HB FULLER AUST CO P/L

FIRE RESISTANCE TEST REPORT

Test standard: Sections 2 and 10 of AS 1530.4:2014
Reference Standard: AS 4072.1-2005 AMDT 1 (Rec:2016)
Test sponsor**:** HB Fuller Aust Co P/L
Products: HB Fuller Firesound Sealant
Job number**:** 44715000
Revision: R1.1 Test date: 6 December 2016

Accredited for compliance with ISO/IEC 17025 – Testing

JENSEN HUGHES

jensenhughes.com/pacific

ilac-MRA

NATA
Accreditation No. 3277

Quality management

Revision	Date	Revision description		
R1.0	23 January 2017	Initial issue.		
		Prepared	**Reviewed**	**Authorised**
		Kai Loh	Mandeep Kamal	Steven Halliday
R1.1	23 June 2025	Report rebranding and reference to AS 4072.1-2005		
		Prepared	**Reviewed**	**Authorised**
		Patrick Chan	Mandeep Kamal	Mandeep Kamal
				

Jensen Hughes Fire Testing Pty Ltd
ABN 81 050 241 524
Formerly Warringtonfire Australia Pty Ltd[1]

[1] Warringtonfire Australia Pty Ltd was acquired by Jensen Hughes in December 2023. Jensen Hughes Fire Testing Pty Ltd is not affiliated, associated, authorised, or endorsed by Warringtonfire Australia Pty Ltd, Warringtonfire Testing and Certification Limited or its "Warringtonfire" or "Certifire" brands.

Executive summary

This report documents the findings of the fire resistance test of penetration systems and control joint in accordance with sections 2 and 10 of AS 1530.4:2014 with reference to AS 4072.1–2005 AMDT 1 (Rec:2016). The testing was done on 6 December 2016.

Exova Warringtonfire performed the test at the request of HB Fuller Aust Co P/L.

Table 1 provides details of the test assembly, and Table 2 provides a summary of the test specimen. A summary of the results is provided in Table 3.

Table 1 Test assembly

Item	Detail	
Separating element	Wall	
Nominal separating element size	Width	1600 mm
	Height	1600 mm
	Thickness	90 mm
Number of penetration systems and control joint	Nine	
Restraint conditions	Restrained on all edges	

Table 2 Test specimen

Penetration system or control joint	Service	Local fire-stopping protection	Local aperture size (mm)
A	16 – off CAT6 cables	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 70 mm fillet on both sides.	30 mm wide × 70 mm high aperture
B	16 – off CAT6 cables	HB Fuller Firesound Sealant to the depth of the plasterboard (13mm) with additional 50 mm × 70 mm fillet on both sides.	Ø30 mm
C	2-off 2C+E 2.5mm2 flat TPS cables	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 70 mm fillet on both sides.	Ø26 mm
D	D2 communications group with ET3-150 cable tray	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 50 mm fillet on both sides.	179 mm × 128 mm aperture
E	Control joint at head	HB Fuller Firesound Sealant to the depth of the deflection head track (13m m) on both sides.	1000 mm long × 40 mm high
F	1-off 2C+E 2.5mm2 round cable	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 70 mm fillet on both sides.	Ø25 mm
G	1-off 32NB Medium Galvanised Steel Pipe	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 70 mm fillet on both sides.	Ø57.4 mm

Penetration system or control joint	Service	Local fire-stopping protection	Local aperture size (mm)
H	D1 Power Group with ET3-300 cable tray	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) with additional 50 mm × 50 mm fillet on both sides.	331mm wide × 64 mm high hole
I	1-off repair hole on the exposed side only	HB Fuller Firesound Sealant to the depth of the plasterboard (13 mm) on the exposed side only.	Ø40 mm

Table 3 Test results

Penetration system or control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
B	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
C	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
D	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
E	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 63 minutes	
F	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
G	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
H	Structural adequacy	Not applicable	**-/90/45**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 47 minutes	
I	Structural adequacy	Not applicable	**-/90/45**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 54 minutes	

NOTE: The FRLs for the specimens only apply to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

Table of contents

1.0 Introduction

This report documents the findings of the fire resistance test of penetration systems/control joints in accordance with sections 2 and 10 of AS 1530.4:2014 with reference to AS 4072.1–2005 AMDT 1 (Rec:2016). The testing was done on 6 December 2016.

Jensen Hughes performed the test at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor details

Test sponsor	Address
HB Fuller Aust Co P/L	16-22 Redgum Drive Dandenong South VIC 3175 Australia

2.0 Test specimen

2.1 Schedule of components

Table 5 describes the test specimen and lists the schedule of components. These were provided by the test sponsor and surveyed by Exova Warringtonfire

All measurements were done by Jensen Hughes – unless indicated otherwise.

Detailed drawings of the test specimen are provided in Appendix A.

Table 5 Schedule of components

Item	Description	
Penetration system A		
1.	Service	16-off Clipsal Actassi Lan Cable UTP Cat 6 2D4P6IPV3B
	Cable dimensions	Ø 6.1 mm
	Service detail	The bundle of cables was installed against the top concrete block of the test frame. The cable bundle protruded 500 mm on both the exposed and unexposed sides.
	Service support	The cable bundle was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed side. The deflection head track of the separating element were cut and removed and the flange were twisted inward.
	Aperture size	30 mm wide × 70 mm high
Local fire-stopping protection		
2.	Product name	HB Fuller Firesound Sealant
	Protection	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 Ø50 mm backing rod was inserted in the opening in the deflection head track above the cable bundle. See Figure 1 and Figure 2 in Appendix A for more details.
Penetration system B		
3.	Service	16-off Clipsal Actassi Lan Cable UTP Cat 6 2D4P6IPV3B
	Cable dimensions	Ø 6.1 mm
	Service detail	The cable bundle protruded 500 mm on both the exposed and unexposed sides.
	Service support	The cable bundle was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Aperture size	Ø30mm
Local fire-stopping protection		
4.	Product name	HB Fuller Firesound Sealant
	Protection	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 1 and Figure 2 in Appendix A for more details.

Item	Description		
Penetration system C			
5.	Service	2 – off 2C + E 2.5 mm² Flat TPS Cables	
	Cable dimensions	12 mm × 10.6 mm	
	Service detail	The cables protruded 500 mm on both he exposed and unexposed sides.	
	Service support	The cable bundle was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.	
	Aperture size	Ø26 mm wide	
Local fire-stopping protection			
6.	Product name	HB Fuller Firesound Sealant	
	Protection	The sealant was applied in the annular between the cables and aperture on both sides of the separating element to a depth of 13 mm followed with a 50mm × 70mm fillet. See Figure 1 and Figure 3 in Appendix A for more details.	
Penetration system D			
7.	Service	A pack of 60, 50-pair telecommunication cables (CAT 3 cable), with each of the 100 wires in each cable having an outside diameter of 0.5 mm.	
	Cable size	Width	18 mm
		Height	11 mm
	Cable tray	ET3-150 cable tray.	
	Cable tray size	172 mm wide × 47 mm high with a 19mm wide top lip, and a drop down lip 10mm long. The tray was made from 1mm thick galvanised steel.	
	Service detail	The cables were fixed to the cable tray with plastic cable ties in 10 × 6 configuration. The cable tray system protruded 500 mm on the exposed and the unexposed sides.	
	Service support	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.	
	Aperture size	179 mm wide × 128 mm high.	
Local fire-stopping protection			
8.	Product name	HB Fuller Firesound Sealant	
	Protection	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 1 and Figure 2 in Appendix A for more details.	
Penetration system E			
9.	Service	Control joint	
	Service detail	The control joint was located at the head under the lintel.	
	Aperture size	1000 mm wide × 40 mm high	
Local fire-stopping protection			
10.	Product name	HB Fuller Firesound Sealant	

Item	Description	
	Protection	The sealant was applied in the aperture to the depth of the 13 mm (to the DHT) on both the exposed and unexposed side of the specimen See Figure 1 and Figure 4 in Appendix A for more details.
Penetration system F		
11.	Service	1-off 2C+E 2.5 mm^2
	Cable dimension	Ø10 mm
	Service detail	The cables protruded 500 mm on both the exposed and unexposed sides.
	Service support	The cable was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Aperture size	Ø25mm wide
Local fire-stopping protection		
12.	Product name	HB Fuller Firesound Sealant
	Protection	The sealant was applied in the annular gap (10 mm on west side and 5 mm on east side) between the cable and aperture on both sides of the separating element to a depth of 13 mm followed with a 50 mm × 70 mm fillet. See Figure 1 and Figure 4 in Appendix A for more details.
Penetration system G		
13.	Service	32NB Medium Gal Steel Pipe
	Pipe dimension	Ø 42.4 mm
	Service detail	The pipe protruded 500 mm on both the exposed and unexposed sides.
	Service support	The pipe was supported on the unexposed side with metal pipe clamps at approximately 200 mm from the unexposed face.
	Aperture size	Ø 57.4 mm
Local fire-stopping protection		
14.	Product name	HB Fuller Firesound Sealant
	Protection	The sealant was applied in the annular gap (10 mm on west side and 5 mm on east side) between cable and aperture on both sides of the separating element to a depth of 13 mm followed with a 50 mm × 70 mm fillet. See Figure 1 and Figure 5 in Appendix A for more details.
Penetration system H		
15.	Service	+ 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). + 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). + 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). + 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).
	Cable tray	ET3-300 cable tray.

Item	Description	
	Cable tray size	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.
	Service detail	The cables were fixed to the cable tray with plastic cable ties. The cable tray system protruded 500 mm on the exposed and the unexposed sides.
	Service support	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.
	Aperture size	331 mm wide × 64 mm high.
Local fire-stopping protection		
16.	Product name	HB Fuller Firesound Sealant
	Protection	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 Ø 50 mm backing rods, nominally 64 mm, 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 1 and Figure 4 in Appendix A for more details.
Penetration system I		
17.	Service	Repair Hole
	Service size	Ø40mm diameter
Local fire-stopping protection		
18.	Product name	HB Fuller Firesound Sealant
	Protection	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 1 and Figure 3 in Appendix A for more details.

2.2 Installation details

Table 6 lists the installation details for the test specimen.

Table 6 Installation details

Item	Detail
Completion date for constructing and installing the test specimen	18 November 2016
Separating element constructed by	Representatives of Exova Warringtonfire
Fire-stopping protection for penetration systems and control joints installed by	Representative of the test sponsor

3.0 Test procedure

Table 7 details the test procedure for this fire resistance test.

Table 7 Test procedure

Item	Detail	
Statement of compliance	The test was performed in accordance with the requirements of sections 2 and 10 of AS 1530.4:2014 appropriate for penetration systems/control joints.	
Variations	The 2005 revision of AS 4072.1 has all testing requirements removed from it and placed in AS 1530.4-2005 however the reference in the construction code was not updated to reflect this and still erroneously calls for testing to be in accordance with AS 4072.1. To accommodate this oversight, reference is made to AS 4072.1-2005 AMDT 1 (Rec:2016).	
Pre-test conditioning	The construction and installation of the test specimen was completed on 18 November 2016. The test specimen was subjected to normal laboratory temperatures and conditions between the completion of construction of the test specimen and the start of the test.	
Sampling / specimen selection	The laboratory was not involved in sampling or selecting the test specimen for the fire resistance test. The results obtained during the test only apply to the test samples as received and tested by Jensen Hughes.	
Ambient laboratory temperature	Start of the test	20 °C
	Minimum temperature	20 °C
	Maximum temperature	25 °C
Test duration	91 minutes	
Instrumentation and equipment	The instrumentation was provided in accordance with AS 1530.4:2014 as follows: + The furnace temperature was measured by four mineral insulated metal sheathed (MIMS) Type K thermocouples – with wire diameters not greater than 1 mm, an overall diameter of 3 mm, and the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25 mm from steel supporting tubes. + The unexposed side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5 mm soldered to 12 mm diameter × 0.2 mm thick copper discs covered by 30 mm × 30 mm × 2.0 mm thick inorganic insulating pads. + The thermocouple positions are shown in Table 10 and in Figure 6 to Figure 17 in Appendix D. + A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples. + Cotton pads were available during the test to assess the performance of the specimen under the criteria of integrity. + The furnace pressure was measured at approximately at the mid-height of the lowest service (Service H) It was monitored using a differential pressure transmitter. + All electronic data was sampled at 5 second intervals.	

4.0 Test measurements and results

Table 8 summarises the results the specimen achieved against the performance criteria listed in sections 2 and 10 of AS 1530.4:2014.

Appendix E includes details of the measurements taken during the test.

Table 9 in Appendix B includes observations of any significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4:2014.

Appendix D includes instrumentation details of the specimen.

Photographs of the specimen are included in Appendix F.

Table 8 Test results

Penetration system or control joint	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
B	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
C	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
D	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
E	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 63 minutes	
F	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 60 minutes	
G	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 62 minutes	
H	Structural adequacy	Not applicable	**-/90/45**
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 47 minutes	
I	Structural adequacy	Not applicable	**-/90/45**

Penetration system or control joint	Criteria	Results	Fire resistance level (FRL)
	Integrity	No failure at 91 minutes	
	Insulation	Failure at 54 minutes	

NOTE: The FRLs for the specimens only apply to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

5.0 Application of test results

5.1 Test limitations

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

These results only relate to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, and they do not necessarily reflect the actual behaviour in fires.

5.2 Variations from the tested specimen

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described here was tested following the procedure outlined in AS 1530.4:2014. Any significant variation with respect to size, construction details, loads, stresses, edge or end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

It is recommended that any proposed variation to the tested configuration – other than as permitted under the field of direct application specified in Appendix C – should be referred to the test sponsor. They should then obtain appropriate documentary evidence of compliance from Jensen Hughes Fire Testing or another accredited testing authority.

5.3 Uncertainty of measurements

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 for the result.

Appendix A Drawings of test assembly

The leaders in the drawings represent the items listed in section 2.1. All measurements – unless indicated – are in millimetres.

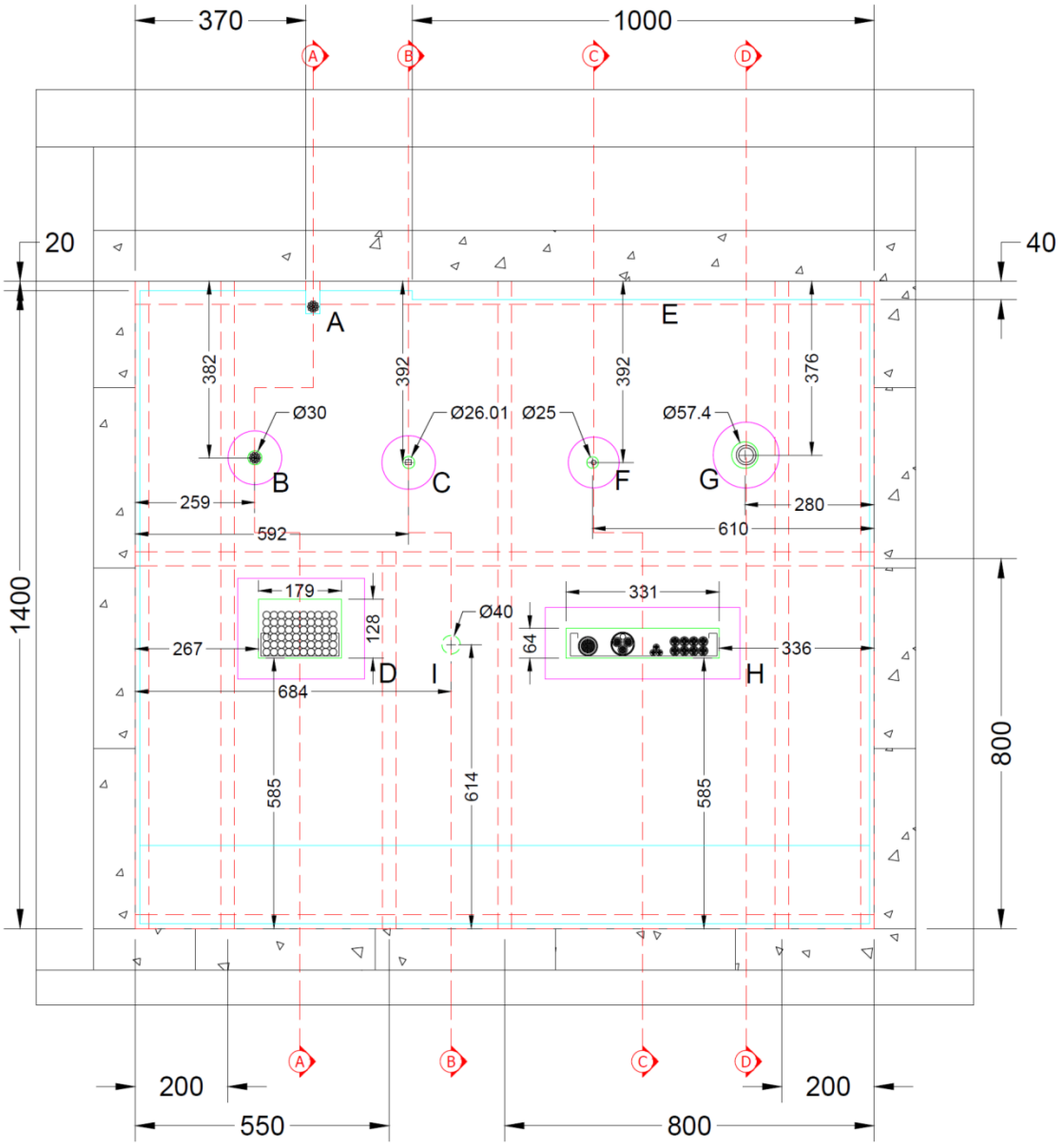


Figure 1 Elevation view of test specimen (unexposed side)

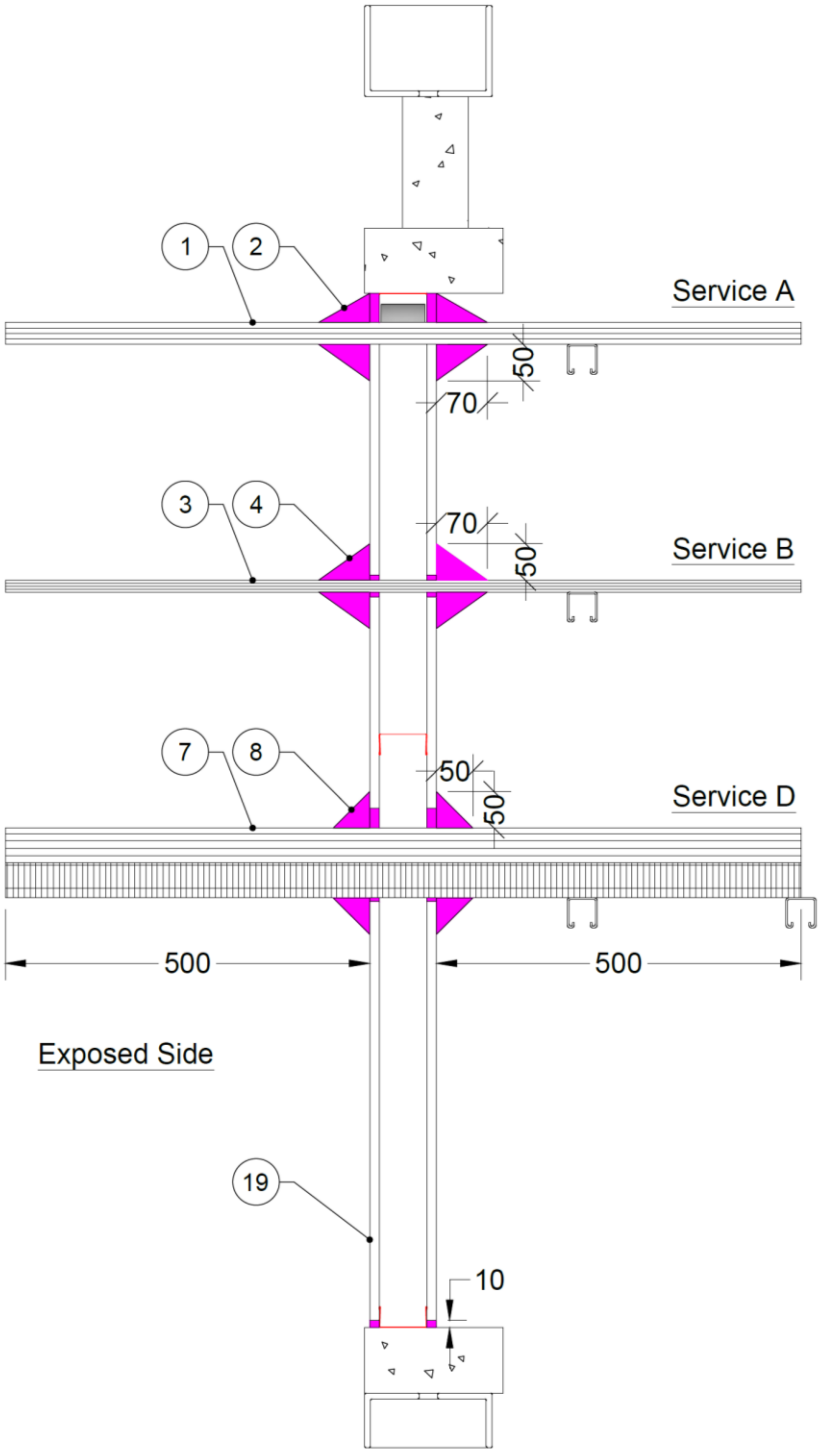


Figure 2 Cross section A-A

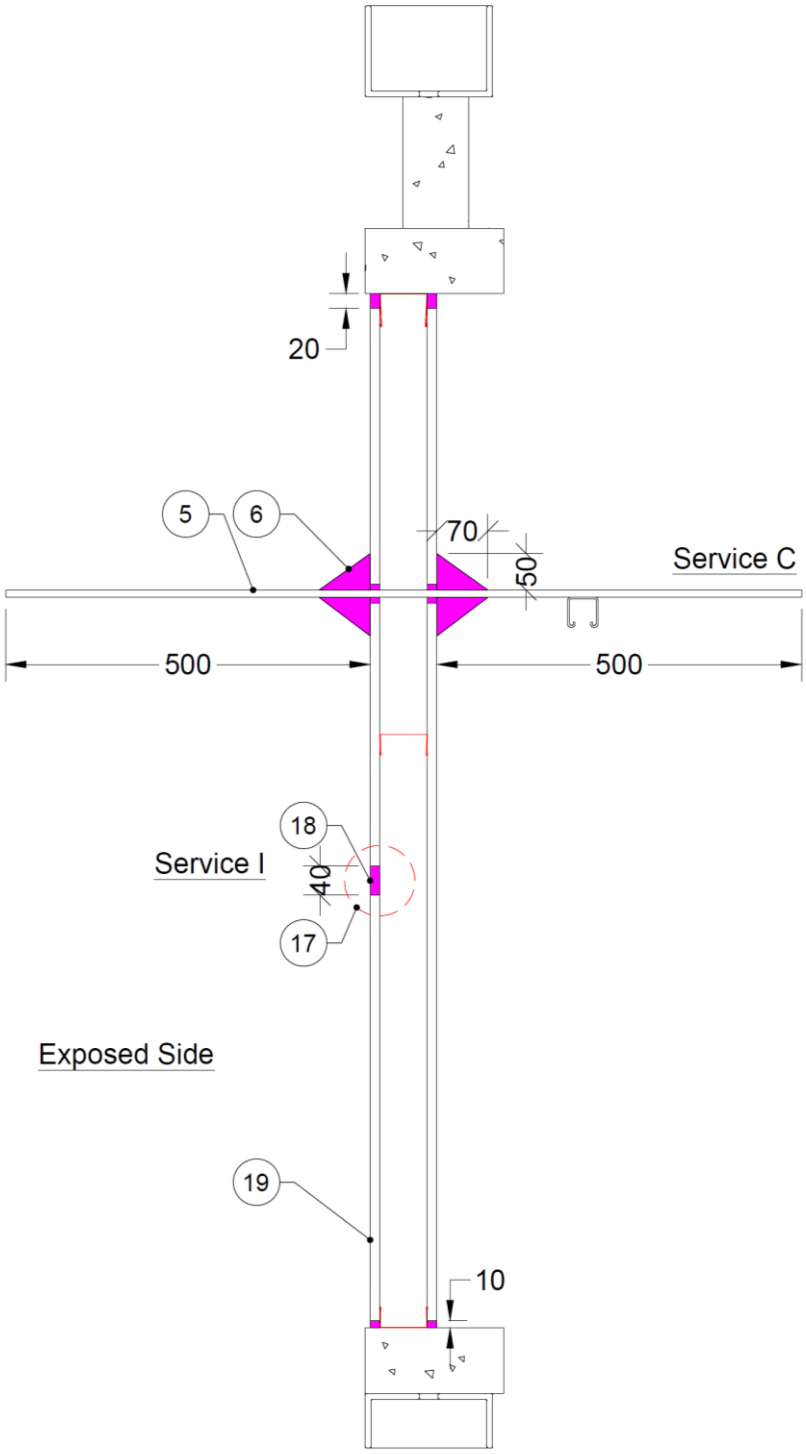


Figure 3 Cross-section B-B

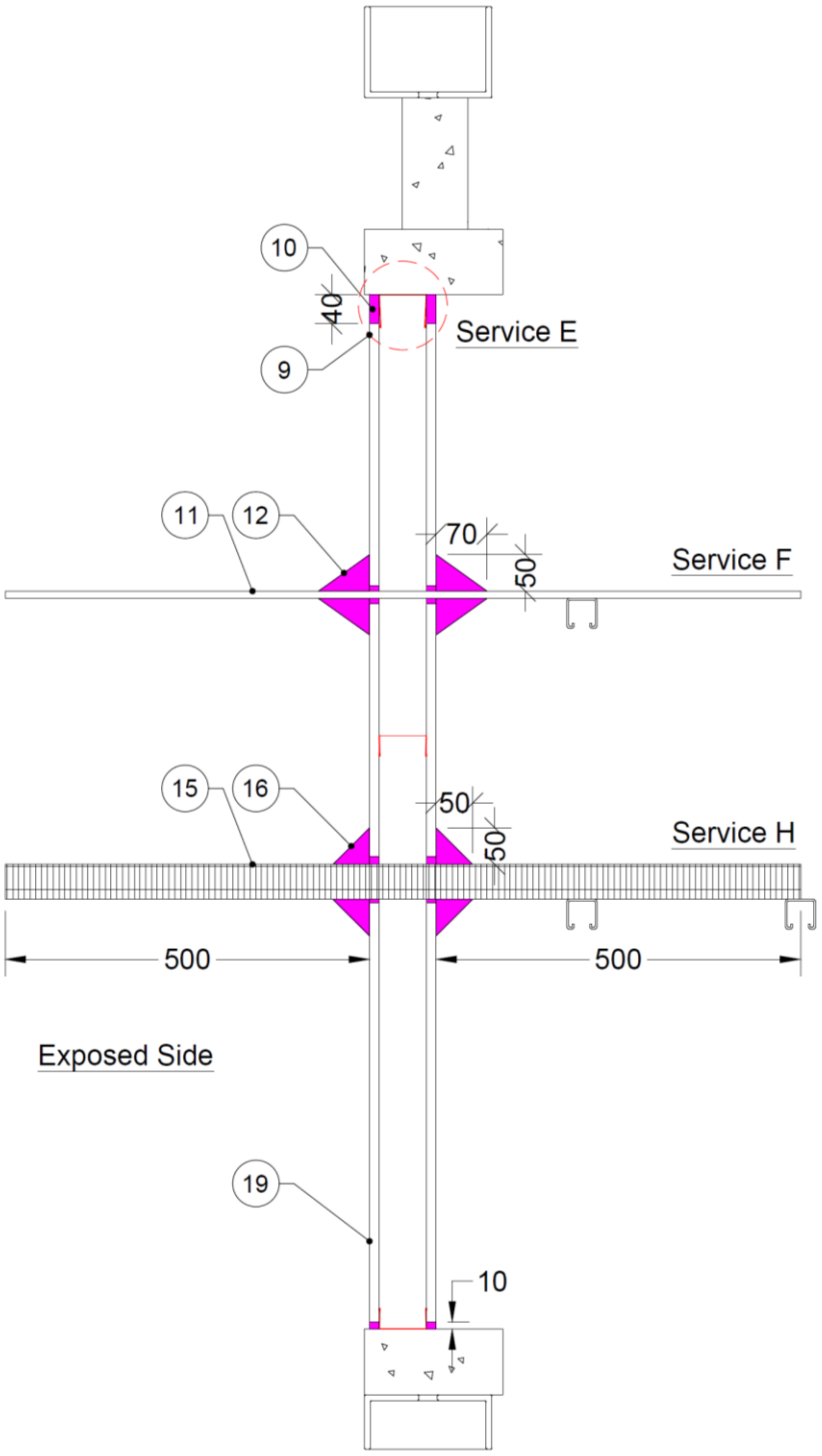


Figure 4 Cross-section C-C

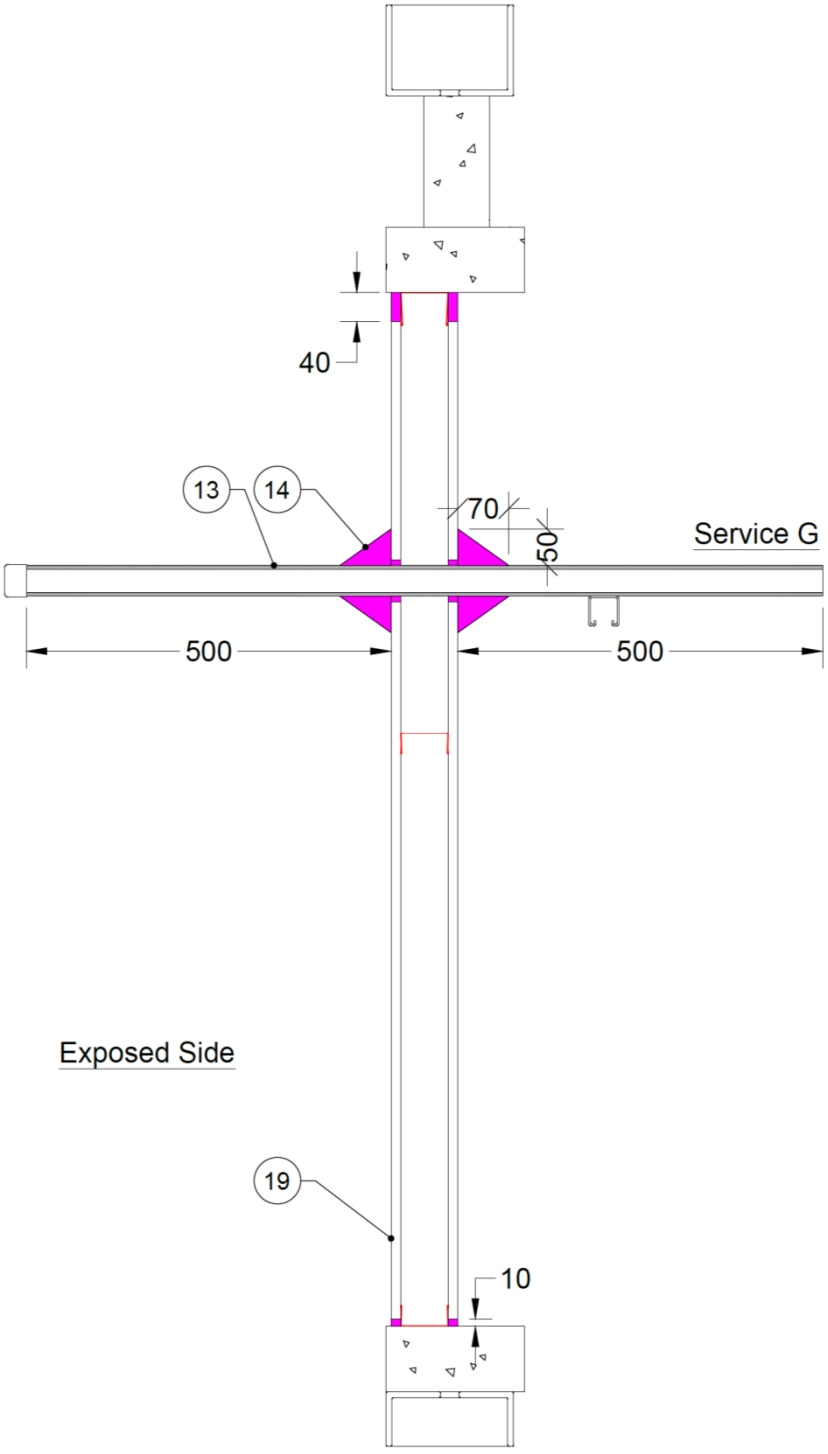


Figure 5 Cross-section D-D

Appendix B Test observations

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

Table 9 Test observations

Time		Observation
Min	Sec	
Penetration system 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.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
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.
45	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.
Penetration system 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.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
45	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.
Penetration system C		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C

Time		Observation
Min	Sec	
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
45	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.
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.
Penetration system 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.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
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.
45	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.
Penetration system E		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
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.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.

Time		Observation
Min	Sec	
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.
Penetration system F		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
45	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	**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.
Penetration system G		
0	00	Fire resistance test commenced and the ambient temperature was approximately 21°C
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
45	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.
Penetration system H		

Time		Observation
Min	Sec	
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.
15	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
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.
45	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.
Penetration system I		
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.
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.
45	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
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 C Direct field of application

The text, figures and tables in this appendix have been taken from section 10 of AS 1530.4:2014.

C.1 General

The results of the fire test contained in the test report are directly applicable without reference to the testing authority to similar constructions where one or more of the changes set out in clauses 10.12.2 to 10.12.6 of AS 1530.4:2014 have been made.

C.2 Separating elements

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

- For elements manufactured from similar types of concrete or masonry, the results of the prototype test may be applied to materials of density within ±15% of the tested specimen. For greater variations, the opinion of a registered testing authority shall be obtained.
- Test results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The reverse does not apply.
- Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.
- Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.
- Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the studs.

C.3 Metal pipes

C.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 of AS 1530.4:2014, 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 of AS 1530.4:2014.

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

C.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 of AS 1530.4:2014.

C.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.

C.3.4 Alternative pipe materials

If an element is penetrated by —

+ a pipe other than brass, copper or ferrous alloys
+ a pipe of cross-section other than circular
+ 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 —
  - melting point of the material is equal to or greater than the tested specimen
  - surface area to mass ratio of a cross-section of the pipe is equal to or less than the tested specimen
  - thermal conductivity is equal to or less than the tested specimen diffusivity of the material.

C.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.

C.5 Plastic pipes

C.5.1 General

In addition to the requirements of clause 10.12.2 of AS 1530.4:2014, test results may be directly applied to masonry and concrete elements thicker than the tested prototype when installed in accordance with figure 10.12.5.1 of AS 1530.4:2014.

Results obtained from a particular test shall not be applied to plastics pipes of different diameters, wall thicknesses or material types.

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.

C.5.2 Services not perpendicular to the fire separation

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

C.6 Control joints

The following variations are permitted:

+ Results obtained from single test on a butt joints may be applied to contoured joints, provided the joints have —
  - equal width and equal or greater depth of sealant; and
  - equal or greater thickness of fire-separating element.
  - Note: Examples of butt and contoured control joints are shown in figure 10.12.6 of AS 1530.4:2014.
+ Facings may be applied to the surface of the fire-stopping system.

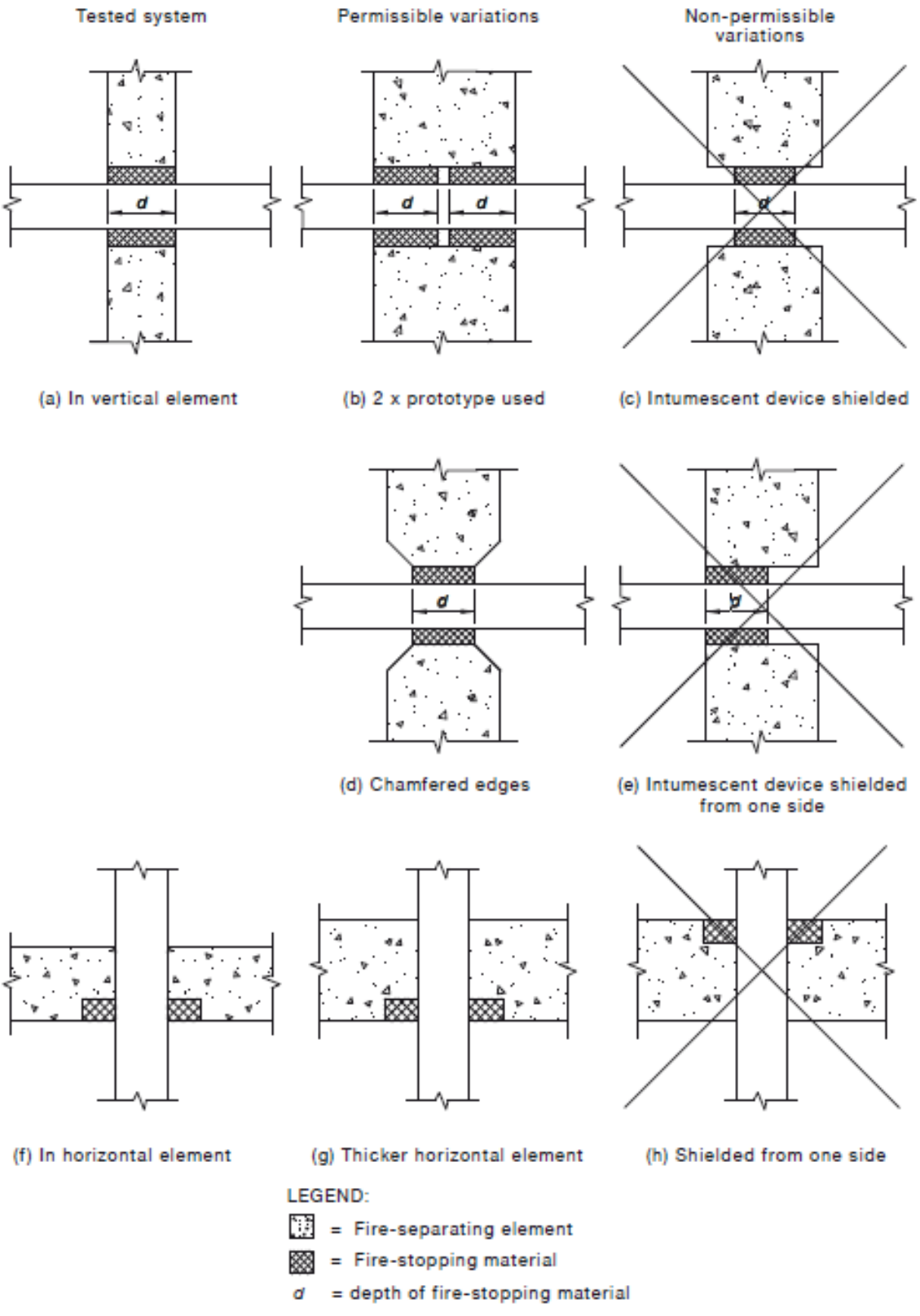


FIGURE 10.12.5.1 EQUIVALENT EXPOSURE OF UPVC PIPE FIRE-STOPPING SYSTEMS

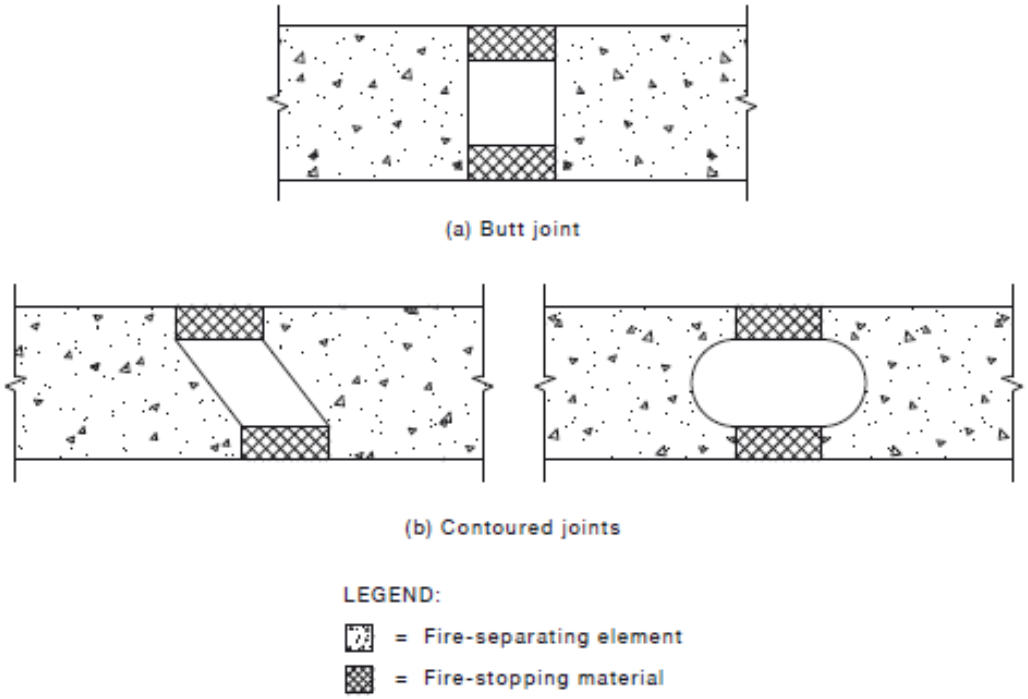


FIGURE 10.12.6 CONTOURED CONTROL JOINTS

Appendix D Instrumentation locations

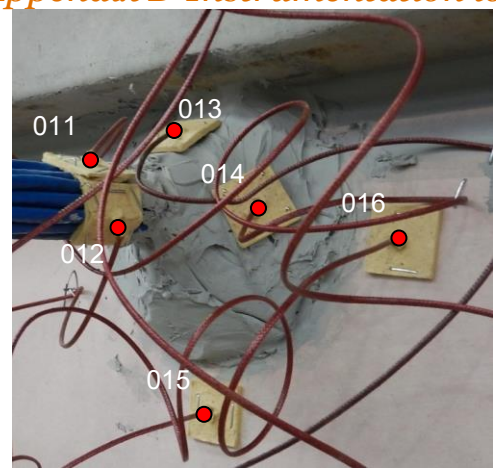


Figure 6 Penetration system A

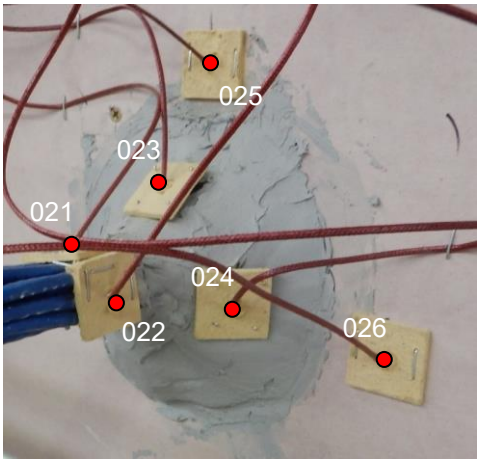


Figure 7 Penetration system B

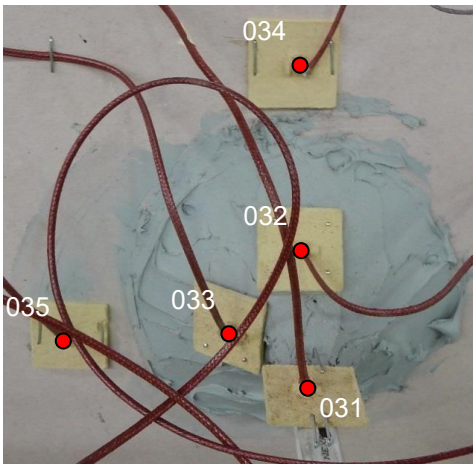


Figure 8 Penetration system C

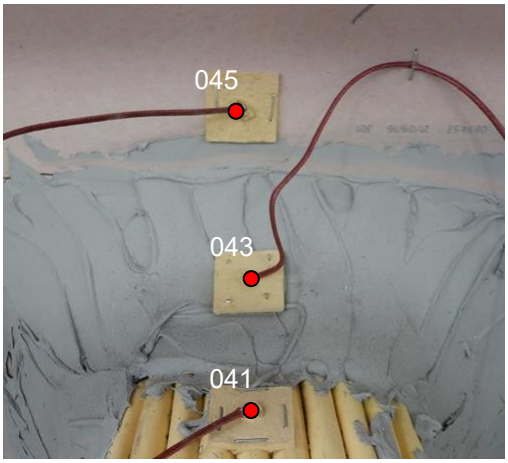


Figure 9 Penetration system D

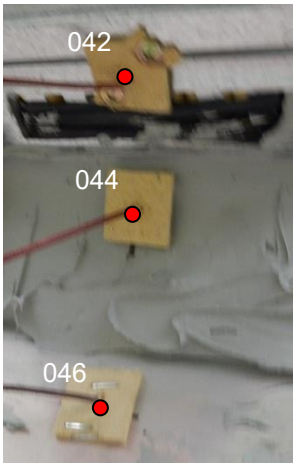


Figure 10 Penetration system D

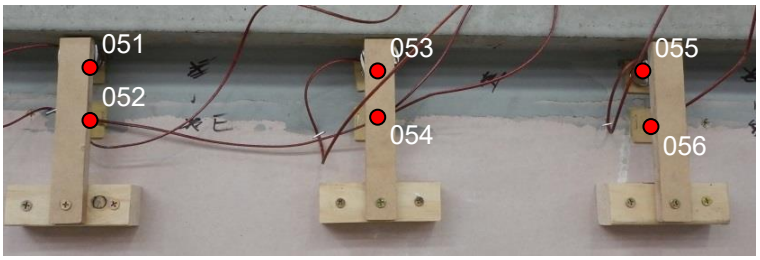


Figure 11 Penetration system E

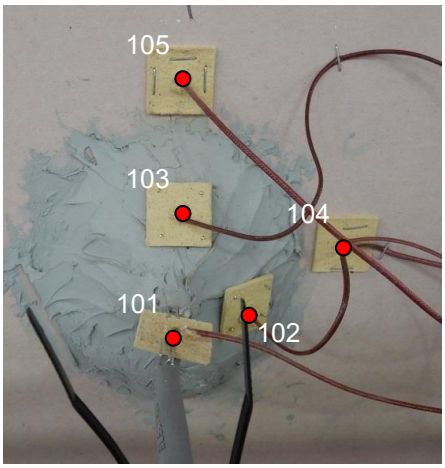


Figure 12 Penetration system F

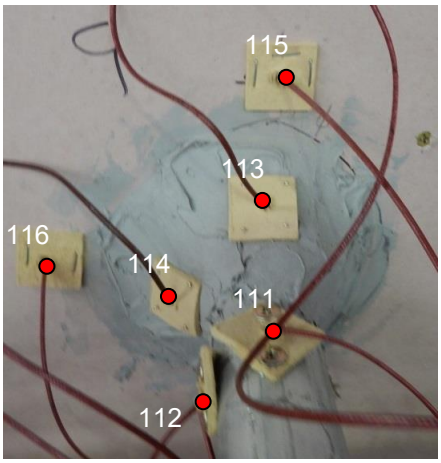


Figure 13 Penetration system G

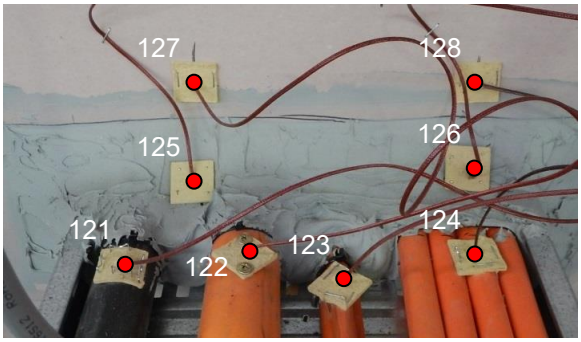


Figure 14 Penetration system H

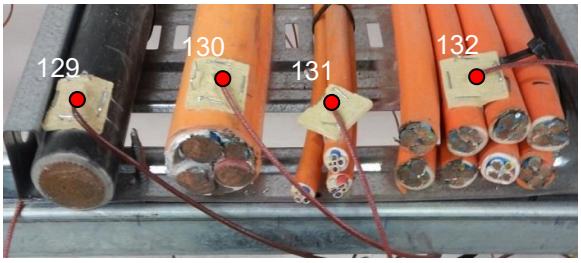


Figure 15 Penetration system H

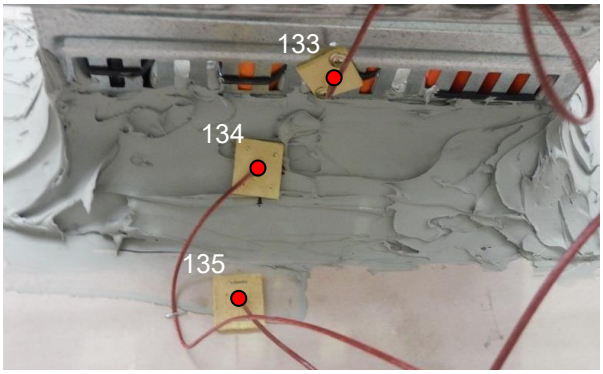


Figure 16 Penetration system H

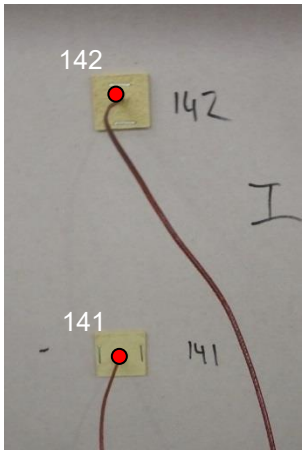


Figure 17 Penetration system I

Table 10 Thermocouple locations

Penetration system or control joint	TC 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.

Penetration system or control joint	TC No.	Description
	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.
	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 E Test data

E.1 Furnace temperature

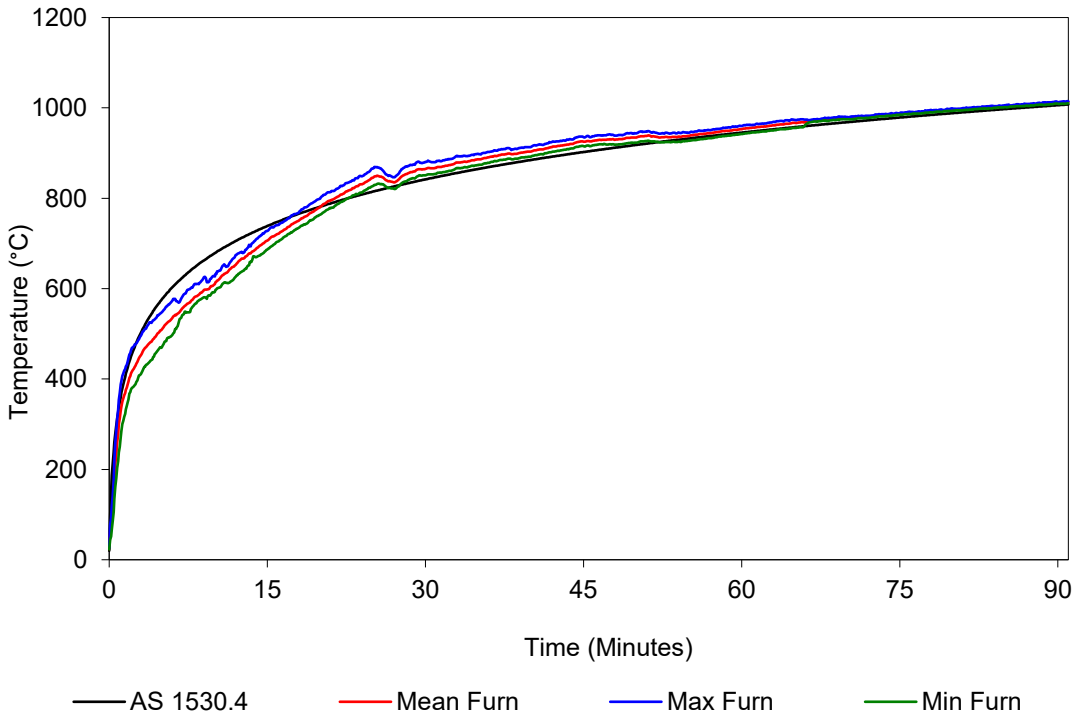


Figure 18 Furnace thermocouple temperature vs time

E.2 Furnace pressure

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

Table 11 Furnace pressure

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

E.3 Specimen temperatures

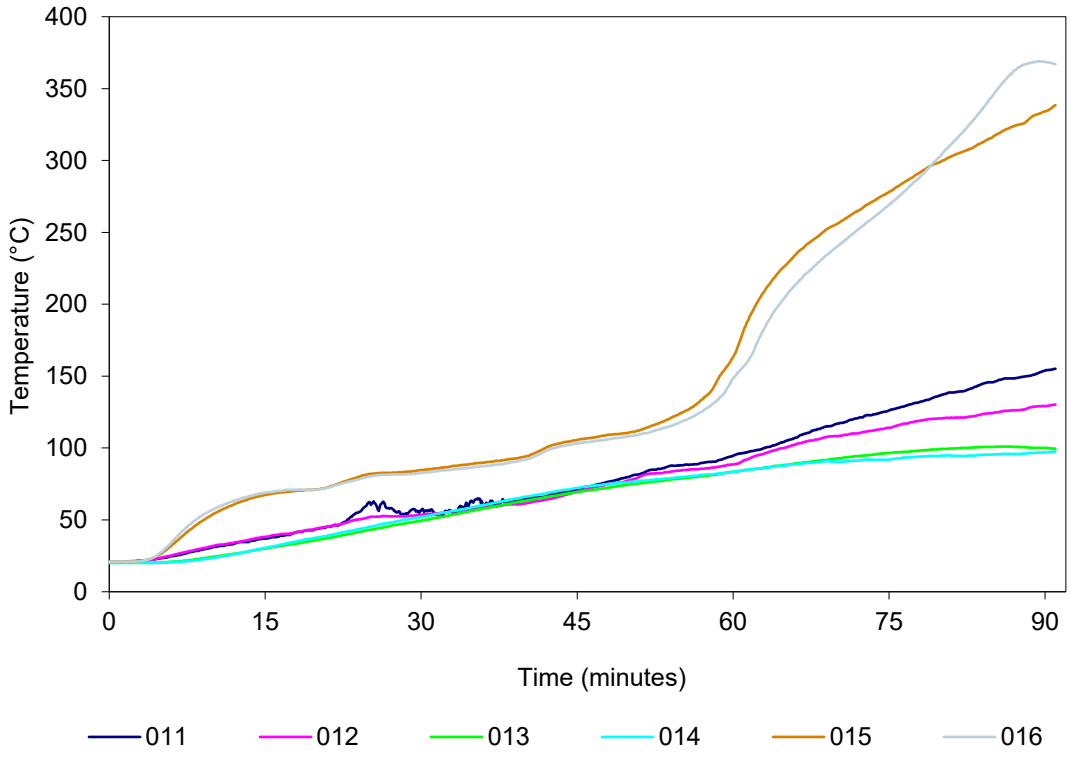


Figure 19 Penetration system A – temperature vs time

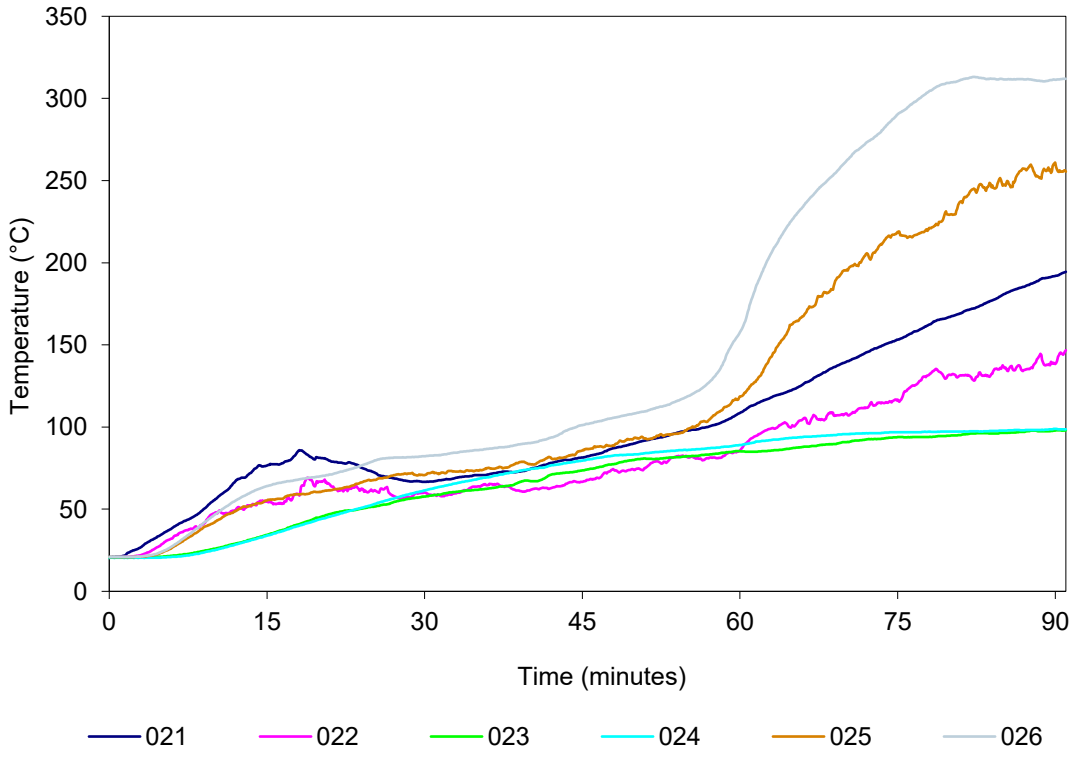


Figure 20 Penetration system B – temperature vs time

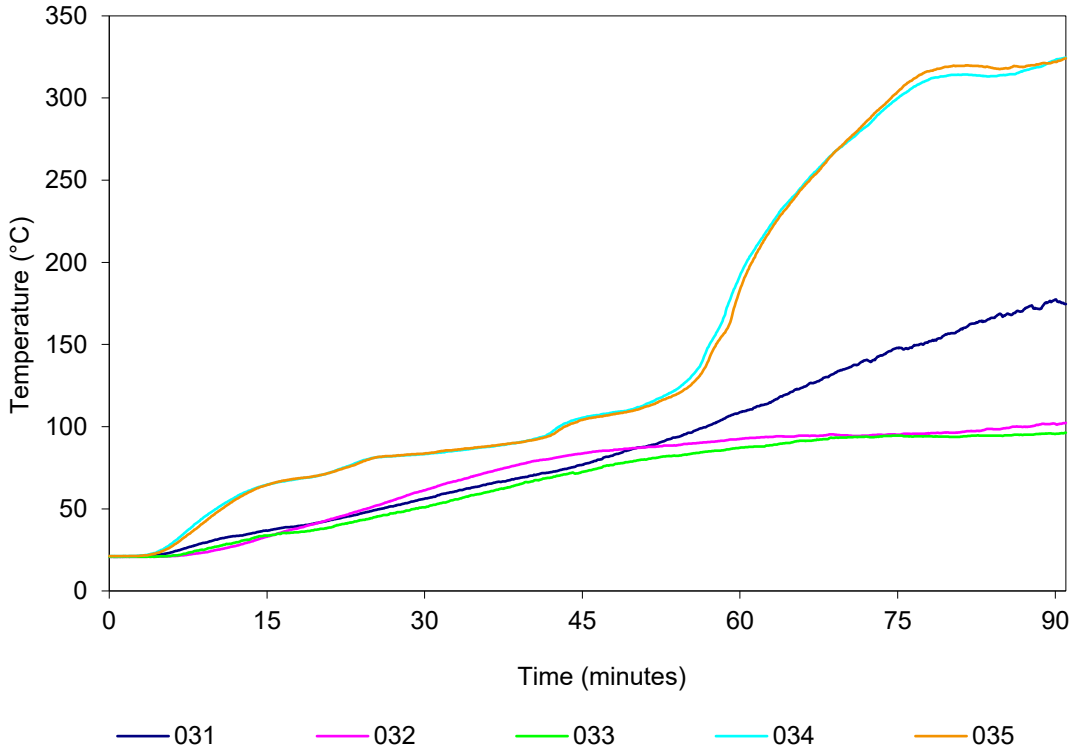


Figure 21 Penetration system C – temperature vs time

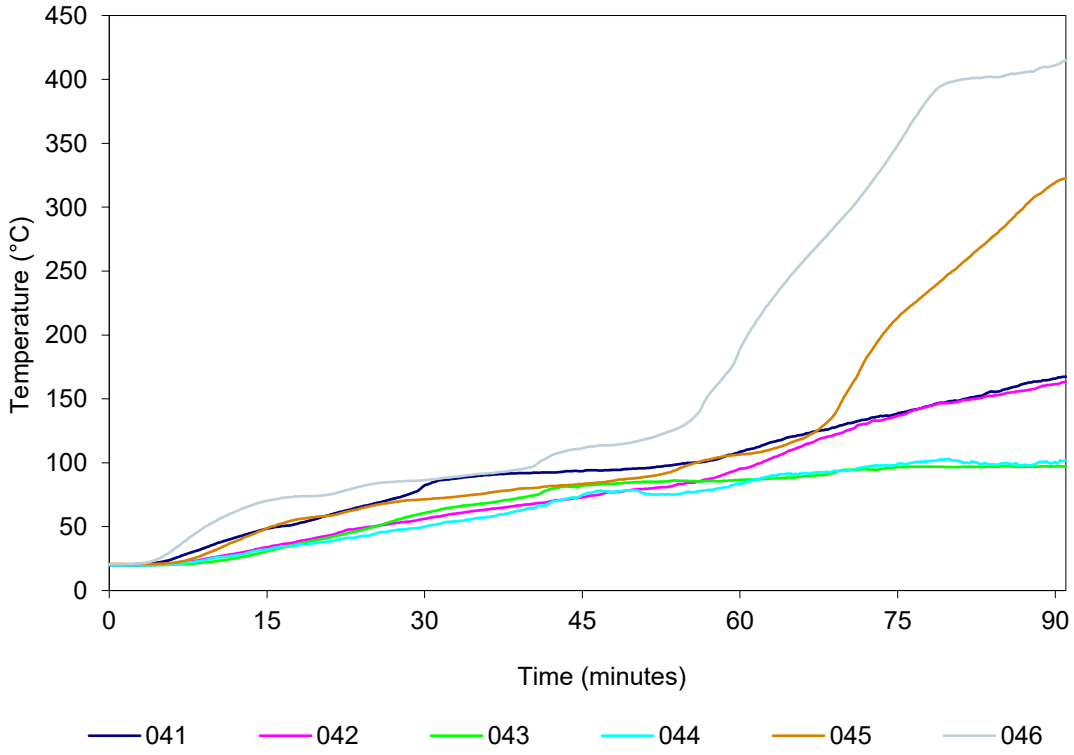


Figure 22 Penetration system D – temperature vs time

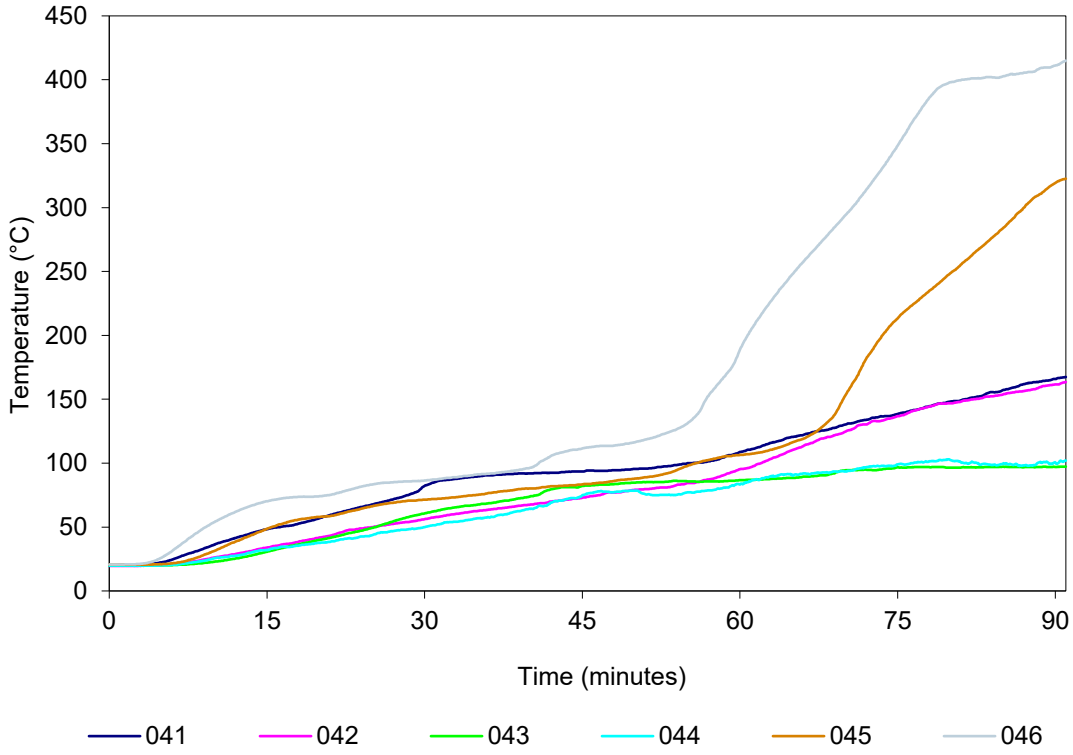


Figure 23 Penetration system E – temperature vs time

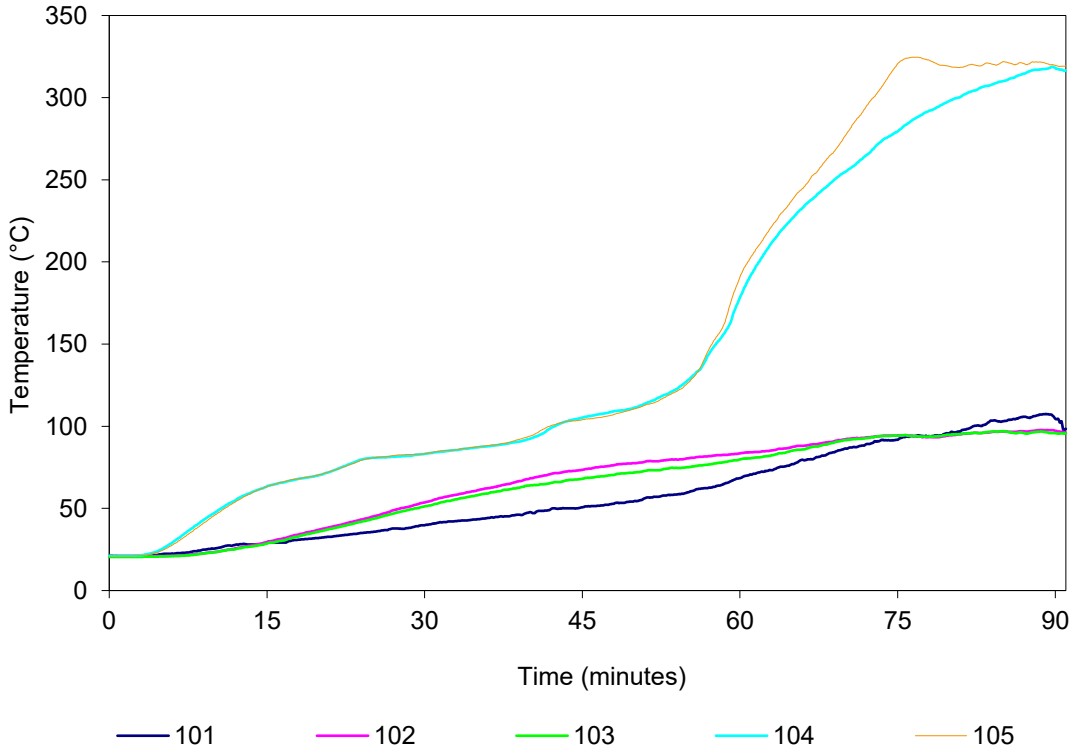


Figure 24 Penetration system F – temperature vs time

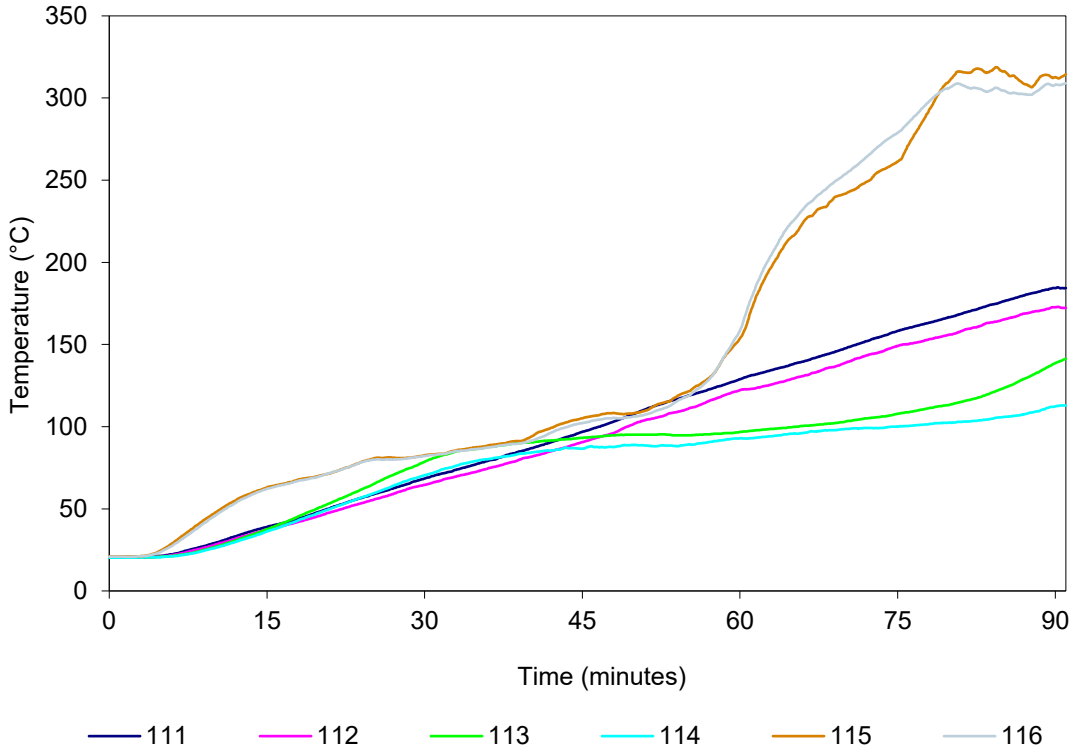


Figure 25 Penetration system G – temperature vs time

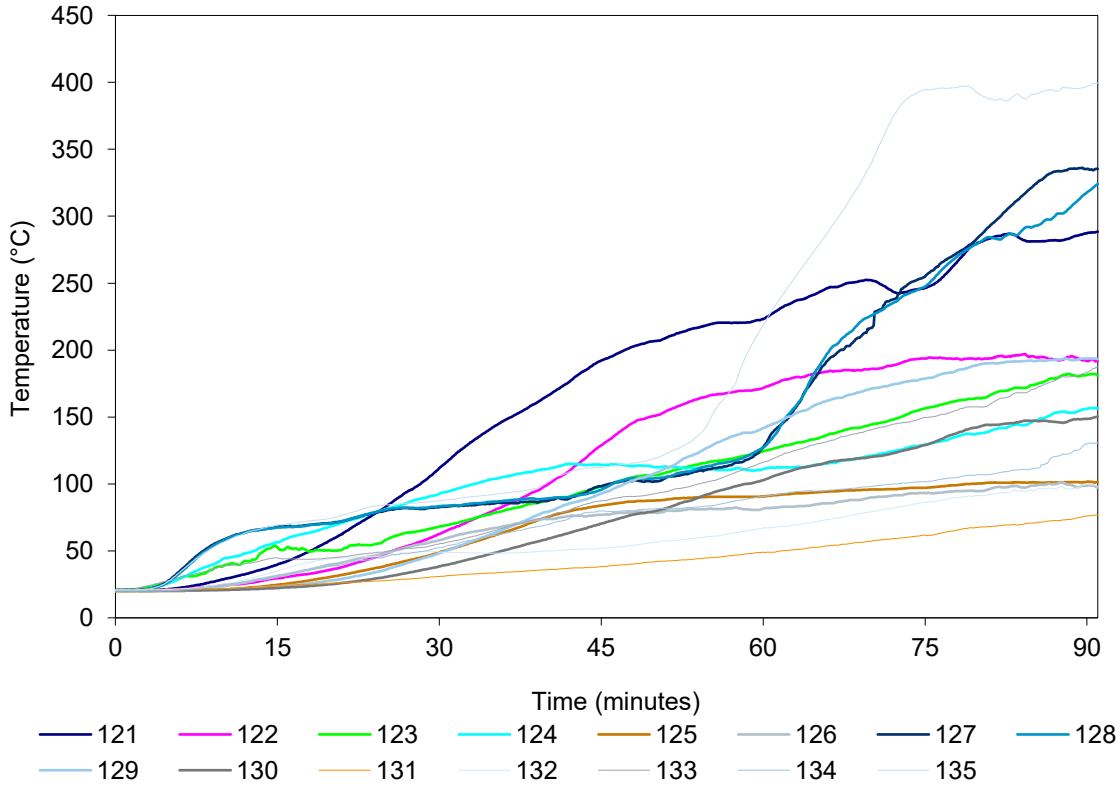


Figure 26 Penetration system H – temperature vs time

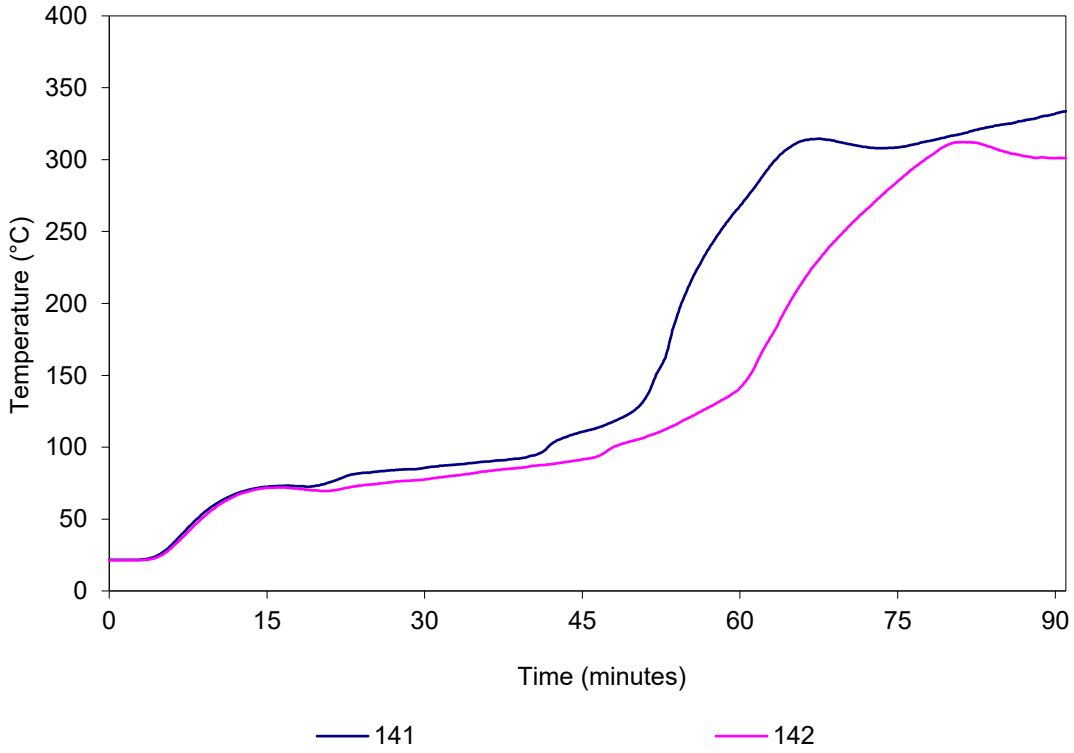


Figure 27 Penetration system I – temperature vs time

Table 12 Test specimen temperatures

Penetration system or Control joint	TC No.	Description[1]	Temp (°C) at t (minutes) t=0	t=15	t=30	t=60	t=90	Limit[2] (minutes)
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	-

Penetration system or Control joint	TC No.	Description[1]	Temp (°C) at t (minutes)					Limit[2] (minutes)
			t=0	t=15	t=30	t=60	t=90	
	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

Penetration system or Control joint	TC No.	Description[1]	Temp (°C) at t (minutes)					Limit[2] (minutes)
			t=0	t=15	t=30	t=60	t=90	
	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

Note: [1] Refer to Table 10 for the locations of thermocouples as only a generic description is included in the table.

2 Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180 K above the initial temperature.

3 No insulation failure before thermocouple malfunction.

‘–’ Under limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

Appendix F Photographs

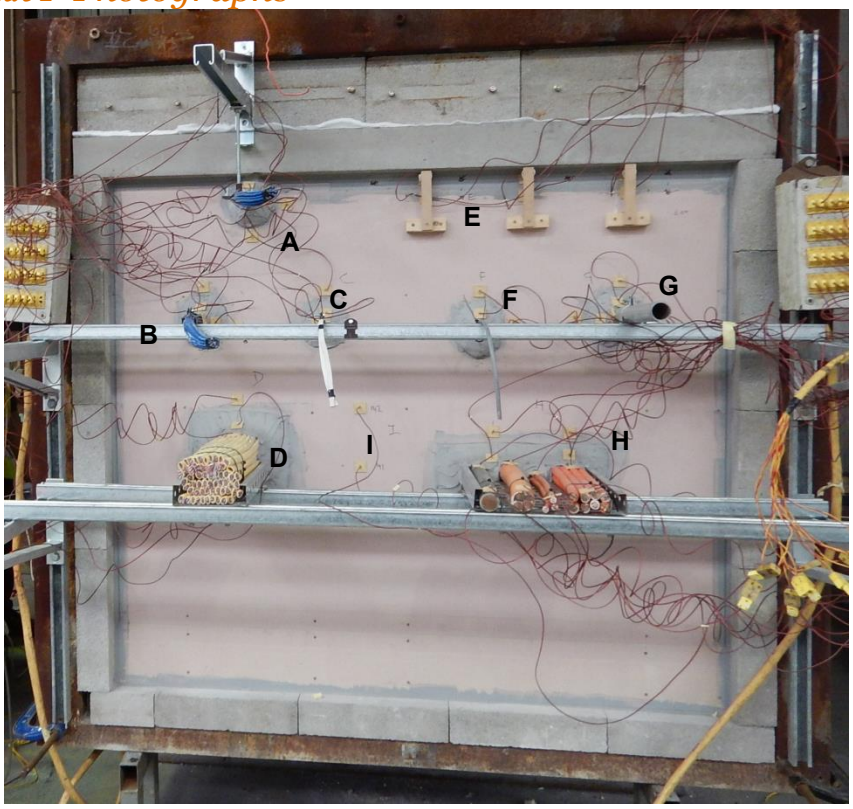


Figure 28 Unexposed face of the specimen before the start of the test

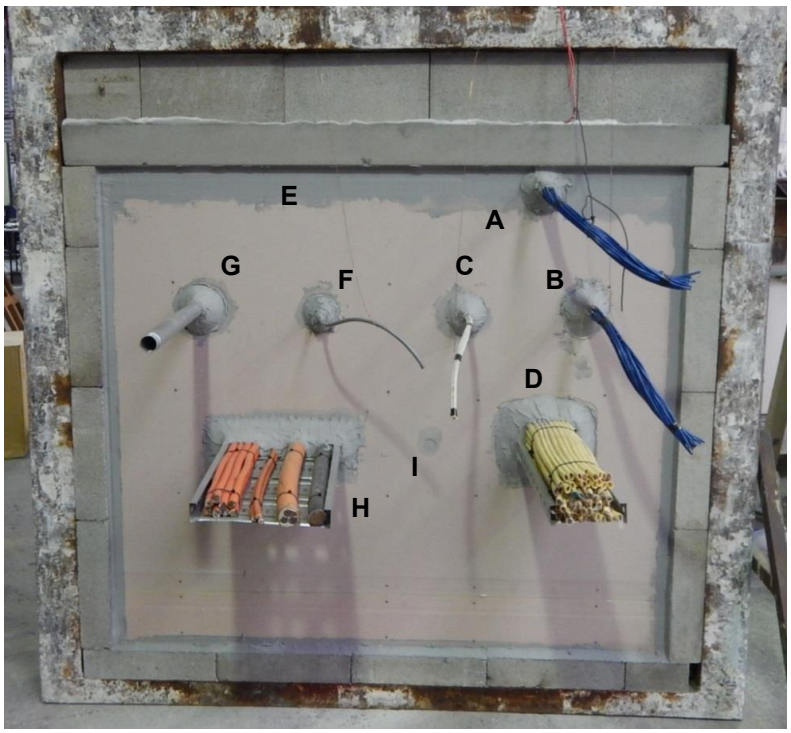
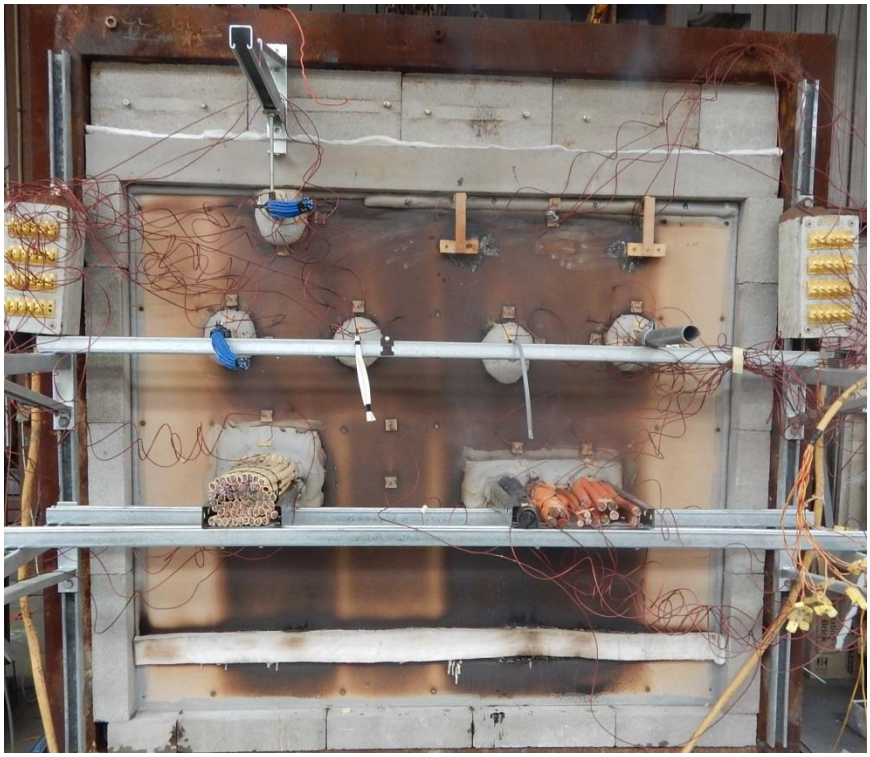


Figure 29 Exposed face of the specimen before the start of the test

West



East

Figure 30 Unexposed face of the specimen at the end of the test

East

West

Figure 31 Exposed face of the specimen at the end of the test

JENSEN HUGHES

Jensen Hughes Fire Testing Pty Ltd
ABN 81 050 241 524

Melbourne – NATA accredited laboratory

409-411 Hammond Road
Dandenong South Vic 3175
Australia
T: +61 3 9767 1000