

## **Test report # PF21008-A**

**Test Number 21008**

**Issued to: Intex International**

**Fire resistance tests for wall penetrations**

**Test method: AS 1530.4:2014**

Report Date 17/09/2021

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## 1.1 Document revision schedule

Revision #	Date	Description
1	27/08/2021	Initial Issue for Client review
2	11/09/2021	Issued with Client comments
3	17/09/2021	Issued to Intex International

## 1.2 Signatories

Report	Name	Signature	Date
Prepared by:	Alexey Kokorin (Technical Manager)		17/09/2021
Authorized by:	Andrew Bain (Authorized signatory)		17/09/2021



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

## 2. Contact details

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### 2.1 IANZ registered Testing Authority

Passive Fire Inspection and Test Services Ltd

Accreditation N<sup>o</sup>: 1335

1/113 Pavilion Drive, Mangere, Auckland, 2022

New Zealand

Contact e-mail: [tests@firelab.co.nz](mailto:tests@firelab.co.nz)

### 2.2 Issued to

Intex International

91-115 Link Drive, Campbellfield, Victoria Australia, 3061

Australia

Contact e-mail: [sales@intexinternational.com](mailto:sales@intexinternational.com)

### 2.3 Manufacturer

RLA Polymers Pty Ltd

215 Colchester Road, Kilsyth, Victoria, 3137

Australia

### 3. Test Results

Specimen #	Joint	Actual Integrity (min)	Actual insulation (min)	FRL*
A	20mm PVC-U Pipe with Cables	172 NF	162	-/150/150
B	25DN Steel Pipe	172 NF	167	-/150/150
C	32mm PVC-U Pipe with Cables	172 NF	172 NF	-/150/150
D	100DN Steel Pipe	172 NF	107	-/150/90
E	16DN Pe-Xa Pipe	172 NF	172 NF	-/150/150
F	32DN Pe-Xa Pipe	172 NF	16	-/150/-
G	D1 and D2 cable configuration with plastic pipe and Cable Bundle on the Cable Tray	170	137	-/150/120
H	20mm Cable Bundle	172 NF	161	-/150/150

NF – No failure during the test

\* - The specimens FRL performance shall be limited to the performance of the separating element.

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The test results relate to the specimens of the product in the form in which they were tested. Differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product, which is supplied or used, is fully represented by the specimens, which were tested.

The specimens were supplied by the sponsor and the Laboratory was not involved in any of selection or sampling procedures.

The results of these fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions.

## 4. Test Details

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### **Test Specification Fire Resistance:**

Failure shall be deemed to have occurred when one of the following occurs:

- a) the temperature at any location on the unexposed face of the test specimen exceeds the initial temperature by more than 180 °C
- b) Integrity failure shall be deemed to have occurred upon ignition of the cotton pad when glowing or flaming occurs for a period of 30 seconds.
- c) Flaming to the unexposed face for 10 seconds or longer shall be deemed to be an Integrity failure.
- d) Integrity failure shall be deemed to occur when a 6mm gap gauge can be passed through the specimen so that the gap gauge projects into the furnace and can be moved a distance of 150mm along the gap.
- e) Integrity failure shall be deemed to occur when a 25mm gap gauge can be passed through the specimen so that the gap gauge projects into the furnace

### **Testing scope:**

AS 1530-2014 Part 4 Section 10 Service penetrations and control joints

AS 4072.1-2005 Part 1 Appendix A - Typical examples of fire-stopping systems for movement joints.

### **Documentation:**

Testing products were verified and tested based on Client description, refer to Specimens description below. All drawings were provided by Client, in case of any difference between the drawings and report description, the text description shall prevail.

### **Testing date:**

04/08/2021

### **Installation completion date:**

22/07/2021

### **Specimens conditioning and delivery to Laboratory:**

Separating element was built by Laboratory in line with Client instructions. Installation of fire stopping system was performed by Client. The Laboratory was not involved in sampling of the materials. Laboratory verified materials during construction of the specimen. The Client

confirmed in writing that BlazeBlocker® Fire Rated Sealant is based on the same formulation as FirePro FR Acrylic Sealant and has identical chemical composition, manufacturing process and properties.

**Termination of The Test:**

The test was discontinued at 172 minutes.

**Use of Reports:**

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This report details the methods of construction, test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS 1530.4. Any significant variation with respect to size, constructional 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.

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.



## 5. Equipment

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### **Furnace:**

1200X1200 Indicative Furnace designed to operate to AS1530.4:2014

### **Temperature:**

Furnace Temperature measurements were controlled with four 3mm Type K MIMS thermocouples set within 50-100 mm from the face of the specimens in line with AS1530.4-2014. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Pressure measurement:**

Kepware Siemens Data logging system including multi-channel recording data at 5 second intervals. Calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Ambient Temperature:**

Ambient temperature was recorded 15 minutes before the test was commenced, at the start of the test and monitored during the test. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Specimen thermocouples:**

Specimen thermocouples were installed to the unexposed face. Type K copper disk thermocouples fixed within the required locations referenced from AS1530.4-2014. Thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

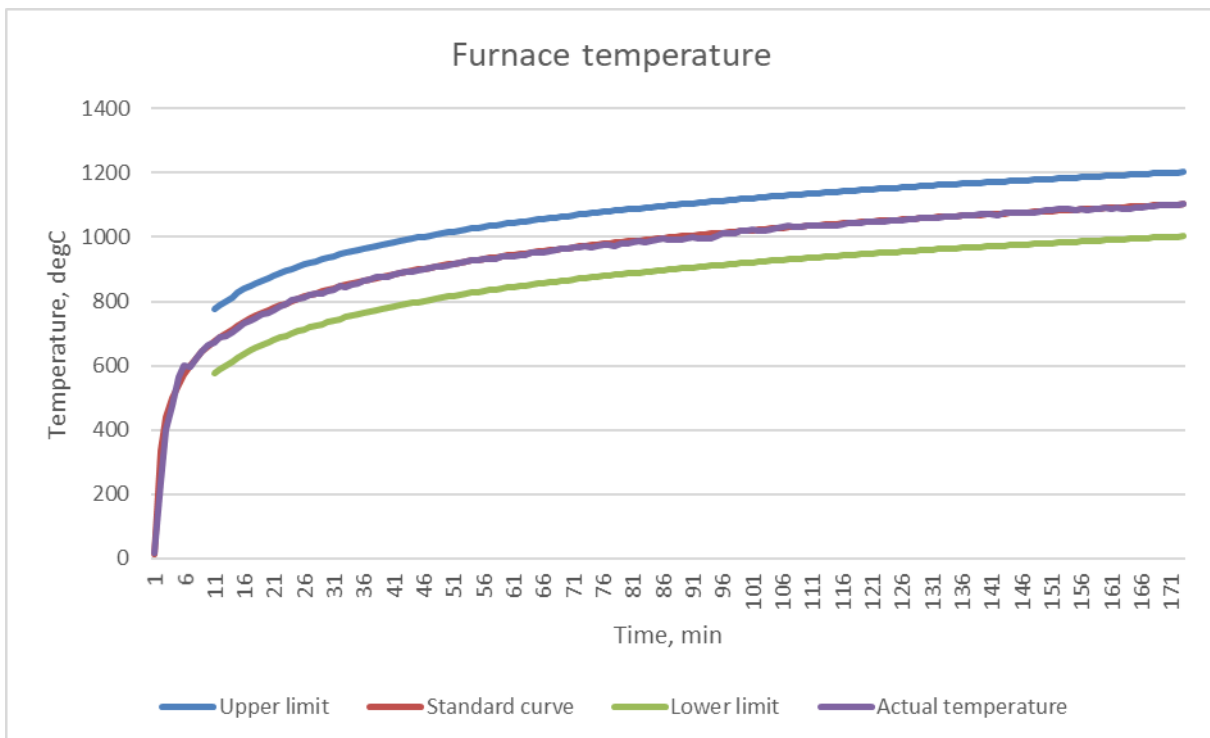
### **Dimensional measurements:**

All linear measurements are made with equipment calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

## 6. Test Conditions

### 6.1 Furnace Temperature

The furnace was controlled to follow the temperature/time relationship specified in AS 1530.4-2014 as closely as possible.

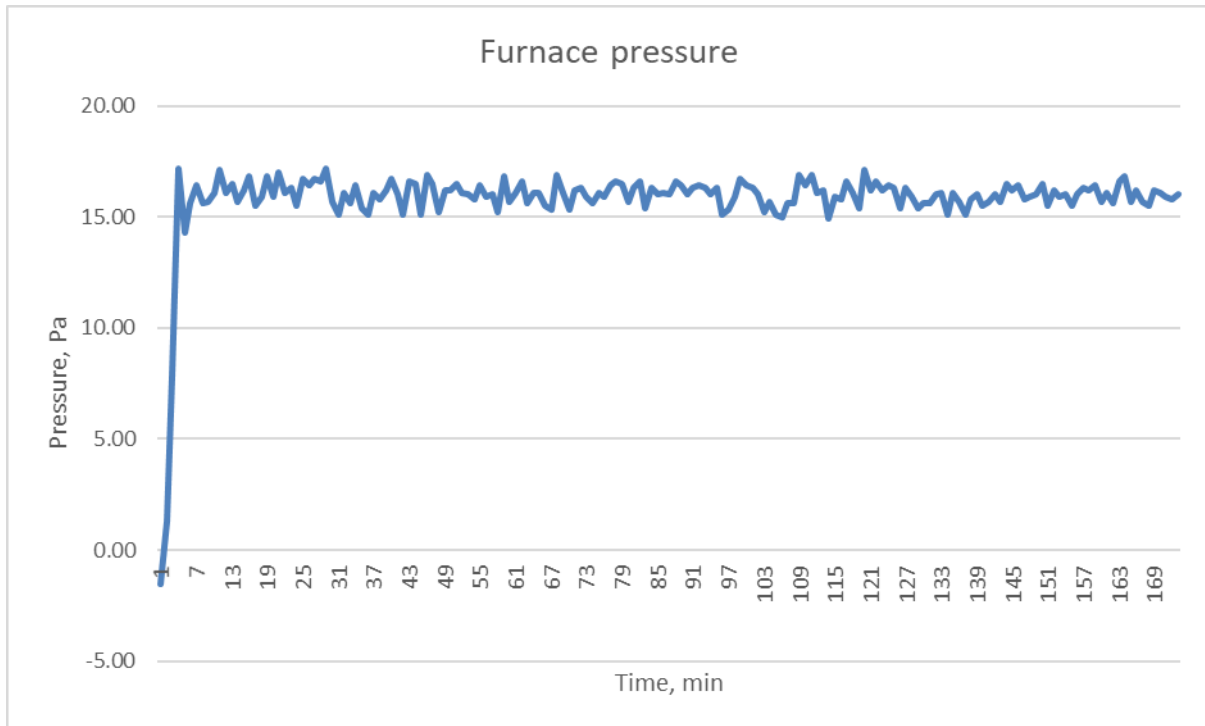


### 6.2 Ambient Temperature

The ambient temperature of the test area 15 minutes before the test and at the commencement of the test was 15 °C.

## 6.3 Pressure Readings

The furnace pressure was maintained at  $16 \pm 3$  Pa with respect to atmosphere. The probe was located 500mm above the furnace floor.



## 7. Schedule of materials

All firestopping products were supplied and installed by Client.

Separating Element		
1.1	Item / Product Name	Speedpanel Wall separating element
	Measurements	Width / Height (W/H): 1165mm x 1185mm
		Thickness (T): 79.50mm
1.2	Item / Product Name	SpeedPanel 78mm Panel
	Measurements	Width / Height (W/H): 283mm x 1200mm
		Thickness (T): 79.50mm
	Installation	Used to create separating element
1.3	Item / Product Name	SpeedPanel C-Track
	Measurements	Width / Height (W/H): 82.79mm x 57.52mm
		Thickness (T): 1.17mm
	Installation	Used to create separating element

Services		
2.1	Item / Product Name	Nexans CU TPS Cable
	Measurements	Outer Diameter (OD): 11.99mm x 5.42mm
	Additional Info	Specimen A, C, G, H
2.2	Item / Product Name	FL@tCore Minimal Section Premise Optical Cable
	Measurements	Outer Diameter (OD): 2.88mm x 1.72mm
	Additional Info	Specimen A, C, G, H
2.3	Item / Product Name	Dynamix UTP Cat6 Cable
	Measurements	Outer Diameter (OD): 5.85mm
	Additional Info	Specimen A, C, G, H
2.4	Item / Product Name	20DN Steel Pipe
	Measurements	Inner Diameter (ID): 16.01mm

		Outer Diameter (OD): 26.82mm
		Width (W): 4.43mm
	Additional Info	Specimen B
2.5	Item / Product Name	100DN Steel Pipe
	Measurements	Inner Diameter (ID): 108.12mm
		Outer Diameter (OD): 114.86mm
		Width (W): 3.15mm
Additional Info	Specimen D	
2.6	Item / Product Name	32DN Kempex Pipe Pe-Xa
	Measurements	Inner Diameter (ID): 22.565mm
		Outer Diameter (OD): 31.97mm
		Width (W): 5.32mm
Additional Info	Specimen F	

2.7	Item / Product Name	16 DN Kempex Pipe Pe-Xa
	Measurements	Inner Diameter (ID): 10.96mm
		Outer Diameter (OD): 16.16mm
		Width (W): 2.54mm
Additional Info	Specimen E	
2.8	Item / Product Name	20mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 16.07mm
		Outer Diameter (OD): 20.02mm
		Width (W): 1.69mm
Additional Info	Specimen A, G	
2.9	Item / Product Name	32mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 27.36mm
		Outer Diameter (OD): 32.20mm
		Width (W): 2.14mm

	Additional Info	Specimen C
2.10	Item / Product Name	50mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 43.51mm
		Outer Diameter (OD): 50.00mm
		Width (W): 2.95mm
Additional Info	Specimen G	
2.11	Item / Product Name	Galvanised Steel Cable tray
	Measurements	Width / Height (W/H): 450mm x 50mm
		Thickness (T): 1.00mm
	Additional Info	Specimen G
2.12	Item / Product Name	Single-core PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 40.72mm
	Additional Info	Specimen G
2.13	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 53.40mm
	Additional Info	Specimen G
2.14	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 14.43mm
	Additional Info	Specimen G
2.15	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 22.59mm
	Additional Info	Specimen G
2.16	Item / Product Name	Garland Communication cable (D2 Cable Bundle)
	Measurements	Outer Diameter (OD): 15.00mm (nominal)
	Additional Info	Specimen G

Sealants		
3.1	Item / Product Name	BlazeBlocker® Fire Rated Sealant
	Measurements	600mL Sausage
	Installation	Used to seal aperture gaps of services

Fixings		
4.1	Item / Product Name	Icons Self Drilling Flathead Screws
	Measurements	10-16 x 30mm
	Installation	Used to fix Speedwall panels to track.
4.3	Item / Product Name	Stainless Steel Cable Ties
	Measurements	4.6 x 200mm
	Installation	Used to fix wrap to services
4.4	Item / Product Name	Steel Wire Clips
	Measurements	Width / Height (W/H): 28mm x 45mm
		Thickness (T): 1.5mm
Installation	Used to fix intumescent strip to services	

Fire Stopping Materials		
5.1	Item / Product Name	Superwool Plus Ceramic Fibre Blanket
	Measurements	Width / Height (W/H): 610mm x 14640mm
		Thickness (T): 13mm
		Density ( $\rho$ ): 128kg/m <sup>3</sup>
Installation	Wrapped around services	
5.2	Item / Product Name	Intumescent Strap
	Measurements	Width (W): 25mm
		Thickness (T): 2.75mm
Installation	Wrapped around services	
5.3	Item / Product Name	USG Boral Firestop Plasterboard

	Measurements	Width / Height (W/H): 1200mm x 1200mm
		Thickness (T): 16mm
	Installation	Attached to separating element around cable tray



## 8. Test Specimens details

### 8.1 Thermocouple Positions Table

SPECIMEN	TC#	THERMOCOUPLE LOCATION DESCRIPTION
A	1	Separating element, 25mm above specimen A
A	2	Separating element, 25mm left of specimen A
A	3	Sealant cone, on the top side of service
A	4	Sealant cone, on the right side of service
A	5	PVC-U Pipe, on the top side of service 25mm from the end of sealant cone
A	6	PVC-U Pipe, on the bottom side of service 25mm from the end of sealant cone
B	7	Separating element, 25mm above specimen B
B	8	Separating element, 25mm right of specimen B
B	9	Ceramic Fibre Blanket, on the top side of service
B	10	Ceramic Fibre Blanket, on the right side of service
B	11	Steel Pipe, on the top side of service 25mm from the end of the Ceramic Fibre Blanket
B	12	Steel Pipe, on the bottom side of service 25mm from the end of the Ceramic Fibre Blanket
C	13	Separating element, 25mm above specimen C
C	14	Separating element, 25mm left of specimen C
C	15	Sealant cone, on the top side of service
C	16	Sealant cone, on the right side of service
C	17	PVC-U Pipe, on the top side of service 25mm from the end of Sealant cone
C	18	PVC-U Pipe, on the right side of service 25mm from the end of Sealant cone
D	19	Separating element, 25mm above specimen D
D	20	Separating element, 25mm right of specimen D

D	21	Ceramic Fibre Blanket, on the top side of service
D	22	Ceramic Fibre Blanket, on the right side of service
D	23	Steel Pipe, on the top side of service 25mm from the end of the Ceramic Fibre Blanket
D	24	Steel Pipe, on the bottom side of service 25mm from the end of the Ceramic Fibre Blanket
SE	25	Separating element, Equidistant between Specimens A, B, D and E
SE	26	Separating element, Equidistant between Specimens E, F, G and H, maximum thickness of separating element
SE	27	Separating element, Equidistant between Specimens E, F, G and H, minimum thickness of separating element
E	28	Separating element, 25mm above specimen E
E	29	Separating element, 25mm right of specimen E
E	30	Pe-Xa Pipe, on the top side of service 25mm from the end of intumescent wrap
E	31	Pe-Xa Pipe, on the bottom side of service 25mm from the end of intumescent wrap
F	32	Separating element, 25mm above specimen F
F	33	Separating element, 25mm left of specimen F
F	34	Pe-Xa Pipe, on the top side of service 25mm from the end of intumescent wrap
F	35	Pe-Xa Pipe, on the bottom side of service 25mm from the end of intumescent wrap
H	36	Separating element, 25mm above specimen H
H	37	Separating element, 25mm left of specimen H
H	38	Sealant cone, on the top side of service
H	39	Sealant cone, on the right side of service
H	40	Cable Bundle, on the top side of service 25mm from the end of sealant cone
H	41	Cable Bundle, on the bottom side of service 25mm from the end of sealant cone

G	42	Separating element, 25mm above additional plasterboard of specimen G
G	43	Separating element, 25mm right of additional plasterboard of specimen G
G	44	Ceramic Blanket, on the bottom side of service below D1 configuration, 25mm from separating element
G	45	Ceramic Blanket, on the bottom side of service below D2 configuration, 25mm from separating element
G	46	Additional plasterboard, 25mm above the ceramic blanket, above D2 configuration
G	47	Additional plasterboard, 25mm above the ceramic blanket, above D1 configuration
G	48	Ceramic Blanket, on the top side of service above D2 configuration, 25mm from separating element
G	49	Ceramic Blanket, on the top side of service above 50mm PVC-U Pipe, 25mm from separating element
G	50	Ceramic Blanket, on the top side of service above D1 configuration, 25mm from separating element
G	51	On cable tray (2.13), on the bottom side of service, below D1 Configuration, 25mm from the end of the ceramic blanket
G	52	On cable tray (2.13), on the bottom side of service, below D2 Configuration, 25mm from the end of the ceramic blanket
G	53	On cable bundle (2.16), on the top side of service, 25mm from the end of the ceramic blanket
G	54	On cable bundle (2.3), on the top side of service, 25mm from the end of the ceramic blanket
G	55	On PVC-U Pipe (2.10), on the top side of service, 25mm from the end of the ceramic blanket
G	56	On cable bundle (2.15), on the top side of service, 25mm from the end of the ceramic blanket
G	57	On cable bundle (2.14), on the top side of service, 25mm from the end of the ceramic blanket
G	58	On PVC-U Pipe (2.8), on the top side of service, 25mm from the end of the ceramic blanket

G	59	On cable bundle (2.13), on the top side of service, 25mm from the end of the ceramic blanket
G	60	On cable bundle (2.12), on the top side of service, 25mm from the end of the ceramic blanket

SE – separating element

## 8.2 Observations

Time Minutes	Test Face	SP#	Observations
2	U	G	Heavy smoke from between cables
2	U	H	Visible smoke from between cables, originating from cone
3	U	E	Heavy smoke from the end of the pipe
3	U	F	Intermittent heavy smoke from the end of the pipe
5	E	A, C	PVC sheathing has melted, cables beginning to deflect
5	E	E, F	Pipes have melted, visible expansion of intumescent wrap
9	U	C	Discoloured yellow smoke protruding from end of pipe
10	U	G	Heavy dark discoloured smoke from cables
10	U	G	Discoloured yellow smoke coming from 50mm pipe
13	U	SE	Light visible smoke from wall joint next to specimen H
25	E/U	ALL	No notable changes
27	U	E, F	Mastic bubbling, minor expansion of intumescent wrap
30	E	B	Discolouring between ceramic wrap and cone
30	E	B	Visible flame coming from discoloured area
30	E	A, C, H	Visible flames and combustion seen within and around mastic cones
30	U	E, F, G	Reduction in smoke density coming from specimens
36	U	SE	Dark discolouring of joint between specimen A and B
44	U	F	Further expansion of intumescent
45	U	SE	Visible smoke from separating element junction near specimen D
50	E	ALL	No notable changes
53	U	SE	Visible discolouring near left side joint to frame
58	U	F	Visible hole found on the top side of pipe, near intumescent wrap
58	U	F	2 x Cotton pad test for 30 seconds, Pass

60	U	H	Mastic cone visible expansion and bubbling
65	U	A, C	Visible expansion of mastic
65	U	D	Ceramic wrap and mastic pulling away from separating element
80	E/U	ALL	No notable changes
85	U	F	Cotton pad test for 30 seconds, Pass
90	E/U	ALL	No notable changes
97	U	D	Discolouring around steel cable tie on ceramic wrap
97	U	G	Smoke protruding from separating element joint below cable tray
105	E/U	ALL	No notable changes
120	U	D, F	Cotton pad test for 30 seconds – Pass
126	E	ALL	No notable changes
126	U	G	Visible hole/gap in mastic near top right of wrap
126	U	G	Discoloured yellow smoke from D2 cable bundle
126	U	SE	Further discolouring of separating element perimeter and joints
126	U	SE	Visible deflection of separating element, into the furnace
126	U	D	Further discolouring of ceramic wrap from separating element
130	U	A	Mastic cone around specimen starting to peel away from separating element
135	U	G	Heavy discolouring of wrap above D2 bundle, heavy smoke continues
135	U	B	Visible discolouring to wrap around visible gap in between mastic cone and wrap
135	U	G	Visible gap within Mastic and ceramic wrap junction, right side on top of tray
140	U	G	Heavy smoke continues from cable tray
150	U	G	Continued heavy smoke from top, bottom and from surrounding joints.
150	U	G	4 x cotton pad tests for 30 seconds on and around cable tray – Pass

167	U	SE	Visible smoke from top right perimeter junction
170	U	G	Visible flaming for more than 10 seconds – Integrity failure – Specimen G ignited on the unexposed side and consequently speed panel lost integrity at the joint
172			TEST DISCONTINUED

