

Test report # PF21009-A

Test Number 21009

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	24/08/2021	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

2.1 IANZ registered Testing Authority

Passive Fire Inspection and Test Services Ltd

Accreditation N^o: 1335

1/113 Pavilion Drive, Mangere, Auckland, 2022

New Zealand

Contact e-mail: 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

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	32DN PVC-U Pipe with Cables	124 NF	95	-/90/90
B	35mm Cable Bundle	124 NF	91	-/90/90
C	3 x 20DN Copper pipes with Armaflex insulation	124 NF	71	-/90/60
D	32DN Pe-Xa Pipe	29	15	-/-/-
E	15mm Cable Bundle	124 NF	82	-/90/60
F	D1 + D2 + assorted cable bundle + Pipe on Cable Tray	124 NF	96	-/90/90
G	16DN Pe-Xa Pipe	124 NF	88	-/90/60
H	40mm Deflection Head Seal	124 NF	80	-/90/60

NF – No failure during the test

* - The specimens FRL performance is limited to the -/90/90 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

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:

02/08/2021

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 124 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

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.

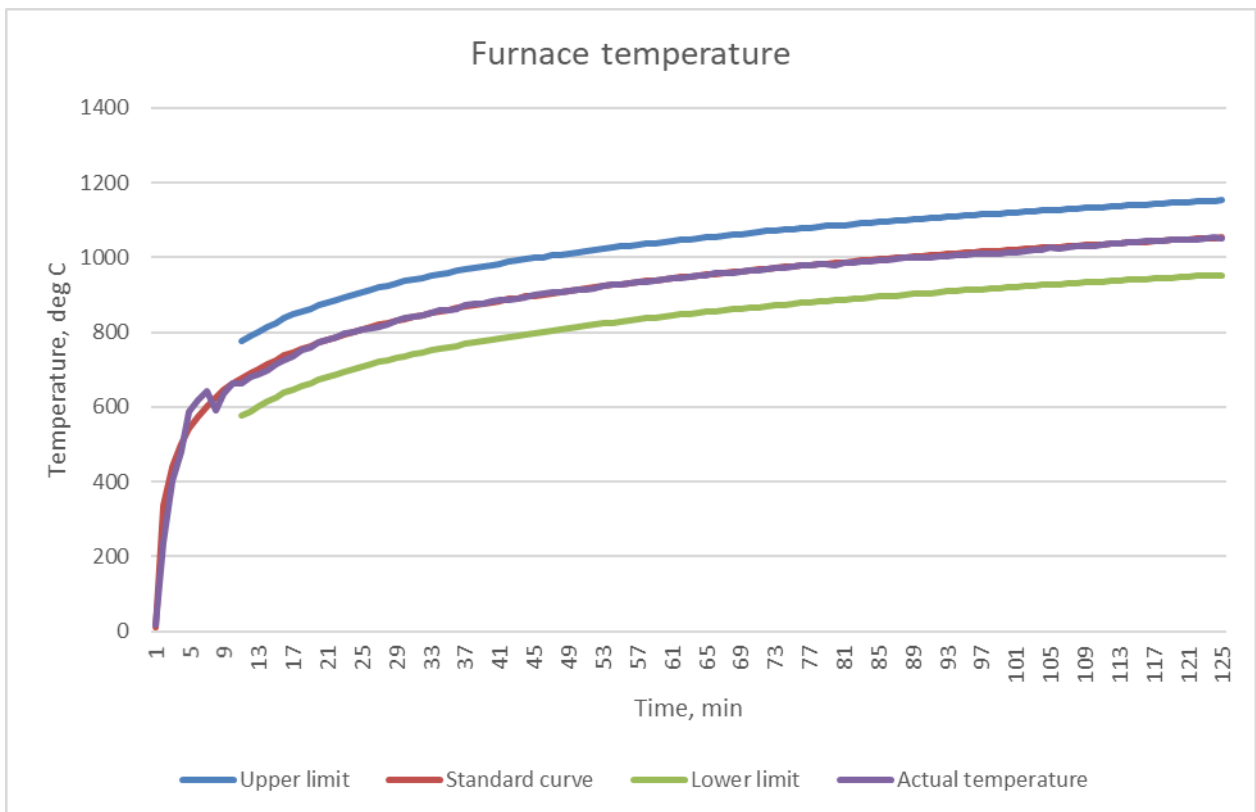
Dimensional measurements:

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.

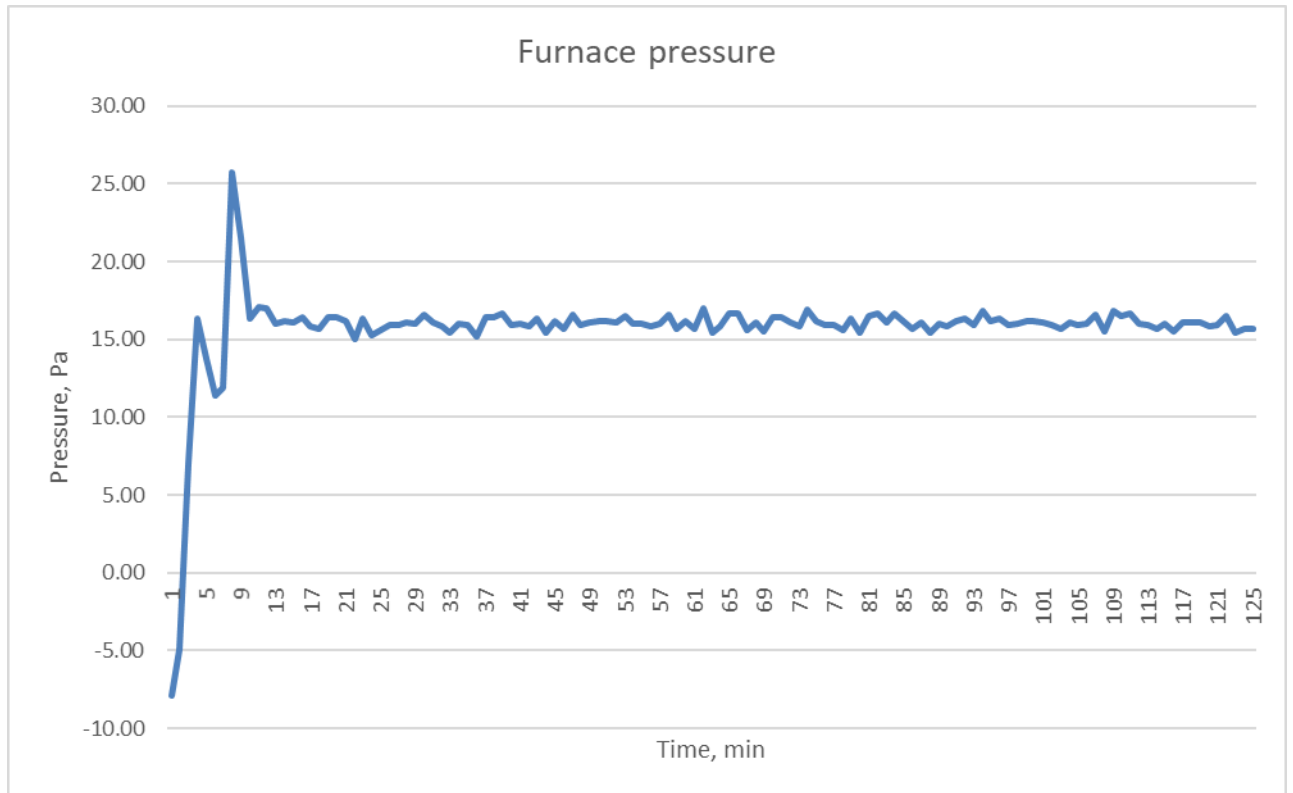


6.2 Ambient Temperature

The ambient temperature of the test area 15 minutes before the test and at the commencement of the test was 18 °C.

6.3 Pressure Readings

The furnace pressure was maintained at 16 ± 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	92mm Steel Stud Plasterboard Separating element with 1 layer of 16mm firerated plasterboard each side
	Measurements	Width / Height (W/H): 1200mm x 1060mm
		Thickness (T): 126mm
1.2	Item / Product Name	Rondo 92mm Steel Stud
	Measurements	Width / Height (W/H): 92mm x 29mm
		Thickness (T): 1mm
Installation	Used to construct separating element	
1.3	Item / Product Name	Rondo 92mm Steel Track
	Measurements	Width / Height (W/H): 94mm x 29mm
		Thickness (T): 0.75mm
Installation	Used to construct separating element	
1.4	Item / Product Name	Rondo Deflection Head Track
	Measurements	Width / Height (W/H): 94mm x 50mm
		Thickness (T): 1mm
Installation	Used to construct separating element	
1.5	Item / Product Name	USG Boral Firestop Plasterboard
	Measurements	Width / Height (W/H): 1020mm x 1200mm
		Thickness (T): 16mm
Installation	Used to construct 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, B, E, F

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, B, E, F
2.3	Item / Product Name	Dynamix UTP Cat6 Cable
	Measurements	Outer Diameter (OD): 5.85mm
	Additional Info	Specimen A, B, E, F
2.4	Item / Product Name	20mm Copper Pipe
	Measurements	Inner Diameter (ID): 16.01mm
		Outer Diameter (OD): 19.09mm
		Width (W): 1.48mm
Additional Info	Specimen C	
2.5	Item / Product Name	Armacell Armaflex Nitrile Rubber Insulation
	Measurements	Inner Diameter (ID): 20.23mm
		Outer Diameter (OD): 55.15mm
		Width (W): 17.97mm
Additional Info	Specimen C	
2.6	Item / Product Name	32DN Kempex Pipe Pe-Xa
	Measurements	Inner Diameter (ID): 22.51mm
		Outer Diameter (OD): 32.23mm
		Width (W): 4.98mm
Additional Info	Specimen D	
2.7	Item / Product Name	16 DN Kempex Pipe Pe-Xa
	Measurements	Inner Diameter (ID): 10.49mm
		Outer Diameter (OD): 16.05mm
		Width (W): 2.25mm
Additional Info	Specimen G	
2.8	Item / Product Name	20mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 16.70mm

		Outer Diameter (OD): 19.82mm
		Width (W): 1.73mm
	Additional Info	Specimen F
2.9	Item / Product Name	32mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 27.49mm
		Outer Diameter (OD): 31.85mm
		Width (W): 2.44mm
Additional Info	Specimen A	
2.10	Item / Product Name	50mm IPLEX Volta PVC-U Pipe
	Measurements	Inner Diameter (ID): 43.99mm
		Outer Diameter (OD): 50.01mm
		Width (W): 3.23mm
Additional Info	Specimen F	
2.11	Item / Product Name	Galvanised Steel Cable tray
	Measurements	Width / Height (W/H): 450mm x 50mm
		Thickness (T): 1.00mm
Additional Info	Specimen F	
2.12	Item / Product Name	Single-core PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 40.72mm
	Additional Info	Specimen F
2.13	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 53.40mm
	Additional Info	Specimen F
2.14	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 14.43mm
	Additional Info	Specimen F
2.15	Item / Product Name	Three core + Earth PVC Insulated Cable (D1 Cable Bundle)
	Measurements	Outer Diameter (OD): 22.59mm

	Additional Info	Specimen F
2.16	Item / Product Name	Garland Communication cable (D2 Cable Bundle)
	Measurements	Outer Diameter (OD): 15.00mm (nominal)
	Additional Info	Specimen F

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	Potters Flat head Self-tapping Screws.
	Measurements	17.25mm, 10-16x16
	Installation	Used to fix frame components
4.2	Item / Product Name	GIB Grabber Screws
	Measurements	32mm
	Installation	Used to fix plasterboard to frame
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 (ρ): 128kg/m ³
	Installation	Wrapped around services
5.2	Item / Product Name	Expandawrap - Intumescent Strip
	Measurements	Width (W): 25mm
		Thickness (T): 2.75mm
	Installation	Wrapped around services

8. Test Specimens details

8.1 Thermocouple Positions Table

SPECIMEN	TC#	THERMOCOUPLE LOCATION DESCRIPTION
A	1	Separating element, 25mm right of specimen A
A	2	Separating element, 25mm below specimen A
A	3	Sealant cone, on the right side of service
A	4	Sealant cone, on the bottom 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	Sealant cone, on the top side of service
B	10	Sealant cone, on the right side of service
B	11	Cable Bundle, on the top side of service 25mm from the end of Sealant cone
B	12	Cable Bundle, on the bottom side of service 25mm from the end of Sealant cone
D	13	Separating element, 25mm above specimen D
D	14	Separating element, 25mm right of specimen D
D	15	Sealant cone, on the top side of service
D	16	Sealant cone, on the right side of service
D	17	Pe-Xa Pipe, on the top side of service 25mm from the end of Sealant cone
D	18	Pe-Xa Pipe, on the right side of service 25mm from the end of Sealant cone
E	19	Separating element, 25mm above specimen E
E	20	Separating element, 25mm right of specimen E
E	21	Sealant cone, on the top side of service

E	22	Sealant cone, on the right side of service
E	23	Cable Bundle, on the top side of service 25mm from the end of Sealant cone
E	24	Cable Bundle, on the bottom side of service 25mm from the end of Sealant cone
SE	25	Separating element, Equidistant between Specimens C, D and E
G	26	Separating element, 25mm above specimen F
G	27	Separating element, 25mm right of specimen F
G	28	Sealant cone, on the top side of service
G	29	Sealant cone, on the right side of service
G	30	Pe-Xa Pipe, on the top side of service 25mm from the end of Sealant cone
G	31	Pe-Xa Pipe, on the bottom side of service 25mm from the end of Sealant cone
C	32	Top left Armaflex copper pipe, on the top side of service 25mm from the end of the intumescent strip
C	33	Top left Armaflex copper pipe, on the right side of service 25mm from the end of the intumescent strip
C	34	Top right Armaflex copper pipe, on the top side of service 25mm from the end of the intumescent strip
C	35	Top right Armaflex copper pipe, on the right side of service 25mm from the end of the intumescent strip
C	36	Bottom Armaflex copper pipe, on the right side of service 25mm from the end of the intumescent strip
C	37	Bottom Armaflex copper pipe, on the left side of service 25mm from the end of the intumescent strip
C	38	Separating element, 25mm above specimen F
C	39	Separating element, 25mm right of specimen F
C	40	Sealant cone, above top left Armaflex copper pipe
C	41	Sealant cone, above top right Armaflex copper pipe
C	42	Sealant cone, below bottom Armaflex copper pipe
F	43	Separating element, 25mm above additional plasterboard of specimen F

F	44	Separating element, 25mm right of additional plasterboard of specimen F
F	45	Separating element, 25mm below additional plasterboard of specimen F
F	46	Additional plasterboard, 25mm above the ceramic blanket, above D2 configuration
F	47	Additional plasterboard, 25mm above the ceramic blanket, above D1 configuration
F	48	Ceramic Blanket, on the top side of service above D2 configuration, 25mm from separating element
F	49	Ceramic Blanket, on the top side of service above 50mm PVC-U Pipe, 25mm from separating element
F	50	Ceramic Blanket, on the top side of service above D1 configuration, 25mm from separating element
F	51	Ceramic Blanket, on the bottom side of service below D2 configuration, 25mm from separating element
F	52	Ceramic Blanket, on the bottom side of service below D1 configuration, 25mm from separating element
F	53	On cable bundle (2.16), on the top side of service, 25mm from the end of the ceramic blanket
F	54	On PVC-U Pipe (2.10), on the top side of service, 25mm from the end of the ceramic blanket
F	55	On cable bundle (2.15), on the top side of service, 25mm from the end of the ceramic blanket
F	56	On cable bundle (2.14), on the top side of service, 25mm from the end of the ceramic blanket
F	57	On PVC-U Pipe (2.8), on the top side of service, 25mm from the end of the ceramic blanket
F	58	On cable bundle (2.13), on the top side of service, 25mm from the end of the ceramic blanket
F	59	On cable bundle (2.12), on the top side of service, 25mm from the end of the ceramic blanket
F	60	On cable tray (2.13), on the bottom side of service, below D2 Configuration, 25mm from the end of the ceramic blanket

F	61	On cable tray (2.13), on the bottom side of service, below D1 Configuration, 25mm from the end of the ceramic blanket
H	62	On the concrete lintel, in-line with service B, 25mm from deflection head seal
H	63	On deflection head seal, in-line with service B
H	64	On separation element, in-line with service B, 25mm below deflection head seal
H	65	On the concrete lintel, 50mm right of service A, 25mm from deflection head seal
H	66	On deflection head seal, 50mm right of service A
H	68	On the concrete lintel, in-line with service D, 25mm from deflection head seal
H	69	On deflection head seal, in-line with service D
H	70	On separation element, in-line with service D, 25mm below deflection head seal

SE – separating element

8.2 Observations

Time Minutes	Test Face	SP#	Observations
1	U	C	Visible smoke protruding from between Armaflex pipes near the end of service
1	U	F	Visible heavy smoke protruding from cable tray, between cable trays and wrap
3	U	F	Further increase in smoke from cable tray
3	U	G	Visible smoke from the end of the pipe
4	U	A	Visible smoke from between cables in the cable bundle
5	E	A	Conduit and cables have begun to melt and deflect
5	U	D	Visible smoke from the end of the pipe
7	E	D, G	Pipes have fallen away from specimen, penetrations appear to be blocked
8	U	F	Visible discolouring and bubbling of 50mm PVC pipe
10	E	C	Armaflex has combusted and beginning to melt, visible expansion
10	U	F	Heavy smoke with dark discolouring
13	U	D, G	Visible deflection in pipes beyond separating element
13	U	F	Visible yellow liquid coming from the end of the pipe
18	U	D	Visible expansion of sealant cone, pipe pulling away from the separating element
20	U	C	Visible expansion of Armaflex beyond sealant cone
29	U	D	25mm Gap Gauge test, protruded through separating element – FAIL
29	U	D	Cotton Pad test for 30 seconds, FAIL
30	E	ALL	No notable changes
42	U	B	Visible expansion of sealant cone from separating element
45	E/U	ALL	No notable changes
55	U	F	Roving thermocouple test on 50mm PVC pipe, 80 degrees

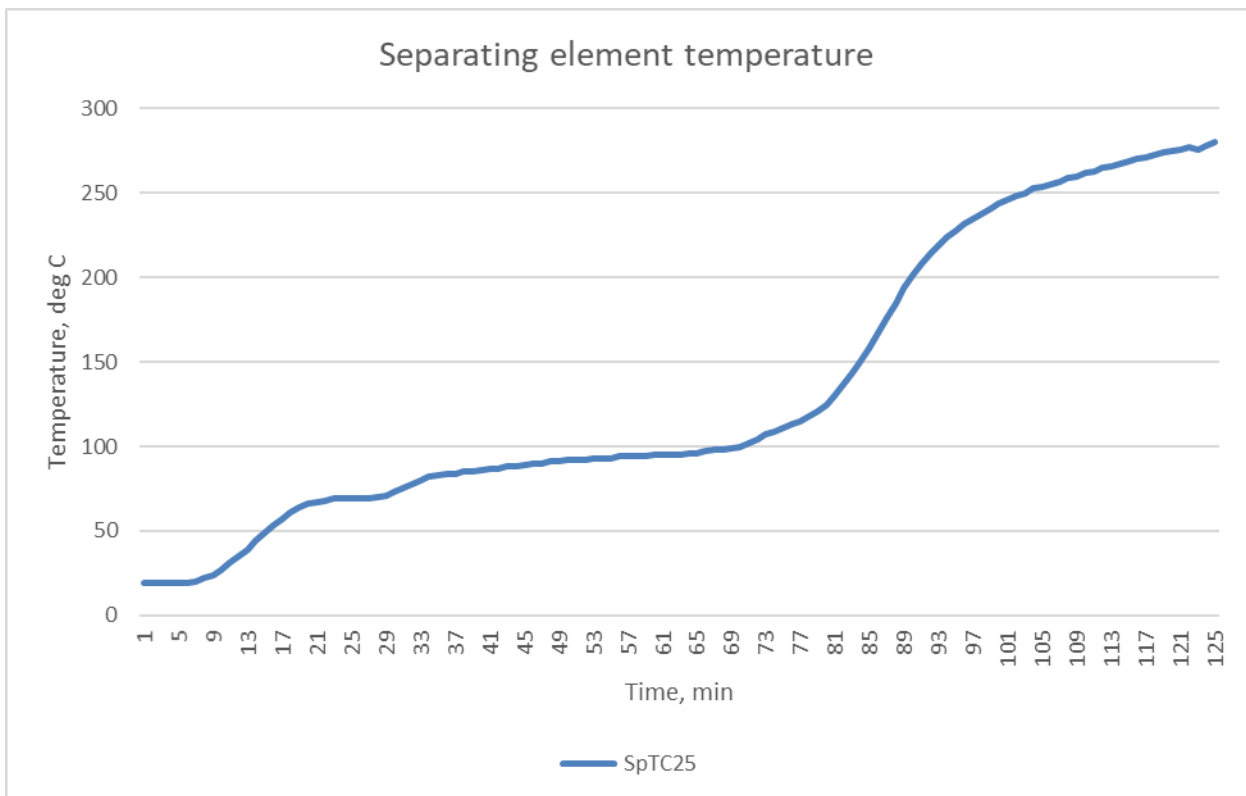
60	E/U	ALL	No notable changes
59	U	C	Roving thermocouple test, 120 degrees
64	U	H	Large sealant expansion near TC69 on the right side, no visible expansion on left side
64	U	C	Large sealant expansion around Armaflex
64	U	G	Visible expansion of sealant cone
67	U	F	Discolouring of wrap above D2 configuration
67	U	F	Sealant separating/pulling away from wrap and cables
72	U	C	Visible splitting in Armaflex, approximately 20mm from sealant cone
84	U	C	Cotton pad test for 30 seconds on top of service, Pass
85	U	C, D	Discolouring of separating element above specimens
88	U	C	Cotton pad test for 30 seconds, Pass
90	E	ALL	No notable changes
93	U	A	A large expansion of sealant cone
97	U	F	Visible sealant expansion around plasterboard
105	U	SE	Further discolouring, further expansion of sealant cones
105	E	ALL	No notable changes
115	U	F	Cotton pad test for 30 seconds on top of service, Pass
115	U	C	Cotton pad test for 30 seconds on top of service, Pass
120	E	ALL	No notable changes
120	U	SE	Darker discolouring of separating element
120	U	F	Heavy smoke protruding from the cable tray
124			TEST DISCONTINUED

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

9. Separating element and main fire-stopping system

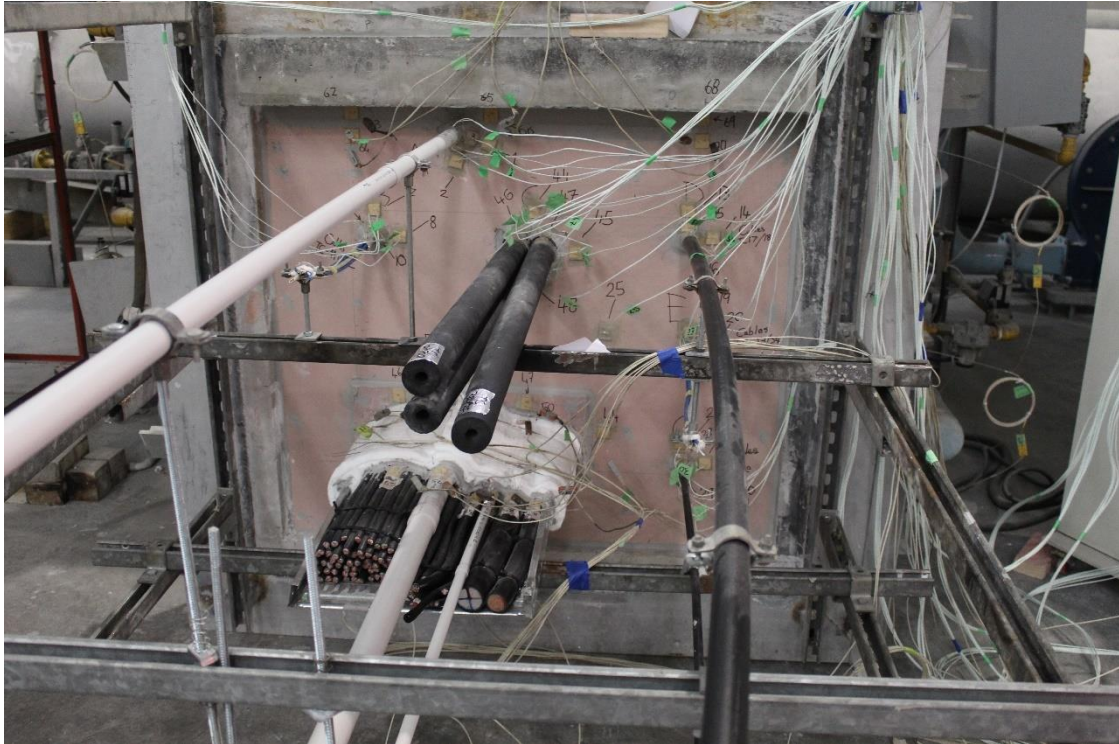
The separating element was constructed within the refractory frame, with a 140mm concrete lintel attached, reducing the frame size to 1200mm x 1060mm. Steel Track (1.3) was fixed to the bottom of the frame, and a Deflection Head (1.4) was fixed to the concrete lintel at 600mm centres. Four Studs (1.2) were fixed to the frame at 50mm, 200mm, 830mm and 1150mm from the unexposed left side of the refractory frame. The frame components were fixed together using screws (4.1). Two sections of plasterboard were cut to 1020mm x 1200mm, resulting in a 40mm gap between the lintel and the top edge of the plasterboard, to become the deflection seal. One layer of plasterboard (1.5) was fixed to each face of the frame, fixed using screws (4.2) at 300mm centres.

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.



10. Specimens

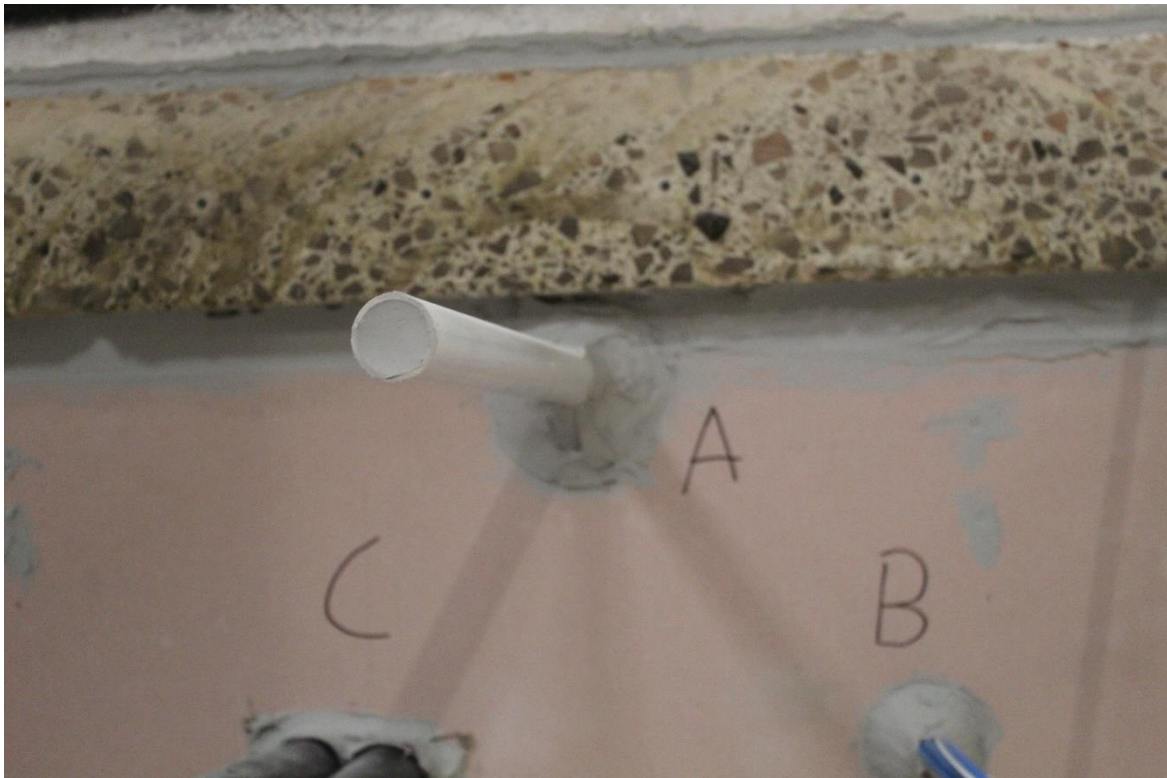
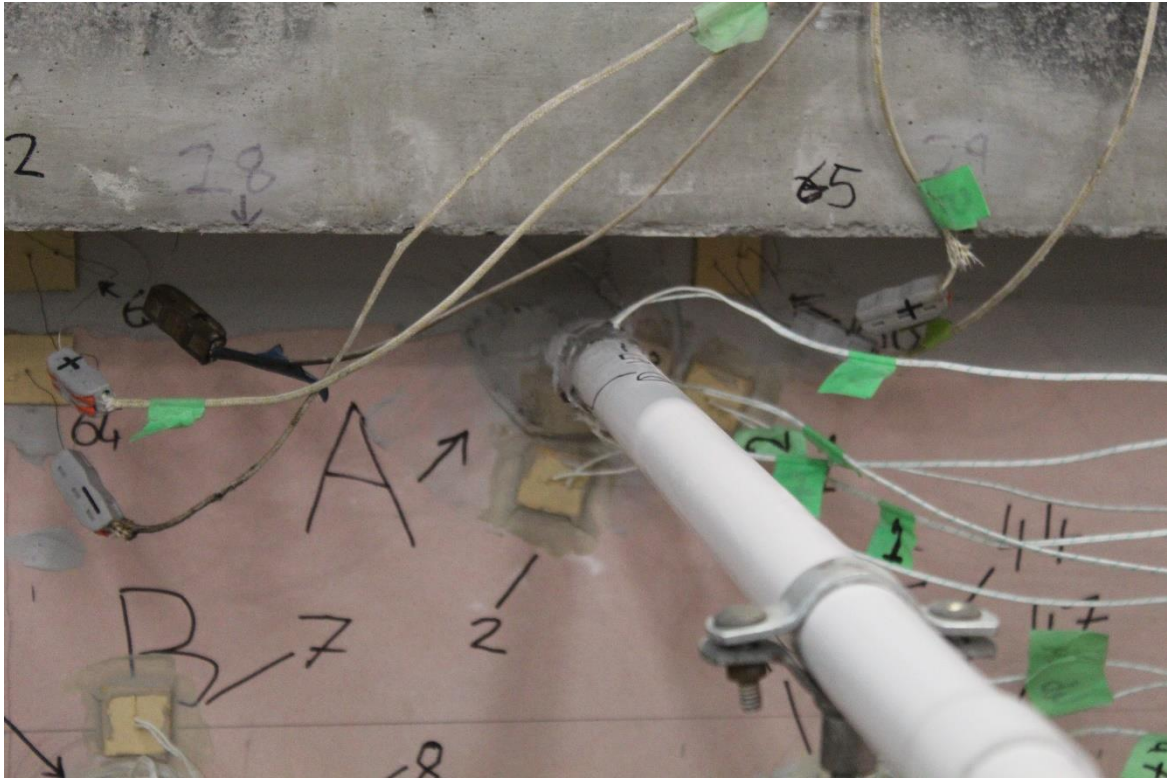
Unexposed faced:

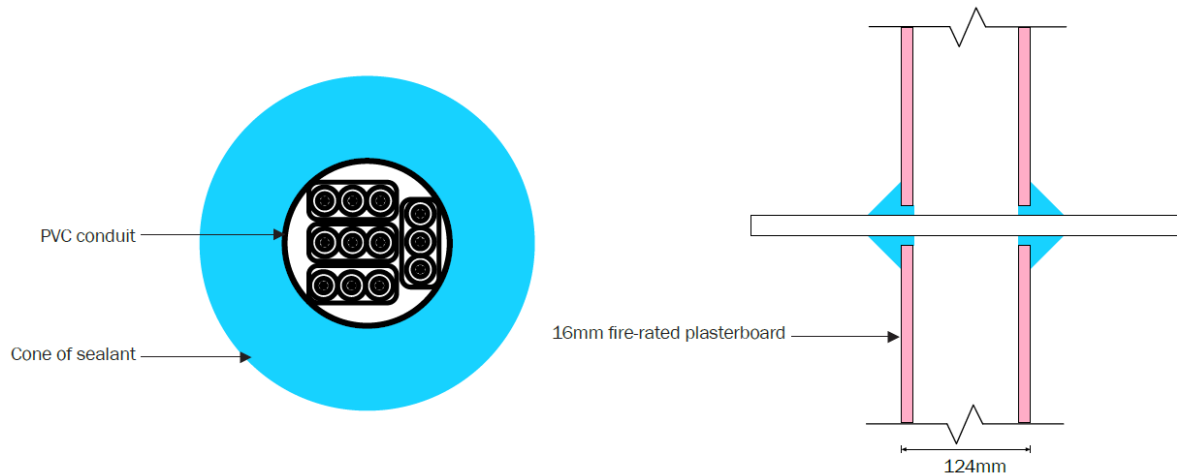


Exposed face:



10.1 Specimen A



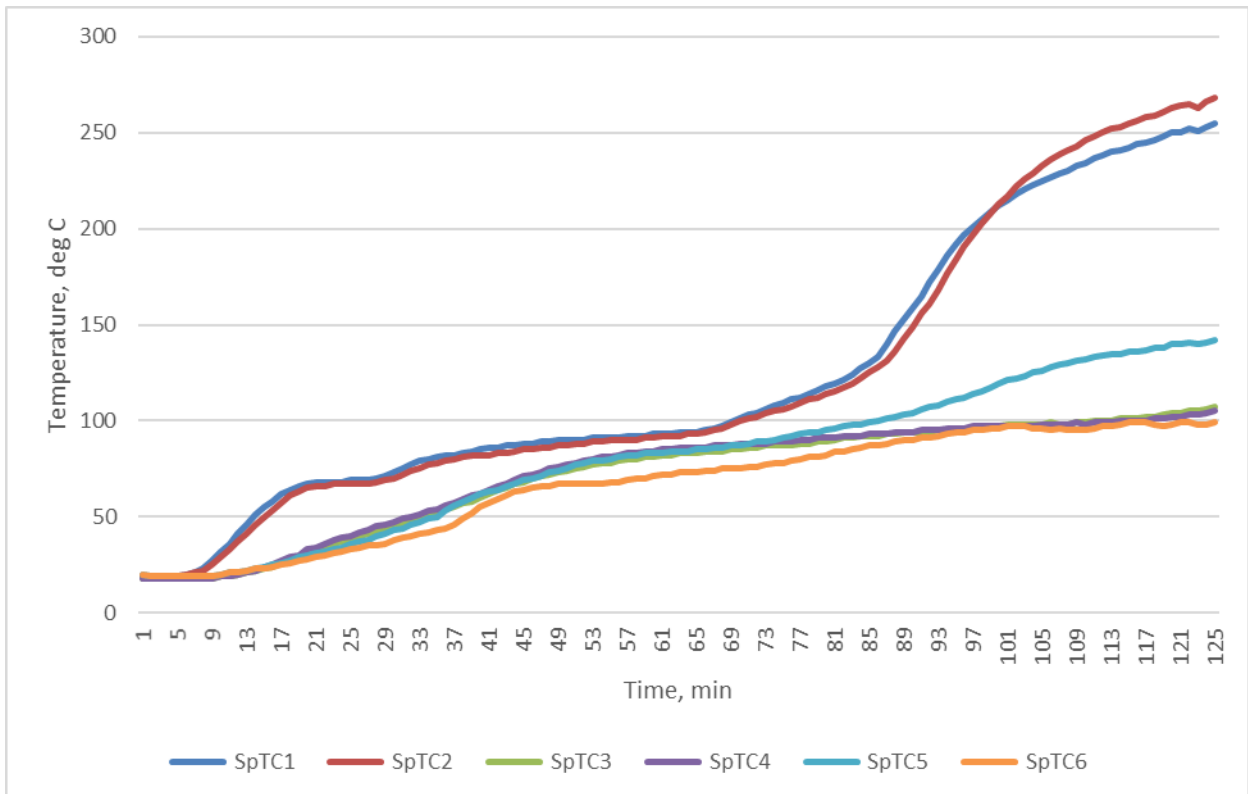


Penetration System		
A	Service	32DN PVC-U Pipe with Cables
	Service Details	Pipe (2.9), 3 x Cable (2.1), 3 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	45mm x 80mm
	Annular Spacing	Min: 1mm, Max: 48mm
Local Fire-stopping Protection		
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element, 2mm below the concrete lintel. 3 x Cable (2.1), 3 x Cable (2.2), 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>Polystyrene backing was installed in the aperture, recessed 13mm (nominal) from both faces. Sealant (3.1) was applied to the apertures, flush with the plasterboard. 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>	

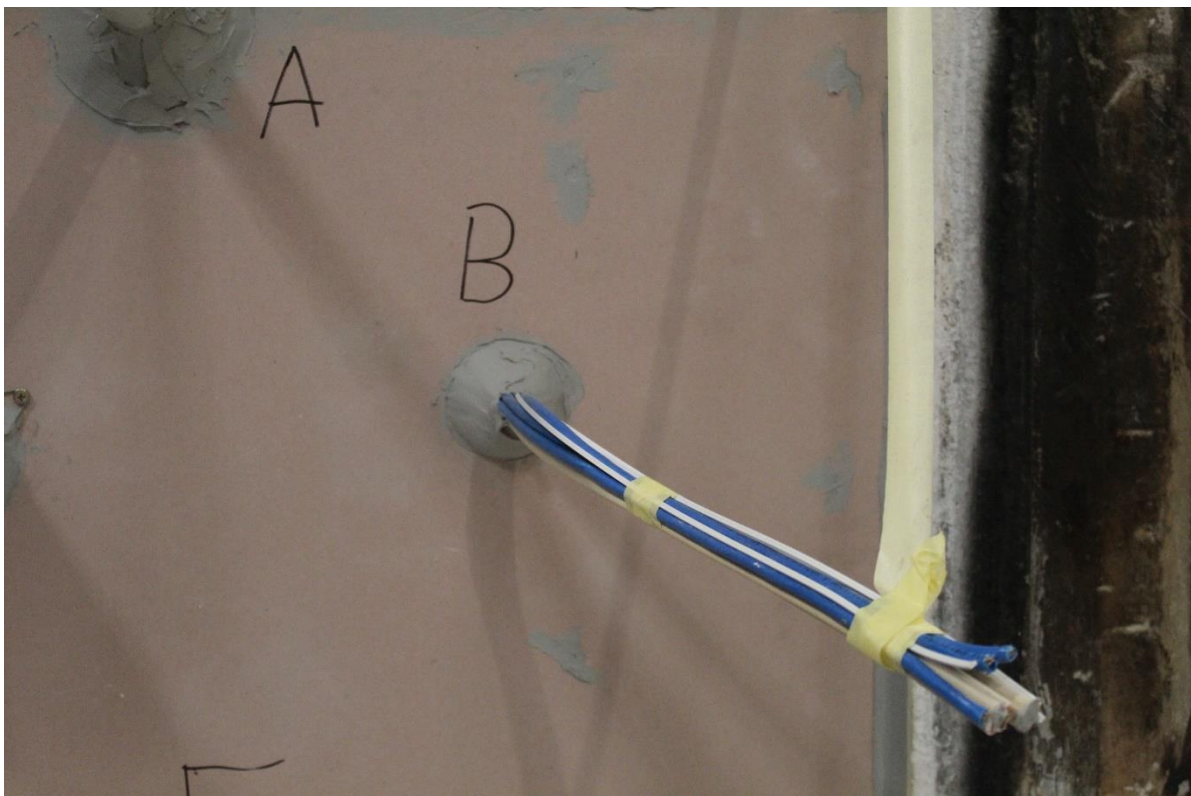
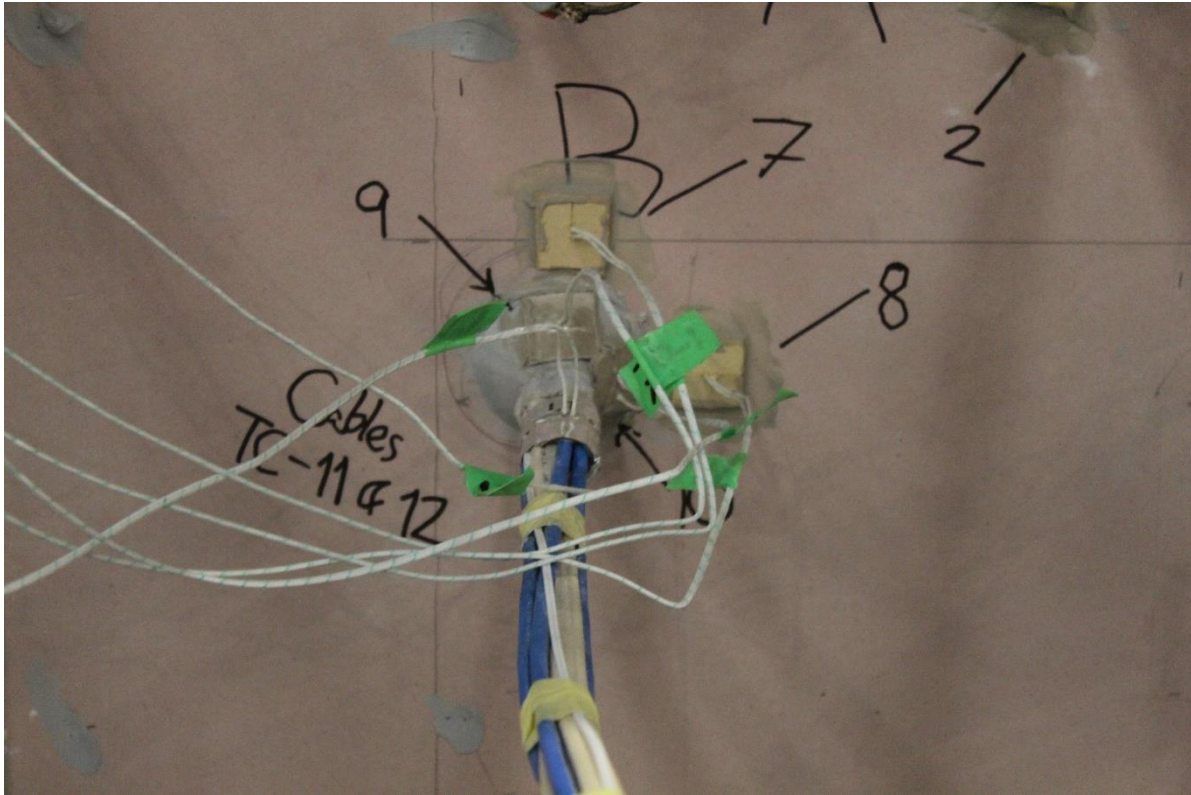
Test results

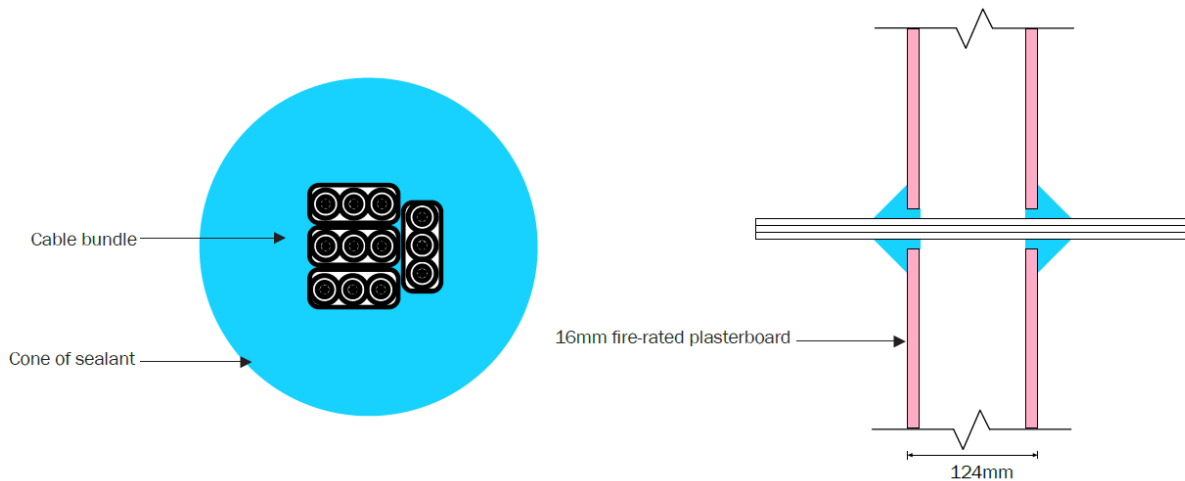
Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	95 min

Specimen A Thermocouples Readings



10.2 Specimen B



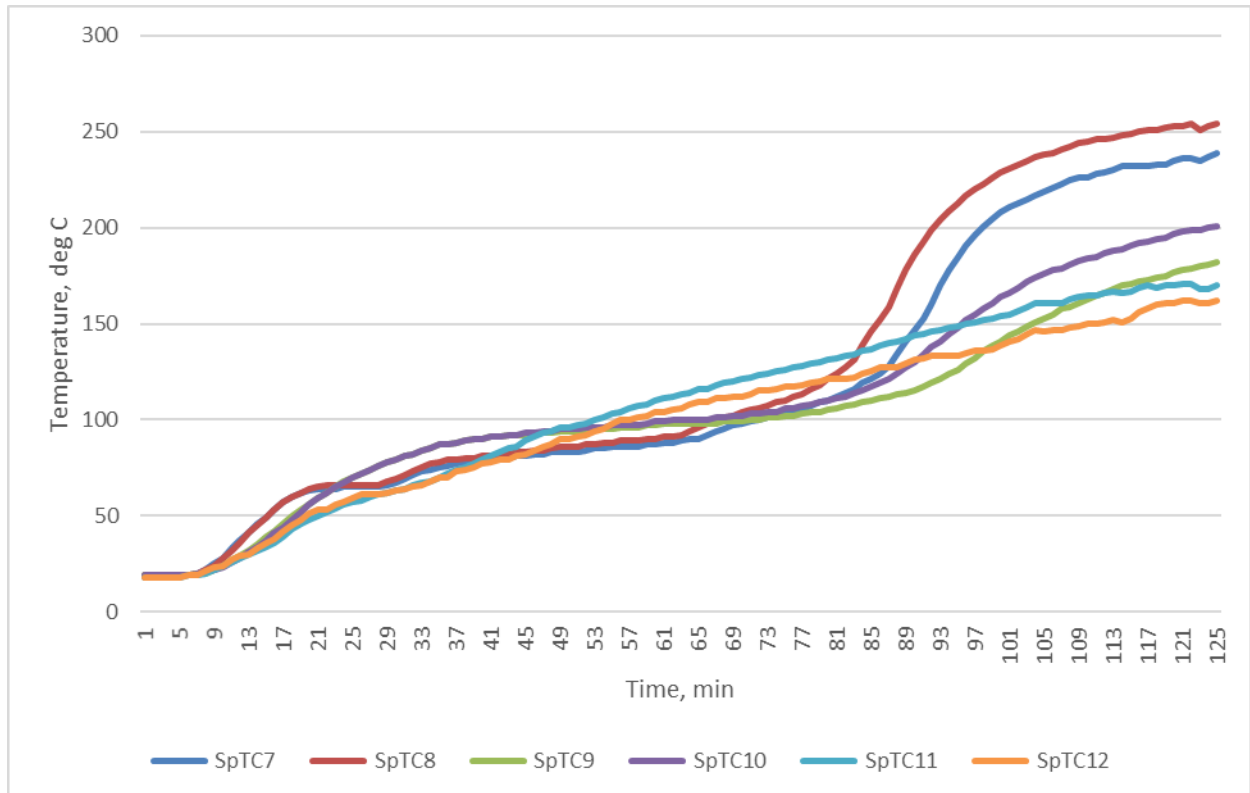


Penetration System		
B	Service	35mm Cable Bundle
	Service Details	3 x Cable (2.1), 3 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm
	Aperture Size	50.70mm
	Annular Spacing	Min: 10mm, Max: 13mm
Local Fire-stopping Protection		
Application	Symmetrical, capped from exposed face only	
Protection Used	<p>Aperture was cut into the separating element. 3 x Cable (2.1), 3 x Cable (2.2), 3 x Cable (2.3) were bundled together and passed through the aperture, extending 500mm from both faces.</p> <p>Polystyrene backing was installed in the aperture, recessed 13mm (nominal) from both faces. Sealant (3.1) was applied to the apertures, flush with the plasterboard. Once cured, a 25mm (nominal) sealant cone was applied to both faces.</p>	

Test results

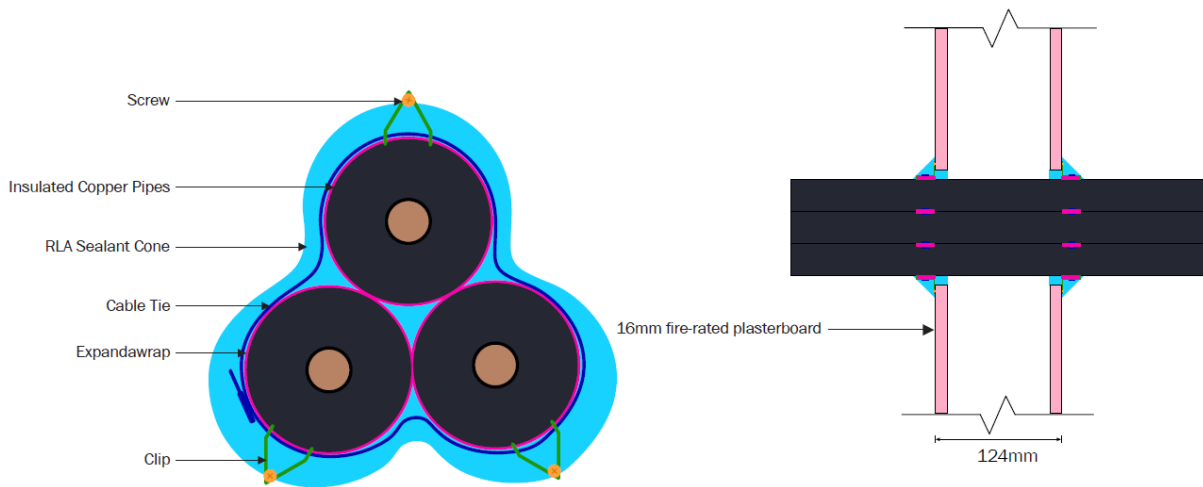
Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	91 min

Specimen B Thermocouples Readings



10.3 Specimen C



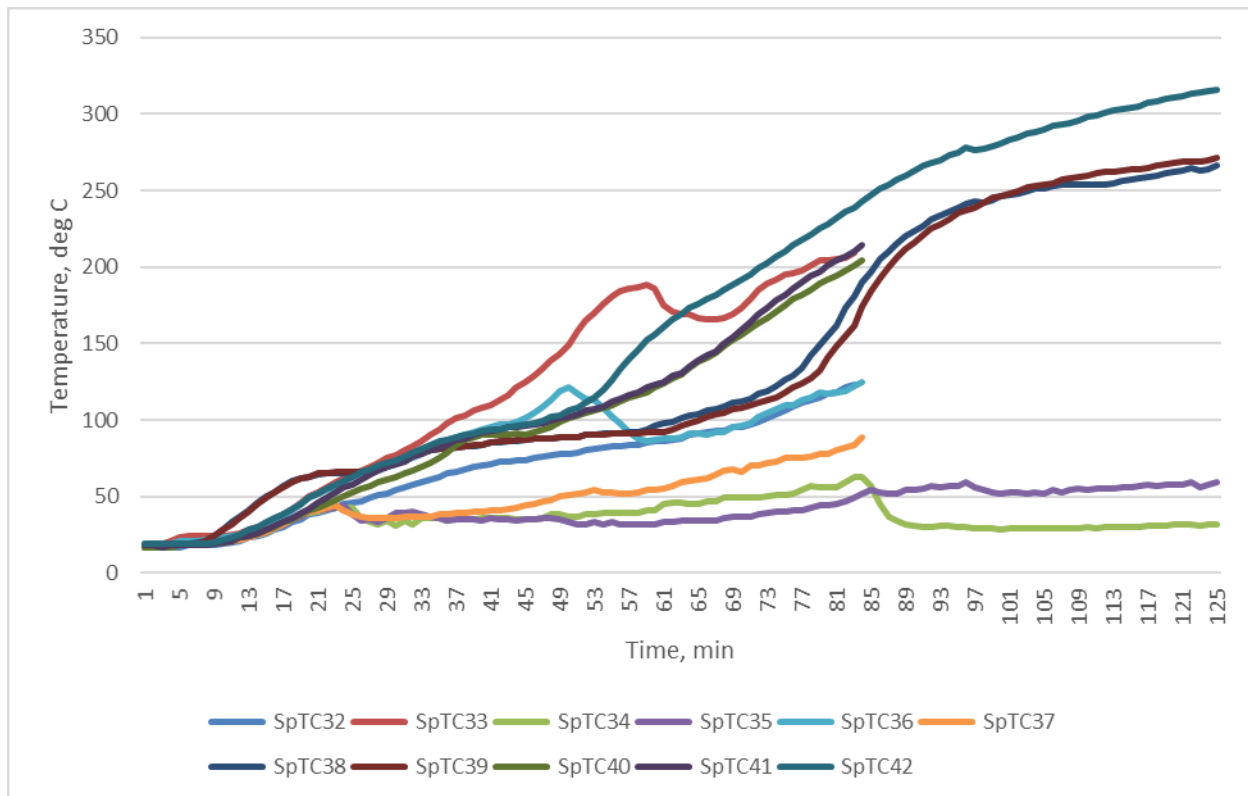


Penetration System		
C	Service	3 x 20DN Copper pipes with Armaflex insulation
	Service Details	3 x Armaflex (2.5), 3 x Copper Pipe (2.4), Intumescent Strap (5.2), Steel Wire clips, (4.4), Screws, (4.2), Cable Ties (4.3)
	Service Support	Unistrut structure at 500mm
	Aperture Size	3 x 57.70mm
	Annular Spacing	Min: 0mm, Max: 1mm
	Local Fire-stopping Protection	
	Application	Symmetrical, capped from exposed face only
	Protection Used	<p>3 holes were cut in the separating element such that the aperture can accommodate 3 pipes. The overall dimensions of the aperture were 115mm x 110mm. A pipe (2.4) was placed into the Armaflex and passed through the aperture extending 500mm from both faces. This was repeated for all 3 pipes.</p> <p>A length of Intumescent strap (5.2) was cut to wrap around each pipe one time, with approximately 20mm overlap. The strap was fixed to the separating element using steel wire clips (4.4) and screws (4.2). This was repeated for all 3 pipes. A 25mm (nominal) radius bead of sealant was applied between the intumescent strip and the separating element.</p>

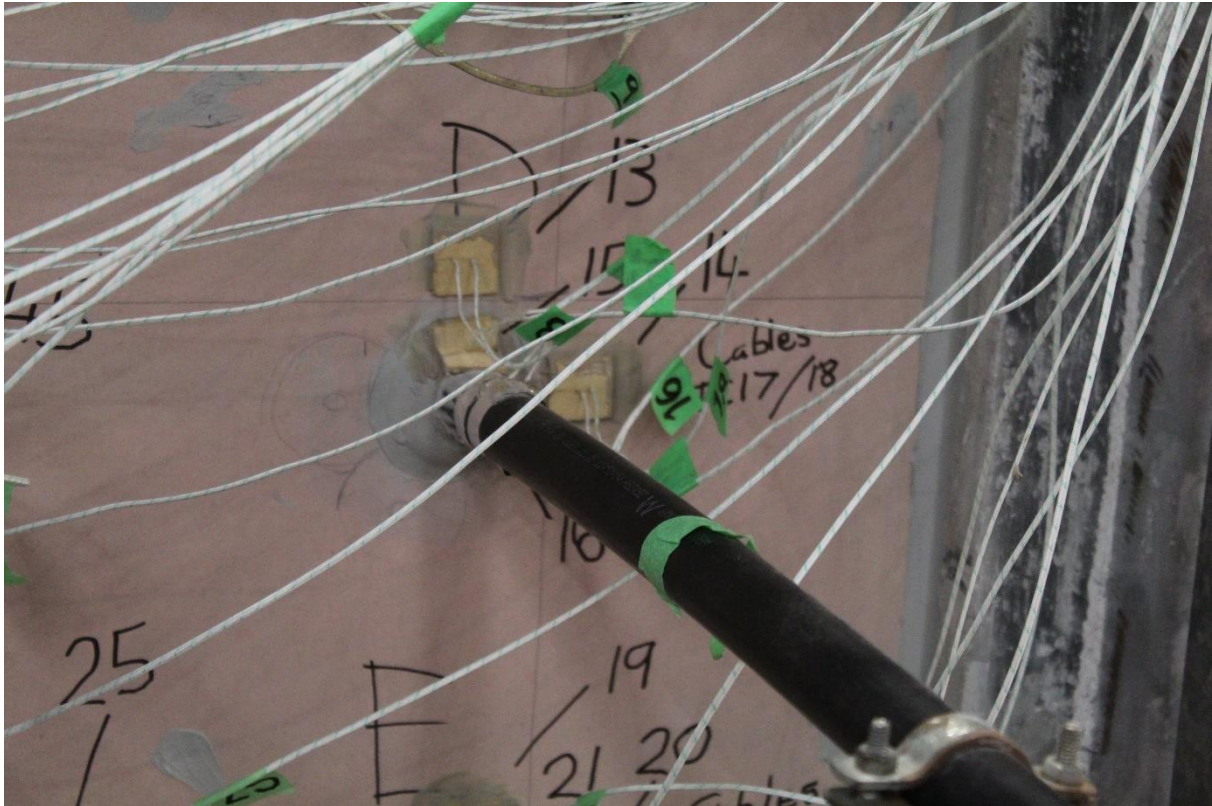
Test results

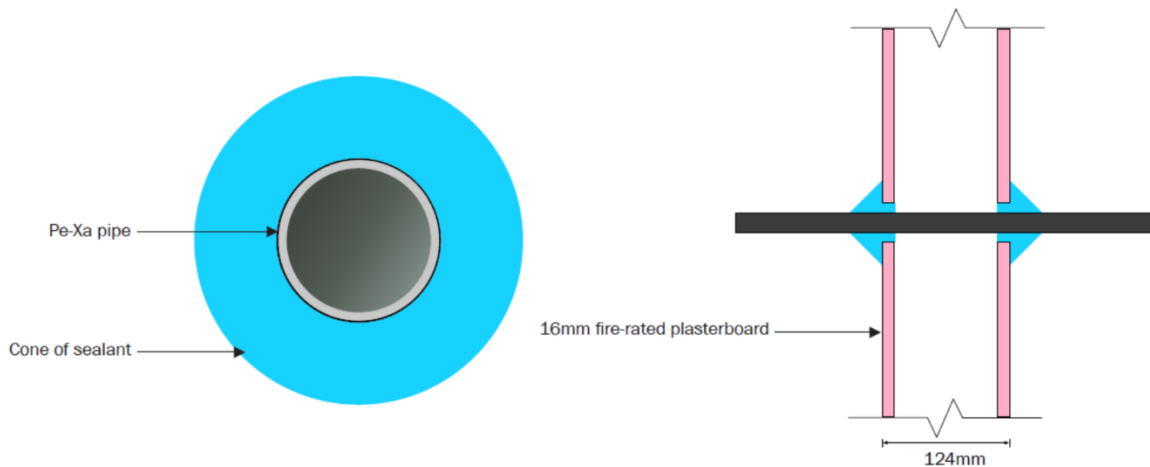
Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	71 min

Specimen C Thermocouples Readings



10.4 Specimen D



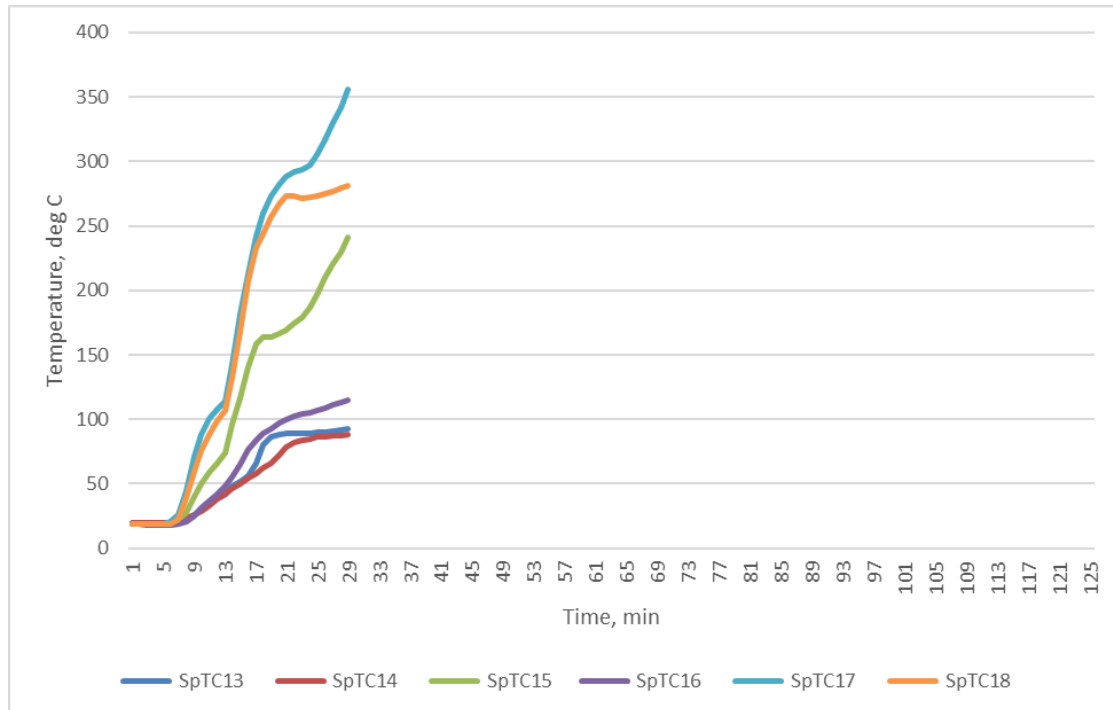


Penetration System		
D	Service	32DN Pe-Xa Pipe
	Service Details	Pipe (2.6), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	50.79mm
	Annular Spacing	Min: 8mm, Max: 11mm
Local Fire-stopping Protection		
Application	Symmetrical, capped from exposed face only	
Protection Used	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. Polystyrene backing was installed in the aperture, recessed 13mm (nominal) from both faces. Sealant (3.1) was applied to the apertures, flush with the plasterboard. Once cured, a 25mm (nominal) sealant cone was applied to both faces.	

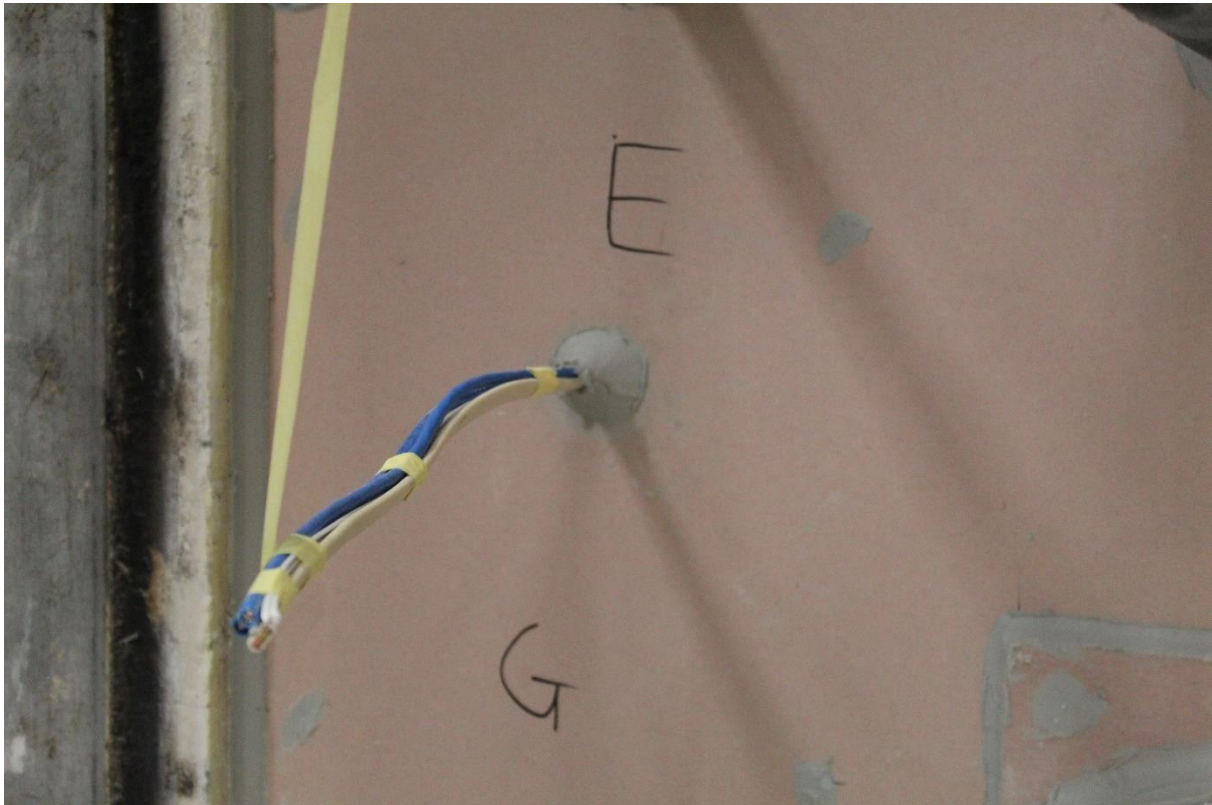
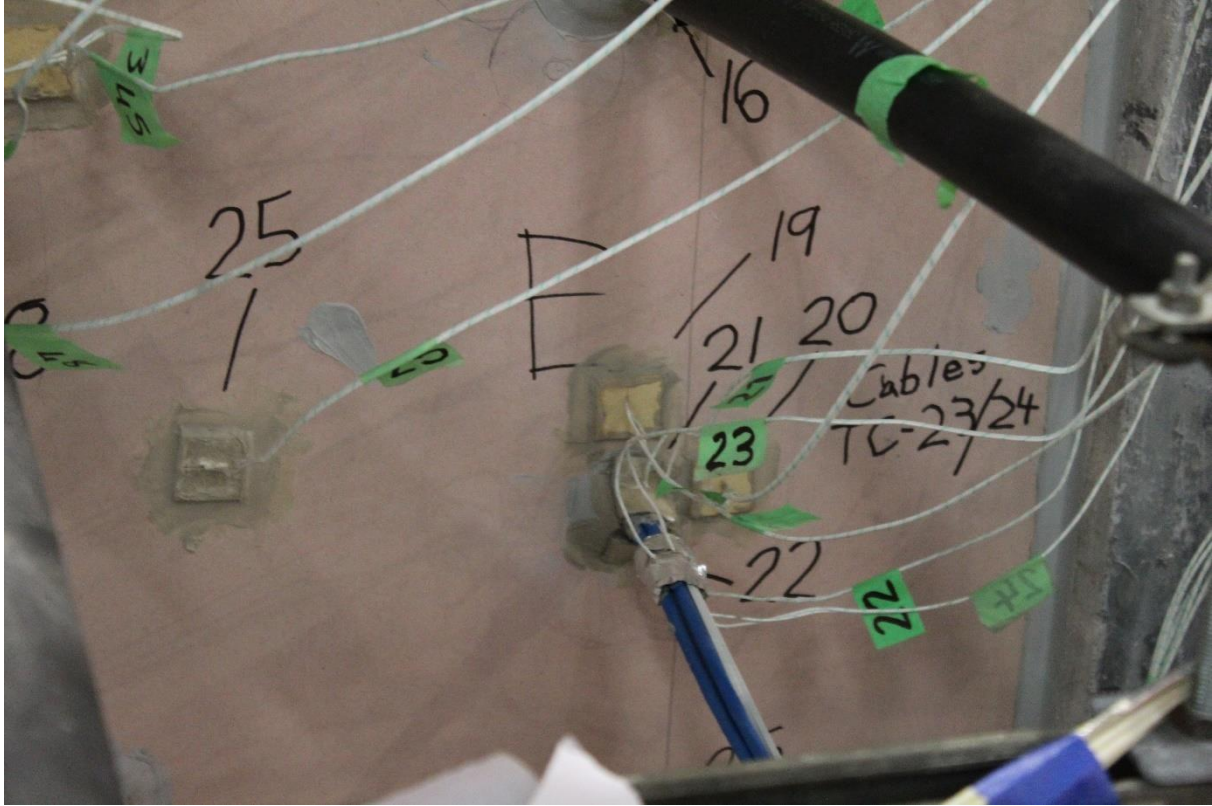
Test results

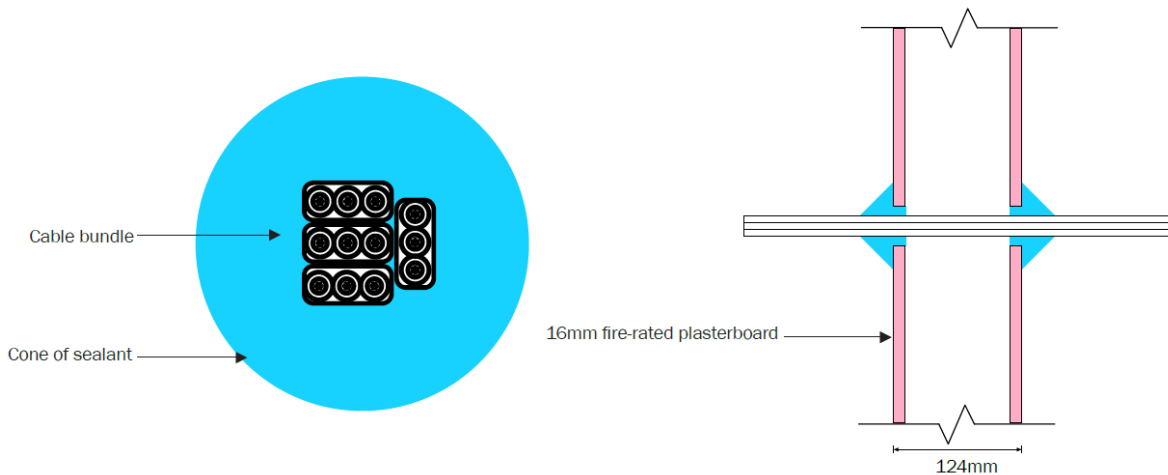
Structural adequacy	Not applicable
Integrity	29 min
Insulation	15 min

Specimen D Thermocouples Readings



10.5 Specimen E



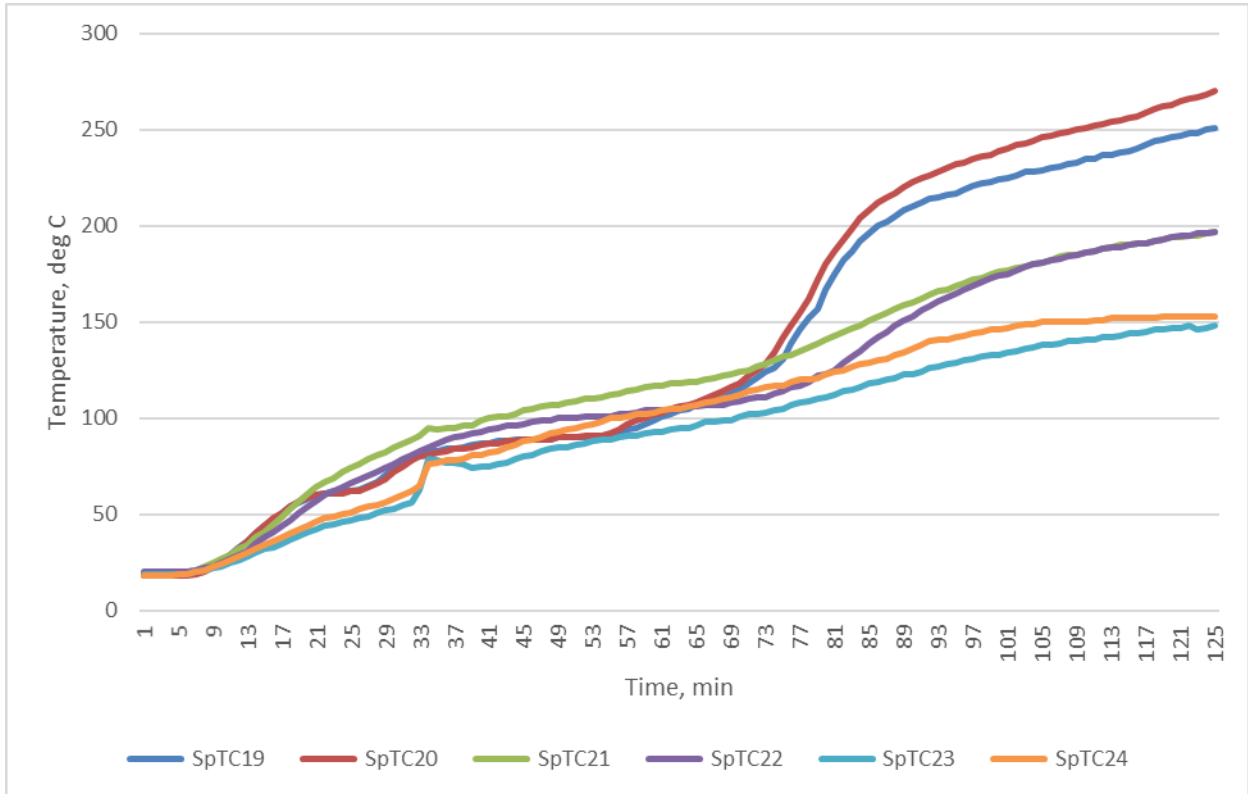


Penetration System		
E	Service	15mm Cable Bundle
	Service Details	1 x Cable (2.1), 2 x Cable (2.2), 3 x Cable (2.3), Sealant (3.1)
	Service Support	Unistrut structure at 500mm
	Aperture Size	32.84mm
	Annular Spacing	Min: 10mm, Max: 13mm
	Local Fire-stopping Protection	
Application	Symmetrical, capped from exposed face only	
Protection Used	Aperture was cut into the separating element. 1 x Cable (2.1), 2 x Cable (2.2), 3 x Cable (2.3) were bundled together and passed through the aperture, extending 500mm from both faces. Polystyrene backing was installed in the aperture, recessed 13mm (nominal) from both faces. Sealant (3.1) was applied to the apertures, flush with the plasterboard. Once cured, a 25mm (nominal) sealant cone was applied to both faces.	

Test results

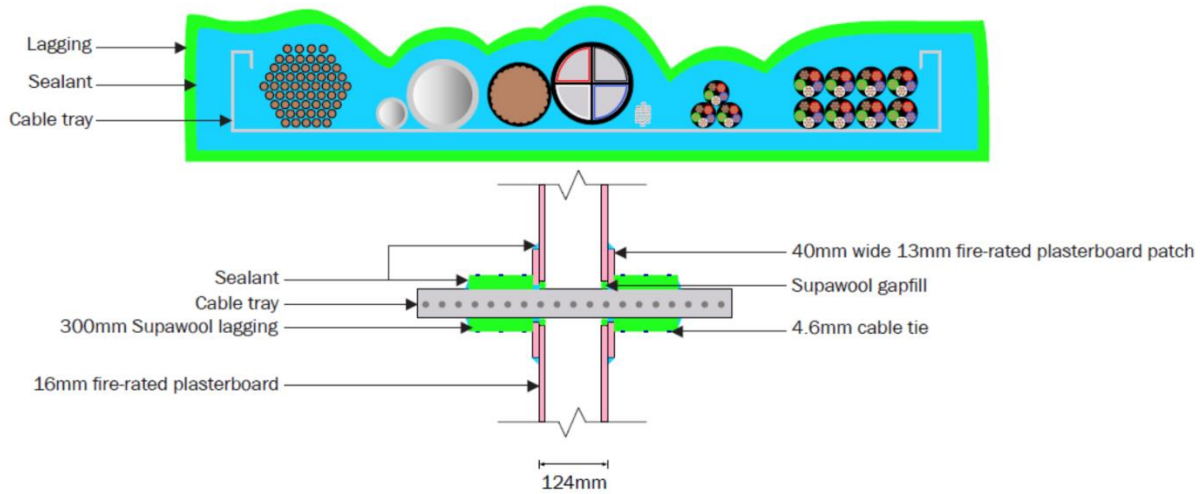
Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	82 min

Specimen E Thermocouples Readings



10.6 Specimen F





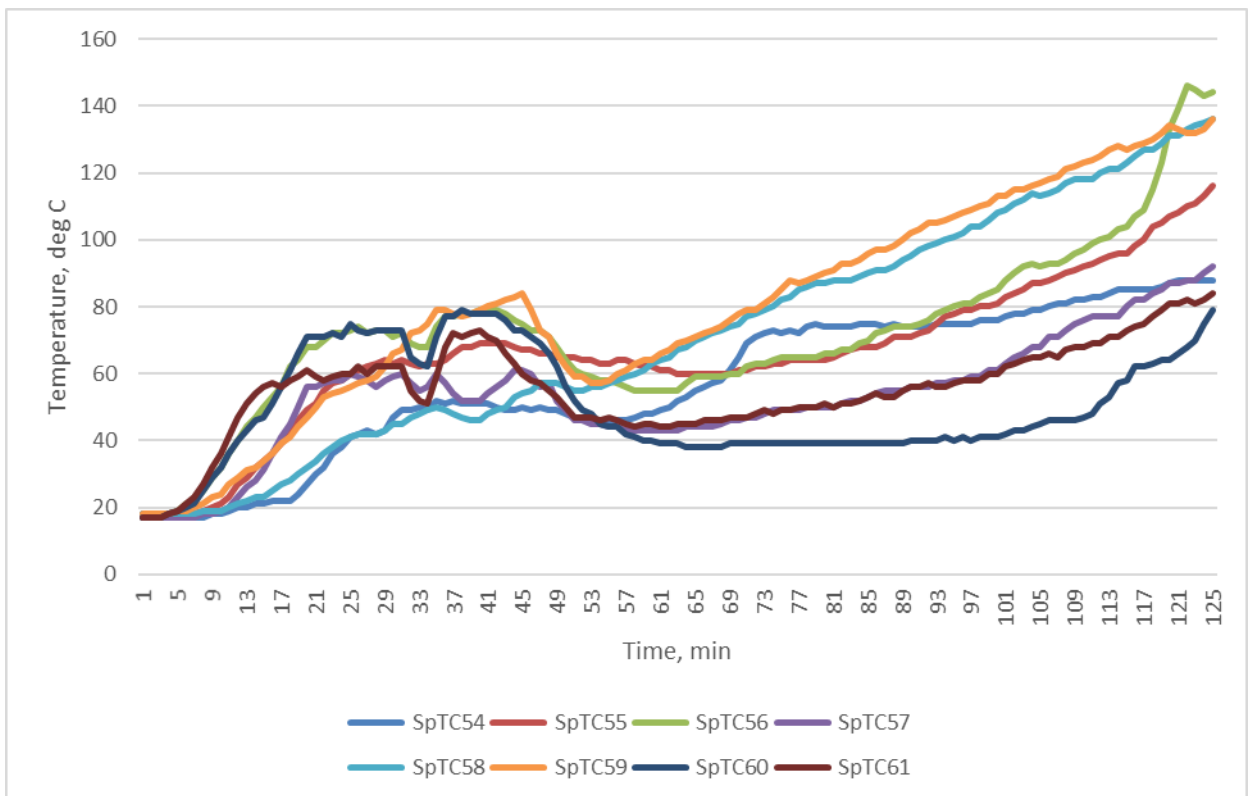
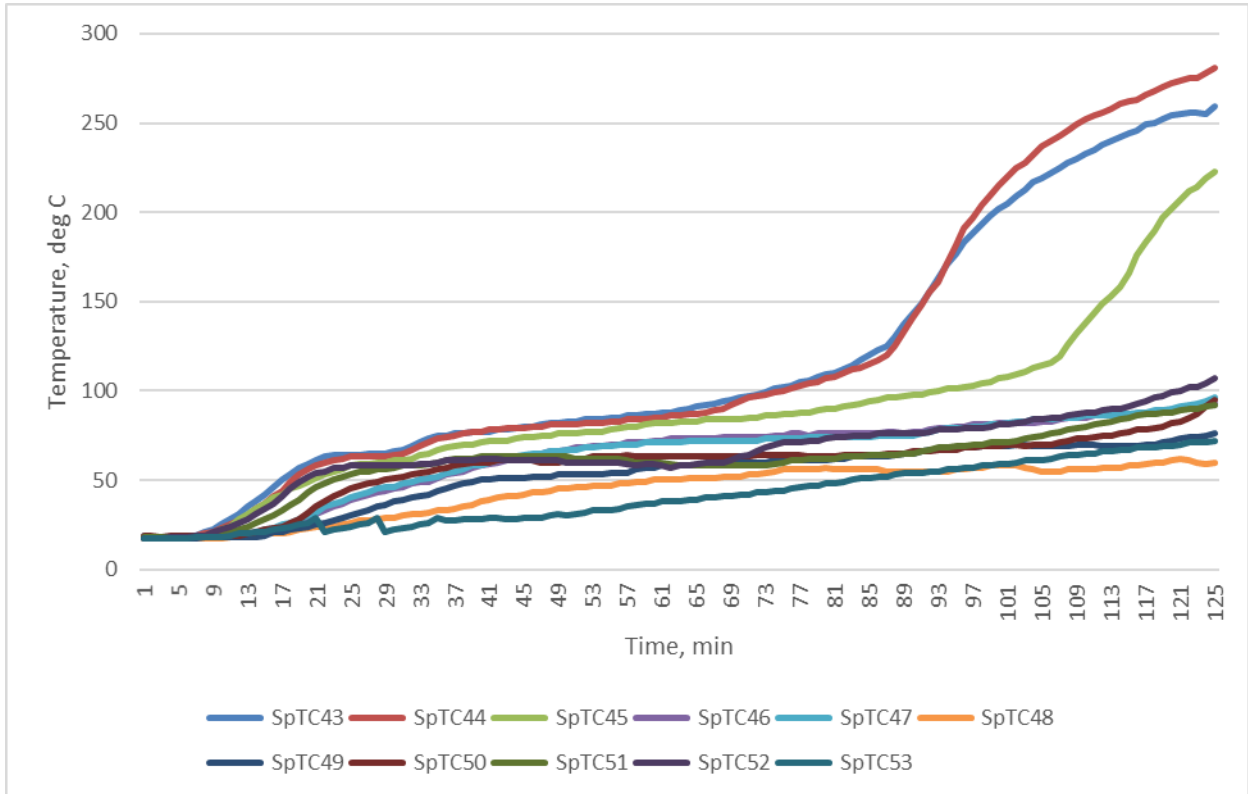
Penetration System			
F	Service	D1 + D2 + assorted cable bundle + Pipe on Cable Tray	
	Service Details	Cable Tray (2.11), Pipe (2.8), Pipe (2.10), 11 x Cable (2.1), 32 x Cable (2.2), 13 x Cable (2.3), 1 x Cable (2.12), 1 x Cable (2.13), 3 x Cable (2.14), 8 x Cable (2.15), 60 x Cable (2.16), Ceramic Fibre Blanket (5.1), Cable ties (4.3) Sealant (3.1). Cable configurations and additional services were put together upon the request of Client.	
	Service Support	Unistrut structure at 500mm	
	Aperture Size	460mm x 110mm	
	Annular Spacing	Min: 1mm, Max: 60mm	
	Local Fire-stopping Protection		
	Application	Symmetrical, capped from exposed face only	
Protection Used	<p>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.</p> <p>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> <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>Sections of the separating element were cut to accommodate the additional pipes and cable bundle. The 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. An additional section of plasterboard was cut to follow the profile of the cable tray and was fixed to the separating element with screws. 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 the additional plasterboard and separating element plasterboard, 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 trays (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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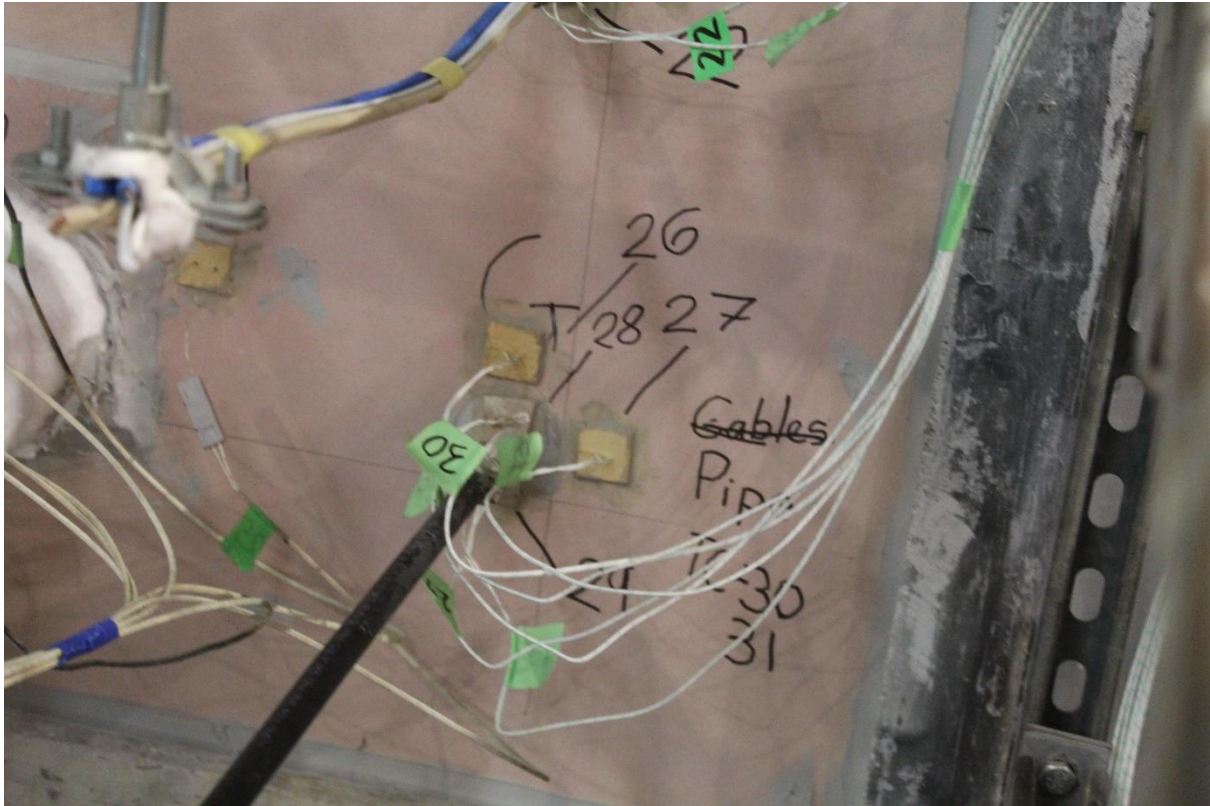
Test results

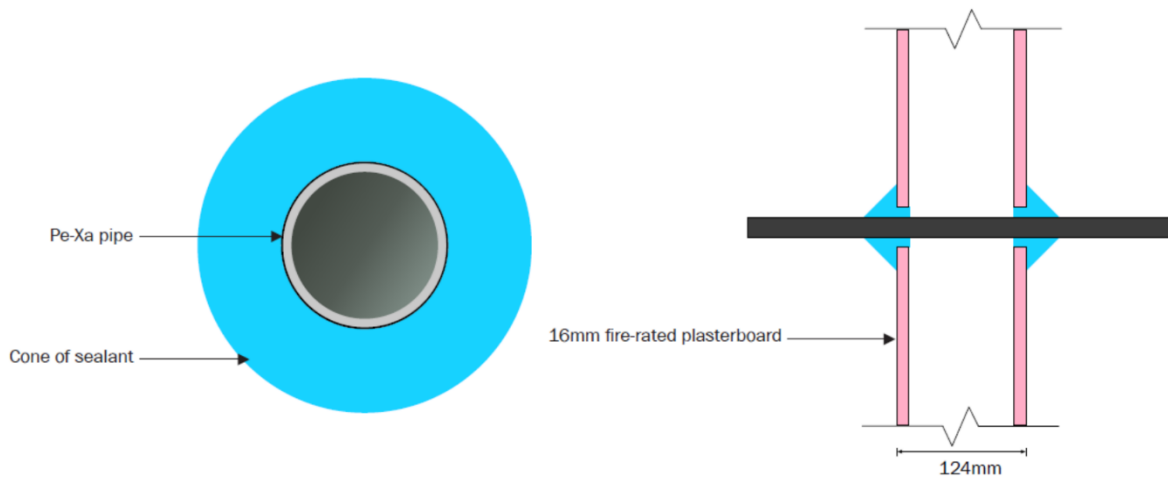
Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	96 min

Specimen F Thermocouples Readings



10.7 Specimen G



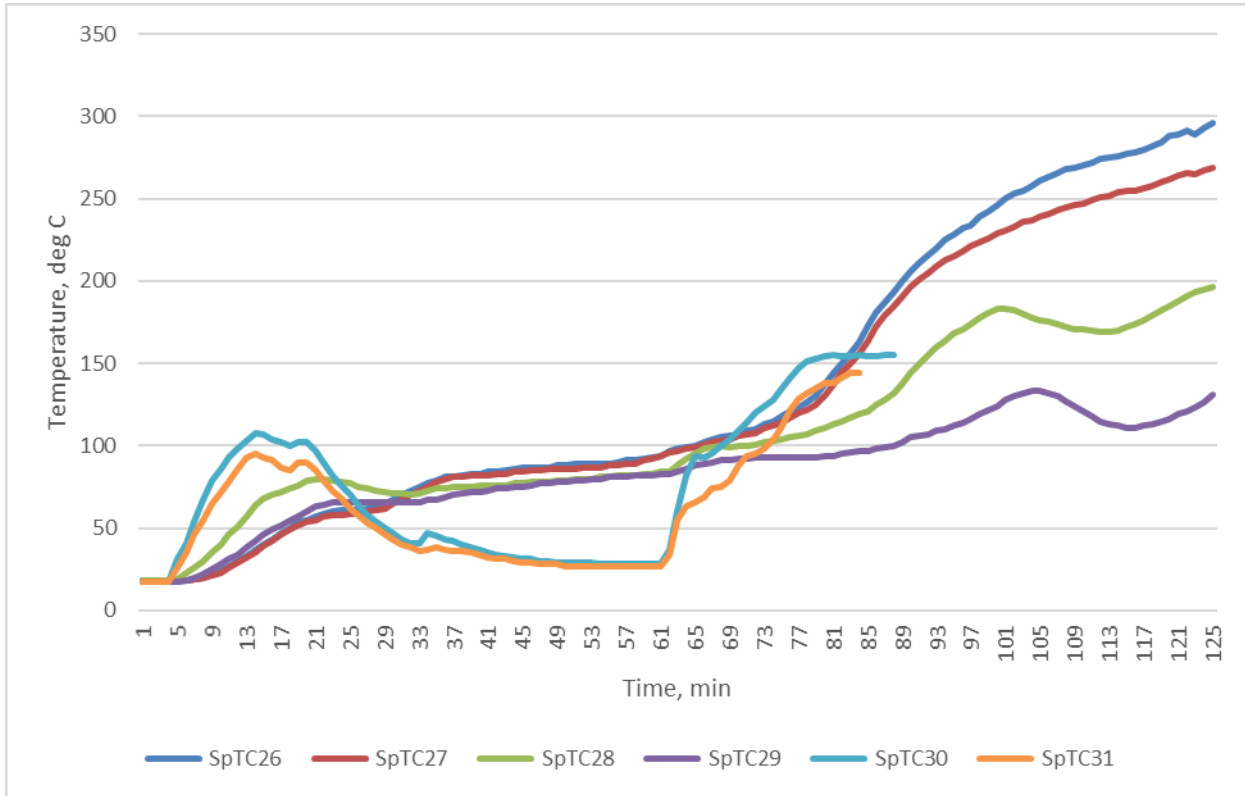


Penetration System		
G	Service	16DN Pe-Xa Pipe
	Service Details	Pipe (2.7), Sealant (3.1)
	Service Support	Unistrut structure at 500mm and 1500mm
	Aperture Size	32.90mm
	Annular Spacing	Min: 8mm, Max: 9mm
Local Fire-stopping Protection		
Application	Symmetrical, capped from exposed face only	
Protection 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 Polystyrene backing was installed in the aperture, recessed 13mm (nominal) from both faces. Sealant (3.1) was applied to the apertures, flush with the plasterboard. Once cured, a 25mm (nominal) sealant cone was applied to both faces.	

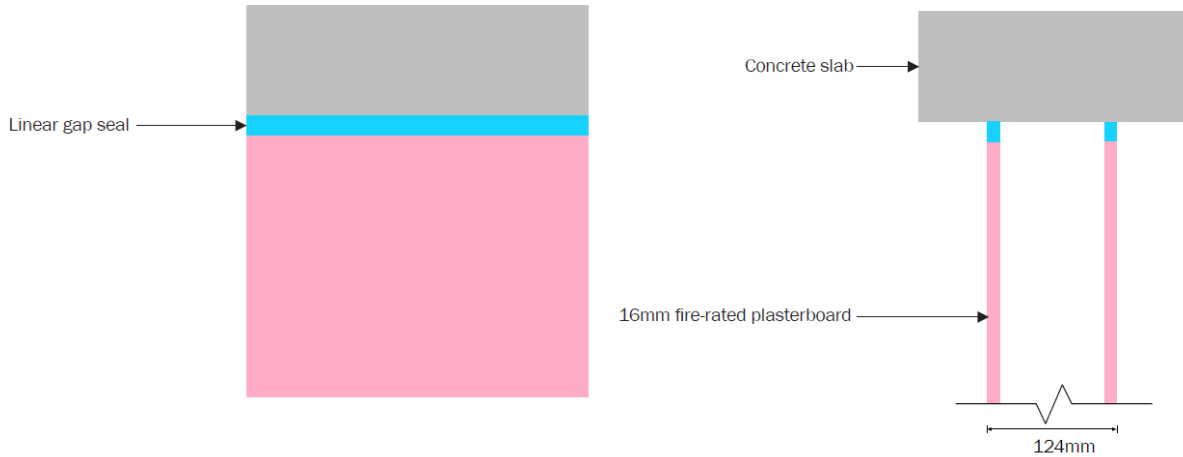
Test results

Structural adequacy	Not applicable
Integrity	No failure at 125 min
Insulation	88 min

Specimen G Thermocouples Readings



10.8 Specimen H

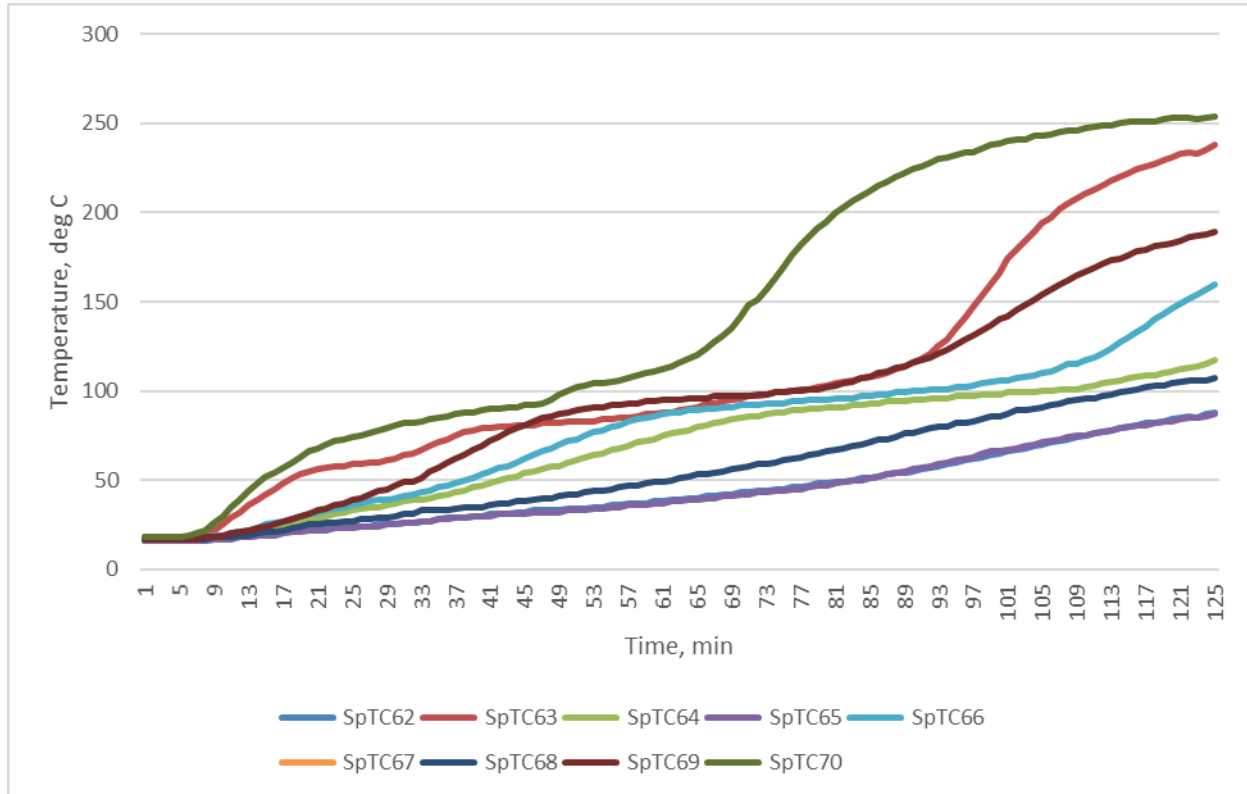


Penetration System		
H	Service	40mm Deflection Head Seal
	Service Details	Sealant (3.1)
	Service Support	N/A
	Aperture Size	1200mm x 40mm
	Annular Spacing	N/A
	Local Fire-stopping Protection	
Application	Symmetrical	
Protection Used	Backing was placed on top of the deflection head to reduce the recess from 16mm to 13mm. The remaining gaps from the deflection head service penetration were packed with backing, making it flush with the rest of the deflection head seal gap. Sealant was applied to the recess, flush with the plasterboard.	

Test results

Structural adequacy	Not applicable
Integrity	No failure at 124 min
Insulation	80 min

