into the control joint at a depth of 10mm from both exposed and unexposed faces of wall. The sealant (item 2) was applied into the control joint to the depth of backing rod and finishing flush with the face of the wall. See Figure 1 and Figure 2 in Appendix A for more details.
Control Joint B		
B	Control joint detail	Control Joint - nominally 1000mm long × 40mm wide, 20mm deep
	Aperture size	40mm × 1000mm
	Local fire-stopping protection	



Item	Description	
	Protection	Two backing rods (item 4) kept together to form an overall size 60mm x 20mm, was installed into the control joint at a depth of 20mm from both exposed and unexposed faces of wall. The sealant (item 2) was applied into the control joint to the depth of backing rod and finishing flush with the face of the wall. See Figure 1 and Figure 2 in Appendix A for more details.
<b>Control joint C</b>		
C	Control joint detail	Control Joint - nominally 1000mm long x 20mm wide, 10mm deep
	Aperture size	20mm x 1000mm
	Local fire-stopping protection	
	Protection	Backing rod (item 4) of size 30mm x 20mm, was installed into the control joint at a depth of 10mm from both exposed and unexposed faces of wall. The sealant (item 3) was applied into the control joint to the depth of backing rod and finishing flush with the face of the wall. See Figure 1 and Figure 2 in Appendix A for more details.
<b>Control joint D</b>		
D	Control joint detail	Control Joint - nominally 1000mm long x 40mm wide, 20mm deep
	Aperture size	40mm x 1000mm
	Local fire-stopping protection	
	Protection	Two backing rods (item 4) kept together to form an overall size 60mm x 20mm, was installed into the control joint at a depth of 20mm from both exposed and unexposed faces of wall. The sealant (item 3) was applied into the control joint to the depth of backing rod and finishing flush with the face of the wall. See Figure 1 and Figure 2 in Appendix A for more details.

## 4. 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	<ul style="list-style-type: none"> <li>The pressure was up to 3Pa below the limits prescribed in the standard during the 90-100-minute periods. The pressure and temperature were within the limits for rest of the test duration. This under pressure is unlikely to have affected the outcome of the test.</li> </ul>	
Pre-test conditioning	The construction and installation of the test specimen was completed on 31 May 2019. 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	19 °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"> <li>The furnace temperature was measured by four mineral insulated metal sheathed (MIMS) Type K thermocouples – with wire diameters not greater than 1 mm and 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.</li> <li>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 Figure 3 to <b>Figure 6</b> in Appendix D.</li> <li>A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.</li> <li>The furnace pressure was measured 230 mm below the mid-height of the control joint and corrected to 15Pa at mid-height of control joint.</li> <li>Cotton pads were available during the test to assess the performance of the specimen under the criteria for integrity.</li> </ul>	

## 5. 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 4.

The measurements taken for the pressure and temperature of the furnace and test specimen are included in Appendix E.

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	-/240/240
	Integrity	No failure at 241 minutes	
	Insulation	No failure at 241 minutes	
B	Structural adequacy	Not applicable	-/240/240
	Integrity	No failure at 241 minutes	
	Insulation	No failure at 241 minutes	
C	Structural adequacy	Not applicable	-/240/240
	Integrity	No failure at 241 minutes	
	Insulation	No failure at 241 minutes	
D	Structural adequacy	Not applicable	-/240/240
	Integrity	No failure at 241 minutes	
	Insulation	No failure at 241 minutes	

## **6. Application of test results**

### **6.1 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.

### **6.2 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.

### **6.3 Uncertainty of measurements**

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

## Appendix A Drawings of test assembly

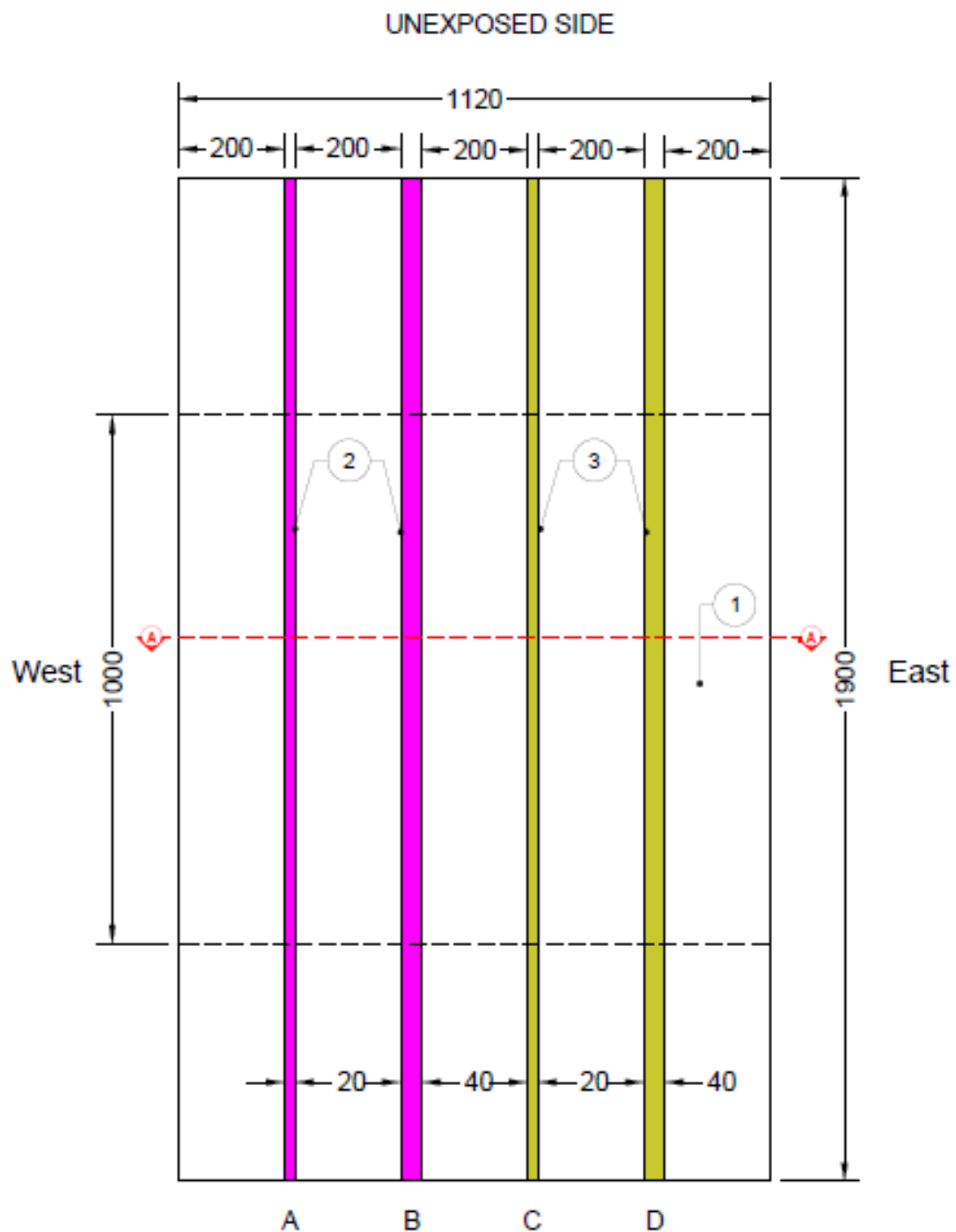


Figure 1 Elevation of test specimen (unexposed side)