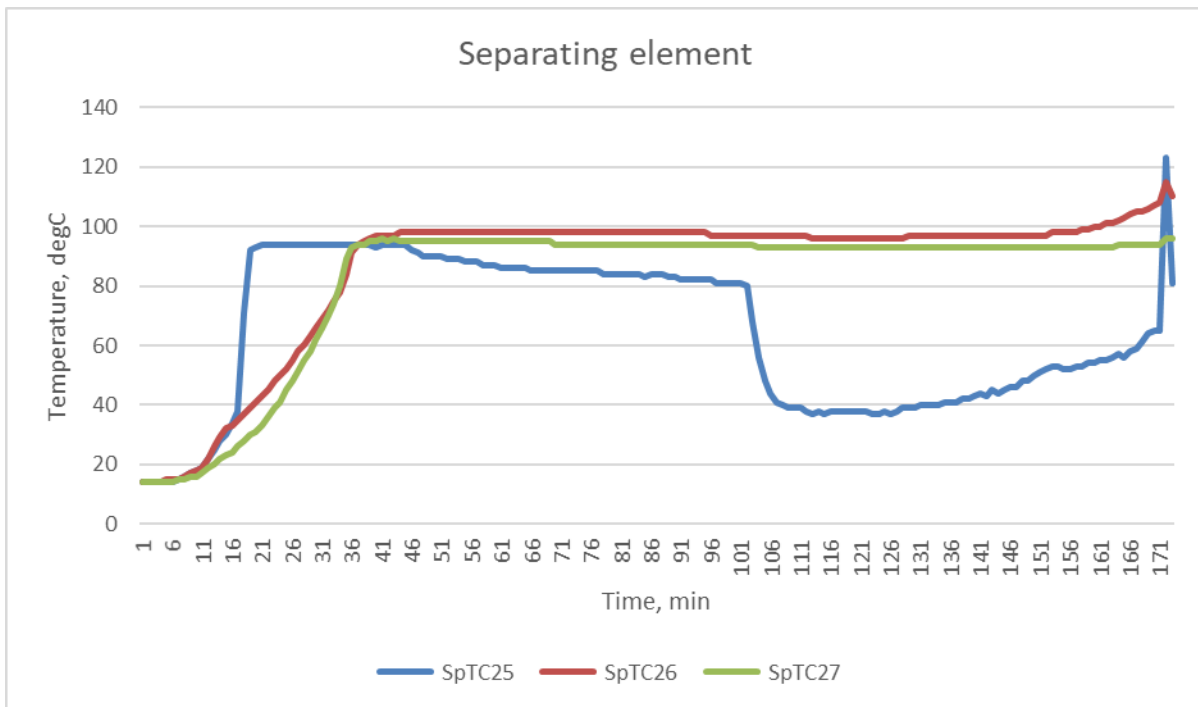
**Key: U = unexposed face. E = Exposed face.**

## 9. Separating element and main fire-stopping system

The Separating Element was constructed by the laboratory, in accordance with the client-supplied diagrams. The laboratory supplied the cable tray, D1 and D2 cables. The laboratory constructed the cable tray in accordance with the client's description. The laboratory was not involved in the service penetration preparation or installation.

The separating element comprised of 5 Speedpanels (1.2), one of which had been cut near the tongue edge of the panel to fit within the frame. The bottom ends of the 5 panels were placed within a C-Track (1.3), then fixed using screws (4.1) at 500mm centres. The left and right sides of the Speedpanels were then fixed to a C-Track using the same method. The top edge of the Speedpanels was also cut to fit within the frame. The final length of C-Track was fixed to the top edge, then the wall was fixed within the refractory frame using slotted angles. The edges of the wall were packed with ceramic fibre, then remaining gaps were filled using sealant (3.1). Gaps between the C-Track and Speedpanel were also sealed using sealant in accordance with the application manual supplied by the client.

Apertures were cut after the completion of the separating element by the client.





## 10. Specimens

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Unexposed faced:

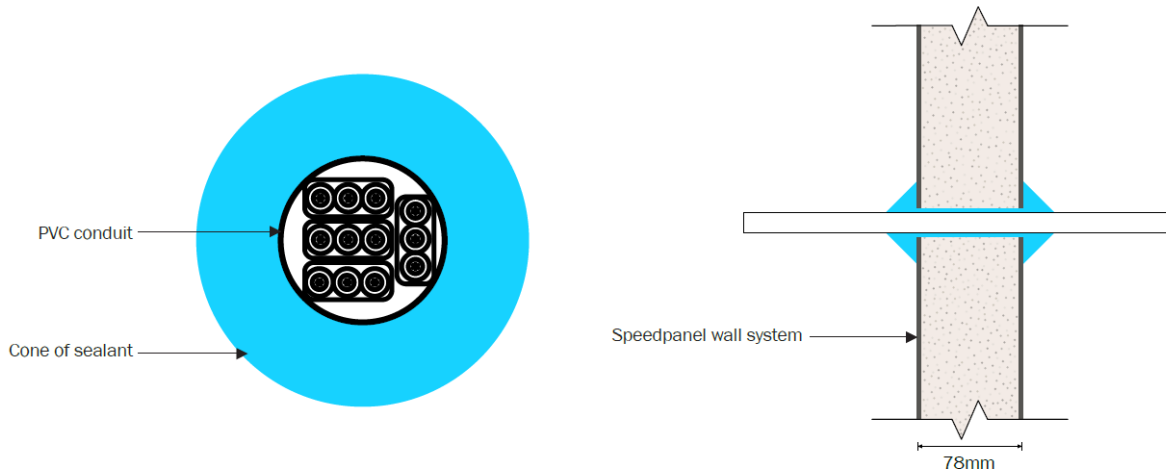


Exposed face:



## 10.1 Specimen A



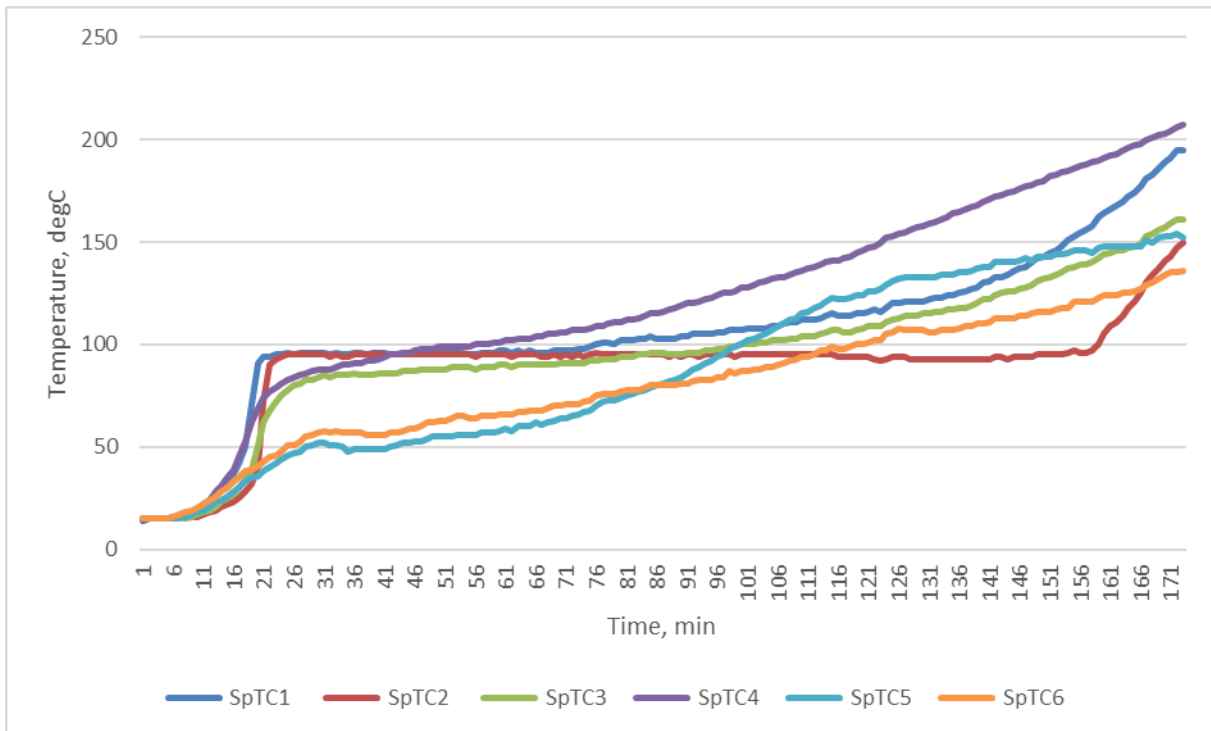


Penetration System		
A	Service	20mm PVC-U Pipe with Cables
	Service Details	Pipe (2.8), 1 x Cable (2.1), 2 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	32.19mm
	Annular Spacing	Min: 6mm, Max: 6mm
	<b>Local Fire-stopping Protection</b>	
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element, 1 x Cable (2.1), 2 x Cable (2.2), and 3 x Cable (2.3) were bundled together and passed into the PVC-U pipe. PVC-U pipe (2.8) was passed through the aperture, extending 500mm from both faces.</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. Once cured, a 25mm (nominal) sealant cone was applied to both faces.</p> <p>An additional section of PVC-U pipe was glued to the unexposed side, extending the total length of the pipe to 2000mm.</p>	

