warringtonfire
Proud to be part of element

Regulatory information report

Penetration systems tested in accordance with AS 1530.4:2014

Test sponsor: Boss Fire & Safety P/L

Job number: FRT180472

Report number: RIR- FRT180472

Test date: 8 March 2019 Revision: R1.0

Amendment schedule

Version	Date	Information relating to report			
R1.0	31/05/2019	Description	Initial issue		
			Prepared by	Reviewed by	Authorised by
		Name	Patrick Chan	Choose an item.	Mandeep Kamal
		Signature			
		Description			
			Prepared by	Reviewed by	Authorised by
		Name			
		Signature			

Contact information

Warringtonfire Australia Pty Ltd – ABN 81 050 241 524

Melbourne – NATA registered laboratory
Unit 2, 409-411 Hammond Road
Dandenong South, VIC 3175
Australia

T: +61 3 9767 1000

Brisbane
Suite 6, Level 12
133 Mary Street
Brisbane, QLD 4000
Australia

T: +61 7 3238 1700

Perth
Unit 22, 22 Railway Road
Subiaco, WA 6008
Australia

T: +61 8 9382 3844

Sydney
Suite 802, Level 8
383 Kent Street
Sydney, NSW 2000
Australia

T: +61 2 9211 4333

Canberra
Unit 2, 11 Murray Crescent
Griffith, ACT 2603
Australia

T: +61 2 6260 8488

General conditions of use

Executive summary

This report documents the findings of the fire resistance test of penetration systems undertaken on 8 March 2019 in accordance with Section 2 and 10 of AS 1530.4:2014. Warringtonfire Australia did the test at the request of Boss Fire & Safety P/L.

The test specimen consisted of 116mm thick plasterboard wall system clad with two layers of fire-rated plasterboard on either side penetrated by 10 penetration systems. A summary of the penetration systems is provided in Table 1.

Table 1 Test summary

Penetration system	Service	Primary local fire-stopping protection	Second local fire-stopping protection	Aperture size (mm)	FRL
A	50mm copper pipe with lagging	BOSS 100mm MaxiCollars™	P40 MAk Wrap with FireMastic - 300™	Ø115	**-/120/90**
B	Bundle of Electric cable	FireMastic - HPE™	-	Ø70	**-/120/120**
C	100mm uPVC sandwich core pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø130	**-/0/0**
D	150mm copper pipe	FireMastic - 300™	-	Ø170	**-/120/0**
E	40mm uPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø60	**-/120/120**
F1	Fire rated GPO (unexposed side)	UniWrap® intumescent in wallbox	-	99 × 55	**-/120/120**
F2	Fire rated GPO (exposed side)	UniWrap® intumescent in wallbox	-	99 × 55	**-/120/90**
G	50mm Galv Sprinkler pipe	FireMastic - 300™	-	Ø80	**-/120/120**
H	80mm uPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø102	**-/120/0**
I	50mmuPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø70	**-/120/120**

Contents

Amendment schedule 2
Executive summary 4
Contents 5
1. Introduction 6
2. Construction details 6
3. Schedule of components 8
4. Test procedure 15
5. Test measurements and results 16
6. Application of test results 17
6.1 Test limitations 17
6.2 Variations from the tested specimen 17
6.3 Uncertainty of measurements 17
Appendix A Drawings of test assembly 18
Appendix B Test observations 32
Appendix C Direct field of application 36

1. Introduction

This report documents the findings of the fire resistance test of penetration systems undertaken on 8 March 2019 in accordance with Section 2 and 10 of AS 1530.4:2014. Warringtonfire Australia did the test at the request of Boss Fire & Safety P/L.

Table 2 Test sponsor details

Test Sponsor	Address
BOSS Fire & Safety P/L	15-23 Kumulla Road Caringbah NSW 2229 Australia

2. Construction details

Table 3 provides details of the test assembly. Table 4 provides a summary of the test specimen. A full description of the specimen is provided in Appendix A and Section 3. Table 5 shows the installation method and orientation of the test specimen.

Table 3 Test assembly

Item	Detail	
Separating element	116mm thick plasterboard wall system clad with two layers of fire-rated plasterboard on either side.	
Nominal separating element size	Width (w): Height (h): Thickness (t):	1200mm 1200mm 116mm
Number of penetration systems	10	
Restraint conditions	Restrained on all edges	

Table 4 Test specimen

Penetration system	Service	Primary local fire-stopping protection	Second local fire-stopping protection	Aperture size (mm)
A	50mm copper pipe with lagging	BOSS 100mm MaxiCollars™	P40-Mak Wrap with FireMastic - 300™	Ø115
B	Bundle of Electric cable	FireMastic -HPE™	-	Ø70
C	100mm uPVC sandwich core pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø130
D	150mm copper pipe	FireMastic - 300™	-	Ø170
E	40mm uPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø60
F1	Fire rated GPO (unexposed side)	UniWrap® intumescent in wallbox	-	99 × 55
F2	Fire rated GPO (exposed side)	UniWrap® intumescent in wallbox	-	99 × 55
G	50mm Galv Sprinkler pipe	FireMastic - 300™	-	Ø80
H	80mm uPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø102

Penetration system	Service	Primary local fire-stopping protection	Second local fire-stopping protection	Aperture size (mm)
I	50mmuPVC pipe	BOSS UniWrap® in metal sleeve	FireMastic - 300™	Ø70

Table 5 Installation method and orientation

Item	Detail
Start date of separating element construction	17 January 2019
Start date of penetration systems installation	21 January 2019
Completion date of test specimen construction and installation	27 February 2019
Separating element constructed by	Representatives of Warringtonfire Melbourne.
Penetration system installed by	Representatives of the test sponsor.
Orientation	Asymmetrical, due to the penetration services being supported on the unexposed side.

3. Schedule of components

Table 6 lists the schedule of components for the test specimen which were provided by the test sponsor and surveyed by Warringtonfire Australia.

Table 6 Schedule of components

Item	Description		
Separating element			
1.	Item name	13mm plasterboard	
	Product name	13mm CSR Fyrchek plasterboard	
	Density	833kg/m^3 (measured)	
	Installation	Two layers of the plasterboard were installed on both the exposed and the unexposed side of the wall metal frame (item 2)..	
2.	Item name	Wall metal frame	
	Product name	64mm Rondo stud and frame	
	Size	Rondo stud: 35.5mm flange × 64mm web Rondo track: 29mm flange × 64mm web	
SE	Size	1200mm wide × 1200mm high × 113mm thick	
	Specification	The wall system was fixed to the concrete blockwork with Ø4.5mm masonry anchors on all edges. The joints between the plasterboards and the concrete blockwork was sealed with sealant.	
Fire-stopping protections			
Sealant			
3.	Product name	BOSS FireMastic - 300^{TM}	
	Density	Nominal 1560kg/m^3 (provide by test sponsor)	
	Installation	• In the annular gap at 5mm depth between the service and the wall. The mastic was then finished flush on both the exposed and the unexposed side. (service A) • In the annular gap at 26mm depth (thickness of the plasterboards) between the service and the wall. The mastic was then finished with 50mm × 50mm fillet on both the exposed and the unexposed side. (service G) • In the annular gap at 26mm depth (thickness of the plasterboards) between the service and the wall. The mastic was then finished with 20mm × 20mm fillet on both the exposed and the unexposed side. (service D) • The mastic was applied as a smoke seal, finished flush on both the exposed and the unexposed side (service C,E,H and I) • On the joints between the plasterboards and the concrete blockwork.	
4.	Product name	BOSS FireMastic – HPE^{TM}	
	Density	Nominal 1300kg/m^3 (provide by test sposnor)	
	Installation	• In the annular gap at 26mm depth (thickness of the plasterboards) between the service and the wall. The mastic was then finished flush on both the exposed and the unexposed side (service B)	
Fire collar			
5.	Product name	BOSS 100mm MaxiCollar ^{TM}	
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h)	136mm (measured) 115mm (measured) 32mm (measured)

Item	Description		
		Outer shell thickness (t)	1mm thick
	Intumescent details	Number of layers Width (w) Thickness (t) Density	5 30mm (measured) 2mm (measured) 1221kg/m^3 (measured)
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with fixings (item 18).	
6.	Product name	BOSS UniWrap® in metal sleeve	
	Size	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	120mm (measured – service C) 49mm (measured – service E) 89mm (measured – service H) 66mm (measured – service I) 111mm (measured – service C) 43mm (measured – service E) 83mm (measured – service H) 56mm (measured – service I) 130mm (measured) 1.7mm
	Intumescent details	Number of layers Width (w) Thickness (t) Density	1 (Service E) 2 (Service I,H) 3 (Service C) 40mm (measured) Nominal 2.0mm (measured) 1185kg/m^3 (measured)
	Installation	Two sets of BOSS UniWrap® were wrapped around the services and secured with adhesive tapes within the separating element. The metal sleeve was inserted into the core hole from the exposed side between the separating element and the BOSS UniWrap® and fiction fix into the separating element.	
Wrap			
7.	Item name	Insulation wrap	
	Product name	BOSS P40 MAK-Wrap	
	Overall size	300mm wide × 40mm thick	
	Mineral fibre wool density	40kg/m^3 (measured)	
	Installation	The wrap was wrapped around the lagged copper pipe (service A) on both the exposed and the unexposed side. The wraps were secured with metal wire at approximately 50mm and 200mm from the separating element.	
Services			
8.	Item name	50mm lagged copper pipe	
	Product name	50mm copper pipe with 30mm thick Thermobreak Tube Thermal Insulation lagging.	
	Size (pipe)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	50mm (measured) 47mm (measured 1.5mm (measured)
	Size (Lagging)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	110mm (measured 50mm (measured) 30mm (measured)
9.	Item name	150mm Copper	

Item	Description		
9	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	152mm (measured) 148mm (measured) 2mm (measured)
10.	Item name	50mm Galvanised steel sprinkler pipe	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	60.5mm (measured) 53.2mm (measured) 3.7mm (measured)
11.	Item name	40mm uPVC pipe	
	Product name	PPPO 1240C – PVP4012-3 BEP PVC SI PVC-U DN 40 PN 12	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	48.3mm (measured) 42.9mm (measured) 2.7mm (measured)
12.	Item name	50mm uPVC pipe	
	Product name	PPPO 1250C Holman – PVP5012 – 3 BEPPVC S1 PVC-U DN 50 PN 12	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	60.3mm (measured) 53.5mm (measured) 3.5mm (measured)
13.	Item name	80mm uPVC pipe	
	Product name	Ipex pipeline Premium BEP PVC 80 PVC-U DWV SH 180703 06 01 2C05D AS/NZS 1260 W LN1383	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	82.3mm (measured) 75.6mm (measured) 3.4mm (measured)
14.	Item name	100mm uPVC (sandwich core) pipe	
	Product name	DPMHH100C Holman-DWV 1003 BEP PVC 100 PVC-U DWV SC SN6	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	109.8mm (measured) 103.3mm (measured) 3.3mm (measured)
15.	Item name	FireSense cables	
	Product	Firesense – FR – 1.50-2C-2 HR Fire rated Electric cable – 2018 ELV Fire – 450/750V rated – 2C × 1.5mm^2 – LSZH – X – HF - 110	
	Overall size	Outer diameter (OD)	10.3mm (measured)
16.	Item name	GPO	
	Material	PVC	
	Size	Width (w) Height (h) Length (l)	115.9mm (measured) 74.7mm (measured) 13.3mm (measured)
17.	Item name	Wall box	
	Material	Steel	
	Overall size	Width (w) Height (h: Length (l)	95.1mm (measured) 51.2mm (measured) 49.4mm (measured)
	Intumescent details	Pieces Width (w)	2 39.7mm (measured)

Item	Description		
		Height (h) Thickness (t) Density	51.2mm (measured) Nominal 2.0mm (measured) 1185kg/m^3 (measured)
Fixings			
18.	Item name	BOSS 100mm Maxi Collar fixing	
	Product name	6g × 25mm plasterboard screws with 25mm washers	
	Installation	3 screws were used to secure the collar to the separating element.	
Penetration system A			
A	Service	50mm lagged copper pipe	
	Service detail	The service protruded 500mm on both the exposed and unexposed side. The Thermobreak lagging covered the whole length of the pipe running continuous through the wall. The service was capped with copper pipe end cap on the exposed side.	
	Service support	The service was support on the unexposed side at 420mm from the wall with pipe clamp. The pipe clamp was installed around the Thermobreak lagging.	
	Aperture size	Ø120mm	
	Annular gap	Nominal 5mm	
	Local fire-stopping protection		
	Protection	BOSS FireMastic – 300™. BOSS 100mm MaxiCollar™ Colla™r BOSS P40-MAKWrap	
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – 300™ to the depth of 5mm and finished flush on both sides. The BOSS 100mm MaxiCollar™ Collars were installed on both sides and fixed to the separating element with screws and washers. A layer of BOSS P40 MAK-WRAP wrapped around the pipe lagging and extend 300mm away from the separating element on both sides. See Figure 3 and Figure 5 in Appendix A for more details.	
Penetration system B			
B	Service	Bundle of 8 × fire alarm cables	
	Service detail	Bundle outside diameter: Ø40mm. The service protruded 500mm on both the exposed and unexposed side.	
	Service support	The service was supported by the pipe clamps on the unexposed side at 75mm and 425mm from the separating element	
	Aperture size	Ø70mm	
	Annular gap	Nominal 15mm	
	Local fire-stopping protection		
	Protection	BOSS FireMastic - HPE™	
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – HPE™ in the depth of 26mm and finished flush on both sides. See Figure 3 and Figure 6 in Appendix A for more details.	
Penetration system C			
C	Service	100mm uPVC (sandwich core) pipe	

Item	Description	
	Service detail	The service protruded 500mm on the exposed side and 2000mm on the unexposed side. The pipe was capped with uPVC pipe cap on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 555mm and 1795mm from the separating element
	Aperture size	Ø130mm
	Annular gap	10mm
	Local fire-stopping protection	
	Protection	BOSS UniWrap® in metal sleeve (three layers UniWrap®) BOSS FireMastic - 300™
	Installation	The BOSS UniWrap® in metal sleeve was inserted into the annular gap between the service and the separating element from the exposed side. The metal sleeve was fixed to the separating element with screws. The BOSS FireMastic -300™ was inserted into the annular gap between the separating element, the service and the metal sleeve. The mastic was finished flush on both the exposed and the unexposed side. See Figure 3 and Figure 7 in Appendix A for more details.
D	Service	150mm Copper pipe
	Service detail	The service was protruded 500mm on both the exposed and the unexposed side of the separating element. The service was capped with copper pipe on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 78mm and 415mm from the separating element
	Aperture size	Ø170mm
	Annular gap	10mm
	Local fire-stopping protection	
	Protection	BOSS FireMastic - 300™
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – 300™ in the depth of 26mm and finished with 20mm × 20mm mastic fillet on both the exposed and the unexposed side. See Figure 3 and Figure 8 in Appendix A for more details.
E	Service	40mm uPVC pipe
	Service detail	The service protruded 500mm on the exposed side and 2000mm on the unexposed side. The pipe was capped with uPVC pipe cap on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 78mm and 1815mm from the separating element
	Aperture size	Ø54mm
	Annular gap	3mm
	Local fire-stopping protection	
	Protection	BOSS UniWrap® in metal sleeve (one layer UniWrap®) BOSS FireMastic - 300™

Item	Description	
	Installation	The BOSS UniWrap® in metal sleeve was insert into the annular gap between the service and the separating element from the exposed side. The metal sleeve was fixed to the separating element with screws. The BOSS FireMastic -300 was inserted into the annular gap between the separating element, the service and the metal sleeve. The mastic was finished flush on both the exposed and the unexposed side. See Figure 3 and Figure 9 in Appendix A for more details.
F1	Service	GPO
	Service detail	The GPO was installed on the unexposed side of the separating element
	Aperture size	99.1mm × 55.2mm
	Annular gap	2mm
	Local fire-stopping protection	
	Protection	Wallbox with BOSS intumescent
	Installation	The wallbox was installed behind the GPO with cable went through the hole on the top of the wallbox. See Figure 3 and Figure 10 in Appendix A for more details.
F2	Service	GPO
	Service detail	The GPO was installed on the exposed side of the separating element
	Aperture size	99.1mm × 55.2mm
	Annular gap	2mm
	Local fire-stopping protection	
	Protection	Wallbox with UniWrap®
	Installation	The wallbox was installed behind the GPO with cable went through the hole on the top of the wallbox. See Figure 4 and Figure 11 in Appendix A for more details.
G	Service	50mm Galvanised steel sprinkler pipe
	Service detail	The service was protruded 500mm on both the exposed and the unexposed side of the separating element. The service was capped with welded steel plate on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 78mm and 410mm from the separating element
	Aperture size	Ø80mm
	Annular gap	10mm
	Local fire-stopping protection	
	Protection	BOSS FireMastic - 300™
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – 300™ in the depth of 26mm and finished with 50mm × 50mm mastic fillet on both the exposed and the unexposed side. See Figure 3 and Figure 12 in Appendix A for more details.
H	Service	80mm uPVC pipe
	Service detail	The service protruded 500mm on the exposed side and 2000mm on the unexposed side. The pipe was capped with uPVC pipe cap on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 420mm and 1815mm from the separating element
	Aperture size	Ø100mm

Item	Description	
	Annular gap	9.7mm
	Local fire-stopping protection	
	Protection	BOSS UniWrap® in metal sleeve (two layers UniWrap®) BOSS FireMastic - 300™
	Installation	The BOSS UniWrap® in metal sleeve was insert into the annular gap between the service and the separating element from the exposed side. The metal sleeve was fixed to the separating element with screws. The BOSS FireMastic -300™ was inserted into the annular gap between the separating element, the service and the metal sleeve. The mastic was finished flush on both the exposed and the unexposed side. See Figure 3 and Figure 13 in Appendix A for more details.
I	Service	50mm uPVC pipe
	Service detail	The service protruded 500mm on the exposed side and 2000mm on the unexposed side. The pipe was capped with uPVC pipe cap on the exposed side.
	Service support	The service was supported by the pipe clamps on the unexposed side at 425mm and 1820mm from the separating element
	Aperture size	Ø70mm
	Annular gap	5mm
	Local fire-stopping protection	
	Protection	BOSS UniWrap® in metal sleeve (two layers UniWrap®) BOSS FireMastic - 300™
	Installation	The BOSS UniWrap® in metal sleeve was insert into the annular gap between the service and the separating element from the exposed side. The metal sleeve was fixed to the separating element with screws. The BOSS FireMastic -300™ was inserted into the annular gap between the separating element, the service and the metal sleeve. The mastic was finished flush on both the exposed and the unexposed side. See Figure 3 and Figure 14 in Appendix A for more details.

4. 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 Section 2 and 10 of AS 1530.4:2014 appropriate for service penetrations.	
Variations	• None	
Pre-test conditioning	The construction and installation of the test specimen was completed on 27 February 2019. 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.	
Ambient laboratory temperature	Start of the test Minimum temperature Maximum temperature	24°C 24°C 28°C
Test duration	121 minutes	
Instrumentation and equipment	The instrumentation was provided in accordance with AS 1530.4:2014 as follow: • The furnace temperature was measured by four mineral insulated metal sheathed Type K thermocouples – with wire diameters not greater than 1mm, an overall diameter of 3mm, and the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes. • The non-fire side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0mm inorganic insulating pads.. • A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples. • The furnace pressure was measured at 370mm below mid-height of the lowest penetration and corrected to mid-height of the lowest penetration. • Cotton pads were available during the test to assess the performance of the specimen under the criteria for integrity.	

5. Test measurements and results

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 summarises the results the specimen achieved against the performance criteria listed in Sections 2 and 10 of AS 1530.4:2014, subject to the variations listed in Section 4.

Table 8 Test results

Penetration system	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121minutes	
	Insulation	Failure at 104 minutes	
B	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121minutes	
	Insulation	No failure at 121 minutes	
C	Structural adequacy	Not applicable	**-/0/0**
	Integrity	Failure at 5 minutes	
	Insulation	Failure at 5 minutes	
D	Structural adequacy	Not applicable	**-/120/0**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 10 minutes	
E	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 minutes	
F1	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 minutes	
F2	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 119 minutes	
G	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 minutes	
H	Structural adequacy	Not applicable	**-/120/0**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 6 minutes	
I	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 minutes	

6. Application of test results

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

6.2 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 herein 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 Australia Pty Ltd or another registered testing authority.

6.3 Uncertainty of measurements

It is not possible to provide a stated degree of accuracy for the results, because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance.

Appendix A Drawings of test assembly

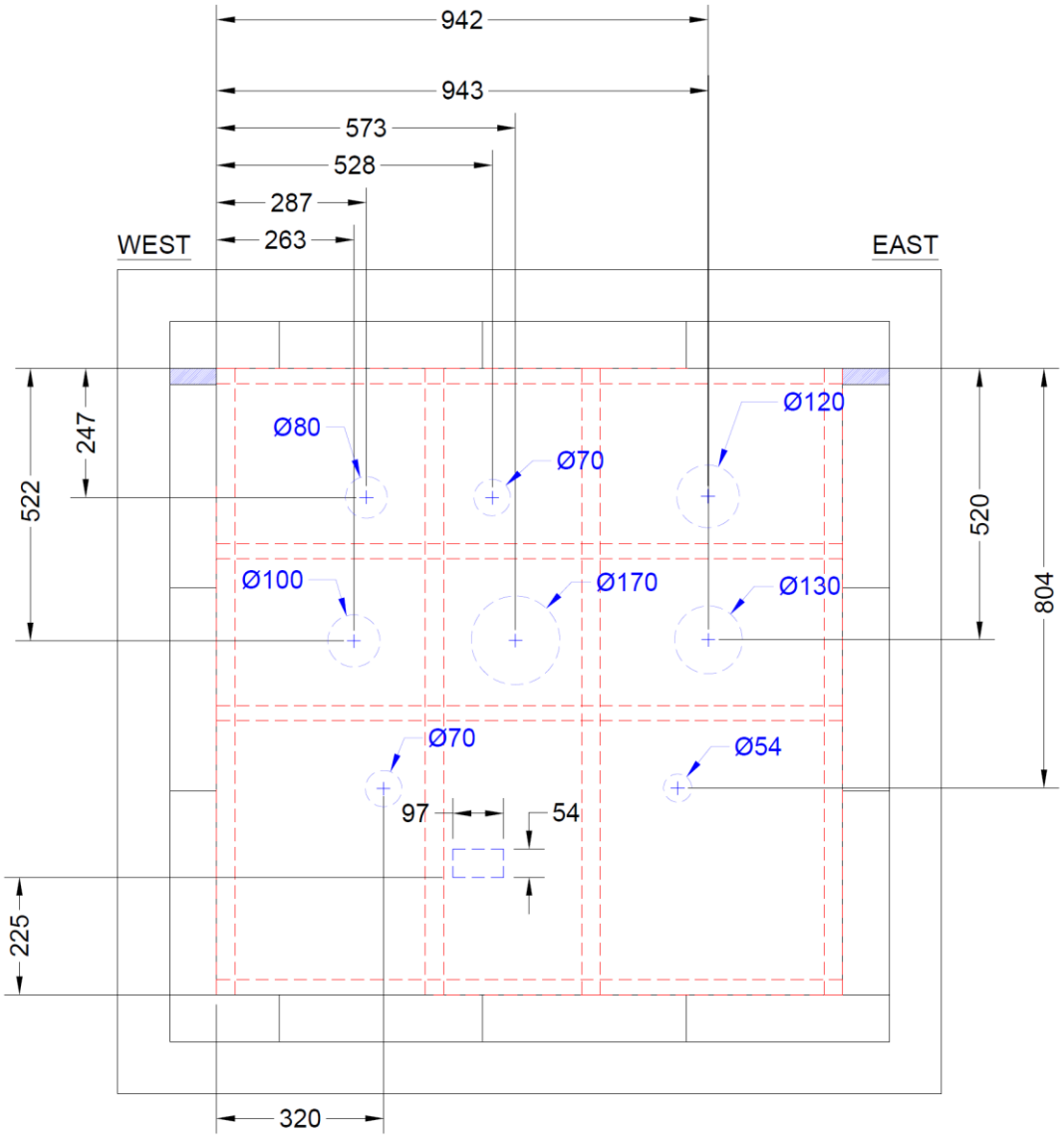


Figure 1 Plan view of test specimen on unexposed side (core hole and wall frame)

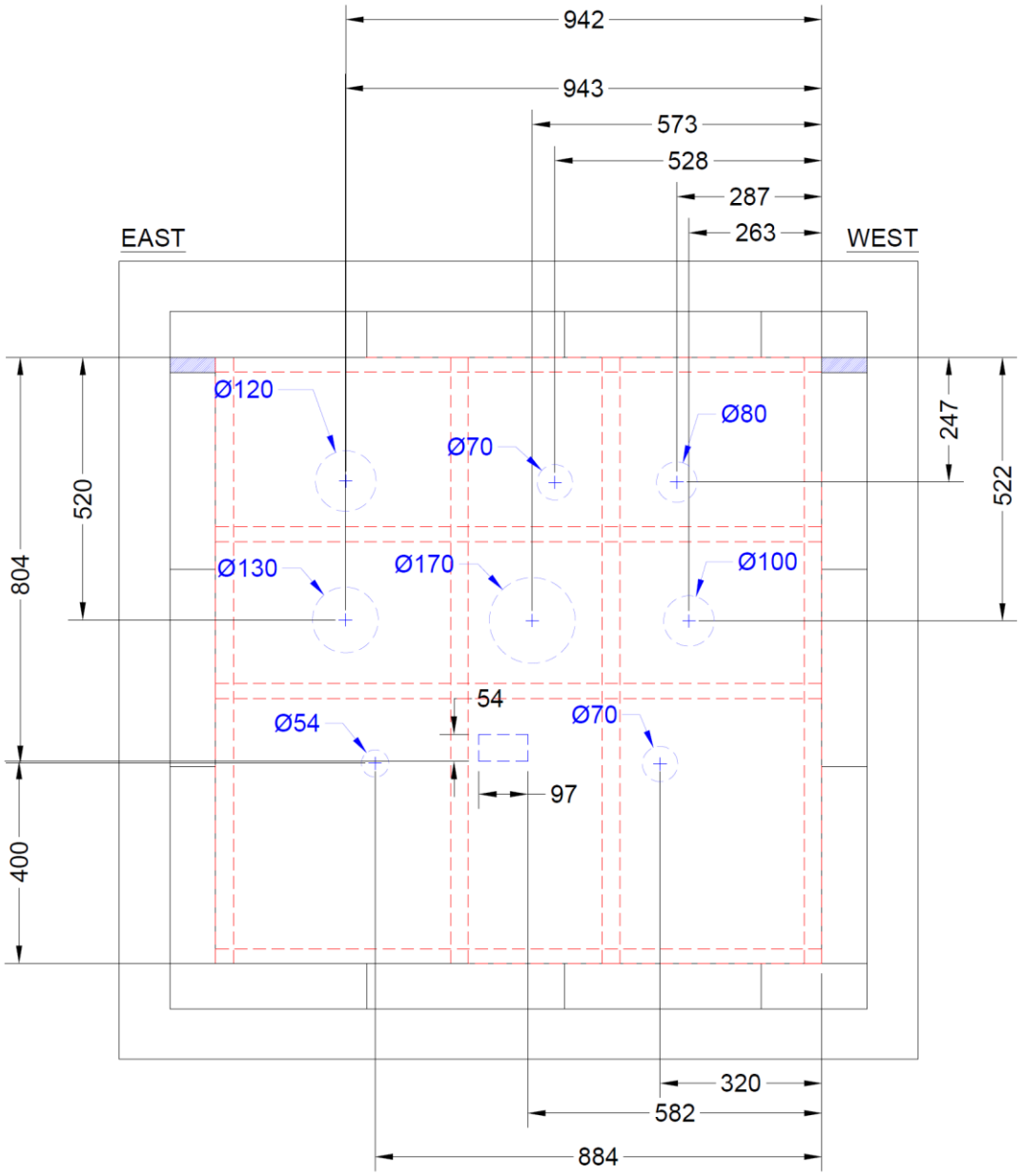


Figure 2 **Plan view of test specimen on exposed side (core hole and wall frame)**

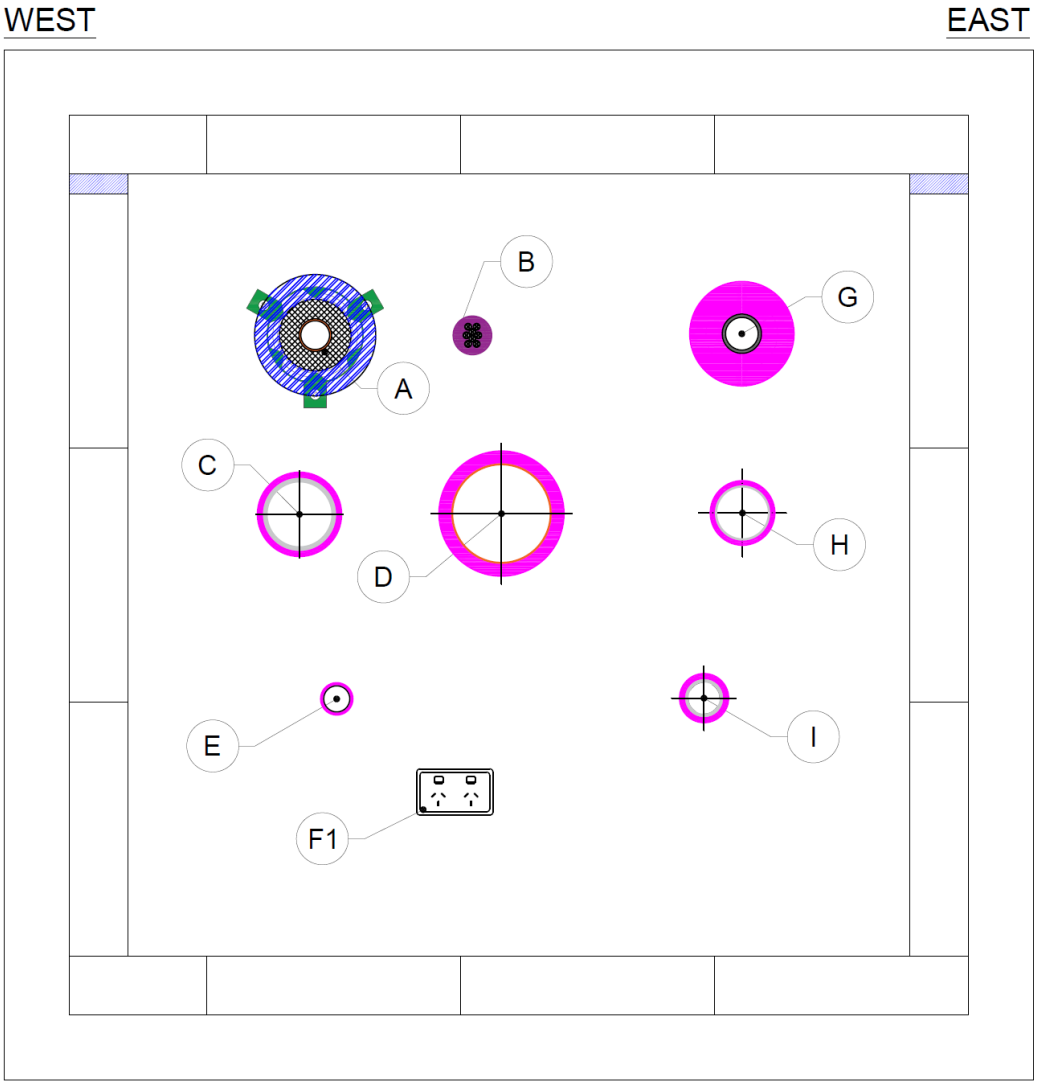


Figure 3 **Plan view of test specimen on unexposed side**

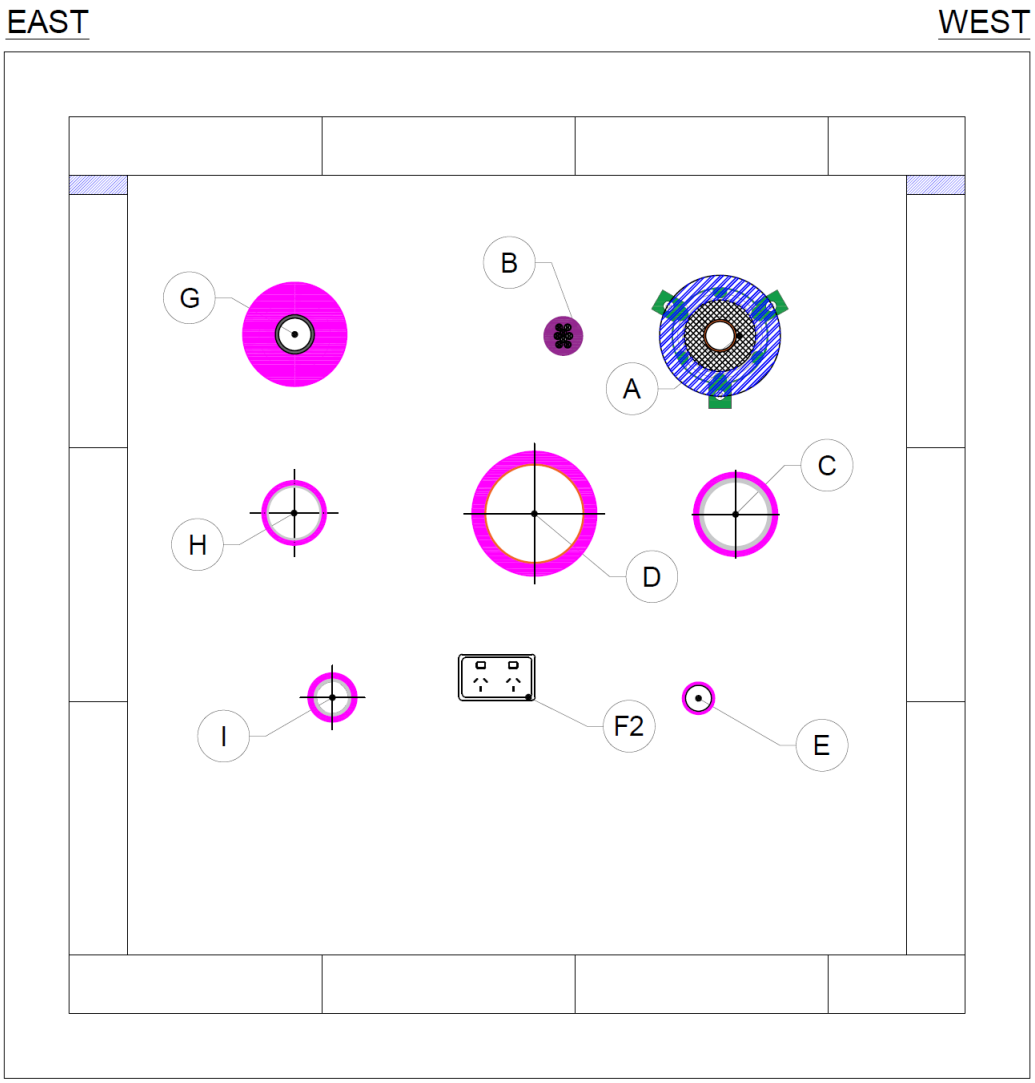


Figure 4 **Plan view of test specimen on exposed side**

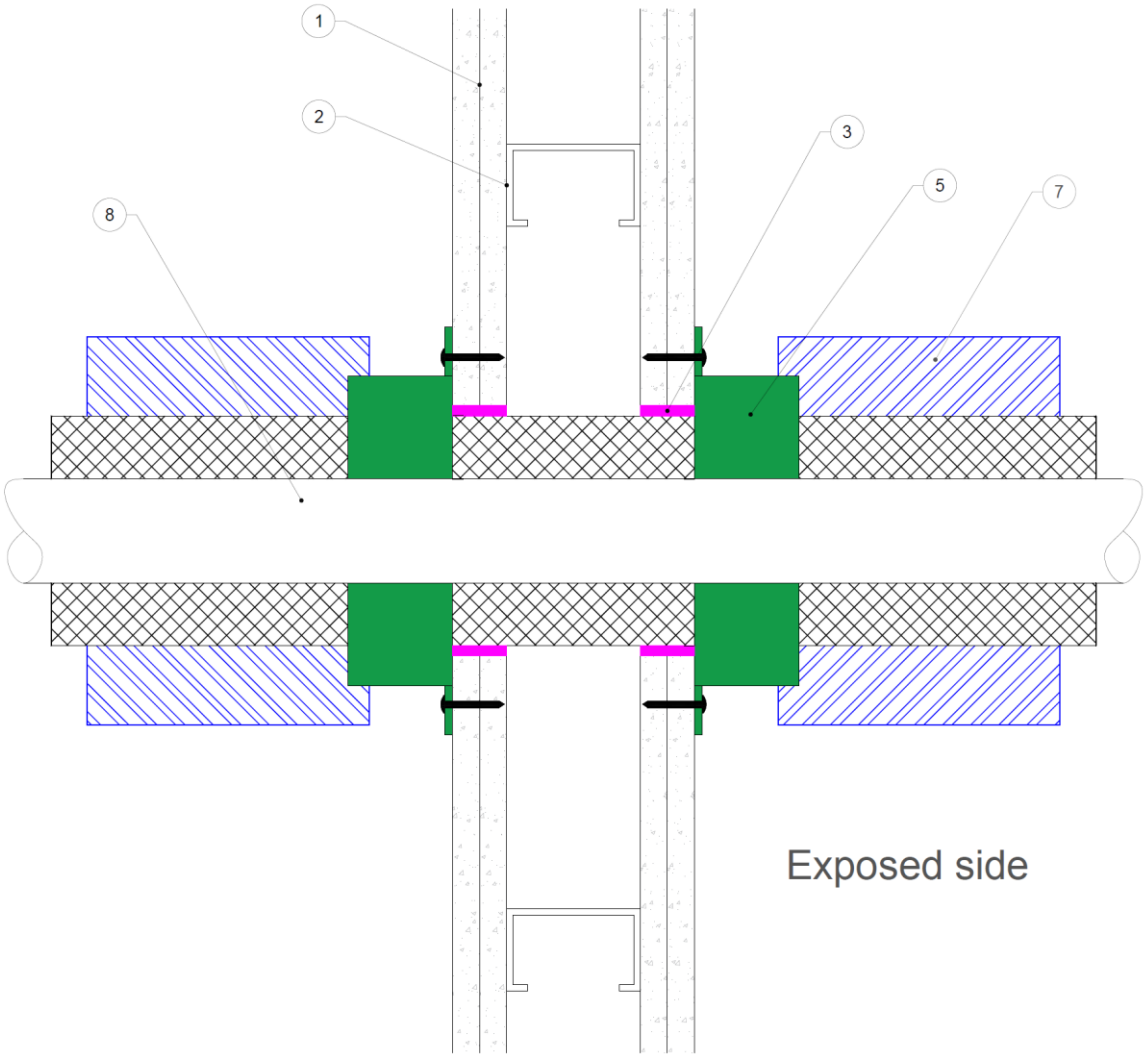


Figure 5 **Cross-section penetration system A**

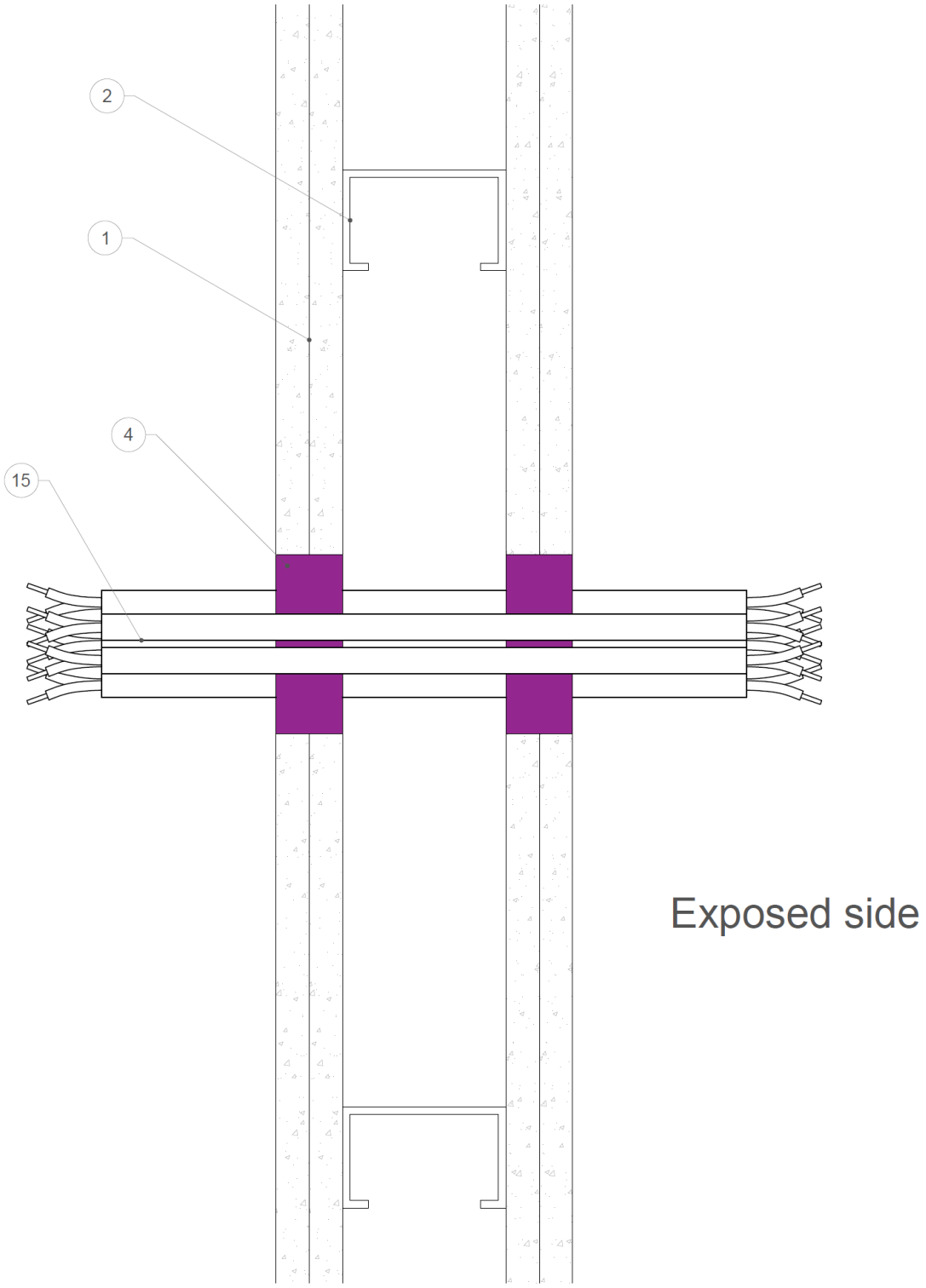


Figure 6 Cross-section penetration system B

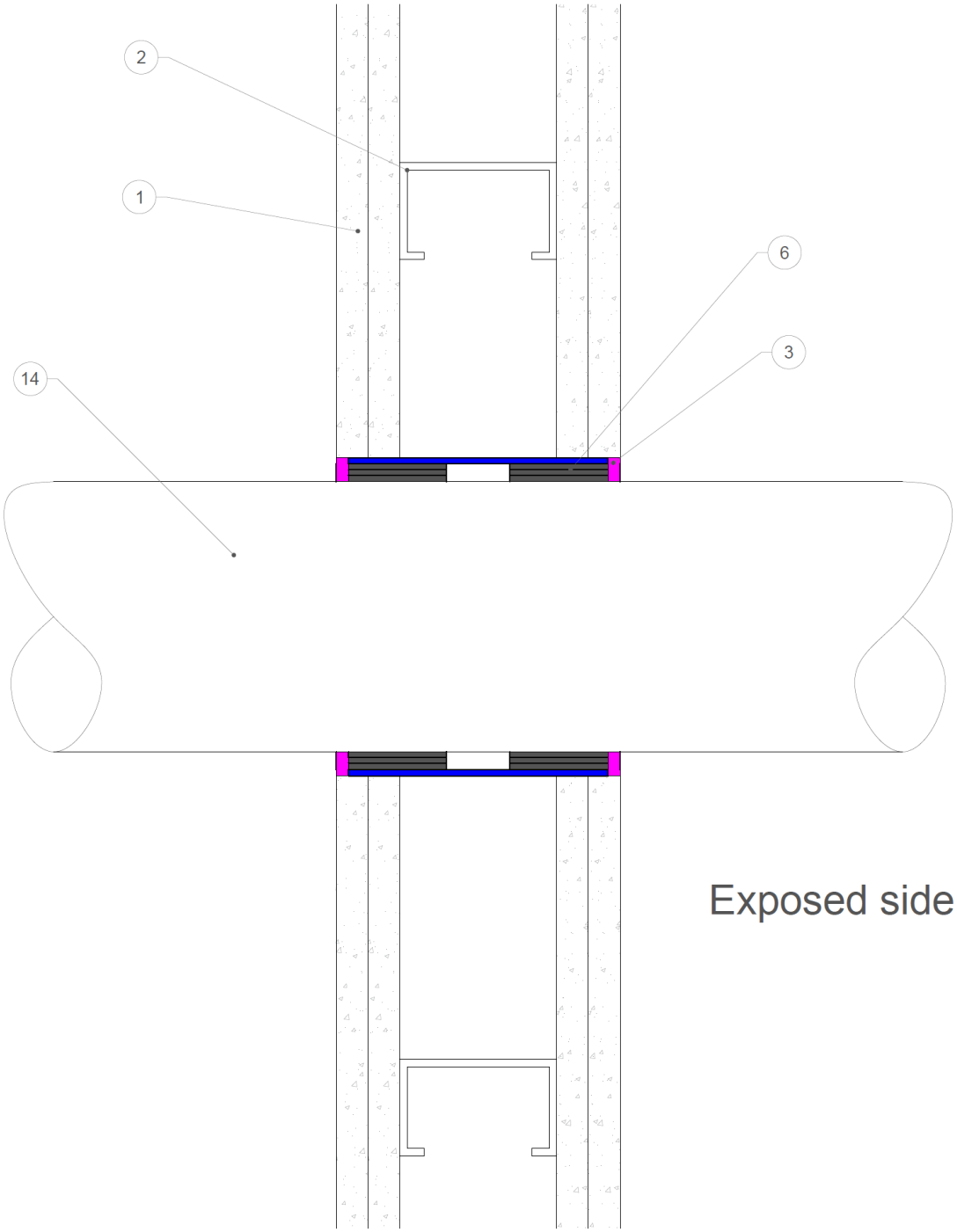


Figure 7 Cross-section penetration system C

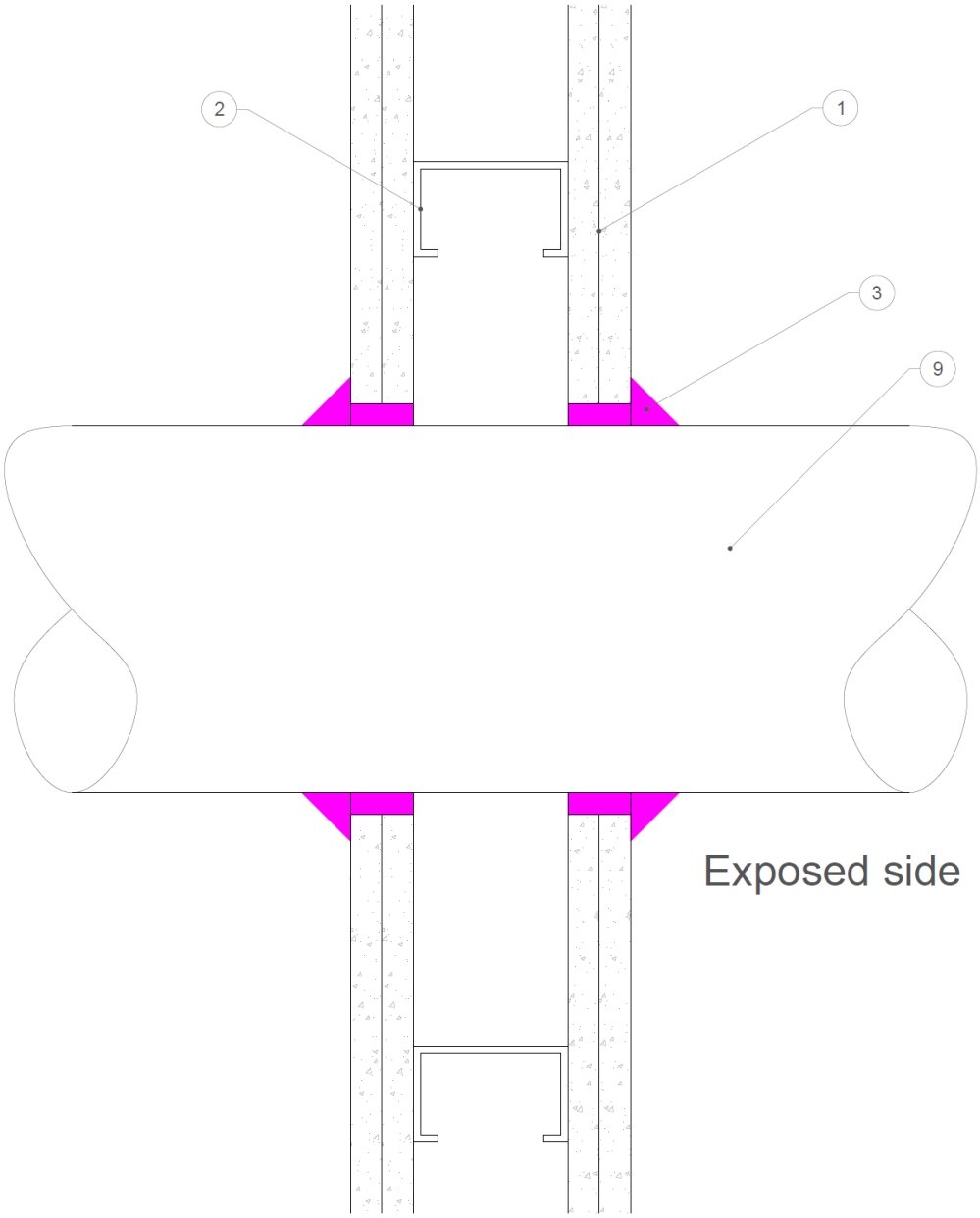


Figure 8 Cross-section penetration system D

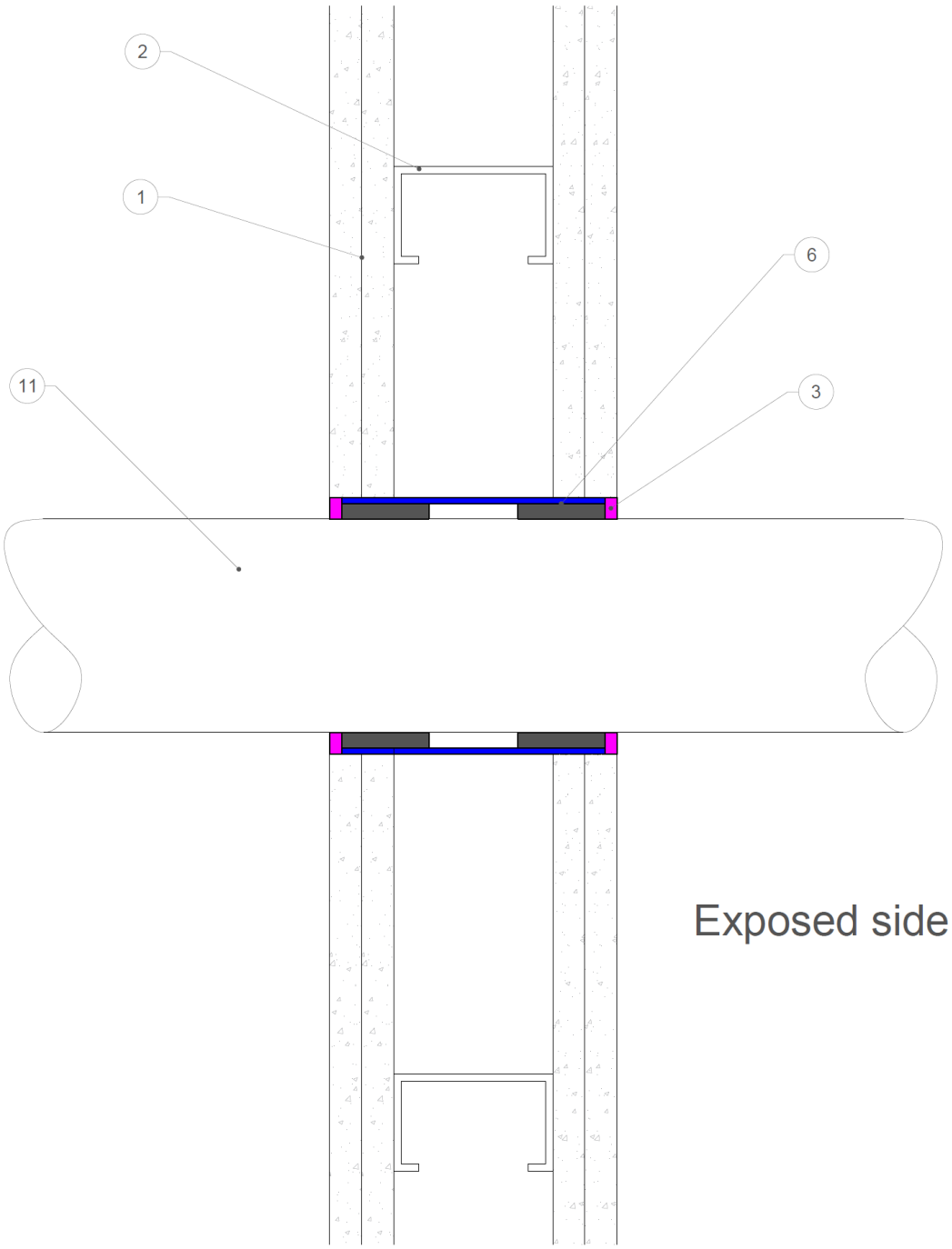


Figure 9 **Cross-section penetration system E**

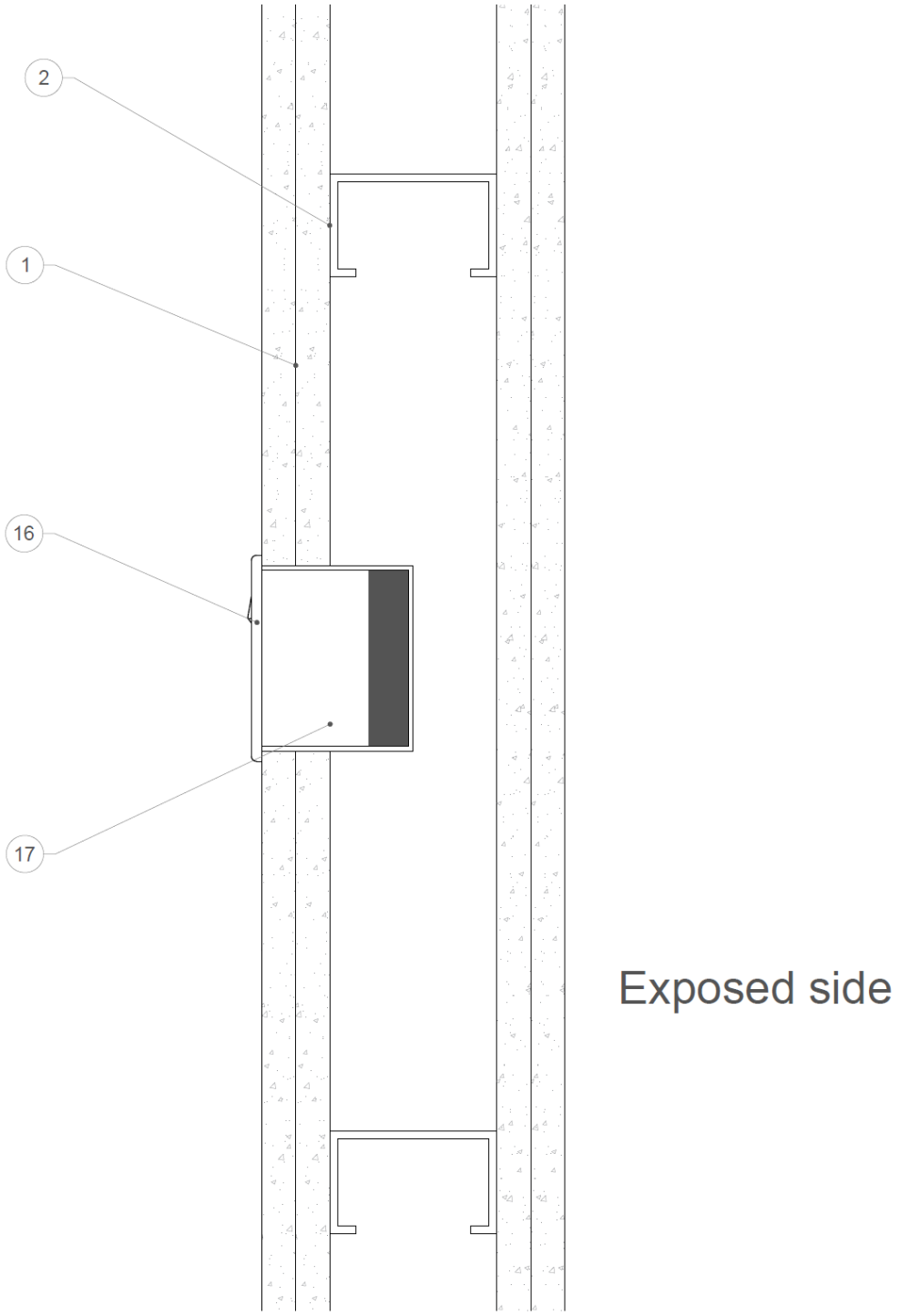


Figure 10 Cross-section penetration system F1

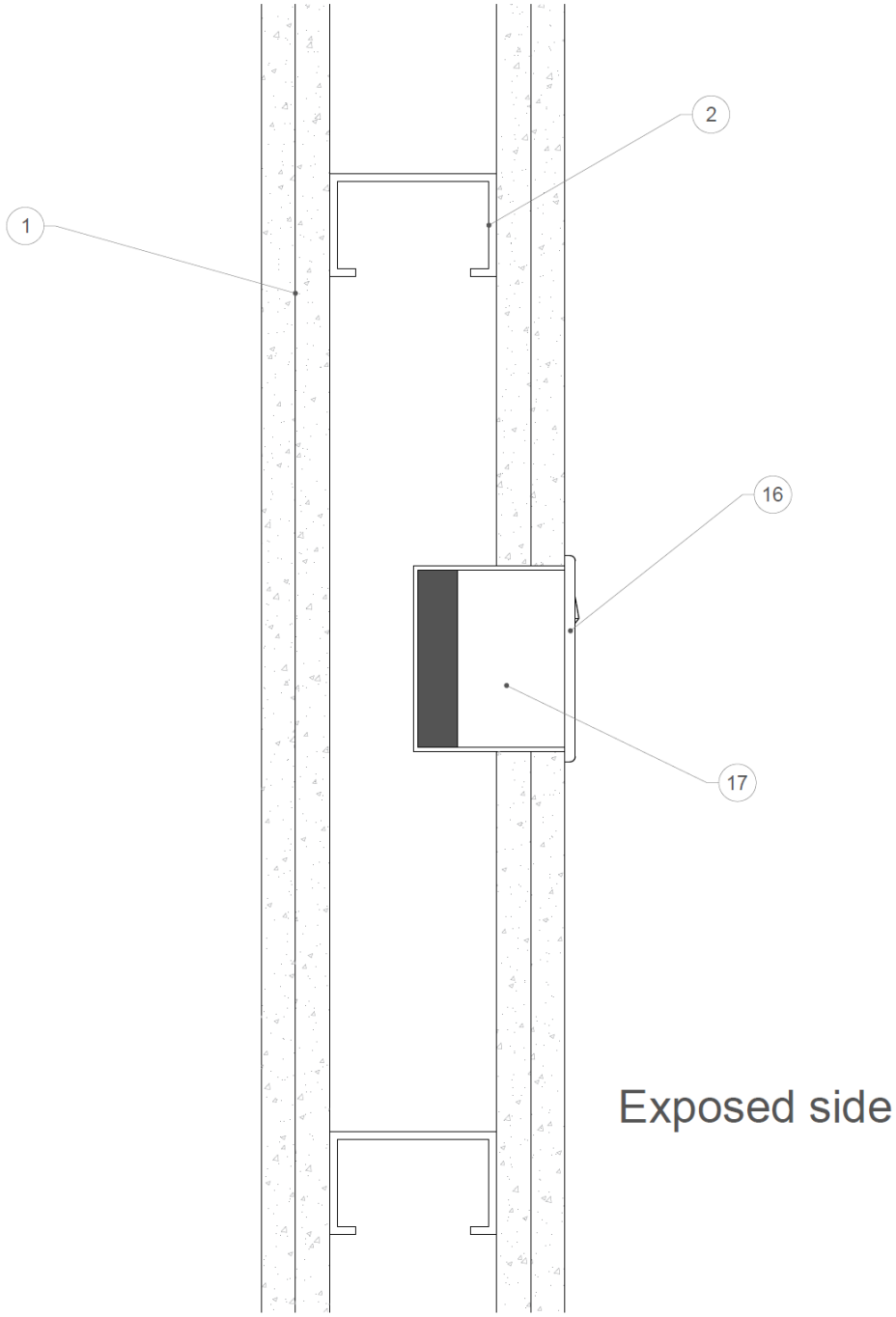


Figure 11 Cross-section penetration system F2

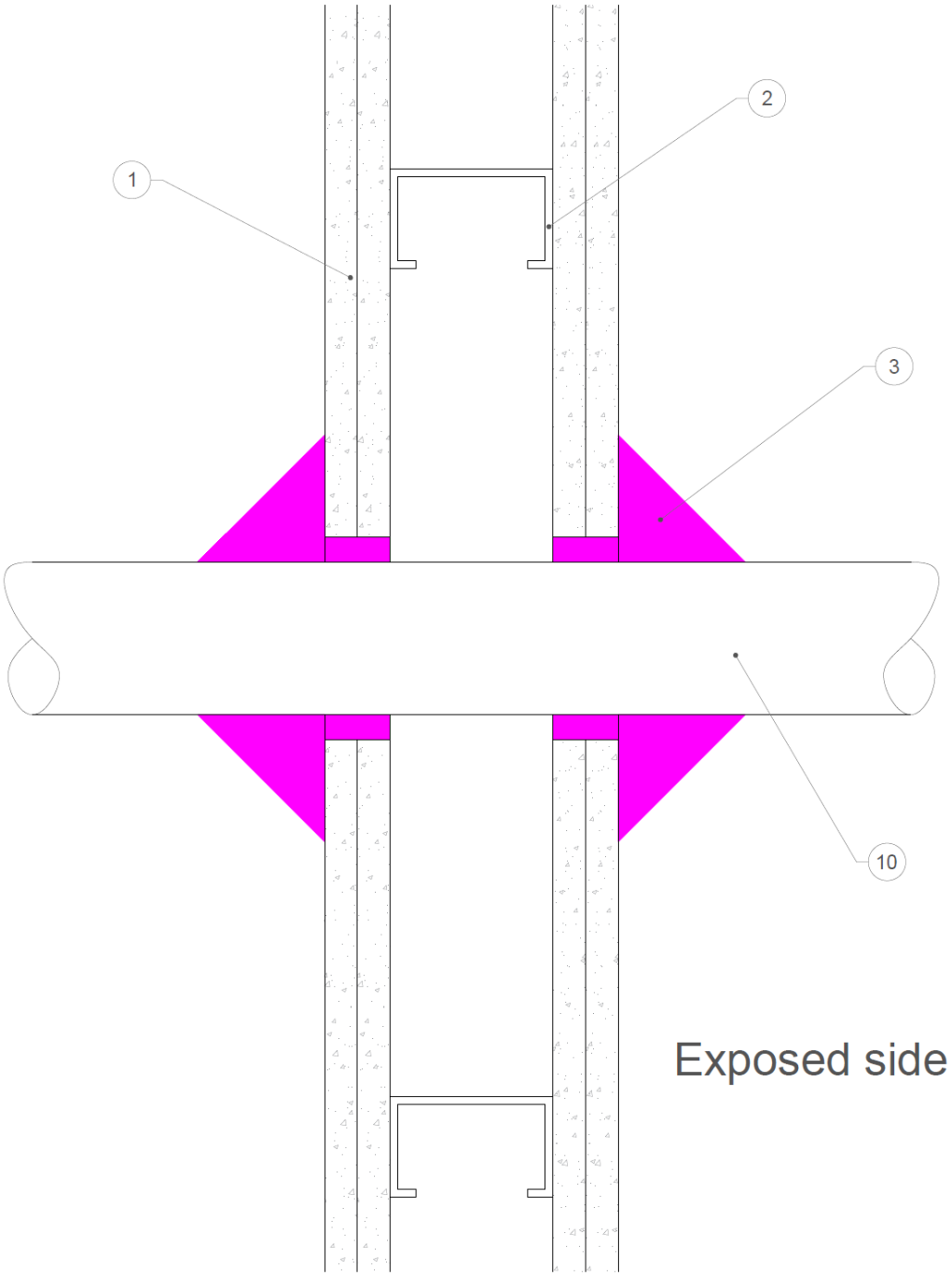


Figure 12 Cross-section penetration system G

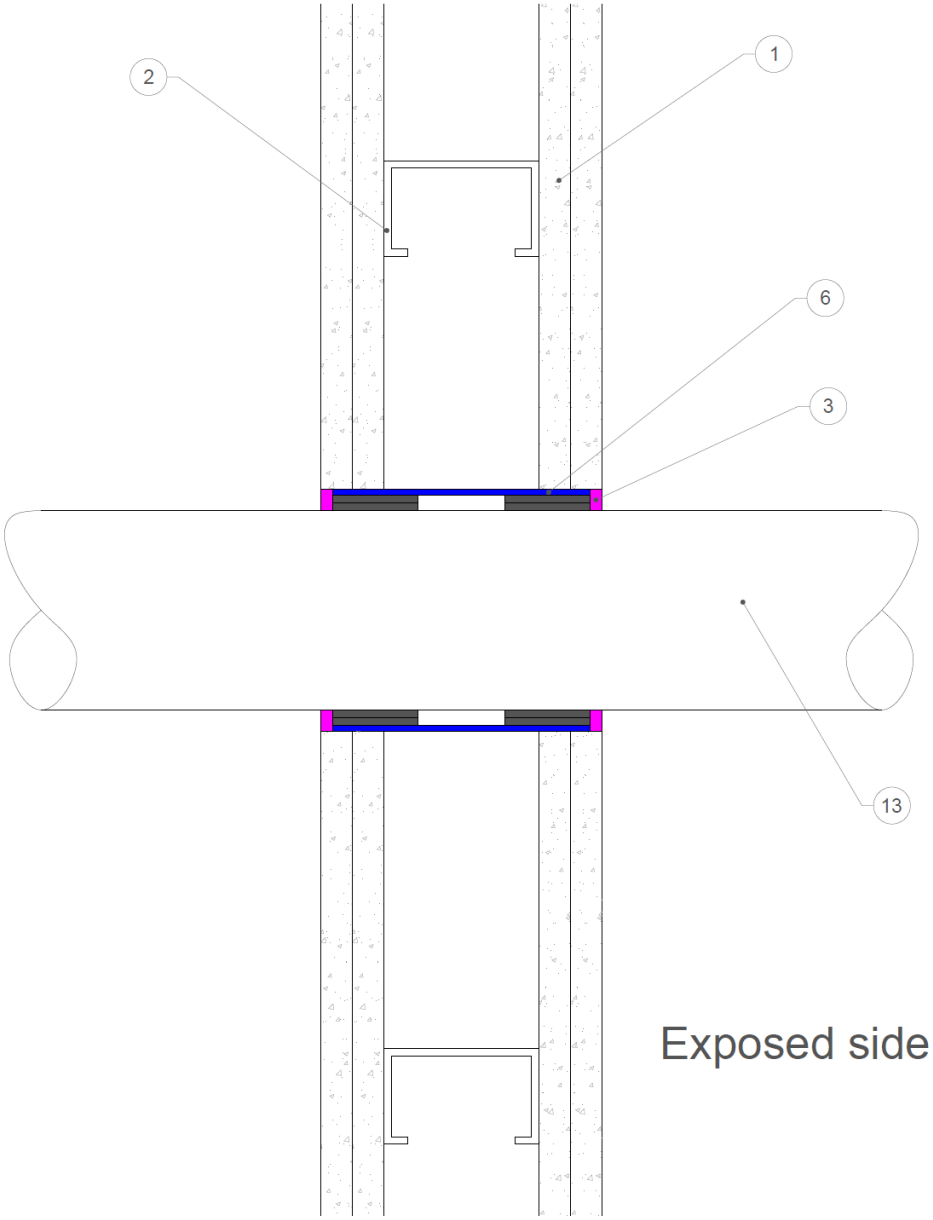


Figure 13 Cross-section penetration system H

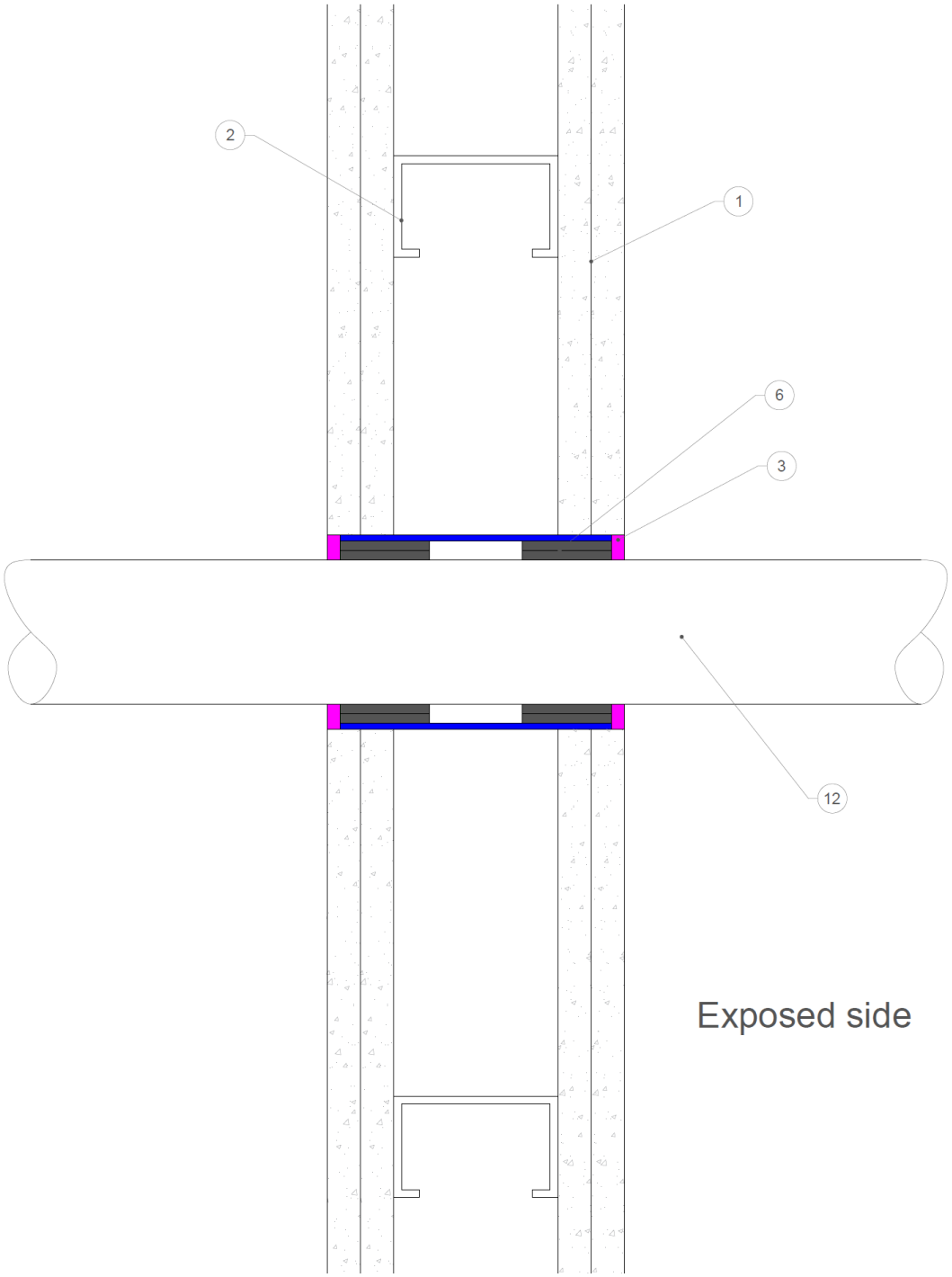


Figure 14 Cross-section penetration system I

Appendix B Test observations

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

Table 9 Test observations

Time		Observation
Min	**Sec**	
Penetration system A		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
01	51	Smoke emitting from the gap between wall and the pipe wrap
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
104	**22**	**A roving thermocouple test was carried out for 90 seconds on the collar body, resulting in a temperature of 206°C. Failure of insulation in accordance with AS 1530.4:2014 Clause 2.13.3(b), where the maximum temperature exceeded the initial temperature by more than 180°C.**
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system B		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system C		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
03	03	Smoke venting from the end of the pipe
03	52	Smoke venting from the end of the pipe
04	27	The pipe was deforming/melting close to the wall system
05	**27**	**A 30 second cotton pad test was carried out at the interface of the wall and pipe resulting in glowing of the cotton pad. Failure of integrity of the specimen in accordance with AS 1530.4:2014, Clause 2.13.2.2, where glowing of the cotton had occurred.**

Time		Observation
Min	Sec	
05	**35**	**TC 033 on the pipe recorded a temperature of 206°C. Failure of insulation in accordance with AS 1530.4:2014 Clause 2.13.3(b), where the maximum temperature of Thermocouple TC 033 had exceeded the initial temperature by more than 206°C.**
121	00	Test stopped at the request of the sponsor.
Penetration system D		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
10	**30**	**TC 045 on the pipe recorded a temperature of 205°C. Failure of insulation in accordance with AS 1530.4:2014 Clause 2.13.3(b), where the maximum temperature of Thermocouple TC 045 had exceeded the initial temperature by more than 205°C.**
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system E		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
04	55	Smoke venting from the end of the pipe
11	57	The pipe was detached from the wall system. Deformation/melting appeared on the pipe where it detached from the wall
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system F1		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
02	12	Smoke emission from the GPO socket and gap between the wall and GPO
04	10	Discoloration appeared on the GPO and the plasterboard
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
53	50	The GPO was partly detached from the wall
56	50	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident

Time		Observation
Min	Sec	
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
69	40	Most of the GPO had detached from the wall.
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
95	00	The GPO had detached from the wall
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system F2		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
119	**45**	**TC 107 on the adjacent plasterboard, 150mm above the wall box recorded a temperature of 204°C.** **Failure of insulation in accordance with AS 1530.4:2014 Clause 2.13.3(b), where the maximum temperature of Thermocouple TC 107 had exceeded the initial temperature by more than 204°C.**
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system G		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system H		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 25°C.
02	43	Smoke venting from the end of the pipe
03	52	Smoke venting from the end of the pipe

Time		Observation
Min	Sec	
04	27	The pipe was deforming/melting close to the wall system
06	**45**	**TC 123 on the pipe recorded a temperature of 210°C. Failure of insulation in accordance with AS 1530.4:2014 Clause 2.13.3(b), where the maximum temperature of Thermocouple TC 123 had exceeded the initial temperature by more than 210°C.**
07	23	The pipe had detached from the wall
08	50	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
10	10	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
22	46	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
121	00	Test stopped at the request of the sponsor.
Penetration system I		
00	00	Fire resistance test started, and the average initial temperature of the specimen was approximately 24°C.
15	13	The expanded intumescent was pushing the pipe out.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
120	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
121	00	Test stopped 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 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.3.5 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.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.

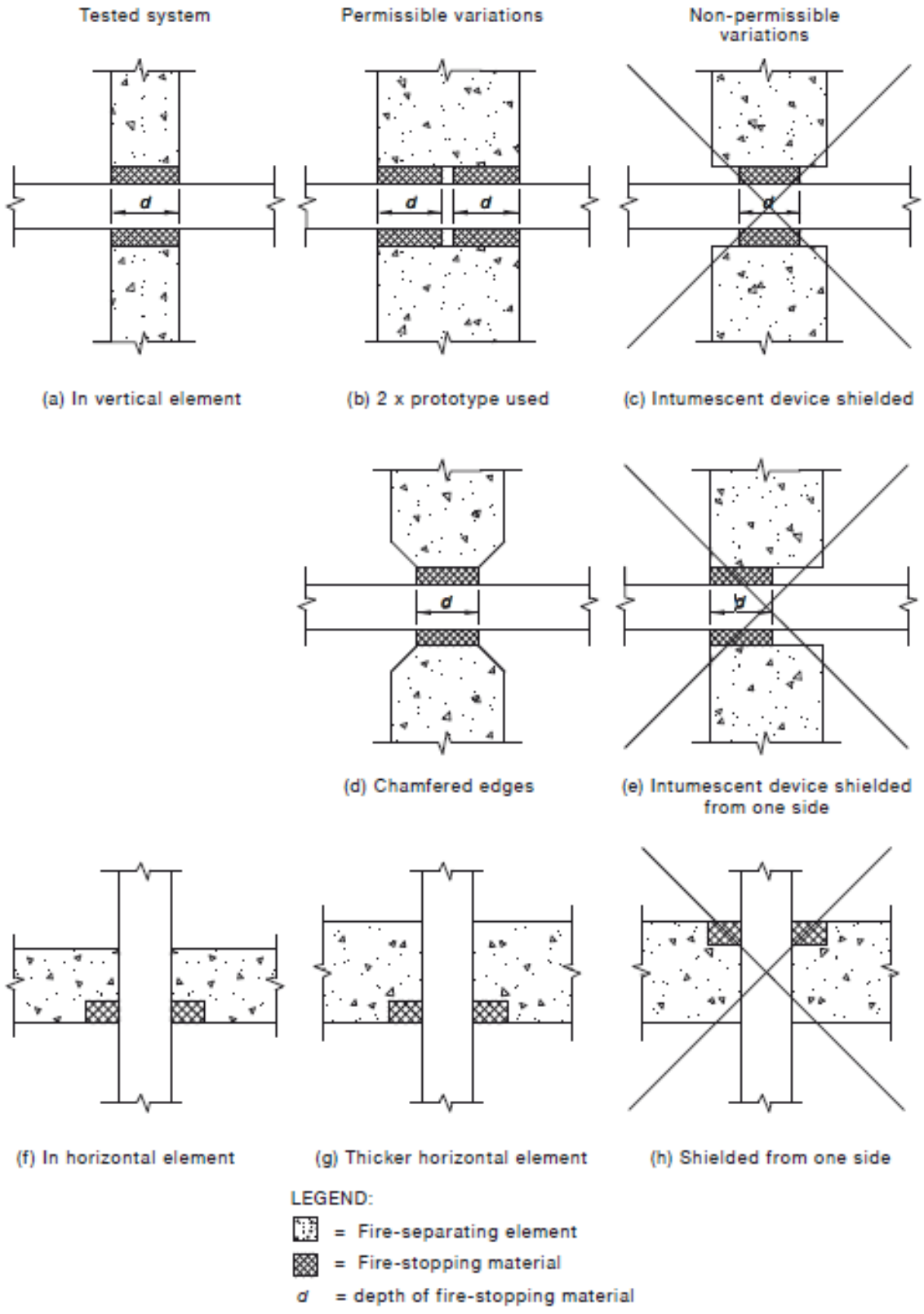
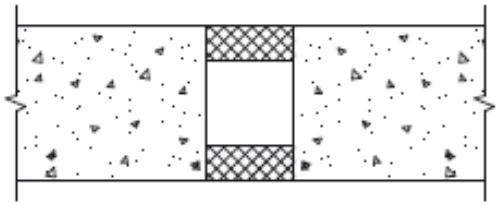
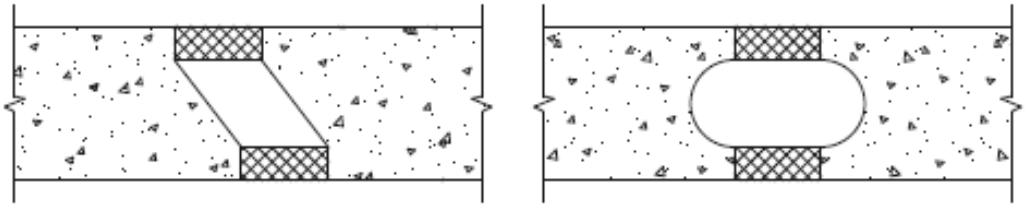


FIGURE 10.12.5.1 EQUIVALENT EXPOSURE OF UPVC PIPE FIRE-STOPPING SYSTEMS



(a) Butt joint



(b) Contoured joints

LEGEND:

= Fire-separating element

= Fire-stopping material

FIGURE 10.12.6 CONTOURED CONTROL JOINTS