



TEST REPORT

Fire resistance test of various services
protected by various systems with Sika
Firerate - PU sealant penetrating a 78mm thick
vertically orientated Speedpanel wall system
tested in accordance with AS 1530.4-2005

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1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 3000 mm wide × 3000 mm high × 78 mm thick Speedpanel wall system penetrated by various services.

TEST SPECIMENS

The Speedpanel wall was penetrated by 8-off different service penetrations which were protected by various protection systems with Sika Firerate - PU sealant. The top edge of the Speedpanel wall system was protected by flashing and bottom edge of the wall system was protected by Sika Firerate - PU sealant on unexposed side.

The full description of the specimen is provided in Figures A1.1 to A1.9 and the 'Schedule of Components' in Section 2.

Service	Penetration service	Primary Penetration service protection
A	400mm diameter Ravenscroft Fire Damper	Sika Firerate – PU Polyurethane fire-rated joint sealant
B	200mm diameter copper pipe	Sika Firerate – PU Polyurethane fire-rated joint sealant
C	100mm diameter uPVC pipe	Pyropanel® Pyrorap
D	100mm diameter uPVC pipe	PROMASEAL® FCW100 Collar
E	100mm diameter uPVC pipe	PROMASEAL® FC100 Collar
F	100mm diameter uPVC pipe	Pyrosleeve® RF-100mm
G	Group B large bundles of telecommunication cables tray	50mm TBA Firetherm Intubatt®
H	Group A PVC insulated power cables tray	50mm TBA Firetherm Intubatt®

Service	Edge detail	Edge detail protection
I	Top edge on south side	Flashing on the unexposed side
J	Top edge on North side	Flashing on the exposed side
K	Bottom edge	Sika Firerate – PU Polyurethane fire-rated joint sealant

ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed into a steel restraint frame by representatives of Speedpanel at EWFA Melbourne on the 21st of July 2014, under the supervision of EWFA representatives. The services were installed into the wall system by representatives of EWFA at EWFA Melbourne on the 23rd to the 25th of July 2014. Penetration protection systems were installed by representatives of the client on the 24th of July 2014. The test applicant supplied all the building materials for construction.

ORIENTATION

The assembly was asymmetric due to pipes and cable trays being supported on the unexposed side only. The screw fixings of the wall system were installed on the unexposed side only.

2 SCHEDULE OF COMPONENTS

Item	Description	
	SERVICE A (Fire Damper)	
1	Product Name	Ravenscroft BSD-C Fire Damper
	Damper size	Ø399mm
	Clear Opening	Ø395mm
	Damper blade thickness	1mm
	Duct and damper Material	0.8mm thick Galvanised steel sheet to form a cylindrical duct.
	Closing method	The galvanised steel blade was actuated with a stainless steel spring. A fusible thermal link, set at approximately 74°C temperature, initiates the closing of the blade.
	Damper Mounting	The damper was located and secured within the wall opening using 480mm square flange on unexposed side of support wall. Flange was secured into wall with 10-off 10g × 30mm long screws along the outside edge of the damper flange (Five-off screws at each horizontal edge and one screw at the centre of the vertical edge. (Item 28).
	Aperture Size	Ø410mm
	Duct	Damper body extended 123mm from the exposed face of the wall and 155mm from the unexposed face of the wall.
2	Penetration Protection	
	Product name	Sika Firerate - PU
	Installation	- Sealant was applied to the internal perimeter of the aperture and also the back face of the flange before installation of damper. - The perimeter of the damper flange was finished off with a fillet of sealant that extended to the depths of the panel contours. - No sealant was applied on the exposed side. See figure A1.1, 2 & 5 in Appendix 1 for more details.
	SERVICE B (200mm COPPER PIPE)	
3	Pipe System	
	Product name	Ø200mm Copper Pipe
	Pipe dimensions	Outside Diameter (OD) 203mm (measured) × 2.15mm thick (measured) pipe that protruded nominally 530mm on the exposed side and 500mm on the unexposed side. The pipe was capped on the exposed side with a copper end cap.
	Pipe Support	The pipe was supported on the unexposed side with metal pipe brackets at approximately 250mm and 500mm from the unexposed face.
	Core hole diameter	Ø210mm

Item	Description	
4	Penetration protection	
	Product name	Sika Firerate - PU
	Installation	The sealant was applied to the internal perimeter of the aperture before installation of copper pipe. Sealant was finished off with a 50mm 45° fillet on both the exposed and unexposed sides of the wall. See figure A1.1, 2 & 6 in Appendix 1 for more details.
SERVICE C (100mm uPVC PIPE)		
5	Pipe System	
	Product name	Ø100mm DWV uPVC SC SN6 Pipe
	Pipe dimensions	Outside Diameter (OD) 111mm (measured) × 3.7mm thick (measured) pipe that protruded nominally 530mm on the exposed side and 2000mm on the unexposed side. The pipe was capped on the exposed side with a uPVC end cap.
	Pipe Support	The pipe was supported on the unexposed side with pipe brackets at approximately 500mm and 1500mm from the unexposed face.
	Core hole diameter	Ø135mm
6	Penetration Protection	
	Product name	Pyropanel Pyrorap Collar- CLPY100
	Collar Size	3-off Flexible intumescent wraps contained in a plastic bag. The intumescent strips were 390mm long × 70mm wide × 3.12mm thick.
	Density	Density of the intumescent strip was 928kg/m ³ .
	Installation	Installed such that the wrap was flush to the exposed face of the wall. The collar and sealant installation was conducted from the unexposed side only. See figure A1.1, 2 & 7 in Appendix 1 for more details.
7	Product name	Sika Firerate - PU
	Installation	The sealant was applied in the annular gap between the wall aperture and the pipe to a depth of 8mm (to the intumescent wrap) and finished off with a 16mm wide × 9mm deep sealant fillet on the unexposed side only. See figure A1.7 in Appendix 1 for more details.
SERVICE D (100mm uPVC PIPE)		
8	Pipe System	
	Product name	Ø100mm DWV uPVC SC SN6 Pipe
	Pipe dimensions	Outside Diameter (OD) 111mm (measured) × 3.7mm thick (measured) pipe that protruded nominally 530mm on the exposed side and 2000mm on the unexposed side. The pipe was capped on the exposed side with a uPVC end cap.
	Pipe Support	The pipe was supported on the unexposed side with pipe brackets at approximately 500mm and 1500mm from the unexposed face.
	Core hole diameter	Ø165mm

Item	Description	
9	Penetration Protection	
	Product name	PROMASEAL® FCW100 Collar (Standard)
	Collar Size	Overall dimensions of the collar were nominal 155mm outer diameter, 115mm inner diameter, and nominal 120mm high. The protrusion of the outer skin past the perforated steel was 6.8mm. The shell of the collar is made from nominal 0.96mm thick steel.
	Intumescent	The intumescent was nominal 103mm high × 17mm thick, with a nominal density of 1033kg/m ³ .
10	Installation	Installed such that collar was flush to the exposed face of the wall. The collar was retained in its location with 4 metal clips (31.4mm × 46.26mm) on the unexposed side only. The metal clips were secured to the collar with a 10g × 16mm long screws (Item 26). The collar protruded approximately 42mm on the unexposed side. The collar and sealant were installed from the unexposed side only. See figure A1.1, 2 & 7 in Appendix 1 for more details.
	Product name	Sika Firerate - PU
10	Installation	Sealant was finished off with nominally 20mm wide × 42mm deep sealant fillet on the unexposed side only. See figure A1.7 in Appendix 1 for more details.
SERVICE E (100mm uPVC PIPE)		
11	Pipe System	
	Product name	Ø100mm DWV uPVC SC SN6 Pipe
	Pipe dimensions	Outside Diameter (OD) 111mm (measured) × 3.7mm thick (measured) pipe that protruded nominally 530mm on the exposed side and 2000mm on the unexposed side. The pipe was capped on the exposed side with a uPVC end cap.
	Pipe Support	The pipe was supported on the unexposed side with pipe brackets at approximately 500mm and 1500mm from the unexposed face.
	Core hole diameter	Ø120mm
12	Penetration Protection	
	Product name	PROMASEAL® FC100 Collar
	Collar Size	Overall dimension of the collar was nominal 150mm outer diameter, 112mm inner diameter, and nominal 53mm high. The outer shell of the collar is made from nominal 0.96mm thick steel.
	Intumescent	The intumescent was nominal 49.8mm high × 17.5mm thick, with a nominal density of 1033kg/m ³ .
	Installation	The exposed side collar was fixed to the wall directly. On the unexposed side two (2-off) × 16mm FR plasterboard (300mm × 300mm) sheets were installed on the face of the wall and collar was installed onto the sheets. The perimeter of the plasterboard was finished with a fillet of Sika Firerate - PU (Item 13) sealant between it and the wall panels. See figure A1.1, 2 & 8 in Appendix 1 for more details.

Item	Description	
	Fixing	4-off 10g × 38mm Drywall laminating screws with Ø18.8mm × 1.29mm metal washers were used to secure the collar onto the Speedpanel (exposed side) and the FR plasterboard squares (unexposed side).
13	Product name	Sika Firerate - PU
	Installation	The sealant was applied around the perimeter of the FR plasterboard squares and finished off with a 5mm fillet. See figure A1.8 in Appendix 1 for more details.
	SERVICE F (100mm uPVC PIPE)	
14	Pipe System	
	Product name	Ø100mm DWV uPVC SC SN6 Pipe
	Pipe dimensions	Outside Diameter (OD) 111mm (measured) × 3.7mm thick (measured) pipe that protruded nominally 530mm on the exposed side and 2000mm on the unexposed side. The pipe was capped on the exposed side with a uPVC end cap.
	Pipe Support	The pipe was supported on the unexposed side with pipe brackets at approximately 500mm and 1500mm from the unexposed face.
	Core hole diameter	Ø120mm
15	Penetration Protection	
	Product name	Pyropanel Pyrosleeve® RF100 Fire Collar
	Collar Size	Overall dimension of the collar was nominal 153mm outer diameter, 123mm inner diameter, and nominal 63mm high. The outer shell of the collar is made from nominal 0.95mm thick steel.
	Intumescent	The intumescent strips had a nominal density of 928kg/m ³ .
	Installation	The exposed side collar was fixed to the wall directly. On the unexposed side two (2-off) × 16mm FR plasterboard (300mm × 300mm) sheets were installed on the face of the wall and collar was installed onto the sheets. The perimeter of the FR plasterboard was finished with a fillet of Sika Firerate - PU (Item 16) sealant between it and the wall panels. See figure A1.1, 2 & 8 in Appendix 1 for more details.
	Fixing	4-off 10g × 38mm Drywall laminating screws were used to secure the collar onto the Speedpanel (exposed side) and the plasterboard squares (unexposed side).
16	Product name	Sika Firerate - PU
	Installation	The sealant was applied around the perimeter of the collar at interface of collar-plasterboard and around the perimeter of the plasterboard squares, both only on the unexposed side and finished off with a 5mm fillet. See figure A1.8 in Appendix 1 for more details.
	SERVICE G (Communication Cables)	
17	Cable System	
	Cables	A pack of 60, 50-pair telecommunication cables, with each of the 100 wires in each cable having an outside diameter of 0.5mm.

Item	Description	
	Tray	The cables were installed onto an ET3-150-3 Ezy Strut Ladder-tray. Measured dimensions of the tray were; 175mm wide × 47mm high with a 19mm wide top lip, and a drop down lip 10mm long. The tray was made from 1mm thick galvanised steel.
	Fixings	The cables were fixed to the cable tray with plastic cable ties.
	Aperture Size	The aperture size was nominally 325mm wide × 246mm high. The aperture was framed out with 81mm× 55mm 1.2BMT C channels. 8-off 10g × 30mm self-drilling screws (Item 28) were used to secure the C channels to the wall on the unexposed side only. 4 screws were located at each corner and 4 screws were located at the mid-width of each channel's unexposed side flange.
	Support of Services	The service projection from the exposed and unexposed surface was 500mm. The cable tray was supported at a distance of 250mm and 500mm from the unexposed face of wall.
18	Penetration Protection	
	Product name	TBA Firetherm Intubatt®
	Size	Exposed layer: 325mm wide × 246mm high × 50mm thick Unexposed layer: 500mm wide × 335mm high × 50mm thick
	Area Weight	11.45kg/m ²
	Installation	2-off layers of batts were installed. An area of the batts was cut-out to accommodate cables and tray. This cut-out was nominally 75mm larger than the profile of the cables and tray. - The first batt was installed (friction fitted) flush to the unexposed face into the boxed out aperture. - The second batt was installed to the unexposed face of the wall over the framed aperture and fixed into place with 6-off Ø 5.2mm × 102mm hex-head screws with Ø 22.77mm × 2mm thick washers. - The second batt was separated into two pieces for installation. The vertical joint of the batts was located at mid-width. See figure A1.1, 2 & 9 in Appendix 1 for more details.
19	Product name	Sika Firerate - PU
	Installation	- A 10mm sealant fillet was applied to the interface of the cables/tray- batt and to the interface of the batt-wall and finished off with 20mm sealant fillet on the unexposed side. - A single bead of sealant was applied to the interface of cables/tray-batt on the exposed side along the top of the cables and tray but not the underside of the tray. - The vertical joint between batts was sealed with sealant. See figure A1.1, 2 & 9 in Appendix 1 for more details.
	SERVICE H (Electrical Cables)	
20	Cable System	

Item	Description	
	Cables	a) One single-core XLPE insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 630mm² (127 × 2.52 mm conductors, insulation 2.2 mm thick, OD 39.5 mm). b) One three-core plus earth XLPE insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 185mm² (32 × 2.52mm conductors, OD 53.8mm). c) Three three-core plus earth PVC insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 6mm² (7 × 1.04mm conductors OD 16mm). d) Eight three-core plus earth PVC insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 16mm² (7 × 1.7mm conductors, OD 20.4mm).
	Tray	The cables were installed onto an ET3-450-3 Ezy Strut Ladder-tray. Measured dimensions of the tray were; 450mm wide × 47mm high with an 18mm wide top lip, and a drop down lip 12mm long. The tray was made from 1mm thick steel.
	Fixings	The cables were fixed to the cable tray with plastic cable ties.
	Aperture Size	The aperture size was nominally 625mm wide × 204mm high. The aperture was framed out with 81mm× 55mm 1.2BMT C channels. 10-off 10g × 30mm self-drilling screws (Item 28) were used to secure the C-channels to the wall on the unexposed side only. 4 screws were located at each corner and a screw was located at the mid-height of each vertical channel's unexposed side flange. 2 screws were located on each horizontal channel's unexposed side flange with equal spacing.
	Support of Services	The service projection from the exposed and unexposed surface was 500mm. The cable tray was supported at a distance of 250mm and 500mm from the unexposed face of wall.
21	Penetration Protection	
	Product name	TBA Firetherm Intubatt®
	Size	Exposed layer: 625mm wide × 204mm high × 50mm thick Unexposed layer: 800mm wide × 380mm high × 50mm thick
	Area Weight	11.45kg/m ²
	Installation	2-off layers of batts were installed. An area of the batts was cut-out to accommodate cables and tray. This cut-out was nominally 5mm larger than the profile of the cables and tray. - The first batt was installed (friction fitted) flush to the unexposed face into the boxed out aperture. - The second batt was installed to the unexposed face of the wall over the framed aperture and fixed into place with 6-off Ø 5.2mm × 102mm hex-head screws with Ø 22.77mm × 2mm thick washers. The screws was located approximately mid-height of each unexposed batt with approximately 305mm horizontal spacing between each screw. The second batt was separated into two pieces for installation. The horizontal joint of the batts was located at the mid-height See figure A1.1, 2 & 9 in Appendix 1 for more details.
22	Product name	Sika Firerate - PU

Item	Description	
	Installation	- A 10mm sealant fillet was applied to the interface of the cables/tray-batt and to the interface of batt-wall and finished off with 20mm sealant fillet on the unexposed side. - A single bead of sealant was applied to the interface of cables/tray-batt on the exposed side along the top of the cables and tray but not the underside of the tray. - The horizontal joint between batts was sealed with sealant. See figure A1.1, 2 & 9 in Appendix 1 for more details.
	Separating Wall	
23	Name	78mm Speedpanel Panels
	Material	Nominally 285mm wide × 78mm thick panels comprised of an aerated concrete core encased in a 0.4mm BMT galvanised steel skin.
	Linear Weight	11.2kg/m (measured)
	Installation	- Panels were installed vertically starting from north edge with groove end in the north vertical track with 20mm gap between the top edge of the Speedpanel and the top track. - Panels were screw fixed (Item 26) to each other at 1000mm centres on the unexposed side only at every panel join. - Panels were screw fixed (Item 27) to vertical tracks at 500mm centres on the unexposed side only. - Panels were screw fixed (Item 28) to head and bottom track at every 2nd panel join on the unexposed side only. See figure A1.1 - 4 in Appendix 1 for more details.
24	Name	Perimeter track
	Material	85mm × 55mm × 1.26mm BMT (measured) galvanised steel C-track
	Installation	Head track fixed to the lintel with Item 29 at 500mm centres. North vertical track fixed to the blockwork with Item 29 at 500mm centres. Bottom track fixed to the blockwork with Item 29 at 500mm centres.
25	Name	Head Flashing
	Material	0.7BMT Galvabond® Steel
	Size	144mm × 4mm, 1610mm long
	Installation	2-off flashings installed over head track. - Unexposed side flashing was installed in the south half of wall and exposed side flashing on the north half of wall. - The overlap of flashings was nominally 200mm. See figure A1.1 - 4 in Appendix 1 for more details.
26	Name	Fixings- Panels
	Material	10g × 16mm Flat Top self-drilling, zinc coated steel screws
	Installation	Panels were screw fixed to each other at every panel join at 1000mm centres from bottom on the unexposed side only.
27	Name	Fixings- Panels to Side tracks
	Material	10g × 16mm Flat Top self-drilling, zinc coated steel screws

Item	Description	
	Installation	Panels were screw fixed to north and south vertical tracks (Item 24) at nominal 500mm centres on the unexposed side only.
28	Name	Fixings- Panels to Head and bottom tracks
	Material	10g × 30mm Flat Top self-drilling, zinc coated steel screws
	Installation	Panels were screw fixed to head and bottom tracks (Item 24) at every 2 nd panel join on unexposed side only.
29	Name	Fixings- Head, bottom and north (fixed) track to lintel/blockwork
	Material	Ø6.5mm × 50mm long Galvanised Mushroom head spike
	Installation	Fixing the tracks (Item 24) to lintel/blockwork at nominal 500mm centres.
30	Name	Sealant
	Material	Sika Firerate - PU
	Installation	- Applied to the interface between the perimeter tracks (Item 24) and the surrounding blockwork along the head, base and fixed edge. - Applied to the spacing between the unexposed side flange of bottom track and the Speedpanel contours. The sealant was applied to the specimen from the unexposed side only. 20mm high × 100mm wide sealant fillet was applied to the spacing between the top track and the Speedpanel at the mid width of the specimen wall to create a fire seal in the head track to separate north and south flashings. See figure A1.3 & 4 in Appendix 1 for more details.

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS1530.4- 2005 Sections 2 and 10 as appropriate for a wall system penetrated by services.

VARIATIONS TO TEST METHOD

The damper was not tested in full accordance with AS1530.4-2005 as a pressure differential was not applied across the damper. The junction of the damper and the wall was tested in accordance with AS1530.4-2005. As such the results for the dampers should not be used to demonstrate strict compliance to AS1530.4-2005 section 7.

PRE-TEST CONDITIONING

The installation of the penetration services into the wall system was finished on the 25th of July 2014 and was tested on the 31st of July 2014.

During the 6 day period, the test specimen was subjected to normal laboratory temperatures and relative humidity conditions.

SAMPLING / SPECIMEN SELECTION

The laboratory was not involved in the sampling or selection of the test specimen for the fire resistance test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was 20°C and did not vary significantly throughout the duration of the test.

TEST DURATION

The test duration was 123 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation provided was in accordance with AS 1530.4-2005 and is detailed below:

The furnace temperature was measured by 8-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and an overall diameter of 3mm with the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes.

The non-fire side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm, soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0 mm inorganic insulating pads. The thermocouple positions are described in Table A4.1, and are shown on Figure A4.1 in Appendix 4.

A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.

Cotton pads and gap gauges were available during the test to assess the performance under the criteria for integrity.

The furnace pressure was measured at approximately 500mm above the floor of the furnace.

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

Furnace temperature and pressure data are provided in Figure A5.1 and Table A5.2 in Appendix 5.

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A5.3 and Table A5.1 in Appendix 5.

OBSERVATIONS

A table that includes observations of the significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4-2005 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimen services listed below achieved the following performance with respect to the performance criteria listed in AS 1530.4-2005, Section 2 & 10.

Penetration Services

Service	Criteria	Result
B	Structural Adequacy	Not applicable
	Integrity	No failure at 123 minutes
	Insulation	Failure at 15 minutes
	FRL	-/120/0
C	Structural Adequacy	Not applicable
	Integrity	Failure at 93 minutes
	Insulation	Failure at 83 minutes
	FRL	-/90/60
D	Structural Adequacy	Not applicable
	Integrity	No failure at 123 minutes
	Insulation	Failure at 88 minutes
	FRL	-/120/60
E	Structural Adequacy	Not applicable
	Integrity	No failure at 123 minutes
	Insulation	No failure at 123 minutes
	FRL	-/120/120
F	Structural Adequacy	Not applicable
	Integrity	No failure at 123 minutes
	Insulation	Failure at 89 minutes
	FRL	-/120/60
G	Structural Adequacy	Not applicable
	Integrity	Failure at 94 minutes
	Insulation	Failure at 38 minutes
	FRL	-/90/30
H	Structural Adequacy	Not applicable
	Integrity	Failure at 91 minutes
	Insulation	Failure at 36 minutes
	FRL	-/90/30

The specimen services listed below achieved the following performance when tested in general accordance with the integrity and insulation criteria of AS 1530.4-2005.

Penetration Services

Service	Criteria	Result
A	Integrity	No failure at 123 minutes
	Insulation	Not applicable

Wall Elements

I	Integrity	No failure at 123 minutes
	Insulation	Failure at 27 minutes
J	Integrity	No failure at 123 minutes
	Insulation	Failure at 16 minutes
K	Integrity	No failure at 123 minutes

6 APPLICATION OF TEST RESULTS

TEST LIMITATIONS

The results of this fire test 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. The results only relate to the behaviour of the specimen of the element of the 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 nor do they necessarily reflect the actual behaviour in fires.

VARIATIONS FROM THE TESTED SPECIMENS

This report details the methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not addressed 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 3 should be referred to the test sponsor in the first instance to obtain appropriate documentary evidence of compliance from Exova Warringtonfire Aus Pty Ltd or another Registered Testing Authority.

UNCERTAINTY OF MEASUREMENT

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

APPENDIX 1 DRAWINGS OF TEST ASSEMBLY

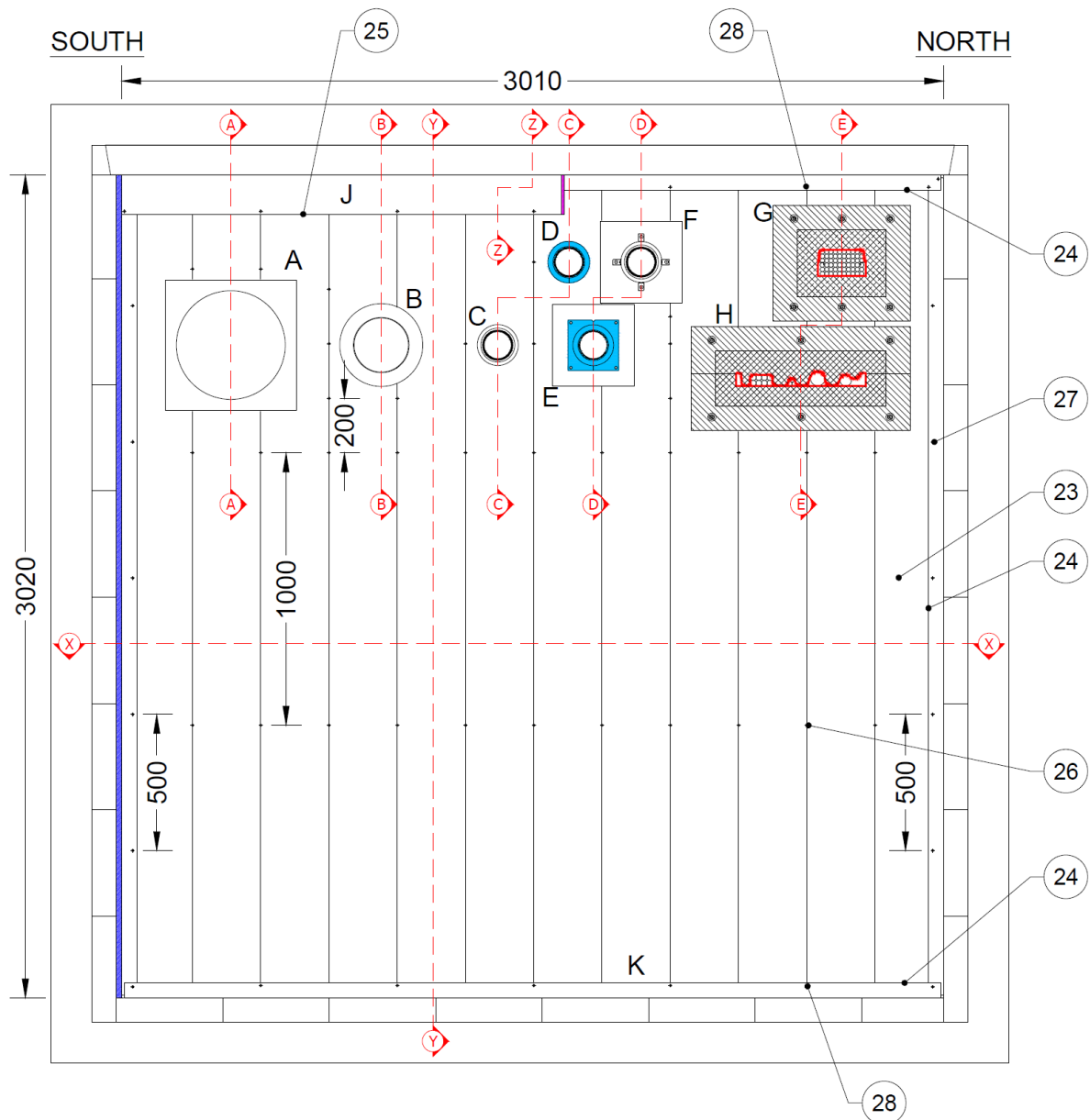


Figure A1.1: Elevation of Test Specimen framing (Unexposed side)

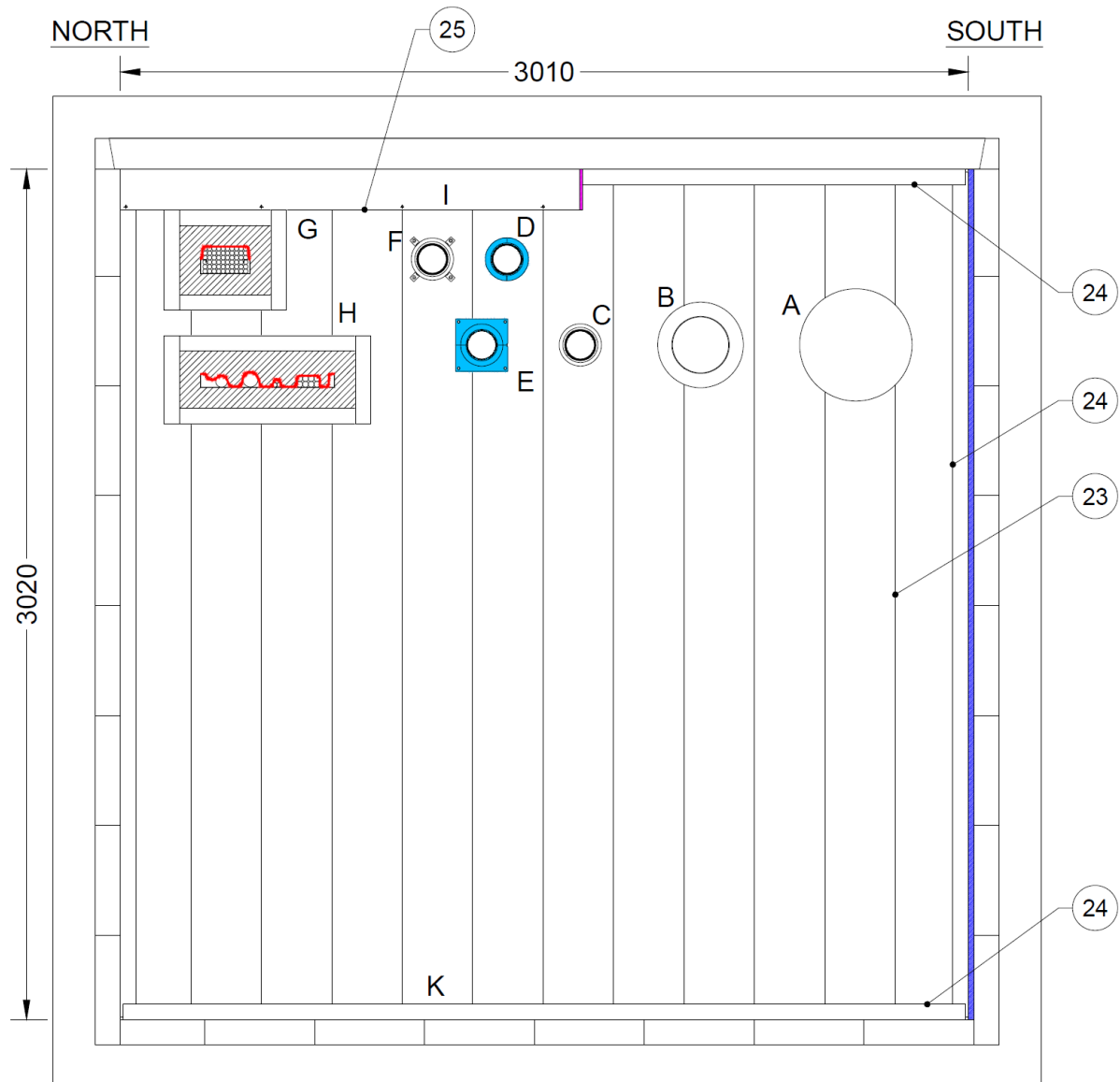


Figure A1.2: Elevation of Test Specimen framing (Exposed side)

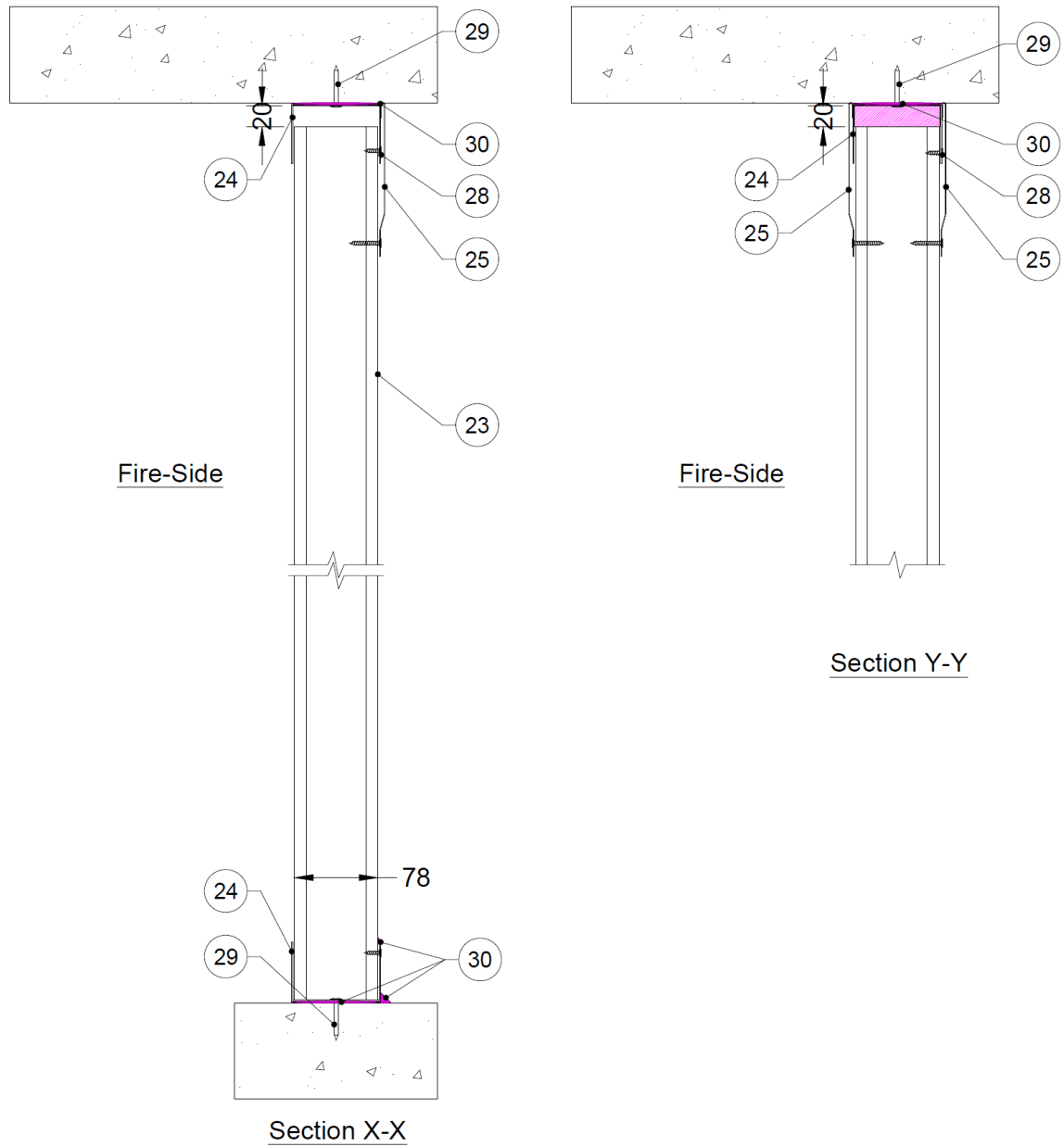


Figure A1.3: Vertical Cross-Section X-X and Y-Y

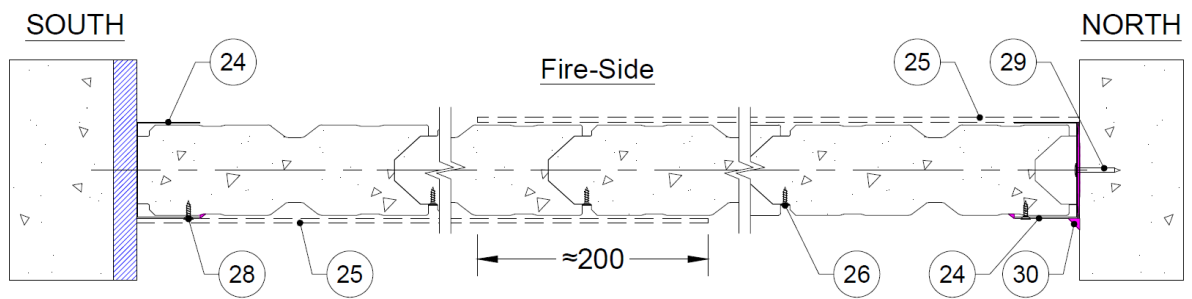


Figure A1.4: Horizontal Cross-Section Z-Z

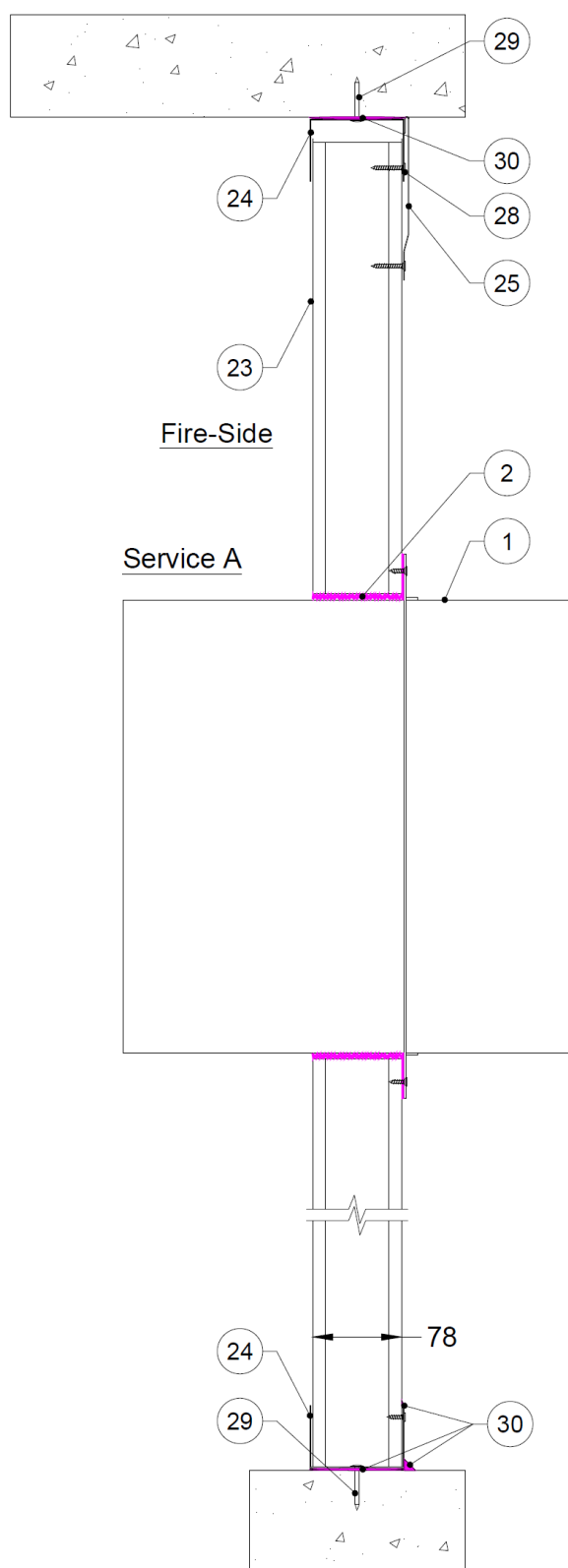


Figure A1.5: Vertical Cross-Section A-A

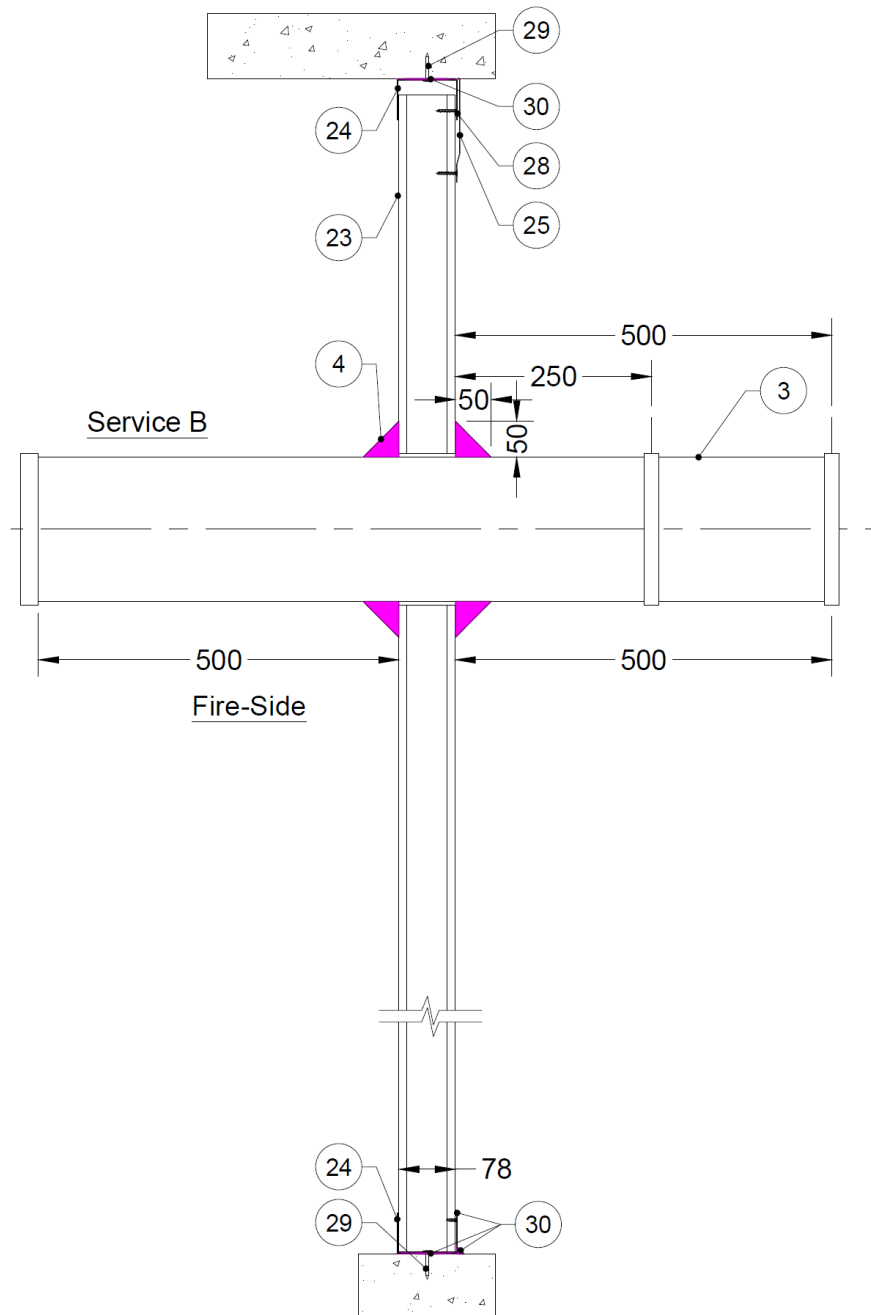


Figure A1.6: Vertical Cross-Section B-B

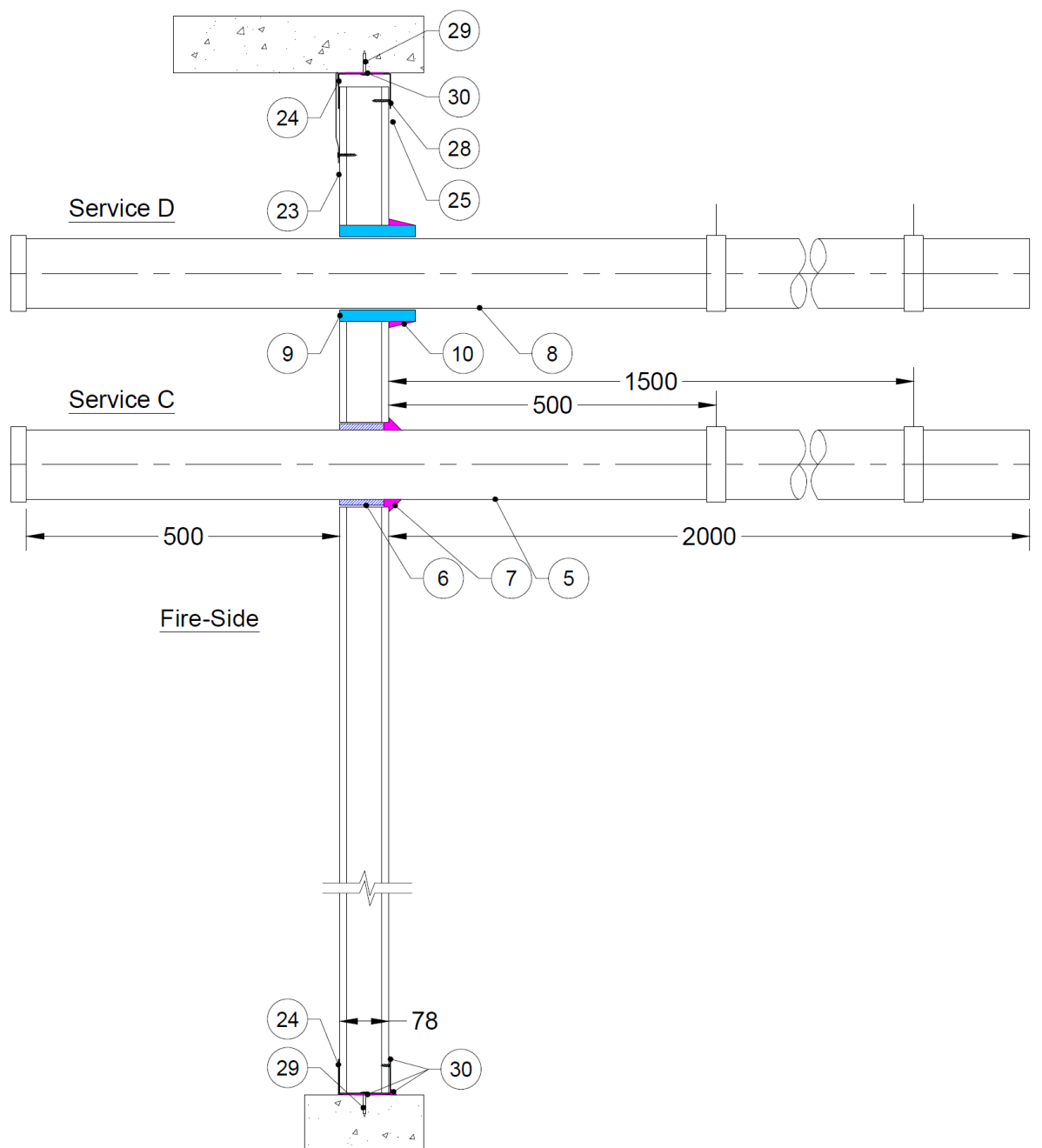


Figure A1.7: Vertical Cross-Section C-C

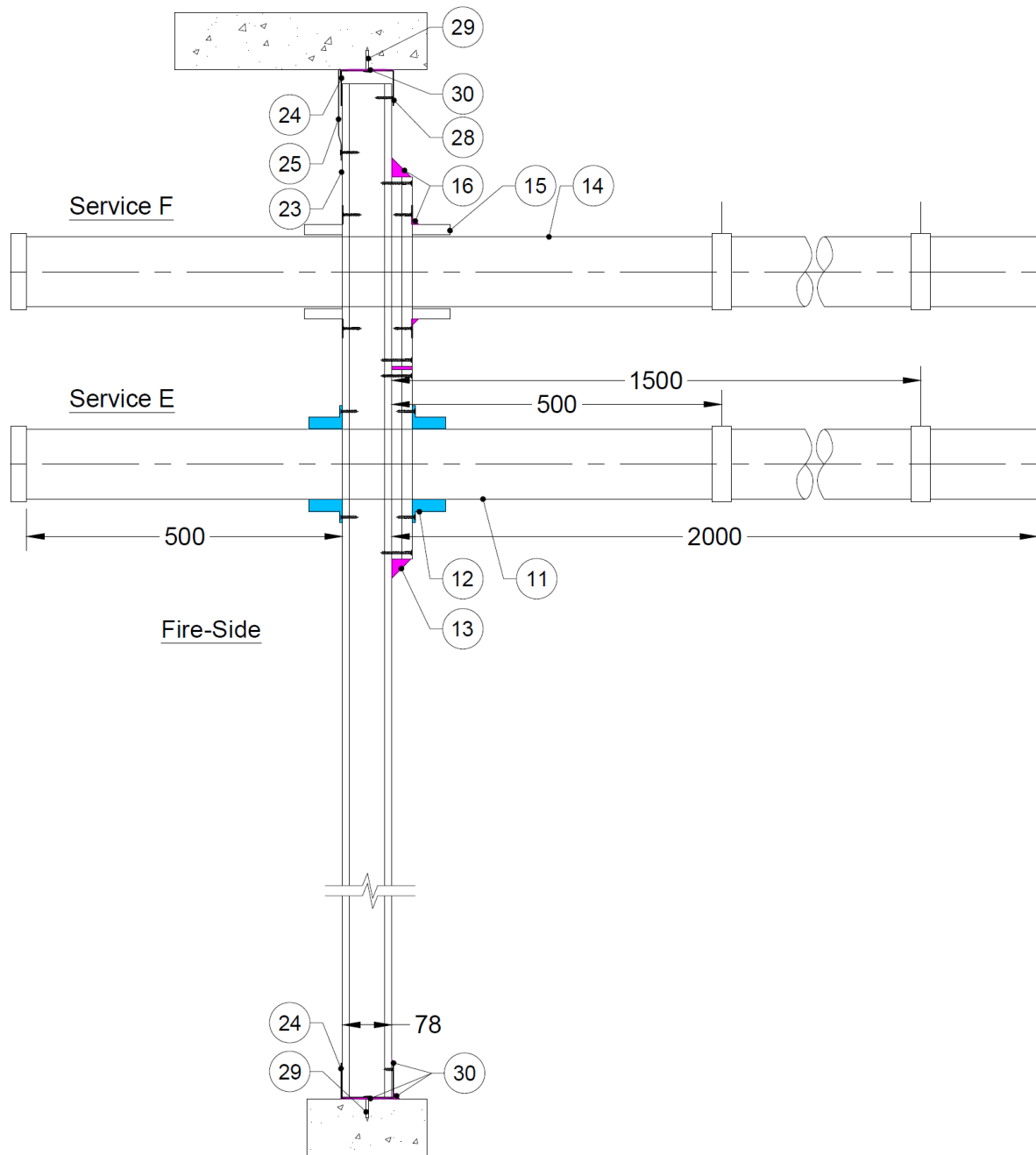


Figure A1.8: Vertical Cross-Section D-D

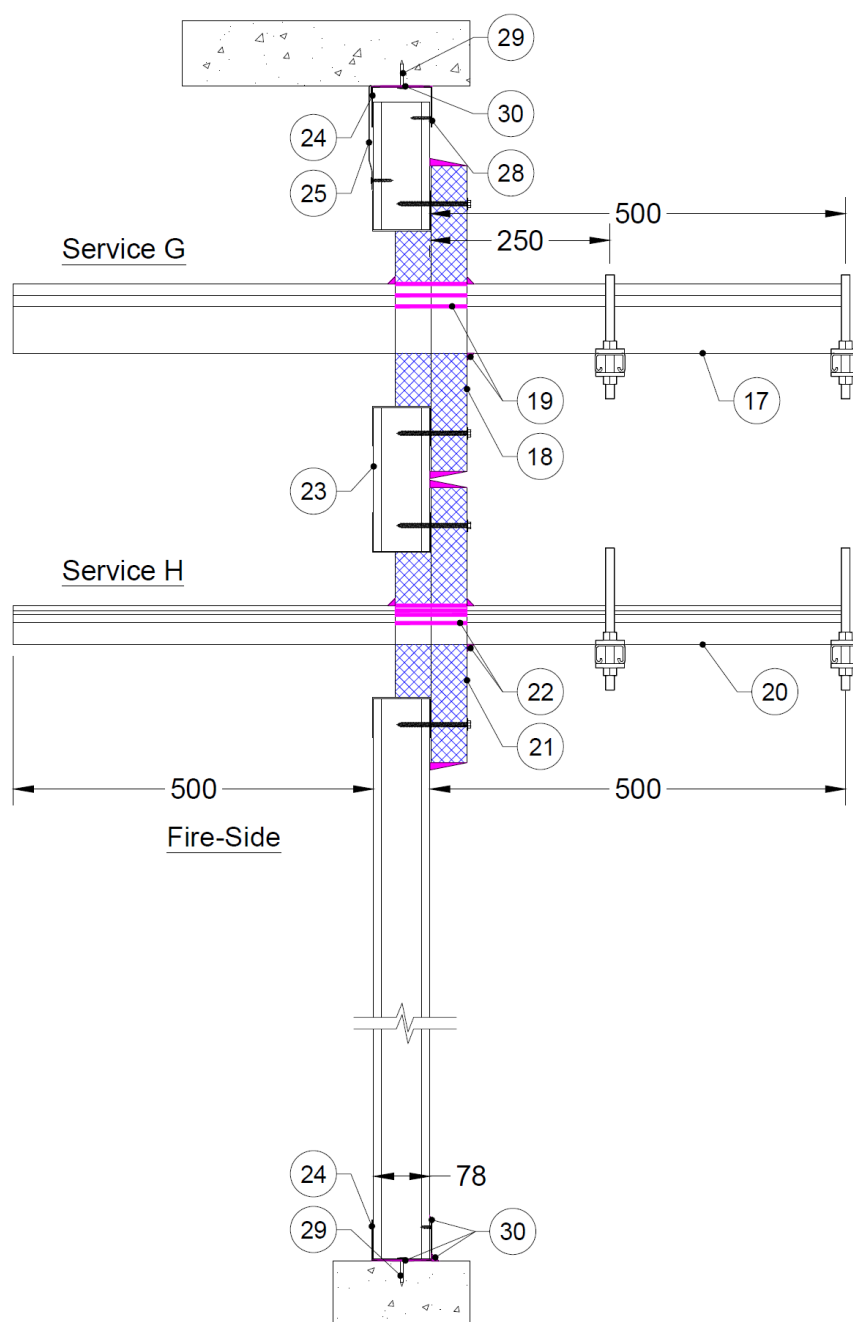


Figure A1.9: Vertical Cross-Section E-E

APPENDIX 2 TEST OBSERVATIONS

The following include observations of the significant behaviour of the specimen.

Time Min Sec		Observation
Service A		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
1	05	The damper activated and closed. A small annular gap was evident along the blade edge between the blade and the housing.
1	50	Smoke emissions had become evident from the bottom edge of the damper at the panel valley
3	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC10 exceed the initial temperature by more than 180°C
4	50	Discolouration had become evident on the damper blade
11	20	Increase in volume of smoke from the panel valley below the damper
15	00	It had become evident that the wall was bowing toward the furnace
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
30	15	Discolouration had become evident on the panel valley above the damper flange
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor
Service B		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
15	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC016 exceed the initial temperature by more than 180°C
15	00	It had become evident that the wall was bowing toward the furnace
18	00	Cracks had become evident on the sealant around the pipe
23	00	Smoke emission had become evident from the sealant on the pipe
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
36	00	It had become evident that sealant fillet was retracting away from the pipe
43	00	It had become evident that sealant fillet had retracted further away from the pipe
53	00	Thermocouples on the top and side of the sealant fillet had detached
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
72	00	Sections of sealant fillet peeling away from itself.
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.
Service C		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
2	30	Smoke venting had become evident from the end of the pipe

Time Min Sec		Observation
9	00	Deformation had become evident on the pipe near the separating element. Dark colour smoke emission had become evident from the end of the pipe
12	00	Decrease in volume of smoke venting had become evident at the end of the pipe
14	30	Decrease in volume of smoke venting had become evident at the end of the pipe
15	00	It had become evident that the wall was bowing toward the furnace
20	00	Sealant ring in annular gap between pipe and wall had been ejected and was hanging off the pipe in front of the wall
22	30	It had become evident that the pipe was pushed away from the separating element by the intumescent. It had become evident that a gap appeared on south side of the pipe where the sealant had pushed out.
25	00	Smoke from annular gap around pipe at the wall
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
34	00	It had become evident that intumescent was visible from the gap between the pipe and the separating element
37	00	The inner intumescent strip had not activated and had moved out of the wall with the pipe while the outer strip had activated
58	00	The pipe had dislodged from the wall and was now moving independently
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
80	00	A section of the sealant ring from the annular gap has broken and was hanging from the pipe
83	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC027 exceed the initial temperature by more than 180°C
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
90	05	It had become evident that glowing was visible on bottom between the separating element and the pipe
90	30	It had become evident that intumescent had detached from the specimen from the interface between the separating element and the pipe
90	40	A 30 second cotton pad test was carried out in accordance with AS 1530.4-2005. No glowing or flaming had become evident
93	05	A 30 second cotton pad test was carried out at the interface of the wall and pipe resulting in flaming of the cotton pad. Failure of integrity of the specimen in accordance with AS 1530.4-2005, clause 2.12.2.2, where ignition of the cotton had occurred
123	00	Test ended at the request of the sponsor.
Service D		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
2	30	Smoke venting had become evident from the end of the pipe
3	50	Ejection of intumescent from the end of the pipe had become evident
4	20	Intumescent continued to issue out of the pipe end
5	25	The volume of smoke from the pipe end had increased
5	40	Significant deformation of the pipe had become evident near the collar

Time Min Sec		Observation
6	25	It had become evident that the pipe had detached from the collar
7	30	A 30 second cotton pad test was carried out in accordance with AS 1530.4-2005. No glowing or flaming had become evident
12	10	It had become evident that intumescent had been ejected from the collar
15	00	It had become evident that the wall was bowing toward the furnace
16	10	Further intumescent had been ejected from the collar
21	00	Further intumescent had been ejected from the collar
25	30	A large section of intumescent had dislodged from the collar
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
85	00	the sealant fillet had dislodged from the service and was hanging from the bottom edge
88	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC030 exceed the initial temperature by more than 180°C
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.
Service E		
0	0	Fire resistance test commenced and the ambient temperature was approximately 20°C
2	30	Smoke venting had become evident from the end of the pipe
5	40	Smoke emission had become evident from the collar
9	20	The venting of smoke from the pipe end had ceased
13	30	The venting of smoke from the collar had ceased
15	00	It had become evident that the wall was bowing toward the furnace
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
54	00	Smoke venting had become evident from the end of the pipe
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
76	00	An increase in the volume of smoke from the end of the pipe had become evident
76	30	Smoke emissions had become evident at the interface between the pipe and the collar
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.
Service F		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C

Time Min Sec		Observation
2	45	Smoke venting had become evident from the end of the pipe
5	40	Smoke emission had become evident from the collar
11	50	A reduction in smoke from the pipe end had become evident
13	30	It had become evident that smoke emission from the collar had ceased
15	00	It had become evident that the wall was bowing toward the furnace
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
54	00	Smoke venting had become evident from the end of the pipe.
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
76	00	An increase in the volume of smoke from the pipe end had become evident
89	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC054 exceed the initial temperature by more than 180°C
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.
Service G		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
1	05	Smoke emissions had become evident from the cable bundle
9	20	Smoke emissions had become evident on the upper edge of the batt
15	00	It had become evident that the wall was bowing toward the furnace
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
38	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC056 exceed the initial temperature by more than 180°C
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
89	05	A 30 second cotton pad test was carried out in accordance with AS 1530.4-2005. No glowing or flaming had become evident
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
92	00	Glowing had become evident through the gap between the insulation batts and the cables.
94	50	Flaming on penetration had become evident. Failure of integrity in accordance with AS 1530.4-2005, clause 2.12.2.4, due to sustained flaming between the insulation batt and the cables for greater than 10 seconds
123	00	Test ended at the request of the sponsor.
Service H		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
1	05	Smoke emissions had become evident from the cable bundle

Time Min Sec		Observation
11	10	A decrease in the volume of smoke from cable bundles had become evident
15	00	It had become evident that the wall was bowing toward the furnace
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005
36	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC83 exceed the initial temperature by more than 180°C
40	00	Smoke emissions had become evident from end of the large single core cable and large multi core cable.
55	30	Smoke emission had become evident from the batt and above the centre screw fixing
58	00	An increase in the volume of smoke had become evident from the batt
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
65	00	Deformation had become evident on the sheathing of the cables near the batt
65	00	Smoke emissions from the sheathing of the cables near the batt had become evident
73	00	Discolouration had become evident on the sealant below the cable tray located below the two large cables
75	00	Discolouration had become evident on the surface of the batt above the cables
88	00	Glowing had become evident through the gap between the batts and the 3 core cables
89	11	A 30 second cotton pad test was carried out in accordance with AS 1530.4-2005. No glowing or flaming had become evident
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
91	00	Flaming on penetration had become evident. Failure of integrity in accordance with AS 1530.4-2005, clause 2.12.2.4, due to sustained flaming between the insulation batt and the cables for greater than 10 seconds.
123	00	Test ended at the request of the sponsor.
Service I		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
1	10	Smoke emission had become evident from the head of the metal at panel dips
13	00	Condensation had become evident on the lintel above the track
14	00	Moisture condensing on the lintel was dripping onto the wall's face
15	00	It had become evident that the wall was bowing toward the furnace
27	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC008 exceed the initial temperature by more than 180°C
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
31	00	Discolouration and smoke had become evident from the panel valleys under the flashing adjacent to TC 007, 008 and 009.
49	00	Further discolouration of the 1 st , 2 nd , 3 rd and 5 th panel valleys from the south edge, the 4 th remains unchanged
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005

Time Min Sec		Observation
123	00	Test ended at the request of the sponsor.
Service J		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
15	00	It had become evident that the wall was bowing toward the furnace
15	20	Discolouration had become evident on the wall below the head track
16	00	Failure of insulation in accordance with AS 1530.4-2005 clause 2.12.3(b), where the maximum temperature of Thermocouple TC092 exceed the initial temperature by more than 180°C
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.
Service K		
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C
15	00	It had become evident that the wall was bowing toward the furnace
16	30	Smoke emission had become evident at the sill from the bottom track
24	00	Smoke emission had become evident along the bottom track
28	00	Cracking had become evident on the sealant at the sill
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
45	00	Cracking had become evident on the sealant at the sill
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4-2005
123	00	Test ended at the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

AS 1530.4-2005 indicates that the results of a fire resistance test contained in this report are directly applicable without reference to the testing authority to similar constructions where one or more of the following changes are made:

A 3.2 PLASTIC PIPES

A 3.2.1 In addition to the requirements of Clause A 3.2, test results may be directly applied to masonry and concrete elements thicker than the tested prototype when installed in accordance with Figure 10.11.5 – AS 1530.4-2005.

Results obtained from a particular test shall not be applied to plastic pipes of different diameters, wall thicknesses or material types, except for the following applications:

- (a) The fire protection system shall be subjected to the fire-resistance test when protecting 40 mm, 50 mm, 65 mm, 80 mm and 100 mm nominal size PVC-U DWV for separating elements and all sizes shall achieve the required FRL.
- (b) For other types of plastic pipes and pipe wall thicknesses, if the maximum and minimum sizes have also been tested and achieved, the required FRL in the subject separating element, a registered testing authority may provide an opinion of the performance of intermediate sizes provided the outside diameter of the largest pipe does not exceed 120 mm and the outside diameter of the smallest pipe is not less than 40 mm.

Results obtained from tests on penetrations through vertical separating elements shall not be used to assess performance in horizontal elements, and vice versa.

As penetration seals for plastic pipes are dependent for activation upon exposure to fire conditions, they shall always be installed with the same orientation and fire exposure as was established in the fire-resistance test.

A 3.2.2 *Services not perpendicular to the fire separation*

Penetrations not perpendicular to the plane of the element are acceptable provided that the fire-stopping system has similar exposure and dimensions to the tested prototype.

A 3.3 METAL PIPES

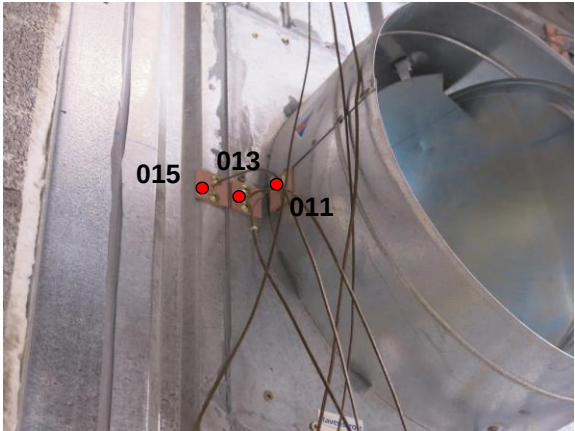
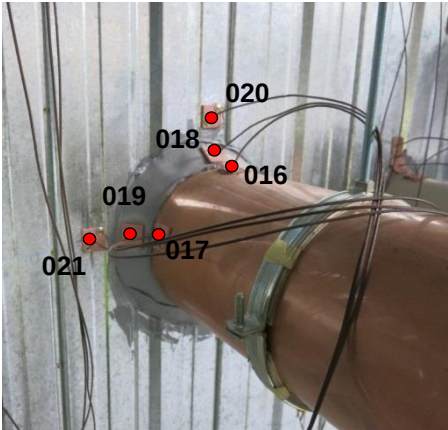
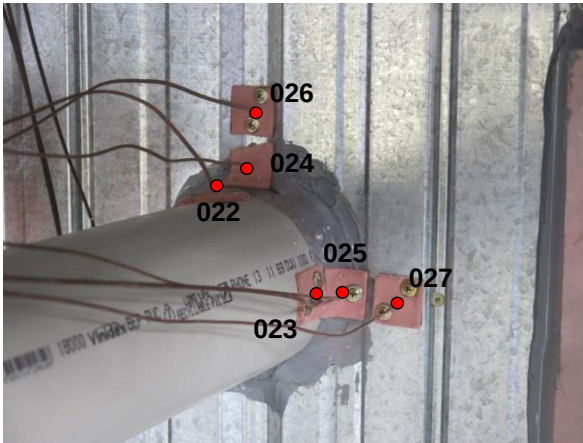
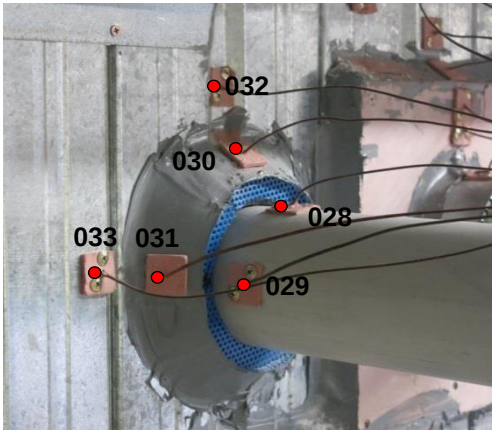
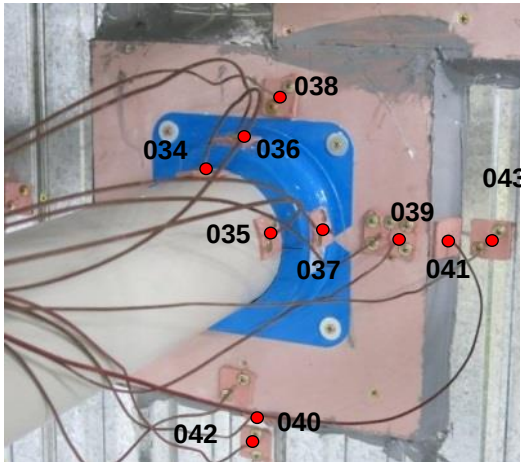
A3.3.1 Results obtained with a penetration sealing system protecting the opening around copper or brass pipes may be applied to pipes of the same material and to ferrous metal pipes having outside diameters not greater than the tested diameter, and wall thicknesses not less than the tested thickness.

A3.3.2 For mineral-fibre, cast and gun applied mastic seals, results obtained in openings with a smooth surface texture may be applied to openings have a rough surface texture.

A 3.4 ELECTRICAL AND COMMUNICATION CABLE

A3.4.1 The test results on the standard configurations specified in Appendix D may be applied to all PVC-insulated and sheathed power and communications cables with copper conductors

APPENDIX 4 INSTRUMENTATION POSITIONS

	
Service A	Service A
	
Service B	Service C
	
Service D	Service E

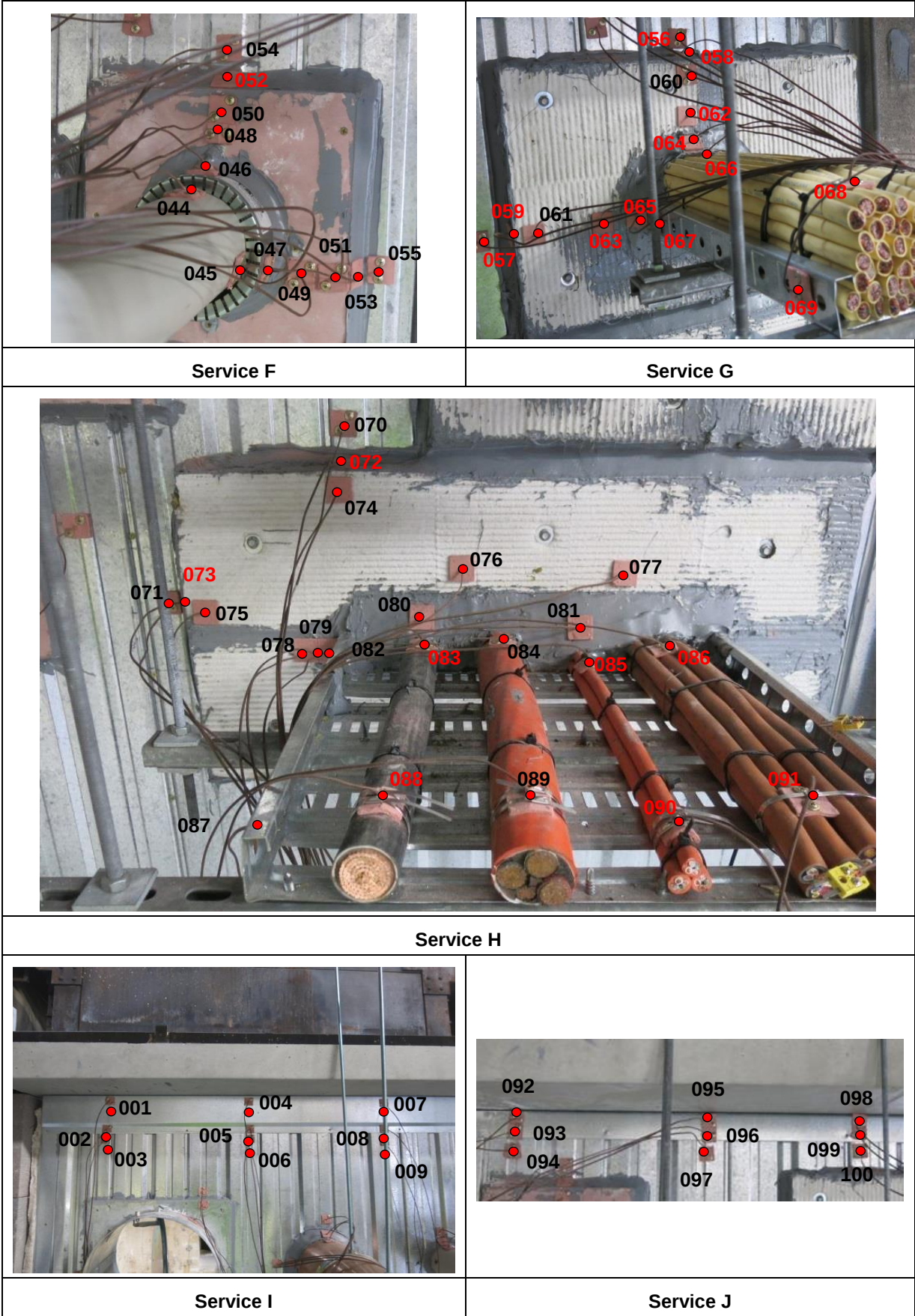


Figure A4.1: Thermocouple locations.

Table A4.1 Thermocouple Locations

Service	T/C No	Description
A	010	25mm from the flange on the top of the damper
	011	25mm from the flange on the side of the damper
	012	25mm from the damper on the flange above the damper
	013	25mm from the damper on the flange beside the damper
	014	25mm from the flange on the wall above the damper
	015	25mm from the flange on the wall beside the damper
B	016	25mm from the sealant fillet on the top of the copper pipe
	017	25mm from the sealant fillet on the side of the copper pipe
	018	On the sealant fillet between the wall and copper pipe, above the pipe
	019	On the sealant fillet between the wall and copper pipe, beside the pipe
	020	25mm from the sealant fillet on the wall above the pipe
	021	25mm from the sealant fillet on the wall beside the pipe
C	022	25mm from the sealant fillet on top of the uPVC pipe
	023	25mm from the sealant fillet on the side of the uPVC pipe
	024	On the sealant fillet between the wall and the uPVC pipe, above the pipe
	025	On the sealant fillet between the wall and the uPVC pipe, beside the pipe
	026	25mm from the sealant fillet on the wall above the uPVC pipe
	027	25mm from the sealant fillet on the wall beside the uPVC pipe
D	028	25mm from the collar on the top of the uPVC pipe
	029	25mm from the collar on the side of the uPVC pipe
	030	On the sealant fillet between the wall and the collar, above the collar
	031	On the sealant fillet between the wall and the collar, beside the collar
	032	25mm from the sealant fillet on the wall above the collar
	033	25mm from the sealant fillet on the wall beside the collar
E	034	25mm from the collar on the top of the uPVC pipe
	035	25mm from the collar on the side of the uPVC pipe
	036	25mm from the uPVC pipe on the collar, above the pipe
	037	25mm from the uPVC pipe on the collar, beside the pipe
	038	25mm from the collar on the plasterboard above the collar
	039	25mm from the collar on the plasterboard beside the collar
	040	On the sealant fillet between the wall and the plasterboard, below the plasterboard
	041	On the sealant fillet between the wall and the plasterboard, beside the plasterboard
	042	25mm from the sealant fillet on the wall below the plasterboard
	043	25mm from the sealant fillet on the wall beside the plasterboard
F	044	25mm from the collar on the top of the uPVC pipe
	045	25mm from the collar on the side of the uPVC pipe
	046	25mm from the uPVC pipe on the collar, above the pipe
	047	25mm from the uPVC pipe on the collar, beside the pipe
	048	25mm from the collar on the plasterboard above the collar
	049	25mm from the collar on the plasterboard beside the collar
	050	25mm from the sealant fillet around the plasterboard, on the plasterboard above the collar
	051	25mm from the sealant fillet around the plasterboard, on the plasterboard beside the collar
	052	On the sealant fillet between the wall and the plasterboard, above the plasterboard
	053	On the sealant fillet between the wall and the plasterboard, beside the plasterboard
	054	25mm from the sealant fillet on the wall above the plasterboard
	055	25mm from the sealant fillet on the wall beside the plasterboard
G	056	25mm from the sealant on the batt edge, on the wall, above the cable tray
	057	25mm from the sealant on the batt edge, on the wall, beside the cable tray
	058	On the sealant fillet between the wall and the batt, above the cable tray
	059	On the sealant fillet between the wall and the batt, beside the cable tray
	060	25mm from the edge of the batt, above the cable tray
	061	25mm from the edge of the batt, beside the cable tray
	062	25mm from the sealant fillet around the cable tray, on the batt, above the cables
	063	25mm from the sealant fillet around the cable tray, on the batt, beside the tray
	064	On the sealant fillet between the batt and the cable tray, above the cables

Service	T/C No	Description
	065	On the sealant fillet between the batt and the cable tray, beside the tray
	066	25mm from the sealant fillet on the top of the cable bundle
	067	25mm from the sealant fillet on the side of the tray
	068	400mm from the sealant fillet on the top of the cable bundle
	069	400mm from the sealant fillet on the side of the tray
H	070	25mm from the sealant on the batt edge, on the wall, above the cable tray
	071	25mm from the sealant on the batt edge, on the wall, beside the cable tray
	072	On the sealant fillet between the wall and the batt, above the cable tray
	073	On the sealant fillet between the wall and the batt, beside the cable tray
	074	25mm from the edge of the batt, above the cable tray
	075	25mm from the edge of the batt, beside the cable tray
	076	25mm from the sealant fillet around the cable tray on the batt, beside the tray
	077	25mm from the sealant fillet around the cable tray on the batt, above the cables
	078	25mm from the sealant fillet around the cable tray on the batt, above the cables
	079	25mm from the cable tray on the sealant fillet around the batt
	080	25mm from the 630mm ² single core cable on the sealant fillet around the cable tray
	081	25mm from the 3-off 6mm ² three core cables on the sealant fillet around the cable tray
	082	25mm from the sealant fillet around the cable tray on the cable tray
	083	25mm from the sealant fillet around the cable tray on the 630mm ² single core cable
	084	25mm from the sealant fillet around the cable tray on the 185mm ² three core + earth cable
	085	25mm from the sealant fillet around the cable tray on the 3-off 6mm ² three core cables
	086	25mm from the sealant fillet around the cable tray on the 8-off 16mm ² three core cables
	087	400mm from the sealant fillet around the cable tray on the side of the tray
	088	400mm from the sealant fillet around the cable tray on the 630mm ² single core cable
	089	400mm from the sealant fillet around the cable tray on the 185mm ² three core + earth cable
	090	400mm from the sealant fillet around the cable tray on the 3-off 6mm ² three core cables
	091	400mm from the sealant fillet around the cable tray on the 8-off 16mm ² three core cables
I	001	15mm from the lintel on the flashing (Southern)
	002	15mm from the wall on the flashing (Southern)
	003	15mm from the flashing on the wall (Southern)
	004	15mm from the lintel on the flashing (Middle)
	005	15mm from the wall on the flashing (Middle)
	006	15mm from the flashing on the wall (Middle)
	007	15mm from the lintel on the flashing (Northern)
	008	15mm from the wall on the flashing (Northern)
	009	15mm from the flashing on the wall (Northern)
J	092	15mm from the lintel on the top track (Southern)
	093	15mm from the panels on the top track (Southern)
	094	15mm from the top track on the panels (Southern)
	095	15mm from the lintel on the top track (Middle)
	096	15mm from the panels on the top track (Middle)
	097	15mm from the top track on the panels (Middle)
	098	15mm from the lintel on the top track (Northern)
	099	15mm from the panels on the top track (Northern)
	100	15mm from the top track on the panels (Northern)

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

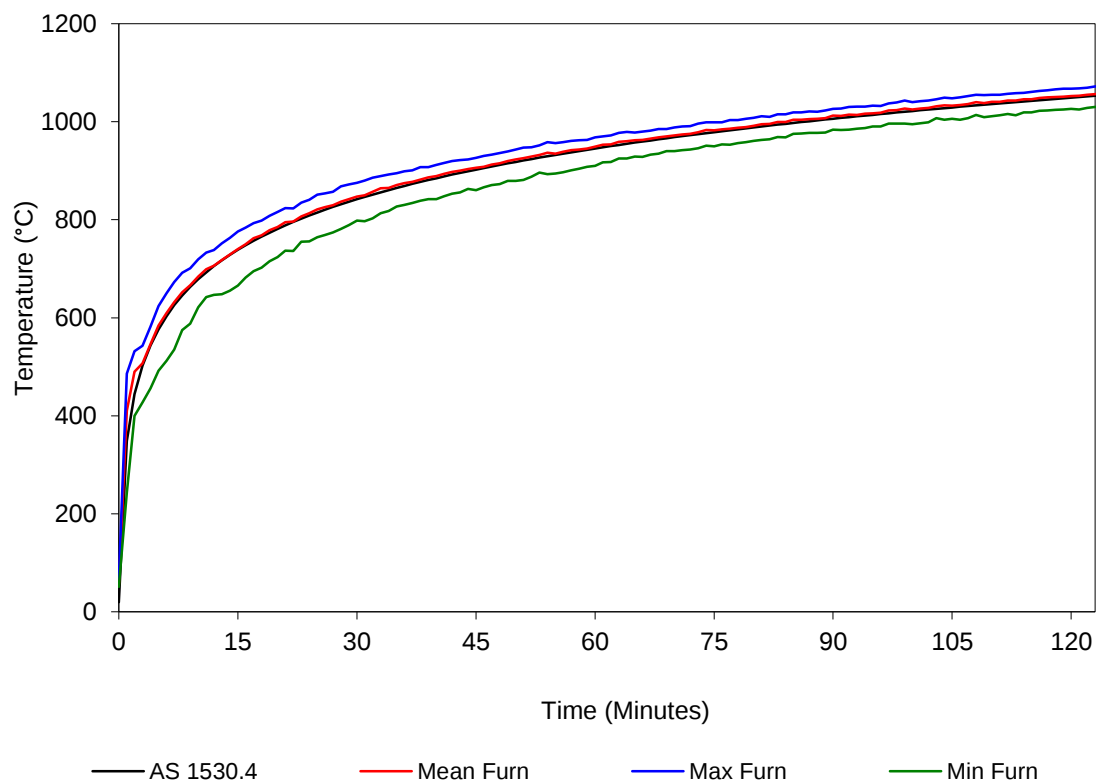


Figure A5.1: Furnace Temperatures vs. Time

A 5.2 FURNACE PRESSURE

The furnace pressure was measured at the mid-height of the Specimen H.

Time (minutes)	Pressure (Pa)	Time (minutes)	Pressure (Pa)
	Avg.		Avg.
5-10	16	65-70	15
10-15	15	70-75	15
15-20	16	75-80	15
20-25	15	80-85	16
25-30	15	85-90	16
30-35	15	90-95	16
35-40	16	95-100	15
40-45	15	100-105	16
45-50	16	105-110	16
50-55	15	110-115	16
55-60	15	115-120	16
60-65	15	120-123	16

A 5.3 SPECIMEN TEMPERATURES

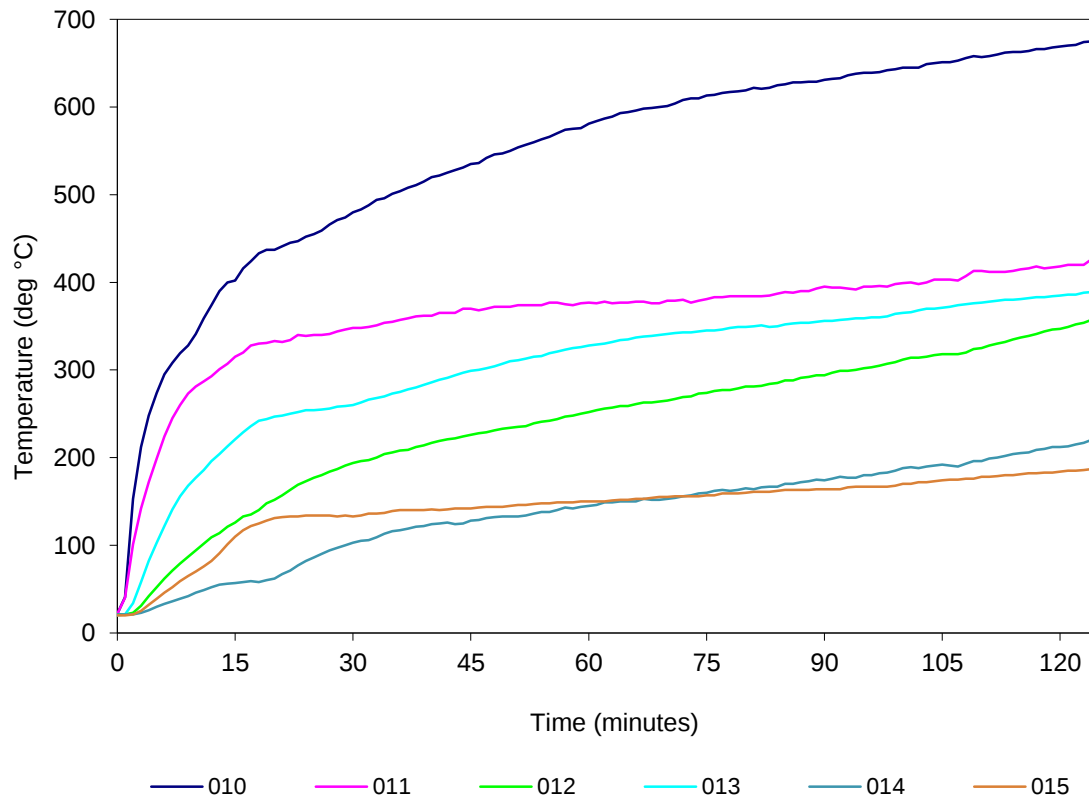


Figure A5.2: Service A. Temperatures vs. Time

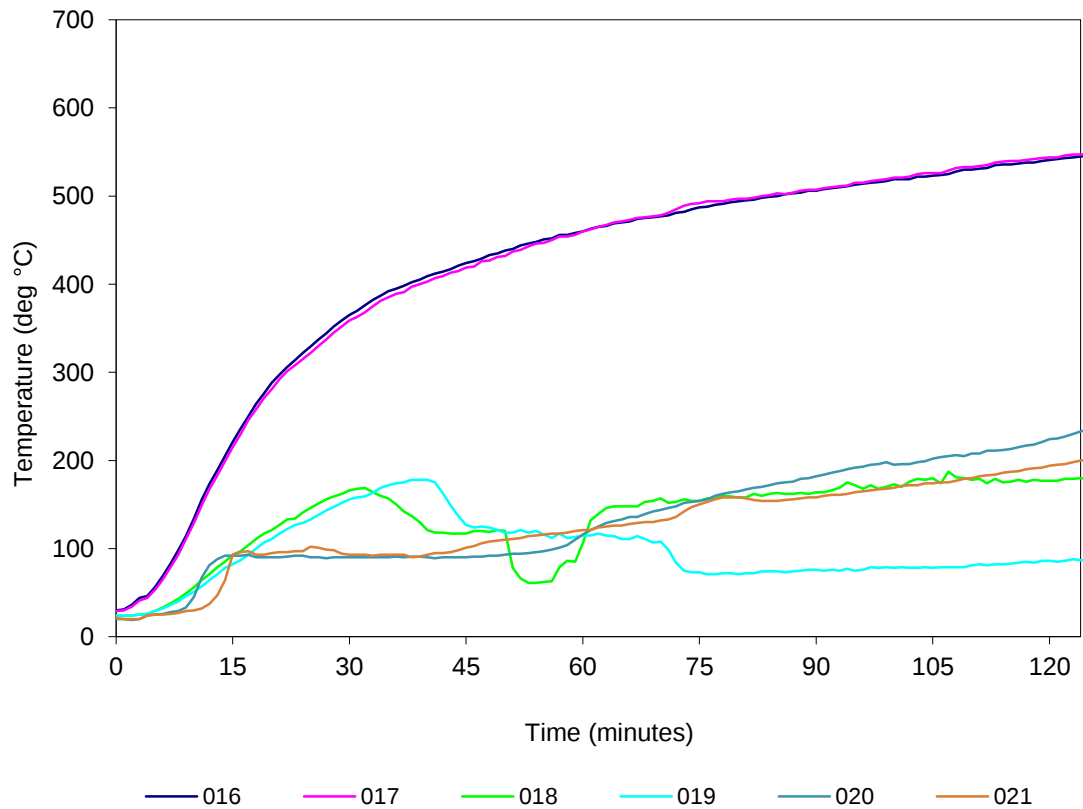


Figure A5.3: Service B. Temperatures vs. Time

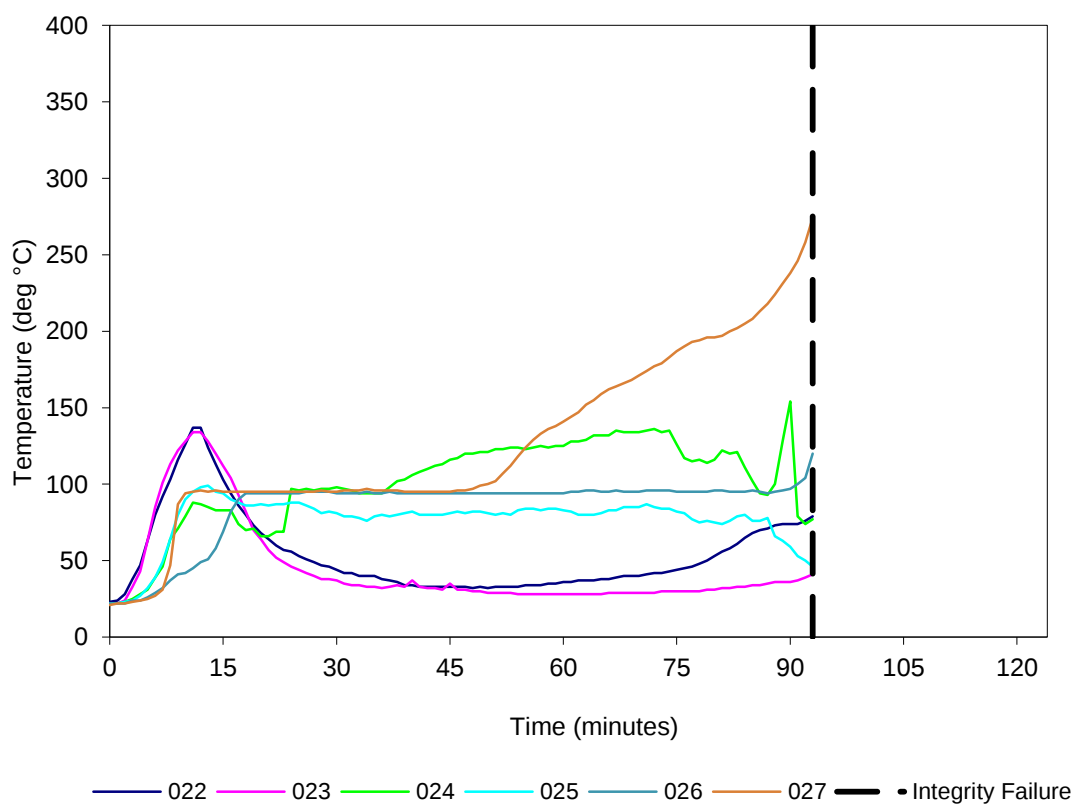


Figure A5.4: Service C. Temperatures vs. time

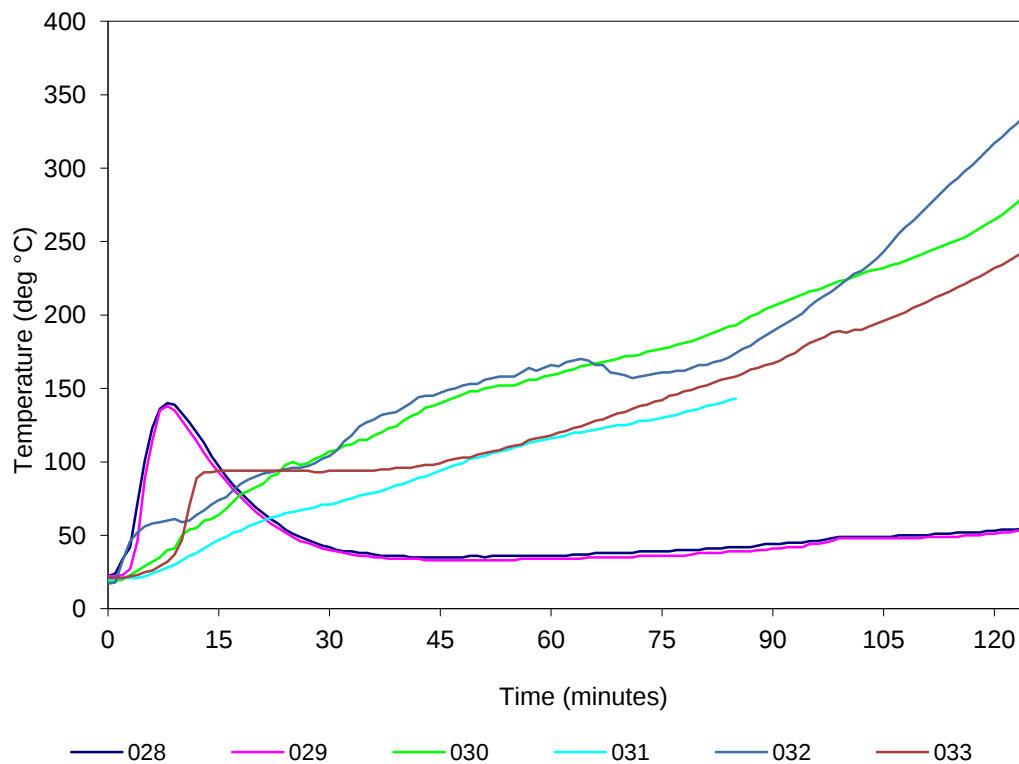
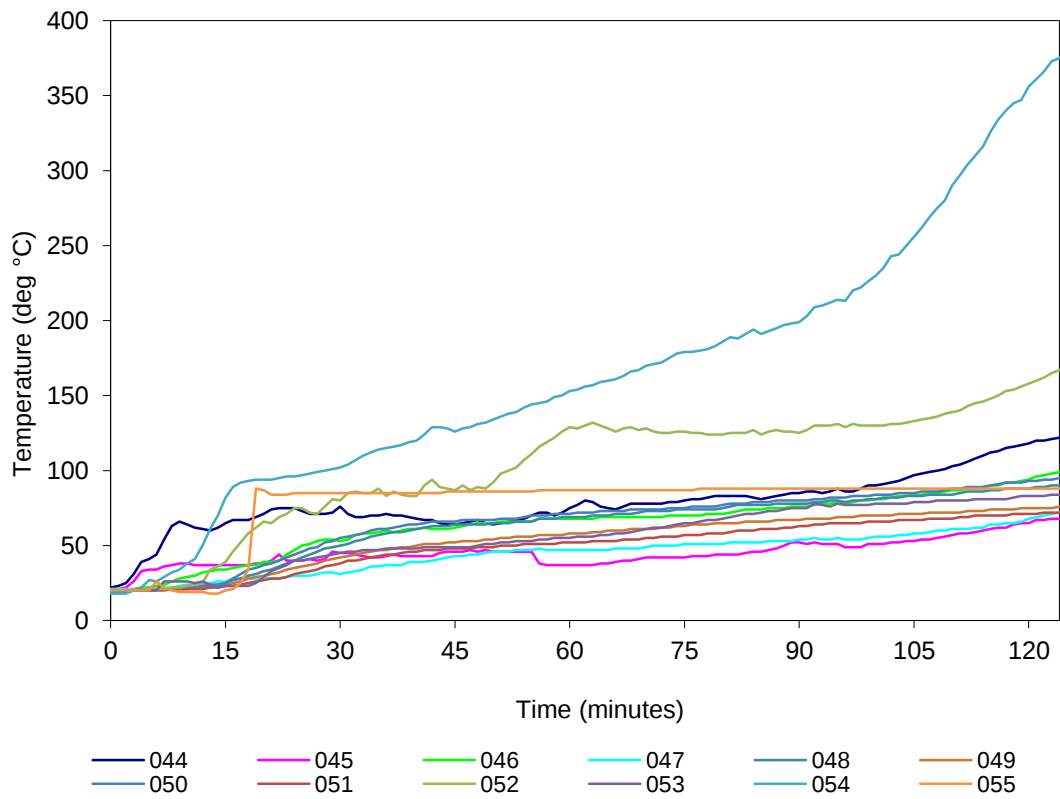
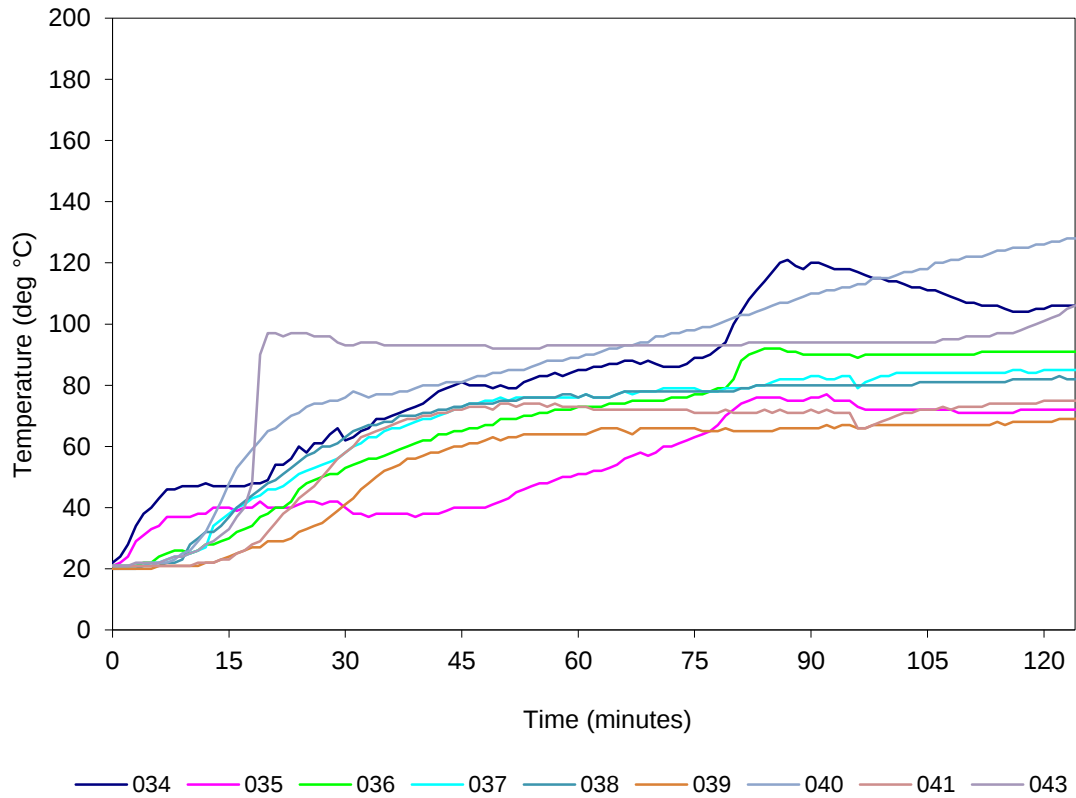
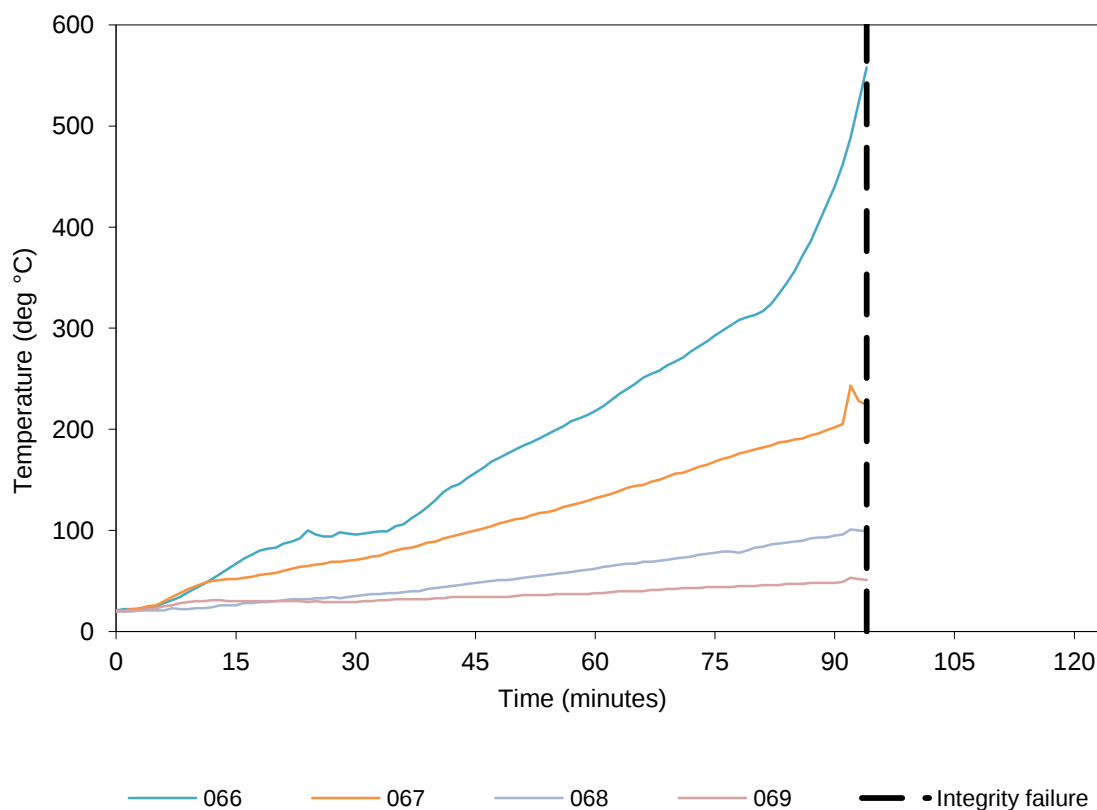
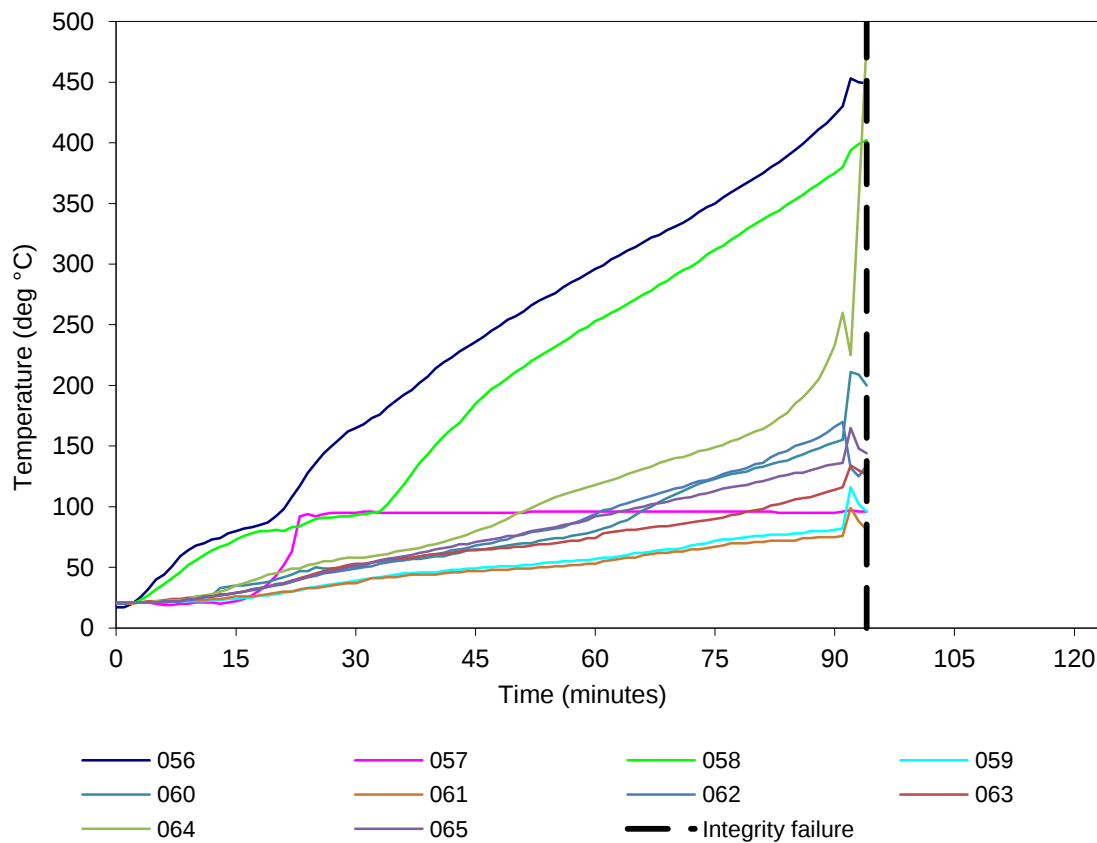


Figure A5.5: Service D. Temperatures vs. time

Note: Thermocouple 031 had detached from the specimen at 85 minutes





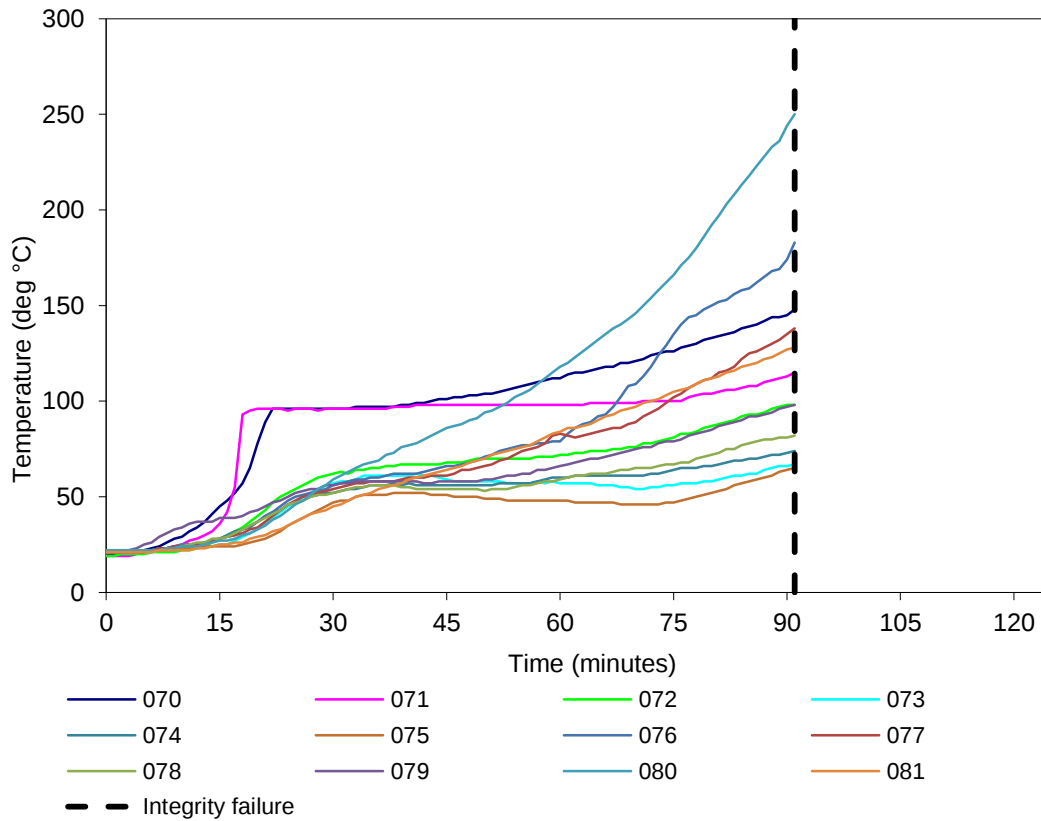


Figure A5.10: Service H - Service protection. Temperatures vs. time

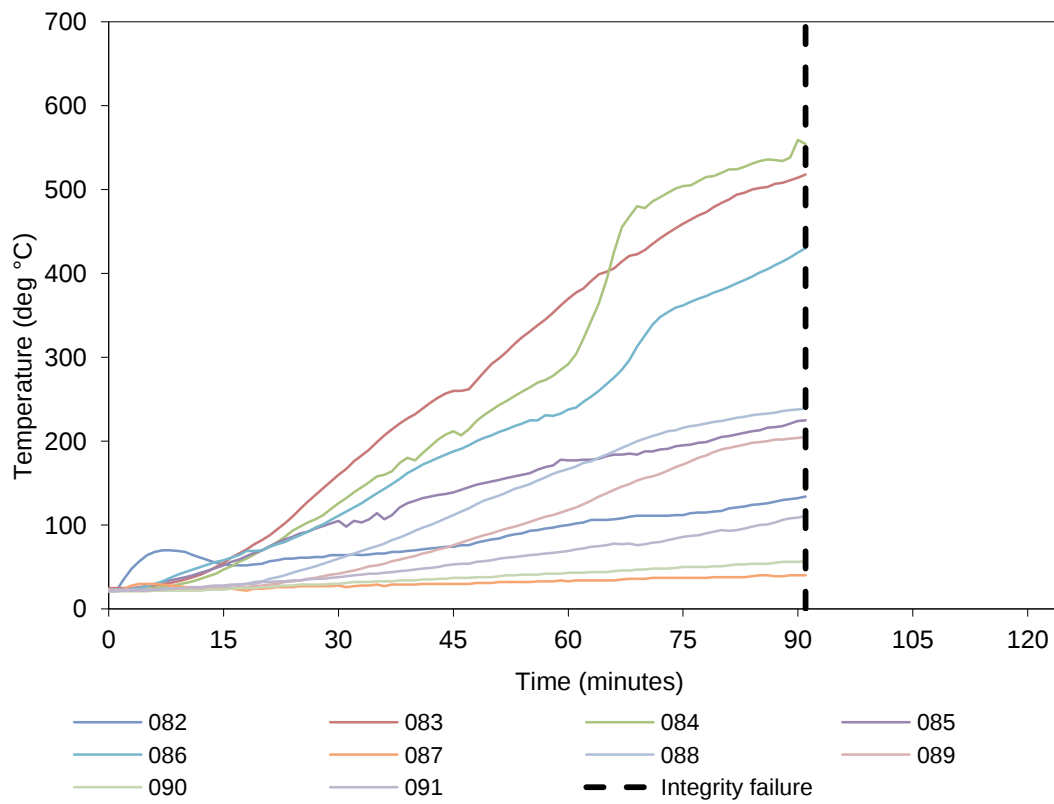


Figure A5.11: Service H - Cable bundles and tray. Temperatures vs. time

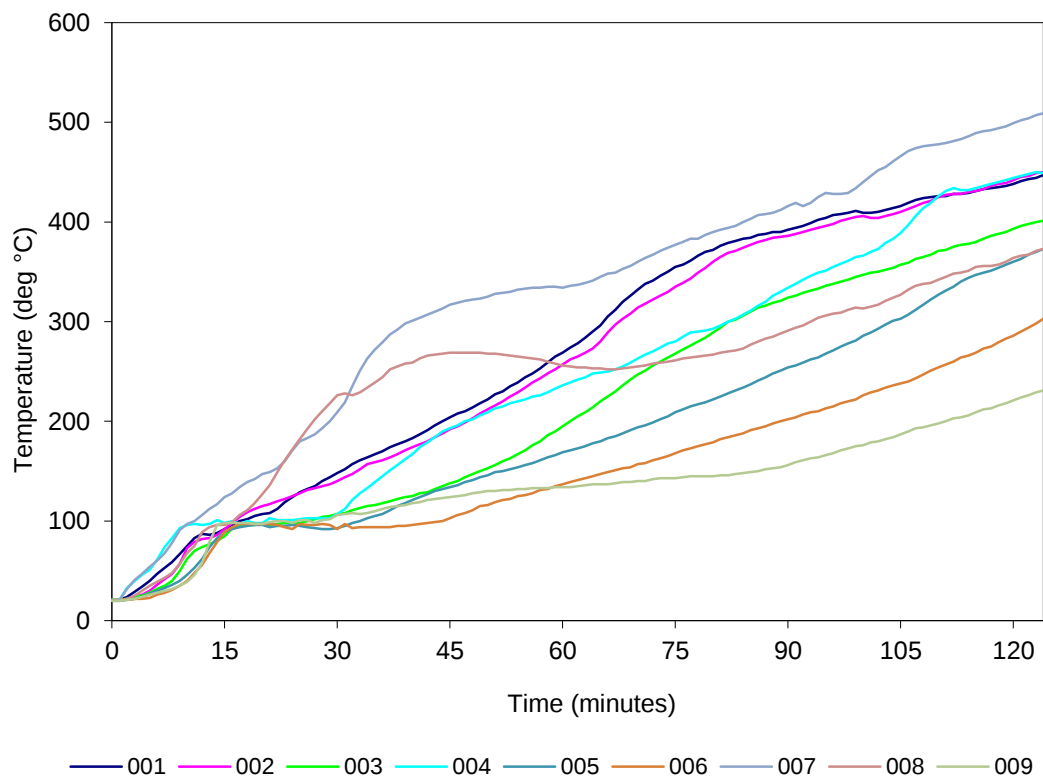


Figure A5.12: Service I. Temperatures vs. Time

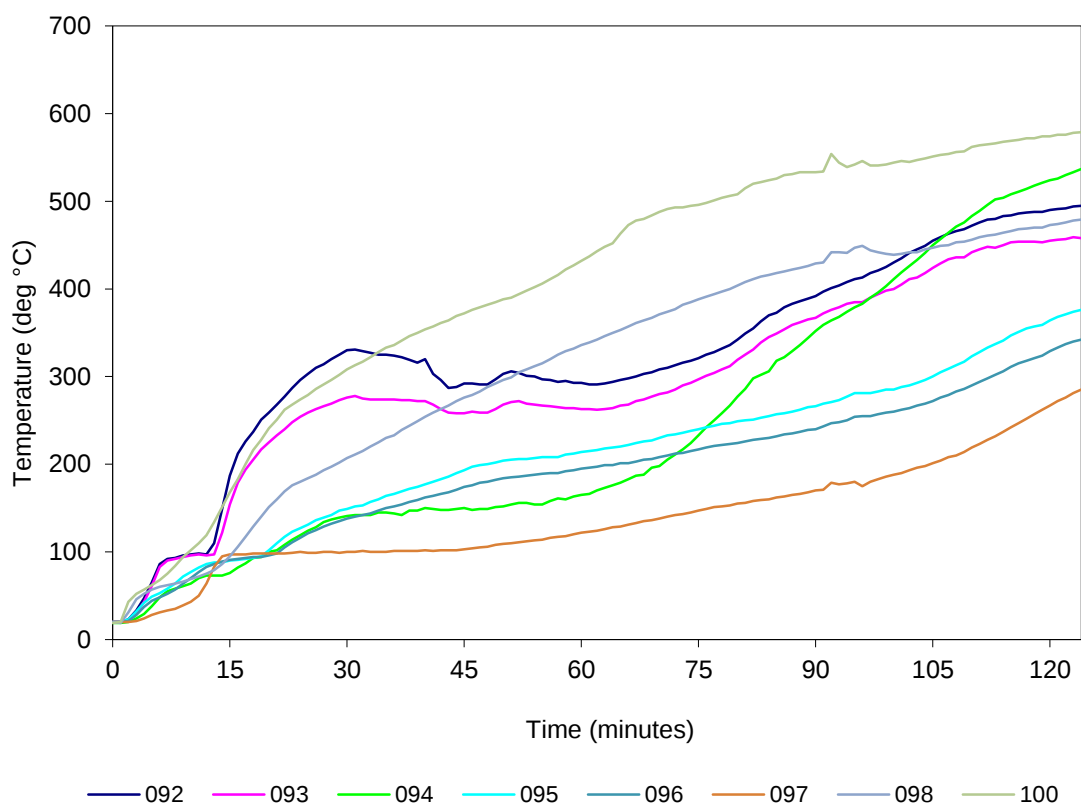


Figure A5.13: Service J. Temperatures vs. time

Note: Thermocouple 099 had malfunctioned for the duration of the test period

Table A5.1: Test Specimen Temperatures

Service	T/C No	Description ²	Temp. (°C) at t (minutes)						Limit ¹ (Mins)
			t=0	t=30	t=60	t=90	t=120	t=123	
A	010	25mm from flange on the damper	22	480	581	631	669	674	3
	011	25mm from flange on the damper	22	348	377	395	418	420	5
	012	25mm from the damper on the flange	21	194	252	294	347	354	33
	013	25mm from the damper on the flange	20	260	328	356	385	388	12
	014	25mm from the flange on the wall	21	103	145	174	212	217	112
	015	25mm from the flange on the wall	20	133	150	164	184	186	-
B	016	25mm from sealant on the pipe	30	365	460	506	541	544	15
	017	25mm from sealant on the pipe	29	359	460	507	544	547	15
	018	On the sealant fillet	24	166	106	164	177	179	-
	019	On the sealant fillet	24	156	115	76	86	88	-
	020	25mm from the sealant fillet on wall	20	90	116	182	224	230	104
	021	25mm from the sealant fillet on wall	21	93	121	158	194	198	-
C	022	25mm from the sealant on the pipe	23	44	36	74	x	x	-
	023	25mm from the sealant on the pipe	22	37	28	36	x	x	-
	024	On the sealant fillet	22	98	125	154	x	x	-
	025	On the sealant fillet	22	81	83	59	x	x	-
	026	25mm from the sealant on the wall	22	94	94	97	x	x	-
	027	25mm from the sealant on the wall	21	95	141	238	x	x	83
D	028	25mm from the collar on the pipe	22	42	36	44	53	54	-
	029	25mm from the collar on the pipe	22	40	34	41	51	53	-
	030	On the sealant fillet	19	107	159	206	265	276	88
	031	On the sealant fillet	20	71	116	#	#	#	#
	032	25mm from the sealant on the wall	17	104	166	189	317	330	92
	033	25mm from the sealant on the wall	21	94	118	167	232	240	107
E	034	25mm from the collar on the pipe	22	62	85	120	105	106	-
	035	25mm from the collar on the pipe	21	40	51	76	72	72	-
	036	25mm from the pipe on the collar	21	53	73	90	91	91	-
	037	25mm from the pipe on the collar	21	58	76	83	85	85	-
	038	25mm from the collar on the board	20	63	76	80	82	82	-
	039	25mm from the collar on the board	20	41	64	66	68	69	-
	040	On the sealant fillet	21	76	89	110	126	128	-
	041	On the sealant fillet	21	58	73	72	75	75	-
	042	25mm from the sealant on the wall	#	#	#	#	#	#	#
	043	25mm from the sealant on the wall	21	93	93	94	101	105	-
F	044	25mm from the collar on the pipe	22	76	75	85	118	121	-
	045	25mm from the collar on the pipe	21	45	37	52	65	68	-
	046	25mm from the pipe on the collar	21	53	68	76	94	98	-
	047	25mm from the pipe on the collar	21	31	47	54	68	71	-
	048	25mm from the collar on the board	20	50	69	78	88	90	-
	049	25mm from the collar on the board	20	42	58	67	75	75	-
	050	25mm from the board edge	19	55	71	80	93	94	-
	051	25mm from the board edge	19	38	52	63	71	72	-
	052	On the sealant fillet	19	80	129	125	158	165	-
	053	On the sealant fillet	19	45	55	75	83	84	-
	054	25mm from the sealant on the wall	18	102	153	199	356	373	89
	055	25mm from the sealant on the wall	20	85	87	88	88	88	-
G	056	25mm from the sealant on the wall	17	165	296	423	x	x	38
	057	25mm from the sealant on the wall	21	95	96	95	x	x	-
	058	On the sealant fillet	20	93	253	375	x	x	47
	059	On the sealant fillet	21	39	57	81	x	x	-
	060	25mm from the batt edge	21	50	80	153	x	x	-
	061	25mm from the batt edge	20	37	53	75	x	x	-
	062	25mm from the sealant on the batt	20	49	94	166	x	x	-
	063	25mm from the sealant on the batt	21	53	74	114	x	x	-
	064	On the sealant fillet	21	58	118	233	x	x	87

Service	T/C No	Description ²	Temp. (°C) at t (minutes)						Limit ¹ (Mins)
			t=0	t=30	t=60	t=90	t=120	t=123	
	065	On the sealant fillet	21	52	92	135	x	x	-
	066	25mm from the sealant on the cable	21	96	218	440	x	x	55
	067	25mm from the sealant on the tray	21	71	132	202	x	x	89
	068	400mm from the sealant on the cable	20	35	62	95	x	x	-
	069	400mm from the sealant on the tray	20	29	38	48	x	x	-
H	070	25mm from the sealant on the wall	20	96	112	145	x	x	-
	071	25mm from the sealant on the wall	19	96	98	113	x	x	-
	072	On the sealant fillet	19	62	72	98	x	x	-
	073	On the sealant fillet	21	57	57	66	x	x	-
	074	25mm from the batt edge	21	52	60	73	x	x	-
	075	25mm from the batt edge	21	47	48	64	x	x	-
	076	25mm from the sealant on the batt	21	56	79	174	x	x	-
	077	25mm from the sealant on the batt	21	54	83	135	x	x	-
	078	25mm from the sealant on the batt	21	52	59	81	x	x	-
	079	On the sealant fillet beside the tray	21	56	66	97	x	x	-
	080	25mm from the cable on the sealant	22	59	118	244	x	x	81
	081	25mm from the cable on the sealant	21	45	84	127	x	x	-
	082	25mm from the sealant on the tray	22	64	100	132	x	x	-
	083	25mm from the sealant on the cable	25	160	370	514	x	x	36
	084	25mm from the sealant on the cable	23	126	292	559	x	x	43
	085	25mm from the sealant on the cable	23	105	177	224	x	x	79
	086	25mm from the sealant on the cable	22	111	238	425	x	x	48
	087	400mm from the sealant on the tray	21	28	33	40	x	x	-
	088	400mm from the sealant on the cable	23	60	167	238	x	x	70
	089	400mm from the sealant on the cable	22	42	118	204	x	x	88
	090	400mm from the sealant on the cable	21	30	43	56	x	x	-
	091	400mm from the sealant on the cable	21	38	69	109	x	x	-
I	001	15mm from the lintel on the flashing	20	148	269	392	438	444	44
	002	15mm from the wall on the flashing	20	140	257	386	442	449	47
	003	15mm from the flashing on the wall	21	107	195	324	393	400	61
	004	15mm from the lintel on the flashing	21	107	236	334	444	450	47
	005	15mm from the wall on the flashing	20	93	169	254	360	370	72
	006	15mm from the flashing on the wall	21	92	137	202	286	298	89
	007	15mm from the lintel on the flashing	20	209	334	416	499	507	29
	008	15mm from the wall on the flashing	20	226	256	291	364	371	27
	009	15mm from the flashing on the wall	20	106	134	156	221	229	111
J	092	15mm from the lintel on the track	20	330	293	392	490	494	16
	093	15mm from the wall on the track	20	276	263	367	455	459	17
	094	15mm from the track on the wall	19	141	165	352	524	533	70
	095	15mm from the lintel on the track	20	149	214	266	364	374	48
	096	15mm from the wall on the track	20	138	195	240	329	340	64
	097	15mm from the track on the wall	20	100	122	170	267	281	104
	098	15mm from the lintel on the track	20	207	336	429	473	478	28
	099	15mm from the wall on the track	#	#	#	#	#	#	#
	100	15mm from the track on the wall	19	308	432	533	574	578	16

- Notes**
- ¹ 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 180K above the initial temperature.
 - ² Refer to Appendix 4 for locations of thermocouples as only a generic description is included in the table.
 - ³ No insulation failure prior to thermocouple failure.
 - # Thermocouple failure
 - x Service failure
 - ‘-’ 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 6 PHOTOGRAPHS

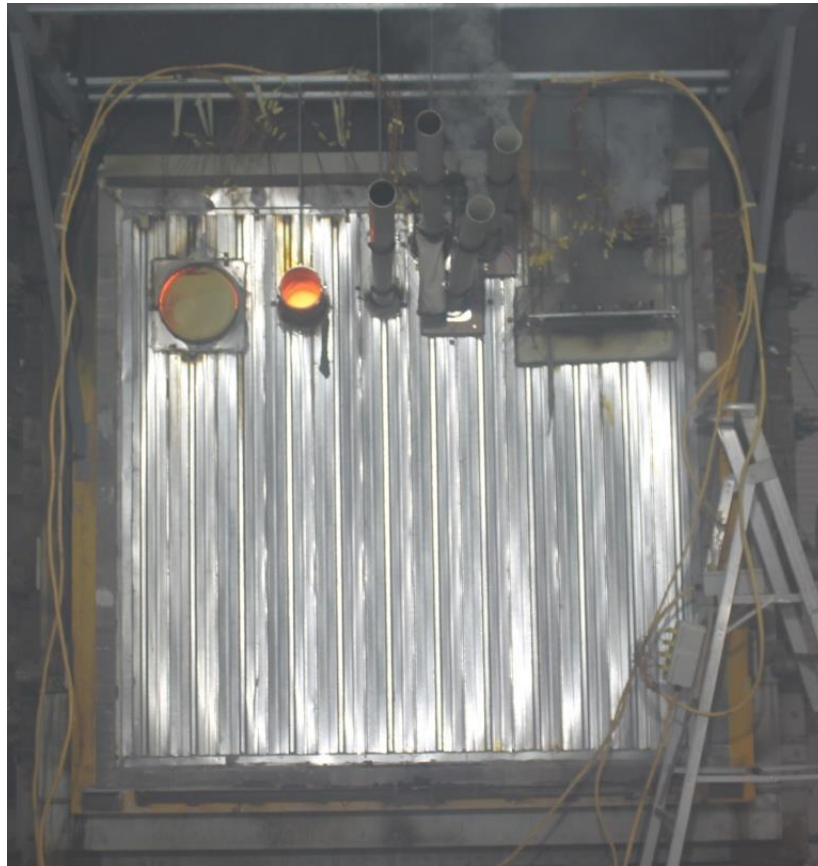


Figure A6.1. Unexposed face of specimen before commencement of the fire-resistance test



Figure A6.2. Exposed face of specimen before commencement of the fire-resistance test

South



North

Figure A6.3. Unexposed face of specimen at the end of the test

North



South

Figure A6.4. Exposed face of specimen at the end of the test