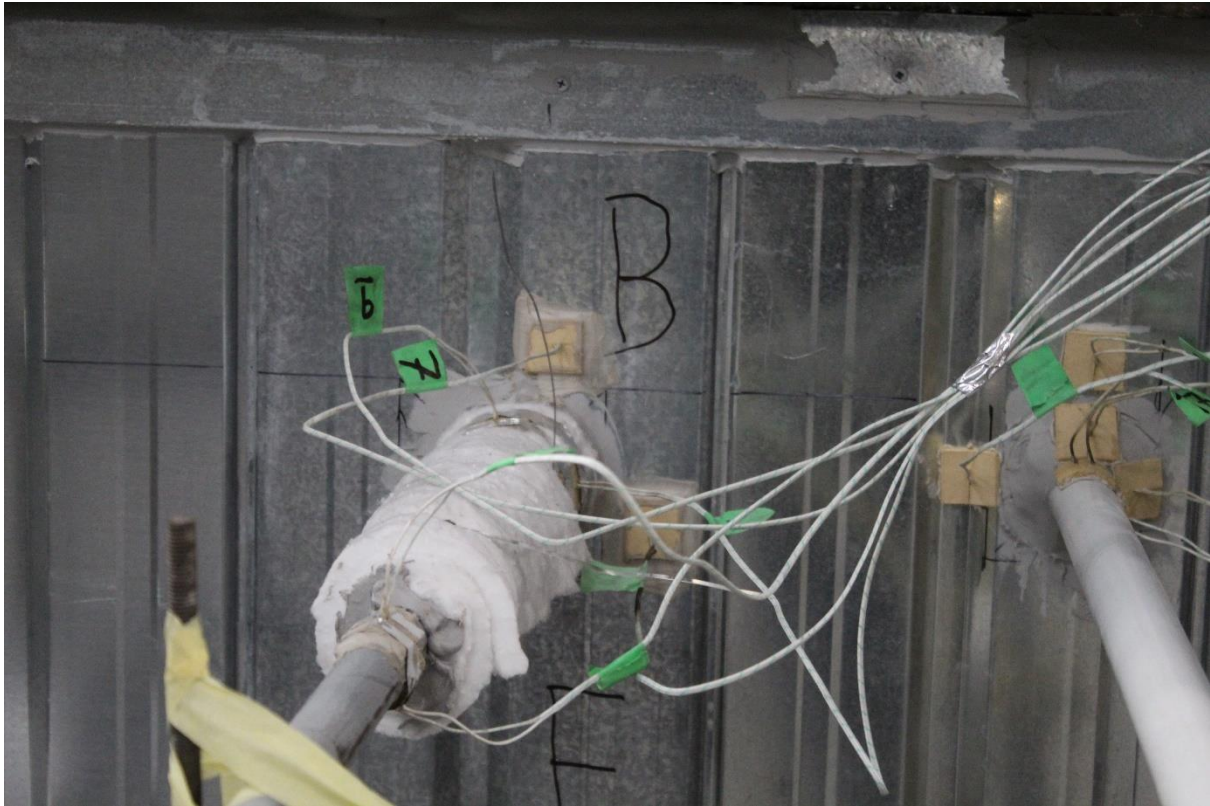
## Test results

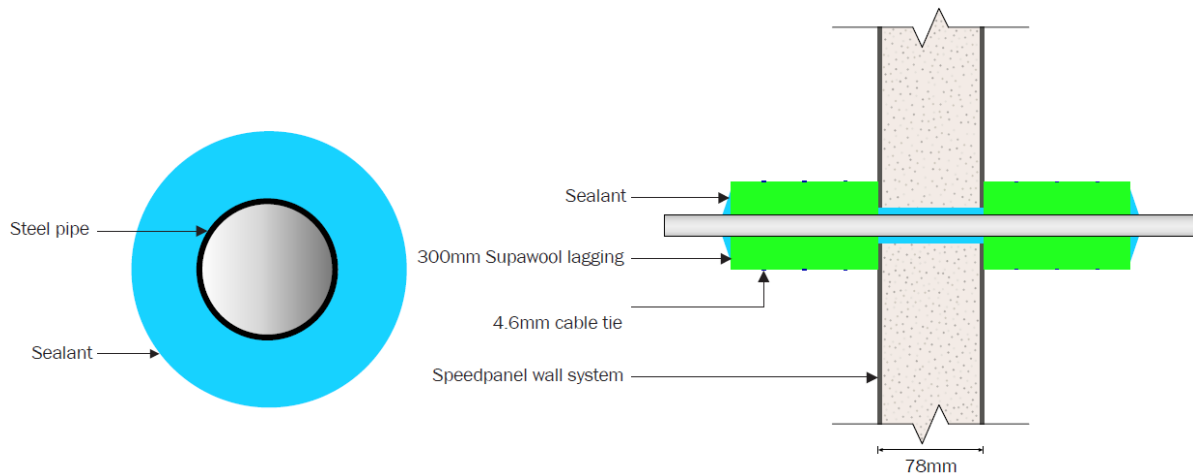
Structural adequacy	Not applicable
Integrity	No failure at 172 min
Insulation	162 min

### Specimen A Thermocouples Readings



## 10.2 Specimen B



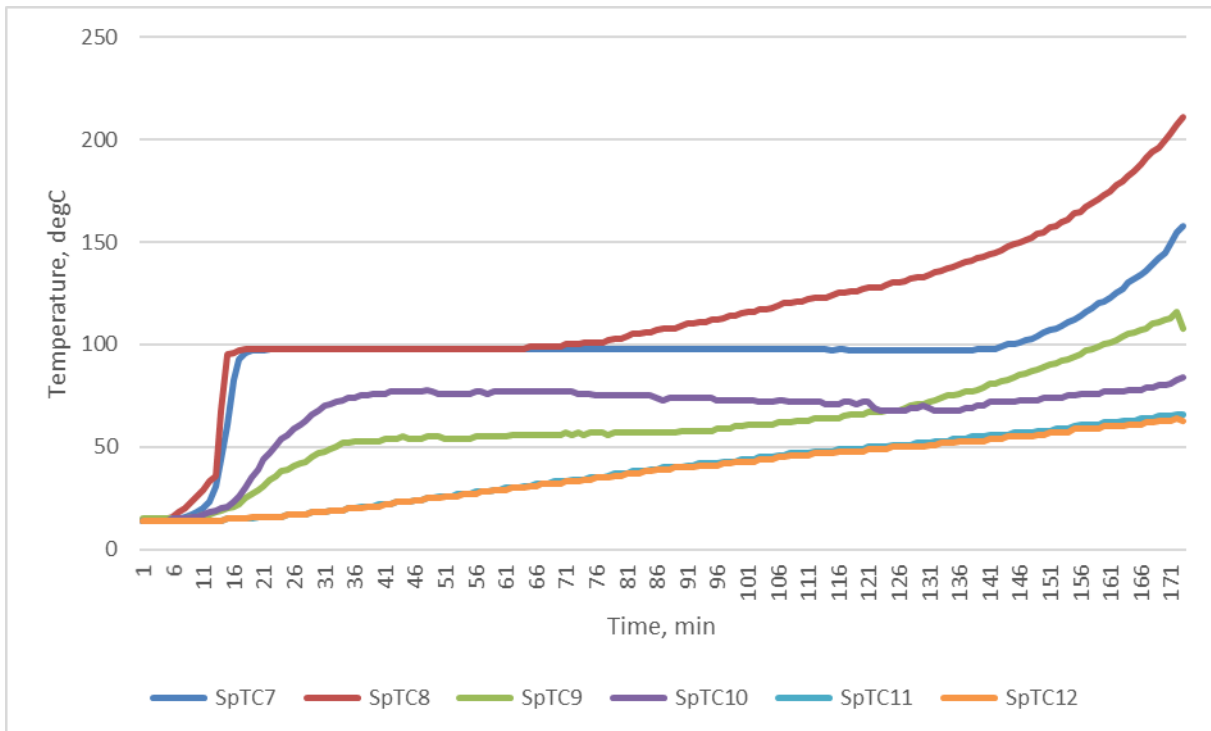


Penetration System		
B	Service	25DN Steel Pipe
	Service Details	Pipe (2.4), Sealant (3.1), Ceramic Fibre Blanket (5.1), Cable Ties (4.3)
	Service Support	Unistrut structure at 500mm
	Aperture Size	35.35mm
	Annular Spacing	Min: 3mm, Max: 6mm
	<b>Local Fire-stopping Protection</b>	
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element, then the steel pipe (2.4) was passed through the aperture, extending 850mm from both faces.</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. A length of Ceramic fibre was cut and wrapped around the service 2 ¼ times. The ceramic fibre was secured using cable ties (4.3), and extended 610mm from both faces. A 25mm (nominal) radius bead of sealant was applied between the speedwall and ceramic fibre. Sealant was applied between the end of the ceramic fibre and the pipe to fill any remaining gaps.</p>	

## Test results

Structural adequacy	Not applicable
Integrity	No failure at 172 min
Insulation	167 min

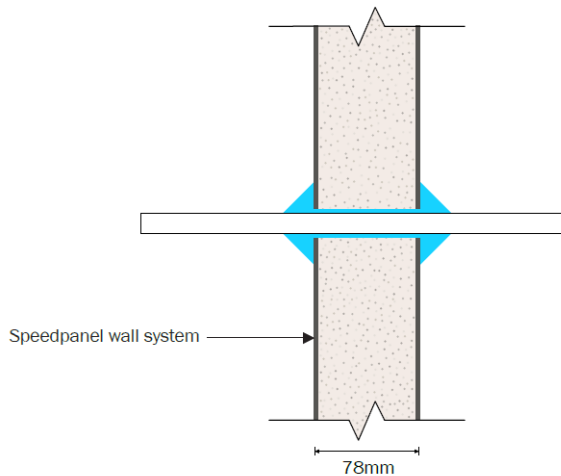
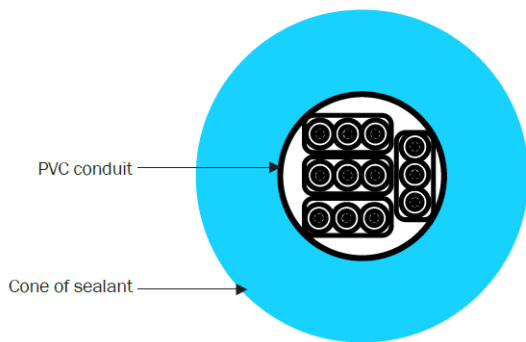
### Specimen B Thermocouples Readings



## 10.3 Specimen C





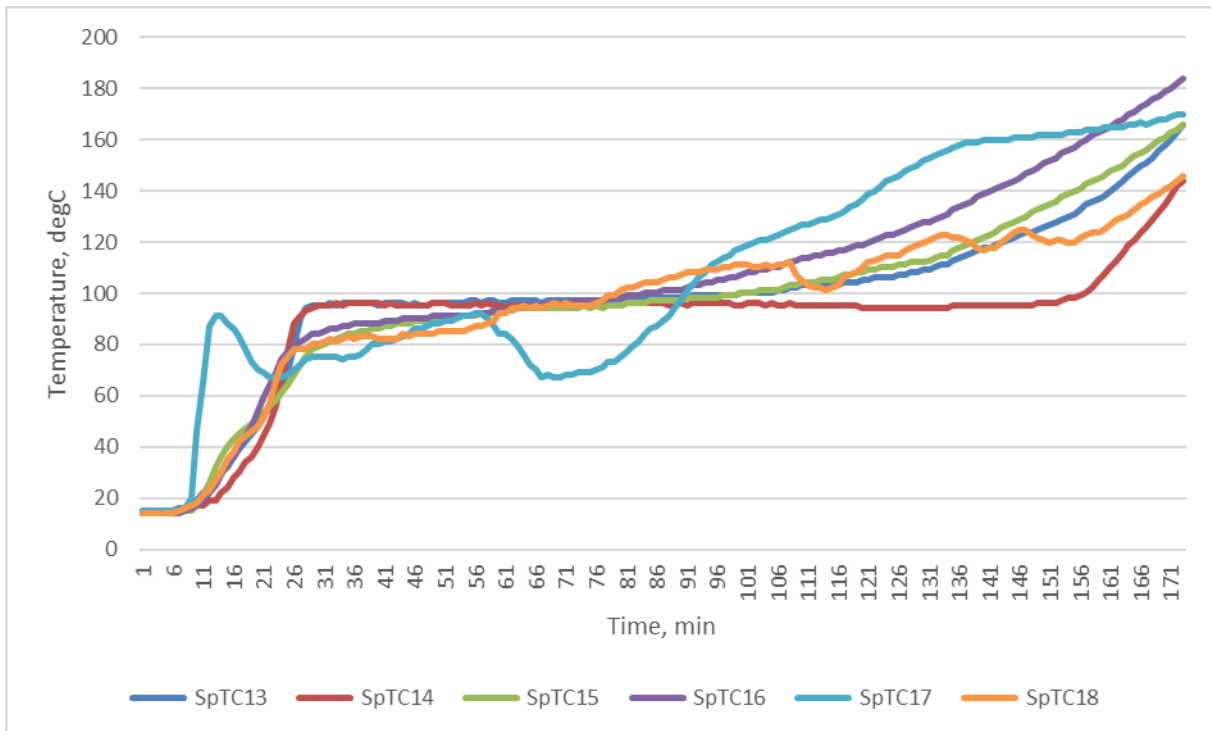


Penetration System		
C	Service	32mm PVC-U Pipe with Cables
	Service Details	Pipe (2.9), 3 x Cable (2.1), 3 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	43.77mm
	Annular Spacing	Min: 3mm, Max: 9mm
<b>Local Fire-stopping Protection</b>		
	Application	Symmetrical, capped from exposed face only
	Protection Used	<p>Aperture was cut into the separating element, 3 x Cable (2.1), 3 x Cable (2.2), and 3 x Cable (2.3) were bundled together and passed into the PVC-U pipe. PVC-U pipe (2.9) was passed through the aperture, extending 500mm from both faces.</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. Once cured, a 25mm (nominal) sealant cone was applied to both faces.</p> <p>An additional section of PVC-U pipe was glued to the unexposed side, extending the total length of the pipe to 2000mm.</p>

## Test results

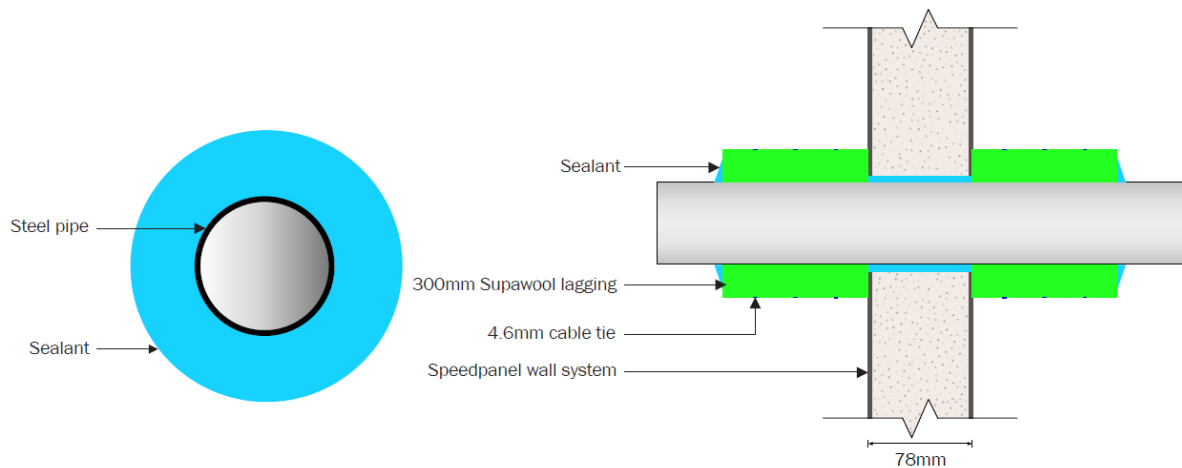
<b>Structural adequacy</b>	<b>Not applicable</b>
<b>Integrity</b>	<b>No failure at 172 min</b>
<b>Insulation</b>	<b>No failure at 172 min</b>

### Specimen C Thermocouples Readings



## 10.4 Specimen D



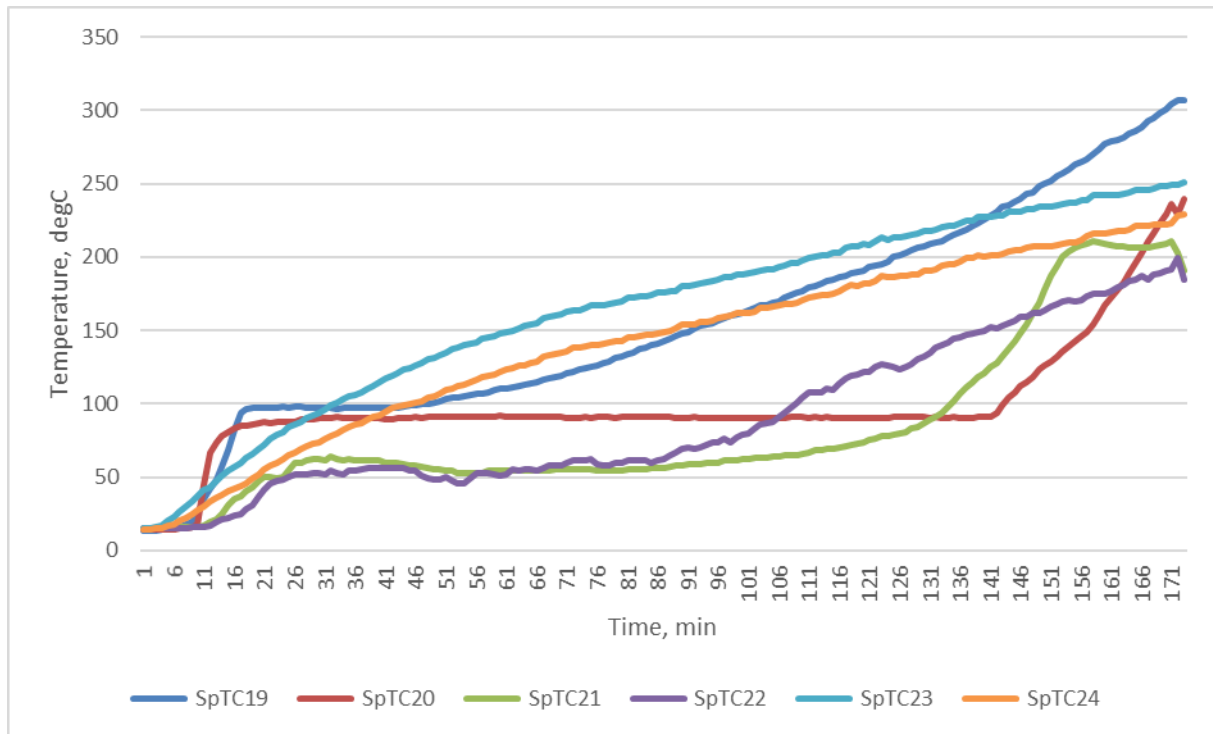


Penetration System		
D	Service	100DN Steel Pipe
	Service Details	Pipe (2.5), Sealant (3.1), Ceramic Fibre Blanket (5.1)
	Service Support	Unistrut structure at 500mm
	Aperture Size	142.37mm
	Annular Spacing	Min: 8mm, Max: 20mm
<b>Local Fire-stopping Protection</b>		
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element, then the steel pipe (2.5) was passed through the aperture, extending 850mm from both faces.</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. A length of Ceramic fibre was cut and wrapped around the service 2 ¼ times. The ceramic fibre was secured using cable ties (4.3), and extended 610mm from both faces. A 25mm (nominal) radius bead of sealant was applied between the speedwall and ceramic fibre. Sealant was applied between the end of the ceramic fibre and the pipe to fill any remaining gaps.</p>	

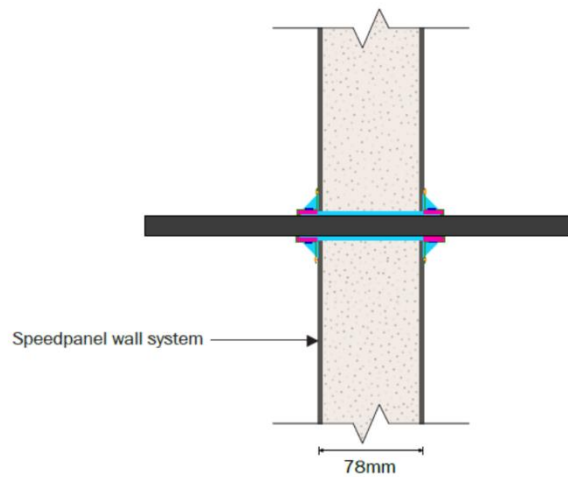
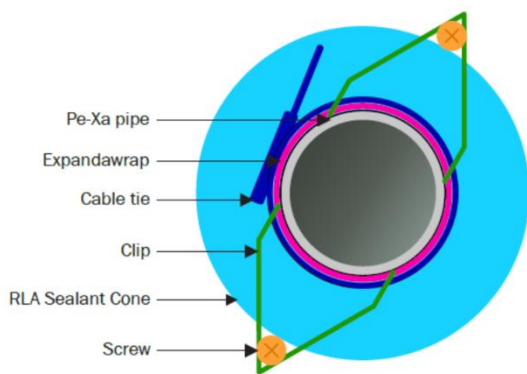
## Test results

Structural adequacy	Not applicable
Integrity	No failure at 172 min
Insulation	107 min

### Specimen D Thermocouples Readings



## 10.5 Specimen E

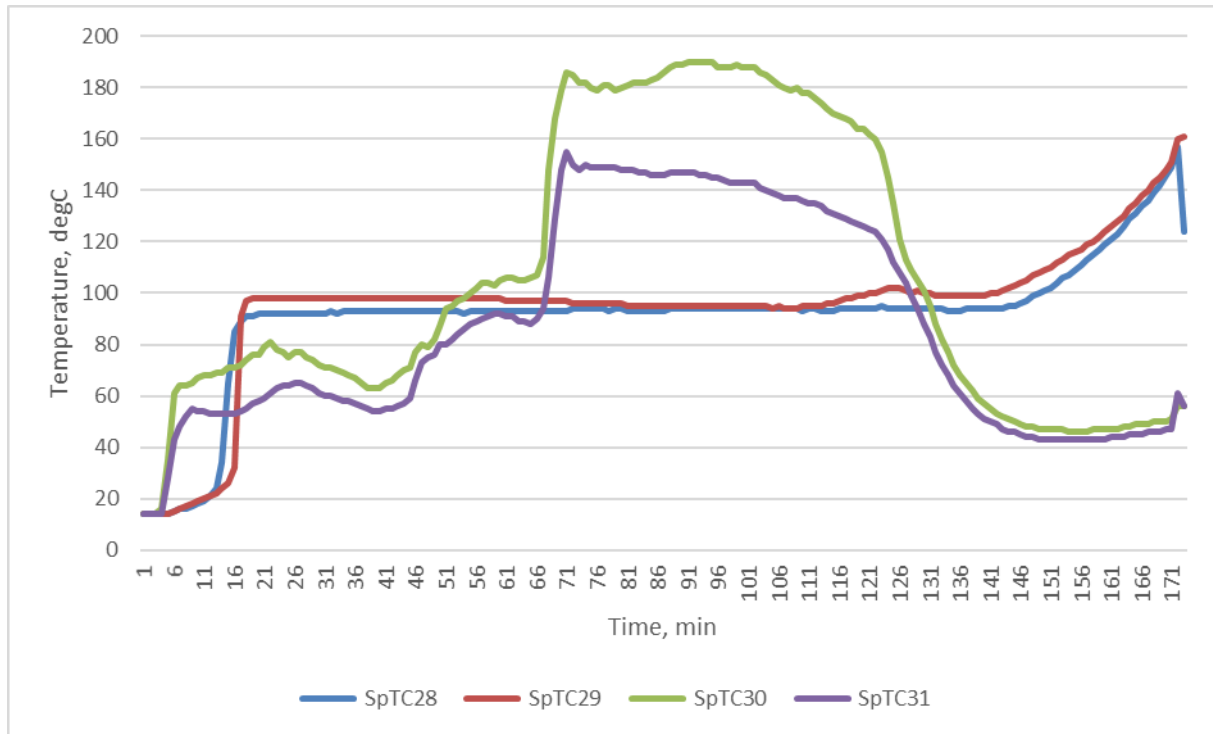


Penetration System		
E	Service	16DN Pe-Xa Pipe
	Service Details	Pipe (2.7), Sealant (3.1), Intumescent Strip (5.2), Steel Wire Clips (4.3), Screws (4.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	29.13mm
	Annular Spacing	Min: 1mm, Max: 12mm
	<b>Local Fire-stopping Protection</b>	
	Application	Symmetrical, capped from exposed face only
	Protection Used	Aperture was cut into the separating element, then Pe-Xa pipe (2.7) was passed through the aperture, extending 500mm from the exposed face, and 2000mm from the unexposed face  Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. A length of Intumescent strap (5.2) was cut to wrap around the pipe one time, with approximately 10mm overlap. The strap was fixed to the separating element using two steel wire clips (4.4) and screws (4.1). A 25mm (nominal) radius bead of sealant was applied between the intumescent strip and the separating element.