Specimen H Thermocouples Readings



11. Additional photographs

11.1 Materials used



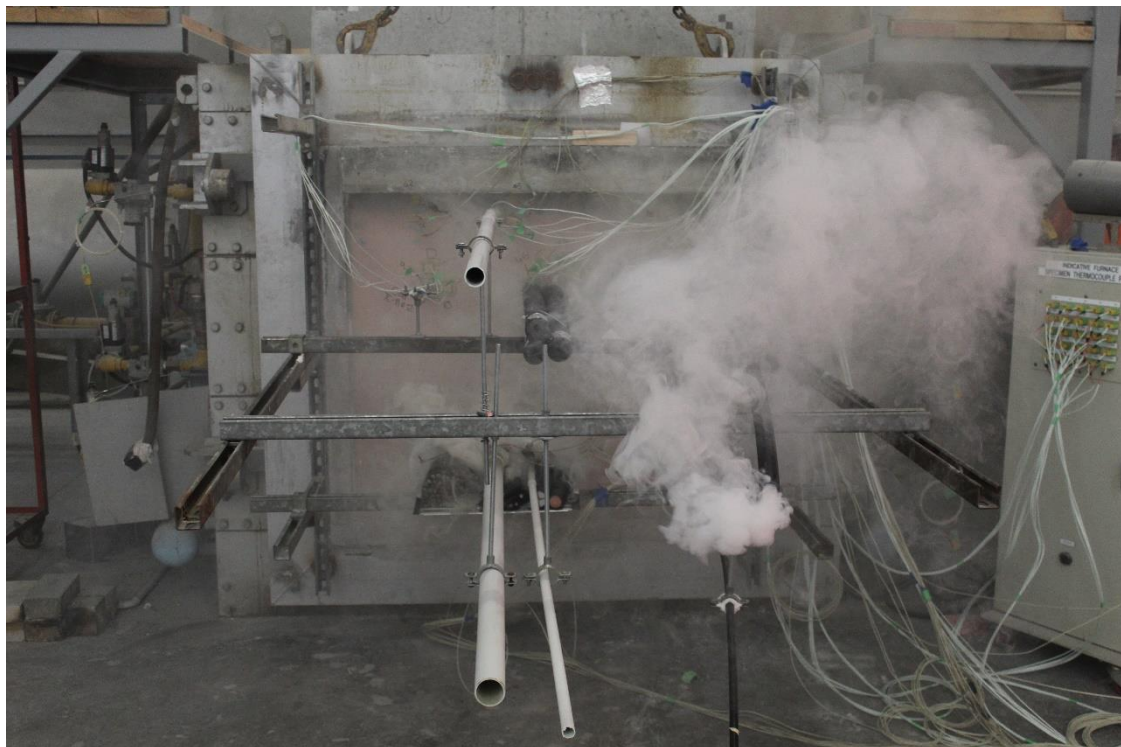
Item 5.2

11.2 During and after the test

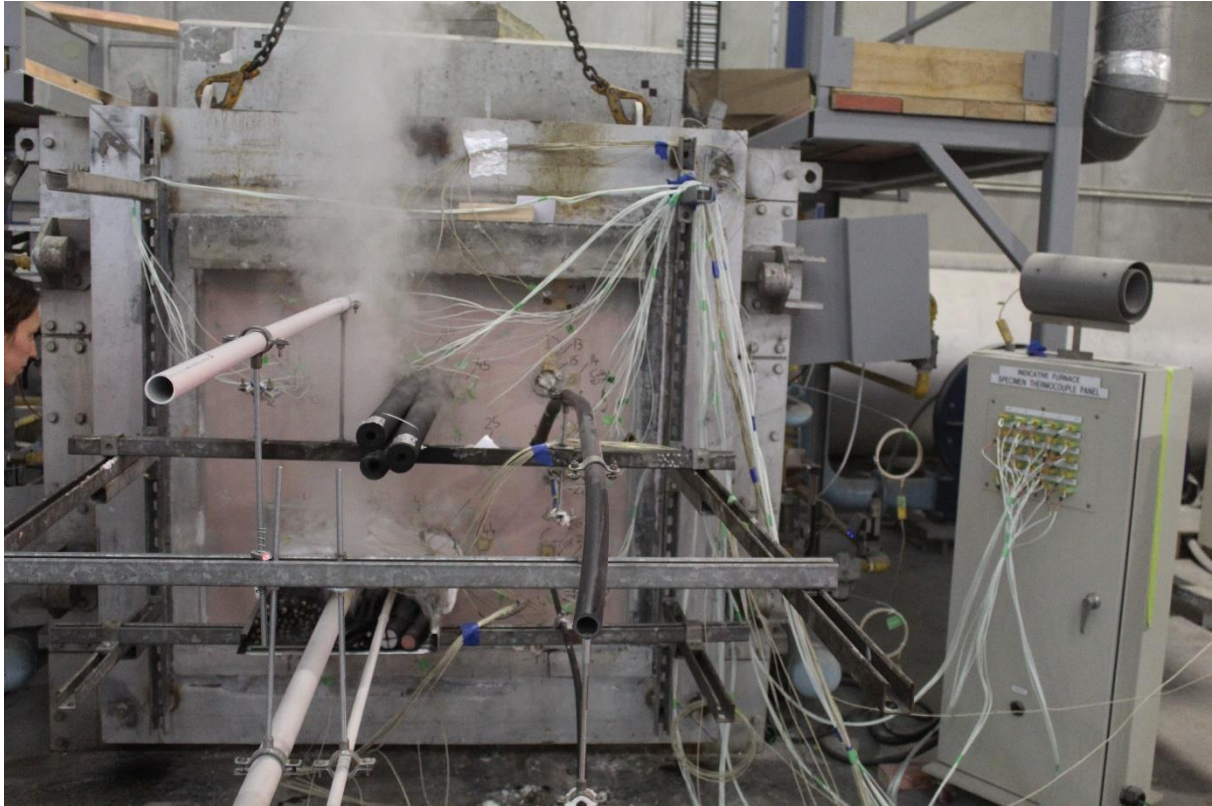
10 minutes:



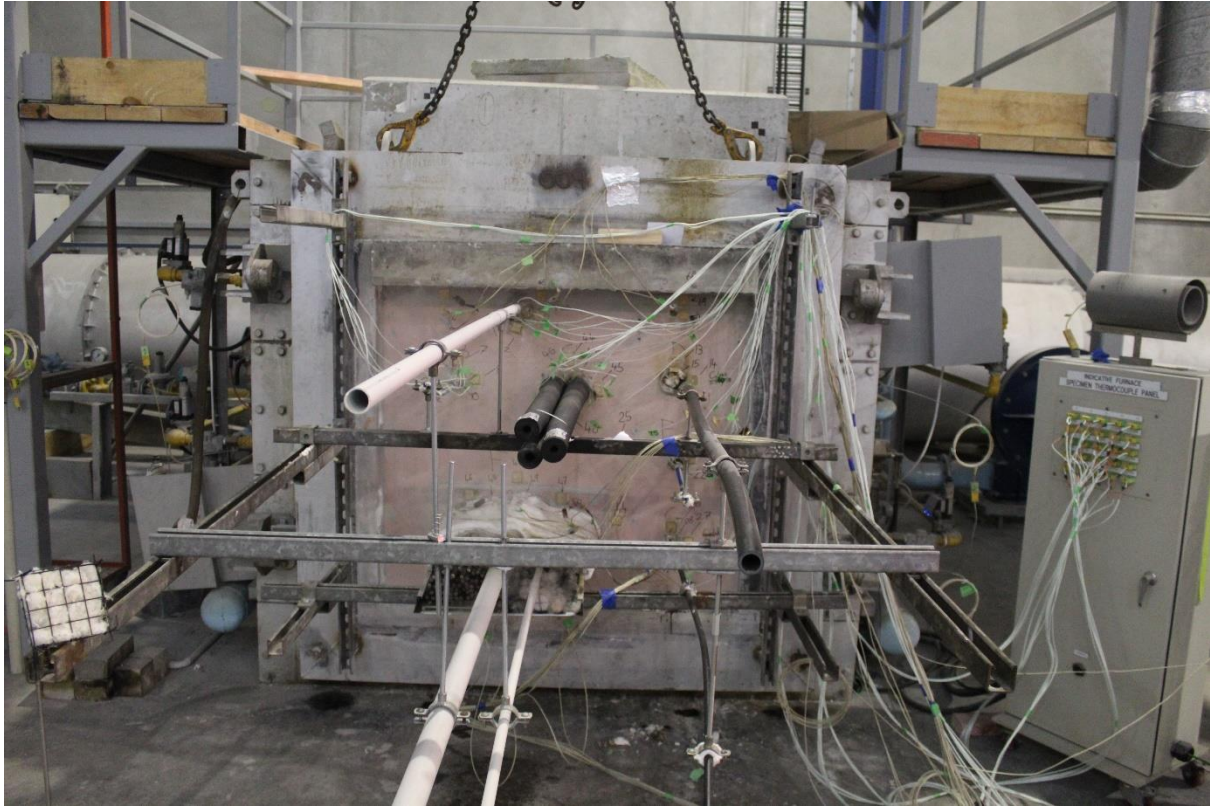
15 minutes:



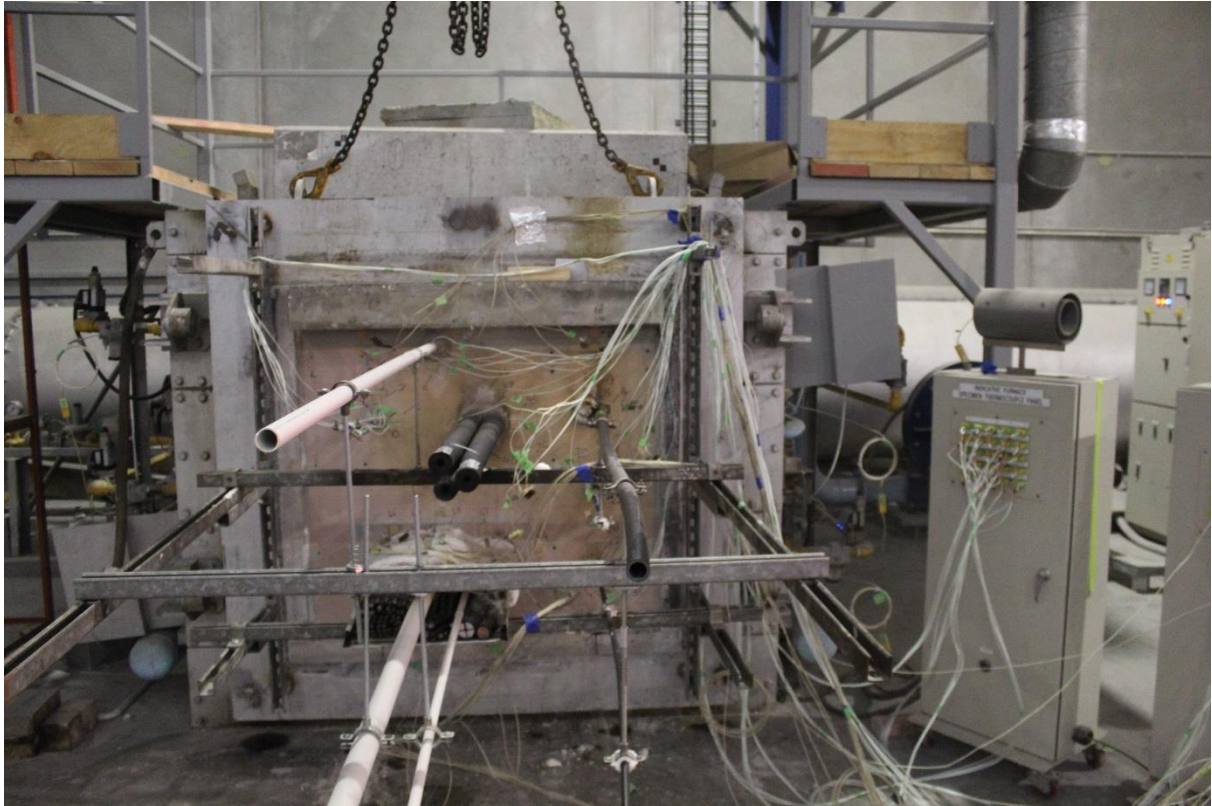
30 minutes:



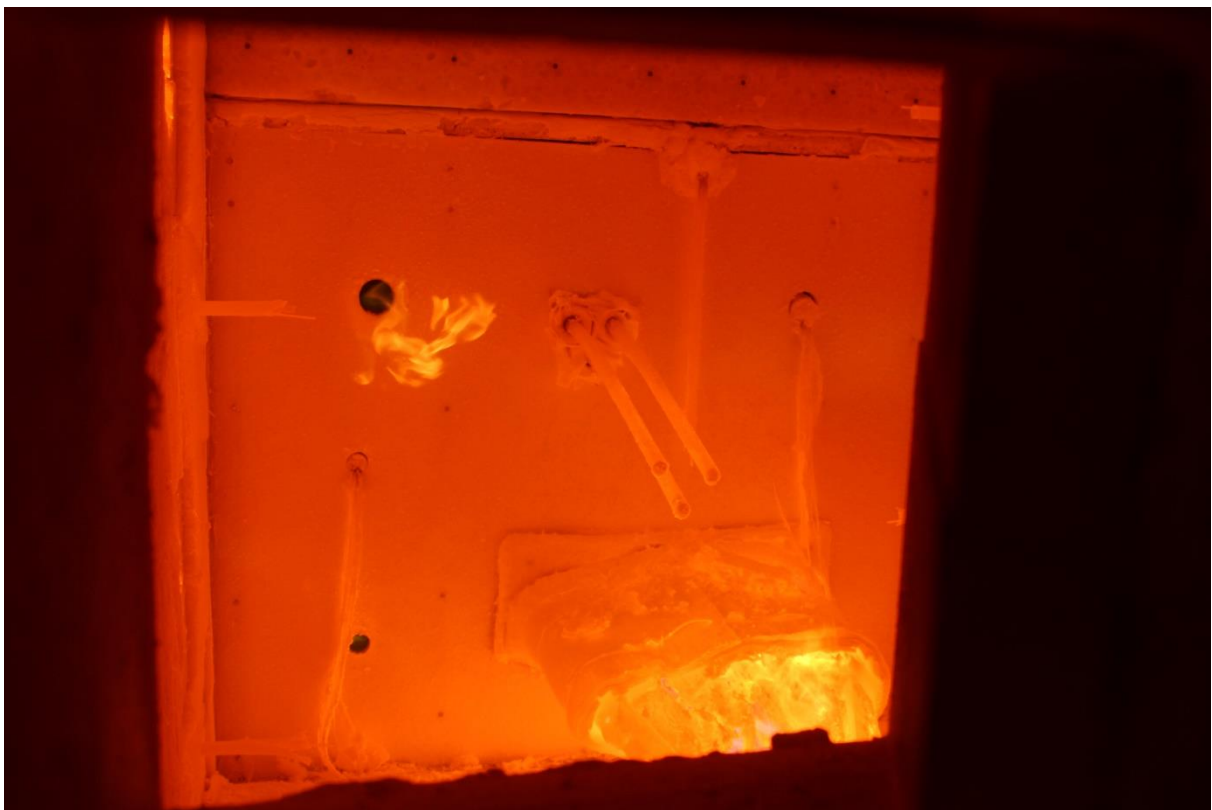
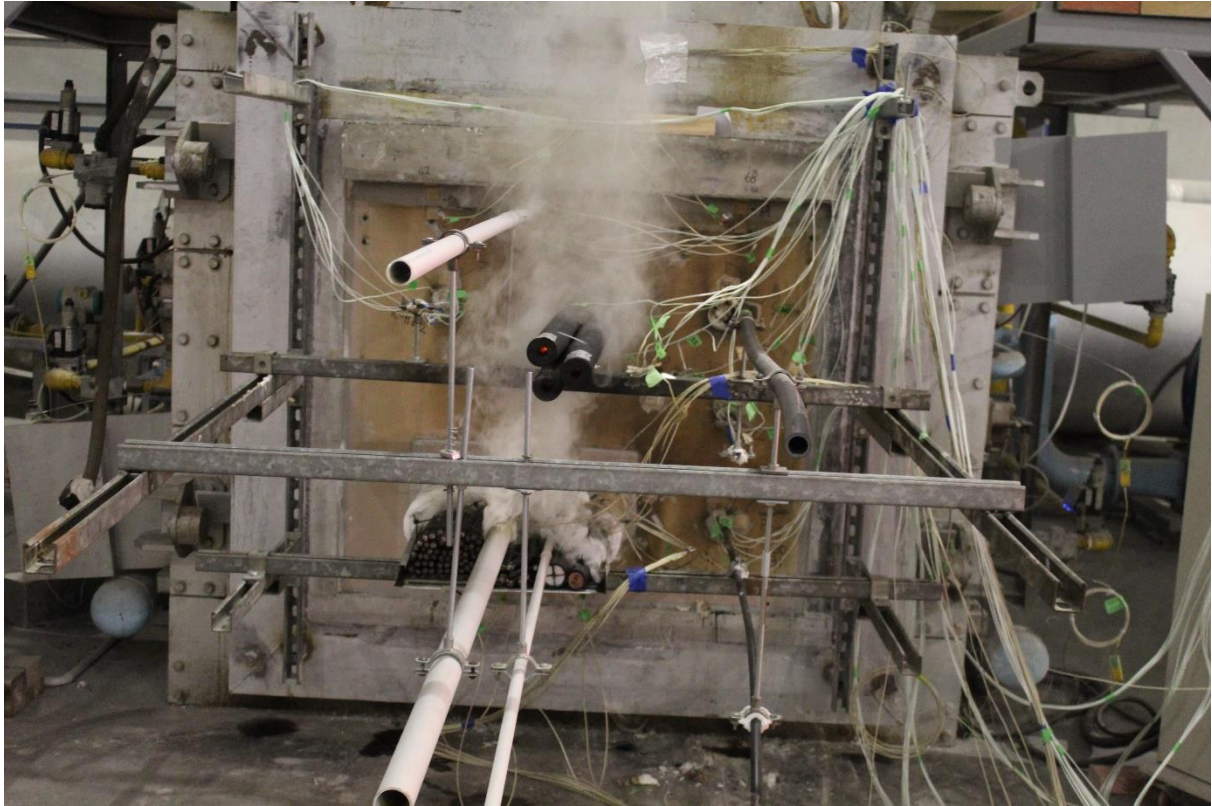
60 minutes:



90 minutes:



120 minutes:



After the test:

