warringtonfire

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Regulatory information report

Test standard: Sections 2 and 10 of AS 1530.4:2014

Test sponsor: Boss Products (Australia) Pty Ltd

Job number: FRT210330

Test date: 24 June 2022 Revision: RIR 1.1

Warringtonfire: accredited for compliance with ISO/IEC 17025 – Testing

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Quality management

Revision	Date	Information about the report			
RIR 1.0	22 July 2022	Description	Initial issue		
			Prepared by	Reviewed by	Authorised by
		Name	Patrick Chan	Mandeep Kamal	Mandeep Kamal
RIR 1.1	13 September 2022	Description	Amendment to the schedule of components table for services D, H & I.		
			Prepared by	Reviewed by	Authorised by
		Name	Patrick Chan	Mandeep Kamal	Mandeep Kamal
		Signature			

Executive summary

This report documents the findings of the fire resistance test of penetration systems in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 24 June 2022.

Warringtonfire performed the test at the request of Boss Products (Australia) Pty Ltd.

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 system	
Nominal separating element size	Width	1200 mm
	Height	1200 mm
	Thickness	130 mm
Number of penetration systems	Nine	
Restraint conditions	Restrained on all edges	

Table 2 Test specimen

Penetration system	Service	Local fire-stopping protection	Aperture size (mm)
A	DN 50 mm steel sprinkler pipe	BOSS FireMastic-300	Ø73 mm
B	• 1 × 48.4 mm steel sprinkler pipe • 2 × 22 mm stainless steel pipes with 20 mm Thermobreak 9705 lagging • 2 × 25 mm Kelox plus pipes • 1 × 25 mm condensation drain pipe • 1 × 16 mm² 3C+E cable • 1 × 50 mm² 2C+E cable • 3 × fire alarm cables • 4 × Cat 6 cables • 1 × 2.5 mm² 2C+E TPS cable • 1 × 2.5 mm² 3C+E TPS cable • 2 × RG6 Coax cables • 1 × Fig 8 cable • 1 × Security cable	• BOSS FyreBox™ – BFB-300 • BOSS FireMastic-300 • BOSS Thermal defence wrap	320 mm wide × 170 mm high
C	16 mm² 3C+E cable	BOSS FireMastic-HPE	Ø40 mm
D	• 2 × CAT 6 cables • 2 × RG6 Coax cables • 1 × Security cable • 1 × Fig 8 cable • 2 × Fire alarm cables	BOSS FireMastic-HPE	Ø40 mm
E	20 mm Pex-Xa pipe	BOSS FireMastic-HPE	Ø60 mm
F	20 mm Pex/Al/Pex pipe	BOSS FireMastic-HPE	Ø60 mm
G	25 mm Kelox plus pipe	BOSS FireMastic-HPE	Ø83 mm
H	• 1 × 3/8” × ¾” Pair coil w/ 19 mm insulation	BOSS FireMastic-HPE	Ø121 mm

Penetration system	Service	Local fire-stopping protection	Aperture size (mm)
	• 1 × 20 mm condensation drain pipe • 1 × 2.5 mm² 3C+E TPS cable • 1 × 2.5 mm² 2C+E TPS cable • 1 × Instrolex control cable		
I	• 1 × 32 mm conduit • 6 × 2.5 mm² 2C+E TPS cables inside the 32 mm conduit	BOSS FireMastic-HPE	Ø70 mm

Table 3 Test results

Penetration system	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 61 minutes	
B	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 94 minutes	
C	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
D	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 93 minutes	
E	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
F	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 65 minutes	
G	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
H	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
I	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	

Contents

1. Introduction

This report documents the findings of the fire resistance test of penetration systems in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 24 June 2022.

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

Table 4 Test sponsor details

Test sponsor	Address
Boss Products (Australia) Pty Ltd	Unit 1, 16 Atkinson Road Taren Point NSW 2229 Australia

2. 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 Warringtonfire.

All measurements were done by Warringtonfire – unless indicated otherwise.

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

Table 5 Schedule of components

Item	Description	
Separating element (SE)		
1.	Item name	130 mm CLT slab
	Manufacturer / Supplier	XLAM
	Product name	CL3/130
	Layers	3
	Size	1200 mm wide × 1200 mm high × 130 mm thick
	Density	464 kg/m^3
	Specification	Layer 1 – 42.5 mm thick MGP10 radiata pine, longitudinal orientation. Layer 2 – 45 mm thick G8 radiata pine, transverse orientation. Layer 3 – 42.5 mm thick MGP10 radiata pine, longitudinal orientation.
	Adhesive	Henkel Loctite HBS Purbond
	Moisture content	11%
SE	Overall size	1200 mm wide × 1200 mm high × 130 mm thick
	Restraint conditions	Restrained at all edges
	Installation	The CLT slab was fixed to the test frame and secured with timber screws. Nine apertures were created to allow services protruding through the wall.
Fire-stopping protections		
Sealant		
2.	Item name	FireMastic HPE
	Manufacturer / Supplier	BOSS Products Australia
	Product name	BOSS FireMastic-HPE
	Batch number	(11031938) Aug 21

Item	Description			
	Density	Nominal 1230 kg/m³ (provided by the test sponsor)		
3.	Item name	FireMastic 300		
	Manufacturer / Supplier	BOSS Products Australia		
	Product name	BOSS FireMastic-300		
	Batch number	(05031890)		
	Density	Nominal 1560 kg/m³ (provided by the test sponsor)		
Transit box				
4.	Item name	FyreBox™ 300		
	Manufacturer / Supplier	BOSS Products Australia		
	Product name	BOSS FyreBox™ – BFB-300		
	Transit box details	Width	300 mm	
		Height	150 mm	
		Length	272 mm	
		Outer shell thickness	1.15 mm thick mild steel	
	Intumescent bag details	Number of bags	Large bag	4
			Medium bag	4
		Width	Large bag	252 mm
			Medium bag	116 mm
		Height	Large bag	80 mm
			Medium bag	85 mm
		Overall thickness	Large bag	9.8 mm
			Medium bag	11 mm
		Density	1335 kg/m^3	
	Brushes	Number of Brushes	4	
		Overall width	295 mm	
		Overall height	100 mm	
		Overall Thickness	3 mm	
	Transit box description	The transit box comprised of two sections: The top section was 300 mm wide × 270 mm deep and 10 mm high. There were two large intumescent bags attached to the top section. The bags were secured with double sided tape and 3 × intumescent bag clamps. Two brushes were attached to the top section on each end. The bottom section was 300 mm wide × 270 mm deep × 150 mm high. There were two large and four medium intumescent bags attached to the bottom section. The bags were secured with double sided tape and 4 × intumescent bag clamps. Two brushes were attached to the bottom section on each end. A service support bar was installed at the mid depth of the bottom section at mid height.		
	Product name	Mounting L angle		
	Overall size	Width	40 mm	
		Height	21.5 mm	
		Outer shell thickness	1.15 mm thick galvanised steel	

Item	Description		
	Description	The mounting L angles were installed around the perimeter of the fire box. They were fixed to the CLT wall with timber screws and to the fire box with hex head Tek screws.	
Wrap			
5.	Item name	Thermal defence wrap	
	Manufacturer / Supplier	BOSS Products Australia	
	Product name	BOSS Thermal defence wrap	
	Overall size	300 mm wide × 6.5 mm thick	
	Mineral fibre wool density	107 kg/m^3	
Services			
6.	Item name	20 mm condensation drain pipe	
	Manufacturer / Supplier	AussieDuct	
	Product name	13522 Aircon and refrigeration HVAC quality BEP PVC long life recyclable PVC phone 13 11 69 S1 20 PVC-U PN12 LIC No 1012 AS/NZS 1477 SL15 [0] 22031711:15	
	Material	uPVC	
	Size	Outer diameter	26.5 mm
		Wall thickness	1.5 mm
7.	Item name	25 mm condensation drain pipe	
	Manufacturer / Supplier	AussieDuct	
	Product name	13566 Aircon and Refrigeration HVAC quality BEP PVC long life recyclable PVC phone 13 11 69 S1 25 PVC-U PN9 LIC No. 1012 AS/NZS 1477 SL18-1 [0] 22012200.44	
	Material	uPVC	
	Size	Outer diameter	33.5 mm
		Wall thickness	1.8 mm
8.	Item name	32 mm conduit	
	Manufacturer / Supplier	AussieDuct	
	Product name	AussieDuct BEP PVC uPVC Electrical AS/NZS 62053 32mm MD-T 0/60	
	Material	uPVC	
	Size	Outer diameter	33 mm
		Wall thickness	1.9 mm
9.	Item name	20 mm Pex-Xa pipe	
	Manufacturer / Supplier	Rehau	
	Product name	Rehau Rautitan platinum 20 × 2.8 1132340 DN/OD20 PN20 SDR 7.4 Pe-Xa 80 For portable water supply AS/NZS 2492 LN1413 209b2220211122 Made by Rehau Design Pressure according ISO 15875 A Class 1-5/10 bar opaque 209b 22 2021-11-22	
	Material	Pex-Xa	
	Size	Outer diameter	20.4 mm

Item	Description		
		Wall thickness	2.9 mm
10.	Item name	20 mm Pex/Al/Pex pipe	
	Manufacturer / Supplier	Rehau	
	Product name	REHAU RAUTITAN gas stabil PE-Xa/Al/PE 20x2.9 T3031920180529 for NG and LPG MOP 70kPa AS4176.8 Class 500 PE-Al-PEX LN75687 GERMANY / GASTEC QA GAS MOP 100mbar ENKEL VOOR GASINSTALLATIES / TIP 442 UNI TS 11344 MOP 0.5 GAS T303 S19 2018-05-29	
	Material	Pex/AL/Pex	
	Size	Outer diameter	20 mm
		Wall thickness	2.9 mm
11.	Item name	25 mm Kelox plus pipe	
	Manufacturer / Supplier	Ke Kelit	
	Product name	KM133 KELOX Plus Ce DOP001-113 (PE schaum) OENORM 21003 Tmax 90 °C 10 bar 25 × 25 13 mm	
	Pipe name	Kelox – Mehrschichtverbundrohr M/multilayer pipe M 25 × 2.5 mm made in Germany Norm EN ISO 21003 gepruft/approved TW/Potable water, Klasse/Class 4u.5 Klasse/Class 1u.2 70°/10 bar Tmax 90°/10 bar KIWA K92045 class 2/10 bar, KOMO K 92049 class 5/6 bar PE-RT type II/AL/PE-RT Type II DVGW DW-8501CM0535, OVGW W1.235 IAPMO, WM022381	
	Size	Pipe outer diameter Pipe wall thickness Insulation outer diameter Insulation thickness Insulation density	24.6 mm 2.6 mm 49.2 mm 13 mm 0.1 kg/m
	Material	Pipe Insulation	PE-RT/AL/PE-RT Soft foam inside, PE film on outer layer.
12.	Item name	3/8” × ¾” Pair coil w/ 19 mm insulation	
	Manufacturer / Supplier	Kembla	
	Product name	Kembla PaircoilMAX Premium Fire retardant Pair coil 3/8” × ¾” × 19 mm	
	Material	Pipe Insulation	Copper Nitrile rubber
	Size	Outer diameter Wall thickness Insulation thickness	9.62 mm + 19 mm 1.4 mm + 2.8 mm 19 mm
13.	Item name	DN 50 mm steel sprinkler pipe	
	Manufacturer / Supplier	Unknown	
	Material	Painted mild steel	
	Size	Outer diameter Wall thickness	60.3 mm 3.3 mm
14.	Item name	DN 40 steel sprinkler pipe	

Item	Description		
	Manufacturer / Supplier	Unknown	
	Material	Galvanised steel	
	Size	Outer diameter	48.7 mm
		Wall thickness	4.1 mm
15.	Item name	DN20 stainless steel pipe	
	Manufacturer / Supplier	AirEnergy	
	Product name	AISI 316L EN 10217-7 22 × 1.2 × 6000 mm 320G Heat No: IS316L 006120	
	Material	Stainless steel	
	Size	Outer diameter	22.3 mm
		Wall thickness	1.4 mm
16.	Item name	2.5 mm^2 3C+E TPS cable	
	Manufacturer / Supplier	Electra cables	
	Product name	Electra cables 2016 V-90 Electric cable 450/750V SRF4025V 2.5mm^2 × 3C+E 3V-90 RoHs 201605213066	
	Size	15.5 mm × 5.7 mm	
17.	Item name	2.5 mm^2 2C+E TPS cable	
	Manufacturer / Supplier	Prysmian	
	Product name	Prysmian L electric cable 450/150V V-90 2C × 2.5 mm^2 + E 2.5 mm^2 CU Made in Australia EESS compliant ESV REG ESV 170166	
	Size	12.1 mm × 5.6 mm	
18.	Item name	Cat 6 cable	
	Manufacturer / Supplier	Ezydata	
	Product name	Ezydata CAT6 4 Pair UTP PVC communication cable	
	Size	Outer diameter	5.8 mm
19.	Item name	RG6 Coax cable	
	Manufacturer / Supplier	Omega	
	Product name	Omega RG6U-Q 75 OHM Coaxial cable 20/21-302237	
	Size	Outer diameter	7.3 mm
20.	Item name	Fire alarm cable	
	Manufacturer / Supplier	FireSense	
	Product name	FireSense – TPS – HF - 1.5 - 2C - ELV – Fire – light duty – PVC Free – LSZH – AS/ACT S008/9 ASA-181006	
	Size	7.0 × 4.5 mm	
21.	Item name	16 mm^2 3C+E cable	
	Manufacturer / Supplier	Electra Cables	

Item	Description		
	Product name	Electra cables 2021 X-90 Electric cable 0.6/1kV XLPE 3160E 16 mm² × 3 C+E CU UV RoHS GMA-503311 EA	
	Size	Diameter	18 mm
22.	Item name	50 mm² 2C+E cable	
	Manufacturer / Supplier	Electra cable	
	Product name	Electra cable 0.6/1kV XLPE2500E 50 mm² × 2C+E Cu UV ROHS 201803152075	
	Size	Diameter	24 mm
23.	Item name	Fig 8 cable	
	Manufacturer / Supplier	Unknown	
	Product name	Fig 8 24/0 20 mm Cable RoHS compliant 224M 2016	
	Size	Diameter	5.7 mm
24.	Item name	Security cable	
	Manufacturer / Supplier	Ezyvision	
	Product name	Ezyvision ACA Approved security cable OSC140200 N402 079M 10/A30272 12/18	
	Size	Diameter	5.7 mm
25.	Item name	Instrolex control cable	
	Manufacturer / Supplier	Nexans Olex	
	Product name	Instrolex Instrumentation Unscreened & Overall screened Pairs (2 pair 1.5 mm² cores)	
	Size	Diameter	10.2 mm
Fixings			
26.	Item name	Timber screws	
	Manufacturer / Supplier	Buildex	
	Product description	Timber hex head with seal 14 G × 100 mm TPI 10 self-drill galvanised screws	
	Size	14 G × 100 mm long	
Pipe insulation			
27.	Item name	THERMOBREAK® LS (9705)	
	Manufacturer / Supplier	Sekisui Foam Australia	
	Material	Crosslinked polyolefin foam with foil facing.	
	Density	0.088 kg/m	
	Size	OD Wall thickness	65.9 mm 25 mm
Penetration system A			
A	Service	DN 50 mm steel sprinkler pipe (item 13)	

Item	Description	
	Service detail	The service protruded from the separating element 500 mm on both the exposed and the unexposed side. The service was capped on the exposed size with a welded end cap.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm on the unexposed side with metal wire.
	Aperture size	Ø73 mm
	Local fire-stopping protection	
	Protection	FireMastic 300 (item 3) was applied to the annular gap between the service and the separating element to a depth of 10 mm and finished with 30 mm × 30 mm fillet on both the exposed and the unexposed sides. See Figure 1 to Figure 6 in Appendix A for more details.
Penetration system B		
B	Service	• 1 × 48.4 mm steel sprinkler pipe (item 14) • 2 × 22 mm stainless steel pipes (item 15) with 20 mm Thermobreak 9705 lagging (item 27) • 2 × 25 mm Kelox plus pipes (item 11) • 1 × 25 mm condensation drain pipe (item 7) • 1 × 16 mm² 3C+E cable (item 21) • 1 × 50 mm² 2C+E cable (item 22) • 3 × fire alarm cables (item 20) • 4 × Cat 6 cables (item 18) • 1 × 2.5 mm² 2C+E TPS cable (item 17) • 1 × 2.5 mm² 3C+E TPS cable (item 16) • 2 × RG6 Coax cables (item 19) • 1 × Fig 8 cable (item 23) • 1 × Security cable (item 24)
	Service detail	The services penetrated the separating element through the FyreBox™ 300 (item 4) and extended 500 mm on the exposed side and 500 mm on the unexposed side (cables and metal pipe) as well as 2000 mm (Kelox plus and condensation pipes). The condensation drain pipe, Kelox plus pipe and stainless steel pipes were capped with FireMastic 300 (item 3) on the exposed side. The 48.4 mm steel sprinkler pipe was capped with a welded end cap
	Service support	The services were supported at 300 mm on the exposed side and 260 mm (all service) & 1490 mm (Kelox plus and condensation pipes) on the exposed side with metal wires.
	Aperture size	320 mm wide × 170 mm high
	Local fire-stopping protection	
	Protection	The FyreBox™ 300 (item 4) was installed in the aperture which protruded from the separating element 71 mm on both the exposed and the unexposed side. The mounting L angles were installed around the FyreBox™ 300 on both the exposed and the unexposed sides. The L angles were fixed to the separating element with timber screws (item 26) and friction fix to the FyreBox™ 300. FireMastic 300 (item 3) was applied into the annular gap between the separating element and the FyreBox™ 300 to a depth of 10 mm and finished flush with the separating element on both the exposed and the unexposed sides. After all the services protruded through the FyreBox™ 300, a layer of thermal defence wrap (item 5) was wrapped around the FyreBox™ 300 and the services up to 300 mm away from the separating element on both the exposed and the unexposed side. The wrap was secured to the FyreBox™ 300 and the services with metal cable ties and metal backing tape.

Item	Description	
		See Figure 1 to Figure 5 and Figure 7 in Appendix A for more details.
Penetration system C		
C	Service	16 mm² 3C+E cable (item 21)
	Service detail	The service protruded from the separating element 500 mm on both the exposed and the unexposed sides.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm on the unexposed side with metal cable ties.
	Aperture size	Ø40 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the service and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 8 in Appendix A for more details.
Penetration system D		
D	Service	• 2 × CAT 6 cables (item 18) • 2 × RG6 Coax cables (item 19) • 2 × Fire alarm cables (item 20) • 1 × Security cable (item 24) • 1 × Fig 8 cable (item 23)
	Service detail	The service protruded from the separating element 500 mm on both the exposed and the unexposed sides.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm on the unexposed side with metal cable ties.
	Aperture size	Ø40 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 9 in Appendix A for more details.
Penetration system E		
E	Service	20 mm Pex-Xa pipe (item 9)
	Service detail	The service protruded from the separating element 500 mm on the exposed side and 2000 mm on the unexposed sides. The service was capped with FireMastic 300 (item 3) on the exposed side.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm & 1490 mm on the unexposed side with metal cable ties.
	Aperture size	Ø60 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 10 in Appendix A for more details.
Penetration system F		
F	Service	20 mm Pex/Al/Pex pipe (item 10)
	Service detail	The service protruded from the separating element 500 mm on the exposed side and 2000 mm on the unexposed sides. The service was capped with FireMastic 300 (item 3) on the exposed side.

Item	Description	
	Service support	The service was supported at 300 mm on the exposed side and 260 mm & 1490 mm on the unexposed side with metal cable ties.
	Aperture size	Ø60 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 11 in Appendix A for more details.
Penetration system G		
G	Service	25 mm Kelox plus pipe (item 11)
	Service detail	The service protruded from the separating element 500 mm on the exposed side and 2000 mm on the unexposed sides. The service was capped with FireMastic 300 (item 3) on the exposed side.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm & 1490 mm on the unexposed side with metal cable ties.
	Aperture size	Ø83 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 12 in Appendix A for more details.
Penetration system H		
H	Service	• 1 × 3/8" × ¾" Pair coil w/ 19 mm insulation (item 12) • 1 × 20 mm condensation drain pipe (item 6) • 1 × 2.5 mm² 3C+E TPS cable (item 16) • 1 × 2.5 mm² 2C+E TPS cable (item 17) • 1 × Instrolex control cable (item 25)
	Service detail	The services protruded from the separating element 500 mm on the exposed side and the unexposed sides. The condensation drain pipe was capped with FireMastic 300 (item 3) on the exposed side. The pair coil was crimped at the end on the exposed side.
	Service support	The service was supported at 300 mm on the exposed side and 260 mm & 1490 mm (condensation drain pipe) on the unexposed side with metal cable ties.
	Aperture size	Ø121 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 13 in Appendix A for more details.
Penetration system I		
I	Service	• 1 × 32 mm conduit (item 8) • 6 × 2.5 mm² 2C+E TPS cables (Item 17) inside the 32 mm conduit
	Service detail	The conduit (item 8) protruded from the separating element 500 mm on the exposed side and 2000 mm on the unexposed side. The TPS cables (item 17) were inserted into the conduit before the conduit was install into the separating element. The gap between the conduit and the TPS cables was filled with FireMastic 300 (item 3). The cables had the same length as the conduit.

Item	Description	
	Service support	The conduit was supported 300 mm on the exposed side and 260 mm & 1490 mm on the unexposed side.
	Aperture size	Ø70 mm
	Local fire-stopping protection	
	Protection	The FireMastic HPE (item 2) was applied into the annular gap between the services and the separating element at the depth of 20 mm and finished flush with the separating element on both the exposed and the unexposed sides. See Figure 1 to Figure 5 and Figure 14 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
Start date for construction of separating element	3 May 2022
Start date for installation of fire-stopping protection for the penetration systems	3 May 2022
Completion date for constructing and installing the test specimen	10 June 2022
Separating element constructed by	Representatives of the test sponsor
Fire-stopping protection for penetration systems installed by	Representatives of the test sponsor
Symmetry	Asymmetrical due to: • The pipes and pair coils capped on the exposed side only. • The pipes protruded nominally 500 mm on the exposed side and 2000 mm on the unexposed. • Fire protection was symmetrical.

3. 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.	
Variations	None	
Pre-test conditioning	The construction and installation of the test specimen was completed on 10 June 2022. 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 Warringtonfire.	
Ambient laboratory temperature	Start of the test Minimum temperature Maximum temperature	16 °C 15 °C 18 °C
Test duration	100 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. • 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 330 mm above mid-height of the lowest penetration and corrected to mid-height of the lowest penetration	

4. 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.

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.

Table 8 Test results

Penetration system	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 61 minutes	
B	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 94 minutes	
C	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
D	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 93 minutes	
E	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
F	Structural adequacy	Not applicable	**-/90/60**
	Integrity	No failure at 100 minutes	
	Insulation	Failure at 65 minutes	
G	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
H	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	
I	Structural adequacy	Not applicable	**-/90/90**
	Integrity	No failure at 100 minutes	
	Insulation	No failure at 100 minutes	

5. 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 Warringtonfire 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 drawings of the test assembly in Figure 1 to Figure 14 were provided by the test sponsor and marked up by Warringtonfire. These mark-ups to the drawings were:

- Adding the item leaders and dimensions in the cross-section drawings.
- Change the specimen identification on the elevation drawings.

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

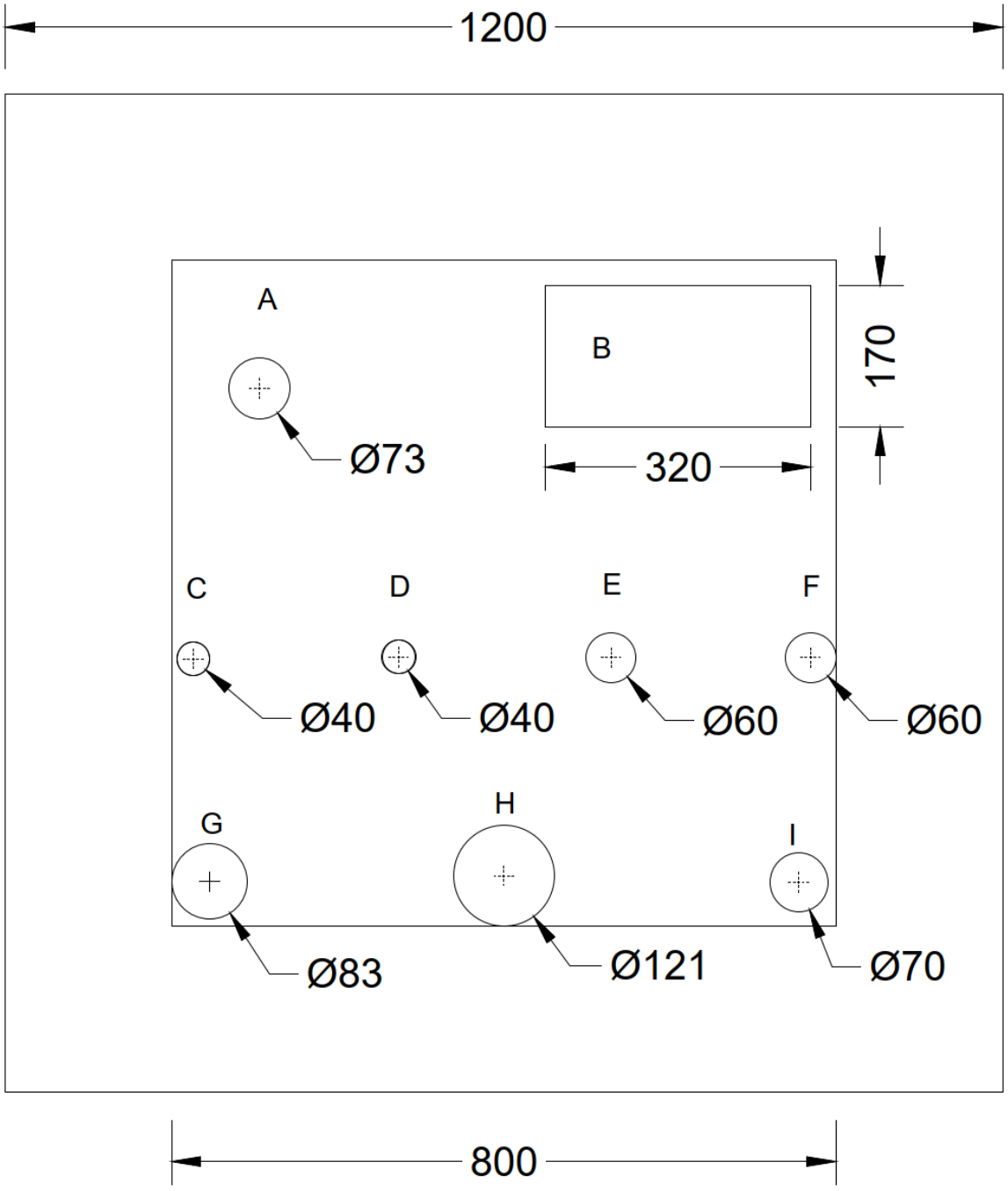

Figure 1 Elevation view of the core hole apertures (unexposed side)

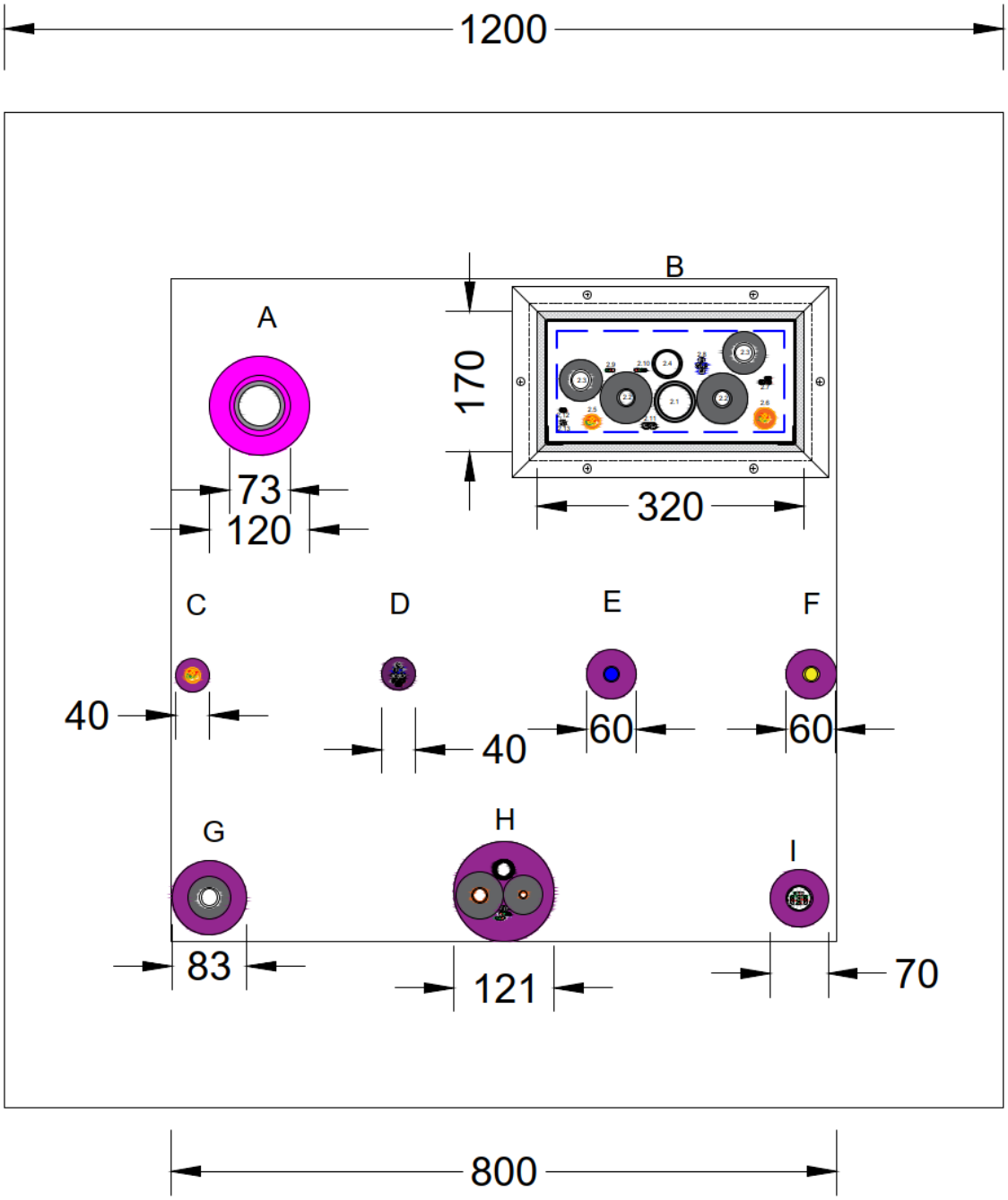

Figure 2 Elevation view of test specimen (unexposed side)

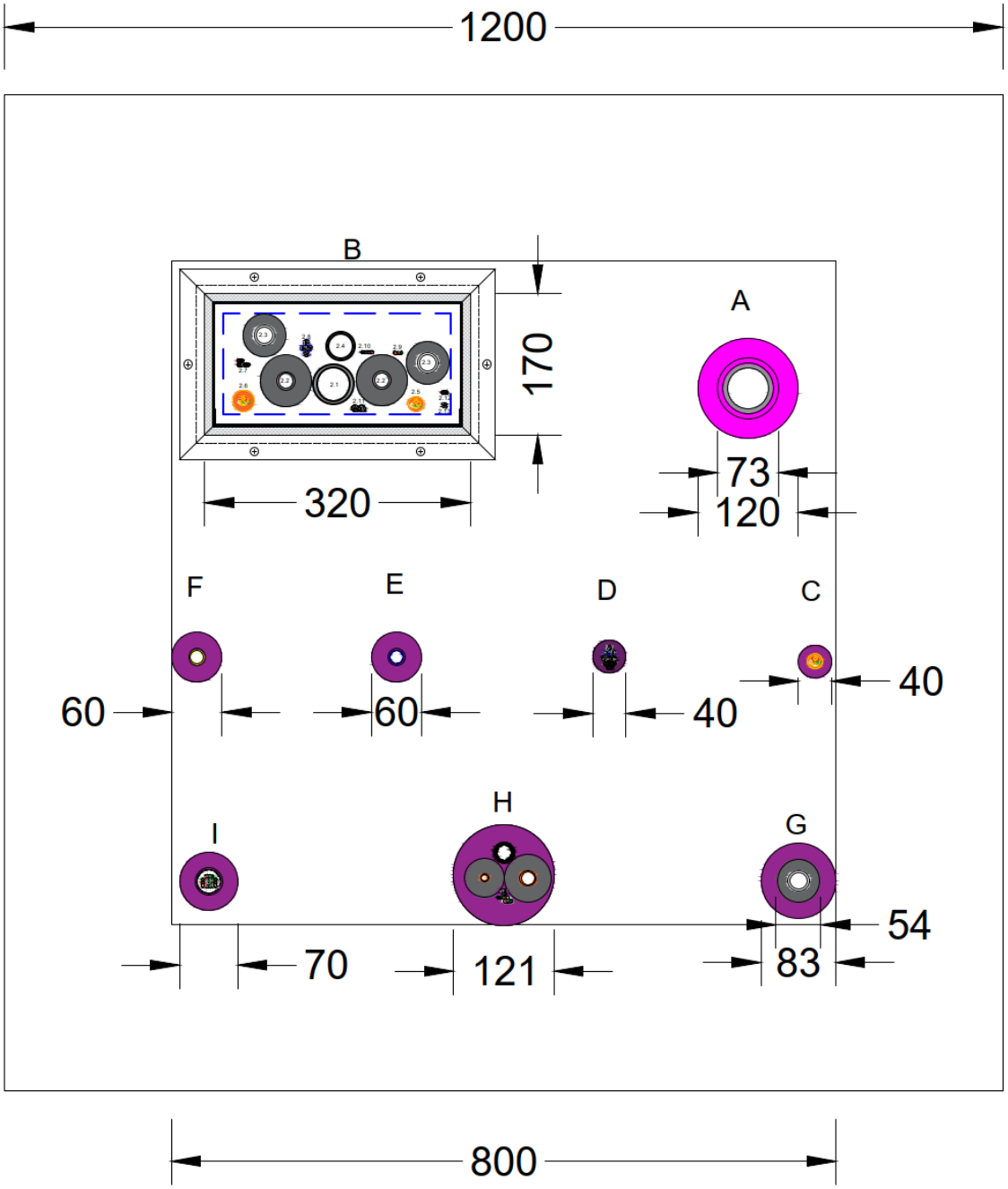

Figure 3 Elevation view of test specimen (exposed side)

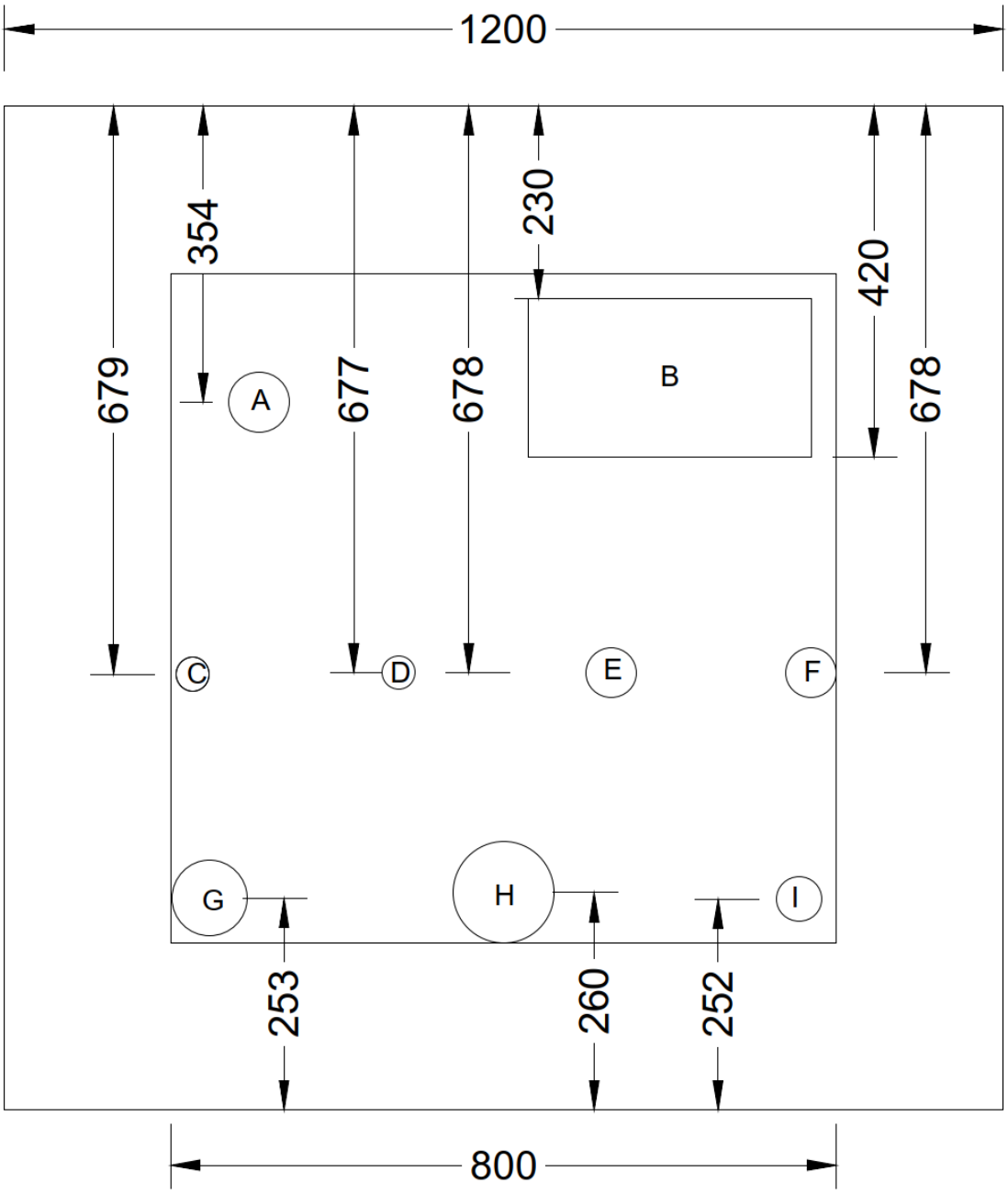

Figure 4 Elevation view of test specimen location (vertical distance)

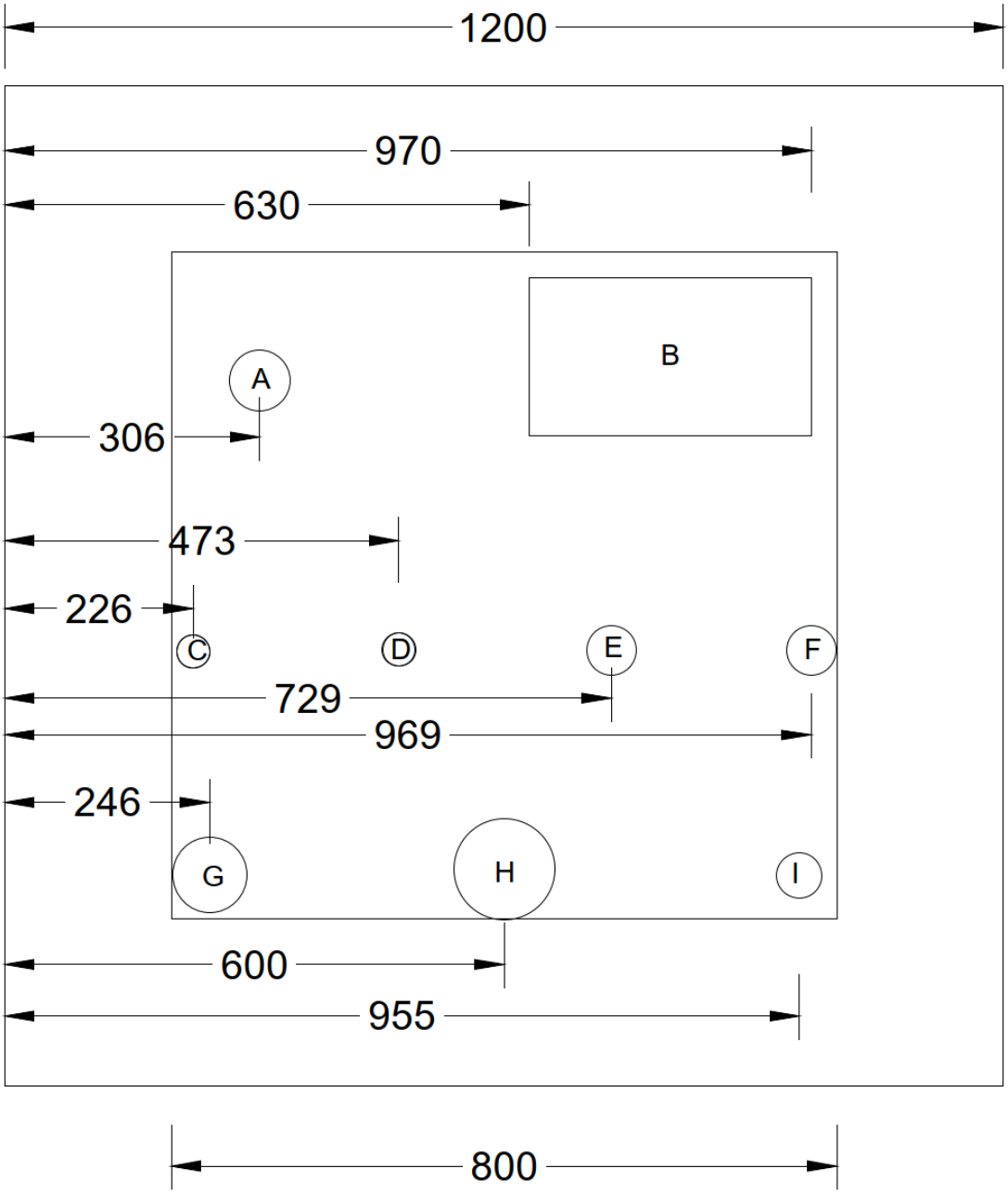

Figure 5 Elevation view of test specimen location (horizontal distance)

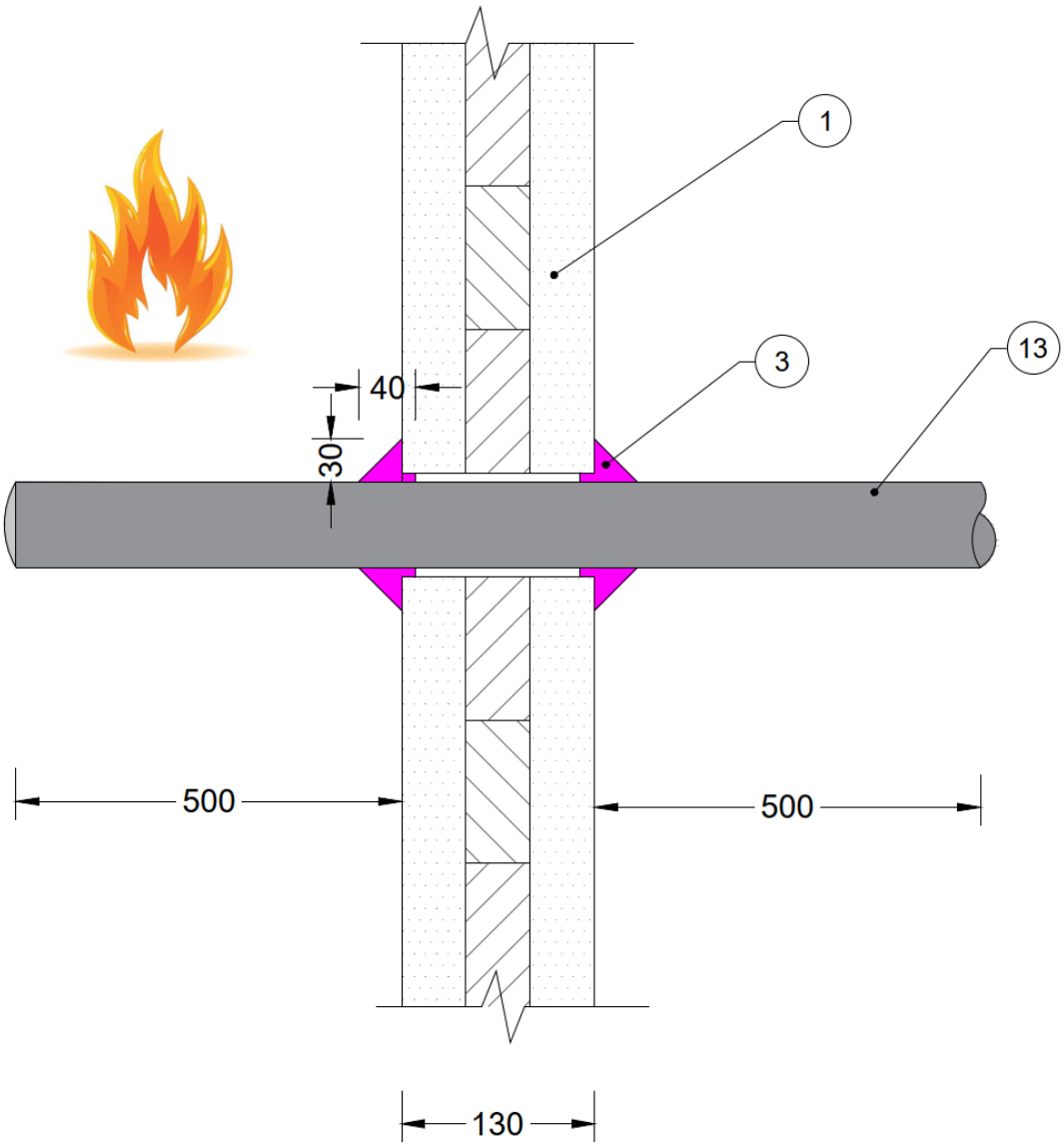

Figure 6 Cross section of specimen A

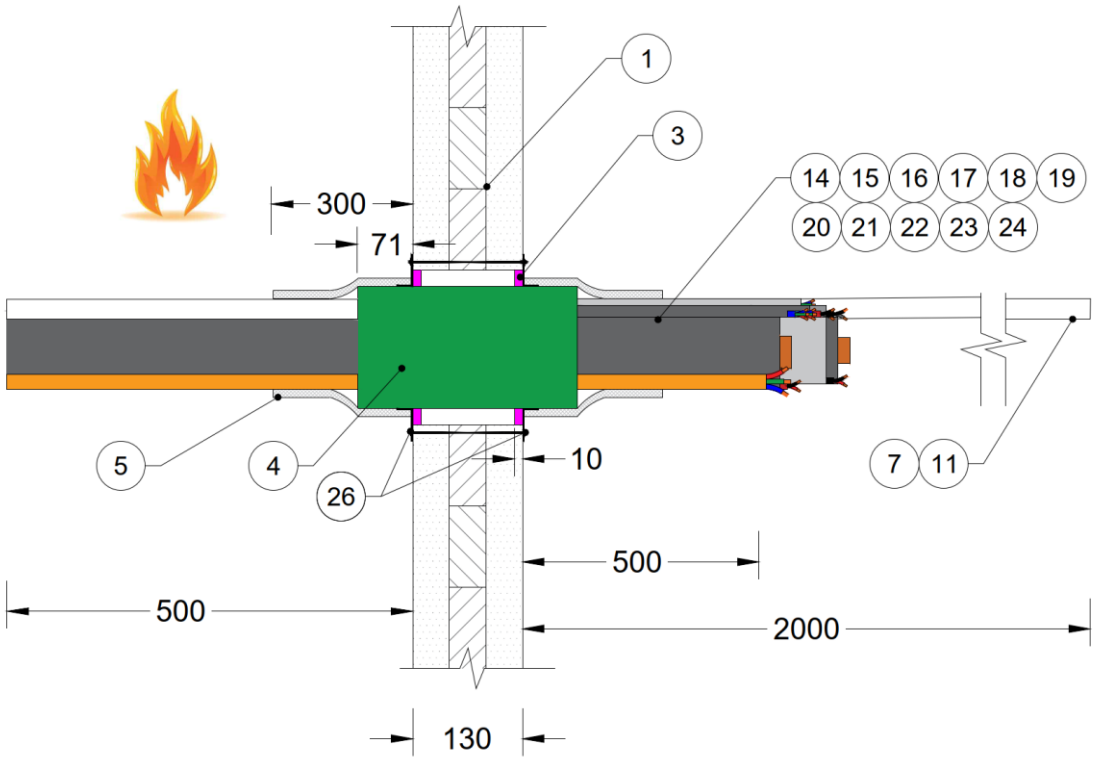

Figure 7 Cross section of specimen B

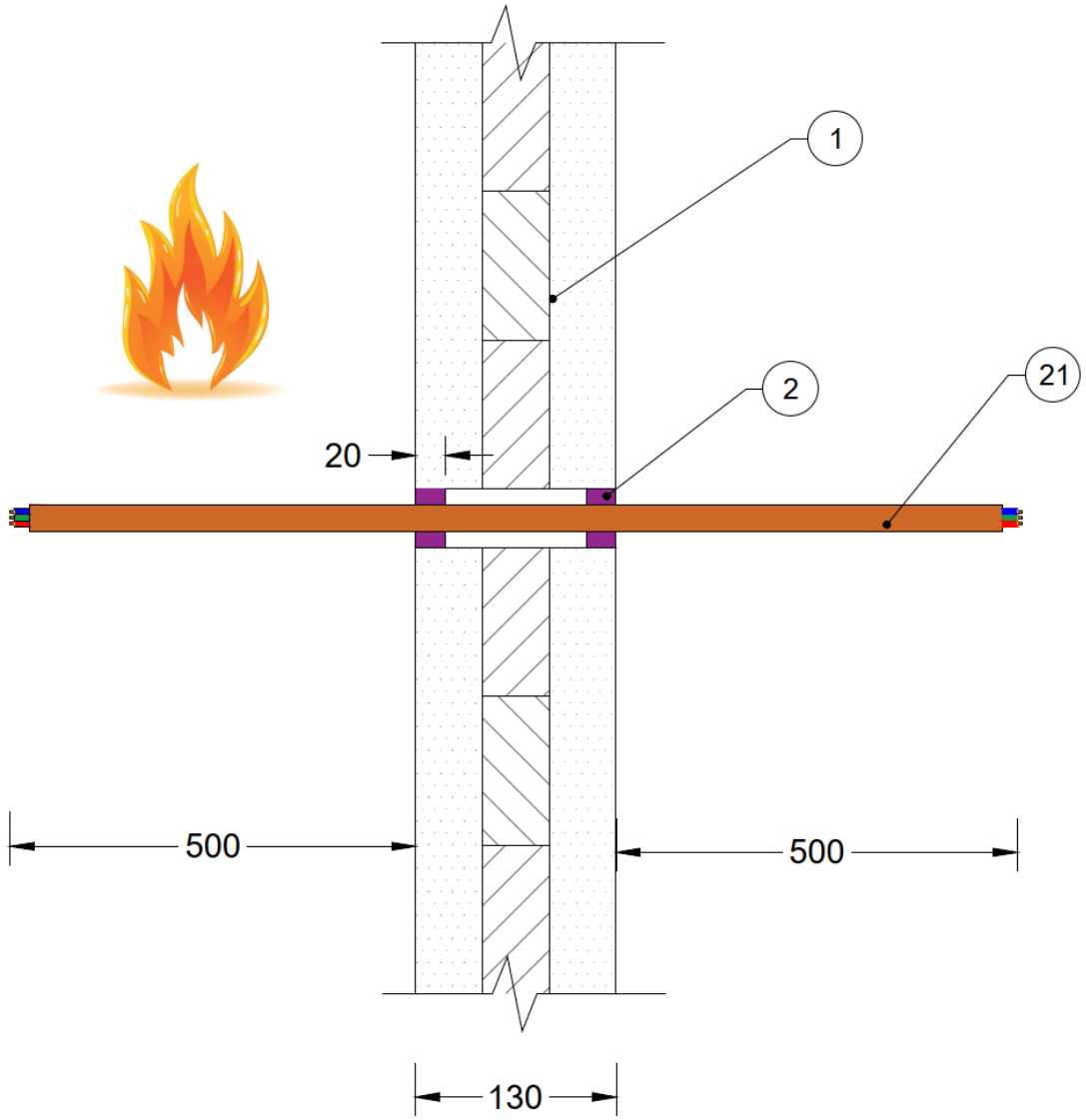

Figure 8 Cross section of specimen C

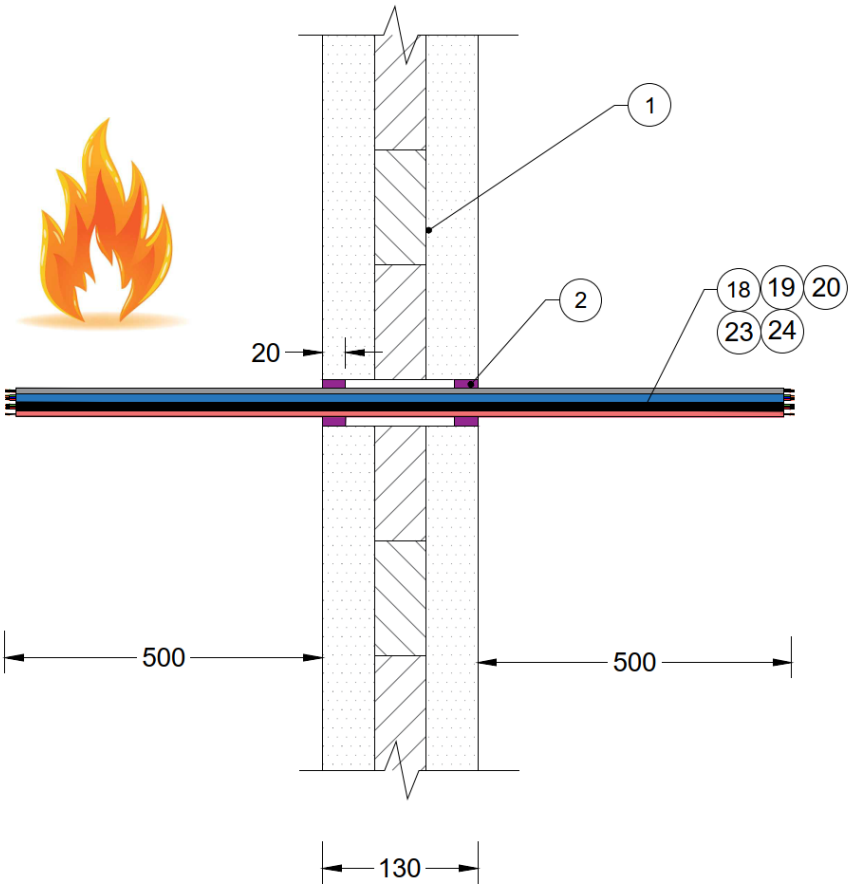

Figure 9 Cross section of specimen D

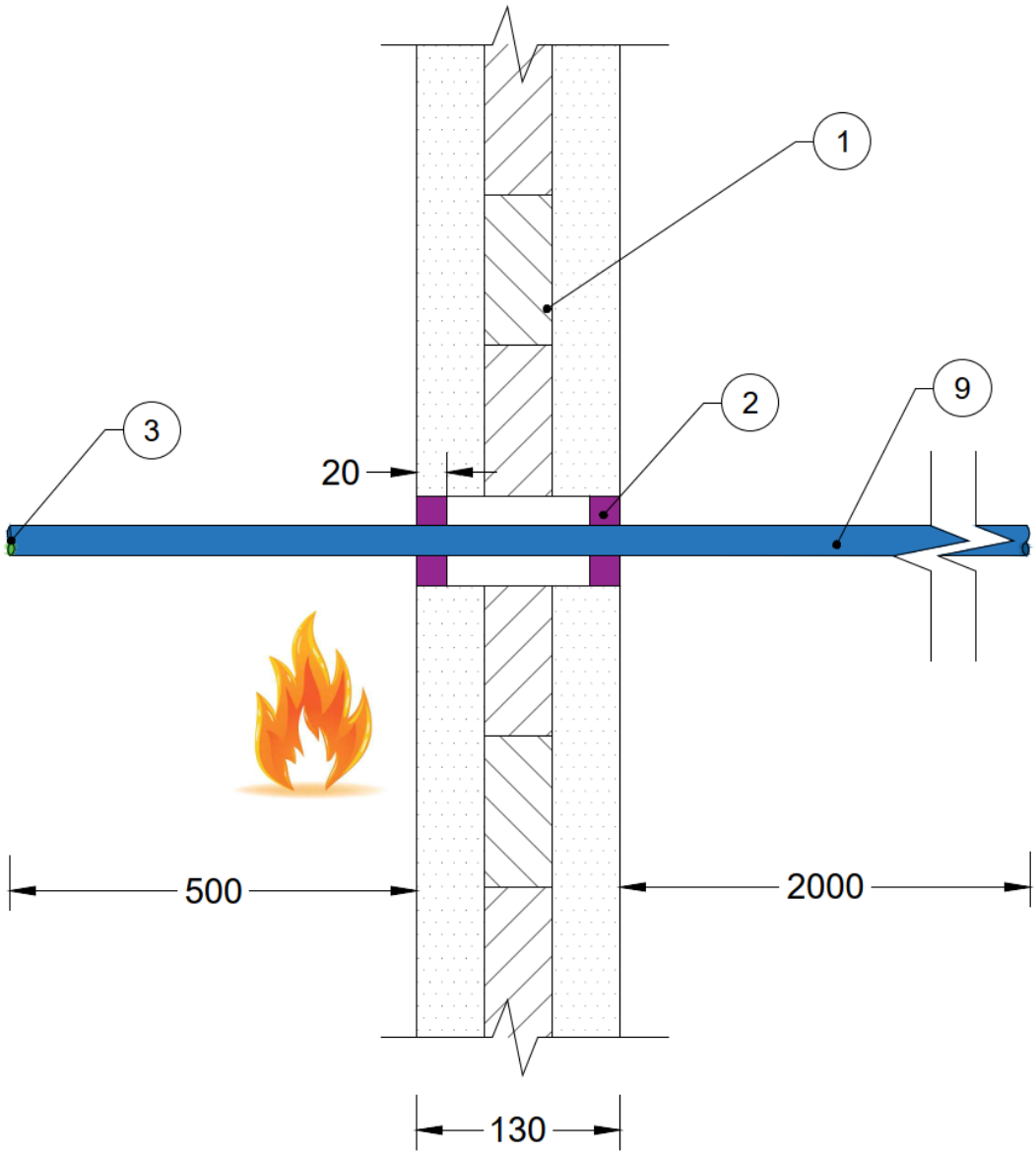

Figure 10 Cross section of specimen E

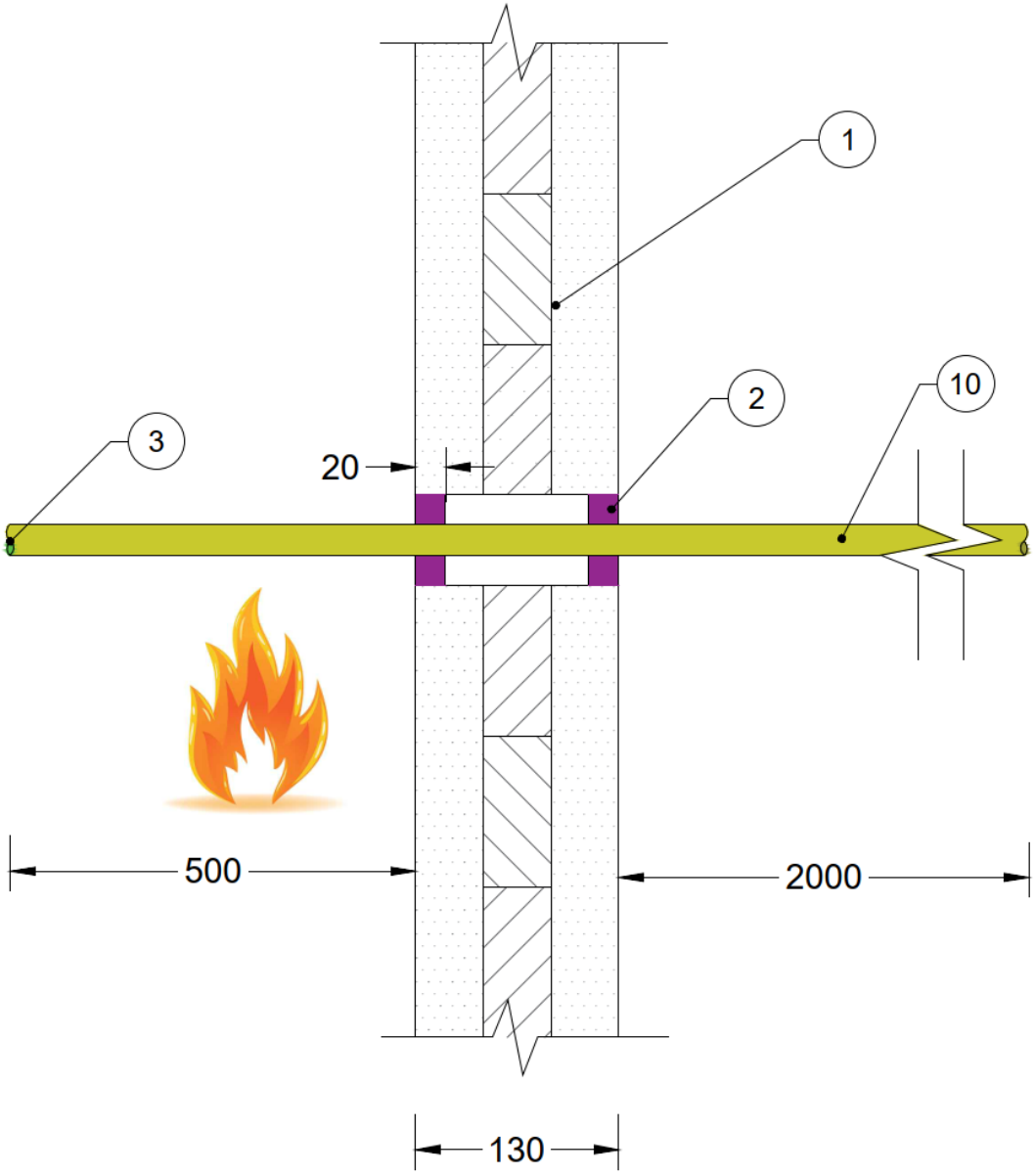

Figure 11 Cross section of specimen F

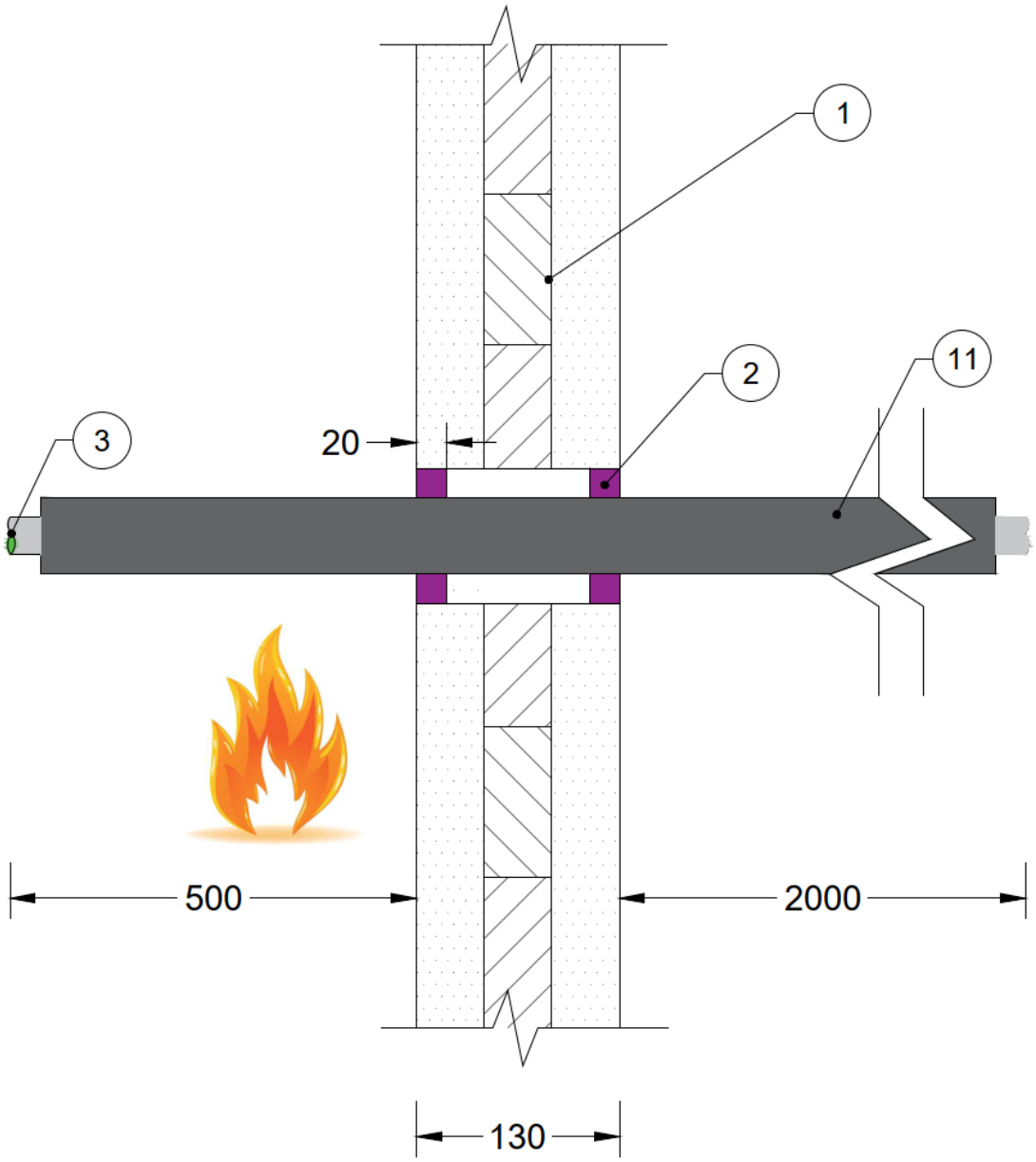

Figure 12 Cross section of specimen G

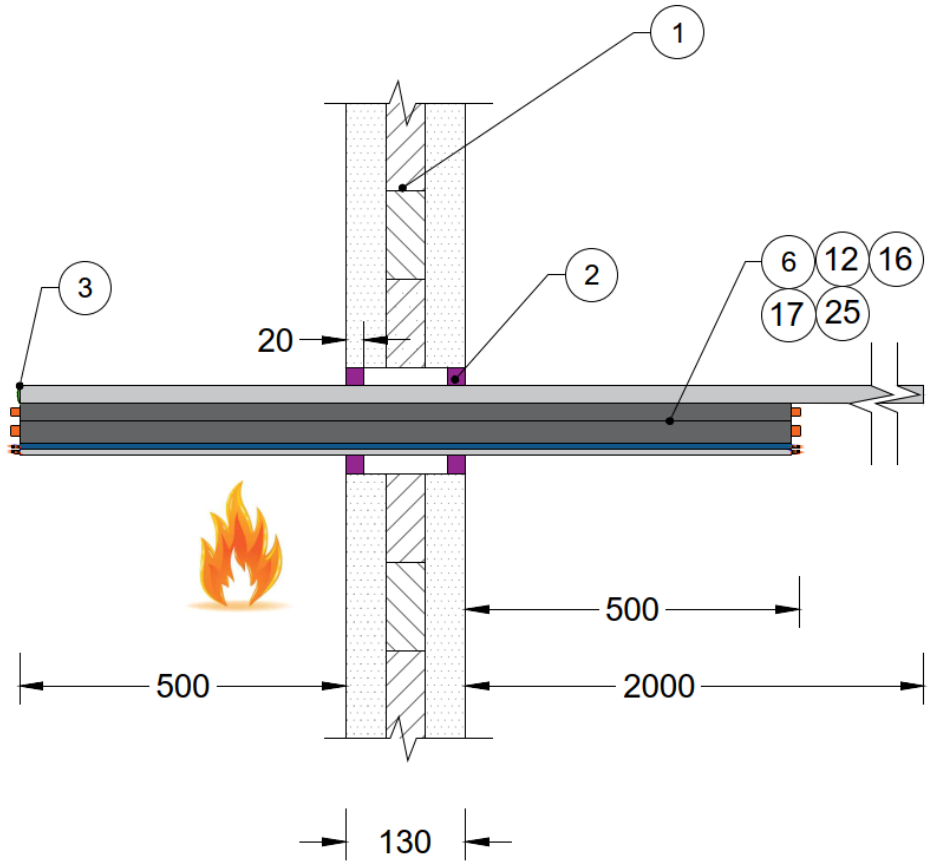

Figure 13 Cross section of specimen H

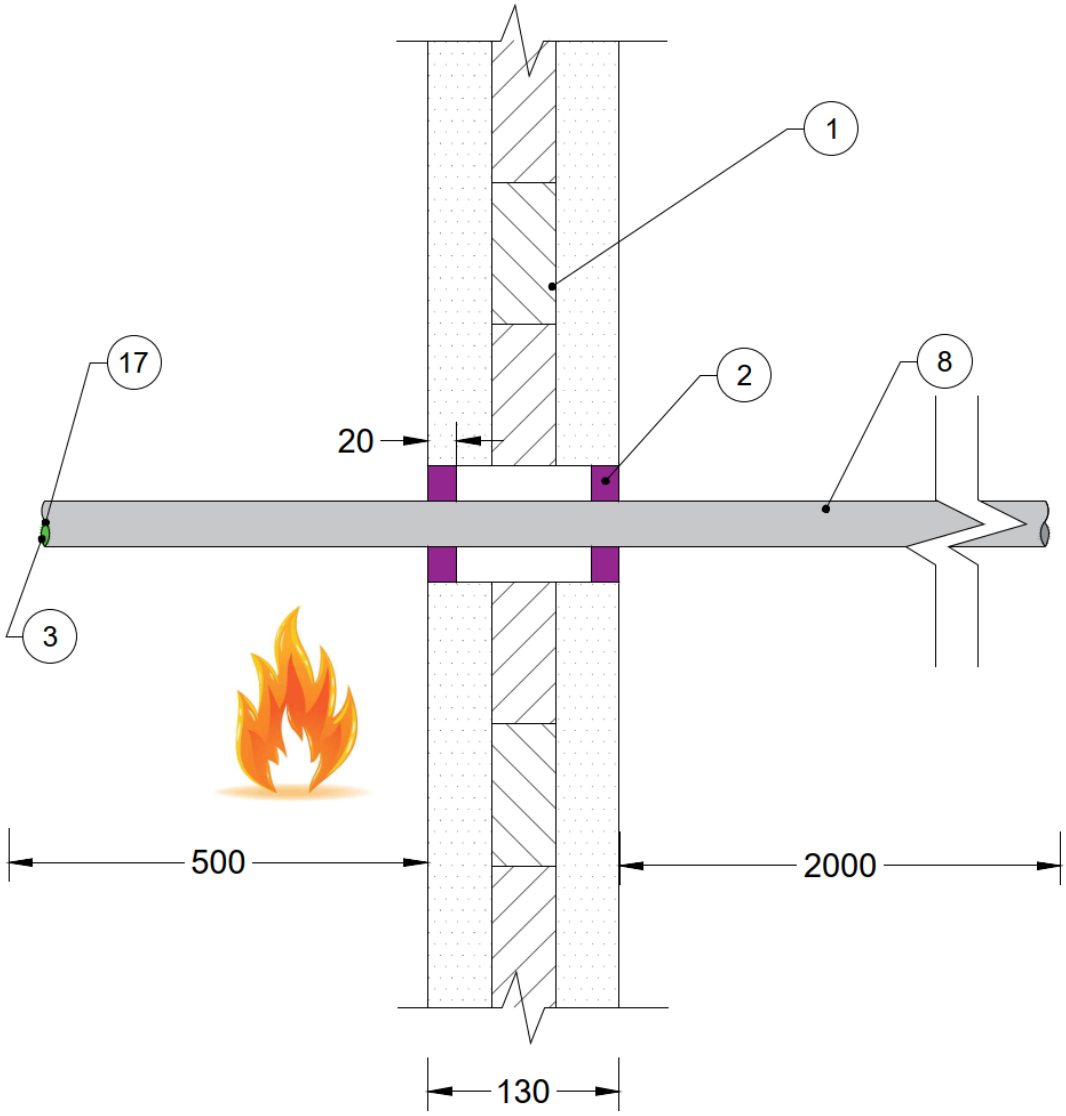

Figure 14 Cross section of specimen I

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		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
61	**10**	**TC005 on the top of the service recorded a temperature of 197 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the temperature of thermocouple TC005 exceeded the initial temperature by more than 180 K.**
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system B		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
01	07	Smoke was emitting from the interface between the wrap and the pipes and cables.
02	30	Volume of smoke emitting from the interface between the wrap and the pipes had increased.
09	40	Smoke was emitting from the interface between the service and the separating element.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
19	10	The intumescent had blown out through the wrap.
20	00	TC16 on the condensation pipe had detached.
29	00	Volume of smoke emitting had decreased.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
94	**30**	**TC010 on the east of the mounting L angle recorded a temperature of 198 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the temperature of thermocouple TC010 exceeded the initial temperature by more than 180 K.**
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system C		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
41	00	Service started getting pushed out due to intumescent expansion.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
83	50	Smoke emitting from the interface between the wall and the sealant.
86	00	Service continued getting pushed out due to intumescent expansion.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system D		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
56	00	Service started getting pushed out due to intumescent expansion.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
83	50	Smoke emitting from the interface between the wall and the sealant.
86	00	Service continued getting pushed out due to intumescent expansion.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
93	**17**	**TC030 on the top of the cable recorded a temperature of 196 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the temperature of thermocouple TC030 exceeded the initial temperature by more than 180 K.**
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system E		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
05	00	Smoke was emitting from the top of the service.
11	00	Smoke was emitting from the interface between the service and the separating element.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system F		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
06	00	Smoke was emitting from the top of the service.
07	50	Smoke emitting from the top of the service had stopped.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
33	12	Smoke emitting from the service had restarted.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
56	00	Service started getting pushed out due to intumescent expansion.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
65	**50**	**TC038 on the top of the pipe recorded a temperature of 196 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the**

Time		Observation
Min	Sec	
		temperature of thermocouple TC038 exceeded the initial temperature by more than 180 K.
83	50	Smoke emitting from the interface between the wall and the sealant.
86	00	Service continued getting pushed out due to intumescent expansion.
90	00	The test specimen continued to maintain integrity in accordance with AS 1530.4:2014.
91	00	TC38 and TC39 were embedded by the intumescent.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system G		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
01	44	Smoke was emitting from the end of the service.
05	30	Smoke emitting from the end of the service had stopped.
13	12	Smoke emitting from the end of the service had restarted.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
67	23	TC42 on the Kelox plus pipe insulation had detached.
83	50	Smoke emitting from the interface between the wall and the sealant.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system H		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
03	03	Smoke was emitting from the top and the bottom of the service.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
51	18	The Paircoil lagging started expanding and smoke was emitting through the lagging.

Time		Observation
Min	Sec	
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
83	50	Smoke emitting from the interface between the wall and the sealant.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.
Penetration system I		
00	00	The fire resistance test started. The initial temperature of the test specimen was approximately 16 °C.
02	16	Smoke was emitting from the end of the service.
05	30	Smoke emitting from the end of the service had stopped.
14	10	Smoke was emitting from the bottom right corner of the separating element.
15	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
30	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
45	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
60	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
90	00	The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
96	00	The separating element wall started to bend and pushed outward.
100	00	The fire resistance test ended.

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 Metal pipes

C.2.1 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.2.2 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.2.3 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.2.4 Insulated – lagged – metal pipes

Where fire test data on the insulation system is 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 10.12.3.2 of AS 1530.4:2014 are satisfied and the following procedures are followed:

- 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.
- 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.

C.2.5 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.3 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.4 Plastic pipes

C.4.1 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.4.2 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.

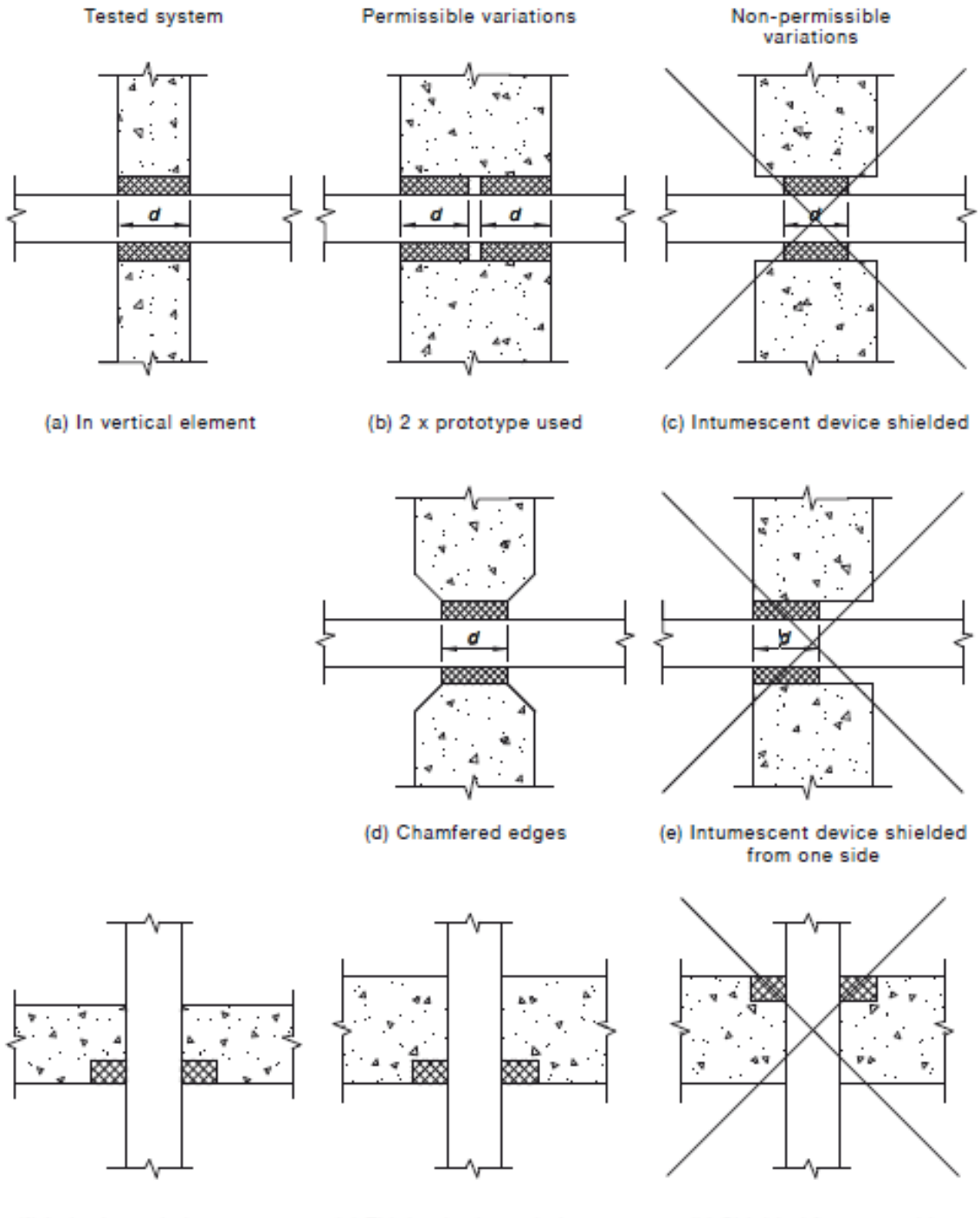

FIGURE 10.12.5.1 EQUIVALENT EXPOSURE OF UPVC PIPE FIRE-STOPPING SYSTEMS

warringtonfire
Proud to be part of element

Global locations

Warringtonfire Australia Pty Ltd
ABN 81 050 241 524

Perth

Suite 4.01, 256 Adelaide Terrace
Perth WA 6000
Australia
T: +61 8 9382 3844

Canberra

Unit 10, 71 Leichhardt Street
Kingston ACT 2604
Australia
T: +61 2 6260 8488

Melbourne

WeWork Level 4, 152 Elizabeth Stree
Melbourne VIC 3000
Australia
T: +61 3 9767 1000

Sydney

Suite 802, Level 8, 383 Kent Street
Sydney NSW 2000
Australia
T: +61 2 9211 4333

Brisbane

Suite B Level 6, 133 Mary Street
Brisbane QLD 4000
Australia
T: +61 7 3238 1700

Melbourne – NATA accredited laboratory

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