## Test results

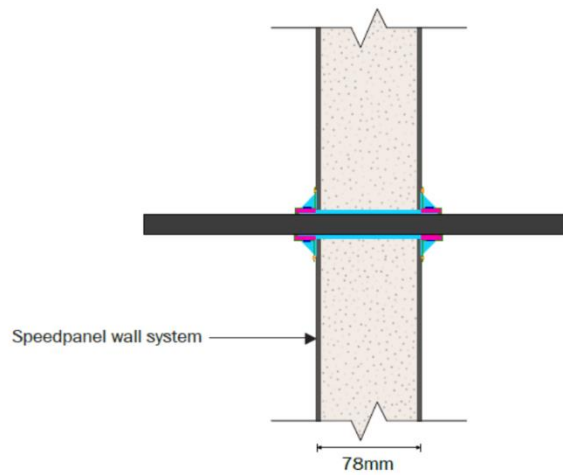
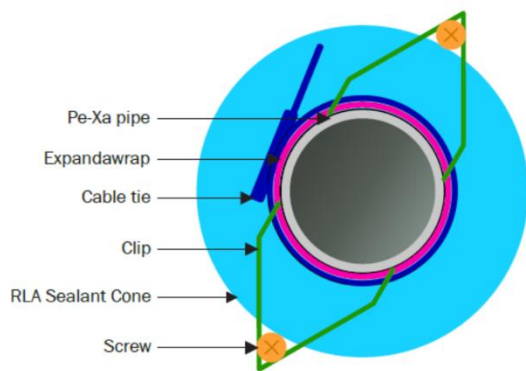
<b>Structural adequacy</b>	<b>Not applicable</b>
<b>Integrity</b>	<b>No failure at 172 min</b>
<b>Insulation</b>	<b>No failure at 172 min</b>

## Specimen E Thermocouples Readings





## 10.6 Specimen F

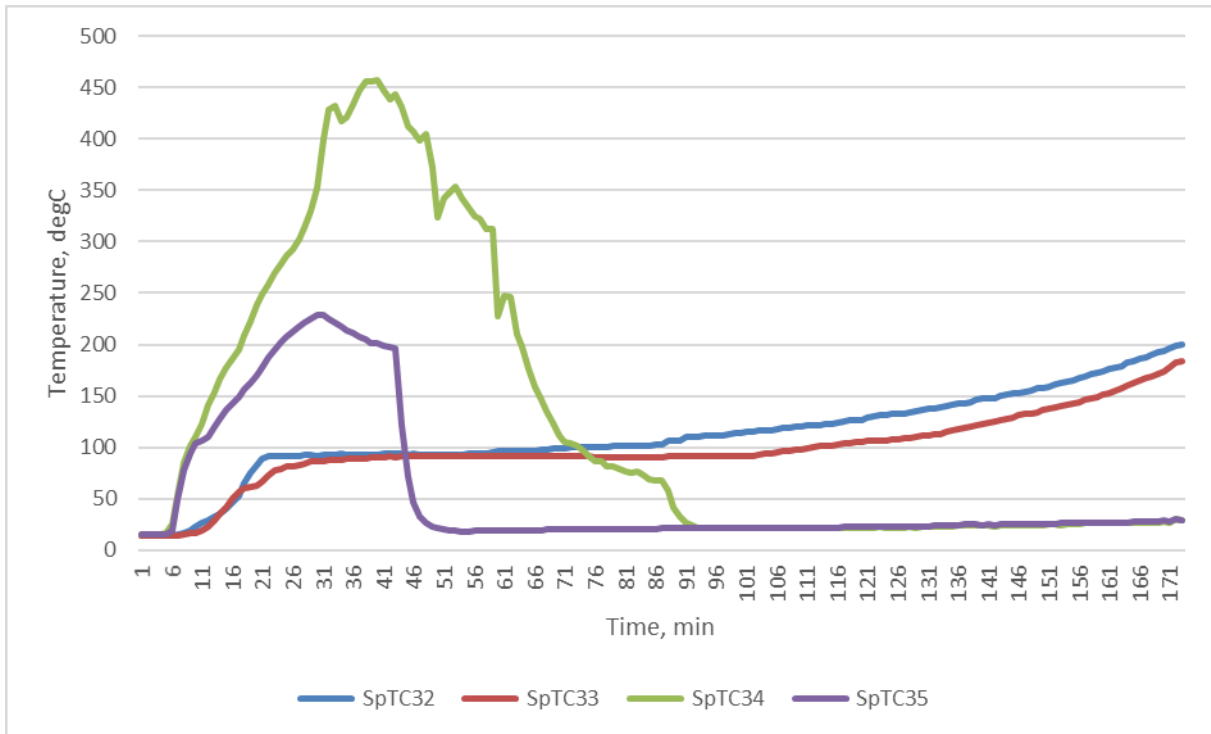


Penetration System		
F	Service	32DN Pe-Xa Pipe
	Service Details	Pipe (2.6), Sealant (3.1), Intumescent Strip (5.2), Steel Wire Clips (4.3), Screws (4.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	44.31mm
	Annular Spacing	Min: 3mm, Max: 9mm
	<b>Local Fire-stopping Protection</b>	
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element, then Pe-Xa pipe (2.6) was passed through the aperture, extending 500mm from the exposed face, and 2000mm from the unexposed face</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. A length of Intumescent strap (5.2) was cut to wrap around the pipe one time, with approximately 10mm overlap. The strap was fixed to the separating element using two steel wire clips (4.4) and screws (4.1). A 25mm (nominal) radius bead of sealant was applied between the intumescent strip and the separating element.</p>	

## Test results

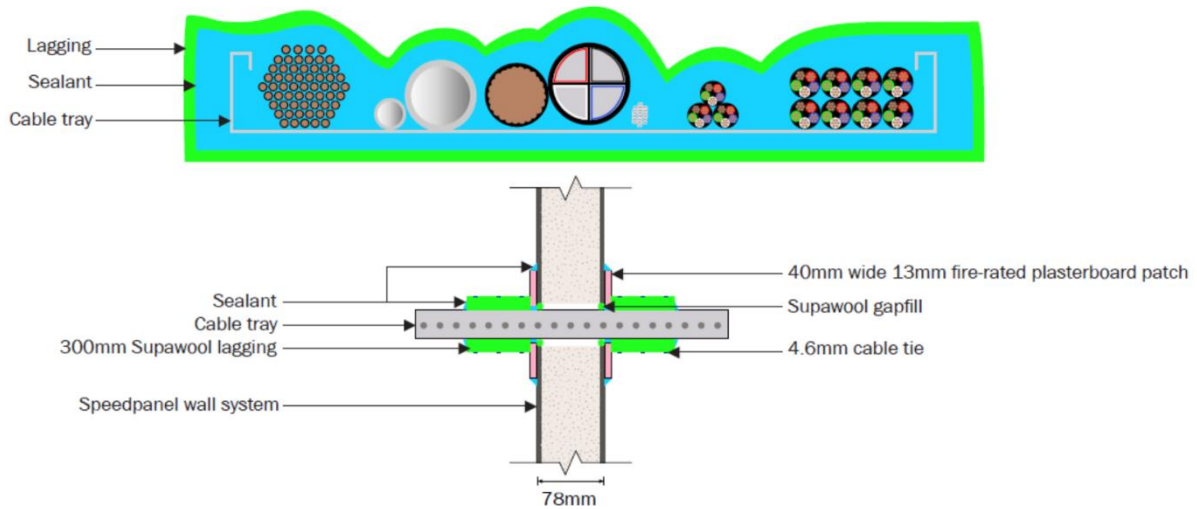
<b>Structural adequacy</b>	<b>Not applicable</b>
<b>Integrity</b>	<b>No failure at 172 min</b>
<b>Insulation</b>	<b>16 min</b>

## Specimen F Thermocouples Readings



## 10.7 Specimen G





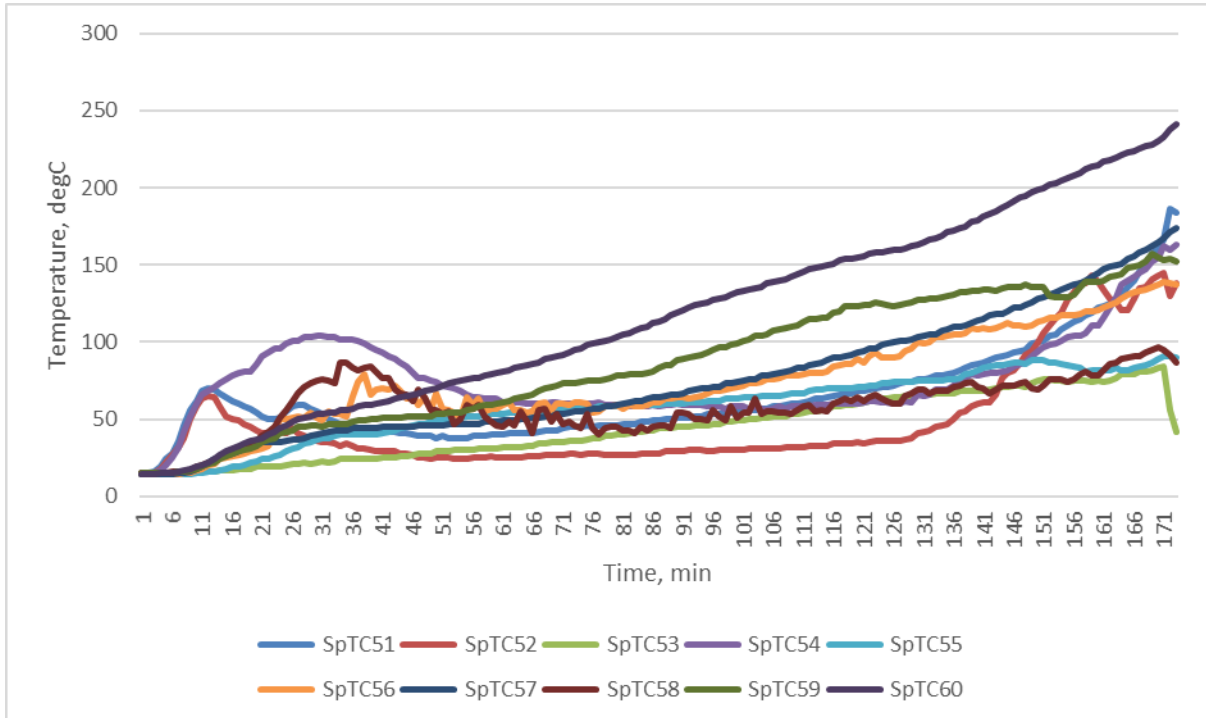
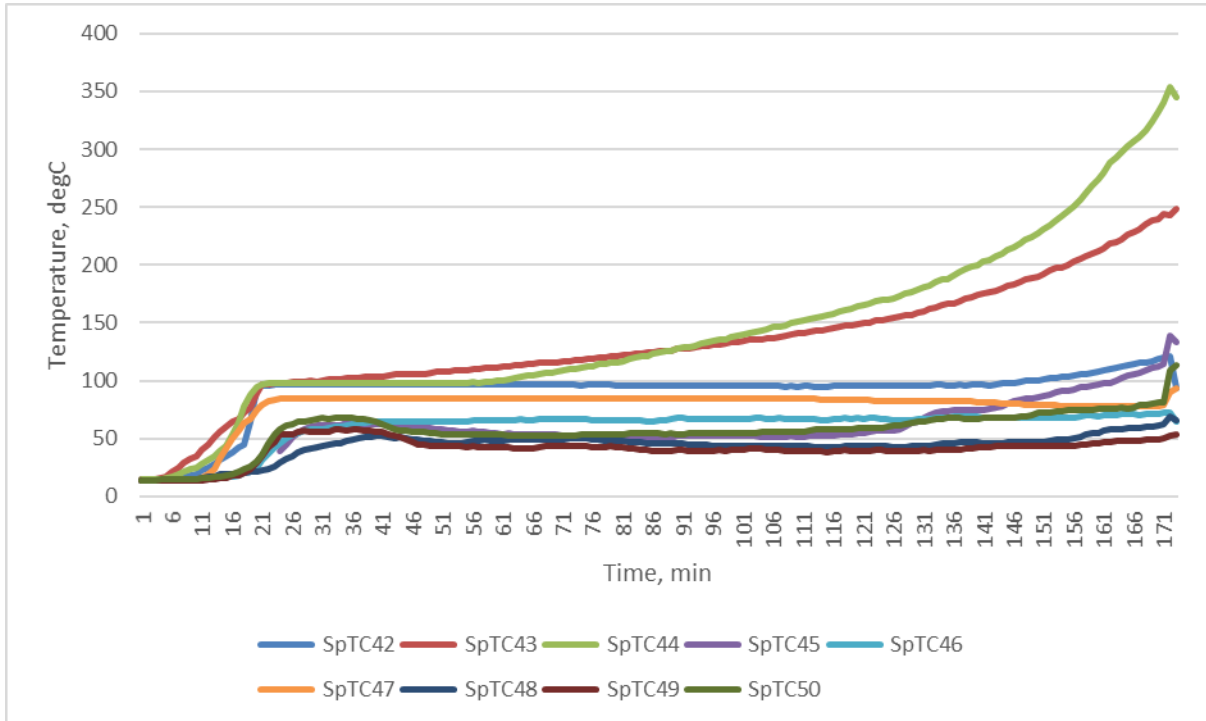
Penetration System		
G	Service	D1 and D2 cable configuration with plastic pipe and Cable Bundle on the Cable Tray
	Service Details	Cable Tray (2.11), Pipe (2.8), Pipe (2.10), 11 x Cable (2.1), 32 x Cable (2.2), 13 x Cable (2.3), 1 x Cable (2.12), 1 x Cable (2.13), 3 x Cable (2.14), 8 x Cable (2.15), 60 x Cable (2.16), Ceramic Fibre Blanket (5.1), Cable ties (4.3) Sealant (3.1), Plasterboard (5.3). Cable configurations and additional services were put together upon the request of Client.
	Service Support	Unistrut structure at 500mm
	Aperture Size	465mm x 115mm
	Annular Spacing	Min: 1mm, Max: 60mm
	<b>Local Fire-stopping Protection</b>	
Application	Symmetrical, capped from exposed face only	
Protection Used	Aperture cut into the separating element. The 60 x D2 Cables (2.16) were bundled using cable ties and placed on the unexposed left side of the cable tray (2.11). The D1 Cable configuration was placed next to the D2 configuration in the order of 8 x Cable (2.15), 3 x Cable (2.14), 1 x Cable (2.13), then 1 x Cable (2.12). The cables were secured to the cable tray with cable ties. The Cable tray was placed through the aperture.  10 x Cable (2.1), 10 x Cable (2.2), and 10 x Cable (2.3) were bundled together and placed in the pipe (2.10).	