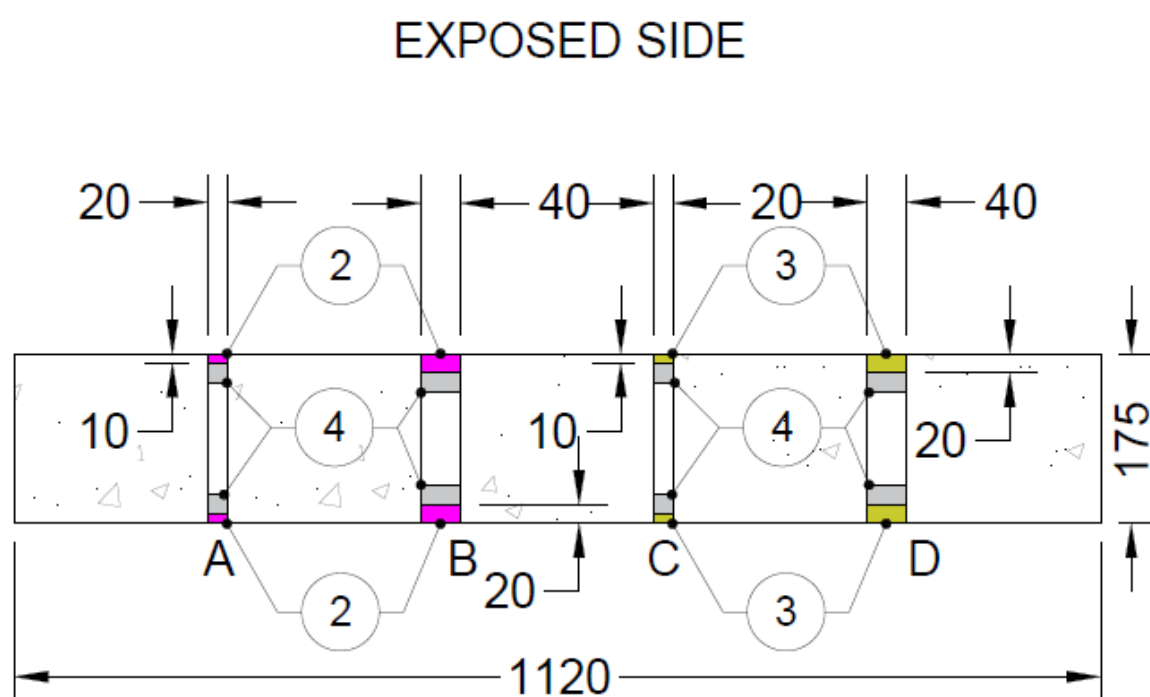


Figure 2 Cross-section A-A

## Appendix B Test observations

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

**Table 9 Test observations**

Time		Observation
Min	Sec	
Control Joint A		
00	00	Fire resistance test started, and the initial temperature of the specimen was approximately 11°C.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
140	45	Sealant had bulged on the control joint.
150	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
176	35	Bulging on the sealant increased on the control joint.
180	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
240	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
241	00	Fire resistance test stopped.
Control Joint B		
00	00	Fire resistance test started, and the initial temperature of the specimen was approximately 11°C.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
140	45	Sealant had bulged on the control joint.
150	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
176	35	Bulging on the sealant increased on the control joint.
180	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
240	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
241	00	Fire resistance test stopped.
Control Joint C		
00	00	Fire resistance test started, and the initial temperature of the specimen was approximately 11°C.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
30	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
150	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
180	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
240	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
241	00	Fire resistance test stopped.
<b>Control Joint D</b>		
00	00	Fire resistance test started, and the initial temperature of the specimen was approximately 11°C.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
150	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
180	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
200	45	Sealant had bulged on the control joint.
225	00	Bulging on the sealant increased on the control joint.
240	00	Specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
241	00	Fire resistance 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.
- 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.

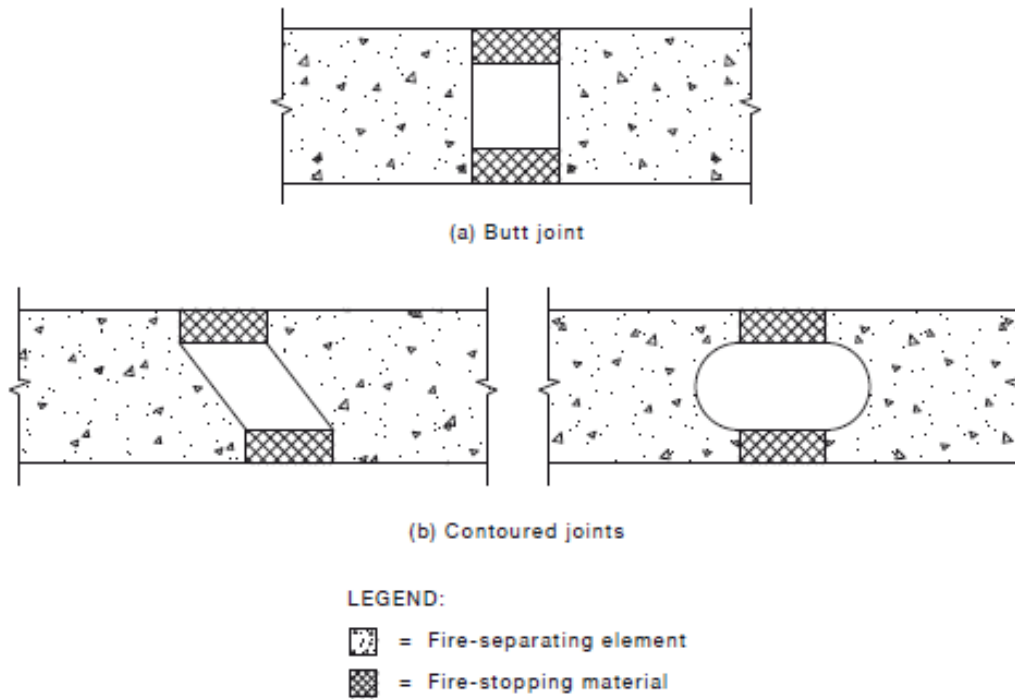


FIGURE 10.12.6 CONTOURED CONTROL JOINTS

## Appendix D Instrumentation locations



Figure 3

Control Joint A

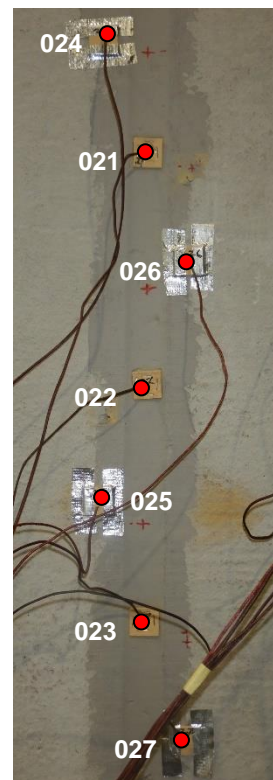


Figure 4

Control Joint B

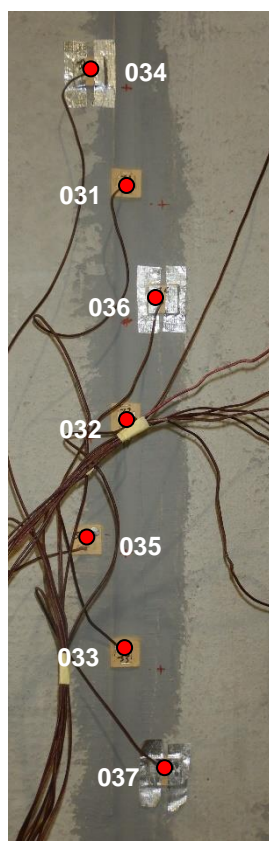


Figure 5

Control Joint C

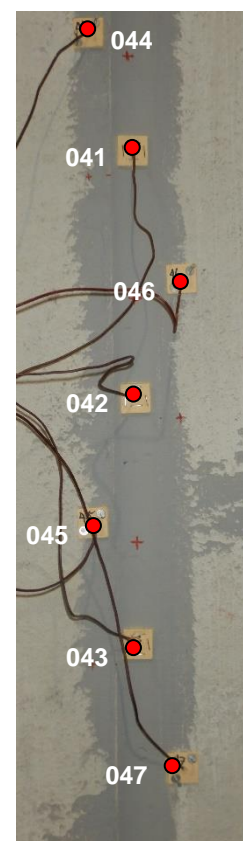


Figure 6

Control Joint D

**Table 10 Thermocouple locations**

Control joint	T/C no.	Description
A	011	On control joint, 250mm up from the centre.
	012	On control joint, at the centre.
	013	On control joint, 250mm down from the centre.
	014	25mm from control joint, 375mm up from the centre
	015	25mm from control joint, 125mm down from the centre
	016	25mm from control joint, 125mm up from the centre
	017	25mm from control joint, 375mm down from the centre
B	021	On control joint, 250mm up from the centre.
	022	On control joint, at the centre.
	023	On control joint, 250mm down from the centre.
	024	25mm from control joint, 375mm up from the centre
	025	25mm from control joint, 125mm down from the centre
	026	25mm from control joint, 125mm up from the centre
	027	25mm from control joint, 375mm down from the centre
C	031	On control joint, 250mm up from the centre.
	032	On control joint, at the centre.
	033	On control joint, 250mm down from the centre.
	034	25mm from control joint, 375mm up from the centre
	035	25mm from control joint, 125mm down from the centre
	036	25mm from control joint, 125mm up from the centre
	037	25mm from control joint, 375mm down from the centre
D	041	On control joint, 250mm up from the centre.
	042	On control joint, at the centre.
	043	On control joint, 250mm down from the centre.
	044	25mm from control joint, 375mm up from the centre
	045	25mm from control joint, 125mm down from the centre
	046	25mm from control joint, 125mm up from the centre
	047	25mm from control joint, 375mm down from the centre

## Appendix E Test data

### E.1 Furnace temperature

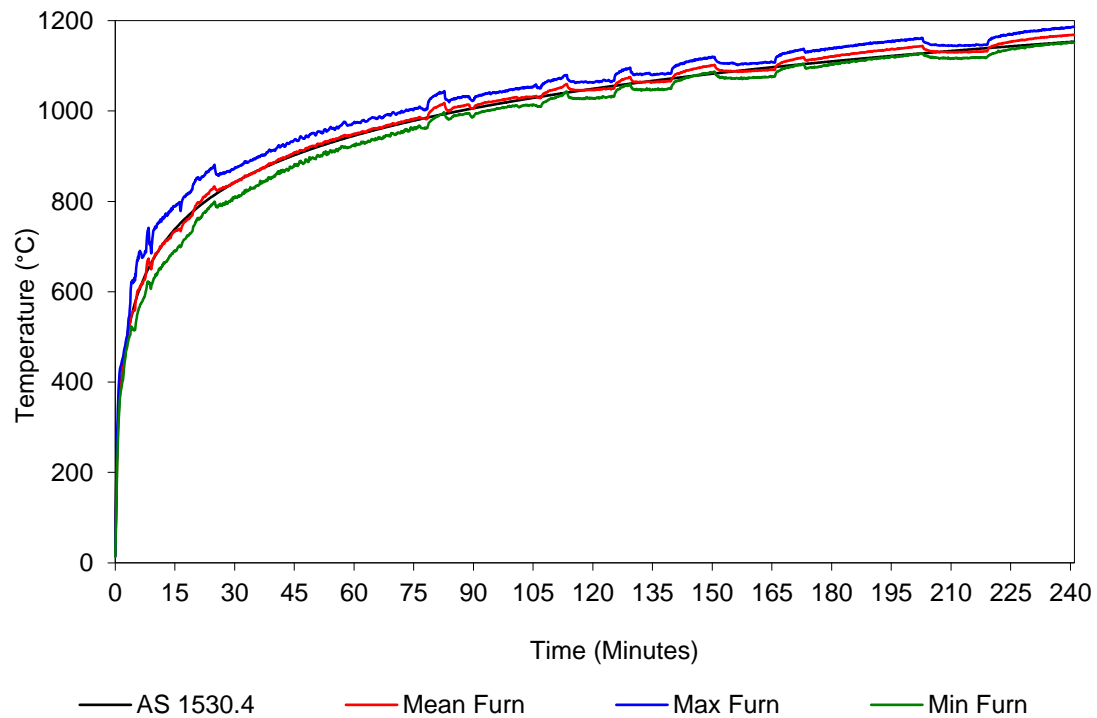


Figure 7 Furnace thermocouple temperature vs time

## E.2 Furnace pressure

The furnace pressure was measured 230 mm below the mid-height of the control joint and corrected to 15Pa at mid-height of control joint.

**Table 11** Furnace pressure

Time (minutes)	Pressure (Pa) average	Time (minutes)	Pressure (Pa) average	Time (minutes)	Pressure (Pa) average
5-10	10	85-90	12	165-170	15
10-15	13	90-95	10	170-175	15
15-20	14	95-100	9	175-180	15
20-25	14	100-105	16	180-185	15
25-30	15	105-110	16	185-190	16
30-35	14	110-115	16	190-195	15
35-40	15	115-120	15	195-200	15
40-45	15	120-125	15	200-205	15
45-50	15	125-130	15	205-210	14
50-55	15	130-135	15	210-215	14
55-60	15	135-140	15	215-220	14
60-65	16	140-145	16	220-225	16
65-70	14	145-150	15	225-230	16
70-75	14	150-155	15	230-235	16
75-80	14	155-160	15	235-240	13
80-85	14	160-165	15		

### E.3 Specimen temperatures

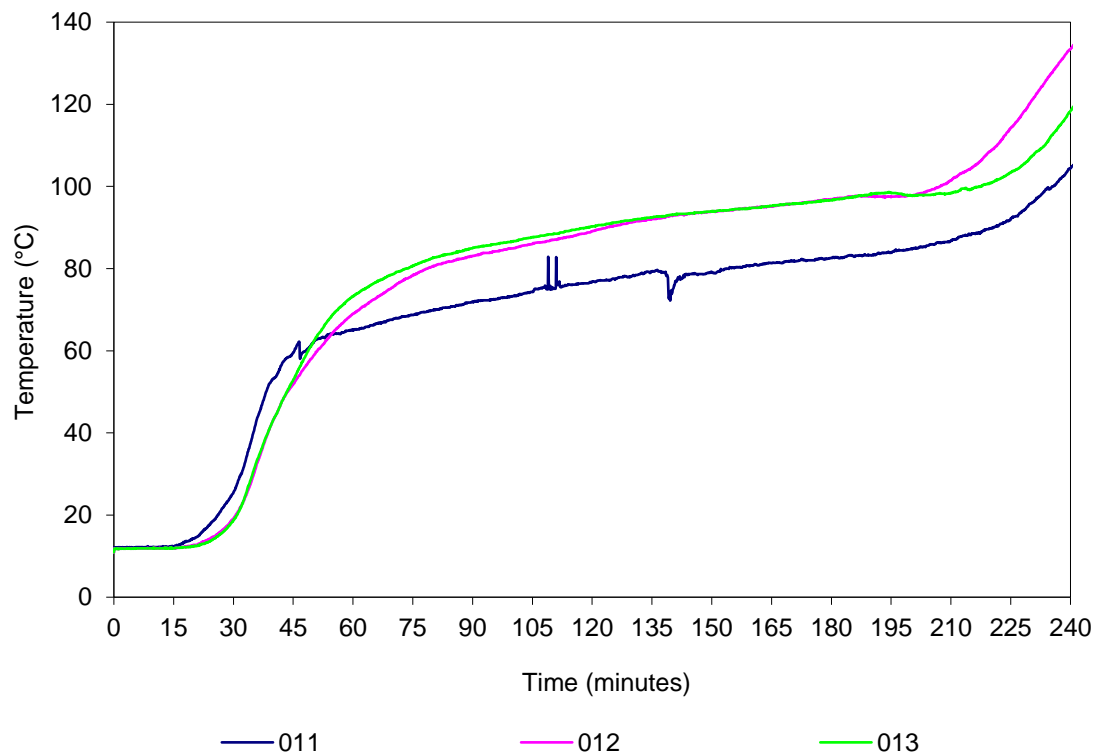


Figure 8 Control Joint A – temperature vs time

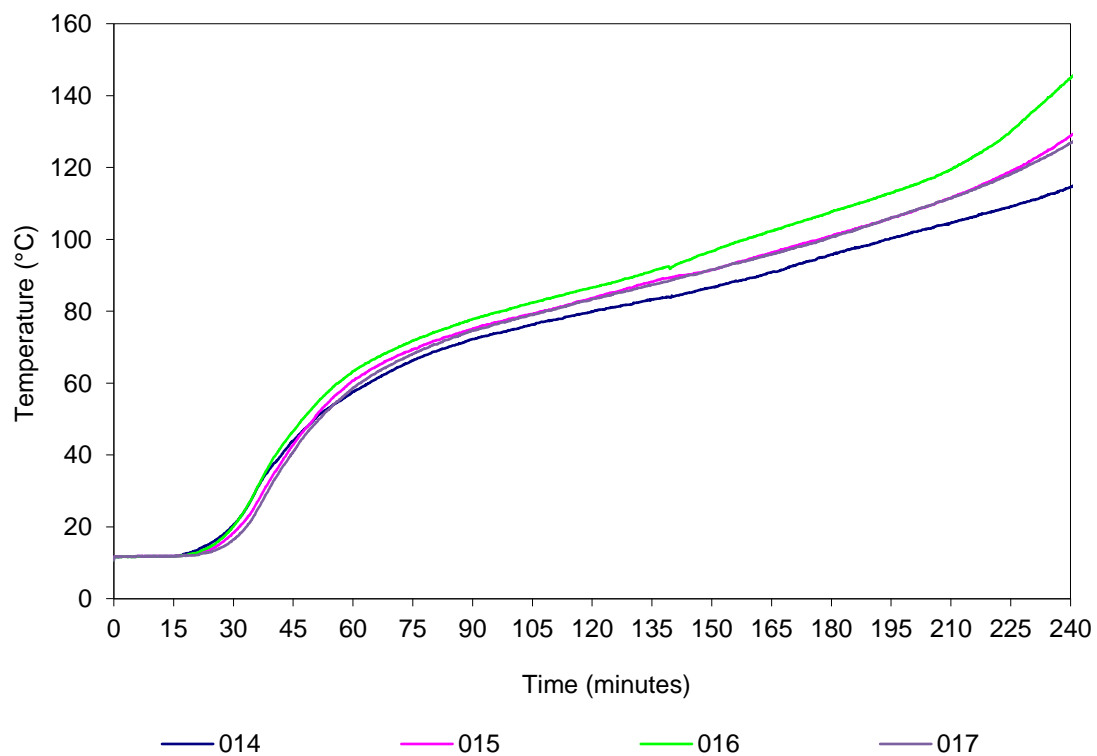


Figure 9 Control Joint A – temperature vs time

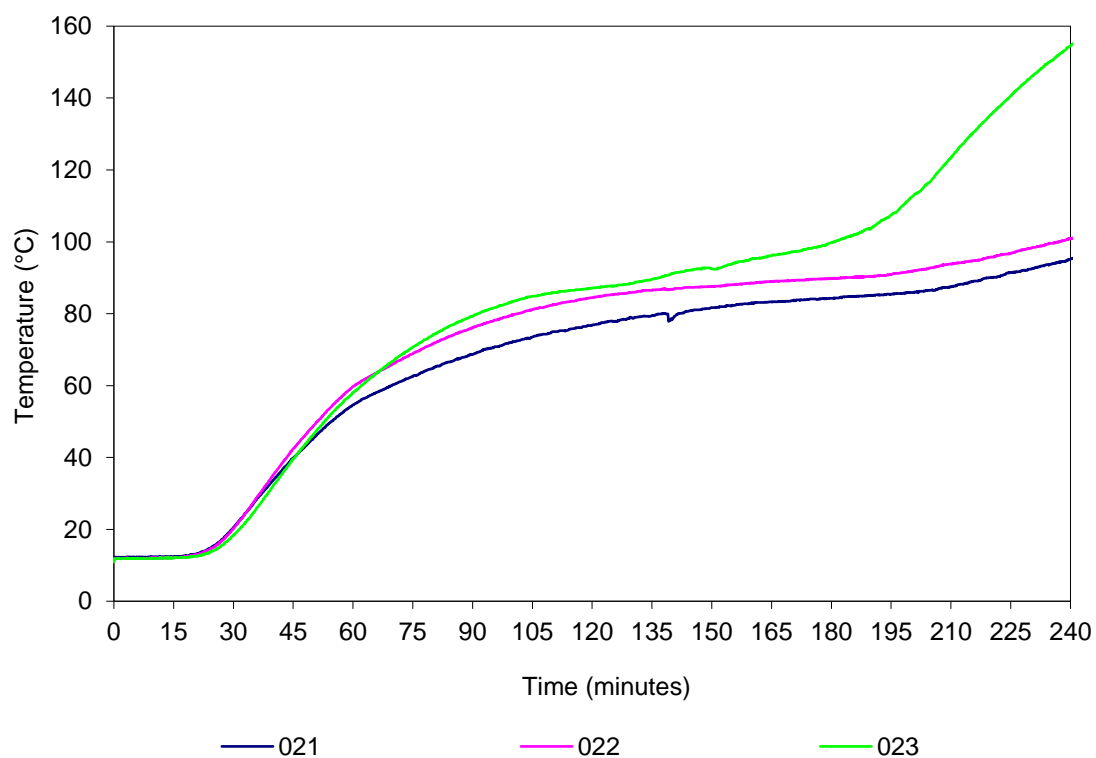


Figure 10 Control Joint B – temperature vs time

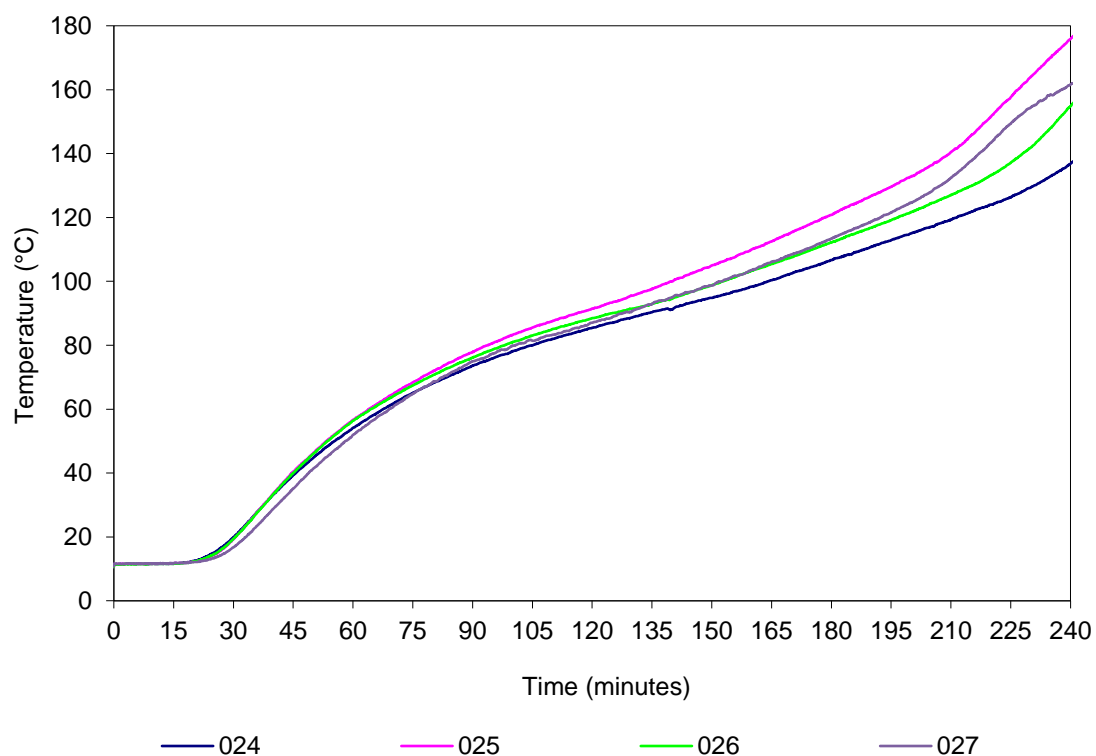


Figure 11 Control Joint B – temperature vs time



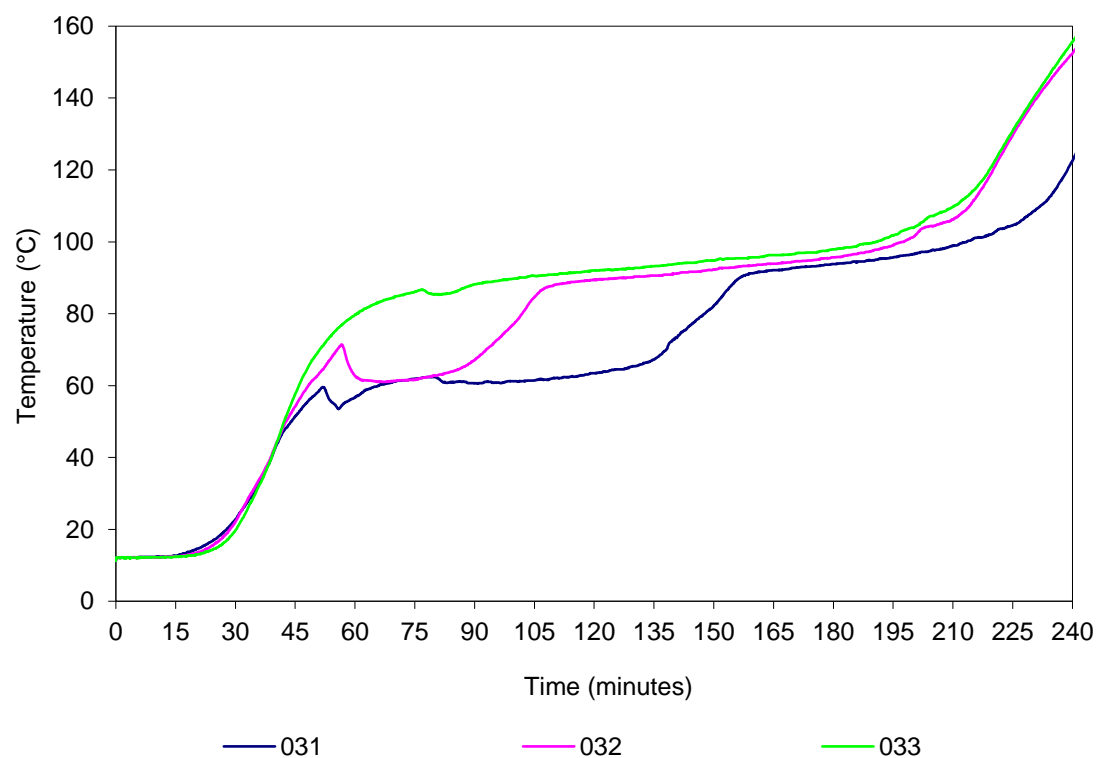


Figure 12 Control Joint C – temperature vs time

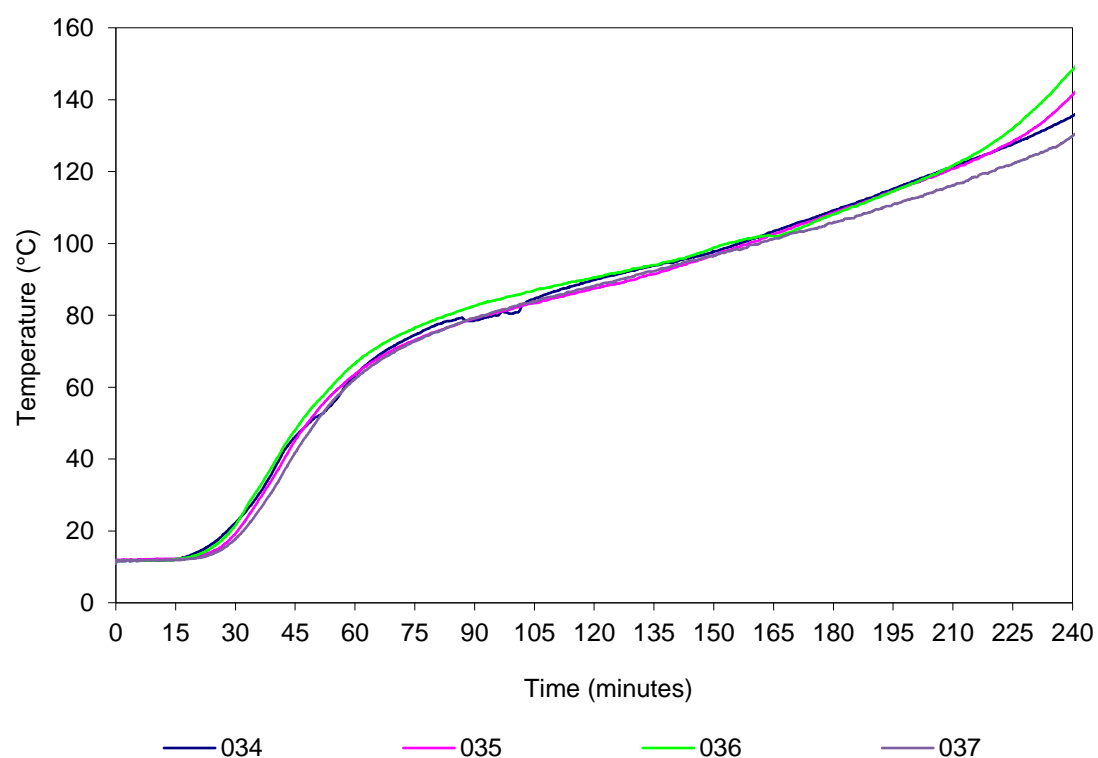


Figure 13 Control Joint C – temperature vs time

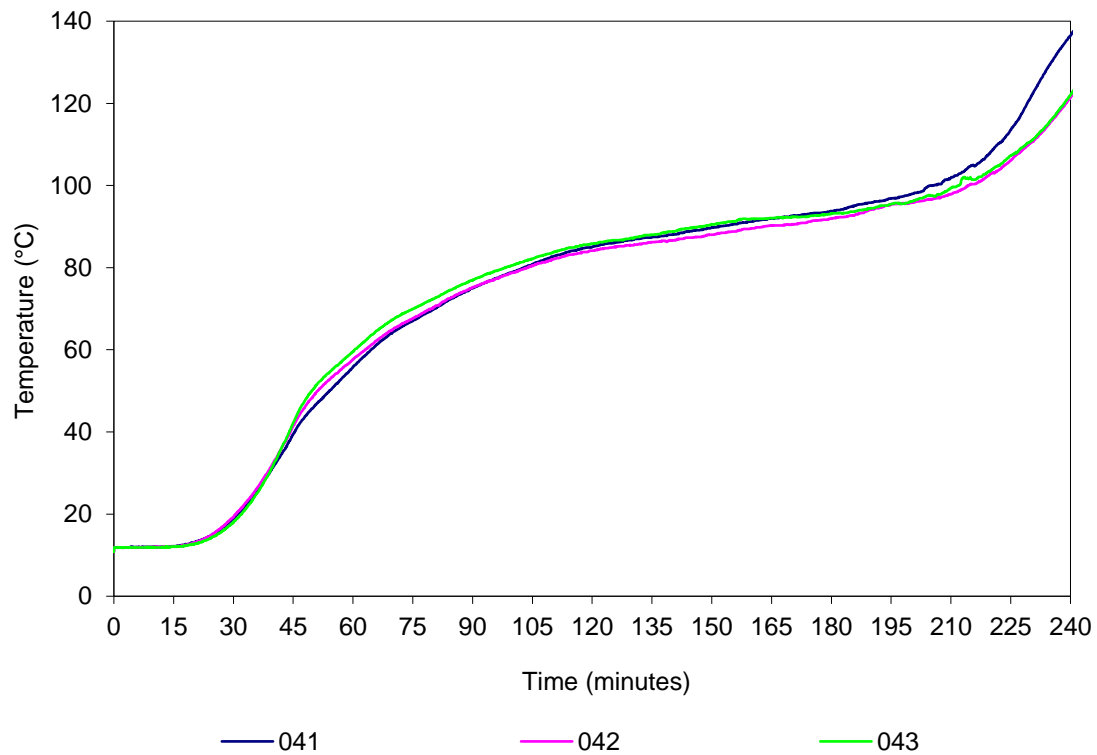


Figure 14 Control Joint D – temperature vs time

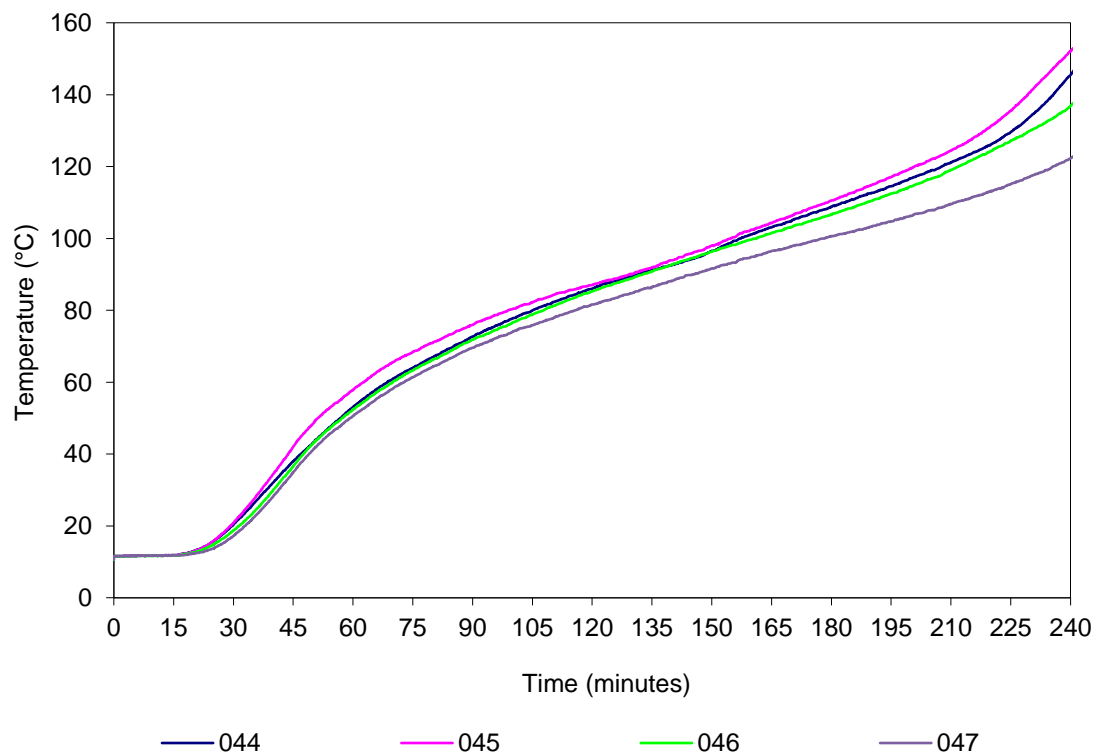


Figure 15 Control Joint D – temperature vs time

Table 12 Test specimen temperatures

Control joint	T/C no.	Description <sup>2</sup>	Temp (°C) at t (minutes)					Limit <sup>1</sup> (minutes)
			t=0	t=60	t=120	t=180	t=240	
A	011	On control joint.	11	65	77	83	105	-
	012	On control joint.	11	69	89	97	134	-
	013	On control joint.	11	73	90	97	119	-
	014	25mm from control joint.	11	58	80	96	115	-
	015	25mm from control joint.	11	61	84	101	129	-
	016	25mm from control joint.	11	63	87	108	145	-
	017	25mm from control joint.	11	59	83	101	127	-
B	021	On control joint.	11	55	77	84	95	-
	022	On control joint.	11	60	85	90	101	-
	023	On control joint.	11	58	87	100	155	-
	024	25mm from control joint.	11	54	85	107	137	-
	025	25mm from control joint.	11	57	92	121	176	-
	026	25mm from control joint.	11	56	89	112	155	-
	027	25mm from control joint.	11	52	87	113	162	-
C	031	On control joint.	11	57	63	94	123	-
	032	On control joint.	11	63	89	96	153	-
	033	On control joint.	11	80	92	98	156	-
	034	25mm from control joint.	11	63	90	109	136	-
	035	25mm from control joint.	11	64	88	109	141	-
	036	25mm from control joint.	11	67	91	108	148	-
	037	25mm from control joint.	11	62	88	106	130	-
D	041	On control joint.	11	56	85	94	137	-
	042	On control joint.	11	58	84	92	122	-
	043	On control joint.	11	60	86	93	122	-
	044	25mm from control joint.	11	53	86	109	146	-
	045	25mm from control joint.	11	58	87	111	152	-
	046	25mm from control joint.	11	53	85	107	137	-
	047	25mm from control joint.	11	51	82	101	122	-

- Notes
- <sup>1</sup> 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.
  - <sup>2</sup> Refer to Appendix D for locations of thermocouples as only a generic description is included in the table.
  - <sup>3</sup> No insulation failure before thermocouple failure.
  - # Thermocouple failure.
  - \* Integrity failure of the control joint.
  - 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

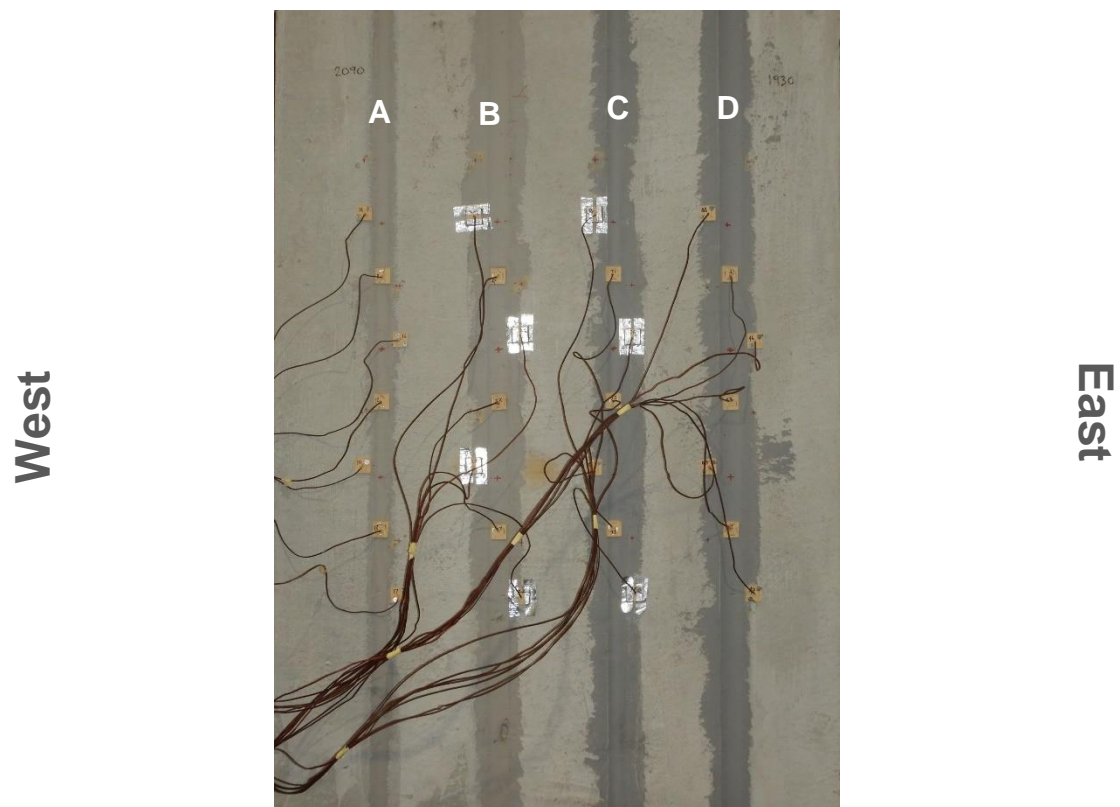


Figure 16 Unexposed face of the specimen before the start of the test

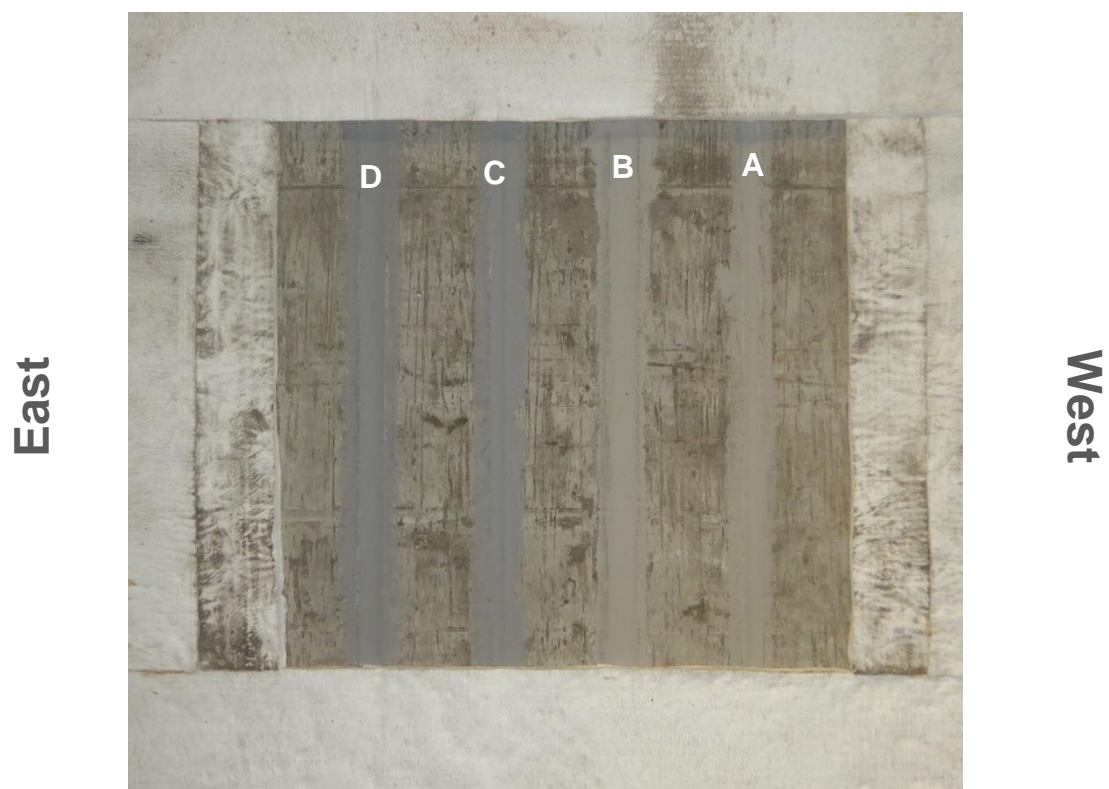


Figure 17 Exposed face of the specimen before the start of the test

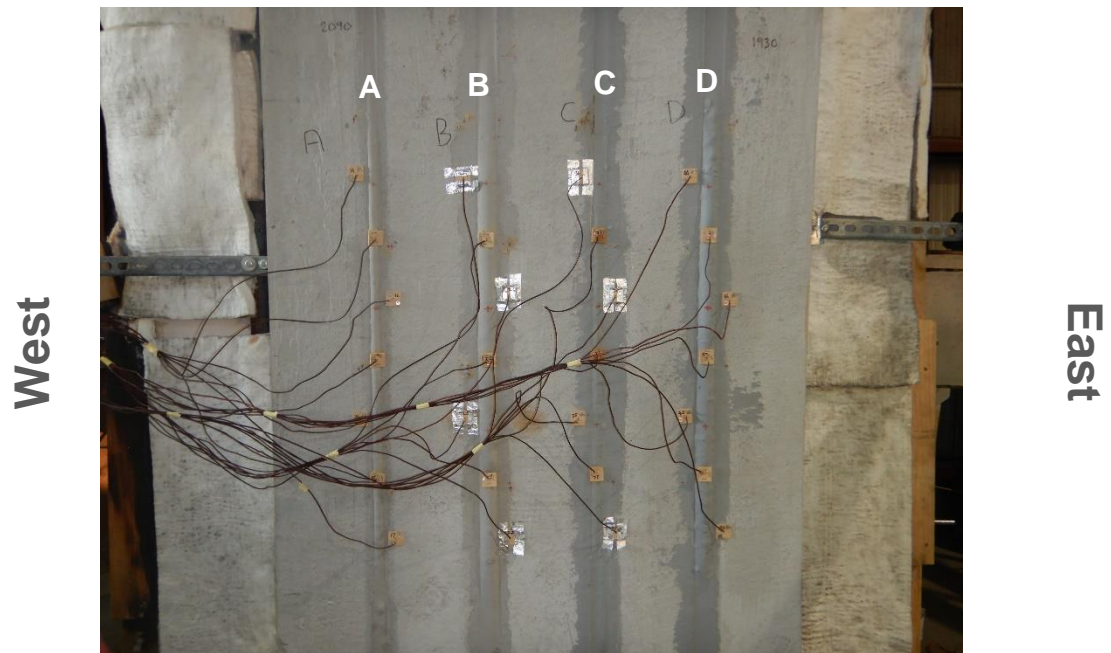


Figure 18 Unexposed face of the specimen at the end of the test



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