TEST REPORT

Fire resistance test in accordance with AS 1530.4- 2014 of one pipe, six cable groups, one control joint, and one repair hole in a 90 mm thick fire resistant wall system protected with HB Fuller Firesound Sealant

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GENERAL CONDITIONS OF USE

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1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 1600mm wide × 1600mm high × 90mm thick non-loadbearing plasterboard wall system.

The wall was restrained at the top, bottom and both vertical edges and sealed with HB Fuller Firesound sealant.

TEST SPECIMENS

The wall assembly consisted of a 1600mm wide × 1600mm high 64mm thick steel framing with a layer of 13mm USG Boral Firestop plasterboard on both the exposed and unexposed side. The wall system consisted of various service penetrations protected by HB Fuller Firesound sealant.

The full description of the specimen is provided in Figures A1.1 to A1.5 and the 'Schedule of Components' in Section 2.

ID	Penetration service detail	Core Hole	Fire protection system detail
A	16-off CAT6 cables	30mm wide × 70mm high aperture	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 70mm fillet on both sides.
B	16-off CAT6 cables	Ø30mm	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 70mm fillet on both sides.
C	2-off 2C+E 2.5mm^2 flat TPS cables	Ø26mm	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 70mm fillet on both sides.
D	D2 communications group with ET3-150 cable tray	179mm × 128mm aperture	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 50mm fillet on both sides.
E	Control joint at head	1000mm long × 40mm high	HB Fuller Firesound Sealant to the depth of the deflection head track (13mm) on both sides.
F	1-off 2C+E 2.5mm^2 round cable	Ø25mm	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 70mm fillet on both sides.
G	1-off 32NB Medium Galvanised Steel Pipe	Ø57.4mm	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 70mm fillet on both sides.
H	D1 Power Group with ET3-300 cable tray	331mm wide × 64mm high hole	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50mm × 50mm fillet on both sides.
I	1-off repair hole on the exposed side only	Ø40mm	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) on the exposed side only.

ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed on the 18th of November 2016.

ORIENTATION

The assembly was asymmetric due to the services being supported on the unexposed side only and the pipe being capped on the fire side. Fire protection application however was symmetrical with the exception of the hole repair which was one side only.

2 SCHEDULE OF COMPONENTS

Item	Description	
	SERVICE A	
1	**Cable System**	
	Product name	16-off Clipsal Actassi Lan Cable UTP Cat 6 2D4P6IPV3B
	Cable dimensions	Ø6.1mm OD
	Cable Support	The cables were bundled together and supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face. The deflection head track (DHT) flanges were cut and removed and the flanges were twisted inwards.
	Aperture Size	30mm wide × 70mm high
2	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the annular gap between the cable bundle and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. A nominally 64mm length of open cell Ø50mm backing rod was inserted in the opening in the deflection head track above the cable bundle. See Figure A1.2 in Appendix 1 for more details.
	SERVICE B	
3	**Cable System**	
	Product name	16-off Clipsal Actassi Lan Cable UTP Cat 6 2D4P6IPV3B
	Cable dimensions	Ø6.1mm
	Cable Support	The cable bundle was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Core hole diameter	Ø30mm
4	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the annular gap between the cable bundle and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. See Figure A1.2 in Appendix 1 for more details.
	SERVICE C	
5	**Cable System**	
	Product name	2-off 2C+E 2.5mm^2 Flat TPS Cables
	Cable dimensions	12mm × 10.6mm
	Cable Support	The cables were supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Core hole diameter	Ø26mm wide

Item	Description	
6	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the annular between the cable bundle and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. See Figure A1.3 in Appendix 1 for more details.
	SERVICE D	
7	**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.
	Tray	The cables were installed onto an ET3-150 cable tray. Measured dimensions of the tray were; 172mm 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 179 mm wide × 128 mm high.
	Support of Services	The service projection from the exposed and unexposed surface was 500 mm. The penetrating service was supported at distances of nominally 200 mm and 500 mm from the unexposed face of the wall.
8	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the gap between cables/tray and aperture on both sides of the separating element to a depth of 13 mm. The mastic fillet was extended in a fillet around the telecommunication cable tray, nominal 50 mm along the separating element and the cables on both the exposed and unexposed side. See Figure A1.2 in Appendix 1 for more details.
	SERVICE E	
9	**Control Joint**	
	Aperture Size	1000mm wide × 40mm high
	Location	The control joint was installed at the head under the lintel.
10	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the aperture to the depth of the 13mm (to the DHT) on both the exposed and unexposed side of the specimen. See Figure A1.4 in Appendix 1 for more details.
	SERVICE F	
11	**Cable System**	
	Product name	1-off 2C+E 2.5mm^2
	Cable dimensions	Ø10mm OD

Item	Description	
	Cable Support	The cable was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Hole Size	Ø25mm wide
	Penetration Protection	
12	**Product name**	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the annular gap (10mm on west side and 5mm on east side) between the cable and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. See Figure A1.4 in Appendix 1 for more details.
	SERVICE G	
13	**Pipe System**	
	Product name	32NB Medium Gal Steel Pipe
	Pipe dimensions	Ø42.4mm OD
	Pipe Support	The pipe was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Hole Size	Ø57.4mm
14	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the annular gap (10mm on west side and 5mm on east side) between cable and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. See Figure A1.5 in Appendix 1 for more details.
	SERVICE H	
15	**Cable System**	
	Cables	a) One single-core XLPE insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 630mm^2 (127 × 2.52 mm conductors, insulation 2.2 mm thick, OD 39.5 mm). b) One three-core plus earth PVC insulated, PVC sheathed for 0.6/1 kV copper conductors complying with AS 5000.1 - 185mm^2 (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 - 6mm^2 (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 - 16mm^2 (7 × 1.7mm conductors, OD 20.4mm).
	Tray	The cables were installed onto an ET3-300 cable tray. Measured dimensions of the tray were; 322 mm wide × 47 high with an 18 mm wide top lip, and a drop down lip 12 mm 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 331 mm wide × 64 mm high.

Item	Description	
	Support of Services	The service projection from the exposed and unexposed surface was 500 mm. The penetrating service was supported at distances of nominally 200 mm and 500 mm from the unexposed face of the wall.
16	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the gap between cables tray and aperture on both sides of the separating element to a depth of 13 mm. Lengths of open cell Ø50 backing rods, nominally 64mm, were installed in between the cables/cable bundles on the tray. The mastic fillet was extended in a fillet around the cable tray, nominal 50 mm along the separating element and the cable on both the exposed and unexposed side. See Figure A1.4 in Appendix 1 for more details.
	SERVICE I	
17	**Repair Hole**	
	Hole Size	Ø40mm diameter
	Location	Core hole only on the exposed side plasterboard.
18	**Penetration Protection**	
	Product name	HB Fuller Firesound Sealant
	Installation	The sealant was applied in the repair hole gap of 40mm in diameter at a depth of 13mm on the exposed side only. See Figure A1.3 in Appendix 1 for more details.
19	**Separating Element**	
	Product	13mm USG Boral Firestop plasterboard
	Size	90 mm thick wall incorporating 2-off 13 mm thick sheets with 64 mm wide steel studs, 64 mm wide steel noggings, and 64 mm deflection head.
	Density	923 kg/m^3
	Specification	Perimeter studs and tracks were fixed to the concrete blockwork using Ø6.5mm × 55mm Sleeve Anchor Hex Head fasteners. Plasterboard sheets were fixed to metal framing using 6g × 32mm, Bugle Head, Needle Point, Fine Thread, Zinc-Yellow screws at 300mm nominal centres. 10mm HB Fuller Sealant installed to full depth at the perimeter (except control joint).

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.4-2014 Sections 2 & 10 subject to the variations below.

VARIATIONS TO TEST METHOD

None

PRE-TEST CONDITIONING

The construction of the specimen was finished on the 18th of November 2016 and was tested on 6th of December 2016. During this period the test specimen was subject 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 varied between 20°C and 25°C during the test.

TEST DURATION

The test duration was 91 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2014 and as detailed below:

The furnace temperature was measured by 4-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and 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.

The furnace pressure was measured at the mid-height of lowest service (Service H).

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

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

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

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A 5.3 and Table A5.2 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 1530.4-2014 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimens listed below achieved the following performance when tested in accordance with AS 1530.4-2014, Section 2 & 10 subject to the variations listed in Section 3.

Service	Criteria	Result
A	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 62 minutes
	FRL	**-/90/60**
B	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 62 minutes
	FRL	**-/90/60**
C	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 60 minutes
	FRL	**-/90/60**
D	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 60 minutes
	FRL	**-/90/60**
E	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 63 minutes
	FRL	**-/90/60**
F	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 60 minutes
	FRL	**-/90/60**
G	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 62 minutes
	FRL	**-/90/60**
H	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 47 minutes
	FRL	**-/90/30**
I	Structural Adequacy	Not applicable
	Integrity	No failure at 91 minutes
	Insulation	Failure at 54 minutes
	FRL	**-/90/30**

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 general 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

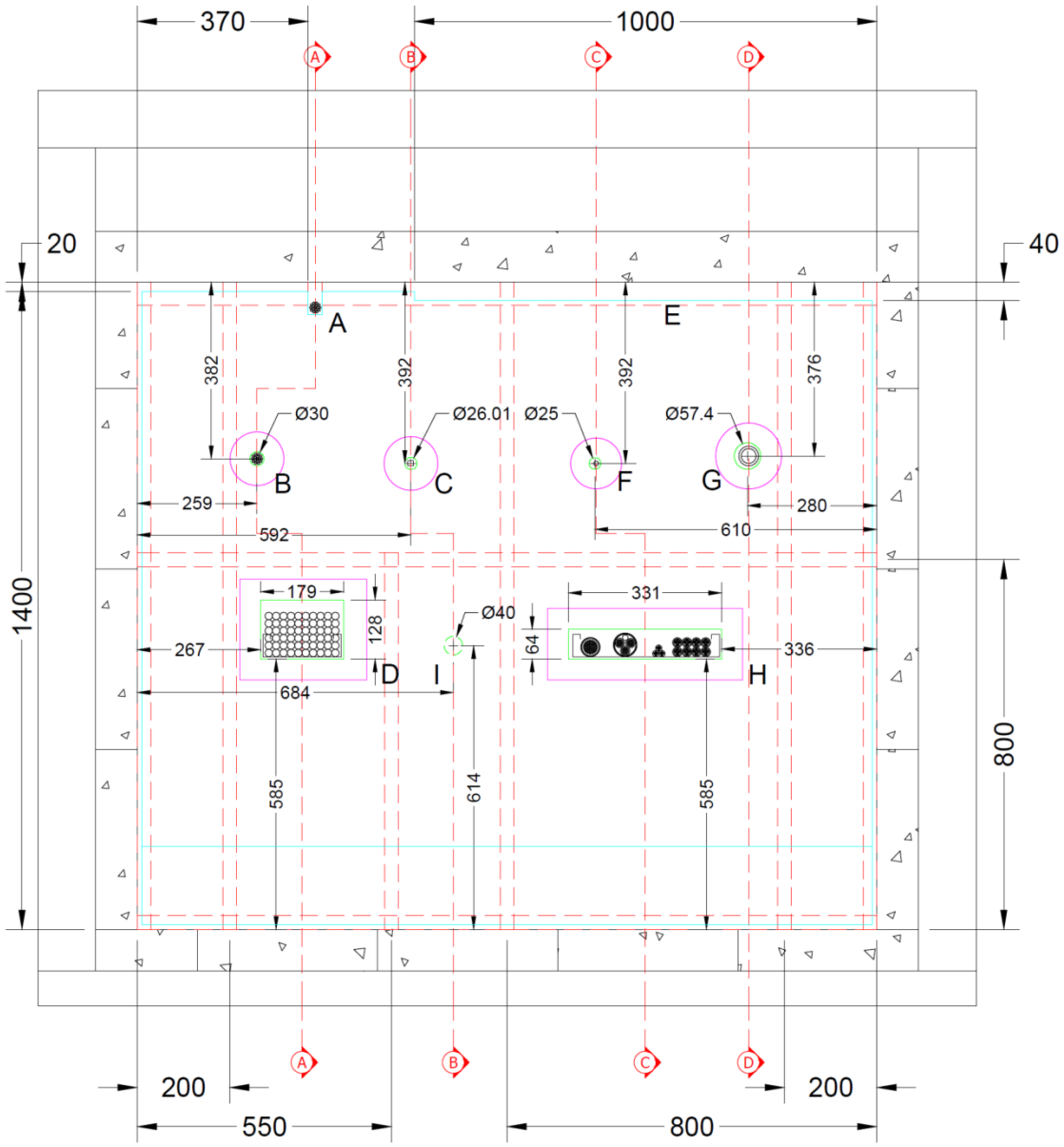


Figure A1.1: Elevation of Test Specimen, Unexposed side

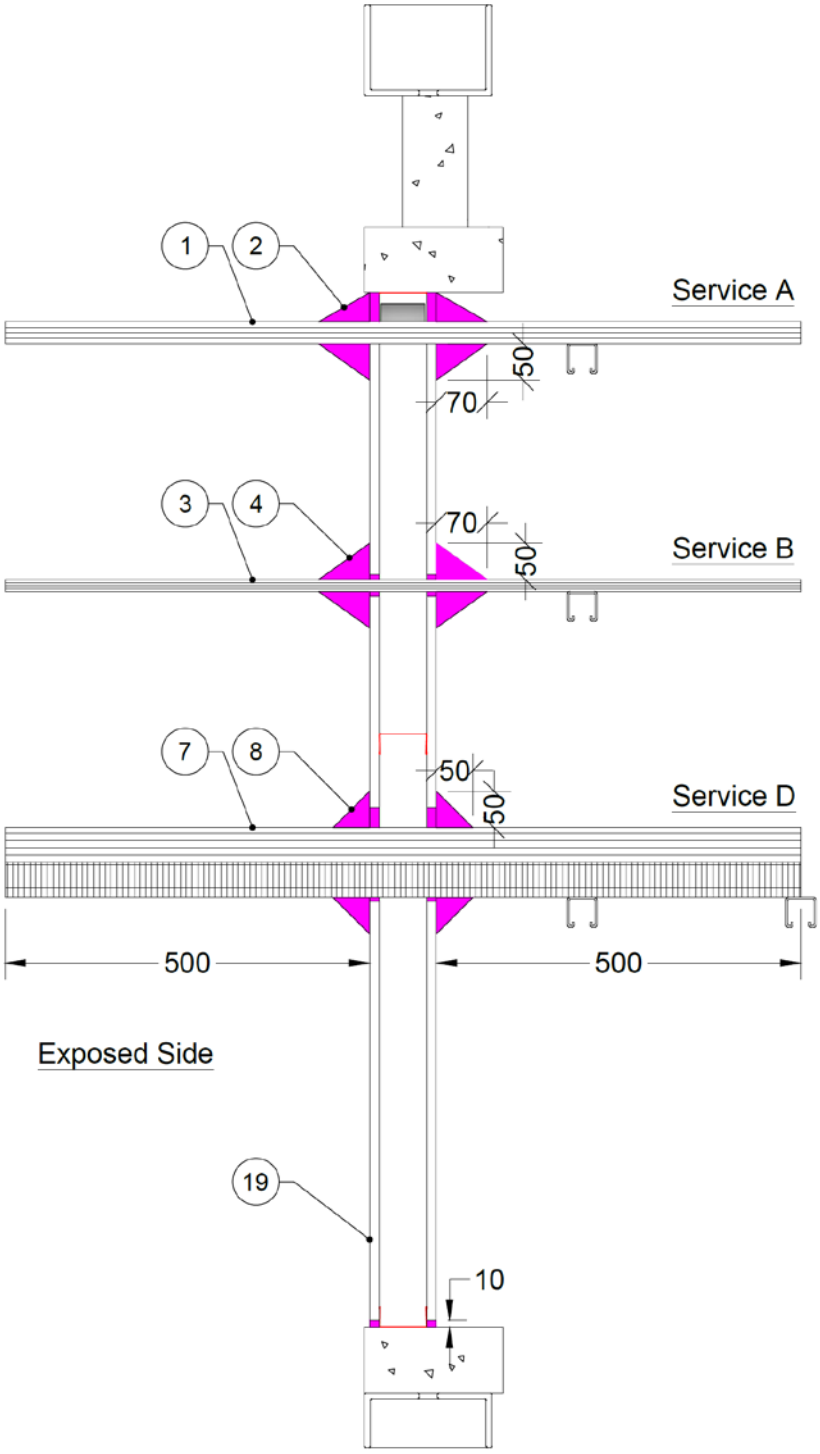


Figure A1.2: Vertical Cross-Section A-A

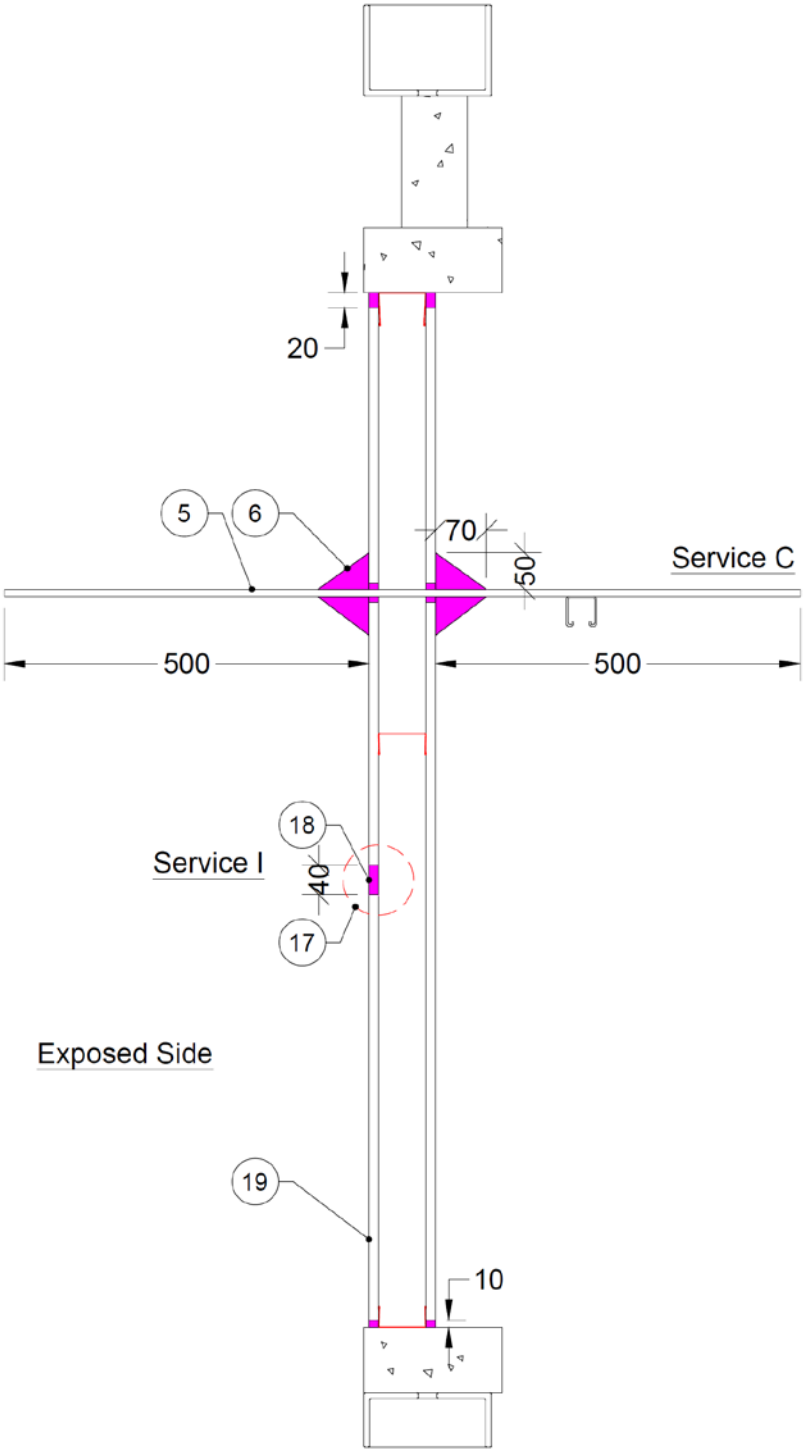


Figure A1.3: Vertical Cross-Section B-B

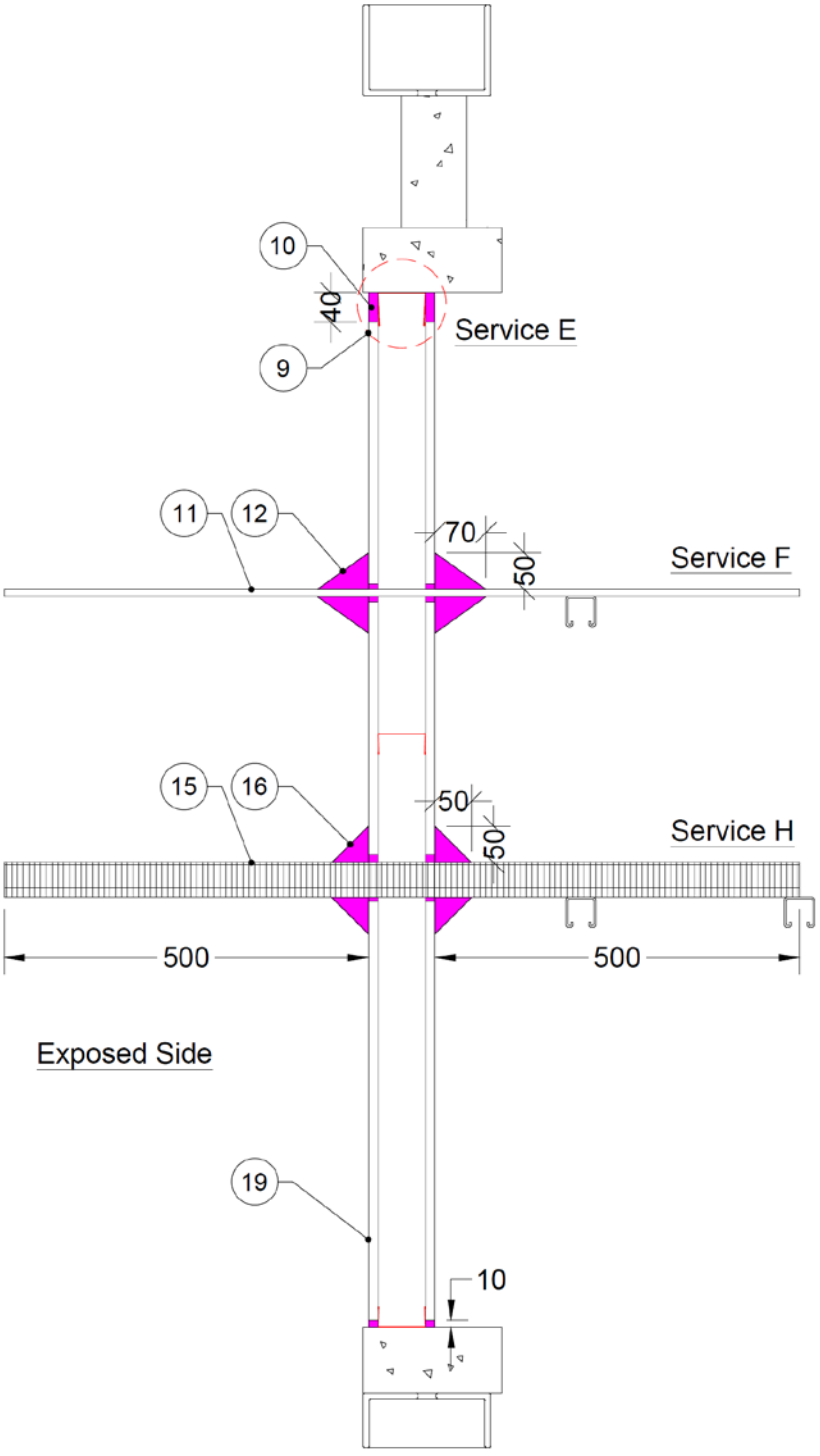


Figure A1.4: Vertical Cross-Section C-C

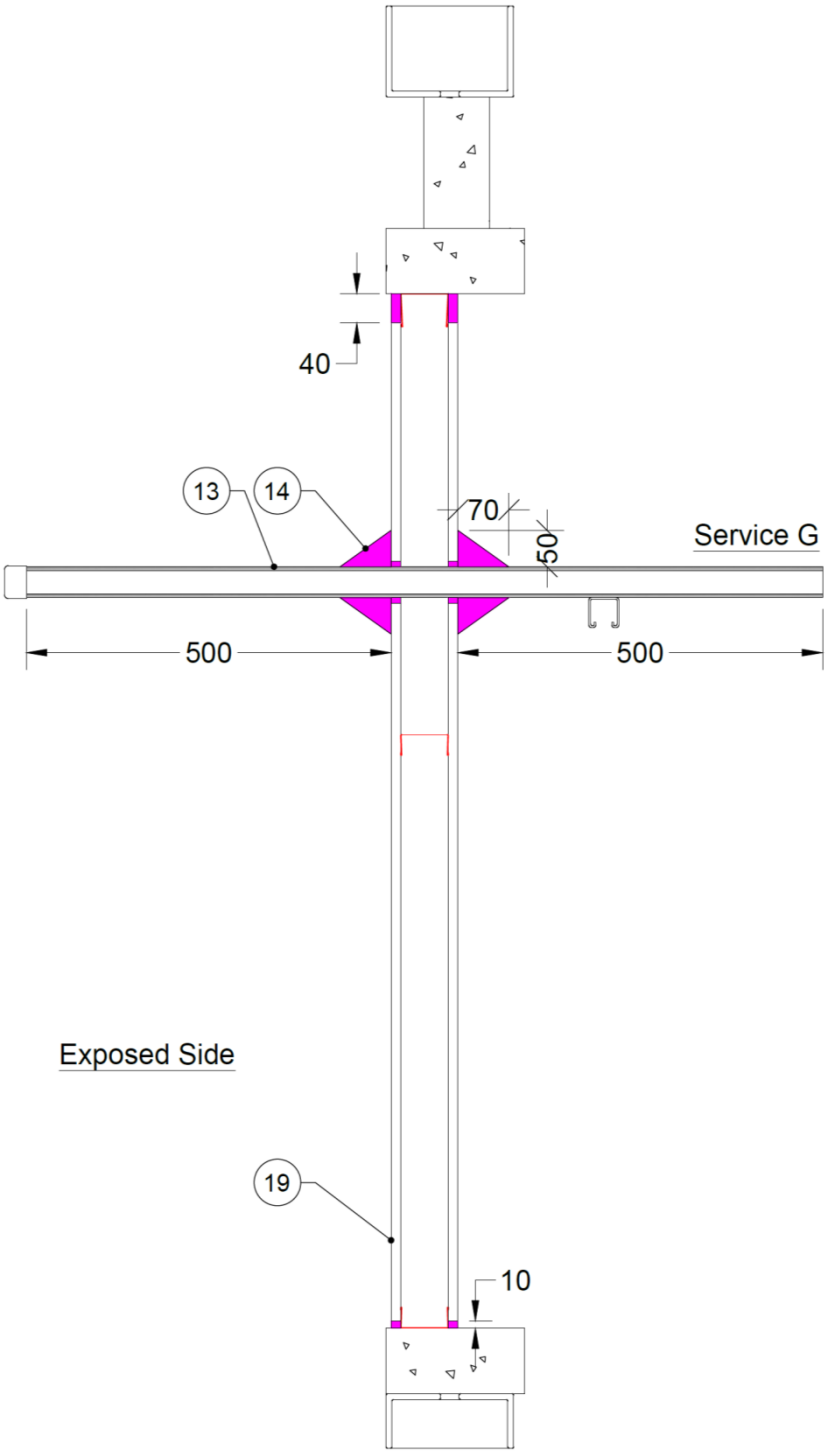


Figure A1.5: Vertical Cross-Section D-D

APPENDIX 2 TEST OBSERVATIONS

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

Time		Observations
min	**sec**	
		Service A
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
01	08	It had become evident that smoke had started venting.
13	52	It had become evident that smoke had stopped venting.
25	00	A liquid substance appeared on the cables as well as a whitish discoloration.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
62	**20**	**TC 015 located at the bottom of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 015 exceeded the initial temperature by more than 180°C.**
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
		Service B
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
02	13	It had become evident that smoke had started venting.
13	52	It had become evident that smoke had stopped venting.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
62	**35**	**TC 026 located at the right side of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 026 exceeded the initial temperature by more than 180°C.**
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
		Service C
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	**45**	**TC 034 located at the top of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 202°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 034 exceeded the initial temperature by more than 180°C.**

Time		Observations
min	sec	
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service D		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
00	49	It had become evident that smoke had started venting.
11	40	Charring on the cables had become evident.
17	30	Smoke venting from the service had reduced.
26	36	It had become evident that a liquid substance had begun dripping from the bottom side of the cable tray.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	**50**	**TC 046 located at the bottom of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 046 exceeded the initial temperature by more than 180°C.**
69	53	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service E		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
35	43	It had become evident that the sealant where the thermocouples are located had expanded.
40	16	The sealant at the middle thermocouple had expanded significantly and pushed the thermocouple support off.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
63	**40**	**TC 054 located at the centre of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 202°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 054 exceeded the initial temperature by more than 180°C.**
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service F		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.

Time		Observations
min	**sec**	
60	**55**	**TC 105 located at the top of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 202°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 105 exceeded the initial temperature by more than 180°C.**
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service G		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
34	07	Minor venting of smoke from the specimen.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
62	**40**	**TC 116 located at the left side of the sample on the plasterboard and 25mm away from the sealant fillet recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 116 exceeded the initial temperature by more than 180°C.**
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service H		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
01	21	It had become evident that smoke had started venting.
16	16	Charring on the cables had become evident.
17	30	Smoke venting from the service has reduced.
18	18	It had become evident that a liquid substance has begun dripping from the bottom side of the cable tray.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
47	**20**	**TC 121 located at the top of the single-core XLPE insulated cable, 25mm from the sealant recorded a temperature of 201°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 121 exceeded the initial temperature by more than 180°C.**
60	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
74	44	It had become evident that the sealant was expanding.
84	12	It had become evident that the cables had significantly deformed.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.
Service I		

Time		Observations
min	sec	
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
34	44	Charring at the lowest horizontal joint of the plasterboard had become evident.
51	25	It had become evident that the sealants along the vertical sides were expanding.
54	**35**	**TC 141 located at the top and 25mm away from the repair hole recorded a temperature of 202°C.** **Failure of insulation in accordance with AS 1530.4-2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 141 exceeded the initial temperature by more than 180°C.**
60	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
74	44	It had become evident that the sealant was expanding.
90	00	Specimen continued to maintain integrity in accordance with AS1530.4- 2014.
91	00	Test terminated at the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

AS 1530.4- 2014 indicates that the results of the fire test contained in the test report are directly applicable without reference to the testing authority to similar constructions where one or more of the changes have been made:

A 3.2 SEPARATING ELEMENTS

Results obtained for sealing systems in various types of masonry and concrete construction may be applied as follows:

a) For elements manufactured from similar types of concrete or masonry, the results of the prototype test may be applied to materials of density within ±15% of the tested specimen. For greater variations, the opinion of a registered testing authority shall be obtained.

b) Test results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The reverse does not apply.

c) Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.

d) Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.

e) Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the studs.

A 3.3 METAL PIPES

A 3.3.1 Sealing systems tested using standard configurations

The results may be applied to brass pipes of the same composition up to maximum outside diameter of 101.6 mm (normally 70/30 arsenical brass) and to copper and ferrous metal pipes having wall thicknesses greater than or equal to those listed in Table 10.12.3.1, provided the same penetration sealing system was used for the above penetrations in the same type of separating element and all the specimens achieved the required FRL.

NOTE: For information on standard configurations, see Appendix F.

TABLE 10.12.3.1

METAL PIPE DEEMED TO HAVE EQUIVALENT FIRE RESISTANCE LEVELS

Nominal size mm	Actual OD (outside diameter) mm	Actual wall thickness mm
32	31.75	0.91
40	38.10	0.91
50	50.80	0.91
65	63.50	0.91
80	76.20	1.22
90	88.90	1.22
100	101.60	1.22
125	127.00	1.42
150	152.40	1.63

A 3.3.2 Sealing systems tested not using standard configurations

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.

NOTE: For information on standard configurations for metal pipes, see Appendix F.

A 3.3.3 Shape and size of openings for penetration seals

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

A 3.3.4 Insulated (lagged) metal pipes

Where fire test data on the insulation system are not available, penetration sealing systems that have been subjected to the standard test with uninsulated metal pipes may be used, provided the appropriate requirements of Clause A 3.3.2 are satisfied and the following procedures are followed:

a) If the insulation is non-combustible or is manufactured solely from mineral fibre, it shall be cut away where the service penetrates the separating element, and the opening shall be fire-stopped in accordance with the tested method.

b) If the insulation is combustible, it shall be cut away for 1000 mm either side of the separating element (provided the pipe did not vent hot gases during the fire resistance test), and the pipe shall be fire-stopped in accordance with the tested method. A non-combustible lagging may be placed over the bare pipe. If venting occurs during the fire-resistance test at a time less than the required FRL, a fire test shall be carried out to evaluate the insulated pipe system.

A 3.3.5 Alternative pipe materials

If an element is penetrated by—

a) a pipe other than brass, copper or ferrous alloys;

b) a pipe of cross-section other than circular; or

c) a pipe outside the field of application specified in this Standard for the standard test configuration,

then the results obtained from a single tested system may be applied to these pipes provided the—

i. melting point of the material is equal to or greater than the tested specimen;

ii. surface area to mass ratio of a cross-section of the pipe is equal to or less than the tested specimen; and

iii. thermal conductivity is equal to or less than the tested specimen diffusivity of the material.

A 3.4 ELECTRICAL AND COMMUNICATION CABLES

Where standard configurations are used for electrical and communication cables, the results of tests may be applied to all PVC and XLPE insulated and PVC sheathed power and communication cables with copper conductors, provided the results are for the same penetration sealing system in the same separating element and all of the specimens achieved the designated FRL or greater.

NOTE: For information on recommended standard configurations for electrical and communication cables, see Appendix D.

A 3.5 CONTROL JOINTS

The following variations are permitted:

a) Results obtained from single test on a butt joints may be applied to contoured joints, provided the joints have—

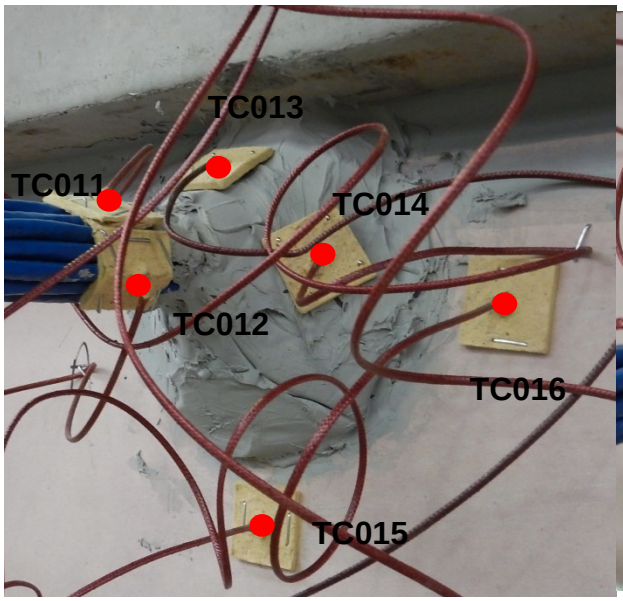
i. equal width and equal or greater depth of sealant; and

ii. equal or greater thickness of fire-separating element.

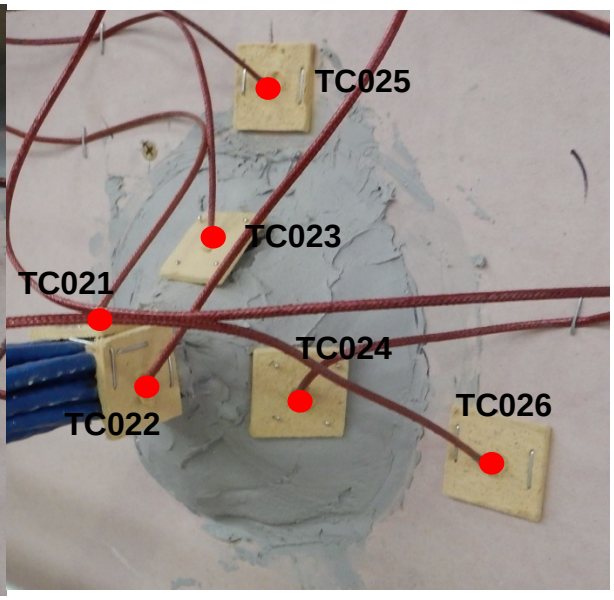
NOTE: Examples of butt and contoured control joints are shown in Figure 10.12.6.

b) Facings may be applied to the surface of the fire-stopping system.

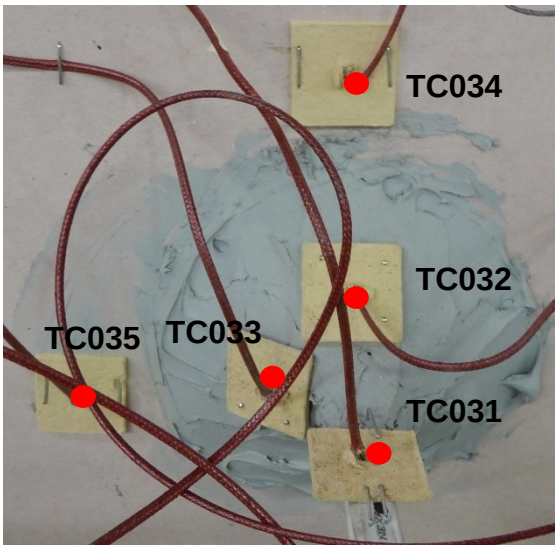
APPENDIX 4 INSTRUMENTATION POSITIONS



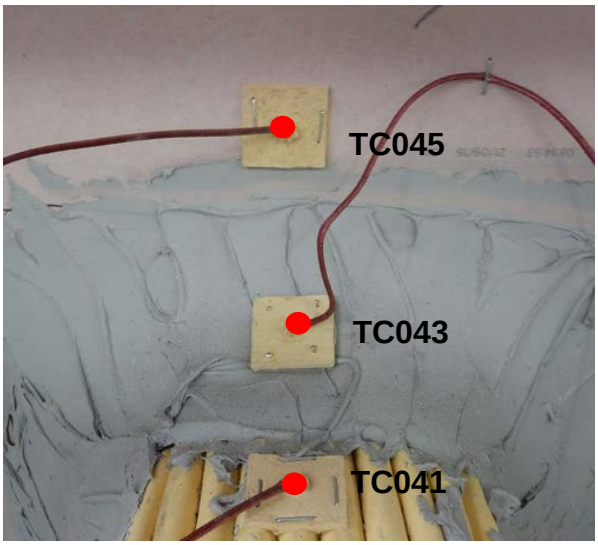
Service A



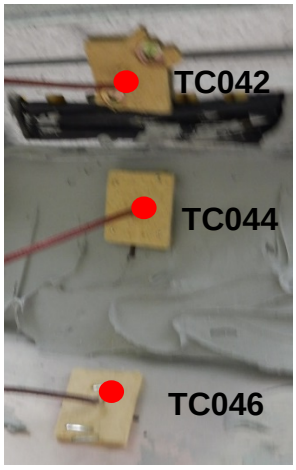
Service B



Service C



Service D



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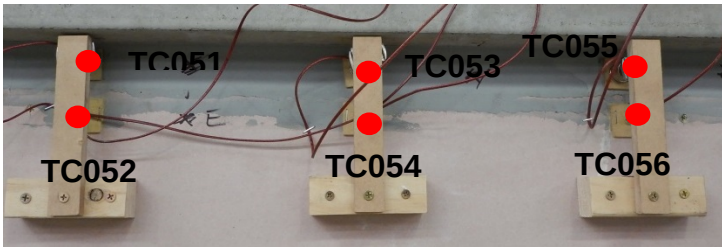
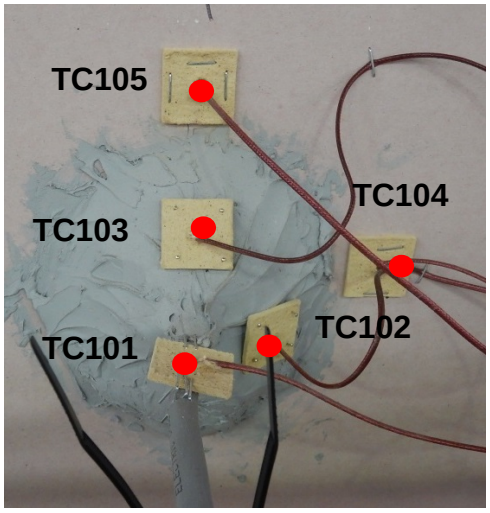
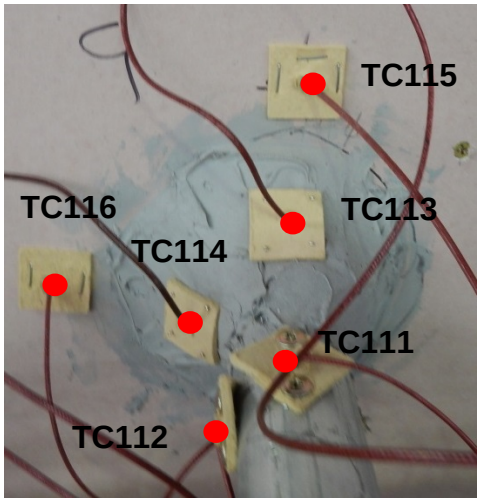


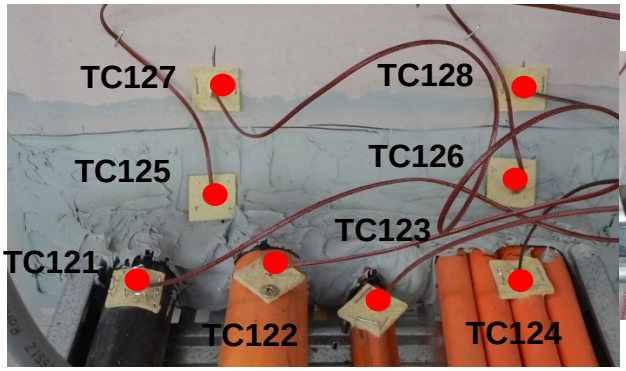
Service E



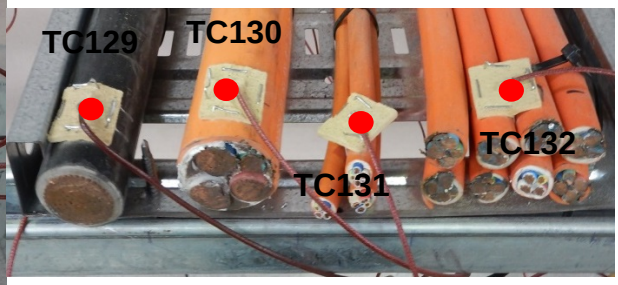
Service F



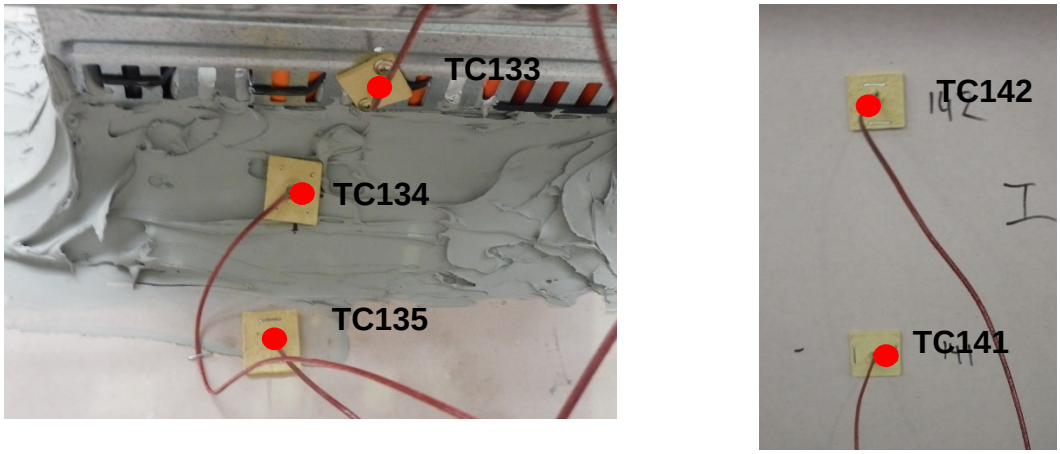
Service G



Service H



Service H



Service H **Service I**

Figure A4.1: Unexposed surface thermocouple locations

Table A4.1: Thermocouple Locations

Service	T/C No.	Description
A	011	On the top of the cables, 25mm from the sealant fillet
	012	On the east side of the cables, 25mm from the sealant fillet.
	013	On the top of the sealant fillet, 25mm from the plasterboard.
	014	On the east side of the sealant fillet, 25mm from the plasterboard.
	015	On the plasterboard, 25mm below the sealant fillet.
	016	On the plasterboard, 25mm east of the sealant fillet.
B	021	On the top of the cables, 25mm from the sealant fillet
	022	On the east side of the cables, 25mm from the sealant fillet.
	023	On the top of the sealant fillet, 25mm from the plasterboard.
	024	On the east side of the sealant fillet, 25mm from the plasterboard.
	025	On the plasterboard, 25mm above the sealant fillet.
	026	On the plasterboard, 25mm east of the sealant fillet.
C	031	On the top of the cables, 25mm from the sealant fillet.
	032	On the top of the sealant fillet, 25mm from the plasterboard
	033	On the west side of the sealant fillet, 25mm from the plasterboard.
	034	On the plasterboard, 25mm above the sealant fillet.
	035	On the plasterboard, 25mm west of the sealant fillet.
D	041	On top of the cables, 25mm from the sealant fillet.
	042	On the bottom of the cable tray, 25mm away from the sealant fillet.
	043	On top of the sealant fillet, 25mm away from the plasterboard.
	044	On the bottom of the sealant fillet, 25mm away from the plasterboard.
	045	On the plasterboard, 25mm above the sealant fillet
	046	On the plasterboard, 25mm below the sealant fillet
E	051	Mid-height of the sealant, 750mm west of the vertical edge.
	052	25mm from the sealant, 750mm west of the vertical edge.
	053	Mid-height of the sealant, 500mm west of the vertical edge.
	054	25mm from the sealant, 500mm west of the vertical edge.
	055	Mid-height of the sealant, 250mm west of the vertical edge.
	056	25mm from the sealant, 250mm west of the vertical edge,
F	101	On top of the cable, 25mm away from the sealant fillet.
	102	On the east side of the sealant fillet, 25mm from the plasterboard.
	103	On top of the sealant fillet, 25mm from the plasterboard.
	104	On the plasterboard, east of the sealant fillet.
	105	On the plasterboard, above the sealant fillet.
G	111	On top of pipe, 25mm from the sealant fillet.
	112	On the west side of the pipe, 25mm from the sealant fillet.
	113	On top of the sealant fillet, 25mm from the plasterboard.
	114	On the west side of the sealant fillet, 25mm from the plasterboard.
	115	On the plasterboard, 25mm above the sealant fillet.

Service	T/C No.	Description
	116	On the plasterboard, 25mm west of the sealant fillet.
H	121	On top of the single-core XLPE insulated cable, 25mm from the sealant fillet.
	122	On top of the three-core plus earth PVC insulated cable, 25mm from the sealant fillet.
	123	On top of the three three-core plus earth PVC insulated cable, 25mm from the sealant fillet.
	124	On top and mid width of the eight three-core plus earth PVC insulated cable, 25mm from the sealant fillet.
	125	West top side of the sealant fillet, 25mm from the plasterboard.
	126	East top side of the sealant fillet, 25mm from the plasterboard.
	127	On the plasterboard, above the west top side of the sealant fillet.
	128	On the plasterboard, above the east top side of the sealant fillet.
	129	On top of the single-core XLPE insulated cable, 25mm from the edge of the cable.
	130	On top of the three-core plus earth PVC insulated cable, 25mm from the edge of the cable.
	131	On top of the three three-core plus earth PVC insulated cable, 25mm from the edge of the cable.
	132	On top and mid width of the eight three-core plus earth PVC insulated cable, 25mm from the edge of the cable.
	133	On the bottom mid-width of the cable tray, 25mm from the sealant fillet.
	134	On the bottom side of the sealant fillet, 25mm from the plasterboard.
	135	On the plasterboard, 25mm below the sealant fillet.
I	141	On the plasterboard, 25mm below the repair hole.
	142	On the plasterboard, 25mm above the repair hole.

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

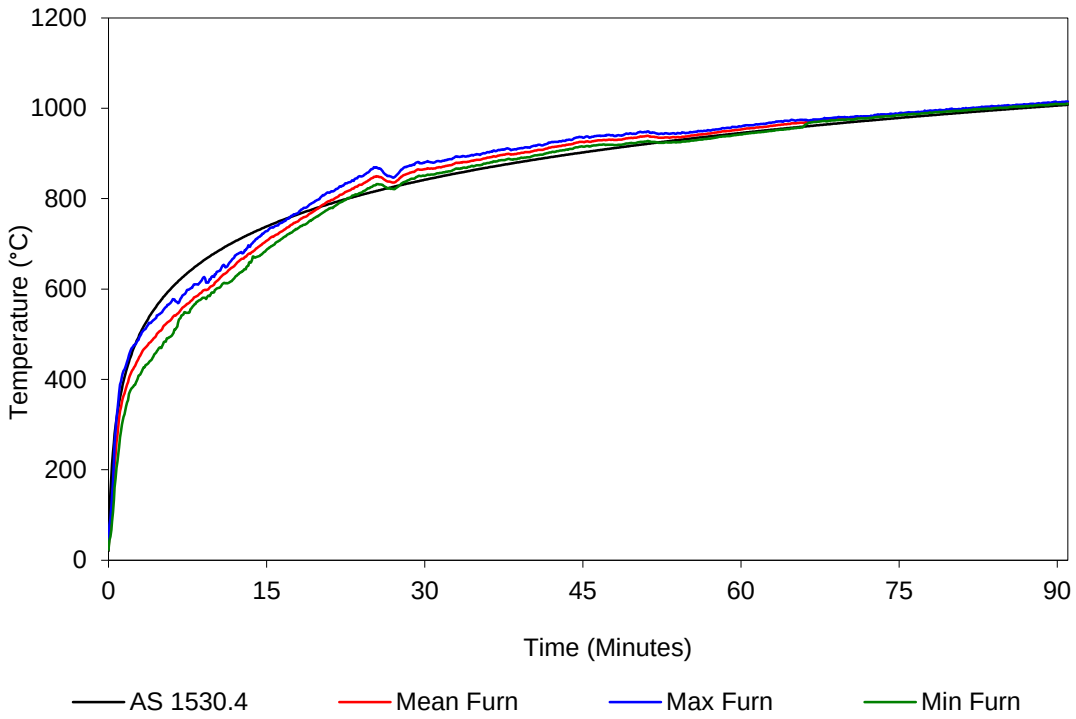


Figure A5.1: Furnace Temperatures vs. Time

A 5.2 FURNACE PRESSURE

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

Table A5.1: Pressure

Time (minutes)	Pressure (Pa) Avg.	Time (minutes)	Pressure (Pa) Avg.
5-10	**17**	50-55	**15**
10-15	**18**	55-60	**17**
15-20	**18**	60-65	**17**
20-25	**17**	65-70	**15**
25-30	**15**	70-75	**16**
30-35	**15**	75-80	**17**
35-40	**16**	80-85	**15**
40-45	**16**	85-90	**15**
45-50	**16**		

A 5.3 SPECIMEN TEMPERATURES

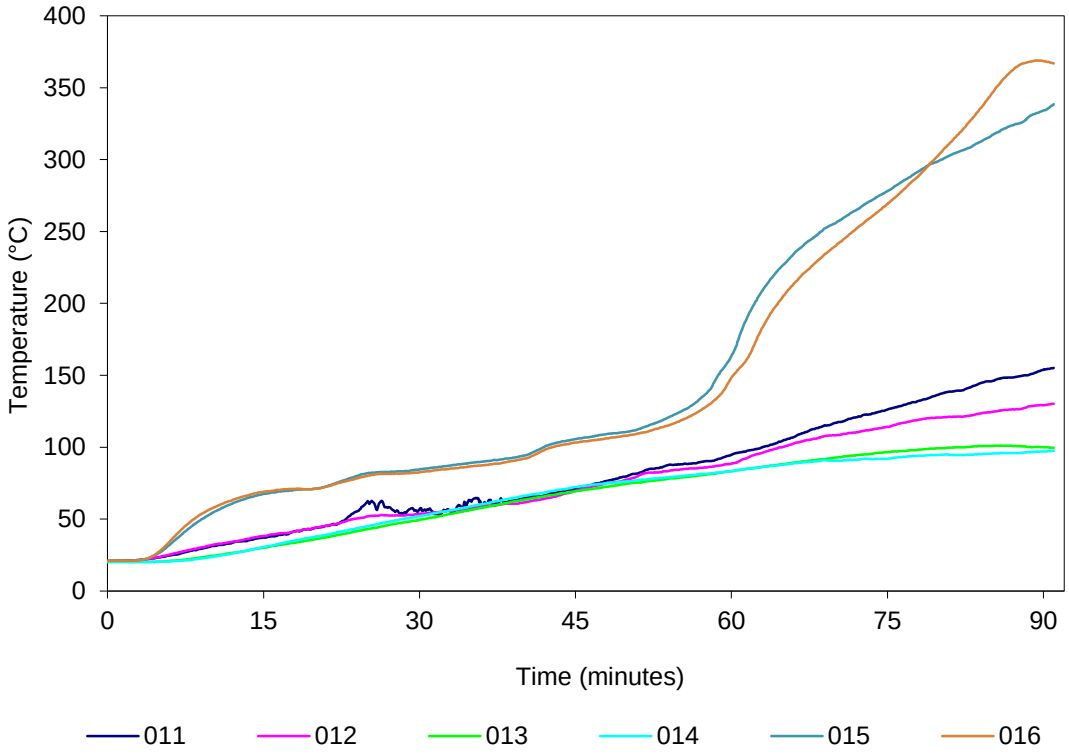


Figure A5.2: Service A. Temperatures vs. time

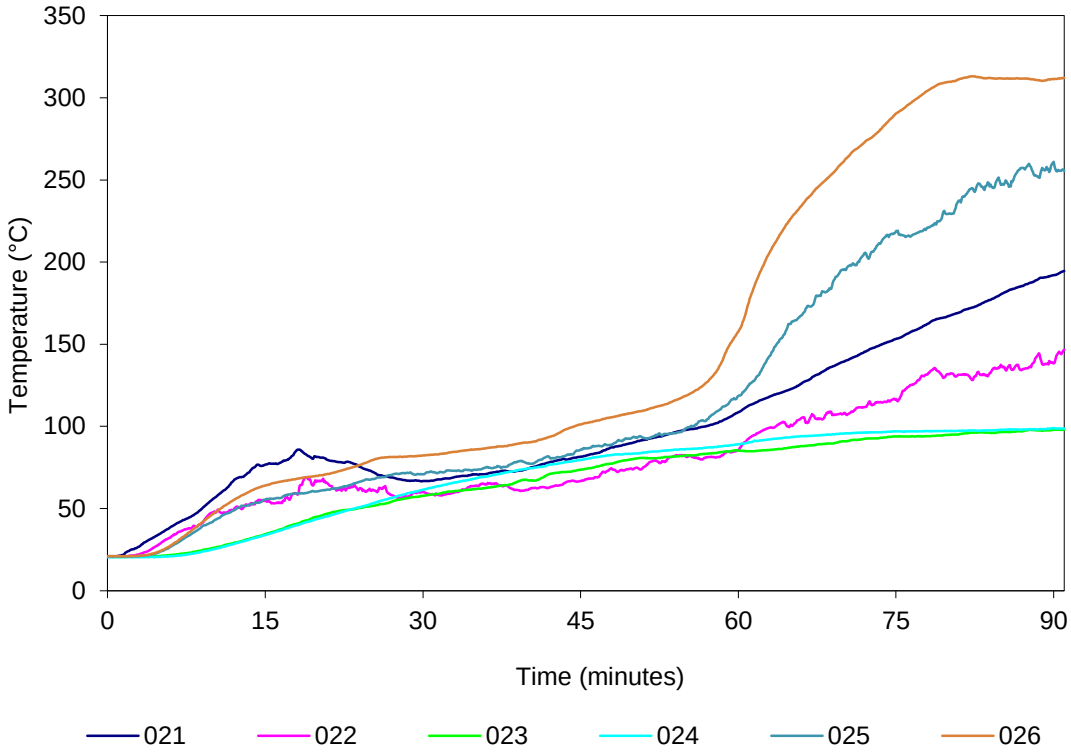


Figure A5.3: Service B. Temperatures vs. Time

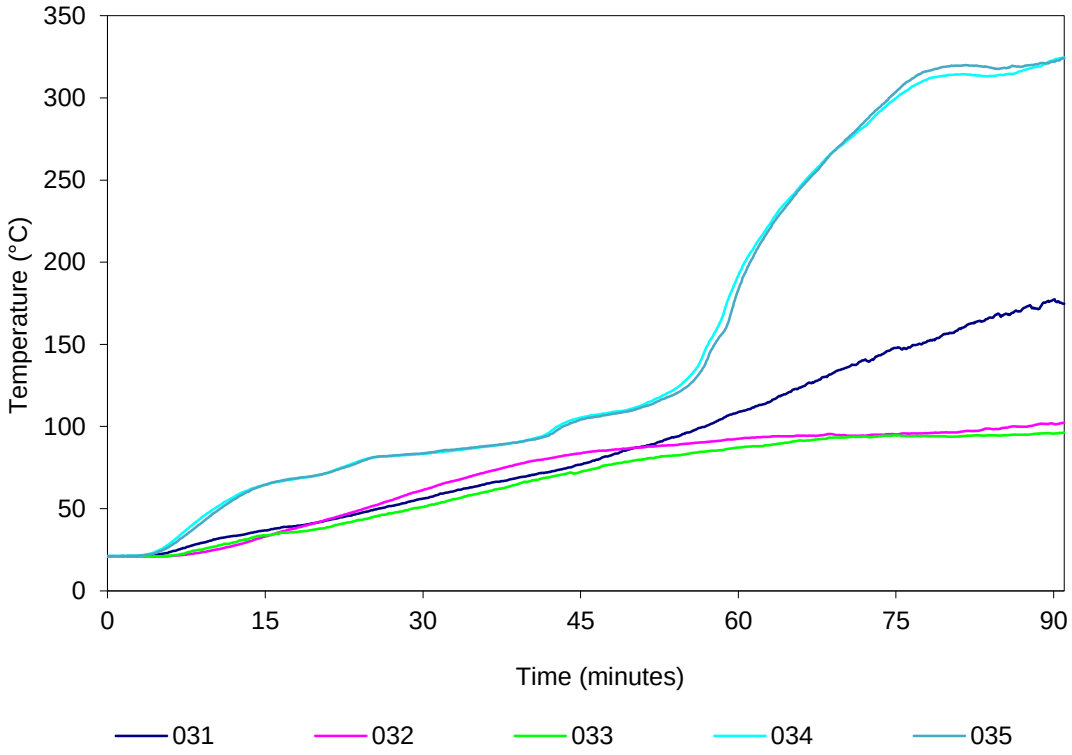


Figure A5.4: Service C. Temperatures vs. time

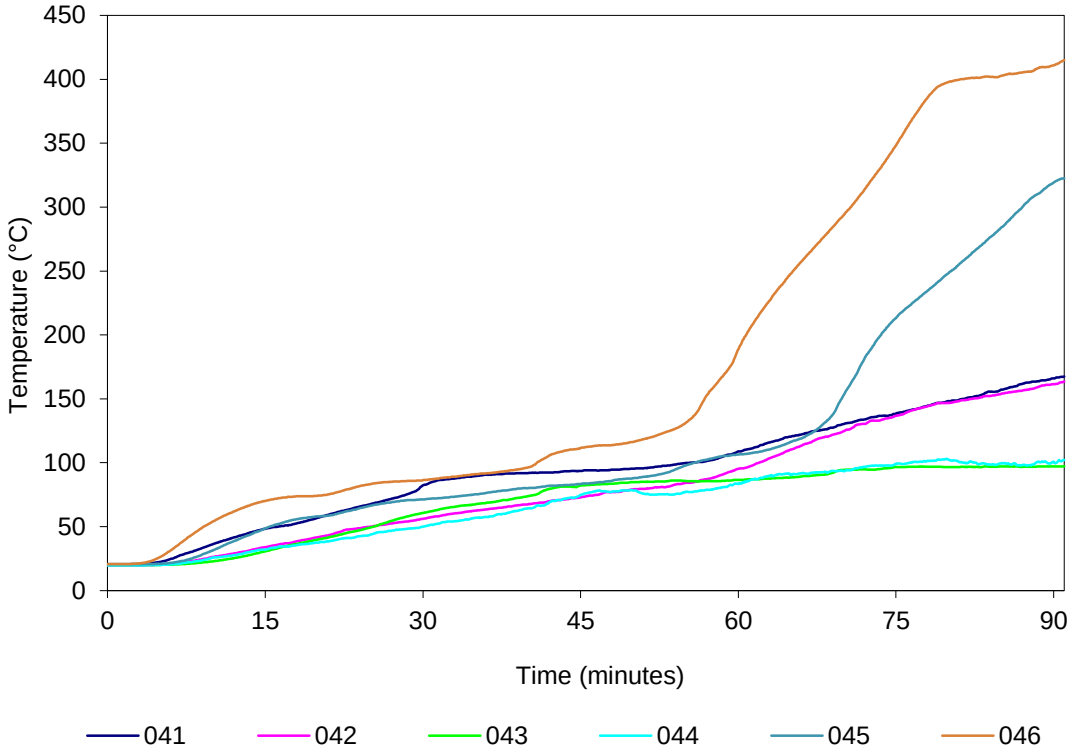


Figure A5.5: Service D. Temperatures vs. time

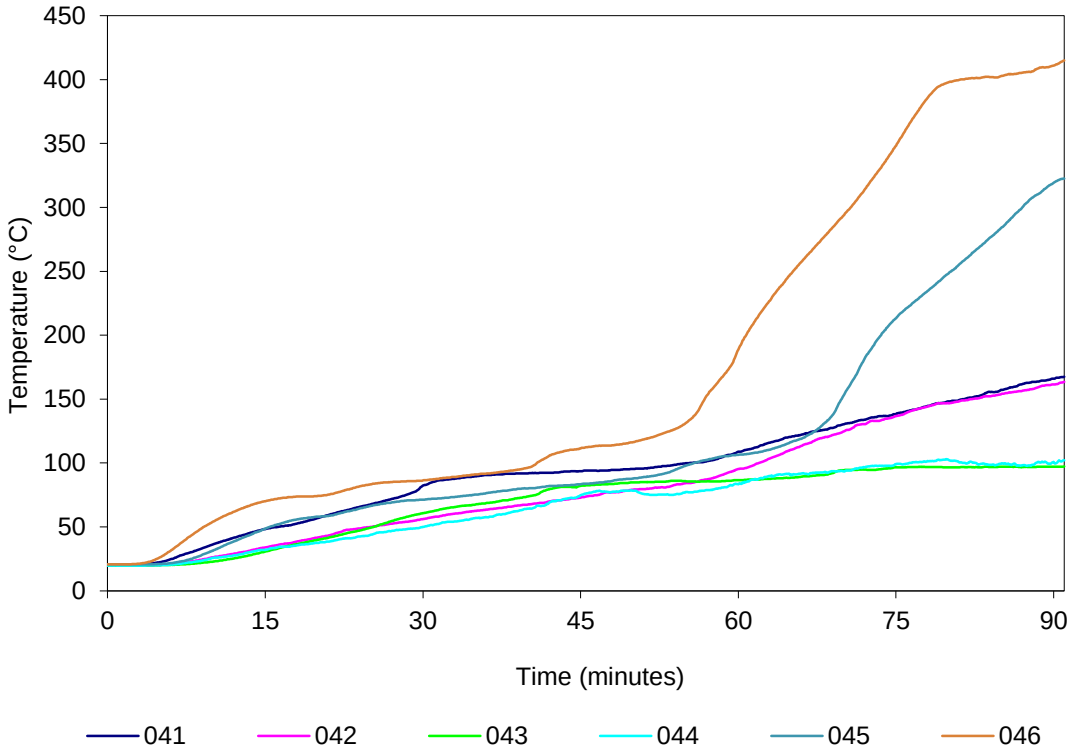


Figure A5.6: Service E. Temperatures vs. Time

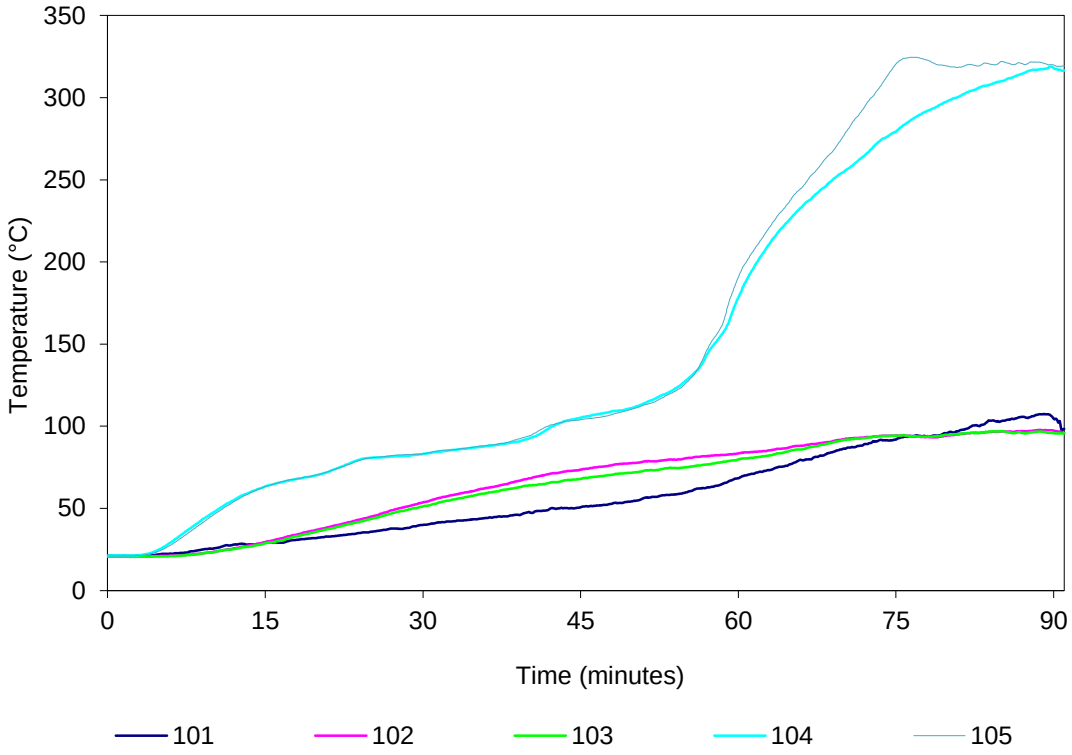


Figure A5.7: Service F. Temperatures vs. Time

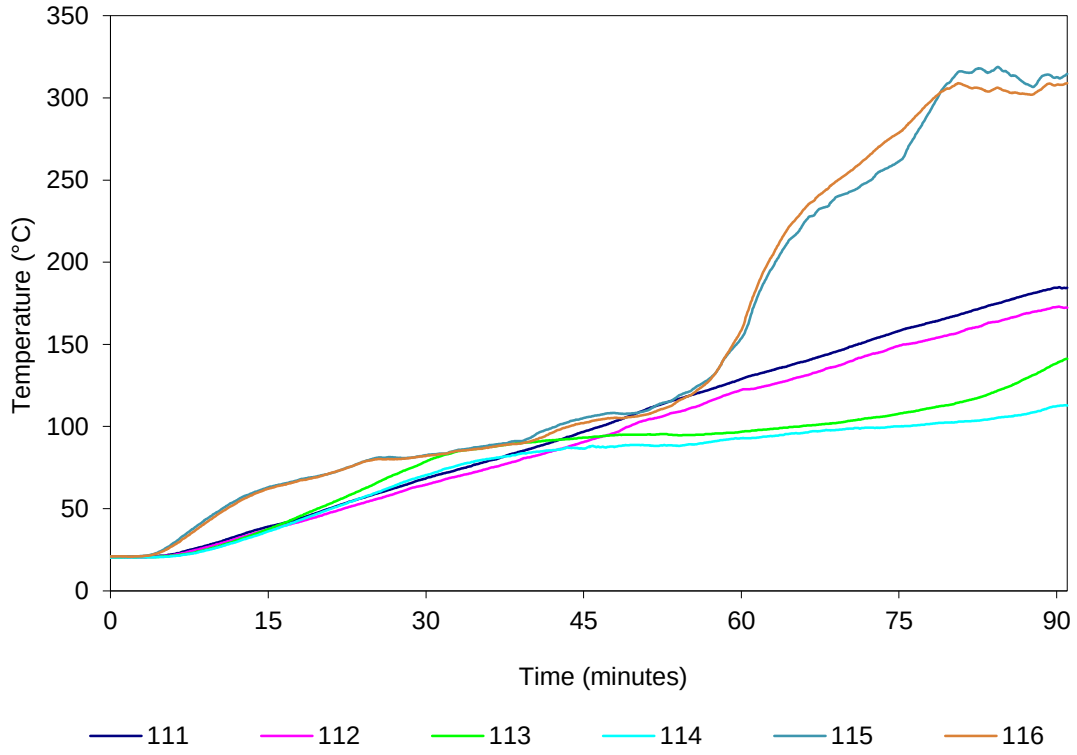


Figure A5.8: Service G. Temperatures vs. Time

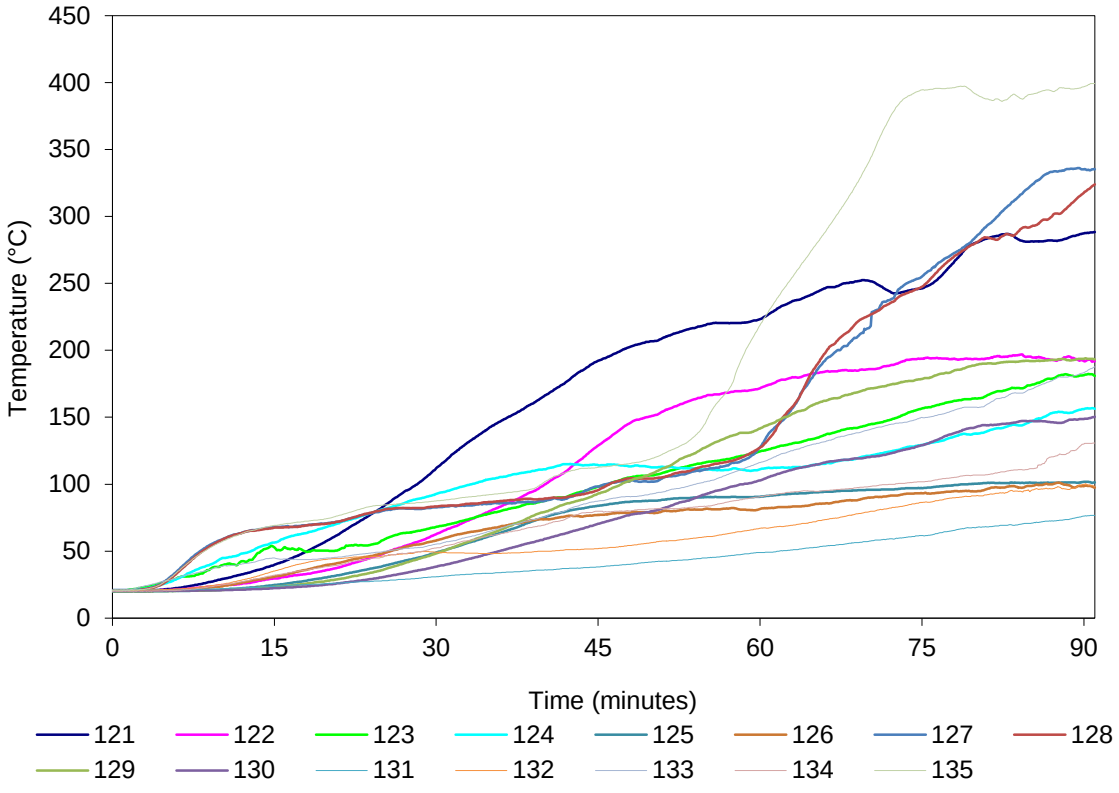


Figure A5.9: Service H. Temperatures vs. Time

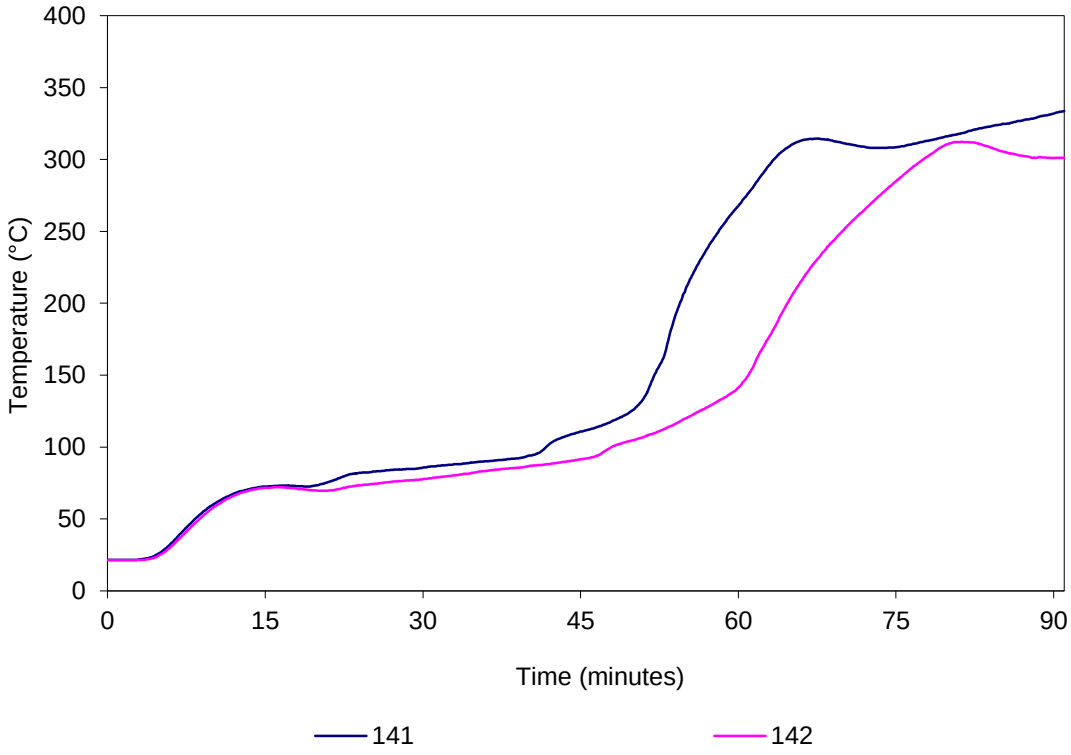


Figure A5.10: Service I. Temperatures vs. Time

Table A5.2: Test Specimen Temperatures

Service	T/C No.	Description[2]	Temp (°C) at t (minutes)					Limit[1] (Mins)
			t=0	t=15	t=30	t=60	t=90	
A	011	On the top of the cables, 25mm from the sealant fillet	21	37	56	95	153	-
	012	On the east side of the cables, 25mm from the sealant fillet.	21	38	54	89	129	-
	013	On the top of the sealant fillet, 25mm from the plasterboard.	20	30	50	83	100	-
	014	On the east side of the sealant fillet, 25mm from the plasterboard.	20	30	53	83	97	-
	015	On the plasterboard, 25mm below the sealant fillet.	21	67	85	163	333	62
	016	On the plasterboard, 25mm east of the sealant fillet.	21	69	83	148	369	64
B	021	On the top of the cables, 25mm from the sealant fillet	21	76	67	109	192	-
	022	On the east side of the cables, 25mm from the sealant fillet.	21	55	59	86	139	-
	023	On the top of the sealant fillet, 25mm from the plasterboard.	21	34	58	85	98	-
	024	On the east side of the sealant fillet, 25mm from the plasterboard.	20	33	62	89	99	-
	025	On the plasterboard, 25mm above the sealant fillet.	21	54	72	119	259	71
	026	On the plasterboard, 25mm east of the sealant fillet.	21	63	83	158	311	62
C	031	On the top of the cables, 25mm from the sealant fillet.	21	37	57	109	177	-
	032	On the top of the sealant fillet, 25mm from the plasterboard	21	33	62	93	102	-
	033	On the west side of the sealant fillet, 25mm from the plasterboard.	21	34	51	87	96	-
	034	On the plasterboard, 25mm above the sealant fillet.	21	64	84	192	323	60
	035	On the plasterboard, 25mm west of the sealant fillet.	21	64	84	183	322	61
D	041	On top of the cables, 25mm from the sealant fillet.	20	48	83	109	166	-
	042	On the bottom of the cable tray, 25mm away from the sealant fillet.	20	34	57	95	161	-
	043	On top of the sealant fillet, 25mm away from the plasterboard.	20	30	61	87	97	-
	044	On the bottom of the sealant fillet, 25mm away from the plasterboard.	20	32	51	83	100	-
	045	On the plasterboard, 25mm above the sealant fillet	21	48	72	106	318	73
	046	On the plasterboard, 25mm below the sealant fillet	21	70	87	189	411	60

E	051	Mid-height of the sealant, 750mm west of the vertical edge.	19	71	89	141	280	76
	052	25mm from the sealant, 750mm west of the vertical edge.	21	70	86	126	385	68
	053	Mid-height of the sealant, 500mm west of the vertical edge.	20	69	91	97	170	-
	054	25mm from the sealant, 500mm west of the vertical edge.	21	68	88	158	363	63
	055	Mid-height of the sealant, 250mm west of the vertical edge.	20	68	93	148	275	76
	056	25mm from the sealant, 250mm west of the vertical edge,	21	56	81	105	303	74
F	101	On top of the cable, 25mm away from the sealant fillet.	21	28	40	68	106	-
	102	On the east side of the sealant fillet, 25mm from the plasterboard.	21	29	54	84	98	-
	103	On top of the sealant fillet, 25mm from the plasterboard.	21	28	52	80	96	-
	104	On the plasterboard, east of the sealant fillet.	21	62	84	178	319	62
	105	On the plasterboard, above the sealant fillet.	21	62	84	191	320	60
G	111	On top of pipe, 25mm from the sealant fillet.	21	39	69	129	184	-
	112	On the west side of the pipe, 25mm from the sealant fillet.	20	37	65	122	173	-
	113	On top of the sealant fillet, 25mm from the plasterboard.	20	37	80	97	138	-
	114	On the west side of the sealant fillet, 25mm from the plasterboard.	20	35	71	93	112	-
	115	On the plasterboard, 25mm above the sealant fillet.	21	62	83	154	312	63
	116	On the plasterboard, 25mm west of the sealant fillet.	21	61	82	159	308	62
H	121	On top of the single-core XLPE insulated cable, 25mm from the sealant fillet.	20	39	114	223	287	47
	122	On top of the three-core plus earth PVC insulated cable, 25mm from the sealant fillet.	21	29	64	172	193	-
	123	On top of the three three-core plus earth PVC insulated cable, 25mm from the sealant fillet.	21	54	69	125	181	-
	124	On top and mid width of the eight three-core plus earth PVC insulated cable, 25mm from the sealant fillet.	20	56	94	111	156	-
	125	West top side of the sealant fillet, 25mm from the plasterboard.	20	24	50	91	102	-
	126	East top side of the sealant fillet, 25mm from the plasterboard.	20	30	59	82	99	-
	127	On the plasterboard, above the west top side of the sealant fillet.	21	68	83	128	335	67
	128	On the plasterboard, above the east top side of the sealant fillet.	21	67	84	127	316	66

	129	On top of the single-core XLPE insulated cable, 25mm from the edge of the cable.	20	23	49	142	194	-
	130	On top of the three-core plus earth PVC insulated cable, 25mm from the edge of the cable.	20	22	39	103	149	-
	131	On top of the three three-core plus earth PVC insulated cable, 25mm from the edge of the cable.	21	24	31	49	76	-
	132	On top and mid width of the eight three-core plus earth PVC insulated cable, 25mm from the edge of the cable.	21	34	49	67	100	-
	133	On the bottom mid-width of the cable tray, 25mm from the sealant fillet.	20	45	56	116	183	-
	134	On the bottom side of the sealant fillet, 25mm from the plasterboard.	20	31	53	91	129	-
	135	On the plasterboard, 25mm below the sealant fillet.	21	69	88	219	396	58
I	141	On the plasterboard, 25mm below the repair hole.	22	72	86	268	331	54
	142	On the plasterboard, 25mm above the repair hole.	21	71	78	141	301	64

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.

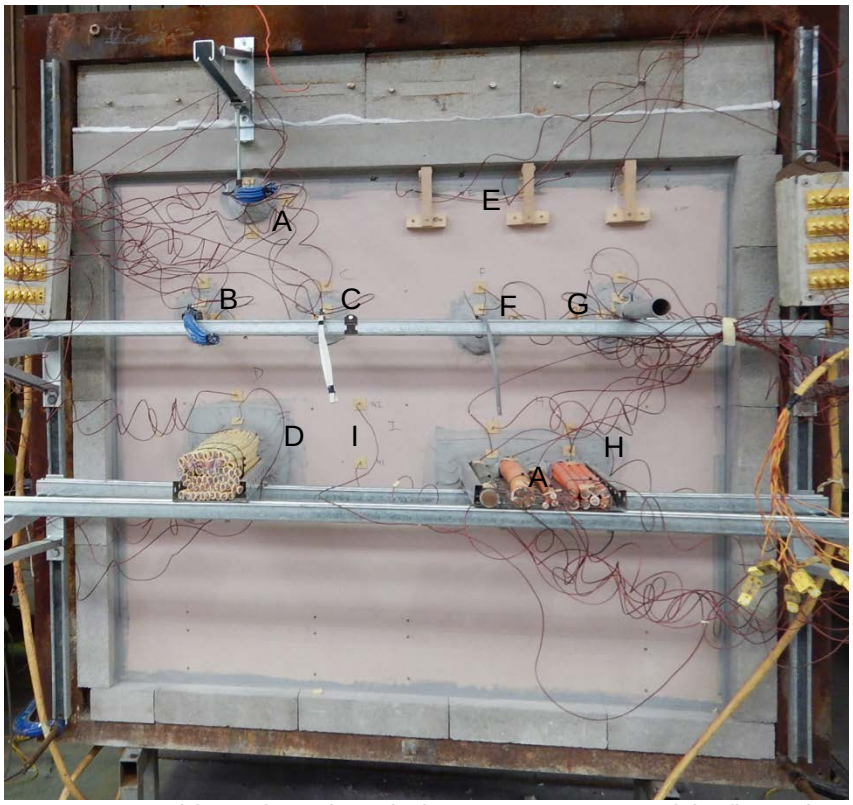
[#] Thermocouple failure.

[*] 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

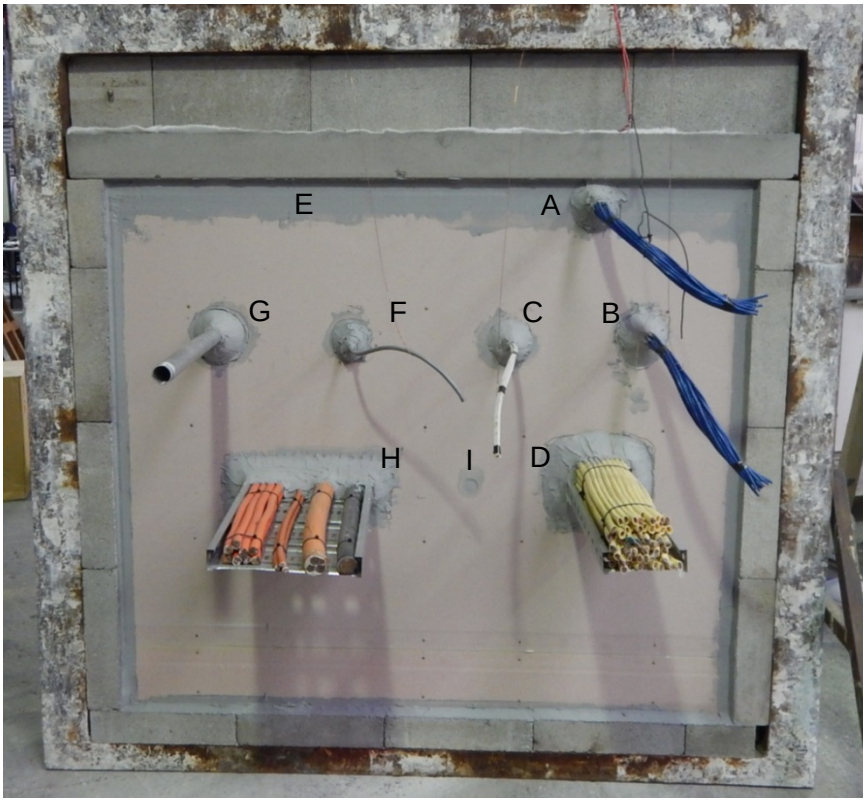
West



East

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

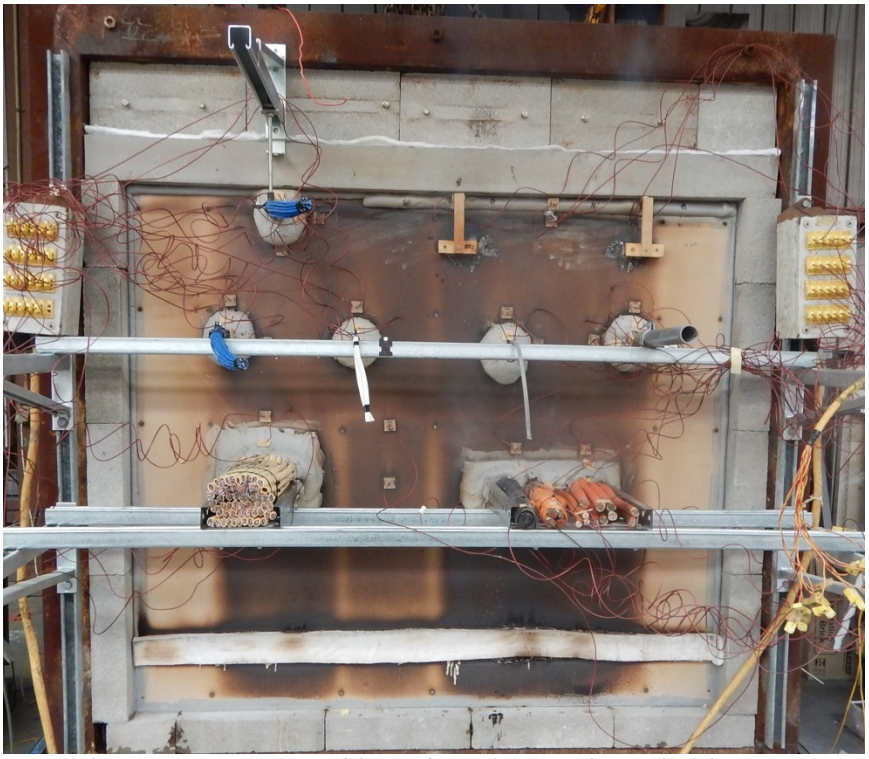
East



West

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

West



East

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

East

West

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