	<p>1 x Cable (2.1), 2 x Cable (2.2), and 3 x Cable (2.3) were bundled together and placed in the pipe (2.8). 20 x Cable (2.2) were bundled together.</p> <p>The cable bundle was placed between the D1 and D2 configurations on the cable tray. The pipe (2.8) was placed on top of the D1 configuration between the 8 x Cable (2.15) and the 3 x Cable (2.14). The pipe (2.10) was placed between the D1 and D2 configurations on top of the additional cable bundle. The additional pipes and cable bundle extended 500mm from both faces.</p> <p>Sections of ceramic fibre blanket (5.1) were cut and pushed into the aperture gaps around the perimeter of the cable bundle, recessed 13mm into the separating element. A section of plasterboard (5.3) was cut to follow the profile of the cable tray and was fixed to the separating element with screws (4.3). This resulted in a maximum aperture gap of approximately 20mm, and a minimum aperture gap of 2mm. A bead of sealant was applied to the perimeter junction between plasterboard and Speedpanel, and the ceramic fibre recess within the aperture was filled with sealant, resulting in a thickness of 30mm (nominal). Sealant was applied flush with the additional plasterboard layer. Once cured, a 25mm (nominal) radius bead of sealant was applied between the plasterboard and the cable tray around the perimeter.</p> <p>The outside of the cable tray was wrapped with two and a half revolutions of ceramic fibre blanket. The end of the blanket measured 300mm from the separating element. The ceramic blanket was secured to the cable tray using cable ties (4.3). The remaining gaps between the cable tray and ceramic blanket were filled using more ceramic blanket.</p> <p>A 25mm (nominal) radius bead of sealant was applied between the plasterboard and the ceramic blanket around the perimeter. The PVC pipes were extended to 2000mm from the unexposed face by gluing another length to the existing pipes.</p>
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## Test results

<b>Structural adequacy</b>	<b>Not applicable</b>
<b>Integrity</b>	<b>170 min</b>
<b>Insulation</b>	<b>137 min</b>

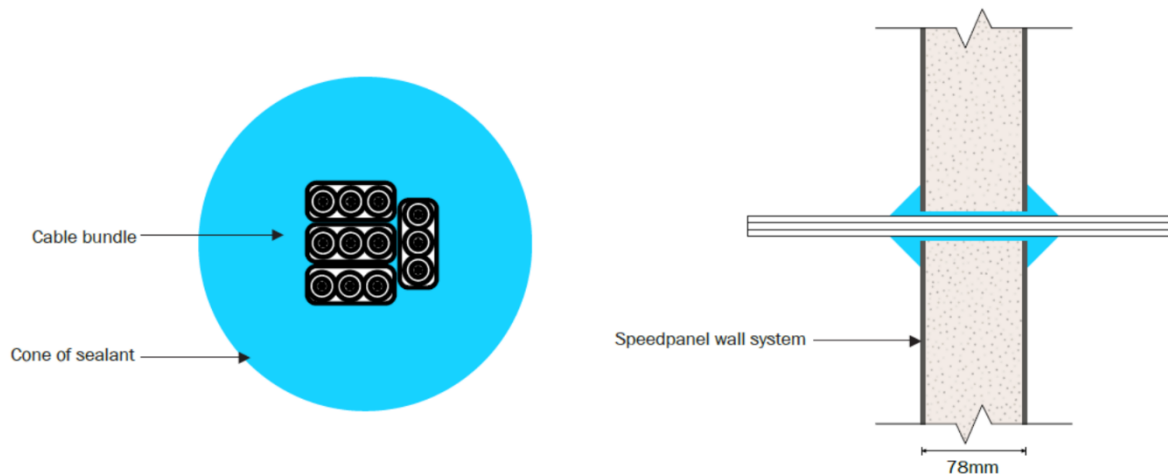
## Specimen G Thermocouples Readings



## 10.8 Specimen H





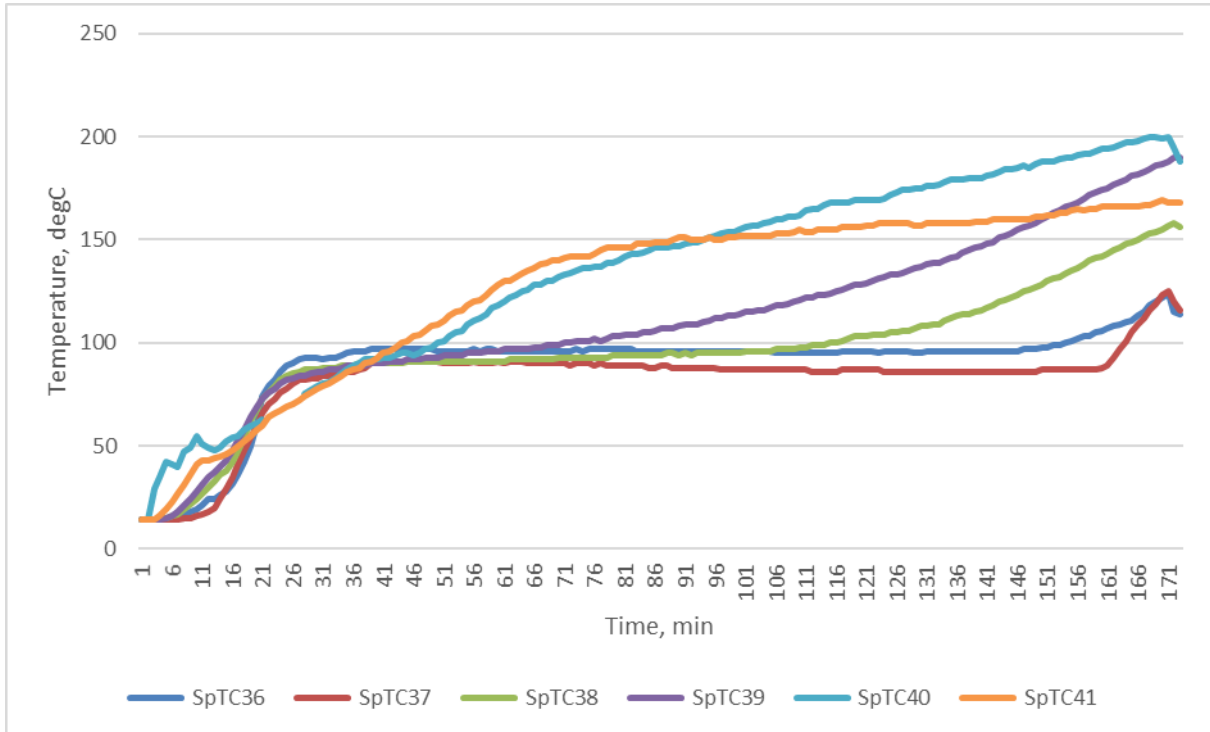


Penetration System		
H	Service	20mm Cable Bundle
	Service Details	3 x Cable (2.1), 3 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	41.79mm
	Annular Spacing	Min: 4mm, Max: 14mm
	<b>Local Fire-stopping Protection</b>	
Application	Symmetrical	
Protection Used	<p>Aperture was cut into the separating element, 3 x Cable (2.1), 3 x Cable (2.2), and 3 x Cable (2.3) were bundled together and passed through the aperture, extending 500mm from both faces.</p> <p>Sealant (3.1) was applied to full depth of the aperture, flush with the Speedpanel at the point of maximum thickness. Once cured, a 25mm (nominal) sealant cone was applied to both faces.</p>	

## Test results

Structural adequacy	Not applicable
Integrity	No failure at 172 min
Insulation	161 min

## Specimen H Thermocouples Readings



## 11. Additional photographs

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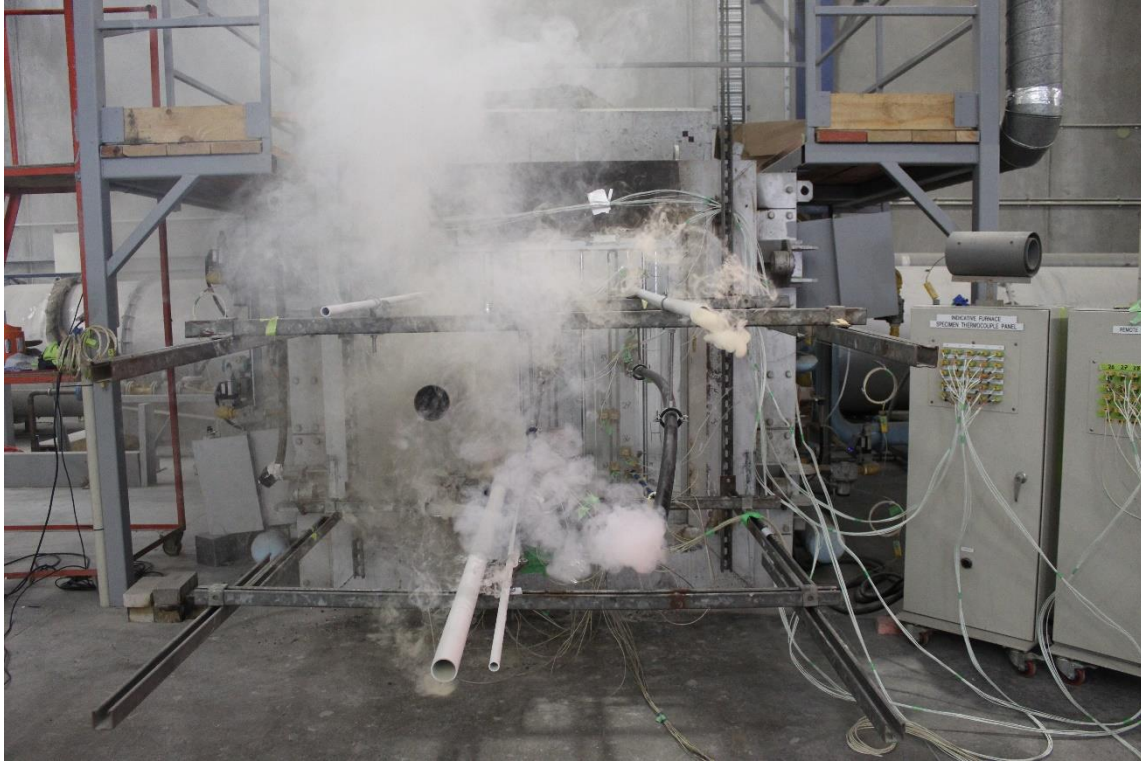
### 11.1 Materials used



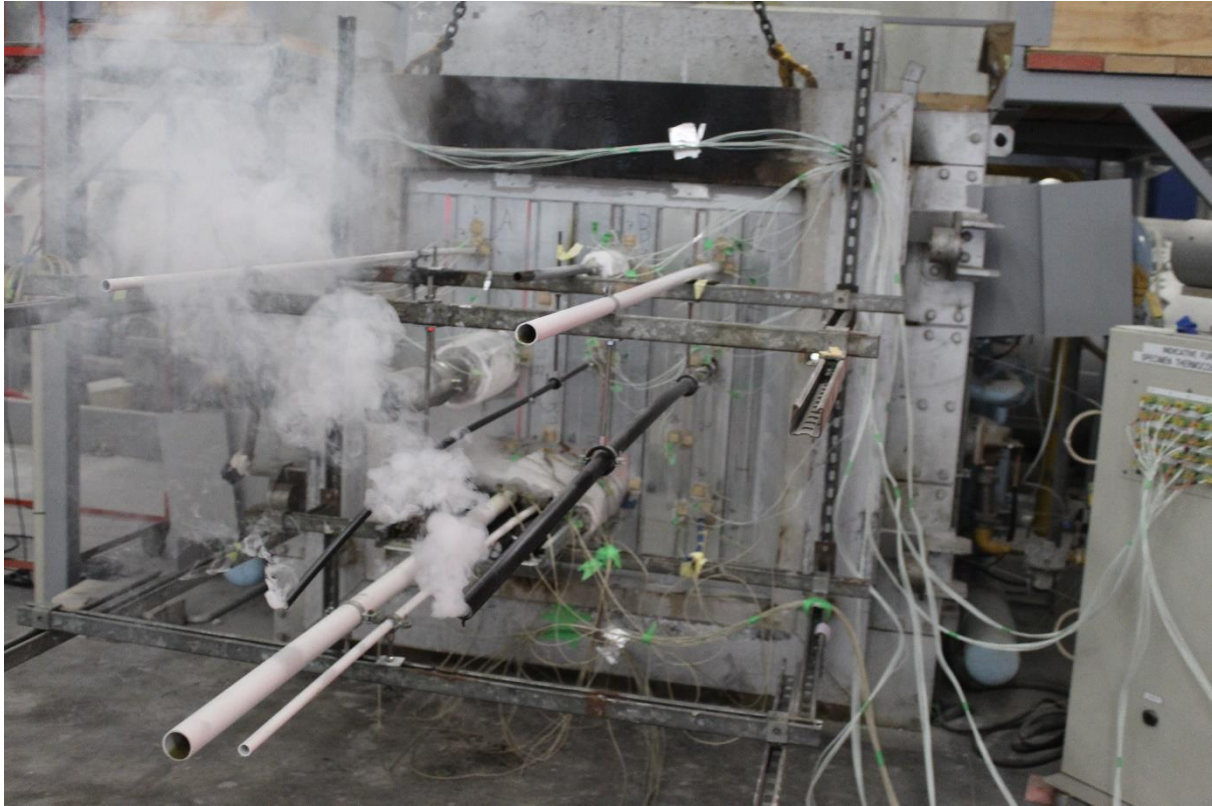
Item 5.2

## 11.2 During and after the test

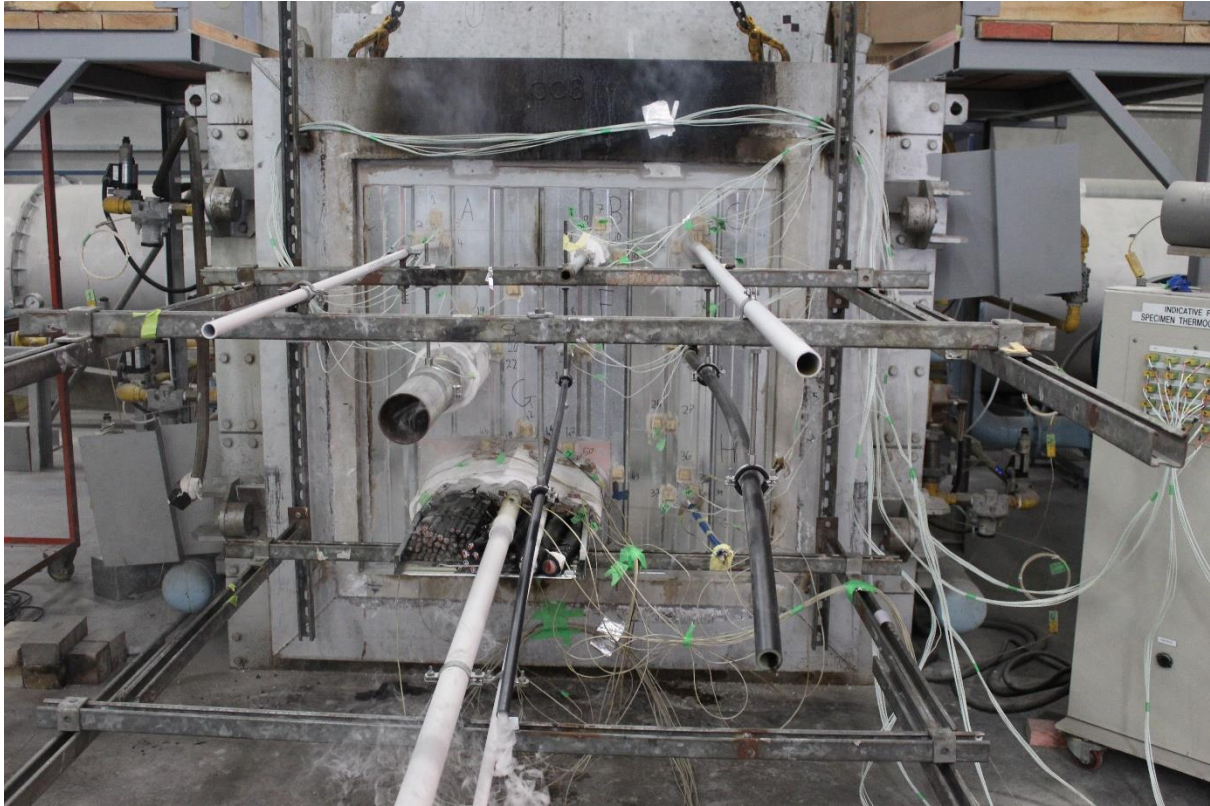
10 minutes:



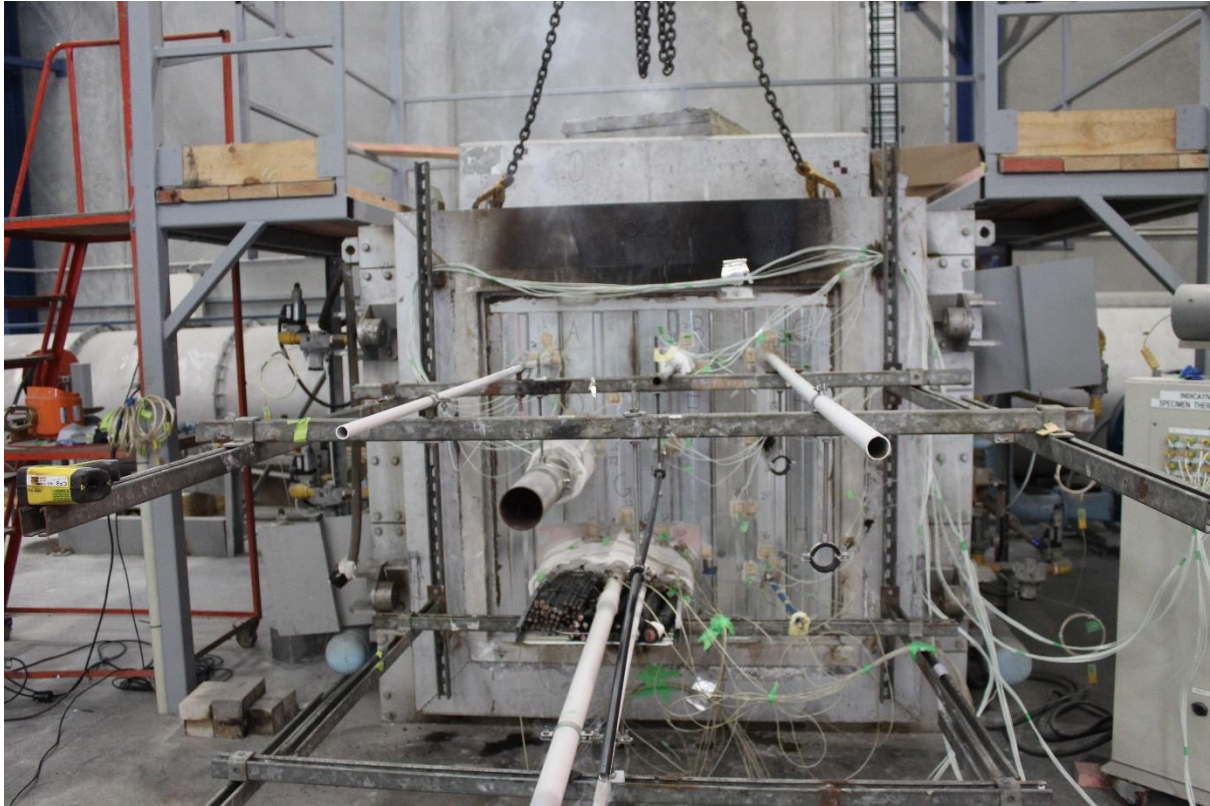
30 minutes:



60 minutes:



90 minutes:

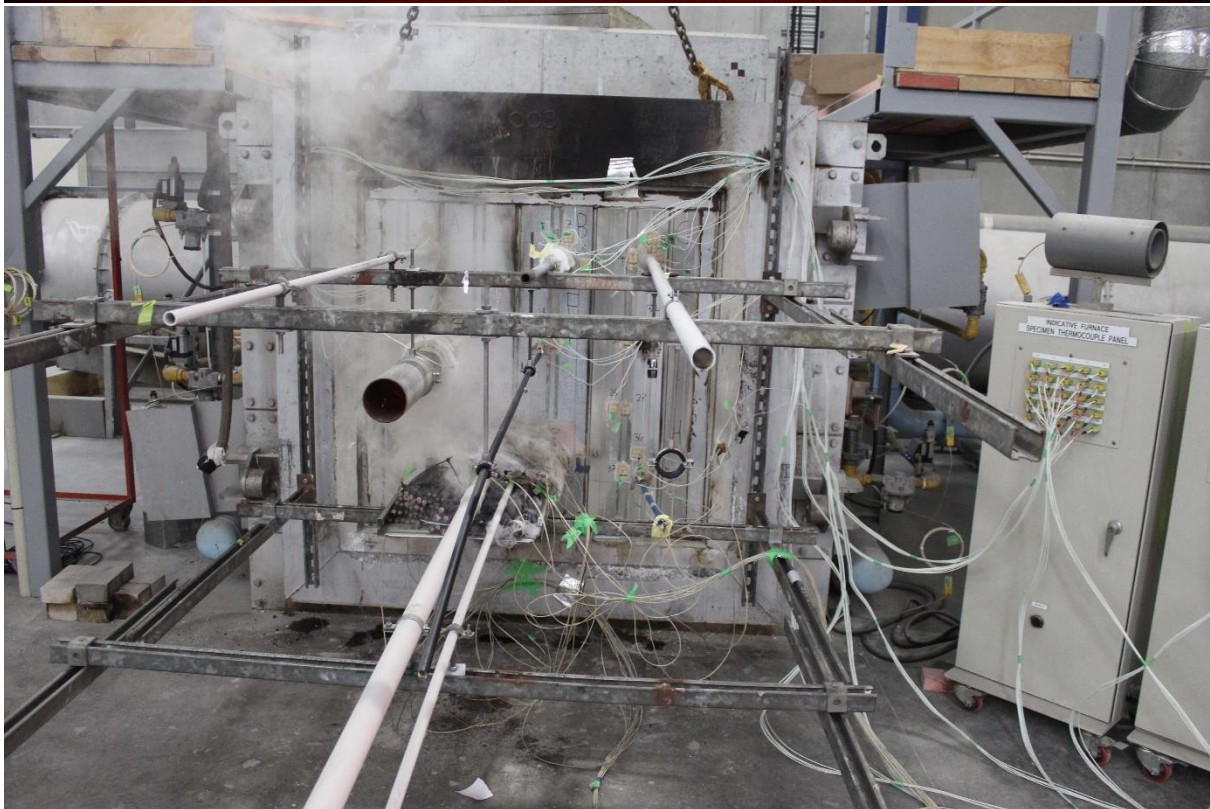


120 minutes:





150 minutes:



After the test:

